COS Calibration Platform Lamp Turn On Spike Evaluation

Date:	March 7, 2003
Document Number:	COS-11-0040
Revision:	Initial Release
Contract No.:	NAS5-98043
CDRL No.:	

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Letter	ECO No.	Description	Check	Approved	Date
-		Initial Release			

Original Release Name	Date
Drawn: S. Osterman	3-7-03
Reviewed:	
Approved:	

THE UNIVERSITY OF COLORADO

At Boulder

The Center for Astrophysics and Space Astronomy

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Size	Code Indent No.	Document No.	Rev
A		COS-11-0040	-
Scale: N/A			

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1. INTRODUCTION

This document describes the testing performed on the calibration platform to evaluate the possibility that the calibration platform lamps would produce a bright transient output spike when initially turned on.

A measurable spike was observed with the Deuterium flat field lamps, but none was noted using the Pt/Ne spectral calibration lamps. The D2 spike will not be bright enough to trigger the local or global count rate protections as described below.

2. TEST SETUP

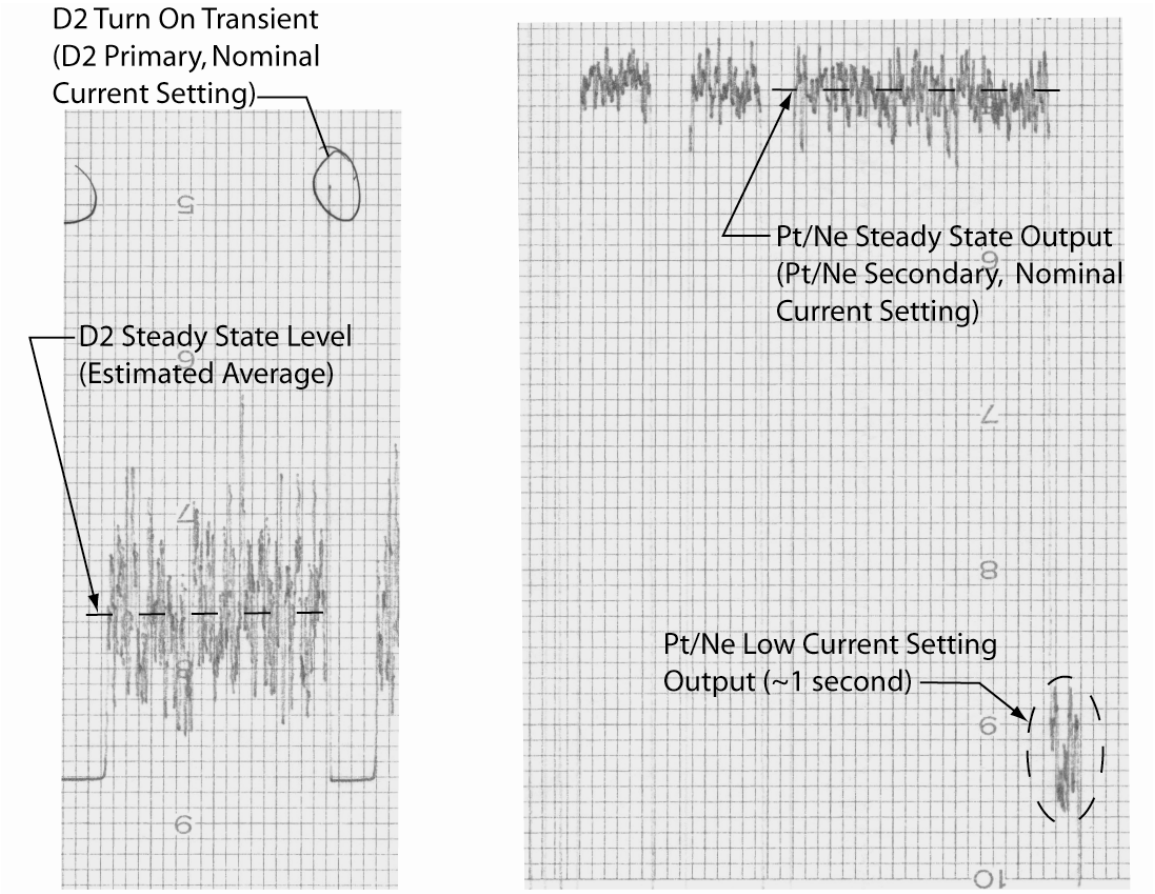
During vacuum alignment of the calibration platform, light from the platform was reflected off of a GSE fold mirror and directed through a narrow band filter (145nm band center) to a 200um pinhole at the nominal location of the aperture block (taking into account differences in the optical path). The flux passing through the pinhole was measured using a Hamamatsu R6836 photomultiplier tube. The signal from this was fed to a Hamamatsu C6465 pulse amplifier and discriminator, and the output from that was then directed to a HP 5302A counter. To measure the transient pulse, the signal was fed in parallel to a Tektronix TVC 501 time to voltage converter whose output was recorded on a Houston Instruments 108620 chart recorder.

The lamps were cycled on and off several times at all three current settings, and the output spike compared to the steady state signal as recorded on the chart paper, and as measured by the HP 5302A counter.

3. DATA AND ANALYSIS

No transient was observed in the Pt/Ne lamps. The figure on the following page appears to show a 1 second pause at a lower signal level, but this was a start at the low setting followed by a switch to the nominal setting one second later. Subsequent starts were directly to the nominal setting.

D2 lamps produced transient pulses ranging from 2 to 5 times the steady state output were observed with a duration of less than 0.3 seconds on all start ups. (0.3 seconds is approaching the response limit of the chart recorder, so this is probably an upper limit.) In the worst case, this transient would yield a 1 second averaged startup count rate of 2.5 times the nominal, or 1.2 times when integrated over 10 seconds. Samples of the chart recorder data are shown on the following page.



D2 Turn On Event
Primary Lamp,
Nominal Current

Pt/Ne Turn On Event (3 Cycles
Shown), Secondary Lamp,
Nominal Current Setting

Sample Chart Recorder Data. Note that time
increases to the left in these plots.

Given the signal to noise ratio for the measurements, the measured data are only approximate, and are summarized below:

Observed Turn On Data for D2 Lamps

Lamp ID	Lamp Setting	Steady State Count Rate (R_S)	Steady State Signal Height (H_S)	Transient Signal Height (H_T)
D2-1	Min	360	0.7	2.7
D2-1	Nom	670	1.2	3.8
D2-1	Max	1850	2.4	4.6
D2-2	Min	540	0.8	3.3
D2-2	Nom	970	1.5	4.2
D2-2	Max	3000	3.3	5.3

Best fit to the steady state counts was of the form

$$Countrate = 20.6253 + 408.537H_S + 149.097H_S^2$$

Using this fit, the countrates for the turn on transient can be estimated as shown below, with the ratios of steady state to transient count rates and the impact on 1 and 10 second integrations tabulated.

Modeled Turn-On Count Rate,Total Counts, and Integrated Count Rate Impact

Lamp ID	Lamp Setting	Steady State Count Rate (Rs)	Modeled Transient Count Rate (Rt)	Estimated transient duration (sec)	Transient to Steady Ratio (Rt/Rs)	Integrated Transient Counts (0.3 Sec)	1 second total scale factor	10 second total scale factor
D2-1	Min	360	2211	0.3	6.1	663	2.5	1.2
D2-1	Nom	670	3726	0.3	5.6	1118	2.4	1.1
D2-1	Max	1850	5055	0.3	2.7	1516	1.5	1.1
D2-2	Min	540	2992	0.3	5.5	898	2.4	1.1
D2-2	Nom	970	4367	0.3	4.5	1310	2.1	1.1
D2-2	Max	3000	6374	0.3	2.1	1912	1.3	1.0

What the last two indicate are the excess counts that would appear in the first 1 or 10 seconds of data. For example, if we anticipated 10,000 counts per second with the

primary deuterium lamp on the nominal setting, then we could anticipate 25,000 counts in the first second, and 110,000 counts in the first 10 seconds (as opposed to 10,000 and 100,000 for steady state operations, respectively)

4. CONCLUSIONS

Pt/Ne lamp do not display any transient turn on behavior and will not impact detector operations.

The D_2 lamps to display a short increase in output at startup, but this is not large enough to impact detector operations. The nominal settings for FUV flat field spectra are low current with the G160M grating for the B segment, and medium current with the G130M grating for flat fielding the A segment. The target count rate is 10,000 counts per second per segment in the steady state. If this is the case, then we may see as many as 25,000 counts in the first second of operation for either setup. However, the current trip settings for the FUV detector count rate protection requires 60,000 counts per second over a 10 second moving boxcar average (600,000 counts total), and there is no possibility that the lamps will violate this at turn on.