



6585 - The High-z Menagerie: A Rare Chance to Study the Early and Exotic Transient Universe

Cycle: 2, Proposal Category: DD

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. David Coulter (PI)	Space Telescope Science Institute
Dr. Justin Pierel (CoI) (CoPI)	Space Telescope Science Institute
Mike Engesser (CoI) (CoPI)	Space Telescope Science Institute
Dr. Armin Rest (CoI)	Space Telescope Science Institute
Dr. Louis-Gregory Strolger (CoI)	Space Telescope Science Institute
Dr. Ori Dosovitz Fox (CoI)	Space Telescope Science Institute
Dr. Suvi Gezari (CoI)	Space Telescope Science Institute
Muryel Guolo (CoI)	The Johns Hopkins University
Mr. Qinan Wang (CoI)	The Johns Hopkins University
Dr. Melissa Shahbandeh (CoI)	Space Telescope Science Institute
Dr. Jacob Jencson (CoI)	California Institute of Technology
Dr. Yossef Zenati (CoI)	The Johns Hopkins University
Prof. Robert M. Quimby (CoI)	San Diego State University
Dr. Sebastian Gomez (CoI)	Space Telescope Science Institute
Dr. Matthew Ryan Siebert (CoI)	Space Telescope Science Institute
Christa Noel DeCoursey (CoI)	University of Arizona
Dr. Eiichi Egami (CoI)	University of Arizona
Prof. Caitlin M. Casey (CoI)	University of Texas at Austin
Dr. Jeyhan Kartaltepe (CoI)	Rochester Institute of Technology
Mitchell Karmen (CoI)	The Johns Hopkins University
Dr. Anton M. Koekemoer (CoI)	Space Telescope Science Institute

<i>Name</i>	<i>Institution</i>
Hollis Akins (CoI)	University of Texas at Austin
Dr. Maximilien Franco (CoI)	University of Texas at Austin
Dr. Takashi Moriya (CoI)	National Astronomical Observatory of Japan (NAOJ)
Prof. Brant Robertson (CoI)	University of California - Santa Cruz
Dr. Jason D. Rhodes (CoI)	Jet Propulsion Laboratory
Ms. lilan yang (CoI)	University of California - Los Angeles
Dr. Nao Suzuki (CoI)	Florida State University
Dr. Henry Joy McCracken (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris
Dr. Santosh Harish (CoI)	Rochester Institute of Technology
Dr. Seiji Fujimoto (CoI)	University of Texas at Austin
Dr. Marko Shuntov (CoI) (ESA Member)	Cosmic Dawn Center, Niels Bohr Institute

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	4	NIRSpec	NIRSpec MultiObject Spectroscopy	(5) v5_withfillers_withrefstars
	12	NIRCam	NIRCam Imaging	(1) COSMOS_SN1

ABSTRACT

JWST is the only resource capable of opening the exciting new frontier of high- z ($z > 3$) supernovae (SNe). These transients are red, faint, and slowly evolving but have implications for an evolving initial mass function (IMF), luminosity evolution for Type Ia supernova (SN Ia) cosmology, and stellar evolution in the early universe. Finding new exotic transients amongst normal high- z SNe is even more challenging because of the low predicted rates in a given JWST pointing, requiring a large survey area to find them. An opportunity to find rare SNe has arisen with the serendipitous overlap of two Cycle 1 treasury programs: Public Release IMAGING for Extragalactic Research, and the COSMOS-Web survey. For the first time, we are sensitive to a large enough volume to discover several peculiar SN candidates in color-magnitude space. Among these is a pair-instability SN (PISN) candidate at $z \sim 3.5$, and three candidates (one $z \sim 3.5$ and two $2 < z < 3$) consistent with SNe Ia, PISNe, or superluminous SNe (SLSNe). Our program will classify these transients, possibly confirm the first true high- z PISN, and put novel constraints on both the high- z IMF and SN Ia luminosity evolution. Additionally, with the rarity of deep, wide, overlapping JWST observations, this represents the best chance to validate a single-epoch candidate prioritization process for exotic SNe discovered in the future. These distant transients evolve on long timescales in the observer frame, and therefore we propose non-disruptive follow-up with JWST using 8.9 hours to address some of JWST's core mission

objectives.

OBSERVING DESCRIPTION

This is a non-disruptive but time-critical DDT. We would greatly appreciate a timely review and decision of our proposal as the beginning of the April window is preferred.

* Program design

This proposal consists of two parts: (1) NIRSpec/MSA spectroscopy, which will allow spectroscopic classification/characterization of the transients as well as spectroscopic determination of host redshifts, and (2) single-epoch NIRCам imaging, which (combined with the discovery epoch) will allow photometric classification of a larger number of the transients and will constrain a variety of progenitor properties.

* Scheduling

Note that all the special requirement constraints provided with this APT are tentative and are not meant to be strict requirements for our observations in any sense. In general, we would like to obtain our NIRCам and NIRSpec data as soon as possible, but we do expect our targets to be visible for most or all of the observing window (depending on the types). We can adjust our observing strategy quickly. Our team is very experienced in producing MSA designs with a short timescale.

* NIRSpec spectroscopy

We will use the NIRSpec/MSA mode to take spectra of multiple transients and their host galaxies. We will use the low-resolution ($R \sim 100$) prism to capture the spectra of the transients (e.g., supernovae) and to measure the redshifts of the host galaxies. Considering the faintness of many of our targets, we adopted the observing strategy successfully employed by the JADES DDT 6541 with slightly lower exposure times as our targets are brighter: triple dithered, nodded, 9 group NRSIRS2 exposures with 3 ramps in each exposure. Targets covered at all three dithers are therefore exposed for a total of ~ 18000 s, which should yield $S/N > 5$ for the target spectral features in our sample.

* NIRCам imaging

JWST Proposal 6585 (Created: Friday, April 5, 2024 at 6:00:46 PM Eastern Standard Time) - Overview

We will also conduct NIRCам imaging to measure the light curves of the transients. For the robust identification of SN types, we will construct 4-band light curves using the COSMOS-Web filters (F115W, F150W, F277W, and F444W). With an integration time of ~ 1250 s per filter, these images will achieve a 5-sigma detection limit of ~ 28 -- 28.5 AB mag. All of our high-priority targets are expected to be brighter than this threshold.

The total time request is 8.9 hours.

Proposal 6585 - Targets - The High-z Menagerie: A Rare Chance to Study the Early and Exotic Transient Universe

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	COSMOS_SN1	RA: 10 00 24.1734 (150.1007225d) Dec: +02 20 24.97 (2.34027d) Equinox: J2000		
<i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i>				
(2)	COSMOS_SN2	RA: 10 00 22.4556 (150.0935650d) Dec: +02 20 56.47 (2.34902d) Equinox: J2000		
<i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i>				
(3)	COSMOS_SN3	RA: 10 00 33.3628 (150.1390117d) Dec: +02 23 44.71 (2.39575d) Equinox: J2000		
<i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i>				
(4)	COSMOS_SN4	RA: 10 00 26.4009 (150.1100038d) Dec: +02 19 33.97 (2.32610d) Equinox: J2000		
<i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i>				
(5)	v5_withfillers_withrefstars	RA: 10 00 30.0881 (150.1253671d) Dec: +02 21 44.71 (2.36242d) Equinox: J2000		
<i>Comments:</i> <i>Description=[]</i>				

Fixed Targets

Proposal 6585 - Observation 4 - The High-z Menagerie: A Rare Chance to Study the Early and Exotic Transient Universe

Fri Apr 05 23:00:46 GMT 2024

Observation	Proposal 6585, Observation 4: NIRSpec Diagnostic Status: Warning Observing Template: NIRSpec MultiObject Spectroscopy Coordinated Parallel Template(s): NIRCam Imaging																																																		
	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 4:1) Warning (Form): The recommended value is 8 Reference Stars for this template. (NIRSpec (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.																																																		
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Dithers	<table border="1"> <thead> <tr> <th>#</th> <th>Dither Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>NONE</td> </tr> </tbody> </table>											#	Dither Type	1	NONE																																				
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Proposal 6585 - Observation 4 - The High-z Menagerie: A Rare Chance to Study the Early and Exotic Transient Universe

Spectral Elements	NIRSpec	Exposure	MSA	Nod Pattern	Pointing	Aperture PA	Dispersion Offset	Cross-Dispersion	Total Dithers	Total	Total Exposure
	MultiObject	Specification	Configuration				(Shutters)	Offset (Shutters)		Integrations	Time
	Spectroscopy										
1		1 (PRISM/CLEAR)	c1 : apr2_p1_c1	3 Shutter Slitlet	150.1252775 Degrees 2.36205 Degrees	246.65239708902 425			3	9	6039.8
2		1 (PRISM/CLEAR)	c1 : apr2_p1_c2	3 Shutter Slitlet	150.12536583333 332 Degrees 2.361847222222 224 Degrees	246.65240107409 704			3	9	6039.8
3		1 (PRISM/CLEAR)	c1 : apr2_p1_c3	3 Shutter Slitlet	150.12504208333 334 Degrees 2.362597222222 225 Degrees	246.65238645554 928			3	9	6039.8
Spectral Elements	NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure	ETC Wkbk.Calc	
									Time	ID	
1		F150W	F444W	MEDIUM2	10	2	6	3	5958.907		
2		F150W	F444W	MEDIUM2	10	2	6	3	5958.907		
3		F150W	F444W	MEDIUM2	10	2	6	3	5958.907		
Special Requirements	No Parallel Attachments										
	MSA Scheduled Aperture PA 246.6524 to 246.6524 Degrees (V3 108.07782 to 108.07782)										
Group Observations 4, 12, Non-interruptible											
Same V3 PA 4, 12 (Aperture PAs differ)											

Proposal 6585 - Observation 12 - The High-z Menagerie: A Rare Chance to Study the Early and Exotic Transient Universe

Fri Apr 05 23:00:46 GMT 2024

Observation	<p>Proposal 6585, Observation 12: NIRCam</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
Diagnostics	<p>(Visit 12:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(NIRCam (Obs 12)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p>									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(1)	COSMOS_SN1	RA: 10 00 24.1734 (150.1007225d) Dec: +02 20 24.97 (2.34027d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i></p>									
Template	Module		Subarray			Target Placement				
	ALL		FULL			A Short (on A3)				
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions
	1	NONE				STANDARD				3
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	F444W	SHALLOW4	8	1	3	3	1256.202	
	2	F150W	F277W	SHALLOW4	8	1	3	3	1256.202	
Special Requirements	<p>Fiducial Point Override NRCAS_FULL</p> <p>Group Observations 4, 12, Non-interruptible Same V3 PA 4, 12 (Aperture PAs differ)</p>									