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Subgroup 20: Covariance Matrix Evaluation and Process in the Resolved/Unresolved Resonance Regions Status Report 2003

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This report includes the activity of SG20 from April 2002 to April 2003. In this period our main task was to process the evaluated covariance files to generate covariance matrices of the group-constants, and those were compared with the original data in order to check whether the obtained values were reasonable. We also tried to understand what is the adequate way to represent uncertainty information in the unresolved region.

- New format proposal (Dr.Larson, ORNL)
  - A new ENDF format for resonance parameters was proposed, which is called "Concise Covariance Matrix Format." This was submitted to CSEWG in 2002. The format has features of:
    * The covariance is decomposed into variances and correlation coefficients.
    * The correlations are represented by 2-digit integers.
    * Zero's are eliminated to make a file smaller.
  - The format is not yet approved, but at this moment this is only one possibility to store the huge covariance matrix of ^{235}U resonance parameters in ENDF, JENDL, and JEFF.
- ERRORJ code distribution (Dr.Ishikawa, JNC)
  - The ERRORJ code which generates a covariance of group constants when the Reich-Moore R-matrix is used, has been distributed by JNC, and we have obtained some feedbacks from users.
  - A quantitative study of sensitivity and uncertainty analysis was carried out by Dr. Kodeli et al. They informed us that the JENDL-3.2 covariance data of U agree with KRITZ critical experiments. However, the Pu data in JENDL-3.2 are too optimistic. Dr.Shibata of JAERI announced that they will re-examine the covariance data for the next general purpose library.
  - The code was distributed to several institutes (check !). Those experiences would improve our evaluation task.
  - We also discussed about an extension of the ERRORJ code to process the huge ^{235}U covariance data which are represented by the Dr.Larson's format. As an example, we have a plan to generate a simplified covariance in this format. The method developed by JENDL will be adopted.

- Uncertainty representation in the unresolved region (Dr.Kawano, Kyushu Univ., LANL)
  - The covariance matrices of unresolved resonance region were investigated. In the unresolved region, an energy averaged cross section is more important than the fluctuating excitation function. When one takes the average of cross sections, the statistical errors disappear, and the systematic errors remain.
  - Therefore the uncertainty in the unresolved region is essentially the systematic errors with very strong correlation.
  - The covariance of unresolved resonance parameters — S_0, S_1, and D_0 — were estimated by fitting those to the averaged experimental data and those uncertainties. We found that the calculated uncertainties in the cross section become too small if we do not include the nuclear radius R, however the uncertainty in R is not allowed in the ENDF format.
  - This subject was published in the Proc. of Int. Symp. Reactor Dosimetry, Belgium, 18–24 Aug. 2002.