



Contribution ID: 45

Type: **Poster**

Emission Channeling with Timepix position sensitive detectors

Wednesday 7 December 2016 18:35 (10 minutes)

Electron emission channeling accurately measures the lattice location of radioactive impurities in single crystals by looking at the anisotropic emission of decay electrons (beta particles or conversion electrons) in the vicinity of major crystallographic directions. Lately, the search for the advantages that modern position-sensitive detectors (PSDs) can bring motivated several emission channeling measurements with a Timepix detector. Timepix is a CERN developed PSD with a matrix of 512*512 pixels of 55 um size. The characteristics of the Timepix sensor and its readout system provide a method of measuring beta emission channeling patterns with lower background from X rays and gammas, and with higher angular resolution than provided by currently used PSDs with much larger pixel size. Here we will explain methods for using Timepix for electron emission channeling and illustrate this with the case of lattice location studies for ^{24}Na in GaN. We will also look into the effect that improvements in detection characteristics have upon the observables in lattice location experiments, in particular the accuracy of locating the probe atoms in the crystallographic unit cell.

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Session Classification: Poster Session