STScI | SPACE TELESCOPE SCIENCE INSTITUTE

JWST Master Class 2019

Integral Flux Unit Module

Space Telescope Science Institute
San Martin Drive, Baltimore MD 21218

IFUs Master Class APT/ETC Worksheet (NGC 6240)

NIRSpec Target Acquisition

1) What is the Visit Splitting Distance for NGC 6240?
   55 arcsec
2) What TA method is appropriate?
   WATA
3) What is the name of the 2nd closest 2MASS star?:
   2MASS J16530044+0223201 = WISEA J165300.43+022
4) How far is this star from the science target?:
   49 arcsec (May require PA constraint)
5) Will this star saturate with FULL readout?
   Yes (J = 14.2 Vega mag)
6) What readout mode is required for TA not to saturate this star?
   SUB32
7) What is the parallax of this star? Hint: https://gea.esac.esa.int/archive/
   0.89 mas
8) How large is the proper motion of this star? Hint: P.M. < 60 x parallax
   <53 mas
9) Is this star suitable for the type of TA you selected?
   Yes for WATA, No for MSATA
10) What Acquisition Filter should you select?
    F140X or CLEAR would give S/N > 20. No saturation occurs for SUB32 readout.
11) What Acquisition Readout Pattern should you select?
    NRS
12) What values does this yield for the Acq Exposure Time parameters?
    3 Groups, 1 Integration/Exp, 1 Integration, 0.215 second Total Exposure Time
13) What is the SNR for TA in F140X with these parameters and the above 2MASS star?
    SNR = 75.6

NIRSpec Science Parameters

1) Which Dither Type(s) is/are appropriate for an extended source?
   4-Point Dither, Cycling or Sparse Cycling
2) What Grating/Filter should we use for kinematics of the H2 1-0 S(0) 2.1 μm line?
   G235H/F170LP
3) What Readout Pattern is recommended for the source flux?
   NRSIRS2RAPID
4) What Exposure Parameters will give adequate S/N for our science goal?
   7 Groups/Int, 1 Integration
5) Is Leakcal advisable?
   No. there are only ~6 stars in the MSA aperture that may fall in open shutters,
   A 4-point dither can be used to reject them. The target is bright enough that diffuse leakage from the sky background and the edges of the galaxy should be negligible.
6) Should any Leakcal exposure be Dithered?
   If a Leakcal is taken, it does not need to be dithered to measure any diffuse background.
   A full set of dithers would double the Science exposure time.
7) Is Autocal necessary?
   No. Autocals are not necessary for most science cases.

Continue to MIRI Target Acquistion on next page...

MIRI Target Acquisition

1) What is the Visit Splitting Distance for NGC 6240?
   55 arcsec
2) Is TA required for the science?
   No, if we don't mind an offset of 0.34" (1-sigma).
3) What is the name of the closest 2MASS star?:
   2MASS J16530119+0224138 = USNO-A2.0-0900-09058900
4) How far is this star from the science target?
   35 arcsec. Note that it is too far for MIRI TA, but we continue our checks anyway...
5) Would this star saturate with FAST readout? Hint: Check photometry in NED.
   No (IRAC 5.8 microns Fnu = 8.9 mJy)
6) What is the proper motion of this star? Hint: APT fixed target resolver tells you.
   (PMRA, PMDec) = (-3.84E-4 sec/yr, -9.6E-3 "/yr)
7) How far has the star moved in Declination since 2015 November?
   38 mas
8) What Acquisition Filter should be selected for this star?
   F560W would give S/N > 20. No saturation occurs...
9) What Acquisition Readout Pattern should you select?
   FAST
10) How many Acquisition Groups/Int did you select?
    8
11) What values does this yield for the Acq Exposure Time parameters?
    1 Integration/Exp, 1 Integration, 22.2 second Total Exposure Time

Continue to MIRI MRS Parameters on next page....

MIRI MRS Parameters

1) What Primary Channel should be chosen?
   ALL, if we want to observe in all 4 channels
2) Which Dither Type is best?
   4-Point, to optimize PSF sampling.
3) What should the Dither be 'Optimized For':
   Extended Source. This small dither pattern gives best overlap for the 4 channels.
   Note that 'Dither Direction' can only be 'NEGATIVE' for this choice.
4) Should Simultaneous Imaging be used?
   Yes, if the data volume constraints are not exceeded. This will improve astrometry, even though there are no science targets of interest in the adjacent blank field.
5) What channel and Wavelength sub-band does the peak of the 8 micron PAH fall in?
   CH2 SHORT
6) How many exposures are specified in the Exposure Parameters Window?
   9 total, 3 per each wavelength sub-band (IMAGER, MRSLONG, MRSSHORT)
7) What Readout Pattern is recommended for the source flux?
   SLOW
8) What Exposure Parameters will give adequate S/N for our science goal?
   7 Groups/Int, 1 Integration, 1 Exposure gives S/N=115-205 at 8 microns.
9) Is there any reason to use different exposure parameters for the MRSLONG and MRSSHORT detectors?
   Check for saturation at long wavelengths, since the spectrum is quite red.
10) Is a dedicated background required for the science?
    Yes. Thermal background is an issue for the longest wavelengths.
11) Where can the background be located to make best use of the simultaneous imaging?
    Place the galaxy in the MIRI imaging region. Watch out that it doesn't saturate!