



12931 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

Cycle: 20, 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	(2) ABELL-1689	WFC3/UVIS	4	06-May-2013 21:01:01.0	yes
02	(2) ABELL-1689	WFC3/UVIS	4	06-May-2013 21:01:11.0	yes
03	(2) ABELL-1689	WFC3/UVIS	4	06-May-2013 21:01:18.0	yes
04	(2) ABELL-1689	WFC3/UVIS	4	06-May-2013 21:01:24.0	yes
05	(2) ABELL-1689	WFC3/UVIS	5	06-May-2013 21:01:30.0	yes
06	(2) ABELL-1689	WFC3/UVIS	5	06-May-2013 21:01:38.0	yes

26 Total Orbits Used

ABSTRACT

There has been much recent interest in the ultra-faint galaxies that are near or beyond our current detection limits at $z > 1$. These galaxies are likely responsible for reionizing the intergalactic medium and make up a significant fraction of the global star formation rate density. Unfortunately, we can not study them in detail as they are too faint ($27 < V < 30$) for morphological studies or follow-up spectroscopy. With previous UVIS F275W imaging, we have demonstrated that we can efficiently select ultra-faint galaxies at $z \sim 2$ by using magnification from strong gravitational lensing by the massive cluster Abell 1689. This unique cluster offers the largest area with high magnifications (1.5-4 magnitudes). We selected 81 galaxies at $1.7 < z < 2.3$ behind Abell 1689, extending the previous luminosity function a factor of 100x fainter.

We propose to extend this study to a much broader redshift range. 10 orbits of F225W and 16 orbits of F336W imaging will allow identification of 50-100 ultra-faint star-forming ($SFR < 0.1 M_{\text{sol}}/\text{yr}$) galaxies at each of the two target redshifts, $1 < z < 1.7$ and $2.3 < z < 3.0$, respectively. The high magnification of these samples enables ultra-high resolution (< 100 pc) morphologies as well as rest-frame UV and optical spectroscopy from the ground.

We will extend the measurement of the faint-end of the UV luminosity function 30-100x fainter than before and measure the evolution of the faint-end slope from $1 < z < 3$, allowing the ultimate determination of the global star formation rate density at the epoch of peak star formation. Finally, we will measure the Lyman continuum escape fraction in these galaxies that are analogous to those that reionized the universe.

OBSERVING DESCRIPTION

The program will obtain 16 orbits of UVIS F336W and 10 orbits of F225W imaging of a single pointing centered on the lensing cluster Abell 1689. We will use half-orbit exposures to reduce read noise. There are plenty of exposures to remove the significant number of cosmic rays in half-orbit exposures.

We will use the WFC3-UVIS-DITHER-BOX pattern with sub-pixel dithering to allow us to reconstruct the PSF at higher resolution. Because of recent degradation in the CTE, we will be using the post-flash LED to add background to each image to get us to an average background of 13 e-, including dark and background. This requires 8 and 11 e- flashes in F336W and F225W, respectively.

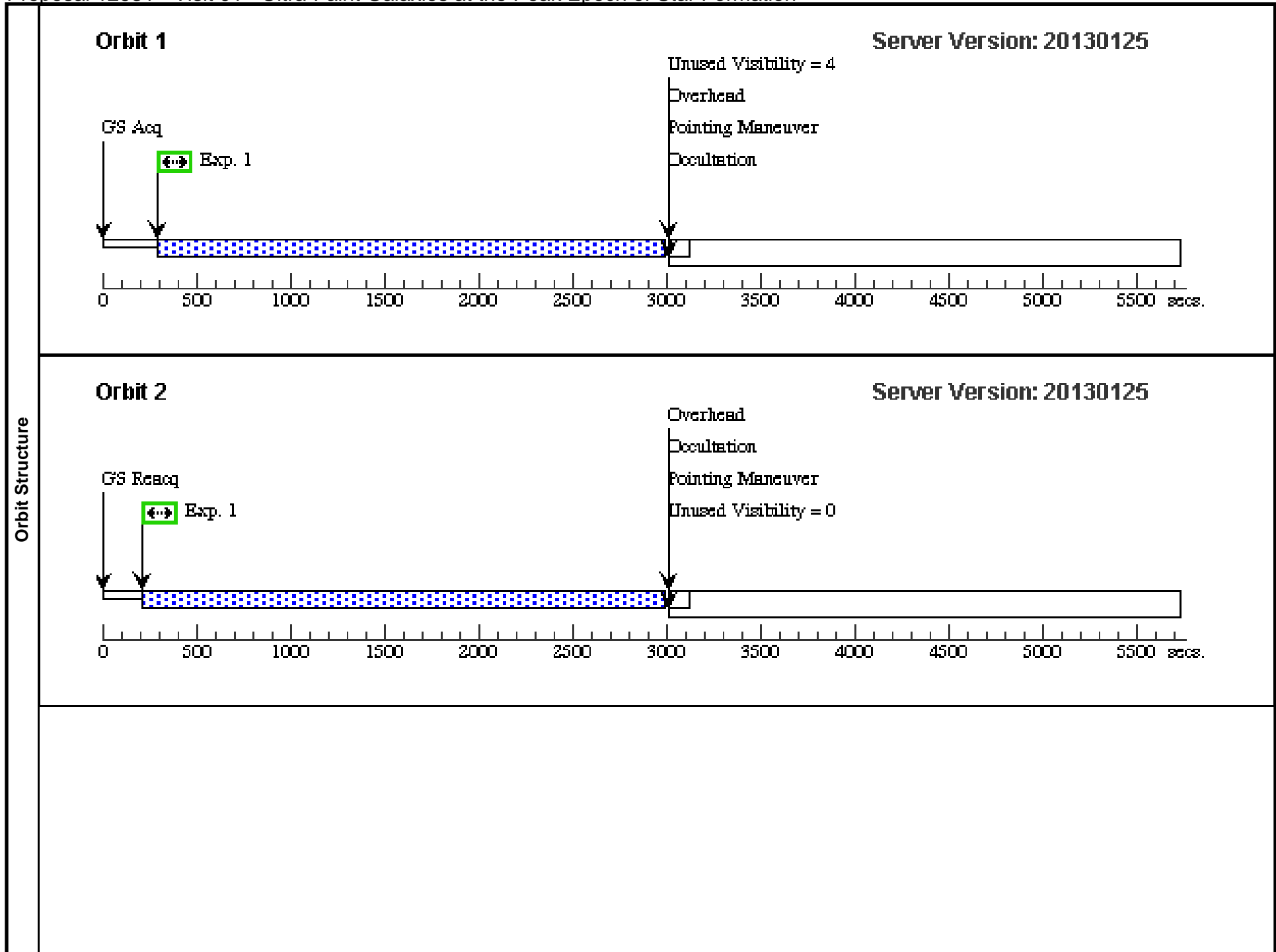
Proposal 12931 (STScI Edit Number: 0, Created: Monday, May 6, 2013 8:01:45 PM EST) - Overview

For each filter, we obtain images with orientation rotations of approximately 90 degrees. This will allow us to assess the magnitude of CTE issues at the faint end, as many objects will lie near the readout edge at one orientation and far from the readout edge at the other orientation.

Proposal 12931 - Visit 01 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

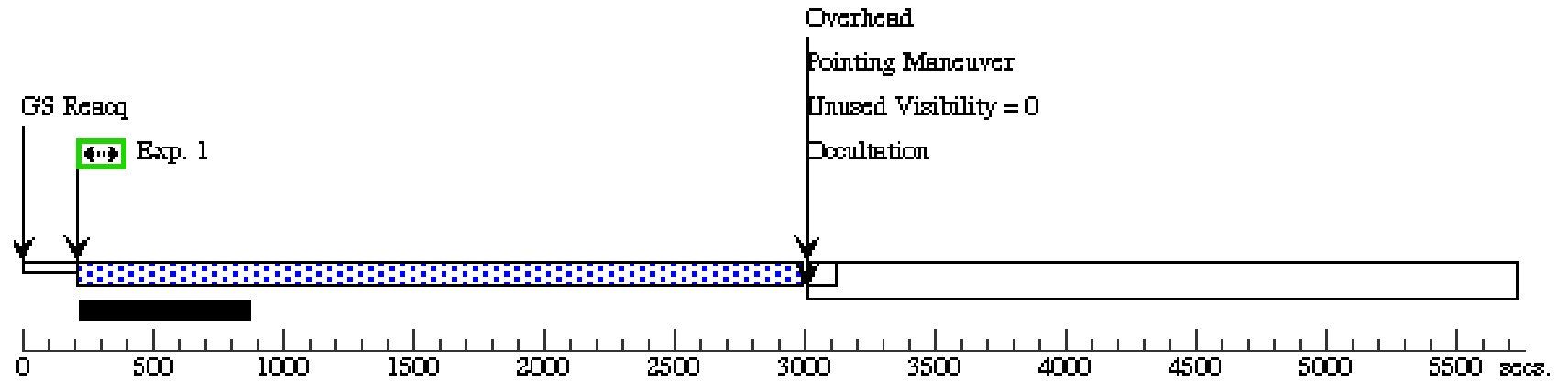
Tue May 07 01:01:46 GMT 2013

Visit	Proposal 12931, Visit 01, pi Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 100%; ORIENT 117D TO 117 D									
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	ABELL-1689	RA: 13 11 30.0000 (197.8750000d) Dec: -01 20 31.00 (-1.34194d) Equinox: J2000		V=27	Reference Frame: ICRS				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4.0	POS TARG -0.21,-0.97	Pattern 1, Exps 1-1 in Visit 01 (1)	2670 Secs	
									[==>(Pattern 1)]	[1]
									[==>2785.0 Secs (Pattern 2)]	[2]
									[==>2785.0 Secs (Pattern 3)]	[3]
								[==>2785.0 Secs (Pattern 4)]	[4]	



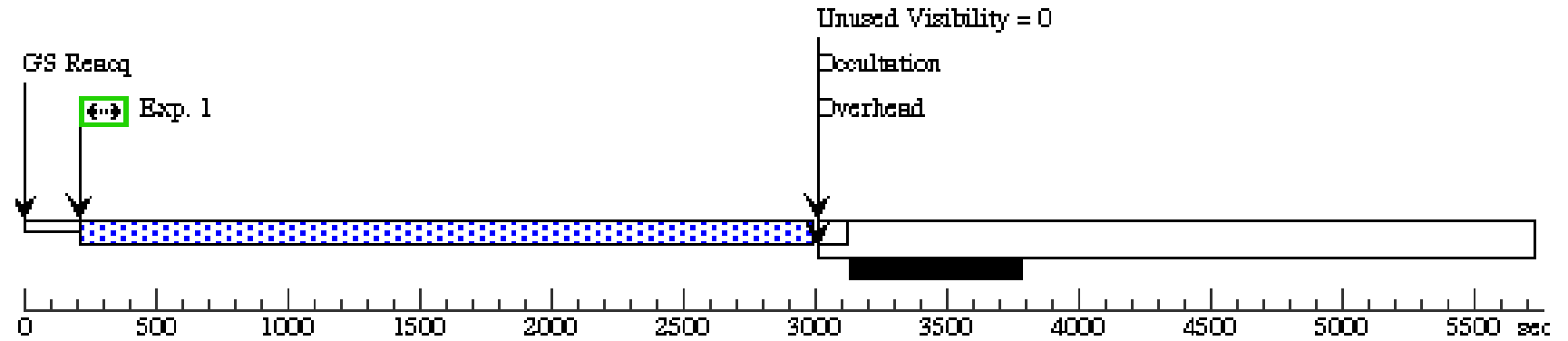
Orbit 3

Server Version: 20130125



Orbit 4

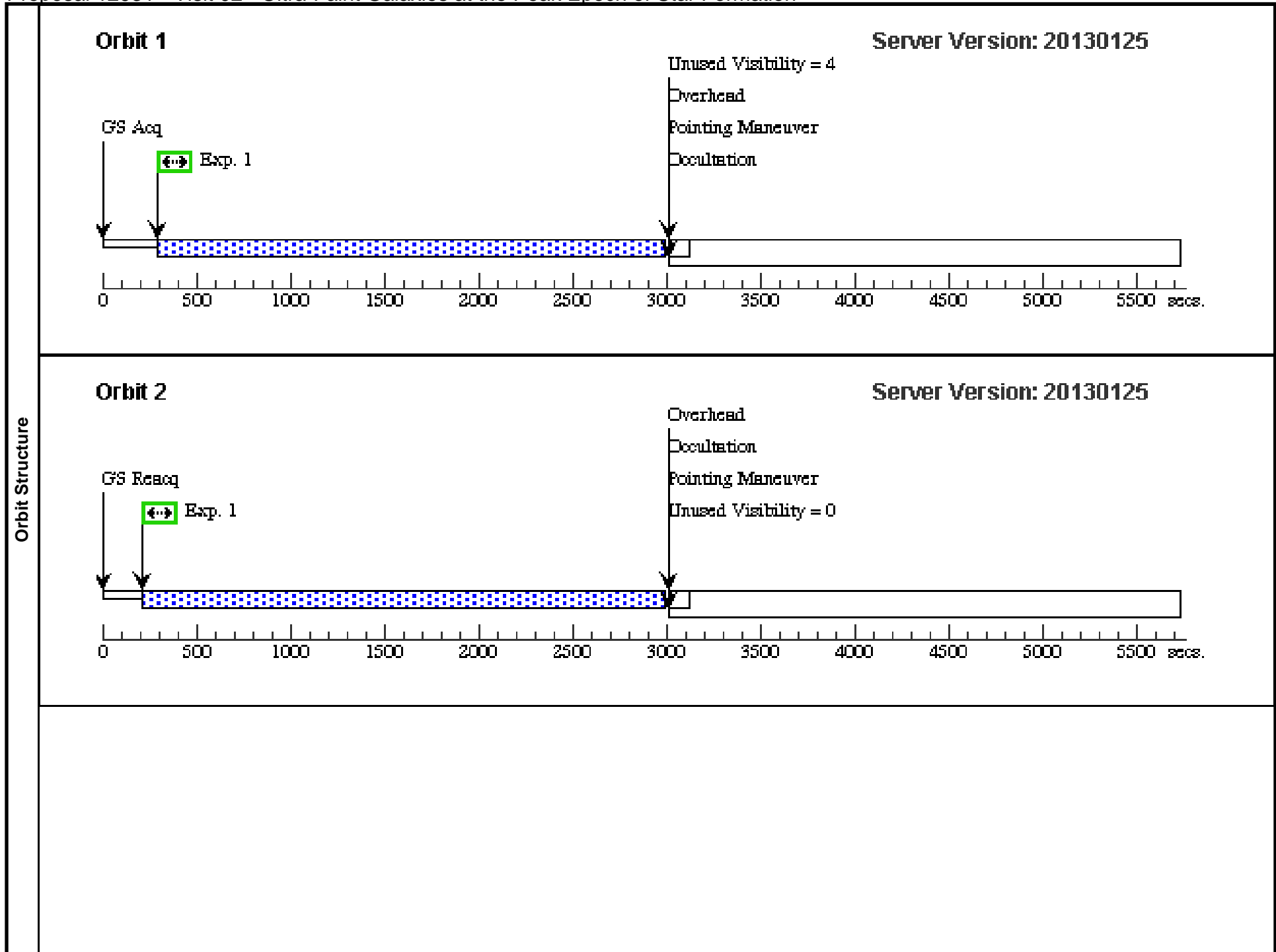
Server Version: 20130125



Proposal 12931 - Visit 02 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

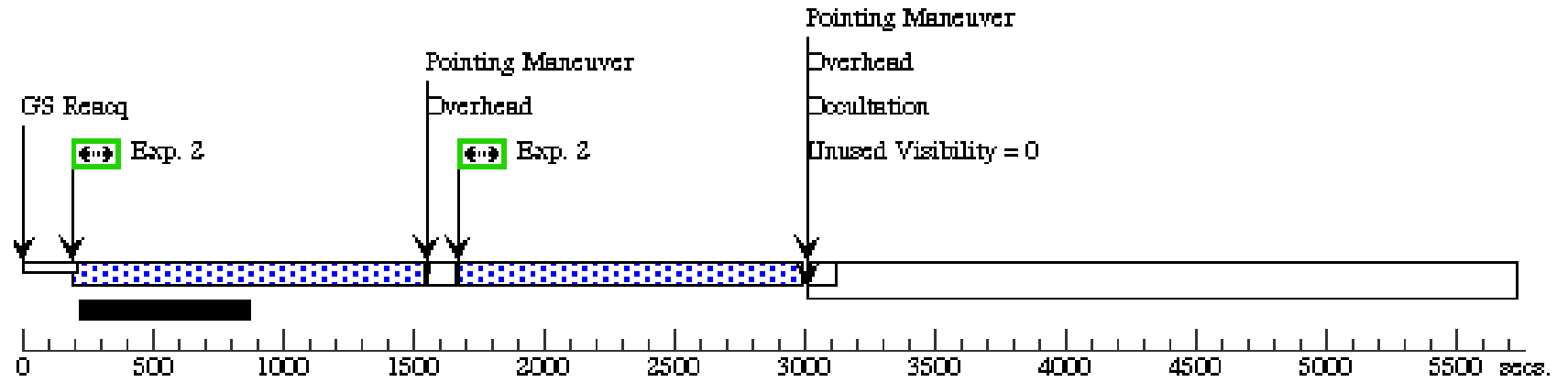
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	(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false						(1)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	ABELL-1689	RA: 13 11 30.0000 (197.8750000d) Dec: -01 20 31.00 (-1.34194d) Equinox: J2000				V=27		Reference Frame: ICRS		
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1	(2) ABELL-1689	(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W	FLASH=4.0	POS TARG 0.21,0.97	Pattern 2, Exps 1-1 in Visit 02 (2)	2670 Secs		
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									[==>2785.0 Secs (Pattern 2)]		[2]
	2	(2) ABELL-1689	(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F275W	FLASH=11.0	POS TARG 0.00,0.00	Pattern 1, Exps 2-2 in Visit 02 (1)	1300 Secs		
								[==>1325.0 Secs (Pattern 1)]		[3]	
								[==>1325.0 Secs (Pattern 2)]		[4]	
								[==>1325.0 Secs (Pattern 3)]		[4]	
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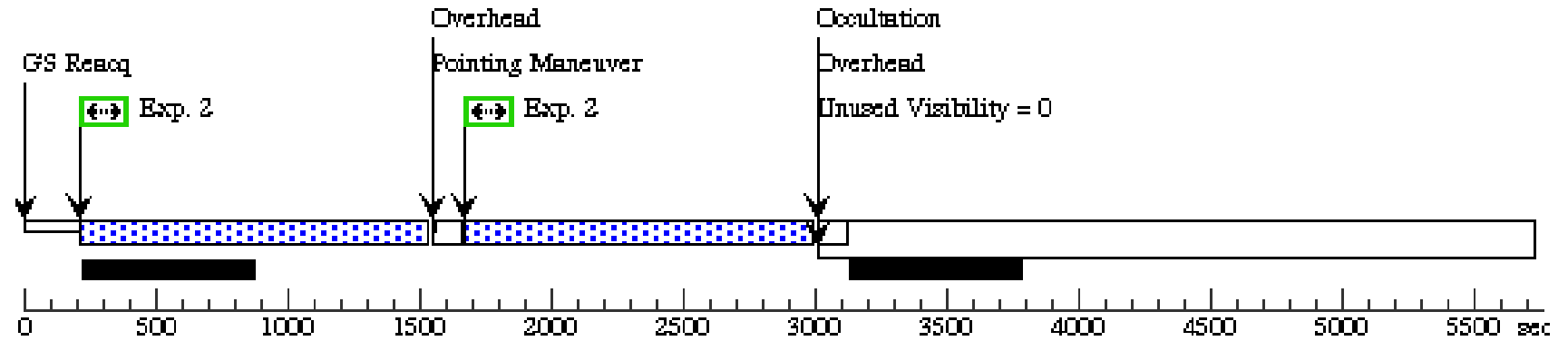
Orbit 3

Server Version: 20130125



Orbit 4

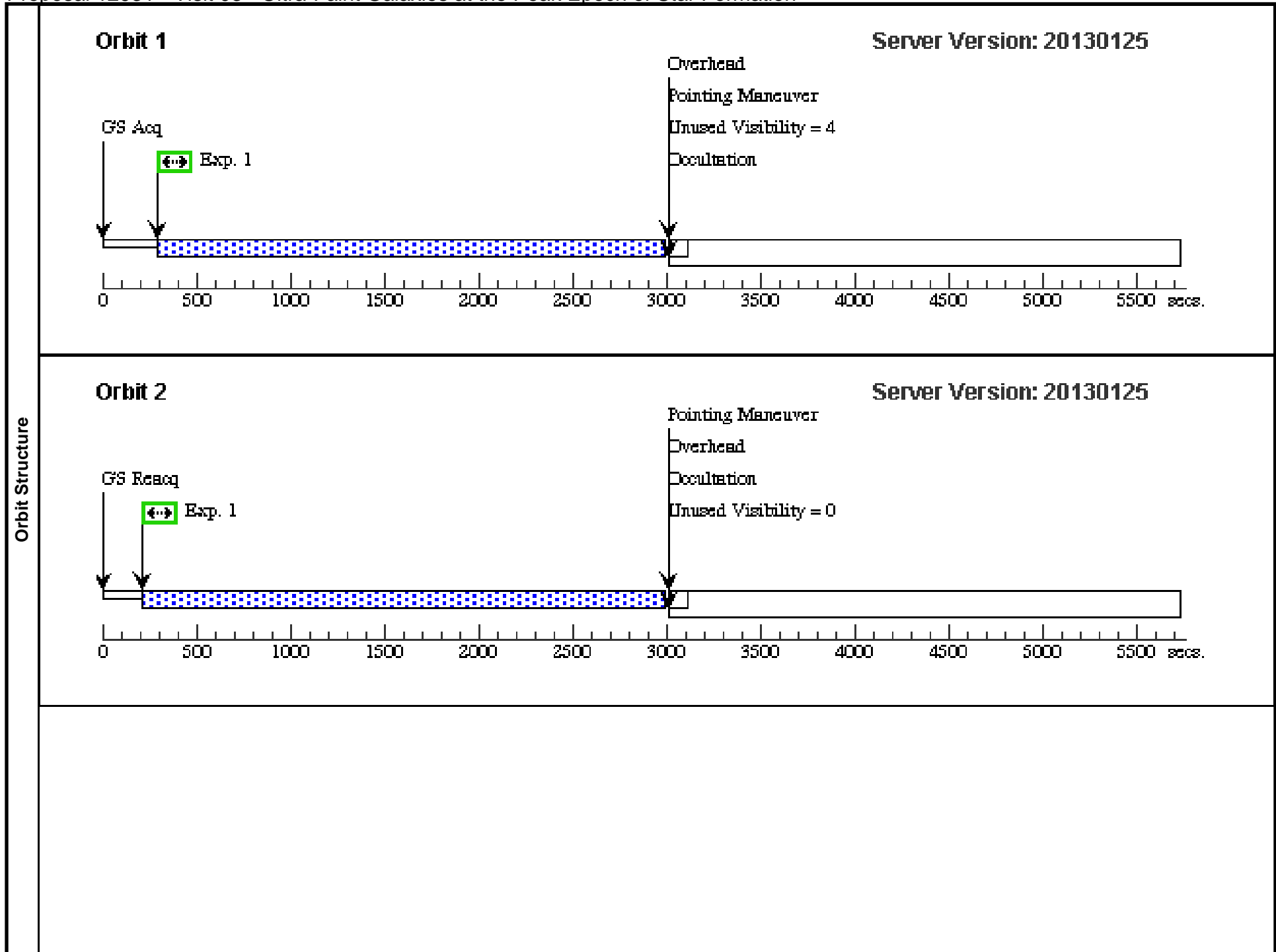
Server Version: 20130125



Proposal 12931 - Visit 03 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

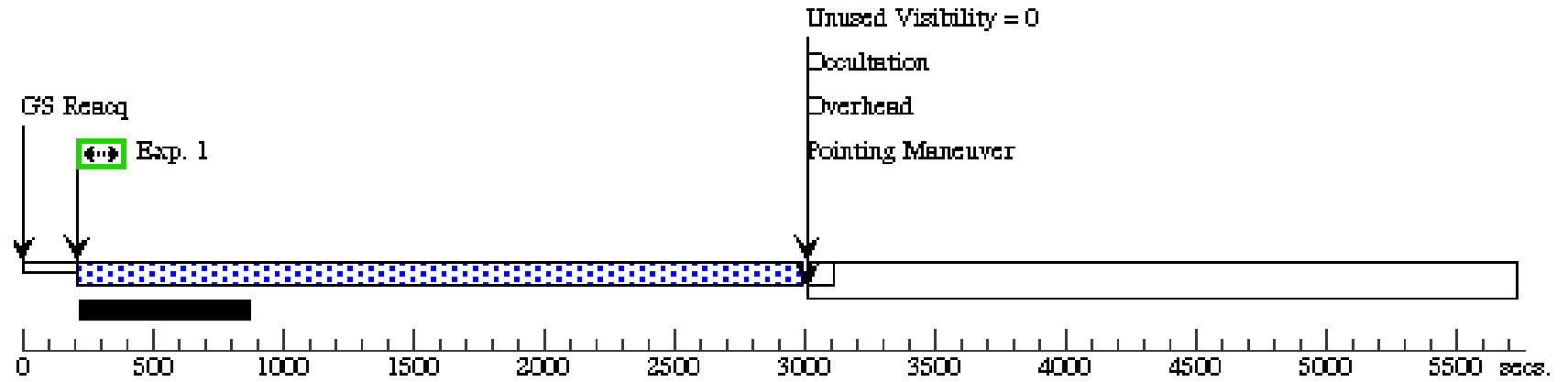
Tue May 07 01:01:55 GMT 2013

Visit	Proposal 12931, Visit 03, completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 100%; ORIENT 201D TO 214 D									
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	ABELL-1689	RA: 13 11 30.0000 (197.8750000d) Dec: -01 20 31.00 (-1.34194d) Equinox: J2000		V=27	Reference Frame: ICRS				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W		POS TARG -0.21,-0.97	Pattern 1, Exps 1-1 in Visit 03 (1)	2670 Secs	
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									[==>2785.0 Secs (Pattern 2)]	[2]
									[==>2785.0 Secs (Pattern 3)]	[3]
								[==>2785.0 Secs (Pattern 4)]	[4]	



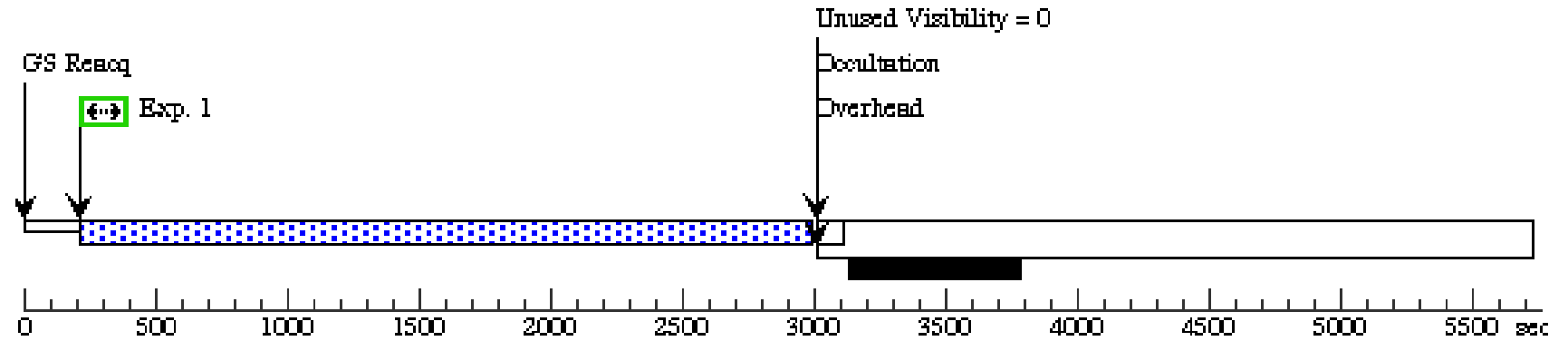
Orbit 3

Server Version: 20130125



Orbit 4

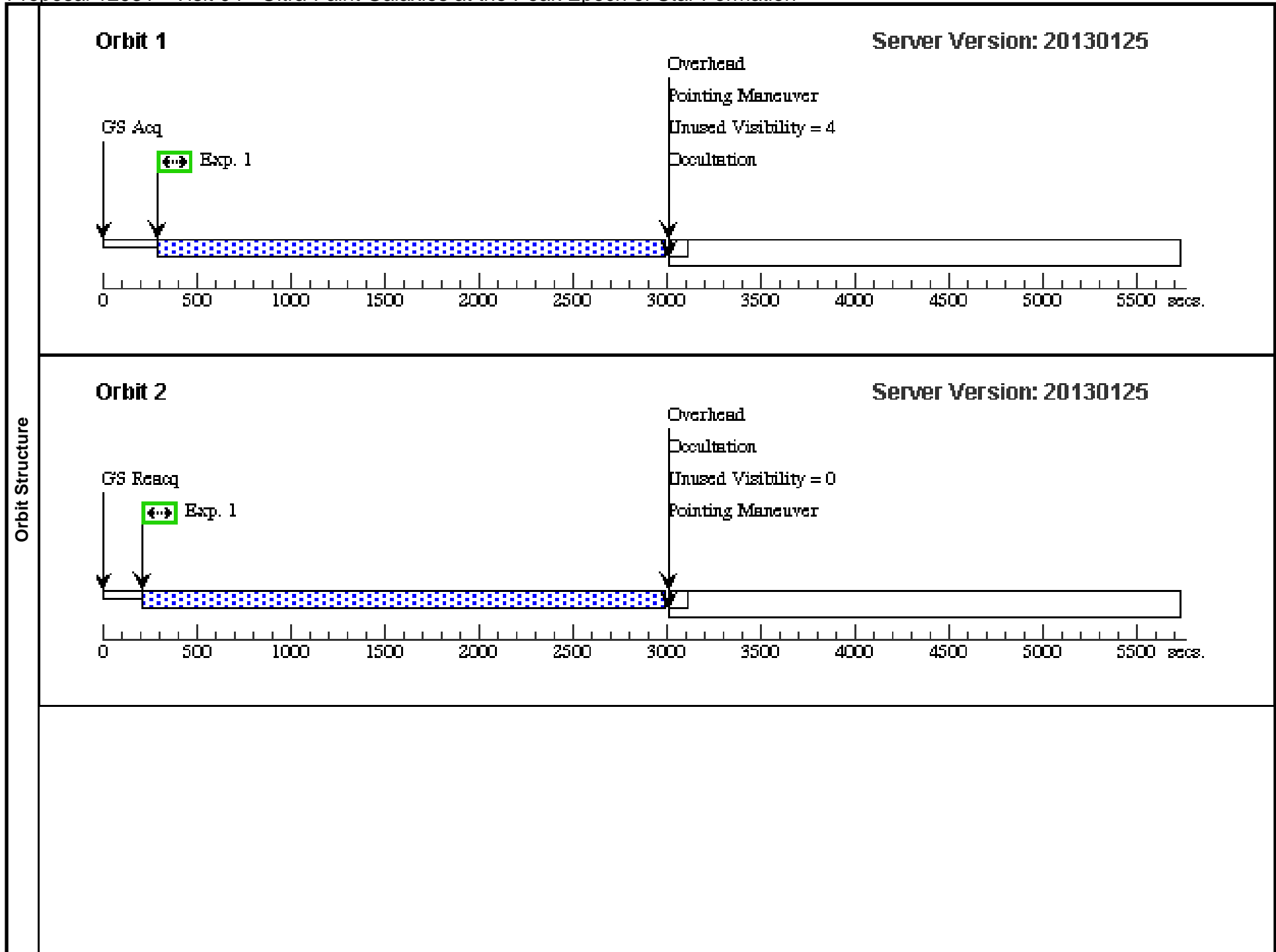
Server Version: 20130125



Proposal 12931 - Visit 04 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

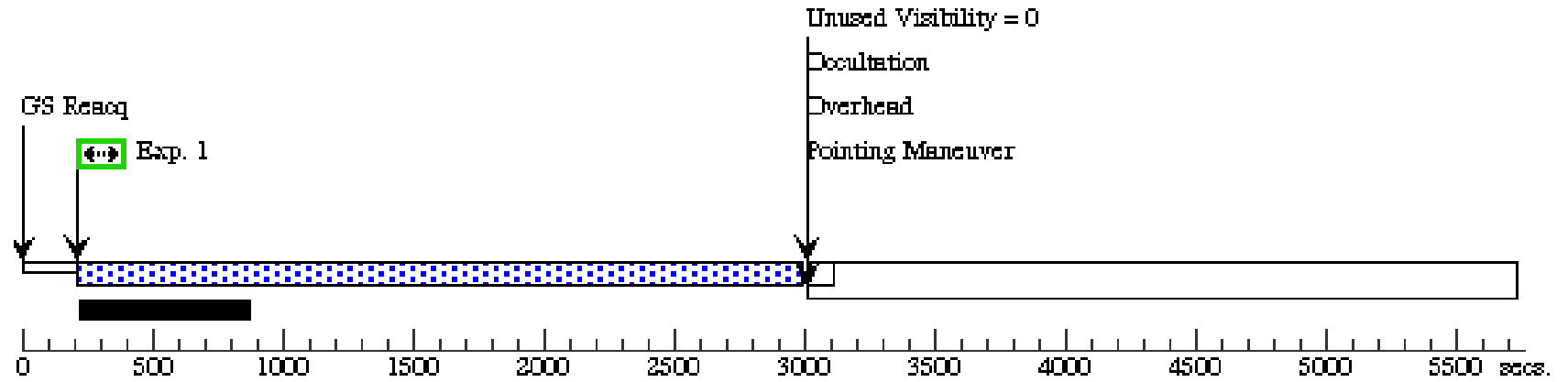
Tue May 07 01:01:58 GMT 2013

Visit	Proposal 12931, Visit 04, completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 100%; SAME ORIENT AS 03									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	ABELL-1689	RA: 13 11 30.0000 (197.8750000d) Dec: -01 20 31.00 (-1.34194d) Equinox: J2000		V=27	Reference Frame: ICRS				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F336W		POS TARG 0.21,0.97	Pattern 1, Exps 1-1 in Visit 04 (1)	2670 Secs	
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									[==>2785.0 Secs (Pattern 2)]	[2]
									[==>2785.0 Secs (Pattern 3)]	[3]
									[==>2785.0 Secs (Pattern 4)]	[4]



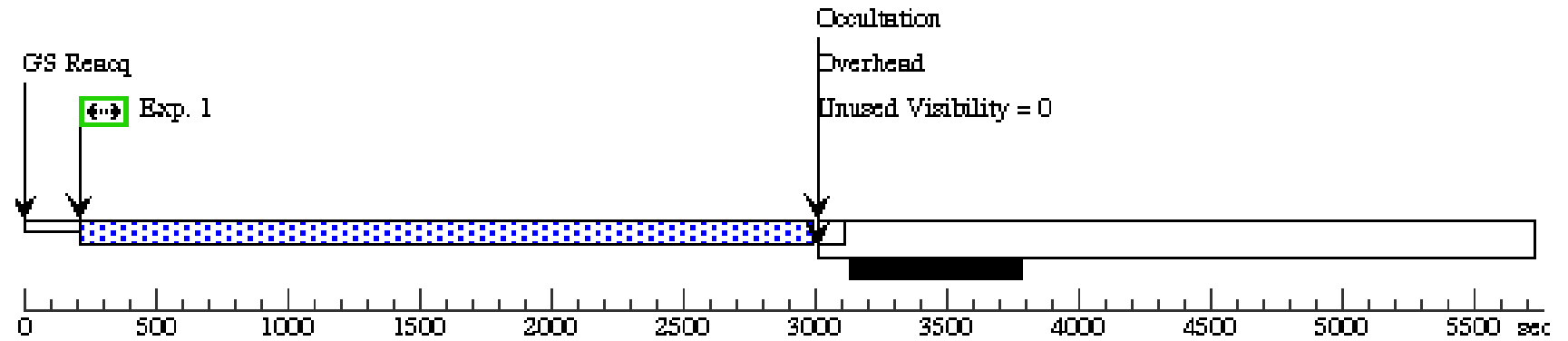
Orbit 3

Server Version: 20130125



Orbit 4

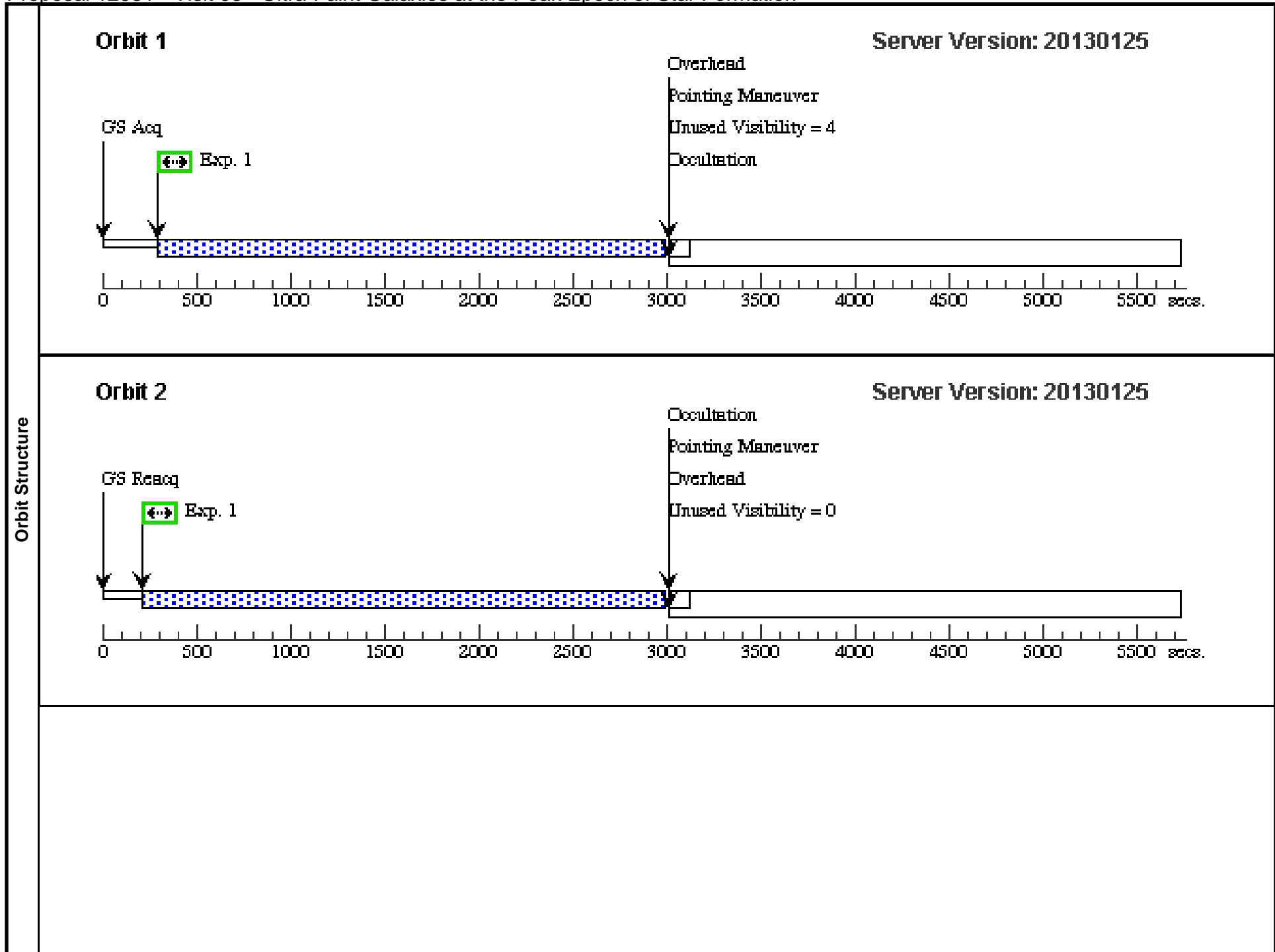
Server Version: 20130125



Proposal 12931 - Visit 05 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

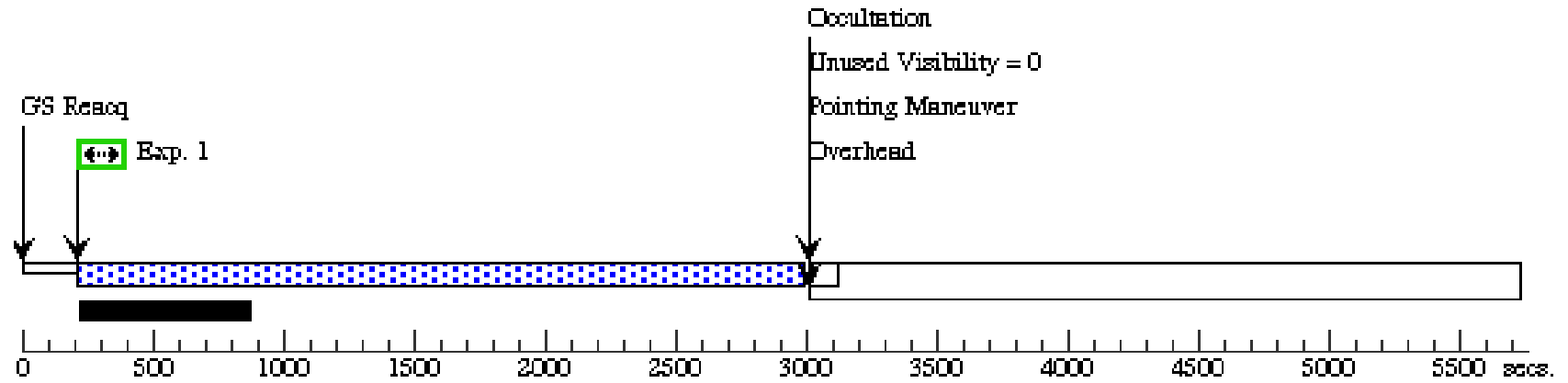
Tue May 07 01:02:02 GMT 2013

Visit	Proposal 12931, Visit 05, pi Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 100%; SAME ORIENT AS 01									
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Fixed Targets	# (2)	Name ABELL-1689	Target Coordinates RA: 13 11 30.0000 (197.8750000d) Dec: -01 20 31.00 (-1.34194d) Equinox: J2000	Targ. Coord. Corrections	Fluxes V=27	Miscellaneous Reference Frame: ICRS				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	# 1 2	Label (2) ABELL-1689	Target (2) ABELL-1689	Config,Mode,Aperture WFC3/UVIS, ACCUM, UVIS-CENTER	Spectral Els. F225W	Opt. Params. FLASH=11.0	Special Reqs. POS TARG -0.22,-1.54	Groups Pattern 1, Exps 1-1 i n Visit 05 (1)	Exp. Time/[Actual Dur.] 2670 Secs [==>(Pattern 1)] [==>2785.0 Secs (Pattern 2)] [==>2785.0 Secs (Pattern 3)] [==>2785.0 Secs (Pattern 4)] 2780 Secs [==>]	Orbit [1] [2] [3] [4] [5]



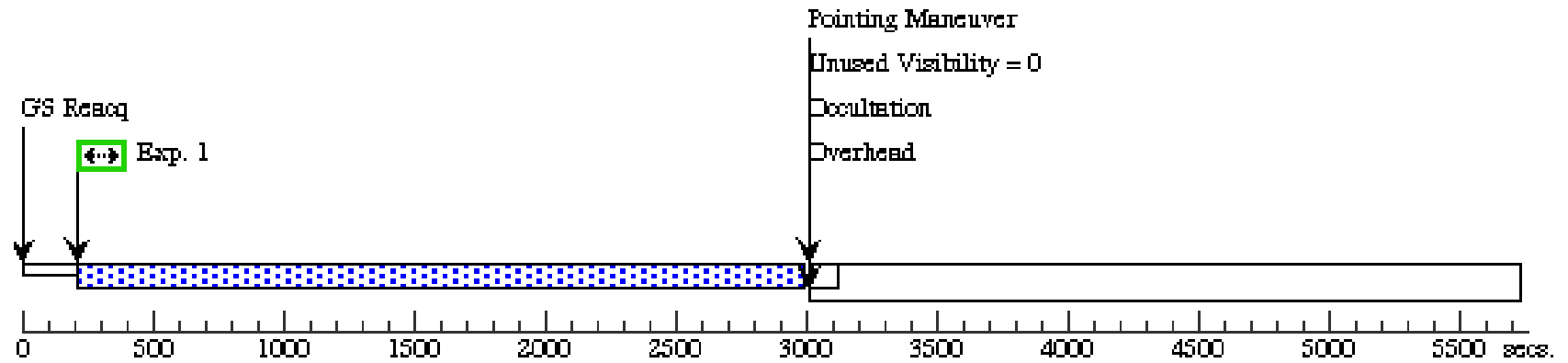
Orbit 3

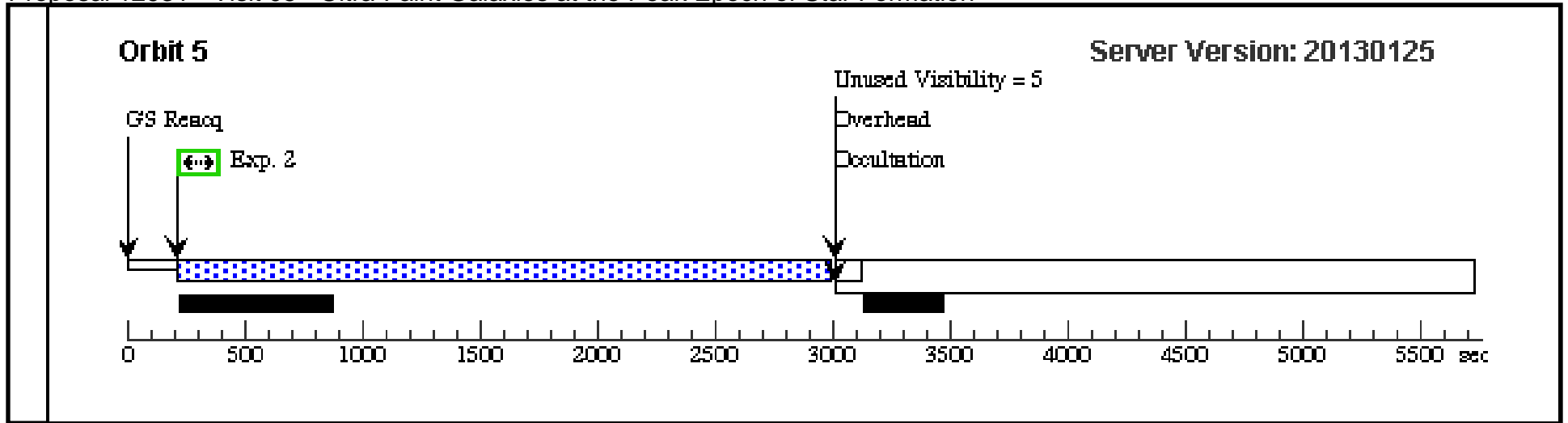
Server Version: 20130125



Orbit 4

Server Version: 20130125

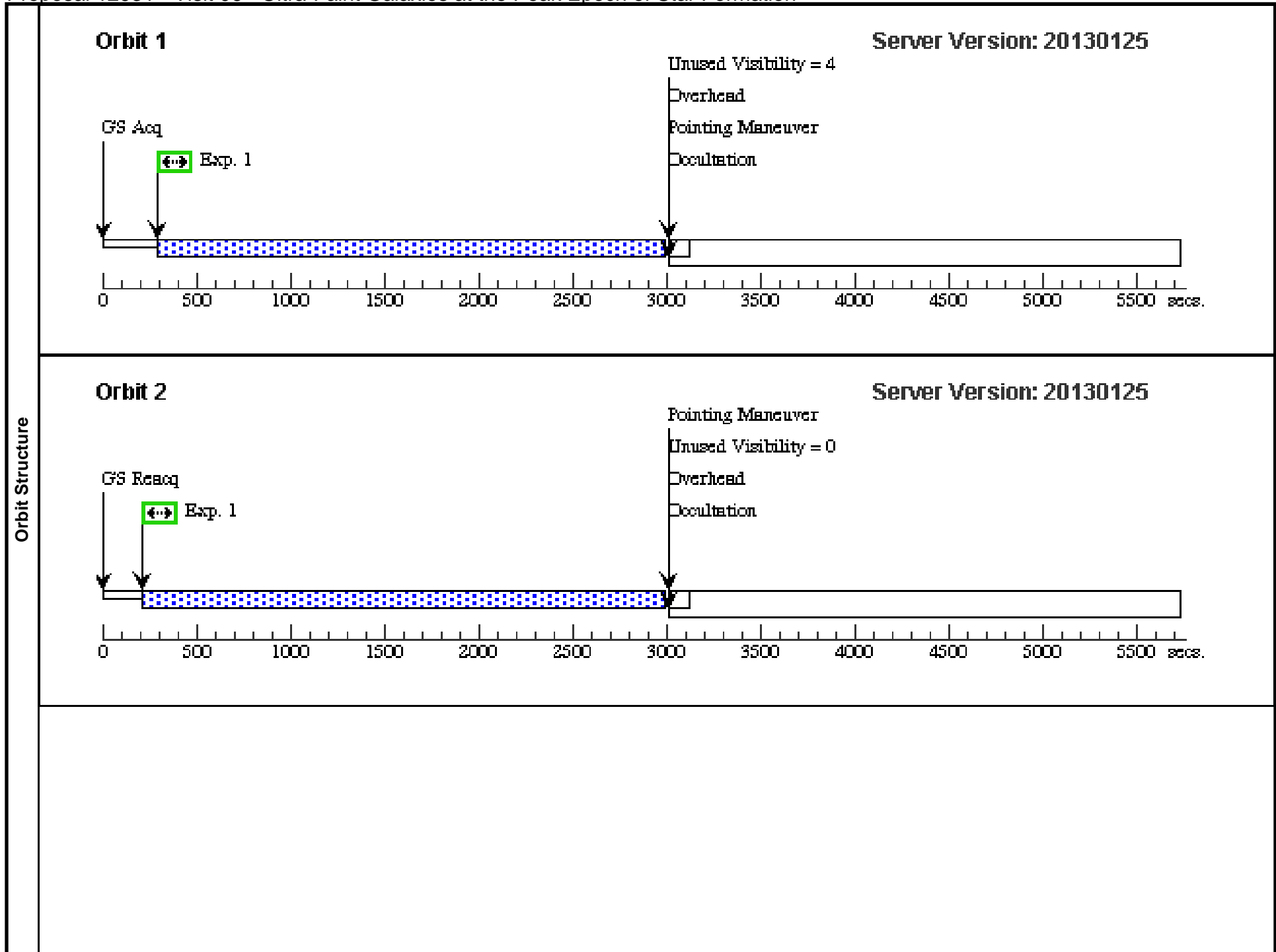




Proposal 12931 - Visit 06 - Ultra-Faint Galaxies at the Peak Epoch of Star Formation

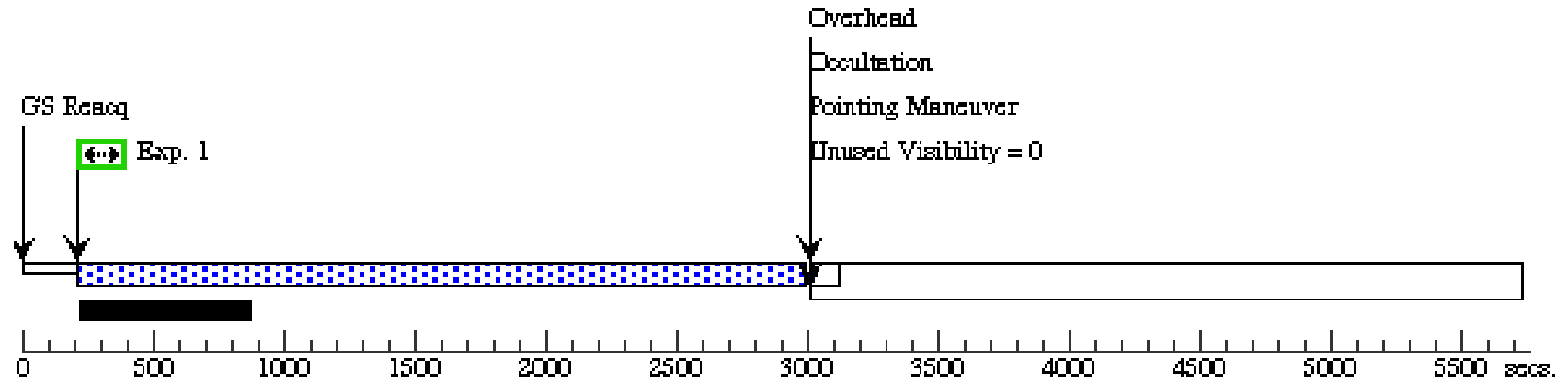
Tue May 07 01:02:06 GMT 2013

Visit	Proposal 12931, Visit 06, completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 100%; SAME ORIENT AS 03									
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	ABELL-1689	RA: 13 11 30.0000 (197.8750000d) Dec: -01 20 31.00 (-1.34194d) Equinox: J2000		V=27	Reference Frame: ICRS				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=11.0			Pattern 1, Exps 1-1 i n Visit 06 (1)	2670 Secs [==>(Pattern 1)] [1] [==>2785.0 Secs (Pattern 2)] [2] [==>2785.0 Secs (Pattern 3)] [3] [==>2785.0 Secs (Pattern 4)] [4]
2		(2) ABELL-1689	WFC3/UVIS, ACCUM, UVIS-CENTER	F225W	FLASH=11.0	POS TARG -0.22,-1.54			2780 Secs [==>] [5]	



Orbit 3

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Orbit 4

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