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A study of the intrinsic background from the Beryllium Filter Spectrometer on Taipan

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The Beryllium filter spectrometer on Taipan is a low-energy band-pass spectrometer that employs a number of materials to effectively scatter out neutrons of higher energies and transmit only neutrons in the energy range, $ef=1.2\pm0.5$ meV. Here in this study the spectrometer response is studied in order to understand and identify the inherent background from the spectrometer itself.

Ambient air and nickel are used as scatterers in this study as the former gives a reasonable detection limit of the spectrometer and the latter gives enough scatter to observe the inelastic signal but not too much to swamp out the inherent signal produced by the spectrometer itself. The background shape is found to be hull-like that reflects the total scattering cross-sections of the filter materials themselves and that of the copper cooling frame and the iron found in the stainless steel collimator. Furthermore the detailed inelastic signals from the last set of Beryllium blocks next to the detector bank are identifiable as low intensity parts of the spectra.

A simple experimental method using the collected spectra are used to identify features associated with scatter from the spectrometer and those from the sample under investigation which can then be used to potentially effectively strip-out the spectrometer profile from collected spectra. Further work is discussed to minimise the scatter generated from the spectrometer filter blocks and frames in order to reduce the background to the ultimate minimum limit.

Level of Expertise

Experienced Researcher

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

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