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How to take a perfect image with DINGO

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Neutron tomography is a powerful non-destructive technique used to study the internal structure of opaque objects. Neutron images are obtained by exposing an object to a uniform neutron beam. The transmitted neutrons interact with a phosphor which converts from neutrons to visible light, which is then demagnified on to a CCD camera.
The modulation transfer function (MTF) is routinely used to determine the sharpness of an image, i.e. the ability of the imaging system to transfer information from an object to an image. The spatial frequency (SF) is the rate of transition between light and dark features in the image. For a perfect system where all of the frequency information is passed from object to image equally, the MTF of the will be 1 or 100% for all spatial frequencies and all features and contrast in the object will be transferred to the image.
We performed a series of measurements to optimise the time necessary to obtain high-resolution radiographs with the DINGO instrument. We determined the MTF over a range of experimental conditions to understand the various contributions of DINGO's imaging system variables to radiograph resolution. The system components varied in this study are the two beam modes, different scintillator screens, and pixel resolution of different cameras and lenses. We also compared the different exposure times of the object to the neutron beam to try to understand the minimum exposure time that will generate good resolution radiographs.
Details of the use of this method for determining the quality of a neutron tomographic imaging system will be presented and the MTF data will be used to determine the optimal operating arrangement.

Level of Expertise

Early Career <5 Years

Presenter Gender

Woman

Pronouns

She/Her

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

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