



Cycle 23 COS FUV Dark Monitor Summary

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ABSTRACT

Here we summarize the Cycle 23 FUV Dark Monitoring Program for the Cosmic Origin Spectrograph (COS) on the Hubble Space Telescope (HST) covering dates November 2015 to October 2016. We give an overview of the calibration plan and summary for this calibration program.

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1. Introduction

This program is designed to perform routine monitoring of FUV XDL detector dark rate. The main purpose is to look for evidence of a change in the dark rate, both to track on-orbit time dependence and to check for a developing detector problem. Results from this program are used to update the ETC. Every week, five 22-minute exposures were taken with the shutter closed for a total of 260 orbits.

2 Analysis and Results

After screening for SAA passages, the dark rate of each observation was measured in 25 second intervals from a region that excluded the noisy edges of the active area. Dark rates were measured vs. time and summed darks for each visit were constructed from all non- SAA impacted events.

The overall trend in the dark rate has been relatively constant for Segments A and B. This cycle there was no baseline jump behavior seen in past cycles for segment FUVA. (Figure 1). Additionally, both segments show individual observations and portions of observations that significantly vary from the baseline dark rate. Both of these effects appear to have some correlation with the solar cycle, though direct cause and effect have not yet been determined.

Due to the lack of a measurable trend and the extreme variability seen in observations, we adopt an ETC estimate for the dark-rate that corresponds to the 95% level in the probability distribution function determined from dark measurements over a period of the previous 6 months to 1 year.

3 Summary

The COS FUV XDL detector dark rate continues to follow former trends. The FUVB detector shows a relatively constant dark rate trend where as FUVA continues to experience baseline increase and a slow decrease back to nominal as it has in the past. The extra orbits for extra exposures show no significant difference in the dark rate for different high voltage settings.

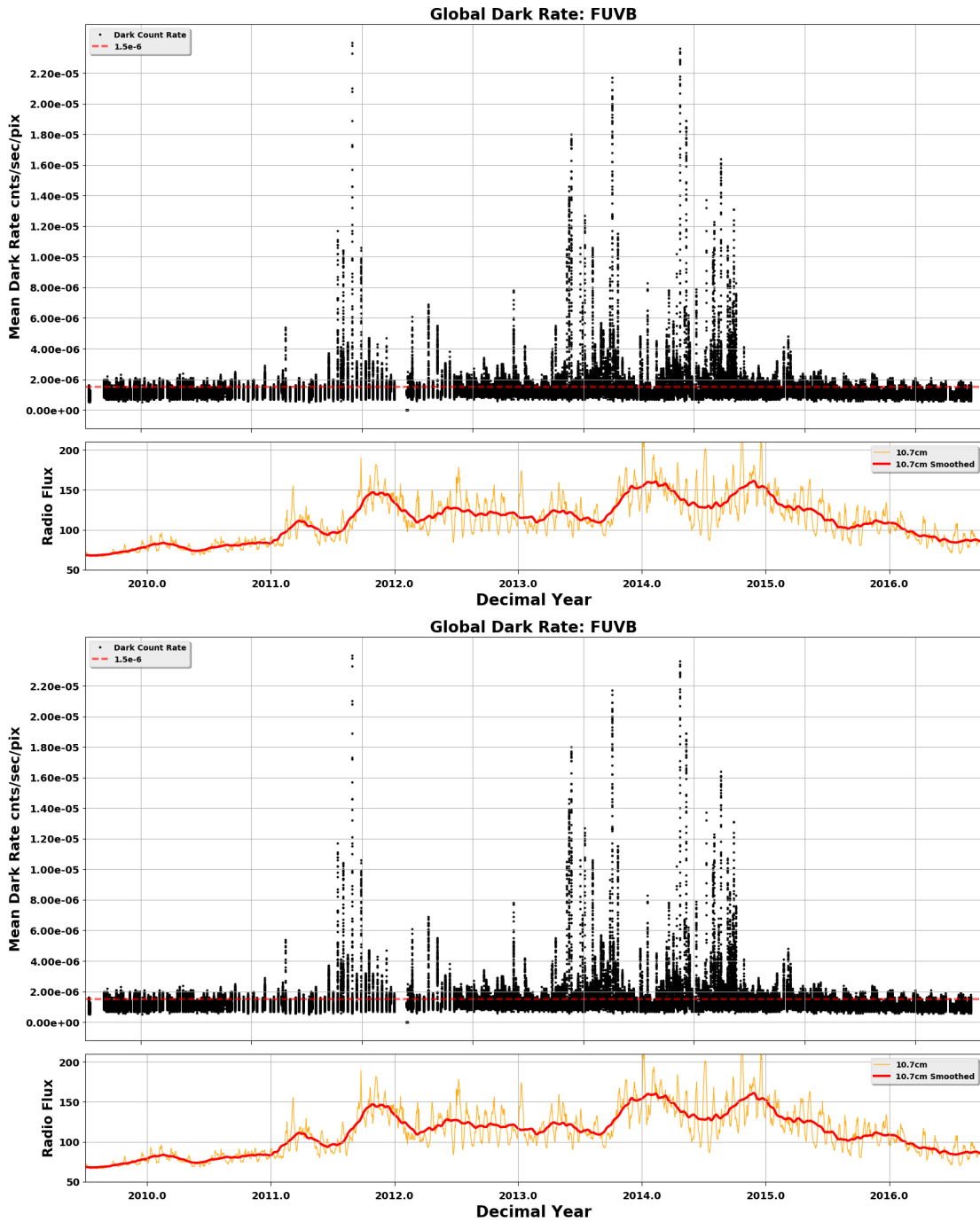


Figure 1.: COS/FUV dark rates on FUVB (top) and FUVB (bottom) as a function of time, from COS installation through Cycle 23. The first subplot shows the measured dark-rate in 25 second increments throughout every observation. The groupings of points represent individual visits, and demonstrate that the variability within a given exposure is sometimes extremely large. The red dashed line displays a fiducial dark rate of 1.5×10^{-6} cnts/pix/s. The bottom panels display the 10.7 cm emission tracking the solar cycle.