14699 - The hosts of the early ionized bubbles: the nature and diversity of the most luminous Lyman-alpha emitters at z~6-7

Cycle: 24, 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) VR7	WFC3/IR	3	28-Nov-2016 21:09:09.0	yes
02	(2) MASOSA	WFC3/IR	4	28-Nov-2016 21:09:11.0	yes
03	(3) SCR7	WFC3/IR	1	28-Nov-2016 21:09:13.0	yes
04	(10) SSM16-SA22-509891	WFC3/IR	1	28-Nov-2016 21:09:14.0	yes
05	(10) SSM16-SA22-509891	WFC3/IR	1	28-Nov-2016 21:09:14.0	yes
06	(9) SSM16-SA22-390412	WFC3/IR	1	28-Nov-2016 21:09:15.0	yes
07	(10) SSM16-SA22-509891	WFC3/IR	1	28-Nov-2016 21:09:16.0	yes

12 Total Orbits Used

ABSTRACT

The most distant sources stringently test models of early galaxy formation and of the epoch of re-ionisation. Recently, we have spectroscopically confirmed the brightest Lyman-alpha (Lya) emitters at z~7 (e.g. CR7; Sobral et al. 2015) and showed that luminous Lya emitters at z~7 (e.g. Himiko) are not as rare as previously thought. Surprisingly, we find even higher luminosity Lya emitters at z = 6.6 (Matthee et al. 2015) and at z=5.7, implying that at these high redshifts the bright end of the Lya luminosity function is likely a power-law, and certainly not a Schechter function. We are also revealing, for the first time, the potential diversity and unexpected nature of luminous Lya emitters at z~6-7. CR7 is already the subject of a wide variety of papers exploring its PopIII-like or direct collapse black hole (DCBH) nature; now is the time to study the first sample of CR7-like sources at z~6-7.

Our aim is to study the first sample of ~10 luminous Lya emitters just before and after the epoch of re-ionisation, in order to unveil their nature and evolution. Are they capable of ionising their own bubbles (allowing their Lya to be observable)? Are all sources split into multiple components? What are their typical (and range of) UV luminosities and sizes? Do they always contain redder/older stellar populations, likely responsible for previously ionizing a local bubble? Can some of them be lensed? We will be able to address these questions for the first time, by obtaining WFC3 observations of MASOSA and other 9 newly discovered luminous Lya emitters at z=5.7 and 6.6 in the SA22 field and directly compare them with the same observations already done for CR7+Himiko.

OBSERVING DESCRIPTION

Follow up in rest-frame UV of bright Lyman-alpha emitters at z=6.6 and z=5.7.

Some pointings contain more than one target (e.g. VR7). For VR7 observations, WFC3 needs to have the longer axis (136 arcsec) of the CCD aligned North-South, to image both sources.

Two filters will be used for the z=6.6 targets (pointing centers: VR7, MASOSA, SA22WIDE-219795): F110W and F160W.

Two other filters will be used for the z=5.7 targets (SSM16 targets), to probe similar rest-frame lambda: F098M and F140W.

Visit

Proposal 14699, Visit 01, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: Orientation should have 132arcsec lenght of the detector orientated ~N-S.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2), (3)

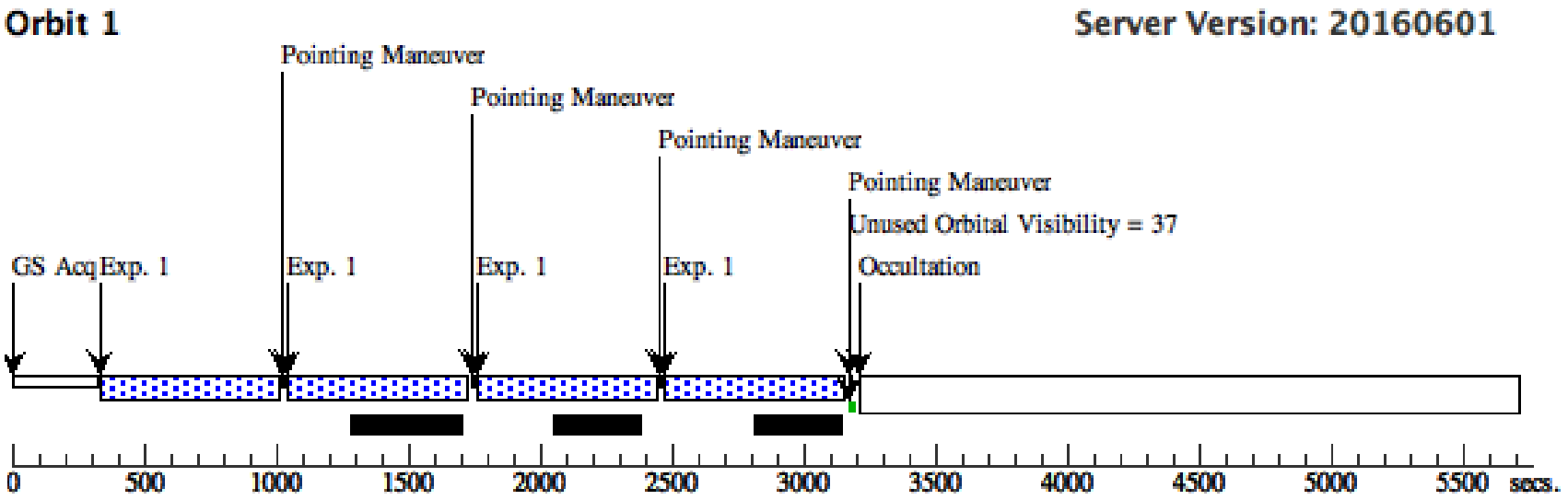
Fixed Targets

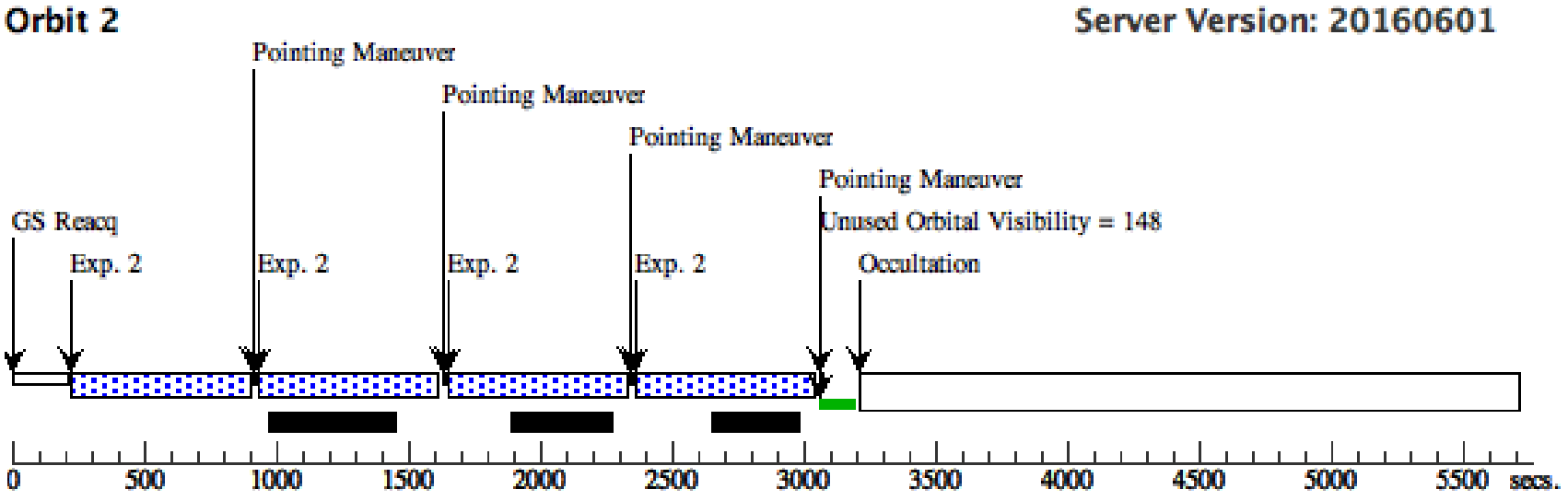
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VR7	RA: 22 18 56.3600 (334.7348333d) Dec: +00 08 7.32 (.13537d) Equinox: J2000		V=35 24.5 AB J band. Undetected blue r of z band (z=6.6 source)	Reference Frame: ICRS

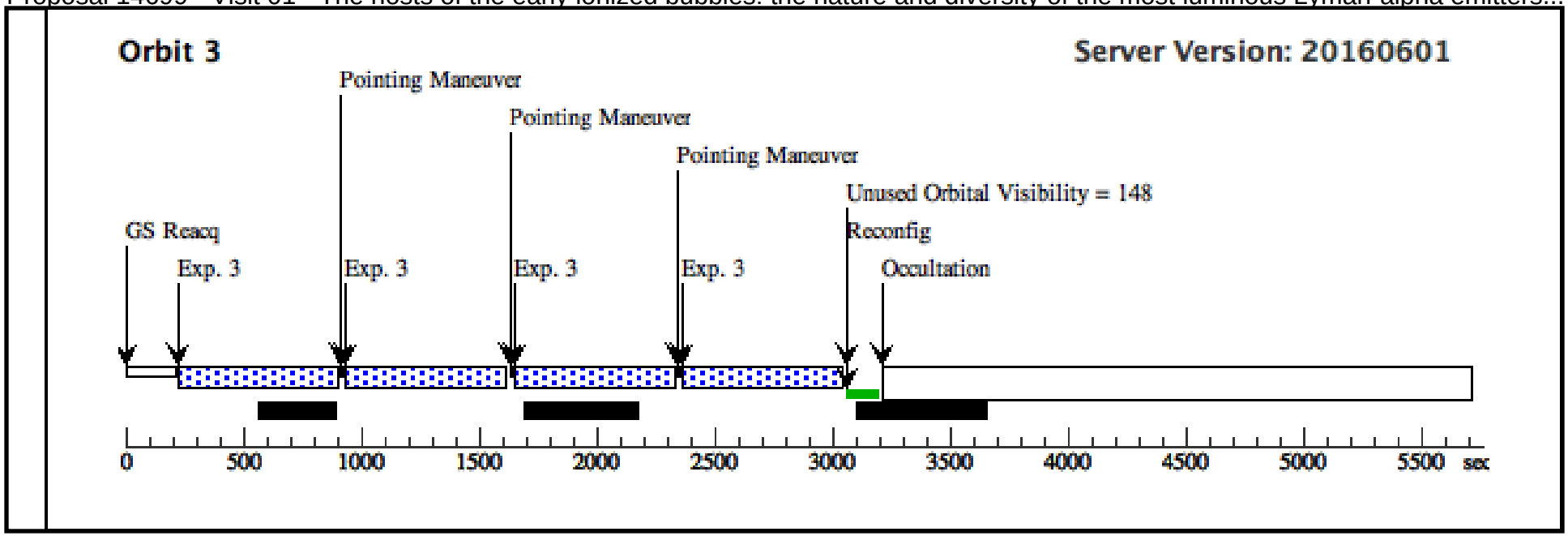
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) VR7	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 01 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) VR7	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 in Visit 01 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
3		(1) VR7	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 3-3 in Visit 01 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[3]***

Orbit Structure






Orbit 3
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Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 148
GS Reacq
Reconfig
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Exp. 3
Exp. 3
Occultation
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14699, Visit 02, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2), (3), (4)

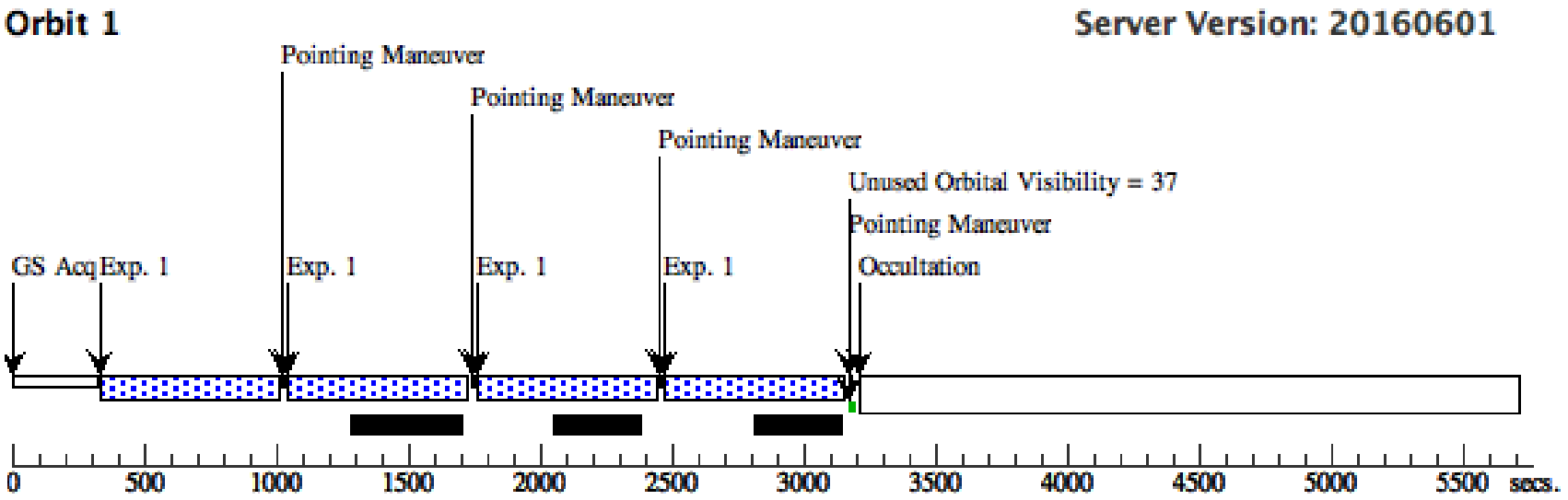
Fixed Targets

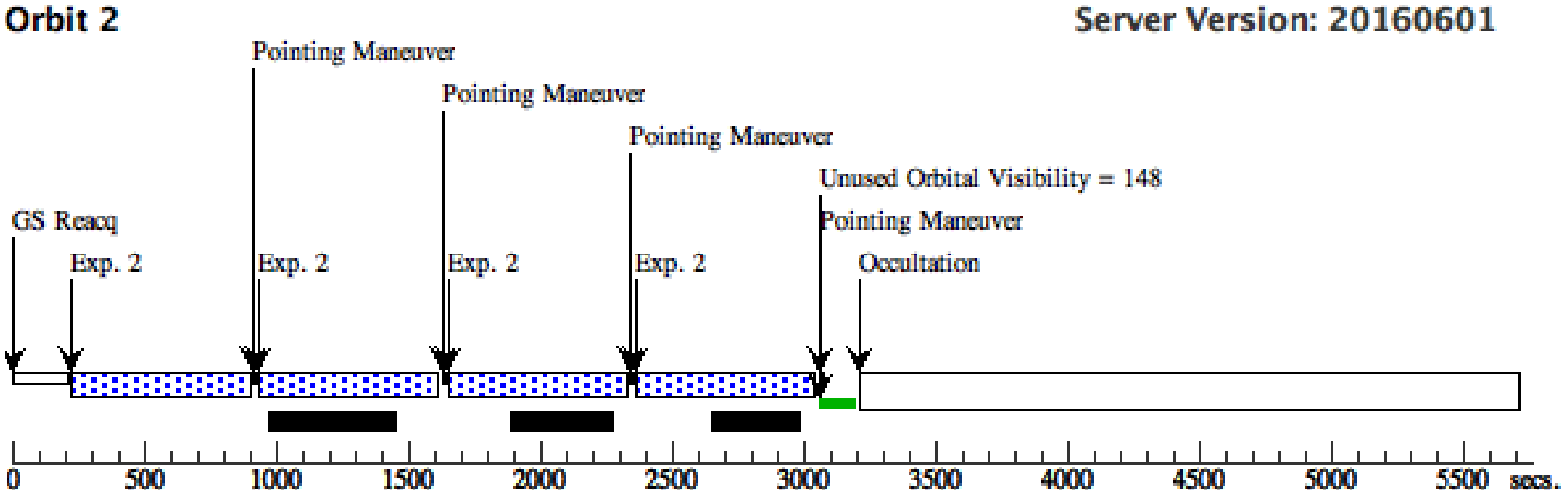
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	MASOSA	RA: 10 01 24.8010 (150.3533375d) Dec: +02 31 45.34 (2.52926d) Equinox: J2000		V=35 26 AB J band. Undetected bluer of z band (z=6.6 source)	Reference Frame: ICRS

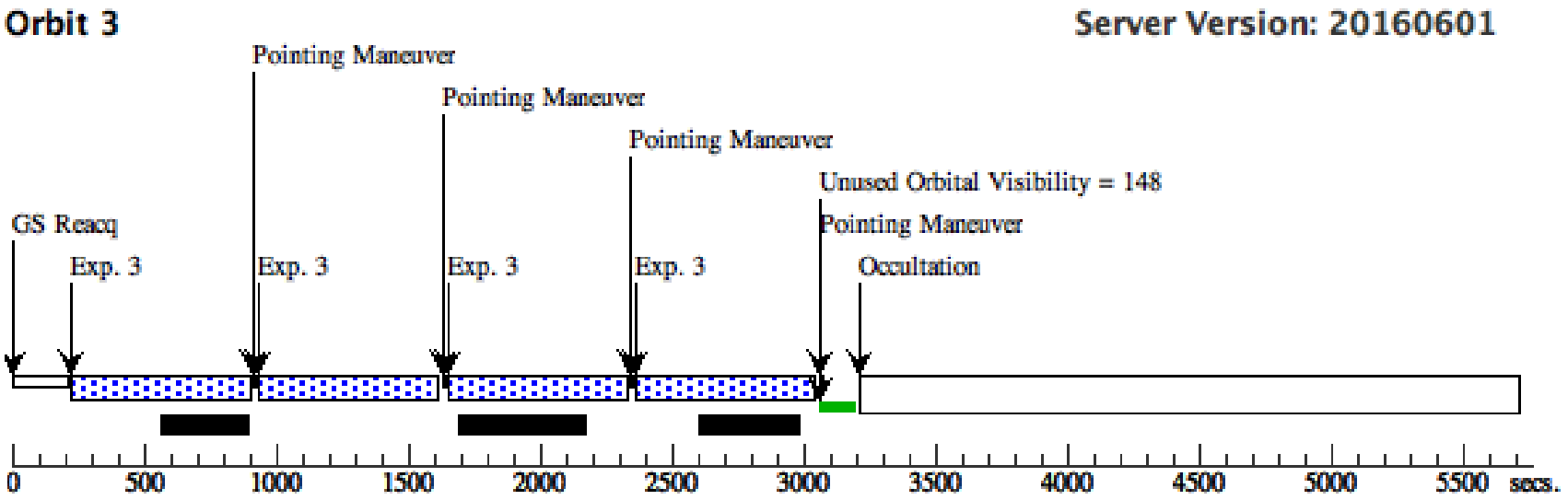
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) MASOSA	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 02 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(2) MASOSA	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 in Visit 02 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
3		(2) MASOSA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 3-3 in Visit 02 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[3]***
4		(2) MASOSA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 4-4 in Visit 02 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[4]***

Orbit Structure



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Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 148
GS Reacq
Pointing Maneuver
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Occultation
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3500
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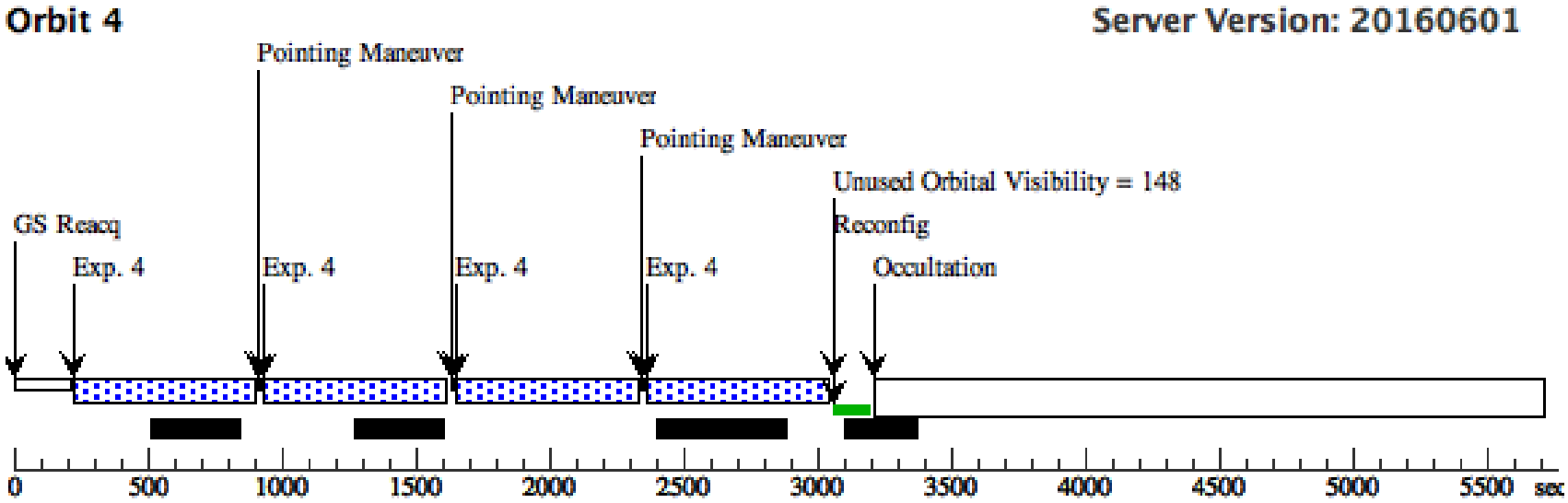
5500
secs.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Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 148
GS Reacq
Reconfig
Exp. 4
Exp. 4
Exp. 4
Exp. 4
Occultation
0
500
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1500
2000
2500
3000
3500
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4500
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5500
sec

Visit

Proposal 14699, Visit 03, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: Orientation should have 132arcsec lenght of the detector orientated ~N-S.

Patterns

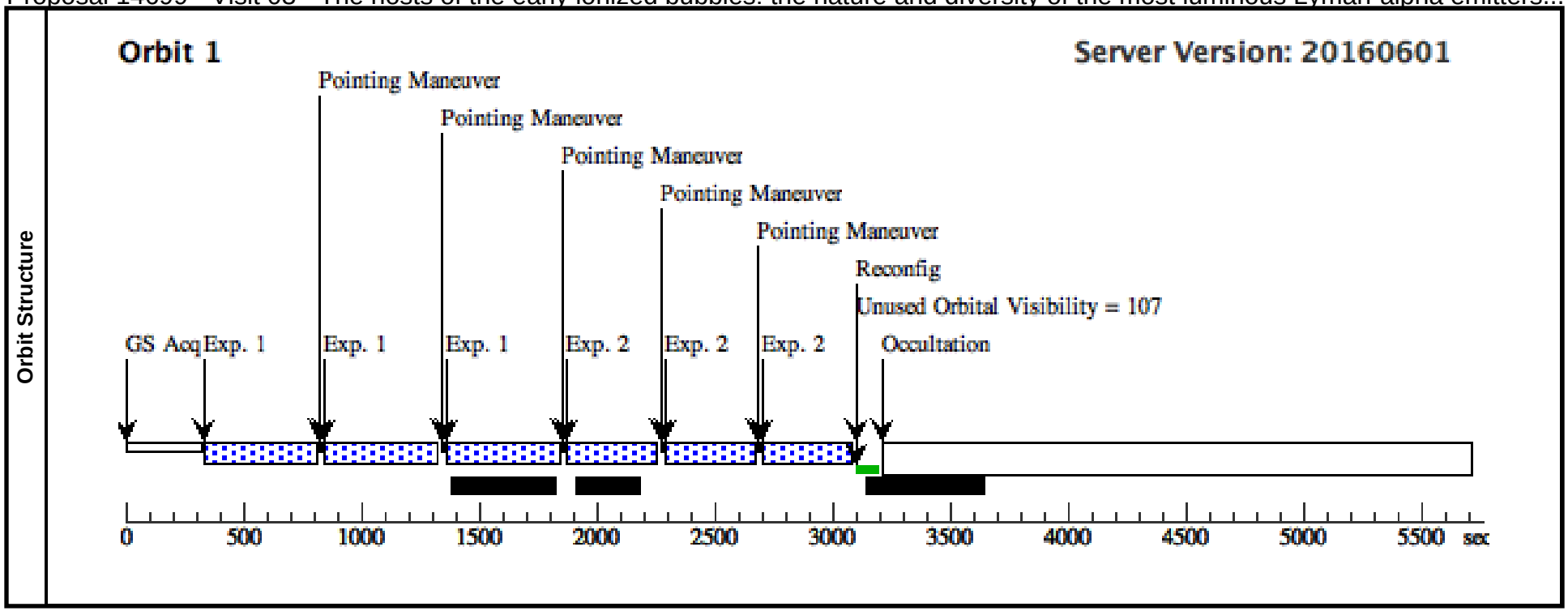
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=18.5		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.5	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SCR7	RA: 09 59 50.0500 (149.9585417d) Dec: +01 49 42.72 (1.82853d) Equinox: J2000		V=35 ~25 AB Jband. Undetected bluer of z band (z=6.6 source)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SCR7	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 2, Exps 1-1 in Visit 03 (2)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(3) SCR7	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=8; SAMP-SEQ=SPARS50		Pattern 2, Exps 2-2 in Visit 03 (2)	352.935448 Secs (1058.806 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20160601
Pointing Maneuver
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Pointing Maneuver
Reconfig
Unused Orbital Visibility = 107
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Exp. 2
Exp. 2
Occultation
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500
1000
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2500
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3500
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4500
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5500
sec

Visit

Proposal 14699, Visit 04, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: Orientation should have 132arcsec lenght of the detector orientated ~N-S.

Patterns

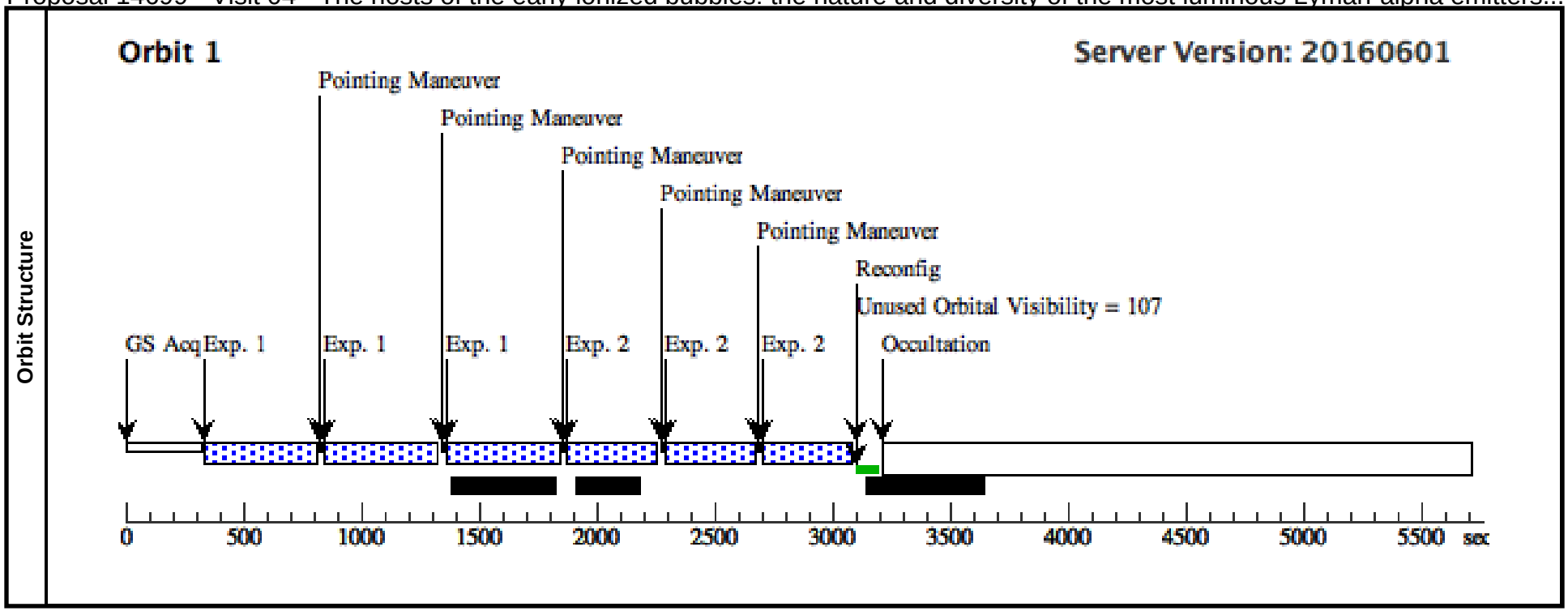
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=18.5		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.5	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(10)	SSM16-SA22-509891	RA: 22 19 49.7610 (334.9573375d) Dec: +00 48 23.90 (.80664d) Equinox: J2000		V=35 J~24. Undetected bluer of r band (z=5.7 source)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(10) SSM16-SA22-509891	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 2, Exps 1-1 in Visit 04 (2)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(10) SSM16-SA22-509891	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=8; SAMP-SEQ=SPARS50		Pattern 2, Exps 2-2 in Visit 04 (2)	352.935448 Secs (1058.806 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***


Orbit Structure
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Pointing Maneuver
Reconfig
Unused Orbital Visibility = 107
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
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4500
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5500
sec

Visit

Proposal 14699, Visit 05, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: Orientation should have 132arcsec lenght of the detector orientated ~N-S.

Patterns

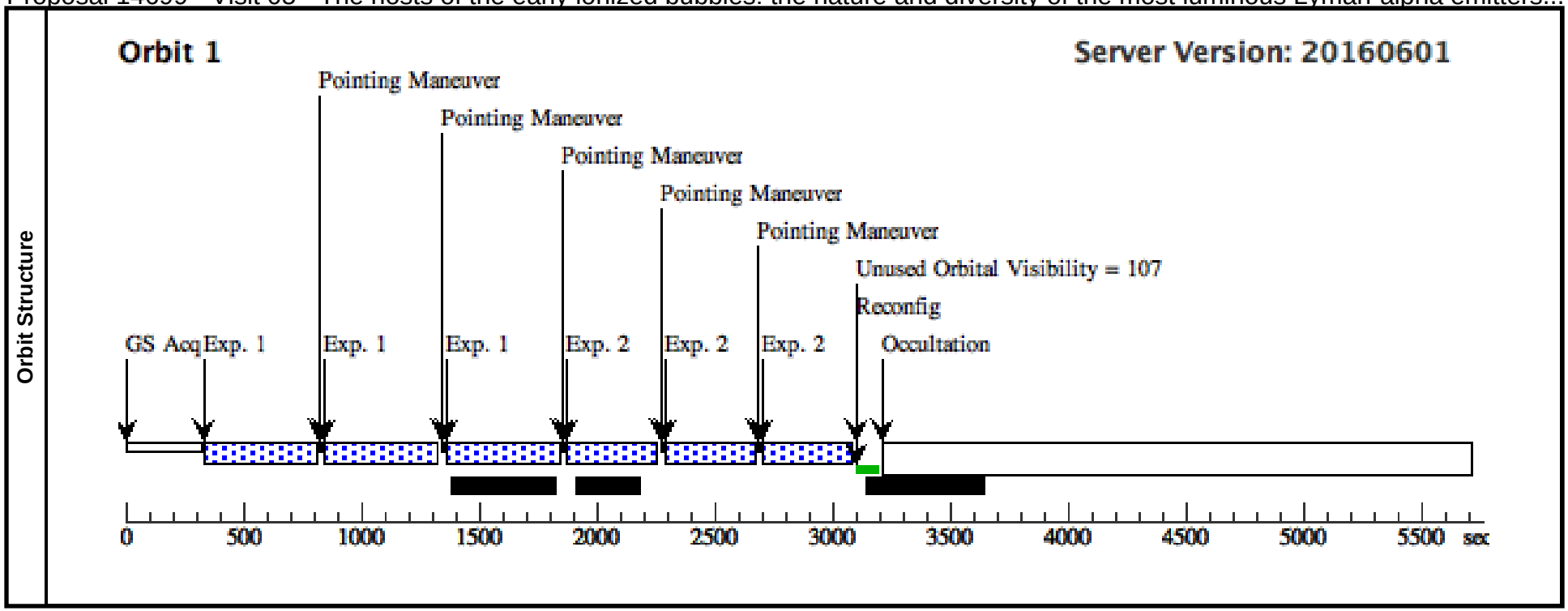
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=18.5		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.5	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(10)	SSM16-SA22-509891	RA: 22 19 49.7610 (334.9573375d) Dec: +00 48 23.90 (.80664d) Equinox: J2000		V=35 J~24. Undetected bluer of r band (z=5.7 source)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(10) SSM16-SA22-509891	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 2, Exps 1-1 in Visit 05 (2)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(10) SSM16-SA22-509891	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=8; SAMP-SEQ=SPARS50		Pattern 2, Exps 2-2 in Visit 05 (2)	352.935448 Secs (1058.806 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***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Pointing Maneuver
Unused Orbital Visibility = 107
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Exp. 2
Exp. 2
Occultation
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5500
sec

Visit

Proposal 14699, Visit 06, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: Orientation should have 132arcsec lenght of the detector orientated ~N-S.

Patterns

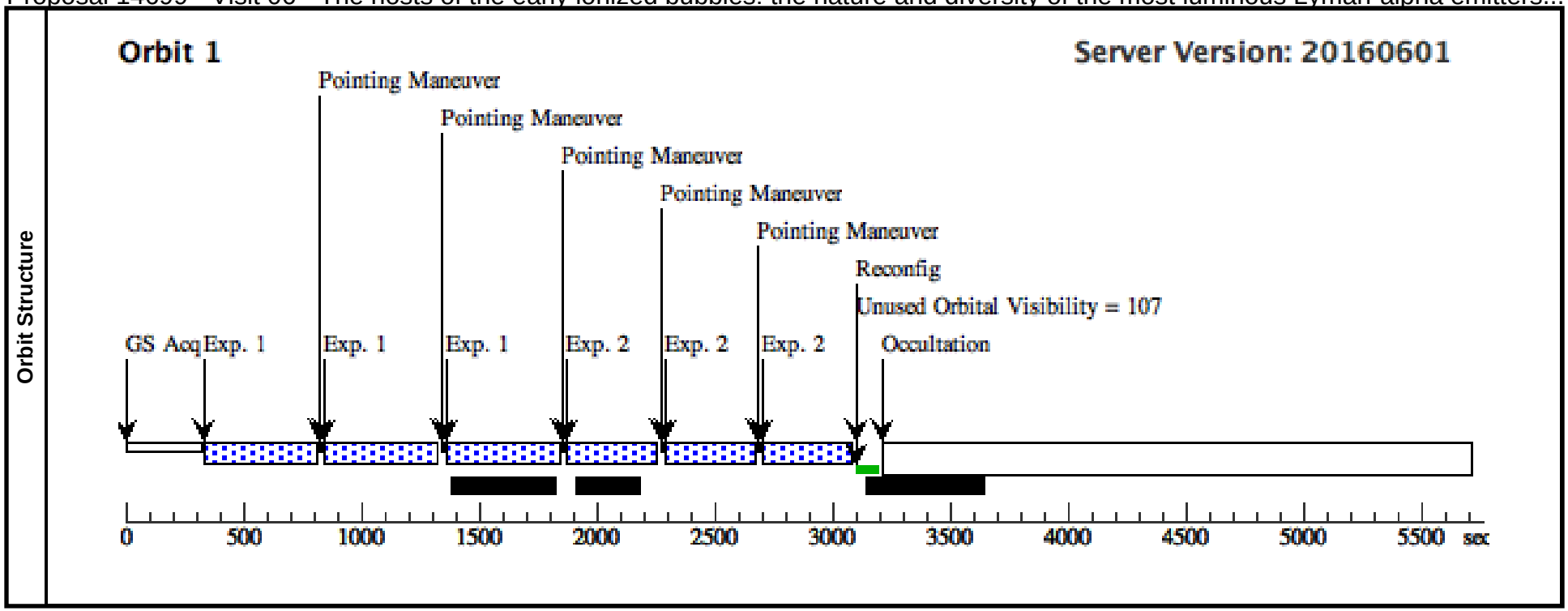
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=18.5		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.5	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(9)	SSM16-SA22-390412	RA: 22 15 1.2160 (333.7550667d) Dec: +00 46 24.25 (.77340d) Equinox: J2000		V=35 J~24. Undetected bluer of r band (z=5.7 source)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(9) SSM16-SA22-390412	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 2, Exps 1-1 in Visit 06 (2)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(9) SSM16-SA22-390412	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=8; SAMP-SEQ=SPARS50		Pattern 2, Exps 2-2 in Visit 06 (2)	352.935448 Secs (1058.806 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***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Pointing Maneuver
Reconfig
Unused Orbital Visibility = 107
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Exp. 2
Exp. 2
Occultation
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Visit

Proposal 14699, Visit 07, implementation Tue Nov 29 02:09:17 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: Orientation should have 132arcsec lenght of the detector orientated ~N-S.

Patterns

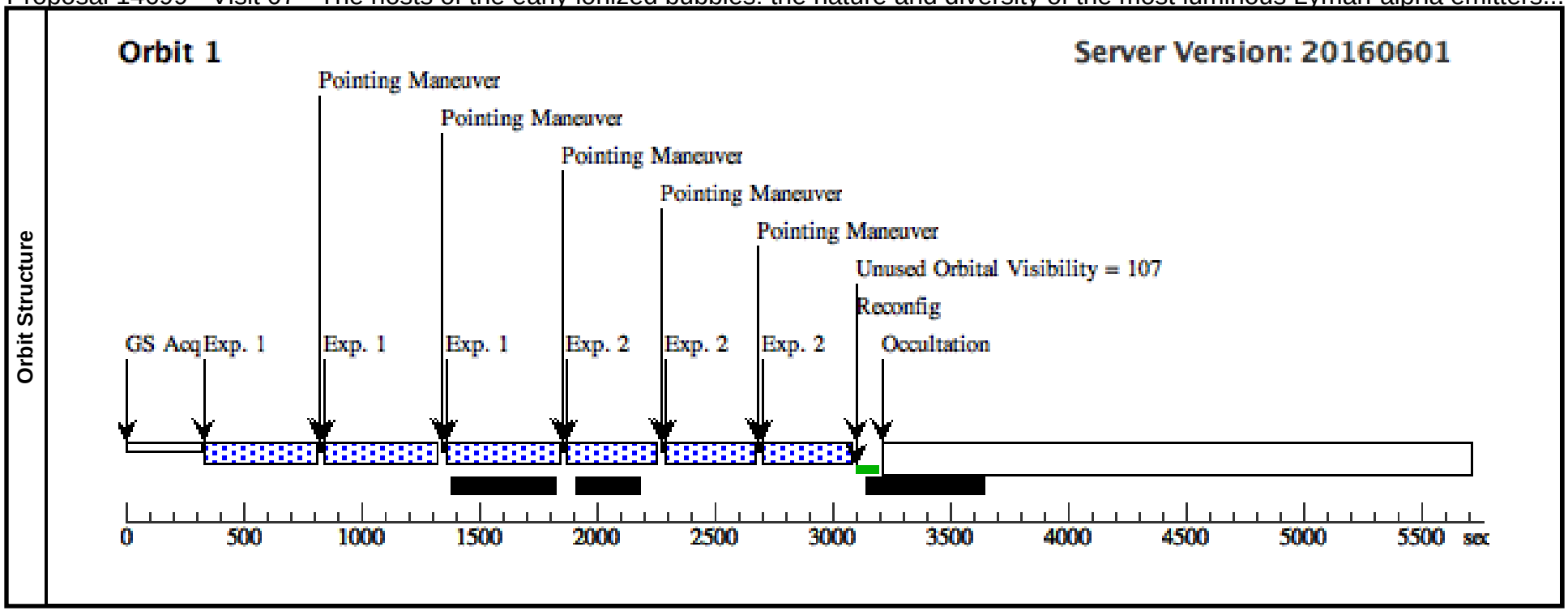
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=SPIRAL	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=18.5		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.5	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(10)	SSM16-SA22-509891	RA: 22 19 49.7610 (334.9573375d) Dec: +00 48 23.90 (.80664d) Equinox: J2000		V=35 J~24. Undetected bluer of r band (z=5.7 source)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(10) SSM16-SA22-509891	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 2, Exps 1-1 in Visit 07 (2)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(10) SSM16-SA22-509891	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=8; SAMP-SEQ=SPARS50		Pattern 2, Exps 2-2 in Visit 07 (2)	352.935448 Secs (1058.806 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***


Orbit Structure
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Pointing Maneuver
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Pointing Maneuver
Unused Orbital Visibility = 107
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec