Developments in PET from HEP

Leandar Litov

University of Sofia

Abstract. High energy physics is the main source of new imaging technologies in the medicine, PET being one of the most prominent examples. The influence of the new developments in the PET technology will be demonstrated on the example of PET detector based on Resistive Plate Chambers (RPC). RPC are gaseous parallel plate detectors for charged particles that are widely used in large-scale high energy physics experiments as fast trigger detectors for muon spectrometers. The RPC's main advantages are the high time and spatial resolution, their ability to work in strong magnetic fields and the possibility to construct inexpensive large area detectors (~2-3 square meters). Transforming the resistive plate chambers from charged-particle into gamma-quanta detectors opens the way towards their application as a basic element of a hybrid imaging system, which combines positron emission tomography with magnetic resonance imaging in a single device. Results towards the development of a hybrid imaging system based on multigap glass resistive plate chambers are present. The detector design is chosen after detailed GEANT based simulations. A special care is taken to decrease the efficiency for Compton scattered photons, while keeping relatively high efficiency for 511 keV photons. RPC technology allows building a device with a large field of view, increasing drastically the geometrical acceptance in comparison to the standard devices. The RPC's excellent position resolution for the gamma quanta impact point and the time-of-flight measurement accuracy will allow reconstruction of the image with precision better than 1 mm. The first prototypes have been build and tested. The detector prototypes and the test set-up will be presented as well as the simulation and test results.