Fundamental constants of nucleon-meson dynamics

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Запропоновано новий феноменологічний підхід для обчислення констант протону та нейтрону. В основу роботи покладено нестандартну ідею: стала Планка $\hbar$ та швидкість “світла” (мезону) c в нуклон-мезонній динамиці відмінні від цих же констант в квантовій електродинамиці.

In this paper, we are proposing an approach to calculate fundamental physical constants that characterize nucleon-meson dynamics. The approach is based on the referenced papers [1, 2], and on the premise that fundamental constants are reducible to mathematical relations and operations, which can be used to predict, define and calculate other fundamental “natural” unit systems (quanta).

At the present, we have, when compared to available data on quantum electrodynamics (electron-photon dynamics), very limited experimental fundamental constant data for the proton and the neutron. Such constants as the neutron or proton radius, or the Rydberg constant are not adequately defined in nucleon-meson dynamics.

From experiment, we know the mass and the charge of proton and neutron. Other physical characteristics such as nuclear magneton. Compton wavelength of the proton and the neutron are derived quantities, that incorporate $\hbar$ and c constants in the relations. It is presently assumed in physics that electrodynamic constants of $\hbar$ and c are applicable to characterization of nucleon-meson dynamics. Our calculations show that constants $\hbar$ and c for nucleon-meson dynamics are different from the same constants in quantum electrodynamics. This is natural, because the electron emits a photon, while the nucleon emits a meson.

We propose that standard formulas for fundamental characteristics of proton and neutron can be modified to represent the nucleon-meson constants and not electrodynamic constants. Below we show the proposed modifications (Definitions of Quantities are shown in [2]):

	Standard Relationships	**Proposed Relationships**
Compton Wavelength of proton	$\lambda_p = \hbar/m_p c$	$\lambda_p = \hbar_p m_p v_p$
Compton Wavelength of neutron	$\lambda_n = \hbar/m_n c$	$\lambda_n = \hbar_n/m_n v_n$
Proton magneton	$\mu_p = q\hbar/2m_p c$	$\mu_p = q_p\hbar_p/2m_p v_p$
Neutron magneton	$\mu_n = q\hbar/2m_n c$	$\mu_n = q_n\hbar_n/2m_n v_n$
Proton radius		$r_p = \hbar_p\alpha_{fp} m_p v_p$, $\hbar_p \neq \hbar$
Neutron radius		$r_n = \hbar_n\alpha_{fn}/m_n v_n$, $\hbar_n \neq \hbar$

where v_p and v_n are velocities of mesons which are emitted by proton and neutron. In our approach, we assume that:

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1. The physical relationships between quantities are the same for all inertial frames of reference.

2. The scale-symmetry is a fundamental concept in all of physics, including the photon, electron, meson, proton, neutron, etc.: that is, the scale-invariance of the physical relationships between quantities with respect to the scale group.

3. Physical quantities have a fundamental relationship to, an equilibrium frame of reference and that the equilibrium frame of reference is scale invariant [2].

When we consider that the laws of physics are invariant in all inertial frames of reference, and that the scale-symmetry is a fundamental aspect of physical relationships and constants, constant values that deal with quantum electrodynamics (constants that satisfy physical relationships for electron mass, photon, Compton wavelength, etc., ([2] — Table 1), are not applicable for the proton or neutron, which have different masses and hence, different scales of reference.

Earlier [2] we stated that:

$$1 = \left(q_1^{x_1} q_2^{x_2} q_3^{x_3} \cdots q_s^{x_s}\right) / \left(p_1^{j_1} p^{j_2} 2 p_3^{j_3} \cdots p_z^{j_z}\right) \tag{1}$$

or,

$$1 = Y'/KX, \tag{2}$$

where

$$Y' \equiv \left(q_1^{x_1} q_2^{x_2} q_3^{x_3} \cdots p_z^{j_z}\right), \tag{3}$$

$$1/KX \equiv \left(p^{j_1} p^{j_2} p_3^{j_3} \cdots p_z^{j_z}\right), \tag{4}$$

$(q_s)^0 = 1, \quad (q_s^{-1})^0 = 1,$

$q_{1'}, q_{2'}, q_{3'}, \ldots, q_{s'}, p_{1'}, p_{2'}, q_{3'}, \ldots, p_{z'}$ are quantities,

$x_{1'}, x_{2'}, x_{3'}, \ldots, x_{s'}, j_{1'}, j_{2'}, j_{3'}, \ldots, j_{z'}$ are real numbers,

K is the slope for line $Y' = KX$,

$j, s, x, z = 1, 2, 3, \ldots.$

We require that the equations (1) and (2) are scale invariant. That is the equations (1) and (2) are invariant with respect to the following transformations:

$$q_1 \to q_1' = aq_1, \quad q_2 \to q_2' = aq_2, \quad q^3 \to q_3' = aq_3, \quad \ldots, \tag{5}$$

$$p_1 \to p_1' = ap_1, \quad p_2 \to p_2' = ap_2, \quad p^3 \to p_3' = ap_3, \quad \ldots, \tag{6}$$

where "a" is a scale transformation parameter, and all physical quantities (q_s and p_z) have to be subjected to transformation. Hence, based on equations (1) and (2), it follows that "1" is always invariant with respect to scale transformations (5) and (6).

Thus, electron, proton, and neutron constants are on the lines:

$$1 = Y'/K_eX, \quad \text{where } K_e \text{ is the slope for electron line,} \tag{7}$$

$$1 = Y'/K_pX, \quad \text{where } K_p \text{ is the slope for proton line,} \tag{8}$$

$$1 = Y'/K_nX, \quad \text{where } K_n \text{ is the slope for neutron line,} \tag{9}$$

Table 1. Fundamental Constants of Proton Dynamics

Symbols	Constants	Relationships of Quantities
V_{op}	$1,075827 \cdot 10^{-36}$	$V_{op} = m/d$
h_p	$2,667688 \cdot 10^{-30}$	$h_p = W/f$
m_p	$1,672623 \cdot 10^{-27}$	$m_p = F/Y$
S_p	$1,440869 \cdot 10^{-22}$	$C_p = q/V$
L_p	$5,635247 \cdot 10^{-18}$	$L_p = \phi/i$
ϕ_p	$3,491143 \cdot 10^{-15}$	$\phi_p = F/H$
S_p	$1,024662 \cdot 10^{-12}$	$S_p = V/E$
W_p	$2,162829 \cdot 10^{-12}$	$W_p = Pt$
λ_p	$4,435318 \cdot 10^{-11}$	$\lambda_p = v/f$
α_{fp}	$1,155117 \cdot 10^{-2}$	$\alpha_{fp} = S/2\lambda$
1	$1,000000 \cdot 10^{0}$	$1 = GR$
$R_{\infty p}$	$1,504171 \cdot 10^{6}$	$R_{\infty p} = \alpha_{fp}^3/S$
D_p	$1,681364 \cdot 10^{7}$	$D_p = q/A$
V_p	$3,595937 \cdot 10^{7}$	$V_p = H/D$
B_p	$3,325110 \cdot 10^{9}$	$B_p = E/v$
H_p	$6,046079 \cdot 10^{14}$	$H_p = i/S$
E_p	$1,195689 \cdot 10^{17}$	$E_p = V/S$
f_p	$8,107560 \cdot 10^{17}$	$f_p = W/h$
ω_p	$3,509387 \cdot 10^{19}$	$\omega_p = (\alpha)^{1/2}$

Table 2. Fundamental Constants of Neutron Dynamics

Symbols	Constants	Relationships of Quantities
V_{on}	$1,077819 \cdot 10^{-36}$	$V_{on} = m/d$
h_n	$2,671749 \cdot 10^{-30}$	$h_n = W/f$
m_n	$1,674929 \cdot 10^{-27}$	$m_n = F/Y$
C_n	$1,442489 \cdot 10^{-22}$	$C_n = q/V$
L_n	$5,640249 \cdot 10^{-18}$	$L_n = \phi/i$
ϕ_n	$3,493739 \cdot 10^{-15}$	$\phi_n = F/H$
S_n	$1,025295 \cdot 10^{-12}$	$S_n = V/E$
W_n	$2,164127 \cdot 10^{-12}$	$W_n = Pt$
λ_n	$4,437681 \cdot 10^{-11}$	$\lambda_n = v/f$
α_{fn}	$1,155214 \cdot 10^{-2}$	$\alpha_{fn} = S/2$
1	$1,000000 \cdot 10^{0}$	$1 = GR$
$R_{\infty n}$	$1,503623 \cdot 10^{5}$	$R_{\infty n} = \alpha_{fp}^3/s$
D_n	$1,680739 \cdot 10^{7}$	$D_n = q/A$
V_n	$3,594539 \cdot 10^{7}$	$V_n = H/D$
B_n	$3,323482 \cdot 10^{9}$	$B_n = E/v$
H_n	$6,041484 \cdot 10^{14}$	$H_n = i/S$
E_n	$1,194639 \cdot 10^{17}$	$E_n = V/S$
f_n	$8,100040 \cdot 10^{17}$	$f_n = W/h$
ω_n	$3,505861 \cdot 10^{19}$	$\omega_n = (\alpha)^{1/2}$

The equations (7)–(9) are straight lines in the $X - Y'$ plane that go through the Absolute frame of reference of 1. Therefore, all electron, proton, and neutron constants are located on straight lines that have fixed slopes of K_e, K_p, and K_n, and a common hidden Absolute frame of reference of 10° or 1. Note, because the lines with slopes K_e, K_p, and K_n go through the center of equilibrium, it requires only one constant and the Absolute frame of reference of 1 to compute another set of constants for a new particle.

We computed constants that characterize proton and neutron, by raising electrons constant values ([2] — Table 1) to a power of the difference between the masses of the proton (and neutron) and the electron [$\ln m_p/m_e = 0,89135$ and $\ln m_n/\ln m_e = 0,89133$]. Some of the calculations are listed in the Tables 1 and 2.

1. Bedrij O., Fundamental constants in quantum electrodynamics, *Dopovidi Ukrainian Academy of Sciences*, 1993, № 3, 40–45.
2. Bedrij O., Scale invariance, unifying principle order and sequence of physical quantities and fundamental constants, *Dopovidi Ukrainian Academy of Sciences*, 1993, № 4, 67–73.