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Determination of the stopping power for alpha particles in carbon using resonant scattering

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It is important to have a correct stopping power of the charged particle in a target. Because it directly affects experiments for thick target neutron yield measurements. The experimental stopping power for alpha particles in many substances can have discrepancies of up to 10% according to the database which was created by H. Paul [1]. These discrepancies can be significantly greater in Bragg's peak region. The transmission method, which always is used to measure stopping power, has several limitations. These limitations are accuracy of target thickness measurement, the manufacturing of self-supporting films, target uniformity. We used a different approach based on the resonant scattering of charged particles on target nuclei [2]. This method requires thick targets. Thus its eliminates thickness inhomogeneity. In addition, the accurate value of the resonance energy is not important for this method. We obtained the stopping power for alpha particles in carbon to carry out a benchmark experiment to measure thick target neutron yield from 13C(α,n)16O reaction [3].

1. Claudia Montanari, P. Dimitriou. The IAEA stopping power database, following the trends in stiopping power of ions in matter // Nuclear Instruments and methods in physics research Section B. 408:50-55

2. T.L. Bobrovskiy et al. Determination of stopping power for light ions using resonance backscattering // Nuclear Instruments and methods in physics research Section B. 4 august 2023

3. P.S. Prusachenko et al. Experimental study of thick target yield from the 13C(α,n)16O reaction // Nuclear science and engineering. 9 august 2023.

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