Service de Physique Nucléaire

Séminaire

le vendredi 1 juin 2012 à 11h00
CEA Saclay, Orme des Merisiers, Bât. 703, Salle 135

Trends in gaseous detectors and new physics

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Micropattern gaseous detectors are widely used by many experiments and future projects. The high radiation resistance and excellent spatial and time resolution make them an invaluable tool to confront future detector challenges at the next generation of colliders. Some examples are particle and nuclear physics projects : COMPASS, CAST, LHC-B, TOTEM, RICH, NA48, CLOE, CLAS12G, n-TOF, ILC, T2K, ATLAS-sLHC, CMS-sLHC.
I will present a fast review on principle and basic performance of Micromegas detector. I will point out new developments that are currently under way and especially novel industrial ways of fabricating the detector in a single process : 'Bulk' ,'Ingrid', 'MicroBulk' technologies and the latest 'Piggy Back' with new promising features. Originally developed for the high-energy physics, Micromegas applications have expanded to astrophysics, neutrino physics, dark matter search, neutron detection and medical imaging. Its ability to detect low-energy, low-background rare events will also be discussed. The detection of low energy ion recoils in dark matter search could be of great importance to determine the direction of WIMP wind. First reconstructed tracks of keV recoils observed by MiMac is a proof of the concept. The detector is used in CAST for solar axion search. The achieved low background level greatly improves the sensitivity of the experiment and suggests novel investigations.
A new type of radiation detector based on a spherical geometry will also be presented. The detector consists of a large spherical gas volume with a central electrode forming a radial electric field. A small spherical sensor located at the center is acting as a proportional amplification structure. This new concept has been proven to operate in a simple and robust way and allows reading large volumes with a single read-out channel. It allows high gas gains to be reached and operates in a wide range of gas pressures. Sub-keV energy threshold with good energy resolution is achieved. I will discuss recent results with a record energy threshold of 20 eV. The bench mark result is the observation of a well resolved peak at 283 eV due to carbon fluorescence which is unique performance for such large-massive detector. Such a device would open the way to detect the neutrino-nucleus interaction, which, although a standard process, remains undetected due to the low energy of the neutrino-induced nuclear recoils. Other physics goals of such a device could include supernova detection, double beta decay, low energy neutrino oscillations and study of non-standard properties of the neutrino, among others.

Le café sera servi 10 minutes avant

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