

Detector bank upgrade of the Necsca neutron powder diffractometer

Wednesday, 29 November 2017 14:20 (20 minutes)

The current detector system of Necsca's Powder Instrument for Transition in Structure Investigations (PITSI) neutron diffractometer consists of 15 vertically stacked 609.6 mm x 25.4 mm Reuter-Stokes He3 gas-filled position sensitive tube detectors. This assembly results in a pseudo area detector with an active area of $\sim 610 \times 380 \text{ mm}^2$. At a sample-to-detector distance of 1.6 m, the detector spans a 2θ angle of a mere 21° , requiring the detector to be step-scanned to 6 positions in order to cover a range of 10° to 120° . This significantly influences measurement time.

A project is currently under way to increase the active area of the detector by adding an additional 33 tubes. The resulting detector assembly will consist of three banks each containing 16 tubes, separated by a dead-space of 18.5° at 1.6 m. This configuration requires a step-scan of only 2 positions to cover the complete 2θ range, effectively increasing the instrument acquisition speed by a factor greater than 3. The sample to detector distance can be varied from 1.6 m to 1.2 m providing the ability to reduce the measurement time even more with a trade-off in angular resolution.

The current USB-communication based electronics (from Instrumentation Associates) will also be replaced by an Ethernet based Mesytex system to increase stability and reduce the amount of cabling needed.

Formal Invitation Letter Required

Yes

Primary author: Dr MARAIS, Deon (The South African Nuclear Energy Corporation (Necsca) SOC Limited)

Co-authors: Dr VENTER, Andrew (The South African Nuclear Energy Corporation (Necsca) SOC Limited); Mr RAATHS, Christo (The South African Nuclear Energy Corporation (Necsca) SOC Limited); Mr LESH, Mark (Australian Nuclear Science and Technology Organisation (ANSTO)); Mr VAN HEERDEN, Rudolph (The South African Nuclear Energy Corporation (Necsca) SOC Limited)

Presenter: Dr MARAIS, Deon (The South African Nuclear Energy Corporation (Necsca) SOC Limited)

Session Classification: Session B