SENSITIVITY ANALYSIS FOR SHIELDING
DATA EVALUATION BY INTERACTIVE GRAPHICS COMPUTING*

by

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Sensitivity studies are being carried out to determine the impacts of cross section uncertainties on the results of neutron transport experiments for several materials.

A very simple and direct approach has been adopted at RPI where a parametric variation of the input data is carried out to determine the consequences of data uncertainties. The problem of data handling and manipulation has been overcome through the development of a sophisticated interactive graphic analysis system. The system operates on a PDP-15 computer associated with a View Tube. To increase the interactive capabilities of the system a Hardware Dialogue Unit (HDU) has been interfaced to the PDP-15.⁽¹⁾ Hardware and software for the system modifications were designed and implemented at RPI .

The processed data (normally SUPERTOG ⁽²⁾ output) is transferred directly from a large remote computer to the local computer. The interactive graphic program automatically creates displayable files from this data and allows the user to display, manipulate, and modify any cross section on the screen at the selection of push buttons from the HDU. Along with the original data the errors or uncertainties associated with the data also are displayed.

In addition to displaying and modifying the individual cross sections, the program also provides the capability to interactively modify the secondary distribution on a selective basis or through a variety of pre-defined gross adjustment schemes.

The usefulness of the system is increased through the development of approximate but viable calculational models (continuous slowing down theory⁽³⁾ in this case) to allow a rapid survey by

calculating the results following a data change, and graphically comparing them with the integral measurements. Initial conclusions reached on the basis of the approximate model are then tested by carrying out a precise calculation at the remote computer.

By using this strategy, we have successfully interpreted the discrepancies between the calculated and measured spectra in uranium,^(4,5) where both the total inelastic cross section and the secondary distribution have been modified (compared to ENDF/B-IV) to bring the calculation in line with experiment.

Efforts are continuing to analyse and interpret the integral measurements in iron and sodium. For iron the ENDF/B-IV data appears to yield generally satisfactory results, but work is continuing in connection with the uncertainty in multigroup constants where the cross sections show substantial structure, and the impact of this uncertainty on the details of the final spectrum. Investigations recently have been initiated relative to sodium.

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