CALCULATION OF PRE-EQUILIBRIUM EFFECTS IN NEUTRON-INDUCED CROSS SECTION ON ^{65}CU

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I. Introduction

The calculations of proton emission spectra and of the excitation function produced by (*n*, x*p*) and (*n*, *p*) reactions are indispensable for the design of nuclear devices. The development of high quality nuclear data of copper is particularly important due to its role as an important structural material in many ADS.

^{63}Cu (69,17 %) ^{65}Cu (30,83 %)

L. YETTOU Preequilibrium Models for ^{63}Cu(*n*, *xp*) Reaction in Neutrons at 9, 11, 14.8 and 15 MeV Using the EMPIRE 3.2 Code. Nuclear Science and Engineering. Volume 183. 275-285. June 2016. http://dx.doi.org/10.13182/NSE15-73.

^{65}Cu(*n*, *xp*) ^{65}Cu(*n*, *p*)^{65}Ni

Preequilibrium models
Optical model } **(RIPL-3)** **(EMPIRE and TALYS)**
Level density }

Adjustable level density parameter *a* (Atilno, ROHFBA, ROHFBP)

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Theoretical models

$$\frac{d\sigma_k^{PE}}{dE_k} = \sigma^{CF} \sum_{p_\pi=p_\pi^0}^{p_\pi^{max}} \sum_{p_\nu=p_\nu^0}^{p_\nu^{max}} W_k(p_\pi, h_\pi, p_\nu, h_{\nu,} E_k) \quad \tau\,(p_\pi, h_\pi, p_\nu, h_\nu) \times P\,(p_\pi, h_\pi, p_\nu, h_{\nu,}) \qquad (1)$$

TALYS

$$\frac{d\sigma_{a,b}}{d\epsilon_b}(\epsilon_b) = \sigma_{a,b}^r(E_{inc}) D_{a,b}(E_{inc}) \times \sum_n W_b(E, n, \epsilon_b)\tau(n) \quad , \qquad (2)$$

(PCROSS) EMPIRE

Hybrid Monte-Carlo Simulation (HMS) (DDHMS)

Hauser-Feshbach theory.

HFBM

GSM

Back Shifted Fermi Gas Model

Fermi Gas Model

Gilbert-Cameron

} **Level densities**

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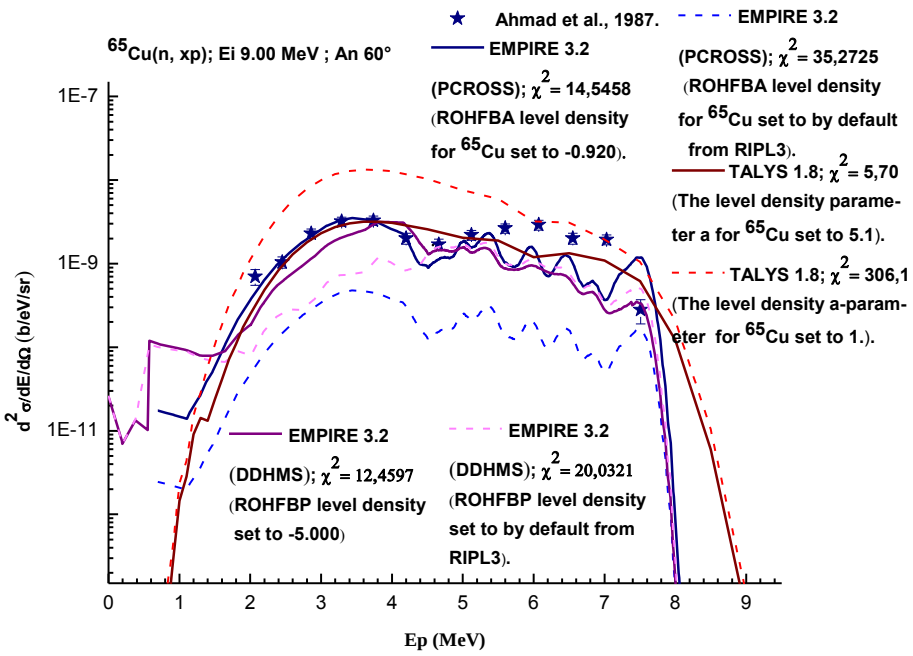

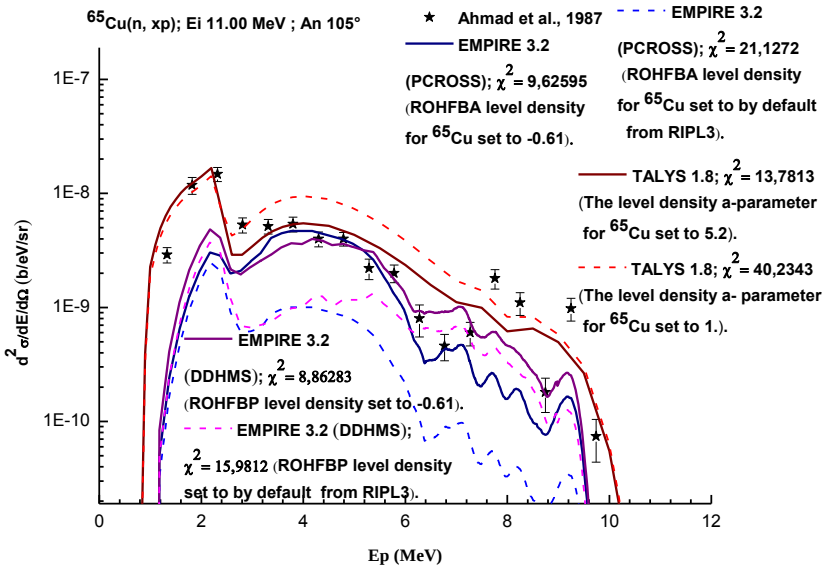

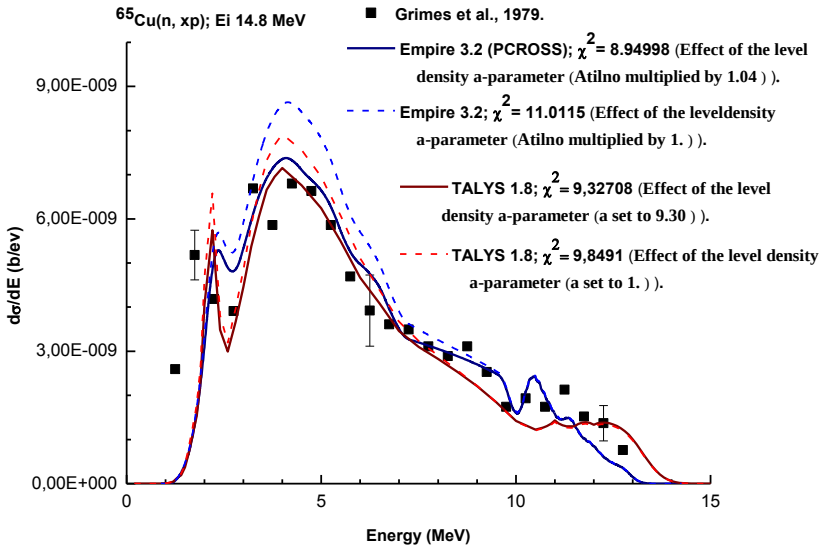

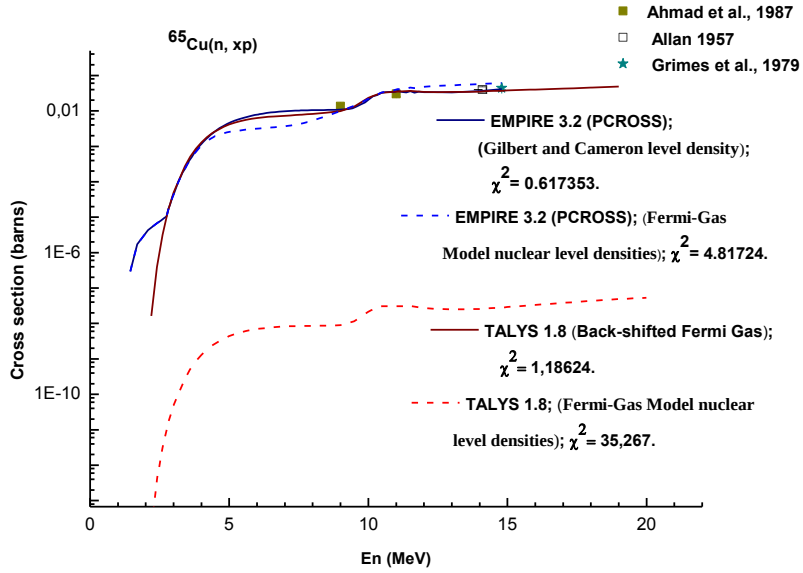

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Conclusion

- **Analyzed and calculated the double-differential cross sections.**
- **Angle-integrated calculations.**
- **Proton emission cross section of (*n*, *xp*) reactions and the excitation function of (*n*, *p*) on the ^{65}Cu target using the EMPIRE 3.2 and TALYS 1.8 codes.**
- **Our results show not only that the calculations of the pre-equilibrium in terms of Exciton Model and HMS with the Ignatyuk systematics for the ^{65}Cu(*n*, *xp*) reaction are in a good agreement with the experimental results .**
- **Different level density models used and the changed on the level density a-parameter affect strongly the fit. For all the figures shown in this work, the EMPIRE 3.2 and TALYS 1.8 results show that the lower χ^2 value gives a significantly better fit when compared to the experimental data .**

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THANK YOU FOR YOUR ATTENTION

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