

MATISSE: sounding milli-arcsecond angular resolution



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de la CÔTE d'AZUR



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LAGRANGE

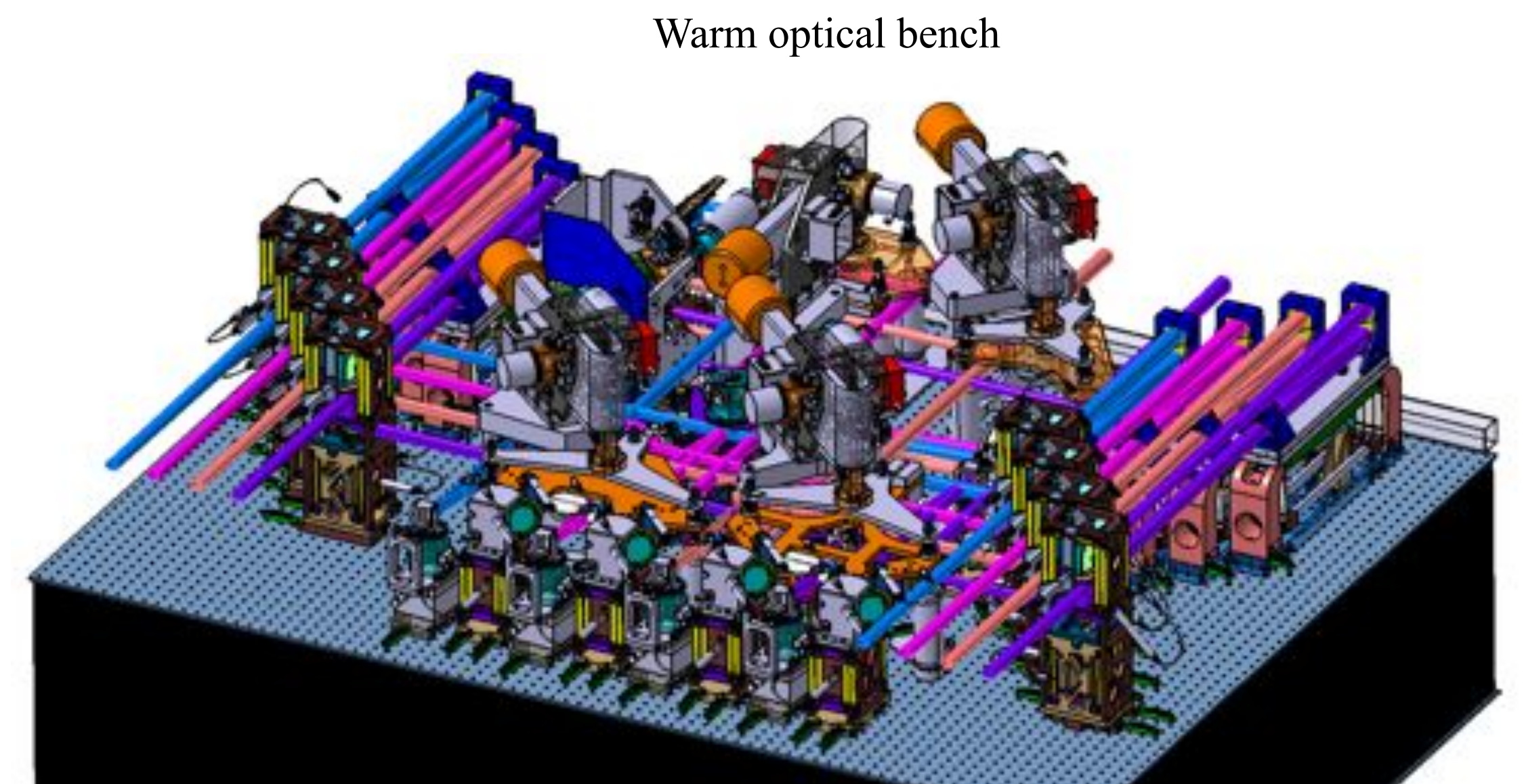
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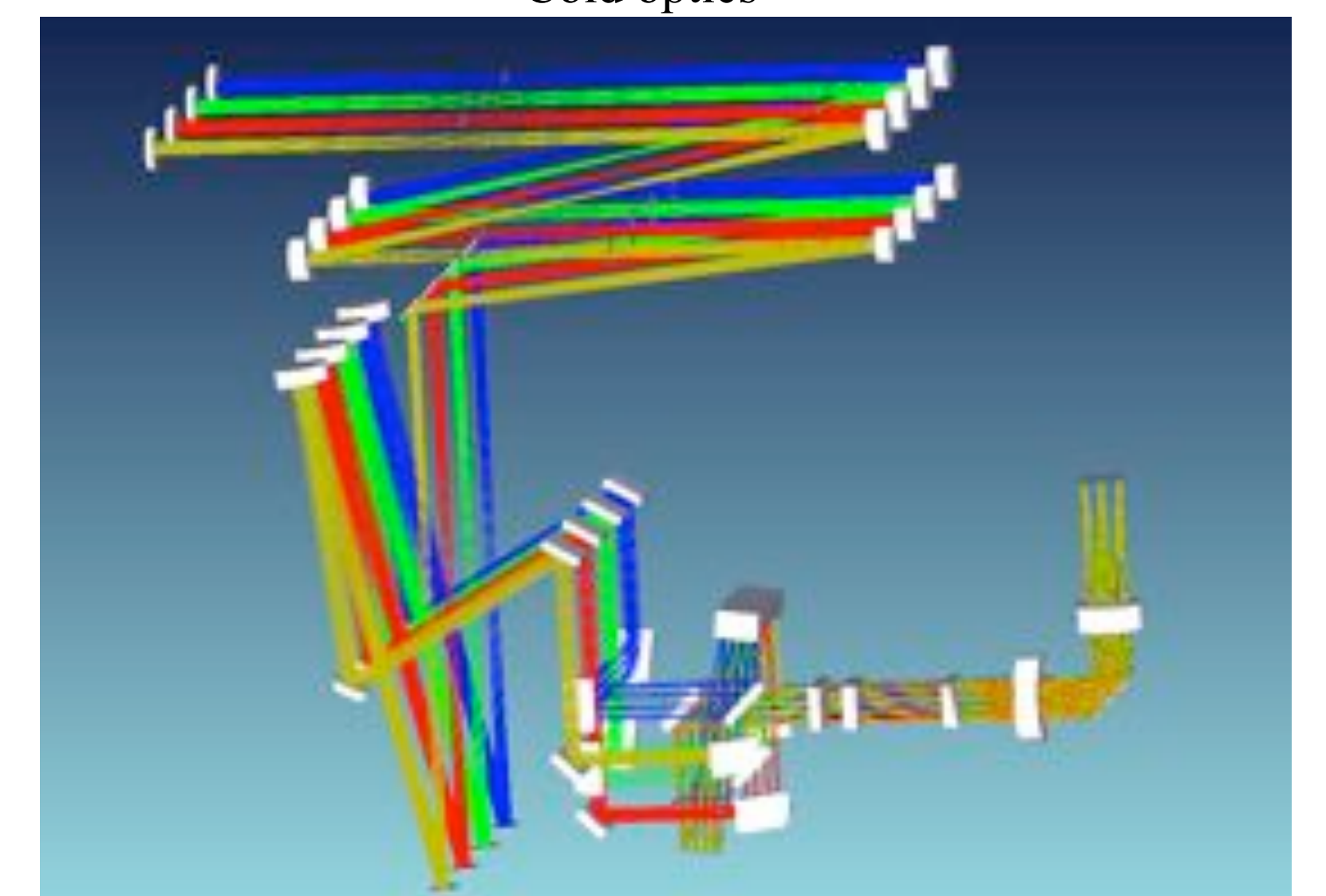
Presentation

MATISSE (Multi-AperTure mid-Infrared SpectroScopic Experiment) is the second-generation mid-infrared instrument of the VLTI. It will combine 4 telescopes of the VLTI array and will provide spectro-images at milli-arcseconds resolution at wavelengths from 3 to 13 microns. The MATISSE science will cover Active Galactic Nuclei, protoplanetary discs, the formation and evolution of planetary systems, the birth of massive stars as well as the observation of the high-contrast environment of hot and evolved stars.

MATISSE is in fact composed of 2 instruments: MATISSE-LM and MATISSE-N, with a few common optics on a warm table (including the LM/N dichroic plate), and separate cryostats and cameras. The optical functions include periscopes, delay lines, beam commutation, internal calibration source, anamorphosis, spectrograph, camera, etc.



Warm optical bench



Cold optics

Science with MATISSE

MATISSE's 2 main scientific drivers are the protoplanetary disks and the AGNs. With the new (for infrared interferometry!) capability of producing images, we will be able to image the central regions of the objects of interest down to 1 Jansky in the N band and down to 0.1 Jansky in the L band under certain conditions (presence of a fringe tracker). For YSOs, this correspond to 30-40 potential targets.

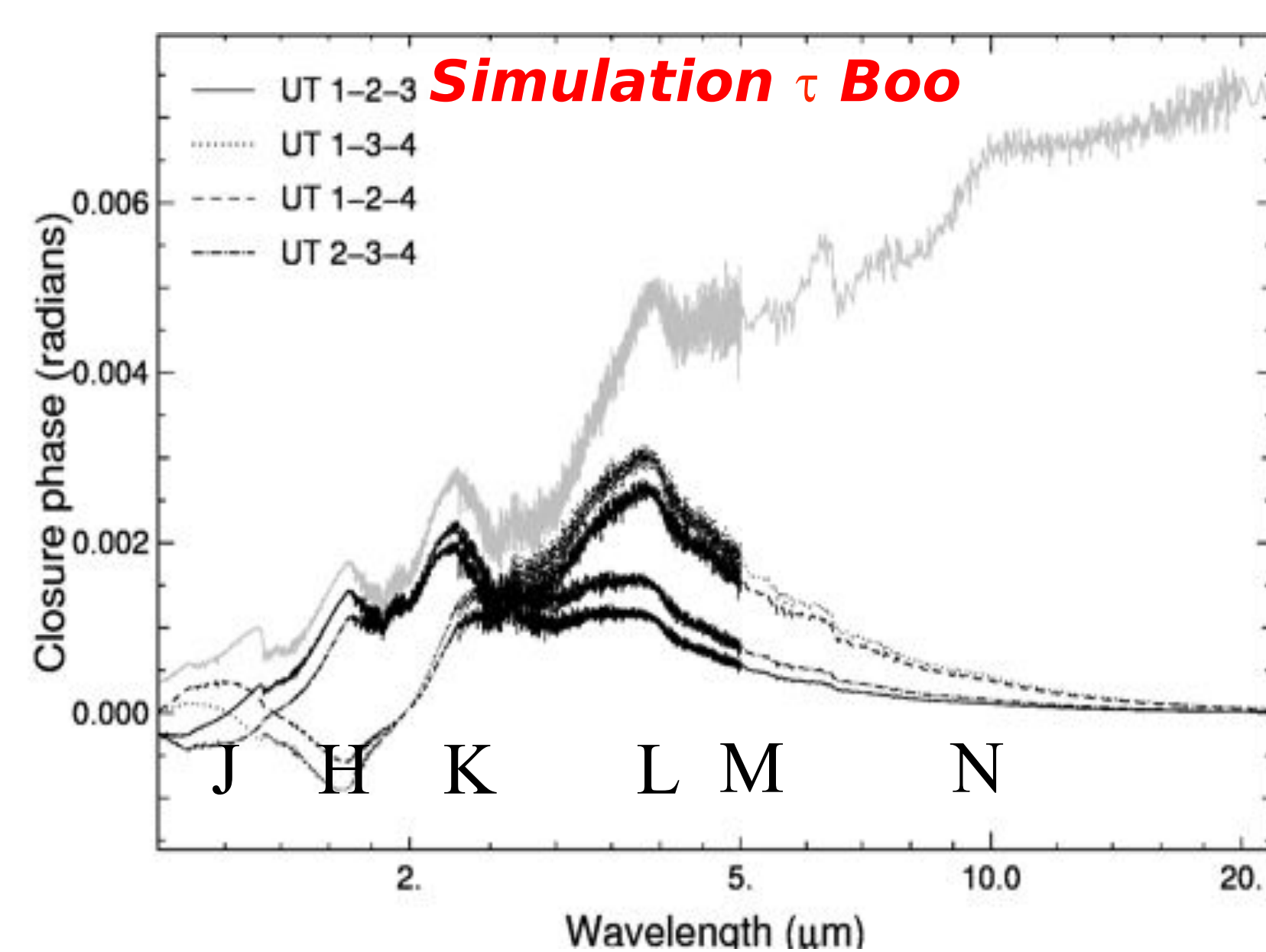
Several tests and simulations have shown that for a set of targets, details on the inner regions of protoplanetary disks will be reconstructed with a dynamic range of ~10-100 with 4 nights of observation, depending on the target brightness and ambient conditions.

The figure below shows typical images that MATISSE would be able to reconstruct, for different sizes and different observing conditions. (the model image is the same in all cases)



MATISSE / YSO

MATISSE / AGN



Exoplanets with MATISSE?

We investigated whether MATISSE could be used to characterize hot Jupiters, as the planet expected interferometric signal is strongest in L band (see graph on the right). A low-resolution spectrum ($R=30$) can potentially be extracted from the L-band MATISSE data, allowing a characterization of non-transiting planets. A handful of planets can potentially be characterized using MATISSE.

Status of the instrument

Clean room awaiting installation of MATISSE in Nice



MATISSE is now being manufactured after having successfully passed the Final Design Review (FDR) in July 2012. All the elements are built and are tested individually. Today, the cryostats and electronics cabinets are being tested in Heidelberg, the Aquarius detector has been delivered and is being tested in Bonn, the warm mechanics and optics are ordered and have started manufacturing, while the MATISSE clean room is being prepared for the instrument arrival in Nice.

Arrival of the main optical bench in Nice (Nov. 2012)



Electronic cabinets in Heidelberg (Oct 2012)



Cryostats in Heidelberg (Oct 2012)



2016

First light

2014

Acceptance
Europe

2013

Integration

2012

Final design

2010

Preliminary
design