Beijing, September 14, 2010

Memorandum - 2010

on going on the cooperation in the field of nuclear data exchange, evaluation and validation, issue of nuclide charts and tables between China Nuclear Data Centre (China Institute of Atomic Energy, Beijing, China) and Standard Reference Data Centre (Joint Stock Company "Energy & Industry Analytica" -"Rosatom" Group of Enterprises, Moscow, Russia) and Centre for Radionuclide Data (Khlopin Radium Institute, St .Petersburg, Russia) in correspondence with decisions of intergovernmental Chinese-Russian Commission for preparation of annual Prime-Ministers meetings (Beijing,China,August 30,2010 and Moscow,Russia, July 25, 2009)

Scientific cooperation between Standard Reference Data Centre (Joint Stock Company "Energy & Industry Analytica" -"Rosatom" Group of Enterprises, Moscow, Russia) and Centre for Radionuclide Data, St. Petersburg, Russia), from one side, and China Nuclear Data Centre (China Institute of Atomic Energy, Beijing, China) is being realized in correspondence with decisions of intergovernmental Chinese-Russian Commission for preparation of annual Prime-Ministers meetings (Sub-commission in Nuclear Field). A program of joint studies is outlined in Memorandum 2009 signed by the Russian and Chinese parties on the 28-th of October 2009, Beijing.

In accordance with the Memorandum 2009 Working Meeting of Chinese-Russian Group on Nuclear Data was held in Beijing, China from the 13-th of September till the 23-th of September, 2009. The agenda of the Meeting included following topics:

1. Publication of the new issues of "Nuclide Guide" and **table-type** Chart of Nuclides.
2. Discussion of Introduction to "Nuclide Guide" and methods used for evaluation of 9 characteristics of nuclides.
3. Needs in nuclear data. Discussion of the algorithms for getting uncertainties for microscopic nuclear data (cross-sections, angle and energy distributions of secondary particles) on the basis of prescribed uncertainties for macroscopic nuclear data (heating, criticality, etc).
4. Status of experimental studies for support of nuclear data in Russia and China. Perspectives for performing nuclear data measurements in China.
5. Nuclear data and atomic industry.
6. Evaluation methods including those of the evaluation for discrepant experimental data.
7. Evaluation of half-lives on the basis of discrepant experimental data
8. Construction of the covariances between the experimental data.
9. Evaluation of the dosimetry reaction cross-sections.
10. Validation of evaluated covariance data.
11. Recommended fission yields for basic fuel isotopes U-235 and Pu-239 for different incident neutron energies.
12. Analysis of the effective resonance integral taking into account a temperature Doppler effect.

The following statements have been agreed by Chinese and Russian parties as a result of a discussion.

1. All the evaluated data for 9 characteristics of nuclides included in new (revised and supplemented) issue of "Nuclide Guide" are mainly prepared for publication. In particular, average energies of emitted gamma-particles for over 500 nuclides were recalculated. Besides, new values of the thermal activation cross-sections were compiled (on the basis of the S.F.Mughabghab, "Atlas of Neutron Resonances" NNDC, BNL,2006). At the same time minor corrections are necessary to take into account the data published in late 2009 and early 2010.
2. The parties confirm that programming the algorithms for getting uncertainties for microscopic nuclear data on the basis of prescribed uncertainties for macroscopic nuclear data is underway.
3. The parties are developing a structure of the table-type Chart of Nuclides.
4. The Chinese and Russian parties discussed the status of experimental studies for support of nuclear data in both the countries. There is small progress in performing new measurements of decay data and microscopic cross-sections for few nuclides.
5. The method of the half-life evaluation on the basis of discrepant experimental data was developed.
6. The evaluation of the decay data for few important minor actinides was carried out.
7. There is an essential progress in a development of the criteria for the validation of evaluated covariance data. Particularly, a set of the criteria for the validation of evaluated covariance data was proposed and realized in routine evaluation work.
8. Both parties recognize the importance of development of the systematics for neutron cross-sections used for justification of producing thermonuclear energy.
9. Chinese and Russian scientists (T.V. Golashvili, S.A. Badikov, V.P. Chechev, Huang Xiaolong, Ge Zhigang, Wu Zhendong) prepared a joint paper "Consistency of Existing Decay Data Bases" and presented the paper at International Conference "Nuclear Data for Science and Technology" (South Korea, April 2010).

Chinese and Russian parties got an agreement that:

1. Both parties will be guided by statements of the Agreement for 2007 – 2009 (from the 17-th of October 2007, Beijing) and this Memorandum in forthcoming joint scientific work.

2. New issue of "Nuclide Guide" will be published in 2011 in China with financial support of the China CODATA Committee.

3. The publication of the wall-type "Chart of Nuclides" is shifted to 2011 due to short funding.

4. The list of needs in nuclear data and their uncertainties for most important fissile isotopes and minor actinides is being developed by Chinese and Russian scientists. The list must be corrected to meet the technological requirements for Generation 4 reactors.

5. A scientific work on evaluation of decay data for minor actinides will be continued.

6. Chinese and Russian parties will make re-evaluation of the fission yields for basic fuel isotopes U-235 and Pu-239 for different incident neutron energies.

7. Chinese party will consider an opportunity of performing new measurements of decay data and microscopic cross-sections for some nuclides. Russian party will prepare a draft list of such nuclides.

8. Chinese and Russian parties intend to develop new neutron cross-section systematics for threshold reactions at neutron energy 14 MeV (including uncertainties of evaluated values) and systematics for excitation functions in the energy range from threshold to 30 MeV.

9. A set of the criteria for the validation of evaluated covariance data can be used for testing Chinese Evaluated Data Libraries (CENDL).

10. Chinese and Russian scientists (T.V. Golashvili, S.A. Badikov, V.P. Chechev, Huang Xiaolong, Ge Zhigang, Wu Zhendong) will prepare a joint paper "Evaluation of the $^{48}Ti(n,p)^{48}Sc$, $^{63}Cu(n,2n)^{62}Cu$, $^{169}Tm(n,2n)^{168}Tm$ Reaction Cross Sections Including Covariance Information" for presentation at the 14-th International Simposium on Reactor Dosimetry (Bretton Woods, NH, USA, May 2011).

11. It is necessary to exchange missions regularly. China and Russian parties agree that China team will visit Moscow and Russian team will visit Beijing in 2011 (in case of financial support). A collaboration between Data Certification Comission ("Rosatom" Corporation) and Chinese Task Group on Nuclear Data Evaluation would be desirable.

12. Forthcoming joint work of Russian and Chinese scientists in 2011 must be included in overall program of scientific and technical collaboration between Russian Federation and People's Republic of China for 2011 and in the program of the Russian-Chinese collaboration in the nuclear field for 2011 (intergovernmental Chinese-Russian Commission for preparation of annual Prime-Ministers meetings).

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