15684 - The progenitor and physics of the first TeV gamma-ray burst

Cycle: 26, Proposal Category: GO/DD

(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) GRB190114C	ACS/WFC	2	25-Apr-2019 12:00:41.0	yes
02	(1) GRB190114C	ACS/WFC	1	25-Apr-2019 12:00:42.0	yes
04	(1) GRB190114C	ACS/WFC	1	25-Apr-2019 12:00:43.0	yes
03	(1) GRB190114C	ACS/WFC	2	25-Apr-2019 12:00:44.0	yes

6 Total Orbits Used

ABSTRACT

The detection by the MAGIC telescope of GRB 190114C, with photons approaching TeV energies, marks it as the first GRB to create luminous emission in this extreme energy range. At a redshift of z=0.41, scattering off the extragalactic background light (EBL) should greatly diminish the luminosity at this energy, and its detection is either implying something about fundamental physics, or suggesting an event which can create a truly exceptional high energy component. Here we propose a programme of HST observations that will dissect the details of this explosion; we will track the source as it fades into its host, determine the true energy (through the detection of any so-called jet-break) and disentangle the afterglow from any associated supernova. These observations will constrain the physics of the GRB emission and compare the properties of the progenitor star - through its supernova -- with those of other GRBs. Together this will enable us to test the origin of this extreme burst. Hot on the heels of the detection of gravitational waves and high energy neutrinos this detection of TeV photons from a GRB further highlights how new technologies enable insights into hitherto inaccessible areas of science.

OBSERVING DESCRIPTION

Our aim is to characterise the afterglow, supernova and host galaxy of GRB 190114C, the first GRB to be detected at GeV energies. We will do this via imaging and grism spectroscopy.

Our first epoch will consist of two orbits of grism spectroscopy using a 4-point dither (and also obtaining two direct images in F606W). A second visit will contain imaging observations in F475W/F775W and F850LP. Combined these will allow us to measure the properties of any associated supernova as well as obtaining a blue point which will provide a better measurement of the afterglow light. These images will also charaterize the morphology of the host galaxy.

Beyond this we intend to obtain two further epochs of imaging (1 orbit each), with the precise strategy dictacted by the outcome of earlier observations (both on the ground and with HST). These will be requested with a >3 week turnaround.

Visit

Proposal 15684, Visit 01, completed Thu Apr 25 16:00:45 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=18.39		
	Number Of Points=4	Angle Between Sides=68.14		
	Point Spacing=0.262	Center Pattern=false		
	Line Spacing=0.192			

Fixed Targets

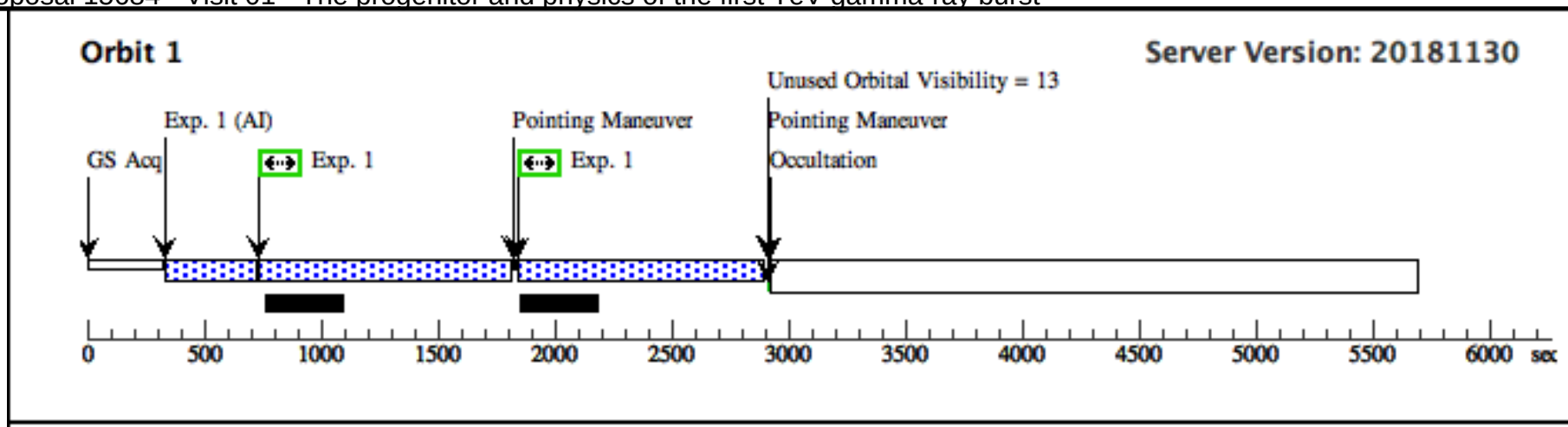
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190114C	RA: 03 38 1.1600 (54.5048333d)		V=22+/-2	Reference Frame: ICRS
		Dec: -26 56 46.90 (-26.94636d)			
		Equinox: J2000			

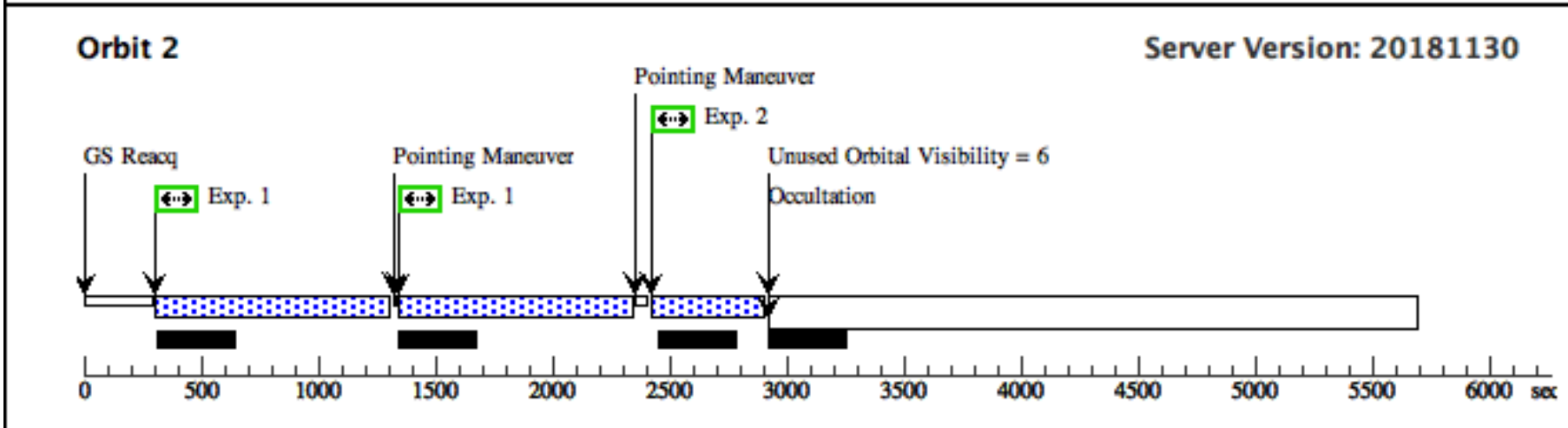
Comments:
Category=EXT-STAR
Description=[GAMMA RAY BURSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190114C	ACS/WFC, ACCUM, WFC-FIX	G800L	AUTOIMAGE=YES		Pattern 1, Exps 1-1 in Visit 01 (1)	900 Secs (3620 Secs)	
								[==>930.0 Secs (Pattern 1)]	***[1]***
								[==>930.0 Secs (Pattern 2)]	
								[==>880.0 Secs (Pattern 3)]	***[2]***
								[==>880.0 Secs (Pattern 4)]	
2		(1) GRB190114C	ACS/WFC, ACCUM, WFC-FIX	F606W		POS TARG 75,-95		340 Secs (340 Secs)	
								[==>]	***[2]***

Orbit Structure





Visit

Proposal 15684, Visit 02, completed Thu Apr 25 16:00:45 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1-3)
	Purpose=DITHER	Pattern Orientation=41.788		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.604	Center Pattern=false		
	Line Spacing=			

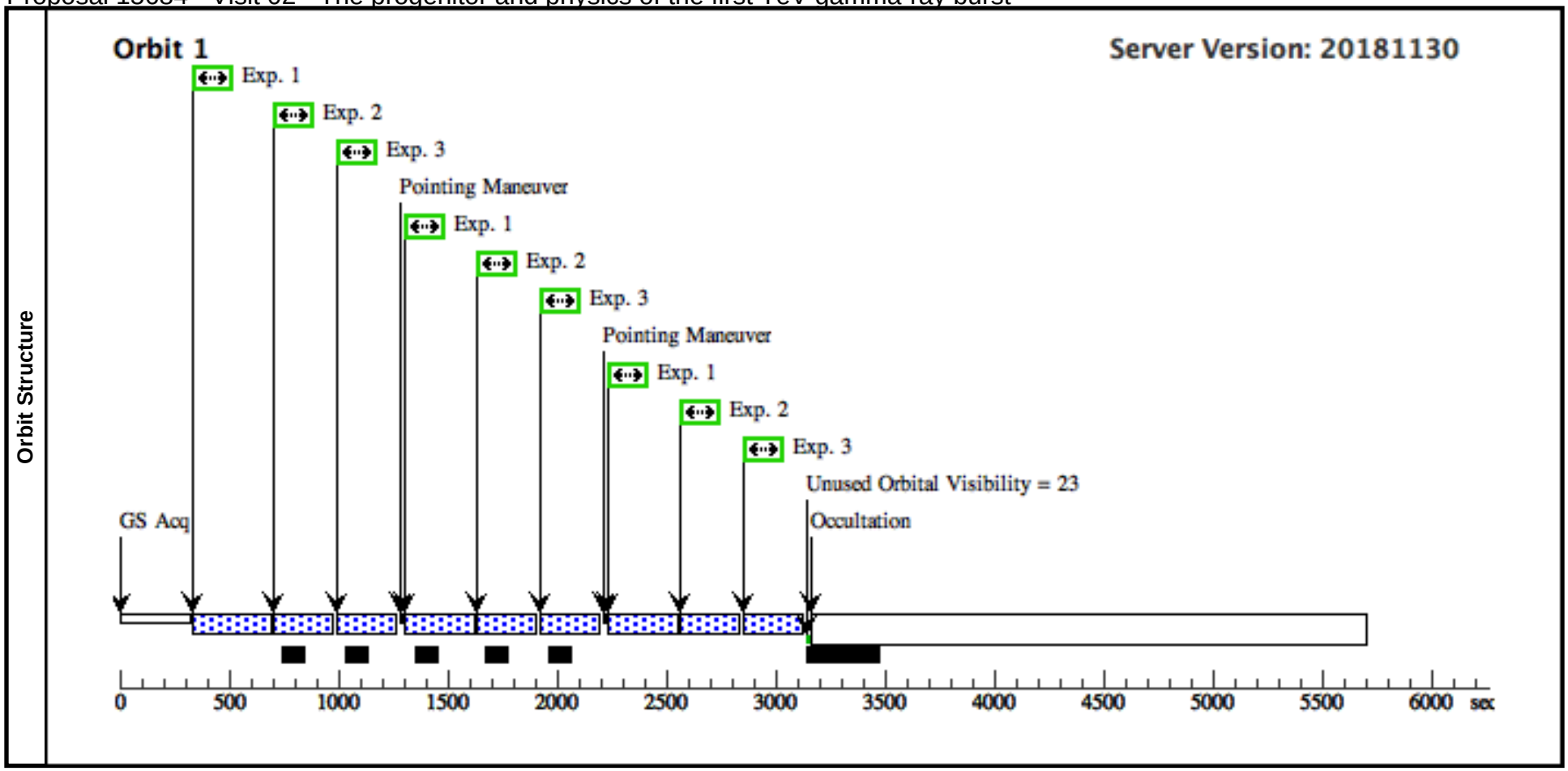
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190114C	RA: 03 38 1.1600 (54.5048333d)		V=22+/-2	Reference Frame: ICRS
		Dec: -26 56 46.90 (-26.94636d)			
		Equinox: J2000			

Comments:
Category=EXT-STAR
Description=[GAMMA RAY BURSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190114C	ACS/WFC, ACCUM, WFC2C-2K	F475W			Pattern 3, Exps 1-3 in Visit 02 (3)	150 Secs (450 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
2		(1) GRB190114C	ACS/WFC, ACCUM, WFC2C-2K	F775W			Pattern 3, Exps 1-3 in Visit 02 (3)	120 Secs (360 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
3		(1) GRB190114C	ACS/WFC, ACCUM, WFC2C-2K	F850LP			Pattern 3, Exps 1-3 in Visit 02 (3)	120 Secs (360 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	


Orbit Structure
Orbit 1
Server Version: 20181130
Exp. 1
Exp. 2
Exp. 3
Pointing Maneuver
Exp. 1
Exp. 2
Exp. 3
Pointing Maneuver
Exp. 1
Exp. 2
Exp. 3
Unused Orbital Visibility = 23
GS Acq
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15684, Visit 04, implementation Thu Apr 25 16:00:45 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BEFORE 01-JUL-2019:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1-2)
	Purpose=DITHER	Pattern Orientation=41.788		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.604	Center Pattern=false		
	Line Spacing=			

Fixed Targets

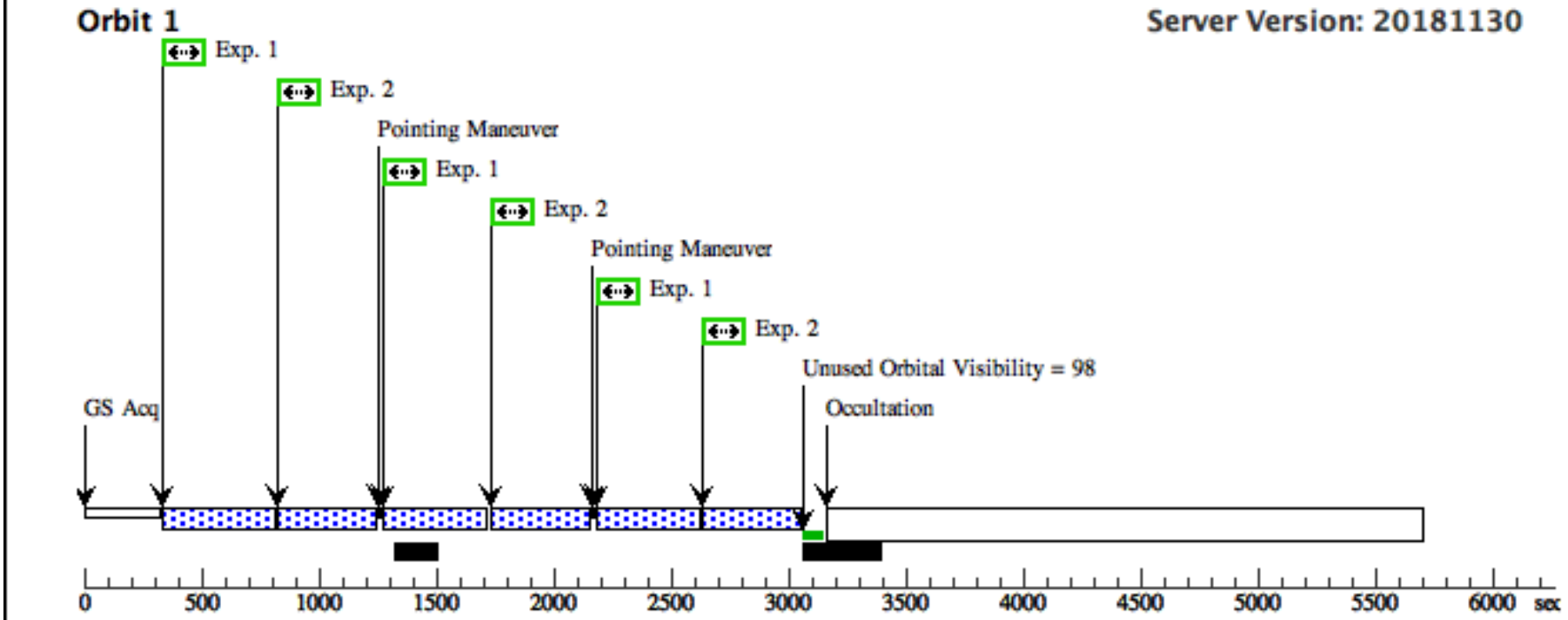
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190114C	RA: 03 38 1.1600 (54.5048333d)		V=22+/-2	Reference Frame: ICRS
		Dec: -26 56 46.90 (-26.94636d)			
		Equinox: J2000			

Comments:
Category=EXT-STAR
Description=[GAMMA RAY BURSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190114C	ACS/WFC, ACCUM, WFC2C-2K	F775W			Pattern 3, Exps 1-2 in Visit 04 (3)	275 Secs (825 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
2		(1) GRB190114C	ACS/WFC, ACCUM, WFC2C-2K	F606W			Pattern 3, Exps 1-2 in Visit 04 (3)	250 Secs (750 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	

Orbit Structure



Visit

Proposal 15684, Visit 03, failed Thu Apr 25 16:00:45 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BETWEEN 12-MAR-2019:00:00:00 AND 20-MAR-2019:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.604 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1-2)
(4)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		(3-4)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	GRB190114C	RA: 03 38 1.1600 (54.5048333d) Dec: -26 56 46.90 (-26.94636d) Equinox: J2000		V=22+/-2	Reference Frame: ICRS

Comments:
Category=EXT-STAR
Description=[GAMMA RAY BURSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) GRB190114C	ACS/WFC, ACCUM, WFC1-CTE	F475W			Pattern 3, Exps 1-2 in Visit 03 (3)	370 Secs (1110 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2		(1) GRB190114C	ACS/WFC, ACCUM, WFC1-CTE	F850LP			Pattern 3, Exps 1-2 in Visit 03 (3)	370 Secs (1110 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]*** ***[2]***
3		(1) GRB190114C	ACS/WFC, ACCUM, WFC1-CTE	F606W			Pattern 4, Exps 3-4 in Visit 03 (4)	360 Secs (720 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
4		(1) GRB190114C	ACS/WFC, ACCUM, WFC1-CTE	F775W			Pattern 4, Exps 3-4 in Visit 03 (4)	420 Secs (840 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***

Orbit Structure