12614 - Are the Ultra-Compact High-Velocity Clouds Minihalos? Constraints from Quasar Absorption Lines

Cycle: 19, 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) SDSS-J150952.19+111047.0	COS/FUV COS/NUV	4	11-Jul-2011 22:59:05.0	yes
02	(1) SDSS-J150952.19+111047.0	COS/FUV COS/NUV	4	11-Jul-2011 22:59:10.0	yes
03	(1) SDSS-J150952.19+111047.0	COS/FUV COS/NUV	4	11-Jul-2011 22:59:15.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(1) SDSS-J150952.19+111047.0	COS/FUV COS/NUV	4	11-Jul-2011 22:59:20.0	yes
05	(1) SDSS-J150952.19+111047.0	COS/FUV COS/NUV	4	11-Jul-2011 22:59:26.0	yes
06	(2) SDSS-J160519.70+144852.2	COS/FUV COS/NUV	3	11-Jul-2011 22:59:30.0	yes

23 Total Orbits Used

ABSTRACT

We propose spectroscopic metal absorption-line observations (C II 1334.5A, Si III 1260.4A, and Si III 1206.5A) of two ultra-compact 21cm H I Arecibo sources, toward two closely aligned (4 and 10 arcmin) and suitably bright (41 and 291 microJy in the FUV) background SDSS quasars that we have identified for this purpose. These ultra-compact H I clouds have been proposed as possible 21cm-selected minihalos in the Local Group. COS measurements will constrain the metallicity and thermal pressures in these possibly multiphased clouds, and will provide a test of the minihalo hypothesis. We request 23 orbits.

OBSERVING DESCRIPTION

we require COS observations toward two quasars that are positioned close to and behind the ultra-compact 21cm H I Arecibo sources AGC258242 and AGC268069. We have identified two FUV-bright (> 40 Jy) SDSS quasars that are suitable for this purpose. Our goal is to detect the CII 1334.5A, SiII 1260.4A, and SiIII 1206.5A absorption lines in the UCHVCs, and to infer the ion column densities. For the spectroscopy we will the COS FUV G130M grating, with a central wavelength of 1327A, (R~20, 000-24, 000).

Our minihalo models predict that CII, SiII, SiIII should be readily observable, but that other ions are too underabundant to detect easily. Spectral observations with G130M could also reveal the existence of OI 1302.2A, SII 1259.5A, SiIV 1393.8A, and NV 1238.8A. Detecting any of these species will provide significant clues regarding the nature and location of the UCHVCs, in addition to testing the minihalo hypothesis.

AGC258242 – An SDSS quasar is located at an angular distance of 4 arcmin from the center of AGC258242. This quasar is at a redshift z = 0.2851, and has a mean GALEX FUV specific flux of 41 micro-Jy (FUV AB mag = 19.86). Given the H I column density and the radial extent of this

UCHVC, we predict the following metal-line column-densities for this cloud: For CII 1334.5A, N_CII~1.6e14 cm^2; For SiII 1260.4A, N_SiII~1.4e13 cm^2; And for SiIII 1206.5A, 1e12<N_SiIII < 2e13 cm^2, depending on the bounding pressure.
For CII 1334.5A, the predicted column density implies an optical depth, tau=11.4, which will produce an observed equivalent width (EW) of 51 mA. This EW is smaller than a resolution element (but wider than the intrinsic line width), and is expected to result in an absorption trough at 0.3 the continuum level. A continuum signal to noise ratio (SNR) of 10 will allow a clear and secure (7sigma) measurement of the absorbing column. This requires an exposure time of 22, 600 s, or about 8 orbits.
In estimating the exposure time, we used the COS exposure time calculator. For the background source we used the FOS-based QSO spectrum. This spectrum extends to higher quasar-rest-frame energies, and ensures that the redshifted spectrum still contains the wave-lengths of the absorbing species. We place the quasar at the appropriate redshift (z = 0.2851) and apply an average galactic extinction with E_B-V = 0.049 (Schlegel et al. 1998), normalizing the intensity using the measured GALEX FUV AB magnitude of 19.86. We use a standard background model. When deriving the SNR listed in the tables, we required a 7sigma detection of the absorption features.
For SiII 1260.4A, the required exposure time is 53, 000 s, or 20 orbits. The predicted column of SiIII depends on the assumed bounding pressure, but always yields very large required exposure times for a 7 detection. With 20 orbits, we can obtain a 6.3sigma (or 3.9sigma)
detection for an assumed low (or high) bounding pressure, which we consider sufficient.

AGC268069 – An SDSS quasar is located at an angular distance of 10 arcmin from the center of AGC268069. At a redshift z = 0.3721, this FUV bright quasar has a GALEX FUV specific flux of 291 micro-Jy (FUV AB mag of 17.7). The presence of low- and intermediate-ionization metal absorption lines at such a high separation from the cloud center, is a telltale sign of a low bounding pressure, and thus constrain the pressure and associated distances of the UCHVCs.
In computing the required exposure times, we used the assumptions described above, this time adopting an average galactic extinction with E_B-V = 0.043 (Schlegel et al. 1998).
If the pressure in the environment of the UCHVCs is low (PHIM~10 cm^3 K), then a 3-orbit observation of AGC268069 will provide distinct absorption line signatures of C II, Si II, and Si III. It is, however, more likely that the ambient pressure in the Galactic halo is large. In this case, non-detections can be used to place a lower limit on the surrounding pressure.

Visit

Proposal 12614, Visit 01

Tue Jul 12 02:59:35 GMT 2011

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

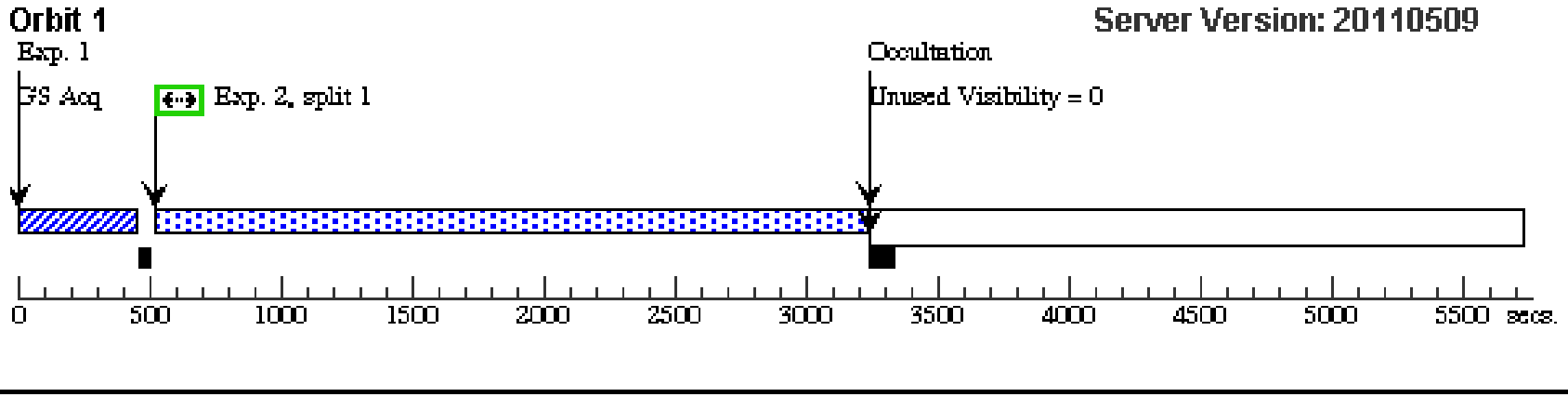
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J150952.19+111047.0	RA: 15 09 52.1928 (227.4674700d) Dec: +11 10 47.03 (11.17973d) Equinox: J2000		V=18.1 GALEX FUV AB mag = 19.9	Reference Frame: ICRS

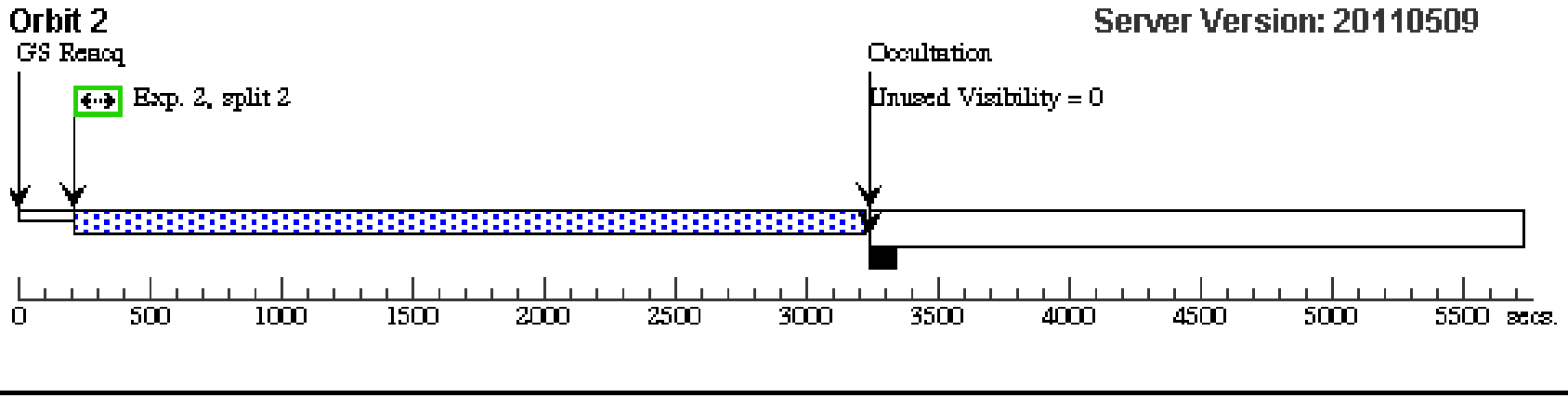
Comments: This object was generated by the targetselector and retrieved from the NED database.

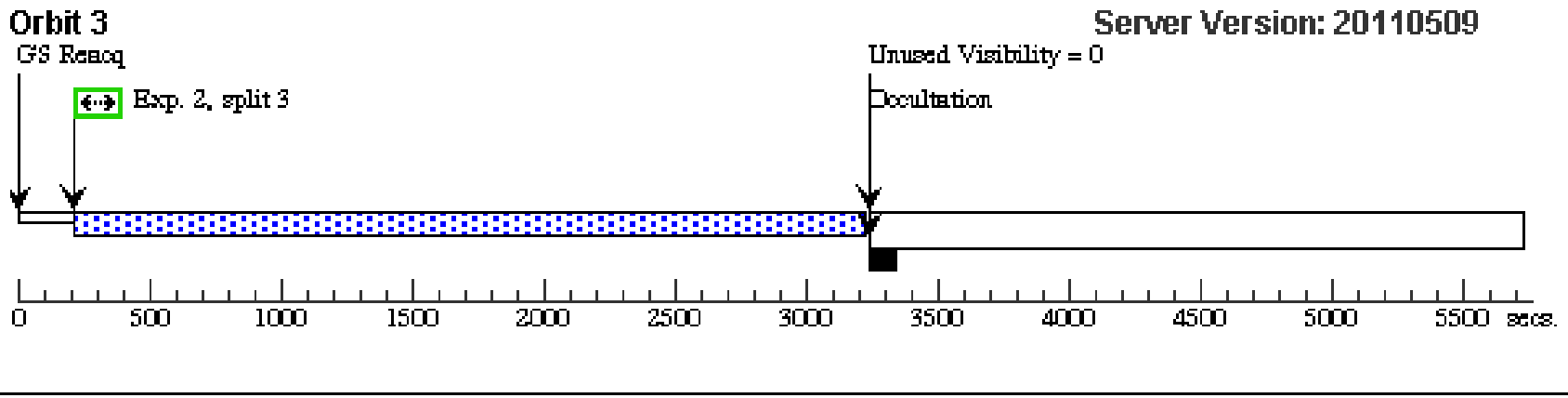
Exposures

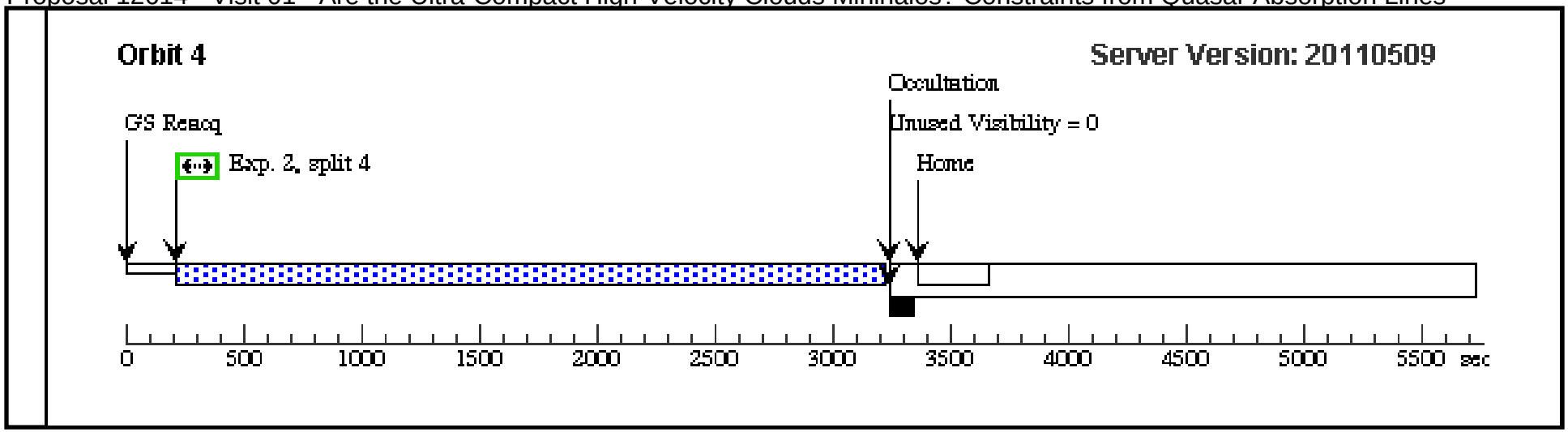
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	TA (COS.ta.183434)	(1) SDSS-J150952.19+111047.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				27.3 Secs	
								[==>]	***[1]***
2	tg1 visit1of5 (COS.sp.184053)	(1) SDSS-J150952.19+111047.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=ALL			2959 Secs	
								[==>2548.0 Secs (Split 1)]	***[1]***
								[==>(Split 2)]	***[2]***
								[==>(Split 3)]	***[3]***
								[==>(Split 4)]	***[4]***

Orbit Structure








Orbit 4
Server Version: 20110509
Occultation
GS Reacq
Unused Visibility = 0
Exp. 2, split 4
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3500
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4500
5000
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sec

Visit

Proposal 12614, Visit 02 Tue Jul 12 02:59:36 GMT 2011

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

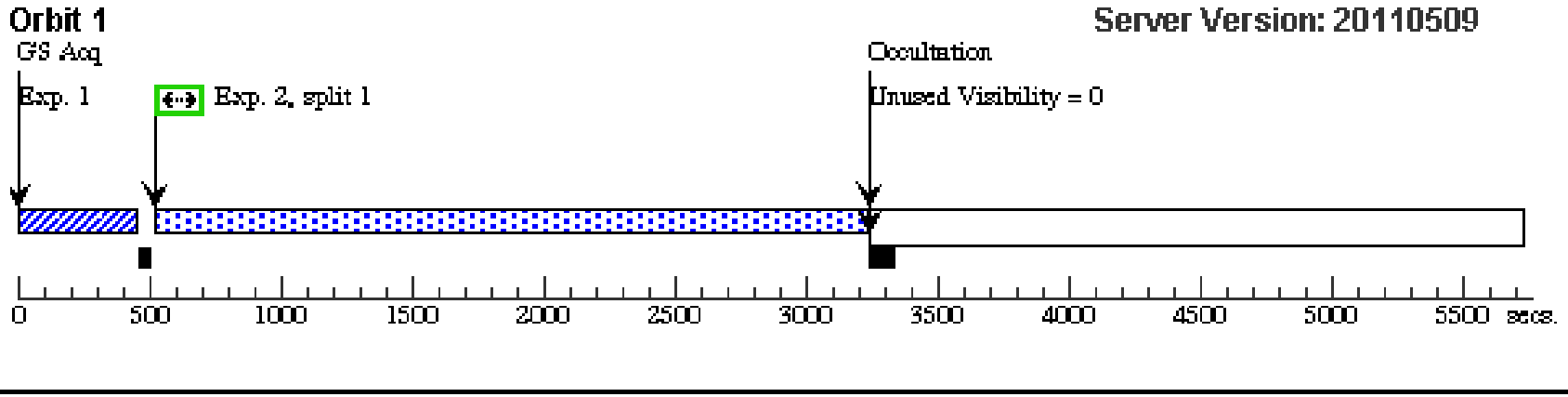
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J150952.19+111047.0	RA: 15 09 52.1928 (227.4674700d) Dec: +11 10 47.03 (11.17973d) Equinox: J2000		V=18.1 GALEX FUV AB mag = 19.9	Reference Frame: ICRS

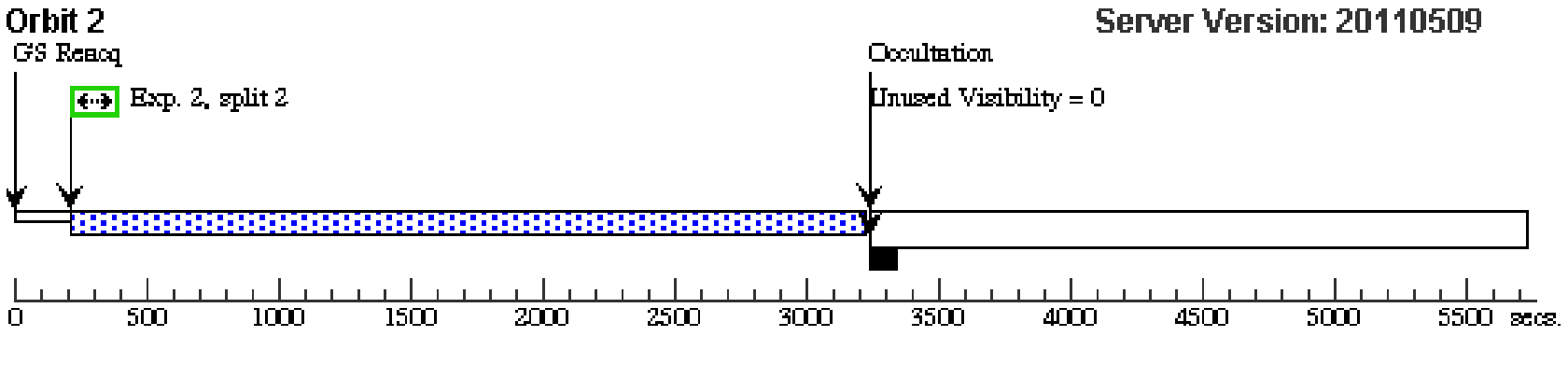
Comments: This object was generated by the targetselector and retrieved from the NED database.

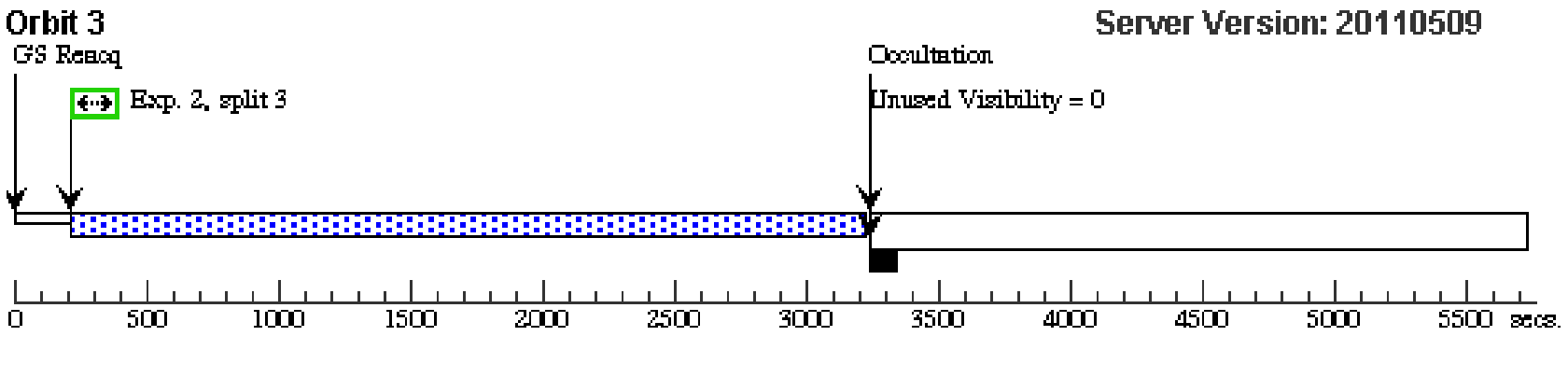
Exposures

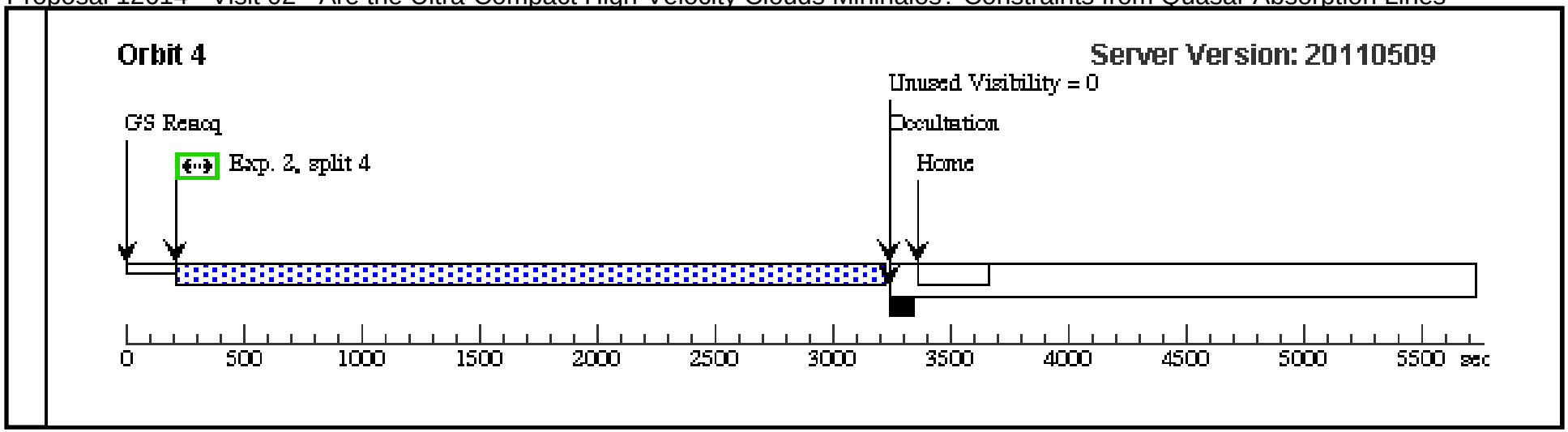
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	TA (COS.ta.183434)	(1) SDSS-J150952.19+111047.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				27.3 Secs	
								[==>]	***[1]***
2	tg1 visit2of5 (COS.sp.184053)	(1) SDSS-J150952.19+111047.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=ALL			2959 Secs	
								[==>2548.0 Secs (Split 1)]	***[1]***
								[==>(Split 2)]	***[2]***
								[==>(Split 3)]	***[3]***
								[==>(Split 4)]	***[4]***

Orbit Structure








Orbit 4
Server Version: 20110509
Unused Visibility = 0
GS Reacq
Occultation
Exp. 2, split 4
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4500
5000
5500
sec

Visit

Proposal 12614, Visit 03 Tue Jul 12 02:59:37 GMT 2011

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

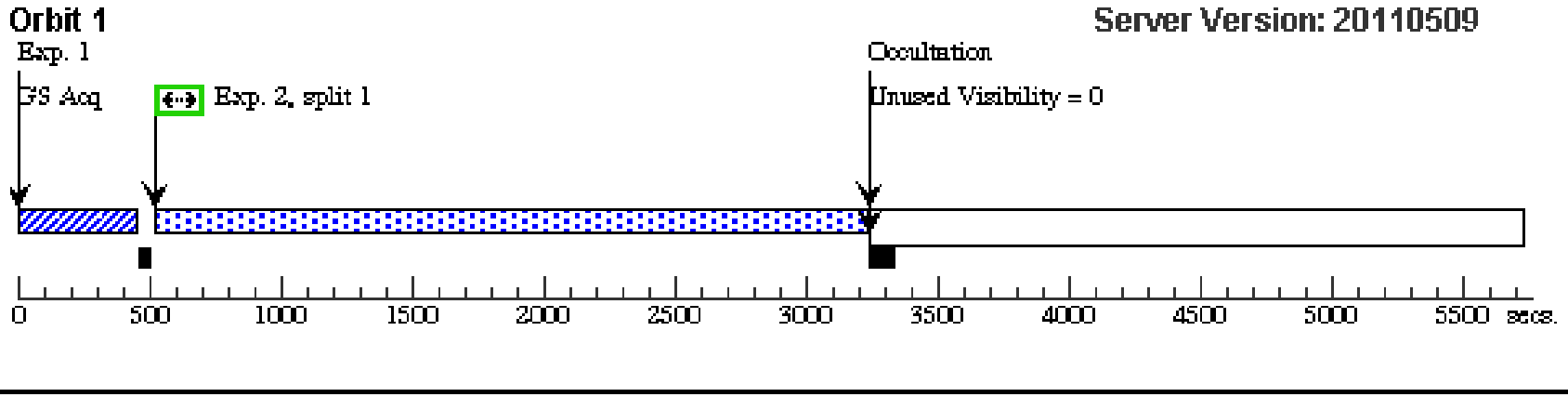
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J150952.19+111047.0	RA: 15 09 52.1928 (227.4674700d) Dec: +11 10 47.03 (11.17973d) Equinox: J2000		V=18.1 GALEX FUV AB mag = 19.9	Reference Frame: ICRS

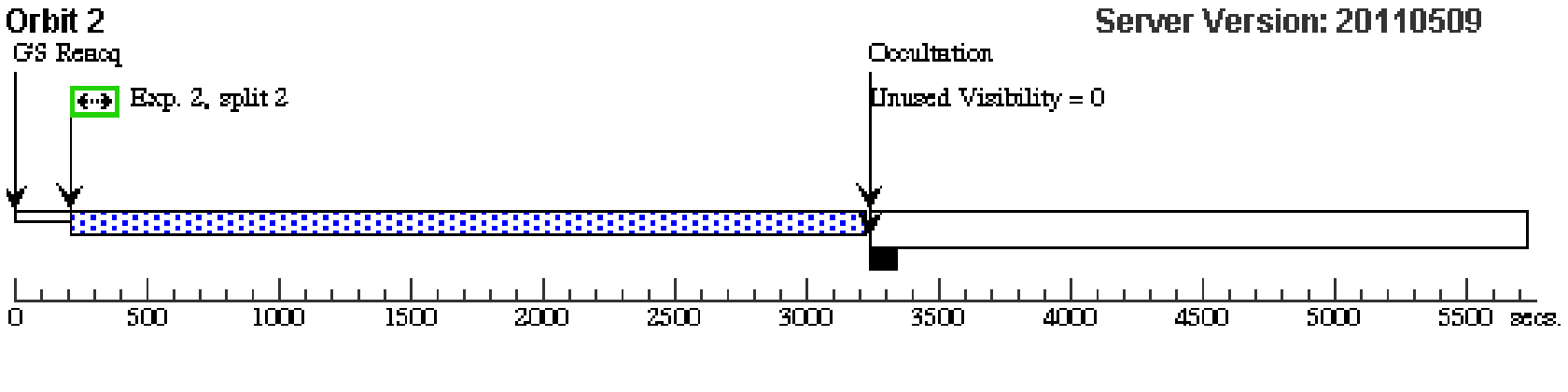
Comments: This object was generated by the targetselector and retrieved from the NED database.

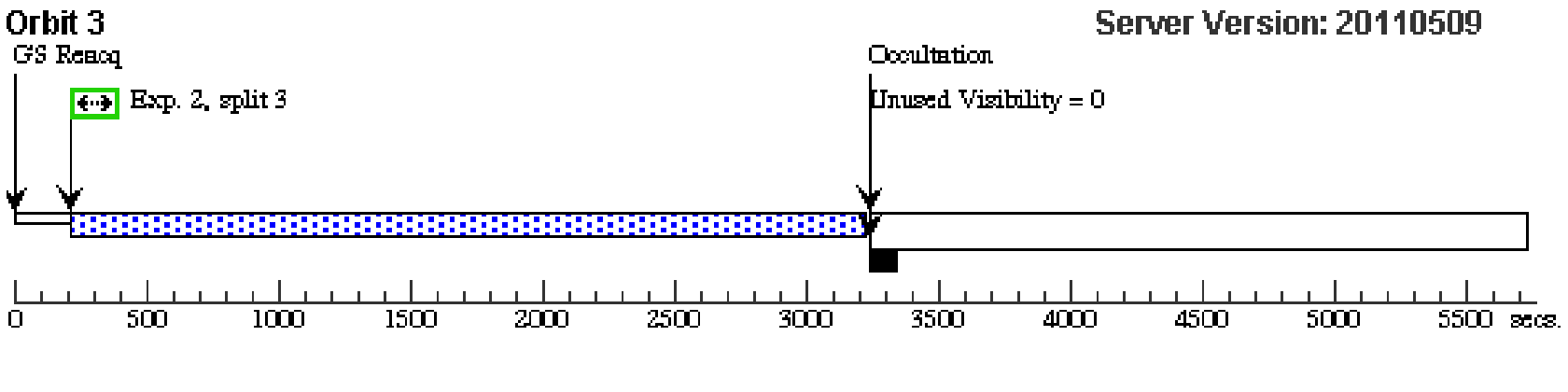
Exposures

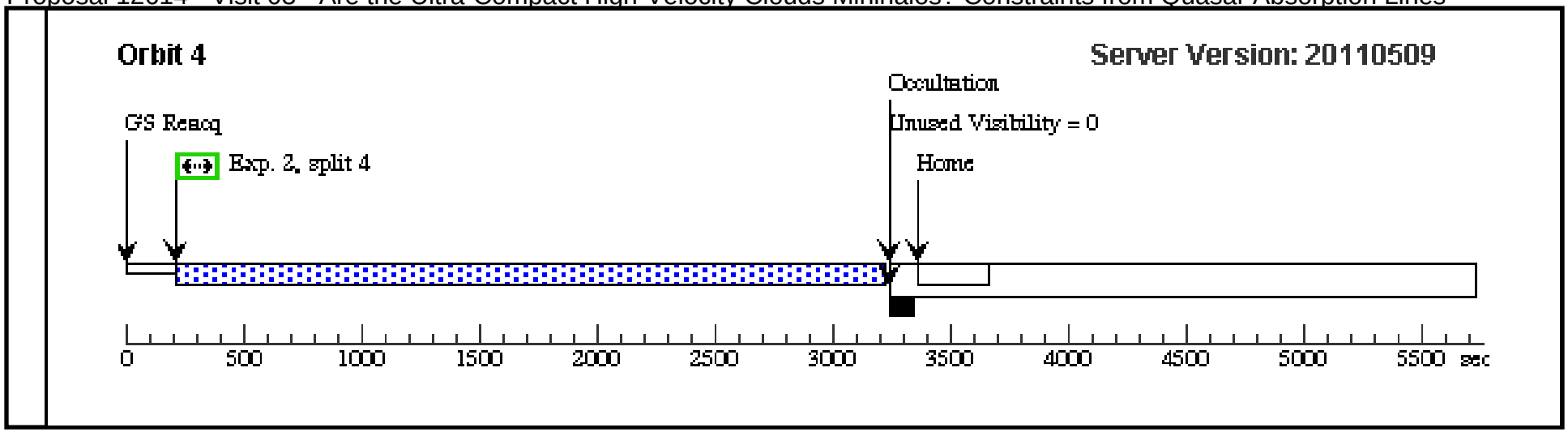
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	TA (COS.ta.183434)	(1) SDSS-J150952.19+111047.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				27.3 Secs	
								[==>]	***[1]***
2	tg1 visit3of5 (COS.sp.184053)	(1) SDSS-J150952.19+111047.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=ALL			2959 Secs	
								[==>2548.0 Secs (Split 1)]	***[1]***
								[==>(Split 2)]	***[2]***
								[==>(Split 3)]	***[3]***
								[==>(Split 4)]	***[4]***

Orbit Structure








Orbit 4
Server Version: 20110509
Occultation
GS Reacq
Unused Visibility = 0
Exp. 2, split 4
Home
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5000
5500
sec

Visit

Proposal 12614, Visit 04 Tue Jul 12 02:59:38 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(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

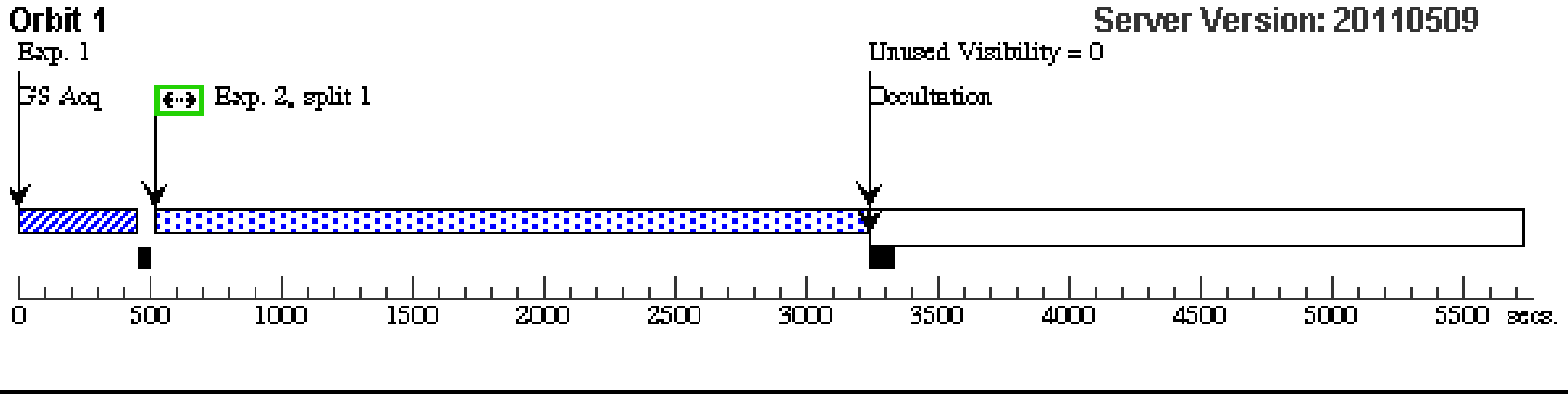
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J150952.19+111047.0	RA: 15 09 52.1928 (227.4674700d) Dec: +11 10 47.03 (11.17973d) Equinox: J2000		V=18.1 GALEX FUV AB mag = 19.9	Reference Frame: ICRS

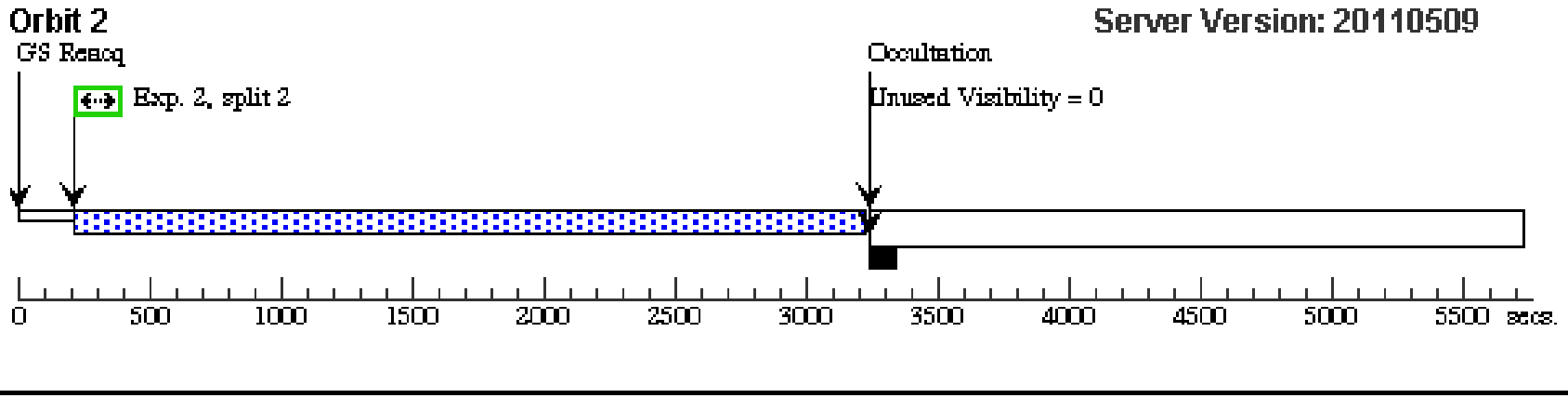
Comments: This object was generated by the targetselector and retrieved from the NED database.

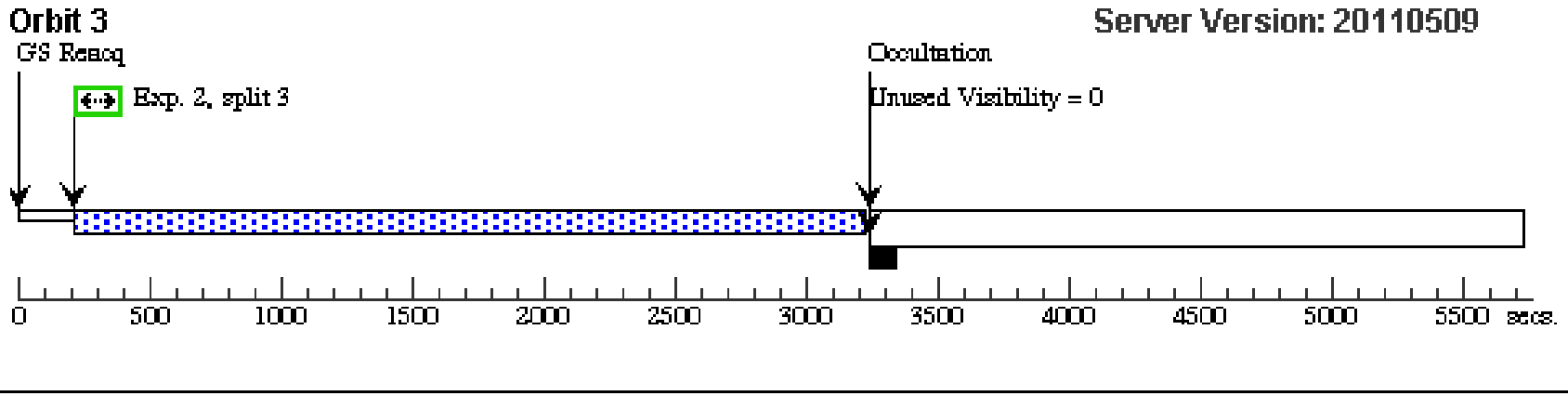
Exposures

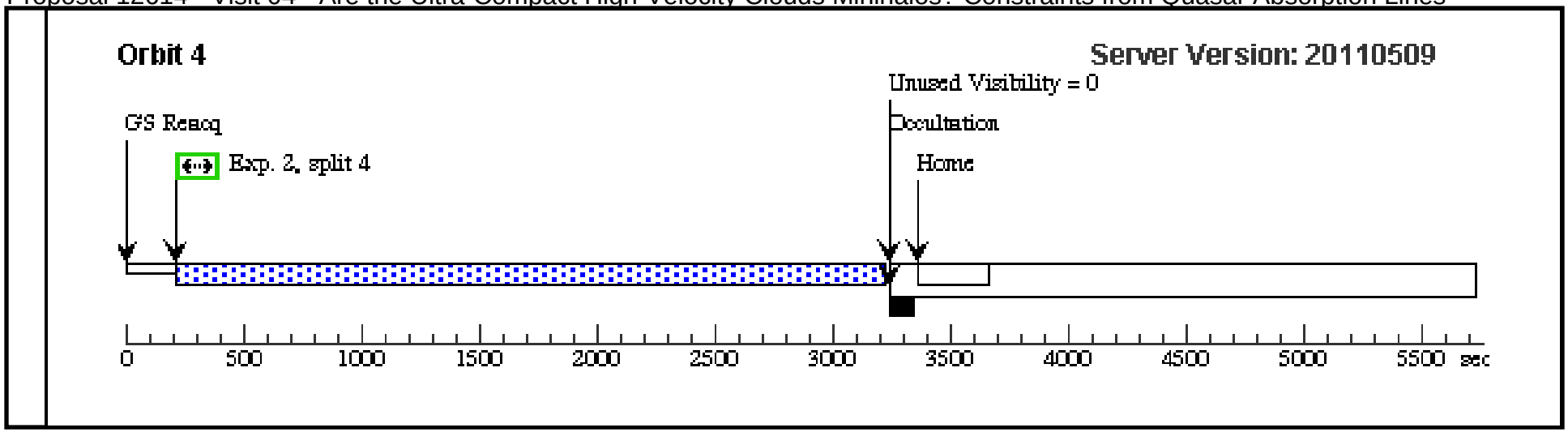
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	TA (COS.ta.183434)	(1) SDSS-J150952.19+111047.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				27.3 Secs	
								[==>]	***[1]***
2	tg1 visit4of5 (COS.sp.184053)	(1) SDSS-J150952.19+111047.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=ALL			2959 Secs	
								[==>2548.0 Secs (Split 1)]	***[1]***
								[==>(Split 2)]	***[2]***
								[==>(Split 3)]	***[3]***
								[==>(Split 4)]	***[4]***

Orbit Structure








Orbit 4
Server Version: 20110509
Unused Visibility = 0
GS Reacq
Occultation
Exp. 2, split 4
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1500
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4500
5000
5500
sec

Visit

Proposal 12614, Visit 05 Tue Jul 12 02:59:39 GMT 2011

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

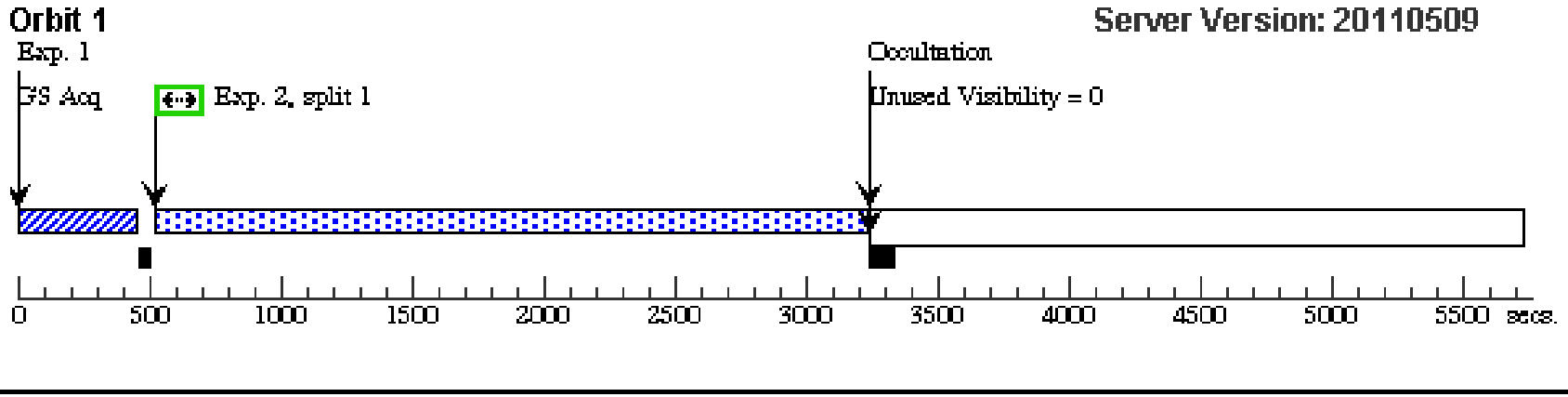
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J150952.19+111047.0	RA: 15 09 52.1928 (227.4674700d) Dec: +11 10 47.03 (11.17973d) Equinox: J2000		V=18.1 GALEX FUV AB mag = 19.9	Reference Frame: ICRS

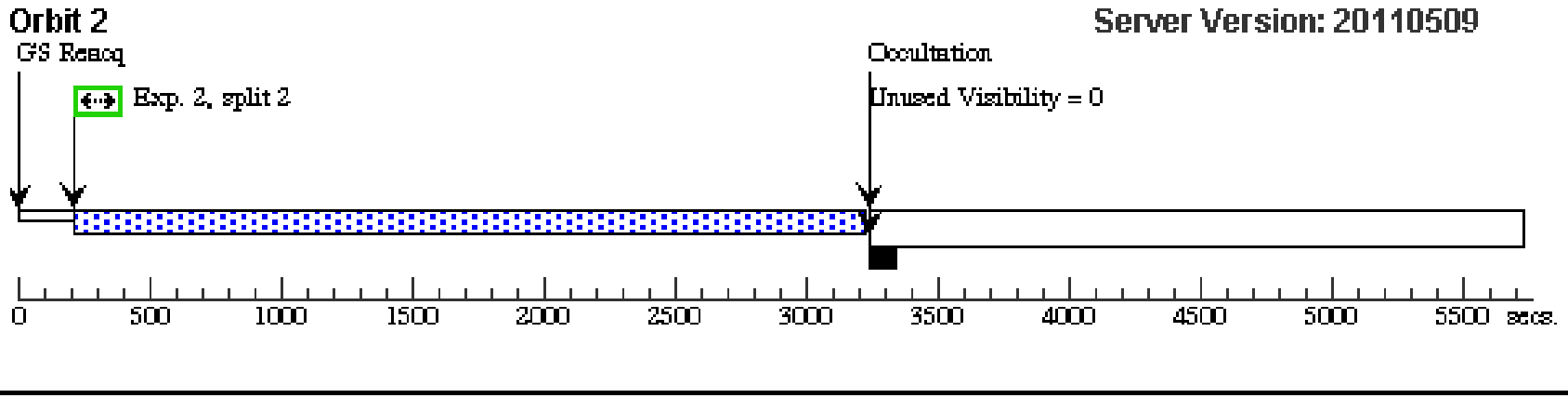
Comments: This object was generated by the targetselector and retrieved from the NED database.

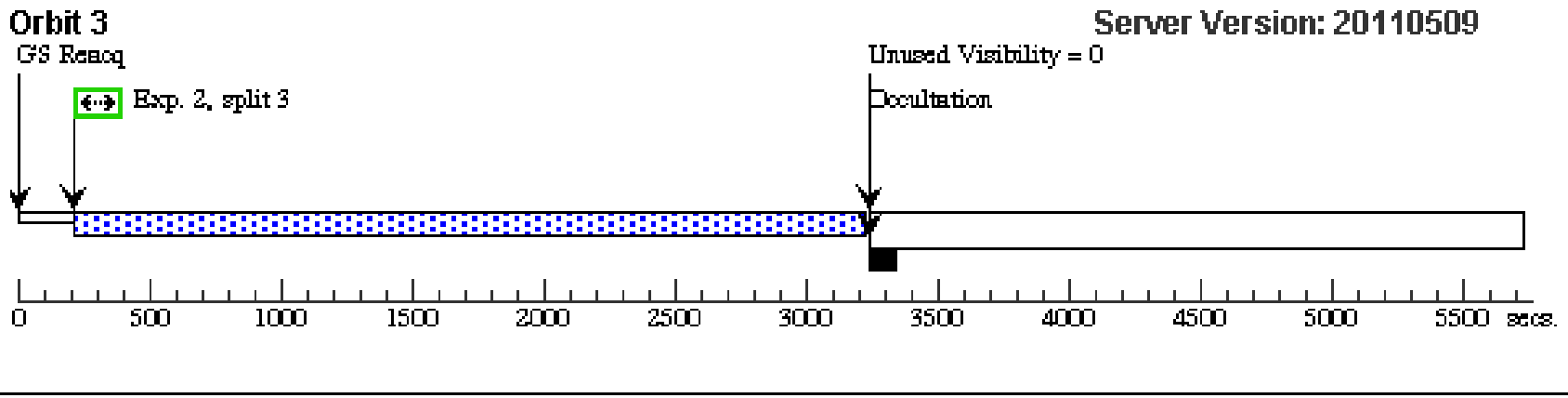
Exposures

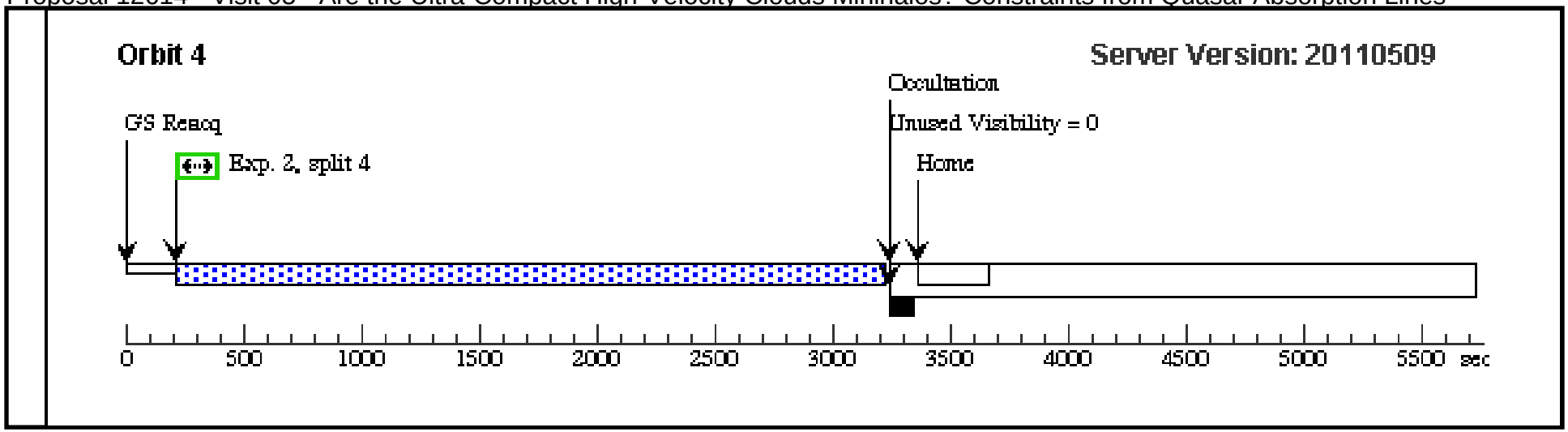
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	TA (COS.ta.183434)	(1) SDSS-J150952.19+111047.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				27.3 Secs	
								[==>]	***[1]***
2	tg1 visit5of5 (COS.sp.184053)	(1) SDSS-J150952.19+111047.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=ALL			2959 Secs	
								[==>2548.0 Secs (Split 1)]	***[1]***
								[==>(Split 2)]	***[2]***
								[==>(Split 3)]	***[3]***
								[==>(Split 4)]	***[4]***

Orbit Structure








Orbit 4
Server Version: 20110509
Occultation
GS Reacq
Unused Visibility = 0
Exp. 2, split 4
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12614, Visit 06 Tue Jul 12 02:59:40 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 06) 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 06) 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)	SDSS-J160519.70+144852.2	RA: 16 05 19.7026 (241.3320942d) Dec: +14 48 52.27 (14.81452d) Equinox: J2000		V=16.7 GALEX FUV AB mag = 17.7	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	TA (COS.ta.198769)	(2) SDSS-J160519.70+144852.2	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				60 Secs *[==>]*	*[1]*
2	tg2 sci 1 of 3 (COS.sp.184059)	(2) SDSS-J160519.70+144852.2	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2268; FP-POS=1			2268 Secs *[==>2455.0 Secs]*	*[1]*
3	tg2 sci 2 of 3 (COS.sp.184060)	(2) SDSS-J160519.70+144852.2	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=2			2959 Secs *[==>]*	*[2]*
4	tg2 sci 3 of 3 (COS.sp.184060)	(2) SDSS-J160519.70+144852.2	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=2959; FP-POS=3			2959 Secs *[==>]*	*[3]*

Orbit Structure