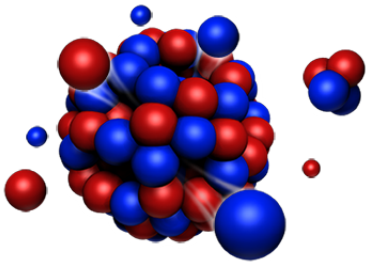

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Fast neutron measurements with solid state detectors at pulsed spallation sources

Monday, 14 October 2019 16:30 (2 hours)

Fast neutron measurements have been performed with silicon and diamond detectors at ChipIr and nTOF facilties.
ChipIr, for Chip Irradiation, is a new beamline at the ISIS spallation neutron source of the Rutherford Appleton Laboratory, where the 800 MeV proton beam is collided on a tungsten target. The 14 meters long beamline has been designed to extract a fast atmospheric-like neutron spectrum. The neutron flux of about $5 \cdot 10^6 s^{-1} cm^{-2}$ with E > 10 MeV is deemed to be ideal for single event effect testing of microelectronics.
The neutron Time-Of-Flight facility (nTOF) at CERN is a 200 meters long beamline designed mainly for cross section measurements. Neutrons are produced by spallation of 24 GeV protons from the Proton Synchrotron accelerator on a lead target.

The pulsed nature of the spallation sources gives very high instantaneous counting rates that dictate the use of a fast electronic chain, with a current preamplifier, and digital acquisition, 1 Gsample/s. All the waveforms are recorded using the digitizer in oscilloscope mode, triggering on the accelerators extraction. The off-line analysis extracts for every neutron interaction the time-stamp and the pulse area, so that time of flight and deposited energy spectra can be built.
At nTOF, the short pulses and long flightpath allow for a selection in energy of the neutrons by means of the time of flight. Therefore response functions of detectors to fast neutrons can be presented and compared to Monte Carlo simulations.
At ChipIr, the longer and more complex pulse structure and shorter flightpath does not allow the same analysis. Therefore the measurements at nTOF are used for interpretation of the ChipIr measurements.

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