



Rubin Operations Status

S3ACC 2023
Miami

Bob Blum



U.S. DEPARTMENT OF
ENERGY

Highlights

- Project Status and Progress
- Schedule and plans update
- DP0 continues well. Planning increment as DP0.3 for summer. Solar system catalog.
- In-Kind Program
- Rubin-Euclid
- Satellites
- Rubin Observatory Sustainability
- Education and Public Outreach

We took formal control of the TMA in March '23.

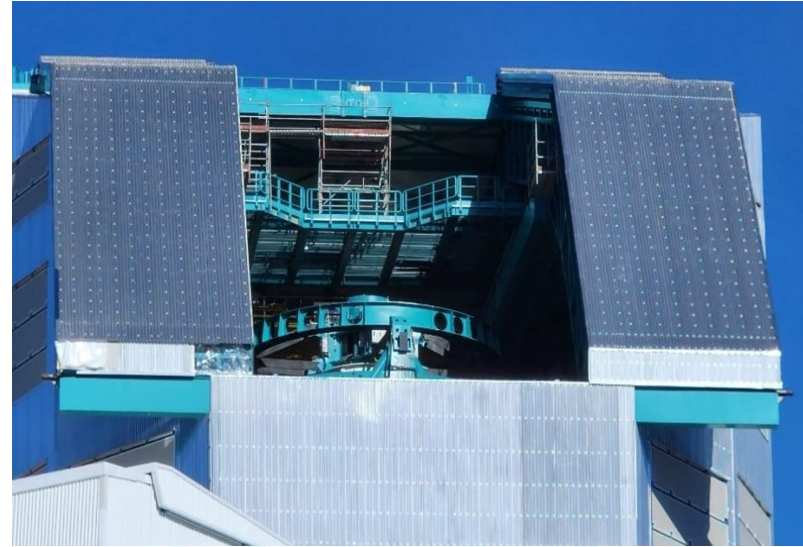
The Dome is making good progress too, **but the work will continue until next year.**

The LSST camera is cold and in the last round of testing at SLAC. **Planning shipment to Chile in October '23.**

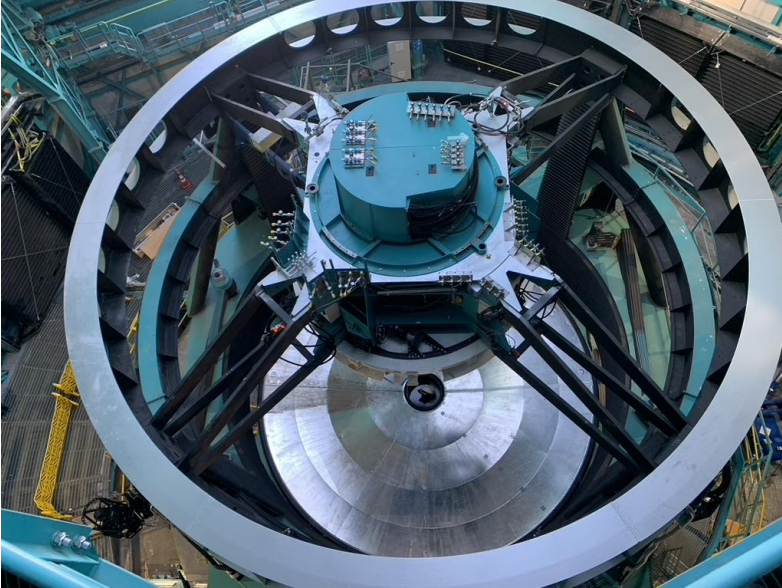
Data Management team is effectively already in commissioning phase (and some operations).

The Integration team is keeping track of schedule updates to **optimize both the use of space and resources.**

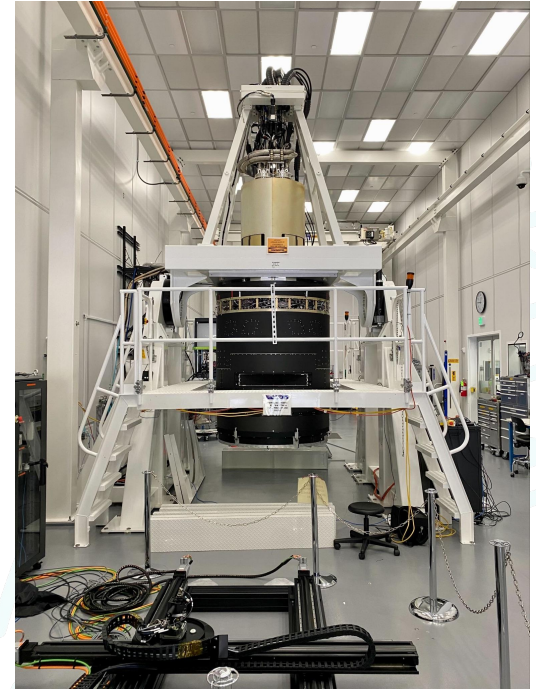
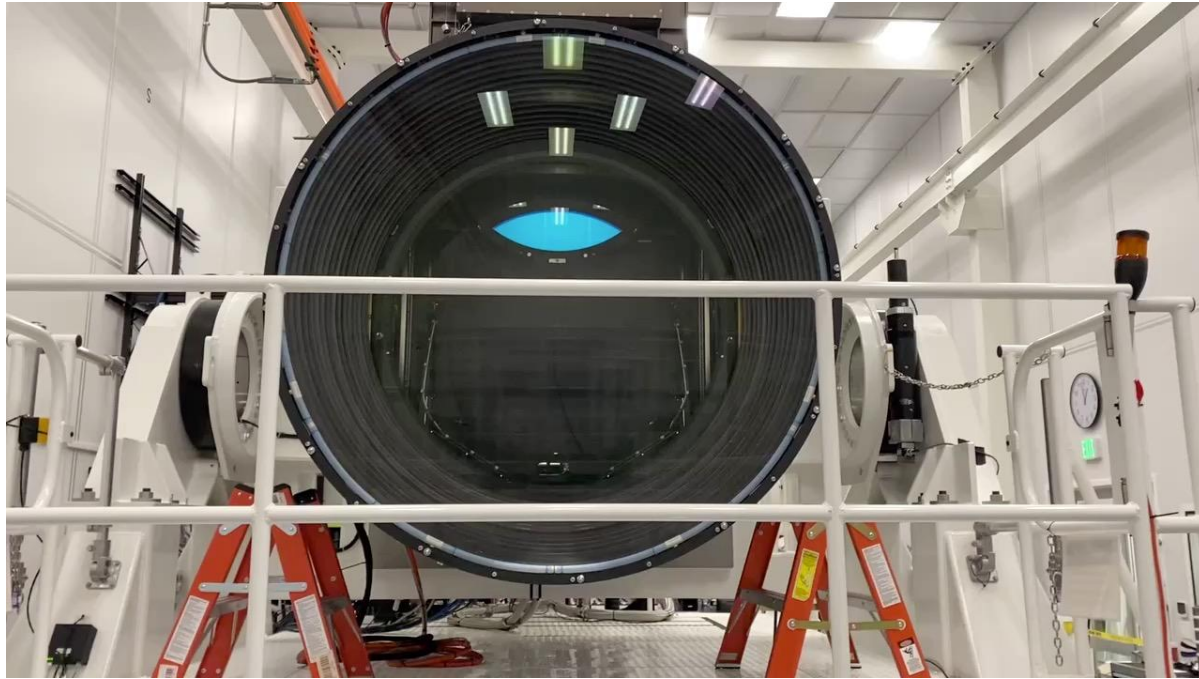
Similarly, the commissioning team is working on refining the observatory validation plan, with a focus on **efficiency on and off sky.**



Current Configuration: “a functioning telescope”

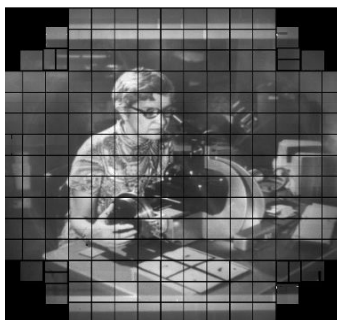
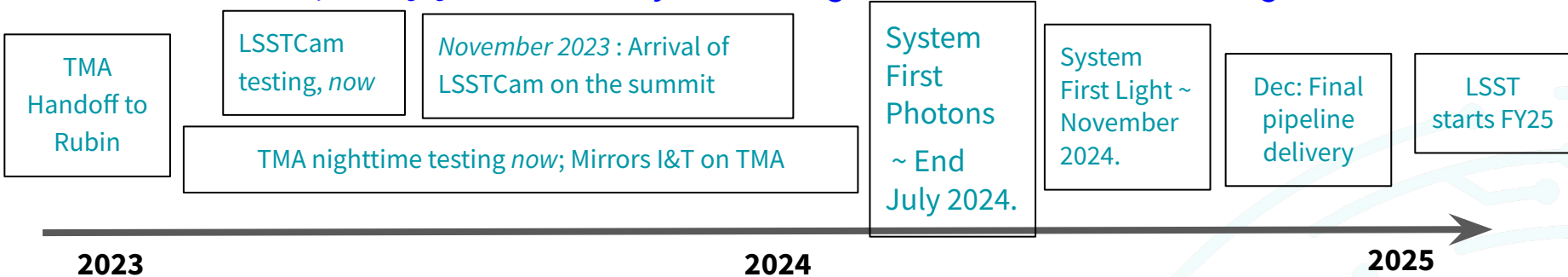


Camera undergoing final testing



Rubin Timeline (<https://dmtn-232.lsst.io/>)

2023, a key year for full system integration and commissioning!



The COSMOS field seen by Hyper Suprime-Cam, courtesy of the HSC Collaboration, R. Lupton, and N. Lust.

Project Schedule Update

- New forecast finish. As of July this year, March, 2025. Planning for ~5 months contingency on project. [Expect Operations phase begins in “mid 2025.”](#)
- Start of Full/Survey Operations planning date: June 01, 2025 (not the start of LSST!)

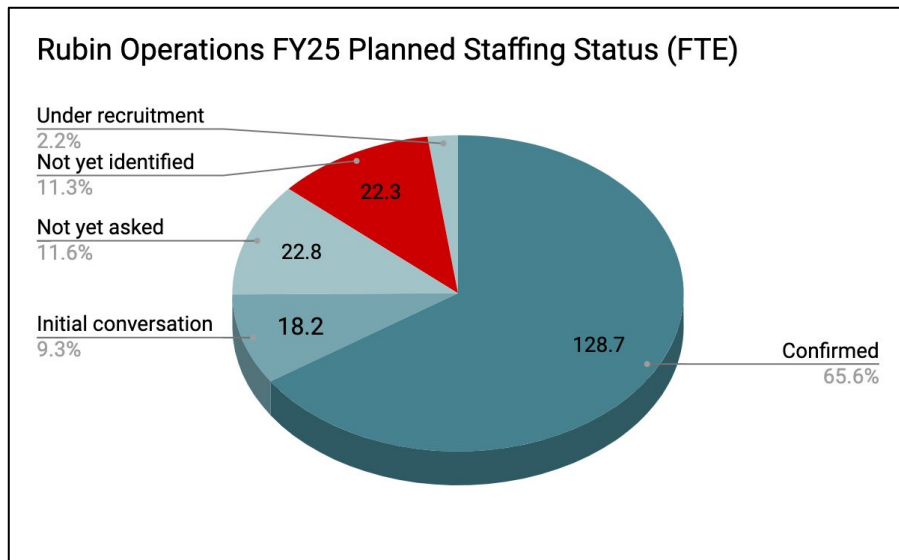
Rubin Operations Survey and Data Release Timeline

Nominal LSST Survey Start Date: June 2025

Event	Date	Milestone Date		FY22	2022	FY23	2023	FY24	2024	FY25	2025	FY26	2026	FY27	2027	FY28	2028
DP0.1	DC2 Simulated Sky Survey	June 2021	2021-06-30														
DP0.2	Reprocessed DC2 Survey	June 2022	2022-06-30														
DP0.3	Solar System PPDB Simulation	Jun 2023 - Sep 2023	2023-07-31														
FL	System First Light	Oct 2024 - Feb 2025	2024-12-23														
DP1	First Light LSSTCam Data	Dec 2024 - Apr 2025	2025-02-22														
OPS	Start of Operations	Feb 2025 - Jul 2025	2025-06-01														
SVY	Start of Survey	Feb 2025 - Sep 2025	2025-06-27														
DP2	LSSTCam Science Validation Data	Aug 2025 - Mar 2026	2025-11-26														
DR1	LSST First 6 Months Data	Feb 2026 - Nov 2026	2026-06-27														
DR2	LSST Year 1 Data	Feb 2027 - Nov 2027	2027-06-27														
DR3	LSST Year 2 Data	Feb 2028 - Sep 2028	2028-06-27														

Staffing plan

- Staffing is a key readiness element (including from LSST: UK for the UK Data Facility)
- We are making progress on filling roles with new hires and new recruits from NOIRLab/SLAC:



Status March, 2023



Survey Cadence Optimization

- Phase 2 recommendation (V3 of baseline; [see ls.st/pstn-055](https://ls.st/pstn-055)), released in December 2022.
- Optimization to continue throughout pre-Operations and LSST period
- There are 9 remaining important aspects of the cadence to resolve. SCOC is working on this now.

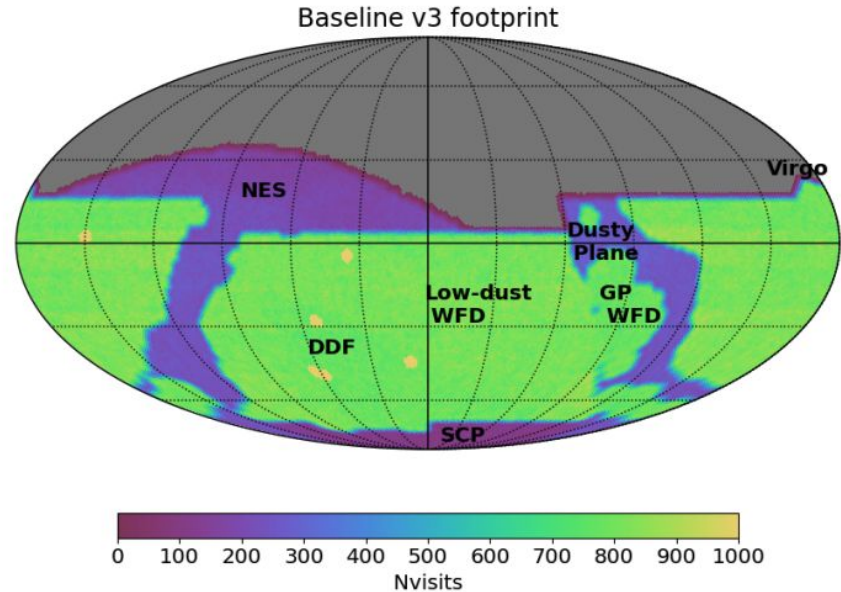


Figure 11: Number of visits per pointing in all filters for baseline_v3. The color bar saturates at 1000. The Virgo cluster is visible on the right of the map, in the Northern hemisphere.

Remaining 9 items for SCOC

See ls.st/pstn-055

SWAPPING FILTERS (u, z, y vs u, z; also visit pairs)

ROLLING CADENCE (uniformity concerns)

GALACTIC PLANE FOOTPRINT AND FILTER BALANCE (extent and filter balance)

REBALANCE EXPOSURE TIME (save time in some filters)

DDF CADENCE (“optimize” intranight cadence)

ToO workshop (community input/workshop)

EARLY SCIENCE (year one program, template generation)

EUCLID COORDINATION (coordination in EDFs)

1x30 vs 2x15 EXPOSURES (need on-sky data)

Data preview 0

- Continue to support DP0.2 with up to **900** delegates on Google Cloud deployment of the Rubin Science Platform.
- To join DP0, visit dp0-2.lsst.io and follow the getting started checklist
- Rubin DP0 Summer School based on DP0.2, June 12 - 16
- Expanding DP0 to include Solar System simulated object catalog, **DP0.3** (new data product, not addition to DP0.2)



LSST Vera C. Rubin Observatory Documentation for Data Preview 0.2

Vera C. Rubin Observatory Documentation for Data Preview 0.2 » [DP0 Delegate Homepage](#) » [DP0 Virtual Summer School 2023](#)

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DP0 Virtual Summer School 2023

Dates: June 12-16, 2023

Times (delegates may attend either session):

Session A: 8:00-11:00 PDT (15:00-18:00 UTC)

Session B: 19:00-21:00 PDT (02:00-04:00 UTC; +1 day)

Location: virtual (Zoom)

Eligibility: All DP0 delegates are eligible to register for the DP0 Virtual Summer School. There is currently space available for new DP0 delegates; for more information about how to become a delegate, see the [Getting started with DP0 checklist](#).

Expect DP0.3 focused delegate assembly August 18

Rubin Euclid Collaboration (good satellite problem)

- Extensive Community based, Science Based program to define derived data products from Rubin+Euclid
- Independently, Rubin agreed to observe in the Euclid Deep Field South. Euclid and Rubin agreed (MOU) to sharing data from both surveys with both communities.
- Now working on implementation phase of larger DDP program (letter of intent). Requires additional resources beyond either projects currently funded plans.

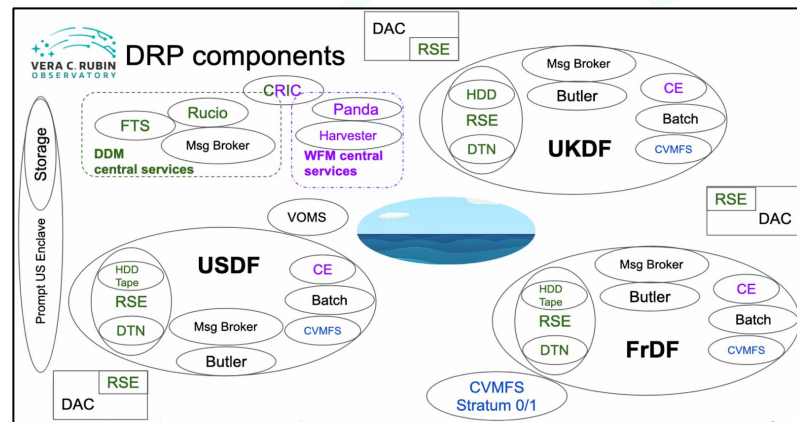


In-Kind Program

- Data Rights Agreements (DRA) now in final development. With lawyers (ack!) at AURA and SLAC.
- Each Program subject to DRA with either SLAC or AURA. Several have contributions that require both flavors. Both have ~same terms and conditions.
- Major data processing contributions from UK:LSST and France (IN2P3) are subject to DOE level agreements (annex to existing international agreements).
- Developing plans for further In-Kind Program Contributions. **Fundamentally based on: 1) current program active, manageable, delivering value; 2) what are we missing that the community wants?**
- **New contributions will be limited, competitive, and open to US and internationals**

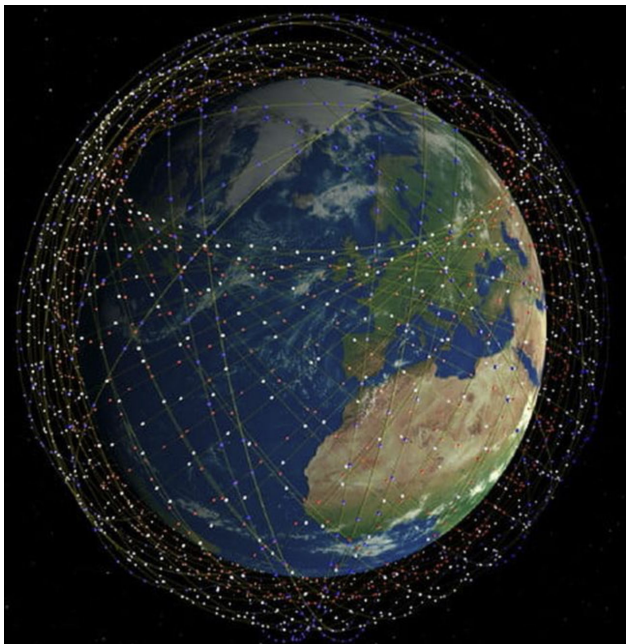
Preparing for DRP: SLAC, France, UK

- Data routinely flowing from summit to SLAC via LHN and ESNet (See talk by C. Silva, Wednesday)
- Multi-site testing/scaling work is underway, via increasingly complex stages
 - Start with job submission to central PanDA server from each site, to be executed at those sites (done)
 - Expand to central submission (done - no issues running 3k cores per site)
 - Use Rucio/FTS to move input/output files among sites
 - Rucio-butler integration about to be tested
 - Test scaling up numbers of simultaneous processes and volume of data
- Routine HSC reprocessing in progress at the USDF for months now
 - Engagement of Campaign Mgmt, Pipelines and Infrastructure groups
 - Pipelines group started a **full HSC PDR2 multi-site reprocessing**
 - Single epoch processing at the USDF
 - Coadds to be done multisite
- Rucio and PanDA servers installed at SLAC; in final testing
 - FTS3 server at SLAC being installed; using a server in the UK in the meantime



Impact of LEO Satellite Constellations on Rubin Observatory and LSST science

Željko Ivezić, with Tony Tyson, Meredith Rawls,
Peter Yoachim and the Rubin team



<https://www.universetoday.com/156383/starlink-satellites-are-still-bright/>



Impact of LEO Satellite Constellations on Rubin Observatory and LSST science

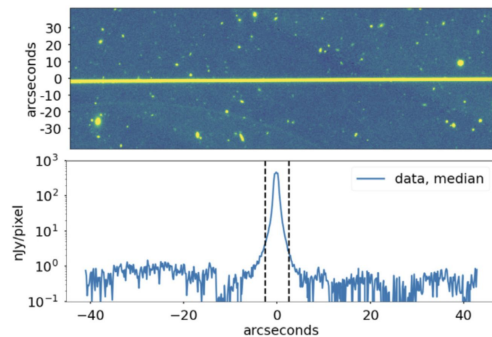
Quantitative assessment depends on several imperfectly known quantities:

1) The number of satellites and their orbital distribution

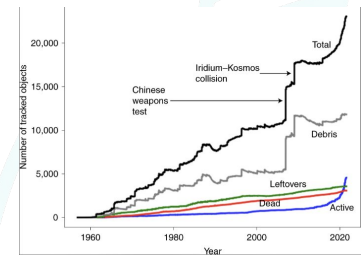
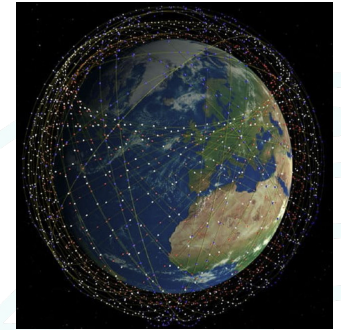
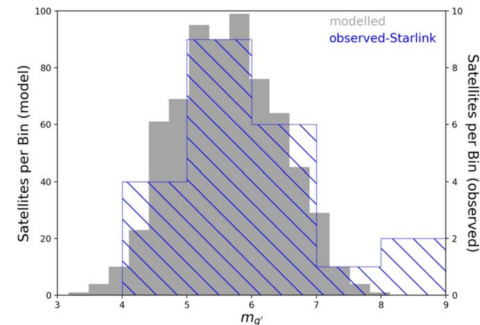
2) The satellite brightness distribution

3) Impact on LSST images and mitigation

I. Hasan, J.A. Tyson, C. Saunders et al.



Lawler, Boley, & Rein



Summary (from Rubin/LSST point of view)

With tens of thousands of LEOsats, generally ***no combination of mitigations can completely avoid the impacts of the satellite trails*** on LSST science programs.

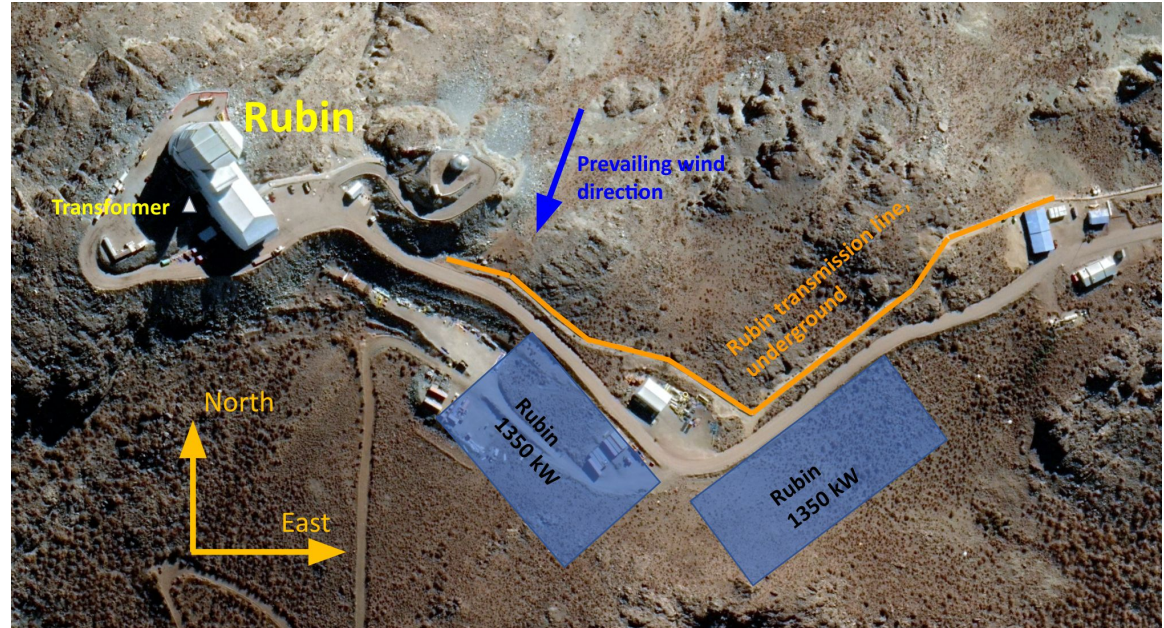
However, current predictions of the impact correspond to a **“nuisance”** that we have to plan for (~1% of pixels lost), rather than a “catastrophic” impact (>10% of pixels lost).

We need to continue to **constructively** communicate with satellite providers.

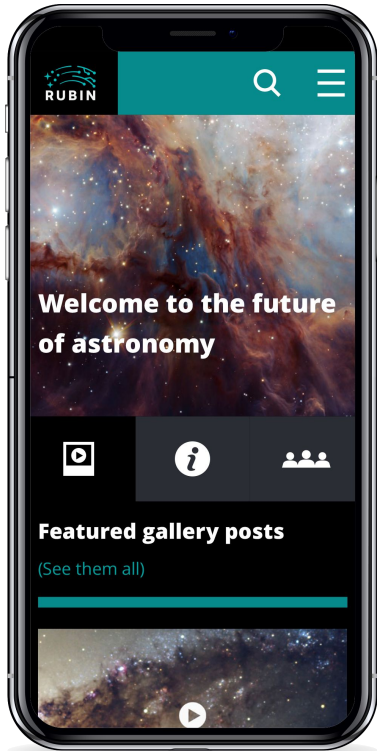
Not time to panic.



- New supplemental proposal to NSF submitted; led by NOIRLab (builds on current large investment)
- Goal: Pachón Carbon Neutral
- Supplement Covers 40% of Rubin use, one half of ultimate 2x1350 kW system proposed
- Accounts for 1400 tons CO₂
- Engineering, site, PM, hardware \$4.2M
- Engage local university engineering students



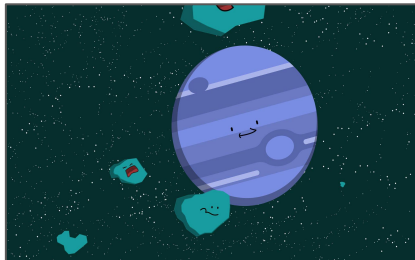
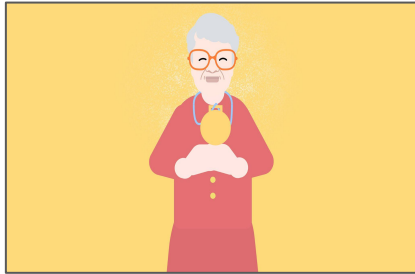
EPO Program is active in Operations!



Website live:
rubinobservatory.org

**Initial Public launch on social media in
Jan/Feb 2023, continuing to build engagement.**

Animated videos on YouTube, available in [English](#) and [Spanish](#)



Try for a high score at spacesurveyors.app

- New content regularly posted to [News](#), [Events](#), [Rubin Voices](#), and [Education](#) sections
- Final versions of the [Surveying the Solar System](#) and [Expanding Universe](#) formal education investigations released
- Internal testing of Citizen Science Principal Investigator workflows and notebooks ([LSST: UK connection](#))
- So far in FY23, social media accounts published 467 posts, reaching 255,540 users and growing



Press Release

Bringing the Universe to You - Rubin Observatory Premieres its Education and Public Outreach Program

June 1, 2023

Teachers, students, and the general public can now explore a suite of online, interactive experiences that highlight Rubin Observatory and its science

[Read more](#)



Summary

- Planning survey start in mid 2025
- Data Preview 0 continues successful development of Ops team and community. Adding Solar System catalog as DP0.3
- Satellites impact is frustratingly hard to pin down. Direct impact seems manageable, but systematics not understood.
- In-kind program is active and growing. Progress in DRAs is slow but progressing
- Continuing to further develop Sustainability program for Rubin Observatory and NOIRLab
- EPO active in Operations

End of Presentation

