

Opportunities for UK involvement in Rubin commissioning

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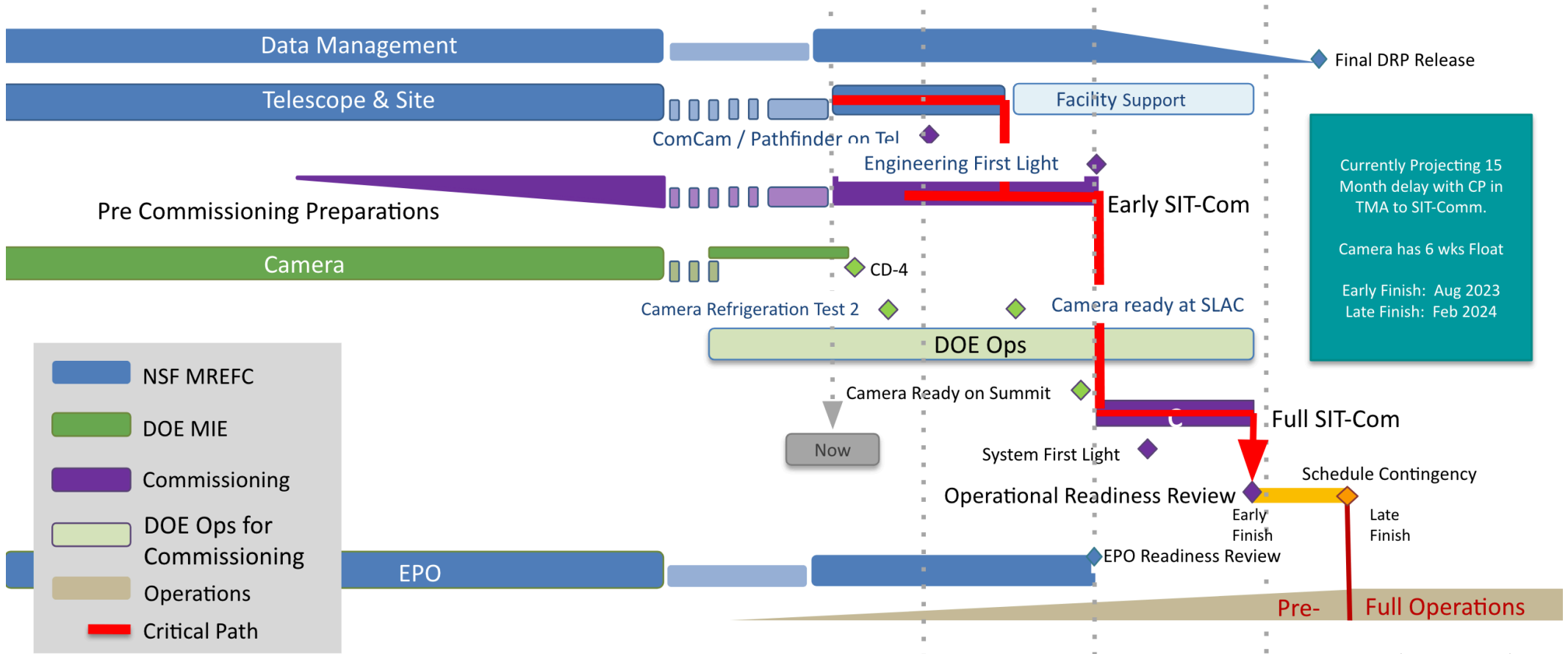
LSST Strong Lensing Science Collaboration Co-chair

Astrophysics and Space Research, University of Birmingham

Update on Rubin's timeline: April 2021

From: <https://www.lsst.org/sites/default/files/img/Project%20Schedule.png>

CY2017				CY2018				CY2019				CY2020				CY2021				CY2022				CY2023				CY2024							
Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
FY2017				FY2018				FY2019				FY2020				FY2021				FY2022				FY2023				FY2024							
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4



09 April 2021 – COVID Re-Plan

Update on Rubin's timeline: May 2021

From: Chuck Claver's presentation to Science Collaboration Chairs, May 26, 2021, https://drive.google.com/file/d/1_9yHgpGLJ6rbmo3y1zE15hsjXTrNAhiD/view

- Telescope mount assembly (**TMA**) is the critical path:
 - assembly happening now; verification Q4 CY2021
 - main risk: pandemic restrictions on personnel on summit this Chilean winter (now)
- Commissioning Camera (**ComCam**):
 - integration tests already underway at the summit (without TMA)
 - aim for ComCam on TMA Q4 CY2021
- **Mirrors**: aim for M1+M2+M3 all on TMA September 2022
- **Engineering first light**: aim for November 2022
- **Active Optics** calibration and verification: aim for Q4 CY2022
- **LSSTCam**: arrives in Chile June 2022, integration starts January 2023
- **Operations Readiness Review**: Q3 CY2023
- **Survey operations begin**: October 2023 (early) — February 2024 (late)

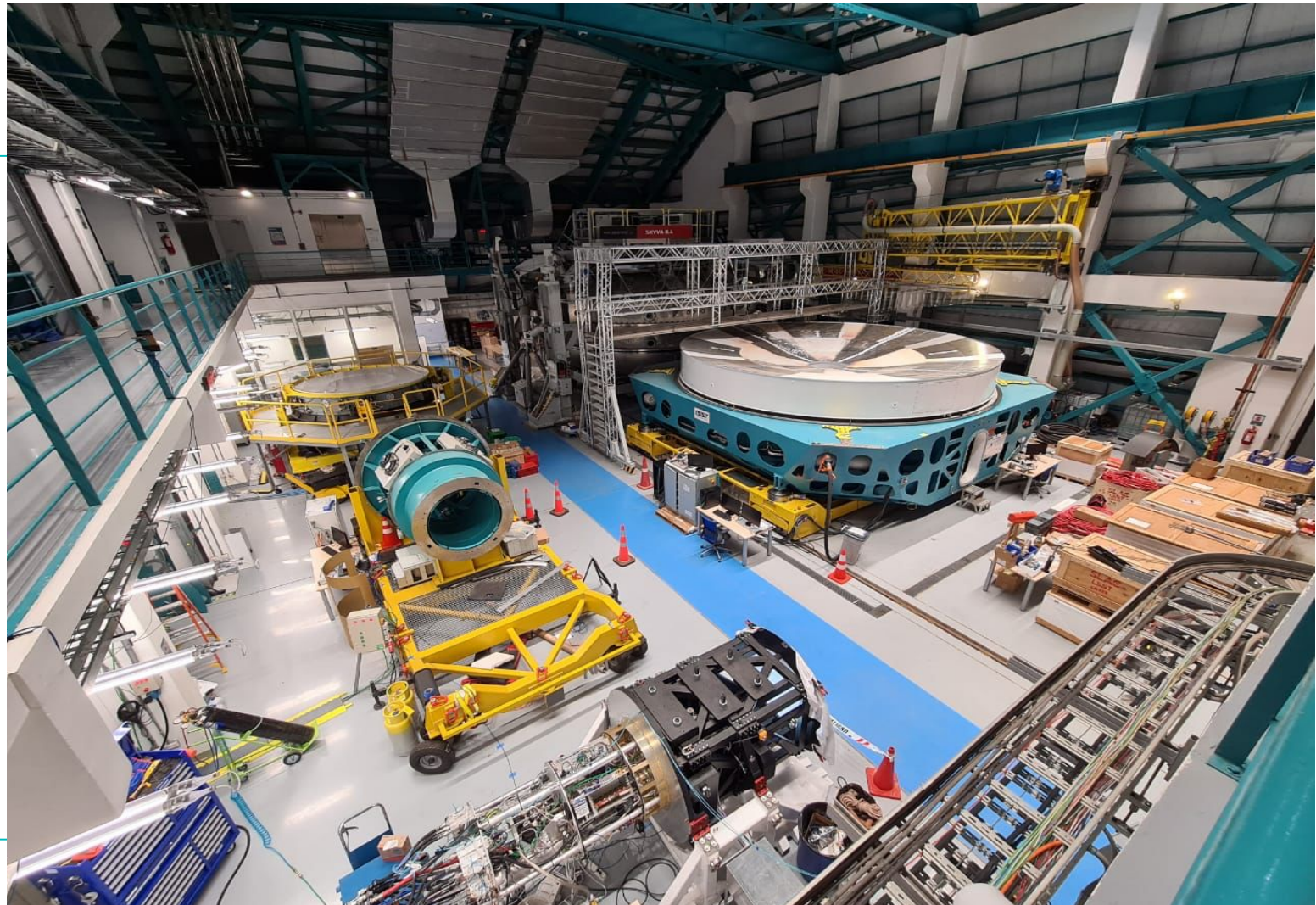
Inside the summit facility

From: Chuck Claver's presentation to Science Collaboration Chairs, May 26, 2021, https://drive.google.com/file/d/1_9yHgpGLJ6rbmo3y1zE15hsjXTrNAhiD/view



Systems at Level-3 in the Summit Facility (clockwise from the bottom):

- ComCam+ PathFinder
- Camera Cart w/Integrating assembly
- M2 Cell w/surrogate mirror
- Coating plant & washing station
- M1M3 cell w/surrogate mirror
- M1M3 thermal systems (boxes)



Vera C. Rubin Observatory

On-sky commissioning observations and data releases

Three phases of on-sky commissioning observations:

1. System integration and testing with ComCam: Q4 CY 2022
 2. System integration and testing with LSSTCam: 2023
 3. Two science verification surveys in 2023
 - Prompt Products (PP)
 - Data Release Products (DRP)
- Science Collaboration “Commissioning Notes” on recommended fields:
 - <https://arxiv.org/abs/2010.15318>
 - <https://drive.google.com/drive/folders/0B37pDCQCjt3nfmZrcmpsQUE0ajFaUUVnU1g0THU1RS1NRTIjWmZCMmx0SUNIQkVWWWIGalk?resourcekey=0-FJw2mlpUEnYTFdjQb5cLoQ>

On-sky commissioning observations and data releases

From: Chuck Claver's presentation to Science Collaboration Chairs, May 26, 2021, https://drive.google.com/file/d/1_9yHgpGLJ6rbmo3y1zE15hsjXTrNAhiD/view



Looking longer term: Commissioning Data

Rubin Data Releases	Sep 2021	Jun 2022	Mar 2023	Dec 2023	Dec 2024	Sep 2025
	DP0.1	DP0.2	DP1	DP2	DR1	DR2
Data Product	DC2 Simulated Sky Survey	Reprocessed DC2 Survey	ComCam On-Sky Data	LSSTCam On-Sky Data	LSST Early Science Data	LSST Year 1 Data
DRP Processed Visit Images and Visit Catalogs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DRP Coadded Images	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DRP Object and ForcedSource Catalogs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DRP Difference Images and DIASources	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DRP DIAObject Catalogs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PP Processed Visit Images	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PP Difference Images	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PP Catalogs (DIASources, DIAObjects, DIAForcedSources)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PP Alerts (Canned)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PP Alerts (Live, Brokered)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
PP SSP Catalogs	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DRP SSP Catalogs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Credit: Phil Marshall

Opportunity for UK involvement

- A UK team will formally join Rubin's System Integration Test and Commissioning (SITCOM) team in early 2022
- High priority request from SITCOM: UK expertise from VISTA commissioning
- Next step is to select the UK team:
 - Call for proposals opens today and closes September 15, 2021
 - <https://lsst-uk.atlassian.net/wiki/spaces/HOME/pages/2632810497/UK+contributions+to+Rubin+commissioning+call+for+proposals>
 - Three staff years of funding is available; up to 50% ear-marked for VISTA expertise
 - Most team members are likely to be unfunded, contributing fractions of FTE/person
- Full access to all on-sky commissioning data and Rubin software pipelines
- No science publications before commissioning data are released
- UK team will operate under direction of SITCOM, and coordinated by GPS

Example value-added contributions to commissioning 1/2

- Scientific validation studies that advance operational readiness, for example:
 - validation of template generation and difference imaging
 - object detection, deblending and interaction with background modelling, including crowded fields, and LSB emission
 - stray and scattered light mitigation and modelling
 - others that are timely and relevant to operational readiness
- Testing and optimising Rubin Science Pipelines that are being developed collaboratively with the Rubin Data Management team
- Technical and scientific analyses of on-sky commissioning data to inform fine tuning of the the initial LSST observing strategy
- Develop image and catalog visualisation tools to assist in commissioning, and potential implementation in Science Platform

Example value-added contributions to commissioning 2/2

- Absolute photometric calibration, including using external data and observations
- Contributions to integrating, testing, integrating Rubin's calibration systems including Auxiliary Telescope
- Anomaly analysis of the engineering facility database, e.g. using machine learning to detect anomalies and correlate with data
- Evaluate and optimise operational configurations of the observatory in different conditions
- Contributions to daytime and nighttime summit operations
- Developing user-oriented documentation and tutorials covering science pipelines, data access services, & operational procedures
- Characterise system performance at margins of operational parameter space, e.g. seeing, sky brightness, humidity, ...

Summary of expressions of interest from 2020 (from in-kind proposal) 1/2

- Active optics:
 - Will Sutherland (VISTA Project Scientist 2000-2009) and Gavin Dalton tested and debugged the active optics subsystems during VISTA commissioning.
 - Early career colleagues are also keen to contribute on-summit, including both instrumentation postdocs with experience of commissioning instruments on wide-field and/or large telescopes, and students who have relevant experience from wide field surveys including the Dark Energy Survey (DES).
- Data analysis:
 - Eleven different UK groups (mostly embedded in LSST Science Collaborations) have technical expertise required to analyse commissioning data and correlate with telemetry and other observing parameters, including off-axis angle.
 - For example, analysis of commissioning observations of strongly lensed quasars would test Rubin's active optics performance, and has strong synergy with the UK's VISTA-based expertise discussed above.

Summary of expressions of interest from 2020 (from in-kind proposal) 2/2

- Visual inspection:
 - Colleagues at the University of Sussex have expertise in visual inspection of commissioning data from the DES “eyeball squad”.
 - Colleagues at the Open University have complementary expertise in crowd sourcing visual inspection using the Zooniverse platform.
- Operational rehearsals:
 - Cambridge Astronomical Survey Unit have expertise in designing and supporting “Operational Rehearsals” for the commissioning of wide-field survey instruments, including design of data quality checks.
 - We envisage this being relevant to planning, testing and rehearsing Rubin’s nightly workflow in the latter stages of commissioning.

UK timeline

<ul style="list-style-type: none">• September 15, 2021 at 5pm UT	<ul style="list-style-type: none">• Deadline for proposal submission
<ul style="list-style-type: none">• Late September and October 2021	<ul style="list-style-type: none">• LSST:UK review of proposals and preparation of full UK proposal
<ul style="list-style-type: none">• End of October 2021	<ul style="list-style-type: none">• Transmission of full UK proposal to SITCOM leadership
<ul style="list-style-type: none">• November and early December 2021	<ul style="list-style-type: none">• Joint review of UK proposal by SITCOM and LSST:UK leadership
<ul style="list-style-type: none">• End of 2021	<ul style="list-style-type: none">• LSST:UK and SITCOM agree UK members of SITCOM team
<ul style="list-style-type: none">• Early 2022	<ul style="list-style-type: none">• LSST:UK team members join SITCOM and begin training
<ul style="list-style-type: none">• Late 2023 / early 2024	<ul style="list-style-type: none">• Commissioning ends and survey operations begin

Closing thoughts and reminders

- Call for proposals opens today and closes September 15, 2021
- <https://lsst-uk.atlassian.net/wiki/spaces/HOME/pages/2632810497/UK+contributions+to+Rubin+commissioning+call+for+proposals>
- Call for proposals is open to everyone in the UK
- UK colleagues only eligible to join SITCOM via this UK-specific process (i.e. not via the parallel US/Chile Announcement of Opportunity)
- Collaboration between UK groups and coordination with Science Collaboration colleagues is strongly encouraged
- Proposals must be aligned with supporting smooth transition to operations, not just helping you to do your science
- SITCOM membership comes with important rights and responsibilities
- Most UK team members unlikely to be funded (except for travel)