18217 - X-ray Flashes as Dirty Fireballs or Off-axis GRBs

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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Gokul Prem Srinivasaragavan (CoI)	University of Maryland
Dr. Stephen Bradley Cenko (CoI)	NASA Goddard Space Flight Center

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) XRF	WFC3/UVIS	1	08-Dec-2025 13:01:23.0	yes
02	(1) XRF	WFC3/UVIS	2	08-Dec-2025 13:01:24.0	yes
03	(1) XRF	WFC3/UVIS	2	08-Dec-2025 13:01:25.0	yes

5 Total Orbits Used

ABSTRACT

The collapsar model provides a very good model for the energetics, prompt gamma-ray emission, and the subsequent afterglow emission of long-duration GRBs. However, it does not provide a ready explanation for the apparent variations in the opening angle of the jet and in the explosive energy release. It has been speculated that there exist classes of relativistic explosions which have a lower Lorentz factor and wider opening angle than classical GRBs that peak in the X-ray band, known as dirty fireballs, with afterglows similar to classical GRBs. A decade long search with ground- based optical surveys has found a dozen afterglows without a gamma-ray trigger, but their physical interpretation have been limited by a lack

of coverage by high-energy missions, as well as a dearth of late-time sensitive afterglow observations. The recently launched Einstein Probe (EP) and Space Variable Objects Monitor (SVOM) are changing this landscape, offering a clear path to identify dirty fireballs. Here, we propose a comprehensive program with the VLA, XMM-Newton, and HST to help distinguish dirty fireballs from their primary false positives, GRBs viewed slightly off-axis. The discovery of a single dirty fireball would have a dramatic impact on our view of the GRB phenomenon.

OBSERVING DESCRIPTION

This is a target-of-opportunity proposal. We will trigger on one object with HST. For that object, we will obtain three epochs of ToO observations with WFC3. The first will be one orbit at 1-2 months after discovery (i.e., non-disruptive) in the F606W filter. The second will be at 2-4 months, also in F606W, this time two orbits. And the third will be after the transient light has faded, 2 additional orbits in F606W for the purpose of subtracting out the host-galaxy contribution. So, the total HST observation comes out to 5 orbits of WFC3/F606W observations.

Visit

Proposal 18217, Visit 01, implementation Mon Dec 08 18:01:25 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: TOO RESPONSE TIME 30.0D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)

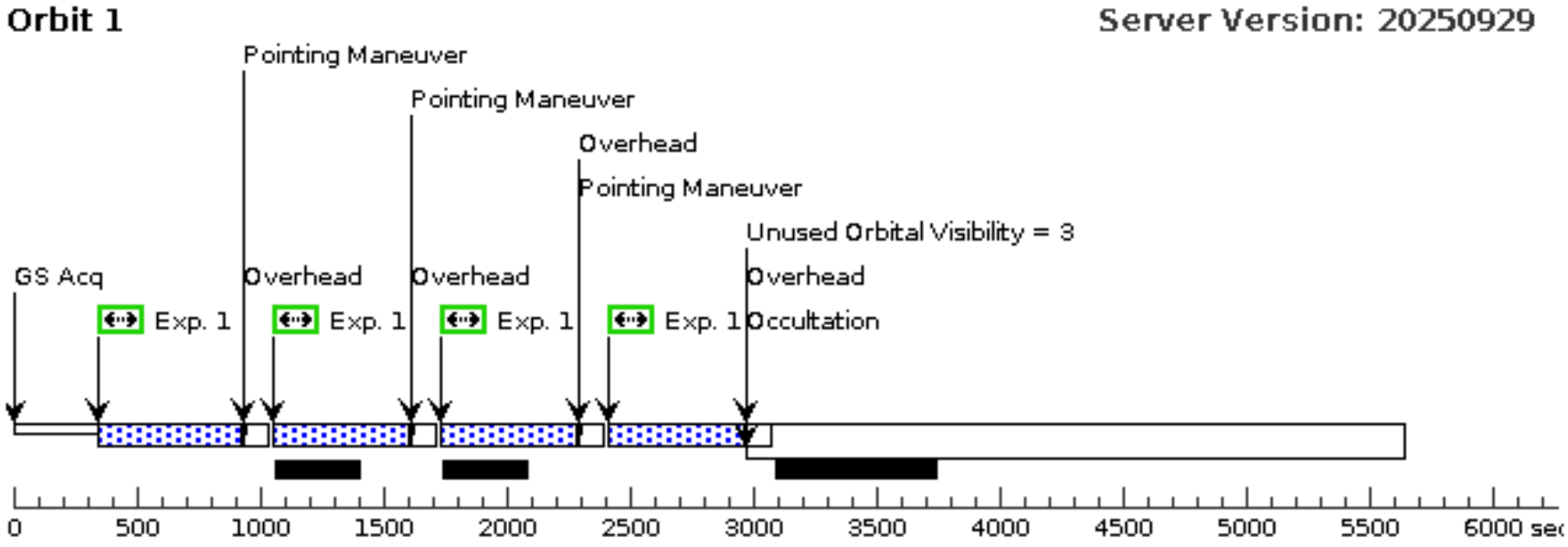
Generic Targets

#	Name	Criteria	Description
(1)	XRF	Soft X-ray flash (Ep<25 keV, Eiso>1E51 erg)	

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) XRF	WFC3/UVIS, ACCUM, UVIS	F606W			Pattern 1, Exps 1-1 in Visit 01 (1)	551 Secs (2204 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 18217, Visit 02, implementation Mon Dec 08 18:01:25 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: TOO RESPONSE TIME 30.0D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1), (2)

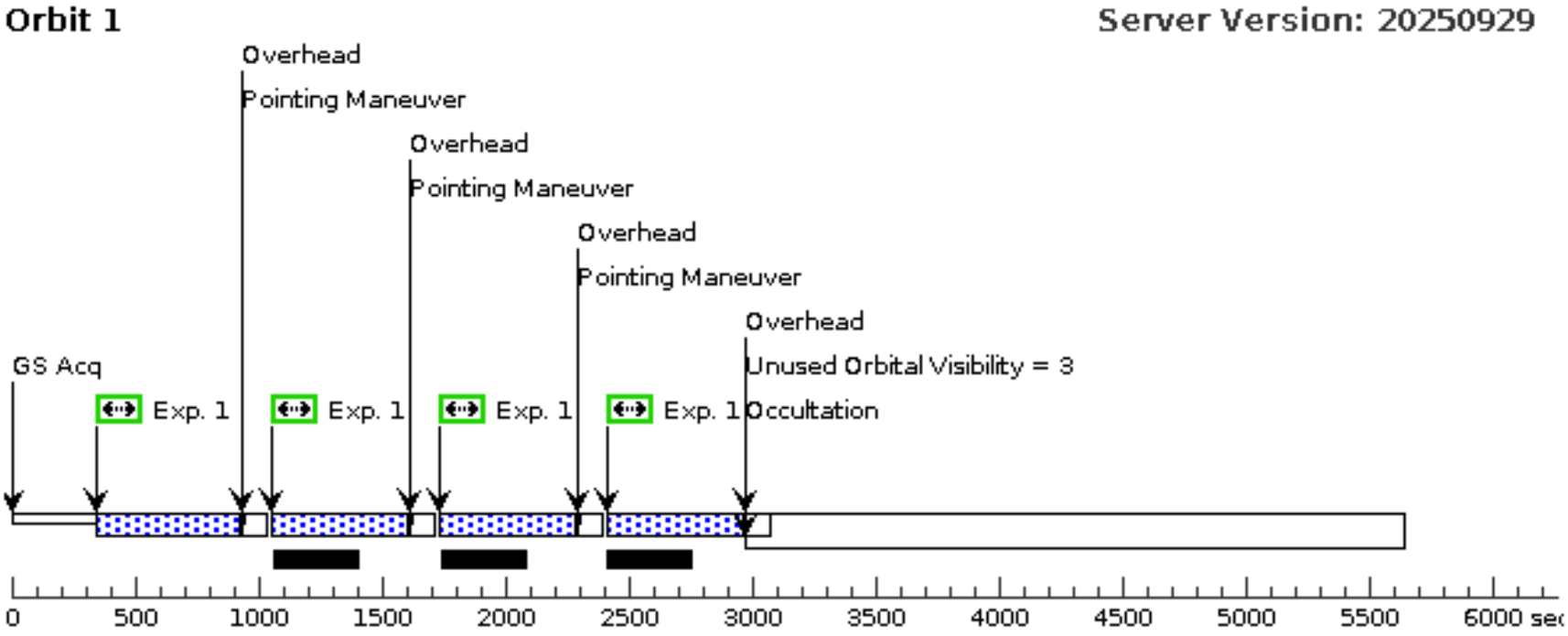
Generic Targets

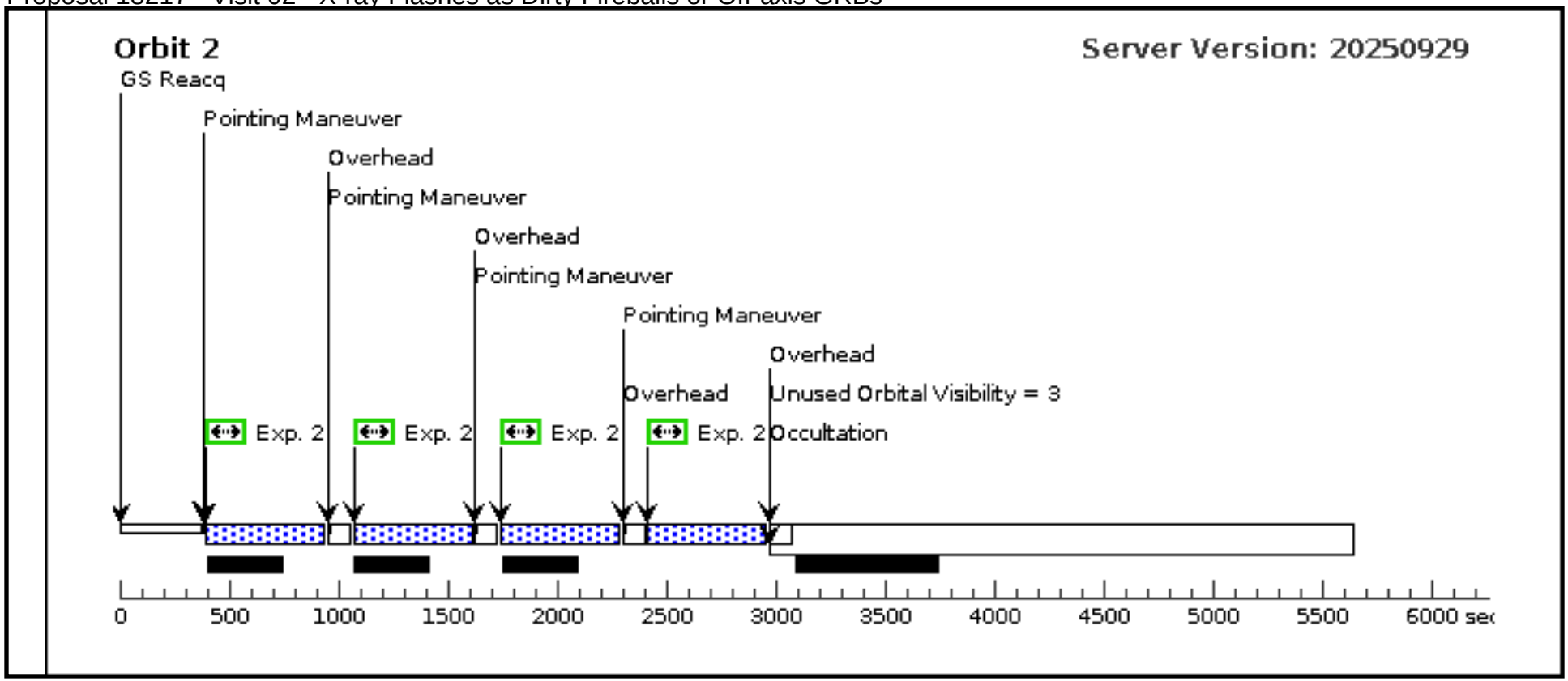
#	Name	Criteria	Description
(1)	XRF	Soft X-ray flash (Ep<25 keV, Eiso>1E51 erg)	

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) XRF	WFC3/UVIS, ACCUM, UVIS	F606W			Pattern 1, Exps 1-1 in Visit 02 (1)	551 Secs (2204 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) XRF	WFC3/UVIS, ACCUM, UVIS	F606W			Pattern 1, Exps 2-2 in Visit 02 (1)	546 Secs (2184 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250929
GS Reacq
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Overhead
Unused Orbital Visibility = 3
Exp. 2
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18217, Visit 03, implementation Mon Dec 08 18:01:25 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: TOO RESPONSE TIME 30.0D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1), (2)

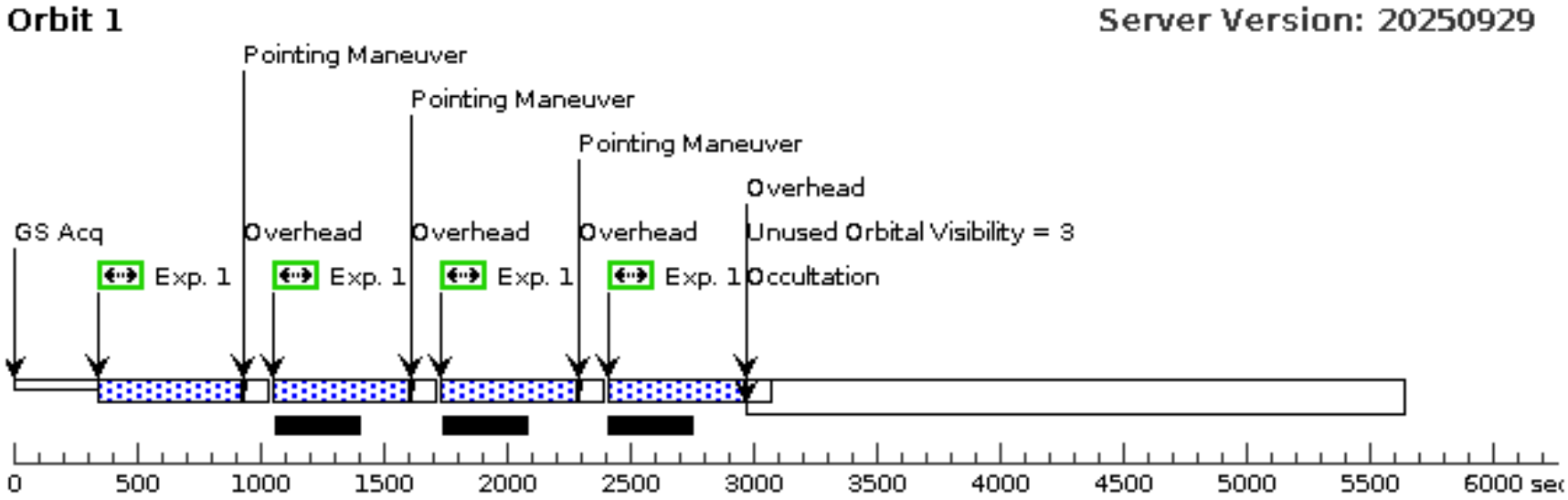
Generic Targets

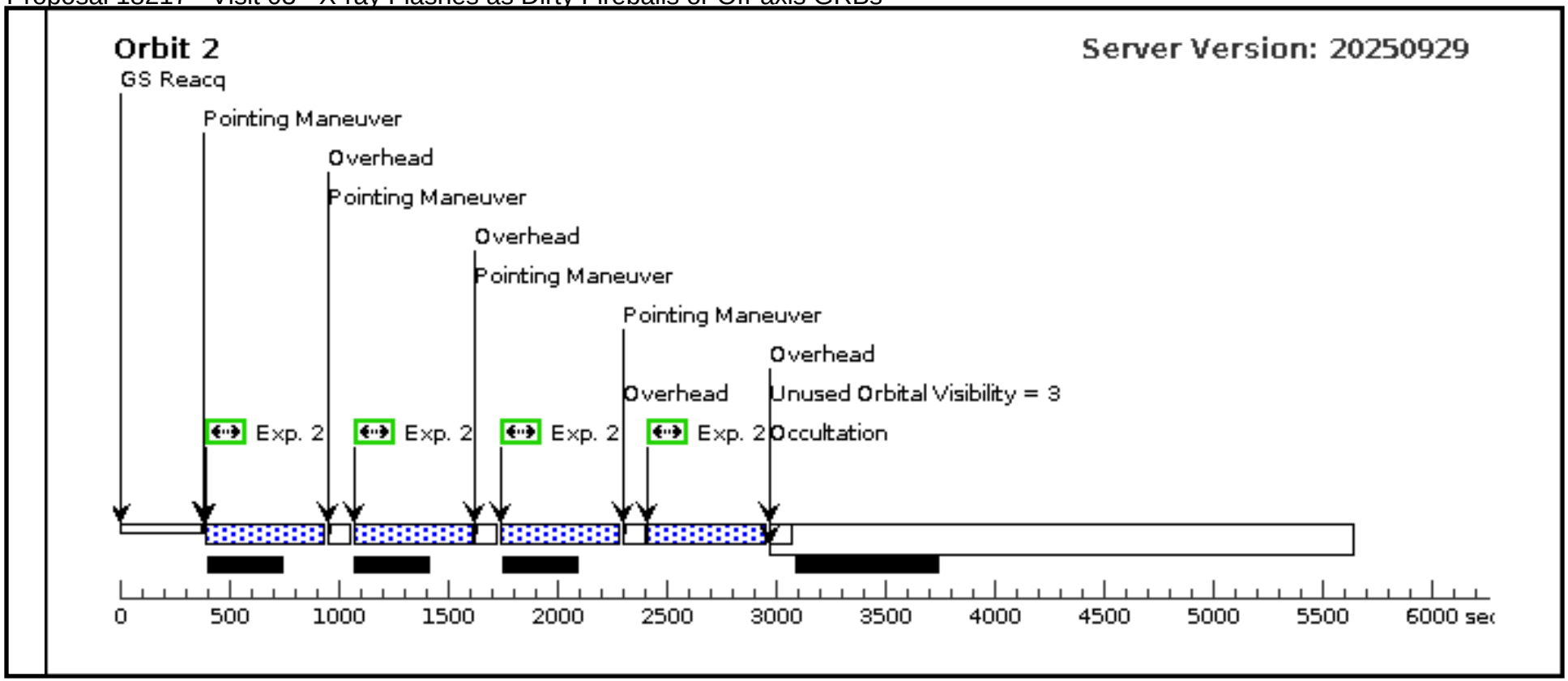
#	Name	Criteria	Description
(1)	XRF	Soft X-ray flash (Ep<25 keV, Eiso>1E51 erg)	

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) XRF	WFC3/UVIS, ACCUM, UVIS	F606W			Pattern 1, Exps 1-1 in Visit 03 (1)	551 Secs (2204 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) XRF	WFC3/UVIS, ACCUM, UVIS	F606W			Pattern 1, Exps 2-2 in Visit 03 (1)	546 Secs (2184 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250929
GS Reacq
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Overhead
Unused Orbital Visibility = 3
Exp. 2
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec