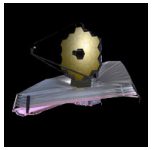

5842 - What lies beyond the inner spiral of Apep?

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI imaging of Apep				
	1	Apep	MIRI Imaging	(1) AX-J1600.9-5142

ABSTRACT

Wolf-Rayet binaries have been found to drive spiral dust shell that encode and amplify the internal workings of these evolved stellar systems. While ground based imaging has so far been unable to detect their higher order outer dust shells, JWST has demonstrated in recent ERS observations that ~20 concentric dust shells could be detected in WR140. We propose to leverage this unique capability to study the analogous system, Apep, which has presented the field with enduring and fundamental questions since its discovery. Apep's spectroscopically determined wind speed of 3500 km/s appeared to be four times faster than the expansion speed of its inner dust plume resolved with ground-based imaging, which is striking given the overwhelming momentum embodied by the WR wind. It has been suggested that the central WR binary is capable of launching spatially anisotropic wind speeds caused by rapid rotation of the stars, a scenario which would make Apep the best candidate for a long-duration gamma ray burst progenitor in the Galaxy if this theory is confirmed. However, alternative explanations for the wind and dust speed discrepancy are possible, and each of which predicts a different geometry for the outer spiral plumes of Apep which the central star launched further back in time. This proposal aims to

resolve the outer dust shells of Apep to discern between potential scenarios explaining this wind speed puzzle. The possible scenarios of Apep have far-reaching implications for stellar-wind physics and the role played by massive stars in the enrichment of the ISM and dust budgets, and for settling Apep's standing as a local candidate long-duration gamma ray burst progenitor.

OBSERVING DESCRIPTION

The observations aim to resolve the outer dust shells of Apep (AX-J1600.9-5142) with MIRI imaging. We will observe Apep with the F770W, 1500W and F2550W filters for 0.26h, 0.68 h and 0.45 h respectively and utilise the FULL detector subarray. We used the ETC to estimate the number of groups and integrations that will allow for sufficient S/N to detect the edge locations of the fifth dust shell from the centre while achieving a high dynamic range given the brighter lower order shells. The observations will be dithered with 3 sets of 4-point sets optimised for extended sources. No PSF calibrator observations are required in the sequence given that the structures are expected to be extended and the large-scale location of dust features well-resolved.

Proposal 5842 - Targets - What lies beyond the inner spiral of Apep?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	AX-J1600.9-5142	RA: 16 00 50.4787 (240.2103279d) Dec: -51 42 44.98 (-51.71249d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[WC stars, WN stars, Wolf-Rayet stars]

Observation

Proposal 5842, Observation 1: Apep

Wed Jul 03 15:03:57 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI 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)	AX-J1600.9-5142	RA: 16 00 50.4787 (240.2103279d) Dec: -51 42 44.98 (-51.71249d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[WC stars, WN stars, Wolf-Rayet stars]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	12		5	3			LARGE

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	28	1	1	Dither 1	12	12	932.413	178849
2	F1500W	FASTR1	24	3	1	Dither 1	12	36	2464.236	178849
3	F2550W	FASTR1	9	5	1	Dither 1	12	60	1631.724	178849