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Measurement of 27(alpha, n gamma)30 P reaction yields.

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Reactions induced by alpha particles on stable elements play a relevant role in several scientific fields, from nuclear technologies and nuclear
astrophysics, to dark matter searches and neutrino physics. Accurate data on the neutron yield from the interaction of α-particles with nuclei via (α, n) reactions are of particular interest in this context, both due to the inconsistency of the available experimental data in the literature and to the renewed interest for novel applications. The need for new measurements with
higher precision has been recently recognized [1].

In this work we focus on reactions induced by alpha particles on stable Al, a common reaction that has been propose as a benchmark to intercompare measurements and cross check experimental techniques. In particular we focus on the measurement of $^{27}Al(\alpha, n)$ reaction yields via activation and $^{27}Al(\alpha, n\gamma)$ production yields. The measurements have been performed in the framework of a wider effort by the Spanish MANY collaboration, whose ultimate goal is the measurement of (α, xn) production yields, reaction cross-sections and neutron energy spectra.

The main objective of this work was the commissioning of the detector system and the new experimental beamline via the previously measured $^{27}Al(\alpha, n)^{30}P$ reaction. The experiment was carried out at the CMAM laboratory in Madrid [2], Spain using an array of $LaBr_3$(Ce) FATIMA-type [3] detectors placed at selected angles in the laboratory frame. The gamma spectroscopy measurements allow to determine the total reaction yield from the decay of the activation products and the $(\alpha, n\gamma)$ yield from the de-excitation of the states in the target nuclei. The setup was complemented by a neutron monitoring unit based on a ^3He-filled neutron proportional counter embedded high-density
polyethylene, and a high-resolution HPGe detector to aid gamma-ray
identification.

The presentation will address the thick-target yields obtained by activation in the 5 to 9 MeV energy range, the gamma yield resulting for the $^{27}Al(\alpha, n)$ reaction as a function of energy, and the effect of angular correlations on the experimentally obtained gamma yields.

References.

[1] S. Westerdale et al., Tech. Report INDC (2022) NDS-0836

[2] A. Redondo-Cubero et al., Eur. Phys. J. Plus 136 (2021) 175

[3] V. Vedia et al., Nucl. Instrum. Methods A 857 (2017) 98

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