

## Juggled interferometer for gravitational wave detection

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Juggled interferometer (JIFO) is a novel type of earthbound gravitational wave detector targeting a frequency band of 0.1–10 Hz. By using repeatedly free-falling test masses, JIFO can in principle decouple test masses from the seismically noisy environment and avoid suspension thermal noise in a straightforward manner. Since the test masses are in a weightless state, as is the case with space gravitational wave detectors, JIFO would be a good testbed for technologies of space projects.

Here, the concept of the Michelson-type JIFO is introduced. Then the experiment setup and the data read-out method of a JIFO are discussed. Considering the displacement noise budget of the Einstein Telescope (ET), we show that the juggled test masses could significantly improve the sensitivity at 0.1-2.5 Hz even with discontinuous data. The science cases brought with the improved sensitivity would include detecting quasi-normal modes of black holes with 104-105 Msun, testing Brans-Dicke theory with black-hole and neutron-star inspirals, and detecting primordial-black-hole-related gravitational waves.

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