



Contribution ID: 135

Type: Poster (Session A)

The Optical Time Projection Chamber for imaging of nuclear decays

We present a novel type of a Time Projection Chamber in which tracks of charged particles are recorded by means of optical imaging. Particles of interest (heavy ions, α particles, protons) are stopped within an active volume of gas composed of argon and helium with small admixtures of nitrogen and methane. The primary ionization charges drift to the amplification stages where emission of light occurs. The image of this light pattern is recorded by a CCD camera located outside the gaseous volume and is combined with the measured drifttime profile, allowing the 3-D reconstruction of the tracks. First results of test measurements will be presented. Radioactive ions were stopped within the chamber and their subsequent decays with emission of low energy protons and α particles were recorded. In the near future the detector will be applied to the study of the recently discovered two-proton radioactivity, in particular, the angular correlation between two protons emitted during the decay of ^{45}Fe will be investigated.

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