National press release **22/10/2025**

The state-of-the-art 4MOST cosmograph sees its first light

- 4MOST, the four-metre Multi-Object Spectrograph Telescope, has begun mapping the sky at record speed, analysing light emitted by 2,400 cosmic objects simultaneously.
- It is the largest instrument of its kind in the Southern hemisphere and two of its spectrographs were built with significant support from French teams.
- Over a period of 15 years, 4MOST will identify the features of faraway stars and galaxies by mapping vast patches of sky.

The 4MOST instrument, installed on the Visible and Infrared Survey Telescope for Astronomy (VISTA) at the European Southern Observatory (ESO) in Chile and developed in large part by CNRS teams at Université Claude Bernard Lyon 1 and ENS Lyon, has captured its first light. This first light collected from space and analysed by 4MOST's spectrographs marks the beginning of a vast adventure to study and map the sky. Thanks to its cutting-edge technology, 4MOST can study the light of 2,400 cosmic objects simultaneously and every 15 minutes.

Mapping the universe at record speed

On 18 October 2025, the 4-metre Multi-Object Spectroscopic Telescope (4MOST) installed on the Visible and Infrared Survey Telescope for Astronomy (VISTA) at the European Southern Observatory (ESO) in the Atacama Desert in Chile captured its first light observations in the sky (**Figure 1**). This first light is not a snapshot of space: 4MOST registers spectra – light captured from cosmic objects that is split into colour components across the visible light range, from violet to red. Using individual optical fibres, it can capture the light of 2,436 cosmic objects in 18,000 wavelengths.

In development since 2010, the three 4MOST spectrographs will operate for at least 15 years, allowing astronomers to investigate a range of subjects, from the composition of stars to dark matter and dark energy. Scientists will analyse spectra from thousands of objects captured at 10-20 minute intervals to record the temperatures, chemical compositions, movement and distances of tens of millions of stars in the Southern skies.

4MOST is the largest multi-object spectrograph in the Southern hemisphere. Its extensive field of view – five times larger than the Moon – along with the number of sources it can observe simultaneously and the detail in its spectra make the instrument truly unique.

A significant French contribution

France and CNRS have played a major role in the development of this European instrument. Two of its three spectrographs were created by the CRAL (Centre de recherche astrophysique de Lyon) (CNRS/Université Claude Bernard Lyon 1/ENS de Lyon).

These two low-resolution, identical spectrographs (LRS) are vital to ensuring that 4MOST covers the entire colour spectrum, from 370 to 950 nm. The third, high-resolution spectrograph looks at higher wavelength resolution in three selected colour bands. Scientists use the spectrographs, each of which is connected to 812 optical fibres the width of a human hair, to conduct vast surveys of the sky, making VISTA and its four-metre mirror the world's largest telescope for this type of research (**Figure 2**).

The French team of around 15 engineers, technicians and researchers has taken part since 2014 in the design, assembly and testing of the spectrographs until they were fitted onto the telescope this summer. "4MOST has been an incredible adventure, technically speaking and for the team," said Florence Laurent, an optical engineer at CNRS. "Driven by talented and complementary international teams at multiple locations, this project illustrates the power of a collective working to achieve a common goal: science." The instrument is eagerly awaited by the world's astrophysics community, explains Johan Richard, an astronomist at the same laboratory: "It will multiply by tenfold our ability to map large regions of the sky. The volume of physical measurements we'll obtain for such distant objects is truly impressive!"

A promising first light

4MOST's first light observation demonstrates the full potential of the instrument, which can observe a broad field of view while simultaneously analysing several thousand cosmic objects at once (**Figure 3**).
One of the most noteworthy observations was the Sculptor Galaxy (NGC253), the largest in the Southern sky after the two Magellanic Clouds. The galaxy's visible diameter equals that of the Moon, but its fainter brightness makes it much harder to see.

Another object seen was the NGC 288 globular cluster, formed over 13 billion years ago in the earliest phases of the formation of the Milky Way and composed of around 100,000 stars containing only small amounts of elements heavier than hydrogen and helium.

In total, spectra from over 2,000 sources were analysed (**Figure 4**), including stars in our galaxy for which we now know the temperature, mass, diameter, velocity, age and chemical composition. 4MOST simultaneously generated spectra from over 100 galaxies – as far as 10 billion light years away (**Figure 5**) – to determine their distance, movement, star formation history and their central black holes.

Over 700 people from universities and research institutes around the world will work with 4MOST. Twenty-five science programmes involving several CNRS research laboratories are already in place for the next five years.

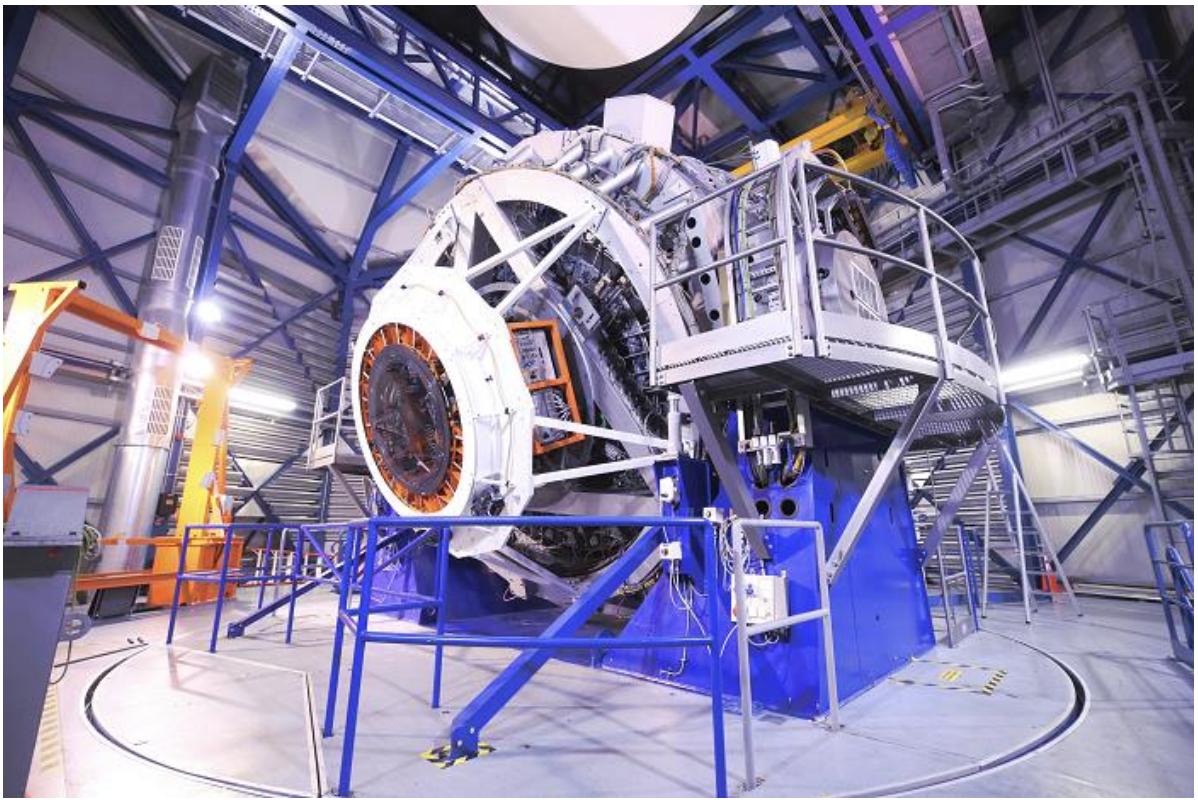

Figure 1: The Visible and Infrared Survey Telescope for Astronomy (VISTA) on which the 4MOST instrument is mounted. **Image: Allar Saviauk / AIP**

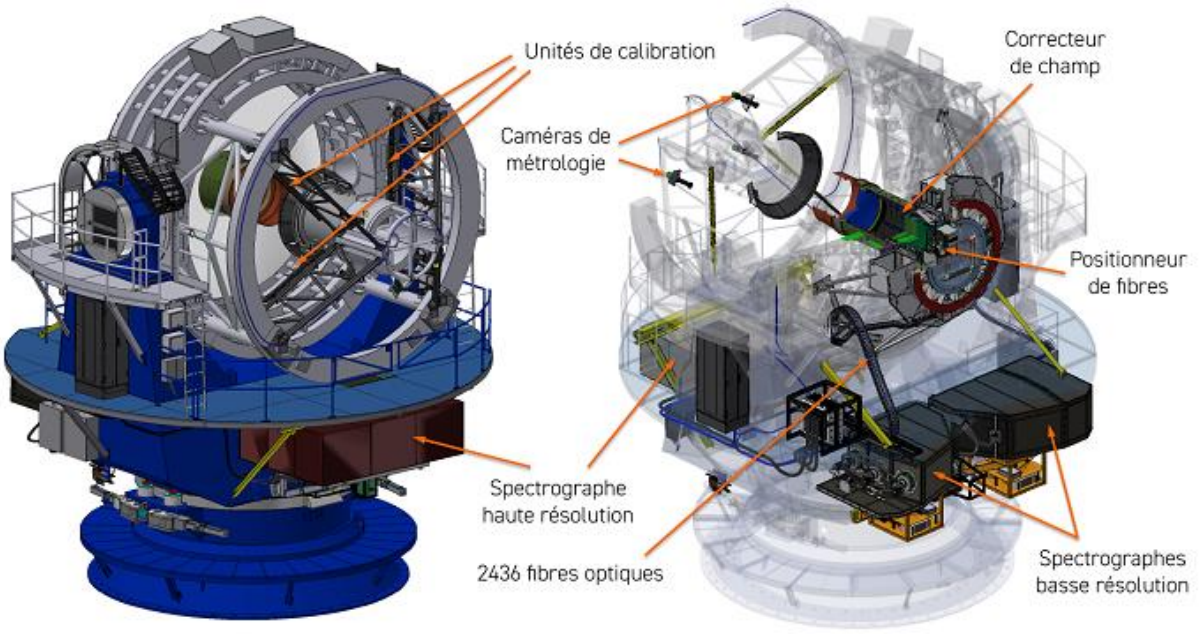

Figure 2: Diagram of the main components of 4MOST on VISTA. Light collected by the mirror is sent to three spectrographs – one high-resolution and two low-resolution – by a system of optical fibres pointed at specific astrophysical sources. **Image: 4MOST consortium**

Figure 3: The region targeted for 4MOST's first run includes the Sculptor Galaxy (in the top-right quarter of the image) and NGC288 (bottom-left quarter), a dense globular cluster of approximately 100,000 stars located at the edge of our galaxy. **Image: Harshwardhan Pathak**

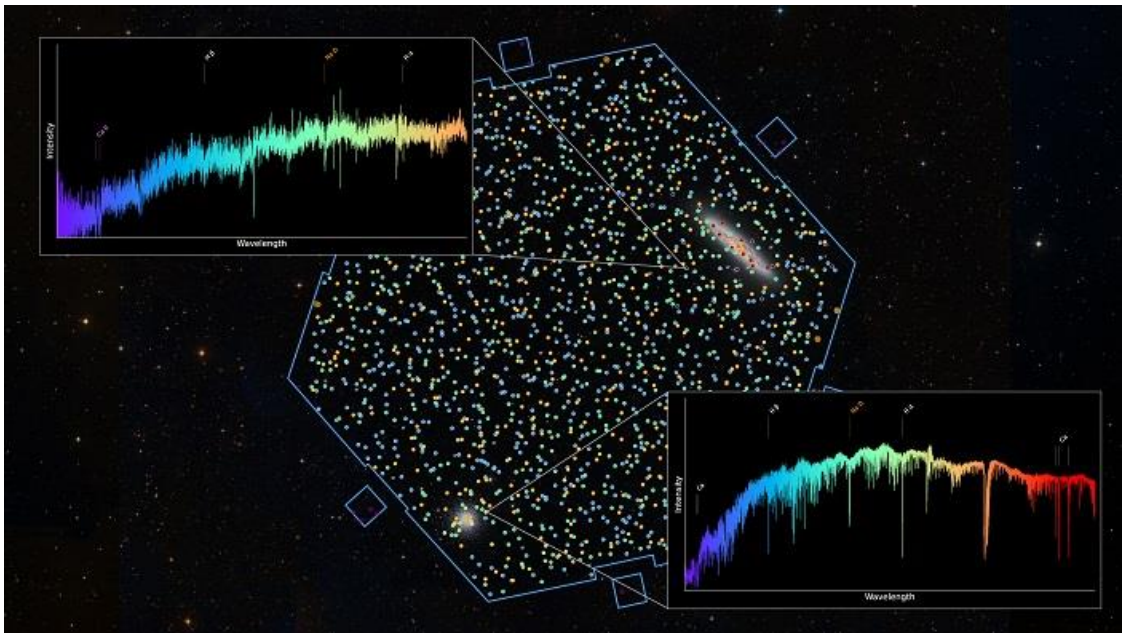

Figure 4: 4MOST's first light field. Blue lines indicate the instrument's field of view. Each dot represents a cosmic object from which light was collected by the instrument's optical fibres for spectrum analysis. Objects are classified by colour: green points indicate galaxies lying in the background; red points indicate planetary nebula; yellow points indicate bright stars, and so on. A spectrum was obtained for each point. Analysing them provides information on the temperature, composition, velocity, mass and distance of these objects. Two examples of spectra with different profiles are shown in the image. The one from the globular cluster, for example, shows that its stars contain only very small amounts of elements, a

sign of a very old formation. **Image: Roelof de Jong / AIP; Jens-Kristian Krogager / CRAL; Background image: Harshwardhan Pathak / Telescope Live**

Figure 5: One of the over 2,000 spectra from 4MOST's first light, superimposed on the area of sky where it came from. Measured by pointing an optical fibre at a galaxy in the background, this spectrum reveals the typical shape of an active galactic nucleus (AGN), which indicates the presence of a supermassive black hole. **Image: Roelof de Jong / AIP; Jens-Kristian Krogager / CRAL; Background image: Harshwardhan Pathak / Telescope Live**

Additional images

The following images can be downloaded at the address below and used for communications (Correct credits must be given).

Download here: https://cloud.osu-lyon.fr/s/kpqXiL5CY2Gjwo4

Image	Legend	Credit(s)
	*The 4MOST logo surrounded by the logos of institutions taking part in the project, illustrating the international cooperation that defines the 4MOST community.*	Moritz Gammel
	*Image of the 4MOST instrument with portraits of consortium members superimposed on the optical fibres.*	Moritz Gammel
	*One of the two low-resolution spectrographs (LRS) at the Centre de recherche astrophysique de Lyon (CRAL) in 2021.*	Éric Le Roux / Université Claude Bernard Lyon 1

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	*Final preparation of the low-resolution spectrographs (LRS) before their transfer to VISTA at Cerro Paranal.*	Alban Remillieux / CRAL
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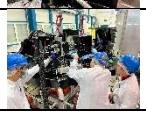	*Final preparation of the low-resolution spectrographs (LRS) before their transfer to VISTA at Cerro Paranal by CRAL team members.*	Alban Remillieux / CRAL
	*The winding road to the Visible and Infrared Survey Telescope for Astronomy (VISTA) at the European Southern Observatory (ESO) in the Atacama Desert in Chile at Cerro Paranal.*	Florence Laurent / CRAL
	*The winding road to the Visible and Infrared Survey Telescope for Astronomy (VISTA) at the European Southern Observatory (ESO) in the Atacama Desert in Chile at Cerro Paranal.*	Allar Saviauk / AIP
	*Transportation of 4MOST's low-resolution spectrographs (LRS) to VISTA with the domes of the Very Large Telescope (VLT) in the background.*	Florence Laurent / CRAL
	*The 4MOST low-resolution spectrographs (LRS) were installed on VISTA using cranes. The domes of the Very Large Telescope are visible in the background.*	Allar Saviauk / AIP
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	*The 4MOST low-resolution spectrographs (LRS) were installed on VISTA by passing them through the open dome with the help of a crane.*	Florence Laurent / CRAL
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	*The 4MOST low-resolution spectrographs (LRS) were installed on VISTA by passing them through the dome's opening with the help of a crane.*	Allar Saviauk / AIP
	*The low-resolution spectrographs (LRS) of 4MOST (the black boxes at the bottom of the image), installed and connected to VISTA.*	Florence Laurent / CRAL

	*4MOST's two low-resolution spectrographs (LRS), installed on the European Southern Observatory's (ESO) VISTA.*	Allar Saviauk / AIP
	*4MOST's two low-resolution spectrographs (LRS), installed on the European Southern Observatory's (ESO) VISTA.*	Florence Laurent / CRAL
	*The 4MOST's high-resolution spectrograph (HRS) was installed on VISTA using a crane. The domes of the Very Large Telescope (VLT) are visible in the background.*	Allar Saviauk / AIP
	*General view inside the dome of VISTA during the installation of 4MOST's high-resolution spectrograph (HRS).*	Allar Saviauk / AIP
	*Front-angle view of VISTA during the installation of 4MOST's high-resolution spectrograph (HRS).*	Allar Saviauk / AIP
	*Side-angle view of VISTA with the dome opened.*	Allar Saviauk / AIP

Video resources

Video: 4MOST, the new generation cosmograph
YouTube: https://www.youtube.com/watch?v=0hQNNodQTiU
Canal U: publish after the press release
Download here: https://filesender.renater.fr/?s=download&token=b9197e18-3d10-4c7a-aada-0e2a84ab640b
Short presentation of the 4MOST instrument, made by the team on site inside the VISTA dome just after its installation and before the first light observations. CRAL Researcher Johan Richard presents its design and different components.
Embargoed until the press release is published!
Credit: Roelof de Jong (AIP) / Knowledge sharing office at the Lyon Observatory

Video: "The 4MOST spectrograph for ESO's VISTA telescope"
YouTube: https://www.youtube.com/watch?v=FsdjX4URtwA (with English-language subtitles)
Canal U: https://www.canal-u.tv/chaines/observatoire-lyon/l-instrument-4most-pour-le-telescope-vista
Download: https://filesender.renater.fr/?s=download&token=55d41c2b-a2ee-45c6-bed0-59928dd8b845
Presentation of one of the two low-resolution spectrographs (LRS) produced at the Lyon Observatory before its transfer to Potsdam with Johan Richard, astrophysicist at CRAL and Scientific Director of the 4MOST project.
Credit: Knowledge sharing office at the Lyon Observatory

Video: "*4MOST Spectrographs Installed — Our New Eye on the Cosmos!*"
YouTube: https://www.youtube.com/watch?v=3D-b5Q6INJI
Timelapse video of the installation of 4MOST on VISTA.
Credit: Allar Saviauk / AIP

Note: other videos will be posted after the embargo expires on the ESO website.

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