Experience with the use of ERROR-J

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ERROR-J distribution from NEA-DB

Distributed by NEA-DB since 2002 under several versions:

- ERRORJ	NEA-1676/01 Tested
- ERRORJ 2	NEA-1676/02 Obsolete
- ERRORJ 2	NEA-1676/03 Obsolete
- ERRORJ 2.2	NEA-1676/04 Obsolete
- ERRORJ-2.2.1	NEA-1676/05 Obsolete
- ERRORJ-2.2.1	NEA-1676/06 Tested
- ERRORJ-2.3	NEA-1676/07 Testing in progress

ERRORJ-2.3 can be incorporated into the NJOY code system.
For verification purposes it may be useful to keep at the first stage both ERRORR and ERRORJ modules in NJOY.

Covariance Data Processed by ERROR-J

- ***MF*=31:** covariance of average number of neutrons per fission (MT=452, 455, 456)
- ***MF*=32:** covariance of resonance parameters
- ***MF*=33:** covariance of neutron cross section
- ***MF*=34:** covariance of angular distribution of secondary neutron (MT=2/P1 only)
- ***MF*=35:** covariance of energy distribution of secondary neutron (MT=18 only)

Not available:

- *MF*=30: Data covariances obtained from parameter covariances and sensitivities
- *MF*=40: Covariances for production of radioactive nuclei

UTILITY MODULES OF ERROR-J system

NJOYCOVX: covariance format conversion from COVFIL of ERRORR/NJOY to COVERX format

EDITCVX: editing program of COVERX format files

- four rule operations of arithmetic to data
- replacement or deletion of requested data
- addition of new data
- union of two COVERX format files into one
- division of a COVERX format file into files by nuclides

VIEWCVX: viewer program of COVERX format file

- list of nuclides and reaction types
- cross sections and standard deviations by each reaction
- matrix with group structure of absolute or relative covariance
- correlation matrix
- general information for COVERX

MF=32 & 33

- **Few vs. fine group covariances.**
- **Effect of resonance self-shielding in the processing on the covariance matrices: big effect in first versions of ERRORJ, small in the last version.**

MF=34 (Covariance of $\bar{\mu}$)

$\bar{\mu}$: average cosine of the scattering angle for elastic

- MF=3/MT=251: $\bar{\mu}$ (multigroup constants in LAB)
- MF=3/MT=2: elastic scattering cross sections
- MF=4/MT=2: angular distributions for elastic scattering – CM
- MF=34/MT=2: covariance of P1 Legendre component - CM

At present the covariances of $\bar{\mu}$ *are* given in MF=34 in **CM** system, and are converted to **LAB**.

PROBLEM:

- Loss of accuracy in CM→ LAB transformation.

Recommandation:

- Add in ERRORJ processing of covariances into CM for use in XS sensitivity uncertainty analysis
- allow the LAB representation of covariance of $\bar{\mu}$ in MF=34 (proposal expressed at CSEWG). No need for conversion, minor modifications in ERRORJ needed.

MF=35 (Covariance of χ)

- For fission spectra covariances different format standards are used, either with or without the scaling by the bin-energy widths.
- ERROR-J assumes that the matrix elements are divided by the bin-widths as is done in JENDL-3.3, contrary to the format of ^{252}Cf spontaneous fission spectrum in ENDF/B-VII.
- In case of using the definition adopted for ^{252}Cf in ENDF/B-VII the elements of the rows or columns can be summed up directly without requiring any division. **In this way it may be numerically easier to fulfil the requirement that the rows and columns of the matrices must sum to 0.**
- **Verification procedure needed** to check that the rows & columns sum to 0 ($<10^{-5}$).