Invited Lecture

The new D007 permanently-polarized diffuse scattering instrument and other upgrades for powder diffraction at the ILL

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The D7 neutron diffuse scattering instrument at the Institut Laue-Langevin [1] has been an important experimental tool in the study of disordered materials, making use of neutron polarization analysis to provide a clean and unambiguous separation of the magnetic, incoherent, and structural contributions to the scattering.

D7 has been disassembled, and the new D007 [2] starts its commissioning in 2024. The upgrade promises an increase in flux by an order of magnitude with a comparable resolution.

Both diffraction and spectroscopic modes will be still available. In diffraction mode, the same momentum transfer range as D7 will be accessible ($0.2\ Å^{-1} \lesssim Q \lesssim 4.1\ Å^{-1}$). The instrument may be converted into a polarized direct geometry time-of-flight spectrometer by adding a system of two choppers, and should offer a comparable energy resolution ($0.1\ meV \leq \Delta E \leq 0.5\ meV$ depending on the incident wavelength [3]).

In addition to D007, we will briefly present the other ILL powder diffraction instruments/projects upgrades such as XtremeD, high-intensity diffractometer focusing on extreme sample environments, and the new detector project for the very high-intensity diffractometer D20.

[1] J. R. Stewart et al., Journal of Applied Crystallography **42**, 69-84 (2009).

[2] G. J. Nilsen et al., Nuclear Instruments and Methods in Physics Research A **951**, 162990 (2020).

[3] T. Fennell et al., Nuclear Instruments and Methods in Physics Research A **857**, 24-30 (2017).