15483 - COS FUV G140L/800 Flux Calibration and Cross-Dispersion Profile

Cycle: 25, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) WD0308-565 DARK	COS/FUV COS/NUV S/C	1	23-May-2018 19:04:44.0	yes

1 Total Orbits Used

ABSTRACT

We obtain spectra of WD 0308-565, a spectrophotometric hot subdwarf standard, at all FP-POS for the calibration of the new cenwave G140L/800 at lifetime position 4. The new mode, to be offered starting in Cycle 26, is designed to allow observations from 800 to 1950 A in a single setting with COS/FUV detector segment A, with segment B turned off. The mode is designed to reduce the astigmatic height of the spectrum at wavelengths in the 912-1100 A wavelength region, allowing for decreased detector noise and correspondingly better S/N at these wavelengths compared to

G140L/1280 segment B. These observations will be used to determine the flux calibration and cross-dispersion profile.

OBSERVING DESCRIPTION

The hot subdwarf WD 0308-565 will be observed at all four FP-POS. Since the new mode has not yet been implemented, we will use the TEST row to specify the parameters required for the observations.

The program is designed as follows:

1. Perform an ACQ/IMAGE to acquire target WD 0308-565.
2. Use special commanding to redefine the TEST wavelength setting to the G140L/800 OSM rotation position (STEP=1615) and absolute focus position (FOCUS=-1487) determined from the focus sweep (PID 15451). Resolver positions are RES1=35178 and RES2=39803.
3. Take spectra at all four FP-POS. Exposure time per FP-POS (362.5 seconds) is calculated following the reasoning below.
4. Use special commanding to restore the TEST row using ACTION RESTORE.

Requirements for Flux Calibration:

The requirement for G140L/1105 is 2% relative accuracy. For G140L/800, this is not possible below 1100 A due to the low throughput. Our goal is instead to achieve 10% relative accuracy below 1100 A. If we allocate 5% of the error budget to random photometric errors (the other 5% being allocated for TDS residuals and the effects of small wavelength offsets on the photometric calibration), this requires S/N of 20 over 100 pixels, or S/N = 5 per resel.

Requirements for 2D Spectral Profiles:

The requirement for the profiles is currently S/N = 50/resel in the combined FP-POS so that enclosed energy contours can be defined at the 99% level. Re-analysis of error propagation suggests that 0.5% relative photometric accuracy (for profile uncertainty only, part of the overall error budget) can be achieved with S/N = 30/resel in the combined FP-POS at the long wavelength edge of G140L/800, near 1700 A. (This implies S/N > 30 between 1100 and 1700 A.) Simulations performed by artificially decreasing the exposure time of the LP4 profiles (PID 14910; PI Rafelski), re-deriving profiles and traces with the truncated exposures, and re-calibrating the high S/N data with the profiles derived from the low S/N data show that the RMS difference in flux between the typical and modified calibrations is < 1%.

Synthesis of Requirements and Justification of Exposure Time:

Coincidentally, achieving S/N = 5 below 1100 A requires 1450 s and yields S/N > 30 over the entire range above 1100 A. This satisfies the S/N

requirements for the profiles for wavelengths greater than 1100 A and the flux calibration requirements across the whole segment. Achieving S/N = 20-30 for wavelengths below 1100 A would take an unreasonable amount of time (20,000 s) and lead to a substantial decrease of the detector lifetime. Therefore the program will be 1450 s, or 362.5 s per each of the four FP-POS. Profiles at short wavelengths will be derived by calculating enclosed energy contours in heavily binned cross-sections of the 800 footprint.

Scheduling:
We request the data by the end of June. Schedulability is set to 100; WD 0308-565 is available throughout the period.

----SPECIAL REQUESTS:----
1. Please turn off calibration for the COS/FUV exposures.
2. Please disassociate all exposures.
3. Please set minwave = 800 for the COS/FUV exposures.
SQL is used to meet the above requests.
In case 1 qexposure.control_id is modified.
In case 2 qeassociation records are deleted.
In case 3 qelogsheet.minwave is modified.
Please see G. Chapman / M. Reinhart.

Visit

Proposal 15483, Visit 01, implementation Wed May 23 23:04:46 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: S/C, COS/FUV, COS/NUV

Special Requirements: SCHED 100%

Comments: Program is requested to execute before 01-JUL-2018

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD0308-565 Alt Name1: J03094790-5623494	RA: 03 09 47.9200 (47.4496667d) Dec: -56 23 49.41 (-56.39706d) Equinox: J2000	Proper Motion RA: 0.018141 sec of time/yr Proper Motion Dec: 0.0643 arcsec/yr Epoch of Position: 2000	V=14.14	Reference Frame: ICRS

Comments: The co-ordinates are from earlier COS FUV calibration proposals for the same target, e.g. 14854.
Category=CALIBRATION
Description=[PHOTOMETRIC]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acquisition (1162492)	(1) WD0308-565	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				45 Secs (45 Secs) *[==>]*	*[1]*
	Comments: 45 s exposure time gives S/N ~ 60.								
2	Special Command -TEST - Redefine CENWAVE= 800 with focus position - 1487 absolute	DARK	S/C, DATA, NONE			SPEC COM INSTR ELOSMTEST; QESIPARM ACTION TEST; QESIPARM GRATING G140L; QESIPARM CENTWAVE 800; QESIPARM STEP 1 615; QESIPARM RES1 3 5178; QESIPARM RES2 3 9803; QESIPARM FOCUS 4 -1487		14 Secs (14 Secs) *[==>]*	*[1]*
	Comments: Special commanding to overwrite the G140L/TEST settings with the G140L/800 settings. OSM1 should be set to position of 1615, +17 steps from the G140L/1105 position of 1598. This shifts the Segment A coverage to 815-1948 A. (Segment B is off by default.) FOCUS is at -1487, the absolute focus determined for G140L/800.								
3	G140L/FUVA/800 (1163805)	(1) WD0308-565	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=236; SEGMENT=A; LIFETIME-POS=LP4			362.5 Secs (1450 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]*
	Comments: Buffer time per the ETC is 354(2/3) = 236 seconds.* *SQL is required to set qelogsheet.minwave to 800, to bypass calibration and to delete qeassociations.*								
4	Special Command to restore TEST row	DARK	S/C, DATA, NONE			SPEC COM INSTR ELOSMTEST; QESIPARM ACTION RESTORE		14 Secs (14 Secs) *[==>]*	*[1]*
	Comments: Special commanding to restore test row.								

Orbit Structure