1.5.6 JRA6 - MCNSI

Coordinator: 14 - DTU
Partners: 12 – NPL, 1 – STFC, 13 – HMI, 5 – PSI, 8 – ILL, 4 – FZJ, 10 - CNR

Project objectives

MCNSI is an abbreviation of “Monte Carlo Simulations of Neutron Scattering Instruments”. This JRA has developed and tested software which can be used to describe neutron instrumentation.

The back-bone of the MCNSI JRA is the three software packages for neutron ray-tracing Monte-Carlo simulation: McStas, VITESS, and RESTRAX. This JRA has developed these packages with four main tasks which will be described in detail in the following: 1) Meeting activities etc. 2) New capabilities for the packages, including updated documentation; 3) Testing of the packages, by inter-comparison and by comparing with experiments; 4) Development of the concept of virtual experiments.

Methods

This has been a pure software project, in which tools have been developed to describe the functioning of neutron scattering instruments. Software has been developed for all common platforms, including Windows, Linux, and MacOS, using the newest tools available for example, visualization and graphical user interfaces.

The software has been tested at a number of levels from internal logic, over the behaviour of each individual instrument component to cross-comparison of complex instruments between packages and with actual experiments.

Impact

The improvement of the packages has had the largest present impact on their reliability and accessibility. The testing scheme has rendered the three packages in MCNSI the most trusted packages worldwide, and all neutron instruments under development have been simulated using (at least) one of the MCNSI packages. In addition, the high level of documentation has increased the user base to cover a large fraction of all instrument scientists. Both McStas and VITESS have more than 100 unique downloads for each new version.

The impact in the future clearly lies with the concept of virtual experiments. In a handful of years from now, this will be used for a number of tasks closely related to the performance of actual experiments, e.g. Instrument design, beamtime preparation, on-the-fly interaction with experiments, data analysis, teaching/training, and outreach.

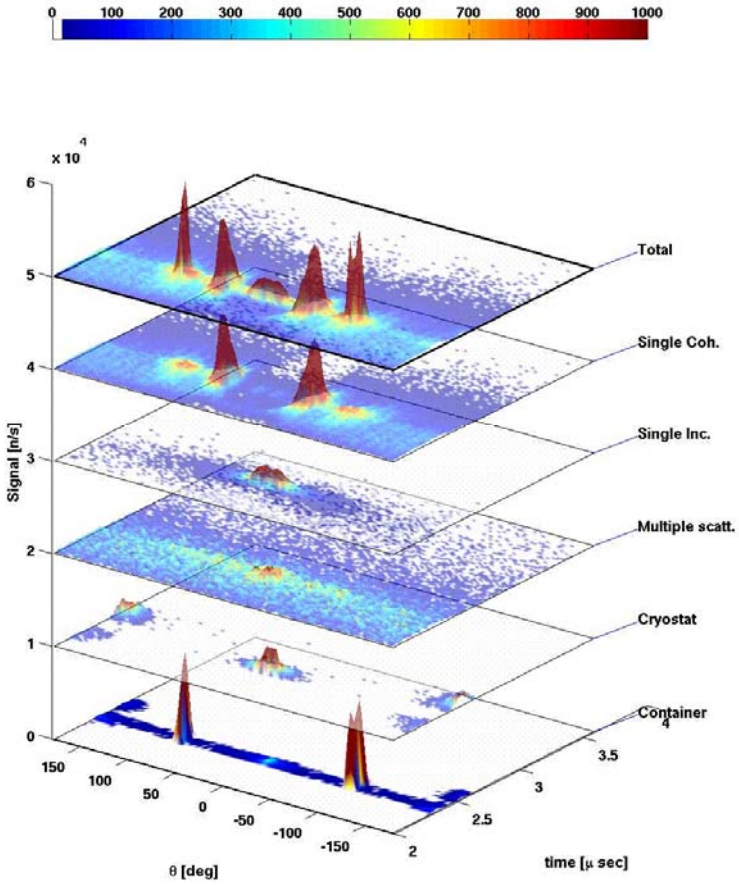

Figure J6 Virtual experiment data separating the scattering data into contributions from sample, sample container, cryostat, and multiple scattering. This cannot be done with a real experiment and could have huge future benefits.