13372 - Mapping the magnetospheric structure at outburst of the pre-main sequence close binary AK Sco

Cycle: 21, Proposal Category: GO

(UV Initiative)

(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) V-AK-SCO	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	20-Mar-2014 21:25:42.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
02	(1) V-AK-SCO	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	4	20-Mar-2014 21:26:40.0	yes
03	(1) V-AK-SCO	COS/FUV COS/NUV	7	20-Mar-2014 21:27:22.0	yes

14 Total Orbits Used

ABSTRACT

Pre-main sequence (PMS) binaries are surrounded by circumbinary disks from which matter falls onto both components. The material dragged from the circumbinary disk flows onto each star through independent streams channelled by the variable gravitational field. The action of the bar-like potential is most prominent in high eccentricity systems made of two equal mass stars. AK Sco is a unique PMS system composed of two F5 stars that get as close as 11.3 stellar radii at periastron (e=0.47). AK Sco is an ideal laboratory to study matter infall in binaries and its role in orbit circularization. Our team has reported recently, the discovery of an unexpected 1.3mHz ultra low frequency (ULF) oscillation in the ultraviolet light curve at periastron passage. The oscillation lasted ~0.6% of the orbital period. According to our numerical simulations, the cirscumstellar structures get in contact at periastron producing an accretion outburst that triggered of the oscillation. If confirmed, this would unveil a new mechanism for angular momentum loss during pre-main sequence evolution and a new type of interacting binary. The objective of this project is to identify the source of the oscillation and the physical structure of the accretion flow before, during and after the oscillation is triggered. Since the accretion flow radiates in the ultraviolet range, this study requires an ultraviolet (UV) spectroscopic monitoring.

OBSERVING DESCRIPTION

AK Sco is a spectroscopic binary with period 13.609453 days and ephemeris for the phase.
Phase = (JD-2446654.3634)/13.609453- INT(JD-2446654.3634)

The target has to be visited twice, for 20,000 seconds each time.
The two visits must be subsequent hence, if the first visit begins at T0, the second must begin at T0+13.609453days.

During the FIRST VISIT the target has to be observed with COS, begining 10,000 before phase=0 and ending 10,000 after phase=0. All the

observations need to be carried out in TIME-TAG mode. 7 orbits are to be spent in this first visit.
Orbit 1: Star acquisition, instrument setting and then observations with G130M and G230M.
Subsequent 6 orbits, AK Sco will be observed with G160M, G130M and G230M

During the SECOND VISIT, AK Sco will be observed with STIS, starting 10,000 before the periastron passage (Phase0) and ending 10,000 after the passage. Again, 7 orbits are to be spent in this visit.
Orbit 1: Acquisition and STIS set-up plus 6 sets of observations with G140L and G230L
Subsequent 6 orbits: 8 sets of sort exposures with G140L and G230L will be obtained per orbit.

AK Sco is schedulable from August 2 to October 20, 2013 and from January 25 to October 20, 2014.

Assuming that the first scheludable dates are in September, the program could begin in:
Sept 12, 2013, 19h:14m:47s UT,
or in any date adding an entire number of 13.609453 days (13d 14h 37m 37 s) that satifies there is a second periastron passage within the visibility period.

ADDITIONAL COMMENTS
The observations are time critical since we want to monitor a low frequency oscillation triggered at periastron passage in a PMS spectroscopic binary. The program can only be started at Julian Dates (JD0)satisfying,
0.9914956 = (JD0-2446654.3634)/13.609453-INT(JD0-2446654.3634)/13.609453
and requires a subsequent visit a JD1s
1.9914956 = (JD1-2446654.3634)/13.609453-INT(JD0-2446654.3634)/13.609453

Visibility windows when this is possible are indicated in the description using the Visit Planner tool.

Visit

Proposal 13372, AK Sco with STIS-1 (01), implementation Fri Mar 21 01:27:39 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: ORIENT 45D TO 135 D; Period 13.609453 D AND ZERO-PHASE HJD2446654.3634

Comments: Zero phase HJD, "T (J:D:) = 46 654.3634 " from Alencar et al. 2003, A&A 409, 1037. TO this value, I have added 2,440,000. Please double check. kf - 07.02.13

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-AK-SCO	RA: 16 54 44.8492 (253.6868717d) Dec: -36 53 18.57 (-36.88849d) Equinox: J2000	Proper Motion RA: -8.91 mas/yr Proper Motion Dec: -29.61 mas/yr Epoch of Position: 2000 Radial Velocity: -30 km/sec	V=9.14+/-0.5	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
The object is bright enough to be included in the GSC with entry number 07371-00870 (entry according SIMBAD Database).

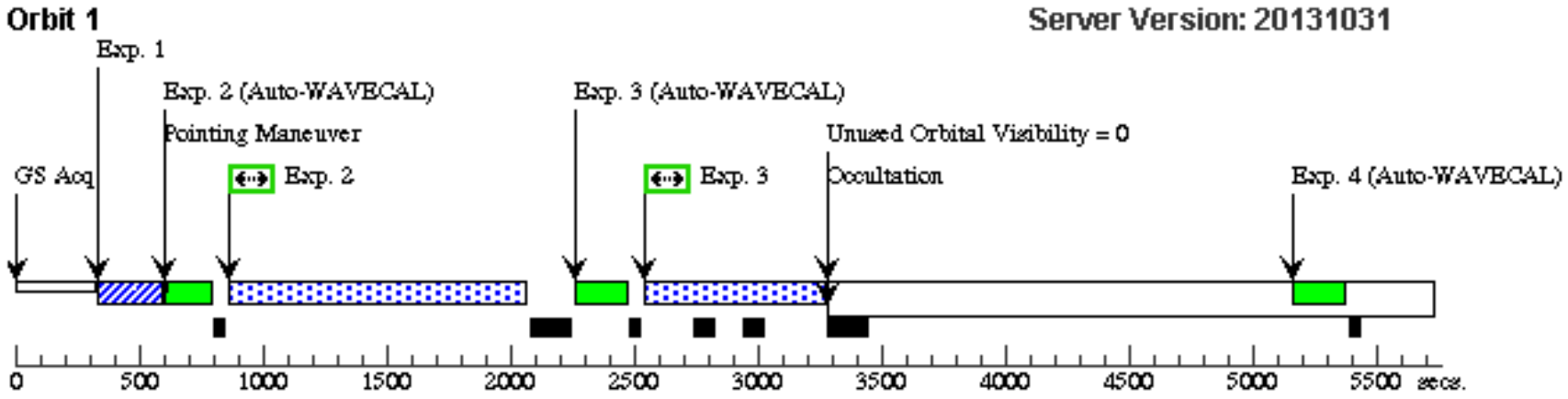
Proper motions are retrieved also from SIMBAD, they are based in the New Hipparcos reduction (van Leeuwen 2007, A&A,474,653). They are ICRS thus I've assigned epoch 2000.

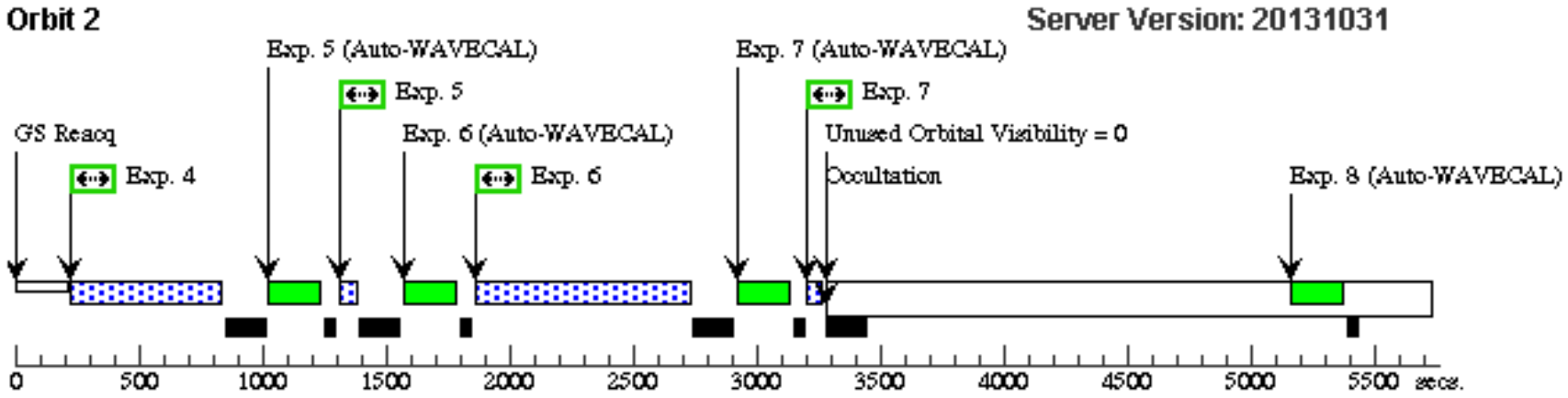
Also HD 152404

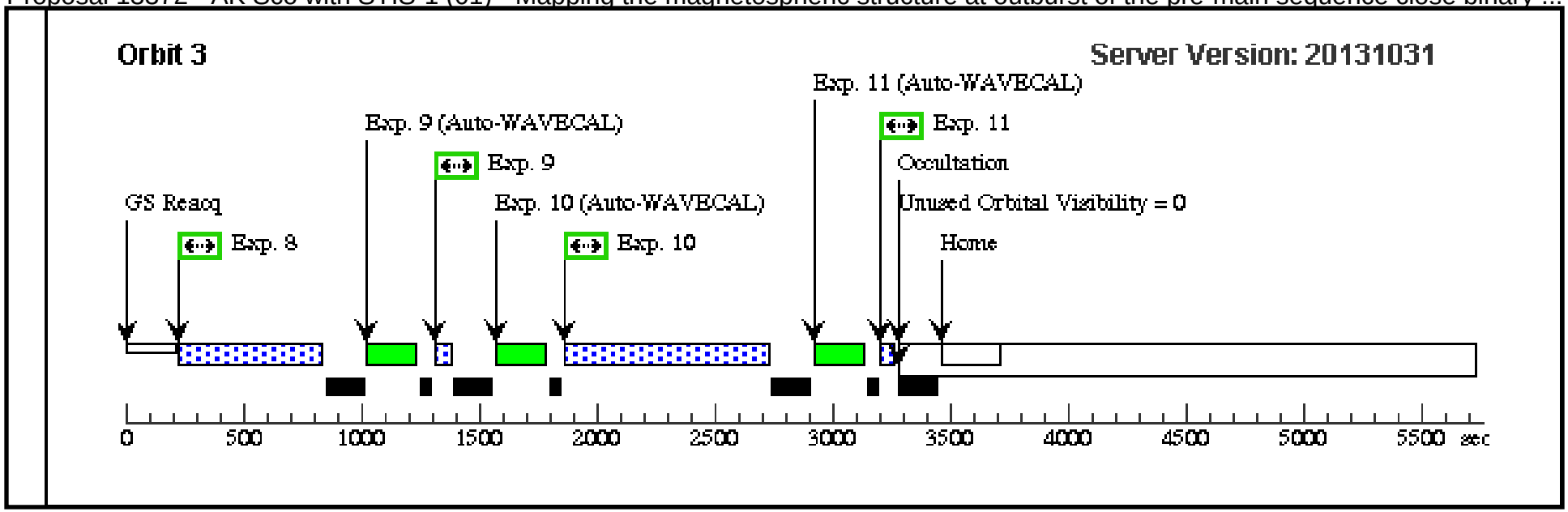
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.514675)	(1) V-AK-SCO	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.9920 TO 0.9933; GS ACQ SCENARIO BASE1B3		0.4 Secs (0.4 Secs) *[==>]*	***[1]***
2	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			1191 Secs (1191 Secs) *[==>]*	***[1]***
3	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			716 Secs (716 Secs) *[==>]*	***[1]***
4	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			600 Secs (600 Secs) *[==>]*	***[2]***
5	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			60 Secs (60 Secs) *[==>]*	***[2]***
6	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			860 Secs (860 Secs) *[==>]*	***[2]***
7	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			50 Secs (50 Secs) *[==>]*	***[2]***
8	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			600 Secs (600 Secs) *[==>]*	***[3]***
9	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			60 Secs (60 Secs) *[==>]*	***[3]***
10	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			860 Secs (860 Secs) *[==>]*	***[3]***
11	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			50 Secs (50 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20131031
Exp. 11 (Auto-WAVECAL)
Exp. 9 (Auto-WAVECAL)
Exp. 11
Exp. 9
Occultation
GS Reacq
Exp. 10 (Auto-WAVECAL)
Unused Orbital Visibility = 0
Exp. 8
Exp. 10
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13372, AK Sco with STIS-2 (02), implementation Fri Mar 21 01:27:43 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: Period 13.609453 D AND ZERO-PHASE HJD2446654.3634

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-AK-SCO	RA: 16 54 44.8492 (253.6868717d)	Proper Motion RA: -8.91 mas/yr	V=9.14+/-0.5	Reference Frame: ICRS
		Dec: -36 53 18.57 (-36.88849d)	Proper Motion Dec: -29.61 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: -30 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
The object is bright enough to be included in the GSC with entry number 07371-00870 (entry according SIMBAD Database).

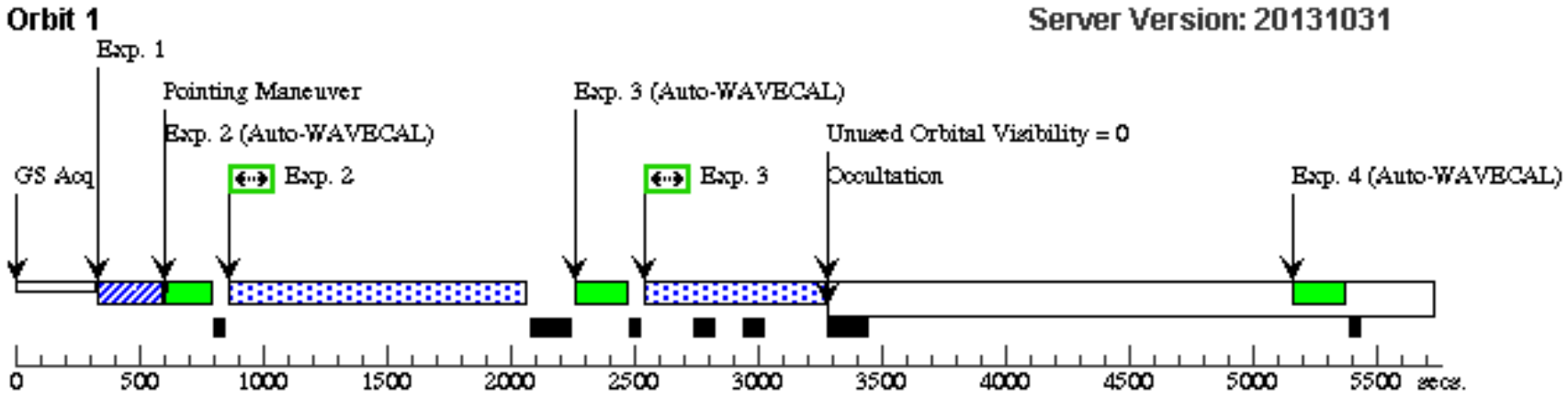
Proper motions are retrieved also from SIMBAD, they are based in the New Hipparcos reduction (van Leeuwen 2007, A&A,474,653). They are ICRS thus I've assigned epoch 2000.

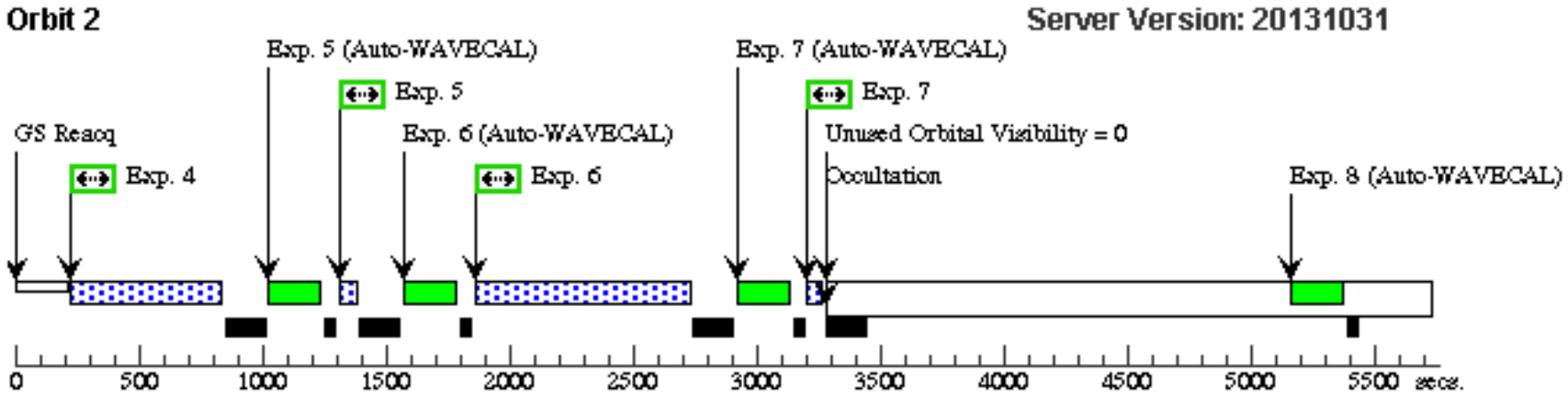
Also HD 152404

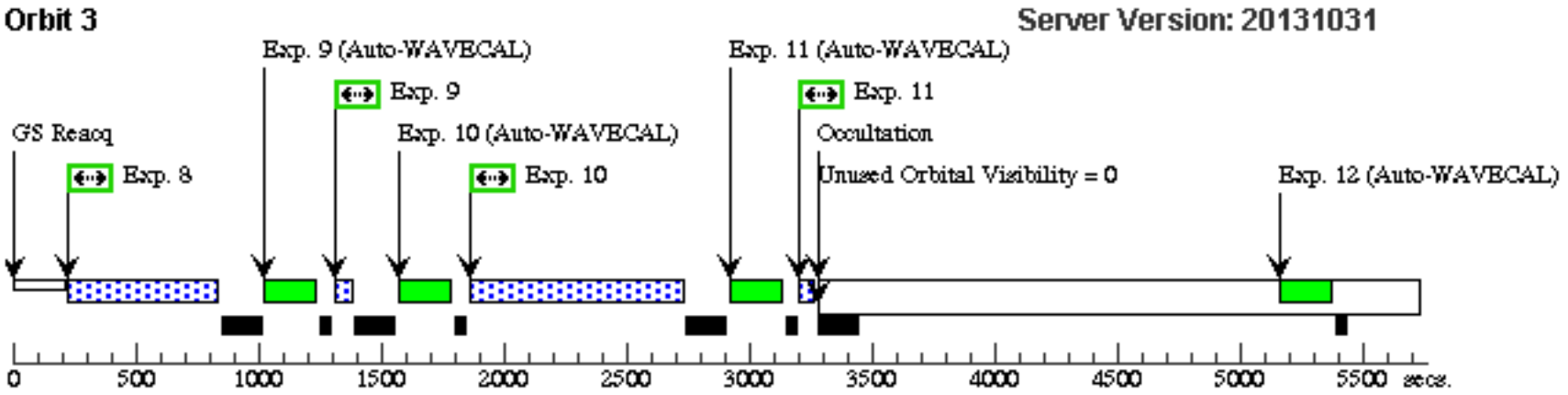
Exposures

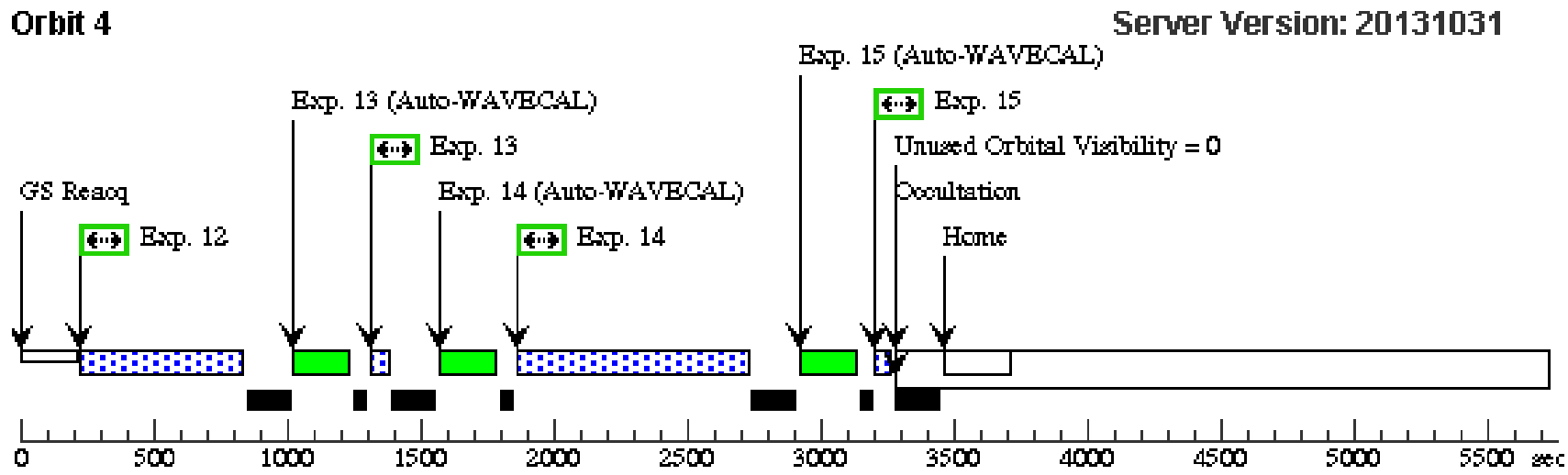
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.514675)	(1) V-AK-SCO	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.9888 TO 0.99100; GS ACQ SCENARIO BASE1B3		0.4 Secs (0.4 Secs) *[==>]*	*[1]*
2	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			1191 Secs (1191 Secs) *[==>]*	*[1]*
3	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			716 Secs (716 Secs) *[==>]*	*[1]*
4	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			600 Secs (600 Secs) *[==>]*	*[2]*
5	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			60 Secs (60 Secs) *[==>]*	*[2]*
6	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			860 Secs (860 Secs) *[==>]*	*[2]*
7	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			50 Secs (50 Secs) *[==>]*	*[2]*
8	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			600 Secs (600 Secs) *[==>]*	*[3]*
9	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			60 Secs (60 Secs) *[==>]*	*[3]*
10	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			860 Secs (860 Secs) *[==>]*	*[3]*
11	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			50 Secs (50 Secs) *[==>]*	*[3]*
12	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			600 Secs (600 Secs) *[==>]*	*[4]*
13	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			60 Secs (60 Secs) *[==>]*	*[4]*
14	(STIS.sp.514669)	(1) V-AK-SCO	STIS/FUV-MAMA, TIME-TAG, 52X0.2	G140L 1425 A	BUFFER-TIME=1000			860 Secs (860 Secs) *[==>]*	*[4]*
15	(STIS.sp.514670)	(1) V-AK-SCO	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=200			50 Secs (50 Secs) *[==>]*	*[4]*

Orbit Structure






Orbit 3
Server Version: 20131031
Exp. 9 (Auto-WAVECAL)
Exp. 9
Exp. 10 (Auto-WAVECAL)
Exp. 11 (Auto-WAVECAL)
Exp. 11
Occultation
GS Reacq
Exp. 8
Exp. 10
Unused Orbital Visibility = 0
Exp. 12 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 4
Server Version: 20131031
Exp. 15 (Auto-WAVECAL)
Exp. 13 (Auto-WAVECAL)
Exp. 15
Exp. 13
Unused Orbital Visibility = 0
GS Reacq
Exp. 14 (Auto-WAVECAL)
Occultation
Exp. 12
Exp. 14
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13372, AK Sco with COS (03), implementation Fri Mar 21 01:27:46 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: AFTER 02 BY 13.55 D TO 13.61 D

Comments: Reviewed by kf - June 20 2013.

BOT Checked for COS and STIS, 06/20/13. Only warnings are where target star has been misidentified in the GSC2 catalog.

Diagnostics

(AK Sco with COS (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.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-AK-SCO	RA: 16 54 44.8492 (253.6868717d)	Proper Motion RA: -8.91 mas/yr	V=9.14+/-0.5	Reference Frame: ICRS
		Dec: -36 53 18.57 (-36.88849d)	Proper Motion Dec: -29.61 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: -30 km/sec		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
The object is bright enough to be included in the GSC with entry number 07371-00870 (entry according SIMBAD Database).

Proper motions are retrieved also from SIMBAD, they are based in the New Hipparcos reduction (van Leeuwen 2007, A&A,474,653). They are ICRS thus I've assigned epoch 2000.

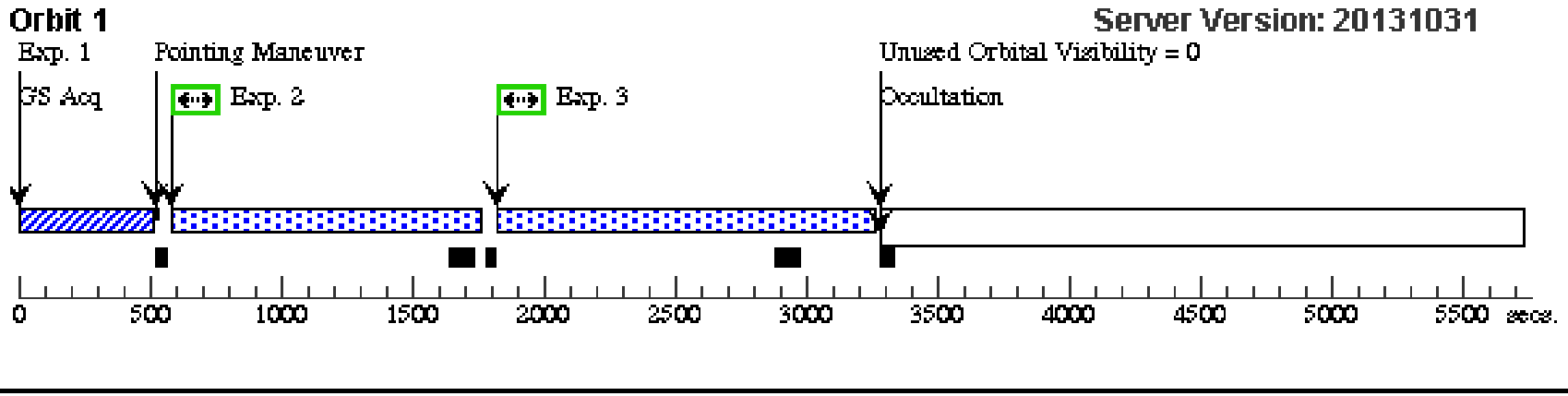
Also HD 152404

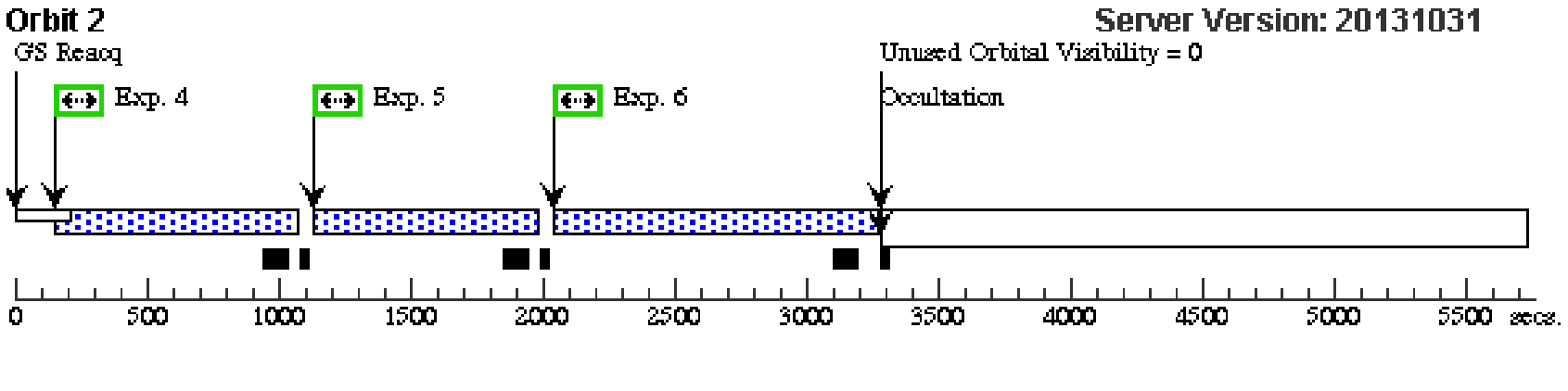
Exposures

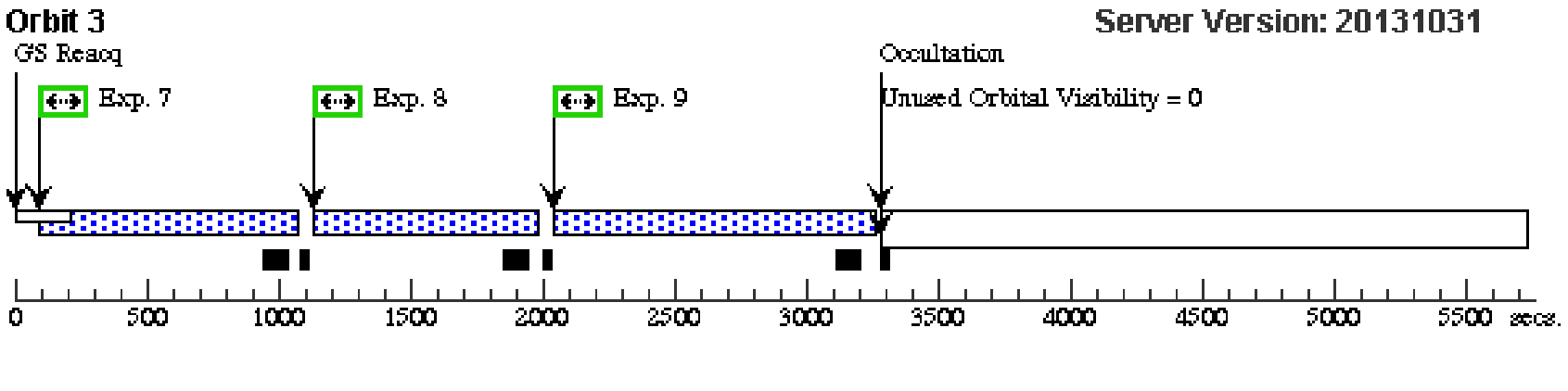
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.514660)	(1) V-AK-SCO	COS/NUV, ACQ/IMAGE, BOA	MIRRORA		GS ACQ SCENARIO BASE1B3		52 Secs (52 Secs) *[==>]*	 ***[1]***
2	(COS.sp.514647)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G130M 1309 A	BUFFER-TIME=890; FP-POS=1			1000 Secs (1000 Secs) *[==>]*	 ***[1]***
Comments: This is the first exposure of the monitoring (see proposal description)									
3	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1589 A	FP-POS=2; BUFFER-TIME=890			1260 Secs (1260 Secs) *[==>]*	 ***[1]***
4	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[2]***
5	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[2]***
6	(COS.sp.514647)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G130M 1300 A	BUFFER-TIME=890; FP-POS=1			1037 Secs (1037 Secs) *[==>]*	 ***[2]***
7	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[3]***
8	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[3]***
9	(COS.sp.514647)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=890; FP-POS=2			1035 Secs (1035 Secs) *[==>]*	 ***[3]***
10	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[4]***
11	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[4]***
12	(COS.sp.514647)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G130M 1318 A	BUFFER-TIME=890; FP-POS=2			1035 Secs (1035 Secs) *[==>]*	 ***[4]***
13	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=690; FP-POS=3			800 Secs (800 Secs) *[==>]*	 ***[5]***
14	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=690; FP-POS=3			800 Secs (800 Secs) *[==>]*	 ***[5]***
15	(COS.sp.514647)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G130M 1309 A	BUFFER-TIME=890; FP-POS=3			1035 Secs (1035 Secs) *[==>]*	 ***[5]***
16	(COS.sp.514649)	(1) V-AK-SCO	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=690; FP-POS=1			800 Secs (800 Secs) *[==>]*	 ***[6]***

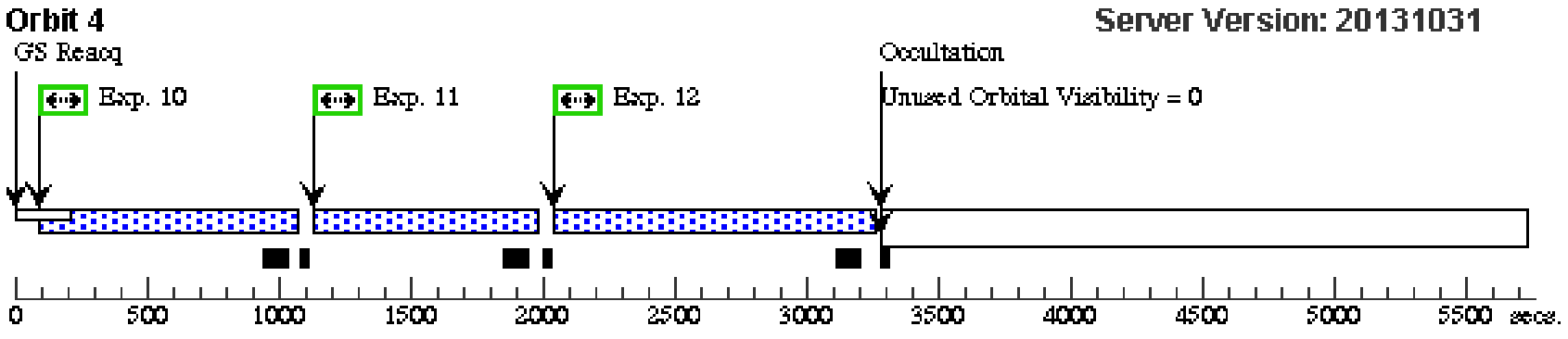
	17	(COS.sp.514 (1) V-AK-SCO 649)	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=690; FP-POS=1	800 Secs (800 Secs) *[==>]*		***[6]***
	18	(COS.sp.514 (1) V-AK-SCO 647)	COS/FUV, TIME-TAG, PSA	G130M 1300 A	BUFFER-TIME=890; FP-POS=1	1035 Secs (1035 Secs) *[==>]*		***[6]***
	19	(COS.sp.514 (1) V-AK-SCO 649)	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=690; FP-POS=4	800 Secs (800 Secs) *[==>]*		***[7]***
	20	(COS.sp.514 (1) V-AK-SCO 649)	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=690; FP-POS=4	800 Secs (800 Secs) *[==>]*		***[7]***
	21	(COS.sp.514 (1) V-AK-SCO 647)	COS/FUV, TIME-TAG, PSA	G130M 1309 A	BUFFER-TIME=823; FP-POS=4	1035 Secs (1035 Secs) *[==>]*		***[7]***

Orbit Structure





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Exp. 11
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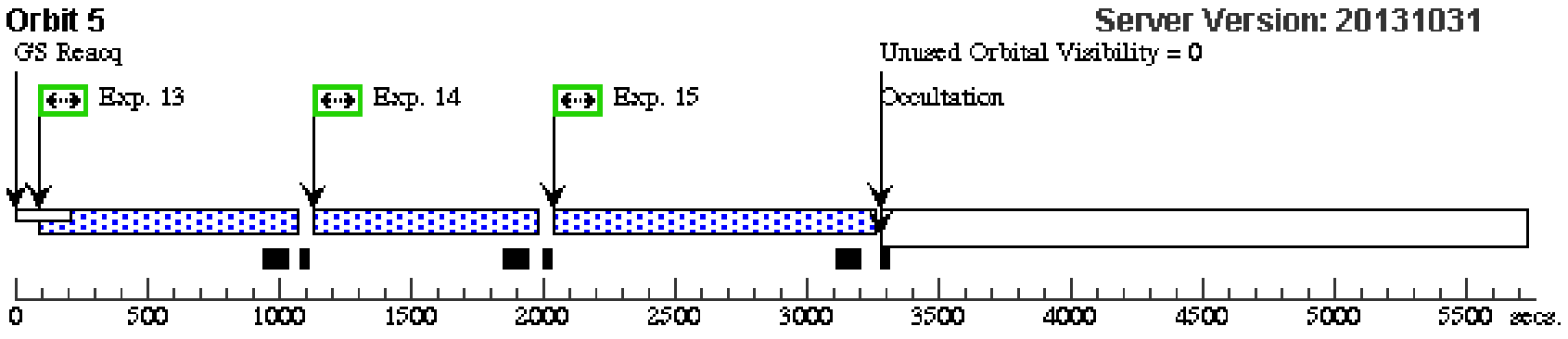
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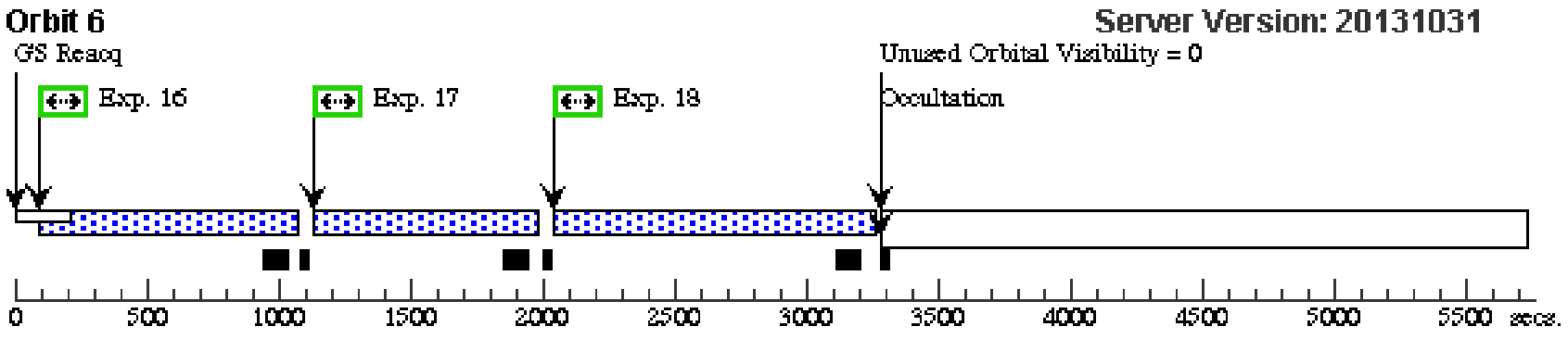
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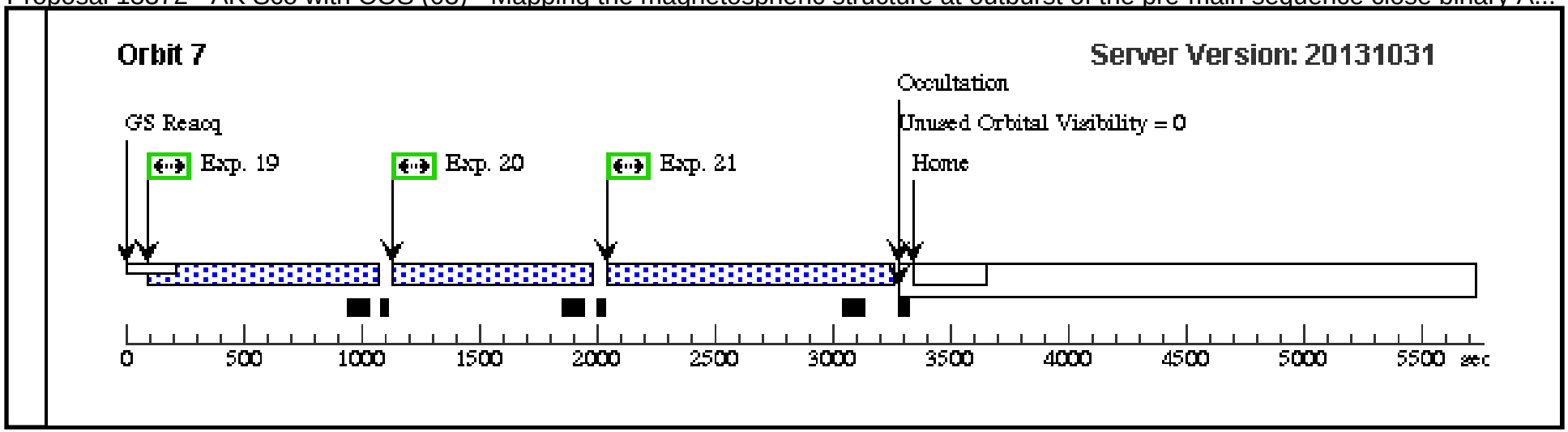
Orbit 7
Server Version: 20131031
Occultation
GS Reacq
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Exp. 20
Exp. 21
Home
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sec