Contribution ID: **1230** Type: **Poster (Student, In Competition) / Affiche (Étudiant(e), inscrit à la compétition)**

Development of synchrotron-based x-ray scatter projection imaging

Tuesday, 14 June 2016 19:00 (2 minutes)

In medical x-ray imaging a major challenge is to obtain adequate soft tissue contrast. The goal of our research is to develop a high soft-tissue contrast x-ray technique based on the detection of low-angle scattered photons. Scattered photons comprise up to 90% of the radiation downstream of the patient and can provide information in addition to that of the transmitted primary x rays. In particular, the cross section for coherent x-ray scattering, the basis of x-ray diffraction, varies with angle and photon energy in a material-specific manner, even for amorphous materials, and thus it can provide good soft tissue contrast. At the photon energies of medical radiology coherent scatter is a minority of all photon interactions, but its forward nature at these energies makes it relatively easy to detect. For example, in abdominal radiography coherent single scatter is 10% of the total scatter and 26% of the primary fluence.

We are developing x-ray scatter imaging at the BioMedical Imaging & Therapy (BMIT) facility of the Canadian Light Source (CLS) synchrotron in Saskatoon, Canada. The BMIT facility provides an excellent development environment with the availability of monoenergetic x-ray beams, flat-panel x-ray imagers and automated sample positioning stages. The best images are obtained using step-and-shoot scanning with a pencil beam and area detector to capture sequentially the scatter pattern for each primary beam location on the sample. Primary x-ray transmission is recorded simultaneously using photodiodes. Our beam energy is 33.2 keV and the pencil beam area is about 2.5 mm². The technological challenge is to acquire the scatter data in a reasonable time. Our aim is to acquire images on a time scale similar to that of nuclear medicine, e.g., under 15 minutes. Geometries using multiple pencil beams producing partially-overlapping scatter patterns reduce acquisition time but increase the complexity due to the need for a disentangling algorithm to extract the data. Continuous sample motion, rather than step-and-shoot, also reduces acquisition time at the expense of introducing motion blur and is the subject of our latest investigation. Our recent work with plastic phantoms and animal tissues is described.

Primary author: DYDULA, Christopher (Carleton University)

Co-authors: BELEV, George (Canadian Light Source); JOHNS, Paul (Carleton University)

Presenter: DYDULA, Christopher (Carleton University)

Session Classification: DPMB Poster session, with beer / Session d'affiches DPMB, avec bière

Track Classification: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)