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Construction and Implementation of an Energy-Dependent Instrument Response Function for Accurate Analysis of Neutron Time-of-Flight Data Z. L. MOHAMED, O. M. MANNION, J. P. KNAUER, C. J. FORREST, Laboratory for Laser Energetics, U. of Rochester — Analysis of neutron time-of-flight (nTOF) data in cryogenic DT experiments is often conducted over a relatively small range of neutron energies corresponding to DD and DT primary neutrons and therefore often employs instrument response functions (IRFs) corresponding to monoenergetic 2.45- or 14.03-MeV neutrons. Some analyses, such as those focused on nTOF data corresponding to nuclear physics experiments as well as recent analyses of areal densities in cryogenic experiments, span a much wider range of neutron energies. These analyses require the use of an energy-dependent IRF for accurate treatment of the data. This work describes construction of the energy-dependent IRF and application of this IRF in a forward fit via matrix multiplication. The process is detailed for the xylene nTOFs used at the Omega Laser Facility. To demonstrate the effects of the energy-dependent IRF on inferred quantities of interest, the forward-fit analysis is applied to synthetic data using the energy-dependent IRF as well as monoenergetic IRFs. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.

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