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## Compact four-layered Timepix-based particle tracker WidePIX 3D: The first applications in X-ray CT imaging

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WidePIX 3D is a compact Timepix-based ionizing radiation detector with 3D position sensitivity [1]. The device consists of four Timepix chips with 300  $\mu\text{m}$  silicon sensors tightly stacked together. The insensitive gap between the subsequent layers is 250  $\mu\text{m}$  only, since the read-out chips were thinned down to 100  $\mu\text{m}$ . The sensor volume is, therefore, divided into a 3D array of  $256 \times 256 \times 4$  voxels,  $55 \times 55 \times 300$   $\mu\text{m}$  each. Although the detector was originally designed as a wide field-of-view particle tracker its construction is advantageous for X-ray imaging as well. Four layers of the device can be either used for improvement of quantum efficiency of silicon sensors (as the total thickness of four sensors is 1.2 mm) while keeping the spatial resolution of a thin sensor or for multi-channel energy sensitive imaging. Similar approach is known from a single-shot dual-energy X-ray computed radiography utilizing a dual-layer detector [2]. WidePIX 3D provides up to four sample images produced by different photon spectra from a single exposure. Furthermore, the detection threshold of each layer can be individually adjusted to optimize the resolving performance for elements expected within the scanned sample.

In this contribution we present the first results of using the WidePIX 3D detector as an imaging camera for energy-sensitive X-ray computed radiography and CT. The procedure of precise threshold-energy calibration of the detector using X-ray fluorescence will be described and material-resolving radiographies and CT data will be demonstrated.

[1] ADVACAM s.r.o., WidePIX 3D, Compact Large Field of View Particle Tracker (2018) <http://advacam.com/camera/widepix-3d>

[2] Rassouli N. et al, Detector/based spectral CT with a novel dual-layer technology: principles and applications; in: Insights Imaging, 8(6):589–598 (2017), DOI: 10.1007/s13244-017-0571-4.

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