Computer Code Abstracts

PIGG

1. Name of Code: PIGG.
2. Computer for Which Code is Designed: CD 3600.
3. Nature of Physical Problems Solved: PIGG solves the P_1 equations in a Greuling-Goertzel approximation for the spatially dependent multigroup neutron flux in both slab and cylindrical geometry. The resonance absorption and fission are calculated using single-pin resonance and fission integrals, Dancoff factors, and resonance-distribution functions. The thermal region can be treated either as one group or as few groups to which diffusion equations are applied. Logarithmic boundary conditions are applied at the external boundaries. The output is very extensive and includes the criticality factor, point-wise group spectra and macrogroup constants, region-averaged macrogroup constants, and epithermal reaction rates for selected isotopes in different mesh points and macrogroups. Interesting applications include calculation of space-dependent epithermal spectra in BWR-fuel elements, spectrum transients near core-reflector interfaces, and effective macrogroup boundary conditions on control absorbers.
4. Method of Solution: Three point difference equations for the group flux are obtained using box integration. The equations are solved using power iteration accelerated by Chebyshev extrapolation of the normalized source. Matrix factorization technique is used for solving the inhomogeneous equations.
5. Restrictions on the Complexity of the Problem: 39 epithermal and 6 thermal groups. 100 mesh points in 20 regions, and 10 homogeneous compositions. 28 different materials may be used for calculation of macroscopic cross sections in 6 macrogroups. For special calculations of reaction rates, 10 selected nuclides in 6 selected mesh points may be used.
6. Typical Running Time: 3 min.
7. Unusual Features of the Program: Options for full or part output on line printer, magnetic tape, and card punch.
8. Related and Auxiliary Programs: Library tape containing macrogroup lethargy structure and Watt's normalized fission spectrum, resonance integral distribution functions and cross sections for 28 materials; program to update the library tape.
9. Status: In production.
10. Machine Requirements: 32K CD 3600, 4 scratch units on drums and up to 3 units on magnetic tapes.
11. Programming Language Used: 3600 FORTRAN, an extended FORTRAN 63.
12. Operating System or Monitor under which Program is Executed: DRUM SCOPE V2.0.
13. Material Available through ENEA Computer Program Library, Ispra, Italy:
    a. FORTRAN source deck and sample problem
    b. Library tape
    c. Program to update library tape
    d. Reference document.
14. *Reference:*
    J. O. BERG, G. E. FLADMARK, T. KULIKOWSKA, and O. P. TVERBAKK, "PIGG, a Multigroup One-Dimensional P-1 Code," Kjeller Report KR-129, Institutt for Atomenergi, Kjeller, Norway (May 1968).

T. Kulikowska

Institute of Nuclear Research
Swierk, Poland

J. O. Berg
G. E. Fladmark
O. P. Tverbakk

Institutt for Atomenergi
Kjeller, Norway

May 5, 1969

ETOX

A Code to Calculate Group Constants for Nuclear Reactor Calculations

1. Name of Code: ETOX[1]
2. Computer for Which Code is Designed: UNIVAC 1108. Programming Language: "Standard" FORTRAN-IV.
3. Nature of Code: ETOX (ENDF/B[2] TO 1DX[3]) calculates multigroup constants for nuclear reactor calculations using data from the Evaluated Nuclear Data File (ENDF/B[2]). The code is designed to compute and punch:
   a. Infinite dilute cross sections
   b. Temperature dependent self-shielding factors for arbitrary values of σ_0 (total cross section per atom) in the "Russian" (Bondarenko[4]) format
   c. Inelastic scattering probability matrices.
4. Method of Solution: Microscopic cross section values are constructed as specified by the ENDF/B.[2] Group constants are obtained by integrating the microscopic data over group intervals using the flux weighting scheme $\phi(u) \propto 1/\Sigma_t(u)$, $\Sigma_t(u) = N_j \sigma_{tj} + N_j \sigma_0$. Integration methods used include Romberg,[5] Guassian Quadrature,[6] N-point,[7] Simpson[6] and Trapazoidal.[6] The code allows