Nancy Grace Roman Space Telescope Mission, Operations, and User Tools

Roman Space Telescope

The Mission
- NASA Mission in development for mid-2020s launch
- Top large space priority of ASTRO2010 Decadal Survey
- STScI will be the Science Operations Center for Roman, with science support activities shared by GSFC, STScI, and IPAC

Science
- *Dark Energy:* Distinct equation-of-state measures
- *Exoplanets:* Microlensing discovery down to sub-Earth masses; Coronagraphic imaging and spectroscopy
- *Astrophysics:* Funding opportunities for new observations and archival research programs

Telescope
- Existing Hubble-size 2.4-m primary, 3-mirror anastigmat

Wide Field Instrument (WFI)
- 0.5–2.3 microns, 0.28 degrees^2 (100× Hubble's FOV)
- Eight broad-band filters + slitless spectroscopy

Coronagraphic Instrument
- 0.4–1.0 microns, 10^{-9} contrast goal

Space Telescope Science Institute

STScI Science Operations Center
- Create scheduling system, data archive, WFI data processing system, and dark energy survey products
- Technical Reports on various mission topics, available at the STScI Roman Space Telescope Documentation webpage
- Community engagement and Science Team support
- Questions? **Email help@stsci.edu**

Software and Simulation Tools for Roman/WFI
STScI Science Planning Toolbox includes:

WebbPSF: Provides realistic field-dependent PSF simulations

Pandeia: Calculates simulated data, exposure times, and signal-to-noise ratios

STIPS: Simulates complex astronomical scenes

Field-of-View (FOV) Overlay: Displays FOV footprint on top of DSS, SDSS, or GALEX images

WebbPSF
A customizable multi-mission interface to perform point-spread function (PSF) simulations and calculations

- Simulated PSFs are critical to predict the performance of the observatory and to simulate scenes
- WebbPSF accounts for pupil shapes, source spectral energy distributions, filter bandpasses, and field-dependent aberrations
- WebbPSF contains flexible Python tools for analysis or export of PSFs
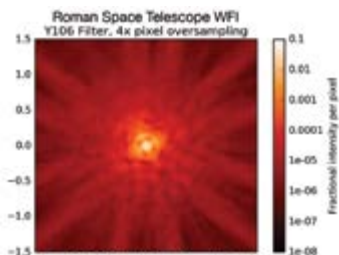
Simulated Roman/WFI PSF in the Y106 filter

Pandeia
A multi-mission data cube simulator and signal-to-noise ratio/exposure time calculator (ETC)

- Accounts for the effects of wavelength-dependent PSFs and pixel-to-pixel correlations inherent to modern IR detectors
- Detailed scene creation for broad science cases (extra-galactic, galactic, etc.)
- Support for a wide range of instrument modes
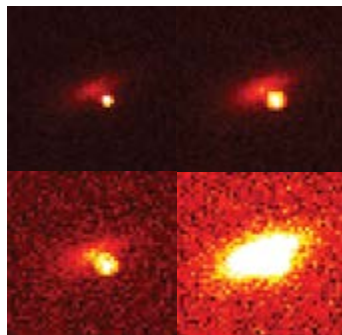
Simulated high-z supernova and host galaxy in the F087, F158, W146, and F184 filters

STIPS
A tool designed to produce full-scene pipeline-processed simulated data

- Generate complex astronomical scenes through user-specified inputs (e.g., star cluster structural and population characteristics)
- Possibility to include post-pipeline data reduction residuals

Simulated composite-color Roman/WFI globular cluster image

Field of View Overlay
Quickly and simply display the FOV outline of the Roman instruments over sky images

- Supports overlays on DSS, SDSS, or GALEX images
- Object catalogs can be extracted and shown in a separate window
- Uses functionalities of the Mikulski Archive for Space Telescopes (MAST)
- As MAST Portal functionality expands, tool features will improve
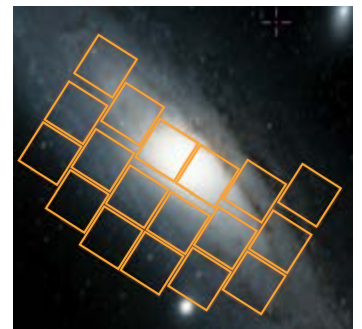
MAST-FOV Overlay of the Roman/WFI field on the Andromeda Galaxy

NASA's Nancy Grace Roman Space Telescope was previously known as the Wide Field Infrared Survey Telescope (WFIRST).

Links to tools created by STScI and Roman Space Telescope Partners are available at https://www.stsci.edu/roman/science-planning-toolbox.