

## **Shielding Design for the SNS Dual Beamline 1 Serving USANS and NOMAD Instruments**

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Although considerable experience has been amassed on the shielding of neutron beamlines and experimental areas at neutron scattering facilities, the required radiation transport calculations often remain challenging. In this paper we discuss the shielding design analyses for a dual beamline under construction at the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory. The SNS Beamline 1 will deliver neutrons to two instruments: the Time-of-Flight Ultra-Small-Angle Neutron Scattering Instrument (USANS) and the Nanoscale-Ordered Materials Diffractometer (NOMAD). NOMAD and USANS view the top upstream supercritical liquid H<sub>2</sub> (20 K) decoupled and poisoned moderator. The source spectrum extends well into the 100 MeV region (up to ~300 MeV), and while the intensity at the high energies is greatly reduced, the high-energy neutrons still dictate shielding requirements. Because of the close proximity of the two beam guides, the radiation “cross-talk” effects are important and made the design challenging. For example, the original USANS design called for a straight diverging beam guide up to the pre-monochromator. However, simulations revealed that with the USANS beam in operation, the dose rates in the NOMAD sample room would be too high to allow access to the NOMAD sample. This scenario led to the addition of a T-0 chopper to the USANS beamline and implementation of a secondary shutter. All radiation transport calculations were performed with the MCNPX code version that contained the neutron mirror guide option, permitting the thermal and cold neutron transport in the neutron guides to be adequately described.