Colloquium: New detectors and their impact to physics

Micropattern gaseous detectors (MPGD), especially Micromegas and GEM are widely used by many experiments and future projects. A brief review on Micromegas detector with current developments and future projects will be presented. The detector is used in several experiments in both particle and nuclear physics. I will point out new developments currently under way and especially novel industrial ways of fabricating the detector. Originally developed for the high-energy physics, applications have expanded to astrophysics, neutrino physics and dark matter search. This device is also used for solar axion search at CERN. The achieved low background level greatly improves the sensitivity of the experiment and suggests novel investigations. Developments aiming to reach picosecond time resolution are under way by an international collaboration. This is a challenge for future ultra high-luminosity accelerators as well as for particle identification. Recent very-encouraging beam test results at CERN will be presented.

A new type of radiation detector based on a spherical geometry is under development by our group in saclay. 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.

Sub-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.

The next project is larger detector of 1.4 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 give the status of the experiment and prospects of a first physics run expected next year.

A multi-ball sensor with robust DLC bias electrode has been recently developed opening the way to build very-large detectors, reach high gas pressures and provides 3D track capability.

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.

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WEDNESDAY, DECEMBER 4
4PM ROOM 100 SCIENCE HALL
REFRESHMENTS AT 3:30PM IN 108 SCIENCE HALL