

# Experimental Activities in China

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The following nuclear data measurement laboratories are included in China Nuclear Data Network: China Institute of Atomic Energy (CIAE), Peking University, Sichuan University, Lanzhou University and etc. The summarized activities are covered during the period of last one year:

## 1. China Institute of Atomic Energy

### Neutron emission cross sections from $^9\text{Be}$ at neutron energy of 8 MeV:

The CIAE's program for the neutron emission double-differential cross section measurement was continued for beryllium at 8.17 MeV neutrons since beryllium is a very important element in fusion technology. The existing experimental DDX data are sparse and the evaluated data from different libraries are very different. For light nuclide, the model calculation is very difficult and precise experimental data are necessary for model calculation checking and parameters fixing.

The experiment was carried out with the Multi-detector Fast Neutron TOF Spectrometer on the HI-13 Tandem Accelerator of CIAE. A deuterium gas target with 10 mm in diameter and 30 mm in length gas was used to generate neutrons by D(d,n) reaction. The deuterium gas pressure is about 6 bars. Three BC501A ( $\phi 180 \times 100$ ) neutron detectors were used to detect the emitted neutron TOF spectrum from sample. The distances from center of gas target to center of sample and from center of sample to center of detector are 18 cm and ~600 cm, respectively. Twelve angles from 30 to 150 degree of TOF spectra were measured with gas in, sample in and out, gas out, sample in and out runs.

### Precise measurements of $\gamma$ -ray Relative Intensities for $^{66}\text{Ga}$

The standard radioactive sources for the  $\gamma$ -detector efficiency calibration are up to 2754 keV. The  $\gamma$ -emission energies from  $^{66}\text{Ga}$  decay widely cover over 800-4806 keV and  $^{66}\text{Ga}$  has been recommended as a secondary standard calibration source by IAEA. It's necessary to know the  $\gamma$ -emission intensities from  $^{66}\text{Ga}$  precisely. The most important thing is that the detector involved in this measurement has a good efficiency curve. The efficiencies below 2754keV can be calibrated with the available radioactive sources for example  $^{24}\text{Na}$ ,  $^{60}\text{Co}$ ,  $^{54}\text{Mn}$ ,  $^{65}\text{Zn}$ ,  $^{137}\text{Cs}$ ,  $^{133}\text{Ba}$  and mixed  $^{125}\text{Sb} + ^{154}\text{Eu} + ^{155}\text{Eu}$  source. Above 2754keV, it is hard to find suitable sources. The  $^{19}\text{F}(p,\alpha\gamma)^{16}\text{O}$  resonance reaction at  $E_p=340.46\text{keV}$  was chosen as calibration source. After a number of small corrections, for example, the kinematics correction, angular

distribution correction *etc*, the ratio of  $\alpha$  particles and  $\gamma$ -rays of 6.13MeV is 1:1. An absolute measurement of the detector efficiency at 6.13MeV has been performed by a concurrent measurement of  $\alpha$  particles and  $\gamma$ -rays from this reaction. The detector efficiencies also investigated by means of a Monte-Carlo calculation using the EGS4 code.

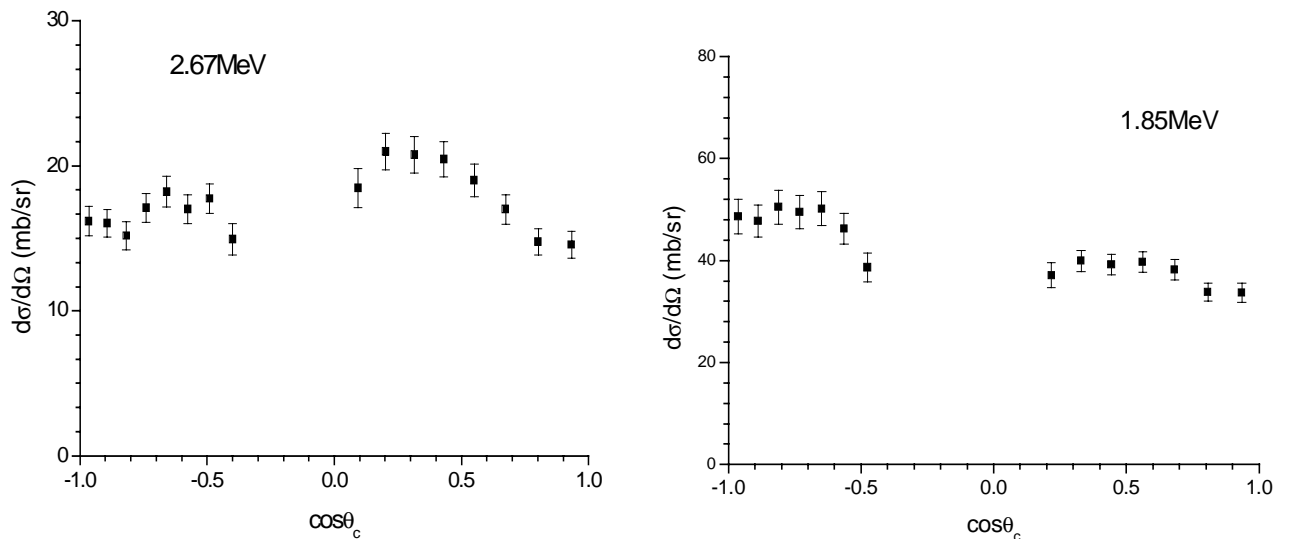
## 2. Peking University

### Measurement of differential cross sections of the ${}^6\text{Li}(n,t){}^4\text{He}$ reaction at 1.85 – 4.42 MeV:

The differential cross section data of the  ${}^6\text{Li}(n,t){}^4\text{He}$  reaction are important for practical application and for the study of the reaction mechanism. Although there are some differential data for  ${}^6\text{Li}(n,t){}^4\text{He}$  reaction, most data are restricted to keV region and  $\sim 14\text{MeV}$ , and there are few differential data with large discrepancies in MeV region. Using a gridded ionization chamber, the differential cross sections were measured at 1.85, 2.67, 3.67 and 4.42MeV in Beijing University, The total uncertainties of differential cross sections are 5.1~7.3 %.

### The differential cross section for ${}^{10}\text{B}(n, \alpha){}^7\text{Li}$ reaction:

The differential cross-section and integrated cross sections measurement for  ${}^{10}\text{B}(n, \alpha){}^7\text{Li}$  reaction was continued at 1.85MeV and 2.67MeV.



**Fig.1 the differential cross section for  ${}^{10}\text{B}(n,\alpha){}^7\text{Li}$  reaction**

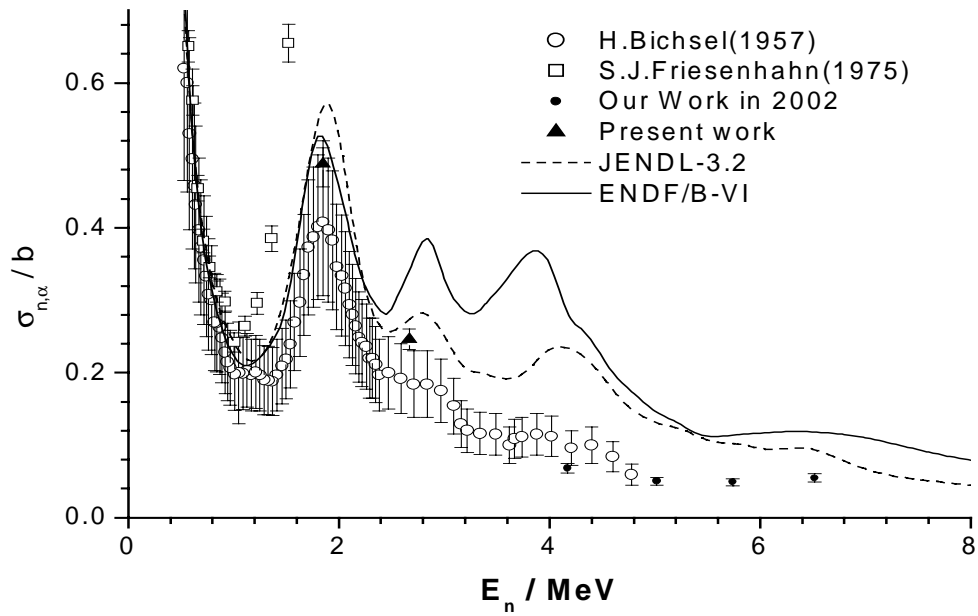


Fig.2 the cross section for  $^{10}\text{B}(n, \alpha) ^7\text{Li}$  reaction

### 3 Lanzhou University:

The following cross sections was measured at neutron energy from 13.5 to 14.6 MeV at Lanzhou University by using the activation method :

$^{150}\text{Nd}(n,2n)^{149}\text{Nd}$ ,  $^{148}\text{Nd}(n,2n)^{147}\text{Nd}$ ,  $^{142}\text{Nd}(n,2n)^{141}\text{Nd}$ ,  $^{160}\text{Gd}(n,2n)^{159}\text{Gd}$ ,  
 $^{141}\text{Pr}(n, p)^{141}\text{Ce}$ ,  $^{139}\text{La}(n, p)^{139}\text{Ba}$ ,  $^{158}\text{Gd}(n, p)^{158}\text{Eu}$ ,  $^{146}\text{Nd}(n, p)^{146}\text{Pr}$ .

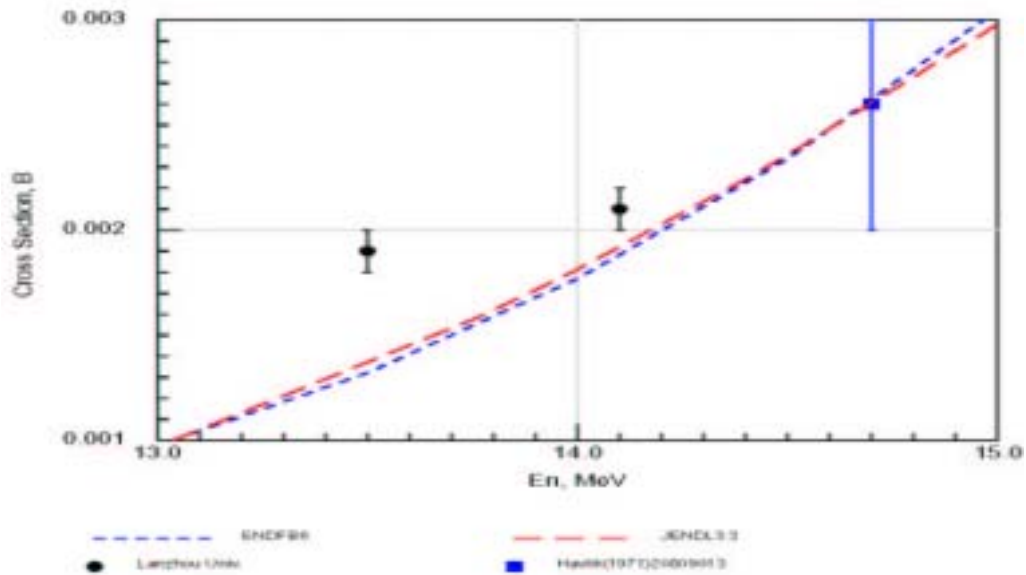
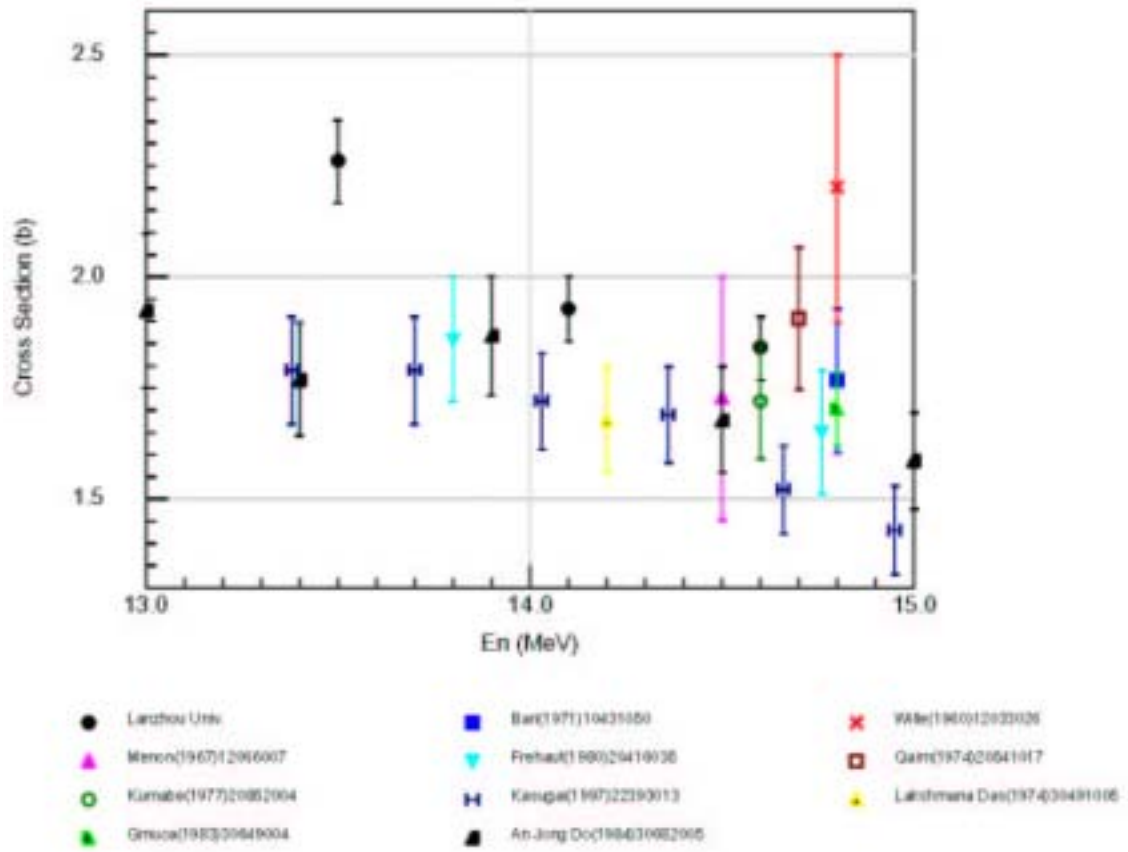


Fig.3 the cross section for  $^{158}\text{Gd}(n, p)^{158}\text{Eu}$  reaction



**Fig.4** the cross section for  $^{142}\text{Nd}(n,2n)^{141}\text{Nd}$ , reaction

**4 Sichuan University:**

The cross sections for the  $^{115}\text{In}(n, \gamma)^{116}\text{In}$ ,  $^{116\text{m}}\text{In}(n, \gamma)^{117}\text{In}$  and  $^{71}\text{Ga}(n,\gamma)^{72}\text{Ga}$  reaction were measured in neutron energy range from 30 to 1500 keV.