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A new experiment for axion-like particle search

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In Particle Physics, axions appear in very well motivated extensions of the Standard Model including the Peccei-Quinn mechanism proposed to solve the long-standing strong-CP problem. Together with the weakly interacting massive particles of supersymmetric theories, axions are also a favored candidate for resolving the Dark Matter issue.

I propose a new detection scheme for the search of axion-like particles based on a Light-Shining-Through-Wall (LSW) experiment in a photon frequency domain never explored before, at very low energy and with extremely intense photon sources.

The aim of the project is the design of a different and innovative experiment, based on the implementation of a new single-photon detector working in the sub-THz region, and exploiting nano-technology devices at energy and temperature ranges never used in Particle Physics before.

The ultimate goal is to answer one of the most pressing questions in Particle Physics with an unusual approach, based on state-of-the-art, and beyond, nano- and quantum-technology: using leading edge nano-tech detectors to investigate fundamental issues of Particle Physics.

With radiation sources below the THz, thanks to the use of high luminosity klystrons or gyrotrons, present laboratory exclusion limits on axion-like particles might be improved by few orders of magnitude. The underlying idea of this proposal has been recently published in a paper in the Physics of the Dark Universe journal (see Phys. Dark Univ. 12, 37 (2016) for details).

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