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A cheap and highly-available source-based testbed for novel neutron detectors

Neutrons are important probes of matter and are crucial for an increasing number of applications in both scientific and industrial fields. A key element for such studies is the ability to reliably detect neutrons. One of the most common neutron detector technology in neutron imaging today are He-3 gas-based detectors. However, due to the increasing scarcity of He-3, alternative technologies are desperately needed.

It is vital for each of these new technologies and the resulting instrument prototypes to be tested at a dedicated facility offering neutron irradiation. This is typically done using either standard neutron-emitting radioactive sources or by going to a reactor beam line. However, the latter is both highly limited in available beam time and prohibitively cost intensive while the former typically only provides functional tests.

This is where a technique called “tagging” comes in. Tagging neutrons makes it possible to study the detector responses as function of neutron energy even with standard radioactive sources. This data is absolutely crucial to evaluate detector performance but is missing in “classical” irradiations of detectors with radioactive sources.

The method of tagging high-energy or “fast” neutrons has already been established and the corresponding setup is now located at the Source Testing Facility (STF) at Lund University. By extending this method to lower or “thermal” energies and by using different sources of neutrons, the full energy range of neutrons could be made available for in-depth tests of the neutron-response of detector prototypes – cheap, safely and available around the clock.

Summary

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