12912 - Imaging the Crab nebula when it is flaring in gamma-rays

Cycle: 20, 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) CRAB	ACS/WFC	1	05-Mar-2013 02:35:10.0	yes

1 Total Orbits Used

ABSTRACT

One of the most intriguing results of the gamma-ray instruments currently in orbit has been the detection of powerful flares from the Crab Nebula in September 2010. In April 2011 a similar flare, lasting several days, made the nebula the brightest source in the gamma-ray sky. A critical reassessment of long term behavior of the Crab flux clearly showed that both Agile and Fermi had already detected similar events in October 2007

and February 2009, pointing to a recurrence time of once per year. A HST observing strategy must be set up to react promptly to any possible new brightening of the Crab in gamma rays. In September 2010 we requested a DD observation which was promptly accepted and carried out. However, the lack of a suitable reference image hampered our efforts to pinpoint the sites of possible variability inside the nebula. Thus, while now we ask for a triggered TOO observation of the Crab Nebula with ACS/WFC in case a gamma-ray flare is announced by the Agile and/or Fermi missions, we are also organizing a regular (monthly) monitoring of the source both in X-ray and optical through a joint Chandra-HST proposal.

OBSERVING DESCRIPTION

We ask to perform simple imaging of the Crab Pulsar and Nebula, reacting with the fastest possible response time to a trigger provided by the detection of a new gamma-ray flare from the Crab nebula by Fermi-LAT and/or AGILE. We will use the same setup we adopted in our ongoing HST monitoring campaign of the Crab. We will use the ACS/WFC with the WFC1 aperture, with the large-band F550M filter, well suited to sample the continuum emission from the system, with almost no contamination from line emission from the SNR filaments. A box dithering pattern will be implemented to fill the inter-chip gap as well as to reject cosmic ray hits. Setting an exposure of 500 s for each position of the dithering pattern results in 2000 s exposure time per visit, which is well suited to achieve our goals and allows for an optimal use of the orbital visibility window. The new image will be compared to the most recent reference one, acquired with an identical instrument setup within a monthly multiwavelength X-ray and optical monitoring campaign proposed as a joint Chandra-HST program. Thanks to the sharp angular resolution of HST, the proposed fast TOO observation will be crucial to pinpoint the region responsible for the puzzling gamma-ray flare.

Visit

Proposal 12912, Visit 01, implementation Tue Mar 05 02:35:18 GMT 2013

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=3.5 Line Spacing=0.5	Coordinate Frame=POS-TARG Pattern Orientation=85.28 Angle Between Sides=85.28 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CRAB	RA: 05 34 31.9500 (83.6331250d) Dec: +22 00 52.10 (22.01447d) Equinox: J2000		V=16.5+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) CRAB	ACS/WFC, ACCUM, WFC1	F550M			Pattern 1, Exps 1-1 in Visit 01 (1)	500 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure