

Evaluation Modifications between the Beta-2 and Beta-3 Versions of ENDF/B-VII*

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ABSTRACT

The work at Los Alamos over the past 6 months in finalizing nuclear data evaluations for the upcoming issue of the ENDF/B-VII database is described. The revisions include photonuclear data evaluations for ^{51}V , $^{180,183}\text{W}$, ^{232}Th , $^{233,234,236}\text{U}$, and $^{238,241}\text{Pu}$. These revisions deal primarily with reformatting discrete (γ,n) angular distributions and correcting energy grids and summations so that processing through the NJOY computer code is now possible. Changes were also made to neutron-induced evaluations of ^{208}Pb , $^{233,234,235,238,239}\text{U}$, ^{239}Pu and ^{241}Am data. These changes ranged from simple energy grid corrections to small revisions in capture and fission cross sections as well as fission neutron multiplicities (nubar). All the corrected data files were successfully passed through the standard CSEWG checking codes.

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**EVALUATION MODIFICATIONS BETWEEN THE BETA-2
AND BETA-3 VERSIONS OF ENDF/B-VII ***

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PHOTO-NUCLEAR EVALUATIONS

- Non-actinides: ^{51}V , ^{180}W , $^{183}\text{W} + \gamma$

Evaluations would not process through NJOY. Fixed by shifting all MF=4,MT=50-90 data to MF=6.

- Actinides: ^{232}Th , $^{233,234,236}\text{U}$, $^{238,241}\text{Pu} + \gamma$

Resumed and corrected energy grids of MF=3, MT=3. Also corrected erroneous LNU's and energy grids for MF=1, MT=452-456. Some cases only have MT=456 but this has not been fixed yet.

NEUTRON-INDUCED EVALUATIONS

- Non-actinide: $^{208}\text{Pb} + n$

Following the suggestion of M. Milosevic, we reduced the width of the 153.25-keV resonance by a factor of ten. This obviously was just a typographical error in the original resonance analysis.

- Actinides: ^{232}Th , $^{233,234,235,238,239}\text{U}$, ^{239}Pu , $^{241}\text{Am} + n$

Various minor corrections, as described below.

- $^{241}\text{Am} + n$

Energy grid and summation errors in MF=13, MT=3 data were corrected, as well as similar problems in MF=3, MT=1 and 102.

- $^{235,238}\text{U}, ^{239}\text{Pu} + n$

New energy release data (MF=1, MT=458) based on a recent analysis by Madland [Nucl.Phys. A772, 113 (2006)] were incorporated. The average total fission product kinetic and prompt fission gamma energies were taken from Madland's analysis. The average total prompt fission neutron kinetic energy was obtained from NJOY using the MF=5, MT=18 spectra and MF=1, MT=456 nubar from the evaluation. The remaining kinetic energy of delayed fission neutrons, total energy of delayed gammas and betas, and the neutrino energy release were taken from ENDF/B-VI Release 8.

- $^{233}\text{U} + \text{n}$

Reduced thermal region nubar by about 0.3% to conform with the ENDF/B-VII standards recommendation.

- $^{235}\text{U} + \text{n}$

Modified low-energy ($E_n < 10$ keV) delayed and prompt nubar according to a suggestion by Cecil Lubitz. These (small) changes result in much greater consistency with the JENDL-3.3 evaluation.

- $^{235}\text{U}, ^{239}\text{Pu} + \text{n}$

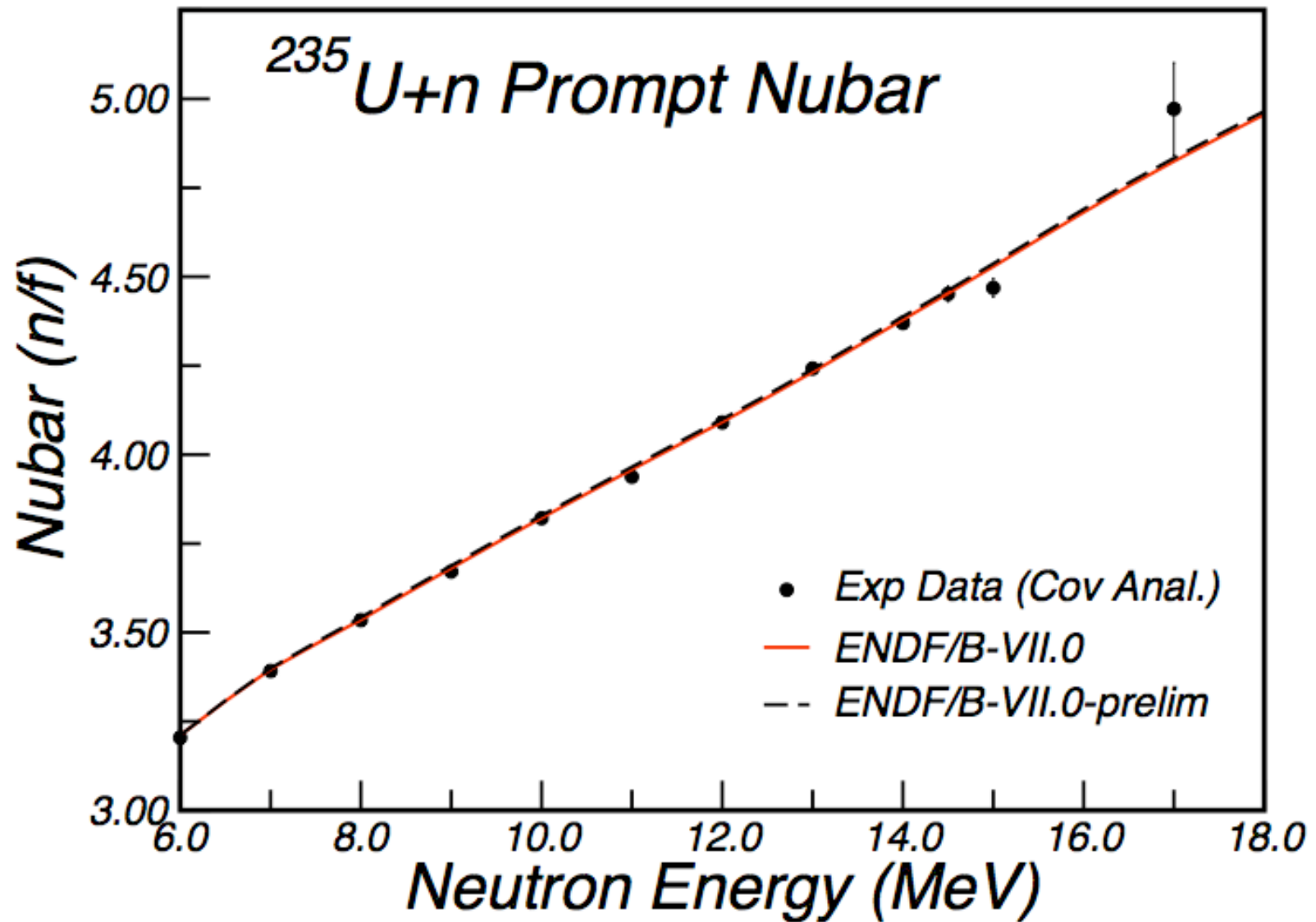
Incorporated the comprehensive LLNL delayed gamma-ray data from D. Brown and J. Pruet et al.

- $^{239}\text{U} + \text{n}$

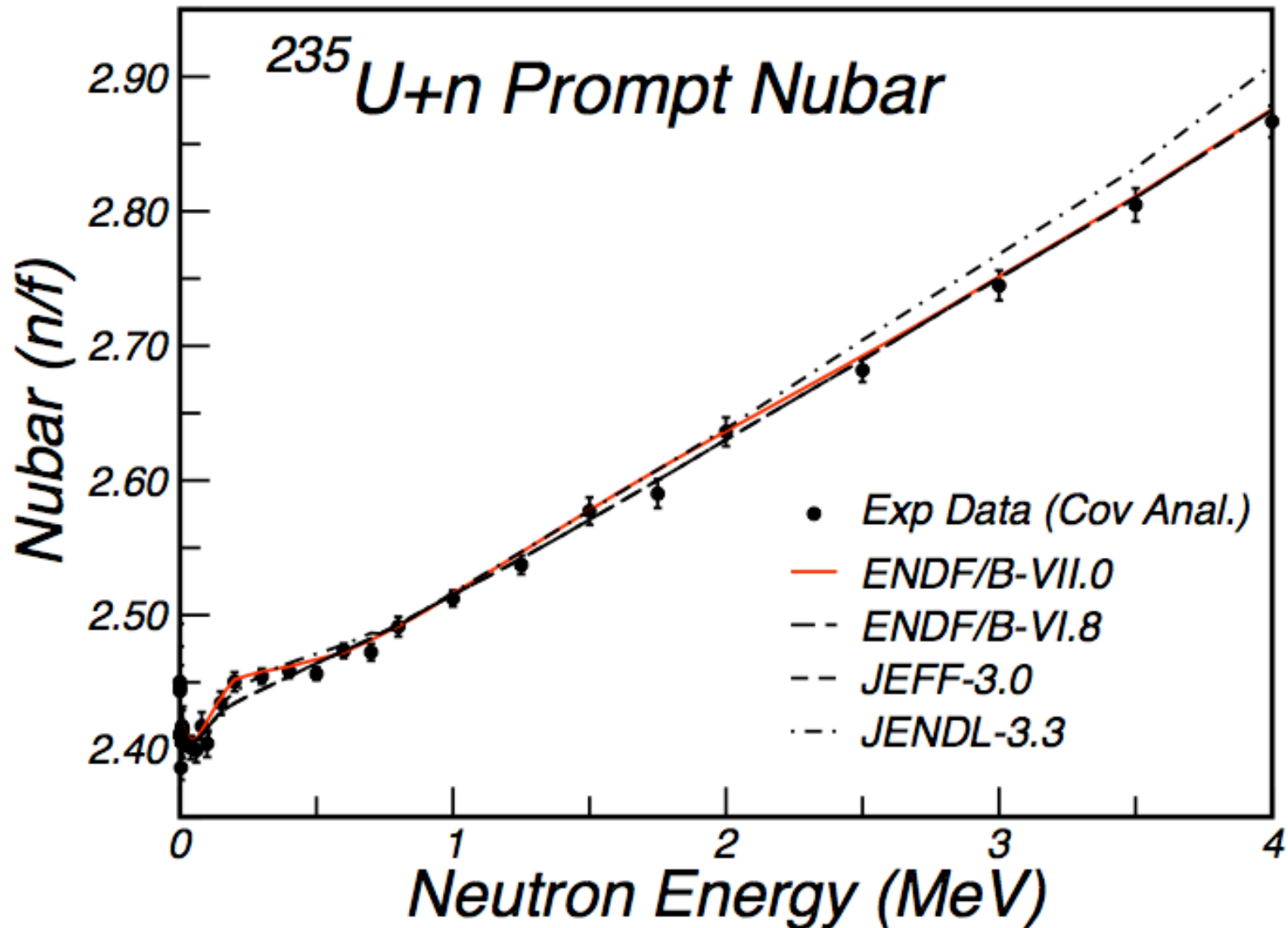
Reduced the capture cross section and increased the fission cross section in the resonance region to agree with Mughabghab's values. This was accomplished by simply adjusting background cross sections.

- $^{233,235,238}\text{U}, ^{239}\text{Pu} + \text{n}$

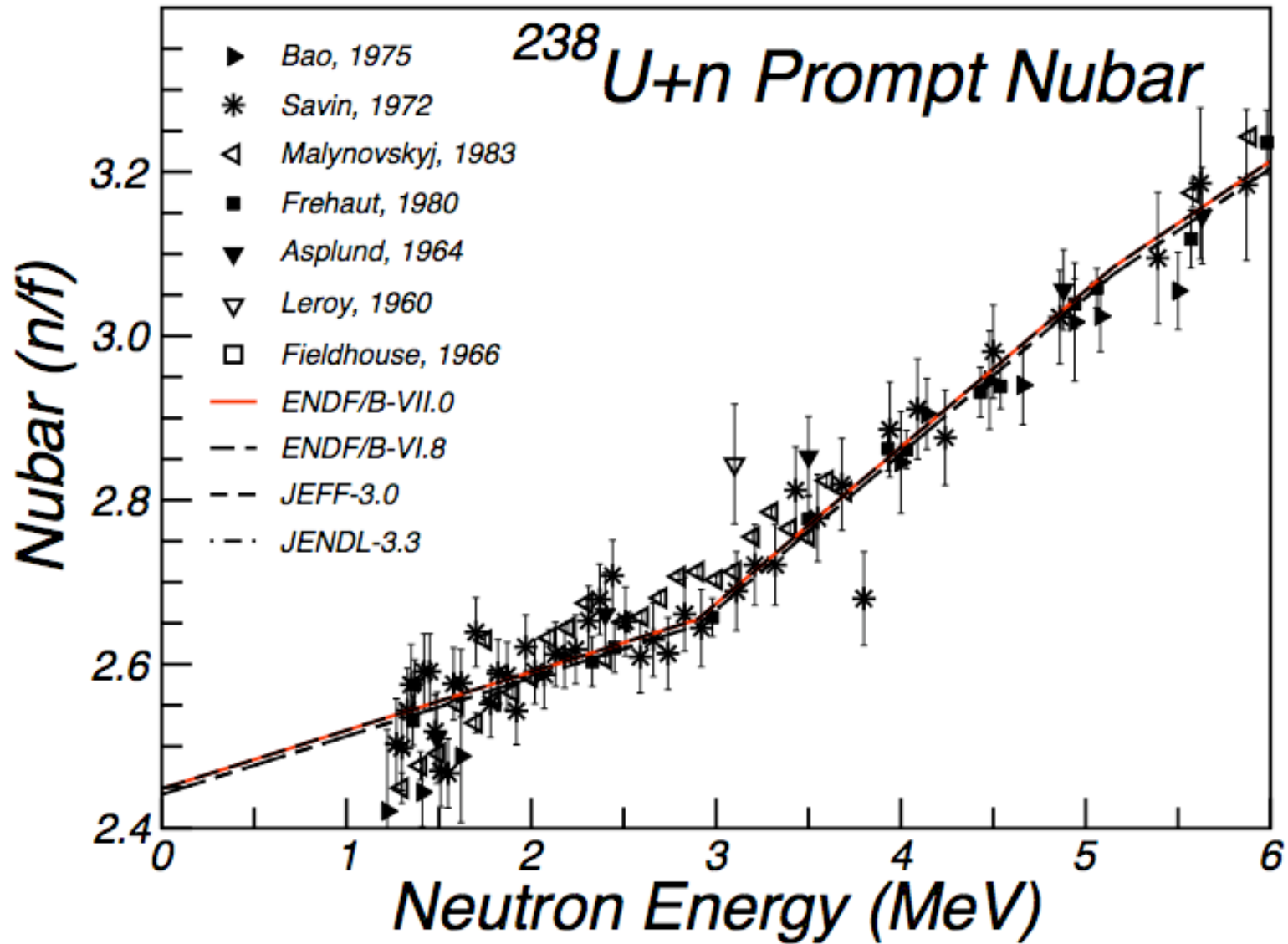
Updated and cleaned up the MF=1, MT=451 descriptive material. Modified nubar by -0.2% above 6 MeV to correct a normalization error in our nubar data base, caused by normalizing data to total rather than the prompt ^{252}Cf nubar standard. At lower energies the evaluations are based on generally matching the experimental data within uncertainties but with minor adjustments based on fast critical data. Thus the nubar data were left unchanged in the fission spectrum region ($E_n < 6$ MeV).



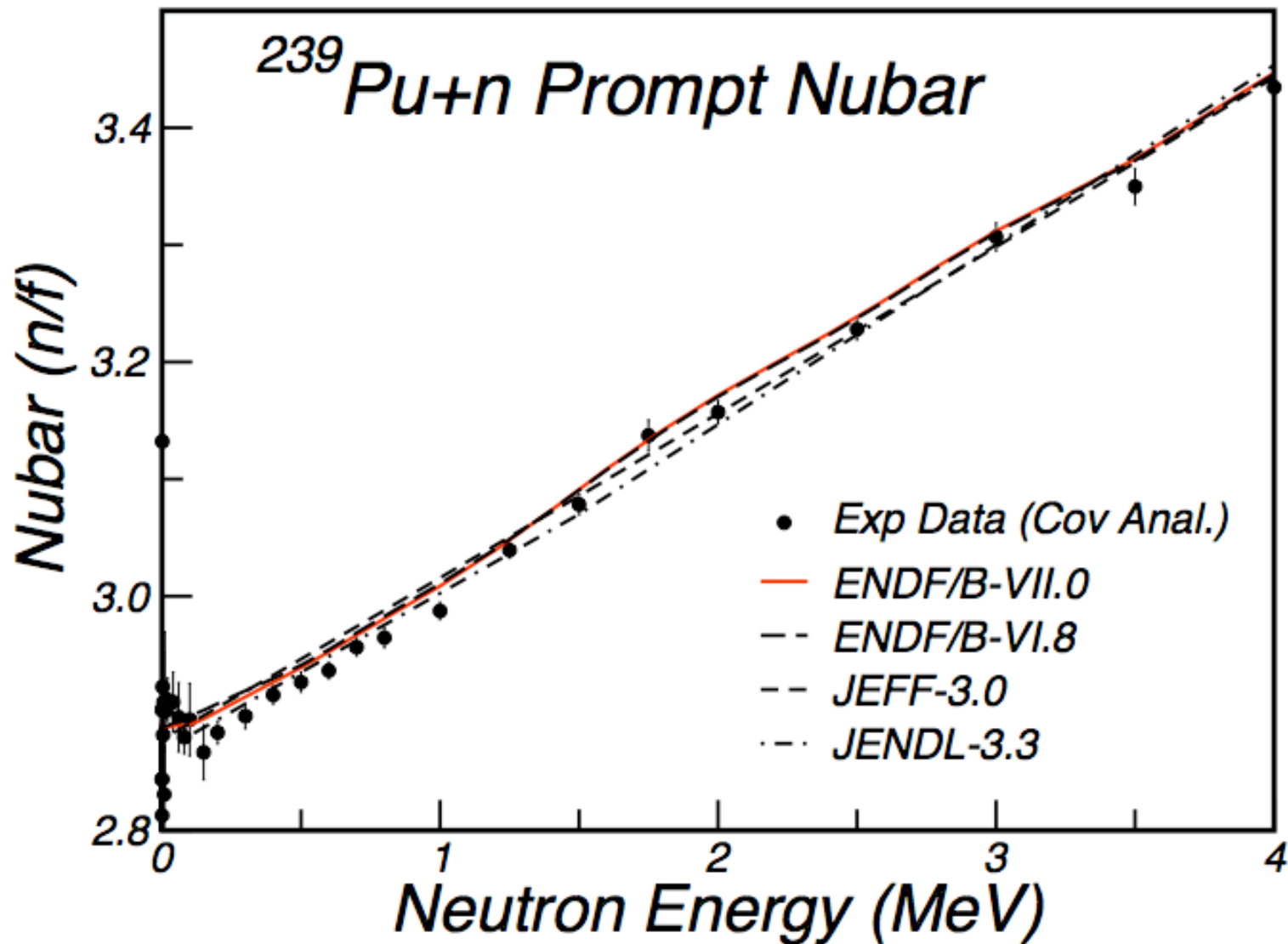
The solid red curve is final ENDF/B-VII after -0.2% correction for standards.



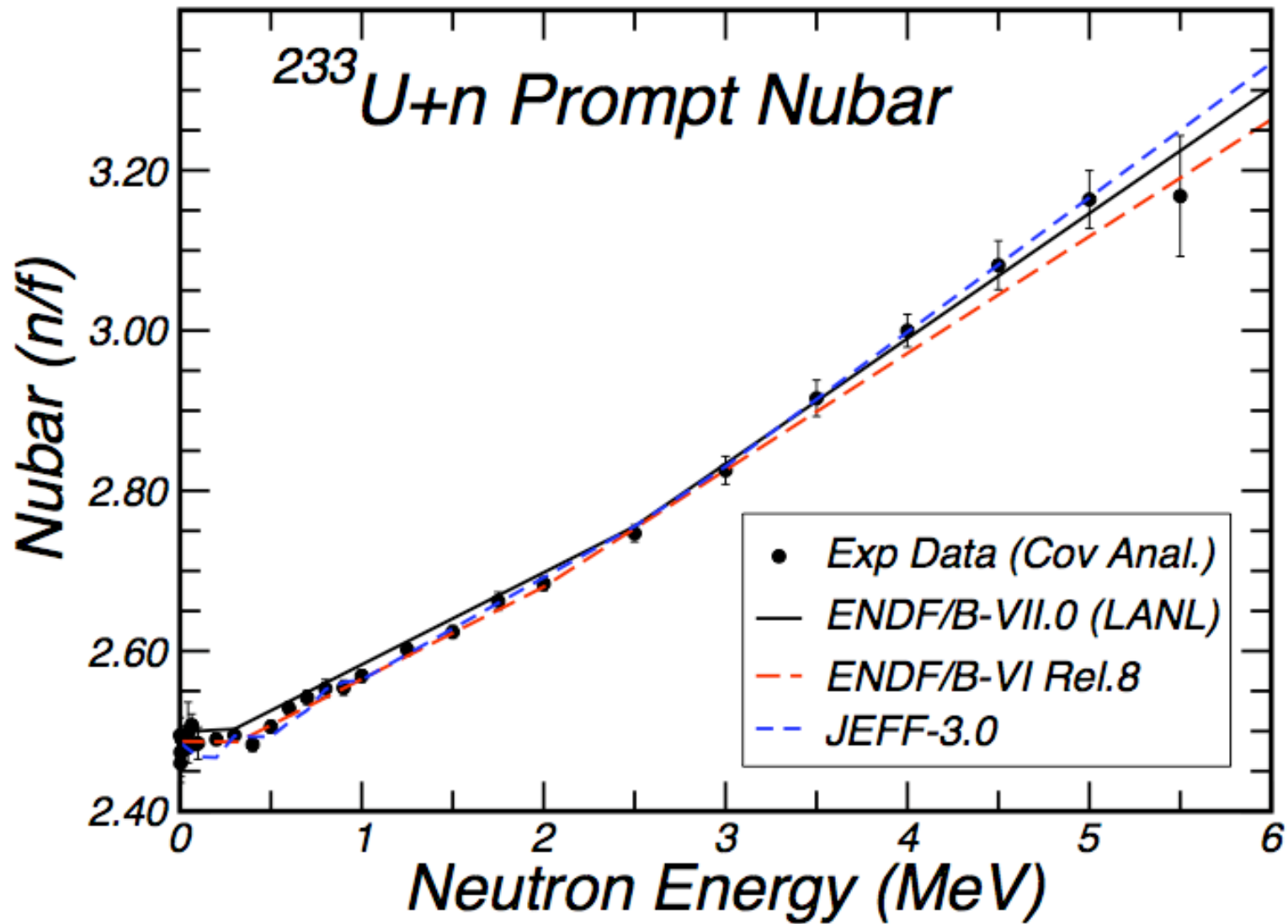
Low-energy ENDF/B-VII compared to covariance analysis of exp. data. The V7 evaluation (red solid curve) is essentially within experimental errors.



Low-energy ENDF/B-VII compared to experimental data. The V7 evaluation (red solid curve) is the same as the V6 evaluation (dashed black curve).



Low-energy ENDF/B-VII compared to covariance analysis of exp. data. V7 evaluation at low energies is near top of error bars from cov. analysis.



Low-energy ENDF/B-VII compared to covariance analysis of exp. data. V7 evaluation at low energies is slightly above error bars from cov. analysis.