

NIRSpec MOS Operations

The operational features of the JWST NIRSpec multi-object spectroscopy (MOS) observing mode define how instrument-level capabilities can be applied for science. These features include target acquisition methods, dither /nods for each observing mode, and special considerations.

Introduction

Parent article: [NIRSpec Operations](#)

See also: [NIRSpec MOS Observing Process](#), [NIRSpec MOS Proposal Checklist](#), [NIRSpec MOS Recommended Strategies](#), and [NIRSpec Target Acquisition Recommended Strategies](#)

The NIRSpec [MOS observing mode](#) provides the means to simultaneously obtain spectra of multiple objects within the MSA's 3.6' × 3.4' field of view. This observing mode has some unique operational considerations, this article discusses and links to important aspects of the NIRSpec MOS observing mode.

MOS operations highlights

To accurately align science sources within the small 0.2" × 0.46" MSA shutters, [NIRSpec MOS mode](#) observations must be planned and executed at a fixed instrument aperture position angle. These fixed observations translate to significant JWST planning and scheduling constraints. As a result, *users seeking to acquire NIRSpec MOS observations must follow a [multi-step observing process](#) with proposal and flight-ready update stages, instead of the [single stream process](#) available to most science modes.*

In the proposal process, MOS observers are strongly encouraged to use the [NIRSpec MSA Planning Tool \(MPT\)](#) to create placeholder observations. After a MOS proposal is accepted by the JWST time allocation committee (TAC), the flight update to executable visits will be carried out using an orientation assigned by the JWST observing cycle long range plan. Additionally, if a program requests the [pre-imaging option with NIRCcam](#), the update to flight executable visits for MOS observations will happen after the pre-images and catalogs are acquired and delivered.

The NIRSpec MSA is different from many existing ground-based MOS instruments because of the fixed grid of small-sized shutters (0.2" × 0.46"); this means that science targets cannot all be centered in their respective slitlet apertures. Hence, for optimal source throughput and data results, the NIRSpec MOS observations demand the accurate relative knowledge of astrometric positions of science sources and target acquisition reference objects for observation planning. The [standard MSA-based NIRSpec target acquisition \(MSATA\)](#) uses reference stars to align science sources in their respective slitlets (or columns of open shutters that form spectral slits). This TA method is designed for use with planning catalog coordinate accuracies from 5–50 mas. A blind pointing option is also available for NIRSpec MOS science. This [VERIFY_ONLY option](#) does not execute target acquisition on the spacecraft, but observes a pointing verification image through the MSA shutters in imaging mode (with an optional shutter configuration file to block bright targets).

Not all science fields of interest have excellent astrometry for the NIRSpec standard TA, so the concept of using NIRCam to [acquire pre-images](#) was developed for follow-up NIRSpec MOS observation planning.

Additional information on operational aspects of the NIRSpec MOS observing mode are included in the following articles:

- [The NIRSpec MOS Observing Process](#)
- [NIRSpec MOS Dithering Strategies](#)
- [Target Acquisition options for the MOS Mode](#)
- [NIRSpec MOS Operations - Catalogs and Images](#)
 - [Hubble Space Telescope Finder Images](#)
- [NIRSpec MOS Operations - Pre-Imaging using NIRCam](#)
- [NIRSpec MOS Operations - Confirmation Images](#)

To get the most out of NIRSpec multiplexing, the [JWST Astronomers Proposal Tool \(APT\)](#) includes a specialized [MSA Planning Tool \(MPT\)](#). The MPT has algorithms to search through multiple field pointings to derive optimized MOS observing plans over multiple different MSA shutter configurations, including dithers and weight priorities on prime science sources of interest. The [NIRSpec MPT suite](#) of observation planning articles were created to assist users in making successful NIRSpec MOS observations.