

The Coronagraph Instrument on NASA's Nancy Grace Roman Space Telescope

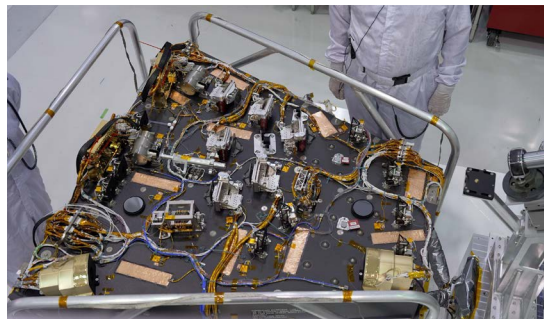
NASA's new exoplanet hunter

NASA's Coronagraph Instrument will fly aboard the agency's next flagship observatory, the Nancy Grace Roman Space Telescope. The instrument will allow astronomers to directly image exoplanets, or planets outside of our solar system.

Designed to be 100 to 1,000 times more powerful than any previous coronagraph, the Roman Coronagraph will capture light from large, gaseous exoplanets and from the gas and dust surrounding stars. The instrument will block out the glare from these stars so that scientists can detect the planets in their orbit.

Currently, both ground- and space-based instruments that detect exoplanets can "see" only bright, young exoplanets up to several million times fainter than their host star. The Roman Coronagraph will be able to detect planets much fainter than that. And it will be able to detect exoplanets orbiting much closer to their host stars than any other coronagraph has been able to detect to date.

The Coronagraph Instrument is a technology demonstration and one of two instruments flying on Roman. The other is the Wide-Field Instrument. While the coronagraph is not required to conduct mission science, the instrument will demonstrate, for the first time in space, technologies that could support the future of exoplanet research and the search for life with future NASA missions.



The optics bench for the Roman Coronagraph Instrument, which will fly on NASA's Nancy Grace Roman Space Telescope

Expected Mission Timeline

- **No later than May 2027:** The Roman Space Telescope is set to launch from Cape Canaveral, Florida, aboard a SpaceX Falcon Heavy rocket.
- **Three months:** Duration of Coronagraph Instrument technology demonstration, which will take place within the first 1 1/2 years of Roman's operations in space.

Key Objectives

- Demonstrate key technologies for space-based direct imaging of exoplanets, including:
 - Wavefront sensing and control
 - Deformable mirrors
 - Coronagraph masks
 - High-precision cameras

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- Detect exoplanets at least 10 million times fainter than their host star. As a technology demonstration, the Coronagraph Instrument will satisfy its threshold technical requirement by achieving this goal.
 - If the Coronagraph Instrument exceeds its minimum requirements, it is projected to have the sensitivity to detect exoplanets more than 100 million times fainter than their star. It could even be capable of taking the first direct images of mature Jupiter-like exoplanets.
- Point the way to the future. The Coronagraph Instrument aims to show how advanced coronagraph technology could push forward exoplanet detection and study.
 - The success of this instrument could pave the way for future technologies like those proposed for NASA's Habitable Worlds Observatory, a mission concept recommended by the 2020 astronomy and astrophysics decadal survey.

Instrument Details

- The Coronagraph Instrument is roughly the shape and size of a baby grand piano. The widest part of the instrument measures about 5 1/2 feet (1.7 meters) across.
- The Coronagraph Instrument is mounted onto the Roman Space Telescope's Instrument Carrier alongside the Wide-Field Instrument.

Masks and Mirrors

- The Coronagraph Instrument uses a series of masks and deformable mirrors to filter and distort incoming starlight to "see" orbiting exoplanets that would otherwise be blocked by the bright light. The masks will also block interference from the telescope itself.
 - These masks and mirrors will be implemented in a variety of observing modes to fit different types of target systems.



NASA's Nancy Grace Roman Space Telescope

Mission Partners/Project Team

NASA's Jet Propulsion Laboratory in Southern California is responsible for building the Coronagraph Instrument, with additional testing conducted at NASA's Goddard Space Flight Center in Greenbelt, Maryland, which manages the mission.

International partners for the Roman Coronagraph Instrument include ESA (European Space Agency), CNES, (Centre National d'Études Spatiales), JAXA (Japan Aerospace Exploration Agency), and the Max Planck Institute for Astronomy.

Mission Websites

For more information about the Coronagraph Instrument, visit:

<https://roman.gsfc.nasa.gov/coronagraph.html>

For more information about NASA's Nancy Grace Roman Space Telescope mission, visit:

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

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