



Measurement of the $^{124}\text{Xe}(n, p)^{124}\text{I}$ reaction cross section induced by 14.8 MeV neutron

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I Introduction

The measurement of (n, p) reaction cross section induced by fast neutron plays an important role in nuclear reaction mechanism research and nuclear technology applications. However, most experiments focused on solid elements, and few results were reported related to xenon(Xe) gas. There is only one experimental data of the $^{124}\text{Xe}(n, p)^{124}\text{I}$ reaction cross section which was obtained at fission neutron spectrum. Therefore, it is necessary to make further measurement.

II Experiment

Measurement has been performed by the activation method. Quasi monoenergetic neutron beams were produced at the Cockcroft-Walton Accelerator of CIAE, by the $\text{T}(d, n)^4\text{He}$ reaction. A cell made of quartz was used as the container of ^{124}Xe (99.9% abundance) gas, and the mass of ^{124}Xe in the cell was determined by weighing method. Two high purity Nb foils were attached to the cell and performed as monitors of the neutron flux determined by $^{93}\text{Nb}(n, 2n)^{92\text{m}}\text{Nb}$ reaction. After irradiation, the activities of ^{123}Xe and $^{92\text{m}}\text{Nb}$ were measured by HPGe γ ray spectrometer.

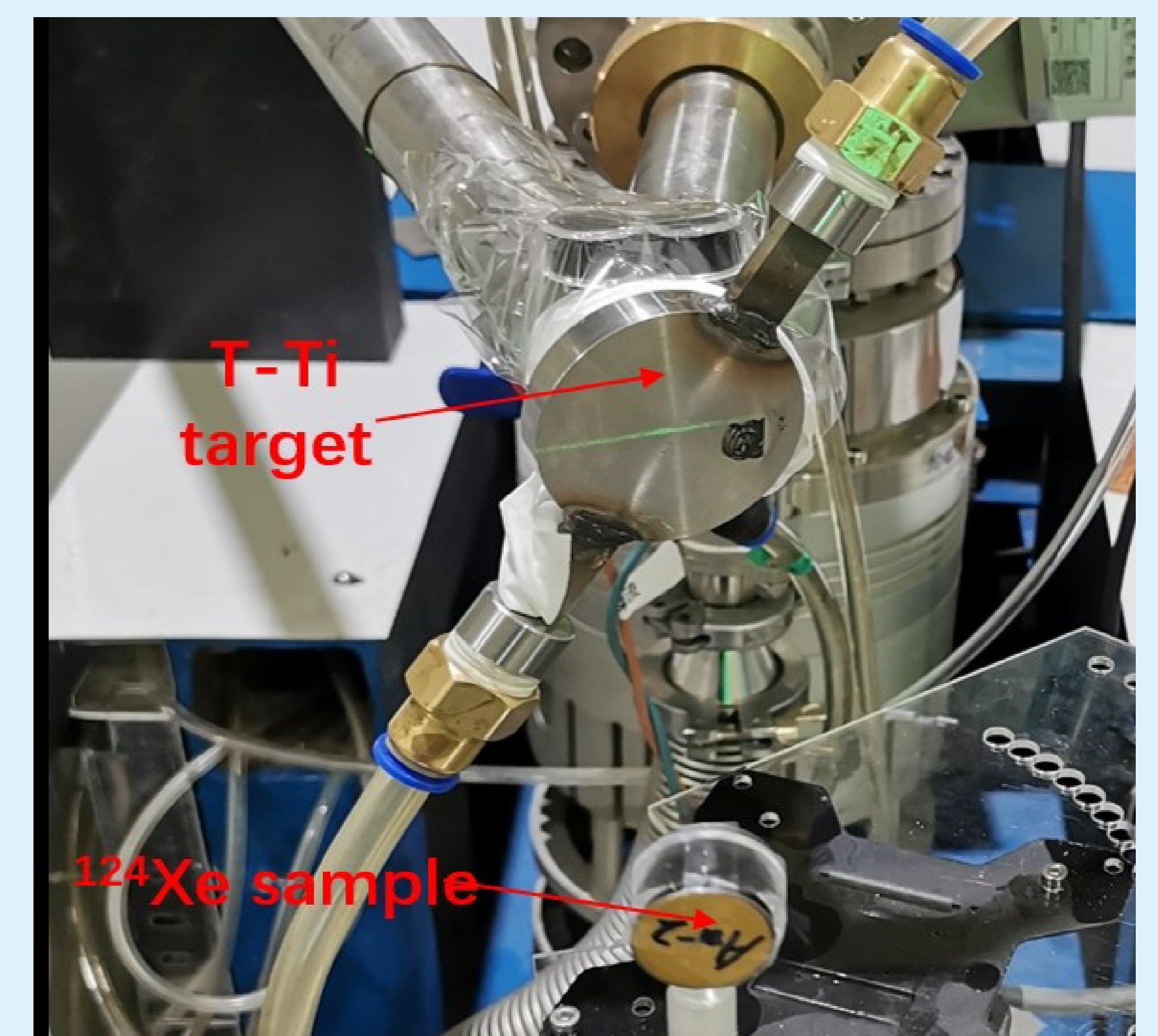


Fig. 1 Schematic view of the irradiation experiment

III Results and discussion

The cross section was calculated by the following formula^[1,2]:

$$\sigma_x = \frac{[\eta\epsilon I_\gamma m KSD]_0}{[\eta\epsilon I_\gamma m KSD]_x} \cdot \frac{[\lambda FCA]_x}{[\lambda FCA]_0} R_n \sigma_0$$

The result is listed below. The overall uncertainty was about 5.0% ($k = 1$). The result was compared with evaluations and was found to be consistent with TENDL-2012.

Reaction	Cross section/mb
$^{124}\text{Xe}(n, p)^{124}\text{I}$	36.1(1.8)
$^{93}\text{Nb}(n, 2n)^{92\text{m}}\text{Nb}$	459.7(50) ^[3]

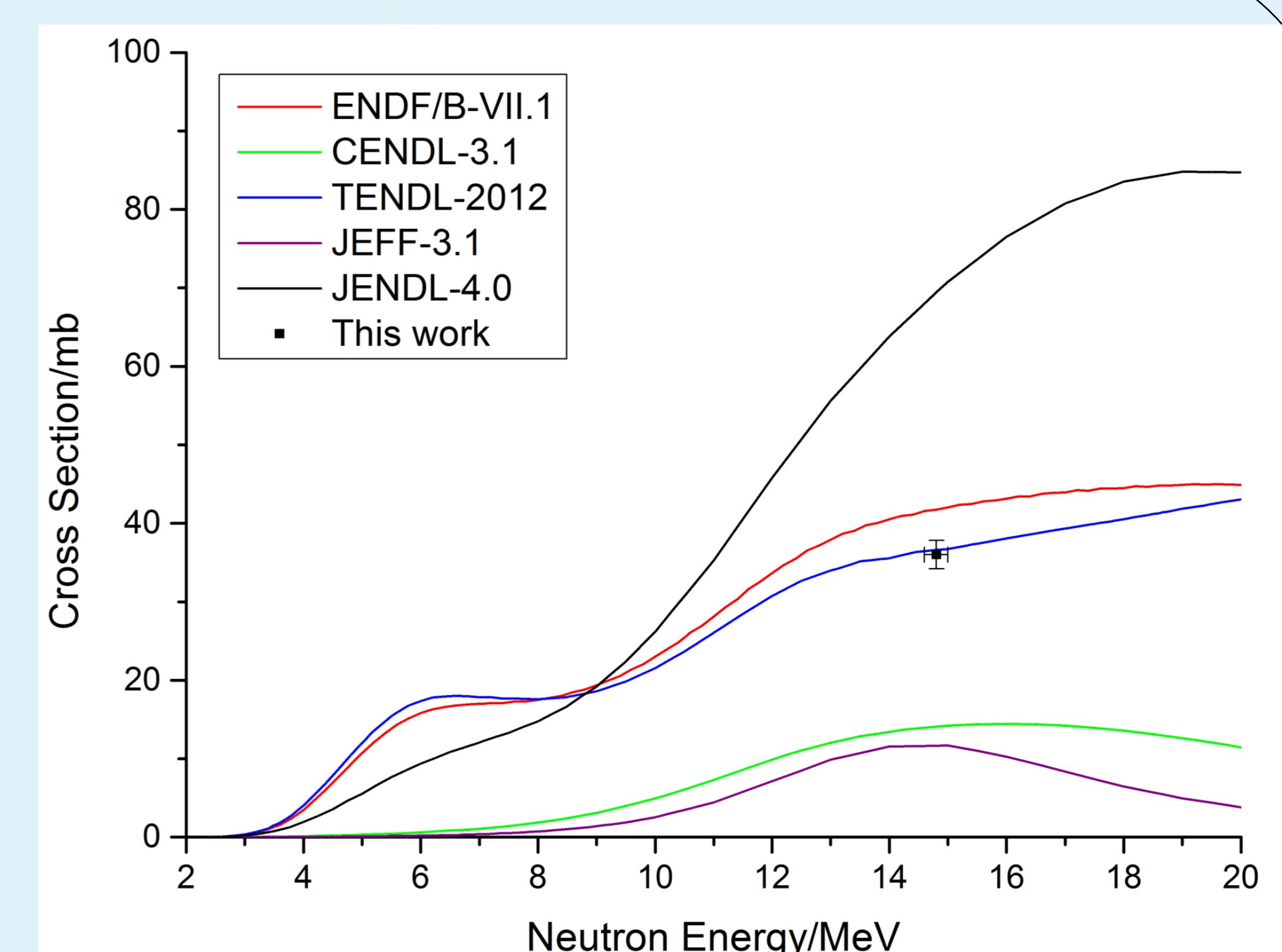


Fig. 2 $^{124}\text{Xe}(n, p)$ cross section result and comparison with evaluations

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