

## Differential cross-section measurements for $^3\text{He}$ -induced reactions and elastic scattering on $^{16}\text{O}$

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Ion Beam Analysis (IBA) is a group of least-destructive techniques employing MeV ion beams to determine the composition and depth profile of materials. Particularly  $^3\text{He}$  beams come up with certain advantages. The most crucial ones are that the Q-values of  $^3\text{He}$ -induced reactions on most light isotopes are very high and that no special radiation safety precautions are required. In addition,  $^3\text{He}$  is the most suitable beam for the analysis of deuterium inside materials, rendering  $^3\text{He}$ -IBA essential in fusion energy research [1]. Nevertheless, the application of  $^3\text{He}$ -IBA is hindered by the lack of suitable differential cross sections, which in the case of  $^{16}\text{O}$  are almost nonexistent.

In the present work, the differential cross sections of the  $^{16}\text{O}(^3\text{He}, p_0)^{18}\text{F}$ ,  $^{16}\text{O}(^3\text{He}, p_1)^{18}\text{F}$  and  $^{16}\text{O}(^3\text{He}, \alpha_0)^{15}\text{O}$  nuclear reactions, along with the  $^{nat}\text{O}(^3\text{He}, ^3\text{He}_0)$  elastic scattering, were determined for the first time at five detection angles ranging from  $130^\circ$  to  $170^\circ$  over a beam energy range of 2.2 to 5 MeV. The obtained differential cross-section data were validated through a benchmarking experiment. All measurements took place at the 4 MV Dynamitron Tandem Laboratory of the Central Unit for Ion Beams and Radionuclides of the Ruhr University Bochum in Germany.

## References

- [1] M. Mayer *et al.*, *Nucl. Fusion* 60 (2020) 025001.