European Organisation for Astronomical Research in the Southern Hemisphere

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APPLICATION FOR OBSERVING TIME

PERIOD: **96Z**

Important Notice: **DDT**

By submitting this proposal, the PI takes full responsibility for the content of the proposal, in particular with regard to the names of CoIs and the agreement to act according to the ESO policy and regulations, should observing time be granted.

1. Title

Category: **X–0**

First exoplanet image

2. Abstract / Total Time Requested

Total Amount of Time:

The TW Hydrae association is a group of about 30 very young stars located 50 pc from Earth that are 5-10 million years old. The best studied members of this stellar association are TW Hydrae (nearest known accreting T Tauri star to the Earth), HR 4796 (an A-type star with resolved dusty debris disk; the most massive known group member), HD 98800 (a quadruple star system with debris disk) and 2M1207 (accreting brown dwarf with spectral type M8 of mass ≈25MJup and ≈8Myr age located ≈70 pc from Earth with a remarkable planetary-mass companion 2M1207b: a very red object at a close separation of ≈780 mas (≈55 AU) with a spectral type L5-L9.5). Different evolutionary models predict for the companion an object within the planetary regime with a mass of M=5±2 MJup and an effective temperature of Teff=1250±200 K.

3.

Run	Period	Instrument	Time	Month	Moon	Seeing	Sky	Mode	Type
A	96	NACO	1h	any	n	0.8	PHO	s	

4. Number of nights/hours

	Telescope(s)	Amount of time
a) already awarded to this project:	VLT	4h
b) still required to complete this project:	VLT	3h

5. Special remarks:

6. Principal Investigator: beevageeva

6a. Co-investigators:

E. F.	Van Dishoeck	1096
E.	Dartois	1150

7. Description of the proposed programme

A – Scientific Rationale: We already have a few photometric and astrometric results from Two Micron All Sky Survey (2MASS) in bands: J , H , Ks (The transformations between the two filters Ks and K were found smaller than the measuring errors.) and from Keck telescope in L' band
The parent dwarf appears to be of spectral type M8 with magnitudes: 13.00(J), 12.39(H), 11.95(K), 11.38 (L') and the giant planet candidate: spectral type L5 - L9.5 with magnitudes: $\geq$ 18.5(J), 18.09 (K), 16.93(K), 15.28(L')

B – Immediate Objective: It is not established yet the nature of the companion of the brown dwarf that we believe is a giant planet (Contamination by a foreground or background field L dwarf is still possible).
We need to repeat the photometric measurements using adaptive optics infrared wavefront sensing to acquire sharp images with bigger integration time and to obtain spectroscopic results. If we can confirm the belief that the companion is a planet these would be the first images of an exoplanet.

7. Description of the proposed programme and attachments

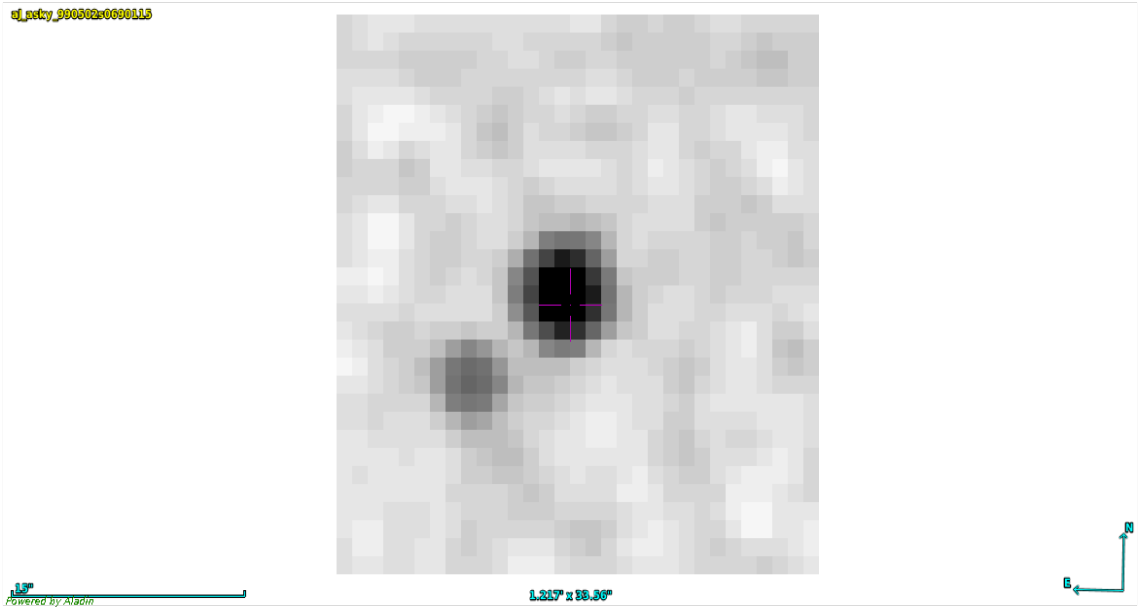

Fig. 1: image obtained from 2 mass centered on the parent dwarf: RA: 12h:07m:33.47s and dec: -39d:32m:54.0s , 30 arcsec

8. Justification of requested observing time and observing conditions

Lunar Phase Justification: The object we want to observe is very faint

Time Justification: (including seeing overhead) We need images in band J, H, Ks and L' and specter of the object with upper limit estimated magnitude ≈ 20 in band J; ETC gave us NDIT = 9 (J), NDIT = 1 (H, Ks and L') and NDIT = 120(specter) for DIT = 20s making a total time 2640s (we estimated to 1 h with overheads)

8a. Telescope Justification:

VLT is the world's most advanced optical instrument, consisting of four Unit Telescopes with main mirrors of 8.2m diameter and four movable 1.8m diameter Auxiliary Telescopes. We want to use UT1 beacuse we want to use intrument NACO.
NACO = Nasmyth Adaptive Optics System (NAOS) + Near-Infrared Imager and Spectrograph (CONICA)
NACO has been contributing to major discoveries in different fields of astronomy: exoplanets, the Galactic centre of the Milky Way, young stellar objects, Solar System bodies, etc.
In order to split the beam for the adaptive optics we use the N90C10 dichroic (90% flux to the wavefront sensor of NAOS and 10% to the camera CONICA) for J, H and Ks band. This mode is dedicated to the sharp imaging of red sources V K $\geq$ 6 (M5 or later spectral type), but this cannot be used for L' filter and specter and we use VIS dichroic (90% flux to the wavefront sensor and 90% to the camera) for these.

8b. DDT Justification:

The only option was for cycle 96z(DDT cycle)

8c. Calibration Request:

Standard Calibration

9. Report on the use of ESO facilities during the last 2 years

September 2003, VLT(UT3) telescope with instrument ISAAC at Nasmyth A focus: Spectroscopic surveys of large numbers of young low-mass stars which are still deeply embedded in their parental clouds. Our infrared spectra show a rich variety of features due to ices and gas-phase molecules, each of which trace different aspects of the physical and chemical state of the objects.
We already published the data: Origin and Evolution of Ices in star-forming regions a VLT-ISAAC 35 μm spectroscopic survey

9a. ESO Archive - Are the data requested by this proposal in the ESO Archive (http://archive.eso.org)? If so, explain the need for new data.

No

9b. GTO/Public Survey Duplications:

There are some results from 2 mass survey that our research is based on. We want to repeat the observations in J, H, Ks and L' band using adaptative optics and a bigger integration time and to obtain its specter in order to determine the nature of the companion of the brown dwarf that appears faintly in the images from 2 mass.

10. Applicant's publications related to the subject of this application during the last 2 years

E. F. Van Dishoeck , E. Dartois, K. M.Pontoppidan, W. F. Thi, L. D'Hendecourt, A. C. A. Boogert, H. J.Fraser, W. A. Schutte, A. G. G. M Tielen: Origin and Evolution of Ices in star-forming regions a VLT-ISAAC 35 μm spectroscopic survey

11. List of targets proposed in this programme

Run	Target/Field	α(J2000)	δ(J2000)	ToT	Mag.	Diam.	Additional info	Reference star
A	2M1207	12:07:33.47	-39:32:54.0	1	13			2M1207

Target Notes: RA above given in h:m:s format and declination in d:m:s format and the magnitude are those of the parent brown dwarf(2M1207). We use as reference star for adaptive optics the same target star - the parent brown dwarf - because the Adaptive Optics System (NAOS) is designed to work with natural guide stars. For spectroscopy we observe simultaneously the parent dwarf and its companion(2M1207b) at coordinates: RA: 12h:07m:34.01s, dec: -39d:32m:58.9s
We will use the following filters for imaging:

name	central wavelength(μm)	width(μm)	limit magnitude
J	1.265	0.25	24.05
H	1.66	0.33	24.05
Ks	2.18	0.35	23.35
L'	3.80	0.62	18.55

12. Scheduling requirements

This proposal involves time-critical observations, or observations to be performed at specific time intervals.

13. Instrument configuration

Period	Instrument	Run ID	Parameter	Value or list
96	NACO	A	IMG filters: J, H, Ks	N90C10 dichroic, FowlerNsamp(HighSensitivity) detector mode, detector FOV: 27.6x27.6 arcsec
96	NACO	A	IMG filter: L'	VIS dichroic, Uncorr(HighWellDepth) detector mode, detector FOV: 27.6x27.6 arcsec
96	NACO	A	Spectroscopy	VIS dichroic, S54 4 SJ spectroscopic mode(camera S54), FowlerNsamp(HighSensitivity) detector mode, 86 mas slit width