

# 2013/14 Status Report of China Nuclear Data Center

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## 1. General Information of China Nuclear Data Center

### 1-1. Manpower Information:

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 China Institute of Atomic Energy last year.

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

21 official staff + 5 technical support seniors (retired staff) + 6 graduated students.

Director: Ge Zhigang.

Deputy Directors: Dr.Chen Guochang and Dr.Wu Haicheng.

### 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. Information of Nuclear Data Activities

- 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 activities are going on for the new CENDL, which contain the neutron, activation and fission yields files. As some examples, following are the new evaluations for the neutron files of  $^{27}\text{Al}$ ,  $^{48}\text{Ti}$ ,  $^{232}\text{Th}$ .

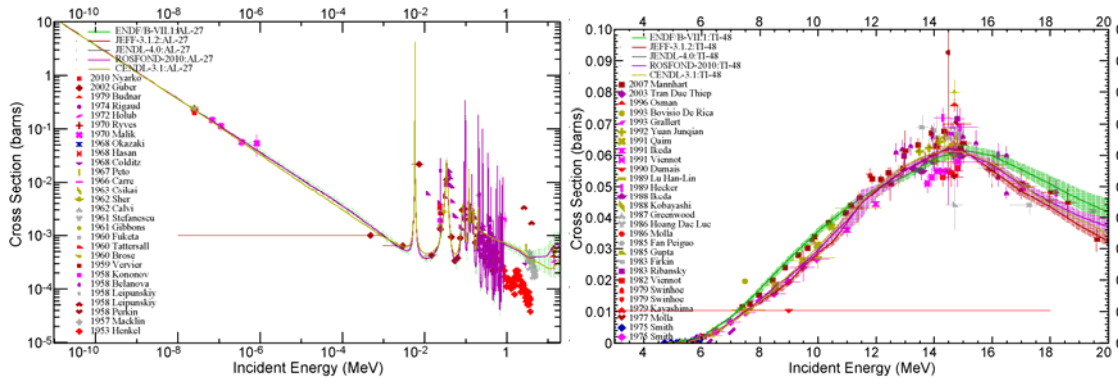


Fig.1  $^{27}\text{Al}(n, g)$ (left),  $^{48}\text{Ti}(n, p)$  (right) new evaluation comparison with evaluated files and exp.data.

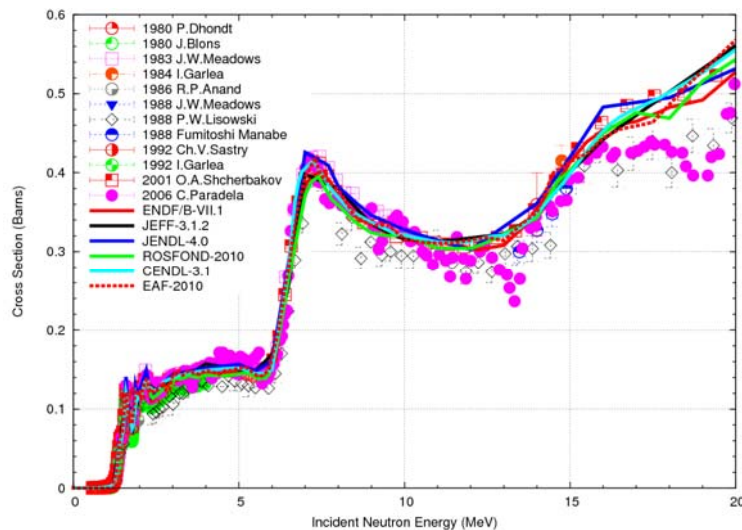


Fig.2  $^{232}\text{Th}(n, f)$  new evaluation compared with other evaluated files and exp. data.

- A covariance evaluation system is being developing for the CENDL project, which can be used for the  $(n, \text{tot})$ ,  $(n, \text{el})$ ,  $(n, \gamma)$ ,  $(n, \text{inl})$ ,  $(n, p)$ ,  $(n, \alpha)$ ,  $(n, 2n)$ ,  $(n, np)$ ,  $(n, n\alpha)$ ,  $(n, 3n)$ ,  $(n, f)$  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.

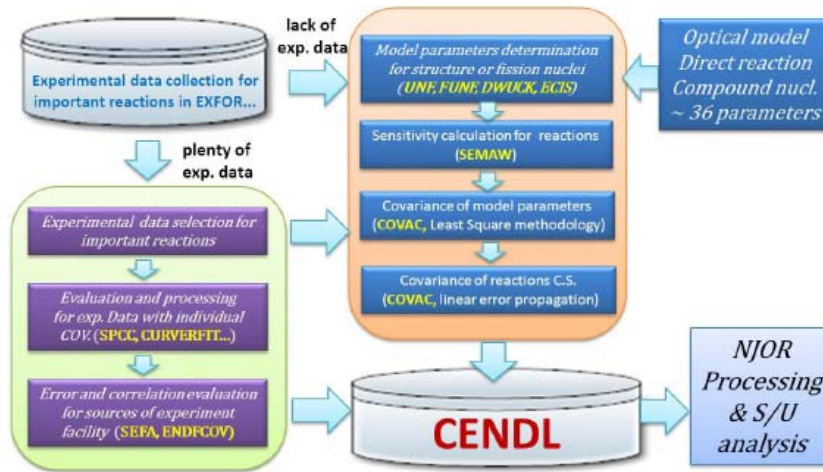


Fig.3 Scheme of covariance evaluation flow in CNDC

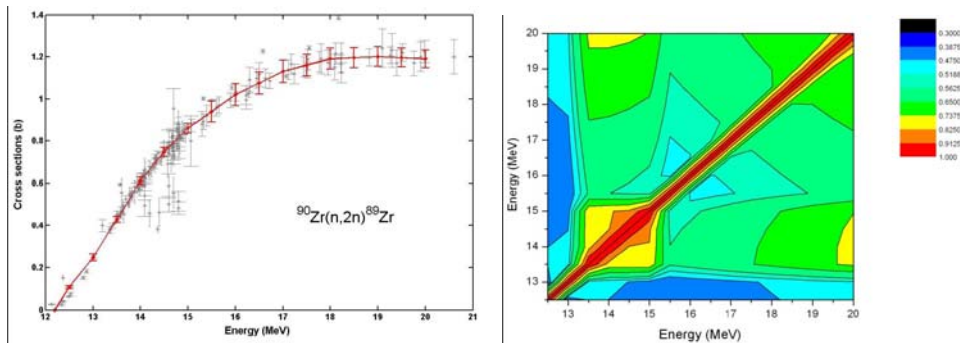


Fig.4  $^{90}\text{Zr}(n,2n)^{89}\text{Zr}$  evaluation with error (left) and coefficient of correlation(right) by SEFA

## 2-2. Nuclear Structure and Decay Data Evaluation.

$^{235}\text{U}$  decay data evaluation which contained half-life,  $\gamma$  decay data,  $\alpha$  decay data and level scheme et al., has been performed.

Tab.1 The new evaluated energies for  $\alpha$  decay of  $^{235}\text{U}$ (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 <sup>b</sup>
						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 5 <sup>a</sup>	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

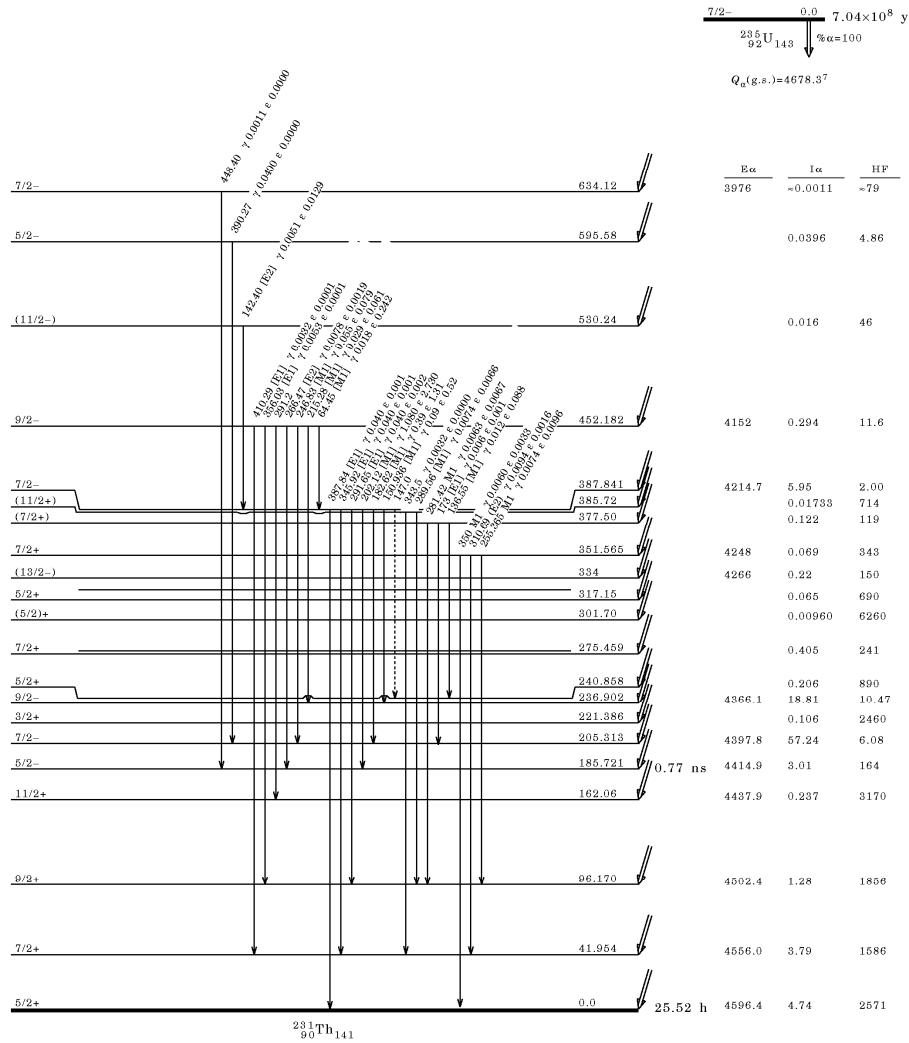


Fig.5  $\alpha$  Decay Level of  ${}^{235}\text{U}$

### 3. EXFOR Software and Database Compilation Progress

#### 3-1. GDgraph Software

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

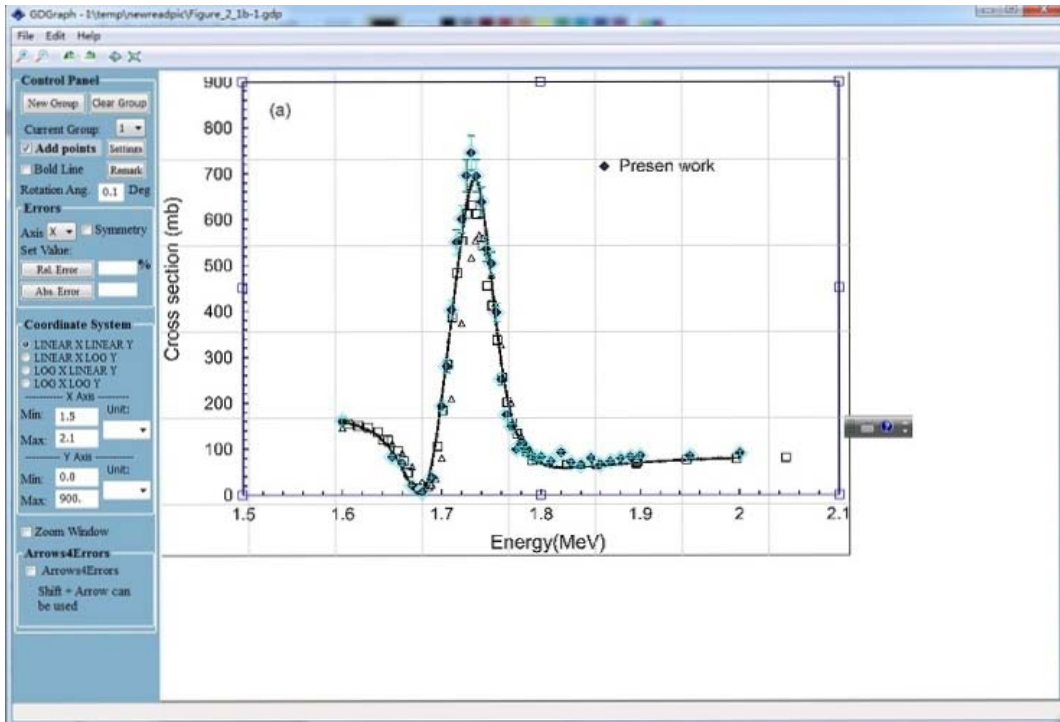


Fig.6 The GUI of GDgraph-5.0 (partial)

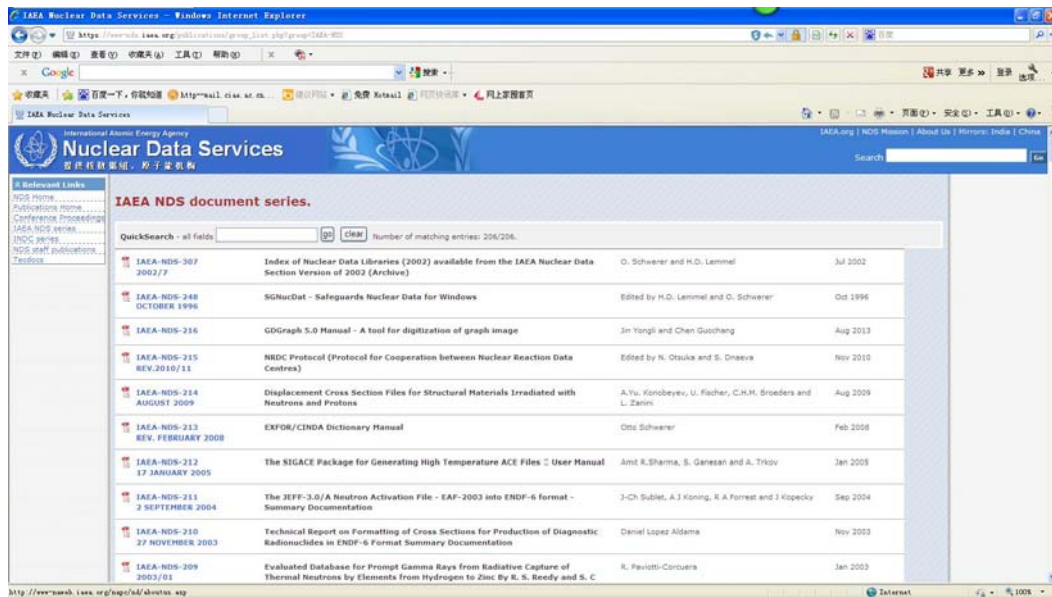


Fig.7 The user's manual (English version) of GDgraph-5.0 is available

### 3-2. 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

4-1. 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: **Error! Hyperlink reference not valid.** version) has been established for providing the general nuclear data and related information services to china users.



Fig.8 The Web site of the database of nuclear physics(Chinese Version)



Fig.9-1 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.9-2 The statistics of the nuclear data service(2).

#### 4-2. 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.10 《Nuclear Characteristics of Nuclides》

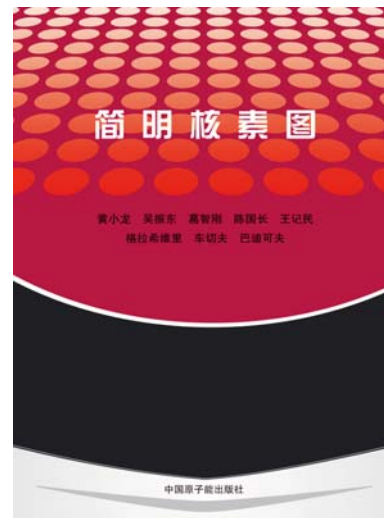


Fig.11 《Nuclides Table》