2013/14 Status Report of China Nuclear Data Center

GE Zhigang

China Nuclear Data Center(CNDC)
China Committee of Nuclear Data(CCND)
China Institute of Atomic Energy(CIAE)
P.O.Box 275-41,Beijing 102413, P.R.China
E-Mail:gezg@ciae.ac.cn

CHINA NUCLEAR DATA CENTER

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:

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

- ✓ **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.**

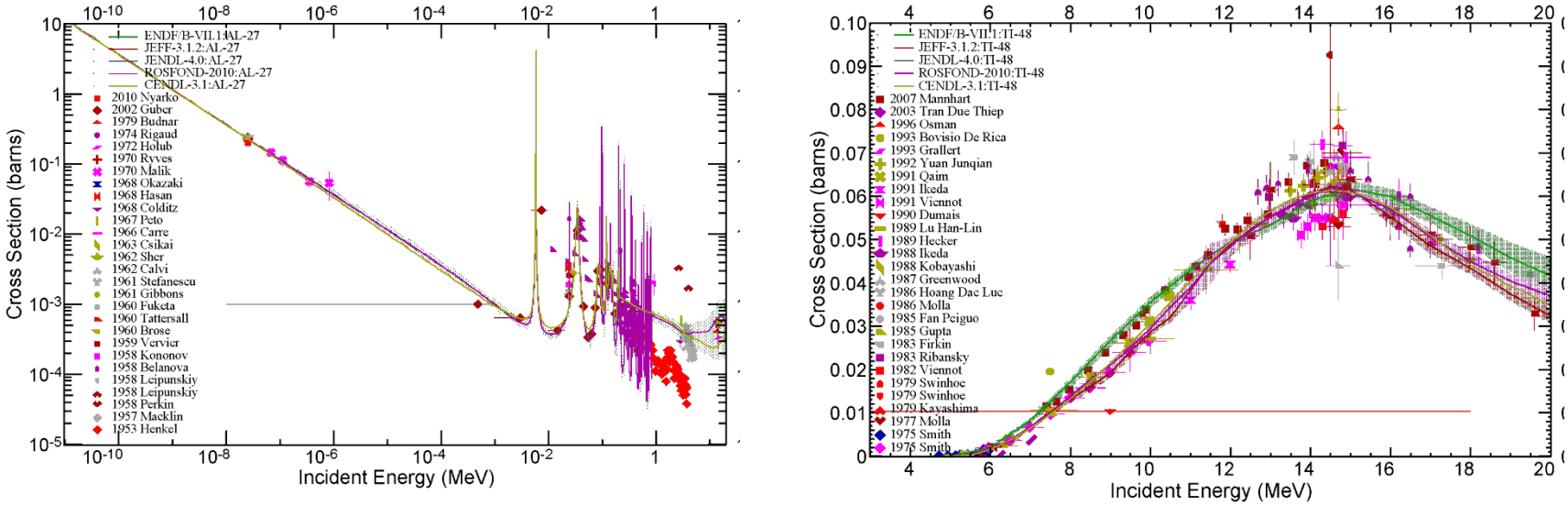


Fig.1 ^{27}Al(n, g)(left), ^{48}Ti(n, p) (right) new evaluation compared with evaluated files and exp.data.

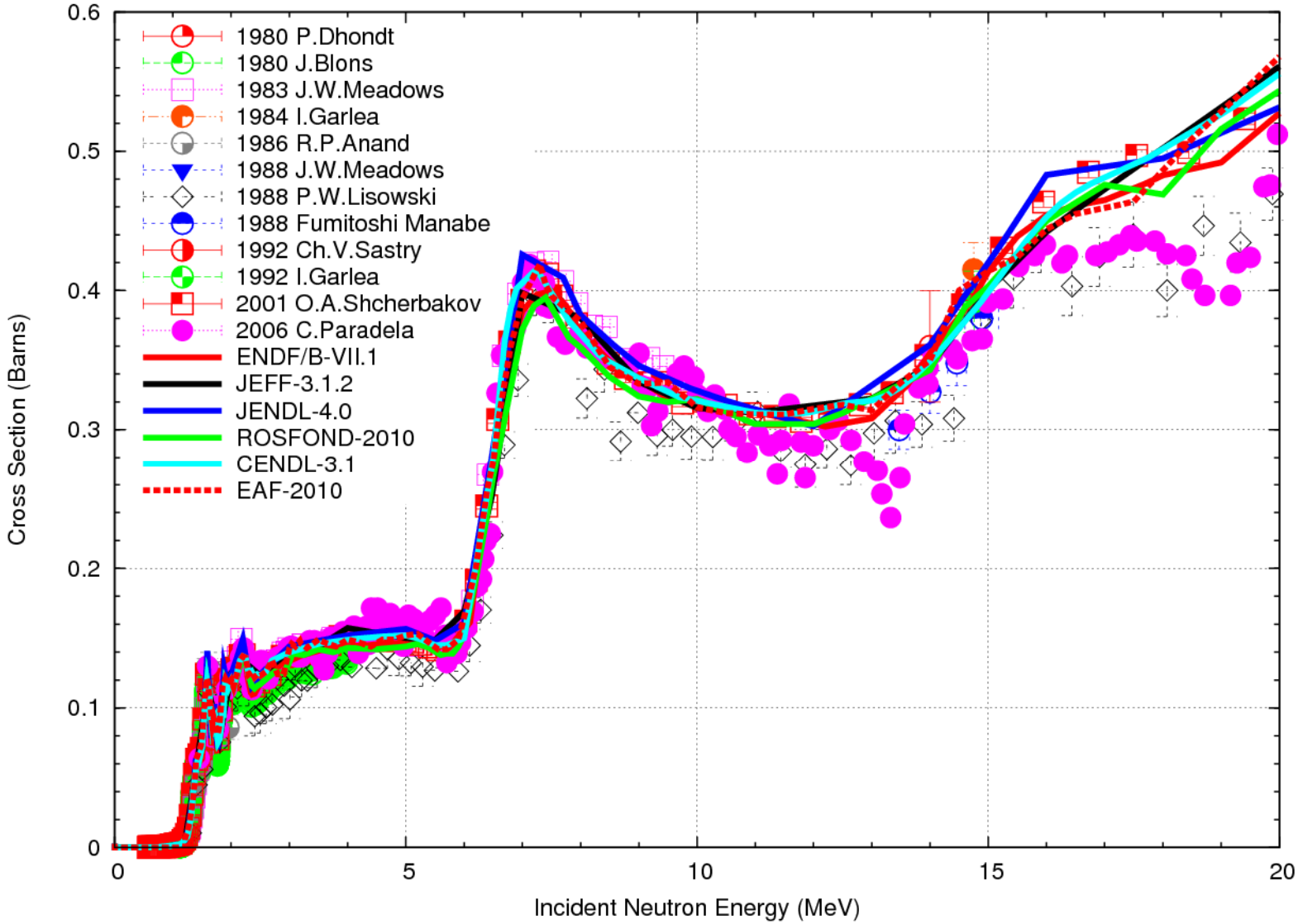
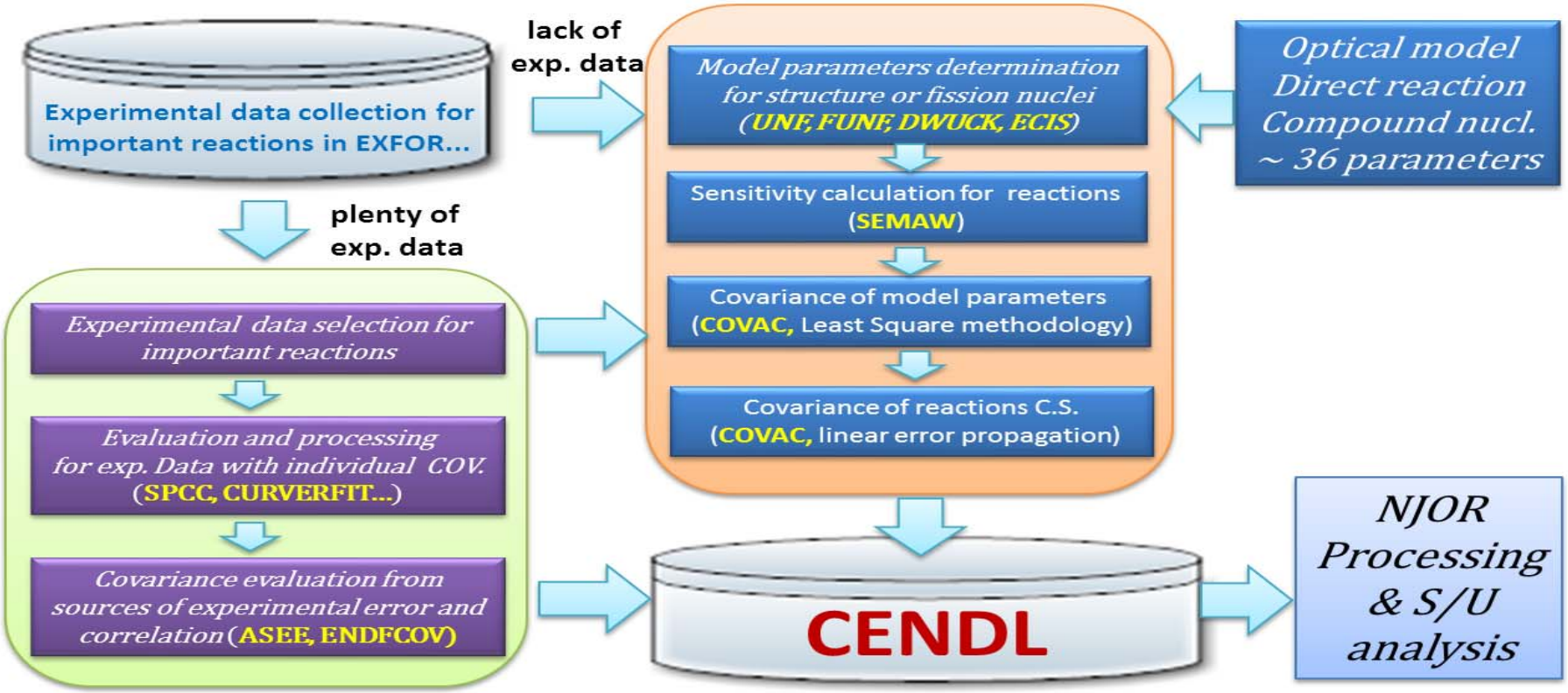


Fig.2 ^{232}Th(n, f) new evaluation compared with other evaluated files and exp. data.

- **A covariance evaluation system is being developing for the CENDL project, which can be used for the (n,tot), (n,el), (n,γ) , (n,inl) , (n,p) , (n,α) , (n,2n) , (n,np) , (n,nα) , (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, nα) ,(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}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.

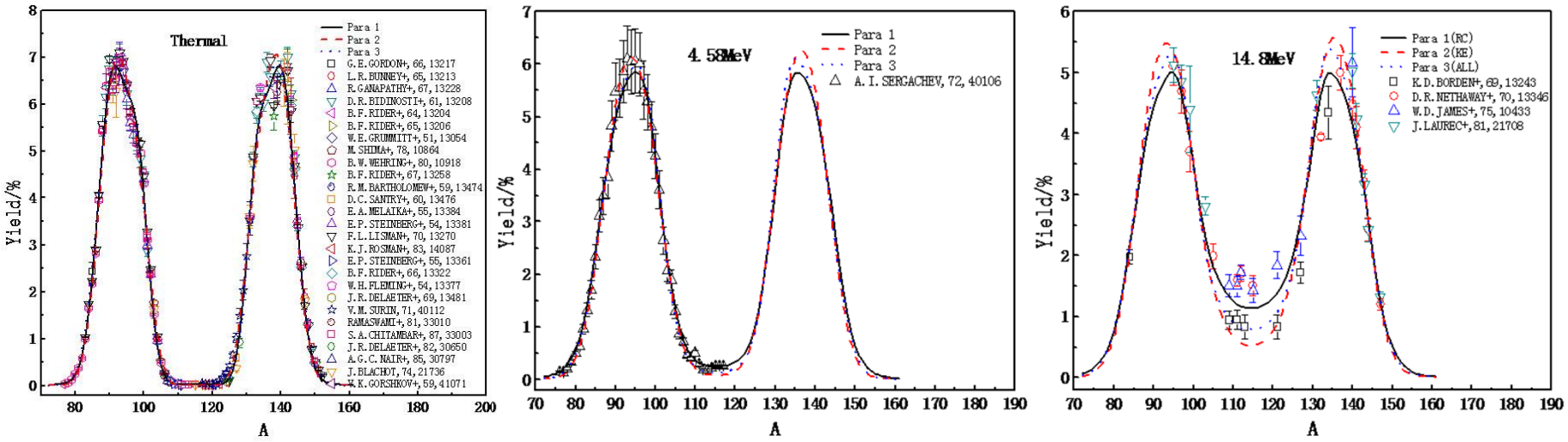


Fig.4 n+^{233}U, mass distributions for thermal,4.58MeV,and 14.8MeV

Covariance extracted from experimental data

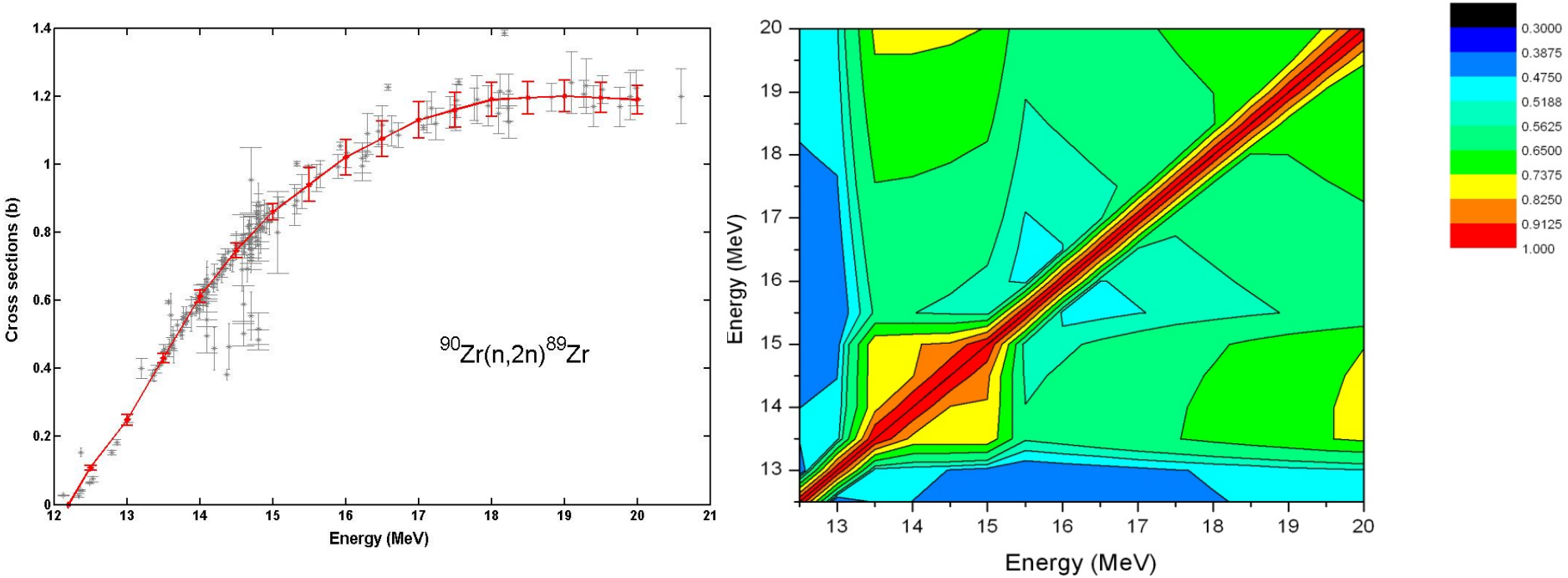


Fig. 5 ^{90}Zr(n,2n) ^{89}Zr evaluation with error (left) and the coefficient of correlation (right)by ASEE

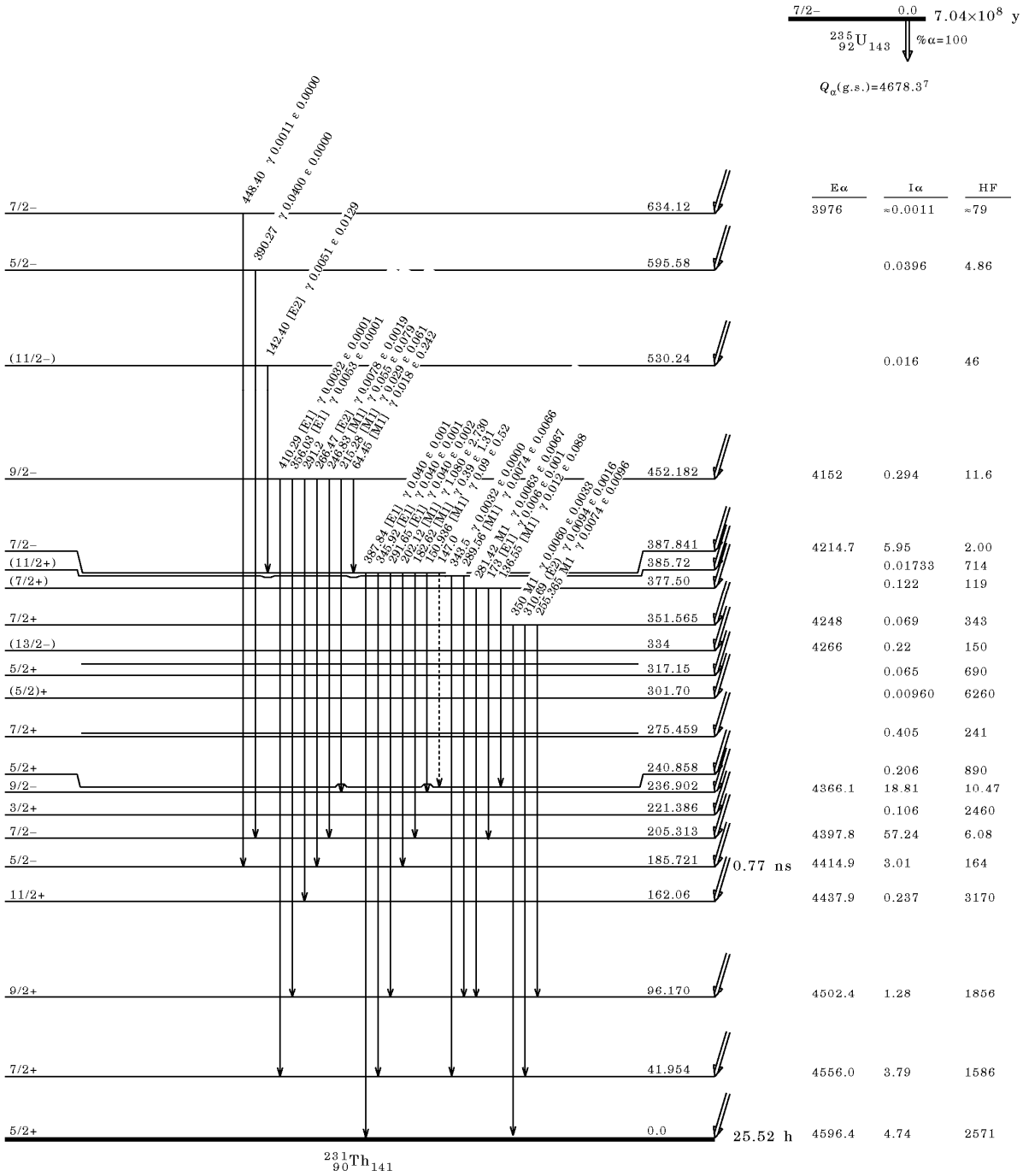
Covariance by ASEE is designed to exhibit the current level of measurement towards a certain reaction C.S. through analyze every error sources non-negligible. It is suggested to avoid the limitation of L-S in processing the case with lots of experimental data.

- **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 En and Q(α) 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

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/.

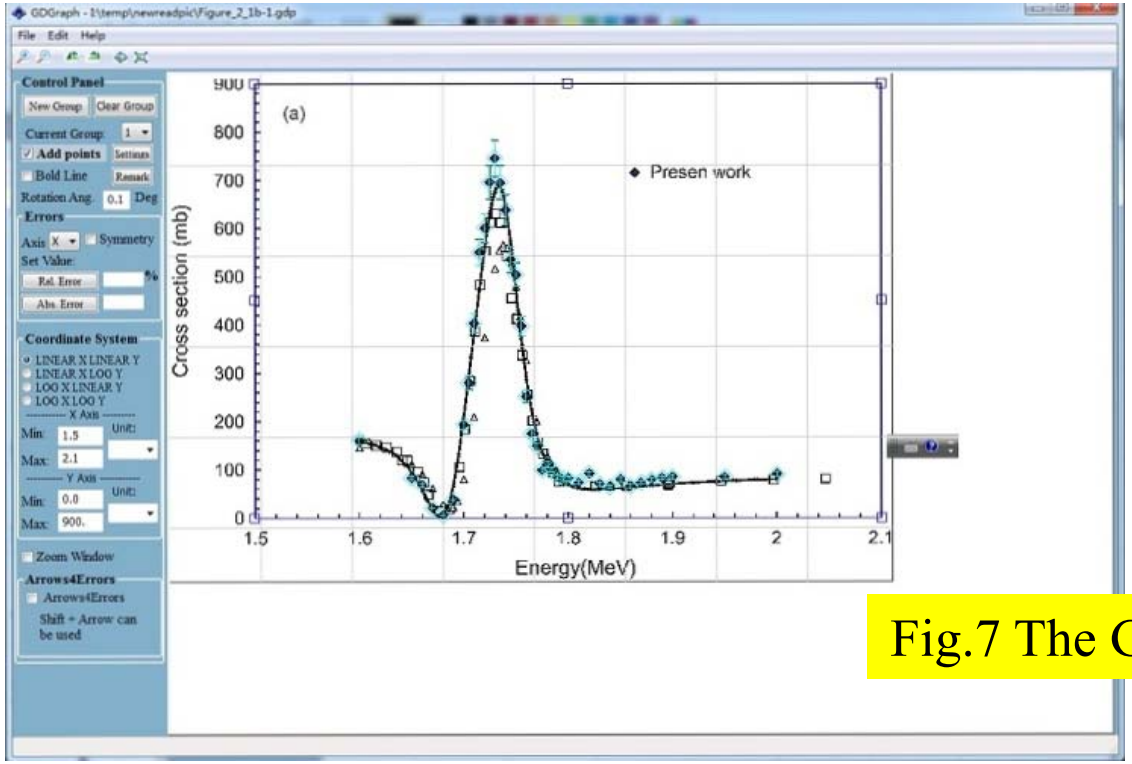


Fig.7 The GUI of GDgraph-5.0 (partial)

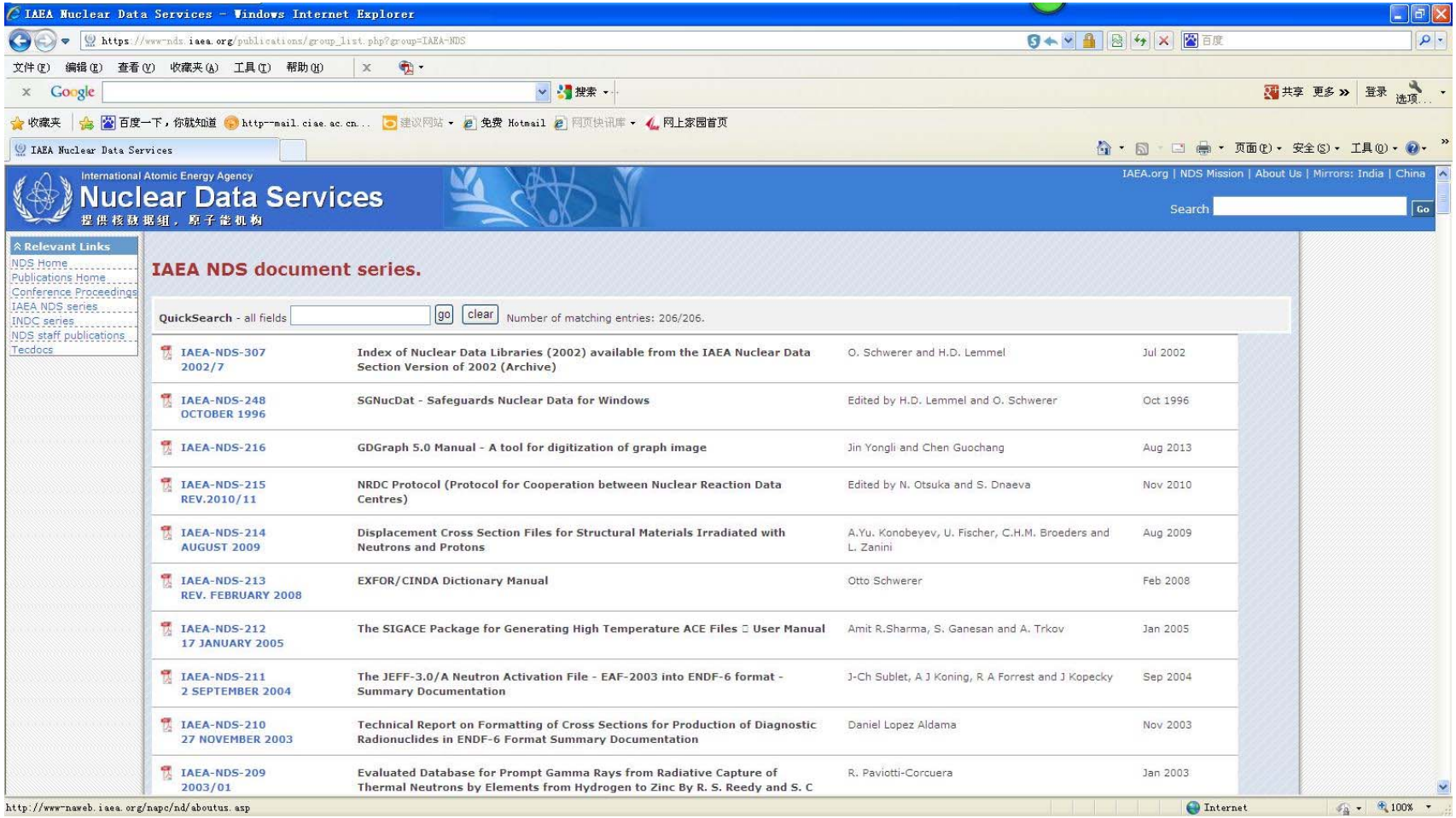


Fig.8 The user's manual (English version) of GDgraph-5.0 is available

- **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.**

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

数据来源统计

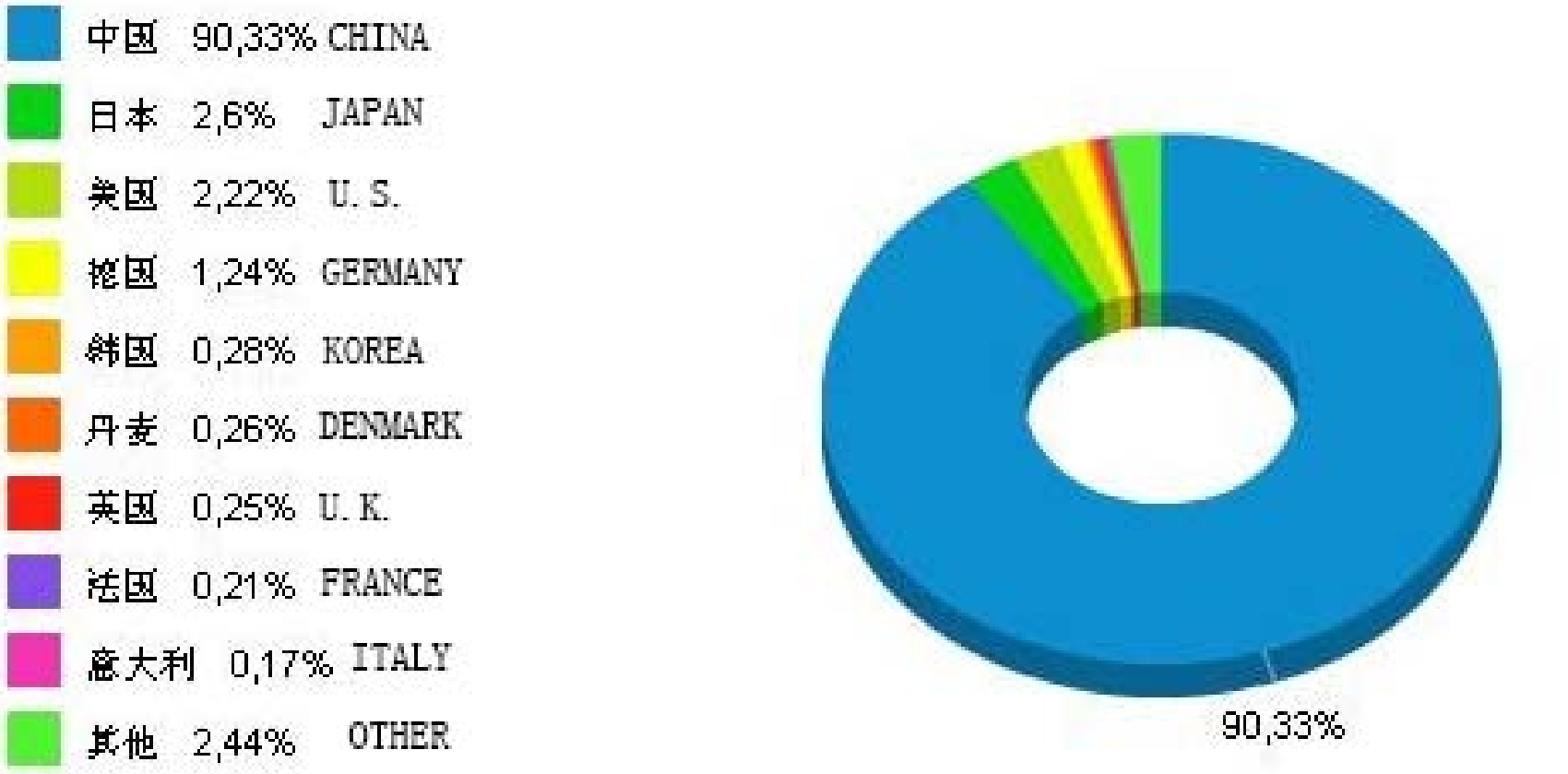


Fig.10-1 The statistics of the nuclear data service(1).

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 !