15137 - Spectroscopically-Confirmed z > 6 Galaxies with Extremely Blue UV Slopes: Possible Pop III dominated targets for JWST spectroscopy

Cycle: 25, Proposal Category: GO

(JWST Initative)

(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) SDF07	WFC3/IR	2	12-Jul-2018 10:00:18.0	yes
02	(2) SDF28	WFC3/IR	2	12-Jul-2018 10:00:20.0	yes
03	(3) SDF30	WFC3/IR	3	12-Jul-2018 10:00:21.0	yes
04	(4) SDF43	WFC3/IR	1	12-Jul-2018 10:00:22.0	yes
05	(5) SDF61	WFC3/IR	2	12-Jul-2018 10:00:23.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
06	(6) SDF63	WFC3/IR	1	12-Jul-2018 10:00:24.0	yes
07	(7) SDF64	WFC3/IR	1	12-Jul-2018 10:00:25.0	yes

12 Total Orbits Used

ABSTRACT

We propose to use HST/WFC3 to study 7 galaxies at z>6 with much bluer rest-frame UV continua than models of stellar populations and galaxy formation can accommodate. They were selected from a dedicated, large Subaru survey of bright spectroscopically-confirmed galaxies at z>6, and have extremely steep UV-slopes around beta=-3.

Such slopes have never been found in low-z galaxies, nor have they been predicted by cosmological simulations. Although recent HST observations found some extreme UV-slopes in photometrically-selected galaxies at z>6, this is controversial, since it could be caused by contamination and bias in photometrically-selected samples.

Our galaxies are bright (J=25-26.5 AB-mag) with secure spectroscopic redshifts, so their measurements of beta are NOT subject to these effects. They are the most promising candidates of truly extremely blue galaxies. Their uncertainties in beta are 0.3-0.5, mainly due to the short UV continuum baseline from previous HST data.

We propose to add critical WFC3 near-IR images over a larger wavelength baseline to significantly improve the beta measurements by reducing uncertainties to <0.2. The new images will conclusively confirm the existence of beta = -3 galaxies at z>6. Such ultra-blue beta-values would suggest the existence of very young stellar populations with extremely low metallicity and dust content, which are possibly Pop III star dominated. Their confirmation will have significant impact on early galaxy formation, their star formation history, associated metallicity, dust, and even initial mass function. They would make very compelling targets for JWST spectroscopy. The HST/WFC3 data therefore must be completed now.

OBSERVING DESCRIPTION

Our observing strategy is straightforward (simple broad-band photometry). We
will observe 7 spectroscopically confirmed galaxies at z >= 6 with
12 HST orbits covering 7 pointings. Five galaxies are in the the Subaru Deep

Field (13h24m, 27d30m) and two are in the UKIDSS Ultra-Deep Survey field (2h18m, -5d10m). We will observe using specific WFC3-IR filters needed to complement previous observations, and provide the optimally wide wavelength baselines to measure the SED rest-frame UV slope of the target galaxies. Each pointing will be observed in a single orbit per filter and repeated for one, two, or three WFC3 bands, chosen from F105W, F125W, F140W, and F160W. The choice of filter depends on galaxy redshift and existing data. According to our existing WFC3 data, these galaxies span a magnitude range of $25.16 < J_{AB} < 26.66$, and WFC3 is able to detect them with one-orbit integrations. The integration of each object per band will be broken into four individual exposures with sub-pixel dithering, to improve PSF and to remove bad pixels and CRs. These galaxies were chosen so that all of them can be observed within 12 HST orbits regardless of rolling angles (with fixed coordinates). We do not have any scheduling constraints or special requirements.

Visit

Proposal 15137, SDF07 (01), completed Thu Jul 12 14:00:25 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDF07	RA: 13 24 15.9870 (201.0666125d) Dec: +27 16 11.05 (27.26974d) Equinox: J2000		V=(?) J = 26.66 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SDF07	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS50; NSAMP=14		Pattern 1, Exps 1-2 in SDF07 (01) (1)	652.938154 Secs (2611.753 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
2		(1) SDF07	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-2 in SDF07 (01) (1)	652.938154 Secs (2611.753 Secs)	
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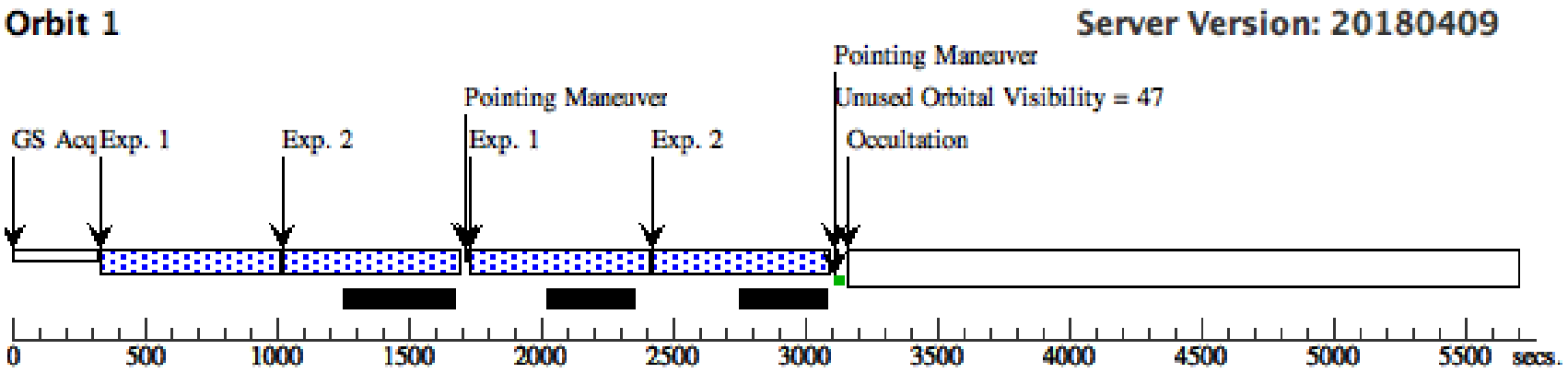
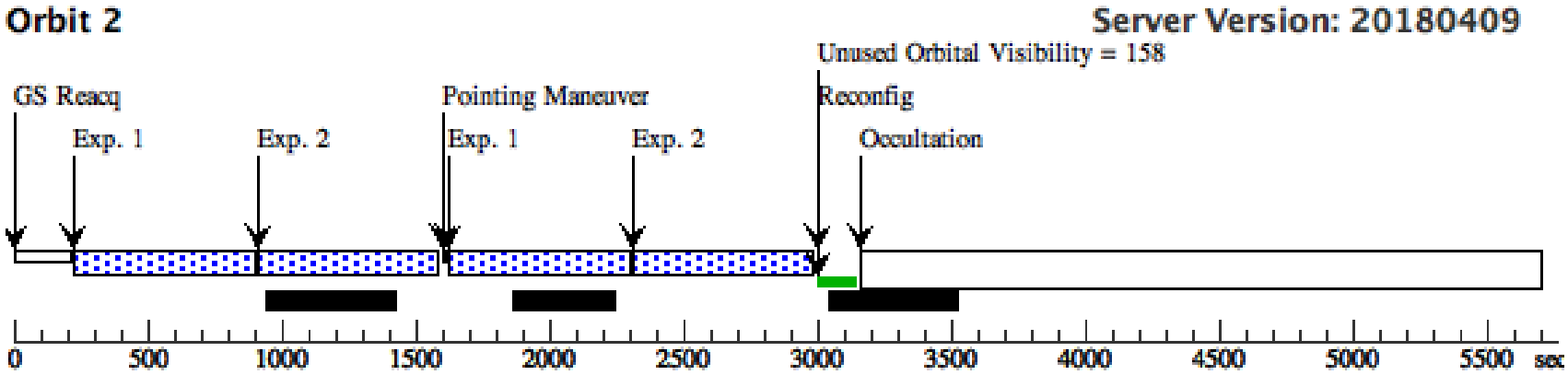
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***

Orbit Structure





Visit

Proposal 15137, SDF028 (02), completed Thu Jul 12 14:00:26 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDF28	RA: 13 24 42.4520 (201.1768833d) Dec: +27 24 23.35 (27.40649d) Equinox: J2000		V=(?) J = 25.84 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SDF28	WFC3/IR, MULTIACCUM, IR-FIX	F140W	SAMP-SEQ=SPARS50; NSAMP=14	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-2 in SDF028 (02) (1)	652.938154 Secs (2611.753 Secs)	
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								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
2		(2) SDF28	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-2 in SDF028 (02) (1)	652.938154 Secs (2611.753 Secs)	
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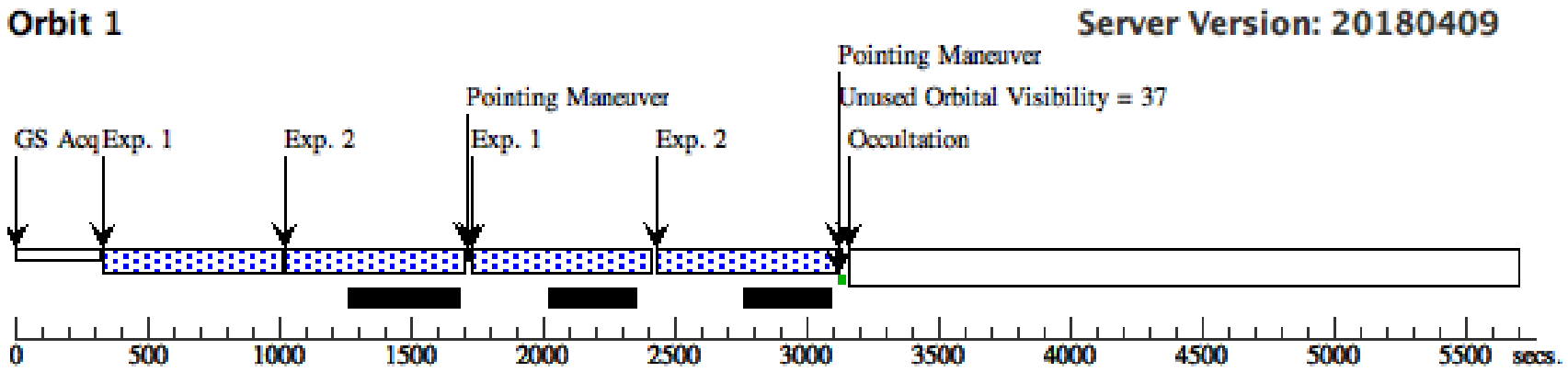
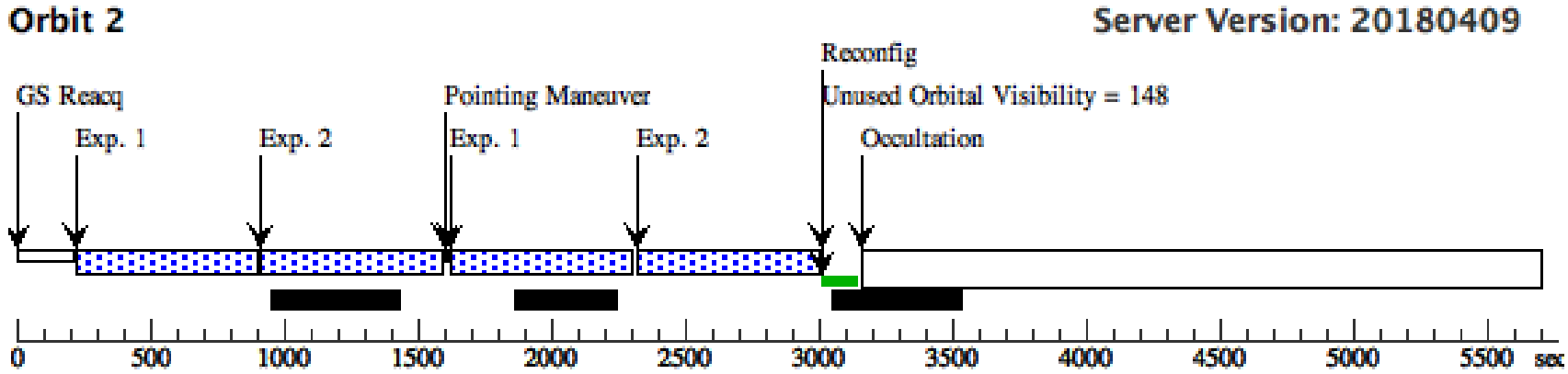
Orbit Structure





Visit

Proposal 15137, SDF030 (03), completed Thu Jul 12 14:00:26 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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		(1-3)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDF30	RA: 13 24 0.3010 (201.0012542d) Dec: +27 32 37.95 (27.54387d) Equinox: J2000		V=(?) J = 26.11 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SDF30	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-3 in SDF030 (03) (1)	652.938154 Secs (2611.753 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)]	***[2]***
								[==>(Pattern 4)]	***[3]***
2		(3) SDF30	WFC3/IR, MULTIACCUM, IR-FIX	F125W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-3 in SDF030 (03) (1)	652.938154 Secs (2611.753 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)] *[==>(Pattern 3)]*	***[2]***
								[==>(Pattern 4)]	***[3]***
3		(3) SDF30	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS 50; NSAMP=14		Pattern 1, Exps 1-3 in SDF030 (03) (1)	652.938154 Secs (2611.753 Secs)	
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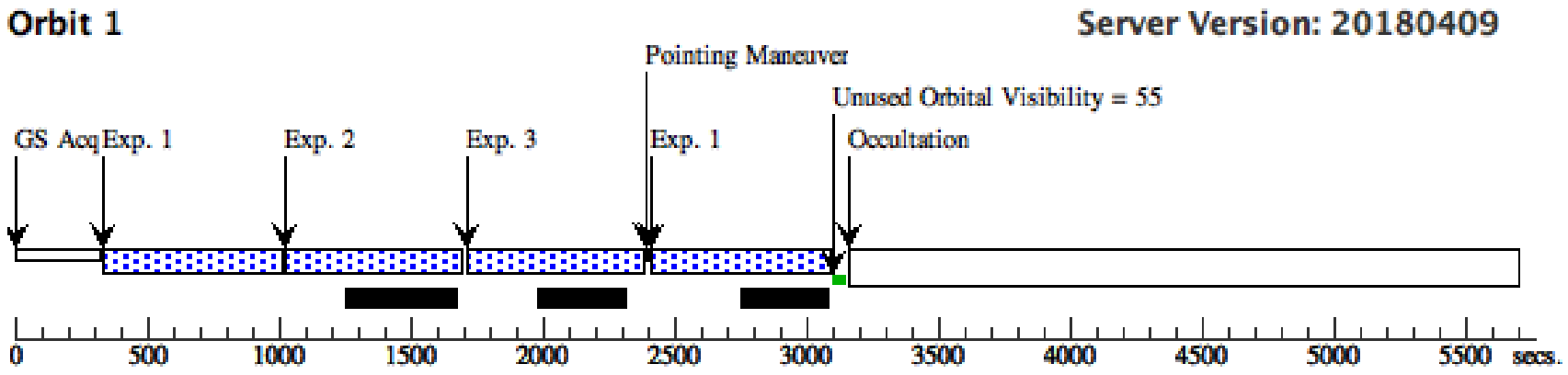
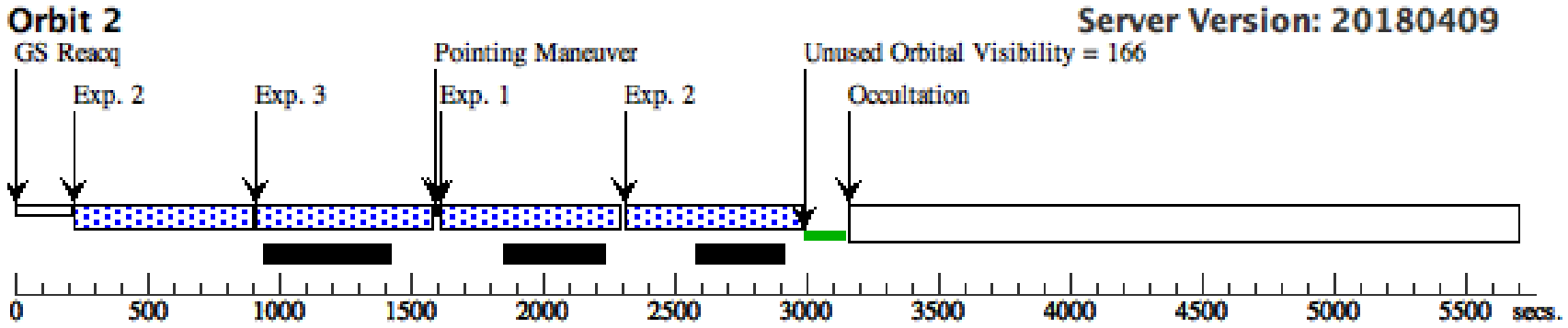
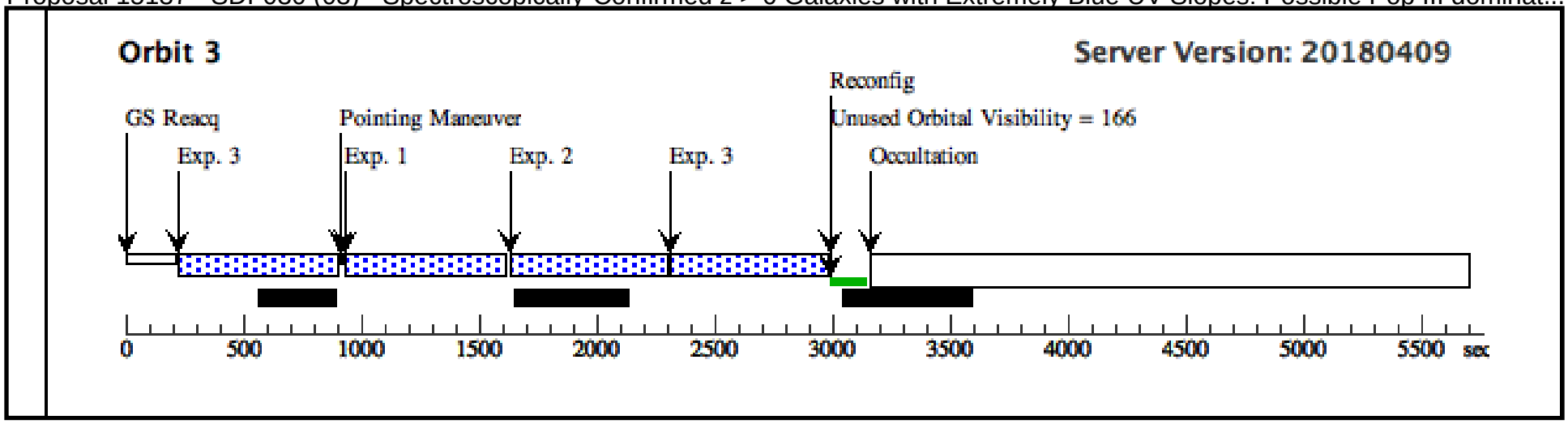
Orbit Structure



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Exp. 2
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Visit

Proposal 15137, SDF043 (04), completed Thu Jul 12 14:00:26 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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

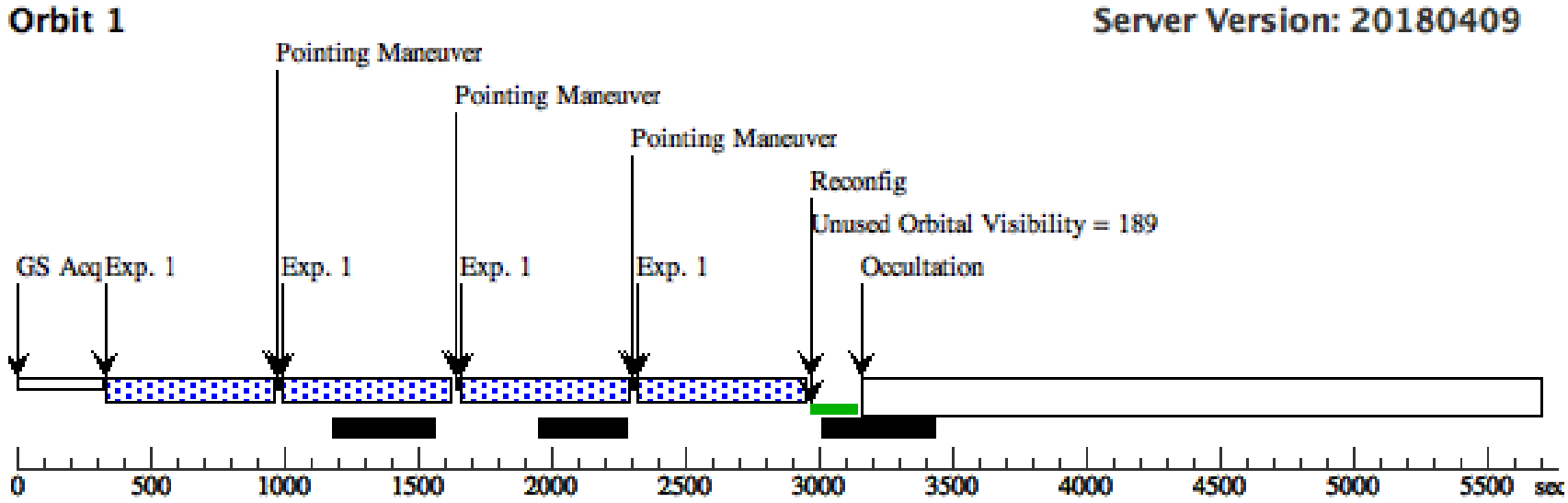
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	SDF43	RA: 13 23 53.0540 (200.9710583d) Dec: +27 16 30.75 (27.27521d) Equinox: J2000		V=(?) J = 26.23 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) SDF43	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS50; NSAMP=13	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in SDF043 (04) (1)	602.937703 Secs (2411.751 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 15137, SDF061 (05), scheduling Thu Jul 12 14:00:26 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	SDF61	RA: 13 25 22.2910 (201.3428792d) Dec: +27 35 19.95 (27.58887d) Equinox: J2000		V=(?) J = 25.93 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(5) SDF61	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS50; NSAMP=14	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-2 in SDF061 (05) (1)	652.938154 Secs (2611.753 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[1]***
								[==>(Pattern 3)] *[==>(Pattern 4)]*	***[2]***
2		(5) SDF61	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-2 in SDF061 (05) (1)	652.938154 Secs (2611.753 Secs)	
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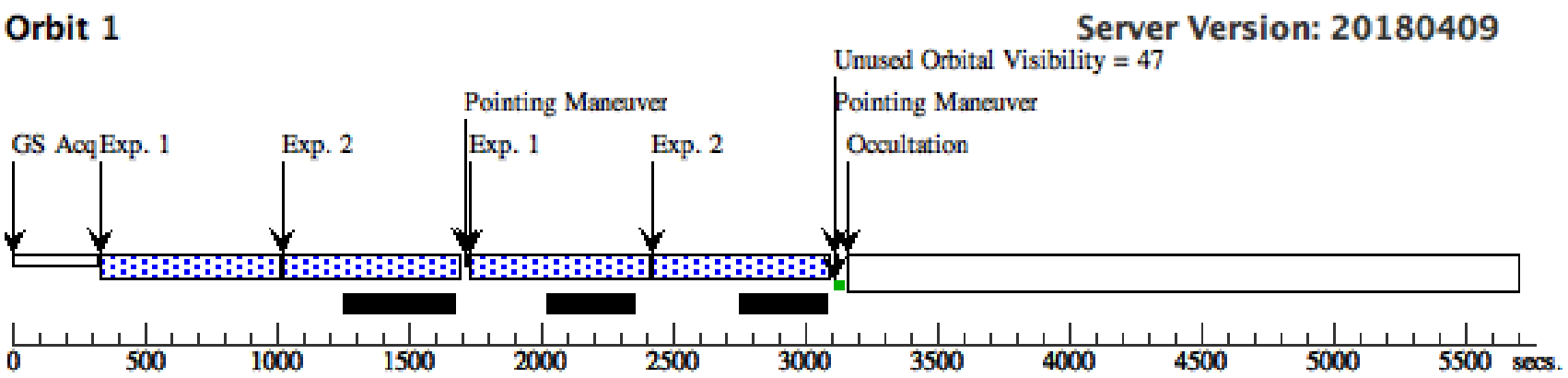
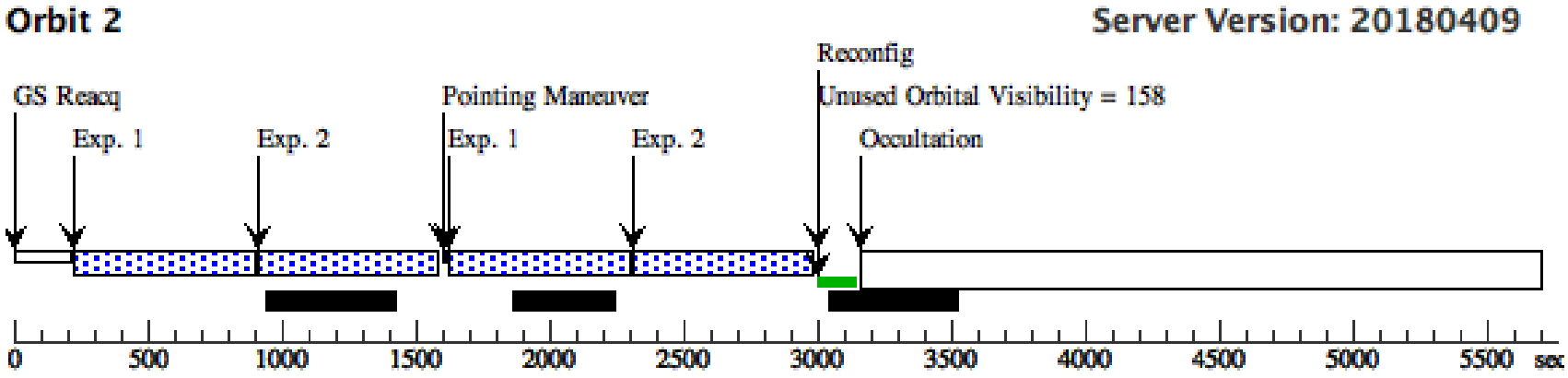
Orbit Structure





Visit

Proposal 15137, SDF063 (06), implementation Thu Jul 12 14:00:26 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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

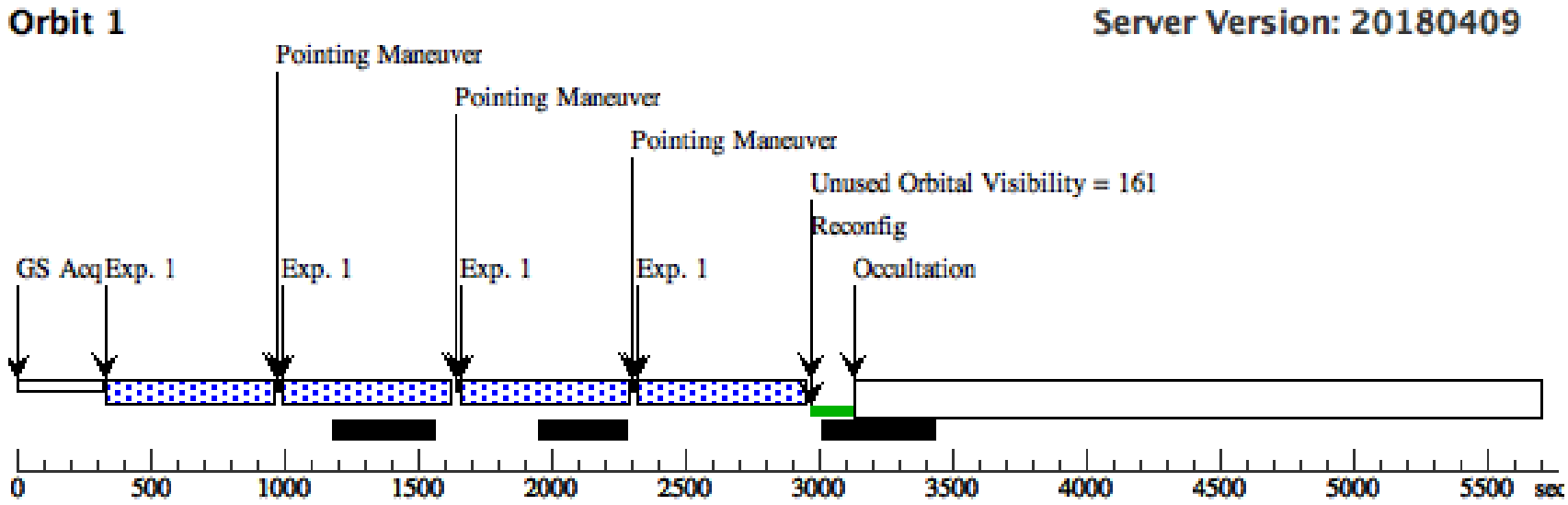
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	SDF63	RA: 02 18 0.8990 (34.5037458d) Dec: -05 11 37.69 (-5.19380d) Equinox: J2000		V=(?) J = 25.16 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(6) SDF63	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS50; NSAMP=13	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in SDF063 (06) (1)	602.937703 Secs (2411.751 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 15137, SDF064 (07), scheduling Thu Jul 12 14:00:26 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; GUID TOL 0.01"; SCHED 50%

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)	SDF64	RA: 02 17 35.3370 (34.3972375d) Dec: -05 10 32.50 (-5.17569d) Equinox: J2000		V=(?) J = 25.22 AB mag	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(7) SDF64	WFC3/IR, MULTIACCUM, IR-FIX	F105W	SAMP-SEQ=SPARS50; NSAMP=13	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in SDF064 (07) (1)	602.937703 Secs (2411.751 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure