A new experiment to search for hidden sector particles in the 3-60 MeV range using the PRad experimental setup*

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A new experiment will search the 3-60 MeV mass region for hidden sector particles produced through a Bremsstrahlung-like process. This experiment is unique in that it will detect all final-state particles, will be sensitive to both charged and neutral decay products, and will have both high-resolution energy and position information for charged decay products. Two beam energies will be used to suppress "false bumps" from kinematical reflections from known physics processes. This search will be able to resolve the hypothetical X17 anomaly seen in two measurements at the ATOMKI accelerator. Additionally, the 1-100 MeV mass range is well-motivated to search because of astronomical small-scale structure and the muon anomalous magnetic moment. This experiment will use the PRad experimental setup in Hall B at Jefferson Lab. This consists of a 1μm Tantalum target that is 7.5m upstream of two GEM planes separated by 0.1m and the HyCal calorimeter. This setup will allow for tracking of the recoil electron and charged decay products to reduce beam-related backgrounds. This experiment will have a coupling constant, ϵ^2, sensitivity from 7.2×10^{-8} to 5.9×10^{-9}. This proposal was brought to JLab PAC49 and is now a conditionally-approved experiment.

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