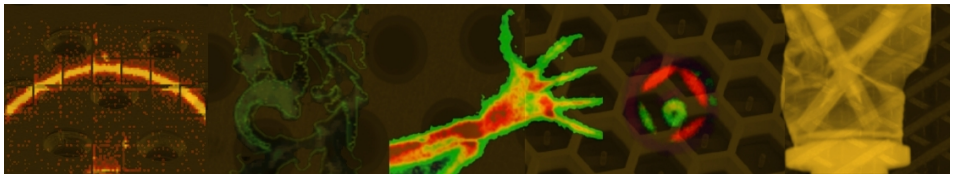

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Applications of MPGD detectors for hadron therapy and investigation of their potential use for environmental gamma rays monitoring.

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Remarkable scientific and technological progress during the last years has led to the construction of accelerator based facilities dedicated to hadron therapy. This kind of technology requires precise and continuous control of position, intensity and shape of the ions or protons used to irradiate cancers. Patient safety, accelerator operation and dose delivery should be optimized by a real time monitoring of beam intensity and profile before and during the treatment, by using non-destructive, high spatial resolution detectors. For this purpose, inspired by a prototype designed and developed at LNF as beam detector monitor for the DAFNE e+e- machine, the authors have studied and built a beam monitor for hadron therapy application. Based on Micro Pattern Gaseous Detectors (MPGDs), it is called TPC-GEM (TPG) detector and is characterized by high spatial resolution and rate capability. Due to the low amount of material in the active volume, it is "not invasive", therefore the beam characteristics are preserved, so minimizing the uncertainties on beam position, intensity, energy and stability.
Deriving from nuclear weapons tests and the nuclear power plant accidents, 137Cs is present in almost all soils in Europe, due to its relatively long half-life of 30.2 years, and it is the main source of artificial γ-radiation. As a consequence of Chernobyl accident in 1986, most European countries extended their γ-dose rate monitoring networks for early warning, moreover the Fukushima disaster in 2011 triggered the need for a series of further improvements for radiation protection. The types of detector in use for these monitoring networks are Geiger-Müller counters, proportional counters, scintillation detectors and ionization chambers. With the aim to design a new gamma detector characterized by higher sensitivity and efficiency, larger active volume and low costs, the authors are studying a potential use of MPGDs for environmental gamma measurements.
The aim of this talk is to present two applications of MPGDs beyond HEP under study: quality assurance in cancer treatments and radiological monitoring. The Monte Carlo simulations of the beam monitor prototype carried out to optimize the geometrical set up and to predict the detector behavior will be shown. The experimental results of the TPC-GEM characterization using an X-ray tube will be presented, as well as the future developments. Moreover the preliminary feasibility study for environmental gamma rays detection based on Monte Carlo simulations will also be shown.

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