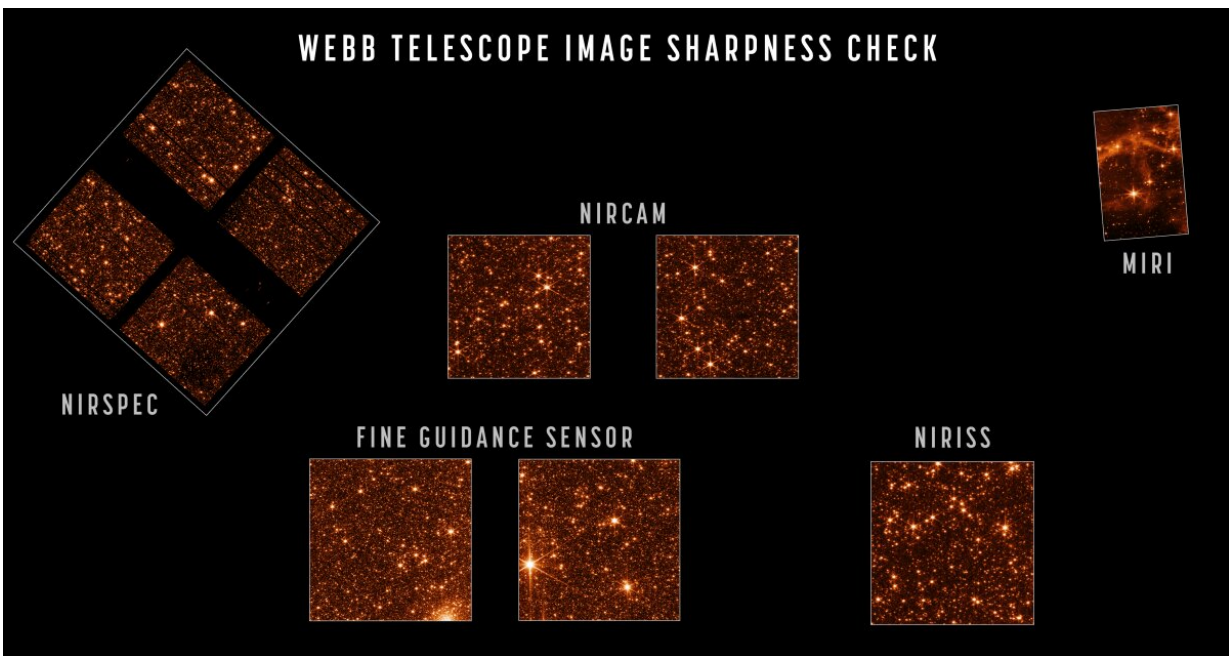


NASA's Webb telescope is now in full focus, ready for instrument commissioning

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Engineering images of sharply focused stars in the field of view of each instrument demonstrate that the telescope is fully aligned and in focus. For this test, Webb pointed at part of the Large Magellanic Cloud, a small satellite galaxy of the Milky Way, providing a dense field of hundreds of thousands of stars across all the observatory's sensors. The sizes and positions of the images shown here depict the relative arrangement of each of Webb's instruments in the telescope's focal plane, each pointing at a slightly offset part of the sky relative to one another. Webb's three imaging instruments are NIRC*am* (images shown here at a wavelength of 2 microns), NIRISS (image shown here at 1.5 microns), and MIRI (shown at 7.7 microns, a longer wavelength revealing emission from interstellar clouds as well as starlight). NIR*Spec* is a spectrograph rather than imager but can take images, such as the 1.1 micron image shown here, for

calibrations and target acquisition. The dark regions visible in parts of the NIRSpec data are due to structures of its microshutter array, which has several hundred thousand controllable shutters that can be opened or shut to select which light is sent into the spectrograph. Lastly, Webb's Fine Guidance Sensor tracks guide stars to point the observatory accurately and precisely; its two sensors are not generally used for scientific imaging but can take calibration images such as those shown here. This image data is used not just to assess image sharpness but also to precisely measure and calibrate subtle image distortions and alignments between sensors as part of Webb's overall instrument calibration process. Credit: NASA/STScI

Alignment of NASA's James Webb Space Telescope is now complete. After full review, the observatory has been confirmed to be capable of capturing crisp, well-focused images with each of its four powerful onboard science instruments. Upon completing the seventh and final stage of telescope alignment, the team held a set of key decision meetings and unanimously agreed that Webb is ready to move forward into its next and final series of preparations, known as science instrument commissioning. This process will take about two months before scientific operations begin in the summer.

The alignment of the telescope across all of Webb's instruments can be seen in a series of images that captures the [observatory](#)'s full field of view.

"These remarkable test images from a successfully aligned telescope demonstrate what people across countries and continents can achieve when there is a bold scientific vision to explore the universe," said Lee Feinberg, Webb optical telescope element manager at NASA's Goddard Space Flight Center.

The optical performance of the telescope continues to be better than the

engineering team's most optimistic predictions. Webb's [mirrors](#) are now directing fully focused light collected from [space](#) down into each instrument, and each instrument is successfully capturing images with the light being delivered to them. The [image quality](#) delivered to all instruments is "diffraction-limited," meaning that the fineness of detail that can be seen is as good as physically possible given the size of the telescope. From this point forward the only changes to the mirrors will be very small, periodic adjustments to the primary mirror segments.

"With the completion of telescope alignment and half a lifetime's worth of effort, my role on the James Webb Space Telescope mission has come to an end," said Scott Acton, Webb wavefront sensing and controls scientist, Ball Aerospace. "These images have profoundly changed the way I see the universe. We are surrounded by a symphony of creation; there are galaxies everywhere. It is my hope that everyone in the world can see them."

Now, the Webb team will turn its attention to science instrument commissioning. Each instrument is a highly sophisticated set of detectors equipped with unique lenses, masks, filters, and customized equipment that helps it perform the science it was designed to achieve. The specialized characteristics of these instruments will be configured and operated in various combinations during the instrument commissioning phase to fully confirm their readiness for science. With the formal conclusion of telescope alignment, key personnel involved with the commissioning of each instrument have arrived at the Mission Operations Center at the Space Telescope Science Institute in Baltimore, and some personnel involved with telescope alignment have concluded their duties.

Though telescope alignment is complete, some telescope calibration activities remain: As part of scientific instrument commissioning, the [telescope](#) will be commanded to point to different areas in the sky where

the total amount of [solar radiation](#) hitting the observatory will vary to confirm thermal stability when changing targets. Furthermore, ongoing maintenance observations every two days will monitor the mirror alignment, and when needed, apply corrections to keep the mirrors in their aligned locations.

Provided by NASA's Goddard Space Flight Center

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