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A COMPARISON OF ENDF/B III EVALUATED DATA SETS
WITH LLL PULSED SPHERE MEASUREMENTS*

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August, 1972

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A COMPARISON OF ENDF/B III EVALUATED DATA SETS
WITH LLL PULSED SPHERE MEASUREMENTS*

Paper to be presented by
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An LLL pulsed sphere measurement consists of a thick spherical shell surrounding a 14 MeV neutron source, with a collimated neutron detector located some distance away. Time-of-flight techniques are used to determine the time spectrum of the neutrons emerging from the sphere. The neutron energy range corresponding to the time spectrum is from about 14 MeV to about 2.5 MeV. The pulsed spheres are useful in providing benchmark-type integral tests of fast neutron elastic and inelastic scattering cross sections and secondary energy distributions.

A connection between the LLL pulsed sphere experimental data and

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corresponding evaluated data sets is made by means of the TART Monte Carlo 3-dimensional neutronics code. The experimental configuration is mocked-up, and an analogue calculation is carried out to compare with the experimental time spectrum. As a check on the accuracy of the TART code, several test problems were run on the TART code at LLL and on the MCN Monte Carlo code at Los Alamos, using the same evaluated data library in each case. The results of the two codes agreed to within Monte Carlo statistics, even though TART does an analogue calculation while MCN does an expectation calculation. Although collimator effects are not routinely included in TART Monte Carlo calculations of the pulsed sphere experiments, these effects have been studied and found to be unimportant even for high Z materials where they are small when compared with the effects of data uncertainties.

As part of a continuing program of data evaluation and data testing at LLL, we used ENDF/B III evaluated data sets in TART pulsed-sphere calculations and compared them with the LLL pulsed sphere data. The following materials were studied: H_2O , D_2O , Li^6 , Li^7 , Be^9 , C^{12} , H^{14} , Hg , Al , Ti , Fe , and Pb . Some ENDF/B III evaluated data sets show a deficiency in the number of high-energy inelastically-scattered neutrons. Recent LLL ring-geometry inelastic scattering experiments on iron and measurements of neutron differential cross sections reported in the literature led to an evaluated data set for iron which does not exhibit this deficiency in high energy neutrons.