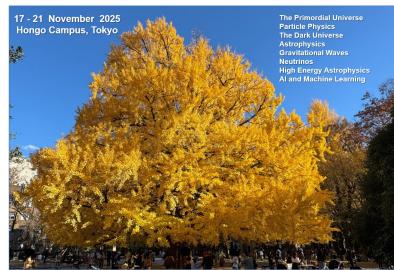


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The Einstein Telescope: challenges and opportunities of a third-generation detector

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The Einstein Telescope (ET) is a European project for a third-generation gravitational-wave detector designed to increase the sensitivity of present interferometers by approximately one order of magnitude.

Two reference designs are currently under investigation: a triangular-shaped detector with 10 km arms, and a configuration with two L-shaped detectors with 15 km arms, both located in Europe. Each arm will host a 'xylophone' setup of two interferometers: one optimized for high frequencies, the other, cryogenic, for low frequencies. This design will significantly expand the observable volume of the Universe and improve source parameter estimation.

In this contribution, we outline the scientific program of the ET, tracing the project's evolution, current status, and prospects. We give an overview of the technological challenges, especially for the low-frequency instrument, and the scientific reach of a third-generation detector like ET, highlighting the potential for discoveries in fundamental physics, multi-messenger astrophysics, and cosmology.

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