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A Method for the Simultaneous Collection of the data for X-ray Computed Tomography and X-ray Fluorescence Computed Tomography

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This project aims to demonstrate a method for the simultaneous collection of the data for X-ray Computed Tomography (XCT) and X-ray Fluorescence Computed Tomography (XFCT) at the Imaging and Medical Beamline, in conjunction with Swinburne University of Technology. XCT is known to give high quality morphological images of a specimen, while FXCT potentially provides functional information. Combining these two image methods provides complimentary information and has several advantages, such as reducing the radiation dose a patient would receive if the techniques were collected separately.

Initial testing was conducted on a 4 cm diameter plastic cylinder (the phantom) with along the axial direction that was filled with Iodine solution as the fluorophore. This design emulates a rat head, where the holes represent vessels or tissues stained using Iodine based contrast agents. The beam was modulated using a 5 mm thick aluminium comb with 1 mm wide tines, producing bright and dark regions and resulting in modulation of the fluorescence signal emitted by the fluorophore as the phantom rotated through the pattern, without affecting the XCT reconstruction. We hypothesise that this modulated fluorescence signal can then be reconstructed to prove spatial knowledge of the fluorophore.

Results from preliminary experiments that demonstrate the feasibility of this experimental approach will be presented.

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