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D007: a new instrument for neutron diffuse scattering with polarization analysis

The ILL is finalising the construction of the D007 neutron diffuse scattering spectrometer. The instrument makes use of neutron polarization analysis to provide a clean and unambiguous separation of the magnetic, incoherent, and structural contributions to the scattering. It replaces D7, which made major contributions in the study of frustrated magnetism, short-ranged order and the dynamics of soft matter. D007 represents a major upgrade over its predecessor, with calculations predicting more than a ten-fold increase in the flux without a major change in the resolution [1]. The instrument will offer improved capabilities over D7, which was used to measure diffraction from liquids, powders, and single crystals. Time-of-flight spectroscopy, previously possible but challenging on the old D7, will now be viable due to the flux boost and cleaner thanks to the installation of frame-overlap suppression.

D007 received its first neutrons in 2024, with initial measurements qualitatively confirming the predictions. Further development is proceeding with the installation of the new chopper system for spectroscopy and new two-dimensional position-sensitive detectors, and with technical issues discovered during initial tests being resolved. The instrument will be finished and introduced into the user programme in 2025.

This contribution will introduce the layout and instrument goals for D007, describing the upgrades over D7, and will present the results from the preliminary measurements to test its performance.

[1] G. J. Nilsen et al, Nuc. Instr. Methods. Phys. Res. A 951, 162990 (2020).

Primary authors: WILDES, Andrew (Institut Laue Langevin); MANZIN, Giuliana (ILL); Dr MANGIN-THRO, Lucile (Institut Laue-Langevin); AMOUDRUZ, baptiste (ill2024); GIROUD, benjamin; JIMENEZ, pierre

Presenters: WILDES, Andrew (Institut Laue Langevin); Dr MANGIN-THRO, Lucile (Institut Laue-Langevin)

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