



## 12764 - The demographics of dark gamma-ray bursts

Cycle: 19, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Dr. Andrew J. Levan (PI) (ESA Member) (Contact)</b>	<b>The University of Warwick</b>	<b>a.j.levan@warwick.ac.uk</b>
Prof. Nial R. Tanvir (CoI) (ESA Member)	University of Leicester	nrt3@star.le.ac.uk
Prof. Jens Hjorth (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute	jens@dark-cosmology.dk
Dr. Paul T. O'Brien (CoI) (ESA Member)	University of Leicester	pto@star.le.ac.uk
Dr. Daniel Perley (CoI)	California Institute of Technology	dperley@astro.caltech.edu
Dr. Darach Watson (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute	darach@astro.ku.dk
Dr. Andrew S. Fruchter (CoI)	Space Telescope Science Institute	fruchter@stsci.edu
Dr. Daniele Malesani (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute	malesani@dark-cosmology.dk

### 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>
H1	(4) GRB110915A	WFC3/IR	1	17-Apr-2013 21:01:00.0	yes
H2	(5) GRB110328A	WFC3/IR	1	17-Apr-2013 21:01:07.0	yes
V1	(4) GRB110915A	WFC3/UVIS	1	17-Apr-2013 21:01:12.0	yes
V2	(5) GRB110328A	WFC3/UVIS	1	17-Apr-2013 21:01:17.0	yes
D1	(6) GRB111215A	WFC3/IR WFC3/UVIS	1	17-Apr-2013 21:01:24.0	yes
D2	(7) GRB120320A	WFC3/IR WFC3/UVIS	1	17-Apr-2013 21:01:31.0	yes

6 Total Orbits Used

## **ABSTRACT**

Dark gamma-ray bursts (GRBs) -- where the optical emission is apparently suppressed -- can only be reliably localized by their X-ray afterglows. Here we propose to complete a survey using the sensitivity and point spread function of Chandra to precisely pinpoint the GRB locations, and HST to locate and study the host galaxies. Our results to date are suggestive of most dark GRBs originating in more luminous galaxies than "bright" GRBs. Our new observations will increase the statistical certainty of this result, while simultaneously allowing us to more precisely identify the minority of dark GRBs which most likely originate from the highest redshifts.

## **OBSERVING DESCRIPTION**

We propose to obtain HST optical and IR observations of a sample of dark gamma-ray bursts (bursts whose optical afterglows were apparently suppressed). We will adopt a strategy depending on the available information on the host galaxy at the time of trigger. If ground based optical observations have located a candidate host we will obtain observations in a single orbit, split between F606W and F160W (visits D1 and D2). If no host galaxy is visible to deep limits we will use single orbit observations in each filter (visit H1,H2 and V1, V2).

For our single orbit, single filter visits we will use the default 4 point dither patterns, with the target placed at the default aimpoints on both UVIS and IR chips. Because of buffer dump issues we cannot obtain 8 exposures within a single orbit, and hence for visits D1 and D2 we use a 3 point line dither, which allows for good CR rejection, and a degree of psf recovery.

Proposal 12764 - Visit H1 - The demographics of dark gamma-ray bursts

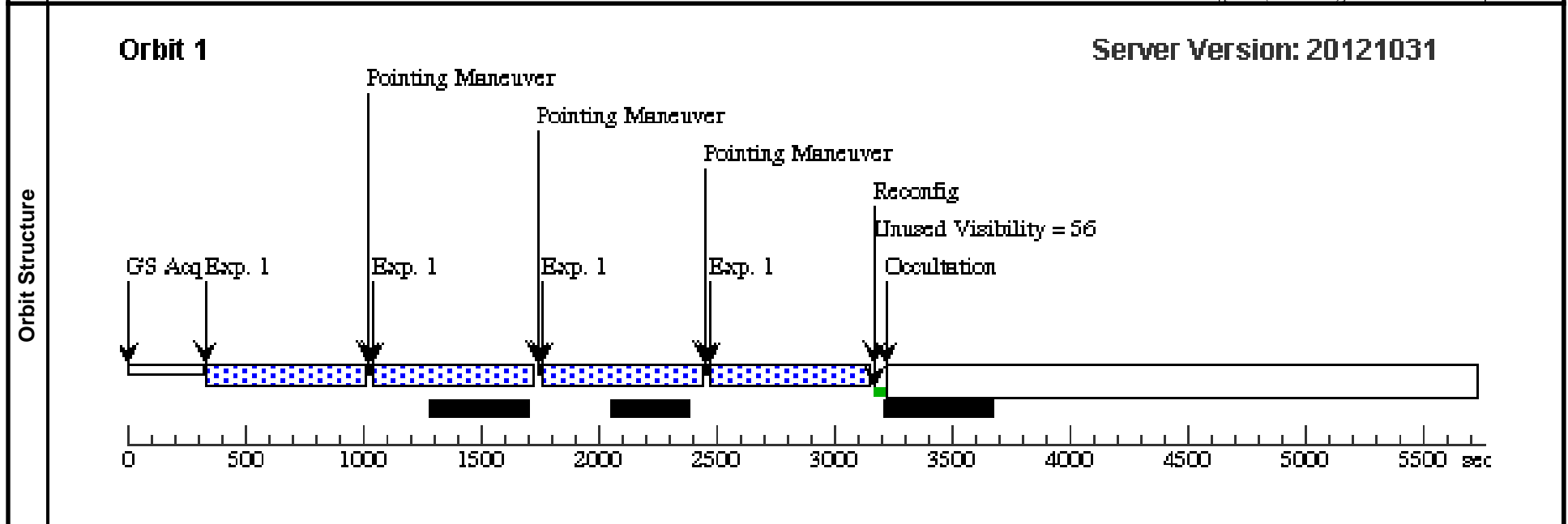
Thu Apr 18 01:01:39 GMT 2013

<b>Visit</b>	<b>Proposal 12764, Visit H1, completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: (none) <i>Comments: F160W, 1 orbit, 4 point dither</i>		

<b>Patterns</b>	#	Primary Pattern	Secondary Pattern	Exposures
	(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false	(1)

<b>Fixed Targets</b>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(4)	GRB110915A	RA: 20 43 17.8900 (310.8245417d) Dec: -00 43 23.60 (-.72322d) Equinox: J2000		V=27+/-2	Reference Frame: Chandra

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(4) GRB110915A	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S50		Pattern 2, Exps 1-1 in Visit H1 (2)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 12764 - Visit H2 - The demographics of dark gamma-ray bursts

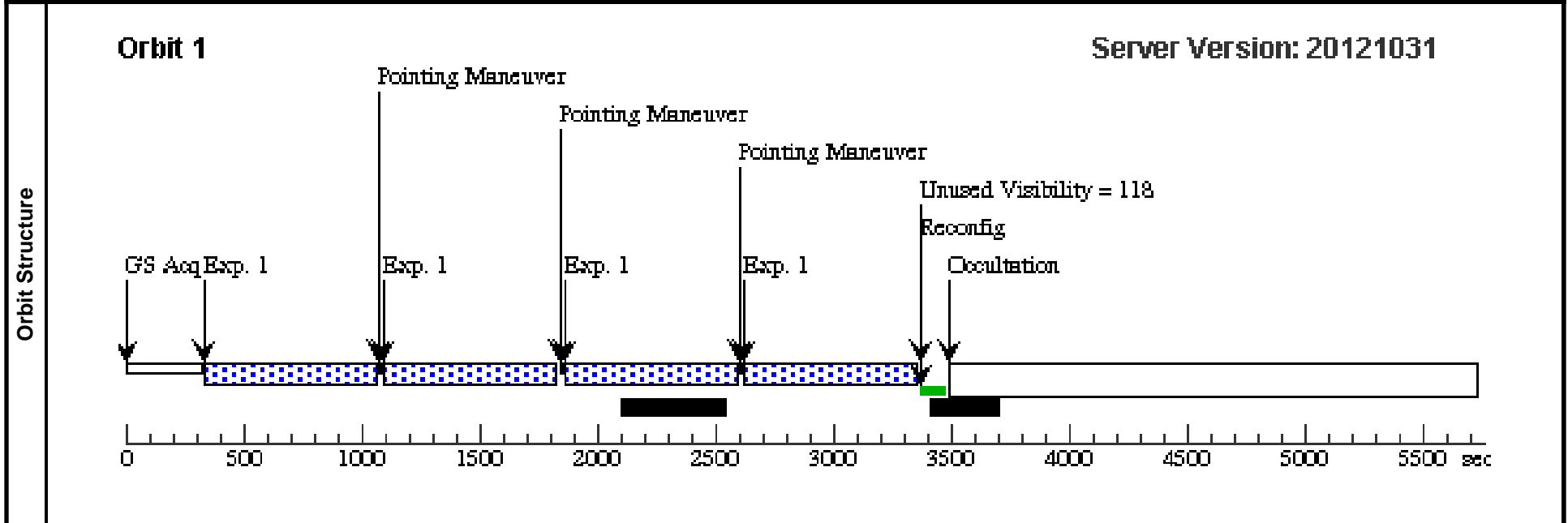
Thu Apr 18 01:01:41 GMT 2013

<b>Visit</b>	<b>Proposal 12764, Visit H2, completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR Special Requirements: ORIENT 237D TO 237 D Comments: F160W, 1 orbit, 4 point dither		

<b>Patterns</b>	#	Primary Pattern	Secondary Pattern	Exposures
	(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false	

<b>Fixed Targets</b>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(5)	GRB110328A	RA: 16 44 49.8700 (251.2077917d) Dec: +57 35 0.20 (57.58339d) Equinox: J2000		V=23+/-0.5	Reference Frame: Swift

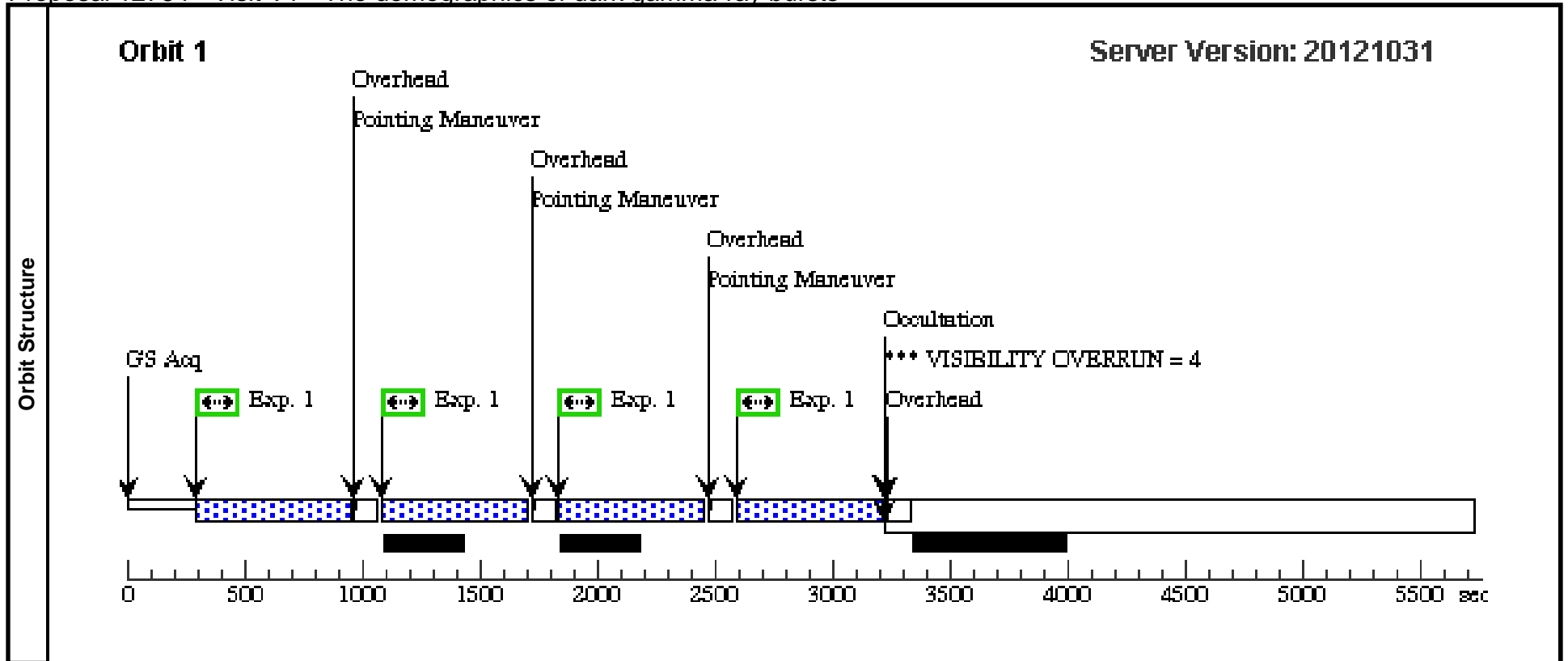
<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(5) GRB110328A	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=8; SAMP-SEQ=SPAR S100	GS ACQ SCENARI O BASE1B3	Pattern 2, Exps 1-1 i n Visit H2 (2)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 12764 - Visit V1 - The demographics of dark gamma-ray bursts

Thu Apr 18 01:01:41 GMT 2013

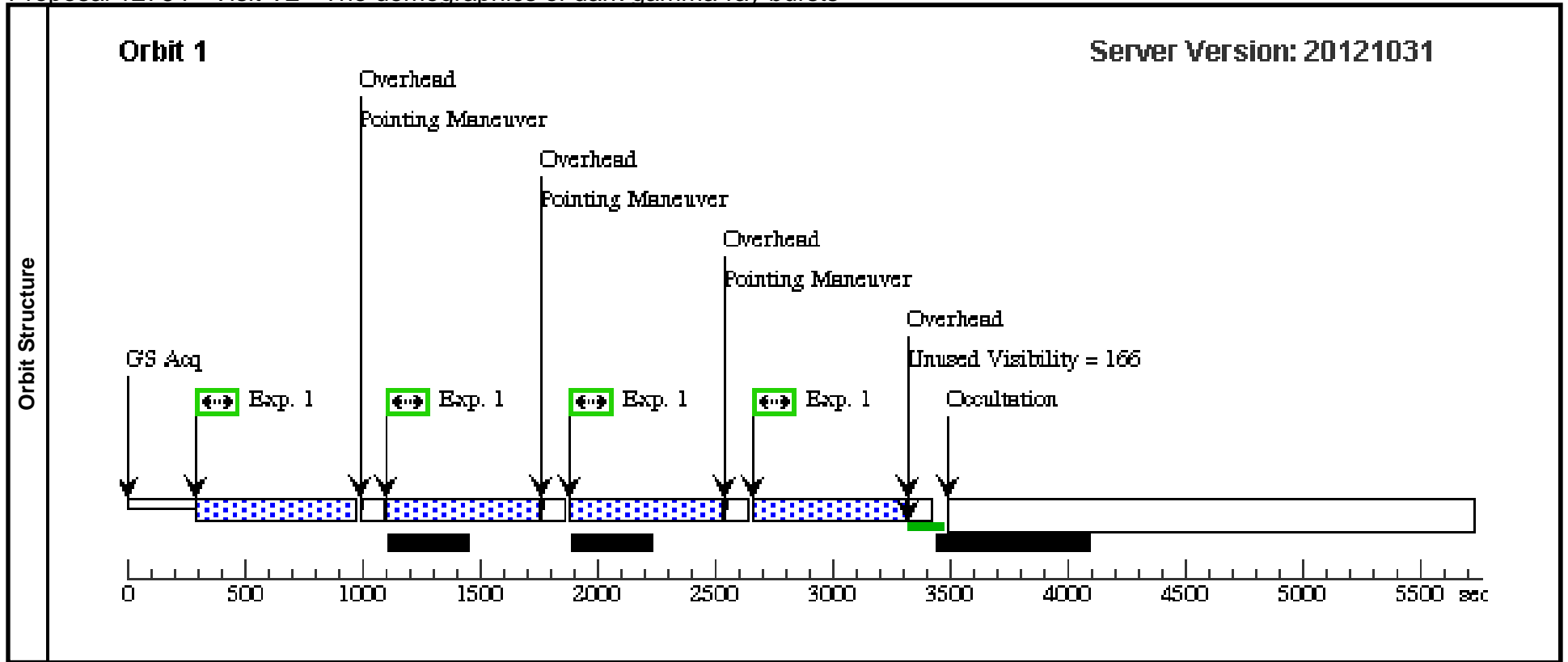
<b>Visit</b>	<b>Proposal 12764, Visit V1, completed</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: WFC3/UVIS Special Requirements: (none) <i>Comments: F606W, 1 orbit, 4 point dither</i>									
	(Visit V1) Warning (Orbit Planner): VISIBILITY OVERRUN									
<b>Diagnosics</b>										
<b>Patterns</b>	<b>#</b>	<b>Primary Pattern</b>	<b>Secondary Pattern</b>	<b>Exposures</b>						
	(1)	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)						
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>				
	(4)	GRB110915A	RA: 20 43 17.8900 (310.8245417d) Dec: -00 43 23.60 (-.72322d) Equinox: J2000		V=27+/-2	Reference Frame: Chandra				
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>	<b>Orbit</b>
	1	(4) GRB110915A	WFC3/UVIS, ACCUM, UVIS	F606W				Pattern 1, Exps 1-1 in Visit V1 (1)	500 Secs [==>627.0 Secs (Pattern 1)] [==>627.0 Secs (Pattern 2)] [==>627.0 Secs (Pattern 3)] [==>627.0 Secs (Pattern 4)]	[1]



Proposal 12764 - Visit V2 - The demographics of dark gamma-ray bursts

Thu Apr 18 01:01:43 GMT 2013

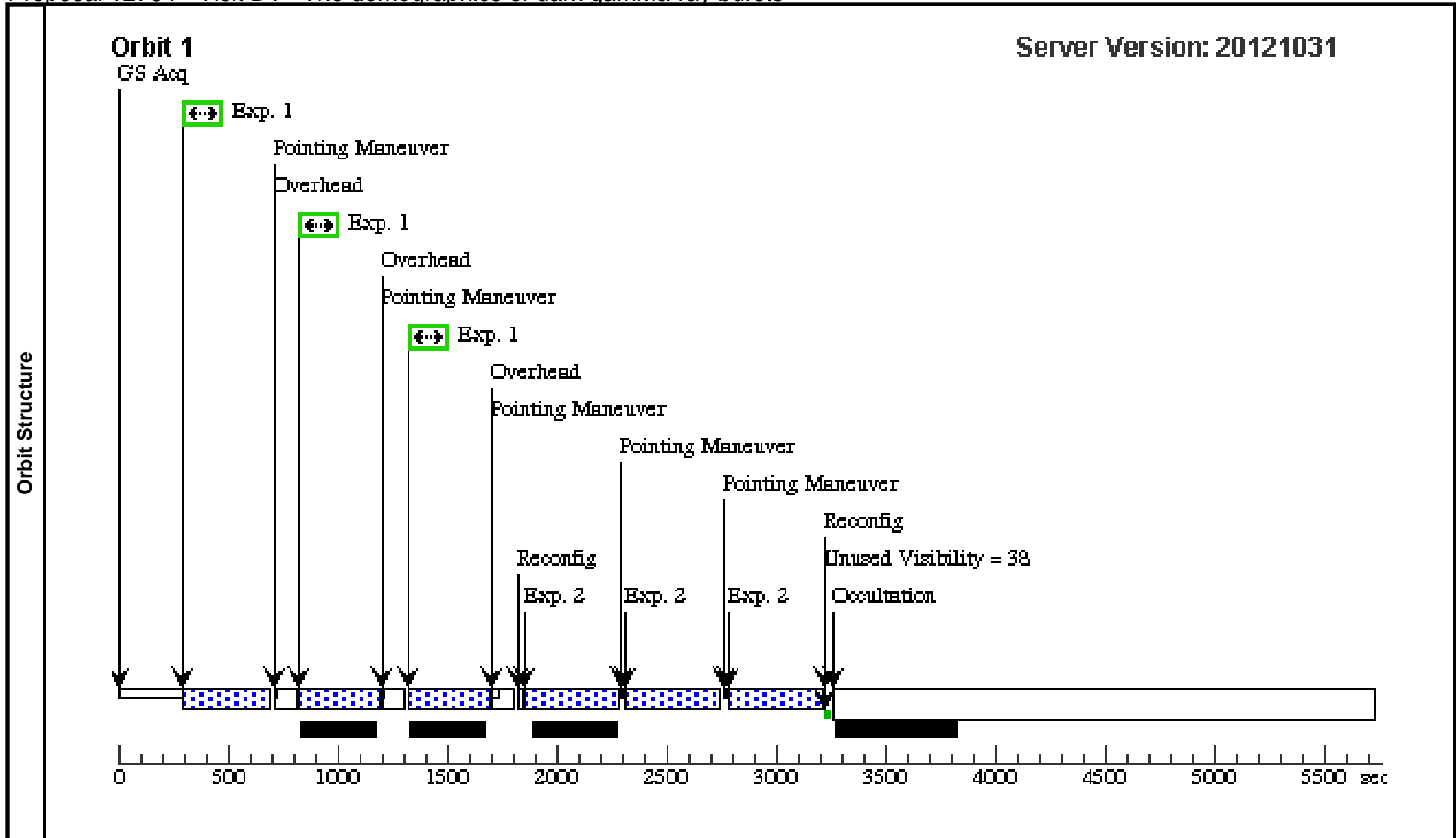
<b>Visit</b>	<b>Proposal 12764, Visit V2, completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/UVIS Special Requirements: SAME ORIENT AS H2; ON HOLD Comments: F606W, 1 orbit, 4 point dither On Hold Comments: Awaiting GRB trigger									
<b>Patterns</b>	<b>#</b>	<b>Primary Pattern</b>	<b>Secondary Pattern</b>	<b>Exposures</b>						
	(1)	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)					
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>				
	(5)	GRB110328A	RA: 16 44 49.8700 (251.2077917d) Dec: +57 35 0.20 (57.58339d) Equinox: J2000		V=23+/-0.5	Reference Frame: Swift				
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>	<b>Orbit</b>
	1	(5) GRB110328A		WFC3/UVIS, ACCUM, UVIS2	F606W			Pattern 1, Exps 1-1 in Visit V2 (1)	650 Secs [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 12764 - Visit D1 - The demographics of dark gamma-ray bursts

Thu Apr 18 01:01:44 GMT 2013

Visit	<b>Proposal 12764, Visit D1, scheduling</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: ORIENT 65D TO 95 D; ORIENT 245D TO 280 D; ORIENT 310D TO 16 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
(3)		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		(1)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(6)	GRB111215A	RA: 23 18 13.3200 (349.5555000d) Dec: +32 29 38.40 (32.49400d) Equinox: J2000		V=24+/-1	Reference Frame: Swift				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(6) GRB111215A	WFC3/UVIS, ACCUM, UVIS2	F606W	CR-SPLIT=NO		Pattern 4, Exps 1-1 in Visit D1 (4)	370 Secs [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)]	[1]
2		(6) GRB111215A	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 3, Exps 2-2 in Visit D1 (3)	[=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)]	[1]	



Proposal 12764 - Visit D2 - The demographics of dark gamma-ray bursts

Thu Apr 18 01:01:45 GMT 2013

Visit	<b>Proposal 12764, Visit D2, completed</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: ORIENT 20D TO 90 D; ORIENT 110D TO 180 D; ORIENT 200D TO 270 D; ORIENT 290D TO 0 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(3)	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		(1)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(7)	GRB120320A	RA: 14 10 4.2200 (212.5175833d) Dec: +08 41 47.20 (8.69644d) Equinox: J2000		V=23+/-1	Reference Frame: Swift				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(7) GRB120320A	WFC3/UVIS, ACCUM, UVIS	F606W	CR-SPLIT=NO		Pattern 4, Exps 1-1 in Visit D2 (4)	370 Secs [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
2		(7) GRB120320A	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPAR S50		Pattern 3, Exps 2-2 in Visit D2 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]	

