



# Cycle 22 Characterization of HV Change Effect on the COS/FUV Sensitivity

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## ABSTRACT

*Program 13971 was a special calibration program executed in Cycle 22 in order to characterize the effect of the COS FUV detector high voltage on the sensitivity. Previous changes to the high voltage settings led us to believe that an increase in the high voltage values caused an increase in sensitivity in addition to the expected increase in gain. This program was designed to measure that effect and determine whether it is a function of incident wavelength and/or position on the detector.*

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## 1. Introduction

Measurements of the COS FUV Time Dependent Sensitivity (TDS) seem to show that increasing the detector high voltage (HV) leads to a slight increase in sensitivity in addition to the expected change in the modal gain (Sana et al 2015). Because this effect is so small, however, the normal TDS measurements are not able to provide a definitive answer or determine the magnitude.

In order to quantify this effect to the ~1% level, a special calibration program was designed to collect spectra of an external target at a variety of commanded HV levels and measure the relationship between the voltage and the sensitivity as a function of wavelength and/or detector pixel. No mechanisms were moved while the voltage was changed in order to minimize any mechanical variations; extra TAGFLASH exposures were added to monitor drifts from other sources.

## 2. Execution

Data were obtained during three visits in program 13971:

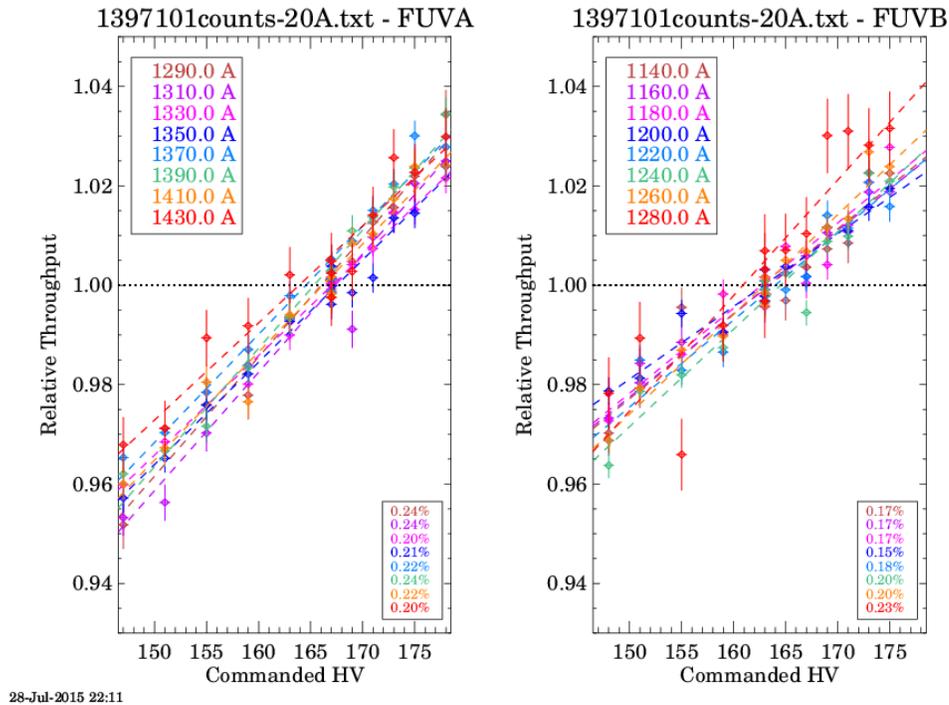
- Visit 01 contained 13 exposures of the target using G130M/1291, and executed on February 10, 2015 – the day after the move to LP3.
- Visit 02 ran on April 16, 2015, and obtained 10 exposures with G160M/1623.
- Visit 03 is comprised of 12 exposures with the G140L/1280 setting and executed on April 19, 2005.

All three visits used WD0308-565 as the target. Each one used a different grating in order to help disentangle changes as a function of wavelength and those as a function of detector pixel. Commanded high voltage levels covered 147 to 178 on Segment A, and 148 to 175 on Segment B. The lowest HV values were chosen to be low enough that some events would fall below the pulse height threshold; the highest were the maximum values used to date on orbit. In order to measure repeatability, one HV value was repeated in each visit.

All three visits executed as expected, and all of the data files were complete.

## 3. Preliminary Analysis

At this time, only preliminary analysis of the data has been completed, but some trends are evident. As shown in Figure 1, there is an approximately linear dependence of throughput on the commanded high voltage. The slope of this effect is slightly different on the two detector segments. Further analysis will be necessary to understand whether this dependence is a function of wavelength, detector position, or both. Those details will be presented in a separate ISR when a more complete analysis has been performed.



**Figure 1:** Relative Throughput as a function of Commanded High Voltage (HV levels are shown) for 20 Å regions of the detector for data from Visit 01. This preliminary analysis shows that there is a clear dependence of throughput on the commanded detector high voltage. There also appears to be a slight dependence on the wavelength range, although this could instead be due to changes in the position on the detector. The wavelength ranges at the ends of each segment show more scatter due to edge effects that have not been completely corrected.

## Change History for COS ISR 2016-08

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### References

H. Sana et al., 2015, Instrument Science Report COS 2015-06, “Summary of COS Cycle 21 Calibration Program”