10824 - Measuring the Shape and Orientation of the Galactic Dark-Matter Halo using Hypervelocity Stars

Cycle: 15, Proposal Category: GO

(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) SDSSJ090745.0+024507	ACS/WFC	1	13-Oct-2006 21:00:53.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
02	(2) SDSSJ093320.86+441705.4	ACS/WFC	1	13-Oct-2006 21:00:59.0	yes
03	(3) HE0437-5439	ACS/WFC	1	13-Oct-2006 21:01:05.0	yes
04	(4) SDSSJ091301.0+305120	ACS/WFC	1	13-Oct-2006 21:01:09.0	yes
54	(4) SDSSJ091301.0+305120	ACS/WFC	1	13-Oct-2006 21:01:14.0	yes
05	(5) SDSSJ091759.5+672238	ACS/WFC	1	13-Oct-2006 21:01:21.0	yes

6 Total Orbits Used

ABSTRACT

We propose to obtain high-resolution images of five hypervelocity stars in the Galactic halo in order to establish the first-epoch astrometric frame for them, as a part of a long-term program to measure precise proper motions. The origin of these recently discovered stars, all with positive radial velocities above 540 km/s, is consistent only with being ejected from the deep potential well of the massive black hole at the Galactic center. The deviations of their space motions from purely radial trajectories probe the departures from spherical symmetry of the Galactic potential, mainly due to the triaxiality of the dark-matter halo. Reconstructing the full three-dimensional space motion of the hypervelocity stars, through astrometric proper motions, provides a unique opportunity to measure the shape and orientation of the dark halo. The hypervelocity stars allow measurement of the potential up to 75 kpc from the center, independently of and at larger distances than are afforded by tidal streams of satellite galaxies such as the Sagittarius dSph galaxy. HVS3 may be associated with the LMC, rather then the Galactic center, and would therefore present a case for a supermassive black hole at the center of the LMC. We request one orbit with ACS/WFC for each of the five hypervelocity stars to establish their current positions relative to background galaxies. We will request a repeated observation of these stars in Cycle 17, which will conclusively measure the astrometric proper motions.

OBSERVING DESCRIPTION

In this program we are obtaining first-epoch images of 5 hypervelocity stars. The aim is to measure their proper motions against the reference frame of background galaxies.

Each target will be centered either in the middle of WFC1, or for the brightest targets we will reduce overheads by using the subraster WFC1-2K. The targets will be observed either in F814W or F850LP, which appear to be better filters than the F606W mentioned in the original proposal. The reason is that the crucial background galaxies will give a better S/N at longer wavelengths, according to the ACS ETC. For each target we will take the maximum number of exposures possible in one orbit, with appropriate dithering. Exposures are chosen for each target to be no more than 70% of saturation on the target star.

Visit

Proposal 10824, Visit 01, completed Sat Oct 14 01:01:23 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BEFORE 01-NOV-2006:00:00:00

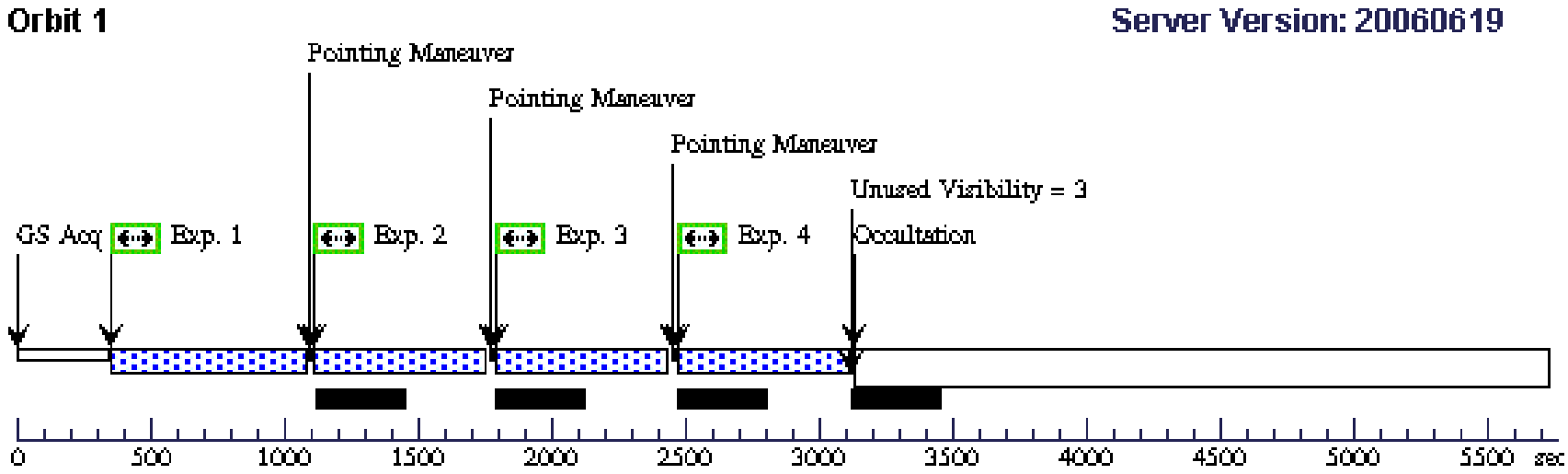
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ090745.0+024507 Alt Name1: HVS1	RA: 09 07 44.9900 (136.9374583d) Dec: +02 45 6.40 (2.75178d) Equinox: J2000		V=19.96+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SDSSJ090745.0+024507	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO			520.0 Secs *[==>522.0 Secs]*	 ***[1]***
2		(1) SDSSJ090745.0+024507	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.25073, 0.54151		520.0 Secs *[==>522.0 Secs]*	 ***[1]***
3		(1) SDSSJ090745.0+024507	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.52487, 0.7861		520.0 Secs *[==>522.0 Secs]*	 ***[1]***
4		(1) SDSSJ090745.0+024507	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.7713,0.33176		520.0 Secs *[==>522.0 Secs]*	 ***[1]***

Orbit Structure



Visit

Proposal 10824, Visit 02, completed Sat Oct 14 01:01:24 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BEFORE 20-OCT-2006:00:00:00

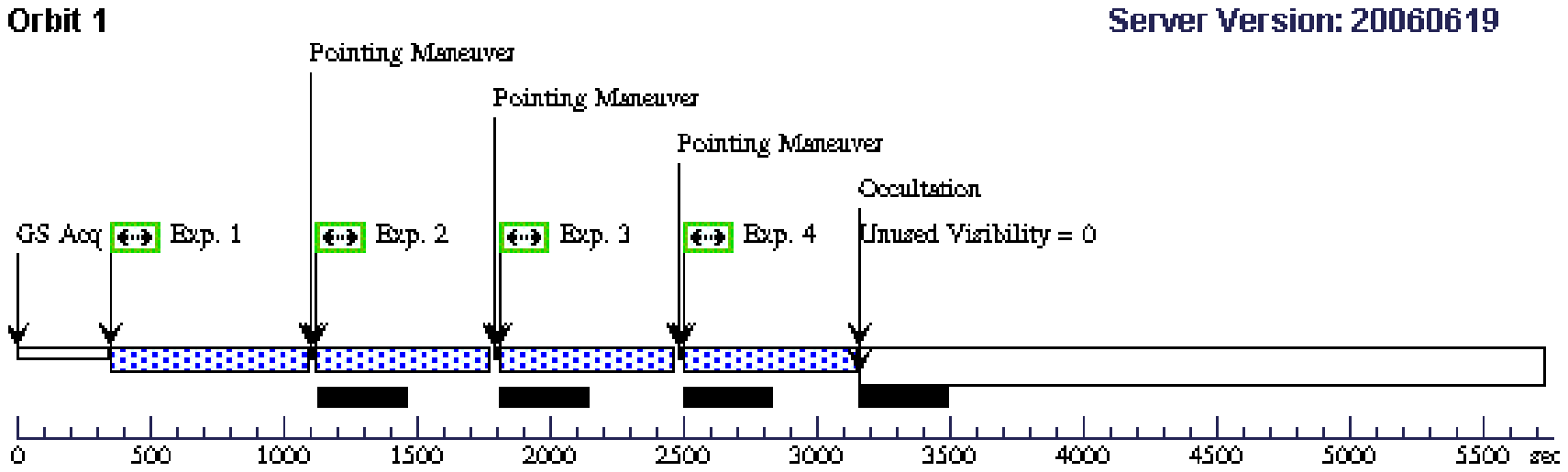
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDSSJ093320.86+441705.4 Alt Name1: HVS2 Alt Name2: US708	RA: 09 33 20.8800 (143.3370000d) Dec: +44 17 5.50 (44.28486d) Equinox: J2000		V=19.0+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) SDSSJ093320.86+441705.4	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO			520.0 Secs *[==>532.0 Secs]*	 ***[1]***
2		(2) SDSSJ093320.86+441705.4	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.25073, 0.54151		520.0 Secs *[==>532.0 Secs]*	 ***[1]***
3		(2) SDSSJ093320.86+441705.4	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.52487, 0.7861		520.0 Secs *[==>532.0 Secs]*	 ***[1]***
4		(2) SDSSJ093320.86+441705.4	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.7713,0.33176		520.0 Secs *[==>532.0 Secs]*	 ***[1]***

Orbit Structure



Visit

Proposal 10824, Visit 03, completed Sat Oct 14 01:01:25 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

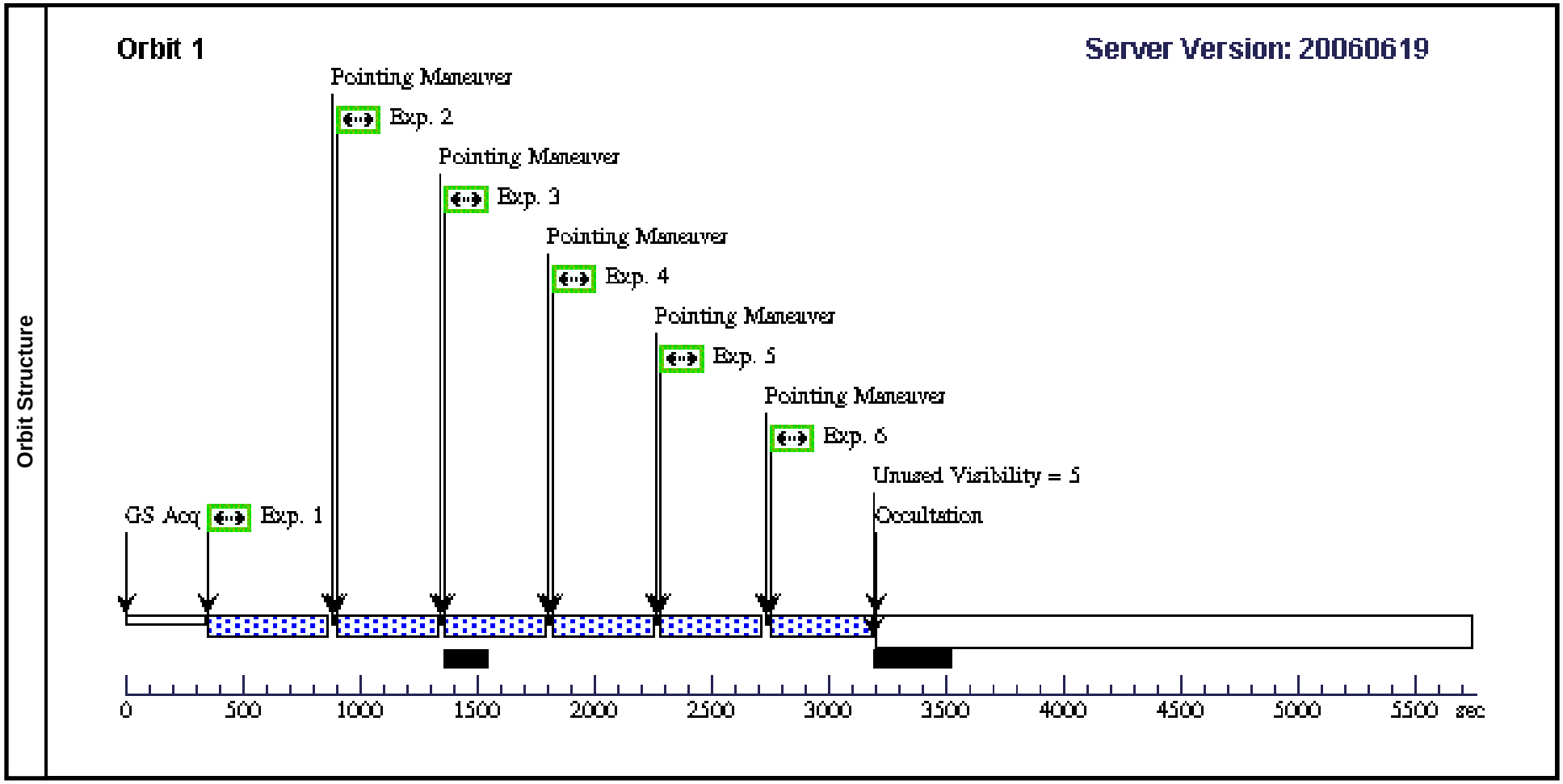
Special Requirements: BEFORE 20-JUL-2006:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	HE0437-5439 Alt Name1: HVS3	RA: 04 38 12.7700 (69.5532083d) Dec: -54 33 11.80 (-54.55328d) Equinox: J2000		V=16.2+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(3) HE0437-5439	ACS/WFC, ACCUM, WFC1-2K	F850LP	CR-SPLIT=NO			255.0 Secs	
								[==>257.0 Secs]	***[1]***
2		(3) HE0437-5439	ACS/WFC, ACCUM, WFC1-2K	F850LP	CR-SPLIT=NO	POS TARG 0.29815, 0.0473		255.0 Secs	
								[==>257.0 Secs]	***[1]***
3		(3) HE0437-5439	ACS/WFC, ACCUM, WFC1-2K	F850LP	CR-SPLIT=NO	POS TARG 0.6127,0 .04604		255.0 Secs	
								[==>257.0 Secs]	***[1]***
4		(3) HE0437-5439	ACS/WFC, ACCUM, WFC1-2K	F850LP	CR-SPLIT=NO	POS TARG 0.16794, 0.53528		255.0 Secs	
								[==>257.0 Secs]	***[1]***
5		(3) HE0437-5439	ACS/WFC, ACCUM, WFC1-2K	F850LP	CR-SPLIT=NO	POS TARG 0.48231, 0.53404		255.0 Secs	
								[==>257.0 Secs]	***[1]***
6		(3) HE0437-5439	ACS/WFC, ACCUM, WFC1-2K	F850LP	CR-SPLIT=NO	POS TARG 0.78064, 0.58136		255.0 Secs	
								[==>257.0 Secs]	***[1]***


Orbit Structure
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Server Version: 20060619
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 3
Pointing Maneuver
Exp. 4
Pointing Maneuver
Exp. 5
Pointing Maneuver
Exp. 6
Unused Visibility = 5
Occultation
GS Acq
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10824, Visit 04, failed Sat Oct 14 01:01:25 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

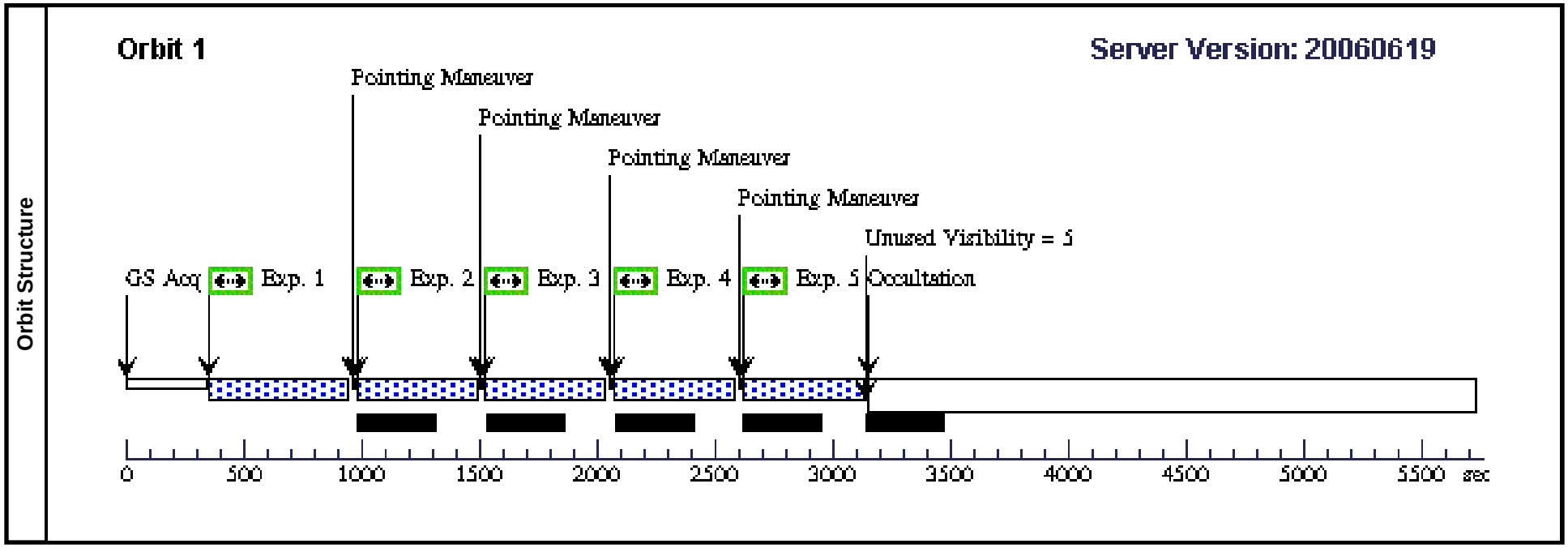
Special Requirements: BEFORE 23-OCT-2006:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	SDSSJ091301.0+305120 Alt Name1: HVS4	RA: 09 13 1.0000 (138.2541667d) Dec: +30 51 20.20 (30.85561d) Equinox: J2000		V=18.59+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO			390.0 Secs *[==>]*	 ***[1]***
2		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.26063, 0.53727		390.0 Secs *[==>]*	 ***[1]***
3		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.5212,1.07448		390.0 Secs *[==>]*	 ***[1]***
4		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.77839, 0.81512		390.0 Secs *[==>]*	 ***[1]***
5		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 1.03448, 0.35651		390.0 Secs *[==>]*	 ***[1]***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Pointing Maneuver
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Pointing Maneuver
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GS Acq
Exp. 1
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Occultation
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10824, Visit 54 Sat Oct 14 01:01:26 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

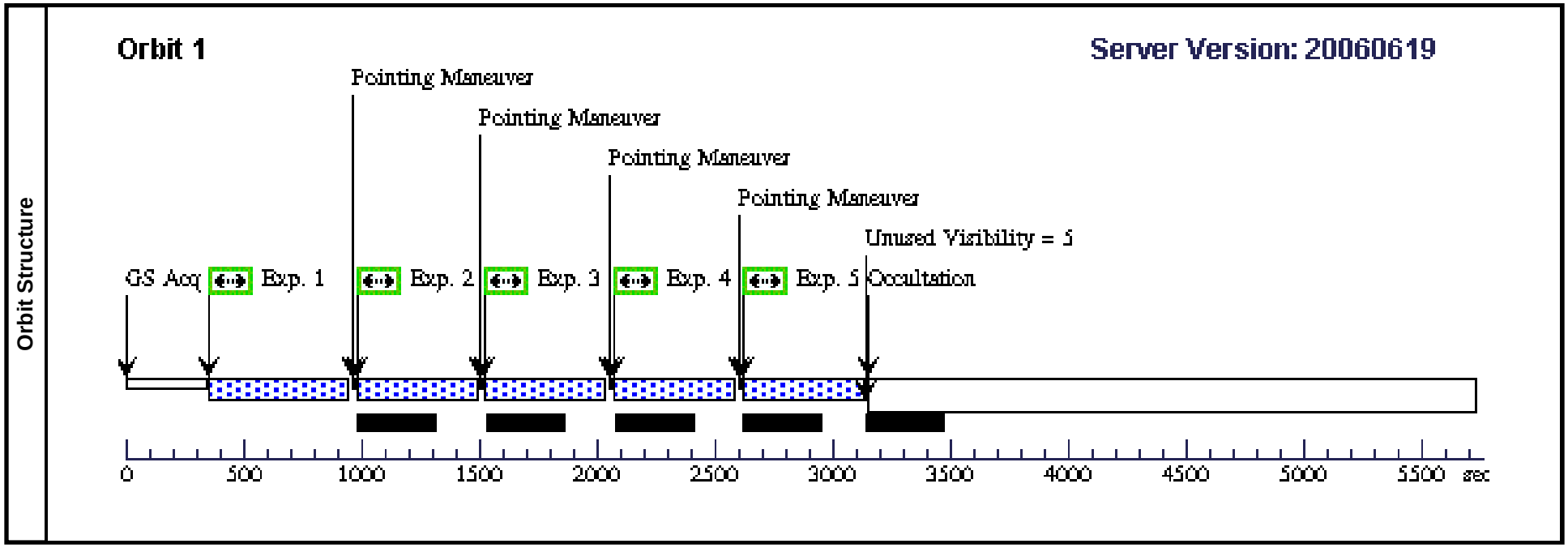
Special Requirements: BEFORE 23-NOV-2006:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	SDSSJ091301.0+305120 Alt Name1: HVS4	RA: 09 13 1.0000 (138.2541667d) Dec: +30 51 20.20 (30.85561d) Equinox: J2000		V=18.59+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO			390.0 Secs *[==>]*	 ***[1]***
2		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.26063, 0.53727		390.0 Secs *[==>]*	 ***[1]***
3		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.5212,1.07448		390.0 Secs *[==>]*	 ***[1]***
4		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 0.77839, 0.81512		390.0 Secs *[==>]*	 ***[1]***
5		(4) SDSSJ091301.0+305120	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO	POS TARG 1.03448, 0.35651		390.0 Secs *[==>]*	 ***[1]***


Orbit Structure
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Server Version: 20060619
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 5
GS Acq
Exp. 1
Exp. 2
Exp. 3
Exp. 4
Exp. 5
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10824, Visit 05, completed Sat Oct 14 01:01:27 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

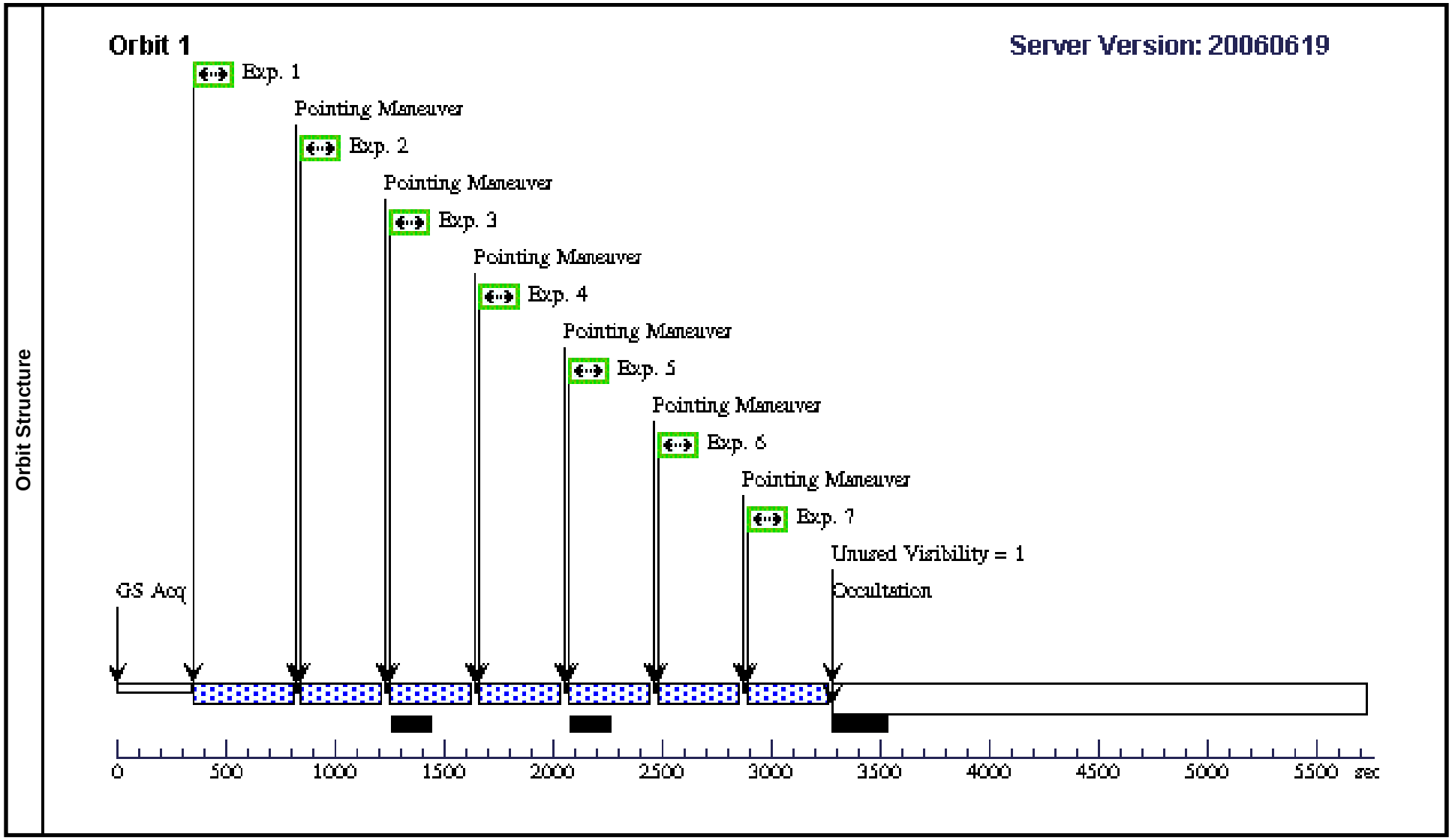
Special Requirements: BEFORE 20-SEP-2006:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	SDSSJ091759.5+672238 Alt Name1: HVS5	RA: 09 17 59.5500 (139.4981250d) Dec: +67 22 38.80 (67.37744d) Equinox: J2000		V=18.09+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO			195.0 Secs *[==>199.0 Secs]*	 ***[1]***
2		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO	POS TARG 0.30527, 0.05137		195.0 Secs *[==>199.0 Secs]*	 ***[1]***
3		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO	POS TARG 0.6104,0.05299		195.0 Secs *[==>199.0 Secs]*	 ***[1]***
4		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO	POS TARG 0.1727,0.5321		195.0 Secs *[==>199.0 Secs]*	 ***[1]***
5		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO	POS TARG 0.47775, 0.56923		195.0 Secs *[==>199.0 Secs]*	 ***[1]***
6		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO	POS TARG 0.7831,0.59932		195.0 Secs *[==>199.0 Secs]*	 ***[1]***
7		(5) SDSSJ091759.5+672238	ACS/WFC, ACCUM, WFC1-2K	F814W	CR-SPLIT=NO	POS TARG 0.93792, 0.33363		195.0 Secs *[==>199.0 Secs]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20060619
Exp. 1
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 3
Pointing Maneuver
Exp. 4
Pointing Maneuver
Exp. 5
Pointing Maneuver
Exp. 6
Pointing Maneuver
Exp. 7
Unused Visibility = 1
GS Acq
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec