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Detection of dark photons through Stark effect measurement with Rydberg atoms in microwave cavities.

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In this paper, we present 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 significantly enhanced around the resonances 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 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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