

Additive manufacturing of a wavelength shifting fibres (WLSF) based detector element: IMAT diffraction detector array.

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IMAT (Imaging and Materials Science & Engineering) is a neutron imaging and diffraction instrument for materials science, materials processing and engineering. It is located at the Science and Technology Facilities Council's ISIS Neutron and Muon Source. The special features of the instrument will be energy-selective neutron imaging and the combination of neutron imaging and neutron diffraction.

The instrument is being built in several stages. The first stage is almost complete with two imaging cameras available: a gated CCD camera and a time-of-flight capable high resolution pixel detector.

Currently IMAT has a new diffraction detector array in the prototype stage. The angular coverage of the detectors is 53° vertical and 30° horizontal and the theoretical detecting surface lies on a 2000 mm spherical radius.

The aim of this design is to reduce the time-of-flight approximation, usually introduced when using arrays of flat detectors, by creating curved detector elements. In order to follow the curvature, every single 64-pixels submodule has been 3D printed.

We have developed a WLSF scintillator detector with a 0.1 m^2 detecting area per module. Each module has 64×8 pixels and a $2 \text{ mm} \times 100 \text{ mm}$ pixel size. A $\text{ZnS}/^6\text{LiF}$ scintillator combined with a fibre encoding scheme is used to record the neutron events.

Formal Invitation Letter Required

No

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