

Current challenges in hyperspectral X-ray transmission imaging

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Throughout the last decades, photon-counting detectors have made spectral imaging possible. This allows for improved segmentation and identification of the different materials present in the sample under investigation. However, these detectors are often limited to a small number (1 to 8) energy bins [1], and due to the various interaction mechanisms in the imaging process the unambiguous identification of specific materials is not straight-forward [2].

Recently, a new type of detectors have been developed, which allow for 2D spectroscopic imaging, or hyperspectral imaging [3,4,5]. The output of these detectors is a complete X-ray spectrum for each individual pixel, hence creating a large number (typically in the order of 1000) monochromatic images. With this data, the interpretation and data analysis is more intuitive and requires less sample-specific calibration to allow for material identification, for both radiographic and tomographic datasets [6,7].

However, many challenges remain for this type of detectors. These are in the first place a consequence of the limited count-rate which can be achieved due to the complex readout mechanisms in these systems. In this presentation, we will elaborate on these limitations, and we will discuss potential solutions to these challenges.

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