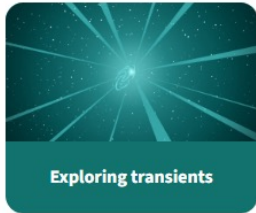
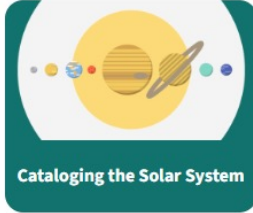


Jira environment software for system engineering with the ELT instrumentation program

13-05-2026

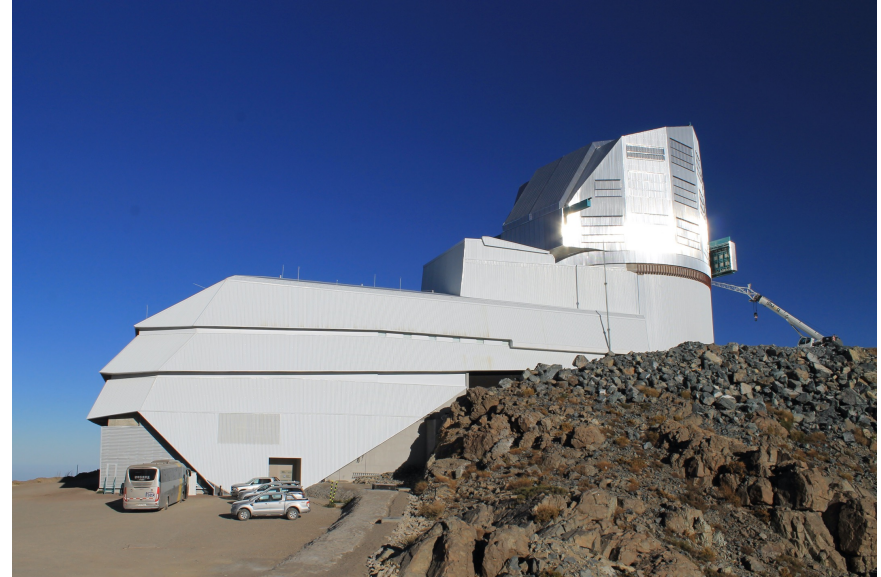
Gabriele Rodeghiero, Andrea Balestra, Marco Riva,
Luca Rosignoli, Alessio Taranto, Matteo De Magistris,
Enrico Giro, Rodolfo Canestrari, Alessio Zanutta,
Marcello A. Scalera

Explore Rubin's key science areas



About Rubin Observatory

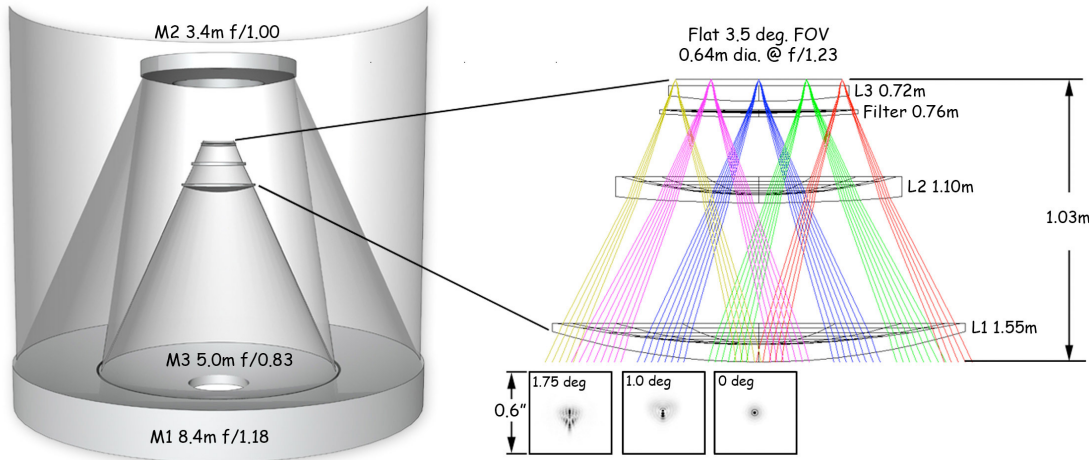
Located on a mountaintop in Chile, NSF-DOE Vera C. Rubin Observatory will **capture the cosmos** in exquisite detail. Using the largest camera ever built, Rubin will repeatedly scan the sky for 10 years and create an ultra-wide, ultra-high-definition time-lapse record of our Universe.



Credits: Vera C. Rubin Observatory

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, 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**

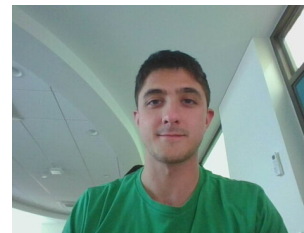
Three missions in 2024: **5 months**

Two missions in 2025: **4 months**

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



Gabriele Rodeghiero
Tecnologo OAS-OAAb



Luca Rosignoli
PhD UNIBO



Alessio Taranto
PhD UNIBO



Enrico Giro
Dirigente tecnologo
OATS

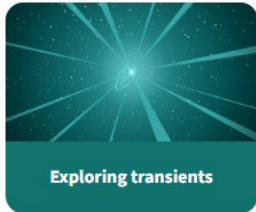
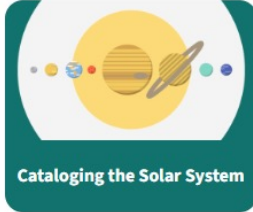


Rodolfo Canestrari
Primo tecnologo
IASF Pa

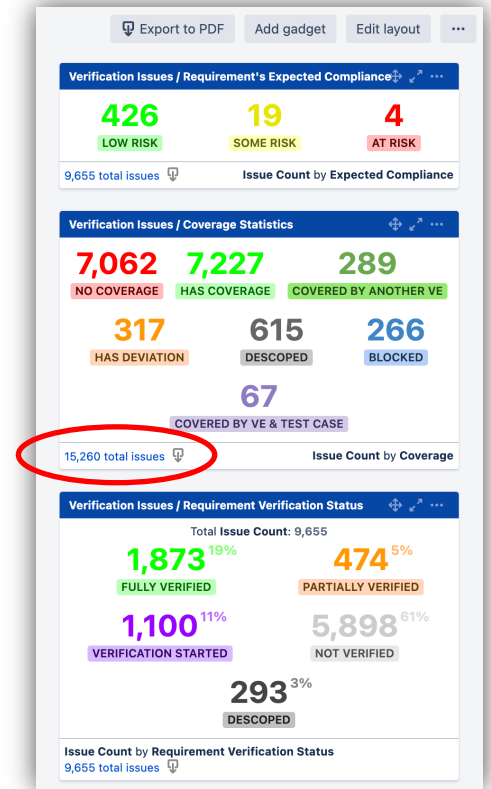


Felice Cusano
Tecnologo
OAS

Explore Rubin's key science areas



4 science cases led to 15260 verification issues (Requirements)



Rubin M2 cell verification

INA-S21 task:

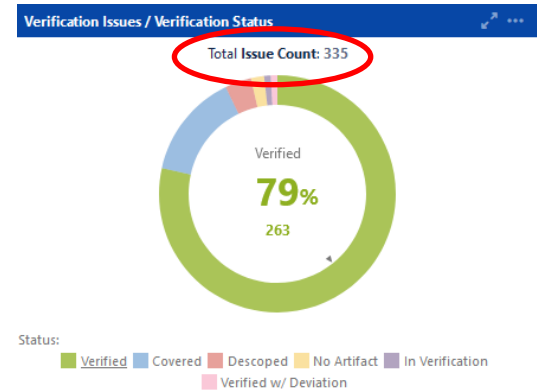
Verification of HW/SW functionalities,
335 verification issues to be verified.

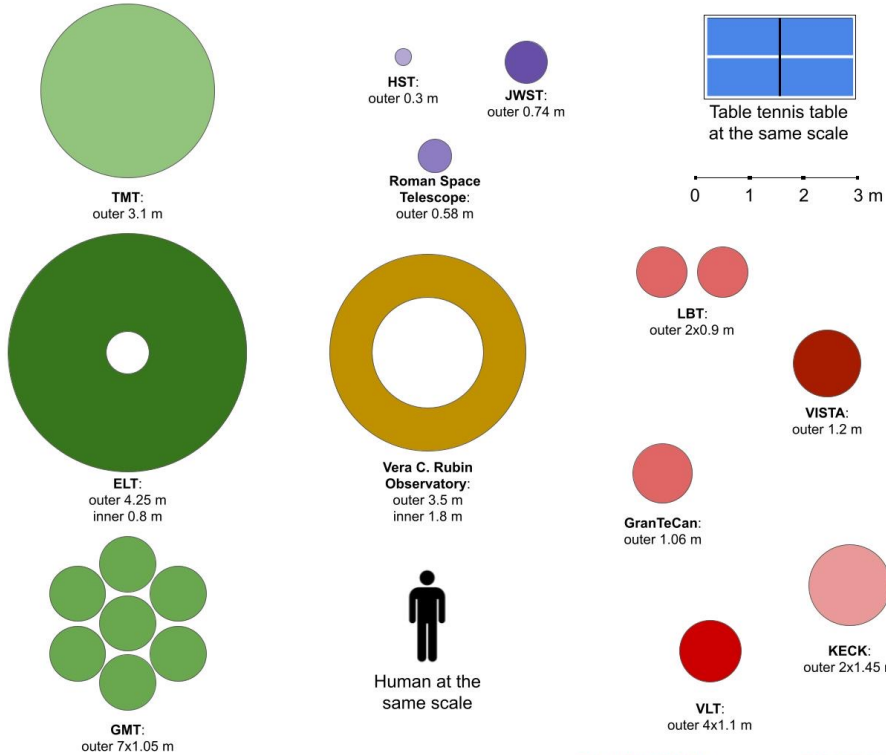
Mirror

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



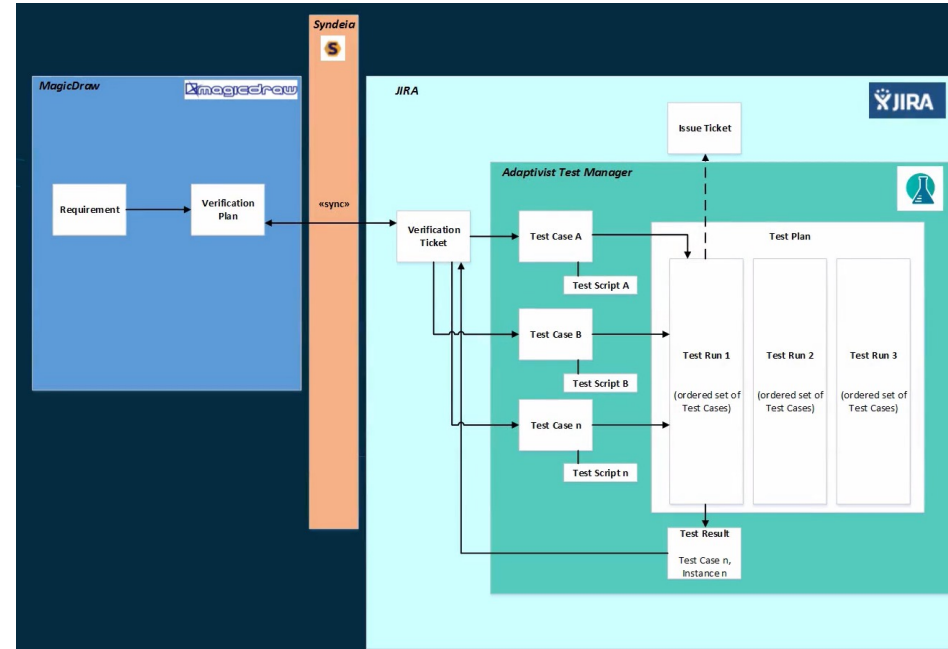


Credits: R. Canestrari rodolfo.canestrari@inaf.it G. Rodeghiero gabriele.rodeghiero@inaf.it



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

Hierarchical structure in Jira – test case



SMARTBEAR Zephyr

Test Cases Test Cycles Test Plans Reports

+ New Folder [Search] + New Test Case Archive Clone More

M2 [Filters]

<input type="checkbox"/>	P:	Key:	V:	Name*	Status:	R:
<input type="checkbox"/>	04	LVV-T870	1.0 -	(04) M2 Mirror Shipping Container Structural Analysis	APPROVED	●
<input type="checkbox"/>	05	LVV-T871	1.0 -	(05) M2 Receiving Inspection Report	APPROVED	●
<input type="checkbox"/>	06	LVV-T872	1.0 -	(06) M2 Optical Fabrication Support Pad Final Design Review	APPROVED	●
<input type="checkbox"/>	08a	LVV-T874	1.0 -	(08a) M2 Cell Weldment Final Design Review and Fabrication Readiness Review	APPROVED	●
<input type="checkbox"/>	08b	LVV-T875	1.0 -	(08b) M2 Cell Weldment Final Design Review Compliance	APPROVED	●
<input type="checkbox"/>	092-308-AT-M-00003 / 092-308-AT-M-00027	LVV-T2296	1.0 -	(092-308-AT-M-00003 / 092-308-AT-M-00027) M2 Installation/Extraction Procedure	APPROVED	●
<input type="checkbox"/>	092-308-HP-M-02400	LVV-T1508	1.0 -	(092-308-HP-M-02400) A.2.2.1: TMA - M2 Mirror Cell Assembly Thermal Control System Cooling Air	APPROVED	●
<input type="checkbox"/>	092-308-HP-M-02700	LVV-T1542	1.0 -	(092-308-HP-M-02700) A.2.6: TMA - M2 Surrogate Mass Removal & Installation	APPROVED	●

1 Test case verifies 1 or multiple requirements or verification issues

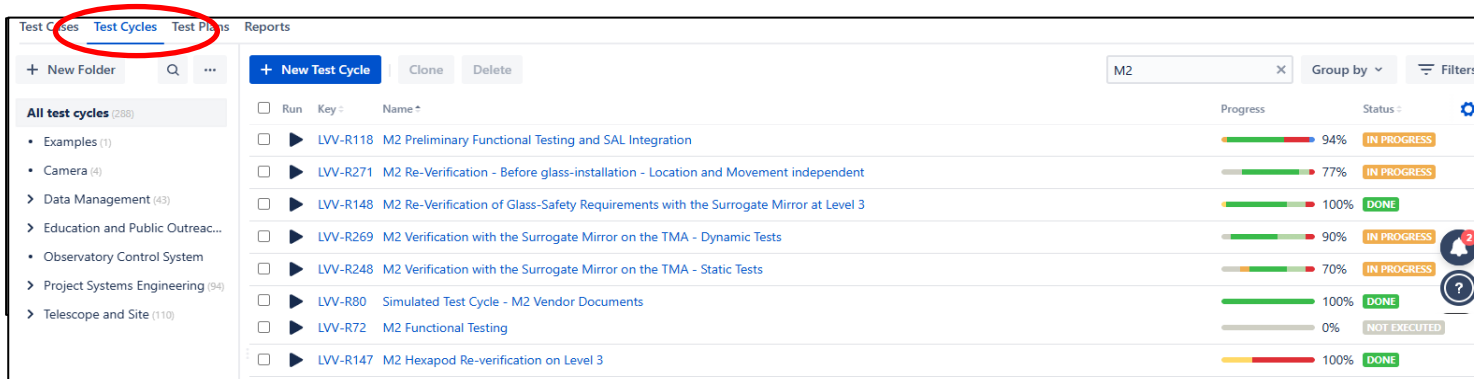
Examples

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.



Hierarchical structure in Jira – test cycle



The screenshot shows the Jira Test Cycles interface. The 'Test Cycles' tab is selected and circled in red. The interface displays a list of test cycles for the 'M2' project. Each test cycle includes a 'Run' checkbox, a 'Key', a 'Name', a 'Progress' bar, and a 'Status' indicator.

Run	Key	Name	Progress	Status
<input type="checkbox"/>	LJV-R118	M2 Preliminary Functional Testing and SAL Integration	94%	IN PROGRESS
<input type="checkbox"/>	LJV-R271	M2 Re-Verification - Before glass-installation - Location and Movement independent	77%	IN PROGRESS
<input type="checkbox"/>	LJV-R148	M2 Re-Verification of Glass-Safety Requirements with the Surrogate Mirror at Level 3	100%	DONE
<input type="checkbox"/>	LJV-R269	M2 Verification with the Surrogate Mirror on the TMA - Dynamic Tests	90%	IN PROGRESS
<input type="checkbox"/>	LJV-R248	M2 Verification with the Surrogate Mirror on the TMA - Static Tests	70%	IN PROGRESS
<input type="checkbox"/>	LJV-R80	Simulated Test Cycle - M2 Vendor Documents	100%	DONE
<input type="checkbox"/>	LJV-R72	M2 Functional Testing	0%	NOT EXECUTED
<input type="checkbox"/>	LJV-R147	M2 Hexapod Re-verification on Level 3	100%	DONE

1 Test cycle contains **multiple test cases**

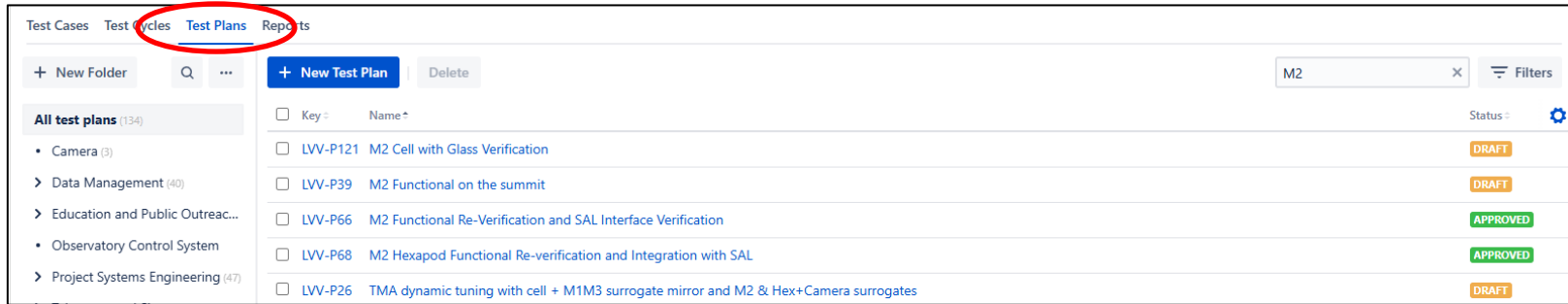
Examples

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).



Hierarchical structure in Jira – test plan



The screenshot shows the Jira Test Plans interface. The 'Test Plans' tab is highlighted with a red circle. The interface includes a sidebar with a tree view of test plans, a main table of test plans, and a top navigation bar. The table lists several test plans with their keys and names, and their status (DRAFT or APPROVED).

Key	Name	Status
LVV-P121	M2 Cell with Glass Verification	DRAFT
LVV-P39	M2 Functional on the summit	DRAFT
LVV-P66	M2 Functional Re-Verification and SAL Interface Verification	APPROVED
LVV-P68	M2 Hexapod Functional Re-verification and Integration with SAL	APPROVED
LVV-P26	TMA dynamic tuning with cell + M1M3 surrogate mirror and M2 & Hex+Camera surrogates	DRAFT

1 Test plan contains **multiple test cycles**

Examples

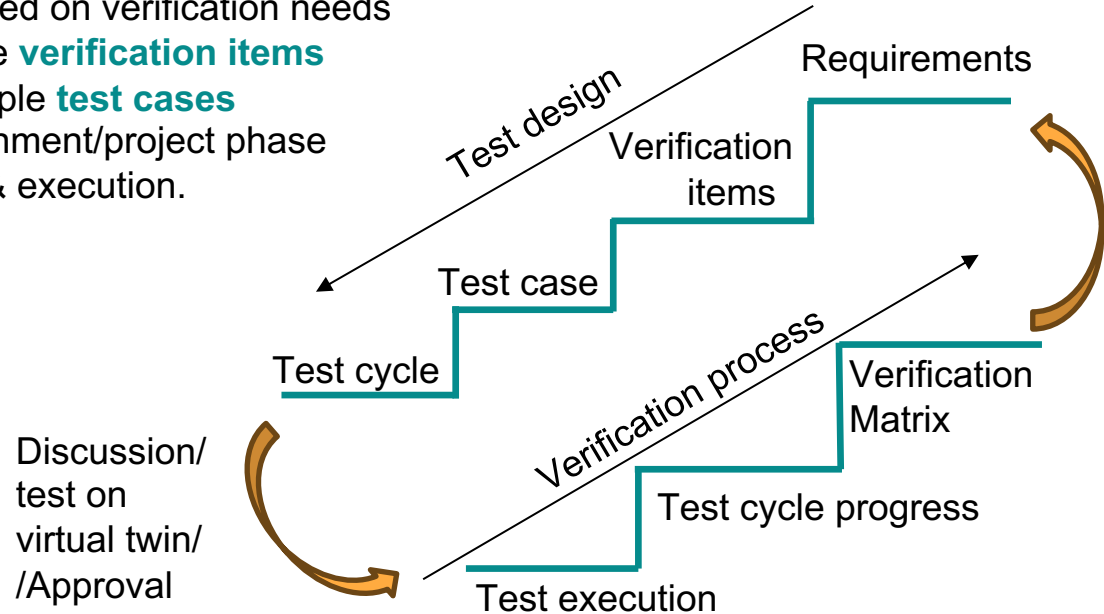
A Test plan for the instrument preliminary acceptance in Europe (PAE)

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

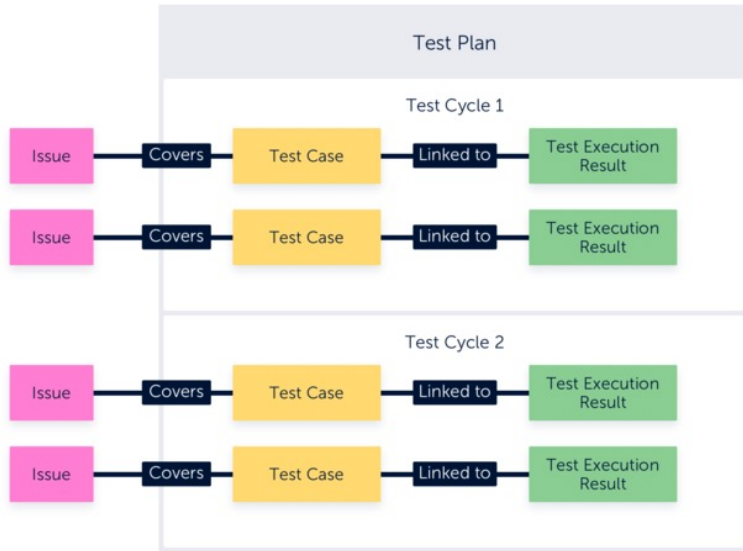


335 verification items for the M2 cell

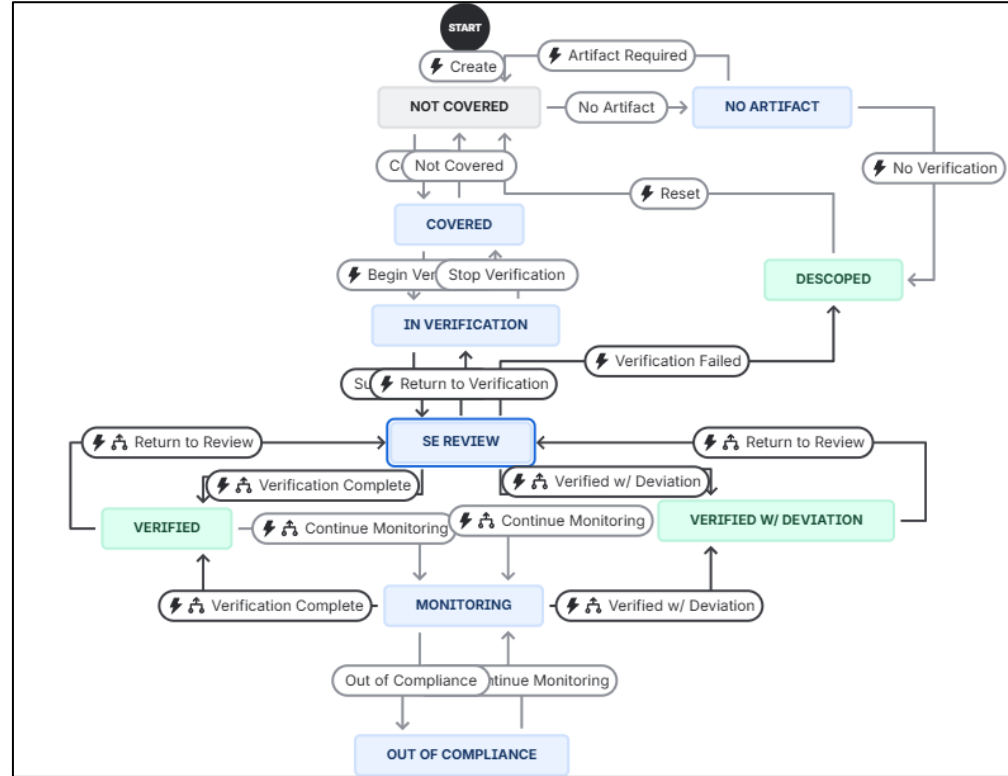
- Verification items grouped by nature: **glass-safety**, performance, functional etc.
- Test case design and definition based on verification needs
- Each **test case** verifies one or more **verification items**
- Each **test campaign** includes multiple **test cases**
- Each **test plan** relates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



Requirement workflow



Credits: Smartbear



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.

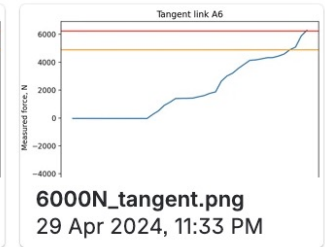
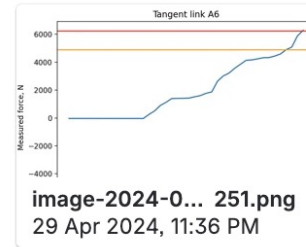
NOTE:

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).

Attachments 2



Results of test

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	▶

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	BX	⚙️
✘ LVV-9638	evaluate IQ for Zemax v3.8	RESOLVED	BX	⚙️
✘ LVV-9639	obtain M2 actuator non-repe...	UNPLANNED	👤	⚙️
✘ LVV-9640	derive M2 influence matrix a...	UNPLANNED	BX	⚙️
✘ LVV-9714	measure M2 thermal gradient...	UNPLANNED	👤	⚙️
✘ LVV-9715	obtain M2 coating uniformity ...	UNPLANNED	TV	⚙️

verifies

<input checked="" type="checkbox"/>	LVV-1537	OSS-REQ-0229-V-01: Image ...	IN VERIFICATION	👤	⚙️
-------------------------------------	----------	------------------------------	-----------------	---	----

Lower level requirements link

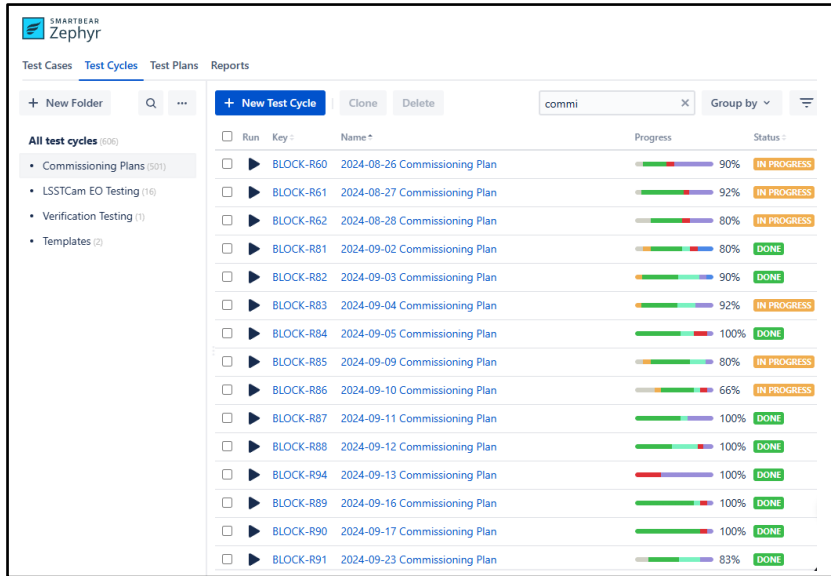
Lower Level Requirement

[\[LTS-108-REQ-0011\]](#): 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, [\[LTS-REQ-0032\]](#): 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]

Synoptic view of requirements, tasks and test progress

<input checked="" type="checkbox"/> 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
<input checked="" type="checkbox"/> 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: -
<input checked="" type="checkbox"/> 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
<input checked="" type="checkbox"/> 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
<input checked="" type="checkbox"/> 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: -

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



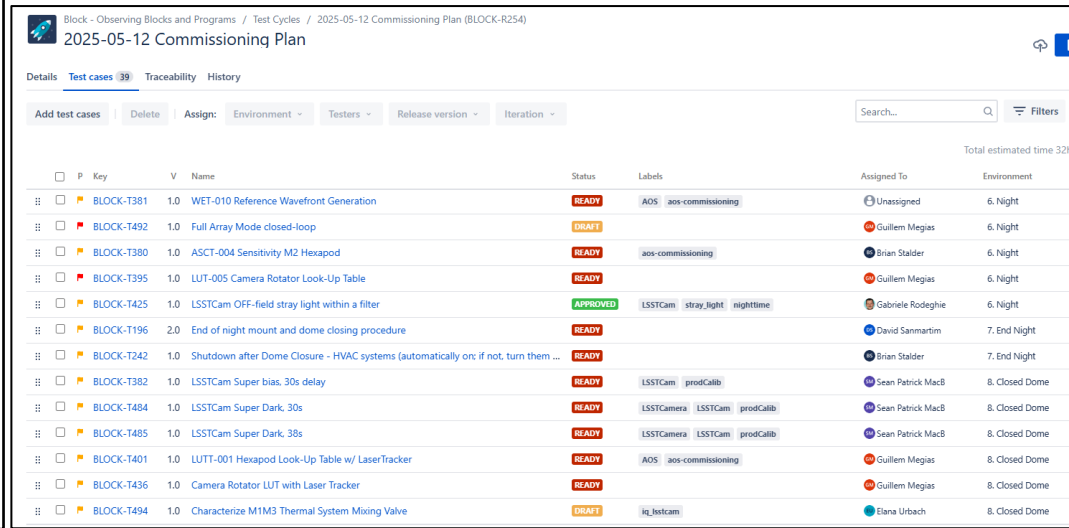
SMARTBEAR Zephyr Test Cycles Reports

+ New Folder 🔍 ... + New Test Cycle Clone Delete commi Group by

All test cycles (606)

- Commissioning Plans (501)
- LSSTCam EO Testing (16)
- Verification Testing (1)
- Templates (2)

Run	Key	Name	Progress	Status
<input type="checkbox"/>	▶	BLOCK-R60	2024-08-26 Commissioning Plan	90% IN PROGRESS
<input type="checkbox"/>	▶	BLOCK-R61	2024-08-27 Commissioning Plan	92% IN PROGRESS
<input type="checkbox"/>	▶	BLOCK-R62	2024-08-28 Commissioning Plan	80% IN PROGRESS
<input type="checkbox"/>	▶	BLOCK-R81	2024-09-02 Commissioning Plan	80% DONE
<input type="checkbox"/>	▶	BLOCK-R82	2024-09-03 Commissioning Plan	90% DONE
<input type="checkbox"/>	▶	BLOCK-R83	2024-09-04 Commissioning Plan	92% IN PROGRESS
<input type="checkbox"/>	▶	BLOCK-R84	2024-09-05 Commissioning Plan	100% DONE
<input type="checkbox"/>	▶	BLOCK-R85	2024-09-09 Commissioning Plan	80% IN PROGRESS
<input type="checkbox"/>	▶	BLOCK-R86	2024-09-10 Commissioning Plan	66% IN PROGRESS
<input type="checkbox"/>	▶	BLOCK-R87	2024-09-11 Commissioning Plan	100% DONE
<input type="checkbox"/>	▶	BLOCK-R88	2024-09-12 Commissioning Plan	100% DONE
<input type="checkbox"/>	▶	BLOCK-R94	2024-09-13 Commissioning Plan	100% DONE
<input type="checkbox"/>	▶	BLOCK-R89	2024-09-16 Commissioning Plan	100% DONE
<input type="checkbox"/>	▶	BLOCK-R90	2024-09-17 Commissioning Plan	100% DONE
<input type="checkbox"/>	▶	BLOCK-R91	2024-09-23 Commissioning Plan	83% DONE



Block - Observing Blocks and Programs / Test Cycles / 2025-05-12 Commissioning Plan (BLOCK-R254)

2025-05-12 Commissioning Plan

Details Test cases (39) Traceability History

Add test cases Delete Assign: Environment Testers Release version Iteration Search... Filters

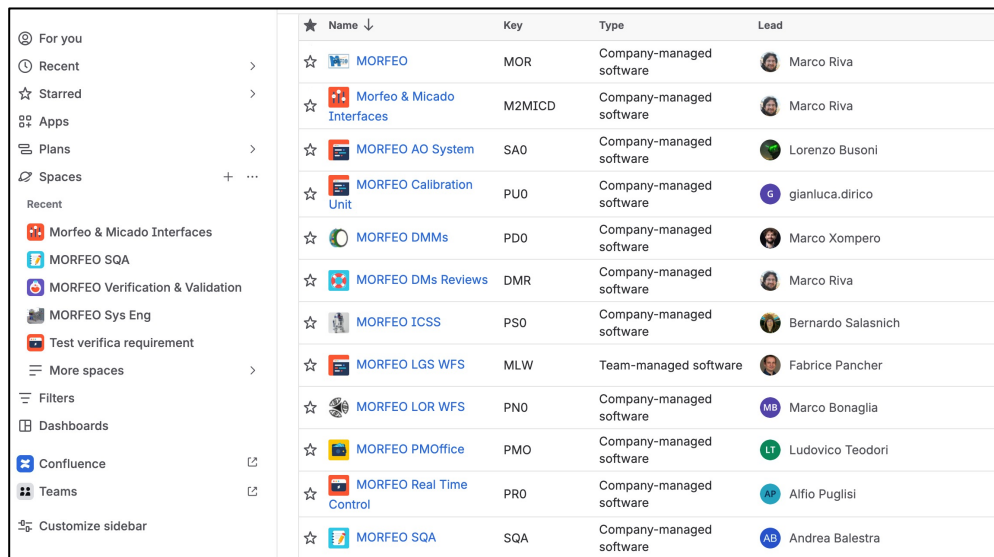
Total estimated time 32h

P	Key	V	Name	Status	Labels	Assigned To	Environment
<input type="checkbox"/>	▶	BLOCK-T381	1.0 WET-010 Reference Wavefront Generation	READY	AOS aos-commissioning	Unassigned	6. Night
<input type="checkbox"/>	▶	BLOCK-T492	1.0 Full Array Mode closed-loop	DRAFT		Guillem Megias	6. Night
<input type="checkbox"/>	▶	BLOCK-T380	1.0 ASCT-004 Sensitivity M2 Hexapod	READY	aos-commissioning	Brian Stalder	6. Night
<input type="checkbox"/>	▶	BLOCK-T395	1.0 LUT-005 Camera Rotator Look-Up Table	READY		Guillem Megias	6. Night
<input type="checkbox"/>	▶	BLOCK-T425	1.0 LSSTCam Off-field stray light within a filter	APPROVED	LSSTCam stray_light nighttime	Gabriele Rodeghiero	6. Night
<input type="checkbox"/>	▶	BLOCK-T196	2.0 End of night mount and dome closing procedure	READY		David Sanmartin	7. End Night
<input type="checkbox"/>	▶	BLOCK-T242	1.0 Shutdown after Dome Closure - HVAC systems (automatically on if not, turn them ...	READY		Brian Stalder	7. End Night
<input type="checkbox"/>	▶	BLOCK-T382	1.0 LSSTCam Super bias, 30s delay	READY	LSSTCam prodCalib	Sean Patrick MacB	8. Closed Dome
<input type="checkbox"/>	▶	BLOCK-T484	1.0 LSSTCam Super Dark, 30s	READY	LSSTCamera LSSTCam prodCalib	Sean Patrick MacB	8. Closed Dome
<input type="checkbox"/>	▶	BLOCK-T485	1.0 LSSTCam Super Dark, 38s	READY	LSSTCamera LSSTCam prodCalib	Sean Patrick MacB	8. Closed Dome
<input type="checkbox"/>	▶	BLOCK-T401	1.0 LUT-001 Hexapod Look-Up Table w/ LaserTracker	READY	AOS aos-commissioning	Guillem Megias	8. Closed Dome
<input type="checkbox"/>	▶	BLOCK-T436	1.0 Camera Rotator LUT with Laser Tracker	READY		Guillem Megias	8. Closed Dome
<input type="checkbox"/>	▶	BLOCK-T494	1.0 Characterize M1M3 Thermal System Mixing Valve	DRAFT	lsstcam	Elena Urbach	8. Closed Dome

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.

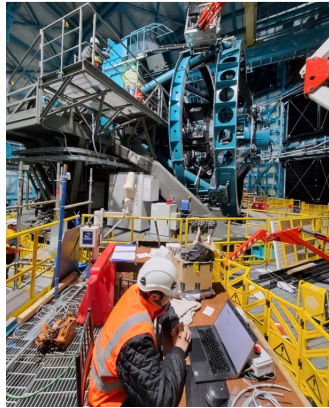
Test case/ requirement	Requirement formulation	MORFEO testing in BIH	MORFEO testing in IAA
MAO-SF0-1.2.3.12: Unvignetted FOV (Secondary port)	the PFRO shall be designed to deliver an unvignetted field of view of at least 2.5 arcmin diameter at the secondary port.	YES First test execution & verification	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



Name ↓	Key	Type	Lead
MORFEO	MOR	Company-managed software	Marco Riva
Morfeo & Micado Interfaces	M2MICD	Company-managed software	Marco Riva
MORFEO AO System	SA0	Company-managed software	Lorenzo Busoni
MORFEO Calibration Unit	PU0	Company-managed software	gianluca.dirico
MORFEO DMMs	PDO	Company-managed software	Marco Xompero
MORFEO DMs Reviews	DMR	Company-managed software	Marco Riva
MORFEO ICSS	PS0	Company-managed software	Bernardo Salasnich
MORFEO LGS WFS	MLW	Team-managed software	Fabrice Pancher
MORFEO LOR WFS	PN0	Company-managed software	Marco Bonaglia
MORFEO PMOffice	PMO	Company-managed software	Ludovico Teodori
MORFEO Real Time Control	PRO	Company-managed software	Alfio Puglisi
MORFEO SQA	SQA	Company-managed software	Andrea Balestra

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



