13348 - Imaging the Crab nebula when it is flaring in gamma-rays

Cycle: 21, 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	11-Jul-2013 16:59:52.0	yes
02	(1) CRAB	ACS/WFC	1	11-Jul-2013 16:59:59.0	yes

2 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. Such events, detected roughly once per year, can be very spectacular. Indeed, in April 2011, for a few days the Crab was by far the brightest source in the gamma-ray sky. Such a dramatic variability challenges our understanding of how pulsar wind nebulae work and defies current astrophysical

models for particle acceleration. With the aim of locating the site(s) of the flares, an ad hoc HST strategy must be put in place to be prepared and react promptly in case of a new brightening in gamma rays. We ask here 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. This is a crucial part of a multiwavelength program that we are organizing, based on lessons learnt from our follow-up observations of previous flares, including 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 two-epoch 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. The first-epoch observation should be performed as soon as possible after the trigger, the second-epoch observation about 10 days after the first one. For each epoch, 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 images collected under the proposed ToO will be completed and compared with images acquired with an identical instrument setup within a monthly multiwavelength X-ray and optical monitoring campaign. 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 13348, Visit 01 Thu Jul 11 21:00:06 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 80%; ON HOLD ; TOO RESPONSE TIME 1.0D

On Hold Comments: This is a target of opportunity observation. The trigger will be provided by the detection of a new gamma-ray flare from the Crab nebula by Fermi-LAT and/or AGILE.

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)

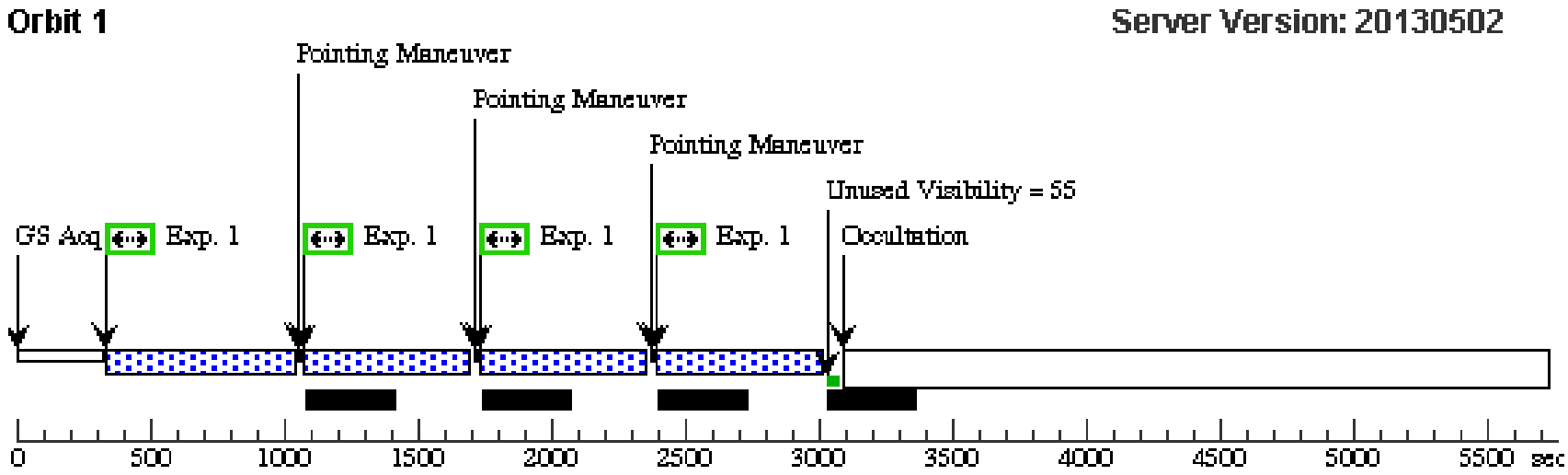
Fixed Targets

#	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 (Total)/[Actual Dur.]	Orbit
1		(1) CRAB	ACS/WFC, ACCUM, WFC1	F550M			Pattern 1, Exps 1-1 in Visit 01 (1)	500 Secs (2000 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13348, Visit 02 Thu Jul 11 21:00:08 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 80%; AFTER 01 BY 8 D TO 12 D

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 (Total)/[Actual Dur.]	Orbit
1		(1) CRAB	ACS/WFC, ACCUM, WFC1	F550M			Pattern 1, Exps 1-1 in Visit 02 (1)	500 Secs (2000 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure