Electron Scattering on 12C, the Structure of the Hoyle State and a Neutron Ball for (e,e[1]n) Experiments at the S-DALINAC

By Maksym Chernykh

Cuvillier Verlag Aug 2008, 2008. Taschenbuch. Book Condition: Neu. 211x144x10 mm. Neuware - The present thesis consists of two parts. Part I is devoted to the study of the second $Jpi = 0+$ state (Hoyle state) in 12C. Part II deals with the construction of a neutron detector ball for the electron scattering coincidence experiments. The monopole matrix element for the transition from the ground state to the Hoyle state in 12C through internal pair production is an important quantity for calculation of the 3a reaction rate in supernova nucleosynthesis. Therefore, a new value for the monopole matrix element has been extracted using the high-precision electron scattering data. The 12C(e,e') experiment was carried out at the Lintott spectrometer at the S-DALINAC with beam energies between 29.3 MeV and 78.3 MeV and scattering angles between 69 and 141, corresponding to momentum transfers $q = 0.2 - 0.7$ fm-1. An energy resolution aE 28 keV (FWHM) was achieved. A pair width $T pi = 62.2(10) \times 10$-6 eV was extracted combining a model-independent analysis of the data in the measured momentum transfer range based on plane-wave Born approximation as well as a Fourier-Bessel analysis covering a large momentum transfer range up to...

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