



13831 - GRB hosts and the search for missing star formation at high redshift

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) GRB-120521C	WFC3/IR	4	23-Jul-2014 21:45:42.0	yes

<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>
02	(4) GRB-140515A	WFC3/IR	4	23-Jul-2014 21:45:44.0	yes
03	(5) GRB-130606A	WFC3/IR	4	23-Jul-2014 21:45:46.0	yes
04	(2) GRB-050904	WFC3/IR	5	23-Jul-2014 21:45:49.0	yes
05	(3) GRB-080913	WFC3/IR	3	23-Jul-2014 21:45:50.0	yes

20 Total Orbits Used

ABSTRACT

Measuring the star formation rate (SFR) at high redshift is crucial for understanding cosmic reionization and the formation of galaxies at early times. Two common, complementary approaches are Lyman-Break-Galaxy (LBG) surveys, providing large samples, and Gamma-Ray-Bursts (GRBs) which can sign-post star formation even in the smallest galaxies. Recent results of both methods have found evidence for a dominant population of very faint star-forming galaxies at $z > 5$, representing a continuation of the steepening of the galaxy luminosity function with redshift. However, LBG surveys are affected by possible incompleteness and contamination, while the magnitude limit means very large correction factors must be applied to account for these unseen galaxies. On the other hand GRBs suffer small number statistics and have their own selection biases. We propose to construct a new sample of six $6 < z < 8.2$ GRB hosts with deep imaging in order to assess the proportion of star formation in very faint galaxies during at this key epoch. This is a critical issue, since only if faint galaxies dominate global star formation can UV light from stars sustain reionization. We will carry out WFC3/IR (F140W) imaging to a limit approaching that of the current HUDF observations ($M(AB) \sim -18$) in all cases. Prior knowledge of the exact locations and redshifts of the targets means that this can be achieved relatively economically, since we can accept a lower level of significance and single filter. This method depends only on GRBs and SF tracing UV light (both likely at high- z), and in turn will constrain the completeness correction to be applied to LBG surveys in order to derive the ionizing photon budget.

OBSERVING DESCRIPTION

The aim of this proposal is to obtain deep observations of the host galaxies of high redshift $z \sim 6$ GRBs. We will utilize the F140W filter exclusively for its depth, and will obtain observations of 5 targets with exposure times of 5 orbits (050904), 4 orbits (120521C, 130606A, 140515A) and 3 orbits (080913, with a shorter exposure time due to pre-existing data).

We will utilize a 3-point dither pattern within each orbit, with the dither_blob pattern executed as pos-targs between each orbit to step over the IR

Proposal 13831 (STScI Edit Number: 0, Created: Wednesday, July 23, 2014 8:45:52 PM EST) - Overview

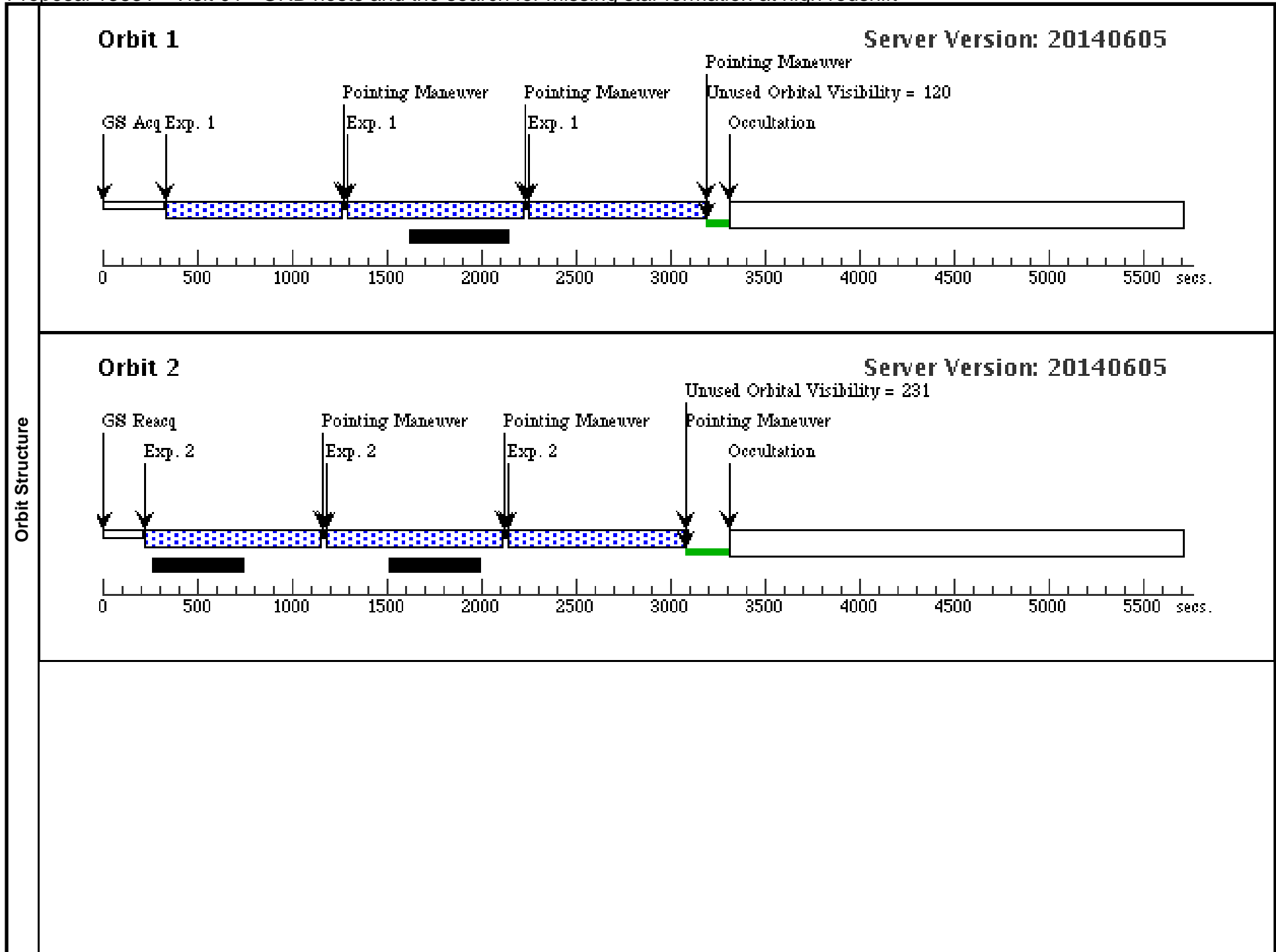
blobs. We also introduce an additional 3.5 pixel shift in the x-axis such that in a 4 orbit observation we essentially obtain an optimal 6 point dither pattern at each of the dither_blob positions (i.e. 12 points in total). For the 5 orbit visit we repeat the first base position of the pattern, and for the 3 orbit visit we do not include the fourth position, but will still obtain a 9-point dither. We utilize the STEP read sequence within each orbit in order to obtain dynamic range to map ground based observations to the same co-ordinate system as the HST imaging.

For GRB 120521C, GRB 080913 and GRB 050904 we have also introduced some roll angle constraints to avoid the risks of contamination from diffraction spikes of bright stars.

Proposal 13831 - Visit 01 - GRB hosts and the search for missing star formation at high redshift

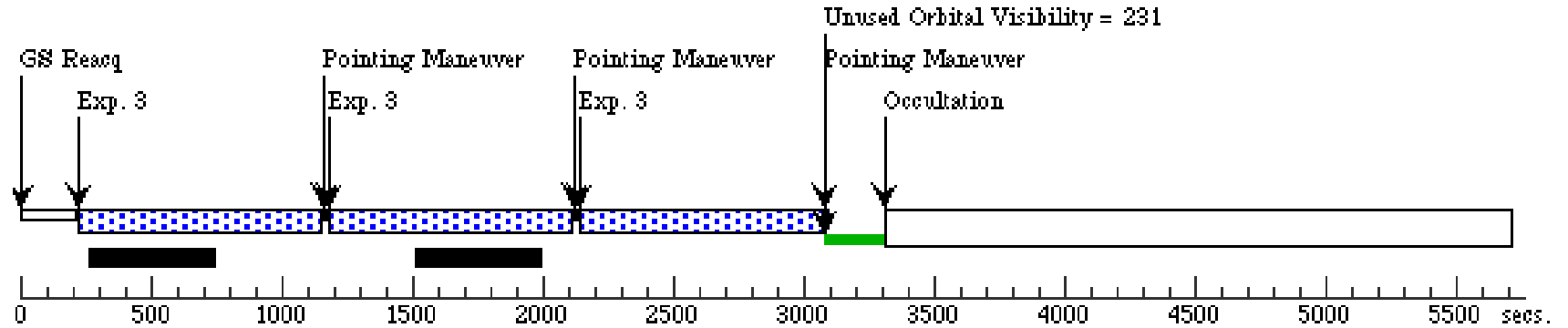
Thu Jul 24 01:45:52 GMT 2014

Visit	Proposal 13831, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: ORIENT 145D TO 215 D; ORIENT 235D TO 305 D; ORIENT 325D TO 35 D; ORIENT 55D TO 125 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(6)	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		(1), (2), (3), (4)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	GRB-120521C	RA: 14 17 8.8000 (214.2866667d) Dec: +42 08 41.00 (42.14472d) Equinox: J2000		V=(?) H(AB)~29	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 (Total)/[Actual Dur.]	Orbit
	1	(1) GRB-120521C	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG -1.930,- 1.729	Pattern 6, Exps 1-1 i n Visit 01 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
	2	(1) GRB-120521C	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 1.930,1. 729	Pattern 6, Exps 2-2 i n Visit 01 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]
	3	(1) GRB-120521C	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG -2.404,- 1.729	Pattern 6, Exps 3-3 i n Visit 01 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[3]
	4	(1) GRB-120521C	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 1.456,1. 729	Pattern 6, Exps 4-4 i n Visit 01 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[4]



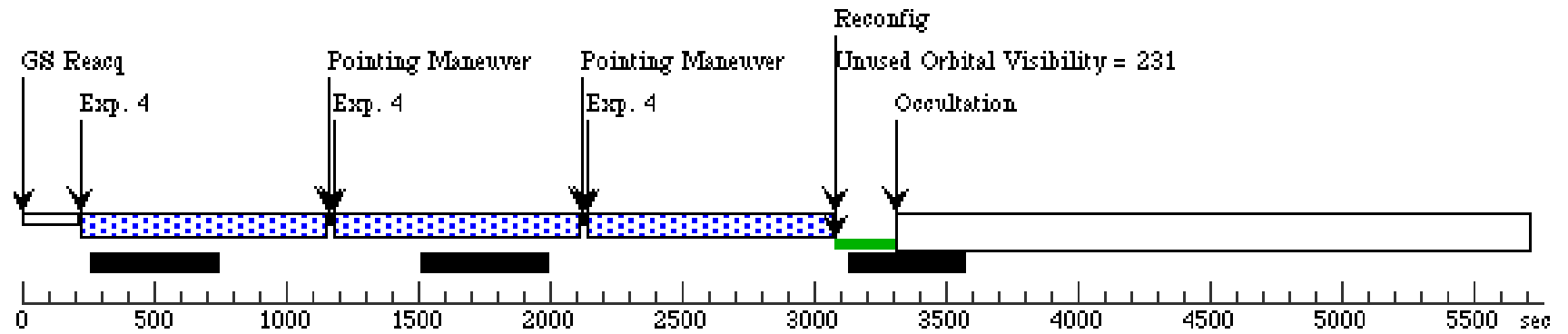
Orbit 3

Server Version: 20140605



Orbit 4

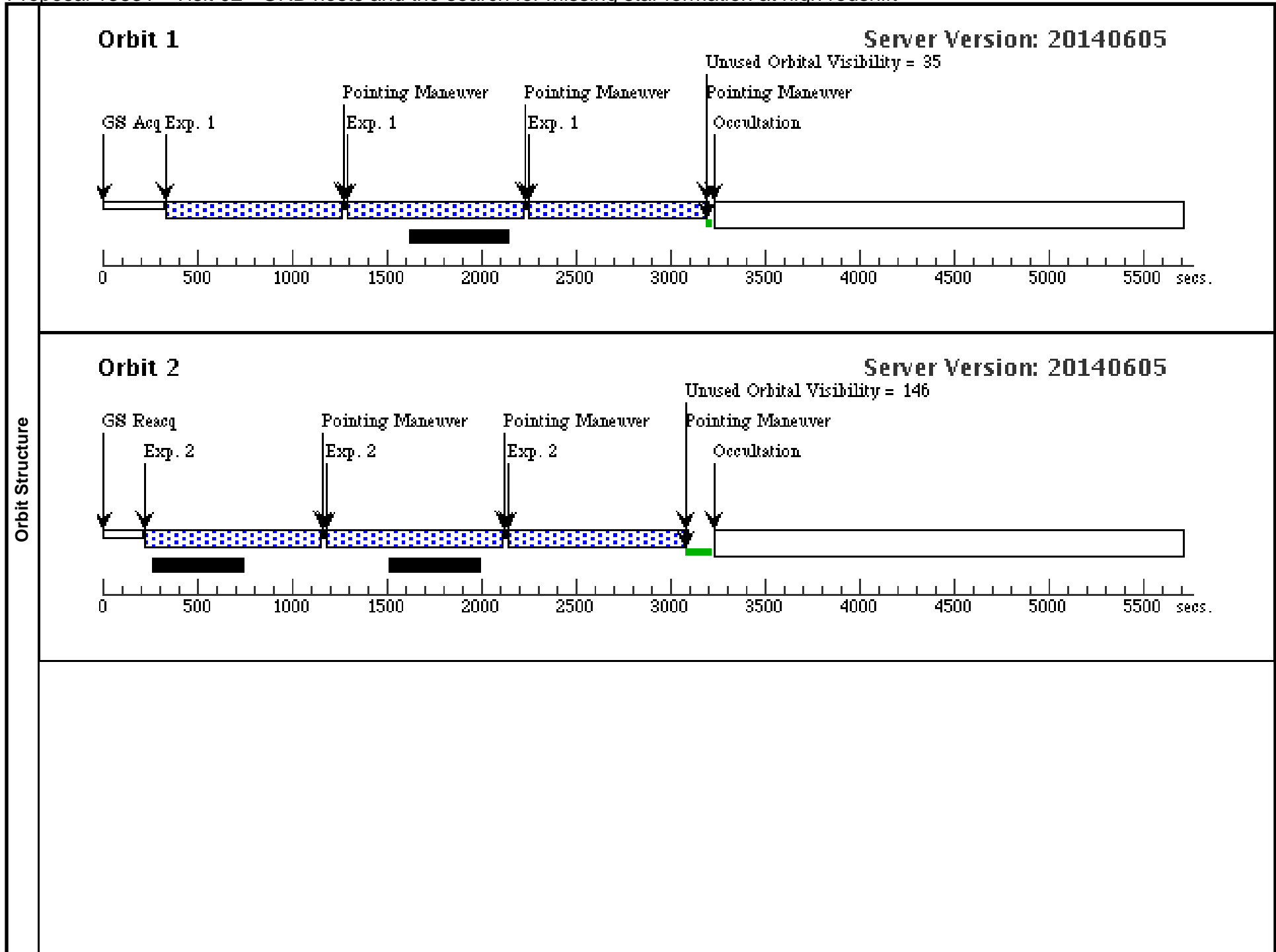
Server Version: 20140605



Proposal 13831 - Visit 02 - GRB hosts and the search for missing star formation at high redshift

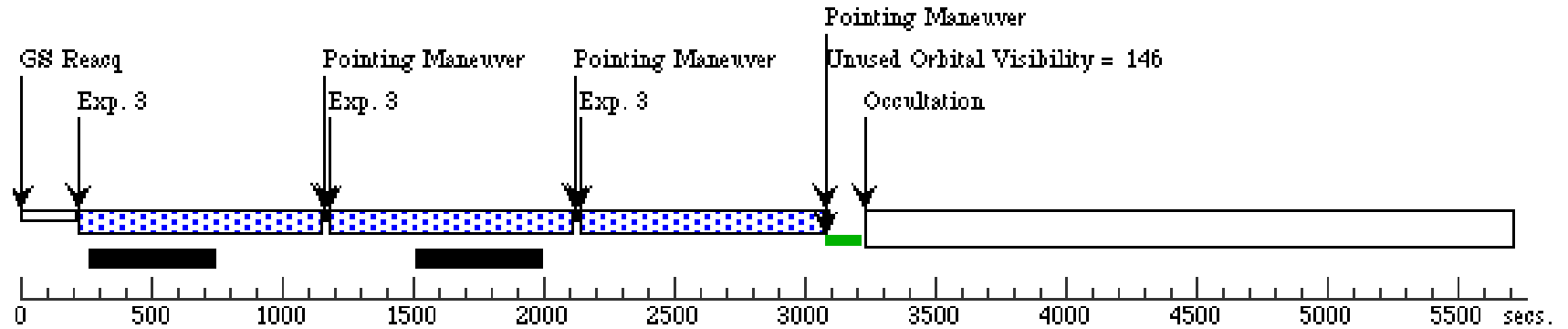
Thu Jul 24 01:45:52 GMT 2014

Visit	Proposal 13831, Visit 02 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(6)	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		(1), (2), (3), (4)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	GRB-140515A	RA: 12 24 15.4500 (186.0643750d) Dec: +15 06 17.00 (15.10472d) Equinox: J2000		V=(?) H(AB)~29	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(4) GRB-140515A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG -1.930,-1.729	Pattern 6, Exps 1-1 in Visit 02 (6)	899.233261 Secs (2697.7 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
	2		(4) GRB-140515A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 1.930,1.729	Pattern 6, Exps 2-2 in Visit 02 (6)	899.233261 Secs (2697.7 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]
3		(4) GRB-140515A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG -2.404,-1.729	Pattern 6, Exps 3-3 in Visit 02 (6)	899.233261 Secs (2697.7 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[3]	
4		(4) GRB-140515A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 1.456,1.729	Pattern 6, Exps 4-4 in Visit 02 (6)	899.233261 Secs (2697.7 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[4]	



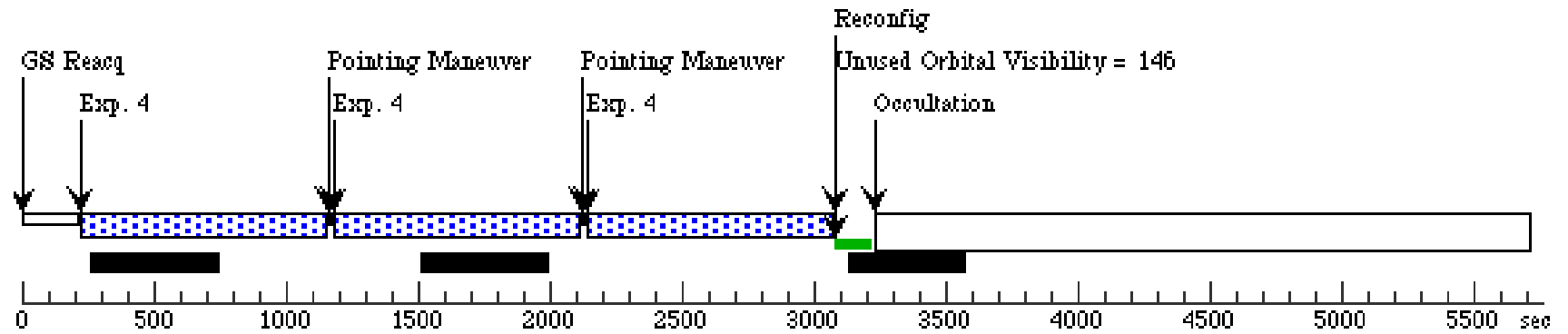
Orbit 3

Server Version: 20140605



Orbit 4

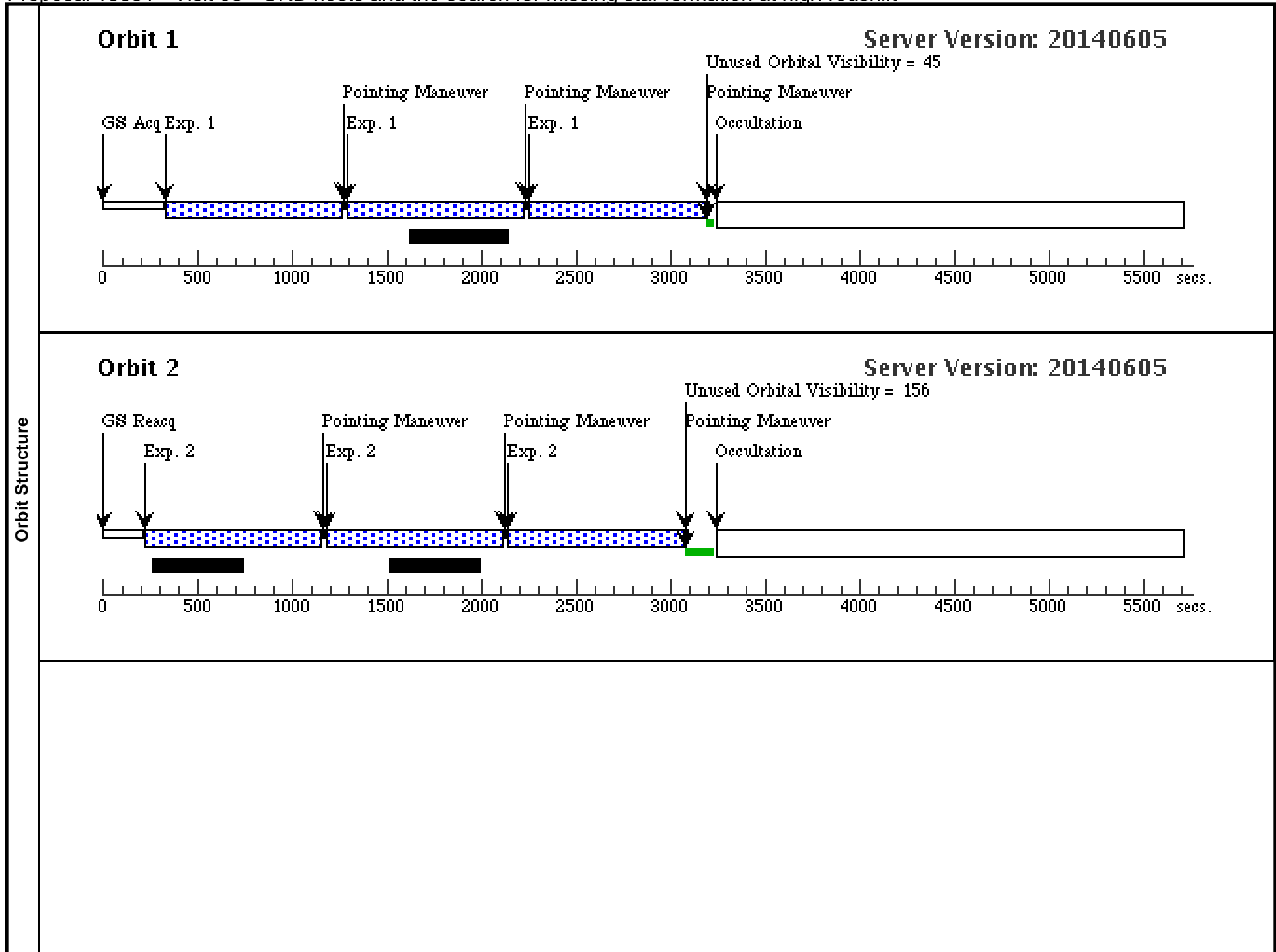
Server Version: 20140605



Proposal 13831 - Visit 03 - GRB hosts and the search for missing star formation at high redshift

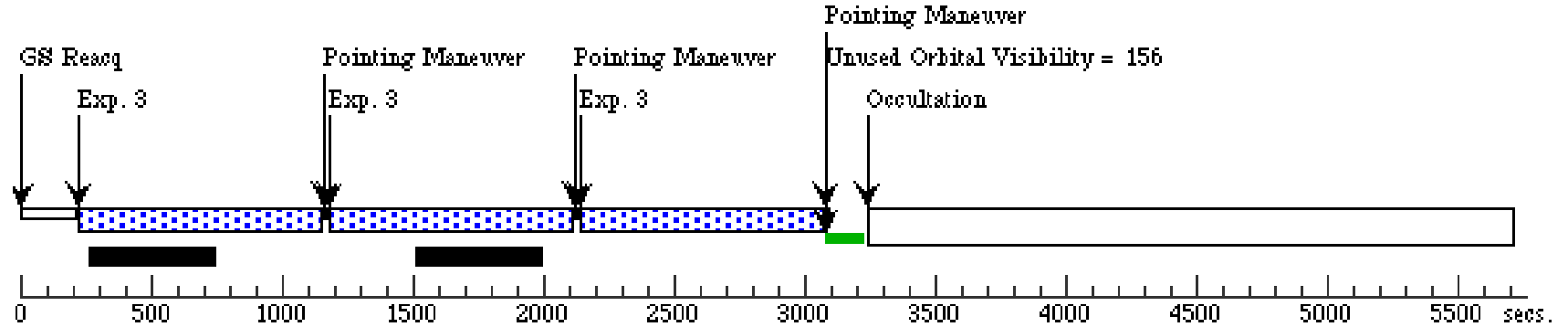
Thu Jul 24 01:45:52 GMT 2014

Visit	Proposal 13831, Visit 03 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(6)	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		(1), (2), (3), (4)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(5)	GRB-130606A	RA: 16 37 35.2000 (249.3966667d) Dec: +29 47 47.00 (29.79639d) Equinox: J2000		V=(?) H(AB)~29	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(5) GRB-130606A	(5) GRB-130606A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG -1.930,-1.729	Pattern 6, Exps 1-1 in Visit 03 (6)	899.233261 Secs (2697.7 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
	2	(5) GRB-130606A	(5) GRB-130606A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 1.930,1.729	Pattern 6, Exps 2-2 in Visit 03 (6)	899.233261 Secs (2697.7 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]
3	(5) GRB-130606A	(5) GRB-130606A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG -2.404,-1.729	Pattern 6, Exps 3-3 in Visit 03 (6)	899.233261 Secs (2697.7 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[3]	
4	(5) GRB-130606A	(5) GRB-130606A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP100	POS TARG 1.456,1.729	Pattern 6, Exps 4-4 in Visit 03 (6)	899.233261 Secs (2697.7 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[4]	



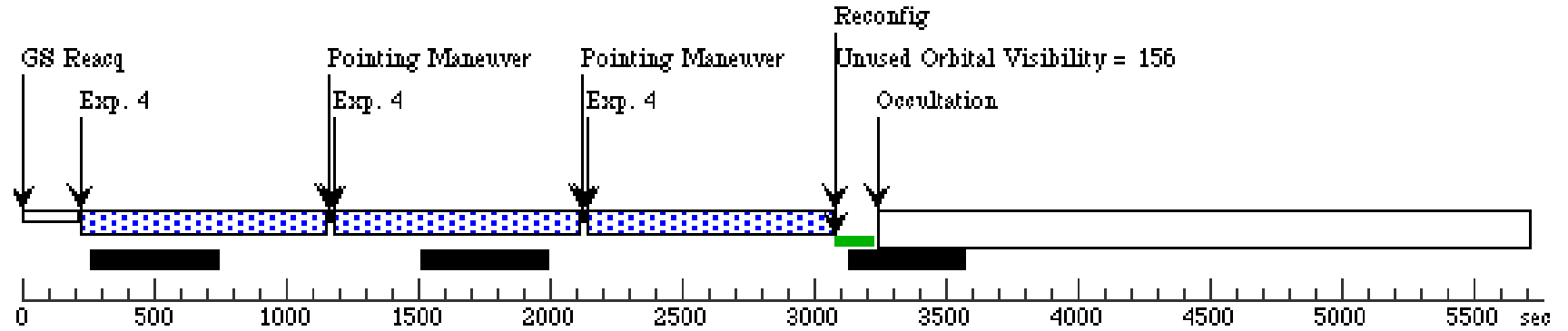
Orbit 3

Server Version: 20140605



Orbit 4

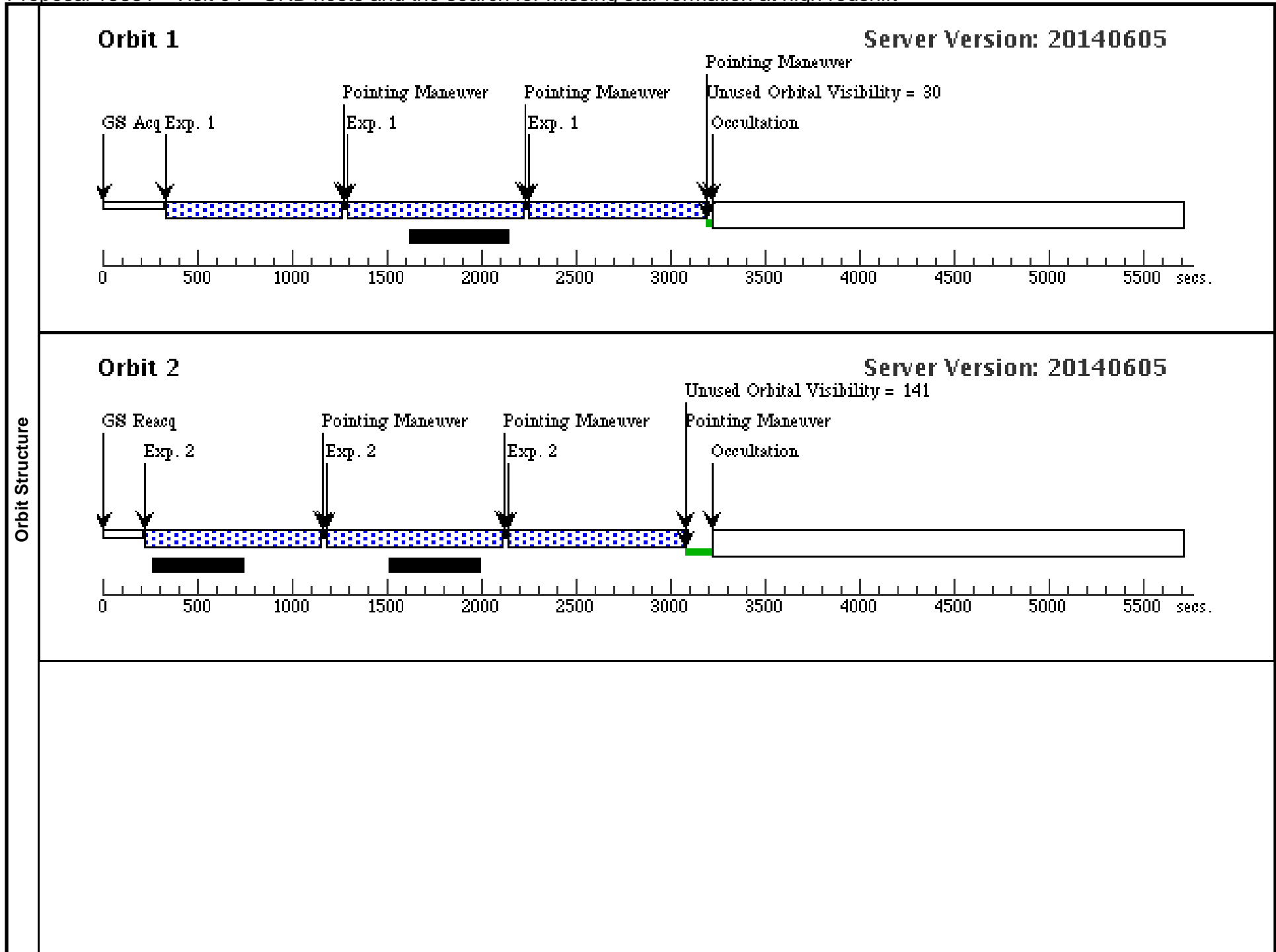
Server Version: 20140605



Proposal 13831 - Visit 04 - GRB hosts and the search for missing star formation at high redshift

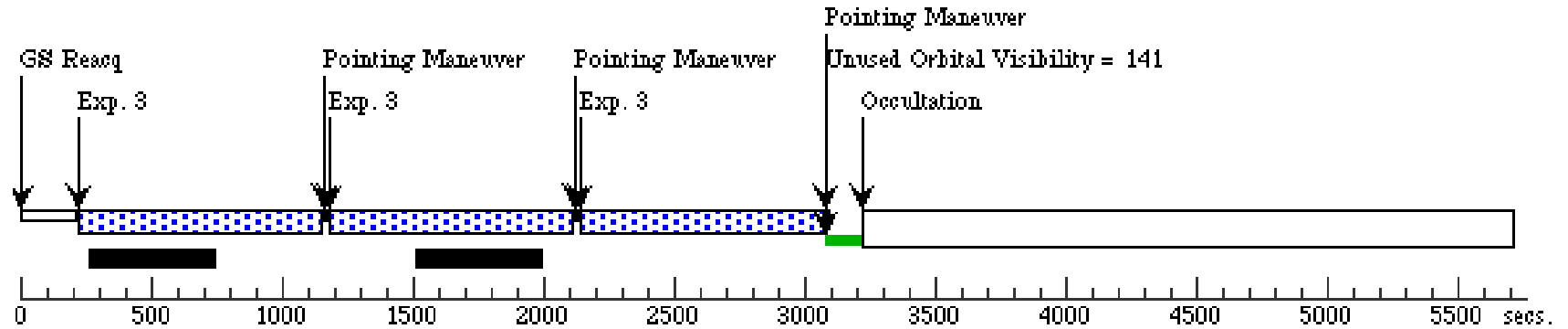
Thu Jul 24 01:45:53 GMT 2014

Visit	Proposal 13831, Visit 04 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: ORIENT 70D TO 120 D; ORIENT 160D TO 210 D; ORIENT 250D TO 300 D; ORIENT 340D TO 30 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(6)	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		(1), (2), (3), (4), (5)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	GRB-050904	RA: 00 54 50.9000 (13.7120833d) Dec: +14 05 12.00 (14.08667d) Equinox: J2000		V=(?) H(AB)~29	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(2) GRB-050904	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG -1.930,- 1.729	Pattern 6, Exps 1-1 i n Visit 04 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
	2	(2) GRB-050904	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 1.930,1. 729	Pattern 6, Exps 2-2 i n Visit 04 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]
	3	(2) GRB-050904	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG -2.404,- 1.729	Pattern 6, Exps 3-3 i n Visit 04 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[3]
	4	(2) GRB-050904	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 1.456,1. 729	Pattern 6, Exps 4-4 i n Visit 04 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[4]
	5	(2) GRB-050904	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 1.456,1. 729	Pattern 6, Exps 5-5 i n Visit 04 (6)	899.233261 Secs (2697.7 Secs)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[5]



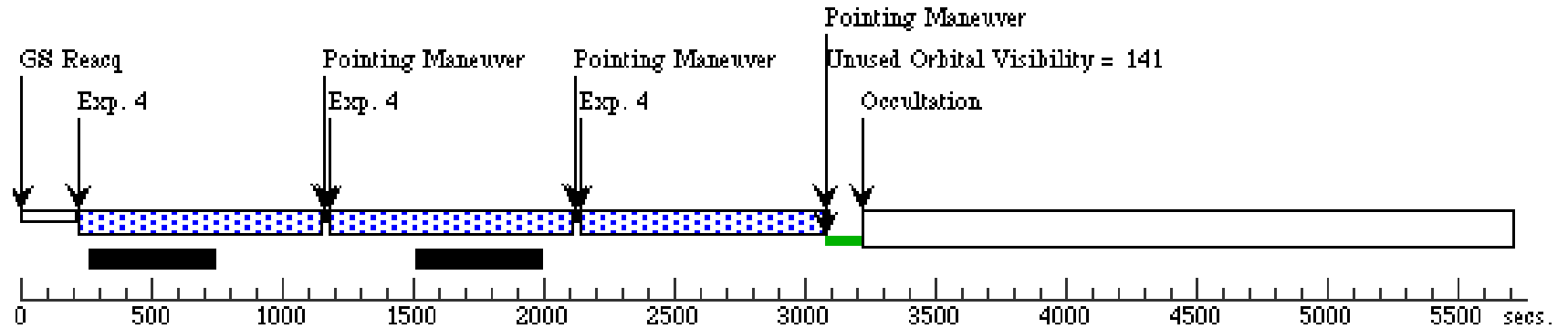
Orbit 3

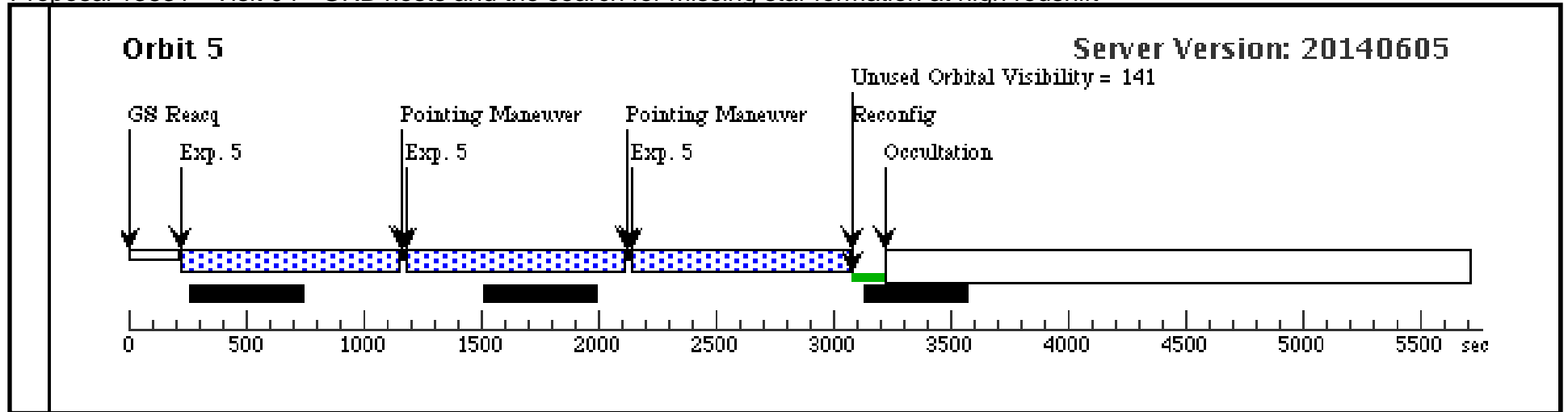
Server Version: 20140605



Orbit 4

Server Version: 20140605





Proposal 13831 - Visit 05 - GRB hosts and the search for missing star formation at high redshift

Thu Jul 24 01:45:53 GMT 2014

Visit	Proposal 13831, Visit 05 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: ORIENT 72.4D TO 81.3 D; ORIENT 162.4D TO 171.3 D; ORIENT 252.4D TO 261.3 D; ORIENT 342.4D TO 351.3 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(6)	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		(1), (2), (3)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	GRB-080913	RA: 04 22 54.7000 (65.7279167d) Dec: -25 07 46.00 (-25.12944d) Equinox: J2000		V=? H(AB)~29	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(3) GRB-080913	(3) GRB-080913	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG -1.930,- 1.729	Pattern 6, Exps 1-1 i n Visit 05 (6)	899.233261 Secs (2697.7 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
	2	(3) GRB-080913	(3) GRB-080913	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG 1.930,1. 729	Pattern 6, Exps 2-2 i n Visit 05 (6)	899.233261 Secs (2697.7 Secs)	
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]	
3	(3) GRB-080913	(3) GRB-080913	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=15; SAMP-SEQ=STEP1 00	POS TARG -2.404,- 1.729	Pattern 6, Exps 3-3 i n Visit 05 (6)	899.233261 Secs (2697.7 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[3]	

