UT-BATTELLE

ORNL Cross-Section Processing Status

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AMPX Status

- ENDF/B-VI Multigroup Library Development
  - Corrected processing problems with collision kinematics treatment
  - Corrected various systematic errors in processing procedures
  - Generated 238-group ENDF/B-VI library for testing
  - Currently performing various benchmark calculations with the library in the SCALE 5 code system
  - Good results obtained for various benchmark calculations; however, some results are consistently 1-2% below critical.
  - Currently investigating multigroup scattering matrices to resolve discrepancies with benchmark results

AMPX Status

- AMPX developments to support continuous-energy version of KENO V.a
  - Developed new processing modules to support Point KENO development effort
  - Point KENO cross-section library components
    - $\bar{\upsilon}(E)$ delayed and prompt
    - 1-D continuous-energy cross sections as a function of temperature $\sigma(E,T)$
    - 2-D joint probability distributions for particle collisions $f(E \rightarrow E', \mu)$
    - Probability tables for unresolved resonance region
  - MONTEGO and JAMAICAN modules
    - Generate joint probability density functions (PDF) and cumulative distribution functions (CDF)
    - Produce tabular PDFs and CDFs in lab system
  - PLATINUM module developed to assemble Point KENO cross-section file for a nuclide
- Used AMPX to generate test ENDF/B-VI library for Point KENO
  - 50 Nuclides

Point KENO V.a Testing

- Prototypic Point KENO cross-section data generated for 50 ENDF/B-VI Release 7 nuclides

^{27}Al	^{52}Cr	^{56}Fe	^{55}Mn	^{31}P	^{242}Pu	^{30}Si	^{238}U
^{241}Am	^{53}Cr	^{57}Fe	Mo	^{236}Pu	^{243}Pu	^{232}U	
^{10}B	C	^{58}Fe	^{14}N	^{237}Pu	^{244}Pu	^{233}U	
^{11}B	^{63}Cu	^{1}H	^{23}Na	^{238}Pu	S	^{234}U	
Ca	^{65}Cu	H_2O	^{58}Ni	^{239}Pu	Si	^{235}U	
Cd	^{19}F	CH_2	^{60}Ni	^{240}Pu	^{28}Si	^{236}U	
^{50}Cr	^{54}Fe	K	^{16}O	^{241}Pu	^{29}Si	^{237}U	

Point KENO V.a Testing

- Point KENO V.a used to calculate 54 different criticality test problems
  - 33 KENO test problems
    - Uranium metal (single units and arrays)
    - Uranyl fluoride and nitrate solutions
    - Mixed metal and solution problems
    - Various geometrical and reflector configurations
  - 21 benchmark problems
    - LWR-type UO_2 fuel pin lattices
    - Green-block experiments: homogenized U in paraffin blocks
    - Uranyl fluoride and nitrate solutions (low and high enriched)
- Calculations performed on DEC Alpha XP1000 workstation

Point KENO V.a Testing

Case ID	Description	Point KENO ENDF/B-VI Rel. 7	KENO V.a 199-group ENDF/B-VI Rel. 3	KENO V.a 238-group ENDF/B-V
cas01	U(2.35)O_2 pin lattice	0.9950 ± 0.0016	0.9947 ± 0.0015	0.9937 ± 0.0015
cas07	U(2.35)O_2 pin lattice	0.9965 ± 0.0018	0.9934 ± 0.0016	0.9956 ± 0.0015
cas19	U(2.35)O_2 pin lattice	1.0008 ± 0.0016	0.9937 ± 0.0022	0.9903 ± 0.0014
cas34	U(2.46)O_2 pin lattice	0.9997 ± 0.0016	0.9973 ± 0.0011	0.9925 ± 0.0015
cas82	U(2.0) in Paraffin	1.0003 ± 0.0014	1.0241 ± 0.0015	1.0021 ± 0.0016
cas83	U(2.0) in Paraffin	1.0011 ± 0.0019	1.0194 ± 0.0017	0.9992 ± 0.0017
cas84	U(3.0) in Paraffin	1.0129 ± 0.0021	1.0357 ± 0.0017	1.0118 ± 0.0017
cas85	U(3.0) in Paraffin	1.0177 ± 0.0016	1.0407 ± 0.0020	1.0123 ± 0.0020
cas88	U(93.2)$O_2(NO_3)_2$	1.0026 ± 0.0023	1.0029 ± 0.0025	1.0090 ± 0.0021