Contribution ID: **26** Type: **not specified**

From IN8 to THERMES – a thermal three-axis spectrometer commissioned at ILL

The three-axis spectrometer IN8 offers to ILL users advanced conditions for studies of thermal excitations in single crystals and liquids. The instrument performance and flexibility are ensured by the use of large double-focusing monochromators and analysers providing high counting rate even for small and low-scattering samples. The new monochromator unit has been recently commissioned. The device is the fruit of the experience accumulated in the former TAS-group at ILL in using Bragg-focusing beam optics with independently variable and remotely controlled horizontal and vertical focusing (bending) of the crystal reflecting planes. The new monochromator for the thermal neutron beam considerably outperforms the previously used one. It consists of 4 different exchangeable crystal planes. The two planes are built from mosaic crystals of pyrolytic graphite and copper with the principal reflections PG002 and Cu200 chosen to provide a broad range of monochromatic neutron wave vectors and energy resolution of the incident beam. The other two planes are assembled with elastically bent perfect silicon crystals set to make use of the reflections Si111 and Si311 with prohibited second-order diffraction harmonics. The mosaic crystal planes are used in experiments requesting maximum monochromatic intensity at the sample position and variable resolution. The silicon crystal planes, with similar to mosaic crystals available resolution range, provide particularly “clean” conditions for experiments with multi-analyser configurations (such as FlatCone, for instance) at the expense of marginally lower monochromatic flux. The further step in renovation of the spectrometer is a classical single-detector secondary spectrometer set-up called THERMES (THERMal Excitations Spectrometer) now commissioned at IN8. The new instrument benefits from a compact design that permits a larger accessible dynamic range (wider available angular ranges in the existing experimental zone) with particular attention paid to neutron shielding including special construction of the detector diaphragm. The user experiments have been routinely performed over the last few reactor cycles. Further development of specific sample environment for this spectrometer is under way.

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Session Classification: Poster session