11555 - Transition Region and Chromospheric Activity on Low Metallicity Arcturus Moving Group `Alien' Dwarfs

Cycle: 17, Proposal Category: GO

(Availability Mode: AVAILABLE)

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) HD145417	COS/FUV COS/NUV	2	20-Jan-2010 21:00:50.0	yes
02	(2) HD65583	COS/FUV COS/NUV	2	20-Jan-2010 21:00:57.0	yes
03	(3) HD90508-OFFSET (4) HD90508	COS/FUV COS/NUV	4	20-Jan-2010 21:01:07.0	yes

8 Total Orbits Used

ABSTRACT

How does low metallicity affect the heating and resultant temperature structure of the chromospheres, transition regions, and coronae of old solar-like dwarf stars?

The Arcturus Moving Group is very likely a remnant of the merger of a dwarf galaxy with the Milky Way Galaxy in the distant (~ 7- 8 Gyr) past. This kinematically distinct group has members that are located very close to the Sun, allowing study of stellar activity on very old, low metallicity stars that typically would not be possible. We propose to obtain COS G140L spectra of four dwarf star members of the Arcturus Moving Group to measure the fluxes of their transition region and upper chromospheric emission lines and to investigate the effects of low metallicity on the outer atmospheric radiative losses and temperature structure. Our targets have metallicities of ~ 20% solar or less, spectral types F9 - M4, and are at distances less than 25 pc from the Sun. COS is the only UV spectrograph that is capable of registering the FUV spectra of these stars in a reasonable number of HST orbits.

OBSERVING DESCRIPTION

Four dwarf star members of the Arcturus Moving Group are to be observed using COS G140L with 2 orbits allocated per star. Three of the strars (HD145417, HD65583, and HD90508) are visually bright with V magnitudes between 6.4and 7.5; these stars have very accurate coordinates from the Hipparcos Catalogue. All the stars have very large proper motions of more than 1 arcsecond per year. The coordinates given in this Phase II proposal are already corrected for proper motion to 2000.0.

The fourth target (LHS2266) is a much fainter M dwarf with V=12.5 BUT it is the common proper motion partner of HD90508 and the separation between the two stars is only 3.5 arcseconds.

For each star/visit we use basically the same observational setup:
Acquisition consists of a 2X2 ACQ/SEARCH followed by an ACQ/IMAGE.
The G140L (1230A) spectrum is taken in four pieces at the nominal FP-POS positions.
We do FP-POS=1 and 2 in the first orbit and FP-POS=3 and 4 in the second orbit to maximize
exposure time at the shorter wavelengths (e.g N V at 1238,1242A).

We have GALEX GRISM spectra for HD65583 and HD90508 which provide a useful check of the COS ETC model predictions. We find that the

models overpredict the expected COS NUV signal when normalized to the V magnitudes, even though these stars are all within 25parsecs and have minimal IS absorption. Nevertheless we have used the model-predicted count rates to control our choice of acquisition modes.

For HD145417 we use BOA+MIRRORA and a 15 second exposure [see COS75580]
For HD65583 we also use BOA+MIRRORA and 15 sec exposure [see COS74448 (GALEX input), COS74455 +COS74475 (models)].
For HD90508 we use BOA+MIRRORB and a 20 sec exposure [see COS75603 (GALEX input), COS75593 (model)].
FOR LHS2266 model predictions suggest that PSA+MIRRORA is allowed with exposures of order 30-60 seconds (see COS75611). HOWEVER, this star is 3.5 arcseconds away from HD90508 which needs MIRRORB and we cannot perform a standard aquistion with the brighter star in the FOV. It is therefore simpler and safer to construct a 4 orbit visit to HD90508 with an offset pointing used to put LHS2266 into the PSA for its two-orbit exposure.

The offset information for LHS 2266 (HD90508-OFFSET) is ------
Recently measured separations are from Chandra ACIS on 2007.0356 of +0.135S in RA and +3.81 arcsec in Dec and an optical CCD measurement on 2006.9586 of +0.113S in RA and +3.25 arcsec in Dec (Cvetkovic et al. 2007, Serb. Astron., 174, 83). The offset used here splits the difference between these two measurements and should be good to better than 0.5 arcseconds. LHS 2266 is located at larger RA and Dec and the offset coordinates are thus both positive.

The COS Spectroscopy ETC indicates no problems when fed the existing GALEX GRISM spectra for these targets (see COS75662 and COS75658).

2009 DEC 15: Changed ALL G140L FP-POS=3 and FP-POS=4 exposures to SEGMENT=A to avoid zero order problem on Segment B.

2010 JAN 19: ACQ/SEARCH changed to SCAN-SIZE=3 as a precaution, given the large proper motions of these stars, based on STScI and COS Team advice.

Visit

Proposal 11555, Visit 01, implementation Thu Jan 21 02:01:12 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

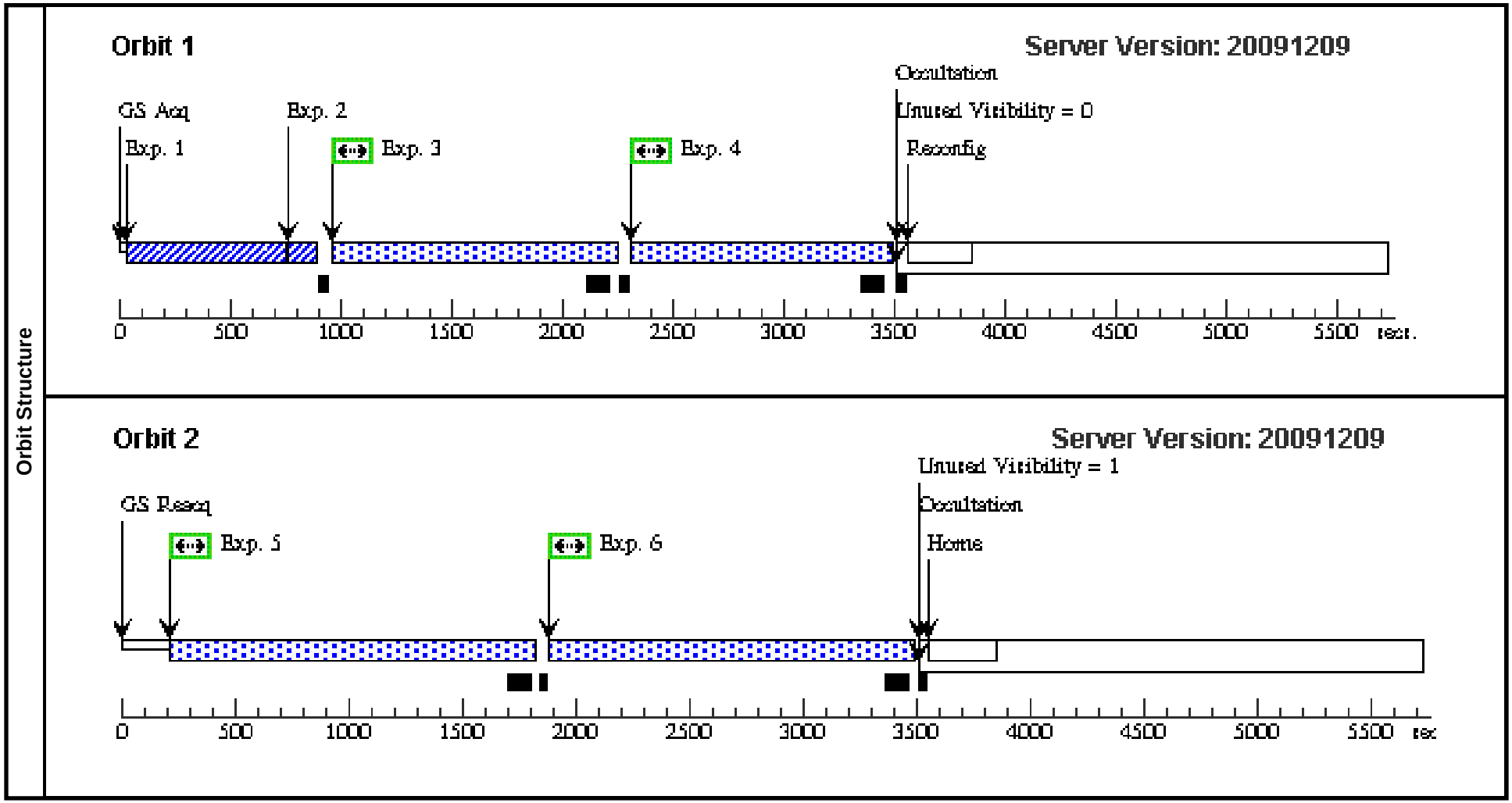
Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD145417	RA: 16 13 48.5585 (243.4523271d) Dec: -57 34 13.84 (-57.57051d) Equinox: J2000	Proper Motion RA: -0.106175s/yr Proper Motion Dec: -1.41072"/yr Parallax: 0.07275" Epoch of Position: 2000.0	V=7.52+/-0.01	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) HD145417	COS/NUV, ACQ/SEARCH, BOA	MIRRORA	SCAN-SIZE=3			15 Secs *[==>]*	 ***[1]***
2		(1) HD145417	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				15 Secs *[==>]*	 ***[1]***
3		(1) HD145417	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=990; FP-POS=1			1110 Secs *[==>]*	 ***[1]***
4		(1) HD145417	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1005; FP-POS=2			1125 Secs *[==>]*	 ***[1]***
5		(1) HD145417	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1450; FP-POS=3; SEGMENT=A			1560 Secs *[==>]*	 ***[2]***
6		(1) HD145417	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1445; FP-POS=4; SEGMENT=A			1555 Secs *[==>]*	 ***[2]***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Exp. 2
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Exp. 1
Exp. 3
Exp. 4
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sec.
Orbit 2
Server Version: 20091209
Unused Visibility = 1
GS Reacq
Occultation
Exp. 5
Exp. 6
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2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11555, Visit 02, implementation Thu Jan 21 02:01:14 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

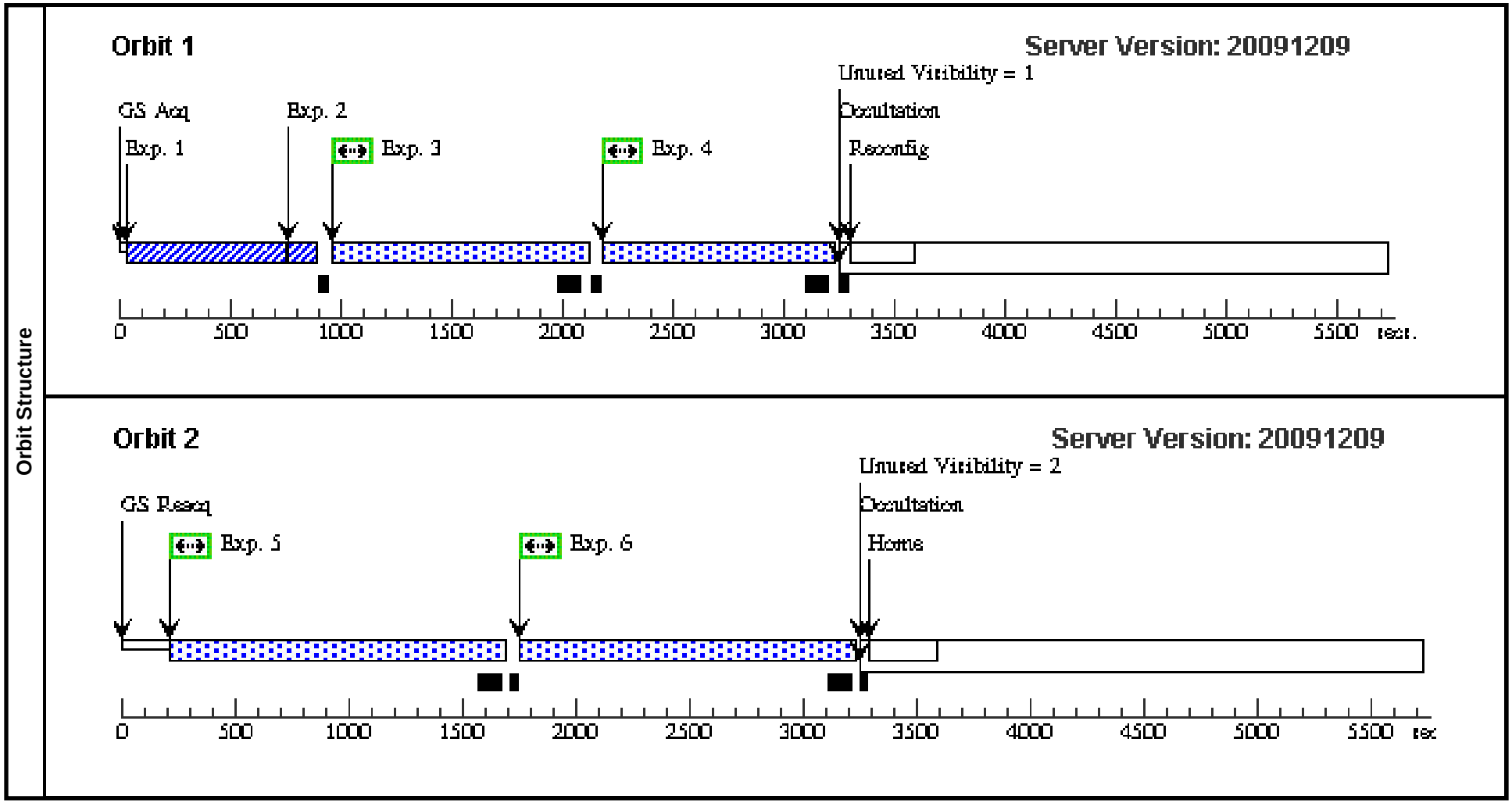
Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HD65583	RA: 08 00 32.1290 (120.1338708d) Dec: +29 12 44.48 (29.21236d) Equinox: J2000	Proper Motion RA: -0.013072s/yr Proper Motion Dec: -1.16422"/yr Parallax: 0.05952" Epoch of Position: 2000.0	V=6.94+/-0.01	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) HD65583	COS/NUV, ACQ/SEARCH, BOA	MIRRORA	SCAN-SIZE=3			15 Secs *[==>]*	*[1]*
2		(2) HD65583	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				15 Secs *[==>]*	*[1]*
3		(2) HD65583	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=860; FP-POS=1			980 Secs *[==>]*	*[1]*
4		(2) HD65583	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=880; FP-POS=2			1000 Secs *[==>]*	*[1]*
5		(2) HD65583	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1320; FP-POS=3; SEGMENT=A			1430 Secs *[==>]*	*[2]*
6		(2) HD65583	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1320; FP-POS=4; SEGMENT=A			1430 Secs *[==>]*	*[2]*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GS Acq
Exp. 1
Exp. 2
Exp. 3
Exp. 4
Occultation
Reconfig
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5000
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sec.
Orbit 2
Server Version: 20091209
Unused Visibility = 2
GS Reacq
Exp. 5
Exp. 6
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11555, Visit 03, implementation Thu Jan 21 02:01:14 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

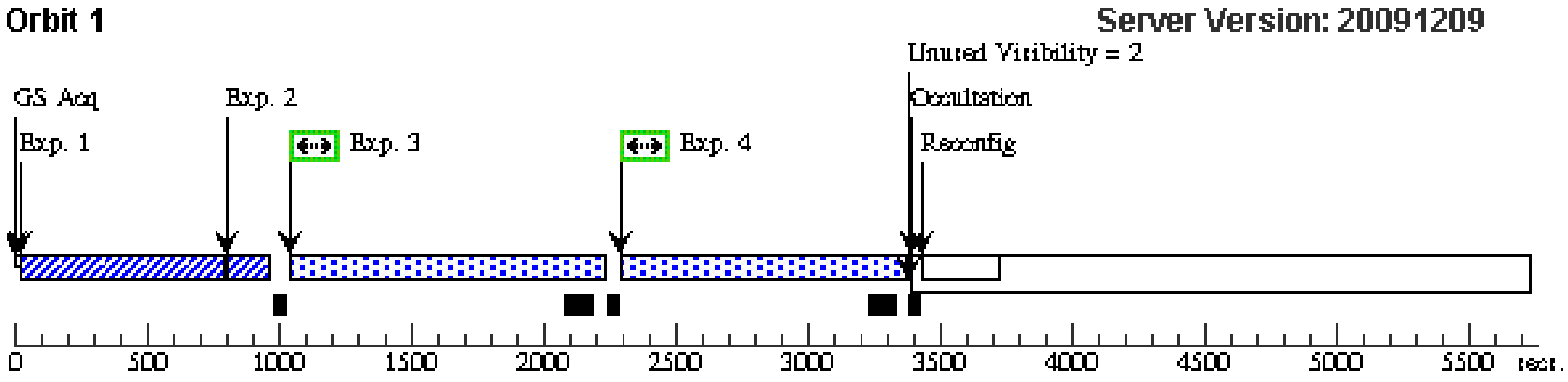
Fixed Targets

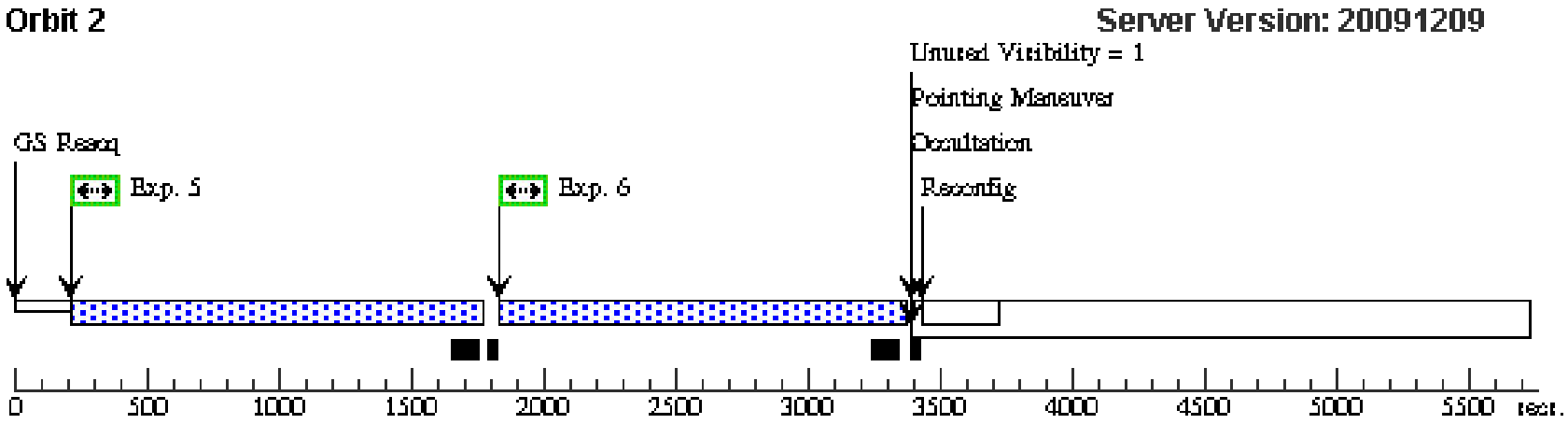
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	HD90508-OFFSET	Offset from HD90508 by	Proper Motion RA: 0.0s/yr	V=12.5+/-0.1	Offset Position (HD90508-OFFSET)
	Alt Name1: LHS2266	RA Offset: 0.125 Secs	Proper Motion Dec: -0.0"/yr		Reference Frame: ICRS
		Dec Offset: 3.6 Arcsec	Parallax: 0.0"		
			Epoch of Position: 2000.0		
Comments: Common proper motion companion to HD90508, known as LHS 2266. Recently measured separations are from Chandra ACIS on 2007.0356 of +0.135S in RA and +3.81 arcsec in Dec and an optical CCD measurement on 2006.9586 of +0.113S in RA and +3.25 arcsec in Dec (Cvetkovic et al. 2007, Serb. Astron., 174, 83). The offset used here splits the difference between these two measurements and should be good to better than 0.5 arcseconds.					
(4)	HD90508	RA: 10 28 3.8823 (157.0161762d)	Proper Motion RA: 0.008151s/yr	V=6.44+/-0.01	Reference Frame: ICRS
		Dec: +48 47 5.64 (48.78490d)	Proper Motion Dec: -0.88176"/yr		
		Equinox: J2000	Parallax: 0.04245"		
			Epoch of Position: 2000.0		

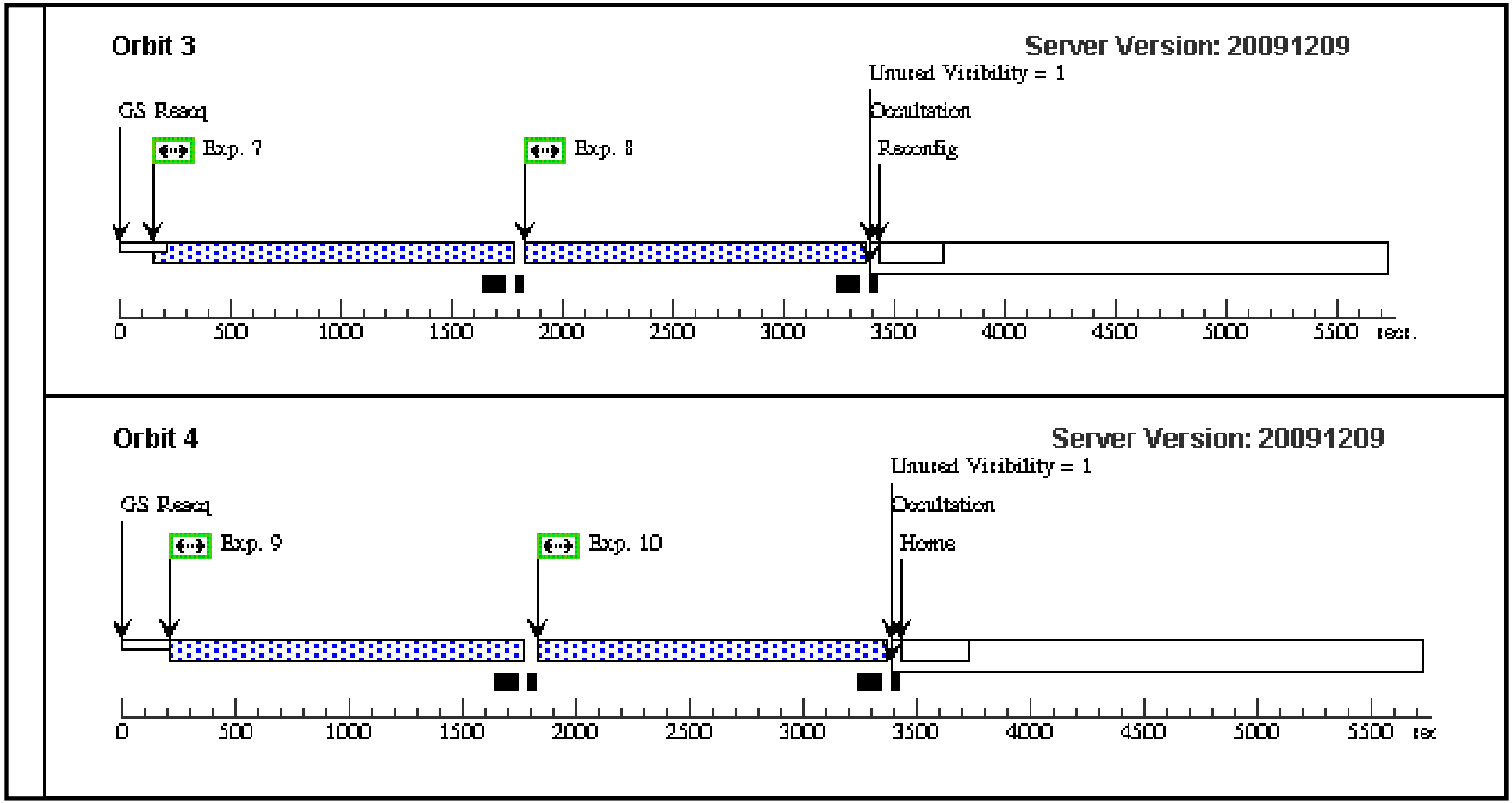
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) HD90508	COS/NUV, ACQ/SEARCH, BOA	MIRRORB	SCAN-SIZE=3			20 Secs	
								[==>]	***[1]***
2		(4) HD90508	COS/NUV, ACQ/IMAGE, BOA	MIRRORB				20 Secs	
								[==>]	***[1]***
3		(4) HD90508	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=885; FP-POS=1			1005 Secs	
								[==>]	***[1]***
4		(4) HD90508	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=910; FP-POS=2			1030 Secs	
								[==>]	***[1]***
5		(4) HD90508	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1400; FP-POS=3; SEGMENT=A			1510 Secs	
								[==>]	***[2]***
6		(4) HD90508	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1375; FP-POS=4; SEGMENT=A			1485 Secs	
								[==>]	***[2]***
7		(3) HD90508-OFFSET	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1395; FP-POS=1			1505 Secs	
								[==>]	***[3]***
8		(3) HD90508-OFFSET	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1380; FP-POS=2			1490 Secs	
								[==>]	***[3]***
9		(3) HD90508-OFFSET	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1395; FP-POS=3; SEGMENT=A			1505 Secs	
								[==>]	***[4]***
10		(3) HD90508-OFFSET	COS/FUV, TIME-TAG, PSA	G140L 1230 A	BUFFER-TIME=1380; FP-POS=4; SEGMENT=A			1490 Secs	
								[==>]	***[4]***

Orbit Structure



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sec.
Orbit 4
Server Version: 20091209
Unused Visibility = 1
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Occultation
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Exp. 10
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sec