Creating a NIRISS Observing Program

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NIRISS observing modes and templates

A JWST observing program that uses the NIRISS instrument is designed by using one of the NIRISS templates in the Astronomer's Proposal Tool (APT). NIRISS has imaging (0.8–5.0 μm) and slitless spectroscopy (0.86–2.8 μm) capabilities and offers 4 observing templates: wide field slitless spectroscopy, single object slitless spectroscopy, aperture masking interferometry, and imaging.

Step-by-step in APT

The step-by-step instructions for using the NIRISS observing templates in the APT are provided in the following articles:

- NIRISS Wide Field Slitless Spectroscopy Template Guide
- NIRISS Single-Object Slitless Spectroscopy APT Template
- NIRISS Aperture Masking Interferometry APT Template
- NIRISS Imaging APT Template

The text below provides context for each of these observing templates.

Wide field slitless spectroscopy

The NIRISS wide field slitless spectroscopy (WFSS) mode is designed to obtain spectra in the 0.8–2.2 μm wavelength range for every source within the 2.2' × 2.2' field of view of the NIRISS detector. One or more of the NIRISS short-wavelength imaging filters must be used as blocking elements in WFSS observations. The user can select either one of the NIRISS WFSS grisms or both of them. Use of both grisms provides orthogonal spectra of the objects within the field of view. The WFSS observations are taken in full-frame readout. This observing mode does not use subarrays. The NIRISS PSFs are under-sampled across the wavelength range used for WFSS and dithering is essential.

Single object slitless spectroscopy

The NIRISS single object slitless spectroscopy (SOSS) mode is designed for exoplanet transits. SOSS allows high cadence time resolved observations and has two available subarray *readout patterns*, *SUBSTRIP256* and *SUBSTRIP96*. SOSS provides two usable orders of cross-dispersed spectra for a single object in the wavelength range 0.6–2.8 µm at a resolution of R ≈ 700 in the first order when full-frame readout or the default *SUBSTRIP256* subarray readout are used. In the *SUBSTRIP96* subarray readout, useful data are obtained only for first order and the wavelength range is somewhat reduced. Dithering is not implemented for SOSS mode. Target acquisition (TA) is required if using a subarray, and *strongly encouraged* for full-frame readout. SOSS data will be processed properly in the JWST calibration pipeline *only if a TA was performed.*

Aperture masking interferometry

The NIRISS aperture masking interferometry (AMI) mode offers the highest spatial resolution on JWST and allows high contrast imaging (10^{-4}) at separations of 70–400 mas in four long-wavelength filters (≈ 2.8, 3.8, 4.3, and 4.8 µm). The NIRISS AMI mode uses an 80 × 80 pixel subarray for bright targets. Dithering is not recommended. Target acquisition (TA) is required if using a subarray.

Imaging

The NIRISS imaging mode offers imaging capability over the wavelength range 0.8–5.0 µm. This mode is currently supported to be used in parallel with NIRCam imaging as the prime science instrument; NIRISS imaging will be considered as a parallel mode to MIRI imaging in future cycles. Only full frame readout is supported.