EMU, the backscattering spectrometer at the Australian Centre for Neutron Scattering

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The cold-neutron backscattering spectrometer, EMU, one of the four spectrometers at ANSTO, received its operating licence in 2016. First spectra were obtained from measurements on laboratory standards such as polyethylene, m-Xylene and ammonia perchlorate [1]. The high energy resolution of EMU allows dynamics in the nanosecond timeframe to be observed. This high resolution is due to backscattering from the Si (111) crystal monochromator and analyser arrays, delivering a spectrometer FWHM energy resolution in the order of 1.2μeV. EMU also features a linear Doppler drive modulating incident neutron energies over ± 31 μeV. Scattered, analysed neutrons are counted in ^{3}He LPSD arrays. By setting the Doppler-driven backscattering monochromator to zero motion, elastic fixed window scans (EFW) can be performed. Changes in intensity of the analysed neutrons,with changing temperature, for example, correspond to changing dynamics in the system. Alternatively, when the incident energy is modulated, quasi-elastic neutron scattering (QENS) can be used to observe changes in the profile shape of the elastic peak. Finally, EMU can be used to observe purely inelastic scattering, such as observed in samples exhibiting rotational tunnelling.

Future work will involve developing MANTID software for data treatment and analysis, and continuing to improve the signal-to-noise ratio.

[1] N. R. de Souza, A. Klapproth, G. N.Iles, *Neutron News* **27**, Issue 2 (2016)