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SOGRO: Superconducting Tensor Detector for Mid-Frequency Gravitational Waves[1]

HO JUNG PAIK, Univ of Maryland-College Park

Detection of gravitational waves (GWs) from binary black holes (BHs) and binary neutron stars by advanced laser interferometers has opened a new window of astronomical observation. Many conceivable sources such as intermediate-mass BH binaries and white dwarf binaries, as well as inspiraling stellar-mass BH binaries, would emit GWs below 10 Hz. It is highly desirable to open a new window in the infrasound frequency band below 10 Hz. We propose to construct a mid-frequency tensor detector by combining six magnetically levitated superconducting test masses. Seismic and Newtonian gravity noise are serious obstacles in constructing terrestrial GW detectors at sub-Hz frequencies. The proposed detector is capable of rejecting the seismic noise to one part in 10^9 by its common-mode rejection characteristic, and can reject the near-field Newtonian gravity noise to a sufficient degree by its full-tensor nature. Such a detector is equally sensitive to GWs coming from anywhere in the sky, and is capable of resolving the source direction and wave polarization. I will present the design concept of a new mid-frequency detector, named SOGRO, which could reach a strain sensitivity of 10^{-19}-10^{-21} $\mathrm{Hz}^{-1/2}$ at 0.1-10 Hz.

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