

MOSAIC NIR channel for the ELT

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Abstract

The European Southern Observatory's (ESO) 39-meter European Large Telescope (ELT) is set to begin scientific operations in 2028 on Cerro Armazones (3046 m altitude) in the Atacama Desert, Chile. MOSAIC, alongside ANDES, is one of the two first-generation instruments in the ELT roadmap and will follow the first-light instruments—HARMONI, METIS, MICADO, and MORFEO. As a versatile multi-object spectrograph, MOSAIC is designed for a wide range of scientific applications requiring high multiplexing capabilities, and it will provide unique observational capacities at the ELT. MOSAIC enables multi-object observations with both low and high spectral resolution (LR and HR) modes, utilizing the ELT's entire Field of View (FoV, 40 arcmin^2). It includes two channels, each served by MOS fiber bundles: the VIS channel ($0.39 - 0.95 \text{ }\mu\text{m}$) and the NIR channel ($0.95 - 1.8 \text{ }\mu\text{m}$, J and H bands). These channels span the full range with a spectral resolution of $R \geq 4,000$ in a single exposure. Additionally, both channels offer an HR mode ($R \geq 18,000$), covering four windows in VIS and the H band in NIR. The NIR channel also provides a mIFU mode with eight integral field units. All MOSAIC modes benefit from Ground-Layer Adaptive Optics (GLAO), utilizing both natural and laser guide stars, and are optimized to deliver high survey speed, minimizing the required observing time to reach the target signal-to-noise ratio across the large statistical samples needed for MOSAIC's diverse science cases. Currently in the B1 phase, MOSAIC's architecture has been optimized to reduce risk and cost while maintaining scientific performance and adhering to the mass, volume, and power constraints of the Nasmyth platform, where it will be installed. The goal is to achieve Preliminary Acceptance in Europe (PAE) by 2032, with on-sky operations dependent on the ELT timeline. The MOSAIC consortium is responsible for securing funding for both human resources and hardware procurement. This extensive funding effort has resulted in a large consortium of approximately 350 members across 23 institutional partners in 13 countries.

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