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Measuring B_nat(n, tot) Reaction as an International Standard

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The final accuracy of the evaluations relies on the quality of the experimental datasets being used. But, conversely, the quality of the experimental datasets relies on the quality of the standards used as reference. Big improvements have been done in the last decade, after the IAEA launched an international project for the "Maintenance of the Neutron Cross-Sections Standards", adopting the upgraded version of the GMAP code from ENDF/B. Present Nuclear Data Standards (IAEA NDS) are those collected by A.D. Carlson et al in [1], where it is explained how the short table of principal international standards –the so-called Thermal Neutron Constants (TNC) together with the specific neutron cross-sections of light elements (H, Li6 and B10)- play a relevant role in the whole NDS evaluation by adopting the upgraded version of the GMAP code from ENDF/B.
Mention must be made of the fact that these TNC –which include (n,f), (n,g) and (n,el) reactions–cannot be directly measured as "absolute", trailing so an USU (Unknown Systematic Uncertainty) [see 2] that cannot be removed by statistical analysis. New inputs are needed to increase the quality of this international effort and one of the most sensitive points is the standard value at thermal point of the B10(n,α) reaction, which experimental uncertainty depends on the acknowledge of the flux of the used neutron source.The interest in measuring the B_nat(n,tot) reaction as a way to improve the B10(n,α) standard is discussed in this work. Looking for an absolute Standard around thermal an near-epithermal energy region, the B_nat(n,tot) cross section is well suited because it can be accurately obtained from a neutron transmission experiment by using cumulative thin samples, and based on integrating the cross section function over a wide energy interval. The method and a possible experimental setup will be presented in this work.
REFERENCES
[1] A. D. Carlson, V.G. Pronyaev, R. Capote et al., "Evaluation of Neutron Data Standards," Nucl. Data Sheets 148, (2018)142–187.
[2] R. Capote, S. Badikov, A.D. Carlson et al., "Unrecognized Sources of Uncertainties (USU) in Experimental Nuclear Data," Nucl. Data Sheets 163, (2020)191–227.

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