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Introducing the Multimode Acoustic Gravitational Wave Detection Experiment: MAGE

Since the advent of gravitational wave (GW) detection in 2015 [1], many such further events have been recorded by the current generation of laser interferometric GW detectors. While highly successful; such detectors possess a limitation in that they are insensitive to potential GWs in the high frequency bands of several hundreds of kHz and above. This has motivated the emergence of a new wave of experiments in the field of high frequency gravitational wave (HFGW) detection [2]. Here, we present a maturing solution [3,4] to the potential detection of HFGWs.

The Multi-mode Acoustic Gravitational wave Experiment (MAGE) is a high frequency gravitational wave detection experiment. In its first stage, the experiment features two near-identical quartz bulk acoustic wave resonators that act as strain antennas with spectral sensitivity as low as 6×10ˆ(-21) ([strain])/√Hzin multiple narrow bands across MHz frequencies. MAGE is the successor to the initial path-finding experiments; GEN 1 and GEN 2. The primary goals of MAGE will be to target signatures arising from objects and/or particles beyond that of the standard model, as well as identifying the source of the rare events seen in the predecessor experiment. The experimental set-up, current status and future directions for MAGE are discussed. Calibration procedures of the detector and signal amplification chain are presented. The sensitivity of MAGE to gravitational waves is estimated from knowledge of the quartz resonators

Author: CAMPBELL, William

Co-authors: GORYACHEV, Maxim; TOBAR, Michael

Presenter: CAMPBELL, William

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