

## CROSS-SECTIONS MEASUREMENTS OF N-INDUCED REACTIONS

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The interaction of fast neutrons in matter has implications as diverse as the choice of materials for fusion reactors or as the study of damages induced in human cells by secondary neutrons in hadron therapy. The K-130 cyclotron at the Department of Physics, University of Jyväskylä (JYFL) can produce intense neutron beams (as high as 1% of the number of projectiles) of maximum energies near 100 MeV with protons or 50 MeV with deuterons by stopping the beams in various materials. We intend to send such beams on a target enriched in  $^{18}\text{O}$  to study the  $^{18}\text{O}(n, \alpha)^{15}\text{C}$  reaction, as it is a possible reaction for production of a  $^{15}\text{C}$  beam at the SPIRAL2 facility. We used the known  $^{16}\text{O}(n, p)^{16}\text{N}$  with a 55 MeV deuteron beam on a carbon target to debug the concept. The activities were produced in the JYFL MAP cave and transported within 2 s to the cellar where the background is low, with a mechanical system designed in the lab [1]. The radioactivity is proportional to the overlap integral of neutron spectrum  $n(E)$  and cross section  $\sigma(E)$ . In the present test case the energy of the  $^{16}\text{N}$  line was 6.128 MeV, which is far above the range of usual standards, Fig. 1 shows the efficiency curve.

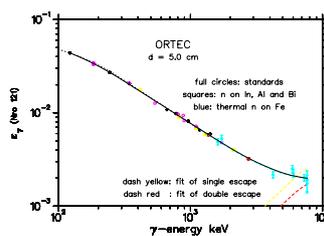


Figure 1: Efficiency curve constructed by mixing standards, activities produced with neutrons and the prompt capture  $\gamma$ -rays on the iron of the transport system.

With the analysis nearing completion, we can state that the method allows a sensitivity of 1 mb at the peak of  $\sigma$ . With the present shielding, the collected neutron dosis on the Ge detector will approach  $1.0\text{e}7 \text{ n/cm}^2$  after a week, i.e., 10 times less than the limit of the first visible damages. In conclusion, we have demonstrated the feasibility of the method and will carry out the measurement of  $^{18}\text{O}(n, \alpha)^{15}\text{C}$  this summer.

[1] G.Lhersonneau et al. NIMA **698**, 224 (2013)