International Atomic Energy Agency

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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

# Table of Content Translations

of

# Soviet Reports received by the

# INDC Secretariat

Translated by the IAEA
April 1976

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## Foreword

The INDC Secretariat receives a number of Soviet reports in Russian as part of the INDC document distribution system. Because of their large number and size most of them cannot be translated by the IAEA. The "Nuclear Physics Research in the USSR - Collected Abstracts" report series and occasional reports of interest to the nuclear data community are translated by the IAEA on a regular basis, and are normally given a "U" distribution.

The "Table of Content Translations" contain the translation of the table of contents, and abstracts when available, of those Soviet reports which the IAEA does not translate. The originals of these reports are normally available in limited quantities only and are given an INDC"G" distribution.

This issue contains the table of content translation of the following reports:

- Nuclear Constants, Volume 20, Part I (1975)
  Original distributed as INDC(CCP)-86/G

- Nuclear Constants, Volume 20, Part II (1975)
  Original distributed as INDC(CCP)-87/G.

NUCLEAR CONSTANTS, Volume 20, Part 1

INDC(CCP)-86/G

## Unique Definition of Nuclear Data Accuracy*, L. N. Usachev

An approach to development of the unique definition of evaluated nuclear data accuracy suitable for reactor and other applications is proposed. In this connection the nature of experimental nuclear data errors is discussed and recommendations for the representation of the error components in publications are given.

A general algorithm is given for the calculation of the "unique" error important in applications - the error in the integral under the curve and in its general slope - on the basis of the representation of errors by a covariance matrix being obtained at the parametrization of experimental data by the least square method.

## Resonance Analysis of the Nuclear Reactions Cross Sections by Pade-Approximation, V.N. Vinogradov, E.V. Gai, N.S. Rabotnov

A method for the analysis of the nuclear reactions cross sections energy dependence by rational approximations (Pade-approximations) is outlined. Resonance energies and total widths may be evaluated without any a priori assumptions on the S-matrix structure.
The uniqueness of this method is illustrated by a model problem and a resonance analysis of neutron cross sections.

## Average Neutron Cross-Sections in Statistical Theory of Nuclear Reactions, V.M. Bychkov, V.S. Shorin

The calculation of average neutron induced elastic and inelastic scattering and radiative capture cross-sections are performed using the Hauser-Feschbach, Moldauer and Tepel-Weidenmüller statistical models. The differences between the models predictions are shown for the cases of weak, intermediate and strong absorption.

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* Released in December 1974 as INDC(CCP)-45/L.

Neutron Cross-Section of Deuterium in the Energy Range from 0,0001 eV to 15 MeV*, N.O. Bazazyants, A.S. Zabrodskaya, A.F. Larina, M.N. Nikolaev

An evaluation of deuterium neutron cross-section, neutron spectra from the D(n,2n)P reaction is given as well as neutron angular distributions of this reaction and of neutrons elastically scattered on deuterium.

The evaluation results are presented in the format of the SOCRATOR library. The 26-group constants set for deuterium is also given.

On the Exact Energy Dependence of the Total Cross Section of Iron for Intermediate and Fast Neutrons, V.V. Vozyakov, V.V. Filippov

The group self-shielding factors for the total neutron cross section determined from transmission measurements are compared with calculations using the evaluated data files KEDAK, UKNDL and USSR.

The Evaluation of the Neutron Cross Sections for Iron, V.M. Bychkov, V.V. Vozyakov, V.N. Manokhin, V.P. Platonov, V.I. Popov and V.G. Pronyaev

The description of the full file of the neutron cross section for natural iron is given. The evaluated data are presented in the SOKRATOR format and is included in the evaluated data library of the Soviet Nuclear Data Centre (CJD, Obninsk).

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* This work can be obtained from the CJD (USSR Nuclear Data Centre in Obninsk) on request. (66 pages, 9 Tables and 15 Figures) These data and the report have been requested by IAEA/NDS.

Neutron Cross Section Evaluation of $^{93}$Nb in the Energy Range from 30 keV to 20 MeV, D. Hermsdorf, G. Kiesig, D. Seeliger

The reaction cross sections for $^{93}$Nb + n at neutron incident energies from 30 keV up to 20 MeV have been evaluated using a critical analysis of experimental data as well as calculations of nuclear reaction models. Statistical models including particle emission from pre-equilibrium states have proven to be valuable tools for evaluation purposes. In the present work recommended data are given and compared with results of older evaluations.

Decay of $^{144}$Ce, $^{144}$Pr, $^{144}$Pm*, Yu.I. Grigoryan, F.E. Chukreev

The evaluation of the published data on decay characteristics of radioactive nuclei $^{144}$Ce, $^{144}$Pr, $^{144}$Pm has been performed, including energies and intensities of $\beta^-$ and $\gamma$ - radiation and conversion electrons, and conversion coefficients. Improved decay schemes are given.

The Neutron Cross-Sections of Erbium and its Stable Isotopes**, S.M. Zakharova, L.P. Abagyan, N.O. Bazazyants, A.G. Dovbenko, Zh.A. Korchagina, L.V. Petrova, E.F. Sinitsa, S.I. Tikhonova

The evaluation of the energy dependence of the total, capture, elastic and inelastic scattering neutron cross-sections, and of the anisotropy of elastically scattered neutrons has been performed for natural erbium and its stable isotopes with mass numbers 162, 164, 166, 167, 168 and 170 from thermal energies to about 15 MeV.

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* See also "Critical Evaluation of Radioactive Decay Constants for $^{99}$Mo, $^{144}$Ce, $^{144}$Pr and $^{144}$Pm", by same authors, released in January 1976 as INDC(CCP)-74/N.

** This work can be obtained from the CJD (USSR Nuclear Data Centre in Obninsk) on request. (150 pages, 30 Tables, 14 Figures). These data and the report have been requested by IAEA/NDS.

Evaluation of $\bar{\upsilon}$ ($E_n$) for U-233, U-235, U-238 and Pu-239,
L.I. Prokhorova, V.P. Platonov, G.N. Smirenkin

The evaluation of the dependence of number of prompt neutrons on the energy of incident neutrons for U-233, U-235, U-238 and Pu-239 has been made. The recommended values of $\upsilon$ ($E_n$) for these isotopes from 0 up to 5 MeV are presented. The analysis of uncertainties of the recommended values of $\upsilon$ ($E_n$) has been performed.

The Evaluation of the Averaged Parameters for U-235 in the Energy Region of Unresolved Resonances*, G.V. Antsi pov, V.A. Konshin, E. Sh. Sukhovitzkij

The averaged parameters for U-235 in the energy region 0.1-100 keV have been obtained by means of analysis of the parameters in the energy region of unresolved resonances, and also by means of adjustment to the evaluated total and fission cross sections. The averaged parameters obtained allows one to calculate all cross sections. The comparison of the calculated and experimental data of the capture to fission ratio $\alpha = \frac{\sigma_r}{\sigma_f}$ are given for checking the quality of the averaged parameters.

The Evaluation of the Neutron Inelastic Cross Section of U-235*, G.V. Antsipov, V.A. Ksmyshin, V.P. Korennoi, E.Sh. Sukhovitzkij

The evaluation of the neutron inelastic cross section has been performed using the latest calculations and experimental and indirect data in the energy range from threshold up to 15 MeV. The results of this evaluation are compared with data of other libraries and with experimental data.

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* See also "Compendium of Selected Translations of Soviet Reports on the Evaluation of the Neutron Nuclear Data for $^{235}U$", by Konshin et al., released in January 1976 as INDC(CCP)-78/U.

NUCLEAR CONSTANTS, Volume 20, Part 2

INDC(CCP)-87/G

The Evaluation of Nuclear Data of U-235 in the Neutron Energy Range $10^{-4}$ eV with the Purpose of Developing a Full File *, G.V. Antsipov, A.R. Benderskij, V.A. Konshin, V.P. Korennoi, G.B. Morogovskij, E.Sh. Sukhovitskij

The results of neutron data evaluation for $U^{235}$ in the energy region $10^{-4}$ eV to 15 MeV are given. In the resonance energy region (0.3 to 140 eV) the single-level as well as multi-level parameters are obtained allowing a simultaneous interpretation of the experimental data for $\sigma_t$, $\sigma_f$ and $\sigma_c$. The average statistical parameters for neutron cross section calculation in the unresolved energy region are evaluated. Analysis of elastic angular distribution is done by using both the Bessel functions and Legendre polynomials. Spectra of gamma-rays from capture, fission and inelastic scattering are calculated.

Analysis of the Neutron Induced Radiation Capture Cross Section for $^{238}U$ between 1 and 100 keV, V.A. Tolstikov, V.S. Shorin

The evaluation of the $^{238}U$ capture cross section for 1-100 keV neutrons by experimental data analysis using the statistical theory has been performed.

Information on average resonance parameters for S and P-neutrons, radiation and neutron strength functions, was obtained.

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* See also "Compendium of Selected Translation of Soviet Reports on the Evaluation of the Neutron Nuclear Data for $^{235}U$", by Konshin et al., released in January 1976 as INDC(CCP)-78/U

The Evaluation of the Influence of the Uncertainties in the Data on Oscillation Spectra of Atoms of Moderators on the Calculation of Different Characteristics, V.I. Ionkin, Yu.V. Lissitshkin, V.A. Parfenov

The paper presents a consideration of the current situation with the data on oscillation spectra of atoms of such moderators as beryllium and zirconium hydrids as well as an evaluation of the influence of existing discrepancies of the above data on calculations of different characteristics, from double-differential scattering cross-sections to the effective breeding ratio and the temperature coefficient of reactivity.

Current Tendencies in the Evaluation of Criticality and Breeding Ratio for a Large Reactor, A.I. Voropaev, A.A. Van'kov, B.V. Koloskov, M.F. Troianov

The experimental data concerned with the criticality and reaction rate ratios for the ZPR-6 (6A and 7) assemblies are analized. As a result of a comparison between experiment and calculations, the evaluations of the criticality and the breeding ratio for a large reactor are made.

The Precisional Calculation of the Small Sample Reaction Rate by Monte-Carlo Method, V.B. Polevoi

Method is developed for the calculation of activation of small samples irradiated by an anisotropic neutron flux. Thermal motion of atoms, scattering anisotropy, detailed energy dependence of cross sections, self-shielding and flux depression effects are taken into account.

Calculational results for activation of the gold foil detectors used for determination of neutron flux in the State Thermal Neutron Flux Standard of the USSR as well as for the activation of three gold foil sandwiches are given as an example.

## On the Method of Determining the Fission-Fragment Activity of Pulsed Reactor Cladding, A.I. Nazarov, V.V. Frunze, V.P. Shushkanova

The paper presents the total fission product activity as a function of time for the thermal neutron induced fission of U-235 in analytical form. This form allows to determine the activity of fission products during pulsed reactor operation.

Due to the insignificant difference between the resulting activity for uranium fission by thermal neutrons and fission spectrum neutrons this method can be successfully applied for estimating the total activity of the circuit using U-235 fission under pulsed operation conditions for power purposes in particular using the Winterberg scheme.

## Numerical Algorithm and Computer Programme for the Calculation of Differential Energy Spectra and Average Cross Sections of Gamma-Rays, V.A. Sholokhova

Numerical solution of the integro-differential equation of gamma-ray transport is described. A point isotropic monoenergetic source in an infinite homogeneous medium is considered. The transport equation was solved by means of the moments method, which consist, in essence, of a double expansion in angle and space variables. The Computer Programme for the calculation of the moments, fluxes, buildup factors of the scattered gamma-rays, and multi-group cross sections was written. Numerical results for the penetration of 10-MeV gamma-rays in water have been obtained. Distances up to 20 mean free paths were considered.