A microscopic theory of the neutron

J.X. Zheng-Johansson

Inst of Fundamental Physics Research
IOFPR, Svartar, Nykoping
Sweden
jxzj100a@gmail.com

A microscopic theory of the neutron, which consists in a neutron model constructed based on key relevant experimental observations, and the first principles solutions for the basic properties of the model neutron, is developed within a framework consistent with the Standard Model. The neutron is proposed to be composed of an electron e and a proton p that are separated at a distance $r_1 \sim 10^{-18}$ m, and are in relative orbital angular motion and Thomas precession highly relativistically, with their reduced mass moving along a quantised $l = 1$th circular orbit of radius r_1 about their instantaneous mass centre. The associated rotational energy flux or vortex has a spin angular momentum $\frac{1}{2}\hbar$ and is identifiable as a (confined) antineutrino. The particles e, p are attracted with one another predominantly by a central magnetic force produced as result of the particles' relative orbital, precessional and intrinsic angular motions. The interaction force (resembling the weak force), potential (resembling the Higgs' field), and a corresponding excitation Hamiltonian (H_I), among others, are derived based directly on first principles laws of electromagnetism, quantum mechanics and relativistic mechanics within a unified framework. In particular, the equation for $\frac{4}{3}\pi r_1^3 H_I$, which is directly comparable with the Fermi constant G_F, is predicted as $G_F = \frac{4}{3}\pi r_1^3 H_I = A_o C_{01}/\gamma_e\gamma_p$, where $A_o = e^2\hbar^2/12\pi\epsilon_0 m_e^0 m_p^0 c^2$, m_e^0, m_p^0 are the e, p rest masses, C_{01} is a geometric factor, and γ_e, γ_p are the Lorentz factors. Quantitative solution for a stationary meta-stable neutron is found to exist at the extremal point $r_{1m} = 2.513 \times 10^{-18}$ m, at which the G_F is a minimum (whence the neutron lifetime is a maximum) and is equal to the experimental value. Solutions for the neutron spin ($\frac{1}{2}$), apparent magnetic moment, and the intermediate vector boson masses are also given in this paper.