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Ultralight dark matter searches with laser interferometry

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Despite overwhelming observational evidence for the existence of dark matter, its identity and properties remain a mystery. Recently, bosonic ultralight fields with masses below 1 eV are gaining a lot of attention, as they are well motivated by cosmology. Laser interferometers are sensitive to oscillations from such fields that change the interference fringe. Recently, we have proposed to search for axion dark matter by measuring the birefringence effect using a bow-tie optical ring cavity [PRL 121, 161301 (2018)] and gravitational wave detectors [PRL 123, 111301 (2019)]. We have also proposed to search for vector dark matter by searching for non-standard force acting on mirrors [PRD 102, 102001 (2020)]. In this talk, I will present some of the first results from a table-top experiment, Dark matter Axion search with riNg Cavity Experiment (DANCE) [arXiv:2303.035947], and the status of axion and vector dark matter searches using gravitational wave detectors.

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