

Plenary Talk

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LISA: The first space-based gravitational-wave observatory —

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Since their first detection, gravitational waves (GWs) have become a central pillar of current and future efforts to study the Universe. Ground-based observatories have opened a new observational window, allowing us to detect GWs from mergers of neutron stars and black holes with masses up to a few hundred solar masses.

The first space-based gravitational-wave observatory, the Laser Interferometer Space Antenna (LISA), will extend these observations to the millihertz band, the natural frequency range of sources involving massive black holes with masses of millions of solar masses. In 2024, LISA was adopted by ESA as its next L-class mission, with a launch anticipated in the mid-2030s. The mission is currently progressing through its preliminary design reviews, consolidating the overall design and paving the way toward full implementation.

In this plenary talk, I will discuss the science case for LISA, introduce the mission concept, highlight the key technological challenges, and outline the roadmap from engineering models to flight hardware.