11301 - Dynamical Masses and Radii of Four White Dwarf Stars

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Edmund Nelan (PI)	**Space Telescope Science Institute**	
Mr. Russell Makidon (CoI)	Space Telescope Science Institute	
Dr. Howard E. Bond (CoI)	Space Telescope Science Institute	bond@stsci.edu
Dr. Gail Schaefer (CoI)	Space Telescope Science Institute	gschaefer@stsci.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) WD1639+153 (2) WD1639-REF1 (3) WD1639-REF2 (4) WD1639-REF3 (7) WD1639-REF7	FGS	1	18-Jan-2008 05:38:40.0	yes
02	(1) WD1639+153 (2) WD1639-REF1 (3) WD1639-REF2 (4) WD1639-REF3 (7) WD1639-REF7	FGS	1	18-Jan-2008 05:38:47.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(8) WD1818+126 (9) WD1818-GSC1-REF1 (10) WD1818-GSC1-REF2 (11) WD1818-GSC1-REF3 (12) WD1818-GSC2-REF1 (13) WD1818-GSC2-REF2 (14) WD1818-GSC2-REF3 (15) WD1818-GSC2-REF4	FGS	1	18-Jan-2008 05:38:53.0	yes

3 Total Orbits Used

ABSTRACT

This proposal uses the FGS1r in TRANS mode to resolve a pair of double degenerate binary systems (WD1639+153 and WD 1818+26) in order to determine their orbital elements. In addition, the binaries and several nearby field stars are observed by FGS1r in POS mode to establish the local inertial reference frame of each binary, as well as its parallax and proper motion. This will allow for a direct measurement of the distance and radius of each of the four WD stars. When combined with the orbital elements, this leads to a dynamical mass measurement for each WD, and a four calibration points of the WD mass-radius relation.

OBSERVING DESCRIPTION

We will use FGS1r in its high angular resolution observing mode (TRANS) to resolve the white dwarf binary systems. Each exposure will be comprised of about 20 scans. The interferograms derived from each scan will be cross-correlated and co-added to yield a high SNR. To further surpress the noise (these targets are near the FGS's faint limiting magnitude), the co-added inteferograms will be carefully smoothed by being represented as a piece-wise smooth segmanted polynomial. These observations will yield the separation and position angle of the binary components, as well as the brightness of each. In addition, the binary and field stars simultaneously in the FGS FOV will be observed in POS mode to accurately determine the relative positions of the stars. This will facilitate the construction of an inertial reference frame for the binary, thereby allowing the relative orbit that will be ultimately determined from the TRANS data to be converted into a physical orbit. This will allow us to

determine the relative mass of each white dwarf in the binarty system. In addition, the POS mode data will give the proper motion and parallax of the binary, which will allow us to compute the mass and radius of each white dwarf.

ADDITIONAL COMMENTS

The observations should be scheduled to occur at times of maximum parallax factor to allow us to determine the distance to each of these two white dwarf binary systems.

Visit

Proposal 11301, Visit 01, implementation Fri Jan 18 10:38:57 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: FGS

Special Requirements: PCS MODE FINE; SCHED 70%; ORIENT 309.0D TO 310.0 D; BETWEEN 19-JAN-2008:00:00:00 AND 22-JAN-2008:00:00:00

Diagnostics

(Visit 01) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
(Visit 01) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
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(Visit 01) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
(Visit 01) Warning (OP): SHORT FGS SCAN LENGTH MAY SIGNAL PROBLEMS
(Visit 01) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
(Visit 01) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA

Fixed Targets

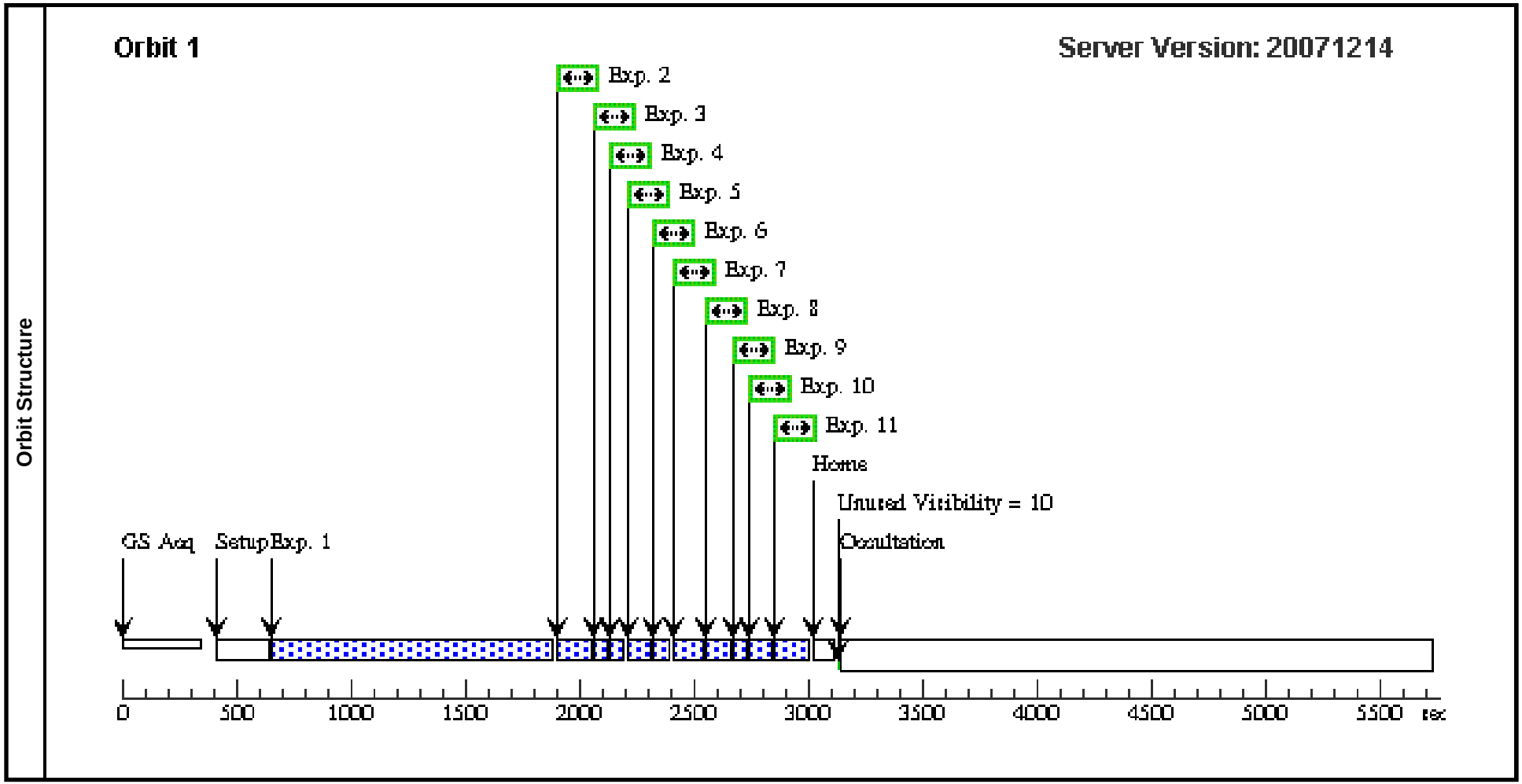
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD1639+153	RA: 16 41 36.7000 (250.4029167d) Dec: +15 12 36.38 (15.21011d) Equinox: J2000	Proper Motion RA: 0.005s/yr Proper Motion Dec: -0.736"/yr Parallax: 0" Epoch of Position: 2000	V=15.7+/-0.1	Reference Frame: HST CYCLE 10 OBSERVATIONS
(2)	WD1639-REF1 Alt Name1: GSC1520.00549	RA: 16 41 39.6000 (250.4150000d) Dec: +15 12 1.87 (15.20052d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=10.73+/-0.1	Reference Frame: ICRS
(3)	WD1639-REF2 Alt Name1: GSC1520.00514	RA: 16 41 54.1000 (250.4754167d) Dec: +15 11 19.20 (15.18867d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=12.1+/-0.1	Reference Frame: ICRS
(4)	WD1639-REF3 Alt Name1: GSC1520.00496	RA: 16 41 49.1300 (250.4547083d) Dec: +15 11 1.97 (15.18388d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=14.69+/-0	Reference Frame: ICRS
(7)	WD1639-REF7 Alt Name1: GSC1520.00612	RA: 16 41 25.9400 (250.3580833d) Dec: +15 15 44.39 (15.26233d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=13.26+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	1	(1) WD1639+153	FGS, TRANS, 1	F583W	STEP-SIZE=0.5; SCANS=25		Sequence 1-11 Non-Int	820.0 Secs *[==>]*	 ***[1]***
2	2	(1) WD1639+153	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	20.0 Secs *[==>]*	 ***[1]***
3	3	(2) WD1639-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs *[==>]*	 ***[1]***
4	4	(3) WD1639-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs *[==>]*	 ***[1]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
5	5	(7) WD1639-REF7	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
6	7	(2) WD1639-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
7	8	(1) WD1639+153	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	20.0 Secs	
								[==>]	***[1]***
8	9	(4) WD1639-REF3	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
9	10	(3) WD1639-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
10	11	(7) WD1639-REF7	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
11	12	(1) WD1639+153	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	20.0 Secs	
								[==>]	***[1]***


Orbit Structure
Orbit 1
Server Version: 20071214
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Exp. 6
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Exp. 11
Home
Unused Vitibility = 10
GS Acq
Setup
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11301, Visit 02, implementation Fri Jan 18 10:38:58 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: FGS

Special Requirements: PCS MODE FINE; SCHED 70%; ORIENT 292.0D TO 292.0 D; BETWEEN 28-FEB-2008:00:00:00 AND 04-MAR-2008:00:00:00

Diagnostics

(Visit 02) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
(Visit 02) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
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(Visit 02) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA
(Visit 02) Warning (OP): SHORT FGS SCAN LENGTH MAY SIGNAL PROBLEMS
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(Visit 02) Warning (OP): FGS EXPOSURE TOO SHORT TO GUARANTEE SCIENCE DATA

Fixed Targets

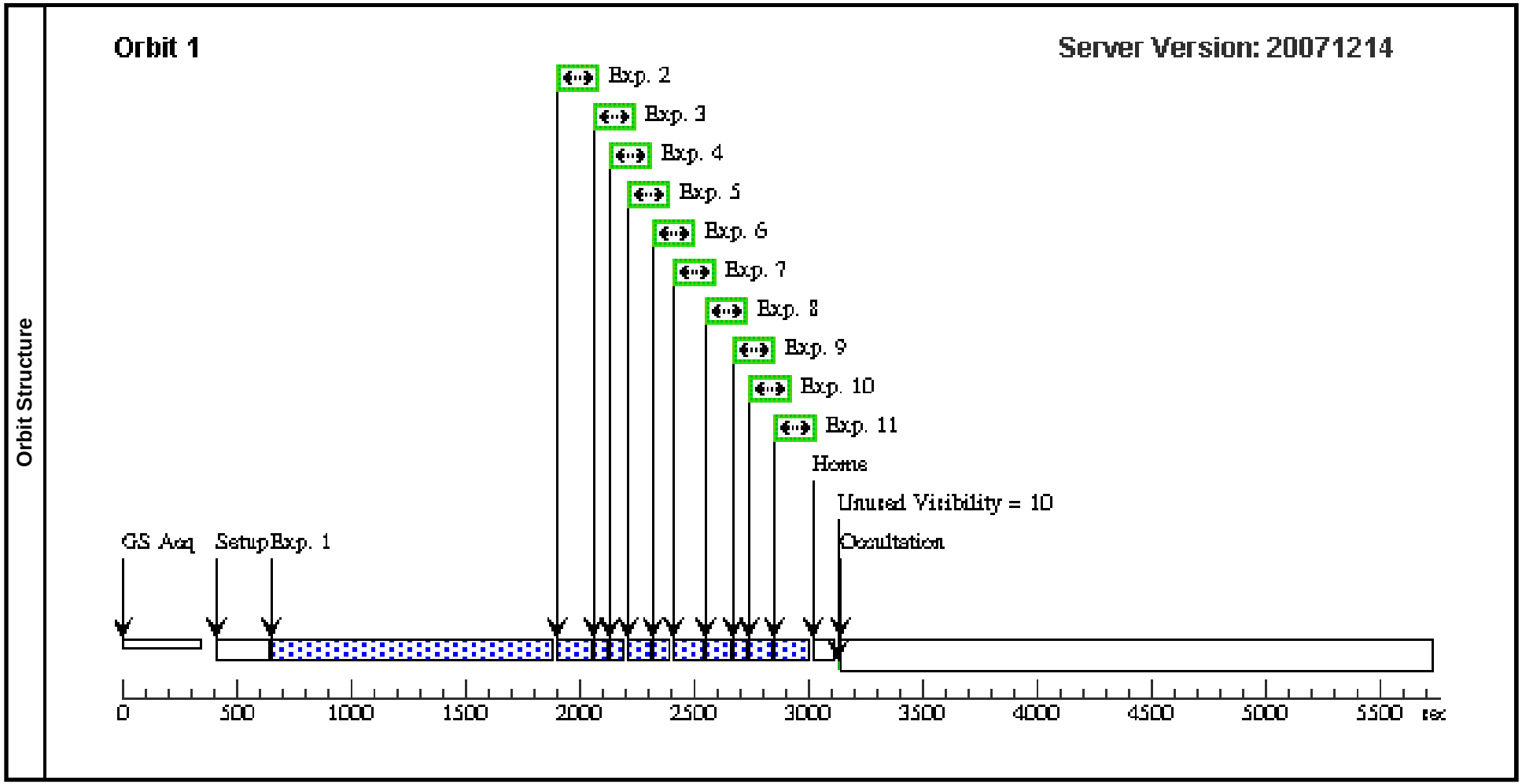
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD1639+153	RA: 16 41 36.7000 (250.4029167d) Dec: +15 12 36.38 (15.21011d) Equinox: J2000	Proper Motion RA: 0.005s/yr Proper Motion Dec: -0.736"/yr Parallax: 0" Epoch of Position: 2000	V=15.7+/-0.1	Reference Frame: HST CYCLE 10 OBSERVATIONS
(2)	WD1639-REF1 Alt Name1: GSC1520.00549	RA: 16 41 39.6000 (250.4150000d) Dec: +15 12 1.87 (15.20052d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=10.73+/-0.1	Reference Frame: ICRS
(3)	WD1639-REF2 Alt Name1: GSC1520.00514	RA: 16 41 54.1000 (250.4754167d) Dec: +15 11 19.20 (15.18867d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=12.1+/-0.1	Reference Frame: ICRS
(4)	WD1639-REF3 Alt Name1: GSC1520.00496	RA: 16 41 49.1300 (250.4547083d) Dec: +15 11 1.97 (15.18388d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=14.69+/-0	Reference Frame: ICRS
(7)	WD1639-REF7 Alt Name1: GSC1520.00612	RA: 16 41 25.9400 (250.3580833d) Dec: +15 15 44.39 (15.26233d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=13.26+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	1	(1) WD1639+153	FGS, TRANS, 1	F583W	STEP-SIZE=0.5; SCANS=25		Sequence 1-11 Non-Int	820.0 Secs *[==>]*	 ***[1]***
2	2	(1) WD1639+153	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	20.0 Secs *[==>]*	 ***[1]***
3	3	(2) WD1639-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs *[==>]*	 ***[1]***
4	4	(3) WD1639-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs *[==>]*	 ***[1]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
5	5	(7) WD1639-REF7	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
6	6	(2) WD1639-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
7	7	(1) WD1639+153	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	20.0 Secs	
								[==>]	***[1]***
8	8	(4) WD1639-REF3	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
9	9	(3) WD1639-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
10	9	(7) WD1639-REF7	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	5.0 Secs	
								[==>]	***[1]***
11	9	(1) WD1639+153	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-11 Non-Int	20.0 Secs	
								[==>]	***[1]***


Orbit 1
Server Version: 20071214
Orbit Structure
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Exp. 6
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Exp. 11
Home
Unused Vitibility = 10
GS Acq
Setup
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11301, Visit 03, implementation Fri Jan 18 10:38:59 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: FGS

Special Requirements: PCS MODE FINE; SCHED 70%; ORIENT 255.0D TO 255.0 D; BETWEEN 27-MAR-2008:00:00:00 AND 01-APR-2008:00:00:00

Diagnostics

(Visit 03) Warning (OP): SHORT FGS SCAN LENGTH MAY SIGNAL PROBLEMS

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(8)	WD1818+126	RA: 18 20 30.8800 (275.1286667d) Dec: +12 39 17.70 (12.65492d) Equinox: J2000	Proper Motion RA: 0.007s/yr Proper Motion Dec: 0.271"/yr Parallax: 0" Epoch of Position: 2000	V=16.06+/-0.1	Reference Frame: HST CYCLE 10 PROPOSAL
(9)	WD1818-GSC1-REF1 Alt Name1: GSC1018.02189	RA: 18 20 23.6700 (275.0986250d) Dec: +12 39 43.80 (12.66217d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=10.92+/-0.2	Reference Frame: ICRS
(10)	WD1818-GSC1-REF2 Alt Name1: GSC1018.02278	RA: 18 20 26.3600 (275.1098333d) Dec: +12 39 25.20 (12.65700d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=12.7+/-0.2	Reference Frame: ICRS
(11)	WD1818-GSC1-REF3 Alt Name1: GSC1018.01251	RA: 18 20 31.9700 (275.1332083d) Dec: +12 38 48.12 (12.64670d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=12.97+/-0.2	Reference Frame: ICRS
(12)	WD1818-GSC2-REF1 Alt Name1: N020230030828	RA: 18 20 33.8600 (275.1410833d) Dec: +12 39 5.56 (12.65154d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=14.23+/-0.2	Reference Frame: ICRS
Comments: position and magnitude from GSC2, using Kriss & Stys color transformations.					
(13)	WD1818-GSC2-REF2 Alt Name1: N020230030566	RA: 18 20 35.3400 (275.1472500d) Dec: +12 38 50.74 (12.64743d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=14.49+/-0.2	Reference Frame: ICRS
Comments: position and magnitude from GSC2, using Kriss & Stys color transformations					
(14)	WD1818-GSC2-REF3 Alt Name1: N020230031910	RA: 18 20 33.6100 (275.1400417d) Dec: +12 40 16.29 (12.67119d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=14.43+/-0.3	Reference Frame: ICRS
Comments: position and magnitude from GSC2, using Kriss & Stys color transformation					

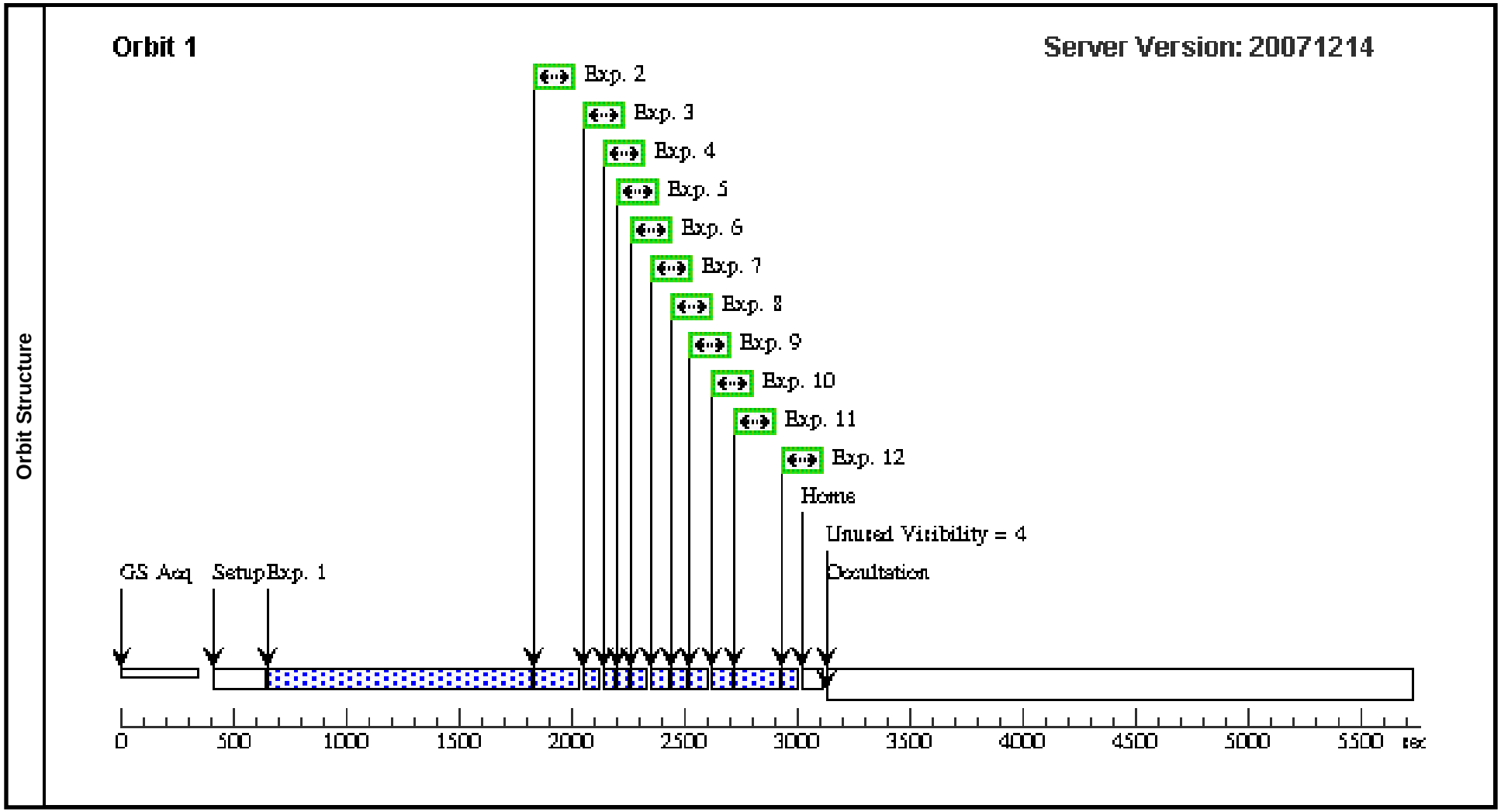
Fixed Targets (continued)

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(15)	WD1818-GSC2-REF4 Alt Name1: N020230031978	RA: 18 20 29.4800 (275.1228333d) Dec: +12 40 21.03 (12.67251d) Equinox: J2000	Parallax: 0" Epoch of Position:	V=15.01+/-0.2	Reference Frame: ICRS

Comments: position and magnitude from GSC2, color transformation using Kriss & Stys

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	1	(8) WD1818+126	FGS, TRANS, 1	F583W	STEP-SIZE=0.4; SCANS=20	POS TARG 0.0,0.0	Sequence 1-12 Non-Int	830.0 Secs *[==>]*	 ***[1]***
2	2	(8) WD1818+126	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	25.0 Secs *[==>]*	 ***[1]***
3	3	(9) WD1818-GSC1-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	10.0 Secs *[==>]*	 ***[1]***
4	4	(10) WD1818-GSC1-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	10.0 Secs *[==>]*	 ***[1]***
5	5	(11) WD1818-GSC1-REF3	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	10.0 Secs *[==>]*	 ***[1]***
6	6	(12) WD1818-GSC2-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	15.0 Secs *[==>]*	 ***[1]***
7	7	(13) WD1818-GSC2-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	15.0 Secs *[==>]*	 ***[1]***
8	8	(10) WD1818-GSC1-REF2	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	10.0 Secs *[==>]*	 ***[1]***
9	9	(14) WD1818-GSC2-REF3	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	15.0 Secs *[==>]*	 ***[1]***
10	10	(15) WD1818-GSC2-REF4	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	15.0 Secs *[==>]*	 ***[1]***
11	11	(8) WD1818+126	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	25.0 Secs *[==>]*	 ***[1]***
12	12	(9) WD1818-GSC1-REF1	FGS, POS, 1	F583W		SAME POS AS 1	Sequence 1-12 Non-Int	10.0 Secs *[==>]*	 ***[1]***


Orbit 1
Server Version: 20071214
Orbit Structure
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Exp. 6
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Exp. 11
Exp. 12
Home
Unused Vitibility = 4
Occultation
GS Acq
Setup
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec