

TIME DOMAIN MULTI-MESSENGER ASTRONOMY



WITH THE ROMAN SPACE TELESCOPE

MIRRORS



HUBBLE

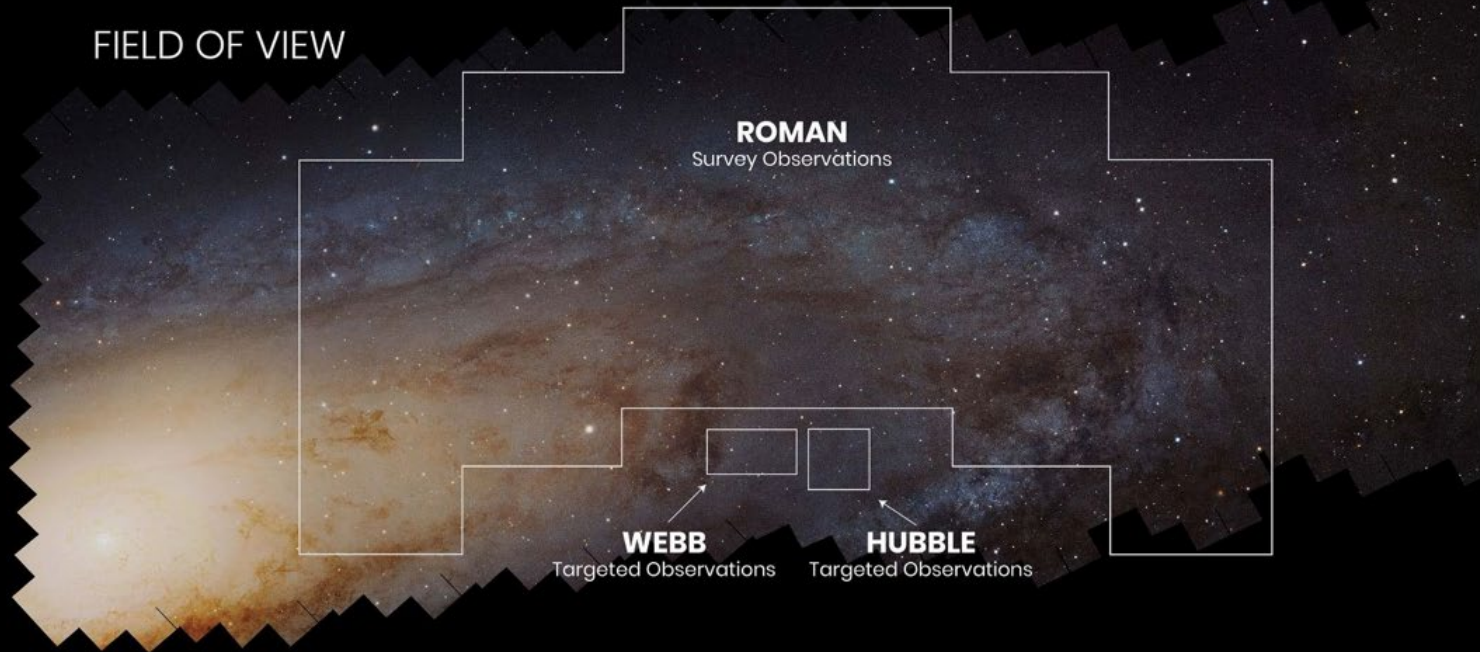


ROMAN



WEBB

FIELD OF VIEW



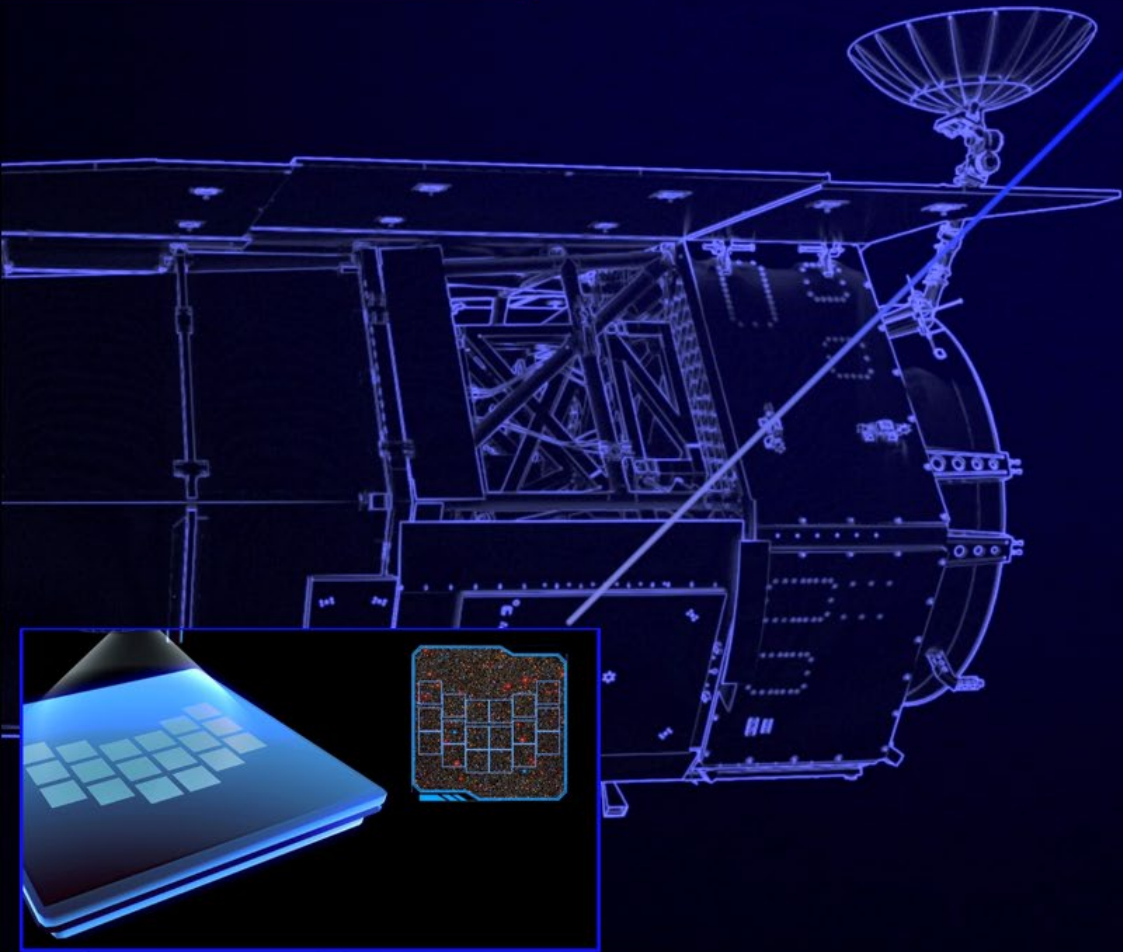
WAVELENGTH





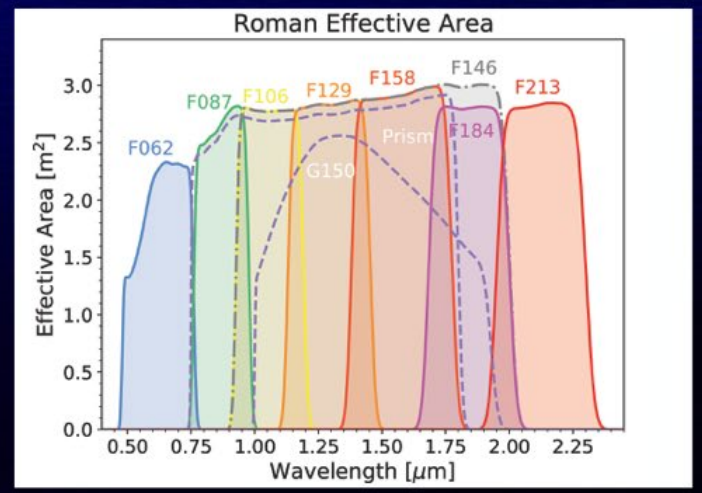
Ground-based image

WIDE FIELD INSTRUMENT



WIDE FIELD INSTRUMENT

- Infrared imaging and spectroscopy
- 18 4096 x 4096-pixel sensors
- 100 times the area of Hubble



WILL OBSERVE THOUSANDS OF EXOPLANETS

30% GAS GIANT

The size of Saturn or Jupiter (the largest planet in our solar system), or many times bigger. They can be hotter than some stars!

31% SUPER-EARTH

Planets in this size range between Earth and Neptune don't exist in our solar system. Super-Earths, a reference to larger size, might be rocky worlds like Earth, while mini-Neptunes are likely shrouded in puffy atmospheres.

4% TERRESTRIAL

Small, rocky planets. Around the size of our home planet, or a little smaller.

35% NEPTUNE-LIKE

Similar in size to Neptune and Uranus. They can be ice giants, or much warmer. "Warm" Neptunes are more rare.

~~50,000+~~
PLANETS FOUND

Roman will find **100,000+** new exoplanets!

WILL OBSERVE THOUSANDS OF EXOPLANETS

GALACTIC BULGE TIME DOMAIN SURVEY

Science Focus: To detect exoplanets through both the gravitational microlensing and transit methods. It will also enable studies of variable star physics, and provide insights into the structure of our Milky Way Galaxy.

Instruments: The Wide Field Instrument - imaging of high stellar density fields.

SURVEY DESIGN

7 fields for a total of ~2 square degrees

Cadence of 15 minutes

6 x 72 day "bulge seasons"

~432 days over 5 yr mission



MILLIONS OF GALAXIES

Hubble Observations



Spiral Galaxy



Barred Spiral Galaxy



Dwarf Elliptical Galaxy

Hubble Observations



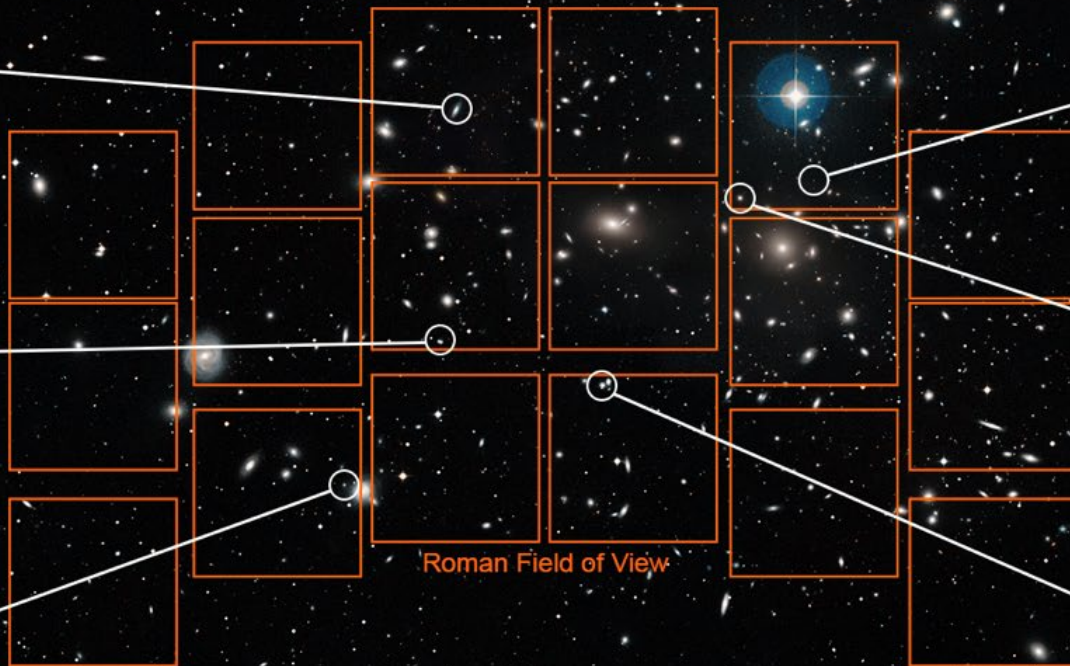
Irregular Galaxy



Elliptical Galaxy



Lenticular Galaxy



Roman Field of View

HIGH LATITUDE WIDE AREA SURVEY

Science Focus: To measure the shape of hundreds of millions of galaxies and the distance/redshift of 10s of millions.

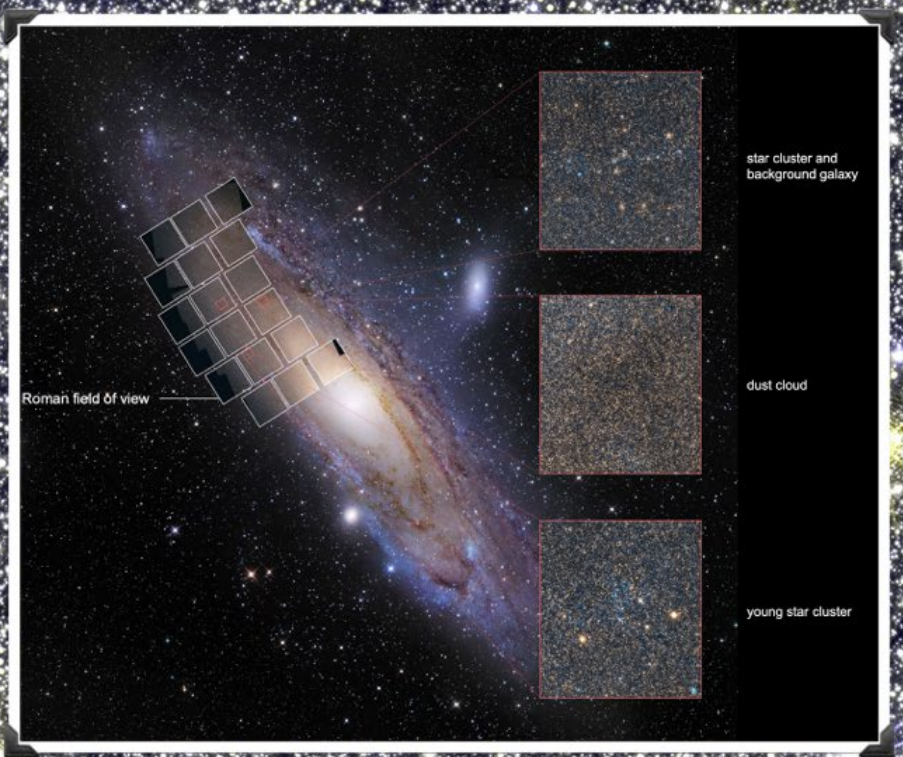
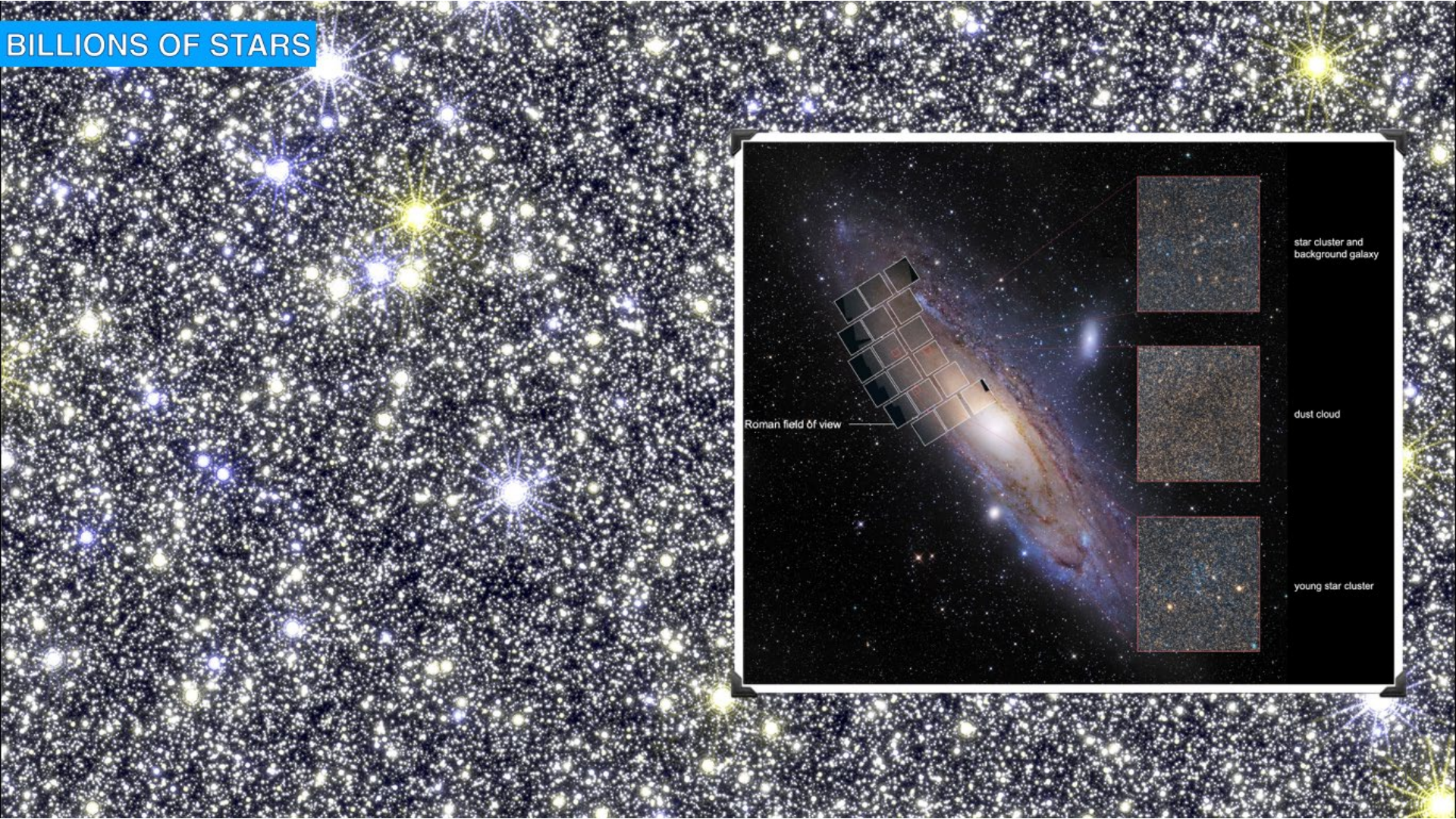
Instruments: Wide Field Instrument - both imaging and grism spectroscopy

SURVEY DESIGN

Images of least 1700 square degrees in 4 near-infrared bands

Grism spectroscopy of the same area

BILLIONS OF STARS



HIGH LATITUDE TIME DOMAIN SURVEY

Science Focus: To observe SN Ia and other time domain focused astrophysical phenomena.

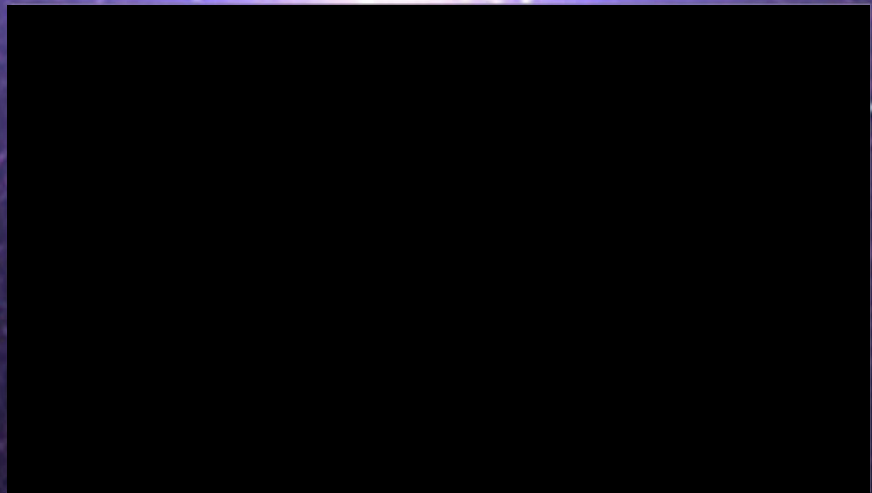
Instrument: Wide Field Instrument - imaging and prism spectroscopy

SURVEY DESIGN

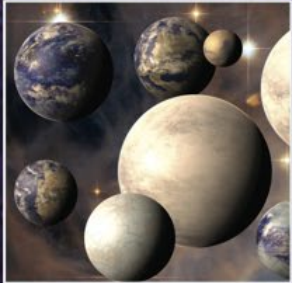
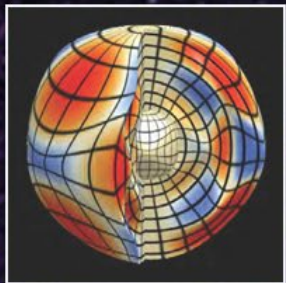
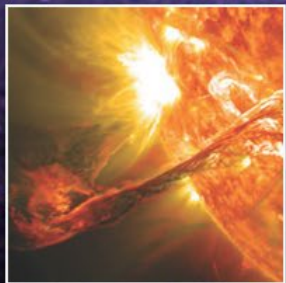
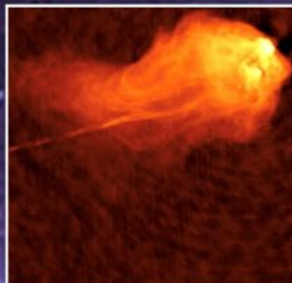
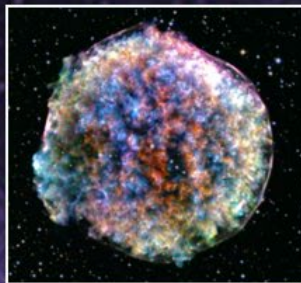
6 months over two years

5 day cadence

Northern and southern hemisphere observing fields



ENABLING THE DETECTION AND STUDY OF A DIVERSE RANGE OF TRANSIENTS



Explosive & Variable Extragalactic Sources:

- Supernovae
- AGNs
- Blazars
- Quasars
- Tidal Disruption Events
- Gamma-ray Bursts
- Kilonovae
- (NS-NS Gravitational Wave Counterparts)

Variable Stars:

- Eclipsing Binaries
- Flare Stars
- Cepheids
- T Tauri Stars
- White Dwarfs
- Neutron Stars
- Emission line stars (Be stars)
- RR Lyrae Stars
- WD Oscillations
- Novae
- Many many more!

RAPID

Roman Alerts Promptly from Image Differencing

Overview: RAPID (Roman Alerts Promptly from Image Differencing) is a Project Infrastructure Team for the Nancy Grace Roman Space Telescope. The Astro2020 Decadal Survey identified time-domain and multi-messenger science as a high priority. RAPID will enable a wide suite of dynamic-sky science for Roman. The RAPID team has experience providing services to the global time-domain community and will leverage previous work on other projects, particularly the Zwicky Transient Facility. The Principal Investigator for RAPID is Professor Mansi Kasliwal (Caltech). The primary development work for RAPID will be performed at IPAC.

Links

[Roman at IPAC](#) ↗

[Roman at STScI](#) ↗

[Zwicky Transient Facility](#)

[Homepage](#) ↗

[Caltech Astronomy](#) ↗

Time Domain Project Infrastructure Team:

Core team members of RAPID at IPAC are Ben Rusholme, Schuyler Van Dyk, Roberta Paladini, and Joe Masiero, joined by Caltech Astronomy colleagues Mansi Kasliwal, Lin Yan, and Ashish Mahabal.

<https://www.ipac.caltech.edu/project/rapid>

Want Roman to do the science you are interested in? Get involved!

Monday, January 8, 2024

Splinter: Building the Roman Supernova Pipeline; Room R07; 9:30 AM CT - 11:30 AM CT

Tuesday, January 9, 2024

Special Session: The Future of Galactic Plane Science with the Roman Space Telescope; Room 216; 2:00 PM CT - 3:30 PM CT

Splinter: Maximizing the Science of Roman with Simulations; Room 240/241; 2:00 PM CT - 3:30 PM CT

Wednesday, January 10, 2024

Splinter: A Discussion of Science Drivers for Defining Roman's Core Community Surveys; Room 235/236; 9:00 AM CT - 11:30 AM CT

Thursday, January 11, 2024

Town hall: Nancy Grace Roman Space Telescope; Room 207; 12:45 PM CT - 1:45 PM CT

https://roman.gsfc.nasa.gov/for_scientists.html

Get Involved

Roman Virtual Lecture Series at IPAC/Caltech

**ROSES / Research and Support Participation
Opportunities**

**Call for Community Input into the Definition of the
Roman Space Telescope's Core Community Surveys**