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Optical Ring Cavity Search for Axion Dark Matter

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We propose a novel experiment to search for axion dark matter which differentiates the phase velocities of the left and right-handed polarized photons. Our optical cavity measures the difference of the resonant frequencies between two circular-polarizations of the laser beam. The design of our cavity adopts double-pass configuration to realize a null experiment and give a high common mode rejection of environmental disturbances. We estimate the potential sensitivity to the axion-photon coupling constant gaγ for the axion mass m≅10−10 eV. In a low mass range m≅10−15 eV, we can achieve gaγ≅3×10−16 GeV−1 which is beyond the current bound by several orders of magnitude.This presentation is based on our recent paper https://arxiv.org/abs/1805.11753 .

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