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A method to design mechanical transducers for resonant mass gravitational wave detectors

In this work a method to design two mechanical modes transducers for spherical resonant mass gravitational wave detectors is presented. Applied for SCHENBERG detector that uses microwave multiparametric sensors. The detector has 17 mechanical modes and more 6 electromagnetic modes for the microwave cavities. Here these aspects of the mechanical design that should allow amplification in amplitude around 10000 times. For this to be possible, these transducers, when placed on the spherical surface of the detector, must meet conditions that involve: size limitations, can be manufactured with a high mechanical and electrical Q, have an effective mass ratio between their modes to provide the intended amplification and compose a resonant system that has characteristics necessary for the detection of gravitational waves (GW). To meet this last aspect, the transducers must form a resonant system with the sphere around the quadrupole frequencies of the sphere. This work describes how these transducers were designed to be able to meet all these conditions. In this project, the use of simulations using the finite element method (FEM) was essential.

Primary authors: BORTOLI, Fabio da Silva (IFSP - Sao Paulo Federal Institute); FRAJUCA, Carlos (IFSP); MAGALHAES, Nadja (Federal University of Sao Paulo - Brazil)

Presenter: BORTOLI, Fabio da Silva (IFSP - Sao Paulo Federal Institute)

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