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Neutrino Physics with the SHiP experiment

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The SHiP Collaboration has proposed a general-purpose experimental facility operating in beam dump mode at the CERN SPS accelerator with the aim of searching for light, long-lived exotic particles of Hidden Sector models. The SHiP experiment incorporates a muon shield based on magnetic sweeping and two complementary apparatuses.

The detector immediately downstream of the muon shield is optimised both for recoil signatures of light dark matter scattering and for tau neutrino physics. The second one aims at measuring the visible decays of hidden sector particles to both fully reconstructible final states and to partially reconstructible final states with neutrinos, in a nearly background free environment.

Using the high-intensity beam of 400 GeV protons, the experiment is capable of integrating 2×10^{20} protons in five years, which allows probing heavy neutrinos with GeV-scale masses at sensitivities that exceed those of existing and projected experiments. The sensitivity to light dark matter reaches well below the elastic scalar Dark Matter relic density limits in the range from a few MeV/c^2 up to $200 \text{ MeV}/c^2$. The tau neutrino deep-inelastic scattering cross-sections will be measured with a statistics a thousand times larger than currently available, with the extraction of the F4 and F5 structure functions, never measured so far.

An overview of the SHiP neutrino program will be reported at this conference.

Collaboration name

SHiP Collaboration

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