

The SHADOWS experiment at the CERN SPS

SHADOWS (Search for Hidden And Dark Objects With the SPS) is a proposed proton beam-dump experiment for the search of a large variety of feeble-interacting particles (FIP) at the CERN SPS. It will exploit the potential for searches and discoveries at the intensity frontier offered by the upgrade of the ECN3 beam line.

SHADOWS will be located off-axis, which allows the optimisation of the S/B ratio, and will collect data from up to 5×10^{19} protons of 400 GeV on target in 4 years of operations.

The experiment has a transversal size of $2.5 \times 2.5 \text{ m}^2$ and is composed by an upstream veto, a 20 m long decay volume and a spectrometer with a tracking system in a dipole magnet, a timing detector, a calorimeter and a muon system. The conceived detector offers excellent tracking and timing performance for the identification and reconstruction of most of the visible final state of FIP decays.

SHADOWS will allow to explore a large parameter space region of many FIPs, like light dark scalars, axion-like particles and heavy neutral leptons, with masses ranging between 0.1 and 10 GeV.

It will be possibly complemented by a dedicated neutrino experiment (NaNu@SHADOWS) to further extend the physics reach, in particular for the study of tau-neutrino events.

After a general introduction on the current status of FIP searches, the talk will describe the SHADOWS detector concept and physics programme with focus on the detector challenges of the experiment.