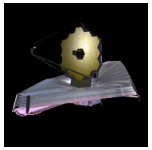

9381 - Unveiling the Nature of a Bright, Long-Duration Transient Discovered in Four-Epoch JWST Observations Over Two Years

Cycle: 3, Proposal Category: DD

INVESTIGATORS

Name	*Institution*
Dr. Feige Wang (PI)	**University of Michigan**
Dr. Eiichi Egami (CoI) (CoPI)	University of Arizona
Christa Noel DeCoursey (CoI) (CoPI)	University of Arizona
Mr. Wei Leong Tee (CoI) (CoPI)	University of Arizona
Maria Pudoka (CoI)	University of Arizona
Dr. Kohei Inayoshi (CoI)	Peking University
Dr. Jinyi Yang (CoI)	University of Michigan
Hollis Akins (CoI)	University of Texas at Austin
Prof. Caitlin M. Casey (CoI)	University of California - Santa Barbara
Dr. Jaclyn Champagne (CoI)	University of Arizona
Dr. David Coulter (CoI)	Space Telescope Science Institute
Mike Engesser (CoI)	Space Telescope Science Institute
Prof. Xiaohui Fan (CoI)	University of Arizona
Dr. Ori Dosovitz Fox (CoI)	Space Telescope Science Institute
Dr. Maximilien Franco (CoI) (ESA Member)	Universite Paris-Saclay
Dr. Sebastian Gomez (CoI)	University of Texas at Austin
Dr. Koki Kakiichi (CoI) (ESA Member)	Cosmic Dawn Center, Niels Bohr Institute
Dr. Jeyhan Kartaltepe (CoI)	Rochester Institute of Technology
Dr. Jianwei Lyu (CoI)	University of Arizona
Dr. Seppo Mattila (CoI) (ESA Member)	University of Turku
Dr. Estefania Padilla Gonzalez (CoI)	The Johns Hopkins University

Name	*Institution*
Dr. Justin Pierel (CoI)	Space Telescope Science Institute
Dr. Armin Rest (CoI)	Space Telescope Science Institute
Dr. Melissa Shahbandeh (CoI)	Space Telescope Science Institute
Dr. Marko Shuntov (CoI) (ESA Member)	Cosmic Dawn Center, Niels Bohr Institute
Dr. Matthew Ryan Siebert (CoI)	Space Telescope Science Institute
Dr. Louis-Gregory Strolger (CoI)	Space Telescope Science Institute
Dr. Fengwu Sun (CoI)	Harvard University
Dr. Siwei Zou (CoI)	National Astronomical Observatories of China (NAOC)

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRSpec Fixed Slit Spectroscopy	(1) C3D-BLT1

ABSTRACT

We propose to perform deep NIRSpec/Prism spectroscopic observations of a remarkable, bright, and long-duration transient, C3D-BLT1, identified in the COSMOS field through four epochs of JWST observations spanning two years. C3D-BLT1 is among the brightest transient (~25 AB mag) discovered by JWST, hostless in all but the deepest PRIMER F277W image, and exhibits dramatic spectral energy distribution (SED) evolution from blue to red over a period of 470 days. Its unique color evolution and long-duration nature suggest a rare and energetic event, potentially consistent with a pair-instability supernova (PISN) at z~5, a superluminous supernova (SLSN) at z~4, or a tidal disruption event (TDE) in a low-mass galaxy at cosmic noon. If confirmed as a PISN or TDE, this program would provide the first strong evidence for the existence of massive stars (>140 M_sun) or massive seed black holes (~10^4 M_sun) in the early Universe. If it is a SLSN, this would represent the first detection of such an exotic explosion mechanism beyond cosmic noon. Even if none of these scenarios applies, this program would still reveal a new class of transients and/or shed light on SN dust formation mechanisms. Furthermore, this effort will serve as a pathfinder for studying high-redshift, long-duration transients with JWST. This program is time-critical, meets all the criteria for JWST DDT consideration, and offers high scientific return with a small request of just 4.1 hours.

OBSERVING DESCRIPTION

We will perform NIRSpec/PRISM FSS observations using WATA acquisition, placing the target on the S200A1 slit.

The observation is straightforward and will use the standard 5-nod dither pattern. We plan to use 8 groups and 3 integrations, yielding a total on-source exposure time of 8972s. Including all overheads, the total observation time is 4.1 hours.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	C3D-BLT1	RA: 10 00 16.9815 (150.0707562d) Dec: +02 23 57.27 (2.39924d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2025	

Comments:
Category=Unidentified
Description=[Infrared sources]

Observation

Proposal 9381, Observation 1 Sat May 10 01:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

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)	C3D-BLT1	RA: 10 00 16.9815 (150.0707562d) Dec: +02 23 57.27 (2.39924d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2025	

Comments:
Category=Unidentified
Description=[Infrared sources]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	FULL	CLEAR	NRSRAPIDD6	3	1	1	171.788	250273.7

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	5	NONE

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	S200A1	NRSIRS2	8	3	1	NONE	5	15	8972.167	

Special Requirements	Before Date 28-MAY-2025:00:00:00