



Contribution ID: 48

Type: not specified

The BDX experiment: dark matter search in a Beam Dump eXperiment

The existence of light dark matter particles, with mass in the MeV-GeV range, is theoretically well motivated and at the same time almost unexplored. Such particles could be charged under a new U(1) interaction mediated by a massive gauge boson A' , called heavy or dark photon, proposed in many beyond Standard Model theories. The heavy photon is expected to couple weakly to normal charge by kinetically mixing with the “ordinary” photon and thus it can be produced by electron Bremsstrahlung off heavy nuclear targets.

The Beam Dump eXperiment (BDX) proposes to produce light dark matter particles χ in an electron beam-dump via the A' decay into a pair of χ and then to detect the χ interaction in a downstream calorimeter. The calorimeter will be surrounded by active veto detectors and passive shielding to reduce as much as possible the Standard Model particle background.

BDX will probe a wide unexplored region of dark matter parameter space with the unique feature of being simultaneously sensitive to both χ -proton and χ -electron scattering processes.

In order to quantify the background rejection capability and finalize the experimental setup design a BDX prototype is under construction and a campaign of cosmogenic background measurements will be performed next year at the Laboratory Nazionali del Sud in Catania.

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