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First spectrum measured on EMU, the cold-neutron backscattering spectrometer at the Bragg Institute, ANSTO

The cold-neutron backscattering spectrometer, EMU, one of the four spectrometers at ANSTO received its commissioning licence in 2015. This allowed opening the neutron beam onto the instrument and after measuring nominal background radiation we made our first measurements with the instrument. EMU is based on Si (111) crystal backscattering and extracts neutrons from a cold neutron guide via a double HOPG (002) crystal premonochromator setup. Backscattering occurs through implementation of spherical focusing between the Si (111) crystal monochromator and analyser arrays, aiming to deliver a spectrometer FWHM energy resolution in the order of 1.2 μeV. EMU also features a 7-metre long focusing guide located between the two premonochromators, a so-called graphite chopper alternating beam delivery to the backscattering crystal monochromator and then into the secondary spectrometer [1], and a linear Doppler drive modulating incident neutron energies over ± 31 μeV. Scattered, analysed neutrons are counted in 3He LPSD arrays.

We measured two samples, one a vanadium sample can and secondly a polyethylene sheet. Using event counting obtained from two temporarily placed 3He detector tubes, we were able to obtain a backscattered spectrum. It is critical to ensure that detected neutrons have been backscattered. Backscattered neutrons travel a further distance than those that scatter immediately at the sample and therefore the timing signal must be known accurately, to distinguish between spurious and actual data.

Future work will involve developing MANTID software for data treatment and analysis.

[1] B. Frick and M. Gonzalez, Physica B, 301, 8 (2001)

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