14760 - Imaging a Massive Galaxy Overdensity at z=2.3: The Morphology-Density Relation at High Redshift

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) POS01	WFC3/IR	1	19-Aug-2017 01:00:20.0	yes
02	(2) POS02	WFC3/IR	1	19-Aug-2017 01:00:22.0	yes
03	(3) POS03	WFC3/IR	1	19-Aug-2017 01:00:23.0	yes
04	(4) POS04	WFC3/IR	1	19-Aug-2017 01:00:23.0	yes
05	(5) POS05	WFC3/IR	1	19-Aug-2017 01:00:24.0	yes
06	(6) POS06	WFC3/IR	1	19-Aug-2017 01:00:25.0	yes
07	(7) POS07	WFC3/IR	1	19-Aug-2017 01:00:26.0	yes
08	(8) POS08	WFC3/IR	1	19-Aug-2017 01:00:27.0	yes
09	(9) POS09	WFC3/IR	1	19-Aug-2017 01:00:27.0	yes

9 Total Orbits Used

ABSTRACT

We propose deep HST/WFC3 imaging in the density peak area of BOSS1441 protocluster at z = 2.32 traced by an extreme rare group of Ly-alpha absorbers and multiple quasars. This structure is selected from the large survey volume of 1 Gpc^3 covered by SDSS, and is the most overdense and robustly established cluster-sized overdensity at z ~ 2. This massive structure centered on a 7' x7' (12 Mpc x 12 Mpc) sub-region has the highest galaxy overdensity of 10.8+/-1.0, anchored by the largest and most luminous Lyman alpha nebula known at z>2. In this area, our Keck+ LBT observations have obtained the spectra for the unique Ly-alpha nebula, 20 strong Ly-alpha emitting galaxies at z=2.32+/-0.02, and 110 Lyman break galaxies (i < 24.5). This field is also covered in complete wavelength observations from U-band to K-band using ground-based imaging. Here we propose to use nine HST/WFC3 pointings to cover this central region in 9 orbits. We will measure the detailed rest-frame optical morphology of this sample, to determine whether the universal morphology-density relationship observed in the low-redshift universe is already in place in and around most overdense region at z ~ 2. We will also probe the powering mechanism of the largest Ly-alpha nebula, testing if this nebula is powered by merging of separated galaxies. Combining the new HST observations with the existing multi-wavelength imaging ranging from 0.3 - 2.3 microns, optical spectroscopy, and narrow-band imaging, we will provide a complete sample of galaxies in the most massive protocluster at z=2 which could be evolved into the most massive galaxy clusters (10^15 M_sun) in later epoch.

OBSERVING DESCRIPTION

Brief Summary of Science:

In our program, we will conduct the deep WFC3 imaging in the most massive protocluster field, BOSS1441, at z=2.32. This field contains a galaxy overdensty compared to the random fields on a large scale of 15 Mpcs. We will use HST WFC3/F160W deep imaging to conduct deep imaging, and study the density-morphology relation in this extremely overdense field in the early Universe.

Description of observations:

Our project contains 9 orbits. In this project, we have 9 targets, with each target representing a different pointings. We will use these 9 different pointings to map the BOSS1441 field. We use 1-orbit for each pointing. Each pointing contains 7 - 15 galaxies that resides at z~ 2.3 and we need to measure the morphology for these galaxies. These galaxies are randomly distributed in the WFC3 field of view.

We have a special setting: we need to set the position angle (PA) for each pointings to specific degree range (typical PA for our fields are ~20 deg). The PA means the angle from the North to the longer axis of the detector, north-east direction. From the current Phase-II, we tentatively set a Orientation Range for each visit, with the minOrient of ~60 and maxOrient of 70 deg. This number is calculated by us and could not be 100% precise. Our purpose is to achieve a PA for each visit. Note we can add 180 deg to any current PA requirements we listed.

For cosmic ray rejection, we use 5 different exposures to populate each orbit. We checked the HST instrumentation handbook and we found it suggests a 5 different exposures to populate a ~3000 sec exposure for a complete rejection of cosmic rays. Specifically, we use a standard 4-point small-scale dither pattern and plus an additional exposure to populate each orbit. We think these arrangements enables us to reject cosmic ray, and provide a half-pixel subsampling of the point-spread function (PSF) for each pointing.

We use a total two visits to populate our 9 orbits. The first visit has 5 orbits. For each orbit in the first visit, we use NSAMP= 12, SPARS=50 for the first four exposures, and NSAMP=10, SPARS=50 for the fifth exposure. The second visit has 4 orbits and we use NSAMP=11 for the first four exposures and NSAMP=13 for the fifth orbits. We use IR-FIX to center each pointing, enabling to perfectly center the pointing in the detector. Our galaxies are randomly distributed in each pointings.

Visit

Proposal 14760, Visit 01, scheduling Sat Aug 19 05:00:28 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 62D TO 73 D; ORIENT 242D TO 253 D

Patterns

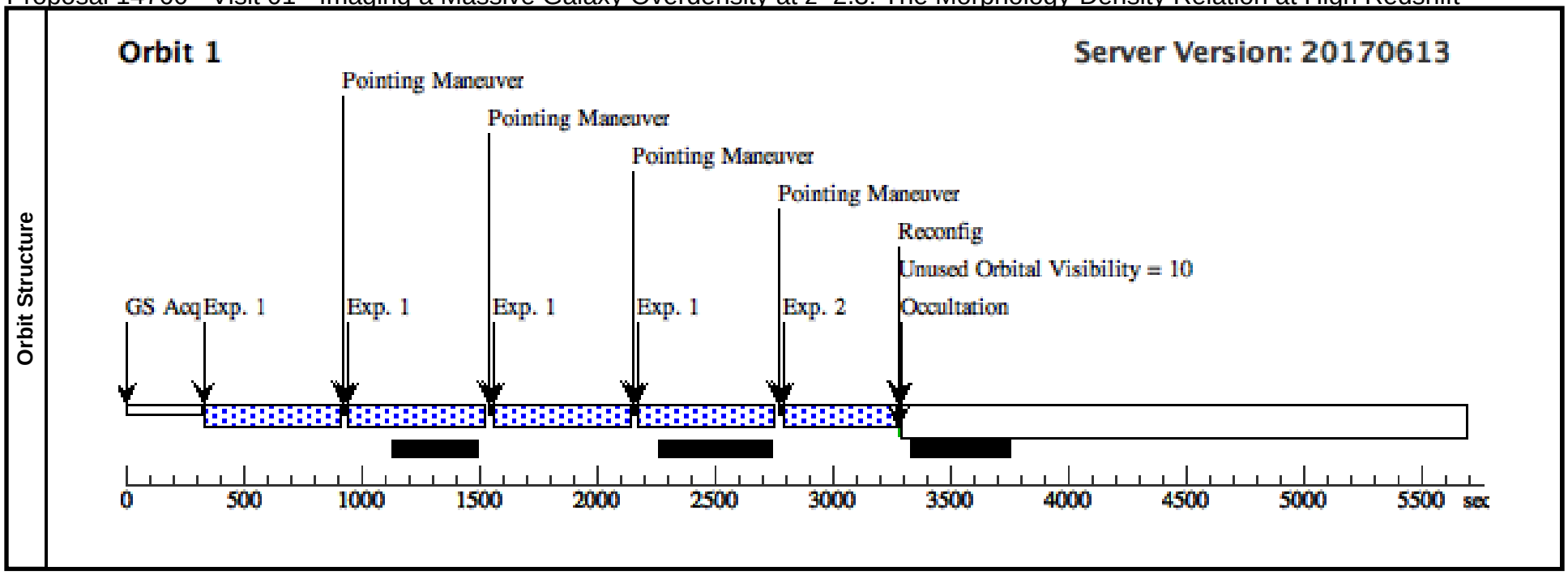
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	POS01	RA: 14 41 26.3410 (220.3597542d) Dec: +40 03 17.41 (40.05484d) Equinox: J2000	Redshift: 2.32	V=24.2+/-0.02	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS01	(1) POS01	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 01 (1)	552.937252 Secs (2211.749 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS01	(1) POS01	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=SPARS50			452.93635 Secs (452.936 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 10
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14760, Visit 02, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

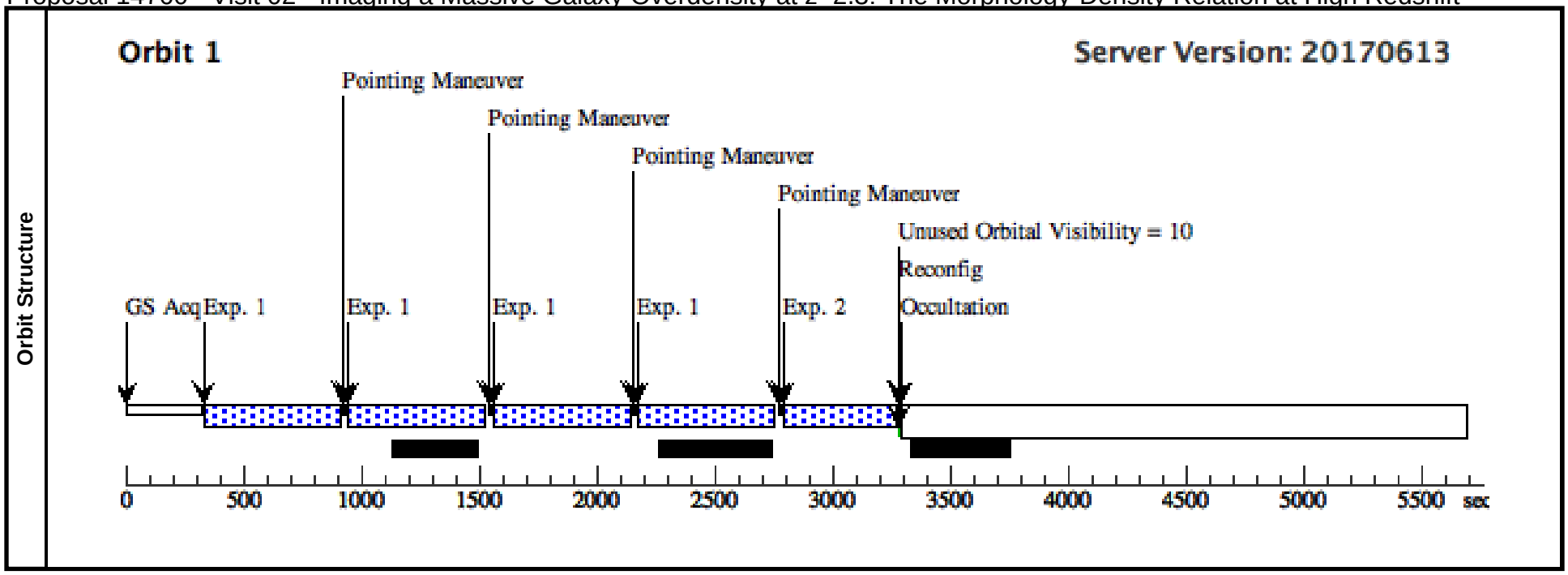
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	POS02	RA: 14 41 30.2660 (220.3761083d) Dec: +40 01 8.08 (40.01891d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS02	(2) POS02	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 02 (1)	552.937252 Secs (2211.749 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS02	(2) POS02	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=SPARS50			452.93635 Secs (452.936 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 10
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14760, Visit 03, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 62D TO 68 D; ORIENT 242D TO 248 D

Patterns

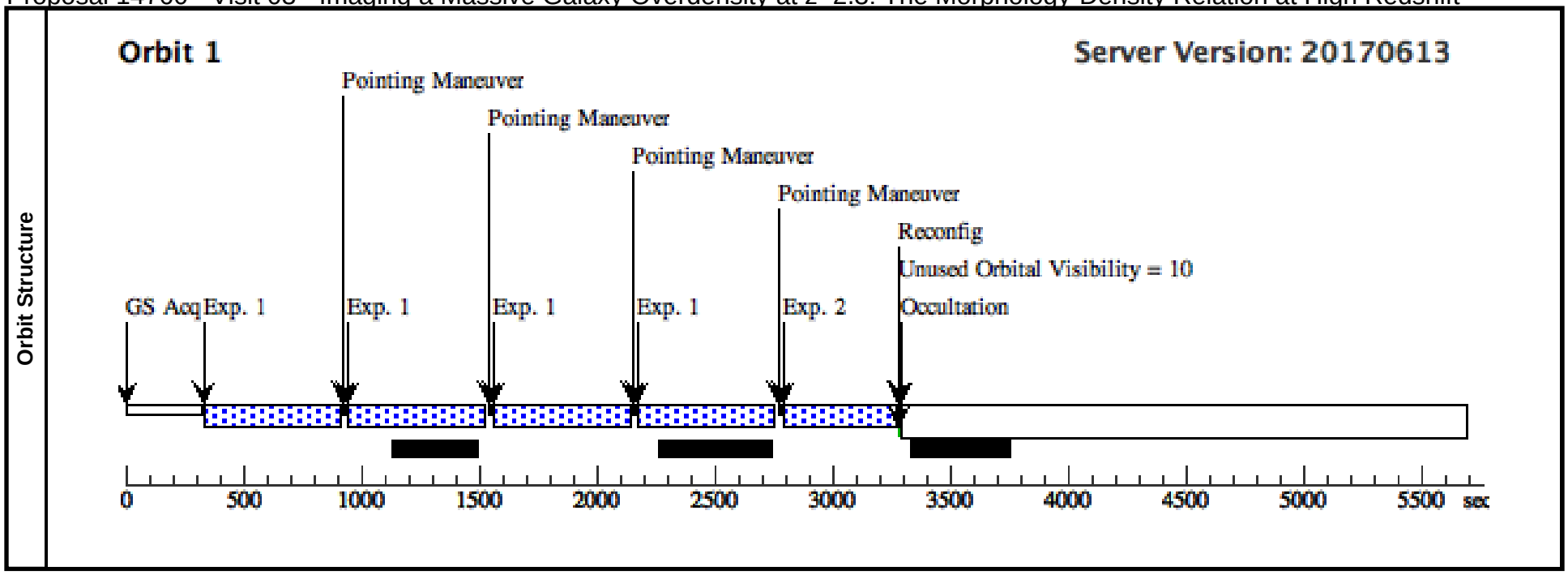
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	POS03	RA: 14 41 32.9200 (220.3871667d) Dec: +40 06 0.13 (40.10004d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS03	(3) POS03	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 03 (1)	552.937252 Secs (2211.749 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS03	(3) POS03	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=SPARS50			452.93635 Secs (452.936 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 10
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14760, Visit 04, scheduled Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 45D TO 78 D

Patterns

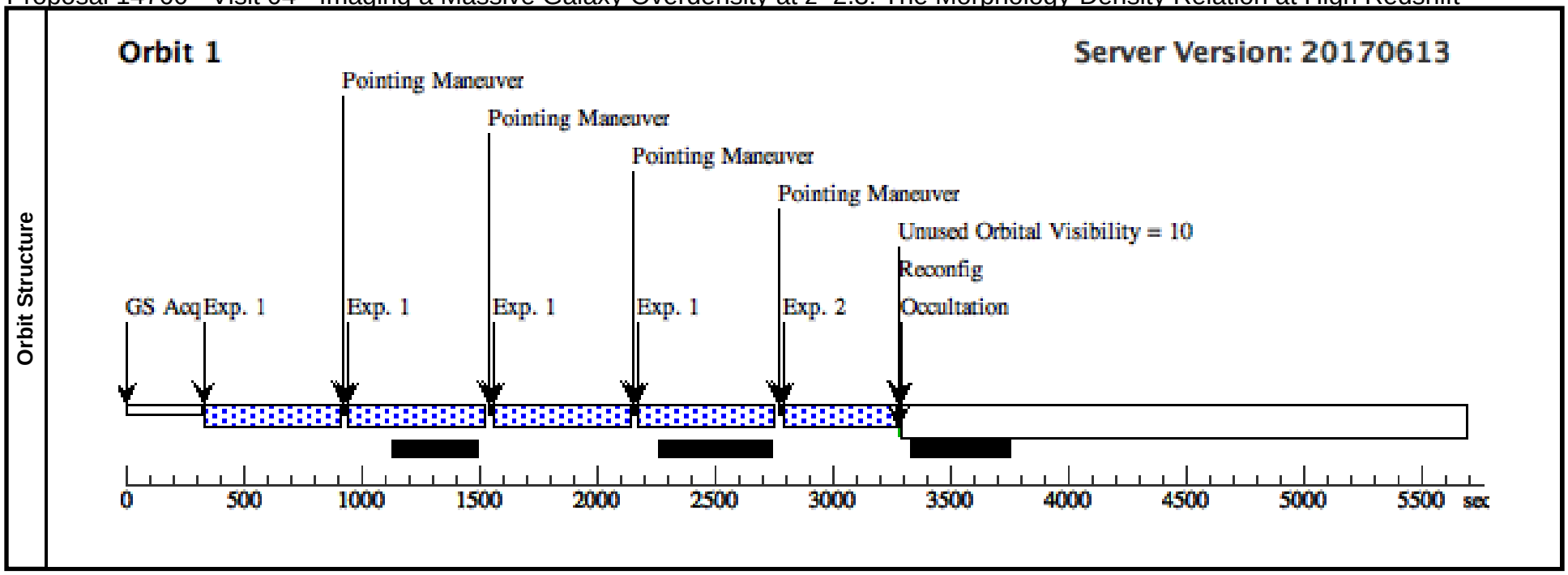
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	POS04	RA: 14 41 39.4250 (220.4142708d) Dec: +40 03 6.99 (40.05194d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS04	(4) POS04	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 04 (1)	552.937252 Secs (2211.749 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS04	(4) POS04	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=SPARS50			452.93635 Secs (452.936 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 10
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
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5500
sec

Visit

Proposal 14760, Visit 05, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

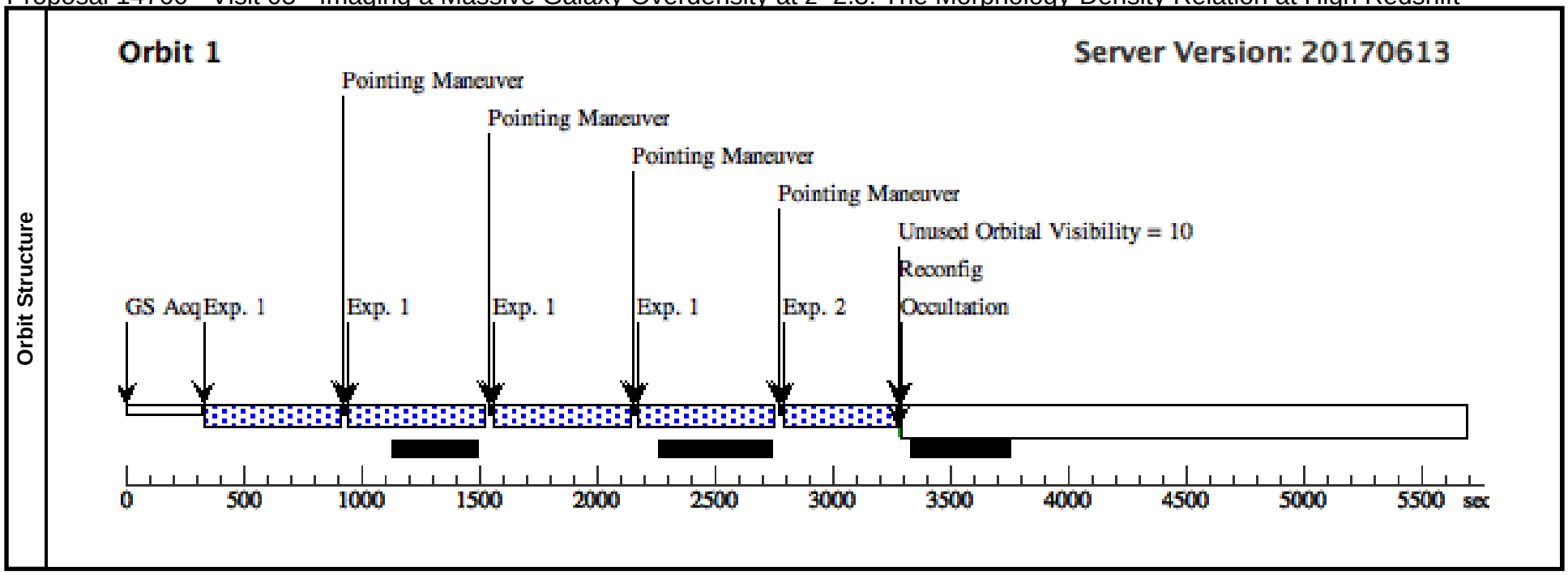
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	POS05	RA: 14 41 40.6990 (220.4195792d) Dec: +40 00 29.47 (40.00819d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS05	(5) POS05	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=12; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 05 (1)	552.937252 Secs (2211.749 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS05	(5) POS05	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=10; SAMP-SEQ=SPARS50			452.93635 Secs (452.936 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 10
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
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1500
2000
2500
3000
3500
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4500
5000
5500
sec

Visit

Proposal 14760, Visit 06, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 64D TO 76 D

Patterns

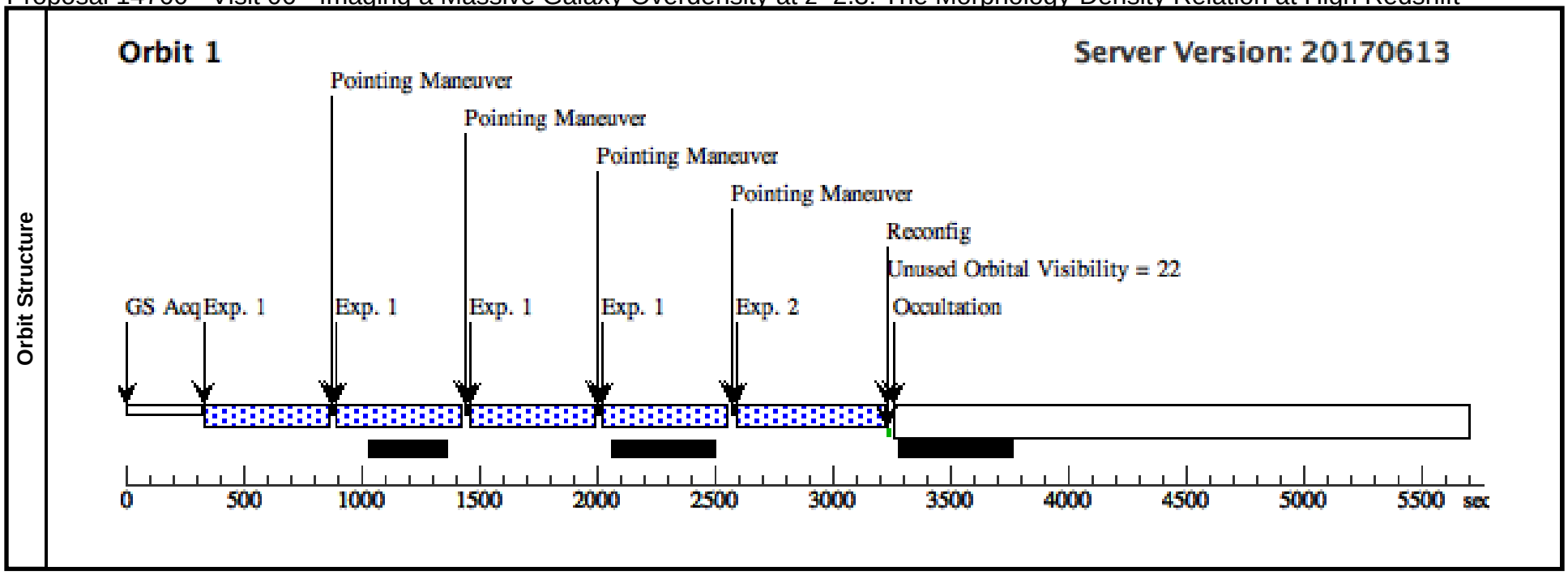
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	POS06	RA: 14 41 15.2170 (220.3134042d) Dec: +39 58 51.67 (39.98102d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS06	(6) POS06	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=11; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 06 (1)	502.936801 Secs (2011.747 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS06	(6) POS06	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=13; SAMP-SEQ=SPARS50			602.937703 Secs (602.938 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 22
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
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1500
2000
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3000
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sec

Visit

Proposal 14760, Visit 07, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 40D TO 60 D

Patterns

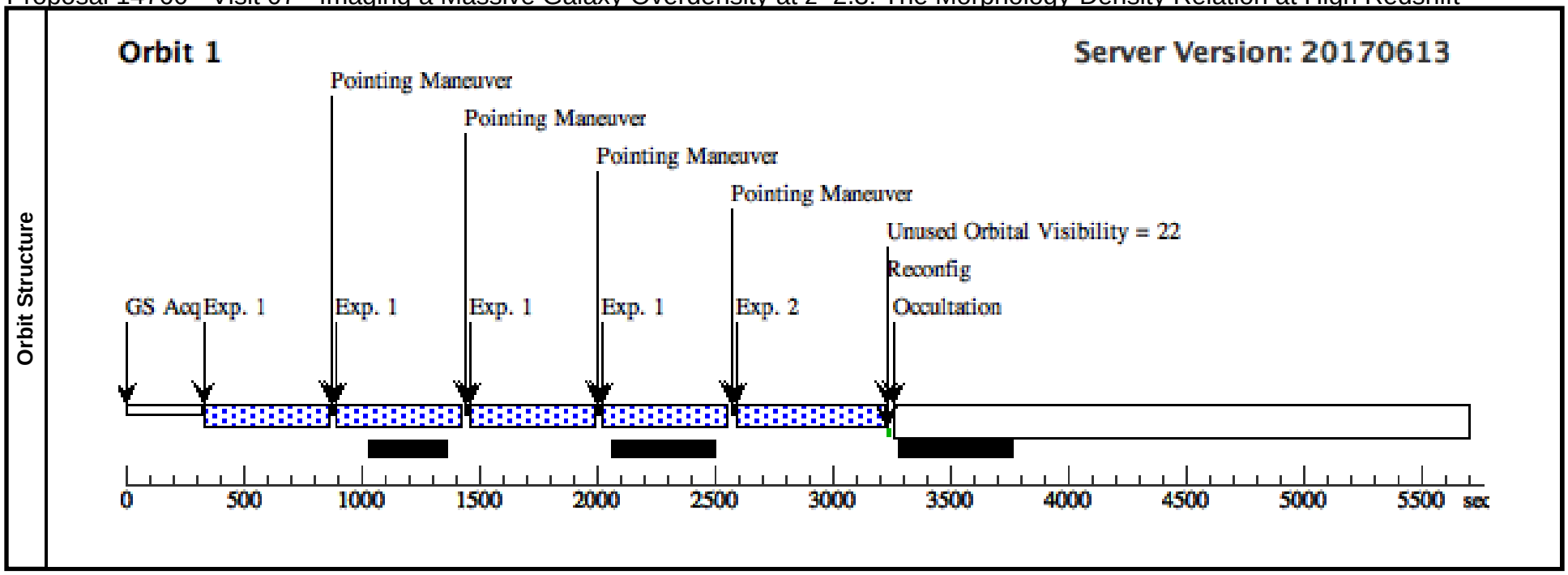
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(7)	POS07	RA: 14 41 17.2630 (220.3219292d) Dec: +39 54 43.25 (39.91201d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS07	(7) POS07	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=11; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 07 (1)	502.936801 Secs (2011.747 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	POS07	(7) POS07	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=13; SAMP-SEQ=SPARS50			602.937703 Secs (602.938 Secs) *[==>]*	***[1]***


Orbit Structure
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Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 22
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
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Visit

Proposal 14760, Visit 08, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

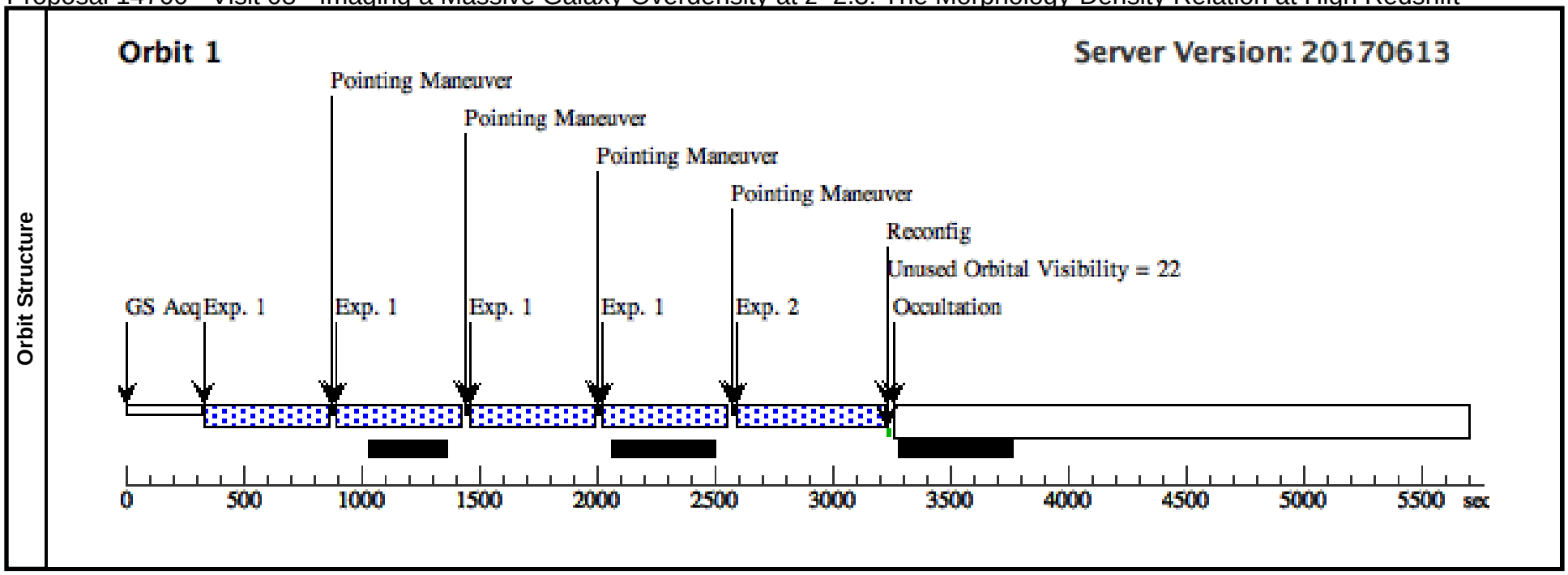
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(8)	POS08	RA: 14 41 2.7320 (220.2613833d) Dec: +39 54 40.35 (39.91121d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS08	(8) POS08	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=11; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 08 (1)	502.936801 Secs (2011.747 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2	POS08	(8) POS08	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=13; SAMP-SEQ=SPARS50			602.937703 Secs (602.938 Secs) *[==>]*	 ***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 22
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
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500
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2000
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3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14760, Visit 09, scheduling Sat Aug 19 05:00:29 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 40D TO 68 D

Patterns

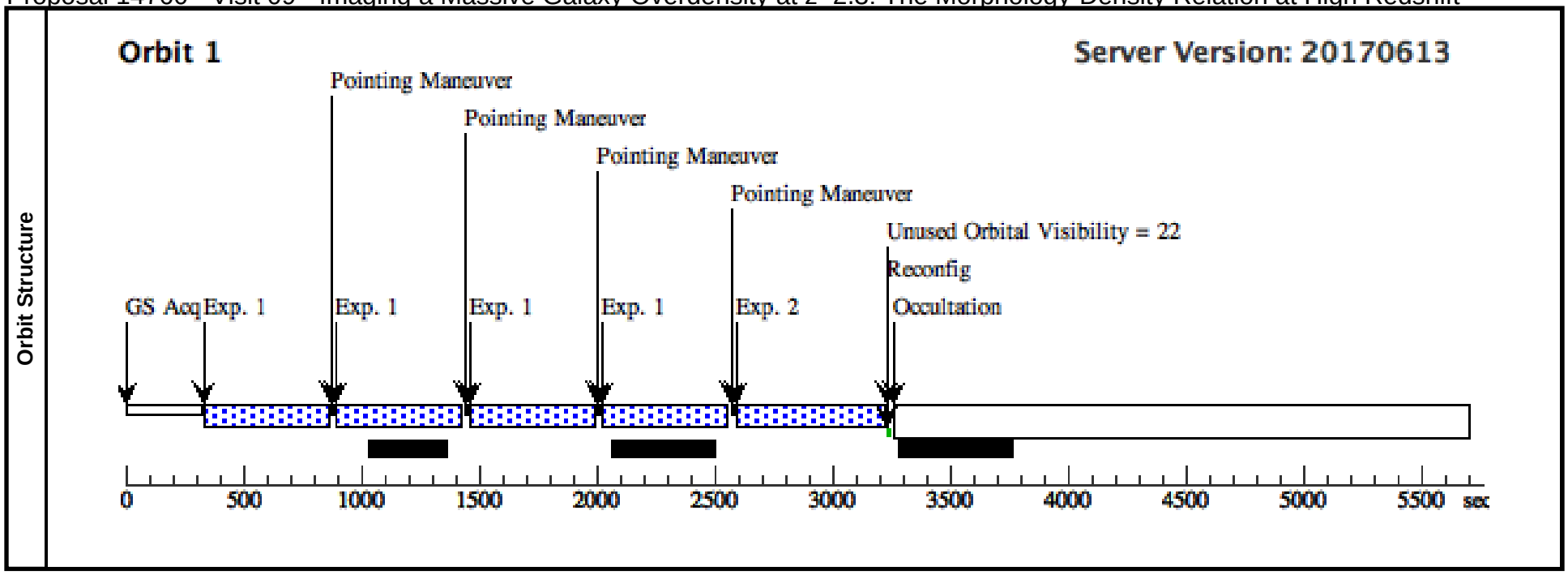
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(9)	POS09	RA: 14 40 52.9190 (220.2204958d) Dec: +39 53 30.77 (39.89188d) Equinox: J2000	Redshift: 2.32	V=24.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POS09	(9) POS09	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=11; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 09 (1)	502.936801 Secs (2011.747 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	POS09	(9) POS09	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=13; SAMP-SEQ=SPARS50			602.937703 Secs (602.938 Secs) *[==>]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20170613
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 22
Reconfig
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec