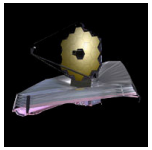

5846 - The enigma of Ultra-Luminous X-ray sources and its Achilles Heel in the Foot Nebula

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI MRS	MIRI Medium Resolution Spectroscopy	(1) SST2011-J081929.00+704219.3
	2	NIRspec G395M	NIRSpec IFU Spectroscopy	(1) SST2011-J081929.00+704219.3

ABSTRACT

We request 15.2 hr science time for the NIRspec IFU and MIRI MRS observations of the template low-metallicity ultra-luminous X-ray source (ULX) Holmberg II X-1 and the high-excitation HeIII nebula it powers. Believed to be comprised of a black hole accreting matter from its massive-star donor, Holmebrg II X-1 is the closest and the best example of the enigmatic population of accreting black hole binaries in low-metallcity galaxies. It is hypothesised that strong hard ionizing radiation and energetic outflows of the accreting black holes is the key feedback agent regulating the state of the interstellar medium in low-metallicity galaxies but lack of conclusive observations precludes definite conclusions. The unique capabilities of JWST allow us to spectroscopically map the nebulae around ULXs. Using both, NIRspec and MIRI, we will chart the ionization fronts within the Holmberg II X-1 nebula, establish whether the dust is present, and finally settle the type of its donor star. Complemented by archival X-ray, UV and optical spectra, the new JWST data will be analyzed using photoionization and dust models to uncover the physical conditions within the nebula and shed much needed light on the nature of ULXs.

OBSERVING DESCRIPTION

We propose IFU observations of the compact nebula (3 arcsec diameter) around a point source. For observations 1, we use all MIRI Channels. To optimally sample the MIRI PSF and mitigate any cosmic rays and detector impurities we apply a DITHER-1 strategy and 30 groups per integration using the SLOWR1 readout pattern for all Channels and wavelength ranges, needed to avoid onboard memory issues. The extended regions and a blind-pointing accuracy of 0.1" allows us to waive TA. Additionally we request to use the Imager in parallel which will optimize the astrometric accuracy needed to exact spatially dependent information form the extended source in the IFU. For the Imaging part we request the F560W filter using 30 groups an 1 integration which does not saturate most sources.

For Observation 2, we use NIRspec G395M/F290LP. To optimally sample the NIRSpec PSF and mitigate any cosmic rays and detector impurities we propose to apply a 4-POINT-DITHER strategy and 40 groups per integration using the NRSIRS2 readout pattern. The extended regions and a blind-pointing accuracy of 0.1 arcsec allows us to waive WATA.

Proposal 5846 - Targets - The enigma of Ultra-Luminous X-ray sources and its Achilles Heel in the Foot Nebula

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SST2011-J081929.00+704219.3	RA: 08 19 28.9900 (124.8707917d) Dec: +70 42 19.40 (70.70539d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Compact binary stars, High-mass X-ray binary stars, X-ray binary stars]
Extended=YES

Observation

Proposal 5846, Observation 1: MIRI MRS

Thu Jan 02 19:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution 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)	SST2011-J081929.00+704219.3	RA: 08 19 28.9900 (124.8707917d) Dec: +70 42 19.40 (70.70539d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Compact binary stars, High-mass X-ray binary stars, X-ray binary stars]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F560W	FASTR1	30	1	1	Dither 1	4	4	333.005	173296
1	SHORT(A)	MRSLONG		SLOWR1	30	5	1	Dither 1	4	20	14716.191	173296
1	SHORT(A)	MRSSHORT		SLOWR1	30	5	1	Dither 1	4	20	14716.191	173296
2		IMAGER	F560W	FASTR1	30	1	1	Dither 1	4	4	333.005	173296
2	MEDIUM(B)	MRSLONG		SLOWR1	30	5	1	Dither 1	4	20	14716.191	173296
2	MEDIUM(B)	MRSSHORT		SLOWR1	30	5	1	Dither 1	4	20	14716.191	173296
3		IMAGER	F560W	FASTR1	30	1	1	Dither 1	4	4	333.005	173296
3	LONG(C)	MRSLONG		SLOWR1	30	5	1	Dither 1	4	20	14716.191	173296
3	LONG(C)	MRSSHORT		SLOWR1	30	5	1	Dither 1	4	20	14716.191	173296

Special Requirements	Aperture PA Range 110 to 210 Degrees (V3 110.0 to 210.0)

Observation

Proposal 5846, Observation 2: NIRspec G395M

Thu Jan 02 19:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

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)	SST2011-J081929.00+704219.3	RA: 08 19 28.9900 (124.8707917d) Dec: +70 42 19.40 (70.70539d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Compact binary stars, High-mass X-ray binary stars, X-ray binary stars]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	8	

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	G395M/F290LP	NRSIRS2	20	1	false	true	NONE	8	8	11787.823	228563