

In this special issue you'll find selections on:

- METIS consortium news
- Performance updates
- Science case news
- R&D program updates

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METIS on Solid Financial Basis

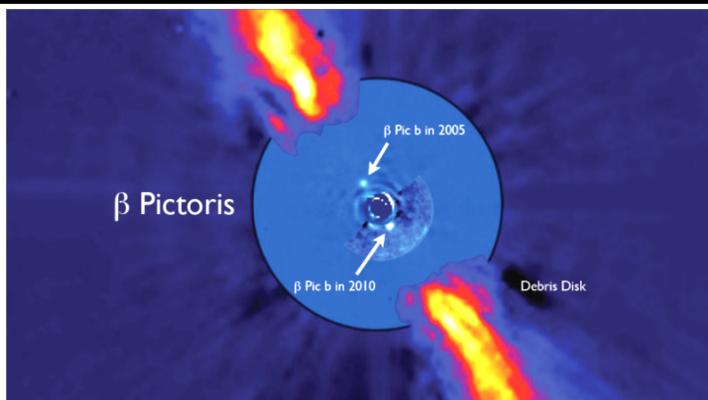
LEIDEN – The METIS project is financially in excellent shape. Following NOVA's allocation of 10 M€ to the design and construction of METIS, CEA Saclay and MPIA Heidelberg have given METIS a very high priority, with anticipated contributions on the order of 50 FTE-years. Hence, the commitments from all three major partners in METIS already constitute approximately 200 FTE-years, or about 90% of the necessary manpower for METIS.

Mid-IR Ideal for ELTs

HEIDELBERG – The huge aperture of ELTs makes them the ideal facility for efficient mid-IR astronomy from the ground. "The bigger the telescope and the higher the angular resolution, the smaller the impact of the thermal background. Hence, the largest gain in sensitivity will be in the mid-IR regime, with respect to shorter wavelengths" explains instrument scientist Rainer Lenzen.

4QPM Test Successful

SACLAY – The innovative 4QPM coronagraphic mask, which suppresses the starlight by interferometric nulling, has been successfully tested within the JWST-MIRI imager.

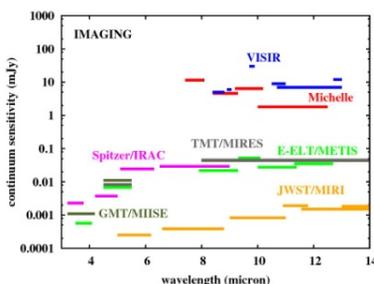


LEIDEN – Direct thermal imaging of extrasolar planets recently took a significant step forward with the detection of a Jupiter-mass exoplanet around beta-Pictoris. Subsequent coronagraphic imaging of the planet at L-band, carried out by METIS team members,

confirmed its orbital motion. "The unique combination of thermal infrared wavelengths with the high contrast imaging and spectroscopic capabilities of METIS will enable a significant leap in the direct characterization of exoplanets", says Matthew Kenworthy.

METIS on 38m E-ELT Still Reaches Sensitivity Requirements

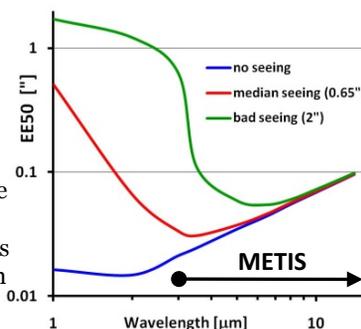
LEIDEN – The sensitivity estimates for a redesigned 38m E-ELT show that METIS will



still reach its required performance. The estimated performance even leaves some margin for degraded mirror reflectivity. "The slightly colder ambient temperatures on Cerro Armazones, with respect to Paranal, help METIS to maintain its high performance", says METIS post-doc Eva Meyer.

METIS Handles Bad Observing Conditions

CERRO ARMAZONES – While most NIR instruments require above average observing conditions, METIS – in combination with the E-ELT internal SCAO – will still achieve very good resolution and sensitivity under seeing as bad as 2". (See figure to the right which shows the 50% encircled energy as a function of wavelength). The lower impact of residual wavefront errors at mid-IR wavelengths enables METIS to reach many science goals under mediocre seeing conditions.



Also bright and grey time – unacceptable for many sensitive studies at optical wavelengths – is equally valuable time for METIS.

METIS Team Confirms Baseline

GARCHING – At their recent meeting, the METIS team reconfirmed the instrument baseline:

- A diffraction limited **imager** at L/M, and N band with an 18"×18" FOV, including coronagraphy, and low-resolution ($R \leq 5000$) long slit spectroscopy.

- An IFU high resolution **spectrograph** at 2.9–5.3µm at resolution $R \sim 100,000$.

"With this baseline, METIS combines half the functionality of CONICA with half of CRIRES and half of VISIR, with the exciting possibilities provided by the E-ELT" says principal investigator Bernhard Brandl.

METIS Consortium Expands Expertise on Exoplanets

ZÜRICH – The successful hunt for exoplanets on other facilities has led the METIS consortium to expand their efforts in this area. "Exoplanet detections and their follow-up characterizations are ideal areas for METIS as many biomarkers fall in that wavelength range", according to new exoplanet science coordinator Lisa Kaltenecker.

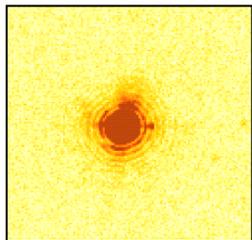
A major step is the addition of ETH Zürich as the sixth consortium partner to METIS. The group of Prof. Michael Meyer will add considerable expertise in both the scientific understanding of exoplanets and observing techniques. "We are very excited about joining METIS. I believe that METIS has the potential to transform some key areas of astrophysics" says Prof. Meyer, who is setting up an infrared test facility at the ETH.

METIS Examines High-z Galaxies

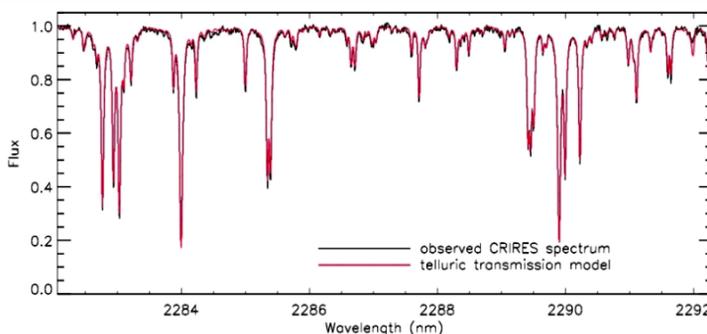
EDINBURGH – For distant galaxies the hydrogen H α and P α lines will be red-shifted into the L-band at intervals of $3.4 < z < 5.4$ and $0.6 < z < 1.2$, respectively. Since the emission likely comes from compact knots of star formation rather than from an extended disk, these objects can be detected, resolved and studied with METIS. “*This science case is quite unique to METIS as these line diagnostics suffer much less from extinction than UV lines shifted into the near-IR*”, explains METIS science team member and KMOS scientist Michele Cirasuolo.

METIS uses Proven Detector Technology

GARCHING – The two types of METIS detectors have already become existing technology. While the HAWAII-2RG detectors for L/M band have already been used in several ESO instruments, the AQUARIUS 1024² detector for N-band has just been delivered to ESO for the VISIR upgrade project and is currently being tested.



“*Although a lot of work still needs to be done, the cosmetic quality and performance of the new AQUARIUS detectors exceeds by far the performance of the mid-IR detectors currently in use*”, according to ESO’s detector experts Gert Finger and Derek Ives.

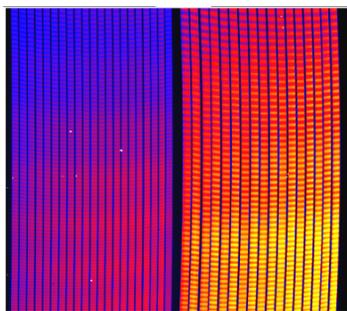


Breakthrough in Efficient Calibration

LEUVEN/SACLAY – Many constituents of the Earth’s atmosphere emit and absorb light at infrared wavelengths, affecting the observed spectrum of the science target. Therefore, a standard star is usually observed before/after the science target to calibrate out the atmospheric effects. However, this classical approach needs precious observing time, suffers from changes in the atmospheric conditions, and is not efficient for long slits and IFUs. Recent

tests with CRILES on the VLT have shown that model spectra, produced with the HITRAN code, can be used instead of the standard star – provided that the atmospheric conditions at the time of observation have been accurately recorded. “*The excellent match between the observed spectrum (black line) and the model spectrum (red line) in the above figure demonstrates the potential of this technique*” explains Calibration Scientist Joris Blommaert.

IFU Prototype Shows Excellent Performance

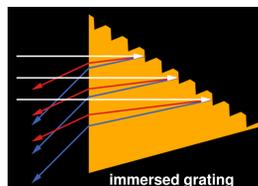


EDINBURGH – Although METIS will be the first high-resolution mid-IR integral-field spectrograph in the world, a very similar IFU has been recently built and tested within the MIRI spectrograph for JWST. The good test results indicate that this technology will allow METIS to reach its ambitious science requirements.

METIS Technology Development Program on Track

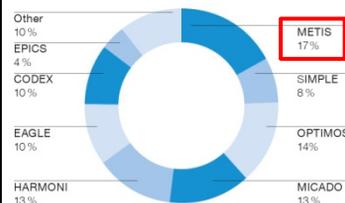
DWINGELOO – The NWO-funded technology development program for METIS is making good progress. Several projects have been started, including the cold chopper (right column), the development of powerful, vibration-free sorption coolers in collaboration with TU Twente

and Dutch Space, and a program, together with SRON, TNO and MiPlaza, to investigate the manufacturing of immersed gratings, which allow more compact spectrograph designs.



METIS Science Very Popular

GARCHING – In preparation for the science operation ESO has launched the Design Reference Science Plan (DRSP), which collected feedback from the community in the form of 188 science cases by 157 PIs from 105 institutes across Europe (ESO Messenger No.138).



The science cases were spread over all eight proposed E-ELT instruments. However, with 17%, METIS was the most requested E-ELT science instrument.

METIS Develops Precise Cryogenic Chopping Mirror

MAASTRICHT – The accurate subtraction of the thermal background is of utmost importance to ground-based instruments working in the thermal infrared. Since the large size of the optical components of an ELT prohibits classical chopping and nodding techniques, the METIS team, together with Janssen Precision Engineering and SRON, are developing a 2-dimensional, precise and fast cryogenic chopper.

