

A New Generation of Detectors for Future Neutron Science Instrumentation

Neutron scattering science - the study of materials using neutrons - is in an exciting period, with new large facilities under construction in China (Chinese Spallation Neutron Source), the US (second target station at the Spallation Neutron Source) and Europe (European Spallation Source). Additionally, large upgrades in the numbers of instruments are planned at major facilities in the US, Japan, Russia and Europe. These upgrades create a much greater demand for detectors in terms of numbers of instruments and their solid angle coverage in the coming decade than in the previous one. Additionally, the requirements of a new generation of instrumentation naturally pushes the boundaries of state-of-the-art in terms of performance. Previous generations of performant neutron detectors used the Helium-3 isotope as the material sensitive to neutrons; however, since 2009, the supply of Helium-3 is increasingly rare and the prices have risen considerably- the so-called "Helium-3 Crisis".

Along with other disciplines reliant upon Helium-3 gas, the neutron scattering community has devoted significant effort into detector development. The aim was to mitigate the usage and demand for Helium-3 by developing replacement technologies, but also to match the challenging performance requirements for the new generation of instruments with creative technical solutions. This talk presents an overview of the status and outlook of these developments, and the performance of this new generation of neutron detectors for large scale facilities, with particular emphasis on the developments for the European Spallation Source. A perspective towards high resolution, high rate devices is given.

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