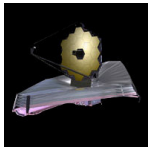

6549 - Lensed Supernova Encore at z=2! The First Galaxy to Host Two Multiply-Imaged Supernovae

Cycle: 2, Proposal Category: DD

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OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
Observation Folder				
	1		NIRCam Imaging	(1) Requiem2
	2		NIRCam Imaging	(1) Requiem2
	3		NIRCam Imaging	(1) Requiem2

ABSTRACT

A bright z = 1.95 supernova (SN) candidate was discovered in JWST/NIRCam imaging acquired on 2023 November 17. The source, which is quintuply-imaged as a result of strong gravitational lensing by a foreground cluster, was detected in two of the four locations and, remarkably, shares a host galaxy with a previous lensed SN. We therefore name this SN, “Encore”. This would make the cluster (MACS J0138.0-2155) the first known system to produce more than one multiply-imaged SN and, for the first time in history, enable multiple enhanced tests impossible until now. Moreover, based on the host galaxy properties alone, the previous lensed SN (SN Requiem) was given a 70% probability of being Type Ia (SN Ia), and we therefore adopt the same probability for SN Encore. Considering the rarity of finding multiple SNe Ia in the same host galaxy, compounded with the extreme rarity of lensed SNe, this discovery is truly surprising. This is easily the most distant case of a galaxy hosting two likely SNe Ia (previously z~0.6), providing a novel opportunity to probe the role of interstellar dust in SN Ia cosmology at high-z. Additional observations, only possible with JWST, are needed to confirm the SN type and constrain the light curve parameters, which will also enable an independent measurement of the Hubble Constant (H0) with ~15% precision using the two visible images of the SN. Both SN Requiem and SN Encore have a final image arriving in ~2033, meaning that follow-up now will give us an unprecedented baseline for time delay cosmology in a decade. We request a disruptive turnaround time and 7.25 hours with all overheads for this rare opportunity that must not be missed.

OBSERVING DESCRIPTION

We propose 3 epochs to observe a new multiply-imaged SN Ia candidate, the first to appear in a lensing system that previously housed a lensed SN, and in fact in the same host galaxy. We use three filter pairs to cover the SN SED from UV-IR wavelengths and the three epochs should cover the second rest-frame near-IR peak. The observability window is closing January 9th and the SN will not be visible when it re-opens in July, making this the only opportunity to glean information from the light curve until the next image appears in ~10 years. We therefore extract the maximum amount of information possible by proposing three epochs spaced by 4-7 rest-frame days, which fills out the remaining window. In sum, we will measure H0 through the measurement of time delays.

Proposal 6549 - Targets - Lensed Supernova Encore at z=2! The First Galaxy to Host Two Multiply-Imaged Supernovae

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	Requiem2	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		

Comments:
Category=Star
Description=[Type Ia supernovae]
Extended=NO

Observation

Proposal 6549, Observation 1

Tue Nov 28 02:00:24 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)	Requiem2	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		

Comments:
Category=Star
Description=[Type Ia supernovae]
Extended=NO

Template

Module	Subarray	Target Placement
B	FULL	Module Gap

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	F444W	BRIGHT2	8	2	8	4	1417.254	
2	F150W	F356W	BRIGHT2	10	1	4	4	858.942	
3	F200W	F277W	BRIGHT2	10	1	4	4	858.942	

Special Requirements

Before Date 10-DEC-2023:00:00:00
Offset 58.83 arcsec, -18.6 arcsec

2 After 1 by 15 Days to 21 Days

Observation

Proposal 6549, Observation 2

Tue Nov 28 02:00:24 GMT 2023

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)	Requiem2	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		

Comments:
Category=Star
Description=[Type Ia supernovae]
Extended=NO

Template

Module	Subarray	Target Placement
B	FULL	Module Gap

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	F444W	BRIGHT2	9	2	8	4	1589.042	
2	F150W	F356W	BRIGHT2	6	2	8	4	1073.677	
3	F200W	F277W	BRIGHT2	6	2	8	4	1073.677	

Special Requirements

Offset 58.83 arcsec, -18.6 arcsec

2 After 1 by 15 Days to 21 Days
3 After 2 by 15 Days to 21 Days

Observation

Proposal 6549, Observation 3

Tue Nov 28 02:00:24 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	Requiem2	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		

Comments:
Category=Star
Description=[Type Ia supernovae]
Extended=NO

Template

Module	Subarray	Target Placement
B	FULL	Module Gap

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	F444W	BRIGHT2	9	2	8	4	1589.042	
2	F150W	F356W	BRIGHT2	6	2	8	4	1073.677	
3	F200W	F277W	BRIGHT2	6	2	8	4	1073.677	

Special Requirements

Offset 58.83 arcsec, -18.6 arcsec

3 After 2 by 15 Days to 21 Days