



Contribution ID : 242

Type : **Oral**

Full-field tomography with scattered X-rays

Friday, 20 November 2020 16:35 (20)

X-ray absorption imaging relies on transmitted photons being absorbed by the subject. As a natural consequence, X-rays are also scattered in significant quantities in all directions. This makes it potentially feasible to do tomography and obtain 3D volumetric information by capturing photons using detectors placed around the subject. Scatter tomography has previously been attempted with pencil and sheet beam illumination, in order to limit the multiple-scattering of photons, which generates an unwanted background signal. At energies suitable for preclinical imaging, multiple-scattering is less problematic, making it possible to imagine doing tomography even with full-field X-ray illumination. With the aim of augmenting our existing full-field 2D imaging experiments with additional scatter detectors, we pursued this possibility. Here we present what we believe are the first successful X-ray Scatter Tomography experiments using full-field illumination, performed in 2019 at the Imaging & Medical Beamline, of the chest of a juvenile rat, achieving sufficient resolution for segmentation of the lung and major airways.

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Session Classification : Session 15 - Manufacturing, Engineering and Cultural Heritage

Track Classification : Manufacturing, Engineering and Cultural Heritage