



13110 - The Astrophysics of the Most Energetic Gamma-Ray Bursts

Cycle: 20, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Andrew S. Fruchter (PI) (Contact)	Space Telescope Science Institute	fruchter@stsci.edu
Dr. Kuntal Misra (CoI)	Aryabhata Research Institute of Observational Sci	kuntal@aries.res.in
Dr. John F. Graham (CoI) (ESA Member)	Max-Planck-Institut fur extraterrestrische Physik	graham@stsci.edu
Dr. Asaf Pe'er (CoI)	Harvard University	apeer@cfa.harvard.edu
Dr. Stephen T. Holland (CoI)	Eureka Scientific Inc.	stephenastronomy@gmail.com
Prof. Nial R. Tanvir (CoI) (ESA Member)	University of Leicester	nrt3@star.le.ac.uk
Prof. Andrew J. Levan (CoI) (ESA Member)	The University of Warwick	a.j.levan@warwick.ac.uk
Dr. Stephen Bradley Cenko (CoI)	NASA Goddard Space Flight Center	brad.cenko@nasa.gov

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) GRB130427A	WFC3/IR WFC3/UVIS	1	19-Nov-2014 21:00:49.0	yes
02	(2) GRB130427A	WFC3/IR WFC3/UVIS	1	19-Nov-2014 21:00:51.0	yes
03	(2) GRB130427A	WFC3/IR WFC3/UVIS	2	19-Nov-2014 21:00:53.0	yes
04	(2) GRB130427A	WFC3/IR WFC3/UVIS	3	19-Nov-2014 21:00:56.0	yes

7 Total Orbits Used

ABSTRACT

The Large Area Telescope (LAT) of Fermi has found a sample of highly relativistic gamma-ray bursts (GRBs), which may be among the most energetic bursts ever discovered. Here we propose to use Chandra, HST and the EVLA to follow the late time light curve of a LAT detected burst that also has excellent early multi-wavelength coverage. Our observations, in conjunction with the Fermi data, will allow us to measure the energy and the bulk Lorentz factor of the explosion. Recent work on some of the most powerful GRBs begins to substantially constrain physical models of the progenitors. The energetics of the highly relativistic LAT bursts may greatly strengthen these constraints and provide new insight into the currently unknown mechanism that determines the energy in a GRB.

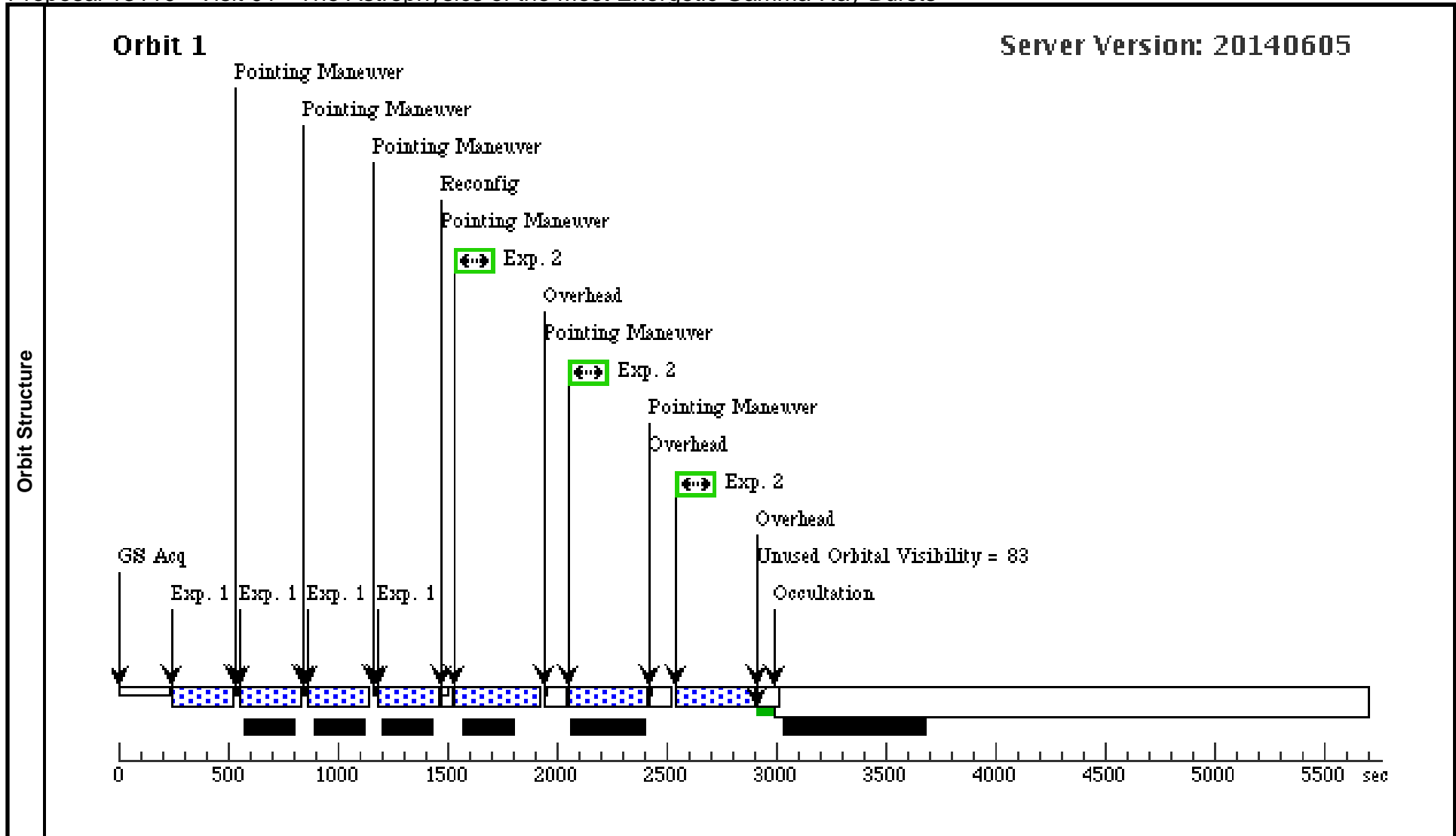
OBSERVING DESCRIPTION

We plan three visits with HST: the first an orbit long, a second two orbits long, and a third four orbits long. The first visit will occur about around twenty days after outburst. The second will be around forty days after outburst. The exact times will be scaled according to the decay seen from the ground. The third visit will be taken at least six months after the burst to allow an accurate host subtraction. We will use the UVIS camera on WFC3 because WFC3 easily has as good sensitivity on point sources as ACS with smaller detector-induced noise sources (CTE, bias-stripping, etc). We will choose the filter at the time of the ToO to match one of the best observed bands from the ground (most likely a red band). If the OT and host are sufficiently bright in the first two epochs we will divide the last epoch into 3 orbits with WFC3/UVIS and one orbit with WFC3/IR, in order to better study the environment underlying this extremely energetic burst.

Proposal 13110 - Visit 01 - The Astrophysics of the Most Energetic Gamma-Ray Bursts

Thu Nov 20 02:00:57 GMT 2014

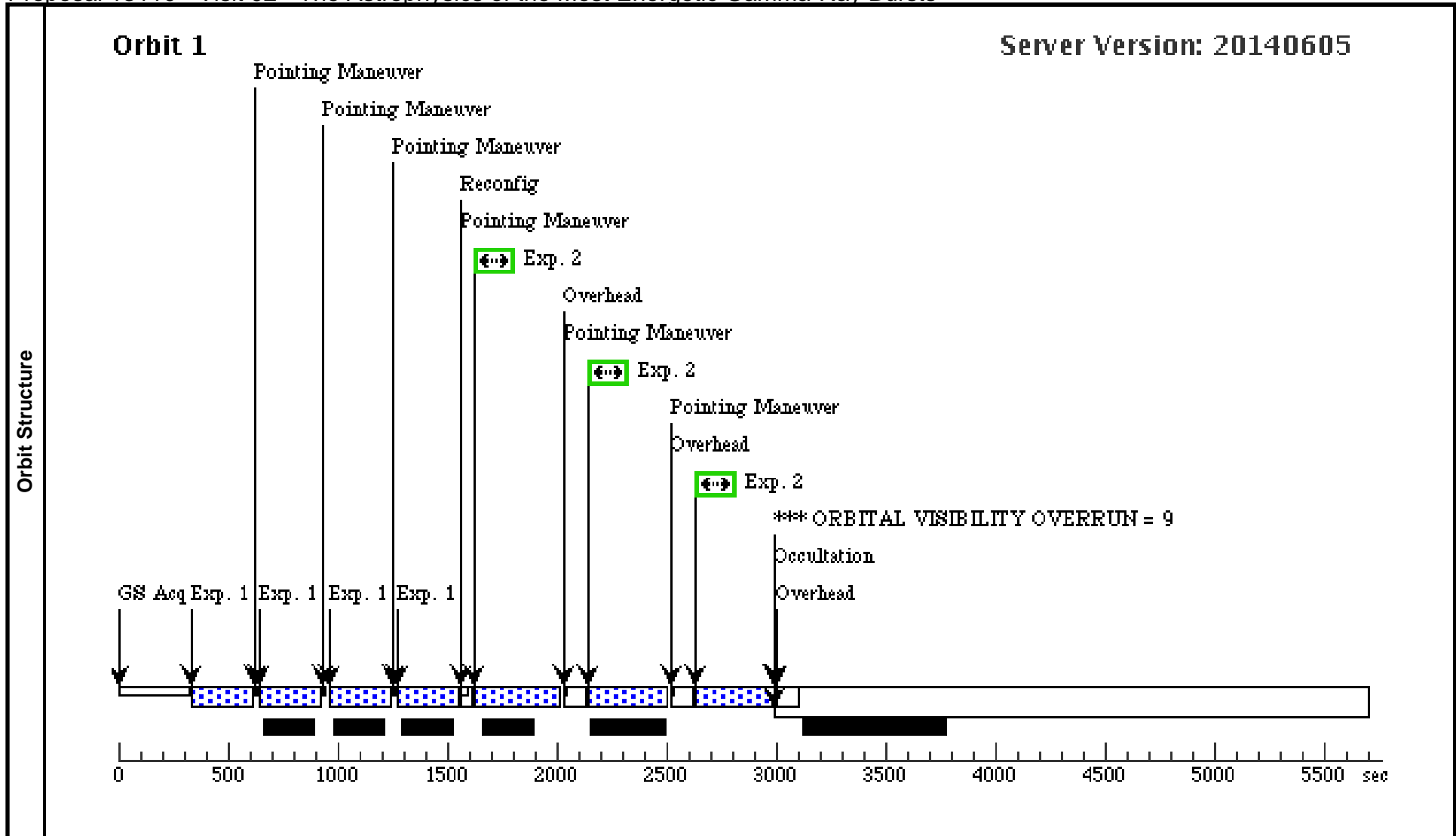
Visit	Proposal 13110, Visit 01, completed Diagnostic Status: Warning Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: SCHED 100%; BEFORE 20-JUL-2013:00:00:00										
	(Exposure 1 (Pattern 8, Exps 1-1 in Visit 01) special requirements) Warning (Form): Be very careful mixing POS TARG and Center_Pattern = Yes										
Diagnos											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(4)	Pattern Type=WFC3-UVIS-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false								(2)	
Patterns	(8)	Pattern Type=WFC3-IR-DITHER- BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true				Pattern Type=WFC3-IR-DITHER- LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(2)	GRB130427A	RA: 11 32 32.8400 (173.1368333d) Dec: +27 41 56.20 (27.69894d) Equinox: J2000					V=22+/-1		Reference Frame: SDSS	
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	(2) GRB130427A		WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=STEP5 0; NSAMP=10	POS TARG 40,30; GS ACQ SCENARI O SINGLE	Pattern 8, Exps 1-1 i n Visit 01 (8)	249.23203 Secs (996.928 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]		[1]
Exposures	2	(2) GRB130427A		WFC3/UVIS, ACCUM, UVIS1	F606W		POS TARG 40,30	Pattern 4, Exps 2-2 i n Visit 01 (4)	360 Secs (1080 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]		[1]



Proposal 13110 - Visit 02 - The Astrophysics of the Most Energetic Gamma-Ray Bursts

Thu Nov 20 02:00:58 GMT 2014

Visit	Proposal 13110, Visit 02, completed Diagnostic Status: Warning Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: SCHED 100%; ORIENT 255D TO 260 D; BEFORE 15-JAN-2014:00:00:00									
	(Visit 02) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (Exposure 1 (Pattern 8, Exps 1-1 in Visit 02) special requirements) Warning (Form): Be very careful mixing POS TARG and Center_Pattern = Yes									
Diagnosics										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures
	(4)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false								(2)
(8)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true				Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes	Miscellaneous	
	(2)	GRB130427A	RA: 11 32 32.8400 (173.1368333d) Dec: +27 41 56.20 (27.69894d) Equinox: J2000					V=22+/-1	Reference Frame: SDSS	
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(2) GRB130427A	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=STEP5 NSAMP=10	POS TARG -40,-30	Pattern 8, Exps 1-1 in Visit 02 (8)	249.23203 Secs (996.928 Secs)	[1]	
2	(2) GRB130427A	WFC3/UVIS, ACCUM, UVIS2	F606W	POS TARG -40,-30	Pattern 4, Exps 2-2 in Visit 02 (4)	360 Secs (1080 Secs)	[1]			



Proposal 13110 - Visit 03 - The Astrophysics of the Most Energetic Gamma-Ray Bursts

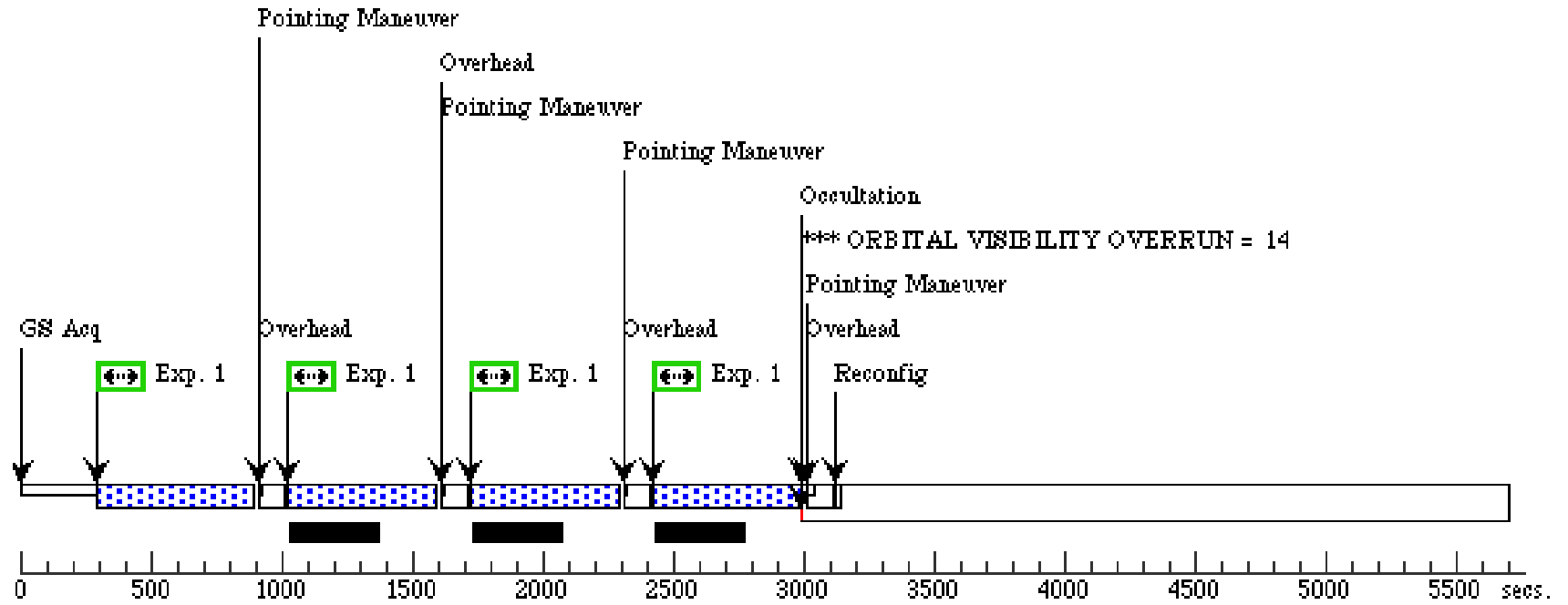
Thu Nov 20 02:00:58 GMT 2014

Visit	Proposal 13110, Visit 03, completed Diagnostic Status: Warning Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: SCHED 100%; ORIENT 185D TO 195 D; BETWEEN 21-FEB-2014:00:00:00 AND 31-MAR-2014:00:00:00									
	(Visit 03) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (Exposure 2 (Pattern 10, Exps 2-2 in Visit 03) special requirements) Warning (Form): Be very careful mixing POS TARG and Center_Pattern = Yes									
Diagnosics										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures
	(10)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	(2)				
(9)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false			(1)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	GRB130427A	RA: 11 32 32.8400 (173.1368333d) Dec: +27 41 56.20 (27.69894d) Equinox: J2000		V=22+/-1	Reference Frame: SDSS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(2) GRB130427A	WFC3/UVIS, ACCUM, UVIS2	F606W			POS TARG 40,-25; GS ACQ SCENARI O BASE1B3	Pattern 9, Exps 1-1 in Visit 03 (9)	550 Secs (2288 Secs) [==>572.0 Secs (Pattern 1)] [==>572.0 Secs (Pattern 2)] [==>572.0 Secs (Pattern 3)] [==>572.0 Secs (Pattern 4)]	[1]
2	(2) GRB130427A	WFC3/IR, MULTIACCUM, IR-FIX	F160W		NSAMP=13; SAMP-SEQ=SPAR S50	POS TARG 40,-25	Pattern 10, Exps 2-2 in Visit 03 (10)	602.937703 Secs (2411.751 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]	[2]	

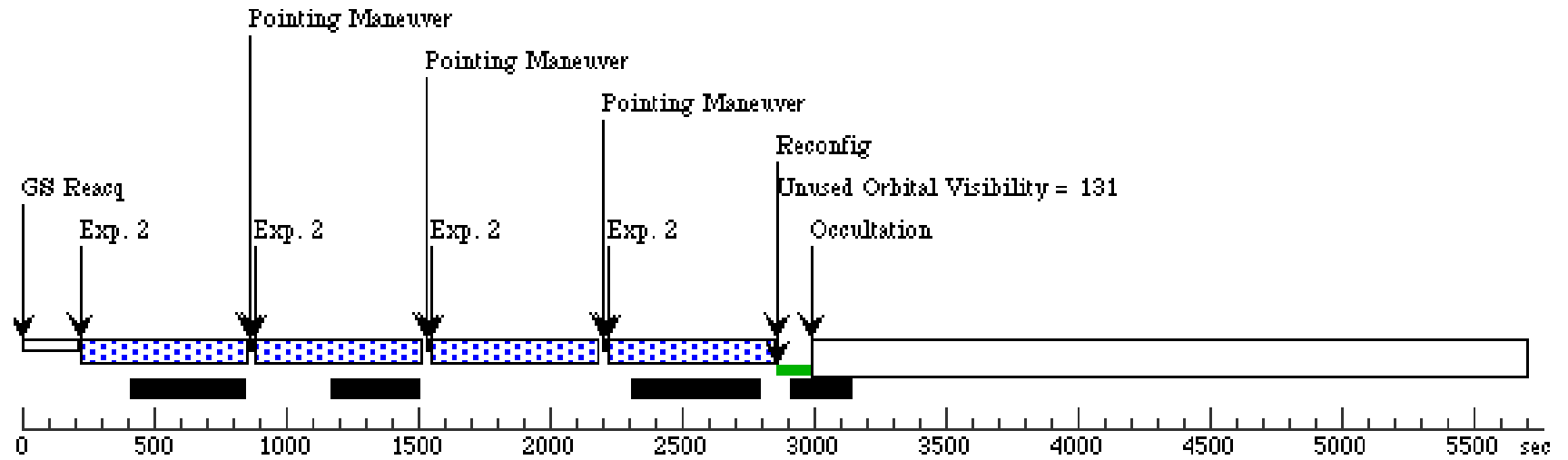
Orbit 1

Server Version: 20140605

Orbit Structure



Orbit 2



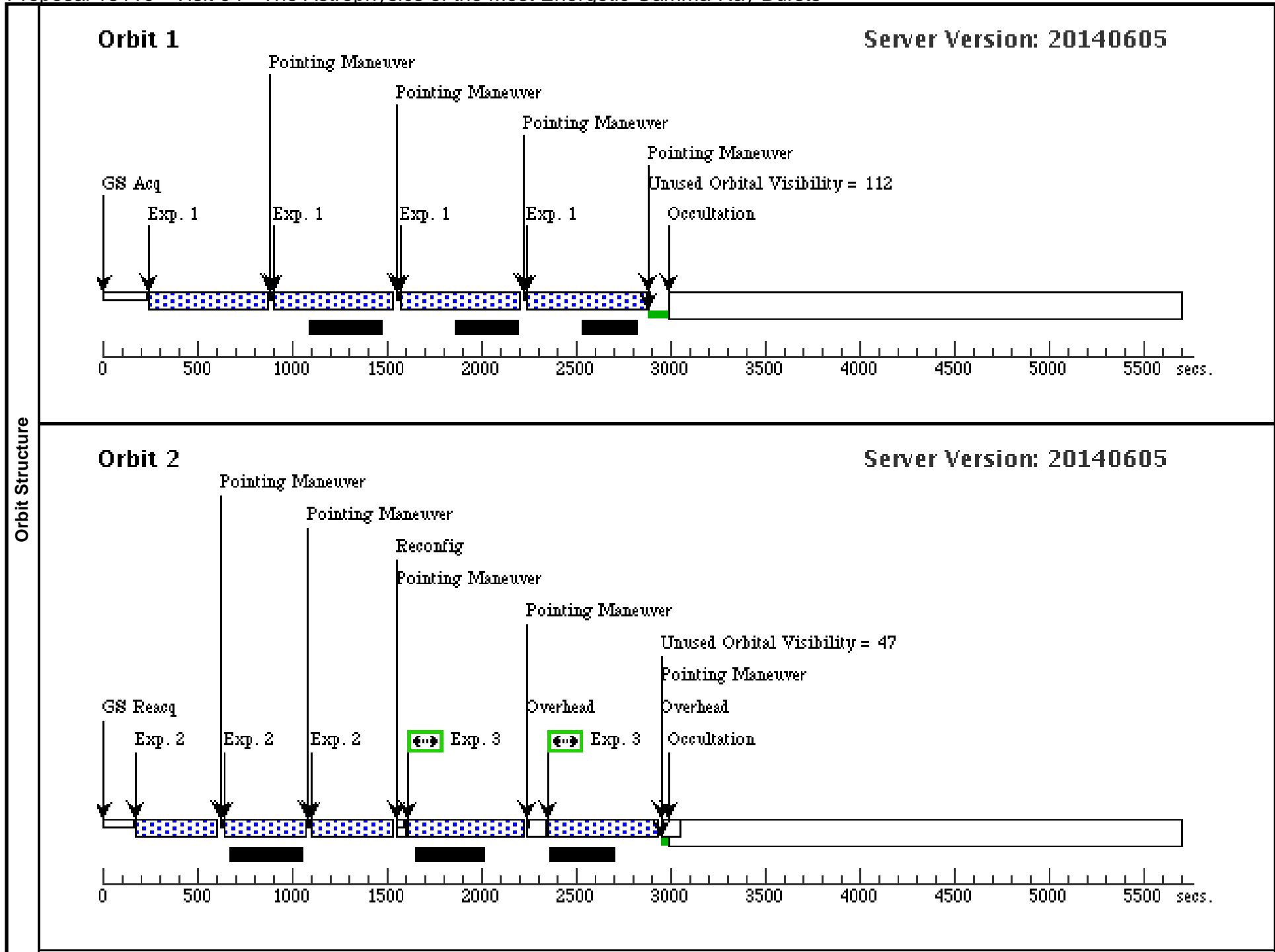
Proposal 13110 - Visit 04 - The Astrophysics of the Most Energetic Gamma-Ray Bursts

Thu Nov 20 02:00:58 GMT 2014

Visit	Proposal 13110, Visit 04, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: SCHED 100%; ORIENT 270D TO 315 D; BETWEEN 01-DEC-2014:00:00:00 AND 31-DEC-2014:00:00:00					
	(Exposure 1 (Pattern 8, Exps 1-1 in Visit 04) special requirements) Warning (Form): Be very careful mixing POS TARG and Center_Pattern = Yes					
Diagnostics						
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
		(11)	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		(2)
		(4)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(4)
		(8)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false
(9)		Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false			(3)
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	GRB130427A	RA: 11 32 32.8400 (173.1368333d) Dec: +27 41 56.20 (27.69894d) Equinox: J2000		V=22+/-1	Reference Frame: SDSS

Proposal 13110 - Visit 04 - The Astrophysics of the Most Energetic Gamma-Ray Bursts

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	(2) GRB130427A	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=13; SAMP-SEQ=SPAR S50	POS TARG 0,0; GS ACQ SCENARI O SINGLE	Pattern 8, Exps 1-1 in Visit 04 (8)	602.937703 Secs (2411.751 Secs) [==>(Pattern 1,1)] [==>(Pattern 1,2)] [==>(Pattern 2,1)] [==>(Pattern 2,2)]	[1]
	2	(2) GRB130427A	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=9; SAMP-SEQ=SPAR S50	POS TARG -0.5,-0.5	Pattern 11, Exps 2-2 in Visit 04 (11)	402.935899 Secs (1208.808 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]
	3	(2) GRB130427A	WFC3/UVIS, ACCUM, UVIS2	F606W		POS TARG -40,-30	Pattern 9, Exps 3-3 in Visit 04 (9)	500 Secs (2246 Secs) [==>582.0 Secs (Pattern 1)] [==>582.0 Secs (Pattern 2)] [==>541.0 Secs (Pattern 3)] [==>541.0 Secs (Pattern 4)]	[2] [3]
	4	(2) GRB130427A	WFC3/UVIS, ACCUM, UVIS2	F606W		POS TARG -39.5,-2 9.5	Pattern 4, Exps 4-4 in Visit 04 (4)	350 Secs (1173 Secs) [==>391.0 Secs (Pattern 1)] [==>391.0 Secs (Pattern 2)] [==>391.0 Secs (Pattern 3)]	[3]



Orbit 3

