13762 - A powerful starburst at z=5.4 with strong Lyman alpha emission: resolved SED with HST

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) LAEJ1414+5446	ACS/WFC WFC3/IR	2	02-Sep-2015 21:01:00.0	yes
A1	BIAS	ACS/WFC	1	02-Sep-2015 21:01:02.0	yes
A2	BIAS	ACS/WFC	1	02-Sep-2015 21:01:03.0	yes
A3	BIAS	ACS/WFC	1	02-Sep-2015 21:01:03.0	yes
A4	BIAS	ACS/WFC	1	02-Sep-2015 21:01:04.0	yes

6 Total Orbits Used

ABSTRACT

We serendipitously discovered the brightest galaxy known at z>5 as part of a faint quasar survey. LAEJ1414+5446 has extremely strong Lyman alpha emission and a bright stellar continuum, consistent with an unobscured star formation rate of ~300 Msun/yr. This object is uniquely suited for detailed studies of a powerful starburst galaxy near the epoch of reionization. Archival HST snapshot imaging in a single band (blueward of Lyman alpha) shows that the galaxy resolves into multiple emission components on 0.4" scales. We propose multi-band imaging with ACS/WFC and WFC3/IR in order to fill out the spectral energy distribution (SED) at rest-frame UV wavelengths, while resolving the individual emission clumps. Combined with Spitzer observations, the UV SED will constrain the star formation activity, stellar population age, and dust extinction in an extremely luminous starburst at z>5. We will map the Lyman alpha emission in a narrow band and use SED modeling to estimate the escape fraction of ionizing photons. Constraints on the star formation activity and history of a potentially massive galaxy at z>5 will impact models of galaxy formation during the reionization epoch and provide clues to the star formation activity at higher redshift that is thought to drive reionization.

OBSERVING DESCRIPTION

This program will obtain ACS and WFC3 imaging of a bright, high-redshift galaxy with strong Lyman alpha emission. The primary goals are 1) spatially resolve the UV SED of the galaxy from 0.9um to 1.6um, obtaining a measurement of the UV continuum slope; 2) spatially map the strong Lyman alpha emission with a combination of narrow and broad band imaging; 3) obtain high-resolution, high-S/N images of nearby lensed arcs from a lensing group centered ~30" from the high-z galaxy.

The ACS orbit is split between the F850LP bandpass to provide a continuum image, and the F792N ramp filter centered on the strong Lyman alpha emission at 7816Ang. The broadband image uses the WFC2-ORAMP aperture to align the pixels between the broad and narrow images. In order to obtain F850LP imaging of the lensed arcs ~30" from the target galaxy, we impose an orientation constraint of 215 degrees to 45 degrees, keeping the cluster center well within the WFC2 chip in the broadband image, while sacrificing only a small amount of visibility. Each filter has a pair of ~600s exposures with the ACS-WFC-DITHER-LINE pattern.

The WFC3 orbit is split between F125W and F160W, using a 3-point dither pattern with 10x50s sampling sequence at each dither point. As the galaxy is centered on the chip no orientation restrictions are needed.

CALIBRATION ORBITS: As per STScI policy, 4 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 13762. The ACS Instrument Team at STScI is responsible for producing superbias reference files from the bias frames obtained in this GO proposal.

Visit

Proposal 13762, Visit 01, implementation

Thu Sep 03 01:01:05 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, ACS/WFC

Special Requirements: ORIENT 90D TO 350 D; GROUP 01,A1,A2,A3,A4 WITHIN 14D

Diagnostics

(Exposure 1 (Pattern 8, Exps 1-1 in Visit 01)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(5)	Pattern Type=WFC3-IR-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(3), (4)
(8)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=1.265 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=130.28 Angle Between Sides= Center Pattern=false		(1), (2)

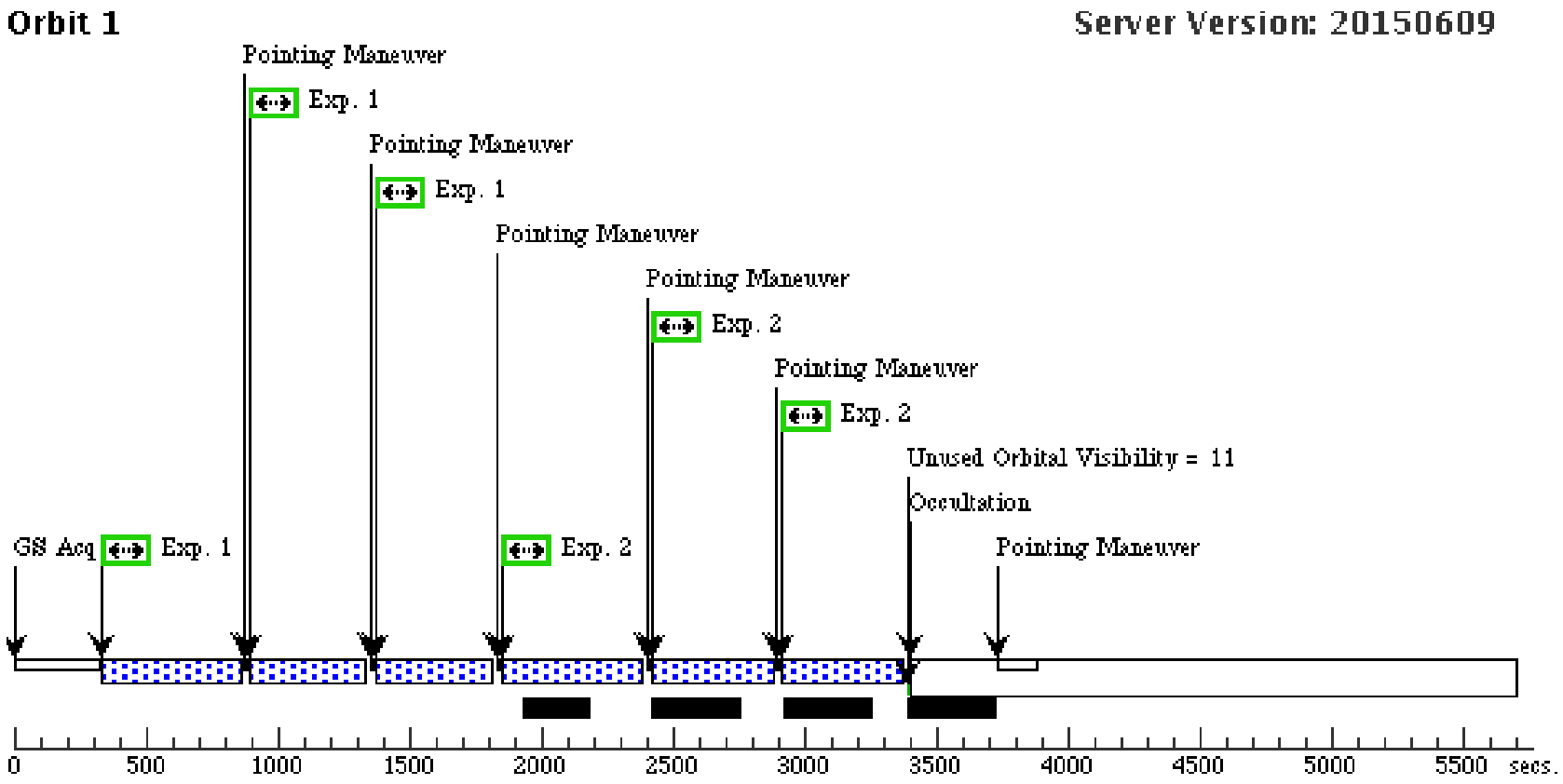
Fixed Targets

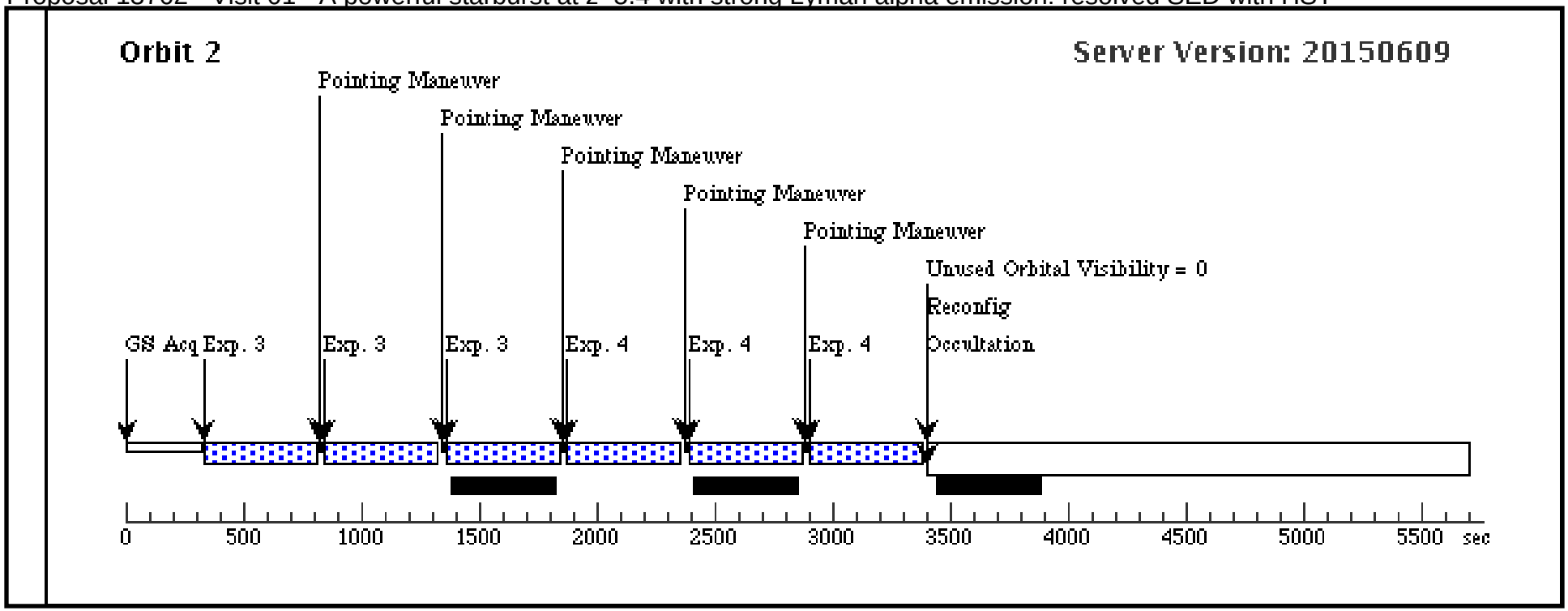
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	LAEJ1414+5446	RA: 14 14 46.8200 (213.6950833d) Dec: +54 46 31.90 (54.77553d) Equinox: J2000		V=(?) i(AB)=23.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) LAEJ1414+5446	ACS/WFC, ACCUM, WFC2-ORAMPQ	FR782N 7816.0 A		GS ACQ SCENARIO BASE1B3	Pattern 8, Exps 1-1 in Visit 01 (8)	271 Secs (813 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(1) LAEJ1414+5446	ACS/WFC, ACCUM, WFC2-ORAMP	F850LP			Pattern 8, Exps 2-2 in Visit 01 (8)	337 Secs (1011 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
3		(1) LAEJ1414+5446	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 5, Exps 3-3 in Visit 01 (5)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[2]***
4		(1) LAEJ1414+5446	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=SPARS50		Pattern 5, Exps 4-4 in Visit 01 (5)	452.93635 Secs (1358.809 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[2]***

Orbit Structure




Orbit 2
Server Version: 20150609
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 0
Reconfig
GS Acq
Exp. 3
Exp. 3
Exp. 3
Exp. 4
Exp. 4
Exp. 4
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13762, WFC2-ORAMPQ bias for Visit 01 (A1), scheduling Thu Sep 03 01:01:06 GMT 2015

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

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

Comments: WFC2-ORAMPQ subarray bias frames charged to Cycle 22 ACS Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A1))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (A1))) Error (Form): Illegal selection: DEF.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A1))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION=NONE
The combination of attributes chosen is illegal.

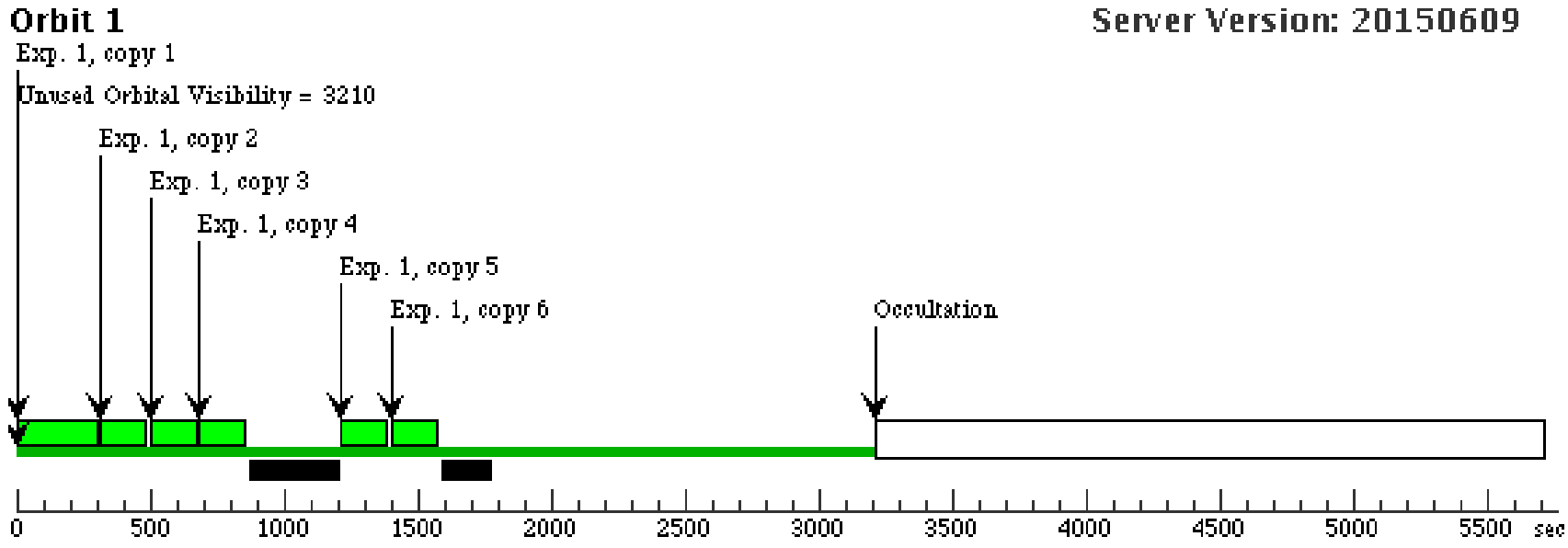
(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A1))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A1))) Error (Form): COMPRESSION is not 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, WFC2-ORAMPQ	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 13762, WFC2-ORAMPQ bias for Visit 01 (A2), scheduling Thu Sep 03 01:01:06 GMT 2015

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: WFC2-ORAMPQ subarray bias frames charged to Cycle 22 ACS Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A2))) Error (Form): Illegal selection: DEF.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A2))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (A2))) Error (Form): This attribute cannot have this value due to other choices: Optional_Parameter=COMPRESSION
The combination of attributes chosen is illegal.

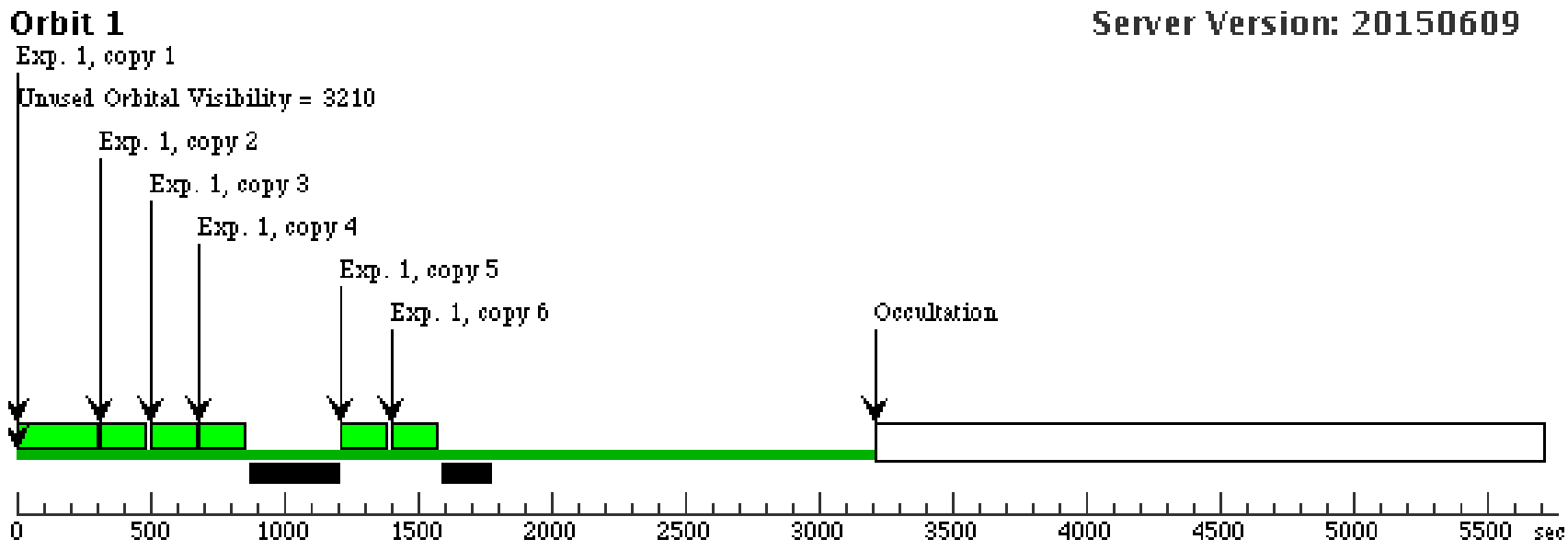
(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A2))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A2))) 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, WFC2-ORAMPQ	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 13762, WFC2-ORAMPQ bias for Visit 01 (A3), scheduling Thu Sep 03 01:01:06 GMT 2015

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: WFC2-ORAMPQ subarray bias frames charged to Cycle 22 ACS Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (A3))) 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 (WFC2-ORAMPQ bias for Visit 01 (A3))) Error (Form): Illegal selection: DEF.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A3))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A3))) Error (Form): Target BIAS is no longer a valid selection

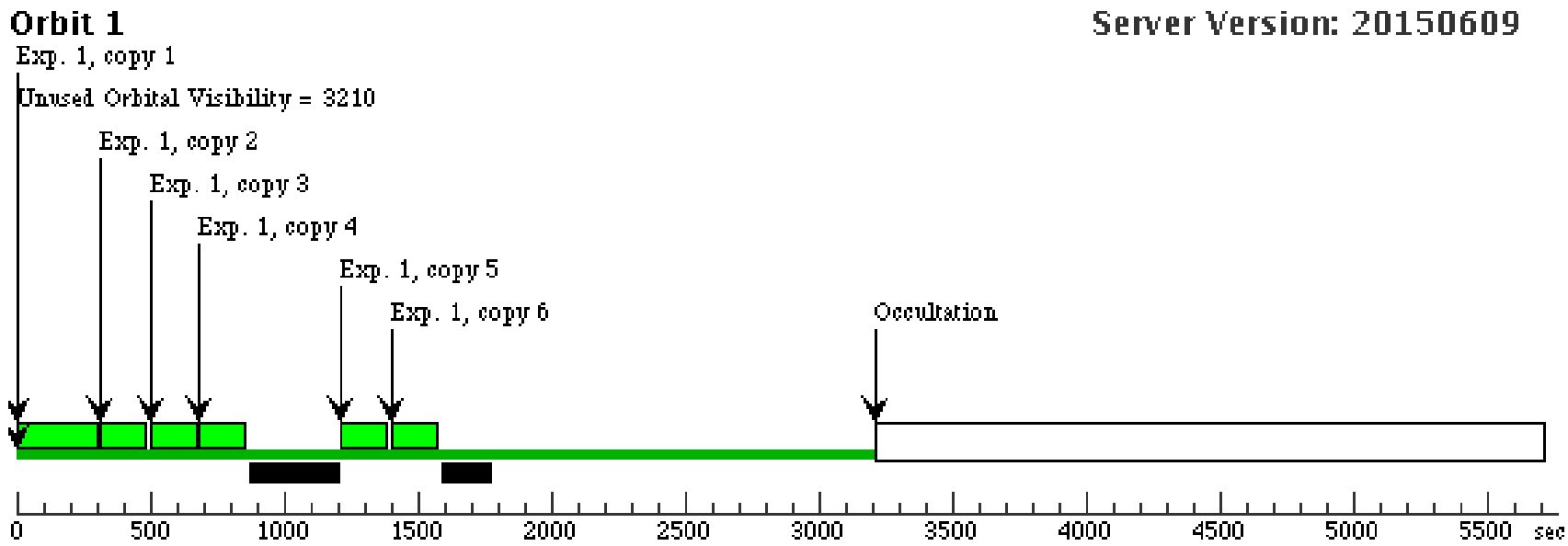
(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A3))) Error (Form): This attribute is not allowed to have this value: Calibration_Target = BIAS
It is an Available option and cannot normally be used in a GO proposal.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A3))) Error (Form): COMPRESSION is not 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, WFC2-ORAMPQ	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 13762, WFC2-ORAMPQ bias for Visit 01 (A4), scheduling Thu Sep 03 01:01:06 GMT 2015

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Comments: WFC2-ORAMPQ subarray bias frames charged to Cycle 22 ACS Calibration Program. Avoid SAA passages; SAA-impacted orbits are usable.

Diagnostics

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A4))) Error (Form): Illegal selection: DEF.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (A4))) Error (Form): COMPRESSION is not a valid selection

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (A4))) Error (Form): Target BIAS is no longer a valid selection

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (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 (WFC2-ORAMPQ bias for Visit 01 (A4))) Error (Form): This attribute cannot have this value due to other choices: Spectral_Element=DEF
This value is by default illegal.

(Exposure 1 (WFC2-ORAMPQ bias for Visit 01 (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, WFC2-ORAMPQ	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