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Engineering of the thermal moderator for a Compact Accelerator driven Neutron Source (CANS)

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In a CANS, different from a research reactor or a spallation source, the primary neutrons are produced inside a volume below 200 cm^3 . One of the main requirements for a well-optimized research neutron source is to convert this compact fast neutron cloud into a compact thermal neutron cloud. There the geometry needs to be suitable for the extraction of neutron beams towards the instruments. In addition, the time structure of the pulsed proton beam impinging on the target is convoluted with the time constants of the moderation, absorption, and diffusion processes inside the moderator material.

In this presentation, we present simulations performed by exact MCNPx Monte-Carlo methods and approximated analytical diffusion-based models. We will show the effect of different moderator materials (hydrogen, deuterium, beryllium, and carbon based), dilution, poisoning, and combination of different materials inside the thermal moderator and with reflectors surrounding the thermal moderator on the peak flux and the time structure of the neutron beams delivered to a potential instrument.

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