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Search for vector dark matter in microwave cavities with Rydberg atoms

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In this talk, I present a proposal of an experiment based on 1) the application of a strong electric field inside a microwave cavity and 2) electrometry using Rydberg atoms. This kind of experiment could be extremely useful at detecting dark photons through the stationary electric field filling the whole space it induces. The sensitivity of this experiment is quite constant over a significant frequency range, and looks overall independent of the mode of the cavity. We show that this experiment could improve the current constraint on the coupling constant of the dark photons to Standard Model photons around the tenth of μeV mass range. The main limiting factor on the sensitivity of the experiment is surprisingly not the quality factor of the cavity but mainly the amplitude stability of the applied field.

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