12876 - Project WHIPS (Warm H2 In Protoplanetary Systems): Direct Measurement of Molecular Abundances in Circumstellar Disks

Cycle: 20, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) V-AA-TAU	COS/FUV COS/NUV	4	19-Jul-2013 21:33:35.0	yes
02	(1) V-AA-TAU	COS/FUV COS/NUV	6	19-Jul-2013 21:33:53.0	yes
03	(4) V-ET-CHA	COS/FUV COS/NUV	6	19-Jul-2013 21:34:13.0	yes
53	(4) V-ET-CHA	COS/FUV COS/NUV	6	19-Jul-2013 21:34:31.0	yes
04	(6) V-RW-AUR	COS/FUV COS/NUV	6	19-Jul-2013 21:34:49.0	yes

28 Total Orbits Used

ABSTRACT

The composition and spatial distribution of molecular gas in the inner few AU of young (< 10 Myr) circumstellar disks are important components to our understanding of the formation and evolution of extrasolar planetary systems. Recent observations of these systems with HST-COS have vastly increased the number of disks with well-characterized ultraviolet H2 and CO spectra, and initial results suggest a CO/H2 ratio 3-to-4 orders of magnitude larger than expected from interstellar abundances. It is not clear from existing observations if this reflects the local CO/H2 abundance ratio or if these observations are sampling separate molecular populations. We propose Project WHIPS (Warm H2 in Protoplanetary Systems) to answer this question by using absorption line spectrosopy of H2 to directly probe a sightline through the warm molecular material in a sample of three disks with well-characterized CO absorption. This program takes advantage of the short-wavelength, medium-resolution capability of the newly commissioned COS G130M lam1222 mode to measure warm H2 absorption in circumstellar disks with Hubble for the first time.

OBSERVING DESCRIPTION

We will observe 3 protoplanetary disk targets to directly measure the CO/H2 abundance ratio in at planet-forming radii (r < 10 AU). We will combine CO observations of the 4th Positive Band with observations of the H2 Lyman system. The CO lines have been observed previously as part of HST GO 11616. H2 will be studied with the newly comissioned G130M CENWAVE1222 mode. These targets have all been safely observed previously with HST-COS and STIS and we use these spectra to calculate exposure times and intrument safety.

Visit

Proposal 12876, AATAU-v1 (01), completed Sat Jul 20 01:35:04 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Comments: BOT checked, kf, 06/29/12. The only violation is a mis-typing of the target star, which has been observed safely with COS.

Diagnostics

(AATAU-v1 (01)) Warning (Form): The 'SCHED=100' special requirement must be selected for this visit.

(AATAU-v1 (01)) Warning (Orbit Planner): VISIBILITY OVERRUN

Fixed Targets

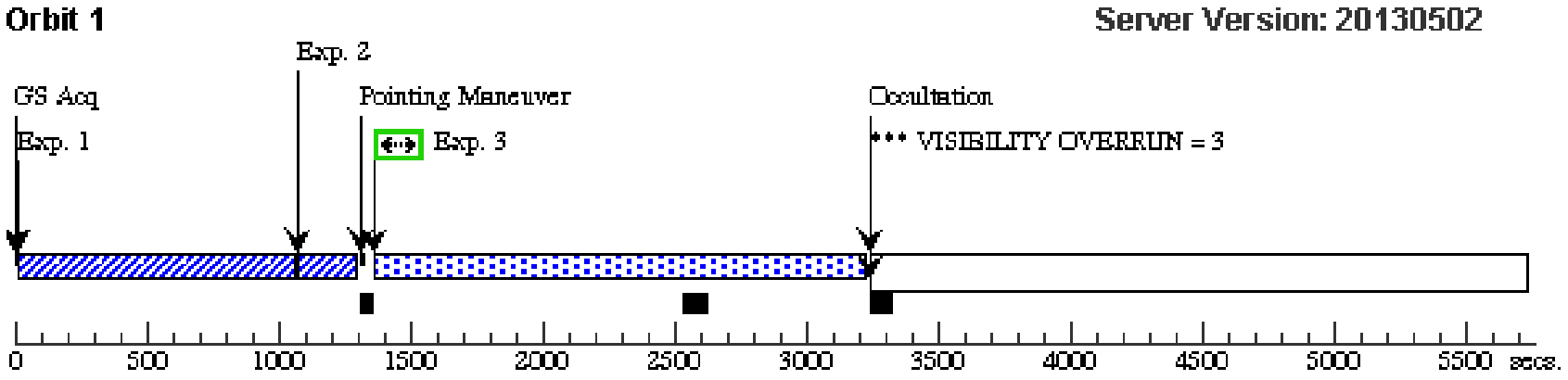
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-AA-TAU	RA: 04 34 55.4240 (68.7309333d) Dec: +24 28 53.16 (24.48143d) Equinox: J2000	Proper Motion RA: 1.6 mas/yr Proper Motion Dec: -14.7 mas/yr Epoch of Position: 2000 Radial Velocity: 34 km/sec	V=12.82	Reference Frame: ICRS

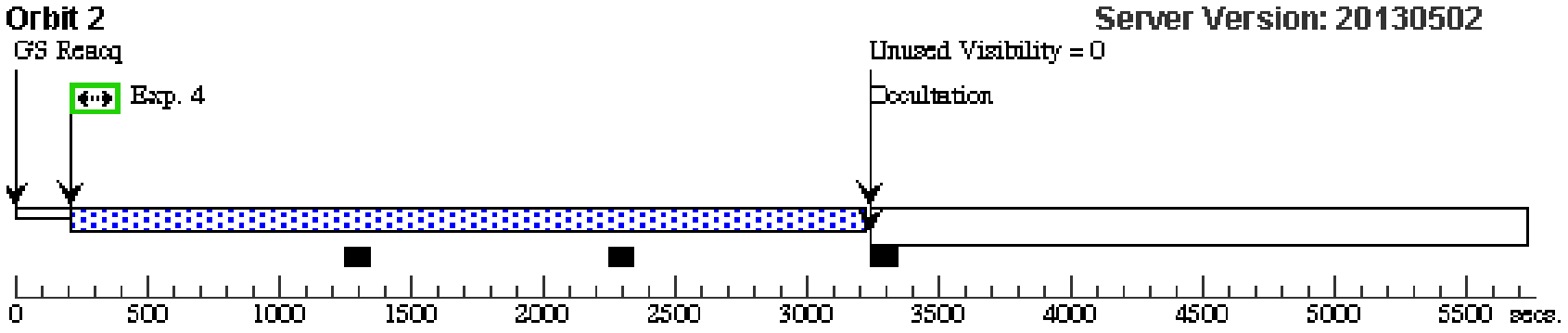
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

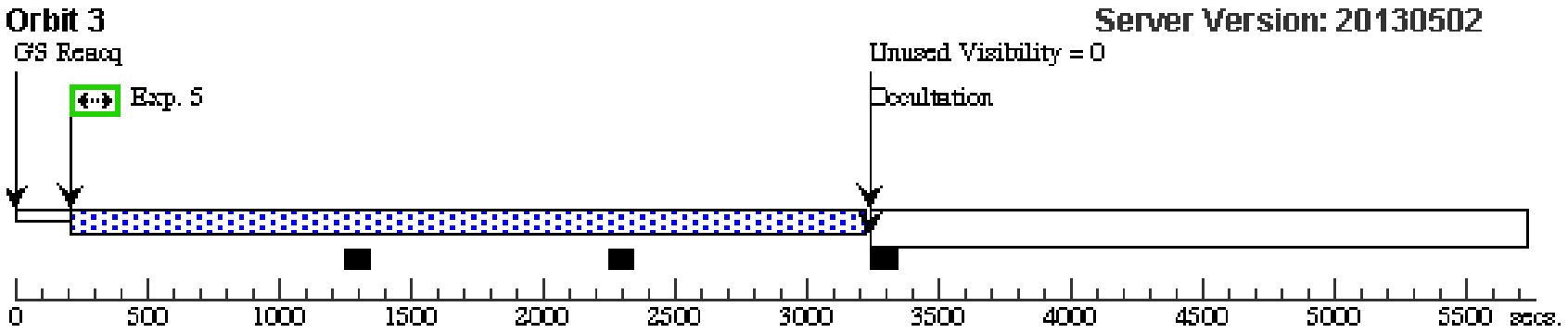
Exposures

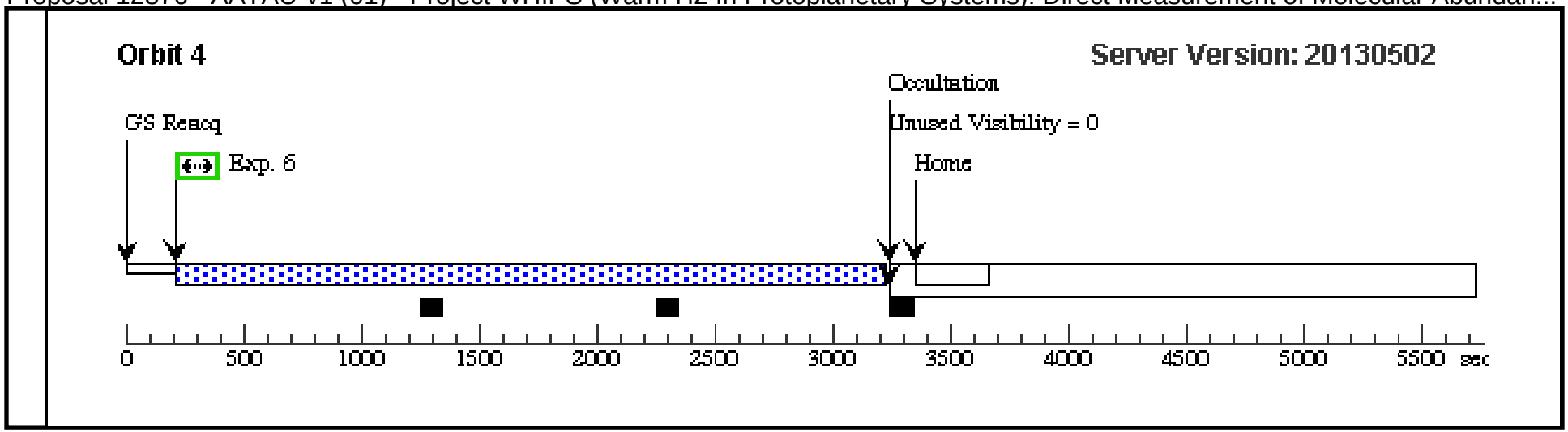
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	AATAU-ACQ/SEARCH (COS.ta.435475)	(1) V-AA-TAU	COS/NUV, ACQ/SEARCH, PSA	MIRRORB	SCAN-SIZE=3			50 Secs (50 Secs) *[==>]*	*[1]*
	Comments: Target NUV spectrum from DAO (GO 11616) spectra w/STIS G230L. - kf - 06/27/12 *Revised to take average IUE flux from 1982 - 1989,with PSA/MIRRORB per instruction of contact scientist - kf - 10/22/12*								
2	AATAU-ACQ/IMAGE (COS.ta.435475)	(1) V-AA-TAU	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				50 Secs (50 Secs) *[==>]*	*[1]*
	Comments: Revised to take average IUE flux from 1982 - 1989,with PSA/MIRRORB per instruction of contact scientist - kf - 10/22/12								
3	AATAU-G130M-1 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=1000			1681 Secs (1681 Secs) *[==>]*	*[1]*
4	AATAU-G130M-2 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=1000			2958 Secs (2958 Secs) *[==>]*	*[2]*
5	AATAU-G130M-3 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=1000			2958 Secs (2958 Secs) *[==>]*	*[3]*
6	AATAU-G130M-4 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=1000			2958 Secs (2958 Secs) *[==>]*	*[4]*

Orbit Structure





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Visit

Proposal 12876, AATAU-v2 (02), completed Sat Jul 20 01:35:07 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: AFTER 01 BY 0 D TO 2 D

Comments: BOT checked, kf, 06/29/12. The only violation is a mis-typing of the target star, which has been observed safely with COS.

Diagnostics

(AATAU-v2 (02)) Warning (Form): The 'SCHED=100' special requirement must be selected for this visit.

(AATAU-v2 (02)) Warning (Orbit Planner): VISIBILITY OVERRUN

(AATAU-v2 (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

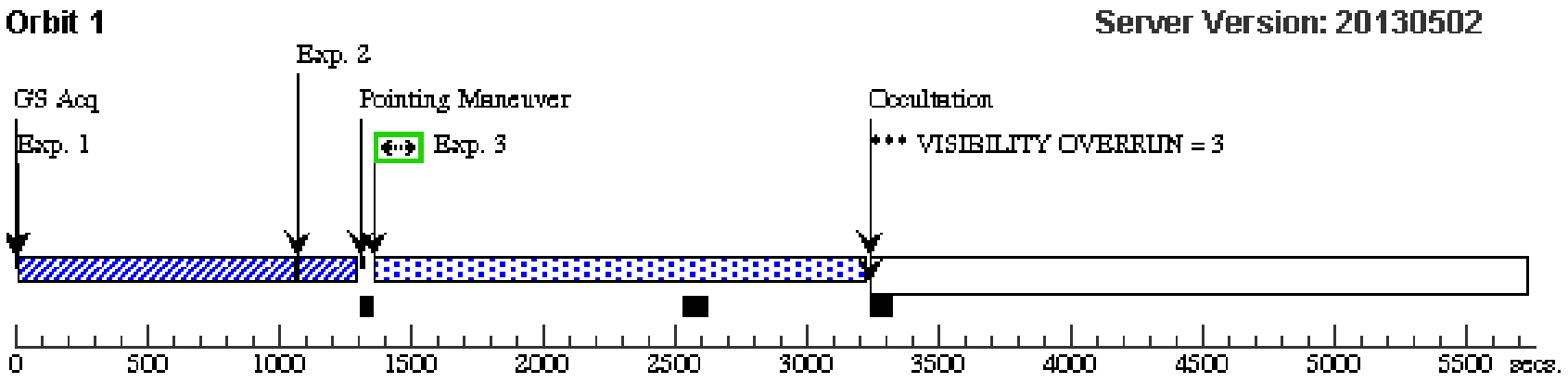
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-AA-TAU	RA: 04 34 55.4240 (68.7309333d) Dec: +24 28 53.16 (24.48143d) Equinox: J2000	Proper Motion RA: 1.6 mas/yr Proper Motion Dec: -14.7 mas/yr Epoch of Position: 2000 Radial Velocity: 34 km/sec	V=12.82	Reference Frame: ICRS

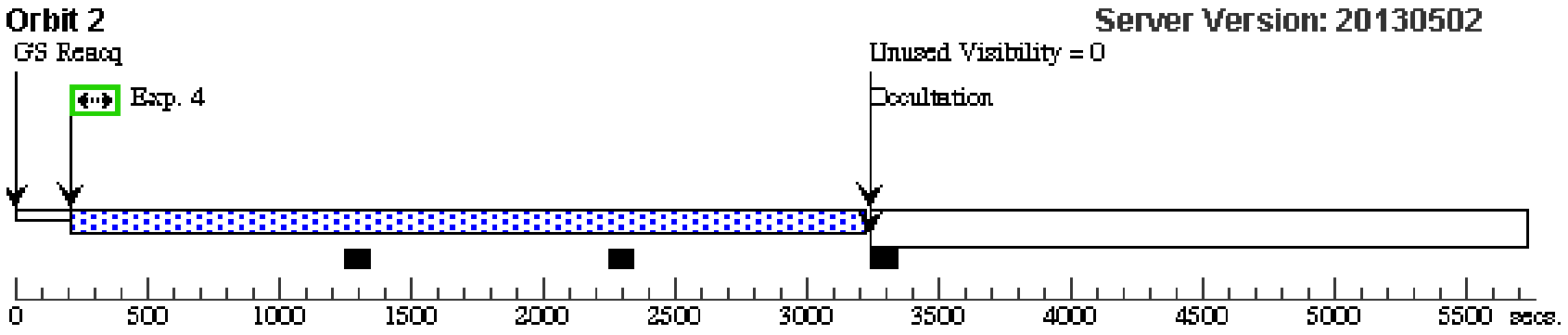
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

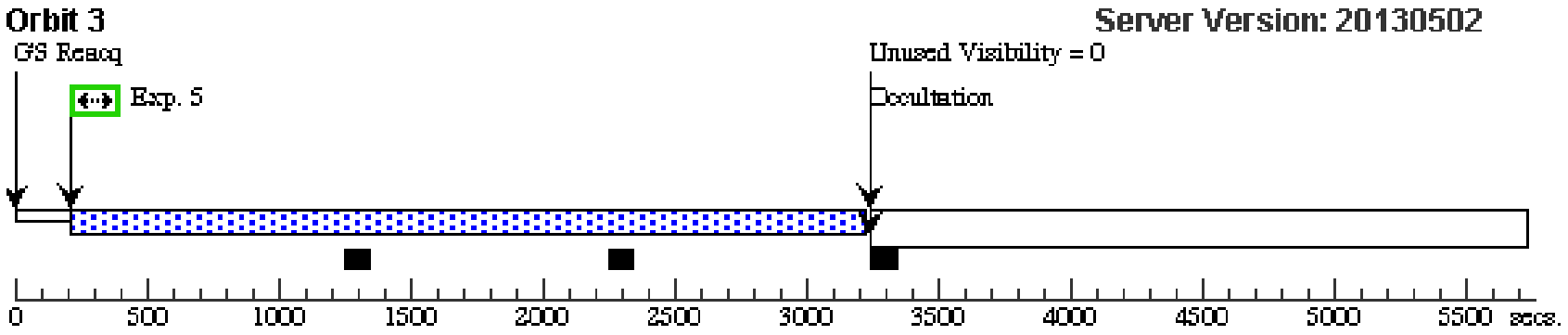
Exposures

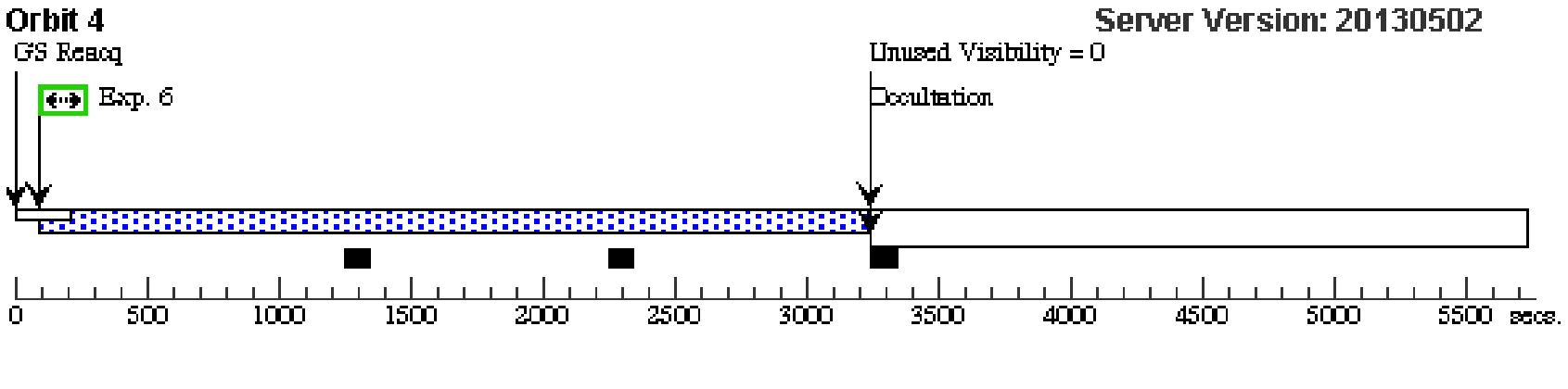
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	AATAU-ACQ/SEARCH2 (COS.ta.435475)	(1) V-AA-TAU	COS/NUV, ACQ/SEARCH, PSA	MIRRORB	SCAN-SIZE=3			50 Secs (50 Secs) *[==>]*	*[1]*
	Comments: Target NUV spectrum from DAO (GO 11616) spectra w/STIS G230L. - kf - 06/27/12 *Revised to take average IUE flux from 1982 - 1989,with PSA/MIRRORB per instruction of contact scientist - kf - 10/22/12*								
2	AATAU-ACQ/IMAGE2 (COS.ta.435475)	(1) V-AA-TAU	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				50 Secs (50 Secs) *[==>]*	*[1]*
	Comments: Revised to take average IUE flux from 1982 - 1989,with PSA/MIRRORB per instruction of contact scientist - kf - 10/22/12								
3	AATAU-G130M2-1 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=1000			1681 Secs (1681 Secs) *[==>]*	*[1]*
4	AATAU-G130M2-2 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=1000			2958 Secs (2958 Secs) *[==>]*	*[2]*
5	AATAU-G130M2-4 (COS.sp.411966)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=1000			2958 Secs (2958 Secs) *[==>]*	*[3]*
6	AATAU-G160M2-1 (COS.sp.411967)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G160M 1577 A	FP-POS=1; BUFFER-TIME=1000			2956 Secs (2956 Secs) *[==>]*	*[4]*
7	AATAU-G160M2-2 (COS.sp.411967)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G160M 1589 A	FP-POS=2; BUFFER-TIME=1290			1400 Secs (1400 Secs) *[==>]*	*[5]*
8	AATAU-G160M2-3 (COS.sp.411967)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=1000			1384 Secs (1384 Secs) *[==>]*	*[5]*
9	AATAU-G160M2-4 (COS.sp.411967)	(1) V-AA-TAU	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=4; BUFFER-TIME=1000			2958 Secs (2958 Secs) *[==>]*	*[6]*

Orbit Structure





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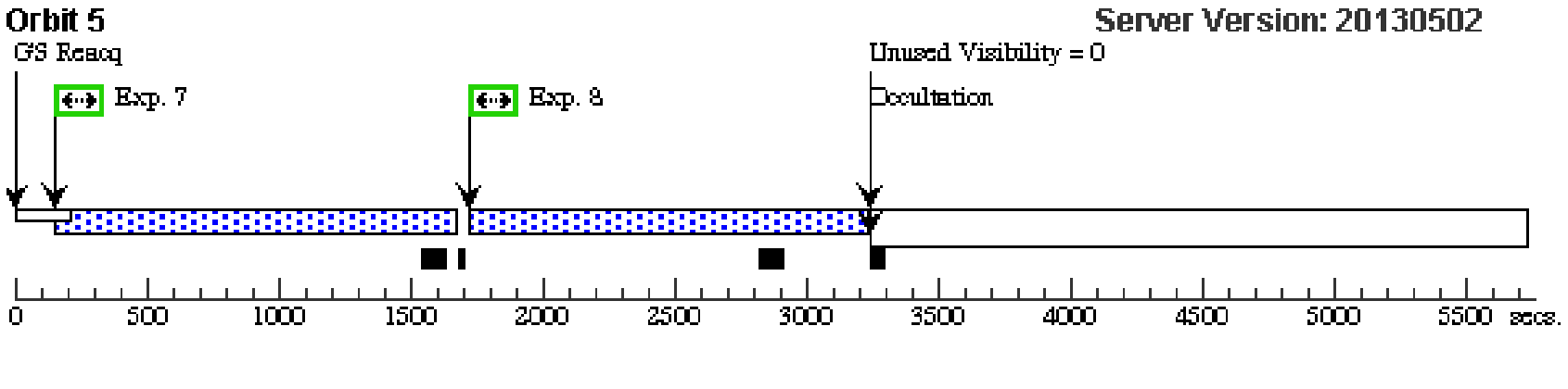
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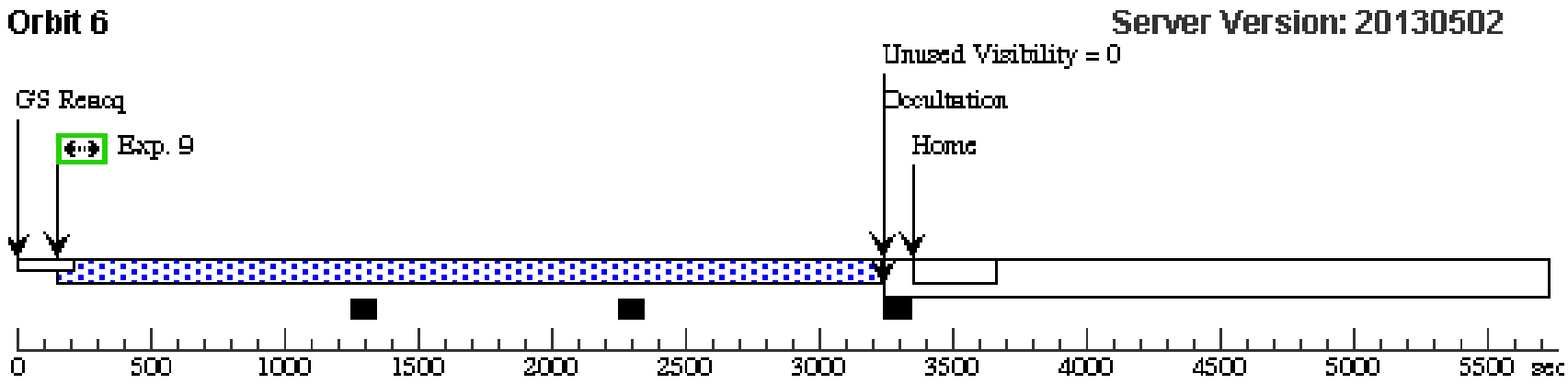
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Visit

Proposal 12876, ETCHA-v1 (03), failed Sat Jul 20 01:35:10 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Comments: No objects found in BOT check - but there are other stars in the vicinity. We adopt the target acq strategy used successfully by COS program 11616. kf - 06/29/12

Diagnostics

(ETCHA-v1 (03)) 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.

(ETCHA-v1 (03)) Warning (Orbit Planner): VISIBILITY OVERRUN

Fixed Targets

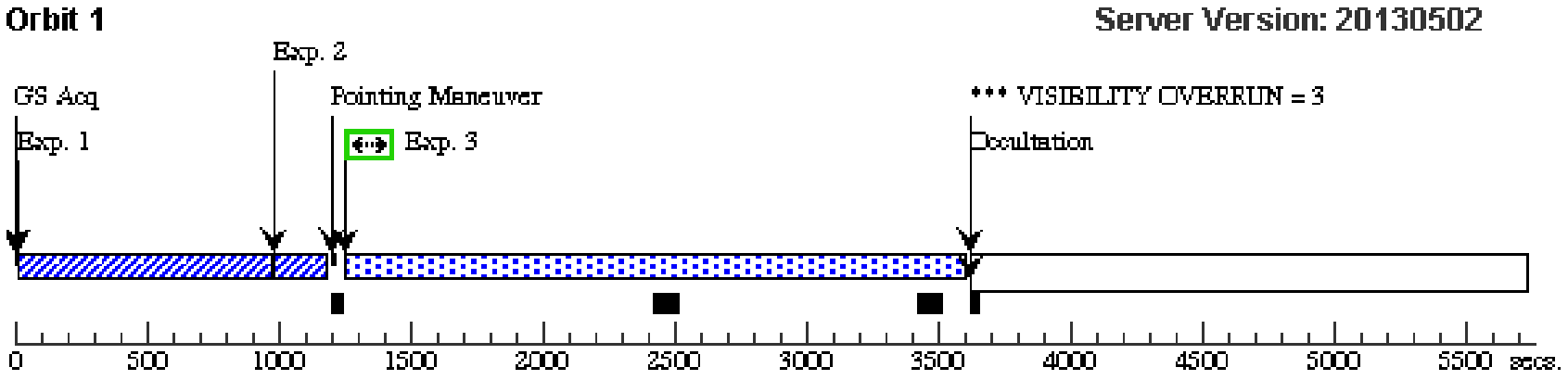
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	V-ET-CHA	RA: 08 43 18.5800 (130.8274167d) Dec: -79 05 18.20 (-79.08839d) Equinox: J2000	Proper Motion RA: -28 mas/yr Proper Motion Dec: 28 mas/yr Parallax: 0.01" Epoch of Position: 2000 Radial Velocity: 0 km/sec	V=13.97	Reference Frame: ICRS

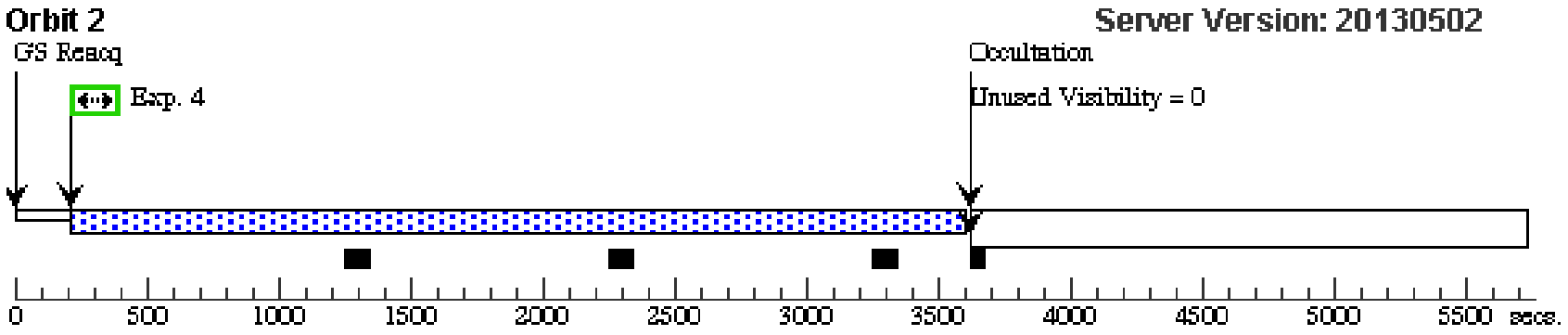
*Comments: Proper motion not known very well, but target is at d~97pc. Took average values from the eta Cha group [mu_alpha*COS(delta),mu_delta], Table 11 from Fernadez et al. 2008 (http://adsabs.harvard.edu/cgi-bin/nph-bib_query?2008A%26A...480..735F&db_key=AST).*

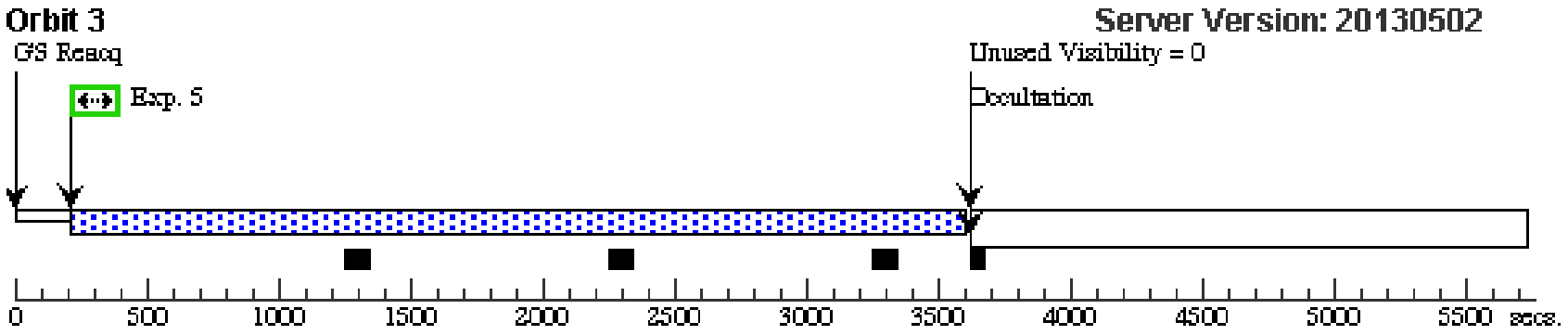
Exposures

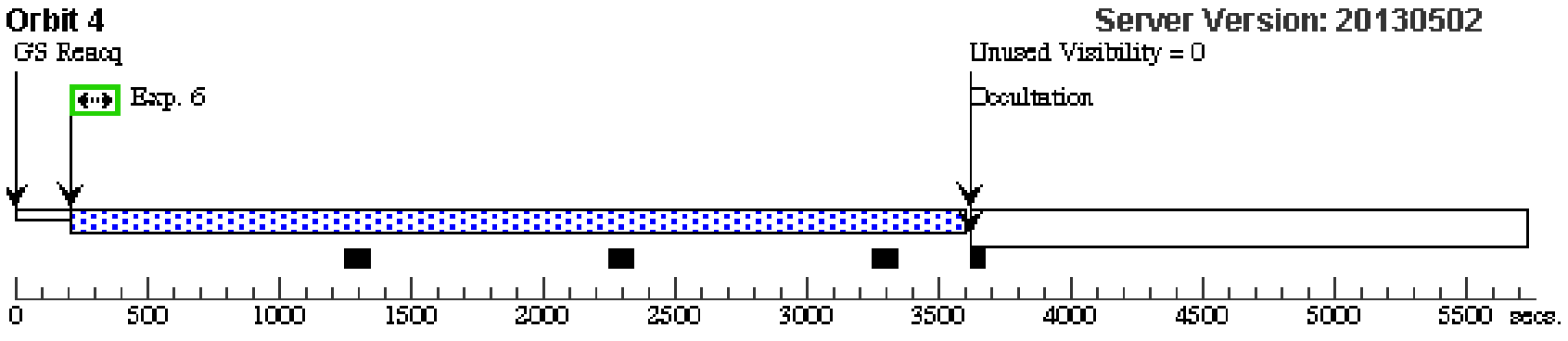
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ETCHA-ACQ/SEARCH (COS.ta.412057)	(4) V-ET-CHA	COS/NUV, ACQ/SEARCH, PSA	MIRRORB	SCAN-SIZE=3			40.0 Secs (40 Secs) *[==>]*	***[1]***
Comments: Target NUV spectrum from DAO (GO 11616) spectra w/STIS G230L. - kf - 06/27/12									
2	ETCHA-ACQ/IMAGE (COS.ta.412057)	(4) V-ET-CHA	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				40.0 Secs (40 Secs) *[==>]*	***[1]***
3	ETCHA-G130M-1 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=1000			2170 Secs (2170 Secs) *[==>]*	***[1]***
4	ETCHA-G130M-2 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=1000			3337 Secs (3337 Secs) *[==>]*	***[2]***
5	ETCHA-G130M-3 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=1000			3337 Secs (3337 Secs) *[==>]*	***[3]***
6	ETCHA-G130M-4 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=1000			3337 Secs (3337 Secs) *[==>]*	***[4]***
7	ETCHA-G160M-1 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1577 A	FP-POS=1; BUFFER-TIME=1390			1500 Secs (1500 Secs) *[==>]*	***[5]***
8	ETCHA-G160M-2 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1589 A	FP-POS=2; BUFFER-TIME=1390			1661 Secs (1661 Secs) *[==>]*	***[5]***
9	ETCHA-G160M-3 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=1390			1500 Secs (1500 Secs) *[==>]*	***[6]***
10	ETCHA-G160M-4 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=4; BUFFER-TIME=1390			1663 Secs (1663 Secs) *[==>]*	***[6]***

Orbit Structure





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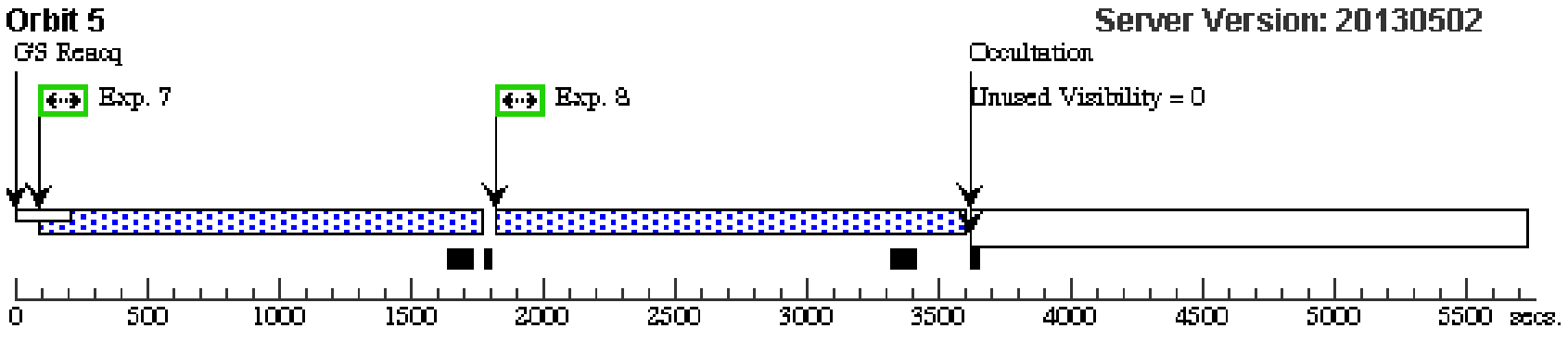
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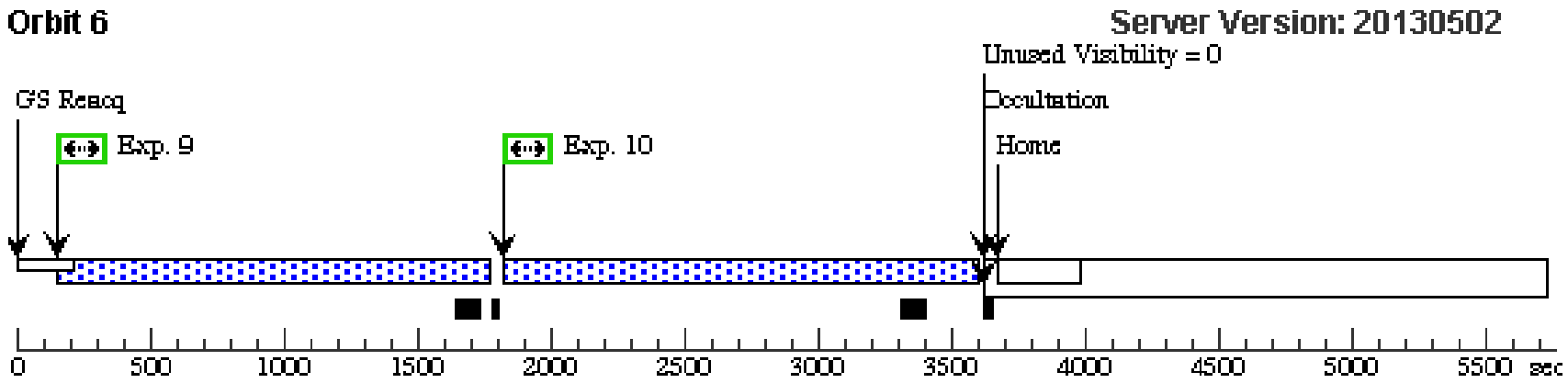
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sec

Visit

Proposal 12876, ETCHA-v1 (53) Sat Jul 20 01:35:15 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Comments: No objects found in BOT check - but there are other stars in the vicinity. We adopt the target acq strategy used successfully by COS program 11616. kf - 06/29/12

This is a repeat of visit 3, which failed to acquire guide stars.

Diagnostics

(ETCHA-v1 (53)) Warning (Orbit Planner): VISIBILITY OVERRUN

(ETCHA-v1 (53)) 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

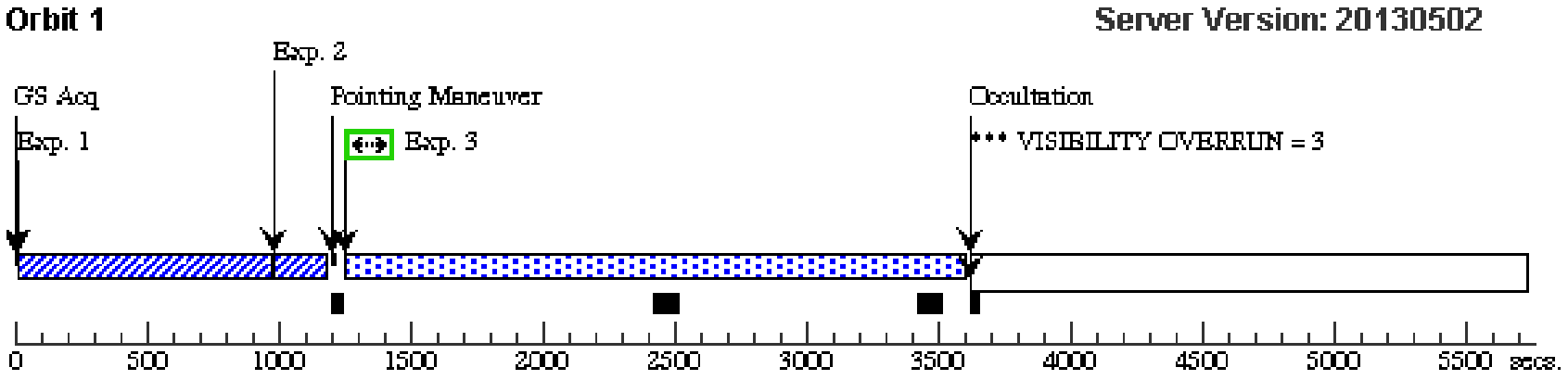
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	V-ET-CHA	RA: 08 43 18.5800 (130.8274167d)	Proper Motion RA: -28 mas/yr	V=13.97	Reference Frame: ICRS
		Dec: -79 05 18.20 (-79.08839d)	Proper Motion Dec: 28 mas/yr		
		Equinox: J2000	Parallax: 0.01"		
			Epoch of Position: 2000		
			Radial Velocity: 0 km/sec		

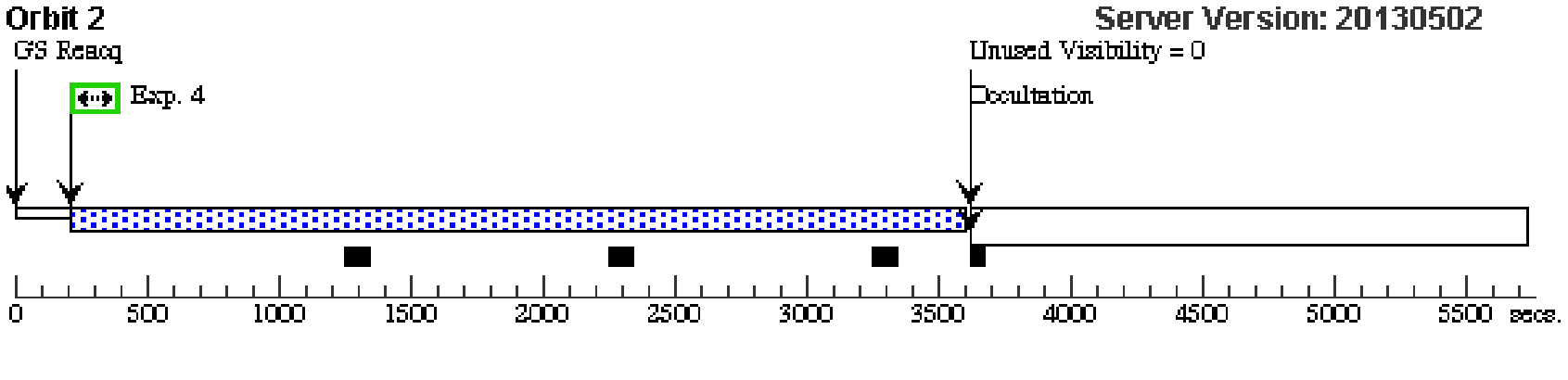
*Comments: Proper motion not known very well, but target is at d~97pc. Took average values from the eta Cha group [mu_alpha*COS(delta),mu_delta], Table 11 from Fernadez et al. 2008 (http://adsabs.harvard.edu/cgi-bin/nph-bib_query?2008A%26A...480..735F&db_key=AST).*

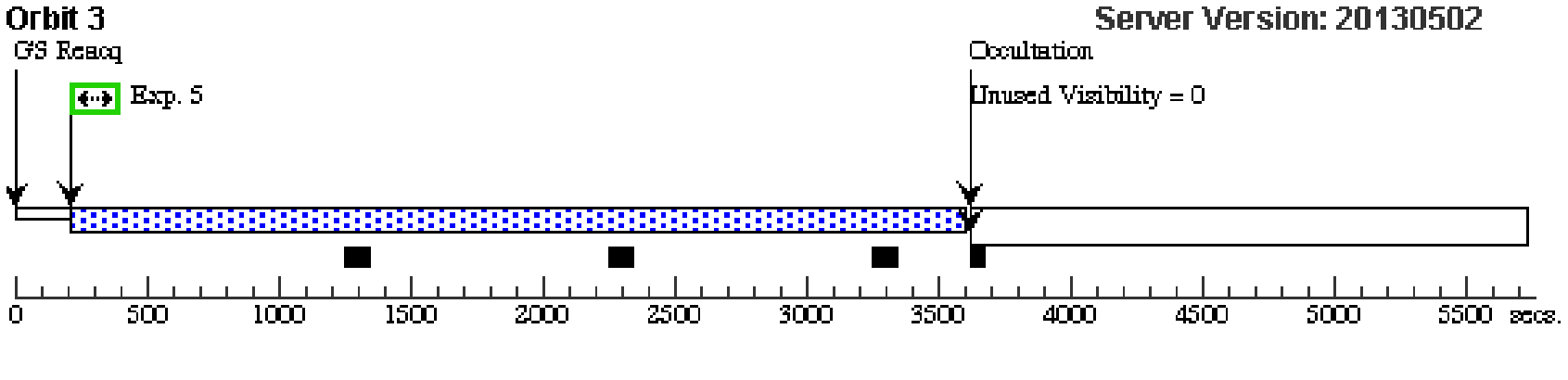
Exposures

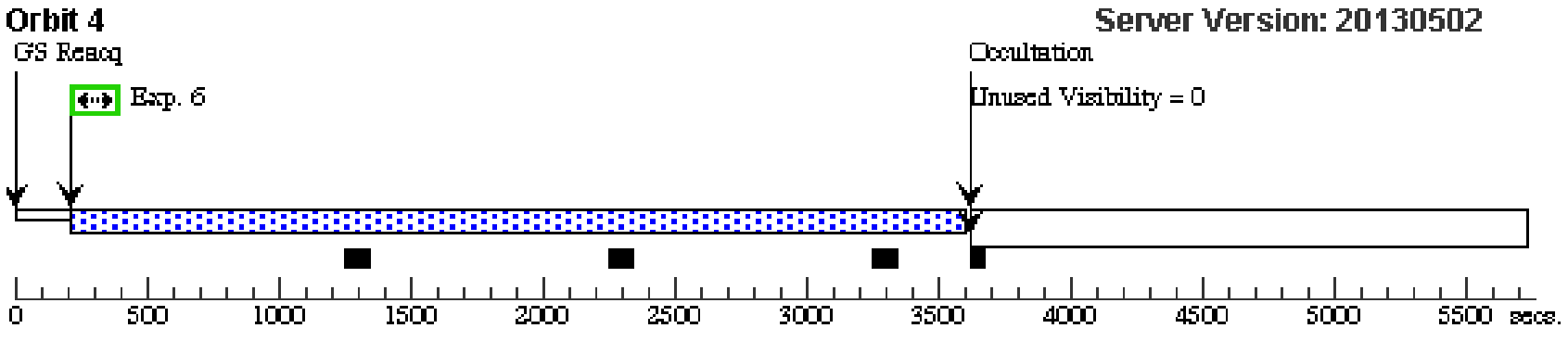
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ETCHA-ACQ/SEARCH (COS.ta.412057)	(4) V-ET-CHA	COS/NUV, ACQ/SEARCH, PSA	MIRRORB	SCAN-SIZE=3			40.0 Secs (40 Secs) *[==>]*	***[1]***
Comments: Target NUV spectrum from DAO (GO 11616) spectra w/STIS G230L. - kf - 06/27/12									
2	ETCHA-ACQ/IMAGE (COS.ta.412057)	(4) V-ET-CHA	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				40.0 Secs (40 Secs) *[==>]*	***[1]***
3	ETCHA-G130M-1 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=1000			2170 Secs (2170 Secs) *[==>]*	***[1]***
4	ETCHA-G130M-2 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=1000			3337 Secs (3337 Secs) *[==>]*	***[2]***
5	ETCHA-G130M-3 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=1000			3337 Secs (3337 Secs) *[==>]*	***[3]***
6	ETCHA-G130M-4 (COS.sp.412058)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=1000			3337 Secs (3337 Secs) *[==>]*	***[4]***
7	ETCHA-G160M-1 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1577 A	FP-POS=1; BUFFER-TIME=1390			1500 Secs (1500 Secs) *[==>]*	***[5]***
8	ETCHA-G160M-2 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1589 A	FP-POS=2; BUFFER-TIME=1390			1661 Secs (1661 Secs) *[==>]*	***[5]***
9	ETCHA-G160M-3 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=1390			1500 Secs (1500 Secs) *[==>]*	***[6]***
10	ETCHA-G160M-4 (COS.sp.412060)	(4) V-ET-CHA	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=4; BUFFER-TIME=1390			1663 Secs (1663 Secs) *[==>]*	***[6]***

Orbit Structure





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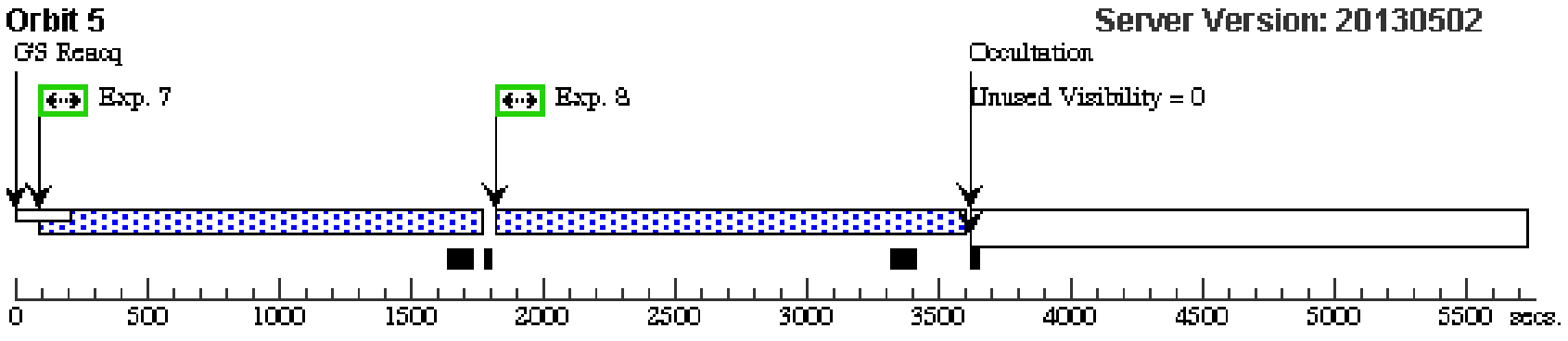
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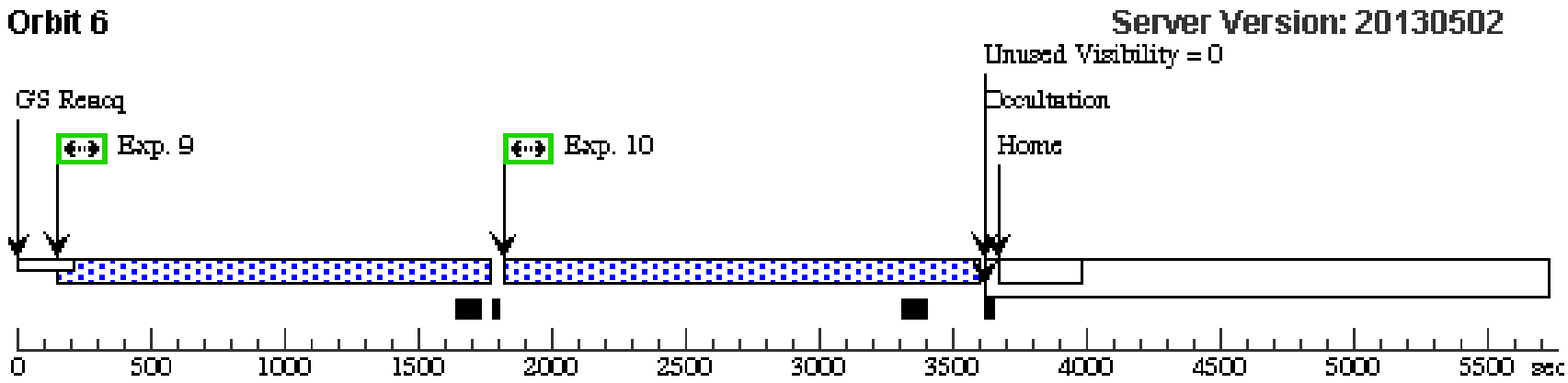
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5500
sec

Visit

Proposal 12876, RWAUR-v1 (04), scheduling Sat Jul 20 01:35:17 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Comments: BOT checked, kf, 06/29/12. The only violation is a mis-typing of the target star, which has been observed safely with COS.

Diagnostics

(RWAUR-v1 (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.

Fixed Targets

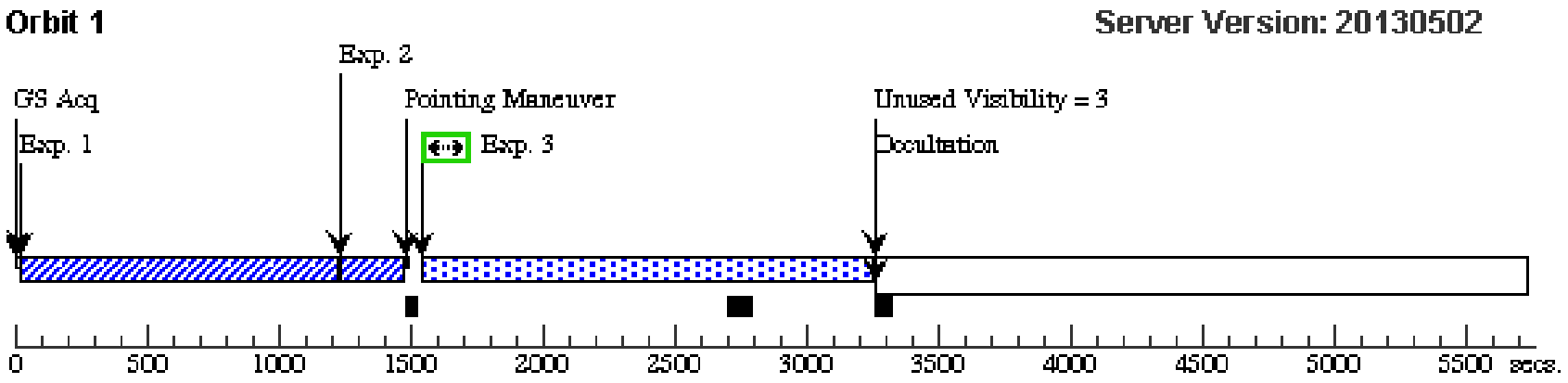
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	V-RW-AUR	RA: 05 07 49.5662 (76.9565258d) Dec: +30 24 5.18 (30.40144d) Equinox: J2000	Proper Motion RA: 7.23 mas/yr Proper Motion Dec: -20.33 mas/yr Parallax: 0.01542" Epoch of Position: 2000 Radial Velocity: 14 km/sec	V=10.36 V = 10.36	Reference Frame: ICRS

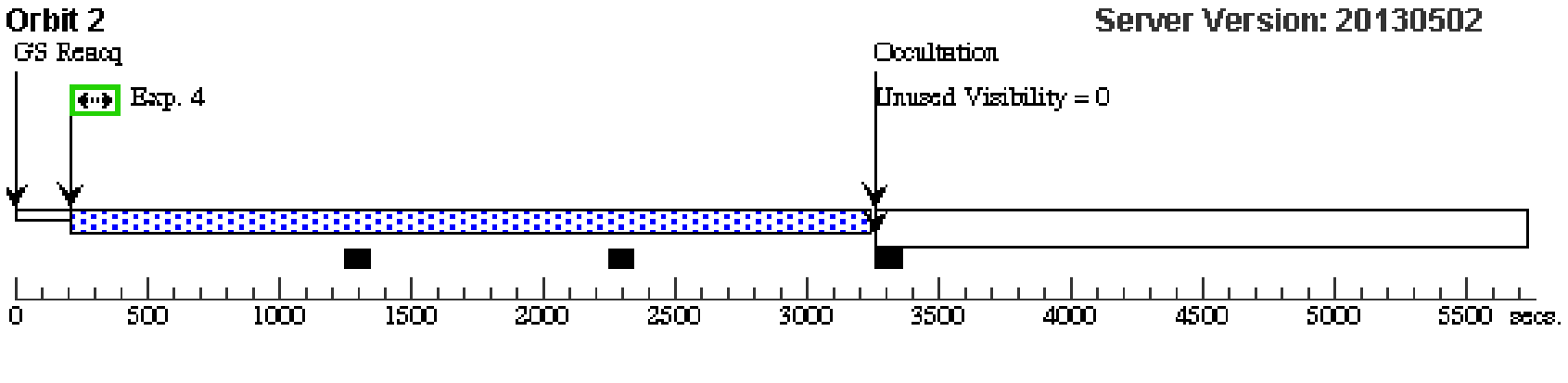
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

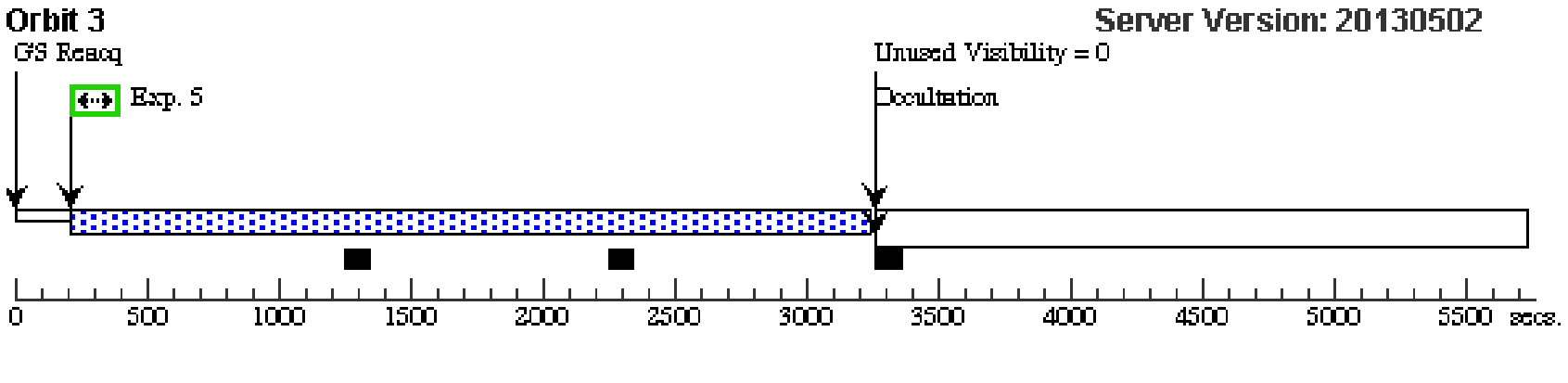
Exposures

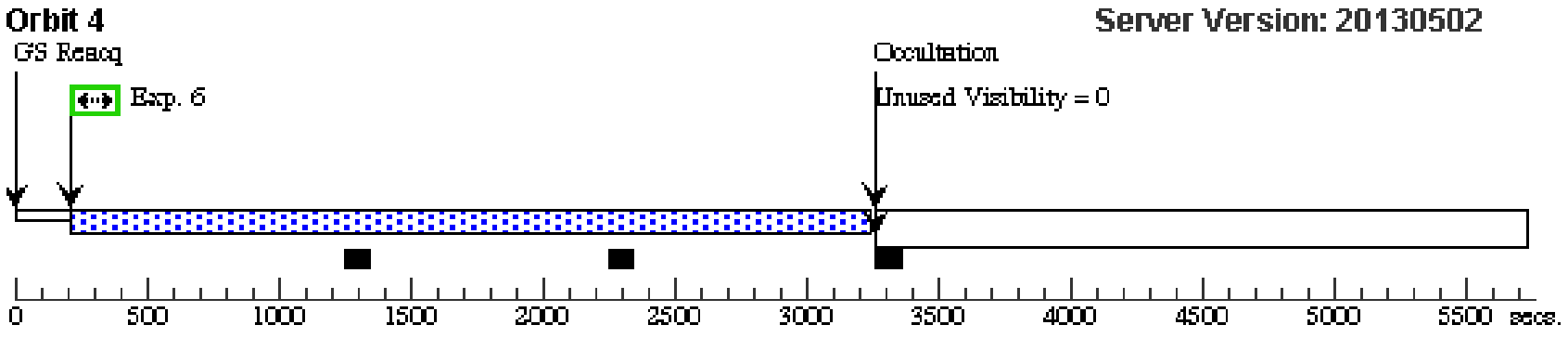
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	RWAUR-ACQ/SEARCH (COS.ta.434750)	(6) V-RW-AUR	COS/NUV, ACQ/SEARCH, BOA	MIRRORA	SCAN-SIZE=3			67 Secs (67 Secs) *[==>]*	***[1]***
Comments: Target NUV spectrum from DAO (GO 11616) spectra w/STIS G230L. - kf - 06/27/12 *The target acq was changed to a 67 second BOA observation at the request of the STScI contact scientist - kf - 10/18/12*									
2	RWAUR-ACQ/IMAGE (COS.ta.434750)	(6) V-RW-AUR	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				67.0 Secs (67 Secs) *[==>]*	***[1]***
Comments: The target acq was changed to a 67 second BOA observation at the request of the STScI contact scientist - kf - 10/18/12									
3	RWAUR-G130M-1 (COS.sp.412073)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=1; BUFFER-TIME=1000			1524 Secs (1524 Secs) *[==>]*	***[1]***
4	RWAUR-G130M-2 (COS.sp.412073)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=2; BUFFER-TIME=1000			2981 Secs (2981 Secs) *[==>]*	***[2]***
5	RWAUR-G130M-3 (COS.sp.412073)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=3; BUFFER-TIME=1000			2981 Secs (2981 Secs) *[==>]*	***[3]***
6	RWAUR-G130M-4 (COS.sp.412073)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=4; BUFFER-TIME=1000			2981 Secs (2981 Secs) *[==>]*	***[4]***
7	RWAUR-G160M-1 (COS.sp.412075)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G160M 1577 A	FP-POS=1; BUFFER-TIME=1390			1500 Secs (1500 Secs) *[==>]*	***[5]***
8	RWAUR-G160M-2 (COS.sp.412075)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G160M 1589 A	FP-POS=2; BUFFER-TIME=1390			1305 Secs (1305 Secs) *[==>]*	***[5]***
9	RWAUR-G160M-3 (COS.sp.412075)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G160M 1611 A	FP-POS=3; BUFFER-TIME=1390			1500 Secs (1500 Secs) *[==>]*	***[6]***
10	RWAUR-G160M-4 (COS.sp.412075)	(6) V-RW-AUR	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=4; BUFFER-TIME=1390			1307 Secs (1307 Secs) *[==>]*	***[6]***

Orbit Structure





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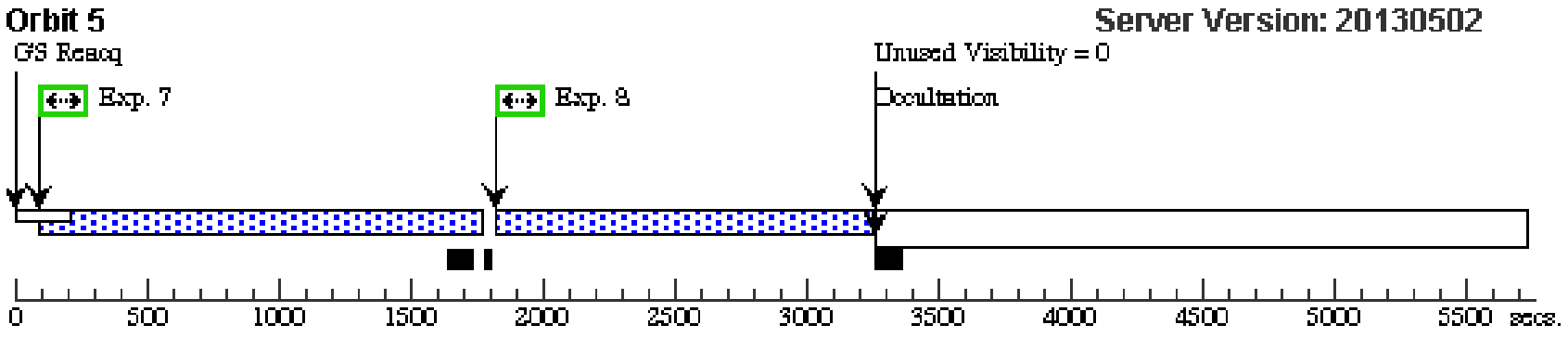
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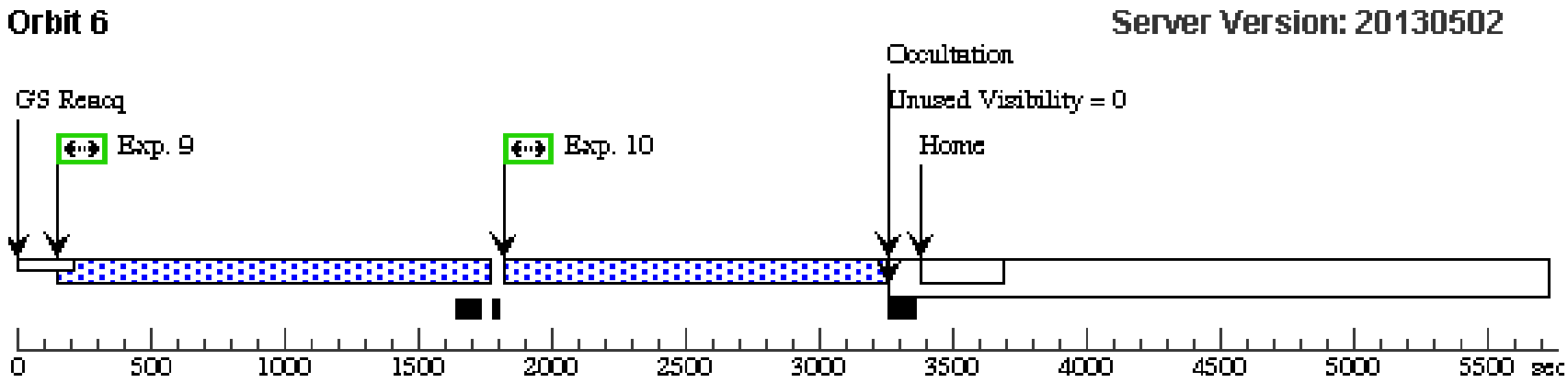
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