FAKULTÄT für PHYSIK
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MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 19.04.2018, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Prof. Pawel Moskal

(Jagiellonian University Cracow, Poland)

J-PET: Towards total-body modular PET from plastic scintillators

Positron emission tomography (PET) is a well established medical diagnostics method. It is, however, very expensive, in part due to the very high costs of the currently used commercial PET scanners, which all are based on relatively expensive inorganic crystals. The high cost of PET is also one of the barriers for the common use of this modality with a large axial field-of-view, which would enable single-bed imaging of the whole human body.
In this talk a proposition of the usage of plastic scintillators as a detection material for positron emission tomography will be presented. A tomograph built from axially arranged plastic scintillator strips may allow for the construction of a cost effective total-body scanner due to the less expensive detector material and reduced number of the electronic channels.
The Jagiellonian Positron Emission Tomograph (J-PET) is the first PET built from plastic scintillators. The J-PET prototype consists of 192 detection modules arranged axially in three layers forming a cylindrical diagnostic chamber with an inner diameter of 85 cm and an axial field-of-view of 50 cm. Axial arrangement of long strips of plastic scintillators, their small light attenuation, superior timing properties, and relative ease of increasing the axial field-of-view opens promising perspectives for a cost effective construction of the total-body PET scanner, as well as construction of MR and CT compatible PET inserts.
The status of the commissioning of the first J-PET prototype as well as the status of the development of the second fully modular and portable J-PET tomograph will be presented and discussed. The modularity and light weight of the J-PET shall enable adjustment of the size of the diagnostic chamber to the size of the patient. In the talk we will present the method of photon registration, fully digital signal processing and data acquisition, as well as methods of event selection and image reconstruction. Additionally, we will argue that J-PET shall enable imaging of positronium properties based on three-photon e+e- annihilations. We will present results of feasibility studies of positronium imaging, showing that it may deliver new diagnostic informations, additonal to the presently available standardised uptake value indicator.

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