



14607 - Identify the signature of neutron star mergers through rapid Hubble observations of a short GRB

Cycle: 24, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) GW170817	WFC3/UVIS	1	16-May-2018 13:02:35.0	yes
02	(1) GW170817	WFC3/UVIS	1	16-May-2018 13:02:36.0	yes
03	(1) GW170817	WFC3/UVIS	1	16-May-2018 13:02:37.0	yes
04	(2) SHORTGRB	WFC3/IR	1	16-May-2018 13:02:37.0	yes

4 Total Orbits Used

ABSTRACT

The afterglow of some short GRBs displays a late-time rebrightening, visible a few days after the gamma-ray burst. Recent HST observations provided tantalizing evidence that such late-time bump could be explained as the emergence of the underlying kilonova emission. This would

represent the incontrovertible signature of a neutron star merger, and the first direct link between short GRBs and their progenitors. If the kilonova interpretation is correct, it would also confirm that neutron star mergers are significant and possibly dominant sources of the heaviest elements (e.g. gold, platinum, uranium) in the Universe.

Here we ask for rapid HST follow-up observation of a nearby ($z < 0.4$) short duration GRB in order to detect the expected kilonova bump, and to constrain the origin of the observed emission. Multi-color observations are critical to pin down the nature of the observed rebrightening, and to distinguish it from the standard afterglow. The proposed observations will provide the smoking gun evidence connecting short GRBs and neutron star mergers, and will serve as a powerful observational input in the forthcoming era of gravitational wave astronomy.

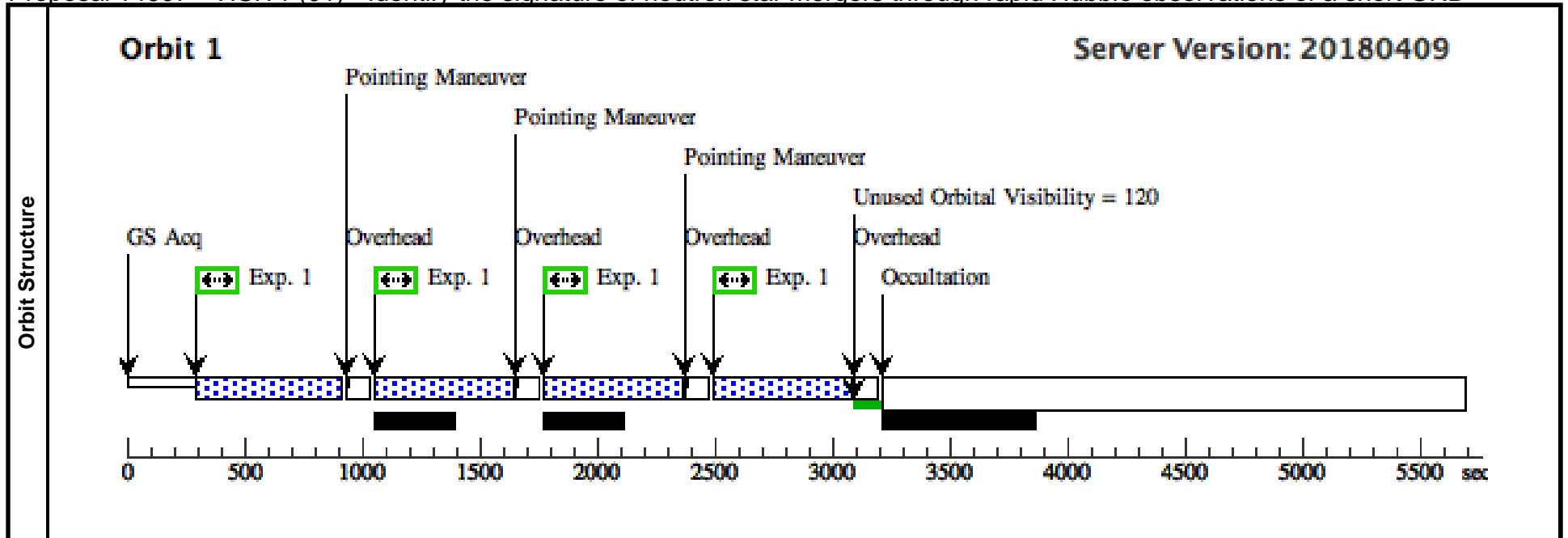
OBSERVING DESCRIPTION

Below we provide an illustrative description of our observational strategy. Given the broad range of short GRB redshifts, afterglow and host properties, the exact details of the observations (response time, cadence, and filters) will be determined on a case by case basis. We request four epochs of observations, the exact times will be scaled according to the observed afterglow decay, the GRB distance scale, and the total time span of the ground-based data. We will plan our observations in order to require a reaction time > 2 days. Each epoch will consist of three orbits in order to image the target in different colors. We remark that the choice of UVIS and IR filters reported in this observing form is preliminary, and the final selection will be made at the time of the ToO in order to match the best sampled light curves from the ground.

Proposal 14607 - VISIT1 (01) - Identify the signature of neutron star mergers through rapid Hubble observations of a short GRB

Wed May 16 17:02:38 GMT 2018

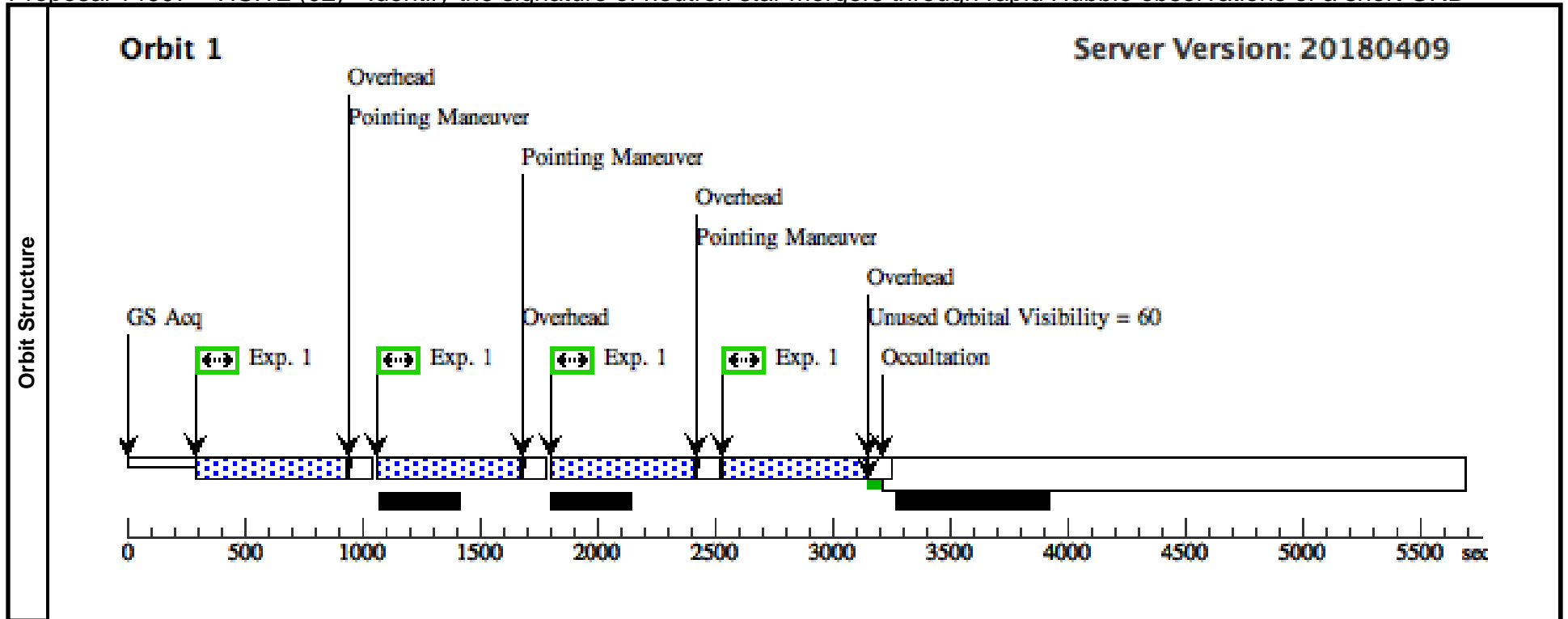
Visit	Proposal 14607, VISIT1 (01), completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 0D TO 90 D; ORIENT 130D TO 190 D; ORIENT 225D TO 285 D; ORIENT 335D TO 345 D; ON HOLD ; TOO RESPONSE TIME 25.0H Comments: <i>Our favorite time-window is between January 26 and February 1st, in coordination with scheduled Chandra, XMM-Newton and ATCA observations</i> On Hold Comments: <i>nearby GRB</i>									
	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)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	GW170817	RA: 13 09 48.0850 (197.4503542d) Dec: -23 22 53.34 (-23.38148d) Equinox: J2000		V=28 F606W~27 AB mag	Reference Frame: SIMBAD				
	Comments: Category=STAR Description=[GAMMA RAY BURSTER] Extended=NO									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	UVIS	(1) GW170817	WFC3/UVIS, ACCUM, UVIS	F606W		GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in VISIT1 (01) (1)	500 Secs (2372 Secs) [==>593 Secs (Pattern 1)] [==>593 Secs (Pattern 2)] [==>593 Secs (Pattern 3)] [==>593 Secs (Pattern 4)]	[1]



Proposal 14607 - VISIT2 (02) - Identify the signature of neutron star mergers through rapid Hubble observations of a short GRB

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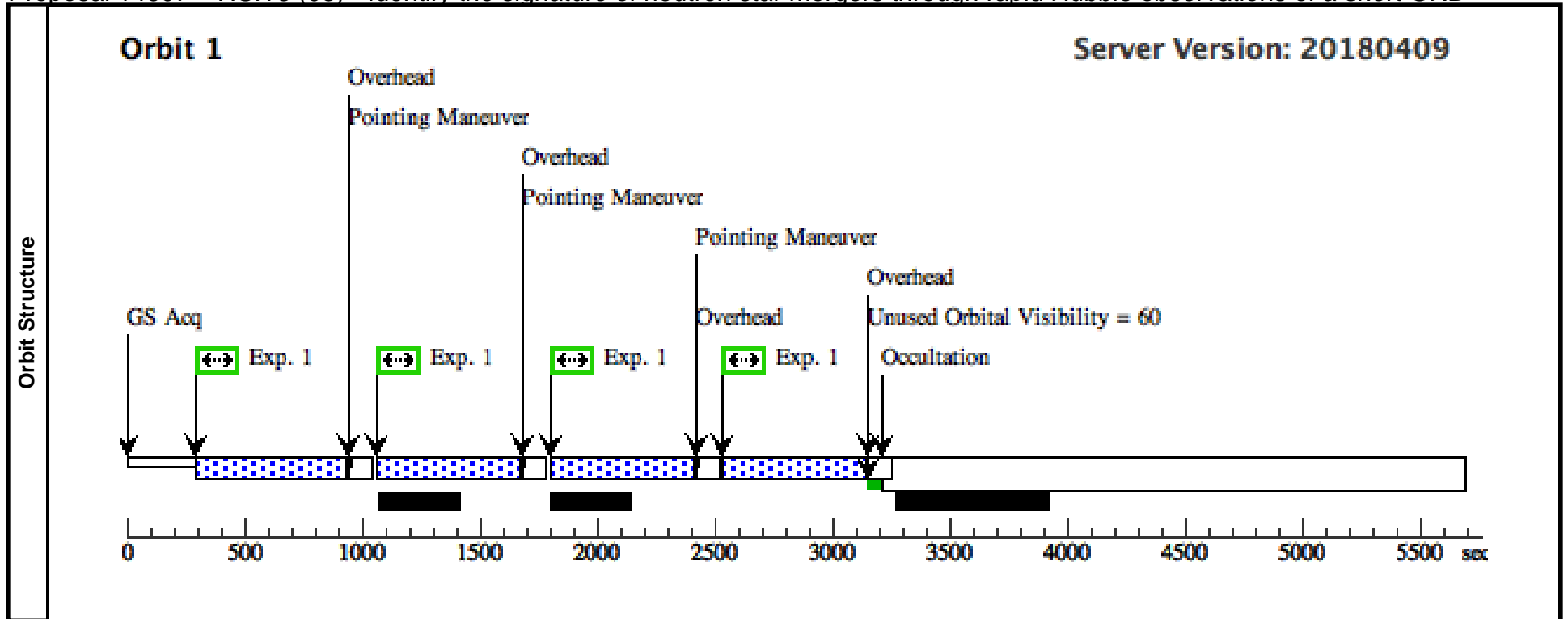
Visit	Proposal 14607, VISIT2 (02), completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 0D TO 90 D; ORIENT 130D TO 190 D; ORIENT 225D TO 285 D; ORIENT 335D TO 345 D; AFTER 01 BY 30 D TO 45 D; ON HOLD ; TOO RESPONSE TIME 25.0H Comments: <i>Our favorite time-window is between February 28 and March 3rd.</i> On Hold Comments: <i>nearby GRB</i>										
	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)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	GW170817	RA: 13 09 48.0850 (197.4503542d) Dec: -23 22 53.34 (-23.38148d) Equinox: J2000				V=28 F606W~27 AB mag		Reference Frame: SIMBAD		
Comments: Category=STAR Description=[GAMMA RAY BURSTER] Extended=NO											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	UVIS	(1) GW170817	WFC3/UVIS, ACCUM, UVIS	F606W		GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in VISIT2 (02) (1)	500 Secs (2432 Secs) [==>608.0 Secs (Pattern 1)] [==>608.0 Secs (Pattern 2)] [==>608.0 Secs (Pattern 3)] [==>608.0 Secs (Pattern 4)]		[1]



Proposal 14607 - VISIT3 (03) - Identify the signature of neutron star mergers through rapid Hubble observations of a short GRB

Wed May 16 17:02:38 GMT 2018

Visit	Proposal 14607, VISIT3 (03), scheduling Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: ORIENT 0D TO 90 D; ORIENT 130D TO 190 D; ORIENT 225D TO 285 D; ORIENT 335D TO 345 D; AFTER 02 BY 75 D TO 90 D; ON HOLD ; TOO RESPONSE TIME 25.0H Comments: <i>Our favorite time-window is between May 15th and June 1st.</i> On Hold Comments: <i>nearby GRB</i>									
	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)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	GW170817	RA: 13 09 48.0850 (197.4503542d) Dec: -23 22 53.34 (-23.38148d) Equinox: J2000		V=28 F606W~27 AB mag	Reference Frame: SIMBAD				
	Comments: Category=STAR Description=[GAMMA RAY BURSTER] Extended=NO									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	UVIS	(1) GW170817	WFC3/UVIS, ACCUM, UVIS	F606W		GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-1 in VISIT3 (03) (1)	500 Secs (2432 Secs) [==>608.0 Secs (Pattern 1)] [==>608.0 Secs (Pattern 2)] [==>608.0 Secs (Pattern 3)] [==>608.0 Secs (Pattern 4)]	[1]



Proposal 14607 - NEW VISIT3 (04) - Identify the signature of neutron star mergers through rapid Hubble observations of a short GRB

Wed May 16 17:02:39 GMT 2018

Visit	Proposal 14607, NEW VISIT3 (04) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: ORIENT 50D TO 130 D Comments: <i>We'd like to keep the same orientation from previous visits of the same target.</i>		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	SHORTGRB	RA: 18 39 54.5600 (279.9773333d) Dec: +62 23 30.50 (62.39181d) Equinox: J2000		V=25	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[GAMMA RAY BURSTER, NEUTRON STAR, SUPERNOVA, X-RAY BURSTER, X-RAY TRANSIENT]

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(2) SHORTGRB	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP100; NSAMP=13			Pattern 2, Exps 1-1 in NEW VISIT3 (04) (2)	699.232615 Secs (2796.93 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]

