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STAX, a search for axion-like particles with sub-THz photons

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An improved detection scheme for a light-shining-through-wall (LSW) experiment for axion-like particle searches is introduced. Extremely intense photon fluxes (from 100 kW to 1MW) from sources at frequencies in the sub-THz range are sent in an intense magnetic field where a photon to axion-like particle conversion is possible. A single photon detector in this frequency domain based on a superconducting phase transition edge sensor is proposed. High quality factor Fabry-Perot cavities in the microwave domain ($Q \approx 104\text{-}105$), both on the photon-axion conversion and photon regeneration side are used to increase the sensitivity. The present exclusion limits based on laboratory experiments for axion-like particles searches might be improved by at least four orders of magnitude for axion masses ≤ 0.01 meV.

Primary authors: POLOSA, Antonio Davide (ROMA1); CAVOTO, Gianluca (ROMA1); SPAGNOLO, Paolo (PI)

Co-authors: CRUCIANI, Angelo (ROMA1); Dr VIGNATI, Marco (ROMA1)

Presenters: POLOSA, Antonio Davide (ROMA1); CAVOTO, Gianluca (ROMA1)

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