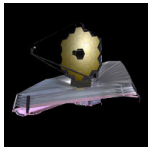

4857 - Confirmation of Planetary Companions to White Dwarf Stars

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	2	WD2105-82	MIRI Imaging	(1) LP-852-7
	3	WD1202	MIRI Imaging	(2) LAWD-83

ABSTRACT

We propose single-band MIRI F1500W imagery to confirm two high-quality candidate Jovian-mass planets detected around white dwarf stars. These observations will both confirm common proper motion and potentially measure a change in the relative position of the planet around the star due to

orbital motion. JWST Cycle 1 observations of metal-rich white dwarf stars detected two point-source companions with fluxes and colors consistent with planet masses of 1-5 Jupiter masses. Due to their proximity to the white dwarf star, the odds these are background galaxies is less than 2%. However, a second epoch image is required to conclusively demonstrate their true nature.

If confirmed, these companions would be among the first true Jupiter analogs discovered around other stars, with masses, orbital separations, and ages consistent with the giant planets in our own solar system. They are bright enough to allow spectroscopic follow up to measure the chemical composition of their atmosphere, testing atmosphere models in a regime quite different to that probed by either young planets, or transit spectroscopy. If the observations demonstrate that the companions are background sources, this null result will cast doubt on the theory that planets are responsible for driving the accretion of metals known to occur in 25--50% of field white dwarf stars. Conversely, confirmation of these planets is strong evidence in favour of the theory, and argues that such white dwarf-planet systems are common in the Galaxy.

OBSERVING DESCRIPTION

This proposal requests F1500W MIRI imaging observations of two white dwarf stars in order to detect common proper motion of a candidate planet within 2 arc seconds of each white dwarf. These candidates were found using MIRI imaging in Cycle 1. The exposure times were set to obtain a SNR of 15 in the F1500W filter using 70 groups and 2 integrations and cyclic dithering. Dithering is necessary to fully measure the PSF so that the WD can be subtracted to get good flux and centroid locations on the nearby companion source.

Proposal 4857 - Targets - Confirmation of Planetary Companions to White Dwarf Stars

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	LP-852-7	RA: 12 05 26.6739 (181.3611413d)	Proper Motion RA: 41.819 mas/yr	
		Dec: -23 33 12.14 (-23.55337d)	Proper Motion Dec: 226.558 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[White dwarfs]*				
(2)	LAWD-83	RA: 21 13 16.8549 (318.3202287d)	Proper Motion RA: 264.139 mas/yr	
		Dec: -81 49 12.88 (-81.82024d)	Proper Motion Dec: -379.9770000341596 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[White dwarfs]*				

Observation

Proposal 4857, Observation 2: WD2105-82

Thu Mar 20 23:00:16 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI 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)	LP-852-7	RA: 12 05 26.6739 (181.3611413d)	Proper Motion RA: 41.819 mas/yr	
		Dec: -23 33 12.14 (-23.55337d)	Proper Motion Dec: 226.558 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[White dwarfs]

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	19						DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1500W	FASTR1	70	2	1	Dither 1	19	38	7434.332	

Observation

Proposal 4857, Observation 3: WD1202

Thu Mar 20 23:00:16 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI 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
(2)	LAWD-83	RA: 21 13 16.8549 (318.3202287d)	Proper Motion RA: 264.139 mas/yr	
		Dec: -81 49 12.88 (-81.82024d)	Proper Motion Dec: -379.9770000341596 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[White dwarfs]

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	11						DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1500W	FASTR1	70	2	1	Dither 1	11	22	4304.087	