



## 11640 - Lyman Alpha Imaging of Two Quasar Host Galaxies at $z > 6$

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
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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	(1) J1148+5251 (2) 1148-PSFSTAR	WFC3/UVIS	4	16-Sep-2010 21:02:41.0	yes
02	(1) J1148+5251	WFC3/UVIS	4	16-Sep-2010 21:02:49.0	yes
03	(3) J1030+0524-AVOID-STAR	WFC3/UVIS	4	16-Sep-2010 21:02:55.0	yes
04	(3) J1030+0524-AVOID-STAR	WFC3/UVIS	4	16-Sep-2010 21:03:03.0	yes

16 Total Orbits Used

### ABSTRACT

We propose to image the Lyman Alpha emission line in two of the highest redshift quasar host galaxies (redshifts  $z=6.31$  and  $6.42$ ) to map the amount and extent of star formation in the hosts and in their immediate environment. These observations are now possible for the first time, as UVIS

## Proposal 11640 (STScI Edit Number: 4, Created: Thursday, September 16, 2010 8:03:07 PM EST) - Overview

on WFC3 (coincidentally) provides narrow-band filters at the right wavelengths. Circumstantial evidence (based on NIR, radio/millimeter and molecular gas measurements) suggests that these quasar hosts are undergoing intense  $\sim 1000$  Msun/yr bursts of star formation over scales of  $\sim 5$  kpc (0.6"). Our program will provide (continuum-subtracted) images of the Lyman Alpha emission in the host which will in turn directly constrain the extent and magnitude of star formation in the host. In the case of the host galaxy of J1148+5251 ( $z=6.42$ ) the Lyman Alpha emission will be compared to resolved imaging of the molecular gas phase (CO and [CII]) which in turn will yield critical constraints on the structure of the host galaxy and the conditions of the interstellar medium. The observations should also be sensitive enough to reveal potential companion galaxies (if the quasars are residing in major overdensities at these redshifts) and infall signatures in the immediate vicinity of the quasar. The narrow-band filters of UVIS/WFC3 provide the unique opportunity to study host/bulge formation at the end of cosmic reionization (less than 1Gyr after the Big Bang).

### **OBSERVING DESCRIPTION**

observing program to obtain narrow band lyman alpha imaging of 2 qso hosts at  $z\sim 6$  using the quad filters on wfc3.

for each qso, one narrow band filter will be centred on the lyman alpha emission. a second narrow-band filter will observe the continuum emission. strategy is to observe one line and one continuum image in one orbit.

exposure times are long (half orbit) as observations are read-out noise dominated.

also, one psf star will be observed in the beginning of visit 1.

### **ADDITIONAL COMMENTS**

important note: all four visits should be scheduled as closely together in time as possible as psf stability is key to this program. certainly visits 1&2 and visits 3&4 need to be scheduled close in time. if all four visits could be scheduled close in time this would be ideal (psf star will only be observed in visit 1).

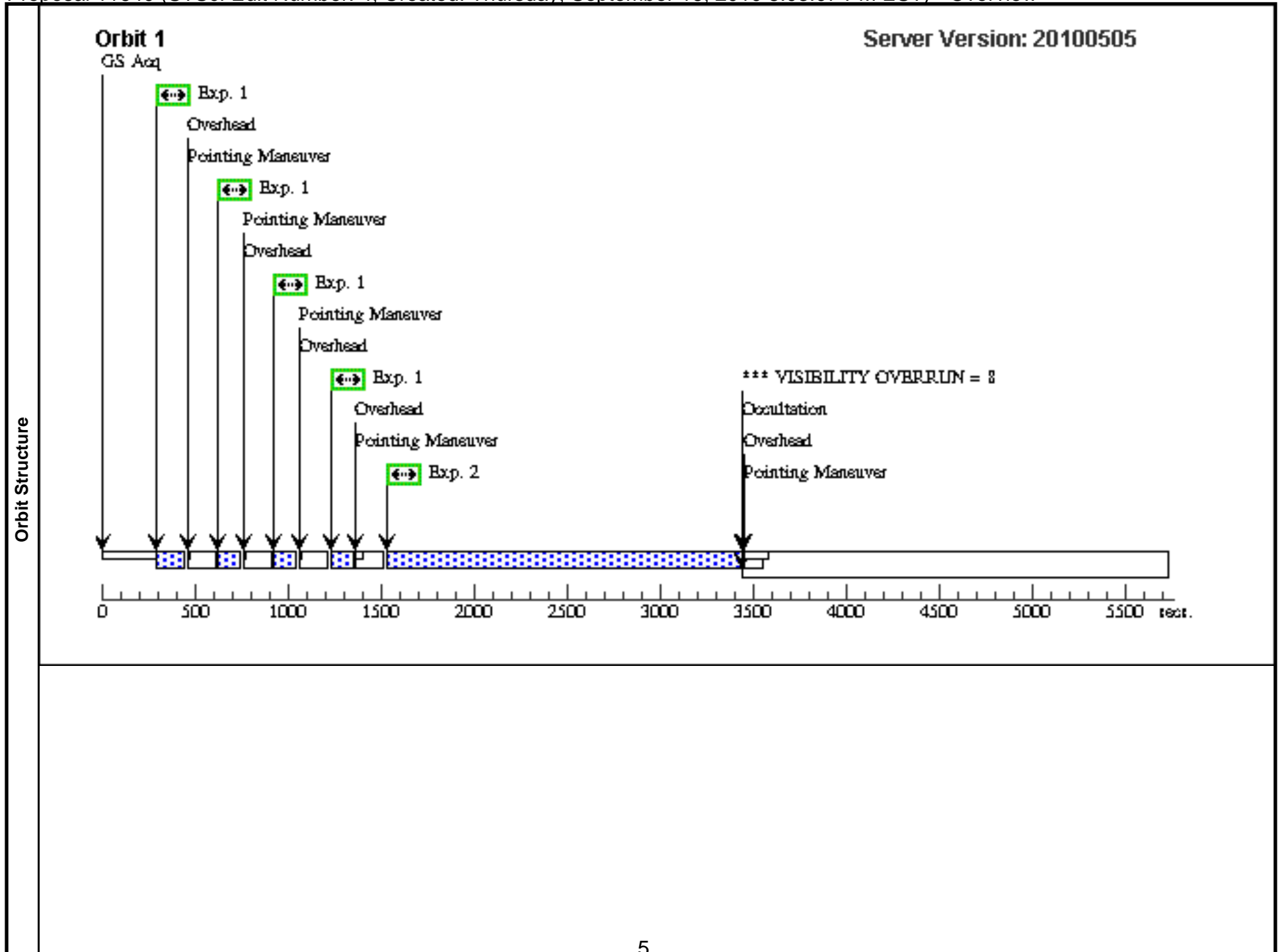
Proposal 11640 (STScI Edit Number: 4, Created: Thursday, September 16, 2010 8:03:07 PM EST) - Overview

Fri Sep 17 01:03:07 GMT 2010

<b>Visit</b>	<b>Proposal 11640, Visit 01, implementation</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: WFC3/UVIS Special Requirements: (none) <i>Comments: first visit for J1148                  this includes the PSF star in the first orbit                  no roll angle constraints</i>						
	<b>Diagnostics</b>	(Visit 01) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 01) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 01) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 01) Warning (Orbit Planner): VISIBILITY OVERRUN (1148-PSF (01.001)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-line (01.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-cont (01.004)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-line (01.005)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-cont (01.006)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-line (01.007)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-cont (01.008)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.					
<b>Patterns</b>		<b>#</b>		<b>Primary Pattern</b>	<b>Secondary Pattern</b>	<b>Exposures</b>	
		(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)	
<b>Fixed Targets</b>		<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>
		(1)	J1148+5251	RA: 11 48 16.6400 (177.0693333d) Dec: +52 51 50.30 (52.86397d) Equinox: J2000	Redshift: 6.42	V=25	Reference Frame: ICRS
		<i>Comments: no v band magnitude (no flux due to gunn peterson effect).</i>					
(2)		1148-PSFSTAR	RA: 11 48 20.5300 (177.0855417d) Alt Name1: N71Y000922 Dec: +52 52 26.60 (52.87406d) Equinox: J2000		V=15.22	Reference Frame: ICRS	

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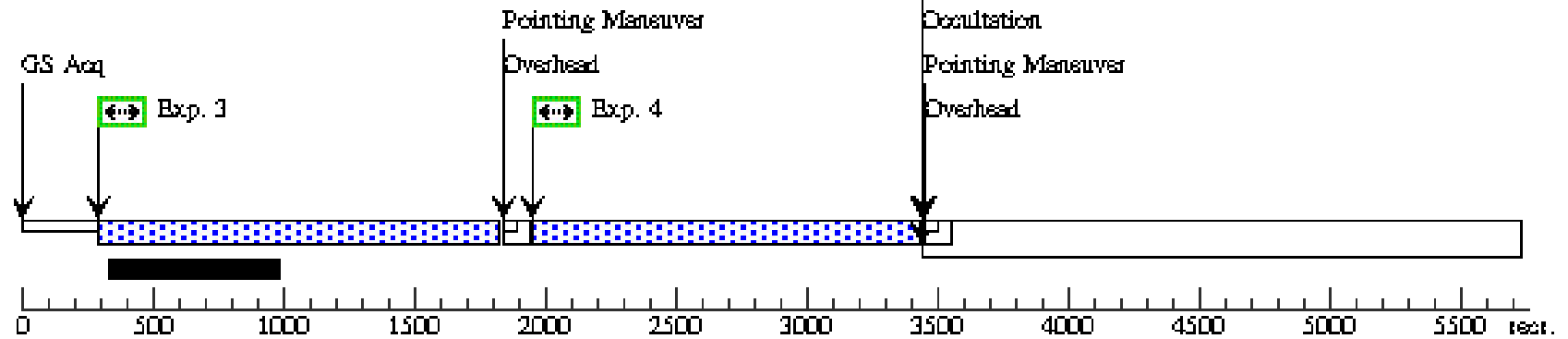
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit	
	1	1148-PSF	(2) J1148-PSFSTAR	WFC3/UVIS, ACCUM, UVIS-QUAD-SUB	FQ906N	CR-SPLIT=NO	GS ACQ SCENARI O BASE1B3	Pattern 1, Exps 1-1 (1)	120 Secs [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]	
	<i>Comments: only quadrant of interest will be read out to minimize overheads.</i>										
	<i>psf star will be observed in standard dither mode.</i>										
	2	1148-line	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ906N	CR-SPLIT=NO			1910 Secs [==>]	[1]	
	<i>Comments: the remainder of orbit 1 will be used to observe J1148 in the 'line' filter.</i>										
	<i>note: no cosmic ray split as we are read out noise dominated (and will have 8 frames for cr rejection).</i>										
	3	1148-line	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ906N	CR-SPLIT=NO	POS TARG 0.3,0.1; NEW OBSET FULL ACQ		1500 Secs [==>]	[2]	
	<i>Comments: note that for the beginning of orbit 2 we force apt to get new guide stars (see special requirements). within visit 1, orbit 1 and orbits 2-4 have seperate guidestars (because of psf star observations in orbit 1)</i>										
4	1148-cont	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ924N	CR-SPLIT=NO	POS TARG 0.3,0.1		1484 Secs [==>]	[2]		
5	1148-line	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ906N	CR-SPLIT=NO	POS TARG 0.4,0.2		1561 Secs [==>]	[3]		
6	1148-cont	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ924N	CR-SPLIT=NO	POS TARG 0.4,0.2		1561 Secs [==>]	[3]		
7	1148-line	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ906N	CR-SPLIT=NO	POS TARG 0.1,0.3		1561 Secs [==>]	[4]		
8	1148-cont	(1) J1148+5251	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ924N	CR-SPLIT=NO	POS TARG 0.1,0.3		1561 Secs [==>]	[4]		



### Orbit 2

Server Version: 20100505

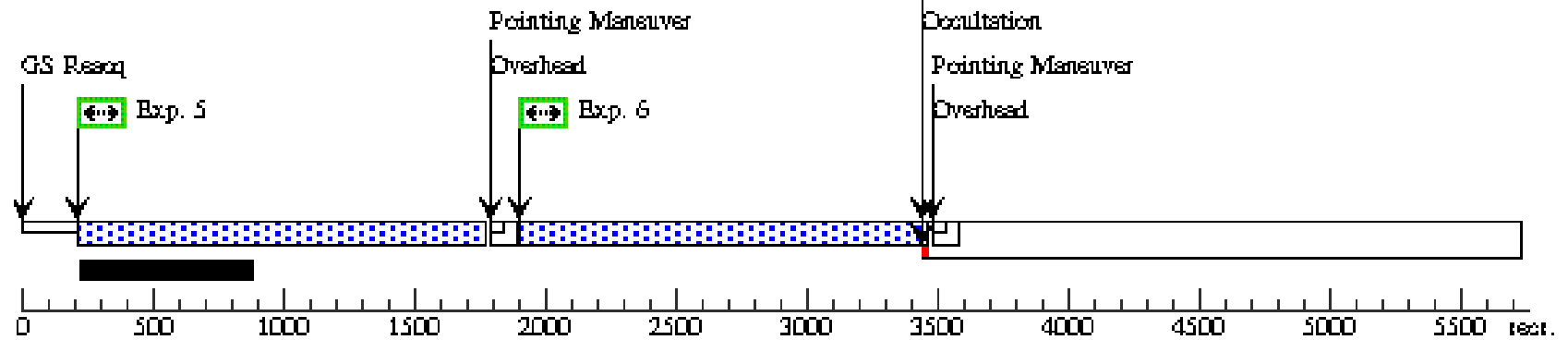
\*\*\* VISIBILITY OVERRUN = 8

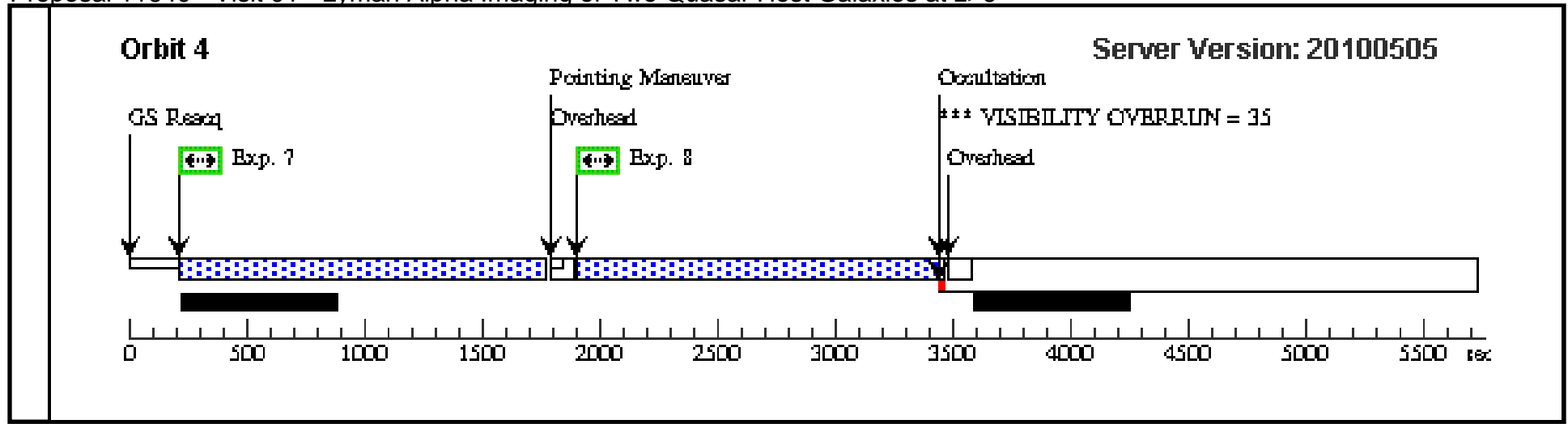


### Orbit 3

Server Version: 20100505

\*\*\* VISIBILITY OVERRUN = 35

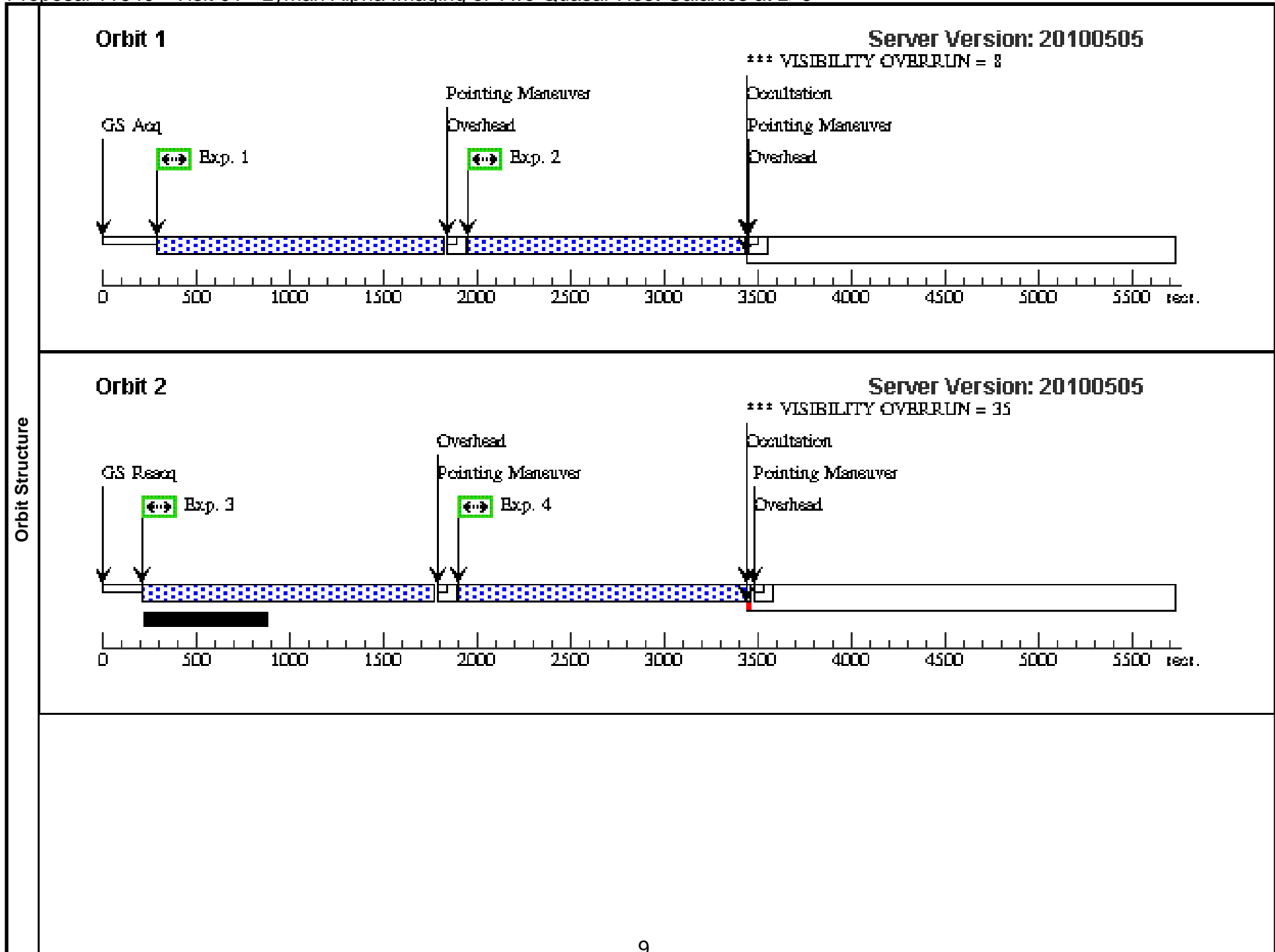




Proposal 11640 - Visit 01 - Lyman Alpha Imaging of Two Quasar Host Galaxies at z>6

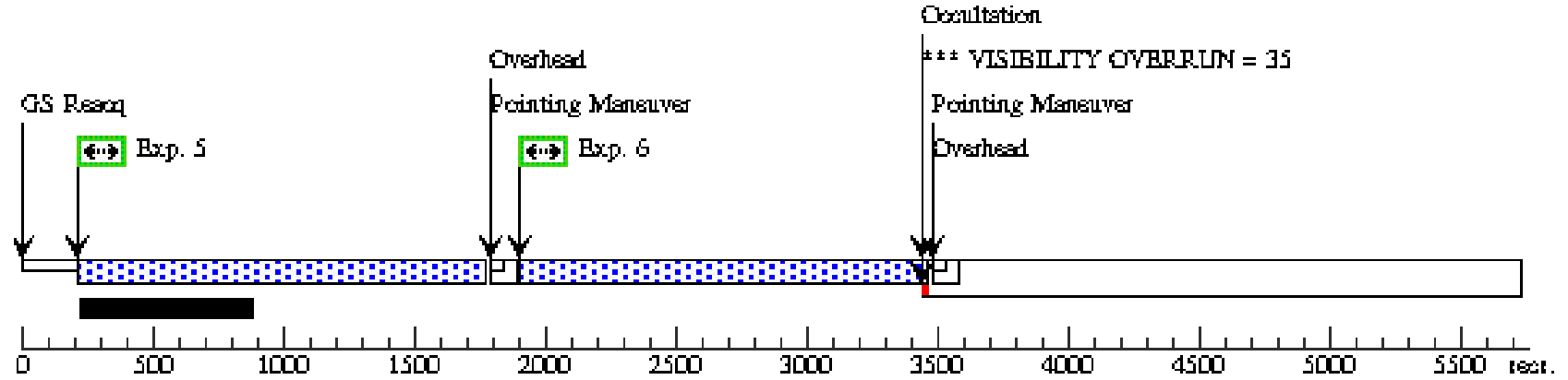
Fri Sep 17 01:03:09 GMT 2010

<b>Visit</b>	<b>Proposal 11640, Visit 02, implementation</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 45D TO 45D FROM 01 <i>Comments: second visit for J1148</i> <i>visit 2 to be executed with a roll angle 45 degrees offset from the visit 1</i>																																																																																																				
	<b>Diagnostics</b>	(Visit 02) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 02) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 02) Warning (Orbit Planner): VISIBILITY OVERRUN (Visit 02) Warning (Orbit Planner): VISIBILITY OVERRUN (1148-line (02.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-cont (02.004)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-line (02.005)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-cont (02.006)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-line (02.007)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1148-cont (02.008)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.																																																																																																			
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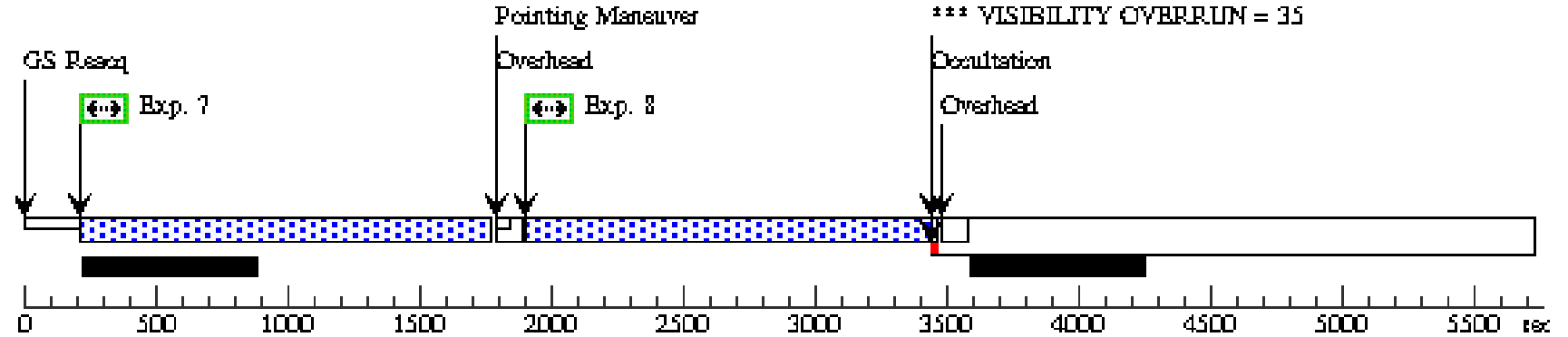
**Orbit 3**

Server Version: 20100505



**Orbit 4**

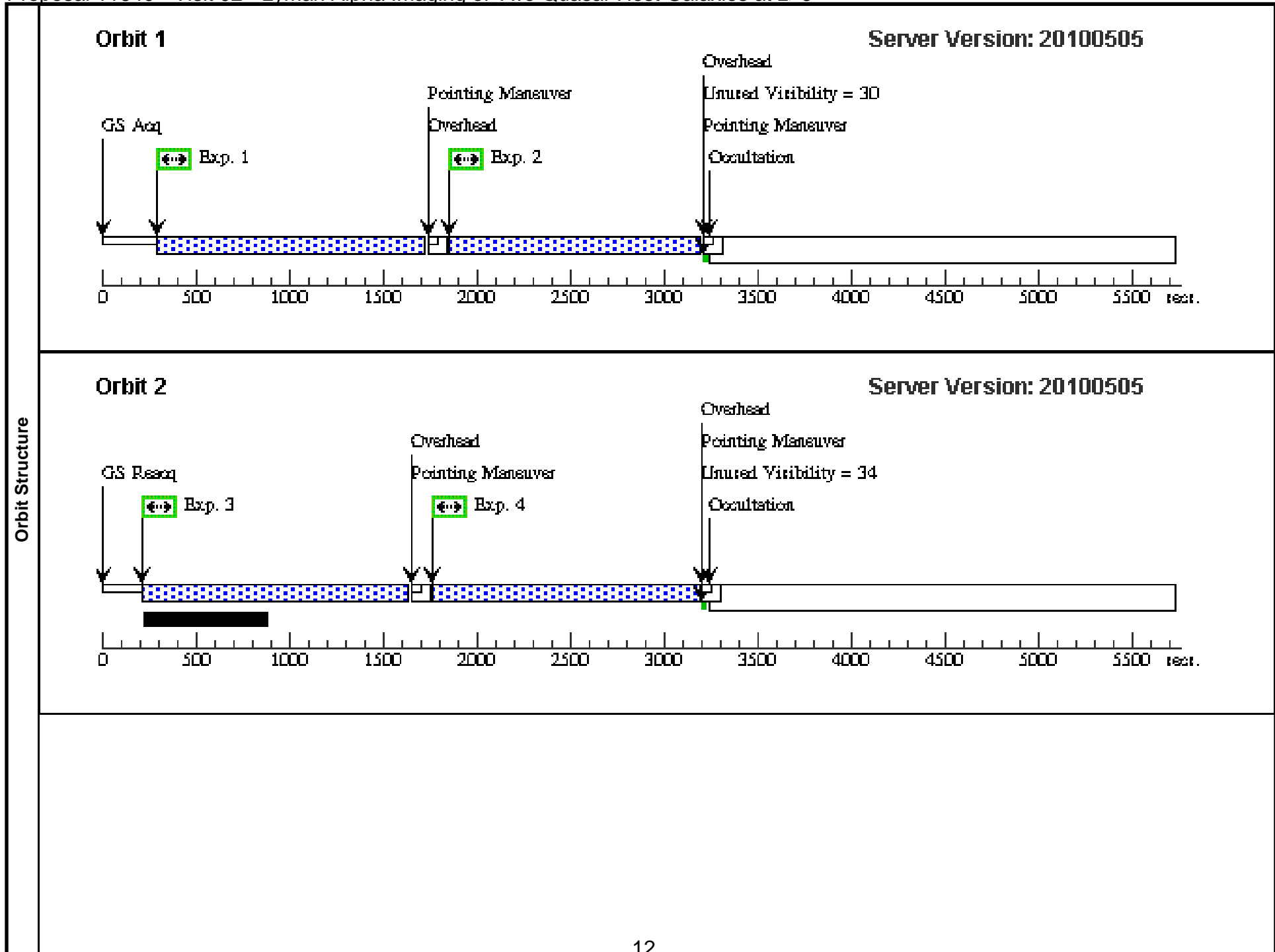
Server Version: 20100505



Proposal 11640 - Visit 02 - Lyman Alpha Imaging of Two Quasar Host Galaxies at z>6

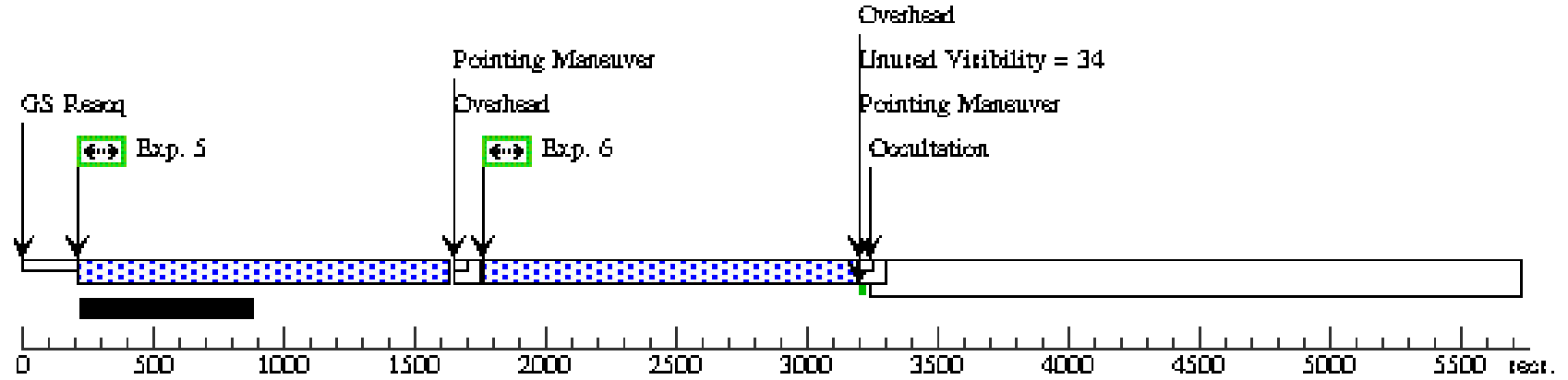
Fri Sep 17 01:03:10 GMT 2010

<b>Visit</b>	<b>Proposal 11640, Visit 03, scheduling</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 277D TO 285 D <i>Comments: first visit for J1030</i> <i>[note that we do not center on J1030 because of bright star]</i>																																																																																																		
	<b>Diagnosics</b> (1030-line (03.003)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1030-cont (03.004)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1030-line (03.005)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1030-cont (03.006)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1030-line (03.007)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures. (1030-cont (03.008)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.																																																																																																		
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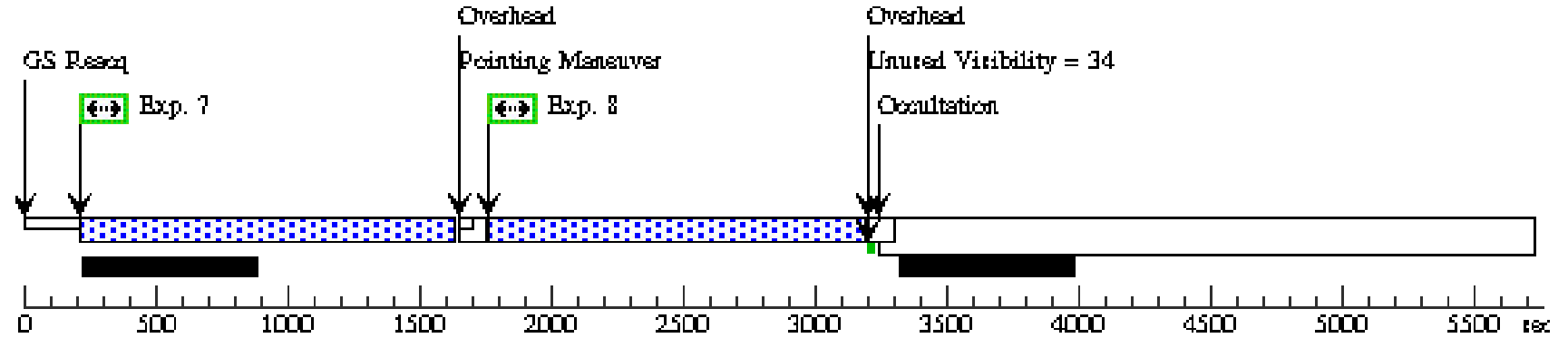
**Orbit 3**

Server Version: 20100505



**Orbit 4**

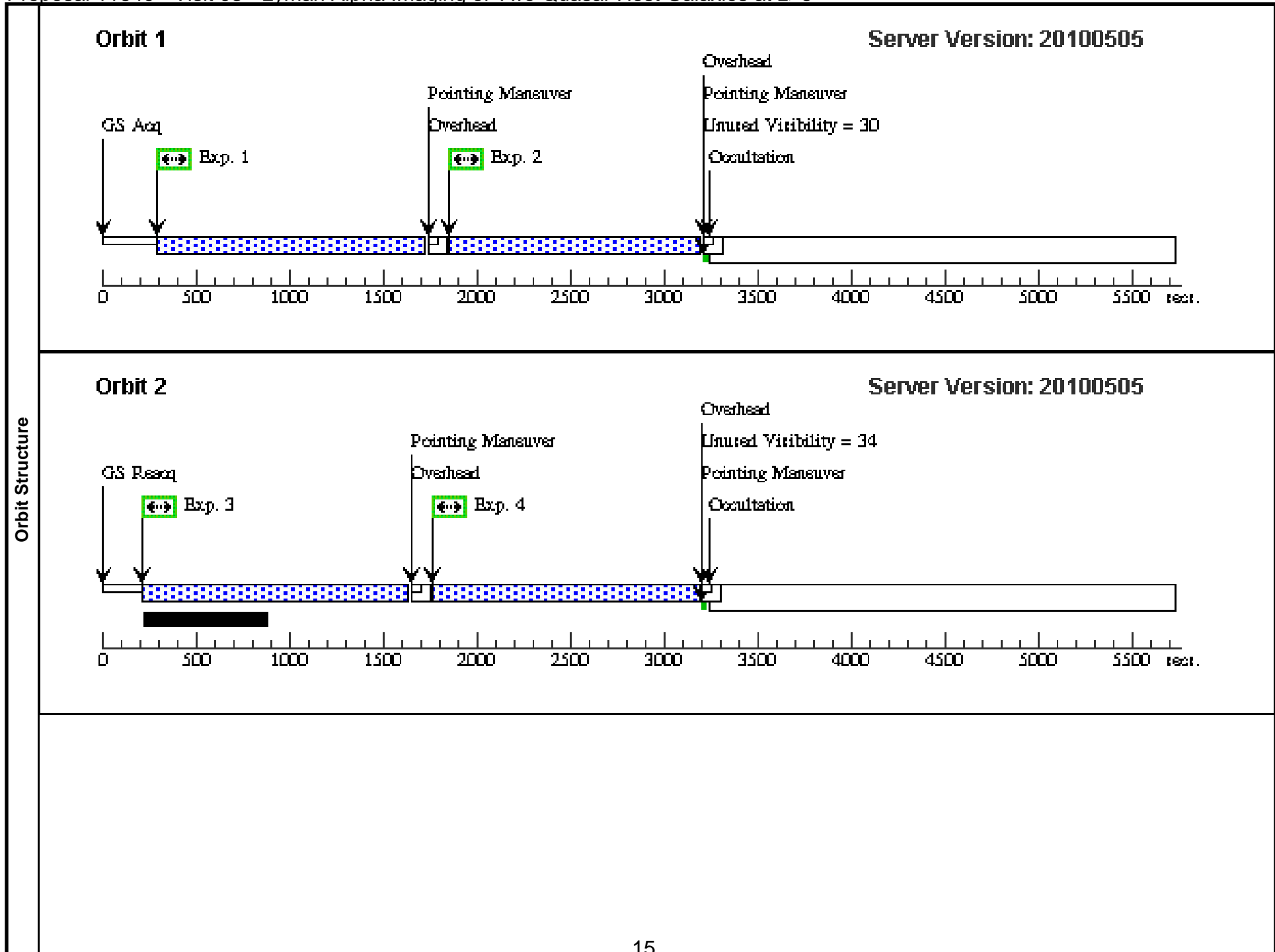
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Proposal 11640 - Visit 03 - Lyman Alpha Imaging of Two Quasar Host Galaxies at z>6

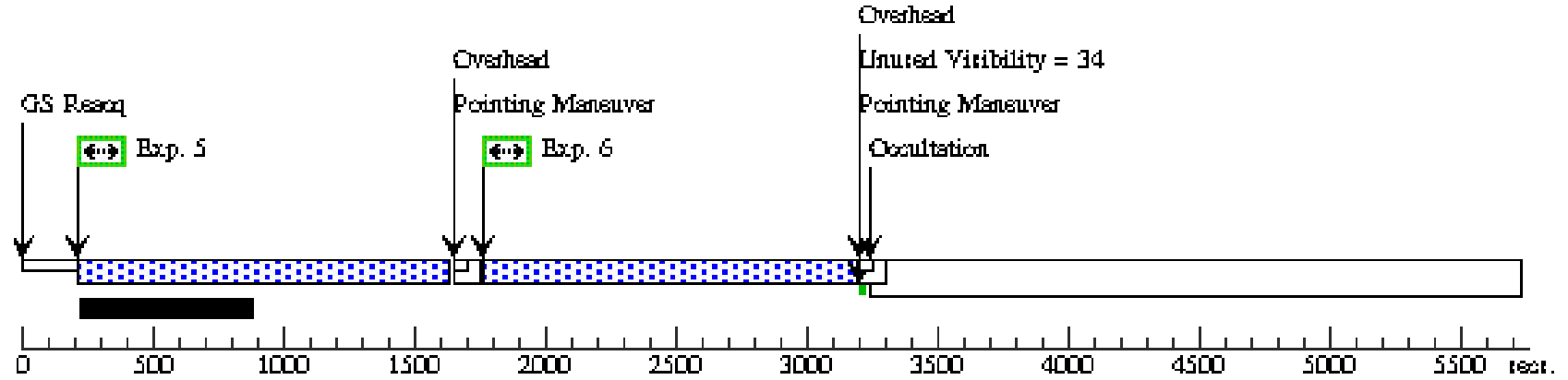
Fri Sep 17 01:03:11 GMT 2010

<b>Visit</b>	<b>Proposal 11640, Visit 04, completed</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 45D TO 45D FROM 03 <i>Comments: second visit for J1030 need to be 45 degrees offset from previous observations</i>																																																																																																		
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