



## 13523 - COS PtNe Lamp Cross-calibration

Cycle: 21, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

### INVESTIGATORS

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### VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	WAVE	COS/FUV COS/NUV	1	15-Oct-2013 21:20:10.0	yes

1 Total Orbits Used

### ABSTRACT

COS has two internal Platinum-Neon Hollow Cathode wavelength calibration lamps. PtNe#1 is currently used for TAGFLASH'd wavelength calibration exposures on all COS science exposures, while PtNe#2 is used during target acquisitions (TAs). This program is designed to cross-calibrate the lamps, so that the required exposure times for both lamps are known. This will allow us to resume standard science operations as quickly as possible should one of the lamps fail. While this program is only one-orbit long, it is necessarily greater than 1800s, which may preclude it from being executed during occultation.

### OBSERVING DESCRIPTION

## Proposal 13523 (STScI Edit Number: 0, Created: Tuesday, October 15, 2013 8:20:19 PM EST) - Overview

Use FUV/G140L and NUV/G230L observations to estimate the coeval comparative throughput of the COS PtNe Wavecal lamps. This will allow us to have accurate TAGFLASH and LTACAL times for both lamps. Also use NUV TIMETAG images to determine the PtNe#1 LTAIMCAL times, while verifying the PtNe#2 images for the first time (only PtNe#1 images were available in SMOV). While this program is only one-orbit long, it is necessarily greater than 1800s, which may preclude it from being executed during occultation.

### **REAL TIME JUSTIFICATION**

**Purpose:** Determine NUV and FUV TAGFLASH exposure times for PtNe #2, and Target Acquisition Lamp durations for PtNe #1.

**Description:** COS has two internal Platinum-Neon Hollow Cathode wavelength calibration lamps. PtNe#1 is currently used for TAGFLASH'd wavelength calibration exposures on all COS science exposures, while PtNe#2 is used during target acquisitions (TAs). This program is designed to cross-calibrate the lamps, so that the required exposure times for both lamps are known. This will allow us to resume standard science operations as quickly as possible should one of the lamps fail.

**Accuracy:** Determine Lamp duration to reach  $S/N = 40$  to within 2.5%, this will allow us to accurately determine TAGFLASH, LTAIMCAL, and LTACAL times for both lamps.

**Comments on Accuracy:**  $2.5\% \text{ of } 1600 \text{ counts} = 40 = \sqrt{1600}$

**Products:** ISR, revised TAGFLASH table for PtNe#2, revised exposure times for TAs which use PtNe #1

### **CALIBRATION JUSTIFICATION**

This will be the first time the PtNe lamps have been cross-calibrated on-orbit.

### **ADDITIONAL COMMENTS**

The original proposal was for one full internal orbit. As constructed, the following error condition applies:

**Brief Description:**

Visit 01 is wholly internal and has a duration of 3705 seconds.

This exceeds the 1800 sec maximum duration for such a Visit.

**Detailed Description:**

In order to ensure scheduling efficiency, visits which are wholly internal or which are Earth Calibrations should be kept short enough to allow

them to be scheduled during occultations. If the defined duration limits are exceeded by a visit then this message is generated.

In order to avoid this message the affected visit should be shortened or broken up, such that each visit is shorter than the limit. However, if the visit has already been shortened as far as possible, then this message cannot be avoided. In this case this message should make the PC aware that significant effort may be necessary in order to schedule the observation.

Proposal 13523 - PTNE1\_2\_NUV & FUV\_WCA\_EXPOSURES (01) - COS PtNe Lamp Cross-calibration

<b>Visit</b>	<p>Proposal 13523, PTNE1_2_NUV_&amp;_FUV_WCA_EXPOSURES (01) <span style="float: right;">Wed Oct 16 01:20:20 GMT 2013</span></p> <p><b>Diagnostic Status: Warning</b></p> <p>Scientific Instruments: COS/NUV, COS/FUV</p> <p>Special Requirements: SCHED 100%</p> <p><i>Comments: Exposure times are estimated from existing COS exposures.</i></p>
<b>Diagnostics</b>	<p>(PTNE1_2_NUV_&amp;_FUV_WCA_EXPOSURES (01)) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU</p>

Proposal 13523 - PTNE1 2 NUV & FUV WCA EXPOSURES (01) - COS PtNe Lamp Cross-calibration

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	FUV/1105/ Wavecal/1/ MED	WAVE	COS/FUV, TIME-TAG, WCA	G140L 1105 A	BUFFER-TIME=80; FP-POS=3; CURRENT=MEDI UM	QESIPARM USELA MP LINE1	60 Secs (60 Secs) [==>]	[1]	
	<p><i>Comments: A recent G140L 1105 TAGFLASH gives about 400 counts/s over 1000A. or about 0.4 ct/A/s. Over each 175A band, we want &gt; 1600 counts, this works out to 22s. To ensure that we have that for every band, we increase this to 60s.</i></p>									
	2	FUV/1105/ Wavecal/2/ MED	WAVE	COS/FUV, TIME-TAG, WCA	G140L 1105 A	BUFFER-TIME=80; FP-POS=3; CURRENT=MEDI UM	QESIPARM USELA MP LINE2	60 Secs (60 Secs) [==>]	[1]	
	<p><i>Comments: We expect similar counts for LAMP1 and LAMP2</i></p>									
	3	NUV/2635/ Wavecal/1/ MED	WAVE	COS/NUV, TIME-TAG, WCA	G230L 2635 A	CURRENT=MEDIU M; FP-POS=3; BUFFER-TIME=11 1	QESIPARM USELA MP LINE1	90 Secs (90 Secs) [==>]	[1]	
	<p><i>Comments: A recent NUV/2635 TAGFLASH (LC3ZLARKQ./smov/cos/Data/13125) gives the following number of counts for the three stripes in 14 seconds.</i>  <i>C~ 600</i>  <i>B ~ 30000</i>  <i>A ~ 2835</i>  <i>It's stripe A that we are most interested in, 5x this exposure time should be sufficient (5 x 14 = 90). The math is that the G230L stripes are 400A, the M's are 35A, so the time we need is 160s</i>  <math>t = (1600/2835) * (400/35.) * 14 = 90s.</math></p>									
4	NUV/2635/ Wavecal/2/ MED	WAVE	COS/NUV, TIME-TAG, WCA	G230L 2635 A	CURRENT=MEDIU M; FP-POS=3; BUFFER-TIME=11 1	QESIPARM USELA MP LINE2	90 Secs (90 Secs) [==>]	[1]		
<p><i>Comments: Should be similar in counts to previous exposure with lamp #1</i></p>										
5	NUV/3000/ Wavecal/1/ MED	WAVE	COS/NUV, TIME-TAG, WCA	G230L 3000 A	CURRENT=MEDIU M; FP-POS=3; BUFFER-TIME=11 1	QESIPARM USELA MP LINE1	60 Secs (60 Secs) [==>]	[1]		
<p><i>Comments: A recent NUV/3000 TAGFLASH (LC5701CEQ./smov/cos/Data/13127) gives the following number of counts for the three stripes in 7 seconds.</i>  <i>C~ 400</i>  <i>B ~ 7000</i>  <i>A ~ 6000</i>  <i>It's stripe A that we are most interested in, he math is that the G230L stripes are 400A, the M's are 35A, so the time we need is given by</i>  <math>t = (1600/6000.) * (400/35.) * 7 = 26s. we go for 60s just to be sure.</math></p>										
6	NUV/3000/ Wavecal/2/ MED	WAVE	COS/NUV, TIME-TAG, WCA	G230L 3000 A	CURRENT=MEDIU M; FP-POS=3; BUFFER-TIME=11 1	QESIPARM USELA MP LINE2	60 Secs (60 Secs) [==>]	[1]		
<p><i>Comments: We expect similar counts for LAMP1 and LAMP2</i></p>										

Proposal 13523 - PTNE1 2 NUV & FUV WCA EXPOSURES (01) - COS PtNe Lamp Cross-calibration

7	NUV/3360/ Wavecal/1/ MED	WAVE	COS/NUV, TIME-TAG, WCA	G230L 3360 A	CURRENT=MEDIU M; FP-POS=3; BUFFER-TIME=11 1	QESIPARM USELA MP LINE1	60 Secs (60 Secs) [==>]	[1]
<p>Comments: A recent NUV/3000 TAGFLASH (LC5701CEQ./smov/cos/Data/13127) gives the following number of counts for the three stripes in 14 seconds.</p> <p>C~ N/A B ~ 11000 A ~ 10000</p> <p>It's stripe A that we are most interested in, he math is that the G230L stripes are 400A, the M's are 35A, so the time we need is given by <math>t = (1600/10000.) * (400/35.) * 14 = 26s.</math> we go for 60s just to be sure.</p>								
8	NUV/3360/ Wavecal/2/ MED	WAVE	COS/NUV, TIME-TAG, WCA	G230L 3360 A	CURRENT=MEDIU M; FP-POS=3; BUFFER-TIME=11 1	QESIPARM USELA MP LINE2	60 Secs (60 Secs) [==>]	[1]
9	NUV/IMAG E/WCA/2/L OW/B	WAVE	COS/NUV, TIME-TAG, WCA	MIRRORB	CURRENT=LOW	QESIPARM USELA MP LINE2	40 Secs (40 Secs) [==>]	[1]
<p>Comments: For Lamp 2/LOW, we usually get :</p> <p>APERTURE/MIRROR = PSA/MIRRORB LAMP EXPTIME = 30.000 s Reported Lamp Events = 786 counts : Rate = 26.200 counts/s Lamp Background events in 50x300 TA BOX = 311 : Rate = 10.379 counts/s Actual Lamp Events = 475 counts : Rate = 15.821 counts/s WCA found @ [AD,XD] or (Y,X) DET = [699,213]</p>								
10	NUV/IMAG E/WCA/1/L OW/B	WAVE	COS/NUV, TIME-TAG, WCA	MIRRORB	CURRENT=LOW	QESIPARM USELA MP LINE1	40 Secs (40 Secs) [==>]	[1]
<p>Comments: For Lamp 2/Lo, we usually get :</p> <p>APERTURE/MIRROR = PSA/MIRRORB LAMP EXPTIME = 30.000 s Reported Lamp Events = 786 counts : Rate = 26.200 counts/s Lamp Background events in 50x300 TA BOX = 311 : Rate = 10.379 counts/s Actual Lamp Events = 475 counts : Rate = 15.821 counts/s WCA found @ [AD,XD] or (Y,X) DET = [699,213]</p> <p>We expect 6 times more counts for Lamp 1 at Low (which has a higher LOW current than lamp 2) Therefore, we expect, 62 ct/s, this is spread over ~ 30 pixels and two peaks, so there should not be a local or global count rate issue.</p> <p>In 11474, we took a LINE1/MIRRORB image (labq02ozq_rawtag), here we measure the brightest pixel at 45counts/40 seconds.</p>								
11	NUV/IMAG E/WCA/2/L OW/A	WAVE	COS/NUV, TIME-TAG, WCA	MIRRORA	CURRENT=LOW	QESIPARM USELA MP LINE2	20 Secs (20 Secs) [==>]	[1]
<p>Comments: For Lamp #2/Lo/MIRRORA:</p> <p>LAMP EXPTIME = 7.000 s Reported Lamp Events = 3099 counts : Rate = 442.714 counts/s Lamp Background events in 50x300 TA BOX = 71 : Rate = 10.192 counts/s Actual Lamp Events = 3028 counts : Rate = 432.522 counts/s WCA found @ [AD,XD] or (Y,X) DET = [486,373]</p> <p>The lamp image spot size is ~6p FWHM in AD ad ~12p FWHM in XD, so the light is spread over at least 72+ pixels. This puts the LINE2 brightest count rate/pixel at ~6 ct/s/pixel. Measuring an actual LINE1 WCA image, gives a max of 960 counts in a 20s, or 48 counts/s at the brightest pixel (labq02p1q_rawtag.fits).</p>								

Proposal 13523 - PTNE1 2 NUV & FUV WCA EXPOSURES (01) - COS PtNe Lamp Cross-calibration

12 NUV/IMAG WAVE COS/NUV, TIME-TAG, WCA MIRRORA CURRENT=LOW QESIPARM USELA  
 E/WCA/1/L MP LINE1  
 OW/A

20 Secs (20 Secs)	
[==>]	[!]

Comments: For Lamp #2/Lo/MIRRORA:

LAMP EXPTIME = 7.000 s  
 Reported Lamp Events = 3099 counts : Rate = 442.714 counts/s  
 Lamp Background events in 50x300 TA BOX = 71 : Rate = 10.192 counts/s  
 Actual Lamp Events = 3028 counts : Rate = 432.522 counts/s  
 WCA found @ [AD,XD] or (Y,X) DET = [486,373]

The lamp image spot size is ~6p FWHM in AD ad ~12p FWHM in XD, so the light is spread over at least 72+ pixels. This puts the LINE2 brightest count rate/pixel at ~6 ct/s/pixel. Measuring an actual LINE1 WCA image, gives a max of 960 counts in a 20s, or 48 counts/s at the brightest pixel (labq02p1q\_rawtag.fits).

