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Moderator Choices for SNS Second Target Station (STS)

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Moderator performance is impacted by the choice of moderator materials, the moderator size and temperature, position with regard to the neutron production zone, the moderator environment including pre-moderator and reflector material choices and sizing. The neutron production zone is defined by the proton beam characteristics such as beam energy, beam footprint and profile, beam power and pulse length, and the target characteristics such as element atomic number, material density, target dimensions, and the choice of the cooling medium and its volume fraction. Many of the choices are constrained by engineering considerations such as for temperature, stress, material fatigue requirements, the need of heat removal, radiation-induced material degradation, and the requirement of safely containing the high radionuclide activity at all times at any operational scenario. Considering all options and constraints, STS, a short-pulse spallation source of 700 kW power at 15 Hz repetition rate, is best served by liquid para-hydrogen moderators pre-moderated with ambient temperature light water and placed in wing arrangement relative to a solid tungsten rotating disk target and surrounded by beryllium reflector. Two moderators located above and below the target disk illuminate the 22 neutron beam lines. Moderator geometries have been identified that provide the highest brightness of cold neutrons to the neutron scattering instruments which is the core strength of STS. Neutronics design analyses are presented to show the concept and performance of the moderators.

Poster back-up

Yes

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