



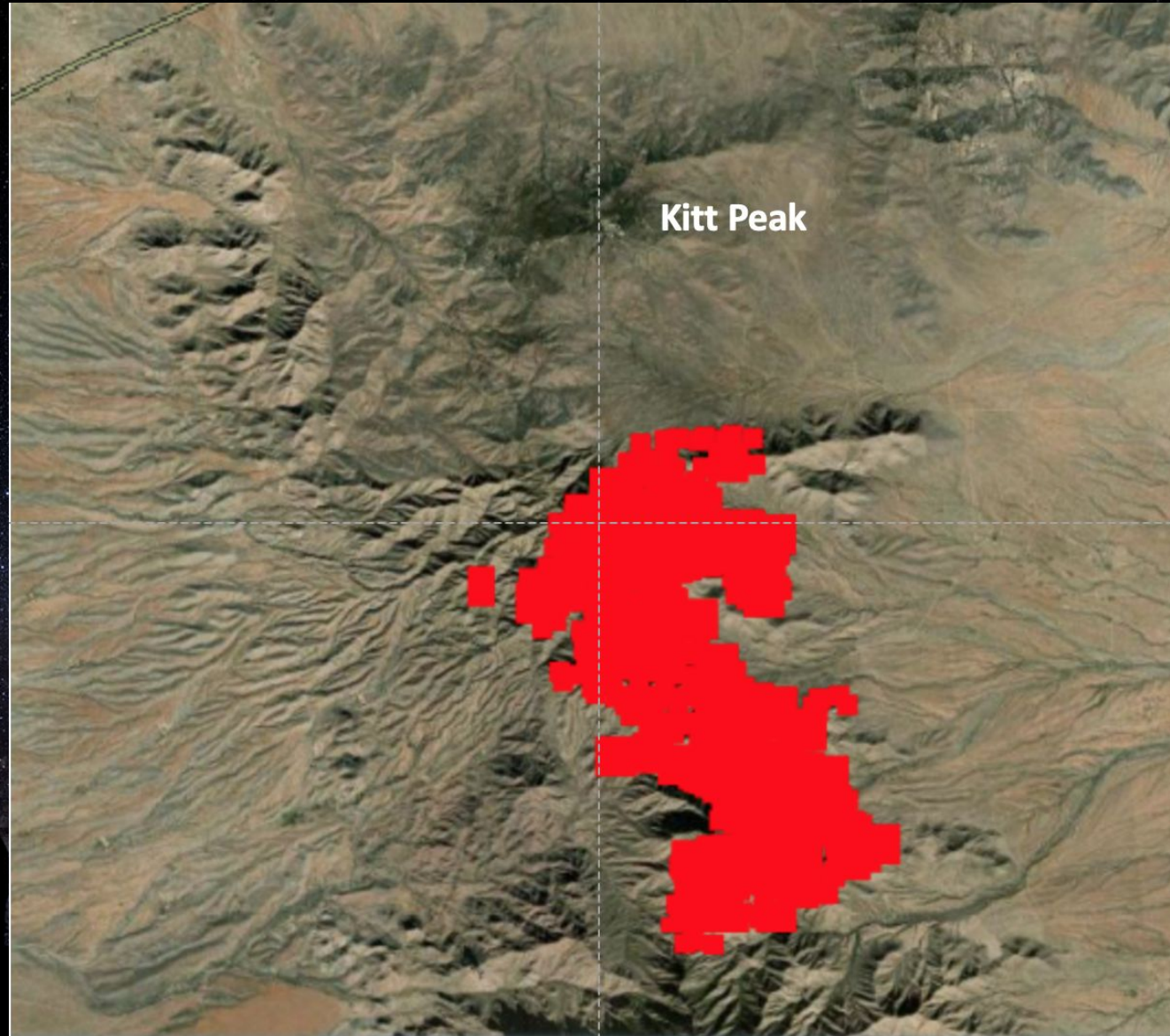
NSF's NOIRLab Open House

AAS 240 – Sheraton Piazza

15 June 2022

*Discovering Our Universe
Together*

Kitt Peak Fire





Kitt Peak Fire



View looking North from the 2.1-meter telescope catwalk

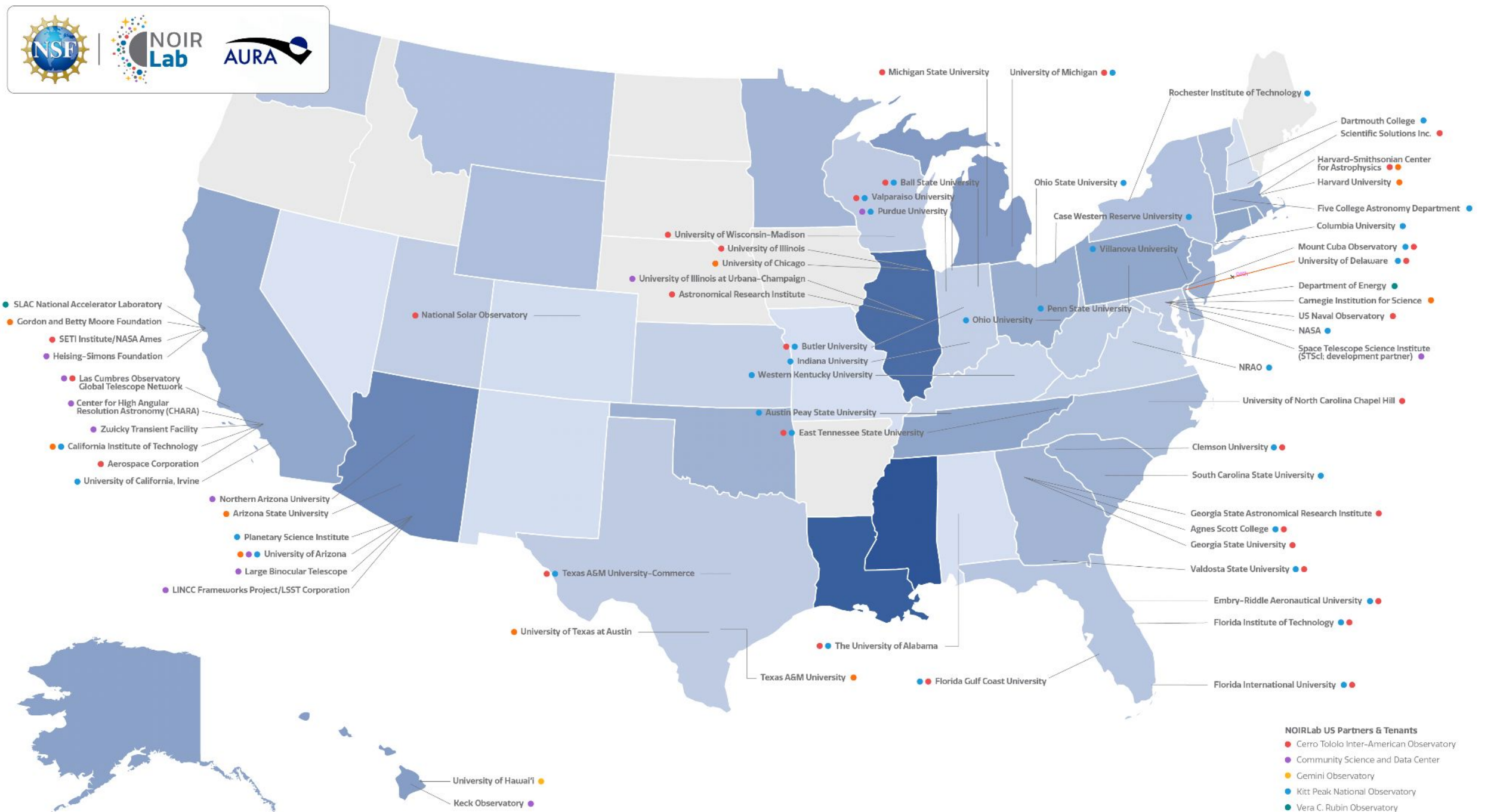
KPNO North View Wed Jun 15 2022 16:31:58



View looking South from the 4-meter telescope catwalk

KPNO South View Wed Jun 15 2022 16:31:10



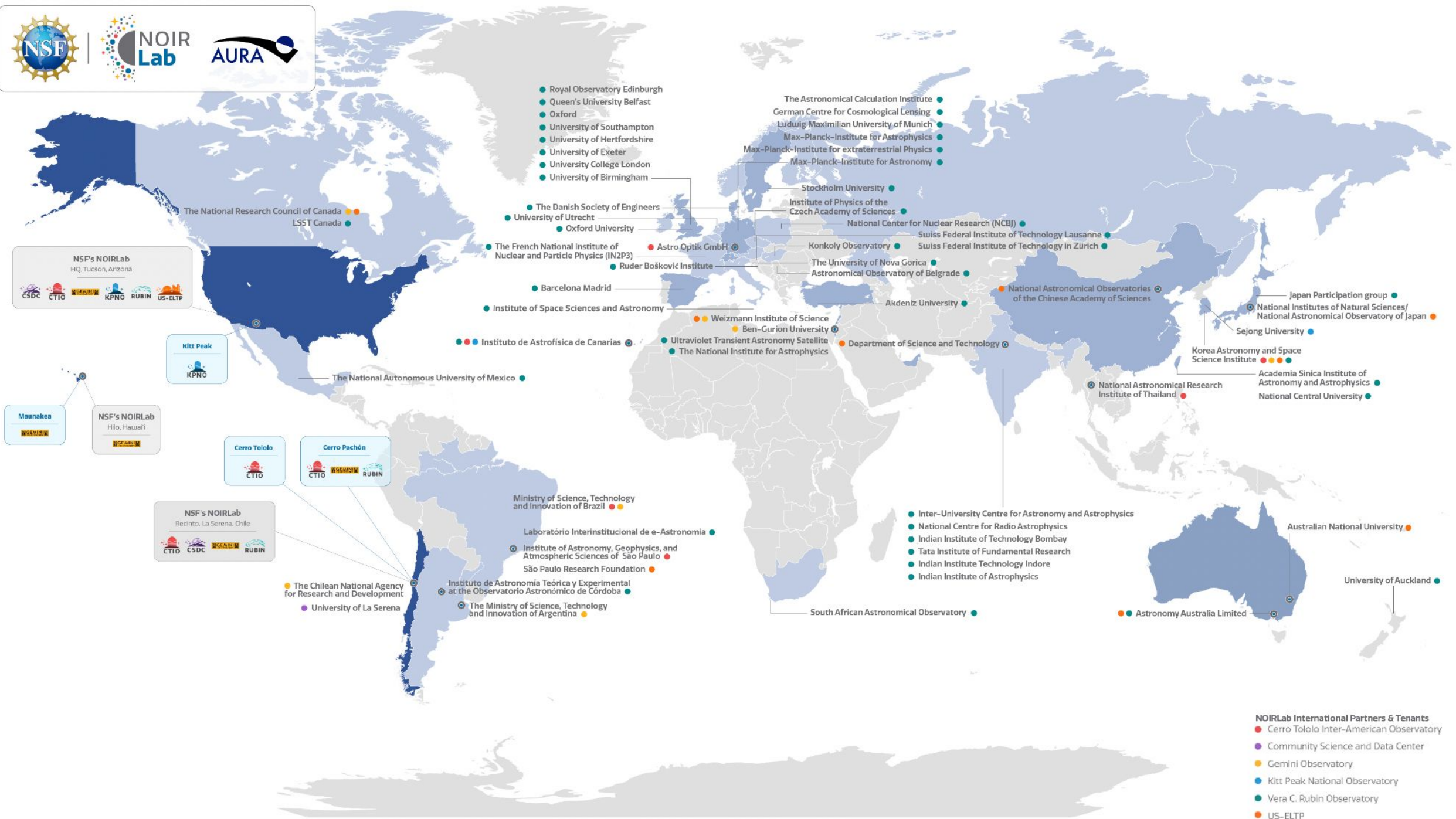


- NOIRLab US Partners & Tenants**
- Cerro Tololo Inter-American Observatory
 - Community Science and Data Center
 - Gemini Observatory
 - Kitt Peak National Observatory
 - Vera C. Rubin Observatory
 - US-ELTP

- SLAC National Accelerator Laboratory
- Gordon and Betty Moore Foundation
- SETI Institute/NASA Ames
- Helsing-Simons Foundation
- Las Cumbres Observatory Global Telescope Network
- Center for High Angular Resolution Astronomy (CHARA)
- Zwicky Transient Facility
- California Institute of Technology
- Aerospace Corporation
- University of California, Irvine
- Northern Arizona University
- Arizona State University
- Planetary Science Institute
- University of Arizona
- Large Binocular Telescope
- LINCC Frameworks Project/LSST Corporation

- University of Hawai'i
- Keck Observatory

- Michigan State University
- University of Michigan
- Rochester Institute of Technology
- Dartmouth College
- Scientific Solutions Inc.
- Harvard-Smithsonian Center for Astrophysics
- Harvard University
- Five College Astronomy Department
- Columbia University
- Mount Cuba Observatory
- University of Delaware
- Department of Energy
- Carnegie Institution for Science
- US Naval Observatory
- NASA
- Space Telescope Science Institute (STScI, development partner)
- NRAO
- University of North Carolina Chapel Hill
- Clemson University
- South Carolina State University
- Georgia State Astronomical Research Institute
- Agnes Scott College
- Georgia State University
- Valdosta State University
- Embry-Riddle Aeronautical University
- Florida Institute of Technology
- Florida International University
- Florida Gulf Coast University
- The University of Alabama
- Texas A&M University
- University of Texas at Austin
- Texas A&M University-Commerce
- East Tennessee State University
- Peay State University
- Austin
- Western Kentucky University
- Indiana University
- Butler University
- Ohio University
- Penn State University
- Villanova University
- Case Western Reserve University
- Ohio State University
- Purdue University
- Valparaiso University
- Ball State University
- University of Wisconsin-Madison
- University of Illinois
- University of Chicago
- University of Illinois at Urbana-Champaign
- Astronomical Research Institute
- National Solar Observatory



- Royal Observatory Edinburgh
- Queen's University Belfast
- Oxford
- University of Southampton
- University of Hertfordshire
- University of Exeter
- University College London
- University of Birmingham

- The Astronomical Calculation Institute
- German Centre for Cosmological Lensing
- Ludwig Maximilian University of Munich
- Max-Planck-Institute for Astrophysics
- Max-Planck-Institute for extraterrestrial Physics
- Max-Planck-Institute for Astronomy

- Stockholm University
- Institute of Physics of the Czech Academy of Sciences
- National Center for Nuclear Research (NCBJ)
- Konkoly Observatory
- The University of Nova Gorica
- Astronomical Observatory of Belgrade

- Swiss Federal Institute of Technology Lausanne
- Swiss Federal Institute of Technology in Zürich

- National Astronomical Observatories of the Chinese Academy of Sciences

- Japan Participation group
- National Institutes of Natural Sciences/ National Astronomical Observatory of Japan
- Sejong University

- Korea Astronomy and Space Science Institute
- Academia Sinica Institute of Astronomy and Astrophysics
- National Central University

- National Astronomical Research Institute of Thailand

- Inter-University Centre for Astronomy and Astrophysics
- National Centre for Radio Astrophysics
- Indian Institute of Technology Bombay
- Tata Institute of Fundamental Research
- Indian Institute Technology Indore
- Indian Institute of Astrophysics

- Australian National University
- University of Auckland

NSF's NOIRLab
HQ, Tucson, Arizona

Kitt Peak
KPNO

Maunakea
Keck

NSF's NOIRLab
Hilo, Hawaii

Cerro Tololo
CTIO

Cerro Pachón
CTIO, Gemini, Rubin

NSF's NOIRLab
Recinto, La Serena, Chile

- The Chilean National Agency for Research and Development
- University of La Serena

- Ministry of Science, Technology and Innovation of Brazil

- Laboratório Interinstitucional de e-Astronomia

- Institute of Astronomy, Geophysics, and Atmospheric Sciences of São Paulo
- São Paulo Research Foundation

- Instituto de Astronomía Teórica y Experimental at the Observatorio Astronómico de Córdoba

- The Ministry of Science, Technology and Innovation of Argentina

- South African Astronomical Observatory

- Astronomy Australia Limited

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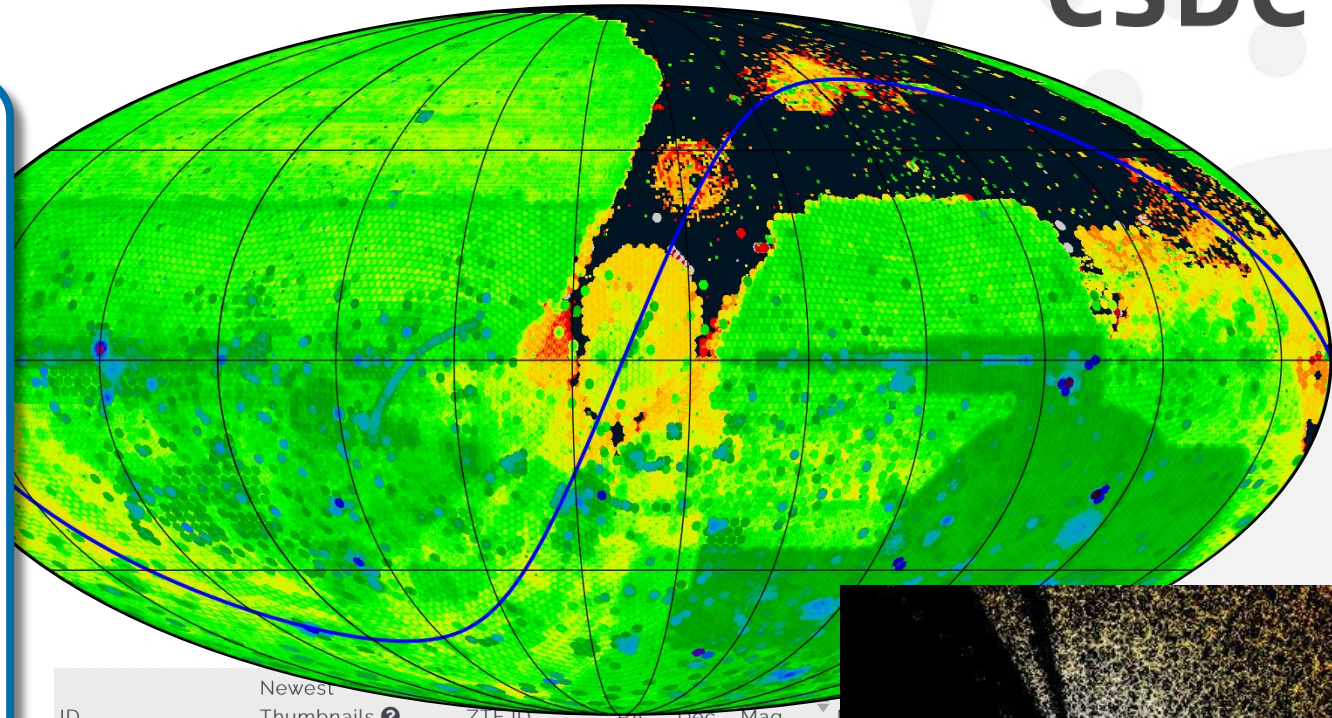
NSF's NOIRLab Open House

*Adam Bolton, Director of the Community Science and
Data Center at NSF's NOIRLab*

*Discovering Our Universe
Together*

An exciting time for US astronomy!

- ★ *Wide-field survey machines*
- ★ *Time-domain alert streams*
- ★ *Diverse telescopes and instruments*
- ★ *New discovery opportunities!*






ID	Newest Thumbnails	ZTF ID	RA	Dec	Mag				
ANT2020pd7xe		ZTF18acclaix	39.00	42.78	18.74				
ANT2018ibc26		ZTF18abtzcmi	34.62	41.14	18.02				
ANT2020afcnlca		ZTF19ackesip	38.15	42.34	18.70				
ANT20204qx4w		ZTF18abvdwqf	34.99	36.91	18.65				
ANT2020my72q		ZTF18accjtez	34.75	39.94	18.74	18.26	277	2022-06-14 11:32:46	2018-11-03 07:00:53
ANT2018e5toc		ZTF18admdyhp	41.15	51.23	18.39	17.88	454	2022-06-14 11:32:04	2018-08-12 10:15:57



Enabling decadal science priorities



	Accessible Data Archives	Big-data Science Platforms	Time-Domain Software Infrastructure	Data Reduction Pipelines
	Ground+space exoplanet data combination	Publication of high-level exoplanet science products; Milky Way stellar population characterization	Solar System object detection & tracking; exoplanet microlensing	Maximizing scientific sensitivity of NOIRLab instrument suite; rapid publication of high-impact results
	Historical data from time-domain and multi-messenger sources	Dark matter substructure traced by stellar surveys; Image cutout services for gravitational-lens searches	Combining real-time triggers from LIGO++ and Rubin-LSST; SNe demographics and cosmology	Real-time reduction of data from MMA counterpart searches and follow-up
	Multi-wavelength analysis of galaxies and quasars	Galaxy & AGN demographics from combination of multiple large surveys	Detection and characterization of tidal disruption events	Detailed characterization of spatially resolved galaxy spectra

Recommendation: “... **pipelines for producing science-ready data across all general-purpose ground-based observatories**... ensuring that all pipelined observations are archived in a standard format for eventual public use....”

Recommendation: “... **high level data products** for large principal investigator-led programs on MREFC-scale astronomical facilities in order to **accelerate the scientific output and maximize the timeliness and community impact** of these key large projects...”

Recommendation: “... **improve coordination among U.S. archive centers** and... create a centralized nexus for interacting with the international archive communities... informed by the broad scientific needs of the astronomical community.”

Recommendation: “A **time-domain astrophysics program** as the highest priority strategic area for mid-scale innovations”

“Develop and diversify the Scientific Workforce”

Recommendation: “**span the career stages** from undergraduate to faculty and beyond, with targeted programs to **improve diversity** at each level; **bridge critical transitions** in the pipeline; and work to **improve diversity of project teams, participants, and beneficiaries.**”

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Recommendation: “... **improve coordination** through a **centralized nexus** for interacting with the international astronomical community to address the **broad scientific needs** of the astronomical community.”

Recommendation: “A **time-domain astrophysics program** as the highest priority strategic area for mid-scale innovations”

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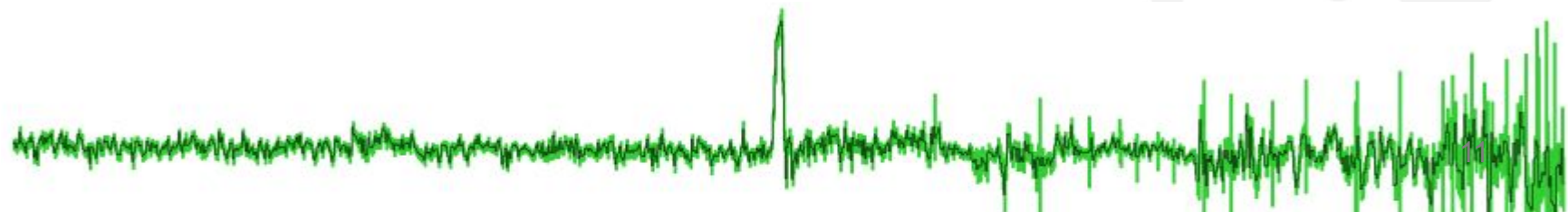
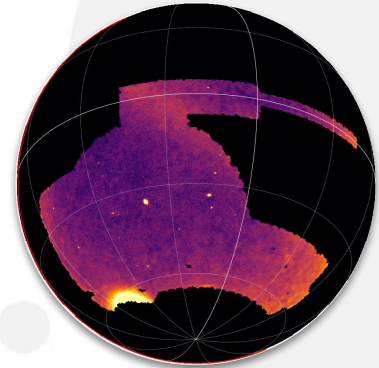
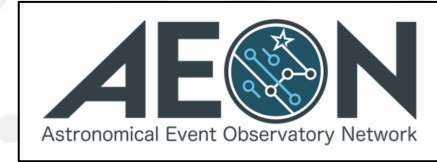
Working with NSF on an integrated vision

- ★ ***End-to-end user support***
- ★ ***Data-driven discovery***
- ★ ***Direct engagement with your science***



Key science capability areas

- ★ An end-to-end system for time domain and multi-messenger astronomy
 - Time allocation, brokered alert streams (LSST++), rapid follow-up observing, prompt data processing and access
- ★ Integrating all our wide-field assets with Rubin
 - Data co-location, common pipelines, common platform
- ★ Spectroscopy as the key to astrophysics in the era of Rubin and GMT+TMT
 - Data reduction software, science-ready data products, online analysis platforms, access to spectroscopic survey data





We are a resource for you

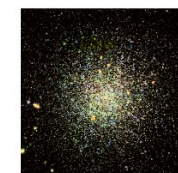


We are always looking to build science-driven collaborations with the community

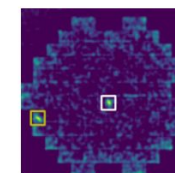
We work to make discoveries accessible to the broadest possible community of scientists

- Dual-anonymous proposal review
- Extensive, accessible training resources for big-data astronomy
- Leveraging research-inclusion activities in Rubin and US-ELTP

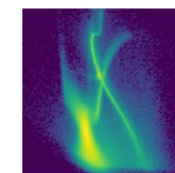
datalab.noirlab.edu



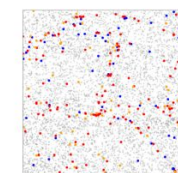
[Getting Started with Data Lab](#)
 Learn the basics such as importing modules, sending a database query, and using the Simple Image Access (SIA) service to create image cutouts.



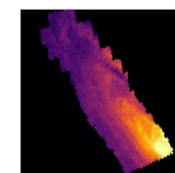
[Dwarf Galaxies in the SMASH survey](#)
 Discover the ultrafaint Hydra II dwarf galaxy in the SMASH DECam survey based on spatial overdensities of blue stars with a detection algorithm.



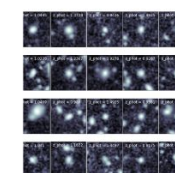
[Exploring SMASH DR2](#)
 The 480 square degree SMASH DECam survey of the Magellanic Clouds and their periphery contains a wealth of objects, including this capture of the SMC with 47 Tuc in the foreground.



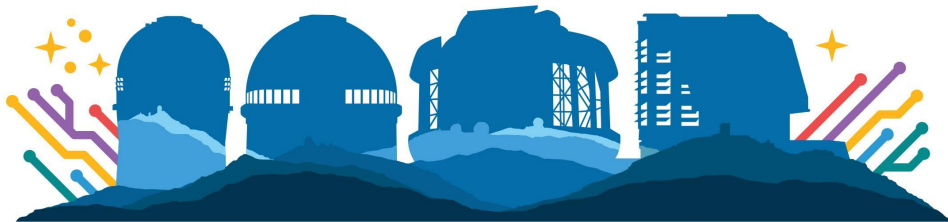
[Large-Scale Structure of the Universe](#)
 Investigate cosmic filaments and clusters of galaxies, pan around an interactive sky viewer, combining spectroscopy and DESI pre-imaging.



[Fun with PHAT](#)
 Visualize the 100 million+ stars in the Andromeda Galaxy captured by the Panchromatic Hubble Andromeda Treasury (PHAT).



[Gallery of Cluster Galaxies](#)
 Use the Simple Image Access (SIA) service to retrieve images from the Gemini GOGREEN program.



Rubin Construction Status Update

Željko Ivezić

**AURA/University of Washington
Rubin Obs. Construction Director**

AAS 240

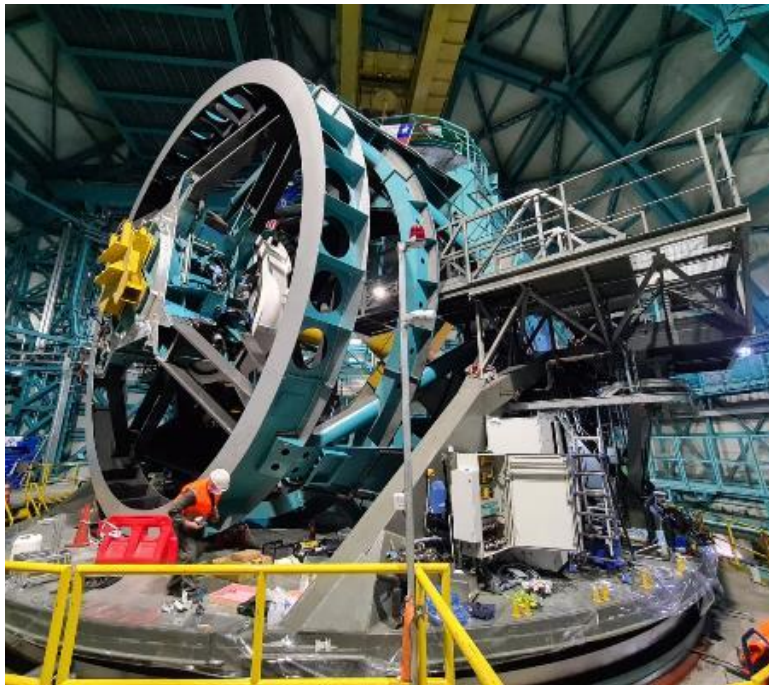
**NOIRLab Open House
Pasadena, June 15, 2022**



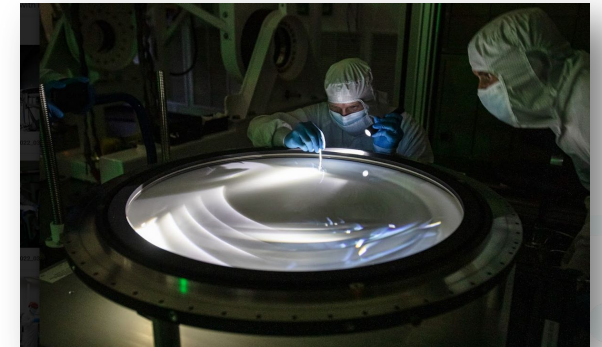
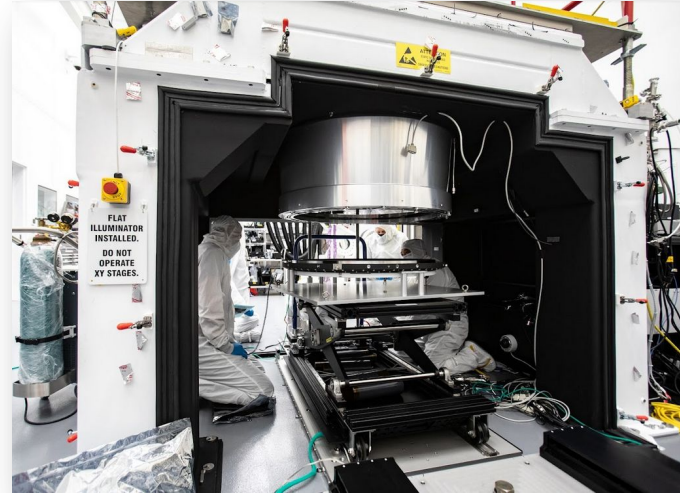
Outline

- Construction progress: high points
- Anticipated schedule to completion

Construction progress



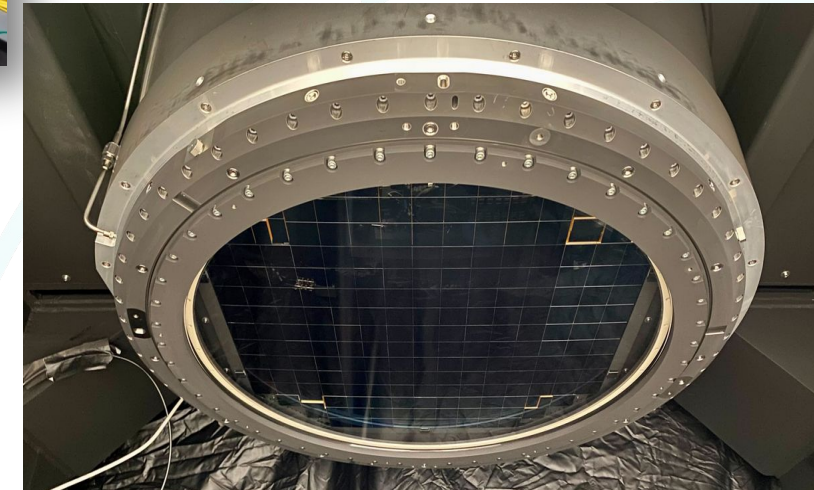
TMA with encoder and electrical work in progress



Cleaning and installation of L3

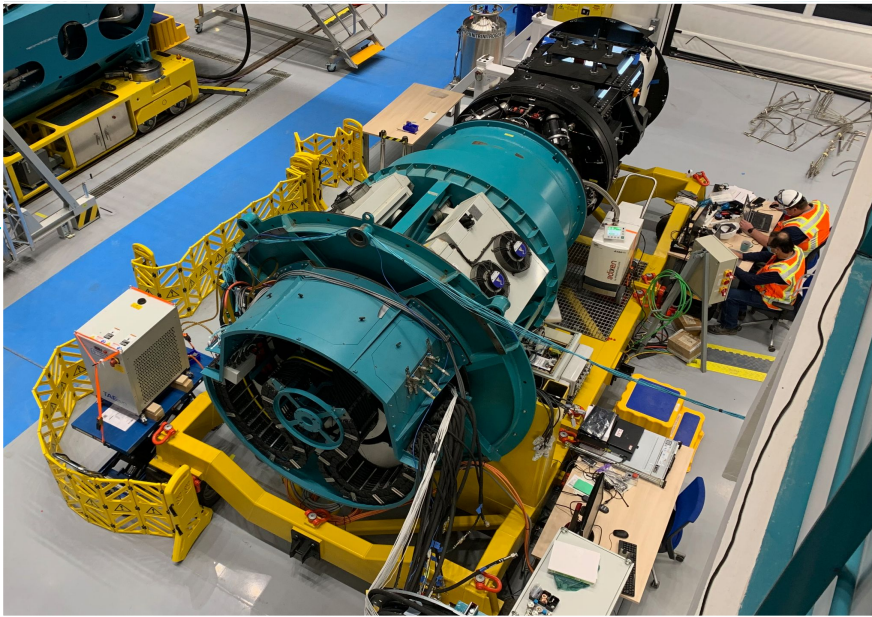


Summit Control Room with LOVE displays during an AuxTel run



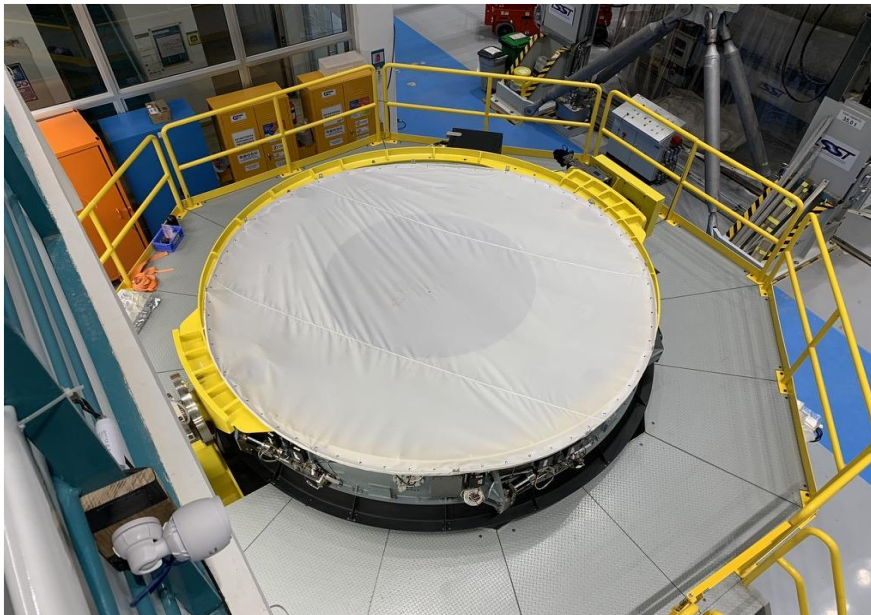
L3 installed on the camera cryostat

Commissioning
camera



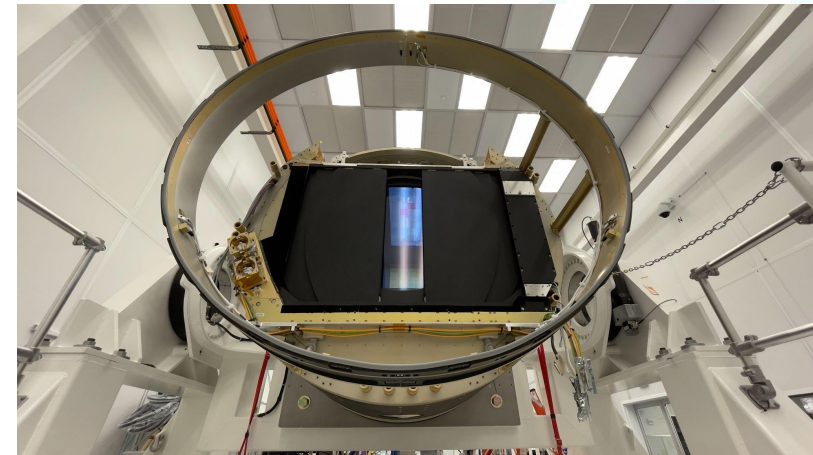
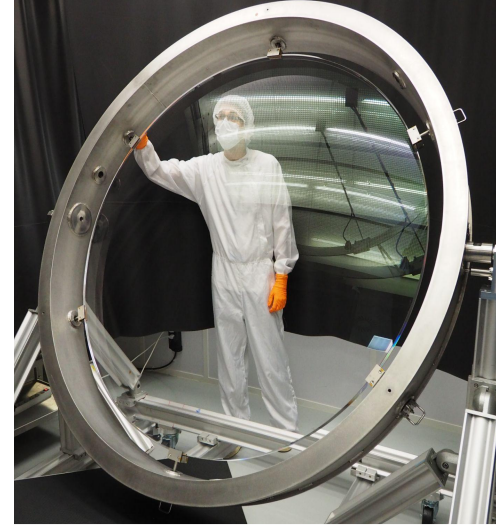
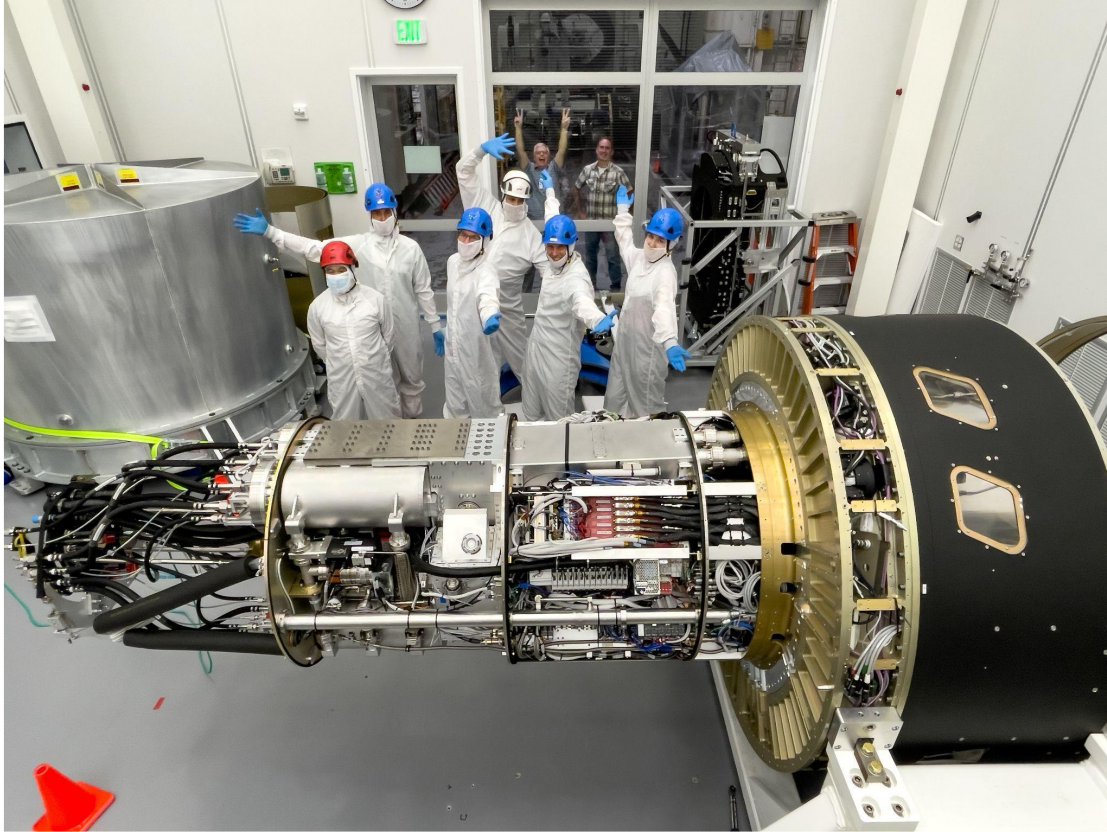
Mirror
washing
station

M2



Coating
chamber

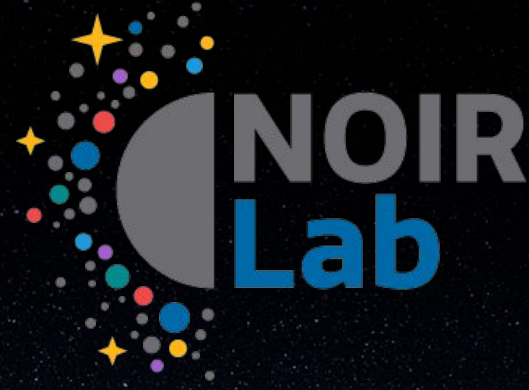
Camera pre-ship review at SLAC: February 2023

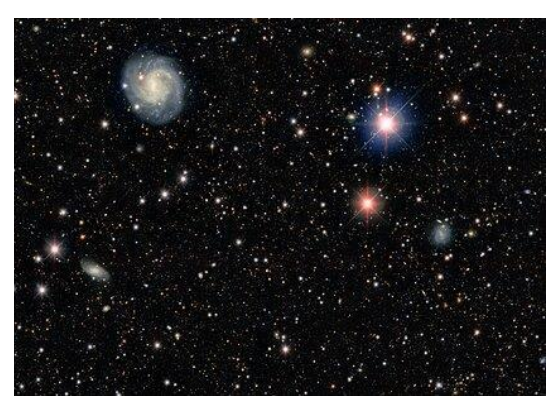


Schedule to Completion

- Despite the progress during the COVID Pandemic the critical path suffered dramatically
- Rebaseline Schedule Submitted to funding agencies in September 2021
- Schedule continues to adjust to conditions
 - **Telescope Mount Assembly contract complete: October 2022**
 - **3-mirror Optical System Ready for Testing: July 2023**
 - **ComCam: Engineering First Light: September 2023**
 - **LSSTCam: System First Light: January 2024**
 - **Operations Readiness Review completed: June 2024**

Still months of uncertainty in first light dates, but we will get there!



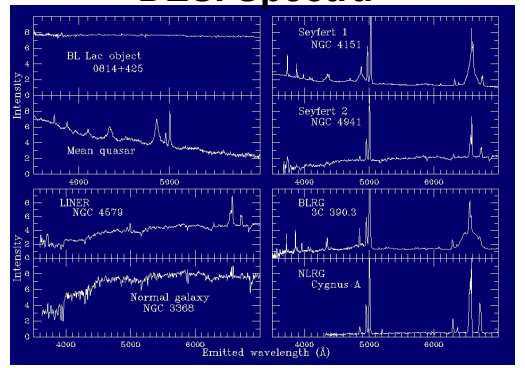


CSDC
DATALAB

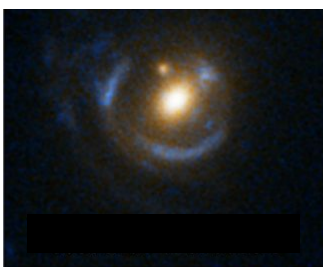
Rubin/DECam Images

+

DESI Spectra



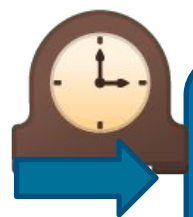
AI network search



Star forming galaxy
strong lenses

Rubin

RUBIN
WATCH LIST



Wait!

NO

BRIGHTENING
EVENT?

YES!

SEND ALERT!

AEON

MSO

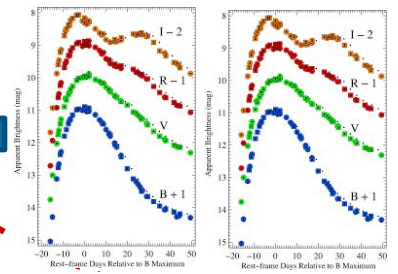
DRAGONS

Gemini

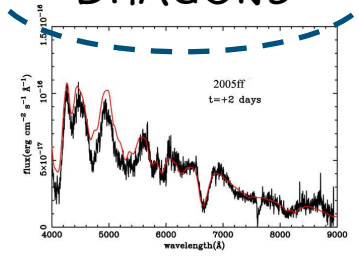
New
Measurement of
the
Hubble
Constant!

SCHEDULE
PHOTOMETRY
ON SOAR

SCHEDULE
SPECTROSCOPY
ON GEMINI



Light Curves



Super Nova!

