



Contribution ID: 64

Type: Oral

Neutron Elastic Scattering Differential Cross Sections on ^{13}C

Thursday, July 20, 2023 5:15 PM (15 minutes)

Neutron elastic scattering cross sections on natural carbon serve as a reference standard in the incident energy range 10 eV to 1.8 MeV. The 2017 standards evaluation [1] is 0.5 to 2.0% higher in that energy range than the 2006 standards evaluation [2]. In addition the ENDF/B-VIII.0 and ENDF-VIII.1 releases split the natural carbon cross sections into the isotopes ^{12}C , ^{13}C , and ^{14}C for the first time. These details call for the re-measurement of the ^{13}C cross sections in sensitive regions. Ten elastic scattering angular distributions were recently measured for incident neutron energies between 0.5 and 3.25 MeV. Measurements were made at the University of Kentucky Accelerator Laboratory (www.pa.uky.edu/accelerator/), using nanosecond pulsed beams and time-of-flight techniques. An overview of neutron production and detection, the new digital data acquisition system, and data analysis will be presented.

Results are compared with data from previous measurements and data-base evaluations. This work was supported by the U.S. Department of Energy awards SC0021424, SC0021243, SC0021175, SSC000056, the U.S. National Science Foundation under grants PHY-1913028 and PHY-2209178, the U. S. Naval Academy Midshipmen Research Fund, and the Donald A. Cowan Physics Fund at the University of Dallas.

[1] A.D. Carson, et al., Nucl. Data Sheets 148, 143 (2020) and 163, 280 (2020).

[2] A.D. Carson, et al., Nucl. Data Sheets 110, 3215 (2009)

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Session Classification: Session 13A

Track Classification: Nuclear Reactions