

Roman Coronagraph Instrument Information Session



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Support from many at the Jet Propulsion Laboratory, Goddard Space Flight Center, and the Science Teams led by Bruce Macintosh and Maggie Turnbull

This document has been reviewed and found not to contain export-controlled technical information.



The Nancy Grace Roman Space Telescope



- 2.4 m Wide Field of View telescope
- 100 times the field of view of Hubble
- Wide Field Instrument science (dark energy, dark matter, exoplanet census)
- Coronagraph Instrument tech demo
- L2 orbit
- 5 year mission lifetime
- Launch in 2026
- Managed by Goddard Space Flight Center
- Coronagraph led by Jet Propulsion Laboratory

Wide-Field science briefing Nov. 15-19

<https://roman.gsfc.nasa.gov/science/workshop112021/>

Today and Thursday's Info Session



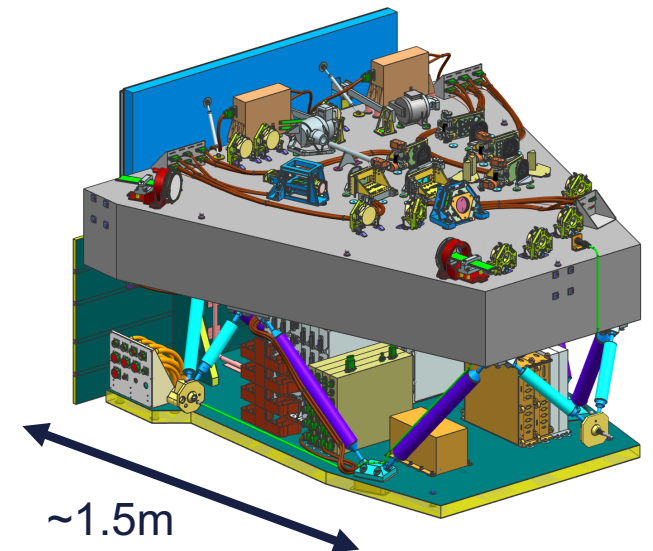
Provide an overview of the Coronagraph Instrument, how it is meeting its objectives and requirements, its current status, and its potential for science. Also review the work the Science Investigation Teams have done to maximize the scientific value of the technology demonstration observations, as well as highlight areas for future work.

This is not a proposal briefing for the Community Participation Program. Questions on the CPP should be directed to Dominic Benford at NASA HQ.

The Roman Coronagraph Instrument paves the way for future exoplanet direct imaging missions



- Coronagraph Instrument is:
 - a technology demonstration instrument on Roman
 - the first space-based coronagraph with active wavefront control
 - a visible light (545-865nm) imager, polarimeter and $R \sim 50$ spectrograph
 - a 100-1,000 times improvement in performance over current ground and space facilities
 - Capable of exoplanetary system science
 - passed Instrument and mission CDR



Technology Objectives for Coronagraph Instrument

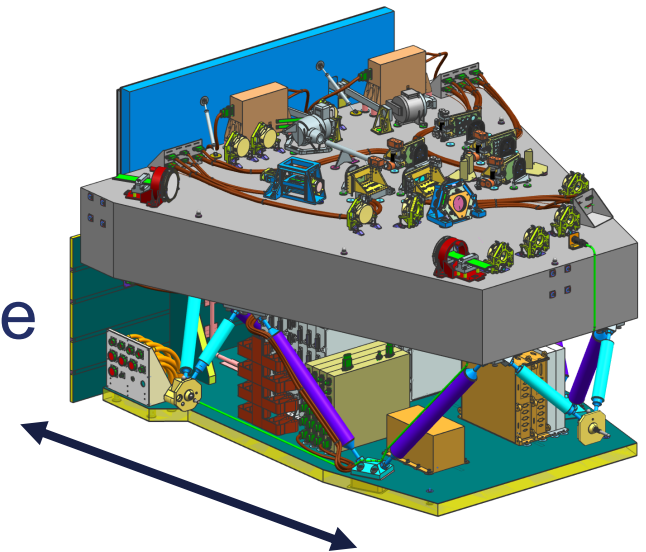


- Demonstrate Coronagraphy with Active Wavefront Control
- Advance Engineering & Readiness of Coronagraph Elements
- Development and Demonstration of Advanced Coronagraph Algorithms
- Collect Data to Enable Integrated Observatory Performance Characterization
- Demonstration of Advanced High-Contrast Data Processing

Original Baseline Technology Requirements (BTRs)



- Broadband High-Contrast Imaging
- High-Contrast Spectroscopy
- High-Contrast Extended Source Imaging
- Broadband High-Contrast Extended Source imaging and Polarimetry

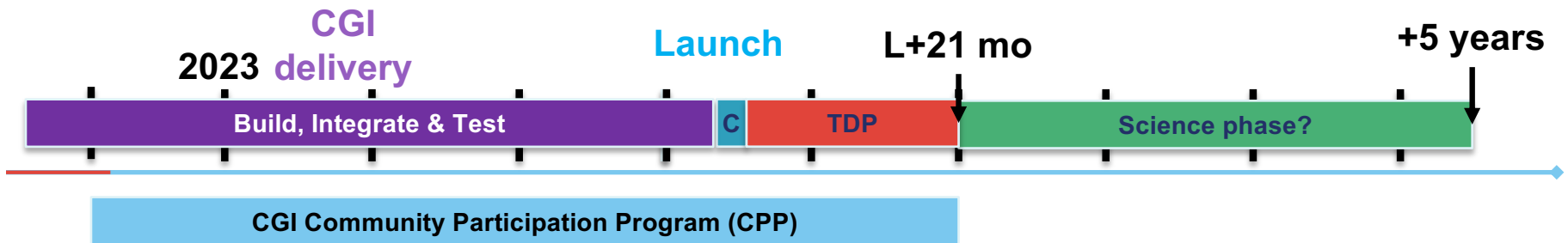


After the Preliminary Design Review in 2019, NASA HQ directed team to move to only Threshold Technology Requirements but retain PDR design.

Threshold Technology Requirement #5 (TTR5)



- **TTR5:** Roman shall be able to measure brightness of an astrophysical point source w/ $\text{SNR} \geq 5$ located $6 - 9 \lambda/D$ from an adjacent star with $V_{AB} \leq 5$, flux ratio $\geq 10^{-7}$; bandpass shall have a central wavelength ≤ 600 nm and a bandwidth $\geq 10\%$.
- Despite removing all but TTR5, HQ directed the team to keep original design
- TTR5 will be verified before instrument delivery with end-to-end performance testing.
 - The optics for the other observing modes will be fully aligned but not end-to-end performance-tested before delivery.



Apr 2021: Passed Instrument Critical Design Review

~2023: Instrument delivery to payload integration & test

~2026: Launch

Commissioning Phase

450 hr in first 90 days after launch

Coronagraph Instrument Technology Demonstration Phase (TDP)

~2200 hr (3 months) baselined in next 1.5 years of mission

- **If TDP successful, potential add'l science phase**

- Up to ~10% of remainder of 5 year mission
- Commission unofficial observing modes (add'l mask+filter combo's)
- Support community engagement in science and technology
- **Not guaranteed: would require additional resources**
- Starshade rendezvous, if selected