16468 - COS FUV LP5 Calibration: Dispersion Solutions

Cycle: 28, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Rachel Plesha (PI) (Contact)	**Space Telescope Science Institute**	**rplesha@stsci.edu**
Dr. William J. Fischer (CoI) (Contact)	Space Telescope Science Institute	wfischer@stsci.edu
Dr. Marc Rafelski (CoI) (Contact)	Space Telescope Science Institute	mrafelski@stsci.edu
Dr. Bethan Lesley James (CoI) (ESA Member) (Contact)	Space Telescope Science Institute - ESA	bjames@stsci.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) EPSILON-ERI	COS/FUV COS/NUV	3	03-Dec-2020 07:00:15.0	yes
02	(1) EPSILON-ERI	COS/FUV COS/NUV	2	03-Dec-2020 07:00:16.0	yes

5 Total Orbits Used

ABSTRACT

The goal of this program is to obtain external data to allow us to derive FUV dispersion solutions for COS/FUV G130M grating at LP5.

The G130M dispersion solutions are 1st order polynomials and the goal of this program is to

1) derive updated dispersion coefficients and

2) derive updated zero points.

The emission-line target epsilon Eridani is used. This program is split into two visits (3 orbits and 2 orbits) so that we avoid a single 4 orbit visit. It is instead designed such that Visit 01 will obtain G130M/FUVA 1291, 1300, and 1327 data, and visit 02 will obtain G130M/FUVA 1318 and 1309 data. Wavelength solutions for G130M/FUVB (1291) will be derived using data of AV75 from the LP5 spectral resolution program, 16467, as was done at LP4. G130M cenwave 1222 will remain at LP4, so we will not be calibrating it at LP5.

The exposure times, and the number of orbits requested, are driven by the number of counts needed to achieve good correlations. The Eps Eri spectrum contains many chromospheric emission lines across the FUV region, but Lyman alpha is too bright for G130M FUVB. The Eps Eri spectrum needs to achieve at least S/N ~5 (~25 counts) in the peak of the weaker emission lines to allow good cross correlation for the primary cenwaves. Different weak features across the difference G130M cenwaves were used to calculate the exposure times needed and, it was determined that a full orbit exposure will give us the needed S/N needed.

OBSERVING DESCRIPTION

This program is essentially the same program as 15365 (COS FUV Dispersion Solutions at LP4) with the exception that all G160M and G130M/1222 exposures were removed as those settings will not operate at LP5.

The primary goal of this proposal is to obtain spectra at the central and extreme standard cenwaves for G130M cenwaves at FP-POS=3 with eps Eri to determine the dispersion vs focus relation and initial zero points for G130M/FUVA. We will also obtain spectra of the intermediate cenwaves to derive zero points for these settings.

Double BOA NUV ACQ/IMAGE target acquisitions will be performed to ensure the best possible target centering for the zero-point measurement. We confirmed this sequence of target acquisitions is 2 to 3 times more accurate than having just a single NUV ACQ/IMAGE from looking at the ACQs performed in program 14909 (COS/FUV Wavelength Calibration at Lifetime Position 3) and 15265. Additionally, this double ACQ/IMAGE serves as a buffer for any gyro 3 late GS ACQs.

For eps Eri, we have designated the following lines as fiducials for our correlations:

G130M FUVA 1360.3 (primary) or 1357.7 (secondary)

According to the current ETC, the peak count rates in our fiducial lines, and exposure times to obtain 25+1-sigma = 30 counts are :

G130M FUVA 1360.3 -> 0.0175 counts/s, or for 30 counts, we need -> 1715s

G130M FUVA 1357.7 -> 0.011 counts/s, or for 30 counts, we need -> 2728s

Visit

Proposal 16468, G130M/FUVA Extreme -- Epsilon Eri (01) Thu Dec 03 12:00:16 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%

Comments: The G130M/c1291 and c1327 Eps Eri observations must be able to achieve 25 peak counts (~100 total) in the following faint lines (per FP):

G130M FUVA 1360.3 (primary) or 1357.7 (secondary)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	EPSILON-ERI	RA: 03 32 55.8450 (53.2326875d)	Proper Motion RA: -975.17 mas/yr	V=3.73	Reference Frame: ICRS
	Alt Name1: HD22049	Dec: -09 27 29.73 (-9.45826d)	Proper Motion Dec: 19.49 mas/yr		
		Equinox: J2000	Parallax: 0.31094"		
			Epoch of Position: 2000		
			Radial Velocity: 16.376 km/sec		

Comments: This from SIMBAD: eps Eri -- Variable of BY Dra type

ICRS coord. (ep=J2000) : 03 32 55.84496 -09 27 29.7312 (Optical) [1.84 1.75 90] A 2007A&A...474..653V
Proper motions mas/yr : -975.17 19.49 [0.21 0.20 0] A 2007A&A...474..653V
Radial velocity : V(km/s) 16.376 [0.0001] / z(spectroscopic) 0.000055 [0.000000] / cz 16.38 [0.00] (Opt) A 2018A&A...616A...7S -- note this is updated from 16.43 in the LP4 program.

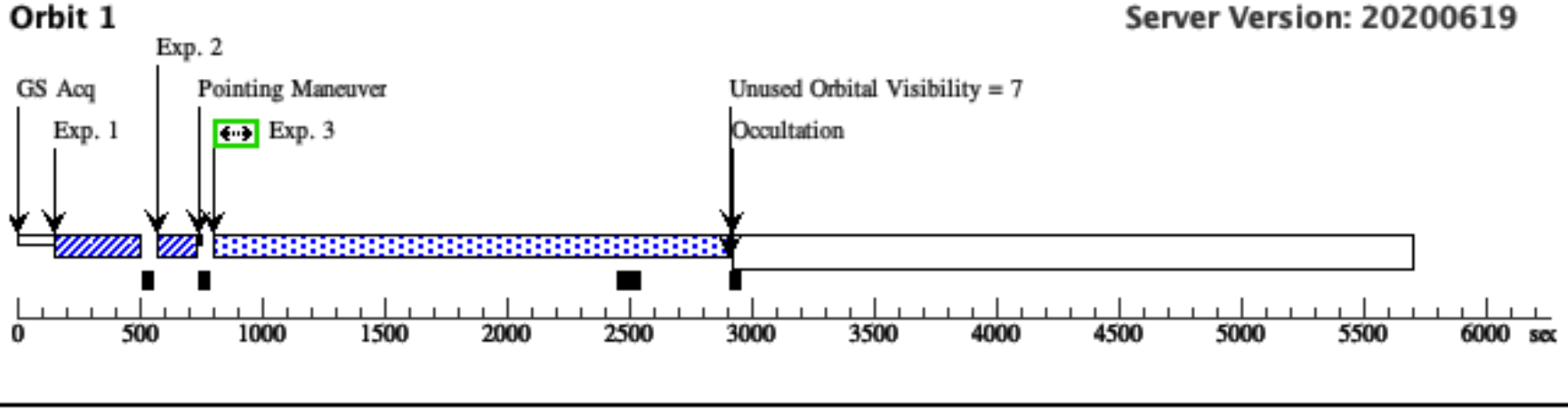
Spectral type: K2Vk: C 2006AJ....132..161G

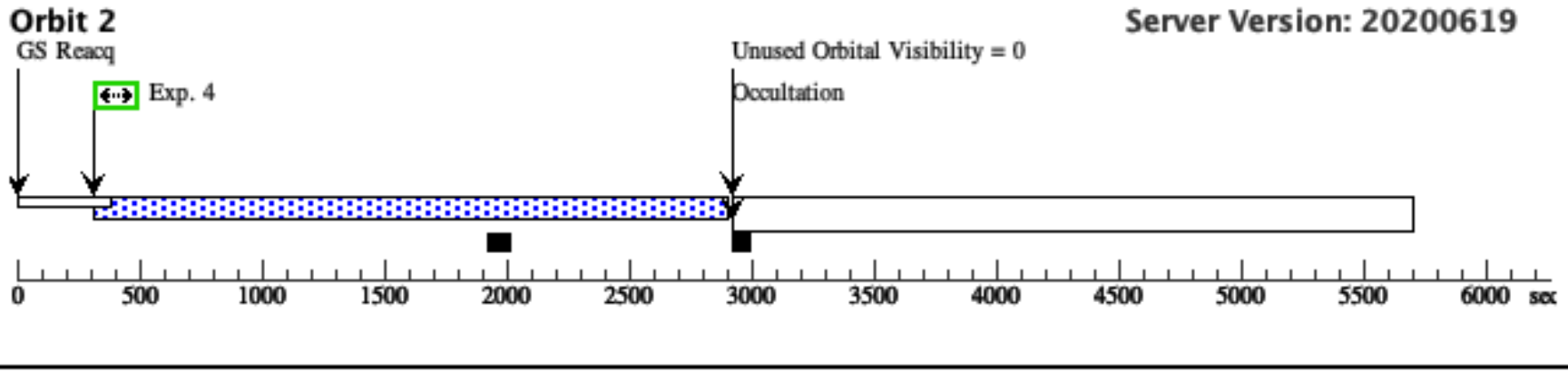
U 5.19 [~] C 2002yCat.2237....0D
B 4.61 [~] C 2002yCat.2237....0D
V 3.73 [~] C 2002yCat.2237....0D
R 3.00 [~] C 2002yCat.2237....0D
I 2.54 [~] C 2002yCat.2237....0D
J 2.23 [~] C 2002yCat.2237....0D
H 1.75 [~] C 2002yCat.2237....0D
K 1.67 [~] C 2002yCat.2237....0D
Category=EXT-STAR
Description=[K V-IV]
Extended=NO

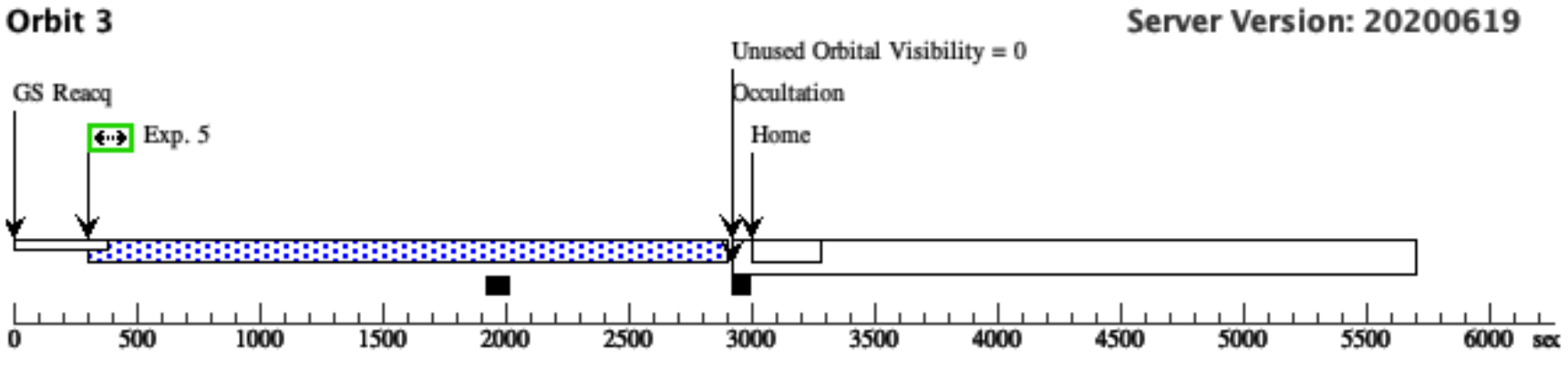
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	BOA+MIRRORB ACQ/IMAGE (COS.ta.1472302)	(1) EPSILON-ERI	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				25 Secs (25 Secs) *[==>]*	***[1]***
	Comments: In Visit 01 of 13650, this target gave the following results for a 20 s exposure (COS.ta.615844) *-> Bck subtracted counts in second image = 2986 ; S/N = 54.64* *We want S/N = 60 (3600 counts) so ET = 3600./2986. = 24 seconds* *This is a K2Vk star, we use a standard model in the ETC Run. We use the U-band magnitude in the ETC as it gives the brightest result to show that it is safe. (Brightest Pixel - 29.725)* *We use the 13650 exposure time as it agrees with an actual COS ACQ/IMAGE.*								
2	2nd BOA+MIRRORB ACQ/IMAGE to optimize centering (COS.ta.1472302)	(1) EPSILON-ERI	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				25 Secs (25 Secs) *[==>]*	***[1]***
	Comments: Identical to TA of previous exposures. See 01.001 for full comments. We do this twice to ensure the best possible centering with BOA+B.								
3	C1300-3 (FUVA-only) (COS.sp.1470227)	(1) EPSILON-ERI	COS/FUV, TIME-TAG, PSA	G130M 1300 A	SEGMENT=A; FP-POS=3; BUFFER-TIME=1500; LIFETIME-POS=LP5			1926 Secs (1926 Secs) *[==>]*	***[1]***
	Comments: See comments in 01.004								
4	C1291-3 (FUVA-only) (COS.sp.1470227)	(1) EPSILON-ERI	COS/FUV, TIME-TAG, PSA	G130M 1291 A	SEGMENT=A; FP-POS=3; BUFFER-TIME=1500; LIFETIME-POS=LP5			2466 Secs (2466 Secs) *[==>]*	***[2]***
	*Comments: BT=2/3 * 4242 = 2828. So, anything less is ok. To be safe, we'll use 1500s.* *Our goal here is to get 25 counts in the peak of the following (weak) lines: G130M FUVA 1360.3 or 1357.7* *The peak count rates in the ETC are :* *1360.3 -> 0.025 counts/s* *1357.7 -> 0.0125 counts/s* *According to the current ETC, the peak count rates in our fiducial lines, and exposure times to obtain 25+1-sigma = 30 counts are :* *G130M FUVA 1360.3 -> 0.025 counts/s, or for 30 counts, we need -> 1200s* *G130M FUVA 1357.7 -> 0.0125 counts/s, or for 30 counts, we need -> 2400s* *So, we meet the goal for both lines with the ~2500 s exposures in 01.003-01.005 and 02.003-02.004.*								
5	C1327-3 (FUVA-only) (COS.sp.1470227)	(1) EPSILON-ERI	COS/FUV, TIME-TAG, PSA	G130M 1327 A	SEGMENT=A; FP-POS=3; BUFFER-TIME=1500; LIFETIME-POS=LP5			2466 Secs (2466 Secs) *[==>]*	***[3]***
	Comments: See comments in 01.004								

Orbit Structure







Visit

Proposal 16468, G130M/FUVA Middle -- Epsilon Eri (02) Thu Dec 03 12:00:17 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%

Comments: The G130M/c1309 Eps Eri observations must be able to achieve 25 peak counts (~100 total) in the following faint lines (per FP):

G130M FUVA 1360.3 (primary) or 1357.7 (secondary)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	EPSILON-ERI	RA: 03 32 55.8450 (53.2326875d)	Proper Motion RA: -975.17 mas/yr	V=3.73	Reference Frame: ICRS
	Alt Name1: HD22049	Dec: -09 27 29.73 (-9.45826d)	Proper Motion Dec: 19.49 mas/yr		
		Equinox: J2000	Parallax: 0.31094"		
			Epoch of Position: 2000		
			Radial Velocity: 16.376 km/sec		

Comments: This from SIMBAD: eps Eri -- Variable of BY Dra type

ICRS coord. (ep=J2000) : 03 32 55.84496 -09 27 29.7312 (Optical) [1.84 1.75 90] A 2007A&A...474..653V
Proper motions mas/yr : -975.17 19.49 [0.21 0.20 0] A 2007A&A...474..653V
Radial velocity : V(km/s) 16.376 [0.0001] / z(spectroscopic) 0.000055 [0.000000] / cz 16.38 [0.00] (Opt) A 2018A&A...616A...7S -- note this is updated from 16.43 in the LP4 program.

Spectral type: K2Vk: C 2006AJ....132..161G

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B 4.61 [~] C 2002yCat.2237....0D
V 3.73 [~] C 2002yCat.2237....0D
R 3.00 [~] C 2002yCat.2237....0D
I 2.54 [~] C 2002yCat.2237....0D
J 2.23 [~] C 2002yCat.2237....0D
H 1.75 [~] C 2002yCat.2237....0D
K 1.67 [~] C 2002yCat.2237....0D
Category=EXT-STAR
Description=[K V-IV]
Extended=NO

Exposures

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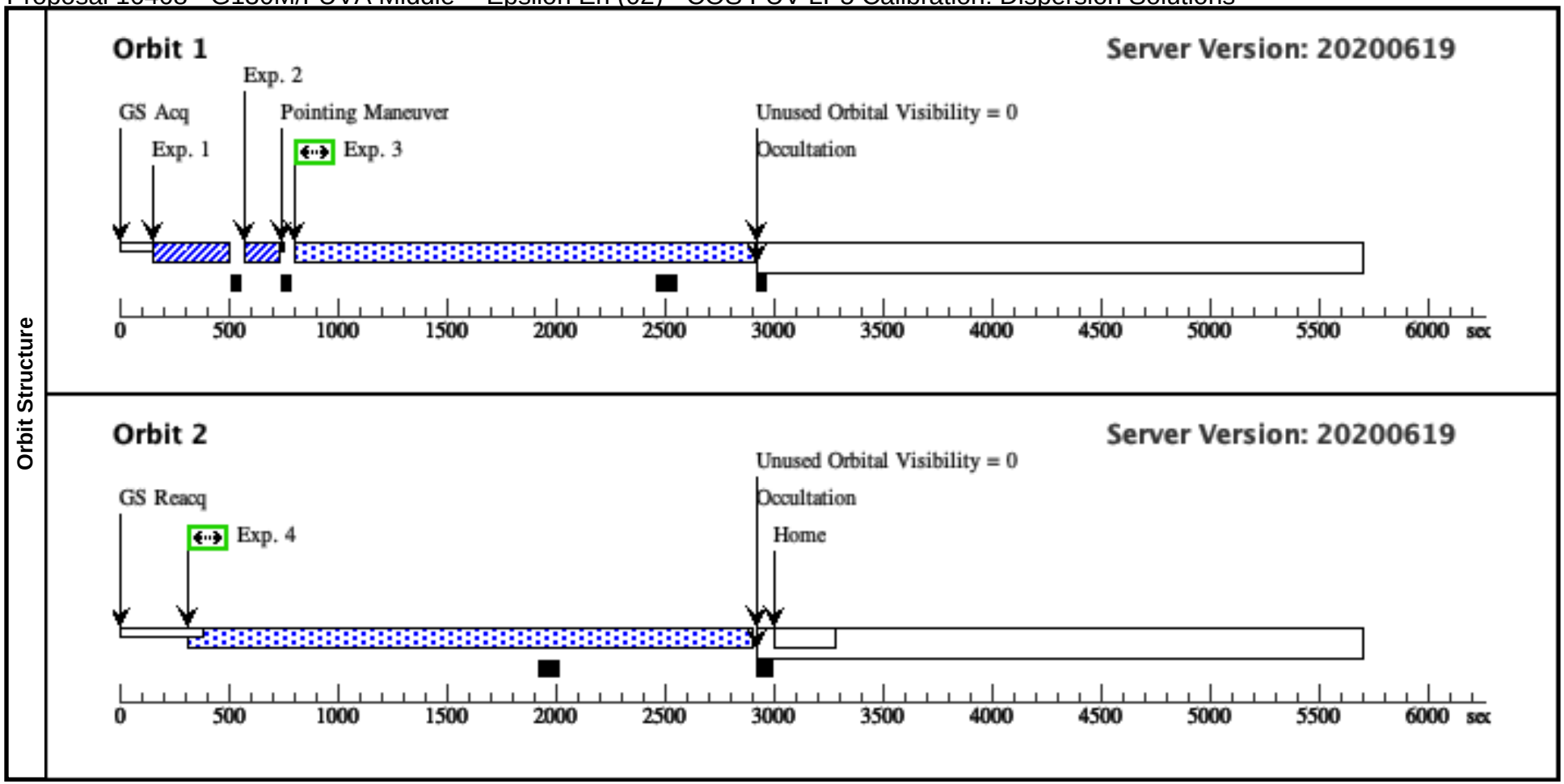
1	BOA+MIRRORB ACQ/IMAGE (COS.ta.1472302)	(1) EPSILON-ERI	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				25 Secs (25 Secs) *[==>]*	***[1]***
Comments: Identical to TA in visit 01. See 01.001 for full comments.									
2	2nd BOA+MIRRORB ACQ/IMAGE to optimize centering (COS.ta.1472302)	(1) EPSILON-ERI	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				25 Secs (25 Secs) *[==>]*	***[1]***
Comments: Identical to TA in visit 01. See 01.001 for full comments. We do this twice to ensure the best possible centering with BOA+B.									
3	C1318-3 (FUVA-only) (COS.sp.1470227)	(1) EPSILON-ERI	COS/FUV, TIME-TAG, PSA	G130M 1318 A	SEGMENT=A; FP-POS=3; BUFFER-TIME=1500; LIFETIME-POS=LP5			1926 Secs (1926 Secs) *[==>]*	***[1]***
Comments: See comments in 01.004									
4	C1309-3 (FUVA-only) (COS.sp.1470227)	(1) EPSILON-ERI	COS/FUV, TIME-TAG, PSA	G130M 1309 A	SEGMENT=A; FP-POS=3; BUFFER-TIME=1500; LIFETIME-POS=LP5			2466 Secs (2466 Secs) *[==>]*	***[2]***
Comments: See comments in 01.004									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Pointing Maneuver
Unused Orbital Visibility = 0
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Exp. 3
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2000
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3000
3500
4000
4500
5000
5500
6000
sec
Orbit 2
Server Version: 20200619
Unused Orbital Visibility = 0
GS Reacq
Occultation
Exp. 4
Home
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1000
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2000
2500
3000
3500
4000
4500
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5500
6000
sec