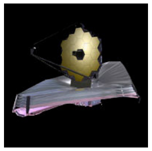

9228 - Investigating the Origin of High Redshift Short GRB 241105A and Its Implications for GRB Classification and r-Process Enrichment

Cycle: 3, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRCam Imaging	(1) GRB241105A
	2		NIRCam Imaging	(1) GRB241105A

ABSTRACT

The detection of GRB 241105A at high redshift (z=2.681) offers a rare chance to explore r-process nucleosynthesis in the early Universe. However, fully exploiting this opportunity requires positive confirmation that the progenitor is a neutron star merger. GRB 241105A, a short gamma-ray burst (GRB) with extended emission, lies at the crossroads of two progenitor scenarios: a compact binary merger or the collapse of a massive star

(collapsar). Resolving this ambiguity is crucial for understanding the formation of heavy elements and the evolution of GRB progenitors at high redshifts.

This proposal requests Director's Discretionary (DD) time to search for a supernova (SN) associated with GRB 241105A. The absence of an SN would establish GRB 241105A as the most distant neutron star merger ever detected, resolving key tensions between observed r-process element abundances in the early Universe and the long delay times required for neutron star mergers to occur. A merger in a UV-bright galaxy would further support the short-progenitor channel for the mergers and serve as a reference for detecting and studying distant bright mergers like this, providing novel avenues to explore the chemical evolution of the early Universe. Conversely, the presence of a SN would identify GRB 241105A as the first confirmed short collapsar at high redshift, reshaping conventional GRB classification and suggesting that massive stars at early epochs can produce short-duration GRBs that mimic mergers observed at low redshifts. These observations have the potential to transform our understanding of GRB progenitors, r-process enrichment, and stellar evolution at high redshifts.

OBSERVING DESCRIPTION

This proposal targets GRB 241105A, discovered on the 5th of November 2024. We aim to either detect or exclude an associated supernova, making a definitive confirmation of the progenitor type as either a collapsing star (supernova discovered) or merging neutron star binary (supernova excluded). We target the expected peak of the supernova at the end of December / start of January, and aim to build a full SED to enhance the detection significance, measure properties of the supernova, and build a full SED of the host to provide context on its metallicity and star formation rate.

A second epoch is planed in September 2025, to be used as a subtraction template for when the transient has faded. This will be vital to ensure the transient is recovered from the galaxy light, especially in the case of a marginal detection.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GRB241105A	RA: 04 24 59.0000 (66.2458333d) Dec: -49 45 9.30 (-49.75258d) Equinox: J2000		

Comments:
Category=Star
Description=[Gamma Ray bursters]

Observation

Proposal 9228, Observation 1

Wed Dec 04 22:00:48 GMT 2024

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)	GRB241105A	RA: 04 24 59.0000 (66.2458333d) Dec: -49 45 9.30 (-49.75258d) Equinox: J2000		

Comments:
Category=Star
Description=[Gamma Ray bursters]

Template

Module	Subarray
B	FULL

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRASCA	3	STANDARD	8" (SMALL)	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	F070W	F277W	MEDIUM8	5	1	3	3	1546.095	
2	F115W	F356W	MEDIUM8	5	1	3	3	1546.095	
3	F150W	F444W	MEDIUM8	5	1	3	3	1546.095	

Special Requirements

Between Dates 20-DEC-2024 and 06-JAN-2025
Offset -32.44381091809758 arcsec, 36.42754696126412 arcsec

Observation

Proposal 9228, Observation 2

Wed Dec 04 22:00:48 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

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)	GRB241105A	RA: 04 24 59.0000 (66.2458333d) Dec: -49 45 9.30 (-49.75258d) Equinox: J2000		

Comments:
Category=Star
Description=[Gamma Ray bursters]

Template

Module	Subarray
B	FULL

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRASCA	3	STANDARD	8" (SMALL)	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	F070W	F277W	MEDIUM8	5	1	3	3	1546.095	
2	F115W	F356W	MEDIUM8	5	1	3	3	1546.095	
3	F150W	F444W	MEDIUM8	5	1	3	3	1546.095	

Special Requirements

Between Dates 18-SEP-2025 and 01-OCT-2025
Offset -29.83586572254223 arcsec, 36.535052753400535 arcsec