Vera C. Rubin Observatory
Data Management

LVV-P117: LDM-503-19a (All P1a DM requirements verified) Test Plan

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DMTR-412

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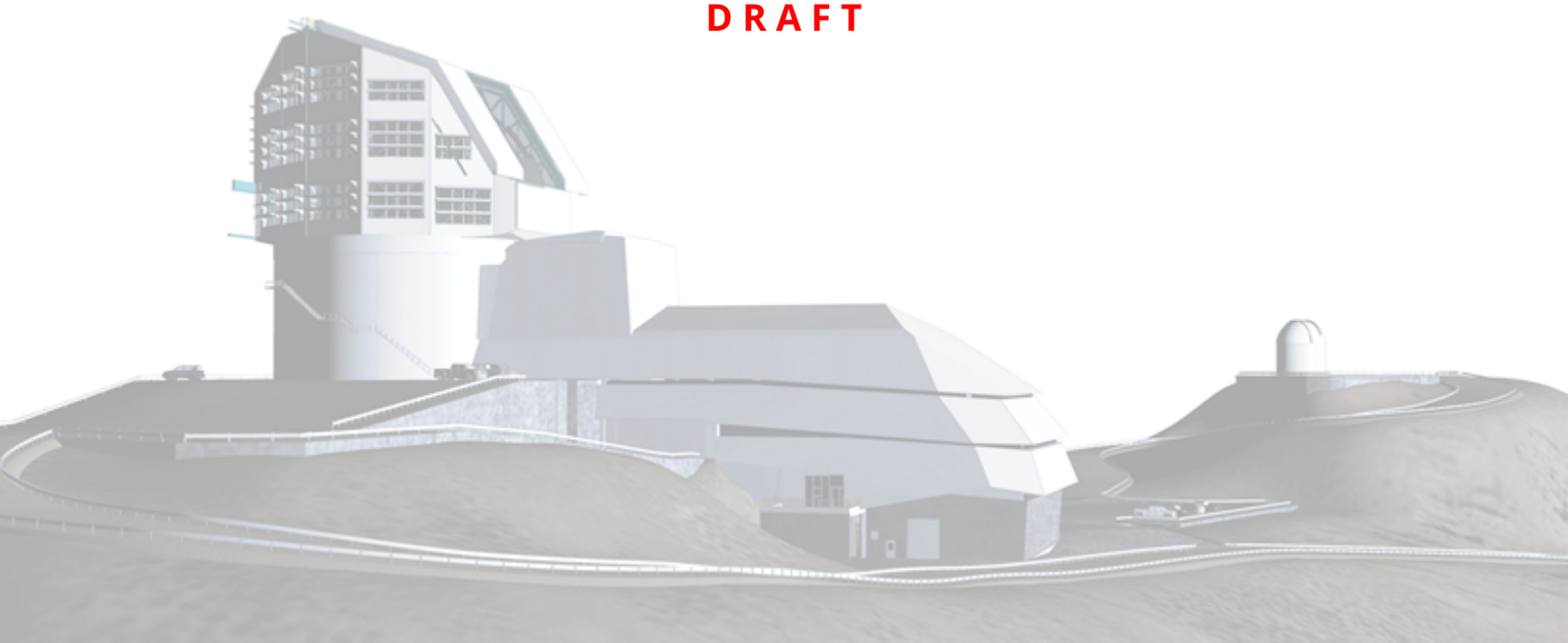
DRAFT



Abstract

This is the test plan for **LDM-503-19a (All P1a DM requirements verified)**, an LSST milestone pertaining to the Data Management Subsystem.
This document is based on content automatically extracted from the Jira test database on 2025-08-26 . The most recent change to the document repository was on 2025-09-10.

Change Record

Version	Date	Description	Owner name
	2023-08-18	First draft	Leanne Guy
1.0	2025-09-10	Test campaign LVV-P117 completed and results approved. DM-38728	Jeff Carlin

Document curator: Leanne Guy
Document source location: `https://github.com/lsst-dm/DMTR-412`
Version from source repository: bf44aa0

Contents

LVV-P117: LDM-503-19a (All P1a DM requirements verified) Test Plan

1 Introduction

1.1 Objectives

This DM acceptance test campaign will verify all DM priority 1a 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 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 1b, 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 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-P117 Jira Test Plan and related Test Cycles (LVV-R275).

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 **??** provides detailed results for each step in each test case.

The current status of test plan LVV-P117 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-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/

[5] **[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

[6] **[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/

[7] **[LSE-160]**, Selvy, B., 2013, *Verification and Validation Process*, Systems Engineering Con-

trolled Document LSE-160, NSF-DOE Vera C. Rubin Observatory, URL https://ls.st/LSE-160

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-P117 owner:	**Jeffrey Carlin**	
	T. Cycle LVV-R275 owner:	**Jeffrey Carlin**	
Test Cases	**Assigned to**	**Executed by**	**Additional Test Personnel**
LVV-E3502	Jim Bosch	Jeffrey Carlin	
LVV-E3503	Robert Lupton	Jeffrey Carlin	
LVV-E3504	Leanne Guy	Jeffrey Carlin	
LVV-E3505	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3506	Eric Bellm	Jeffrey Carlin	
LVV-E3507	Leanne Guy	Undefined	
LVV-E3508	Eric Bellm	Jeffrey Carlin	
LVV-E3509	Leanne Guy	Undefined	
LVV-E3510	Leanne Guy	Jeffrey Carlin	
LVV-E3511	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3512	Eli Rykoff	Jeffrey Carlin	
LVV-E3519	Leanne Guy	Leanne Guy	
LVV-E3520	Leanne Guy	Jeffrey Carlin	
LVV-E3521	Leanne Guy	Undefined	
LVV-E3523	Jim Bosch	Jeffrey Carlin	
LVV-E3524	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3525	Kian-Tat Lim	Jeffrey Carlin	
LVV-E3528	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3530	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3531	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3532	Leanne Guy	Undefined	
LVV-E3535	Jeffrey Carlin	Undefined	
LVV-E3536	Jeffrey Carlin	Undefined	
LVV-E3537	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3538	Jeffrey Carlin	Undefined	
LVV-E3539	Jeffrey Carlin	Undefined	
LVV-E3540	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3541	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3542	Jeffrey Carlin	Undefined	
LVV-E3543	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3544	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3545	Jeffrey Carlin	Undefined	

LVV-E3546	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3547	Jeffrey Carlin	Undefined	
LVV-E3548	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3550	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3551	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3552	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3555	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3556	Leanne Guy	Undefined	
LVV-E3558	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3559	Leanne Guy	Leanne Guy	
LVV-E3560	Kian-Tat Lim	Jeffrey Carlin	
LVV-E3561	Leanne Guy	Jeffrey Carlin	
LVV-E3647	Leanne Guy	Cristián Silva	Ron Lambert (LSST), Greg Thayer (SLAC)
LVV-E3648	Leanne Guy	Cristián Silva	Ron Lambert (LSST), Albert Astudillo (REUNA), Mauricio Rojas (CTIO/CISS), Raylex, Coriant, Telefonica contractors
LVV-E3649	Leanne Guy	Cristián Silva	Ron Lambert (Rubin Observatory), Kian-Tat Lim (Rubin Observatory), Matt Kollross (NCSA), Tony Johnson (SLAC), Gregg Thayer (SLAC)
LVV-E3651	Leanne Guy	Leanne Guy	Leanne Guy
LVV-E3734	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3735	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3743	Jeffrey Carlin	Jeffrey Carlin	
LVV-E3744	Jeffrey Carlin	Undefined	
LVV-E3750	Leanne Guy	Leanne Guy	Leanne Guy
LVV-E4013	Leanne Guy	Jeffrey Carlin	

4 Test Campaign Overview

4.1 Summary

T. Plan LVV-P117:	**LDM-503-19a (All P1a DM requirements verified)**	Approved
T. Cycle LVV-R275:	**LDM-503-19a (All P1a DM requirements verified)**	In Progress

Test Cases	**Ver.**
LVV-E3502	1.0(d)
LVV-E3503	1.0(d)
LVV-E3504	1.0(d)
LVV-E3505	1.0(d)
LVV-E3506	1.0(d)
LVV-E3507	1.0(d)
LVV-E3508	1.0(d)
LVV-E3509	1.0(d)
LVV-E3510	1.0(d)
LVV-E3511	1.0(d)
LVV-E3512	1.0(d)
LVV-E3519	1.0(d)
LVV-E3520	1.0(d)
LVV-E3521	1.0(d)
LVV-E3523	1.0(d)
LVV-E3524	1.0(d)
LVV-E3525	1.0(d)
LVV-E3528	1.0(d)
LVV-E3530	1.0(d)
LVV-E3531	1.0(d)
LVV-E3532	1.0(d)
LVV-E3535	1.0(d)
LVV-E3536	1.0(d)
LVV-E3537	1.0(d)
LVV-E3538	1.0(d)
LVV-E3539	1.0(d)
LVV-E3540	1.0(d)
LVV-E3541	1.0(d)
LVV-E3542	1.0(d)
LVV-E3543	1.0(d)
LVV-E3544	1.0(d)
LVV-E3545	1.0(d)
LVV-E3546	1.0(d)

LVV-E3547	1.0(d)
LVV-E3548	1.0(d)
LVV-E3550	1.0(d)
LVV-E3551	1.0(d)
LVV-E3552	1.0(d)
LVV-E3555	1.0(d)
LVV-E3556	1.0(d)
LVV-E3558	1.0(d)
LVV-E3559	1.0(d)
LVV-E3560	1.0(d)
LVV-E3561	1.0(d)
LVV-E3647	1.0(d)
LVV-E3648	1.0(d)
LVV-E3649	1.0(d)
LVV-E3651	1.0(d)
LVV-E3734	1.0(d)
LVV-E3735	1.0(d)
LVV-E3743	1.0(d)
LVV-E3744	1.0(d)
LVV-E3750	1.0(d)
LVV-E4013	1.0(d)

Table 2: Test Campaign Summary

4.2 Overall Assessment

None

4.3 Recommended Improvements

5 Detailed Tests

5.1 Test Cycle LVV-R275

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

Test Cycle name: LDM-503-19a (All P1a DM requirements verified)
Status: In Progress

Test campaign supporting milestone LDM-503-19a -- all P1a requirements verified.

5.1.1 Software Version/Baseline

Not provided.

5.1.2 Configuration

Not provided.

5.1.3 Test Cases in LVV-R275 Test Cycle

5.1.3.1 LVV-E3502 - Verify implementation of Bad Pixel Map

Version **1.0(d)**. Open *LVV-E3502* test case in Jira.

Verify that the DMS can produce a map of detector pixels that suffer from pathologies, and that these pathologies are encoded in at least 32-bit values.

Preconditions:
None

Final comment:
Executed at the USDF using the DP1 butler repository and pipelines version w_2025_27. The notebook containing the test execution is attached to the Test Report repository as "test_LVV-

T83.ipynb".

Detailed steps :

5.1.3.2 LVV-E3503 - Verify implementation of Crosstalk Correction Matrix

Version **1.0(d)**. Open *LVV-E3503* test case in Jira.

Verify that the DMS can generate a cross-talk correction matrix from appropriate calibration data.
Verify that the DMS can measure the effectiveness of the cross-talk correction matrix.

Preconditions:
None

Final comment:
Test executed using ComCam data as processed by pipelines version w_2025_10. The results are shown in the notebook test_LVV-T85.ipynb attached to this document's repository. Additional verification of the effectiveness of the crosstalk correction can be found on the higher-level (OSS and LSR) tests pertaining to the following Verification Elements:

- LVV-1624
- LVV-1621
- LVV-1642
- LVV-1633
- LVV-1634
- LVV-9802

Detailed steps :

5.1.3.3 LVV-E3504 - Verify Image Archive

Version **1.0(d)**. Open *LVV-E3504* test case in Jira.

Verify that all image Data Products produced by the DMS (Processed Science Exposures, Calibration Exposures, Coadded Exposures) are either archived, or be capable of being recreated on-demand from inputs and processing provenance.

Preconditions:
None

Final comment:
Will be verified using DP1 data at /repo/dp1.

Detailed steps :

5.1.3.4 LVV-E3505 - Verify implementation of Raw Science Image Metadata

Version **1.0(d)**. Open *LVV-E3505* test case in Jira.

Verify successful ingestion of raw data and that image metadata is present and queryable.

Preconditions:
None

Final comment:
The python script to execute this test is attached to the Test Report github repository in scripts/test_LVV-T33.py.

Detailed steps :

5.1.3.5 LVV-E3506 - Verify implementation of Processed Visit Images

Version **1.0(d)**. Open *LVV-E3506* test case in Jira.

Verify that the DMS
1. Successfully produces Processed Visit Images, where the instrument signature has been removed.
2. Successfully combines images obtained during a standard visit.

The verification should include confirming that the images have been trimmed of the over-scan, and that correction of the instrumental signature (including crosstalk) has been applied properly.

Preconditions:
None

Final comment:
Executed at the USDF with pipelines version w_2025_29, using LSSTComCam data from DP1. The resulting notebook is attached to the Test Report repository as ”test_LVV-T38.ipynb”.

Detailed steps :

5.1.3.6 LVV-E3507 - Verify implementation of Generate Data Quality Report Within Specified Time

Version **1.0(d)**. Open *LVV-E3507* test case in Jira.

Verify that the DMS can generate a nightly L1 Data Quality Report within **dqReportComplTime = 4[hour]**, in both human- and machine-readable formats.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.7 LVV-E3508 - Verify implementation of Prompt Processing Data Quality Report Definition

Version **1.0(d)**. Open *LVV-E3508* test case in Jira.

Verify that the DMS produces a Prompt Processing Data Quality Report. Specifically check absolute value and temporal variation of
1. Photometric zeropoint
2. Sky brightness
3. Seeing
4. PSF
5. Detection efficiency

Preconditions:
None

Final comment:
It was noted during this testing that a mechanism for exporting the report to PDF would be useful. It is unclear whether such functionality makes sense within Times Square, but we recommend that it either be implemented there, or that a capability should be developed elsewhere to make it straightforward to export a static artifact from the underlying notebook.

Detailed steps :

5.1.3.8 LVV-E3509 - Verify implementation of Prompt Processing Calibration Report Definition

Version **1.0(d)**. Open *LVV-E3509* test case in Jira.

Verify that the DMS produces a Prompt Processing Calibration Report. Specifically check that this report is capable of identifying when aspects of the telescope or camera are changing with time.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.9 LVV-E3510 - Verify implementation of Engineering and Facility Database Archive

Version **1.0(d)**. Open *LVV-E3510* test case in Jira.

Demonstrate Engineering and Facilities Data (images, associated metadata, and observatory environment and control data) are archived.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2025_24 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T153.ipynb."

Detailed steps :

5.1.3.10 LVV-E3511 - Verify implementation of Calibration Data Products

Version **1.0(d)**. Open *LVV-E3511* test case in Jira.

Verify that the DMS can produce and archive the required Calibration Data Products: cross talk correction, bias, dark, monochromatic dome flats, broad-band flats, fringe correction, and illumination corrections.

Preconditions:
None

Final comment:
Test executed in the RSP at the USDF using pipelines version w_2025_33.

Detailed steps :

5.1.3.11 LVV-E3512 - Verify implementation of Calibration Image Provenance

Version **1.0(d)**. Open *LVV-E3512* test case in Jira.

Verify that the DMS records the required provenance information for the Calibration Data Products.

Preconditions:
None

Final comment:
Tests performed using ComCam on-sky data at the USDF, using w_2025_10 of the science pipelines. See the attached notebook, ”test_LVV-T89.ipynb”, for details.

Detailed steps :

5.1.3.12 LVV-E3519 - Verify implementation of Summit Facility Infrastructure

Version **1.0(d)**. Open *LVV-E3519* 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

Final comment:
None

Detailed steps :

5.1.3.13 LVV-E3520 - Verify implementation of Archive Center

Version **1.0(d)**. Open *LVV-E3520* test case in Jira.

Verify that the Archive Center is sufficiently provisioned to support prompt processing, DRP, and data access needs.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.14 LVV-E3521 - Verify implementation of Archive Center Disaster Recovery

Version **1.0(d)**. Open *LVV-E3521* test case in Jira.

Verify disaster recovery plan for Archive Center.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.15 LVV-E3523 - Verify implementation of Exposure Catalog

Version **1.0(d)**. Open *LVV-E3523* test case in Jira.

Verify that the DMS creates an Exposure Catalog that includes
1. Observation datetime, exposure time
2. Filter
3. Dome, telescope orientation and status
4. Calibration status
5. Airmass and zenith
6. Environmental information
7. Per-sensor information

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2025_09 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T48.ipynb."

Detailed steps :

5.1.3.16 LVV-E3524 - Verify determining effectiveness of dark current frame

Version **1.0(d)**. Open *LVV-E3524* test case in Jira.

Verify that the DMS can determine the effectiveness of a dark correction and determine how often it should be updated.

Preconditions:
None

Final comment:
Test executed using ComCam data as processed by pipelines version w_2025_10. The results are shown in the notebook test_LVV-T1862.ipynb attached to this document's repository.

Detailed steps :

5.1.3.17 LVV-E3525 - Verify implementation of Calibration Production Processing

Version **1.0(d)**. Open *LVV-E3525* test case in Jira.

Execute CPP on a variety of representative cadences, and verify that the calibration pipeline correctly produces necessary calibration products.

Preconditions:
None

Final comment:
Executed at the USDF using pipelines version w_2025_19, the ci_cpp package, and the "test-data_latiss_cpp" dataset.

Detailed steps :

5.1.3.18 LVV-E3528 - Verify implementation of Selection of Datasets

Version **1.0(d)**. Open *LVV-E3528* test case in Jira.

Verify that the DMS can identify and retrieve datasets consisting of logical groupings of Exposures, metadata, provenance, etc., or other groupings that are processed or produced as a logical unit.

Preconditions:
None

Final comment:
Test executed at the USDF (from both the command line and the RSP) using pipelines version w_2025_33.

For this test, we demonstrate that these logical groupings can be applied in butler queries via the ”where” clause. These same query constraints can be passed to pipetasks to apply the selections for processing of data.

Detailed steps :

5.1.3.19 LVV-E3530 - Verify implementation of Image Provenance Access

Version **1.0(d)**. Open *LVV-E3530* test case in Jira.

Verify that available image data products' provenance information can be listed and retrieved.

Preconditions:
None

Final comment:
Executed at the USDF using LSSTComCam data processed with pipelines version 'w_2025_16'. See the attached notebook, ”test_LVV-T2693.ipynb”, for details.

Detailed steps :

5.1.3.20 LVV-E3531 - Verify implementation of Catalog Provenance Access

Version **1.0(d)**. Open *LVV-E3531* test case in Jira.

Verify that available catalog data products' provenance can be listed and retrieved.

Preconditions:
None

Final comment:
Executed at the USDF using LSSTComCam data processed with pipelines version 'w_2025_16'.
See the attached notebook, "test_LVV-T2699.ipynb", for details.

Detailed steps :

5.1.3.21 LVV-E3532 - Verify implementation of Raw Data Archiving Reliability

Version **1.0(d)**. Open *LVV-E3532* test case in Jira.

Verify that raw images are reliably archived.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.22 LVV-E3535 - Verify implementation of minimum number of simultaneous DM EFD query users

Version **1.0(d)**. Open *LVV-E3535* test case in Jira.

Verify that the DM EFD can support **dmEfdQueryUsers = 5** simultaneous queries. The additional requirement that each query must last no more than **dmEfdQueryTime = 10 seconds** will be verified separately in LVV-T1251, but these must be satisfied together.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.23 LVV-E3536 - Verify implementation of maximum time to retrieve DM EFD query results

Version **1.0(d)**. Open *LVV-E3536* test case in Jira.

Verify that the DM EFD can support **dmEfdQueryUsers = 5** simultaneous queries, with each query must executing in no more than **dmEfdQueryTime = 10 seconds.** The requirement on at least 5 simultaneous queries will be verified separately in LVV-T1250, but these must be satisfied together.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.24 LVV-E3537 - Verify calculation of sensor fraction with unusable pixels

Version **1.0(d)**. Open *LVV-E3537* test case in Jira.

Verify that the DM system provides software to assess whether the maximum allowable fraction of sensors with **PixFrac > 1** percent scientifically unusable pixels is less than **SensorFraction = 15 percent.**

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2025_27 in the RSP Notebook aspect at the USDF. Because this test concerns a threshold calculated in LVV-T1841, the two tests were executed together.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1841_1847.ipynb."

Detailed steps :

5.1.3.25 LVV-E3538 - Verify Calculation of Photometric Performance Metrics

Version **1.0(d)**. Open *LVV-E3538* test case in Jira.

Verify that the DMS system provides software to calculate photometric performance metrics, and that the algorithms are properly calculating the desired quantities. Note that because the DMS requirement is that the software shall be provided (and not on the actual measured values of the metrics), we verify all of the requirements via a single test case.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.26 LVV-E3539 - Verify calculation of band-to-band color zero-point accuracy including u-band

Version **1.0(d)**. Open *LVV-E3539* 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

Final comment:
None

Detailed steps :

5.1.3.27 LVV-E3540 - Verify calculation of significance of imperfect crosstalk corrections

Version **1.0(d)**. Open *LVV-E3540* test case in Jira.

Verify that the DM system provides software to assess whether the maximum local significance integrated over the PSF of imperfect crosstalk corrections is less than **Xtalk = 3 sigma**.

Preconditions:
None

Final comment:
Tests performed using ComCam on-sky data at the USDF, using w_2025_10 of the science pipelines. See the attached notebook, "test_LVV-T1843.ipynb", for details.

Detailed steps :

5.1.3.28 LVV-E3541 - Verify calculation of photometric repeatability in gri filters

Version **1.0(d)**. Open *LVV-E3541* test case in Jira.

Verify that the DM system has provided the code to calculate the RMS photometric repeatability of bright non-saturated unresolved point sources in the g, r, and i filters, and assess whether it meets the requirement that it shall be less than **PA1gri = 5.0 millimagnitudes**.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1757.ipynb."

Detailed steps :

5.1.3.29 LVV-E3542 - Verify calculation of zeropoint error fraction exceeding the outlier limit

Version **1.0(d)**. Open *LVV-E3542* 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

Final comment:
None

Detailed steps :

5.1.3.30 LVV-E3543 - Verify calculation of scientifically unusable pixel fraction

Version **1.0(d)**. Open *LVV-E3543* test case in Jira.

Verify that the DM system provides software to assess whether the maximum fraction of pixels scientifically unusable per sensor out of the total allowable fraction of sensors meeting this performance is less than **PixFrac = 1 percent**.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2025_27 in the RSP Notebook aspect at the USDF. Because this test concerns a threshold for LVV-T1847, the two tests were executed together.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1841_1847.ipynb."

Detailed steps :

5.1.3.31 LVV-E3544 - Verify calculation of sky brightness precision

Version **1.0(d)**. Open *LVV-E3544* test case in Jira.

Verify that the DM system provides software to assess whether the maximum error in the precision of the sky brightness determination is less than **SBPrec = 1 percent.**

Preconditions:
None

Final comment:
Executed at the USDF with pipelines version w_2025_28, using LSSTComCam data from DP1. The resulting notebook is attached to the Test Report repository as ”test_LVV-T1840.ipynb”.

Detailed steps :

5.1.3.32 LVV-E3545 - Verify calculation of RMS width of photometric zeropoint

Version **1.0(d)**. Open *LVV-E3545* 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

Final comment:
None

Detailed steps :

5.1.3.33 LVV-E3546 - Verify calculation of image fraction affected by ghosts

Version **1.0(d)**. Open *LVV-E3546* test case in Jira.

Verify that the DM system provides code to assess whether the percentage of image area that has ghosts with surface brightness gradient amplitude of more than 1/3 of the sky noise over 1 arcsec is less than **GhostAF = 1 percent**.

Preconditions:
None

Final comment:
Test executed at the USDF RSP, using w_2025_33. The resulting notebook is attached to this test repository as "test_LVV-T1838.ipynb".

Detailed steps :

5.1.3.34 LVV-E3547 - Verify calculation of band-to-band color zero-point accuracy

Version **1.0(d)**. Open *LVV-E3547* 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

Final comment:
None

Detailed steps :

5.1.3.35 LVV-E3548 - Verify calculation of resolved-to-unresolved flux ratio errors

Version **1.0(d)**. Open *LVV-E3548* test case in Jira.

Verify that the DM system has provided code to assess whether the maximum RMS of the ratio of the error in integrated flux measurement between bright, isolated, resolved sources less than 10 arcsec in diameter and bright, isolated unresolved point sources is less than **ResSource = 2**.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1836.ipynb."

To allow for some flexibility in changing the method of calculating this metric, it has not yet been implemented within 'analysis_tools'. Before future large-scale data processing campaigns, this metric will be incorporated into the 'analysis_tools' tasks and pipelines that are executed as part of data release processing.

Detailed steps :

5.1.3.36 LVV-E3550 - Verify calculation of fraction of relative astrometric measurement error on 5 arcminute scales exceeding outlier limit

Version **1.0(d)**. Open *LVV-E3550* test case in Jira.

Verify that the DM system has provided the code to calculate the maximum fraction of relative astrometric measurements on 5 arcminute scales that exceed the 5 arcminute outlier limit

AD1 = 20 milliarcseconds, and assess whether it meets the requirement that it shall be less than **AF1 = 10 percent.**

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1746.ipynb."

Detailed steps :

5.1.3.37 LVV-E3551 - Verify calculation of fraction of relative astrometric measurement error on 20 arcminute scales exceeding outlier limit

Version **1.0(d)**. Open *LVV-E3551* test case in Jira.

Verify that the DM system has provided the code to calculate the maximum fraction of relative astrometric measurements on 20 arcminute scales that exceed the 20 arcminute outlier limit **AD2 = 20 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **AF2 = 10 percent.**

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1749.ipynb."

Detailed steps :

5.1.3.38 LVV-E3552 - Verify calculation of separations relative to r-band exceeding color difference outlier limit

Version **1.0(d)**. Open *LVV-E3552* test case in Jira.

Verify that the DM system has provided the code to calculate the separations measured relative to the r-band that exceed the color difference outlier limit **AB2 = 20 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **ABF1 = 10 percent.**

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_37 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1750_1753.ipynb."

Detailed steps :

5.1.3.39 LVV-E3555 - Verify calculation of RMS difference of separations relative to r-band

Version **1.0(d)**. Open *LVV-E3555* test case in Jira.

Verify that the DM system has provided the code to calculate the separations measured relative to the r-band, and assess whether it meets the requirement that it shall be less than **AB1 = 10 milliarcseconds.**

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_37 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1750_1753.ipynb."

Detailed steps :

5.1.3.40 LVV-E3556 - Verify Implementation of Data Management Nightly Reporting

Version **1.0(d)**. Open *LVV-E3556* 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

Final comment:
None

Detailed steps :

5.1.3.41 LVV-E3558 - Verify implementation of Provide Calibrated Photometry

Version **1.0(d)**. Open *LVV-E3558* test case in Jira.

Verify that the DMS provides photometry calibrated in AB mags and fluxes (in nJy) for all measured objects and sources. Must be tested for both DRP and AP products.

Preconditions:
None

Final comment:
Test performed in the RSP using public Data Preview 1 (DP1) data products, which are based on on-sky LSSTComCam data. The notebook is attached to this test repository as "test_LVV-T129.ipynb".

Detailed steps :

5.1.3.42 LVV-E3559 - Verify implementation of Wavefront Sensor Data Acquisition

Version **1.0(d)**. Open *LVV-E3559* test case in Jira.

Verify successful ingestion of wavefront sensor data from LSSTCam

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.43 LVV-E3560 - Verify implementation of Raw Science Image Data Acquisition

Version **1.0(d)**. Open *LVV-E3560* test case in Jira.

Verify acquisition of raw data from an LSST camera in all modes.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T29.ipynb."

Detailed steps :

5.1.3.44 LVV-E3561 - Verify implementation of Science Data Archive

Version **1.0(d)**. Open *LVV-E3561* test case in Jira.

Verify that a Science Data Archive has been created and that all LSST public data products have been archived together with the raw data necessary to reproduce them. Verify that the archive is scalable to the data from the full survey and all Data Releases.

This requirement will be verified by analysis. Verification must demonstrate that we have a written plan for how data will be archived and that the storage systems needed exist. The plan should include details on recovery. This is needed before commissioning to support commissioning data taking.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.45 LVV-E3647 - Verify Summit - Base Network Integration (System Level)

Version **1.0(d)**. Open *LVV-E3647* 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.

Final comment:
None

Detailed steps :

5.1.3.46 LVV-E3648 - Verify Summit - Base Network Integration

Version **1.0(d)**. Open *LVV-E3648* test case in Jira.

Verify the integration of the summit to base network by demonstrating a sustained and uninterrupted transfer of data between summit and base over 1 day period at or exceeding rates specified in LDM-142. Done in 3 phases in collaboration with equipment/installation vendors (see test procedure).

Preconditions:
PMCS DMTC-7400-2330 COMPLETE
By phase:

1. Posts from Cerro Pachon to AURA Gatehouse repaired/improved. Fiber installed on posts from Cerro Pachon to AURA Gatehouse. Fiber installed from AURA Gatehouse to AURA compound in La Serena. OTDR purchased.
2. AURA DWDM installed in caseta on Cerro Pachon and in existing computer room in La Serena. DTN installed in La Serena. DTN loaded with software and test data staged.
3. Base Data Center (BDC) ready for installation of LSST DWDM. Fiber connecting existing computer room to BDC. LSST DWDM equipment installed in Summit Computer Room and BDC.

Final comment:
None

Detailed steps :

5.1.3.47 LVV-E3649 - Verify Summit Facility Network Implementation

Version **1.0(d)**. Open *LVV-E3649* test case in Jira.

Verify that data acquired by a AuxTel DAQ can be transferred to Summit DWDM and loaded

in the EFD without problems.

Preconditions:

1. Summit Control Network and Camera Data Backbone installed and operating properly.
2. Summit - Base Network installed and operating properly.
3. EITHER: AuxTel hardware and control systems are functional with LATISS. AuxTel TCS, AuxTel EFD, AuxTel CCS, AuxTel DAQ are connected via Control Network on Summit to Rubin Observatory DWDM (with at least 2 x 10 Gbps ethernet port client cards) 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. AuxTel Archiver/forwarders installed in Summit and operating properly 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, 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.

Final comment:
None

Detailed steps :

5.1.3.48 LVV-E3651 - Verify implementation of Base Wireless LAN (WiFi)

Version **1.0(d)**. Open *LVV-E3651* test case in Jira.

Verify as-built wireless network at the Base Facility supports minBaseWiFi bandwidth (1000 Mbs).

Preconditions:

1. Base Wireless LAN is installed/configured and Test Personnel have accounts for email, internet access.
2. As-built documentation for all of the above is available.

Final comment:
None

Detailed steps :

5.1.3.49 LVV-E3734 - Verify calculation of median relative astrometric measurement error on 200 arcminute scales

Version **1.0(d)**. Open *LVV-E3734* test case in Jira.

Verify that the DM system has provided the code to calculate the median relative astrometric measurement error on 200 arcminute scales and assess whether it meets the requirement that it shall be no more than AM3 = 15 milliarcseconds.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1751_AM1_AM2.ipynb."

Detailed steps :

5.1.3.50 LVV-E3735 - Verify calculation of fraction of relative astrometric measurement error on 200 arcminute scales exceeding outlier limit

Version **1.0(d)**. Open *LVV-E3735* test case in Jira.

Verify that the DM system has provided the code to calculate the maximum fraction of relative astrometric measurements on 200 arcminute scales that exceed the 200 arcminute outlier limit **AD3 = 30 milliarcseconds**, and assess whether it meets the requirement that it shall be less than **AF3 = 10 percent.**

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2024_34 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report as "notebooks/test_LVV-T1752_AF1_AF2.ipynb."

Detailed steps :

5.1.3.51 LVV-E3743 - Verify implementation of L1 Data Product pixel embargo

Version **1.0(d)**. Open *LVV-E3743* test case in Jira.

Verify that Rubin Observatory pixel data is held in a secure location and not released prior

to **L1CommissioningEmbargoT=30 days** after data acquisition during the Commissioning phase.

Preconditions:
None

Final comment:
This test was executed at the USDF with science pipelines version w_2024_43.

Detailed steps :

5.1.3.52 LVV-E3744 - Verify implementation of Level 1 Data Product embargo time

Version **1.0(d)**. Open *LVV-E3744* test case in Jira.

Verify that Rubin Observatory visit image data is not released in any form other than the contents of the public alert stream prior to **L1EmbargoTMin = 80[hour]** after acquisition of the raw image.

Preconditions:
None

Final comment:
None

Detailed steps :

5.1.3.53 LVV-E3750 - Verify implementation of Commissioning Cluster

Version **1.0(d)**. Open *LVV-E3750* test case in Jira.

Verify that the Commissioning Cluster has sufficient Compute/Storage/LAN at the Base Facility

to support Commissioning.

Preconditions:
None

Final comment:
The cluster was moved to the summit facility from the base and is currently in use in commissioning. There is no specification on what should be installed but to provide a useful system, we have ensured that the science pipelines are in stalled and condor as a batch system is available. The verification submits a batch job to run step#1 of nightly validation on some early ComCam images

The batch submission was successful. Aspects of the processing failed and were correctly reported by the batch system as failures.

This test does not test the processing, only the batch system on the commissioning cluster

Detailed steps :

5.1.3.54 LVV-E4013 - Verify Engineering and Facility Database Availability

Version **1.0(d)**. Open *LVV-E4013* test case in Jira.

Demonstrate Engineering and Facilities Data are available for public access within **L1PublicT (24 hours)**.

Preconditions:
None

Final comment:
Test executed with science pipelines version w_2025_24 in the RSP Notebook aspect at the USDF.

The executed notebook was saved in the repository associated with this campaign's test report

as “notebooks/test_LVV-T3155.ipynb.”

Detailed steps :

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
AOS	Active Optics System
AP	Alert Production
AT	Auxiliary Telescope
AURA	Association of Universities for Research in Astronomy
BDC	Base Data Center
CC	Change Control
CCD	Charge-Coupled Device
CCS	Camera Control System
CPP	Calibration Production Processing
CTIO	Cerro Tololo Inter-American Observatory
DAQ	Data Acquisition System
DC2	Data Challenge 2 (DESC)
DEC	Declination
DESC	Dark Energy Science Collaboration
DM	Data Management
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
DP1	Data Preview 1
DP2	Data Preview 2
DR3	Data Release 3
DRP	Data Release Processing
DTN	Data Transfer Node

DWDM	Dense Wave Division Multiplex
Db	Decibel
E2V	Teledyne-e2v semiconductor company
ECDFS	Extended Chandra Deep Field-South Survey
EDFS	Euclid Deep Field South
EFD	Engineering and Facility Database
ESS	Environmental Sensors Support
FITS	Flexible Image Transport System
HSC	Hyper Suprime-Cam
HVAC	Heating, Ventilation, and Air Conditioning
ICRS	International Celestial Reference Frame
ISO	Information Security Officer
ISR	Instrument Signal Removal
ITTN	IT Technote
JSON	JavaScript Object Notation
L1	Lens 1
LAN	Local Area Network
LATISS	LSST Atmospheric Transmission Imager and Slitless Spectrograph
LCA	Document handle LSST camera subsystem controlled documents
LDM	LSST Data Management (Document Handle)
LOVE	LSST Operators Visualization Environment
LSE	LSST Systems Engineering (Document Handle)
LSP	LSST Science Platform (now Rubin Science Platform)
LSR	LSST System Requirements; LSE-29
LSST	Legacy Survey of Space and Time (formerly Large Synoptic Survey Telescope)
LSSTC	LSST Discovery Alliance (formerly LSST Corporation)
LSSTCam	LSST Science Camera
LSSTComCam	Rubin Commissioning Camera
LVV	LSST Verification and Validation
MC	Monte-Carlo (simulation/process)
MJD	Modified Julian Date (to be avoided; see also JD)
MT	Main Telescope
MTAOS	Main Telescope Active Optics System

MTCamera	Main Telescope Camera
MTM1M3	Main Telescope M1M3
MTMount	Main Telescope Mount
NCSA	National Center for Supercomputing Applications
OBS	Organisation Breakdown Structure
OCS	Observatory Control System
OSS	Observatory System Specifications; LSE-30
PB	PetaByte
PDF	Portable Document Format
PMCS	Project Management Controls System
PSF	Point Spread Function
QC	Quality Control
RA	Rapid Analysis
RAM	Random Access Memory
RDP	Rubin Data Production (Obsolete use RDM)
REB	Readout Electronics Board
REUNA	Red Universitaria Nacional
RMS	Root-Mean-Square
RSP	Rubin Science Platform
S3	(Amazon) Simple Storage Service
SLAC	SLAC National Accelerator Laboratory
SNR	Signal to Noise Ratio
SSID	Service Set Identifier
TAI	International Atomic Time
TAP	Table Access Protocol (IVOA standard)
TAXICAB	Telescope and Auxiliary Instrumentation Calibration Acceptance Board
TCS	Telescope Control System
UI	User Interface
URL	Universal Resource Locator
US	United States
USDF	United States Data Facility
WCS	World Coordinate System
YAML	Yet Another Markup Language
bps	bit(s) per second