

# NIRSpec MOS Proposal Checklist

The checklist for proposing for JWST NIRSpec MOS observations is outlined.

## Introduction

As stated in the [JWST NIRSpec Multi-Object Spectroscopy APT Template Guide](#), the NIRSpec MOS science observations are not filled out in the APT template in the same way as all other observing modes. This is because there are better, more automated ways to search for optimal plans for MOS observations to maximize the acquired science spectra. In order to clarify the MOS planning process, a step-by-step checklist for proposing NIRSpec MOS science is summarized below for users. Note that this NIRSpec MOS science mode proposal checklist will make the best sense if used in conjunction with the APT and the [NIRSpec MSA Planning Tool \(MPT\)](#).

## NIRSpec MOS Proposal Checklist

1. Users should first determine the range of feasible MOS observation **Aperture Position Angles** using the [General Target Visibility Tool \(GTVT\)](#). The [NIRSpec Observation Visualization Tool \(NOVT\)](#) or the Aladin viewer in APT may be used to quickly discern whether any feasible position angles will not work for the science, and may warrant a special requirement to restrict the orientation of the proposed observations.
2. NIRSpec MOS mode users typically do not directly fill out the APT template as for other modes (except for Moving Targets and some other exceptional cases). Users typically need to run the [MSA Planning Tool \(MPT\)](#) to create a set of "Planning Visits" with placeholder pointings and MSA shutter configurations that will be representative of the pointing and configurations derived after an angle has been assigned. Using the MPT also helps to predict the number of targets to expect for each pointing for a given observing strategy. For MPT to be able to work, the user must be connected to the internet so MPT can check whether an **Aperture Position Angle (APA)** is feasible.
3. NIRSpec observations planned with MPT require planning [Catalogs](#) of science sources. Observers should create their catalogs that span the [NIRSpec MSA Quadrants](#) in the field of interest. The accuracy of spectroscopy (and target acquisition) directly depends on the *relative* catalog astrometric accuracy.
4. Observers should determine whether existing imaging of their fields of interest will provide the required accuracy for [MSATA target acquisition](#) and science. If existing imaging is inadequate, the observer should propose for [NIRCam pre-imaging](#) in the same cycle in their proposal. NIRCam imaging observations should be fully defined at the time of proposal submission, and should cover a sufficiently large field of view to allow for spectroscopic followup at any potential **APA**.
5. Proposals that request NIRCam pre-imaging to plan NIRSpec MSA observations (MOS science or **MSATA**) should have a [TIMING APT special requirement](#) (specifically, an **AFTER Observation Link**) on the NIRSpec observation separating that observation from the NIRCam pre-imaging observation(s) by a minimum recommended 60 days. The [NIRSpec Observation Visualization Tool \(NOVT\)](#) can be used to visualize and help plan the pre-imaging observations relative to the NIRSpec observation.
6. The [MPT](#) should be run at several available **APA** to test plan results and estimate the observing time needed to execute the science. [Multiplexing depends on a wide range of factors](#): the catalog density,

extent, source distribution, the slit shape used, source centering constraints, etc. (Multiplexing mostly does not depend on aperture position angles for catalogs distributed isotropically in angle. However, strategies that involve a handful of highly weighted sources may be impacted by the selected angle. The user should test this in any case).

7. Once users have an [MPT](#) plan they are happy with, they click **Create Observation** from the "Plans" pane in MPT to populate the [NIRSpec MOS Mode Template](#) with pointings, MSA configurations and exposure parameters. When [MPT](#) is used to create observations, an "Auto\_Target" is created and added to the APT **Targets folder**.
8. The user should continue to fill out the remaining elements of the [MOS APT Template](#), including the decision to add [Confirmation Images](#).
9. The [NIRSpec MOS](#) observation should ideally not have a specific **APA** special requirement added. However, some use cases may need such constraints. For schedulability, a minimum range of ~20 degrees is recommended. Observation planning for [MOS science](#) in the [MPT](#) will use an **APA**, however this angle is not used outside of the [MPT](#).
10. The NIRSpec spectroscopy observations must have an ON HOLD [special requirement](#) added, with a note - "**ON HOLD for aperture position angle assignment**". Currently, the observer must add this requirement. It is not automatically added in APT.
11. Target Acquisition (TA) in the proposal: Standard Target Acquisition (**MSATA**) reference alignment targets, called *reference stars*, and related TA parameters for the science observations cannot be defined at the proposal submission time because the execution Aperture Position Angle isn't yet assigned. Verification exposure parameters for the **VERIFY\_ONLY** TA option can be defined in the proposal at the Observation level.
12. If you have a use case that requires mosaicking, you should create it with the [Manual Planner](#) and specify the mosaic at the Observation level in APT. (MOS observations created by the [MPT](#) have dithers that have been optimized for the scene and should not also have mosaics.)
13. The [APT Visit Planner](#) should be run to check the scheduling of the MOS visits created by the [MPT](#).

## References

[Karakla, D. et al. 2014, Proc. SPIE 9149](#)

The NIRSpec MSA Planning Tool for multi-object spectroscopy with JWST