



# 11304 - The L/T Transition in the Photospheres of Young Sub-Stellar Companions

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

## INVESTIGATORS

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## VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) HNPEGB	NIC1	1	14-Jun-2007 21:35:02.0	yes

1 Total Orbits Used

## ABSTRACT

We propose 3.6-8.0 micron IRAC photometry and 5.5 $\mu$ m low-resolution IRS spectroscopy and imaging of the sub-stellar companions to the ~0.3 Gyr old stars HN Peg and HD 203030. The spectral types of the two secondaries span the critical transition between L and T dwarfs, which is characterized by a rapid sedimentation of dust and appearance of methane in sub-stellar photospheres. HN Peg B (T2.5) and HD 203030 B (L7.5) are the youngest known brown dwarfs at this transition, and present a unique opportunity to examine the role of surface gravity in the process. Both objects stand out from 1-10 Gyr L/T transition dwarfs in the field because they are underluminous in the near-IR compared to the expected luminosities for their ages. Probable reasons include: (1) a decrease in the effective temperature at the onset of methane formation at lower surface gravities in sub-stellar photospheres, or (2) a shift in the emitted flux from the near-IR to the mid-IR region of the SED of young brown dwarfs. The

mid-IR is key for distinguishing between these two hypotheses because it contains several fundamental molecular transitions that create deep absorption bands in the SEDs of L and T dwarfs, and that are inaccessible for study from the ground. Our existing IRAC photometry of HN Peg B does reveal a 0.3-0.5 mag excess in its 3.6-8.0 micron SED. However, this excess is insufficient to account for the lower luminosity of HN Peg B, and indicates that both of the above hypotheses may hold true to certain degrees. With the present proposal we aim to independently confirm the gravity-dependent behavior of L/T transition photospheres in the mid-IR through IRAC photometry of HD 203030 B. We will also seek the culprit for the mid-IR excess of HN Peg B through low resolution spectroscopy and peak-up imaging with IRS. To check for possible duplicity of HN Peg B as the reason for its excess, we request high angular resolution imaging with HST to complement our lower resolution Spitzer imaging.

#### **OBSERVING DESCRIPTION**

NIC 1 images of target HN Peg B in F090M, F110W and F170 filters. The target is dithered between 5 positions within the NIC1 field of view. At each dither position we obtain 1 MULTIACCUM image in each of the three filters.

#### **ADDITIONAL COMMENTS**

We have adopted the observing strategy of HST Program 10247.

Proposal 11304 - Visit 01 - The L/T Transition in the Photospheres of Young Sub-Stellar Companions

Fri Jun 15 01:35:06 GMT 2007

Visit	<b>Proposal 11304, Visit 01</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: NIC1 Special Requirements: (none)									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
	(1)	Pattern Type=NIC-SPIRAL-DITH Purpose=DITHER Number Of Points=5 Point Spacing=1.3 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=0 Angle Between Sides= Center Pattern=true		(1-3)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	HNPEGB	RA: 21 44 28.4450 (326.1185208d) Dec: +14 46 7.43 (14.76873d) Equinox: J2000	Proper Motion RA: 0.015405s/yr Proper Motion Dec: -0.11345"/yr Epoch of Position: 1998.8	V=20.0+/-4.0 J = 15.8; H = 15.4; K = 15.1	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	F090M	(1) HNPEGB	NIC1, MULTIACCUM, NIC1	F090M	CAMERA-FOCUS=DEF;		Sequence 1-3 Non-Int	[==>(Pattern 1)]	[1]
						SAMP-SEQ=SPARS 4;	Pattern 1-3 (1)	[==>(Pattern 2)]		
						NSAMP=7		[==>(Pattern 3)]		
							[==>(Pattern 4)]			
								[==>(Pattern 5)]		
2	F110W	(1) HNPEGB	NIC1, MULTIACCUM, NIC1	F110W	CAMERA-FOCUS=DEF;		Sequence 1-3 Non-Int	[==>(Pattern 1)]	[1]	
					SAMP-SEQ=SPARS 32;	Pattern 1-3 (1)	[==>(Pattern 2)]			
					NSAMP=7		[==>(Pattern 3)]			
							[==>(Pattern 4)]			
								[==>(Pattern 5)]		
3	F170M	(1) HNPEGB	NIC1, MULTIACCUM, NIC1	F170M	CAMERA-FOCUS=DEF;		Sequence 1-3 Non-Int	[==>(Pattern 1)]	[1]	
					SAMP-SEQ=SPARS 32;	Pattern 1-3 (1)	[==>(Pattern 2)]			
					NSAMP=11		[==>(Pattern 3)]			
							[==>(Pattern 4)]			
								[==>(Pattern 5)]		

