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A deci-Hz Gravitational-Wave Lunar Observatory for Cosmology

We are proposing Gravitational-Wave Lunar Observatory for Cosmology (GLOC) – a first of its kind fundamental physics experiment on the surface of the Moon. The experiment would access gravitational waves in the frequency range of deci-Hz to 5 Hz, a challenging regime for all Earth-based detectors and space missions. We find that such a lunar-based experiment can survey over 70% of the observable volume of our universe without significant background contamination. This unprecedented sensitivity makes GLOC a powerful cosmic probe for Dark Energy, Dark Matter and physics beyond the Standard Model. In particular, it will independently trace the Hubble expansion rate up to redshift $z \sim 3$, provide the strongest limits on the sub-solar Dark Matter candidates and test ΛCDM cosmology up to $z \sim 100$. Furthermore, it will have a unique access to gravitational waves from Type Ia supernovae, thus aiding calibration of the standard candles.

Primary frontier topic

Cosmic Frontier

Primary author: JANI, Karan (Vanderbilt University)

Presenter: JANI, Karan (Vanderbilt University)

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