



Cycle 23 COS FUV Internal/External Wavelength Scale Monitor

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21 July, 2017

ABSTRACT

We report on the results of the monitoring of the COS FUV wavelength scale zero-points during Cycle 23 with program PID1443. The full monitoring sequence includes the G130M/1096-1222-1291-1317, the G160M/1577-1623 and the G140L/1105-1280 configurations. All data were taken at LP3.

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1. Introduction

This program monitors the offset between the internal and external wavelength scales. This offset is referred to as "DELTA" in the wavelength dispersion solution reference file and corrects for the shift between the WCA and PSA in TV03 versus the shift between the WCA and PSA on orbit: $(WCA - PSA)_{TV03} - (WCA - PSA)_{orbit}$. Analysis of TV data indicated that this DELTA (offset) is cenwave and FPPOS independent for a

*Operated by the Association of Universities for Research in Astronomy, Inc., for the National
Aeronautics and Space Administration*

particular grating, but it is grating dependent (Oliveira et al. 2010, ISR2010-06). To monitor this effect, this routine calibration program observes the extreme cenwaves for all FUV gratings as well as the “blue modes” at G130M/1096-1222.

2. Execution

This program executes once per year. In Cycle 23, 3 external orbits were used to observe the SMC calibration target AV75 at LP3 in program PID14437. FPPOS=2&4 and FPPOS=1&3 were used in sequence for the G130M and G160M data to mitigate gain-sag effects. FPPOS=3 was used for G140L. V01 executed on March 17, 2016 and failed due to a GS acquisition issue (HOPR83980). To guard against this problem, an ACQ/SEARCH was included in the repeat visit (V51) that executed successfully on June 22nd, 2016. This change should be carried forward when using AV75 to avoid future failures.

3. Analysis and Results

Archival STIS/E140M data were cross-correlated against the COS G160M, G140L and G130M/1291-1327 &1222 (FUVA) monitoring data using known ISM absorption lines present along the sight line to AV75 (Sonnentrucker et al. 2013, ISR2013-06). For G130M/1096 &1222 (FUVB), cross-correlation of the COS data was performed against a line-of-sight model for the wavelength range below the STIS cut-off. Within the 1σ error goals, the offsets derived from this monitoring program (see Table 1) are consistent with expectations for LP3 (COS/FUV wavelength scales: 5.7-7.5 pix for G130M, 5.8-7.2 pix for G160M and 7.5-12.5 pix for G140L; see Oliveira et al. 2010, ISR 2010-06).

Grating/cenwave	Offset range (pix) [*]	Grating/cenwave	Offset range (pix) [*]
G130M/1096	-2.5,+7.3	G160M/1577	-3.4; +5.2
G130M/1222	-4.1, +4.0	G160M/1623	-7.0; +3.8
G130M/1291	-5.9, +1.2	G140L/1105	-2.9,+2.5
G130M/1327	-5.8, +4.1	G140L/1280	-3.8,+3.4

** Offset range to apply so the COS ISM absorption lines coincide with the same STIS ISM absorption lines.*

4. Continuation Plan

This program was continued in Cycle 24 under PID14855 using the same target and structure for a total of 3 external orbits.

References

Oliveira C., Beland S., Keyes C. , & Niemi S., 2010, Instrument Science Report COS 2010-06, “SMOV COS FUV Wavelength Calibration”

Sonnentrucker P., Roman-Duval J., Ely J., Oliveira C., Proffitt C., & Aloisi A., 2013, Instrument Science Report COS 2013-06, “COS FUV Dispersion Solution Verification at the New Lifetime Position”