12816 - Probing the Reionization Epoch of IGM Helium: A Detailed Follow-up Study of Three High-Quality He II Quasars

Cycle: 20, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. David Syphers (PI) (Contact)	**University of Colorado at Boulder**	**david.syphers@colorado.edu**
Prof. Scott F. Anderson (CoI)	University of Washington	anderson@astro.washington.edu
Dr. Charles W. Danforth (CoI)	University of Colorado at Boulder	danforth@origins.colorado.edu
Dr. Gerard A. Kriss (CoI)	Space Telescope Science Institute	gak@stsci.edu
Prof. Avery Meiksin (CoI) (ESA Member)	Royal Observatory Edinburgh	aam@roe.ac.uk
Dr. Steven V. Penton (CoI)	Space Telescope Science Institute	penton@stsci.edu
Prof. Donald P. Schneider (CoI)	The Pennsylvania State University	dps@astro.psu.edu
Prof. J. Michael Shull (CoI)	University of Colorado at Boulder	mshull@casa.colorado.edu
Prof. Donald G. York (CoI)	University of Chicago	don@oddjob.uchicago.edu
Dr. Wei Zheng (CoI)	The Johns Hopkins University	zheng@pha.jhu.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) 4C57.27	COS/FUV COS/NUV	5	11-Jul-2012 21:40:13.0	yes
02	(2) HS1024+1849	COS/FUV COS/NUV	5	11-Jul-2012 21:40:25.0	yes
03	(2) HS1024+1849	COS/FUV COS/NUV	5	11-Jul-2012 21:40:36.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(3) SDSSJ0915+4756	COS/FUV COS/NUV	5	11-Jul-2012 21:40:46.0	yes
05	(3) SDSSJ0915+4756	COS/FUV COS/NUV	5	11-Jul-2012 21:40:55.0	yes

25 Total Orbits Used

ABSTRACT

The full reionization of intergalactic helium likely occurred at redshifts between z=2.7 and 4, dramatically affecting the state of the IGM, including strong heating of the gas. Detailed UV spectral studies of He II Ly-alpha absorption toward a handful of quasars at 2.7<z<3.3 confirm the potential of such IGM probes, but the very small sample (3 sightlines) with detailed, high-S/N information limits the confidence in cosmological inferences. In recent cycles we have been very successful in identifying many new He II quasars at a wide range of redshifts. Here we follow up on the best of these, three uniquely bright He II quasars, including one at higher redshift. SDSSJ0915+4756, at z=3.34, is the brightest confirmed in the FUV at z>2.9, while HS1024+1849 and 4C57.27 are the brightest He II quasars without existing high-resolution and high-S/N observations. We propose a 25-orbit program that will study: (1) the currently ill-constrained evolution of He II reionization, from its end to well before completion; (2) the He II Ly-alpha forest; (3) the interaction of quasars and the IGM with the line-of-sight and transverse proximity effects; (4) high-redshift, high-opacity IGM He II using both Ly-alpha and Ly-beta Gunn-Peterson troughs.

OBSERVING DESCRIPTION

We will conduct a detailed study of three of the brightest and most interesting He II quasars, filling 25 orbits. Most of the data will be taken in G130M/1222 to exploit the ability to obtain moderate resolution in He II Ly-alpha down to redshift 2.5. Some G140L data will be taken for continuum calibration. Accurate SDSS coordinates and prior HST observation allow us to use ACQ/IMAGE only to acquire targets (to S/N=40 for the given times). None of the targets comes close to violating overlight safety, and GALEX imaging directly verifies no nearby UV-bright objects. All FP-POS are used for the G130M observations to maximize usable spectral coverage and S/N. We use defaults for SEGMENT and FLASH.

Visit

Proposal 12816, Visit 01

Thu Jul 12 01:41:04 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

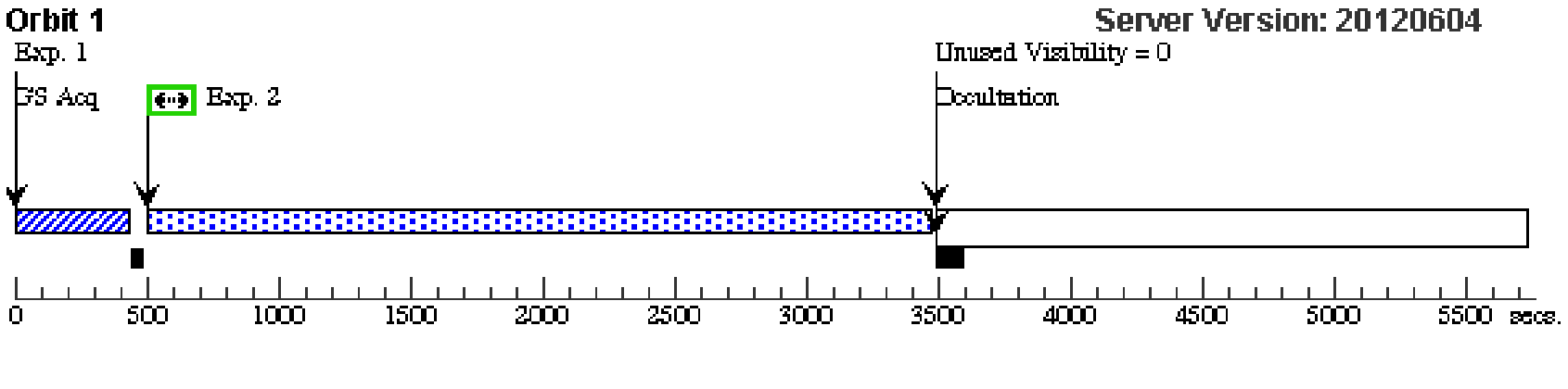
Fixed Targets

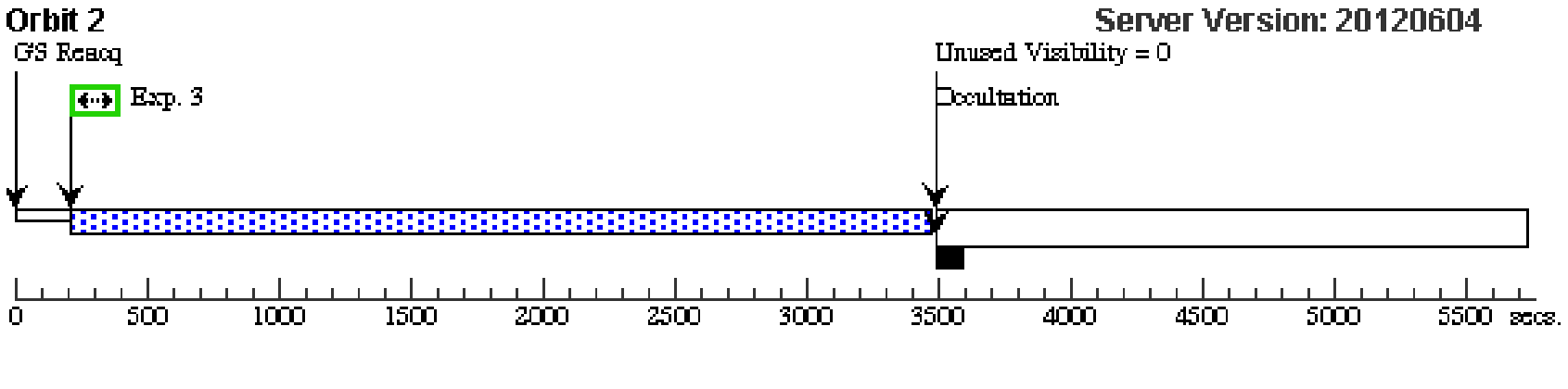
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	4C57.27	RA: 16 03 55.9279 (240.9830329d) Dec: +57 30 54.41 (57.51511d) Equinox: J2000		V=17.3 GALEX NUV: 5.3e-16; COS F UV: 9.0e-16; SDSS: u=18.29, g=17.42, r=17.34, i=17.26, z=17.12	Reference Frame: ICRS

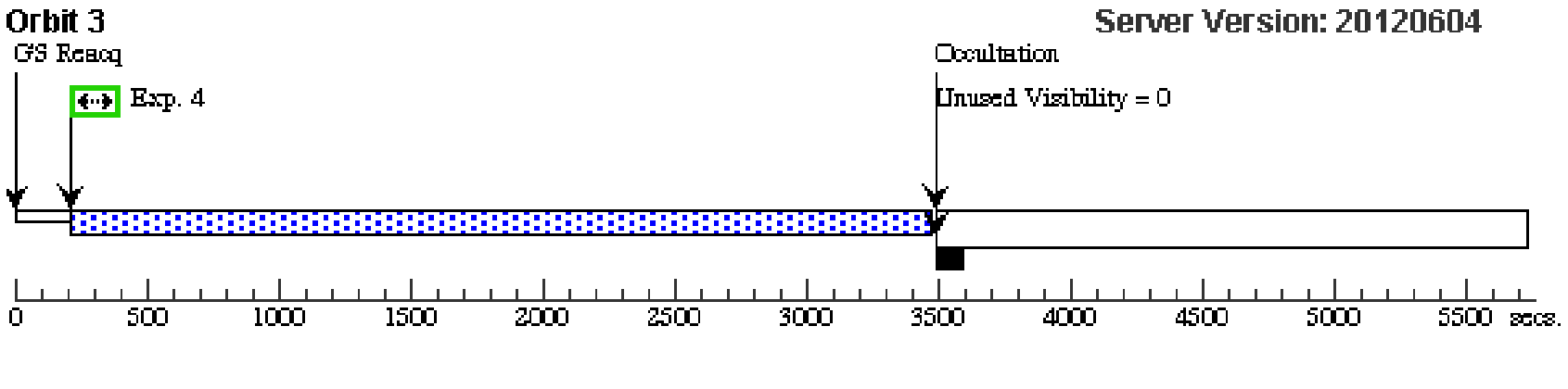
Exposures

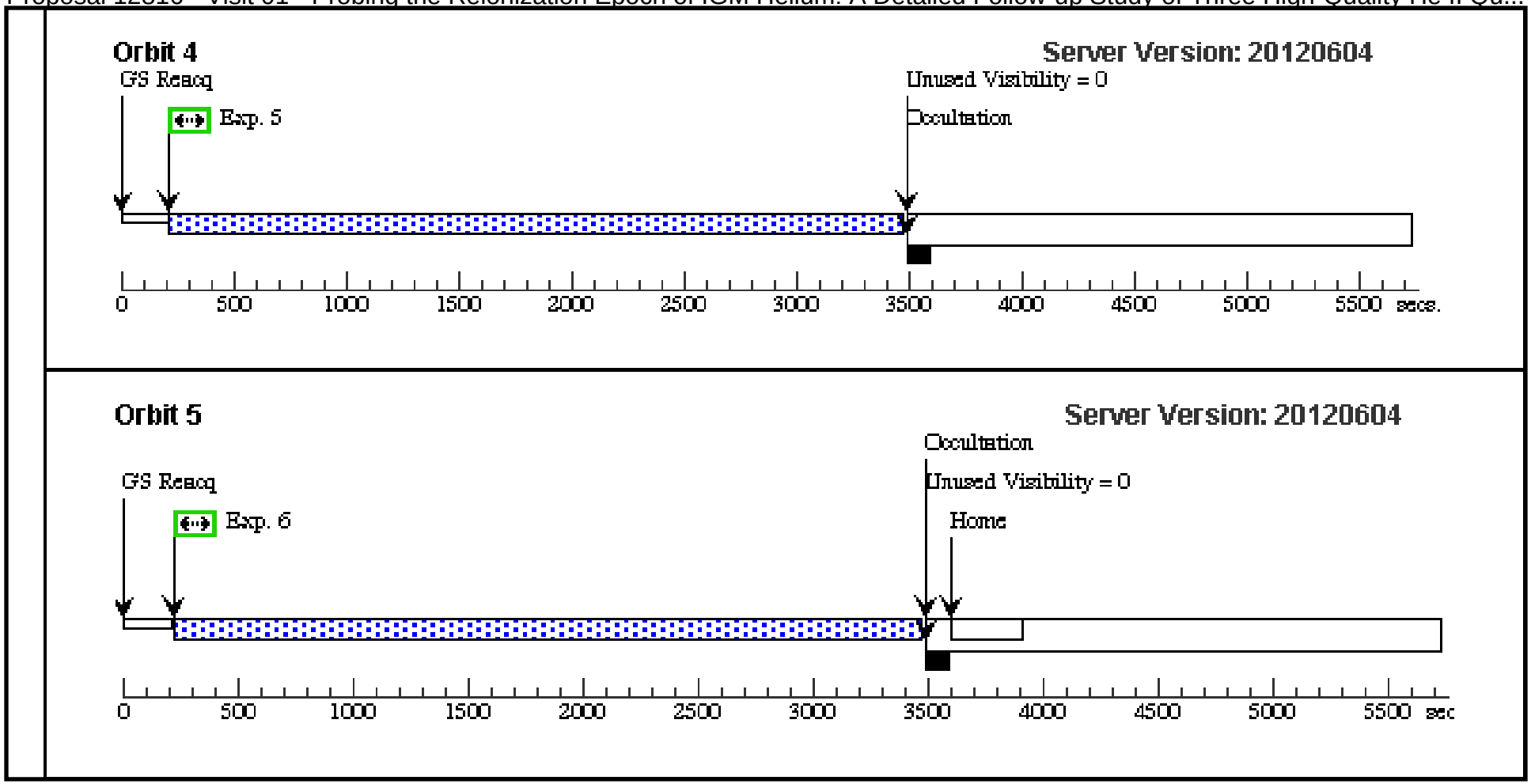
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	ACQ (COS.im.416660)	(1) 4C57.27	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				17 Secs *[==>]*	***[1]***
Comments: ACQ/IMAGE time estimated using the faintest NUV GALEX flux observed.									
2	(COS.sp.416668)	(1) 4C57.27	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=2793			3500 Secs *[==>2793.0 Secs]*	***[1]***
Comments: ETC buffer time is ~13ks, so we use the exposure time instead.									
3	(COS.sp.416668)	(1) 4C57.27	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=3205			3500 Secs *[==>3205.0 Secs]*	***[2]***
4	(COS.sp.416668)	(1) 4C57.27	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=3205			3500 Secs *[==>3205.0 Secs]*	***[3]***
5	(COS.sp.416668)	(1) 4C57.27	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=3205			3500 Secs *[==>3205.0 Secs]*	***[4]***
6	(COS.sp.416668)	(1) 4C57.27	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=3205			3500 Secs *[==>3205.0 Secs]*	***[5]***

Orbit Structure





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5000
5500
secs.
Orbit 5
Server Version: 20120604
Occultation
GS Reacq
Unused Visibility = 0
Exp. 6
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4500
5000
5500
sec

Visit

Proposal 12816, Visit 02 Thu Jul 12 01:41:10 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 02) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

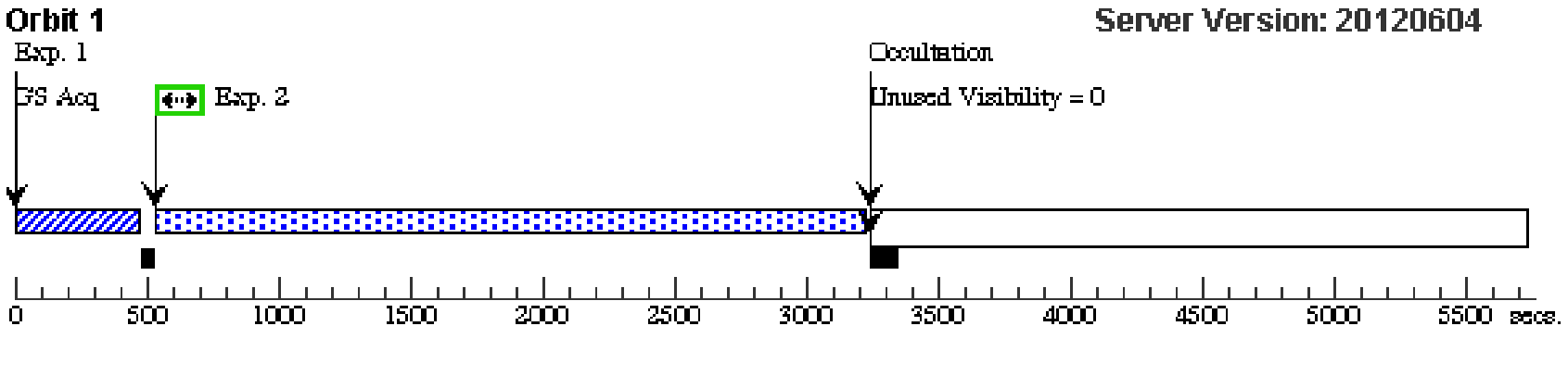
Fixed Targets

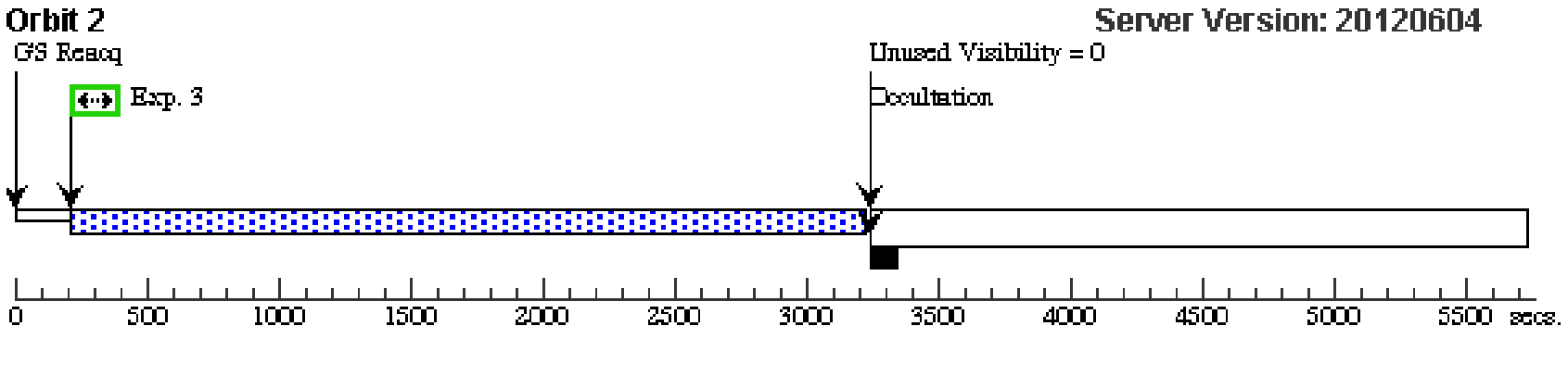
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HS1024+1849	RA: 10 27 34.1331 (156.8922212d) Dec: +18 34 27.59 (18.57433d) Equinox: J2000		V=17.8 GALEX NUV: 2.4e-16; COS F UV: 4.7e-16; SDSS: u=18.90, g=18.01, r=17.83, i=17.70, z=17.70	Reference Frame: ICRS

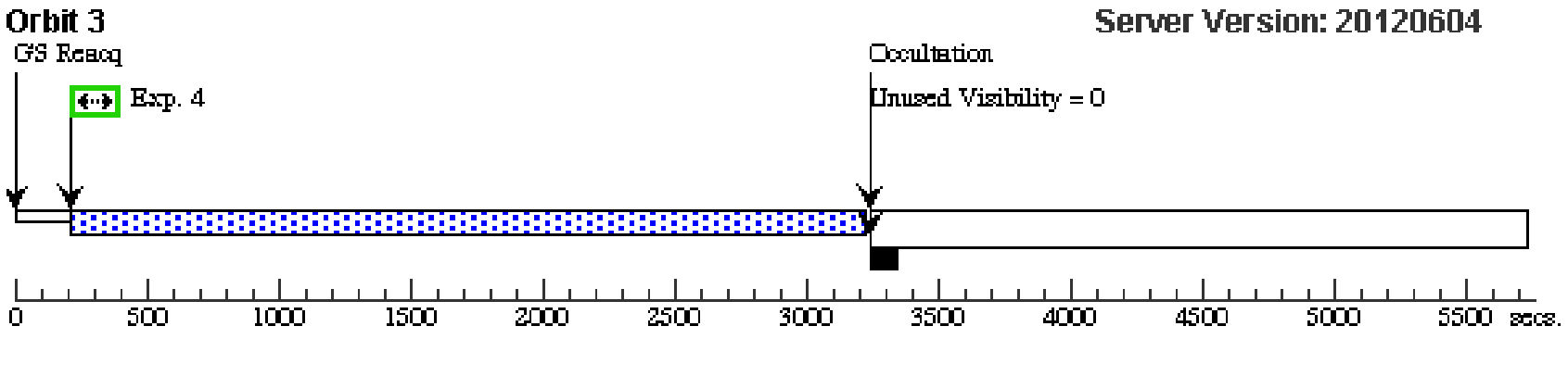
Exposures

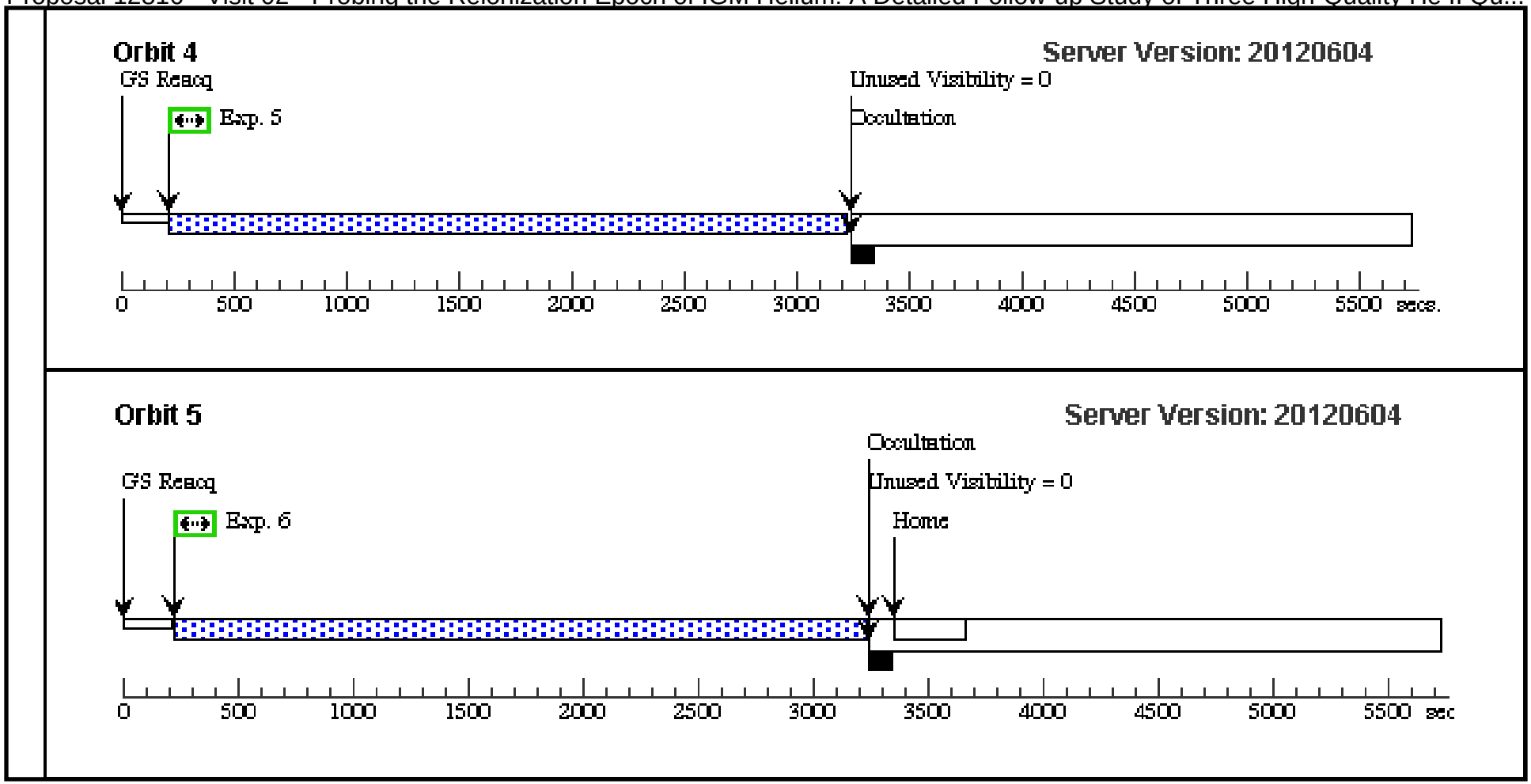
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	ACQ (COS.im.416667)	(2) HS1024+1849	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				34 Secs *[==>]*	***[1]***
Comments: ACQ/IMAGE time estimated using the half the observed GALEX NUV flux, since only a single epoch was available.									
2	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=2512			2600 Secs *[==>2512.0 Secs]*	***[1]***
Comments: ETC buffer time is ~14ks, so we use the exposure time instead.									
3	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[2]***
4	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[3]***
5	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[4]***
6	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[5]***

Orbit Structure





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secs.
Orbit 5
Server Version: 20120604
Occultation
GS Reacq
Unused Visibility = 0
Exp. 6
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5500
sec

Visit

Proposal 12816, Visit 03 Thu Jul 12 01:41:14 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 03) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

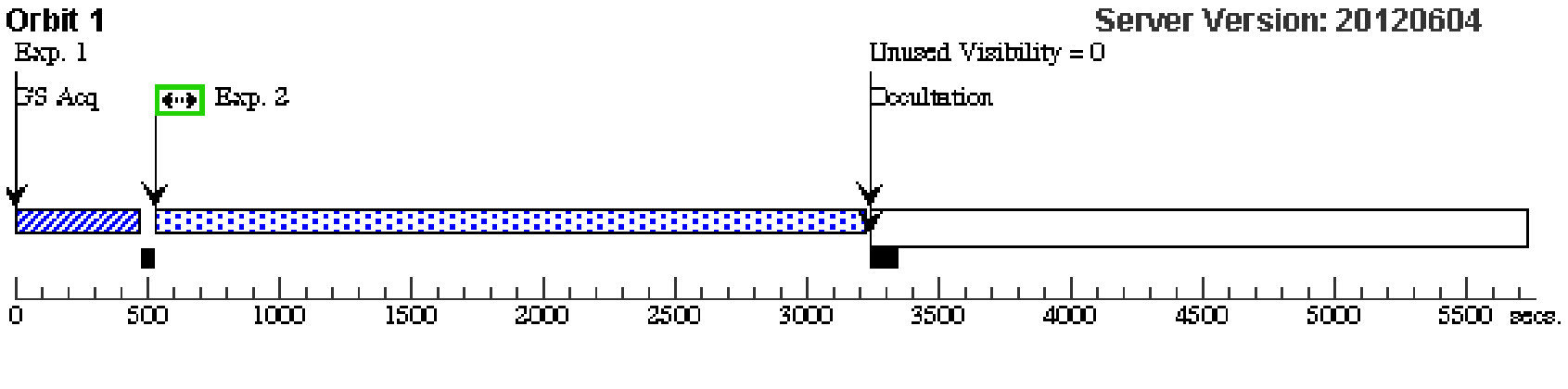
Fixed Targets

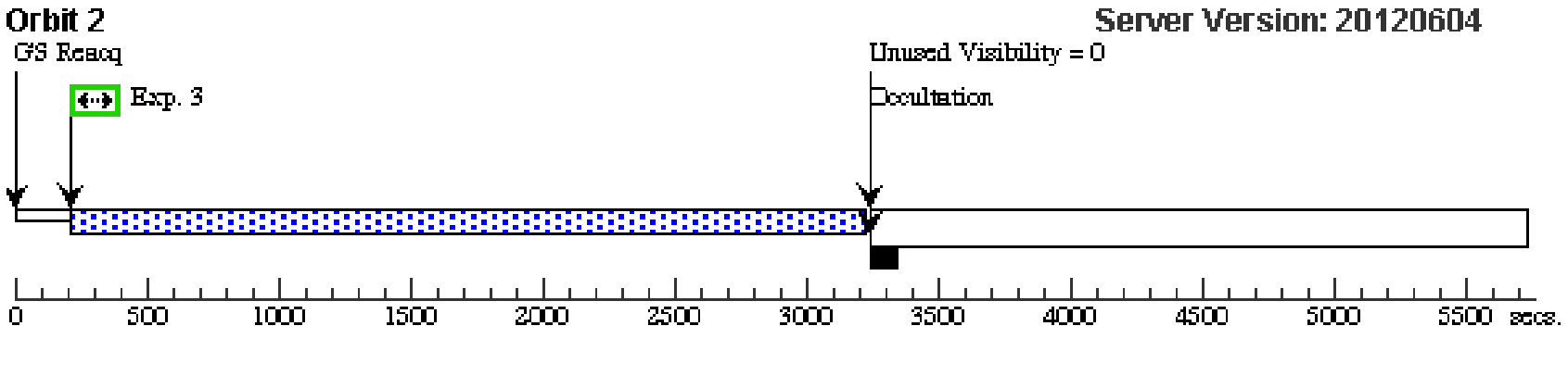
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HS1024+1849	RA: 10 27 34.1331 (156.8922212d) Dec: +18 34 27.59 (18.57433d) Equinox: J2000		V=17.8 GALEX NUV: 2.4e-16; COS F UV: 4.7e-16; SDSS: u=18.90, g=18.01, r=17.83, i=17.70, z=17.70	Reference Frame: ICRS

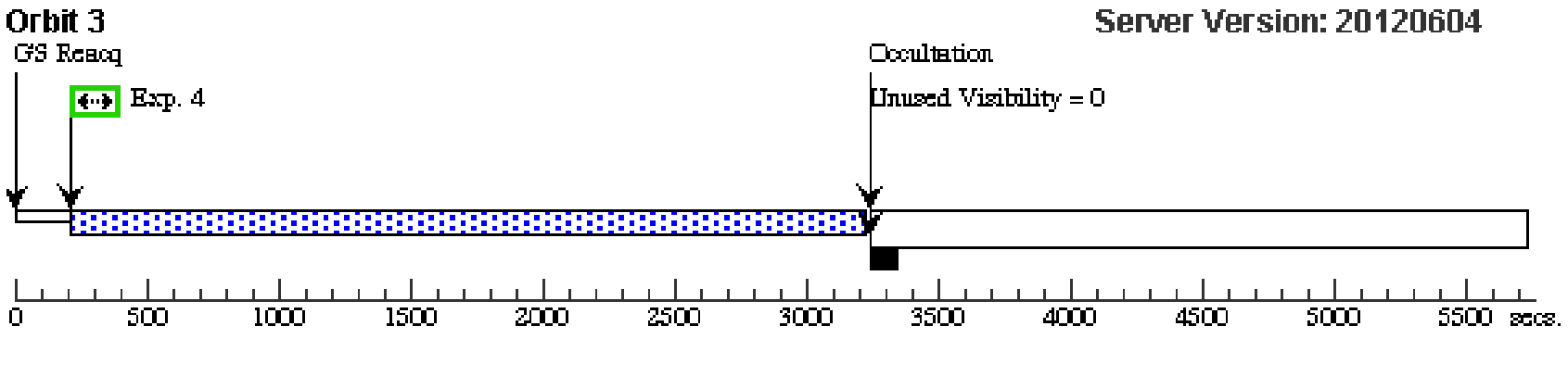
Exposures

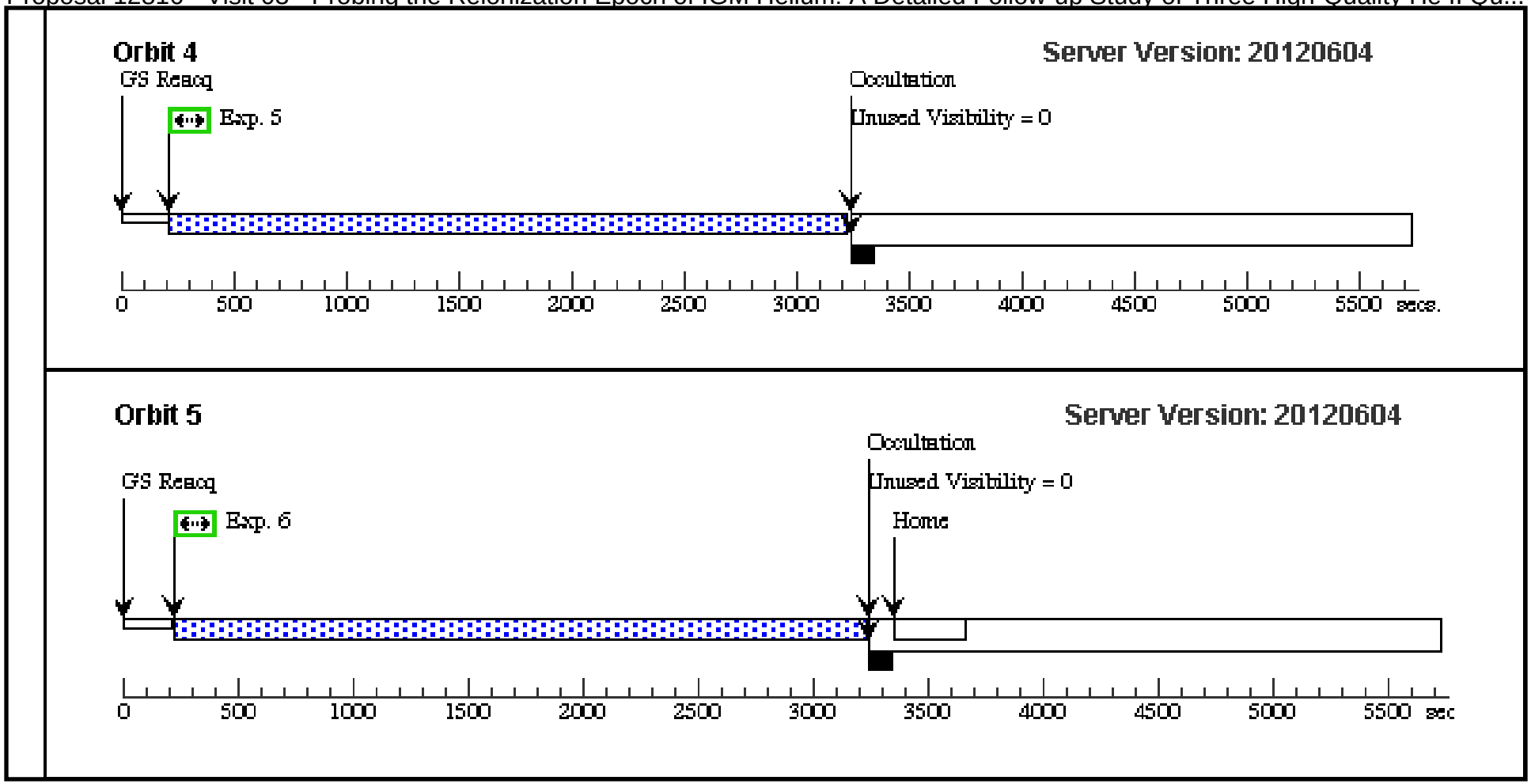
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	ACQ (COS.im.416667)	(2) HS1024+1849	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				34 Secs *[==>]*	***[1]***
Comments: ACQ/IMAGE time estimated using the half the observed GALEX NUV flux, since only a single epoch was available.									
2	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=2512			2600 Secs *[==>2512.0 Secs]*	***[1]***
Comments: ETC buffer time is ~14ks, so we use the exposure time instead.									
3	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[2]***
4	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[3]***
5	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[4]***
6	(COS.sp.416670)	(2) HS1024+1849	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=2958			3000 Secs *[==>2958.0 Secs]*	***[5]***

Orbit Structure





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secs.
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Server Version: 20120604
Occultation
Unused Visibility = 0
GS Reacq
Exp. 6
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sec

Visit

Proposal 12816, Visit 04

Thu Jul 12 01:41:18 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 04) 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.

(Visit 04) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

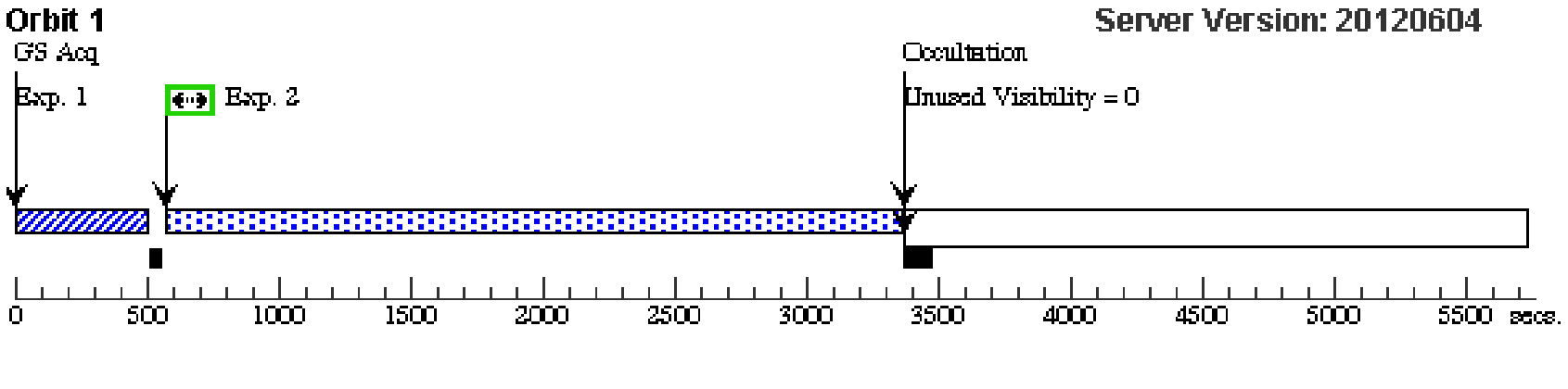
Fixed Targets

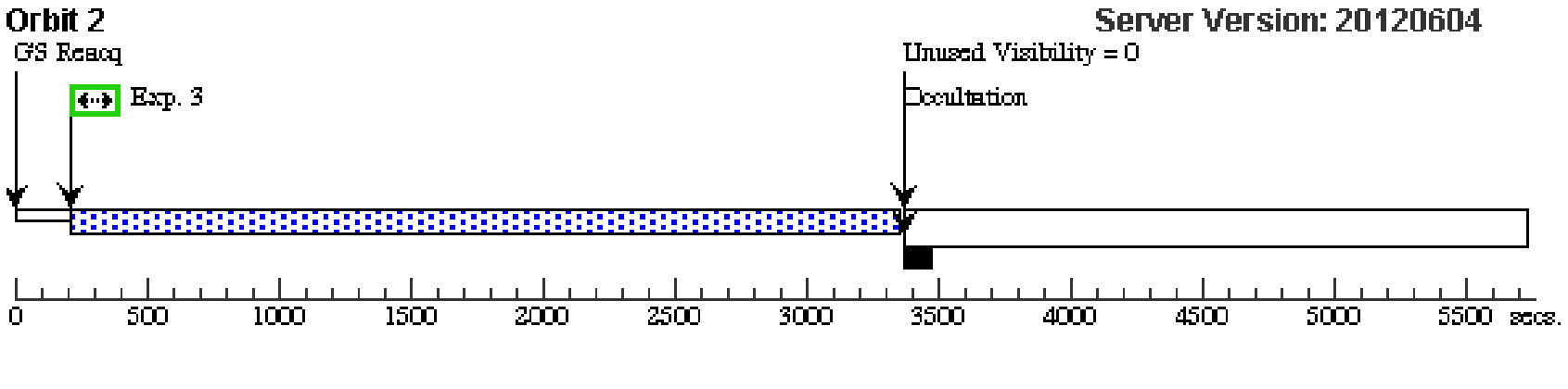
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSSJ0915+4756	RA: 09 15 10.0118 (138.7917158d) Dec: +47 56 58.79 (47.94966d) Equinox: J2000		V=17.8 GALEX NUV: 2.0e-16; COS F UV: 3.8e-16; SDSS: u=19.57, g=18.16, r=17.85, i=17.81, z=17.73	Reference Frame: ICRS

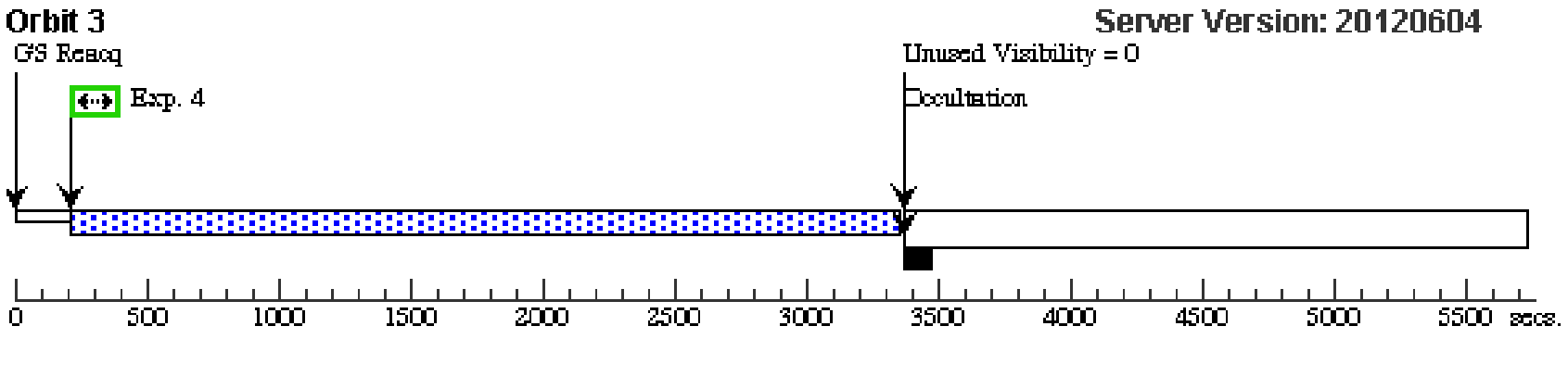
Exposures

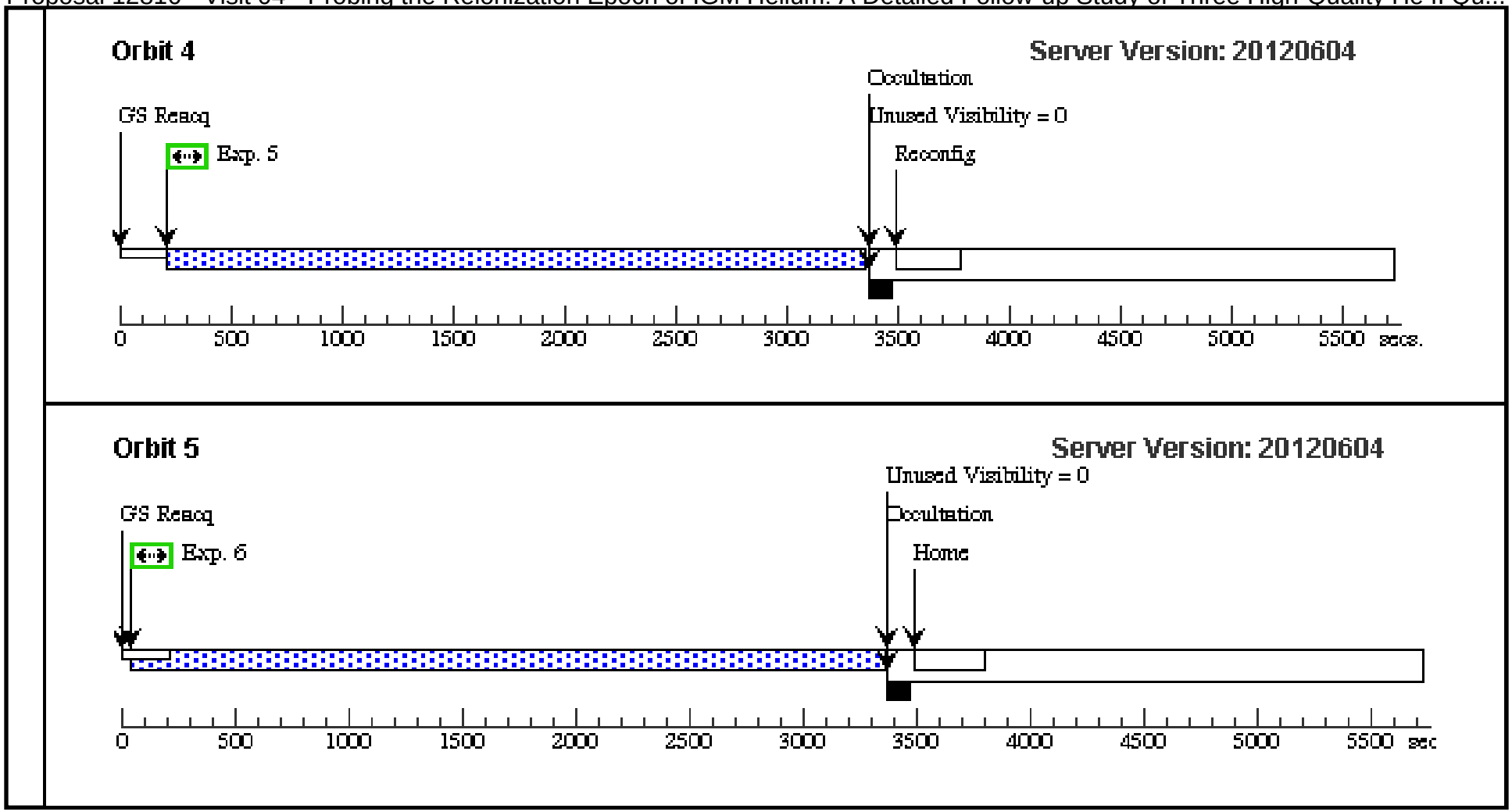
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	ACQ (COS.im.416671)	(3) SDSSJ0915+476	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				50 Secs *[==>]*	*[1]*
Comments: ACQ/IMAGE time estimated using the faintest NUV GALEX flux observed.									
2	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=2613			2600 Secs *[==>2613.0 Secs]*	*[1]*
Comments: ETC buffer time is ~14ks, so we use the exposure time instead.									
3	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=3091			3000 Secs *[==>3091.0 Secs]*	*[2]*
4	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=3091			3000 Secs *[==>3091.0 Secs]*	*[3]*
5	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=3091			3000 Secs *[==>3091.0 Secs]*	*[4]*
6	(COS.sp.416673)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=3089			1700 Secs *[==>3089.0 Secs]*	*[5]*
Comments: ETC buffer time is ~11ks, so we use the exposure time instead.									

Orbit Structure





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5500
secs.
Orbit 5
Server Version: 20120604
Unused Visibility = 0
GS Reacq
Occultation
Exp. 6
Home
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5500
sec

Visit

Proposal 12816, Visit 05

Thu Jul 12 01:41:22 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 05) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

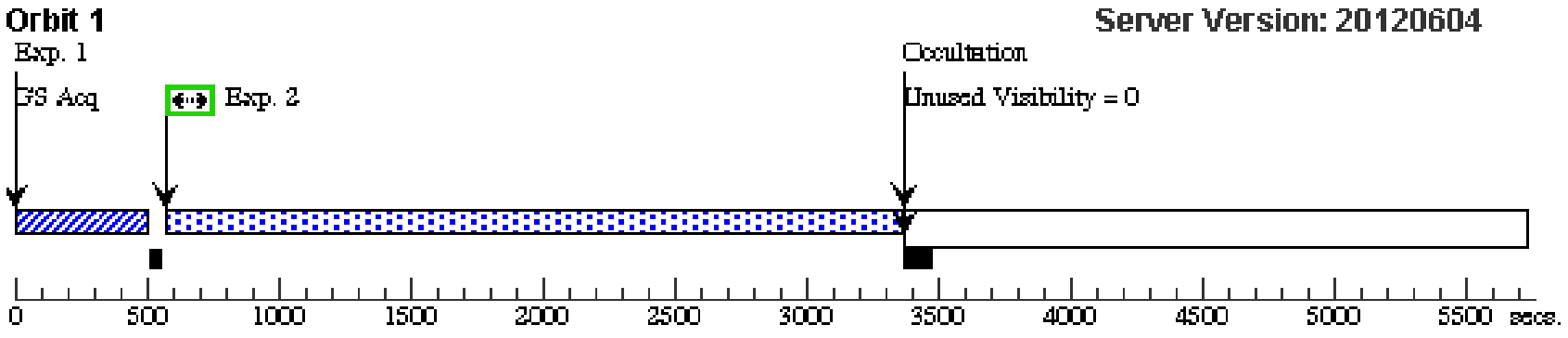
Fixed Targets

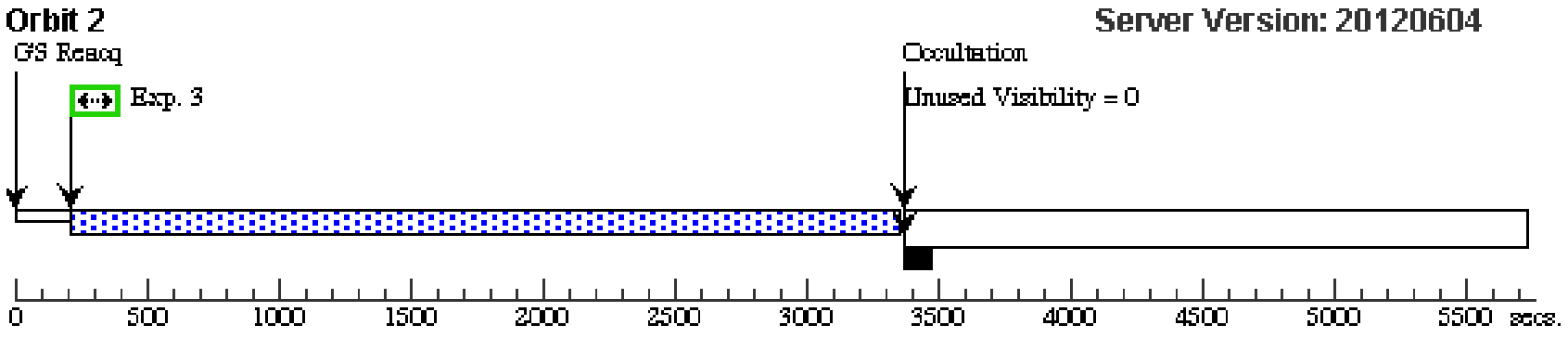
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSSJ0915+4756	RA: 09 15 10.0118 (138.7917158d) Dec: +47 56 58.79 (47.94966d) Equinox: J2000		V=17.8 GALEX NUV: 2.0e-16; COS F UV: 3.8e-16; SDSS: u=19.57, g=18.16, r=17.85, i=17.81, z=17.73	Reference Frame: ICRS

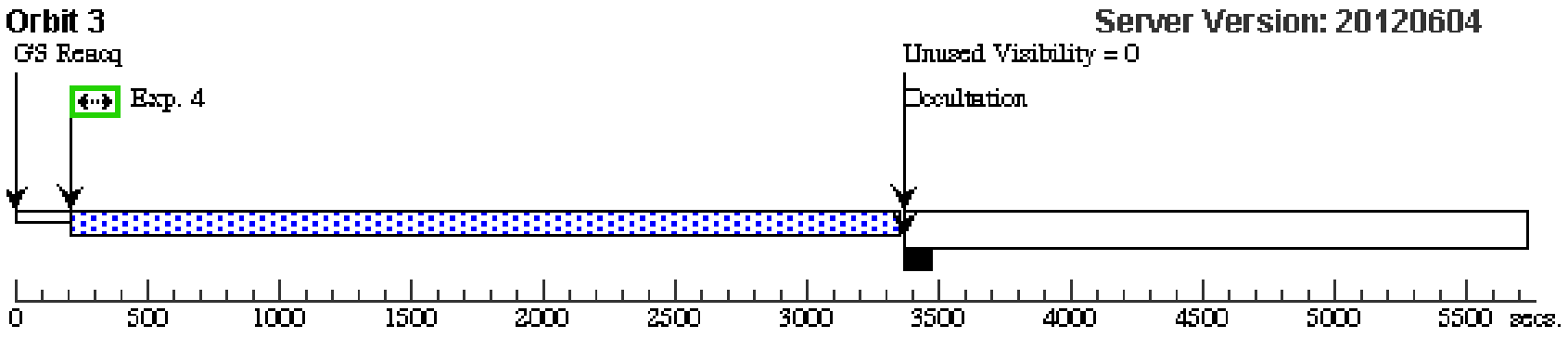
Exposures

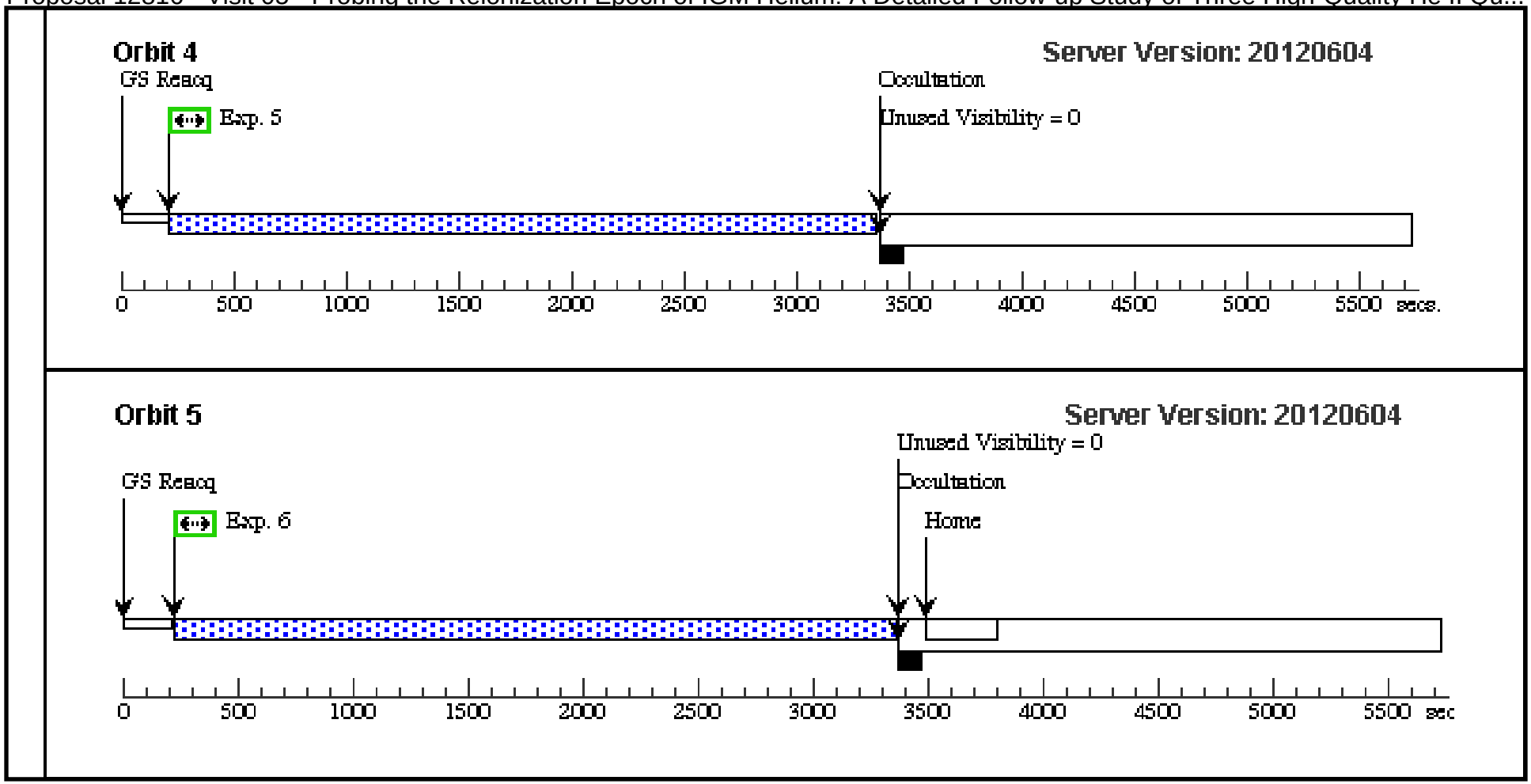
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	ACQ (COS.im.416671)	(3) SDSSJ0915+476	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				50 Secs *[==>]*	*[1]*
Comments: ACQ/IMAGE time estimated using the faintest NUV GALEX flux observed.									
2	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=2613			2600 Secs *[==>2613.0 Secs]*	*[1]*
Comments: ETC buffer time is ~14ks, so we use the exposure time instead.									
3	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=3091			3000 Secs *[==>3091.0 Secs]*	*[2]*
4	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=3091			3000 Secs *[==>3091.0 Secs]*	*[3]*
5	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=3091			3000 Secs *[==>3091.0 Secs]*	*[4]*
6	(COS.sp.416672)	(3) SDSSJ0915+476	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=3091			1700 Secs *[==>3091.0 Secs]*	*[5]*
Comments: ETC buffer time is ~14ks, so we use the exposure time instead.									

Orbit Structure





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Exp. 5
Occultation
Unused Visibility = 0
0
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1000
1500
2000
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3500
4000
4500
5000
5500
secs.
Orbit 5
Server Version: 20120604
Unused Visibility = 0
GS Reacq
Occultation
Exp. 6
Home
0
500
1000
1500
2000
2500
3000
3500
4000
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sec