

Determination of Proton and Neutron Radii

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In note we calculate Proton and Neutron radii[1,2]

The Newtonian gravitation formula has the following form .

$$F = -G \frac{M_1 M_2}{R^2} \quad (1)$$

We assume

$$G = K_0 \rho_1 \rho_2 \quad (2)$$

Where ρ_1 and ρ_2 denote the densities of both M_1 and M_2 separately. Using the

Cavendish experiment we determine K_0 . In (2) $G = 6.7 \times 10^{-8} \text{ cm}^3/\text{g sec}^2$ and the density of

lead $\rho_1 = \rho_2 = 11.37 \text{ g/cm}^3$. From (2) we have

$$K_0 = 5.2 \times 10^{-10} \text{ cm}^9/\text{g}^3 \text{ sec}^2 \quad (3)$$

Thus, K_0 is new gravitational constant.

By using (2) we determine the proton radius γ_p . From (2) we have

$$\gamma_p = \left(\frac{9K_0 m_p^2}{16\pi^2 G_s} \right)^{1/6} \quad (4)$$

In the nucleus the strong interaction prevails. We have [3].

$$\frac{\text{strong interaction}}{\text{gravitational interaction}} = \frac{G_s}{G} = 10^{38} \quad (5)$$

where $G_s = 6.7 \times 10^{30} \text{ cm}^3/\text{g sec}^2$. We know the proton mass $m_p = 1.67 \times 10^{-24} \text{ g}$. From (4) we

obtain the proton radius

$$\gamma_p = 1.5 \times 10^{-15} \text{ cm} = 1.5 \text{ jn} \quad (6)$$

In the same way we have the neutron radius

$$\gamma_n = 1.5 \times 10^{-15} \text{ cm} = 1.5 \text{ jn} \quad (7)$$

Pohl, et al obtain the size of proton 3 fm [4].

References

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