

NIRSpec Instrumentation

JWST NIRSpec instrumentation components include optics, dispersers and filters, detectors, the micro-shutter assembly, an integral field unit, and fixed slits.

Overview of NIRSpec instrument components

The JWST Near Infrared Spectrograph (NIRSpec) enables 0.6–5.3 μm spectroscopy at resolving powers of ~ 100 , $\sim 1,000$, and $\sim 2,700$. NIRSpec offers four observing modes: (1) [multi-object spectroscopy \(MOS\)](#), (2) [integral field unit \(IFU\) spectroscopy](#), (3) [fixed slit \(FS\) spectroscopy](#), and (4) [bright object time-series \(BOTS\) spectroscopy](#). The NIRSpec instrument hardware components used to carry out science in these modes are as follows:

- [NIRSpec optics](#)—NIRSpec is an all-reflective instrument with a total of 14 mirrors along the light path, and interchangeable filters and disperser options to cover the science wavelength range. The [NIRSpec Optics](#) article describes the basic optical path and components. NIRSpec optics are shared for all four observing modes: MOS, FS, IFU, and BOTS observing modes.
- [NIRSpec dispersers and filters](#)—NIRSpec is sensitive to nearly a full decade in wavelength: 0.6–5.3 μm . The NIRSpec optical path contains two wheel mechanisms, the filter wheel assembly (FWA) and the grating wheel assembly (GWA), that provide disperser-filter combinations to cover the NIRSpec wavelength range. The [NIRSpec Dispersers and Filters](#) article describes the FWA and GWA components used for spectroscopy.
- [NIRSpec detectors](#)—NIRSpec uses two "long wavelength cutoff" Hawaii-2RG detectors manufactured by Teledyne Imaging Systems to acquire near-infrared spectra in the 0.6–5.3 μm spectral range. The NIRSpec detectors have 2048×2048 pixels; the inner 2040×2040 pixels are light sensitive.
- [NIRSpec micro-shutter assembly](#)—NIRSpec's micro-shutter assembly (MSA) is a configurable slit mask for [multi-object spectroscopy](#), allowing the simultaneous collection of dozens to hundreds of target spectra within a $3.4' \times 3.6'$ FOV.
- [NIRSpec integral field unit](#)—this NIRSpec observing mode obtains the spectra of a contiguous, extended $3'' \times 3''$ area on the sky. To achieve this, the IFU uses specialized optics to "slice" the extended spatial region and reformat it into a slit alignment that can be dispersed using the NIRSpec spectrograph optics. The [NIRSpec Integral Field Unit](#) article describes some key characteristics of the NIRSpec IFU.
- [NIRSpec fixed slits](#)—the [NIRSpec fixed slit spectroscopy](#) mode can obtain the spectra of single sources at high sensitivity and contrast. To achieve this, the FS mode offers a selection of five slit apertures to be used with the NIRSpec optics that are shared with the [MOS](#) and [IFU](#) observing modes. The [NIRSpec Fixed Slits](#) article describes some key characteristics of the NIRSpec FSs.