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Application of Carrier Suppressing Interferometry in the MAGO Project

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The purpose of the MAGO (Microwave Apparatus for Gravitational-wave Observation) project is to detect high-frequency gravitational waves (GWs) using a superconducting radio-frequency (RF) cavity. The detection principle relies on heterodyne detection. MAGO cavity consists of two identical coupled cells. Coupling of the two cells, produce two close resonant modes(zero and pi mode). When the zero mode is externally excited, interactions between an incident GW and the cavity can induce a transfer of power to the π mode (Heterodyning). This power transfer enables GW detection.Due to the small frequency bant gap between the two modes, the phase noise of the excitation signal (driving the zero mode) plays a critical role in the detection process. To avoid false signal detection, it is essential to isolate the π mode signal from the phase noise of the exciter.

Carrier Suppressing Interferometry (CSI) is a promising technique for measuring extremely low levels of phase noise. Recent advancements by the DESY MSK group have enabled phase noise measurements down to the -210 dBc/Hz level. This capability makes CSI a strong candidate for the signal extraction scheme in the MAGO project. In this presentation, the progress of CSI implementation within the MAGO detection system will be outlined.

Summary

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