



16471 - COS FUV LP5 Calibration: Gain Maps

Cycle: 28, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Christian Johnson (PI) (Contact)	Space Telescope Science Institute	chjohnson1@stsci.edu
Dr. William J. Fischer (CoI)	Space Telescope Science Institute	wfischer@stsci.edu
Dr. Marc Rafelski (CoI)	Space Telescope Science Institute	mrafelski@stsci.edu
Dr. Bethan Lesley James (CoI)	Space Telescope Science Institute - ESA - JWST	bjames@stsci.edu

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
5A	DARK DEUTERIUM NONE	COS COS/FUV S/C	1	20-Sep-2021 13:00:14.0	yes

1 Total Orbits Used

ABSTRACT

This program uses the deuterium lamp to illuminate the regions of the detector being used to collect spectra for lifetime position 5 (LP5) operations. The data obtained will be used to create gain maps of the detector. Because of the strongly varying intensity of the lamp as a function of wavelength, G130M/1309 data will be obtained for Segment A, and G160M/1600 will be used for Segment B.

OBSERVING DESCRIPTION

This program will obtain spectra from the deuterium lamp with enough counts to permit the construction of a gain map covering the region where the spectra fall. In order to efficiently illuminate the two segments, the G130M/1309 setting will be used for Segment A, and G160M/1600 will be used

Proposal 16471 (STScI Edit Number: 0, Created: Monday, September 20, 2021 at 12:00:14 PM Eastern Standard Time) - Overview for Segment B. Both segments can safely remain on with either setting.

Gain maps for this program will be taken immediately after the initialization of LP5 operation (expected to start on Oct. 4, 2021).

The plan for this program includes a single one-orbit visit:

*Visit 5A will be taken at LIFE_ADJ=2 after the start of LP5 operations. The operating HV is expected to be 167/169 for segments A and B, respectively. Due to limitations with mechanism movements the LP5 gain maps are actually placed at the same position as the LP2 gain maps. The counts extend high enough on the detector to cover the LP5 region.

The procedure for collecting this data in each visit is given below. Note that this procedure has been modified from that used in previous cycles to add the initial exposure to explicitly set the aperture position and HV.

* Take an exposure at LP1 to set up the aperture position and HV. This can also be used to measure the gain at LP1.

* Adjust the HV values

* Adjust the aperture in the cross dispersion direction so that the deuterium lamp will illuminate the appropriate region on Segment A when using G130M/1309.

* Take a 440 second deuterium lamp exposure using both detector segments.

* Adjust the aperture to a second cross-dispersion location to obtain additional coverage on Segment A and take another 440 second deuterium lamp exposure.

* Adjust the aperture in the cross dispersion direction so that the deuterium lamp will illuminate the appropriate region on Segment B when using G160M/1600.

* Take a 440 second deuterium lamp exposure using both detector segments.

* Adjust the aperture to a second cross-dispersion location to obtain additional coverage on Segment B and take another 440 second deuterium lamp exposure.

* Return the aperture to the nominal home position

Note that because TRANS resets its aperture zero point when FCA exposures are taken, the aperture is explicitly moved using "QESIPARM XSTEPS", as was done in Program 13970, 14439, 14519, 14941, 15534, 15772, etc.

For reference, the soft and hard stops for the apertures are listed below. All aperture moves should be kept within these ranges.

MEB1:

SOFT STOPS = -275 to 275

HARD STOPS = -282 to 285

MEB2:

SOFT STOPS = -275 to 275

HARD STOPS = -284 to 283

Since the initial exposure of each visit uses the FCA_LP1 aperture position, LAPXSTP = -153. Thus all XAPER values are relative to that position.

Summary table:

Visit	LP	Grating/Segment	Y Position	LAPXSTP	XAPER
5A	2**	G130M/A	1	-213	-60
5A	2**	G130M/A	2	-267*	-114

5A	2**	G160M/B	1	-225	-72
5A	2**	G160M/B	2	-267*	-114

* Limited to be within the soft stops

** Same mechanism position as LP2 but will be used for LP5.

Note that the gain map programs in earlier cycles typically used 400 second exposures. This was increased to 440 seconds starting with the October visits in Cycle 27 (Program 15772) in order to account for a decrease in count rates seen in recent cycles.

Proposal 16471 - 5A: Within ~1 week after start of LP5 operation (5A) - COS FUV LP5 Calibration: Gain Maps

Visit	<p>Proposal 16471, 5A: Within ~1 week after start of LP5 operation (5A) Mon Sep 20 17:00:14 GMT 2021</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: S/C, COS, COS/FUV</p> <p>Special Requirements: BETWEEN 04-OCT-2021:00:00:00 AND 11-OCT-2021:00:00:00; PARALLEL</p> <p><i>Comments: This visit collects data at LP5. It uses the currently expected HV values for LP5 normal modes (167/169)</i></p>
Diagnostics	<p>(5A: Within ~1 week after start of LP5 operation (5A)) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU</p>

Proposal 16471 - 5A: Within ~1 week after start of LP5 operation (5A) - COS FUV LP5 Calibration: Gain Maps

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	G130M/130 9 Deuterium Exposure - Set up at LP1	DEUTERIUM	COS/FUV, TIME-TAG, FCA	G130M 1309 A	CURRENT=MEDIUM; BUFFER-TIME=196; FP-POS=1; SEGMENT=BOTH; LIFETIME-POS=L P1			125 Secs (125 Secs) [==>]	[1]
<p><i>Comments: Short exposure to set aperture to LP1, which is near the center of the aperture range used in this program. It also sets the HV to the LP1 values.</i></p>									
2	Adjust HV to expected LP5 values	DARK	S/C, DATA, NONE			SAA CONTOUR 31; SPEC COM INSTR ELHVADJPROP; QASISTATES COS FUV HVNOM HVNOM; QESIPARM ENDC TSA 167; QESIPARM ENDC TSB 169; QESIPARM SEGMENT AB		39 Secs (39 Secs) [==>]	[1]
<p><i>Comments: Adjust the HV to the expected LP5 values (167/169).</i></p> <p><i>Since the HV is decreasing, rather than increasing, exposure time = 39 seconds</i></p>									
3	Aperture Adjustment for Segment A	NONE	COS, ALIGN/APER		XAPER=-60			0.0 Secs (0 Secs) [==>]	[1]
<p><i>Comments: Put the aperture in the appropriate position to illuminate a portion of the LP2/Blue Modes region of the detector when illuminating Segment A with G130M/1309.</i></p> <p><i>NOTE: the LP5 gain maps are taken at the same aperture position as the LP2/Blue Modes maps.</i></p> <p><i>FCA LAPXSTP value at LP1 is -153</i> <i>Desired LAPXSTP value for FCA to illuminate Segment A with G130M/1309 at Position 1 for LP2 is -213</i></p> <p><i>Therefore, XAPER is set to -213 - -153 = -60</i></p>									
4	G130M/130 9 Deuterium Exposure 1	DEUTERIUM	COS/FUV, TIME-TAG, FCA	G130M 1309 A	CURRENT=MEDIUM; BUFFER-TIME=165; FP-POS=1; SEGMENT=BOTH; LIFETIME-POS=L P1			440 Secs (440 Secs) [==>]	[1]
<p><i>Comments: Deuterium exposure optimized for Segment A. FP-POS=1 was chosen because previous observations show that it has slightly more counts than the other FP-POS values.</i></p>									

Proposal 16471 - 5A: Within ~1 week after start of LP5 operation (5A) - COS FUV LP5 Calibration: Gain Maps

5	Aperture Adjustment 2 f or Segment A	NONE	COS, ALIGN/APER	XAPER=-114	QESIPARM XSTEP S -54	0.0 Secs (0 Secs)	[1]
<p>Comments: Put the aperture in the appropriate position to illuminate a portion of the LP2/Blue Modes region of the detector when illuminating Segment A with G130M/1309. NOTE: LP5 gain map position is the same as for LP2/Blue Modes.</p> <p>FCA LAPXSTP value at LP1 is -153 Desired LAPXSTP value for FCA to illuminate Segment A with G130M/1309 at Position 2 for LP2 is -267</p> <p>Therefore, XAPER is set to -267 - -153 = -114. *HOWEVER*, because of the TRANS rules, the "QESIPARM XSTEPS -54" [(-114 - -60) = -54] Special Requirement is necessary to move the aperture to the correct location.</p>							
6	G130M/1309 Deuterium Exposure 2	DEUTERIUM	COS/FUV, TIME-TAG, FCA	G130M 1309 A	CURRENT=MEDIUM; BUFFER-TIME=165; FP-POS=1; SEGMENT=BOTH; LIFETIME-POS=LPI	440 Secs (440 Secs)	[1]
<p>Comments: Deuterium exposure optimized for Segment A. FP-POS=1 was chosen because previous observations show that it has slightly more counts than the other FP-POS values.</p>							
7	Aperture Adjustment 1 f or Segment B	NONE	COS, ALIGN/APER	XAPER=-72	QESIPARM XSTEP S 42	0.0 Secs (0 Secs)	[1]
<p>Comments: Put the aperture in the appropriate position to illuminate a portion of the LP2/Blue Modes region of the detector when illuminating Segment B with G160M/1600. NOTE: LP5 gain map position is the same as for LP2 Blue Modes.</p> <p>FCA LAPXSTP value at LP1 is -153 Desired LAPXSTP value for FCA to illuminate Segment B with G160M/1600 at Position 1 for LP2 is -225</p> <p>Therefore, XAPER is set to -225 - -153 = -72. *HOWEVER*, because of the TRANS rules, the "QESIPARM XSTEPS 42" [(-72 - -114) = +42] Special Requirement is necessary to move the aperture to the correct location.</p>							
8	G160M/1600 Deuterium Exposure 1	DEUTERIUM	COS/FUV, TIME-TAG, FCA	G160M 1600 A	CURRENT=MEDIUM; BUFFER-TIME=165; FP-POS=4; SEGMENT=BOTH; LIFETIME-POS=LPI	440 Secs (440 Secs)	[1]
<p>Comments: Deuterium exposure optimized for Segment B. FP-POS=4 was chosen because previous observations show that it has slightly more counts than the other FP-POS values.</p>							
9	Aperture Adjustment 2 f or Segment B	NONE	COS, ALIGN/APER	XAPER=-114	QESIPARM XSTEP S -42	0.0 Secs (0 Secs)	[1]
<p>Comments: Put the aperture in the appropriate position to illuminate a portion of the LP2/Blue Modes region of the detector when illuminating Segment B with G160M/1600. NOTE: LP5 gain map position is the same as LP2 Blue modes.</p> <p>FCA LAPXSTP value at LP1 is -153 Desired LAPXSTP value for FCA to illuminate Segment B with G160M/1600 at Position 2 for LP2 is -280, but the aperture soft stop is at -275 and we don't want to exceed that value when including the 5 step overshoot. To leave some pad, I will set it to match the G130M exposure (-267).</p> <p>Therefore, XAPER is set to -267 - -153 = -114. *HOWEVER*, because of the TRANS rules, the "QESIPARM XSTEPS -42" [(-114 - -72) = -42] Special Requirement is necessary to move the aperture to the correct location.</p>							

Proposal 16471 - 5A: Within ~1 week after start of LP5 operation (5A) - COS FUV LP5 Calibration: Gain Maps

10	G160M/160 DEUTERIUM 0 Deuterium Exposure 2	COS/FUV, TIME-TAG, FCA	G160M 1600 A	CURRENT=MEDIUM; M; BUFFER-TIME=165; FP-POS=4; SEGMENT=BOTH; LIFETIME-POS=LPI	440 Secs (440 Secs)	[==>]	[1]
<i>Comments: Deuterium exposure optimized for Segment B. FP-POS=4 was chosen because previous observations show that it has slightly more counts than the other FP-POS values.</i>							
11	Return Aperture to Nominal Position	COS, ALIGN/APER	XAPER=387	QESIPARM XSTEP S 501	0 Secs (0 Secs)	[==>]	[1]
<i>Comments: FCA LAPXSTP value at LP1 is -153, but we want to return the aperture to its nominal position at PSA LP4 (+234), or XAPER = (234 - -153) = 387. *HOWEVER*, because of the TRANS rules, the "QESIPARM XSTEPS +501" [(387- -114) = +501] Special Requirement is necessary to move the aperture to its correct location.</i>							

