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Investigations into material discrimination using multispectral X-ray imaging with Medipix3RX detectors

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In classical X-ray imaging, the absorption or penetration of X-ray photons through a material is used for imaging, but the energy of the incoming photons is not recorded. This makes a targeted material recognition impossible, since a higher absorption of the X-ray photons can result both from a higher density of the sample to be examined and from a higher penetration depth of the radiation. Thus, for example, it cannot be determined during safety-relevant X-ray examinations whether a plastic explosive or a package of flour is involved.

The Medipix3RX, in combination with a high-Z semiconductor sensor, such as cadmium telluride, offers the possibility to capture differentiated energy ranges of a wide X-ray energy spectrum in a single X-ray image and to separate them. This energy-selective examination allows the differentiation of several materials and thus, open up a completely new field of application for X-ray examinations in various fields such as non-destructive material examination, medical applications, homeland security and industrial applications. This talk introduces energy threshold based spectroscopic X-ray imaging using the Medipix3RX Assembly with a 1 mm CdTe sensor, which allows high absorption probabilities for high energy photons, and present first results of this spectroscopic investigations.

Presenter: Mr SCHÜTZ, Michael (University Freiburg)