



## 13568 - Characterization of the Charge-Level Dependence of CTE losses

Cycle: 21, Proposal Category: CAL/WFC3

(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	DARK	WFC3/UVIS	1	01-Nov-2013 21:35:56.0	yes
02	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:02.0	yes
03	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:06.0	yes
04	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:10.0	yes
05	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:14.0	yes
06	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:17.0	yes
07	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:21.0	yes
08	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:25.0	yes
09	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:28.0	yes
10	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:32.0	yes
11	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:36.0	yes

<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>
12	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:39.0	yes
13	DARK	WFC3/UVIS	1	01-Nov-2013 21:36:43.0	yes

13 Total Orbits Used

## ABSTRACT

This internal calibration program will use the charge-injection capability of WFC3/UVIS to explore CTE losses as a function of position and charge-level across the detector. The idea is that the pixel-based CTE-reconstruction model we have in hand characterizes average CTE losses across the detector in terms of the number of traps in each column that affect each Nth electron in a pixel cloud. In actuality, the traps are not uniformly distributed across the detector: most pixels have no traps, but some pixels (probably) have several traps. In addition, the traps that are present are not all the same: some affect the first electron, some the second, some the hundredth, etc, depending on exactly where each trap lies within the silicon of the pixel relative to the resting or shuffling pixel cloud.

We can use the charge-injection images to characterize the location and level of traps. The CI level puts about 15,000 electrons into each injected column. In CI images with no background, we can study the losses in the injected column and the gains in the upstream trail to characterize where there are traps that grab the 1st through the 15,000th electron. Most traps affect electrons below this, so this is a pretty broad characterization of the overall trap locations. We of course do not know exactly which pixel the traps are in, but we do know that there may be more in one column than in another, and we also know that there may be more in the first 200 pixels of a column than on average for that column.

In addition to pinpointing roughly where the traps are, we can also do a similarly rough reckoning of where there may be more or fewer low-electron-grabbing traps than high-electron-grabbing traps. We can do this by post-flashing the CI images. If we take a variety of CI images with increasing levels of post-flash, we can take more and more of the low-traps off the table by looking at how the CI pixel gains and the trails lose with increasing post-flash level, we can also get a rough estimate of which traps are where.

The observing plan is to take CI images with an array of background values (either from the post-flash on low or medium current): 0, 1, 2, 4, 6, 8, 10, 12, 15, 20, 25, 37, 45, 52, 60, 67, 75, 82, 90, 105, 120, 135, 150, 175, 200, 250, 300, 500, 750, 1000, 2000, 3500, 5000, 10000, 15000, 20000, and 28000 electrons. This amounts to 39 internal exposures.

The hope would be to take them over the period of a couple weeks and also take some long-short dark pairs over roughly the same timeframe so that

we can re-pin the CTE model one last time before we release it into the pipeline. We could also try to repeat the external CTE-validation images with the post-flash variation, so that we can make an additional demonstration of the efficacy of the new correction.

### **OBSERVING DESCRIPTION**

We will take charge-injection images with various levels of post-flash to characterize the distribution of traps in the detector.

### **REAL TIME JUSTIFICATION**

We would like all these observations to be taken within a period of about two weeks. Ideally, they will also be taken close in time to that of CAL-13567, though that is not critical. It would also be nice to have these taken in between anneals. The anneals are scheduled for:

2013 Oct 7-13

2013 Nov 4-10

2013 Dec 2-8

2013 Dec 30 - 2014 Jan 5

2014 Jan 27 - Feb 2

2014 Feb 24 - Mar 2

2014 Mar 24 - 30

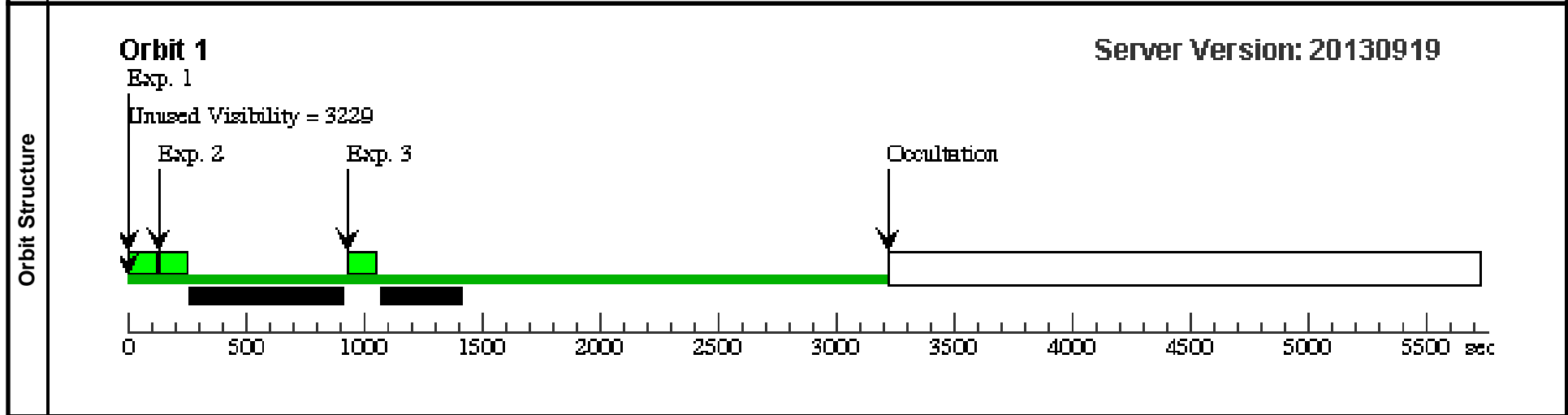
2014 Apr 21 - 27

2014 May 19 - 25

### **CALIBRATION JUSTIFICATION**

These observations will provide a complementary way to study charge traps in the UVIS images.

<b>Visit</b>	Proposal 13568, Visit 01									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: BEFORE 01-APR-2014									
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time (Total)/[Actual Dur.]</b>	<b>Orbit</b>
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25			0.5 Secs (0.5 Secs)	
									[==>]	[1]
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=1.0			0.5 Secs (0.5 Secs)	
								[==>]	[1]	
	3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=0.4			0.5 Secs (0.5 Secs)	
								[==>]	[1]	
<i>Comments: 0.4 s * 75 e/s = 30e</i>										

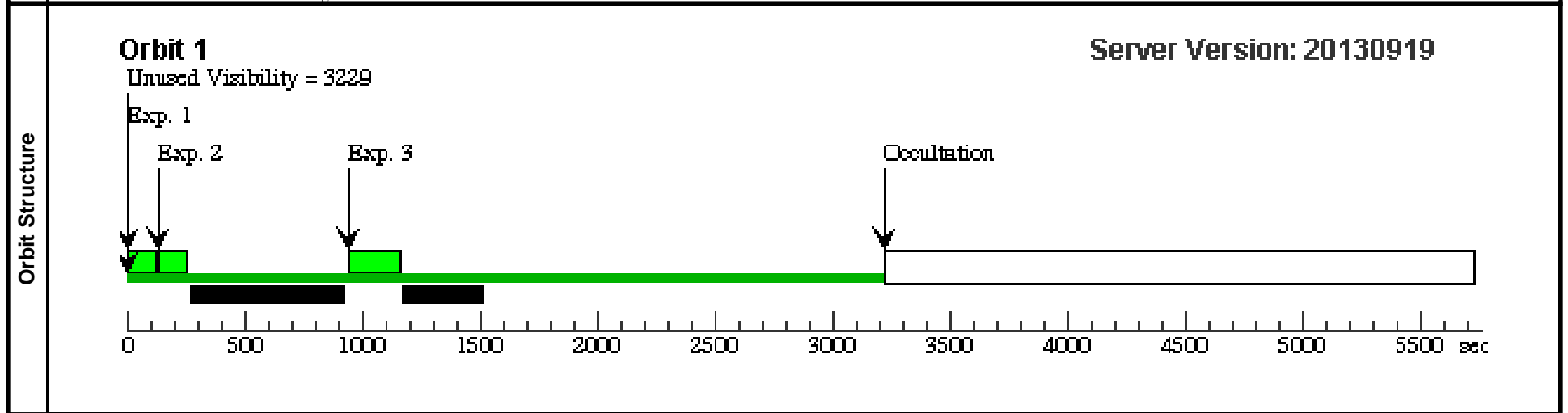


Proposal 13568 - Visit 02 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:52 GMT 2013

Visit	Proposal 13568, Visit 02										
	Diagnostic Status: No Diagnostics										
Scientific Instruments: WFC3/UVIS											
Special Requirements: AFTER 01 BY 0 D TO 14 D											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1		DARK		WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=4.0			0.5 Secs (0.5 Secs) [==>]	[1]
	2		DARK		WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=6.0			0.5 Secs (0.5 Secs) [==>]	[1]
	3		DARK		WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=100			0.5 Secs (0.5 Secs) [==>]	[1]

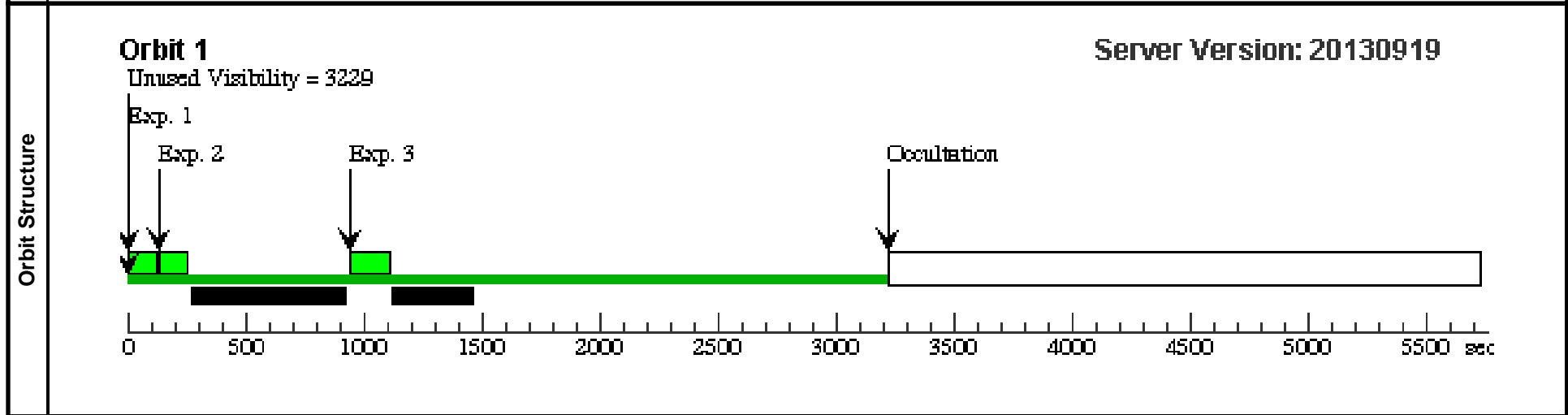
Comments: 100s \* 75 e/s ~ 7500e background



Proposal 13568 - Visit 03 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:52 GMT 2013

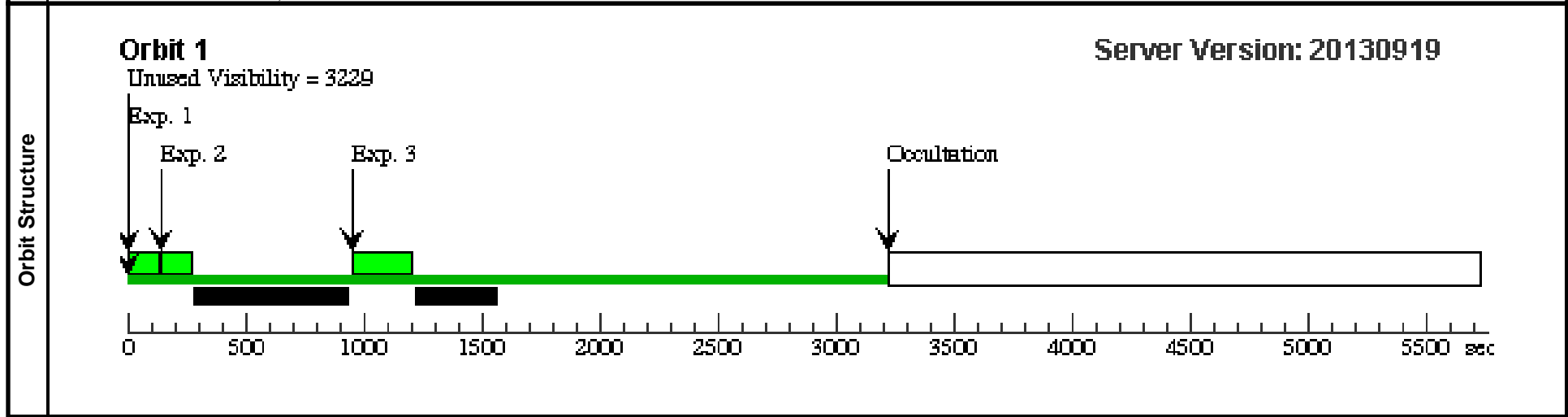
<b>Visit</b>	Proposal 13568, Visit 03									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: AFTER 01 BY 0 D TO 14 D									
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time (Total)/[Actual Dur.]</b>	<b>Orbit</b>
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=10.0			0.5 Secs (0.5 Secs) [==>]	[1]
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=12.0			0.5 Secs (0.5 Secs) [==>]	[1]
	3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=46.7			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 46.7 s * 75 e/s ~ 3500e</i>										



<b>Visit</b>	Proposal 13568, Visit 04									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: AFTER 01 BY 0 D TO 14 D									

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=20.0			0.5 Secs (0.5 Secs) [==>]	[1]
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=25.0			0.5 Secs (0.5 Secs) [==>]	[1]
	3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=133.3			0.5 Secs (0.5 Secs) [==>]	[1]

*Comments: 133.3 s \* 75 e/s ~ 10,000e*

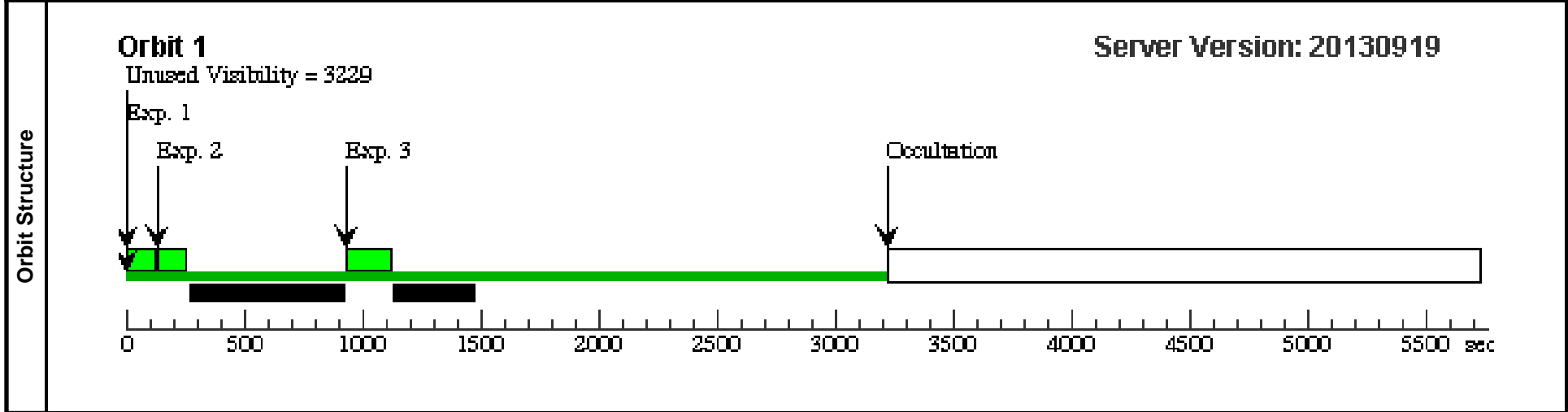


Proposal 13568 - Visit 05 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:54 GMT 2013

<b>Visit</b>	Proposal 13568, Visit 05 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: AFTER 01 BY 0 D TO 14 D									

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=0.5			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 0.5s * 75 e/s = 37.5 background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=0.6			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 0.6s * 75 e/s = 45e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=66.7			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 66.7s * 75 e/s ~ 5000e background</i>										

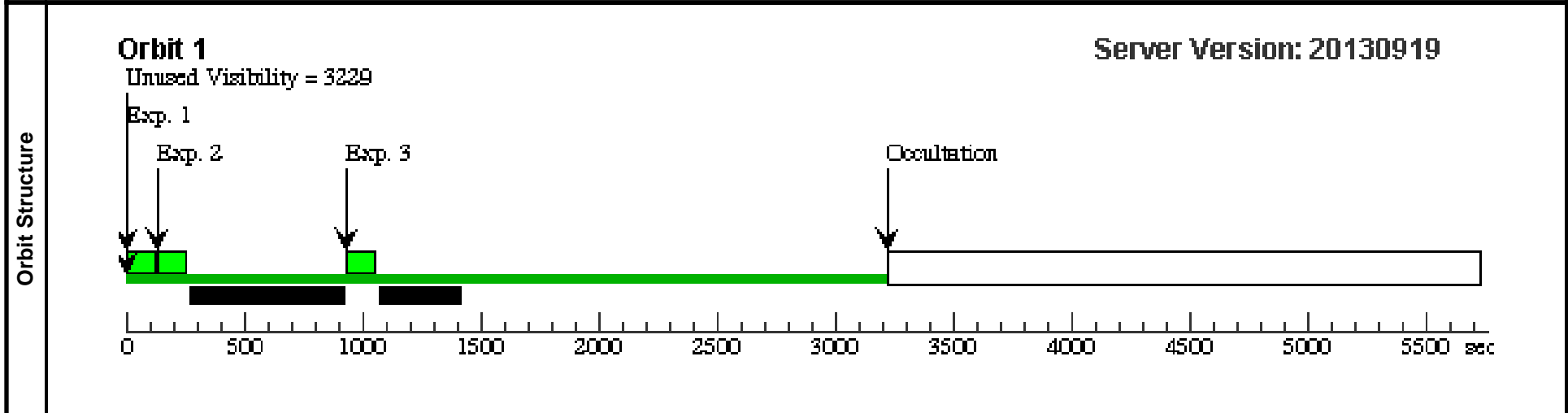




Proposal 13568 - Visit 06 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:54 GMT 2013

Visit	Proposal 13568, Visit 06									
	Diagnostic Status: No Diagnostics									
Scientific Instruments: WFC3/UVIS										
Special Requirements: AFTER 01 BY 0 D TO 14 D										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=0.8			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 0.8s * 75 e/s = 60e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=0.9			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 0.9s * 75 e/s = 67e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=1.0			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 1.0s * 75 e/s = 75e</i>										

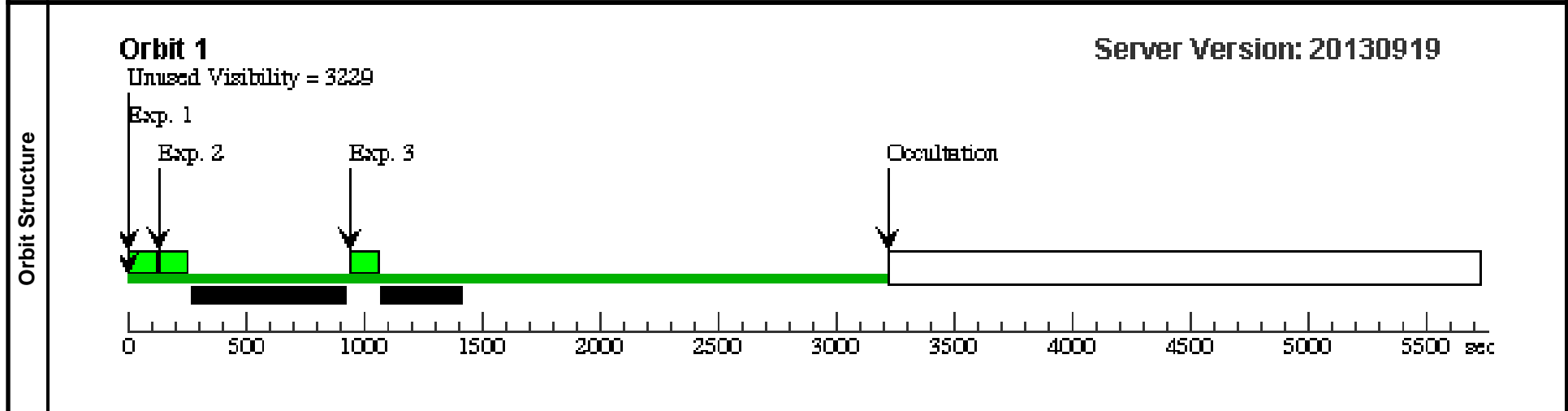


Proposal 13568 - Visit 07 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:55 GMT 2013

<b>Visit</b>	Proposal 13568, Visit 07									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: AFTER 01 BY 0 D TO 14 D									

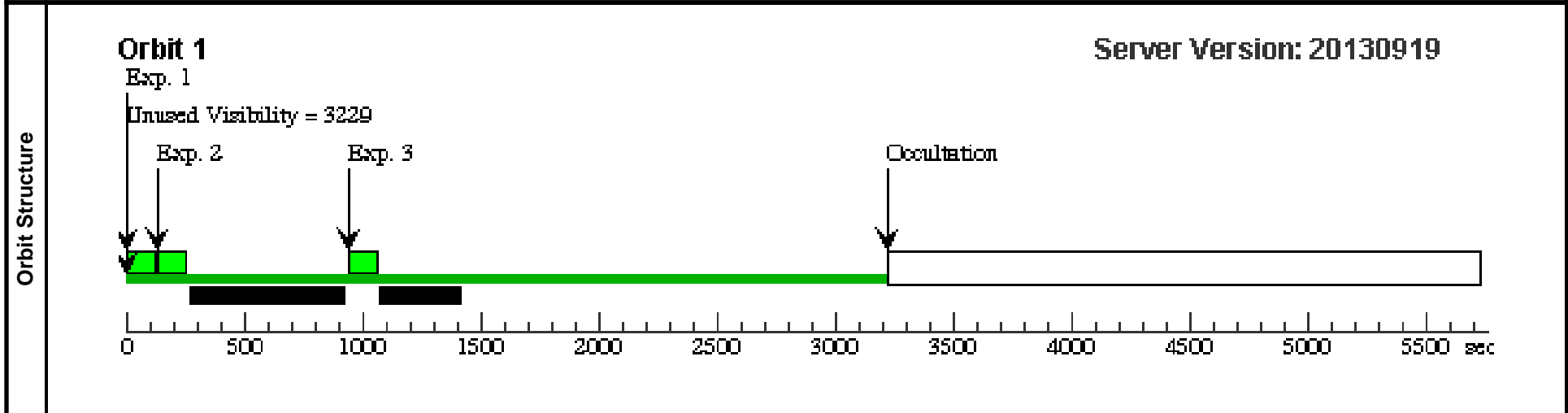
<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=1.1			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 1.1s * 75 e/s = 82e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=1.2			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 1.2s * 75 e/s = 90e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=1.4			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 1.4s * 75 e/s = 105e</i>										



Proposal 13568 - Visit 08 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:55 GMT 2013

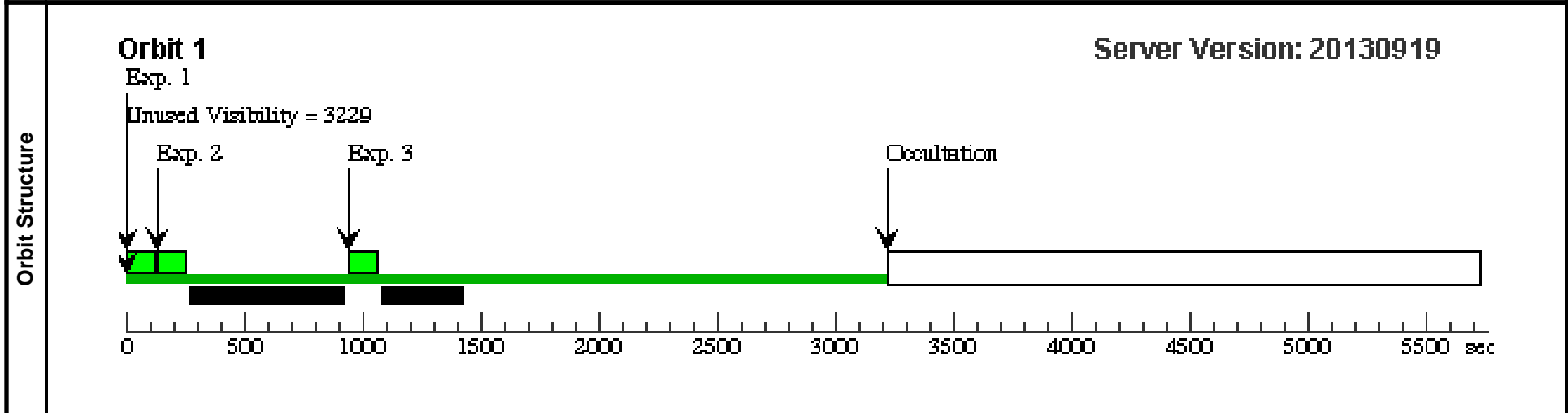
Visit	Proposal 13568, Visit 08									
	Diagnostic Status: No Diagnostics									
Scientific Instruments: WFC3/UVIS										
Special Requirements: AFTER 01 BY 0 D TO 14 D										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=1.6			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 1.6s * 75 e/s = 120e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=1.8			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 1.8s * 75 e/s = 135e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=2.0			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 2.0s * 75 e/s = 150e</i>										



Proposal 13568 - Visit 09 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:56 GMT 2013

Visit	Proposal 13568, Visit 09									
	Diagnostic Status: No Diagnostics									
Scientific Instruments: WFC3/UVIS										
Special Requirements: AFTER 01 BY 0 D TO 14 D										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=2.3			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 2.3s * 75 e/s ~ 175e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=2.7			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 2.7s * 75 e/s ~ 200e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=3.3			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 3.3s * 75 e/s ~ 250e</i>										

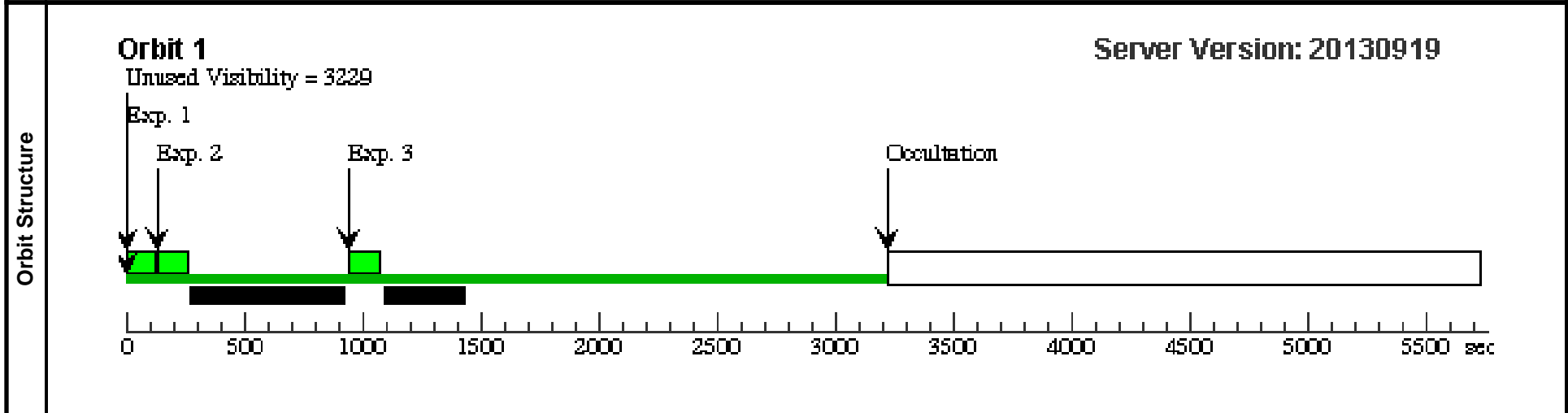


Proposal 13568 - Visit 10 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:56 GMT 2013

<b>Visit</b>	<b>Proposal 13568, Visit 10</b>									
	<b>Diagnostic Status: No Diagnostics</b>									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: AFTER 01 BY 0 D TO 14 D									

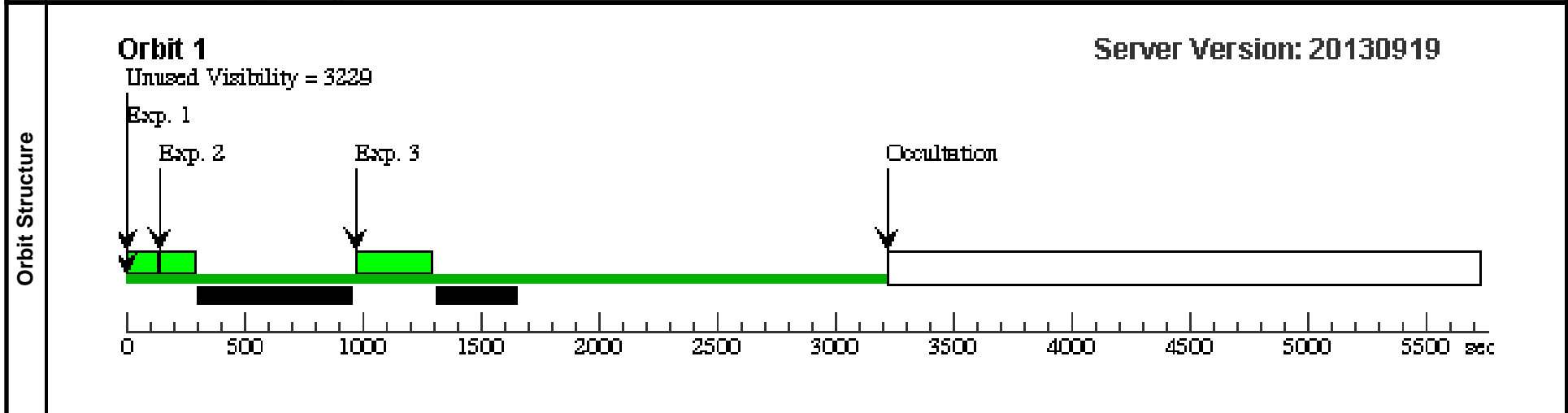
<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=4.0			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 4.0s * 75 e/s ~ 300e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=6.7			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 6.7s * 75 e/s ~ 500e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=10			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 10 s * 75 e/s ~ 750e</i>										



Proposal 13568 - Visit 11 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:57 GMT 2013

Visit	Proposal 13568, Visit 11									
	Diagnostic Status: No Diagnostics									
Scientific Instruments: WFC3/UVIS										
Special Requirements: AFTER 01 BY 0 D TO 14 D										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=13.3			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 13.3s * 75 e/s ~ 1000e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=26.7			0.5 Secs (0.5 Secs) [==>]	[1]
<i>Comments: 26.7s * 75 e/s ~ 2000e background</i>										
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=200			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 200s * 75 e/s ~ 15,000e background</i>										

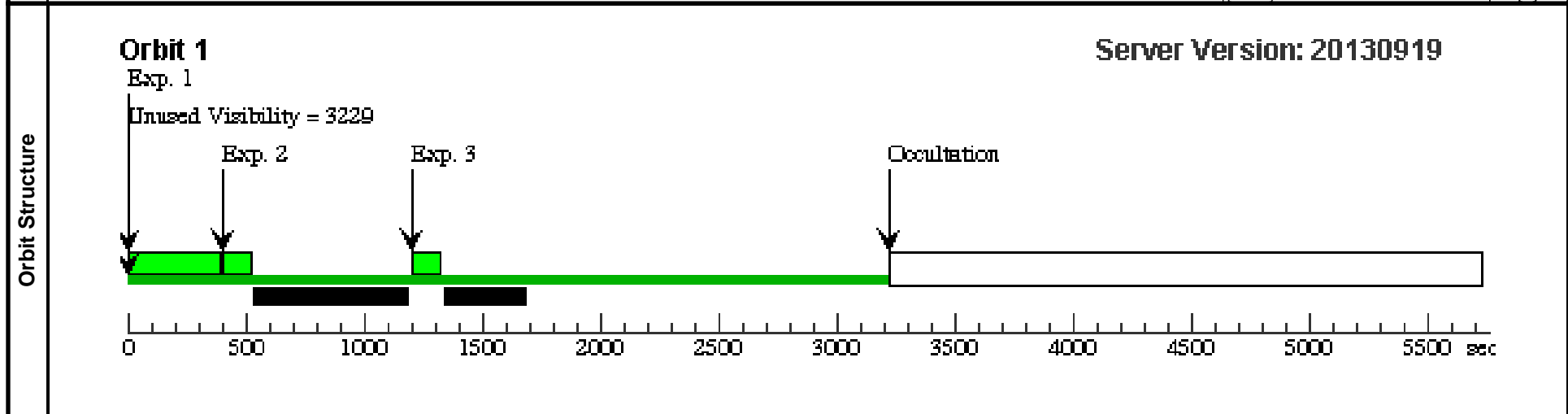


Proposal 13568 - Visit 12 - Characterization of the Charge-Level Dependence of CTE losses

Sat Nov 02 01:36:57 GMT 2013

<b>Visit</b>	Proposal 13568, Visit 12									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: AFTER 01 BY 0 D TO 14 D									

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=266.7			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 266.7s * 75 e/s ~ 20,000e background</i>									
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=8.0			0.5 Secs (0.5 Secs) [==>]	[1]
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=2.0			0.5 Secs (0.5 Secs) [==>]	[1]	



<b>Visit</b>	<b>Proposal 13568, Visit 13</b>									
	<b>Diagnostic Status: No Diagnostics</b>									
	Scientific Instruments: WFC3/UVIS									
	Special Requirements: AFTER 01 BY 0 D TO 14 D									

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASH=15			0.5 Secs (0.5 Secs) [==>]	[1]
	2		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=0.7			0.5 Secs (0.5 Secs) [==>]	[1]
	<i>Comments: 0.7 s * 75 e/s = 52.5e</i>									
3		DARK	WFC3/UVIS, ACCUM, UVIS	DEF	INJECT=LINE25; FLASHCUR=MEDI UM; FLASHEXP=375			0.5 Secs (0.5 Secs) [==>]	[1]	
<i>Comments: 375 s * 75 e/s ~ 28,000e</i>										

