Contribution ID: **45** Type: **Contributed Oral**

A Potential Moderator Testing Facility at ISIS

Wednesday, 26 February 2025 12:00 (20 minutes)

Moderators are essential parts of neutron sources for neutron scattering experiments for both accelerator and reactor based sources. In accelerator driven sources particularly spallation sources it is much easier and more cost effective to change performance by changing the moderator than by changing the accelerator. The balance of neutron flux, brightness, resolution, and energy distribution can all be changed by modifying the moderators. In large neutron sources it is difficult to regularly change the moderators or perform moderator testing due to the pressure to provide consistent neutrons to the users.
There are a range of moderator performance and reliability aspects that would ideally be tested before installation in a large facility, these include:
• Neutronic performance of different moderator configurations,
• Engineering performance such as cooling performance in solid methane,
• Development of diagnostics such as ortho/para measurement for hydrogen moderators,
• Radiochemistry aspects of moderators particularly for liquid and solid methane to support current ISIS moderators,
• Benchmarking simulations –both neutronics and engineering.
At ISIS we are investigating the potential to use an existing compact accelerator for moderator testing. The Front End test Stand (FETS) has been used to develop ion sources for ISIS and provides a 3 MeV H- ion beam with an average beam current of 6 mA at 10% duty factor. FETS has a pulse chopper which enables the proton pulse to be shaped and chopped to match a short pulse neutron source in pulse length, with a corresponding reduction in protons.
A project has been initiated to investigate adding a neutron target to FETS to create a Moderator Engineering Test Stand (FETS-METS). In order to do this a range of systems are needed including: a lithium target, a reflector, cryogenic systems for the cold moderators, diagnostics and safety systems.
Currently in the concept phase, the project is investigating the potential neutronic performance and engineering feasibility of the facility. In this work we will show some of the concept options for a target, moderator, reflector and diagnostic neutron beam line configuration along with initial neutronics calculations to estimate the possible performance for comparison against the requirements.

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Funding Agency

Abstract classification - track type

Instrumentation and Hardware

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Session Classification: Session 7