11183 - Ultraviolet Imaging of Lyman-Alpha-Selected Galaxies at High Redshift

Cycle: 16, 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) GAL-100030+021715	NIC2	5	18-Jan-2008 02:21:55.0	yes
02	(2) GAL-152258-000736	NIC2	5	18-Jan-2008 02:22:03.0	yes
03	(3) GAL-152409-001043	NIC2	5	18-Jan-2008 02:22:14.0	yes

15 Total Orbits Used

ABSTRACT

We propose to carry out deep NICMOS/NIC2 imaging in the rest-frame, ultraviolet continuum of galaxies discovered in the Magellan Multi-Slit Lyman Alpha Survey. This spectroscopic survey identified ultra-faint, redshift 5.7 Lyman-alpha emitters (LAEs) in a 15 nm wide, OH-free band at 819 nm. Imaging with HST is the only way to measure their continuum intensity near rest-frame 160 nm. The ultraviolet photometry will directly measure the rate of star formation in common objects; and, when combined with groundbased Lyman-alpha luminosities, provide a reliable cross-

calibration of Lyman-alpha attenuation and emission equivalent width. Direct measurement of the size of the star-forming regions, unresolved in the groundbased data, will extend measurements of the intensity of star formation to common objects in the high-redshift universe. Gaseous outflows from these galaxies are thought to be the source of their asymmetric line profiles, and area-averaged star formation rates are needed to calibrate feedback recipes, as well as eventually extend the Schmidt-Kennicutt law to high-redshift. The three targets proposed in Cycle~16 lie in fields covered by major galaxy surveys, are not as bright as the unusually luminous sources identified by such surveys at high-redshift, and present an opportunity to study properties of more common galaxies at high-redshift.

OBSERVING DESCRIPTION

Infrared-imaging of three redshift-5.7 galaxies is requested to detect their rest-frame-ultraviolet continuum emission longward of the Lyman break (at ~ 8190 A). The goal is to constrain the star formation rate using the measured UV-flux density and the size of the star-forming region. The targets are extremely faint, and detection requires the low sky background of space-based observations. The galaxies are known to be less than 0.6 arcseconds across, so NIC2 is the preferred camera. Under the warmer temperature of NCS operations, F110W imaging is slightly more sensitive to a flat continuum source than F160W.

Our targets lie in one of two equatorial fields: the COSMOS field (10:00:28.6, +02:12:21.0) and a 15H field (15:23:35.48, -00:08:00.00). In two-gyro mode, the visibility of each target per orbit is 52 minutes in the absence of any additional constraints. The zodiacal background in these fields is only slightly higher than the average value used in the ETC. Nonetheless, our science exposures will be background limited. We will dither exposures by 1.54" (20.533 pixels) using the NIC-SPIRAL-DITH pattern to permit the removal of non-calibrated pixels and improve spatial sampling. A series of linearly-space, non-destructive reads will be made in MULTIACCUM readout mode and used to remove cosmic rays. The observing overheads leave 2400 s of integration time per orbit. A total integration of about 12,000 s can be reached in one 5-orbit visit to each target.

The measured hydrogen Lyman-alpha emission for our targets provide lower limits on the star formation rates between 2 and 7 solar masses per year, where the only assumptions are Case~B recombination and the slope of the stellar mass function (assumed to be Salpeter). The UV-continuum is expected to be a factor of 2 (or more) brighter than suggested by this minimum star formation rate because the blue half of the Lyman-alpha-line profile is redshifted through the line resonance by outflows and the cosmological expansion. For a star formation rate of 4 to 14 solar masses per

year, the UV-continuum at 1650 A is 2.88E28 to 10.6E28 ergs/s/Hz; and the flux density at 1.1 micron is 5.4E-31 to 2.0E-30 ergs/s/cm2/Hz.

The sensitivity of NIC2-F110W to such sources was estimated using the NICMOS Exposure Time Calculator. From the 12 models illustrated in Table 1 in the Phase I Proposal, we find that a spatially-unresolved star cluster is a good target; and 12,000 s integrations in F110W will be sufficient for detection at signal-to-noise ratio of 10, or 10 - 15% accuracy for the star formation rate (with no extinction correction).

Visit

Proposal 11183, Visit 01, implementation Fri Jan 18 07:22:19 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: NIC2

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (OP): VISIBILITY OVERRUN
(Visit 01) Warning (OP): VISIBILITY OVERRUN
(Visit 01) Warning (OP): VISIBILITY OVERRUN
(Visit 01) Warning (OP): VISIBILITY OVERRUN

Patterns

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	Point Spacing=1.54	Center Pattern=false		
	Line Spacing=			

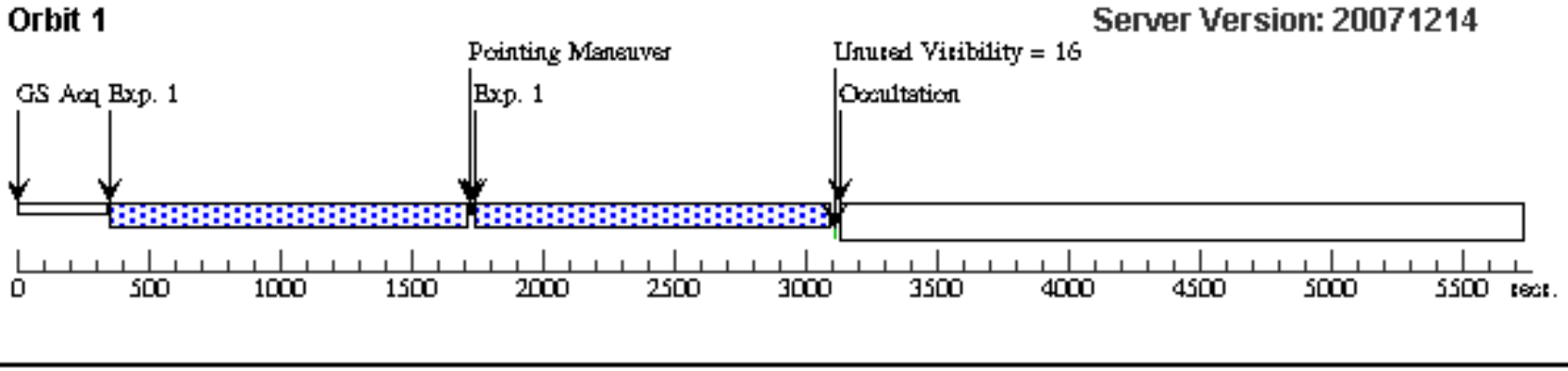
Fixed Targets

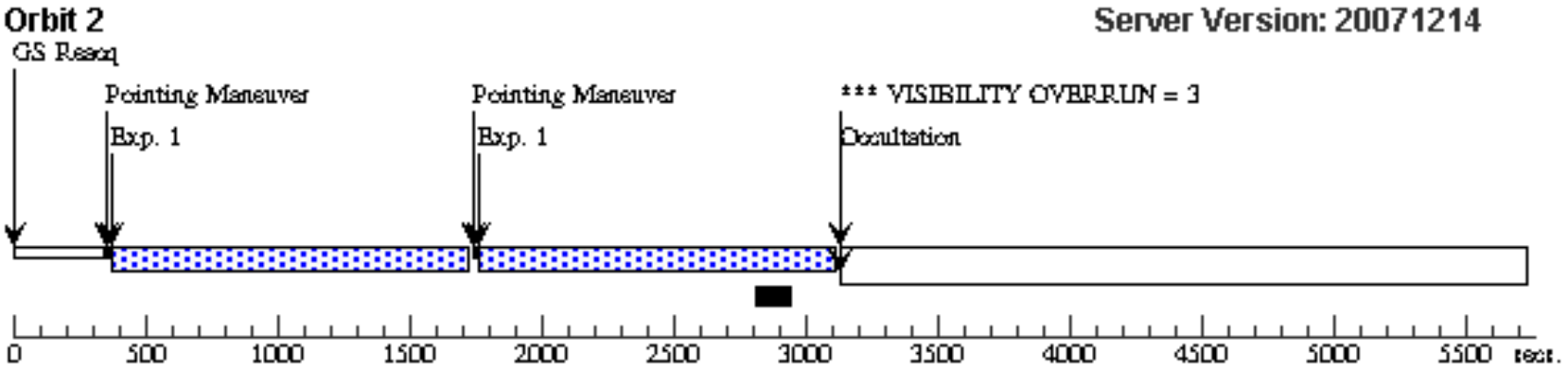
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GAL-100030+021715	RA: 10 00 30.4790 (150.1269958d)	Redshift: 5.7	V=35	Reference Frame: ICRS
	Alt Name1: MSDM80+3	Dec: +02 17 14.80 (2.28744d)		F-LINE(8190)=1+/-0.5E-17	
		Equinox: J2000			

Exposures

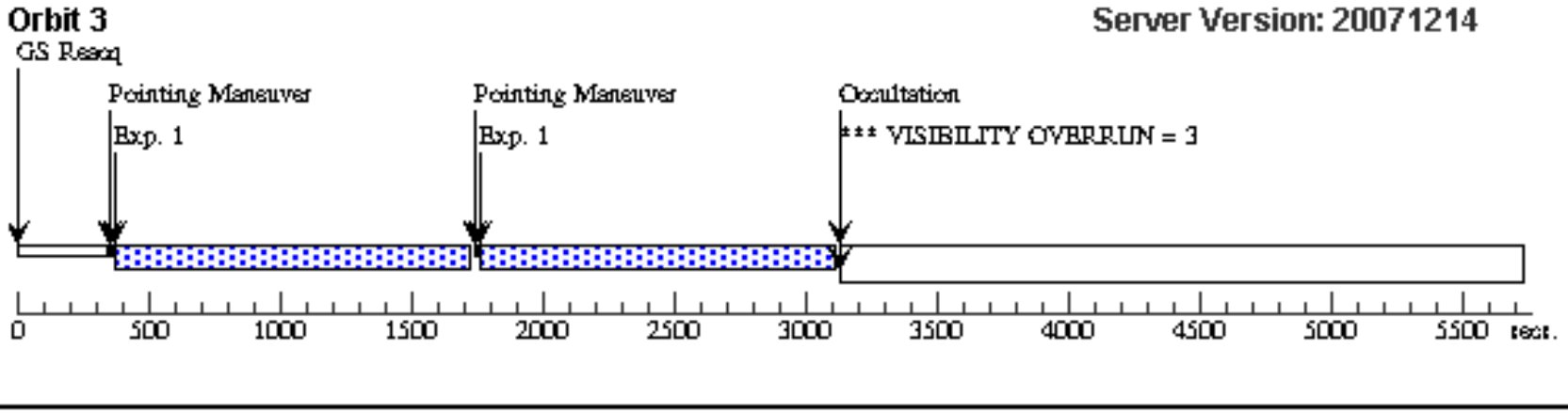
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	MSDM80+3	(1) GAL-100030+021715	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=SPARS64; NSAMP=23	GS ACQ SCENARIO BASE1TNS	Pattern 1-1 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
								[==>(Pattern 5)] *[==>(Pattern 6)]*	***[3]***
								[==>(Pattern 7)] *[==>(Pattern 8)]*	***[4]***
								[==>(Pattern 9)] *[==>(Pattern 10)]*	***[5]***

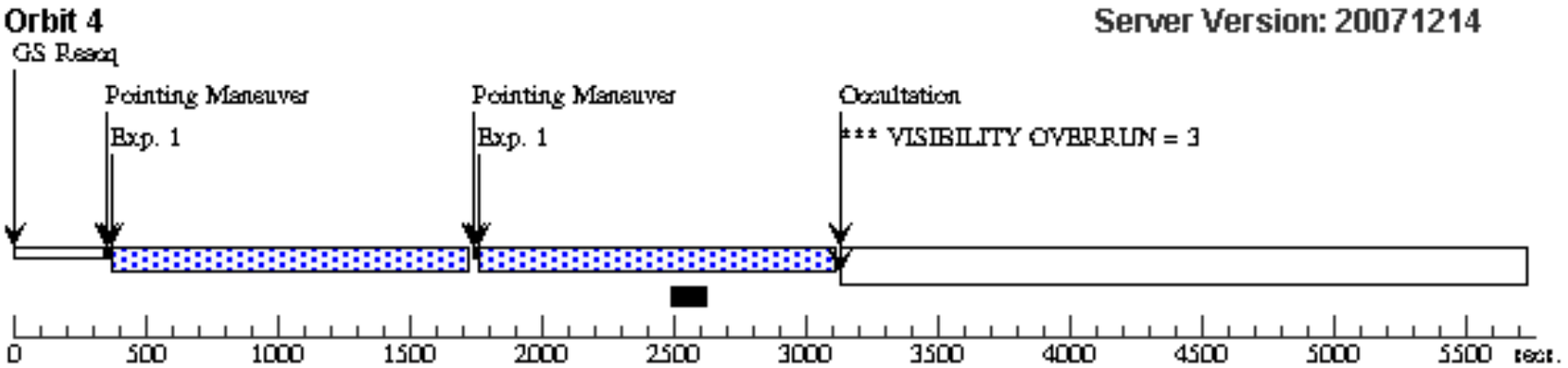
Orbit Structure





Orbit Structure (continued)





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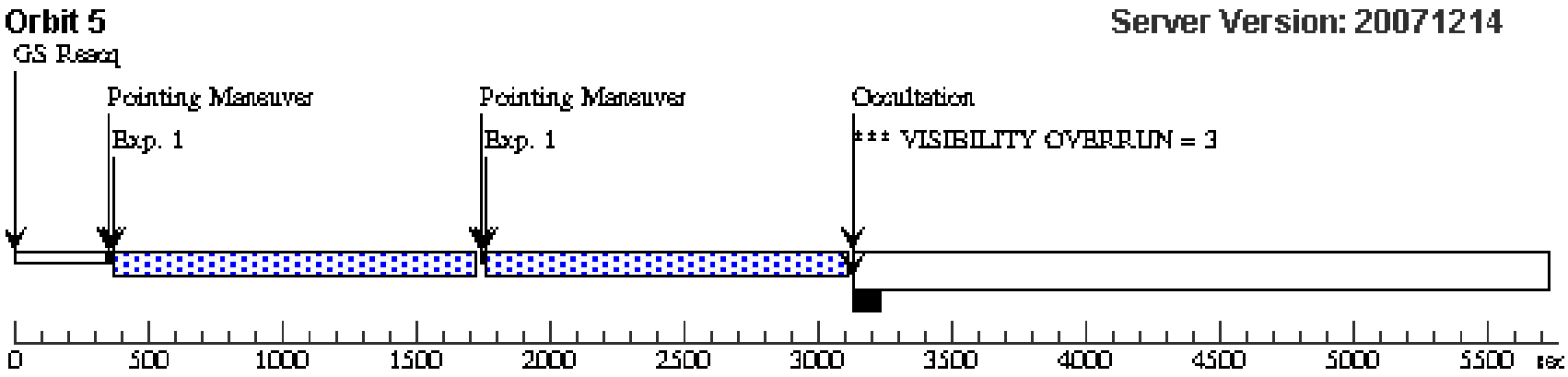

Visit

Proposal 11183, Visit 02, implementation Fri Jan 18 07:22:20 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: NIC2

Special Requirements: (none)

Diagnostics

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(Visit 02) Warning (OP): VISIBILITY OVERRUN
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Patterns

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	Purpose=DITHER	Pattern Orientation=0.0		
	Number Of Points=10	Angle Between Sides=		
	Point Spacing=1.54	Center Pattern=false		
	Line Spacing=			

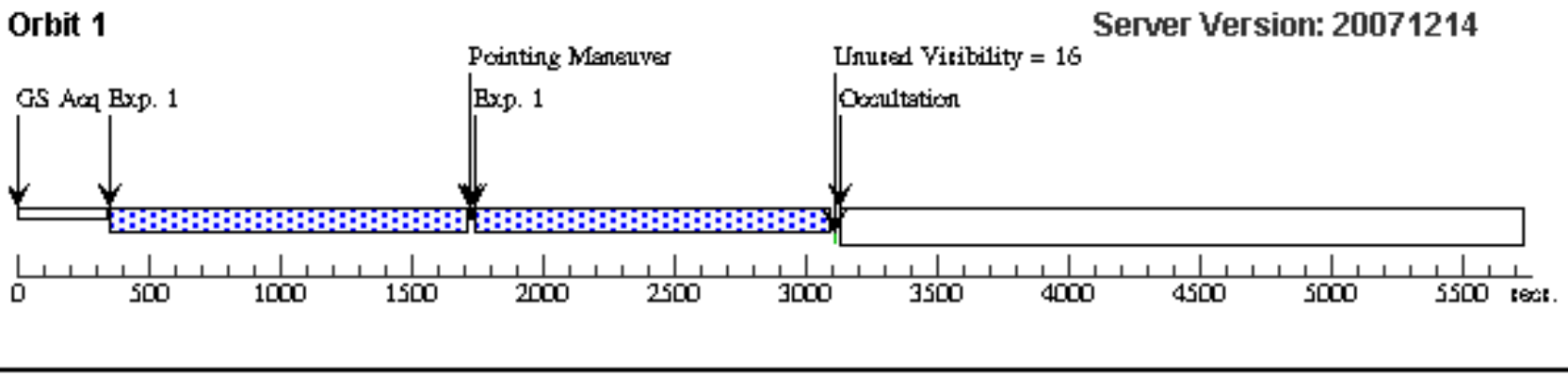
Fixed Targets

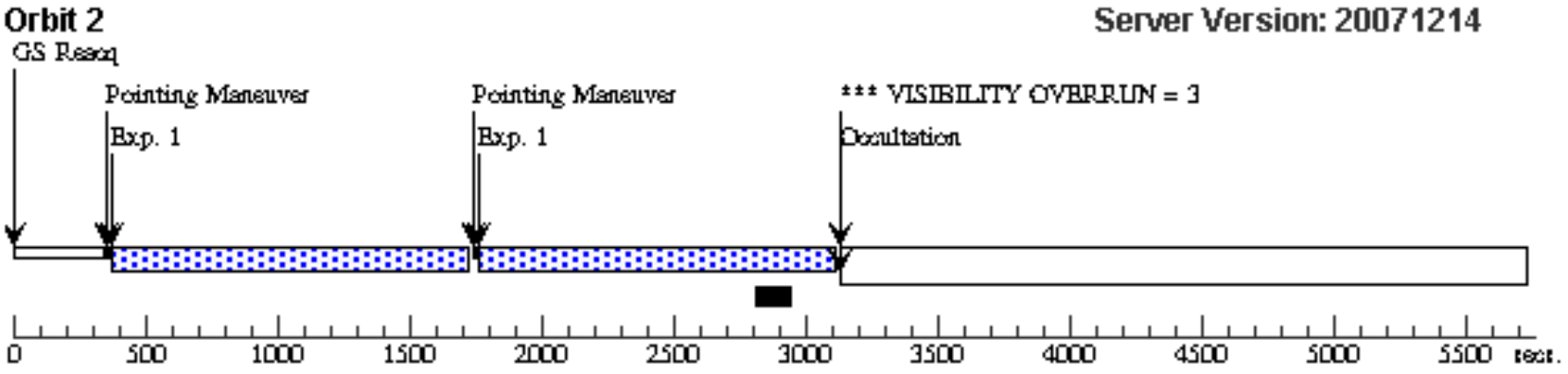
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	GAL-152258-000736	RA: 15 22 57.8800 (230.7411667d)	Redshift: 5.7	V=35	Reference Frame: ICRS
	Alt Name1: MSDM29.5+5	Dec: -00 07 36.34 (-.12676d)		F-LINE(8190)=1+/-0.5E-17	
		Equinox: J2000			

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	MSDM29.5+5	(2) GAL-152258-000736	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=SPARS64; NSAMP=23	GS ACQ SCENARIO BASE1TNS	Pattern 1-1 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
								[==>(Pattern 5)] *[==>(Pattern 6)]*	***[3]***
								[==>(Pattern 7)] *[==>(Pattern 8)]*	***[4]***
								[==>(Pattern 9)] *[==>(Pattern 10)]*	***[5]***

Orbit Structure





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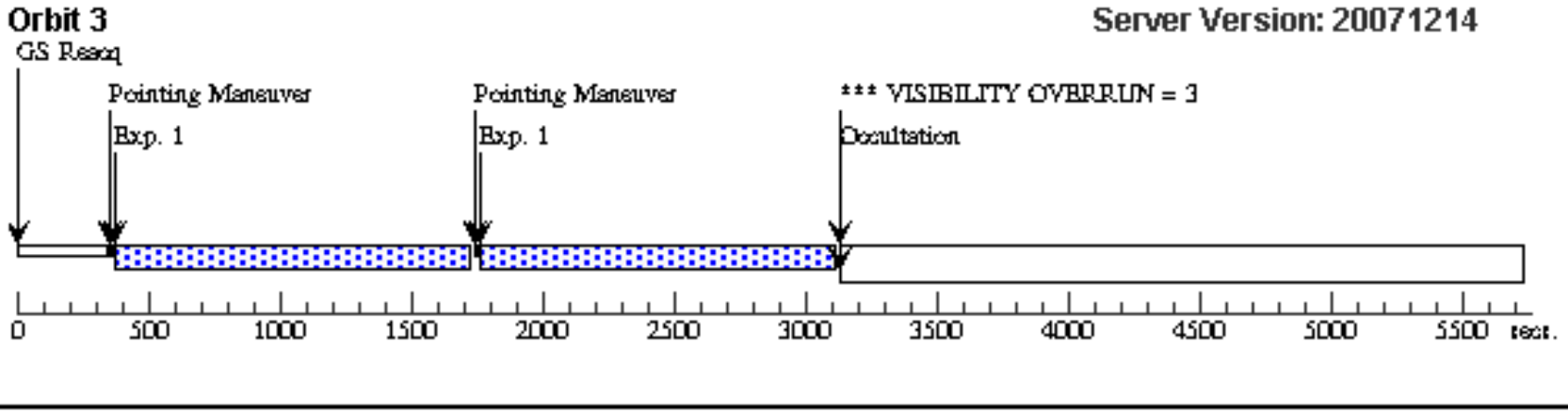

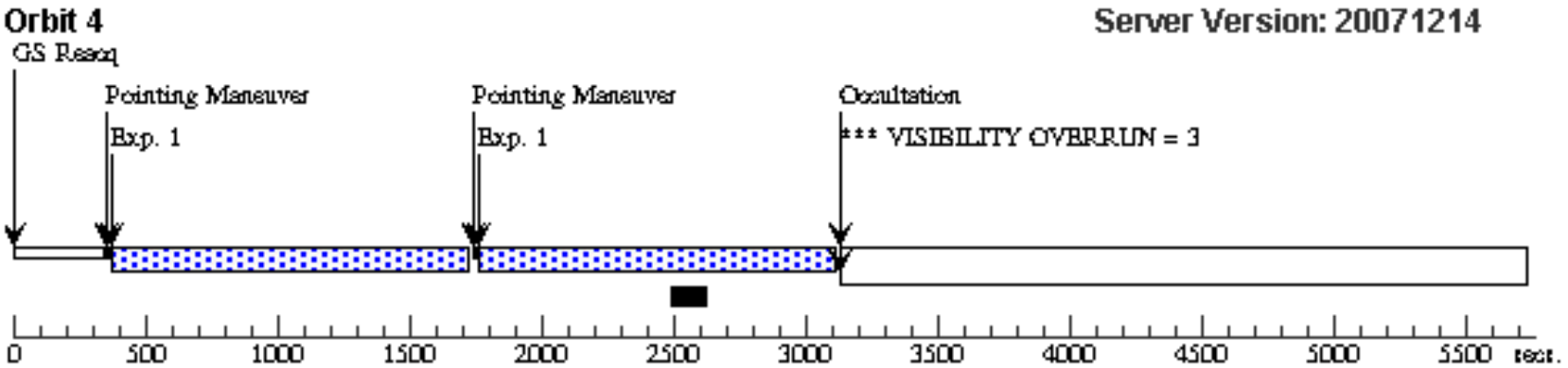

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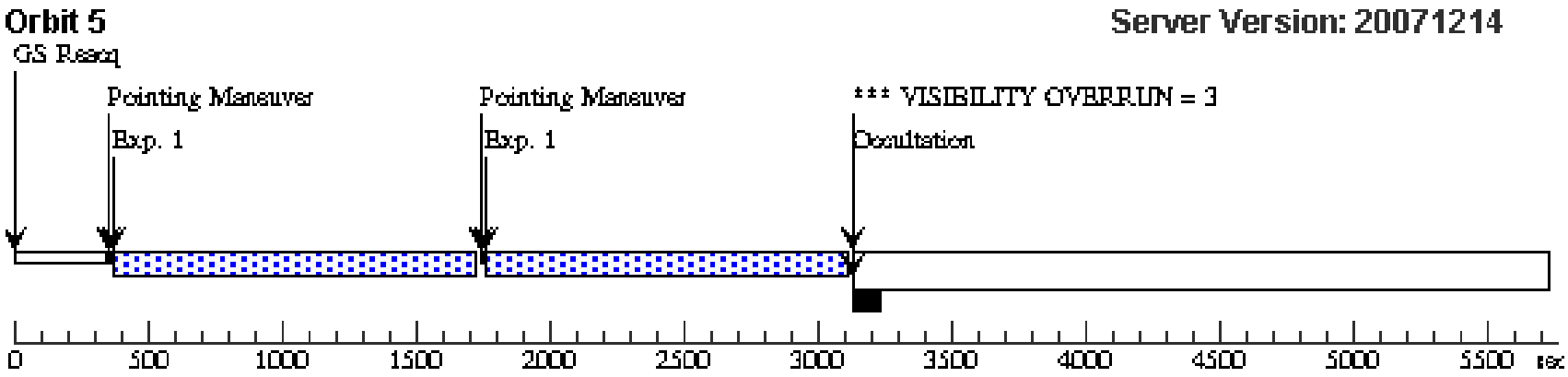

Visit

Proposal 11183, Visit 03, implementation Fri Jan 18 07:22:21 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: NIC2

Special Requirements: (none)

Diagnostics

(Visit 03) Warning (OP): VISIBILITY OVERRUN
(Visit 03) Warning (OP): VISIBILITY OVERRUN
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Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=NIC-SPIRAL-DITH	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=0.0		
	Number Of Points=10	Angle Between Sides=		
	Point Spacing=1.54	Center Pattern=false		
	Line Spacing=			

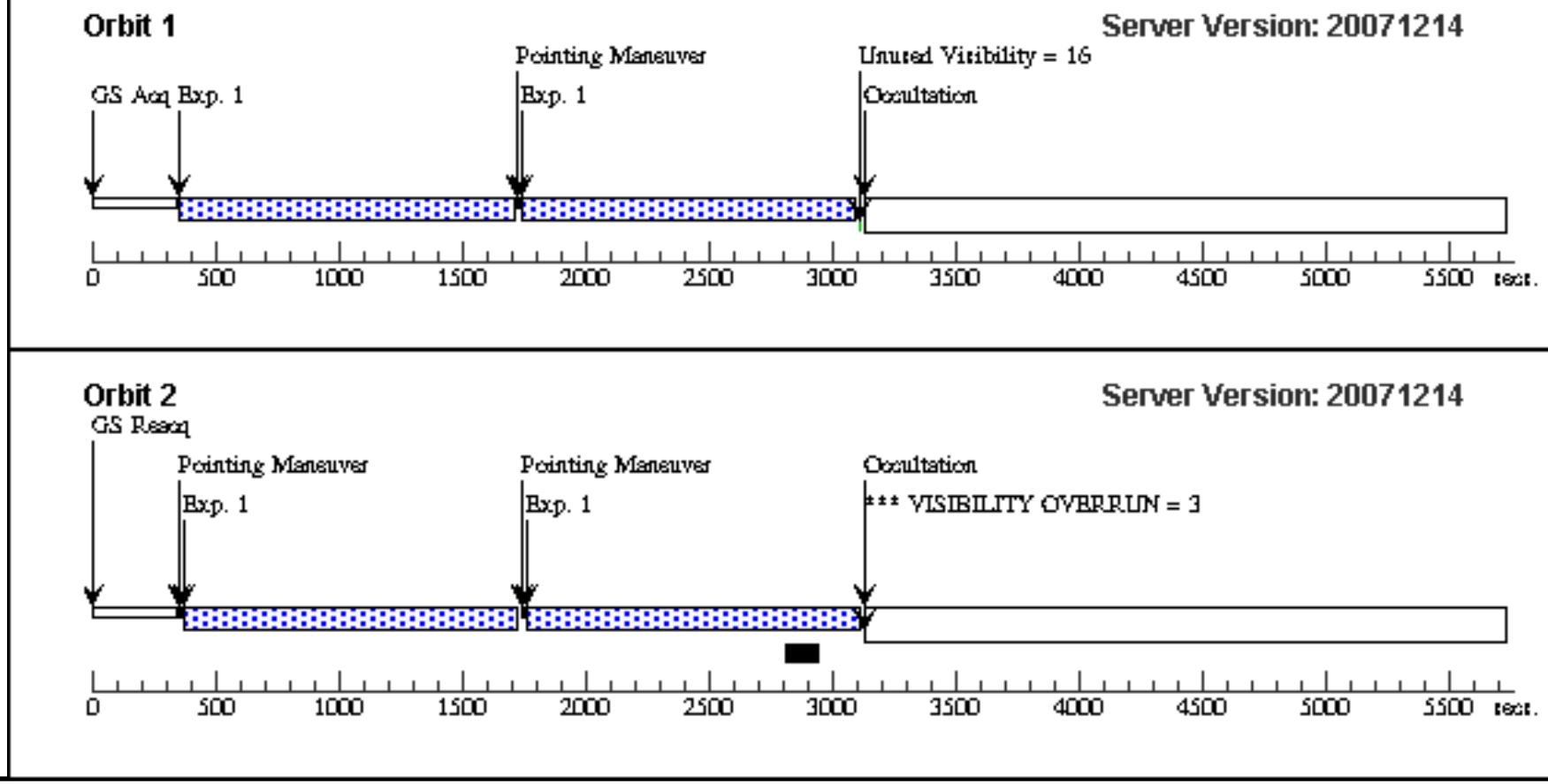
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	GAL-152409-001043	RA: 15 24 8.9290 (231.0372042d)		V=35	Reference Frame: ICRS
	Alt Name1: MSDM71-5	Dec: -00 10 43.06 (-.17863d)		F-LINE=2+/-1E-17	
		Equinox: J2000			

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	MSDM71-5	(3) GAL-152409-001043	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=SPARS64; NSAMP=23	GS ACQ SCENARIO BASE1TNS	Pattern 1-1 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
								[==>(Pattern 5)] *[==>(Pattern 6)]*	***[3]***
								[==>(Pattern 7)] *[==>(Pattern 8)]*	***[4]***
								[==>(Pattern 9)] *[==>(Pattern 10)]*	***[5]***

Orbit Structure



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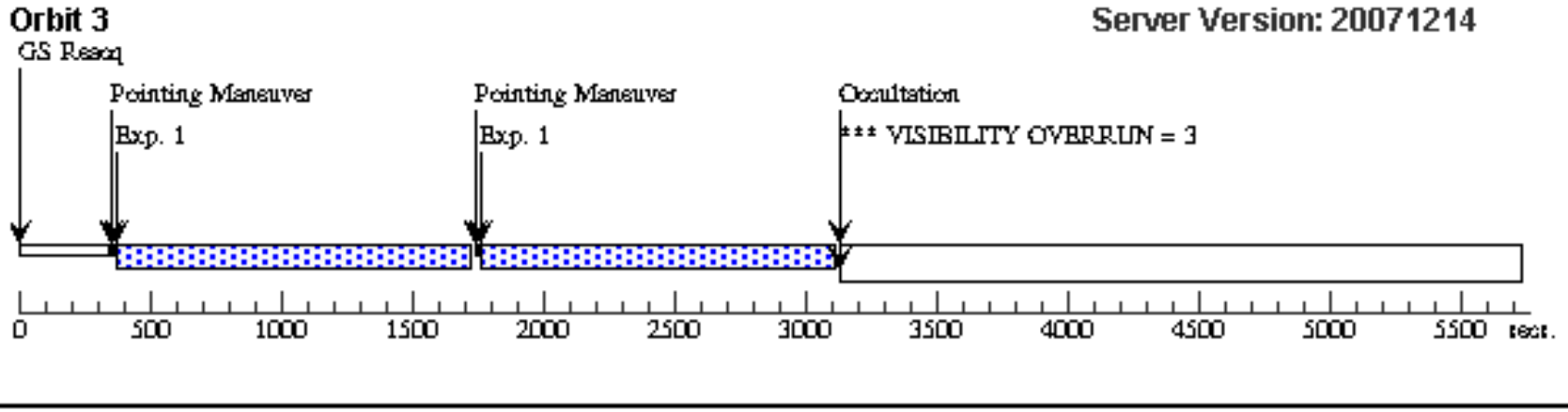

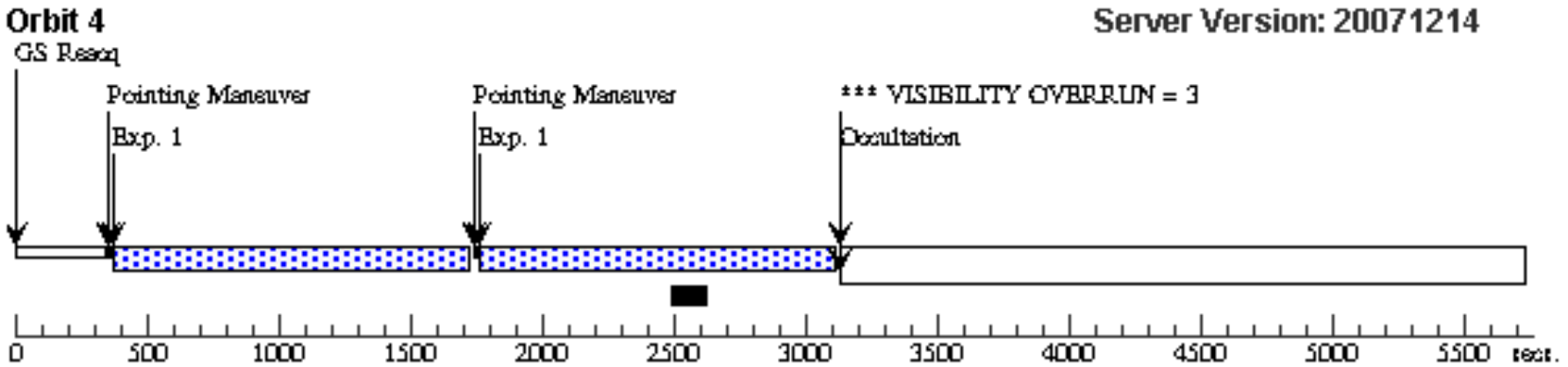

Orbit Structure (continued)