ICANS XX,
20th meeting on Collaboration of Advanced Neutron Sources
March 4 – 9, 2012
Bariloche, Argentina

Study of the next generation inner reflector plug (IRP) at SNS

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Abstract

At SNS, we are considering design changes for the next generation inner reflector plug (IRP). While there are many engineering considerations in the design of the IRP to accommodate the waste disposal constraints at SNS, the focus of this study is on improving the moderator performance. Due to conflicting interests of the instrument scientists regarding neutron intensity and energy resolution, the physics design of the upstream decoupled moderators at SNS remains mostly unchanged, except for the replacement of gadolinium poison with cadmium to prolong the IRP lifetime. For the downstream coupled moderators, we propose an asymmetric large-volume hydrogen moderator. The unusual shape of this conceptual type of moderator is intended to take advantage of the sweet spot of the incoming neutron flux from the target. The preliminary results show a gain of ~65% in neutron intensity for E < 10 meV, with minimum loss of thermal neutrons, though due to its asymmetry one side-beamline sees ~10% less gain than the other two beamlines. However, such a gain is to be dampened by the engineering constrains due to the fluid dynamics and structural integrity. Further iterations with the engineering design of the moderator are underway.