Encoded Physics Knowledge in Checking Codes for Nuclear Cross Section Libraries at Los Alamos

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CHECKACE and CHECKMG from the Nuclear Data Team at Los Alamos

- After the nuclear data evaluations have been processed by NJOY into CE ACE files or MG NDI tables …
- CHECKACE is a collection of Fortran and PERL routines used to read and check data from ACE files
- CHECKMG is a C routine which reads and checks MG data from NDI tables
- Both check for errors and unusual data values based on physics knowledge
  - Give messages which usually require follow-up
  - Quickly catch many errors – but not all possible errors
  - New rules added as more data problems are discovered
  - Bugs found and fixed in evaluations, NJOY, NDIR, etc.

Some Rules of CHECKACE

- Sum of partial xs = total xs at each energy point
  - Both for neutrons and photon production
- Energy grid points non-negative and monotonic
- Negative xs are unphysical
- Reasonable values of MT 2, nu, neutron production from MT 5, Q, etc.
- PDF values > 0.0 and NOT small (eg 1.0e-12)
  - Small indicates that NJOY is correcting a negative value
- CDF values monotonic and last CDF = 1.0

Some Rules of CHECKMG

- Sum of partial xs = total xs at each energy group
- Sum of n production from an incident group over all reactions = the P0 Legendre Scattering Matrix production for that incident group
- Negative xs are unphysical – including the P0 component of the Legendre Scattering Matrix
- |P1|, |P2|, … |PL| components should be ≤ the P0 component of the Legendre Scattering Matrix
- Fission Chi normalizations
- Sum of partial fissions (MT's 19, 20, 21, 38) = MT 18
- Prompt nu + delayed nu = nutot
- Reasonable values of MT 2, nu, Q, gamma production, etc.
- Consistency of kerma and heating numbers