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LS-SBT: The Liquid Scintillator-Surrounding Background Tagger of BDF/SHiP at the CERN SPS

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The Search for Hidden Particles (SHiP) experiment will be the new flagship project of the CERN Physics Beyond Colliders intensity frontier, featuring a dedicated Beam Dump Facility (BDF) at CERN's North Area ECN3 to exploit the full potential of the 400 GeV SPS proton beam.

The experiment is realised by a two-fold detector setup enabling a diverse physics program: While the Hidden Sector (HS) detector will study the decay of Heavy Neutral Leptons (HNL) and other Feebly-Interacting Particles (FIPs) in a broad range of masses and coupling inaccessible to colliders, the upstream Scattering and Neutrino Detector (SND) is going to enable a direct search for Light Dark Matter (LDM), as well as measurements in neutrino physics with unprecedented precision.

As the detector is located closely downstream of the dense proton beam target, a major challenge will be the reduction of beam-related backgrounds. Following a hadron stopper, the superconducting magnet muon shield will deflect most of these particles from the detector acceptance, but muon and neutrino interactions in the detector and its vicinity still have to be correctly discriminated. To this end, the 50 m-long evacuated volume of the HS decay vessel will be enveloped with a Surrounding Background Tagger (SBT) consisting of O(1 000) cells filled with Liquid Scintillator (LS) and equipped with Wavelength-Shifting Optical Modules (WOMs) and SiPM readout.

This contribution will provide details on the specifications and technology of the LS-SBT, showcasing the performance of prototype detectors in several test beam exposures.

Having just been approved by the CERN Research Board, this is the ideal time for new groups to join the project.

Poster prize

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