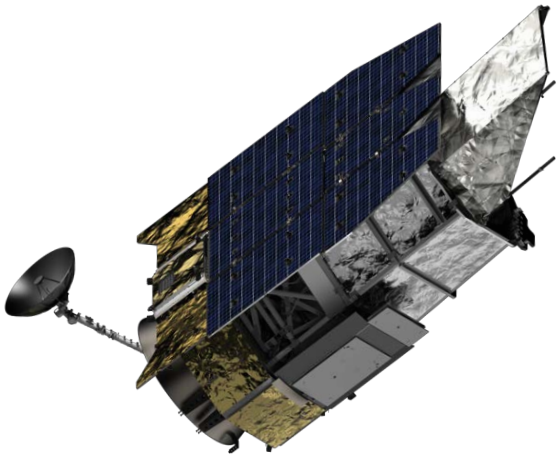
Continuing the Legacy of NASA's Great Observatories

The Nancy Grace Roman Space Telescope

ROMAN SPACE TELESCOPE



The Roman Space Telescope

The Nancy Grace Roman Space Telescope is a Hubble-sized 2.4-meter aperture space observatory optimized for wide-field infrared astronomy (0.5–2.3 μm) and high-performance coronagraphy.

Potential Science Programs

- Measure the history of dark energy in the Universe
- Understand the fossil record of galaxy formation
- Establish the census of "cold" exoplanets
- Characterize the epoch of reionization
- Directly image and characterize faint exoplanets and disks
- Map the history of galaxy evolution over cosmic time
- Survey for planets and small bodies in the Solar System

The Nancy Grace Roman Space Telescope is NASA's next great observatory, designed to complement the capabilities of the Hubble and James Webb Space Telescopes and the next generation of large ground-based facilities such as the Rubin Observatory. Formerly named the Wide Field Infrared Survey Telescope (WFIRST), the Roman Space Telescope is the first telescope to combine the strengths of NASA's flagship missions (high throughput and high-resolution imaging) with the strengths of our most powerful ground-based surveys (wide field of view). Roman offers Hubble sensitivity and 0.1 arcsec resolution over a 0.28 sq deg field of view that is 100x the field of Hubble's visible cameras. Roman is also equipped with a high-performance coronagraph capable of suppressing starlight by factors of up to a billion to 1, to directly discover and characterize exoplanets. The mission is designed to enable cutting edge astrophysics, with funding opportunities for new observations and archival research programs. The Roman Project is currently planning for observatory launch in late 2026.

Roman Space Telescope Imaging Capabilities

Telescope Aperture (2.4 meter)	Field of View (45′x23′; 0.28 sq deg)	Pixel Scale (0.11 arcsec)	Wavelength Range (0.5-2.3 μm)

Filters	F062	F087	F106	F129	F146	F158	F184	F213
Wavelength (μm)	0.48-0.76	0.76-0.98	0.93-1.19	1.13-1.45	0.93-2.00	1.38-1.77	1.68-2.00	1.95-2.30
Sensitivity (5σ AB mag in 1 hr)	28.5	28.2	28.1	28.0	28.3	28.0	27.5	26.2

Roman Space Telescope Spectroscopic Capabilities

	Field of View (sq deg)	Wavelength (μm)	Resolution	Sensitivity (AB mag) (10σ per pixel in 1hr)
Grism	0.28 sq deg	1.00-1.93	461	20.5 at 1.5 μm
Prism	0.28 sq deg	0.75-1.80	80-180	23.5 at 1.5 μm

Roman Space Telescope Coronagraphic Capabilities

	Wavelength (μm)	Inner Working Angle (arcsec)	Outer Working Angle (arcsec)	Detection Limit*	Spectral Resolution
Imaging	0.5-0.8	0.15 (exoplanets) 0.48 (disks)	0.66 (exoplanets) 1.46 (disks)	10^{-9} contrast (after post-processing)	47-75
Spectroscopy	0.675-0.785				

https://roman.gsfc.nasa.gov/science/Roman_Reference_Information.html

*Based on current best estimates of performance.

November 2021

A New NASA Facility for the Entire Astronomical Community

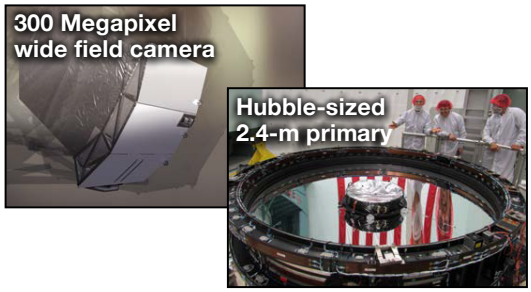
ROMAN SPACE TELESCOPE

100% of the Nancy Grace Roman Space Telescope's observing time is available
The specific implementation of the core surveys will be defined by a community process; all proposed observing time, as well as associated funding, will be competed and selected through peer review

The Roman science teams for the operational mission phase remain to be selected

All Roman data will be publicly available with no period of limited access
Scientists will be able to interact with the cloud-hosted data through a dedicated science platform, in addition to having access to the data through the archive

Big Data Space Astrophysics



Possible Core Survey Implementations

High Latitude Wide Area Survey (2000 sq deg at 27th mag in YJHF184 + spectra) Dark Energy — Cosmic Lensing — High-z Galaxies — Galactic Halo Substructure

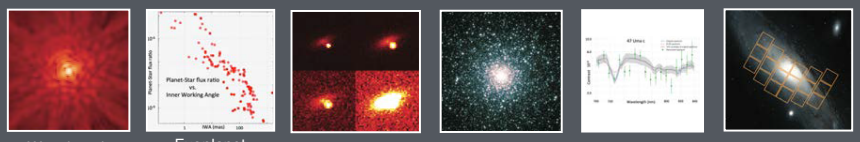
High Latitude Time Domain Survey (~10 deg^2 fields at 28–29th mag, with high cadence) Supernova Discovery — First Light — Galaxy Evolution

Galactic Bulge Time Domain Survey (2.2 sq deg at high cadence) Exoplanet Census — Free Floating Planets — Stellar Pops — Galactic Structure

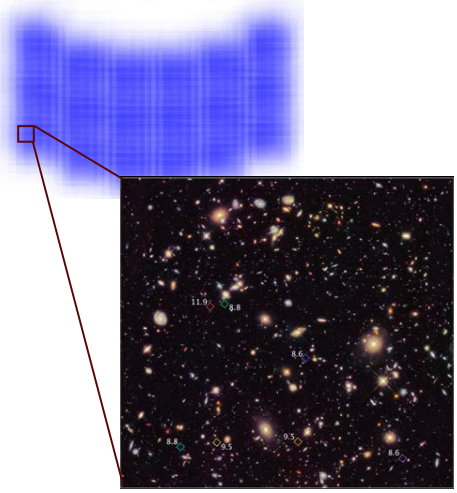
Following the tradition of other NASA Great Observatories, Roman will offer funding opportunities for new observations and archival research programs for all community (peer-review selected) science projects.

Roman Tool Kit for Building Science Simulations

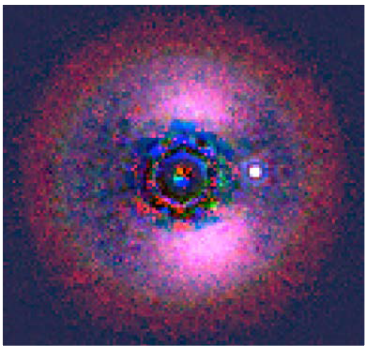
Simulation Tool Kits Now Available at the Roman Space Telescope Science Centers
Science Planning Toolbox at http://www.stsci.edu/roman/
https://roman.ipac.caltech.edu/sims/Simulations_csv.html



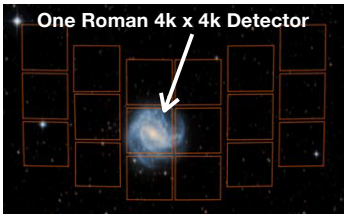
Wavelength Dependent PSF Simulator | Exoplanet Yields Simulator | 3-Dimensional Exposure Time Calculator | Stellar Pops Image Simulator | Coronagraph Instrument Spectral Simulator | Multi-mission Field of View Overlay



The blue footprint shows a simulated Roman 50-dither WFI exposure. The inset is the size of the Hubble Ultra Deep Field. The Roman field-of-view is more than 100x greater than HST or JWST, facilitating equally sensitive but much wider deep fields.



A Roman coronagraphic simulation of a warm Jupiter at 2 AU from a G2 star at d = 3 pc. Roman's high performance coronagraph aims to reach 10^{-9} contrast ratio in the visible, orders of magnitude better than current ground or space capabilities.



Single Roman fields will probe the entire visible extent of all nearby galaxies and >50 kpc of their halo (at 4 Mpc).

For more information please visit https://roman.gsfc.nasa.gov