



# Status of ENDF/B-VIIbeta3

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# ENDF/B-VIIb3 release ( October 2, 2006)

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Complete (14 sub-libraries) precursor of  
ENDF/B-VII.0

- ❑ contents of beta3 the same as of beta2
- ❑ 87 updates in the neutron sub-library
- ❑ small (but many) changes in the decay sub-library
- ❑ cosmetic changes to the standards sub-library

# Changes in actinides

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- ❑ Nubars for the  $^{233,235,238}\text{U}$  and  $^{239}\text{Pu} + n$  adjusted so that they conform to the ENDF/B-VII standard  $^{252}\text{Cf}$  nubar
- ❑ New fission energy release for  $^{235,238}\text{U}$ , and  $^{239}\text{Pu}$  according to Madland (MT=458)
- ❑ Post-fission beta-delayed gammas for  $^{235}\text{U}$  and  $^{239}\text{Pu}$  (MT=460)
- ❑ Updated covariances for  $^{232}\text{Th}$
- ❑ Resonance parameters in  $^{237}\text{Np}$  replaced by JENDL-3.3, in the URR the fission width modified to reproduce LANSCE  $^{237}\text{Np}/^{235}\text{U}$  fission data by F.Tovesson and T.Hill, some typos corrected
- ❑ More reasonable  $(n,\gamma)$  and  $(n,f)$  cross sections at thermal for  $^{239}\text{U}+n$
- ❑ Revised (cleaned up) description part for  $^{233,235,238}\text{U}$  and  $^{239}\text{Pu}$  (thank you Phil 😊 )

# ... in fission products ( $Z=31-68$ )

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- ❑ Updated covariances for 152,153,154,155,157Gd
- ❑ New evaluation for 90Zr (BNL)
- ❑ New covariances for 89Y and 99Tc
- ❑ Set of fixes by D. Brown (LLNL) – interpolation and MF=12
- ❑ Set of fixes by V. Pronyaev (IPPE) – updates of RR to agree with Atlas (Mughabghab:06)
- ❑ Fixed energy balance for a number of materials by adjusting  $\gamma$ -multiplicities in MT=91 and, in some cases, also for (n,2n)
- ❑ Reduced number of sections in 103Rh ((n, $\alpha$ ) to discrete levels eliminated)

# ... and in other materials

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- ❑ New evaluations for  $^{191,193}\text{Ir}$  (BNL,LANL) including covariances
- ❑ Restored full covariances (from ENDF/B-VI.8) for  $^7\text{Li}$
- ❑ Modified alpha production in  $^{56}\text{Fe}$
- ❑ Thermal capture adjusted to Atlas for  $^{201}\text{Hg}$
- ❑ Thermal capture adjusted to Atlas for  $^{208}\text{Pb}$  and the neutron width of the 153.25 keV resonance reduced by factor of 10

# Changes in Standards and Decay

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## Standards

- ❑ Interpolation scheme was changed to be the same as in the ENDF/B-VII.b3 general purpose files

## Decay Data

- ❑ ensuring that sums of the branching ratios add up to 1; fixing rounding problems
- ❑ Kratz-Herrmann systematics used for neutron-rich nuclides with unknown values of beta delayed neutron emission branching ratios and half-lives
- ❑ about 1000 materials out of 3838 revised

# ENDF/B-VIIb3 release summary

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- ❑ Large number of files still affected by changes, however these are to a large extent cosmetic and do not have strong impact on benchmarking (except 90Zr)
- ❑ NJOY-99.161, released along with beta3, fixes most of the problems reported earlier (thanks Bob and Skip 😊)
- ❑ Three extensive validation efforts
  - R. MacFarlane & A. Kahler (LANL)
  - S.C. van der Marck (NRG)
  - Jean Christophe Sublet (Cadarache)

Codes employed in verification/  
validation:

**NJOY-99.161, MCNP-4C3,  
MCNP-5, PUFF-IV, ERRORJ-2.3,  
CALENDF-2005, TRIPOLI-4.4.1**

Problems reported by Sublet

(on Sun Sparc 64, OS Solaris, F90/95 Sun Studio 10)

- ❑ 133Ba doesn't run through UNRESR
- ❑ H1 and Ho166m don't run through HEATR, GASPR and PURR

# Submitted changes for ENDF/B-VII.0

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- ❑  $^{241}\text{Am}$  - corrected energy grid (Phil Young)
- ❑  $^{156}\text{Gd}$  - updated covariances in RR (L. Leal)
- ❑  $^{152,153,154,155,156,157,158,160}\text{Gd}$  - updated covariances in the fast neutron region (D. Rochman)
- ❑ Corrected photo-nuclear files (MF=4, MT=50, 51, ... moved to MF=6) for :
  - $^{51}\text{V}$ ,
  - $^{180}$ ,
  - $^{183}\text{W}$ ,
  - $^{232}\text{Th}$ ,
  - $^{233,234,236}\text{U}$ ,
  - $^{238}\text{Pu}$ ,
  - $^{241}\text{Pu}$  (thanks Phil again 😊 )



# Conclusions

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- ❑ ENDF/B-VIIb3 = ENDF/B-VII.0 (or nearly)
- ❑ Eventual changes will not affect benchmark results
- ❑ ENDF/B-VII.0 files will undergo verification (but not validation!)
- ❑ ENDF/B-VII.0 will be accompanied by the specific version of NJOY (-99.161?)

Library verification: Ramon ...