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Instrument Science Report COS 2016-12(v1)

Cycle 22 COS NUV Internal/External Wavelength Scale Monitor

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20 September, 2016

ABSTRACT

We report on the results of the monitoring of the COS NUV wavlength scale zero-points during Cycle 22. Select cenwaves for all NUV gratings were monitoring in this program with a structure that remained unchanged since Cycle 21.

Contents

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 indicates that this DELTA (offset) is cenwave and FPPOS independent for a particular grating, but it is grating dependent (Oliveira et al. 2010, ISR2010-05). To

monitor this effect, this calibration program takes data for all NUV gratings and seect cenwaves that span the full NUV range.

2. Execution

This program is comprised of 3 visits of 1-orbit each to monitor the wavelength scales of the following settings: G185M/2010, G225M/2217, G285M/2676, and G230L/2635/2950/3000 (FP- POS=3). External target HD6655 was used, as in previous cycles. V01 and V03 executed successfully on Feb 19 and Sep 8, 2015. In V02, (May 24), the target acquisition sequence moved the target away from the center of the COS aperture causing failure due to a pair of bad GS. V52, a repeat of V02, executed successfully on Nov 27, 2015 (HOPR81649).

3. Analysis and Results

A cross-correlation analysis was performed between archival STIS/E1230M data and the COS data using known ISM absorption lines present along the sight line to HD6655 (see Sonnentrucker et al. 2012, ISR2013-06). For those settings that have no overlap with the STIS E230M data (last 3 rows of table below), offsets were measured relative to the same epoch of Cycle 19 COS monitoring program 12722. The COS specifications for NUV wavelength accuracies are 1.7 – 2.4 pix for G185M, 2.3 – 3.2 pix for G225M, 2.3 – 3.5 pix for G285M, and 2.0 – 3.7 pix for G230L. We find that the measured offsets are within the 1σ error goals for all COS/NUV wavelength scales (see Oliveira et al. 2010, ISR 2010-06) for V03 and V52. The larger offsets (~8pix) measured for V01 were not repeatable over the cycle and hint at a potential slight miscentering of the target in that visit only.

Visit	Stripe	G185M	G225M 2217	G285M 2676	G230L 2635	G230L 2950	G230L 3000
Feb. 19 (V01)	A B C	No STIS overlap	... … -5.0	-5.0 -6.2 -5.5	… -7.0 …	… -6.0 …	… -7.5 …
Sept. 8 (V03)	A B C	No STIS overlap	... … +3.4	+2.5 +2.0 +2.2	… +2.5 …	… +3.0 …	… +2.0 …
Nov. 27 (V52)	A B C	No STIS overlap	... … +3.3	+1.6 +2.3 +2.0	… +1.0 …	… +2.0 …	… +1.3 …
COS-COS	Comparisons with Cy19						
Visit (V01)	Stripe	G185M 2010	G225M 2217	G285M 2676	G230L 2635	G230L 2950	G230L 3000
Feb . 19 (V01)	A B C	... -7.9 -6.7	-7.5 -7.0 -7.5	-5.9 -5.3 -6.0	… -7.7 …	… -8.1 …	… -6.9 …
Sept. 8 (V03)	A B C	... +2.3 +1.5	+1.0 +1.5 +2.5	+0.5 +2.0 +1.5	… +2.0 …	… +1.5 …	… +1.8 …
Nov. 27 (V52)	A B C	... +0.5 +0.7	+0.3 +0.5 +1.5	+0.5 +0.8 +1.0	… +0.5 …	… +0.5 …	… +0.3 …

4. Continuation Plan

This program was continued in Cycle 23 under PID 14440 and reduced to a total of 2 orbits separated by 6 months. This reduction by 1 visit of 1 orbit was made to avoid chronic issues and associated bad GS pairs within the May visit. Data from that epoch were not deemed necessary for the monitoring.

Change History for COS ISR 2016-12

Version 1: 20 September 2016 – Original Document

References

Oliveira C., Beland S., Keyes C. , & Niemi S., 2010, Instrument Science Report COS 2010-05, "SMOV COS NUV 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"