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CEA-Saclay Bât. 141, salle André Berthelot

Gaseous detectors : current and future developments

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Micropattern gaseous detectors (MPGD), especially Micromegas and GEM are widely used by many experiments and future projects. The high radiation resistance and the excellent spatial and time resolution make them an invaluable tool to confront future detector challenges at the next generation of colliders. I will present a quick review on principle and basic performance of Micromegas detector. I will point out new developments currently under way and especially novel industrial ways of fabricating the detector.

The detector is used in several projects in particle and nuclear physics : COMPASS, CAST, RICH, NA48, CLAS12G, n-TOF, ILC, T2K, ATLAS-sLHC, CMS-sLHC. I will give details on last development aiming to reach picosecond time resolution a challenge for future LHC ultra high-luminosity upgrades ; recent encouraging beam test results at CERN will be presented. 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. sSub-keV energy threshold and versatility of the target (Ne, He, H) opens the way to search for ultra light dark matter WIMPs down to 100 MeV. Results obtained with a low radioactivity detector, 60 cm in diameter operated in Laboratoire Souterrain de Modane ("Frejus" lab) will be presented. Exclusion plots for WIMPs are very-competitive with existing projects. The next project, under study, is a larger detector that consists in a selected pure copper sphere of 1.5 meter of diameter to be installed at SNOLAB. This will allow benefiting from a larger volume, relative to the current detector and a much lower background level

I will point out the way to detect the neutrino-nucleus interaction, neutrinos from supernova explosions and I will explain the optimization of such detector for a competitive double beta decay experiment using Xe-136 high-pressure target. I will also give some guidelines to address future R&D challenging projects and I will point out the need of new laboratory facility in our Institute to design and to realize advanced detector prototypes.

Le café sera servi 10 minutes avant.

NB : La présentation d'une pièce d'identité est exigée à l'entrée du centre. Tous les auditeurs extérieurs sont priés de prévenir à l'avance Martine Oger, tél. 01 69 08 23 50, e-mail : martine.oger@cea.fr. (U.E. : délai de 24 h, hors U.E. : délai de 4 jours).