17897 - Community Discovery Program: CXO/VLA/HST observations of GW-detected compact mergers in O4b

Cycle: 32, 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) GW-1	WFC3/UVIS	1	06-Feb-2025 13:00:12.0	yes
02	(1) GW-1	WFC3/UVIS	1	06-Feb-2025 13:00:13.0	yes
03	(1) GW-1	WFC3/UVIS	1	06-Feb-2025 13:00:13.0	yes

3 Total Orbits Used

ABSTRACT

The joint detection of GWs and light from the neutron star (NS) merger GW 170817 ushered us into a new era. Deep X-ray observations of GW 170817 constrained the structural properties of a relativistic outflow launched by an NS merger for the first time. After these landmark discoveries, the frontier is now to map the X-ray properties of a population of sources. We propose to exploit the unique capabilities of XMM-Newton to constrain the broad-band properties of very nearby NS-bearing mergers, selected from LVKC-O4 GW triggers or electromagnetically identified kilonovae. Our immediate goals are: (i) map the diversity of emission from NS mergers, (ii) test the nature of the remnant object, (iii) determine if all mergers launch a jet, and (iv) enable the first X-ray detections of NS-BH mergers.

OBSERVING DESCRIPTION

Our detailed follow-up strategy is as follows: [I] Prompt-bright observation (< 2d), trigger if: (i) detection of a bright (> 5x10-13 erg s-1 cm-2, 0.5-10 keV) X-ray counterpart, OR (ii) bright blue/UV-optical counterpart (V < 18); then trigger one 60 ks XMM-Newton observation within 2d to exploit EPIC (and if bright) RGS science, to search for soft components and absorption studies, and OM with u(the most efficient) filter in timing mode (> 150,000 counts). No particular feasibility is needed. The event should be bright given the triggering criteria and the selected observing modes should avoid pile-up. [II] Follow-up observations at t > 10d if: (i) discovery and localisation of an EM (gamma-rays, X-rays, optical, radio) of a GW-detected NS-bearing event, OR (ii) EM-identified kilonova then (indicatively) we will execute three observations. (1) before peak: 60ks XMM-Newton/EPIC/FF/Thin + HST F606W (1orb) + VLA (2hr@6GHz+2hr@10GHz); (2) at the peak: 60ks XMM-Newton/EPIC/FF/Thin + HST F606W (1orb) + VLA (2hr@6GHz+2hr@10GHz) + 60ks NuSTAR; (3) after peak: 100ks XMM-Newton/EPIC/FF/Thin + HST F606W (1orb) + VLA (2hr@6GHz+2hr@10GHz). For the VLA, we require reaching 3sigma limits of 10 microJy (1.5 hr on-source, 2 hr total) in C-band. If detected, we will trigger another 2-hr observation at 10 GHz to constrain the spectral slope. In one orbit observation HST can reach F606W ~27 mag. HST and VLA will be mandatory to firmly constrain the spectral slope and search for cooling frequency breaks in the spectrum. NuSTAR will detect the

afterglow
if it is brighter than >10-13 erg s-1 cm-2 (0.5-10 keV). This will allow us to extend the wavelength range at peak on a broader wavelength scale.

Our total request is 280 ks XMM-Newton time, 3 orbits of HST, 12 hr of VLA and 60 ks of NuSTAR.

Visit

Proposal 17897, GW-1 (01), implementation Thu Feb 06 18:00:13 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: TOO RESPONSE TIME 15.0D

Generic Targets

#	Name	Criteria	Description
(1)	GW-1	GW trigger	GAMMA RAY BURSTER NEUTRON STAR

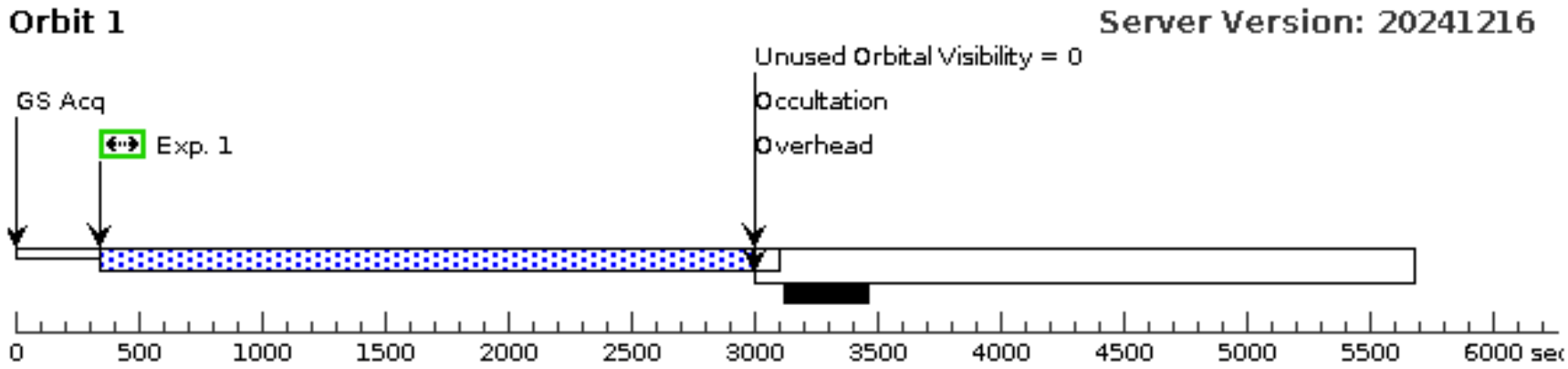
Comments: Electromagnetic counterpart of a GW trigger

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GW-1	WFC3/UVIS, ACCUM, UVIS	F606W		POS TARG 0,0		2400 Secs (2617 Secs) *[==>2617.0 Secs]*	 ***[1]***

Comments: TOO observation

Orbit Structure



Visit

Proposal 17897, GW-1 (02), implementation Thu Feb 06 18:00:13 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: TOO RESPONSE TIME 100.0D

Generic Targets

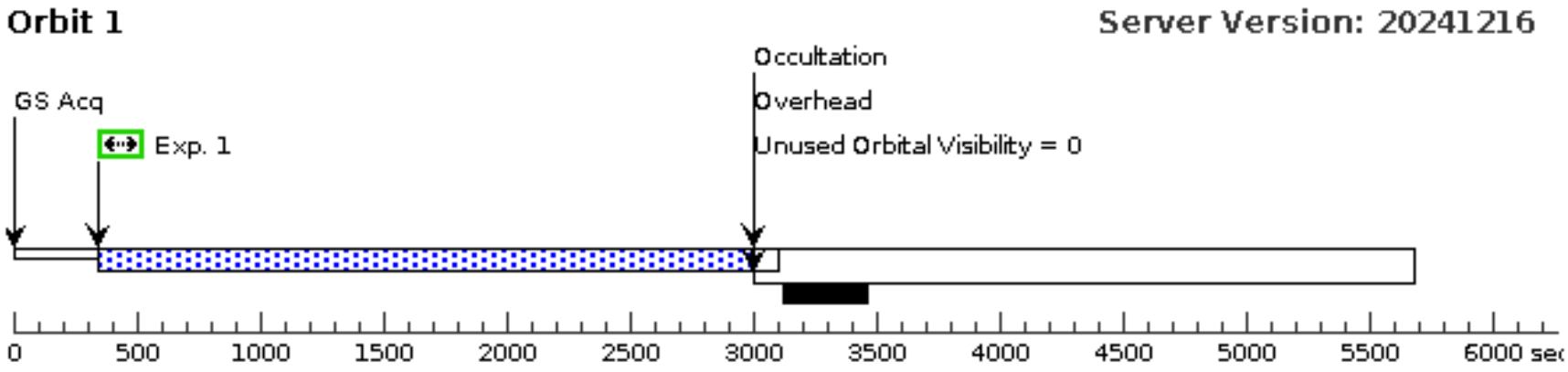
#	Name	Criteria	Description
(1)	GW-1	GW trigger	GAMMA RAY BURSTER NEUTRON STAR

Comments: Electromagnetic counterpart of a GW trigger

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GW-1	WFC3/UVIS, ACCUM, UVIS	F606W				2400 Secs (2617 Secs) *[==>2617.0 Secs]*	 ***[1]***

Orbit Structure



Visit

Proposal 17897, GW-1 (03), implementation Thu Feb 06 18:00:13 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: TOO RESPONSE TIME 200.0D

Generic Targets

#	Name	Criteria	Description
(1)	GW-1	GW trigger	GAMMA RAY BURSTER NEUTRON STAR

Comments: Electromagnetic counterpart of a GW trigger

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GW-1	WFC3/UVIS, ACCUM, UVIS	F606W				2400 Secs (2617 Secs) *[==>2617.0 Secs]*	 ***[1]***

Orbit Structure