11925 - UVIS Detector Linearity

Cycle: 17, Proposal Category: CAL/WFC3

(Availability Mode: RESTRICTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	TUNGSTEN	WFC3/UVIS	1	10-Apr-2009 21:11:00.0	yes
02	TUNGSTEN	WFC3/UVIS	1	10-Apr-2009 21:11:09.0	yes
03	TUNGSTEN	WFC3/UVIS	1	10-Apr-2009 21:11:15.0	yes
04	(4) NGC-1850	WFC3/UVIS	2	10-Apr-2009 21:11:27.0	yes

5 Total Orbits Used

ABSTRACT

This proposal will measure the in-orbit linear response of the UVIS detectors by sampling over the response curve through saturation. This program uses exposures of a standard star field (NGC 1850) to measure the absolute values, and, exposures of a tungsten lamp to measure positional variations in response, following a similar procedure as the ground tests.

OBSERVING DESCRIPTION

The linear response of the UVIS CCD detectors was measured during ground tests for count levels covering the full range of count levels, up to saturation. This proposal will measure the in-orbit linear response of the UVIS detectors by sampling over the response curve through saturation. This program uses exposures of a standard star field (NGC 1850) to measure the absolute values, and, exposures of a tungsten lamp to measure positional variations in response, following a similar procedure as the ground tests. All data are acquired using the standard gain setting of 1.5 e-/DN, and, through the F467M filter as it is a good compromise in terms of exposure time, enabling us to fit the observations into 3 internal orbits and 2 external orbits. Linearity response is independent of wavelength.

The absolute calibration of the linear response is determined from point sources. A series of images of the cluster NGC 1850 are taken with different exposure times to cover a range of detector ADU levels. On average, stars in NGC 1850 range in brightness between V=14 and V=18, and, exposures between 10 and 500 seconds will sample the linear response curve. The target is centered on each UVIS CCD, so that the same stars are observed with both detectors, in order to compare the linearity curve of each detectors. A total of 14 exposures in 2 orbits are obtained.

Flat fields are used to test for variations in linearity as a function of location on the detector. A series of flat field images will be taken at specific ADU levels, read out through subarrays through each amplifier. The table below lists N (number of exposures), ADU level (electrons), and Exposure time (seconds). At low ADU levels, multiple exposures are taken do build up the counting statistics.

N, ADU, ExpTime
10, 100 e- ,1
5, 1000 e-, 10
1, 10,000 e-, 100
1, 20,000 e-, 200
1, 50,000 e-, 500
1, 70,000 e-, 700
1, 80,000 e, 800

1, 90,000 e-. 900

Accuracy Goal: Better than 5% (correctable to <0.3%) over the range 100 e- to 50000 e-.

ANALYSIS:
The data will be processed initially using the standard WFC3-UVIS pipeline analysis. Individual frames will be bias-subtracted using standard techniques, combined, and ratioed against each other. Visual inspection and standard software tools will be used to check for any irregularities as a function of position on each set of images.. Linearity is measured via standard log(DN) vs log(exptime), comparing observed profile and total counts to predictions based on incident flux and exposure time.

CALIBRATION JUSTIFICATION
Linearity response curve is used to determine the saturation thresholds thar are needed for the CCD characteristics table in CDBS (CCDTAB) and the instrument handbook. The latter compiles information useful to GOs, for both preparing proposals and data analysis.

Visit

Proposal 11925, Visit 01 Sat Apr 11 01:11:32 GMT 2009

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU

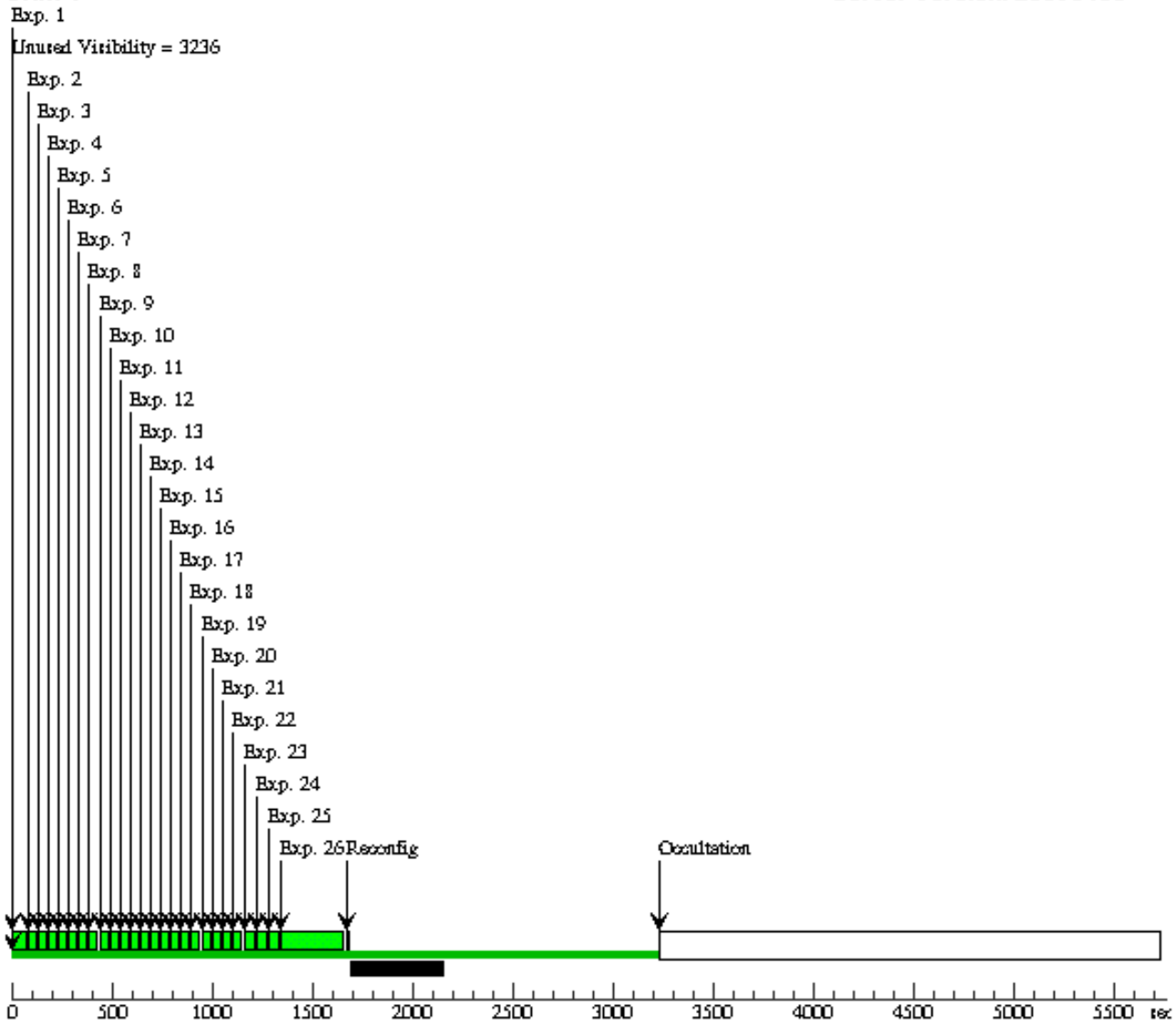
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F467M - 10 0e - A - 1/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				1 Secs	
								[==>]	***[1]***
2	F467M - 10 0e - A - 2/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				1 Secs	
								[==>]	***[1]***
3	F467M - 10 0e - A - 3/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				1 Secs	
								[==>]	***[1]***
4	F467M - 10 0e - A - 4/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				1 Secs	
								[==>]	***[1]***
5	F467M - 10 0e - A - 5/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				1 Secs	
								[==>]	***[1]***
6	F467M - 10 0e - B - 1/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				1 Secs	
								[==>]	***[1]***
7	F467M - 10 0e - B - 2/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				1 Secs	
								[==>]	***[1]***
8	F467M - 10 0e - B - 3/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				1 Secs	
								[==>]	***[1]***
9	F467M - 10 0e - B - 4/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				1 Secs	
								[==>]	***[1]***
10	F467M - 10 0e - B - 5/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				1 Secs	
								[==>]	***[1]***
11	F467M - 10 0e - C - 1/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				1 Secs	
								[==>]	***[1]***
12	F467M - 10 0e - C - 2/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				1 Secs	
								[==>]	***[1]***
13	F467M - 10 0e - C - 3/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				1 Secs	
								[==>]	***[1]***
14	F467M - 10 0e - C - 4/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				1 Secs	
								[==>]	***[1]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
15	F467M - 10 0e - C - 5/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				1 Secs *[==>]*	 ***[1]***
16	F467M - 10 0e - D - 1/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				1 Secs *[==>]*	 ***[1]***
17	F467M - 10 0e - D - 2/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				1 Secs *[==>]*	 ***[1]***
18	F467M - 10 0e - D - 3/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				1 Secs *[==>]*	 ***[1]***
19	F467M - 10 0e - D - 4/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				1 Secs *[==>]*	 ***[1]***
20	F467M - 10 0e - D - 5/5	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				1 Secs *[==>]*	 ***[1]***
21	F467M - 50 0e - A - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				5 Secs *[==>]*	 ***[1]***
22	F467M - 50 0e - A - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				5 Secs *[==>]*	 ***[1]***
23	F467M - 10 00e - A - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				10 Secs *[==>]*	 ***[1]***
24	F467M - 10 00e - A - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				10 Secs *[==>]*	 ***[1]***
25	F467M - 10 00e - A - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				10 Secs *[==>]*	 ***[1]***
26	F467M - 20 000e	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS	F467M				200 Secs *[==>]*	 ***[1]***

Orbit Structure



Visit

Proposal 11925, Visit 02 Sat Apr 11 01:11:34 GMT 2009

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: AFTER_01

Diagnostics

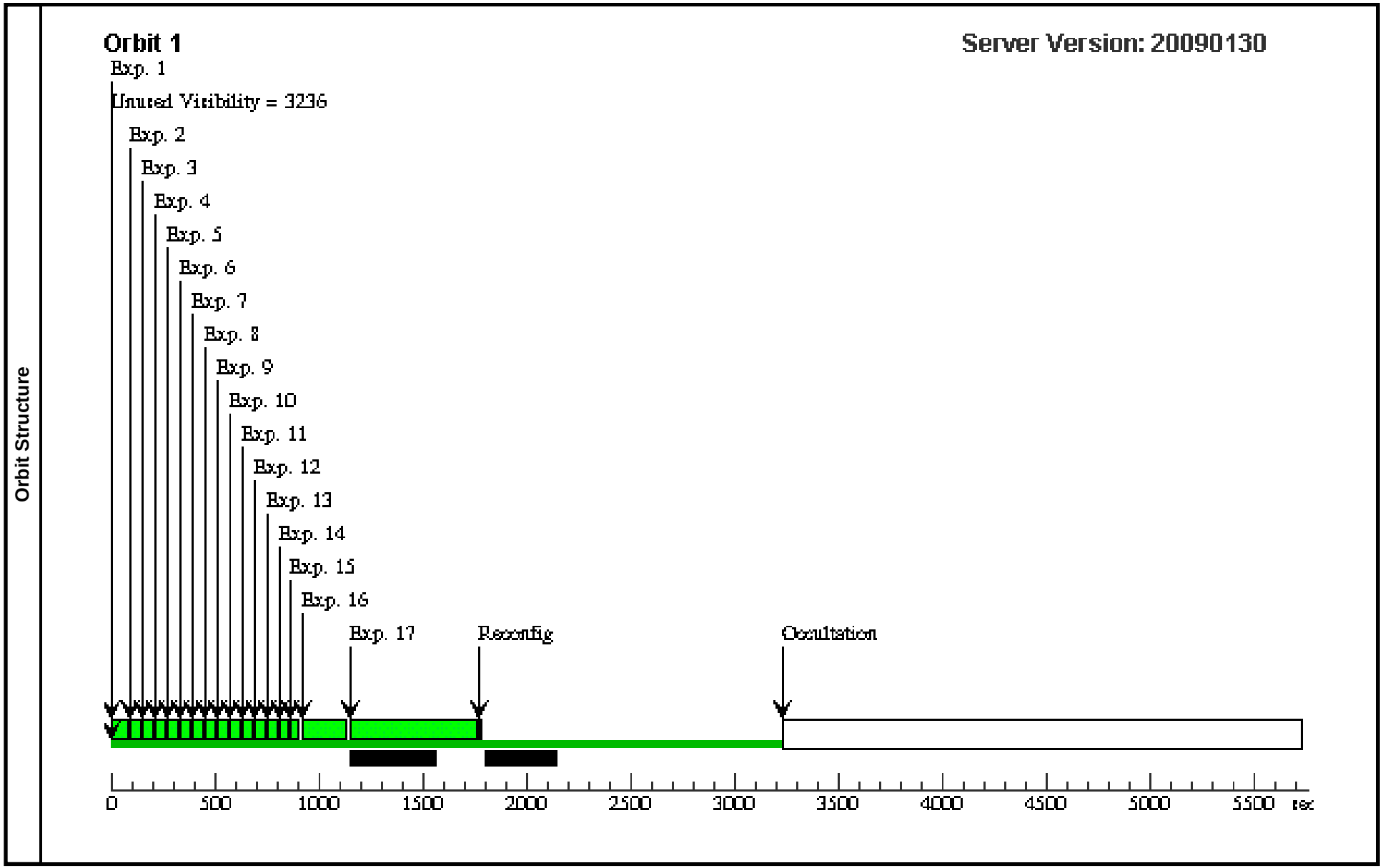
(Visit 02) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F467M - 10 00e - A - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				10 Secs	
								[==>]	***[1]***
2	F467M - 10 00e - B - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				10 Secs	
								[==>]	***[1]***
3	F467M - 10 00e - B - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				10 Secs	
								[==>]	***[1]***
4	F467M - 10 00e - B - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				10 Secs	
								[==>]	***[1]***
5	F467M - 10 00e - B - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				10 Secs	
								[==>]	***[1]***
6	F467M - 10 00e - C - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				10 Secs	
								[==>]	***[1]***
7	F467M - 10 00e - C - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				10 Secs	
								[==>]	***[1]***
8	F467M - 10 00e - C - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				10 Secs	
								[==>]	***[1]***
9	F467M - 10 00e - C - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				10 Secs	
								[==>]	***[1]***
10	F467M - 10 00e - D - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				10 Secs	
								[==>]	***[1]***
11	F467M - 10 00e - D - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				10 Secs	
								[==>]	***[1]***
12	F467M - 10 00e - D - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				10 Secs	
								[==>]	***[1]***
13	F467M - 10 00e - D - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				10 Secs	
								[==>]	***[1]***
14	F467M - 50 0e - A - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				5 Secs	
								[==>]	***[1]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
15	F467M - 500e - A - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512A-SUB	F467M				5 Secs	
								[==>]	***[1]***
16	F467M - 1000e	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS	F467M				100 Secs	
								[==>]	***[1]***
17	F467M - 5000e	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS	F467M				500 Secs	
								[==>]	***[1]***


Orbit Structure
Orbit 1
Server Version: 20090130
Exp. 1
Unused Visibility = 3236
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Exp. 6
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Exp. 11
Exp. 12
Exp. 13
Exp. 14
Exp. 15
Exp. 16
Exp. 17
Reconfig
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11925, Visit 03 Sat Apr 11 01:11:35 GMT 2009

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

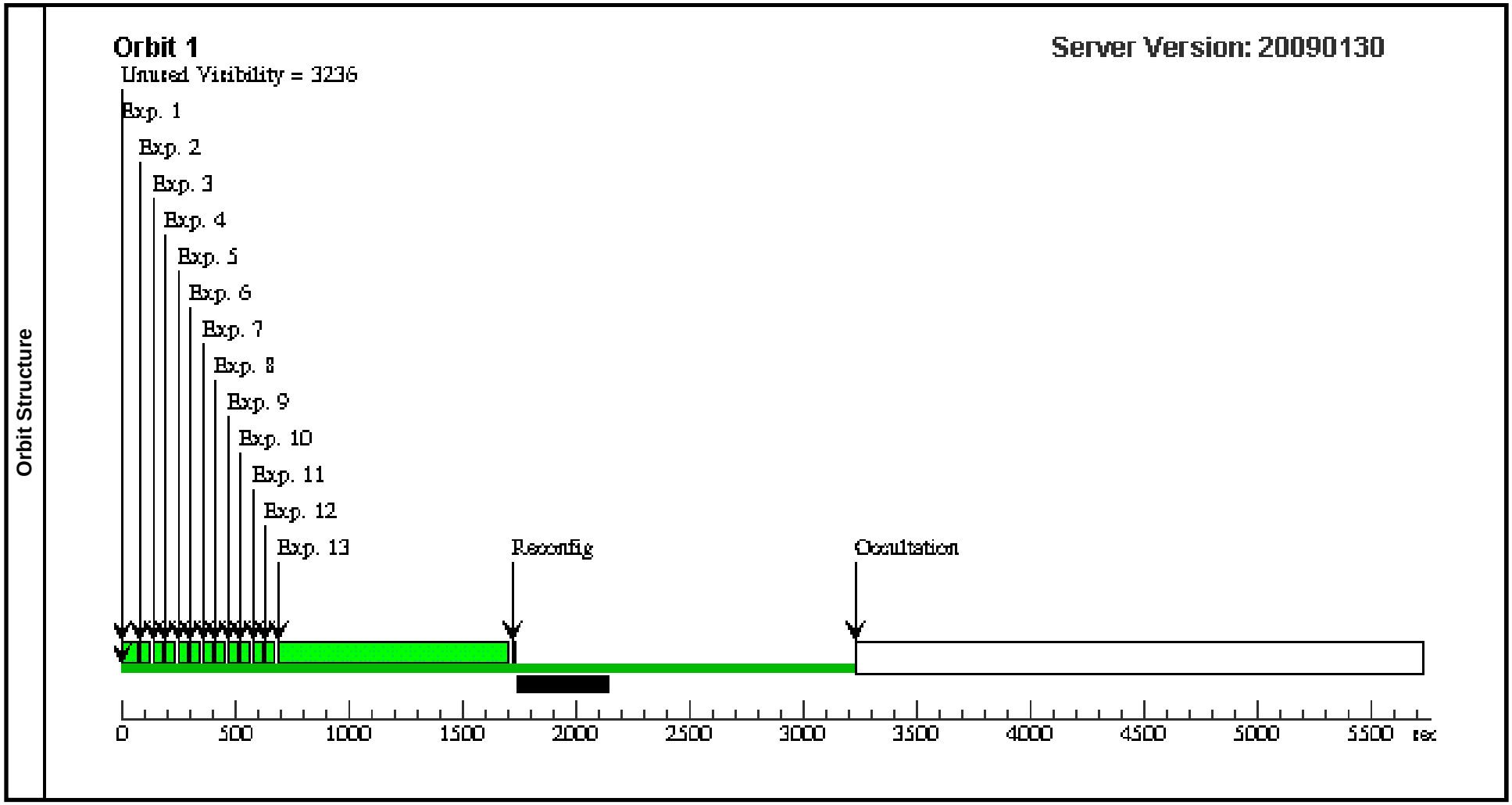
Special Requirements: AFTER_02

Diagnostics

(Visit 03) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F467M - 50 0e - B - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				5 Secs	
								[==>]	***[1]***
2	F467M - 50 0e - B - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				5 Secs	
								[==>]	***[1]***
3	F467M - 50 0e - B - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				5 Secs	
								[==>]	***[1]***
4	F467M - 50 0e - B - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS1-C512B-SUB	F467M				5 Secs	
								[==>]	***[1]***
5	F467M - 50 0e - C - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				5 Secs	
								[==>]	***[1]***
6	F467M - 50 0e - C - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				5 Secs	
								[==>]	***[1]***
7	F467M - 50 0e - C - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				5 Secs	
								[==>]	***[1]***
8	F467M - 50 0e - C - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F467M				5 Secs	
								[==>]	***[1]***
9	F467M - 50 0e - D - 1/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				5 Secs	
								[==>]	***[1]***
10	F467M - 50 0e - D - 2/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				5 Secs	
								[==>]	***[1]***
11	F467M - 50 0e - D - 3/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				5 Secs	
								[==>]	***[1]***
12	F467M - 50 0e - D - 4/4	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS2-C512D-SUB	F467M				5 Secs	
								[==>]	***[1]***
13	F467M - 90 000e	TUNGSTEN	WFC3/UVIS, ACCUM, UVIS	F467M				900 Secs	
								[==>]	***[1]***


Orbit Structure
Orbit 1
Server Version: 20090130
Unused Visibility = 3236
Exp. 1
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Exp. 6
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Exp. 11
Exp. 12
Exp. 13
Reconfig
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11925, Visit 04 Sat Apr 11 01:11:36 GMT 2009

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 15-AUG-2009:00:00:00 AND 30-OCT-2009:00:00:00

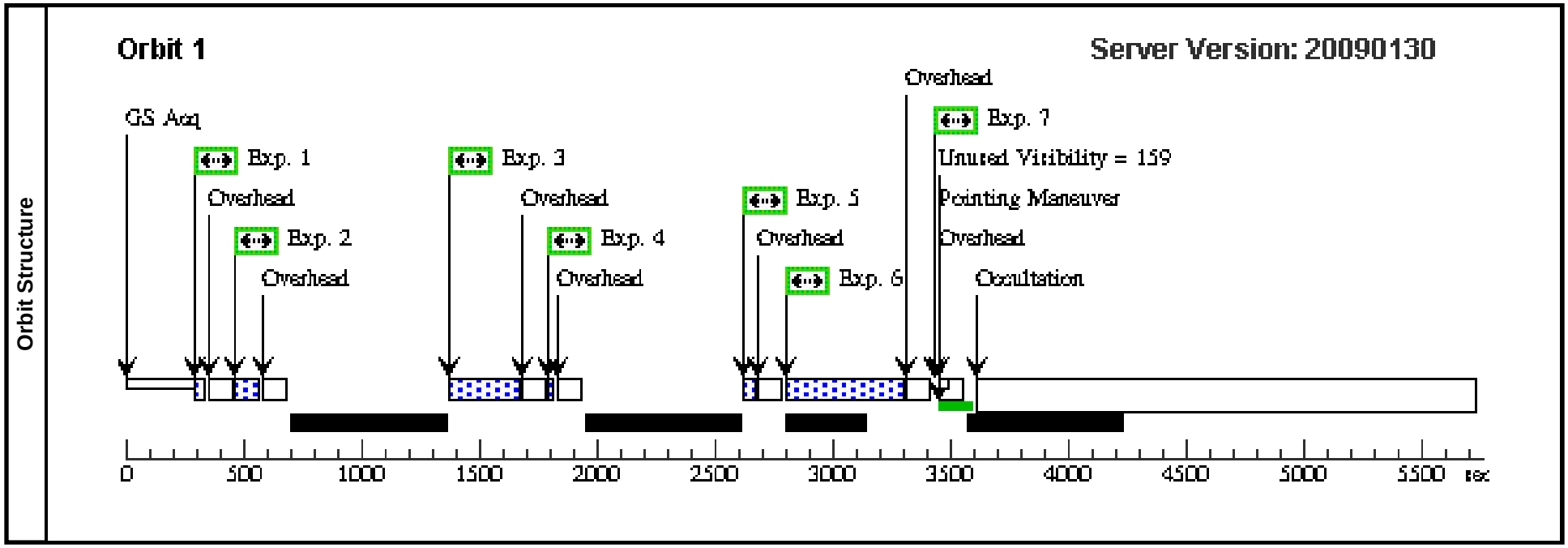
Fixed Targets

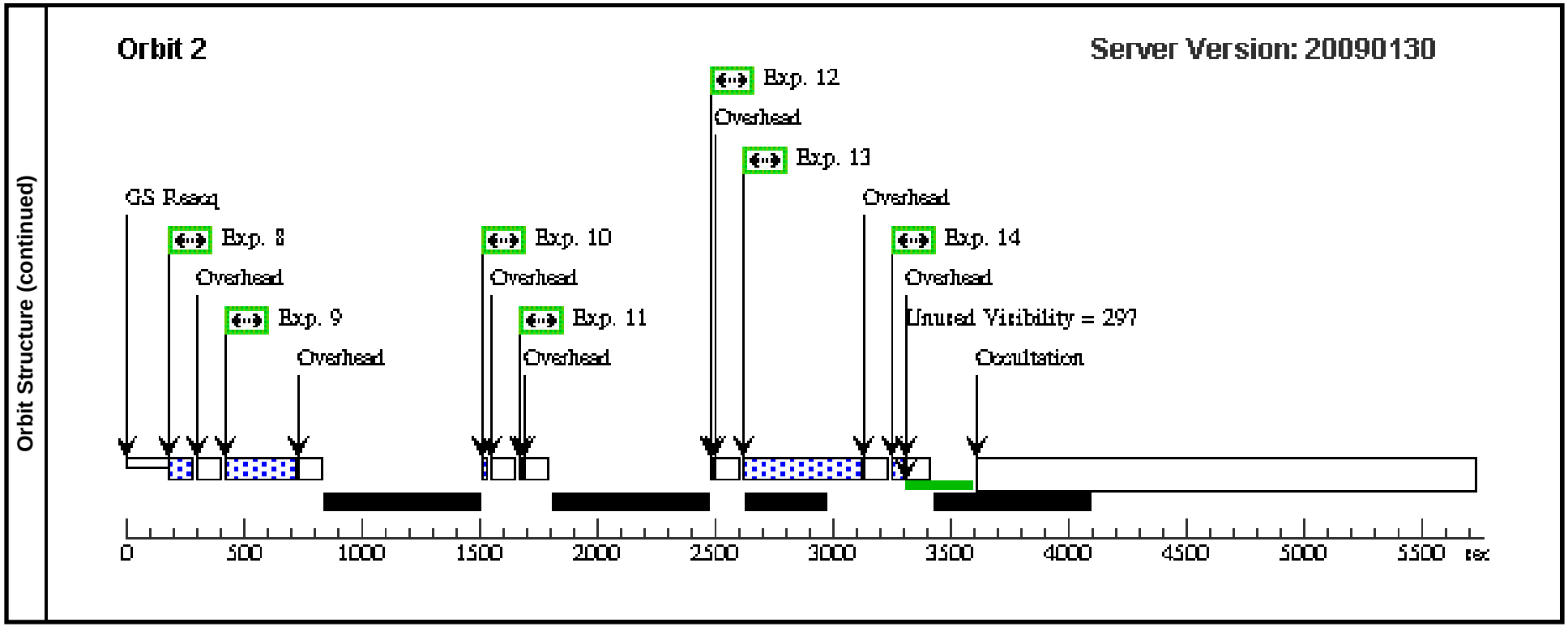
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	NGC-1850	RA: 05 08 44.7000 (77.1862500d) Dec: -68 45 42.00 (-68.76167d) Equinox: J2000		V=15	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the NED database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Cluster-UVIS1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		10 Secs *[==>]*	*[1]*
2	Cluster-UVIS1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		100 Secs *[==>]*	*[1]*
3	Cluster-UVIS1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		300 Secs *[==>]*	*[1]*
4	Cluster-UVIS1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		20 Secs *[==>]*	*[1]*
5	Cluster-UVIS1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		50 Secs *[==>]*	*[1]*
6	Cluster-Uvis1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		500 Secs *[==>]*	*[1]*
7	Cluster-Uvis1	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS1	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		10 Secs *[==>]*	*[1]*
8	Cluster-UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO			100 Secs *[==>]*	*[2]*
9	Cluster UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		300 Secs *[==>]*	*[2]*
10	Cluster-UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO			20 Secs *[==>]*	*[2]*
11	Cluster-UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO			10 Secs *[==>]*	*[2]*
12	Cluster-UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO			10 Secs *[==>]*	*[2]*
13	Cluster-UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO	POS TARG 0,0		500 Secs *[==>]*	*[2]*
14	Cluster-UVIS2	(4) NGC-1850	WFC3/UVIS, ACCUM, UVIS2	F467M	GAIN=1.5; CR-SPLIT=NO			50 Secs *[==>]*	*[2]*


Orbit Structure
Orbit 1
Server Version: 20090130
GS Acq
Exp. 1
Overhead
Exp. 2
Overhead
Exp. 3
Overhead
Exp. 4
Overhead
Exp. 5
Overhead
Exp. 6
Overhead
Exp. 7
Unused Visibility = 159
Pointing Maneuver
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit Structure (continued)
Orbit 2
Server Version: 20090130
GS Reacq
Exp. 8
Overhead
Exp. 9
Overhead
Exp. 10
Overhead
Exp. 11
Overhead
Exp. 12
Overhead
Exp. 13
Overhead
Exp. 14
Overhead
Unused Visibility = 297
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec