Contribution ID : **43** Type : **Poster**

A photon counting detector for x-ray imaging: advantages and challenges

Thursday, 25 November 2021 18:43 (1)

X-ray sensitive area detectors comprised of arrays of photon counting elements have been under development for decades. The difficult and expensive technological development of integrating readout electronic chips with a converter has been substantially supported by areas of science other than synchrotron radiation research. For instance, such innovation is vital in large scale high energy physics detectors. Synchrotron radiation research has benefited from this technology being spun-out into the market.
IMBL has purchased a photon counting array detector: the Eiger2, from the Swiss company Dectris. It will be used in our human radiography programme. An NHMRC grant was awarded to pursue the use of computed tomography in mammography (breast imaging) using the IMBL. Funds were provided for a 3 mega-pixel array detector, with 75 micron pitch pixels. Similar devices have been used in SR x-ray scattering stations for a sometime, but have not yet found extensive use in radiography. The exquisite sensitivity is a great advantage for imaging live subjects; keeping the required dose to a minimum. However they do have field coverage limitations. These are being addressing as part of the human imaging project. In all photon counting detectors currently on the market, the active area is not continuous. The boundaries between IC chips, and multi-chip modules create gaps. For diffraction these missing pixels may be less important, since reflections are often duplicated, or radial integration reduces their effect. In imaging however, every pixel carries potentially important clinical information.
Some initial data from the IMBL Eiger2 is presented, along with ideas for ameliorating the effect of the missing pixels on the radiological information.

Level of Expertise

Expert

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Synchrotron

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Yes

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Session Classification : Poster Session

Track Classification : Instruments & Techniques