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Tailoring the phase space volume for instruments at accelerator based neutron sources

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Neutron scattering instruments require specific bandwidths and timing structures according to the experimental resolution conditions. Recent developments of compact accelerator based pulsed neutron sources (CANS) enable an individual optimization of the neutron energy spectrum and pulse timing. This allows a large flexibility to tailor the spectral and pulse properties according to the instrument requirements and to feed every instrument with a suitable phase space volume.

At CANS neutrons are produced by the interaction of protons in the 10 to 100 MeV range in a suitable target. Embedding the target in a thermal moderator slows down a huge fraction of the released neutrons in a small volume. The reflector surrounding the moderator provides further means to tailor the pulse properties and to increase the thermal neutron flux inside the moderator. Extraction channels inside the moderator and reflector direct the neutrons to the instruments. Each extraction channel can be equipped with a specific one-dimensional cryogenic moderator to serve the associated instrument optimally. The target / moderator / reflector unit (TMR) is optimized to fulfill the specific requirements of the individual neutron instruments.

We will present the flexibility such a TMR offers and show different possibilities to tune the neutron spectra and the timing structures for typical instrument requirements.

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