12434 - Deciphering the Flare in the Crab Nebula:

Cycle: 18, Proposal Category: GO/DD

(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) CRAB-PSR-PWN	ACS/WFC	1	29-Nov-2010 21:56:22.0	yes

1 Total Orbits Used

ABSTRACT

Physics of activity in the "wisps" of the Crab nebula remains poor understood, with shocks, in situ particle acceleration and magnetic field all proposed to be the driving factors. A recent flare in the Crab Nebula discovered with AGILE offers an excellent opportunity to shed the light on this issue. The flare has been successfully observed with Chandra, HST, and VLBI (EVN+MERLIN), with the flaring region (located at ~5" west from the Crab pulsar) remaining in a high state for over two months and showing a brightness temperature of >10^7 . Such a peculiar behavior is difficult to explain with the usual shock scenario. Instead it may imply a magnetic field build up or reconnection, which may turn out a common mechanism driving the activity in the "wisps" inside the Crab nebula. New observations with VLBI (23-24 November) and Chandra (27 November) are aiming at further investigating this possibility. We propose here to image the flaring region concurrently with the HST in order to be able to address radio-optical-X-ray spectral properties and also to study the evolution of the flaring region in all three bands by comparing the new images with the ones made during the previous round of concurrent observations (made about one month ago).

OBSERVING DESCRIPTION

We propose to use the HST/ASC instrument to image optical continuum emission from the Crab nebula and to attempt detecting the region of enhanced emission resulting from the ongoing flare. In order to cover a sufficiently large area and avoid contamination from line emission, we propose to use the WFC-FIX aperture, observing with the broad-band F550M filter. This choice will, in addition, facilitate the comparison with the image from the previous HST ToO observation of the flare (Project 12381), made on October 2, 2010. We propose to use the default 4-point dither box, allocating 550 seconds per single dither pointing. This choice will result in the total on-target time of 2200 seconds, and it will minimize the amount of unused visibility during the observing run.

REAL TIME JUSTIFICATION

The flaring region has been observed recently with VLBI (November 23-24) and Chandra (November 27). Scheduling the HST observation is as closely in time to these observations as possible is desired for improving the accuracy physical modeling and reducing the effect of (likely) emission variability in the flaring region.

Visit

Proposal 12434, Visit 01, implementation Tue Nov 30 02:56:33 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CRAB-PSR-PWN	RA: 05 34 31.9500 (83.6331250d) Dec: +22 00 52.10 (22.01447d) Equinox: J2000	Proper Motion RA: null Proper Motion Dec: null Epoch of Position:	V=16.5+/-0.05	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) CRAB-PSR-PWN	ACS/WFC, ACCUM, WFC-FIX	F550M			Pattern 1, Exps 1-1 in Visit 01 (1)	520 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure