10803 - Detecting the progenitors of core-collapse supernovae

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) SN1999GA	ACS/WFC	2	17-Jan-2008 14:39:39.0	yes
02	(2) SN2006MY	ACS/HRC	2	17-Jan-2008 14:39:48.0	yes
03	(2) SN2006MY	WFPC2	2	17-Jan-2008 14:39:52.0	yes
04	(4) SN2007ZZ	ACS/HRC	1	17-Jan-2008 14:39:55.0	yes

7 Total Orbits Used

ABSTRACT

Modern supernova searches in the nearby Universe are discovering large numbers of SNe which have massive star progenitors (Types II, Ib and Ic). The extensive HST image archive within ~20Mpc enables the indvidual bright stellar content of starforming galaxies to be resolved. As massive, evolved stars are the most luminous single objects in a galaxy, the progenitors of core-collapse SNe are often directly detectable on pre-explosion archive images. We have discovered three progenitors of recent type II-Plateau SNe, showing them to be red supergiants of 8-12 solar masses. This is the first direct evidence that red supergiants do indeed produce normal type II explosions. We have set upper mass limits on a further 7 progenitor stars and suggest that faint type II supernovae are unlikely to come from the collapse of very massive stars which form black holes. These discoveries are providing strong constraints on theoretical models of pre-supernova evolution, explosion models and the origin of the supernova types. We request time to continue this successful project and require ACS observations of future SNe which are discovered in galaxies closer than 20Mpc and which have pre-explosion HST archive images available. This will allow the SNe to be precisely positioned on the pre-explosion images. We have set a final goal for this project of determining masses and types, or setting restrictive mass-limits, for 30 supernovae over the remainder of HST's project life.

OBSERVING DESCRIPTION

We will image future nearby supernovae with ACS, using either the HRC or the WFC. Supernovae will only be observed if there is pre-explosion HST imaging in more than one filter available, and if the supernova is a core-collapse, and if it is within approximately 20Mpc.

The goal of the programme is to identify the massive star progenitors of supernovae in HST archive images. To do this we need precise differential astrometry between the before and after. The images in this proposal will provide the astrometry of the supernova for comparison with pre-explosion images.

This is a ToO programme, in which we cannot specify targets for the Phase II deadline, but will trigger on suitable objects as the Cycle progresses.

Generally we can plan well in advance, and not disrupt the HST schedule.

Visit

Proposal 10803, Visit 01, completed Thu Jan 17 19:40:00 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BEFORE 31-DEC-2006:00:00:00

Comments: ToO Trigger

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false		(1)
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false		(2), (3)

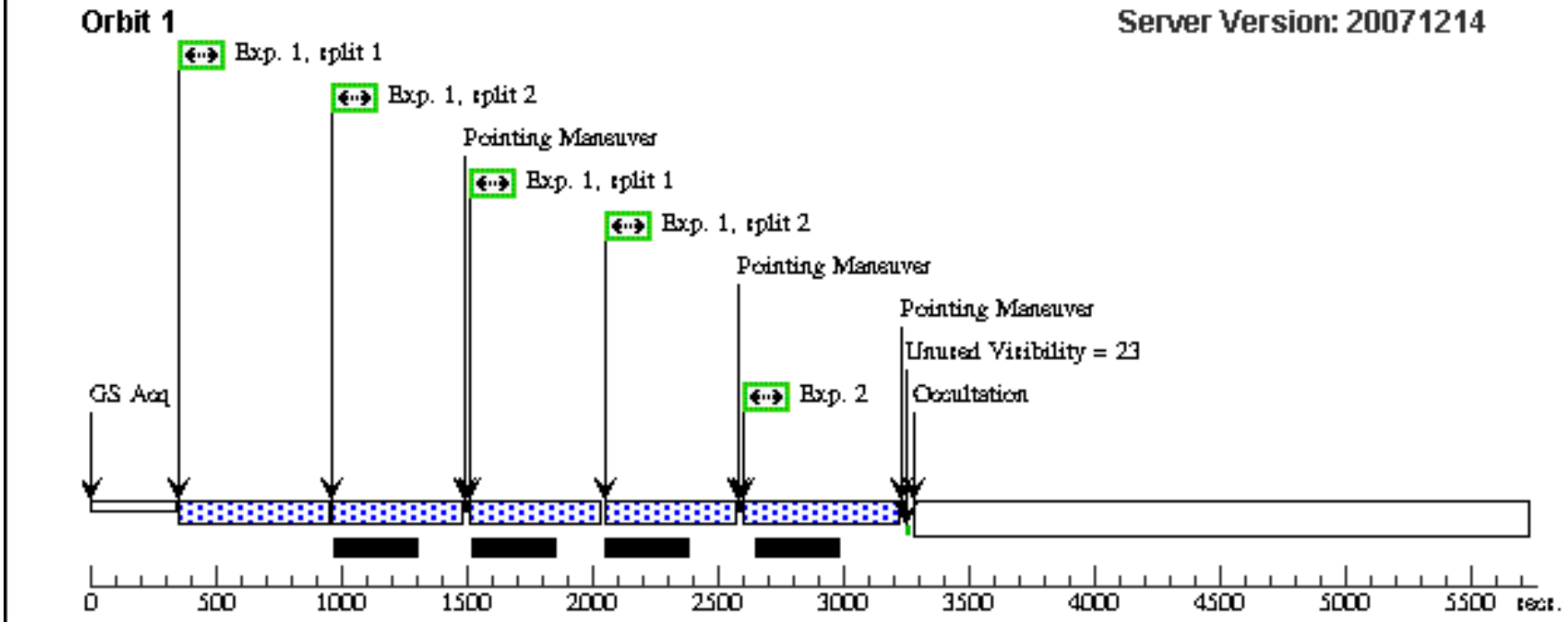
Fixed Targets

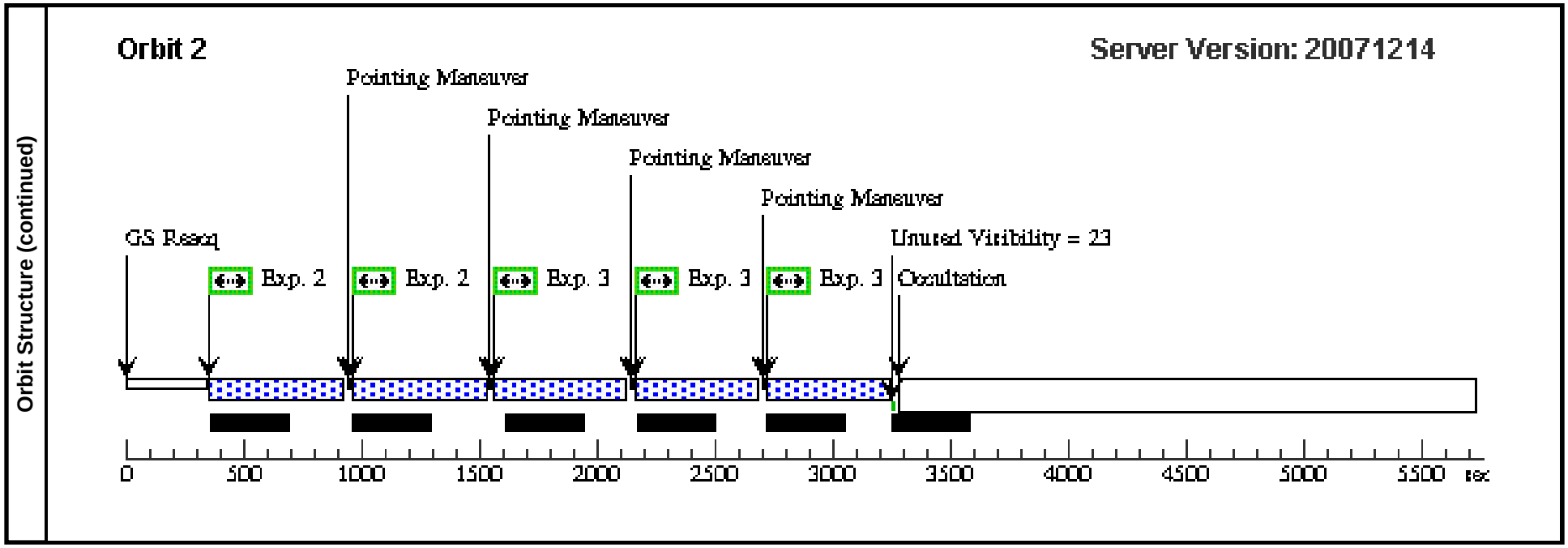
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1999GA	RA: 07 36 16.7000 (114.0695833d) Dec: -69 33 22.00 (-69.55611d) Equinox: J2000		V=23+/-1	Reference Frame: Literature

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	SN1999ga F435W	(1) SN1999GA	ACS/WFC, ACCUM, WFC1	F435W	CR-SPLIT=2		Pattern 1-1 (1)	790.0 Secs	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]*	***[1]***
2	SN1999ga Ha	(1) SN1999GA	ACS/WFC, ACCUM, WFC1	F658N	CR-SPLIT=NO		Pattern 2-2 (2)	450.0 Secs	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)] *[==>(Pattern 3)]*	***[2]***
3	SN1999ga F814W	(1) SN1999GA	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO		Pattern 3-3 (2)	400.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure




Orbit Structure (continued)
Orbit 2
Server Version: 20071214
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
GS Reacq
Exp. 2
Exp. 2
Exp. 3
Exp. 3
Exp. 3
Unused Visibility = 23
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10803, Visit 02, implementation Thu Jan 17 19:40:02 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/HRC

Special Requirements: BEFORE 30-JUN-2007:00:00:00

Comments: ToO Trigger

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=ACS-HRC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.198 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.28 Angle Between Sides= Center Pattern=false		(1), (2), (3)

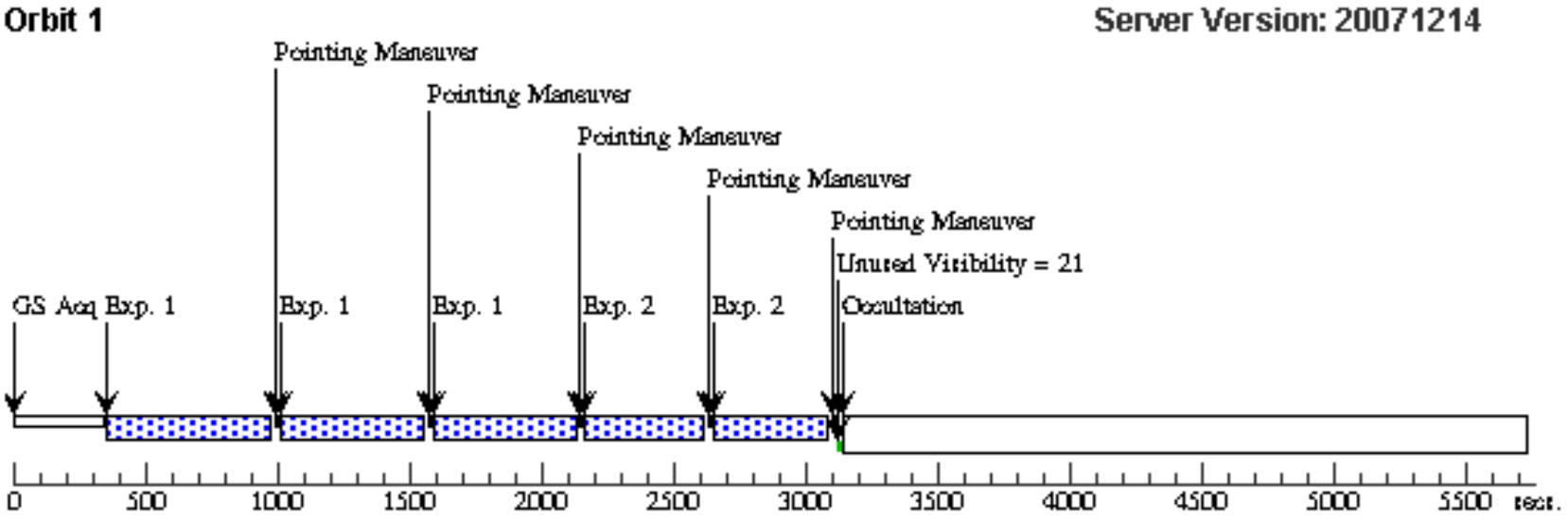
Fixed Targets

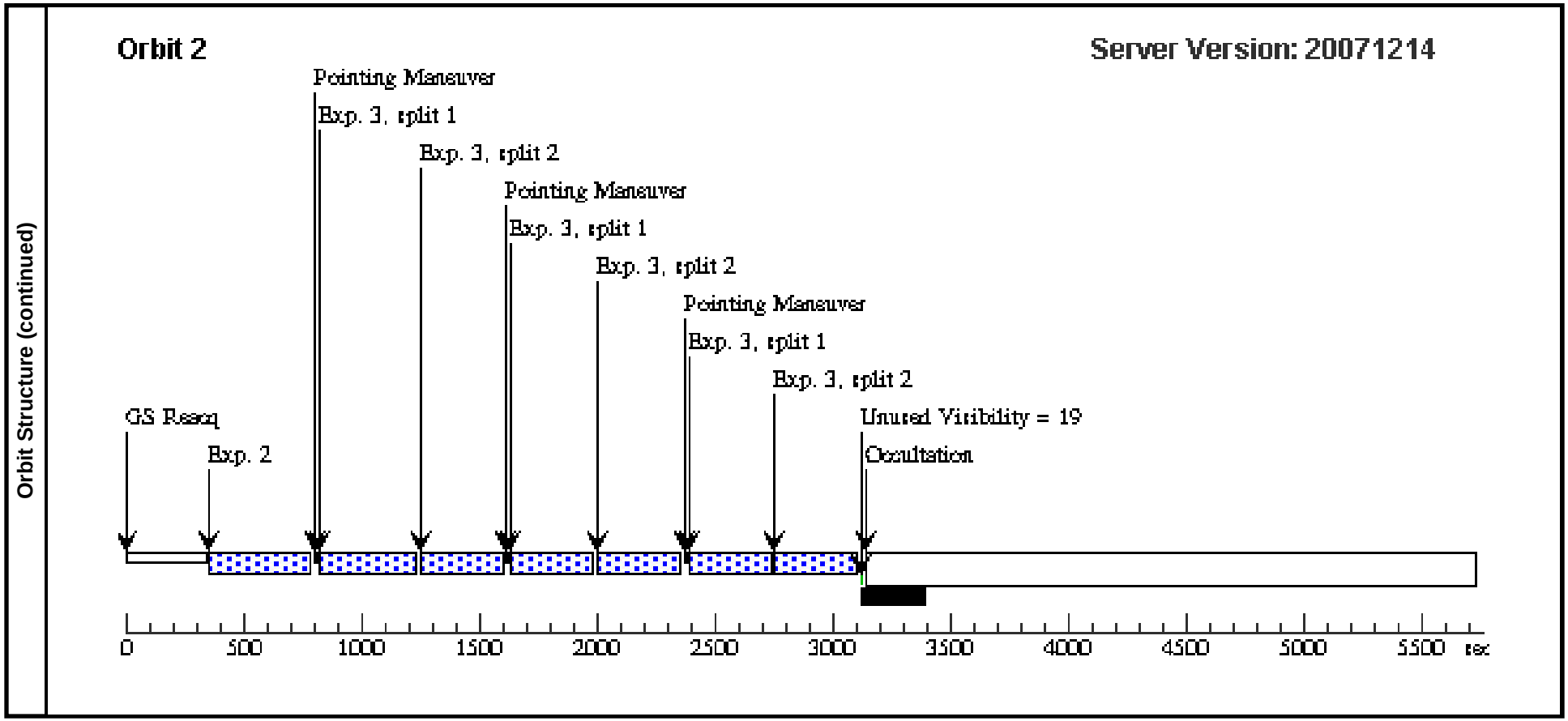
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN2006MY Alt Name1: NGC4651	RA: 12 43 40.7400 (190.9197500d) Dec: +16 23 14.00 (16.38722d) Equinox: J2000		V=18.5+/-0.5	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	SN2006my	(2) SN2006MY	ACS/HRC, ACCUM, HRC-FIX	F435W	CR-SPLIT=NO		Pattern 1-1 (3)	510.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2	SN2006my	(2) SN2006MY	ACS/HRC, ACCUM, HRC-FIX	F814W	CR-SPLIT=NO		Pattern 2-2 (3)	400.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)]	***[2]***
3	SN2006my	(2) SN2006MY	ACS/HRC, ACCUM, HRC-FIX	F555W	CR-SPLIT=2		Pattern 3-3 (3)	640.0 Secs	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]*	***[2]***

Orbit Structure




Orbit Structure (continued)
Orbit 2
Server Version: 20071214
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
GS Reacq
Exp. 2
Unused Visibility = 19
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10803, Visit 03, implementation Thu Jan 17 19:40:02 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

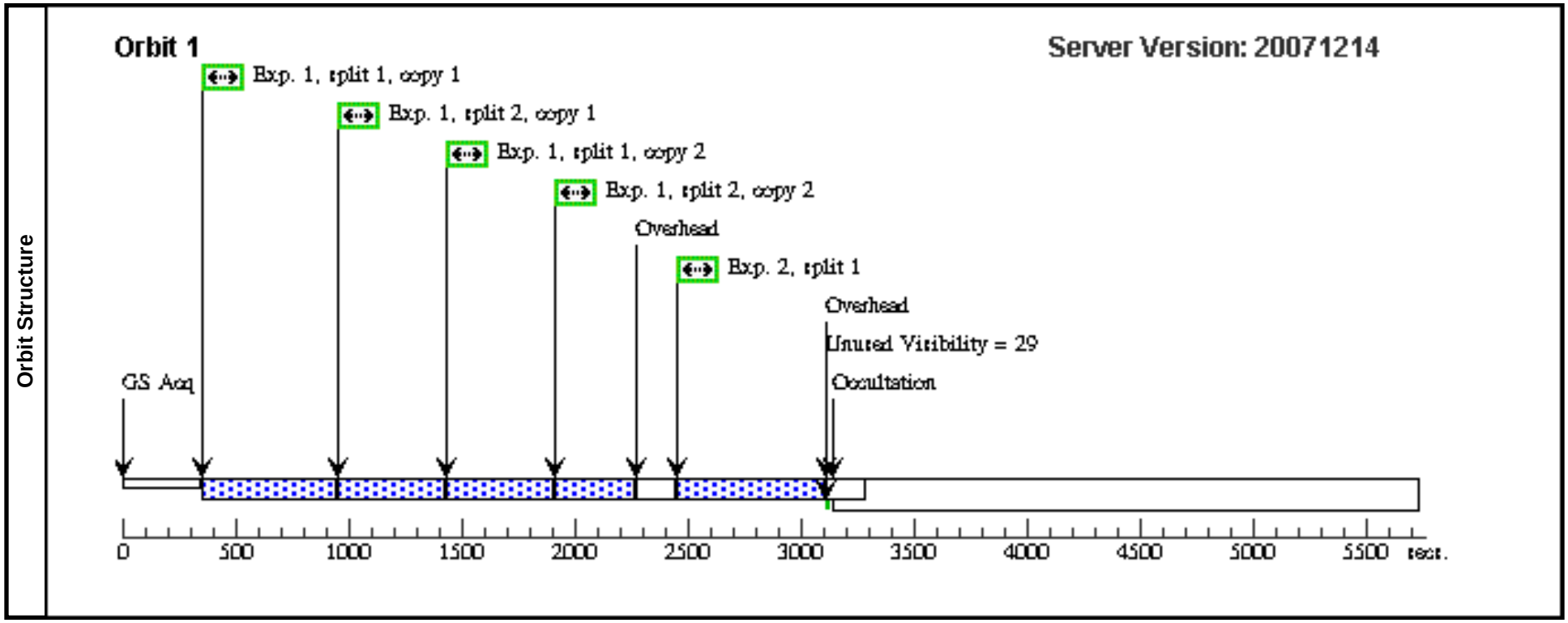
Special Requirements: BEFORE 30-JUN-2007:00:00:00

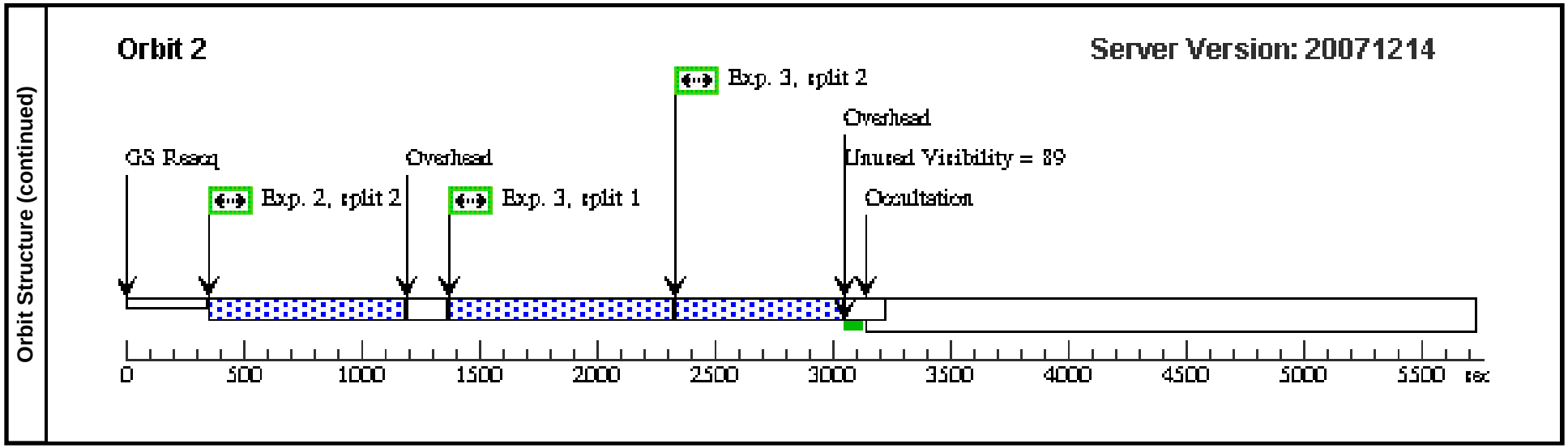
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN2006MY Alt Name1: NGC4651	RA: 12 43 40.7400 (190.9197500d) Dec: +16 23 14.00 (16.38722d) Equinox: J2000		V=18.5+/-0.5	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	SN2006my	(2) SN2006MY	WFPC2, IMAGE, PC1-FIX	F555W	CR-SPLIT=0.5; CR-TOLERANCE=0			600.0 Secs X 2	
								[==>(Copy 1, Split 1)] *[==>(Copy 1, Split 2)]* *[==>(Copy 2, Split 1)]* *[==>(Copy 2, Split 2)]*	***[1]***
2	SN2006my	(2) SN2006MY	WFPC2, IMAGE, PC1-FIX	F814W				1200.0 Secs	
								[==>500.0 Secs (Split 1)]	***[1]***
								[==>700.0 Secs (Split 2)]	***[2]***
3	SN2006my	(2) SN2006MY	WFPC2, IMAGE, PC1-FIX	F450W				1400.0 Secs	
								[==>(Split 1)] *[==>(Split 2)]*	***[2]***


Orbit Structure
Orbit 1
Server Version: 20071214
Exp. 1, split 1, copy 1
Exp. 1, split 2, copy 1
Exp. 1, split 1, copy 2
Exp. 1, split 2, copy 2
Overhead
Exp. 2, split 1
Overhead
Unused Visibility = 29
Occultation
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.


Orbit Structure (continued)
Orbit 2
Server Version: 20071214
GS Reacq
Exp. 2, split 2
Overhead
Exp. 3, split 1
Exp. 3, split 2
Overhead
Unused Visibility = 89
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10803, Visit 04, implementation Thu Jan 17 19:40:03 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/HRC

Special Requirements: ON HOLD

On Hold Comments: ToO on hold

Generic Targets

#	Name	Criteria	Description
(4)	SN2007ZZ	None	SUPERNOVA

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	SN2007ZZ	(4) SN2007ZZ	ACS/HRC, ACCUM, HRC	F555W				900.0 Secs	
								[==>(Split 1)]	
								[==>(Split 2)]	***[1]***

Orbit Structure