

NIRSpec MOS Operations - Catalogs and Images

JWST NIRSpec multi-object spectroscopy (MOS) mode observations require images and the associated catalogs to plan the observations. Optimal data calibration results from planning catalogs with internal relative precision of 5–10 mas.

Catalogs and images for planning MOS observations

Parent articles: [NIRSpec Operations](#) → [NIRSpec MOS Operations](#)

One of the showcase observing modes of NIRSpec is multi-object spectroscopy (MOS) with the micro-shutter assembly (MSA), which consists of roughly a quarter million configurable shutters that are 0.20" × 0.46" in size. The NIRSpec MSA shutters can be opened in adjacent rows to create flexible and positionable spectroscopy slits (slitlets) on prime science targets of interest. Because of the very small shutter size, the NIRSpec MSA spectral data quality will benefit significantly from accurate astrometric knowledge of the positions of planned science sources.

[NIRSpec MOS spectroscopy](#) and the [standard MSA-based target acquisition \(MSATA\)](#) process was designed to execute using planning coordinate precisions from the 5 to 50 mas level. Optimal flux calibration of NIRSpec MOS science will require internal relative precision of 5 to 10 mas (1-sigma) in the catalog used for observation planning. NIRSpec MOS observations planned with catalogs to 50 mas accuracies (e.g., such as from [Sloan Digital Sky Survey](#) imaging) will execute with poorer overall source placement in science apertures, resulting in lower accuracy spectral calibration from aperture flux losses (Figure 2 [in the MSATA article](#) shows the source placement uncertainty as a function of input catalog precision).

The 5–10 mas level of relative astrometric accuracy can presently be achieved using images from the cameras on the Hubble Space Telescope (HST). Tiled mosaics of multiple HST image fields may have slightly decreased accuracy compared to the 5 mas level, but still represent an improvement over the typical in-field relative accuracy in lower resolution space based images (i.e., Spitzer Space Telescope) or ground-based cameras. Radio data (ALMA or VLA) might have the required precision for catalog target coordinates, but the origin of the emitting flux can be very different between these wavelengths and the infrared source positions of interest in JWST NIRSpec observations. Dithered images from the HST ACS or WFC3 UVIS cameras cover a majority of the NIRSpec MSA footprint, and can provide the necessary in-field accuracy for NIRSpec spectroscopy planning. Images from NIRCам on the JWST will also acquire imaging for high precision source catalogs; therefore, the capability for same-cycle [imaging with NIRCам to plan NIRSpec MSA-based science programs](#) will be implemented.

Additional Information on source images and catalogs for NIRSpec MOS spectroscopy planning is included in these articles:

- [Hubble Space Telescope Finder Images and Catalogs](#)
- [NIRSpec MOS Operations: Pre-Imaging Using NIRCам](#)

