11177 - The Nature of z=3 Lyman-Alpha Emitters

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

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	(1) GOODS-1	WFPC2	4	18-Jan-2008 02:07:16.0	yes
02	(1) GOODS-1	WFPC2	4	18-Jan-2008 02:07:21.0	yes
03	(1) GOODS-1	WFPC2	4	18-Jan-2008 02:07:25.0	yes
04	(2) GOODS-2	WFPC2	4	18-Jan-2008 02:07:28.0	yes
05	(2) GOODS-2	WFPC2	4	18-Jan-2008 02:07:31.0	yes
06	(2) GOODS-2	WFPC2	4	18-Jan-2008 02:07:35.0	yes

24 Total Orbits Used

ABSTRACT

The advent of large mosaic CCD cameras on 4 -- 8 m class telescopes has recently led to a revolution in our ability to detect primordial galaxies. Today, large numbers of strong Ly-alpha emitters (LAEs) are being discovered between $2.4 < z < 6$. These are important objects: not only do they sample a part of the galaxy luminosity function that is inaccessible to the Lyman-break technique, but they also tend to be younger and less chemically evolved. In fact, the LAEs now being found are currently our best candidates for galaxies in the act of formation.

To investigate the properties of this class of objects, we have conducted an extremely deep narrow-band (5000 Angstrom; FWHM = 50 Angstrom) and broad-band (UBVRIzJK) survey of the Extended Chandra Deep Field South, and have identified a homogeneous sample of strong Ly-alpha emitters at z = 3.11. Twenty-seven of these objects are located within the region surveyed by Great Observatories Origins Deep Survey (GOODS) and have detailed morphological information available from the rest-frame ultraviolet.

We propose 0.2" resolution narrow-band imaging of 11 of our LAEs using the F502N filter of WFPC2. By comparing the Ly-alpha and rest-frame UV continuum morphologies of these galaxies, we will be able to look for the presence of outflows, constrain their dust content, and test whether these objects are truly primordial galaxies.

OBSERVING DESCRIPTION

We plan to observe eleven luminous Ly-alpha emission galaxy candidates at z = 3.11. These galaxies were originally identified in a 20 hr 5000 Angstrom image of the CDF-S/GOODS-S field taken with the CTIO 4-m telescope. All are unresolved or barely resolved from the ground in 1.0 arcsec seeing, and have average source radii much smaller than this (0.2 arcseconds or less as determined from ACS/WFC V606W imaging from the GOODS archival data). In order to determine the galaxy's morphology in the Ly-alpha line, we propose observations through the F502N narrow-band filter on WFPC2. The emission-line fluxes of these sources range from 1.3 x 10^-16 ergs/cm^2/s to 2.0 x 10^-17 ergs/cm^2/s. In order to get an accurate measurement of the emission-line morphology, we need a signal-to-noise of around eight at minimum. Plugging these values into the WFPC2 exposure time calculator, assuming optimal photometry, and making conservative estimates of the parameters, we find that we will need an exposure time of 25,000s without accounting for CTE effects. The CTE estimation tool gives a CTE loss of approximately 25% so we are requesting 31,000s per pointing. Assuming normal overhead, this implies a total of twelve orbits per setup. (This calculation assumes a conservative 43 minutes per orbit, which is less than what is available for our fields even in two-gyro mode.) We request two fields, making our total orbit request

24 orbits. Our pointings are shown in Figure 3.

We have carefully chosen these pointing to maximize the number of LAEs with confirmed redshifts greater than z = 3.105, while avoiding LAEs with redshifts smaller than this. (Ly-alpha emission from lower redshift LAEs will fall outside the bandpass of the WFPC2 F502N filter.) Our chosen pointings cover six confirmed spectroscopically confirmed LAEs (including the one LAE/AGN) and five unconfirmed objects. We note that, if the orientation of the WFPC2 is non-optimal, one or two of the proposed targets may fall outside of the instrument's field of view. However, all six of the spectroscopically confirmed LAEs will be observable.

In addition, in order to probe for outflows spectroscopically, we will be observing all of our proposed targets at higher resolution with the Robert Stobie Spectrograph (RSS) on the South African Large Telescope (SALT). Both Penn State and Rutgers have access to this telescope.

The magnitudes and colors of the galaxies will be measured using standard photometric packages (eg., SExtractor; Bertin & Arnouts 1996). We will perform quantitative morphological measurements of our galaxies using the GALFIT package (Peng et al. 2002), which allows for the simultaneous fitting of multiple profiles, the measurement of bulge/disk ratios, and the extraction of nuclear sources. In addition, we will calculate concentration index (C), asymmetry (A), and clumpiness (S) of the Ly-alpha emission using the methods of Conselice (2003). All of these programs have been used extensively on HST data. Such a sophisticated 2-dimensional approach is vital in order to perform the best possible measurements of galaxy morphology. We are already in the process of performing these same analyses on the HST/ACS B,V, i, and z images of these galaxies from the GOODS survey. Thus we will be able to directly compare the galaxies' continuum and emission-line morphologies, and thereby test the hypothesis that Ly-alpha is escaping from the objects due to large-scale outflows.

ADDITIONAL COMMENTS

We have placed orientation constraints on our visits in order to maximize the number of our targets observed in each pointing. We have verified that these orientation constraints are scheduable in Cycle 16.

Visit

Proposal 11177, Visit 01 Fri Jan 18 07:07:38 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 240.0D TO 270.0 D

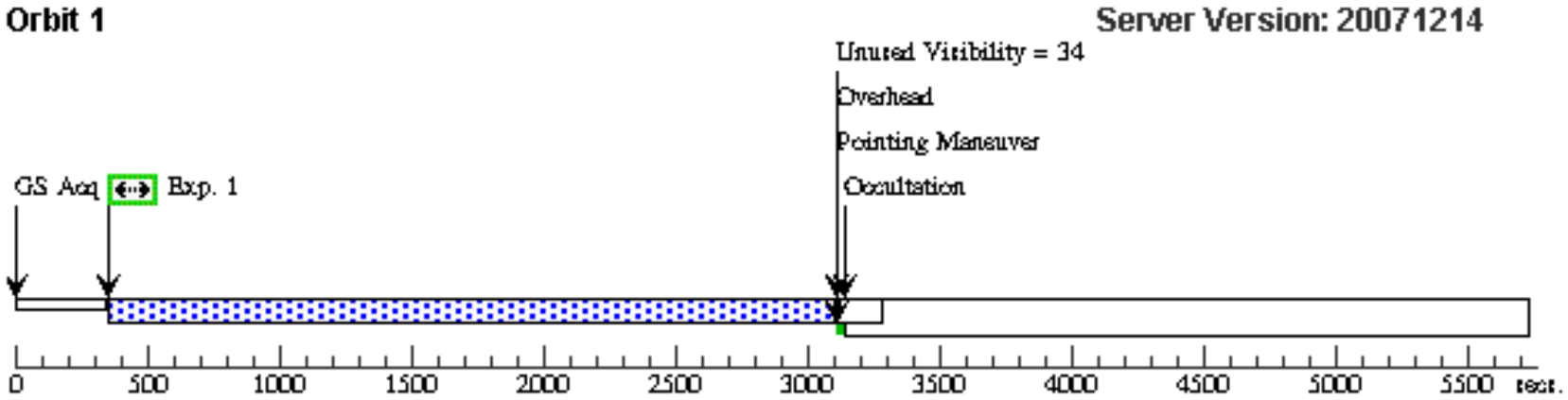
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GOODS-1	RA: 03 32 13.7263 (53.0571929d) Dec: -27 44 37.59 (-27.74378d) Equinox: J2000		V=20	Reference Frame: ICRS

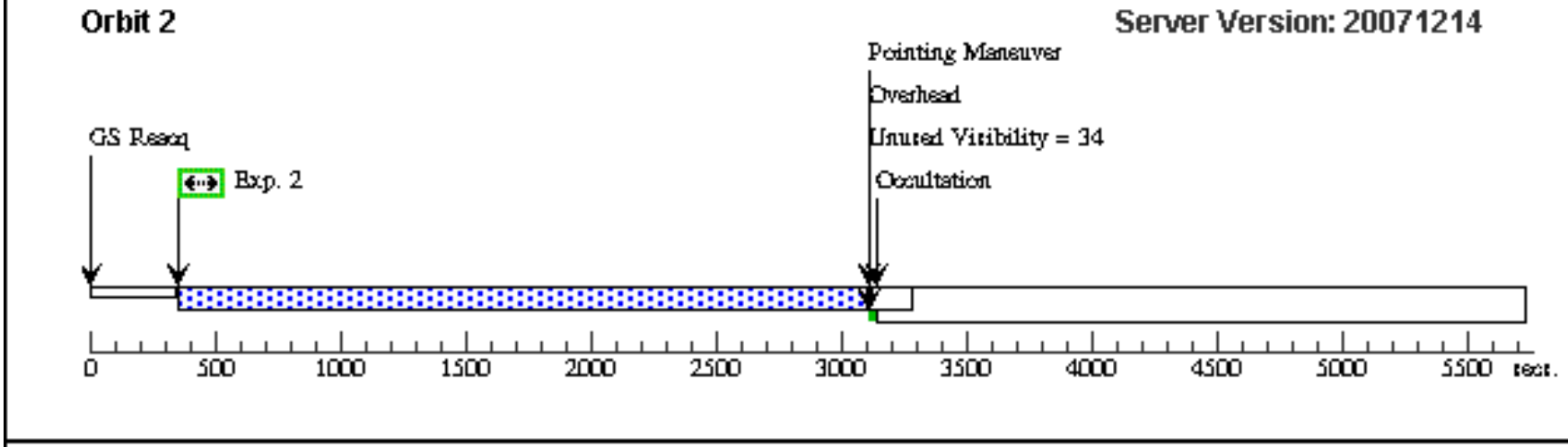
Exposures

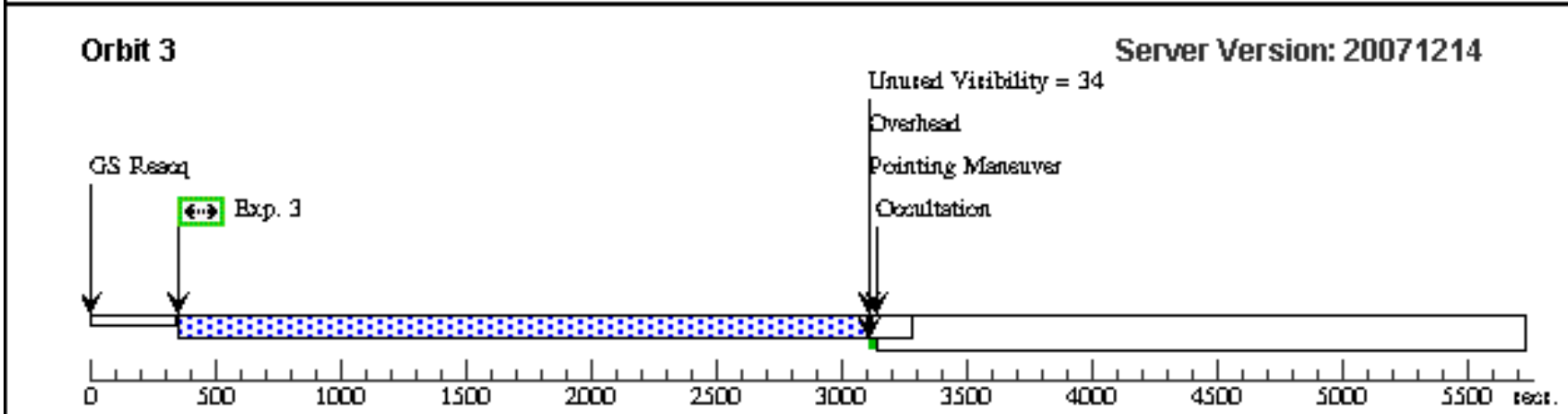
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO			2600.0 Secs *[==>]*	*[1]*
2		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.498,0.249		2600.0 Secs *[==>]*	*[2]*
3		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.747,0.747		2600.0 Secs *[==>]*	*[3]*
4		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.249,0.498		2600.0 Secs *[==>]*	*[4]*

Orbit Structure



Orbit Structure (continued)





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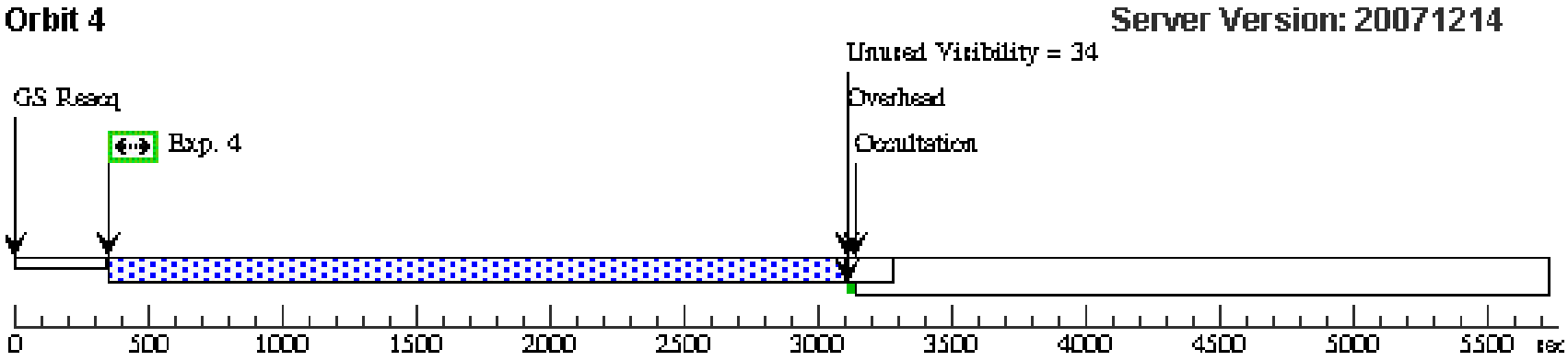


Visit

Proposal 11177, Visit 02 Fri Jan 18 07:07:39 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 240.0D TO 270.0 D

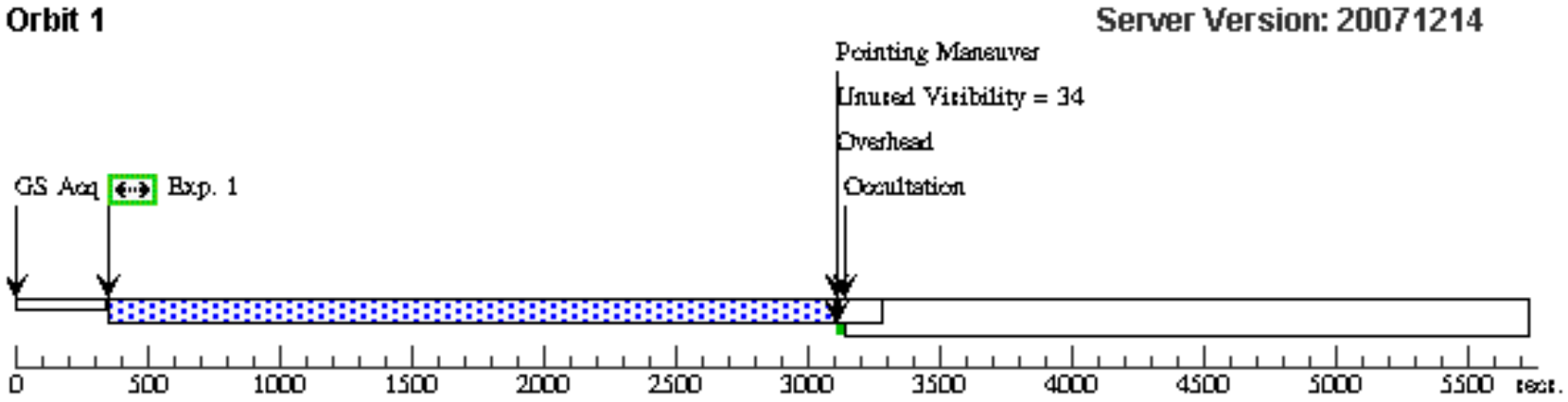
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GOODS-1	RA: 03 32 13.7263 (53.0571929d) Dec: -27 44 37.59 (-27.74378d) Equinox: J2000		V=20	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO			2600.0 Secs	
								[==>]	***[1]***
2		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.498,0.249		2600.0 Secs	
								[==>]	***[2]***
3		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.747,0.747		2600.0 Secs	
								[==>]	***[3]***
4		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.249,0.498		2600.0 Secs	
								[==>]	***[4]***

Orbit Structure



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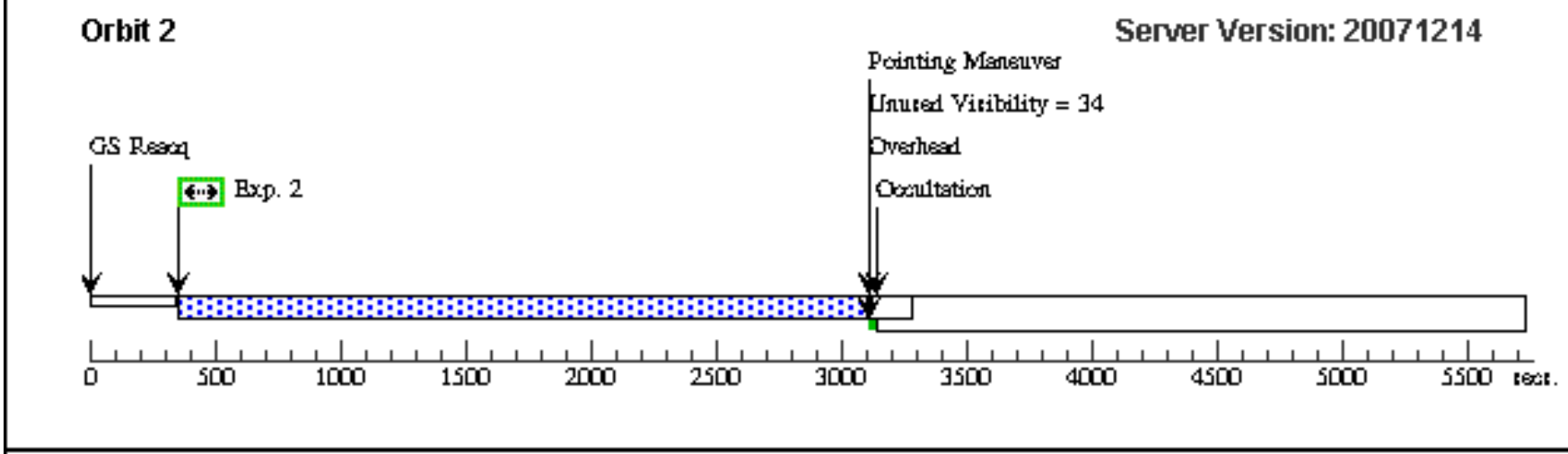

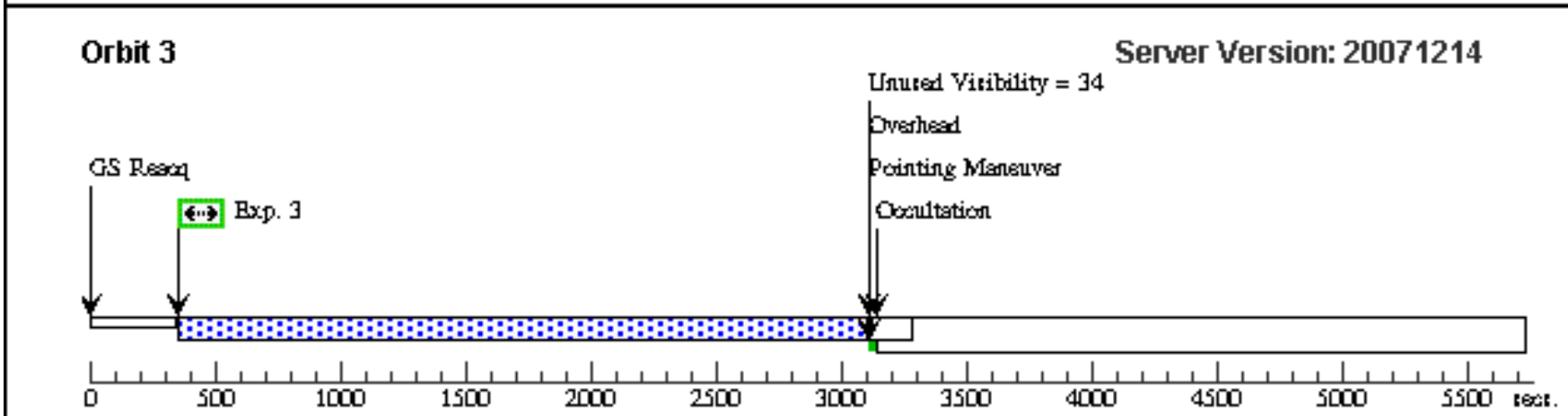

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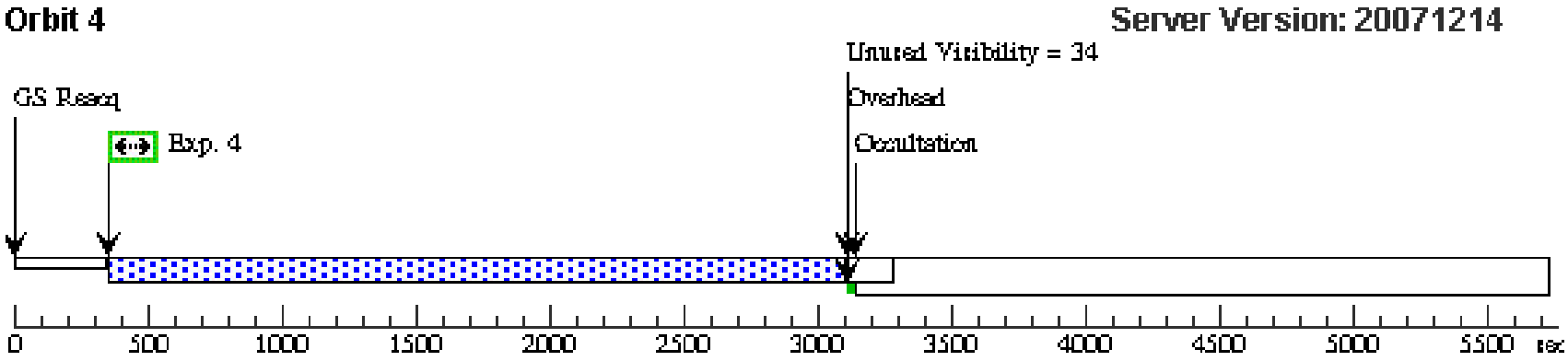


Visit

Proposal 11177, Visit 03 Fri Jan 18 07:07:40 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 240.0D TO 270.0 D

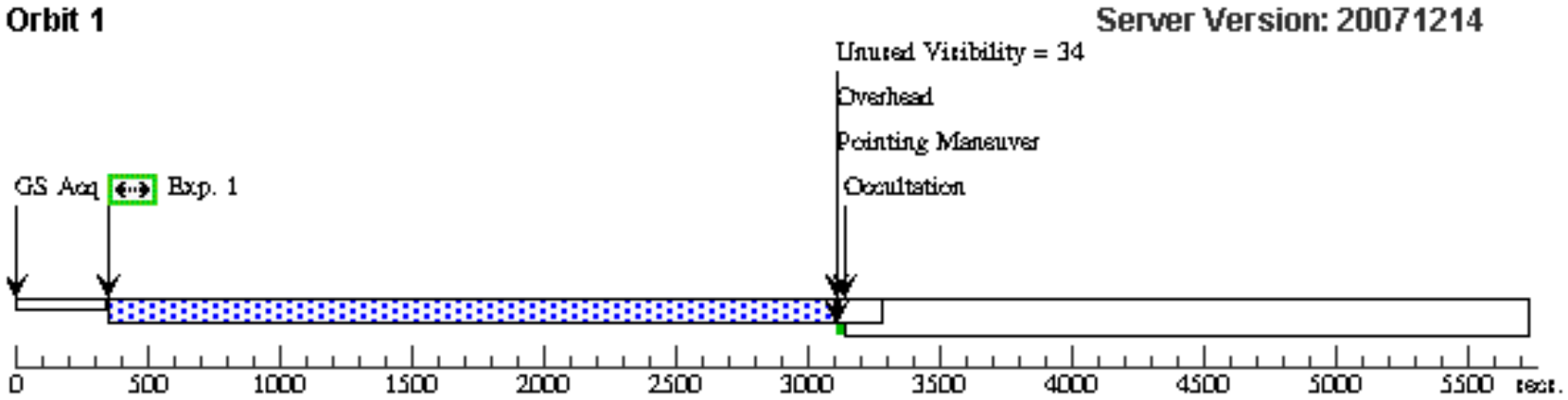
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GOODS-1	RA: 03 32 13.7263 (53.0571929d) Dec: -27 44 37.59 (-27.74378d) Equinox: J2000		V=20	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO			2600.0 Secs	
								[==>]	***[1]***
2		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.498,0.249		2600.0 Secs	
								[==>]	***[2]***
3		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.747,0.747		2600.0 Secs	
								[==>]	***[3]***
4		(1) GOODS-1	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.249,0.498		2600.0 Secs	
								[==>]	***[4]***

Orbit Structure



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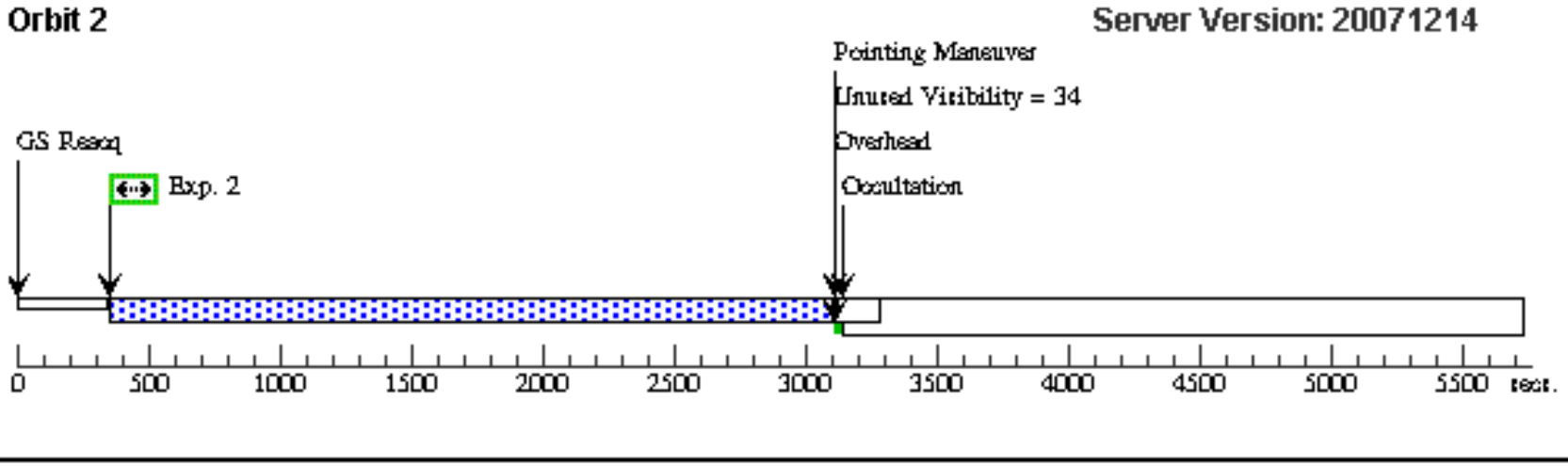

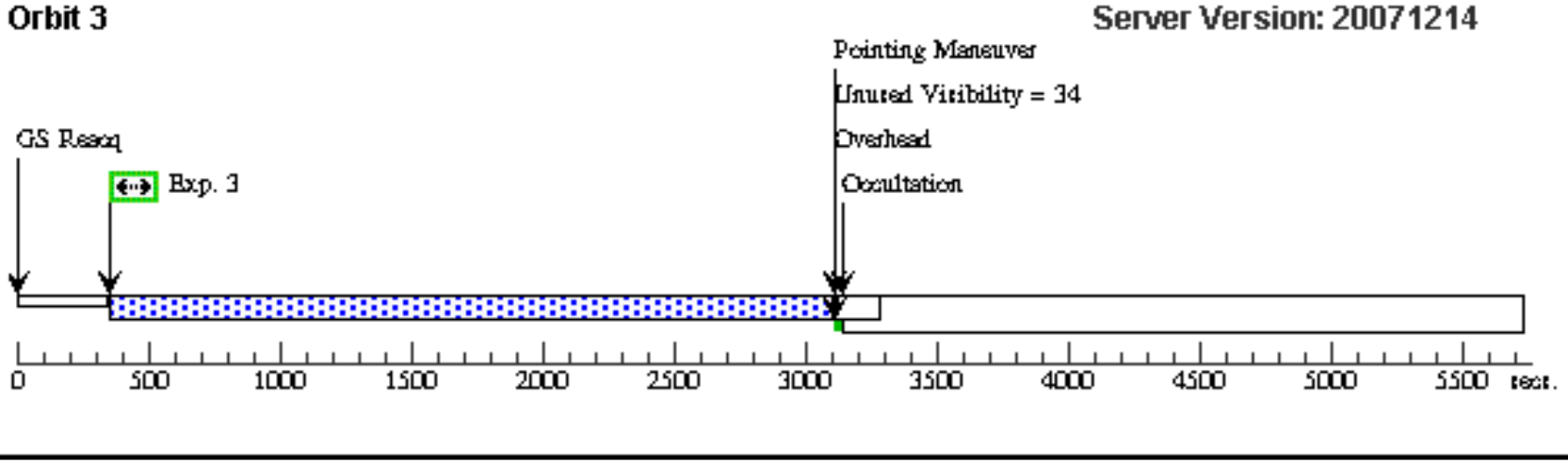

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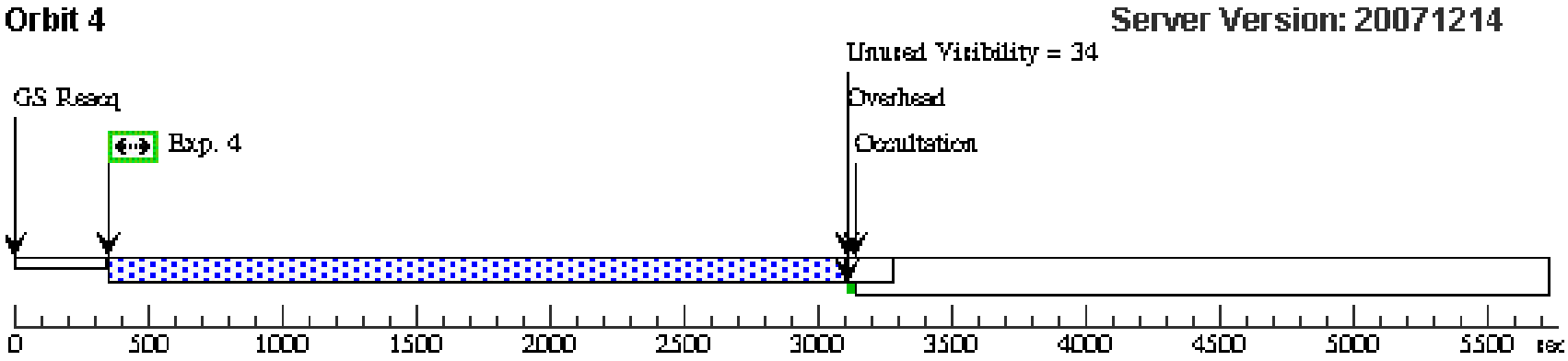


Visit

Proposal 11177, Visit 04 Fri Jan 18 07:07:41 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 265.0D TO 280.0 D

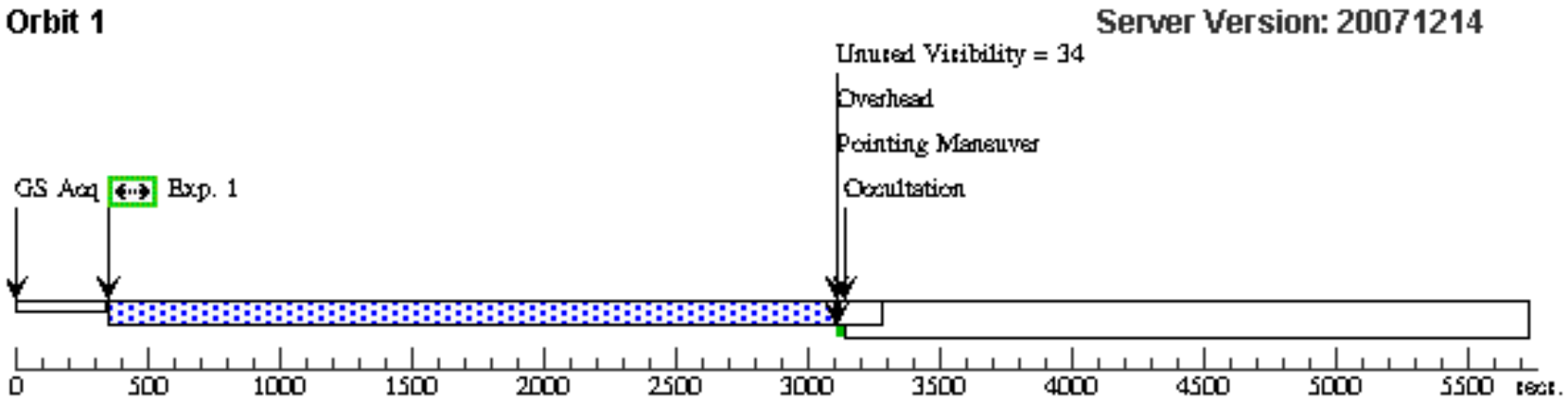
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	GOODS-2	RA: 03 32 22.9880 (53.0957833d) Dec: -27 42 0.00 (-27.70000d) Equinox: J2000		V=20	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO			2600.0 Secs *[==>]*	*[1]*
2		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.498,0.249		2600.0 Secs *[==>]*	*[2]*
3		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.747,0.747		2600.0 Secs *[==>]*	*[3]*
4		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.249,0.498		2600.0 Secs *[==>]*	*[4]*

Orbit Structure



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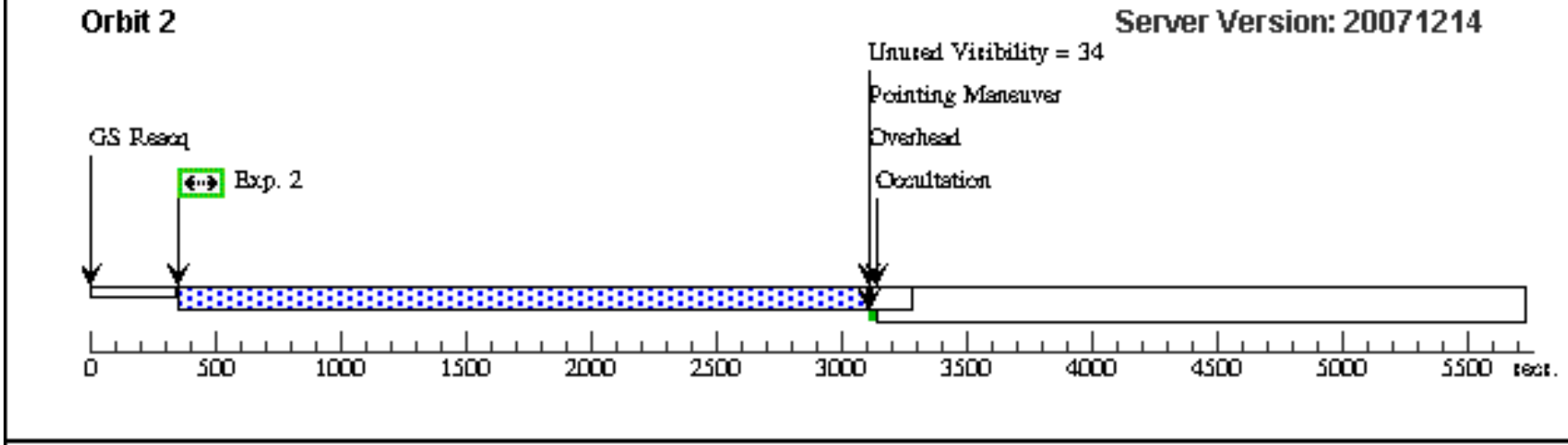

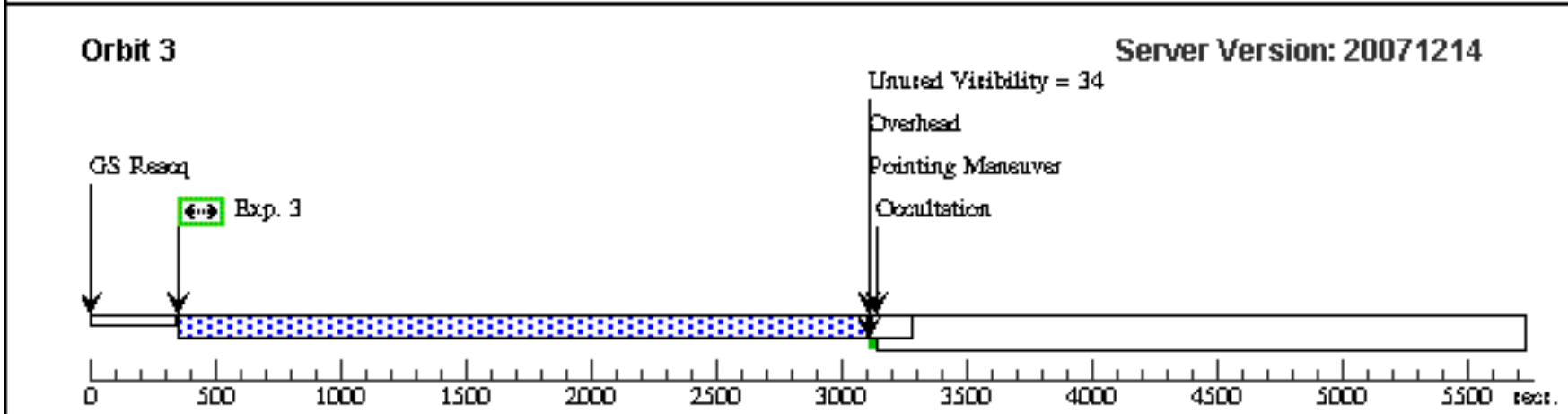

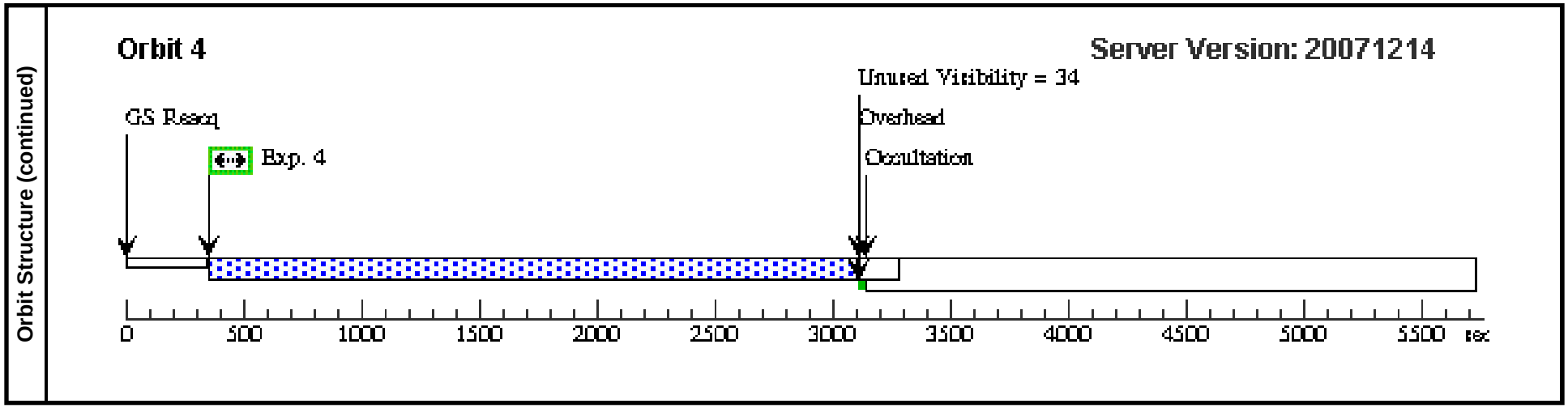
Orbit Structure (continued)
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GS Reacq
Exp. 4
Overhead
Occultation
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1500
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3500
4000
4500
5000
5500
sec

Visit

Proposal 11177, Visit 05 Fri Jan 18 07:07:42 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 265.0D TO 280.0 D

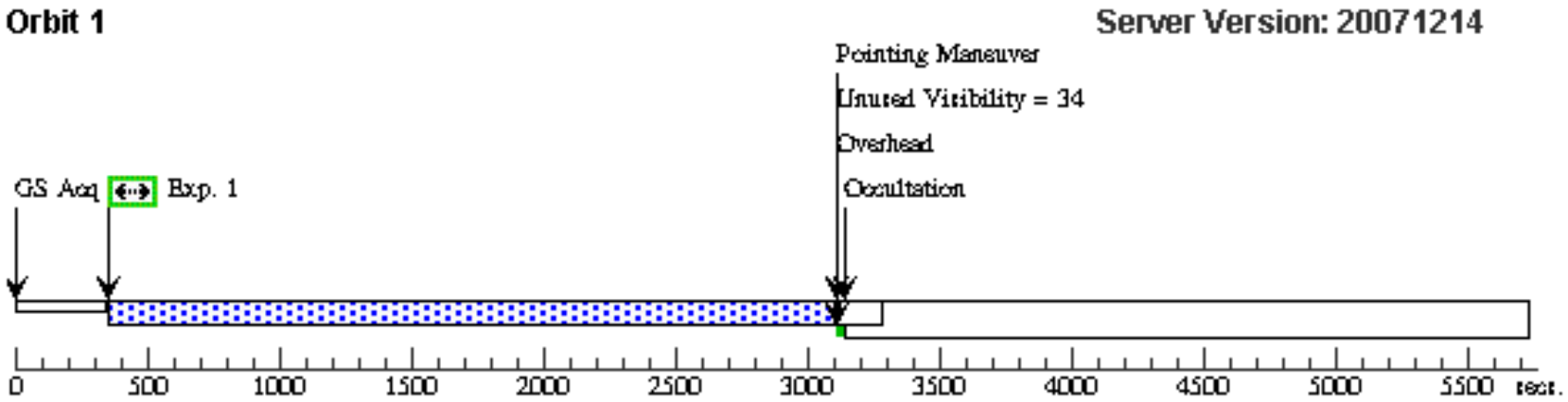
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	GOODS-2	RA: 03 32 22.9880 (53.0957833d) Dec: -27 42 0.00 (-27.70000d) Equinox: J2000		V=20	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO			2600.0 Secs	
								[==>]	***[1]***
2		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.498,0.249		2600.0 Secs	
								[==>]	***[2]***
3		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.747,0.747		2600.0 Secs	
								[==>]	***[3]***
4		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.249,0.498		2600.0 Secs	
								[==>]	***[4]***

Orbit Structure



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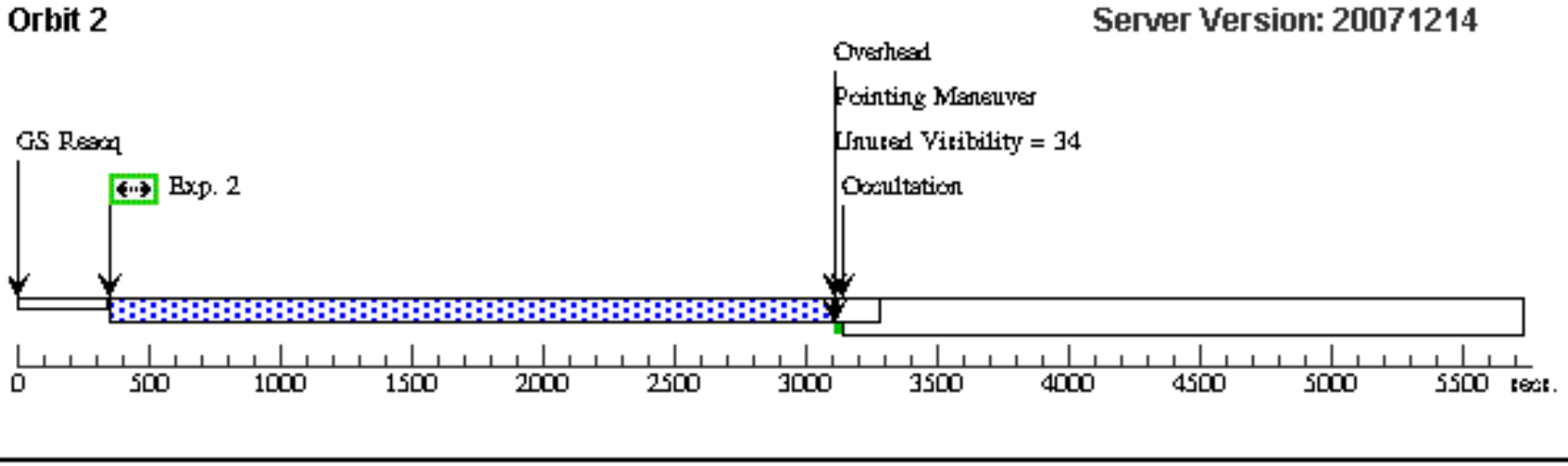

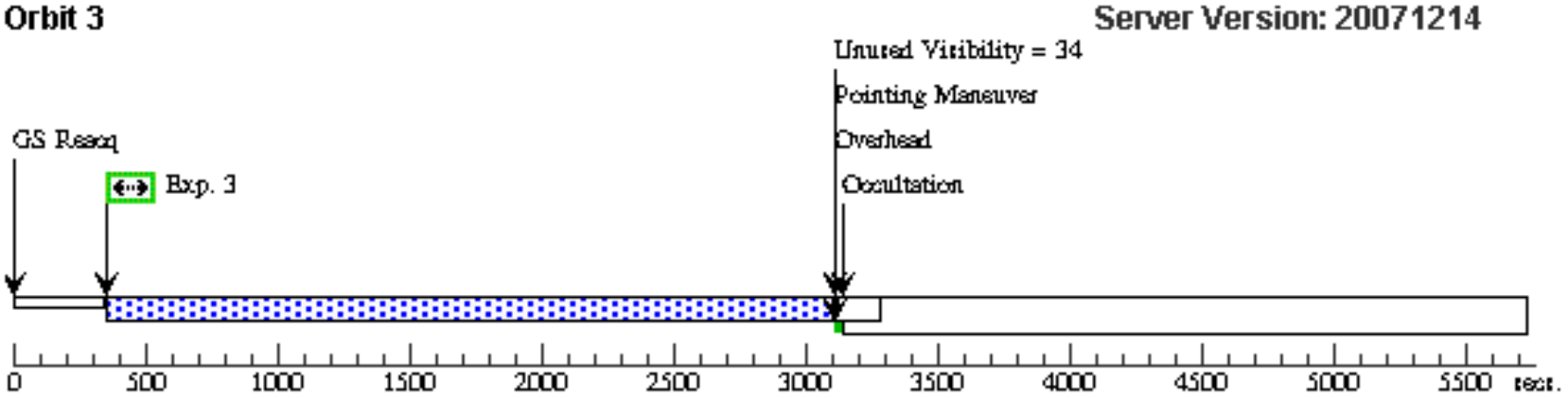

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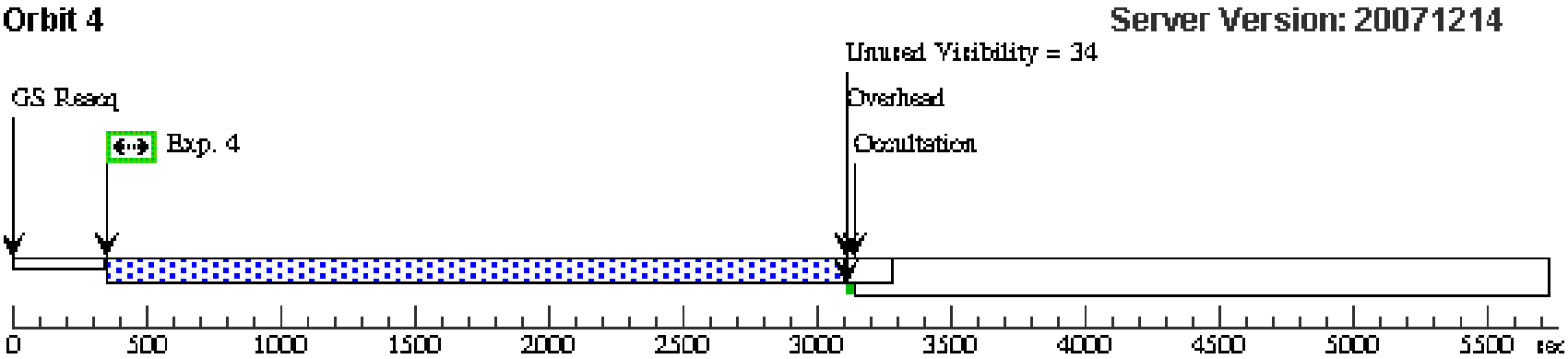


Visit

Proposal 11177, Visit 06 Fri Jan 18 07:07:43 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 265.0D TO 280.0 D

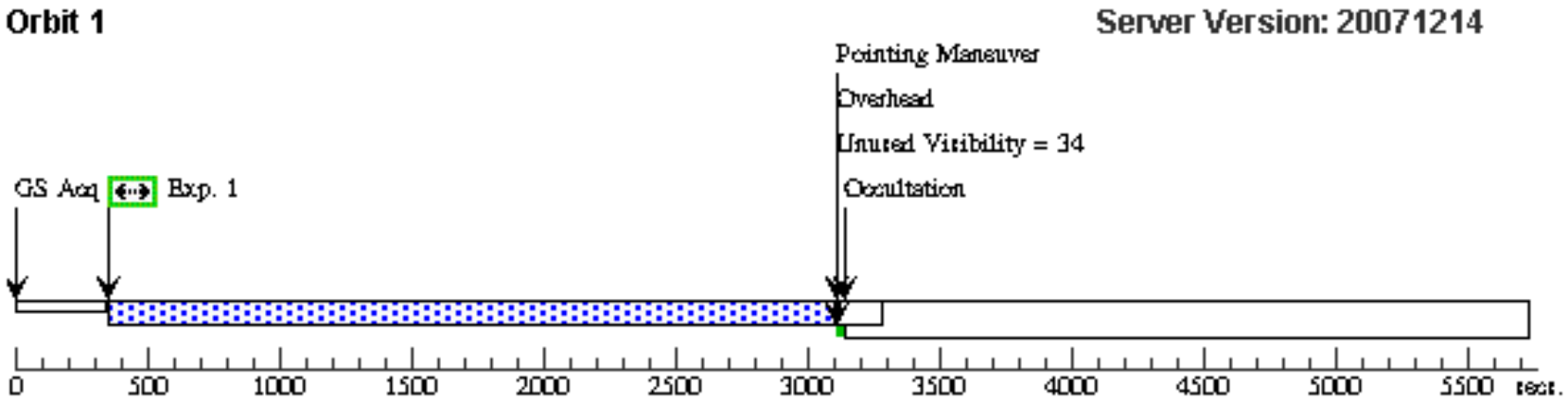
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	GOODS-2	RA: 03 32 22.9880 (53.0957833d) Dec: -27 42 0.00 (-27.70000d) Equinox: J2000		V=20	Reference Frame: ICRS

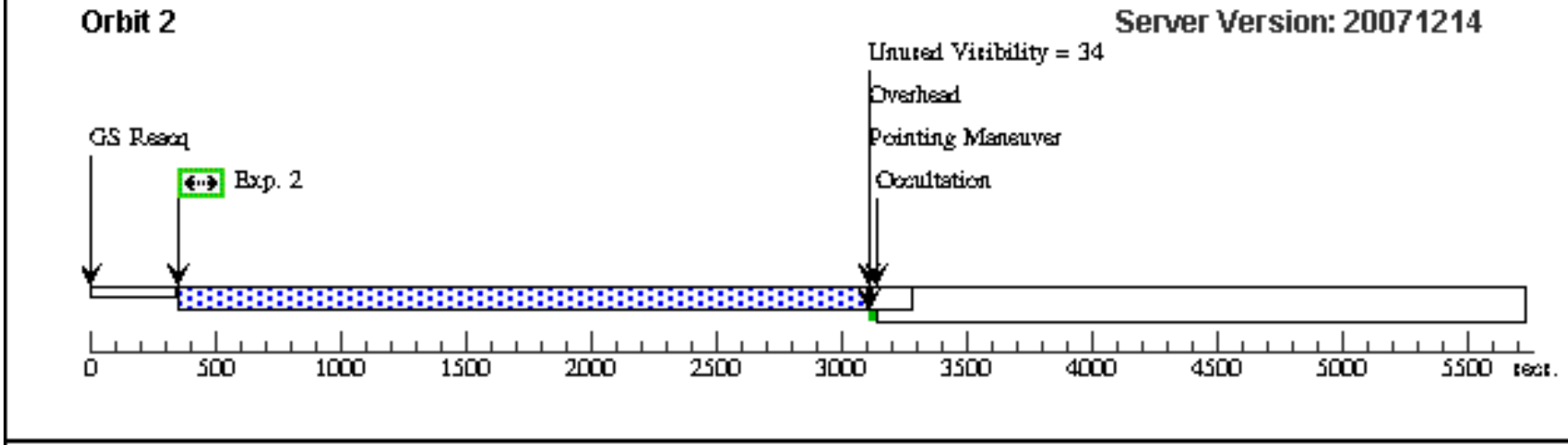
Exposures

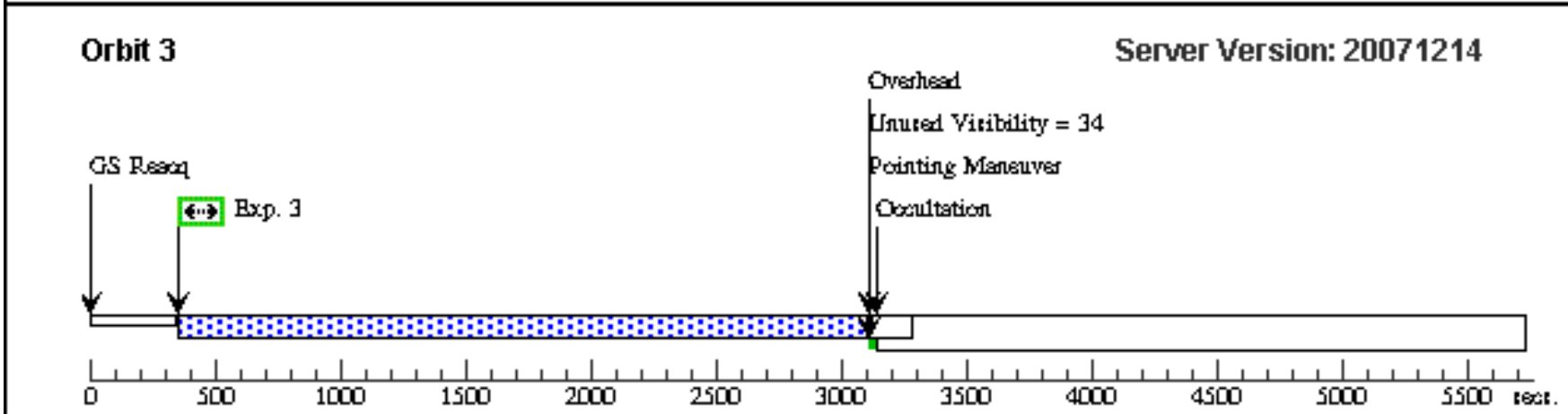
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO			2600.0 Secs *[==>]*	*[1]*
2		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.498,0.249		2600.0 Secs *[==>]*	*[2]*
3		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.747,0.747		2600.0 Secs *[==>]*	*[3]*
4		(2) GOODS-2	WFPC2, IMAGE, WFALL	F502N	CR-SPLIT=NO	POS TARG 0.249,0.498		2600.0 Secs *[==>]*	*[4]*

Orbit Structure



Orbit Structure (continued)





Orbit Structure (continued)