Jira environment software for system engineering with the ELT instrumentation program

13-05-2026

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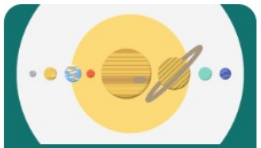
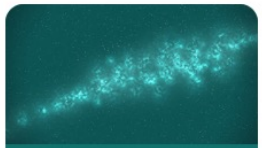
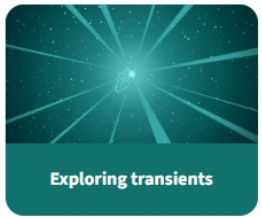
The Vera C. Rubin Observatory

Explore Rubin's key science areas







About Rubin Observatory

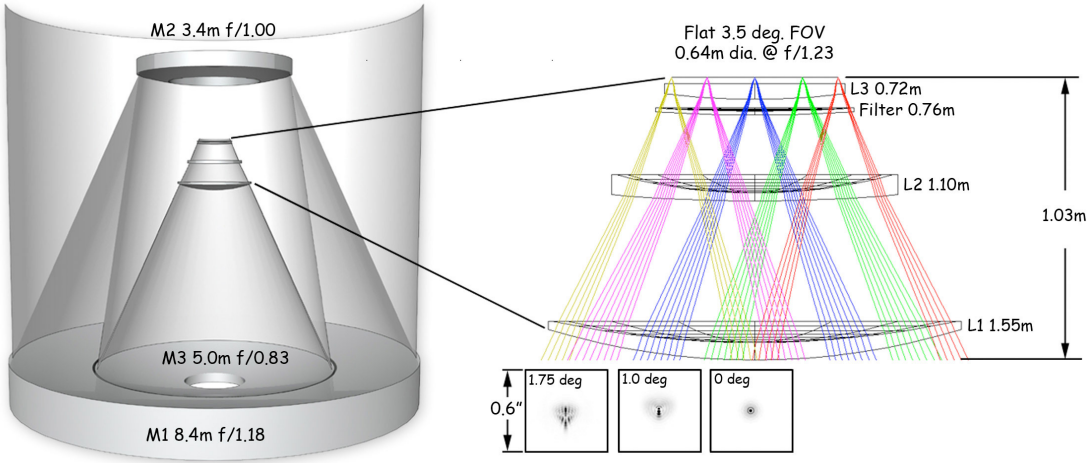
Located on a mountaintop in Chile, NSF–DOE Vera C. Rubin Observatory will **capture the cosmos** in exquisite detail. Using the largest camera ever built, Rubin will repeatedly scan the sky for 10 years and create an ultra-wide, ultra-high-definition time-lapse record of our Universe.

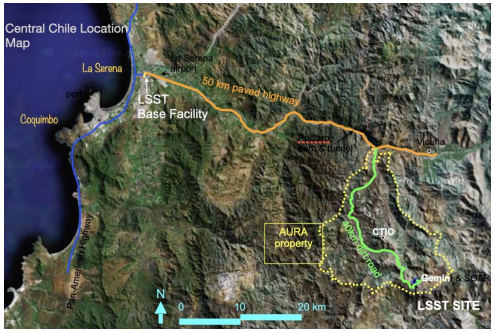
Credits: Vera C. Rubin Observatory

The Vera C. Rubin Observatory

Glass-safety family

- Built by AURA, NSF, DoE, and SLAC, managed by NOIRLab
- Located at Cerro Pachón ridge in Chile, near Gemini Sud
- 10-years survey Southern sky (LSST) 3.2 Gigapixel camera, 3.5° FoV
- M1 8.4-meter, M2 3.4-meter, M3 5-meter, L1 Cam 1.6-meter





Credits: A. Plazas

Credits: SLAC – Vera C. Rubin Observatory

INAF In-kind Program – The INA-S21 team

INAF In-kind program, 23 contributions
(Coordinators: M. Brescia, M. C. Raiteri)

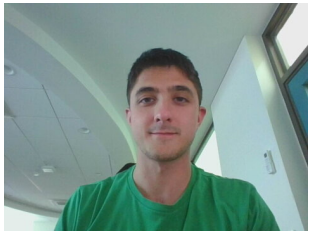
INA-S21: Staff effort in support of Rubin commissioning:
Engineering support at Telescope commissioning

Timeline
Activities started in **spring 2022**

Trips on site (Chile) cumulative budgets:
Three missions in 2023: **5 months**
Three missions in 2024: **5 months**
Two missions in 2025: **4 months**

Official, average commitment cumulative: **1FTE**…

Gabriele Rodeghiero
Tecnologo OAS-OAAb



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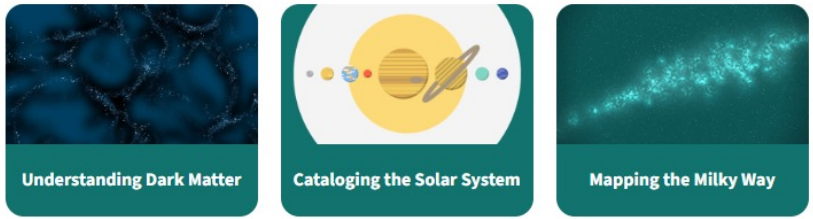
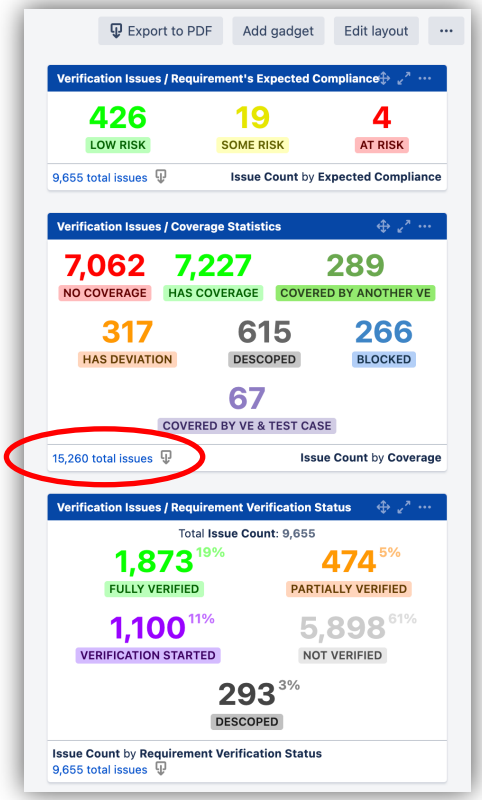
System Engineering @ Rubin Observatory

Explore Rubin's key science areas



4 science cases led to **15260** verification issues (Requirements)



Credits: Vera C. Rubin Observatory

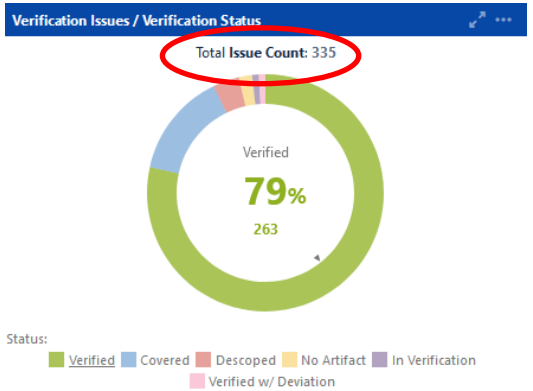
System Engineering @ Rubin Observatory

Rubin M2 cell verification

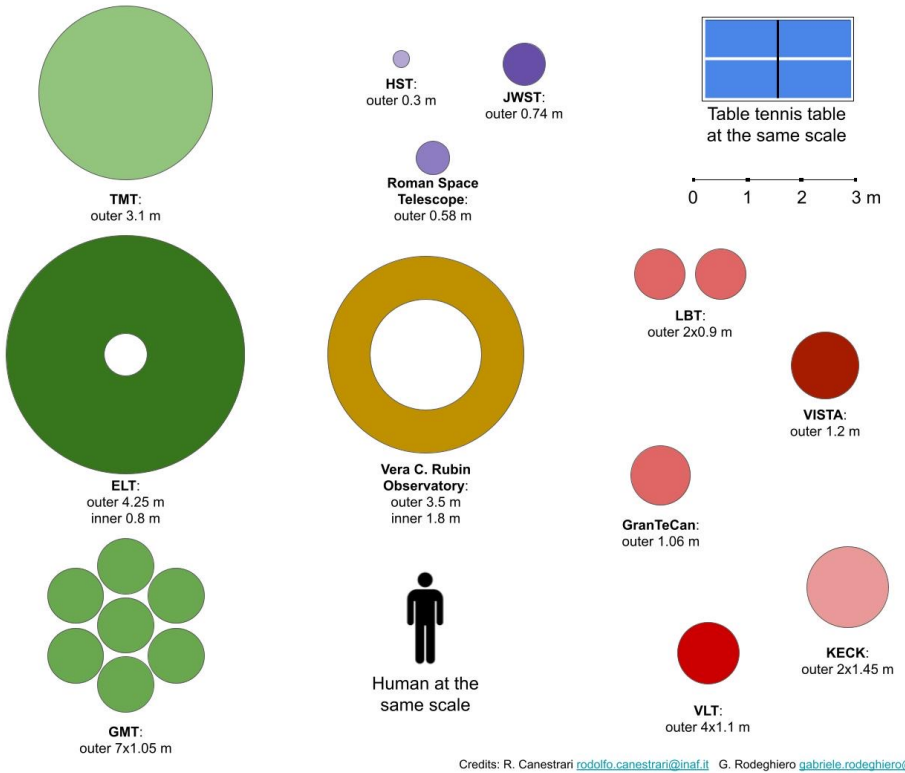
INA-S21 task:
Verification of HW/SW functionalities,
335 verification issues to be verified.

Mirror
1.8 m inner - 3.47 m outer diameter
0.1 m thickness ULE shell

Active optics
72x actuators figure control & weight support
6x tangent links for position & weight support



System Engineering @ Rubin Observatory

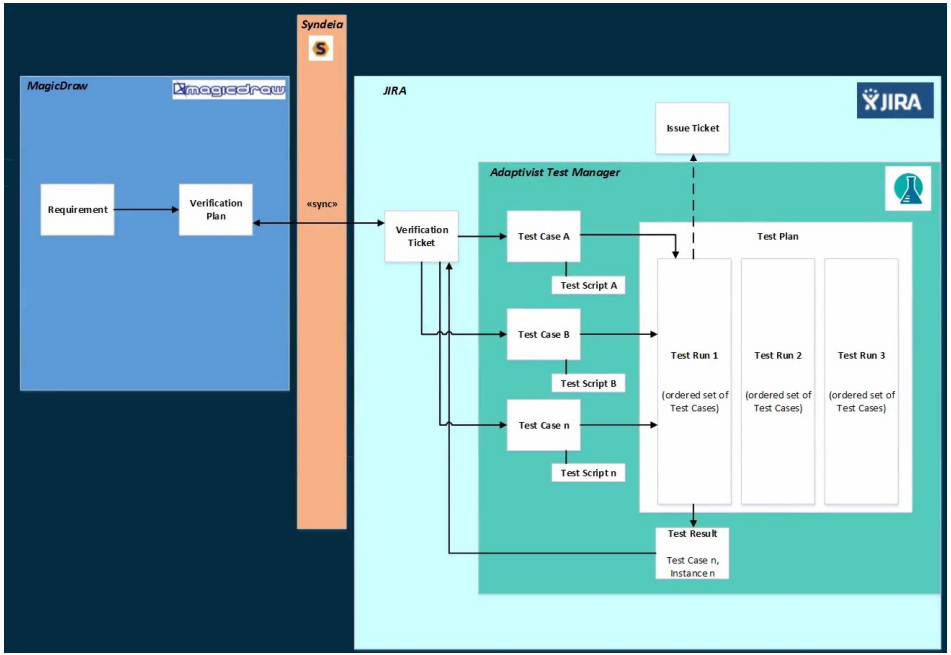


Credits: R. Canestrari rodolfo.canestrari@inaf.it G. Rodeghiero gabriele.rodeghiero@inaf.it

System Engineering @ Rubin Observatory

Rubin System Engineering Architecture

- Rubin has developed an **End-to-End Model Based System Engineering (MBSE)** approach for the project
- Architecture based on 3 software elements: **MagicDraw Cameo**, **Syndeia** & **Jira**
- **MagicDraw Cameo** core tool for system & requirement modeling
- **Jira + Zephyr Scale** test management tool for requirements verification, tasks & tickets
- **Syndeia** bi-directional synchronization and mapping between Cameo & Jira



Credits: Selvy et al. 2018

System Engineering @ Rubin Observatory

Hierarchical structure in Jira – test case

1 Test case verifies **1** or **multiple requirements** or **verification issues**

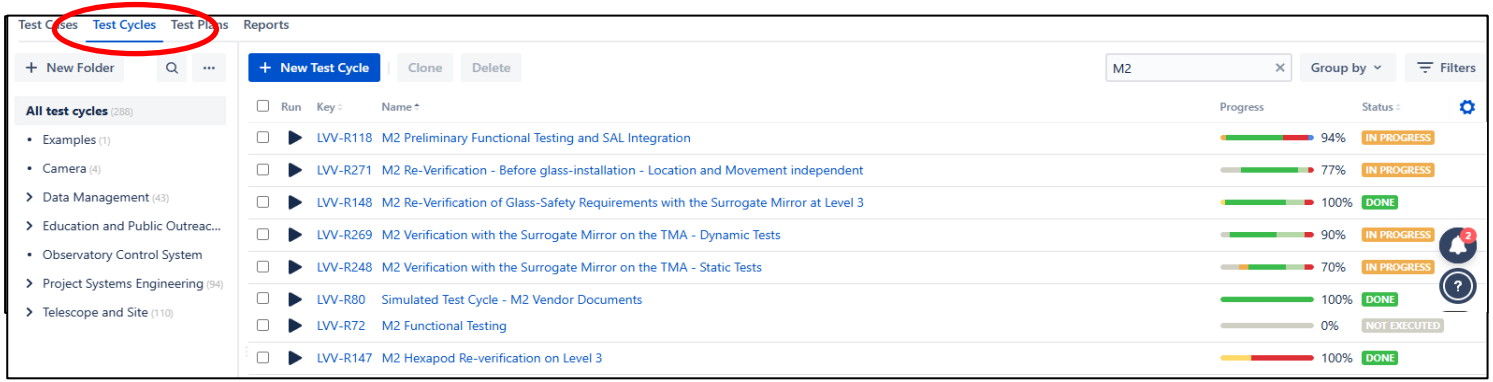
Examples

A Test case for the verification of the mass of the MORFEO calibration unit

A Test case for the verification of the geometric distortions of MICADO.

System Engineering @ Rubin Observatory

Hierarchical structure in Jira – test cycle



1 Test cycle contains **multiple test cases**

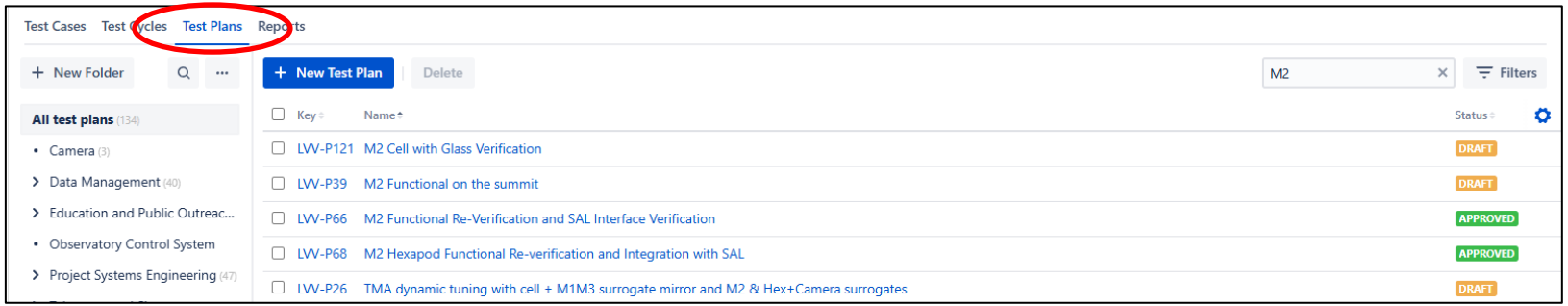
Examples

A Test cycle for the performance verification of an instrument subsystem (e.g., deformable mirrors acceptance tests)

A Test cycle for one night of commissioning at the Rubin telescope (test cases for the night).

System Engineering @ Rubin Observatory

Hierarchical structure in Jira – test plan



1 Test plan contains **multiple test cycles**

Examples

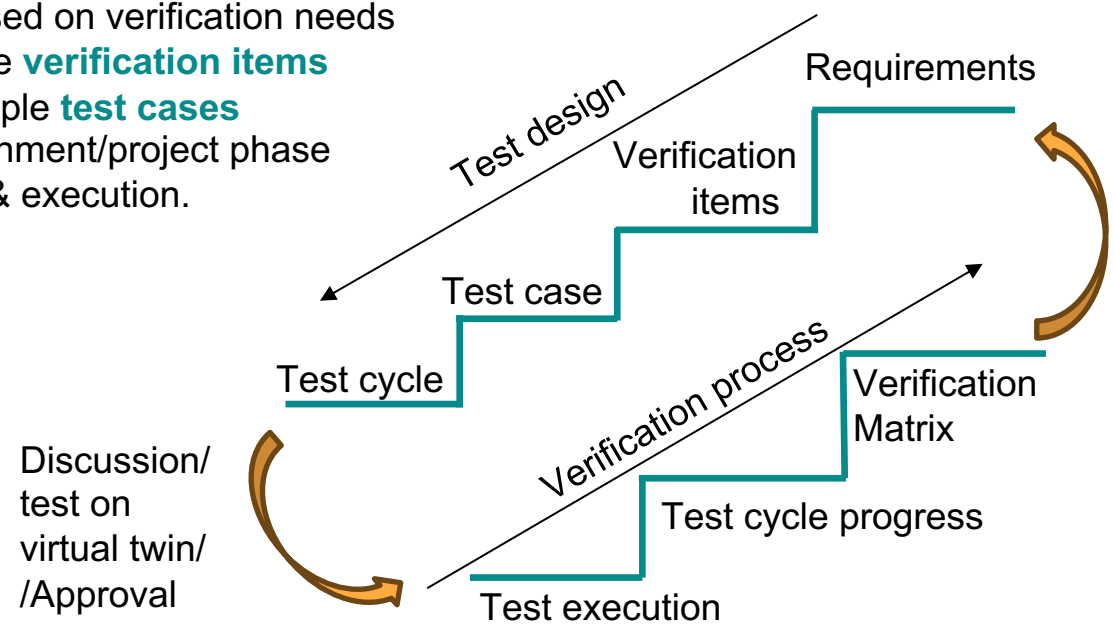
A Test plan for the instrument preliminary acceptance in Europe (PAE)

A Test plan for the verification of the instrument software functionalities and interfaces.

Rubin Verification & Validation scheme

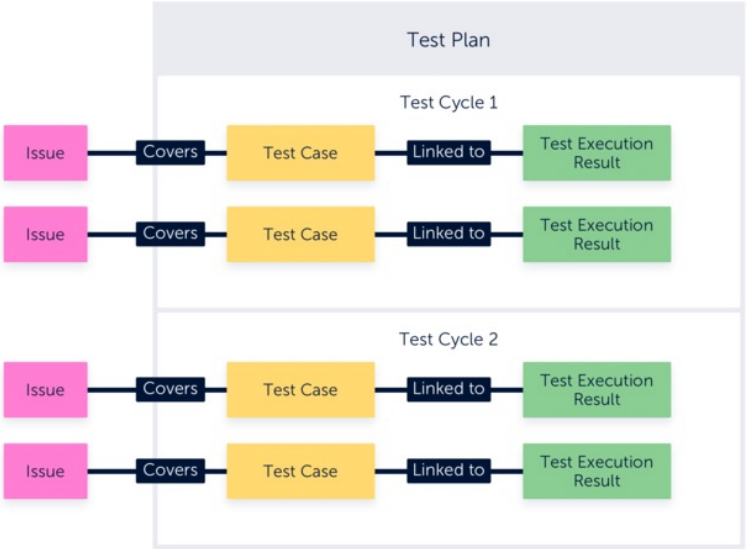
335 verification items for the M2 cell

- Verification items grouped by nature: **glass-safety**, performance, functional etc.
- Test case design and definition based on verification needs
- Each **test case** verifies one or more **verification items**
- Each **test campaign** includes multiple **test cases**
- Each **test plan** relates to an environment/project phase
- **Jira** environment for test planning & execution.

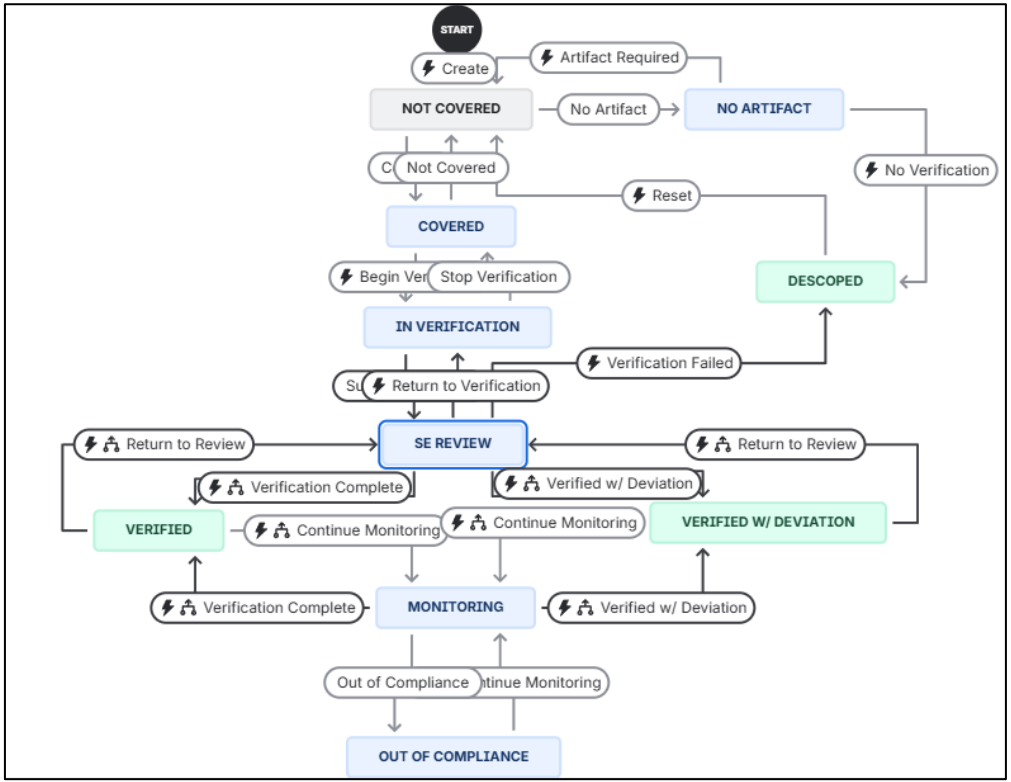


Rubin V&V techniques – verification workflow

Requirement workflow



Credits: Smartbear



Rubin Verification & Validation scheme

Requirement examples

Requirement at sub-system level, M2 cell

LTS-146-REQ-0098-V-01: 3.3.3.2 FORCE RANGE_1

Key details

Requirement Details | Verification Details | Planning Details

Description

FEA and Tangent actuator testing.

NOTE:

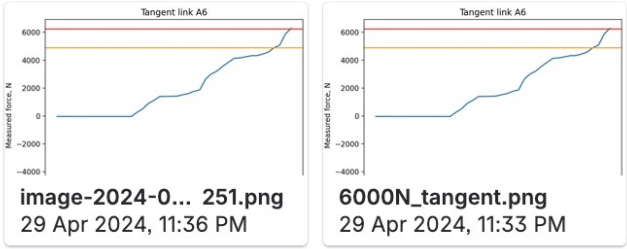
According to the Test plans meeting: 08-05-2024, Doug allowed the tangent link threshold of M2 closed-loop control to be 5800 N.

Requirement Text

Specification: Each mirror support tangent link SHALL have an operational load capacity of at least +/-6,000 N (1,350 lbf).

Results of test

Attachments 2



Test cases linked to requirement verification

Test Cases

coverage

LVV-T878 (1.0)	(09c) M2 Actuator Final Design Review Compl...	APPROVED
LVV-T1783 (2.0)	M2 Actuator Force Limits	APPROVED
LVV-T3017 (1.0)	M2 Dynamic Test, increasing speed, accelera...	APPROVED

Rubin Verification & Validation scheme

Requirement examples

Requirement at system level, Image Quality

TLS-REQ-0041-V-02: T&S Image Quality: M2

Key details

Requirement Details | Verification Details | Planning Details

Description

Undefined

Requirement Text

Specification: The total telescope image quality degradation shall not exceed the telescope system image quality allocation value **Tel_DIQ** defined at zenith.

Requirement Parameters

Tel_DIQ = 0.25[arcsecFWHM] The telescope shall deliver this image quality contribution.

Test cases/tasks
linked to requirement verification

Linked work items

is blocked by

~~LVV-9574~~	evaluate IQ for integrated Ze...	RESOLVED
~~LVV-9638~~	evaluate IQ for Zemax v3.8	RESOLVED
LVV-9639	obtain M2 actuator non-repe...	UNPLANNED
LVV-9640	derive M2 influence matrix a...	UNPLANNED
LVV-9714	measure M2 thermal gradient...	UNPLANNED
LVV-9715	obtain M2 coating uniformity ...	UNPLANNED

verifies

LVV-1537	OSS-REQ-0229-V-01: Image ...	IN VERIFICATION

Lower level requirements link

Lower Level Requirement

[LTS-108-REQ-0011: 2.6 COATING SAMPLES, LTS-97-REQ-0200: 3.8.16.1_1 ADBS ADJUSTABLE SOFTWARE VELOCITY LIMITS, LTS-108-REQ-0015: 2.6.2_2 COATING SAMPLE DISTRIBUTION, LTS-206-REQ-0098: 3.3.12_1 Hexapod Repeatability, LTS-108-REQ-0007: 2.2_2 COATING THICKNESS UNIFORMITY, LTS-108-REQ-0017: 2.6.3 COATING SAMPLE IDENTIFICATION, LTS-108-REQ-0005: 2.1.4 ALUMINUM- SILVER COATING, LTS-108-REQ-0008: 2.3 COATING STRIPPING DURATION, LTS-108-REQ-0023: 2.6.6 COATING SAMPLE PINHOLES, LTS-108-REQ-0010: 2.5 M1M3 TEMPERATURE DIFFERENCE, LTS-108-REQ-0022: 2.6.5_4 COATING SAMPLE TEST MEASUREMENTS, LTS-108-REQ-0021: 2.6.5_3 COATING SAMPLE TEST MEASUREMENTS, LTS-108-REQ-0002: 2.1.1 BARE ALUMINUM COATING, LTS-97-REQ-0176: 3.8.12_4 ADBS Locking Mechanism, LTS-108-REQ-0013: 2.6.1_2 COATING SAMPLE MATERIAL, LTS-108-REQ-0014: 2.6.2_1 COATING SAMPLE DISTRIBUTION, TLS-REQ-0032: 05 Open Loop Tracking Requirements, LTS-108-REQ-0001: 2.1.0 TYPE OF COATING, LTS-97-REQ-0122: 3.8.1_2 ADBS Drive Unit Number, Design Envelope and Locations, LTS-108-REQ-0019: 2.6.5_1 COATING SAMPLE TEST MEASUREMENTS, LTS-108-REQ-0003: 2.1.2 PROTECTED ALUMINUM COATING, LTS-108-REQ-0006: 2.2_1 COATING THICKNESS UNIFORMITY, LTS-108-REQ-0009: 2.4 MIRROR ORIENTATION, LTS-108-REQ-0020: 2.6.5_2 COATING SAMPLE TEST MEASUREMENTS, LTS-206-REQ-0177: 3.5.23_1 Hexapod Repeatability, LTS-108-REQ-0018: 2.6.4 COATING SAMPLE SIZES, LTS-185-REQ-0027: 4.3.4 No contribution to the error budget, LTS-108-REQ-0012: 2.6.1_1 COATING SAMPLE MATERIAL, LTS-108-REQ-0004: 2.1.3 PROTECTED SILVER COATING, LTS-108-REQ-0016: 2.6.2_3 COATING SAMPLE DISTRIBUTION, LTS-108-REQ-0024: 2.6.7 COATING SAMPLE DELIVERY]

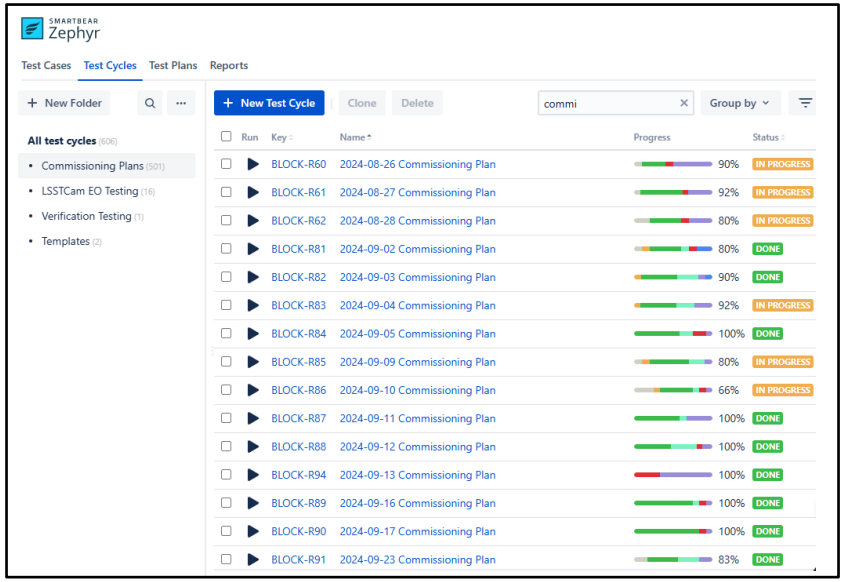
Rubin V&V techniques – verification report

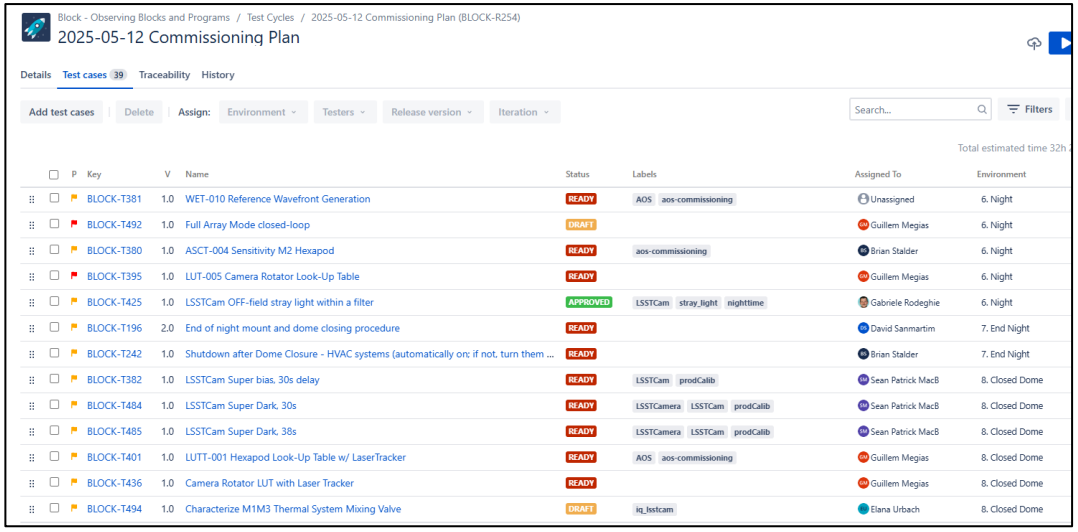
Synoptic view of requirements, tasks and test progress

SUMMIT-8444 DONE (2) Rotator Limit Switch Bulkhead Test	LVV-T2993 APPROVED (1) Camera Rotator -- Bulkhead Limit Switch Position Test	PASS (0) Executed on: 07/Feb/24 7:18 pm Environment: Summit Facility - Telescope Executed by: Holger Drass
	LVV-T2995 APPROVED (1) Camera Rotator -- Rotator Movement Range and Limit Switches	NOT EXECUTED (0) Executed on: Environment: Summit Facility - Telescope
SUMMIT-6556 PROPOSED TASK (1) Connect M1M3 cell light relay signalling lights are powered	LVV-T2232 APPROVED (1) M1M3 Integration with SAL	NOT EXECUTED (0) Executed on: Environment: -
SUMMIT-8490 DONE (1) M2 Mirror Removal/Installation Procedure from/on M2 Cel using the 6-Point Lifter	LVV-T2790 DEFINED (1) M2 Hazard Mitigation Verification on TMA	IN PROGRESS (0) Executed on: Environment: - Executed by: Gabriele Rodeghiero
SUMMIT-7679 DONE (2) M2 Tangent Link Modification to Lower Heat Dissipation	LVV-T1821 APPROVED (1) M2 Tangent Links Heat Dissipation	NOT EXECUTED (0) Executed on: Environment: -
	LVV-T3023 APPROVED (1) M2 Tangent Links Heat Dissipation data analysis after modification	PASS (0) Executed on: 08/Jun/24 5:38 pm Environment: - Executed by: Gabriele Rodeghiero
SUMMIT-8031 DONE (2) M1M3 IMS Offset calibration	LVV-T254 APPROVED (1) M13T-013 Determination of X, Y, Z Zero Coordinate	NOT EXECUTED (0) Executed on: Environment: -
	LVV-T1809 APPROVED (1) M1M3 Support System Optimal Position and IMS Offset calibration	NOT EXECUTED (0) Executed on: Environment: -

Rubin commissioning on-sky – night test plan

- Prioritization of test cases, night timetable built during a daytime call for tests
- Recycling of test procedures, visibility of test cases throughout all sub-systems
- Flexibility, real-time import/deletion of test cases
- Configurability of test cycles





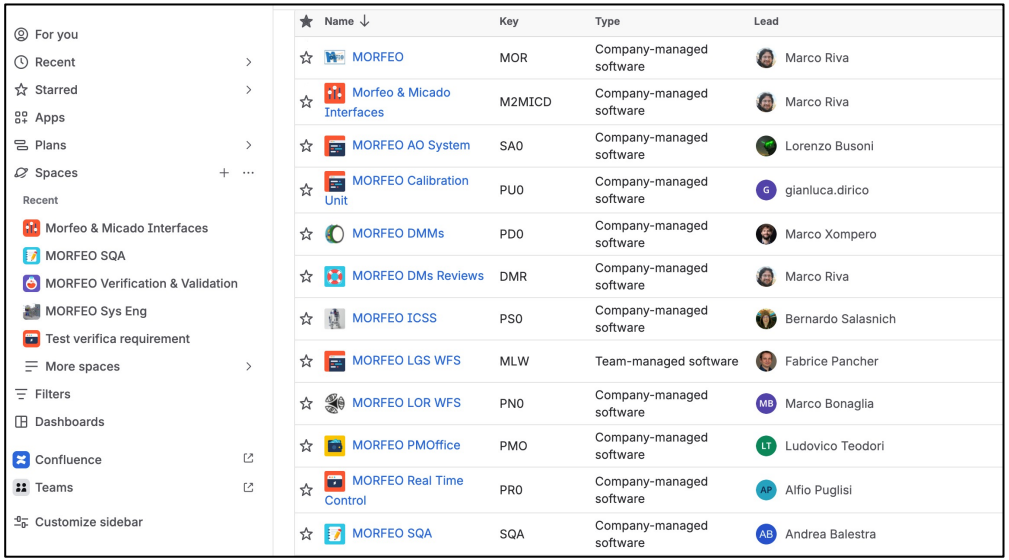
An architecture for large projects

MORFEO & ANDES

MORFEO is adopting the Vera C. Rubin SE approach for test management in Jira and migrating its test procedures from a monster Excel spreadsheet to a Jira Zephyr scale environment.

Test case/ requirement	Requirement formulation	MORFEO testing in BIH	MORFEO testing in IAA
MAO-SF0-1.2.3.12: Unvignetted FOV (Secondary port)	the PFRO shall be designed to deliver an unvignetted field of view of at least 2.5 arcmin diameter at the secondary port.	YES First test execution & verification	NO M11 repositioned at LT accuracy to the BIH calibrated position Remachining of the Intef. plates if needed
MAO-SF0-1.2.3.19: Unvignetted technical FOV (Primary port)	the PFRO shall be designed to deliver a field of view of at least 160 arcsec diameter at the LOR focal plane.	YES First test execution & verification	NO no need for retesting after BIH verification, LT precision is well within the required accuracy
MAO-SF0-1.3.4.1: Unvignetted FOV (Primary port)	the PFRO shall be designed to deliver a field of view of at least 75 arcsec diameter at the MICADO instrument port.	YES First test execution & verification	NO no need for retesting after BIH verification, if optics are positioned at LT precision
MAO-SF0-1.3.4.22: Delivered as built focal ratio	The MORFEO optics shall, as a design goal, provide a 1:1 relay of the beam at both ports. The agreed image space F number with MICADO is F/17.75 +/-1%	YES First test execution & verification, without ELT	NO no need for retesting after BIH verification, if optics are positioned at LT precision
MAO-SF0-1.2.3.14: DelSpace focal ratio	The MORFEO optics shall, as a design goal, deliver an F number equal to F/17.75 +/-0.08	NO verification only by design	NO verification only by design
MAO-SF0-1.3.4.3:	The MORFEO optics should, as a design	NO	NO

3 Testing campaigns overview | Morfeo testing BIH | Morfeo testing IAA | 2 Morfeo sta

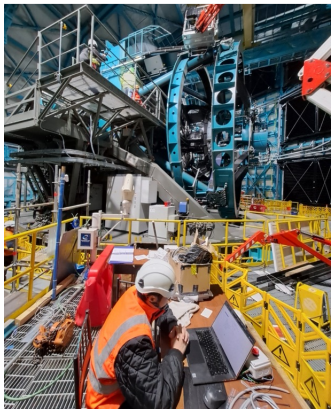


Looking backward & forward

From 8m to ELT scale

- The Vera C. Rubin experience was & is a great learning and training opportunity
- We can still learn a lot from the advanced projects ongoing, and different ecosystems
- We shall remember to train people in addition to AI.

MORFEO integration hall in Bologna




Great collaboration – remember to have fun












Thanks for the attention!