



3738 - Exploring the dramatic fading of SN2010da / NGC 300 ULX-1 with JWST

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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Dr. Emma Beasor (PI)	University of Arizona
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Dr. Nathan Smith (CoI)	University of Arizona
Dr. Ben Davies (CoI) (ESA Member)	Liverpool John Moores University
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Dr. Kishalay De (CoI)	Massachusetts Institute of Technology
Dr. Dominic Walton (CoI) (ESA Member)	University of Hertfordshire

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
ULX1				
	1	NIRSpec-IFU	NIRSpec IFU Spectroscopy	(1) NGC-300-2010DA
	2	MIRI-MRS	MIRI Medium Resolution Spectroscopy	(1) NGC-300-2010DA

ABSTRACT

Over the last 12 years the enigmatic object SN 2010da / NGC 300 ULX-1 has continually defied expectation. Originally classified as a SN imposter, it was soon discovered that the system was extremely X-ray bright, indicative of a compact remnant accreting material from a donor star. It was recently discovered that the donor star in the system is a red supergiant (RSG) making NGC 300 ULX-1 the only known ULX pulsar with a cool supergiant companion. Over the last 4 years the RSG has faded dramatically across optical to near-IR wavelengths by around a factor of 10, and the molecular absorption features indicative of a cool supergiant can no longer be detected. This suggests either the system is returning to a quiescent state following the 2010 outburst or we are witnessing a never-before-seen RSG phase which cannot be explained by “standard” behaviours such as variability or quiescent winds, and may instead be indicative of the stars’ impending death. As such ULX-1 represents a unique opportunity to probe

eruptive mass-loss within an RSG-NS binary, and is a likely progenitor to either a compact object binary system or an elusive Thorne-ytkow object. We are proposing to use NIRCam IFU and MIRI MRS to uncover the current state of ULX-1 and determine the most likely cause for the fading of the system. Ultimately this data will enable us to constrain the total mass lost in the system via either an eruptive outburst or interaction with the NS.

OBSERVING DESCRIPTION

We are proposing to observe NGC 300 ULX-1 with JWST NIRCam IFU and MIRI MRS. In total, we are requesting 7.2 hours of JWST time including overheads.

Proposal 3738 - Targets - Exploring the dramatic fading of SN2010da / NGC 300 ULX-1 with JWST

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	NGC-300-2010DA	RA: 00 55 4.8600 (13.7702500d) Dec: -37 41 43.70 (-37.69547d) Equinox: J2000 <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Circumstellar dust, Ejecta, High-mass X-ray binary stars, Red supergiants] Extended=NO	Epoch of Position: 2015.5	

Proposal 3738 - Observation 1 - Exploring the dramatic fading of SN2010da / NGC 300 ULX-1 with JWST

Thu Aug 17 16:00:29 GMT 2023

Observation	<p>Proposal 3738, Observation 1: NIRSpec-IFU</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
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	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Star</i></p> <p><i>Description=[Circumstellar dust, Ejecta, High-mass X-ray binary stars, Red supergiants]</i></p> <p><i>Extended=NO</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	4-POINT-NOD										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G140H/F100LP	NRSIRS2RAPI D	50	1	false	true	NONE	4	4	2976.134	
	2	G235H/F170LP	NRSIRS2RAPI D	50	1	false	true	NONE	4	4	2976.134	
	3	G395H/F290LP	NRSIRS2RAPI D	50	1	false	true	NONE	4	4	2976.134	
Special Requirements	Group Observations 1, 2, Non-interruptible											

Proposal 3738 - Observation 2 - Exploring the dramatic fading of SN2010da / NGC 300 ULX-1 with JWST

Thu Aug 17 16:00:30 GMT 2023

Observation	Proposal 3738, Observation 2: MIRI-MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy																																																																																																																																													
	(Visit 2:1) Warning (Form): Data Excess over lower threshold (Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.																																																																																																																																													
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