

Cockcroft Institute Seminar

Searching for new physics inside accelerator cavities

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Abstract

Although the Standard Model of particle physics is very successful, experiments, observations and theoretical considerations indicate that it is probably incomplete. Many extensions of the Standard Model contain additional light very weakly interacting particles such as axions, minicharged particles and hidden sector photons. We present several new ideas on how to search for these weakly interacting sub-eV particles in laboratory experiments. One is based on photon - hidden photon oscillations and resembles a classic light shining through a wall experiments. However, instead of laser light it uses microwaves inside cavities. The latter can achieve much higher quality factors than optical cavities increasing the sensitivity. Already with present technology one should be able go far beyond currently existing bounds. Another experiment is sensitive to minicharged particles. It exploits that in strong electric fields -- as present in accelerator cavities -- particle - antiparticle pairs are produced by the Schwinger mechanism. This leads to a macroscopic energy loss in the cavity limiting its quality factor. Moreover, the charged particles move along the lines of the electric field and generate a current that can be measured.