



Cycle 22 COS Target Acquisition Monitor

Steven V. Penton¹

¹ Space Telescope Science Institute, Baltimore, MD

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ABSTRACT

COS program 13972 was designed to verify that COS Target Acquisitions (TA) were performing nominally during Cycle 22, and to check if any of the TA patchable constants present in the COS flight software (FSW) need updating. All observations in 13972 were performed at the FUV lifetime position three (LP3) and at the nominal NUV position. COS exposures obtained in HST program 14035 (HST Cycle 22 Focal Plane Calibration [SI-FGS Alignment]) were also used in this analysis. There are three COS TA modes, FUV spectroscopic, NUV spectroscopic, and NUV imaging. This program verified that all three modes were behaving nominally in Cycle 22, and determined that no SIAF, subarray, or FSW parameter updates were required at this time.

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1. Introduction

There are 3 modes of COS Target Acquisition (TA); NUV imaging, NUV spectroscopic, and FUV spectroscopic. There are 4 COS TA (ACQ) procedures; ACQ/IMAGE, PEAKD, PEAKXD, and SEARCH. The ACQ/PEAKD and SEARCH step the telescope through dwell patterns on the sky. As long as the target light falls correctly within the TA detector sub-arrays, ACQ/PEAKD and SEARCH will continue to nominally assist in TA. ACQ/IMAGE and PEAKXD procedures rely on the sub-arrays and patchable constants in the COS flight software (FSW) which assist in target centering. In

both ACQ/IMAGE and PEAKXD, the internal wavelength calibration lamp is flashed to locate the center of the wavelength calibration aperture (WCA). From this location, the center of the science aperture (SA) in use can be predicted by applying the FSW constant that give the SA offset compared to the WCA center. For ACQ/IMAGE, the offset is in both detector X (along-dispersion, AD) and Y (cross-dispersion, XD). For ACQ/PEAKXD, which uses dispersed light, this offset is only in the Y (XD) direction. HST program 13972 verifies that the TA subarrays are properly used and re-measures the actively used WCA-to-SA offsets to monitor the performance of COS TAs.

ACQ/IMAGE has four combinations of two SAs, the Primary Science Aperture (PSA) and the Bright Object Aperture (BOA), and two mirror modes, MIRRORA and MIRRORB. Each combination is commonly used, and has a slightly different WCA-to-SA offset in both X (AD) and Y(XD), which must be verified. Each COS grating has a different WCA-to-SA XD offset. BOA spectroscopic TAs are not supported for COS, so program 13972 only verifies the WCA-to-PSA offsets that are used in ACQ/PEAKXD. Each COS grating has a different offset, as do each of the FUV lifetime positions (LP). This program only verifies the NUV LP1 and FUV LP3¹ position offsets.

COS centering requirements are based upon the wavelength accuracy requirements in the AD, and flux and resolution optimization in the XD. The strictest NUV requirements are [AD,XD] = [0.041, 0.3]" , while for the FUV they are [AD,XD] = [0.106, 0.3]" . The XD requirement is that all TAs center to within ± 0.3 " with a 1σ goal of ± 0.1 " .

The initial target pointing is based upon definitions of the physical locations of the COS apertures in the Science Instrument Aperture File (SIAF). NUV and FUV (LP3) entries will also be verified in this program.

2. Conclusions

All COS TA modes were verified to be operating well within the requirements during HST Cycle 22. In addition, all COS SIAF NUV (LP1) and FUV (LP3) entries were determined to be accurate to the needs of COS operations, and all TA and science mode NUV and FUV (LP3) subarrays were determined to be correctly defined. Complete details of program 13972 and the Cycle 22 TA parameter verification can be found in a separate ISR.

Change History for COS ISR 2016-09

Version 1: 20 September, 2016 – Original Document

¹The COS FUV channel was moved to LP3 on February 09, 2015.