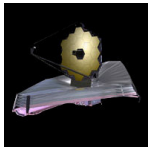

4554 - Revealing the progenitor of the dirty fireball gamma-ray burst AT 2023lcr through its supernova component

Cycle: 2, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
AT2023lcr - JWST epoch 1				
	1	JWST - Photometry	NIRCam Imaging	(1) AT2023lcr
	2	JWST Spectroscopy epoch 1	NIRSpec Fixed Slit Spectroscopy	(1) AT2023lcr

ABSTRACT

AT2023lcr is a transient at redshift 1.0272 with multi-wavelength observations consistent with an on-axis gamma-ray burst (GRB) afterglow with narrow jet. However, no gamma-ray prompt emission was detected in the direction of the transient making it the best dirty fireball candidate observed to date. Dirty fireballs are GRB with sub-relativistic jet unable to create the typical bright flash of gamma-ray radiation, known as GRB prompt emission, seen in typical GRBs. We propose using JWST's NIRCam and NIRSpec as well as HST's NIR camera, to study photometrically and spectroscopically the supernova (SN) component associated to this rare GRB case confirming its collapsar nature, with a total of 4.75 hours of JWST observations and 3 orbits of HST observations. The relatively high-redshift of this target makes the expected SN peak at around 1.2-1.4 microns. Additionally, the expected magnitudes of the SN component fall below the limits for ground-based telescopes, making JWST and HST uniquely suited for this detailed study. The SN spectral observations will reveal crucial information regarding the progenitor and its circumstellar environment. These data will allow us to determine, for the first time, if dirty fireballs come from progenitors similar to typical GRBs, improving our understanding of the role played by mildly relativistic jets during stellar collapse and how these rare cases fit in the full diversity of stellar explosions.

OBSERVING DESCRIPTION

We request a joint campaing with JWST and HST to study the supernova component associated to the dirty fireball AT 2023lcr.

Our observing strategy can be divided between spectroscopy with NIRSpec and photometry (NIRCAM and NIR camera onboard HST)

The two NIRSpec observations will be taken 10 days apart. Both of them will use the Prism with a fixed slit of 0.4", NRSRAPID readout and full subarray. The first observation will consist of 50 groups per integration, 2 integrations per exposure and 6 exposures per specification (6 dithers) for a total observing time of 6570.9 s. The second observation will consists of 70 groups per integration, 2 integrations per exposure and 6 exposures per specification (6 dithers) for a total observing time of 9147.72 s.

During the first NIRSpec observation we will also observe the source photometrically with NIRCAM configured with the SHALLOW4 readout mode, Full subarray with 5 groups per integration, 1 integration per exposure and 4 exposures per specification (4 dithers) for a total exposure time of 2061.46 s using F115W, F150W F277W and F356W.

The HST observations will consists of 3 visits 7 days apart each, with an exposure of 3000 s (3 dithers) per visit, observing with the F125W and F160W) fiters.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	AT2023lcr	RA: 16 31 37.4240 (247.9059333d) Dec: +26 21 58.33 (26.36620d) Equinox: J2000	Epoch of Position: 2000.0	

Comments:
Category=Star
Description=[Gamma Ray bursters, Supernovae]
Extended=NO

Observation

Proposal 4554, Observation 1: JWST - Photometry Fri Jul 28 16:02:28 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	AT2023lcr	RA: 16 31 37.4240 (247.9059333d) Dec: +26 21 58.33 (26.36620d) Equinox: J2000	Epoch of Position: 2000.0	

Comments:
Category=Star
Description=[Gamma Ray bursters, Supernovae]
Extended=NO

Template

Module	Subarray	Target Placement
B	FULLP	B Short (on B4)

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	4	STANDARD		1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F115W	F277W	SHALLOW4	5	1	4	4	1030.73	159892
2	F150W	F356W	SHALLOW4	5	1	4	4	1030.73	159892

Special Requirements

Between Dates 07-AUG-2023:00:00:00 and 14-AUG-2023:00:00:00

Observation

Proposal 4554, Observation 2: JWST Spectroscopy epoch 1 Fri Jul 28 16:02:28 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	AT2023lcr	RA: 16 31 37.4240 (247.9059333d) Dec: +26 21 58.33 (26.36620d) Equinox: J2000	Epoch of Position: 2000.0	

Comments:
Category=Star
Description=[Gamma Ray bursters, Supernovae]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 AT2023lcr	WATA	FULL	CLEAR	NRSRAPIDD6	3	1	1	171.788	159892

Template

Slit	Subarray
S400A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	2	SPECTRAL

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	PRISM/CLEAR	S400A1	NRSIRS2RAPID	36	2	1	NONE	6	12	6477.467	159892

Special Requirements	Between Dates 07-AUG-2023:00:00:00 and 14-AUG-2023:00:00:00