



## 12438 - HST observations of the exceptional Christmas-day gamma-ray burst

Cycle: 18, Proposal Category: GO/DD

(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	(1) GRB101225A	ACS/WFC	1	10-Jan-2011 21:01:35.0	yes

1 Total Orbits Used

### ABSTRACT

On Christmas day 2010, Swift detected one of the most unusual gamma-ray bursts (GRBs) ever seen. It apparently persisted for well over 1000s, had an extremely bright, and long lived X-ray afterglow, followed by a remarkably rapid decay, and exhibited an even longer slow decline in its (very blue) optical lightcurve. Recent observations establish a spectroscopic redshift  $z=0.4$ , and so GRB 101225 is not a member of the low-luminosity

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(and hence low-redshift) class as had been suggested. This leads to the natural question of what can produce such an event? Is this a classical GRB from core collapse or an phenomena involving a galactic nucleus (its early lightcurve and optical spectral were reminsent of Blazars)? Could it be an unusual progenitor in a low density medium (e.g. stellar halo), or a chemically extremely unusual system (e.g. ultra-low metallicity). Our proposed HST observations will help to directly address these questions. We will i) track the light curve to late times, directly measuring the total energy of the explosions, and searching for any evidence of an associated supernova - a supernova comparable to those seen in many long-GRBs is already ruled out by the ground data, but is of course the key to definitely associating this burst with a core-collapse event; ii) precisely position the afterglow on its host galaxy using the invariant PSF of HST to obtain positions much more accurately than is possible from the ground, this will allow us to ascertain if the burst is coincident with the galactic nucleus with far greater confidence and relate the burst to any star-forming regions; iii) characterize the nature of the host galaxy in comparison with those of other GRBs, and hence provide critical clues to the nature of the progenitor.

### **OBSERVING DESCRIPTION**

The aim of this proposal is to obtain HST observations of GRB 101225A utilizing ACS in B and V. We will use observations in F435W and F606W and a three point dither (#13 from ISR 2001-07) to give us a total of 1020s and 880s in each filter respectively. We have shortened the first F606W exposure to avoid issues of buffer dumps within the single orbit observations, while the dither will allow us to remove cosmic rays and ensure against bad pixels etc. We have included a modest range of orient constraints to avoid diffraction spikes from a nearby bright star (R~19), although in practice these are not close to the available orients for the visit.

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Tue Jan 11 02:01:43 GMT 2011

Visit	<b>Proposal 12438, Visit 01</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/WFC Special Requirements: ORIENT 325D TO 35 D; ORIENT 55D TO 125 D; ORIENT 145D TO 215 D; ORIENT 235D TO 305 D									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.138 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=32.99 Angle Between Sides= Center Pattern=false		(1), (2)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	GRB101225A	RA: 00 00 47.4800 (.1978333d) Dec: +44 36 1.00 (44.60028d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	V=25+/-1	Reference Frame: Swift				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) GRB101225A	ACS/WFC, ACCUM, WFC1	F606W				Pattern 1, Exps 1-1 in Visit 01 (1)	1150 Secs [==>200 Secs (Pattern 1)] [==>340 Secs (Pattern 2)] [==>340 Secs (Pattern 3)]	[1]
2	(1) GRB101225A	ACS/WFC, ACCUM, WFC1	F435W				Pattern 1, Exps 2-2 in Visit 01 (1)	1150 Secs [==>340 Secs (Pattern 1)] [==>340 Secs (Pattern 2)] [==>340 Secs (Pattern 3)]	[1]	

