



Vera C. Rubin Observatory  
Data Management

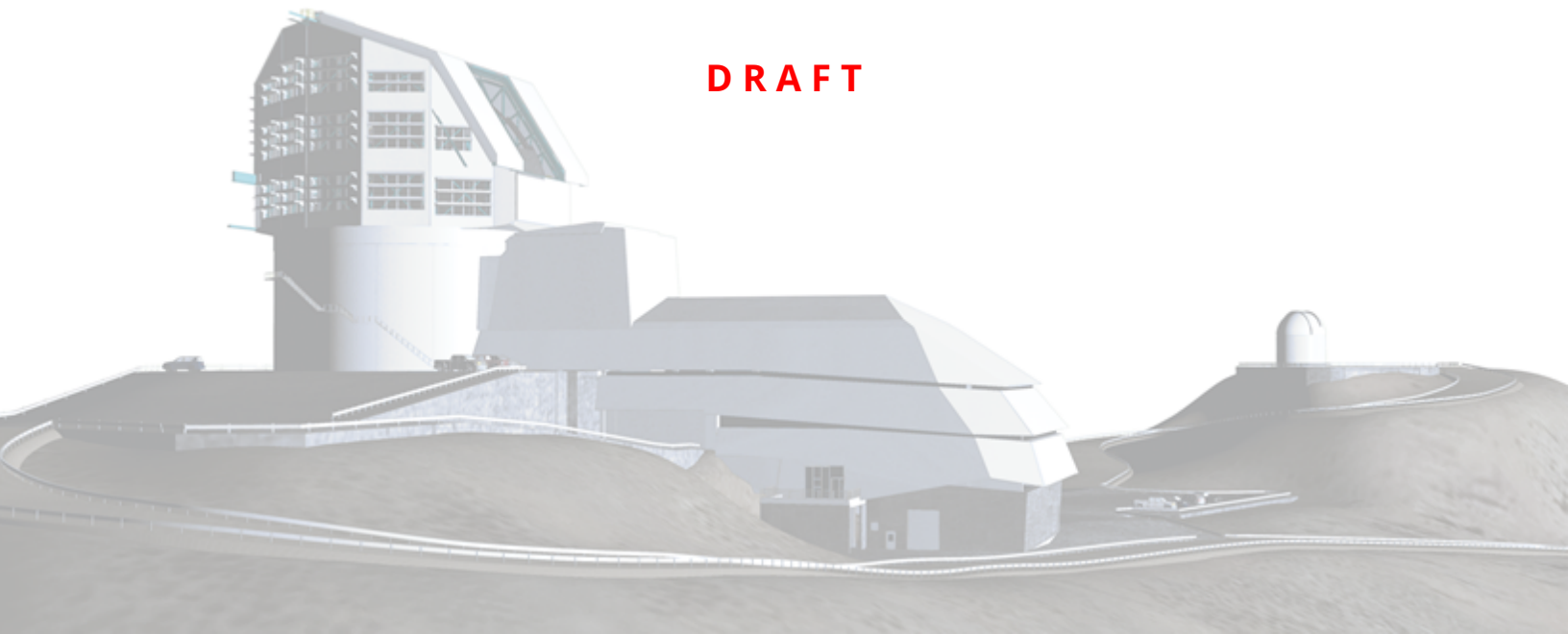
# LVV-P128: LDM-503-19 (All P1a and 1b DM requirements verified) Test Plan and Report

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DMTR-441

Latest Revision: 2026-08-26

**DRAFT**



## Abstract

This is the test plan and report for **LDM-503-19 (All P1a and 1b DM requirements verified)**, an LSST milestone pertaining to the Data Management Subsystem.

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# LVV-P128: LDM-503-19 (All P1a and 1b DM requirements verified) Test Plan and Report

## 1 Introduction

### 1.1 Objectives

This DM acceptance test campaign will verify all DM priority 1a and 1b requirements that have not been verified as part of prior testing and milestones.

### 1.2 System Overview

This test campaign is intended to verify that the DM system satisfies all of the priority 1a and 1b requirements outlined in the Data Management System Requirements (DMSR; LSE-61 ), ensuring that we are progressing toward readiness for LSSTCam on-sky observing. Additional DMSR requirements (priorities 2 and 3) will be verified in later Acceptance Test Campaigns.

#### **Applicable Documents:**

LSE-61: Data Management System (DMS) Requirements

LDM-503 Data Management Test Plan

LDM-639: Data Management Acceptance Test Specification

Tests in this campaign will use data products and artifacts from Data Preview 0.2, which consists of DESC Data Challenge 2 (DC2) simulated data reprocessed using the LSST Science Pipelines, on-sky data from auxTel and LSSTComCam imaging campaigns, precursor data from Subaru+HyperSuprime-Cam (HSC), and camera test-stand data, when appropriate.

### 1.3 Document Overview

This document was generated from Jira, obtaining the relevant information from the LVV-P128 Jira Test Plan and related Test Cycles ( LVV-R155 LVV-R293 ).

Section 1 provides an overview of the test campaign, the system under test (Acceptance), the applicable documentation, and explains how this document is organized. Section 2 provides

additional information about the test plan, like for example the configuration used for this test or related documentation. Section 3 describes the necessary roles and lists the individuals assigned to them.

Section 4 provides a summary of the test results, including an overview in Table 2, an overall assessment statement and suggestions for possible improvements. Section 5 provides detailed results for each step in each test case.

The current status of test plan LVV-P128 in Jira is **Approved**.

## 1.4 References

- [1] **[DMTN-140]**, Comoretto, G., 2021, *Documentation Automation for the Verification and Validation of Rubin Observatory Software*, Data Management Technical Note DMTN-140, NSF-DOE Vera C. Rubin Observatory, URL <https://dmtn-140.lsst.io/>
- [2] **[DMTN-178]**, Comoretto, G., 2021, *Docsteady Usecases for Rubin Observatory Constructions*, Data Management Technical Note DMTN-178, NSF-DOE Vera C. Rubin Observatory, URL <https://dmtn-178.lsst.io/>
- [3] **[LSE-61]**, Dubois-Felsmann, G., Jenness, T., 2019, *Data Management System (DMS) Requirements*, Systems Engineering Controlled Document LSE-61, NSF-DOE Vera C. Rubin Observatory, URL <https://lse-61.lsst.io/>, doi:10.71929/rubin/2587200
- [4] **[LDM-554]**, Dubois-Felsmann, G., Ciardi, D., Mueller, F., Economou, F., 2019, *Data Management LSST Science Platform Requirements*, Data Management Controlled Document LDM-554, NSF-DOE Vera C. Rubin Observatory, URL <https://ldm-554.lsst.io/>
- [5] **[LDM-639]**, Guy, L., Wood-Vasey, W., Bellm, E., et al., 2022, *LSST Data Management Acceptance Test Specification*, Data Management Controlled Document LDM-639, NSF-DOE Vera C. Rubin Observatory, URL <https://ldm-639.lsst.io/>
- [6] **[LSE-131]**, Jacoby, S., Emmons, B., Selvy, B., 2017, *Interface between Data Management and Education and Public Outreach*, Systems Engineering Controlled Document LSE-131, NSF-DOE Vera C. Rubin Observatory, URL <https://ls.st/LSE-131>

- [7] **[LDM-142]**, Kantor, J., 2017, *Network Sizing Model*, Data Management Controlled Document LDM-142, NSF-DOE Vera C. Rubin Observatory, URL <https://ls.st/LDM-142>
- [8] **[LDM-503]**, O'Mullane, W., Swinbank, J., Juric, M., et al., 2023, *Data Management Test Plan*, Data Management Controlled Document LDM-503, NSF-DOE Vera C. Rubin Observatory, URL <https://ldm-503.lsst.io/>
- [9] **[LSE-160]**, Selvy, B., 2013, *Verification and Validation Process*, Systems Engineering Controlled Document LSE-160, NSF-DOE Vera C. Rubin Observatory, URL <https://ls.st/LSE-160>

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## 2 Test Plan Details

### 2.1 Data Collection

Observing is not required for this test campaign.

### 2.2 Verification Environment

Most testing will be performed using the Rubin Science Platform (RSP) and the development cluster at the USDF. All tests will use the most recent available version of the Pipelines.

### 2.3 Entry Criteria

None

### 2.4 Exit Criteria

None

### 2.5 Related Documentation

Docushare collection where additional relevant documentation can be found:

- None

### 2.6 PMCS Activity

Primavera milestones related to the test campaign: None

### 3 Personnel

The personnel involved in the test campaign is shown in the following table.

| T. Plan LVV-P128 owner:  |                    | <b>Jeffrey Carlin</b> |                                                                                                    |
|--------------------------|--------------------|-----------------------|----------------------------------------------------------------------------------------------------|
| T. Cycle LVV-R155 owner: |                    | <b>Leanne Guy</b>     |                                                                                                    |
| <b>Test Cases</b>        | <b>Assigned to</b> | <b>Executed by</b>    | <b>Additional Test Personnel</b>                                                                   |
| LVV-T195                 | Jeffrey Kantor     | Cristián Silva        | Josh Hoblitt (Rubin Obs), Renata Frez (FIU/AmLight), Matt Kollross (NCSA)                          |
| LVV-T189                 | Robert Gruendl     | Cristián Silva        |                                                                                                    |
| LVV-T187                 | Jeffrey Kantor     | Cristián Silva        | Ron Lambert (LSST)                                                                                 |
| LVV-T203                 | Kian-Tat Lim       | Cristián Silva        | Ron Lambert (LSST), Albert Astudillo (REUNA), Jeronimo Bezerra (FIU/AmLight), Matt Kollross (NCSA) |
| LVV-T181                 | Cristián Silva     | Cristián Silva        | Heinrich Reinking (LSST), another LSST DM Person at Summit, Headquarters, or LDF                   |
| LVV-T1612                | Jeffrey Kantor     | Cristián Silva        | Ron Lambert (LSST), Greg Thayer (SLAC)                                                             |
| T. Cycle LVV-R293 owner: |                    | <b>Jeffrey Carlin</b> |                                                                                                    |
| <b>Test Cases</b>        | <b>Assigned to</b> | <b>Executed by</b>    | <b>Additional Test Personnel</b>                                                                   |
| LVV-T2329                | Leanne Guy         | William O'Mullane     |                                                                                                    |
| LVV-T1561                | Jeffrey Carlin     | Undefined             |                                                                                                    |
| LVV-T1560                | Jeffrey Carlin     | Undefined             |                                                                                                    |
| LVV-T1528                | Jeffrey Carlin     | Jeffrey Carlin        |                                                                                                    |
| LVV-T385                 | Leanne Guy         | Leanne Guy            |                                                                                                    |
| LVV-T2901                | Leanne Guy         | Undefined             |                                                                                                    |
| LVV-T2900                | Leanne Guy         | Leanne Guy            |                                                                                                    |
| LVV-T168                 | Jeffrey Carlin     | William O'Mullane     |                                                                                                    |
| LVV-T2177                | Jeffrey Carlin     | Jeffrey Carlin        |                                                                                                    |
| LVV-T1755                | Jeffrey Carlin     | Jeffrey Carlin        |                                                                                                    |
| LVV-T2176                | Jeffrey Carlin     | Jeffrey Carlin        |                                                                                                    |
| LVV-T1754                | Jeffrey Carlin     | Jeffrey Carlin        |                                                                                                    |
| LVV-T376                 | Jeffrey Carlin     | Jeffrey Carlin        |                                                                                                    |
| LVV-T2724                | Leanne Guy         | Jeffrey Carlin        |                                                                                                    |
| LVV-T2899                | Leanne Guy         | Undefined             |                                                                                                    |
| LVV-T2700                | Leanne Guy         | Jeffrey Carlin        |                                                                                                    |
| LVV-T27                  | Jeffrey Carlin     | Undefined             |                                                                                                    |

|          |                |                   |                                                                                                     |
|----------|----------------|-------------------|-----------------------------------------------------------------------------------------------------|
| LVV-T159 | Simon Krughoff | Undefined         |                                                                                                     |
| LVV-T26  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T24  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T58  | Eric Bellm     | Undefined         |                                                                                                     |
| LVV-T180 | Leanne Guy     | William O'Mullane |                                                                                                     |
| LVV-T179 | Leanne Guy     | William O'Mullane |                                                                                                     |
| LVV-T155 | Robert Gruendl | Undefined         |                                                                                                     |
| LVV-T124 | Jeffrey Carlin | William O'Mullane |                                                                                                     |
| LVV-T147 | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T138 | Leanne Guy     | Leanne Guy        |                                                                                                     |
| LVV-T99  | Jeffrey Carlin | Undefined         |                                                                                                     |
| LVV-T96  | Jeffrey Carlin | Undefined         |                                                                                                     |
| LVV-T107 | Eric Bellm     | Undefined         |                                                                                                     |
| LVV-T75  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T74  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T73  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T69  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T67  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T54  | Eric Bellm     | Leanne Guy        |                                                                                                     |
| LVV-T52  | Eric Bellm     | Undefined         |                                                                                                     |
| LVV-T51  | Eric Bellm     | Undefined         |                                                                                                     |
| LVV-T49  | Eric Bellm     | Jeffrey Carlin    |                                                                                                     |
| LVV-T65  | Jeffrey Carlin | Jeffrey Carlin    |                                                                                                     |
| LVV-T211 | Kian-Tat Lim   | Kevin Siruno      |                                                                                                     |
| LVV-T210 | Leanne Guy     | Undefined         |                                                                                                     |
| LVV-T209 | Leanne Guy     | William O'Mullane |                                                                                                     |
| LVV-T202 | Leanne Guy     | Cristián Silva    | Ron Lambert (LSST), Albert Astudillo (REUNA), Jeronimo Bezerra (FIU/Am-Light), Matt Kollross (NCSA) |
| LVV-T201 | Leanne Guy     | Cristián Silva    | Ron Lambert (LSST), Albert Astudillo (REUNA), Jeronimo Bezerra (FIU/Am-Light), Matt Kollross (NCSA) |
| LVV-T200 | Leanne Guy     | Cristián Silva    | Ron Lambert (LSST), Albert Astudillo (REUNA), Jeronimo Bezerra (FIU/Am-Light), Matt Kollross (NCSA) |
| LVV-T196 | Jeffrey Kantor | Cristián Silva    | Josh Hoblitt (Rubin Obs), Renata Frez (FIU/AmLight), Matt Kollross (NCSA)                           |

|           |                   |                   |                                                                           |
|-----------|-------------------|-------------------|---------------------------------------------------------------------------|
| LVV-T194  | Jeffrey Kantor    | Cristián Silva    | Josh Hoblitt (Rubin Obs), Renata Frez (FIU/AmLight), Matt Kollross (NCSA) |
| LVV-T193  | Jeffrey Kantor    | Cristián Silva    | Josh Hoblitt (Rubin Obs), Renata Frez (FIU/AmLight), Matt Kollross (NCSA) |
| LVV-T188  | Jeffrey Kantor    | Cristián Silva    | Jeff Kantor (LSST)                                                        |
| LVV-T186  | Jeffrey Kantor    | Cristián Silva    | Ron Lambert (LSST), Guido Maulen (LSST)                                   |
| LVV-T185  | Jeffrey Kantor    | Cristián Silva    | Ron Lambert (LSST)                                                        |
| LVV-T182  | Leanne Guy        | William O'Mullane |                                                                           |
| LVV-T177  | Leanne Guy        | William O'Mullane |                                                                           |
| LVV-T176  | Robert Gruendl    | Jeffrey Carlin    |                                                                           |
| LVV-T175  | Robert Gruendl    | Cristián Silva    |                                                                           |
| LVV-T174  | Leanne Guy        | Jeffrey Carlin    |                                                                           |
| LVV-T173  | Leanne Guy        | Jeffrey Carlin    |                                                                           |
| LVV-T172  | William O'Mullane | William O'Mullane |                                                                           |
| LVV-T131  | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T64   | Jeffrey Carlin    | Jeffrey Carlin    |                                                                           |
| LVV-T63   | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T105  | Leanne Guy        | Undefined         |                                                                           |
| LVV-T46   | Leanne Guy        | Undefined         |                                                                           |
| LVV-T104  | Leanne Guy        | Undefined         |                                                                           |
| LVV-T150  | Jeffrey Carlin    | Jeffrey Carlin    |                                                                           |
| LVV-T37   | Jeffrey Carlin    | Jeffrey Carlin    |                                                                           |
| LVV-T134  | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T86   | Jeffrey Carlin    | Jeffrey Carlin    |                                                                           |
| LVV-T130  | Jeffrey Carlin    | Jeffrey Carlin    |                                                                           |
| LVV-T128  | Jeffrey Carlin    | Jeffrey Carlin    |                                                                           |
| LVV-T171  | Leanne Guy        | Undefined         |                                                                           |
| LVV-T101  | Kian-Tat Lim      | Jeffrey Carlin    |                                                                           |
| LVV-T3100 | Leanne Guy        | Undefined         |                                                                           |
| LVV-T3098 | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T3097 | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T3096 | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T3095 | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T3094 | Leanne Guy        | Undefined         |                                                                           |
| LVV-T60   | Leanne Guy        | Leanne Guy        |                                                                           |
| LVV-T3170 | Jeffrey Carlin    | Undefined         |                                                                           |
| LVV-T3171 | Jeffrey Carlin    | Undefined         |                                                                           |

|           |                |                |
|-----------|----------------|----------------|
| LVV-T198  | Leanne Guy     | Leanne Guy     |
| LVV-T154  | Colin Slater   | Jeffrey Carlin |
| LVV-T1846 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T1842 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T1839 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T1837 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T2202 | Leanne Guy     | Jeffrey Carlin |
| LVV-T1831 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T1844 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T1845 | Jeffrey Carlin | Jeffrey Carlin |
| LVV-T3177 | Jeffrey Carlin | Jeffrey Carlin |

## 4 Test Campaign Overview

### 4.1 Summary

| T. Plan LVV-P128:  |           | LDM-503-19 (All P1a and 1b DM requirements verified) |         |  | Approved    |
|--------------------|-----------|------------------------------------------------------|---------|--|-------------|
| T. Cycle LVV-R155: |           | Network Acceptance Test Campaign 1                   |         |  | Done        |
| Test Cases         | Ver.      | Status                                               | Comment |  | Issues      |
| LVV-T195           |           |                                                      |         |  |             |
| Execution          | LVV-E1104 | Pass                                                 | None    |  |             |
| LVV-T189           |           |                                                      |         |  |             |
| Execution          | LVV-E3138 | Pass                                                 | None    |  |             |
| LVV-T187           |           |                                                      |         |  |             |
| Execution          | LVV-E3143 | Pass                                                 | None    |  |             |
| LVV-T203           |           |                                                      |         |  |             |
| Execution          | LVV-E3144 | Pass                                                 | None    |  |             |
| LVV-T181           |           |                                                      |         |  |             |
| Execution          | LVV-E3145 | Pass                                                 | None    |  |             |
| LVV-T1612          |           |                                                      |         |  |             |
| Execution          | LVV-E3146 | Pass                                                 | None    |  |             |
| T. Cycle LVV-R293: |           | LDM-503-19 (All P1a and 1b DM requirements verified) |         |  | In Progress |
| Test Cases         | Ver.      | Status                                               | Comment |  | Issues      |
| LVV-T2329          |           |                                                      |         |  |             |
| Execution          | LVV-E3756 | In Progress                                          | None    |  |             |
| LVV-T1561          |           |                                                      |         |  |             |
| Execution          | LVV-E3760 | Not Executed                                         | None    |  |             |
| LVV-T1560          |           |                                                      |         |  |             |
| Execution          | LVV-E3761 | Not Executed                                         | None    |  |             |
| LVV-T1528          |           |                                                      |         |  |             |
| Execution          | LVV-E3762 | Pass                                                 | None    |  |             |
| LVV-T385           |           |                                                      |         |  |             |
| Execution          | LVV-E3767 | Pass                                                 | None    |  |             |
| LVV-T2901          |           |                                                      |         |  |             |
| Execution          | LVV-E3768 | Not Executed                                         | None    |  |             |
| LVV-T2900          |           |                                                      |         |  |             |
| Execution          | LVV-E3769 | In Progress                                          | None    |  |             |
| LVV-T168           |           |                                                      |         |  |             |
| Execution          | LVV-E3770 | Pass                                                 | None    |  |             |
| LVV-T2177          |           |                                                      |         |  |             |

|           |           |              |                                                                                                                                                                                                                                                        |  |
|-----------|-----------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Execution | LVV-E3771 | Pass         | Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w_2025_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test_LVV-T376_T2176_T2177.ipynb. |  |
| LVV-T1755 |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3772 | Pass         | Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w_2025_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test_LVV-T1755.ipynb.            |  |
| LVV-T2176 |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3773 | Pass         | Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w_2025_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test_LVV-T376_T2176_T2177.ipynb. |  |
| LVV-T1754 |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3774 | Pass         | Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w_2025_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test_LVV-T1754.ipynb.            |  |
| LVV-T376  |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3775 | Pass         | Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w_2025_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test_LVV-T376_T2176_T2177.ipynb. |  |
| LVV-T2724 |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3781 | Pass         | None                                                                                                                                                                                                                                                   |  |
| LVV-T2899 |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3782 | Not Executed | None                                                                                                                                                                                                                                                   |  |
| LVV-T2700 |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3785 | Pass         | None                                                                                                                                                                                                                                                   |  |
| LVV-T27   |           |              |                                                                                                                                                                                                                                                        |  |
| Execution | LVV-E3787 | Not Executed | None                                                                                                                                                                                                                                                   |  |
| LVV-T159  |           |              |                                                                                                                                                                                                                                                        |  |

|           |           |              |                                                                                                                                                                                                |
|-----------|-----------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Execution | LVV-E3790 | Not Executed | None                                                                                                                                                                                           |
| LVV-T26   |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3791 | Pass         | Executed at the USDF using the DP1 Qserv database accessed via the TAP service. The notebook containing detailed tests is attached to this document's github repository as test_LVV-T26.ipynb. |
| LVV-T24   |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3792 | Pass         | Executed at the USDF using the DP1 Qserv database accessed via the TAP service. The notebook containing detailed tests is attached to this document's github repository as test_LVV-T24.ipynb. |
| LVV-T58   |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3794 | Not Executed | None                                                                                                                                                                                           |
| LVV-T180  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3797 | Pass         | None                                                                                                                                                                                           |
| LVV-T179  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3798 | Pass         | None                                                                                                                                                                                           |
| LVV-T155  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3802 | Not Executed | None                                                                                                                                                                                           |
| LVV-T124  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3803 | Pass         | None                                                                                                                                                                                           |
| LVV-T147  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3804 | Pass         | None                                                                                                                                                                                           |
| LVV-T138  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3805 | Pass         | Transfers to IDACs via Rucio                                                                                                                                                                   |
| LVV-T99   |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3806 | Not Executed | None                                                                                                                                                                                           |
| LVV-T96   |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3807 | Not Executed | None                                                                                                                                                                                           |
| LVV-T107  |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3810 | Not Executed | None                                                                                                                                                                                           |
| LVV-T75   |           |              |                                                                                                                                                                                                |
| Execution | LVV-E3812 | Pass         | This requirement is verified by inspection, as the multi-band coadds are not part of typical DRP processing, and are not persisted.                                                            |
| LVV-T74   |           |              |                                                                                                                                                                                                |

|           |           |              |                                                                                                                                                                                                       |  |
|-----------|-----------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Execution | LVV-E3813 | Pass         | Test executed on the RSP at USDF using pipelines version w_2025_33. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T73.ipynb."  |  |
| LVV-T73   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3814 | Pass         | Test executed on the RSP at USDF using pipelines version w_2025_33. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T73.ipynb."  |  |
| LVV-T69   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3815 | Initial Pass | Test executed at the USDF using commissioning data processed with pipelines version 'w_2025_49'. The notebook corresponding to this test is attached to the document repo as "test_LVV-T69.ipynb".    |  |
| LVV-T67   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3816 | Pass         | Test executed at the USDF using pipelines version 'w_2026_02'. The associated notebook from this test is attached to the report repository as "test_LVV-T67.ipynb".                                   |  |
| LVV-T54   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3817 | Pass         | None                                                                                                                                                                                                  |  |
| LVV-T52   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3818 | Not Executed | None                                                                                                                                                                                                  |  |
| LVV-T51   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3821 | Not Executed | None                                                                                                                                                                                                  |  |
| LVV-T49   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3822 | Pass         | Test executed on the RSP at USDF, using pipelines version w_2025_50. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T49.ipynb." |  |
| LVV-T65   |           |              |                                                                                                                                                                                                       |  |
| Execution | LVV-E3823 | Pass         | Test executed on the RSP at USDF, using pipelines version w_2025_33. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T65.ipynb." |  |
| LVV-T211  |           |              |                                                                                                                                                                                                       |  |

|           |           |              |                                                                                                                                                                                                                                                |
|-----------|-----------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Execution | LVV-E3824 | Pass         | Setting this test case as a Pass as the Data Access Centers have long since been established and in use since this test case was first defined. To demonstrate the "success" of this test case, I will attach relevant verification artifacts. |
| LVV-T210  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3825 | Not Executed | None                                                                                                                                                                                                                                           |
| LVV-T209  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3826 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T202  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3828 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T201  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3829 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T200  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3830 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T196  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3831 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T194  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3833 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T193  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3834 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T188  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3835 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T186  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3837 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T185  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3838 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T182  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3839 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T177  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3840 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T176  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3841 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T175  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3842 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T174  |           |              |                                                                                                                                                                                                                                                |
| Execution | LVV-E3843 | Pass         | None                                                                                                                                                                                                                                           |
| LVV-T173  |           |              |                                                                                                                                                                                                                                                |

|           |           |              |                                                                                                                                                                                                                                                               |
|-----------|-----------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Execution | LVV-E3844 | Pass         | None                                                                                                                                                                                                                                                          |
| LVV-T172  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3845 | Pass         | None                                                                                                                                                                                                                                                          |
| LVV-T131  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3846 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T64   |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3848 | Pass         | Executed at the USDF using pipelines version 'w_2026_13'. The script that was executed for this test, and its output log, are attached to this document's repo as "test_LVV-T64.py" and "test_LVV-T64.log".                                                   |
| LVV-T63   |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3849 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T105  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3850 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T46   |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3851 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T104  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3852 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T150  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3854 | Pass         | None                                                                                                                                                                                                                                                          |
| LVV-T37   |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3855 | Pass         | Test executed with pipelines version w_2025_41, examining data products from w_2025_30 processing of LSST-Cam on-sky data. The related notebook demonstrating the detailed verification is attached to this report's github repository as test_LVV-T37.ipynb. |
| LVV-T134  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3856 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T86   |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3858 | Pass         | None                                                                                                                                                                                                                                                          |
| LVV-T130  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3859 | Pass         | None                                                                                                                                                                                                                                                          |
| LVV-T128  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3860 | Initial Pass | Test executed at the USDF with pipelines version 'w_2025_50'. The notebook is attached to this report's github repo as "test_LVV-T128.ipynb".                                                                                                                 |
| LVV-T171  |           |              |                                                                                                                                                                                                                                                               |
| Execution | LVV-E3863 | Not Executed | None                                                                                                                                                                                                                                                          |
| LVV-T101  |           |              |                                                                                                                                                                                                                                                               |

|           |           |              |                                                                                                                                                                                                                                                                                                                            |
|-----------|-----------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Execution | LVV-E3868 | Pass         | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3100 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3872 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3098 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3874 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3097 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3875 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3096 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3876 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3095 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3877 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3094 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3878 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T60   |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E3994 | Pass         | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3170 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4047 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T3171 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4048 | Not Executed | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T198  |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4052 | Pass         | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T154  |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4053 | Pass         | None                                                                                                                                                                                                                                                                                                                       |
| LVV-T1846 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4057 | Pass         | Test performed using DRP processing of LSSTComCam data from Data Preview 1. This was necessary because there are not yet any LSSTCam observations containing absolute flux standards in all passbands. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1846.ipynb. |
| LVV-T1842 |           |              |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4058 | Pass         | Test performed using pipelines version w_2025_38 and the DRP processing of Science Validation data with pipelines version w_2025_37. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1842_T2202.ipynb.                                                             |
| LVV-T1839 |           |              |                                                                                                                                                                                                                                                                                                                            |

|           |           |      |                                                                                                                                                                                                                                                                                                                            |
|-----------|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Execution | LVV-E4059 | Pass | Test performed using pipelines version w_2025_38 and the DRP processing of Science Validation data with pipelines version w_2025_37. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1839.ipynb.                                                                   |
| LVV-T1837 |           |      |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4060 | Pass | Test performed using DRP processing of LSSTComCam data from Data Preview 1. This was necessary because there are not yet any LSSTCam observations containing absolute flux standards in all passbands. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1837.ipynb. |
| LVV-T2202 |           |      |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4061 | Pass | Test performed using pipelines version w_2025_38 and the DRP processing of Science Validation data with pipelines version w_2025_37. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1842_T2202.ipynb.                                                             |
| LVV-T1831 |           |      |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4062 | Pass | Verified via inspection of the "Nightly Digest", using a recent night of LSSTCam on-sky observing taken during the Science Validation surveys in commissioning.<br><br>Note that the Nightly Digest is in active development, and will thus improve and evolve over the near future.                                       |
| LVV-T1844 |           |      |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4068 | Pass | Test performed using pipelines version w_2025_38 and the DRP processing of Science Validation data with pipelines version w_2025_37. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1844.ipynb.                                                                   |
| LVV-T1845 |           |      |                                                                                                                                                                                                                                                                                                                            |
| Execution | LVV-E4069 | Pass | Test performed using DRP processing of LSSTComCam data from Data Preview 1. This was necessary because there are not yet any LSSTCam observations containing absolute flux standards in all passbands. The notebook where calculations were performed is attached to this Report's git repository as test_LVV-T1845.ipynb. |
| LVV-T3177 |           |      |                                                                                                                                                                                                                                                                                                                            |

Execution LVV-E4070 Pass

Results are in the notebook "test\_LVV-T3177.ipynb" attached to this test repository.

---

Table 2: Test Campaign Summary

## 4.2 Overall Assessment

None

## 4.3 Recommended Improvements

None

Draft

## 5 Detailed Test Results

### 5.1 Test Cycle LVV-R155

Open test cycle *Network Acceptance Test Campaign 1* in Jira.

Test Cycle name: Network Acceptance Test Campaign 1

Status: Done

This test cycle includes the list of test cases required to verify the network infrastructure without encryption

#### 5.1.1 Software Version/Baseline

Not provided.

#### 5.1.2 Configuration

Not provided.

#### 5.1.3 Test Cases in LVV-R155 Test Cycle

##### 5.1.3.1 LVV-T195 - Verify implementation of Base to Archive Network Reliability

Version **1.0(d)**. Status **Approved**. Open *LVV-T195* test case in Jira.

Verify Base to Archive Network Reliability by demonstrating that the network can recover from outages within  $\text{baseToArchNetMTTR} = 48[\text{hour}]$ .

#### Preconditions:

1. Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with

simulated or pre-cursor data, running on end node computers that are the production hardware or equivalent to it.

2. Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network, running on end node computers that are the production hardware or equivalent to it.
3. At least 6 months of monitoring data for this link is available.
4. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R155-LVV-E1104-1243140252:

| Step LVV-E1104-1                                                 | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------|------------------------------------|
| Description                                                      |                                    |
| Disconnect primary fiber on base side of Base - Archive network. |                                    |
| -----                                                            |                                    |
| Test Data                                                        |                                    |
| LATISS, ComCAM, or FullCAM data.                                 |                                    |
| -----                                                            |                                    |
| Expected Result                                                  |                                    |
| Network fails over to secondary path.                            |                                    |

---

Actual Result

Network on primary path is disconnected

**Image Download Error**

---

Step LVV-E1104-2

Step Execution Status: **Pass**

---

Description

Simulate diagnosis and repair by elapsed time.

---

Test Data

NA

---

Expected Result

Wall clock advances by 48 hours. Data is successfully transferred over secondary path.

---

Actual Result

Traffic shifts to secondary path

**Image Download Error**

---

Step LVV-E1104-3

Step Execution Status: **Pass**

---

Description

Reconnect primary fiber on base side of Base - Archive network.

---

Test Data

NA

---

Expected Result

Network recovers to primary path.

---

Actual Result

Network is reconnected in the primary path

**Image Download Error**

---

Step LVV-E1104-4      Step Execution Status: **Pass**

---

Description

Analyze fail-over and recovery times. Compare to historical data and extrapolate to MTTR.

Test Data

None

Expected Result

Verify recovery can occur within  $\text{baseToArchNetMTTR} = 48[\text{hour}]$ . Demonstrate reconnection and recovery to transfer of data at or exceeding rates specified in LDM-142.

Actual Result

Failover and Recovery of traffic happens in milliseconds, given that both links are available.

### 5.1.3.2 LVV-T189 - Verify implementation of Summit Facility Infrastructure

Version **1.0(d)**. Status **Approved**. Open *LVV-T189* test case in Jira.

Verify that the Summit Facility provides sufficient computing, storage, and network infrastructure to support buffering and forwarding of all raw image data to the Archive Facility, and compute facilities to support Commissioning activities.

**Preconditions:**

Summit facility in place

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R155-LVV-E3138-1243141759:

---

Step LVV-E3138-1      Step Execution Status: **Pass**

---

## Description

Analyze design and sizing model

---

## Test Data

None

---

## Expected Result

---

## Actual Result

Currently the summit provides:

2000 Cores

6PB of S3 Storage

100GB/s interfaces on storage nodes and 10GB/s on computing nodes

600Gbs links from summit to base.

### 5.1.3.3 LVV-T187 - Verify implementation of Summit to Base Network Secondary Link

Version **1.0(d)**. Status **Approved**. Open *LVV-T187* test case in Jira.

Verify automated fail-over from primary to secondary equipment in Rubin Observatory DWDM on simulated failure of primary. Verify bandwidth sufficiency on secondary. Verify automated recovery to primary equipment on simulated restoration of primary. Repeat for failure of Rubin Observatory fiber and fail-over to AURA fiber and DWDM. Demonstrate use of secondary in "catch-up" mode.

#### Preconditions:

1. PMCS DMTC-7400-2400 complete.

2. As-built documentation for Summit - Base Network is available.

NOTE: After the initial test, the corresponding verification elements will be flagged as “Requires Monitoring” such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R155-LVV-E3143-1243141764:

| Step LVV-E3143-1                                                                                                 | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                      |                                    |
| Transfer data between summit and base on primary equipment (LSST Summit - Base) over uninterrupted 1 day period. |                                    |
| -----                                                                                                            |                                    |
| Test Data                                                                                                        |                                    |
| LATISS, ComCAM, or LSSTCAM data.                                                                                 |                                    |
| -----                                                                                                            |                                    |
| Expected Result                                                                                                  |                                    |
| Normal operations.                                                                                               |                                    |
| -----                                                                                                            |                                    |
| Actual Result                                                                                                    |                                    |
| The following is Auxtel data during the first weekend of March                                                   |                                    |
| <b>Image Download Error</b>                                                                                      |                                    |

| Step LVV-E3143-2                                                                                                       | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                            |                                    |
| Simulate equipment outage by disconnecting power card from primary DWDM equipment on base side of Summit - Base Fiber. |                                    |
| -----                                                                                                                  |                                    |

## Test Data

NA

---

## Expected Result

Network fails over to secondary equipment in  $\leq 60$ s.

---

## Actual Result

Fault simulated. Since this is an OSPF deployment, the Fiber restored and converged in less than 10 seconds.

---

Step LVV-E3143-3

Step Execution Status: **Pass**

---

## Description

Transfer data between summit and base over secondary equipment uninterrupted 1 day period while monitoring network.

---

## Test Data

NA

---

## Expected Result

Verify that secondary equipment is capable of transferring 1 night of raw data ( $n_{\text{CalibExpDay}} + n_{\text{RawExpNightMax}} = 450 + 2800 = 3250$  exposures) within  $\text{summToBaseNet2TransMax}$  (72 hours), i.e. at or exceeding rates specified in LDM-142.

---

## Actual Result

Data transfered using secondary link uninterrupted for 1 day

**Image Download Error**

---

Step LVV-E3143-4

Step Execution Status: **Pass**

---

## Description

Restore primary equipment (i.e. reconnect power card to primary equipment.)

---

## Test Data

NA

---

### Expected Result

Network recovers to primary in  $\leq 60$ s.

---

### Actual Result

Since this is an OSPF deployment, the Fiber restored and converged in less than 10 seconds.

---

#### Step LVV-E3143-5

Step Execution Status: **Pass**

---

#### Description

Simulate fiber outage by disconnecting fiber from primary DWDM equipment on base side of Summit - Base Fiber.

---

#### Test Data

NA

---

### Expected Result

Network fails over to AURA DWDM and fiber.

---

### Actual Result

Failure executed

---

#### Step LVV-E3143-6

Step Execution Status: **Pass**

---

#### Description

Transfer data between summit and base over AURA fiber and equipment uninterrupted 1 day period while monitoring network.

---

#### Test Data

LATISS, ComCAM, or FullCAM data.

---

### Expected Result

Verify that AURA fiber and equipment is capable of transferring 1 night of raw data ( $n_{\text{CalibExpDay}} + n_{\text{RawExpNightMax}} = 450 + 2800 = 3250$  exposures) within  $\text{summToBaseNet2TransMax}$  (72 hours), i.e. at or exceeding rates specified in LDM-142.

---

### Actual Result

Auxtel data transferred over 1 day

**Image Download Error**

---

Step LVV-E3143-7      Step Execution Status: **Pass**

---

Description

Restore primary fiber (i.e. reconnect fiber to Rubin Observatory DWDM equipment.)

Test Data

None

Expected Result

Network recovers to Rubin Observatory fiber and DWDM.

Actual Result

Fiber restored

---

Step LVV-E3143-8      Step Execution Status: **Pass**

---

Description

Demonstrate use of secondary in "catch-up" mode.

Test Data

DAQ data buffer full of images and associated meta-data

Expected Result

Images from DAQ buffer and associated metadata are retrievable over secondary path while current observing data is being transferred over primary path.

Actual Result

Traffic recovered over the primary path

**Image Download Error**

#### 5.1.3.4 LVV-T203 - Verify implementation of Archive to Data Access Center Network Secondary Link

Version **1.0(d)**. Status **Approved**. Open *LVV-T203* test case in Jira.

Verify the Archive to Data Access Center Network via Secondary Link by simulating a failure on the primary path and capacity on the secondary path.

##### Preconditions:

1. Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place, running on end node computers that are the production hardware or equivalent to it.
2. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R155-LVV-E3144-1243141765:

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3144-1 | Step Execution Status: <b>Pass</b> |
| Description      |                                    |

---

Transfer data between Archive and DACs on primary path over uninterrupted 1 week period.

---

#### Test Data

Data Release or other petabyte-scale test data set.

---

#### Expected Result

Data transfers without failures or extended latency spikes, at or exceeding rates specified in LDM-142 throughout fail-over period.

---

#### Actual Result

##### **Image Download Error**

Data has been successfully transferred uninterrupted more than 1 week.

---

Step LVV-E3144-2

Step Execution Status: **Pass**

---

#### Description

Simulate outage on primary path by disconnecting fiber on primary on Archive side of Archive - DACs networks.

---

#### Test Data

NA

---

#### Expected Result

Network fails over to secondary links in  $\leq 60$ s.

---

#### Actual Result

Simulating failure can be noticeable checking the ipsec links.

##### **Image Download Error**

---

Step LVV-E3144-3

Step Execution Status: **Pass**

---

#### Description

Transfer data between base and archive over secondary equipment uninterrupted 1 day period.

---

## Test Data

Data Release or other petabyte-scale test data set.

---

## Expected Result

Data transfers without failures or extended latency spikes, at or exceeding rates specified in LDM-142 throughout fail-over period.

---

## Actual Result

During the same period, there's failover to the secondary link, noticeable by the lighter color link.

**Image Download Error** Transfers have been done for more than 24 hours over the secondary path

**Image Download Error**

---

Step LVV-E3144-4

Step Execution Status: **Pass**

---

## Description

Restore connection on primary link (reconnect fiber).

---

## Test Data

NA

---

## Expected Result

Network recovers to primary in  $\leq 60$ s.

---

## Actual Result

Recovery to the main link is completed in expected time

**Image Download Error**

### 5.1.3.5 LVV-T181 - Verify Base Voice Over IP (VOIP)

Version **1.0(d)**. Status **Approved**. Open *LVV-T181* test case in Jira.

Verify as-built VOIP at the Base Facility is operational and performs as expected (i.e. sufficient number of extensions allocated properly, no frequent drop-outs, no frequent jaggies on video,

etc.) on both voice calls and videoconferencing.

### Preconditions:

1. Base VOIP is installed/configured and Test Personnel have phone sets. Base Videoconference system is installed/configured. Summit, Headquarters, and/or LDF Videoconference system is installed/configured.
2. As-built documentation for all of the above is available.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R155-LVV-E3145-1243141766:

| Step LVV-E3145-1                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                        |                                    |
| Test voice calls over VOIP system from Base Facility to locations in Base and to other Rubin Observatory facilities.                                               |                                    |
| -----                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                          |                                    |
| None                                                                                                                                                               |                                    |
| -----                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                    |                                    |
| As-built VOIP at the Base Facility is operational and performs as expected (i.e. sufficient number of extensions allocated properly, no frequent drop-outs, etc.). |                                    |
| -----                                                                                                                                                              |                                    |
| Actual Result                                                                                                                                                      |                                    |
| VoIP works, from base to summit, to NOIRLab, International, etc.                                                                                                   |                                    |
| Step LVV-E3145-2                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                        |                                    |
| Test video conferences over system from Base Facility to locations in Base and to other Rubin Observatory facilities.                                              |                                    |

Test Data

None

Expected Result

Verify (a) planned and (b) as-built VOIP at the Base Facility is operational and performs as expected (i.e. no frequent drop-outs, no frequent audio glitches, no frequent jaggies on video, etc.).

Actual Result

Video conference works and we use Zoom.

#### 5.1.3.6 LVV-T1612 - Verify Summit - Base Network Integration (System Level)

Version **1.0(d)**. Status **Approved**. Open *LVV-T1612* test case in Jira.

Verify ISO Layer 3 full (22 x 10 Gbps ethernet ports on DAQ side with test data from DAQ test stand, AURA, Camera DAQ team do test). Demonstrate transfer of data at or exceeding rates specified in LDM-142.

##### Preconditions:

1. PMCS DMTC-7400-2400 COMPLETE
2. LVV-T1168 Passed
3. EITHER: Full Camera DAQ installed on summit and loaded with data OR: high-quality DAQ application-level simulators that match the form, volume, file paths, compressibility, and cadence of the expected instrument data, running on end node computers that are the production hardware or equivalent to it. Scientific validity of the data content is not essential.
4. Archiver/forwarders installed at Base running on end node computers that are the production hardware or equivalent to it.
5. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as “Requires Monitoring” such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R155-LVV-E3146-1243141767:

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3146-1 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Verify Pre-conditions are satisfied.

-----  
Test Data

NA

-----  
Expected Result

Pre-conditions are satisfied.

-----  
Actual Result

Pre-conditions are met, and T1168 passed

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3146-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Transfer data between summit and base over uninterrupted 1 day period. Monitor transfer of data at or exceeding rates specified in LDM-142.

-----  
Test Data

DAQ pre-loaded data

---

### Expected Result

Data transfers at or exceeding rates specified in LDM-142.

---

### Actual Result

Summit - Base has been in operations for a long time. Several night runs have used this link. The link is 6x100 and 2x100 as specified in LDM-142

**Image Download Error**

## 5.2 Test Cycle LVV-R293

Open test cycle *LDM-503-19 (All P1a and 1b DM requirements verified)* in Jira.

Test Cycle name: LDM-503-19 (All P1a and 1b DM requirements verified)

Status: In Progress

Test campaign supporting milestone LDM-503-19 -- all P1a and 1b requirements verified.

### 5.2.1 Software Version/Baseline

Not provided.

### 5.2.2 Configuration

Not provided.

### 5.2.3 Test Cases in LVV-R293 Test Cycle

#### 5.2.3.1 LVV-T2329 - Verify the archiving of ancillary data

Version **1.0(d)**. Status **Approved**. Open *LVV-T2329* test case in Jira.

Verify that the Science Data Archive contains all necessary engineering and calibration data for the full understanding of the performance and operation of the Observatory.

**Preconditions:**

None

Execution status: **In Progress**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3756-1319223017:

| Step LVV-E3756-1                                                                                                                          |  | Step Execution Status: <b>Not Executed</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------|
| Description                                                                                                                               |  |                                            |
| -----                                                                                                                                     |  |                                            |
| Test Data                                                                                                                                 |  |                                            |
| None                                                                                                                                      |  |                                            |
| -----                                                                                                                                     |  |                                            |
| Expected Result                                                                                                                           |  |                                            |
| -----                                                                                                                                     |  |                                            |
| Actual Result                                                                                                                             |  |                                            |
| We have assessed performance of the observatory and Camera for commissioning see SITCOM-TN-149 and DP1 (RTN-95). Hence we say this is ok. |  |                                            |

**5.2.3.2 LVV-T1561 - Verify provenance availability to science users**

Version **1.0(d)**. Status **Draft**. Open *LW-T1561* test case in Jira.

Verify that archived provenance data is available to science users together with the associated science data products.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.3 LVV-T1560 - Verify archiving of processing provenance

Version **1.0(d)**. Status **Draft**. Open *LW-T1560* test case in Jira.

Verify that provenance information related to data processing, including relevant data from other subsystems, has been archived.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.4 LVV-T1528 - Verify Visualization of MOCs via Science Platform

Version **1.0(d)**. Status **Approved**. Open *LW-T1528* test case in Jira.

Verify that the LSST Science Platform supports the visualization of the LSST-generated MOCs as well as other MOCs which satisfy the IVOA MOC Recommendation.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3762-1319223024:

| Step LVV-E3762-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b><br>Open a HiPS image in the "Rubin HiPS Search" tab of the RSP Portal aspect. Use the "overlays" tool to select a MOC layer and display it. Confirm that the MOC displays as expected.                                                                                                                                                                                                                                                                              |                                    |
| <b>Test Data</b><br>None                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| <b>Expected Result</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |
| <b>Actual Result</b><br>In the RSP at data.lsst.cloud, navigate to the Portal, then select "Rubin HiPS Search". Search at position "95.0 -25.0 Equ J2000", and select one of the various color HiPS maps. Once it is loaded, click on the "overlays" tool and select "MOC - LSSTComCam: DP1 gri". Zoom to the appropriate scale, and observe that the MOC appears as expected. The following screenshot illustrates that the MOC (in red) is displayed:<br><b>Image Download Error</b> |                                    |

### 5.2.3.5 LVV-T385 - Verify implementation of minimum number of simultaneous retrievals of CCD-sized coadd cutouts

Version **1.0(d)**. Status **Defined**. Open *LVV-T385* test case in Jira.

Verify that at least **ccdRetrievalUsers = 20** users can simultaneously retrieve a single CCD-sized coadd cutout using the IVOA SODA protocol.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3767-1319223029:

|                                                                                                                                                       |                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Step LVV-E3767-1                                                                                                                                      | Step Execution Status: <b>Not Executed</b> |
| Description                                                                                                                                           |                                            |
| Verified by LVV_T1332                                                                                                                                 |                                            |
| Test Data                                                                                                                                             |                                            |
| None                                                                                                                                                  |                                            |
| Expected Result                                                                                                                                       |                                            |
| All of the simulated <b>ccdRetrievalUsers = 20</b> users retrieved images within the specified time (see related Verification Element and Test Case). |                                            |
| Actual Result                                                                                                                                         |                                            |

### 5.2.3.6 LVV-T2901 - Verify the the maximum time to retrieve all PVI images for single visit

Version **1.0(d)**. Status **Draft**. Open *LVV-T2901* test case in Jira.

Verify the the maximum time to retrieve all PVI images for single visit including mask and variance plane using single IVOA SIAv2 protocol service query is within **allPviRetrievalTime** for up to **allPviRetrievalUsers** simultaneous requests for distinct focal-plane PVI sets.

#### Preconditions:

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.7 LVV-T2900 - Verify the maximum time to retrieve single-CCD, single-visit PVI image

Version **1.0(d)**. Status **Approved**. Open *LVV-T2900* test case in Jira.

Using Rubin Image Services VO SIAv2 protocol verify the time to receive a Processed Visit Image of a single CCD is within **pviRetrievalTime** with **pviRetrievalUsers** simultaneous requests for distinct single-CCD PVIs.

#### Preconditions:

Image Services VO SIAv2 implementation deployed on the RSP

Execution status: **In Progress**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3769-1319223031:

| Step LVV-E3769-1                                                                                                | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                     |                                    |
| Run test script DMTR-441/notebooks/test_LVV-T2900.ipynb on data-int.lsst.cloud in the scale testing environment |                                    |
| -----                                                                                                           |                                    |
| Test Data                                                                                                       |                                    |
| DP1                                                                                                             |                                    |
| -----                                                                                                           |                                    |
| Expected Result                                                                                                 |                                    |
| Script runs without error                                                                                       |                                    |
| -----                                                                                                           |                                    |
| Actual Result                                                                                                   |                                    |

---

Step LVV-E3769-2      Step Execution Status: **Not Executed**

---

Description

Verify that the query time to retrieve a single-CCD PVI under a load of pviRetrievalUsers = 20

Test Data

DP1

Expected Result

PVI retrieval time under load is < pviRetrievalTime = 10

Actual Result

### 5.2.3.8 LVV-T168 - Verify design of Data Access Services allows Evolution of the LSST Data Model

Version **1.0(d)**. Status **Approved**. Open *LVV-T168* test case in Jira.

Verify that the design of the Data Access Services are able to accommodate changes/evolution of the LSST data model from one release to another.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3770-1319223033:

Step LVV-E3770-1

Step Execution Status: **Pass**

#### Description

Delegate to LSP

#### Test Data

None

#### Expected Result

#### Actual Result

By design the data model is captured and controlled in SDM Schemas as described in <https://dmtn-153.lsst.io/>. This is in use for all data and allows migration/control of data sets. For example see also <https://dmtn-227.lsst.io/#making-the-schema>, <https://dmtn-170.lsst.io/>, <https://sqr-107.lsst.io/#abstract>

### 5.2.3.9 LVV-T2177 - Per-image limit on the median residual ellipticity correlations at scales less than to 5 arcmin.

Version **1.0(d)**. Status **Approved**. Open *LVV-T2177* test case in Jira.

Verify that the per-image limit on the median residual ellipticity correlations at scales less than 5 arcmin (TE3) can be configured in the DMS and applied to the appropriate metrics.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w\_2025\_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test\_LVV-T376\_T2176\_T2177.ipynb.

Detailed steps results LVV-R293-LVV-E3771-1319223034:

---

Step LVV-E3771-1      Step Execution Status: **Pass**


---

#### Description

Check that the correct value for the TE3 threshold has been encoded in the package that measures performance metrics.

---

#### Test Data

None

---

#### Expected Result

---

#### Actual Result

The attached notebook demonstrates the retrieval of a 'visit\_table' and extraction of the TE3 metrics from this table. An example plot from the notebook is shown below:

**Image Download Error** We note that the task to measure these metrics has recently been rewritten, and is thus still in review. Nonetheless, we have demonstrated that the software exists to calculate these metrics, and thus deem this test a Pass. The metrics will be added to the 'analysis\_tools' package soon.

### 5.2.3.10 LVV-T1755 - Verify calculation of residual PSF ellipticity correlations for separations less than 1 arcmin

Version **1.0(d)**. Status **Approved**. Open *LVV-T1755* test case in Jira.

Verify that the DM system has provided the code to calculate the median residual PSF ellipticity correlations averaged over an arbitrary field of view for separations less than 1 arcmin, and assess whether it meets the requirement that it shall be no greater than **TE1 = 2.0e-5[arcminuteSeparationCorrelation]**.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w\_2025\_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test\_LVV-T1755.ipynb.

Detailed steps results LVV-R293-LVV-E3772-1319223035:

| Step LVV-E3772-1                                                                                                                                                                                                                                         | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b><br>Identify a dataset containing at least one field with multiple overlapping visits.                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                                                                                    |                                    |
| <b>Test Data</b><br>None                                                                                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                                                                                    |                                    |
| <b>Expected Result</b><br>A dataset that has been ingested into a Butler repository.                                                                                                                                                                     |                                    |
| -----                                                                                                                                                                                                                                                    |                                    |
| <b>Actual Result</b><br>The code to do these measurements is still in review, so this test's outputs reside in a user collection:<br><br>testcoll = 'u/leget/LSSTCam/DM-46582/PSF_TEx_w37_run2'<br>butler = Butler('/repo/main', collections=[testcoll]) |                                    |
| Step LVV-E3772-2                                                                                                                                                                                                                                         | Step Execution Status: <b>Pass</b> |
| <b>Description</b><br>Point the butler to an appropriate (precursor or simulated) dataset containing data in all filters, that has had the ComputeExPsfTask run on it.                                                                                   |                                    |
| -----                                                                                                                                                                                                                                                    |                                    |
| <b>Test Data</b><br>None                                                                                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                                                                                    |                                    |
| <b>Expected Result</b>                                                                                                                                                                                                                                   |                                    |

## Actual Result

The outputs of the „Ex“ ellipticity residuals task are „stored in the ‘visit\_table’ dataset. Load this table:

```
visitTable = butler.get("visit_table", instrument="LSSTCam")
```

Step LVV-E3772-3

Step Execution Status: **Pass**

## Description

Confirm that the metric TE1 has been calculated, and that its values are reasonable.

## Test Data

None

## Expected Result

A JSON file (and/or a report generated from that JSON file) demonstrating that TE1 has been calculated.

## Actual Result

The attached notebook shows many plots of the TE1 metric, which appear like the following:

**Image Download Error**We note that the task to measure these metrics has recently been rewritten, and is thus still in review. Nonetheless, we have demonstrated that the software exists to calculate these metrics, and thus deem this test a Pass.

### 5.2.3.11 LVV-T2176 - Per-image limit on the median residual ellipticity correlations at scales greater than or equal to 5 arcmin.

Version **1.0(d)**. Status **Approved**. Open *LVV-T2176* test case in Jira.

Verify that the per-image limit on the median residual ellipticity correlations at scales greater than or equal to 5 arcmin (TE4) can be configured in the DMS and applied to the appropriate metrics

## Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w\_2025\_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test\_LVV-T376\_T2176\_T2177.ipynb.

Detailed steps results LVV-R293-LVV-E3773-1319223036:

| Step LVV-E3773-1                                                                                                                                                                                                                                                                                                            | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                                 |                                    |
| Check that the correct value for the TE4 threshold has been encoded in the package that measures performance metrics.                                                                                                                                                                                                       |                                    |
| Test Data                                                                                                                                                                                                                                                                                                                   |                                    |
| None                                                                                                                                                                                                                                                                                                                        |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                             |                                    |
| Actual Result                                                                                                                                                                                                                                                                                                               |                                    |
| The attached notebook demonstrates the retrieval of a 'visit_table' and extraction of the TE4 metrics from this table. An example plot from the notebook is shown below:                                                                                                                                                    |                                    |
| <b>Image Download Error</b> We note that the task to measure these metrics has recently been rewritten, and is thus still in review. Nonetheless, we have demonstrated that the software exists to calculate these metrics, and thus deem this test a Pass. The metrics will be added to the 'analysis_tools' package soon. |                                    |

### 5.2.3.12 LVV-T1754 - Verify calculation of residual PSF ellipticity correlations for separations greater than or equal to 5 arcmin

Version **1.0(d)**. Status **Approved**. Open *LVV-T1754* test case in Jira.

Verify that the DM system has provided the code to calculate the median residual PSF ellipticity correlations averaged over an arbitrary field of view for separations greater than or equal to 5 arcmin, and assess whether it meets the requirement that it shall be no greater than  **$TE2 = 1.0e-7[\text{arcminuteSeparationCorrelation}]$** .

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w\_2025\_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test\_LVV-T1754.ipynb.

Detailed steps results LVV-R293-LVV-E3774-1319223037:

| Step LVV-E3774-1                                                                                          | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                               |                                    |
| Identify a dataset containing at least one field with multiple overlapping visits.                        |                                    |
| -----                                                                                                     |                                    |
| Test Data                                                                                                 |                                    |
| None                                                                                                      |                                    |
| -----                                                                                                     |                                    |
| Expected Result                                                                                           |                                    |
| A dataset that has been ingested into a Butler repository.                                                |                                    |
| -----                                                                                                     |                                    |
| Actual Result                                                                                             |                                    |
| The code to do these measurements is still in review, so this test's outputs reside in a user collection: |                                    |
| <pre>testcoll = 'u/leget/LSSTCam/DM-46582/PSF_TEx_w37_run2'</pre>                                         |                                    |
| <pre>butler = Butler('/repo/main', collections=[testcoll])</pre>                                          |                                    |

| Step LVV-E3774-2                                                                                                     | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                          |                                    |
| Point the butler to an appropriate (precursor or simulated) dataset containing data in all filters, that has had the |                                    |

ComputeExPsfTask run on it.

Test Data

None

Expected Result

Actual Result

The outputs of the „Ex“ ellipticity „residuals“ task are „stored in the ‘visit\_table’ dataset. Load this table:

```
visitTable = butler.get("visit_table", instrument="LSSTCam")
```

Step LVV-E3774-3

Step Execution Status: **Pass**

Description

Confirm that the metric TE2 has been calculated, and that its values are reasonable.

Test Data

None

Expected Result

AJSON file (and/or a report generated from that JSON file) demonstrating that TE2 has been calculated.

Actual Result

The attached notebook shows plots of the TE2 metrics, which appear like the following:

**Image Download Error**We note that the task to measure these metrics has recently been rewritten, and is thus still in review. Nonetheless, we have demonstrated that the software exists to calculate these metrics, and thus deem this test a Pass.

### 5.2.3.13 LVV-T376 - Verify the Calculation of Ellipticity Residuals and Correlations

Version **1.0(d)**. Status **Approved**. Open *LVV-T376* test case in Jira.

Verify that the DMS includes software to enable the calculation of the ellipticity residuals and correlation metrics defined in the OSS.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Test executed using a ticket branch that has not yet been merged to the pipelines codebase, running w\_2025\_37 of the science pipelines at the USDF. Results of the test are attached to this document's repository as test\_LVV-T376\_T2176\_T2177.ipynb.

Detailed steps results LVV-R293-LVV-E3775-1319223038:

| Step LVV-E3775-1                                                                                                                                 | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                      |                                    |
| Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:                                     |                                    |
| -----                                                                                                                                            |                                    |
| Test Data                                                                                                                                        |                                    |
| None                                                                                                                                             |                                    |
| -----                                                                                                                                            |                                    |
| Expected Result                                                                                                                                  |                                    |
| Butler repo available for reading.                                                                                                               |                                    |
| -----                                                                                                                                            |                                    |
| Actual Result                                                                                                                                    |                                    |
| The code to do these measurements is still in review, so this test's outputs reside in a user collection:                                        |                                    |
| <pre>testcoll = 'u/leget/LSSTCam/DM-46582/PSF_TEx_w37_run2' butler = Butler('/repo/main', collections=[testcoll])</pre>                          |                                    |
| Step LVV-E3775-2                                                                                                                                 | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                      |                                    |
| Point the butler to an appropriate (precursor or simulated) dataset containing data in all filters, that has had the ComputeExPsfTask run on it. |                                    |

Test Data

None

Expected Result

Actual Result

The outputs of the „Ex” ellipticity „residuals” task are „stored in the ‘visit\_table’ dataset. Load this table:

```
visitTable = butler.get("visit_table", instrument="LSSTCam")
```

Step LVV-E3775-3

Step Execution Status: **Pass**

Description

Confirm that the ellipticity correlations have been measured, and that the output values for all of the ellipticity performance metrics are as expected.

Test Data

None

Expected Result

Measured ellipticity metrics that are within reasonable values given the input dataset.

Actual Result

The attached notebook shows many plots of the ellipticity residuals, which appear like the following:

**Image Download Error**We note that the task to measure these metrics has recently been rewritten, and is thus still in review. Nonetheless, we have demonstrated that the software exists to calculate these metrics, and thus deem this test a Pass.

#### 5.2.3.14 LVV-T2724 - Verify Result latency for high-volume full-sky queries on the Object table

Version **1.0(d)**. Status **Approved**. Open *LVV-T2724* test case in Jira.

Verify latency against a full scale, e.g DR1 sized Object catalog

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3781-1319223044:

| Step LVV-E3781-1                                                                                                                                                                                             | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b>                                                                                                                                                                                           |                                    |
| Execute at least 50 simultaneous high-volume, full-sky queries. Confirm that the query results are retrieved in less than hvObjectQueryTime=1 hour.                                                          |                                    |
| <hr/>                                                                                                                                                                                                        |                                    |
| <b>Test Data</b>                                                                                                                                                                                             |                                    |
| None                                                                                                                                                                                                         |                                    |
| <hr/>                                                                                                                                                                                                        |                                    |
| <b>Expected Result</b>                                                                                                                                                                                       |                                    |
| <hr/>                                                                                                                                                                                                        |                                    |
| <b>Actual Result</b>                                                                                                                                                                                         |                                    |
| The test was executed by running the notebook "test_LVV-T2724.ipynb" (attached to this document's repository) in the mobu test framework, which executed 50 simultaneous all-sky queries like the following: |                                    |
| # High-volume query                                                                                                                                                                                          |                                    |
| query = """SELECT *,                                                                                                                                                                                         |                                    |
| scisql_nanojanskyToAbMag(r_cModelFlux) as rmag                                                                                                                                                               |                                    |
| FROM dp1.Object as o                                                                                                                                                                                         |                                    |
| JOIN dp1.ForcedSource AS fs ON o.objectId = fs.objectId                                                                                                                                                      |                                    |
| WHERE scisql_nanojanskyToAbMag(r_cModelFlux) < 17                                                                                                                                                            |                                    |
| """                                                                                                                                                                                                          |                                    |
| Query execution time is monitored via a Chronograph dashboard, which yields the following query execution times from the test:                                                                               |                                    |

## Image Download Error

The y-axis of this plot is the mean duration of queries in seconds, which is roughly flat at ~400 seconds (roughly 6-7 minutes) after some initial bottlenecks. The requirement is thus met, as this is much less than the required 1 hour.

We note that the requirement was tested using DP1, which is not really a "full-sky" dataset. Thus this requirement should be revisited in the future when true full-sky datasets are available.

### 5.2.3.15 LVV-T2899 - Verify performance for radius for low-volume query

Version **1.0(d)**. Status **Draft**. Open *LW-T2899* test case in Jira.

Verify the response time (*lvQueryTime*) for queries that are spatially restricted to a circle of radius **lvSkyRadius** and that return at most *lvMaxReturnedResults* of data under a load of *lvQueryUsers* simultaneous queries.

#### Preconditions:

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.16 LVV-T2700 - Verify Result latency for high-volume complex queries

Version **1.0(d)**. Status **Approved**. Open *LW-T2700* test case in Jira.

Verify that complex high-volume queries that involve full-sky spatial and temporal correlations can be answered in less than **hvComplexQueryTime**.

#### Preconditions:

An operational QSERV database that has been verified via LVV-T1085 and LVV-T1086 and LVV-T1087.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3785-1319223048:

| Step LVV-E3785-1                                                                                                                                                                                                      | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                           |                                    |
| Execute at least 50 simultaneous complex, high-volume (i.e., all-sky) queries. Confirm that the query results are retrieved in less than hvComplexQueryTime=12 hours.                                                 |                                    |
| Test Data                                                                                                                                                                                                             |                                    |
| None                                                                                                                                                                                                                  |                                    |
| Expected Result                                                                                                                                                                                                       |                                    |
| Actual Result                                                                                                                                                                                                         |                                    |
| The test was executed by running the notebook "test_LVV-T2700.ipynb" (attached to this document's repository) in the mobu test framework, which executed 50 simultaneous complex, all-sky queries like the following: |                                    |

# High-volume complex query involving full-sky spatial and temporal correlations and use of some internal functions # Mag 17 cut: Results in a 1.1 GB dataframe, greater than the limit for "small queries" of 0.5GB query = `SELECT coord_ra,coord_dec, scisql_nanojanskyToAbMag(r_scienceFluxMean) as rScienceMag FROM dp1.DiaObject AS diao JOIN dp1.ForcedSourceOnDiaObject as fsodo ON fsodo.diaObjectId = diao.diaObjectId JOIN dp1.Visit as vis ON vis.visit = fsodo.visit where scisql_nanojanskyToAbMag(r_scienceFluxMean) < 23` Query execution time is monitored via a Chronograph dashboard, which yields the following query execution times from the test: **Image Download Error** The y-axis of this plot is the mean duration of queries in seconds, which is roughly flat at ~6800 seconds (less than 2 hours). The requirement is thus met, as this is much less than the required 12 hours.

We note that the requirement was tested using DP1, which is not really a "full-sky" dataset. Thus this requirement should be revisited in the future when true full-sky datasets are available.

### 5.2.3.17 LVV-T27 - Verify implementation of Data Availability

Version **1.0(d)**. Status **Draft**. Open *LVV-T27* test case in Jira.

Determine if all required categories of raw data (specifically enumerated: raw exposures, calibration frames, telemetry, configuration metadata) can be located through the Science Platform and are available for download. Verify through (1) administrative review; (2) checking with precursor data; (3) checking on early data feeds from the Summit such as from AuxTel and ComCam.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.18 LVV-T159 - Verify implementation of Regenerating Data Products from Previous Data Releases

Version **1.0(d)**. Status **Draft**. Open *LVV-T159* test case in Jira.

Show that un-archived data products from previous data releases can be generated using through the LSST Science Platform.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.19 LVV-T26 - Verify implementation of Maximum Likelihood Values and Covariances

Version **1.0(d)**. Status **Approved**. Open *LVV-T26* test case in Jira.

Verify that quantities delivered by all measurement algorithms include maximum likelihood values and covariances.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Executed at the USDF using the DP1 Qserv database accessed via the TAP service. The notebook containing detailed tests is attached to this document's github repository as test\_LVV-T26.ipynb.

Detailed steps results LVV-R293-LVV-E3791-1319223056:

| Step LVV-E3791-1                                                                 | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------|------------------------------------|
| Description                                                                      |                                    |
| Load a table of measured quantities that was produced by the Science Pipelines.  |                                    |
| -----                                                                            |                                    |
| Test Data                                                                        |                                    |
| None                                                                             |                                    |
| -----                                                                            |                                    |
| Expected Result                                                                  |                                    |
| -----                                                                            |                                    |
| Actual Result                                                                    |                                    |
| In the attached notebook, the TAP service was instantiated via:                  |                                    |
| <pre>from lsst.rsp import get_tap_service service = get_tap_service('tap')</pre> |                                    |

The query to retrieve the list of columns in the DP1 Object table is as follows:

```
query = "SELECT column_name, datatype, description, unit "\
        "FROM tap_schema.columns "\
        "WHERE table_name = 'dp1.Object'"
columns = service.search(query).to_table()
```

This returns a table including 1296 columns.

| Step LVV-E3791-2                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Step Execution Status: <b>Pass</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |
| Verify that maximum likelihood and covariant quantities are provided.                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Test Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |
| None                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Actual Result                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |
| The attached notebook confirms the following for the Object table:                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |
| <ul style="list-style-type: none"> <li>• All (maximum likelihood) flux measurement columns are accompanied by errors</li> <li>• Boolean flags are provided to notify users when measurement algorithms may have erred</li> <li>• Coordinates (which consist of RA and Dec measured jointly) provide covariances</li> <li>• Model-fit results (in particular, Sersic and "TwoGaussian" fits from multiProFit) include goodness-of-fit (reduced chi-squared) columns</li> </ul> |                                    |

Assuming that the Object table can be taken as representative of all tables produced by the Science Pipelines, we have demonstrated that the required quantities are being reported.

### 5.2.3.20 LVV-T24 - Verify implementation of Computing Derived Quantities

Version **1.0(d)**. Status **Approved**. Open *LVV-T24* test case in Jira.

Verify that common derived quantities have been made available to end-users either as pre-computed columns or by providing functions that can be used dynamically in queries. These should at least include the ability to calculate the reduced chi-squared of fitted models and make it as easy as possible to calculate color-color diagrams.

**Preconditions:**

Example data set (e.g., non-LSST or LSST commissioning) loaded into the Science Platform in a format consistent with the DPDD.

Execution status: **Pass**

Final comment:

Executed at the USDF using the DP1 Qserv database accessed via the TAP service. The notebook containing detailed tests is attached to this document's github repository as test\_LVV-T24.ipynb.

Detailed steps results LVV-R293-LVV-E3792-1319223057:

| Step LVV-E3792-1                                                                                                                                                                                                                                                                                                                                                                                  | Step Execution Status: <b>Pass</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                                                                                                       |                                    |
| Execute a query of the Object table from the TAP service. Include in this query: <ul style="list-style-type: none"><li>• derived quantities that appear in the TAP Object table but are not in the Butler version of the table</li><li>• calculated quantities using ADQL functions or mathematical combinations of table columns</li><li>• colors calculated from tabulated magnitudes</li></ul> |                                    |
| Test Data                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| None                                                                                                                                                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                                                                                                   |                                    |
| Actual Result                                                                                                                                                                                                                                                                                                                                                                                     |                                    |

In the attached notebook, the TAP service was instantiated via:

```
from lsst.rsp import get_tap_service
service = get_tap_service('tap')
```

The query of the DP1 Object table is as follows:

```
query = """SELECT g_psfMag,
    scisql_nanojanskyToAbMag(g_psfFlux) AS gmag_psf,
    scisql_nanojanskyToAbMagSigma(g_psfFlux, g_psfFluxErr) AS gmag_psf_err,
    g_psfMagErr, i_psfMag, r_psfMag,
    (g_psfMag-r_psfMag) as gr, (r_psfMag-i_psfMag) as ri,
    r_psfModel_TwoGaussian_chisq_reduced, coord_ra_dec_Cov,
    RADIANS(coord_ra) AS ra_rad,
    RADIANS(coord_dec) AS dec_rad,
    coord_dec, coord_ra,
    DISTANCE(POINT('ICRS', coord_ra, coord_dec), POINT('ICRS', 53.01, -28.35)) AS distance,
    scisql_nanojanskyToAbMag(g_sersicFlux) AS g_sersicMag,
    scisql_nanojanskyToAbMagSigma(g_sersicFlux, g_sersicFluxErr) AS g_sersicMagErr,
    r_psfFlux/r_psfFluxErr as r_snr
FROM dp1.Object
WHERE CONTAINS(POINT('ICRS', coord_ra, coord_dec),CIRCLE('ICRS', 53.01, -28.35, 0.1))=1
AND refExtendedness < 0.5
AND r_psfFlux/r_psfFluxErr > 50
"""
```

Among other things, this query returns:

- `scisql_nanojanskyToAbMag(g_psfFlux) AS gmag_psf`: apply a function to calculate the magnitude from the tabulated flux (note the similar function to calculate the magnitude error as well).
- `SELECT g_psfMag, g_psfMagErr, i_psfMag, r_psfMag`: select the PSF magnitudes, which are derived quantities based on the `{band}_psfFlux` columns. The magnitudes are not included in the Butler object table.
- `(g_psfMag-r_psfMag) as gr, (r_psfMag-i_psfMag) as ri`: calculate colors based on mathematical operations performed on the tabulated `psfMag` columns.
- `SELECT r_psfModel_TwoGaussian_chisq_reduced, coord_ra_dec_Cov`: select the reduced  $\chi^2$  of the double-Gaussian fit (from the multiProFit model fitting), and the covariance of the RA, Dec positions.
- `RADIANS(coord_ra) AS ra_rad, RADIANS(coord_dec) AS dec_rad`: apply a function to convert the RA, Dec positions to radians rather than their default units of degrees.
- `DISTANCE(POINT('ICRS', coord_ra, coord_dec), POINT('ICRS', 53.01, -28.35)) AS distance`: apply a function to calculate and return the distance of each query result (in degrees) from a given position.
- `r_psfFlux/r_psfFluxErr as r_snr`: calculate the signal-to-noise ratio ("SNR") based on a mathematical operation performed on two table columns.

The query statement itself demonstrates many of the required aspects, as it retrieves derived quantities from the Object table, calculated quantities based on application of functions or mathematical operations on table columns, chi-squared and covariance values, and colors for the construction of a color-color diagram.

---

Step LVV-E3792-2

Step Execution Status: **Pass**

---

#### Description

Examine the returned data and confirm that they are well-formed and consistent with expectations. (For example, by plotting a color-color diagram.)

---

#### Test Data

None

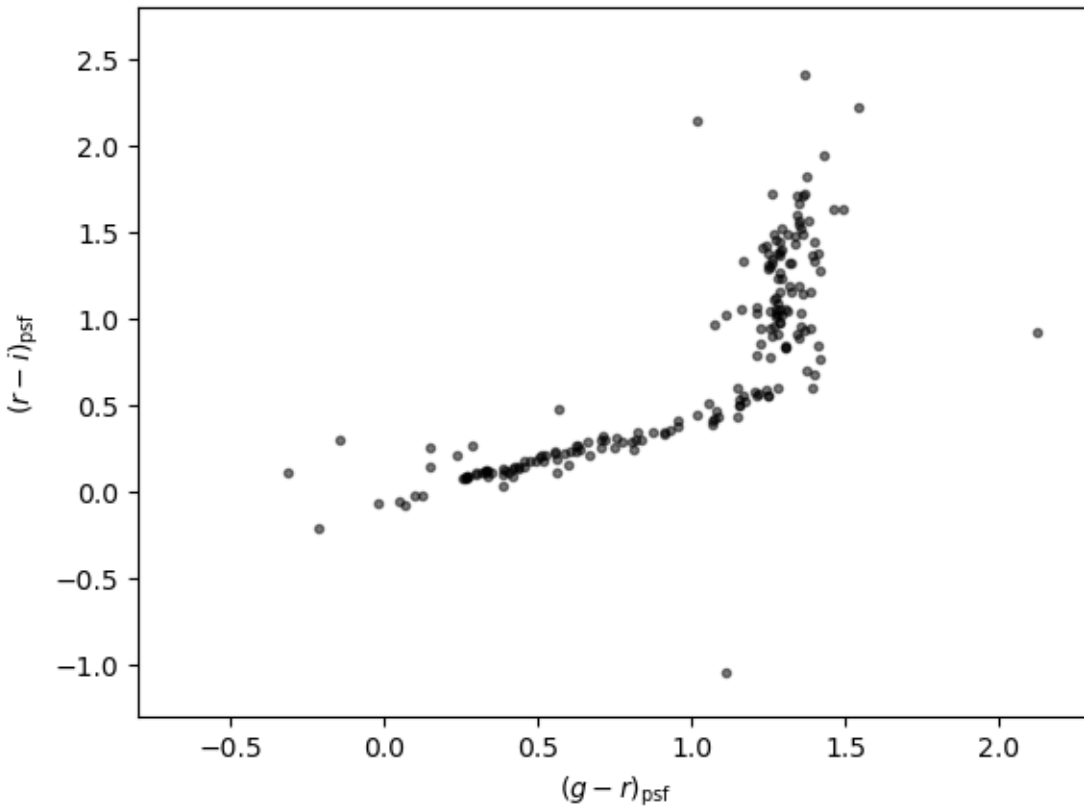
---

#### Expected Result

---

#### Actual Result

The attached notebook contains a variety of plots confirming that the retrieved data are as expected. For example, here is a color-color diagram based on colors retrieved directly from a calculation written into the TAP query:



#### 5.2.3.21 LVV-T58 - Verify implementation of Matching DIASources to Objects

Version **1.0(d)**. Status **Draft**. Open *LVV-T58* test case in Jira.

Verify that a cross-match table is available between DIASources and Objects.

##### Preconditions:

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.22 LVV-T180 - Verify implementation of Data Management Unscheduled Downtime

Version **1.0(d)**. Status **Approved**. Open *LVV-T180* test case in Jira.

This applies only to downtime that would prevent the collection of survey data. Verification means that analysis has occurred to identify likely hardware failures that would prevent survey operations and that mitigations that minimize the downtime to less than DM Downtime (1 day/year) are in place. Known systems that fall in this category include: Image and EFD Archiving, Observatory Operations Data, Telemetry Gateway, Data Backbone, Managed Database, Inter-Site Networks, and Service Management and Monitoring.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3797-1319223062:

| Step LVV-E3797-1 | Step Execution Status: <b>Pass</b>                                                                        |
|------------------|-----------------------------------------------------------------------------------------------------------|
| Description      | Analyze likely hardware failures with mitigations to compute estimated unplanned downtime                 |
| Test Data        | None                                                                                                      |
| Expected Result  |                                                                                                           |
| Actual Result    | DM systems were built with full redundancy for image quality and processing. The summit has full QA/Rapid |

analysis capability even if the redundant links fail to USDF. In the past year the link and backup have functioned well with only around 50 hours down time during observing time (loss of the link does not stop observing). Observing interruptions on summit from DHCP and Postgres problems caused some hours (about 4 each) of lost time in the last year. e believe this demonstrates a reasonable level of redundancy and resilience.

### 5.2.3.23 LVV-T179 - Verify implementation of Compute Platform Heterogeneity

Version **1.0(d)**. Status **Approved**. Open *LVV-T179* test case in Jira.

Demonstrate that production results are the same (within machine accuracy) when production occurs on different platforms (OS, kernel, hardware provisioning).

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3798-1319223063:

| Step LVV-E3798-1                                                                      | Step Execution Status: <b>Pass</b> |
|---------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                           |                                    |
| Configure heterogeneous cluster, execute AP+DRP+LSP, observe correct functioning      |                                    |
| -----                                                                                 |                                    |
| Test Data                                                                             |                                    |
| None                                                                                  |                                    |
| -----                                                                                 |                                    |
| Expected Result                                                                       |                                    |
| -----                                                                                 |                                    |
| Actual Result                                                                         |                                    |
| We have Rome/Milan/GPU in SLAC and have executed DP0.1 DP0.2 nightly alerts and DRP . |                                    |

#### 5.2.3.24 LVV-T155 - Verify implementation of Un-Archived Data Product Cache

Version **1.0(d)**. Status **Draft**. Open *LW-T155* test case in Jira.

Demonstrate that the DMS provides low-latency storage for at least `l1CacheLifetime` (30 days) to keep prompt processing pre-covery images on hand.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.25 LVV-T124 - Verify implementation of Software Architecture to Enable Community Re-Use

Version **1.0(d)**. Status **Approved**. Open *LW-T124* test case in Jira.

Show that the LSST software is capable of being executed in multiple contexts: single user instance, batch processing, continuous integration.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3803-1319223070:

|                  |                                            |
|------------------|--------------------------------------------|
| Step LVV-E3803-1 | Step Execution Status: <b>Not Executed</b> |
| Description      |                                            |

Test Data  
None

Expected Result

Actual Result  
<https://pipelines.lsst.io/#installation> shows how to install on multiple platforms - we test on Intel and M mac and linux machines.

for external code/algorithms <https://dmtn-246.lsst.io/> demonstrates a away ot do this.

Numerous notebooks exist on configuring and running the pipelines e..g <https://dp1.lsst.io/tutorials/notebook/index.html#data-products-definitions>

As well as in the pipelines docs e.g. <https://pipelines.lsst.io/getting-started/singleframe.html>

We also have one case of reuse by Spherex quoted in <https://arxiv.org/abs/2511.15823>

Rubin piplienes have also been used for HSC data releases. See e.g. [https://hsc-release.mtk.nao.ac.jp/doc/index.php/acknowledging\\_hsc\\_pdr3/](https://hsc-release.mtk.nao.ac.jp/doc/index.php/acknowledging_hsc_pdr3/)

### 5.2.3.26 LVV-T147 - Verify implementation of Control of Level-1 Production

Version **1.0(d)**. Status **Approved**. Open *LVV-T147* test case in Jira.

Demonstrate that the DMS can control all Prompt Processing across DMS facilities.

## Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3804-1319223071:

| Step LVV-E3804-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |
| Observe existence and capability of Prompt DMCS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Test Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |
| None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Actual Result                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |
| <p>The following are screenshots from various grafana dashboards used to monitor prompt processing. The first screenshot demonstrates that the processing is running on hundreds of workers:<b>Image Download Error</b>The following screenshot shows the processing time for many tasks executed by the prompt processing, demonstrating that the system is capable of processing images in nearly real-time.</p> <p><b>Image Download Error</b>Finally, we show an alert production and prompt processing status dashboard that is used to monitor the AP and Prompt services themselves.</p> <p><b>Image Download Error</b></p> <p>Links to the various dashboards:</p> <p>prompt overview: <a href="https://grafana.slac.stanford.edu/d/feifuf82d6tj4f/prompt-processing-production-overview">https://grafana.slac.stanford.edu/d/feifuf82d6tj4f/prompt-processing-production-overview</a></p> <p>prompt processing statistics: <a href="https://grafana.slac.stanford.edu/d/c0a9c6d3-4ea8-452d-bb91-962304c1b0d2/prompt-processing-pr">https://grafana.slac.stanford.edu/d/c0a9c6d3-4ea8-452d-bb91-962304c1b0d2/prompt-processing-pr</a></p> <p>prompt timing: <a href="https://grafana.slac.stanford.edu/d/eeimq740rdgjkf/">https://grafana.slac.stanford.edu/d/eeimq740rdgjkf/</a></p> |                                    |

### 5.2.3.27 LVV-T138 - Verify provision of Bulk Download Service

Version **1.0(d)**. Status **Approved**. Open *LVV-T138* test case in Jira.

Verify that DM has provided software to enable bulk download of data products and raw data, subject to network bandwidth.

**Preconditions:**

Execution status: **Pass**

Final comment:

Transfers to IDACs via Rucio

Detailed steps results LVV-R293-LVV-E3805-1319223072:

| Step LVV-E3805-1                                                                                                                    | Step Execution Status: <b>Pass</b> |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                         |                                    |
| Verify that a plan for bulk data transfer exists                                                                                    |                                    |
| -----                                                                                                                               |                                    |
| Test Data                                                                                                                           |                                    |
| None                                                                                                                                |                                    |
| -----                                                                                                                               |                                    |
| Expected Result                                                                                                                     |                                    |
| A plan exists                                                                                                                       |                                    |
| -----                                                                                                                               |                                    |
| Actual Result                                                                                                                       |                                    |
| The plans and policies for bulk data download are described in : <a href="https://rtn-086.lsst.io/">https://rtn-086.lsst.io/</a> -- |                                    |
| Step LVV-E3805-2                                                                                                                    | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                         |                                    |
| Verify that the software to enable bulk download of data products and raw data. Exist                                               |                                    |
| -----                                                                                                                               |                                    |
| Test Data                                                                                                                           |                                    |
| None                                                                                                                                |                                    |
| -----                                                                                                                               |                                    |

---

### Expected Result

Software exists

---

### Actual Result

The Rucio software, developed by CERN is the chosen software to enable Rubin bulk download of data products and raw data. <https://rucio.cern.ch/> and is available in github at : <https://github.com/rucio/rucio>

DM has provided additional software to add Butler specific information to Rucio metadata: [https://github.com/lst/rucio\\_register](https://github.com/lst/rucio_register)

| Step LVV-E3805-3                                                                                                            | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                 |                                    |
| Inspect the logs and metrics and monitoring dashboards that demonstrate data transfers using the bulk data transfer service |                                    |

---

### Test Data

None

---

### Expected Result

Logs and monitoring of transfers available

---

### Actual Result

A rucio transfer monitoring dashboard is configured in grafana at the US data facility and shows the transfers using Rucio. A screen shot is attached of showing data transfers over the 3 month period from July -- September 2025. The dashboard shows regular bulk data transfers to the UK and FR data facilities of between 5-30 TB in a 1 day period.

### Image Download Error

## 5.2.3.28 LVV-T99 - Verify implementation of Processing of Datasets

Version **1.0(d)**. Status **Approved**. Open *LVV-T99* test case in Jira.

Execute AP and DRP, simulate failures, observe correct processing

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.29 LVV-T96 - Verify implementation of Query Repeatability

Version **1.0(d)**. Status **Draft**. Open *LVV-T96* test case in Jira.

Verify that prior queries can be rerun with identical results, or with new additional data for live (Alert Production) databases.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.30 LVV-T107 - Verify implementation of Level-1 Production Completeness

Version **1.0(d)**. Status **Approved**. Open *LVV-T107* test case in Jira.

Verify that the DMS successfully eventually processes all images of sufficient quality for processing, even after connectivity failures.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.31 LVV-T75 - Verify implementation of Multi-band Coadds

Version **1.0(d)**. Status **Approved**. Open *LVV-T75* test case in Jira.

Verify that the DRP pipelines produce multi-band coadds for detection purposes.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

This requirement is verified by inspection, as the multi-band coadds are not part of typical DRP processing, and are not persisted.

Detailed steps results LVV-R293-LVV-E3812-1319223079:

| Step LVV-E3812-1                                                                                                                                                                                                             |  | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------|
| Description                                                                                                                                                                                                                  |  |                                    |
| Verify that code exists in the LSST Science Pipelines to create deep detection coadds based on all filters.                                                                                                                  |  |                                    |
| -----                                                                                                                                                                                                                        |  |                                    |
| Test Data                                                                                                                                                                                                                    |  |                                    |
| None                                                                                                                                                                                                                         |  |                                    |
| -----                                                                                                                                                                                                                        |  |                                    |
| Expected Result                                                                                                                                                                                                              |  |                                    |
| -----                                                                                                                                                                                                                        |  |                                    |
| Actual Result                                                                                                                                                                                                                |  |                                    |
| Multi-band coadds are created by the "chi^2 coadd" algorithm at assemble_chi2_coadd.py. As noted in the doc-strings of that module, the chi^2 coadds are created based on the methods of Szalay et al. 1999 and Kaiser 2001. |  |                                    |

We have thus demonstrated that the codebase that is available to the Rubin users community has provided tools to create multiband deep detection coadds.

### 5.2.3.32 LVV-T74 - Verify implementation of Template Coadds

Version **1.0(d)**. Status **Approved**. Open *LVV-T74* test case in Jira.

Verify that the DMS can produce Template Coadds for DIA processing.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed on the RSP at USDF using pipelines version w\_2025\_33. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test\_LVV-T73.ipynb."

Detailed steps results LVV-R293-LVV-E3813-1319223080:

| Step LVV-E3813-1                                                                                                                                                                                                                                                                                                                                                 | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                                                                      |                                    |
| Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset. |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                            |                                    |
| Test Data                                                                                                                                                                                                                                                                                                                                                        |                                    |
| None                                                                                                                                                                                                                                                                                                                                                             |                                    |
| -----                                                                                                                                                                                                                                                                                                                                                            |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                                                                  |                                    |
| An output dataset including difference images and DIASource and DIAObject measurements.                                                                                                                                                                                                                                                                          |                                    |

---

### Actual Result

For this test, we use the Data Preview 1 dataset as processed through DRP processing. The butler repository and collection at USDF were initialized as follows:

```
butler = Butler('/repo/dp1', collections="LSSTComCam/DP1")
```

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3813-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

### Description

Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.

---

### Test Data

None

---

### Expected Result

---

### Actual Result

Catalogs are not the focus of this particular test, so we did not examine them.

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3813-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

### Description

Confirm that the template coadds have been created and are well-formed.

---

### Test Data

None

---

### Expected Result

---

### Actual Result

In the attached notebook, we displayed and examined template coadds to confirm that they are well-formed, confirmed that the templates were created from the 1/3 of images with the best seeing, and compared template, visit, and difference images in the ugrizy bands.

We have confirmed that the pipelines are capable of producing and applying well-formed template coadds.

### 5.2.3.33 LVV-T73 - Verify implementation of Deep Detection Coadds

Version **1.0(d)**. Status **Approved**. Open *LVV-T73* test case in Jira.

Verify that the DRP pipelines produce a suite of per-band coadded images that are optimized for depth.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed on the RSP at USDF using pipelines version w\_2025\_33. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test\_LVV-T73.ipynb."

Detailed steps results LVV-R293-LVV-E3814-1319223081:

| Step LVV-E3814-1                                                                                             | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                  |                                    |
| Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following: |                                    |
| -----                                                                                                        |                                    |
| Test Data                                                                                                    |                                    |
| None                                                                                                         |                                    |
| -----                                                                                                        |                                    |
| Expected Result                                                                                              |                                    |
| Butler repo available for reading.                                                                           |                                    |
| -----                                                                                                        |                                    |
| Actual Result                                                                                                |                                    |

We use data processed with w\_2025\_33, which currently resides in the Butler repository /repo/embargo:

```
butler = Butler('/repo/embargo', collections="LSSTCam/runs/DRP/20250604_20250814/w_2025_33/DM-52202")
```

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3814-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Verify through inspection that per-filter coadds exist for each tract+patch possible

Test Data

None

Expected Result

Actual Result

In the attached notebook, we extracted the list of all visit+detector combinations that exist in the repository. For each of these we queried the Butler for 'deep\_coadd' images overlapping the central coordinate of the detector. All but 2% of the visits have corresponding deep coadds. The small fraction of images that do not have coadds likely consists of sky areas where only a single overlapping visit was obtained.

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3814-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Verify through inspection that the images used to generate those coadds met specified conditions

Test Data

None

Expected Result

Actual Result

In the attached notebook, we demonstrate that the visits contributing to the selected i-band coadd all have seeing (measured PSF FWHM) less than 1.7", as expected. The following figure illustrates this:

**Image Download Error**

---

Step LVV-E3814-4

Step Execution Status: **Pass**

---

Description

Visually inspect a subset of the coadds to verify that they visually appear reasonable and to be from good quality data.

---

Test Data

None

---

Expected Result

---

Actual Result

We explored some coadd images and confirmed that they are well-formed and reasonable. By comparison to visit images at the same position, we also confirmed that the coadds are indeed deeper than the single-visit images.

### 5.2.3.34 LVV-T69 - Verify implementation of Object Characterization

Version **1.0(d)**. Status **Approved**. Open *LVV-T69* test case in Jira.

Verify that Object catalogs produced by the DRP pipeline include all measurements listed in DMS-REQ-0276: a point-source model fit, a bulge-disk model fit, standard colors, a centroid, adaptive moments, Petrosian and Kron fluxes, surface brightness at multiple apertures, proper motion and parallax, and a variability characterization.

**Preconditions:**

None

Execution status: **Initial Pass**

Final comment:

Test executed at the USDF using commissioning data processed with pipelines version 'w\_2025\_49'. The notebook corresponding to this test is attached to the document repo as "test\_LVV-T69.ipynb".

Detailed steps results LVV-R293-LVV-E3815-1319223082:

Step LVV-E3815-1

Step Execution Status: **Initial Pass**

#### Description

Execute DRP processing, load the results, and observe catalog contents to confirm that the required measurements are present.

#### Test Data

None

#### Expected Result

#### Actual Result

In the attached notebook, we demonstrate that the 'object' table contains a point-source model fit, bulge-disk model fit, standard colors (via GAAP fluxes), a centroid, adaptive moments, cModel, Kron, and Sersic galaxy model fluxes, and fluxes in concentric apertures.

We note that proper motions and parallaxes, and variability characterization, are not available at this time. These will be provided with Data Release 1. We thus rule this test an "Initial Pass" with the caveat that these additional quantities will come in future data products.

### 5.2.3.35 LVV-T67 - Verify implementation of Object Catalog

Version **1.0(d)**. Status **Approved**. Open *LVV-T67* test case in Jira.

Verify that the DRP pipelines produce an Object catalog derived from detections made on both coadded images and difference images and measurements performed on coadds and possibly overlapping single-epoch images.

#### Preconditions:

Input Data

DECam HiTS data (raw science images and master calibrations)

HSC "RC2" data (raw science images and master calibrations)

Execution status: **Pass**

Final comment:

Test executed at the USDF using pipelines version 'w\_2026\_02'. The associated notebook from this test is attached to the report repository as "test\_LVV-T67.ipynb".

Detailed steps results LVV-R293-LVV-E3816-1319223083:

| Step LVV-E3816-1                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                          |                                    |
| Identify a dataset that has been processed through coaddition and object table creation.                                                                             |                                    |
| -----                                                                                                                                                                |                                    |
| Test Data                                                                                                                                                            |                                    |
| None                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                |                                    |
| Expected Result                                                                                                                                                      |                                    |
| -----                                                                                                                                                                |                                    |
| Actual Result                                                                                                                                                        |                                    |
| We select "dp2_prep" data processing that used the release candidate 'v30_0_0_rc2' version of the pipelines. Its repo/collection were initialized via the following: |                                    |
| <pre>butler = Butler('dp2_prep', collections="LSSTCam/runs/DRP/20250515-20251214/v30_0_0_rc2/DM-53697")</pre>                                                        |                                    |
| Step LVV-E3816-2                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                          |                                    |
| Examine an Object catalog and confirm that it has measurements of deblended objects from the deep coadd images.                                                      |                                    |
| -----                                                                                                                                                                |                                    |
| Test Data                                                                                                                                                            |                                    |
| None                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                |                                    |
| Expected Result                                                                                                                                                      |                                    |
| -----                                                                                                                                                                |                                    |

---

### Actual Result

In the attached notebook, we examined the Object catalog at a randomly-selected position, and confirmed that it contains measurements of deblended objects. Object coordinates were overlaid on a corresponding 'deep\_coadd' image to confirm that overlapping sources have been deblended.

At present, the Object catalog does not contain information from difference imaging or single-epoch images. The Object table will continue to evolve in future data releases and processing campaigns.

### 5.2.3.36 LVV-T54 - Verify implementation of Alert Content

Version **1.0(d)**. Status **Approved**. Open *LVV-T54* test case in Jira.

Verify that the DMS creates an Alert for each detected DIASource

Verify that this Alert is broadcasted using community protocols

Verify that the context of the Alert packet match requirements.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3817-1319223084:

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3817-1 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

#### Description

Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.

---

## Test Data

None

---

## Expected Result

An output dataset including difference images and DIASource and DIAObject measurements.

---

## Actual Result

Performed as part of the prompt processing commissioning

---

### Step LVV-E3817-2

Step Execution Status: **Pass**

---

#### Description

Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.

---

## Test Data

None

---

## Expected Result

---

## Actual Result

All data products stated in the requirement are present for inclusion in the alert packets, except for mask information in the cutouts. This is awaiting a bug fix implementation in astropy v8. We're on v7.2 right now <https://github.com/astropy/astropy/pull/18862>

---

### Step LVV-E3817-3

Step Execution Status: **Pass**

---

#### Description

Examine the serialized alert packets to confirm the presence of the required elements (LVV-105).

---

## Test Data

None

---

## Expected Result

---

#### Actual Result

The alert packets successfully sent to brokers, containing all information except the masks on the cutouts.

### 5.2.3.37 LVV-T52 - Verify implementation of DIAObject Attributes

Version **1.0(d)**. Status **Draft**. Open *LVV-T52* test case in Jira.

Verify that the DMS provides summary attributes for each DIAObject, including periodicity measures.

#### Preconditions:

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.38 LVV-T51 - Verify implementation of DIAObject Catalog

Version **1.0(d)**. Status **Approved**. Open *LVV-T51* test case in Jira.

Verify that the DIAObject includes a unique ID, identifiers for nearest stars and nearest galaxies, and probability of matching to static Object.

#### Preconditions:

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.39 LVV-T49 - Verify implementation of DIASource Catalog

Version **1.0(d)**. Status **Approved**. Open *LVV-T49* test case in Jira.

Verify that the DMS produces a Source catalog from Difference Exposures with the required attributes.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed on the RSP at USDF, using pipelines version w\_2025\_50. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test\_LVV-T49.ipynb."

Detailed steps results LVV-R293-LVV-E3822-1319223090:

| Step LVV-E3822-1                                                                                                                                                                                                                                                                                          | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                               |                                    |
| The 'path' that you will use depends on where you are running the science pipelines. Options:                                                                                                                                                                                                             |                                    |
| <ul style="list-style-type: none"> <li>• local (newinstall.sh - based install):[path_to_installation]/loadLSST.bash</li> <li>• development cluster ("lsst-dev"): /software/lsstsw/stack/loadLSST.bash</li> <li>• LSP Notebook aspect (from a terminal): /opt/lsst/software/stack/loadLSST.bash</li> </ul> |                                    |

From the command line, execute the commands below in the example code:

-----  
Test Data  
None

---

### Expected Result

Science pipeline software is available for use. If additional packages are needed (for example, 'obs' packages such as 'obs\_subaru'), then additional 'setup' commands will be necessary.

To check versions in use, type:  
eups list -s

---

### Actual Result

For this test, we use LSSTCam on-sky data processed in one of the "Intermittent Cumulative DRP" campaigns.

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3822-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

#### Description

Perform the steps of Alert Production (including, but not necessarily limited to, single frame processing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.

---

#### Test Data

None

---

### Expected Result

An output dataset including difference images and DIASource and DIAObject measurements.

---

### Actual Result

The processing was done as part of "intermittent DRP" processing in collection "LSSTCam/runs/DRP/20250417\_20250921/w\_2025\_4953545".

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3822-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

#### Description

Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.

---

#### Test Data

None

---

## Expected Result

---

### Actual Result

The repo/collection was initialized via:

```
butler = Butler('dp2_prep', collections=['LSSTCam/runs/DRP/20250417_20250921/w_2025_49/DM-53545'])
```

Then, a query was executed for 'dia\_source' catalogs in this repository:

```
source_refs_dict = {}
bands_list = ['u', 'g', 'r', 'i', 'z', 'y']
for band in bands_list:
    source_refs_dict[band] = butler.query_datasets('dia_source', band=band,
                                                  skymap='lsst_cells_v2', limit=1)
```

By printing the results to the screen, we confirm that the data products were produced.

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3822-4 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

### Description

Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:

---

### Test Data

None

---

### Expected Result

Butler repo available for reading.

---

### Actual Result

We use the same repo/collection as in step 3:

```
butler = Butler('dp2_prep', collections=['LSSTCam/runs/DRP/20250417_20250921/w_2025_49/DM-53545'])
```

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3822-5 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

### Description

Verify that products are produced for DIASource catalog

---

### Test Data

None

---

Expected Result

---

Actual Result

In the attached notebook ("test\_LVV-T49.ipynb"), we demonstrate that all of the required fluxes, positions, shapes, and characterization parameters are present in the 'dia\_source' catalogs.

#### 5.2.3.40 LVV-T65 - Verify implementation of Source Catalog

Version **1.0(d)**. Status **Approved**. Open *LVV-T65* test case in Jira.

Verify that all Sources produced by the DRP pipelines contain the entries listed in DMS-REQ-0267.

##### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed on the RSP at USDF, using pipelines version w\_2025\_33. The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test\_LVV-T65.ipynb."

Detailed steps results LVV-R293-LVV-E3823-1319223091:

---

| Step LVV-E3823-1 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|
|------------------|------------------------------------|

---

##### Description

Identify a suitable small dataset to process through the DRP.

---

Test Data

None

-----  
Expected Result

-----  
Actual Result

For this test, we use LSSTCam on-sky data processed in one of the "Intermittent Cumulative DRP" campaigns.

---

Step LVV-E3823-2      Step Execution Status: **Pass**

---

Description

Process data with the Data Release Production payload, starting from raw science images and generating science data products, placing them in the Data Backbone.

-----  
Test Data

None

-----  
Expected Result

-----  
Actual Result

The Butler repository and collection containing the results of the processing was accessed via:

butler = Butler('/repo/main', collections="LSSTCam/runs/DRP/20250501\_20250609/w\_2025\_30/DM-51933")

---

Step LVV-E3823-3      Step Execution Status: **Pass**

---

Description

Confirm that source catalogs have been produced for single visits and coadds, and that it contains the required measurements.

-----  
Test Data

None

-----  
Expected Result

A source catalog containing the measured attributes (and associated errors), including location on the focal plane; a static point-source model fit to world coordinates and flux; a centroid and adaptive moments; and surface brightnesses through elliptical multiple apertures that are concentric, PSF-homogenized, and logarithmically spaced in

intensity.

---

#### Actual Result

In the attached notebook, we demonstrate via inspection and various plots that the required attributes are measured, and their associated errors are provided for all sources. We note that the concentric fluxes are measured through circular apertures, and are not PSF-homogenized, but the scientific usefulness of such quantities is unclear. We thus consider this a passing test, but will explore the possibility of including additional concentric-aperture fluxes in future processing.

#### 5.2.3.41 LVV-T211 - Verify implementation of Data Access Center Geographical Distribution

Version **1.0(d)**. Status **Approved**. Open *LVV-T211* test case in Jira.

Verify that the DACs are geographically distributed to provide low-latency access to data-rights community.

##### Preconditions:

None

Execution status: **Pass**

Final comment:

Setting this test case as a Pass as the Data Access Centers have long since been established and in use since this test case was first defined. To demonstrate the "success" of this test case, I will attach relevant verification artifacts.

Detailed steps results LVV-R293-LVV-E3824-1319223092:

---

|                  |                                            |
|------------------|--------------------------------------------|
| Step LVV-E3824-1 | Step Execution Status: <b>Not Executed</b> |
|------------------|--------------------------------------------|

---

Description

Analyze design

---

Test Data

None

-----  
Expected Result

-----  
Actual Result

#### 5.2.3.42 LVV-T210 - Verify implementation of Data Access Center Simultaneous Connections

Version **1.0(d)**. Status **Draft**. Open *LVV-T210* test case in Jira.

Verify that the each DAC can support at least `dacMinConnections` simultaneously

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.43 LVV-T209 - Verify implementation of Data Access Centers

Version **1.0(d)**. Status **Approved**. Open *LVV-T209* test case in Jira.

Verify that the Data Access Centers are provisioned with computing resources necessary to support end-user access to LSST Data Products.

##### **Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3826-1319223095:

| Step LVV-E3826-1                                                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                          |                                    |
| Analyze design                                                                                                                                                                                       |                                    |
| -----                                                                                                                                                                                                |                                    |
| Test Data                                                                                                                                                                                            |                                    |
| None                                                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                                |                                    |
| Expected Result                                                                                                                                                                                      |                                    |
| -----                                                                                                                                                                                                |                                    |
| Actual Result                                                                                                                                                                                        |                                    |
| <a href="https://rtn-041.lsst.io/">https://rtn-041.lsst.io/</a> Describes DP0.2 and the US DAC access, see also <a href="https://dmtm-209.lsst.io/">https://dmtm-209.lsst.io/</a> on the Google DAC. |                                    |

#### 5.2.3.44 LVV-T202 - Verify implementation of Archive to Data Access Center Network Reliability

Version **1.0(d)**. Status **Approved**. Open *LVV-T202* test case in Jira.

Verify the reliability of Archive to Data Access Center Network by demonstrating successful failover and capacity to the secondary part and subsequent recovery to primary within or exceeding  $chToDacNetMTTR = 48[\text{hour}]$ .

**Preconditions:**

1. Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place, running on end node computers that are the production hardware or equivalent to it.
2. As-built documentation for all of the above is available.
3. NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, LSSTCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as “Requires Monitoring” such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3828-1319223097:

| Step LVV-E3828-1                                                                                                               | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                    |                                    |
| Simulate failure on primary paths by disconnecting fiber at an endpoint location in the archive on the Archive - DACs network. |                                    |
| -----                                                                                                                          |                                    |
| Test Data                                                                                                                      |                                    |
| NA                                                                                                                             |                                    |
| -----                                                                                                                          |                                    |
| Expected Result                                                                                                                |                                    |
| Networks fail over to secondary paths.                                                                                         |                                    |
| -----                                                                                                                          |                                    |
| Actual Result                                                                                                                  |                                    |
| Primary link failed during the week and traffic shifted to backup link without interrupting transfers.                         |                                    |

## LHN Traffic



12 Gb

11 Gb

10 Gb

9 Gb

8 Gb

7 Gb

6 Gb

5 Gb

4 Gb

3 Gb

DRAFT  
2 Gb

87

DRAFT

---

Step LVV-E3828-2      Step Execution Status: **Pass**

---

Description

Monitor transfers on secondary paths for 1 day.

Test Data

None

Expected Result

Transfers occur without extended failures or extended latency spikes. Data transfers on secondary at rates at or above those specified in LDM-142.

Actual Result

---

Step LVV-E3828-3      Step Execution Status: **Pass**

---

Description

Simulate repair and recovery period by leaving primary fiber disconnected for at least 1 day, then reconnecting primary fiber.

Test Data

NA

Expected Result

Wall clock advances by 1 day. Network recovers to primary path. Verify entire process meets chToDacNetMTTR = 48[hour].

Actual Result

Traffic shifted to primary link when the path was restored.

### 5.2.3.45 LVV-T201 - Verify implementation of Archive to Data Access Center Network Availability

Version **1.0(d)**. Status **Approved**. Open *LVV-T201* test case in Jira.

Verify availability of archiving to Data Access Center Network using test and historical data of or exceeding archToDacNetMTBF= 180[day].

#### Preconditions:

1. Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place, running on end node computers that are the production hardware or equivalent to it.
2. At least 6 months of historical monitoring data is available on these network links, running on end node computers that are the production hardware or equivalent to it.
3. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3829-1319223098:

---

Step LVV-E3829-1      Step Execution Status: **Pass**

---

Description

Transfer data between archive and DACs over uninterrupted 1 week period.

Test Data

Data Release or petabyte-scale test data set

Expected Result

Data transfers without failures or extended latency spikes

Actual Result

---

Step LVV-E3829-2      Step Execution Status: **Pass**

---

Description

Analyze test data and compare to historical data. Extrapolate to 1 year testimate of MTBF.

Test Data

NA

Expected Result

Networks can meet archToDacNetMTBF = 180[day] at or exceeding rates specified in LDM-142.

Actual Result

The following are ~6 months of traffic in the LHN,

### 5.2.3.46 LVV-T200 - Verify implementation of Archive to Data Access Center Network

Version **1.0(d)**. Status **Approved**. Open *LVV-T200* test case in Jira.

Verify archiving of data to Data Access Center Network at or exceeding rates specified in LDM-142, i.e at archToDacBandwidth = 10000[megabit per second].

## Preconditions:

1. Data is staged in LDF and data transfer capabilities to US DAC and Chilean DAC are in place, running on end node computers that are the production hardware or equivalent to it.
2. At least 6 months of historical monitoring data is available on these network links.
3. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, LSSTCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3830-1319223099:

| Step LVV-E3830-1                                                                             | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                  |                                    |
| Transfer data from Data Facility to US and Chilean DACs over an uninterrupted 1 week period. |                                    |
| -----                                                                                        |                                    |
| Test Data                                                                                    |                                    |
| Data Release                                                                                 |                                    |
| -----                                                                                        |                                    |

## Expected Result

Data transfers without significant failures or extended latency spikes

## Actual Result

Step LVV-E3830-2

Step Execution Status: **Pass**

## Description

Analyze network logs and compare with historical data on the links.

## Test Data

NA

## Expected Result

The networks can transfer data at archToDacBandwidth = 10000[megabit per second], i.e. at or exceeding rates specified in LDM-142.

## Actual Result

### 5.2.3.47 LVV-T196 - Verify implementation of Base to Archive Network Secondary Link

Version **1.0(d)**. Status **Approved**. Open *LVV-T196* test case in Jira.

Verify Base to Archive Network Secondary Link failover and capacity, and subsequent recovery primary. Demonstrate the use of the secondary path in "catch-up" mode.

## Preconditions:

1. Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data, running on end node computers that are the production

- hardware or equivalent to it.
2. Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network, running on end node computers that are the production hardware or equivalent to it.
3. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3831-1319223100:

| Step LVV-E3831-1                                                                                                 | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                      |                                    |
| Transfer data between base and archive on primary links over uninterrupted 1 day period.                         |                                    |
| -----                                                                                                            |                                    |
| Test Data                                                                                                        |                                    |
| LATISS, ComCAM, or FullCAM data.                                                                                 |                                    |
| -----                                                                                                            |                                    |
| Expected Result                                                                                                  |                                    |
| Data is successfully transferred over primary link at or exceeding rates specified in LDM-142 throughout period. |                                    |
| -----                                                                                                            |                                    |
| Actual Result                                                                                                    |                                    |
| Data is transferred successfully                                                                                 |                                    |

### Image Download Error

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3831-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

#### Description

Simulate outage by disconnecting fiber on primary fiber on Base side of Base - Archive Network.

---

#### Test Data

NA

---

#### Expected Result

Network fails over to secondary links in  $\leq 60$ s

---

#### Actual Result

There's an outage in the primary link 10/06 ~12:00

### Image Download Error

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3831-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

#### Description

Transfer data between base and archive over secondary equipment uninterrupted 1 day period.

---

#### Test Data

LATISS, ComCAM, or FullCAM data.

---

#### Expected Result

Data is successfully transferred over secondary link at or exceeding rates specified in LDM-142 throughout period.

---

#### Actual Result

Secondary link is activated and transfers data to USDF.

### Image Download Error

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3831-4 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

## Description

Restore connection on primary link by reconnecting fiber.

---

### Test Data

NA

---

### Expected Result

Network recovers to primary.

---

### Actual Result

Link is recovered and data shifts to the primary link

**Image Download Error**

---

Step LVV-E3831-5

Step Execution Status: **Pass**

---

### Description

Demonstrate use of secondary in catch-up mode.

---

### Test Data

DAQ buffer full of images and associated metadata.

---

### Expected Result

Images from DAQ buffer and associated metadata are retrievable over secondary path while current observing data is being transferred over primary path.

---

### Actual Result

Data is sent using the primary link if it's available

**Image Download Error**

### 5.2.3.48 LVV-T194 - Verify implementation of Base to Archive Network Availability

Version **1.0(d)**. Status **Approved**. Open *LVV-T194* test case in Jira.

Verify the availability of the Base to Archive Network communications by demonstrating that it meets or exceeds a mean time between failures, measured over a 1-yr period of MTBF > baseToArchNetMTBF (180[day])

#### Preconditions:

1. Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data, running on end node computers that are the production hardware or equivalent to it.
2. Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network, running on end node computers that are the production hardware or equivalent to it.
3. At least 6 months of historical monitoring data on this link is available.
4. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3833-1319223103:

---

Step LVV-E3833-1

Step Execution Status: **Pass**

---

Description

Transfer data between base and archive over uninterrupted 1 week period.

---

Test Data

LATISS, ComCAM, or FullCAM data.

---

Expected Result

Data is successfully transferred during the entire week.

---

Actual Result

Data has been successfully transferred from Summit to USDF for several weeks.

**Image Download Error**

---

Step LVV-E3833-2

Step Execution Status: **Pass**

---

Description

Analyze monitoring/performance data, compare to historical data, and extrapolate to a full year, average and peak throughput and latency.

---

Test Data

NA

---

Expected Result

Extrapolated network availability meets  $\text{baseToArchNetMTBF} = 180[\text{day}]$ . Note that this is for complete loss of transfer service (all paths), not a single path failure with successful fail-over.

---

Actual Result

Since the installation of the perfsonar at SLAC (May 2024) and up to December 2024, there has been no complete loss of transfers.

**Image Download Error**

### 5.2.3.49 LVV-T193 - Verify implementation of Base to Archive Network

Version **1.0(d)**. Status **Approved**. Open *LVV-T193* test case in Jira.

Verify that the data acquired by a DAQ can be transferred within the required time, i.e. verify that link is capable of transferring image for prompt processing in `oArchiveMaxTransferTime` = 5[second], i.e. at or exceeding rates specified in LDM-142.

#### Preconditions:

1. Archiver/Forwarders are configured at Base, connected to REUNA DWDM, loaded with simulated or pre-cursor data, running on end node computers that are the production hardware or equivalent to it.
2. Archiver/Forwarder receivers or other capability is on configured at LDF, connected to Base - Archive Network, running on end node computers that are the production hardware or equivalent to it.
3. As-built documentation for all of the above is available.

NOTE: This test will be repeated at increasing data volumes as additional observatory capabilities (e.g. ComCAM, FullCam) become available. Final verification will be tested at full operational volume. After the initial test, the corresponding verification elements will be flagged as "Requires Monitoring" such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3834-1319223104:

| Step LVV-E3834-1                                                                                                                                           | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                |                                    |
| Transfer data between base and archive while monitoring the network over uninterrupted 1 day period (with repeated transfers on normal observing cadence). |                                    |

---

#### Test Data

LATISS, ComCAM, or FullCAM data.

---

#### Expected Result

Data transfers occur without significant delay or frequent latency spikes.

---

#### Actual Result

Summit has been regularly sending ComCam data to USDF. The following is the transfer rate of the LHN link during the first week of November 2024

#### Image Download Error

---

Step LVV-E3834-2

Step Execution Status: **Pass**

---

#### Description

Analyze the network logs and monitoring system to determine average and peak latency and packet loss statistics.

---

#### Test Data

None

---

#### Expected Result

Data can be transferred within the required time, i.e. verify that link is capable of transferring image for prompt processing in oArchiveMaxTransferTime = 5[second]. Verify transfer of data at or exceeding rates specified in LDM-142 at least 98% of the time.

---

#### Actual Result

Link is capable of sending data below the 5 seconds mark. The following is a benchmark of 10 nodes sending 25 files each of 20MB.

#### Image Download Error

### 5.2.3.50 LVV-T188 - Verify implementation of Summit to Base Network Ownership and Operation

Version **1.0(d)**. Status **Approved**. Open *LVV-T188* test case in Jira.

Verify Summit to Base Network Ownership and Operation by LSST and/or the operations entity by inspection of construction and operations contracts and Indefeasible Rights.

**Preconditions:**

1. As-built documentation for all of the above contracts and IRUs is available.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3835-1319223105:

| Step LVV-E3835-1                                                                                                                                                                                                                                                                                                | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                     |                                    |
| Examine contracts with REUNA and telefonica for fiber ownership and maintenance terms.                                                                                                                                                                                                                          |                                    |
| -----                                                                                                                                                                                                                                                                                                           |                                    |
| Test Data                                                                                                                                                                                                                                                                                                       |                                    |
| None                                                                                                                                                                                                                                                                                                            |                                    |
| -----                                                                                                                                                                                                                                                                                                           |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                 |                                    |
| Rubin Observatory is owner of fibers on AURA property and Summit - Base DWDM and has 15-year IRU for use of fibers on all segments. REUNA is owner of LS - SCL DWDM on AURA property and in Santiago, and is operator on all fibers and DWDM. Telefonica is contracted to maintain fibers not on AURA property. |                                    |
| -----                                                                                                                                                                                                                                                                                                           |                                    |
| Actual Result                                                                                                                                                                                                                                                                                                   |                                    |
| Contract CH2015-314 named "Contrato por servicio Redes de fibra óptica", Annex 1 specifies the following: "Un IRU de un enlace con ruta diversa al canal de fibra optica de por lo menos 40Gbps por un periodo de 15 años desde 30 de Nov. de 2019 al 30 de Sept. de 2034....."                                 |                                    |

In the point "Octavo", Reuna is defined as the single responsible for the operation and maintenance of the link.

### 5.2.3.51 LVV-T186 - Verify implementation of Summit to Base Network Reliability

Version **1.0(d)**. Status **Approved**. Open *LVV-T186* test case in Jira.

Verify the reliability of the summit to base network by demonstrating reconnection and recovery to transfer of data at or exceeding rates specified in LDM-142 following a cut in network connection, within MTTR specification. The network operator will provide MTTR data on links during commissioning and operations.

#### Preconditions:

1. PMCS DMTC-7400-2400 Complete
2. As-built documentation for Summit - Base Network is available.

NOTE: After the initial test, the corresponding verification elements will be flagged as “Requires Monitoring” such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3837-1319223109:

---

|                                                                                             |                                    |
|---------------------------------------------------------------------------------------------|------------------------------------|
| Step LVV-E3837-1                                                                            | Step Execution Status: <b>Pass</b> |
| Description                                                                                 |                                    |
| Disconnect fiber cable at an endpoint location on the base side of the Summit - Base fiber. |                                    |

---

-----

## Test Data

- LATISS, ComCAM, or LSSTCam data

---

### Expected Result

Fiber is disconnected and the fault is detected by the network monitoring system.

---

### Actual Result

Fiber cut was detected and reported

"• Fecha y Hora de inicio: 09:04 (GMT-3), Viernes 16 de Febrero de 2024. (Fecha del mensaje Viernes 16 de febrero de 2024, 10:06 AM)

- Mensaje N°: 01

• Descripción del problema: Informamos que detectamos una **falla** en el Enlace Principal Santiago - La Serena, en el tramo **La Serena - Vicuña**. Ya hemos tomado contacto con proveedor para generar un caso, saber las causas del evento y obtener una pronta solución a este inconveniente"

---

#### Step LVV-E3837-2

Step Execution Status: **Pass**

---

#### Description

Measure the cable with the OTDR to locate the distance from the end point. Diagnose that it is a break.

---

### Test Data

NA

---

### Expected Result

OTDR shows the fiber is disconnected (break).

---

### Actual Result

Location of the fiber cut was identified

"• Fecha y Hora de inicio: 09:04 (GMT-3), Viernes 16 de Febrero de 2024. (Fecha del mensaje Viernes 16 de febrero de 2024, 12:25 PM)

- Mensaje N°: 04

• Descripción del problema: Informamos que el proveedor nos indica que hay un corte de fibra aproximadamente 20kms de La Serena , se deben reemplazar 400 mts de fibra un ETR de 18 hrs."

---

#### Step LVV-E3837-3

Step Execution Status: **Pass**

## Description

Elapse time to simulate the following:

- Go to the most inaccessible place which would mean carrying all the tools/splicer/generator/tent equipment some metres.
- Erect a tent to make the splice
- Start the generator
- Do a splice on some random piece of cable
- At an end point measure the cable again to ensure it is break free.
- Take down and reinstall an isolated pole (not in the actual fiber path)
- Put the cable on the pole.

---

### Test Data

NA

---

### Expected Result

Wall clock advances by 24 hours.

---

### Actual Result

Fiber cut was detected in this location, hence a temporary tent was built to fusion the fiber.

### Image Download Error

---

Step LVV-E3837-4

Step Execution Status: **Pass**

---

### Description

Clean fiber connections. Restore connection (e.g. reconnect cable). Cycle equipment as necessary to confirm fiber is connected.

---

### Test Data

NA

---

### Expected Result

Network recovers and resumes sending data.

---

### Actual Result

Network was recovered

”• Fecha y Hora de inicio: 09:04 (GMT-3), Viernes 16 de Febrero de 2024. (Fecha del correo de finalizacion, sabado 17 de Febrero 2024, 10:43 PM)

• Fecha y Hora de término: 17:23 (GMT-3), Viernes 16 de Febrero de 2024

• Tiempo estimado de solución: Pendiente

• Motivo: Pendiente

• Mensaje N°: 08

• Descripción del problema: Proveedor informa que trabajos de reparación finalizaron, por lo tanto, no se esperan nuevas interrupciones en el servicio.

Saludos cordiales desde REUNA.”

| Step LVV-E3837-5                                                                                                                                        | Step Execution Status: <b>Pass</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                             |                                    |
| Measure with OTDR to ensure back to normal state.                                                                                                       |                                    |
| Test Data                                                                                                                                               |                                    |
| NA                                                                                                                                                      |                                    |
| Expected Result                                                                                                                                         |                                    |
| OTDR indicates normal state.                                                                                                                            |                                    |
| Actual Result                                                                                                                                           |                                    |
| Service was restored                                                                                                                                    |                                    |
| ”• Fecha y Hora de inicio: 09:04 (GMT-3), Viernes 16 de Febrero de 2024. (Fecha del correo de finalizacion, sabado 17 de Febrero 2024, 10:43 PM)        |                                    |
| • Fecha y Hora de término: 17:23 (GMT-3), Viernes 16 de Febrero de 2024                                                                                 |                                    |
| • Tiempo estimado de solución: Pendiente                                                                                                                |                                    |
| • Motivo: Pendiente                                                                                                                                     |                                    |
| • Mensaje N°: 08                                                                                                                                        |                                    |
| • Descripción del problema: Proveedor informa que trabajos de reparación finalizaron, por lo tanto, no se esperan nuevas interrupciones en el servicio. |                                    |
| Saludos cordiales desde REUNA.”                                                                                                                         |                                    |

### 5.2.3.52 LVV-T185 - Verify implementation of Summit to Base Network Availability

Version **1.0(d)**. Status **Approved**. Open *LVV-T185* test case in Jira.

Verify the availability of Summit to Base Network by demonstrating that the mean time between failures is less than summToBaseNetMTBF (90 days) over 1 year.

### Preconditions:

1. PMCS DMTC-7400-2400 Complete.
2. 6 months of historical availability data for this link is available.
3. perSonar installed in Summit and publishing statistics to MadDash.
4. As-built documentation for all of the above is available.

NOTE: After the initial test, the corresponding verification elements will be flagged as “Requires Monitoring” such that those requirements will be closed out as having been verified but will continue to be monitored throughout commissioning to ensure they do not drop out of compliance. This will also be monitored for end to end Summit - Data Facility transfers during Commissioning.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3838-1319223110:

| Step LVV-E3838-1                                                                  | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------|------------------------------------|
| Description                                                                       |                                    |
| Monitor summit to base networking for at least 1 week                             |                                    |
| -----                                                                             |                                    |
| Test Data                                                                         |                                    |
| LATISS, ComCAM, and/or Full Camera data.                                          |                                    |
| -----                                                                             |                                    |
| Expected Result                                                                   |                                    |
| Summit - base network is operational for 1 week and monitoring data is collected. |                                    |
| -----                                                                             |                                    |

## Actual Result

Link meets the condition

**Image Download Error**

---

Step LVV-E3838-2

Step Execution Status: **Pass**

---

## Description

Extrapolate annual availability, compare with at least 6 months of historical data on the link.

---

## Test Data

Historical and current logs

---

## Expected Result

The mean time between failures (MTBF) is projected to be less than summToBaseNetMTBF (90 days) over 1 year.

---

## Actual Result

Link meets the condition, during the last 6 months, there was only 1 outage. The rest are temperature related, and not the link

**Image Download Error**

### 5.2.3.53 LVV-T182 - Verify implementation of Prefer Computing and Storage Down

Version **1.0(d)**. Status **Approved**. Open *LVV-T182* test case in Jira.

Only build compute or storage facilities at the summit that are justified by operational need or to prevent loss of data during networking downtimes.

#### **Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3839-1319223111:

|                                                                                                                                           |                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Step LVV-E3839-1                                                                                                                          | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                               |                                    |
| Analyze design and allocation of resources at the summit, base station and data facilities.                                               |                                    |
| -----                                                                                                                                     |                                    |
| Test Data                                                                                                                                 |                                    |
| None                                                                                                                                      |                                    |
| -----                                                                                                                                     |                                    |
| Expected Result                                                                                                                           |                                    |
| -----                                                                                                                                     |                                    |
| Actual Result                                                                                                                             |                                    |
| We have a full tests system at the base in LAS and the Chile DAC will be there. This is appropriate.                                      |                                    |
| Step LVV-E3839-2                                                                                                                          | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                               |                                    |
| Confirm that allocation of resources at summit is only what is needed and no more.                                                        |                                    |
| -----                                                                                                                                     |                                    |
| Test Data                                                                                                                                 |                                    |
| None                                                                                                                                      |                                    |
| -----                                                                                                                                     |                                    |
| Expected Result                                                                                                                           |                                    |
| -----                                                                                                                                     |                                    |
| Actual Result                                                                                                                             |                                    |
| We have a 2200 node cluster at the summit to process rpaid analysis and 6PB storage for one months data as required. This is appropriate. |                                    |

#### 5.2.3.54 LVV-T177 - Verify implementation of Incorporate Fault-Tolerance

Version **1.0(d)**. Status **Approved**. Open *LVV-T177* test case in Jira.

Demonstrate that Data Management Systems have features that prevent data loss. Includes: MD5SUM/checksum verification for data transfer; RAID to eliminate single-point disk failures; multi-site and tape for disaster recovery of raw data; multiple site (and tape?) for backup/recovery of Data Release products; DB transaction logging and backup to maintain DB integrity. (Note: storage to prevent loss in case of networking failures is covered in LVV-T175 ).

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3840-1319223112:

| Step LVV-E3840-1 | Step Execution Status: <b>Pass</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description      | Analyze design; execute single-day operations rehearsal including failures, observe recovery without loss of data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Test Data        | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Expected Result  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Actual Result    | We have executed several Data Previews and Operations rehearsals including DP1 see <a href="https://rtn-095.lsst.io/">https://rtn-095.lsst.io/</a> . These had failures of links, machines, algorithms - all were recovered and no data was lost. See <a href="https://rtn-027.lsst.io/">https://rtn-027.lsst.io/</a> for validation of DP2 (though RTN-095 covers most of it). For some early state and issues see <a href="https://rtn-100.lsst.io/#milestone-ops-rehearsal-for-data-processing-no-3">https://rtn-100.lsst.io/#milestone-ops-rehearsal-for-data-processing-no-3</a> and <a href="https://rtn-063.lsst.io/">https://rtn-063.lsst.io/</a> (another DRP rehearsal using HSC) |

### 5.2.3.55 LVV-T176 - Verify implementation of Infrastructure Sizing for "catching up"

Version **1.0(d)**. Status **Draft**. Open *LW-T176* test case in Jira.

Demonstrate Data Management System has sufficient excess capacity (compute infrastructure) to process one night's data (2800 exposures) within 24 hours while also maintaining nightly Alert Production (note this is very similar to LVV-T173).

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3841-1319223113:

| Step LVV-E3841-1                                                                                                                                        | Step Execution Status: <b>Pass</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                             |                                    |
| Execute single-day operations rehearsal including catch-up after failure, observe data products generated in time                                       |                                    |
| -----                                                                                                                                                   |                                    |
| Test Data                                                                                                                                               |                                    |
| None                                                                                                                                                    |                                    |
| -----                                                                                                                                                   |                                    |
| Expected Result                                                                                                                                         |                                    |
| -----                                                                                                                                                   |                                    |
| Actual Result                                                                                                                                           |                                    |
| During Commissioning we have executed catch up after outages as well as reprocessing campaigns, all while executing Prompt processing during observing. |                                    |

### 5.2.3.56 LVV-T175 - Verify implementation of Temporary Storage for Communications Links

Version **1.0(d)**. Status **Approved**. Open *LVV-T175* test case in Jira.

Demonstrate that storage capacity is present and usable to prevent data loss if networking is interrupted between summit and base, base and archive, or archive and DAC. The requirement is to have storage necessary to hold tempStorageReIMTTR (200%) of the expected raw data that would arrive during the Mean Time to Repair (summToBaseNetMTTR = 24 hours, baseToArchNetMTTR = 48 hours, archToDacNetMTTR = 48 hours). This scale is further set by  $nCalibExpDay + nRawExpNightMax = 450 + 2800 = 3250$  exposures/day.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3842-1319223114:

| Step LVV-E3842-1                                                           | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------|------------------------------------|
| Description                                                                |                                    |
| Analyze sizing model and network/storage design                            |                                    |
| -----                                                                      |                                    |
| Test Data                                                                  |                                    |
| None                                                                       |                                    |
| -----                                                                      |                                    |
| Expected Result                                                            |                                    |
| -----                                                                      |                                    |
| Actual Result                                                              |                                    |
| Storage has been sized to support up to 30 days in case of a link failure. |                                    |

```
bash-5.1$ ceph df
--- RAW STORAGE ---
CLASS      SIZE      AVAIL      USED      RAW USED      %RAW USED
nvme       5.4 PiB   3.2 PiB   2.2 PiB   2.2 PiB         40.00
TOTAL      5.4 PiB   3.2 PiB   2.2 PiB   2.2 PiB         40.00

--- POOLS ---
POOL                                ID  PGS  STORED  OBJECTS  USED
.rgw.root                          1   32   8.3 KiB    20    228 KiB
lfa.rgw.meta                        2   32   13 KiB    72    672 KiB
lfa.rgw.control                     3   32    0 B      8      0 B
.mgr                                4    1  192 MiB   49    576 MiB
lfa.rgw.log                          5  128   3.0 MiB  350     11 MiB
replicapool                         6  128   43 GiB  11.97k   129 GiB
lfa.rgw.buckets.index               7 1024   34 GiB   6.41k   103 GiB
lfa.rgw.buckets.non-ec              8   32   20 MiB    16     59 MiB
lfa.rgw.otp                          9    1    0 B      0      0 B
lfa.rgw.buckets.data               10 2048   1.4 PiB 589.69M   2.0 PiB
.nfs                                14   32   21 KiB    44    341 KiB
nfs1-metadata                       23   32   3.5 GiB   3.67M    10 GiB
nfs1-data0                          24  256   58 TiB  33.75M   174 TiB
bash-5.1$
```

### 5.2.3.57 LVV-T174 - Verify implementation of Re-processing Capacity

Version **1.0(d)**. Status **Approved**. Open *LVV-T174* test case in Jira.

Verify that the DMS has sufficient processing, storage, and network to reprocess all data within

"drProcessingPeriod" (1 year) while maintaining full Prompt Processing capability.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3843-1319223115:

| Step LVV-E3843-1                                                                                                                                                                                                                                                                                                           | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                                                                                |                                    |
| Analyze the sizing model.                                                                                                                                                                                                                                                                                                  |                                    |
| -----                                                                                                                                                                                                                                                                                                                      |                                    |
| Test Data                                                                                                                                                                                                                                                                                                                  |                                    |
| None                                                                                                                                                                                                                                                                                                                       |                                    |
| -----                                                                                                                                                                                                                                                                                                                      |                                    |
| Expected Result                                                                                                                                                                                                                                                                                                            |                                    |
| -----                                                                                                                                                                                                                                                                                                                      |                                    |
| Actual Result                                                                                                                                                                                                                                                                                                              |                                    |
| DMTN-135 presents the detailed DM sizing model for construction and operations. As stated in that document:                                                                                                                                                                                                                |                                    |
| "Annual DRP execution starts at the beginning of LSST Operations Year 2 with the processing for DR2. The hardware for each year's processing must be purchased and ready for use at the beginning of the year, so it is allocated in the tables to the prior fiscal year, when the images for that processing were taken." |                                    |
| This demonstrates that plans are in place to facilitate reprocessing.                                                                                                                                                                                                                                                      |                                    |

### 5.2.3.58 LVV-T173 - Verify implementation of Pipeline Throughput

Version **1.0(d)**. Status **Approved**. Open *LVV-T173* test case in Jira.

Specification: The infrastructure will be sized such that the net throughput of the data processing pipelines will permit a complete processing of a night’s observing data prior to the start of the next observing night, assuming no system outages.

Demonstrate that the Alert Production Pipeline is capable of processing nRawExpNightMax (2800) science exposures within a (24-nightDurationMax) 12 hour period and issue alerts in offline batch mode.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3844-1319223116:

| Step LVV-E3844-1                                                                                                                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                          |                                    |
| Execute single-day operations rehearsal, observe data products generated in time                                                                                                                                                                                     |                                    |
| -----                                                                                                                                                                                                                                                                |                                    |
| Test Data                                                                                                                                                                                                                                                            |                                    |
| None                                                                                                                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                                                                                                |                                    |
| Expected Result                                                                                                                                                                                                                                                      |                                    |
| -----                                                                                                                                                                                                                                                                |                                    |
| Actual Result                                                                                                                                                                                                                                                        |                                    |
| We have been commissioning the system with LSSTCam for nearly a year, and have always been able to keep up with the daily processing with no major backlogs. We thus consider that demonstration that the pipeline throughput is sufficient for sustained observing. |                                    |

### 5.2.3.59 LVV-T172 - Verify implementation of Optimization of Cost, Reliability and Availability

Version **1.0(d)**. Status **Approved**. Open *LVV-T172* test case in Jira.

In matters of cost, system reliability (functioning properly at a given time) has precedence over system availability (ability to use the system at a given time). The optimization may be outside the realm of direct testing as it is more of a system provisioning guideline but on its face it demands that the Data Management System include failure reporting, regimented change control, acceptance testing, maintenance and monitoring.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3845-1319223117:

| Step LVV-E3845-1                                                                                                                                                                                                       | Step Execution Status: <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                            |                                    |
| Analyze resource management policy                                                                                                                                                                                     |                                    |
| -----                                                                                                                                                                                                                  |                                    |
| Test Data                                                                                                                                                                                                              |                                    |
| None                                                                                                                                                                                                                   |                                    |
| -----                                                                                                                                                                                                                  |                                    |
| Expected Result                                                                                                                                                                                                        |                                    |
| -----                                                                                                                                                                                                                  |                                    |
| Actual Result                                                                                                                                                                                                          |                                    |
| DM arrived to operations and returned several million to contingency. We have already delivered DP1 and are working on DP2. We delivered the First Look images and have processed all data coming from Pachon. We have |                                    |

delivered efficiently within cost and optimised appropriately. More of course remains to be done

#### 5.2.3.60 LVV-T131 - Verify implementation of Provide User Interface Services

Version **1.0(d)**. Status **Defined**. Open *LVV-T131* test case in Jira.

Verify the availability and functionality of the broad range of user interface services called for in the requirement, as applied to both Nightly and DRP data. This will primarily be done by verifications performed at the LSST Science Platform level, based on the requirements in LDM-554; however, a high-level set of tests corresponding to the DMS-REQ-0160 requirement are defined below.

##### **Preconditions:**

1. Testing this requirement relies on a set of data products meeting the data model implied by the DPDD existing in a deployment of the Science Platform and its underlying database and file services.
  - (a) In particular, both image and catalog data products are required.
  - (b) From the specific language of the underlying requirement, it appears clear that coadded data products are required, but in practice single-epoch data products should be included in the test as well.
2. Depending on when this requirement is tested, the tests may involve either or both of precursor data and LSST commissioning data. The use of the latter is ultimately essential to ensure that the tests are performed with as LSST-like a dataset as possible.

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.61 LVV-T64 - Verify implementation of Coadded Image Provenance

Version **1.0(d)**. Status **Approved**. Open *LVV-T64* test case in Jira.

Verify that all coadd data products produced by the DRP pipelines are associated with provenance information that includes the set of input epochs contributing to that coadd as well as any additional information needed to exactly produce that coadd.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Executed at the USDF using pipelines version 'w\_2026\_13'. The script that was executed for this test, and its output log, are attached to this document's repo as "test\_LVV-T64.py" and "test\_LVV-T64.log".

Detailed steps results LVV-R293-LVV-E3848-1319223120:

| Step LVV-E3848-1                                                                                                                                                                          | Step Execution Status: <b>Pass</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                               |                                    |
| Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:                                                                              |                                    |
| -----                                                                                                                                                                                     |                                    |
| Test Data                                                                                                                                                                                 |                                    |
| None                                                                                                                                                                                      |                                    |
| -----                                                                                                                                                                                     |                                    |
| Expected Result                                                                                                                                                                           |                                    |
| Butler repo available for reading.                                                                                                                                                        |                                    |
| -----                                                                                                                                                                                     |                                    |
| Actual Result                                                                                                                                                                             |                                    |
| The following code was executed to point to a recently processed DP2 prep collection:                                                                                                     |                                    |
| <pre>from lsst.daf.butler import Butler from lsst.pipe.base.pipeline_graph.visualization import show  # Initialize the Butler pointing to recently-processed data repo = "dp2_prep"</pre> |                                    |

coll = 'LSSTCam/runs/DRP/DP2-pilot/v30\_0\_4\_rc1/DM-54210/stage3'  
butler = Butler(repo, collections=[coll])

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3848-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Retrieve a deep coadd image from the Butler.

Test Data

None

Expected Result

Actual Result

All steps were executed as part of a script from the command line at the USDF. The script was executed as follows, which includes piping the output to a log file:

```
python test_LVV-T64.py 2>&1 | tee test_LVV-T64.log
```

The log contains the following output notifying which 'deep\_coadd' image was randomly selected:

```
Selected DatasetRef: deep_coadd@{band: 'i', skymap: 'lsst_cells_v2', tract: 9813, patch: 70}[sc=ExposureF](run=LSSTCam/runs/DRP/pilot/v30_0_4_rc1/DM-54210/stage3/20260220T185213Z id=019c7c6b-4e13-7070-9c97-09abadbac187)
```

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E3848-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Retrieve the list of coadd inputs that contributed to the coadd image, and examine them.

Test Data

None

Expected Result

## Actual Result

The output log shows the results of executing "coadd\_inputs = coadd.info.getCoaddInputs()" and then extracting the visit and ccd lists:

### Coadd input visits

| id  | bbox_min_x | bbox_min_y | bbox_max_x | bbox_max_y | visit         |
|-----|------------|------------|------------|------------|---------------|
| pix | pix        | pix        | pix        |            |               |
| 0   | 0          | 0          | -1         | -1         | 2025051500122 |
| 0   | 0          | 0          | -1         | -1         | 2025051500123 |
| 0   | 0          | 0          | -1         | -1         | 2025051500124 |
| 0   | 0          | 0          | -1         | -1         | 2025051500125 |
| 0   | 0          | 0          | -1         | -1         | 2025051500126 |
| 0   | 0          | 0          | -1         | -1         | 2025051500127 |
| 0   | 0          | 0          | -1         | -1         | 2025051500128 |
| 0   | 0          | 0          | -1         | -1         | 2025051500129 |
| 0   | 0          | 0          | -1         | -1         | 2025051500130 |
| ... | ...        | ...        | ...        | ...        | ...           |
| 0   | 0          | 0          | -1         | -1         | 2025121600090 |
| 0   | 0          | 0          | -1         | -1         | 2025121600091 |
| 0   | 0          | 0          | -1         | -1         | 2025121900235 |
| 0   | 0          | 0          | -1         | -1         | 2025121900236 |
| 0   | 0          | 0          | -1         | -1         | 2025123100242 |
| 0   | 0          | 0          | -1         | -1         | 2025123100243 |
| 0   | 0          | 0          | -1         | -1         | 2025123100246 |
| 0   | 0          | 0          | -1         | -1         | 2025123100247 |
| 0   | 0          | 0          | -1         | -1         | 2026010100266 |
| 0   | 0          | 0          | -1         | -1         | 2026010100267 |

Length = 123 rows

### Coadd input CCDs

| id  | bbox_min_x | bbox_min_y | bbox_max_x | bbox_max_y | visit         | ccd | weight        |
|-----|------------|------------|------------|------------|---------------|-----|---------------|
| pix | pix        | pix        | pix        |            |               |     |               |
| 0   | 0          | 0          | -1         | -1         | 2025051500122 | 139 | 0.00044828246 |
| 0   | 0          | 0          | -1         | -1         | 2025051500122 | 142 | 0.00044961445 |
| 0   | 0          | 0          | -1         | -1         | 2025051500122 | 143 | 0.00043541516 |
| 0   | 0          | 0          | -1         | -1         | 2025051500123 | 139 | 0.0006545108  |
| 0   | 0          | 0          | -1         | -1         | 2025051500123 | 140 | 0.0006465445  |
| 0   | 0          | 0          | -1         | -1         | 2025051500123 | 142 | 0.0006375272  |
| 0   | 0          | 0          | -1         | -1         | 2025051500123 | 143 | 0.00061971653 |
| 0   | 0          | 0          | -1         | -1         | 2025051500124 | 139 | 0.0007354588  |
| 0   | 0          | 0          | -1         | -1         | 2025051500124 | 140 | 0.00072857214 |

```
...      ...      ...      ...      ...      ...      ...
0      0      0      -1      -1 2025123100247 108 0.0006242411
0      0      0      -1      -1 2025123100247 109 0.0006132769
0      0      0      -1      -1 2026010100266 104 0.00046470456
0      0      0      -1      -1 2026010100266 107 0.0004648852
0      0      0      -1      -1 2026010100266 111 0.00046319223
0      0      0      -1      -1 2026010100266 114 0.00046469842
0      0      0      -1      -1 2026010100267 62 0.0004659005
0      0      0      -1      -1 2026010100267 69 0.00046485366
0      0      0      -1      -1 2026010100267 101 0.00045227894
0      0      0      -1      -1 2026010100267 108 0.00046505127
```

Length = 436 rows

---

Step LVV-E3848-4      Step Execution Status: **Pass**

---

Description

Query and verify provenance of the configuration and software versions that went into producing the coadd image.

Test Data

None

Expected Result

Actual Result

The script continues to display the quantum graph for this run, as well as list the configuration and package versions that were used. The following shows a portion of the log output:

Configuration for assembleDeepCoadd task:

```
import lsst.drp.tasks.assemble_coadd
```

```
assert type(config) is lsst.drp.tasks.assemble_coadd.CompareWarpAssembleCoaddConfig, f"config is of type {type(config).__module__} instead of lsst.drp.tasks.assemble_coadd.CompareWarpAssembleCoaddConfig"
```

```
import lsst.meas.algorithms
```

```
import lsst.meas.algorithms.detection
```

```
import lsst.meas.algorithms.gaussianPsfFactory
```

```
import lsst.meas.algorithms.maskStreaks
```

```
import lsst.meas.algorithms.scaleVariance
```

```
import lsst.meas.algorithms.subtractBackground
import lsst.pipe.base.config
import lsst.pipe.tasks.coaddInputRecorder
import lsst.pipe.tasks.healSparseMapping
import lsst.pipe.tasks.interpImage
import lsst.pipe.tasks.scaleZeroPoint
import lsst.pipe.tasks.selectImages
# Flag to enable/disable saving of log output for a task, enabled by default.
config.saveLogOutput=True

# Coadd name: typically one of deep or goodSeeing.
config.coaddName='deep'

# Flag to enable/disable saving of log output for a task, enabled by default.
config.select.saveLogOutput=True

# Maximum PSF FWHM (in arcseconds) to select. This can be used in conjunction with the per-visit maxPsfFwhm
in BestSeeingSelectVisitsTask to ensure that no outlier CCD has a PSF FWHM larger than this value.
config.select.maxPsfFwhm=1.8
```

#### PACKAGES:

Packages used for run:

```
Packages({
'Bottleneck':'1.6.0',
'Brotli':'1.1.0',
'Deprecated':'1.3.1',
'Flask':'3.1.3',
'GaiaXPy':'2.1.2',
'GalSim':'2.8.3',
'GitPython':'3.1.46',
'Jinja2':'3.1.6',
'LSSTDESC.Coord':'1.3.1',
```

We have thus demonstrated that the pipelines are producing sufficient provenance to recreate coadd images.

### 5.2.3.62 LVV-T63 - Verify implementation of Produce Images for EPO

Version **1.0(d)**. Status **Draft**. Open *LW-T63* test case in Jira.

This test will verify that the DRP pipelines produce the image data products called out in LSE-131. Currently this is limited to a color all-sky HiPS map. This will be verified (1) by inspection of pipeline configurations and (2) in operations rehearsals on precursor data. The production of a usable HiPS map will be verified by browsing it with community tools.

**Preconditions:**

In order for an operational test to be successful, as a precondition the inputs to that production must exist. For the only currently mandated image data production in LSE-131, a color all-sky HiPS map down to 1 arcsecond resolution, the prerequisite inputs to that are the single-filter coadds in the bands required by the yet-to-be-specified color prescription.

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.63 LVV-T105 - Verify implementation of Generate Calibration Report Within Specified Time

Version **1.0(d)**. Status **Draft**. Open *LVV-T105* test case in Jira.

Verify that the DMS can generate a night Calibration Report in both human-readable and machine-parseable forms.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.64 LVV-T46 - Verify implementation of Prompt Processing Performance Report Definition

Version **1.0(d)**. Status **Draft**. Open *LVV-T46* test case in Jira.

Verify that the DMS produces a Prompt Processing Performance Report. Specifically check that the number of observations that describe each of the following:

1. Successfully processed, recoverable failures, unrecoverable failures.
2. Archived
3. Result in science.

This is testing more the processing rather than the observatory system.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.65 LVV-T104 - Verify implementation of Generate DMS Performance Report Within Specified Time

Version **1.0(d)**. Status **Draft**. Open *LVV-T104* test case in Jira.

Verify that the DMS can generate a nightly Performance Report within perfReportComplTime

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.66 LVV-T150 - Verify implementation of Maintain Archive Publicly Accessible

Version **1.0(d)**. Status **Approved**. Open *LVV-T150* test case in Jira.

Verify that prior data releases remain accessible.

**Preconditions:**

Availability of at least three (3) data releases, of which at least one of them must be archived outside the QSERV database. These can be precursor datasets, if needed.

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3854-1319223129:

| Step LVV-E3854-1                                                                                                                                                                                                                                                                                    | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b>                                                                                                                                                                                                                                                                                  |                                    |
| Confirm that at least two data releases (the most recent, and one previous) are accessible to users (and can be queried) from the standard channels.                                                                                                                                                |                                    |
| -----                                                                                                                                                                                                                                                                                               |                                    |
| <b>Test Data</b>                                                                                                                                                                                                                                                                                    |                                    |
| None                                                                                                                                                                                                                                                                                                |                                    |
| -----                                                                                                                                                                                                                                                                                               |                                    |
| <b>Expected Result</b>                                                                                                                                                                                                                                                                              |                                    |
| Simple queries return catalog data from the data releases that are available in QSERV.                                                                                                                                                                                                              |                                    |
| -----                                                                                                                                                                                                                                                                                               |                                    |
| <b>Actual Result</b>                                                                                                                                                                                                                                                                                |                                    |
| From the public RSP instance at data.lsst.cloud, we executed the attached notebook ("test_LVV-T150.ipynb"). This notebook demonstrates accessing catalogs from DP0.2 and DP1 via the same TAP service. We see that the capability of maintaining multiple data releases accessible to users is met. |                                    |
| In the DM sizing model (DMTN-135) and with Data Previews (DP0.2, DP0.3, and DP1) we have demonstrated design intent to meet the requirement when further data releases are available in the future.                                                                                                 |                                    |

### 5.2.3.67 LVV-T37 - Verify implementation of Difference Exposure Attributes

Version **1.0(d)**. Status **Approved**. Open *LVV-T37* test case in Jira.

Verify that for each Difference Exposure the DMS stores

1. The identify of the input exposures and related provenance information
2. Metadata attributes of the subtraction, including the PSF-matching kernel used.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test executed with pipelines version w\_2025\_41, examining data products from w\_2025\_30 processing of LSSTCam on-sky data. The related notebook demonstrating the detailed verification is attached to this report's github repository as test\_LVV-T37.ipynb.

Detailed steps results LVV-R293-LVV-E3855-1319223130:

| Step LVV-E3855-1                                                                                                                             | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                  |                                    |
| Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the following:                                 |                                    |
| -----                                                                                                                                        |                                    |
| Test Data                                                                                                                                    |                                    |
| None                                                                                                                                         |                                    |
| -----                                                                                                                                        |                                    |
| Expected Result                                                                                                                              |                                    |
| Butler repo available for reading.                                                                                                           |                                    |
| -----                                                                                                                                        |                                    |
| Actual Result                                                                                                                                |                                    |
| For this test, we use processing of LSSTCam on-sky data that included difference imaging. The command executed to instantiate the Butler is: |                                    |
| ""butler = Butler('/repo/main', collections="LSSTCam/runs/DRP/20250501_20250609/w_2025_30/DM-51933")""                                       |                                    |

---

Step LVV-E3855-2

Step Execution Status: **Pass**

---

Description

Retrieve and examine a difference image. Verify that we can recover the provenance information about which template was used for each subtraction, which input images were used for that template, and that we can successfully extract the PSF matching kernel.

Test Data

None

Expected Result

Actual Result

In the attached notebook, we demonstrate that difference images can be retrieved for each of the ugrizy bands. An image is displayed, and it is confirmed to be mostly blank, as expected of a difference image.

We examined the metadata, including the WCS and visitInfo, and the full processing history.

By retrieving the 'template\_detector' dataset associated with a 'difference\_image', we confirm that the inputs that were used to create the template can be retrieved.

Finally, we retrieve and examine the difference kernel, an image of which looks like the following:

**Image Download Error**

We have thus demonstrated that all of the required properties are available with the 'difference\_image' data products produced by the LSST Science Pipelines.

### 5.2.3.68 LVV-T134 - Verify implementation of Provide Image Access Services

Version **1.0(d)**. Status **Approved**. Open *LVV-T134* test case in Jira.

Verify that images can be identified and that images and image cut-outs can be retrieved using the network interfaces - primarily IVOA standards-based - and Python APIs provided for image access by science users.

**Preconditions:**

Testing requires the establishment of running services such as SIAv2 and SODA to which the tests can be applied and a dataset with all LSST image types

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.69 LVV-T86 - Verify implementation of Illumination Correction Frame

Version **1.0(d)**. Status **Approved**. Open *LVV-T86* test case in Jira.

Verify that the DMS can produce an illumination correction frame calibration product.  
Verify that the DMS can determine the effectiveness of an illumination correction and determine how often it should be updated.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3858-1319223133:

| Step LVV-E3858-1                                                                                        | Step Execution Status: <b>Pass</b> |
|---------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                             |                                    |
| Confirm that code exists to derive the illumination corrections, and to verify that they are effective. |                                    |
| -----                                                                                                   |                                    |
| Test Data                                                                                               |                                    |
| None                                                                                                    |                                    |
| -----                                                                                                   |                                    |
| Expected Result                                                                                         |                                    |

---

### Actual Result

Illumination corrections are calculated as part of the FGCM photometric calibration code (see, e.g., the code at this link). The pipeline to calculate these resides in 'cp\_pipe', and verification of their effectiveness is in a 'cp\_verify' pipeline.

The code produces figures like the following, which illustrates the illumination correction on the left, and the residuals after applying the correction on the right:

**Image Download Error**

### 5.2.3.70 LVV-T130 - Verify implementation of Enable a Range of Shape Measurement Approaches

Version **1.0(d)**. Status **Approved**. Open *LVV-T130* test case in Jira.

Verify that multiple shape measurement algorithms can be used.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3859-1319223134:

---

| Step LVV-E3859-1                                                                                                | Step Execution Status: <b>Pass</b> |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                     |                                    |
| Examine catalogs from DRP processing and confirm that multiple methods of shape measurements have been applied. |                                    |

---

---

### Test Data

None

---

## Expected Result

---

## Actual Result

The Data Preview 1 (DP1) tutorial notebook at <https://dp1.lsst.io/tutorials/notebook/303/notebook-303-2.html> illustrates various shape measurements that are produced in DRP processing. These include "HSM moments" measured using the re-Gaussianization method of Hirata & Seljak 2003, implemented by Mandelbaum et al. 2005) and elliptical Kron shape measurements. In addition, the MultiProFit plugin that is executed during DRP processing fits elliptical exponential and Sersic models to data from multiple bands simultaneously.

The notebook linked above demonstrates how to access the different shape measurements and visualize them on images.

### 5.2.3.71 LVV-T128 - Verify implementation Provide Astrometric Model

Version **1.0(d)**. Status **Approved**. Open *LVV-T128* test case in Jira.

Verify that an astrometric model is available for Objects and DIAObjects.

#### Preconditions:

None

Execution status: **Initial Pass**

Final comment:

Test executed at the USDF with pipelines version 'w\_2025\_50'. The notebook is attached to this report's github repo as "test\_LVV-T128.ipynb".

Detailed steps results LVV-R293-LVV-E3860-1319223135:

---

Step LVV-E3860-1

Step Execution Status: **Initial Pass**

---

#### Description

Examine catalogs produced by DRP processing and confirm that the proper motion and parallax measurements are included.

Test Data

None

Expected Result

Actual Result

This test was executed using recently-processed on-sky commissioning data in the following Butler repo/collection:  
butler = Butler('dp2\_prep', collections=['LSSTCam/runs/DRP/20250417\_20250921/w\_2025\_49/DM-53545'])

In the attached notebook, we demonstrated that the 'isolated\_star\_stellar\_motions' catalog contains measured proper motions and parallaxes for many stars, as well as covariances that can be used to derive uncertainties on the measurements.

Because only a subset of objects are currently being measured (i.e., only "isolated stars", and not all Objects), and because they are not matched to the Object and DIAObject tables, there is still work to be done. Nonetheless, we have demonstrated that the tools to make the measurements exist. This test should be re-executed in the future to confirm that the measurements are performed for all objects and that they are reported in the Object and DIAObject tables.

### 5.2.3.72 LVV-T171 - Verify Pipeline Availability

Version **1.0(d)**. Status **Approved**. Open *LVV-T171* test case in Jira.

Demonstrate that Data Management System pipelines are available for use without disruptions of greater than productionMaxDowntime (24 hours).

This requires a regimented change control process and testing infrastructure for all pipelines and their underlying software services, and regimented management and monitoring of compute and networking resources.

The list of services covered by this test include:

- Image and EFD Archiving,
- Prompt Processing,

- OCS Driven Batch,
- Telemetry Gateway,
- Alert Distribution,
- Alert Filtering,
- Batch Production,
- Data Backbone,
- Compute/Storage/LAN,
- Inter-Site Networks, and
- Service Management and Monitoring.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

### 5.2.3.73 LVV-T101 - Verify implementation of Transient Alert Distribution

Version **1.0(d)**. Status **Approved**. Open *LVV-T101* test case in Jira.

Precursor or simulated data, execute AP, observe distribution to simulated clients using standard protocols

**Preconditions:**

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3868-1319223144:

---

Step LVV-E3868-1

Step Execution Status: **Pass**

---

Description

Execute AP

---

Test Data

None

---

Expected Result

---

Actual Result

As of Sept. 2025 the AP pipelines are being executed during LSSTCam on-sky observing. AP is run on images where sufficient template coverage exists from the Science Verification survey data.

---

Step LVV-E3868-2

Step Execution Status: **Pass**

---

Description

Observe distribution to simulated clients using standard protocols

---

Test Data

None

---

Expected Result

---

Actual Result

Alert distribution of LSSTCam on-sky alerts began in Sept 2025 on a trial basis, with alerts distributed to brokers but not made publicly visible.

The attached screenshot shows the view of an LSST alert in the Babamul broker, demonstrating that alerts are successfully being issued by Rubin and retrieved by brokers.

**Image Download Error**

Details of the Alert Distribution System can be found in DMTN-210: Implementation of the LSST Alert Distribution System. As can be seen in that document, the Alert Distribution System consists of a Kafka cluster managed by Strimzi operators, a Confluent schema registry, and an alert database that archives all alerts. These services are accessible via the public internet by clients, who can then use the Avro schemas to decode the alert packets that

they receive.

The successful testing of alert distribution and the successful receipt of alerts by brokers demonstrates that the Alert Distribution System is using community standard tools that enable brokers to readily access and ingest LSST alert packets.

#### 5.2.3.74 LVV-T3100 - Verify secure data transfer from summit to archive

Version **1.0(d)**. Status **Approved**. Open *LVV-T3100* test case in Jira.

Verify that the data transfer from the summit to the USDF complies with funding agency requirements for cyber security.

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.75 LVV-T3098 - Verify uncached L1 data product lifetime for focal plane PVIs

Version **1.0(d)**. Status **Draft**. Open *LVV-T3098* test case in Jira.

Verify that unarchived, Level 1 full focal-plane PVIs are available on the file system and retrievable for **l1CacheLifetime = 30[day]**.

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.76 LVV-T3097 - Verify the minimum number of simultaneous full-visit PVI users

Version **1.0(d)**. Status **Draft**. Open *LVV-T3097* test case in Jira.

Verify that at least **allPviRetrievalUsers = 10** simultaneous users are able to retrieve distinct focal-plane PVI datasets.

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.77 LVV-T3096 - Verify uncached L1 data product lifetime for single CCDs

Version **1.0(d)**. Status **Draft**. Open *LVV-T3096* test case in Jira.

Verify that unarchived, Level 1 single-CCD PVIs are available on the file system and retrievable for **l1CacheLifetime = 30[day]**.

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.78 LVV-T3095 - Verify the minimum number of simultaneous single-CCD PVI users

Version **1.0(d)**. Status **Draft**. Open *LVV-T3095* test case in Jira.

Verify that at least **pviRetrievalUsers = 20** simultaneous users are able to retrieve single, distinct PVI images.

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.79 LVV-T3094 - Verify maximum size of low-volume query results

Version **1.0(d)**. Status **Draft**. Open *LVV-T3094* test case in Jira.

Verify that low-volume queries return less than **lvMaxReturnedResults = 0.5[gigabyte]**

##### **Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.80 LVV-T60 - Publishing the Predicted Visit Schedule

Version **1.0(d)**. Status **Approved**. Open *LVV-T60* test case in Jira.

Verify that a predict-visit schedule can be published by the OCS.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E3994-1573727255:

|                                                                                                                                   |                                    |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Step LVV-E3994-1                                                                                                                  | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                       |                                    |
| Verify that a service description document exists                                                                                 |                                    |
| -----                                                                                                                             |                                    |
| Test Data                                                                                                                         |                                    |
| None                                                                                                                              |                                    |
| -----                                                                                                                             |                                    |
| Expected Result                                                                                                                   |                                    |
| A technote describing the service exosts                                                                                          |                                    |
| -----                                                                                                                             |                                    |
| Actual Result                                                                                                                     |                                    |
| A service description tech note exists: <a href="https://dmtn-263.lsst.io/">https://dmtn-263.lsst.io/</a>                         |                                    |
| Step LVV-E3994-2                                                                                                                  | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                       |                                    |
| Without logging on to the RSP, go to the following URL:                                                                           |                                    |
| <a href="https://usdf-rsp-dev.slac.stanford.edu/obsloctap/schedule">https://usdf-rsp-dev.slac.stanford.edu/obsloctap/schedule</a> |                                    |
| Verify by inspection that the service is available                                                                                |                                    |
| -----                                                                                                                             |                                    |
| Test Data                                                                                                                         |                                    |
| None                                                                                                                              |                                    |
| -----                                                                                                                             |                                    |

## Expected Result

A valid webpage that shows the service

---

## Actual Result

The service is available as a web page and returns observation data from the scheduler. **Image Download Error**

---

### Step LVV-E3994-3

Step Execution Status: **Pass**

---

#### Description

Run the jupyter notebook in

[https://github.com/lsst-dm/DMTR-441/notebooks/test\\_LVV-T60.ipynb](https://github.com/lsst-dm/DMTR-441/notebooks/test_LVV-T60.ipynb)

---

#### Test Data

None

---

## Expected Result

The notebook runs successfully. The notebook contains assertions that check all aspects of the requirement.

---

## Actual Result

---

### Step LVV-E3994-4

Step Execution Status: **Pass**

---

#### Description

Verify that a user friendly UX is provided.

---

#### Test Data

None

---

## Expected Result

A user-friendly user interface exists

---

## Actual Result

A static user-friendly interface is available at: <https://usdf-rsp.slac.stanford.edu/obsloctap/static/viewer.html> and can be easily queried

#### 5.2.3.81 LVV-T3170 - Verify max time to retrieve low-volume query results

Version **1.0(d)**. Status **Draft**. Open *LW-T3170* test case in Jira.

Verify that low volume query results are retrievable in a maximum time of **lvQueryTime = 10 seconds**.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.82 LVV-T3171 - Verify min number of simultaneous low-volume query users

Version **1.0(d)**. Status **Draft**. Open *LW-T3171* test case in Jira.

Verify that a minimum of **lvQueryUsers = 100** users can simultaneously execute low volume queries.

**Preconditions:**

None

Execution status: **Not Executed**

Final comment:

None

#### 5.2.3.83 LVV-T198 - Verify implementation of Archive Center Disaster Recovery

Version **1.0(d)**. Status **Approved**. Open *LW-T198* test case in Jira.

Verify disaster recovery plan for Archive Center.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E4052-1832165345:

| Step LVV-E4052-1                                                                                                                                                                                                              | Step Execution Status: <b>Pass</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                   |                                    |
| Verify the existence of a disaster recovery plan for the archive center and that it covers back up and recovery of data in the event of a disaster.                                                                           |                                    |
| -----                                                                                                                                                                                                                         |                                    |
| Test Data                                                                                                                                                                                                                     |                                    |
| None                                                                                                                                                                                                                          |                                    |
| -----                                                                                                                                                                                                                         |                                    |
| Expected Result                                                                                                                                                                                                               |                                    |
| A disaster recovery plan for the data archive exists                                                                                                                                                                          |                                    |
| -----                                                                                                                                                                                                                         |                                    |
| Actual Result                                                                                                                                                                                                                 |                                    |
| RTN-078: USDF Disaster Recovery Plan, provides the disaster recovery plan for the USDF -- the main Rubin/LSST archive. The plan covers data recovery in the event of a disaster for both the USDF and the cloud-based US DAC. |                                    |
| It presents a risk analysis and assessment, recovery strategies for hardware, services and data, and backup procedures.                                                                                                       |                                    |

#### 5.2.3.84 LVV-T154 - Verify implementation of Raw Data Archiving Reliability

Version **1.0(d)**. Status **Approved**. Open *LVV-T154* test case in Jira.

Verify that raw images are reliably archived.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

None

Detailed steps results LVV-R293-LVV-E4053-1832165346:

| Step LVV-E4053-1                                                                                                                                                                                                                                         |  | Step Execution Status: <b>Pass</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------|
| Description                                                                                                                                                                                                                                              |  |                                    |
| Inspect scripts that archive the raw data and confirm that the data are transferred to multiple archives                                                                                                                                                 |  |                                    |
| -----                                                                                                                                                                                                                                                    |  |                                    |
| Test Data                                                                                                                                                                                                                                                |  |                                    |
| None                                                                                                                                                                                                                                                     |  |                                    |
| -----                                                                                                                                                                                                                                                    |  |                                    |
| Expected Result                                                                                                                                                                                                                                          |  |                                    |
| -----                                                                                                                                                                                                                                                    |  |                                    |
| Actual Result                                                                                                                                                                                                                                            |  |                                    |
| The script to "unembargo" raw files to the archive, the French Data Facility, and to tape is at this link in the transfer_embargo repository. This script ensures reliability by using Rucio to register files and track their status when transferring. |  |                                    |

### 5.2.3.85 LVV-T1846 - Verify calculation of band-to-band color zero-point accuracy including u-band

Version **1.0(d)**. Status **Approved**. Open *LVV-T1846* test case in Jira.

Verify that the DM system provides software to assess whether the accuracy of absolute band-to-band color zero-points for all colors constructed from any filter pair, including the u-band, is less than **PA5u = 10 millimagnitudes**.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Test performed using DRP processing of LSSTComCam data from Data Preview 1. This was necessary because there are not yet any LSSTCom observations containing absolute flux standards in all passbands. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1846.ipynb.

Detailed steps results LVV-R293-LVV-E4057-1832165354:

| Step LVV-E4057-1                                                                                                                     | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                          |                                    |
| Identify spectrophotometric standard stars that have been observed as part of a processed dataset.                                   |                                    |
| -----                                                                                                                                |                                    |
| Test Data                                                                                                                            |                                    |
| None                                                                                                                                 |                                    |
| -----                                                                                                                                |                                    |
| Expected Result                                                                                                                      |                                    |
| One or more standards with well-calibrated absolute fluxes to which measured photometry can be compared.                             |                                    |
| -----                                                                                                                                |                                    |
| Actual Result                                                                                                                        |                                    |
| The Calspec standard C26202 was observed with LSSTComCam and was part of Data Preview 1.                                             |                                    |
| Step LVV-E4057-2                                                                                                                     | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                          |                                    |
| Calculate synthetic AB magnitudes for the standard stars, using the standard Rubin bandpasses and published Calspec (or other) SEDs. |                                    |
| -----                                                                                                                                |                                    |

## Test Data

None

---

## Expected Result

---

## Actual Result

The attached notebook demonstrates the use of the system characteristics and throughputs from 'syseng\_throughputs' to integrate the SED of C26202 and derive magnitudes in LSSTComCam passbands.

---

Step LVV-E4057-3

Step Execution Status: **Pass**

---

## Description

Extract 'object' table measurements of the standards, and calculate the median offset between the measured colors and the synthetic (predicted) colors in the AB magnitude system. (Include only colors that contain the u-band.) Confirm that the offsets are less than PA5u=10 mmag.

---

## Test Data

None

---

## Expected Result

Median color offsets in all LSST passbands for each standard star.

---

## Actual Result

The attached notebook compiles all measurements in each color, then compares them to synthetic colors for C26202. Comparisons are made to both an empirical (HST-derived) SED and a model SED from fitting to the empirical spectrum. The offsets are as follows:

| color | meas_DP1   | stiswfcnic_007 | mod_008    | diff_DP1_stis |
|-------|------------|----------------|------------|---------------|
|       | mag        | mag            | mag        |               |
| str3  | float32[1] | float64[1]     | float64[1] |               |
| u-g   | 0.9277     | 0.8809         | 0.8943     |               |
| u-r   | 1.2606     | 1.2108         | 1.2253     |               |
| u-i   | 1.3634     | 1.3126         | 1.3274     |               |
| u-z   | 1.3795     | 1.3291         | 1.3433     |               |
| u-y   | 1.3841     | 1.3340         | 1.3481     |               |

We see that for all colors including u-band the offsets exceed the required threshold of 10 mmag.

We have demonstrated the capability of calculating the accuracy of color zeropoints exists. However, given that the present test was executed on LSSTComCam data, and that the thresholds were not met, we will assess the result as a Pass, but revisit the test when sufficient LSSTCam data are available.

#### 5.2.3.86 LVV-T1842 - Verify calculation of zeropoint error fraction exceeding the outlier limit

Version **1.0(d)**. Status **Approved**. Open *LVV-T1842* test case in Jira.

Verify that the DM system provides software to calculate the fraction of zeropoint errors that exceed the zero point error outlier limit, and confirm that it is less than **PF2 = 10 percent**.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Test performed using pipelines version w\_2025\_38 and the DRP processing of Science Validation data with pipelines version w\_2025\_37. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1842\_T2202.ipynb.

Detailed steps results LVV-R293-LVV-E4058-1832165356:

| Step LVV-E4058-1                                                                                                                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                        |                                    |
| Identify a dataset containing at least one field in each of the u, g, r, i, z, and y filters with multiple overlapping visits.                                                                                                                                     |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                                                                                                                          |                                    |
| None                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                    |                                    |
| A dataset that has been ingested into a Butler repository.                                                                                                                                                                                                         |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Actual Result                                                                                                                                                                                                                                                      |                                    |
| This test used the DRP processing in Butler collection LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 of /repo/main.                                                                                                                                        |                                    |
| Step LVV-E4058-2                                                                                                                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                                                                                                        |                                    |
| Execute 'analysis_tools' on a repository containing processed data. Identify the path to the data, which we will call 'DATA/path', then execute something similar to the following (with paths, datasets, and flags replaced or additionally specified as needed): |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                                                                                                                          |                                    |
| None                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                    |                                    |

The output collection (in this case, "u/username/atools\_metrics") containing metric measurements and any associated extras and metadata is available via the butler.

---

## Actual Result

While 'analysis\_tools' is executed as part of DRP processing, it is not configured to run the TargetRefcatDeltaPhotomMetrics task that calculates the zeropoint offsets by comparing the 'source' table to the reference catalog. We thus executed the relevant tasks manually as follows:

```
""
setup -t d_latest lsst_distrib

pipetask run -b /repo/main -i LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 -p $DRP_PIPE_DIR/pipelines/_ingredie
visit-source.yaml#makeAnalysisSourcePhotometricRefMatch,analyzeSourcePhotometricRefMatch -o u/jcarlin/src_refmatch_atools_
-d "instrument='LSSTCam' AND skymap='lsst_cells_v1'" --register-dataset-types --instrument lsst.obs.lsst.LsstCam
-j 16 2>&1 | tee src_refmatch_atools_w37.log
""
```

---

Step LVV-E4058-3

Step Execution Status: **Pass**

---

## Description

Load the relevant zeropoint metrics from the Butler repository, and perform any calculations necessary to extract PF2.

---

## Test Data

None

---

## Expected Result

---

## Actual Result

In the attached notebook, we first queried the Butler for the relevant datasets:

```
""
testcoll = 'u/jcarlin/src_refmatch_atools_w37'
butler = Butler('/repo/main', collections=[testcoll])
srcref_refs = butler.query_datasets('source_ref_match_photom_metrics', collections=testcoll)
""
```

After extracting the median offsets between the source table and refcat magnitudes, we separated them per band to make this figure:

## Image Download Error

|                                                                                                                                                                                                                                                              |                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Step LVV-E4058-4                                                                                                                                                                                                                                             | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                                                                                                  |                                    |
| Confirm that the PF2 value is less than 10% for all of the ugrizy bands.                                                                                                                                                                                     |                                    |
| Test Data                                                                                                                                                                                                                                                    |                                    |
| None                                                                                                                                                                                                                                                         |                                    |
| Expected Result                                                                                                                                                                                                                                              |                                    |
| Actual Result                                                                                                                                                                                                                                                |                                    |
| We calculated statistics on each of the distributions from the figure above, and found the following:                                                                                                                                                        |                                    |
| <p>u band: PF2 (outlier percentage): 0.00 % g band: PF2 (outlier percentage): 0.26 % r band: PF2 (outlier percentage): 0.21 % i band: PF2 (outlier percentage): 0.19 % z band: PF2 (outlier percentage): 0.00 % y band: PF2 (outlier percentage): 0.00 %</p> |                                    |
| We see that the percentage of zeropoint outliers exceeding PA4=15 mmag is less than 10% for all of the ugrizy bands.                                                                                                                                         |                                    |

### 5.2.3.87 LVV-T1839 - Verify calculation of RMS width of photometric zeropoint

Version **1.0(d)**. Status **Approved**. Open *LVV-T1839* test case in Jira.

Verify that the DM system provides code to assess whether the RMS width of the internal photometric zero-point (precision of system uniformity across the sky) for all bands except u-band is less than **PA3 = 10 millimagnitudes**.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test performed using pipelines version w\_2025\_38 and the DRP processing of Science Validation data with pipelines version w\_2025\_37. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1839.ipynb.

Detailed steps results LVV-R293-LVV-E4059-1832165358:

| Step LVV-E4059-1                                                                                                                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                        |                                    |
| Identify a dataset containing at least one field in each of the g, r, i, z, and y filters with multiple overlapping visits.                                                                                                                                        |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                                                                                                                          |                                    |
| None                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                    |                                    |
| A dataset that has been ingested into a Butler repository.                                                                                                                                                                                                         |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Actual Result                                                                                                                                                                                                                                                      |                                    |
| This test used the DRP processing in Butler collection LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 of /repo/main.                                                                                                                                        |                                    |
| Step LVV-E4059-2                                                                                                                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                                                                                                        |                                    |
| Execute 'analysis_tools' on a repository containing processed data. Identify the path to the data, which we will call 'DATA/path', then execute something similar to the following (with paths, datasets, and flags replaced or additionally specified as needed): |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                                                                                                                          |                                    |
| None                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                    |                                    |

The output collection (in this case, "u/username/atools\_metrics") containing metric measurements and any associated extras and metadata is available via the butler.

---

## Actual Result

While 'analysis\_tools' is executed as part of DRP processing, it is not configured to run the TargetRefcatDeltaPhotomMetrics task that calculates the zeropoint offsets by comparing the 'source' table to the reference catalog. We thus executed the relevant tasks manually as follows:

```
'''
```

```
setup -t d_latest lsst_distrib
```

```
pipetask run -b /repo/main -i LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 -p $DRP_PIPE_DIR/pipelines/_ingredie  
visit-source.yaml#makeAnalysisSourcePhotometricRefMatch,analyzeSourcePhotometricRefMatch -o u/jcarlin/src_refmatch_atools_  
-d "instrument='LSSTCam' AND skymap='lsst_cells_v1'" --register-dataset-types --instrument lsst.obs.lsst.LsstCam  
-j 16 2>&1 | tee src_refmatch_atools_w37.log
```

```
'''
```

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E4059-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

## Description

Load the relevant zeropoint metrics from the Butler repository, and perform any calculations necessary to extract PA3.

---

## Test Data

None

---

## Expected Result

---

## Actual Result

In the attached notebook, we first queried the Butler for the relevant datasets:

```
'''
```

```
testcoll = 'u/jcarlin/src_refmatch_atools_w37'
```

```
butler = Butler('/repo/main', collections=[testcoll])
```

```
srcref_refs = butler.query_datasets('source_ref_match_photom_metrics', collections=testcoll)
```

```
'''
```

After extracting the median offsets between the source table and refcat magnitudes, we separated them per band to make this figure:

## Image Download Error

| Step LVV-E4059-4                                                                                      | Step Execution Status: <b>Pass</b> |
|-------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                           |                                    |
| Confirm that the PA3 value is less than 10 mmag for all of the grizy bands.                           |                                    |
| Test Data                                                                                             |                                    |
| None                                                                                                  |                                    |
| Expected Result                                                                                       |                                    |
| Actual Result                                                                                         |                                    |
| We calculated statistics on each of the distributions from the figure above, and found the following: |                                    |

## Image Download Error

We see that the rms zeropoint offsets are less than 10 mmag for all five of the grizy bands.

### 5.2.3.88 LVV-T1837 - Verify calculation of band-to-band color zero-point accuracy

Version **1.0(d)**. Status **Approved**. Open *LVV-T1837* test case in Jira.

Verify that the DM system provides code to assess whether the accuracy of absolute band-to-band color zero-points for all colors constructed from any filter pair, excluding the u-band, is less than **PA5 = 5 millimagnitudes**.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Test performed using DRP processing of LSSTComCam data from Data Preview 1. This was necessary because there are not yet any LSSTCam observations containing absolute flux stan-

dards in all passbands. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1837.ipynb.

Detailed steps results LVV-R293-LVV-E4060-1832165359:

| Step LVV-E4060-1                                                                                                                                                                                 | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b>                                                                                                                                                                               |                                    |
| Identify spectrophotometric standard stars that have been observed as part of a processed dataset.                                                                                               |                                    |
| -----                                                                                                                                                                                            |                                    |
| <b>Test Data</b>                                                                                                                                                                                 |                                    |
| None                                                                                                                                                                                             |                                    |
| -----                                                                                                                                                                                            |                                    |
| <b>Expected Result</b>                                                                                                                                                                           |                                    |
| One or more standards with well-calibrated absolute fluxes to which measured photometry can be compared.                                                                                         |                                    |
| -----                                                                                                                                                                                            |                                    |
| <b>Actual Result</b>                                                                                                                                                                             |                                    |
| The Calspec standard C26202 was observed with LSSTComCam and was part of Data Preview 1.                                                                                                         |                                    |
| Step LVV-E4060-2                                                                                                                                                                                 | Step Execution Status: <b>Pass</b> |
| <b>Description</b>                                                                                                                                                                               |                                    |
| Calculate synthetic AB magnitudes for the standard stars, using the standard Rubin bandpasses and published Calspec (or other) SEDs.                                                             |                                    |
| -----                                                                                                                                                                                            |                                    |
| <b>Test Data</b>                                                                                                                                                                                 |                                    |
| None                                                                                                                                                                                             |                                    |
| -----                                                                                                                                                                                            |                                    |
| <b>Expected Result</b>                                                                                                                                                                           |                                    |
| -----                                                                                                                                                                                            |                                    |
| <b>Actual Result</b>                                                                                                                                                                             |                                    |
| The attached notebook demonstrates the use of the system characteristics and throughputs from 'syseng_throughputs' to integrate the SED of C26202 and derive magnitudes in LSSTComCam passbands. |                                    |

---

Step LVV-E4060-3

Step Execution Status: **Pass**

---

Description

Extract 'object' table measurements of the standards, and calculate the median offset between the measured colors and the synthetic (predicted) colors in the AB magnitude system. (Include only colors without the u-band.) Confirm that the offsets are less than PA5=5 mmag.

Test Data

None

Expected Result

Median color offsets in all LSST passbands for each standard star.

Actual Result

The attached notebook compiles all measurements in each color, then compares them to synthetic colors for C26202. Comparisons are made to both an empirical (HST-derived) SED and a model SED from fitting to the empirical spectrum. The offsets are as follows:

**Image Download Error**

We see that for all colors the offsets are less than the required threshold of 5 mmag.

We have demonstrated the capability of calculating the accuracy of color zeropoints exists. However, given that the present test was executed on LSSTComCam data, we will assess the result as a Pass, but revisit this test when sufficient LSSTCam data are available.

**5.2.3.89 LVV-T2202 - Verify that the of zero-point error outlier limit threshold (PA4) can be applied.**

Version **1.0(d)**. Status **Approved**. Open *LVV-T2202* test case in Jira.

Verify that the DMS has provided the code to apply the zero-point error outlier limit threshold (PA4) to computed values of metrics.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Test performed using pipelines version w\_2025\_38 and the DRP processing of Science Validation data with pipelines version w\_2025\_37. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1842\_T2202.ipynb.

Detailed steps results LVV-R293-LVV-E4061-1832165360:

| Step LVV-E4061-1                                                                                                                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                                                                                                                                                        |                                    |
| Identify a dataset containing at least one field in each of the u, g, r, i, z, and y filters with multiple overlapping visits.                                                                                                                                     |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                                                                                                                          |                                    |
| None                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                    |                                    |
| A dataset that has been ingested into a Butler repository.                                                                                                                                                                                                         |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Actual Result                                                                                                                                                                                                                                                      |                                    |
| This test used the DRP processing in Butler collection LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 of /repo/main.                                                                                                                                        |                                    |
| Step LVV-E4061-2                                                                                                                                                                                                                                                   | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                                                                                                        |                                    |
| Execute 'analysis_tools' on a repository containing processed data. Identify the path to the data, which we will call 'DATA/path', then execute something similar to the following (with paths, datasets, and flags replaced or additionally specified as needed): |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Test Data                                                                                                                                                                                                                                                          |                                    |
| None                                                                                                                                                                                                                                                               |                                    |
| -----                                                                                                                                                                                                                                                              |                                    |
| Expected Result                                                                                                                                                                                                                                                    |                                    |

The output collection (in this case, "u/username/atools\_metrics") containing metric measurements and any associated extras and metadata is available via the butler.

---

## Actual Result

While 'analysis\_tools' is executed as part of DRP processing, it is not configured to run the TargetRefcatDeltaPhotomMetrics task that calculates the zeropoint offsets by comparing the 'source' table to the reference catalog. We thus executed the relevant tasks manually as follows:

```
""
setup -t d_latest lsst_distrib

pipetask run -b /repo/main -i LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 -p $DRP_PIPE_DIR/pipelines/_ingredie
visit-source.yaml#makeAnalysisSourcePhotometricRefMatch,analyzeSourcePhotometricRefMatch -o u/jcarlin/src_refmatch_atools_
-d "instrument='LSSTCam' AND skymap='lsst_cells_v1'" --register-dataset-types --instrument lsst.obs.lsst.LsstCam
-j 16 2>&1 | tee src_refmatch_atools_w37.log
""
```

---

Step LVV-E4061-3

Step Execution Status: **Pass**

---

## Description

Load the relevant zeropoint metrics from the Butler repository, and perform any calculations necessary to extract PF2 via application of the PA4 threshold.

---

## Test Data

None

---

## Expected Result

---

## Actual Result

In the attached notebook, we first queried the Butler for the relevant datasets:

```
""
testcoll = 'u/jcarlin/src_refmatch_atools_w37'
butler = Butler('/repo/main', collections=[testcoll])
srcref_refs = butler.query_datasets('source_ref_match_photom_metrics', collections=testcoll)
""
```

After extracting the median offsets between the source table and refcat magnitudes, we separated them per band to make this figure:

## Image Download Error

Note that the threshold value for PA4 is overplotted on the figure.

|                                                                                                                                                                                                                         |                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Step LVV-E4061-4                                                                                                                                                                                                        | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                                                             |                                    |
| Confirm that the PA4 = 15 mmag threshold has been applied to enable calculation of PF2.                                                                                                                                 |                                    |
| Test Data                                                                                                                                                                                                               |                                    |
| None                                                                                                                                                                                                                    |                                    |
| Expected Result                                                                                                                                                                                                         |                                    |
| Actual Result                                                                                                                                                                                                           |                                    |
| The following lines of the attached notebook show the application of PA4 in calculating the outlier fraction:                                                                                                           |                                    |
| <pre>''' pa4_thresh = 15.0  for band in bands_list:     offsets = tab['offset'][band_sel_dict[band]]     outliers = np.where(offsets &gt; pa4_thresh)     outlier_pct = 100.0 * len(outliers[0])/len(offsets) '''</pre> |                                    |

We note that while these calculations are currently happening in a notebook, we plan to implement them in 'analysis\_tools' in the near future.

### 5.2.3.90 LVV-T1831 - Verify Implementation of Data Management Nightly Reporting

Version **1.0(d)**. Status **Approved**. Open *LVV-T1831* test case in Jira.

Verify that the LSST Data Management subsystem produces a searchable - interactive nightly report(s), from information published in the EFD by each subsystem, summarizing performance and behavior over a user defined period of time (e.g. the previous 24 hours).

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Verified via inspection of the "Nightly Digest", using a recent night of LSSTCam on-sky observing taken during the Science Validation surveys in commissioning.

Note that the Nightly Digest is in active development, and will thus improve and evolve over the near future.

Detailed steps results LVV-R293-LVV-E4062-1832165361:

| Step LVV-E4062-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Step Execution Status: <b>Pass</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                    |
| Examine the nightly reporting tool. Confirm that the date and timespan are configurable, and that plots are interactive.                                                                                                                                                                                                                                                                                                                                                                                                       |                                    |
| <hr/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |
| <b>Test Data</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |
| <hr/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |
| <b>Expected Result</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Demonstration that a tool exists to summarize performance and statistics from the images of data gathered on a (configurable) night or timespan.                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| <hr/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |
| <b>Actual Result</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |
| The Nightly Digest tool was accessed at this link (accessible to Project affiliates only) for the observing date of 15 Sept 2025. The digest summarizes the observing efficiency, PSF FWHM, zero points, Jira issues that arose during the night (if any), and number of exposures dedicated to each observing program, among other information. The screenshot below shows the Nightly Digest for this night. Note that some panels are configurable, and that the capability to download the data is included in each panel. |                                    |
| <b>Image Download Error</b> By clicking the "Plots" link at the lower left of the above page, more detailed plots of sky conditions and data characterization are available.                                                                                                                                                                                                                                                                                                                                                   |                                    |
| <b>Image Download Error</b> Furthermore, a log of the observations, including information about environmental conditions, telescope state and telemetry, measured characterization of each image, and a link to the quicklook calexp image are available on the "Data Log" page:                                                                                                                                                                                                                                               |                                    |

### Image Download Error

We have thus demonstrated that a searchable, interactive nightly report is available via the Rubin Nightly Digest, and that it meets this requirement.

## 5.2.3.91 LVV-T1844 - Verify calculation of u-band photometric zero-point RMS

Version **1.0(d)**. Status **Approved**. Open *LVV-T1844* test case in Jira.

Verify that the DM system provides software to assess whether the RMS width of internal photometric zero-point (precision of system uniformity across the sky) in the u-band is less than **PA3u = 20 millimagnitudes**.

### Preconditions:

None

Execution status: **Pass**

Final comment:

Test performed using pipelines version w\_2025\_38 and the DRP processing of Science Validation data with pipelines version w\_2025\_37. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1844.ipynb.

Detailed steps results LVV-R293-LVV-E4068-1891366026:

| Step LVV-E4068-1                                                                                            | Step Execution Status: <b>Pass</b> |
|-------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>Description</b>                                                                                          |                                    |
| Identify a dataset containing at least one field observed in the u filter with multiple overlapping visits. |                                    |
| -----                                                                                                       |                                    |
| <b>Test Data</b>                                                                                            |                                    |
| None                                                                                                        |                                    |
| -----                                                                                                       |                                    |
| <b>Expected Result</b>                                                                                      |                                    |
| A dataset that has been ingested into a Butler repository.                                                  |                                    |

---

## Actual Result

This test used the DRP processing in Butler collection LSSTCam/runs/DRP/20250604\_20250906/w\_2025\_37/DM-52496 of /repo/main.

---

### Step LVV-E4068-2

Step Execution Status: **Pass**

---

#### Description

Execute 'analysis\_tools' on a repository containing processed data. Identify the path to the data, which we will call 'DATA/path', then execute something similar to the following (with paths, datasets, and flags replaced or additionally specified as needed):

---

#### Test Data

None

---

#### Expected Result

The output collection (in this case, "u/username/atools\_metrics") containing metric measurements and any associated extras and metadata is available via the butler.

---

#### Actual Result

While 'analysis\_tools' is executed as part of DRP processing, it is not configured to run the TargetRefcatDeltaPhotomMetrics task that calculates the zeropoint offsets by comparing the 'source' table to the reference catalog. We thus executed the relevant tasks manually as follows:

'''

```
setup -t d_latest lsst_distrib
```

```
pipetask run -b /repo/main -i LSSTCam/runs/DRP/20250604_20250906/w_2025_37/DM-52496 -p $DRP_PIPE_DIR/pipelines/_ingredie  
visit-source.yaml#makeAnalysisSourcePhotometricRefMatch,analyzeSourcePhotometricRefMatch -o u/jcarlin/src_refmatch_atools_  
-d "instrument='LSSTCam' AND skymap='lsst_cells_v1'" --register-dataset-types --instrument lsst.obs.lsst.LsstCam  
-j 16 2>&1 | tee src_refmatch_atools_w37.log
```

'''

---

### Step LVV-E4068-3

Step Execution Status: **Pass**

---

#### Description

Load the relevant zeropoint metrics from the Butler repository, and perform any calculations necessary to extract PA3u.

---

#### Test Data

None

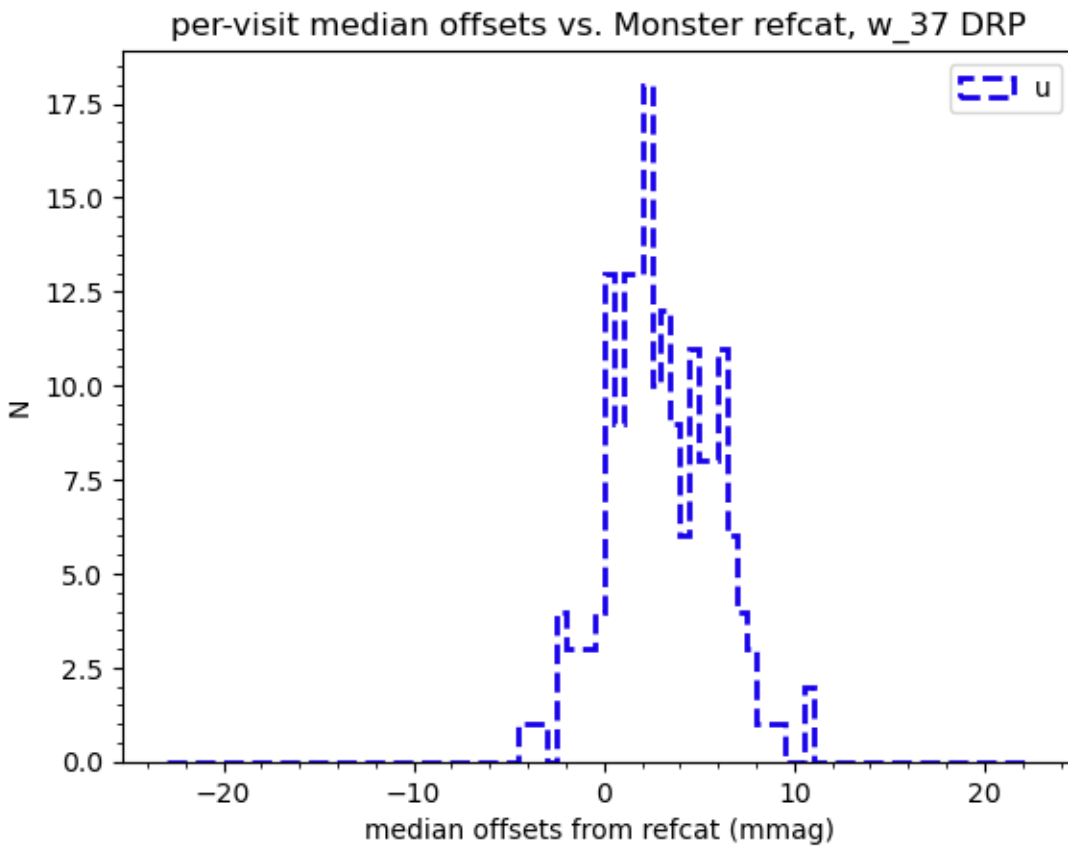
Expected Result

Actual Result

In the attached notebook, we first queried the Butler for the relevant datasets:

```
'''
testcoll = 'u/jcarlin/src_refmatch_atools_w37'
butler = Butler('/repo/main', collections=[testcoll])
srcref_refs = butler.query_datasets('source_ref_match_photom_metrics', collections=testcoll)
'''
```

After extracting the median offsets between the source table and refcat magnitudes, we extracted only the u-band results to make this figure:



---

Step LVV-E4068-4

Step Execution Status: **Pass**

---

Description

Confirm that the PA3u value is less than 20 mmag for the u-band data.

-----

Test Data

None

-----

Expected Result

-----

Actual Result

We calculated statistics on each of the distributions from the figure above, and found the following:

### 5.2.3.92 LVV-T1845 - Verify accuracy of photometric transformation to physical scale

Version **1.0(d)**. Status **Approved**. Open *LVV-T1845* test case in Jira.

Verify that the DM system provides software to assess whether the accuracy of the transformation of internal LSST photometry to a physical scale (e.g. AB magnitudes) is less than **PA6 = 10 millimagnitudes**.

**Preconditions:**

None

Execution status: **Pass**

Final comment:

Test performed using DRP processing of LSSTComCam data from Data Preview 1. This was necessary because there are not yet any LSSTCam observations containing absolute flux standards in all passbands. The notebook where calculations were performed is attached to this Report's git repository as test\_LVV-T1845.ipynb.

## Detailed steps results LVV-R293-LVV-E4069-1895464723:

|                                                                                                                                                                                      |                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Step LVV-E4069-1                                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                          |                                    |
| Identify spectrophotometric standard stars that have been observed as part of a processed dataset.                                                                                   |                                    |
| -----                                                                                                                                                                                |                                    |
| Test Data                                                                                                                                                                            |                                    |
| None                                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                |                                    |
| Expected Result                                                                                                                                                                      |                                    |
| One or more standards with well-calibrated absolute fluxes to which measured photometry can be compared.                                                                             |                                    |
| -----                                                                                                                                                                                |                                    |
| Actual Result                                                                                                                                                                        |                                    |
| The Calspec standard C26202 was observed with LSSTComCam and was part of Data Preview 1.                                                                                             |                                    |
| Step LVV-E4069-2                                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                          |                                    |
| Find all visits in which the standards appear.                                                                                                                                       |                                    |
| -----                                                                                                                                                                                |                                    |
| Test Data                                                                                                                                                                            |                                    |
| None                                                                                                                                                                                 |                                    |
| -----                                                                                                                                                                                |                                    |
| Expected Result                                                                                                                                                                      |                                    |
| -----                                                                                                                                                                                |                                    |
| Actual Result                                                                                                                                                                        |                                    |
| In the attached notebook, one can see that we identified 710 'visit_image' datasets containing C26202, of which 668 of the 'source' catalog entries pass the data quality flag cuts. |                                    |
| Step LVV-E4069-3                                                                                                                                                                     | Step Execution Status: <b>Pass</b> |
| Description                                                                                                                                                                          |                                    |
| Calculate synthetic AB magnitudes for the standard stars, using the standard Rubin bandpasses and published Calspec (or other) SEDs.                                                 |                                    |

---

## Test Data

None

---

## Expected Result

Predicted magnitudes in all LSST passbands.

---

## Actual Result

The attached notebook demonstrates the use of the system characteristics and throughputs from 'syseng\_throughputs' to integrate the SED of C26202 and derive magnitudes in LSSTComCam passbands.

---

### Step LVM-E4069-4

Step Execution Status: **Pass**

---

## Description

Extract 'source' table measurements of the standards, and calculate the median offset between the measured values and the synthetic (predicted) AB magnitudes. Confirm that the offsets are less than PA6=10 mmag.

---

## Test Data

None

---

## Expected Result

Median offsets in all LSST passbands for each standard star.

---

## Actual Result

The attached notebook compiles all measurements in each band, then compares them to synthetic magnitudes from C26202. Comparisons are made to both an empirical (HST-derived) SED and a model SED from fitting to the empirical spectrum. The offsets are as follows:

u-band; empirical SED offset: 50.46 mmag; model SED offset: 36.30 mmag g-band; empirical SED offset: 7.03 mmag; model SED offset: 6.27 mmag r-band; empirical SED offset: 5.05 mmag; model SED offset: 5.41 mmag i-band; empirical SED offset: 0.59 mmag; model SED offset: 1.24 mmag z-band; empirical SED offset: 3.78 mmag; model SED offset: 3.77 mmag y-band; empirical SED offset: 3.26 mmag; model SED offset: 3.22 mmag

We see that in all bands except u, the offsets are less than the required threshold of 10 mmag.

We have demonstrated the capability of calculating the accuracy of transformation to a physical scale (i.e., AB mag-

nitudes) exists. However, the required accuracy is not met for u-band. Given that the present test was executed on LSSTComCam data, we will assess the result as a Pass, but revisit this test when sufficient LSSTCam data are available.

### 5.2.3.93 LVV-T3177 - Verify implementation of Image Differencing with single-exposure templates

Version **1.0(d)**. Status **Approved**. Open *LVV-T3177* test case in Jira.

Verify that the DMS can perform image differencing from single exposures.

#### Preconditions:

None

Execution status: **Pass**

Final comment:

Results are in the notebook "test\_LVV-T3177.ipynb" attached to this test repository.

Detailed steps results LVV-R293-LVV-E4070-1895626380:

| Step LVV-E4070-1                                                                                                                      | Step Execution Status: <b>Pass</b> |
|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Description                                                                                                                           |                                    |
| Identify a dataset that has already been processed through the full DRP pipelines, including difference imaging with coadd templates. |                                    |
| -----                                                                                                                                 |                                    |
| Test Data                                                                                                                             |                                    |
| None                                                                                                                                  |                                    |
| -----                                                                                                                                 |                                    |
| Expected Result                                                                                                                       |                                    |
| -----                                                                                                                                 |                                    |
| Actual Result                                                                                                                         |                                    |
| This test used recently-reprocessed LSSTCam commissioning data from the Butler repo 'dp2_prep' and collection                         |                                    |

"LSSTCam/runs/DRP/20250421\_20250921/d\_2025\_11\_10/DM-53195".

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E4070-2 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Select a single visit+detector image, and re-run template creation and difference imaging for that image. Specify

Test Data

None

Expected Result

Actual Result

A modified pipeline containing only the template creation and image differencing tasks was created and saved as "singleframe\_template\_diff.yaml". This pipeline file, displayed in full in the attached notebook, contained the necessary configuration override to create a template based on only a single input image.

It was executed at the USDF using the following:

```
pipetask run -b dp2_prep -i LSSTCam/runs/DRP/20250421_20250921/d_2025_11_10/DM-53195 -p singleframe_template_diff.yaml#make
```

---

|                  |                                    |
|------------------|------------------------------------|
| Step LVV-E4070-3 | Step Execution Status: <b>Pass</b> |
|------------------|------------------------------------|

---

Description

Compare the difference imaging outputs from a single-exposure template to the DRP-created multi-exposure template, and confirm that the differencing behaved as expected.

Test Data

None

Expected Result

---

### Actual Result

In the attached notebook, the original and “new” (single-exposure) templates are compared. We confirm that the DRP template included 33 inputs, while the new template used only one input. The resulting difference image from the single-exposure template is noisier and less clean than the DRP difference image, as expected.

We have thus confirmed that single-exposure templates can be used in the DMS difference imaging pipelines.

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## A Documentation

The verification process is defined in LSE-160. The use of Docsteady to format Jira information in various test and planing documents is described in DMTN-140 and practical commands are given in DMTN-178.

## B Acronyms used in this document

| Acronym | Description                                                                                                       |
|---------|-------------------------------------------------------------------------------------------------------------------|
| ADQL    | Astronomical Data Query Language (IVOA standard)                                                                  |
| AP      | Alert Production                                                                                                  |
| AURA    | Association of Universities for Research in Astronomy                                                             |
| Avro    | is a row-oriented remote procedure call and data serialization framework developed within Apache's Hadoop project |
| CCD     | Charge-Coupled Device                                                                                             |
| CERN    | European Organization for Nuclear Research                                                                        |
| DAC     | Data Access Center                                                                                                |
| DAQ     | Data Acquisition System                                                                                           |
| DB      | DataBase                                                                                                          |
| DC2     | Data Challenge 2 (DESC)                                                                                           |
| DECam   | Dark Energy Camera                                                                                                |
| DESC    | Dark Energy Science Collaboration                                                                                 |
| DHCP    | Dynamic Host Configuration Protocol                                                                               |
| DIA     | Difference Image Analysis                                                                                         |
| DM      | Data Management                                                                                                   |
| DMCS    | Data Management Control System                                                                                    |
| DMS     | Data Management Subsystem                                                                                         |
| DMS-REQ | Data Management System Requirements prefix                                                                        |
| DMSR    | DM System Requirements; LSE-61                                                                                    |
| DMTN    | DM Technical Note                                                                                                 |
| DMTR    | DM Test Report                                                                                                    |
| DP0     | Data Preview 0                                                                                                    |
| DP1     | Data Preview 1                                                                                                    |
| DP2     | Data Preview 2                                                                                                    |

|        |                                                                |
|--------|----------------------------------------------------------------|
| DPDD   | Data Product Definition Document                               |
| DR1    | Data Release 1                                                 |
| DR2    | Data Release 2                                                 |
| DRP    | Data Release Processing                                        |
| DWDM   | Dense Wave Division Multiplex                                  |
| EFD    | Engineering and Facility Database                              |
| EPO    | Education and Public Outreach                                  |
| FGCM   | Forward Global Calibration Method                              |
| FIU    | Florida International University                               |
| FWHM   | Full Width at Half-Maximum                                     |
| GAaP   | Gaussian Aperture and PSF                                      |
| GB     | Gigabyte                                                       |
| GMT    | Giant Magellan Telescope                                       |
| GPU    | Graphics Processing Unit                                       |
| HSC    | Hyper Suprime-Cam                                              |
| HSM    | Hierarchical Storage Management                                |
| HST    | Hubble Space Telescope                                         |
| HiPS   | Hierarchical Progressive Survey (IVOA standard)                |
| ICRS   | International Celestial Reference Frame                        |
| IP     | Internet Protocol                                              |
| IRU    | indefeasible right to use                                      |
| ISO    | Information Security Officer                                   |
| ISR    | Instrument Signal Removal                                      |
| IVOA   | International Virtual Observatory Alliance                     |
| JSON   | JavaScript Object Notation                                     |
| L1     | Lens 1                                                         |
| LAN    | Local Area Network                                             |
| LATISS | LSST Atmospheric Transmission Imager and Slitless Spectrograph |
| LDF    | LSST Data Facility                                             |
| LDM    | LSST Data Management (Document Handle)                         |
| LHN    | long haul network                                              |
| LSE    | LSST Systems Engineering (Document Handle)                     |
| LSP    | LSST Science Platform (now Rubin Science Platform)             |
| LSST   | Legacy Survey of Space and Time                                |

|            |                                                             |
|------------|-------------------------------------------------------------|
| LSSTCam    | LSST Science Camera                                         |
| LSSTComCam | Rubin Commissioning Camera                                  |
| LVV        | LSST Verification and Validation                            |
| MOC        | Multi-Order Coverage (IVOA standard)                        |
| MTBF       | Mean Time Between Failures                                  |
| MTTR       | Mean Time To Repair                                         |
| NCSA       | National Center for Supercomputing Applications             |
| NOIRLab    | NSF National Optical-Infrared Astronomy Research Laboratory |
| OCS        | Observatory Control System                                  |
| OS         | Operating System                                            |
| OSPF       | Open Short Path First                                       |
| OSS        | Observatory System Specifications; LSE-30                   |
| PM         | Project Manager                                             |
| PMCS       | Project Management Controls System                          |
| PSF        | Point Spread Function                                       |
| PVI        | Processed Visit Image                                       |
| QA         | Quality Assurance                                           |
| QSERV      | LSST Query Services                                         |
| RA         | Rapid Analysis                                              |
| RAID       | Redundant Array of Inexpensive Disks                        |
| REUNA      | Red Universitaria Nacional                                  |
| RMS        | Root-Mean-Square                                            |
| RSP        | Rubin Science Platform                                      |
| RTN        | Rubin Technical Note                                        |
| S3         | (Amazon) Simple Storage Service                             |
| SED        | Spectral Energy Distribution                                |
| SITCOM     | System Integration, Test and Commissioning                  |
| SLAC       | SLAC National Accelerator Laboratory                        |
| SNR        | Signal to Noise Ratio                                       |
| SODA       | Server-side Operations for Data Access (IVOA standard)      |
| TAP        | Table Access Protocol (IVOA standard)                       |
| TB         | TeraByte                                                    |
| TN         | Technical Note                                              |
| UK         | United Kingdom                                              |

|      |                              |
|------|------------------------------|
| URL  | Universal Resource Locator   |
| US   | United States                |
| USDF | United States Data Facility  |
| UX   | User Experience              |
| VO   | Virtual Observatory          |
| VOIP | Voice Over Internet Protocol |
| WCS  | World Coordinate System      |

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