

FerMINI: Fermilab Search for Minicharged Particles

Monday, 10 June 2019 18:00 (15 minutes)

We propose a low-cost and movable setup to probe minicharged particles (or milli-charged particles) using high-intensity proton fixed-target facilities. This proposal, FerMINI, consists of a milliQan-type detector, requiring multi-coincident (nominally, triple-coincident) scintillation signatures within a small time window, located downstream of the proton target of a neutrino experiment. During the collisions of a large number of protons on the target, intense minicharged particle beams may be produced via meson photo-decays and Drell-Yan production. We take advantage of the high statistics, shielding, and potential neutrino-detector-related background reduction to search for minicharged particles in two potential sites: the MINOS near detector hall and the proposed DUNE near detector hall, both at Fermilab. We also explore several alternative designs, including the modifications of the nominal detector to increase signal yield, and combining this detector technology with existing and planned neutrino detectors to better search for minicharged particles. The CERN SPS beam and associated experimental structure also provide a similar alternative. FerMINI can achieve unprecedented sensitivity for minicharged particles in the MeV to few GeV regime with fractional charge $\epsilon = Q\chi/e$ between 10^{-4} (potentially saturating the detector limitation) and 10^{-1} .

This talk is mainly based on [arxiv:1812.03998](#)

If time allowed, I will also talk about new physics cases studied in [arXiv:1806.03310](#), [arXiv:1812.08768](#), [arXiv:1803.03262](#), and [arXiv:1706.00424](#)

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