



11692 - Direct characterization of a recently formed giant planet orbiting on Solar System scales

Cycle: 5, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
NIRISS/AMI				
	1	HD135344A	NIRISS Aperture Masking Interferometry	(1) HD135344A
	2	PSF Reference	NIRISS Aperture Masking Interferometry	(2) HD136013

ABSTRACT

HD 135344 AB is a visual binary system (21" = 2800 au) best known for the prominent spiral arms in the protoplanetary disk around the secondary star. The circumstellar environment of the A0-type primary star has already been depleted, offering an unobscured view of the newly discovered

directly imaged planet, HD 135344 Ab. With an age of only 12 Myr, HD 135344 Ab is the youngest, fully formed directly imaged planet orbiting on Solar System scales ($a = 15\text{--}20$ au). It provides a unique laboratory for studying the formation and early evolution of a giant planet that may have formed near the snowline.

We propose to directly detect HD 135344 Ab using NIRISS aperture masking interferometry to obtain the first atmospheric characterization of the planet in the $3.5\text{--}5\text{ }\mu\text{m}$ range. Our goal is to measure the pseudo-continuum and identify photometric signatures of CO absorption and clouds. The expanded spectral coverage is essential for accurately constraining the planet's bulk properties. Combined with its well-determined age and the expected dynamical mass, these observations will enable us to infer the post-formation entropy, thereby placing valuable constraints on possible formation mechanisms linked to the accretion shock and planetary core mass.

Given the high orbital inclination, Cycle 5 offers the key opportunity to observe HD 135344 Ab at a sufficiently large separation from its star for a robust detection, near the diffraction limit of JWST

OBSERVING DESCRIPTION

The scientific goal of the observations is the atmospheric characterization of the directly imaged planet HD 135344 Ab. We will observe HD 135344 A and a PSF reference (HD 136013) with NIRISS aperture masking interferometry at F480M, F380M, and F430M. The observations will be executed in a non-interruptible sequence and the order of the filters minimizes the motion of the filter wheel between subsequent observations. We aim for an SNR > 400 with the target acquisition to achieve a centroiding accuracy of < 0.05 pixels.

The exposure times were calculated by following the recommenced observing strategy that a detection requires $100/\text{contrast}^2$ photons but also taking into account the actual performance that has been determined from on-sky data. The science and calibration targets are both A0V stars, respectively with magnitudes of 7.5 in the three requested NIRISS filters. The total exposure time amounts 17666s for HD 135344 A and 17122s for the PSF reference. Given the brightness of the observed targets, we will use the SUB80 subarray and the NISRAPID readout pattern. The total requested telescope time is 13.6h.

Proposal 11692 - Targets - Direct characterization of a recently formed giant planet orbiting on Solar System scales

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	HD135344A	RA: 15 15 48.9212 (228.9538383d) Dec: -37 08 56.12 (-37.14892d) Equinox: J2000	Proper Motion RA: -18.74 mas/yr Proper Motion Dec: -24.01 mas/yr Parallax: 0.00741" Epoch of Position: 2016	
	Comments: Category=Star Description=[A stars, Exoplanets]				
Fixed Targets	(2)	HD136013	RA: 15 19 22.3100 (229.8429583d) Dec: -34 01 57.18 (-34.03255d) Equinox: J2000	Proper Motion RA: -16.49 mas/yr Proper Motion Dec: -21.03 mas/yr Parallax: 0.006338" Epoch of Position: 2016	
	Comments: Category=Calibration Description=[Point spread function]				

Proposal 11692 - Observation 1 - Direct characterization of a recently formed giant planet orbiting on Solar System scales

Observation	Proposal 11692, Observation 1: HD135344A									Fri May 08 17:00:18 GMT 2026
	Diagnostic Status: Warning									
	Observing Template: NIRISS Aperture Masking Interferometry									
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)	HD135344A	RA: 15 15 48.9212 (228.9538383d) Dec: -37 08 56.12 (-37.14892d) Equinox: J2000			Proper Motion RA: -18.74 mas/yr Proper Motion Dec: -24.01 mas/yr Parallax: 0.00741" Epoch of Position: 2016				
	Comments: Category=Star Description=[A stars, Exoplanets]									
Acquisition	#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1	SAME	AMIBRIGHT	F480M	NISRAPID	9	1	1	0.475	302447.1
Template	Subarray									
	SUB80									
Dithers	#	Primary Dithers					Subpixel Positions			
	1	NONE					5			
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID	Direct Image
	1	F480M	NISRAPID	62	277	5	1385	6610.882	302447.2	false
	2	F380M	NISRAPID	24	600	5	3000	5719.44	302447.3	false
	3	F430M	NISRAPID	44	348	5	1740	5942.587	302447.4	false

Proposal 11692 - Observation 1 - Direct characterization of a recently formed giant planet orbiting on Solar System scales

PSF References	PSF Reference (Obs 2) (PSF Reference; Filters [F380M, F430M, F480M]) Additional Justification: false
Special Requirements	Between Dates 01-JUL-2026:00:00:00 and 24-AUG-2026:00:00:00 No Parallel Attachments Sequence Observations 1, 2, Non-interruptible

Proposal 11692 - Observation 2 - Direct characterization of a recently formed giant planet orbiting on Solar System scales

Observation	Proposal 11692, Observation 2: PSF Reference									Fri May 08 17:00:18 GMT 2026
	Diagnostic Status: Warning									
	Observing Template: NIRISS Aperture Masking Interferometry									
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		
	(2)	HD136013	RA: 15 19 22.3100 (229.8429583d) Dec: -34 01 57.18 (-34.03255d) Equinox: J2000			Proper Motion RA: -16.49 mas/yr Proper Motion Dec: -21.03 mas/yr Parallax: 0.006338" Epoch of Position: 2016				
	Comments: Category=Calibration Description=[Point spread function]									
Acquisition	#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1	SAME	AMIBRIGHT	F480M	NISRAPID	5	1	1	0.293	302447.5
Template	Subarray									
	SUB80									
Dithers	#	Primary Dithers					Subpixel Positions			
	1	NONE					5			
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID	Direct Image
	1	F480M	NISRAPID	60	277	5	1385	6401.913	302447.6	false
	2	F380M	NISRAPID	23	608	5	3040	5566.362	302447.7	false
	3	F430M	NISRAPID	43	345	5	1725	5761.224	302447.8	false

Proposal 11692 - Observation 2 - Direct characterization of a recently formed giant planet orbiting on Solar System scales

PSF References	PSF Reference: true
Special Requirements	Between Dates 01-JUL-2026:00:00:00 and 24-AUG-2026:00:00:00 No Parallel Attachments Sequence Observations 1, 2, Non-interruptible