



13301 - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

Cycle: 21, Proposal Category: GO

(UV Initiative)

(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) HE2347-4342	COS/FUV COS/NUV	5	24-Jun-2013 22:13:13.0	yes
02	(1) HE2347-4342	COS/FUV COS/NUV	5	24-Jun-2013 22:13:27.0	yes
03	(1) HE2347-4342	COS/FUV COS/NUV	5	24-Jun-2013 22:13:39.0	yes
04	(2) HS1700+6416	COS/FUV COS/NUV	5	24-Jun-2013 22:13:50.0	yes
05	(2) HS1700+6416	COS/FUV COS/NUV	5	24-Jun-2013 22:14:01.0	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>
06	(2) HS1700+6416	COS/FUV COS/NUV	5	24-Jun-2013 22:14:12.0	yes
07	(2) HS1700+6416	COS/FUV COS/NUV	5	24-Jun-2013 22:14:22.0	yes

35 Total Orbits Used

ABSTRACT

We propose to obtain deep observations of the two brightest (known) He II quasars (HE2347-4342 and HS1700+6416) using the short-wavelength mode (G130M/1222) on the Cosmic Origins Spectrograph. These are among the few percent of $z \sim 3$ quasars that have visible flux at the He II Ly-alpha break, owing to unusually low integrated H I column densities along their sight lines. With the new grating mode, we can obtain high-resolution spectra at short (far-ultraviolet) wavelengths (1067-1363 Å) that cover the He II post-reionization epoch at $2.5 < z_{\text{HeII}} < 2.75$. During this time, helium ionization fronts overlap and the intergalactic medium (IGM) becomes transparent in the 4 ryd continuum. These high-S/N, high-resolution spectra are needed to resolve individual He II absorption lines, to compare with H I (Ly α) and metal-line absorbers (C IV, Si IV), and constrain QSO lifetimes and ionization-front overlap with QSO transverse-proximity surveys (Jacobsen et al. 2003; Furlanetto & Lidz 2011). The He II post-reionization epoch is of astronomical and cosmological interest for several reasons: (1) The ionizing continua are changing rapidly, affecting QSO metal-line absorber ratios; (2) Photoelectric heating from He II changes the IGM temperature and equation of state; (3) He II-ionizing QSOs transverse to sight line constrain QSO lifetimes and ionization fronts; (4) Jeans smoothing from this extra heating may affect low-mass galaxy formation.

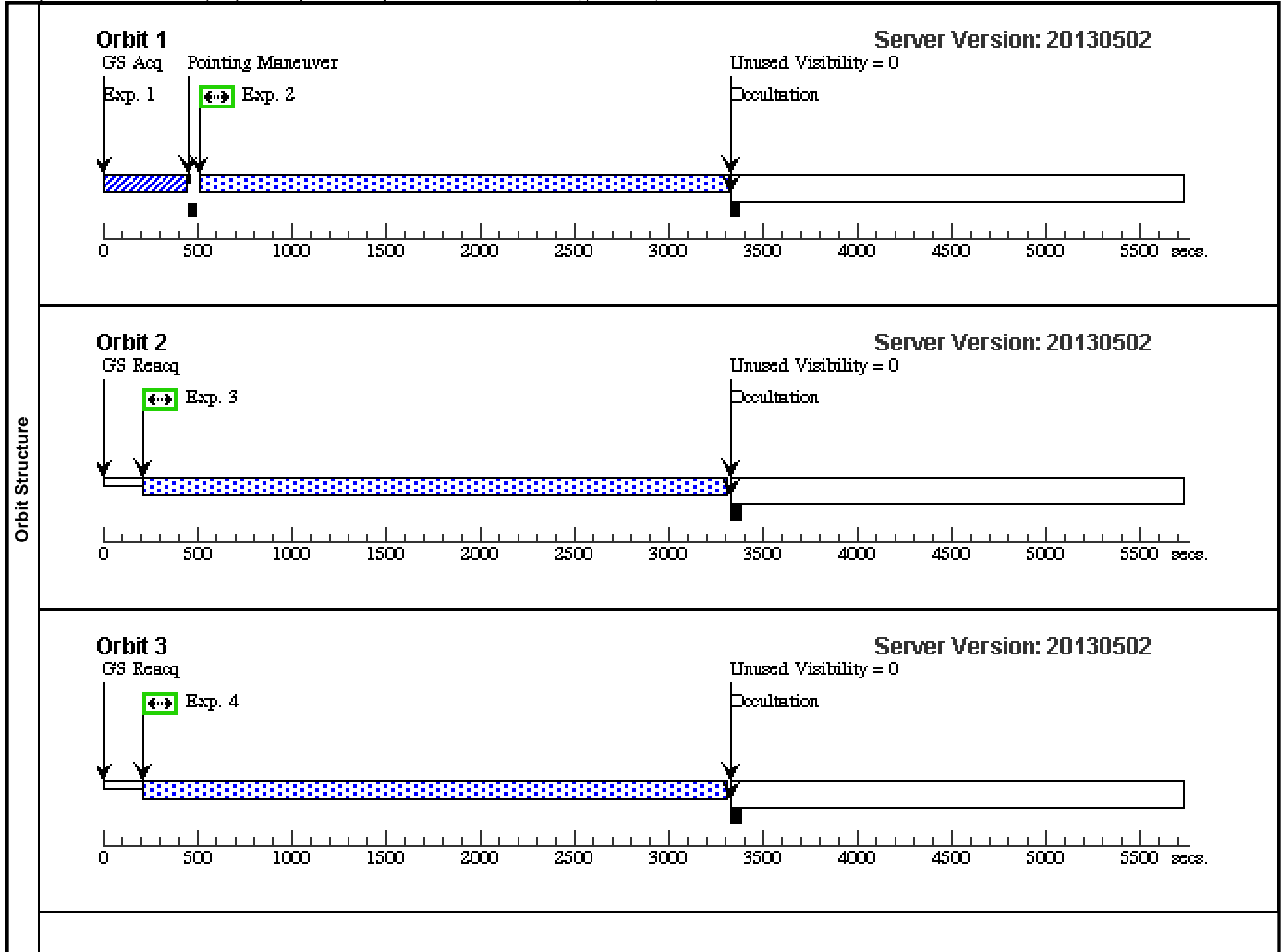
OBSERVING DESCRIPTION

We will conduct a detailed study of the end of the helium reionization epoch using the two FUV-brightest He II quasars. Most of the data will be taken in G130M/1222 to obtain coverage of the He II Gunn-Peterson trough and He II Ly-alpha forest at good resolution. Some G140L data will be taken for continuum fitting, using cenwave 1105 to avoid possible flux and wavelength calibration issues across the two segments. Accurate SDSS coordinates or prior HST observation allow us to use ACQ/IMAGE only to acquire our targets (to S/N=40 for the given time). The targets do not come close to violating overlght safety, and GALEX imaging directly verifies no nearby UV-bright objects. All FP-POS are used for the G130M observations to maximize S/N.

Proposal 13301 - 01 (01) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

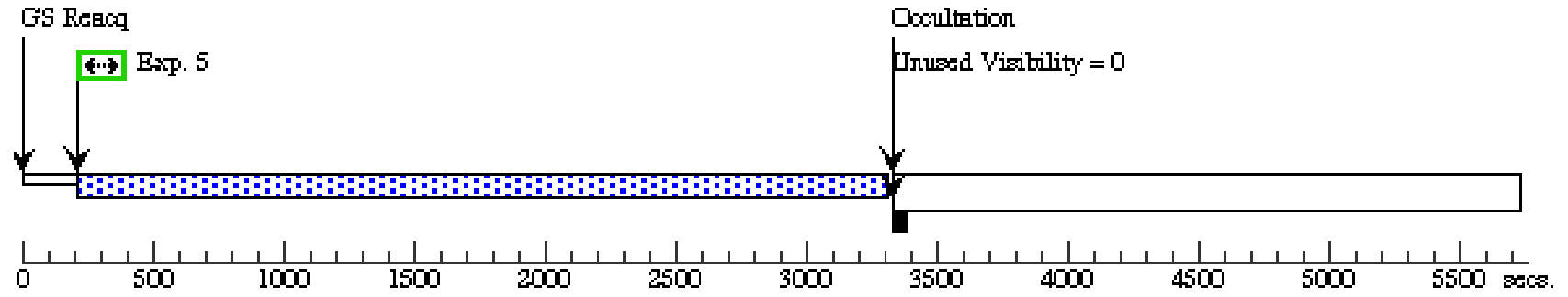
Tue Jun 25 02:14:31 GMT 2013

Visit	Proposal 13301, 01 (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	HE2347-4342	RA: 23 50 34.2300 (357.6426250d) Dec: -43 25 59.80 (-43.43328d) Equinox: J2000			V=16.3+/-0.2 3.5E-15 erg/cm2/s/A at 1150 Angstroms (previous COS G130M)	Reference Frame: ICRS	<i>Comments: Position verified to be accurate to <0.4" by prior COS acquisition (program 11528).</i>		
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.508 227)	(1) HE2347-4342	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				19 Secs (19 Secs) [==>]	[1]
	<i>Comments: ACQ/IMAGE time calculated using the faintest observed GALEX NUV flux.</i>									
	2	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=89 57; SEGMENT=BOTH			2500 Secs (2625 Secs) [==>2625.0 Secs]	[1]
	3	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[2]
	4	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[3]
	5	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[4]
6	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[5]	



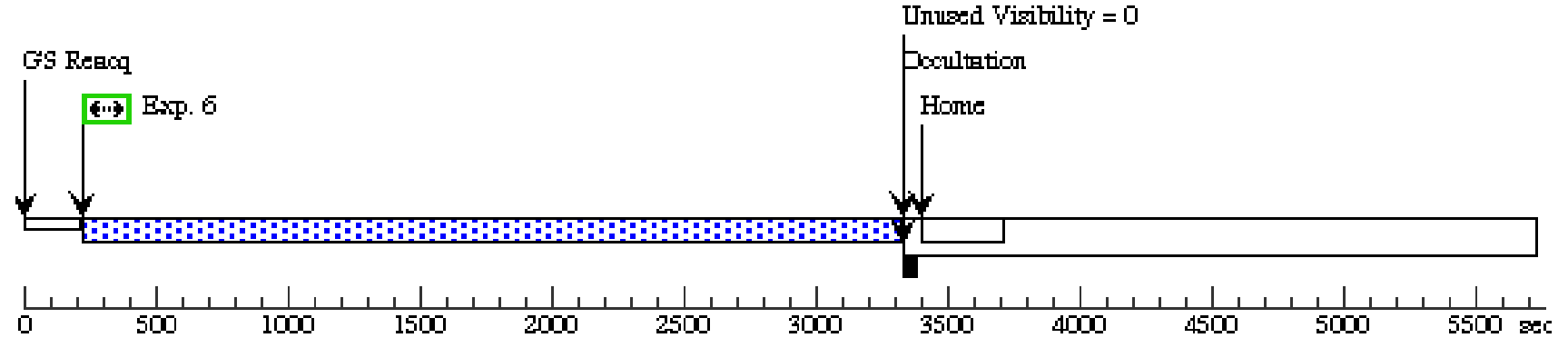
Orbit 4

Server Version: 20130502



Orbit 5

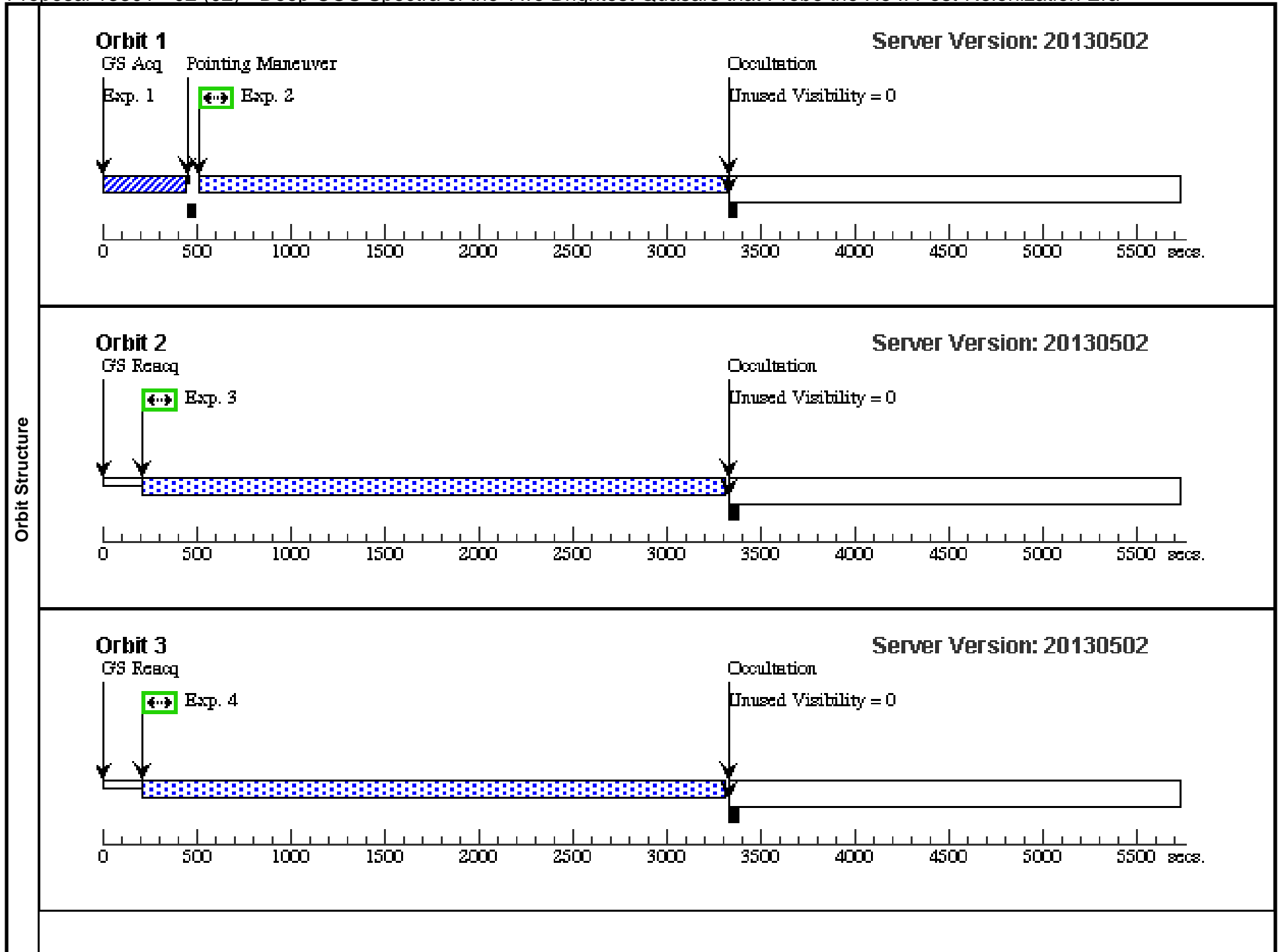
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Proposal 13301 - 02 (02) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

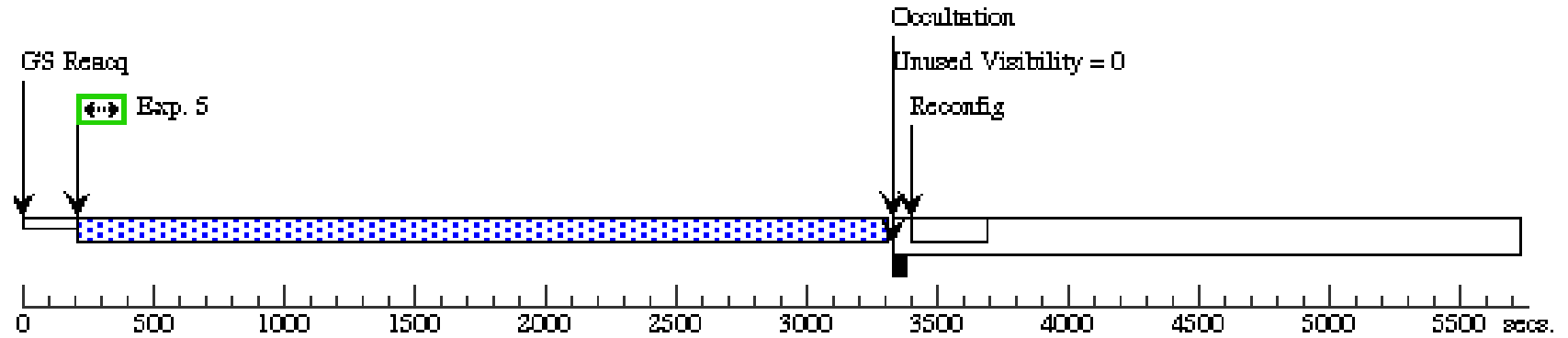
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Visit	Proposal 13301, 02 (02), implementation Diagnostic Status: Warning Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	(02 (02)) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	HE2347-4342	RA: 23 50 34.2300 (357.6426250d) Dec: -43 25 59.80 (-43.43328d) Equinox: J2000		V=16.3+/-0.2 3.5E-15 erg/cm2/s/A at 1150 Angstroms (previous COS G130M)	Reference Frame: ICRS				
<i>Comments: Position verified to be accurate to <0.4" by prior COS acquisition (program 11528).</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.508 227)	(1) HE2347-4342	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				19 Secs (19 Secs) [==>]	[1]
	<i>Comments: ACQ/IMAGE time calculated using the faintest observed GALEX NUV flux.</i>									
	2	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=89 57; SEGMENT=BOTH			2500 Secs (2625 Secs) [==>2625.0 Secs]	[1]
	3	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[2]
	4	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[3]
	5	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[4]
	6	(COS.sp.508 478)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=59 70			3000 Secs (1459 Secs) [==>1459.0 Secs]	[5]
7	(COS.sp.508 478)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=59 70			3000 Secs (1461 Secs) [==>1461.0 Secs]	[5]	



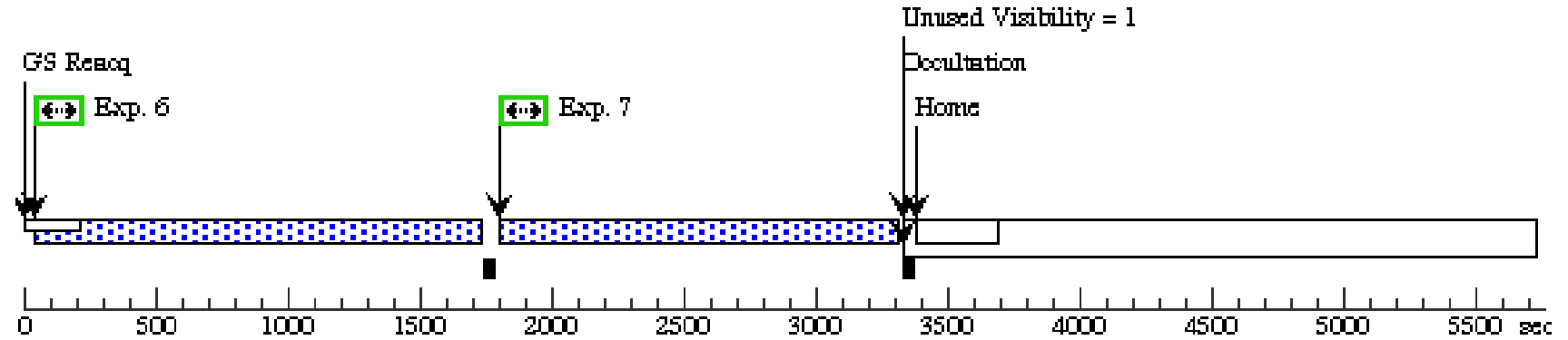
Orbit 4

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Orbit 5

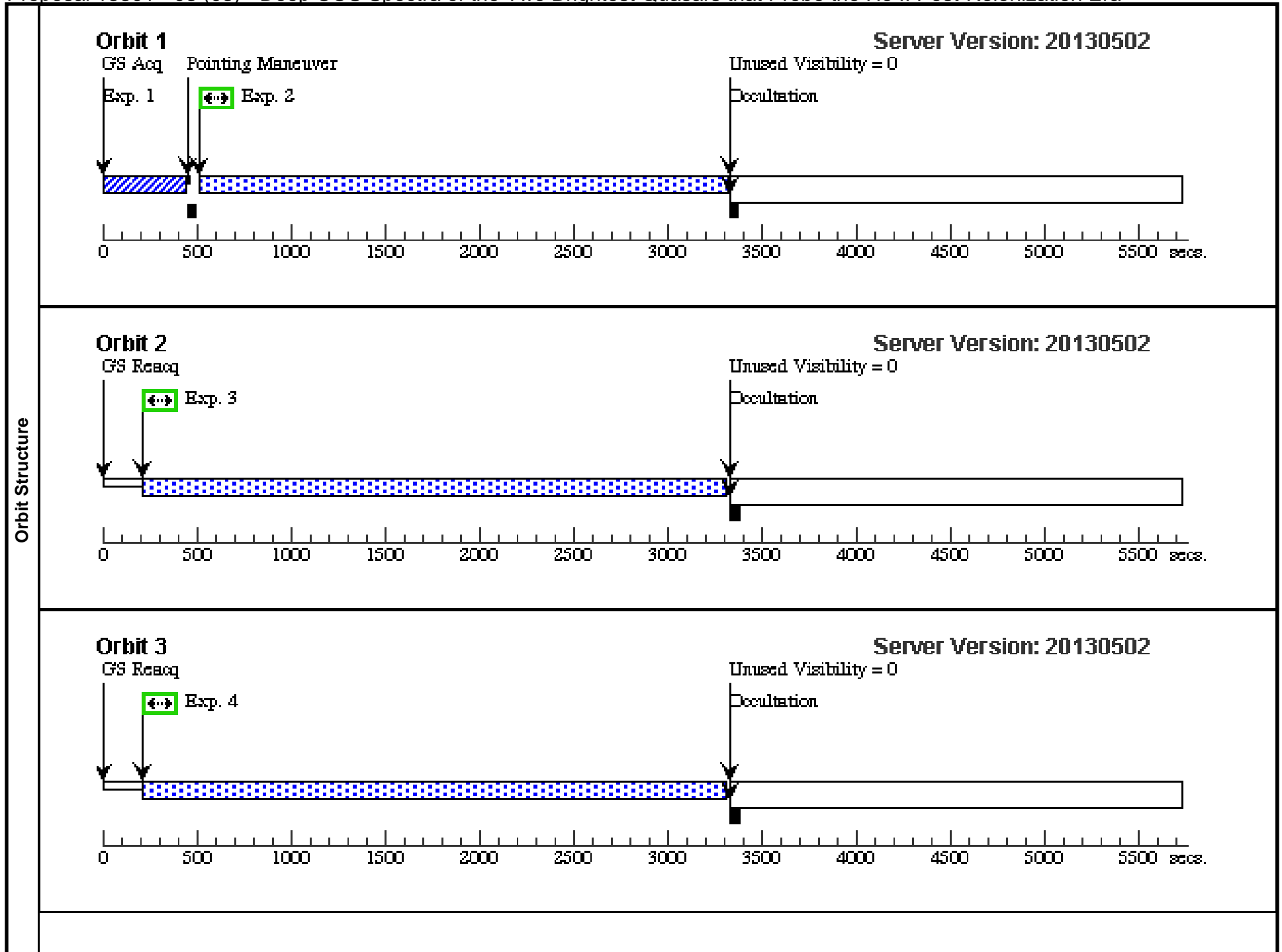
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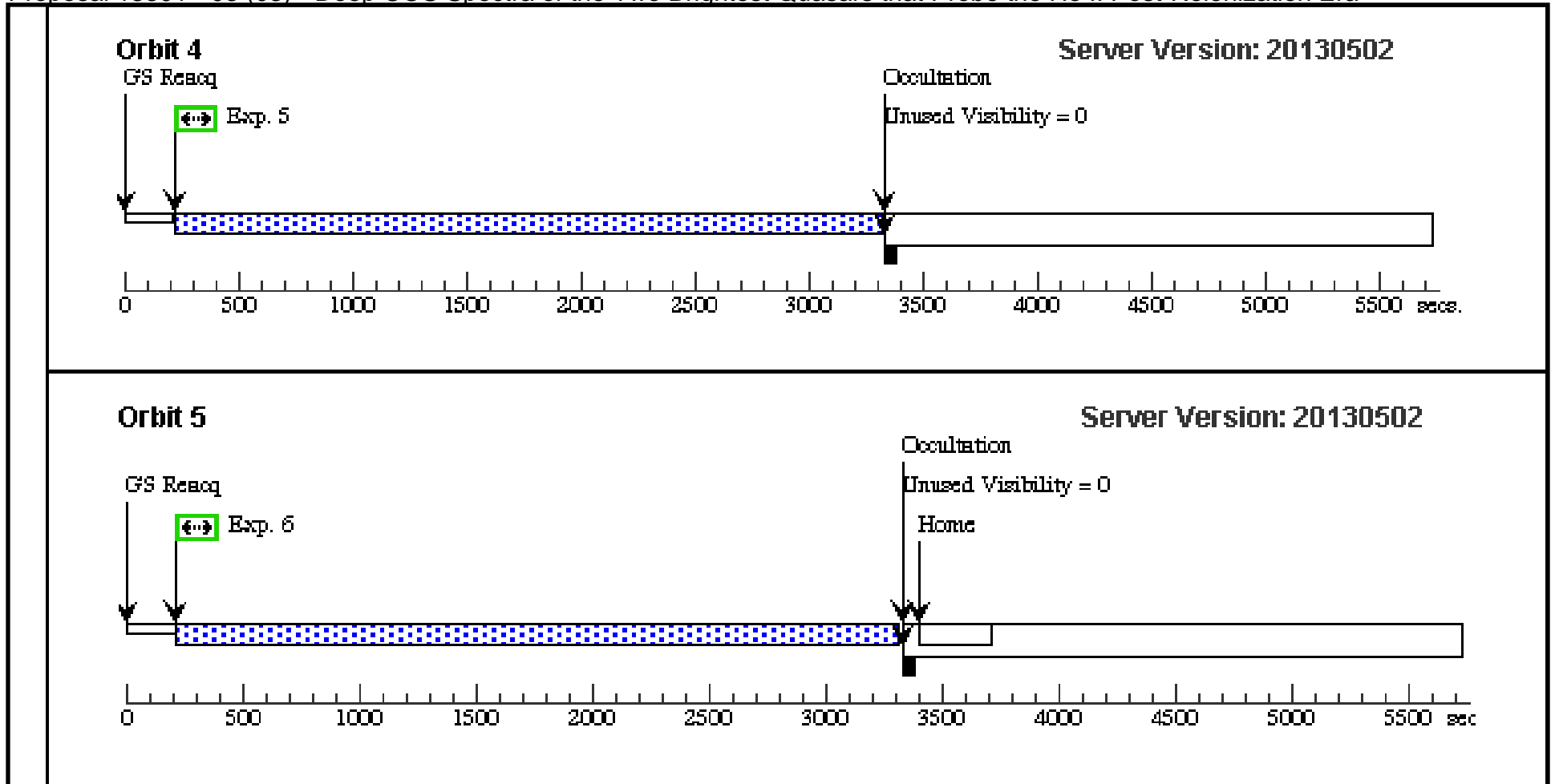


Proposal 13301 - 03 (03) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

Tue Jun 25 02:14:42 GMT 2013

Visit	Proposal 13301, 03 (03), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	HE2347-4342	RA: 23 50 34.2300 (357.6426250d) Dec: -43 25 59.80 (-43.43328d) Equinox: J2000		V=16.3+/-0.2 3.5E-15 erg/cm2/s/A at 1150 Angstroms (previous COS G130M)	Reference Frame: ICRS	<i>Comments: Position verified to be accurate to <0.4" by prior COS acquisition (program 11528).</i>			
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.508 227)	(1) HE2347-4342	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				19 Secs (19 Secs) [==>]	[1]
	<i>Comments: ACQ/IMAGE time calculated using the faintest observed GALEX NUV flux.</i>									
	2	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=89 57; SEGMENT=BOTH			2500 Secs (2625 Secs) [==>2625.0 Secs]	[1]
	3	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[2]
	4	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[3]
	5	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[4]
6	(COS.sp.508 472)	(1) HE2347-4342	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=89 57; SEGMENT=BOTH			3000 Secs (3047 Secs) [==>3047.0 Secs]	[5]	

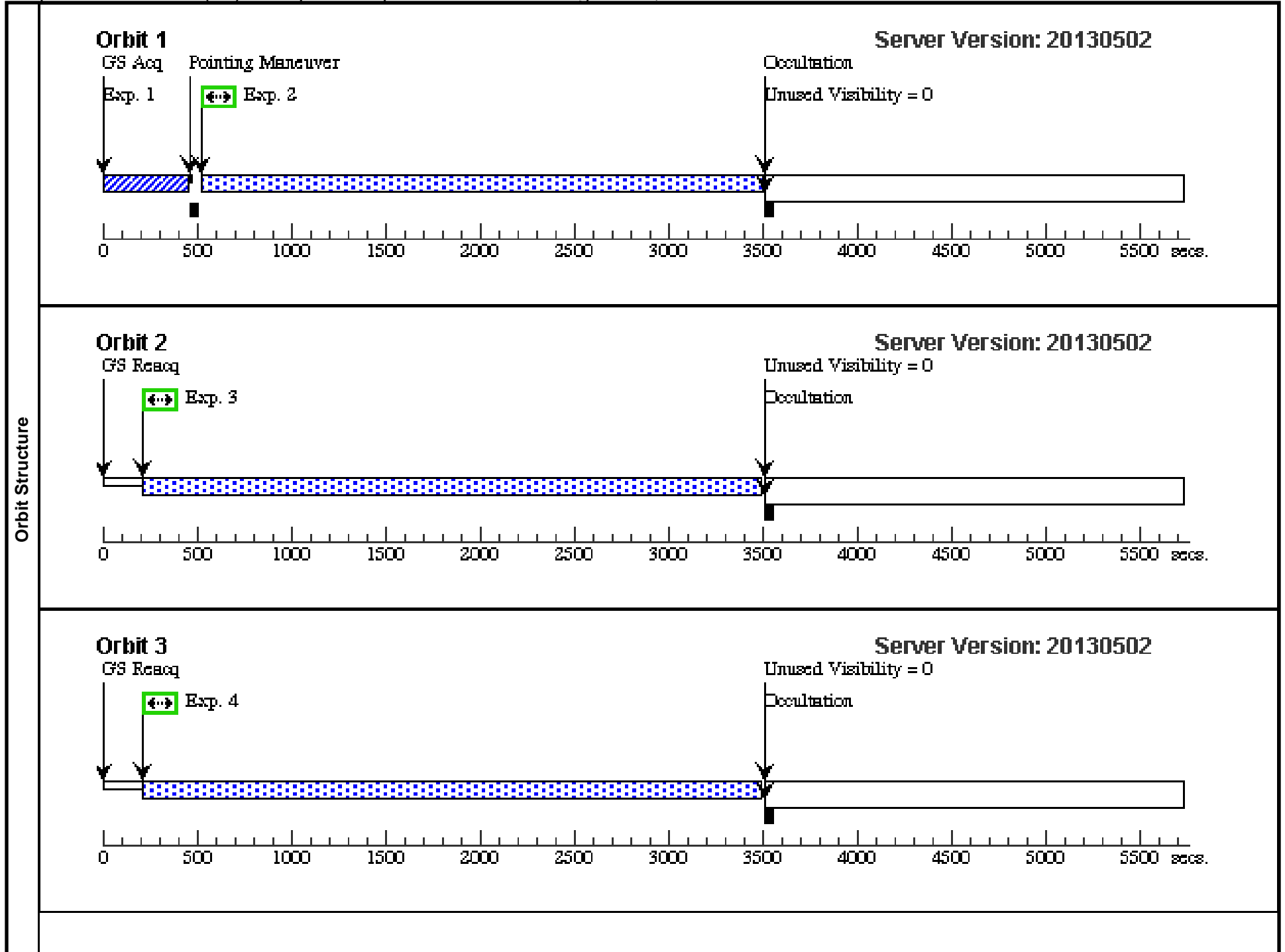




Proposal 13301 - 04 (04) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

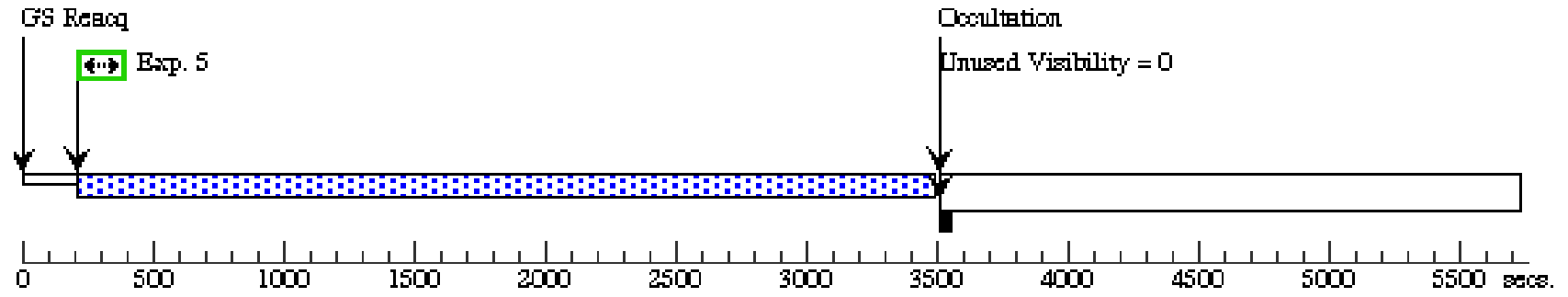
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Visit	Proposal 13301, 04 (04), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	HS1700+6416	RA: 17 01 0.6157 (255.2525654d) Dec: +64 12 9.06 (64.20252d) Equinox: J2000		V=16.1+/-0.2 3.0E-15 erg/cm2/s/A at 1150 (previous COS/G140L observation)	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.508 484)	(2) HS1700+6416	COS/NUV, ACQ/IMAGE, PSA	MIRRORA		GS ACQ SCENARI O BASE1B3		24 Secs (24 Secs) [==>]	[1]
	<i>Comments: ACQ/IMAGE time calculated using half the observed GALEX NUV flux, since only single epoch of imaging was available.</i>									
	2	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=98 35			2800 Secs (2793 Secs) [==>2793.0 Secs]	[1]
	3	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[2]
	4	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[3]
	5	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[4]
6	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[5]	



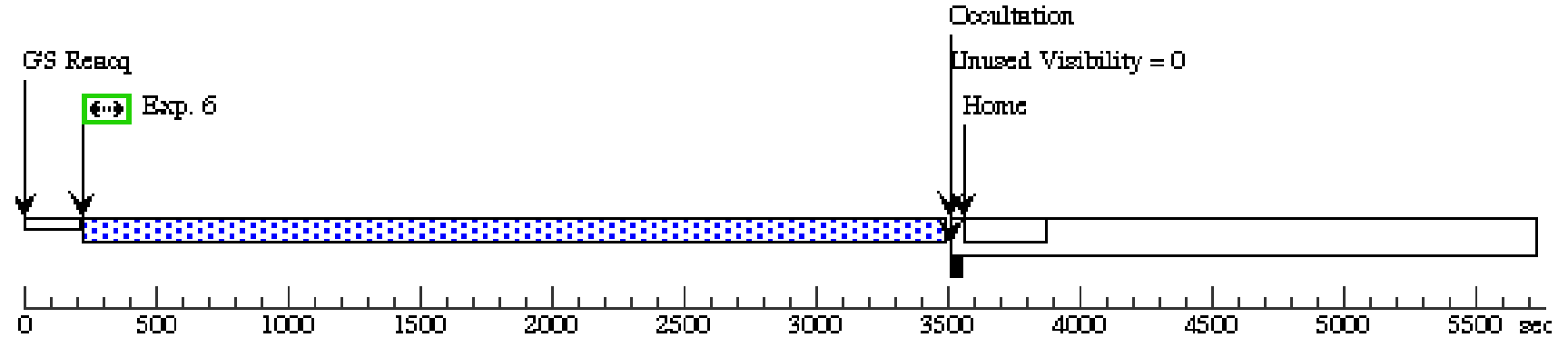
Orbit 4

Server Version: 20130502



Orbit 5

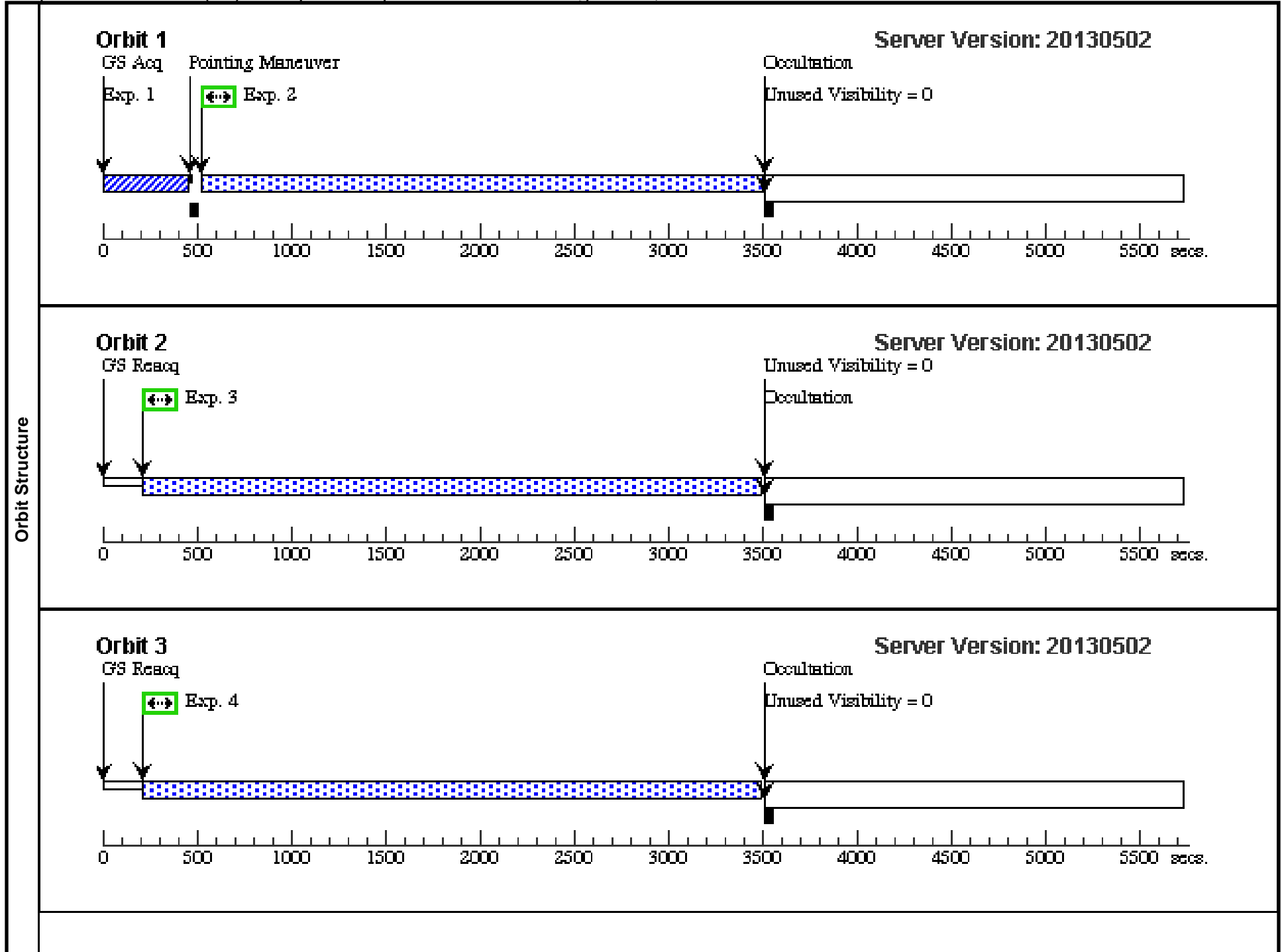
Server Version: 20130502



Proposal 13301 - 05 (05) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

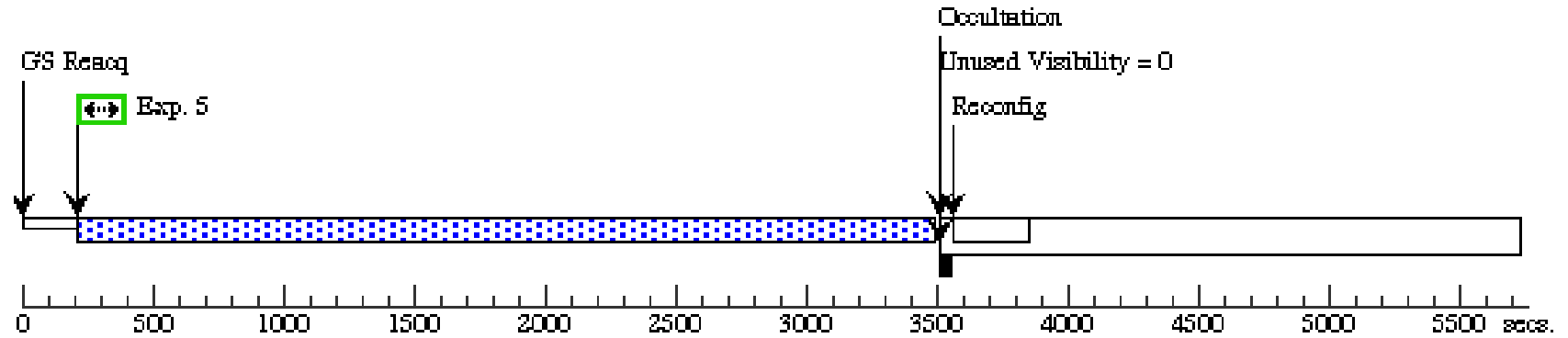
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	(05 (05)) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous				
	(2)	HS1700+6416	RA: 17 01 0.6157 (255.2525654d) Dec: +64 12 9.06 (64.20252d) Equinox: J2000			V=16.1+/-0.2 3.0E-15 erg/cm2/s/A at 1150 (previous COS/G140L observation)	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	(COS.ta.508 484)	(2) HS1700+6416	COS/NUV, ACQ/IMAGE, PSA	MIRRORA		GS ACQ SCENARI O BASE1B3		24 Secs (24 Secs) [==>]	[1]	
	<i>Comments: ACQ/IMAGE time calculated using half the observed GALEX NUV flux, since only single epoch of imaging was available.</i>										
	2	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=98 35				2800 Secs (2793 Secs) [==>2793.0 Secs]	[1]
	3	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=98 35				3200 Secs (3225 Secs) [==>3225.0 Secs]	[2]
	4	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=98 35				3200 Secs (3225 Secs) [==>3225.0 Secs]	[3]
	5	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35				3200 Secs (3225 Secs) [==>3225.0 Secs]	[4]
	6	(COS.sp.508 480)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=65 48				1550 Secs (1549 Secs) [==>1549.0 Secs]	[5]
7	(COS.sp.508 480)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=65 48				1550 Secs (1549 Secs) [==>1549.0 Secs]	[5]	



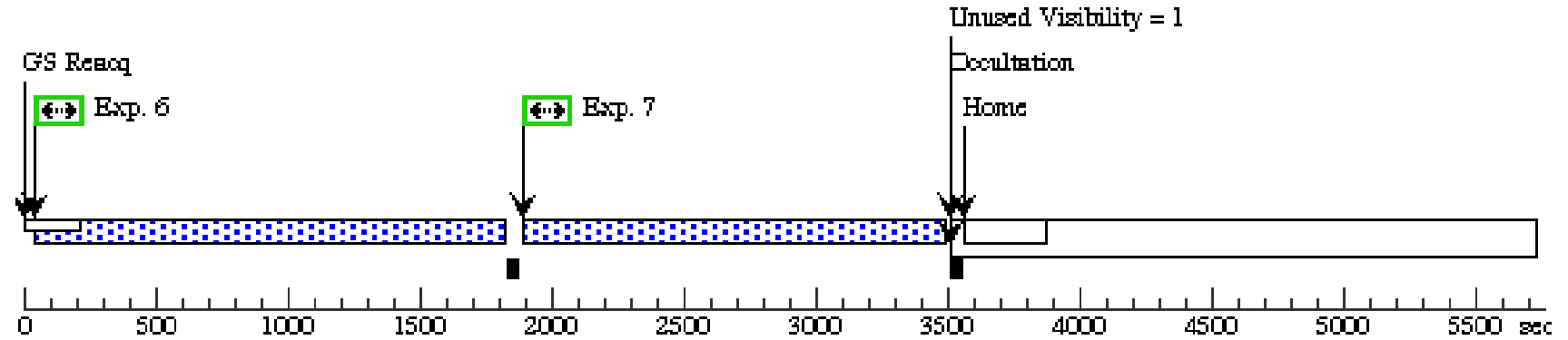
Orbit 4

Server Version: 20130502



Orbit 5

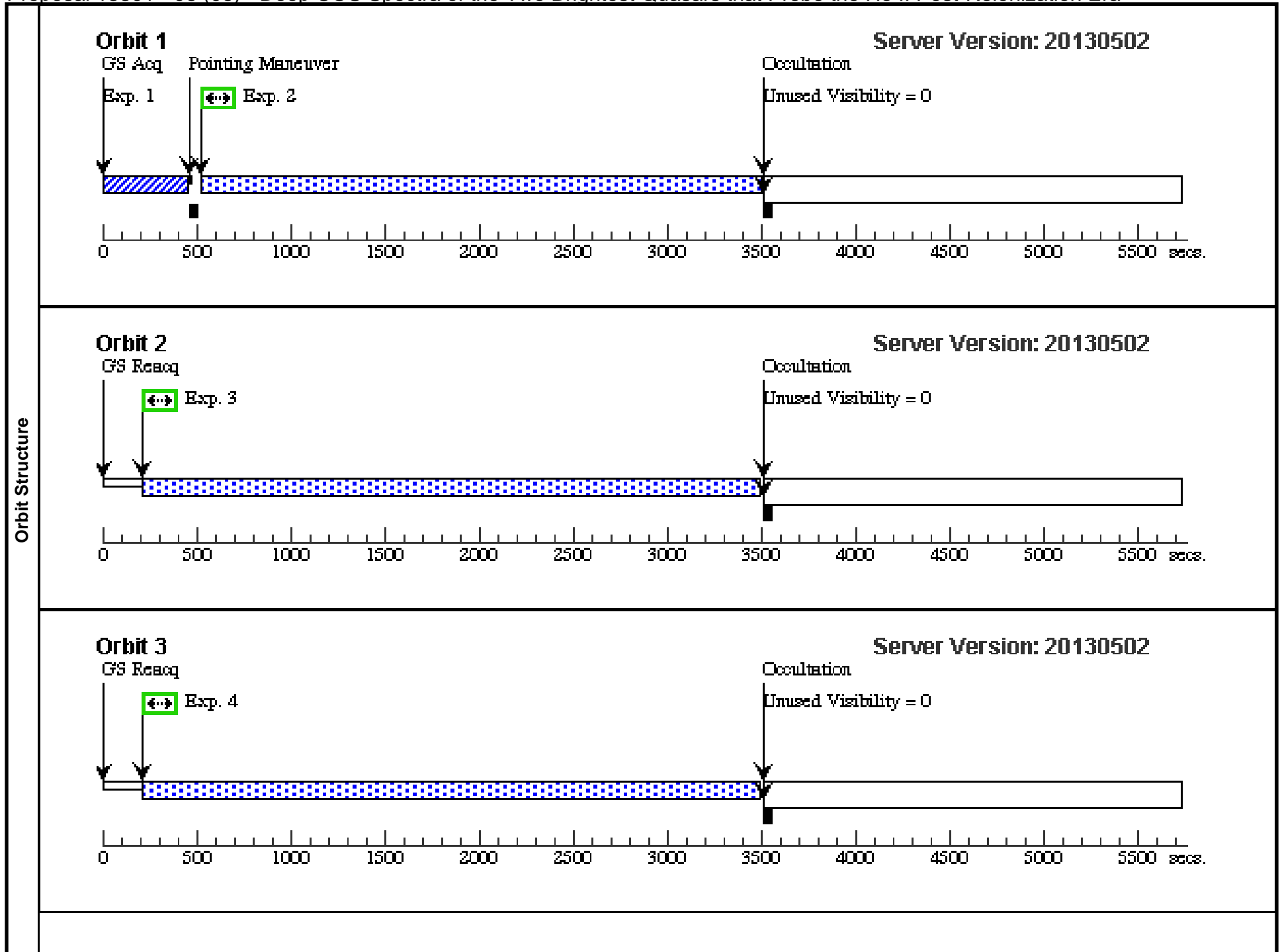
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Proposal 13301 - 06 (06) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

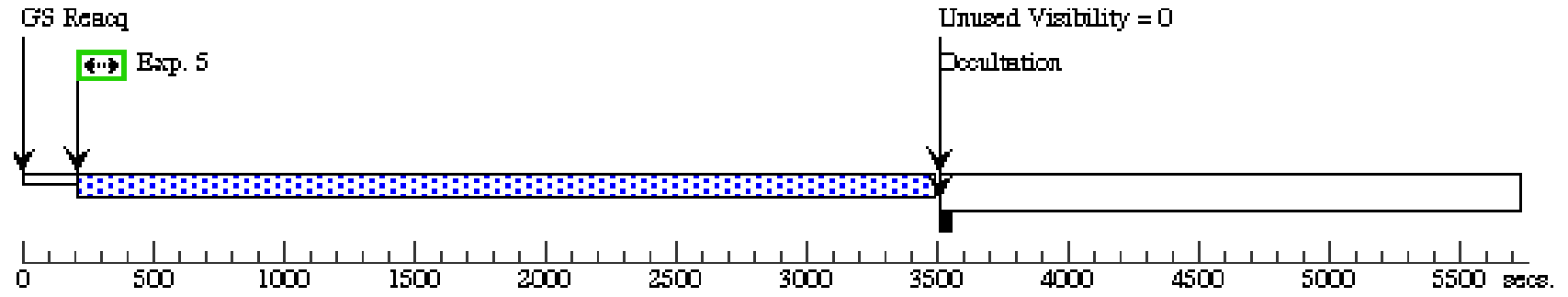
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Visit	Proposal 13301, 06 (06), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	HS1700+6416	RA: 17 01 0.6157 (255.2525654d) Dec: +64 12 9.06 (64.20252d) Equinox: J2000		V=16.1+/-0.2 3.0E-15 erg/cm2/s/A at 1150 (previous COS/G140L observation)	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.508 484)	(2) HS1700+6416	COS/NUV, ACQ/IMAGE, PSA	MIRRORA		GS ACQ SCENARI O BASE1B3		24 Secs (24 Secs) [==>]	[1]
	<i>Comments: ACQ/IMAGE time calculated using half the observed GALEX NUV flux, since only single epoch of imaging was available.</i>									
	2	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=98 35			2800 Secs (2793 Secs) [==>2793.0 Secs]	[1]
	3	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[2]
	4	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[3]
	5	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[4]
6	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[5]	



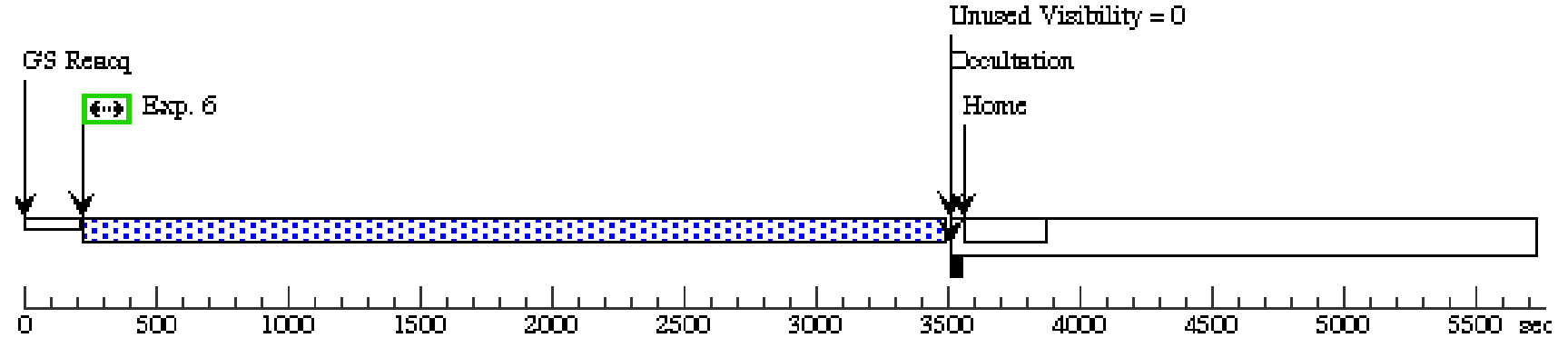
Orbit 4

Server Version: 20130502



Orbit 5

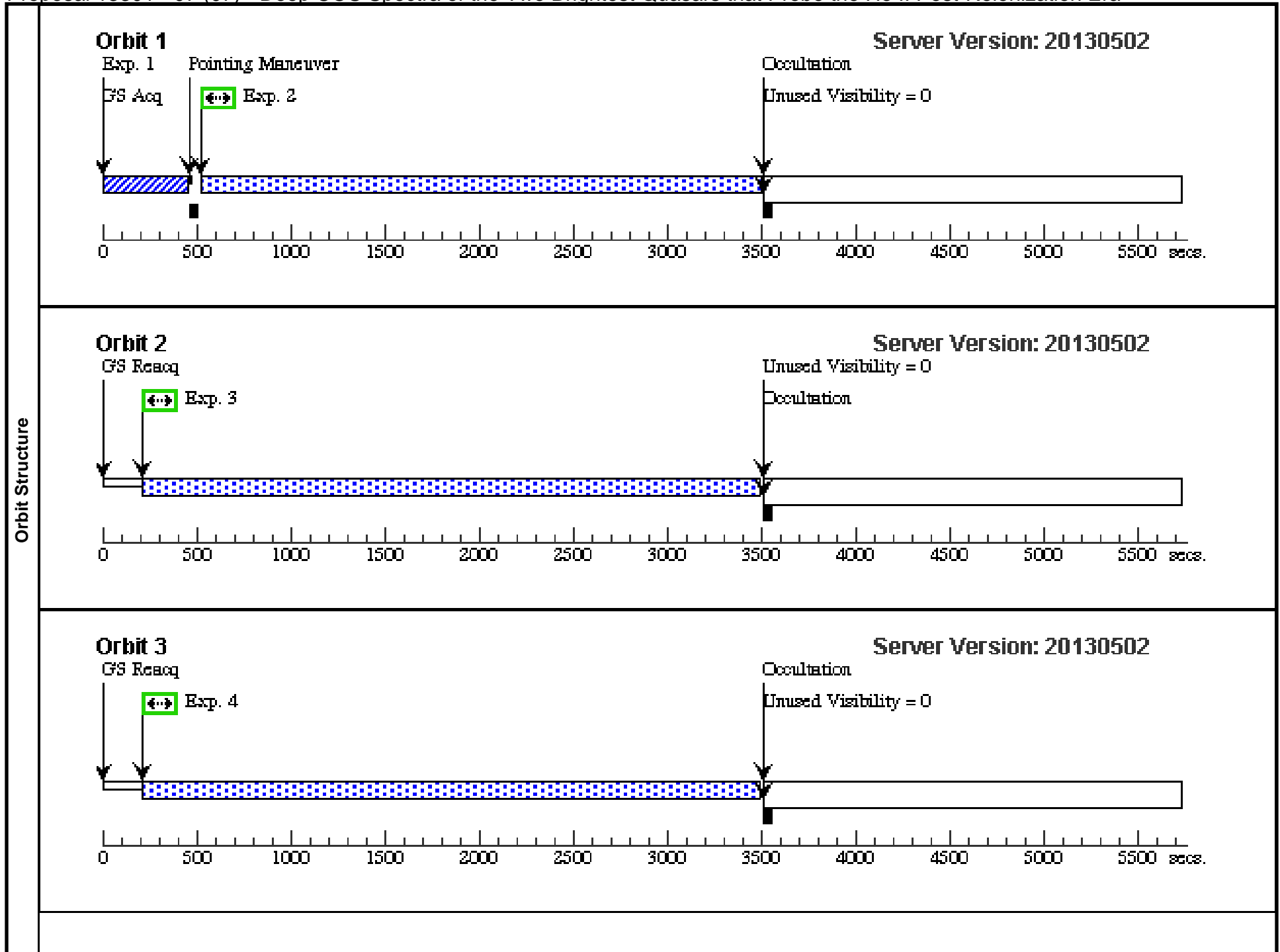
Server Version: 20130502



Proposal 13301 - 07 (07) - Deep COS Spectra of the Two Brightest Quasars that Probe the He II Post-Reionization Era

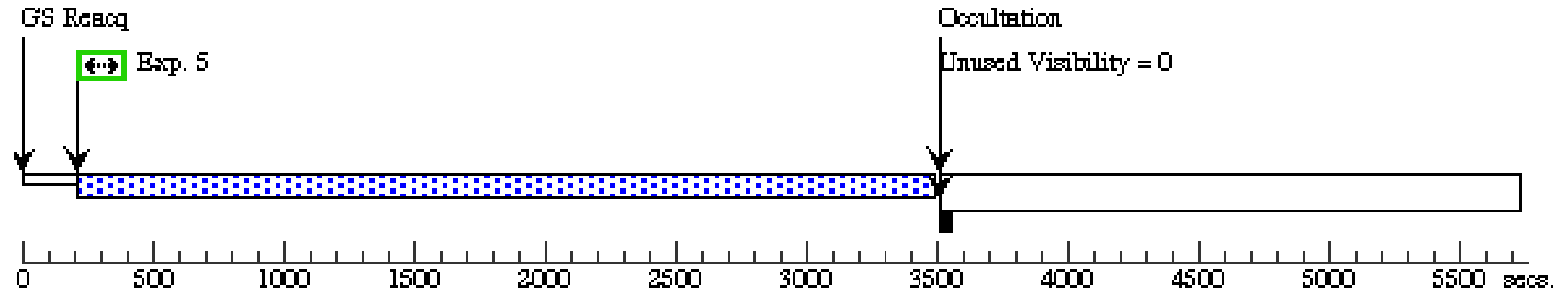
Tue Jun 25 02:14:57 GMT 2013

Visit	Proposal 13301, 07 (07), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	HS1700+6416	RA: 17 01 0.6157 (255.2525654d) Dec: +64 12 9.06 (64.20252d) Equinox: J2000		V=16.1+/-0.2 3.0E-15 erg/cm2/s/A at 1150 (previous COS/G140L observation)	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.508 484)	(2) HS1700+6416	COS/NUV, ACQ/IMAGE, PSA	MIRRORA		GS ACQ SCENARIO BASE1B3		24 Secs (24 Secs) [==>]	[1]
	<i>Comments: ACQ/IMAGE time calculated using half the observed GALEX NUV flux, since only single epoch of imaging was available.</i>									
	2	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=98 35			2800 Secs (2793 Secs) [==>2793.0 Secs]	[1]
	3	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[2]
	4	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[3]
	5	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[4]
6	(COS.sp.508 481)	(2) HS1700+6416	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=98 35			3200 Secs (3225 Secs) [==>3225.0 Secs]	[5]	



Orbit 4

Server Version: 20130502



Orbit 5

Server Version: 20130502

