

2013/14 Status Report of China Nuclear Data Center

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1. *General Information of CNDC*

CNDC View

China Nuclear Data Center (CNDC) was established in 1975 and joined the nuclear data activities of IAEA as the national nuclear data center of China since 1984.

The main task of CNDC:

- **The nuclear data evaluations, libraries and relevant technique researches.**
- **The exchange of nuclear data activities with IAEA, foreign nuclear data centers and agencies.**
- **The management of domestic nuclear data activities.**
- **The services for domestic and foreign nuclear data users.**

1-1 Manpower Information of CNDC

CNDC consists of the four units + an office:

<i>Evaluation Unit</i>	<i>Head: Dr. Huang Xiaolong</i>	<i>4 official staff</i>
<i>Theory Unit</i>	<i>Head: Dr. Ge Zhigang</i>	<i>6 official staff</i>
<i>Macroscopic Data Unit</i>	<i>Head: Dr. Liu Ping</i>	<i>4 official staff</i>
<i>Data Library Unit</i>	<i>Head: Dr. Shu Nengchuan</i>	<i>5 official staff</i>
<i>Secretary Office</i>		<i>2 official staff</i>

- ✓ **3 graduated students started their master degree study in CNDC for nuclear data process code development and related works.**
- ✓ **Ms. Liu Lile joined CNDC and started to do the nuclear data evaluations, who finished her master degree of particle and nuclear physics in CIAE last year.**
- ✓ **21 official staff + 5 technical support seniors (retired staff) + 6 graduated students.**
- ✓ **Planning to increase the official staff up to 25 if possible.**

1-2 Mainly tasks of CNDC in 2013/2014:

- **New evaluations for CENDL Project.**
- **Neutron data library evaluations and data processing for Th-U fuel cycling studies(Chinese TMSR Project).**
- **Nuclear data evaluation and benchmark/validation for China ADS project.**
- **Nuclear structure and decay data evaluation.**
- **Experimental data compilations for EXFOR.**
- **Nuclear data methodology studies.**
- **The benchmark/validation of nuclear data libraries (CENDL-3.1, ENDF/B-VII, JENDL-4. JEFF etc.).**

1-3 Activities information

- **IAEA/NDS Mirror-site in China started service on 2013/08/27, regular update and maintenance are performed by NDS and CNDC.**
- **Foreign scientists (Drs. F.Robin, R.Capote, and Kim Guinyun, et al) from IAEA/NDS, Russia and Korea visited CNDC last year.**
- **The 2013 standing committee meeting of China Committee of Nuclear Data was hold in Beijing on 28, Dec. 2013.**
- **A proposal for the establishment of the nuclear data system with white neutron sources on the CSNS has been provided.**

2. Nuclear Data Evaluation and Methodological Studies

2-1 CENDL Project

- The evaluation of ^{27}Al , ^{48}Ti , ^{232}Th have been performed for CENDL-3.2 according to the updated need from users, new nuclear data evaluation methodologies and experimental information.

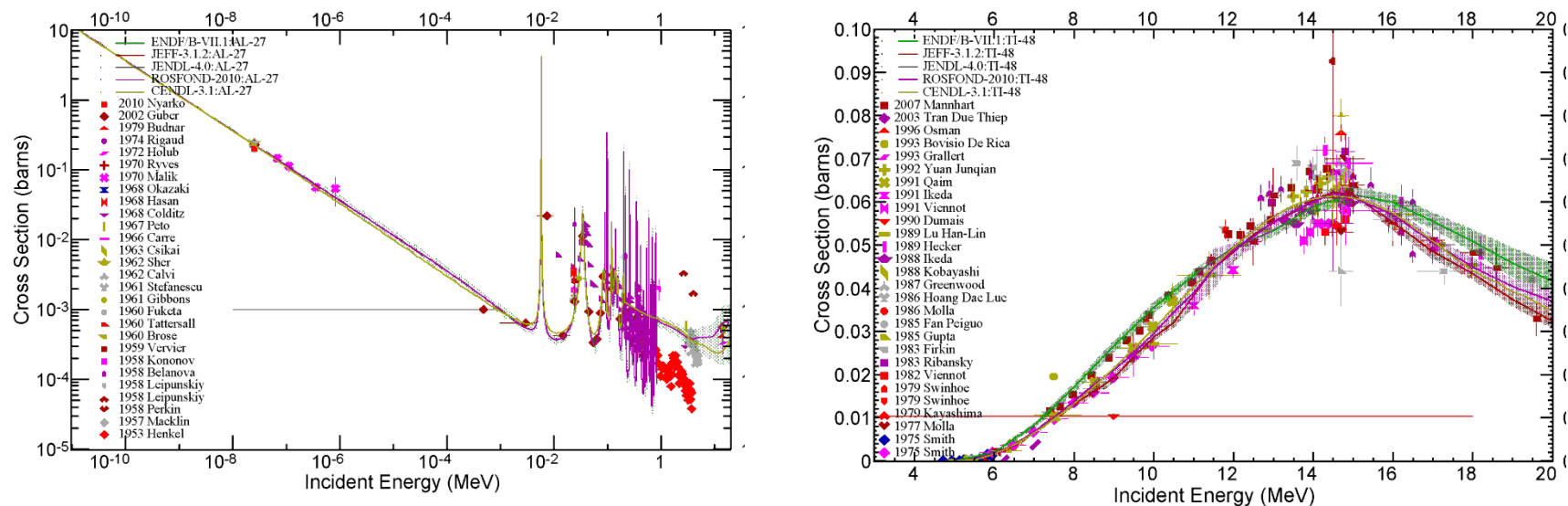


Fig.1 $^{27}\text{Al}(n, g)$ (left), $^{48}\text{Ti}(n, p)$ (right) new evaluation compared with evaluated files and exp.data.

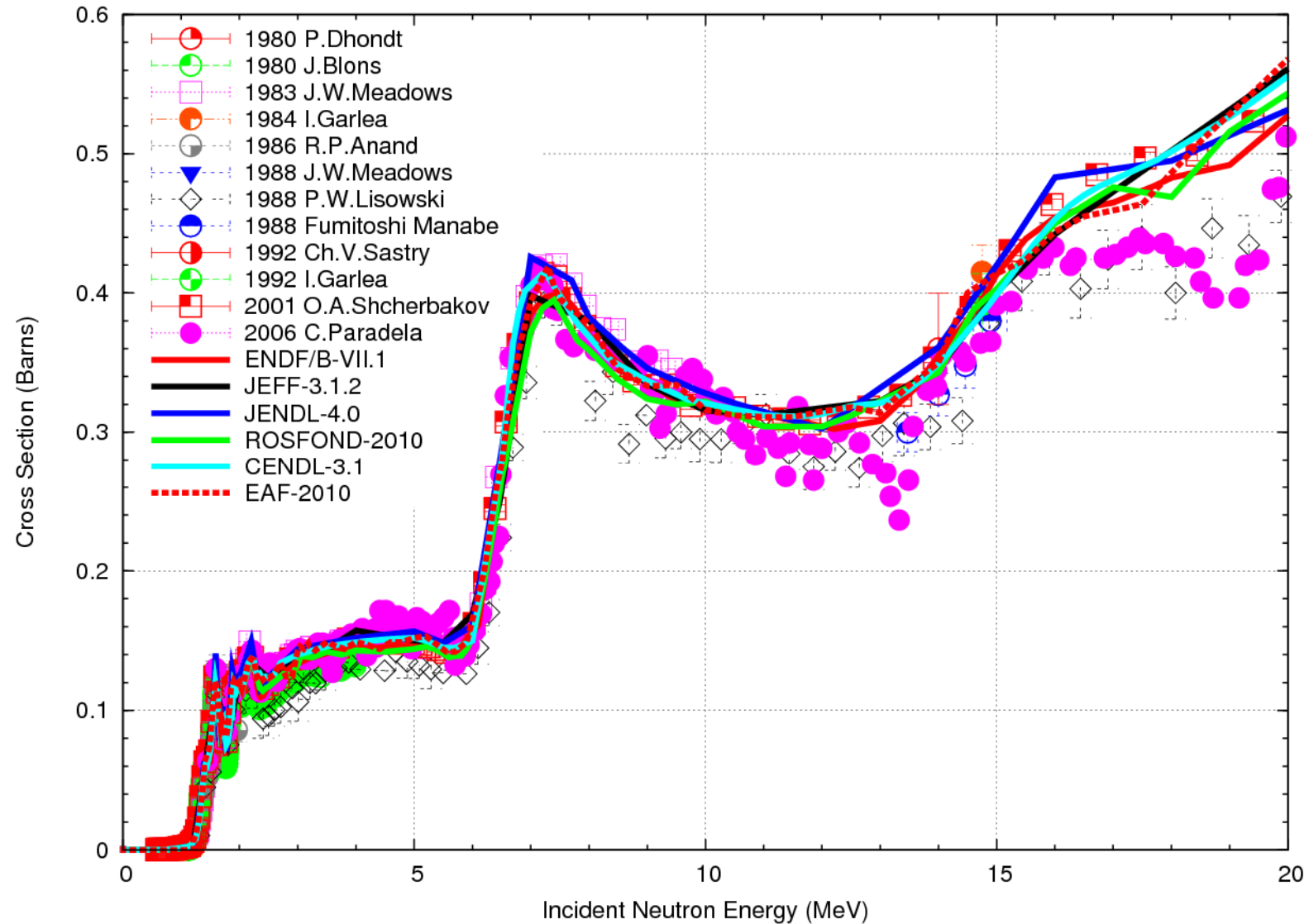
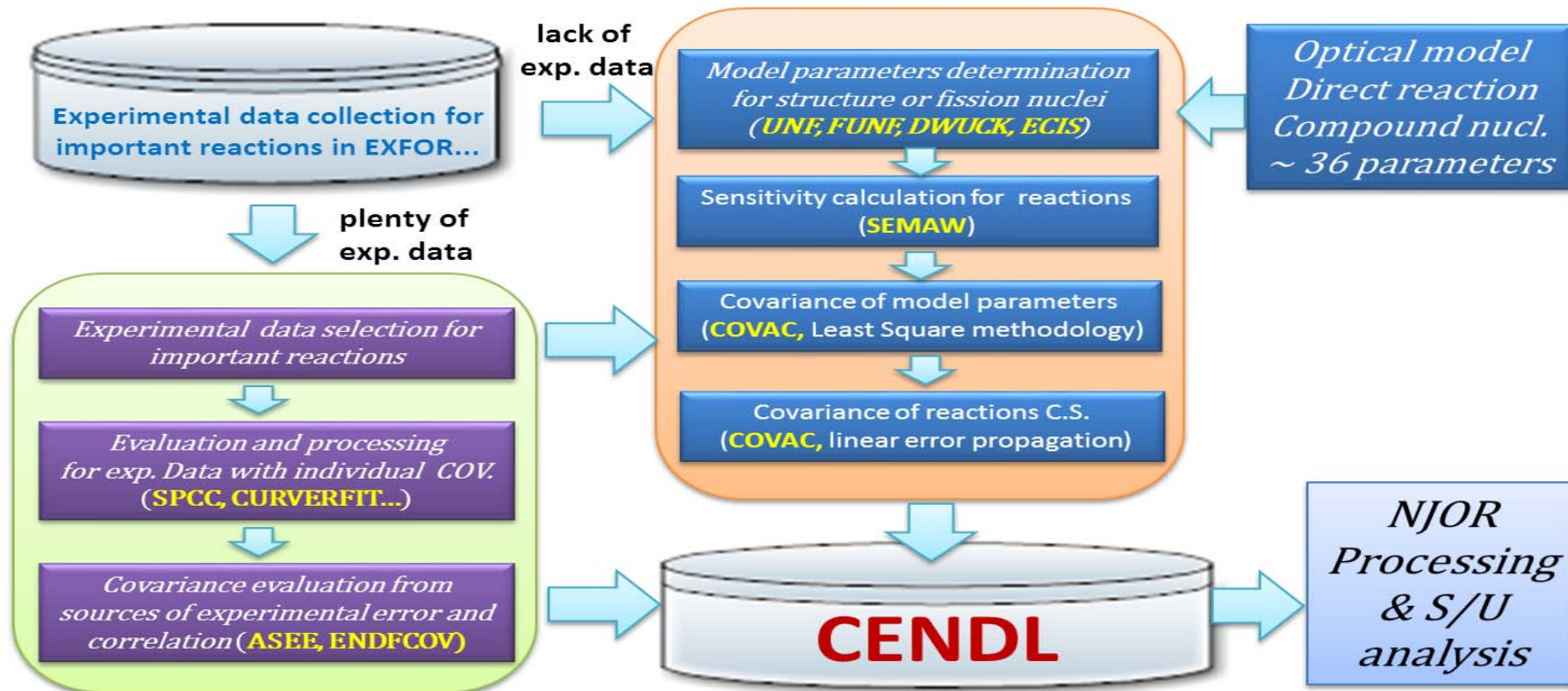


Fig.2 $^{232}\text{Th}(n, f)$ new evaluation compared with other evaluated files and exp. data.

- **A covariance evaluation system is being developing for the CENDL project, which can be used for the (n,tot), (n,e1), (n, γ) , (n,in1) , (n,p) , (n, α) , (n,2n) , (n,np) , (n,n α) , (n,3n), (n,f) et al. reaction channels in the fast neutron energy region. The least square(L-S) methodology and source of experiment facility analysis (SEFA) is used in the system.**

Scheme of covariance evaluation flow in CNDC



Energy: fast neutron energy region

reactions: (n, tot), (n, el), (n, γ), (n, inl), (n, p), (n, α), (n, 2n), (n, np), (n, n α), (n, 3n), (n, f)

Methodology: Least square (L-S), analysis of the sources of experimental errors (ASEE)

Codes: yellow ones in the scheme

● Semi-empirical Model Study on $n+^{233}\text{U}$, ^{235}U and ^{239}Pu Fission Yields

Based upon Brosa model, the model considered the SL, SI and SII fissions, and was parameterized with 11 parameters, which were deduced by fitting to exp. data. The model could calculate mass distributions over the incident energy of 0-20 MeV, and agree exp. data well.

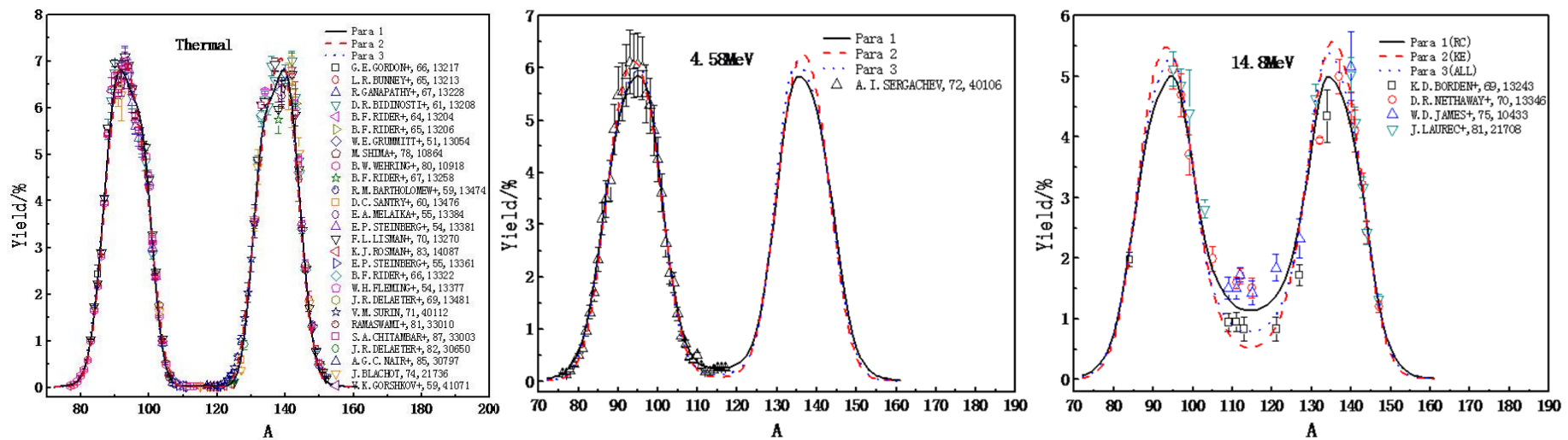


Fig.4 $n+^{233}\text{U}$, mass distributions for thermal, 4.58 MeV, and 14.8 MeV

Covariance extracted from experimental data

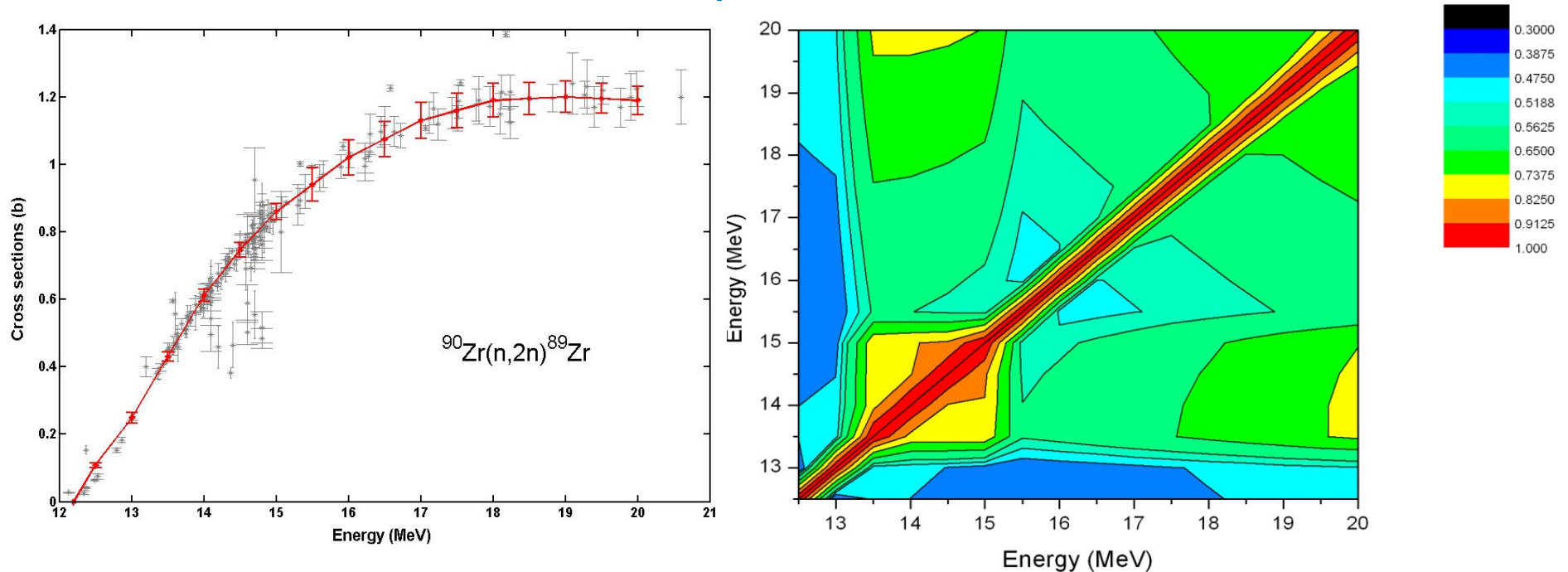


Fig. 5 $^{90}\text{Zr}(n,2n)^{89}\text{Zr}$ evaluation with error (left) and the coefficient of correlation (right) by ASEE

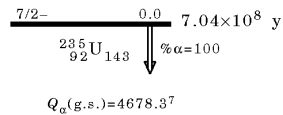
Covariance by ASEE is designed to exhibit the current level of measurement towards a certain reaction C.S. through analyze every error sources non-negligible. It is suggested to avoid the limitation of L-S in processing the case with lots of experimental data.

● Nuclear Structure and Decay Data Evaluation.

^{235}U decay data evaluation which contained half-life, γ decay data, α decay data and level scheme et al., has been performed.

Tab.1 The new evaluated energies for α decay of ^{235}U (partial)

1960 Ba44	1962 Pi06	1966 Ga03	1975 Va11	1991 Ry01	2004 Da24	Calculated based on the level E_n and $Q(\alpha)$ calculations	This work
						3897.2 7	3897.2 7
		3977 10			3976 5	3975.3 7	3976 5
						3990.5 9	3990.5 9
						4013.2 8	4013.2 8
						4053.9 7	4053.9 7
		4069 10			4077	4077.5 7	4077.5 7
	4153	4140 3	4145 6		4152 5	4154.2 7	4152 5
4214	4210	4210 3	4209 4	4214.7 19	4215.8 5	4217.4 7	4214.7 19 ^b
						4219.6 7	4219.6 7
			4219 6			4227.6 7	4227.6 7
		4240 10			4248 5	4252.6 7	4248 5
	4261				4266 5	4270 4	4266 5
		4267 10				4279.3 7	4279.3 7
			4280		4282	4286.9 7	4286.9 7
		4289 10	4295			4302.1 7	4302.1 7
4320	4318	4319 3	4322 4		4322.9	4325.4 7	4322 4
4326						4327.9 7	4327.9 7



Network of Nuclear Reaction Data Centres
6-9 May 2014, Smolenice, Slovakia

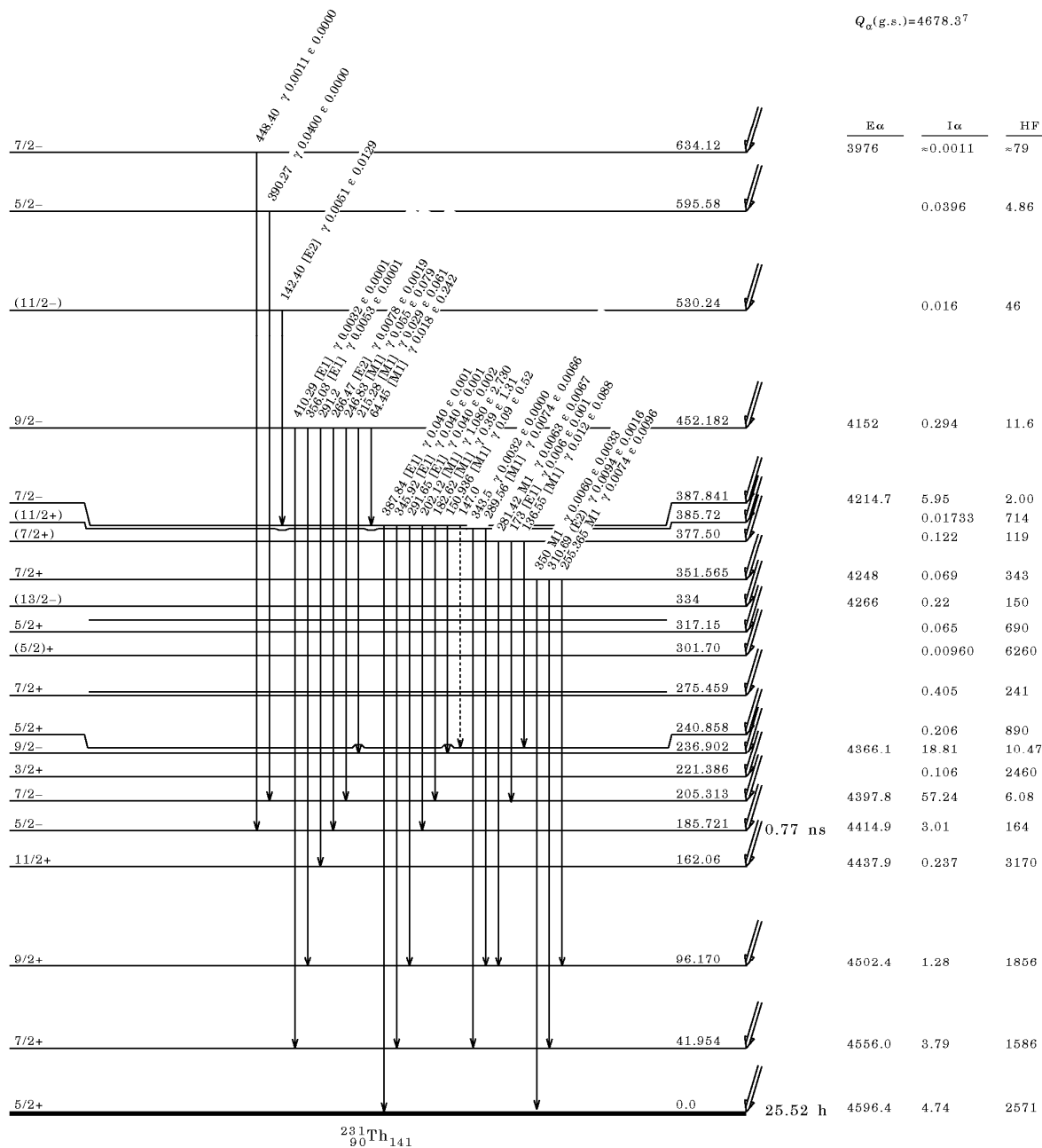


Fig.6 α Decay Level of ^{235}U



3. EXFOR Software and Database Compilation Progress

- **GDgraph Software**
The updated version of the **GDgraph-v5.0** and user's manual (English version) has been released and users can be download from https://www-nds.iaea.org/nrdc/nrdc_sft/.

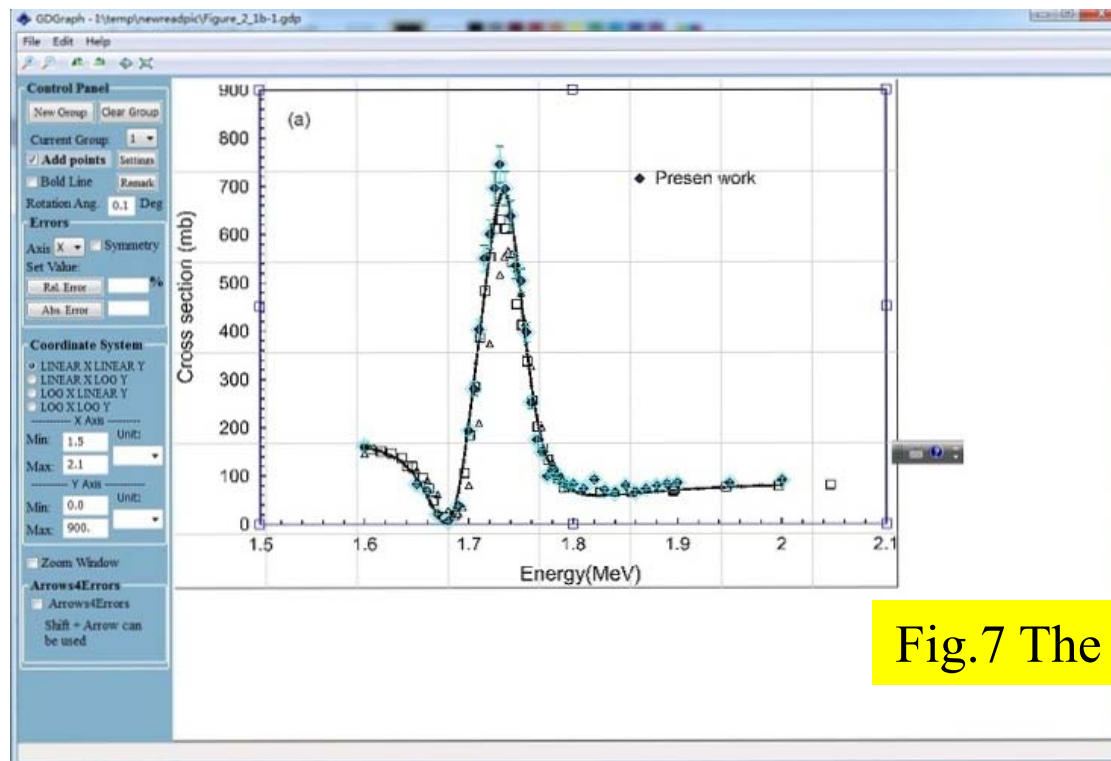


Fig.7 The GUI of GDgraph-5.0 (partial)

The screenshot shows the IAEA Nuclear Data Services website in a Windows Internet Explorer browser. The page title is "IAEA Nuclear Data Services" and the URL is "https://www-nds.iaea.org/publications/group_list.php?group=IAEA-NDS". The page features a search bar and a list of documents under the heading "IAEA NDS document series." The document "GDGraph 5.0 Manual - A tool for digitization of graph image" is highlighted in blue. The table below lists the documents:

IAEA-NDS-XXXX	Document Title	Author(s)	Date
IAEA-NDS-307 2002/7	Index of Nuclear Data Libraries (2002) available from the IAEA Nuclear Data Section Version of 2002 (Archive)	O. Schwere and H.D. Lemmel	Jul 2002
IAEA-NDS-248 OCTOBER 1996	SGNucDat - Safeguards Nuclear Data for Windows	Edited by H.D. Lemmel and O. Schwere	Oct 1996
IAEA-NDS-216	GDGraph 5.0 Manual - A tool for digitization of graph image	Jin Yongli and Chen Guochang	Aug 2013
IAEA-NDS-215 REV.2010/11	NRDC Protocol (Protocol for Cooperation between Nuclear Reaction Data Centres)	Edited by N. Otsuka and S. Dnaeva	Nov 2010
IAEA-NDS-214 AUGUST 2009	Displacement Cross Section Files for Structural Materials Irradiated with Neutrons and Protons	A.Yu. Konobeyev, U. Fischer, C.H.M. Broeders and L. Zanini	Aug 2009
IAEA-NDS-213 REV. FEBRUARY 2008	EXFOR/ CINDA Dictionary Manual	Otto Schwere	Feb 2008
IAEA-NDS-212 17 JANUARY 2005	The SIGACE Package for Generating High Temperature ACE Files - User Manual	Amit R.Sharma, S. Ganesan and A. Trkov	Jan 2005
IAEA-NDS-211 2 SEPTEMBER 2004	The JEFF-3.0/A Neutron Activation File - EAF-2003 into ENDF-6 format - Summary Documentation	J-Ch Sublet, A J Koning, R A Forrest and J Kopecky	Sep 2004
IAEA-NDS-210 27 NOVEMBER 2003	Technical Report on Formatting of Cross Sections for Production of Diagnostic Radionuclides in ENDF-6 Format Summary Documentation	Daniel Lopez Aldama	Nov 2003
IAEA-NDS-209 2003/01	Evaluated Database for Prompt Gamma Rays from Radiative Capture of Thermal Neutrons by Elements from Hydrogen to Zinc By R. S. Reedy and S. C	R. Paviotti-Corcuera	Jan 2003

Fig.8 The user's manual (English version) of GDgraph-5.0 is available

● **EXFOR Compilation.**

During the 2013-2014 EXFOR compile group at CNDC have finished 11 entries and 36 entries is being compiling. All these experimental information were scanned from following journals and proceedings:

- (1) Chinese Physics C(ENG/2007;HEN)
- (2) Atom. Energy Sci. & Tech.(CHN/1959)
- (3) J. of Nucl. & Radiochemistry(CHN/1979)
- (4) Nuclear Physics Review(CHN/1984)
- (5) Nuclear Techniques(CHN/1978;+ENG/1989)
- (6) Com. of Nucl. Data Prog.(ENG/1989)
- (7) Nuclear Science and Techniques(ENG/1989)
- (8) Chinese Physics Letters(ENG/1984)
- (9) Chinese Physics B (ENG)
- (10) Acta Physica Sinica(ENG/1933)
- (11) Proceedings of Conference, Workshop etc.

4. Nuclear data services

- **As a national nuclear data center in China, CNDC is providing the nuclear data services to all the nuclear data users in China, which contains the general purpose and special purpose libraries services, and related information/technology are provided according to the requirements from the users. A web site: <http://www.nuclear.csdb.cn> (chinese version) has been established for providing the general nuclear data and related information services to china users.**

核物理主题数据库
The Database of Nuclear Physics

站内检索 [搜索]

首页 查找数据库 数据检索 关于本库 数据服务 使用指南 服务案例

数据库目录

- 评价核数据库
- 原子核特性数据库
- 实验核数据库
- 核天体数据库
- 医用同位素数据库

核物理主题数据库简介

◆ 随着我国国民经济的持续发展,要求核能以较快速度增长,截至 2009 年,我国核电站总装机容量为9Gwe,预计到2020年将达到70Gwe,到2050年将达到400Gwe。与此同时,国外的核能发展也迎来一个新的发展阶段。为此,我国正在积极开展核科学的相关研究,同时也开始了相关领域的人才培养。在核能快速发展,核相关领域人才队伍急需的新形势下,核科学研究的深入和核数据共享显得及其重要。核物理主题数据库主要包括了核科学研究和核能开发所需的原子核的结构数据和原子核相互作用的核反应数据,同时还包含 ... [详细]

数据检索

查找数据库

任意字段 [v] 检索

数据库推荐

评价核数据库

国际上五个评价中子数据库ENDF/B-6格式,中子入射,10-5eV到20MeV,包括综合说明信息,共振参数,中子截面,角分布、能谱和双微分截面, gamma产生截面,角分布,能谱及部分核素核素的协方差数据 ... [详细]

服务公告

- ◆ 实验核数据库更新 (2012-12-27)
- ◆ 核物理主题数据库网站开通 (2011-07-17)

关于本库

- ◆ 数据库总体概况
- ◆ 参加数据库建设的单位简介
- ◆ 联系我们

联系方式

联系人: 葛智刚, 金永利
电话: 010-69357275
传真: 010-69358119
地址: 北京市房山区新镇

CHINA NUCLEAR DATA CENTER

Fig.9 The Web site of the database of nuclear physics(Chinese Version)

数据来源统计

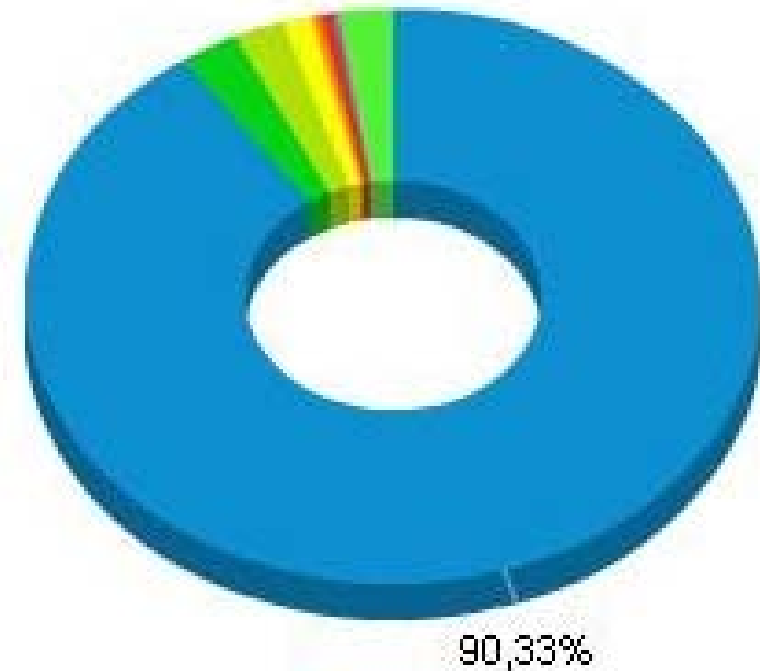


Fig.10-1 The statistics of the nuclear data service(1).

国家或地区	页面访问数	请求数	下载量 (MB)
中国	202370	348171	3186.70
日本	5825	6300	35.33
美国	4981	13952	408.84
德国	2773	3844	35.07
韩国	625	1617	23.54
丹麦	582	1254	35.66
英国	550	1430	39.78
法国	475	978	23.01
意大利	388	972	30.35
瑞典	361	829	26.83

Fig.10-2 The statistics of the nuclear data service(2).

- **Publications and technical reports for users.**
A lot of the technical reports/documents and publications besides the data files are providing for the users. Two publications are being in press and will be available for users soon.



Fig.11 《Nuclear Characteristics of Nuclides》



Fig.12 《Nuclides Table》



***Thank you for your attention !
Comments and suggestion welcome !***