

NEUTRON SKIN MEASUREMENT WITH PION PHOTOPRODUCTION AT THE MAMI ELECTRON BEAM FACILITY

Lorenzo Zana

University of Edinburgh, Edinburgh EH9 3JZ, Midlothian, Scotland

Information on the size and shape of the neutron skin on ^{208}Pb is extracted from coherent pion photoproduction cross sections measured using the Crystal Ball detector together with the Glasgow tagger at the MAMI electron beam facility. On exploitation of an interpolated fit of a theoretical model to the measured cross sections, the half-height radius and diffuseness of the neutron distribution are found to be $c_n=6.70\pm 0.03(\text{stat.})$ fm and $a_n=0.55\pm 0.01(\text{stat.})^{+0.02}_{-0.03}$ (sys) fm, respectively, corresponding to a neutron skin thickness $\Delta r_{np}=0.15\pm 0.03(\text{stat.})^{+0.01}_{-0.03}$ (sys) fm. The results give the first successful extraction of a neutron skin thickness with an electromagnetic probe and indicate that the skin of ^{208}Pb has a halo character. The measurement provides valuable new constraints on both the structure of nuclei and the equation of state for neutron-rich matter.