



14233 - Taming the Tepid Three

Cycle: 23, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) WISEA-J085510.74-071442.5	WFC3/IR	2	18-Jul-2015 21:34:47.0	yes
02	(1) WISEA-J085510.74-071442.5	WFC3/IR	1	18-Jul-2015 21:34:50.0	yes
03	(1) WISEA-J085510.74-071442.5	WFC3/IR	4	18-Jul-2015 21:34:54.0	yes
04	(1) WISEA-J085510.74-071442.5	WFC3/IR	3	18-Jul-2015 21:35:00.0	yes
05	(1) WISEA-J085510.74-071442.5	WFC3/IR	3	18-Jul-2015 21:35:04.0	yes

13 Total Orbits Used

ABSTRACT

With atmospheric conditions similar to those of the Solar System giant planets, cold ($T_{\text{eff}} < 700 \text{ K}$) brown dwarfs are excellent proxies with which to test the ultracool model atmospheres that are critical to our understanding of gas giant exoplanets. A complete census of these objects is also essential for measuring the low-mass stellar mass function and the low-mass limit of star formation. The three coldest known brown dwarfs (WISE 1828+2650, WD 0806-661B, and WISE 0855-0714) all have effective temperature estimates of less than approximately 300 K. Previous HST and

Spitzer observations of WISE 1828+2650 and WD 0806-661B provide near complete coverage of the 1 to 5 micron wavelength range.

Unfortunately, the coldest of the three, WISE 0855-0714, has yet to be securely detected at near-infrared wavelengths which limits our ability to precisely measure many of its basic properties. We therefore propose to obtain near-infrared photometry of WISE 0855-0714 with WFC3 with the F105W, F125W, and F160W filters. These observations will complete HST's reconnaissance of the tepid three and, when combined with published Spitzer photometry, will allow us to compute a more precise estimate of its effective temperature and search for the presence of water clouds in its atmosphere.

OBSERVING DESCRIPTION

We propose to observe W0855 with WFC3 in the F105W, F125W, and F160W filters. Estimating the required exposure time in each of these bands is not straightforward, primarily because WISE 0855 currently remains undetected at F105W and F160W and only marginally detected at J. In addition, this is currently a unique object so it is difficult to bootstrap from similar objects. We therefore use a combination of the low signal-to-noise ratio Faherty et al. detection at J and model spectrum from Morley et al. (2014).

By comparing the F125W and J-band magnitudes for the sample of Y dwarfs from Schneider et al. 2015, we find the average F125W-J mag difference to be ~ 0.7 mag. If we apply this to the 2.6 sigma J-band detection of W0855 from Faherty et al. 2014, we find an approximate F125W mag for W0855 of 25.5. We then scale the 250 K, $\log g = 4.0$ model from Figure 2 to this magnitude and use the WFC3 Exposure Time Calculator to estimate exposure times to achieve a signal-to-noise ratio of 10 in each of the bands. We choose to implement dither sequences in which each individual frame is no longer than 1000 seconds. The number of orbits required is determined by dividing the estimated exposure time by 3600 s (the time available for 1 orbit). The expected magnitude from the model, exposure time estimates, and requested number of orbits for each filter is provided below. We therefore request a total of thirteen orbits for this program. We note that the F160W observations make up just over 75% of the requested number of orbits, but this band (when combined with either F125W or Spitzer [4.5]) has the largest sensitivity to the presence or absence water clouds (Morley et al. 2014) and therefore is critical to our science goals.

F105W:

Expected Magnitude = 26.0

Exposure Time = 4,011 s

Orbits Required = 2

Proposal 14233 (STScI Edit Number: 0, Created: Saturday, July 18, 2015 8:35:06 PM EST) - Overview

F125W:

Expected Magnitude = 25.5

Exposure Time = 3155 s

Orbits Required = 1

F160W:

Expected Magnitude = 26.5

Exposure Time = 34,605 s

Orbits Required = 10

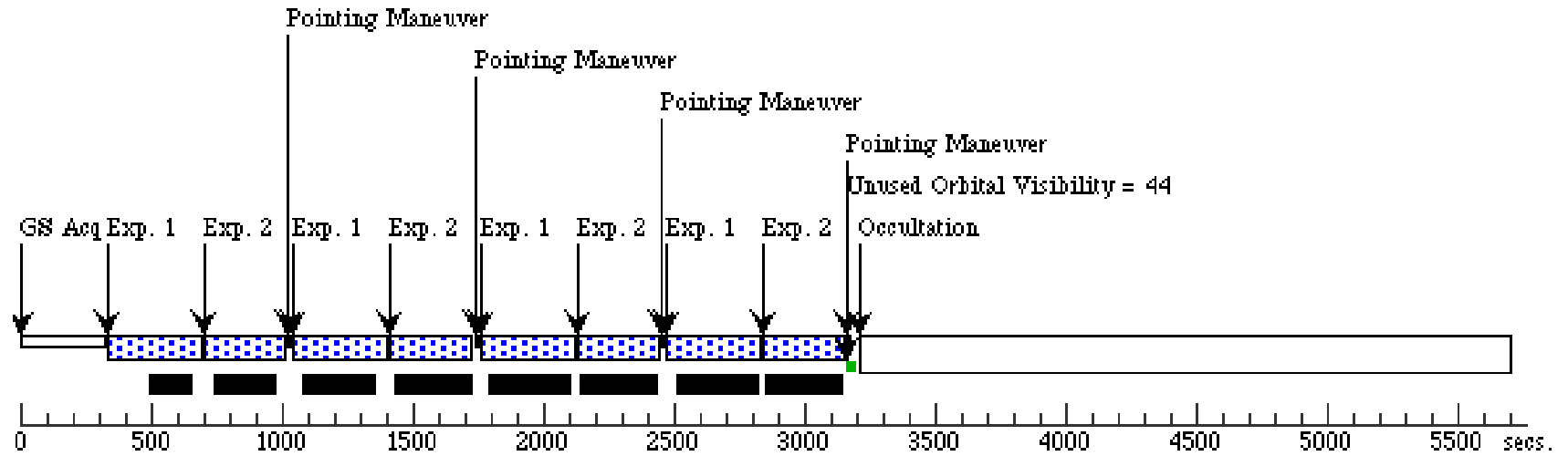
Proposal 14233 - F105W-01 (01) - Taming the Tepid Three

Sun Jul 19 01:35:06 GMT 2015

Visit	Proposal 14233, F105W-01 (01) 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				
	(1)	WISEA-J085510.74-071442.5	RA: 08 55 8.6000 (133.7858333d) Dec: -07 14 39.54 (-7.24432d) Equinox: J2000	Proper Motion RA: -8.10 arcsec/yr Proper Motion Dec: 0.70 arcsec/yr Parallax: 0.433" Epoch of Position: 2014.49905	V=(?) J=24.8	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=NO									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F105W-01	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-2 in F105W-01 (01) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	F105W-01	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=13; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-2 in F105W-01 (01) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	F105W-03	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 3-3 in F105W-01 (01) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	4	F125W-02	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=12; SAMP-SEQ=SPAR S25		Pattern 1, Exps 4-4 in F105W-01 (01) (1)	277.937956 Secs (1111.752 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]

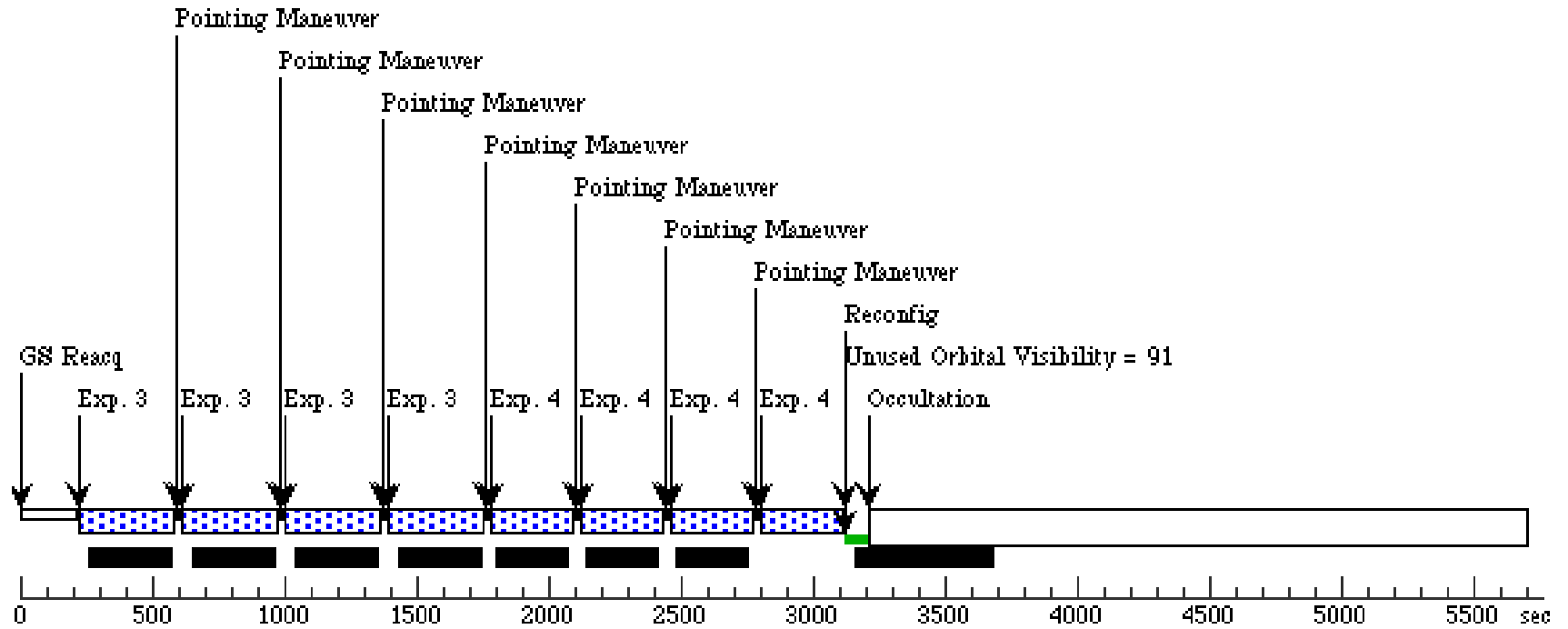
Orbit 1

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Orbit Structure

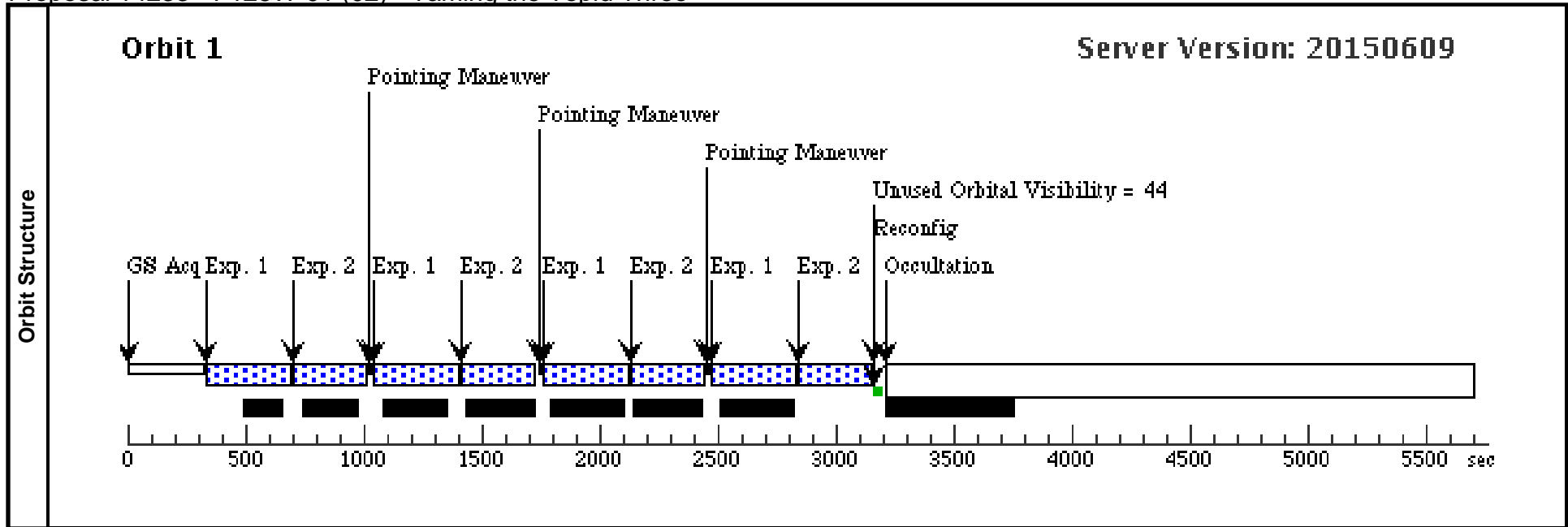
Orbit 2



Proposal 14233 - F125W-01 (02) - Taming the Trepid Three

Sun Jul 19 01:35:07 GMT 2015

Visit	Proposal 14233, F125W-01 (02) 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)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	WISEA-J085510.74-071442.5	RA: 08 55 8.6000 (133.7858333d) Dec: -07 14 39.54 (-7.24432d) Equinox: J2000	Proper Motion RA: -8.10 arcsec/yr Proper Motion Dec: 0.70 arcsec/yr Parallax: 0.433" Epoch of Position: 2014.49905	V=(?) J=24.8	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=NO									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F125W-01	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=14; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-2 in F125W-01 (02) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]
2	F125W-01	(1) WISEA-J085510.74-071442.5	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=13; SAMP-SEQ=SPAR S25			Pattern 1, Exps 1-2 in F125W-01 (02) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



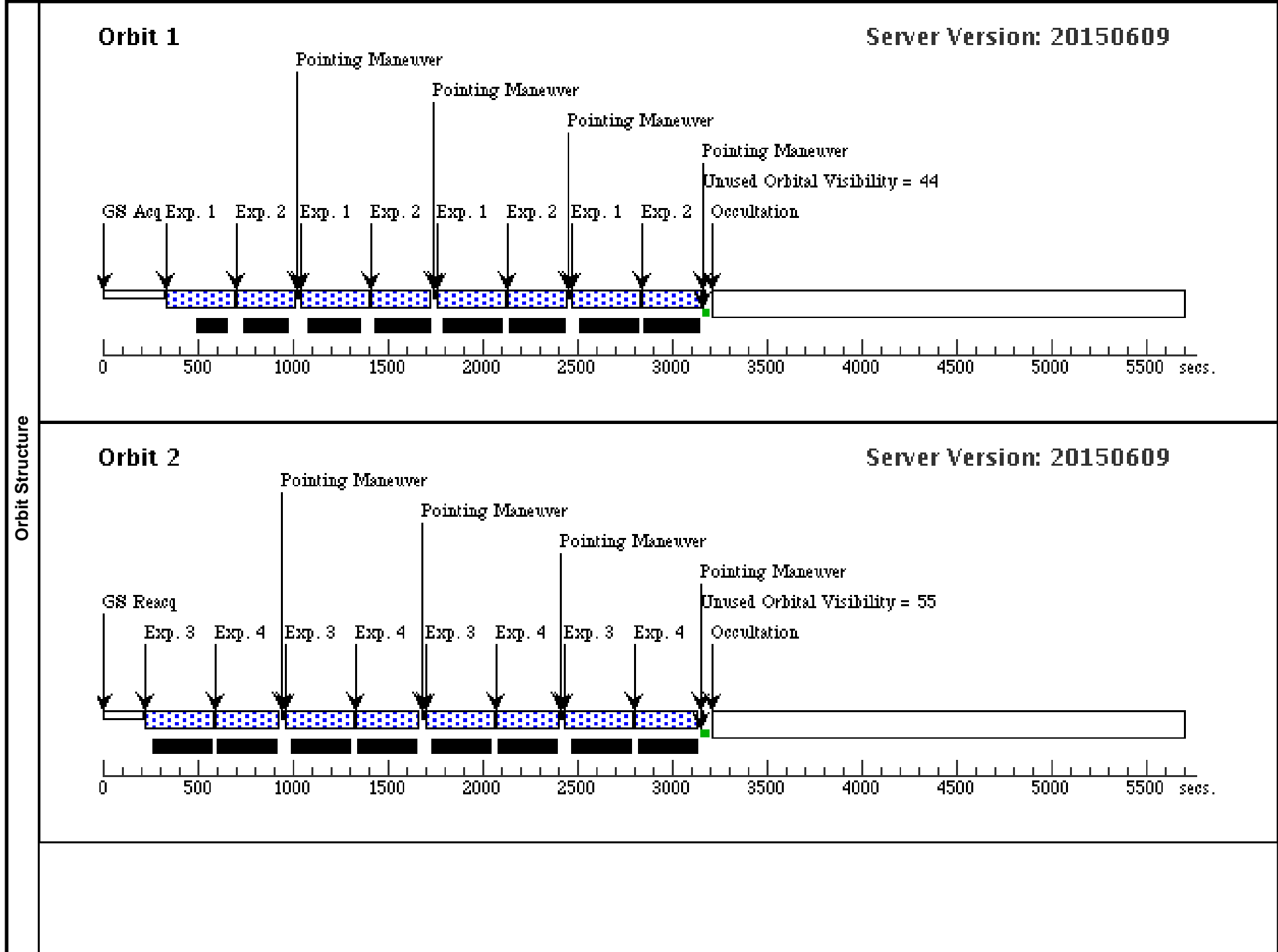
Proposal 14233 - F160W-01 (03) - Taming the Tepid Three

Sun Jul 19 01:35:07 GMT 2015

Visit	Proposal 14233, F160W-01 (03) 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), (5-6), (7-8)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	WISEA-J085510.74-071442.5	RA: 08 55 8.6000 (133.7858333d) Dec: -07 14 39.54 (-7.24432d) Equinox: J2000	Proper Motion RA: -8.10 arcsec/yr Proper Motion Dec: 0.70 arcsec/yr Parallax: 0.433" Epoch of Position: 2014.49905	V=(?) J=24.8	Reference Frame: SIMBAD
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=NO					

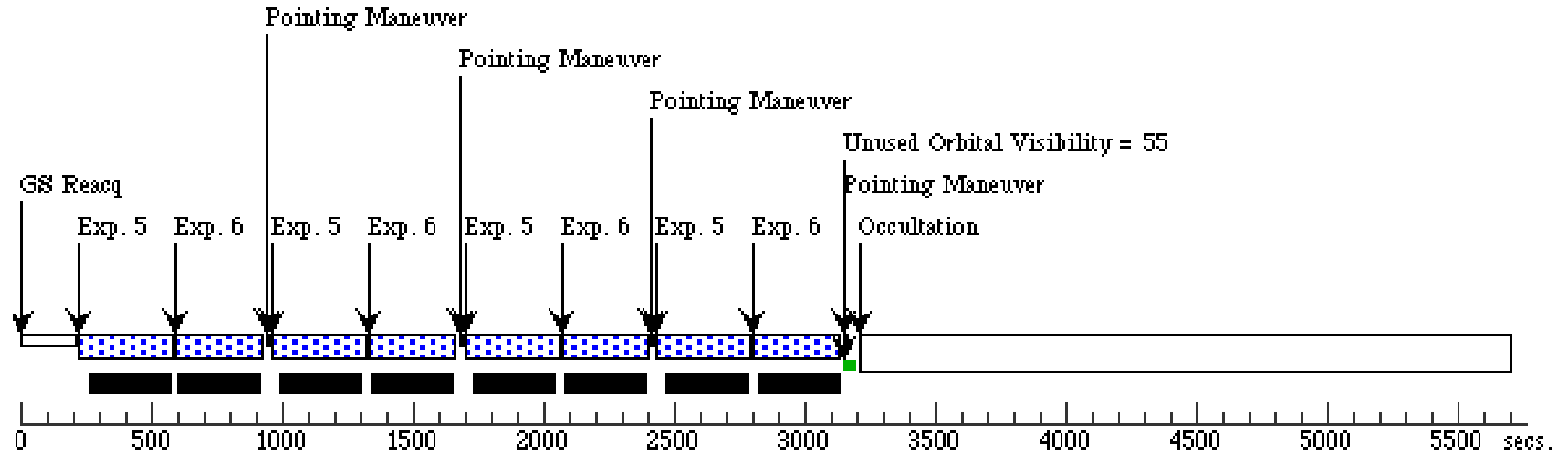
Proposal 14233 - F160W-01 (03) - Taming the Trepid Three

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-2 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=13; SAMP-SEQ=SPAR S25		Pattern 1, Exps 1-2 i n F160W-01 (03) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 3-4 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	4	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 3-4 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	5	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 5-6 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]
	6	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 5-6 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]
	7	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 7-8 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[4]
	8	F160W-01	(1) WISEA-J085510. WFC3/IR, MULTIACCUM, IR 74-071442.5	F160W	NSAMP=14; SAMP-SEQ=SPAR S25		Pattern 1, Exps 7-8 i n F160W-01 (03) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[4]



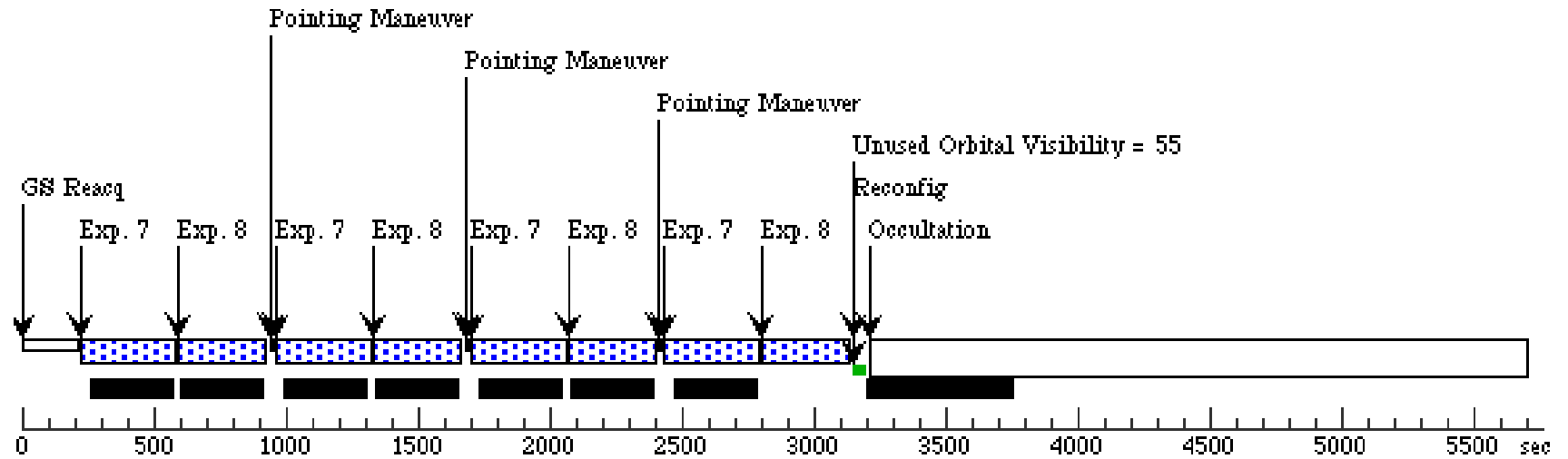
Orbit 3

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Orbit 4

Server Version: 20150609



Proposal 14233 - F160W-01 (04) - Taming the Tepid Three

Sun Jul 19 01:35:07 GMT 2015

Visit	Proposal 14233, F160W-01 (04) 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), (5-6)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	WISEA-J085510.74-071442.5	RA: 08 55 8.6000 (133.7858333d) Dec: -07 14 39.54 (-7.24432d) Equinox: J2000	Proper Motion RA: -8.10 arcsec/yr Proper Motion Dec: 0.70 arcsec/yr Parallax: 0.433" Epoch of Position: 2014.49905	V=(?) J=24.8	Reference Frame: SIMBAD
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Extended=NO						

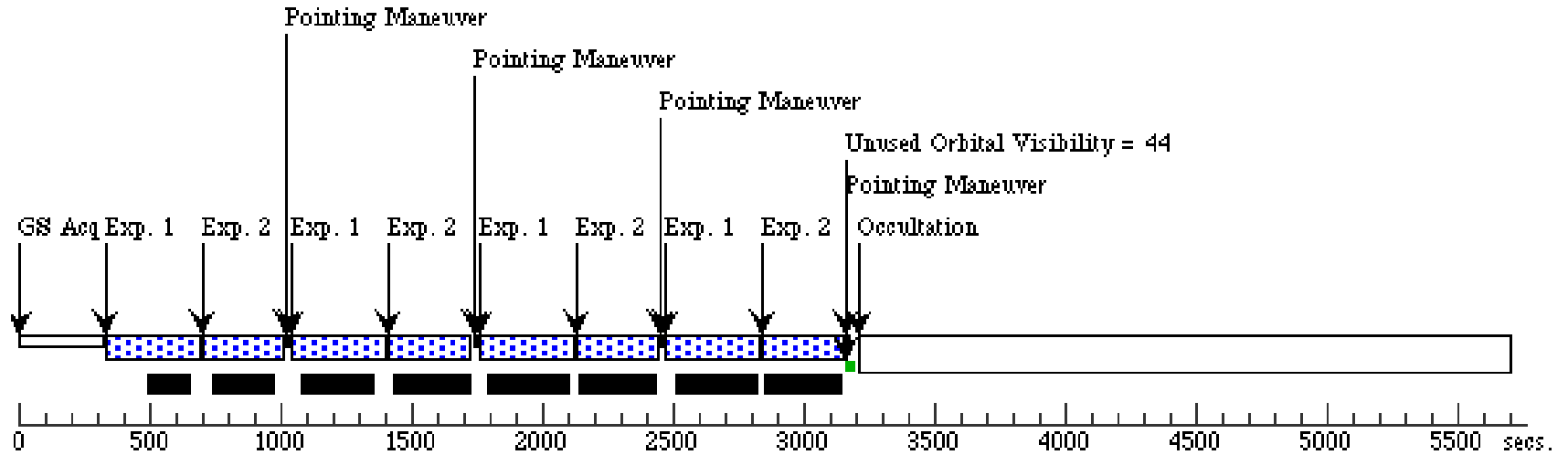
Proposal 14233 - F160W-01 (04) - Taming the Tepid Three

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 1-2 in F160W-01 (04) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=SPAR S25	Pattern 1, Exps 1-2 in F160W-01 (04) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 3-4 in F160W-01 (04) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	4	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 3-4 in F160W-01 (04) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	5	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 5-6 in F160W-01 (04) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]
	6	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 5-6 in F160W-01 (04) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]

Orbit Structure

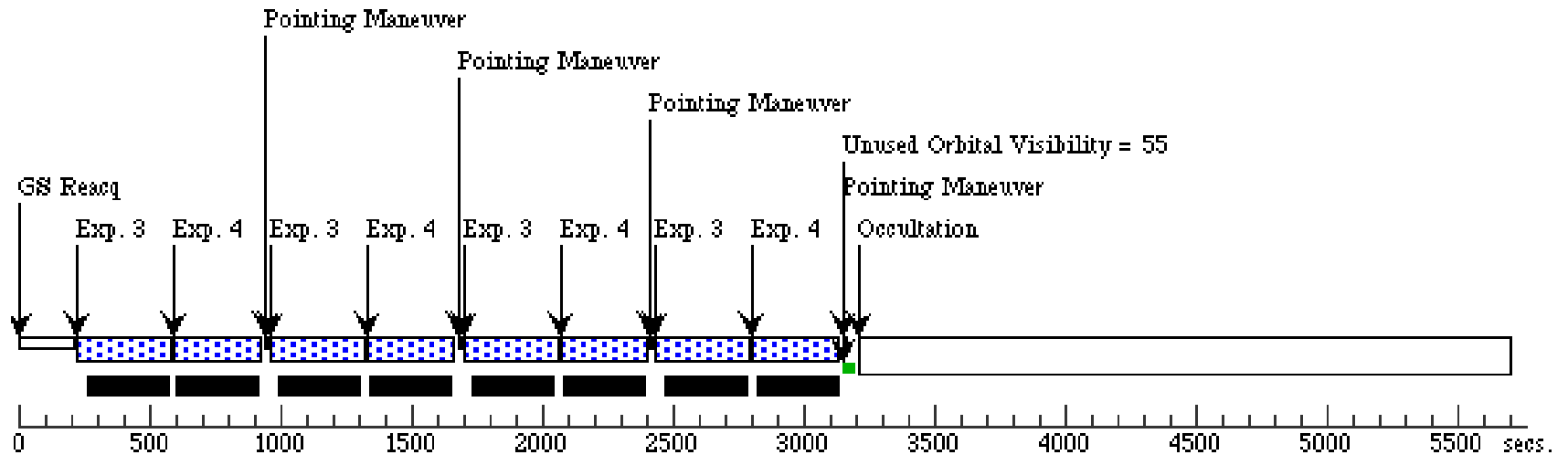
Orbit 1

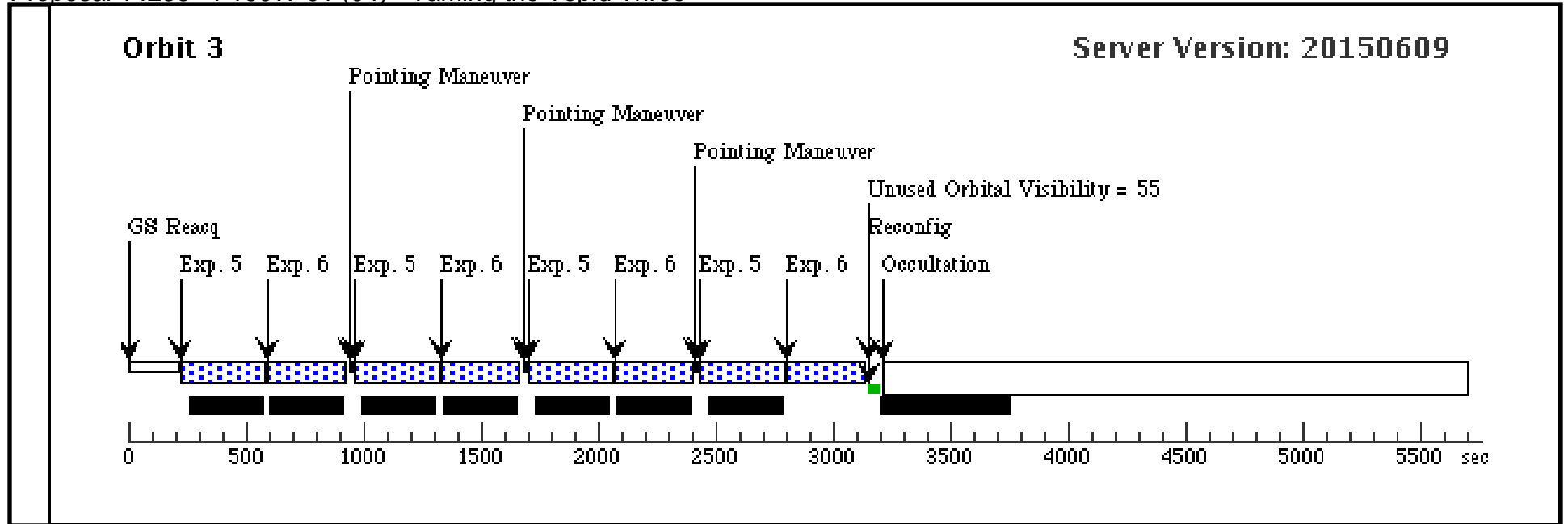
Server Version: 20150609



Orbit 2

Server Version: 20150609





Proposal 14233 - F160W-01 (05) - Taming the Tepid Three

Sun Jul 19 01:35:07 GMT 2015

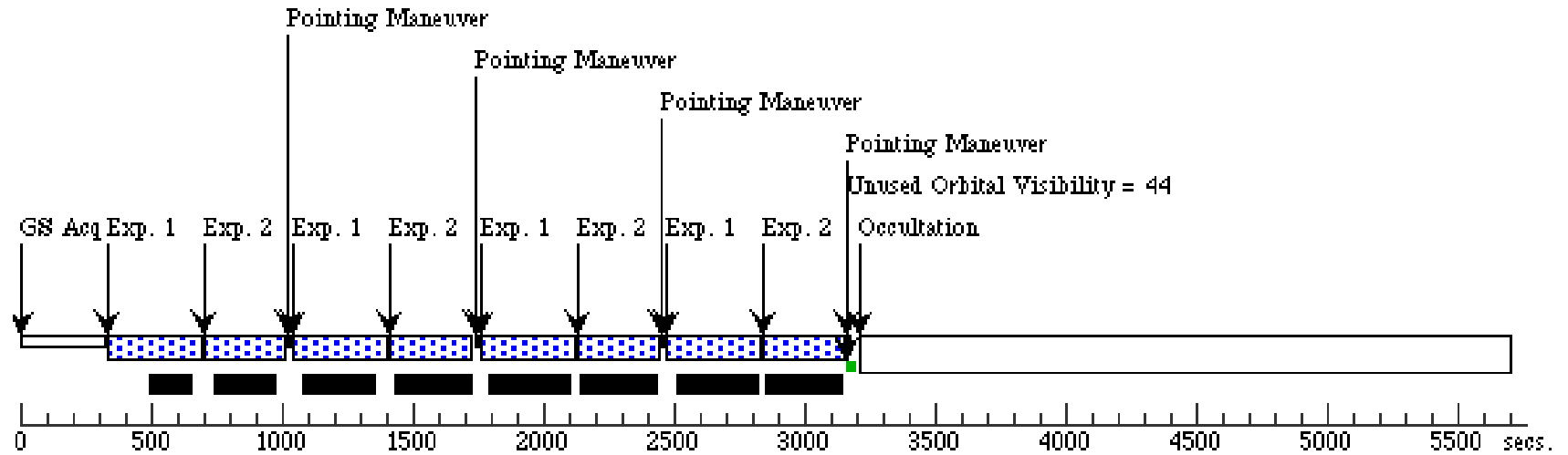
Visit	Proposal 14233, F160W-01 (05) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)					
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
	(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1-2), (3-4), (5-6)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	WISEA-J085510.74-071442.5	RA: 08 55 8.6000 (133.7858333d) Dec: -07 14 39.54 (-7.24432d) Equinox: J2000	Proper Motion RA: -8.10 arcsec/yr Proper Motion Dec: 0.70 arcsec/yr Parallax: 0.433" Epoch of Position: 2014.49905	V=(?) J=24.8	Reference Frame: SIMBAD
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Extended=NO					

Proposal 14233 - F160W-01 (05) - Taming the Tepid Three

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 1-2 in F160W-01 (05) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=SPAR S25	Pattern 1, Exps 1-2 in F160W-01 (05) (1)	302.938471 Secs (1211.754 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 3-4 in F160W-01 (05) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	4	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 3-4 in F160W-01 (05) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	5	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 5-6 in F160W-01 (05) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]
	6	F160W-01	(1) WISEA-J085510. 74-071442.5	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25	Pattern 1, Exps 5-6 in F160W-01 (05) (1)	327.938986 Secs (1311.756 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]

Orbit 1

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Orbit 2

Server Version: 20150609

