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Dark Sector Physics with a Primary Electron Beam Facility at CERN

This input is a summary of an Expression of Interest (SPSC-EOI-018) submitted to the CERN Scientific Committee for the SPS accelerator, SPSC.

A primary electron beam facility is proposed with the main motivations being (i) dark sector experiments, and (ii) to enable a suite of development projects in acceleration technology. The facility would deliver a beam to a Light Dark Matter eXperiment, LDMX, which could probe thermal dark matter over a majority of the viable sub-GeV mass range. LDMX can achieve orders of magnitude better sensitivity than any previous or currently envisioned experiment. LDMX uses missing momentum to search for dark matter produced via dark bremsstrahlung from in the interaction of electrons in a thin target. This requires a low-current, high repetition-rate electron beam, with optimal energy of ~ 16 GeV. We propose to create this electron beam at CERN by restoring the SPS's electron acceleration capability.

The proposed facility would also strengthen the CERN accelerator R&D programme. This is desirable on general grounds, but even more-so now when there is some uncertainty about the optimal next step for CERN's future main accelerator.

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