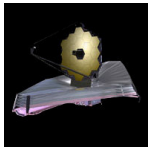

9025 - The Warm Jupiter Opportunity for Understanding Giant Exoplanet Evolution

Cycle: 4, Proposal Category: GO

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OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
WASP 25b				
	1	Transit	NIRSpec Bright Object Time Series	(1) WASP-25
K2-232b				
	2	Transit	NIRSpec Bright Object Time Series	(2) K2-232
WASP 84b				
	3	Transit	NIRSpec Bright Object Time Series	(3) WASP-84
TOI-2031b				
	4	Transit	NIRSpec Bright Object Time Series	(4) TOI-2031
TOI-677b				
	5	Transit 1	NIRSpec Bright Object Time Series	(5) TOI-677
	6	Transit 2	NIRSpec Bright Object Time Series	(5) TOI-677

ABSTRACT

The formation and inward migration of short-period giant exoplanets have remained mysterious. Two migration pathways have been proposed: disk migration and high-eccentricity (high-e) migration. Disk migration is predicted to yield planets in spin-orbit alignment with their host stars, while high-e migration should lead to more diverse inclinations. At the same time, the two migration pathways should also impact atmospheric

compositions in different ways, with disk migrated planets being able to accrete inner disk material while high-e migrated planets cannot, leading to significantly different metallicities and C/O ratios. Both migration pathways are likely important given the diversity in spin-orbit alignments of Hot Jupiters around hot stars above the Kraft Break and the existence of Hot Jupiters in compact multi-planet systems. Recent observations have shown that Warm Jupiters, unlike Hot Jupiters, are all spin-orbit aligned no matter their host star effective temperature, suggesting that they all migrated via the disk. We propose to observe 5 spin-orbit aligned Warm Jupiters with JWST NIRSpec/G395H and combine the data with those of a 6th, previously observed Warm Jupiter, WASP-80 b, to constrain the population level metallicity and C/O ratio. We will then compare our results to those of the Cycle 2 BOWIE-ALIGN program, which observed spin-orbit aligned and misaligned Hot Jupiters orbiting hot stars, and additional JWST programs that targeted aligned, cool star Hot Jupiters, to uncover the link between migration and atmospheric composition of giant exoplanets.

OBSERVING DESCRIPTION

We will observe the transits of 5 warm Jupiters. All observations will be done using NIRSpec/G395H in TSO. The visits will be centered around the mid-transit time of each planet with 1:1 baseline coverage. Target acquisition will be done on the targets themselves for 2 of the planets, while for the remaining 3, which are too bright, nearby target acquisition stars are indicated. All observations will use subarray SUB2048 and will have >10 groups per integration, staying safely below saturation.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	WASP-25	RA: 13 01 26.3760 (195.3599000d) Dec: -27 31 19.92 (-27.52220d) Equinox: J2000	Proper Motion RA: -29.264 mas/yr Proper Motion Dec: -6.1960000266481075 mas/yr Parallax: 0.0046501" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.

Jmag = 10.596
Category=Star
Description=[Exoplanet Systems]
Extended=NO

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	K2-232	RA: 04 55 3.9626 (73.7665108d) Dec: +18 39 16.31 (18.65453d) Equinox: J2000	Proper Motion RA: 61.996 mas/yr Proper Motion Dec: -48.14100002477062 mas/yr Parallax: 0.0077059" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	WASP-84	RA: 08 44 25.7032 (131.1070967d) Dec: +01 51 36.11 (1.86003d) Equinox: J2000	Proper Motion RA: -23.344 mas/yr Proper Motion Dec: -31.56999996463128 mas/yr Parallax: 0.0099636" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	TOI-2031	RA: 22 04 28.0921 (331.1170504d) Dec: +81 33 57.39 (81.56594d) Equinox: J2000	Proper Motion RA: 25.79 mas/yr Proper Motion Dec: 2.398 mas/yr Parallax: 0.0035797" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.

Jmag = 10.312
Category=Star
Description=[Exoplanet Systems]
Extended=NO

(5)	TOI-677	RA: 09 36 28.6865 (144.1195271d)	Proper Motion RA: -24.807 mas/yr
		Dec: -50 27 47.80 (-50.46328d)	Proper Motion Dec: 42.562 mas/yr
		Equinox: J2000	Parallax: 0.0070495"
			Epoch of Position: 2000

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

(6)	TA-K2-232	RA: 04 55 2.5336 (73.7605567d)	Proper Motion RA: 17.530 mas/yr
		Dec: +18 39 50.50 (18.66403d)	Proper Motion Dec: 16.566 mas/yr
		Equinox: J2000	Parallax: 0.0013077"
			Epoch of Position: 2000

Comments: This object was generated by the targetselector and parameters were updated using GAIA EDR3 information found at:
https://vizier.cds.unistra.fr/viz-bin/VizieR-5?-ref=VIZ6877a6712de88c&-out.add=.&-source=I/350/gaiaedr3&-c=073.76063895252%20%2b18.66395491160,eq=ICRS,rs=2&-out.orig=o
Jmag = 15.493
Kmag = 14.456
Category=Star
Description=[Exoplanets]
Extended=NO

(7)	TA-WASP-84	RA: 08 44 27.6973 (131.1154054d)	Proper Motion RA: -6.792 mas/yr
		Dec: +01 51 1.09 (1.85030d)	Proper Motion Dec: -5.727 mas/yr
		Equinox: J2000	Parallax: 0.0024860"
			Epoch of Position: 2000

Comments: This object was generated by the targetselector and parameters were updated using GAIA EDR3 information found at:
https://vizier.cds.unistra.fr/viz-bin/VizieR-5?-ref=VIZ6877ac81b7a6b&-out.add=.&-source=I/350/gaiaedr3&-c=131.11537505935%20%2b01.85027757639,eq=ICRS,rs=2&-out.orig=o
Jmag = 16.230
Kmag = 15.187
Category=Star
Description=[Exoplanets]
Extended=NO

(8)	TA-TOI-677	RA: 09 36 27.7478 (144.1156158d)	Proper Motion RA: -4.202 mas/yr
		Dec: -50 27 28.44 (-50.45790d)	Proper Motion Dec: 2.677 mas/yr
		Equinox: J2000	Parallax: 0.0003919"
			Epoch of Position: 2000

Comments: This object was generated by the targetselector and parameters were updated using GAIA EDR3 information found at:
https://vizier.cds.unistra.fr/viz-bin/VizieR-5?-ref=VIZ6877ac81b7a6b&-out.add=.&-source=I/350/gaiaedr3&-c=144.11558665866%20-50.45788822419,eq=ICRS,rs=2&-out.orig=o
Jmag = 12.604
Kmag = 12.211
Category=Star
Description=[Exoplanets]
Extended=NO

Observation

Proposal 9025, Observation 1: Transit

Thu Jul 17 00:00:13 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Transit (Obs 1)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Transit (Obs 1)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(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)	WASP-25	RA: 13 01 26.3760 (195.3599000d) Dec: -27 31 19.92 (-27.52220d) Equinox: J2000	Proper Motion RA: -29.264 mas/yr Proper Motion Dec: -6.1960000266481075 mas/yr Parallax: 0.0046501" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.

Jmag = 10.596
Category=Star
Description=[Exoplanet Systems]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	99	272	1	1	272	24539.971	

Special Requirements	
	Phase 0.9568373605182704 to 0.9679047039751242 with period 3.76483 Days and zero-phase 2455888.66484 HJD Time Series Observation No Parallel Attachments

Observation

Proposal 9025, Observation 2: Transit Thu Jul 17 00:00:13 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Transit (Obs 2)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Transit (Obs 2)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	K2-232	RA: 04 55 3.9626 (73.7665108d) Dec: +18 39 16.31 (18.65453d) Equinox: J2000	Proper Motion RA: 61.996 mas/yr Proper Motion Dec: -48.14100002477062 mas/yr Parallax: 0.0077059" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	6 TA-K2-232	WATA	SUB32	CLEAR	NRSRAPID	3	1	1	0.08	

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	20	2091	1	1	2091	39650.546	

Special Requirements	
	Phase 0.9776155231511899 to 0.9813462692926583 with period 11.168454 Days and zero-phase 2458160.403851 HJD Time Series Observation No Parallel Attachments

Observation

Proposal 9025, Observation 3: Transit

Thu Jul 17 00:00:13 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Transit (Obs 3)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Transit (Obs 3)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	WASP-84	RA: 08 44 25.7032 (131.1070967d) Dec: +01 51 36.11 (1.86003d) Equinox: J2000	Proper Motion RA: -23.344 mas/yr Proper Motion Dec: -31.56999996463128 mas/yr Parallax: 0.0099636" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	7 TA-WASP-84	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	30	876	1	1	876	24512.652	

Special Requirements	
	Phase 0.9809350540143591 to 0.985823501702985 with period 8.52349648 Days and zero-phase 2456448.052286 HJD Time Series Observation No Parallel Attachments

Observation

Proposal 9025, Observation 4: Transit

Thu Jul 17 00:00:13 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Transit (Obs 4)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Transit (Obs 4)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(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)	TOI-2031	RA: 22 04 28.0921 (331.1170504d) Dec: +81 33 57.39 (81.56594d) Equinox: J2000	Proper Motion RA: 25.79 mas/yr Proper Motion Dec: 2.398 mas/yr Parallax: 0.0035797" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.

Jmag = 10.312
Category=Star
Description=[Exoplanet Systems]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	85	372	1	1	372	28864.403	

Special Requirements	
	Phase 0.9671943759 to 0.9744845146 with period 5.7154834 Days and zero-phase 2459634.565 HJD Time Series Observation No Parallel Attachments

Observation

Proposal 9025, Observation 5: Transit 1 Thu Jul 17 00:00:13 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Transit 1 (Obs 5)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Transit 1 (Obs 5)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	TOI-677	RA: 09 36 28.6865 (144.1195271d)	Proper Motion RA: -24.807 mas/yr	
		Dec: -50 27 47.80 (-50.46328d)	Proper Motion Dec: 42.562 mas/yr	
		Equinox: J2000	Parallax: 0.0070495"	
			Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	8 TA-TOI-677	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	20	1255	1	1	1255	23797.912	

Special Requirements	
	Phase 0.9859091421485741 to 0.9896172626357914 with period 11.2366 Days and zero-phase 2458918.28242 HJD Time Series Observation No Parallel Attachments

Observation

Proposal 9025, Observation 6: Transit 2 Thu Jul 17 00:00:13 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Transit 2 (Obs 6)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Transit 2 (Obs 6)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	TOI-677	RA: 09 36 28.6865 (144.1195271d)	Proper Motion RA: -24.807 mas/yr	
		Dec: -50 27 47.80 (-50.46328d)	Proper Motion Dec: 42.562 mas/yr	
		Equinox: J2000	Parallax: 0.0070495"	
			Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Exoplanet Systems]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	8 TA-TOI-677	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	20	1255	1	1	1255	23797.912	

Special Requirements	
	Phase 0.9859091421485741 to 0.9896172626357914 with period 11.2366 Days and zero-phase 2458918.28242 HJD Time Series Observation No Parallel Attachments