LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

LPNHE PARIS

Séminaire commun LAL - LPNHE

Richard Jacobsson (CERN)

Jeudi 29 janvier 2015 à 11h00

SHiP, a facility at the SPS to search for hidden particles

The discovery of the Higgs boson with mass ~125.5 GeV implies that the Standard Model (SM) may well be a self-consistent, weakly-coupled, effective field theory all the way up to the Planck scale. Nevertheless, it is clear that the SM is incomplete since it does not provide an explanation for the observations of non-zero neutrino masses, the excess of matter over antimatter in the Universe, and the presence of non-baryonic dark matter. These shortcomings may have their origin in new physics involving very weakly interacting particles such as predicted by models of portals to a hidden sector with heavy Majorana leptons, dark photons etc, or in SUSY. Given the small coupling constants and typically long lifetimes, these new different particles have not been significantly constrained by previous experiments, and the reach at current collider experiments is limited by both luminosity and acceptance.

This talk will outline a proposal for a general-purpose fixed target facility at the SPS with the initial aim to search for hidden particles. The large production of charm mesons with the 400 GeV beam and the high intensity of the SPS allow accessing a wide variety of light long-lived exotic particles. The sensitivity studies hitherto performed include the neutrino portals, dark photons, scalar portals, axion portals, and SUSY. For the neutrino portals, the neutrino Minimal Standard Model (nMSM) is of particular interest since it allows accounting simultaneously for neutrino masses and oscillations, baryogenesis, and dark matter. With an integrated total of $2x10^{20}$ protons on target, the experiment is able to achieve a sensitivity which is four orders of magnitude better than previous searches, accessing a significant fraction of the unexplored parameter space which is consistent with cosmological constraints.

In addition, the by-product of optimizing the facility for dark sector searches at the SPS is an unprecedented yield of tau neutrinos produced in D decays and tau lepton decays. For this reason, the SHiP facility will host a hidden particles detector in combination with an upstream neutrino spectrometer in its initial phase. Future extensions include direct searches for dark matter and lepton flavour violation through t→3m.

Such a facility would clearly be an essential complement to the LHC and the other fixed target programs in the search for new physics at CERN.

Salle 101 - Bât. 200, Orsay

Thé et café seront servis 5 mn avant le séminaire

Organisation : Nicolas Delerue (LAL) - seminaires@lal.in2p3.fr - http://www.lal.in2p3.fr

cnrs

UNIVERSITÉ PARIS SUD