



## Electron Scattering on $^{12}\text{C}$ , the Structure of the Hoyle State and a Neutron Ball for $(e,e'1n)$ 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  $J^{\pi} = 0^+$  state (Hoyle state) in  $^{12}\text{C}$ . 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  $^{12}\text{C}$  through internal pair production is an important quantity for calculation of the  $3\alpha$  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  $^{12}\text{C}(e,e')$  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  $q = 0.2 - 0.7 \text{ fm}^{-1}$ . An energy resolution  $\Delta E = 28 \text{ keV}$  (FWHM) was achieved. A pair width  $\Gamma_{\pi} = 62.2(10) \times 10^{-6} \text{ eV}$  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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