16320 - Do collapsars make the heavy elements: A sensitive search in a nearby gamma-ray burst?

Cycle: 28, Proposal Category: GO

(Availability Mode: SUPPORTED)

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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) GRB190829A	WFC3/IR	2	30-Jun-2020 11:08:06.0	yes
02	(1) GRB190829A	WFC3/IR	2	30-Jun-2020 11:08:07.0	yes
03	(1) GRB190829A	WFC3/IR WFC3/UVIS	1	30-Jun-2020 11:08:08.0	yes

5 Total Orbits Used

ABSTRACT

The origin of half of the elements heavier than iron -- the so-called r-process elements -- is a central unsolved mystery in astrophysics. These atoms include both precious metals (e.g. gold) as well as radioactive elements required for geophysical processes on the Earth (e.g. thorium) and even some which are necessary on Earth for advanced life (e.g. iodine). Recent observations with both light and gravitational waves have demonstrated that at least some of these elements are formed through the merger of two neutron stars, but such a population struggles to reproduce the enrichment patterns seen in stars within the Milky Way as well apparent early enrichment in some dwarf galaxies. Instead, recent work implies that the accretion disks formed in the stellar collapse that powers a long duration gamma-ray burst could in-fact be a dominant site. If this is true we should be able to observe r-process synthesis in the associated supernovae. The presence of lanthanides in r-process material creates strong opacity, such that the signature of their synthesis should be a late time infrared component visible in the supernova light. Here we propose sensitive HST observations that will search for both spectroscopic and photometric evidence of the r-process, providing the opportunity to test, for the first time, if collapsars are responsible for heavy element production.

OBSERVING DESCRIPTION

This is a submission for the final 5 oribits of our programme. The aim is to obtain template images and spectroscopy to subtract from our earlier data. Therefore we have set a stringent roll constraint on the spectroscopic observations so that they match the observations obtained in fall 2019. Otherwise these are a repeat of observations already taken under the for-runner of this programme.

Visit

Proposal 16320, Visit 01, implementation Tue Jun 30 15:08:08 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 48.0012D TO 48.0012 D; SEQ 01,02,03 WITHIN 7 D

Fixed Targets

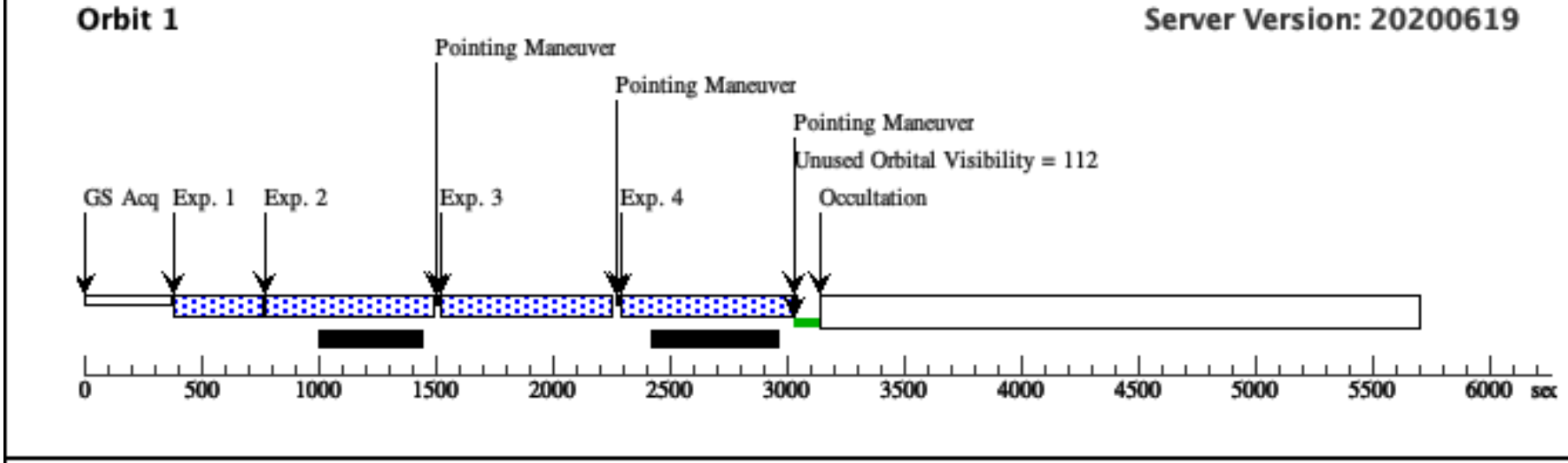
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190829A	RA: 02 58 10.5100 (44.5437917d) Dec: -08 57 29.30 (-8.95814d) Equinox: J2000		V=22+/-2	Reference Frame: ICRS

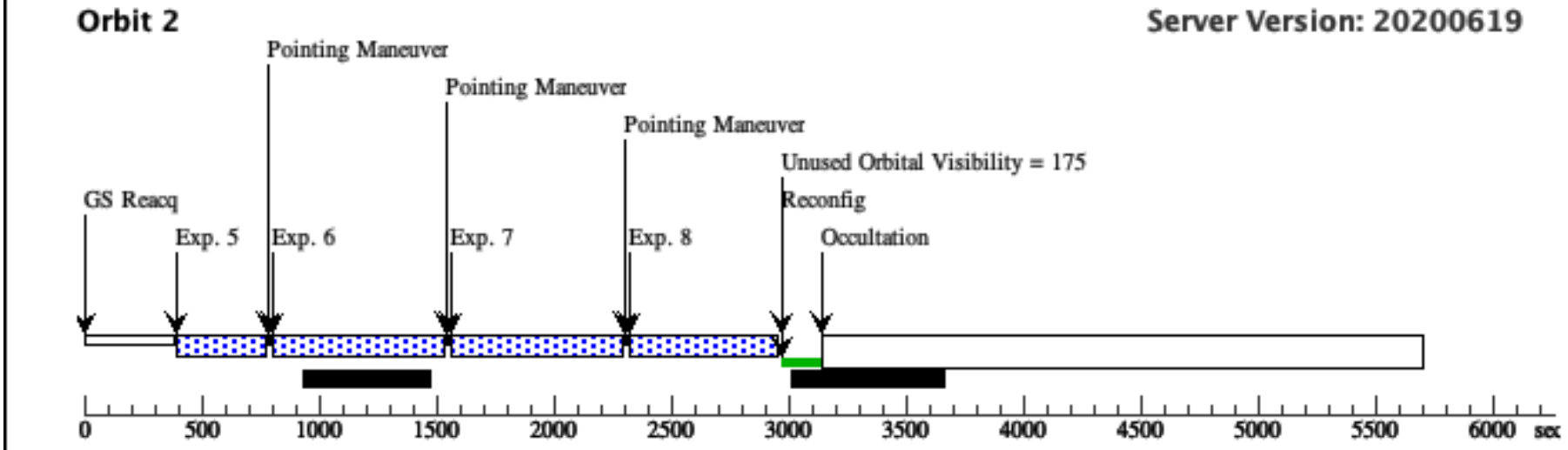
Comments:
Category=UNIDENTIFIED
Description=[X-RAY EMITTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	F125W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG -28.613 66496118098,-32.61113946018116; GS ACQ SCENARIO BASE1B3	Sequence 1-4 Non-Int in Visit 01	349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
2		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -28.613 66496118098,-32.61113946018116	Sequence 1-4 Non-Int in Visit 01	699.232615 Secs (699.233 Secs) *[==>]*	*[1]*
3		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -27.260 66496118098,-31.402139460181157	Sequence 1-4 Non-Int in Visit 01	699.232615 Secs (699.233 Secs) *[==>]*	*[1]*
4		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -25.907 66496118098,-30.193139460181158	Sequence 1-4 Non-Int in Visit 01	699.232615 Secs (699.233 Secs) *[==>]*	*[1]*
5		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	F125W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG -28.613 66496118098,-32.61113946018116	Sequence 5-8 Non-Int in Visit 01	349.232932 Secs (349.233 Secs) *[==>]*	*[2]*
6		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -27.596 66496118098,-32.24813946018116	Sequence 5-8 Non-Int in Visit 01	699.232615 Secs (699.233 Secs) *[==>]*	*[2]*
7		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -26.243 66496118098,-31.039139460181158	Sequence 5-8 Non-Int in Visit 01	699.232615 Secs (699.233 Secs) *[==>]*	*[2]*
8		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=12; SAMP-SEQ=STEP100	POS TARG -24.890 66496118098,-29.827139460181158	Sequence 5-8 Non-Int in Visit 01	599.232292 Secs (599.232 Secs) *[==>]*	*[2]*

Orbit Structure





Visit

Proposal 16320, Visit 02, implementation Tue Jun 30 15:08:08 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SAME ORIENT AS 01

Fixed Targets

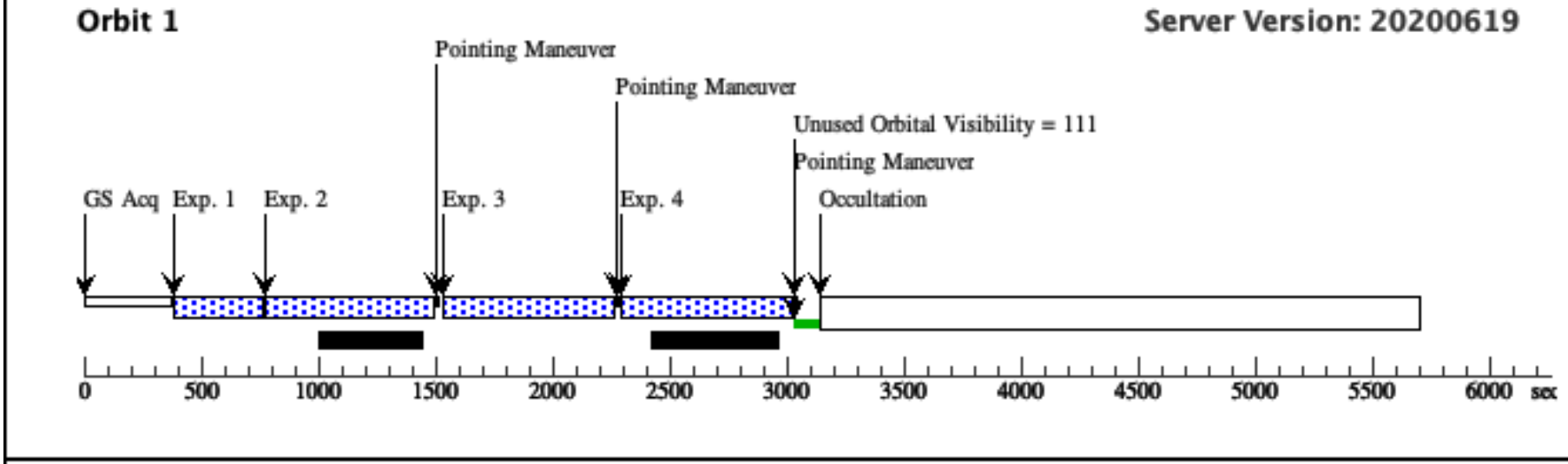
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190829A	RA: 02 58 10.5100 (44.5437917d) Dec: -08 57 29.30 (-8.95814d) Equinox: J2000		V=22+/-2	Reference Frame: ICRS

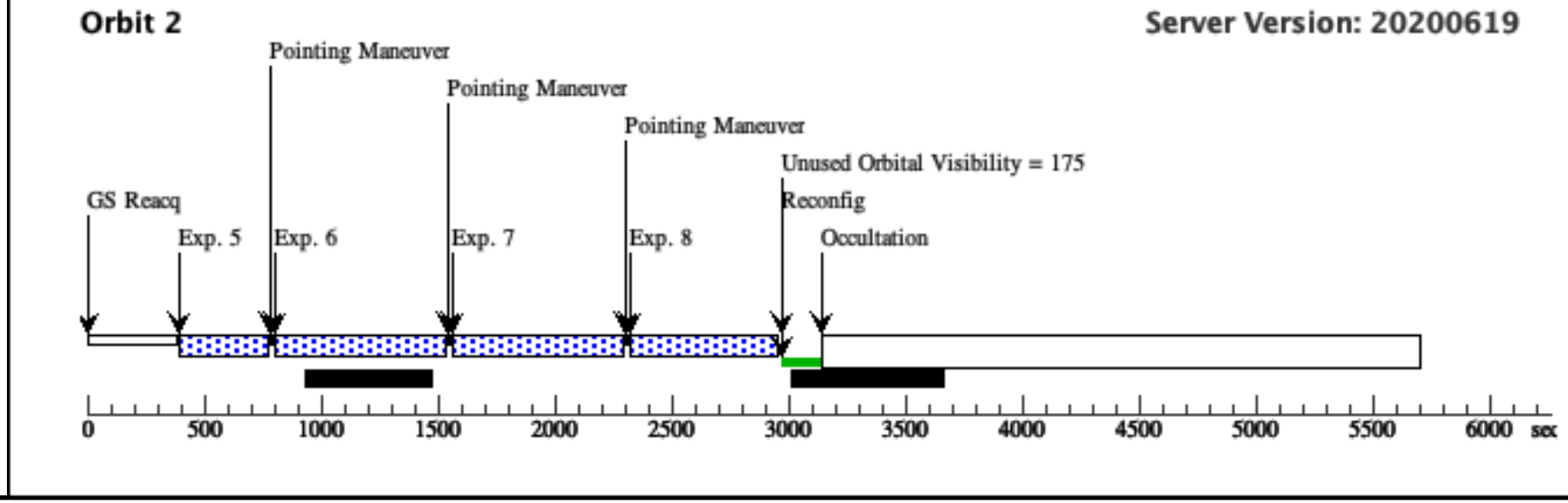
Comments:
Category=UNIDENTIFIED
Description=[X-RAY EMITTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	F140W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG -28.613 66496118098,-32.61113946018116; GS ACQ SCENARIO BASE1B3	Sequence 1-4 Non-Int in Visit 02	349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
2		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -28.613 66496118098,-32.61113946018116	Sequence 1-4 Non-Int in Visit 02	699.232615 Secs (699.233 Secs) *[==>]*	*[1]*
3		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -27.260 66496118098,-31.402139460181157	Sequence 1-4 Non-Int in Visit 02	699.232615 Secs (699.233 Secs) *[==>]*	*[1]*
4		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -25.907 66496118098,-30.193139460181158	Sequence 1-4 Non-Int in Visit 02	699.232615 Secs (699.233 Secs) *[==>]*	*[1]*
5		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	F140W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG -28.613 66496118098,-32.61113946018116	Sequence 5-8 Non-Int in Visit 02	349.232932 Secs (349.233 Secs) *[==>]*	*[2]*
6		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -27.596 66496118098,-32.24813946018116	Sequence 5-8 Non-Int in Visit 02	699.232615 Secs (699.233 Secs) *[==>]*	*[2]*
7		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=13; SAMP-SEQ=STEP100	POS TARG -26.243 66496118098,-31.039139460181158	Sequence 5-8 Non-Int in Visit 02	699.232615 Secs (699.233 Secs) *[==>]*	*[2]*
8		(1) GRB190829A	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=12; SAMP-SEQ=STEP100	POS TARG -24.890 66496118098,-29.827139460181158	Sequence 5-8 Non-Int in Visit 02	599.232292 Secs (599.232 Secs) *[==>]*	*[2]*

Orbit Structure





Visit

Proposal 16320, Visit 03, implementation Tue Jun 30 15:08:09 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1)
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(2)

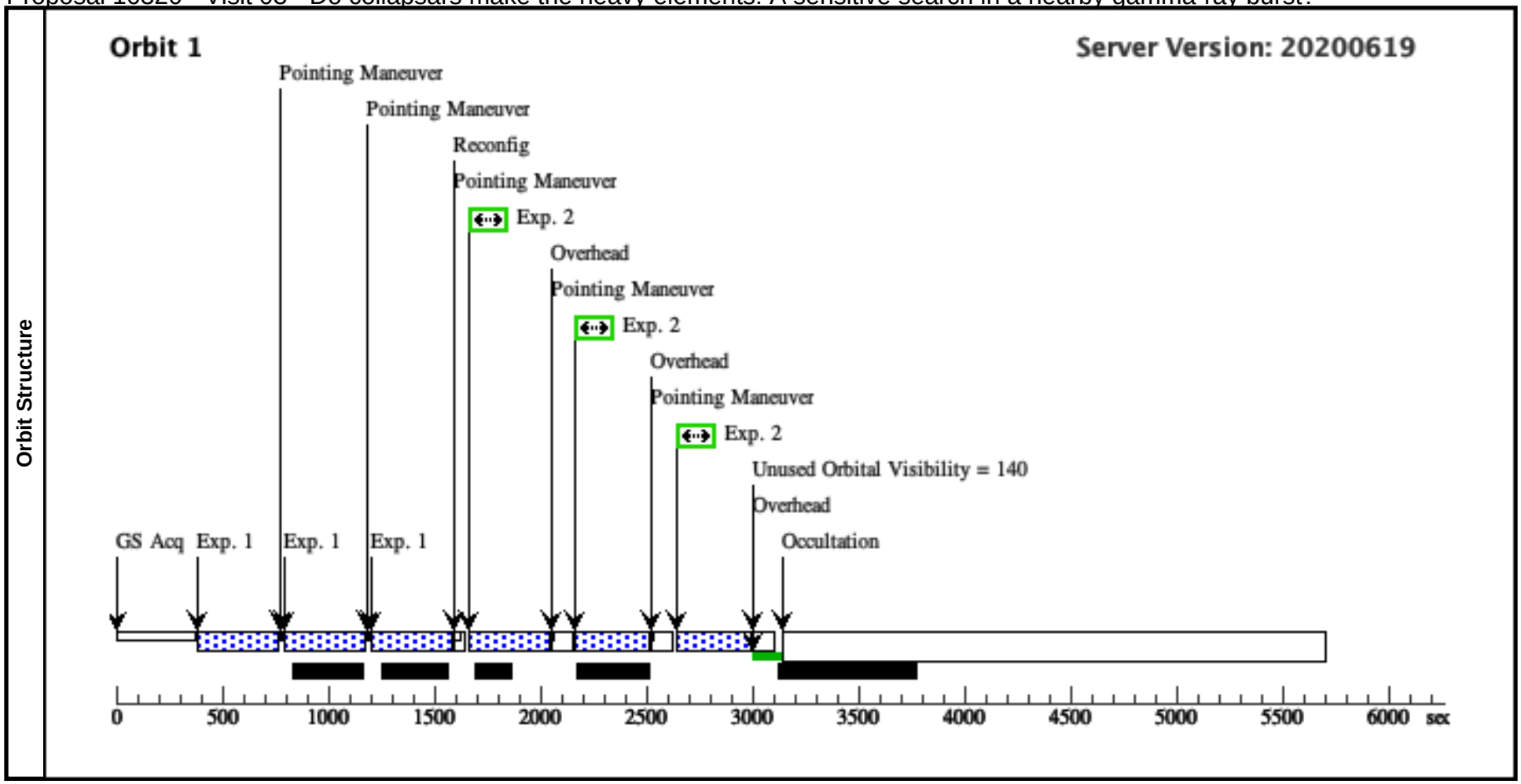
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190829A	RA: 02 58 10.5100 (44.5437917d) Dec: -08 57 29.30 (-8.95814d) Equinox: J2000		V=22+/-2	Reference Frame: ICRS

Comments:
Category=UNIDENTIFIED
Description=[X-RAY EMITTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190829A	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=12; SAMP-SEQ=STEP50	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in Visit 03 (1)	349.232932 Secs (1047.699 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
2		(1) GRB190829A	WFC3/UVIS, ACCUM, UVIS1	F606W			Pattern 2, Exps 2-2 in Visit 03 (2)	348 Secs (1044 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***


Orbit Structure
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Server Version: 20200619
Pointing Maneuver
Pointing Maneuver
Reconfig
Pointing Maneuver
Exp. 2
Overhead
Pointing Maneuver
Exp. 2
Overhead
Pointing Maneuver
Exp. 2
Unused Orbital Visibility = 140
Overhead
Occultation
GS Acq
Exp. 1
Exp. 1
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec