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Search for Light Dark Matter with the DarkMESA Experiment

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The search for Dark Matter is an integral part of New Physics searches, however, Dark Matter has yet to be observed directly. Theoretical models provide a large parameter space for Dark Matter and allow for different properties of the particles. Models incorporating so-called portal interactions, where Dark Matter interacts with Standard Model particles through a mediator particle, are of special interest. Examples for these are Dark Photon and Axion models, which can be studied at low energy accelerator facilities.

The DarkMESA experiment is a beam dump experiment located at the upcoming accelerator MESA at the JGU Mainz. The accelerator provides an electron beam of 155 MeV and 150 μA in extracted beam mode, which, along with the high-power beam dump of the P2 experiment, provides an ideal environment for Light Dark Matter searches.

To accurately predict the expected reach and the impact of the detector design of the DarkMESA experiment on it with respect to different Dark Matter models, most notably Dark Photon and Axion mediated models, a GEANT4 simulation is used. Here, the current status of the simulations is discussed.

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