

Jordan Gué - Search for vector dark matter in microwave cavities with Rydberg atoms

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In this talk, I present the proposal of a novel experiment to search for dark matter, based on the application of an electric field inside a microwave cavity and electrometry using Rydberg atoms. I show that this kind of experiment could be extremely useful for detecting specific dark matter candidates, namely massive vector fields coupled to the photon field, more commonly known as dark photons. Such a massive vector field is a good candidate for dark matter.

Using realistic experimental parameters I show that such an experiment could improve the current constraint on the coupling constant of the dark photons to Standard Model photons in the 1 to 10 μeV mass range, with the possibility of tuning the maximum sensitivity via the cavity size. The main limiting factors on the sensitivity of the experiment are the amplitude stability of the applied field and the measurement uncertainty of the electric field by the atoms.

Orateur: GUÉ, Jordan (SYRTE)