Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Making the invisible visible: search for dark photons using a dielectric multilayer haloscope LAURA MANENTI, New York University Abu Dhabi — Non-thermal production mechanisms could generate light bosonic dark matter (DM) particles. Such DM candidates, the dark photons (DP), would interact with the standard model (SM) matter via absorption and emission of SM photons. Dielectrichaloscopes consist of thin dielectric layers with alternating high and low refractive indices and can convert DP into SM photons, thus making the invisible visible. At NYUAD we are developing a SiO_2/Si_3N_4 dielectric haloscope coupled with a single-photon detector for the detection of 1.5 eV dark photons. We optimise the dielectric stack so that the DP-SM photon conversion is maximum around 1.5 eV and explored different stack configurations to enable conversion over a wider range of masses around 1.5 eV. We obtained an upper limit at 90% confidence level and a discovery limit at 5-sigma on the dark photon-SM photon kinetic mixing parameter under different estimates of background rates.In the first prototype experimental setup, we use an avalanche photodiode in Geiger mode as photosensor. In the second stage of the experiment, we employ a transition-edge sensor which is estimated to have 10^{-4} Hz dark counts rate. I will present the results from our statistical and numerical analyses, along with the experimental findings.

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Date submitted: 06 Jan 2021 Electronic form version 1.4