

Input by Nuno Leonardo, 10.1.2025

# Exploring Hidden Sector | SHiP

The Search for Hidden Particles experiment (SHiP) is a proposed a general-purpose intensity-frontier experimental facility for operating in beam-dump mode at the CERN SPS accelerator to search for feebly interacting GeV-scale particles. The SHiP detector is sensitive both to decay and scattering signatures of models with heavy neutral leptons, dark photons, dark scalars, axion-like particles, light dark matter and other feebly interacting particles (FIPs). First precision measurements of the tau neutrino will become accessible.

The previous Strategy Update (2020) stated that the study of the dark sector is well motivated from the physics point of view but a beam-dump facility would be difficult to fund within the CERN budget at the time. Since then, the BDF/SHiP collaboration demonstrated that the existing ECN3 experimental facility allows to implement the BDF facility at a fraction of the cost of the original proposal, without compromising the physics sensitivity. In 2023 CERN approved the high-intensity upgrade for ECN3, and selected SHiP in 2024 as the experiment for the physics exploitation of the facility. The collaboration has moved towards the preparation of the technical design report, while discussion with the funding agencies of the proponent and new institutes are being pursued for resourcing the detector construction from 2027.

Portugal has a longstanding involvement in the preparation of the SHiP experiment, which will enable a wide search program for FIPs and measurements in neutrino physics. The Portuguese group has performed physics sensitivity studies and deployed a sub-detector prototype based on the RPC technology, with high efficiency and timing capability. We are tasked in the SHiP Proposal for delivering a critical sub-detector, for background vetoing in the decay vessel, and have initiated additional involvement in the preparation of the scattering and neutrino detector (SND). Our physics and detector activities in SHiP benefit from and significantly extend our current involvement in the SND@LHC experiment.

We strongly support the effort of the SHiP collaboration to ensure the detector can be constructed in a timely manner, to be ready for data-taking in 2032, and delivering a successful and impactful physics program over the ensuing 15 years (beyond HL-LHC).