



## 12350 - IR Gain Monitor

Cycle: 18, Proposal Category: CAL/WFC3

(Availability Mode: RESTRICTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Mr. Bryan Hilbert (PI)</b>	<b>Space Telescope Science Institute</b>	<b>hilbert@stsci.edu</b>

### 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 TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:45.0	yes
02	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:48.0	yes
03	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:50.0	yes
04	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:53.0	yes
05	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:54.0	yes
06	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:57.0	yes
07	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:28:59.0	yes
08	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:02.0	yes

Proposal 12350 (STScI Edit Number: 1, Created: Wednesday, October 20, 2010 8:29:20 PM EST) - Overview

<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>
09	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:04.0	yes
10	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:06.0	yes
11	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:08.0	yes
12	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:09.0	yes
13	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:11.0	yes
14	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:13.0	yes
15	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:15.0	yes
16	DARK TUNGSTEN	WFC3/IR	1	20-Oct-2010 21:29:17.0	yes

16 Total Orbits Used

### **ABSTRACT**

The gain of the IR channel of WFC3 will be measured using a series of internal flat fields. Using knowledge gained from ground testing, SMOV, and Cycle 17, we propose to collect flat field ramps which will be used to create photon transfer curves and give a measure of the gain.

### **OBSERVING DESCRIPTION**

Significant difficulties were found in the Cycle 17 version of this proposal. Light leak, from times when the V1 limb angle was less than 0 degrees, contaminated a large percentage of the Cycle 17 data. Self-induced persistence from flat field observations was also a more significant effect than anticipated.

We therefore redesigned the observing strategy used to collect these data. Each of the 16 1-orbit Visits are identical. A Visit begins with a short dark current observation. This is done in order to move the BLANK into position before the Tungsten lamp is turned on. We wish to avoid the situation where the Tungsten lamp is on and a grism or wide band filter rotates through the beam, as this is a potential source of persistence. The dark ramp

## Proposal 12350 (STScI Edit Number: 1, Created: Wednesday, October 20, 2010 8:29:20 PM EST) - Overview

will also serve as a check on any persistence signal present in the detector prior to our observations. After the dark ramp, the Tungsten lamp is turned on and we collect a short flat field observation. Results from Cycle 17 tests have shown that the Tungsten lamp requires 40 to 50 seconds in addition to the time given at the moment in to reach a stable flux output. The purpose of this short flat is to give the lamp time to reach equilibrium, as our data analysis depends on a linear signal reaching the detector for the duration of the observation. With a narrow band filter in the beam, this short flat should not trigger persistence. It can also be used to further monitor the lamp warm-up time. Finally, we collect a longer flat field ramp, which will be used for the gain calculation. This flat is designed to collect ~14,000 DN per pixel, which is roughly half of full well. This minimizes the non-linearity correction we need to make during data analysis, as well as limits the persistence on the detector that may be seen by the following observer.

In order to limit self-induced persistence, we have also set up the Visits so that they are not back-to-back. Cycle 17 data indicate that for these signal levels, persistence affects the measured signal rate (at the 0.5% level or above) for roughly 100 seconds after the observation has completed. By not having the Visits in this proposal occur consecutively, we hope to give this persistence time to relax between observations.

### **CALIBRATION JUSTIFICATION**

The commanded gain for WFC3-IR is 2.5 e-/ADU. However, for proper calibration and data reduction of science data, we must measure the actual gain in the IR channel. By collecting flat field data, we can generate photon transfer curves, measure the true gain of the system, and propagate these values into the data reduction pipeline for WFC3-IR. This will provide the proper factor for converting science data into units of electrons.

### **ADDITIONAL COMMENTS**

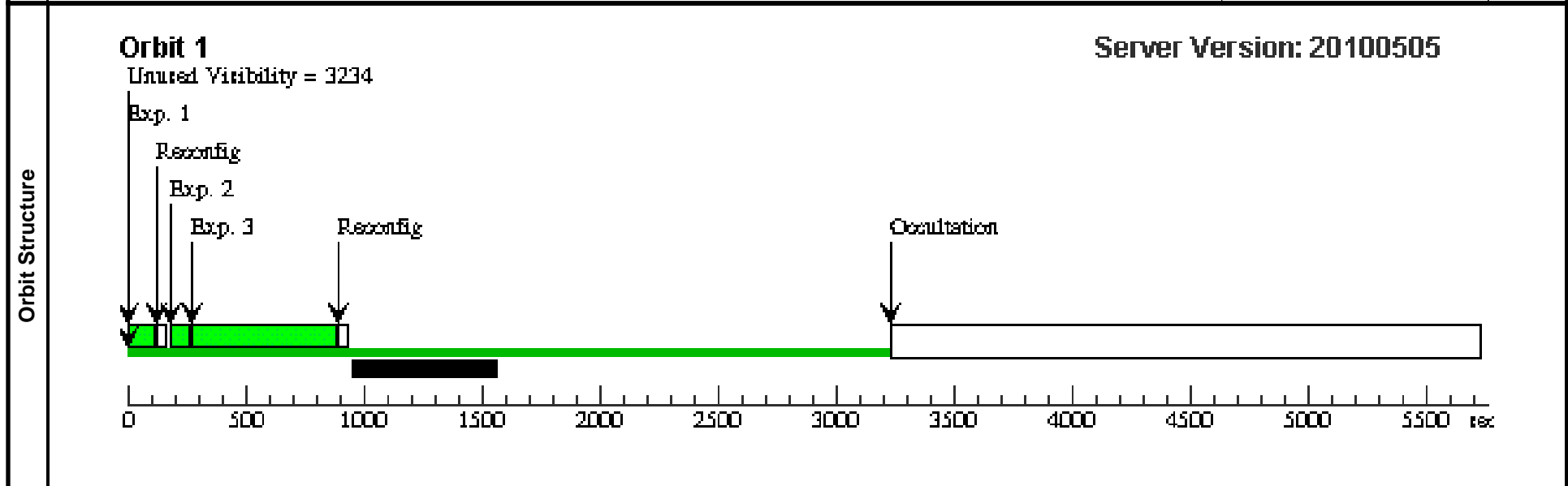
Gain values for each quadrant of the detector will be calculated separately using pairs of ramps. From a given pair of ramps, we will construct a photon transfer curve, plotting the measured mean signal versus variance for each read. A best-fit line to this plot will produce the measured gain value. The expected accuracy of the final calculated gain values is ~2%, based on results from ground testing. (see WFC3 ISR 2008-50)

Proposal 12350 - Visit 01 - IR Gain Monitor

Thu Oct 21 01:29:20 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 01, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: (none)								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat at	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

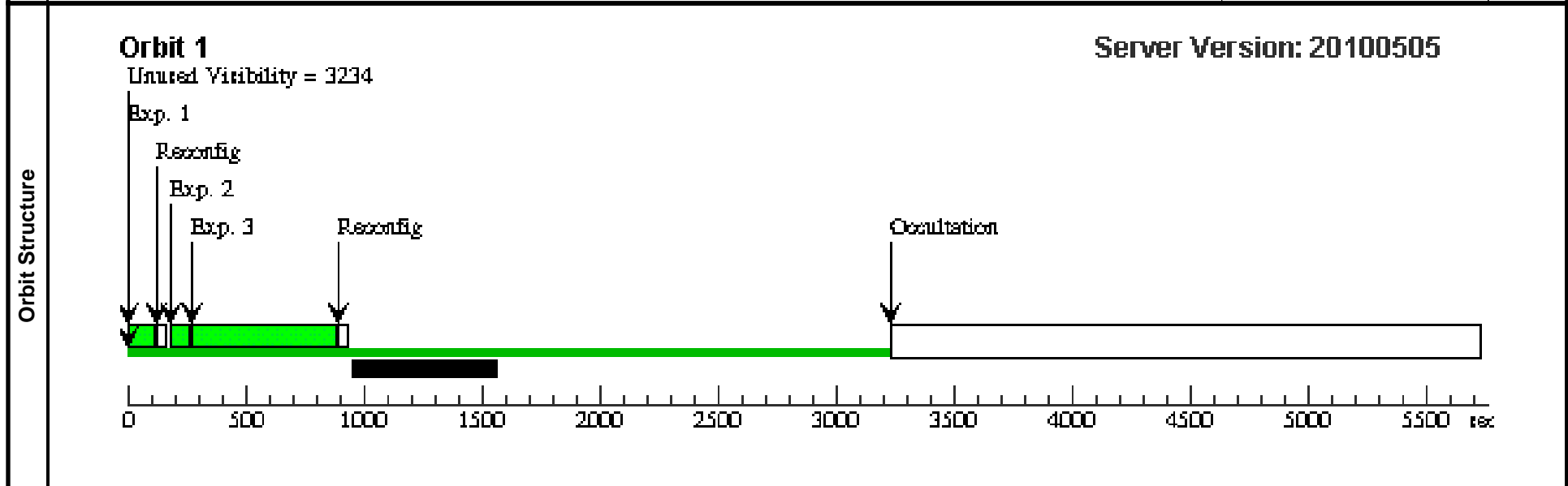


Proposal 12350 - Visit 02 - IR Gain Monitor

Thu Oct 21 01:29:21 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 02, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 01 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

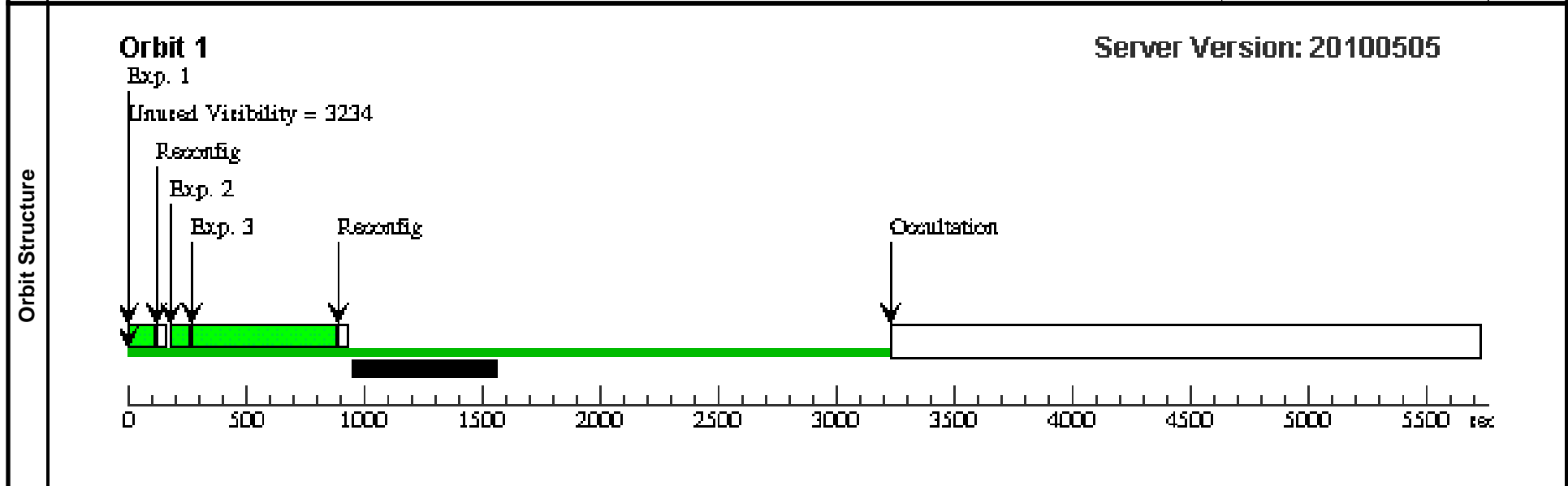


Proposal 12350 - Visit 03 - IR Gain Monitor

Thu Oct 21 01:29:21 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 03, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 02 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

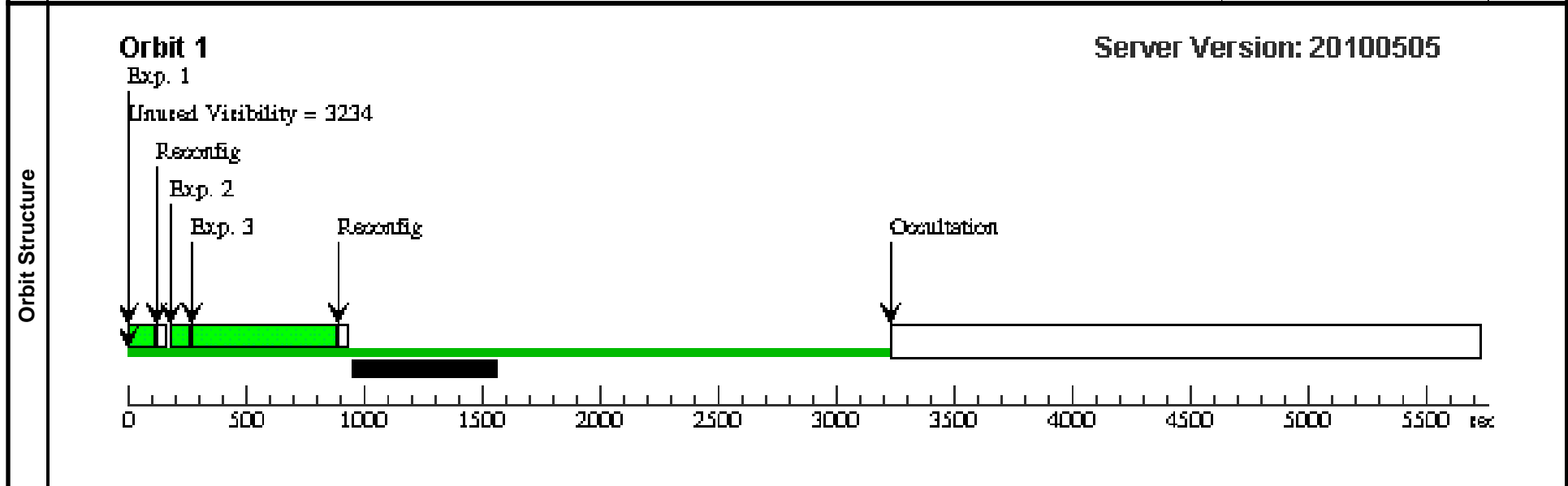


Proposal 12350 - Visit 04 - IR Gain Monitor

Thu Oct 21 01:29:21 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 04, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 03 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat at	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

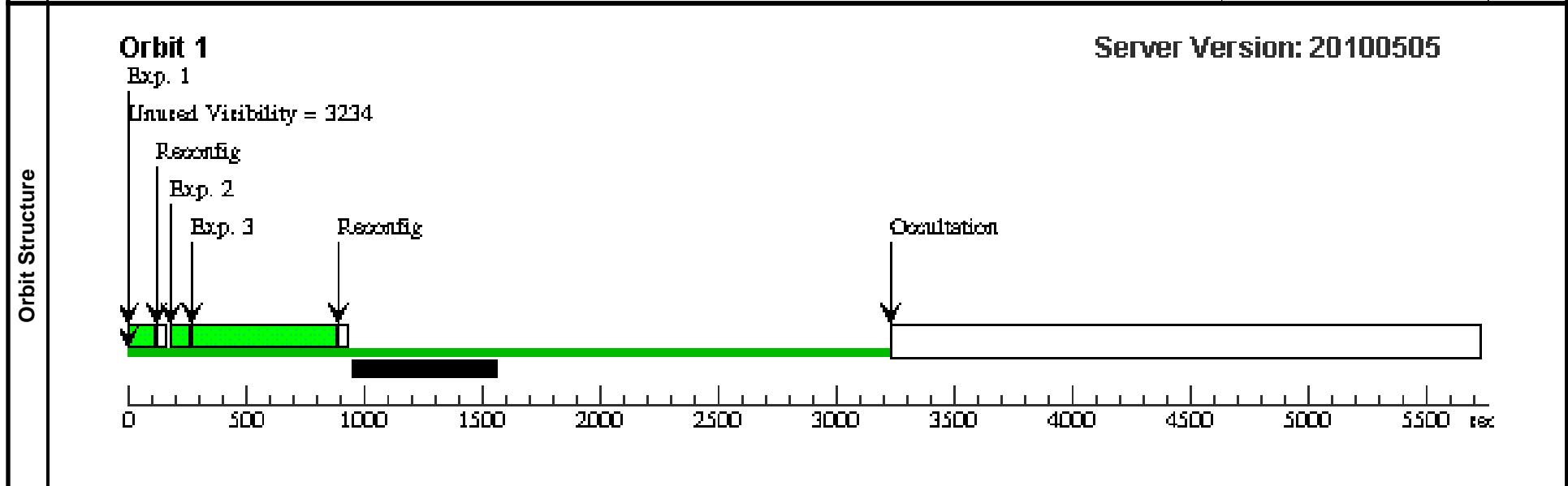


Proposal 12350 - Visit 05 - IR Gain Monitor

Thu Oct 21 01:29:22 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 05, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 04 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat at	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]



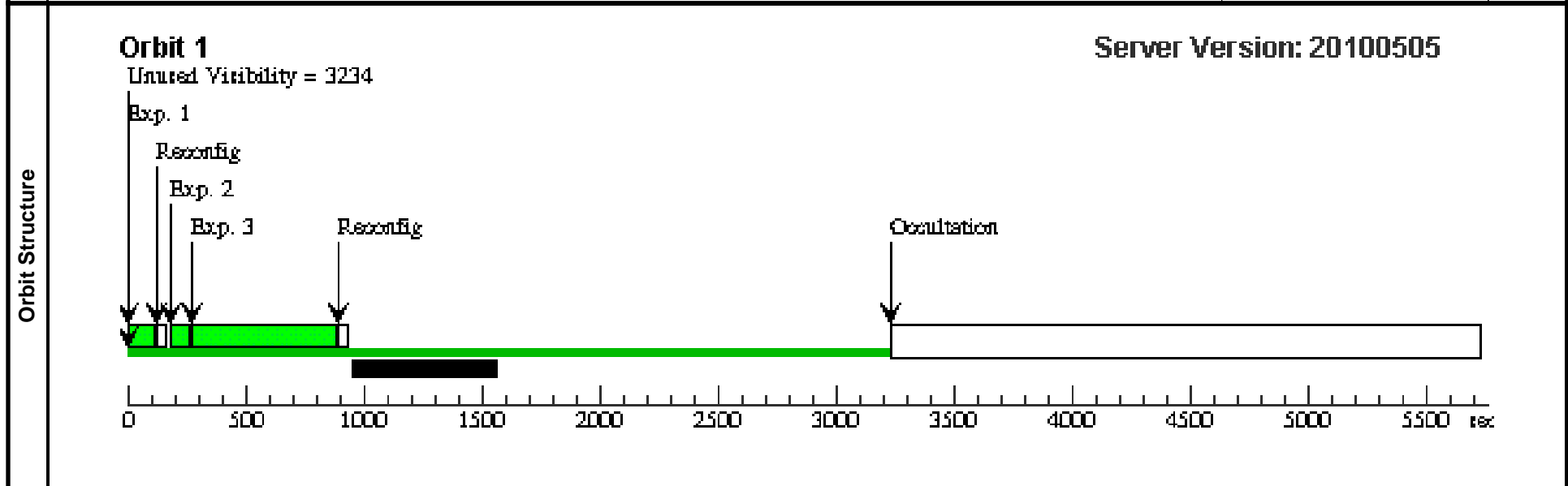


Proposal 12350 - Visit 06 - IR Gain Monitor

Thu Oct 21 01:29:22 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 06, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 05 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

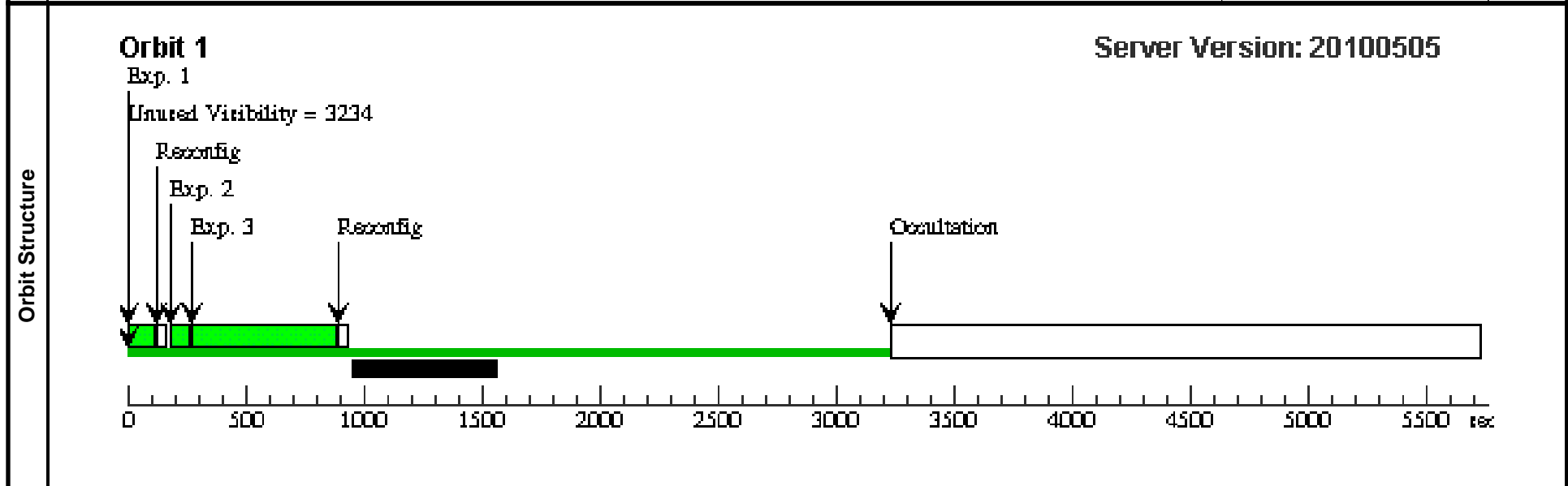


Proposal 12350 - Visit 07 - IR Gain Monitor

Thu Oct 21 01:29:23 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 07, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 06 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

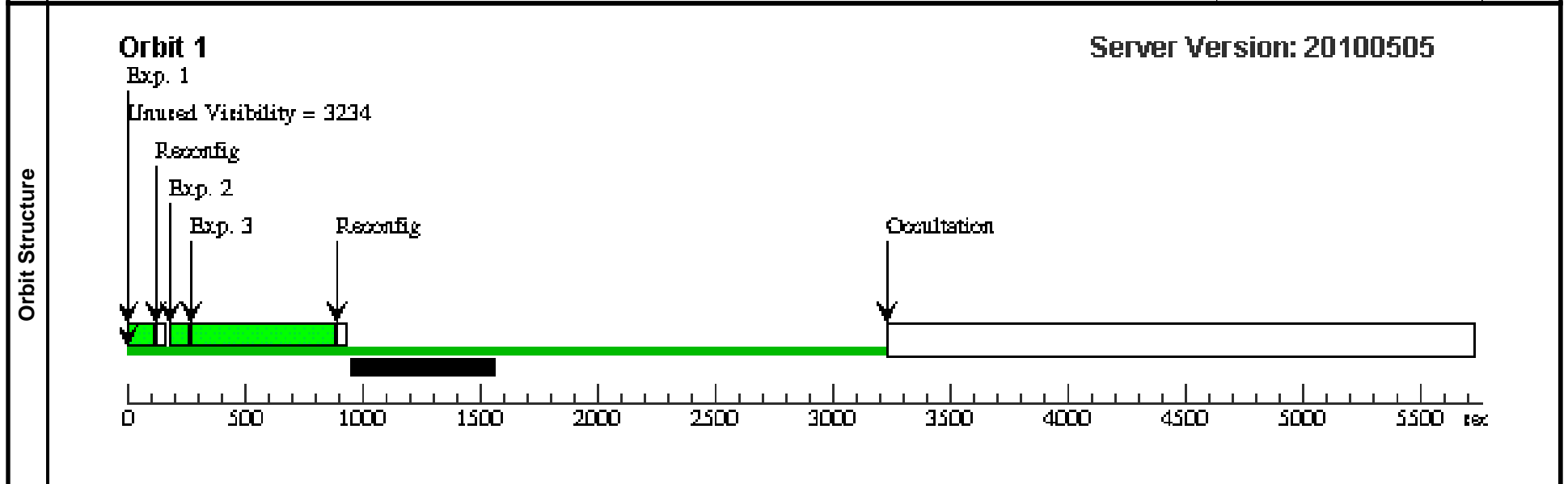


Proposal 12350 - Visit 08 - IR Gain Monitor

Thu Oct 21 01:29:23 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 08, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 07 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat at	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

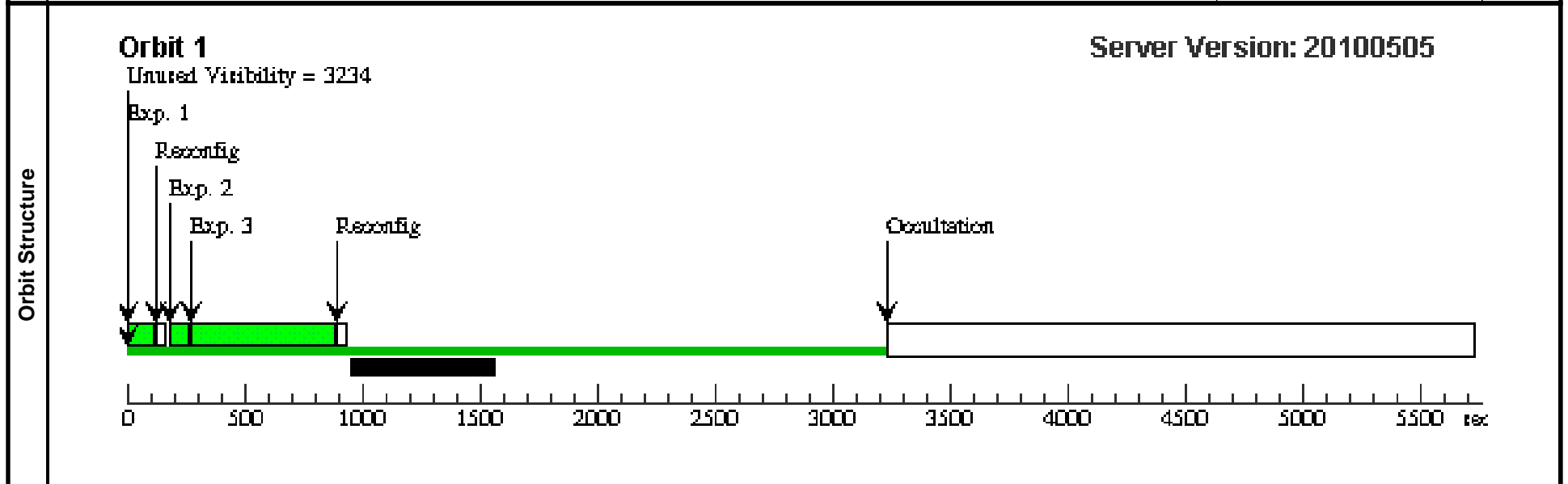


Proposal 12350 - Visit 09 - IR Gain Monitor

Thu Oct 21 01:29:24 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 09, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: BETWEEN 30-NOV-2010:00:00:00 AND 20-DEC-2010:00:00:00								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat at	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

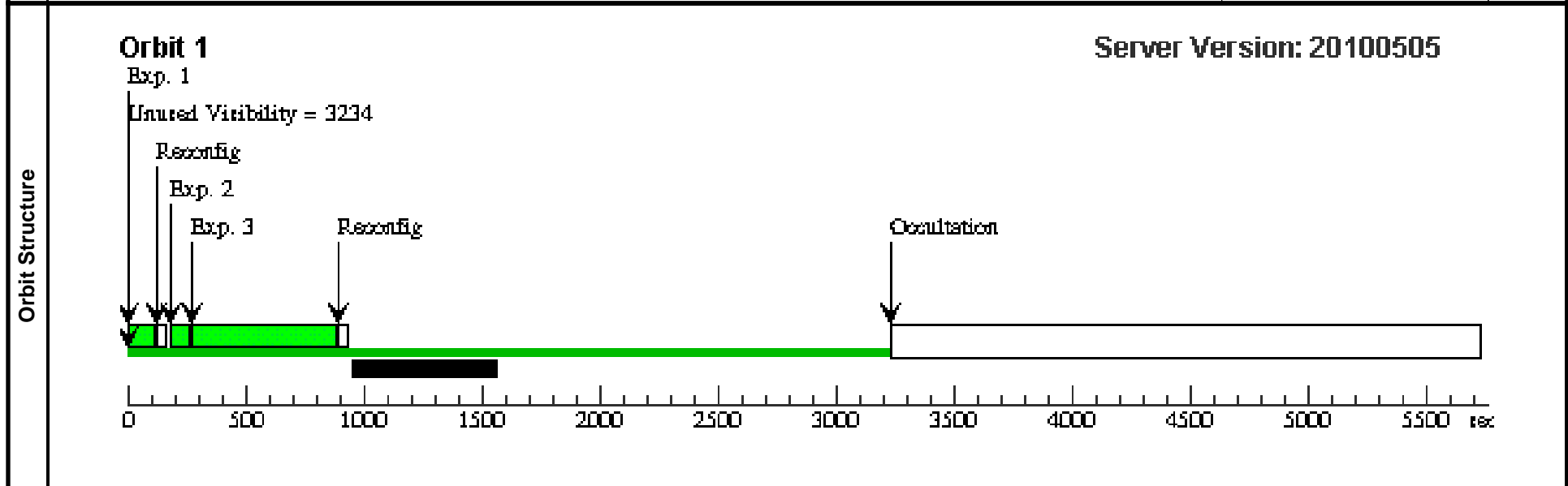


Proposal 12350 - Visit 10 - IR Gain Monitor

Thu Oct 21 01:29:24 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 10, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 09 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

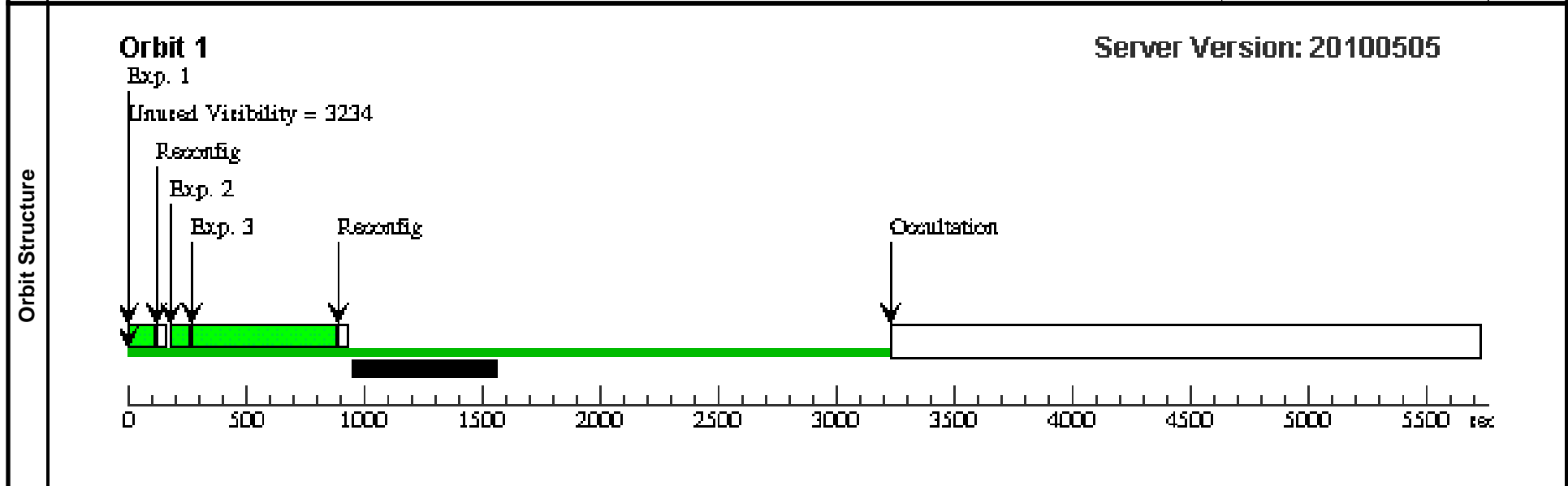


Proposal 12350 - Visit 11 - IR Gain Monitor

Thu Oct 21 01:29:24 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 11, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 10 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

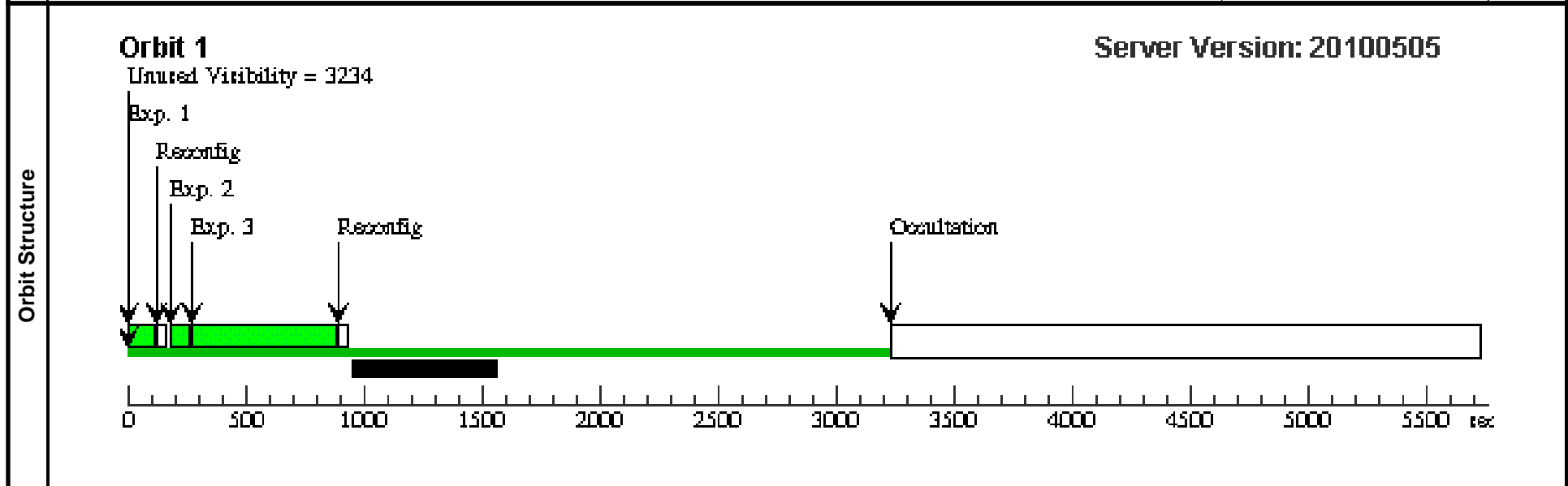


Proposal 12350 - Visit 12 - IR Gain Monitor

Thu Oct 21 01:29:24 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 12, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 11 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

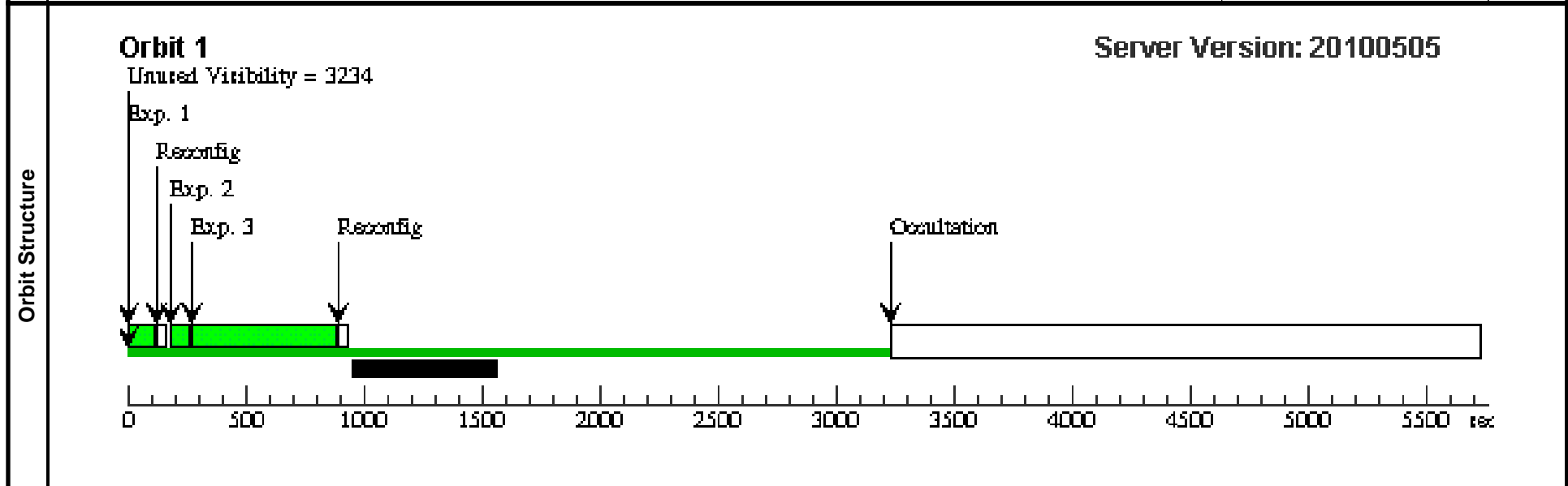


Proposal 12350 - Visit 13 - IR Gain Monitor

Thu Oct 21 01:29:25 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 13, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 12 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]



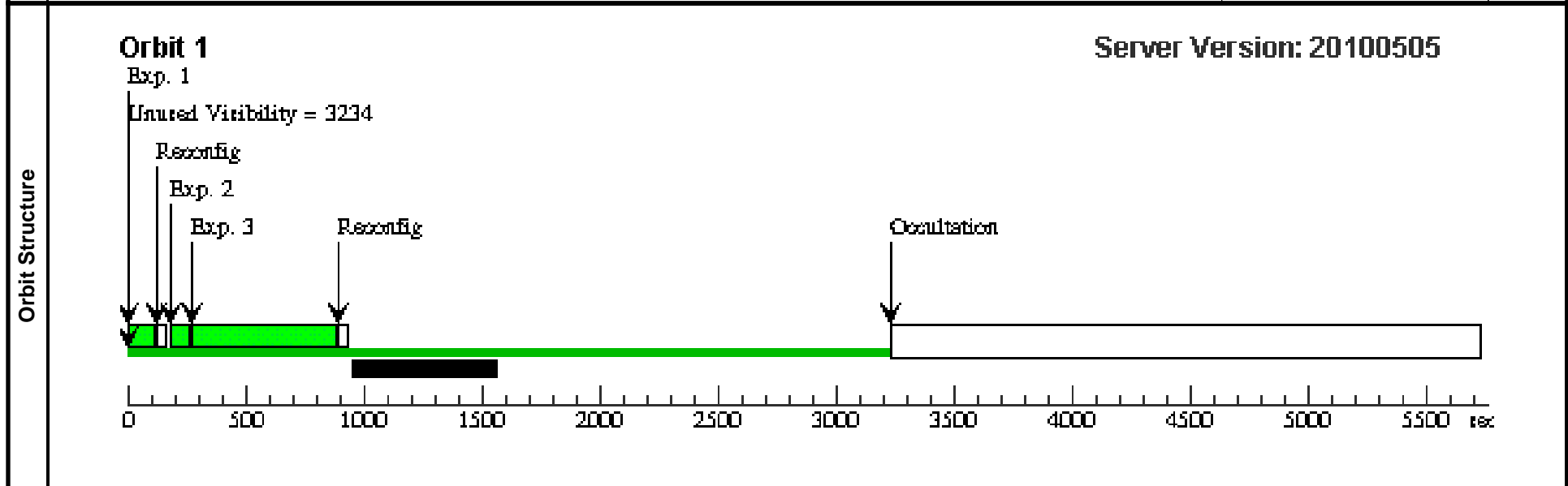


Proposal 12350 - Visit 14 - IR Gain Monitor

Thu Oct 21 01:29:25 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 14, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 13 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

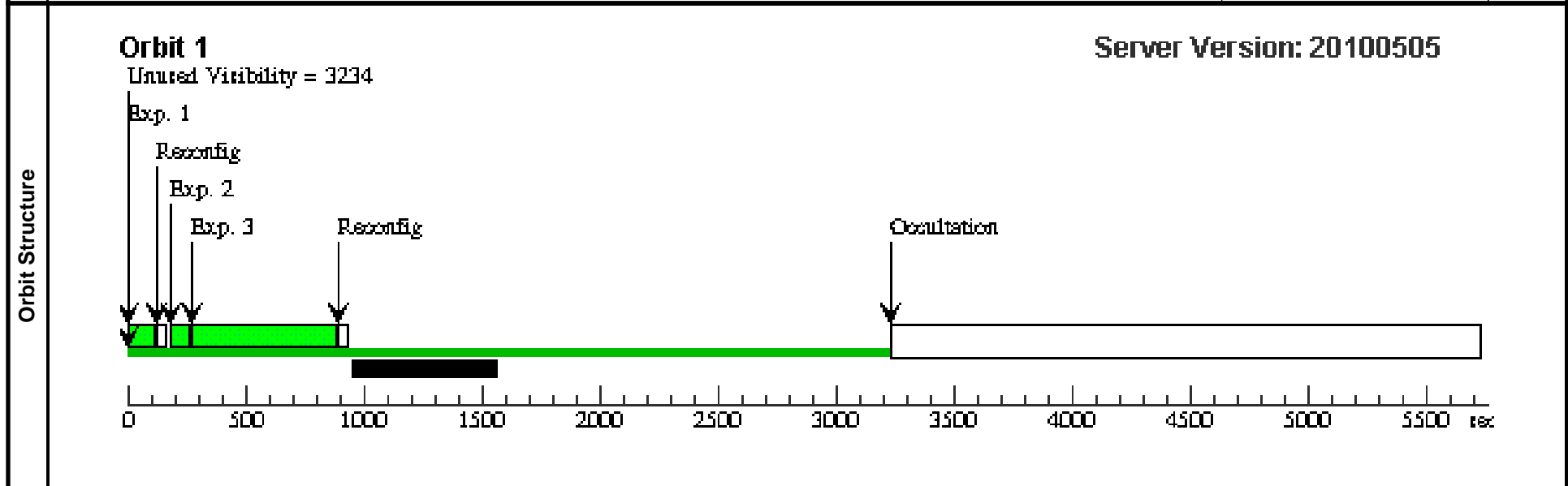


Proposal 12350 - Visit 15 - IR Gain Monitor

Thu Oct 21 01:29:25 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 15, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 14 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]



Proposal 12350 - Visit 16 - IR Gain Monitor

Thu Oct 21 01:29:26 GMT 2010

<b>Visit</b>	Proposal 12350, Visit 16, scheduling								
	Diagnostic Status: No Diagnostics								
	Scientific Instruments: WFC3/IR								
	Special Requirements: AFTER 15 BY 1 Orbits TO 3 D								

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS 10; NSAMP=9			[==>]	[1]
	2	Warm-up Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 10; NSAMP=6			[==>]	[1]
	3	Gain Flat	TUNGSTEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS 50; NSAMP=13			[==>]	[1]

