12306 - The proper motion of SGR 0501+4516

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SGR0501+4516	WFC3/IR	1	10-Jul-2010 03:21:25.0	yes

1 Total Orbits Used

ABSTRACT

We propose to obtain two epochs of WFC3/IR imaging of the counterpart of the soft gamma-repeater, SGR 0501+4516 to measure its proper motion and hence identify its birth place and constrain its age in a model independent manner. Our ground based observations have already located the optical/IR counterpart, and provided proper motion limits of <70 mas/yr. The source has now faded significantly since its first discovery and is becoming too faint for detailed ground based study. Using the excellent point spread function, wide field of view, astrometric stability, and sensitivity

of WFC3, we can now make use of HST to directly measure the proper motion of an SGR for the first time. The location of SGR 0501+4516 in the Galactic anti-centre direction, with a likely low distance (~1.5 kpc), coupled with moderate foreground extinction, and no issues of crowding makes it the only SGR source for which such observations are plausible with current technology. Our proposed observations (one in Cycle 18 and one in Cycle 19) with a baseline of ~2 years should constrain the proper motion to better than 3-4 milliarcseconds per year (3 sigma), corresponding to spatial velocities of less than 25 km/s, smaller than the velocities observed for many radio pulsars. Hence we can place the first direct constraints on the kick velocities given to magnetars at their birth, as well as testing models for their age and evolution, and informing estimates of their rate of creation.

OBSERVING DESCRIPTION

We propose to obtain a proper motion for SGR 0501+4516 via two epochs of observations. One will be taken early in Cycle 18, with a second visit to follow towards the end of Cycle 19, providing a time baseline of ~2 years.

We will use the WFC3 IR channel and the F160W observations. We will use a 4 point dither pattern, but have multiplied the standard offsets by a factor of 3 to enable bright stars (which may leave persistence) to be well removed from eachother and hence possible to centroid with accuracy. Additionally we have specified a restricted range of roll angles, such that diffraction spikes from a bright object in the field at large angular spearation, and from fainter, but closer, objects will not overlap our target position.

Visit

Proposal 12306, Visit 01, implementation Sat Jul 10 07:21:29 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 0.0D TO 10.0 D; ORIENT 31D TO 47 D; ORIENT 53D TO 72 D; ORIENT 75D TO 100 D; ORIENT 121D TO 137 D; ORIENT 143D TO 162 D; ORIENT 165D TO 190 D; ORIENT 212D TO 226 D; ORIENT 232D TO 252 D; ORIENT 256D TO 280 D; ORIENT 301D TO 317 D; ORIENT 322D TO 341 D; ORIENT 346D TO 359.9 D; BEFORE 28-OCT-2010:23:59:59

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SGR0501+4516	RA: 05 01 6.7500 (75.2781250d) Dec: +45 16 34.00 (45.27611d) Equinox: J2000		V=27+/-1 K=20.2	Reference Frame: Gemini

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SGR0501+4516	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP100		Pattern 1, Exps 1-1 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure