

FAKULTÄT für PHYSIK  
LUDWIG-MAXIMILIANS-UNIVERSITÄT  
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT  
TECHNISCHE UNIVERSITÄT MÜNCHEN  
MÜNCHEN/GARCHING

## MLL-KOLLOQUIUM

Donnerstag, 17.01.2013, 16<sup>15</sup> Uhr

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

**Dr. Dennis Schaart**

(Delft University of Technology, The Netherlands)

### Emerging Detector Technologies in Time-of-Flight Positron Emission Tomography

The use of time-of-flight (TOF) information in positron emission tomography (PET) has been shown to significantly improve image quality. Silicon photomultipliers (SiPMs) are a new type of solid-state photosensor with important advantages over conventional photomultiplier tubes (PMTs). SiPMs are small, essentially transparent to gamma rays, and insensitive to magnetic fields. This enables novel PET detector designs offering compactness, MRI-compatibility, and excellent performance. For example, unprecedented timing resolutions of 120 ps FWHM and 95 ps FWHM have recently been demonstrated using SiPMs in combination with LSO:Ce,Ca and LaBr<sub>3</sub>:Ce scintillators, respectively. The recent introduction of the so-called digital SiPM (dSiPM) marks another important step towards fully-digital, high-performance PET systems. Current research in Delft aims at further pushing the limits in timing resolution and the realization of cost-effective, high-performance digital PET detectors for clinical PET/CT and PET/MRI systems. In light of the imminent introduction of particle therapy in the Netherlands, we are furthermore investigating the use of dSiPM-based detectors for online dose verification in particle therapy by imaging the positron emitters and/or prompt gamma radiation generated by the proton beam within the patient. The current status of these activities as well as an outlook on the expected impact of (d)SiPM based detectors on emission tomography will be presented.

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