

A DUAL mission for nuclear astrophysics

The DUAL Consortium

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Abstract DUAL will study the origin and evolution of the elements and explores new frontiers of physics: extreme energies that drive powerful stellar explosions and accelerate particles to macroscopic energies; extreme densities that modify the laws of physics around the most compact objects known; and extreme fields that influence matter in a way that is unknown on Earth. The variability of these extreme objects requires continuous all-sky coverage, while detailed study demands an improvement in sensitivity over previous technologies by at least an order of magnitude. The DUAL payload is composed of an All-Sky Compton Imager (ASCI), and two optical modules, the Laue-Lens Optic (LLO) and the Coded-Mask Optic (CMO). The ASCI serves dual roles simultaneously, both as an optimal focal-plane sensor for deep observations with the optical modules and as a sensitive true all-sky telescope in its own right for all-sky surveys and monitoring. While the optical modules are located on the main satellite, the All-Sky Compton Imager is situated on a deployable structure at a distance of 30 m from the satellite. This configuration not only permits to maintain the less massive payload at the focal distance, it also greatly reduces the spacecraft-induced detector background, and, above all it provides ASCI with a continuous all-sky exposure.

Keywords Nuclear astrophysics · Gamma-ray optics: Compton telescope · Laue lens · Coded aperture imaging · Second cosmic vision call of ESA

The full author list and affiliations are given at the end of the paper.

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