The most distant galaxies in the universe can be seen by ALMA

PI: Include here the name of the PI

1 Abstract

Include here the abstract of your proposal (optional)

2 Scientific Justification

Enter the scientific justification here, together with any figures and tables that you judge necessary.
indirect detection measurements (radial velocity surveys)
Instrument VLT - UT4 with NACO..
The Strehl ratio is a measure of the quality of optical image formation = Iaberrated / Iideal

broad filters:

name	central wavelength	width	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

name , central wavelength, width , limit magnitude J 1.265 0.25 H - 1.66 0.33 Ks - 2.18 0.35 L' - 3.80 0.62
24.05(J) 24.05(H) 23.35(K) 18.55($L\prime$)
We already have 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
parent dwarf : spectral type M8 13.00(J) 12.39(H) 11.95(K) 11.38 (L') giant planet candidate: spectral type L5L9.5 $\geq$ 18.5(J) 18.09 (K) , 16.93(K) a 15.28(L')
use N90C10 dichroic (90% flux to the wavefront sensor of NAOS and 10% to the camera CONICA)
using Myopic Deconvolution Method for the NAOS adaptative optics(MISTRAL) : the log exposure time images taken using AO must be deconvoluted in order to restore fine details
seeing = FWHM of the point spread function
image seeing ¡ 0.6
spectroscopic seeing (seeing during spec obs) ¡ 1
The TW Hydrae association is a group of approximately thirty very young stars located 50 parsecs[1] from Earth that share a common motion and appear to all be roughly the same age, 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 remarkable planetary-mass companion 2M1207b).
2M1207b giant planet companion
Parent star Star 2M1207 Constellation Centaurus Right ascension 12h 07m 33.47s Declination -39d32m54.0s Distance 172 3 ly Spectral type M8
Observed separation Angular separation 769 10 mas Projected separation 40.6 1.3 AU Physical characteristics Mass (m) 4+6 1[5] MJ Radius (r) 1.5[5] RJ Temperature (T) 1600 100 K[3] Discovery information Discovery date April 2004 Discoverer(s) Chauvin et al. Discovery method Imaged Discovery status Published[6]

image from 2 mass centered on parent star:

Instrument :

Telescope Very Large Telescope It 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. The telescopes can work together, to form a giant interferometer, the ESO Very Large Telescope Interferometer, allowing astronomers to see details up to 25 times finer than with the individual telescopes. The large telescopes are named Antu(UT1), Kueyen(UT2), Melipal(UT3) and Yepun(UT4). The ESO Very Large Telescope consists of an array of four 8-meter telescopes which can work independently or in combined mode. In this latter mode the VLT provides the total light collecting power of a 16 meter single telescope. The telescopes may also be used in interferometric mode providing high resolution imaging. The useful wavelength range extends from the near UV up to 25 m in the infrared.

Ritchey-Chretien type.

uses active optics in order to prevent deformation due to external influences such as wind, temperature, mechanical stress. Without active optics, the construction of 8 metre class telescopes is not possible,

8.2m focus nasmyth

Nasmyth Adaptive Optics System (NAOS) Near-Infrared Imager and Spectrograph (CONICA)

NACO has been contributing to major discoveries in different fields of astronomy since 2001: exoplanets, the Galactic centre of the Milky Way, young stellar objects, Solar System bodies, etc.

NACO has observed planets orbiting other stars, providing the first-ever direct image of an exoplanet in 2004. By 2010, it had been able to directly follow the motion of an exoplanet as it moved from one side of the star Beta Pictoris to the other (eso1024). The instrument has also provided the first-ever spectrum of a directly observed exoplanet, allowing astronomers to study the planets atmosphere (eso1002).

Moreover, NACO was involved in one of the most important recent long-term astronomical research programmes. In a 16-year-long study, and after observing 28 stars, astronomers produced the most detailed view ever of the motions of the stars at the heart of our galaxy, the Milky Way and providing evidence for the existence of a lurking supermassive black hole there.

During 2013 alone, 57 papers were produced by the scientific community with data obtained by NACO. NACO has now been moved from Unit Telescope 4 to Unit Telescope 1.

LIST:

NACO observes an intriguing object near a young brown dwarf: the first direct image of an exoplanet Sep 2004 Is this newly discovered feeble point of light the long-sought bona-fide image of an exoplanet? A research paper by an international team of astronomers [2] provides sound arguments in favour, but the definitive answer is now awaiting further observations.

Exoplanet caught on the move (June 2010) For the first time, astronomers have been able to directly follow the motion of an exoplanet as it moves from one side of its host star to the other. The planet has the smallest orbit so far of all directly imaged exoplanets, lying almost as close to its parent star as Saturn is to the Sun

NACO observes Titan's (largest moon of Saturn with a dense atmosphere) atmosphere and surface Fine images of Saturn and Io with VLT NACO (Jan 2002) With its new NAOS-CONICA Adaptive Optics facility, the ESO Very Large Telescope (VLT) at the Paranal Observatory has recently obtained impressive views of the giant planet Saturn and Io, the volcanic moon of Jupiter. They show the two objects with great clarity, unprecedented for a ground-based telescope

NACO tracks stars orbiting the supermassive black hole at the centre of the Milky Way (Dec 2009) the most detailed view ever of the surroundings of the monster lurking at our Galaxy's heart a supermassive black hole. The research has unravelled the hidden secrets of this tumultuous region

by mapping the orbits of almost 30 stars, a five-fold increase over previous studies. One of the stars has now completed a full orbit around the black hole.

4 years later :

Revolutionary ALMA Image Reveals Planetary Genesis (Nov 2014) ALMA, the Atacama Large Millimeter/submillimeter Array, reveals extraordinarily fine detail that has never been seen before in the planet-forming disc around a young star. These are the first observations that have used ALMA in its near-final configuration and the sharpest pictures ever made at submillimetre wavelengths.

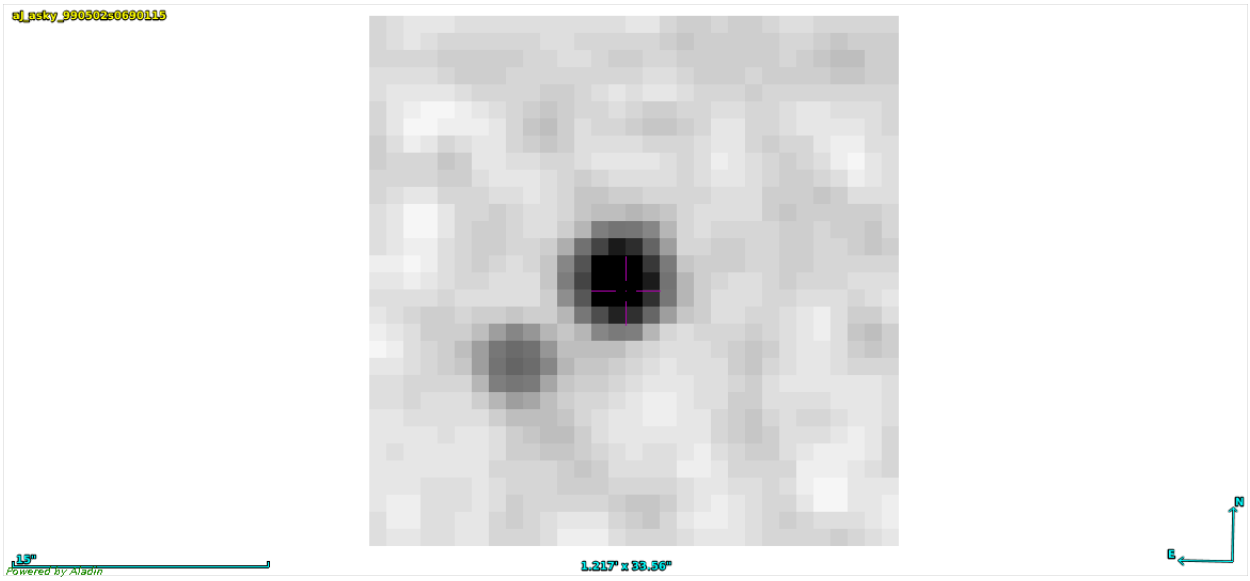

Figure 1: *image obtained from 2 mass centered on parent dwarf: RA: 12h07m33.47s dec: -39d32m54.0s 30 arcsec*

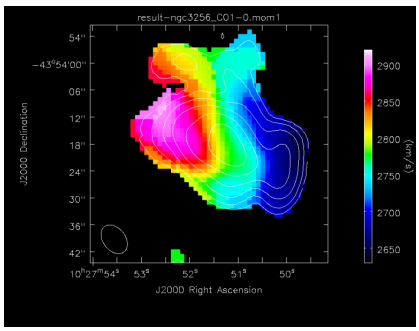

Figure 2: *The CO(1-0) velocity field of NGC 3256, with contours of the total line emission map overlaid (ALMA Science Verification Data).*

You can structure the scientific justification using the two subsections below (optional).

Table 1: *Here we show the continuum sensitivity required per band.*

Frequency (GHz)	Sensitivity (mJy)
100	0.01
300	0.10

2.1 Scientific rationale:

2.2 Immediate objective:

3 Potential for Publicity

4 References

[1] Author1 et al. year, journal, vol, page
[2] Author2 et al. year, journal, vol, page