Contribution ID : **353**   Type : **not specified**

8.51 Impact of Response Function Uncertainty and Gamma Backgrounds on Measurements from Cerenkov Detectors at the National Ignition Facility (NIF)*

Tuesday, 17 April 2018 16:01 (120)

The instrument response function of neutron time-of-flight (nToF) systems is a major contributor to both systematic and statistical uncertainties of derived quantities of interest. In particular, the first and second moments of these distributions are associated with arrival time, t0, and ion temperature Tion. Response times of Cerenkov radiators recently deployed at NIF are set by neutron transit times across the detector, rather than long response-time tails characteristic of scintillation detectors. We present the results of uncertainty analysis showing the significant reduction of uncertainty in determining these quantities using the Cerenkov detector system recently deployed at NIF. The increased sensitivity to gamma radiation requires additional consideration of the effect of this background to the uncertainties in both t0 and Tion. Leveraging the well-understood nature of the Cerenkov process, high fidelity Monte Carlo simulations are combined with analysis techniques to evaluate the effect of background on measured NIF spectra. *Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344.

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Session Classification :   Session #8, Tuesday Afternoon Poster Session