

It is planned to strengthen the lower bound formula and to test some other potentials. An attempt will also be made to estimate the ground-state energy of larger systems ($N=16$ or more). The formulae available at present are inadequate because they give a nonsaturating N -dependence ($E \propto N^2$).

References

- 1) F. Bopp, *Zeitschrift für Physik* **156** (1959) 348;
- 2) A. J. Coleman, *Rev. Mod. Phys.* **35** (1963) 668;
- 3) R. L. Hall, *Proc. Phys. Soc. (London)* **91** (1967) 16; E. G. Weideman, *Nucl. Phys.* **65** (1965) 559;
- 4) Tabakin, *Ann. Phys.* **30** (1964) 51.

B6 The Electromagnetic Formfactor for ${}^3\text{He}$ and ${}^4\text{He}$

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B7 An Exact Solution of the Three-Body Problem and the Triton

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An exact solution of the quantum mechanical three body problem has been found in a closed analytical form for harmonic oscillator forces acting between pairs of three particles¹⁾. The solution can easily be applied to various nuclear physics problems involving the bound state of three-particle systems, where the particles could represent nucleons (${}^3\text{H}$ and ${}^3\text{He}$) or some other composite particles (alpha and two nucleons in the case of ${}^6\text{Li}$), etc. The solution involving harmonic oscillator forces should be regarded only as approximative due to the simplified nature of the forces involved.

The simplest nuclear system for the application of this general three-body solution is the triton. Using triton data alone one can obtain information on the intensities of the three forces involved. The harmonic oscillator force does not include the interaction range parameter, but it is possible to introduce such a parameter artificially by interpreting the results of the parabolic potential as if it were a cut-off potential. In our calculations we used three physical parameters of the triton: (i) the mass radius, $R_m = 1.780$ fm, (ii) the charge radius, $R_c = 1.70$ fm, and (iii) the binding energy, $B = 8.492$ MeV. These parameters do not determine uniquely the intensities of the three forces involved. If one varies the depth of the potential well for the neutron-proton interaction from, for example, 10 MeV to 16 MeV, it follows that the depth of another neutron-proton interaction ranges from 26 MeV to 20 MeV, while the neutron-neutron interaction shows only a slight variation from 13 MeV to 11.6 MeV. In addition to potential depth, potential ranges were also taken into account. Their

main feature is that with the above depth variation the first interaction shows a slight decrease, and the second a slight increase in the two neutron-proton ranges. The range of neutron-neutron interaction remains almost constant (about 3.5 fm). This indicates that the neutron-neutron interaction is almost independent of the relative intensities of the two neutron-proton interactions. Thus the estimate of the neutron-neutron interaction can be represented by a cut-off parabolic potential with a depth of about 12 MeV and a range of approximately 3.5 fm. The effect of the spin-dependent and tensor force has not been considered. Further details and results on the proposed triton model are being prepared for publication.

Reference

- 1) E. Coffou, to be published in *Nuovo Cimento*.