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

Total Instrument Performance and

Advanced Cold Moderator Design — SANS

Rex P. Hjelm & Monika A. Hartl

Manuel Lujan, Jr., Neutron Scattering Center, Los Alamos National Laboratory,

Los Alamos, NM 87544, USA

hjelm@lanl.gov

Abstract

Advanced moderator designs aim to increase the brilliance of sources for neutron instrumentation. For the small-angle neutron scattering (SANS) instrument increases in the cold neutron spectrum are particularly useful to improve the instrument statistics over the low-*Q* domain. A new cold, liquid hydrogen moderator has been implemented as a source for the Lujan Scattering Center SANS, LQD (as well as for the two Lujan Center reflectometers, ASTERIX and SPEAR) as part of the pulsed, spallation Mark III targetmoderator-reflector system (TMRS). The Mark III cold moderator is a composite system of a water premoderator coupled to a partially coupled liquid hydrogen moderator followed by a beryllium filter. This arrangement shifts the intensity of the time-of-flight (TOF) spectrum to longer wavelengths above *ca* 4 Å, so that the intensity in the region is approximately 2.5 times that available from the partially coupled cold moderator, with no premoderation or filter, used in the previous Mark II TMRS configuration. This shift depletes the intensity in the domain between 2 and 4 Å to an average of about 0.4 that available from the Mark II moderator. The MARK III configuration also introduces a sharp beryllium edge in the TOF spectrum at *ca* 4 Å. Here we consider the effects on the TOF spectrum from the Mark III TMRS design on the total performance of LQD. We look at the beneficial effects at low-*Q* and possible adverse ones over the higher *Q*-domain due to the decreased low wavelength intensity and the beryllium edge. We discuss strategies for the TOF data reduction procedures to mitigate any such unfavorable results.