12606 - Verifying the White Dwarf Mass-Radius relation with Sirius B and other resolved Sirius-like systems

Cycle: 19, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Prof. Martin Barstow (PI) (ESA Member) (Contact)	**University of Leicester**	**mab@star.le.ac.uk**
Dr. Jay B. Holberg (CoI) (AdminUSPI)	University of Arizona	holberg@argus.lpl.arizona.edu
Dr. Howard E. Bond (CoI)	Space Telescope Science Institute	bond@stsci.edu
Dr. Matthew Burleigh (CoI) (ESA Member)	University of Leicester	mbu@star.le.ac.uk
Dr. Sarah Casewell (CoI) (ESA Member) (Contact)	University of Leicester	slc25@leicester.ac.uk
Dr. Ivan Hubeny (CoI)	University of Arizona	hubeny@as.arizona.edu
Dr. Jay Farihi (CoI) (ESA Member)	University of Leicester	jf123@star.le.ac.uk

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SIRIUS-B WAVE	STIS/CCD	1	14-Jun-2012 21:04:58.0	yes
02	(4) HD2133B (7) HD2133A	STIS/CCD	1	14-Jun-2012 21:05:11.0	yes
03	(8) 56PER-A	WFC3/UVIS	1	14-Jun-2012 21:05:40.0	yes
04	(2) 14AUR-CA (3) 14AUR-CB	STIS/CCD	1	14-Jun-2012 21:05:58.0	yes
05	(9) HD217411A	WFC3/UVIS	1	14-Jun-2012 21:06:32.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
06	(9) HD217411A (11) HD217411B	STIS/CCD	1	14-Jun-2012 21:06:49.0	yes
07	(10) HR1358A	WFC3/UVIS	1	14-Jun-2012 21:06:55.0	yes
08	(5) HR1358B (10) HR1358A	STIS/CCD	1	14-Jun-2012 21:07:04.0	yes
09	(7) HD2133A	WFC3/UVIS	1	14-Jun-2012 21:07:37.0	yes

9 Total Orbits Used

ABSTRACT

White dwarfs (WDs) are the remnants of all stars with initial masses less than 8Msun, and they provide important laboratories for the study of evolutionary processes and the behaviour of matter at extremes of temperature and density. Knowledge of the WD ages is also important in measuring the ages of stellar populations. However, such results depend on a thorough understanding of the evolution of WDs themselves and on predictions of the cooling rates. In turn, the masses, radii, and photospheric compositions affect these rates.

We propose STIS observations of a sample of white dwarfs in resolved binary systems, for which Sirius B is the prototype, to obtain Balmer line profiles from which we can measure the effective temperature and surface gravity of each star. In addition, we will obtain an accurate radial velocity from the cores of the Halpha lines. These observations will provide improved fundamental information for each white dwarf yielding: a) the gravitational redshift and b) the optical flux normalization. Together these data will provide accurate mass and radius determinations. For Sirius B, in particular, it means the uncertainty in the spectroscopic mass will be on a par with that of the astrometric mass. By reducing the uncertainties in the V magnitude, log g and gravitational redshift to our expected levels, we find that spectroscopic mass and radius uncertainties will be respectively reduced to 3 per cent and 1.6 per cent. At these levels we can precisely test the theoretical M-R for the white dwarfs, distinguishing between a thick or thin H layer for the star and categorically rule out non-C/O core compositions.

OBSERVING DESCRIPTION

We are obtaining spectra of the Balmer lines of the white dwarf companions in 5 Sirius-like binaries (which are close visual binary systems consisting of a white dwarf and a bright main-sequence star).

The STIS spectra will be obtained using the G430L and G750M gratings with the CCD detector. The G430L grating provides complete coverage of the Balmer line series from HBeta, yielding a resolution of 5.4 Angstroms which will be used for the determination of accurate Teff and log g of the white dwarf. The G430L grating does not yield adequate resolution (170km s-1 per pixel) for a sufficiently accurate radial-velocity measurement. Therefore, we will also obtain a pair of G750M exposures using the 52x2.0 arcsecond and 52x0.05 arcsecond slits, centered on Halpha, to obtain accurate radial velocities and photometry as discussed in the Scientific Justification, for both Sirius B and HD 2133. The 0.56 Å/pixel spectral resolution of the grating translates into 30km/s in velocity space and cross-correlation techniques can be used to improve the accuracy beyond this by a factor 10.

The remaining three targets are more challenging with binary separations too small to use the standard slits without serious contamination from the primary. In these cases we will obtain our spectroscopic observations with the 52x0.2F1 setting, placing the primary behind the smaller of the two occulting bars, to provide the scattered light rejection we need. We will need S/N greater than 40 for the Teff and log g measurements as well as the radial velocity. Individual exposures can be easily obtained in one orbit of HST time, yielding a total request (with overheads) of 2 orbits for each target except Sirius B (1 orbit).

For these close binaries where we cannot rely on useful STIS spectrophotometry, we will instead obtain WFC3 UVIS images for accurate photometry, with the F336W, F275W, F218W filters, where the contrast between the primary and secondary are substantially reduced. These magnitudes will be used to establish the photometric radii of the WDs.

The separations of the targets are (with the exception of Sirius B) challenging. To optimise the contrast for observations of each star we place a long slit perpendicular to the line joining the two stars, so that the scattered-light component can be determined and subtracted directly. The field will be acquired using the primary stars and we will then do a blind offset to each white dwarf, based on our accurate astrometry of the previous WFPC2 frames obtained in our various astrometric programmes and perform a peak-up on that to optimise its location in the narrow slit.

ADDITIONAL COMMENTS

The WFC3 UVIS images will be obtained by selecting a roll angle to prevent diffraction spikes from the saturated primary falling onto the white dwaf.

For the STIS observations, we will use the 5x0.2F1-R setting and information from the WFC3 images to place the primary behind the occulting bar to allow uncontaminated observations of the white dwarf.

To optimize the contrast for observations of each star we need to place a long slit perpendicular to the line joining the two stars (as demonstrated for

Sirius B), so that the scattered light component can be determined and subtracted directly. We will be able to calculate the appropriate orientations from our previous WFPC2 images of the systems.

Visit

Proposal 12606, Visit 01, implementation Fri Jun 15 01:07:50 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; ORIENT 24D TO 52 D; ORIENT 204D TO 232 D

Comments: SIRIUS B observation
We know the position of Sirius B, about 9" away from Sirius A, so we go directly to Sirius B without offsetting from Sirius A. Consists of an acquisition image of Sirius B, a spectrum in G430M, a spectrum in G750M, an acquisition peakup in G750M, and a spectrum in G750M with slit of 0.05"

ORIENT requirements are to place Sirius B halfway between the diffraction spikes of Sirius A

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2), (3), (6)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=4	Angle Between Sides=		
	Point Spacing=0.40624	Center Pattern=true		
	Line Spacing=			

Fixed Targets

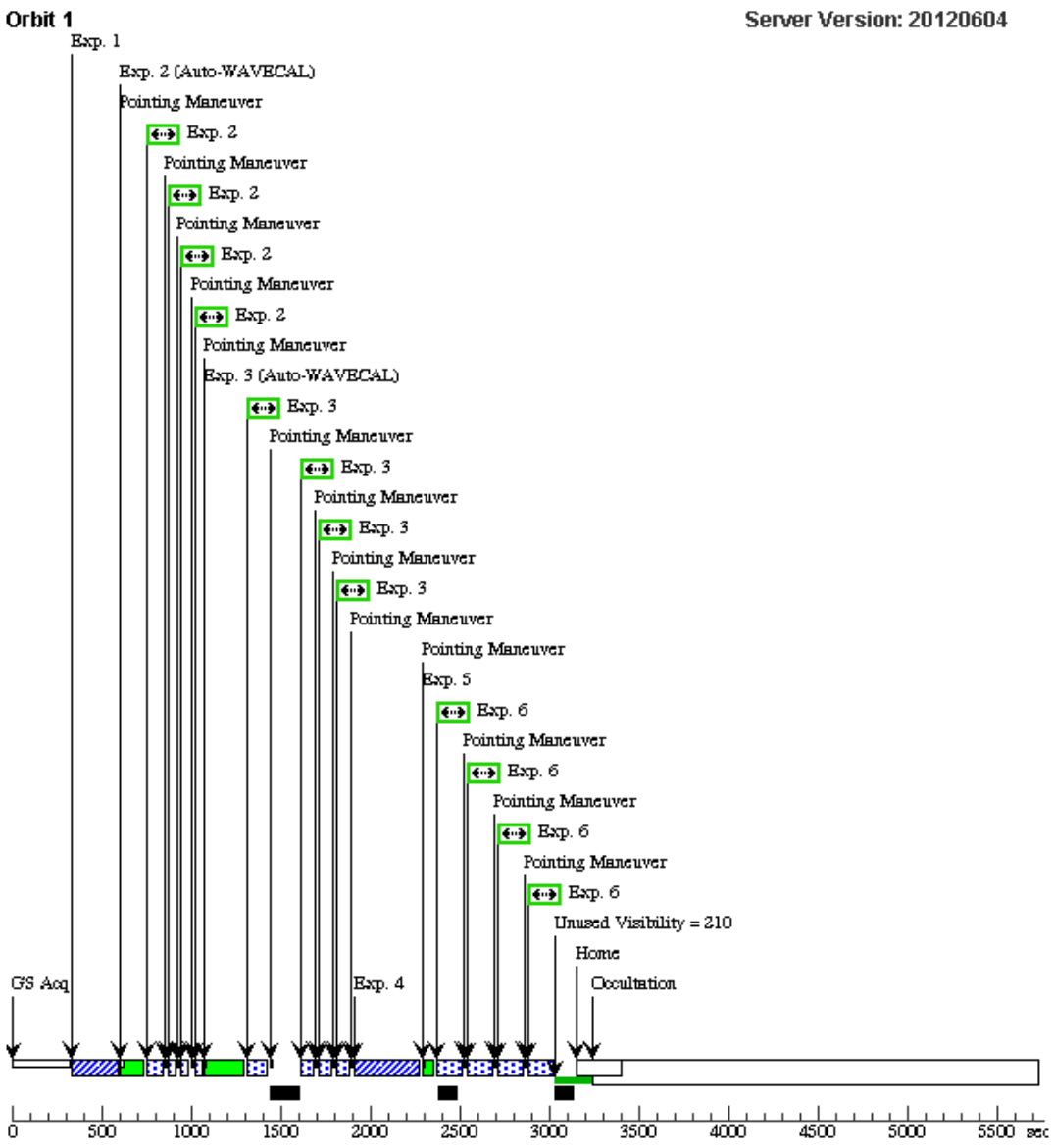
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SIRIUS-B	RA: 06 45 8.9300 (101.2872083d)	Proper Motion RA: -0.3769 arcsec/yr	V=8.44+/-0.06	Reference Frame: ICRS
	Alt Name1: HD-48915B	Dec: -16 43 11.46 (-16.71985d)	Proper Motion Dec: -.9155 arcsec/yr	B=8.41	
	Alt Name2: WD0642-166	Equinox: J2000	Parallax: 0.379"		
			Epoch of Position: 2011.748		

Comments: The RA and Dec of Sirius B are measured from WFC3 frames taken in 2011 October (epoch 2011.748) and corrected for parallax. The proper motion given here is the "effective" proper motion calculated by combining the Hipparcos motion of the center of mass of the Sirius system with the motion of Sirius B in the binary relative to the center of mass at an early 2013 epoch.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Sirius B-acq (183994)	(1) SIRIUS-B	STIS/CCD, ACQ, F28X50OII	MIRROR	ACQTYPE=POINT			0.2 Secs *[==>]*	*[1]*
2	Sirius B STIS-G40L (183862)	(1) SIRIUS-B	STIS/CCD, ACCUM, 52X2E1	G430L 4300 A	CR-SPLIT=NO; GAIN=4		Pattern 2, Exps 2-2 in Visit 01 (2)	3.5 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*
3	Sirius B-STIS-G750M_slit1 (183863)	(1) SIRIUS-B	STIS/CCD, ACCUM, 52X2E1	G750M 6581 A	CR-SPLIT=NO; GAIN=4		Pattern 2, Exps 3-3 in Visit 01 (2)	30 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*
4	Sirius B-acq peak (183983)	(1) SIRIUS-B	STIS/CCD, ACQ/PEAK, 52X0.05E1	G750M 6581 A				4 Secs *[==>]*	*[1]*
5		WAVE	STIS/CCD, ACCUM, 52X0.05	G750M 6581 A				*[==>]*	*[1]*
6	Sirius B-STIS-G750M_slit2 (183864)	(1) SIRIUS-B	STIS/CCD, ACCUM, 52X0.05E1	G750M 6581 A	CR-SPLIT=NO; GAIN=4		Pattern 2, Exps 6-6 in Visit 01 (2)	100 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Proposal 12606 - Visit 02 - Verifying the White Dwarf Mass-Radius relation with Sirius B and other resolved Sirius-like systems

Visit

Proposal 12606, Visit 02, implementation Fri Jun 15 01:07:53 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; SCHED 60%; ORIENT 358.36D TO 8.36 D; ORIENT 178.36D TO 188.36 D

Comments: HD 2133 A and B observation.
We use an ORIENT that places the slit perpendicular to the line joining the stars. We first acquire the bright HD 2133 A, and then do a dispersed peakup on A. We then do a blind offset to take spectra of B with the G430L and G750M gratings.
ORIENTs updated 4/11/12 based on recent WFC3 images. - CoI H. E. Bond

Patterns

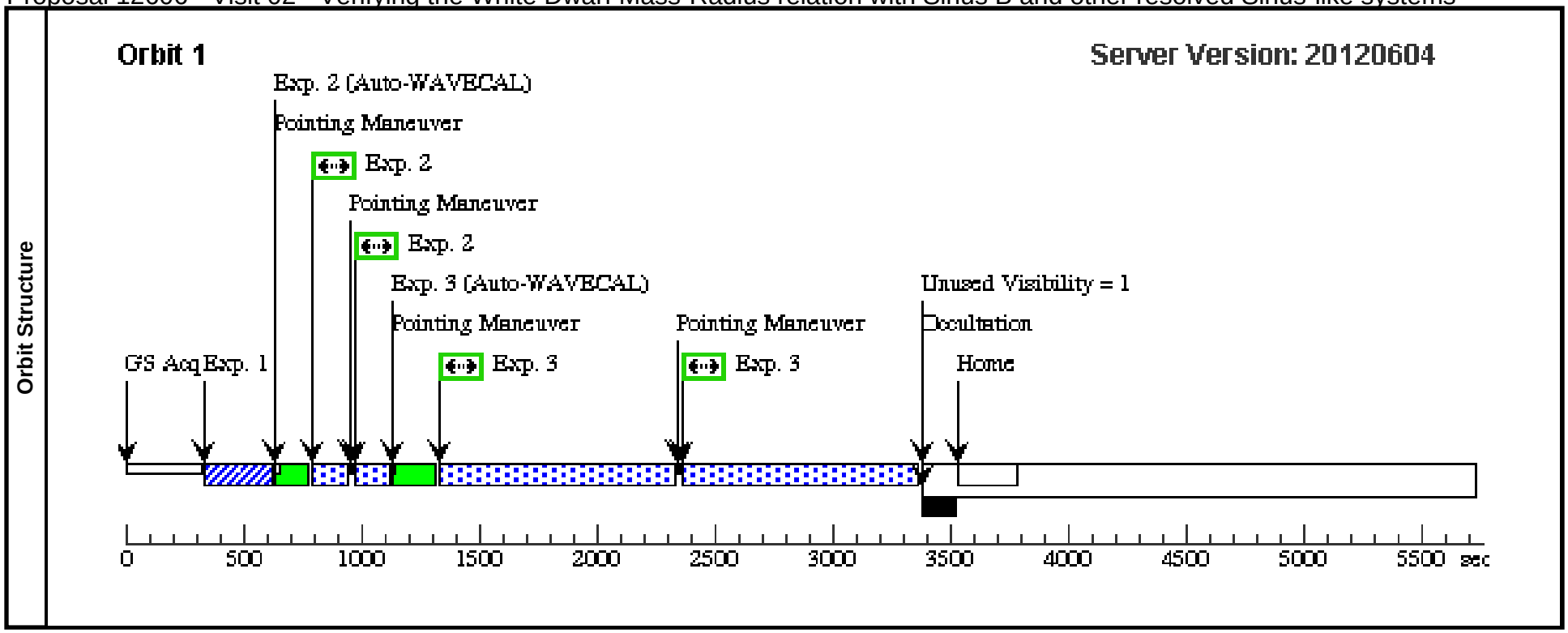
#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2), (3)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.40624	Center Pattern=true		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	HD2133B	Offset from HD2133A by		V=15.6	Offset Position (HD2133B)
		RA Offset: 0.12142 Secs			Reference Frame: ICRS
		Dec Offset: 0.44 Arcsec			
Comments: Target offset updated 4/11/12 based on recent WFC3 image. - CoI H. E. Bond					
(7)	HD2133A	RA: 00 24 41.2150 (6.1717292d)	Proper Motion RA: 2.82 mas/yr	V=9.62	Reference Frame: ICRS
		Dec: -74 14 4.40 (-74.23456d)	Proper Motion Dec: -12.79 mas/yr		
		Equinox: J2000	Parallax: 0.00732"		
			Epoch of Position: 2000.0		

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	HD2133A-acq (183997)	(7) HD2133A	STIS/CCD, ACQ, F28X50OIII	MIRROR	ACQTYPE=POINT			5 Secs *[==>]*	***[1]***
2	HD2133B STIS-G430L (183882)	(4) HD2133B	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 2-2 in Visit 02 (3)	110 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3	HD2133B STIS-G750M (183882)	(4) HD2133B	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 3-3 in Visit 02 (3)	1100 Secs *[==>963.0 Secs (Pattern 1)]* *[==>963.0 Secs (Pattern 2)]*	***[1]***


Orbit Structure
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Server Version: 20120604
Exp. 2 (Auto-WAVECAL)
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 2
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Exp. 3
Pointing Maneuver
Exp. 3
Unused Visibility = 1
Occultation
Home
GS Acq
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Proposal 12606 - Visit 03 - Verifying the White Dwarf Mass-Radius relation with Sirius B and other resolved Sirius-like systems

Visit

Proposal 12606, Visit 03, completed Fri Jun 15 01:07:54 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 313.1D TO 29.5 D; ORIENT 43.1D TO 73 D; ORIENT 92.3D TO 119.5 D; ORIENT 133.1D TO 209.5 D; ORIENT 223.1D TO 250.3 D; ORIENT 272.3D TO 299.5 D

Comments: HD27786B -2
Imaging in 3 filters with WFC3.
Filters are F336W, F218W, F275W

ORIENTs are specified to place white-dwarf companion away from diffraction spikes and bleeding column from bright primary

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=true		(1-6)

Fixed Targets

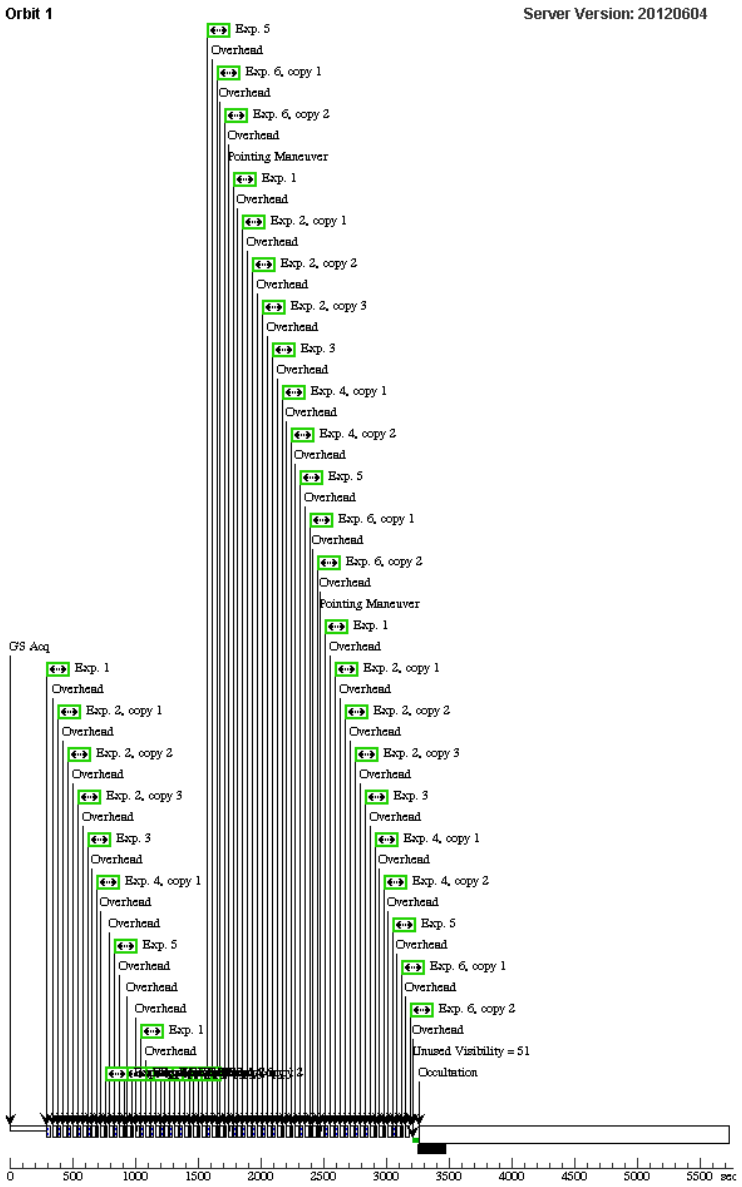
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(8)	56PER-A Alt Name1: HD27786 Alt Name2: GSC2-NCE5031521	RA: 04 24 37.4640 (66.1561000d) Dec: +33 57 34.88 (33.95969d) Equinox: J2000	Proper Motion RA: 56.28 mas/yr Proper Motion Dec: -82.26 mas/yr Parallax: 0.024" Epoch of Position: 2000.0	V=5.792	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(8) 56PER-A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F218W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 03 (1)	1.5 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(8) 56PER-A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F218W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 03 (1)	25 Secs X 3 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]* *[==>(Pattern 4, Copy 3)]*	***[1]***
3		(8) 56PER-A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F275W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 03 (1)	0.5 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
4		(8) 56PER-A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F275W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 03 (1)	15 Secs X 2 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]*	***[1]***
5		(8) 56PER-A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 03 (1)	0.5 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

	6	(8) 56PER-A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO	Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs X 2 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]*	***[1]***

Orbit Structure



Visit

Proposal 12606, Visit 04, implementation Fri Jun 15 01:07:56 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; SCHED 60%; ORIENT 237D TO 253 D; ORIENT 57D TO 73 D

Comments: 14 Aur Cb STIS observation
Acquire bright star 14 Aur Ca. Offset to faint companion and do acq peakup. Obtain spectra in G750M (0.5" and 0.05" slits) and G430L (0.5" slit).
ORIENT specification is to place slit perpendicular to line joining the two stars.

Patterns

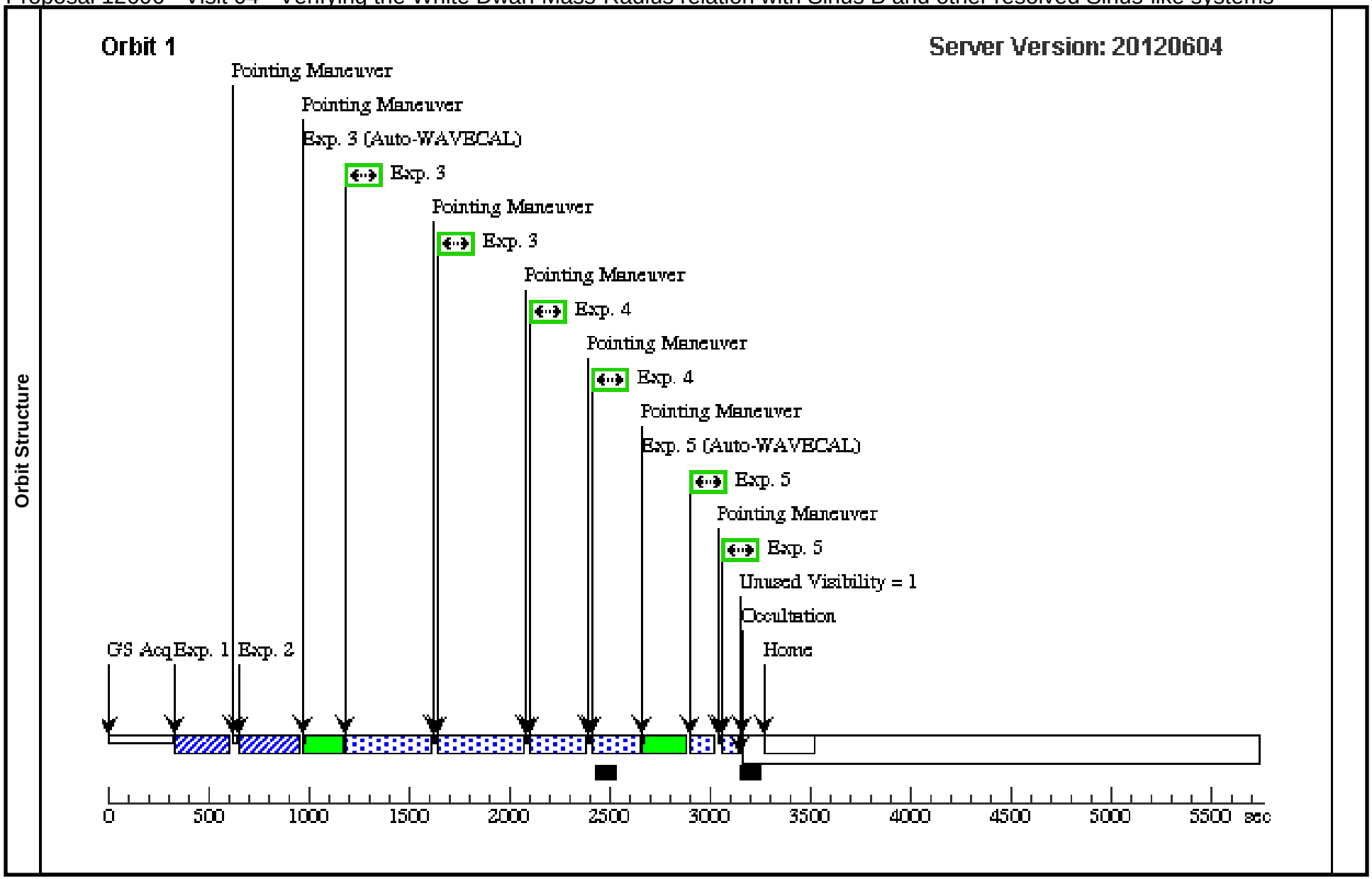
#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.40624	Center Pattern=true		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	14AUR-CA	RA: 05 15 23.5930 (78.8483042d)	Proper Motion RA: -25.05 mas/yr	V=8.0	Reference Frame: ICRS
		Dec: +32 41 4.62 (32.68462d)	Proper Motion Dec: 12.00 mas/yr		
		Equinox: J2000	Parallax: .01142"		
			Epoch of Position: 1999.73		
Comments: Coordinates determined from WFPC2 frame taken in 1999.					
(3)	14AUR-CB	Offset from 14AUR-CA by		V=14.1	Offset Position (14AUR-CB)
		RA Offset: -0.149204 Secs			Reference Frame: ICRS
		Dec Offset: 0.68971 Arcsec			
Comments: This is the white dwarf companion of 14 Aur Ca. Offset measured from WFPC2 frame taken in 1999.					

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	14 Aur Ca acq (183998)	(2) 14AUR-CA	STIS/CCD, ACQ, F28X50OIII	MIRROR	ACQTYPE=POINT			1.2 Secs *[==>]*	***[1]***
2	14 Aur Cb acq	(3) 14AUR-CB	STIS/CCD, ACQ/PEAK, 52X0.05E1	MIRROR				1 Secs *[==>]*	***[1]***
3	14 Aur Cb-STIS-G750M (183888)	(3) 14AUR-CB	STIS/CCD, ACCUM, 52X0.05E1	G750M 6581 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 3-3 in Visit 04 (3)	400 Secs *[==>390.0 Secs (Pattern 1)]* *[==>390.0 Secs (Pattern 2)]*	***[1]***
4	14 Aur Cb-STIS-G750M (183888)	(3) 14AUR-CB	STIS/CCD, ACCUM, 52X0.5E1	G750M 6581 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 4-4 in Visit 04 (3)	200 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	14 Aur Cb STIS-G430L (183889)	(3) 14AUR-CB	STIS/CCD, ACCUM, 52X0.5E1	G430L 4300 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 5-5 in Visit 04 (3)	40 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***


Orbit 1
Server Version: 20120604
Orbit Structure
Pointing Maneuver
Pointing Maneuver
Exp. 3 (Auto-WAVECAL)
Exp. 3
Pointing Maneuver
Exp. 3
Pointing Maneuver
Exp. 4
Pointing Maneuver
Exp. 4
Pointing Maneuver
Exp. 5 (Auto-WAVECAL)
Exp. 5
Pointing Maneuver
Exp. 5
Unused Visibility = 1
Occultation
Home
GS Acq
Exp. 1
Exp. 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12606, Visit 05, completed Fri Jun 15 01:07:58 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 195.9D TO 272.3 D; ORIENT 285.9D TO 313.1 D; ORIENT 335.1D TO 2.3 D; ORIENT 15.9D TO 92.3 D; ORIENT 105.9D TO 133.1 D; ORIENT 155.1D TO 182.3 D

Comments: HD 217411
Imaging in 3 filters with WFC3.
Filters are F336W, F275W, F218W

ORIENTs are specified to place companion away from diffraction spikes from primary

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=true		(1-4)

Fixed Targets

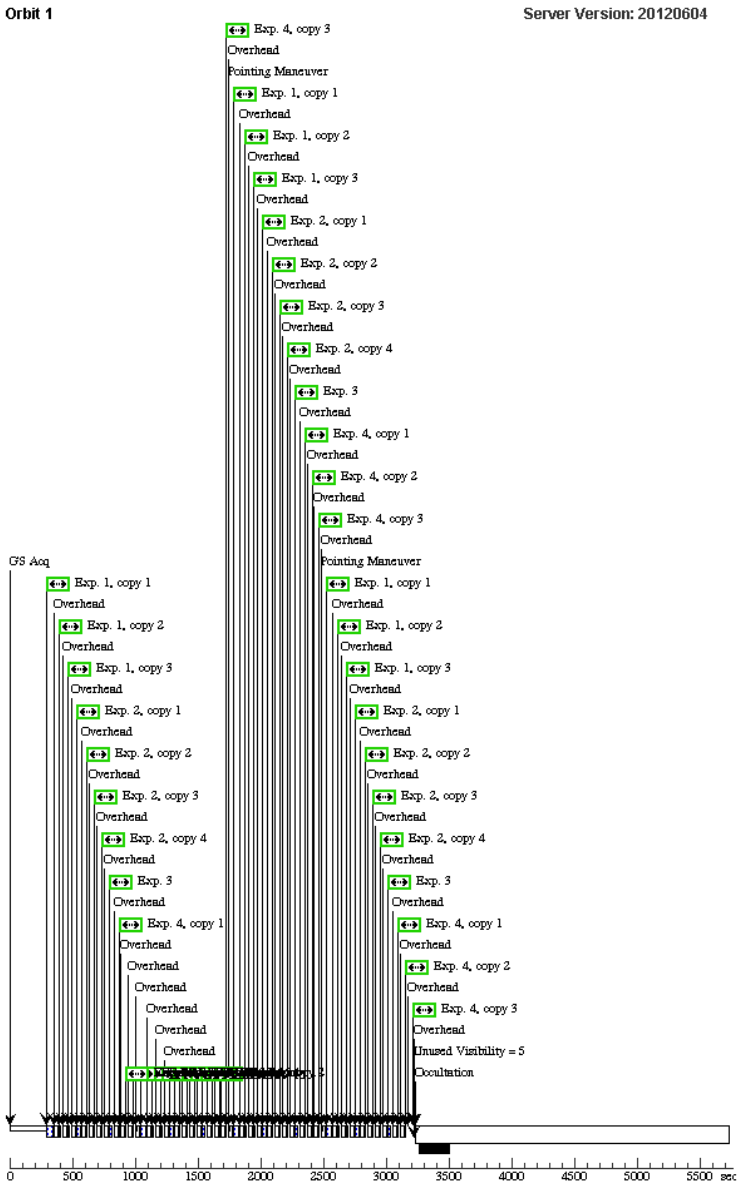
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(9)	HD217411A	RA: 23 00 35.6298 (345.1484575d) Dec: -07 04 9.18 (-7.06922d) Equinox: J2000	Proper Motion RA: 5.20 mas/yr Proper Motion Dec: 10.00 mas/yr Epoch of Position: 2000.0	V=9.9	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(9) HD217411A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F218W	CR-SPLIT=NO		Pattern 1, Exps 1-4 in Visit 05 (1)	15 Secs X 3 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]* *[==>(Pattern 4, Copy 3)]*	***[1]***
2		(9) HD217411A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F275W	CR-SPLIT=NO		Pattern 1, Exps 1-4 in Visit 05 (1)	5 Secs X 4 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 1, Copy 4)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 2, Copy 4)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 3, Copy 4)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]* *[==>(Pattern 4, Copy 3)]* *[==>(Pattern 4, Copy 4)]*	***[1]***
3		(9) HD217411A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO		Pattern 1, Exps 1-4 in Visit 05 (1)	0.5 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

	4	(9) HD217411A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO	Pattern 1, Exps 1-4 in Visit 05 (1)	4 Secs X 3 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]* *[==>(Pattern 4, Copy 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12606, Visit 06, implementation Fri Jun 15 01:08:00 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; SCHED 80%; ORIENT 137.20D TO 147.20 D; ORIENT 317.20D TO 327.20 D

Comments: HD 217411 B STIS observation.
We use an ORIENT that places the slit perpendicular to the line joining the stars. We first acquire the bright A component, and then do an offset to the companion fainter B white dwarf. Spectra are taken with the
G430L and G750M gratings.

ORIENTS updated based on recent WFC3 images. -- CoI H. E. Bond 6/12/12

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2), (3)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.40624	Center Pattern=true		
	Line Spacing=			

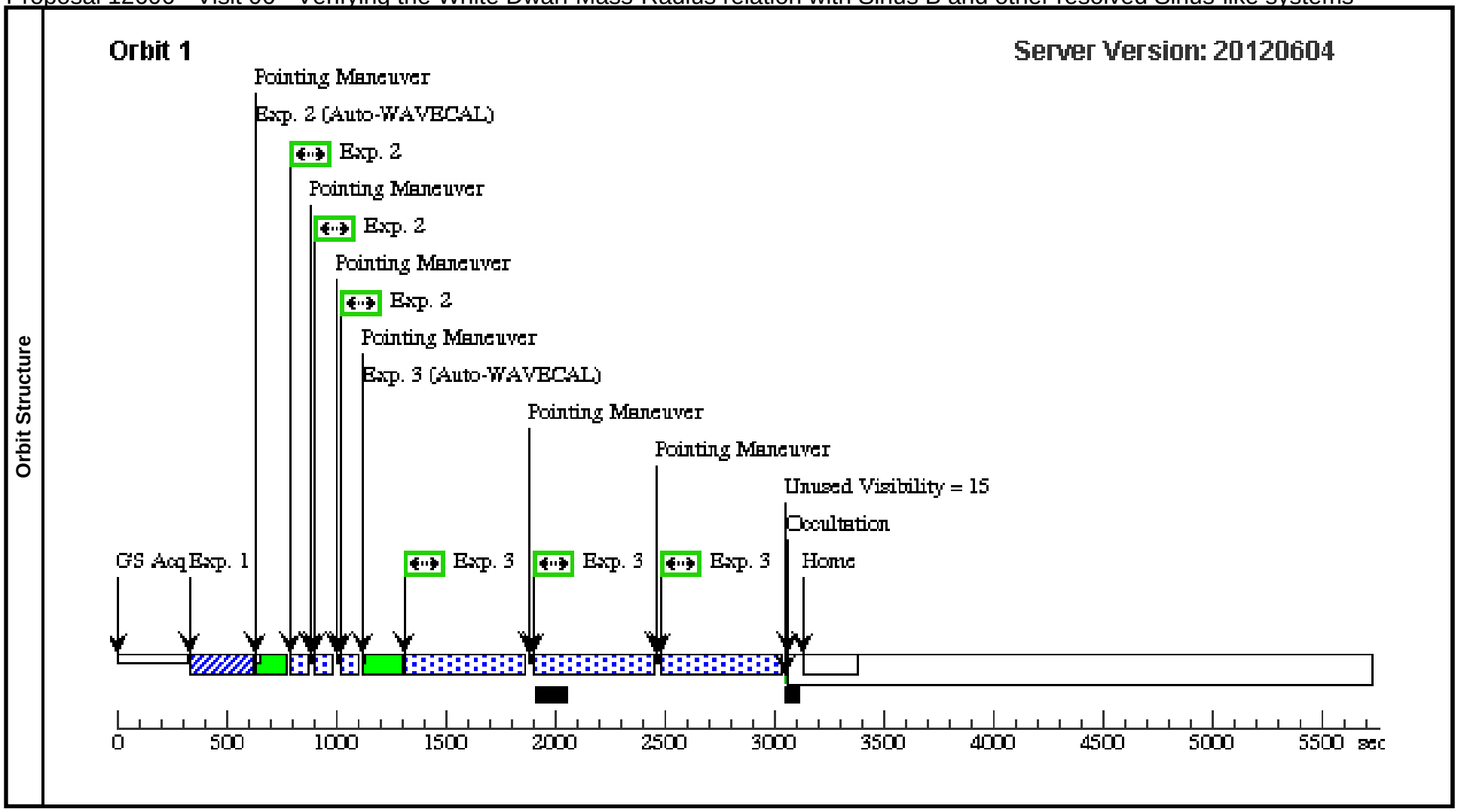
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(9)	HD217411A	RA: 23 00 35.6298 (345.1484575d)	Proper Motion RA: 5.20 mas/yr	V=9.9	Reference Frame: ICRS
		Dec: -07 04 9.18 (-7.06922d)	Proper Motion Dec: 10.00 mas/yr		
		Equinox: J2000	Epoch of Position: 2000.0		
(11)	HD217411B	Offset from HD217411A by		V=14.7	Offset Position (HD217411B)
		RA Offset: -0.009208 Secs			Reference Frame: ICRS
		Dec Offset: -1.08498 Arcsec			

Comments: Target offsets updated based on measurements of recent WFC3 images obtained in this program. -- CoI H. E. Bond 6/12/12.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	HD217411A-acq (183997)	(9) HD217411A	STIS/CCD, ACQ, F28X50OIII	MIRROR	ACQTYPE=POINT			5 Secs	
								[==>]	***[1]***
2	HD214711B STIS-G430L (183882)	(11) HD217411B	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; GAIN=1		Pattern 4, Exps 2-2 in Visit 06 (4)	45 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
3	HD214711B STIS-G750M (183882)	(11) HD217411B	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A	CR-SPLIT=NO; GAIN=1		Pattern 4, Exps 3-3 in Visit 06 (4)	515 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	


Orbit Structure
Orbit 1
Server Version: 20120604
Pointing Maneuver
Exp. 2 (Auto-WAVECAL)
Exp. 2
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 15
Occultation
GS Acq
Exp. 1
Exp. 3
Exp. 3
Exp. 3
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12606, Visit 07, completed Fri Jun 15 01:08:01 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 0.0D TO 0.0 D

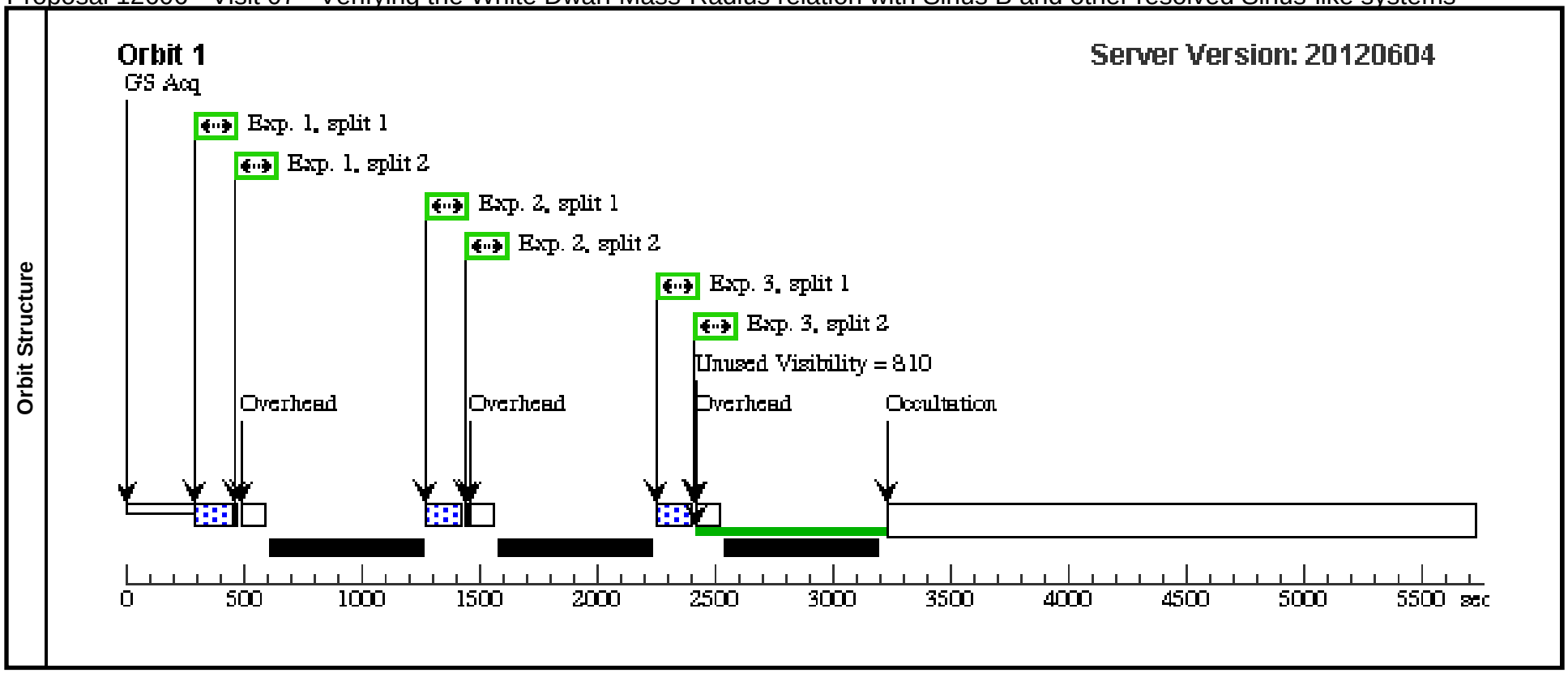
Comments: Imaging in 3 filters with WFC3.
Filters are F275W, F218W, F336W
PA is 10.62D offset = 221.38D
Total angle = 232

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(10)	HR1358A	RA: 04 20 52.7200 (65.2196667d)	Proper Motion RA: 104.25 mas/yr	V=6.2	Reference Frame: ICRS
	Alt Name1: NA01007297	Dec: +13 51 51.94 (13.86443d)	Proper Motion Dec: -18.07 mas/yr		
	Alt Name2: HD27483	Equinox: J2000	Parallax: 0.021"		
			Epoch of Position: 2000		

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	HR1358-WFC3-F336W (183905)	(10) HR1358A	WFC3/UVIS, ACCUM, UVIS	F336W	CR-SPLIT=2			20 Secs *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
2	HR1358-WFC3-F275W (202844)	(10) HR1358A	WFC3/UVIS, ACCUM, UVIS	F275W	CR-SPLIT=2			15 Secs *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3	HR1358-WFC3-F218W (202843)	(10) HR1358A	WFC3/UVIS, ACCUM, UVIS	F218W	CR-SPLIT=2			10 Secs *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20120604
GS Acq
Exp. 1, split 1
Exp. 1, split 2
Exp. 2, split 1
Exp. 2, split 2
Exp. 3, split 1
Exp. 3, split 2
Unused Visibility = 8.10
Overhead
Overhead
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12606, Visit 08, scheduling Fri Jun 15 01:08:02 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: PCS MODE FINE; SCHED 70%; ORIENT 333D TO 349 D; ORIENT 153D TO 169 D

Comments: HR 1358 STIS observation
Acquire bright star. Blind offset to faint companion. Obtain spectra in G750M and G430L/
ORIENT specification is to place slit perpendicular to line joining the two stars.

Patterns

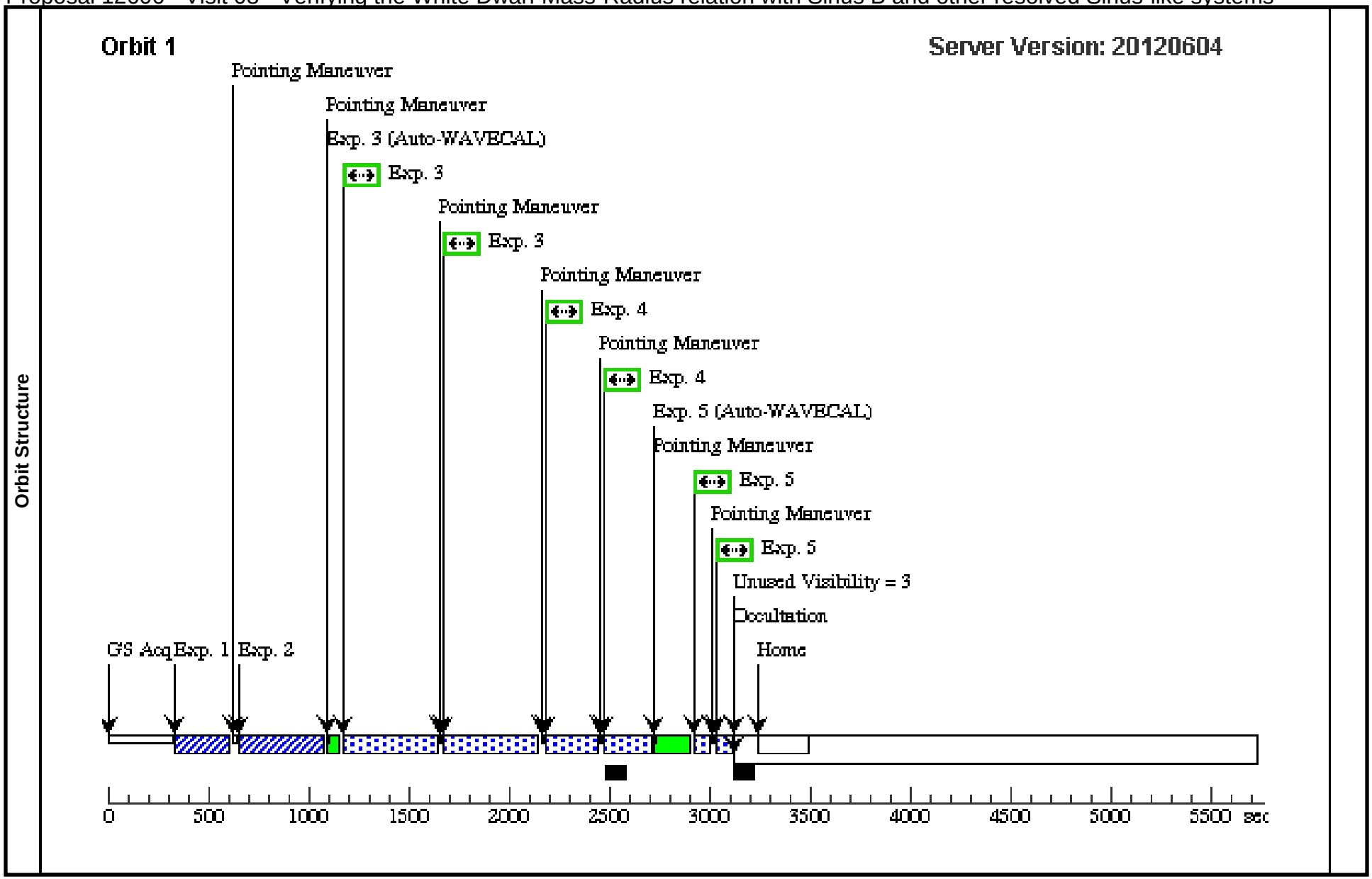
#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.40624	Center Pattern=true		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	HR1358B	Offset from HR1358A by		V=14.5	Offset Position (HR1358B)
	Alt Name1: HD27483B	RA Offset: 0.03573 Secs			Reference Frame: ICRS
	Alt Name2: WD0418+137	Dec Offset: 1.0669 Arcsec			
	Comments: The offsets were updated on 2/16/12, based on measurements of a direct WFC3 image obtained in November 2011. -- CoI H. E. Bond				
(10)	HR1358A	RA: 04 20 52.7200 (65.2196667d)	Proper Motion RA: 104.25 mas/yr	V=6.2	Reference Frame: ICRS
	Alt Name1: NA01007297	Dec: +13 51 51.94 (13.86443d)	Proper Motion Dec: -18.07 mas/yr		
	Alt Name2: HD27483	Equinox: J2000	Parallax: 0.021"		
			Epoch of Position: 2000		

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	HR1358A acq (183998)	(10) HR1358A	STIS/CCD, ACQ, F28X50OIII	MIRROR	ACQTYPE=POINT			0.5 Secs *[==>]*	***[1]***
2	HR 1358A acq/peak	(10) HR1358A	STIS/CCD, ACQ/PEAK, 52X0.05E1	G750M 6581 A				1 Secs *[==>]*	***[1]***
3	HR1358B-STIS-G750M (183888)	(5) HR1358B	STIS/CCD, ACCUM, 52X0.05E1	G750M 6581 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 3-3 in Visit 08 (3)	500 Secs *[==>437.0 Secs (Pattern 1)]* *[==>437.0 Secs (Pattern 2)]*	***[1]***
4	HR1358B-STIS-G750M (183888)	(5) HR1358B	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 4-4 in Visit 08 (3)	200 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5	HR1358B STIS-G430L (183889)	(5) HR1358B	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; GAIN=1		Pattern 3, Exps 5-5 in Visit 08 (3)	40 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***


Orbit 1
Server Version: 20120604
Orbit Structure
Pointing Maneuver
Pointing Maneuver
Exp. 3 (Auto-WAVECAL)
Exp. 3
Pointing Maneuver
Exp. 3
Pointing Maneuver
Exp. 4
Pointing Maneuver
Exp. 4
Exp. 5 (Auto-WAVECAL)
Pointing Maneuver
Exp. 5
Pointing Maneuver
Exp. 5
Unused Visibility = 3
Occultation
Home
GS Acq
Exp. 1
Exp. 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Proposal 12606 - Visit 09 - Verifying the White Dwarf Mass-Radius relation with Sirius B and other resolved Sirius-like systems

Visit

Proposal 12606, Visit 09, completed Fri Jun 15 01:08:03 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 53.6D TO 130 D; ORIENT 143.6D TO 170.8 D; ORIENT 192.8D TO 220 D; ORIENT 233.6D TO 310 D; ORIENT 323.6D TO 350.8 D; ORIENT 12.8D TO 40 D

Comments: HD 2133
Imaging in 3 filters with WFC3.
Filters are F336W, F275W, F218W

ORIENTs are specified to place companion away from diffraction spikes from primary

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=true		(1-6)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(7)	HD2133A	RA: 00 24 41.2150 (6.1717292d) Dec: -74 14 4.40 (-74.23456d) Equinox: J2000	Proper Motion RA: 2.82 mas/yr Proper Motion Dec: -12.79 mas/yr Parallax: 0.00732" Epoch of Position: 2000.0	V=9.62	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(7) HD2133A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F218W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 09 (1)	10 Secs	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
2		(7) HD2133A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F218W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 09 (1)	25 Secs X 3	
								[==>(Pattern 1, Copy 1)]	***[1]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 1, Copy 3)]	
								[==>(Pattern 2, Copy 1)]	
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 2, Copy 3)]	
								[==>(Pattern 3, Copy 1)]	
								[==>(Pattern 3, Copy 2)]	
								[==>(Pattern 3, Copy 3)]	
								[==>(Pattern 4, Copy 1)]	
								[==>(Pattern 4, Copy 2)]	
								[==>(Pattern 4, Copy 3)]	
3		(7) HD2133A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F275W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 09 (1)	2 Secs	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
4		(7) HD2133A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F275W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 09 (1)	15 Secs X 3	
								[==>(Pattern 1, Copy 1)]	***[1]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 1, Copy 3)]	
								[==>(Pattern 2, Copy 1)]	
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 2, Copy 3)]	
								[==>(Pattern 3, Copy 1)]	
								[==>(Pattern 3, Copy 2)]	
								[==>(Pattern 3, Copy 3)]	
								[==>(Pattern 4, Copy 1)]	
								[==>(Pattern 4, Copy 2)]	
								[==>(Pattern 4, Copy 3)]	
5		(7) HD2133A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO		Pattern 1, Exps 1-6 in Visit 09 (1)	0.5 Secs	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	

	6	(7) HD2133A	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO	Pattern 1, Exps 1-6 in Visit 09 (1)	10 Secs X 2 *[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]*	 ***[1]***

Orbit Structure