

NIRSpec FS Wavelength Ranges and Gaps

A physical gap between the JWST NIRSpec detectors affects fixed slit observations of the "A"-type slits at high resolutions. The affected wavelength ranges and gaps are available for all fixed slits and grating-filter combinations.

Introduction

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JWST's NIRSpec supports [fixed slit spectroscopy](#) with [five small apertures](#) located in the MSA mounting frame.

Table 1 lists the wavelength ranges for the "A"-type NIRSpec fixed slit (**S200A1¹**, **S200A2**, **S400A1**, and **S1600A1**) nominal wavelength ranges.

Table 1. NIRSpec "A"-type fixed slits wavelength ranges in FULL frame

Disperser-filter combination	Nominal resolving power	Wavelength range † (μm)
G140M/F070LP¹	~1,000	0.70-1.27
G140M/F100LP		0.97-1.84
G235M/F170LP		1.66-3.07
G395M/F290LP		2.87-5.10
G140H/F070LP	~2,700	0.81-1.27
G140H/F100LP		0.97-1.82
G235H/F170LP		1.66-3.05
G395H/F290LP		2.87-5.14
PRISM/CLEAR	~100	0.60-5.30

† Wavelength range values presented here are approximate. Note that the nominal spectral ranges for medium and high-resolution dispersers may be shortened due to red-end detector cutoffs. The cutoff wavelengths depend on the target aperture location (slit or shutter). Detailed limits are found on the wavelength ranges and gaps pages for the [IFU](#), [FS](#), and [BOTS](#), and in the [ETC](#). Information on wavelength ranges for [MOS](#), which depend on the position of the shutter in the MSA, can be determined using the [MSAViz](#) Tool.

There is a physical gap between the detectors which affects NIRSpec fixed slits observations, resulting in a gap in the wavelength coverage. The wavelength ranges and wavelength gaps are presented here for all the NIRSpec fixed slits using all of the [grating-filter combinations](#). Note that, except for some of the [BOTS subarrays](#), the available fixed slit [subarrays](#) do not affect wavelength coverage.

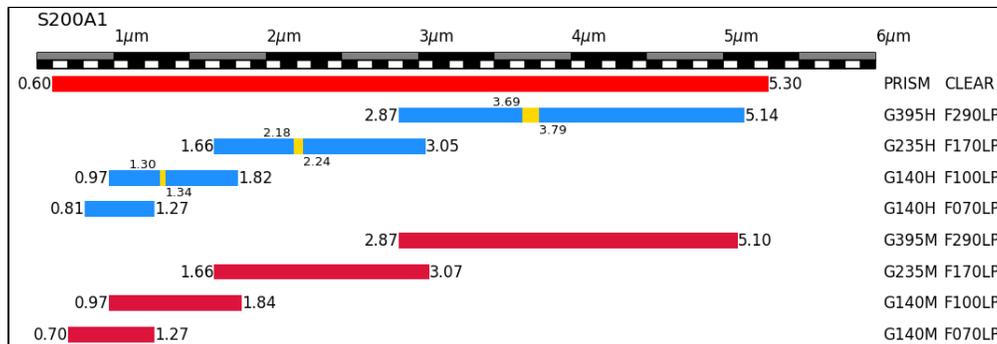
¹ ***Bold italics*** font style is used to indicate parameters, parameter values, and/or special requirements that are set in the APT GUI.

Apertures *S200A1*, *S200A2*, *S400A1*, and *S1600A1*

Figure 1 shows the spectral coverage of the *S200A1* aperture, using the nine available grating-filter combinations. The limits are expressed in units of μm . Gaps in the spectra are shown in yellow. Spectra obtained with the medium-resolution gratings or the *PRISM/CLEAR* do not have a wavelength gap because the complete spectrum will fall onto one detector, NRS1. Note that the exact position of the wavelength gap for the high resolution gratings depends on the grating wheel assembly (GWA) tilt angle and will vary slightly from observation to observation, typically on a scale less than $0.025 \mu\text{m}$ for the prism and $0.01 \mu\text{m}$ for the gratings. The JWST [Exposure Time Calculator \(ETC\)](#) computes these gaps and includes them in plots of count rate or signal-to-noise ratio (SNR) as shown in [Figure 2](#). In this figure, the extracted flux is shown as a function of wavelength for three grating-filter combinations using the *S200A1* aperture.

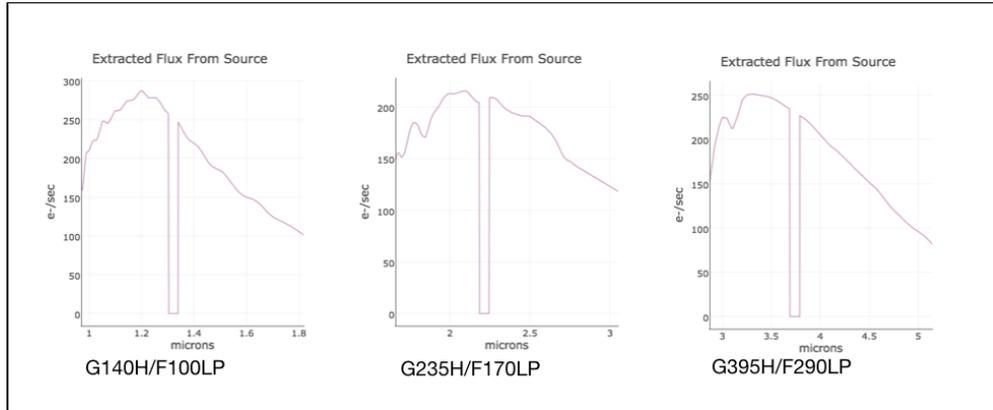
The exact wavelength limits for each slit depends on whether and where cutoffs occur due to detector edges. As seen in Figure 1, detector cutoffs occur at the blue end for the F070LP filter and the G140M and H gratings, and at the red end for the G395M and H grating.

Figure 1. Aperture *S200A1*



The range of available wavelengths for each grating-filter combination using the fixed slit aperture S200A1. Wavelength gaps are shown in yellow and wavelength cutoffs due to detector edges are shown as well. All numbers are given in units of m.

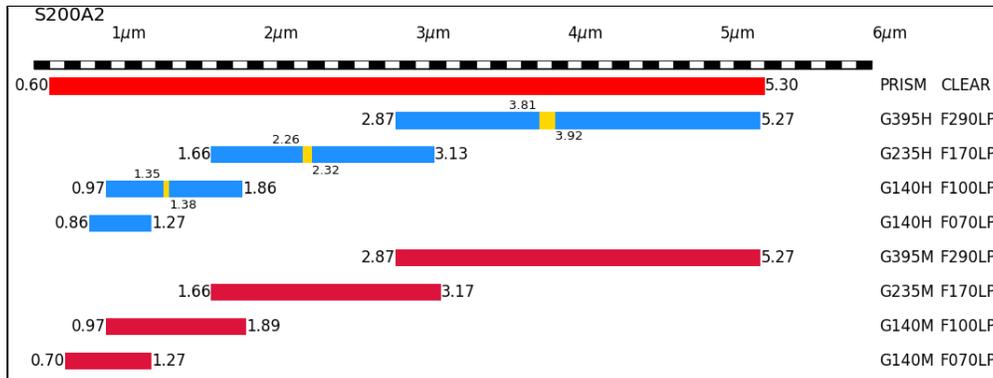
Figure 2. Extracted flux plots from the ETC



Plots of count rate in the ETC, showing the wavelength gap, for the fixed slit aperture S200A1 with three grating-filter combinations. The gaps are clearly marked in each plot.

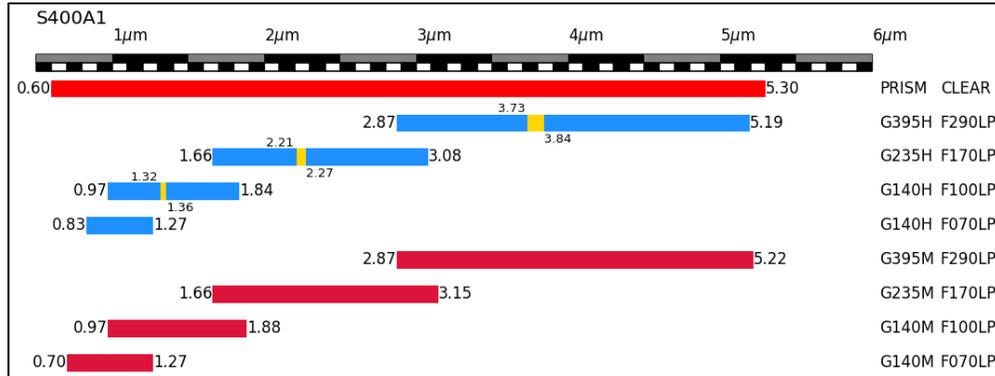
Figures 3, 4, and 5 show the spectral coverage of the **S200A2**, **S400A1**, and **S1600A1** apertures, respectively.

Figure 3. Aperture S200A2



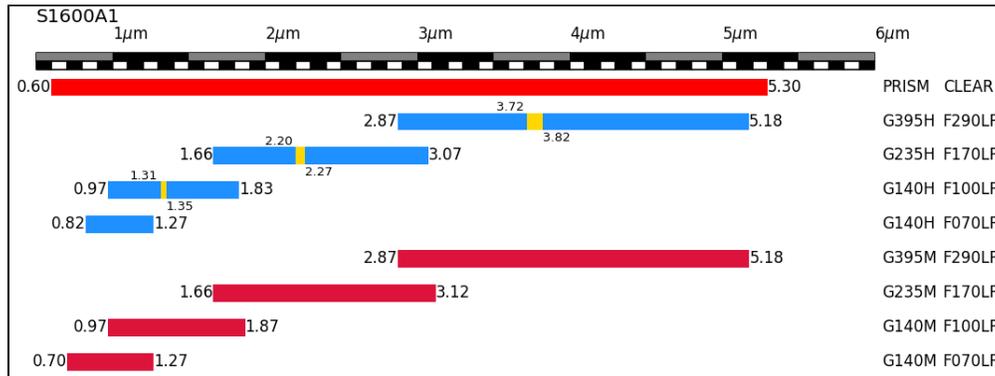
The range of available wavelengths for each grating-filter combination using the fixed slit aperture S200A2. Wavelength gaps are shown in yellow and wavelength cutoffs due to detector edges are shown as well. All numbers are given in units of m.

Figure 4. Aperture S400A1



The range of available wavelengths for each grating-filter combination using the fixed slit aperture S400A1. Wavelength gaps are shown in yellow and wavelength cutoffs due to detector edges are shown as well. All numbers are given in units of m.

Figure 5. Aperture S1600A1



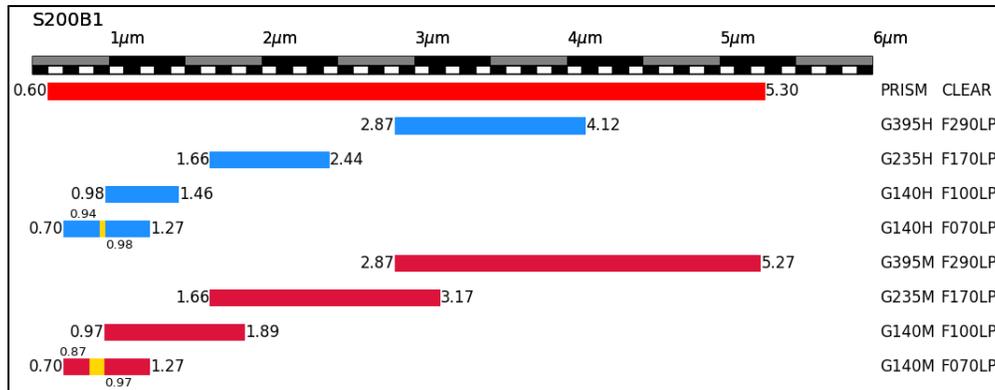
The range of available wavelengths for each grating-filter combination using the fixed slit aperture S1600A1. Wavelength gaps are shown in yellow and wavelength cutoffs due to detector edges are shown as well. All numbers are given in units of m.

✔ The **S200A1** and **S200A2** slits are separated by an amount large enough so that combining the spectra obtained from both slits will provide a means to recover wavelengths lost in the gaps of each of their spectra. Within the FS template in APT, it is possible to specify the slit option "**S200A1 and S200A2**". This will create separate exposure specifications, one for **S200A1**, and one for **S200A2**. These exposures will occur in the same visit. Spectra at wavelengths that fall in the detector gaps are not recoverable in fixed slits spectroscopy mode when using the **S400A1** or **S1600A1** slits.

Aperture S200B1

The **S200B1** aperture is located on the opposite side of NIRSpec's field of view from the "A"-type slits and is there primarily for redundancy. The **S200B1** slit produces a truncated wavelength range when used with high-resolution gratings and as a result, this aperture will not typically be used for science. The **S200B1** slit is also affected by the detector gaps in the **G140H/F070LP** and **G140M/F070LP** grating-filter combinations as shown in Figure 6.

Figure 6. Aperture S200B1



The range of available wavelengths for each grating-filter combination using the fixed slit aperture S200B1. Wavelength gaps are shown in yellow and wavelength cutoffs due to detector edges are shown as well. All numbers are given in units of m.

Last updated

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