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Definition of a standard neutron field with the 7Li(p,n)7Be reaction

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The reaction 7Li(p,n)7Be has been widely used as neutron source in various experiments for astrophysical and technological applications. Since its neutron energy spectrum resembles a Maxwell-Boltzmann distribution around kT= 25 keV for incident proton energies of 1912 keV and for a proper irradiation geometry, it is specially suited for studying neutron capture reactions of interest for the astrophysical s-process. Moreover the 197Au(n,g) cross-section, which has been measured using this neutron spectrum, is used as a reference cross-section in several other experiments due to its small uncertainty of 1.4% [Ratynski and Kaeppeler, Phys. Rev. C 37, 595–604 (1988)]. For proper interpretation of these results, an accurate knowledge of the neutron spectrum itself is important. This motivated a new measurement of the neutron spectrum of the 7Li(p,n)7Be reaction in frame of EFNUDAT at PTB in Braunschweig, Germany. Pulsed protons of 1912 keV energy (1.5 ns in width), provided by the 3.75 MeV Van-de-Graaf accelerator of the Ion-Accelerator-Facility PIAF, were produced and bombarded onto a metallic Li target with a repetition rate of 625 kHz. The neutron time-of-flight spectrum was recorded by a moveable 6Li-glass detector for angles in steps of 5 deg. from 0 deg. to 65 deg. with respect to the proton beam. A long counter, mounted at an angle of 16 deg. and a distance of about 6 m, monitored the neutron flux for each run. The whole spectrum was measured for two flight paths of 35 and 70 cm, respectively. New results on this measurement will be presented and compared to previous measurements.

Author: LEDERER, Claudia (VERA-Laboratory, Faculty of Physics, University of Vienna, Vienna, Austria)

Co-authors: MENGONI, Alberto (International Atomic Energy Agency - Nuclear Data Section, Vienna, Austria); WALLNER, Anton (VERA-Laboratory, Faculty of Physics, University of Vienna, Vienna, Austria); KAEPPELER, Franz (Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany); DILLMANN, Iris (Physik Department E12 und Excellence Cluster Universe, TU Muenchen, Garching, Germany); MOSCONI, Marita (Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany); NOLTE, Ralf (Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany); GIESEN, Ulrich (Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany)

Presenter: LEDERER, Claudia (VERA-Laboratory, Faculty of Physics, University of Vienna, Vienna, Austria)

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