Verification and Testing of Covariance Libraries

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Purpose

• Present current verification and testing of covariance libraries

• Within this context:
  – Verification refers to automatic checks or corrections performed in the processing codes
  – Testing refers to inspections and calculations performed after the data have been processed

• This is a very high-level overview
  – Some additional details are available in published papers and reports
Verification

• Within the AMPX system:
  – PUFF-IV processes covariance data into a COVERX-formatted library
  – COGNAC performs checks and corrections

• COGNAC checks:
  – All redundant covariance matrices are removed
  – Cross section data without covariance information are removed
  – Relative uncertainties larger than 1 are set to 1
  – Correlation values with absolute values larger than 1 are set to +1 or -1
  – Diagonal elements of the covariance matrix are extended if a higher energy group has uncertainty data and the lower energy groups do not
Testing (1)

- Visual inspection and comparison to prior evaluations

H-1 elastic scattering

Pu-239 \( \bar{\nu} \)
Testing (2)

- Data-induced uncertainty propagated to measured critical experiments

<table>
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<th>Category</th>
<th>Avg C/E (CE_V7.1)</th>
<th>St. Dev. Of C/Es</th>
<th>Avg 1σ XS Unc</th>
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What’s missing?

• Improvements to verification
  – Does sampling from the covariances generate the mean values?
  – Detect and fix some data problems, e.g., matrices that are not positive definite

• Validation
  – Benchmark measurements of different systems allow comparison of calculated and measured results for mean values
  – Comparing variability of these results with covariance data prediction provides some insight, especially for major actinides
  – Substitution experiments and reactivity sensitivities may allow this approach to be expanded to other isotopes
References for further information


Questions?

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