

The journey with Timepix detectors from biomedical imaging through subatomic physics to space

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Abstract

In introductory part of the lecture, the story of development of hybrid pixel semiconductor detectors Medipix/Timepix will be recalled. It will be followed by a survey of their applications for X-ray and neutron non-destructive biomedical imaging with micrometric and submicrometric resolution.

The next part will be devoted to the description of ways of using Timepix pixel detectors for visualizing individual traces of particles interacting with their semiconductor sensors, similar to the case of nuclear emulsions and cloud or bubble chambers.

Then the methods of microscopic recognition of individual interactions of charged particles and neutrons in Timepix3 semiconductor sensors in a wide energy range (from keV to GeV with a possible application of Time-of-Flight method) will be presented together with examples of their use for measurement of composition and spectral characteristics of mixed radiation fields around particle accelerators (e.g. in ATLAS and MoEDAL experiments at the LHC) and on orbits of Earth's satellites.

The final part of the lecture will be devoted to an overview of the latest results achieved with Timepix detectors using high-resolution 3D particle tracking technique for needs of hadron therapy, particle experiments at accelerators and for astro-particle physics in space.