13474 - Imaging Polarimetry of the 2013 Comet ISON with ACS: A Study of the Heterogeneous Coma

Cycle: 21, Proposal Category: GO

(Availability Mode: AVAILABLE)

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) ISON	ACS/WFC	3	12-Sep-2013 21:05:18.0	yes
02	(1) ISON	ACS/WFC	3	12-Sep-2013 21:05:54.0	yes
03	(1) ISON	ACS/WFC	6	12-Sep-2013 21:06:30.0	yes
A1	BIAS	ACS/WFC	1	12-Sep-2013 21:06:43.0	yes
A2	BIAS	ACS/WFC	1	12-Sep-2013 21:06:46.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
A3	BIAS	ACS/WFC	1	12-Sep-2013 21:06:50.0	yes
A4	BIAS	ACS/WFC	1	12-Sep-2013 21:06:54.0	yes

16 Total Orbits Used

ABSTRACT

The great comet of 2013, currently referred to as Comet C/2012 S1 (ISON), is anticipated to be a unique observational opportunity. Comet ISON is a sungrazer on a nearly parabolic trajectory, similar to that of the Great Comet of 1680, and likely carries pristine material dating to the time of the solar-system formation. Recent polarimetric observations of other comets have found that different regions of the coma produce different polarimetric light-scattering responses, indicating that different portions of the coma contain different materials. The presence of a strongly negatively polarizing circumnucleus halo region that has been observed very near the nucleus of several comets suggest a depletion of absorbing, carbonaceous particles in this region. High spatial-resolution ACS polarimetric images of Comet ISON not only can be used to place bounds on the material constituents of different regions of its coma, but can also be used to explore its dynamics and acquire an understanding of the radiation-coma interaction that accounts for coma heterogeneities.

OBSERVING DESCRIPTION

We will use the WFC with the following polarizer/filter combinations POL*V/F606W and POL*V/F775W. This selection of filters yields good wavelength coverage for constructing the phase/polarization diagram. For ACS, all wavelengths shortward of 6000 ang are potentially contaminated with molecular line emission, while F814W contains a strong CN bands at 9200 ang. Molecular emission will be unpolarized, which can potentially dilute the scattered light, artificially reducing the measured degree of polarization. The F775W filter, with POLV optics offers the cleanest portion of the comet spectrum. The F606W filter is chosen because it provides a long baseline relative to the F775W filter for assessing the wavelength dependence of scattering, while avoiding the strong contamination from the molecular species CN, C2, and C3. Some contamination from C2 will still be present. Fortunately, these are routinely measured by multiple observers as part of optical spectroscopy (e.g., Cochran, Fink) and photometry (e.g., Schleicher) programs, and we will used published values acquired near the times of our observations to estimate the dilution in the scattered light at each epoch.

Visit

Proposal 13474, Epoch 1 (01), implementation Fri Sep 13 01:07:01 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 40%; BETWEEN 26-OCT-2013:00:00:00 AND 05-DEC-2013:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=1 Line Spacing=1.2	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(1-3), (4-6)

Solar System Targets

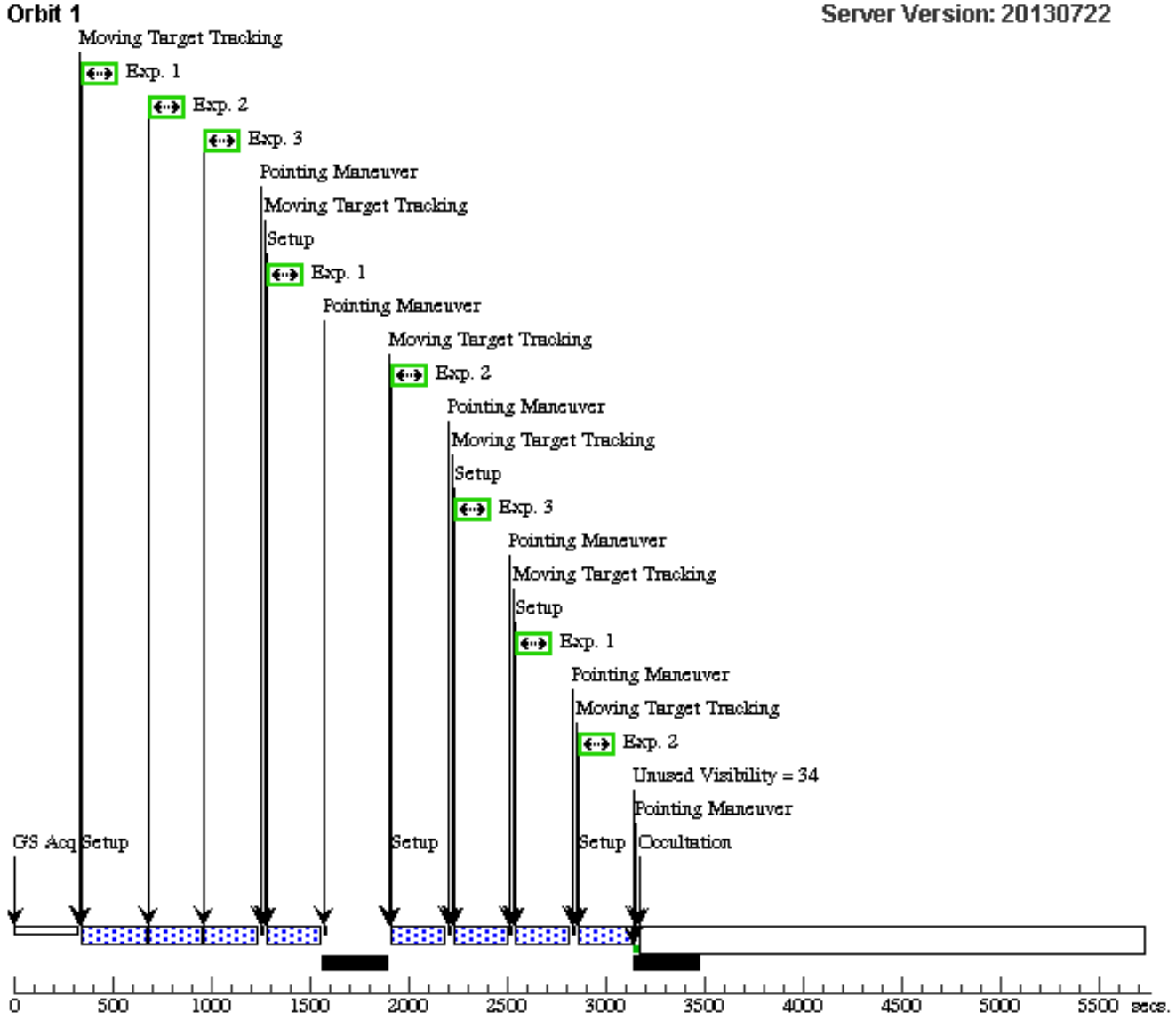
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	ISON	TYPE=COMET,Q=0.0124980099691 7281,E=1.000003928928245,I=61.893 0651794545 ,O=295.7315575148069,W=345.51306 50822808 ,T=28-NOV- 2013:18:49:00,TTimeScale=TDB,EQ UINOX=J2000,EPOCH=08-JAN- 2013:00:00:00,EpochTimeScale=TDB				EARTH

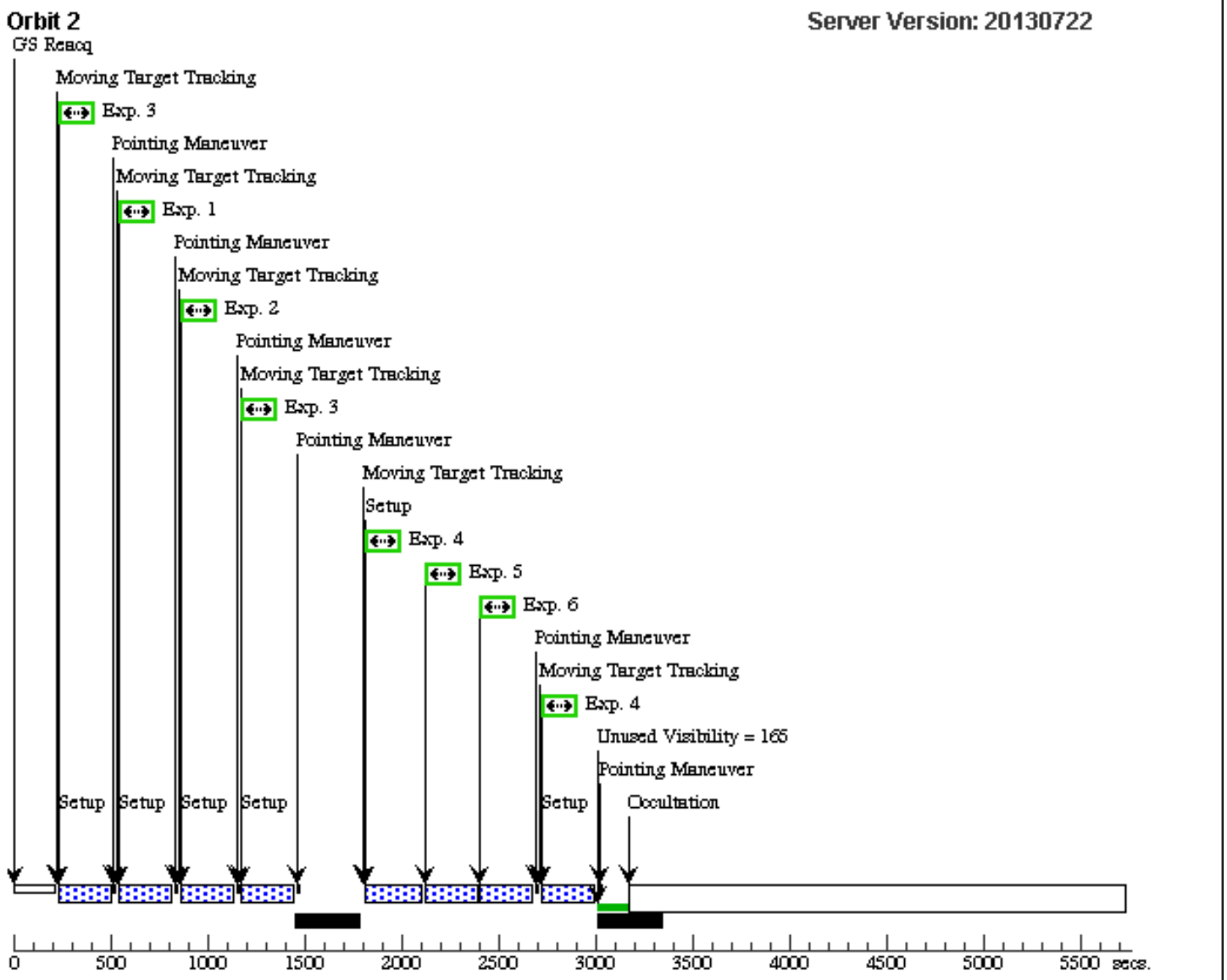
Comments: Target Ephemeris is from JPL Small-Body Database Browser. The solution date is 2013-Aug-26, and is JPL#35

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POL120V/F775W a	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL120V			Pattern 2, Exps 1-3 in Epoch 1 (01) (2)	70 Secs (280 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	***[2]***
2	POL60V/F775W a	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL60V			Pattern 2, Exps 1-3 in Epoch 1 (01) (2)	70 Secs (280 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	***[2]***
3	POL0V/F775W a	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL0V			Pattern 2, Exps 1-3 in Epoch 1 (01) (2)	70 Secs (280 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[2]***
								[==>(Pattern 4)]	
4	POL0V/F606W a	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL0V			Pattern 2, Exps 4-6 in Epoch 1 (01) (2)	75 Secs (300 Secs)	
								[==>(Pattern 1)]	***[2]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	
5	POL60V/F606W a	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL60V			Pattern 2, Exps 4-6 in Epoch 1 (01) (2)	75 Secs (300 Secs)	
								[==>(Pattern 1)]	***[2]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	
6	POL120V/F606W a	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL120V			Pattern 2, Exps 4-6 in Epoch 1 (01) (2)	75 Secs (300 Secs)	
								[==>(Pattern 1)]	***[2]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	

Orbit Structure

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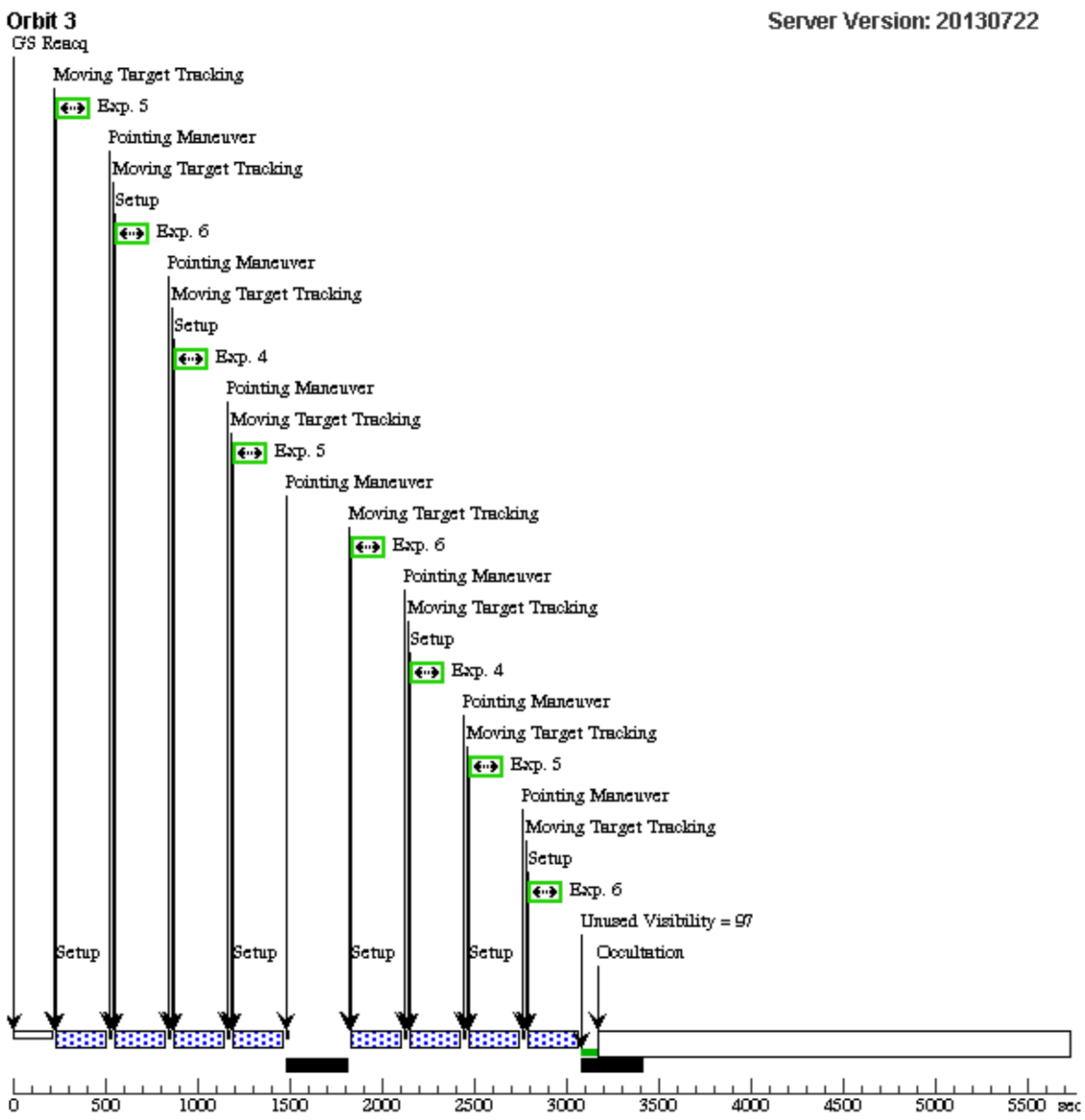
Server Version: 20130722
GS Reacq
Moving Target Tracking
Exp. 3
Pointing Maneuver
Moving Target Tracking
Exp. 1
Pointing Maneuver
Moving Target Tracking
Exp. 2
Pointing Maneuver
Moving Target Tracking
Exp. 3
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 4
Exp. 5
Exp. 6
Pointing Maneuver
Moving Target Tracking
Exp. 4
Unused Visibility = 165
Pointing Maneuver
Occultation
Setup
Setup
Setup
Setup
Setup
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20130722
GS Reacq
Moving Target Tracking
Exp. 5
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 6
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 4
Pointing Maneuver
Moving Target Tracking
Exp. 5
Pointing Maneuver
Moving Target Tracking
Exp. 6
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 4
Pointing Maneuver
Moving Target Tracking
Exp. 5
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 6
Unused Visibility = 97
Occultation
Setup
Setup
Setup
Setup
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13474, Epoch 2 (02), implementation Fri Sep 13 01:07:05 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; BETWEEN 18-DEC-2013:00:00:00 AND 13-JAN-2014:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=1 Line Spacing=1.2	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(1-3), (4-6)

Solar System Targets

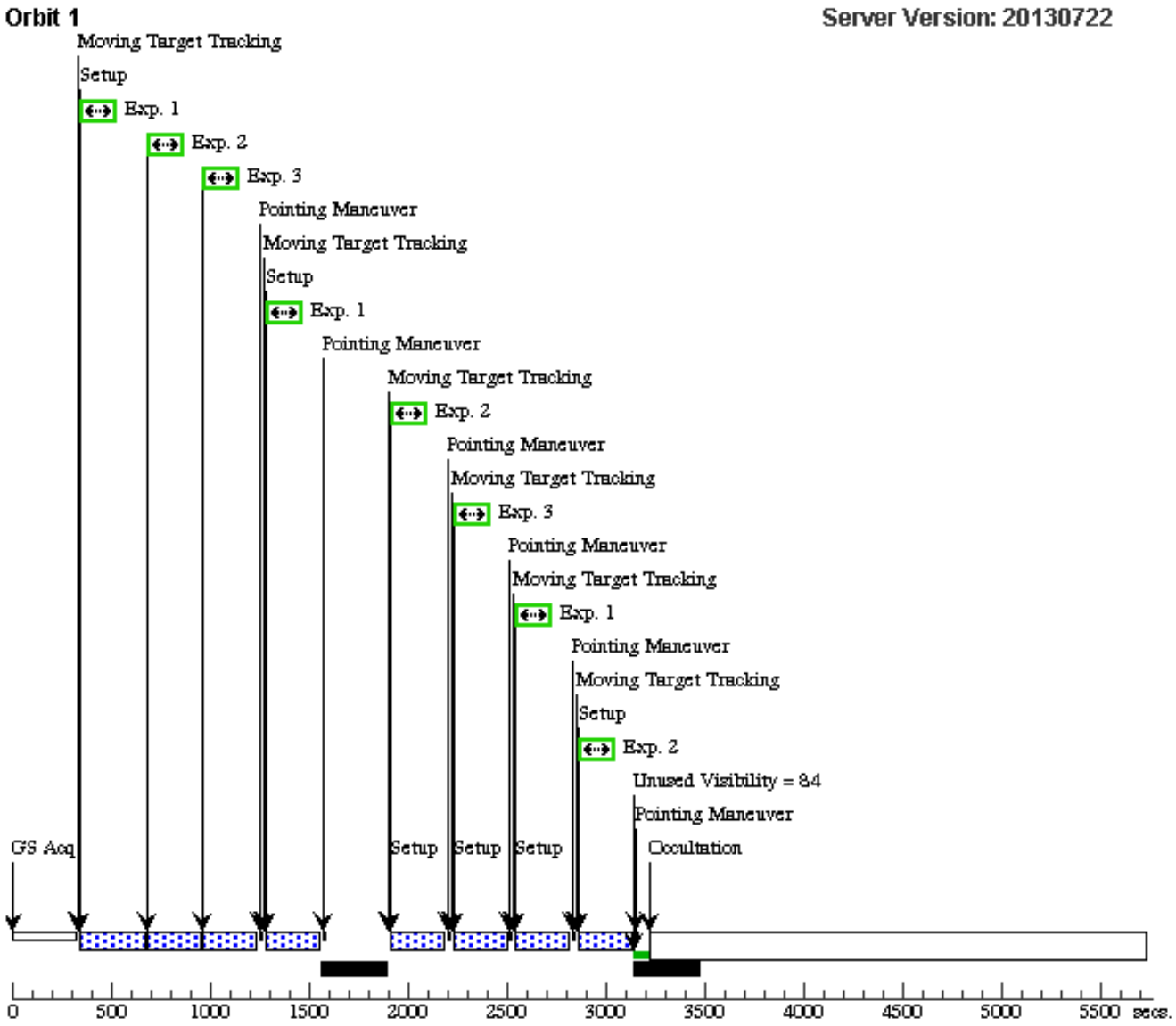
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	ISON	TYPE=COMET,Q=0.0124980099691 7281,E=1.000003928928245,I=61.893 0651794545 ,O=295.7315575148069,W=345.51306 50822808 ,T=28-NOV- 2013:18:49:00,TTimeScale=TDB,EQ UINOX=J2000,EPOCH=08-JAN- 2013:00:00:00,EpochTimeScale=TDB				EARTH

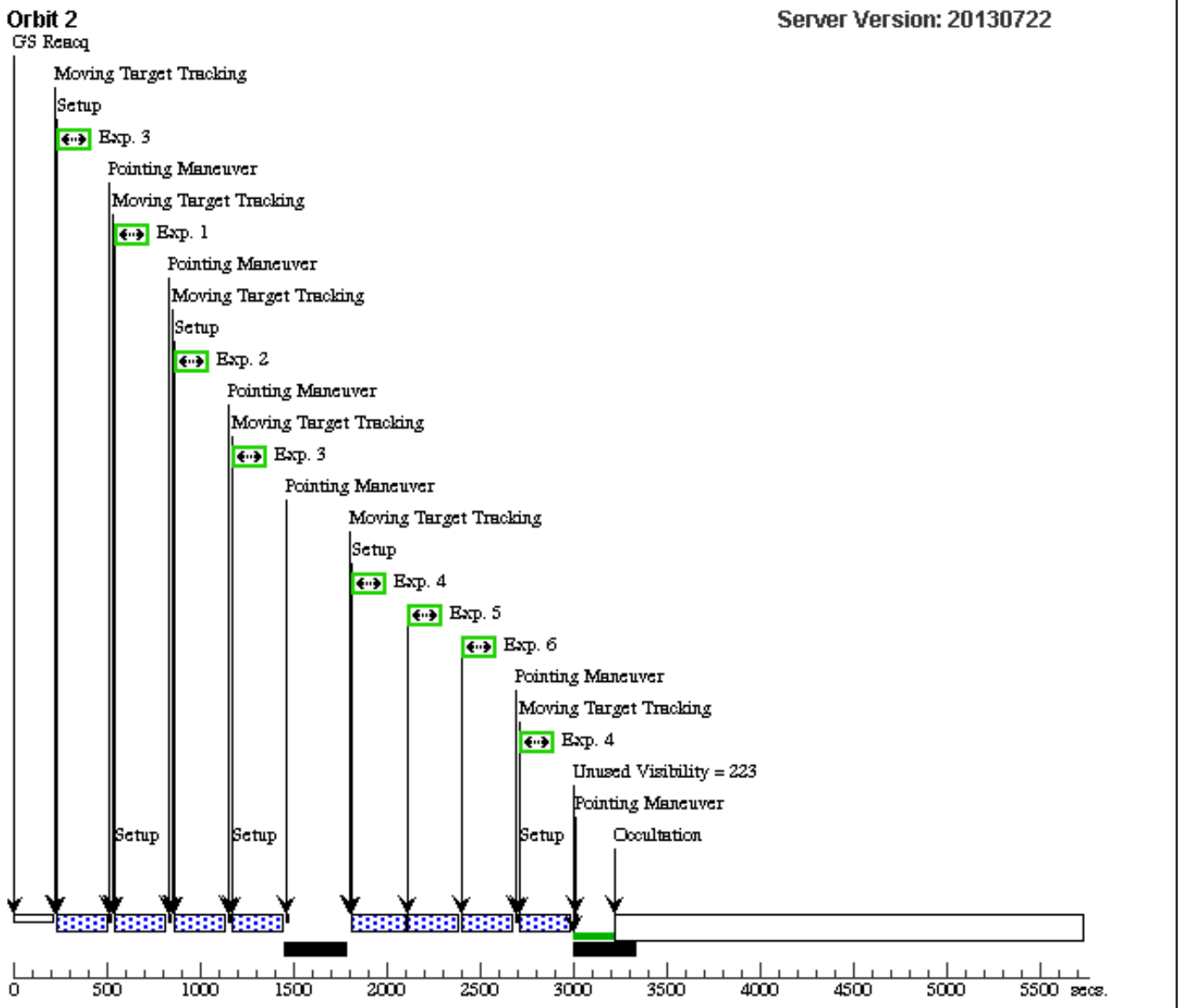
Comments: Target Ephemeris is from JPL Small-Body Database Browser. The solution date is 2013-Aug-26, and is JPL#35

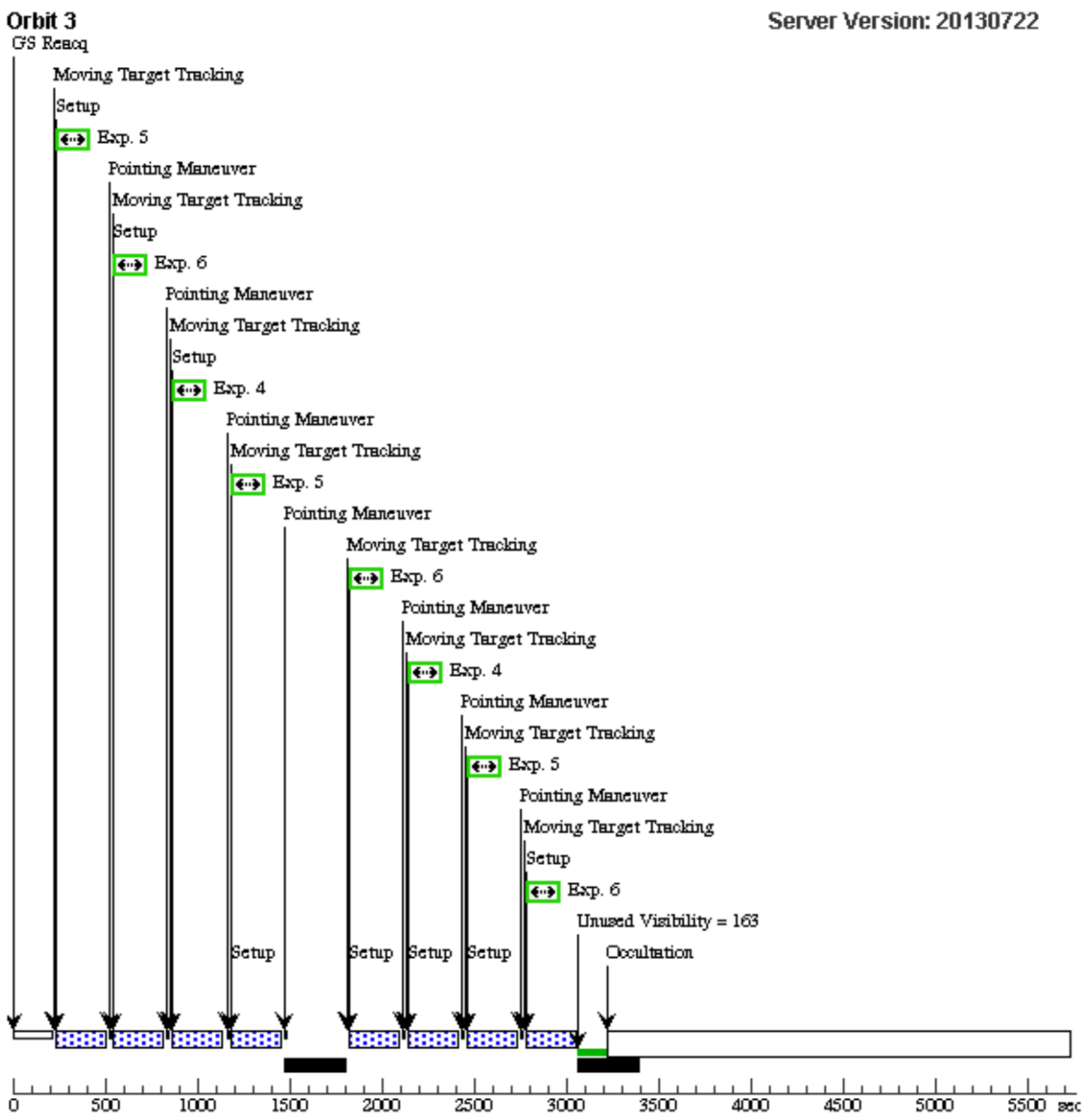
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POL120V/F775W b	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL120V			Pattern 2, Exps 1-3 in Epoch 2 (02) (2)	70 Secs (280 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	***[2]***
2	POL60V/F775W b	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL60V			Pattern 2, Exps 1-3 in Epoch 2 (02) (2)	70 Secs (280 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	***[2]***
3	POL0V/F775W b	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL0V			Pattern 2, Exps 1-3 in Epoch 2 (02) (2)	70 Secs (280 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[2]***
								[==>(Pattern 4)]	
4	POL0V/F606W b	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL0V			Pattern 2, Exps 4-6 in Epoch 2 (02) (2)	73 Secs (292 Secs)	
								[==>(Pattern 1)]	***[2]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	
5	POL60V/F606W b	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL60V			Pattern 2, Exps 4-6 in Epoch 2 (02) (2)	73 Secs (292 Secs)	
								[==>(Pattern 1)]	***[2]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	
6	POL120V/F606W b	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL120V			Pattern 2, Exps 4-6 in Epoch 2 (02) (2)	73 Secs (292 Secs)	
								[==>(Pattern 1)]	***[2]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	

Orbit Structure




Orbit 2
Server Version: 20130722
GS Reacq
Moving Target Tracking
Setup
Exp. 3
Pointing Maneuver
Moving Target Tracking
Exp. 1
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 2
Pointing Maneuver
Moving Target Tracking
Exp. 3
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 4
Exp. 5
Exp. 6
Pointing Maneuver
Moving Target Tracking
Exp. 4
Unused Visibility = 223
Pointing Maneuver
Occultation
Setup
Setup
Setup
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20130722
GS Reacq
Moving Target Tracking
Setup
Exp. 5
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 6
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 4
Pointing Maneuver
Moving Target Tracking
Exp. 5
Pointing Maneuver
Moving Target Tracking
Exp. 6
Pointing Maneuver
Moving Target Tracking
Exp. 4
Pointing Maneuver
Moving Target Tracking
Exp. 5
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 6
Unused Visibility = 163
Occultation
Setup
Setup
Setup
Setup
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13474, Epoch 3 (03), implementation Fri Sep 13 01:07:10 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BETWEEN 10-MAR-2014:00:00:00 AND 14-APR-2014:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=1 Line Spacing=1.2	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(1-3), (4-6)

Solar System Targets

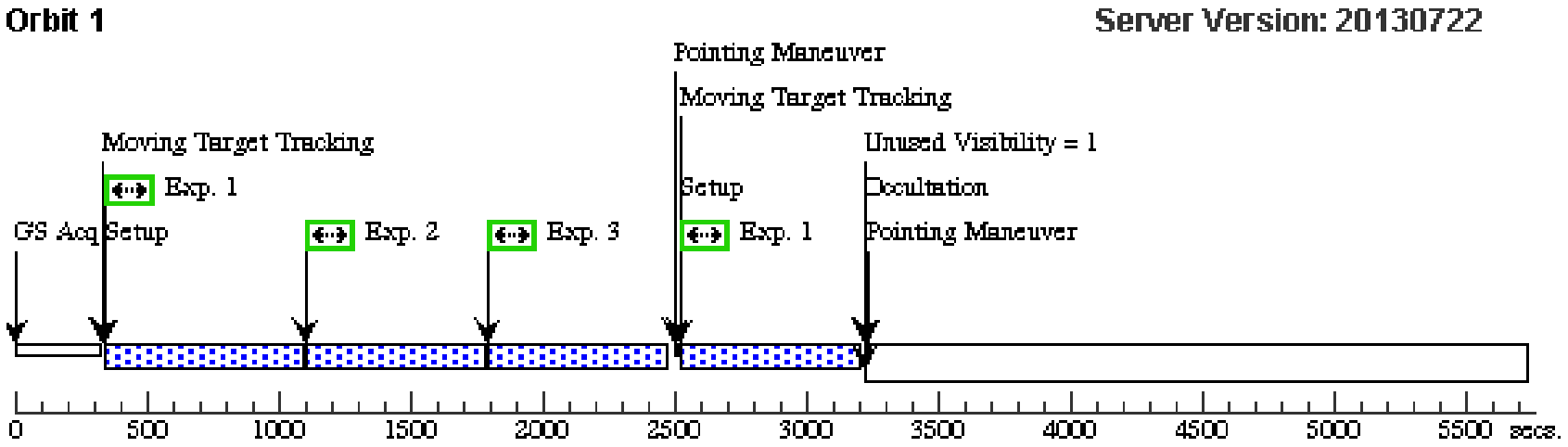
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	ISON	TYPE=COMET,Q=0.0124980099691 7281,E=1.000003928928245,I=61.893 0651794545 ,O=295.7315575148069,W=345.51306 50822808 ,T=28-NOV- 2013:18:49:00,TTimeScale=TDB,EQ UINOX=J2000,EPOCH=08-JAN- 2013:00:00:00,EpochTimeScale=TDB				EARTH

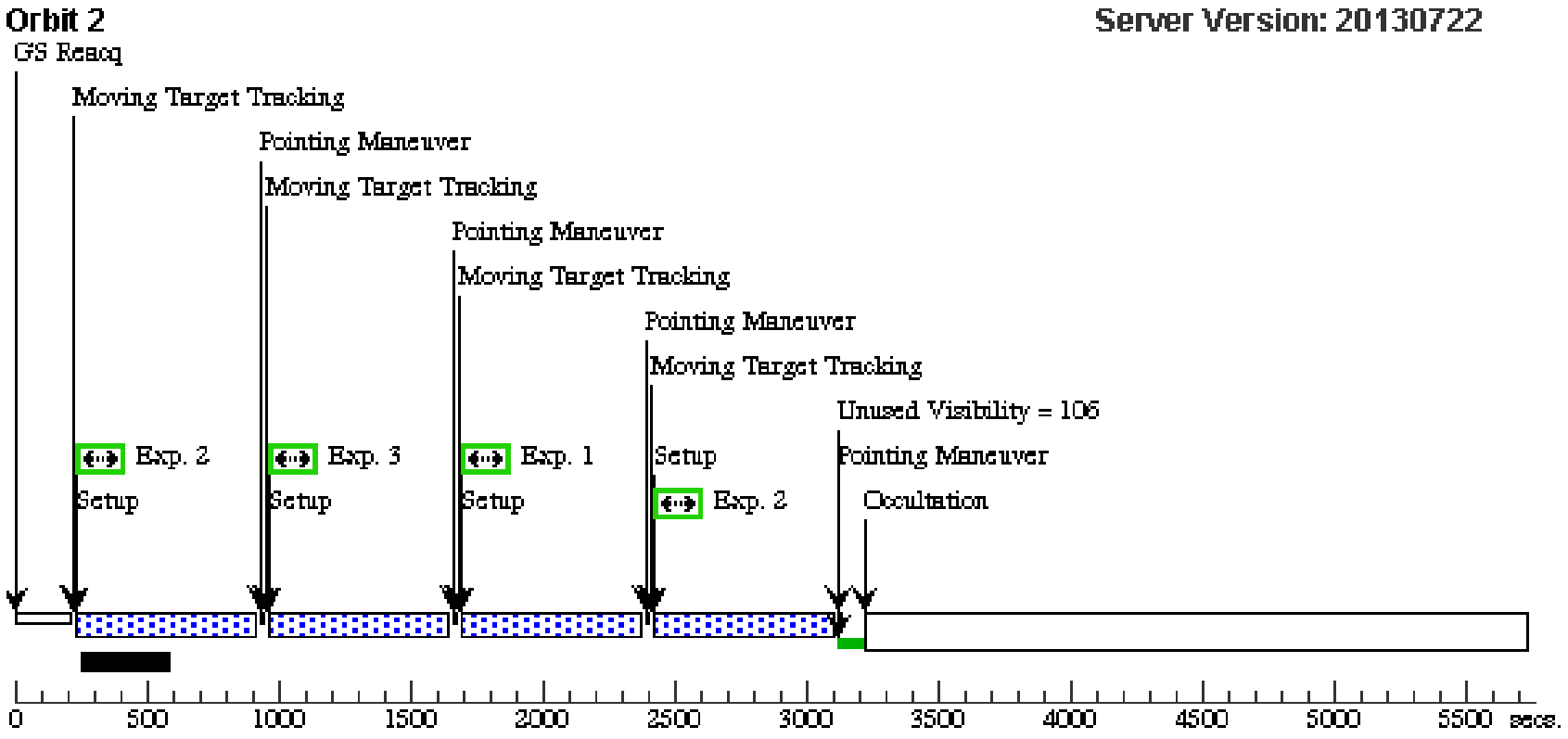
Comments: Target Ephemeris is from JPL Small-Body Database Browser. The solution date is 2013-Aug-26, and is JPL#35

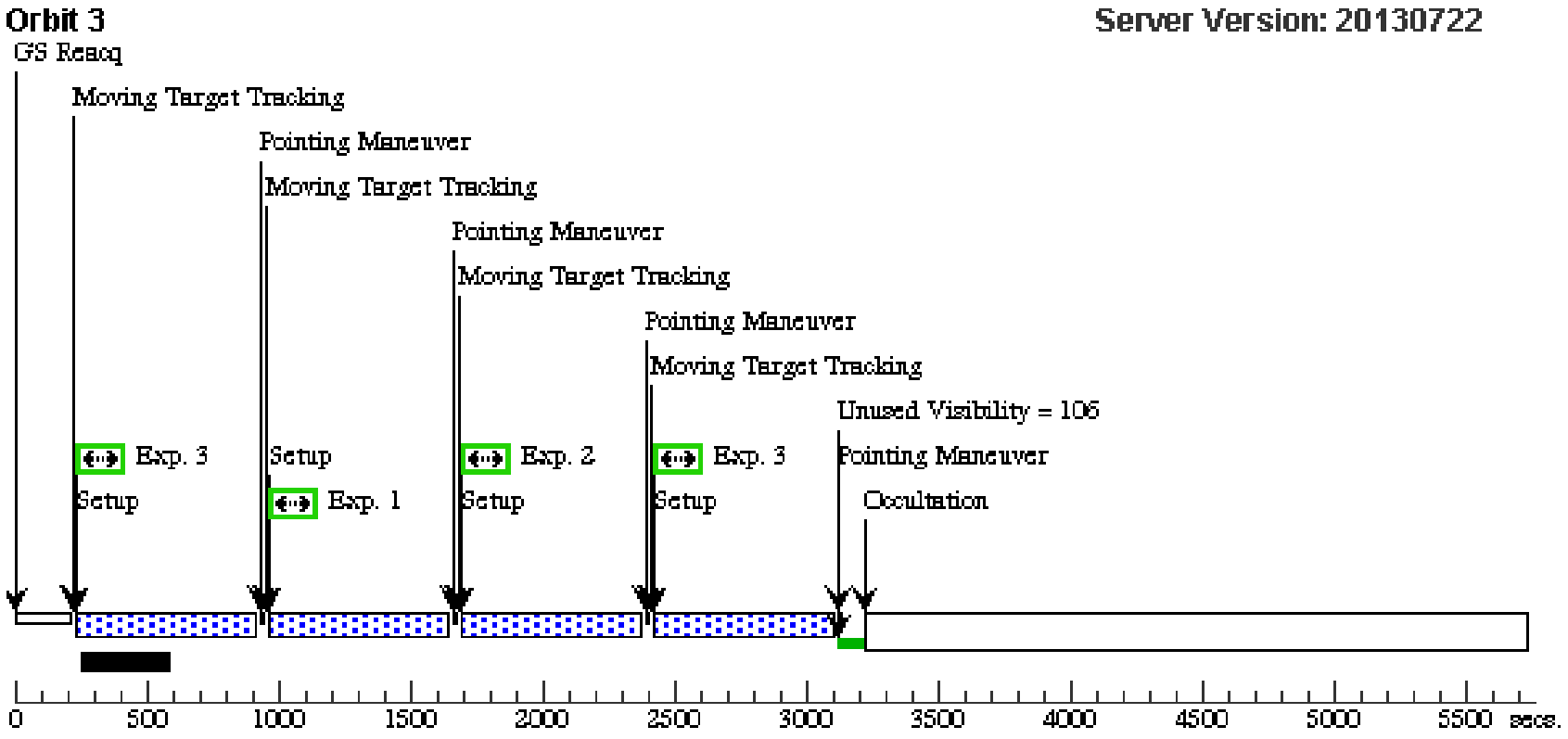
Exposures

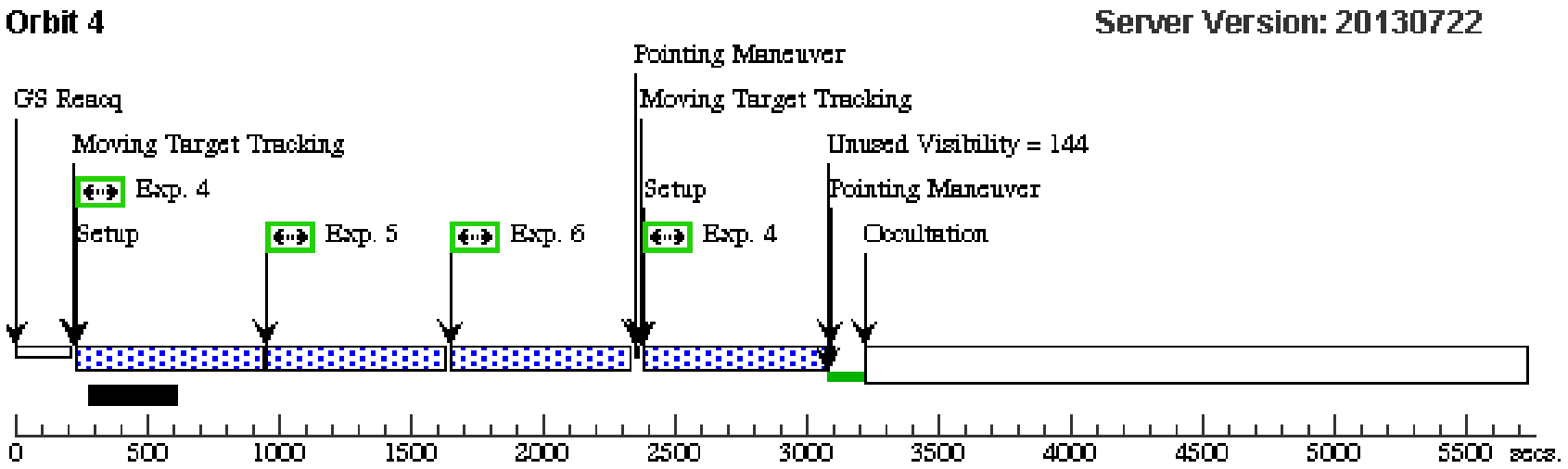
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POL120V/F775W c	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL120V			Pattern 2, Exps 1-3 in Epoch 3 (03) (2)	490 Secs (1960 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[2]***
								[==>(Pattern 4)]	***[3]***
2	POL60V/F775W c	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL60V			Pattern 2, Exps 1-3 in Epoch 3 (03) (2)	490 Secs (1960 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	***[2]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	***[3]***
3	POL0V/F775W c	(1) ISON	ACS/WFC, ACCUM, WFC	F775W POL0V			Pattern 2, Exps 1-3 in Epoch 3 (03) (2)	490 Secs (1960 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	***[2]***
								[==>(Pattern 3)]	***[3]***
								[==>(Pattern 4)]	
4	POL0V/F606W c	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL0V			Pattern 2, Exps 4-6 in Epoch 3 (03) (2)	492 Secs (1968 Secs)	
								[==>(Pattern 1)]	***[4]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	***[5]***
								[==>(Pattern 4)]	***[6]***
5	POL60V/F606W c	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL60V			Pattern 2, Exps 4-6 in Epoch 3 (03) (2)	492 Secs (1968 Secs)	
								[==>(Pattern 1)]	***[4]***
								[==>(Pattern 2)]	***[5]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	***[6]***
6	POL120V/F606W c	(1) ISON	ACS/WFC, ACCUM, WFC	F606W POL120V			Pattern 2, Exps 4-6 in Epoch 3 (03) (2)	492 Secs (1968 Secs)	
								[==>(Pattern 1)]	***[4]***
								[==>(Pattern 2)]	***[5]***
								[==>(Pattern 3)]	***[6]***
								[==>(Pattern 4)]	

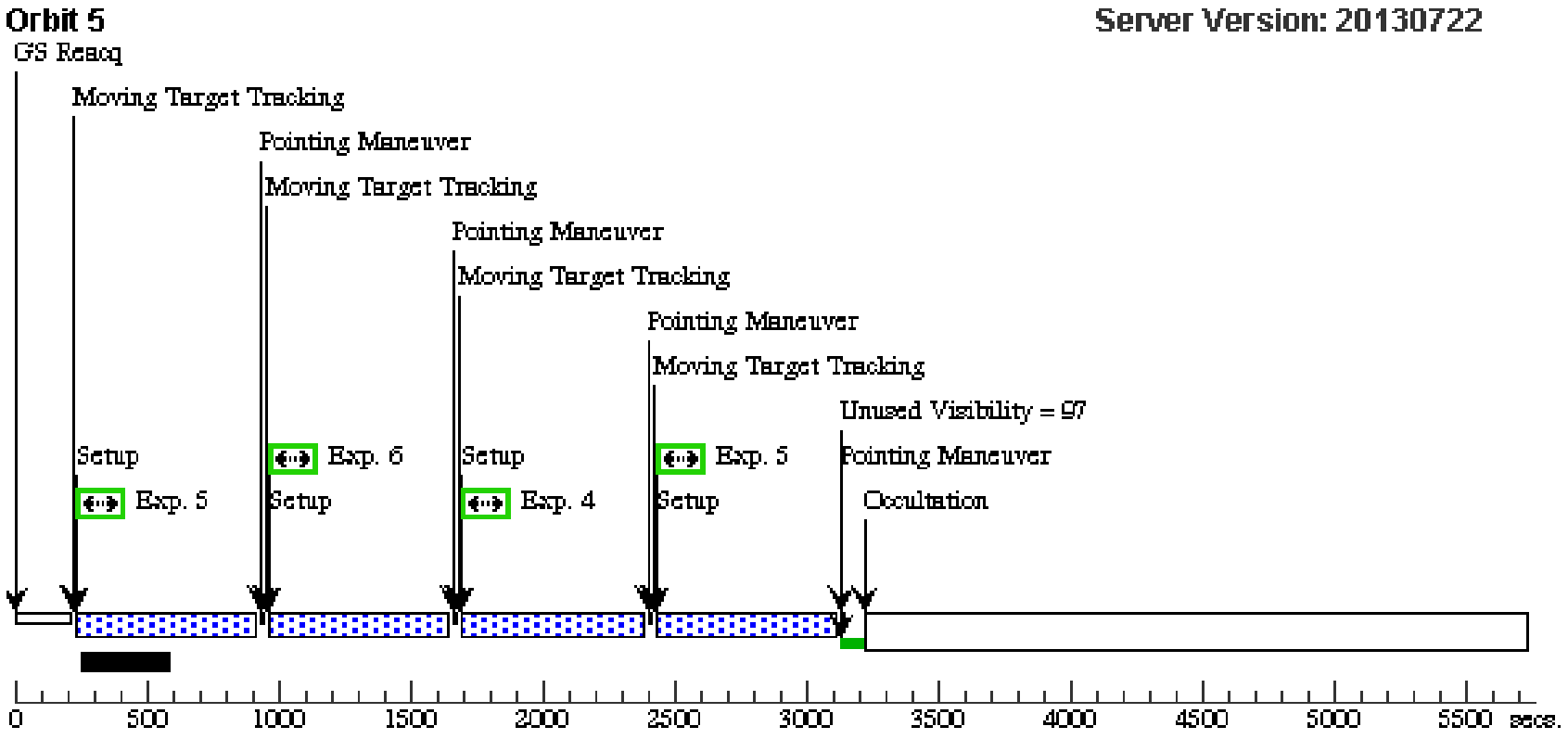
Orbit Structure

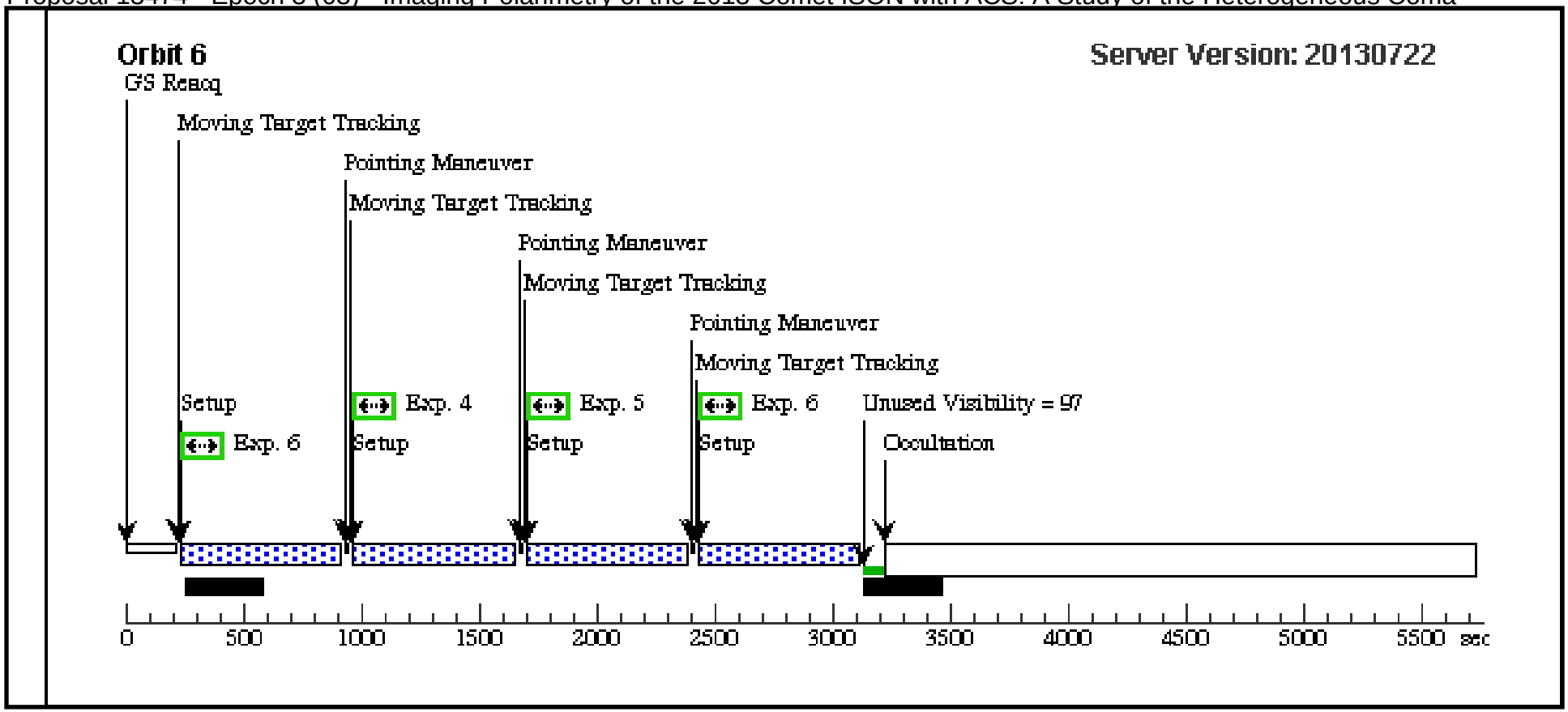



Orbit 2
Server Version: 20130722
GS Reacq
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Visibility = 106
Exp. 2
Setup
Exp. 3
Setup
Exp. 1
Setup
Setup
Exp. 2
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20130722
GS Reacq
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Visibility = 106
Exp. 3
Setup
Setup
Exp. 1
Exp. 2
Setup
Exp. 3
Setup
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 4
Server Version: 20130722
GS Reacq
Moving Target Tracking
Exp. 4
Setup
Exp. 5
Exp. 6
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 4
Unused Visibility = 144
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 5
Server Version: 20130722
GS Reacq
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Visibility = 97
Setup
Exp. 5
Exp. 6
Setup
Setup
Exp. 4
Exp. 5
Setup
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 6
Server Version: 20130722
GS Reacq
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 6
Exp. 4
Setup
Exp. 5
Setup
Exp. 6
Setup
Unused Visibility = 97
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13474, Epoch 3 Bias Frames (A1), implementation Fri Sep 13 01:07:13 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

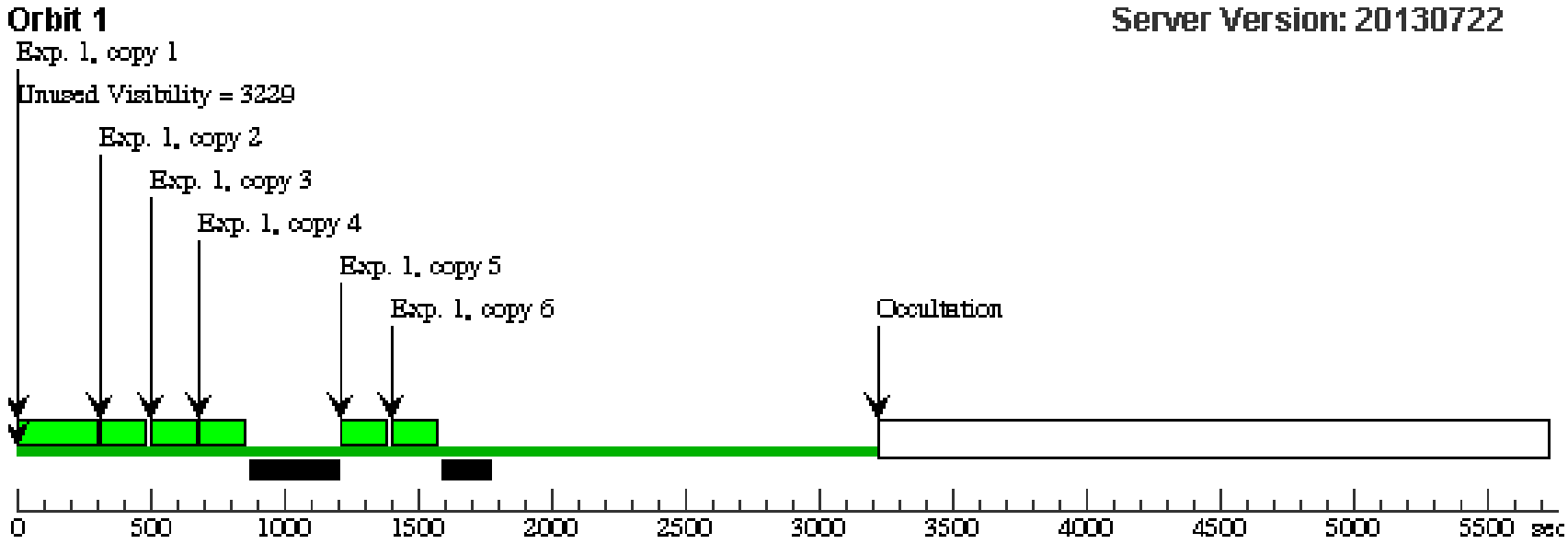
Special Requirements: SEQ A1,A2,A3,A4 WITHIN 1 D

Comments: This orbit is charged to the Cycle 21 ACS Subarray Bias Calibration Program.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		BIAS	ACS/WFC, ACCUM, WFC1-2K	DEF	GAIN=2.0; COMPRESSION=NONE			0 Secs X 6 (0 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]*	***[1]***

Orbit Structure



Visit

Proposal 13474, Epoch 3 Bias Frames (A2), implementation Fri Sep 13 01:07:14 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

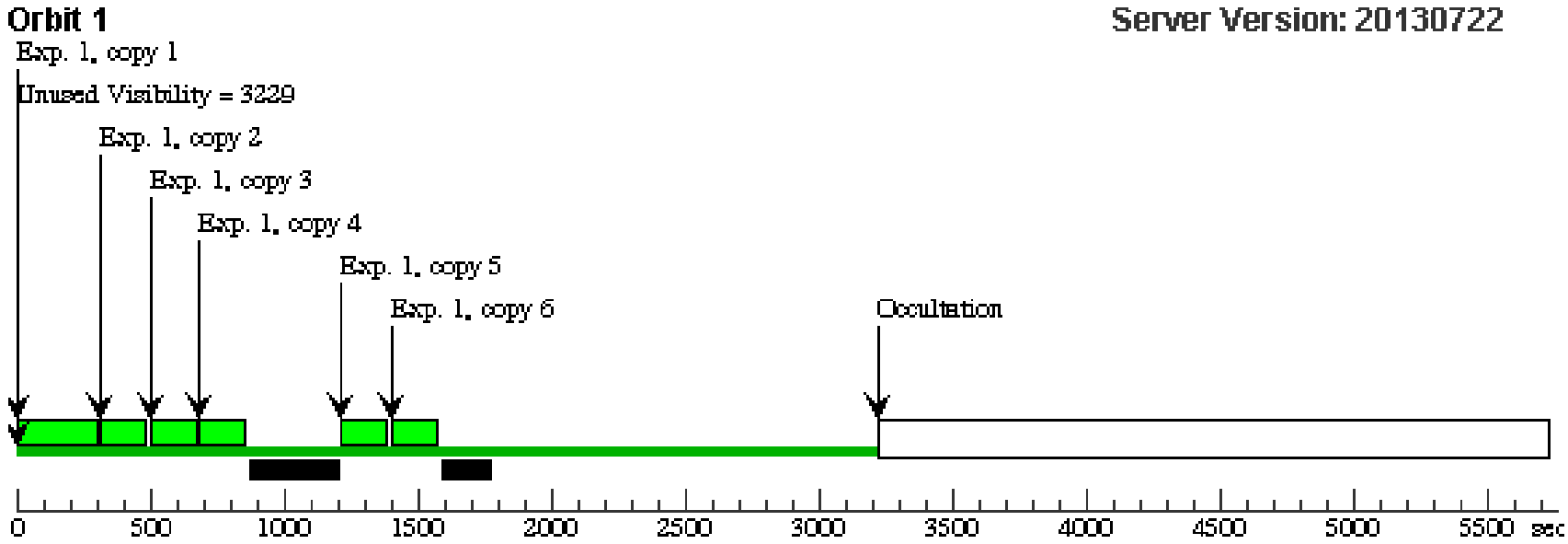
Special Requirements: (none)

Comments: This orbit is charged to the Cycle 21 ACS Subarray Bias Calibration Program.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		BIAS	ACS/WFC, ACCUM, WFC1-2K	DEF	GAIN=2.0; COMPRESSION=NONE			0 Secs X 6 (0 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]*	***[1]***

Orbit Structure



Visit

Proposal 13474, Epoch 3 Bias Frames (A3), implementation Fri Sep 13 01:07:14 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

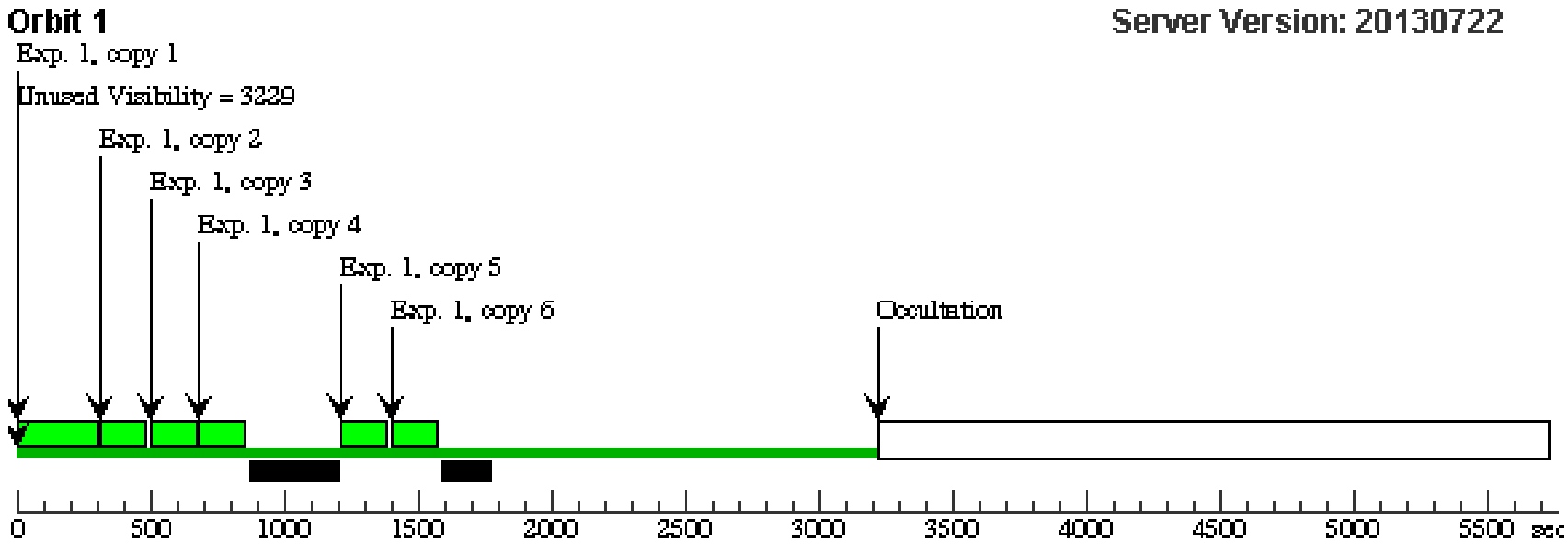
Special Requirements: (none)

Comments: This orbit is charged to the Cycle 21 ACS Subarray Bias Calibration Program.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		BIAS	ACS/WFC, ACCUM, WFC1-2K	DEF	GAIN=2.0; COMPRESSION=NONE			0 Secs X 6 (0 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]*	***[1]***

Orbit Structure



Visit

Proposal 13474, Epoch 3 Bias Frames (A4), implementation Fri Sep 13 01:07:15 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: GROUP A4,03 WITHIN 14D

Comments: This orbit is charged to the Cycle 21 ACS Subarray Bias Calibration Program.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		BIAS	ACS/WFC, ACCUM, WFC1-2K	DEF	GAIN=2.0; COMPRESSION=NONE			0 Secs X 6 (0 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]*	*[1]*

Orbit Structure