13863 - Imaging Polarimetry of the 67P/Churyumov-Gerasimenko with ACS: Supporting the Rosetta Mission

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Dean C. Hines (PI) (Contact)	**Space Telescope Science Institute**	**hines@stsci.edu**
Dr. Gorden Videen (CoI)	Space Science Institute	gorden.videen@gmail.com
Dr. Yuri G. Shkuratov (CoI)	Kharkiv National University	yuriy.shkuratov@gmail.com
Dr. Karri Muinonen (CoI) (ESA Member)	University of Helsinki	karri.muinonen@helsinki.fi
Dr. Michael L. Sitko (CoI)	Space Science Institute	sitko@spacescience.org
Dr. Matthew M Knight (CoI)	Lowell Observatory	knight@lowell.edu
Dr. Carey M Lisse (CoI)	The Johns Hopkins University Applied Physics Laboratory	carey.lisse@jhuapl.edu
Dr. Evgenij Zubko (CoI)	Kharkiv National University	ezubko@rambler.ru
Dr. Vadim Kaydash (CoI)	Kharkiv National University	vgkaydash@gmail.com
Max Mutchler (CoI)	Space Telescope Science Institute	mutchler@stsci.edu
Dr. Padmavati A Yanamandra-Fisher (CoI)	Space Science Institute	padmayf@gmail.com
Prof. A.C. Levasseur-Regourd (CoI) (ESA Member)	Universite Paris	chantal.levasseur@aerov.jussieu.fr
Dr. Jian-Yang Li (CoI)	Planetary Science Institute	jyli@psi.edu
Dr. Ludmilla Kolokolova (CoI)	University of Maryland	ludmilla@astro.umd.edu
Dr. Edith Hadamcik (CoI) (ESA Member)	LATMOS	edith.hadamcik@latmos.ipsl.fr
Dr. Colin Snodgrass (CoI) (ESA Member)	Max Planck Institute for Solar System Research	snodgrass@mps.mpg.de
Dr. Matt Taylor (CoI) (ESA Member)	European Space Agency - ESTEC	mtaylor@esa.int
Dr. Claudia J. Alexander (CoI)	Jet Propulsion Laboratory	calexander@gllsvc.jpl.nasa.gov

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC	4	17-Sep-2014 21:06:57.0	yes
02	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC	4	17-Sep-2014 21:06:59.0	yes
03	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC	4	17-Sep-2014 21:07:00.0	yes
04	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC	3	17-Sep-2014 21:07:02.0	yes
05	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC	3	17-Sep-2014 21:07:03.0	yes
06	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC	3	17-Sep-2014 21:07:05.0	yes
A1	BIAS	ACS/WFC	1	17-Sep-2014 21:07:06.0	yes
A2	BIAS	ACS/WFC	1	17-Sep-2014 21:07:06.0	yes
A3	BIAS	ACS/WFC	1	17-Sep-2014 21:07:07.0	yes
A4	BIAS	ACS/WFC	1	17-Sep-2014 21:07:07.0	yes
B1	BIAS	ACS/WFC	1	17-Sep-2014 21:07:08.0	yes
B2	BIAS	ACS/WFC	1	17-Sep-2014 21:07:09.0	yes
B3	BIAS	ACS/WFC	1	17-Sep-2014 21:07:09.0	yes
B4	BIAS	ACS/WFC	1	17-Sep-2014 21:07:10.0	yes

29 Total Orbits Used

ABSTRACT

We propose ACS/WFC imaging polarimetry of Comet 67P/Churyumov-Gerasimenko (hereafter 67P), in support of the Rosetta mission, to place stringent constraints on dust particles in the coma. Our observations bracket the period when Rosetta operates closest to 67P, and will deploy the Philae lander. Fortunately, this occurs when the comet phase angle is well centered in the negative-polarization branch (12-15 degrees), enabling the different materials within the coma to be mapped using their polarization response, providing information on comet heterogeneity, and on the size, shape/structure, composition, or orientation of the particles. Our results will compare directly with in-situ measurements from Rosetta, placing strong

constraints on material on small scales near and at the nucleus, and on larger scales within the coma. During the encounter, 67P will subtend only about 4-5", so ground-based observations would only provide one or two "polarimetric resolution elements" across the coma, at most. Laser AO systems can provide higher spatial resolution, but do not have visible wavelength polarimetry modes. In addition to our high spatial resolution requirement, this exciting period in the Rosetta mission coincides with the end of the visibility window from Earth, with 67P only visible for around 45 minutes between the end of astronomical twilight and reaching 2 airmasses in mid-November for ground-based telescopes. The necessary S/N could not be achieved by polarimeters on even the largest ground-based telescopes during this window. HST/ACS is the only asset capable of achieving our objectives during this once-in-a-lifetime opportunity.

OBSERVING DESCRIPTION

We use POLV polarizers. This will enable us to construct a broadband polarization image of the coma with a high S/N ~ 300. For ACS, all wavelengths < 0.6 um are potentially contaminated by molecular line emission, and strong CN bands exist at 0.92 um. Molecular emission will be essentially unpolarized, which artificially reduces the measured degree of polarization. While narrowband filters are ideal, their use is prohibitively expensive to obtain sufficient S/N for the comet at its distance and size on in August 2014. We therefore choose the F606W filter. We acknowledge that our results may suffer contamination from the molecular species CN, C2, and C3 that will dilute the polarization signal. However, at 3.5AU from the Sun, the contamination should not be a problem (it was not an issue for Comet ISON at similar distances: Hines et al. 2014), and near-contemporaneous ground-based spectroscopic monitoring (e.g., as coordinated by Co-I, Snodgrass) will provide accurate equivalent-width measurements of the contaminating emission that will then be used to correct the polarimetry . In addition, while the F775W would be less contaminated, the calibration of the filter is less accurate, and the exposure times would need to be about 40% longer to achieve similar S/N in the polarimetry.

The efficacy of ACS/WFC imaging polarimetry for extended sources has been demonstrated in general (e.g., Sparks et al. 2008), and in particular for comets with low, but significant polarization (Hines et al. 2014). The calibration observations of the F606W + visible polarizer combinations were obtained during the Cycle 12 ACS polarimetric calibration campaign (CAL 10055), and Hines has used these to recalibrate the system, showing that precise (p~0.3%) polarization measurements with an absolute accuracy of p%~0.3%, can be achieved with the system.

We expect the measured polarization of 67P to range from ~2-6%. Since polarization follows a Rice, not a Gaussian, distribution, we require a P/sigp > 4 per resolution element. We therefore need p~0.3%. For three perfect polarizers oriented at 60 degrees relative position angles (as in the ACS), the uncertainty in the degree of polarization P (which ranges from 0 for unpolarized light to 1 for fully polarized light) is approximately the

inverse of the signal-to-noise per image. Sparks & Axon (1999) find [see equation in their paper - DCH], where S/Ni is the signal-to-noise of the ith image. Therefore, in order to achieve P/sigp > 4 for P ~2%, we require S/Ni > 268.

Using our successful observations of Comet ISON (Hines et al. 2014) as a validation of our S/N calculations, we estimate the total integration time needed to achieve S/N. Using the above V-band surface brightness, we estimate the exposure time for 2.0e-/DN gain, and a G2V spectrum. To achieve the required S/N, we may have to bin the data by up to 19x19 pixels (we will bin only until we reach the desired precision, S/N). This still yields sub-acrsecond spatial resolution, and cannot be done from the ground.

The results of our exposure time estimates are shown in Table 3. The last column shows our expected allocation need including guide star acquisition (8 minutes), and reacquisition (6 minutes), plus instrument overheads. We use CRSPLIT=2, and a two-position dither. We request a total of 21 orbits for this program.

CALIBRATION ORBITS: As per STScI policy, 8 internal orbits have been added to this proposal for the purpose of obtaining subarray bias frames that are contemporaneous with the science observations. These internal orbits will be charged to STScI's Cycle 22 ACS Calibration Program, not to GO 13863. The ACS Instrument Team at STScI is responsible for producing superbias reference files from the bias frames obtained in this GO proposal.

Visit

Proposal 13863, 67P-Epoch-1-Visit-1 (01), completed Thu Sep 18 01:07:11 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; BETWEEN 18-AUG-2014:00:00:00 AND 20-AUG-2014:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=3.265 Line Spacing=3.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=true		(1)

Solar System Targets

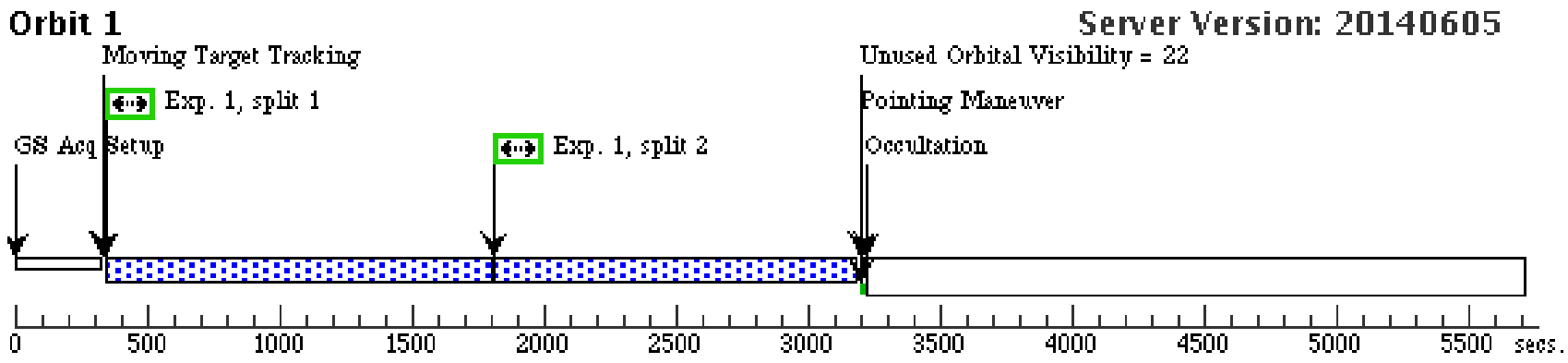
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	COMET-67P-CHURYUMOV-GERASIMENKO	TYPE=COMET,Q=1.243119605049142,E=0.6410532328350245,I=7.040848762748019,O=50.15180617652601,W=12.773219225972,T=13-AUG-2015:00:01:52,TTimeScale=TDT,EQUINOX=J2000,EPOCH=03-MAY-2014:00:00:00,EpochTimeScale=TDT,A1=1.074213162065E-9,A2=1.064203027636E-10,A3=1.297521963716E-10				EARTH

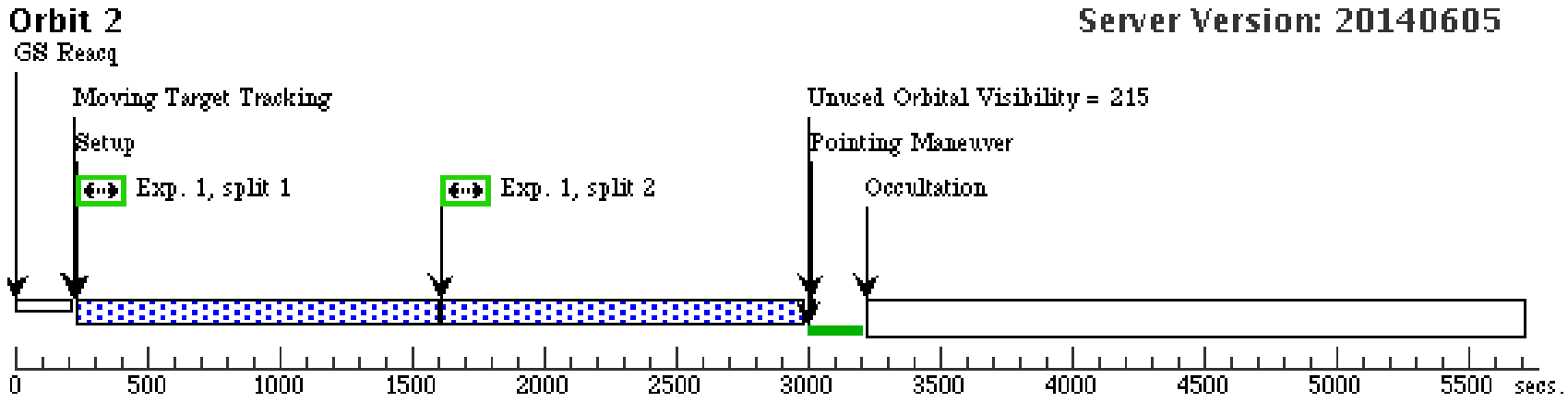
Comments: Ephemeris from HORIZONS JPL#K084/16

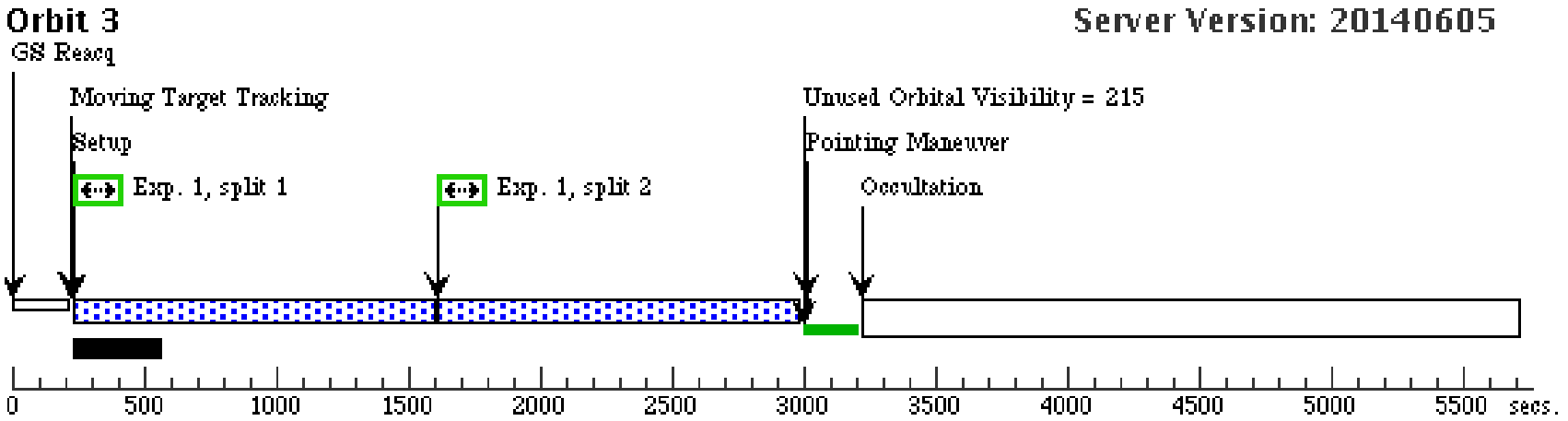
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POL0V	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2		Pattern 1, Exps 1-1 in 67P-Epoch-1-Visit-1 (01) (1)	2400 Secs (9600 Secs)	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]*	***[1]***
								[==>(Pattern 2, Split 1)] *[==>(Pattern 2, Split 2)]*	***[2]***
								[==>(Pattern 3, Split 1)] *[==>(Pattern 3, Split 2)]*	***[3]***
								[==>(Pattern 4, Split 1)] *[==>(Pattern 4, Split 2)]*	***[4]***

Orbit Structure






Orbit 3
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GS Reacq
Moving Target Tracking
Setup
Exp. 1, split 1
Exp. 1, split 2
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Pointing Maneuver
Occultation
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1000
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3500
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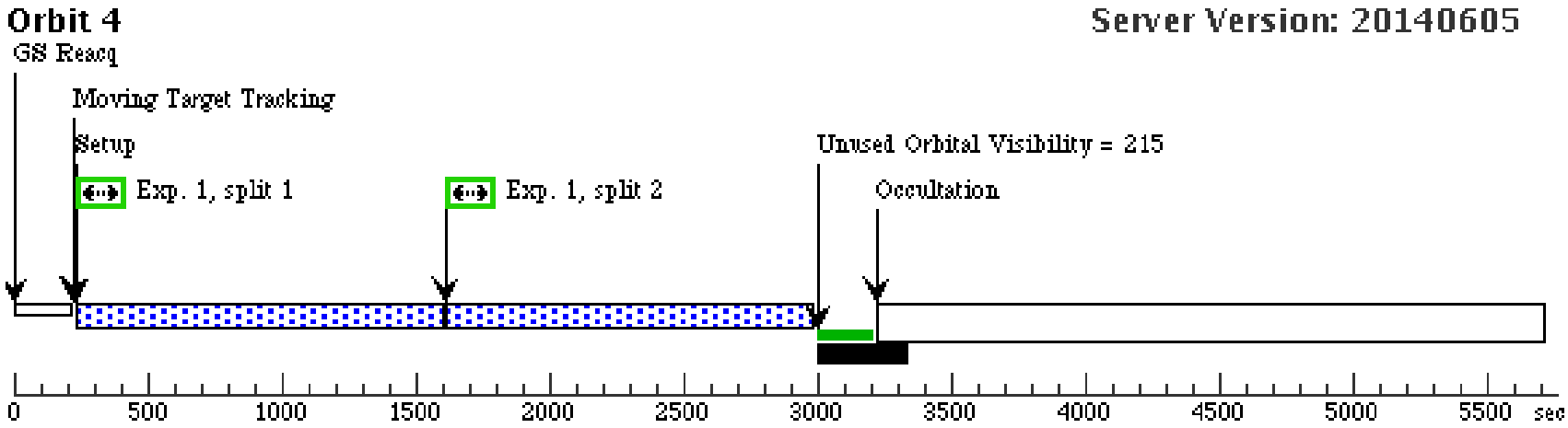
5000
5500
secs.


Orbit 4
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 1, split 1
Exp. 1, split 2
Unused Orbital Visibility = 215
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13863, 67P-Epoch-1-Visit-2 (02), completed Thu Sep 18 01:07:11 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; AFTER 01 BY 23.6 H TO 24.2 H

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=3.265 Line Spacing=3.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=true		(1)

Solar System Targets

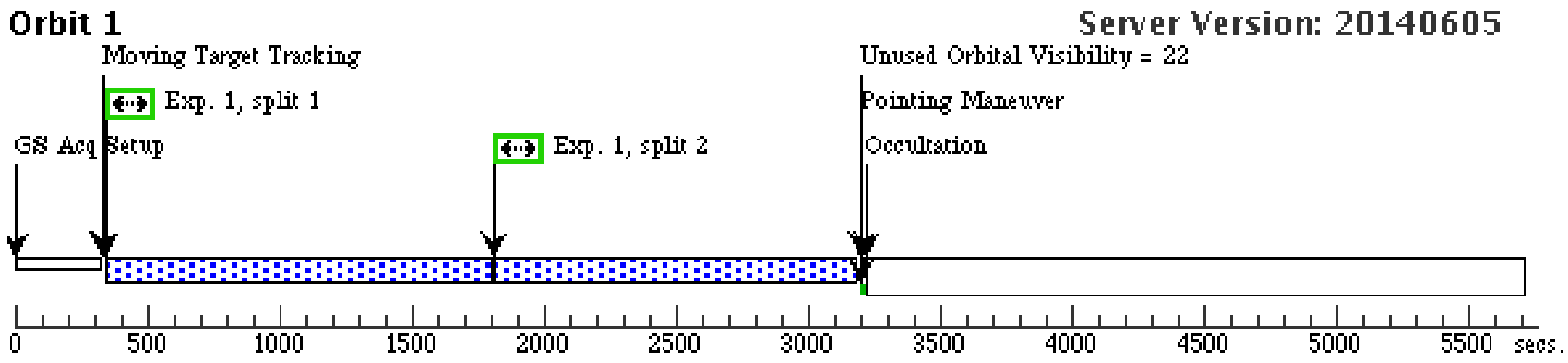
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	COMET-67P-CHURYUMOV-GERASIMENKO	TYPE=COMET,Q=1.243119605049142,E=0.6410532328350245,I=7.048848762748019,O=50.15180617652601,W=12.773219225972,T=13-AUG-2015:00:01:52,TTimeScale=TDT,EQUINOX=J2000,EPOCH=03-MAY-2014:00:00:00,EpochTimeScale=TDT,A1=1.074213162065E-9,A2=1.064203027636E-10,A3=1.297521963716E-10				EARTH

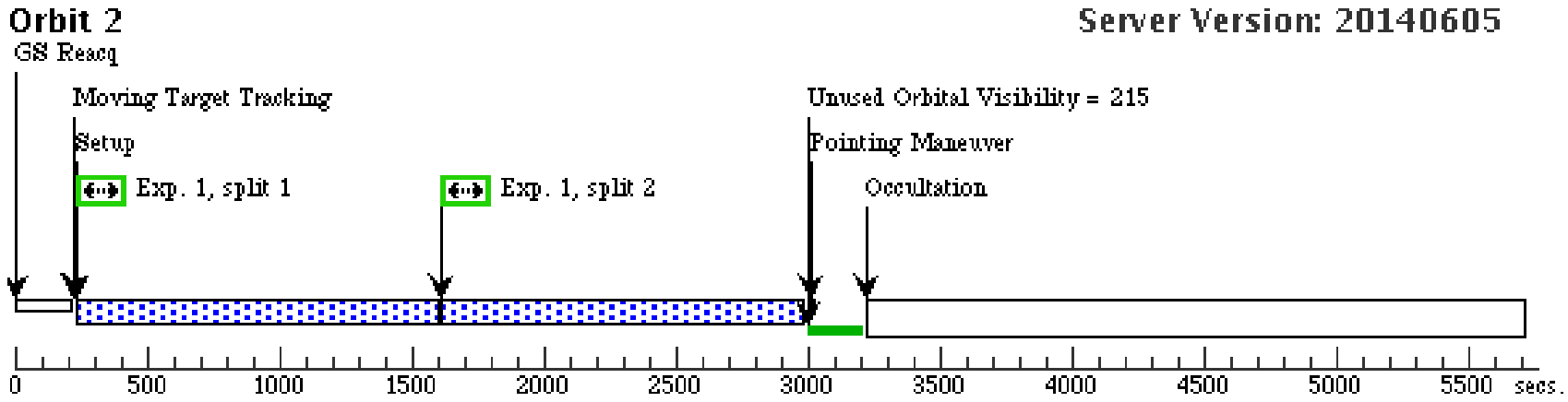
Comments: Ephemeris from HORIZONS JPL#K084/16

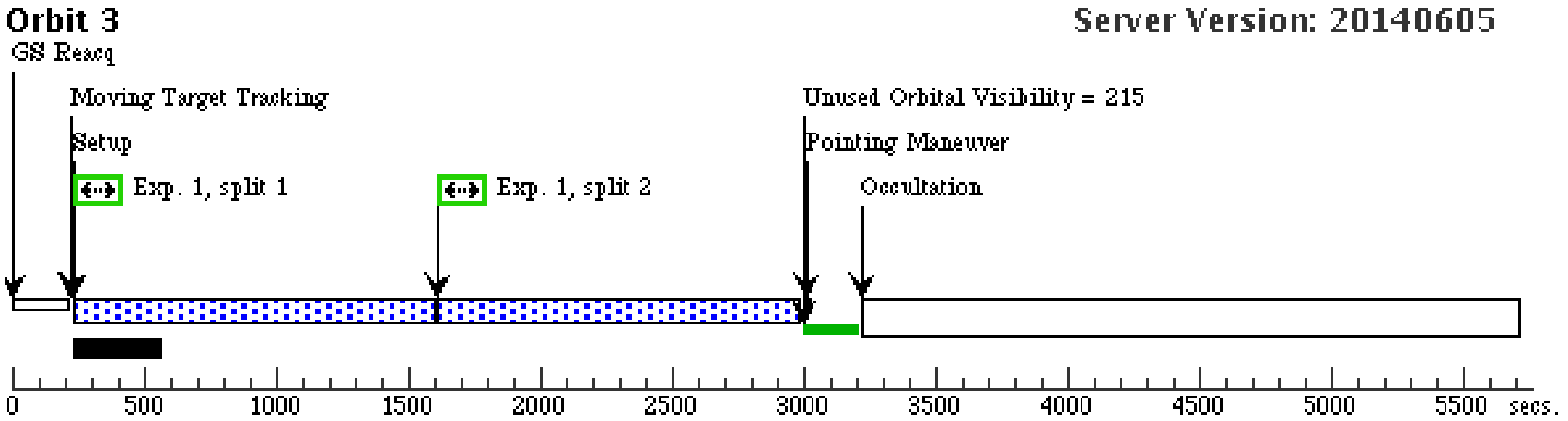
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POL60V	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2		Pattern 1, Exps 1-1 in 67P-Epoch-1-Visit-2 (02) (1)	2400 Secs (9600 Secs)	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]*	***[1]***
								[==>(Pattern 2, Split 1)] *[==>(Pattern 2, Split 2)]*	***[2]***
								[==>(Pattern 3, Split 1)] *[==>(Pattern 3, Split 2)]*	***[3]***
								[==>(Pattern 4, Split 1)] *[==>(Pattern 4, Split 2)]*	***[4]***

Orbit Structure






Orbit 3
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 1, split 1
Exp. 1, split 2
Unused Orbital Visibility = 215
Pointing Maneuver
Occultation
0
500
1000
1500
2000
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3000
3500
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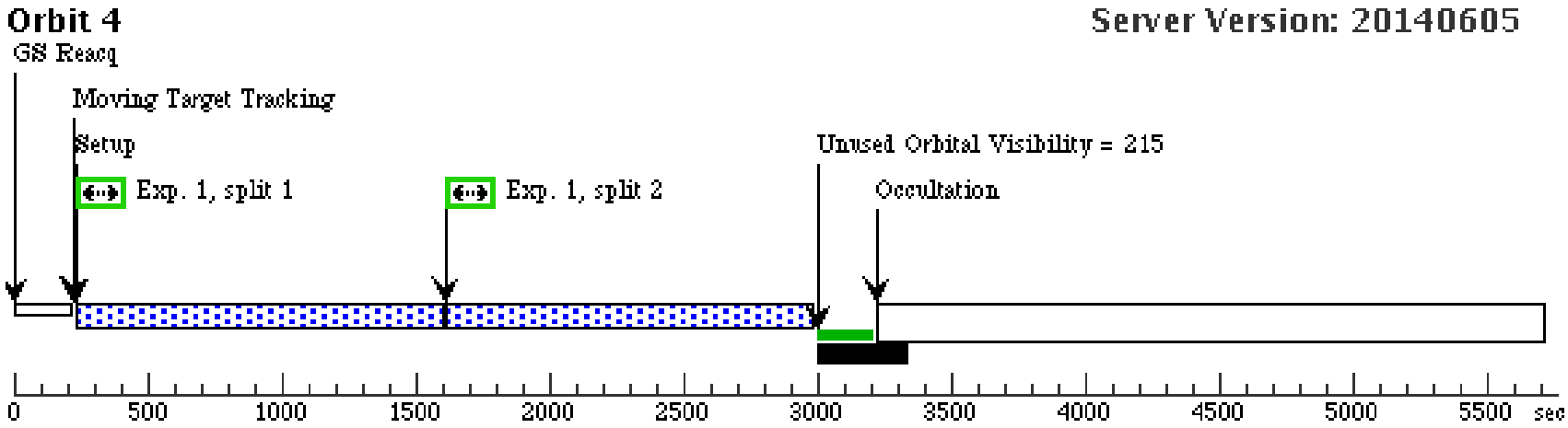
5500
secs.


Orbit 4
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 1, split 1
Exp. 1, split 2
Unused Orbital Visibility = 215
Occultation
0
500
1000
1500
2000
2500
3000
3500
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4500
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5500
sec

Visit

Proposal 13863, 67P-Epoch-1-Visit-3 (03), completed Thu Sep 18 01:07:12 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; AFTER 01 BY 48.8 H TO 49.4 H

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=3.265 Line Spacing=3.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=true		(1)

Solar System Targets

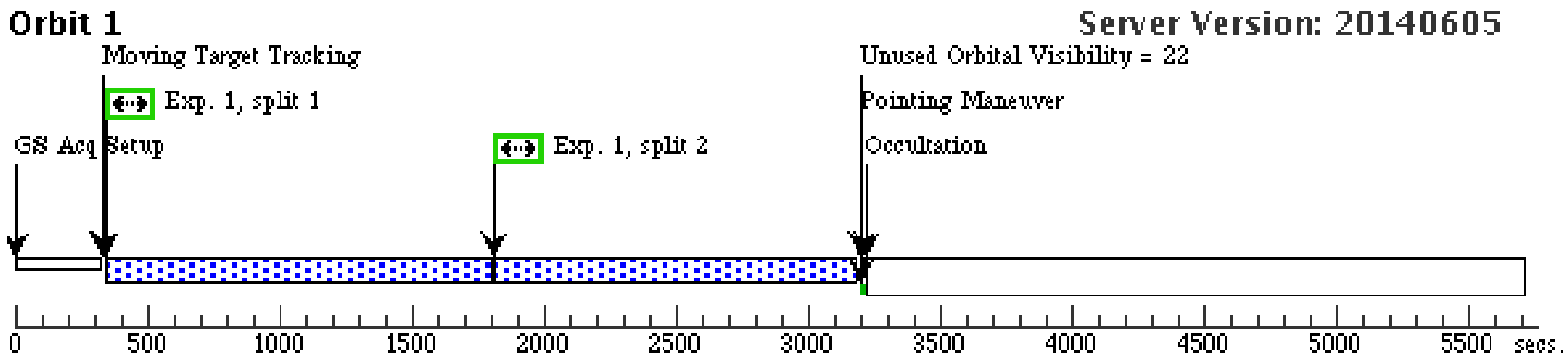
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	COMET-67P-CHURYUMOV-GERASIMENKO	TYPE=COMET,Q=1.243119605049142,E=0.6410532328350245,I=7.048848762748019,O=50.15180617652601,W=12.773219225972,T=13-AUG-2015:00:01:52,TTimeScale=TDT,EQUINOX=J2000,EPOCH=03-MAY-2014:00:00:00,EpochTimeScale=TDT,A1=1.074213162065E-9,A2=1.064203027636E-10,A3=1.297521963716E-10				EARTH

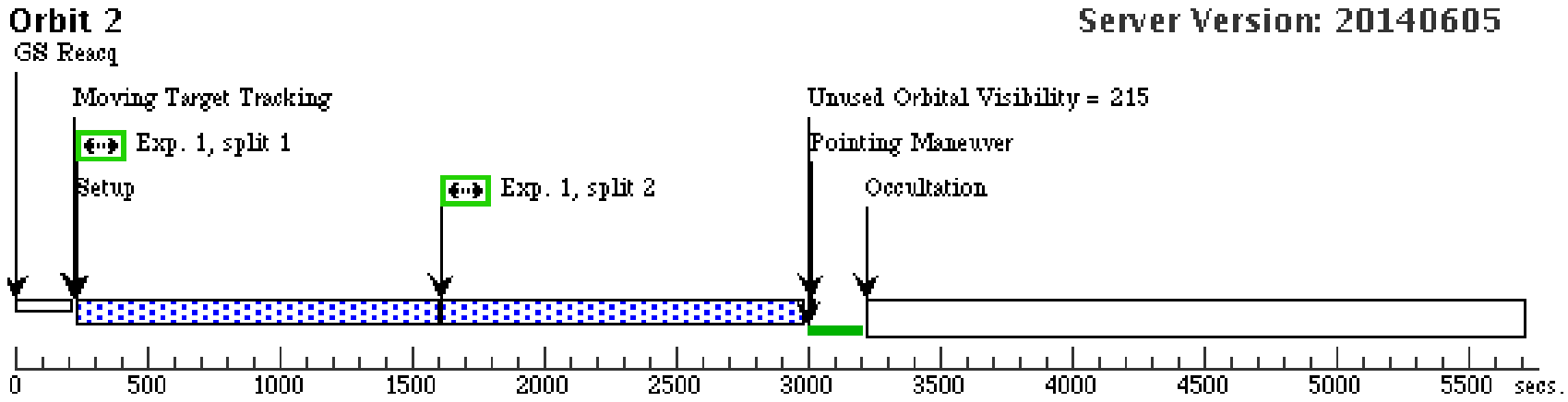
Comments: Ephemeris from HORIZONS JPL#K084/16

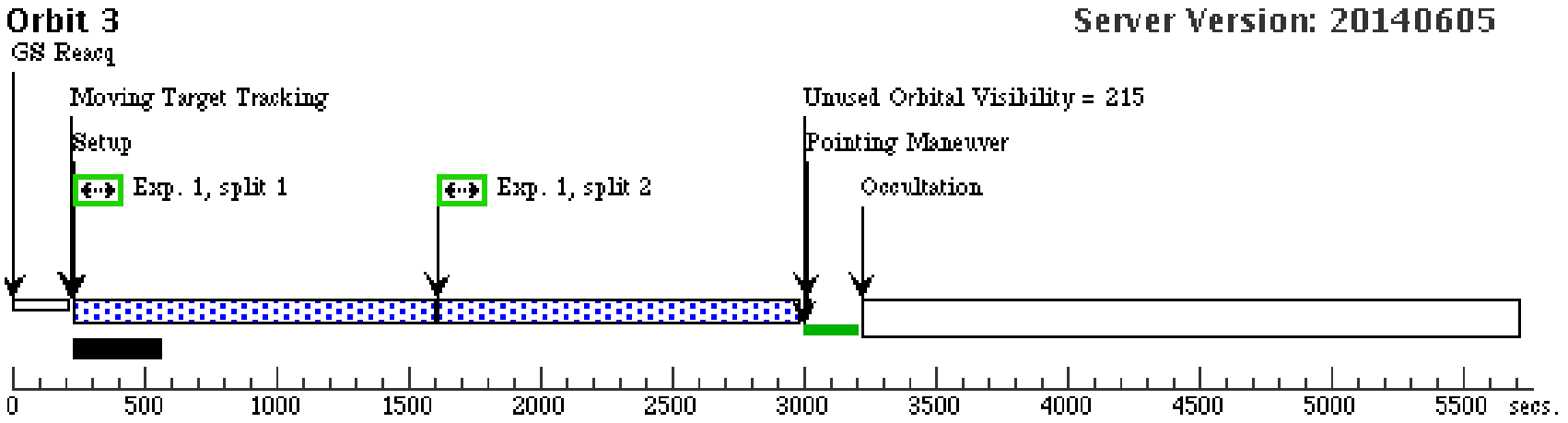
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	POL120V	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in 67P-Epoch-1-Visit-3 (03) (1)	2400 Secs (9600 Secs)	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]*	***[1]***
								[==>(Pattern 2, Split 1)] *[==>(Pattern 2, Split 2)]*	***[2]***
								[==>(Pattern 3, Split 1)] *[==>(Pattern 3, Split 2)]*	***[3]***
								[==>(Pattern 4, Split 1)] *[==>(Pattern 4, Split 2)]*	***[4]***

Orbit Structure






Orbit 3
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 1, split 1
Exp. 1, split 2
Unused Orbital Visibility = 215
Pointing Maneuver
Occultation
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5000
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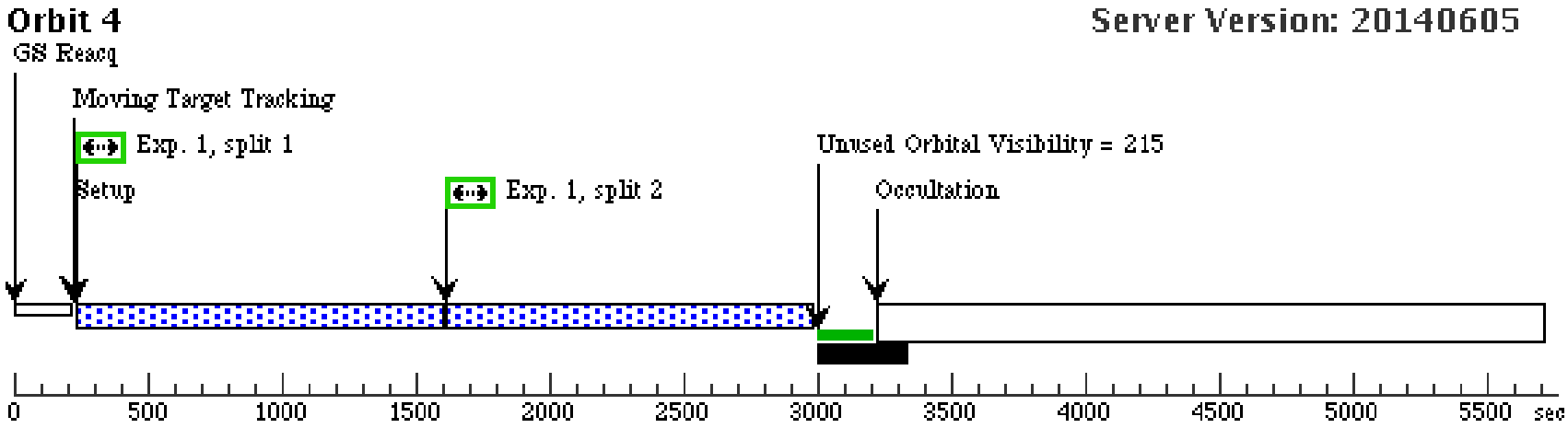
secs.


Orbit 4
Server Version: 20140605
GS Reacq
Moving Target Tracking
Exp. 1, split 1
Setup
Exp. 1, split 2
Unused Orbital Visibility = 215
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13863, 67P-Epoch-2-Visit-1 (04), implementation Thu Sep 18 01:07:12 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; BETWEEN 16-NOV-2014:00:00:00 AND 18-NOV-2014:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=3.265 Line Spacing=3.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=true		(2)
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)

Solar System Targets

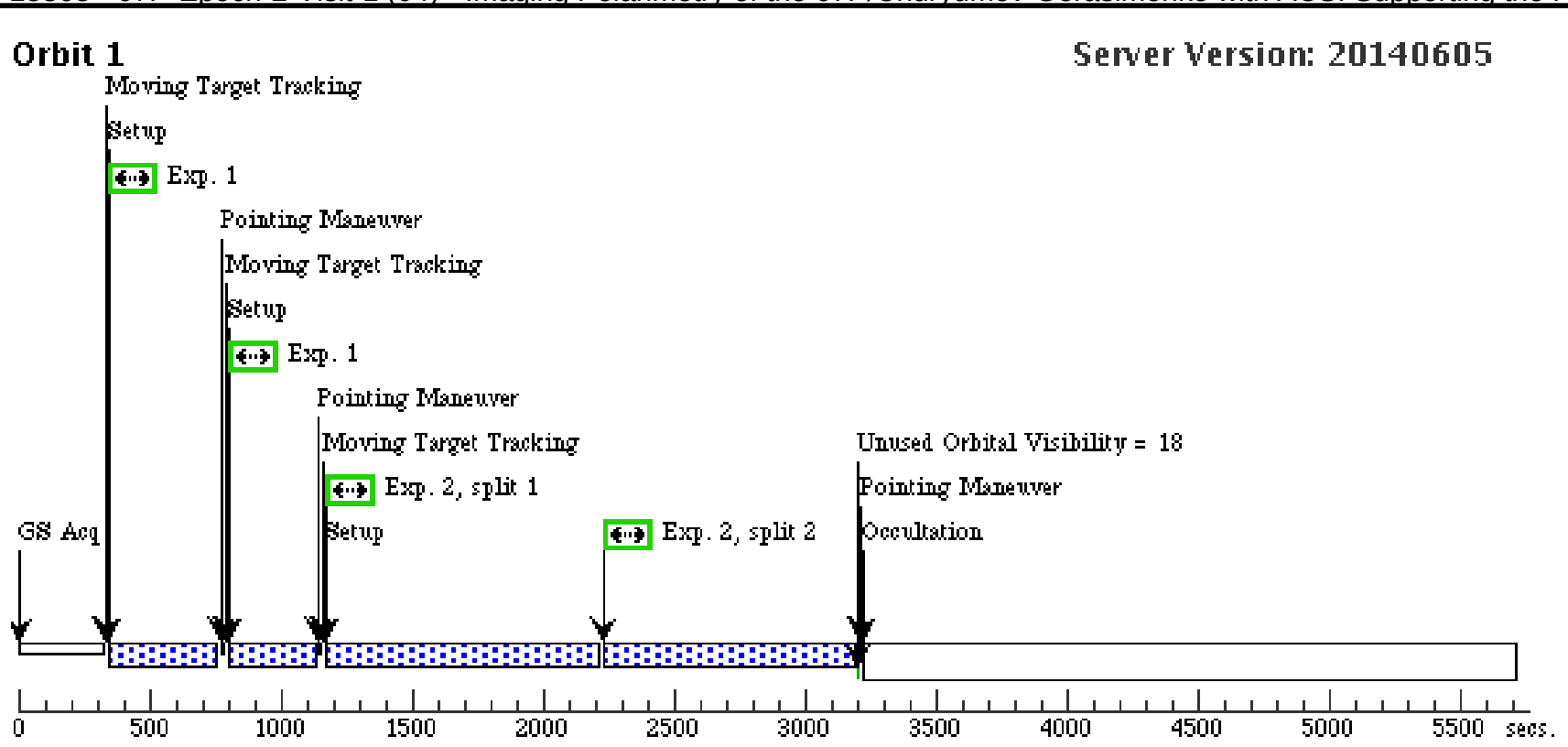
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	COMET-67P-CHURYUMOV-GERASIMENKO	TYPE=COMET,Q=1.243119605049142,E=0.6410532328350245,I=7.040848762748019,O=50.15180617652601,W=12.773219225972,T=13-AUG-2015:00:01:52,TTimeScale=TDT,EQUINOX=J2000,EPOCH=03-MAY-2014:00:00:00,EpochTimeScale=TDT,A1=1.074213162065E-9,A2=1.064203027636E-10,A3=1.297521963716E-10				EARTH

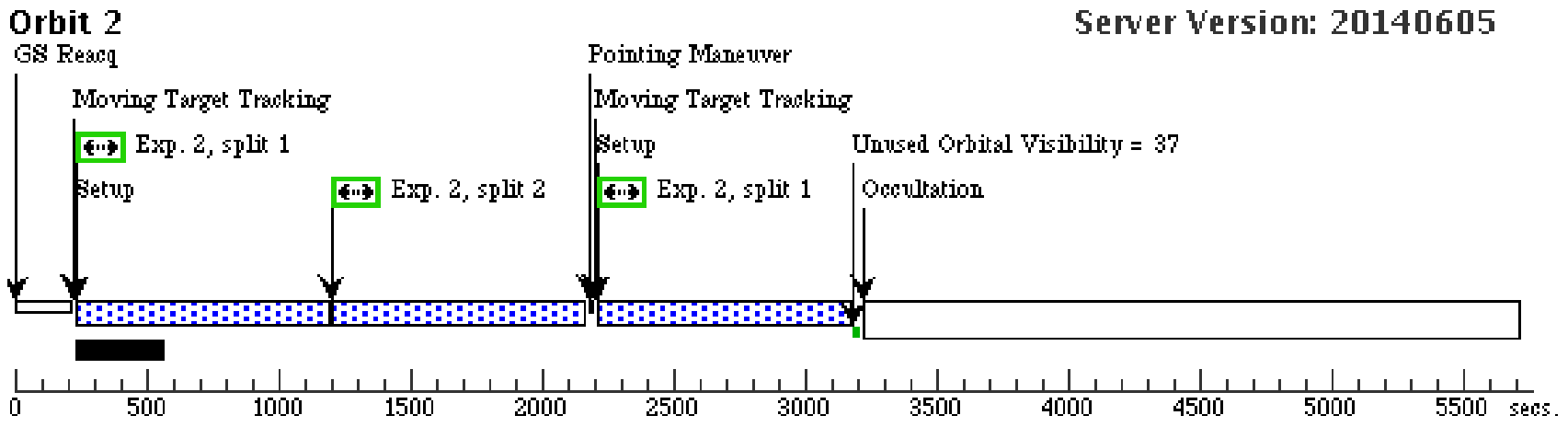
Comments: Ephemeris from HORIZONS JPL#K084/16

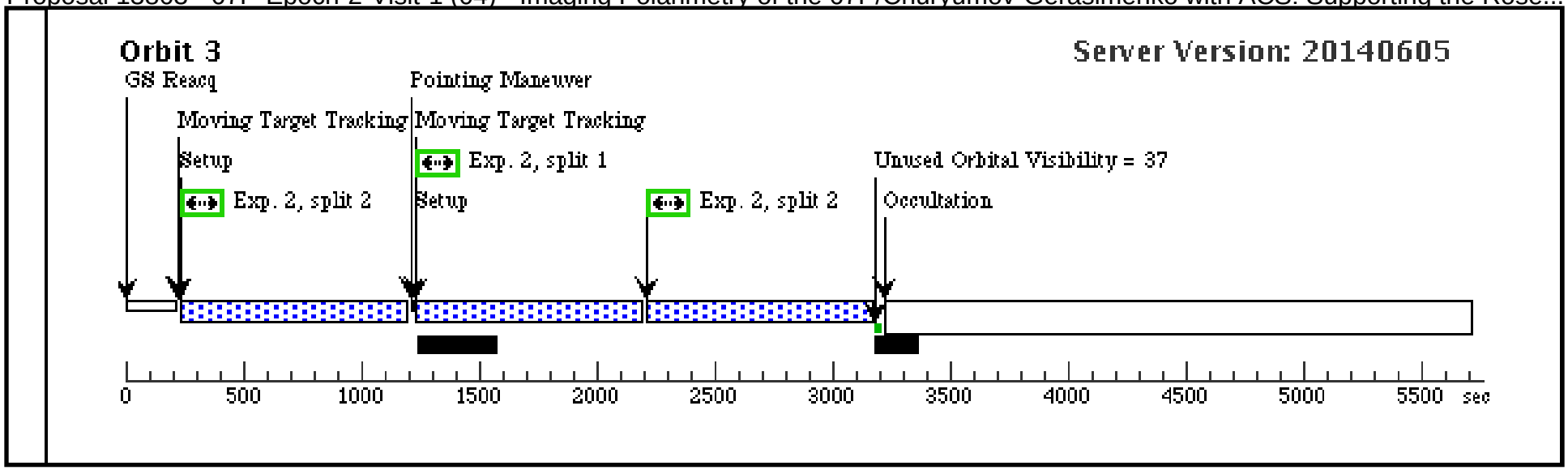
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC1-2K	F775W		GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-1 in 67P-Epoch-2-Visit-1 (04) (2)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	POL0V	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2		Pattern 1, Exps 2-2 in 67P-Epoch-2-Visit-1 (04) (1)	1570 Secs (6280 Secs) *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]*	***[1]*** ***[2]*** ***[3]***

Orbit Structure






Orbit 3
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 2, split 2
Pointing Maneuver
Moving Target Tracking
Exp. 2, split 1
Setup
Exp. 2, split 2
Unused Orbital Visibility = 37
Occultation
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13863, 67P-Epoch-2-Visit-2 (05), implementation Thu Sep 18 01:07:12 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; AFTER 04 BY 23.6 H TO 24.2 H

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=3.265 Line Spacing=3.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=true		(2)
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)

Solar System Targets

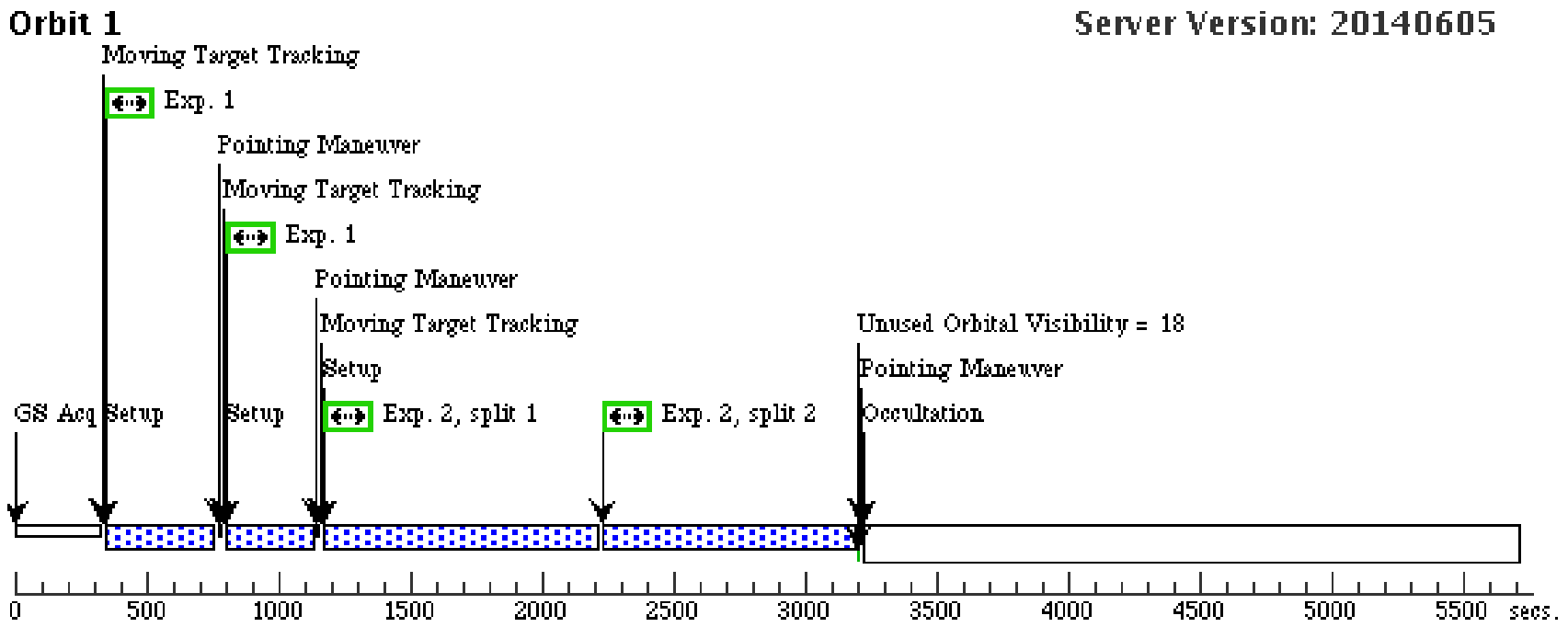
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	COMET-67P-CHURYUMOV-GERASIMENKO	TYPE=COMET,Q=1.243119605049142,E=0.6410532328350245,I=7.040848762748019,O=50.15180617652601,W=12.773219225972,T=13-AUG-2015:00:01:52,TTimeScale=TDT,EQUINOX=J2000,EPOCH=03-MAY-2014:00:00:00,EpochTimeScale=TDT,A1=1.074213162065E-9,A2=1.064203027636E-10,A3=1.297521963716E-10				EARTH

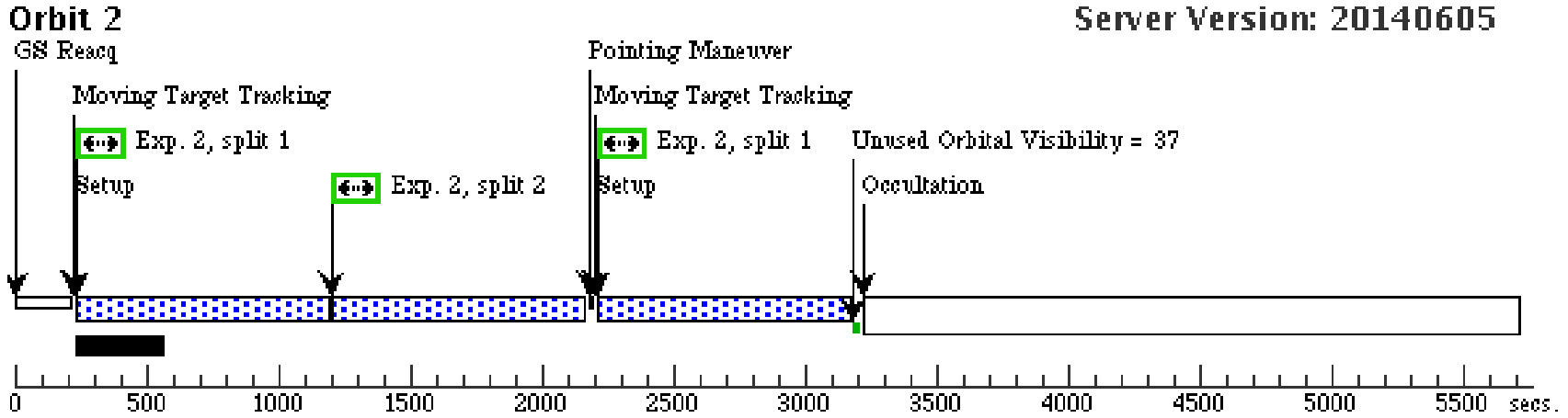
Comments: Ephemeris from HORIZONS JPL#K084/16

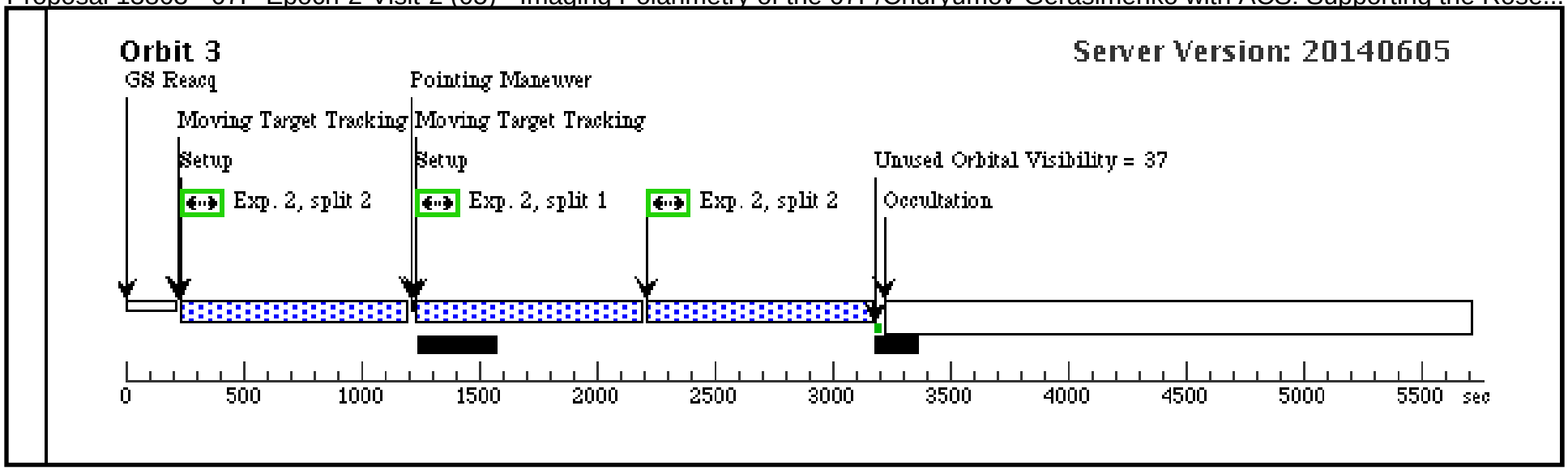
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC1-2K	F775W		GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-1 in 67P-Epoch-2-Visit-2 (05) (2)	150 Secs (300 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2	POL60V	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2		Pattern 1, Exps 2-2 in 67P-Epoch-2-Visit-2 (05) (1)	1570 Secs (6280 Secs) *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]*	***[1]*** ***[2]*** ***[3]***

Orbit Structure






Orbit 3
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 2, split 2
Pointing Maneuver
Moving Target Tracking
Setup
Exp. 2, split 1
Exp. 2, split 2
Unused Orbital Visibility = 37
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13863, 67P-Epoch-2-Visit-3 (06), implementation Thu Sep 18 01:07:12 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 30%; AFTER 04 BY 48.8 H TO 49.4 H

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=3.265 Line Spacing=3.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=true		(2)
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)

Solar System Targets

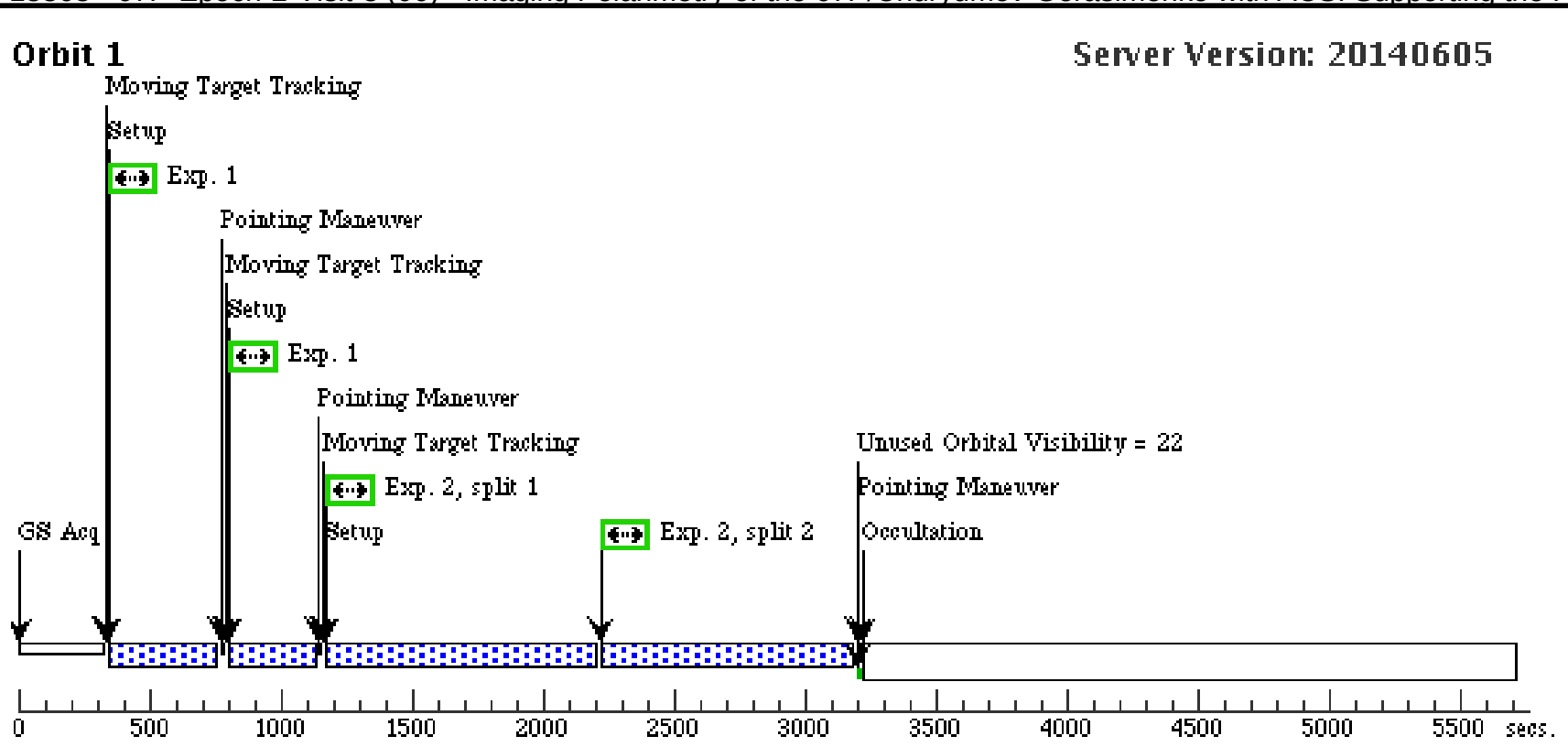
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	COMET-67P-CHURYUMOV-GERASIMENKO	TYPE=COMET,Q=1.243119605049142,E=0.6410532328350245,I=7.040848762748019,O=50.15180617652601,W=12.773219225972,T=13-AUG-2015:00:01:52,TTimeScale=TDT,EQUINOX=J2000,EPOCH=03-MAY-2014:00:00:00,EpochTimeScale=TDT,A1=1.074213162065E-9,A2=1.064203027636E-10,A3=1.297521963716E-10				EARTH

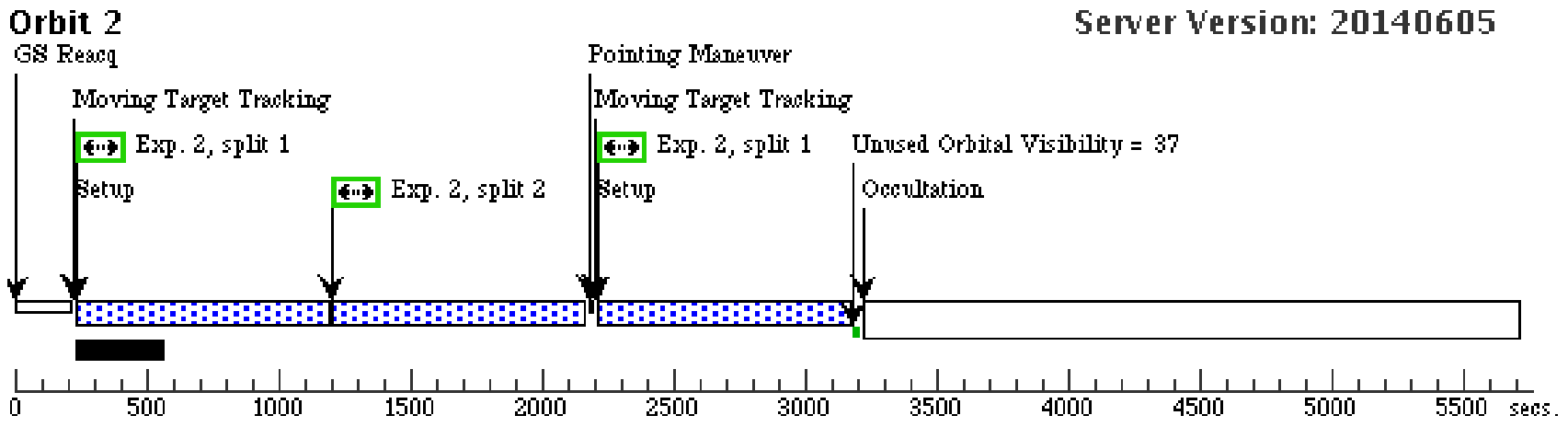
Comments: Ephemeris from HORIZONS JPL#K084/16

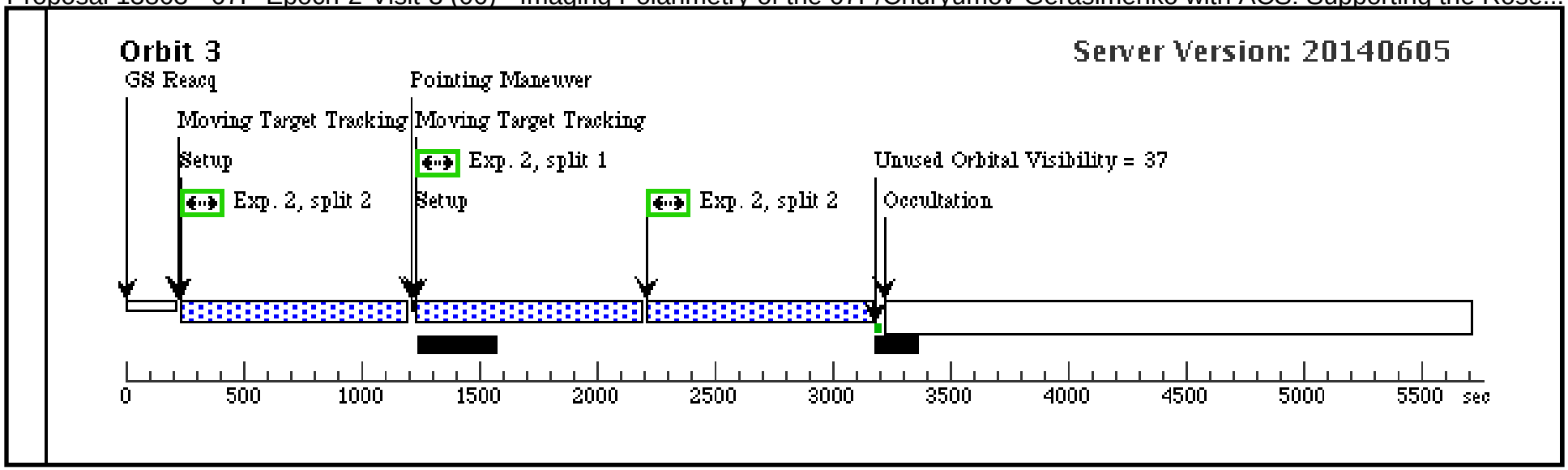
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC1-2K	F775W		GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-1 in 67P-Epoch-2-Visit-3 (06) (2)	150 Secs (300 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[1]***
2	POL120V	(1) COMET-67P-CHURYUMOV-GERASIMENKO	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2		Pattern 1, Exps 2-2 in 67P-Epoch-2-Visit-3 (06) (1)	1570 Secs (6280 Secs)	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]*	***[1]***
								[==>(Pattern 2, Split 1)] *[==>(Pattern 2, Split 2)]* *[==>(Pattern 3, Split 1)]*	***[2]***
								[==>(Pattern 3, Split 2)] *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20140605
GS Reacq
Moving Target Tracking
Setup
Exp. 2, split 2
Pointing Maneuver
Moving Target Tracking
Exp. 2, split 1
Setup
Exp. 2, split 2
Unused Orbital Visibility = 37
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13863, Bias Frames for Epoch 1 (A1), completed Thu Sep 18 01:07:12 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

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

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): Illegal selection: DEF.

(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

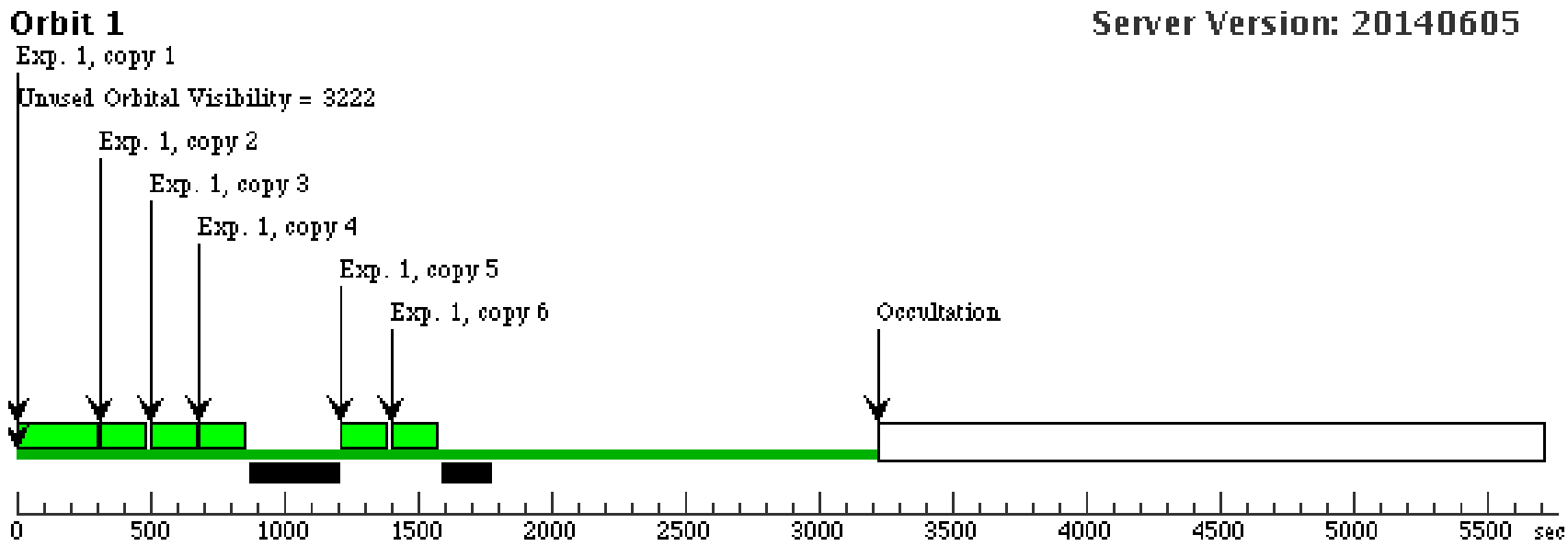
(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A1))) Error (Form): Target BIAS is no longer a valid selection

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 13863, Bias Frames for Epoch 1 (A2), completed Thu Sep 18 01:07:12 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

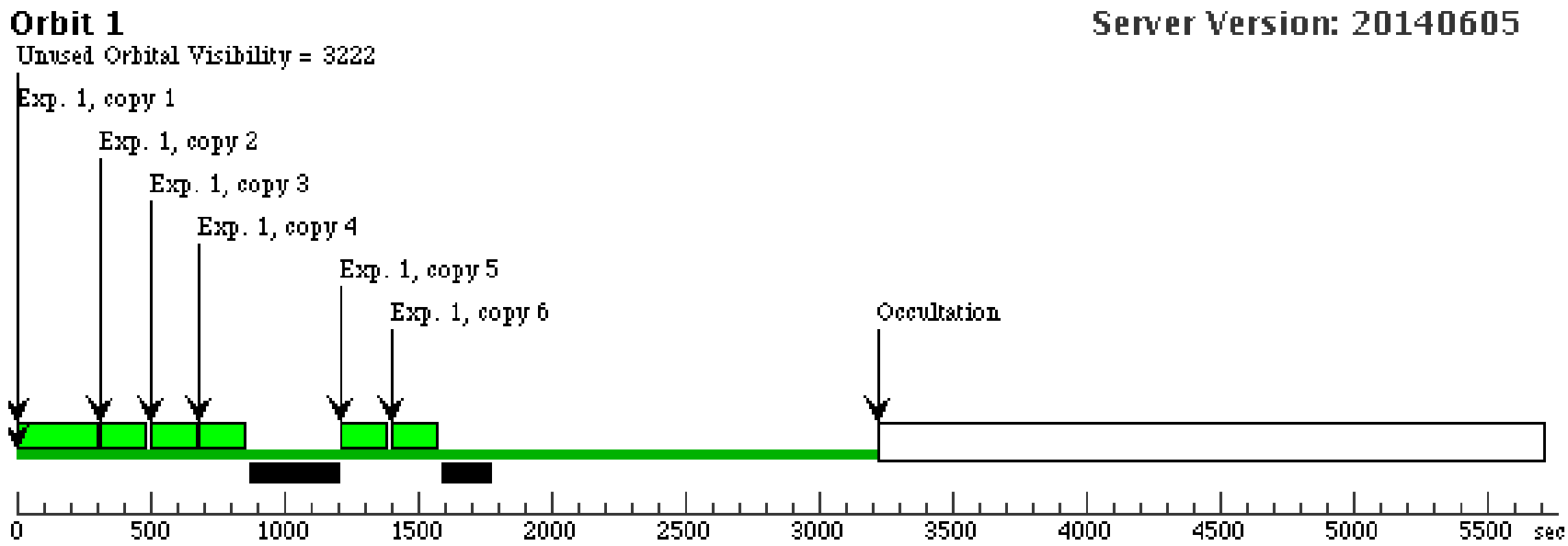
(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A2))) Error (Form): Illegal selection: DEF.

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 13863, Bias Frames for Epoch 1 (A3), completed Thu Sep 18 01:07:13 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): Illegal selection: DEF.

(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

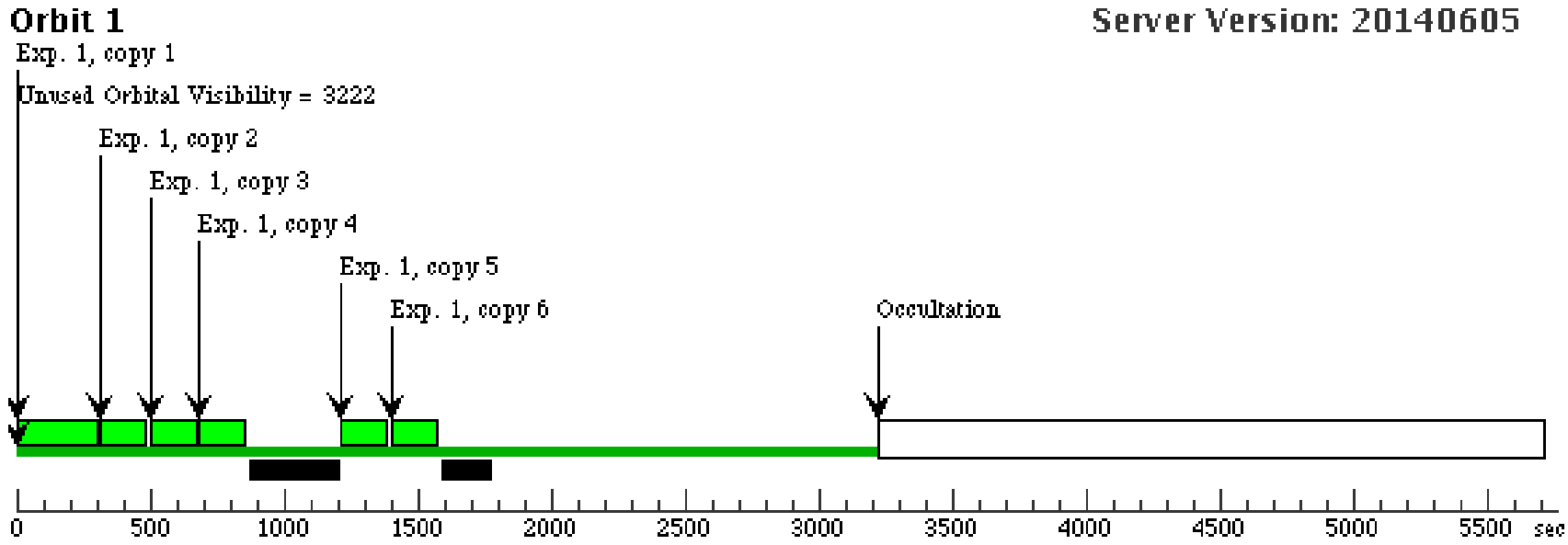
(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A3))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

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 13863, Bias Frames for Epoch 1 (A4), completed Thu Sep 18 01:07:13 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: GROUP A4,01 WITHIN 14D

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): Illegal selection: DEF.

(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): Target BIAS is no longer a valid selection

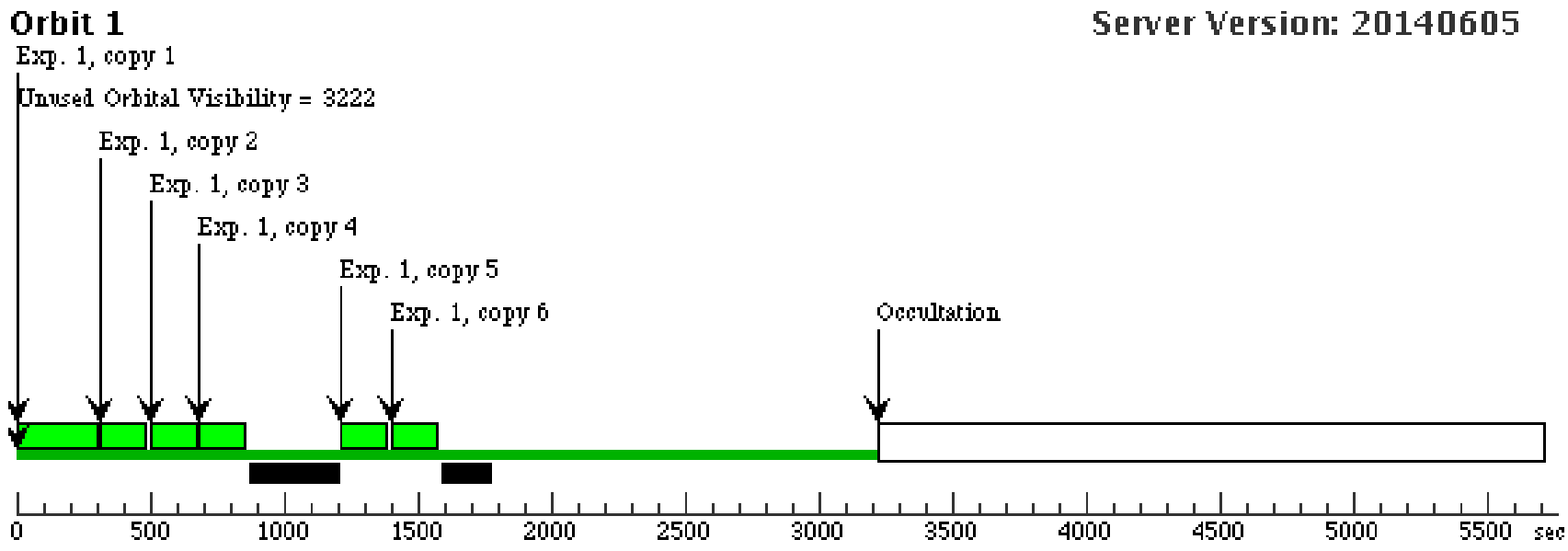
(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (Bias Frames for Epoch 1 (A4))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

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 13863, Bias Frames for Epoch 2 (B1), implementation Thu Sep 18 01:07:13 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: SEQ B1,B2,B3,B4 WITHIN 1 D

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): Illegal selection: DEF.

(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): COMPRESSION is not a valid selection

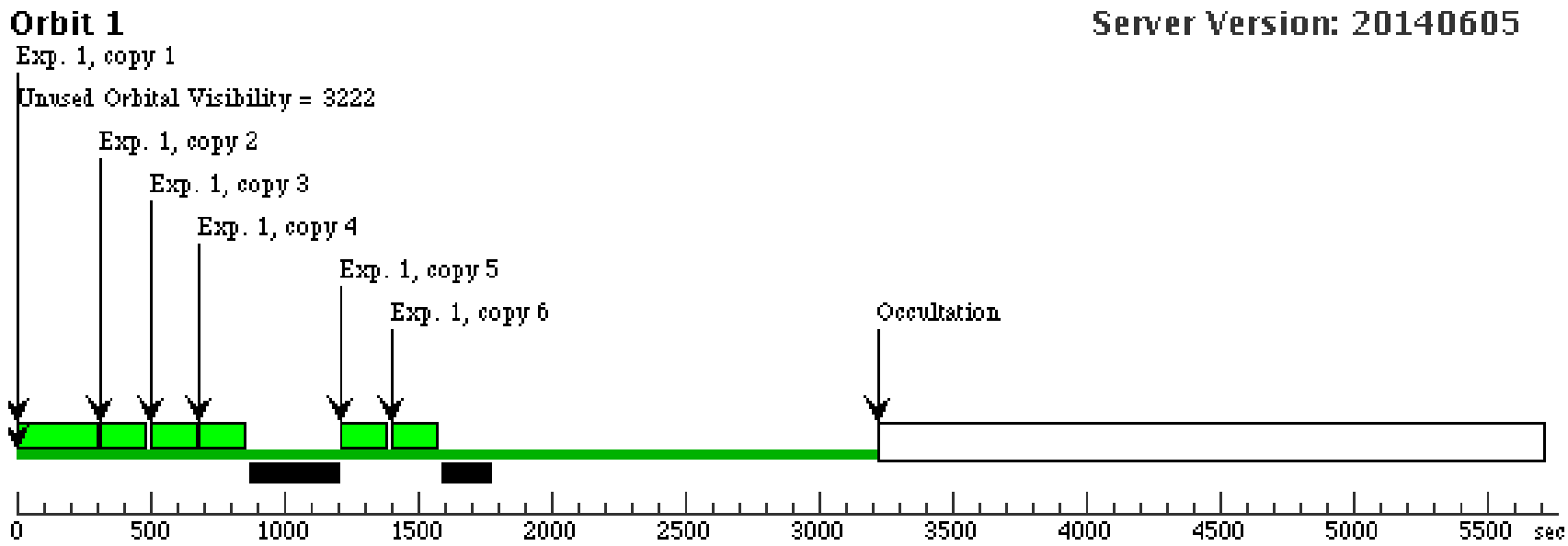
(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B1))) Error (Form): Target BIAS is no longer a valid selection

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 13863, Bias Frames for Epoch 2 (B2), implementation Thu Sep 18 01:07:13 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): COMPRESSION is not a valid selection

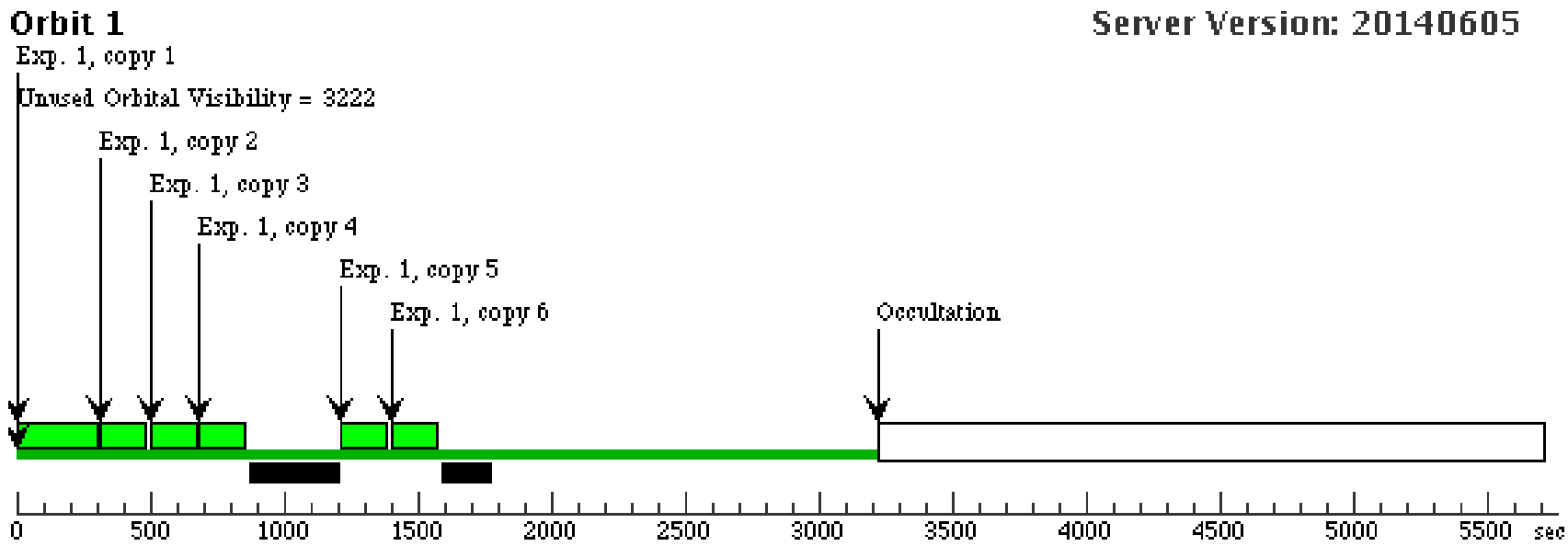
(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B2))) Error (Form): Illegal selection: DEF.

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 13863, Bias Frames for Epoch 2 (B3), implementation Thu Sep 18 01:07:13 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): COMPRESSION is not a valid selection

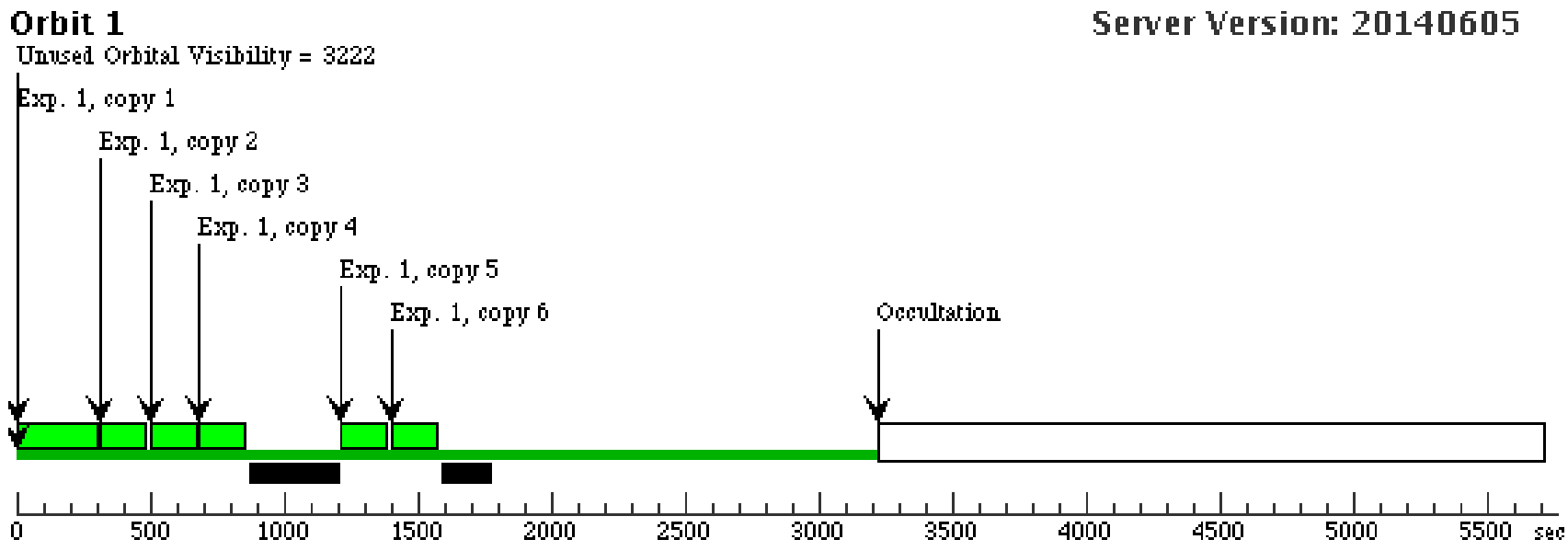
(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (Bias Frames for Epoch 2 (B3))) Error (Form): Illegal selection: DEF.

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 13863, Bias Frames for Epoch 2 (B4), implementation Thu Sep 18 01:07:13 GMT 2014

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: GROUP B4,04 WITHIN 14D

Comments: This orbit will be charged to the Cycle 22 ACS Subarray Bias Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): Illegal selection: DEF.

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

(Exposure 1 (Bias Frames for Epoch 2 (B4))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

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