Searching for Dark Matter candidate with the AURIGA detector

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We present a search for a new scalar particle, called moduli, performed using the cryogenic resonant-mass gravitational wave detector AURIGA. The existence of moduli is predicted by String Theory and may have significant contribution to the Dark Matter (DM) in our Universe. DM clusters under the galaxies gravitational effect, forming the so called galactic halo. The interaction of ordinary matter with a DM halo composed by moduli, causes the mass of electrons, me, and the fine structure constant, α , to oscillate in time. This implies the oscillation of solids with a frequency equal to the mass of the DM particle [Arvanitaki et al., Phys. Rev. Lett. 116, 031102 (2016)]. In particular, the putative signal would appear as a sharp peak ($\Delta f \sim 1 \text{ mHz}$) in the sensitive band of AURIGA, some 100 Hz at about 1 kHz. We used high quality data, selected out of an acquisition of years of continuous running. The search sets upper limits at 95% CL on the moduli coupling to matter de < 10^(-4) (with respect to the gravitational force strength) around moduli masses m = 3.6 \cdot 10^{(-12)} eV.

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