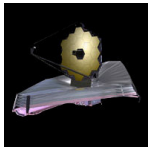

1911 - A Search for the Giant Planets that Drive White Dwarf Accretion

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	WD1620	MIRI Imaging	(3) WD1620-391
	2	WD1202	MIRI Imaging	(1) WD1202-232
	3	WD2105	MIRI Imaging	(2) WD2105-82
	4	WD2149+02	MIRI Imaging	(4) WD2149+02

ABSTRACT

We propose to use MIRI to search for planets around four white dwarf stars to test whether giant planets drive the mysterious metal pollution observed in the atmospheres of many white dwarf stars. Giant planets are believed to throw planetesimals into the white dwarf where they are torn apart and accreted onto the photosphere. The low planet-star contrast makes the planet light detectable in these systems without the use of a

coronagraph. We will search for both resolved companions, and an infrared flux excess from unresolved companions. We chose the nearest (10--22 pc) and youngest (0.8--2.7 Gyr) targets to ensure that we probe down to sub-Jovian masses around these evolved stars. Unlike the one transiting candidate found by Vanderburg et al. (2020), any white dwarf planet we discover will likely have formed beyond the ice line and may be more representative of giant planets found in our own solar system. With our sample, if no planets are found, we will be able to all but rule-out the favored model for how the metals are accreting onto the white dwarf star. Conversely any planets we do find will open a window to studying exoplanets beyond the ice-line.

OBSERVING DESCRIPTION

This program plans to observe 4 white dwarf stars in four MIRI filters: F560W, F770W, F1500W and F2100W. The two blue bands (F560W and F770W) are short exposures that are intended to get good photometry of the white dwarf star. They will also be used to determine the color of any other bright sources near the white dwarf (within ~20") to rule out false positives from the direct imaging part of the program. The F1500W exposure is a long stare (1-4 hours) and intended to search for resolved, nearby companions to the white dwarf star. The white dwarf is dim enough compared to the planet at 15 microns, that this is NOT considered high contrast imaging. At our detection limit we expect the companion-star contrast to be 1:100 or better. The F2100W exposure will be used to gain good photometry of the white dwarf star, but is exposed for long enough to ensure a SNR of 55 on the white dwarf star. For all filters we request a FULL readout of the detector because we gained no improvement in SNR by limiting the readout and we do not know how far away the companion is from the nearby white dwarf star. Also other stars in the frame will help us measure a PSF. All observations use the default 4-point dither where the number of sets is determined by the length of the exposure.

As we are searching for dim companions, we set the requirement that the background be no larger than 20% above minimum for 3 of our targets and not above 10% for the fourth target. The 20% above minimum was set because it otherwise it severely limits the scheduability of the targets and for those targets we can tolerate a slightly higher level of background noise.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	WD1202-232	RA: 12 05 26.7211 (181.3613379d) Dec: -23 33 8.63 (-23.55240d) Equinox: J2000	Proper Motion RA: 0.0030379423371510094 sec of time/yr Proper Motion Dec: 0.22662 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[White dwarfs]*				
(2)	WD2105-82	RA: 21 13 18.7737 (318.3282237d) Dec: -81 49 18.77 (-81.82188d) Equinox: J2000	Proper Motion RA: 0.12383373679131222 sec of time/yr Proper Motion Dec: -0.3799810000600701 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[White dwarfs]*				
(3)	WD1620-391	RA: 16 23 33.9413 (245.8914221d) Dec: -39 13 46.15 (-39.22949d) Equinox: J2000	Proper Motion RA: 0.006638531461357724 sec of time/yr Proper Motion Dec: 3.3400000000000004E-4 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[White dwarfs]*				
(4)	WD2149+02	RA: 21 52 25.3948 (328.1058117d) Dec: +02 23 14.92 (2.38748d) Equinox: J2000	Proper Motion RA: 0.0010293601938018383 sec of time/yr Proper Motion Dec: -0.3005540000685869 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[White dwarfs]*				

Observation

Proposal 1911, Observation 1: WD1620

Sun Nov 20 22:01:02 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

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

(Visit 1:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	WD1620-391	RA: 16 23 33.9413 (245.8914221d) Dec: -39 13 46.15 (-39.22949d) Equinox: J2000	Proper Motion RA: 0.006638531461357724 sec of time/yr Proper Motion Dec: 3.3400000000000004E-4 arcsec/yr Epoch of Position: 2015.5	

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	4-Point-Sets				4	2	POINT SOURCE	POSITIVE	DEFAULT
2	4-Point-Sets				4	4	POINT SOURCE	POSITIVE	DEFAULT
3	4-Point-Sets				5	1	POINT SOURCE	POSITIVE	DEFAULT
4	CYCLING	1	4						DEFAULT
5	CYCLING	1	8						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	F560W	FASTR1	10	2	1	Dither 4	4	8	233.103	60939
2	F770W	FASTR1	10	2	1	Dither 4	4	8	233.103	60939
3	F1500W	FASTR1	80	3	1	Dither 5	8	24	5372.477	60939
4	F2100W	FASTR1	30	1	1	Dither 5	8	8	666.01	

Special Requirements

Background Limited. Background no more than 20th percentile above minimum

Observation

Proposal 1911, Observation 2: WD1202

Sun Nov 20 22:01:02 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	WD1202-232	RA: 12 05 26.7211 (181.3613379d) Dec: -23 33 8.63 (-23.55240d) Equinox: J2000	Proper Motion RA: 0.0030379423371510094 sec of time/yr Proper Motion Dec: 0.22662 arcsec/yr Epoch of Position: 2015.5	

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	4-Point-Sets				4	2	POINT SOURCE	POSITIVE	DEFAULT
2	4-Point-Sets				4	3	POINT SOURCE	POSITIVE	DEFAULT
3	4-Point-Sets				5	1	POINT SOURCE	POSITIVE	DEFAULT
4	CYCLING	1	8						DEFAULT
5	CYCLING	1	4						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	F560W	FASTR1	11	2	1	Dither 5	4	8	255.304	60939
2	F770W	FASTR1	12	2	1	Dither 5	4	8	277.504	60939
3	F1500W	FASTR1	94	4	1	Dither 4	8	32	8413.921	60939
4	F2100W	FASTR1	29	2	1	Dither 4	8	16	1309.819	60939

Special Requirements

Background Limited. Background no more than 20th percentile above minimum

Observation

Proposal 1911, Observation 3: WD2105 Sun Nov 20 22:01:02 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

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

(Visit 3:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	WD2105-82	RA: 21 13 18.7737 (318.3282237d) Dec: -81 49 18.77 (-81.82188d) Equinox: J2000	Proper Motion RA: 0.12383373679131222 sec of time/yr Proper Motion Dec: -0.3799810000600701 arcsec/yr Epoch of Position: 2015.5	

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	4-Point-Sets				4	2	POINT SOURCE	POSITIVE	DEFAULT
2	4-Point-Sets				4	3	POINT SOURCE	POSITIVE	DEFAULT
3	4-Point-Sets				5	1	POINT SOURCE	POSITIVE	DEFAULT
4	CYCLING	1	4						DEFAULT
5	CYCLING	1	8						DEFAULT
6	CYCLING	1	12						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	F560W	FASTR1	10	2	1	Dither 4	4	8	233.103	60939
2	F770W	FASTR1	10	2	1	Dither 4	4	8	233.103	60939
3	F1500W	FASTR1	90	4	1	Dither 6	12	48	12088.074	60939
4	F2100W	FASTR1	33	8	1	Dither 5	8	64	6016.287	60939

Special Requirements	Background Limited. Background no more than 10th percentile above minimum

Observation

Proposal 1911, Observation 4: WD2149+02

Sun Nov 20 22:01:02 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	WD2149+02	RA: 21 52 25.3948 (328.1058117d) Dec: +02 23 14.92 (2.38748d) Equinox: J2000	Proper Motion RA: 0.0010293601938018383 sec of time/yr Proper Motion Dec: -0.3005540000685869 arcsec/yr Epoch of Position: 2015.5	

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	4-Point-Sets				4	2	POINT SOURCE	POSITIVE	DEFAULT
2	4-Point-Sets				4	3	POINT SOURCE	POSITIVE	DEFAULT
3	4-Point-Sets				5	1	POINT SOURCE	POSITIVE	DEFAULT
4	CYCLING	1	4						DEFAULT
5	CYCLING	1	8						DEFAULT
6	CYCLING	1	12						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	F560W	FASTR1	27	2	1	Dither 4	4	8	610.509	60939
2	F770W	FASTR1	10	2	1	Dither 4	4	8	233.103	60939
3	F1500W	FASTR1	90	5	1	Dither 6	12	60	15118.418	60939
4	F2100W	FASTR1	33	8	1	Dither 5	8	64	6016.287	60939

Special Requirements	Background Limited. Background no more than 20th percentile above minimum