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Neutron Noise and delayed neutron backgrounds at spallation facilities.

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Any discussion on neutron source efficiency should not only consider how to maximise the number of ‘useful neutrons’ at the sample but also how to minimize ‘useless neutrons’.

It is well known that the lower power and thick shielding on ISIS target station 2 (TS2) results in very low backgrounds. This is one of several factors that allows a wide variety of instruments to produce world class science despite the relatively weak source strength. Background ‘noise’ can come from a large number of sources, such as sky-shine, target shine, instrument to instrument & sample environment etc. As a result of the effective shielding on ISIS TS2 some of these backgrounds are reduced to extremely low levels and the dominant and limiting backgrounds for some experiments becomes lesser considered backgrounds such as atmospheric neutrons or delayed neutrons. In this work we will outline recent work on ISIS TS2 to measure delayed neutrons and photons after it was found they may be limiting some low contrast reflectivity measurements. Whilst delayed neutrons may be relatively familiar issue in a reactor they are less well known from spallation facilities. In fact the term delayed should not be taken to imply delayed fission neutrons but instead to simply mean neutrons not linked in time to a proton beam pulse. The main cause is likely to be photo neutrons as a result of high energy gamma ray interactions in the target reflector and moderator. The beryllium reflector in particular has a low threshold for photo nuclear interactions. The work includes neutron and gamma measurements as well as neutronics simulations to both attempt to measure and explain the delayed neutrons at ISIS.

Poster back-up

Yes

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