

Does the Vacuum Field Contain More Particles Besides Praons?

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Abstract: The speed of light is derived with respect to the structure of the vacuum field, after the cross-section of particles in that field is bound to positive nucleons of the atom. The vacuum field has been defined by two classes of interacting particles (some known in modern physics but undetected, and others that are proposed). Furthermore, these proposed particles are considered contributors to fundamental quantities in Quantum Mechanics.

Keywords: particles; vacuum field; speed of light.

1 Introduction

Do praons actually exist? Can they be prospected, and are there modern experiments that confirm the existence of these particles? If we consider the notion that they are charged components of the vacuum field, as suggested by Fedosin [1], they could be located in the vicinity and/or inside any electrical charges of atoms.

We will hardly be able to locate and mathematically describe praons within an absolute vacuum chamber devoid of electrical charges. These are good physical references that we need, as praons would have to be electrically supplied by them when in contact with particles endowed with quantum fields.

And given that light is a physical agent that propagates in a vacuum, its derivation would be feasible considering the information concerning the praons, the medium in which it propagates.

Fedosin [2], derived the formula for the speed of light in terms of the density of the praons and their radii. We proposed a different method, which directly involves particles, which are considered to be carriers of the praons themselves. The advantage

is that this method seems to indicate the existence of other particles in the vacuum field, which also interact with the quantum field of larger particles.

2. Quantum Field Conditions Favorable to Praons

Although direct detection and observation of praons are currently unfeasible, hypotheses can be explored within these scenarios of uncertainty. One such hypothesis is that the mass and energy of electric charges are the source of praon cross-sections, which are much smaller than the charges themselves, but are powered by their quantum fields.

In the case of protons, there would be praons that would be inextricably participating in exchanges between internal quantum fields, which is deducible from the work of Peskin and Schroder [3]. Thus, we define the conditions for praons to act in these regimes.

If there are indeed intrinsic praons to electric charges, the speed of light should be measurable within these quantum conditions imposed by quantum fields, which characterize the excitation of the vacuum field.

If praons are active in ultramicroscopic regimes, it is necessary that we prove that they have a quantum basis. The previous hypothesis suggests that the mass of subatomic particles in very small regions may be a source of praons, whose cross-section is supported by a quantum-relativistic path in terms of the factors involved.

In Figure 1, we have a graphical representation of the cross-section along with some of the elements that make up the quantum field of the proton, its quarks.

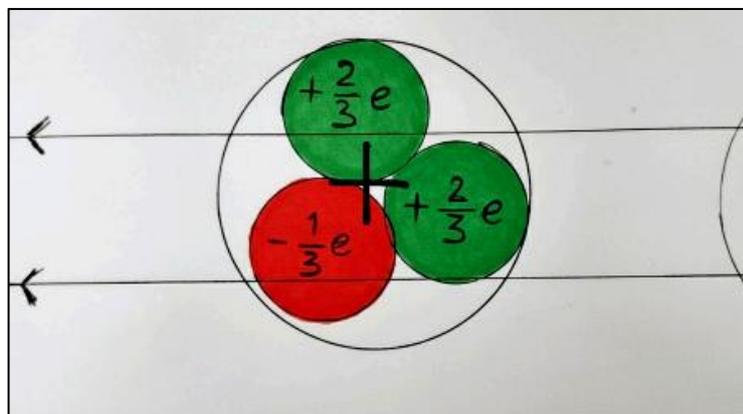


Fig 1. Positive charge (proton) and praon lines that pass through it.

This configuration is associated with the formula shown in [1]:

$$\vartheta = \sigma \sqrt{\frac{\Gamma}{G}} = 2,67 \cdot 10^{-30} m^2 \quad (1)$$

Here ϑ is the cross-section of charged particles in the vacuum field, and:

$$\Gamma = \frac{e^2}{4\varepsilon_0 M_p M_e} = 1,514 \cdot 10^{29} m^3 kg^{-1} s^{-2} \quad (2)$$

is the strong gravitational constant introduced by Fedosin [4], G is the gravitational constant, and σ is the cross-section of the graviton flux interacting with matter particles.

However, this expression does not give a quantum meaning to the charged particles of the vacuum field (praons), but this will change shortly. In fact, the same cross-section of these tiny particles is described in this way:

$$\vartheta = \frac{(\hbar + h)2R_p}{\frac{m_p}{c}} \approx 2,67 \cdot 10^{-30} m^2 \quad (3)$$

Here h is Planck's constant and $\hbar = h/2\pi$ is its reduced version, R_p is the radius of the proton, m_p the mass of the proton and c is the speed of light. Interestingly, the speed of light is derived, showing that it is a resultant of vacuum praons. Based on (3) and in the radius of the proton in the consistent model [5], we define that the speed of light can be obtained inside a proton as:

$$2 \left(\frac{hR_p}{\vartheta m_p} + \frac{R_p \hbar}{\vartheta m_p} \right) = 2,998945928 \cdot 10^8 \text{ ms}^{-1} \quad (4)$$

The percentage difference compared to c is 0.034%. This allows us to draw a parallel with Maxwell's equation:

$$2 \left(\frac{hR_p}{\vartheta m_p} + \frac{R_p \hbar}{\vartheta m_p} \right) \approx \frac{1}{\sqrt{\varepsilon_0 \mu_0}} \quad (5)$$

Furthermore, the cross-section of praons can also be expressed as:

$$\vartheta = 2 \left(\frac{\hbar R_p}{m_p c} + \frac{h R_p}{m_p c} \right) \sim 2,67 \cdot 10^{-30} m^2 \quad (6)$$

Would there be any experiment in which the formulas about praons would be testable? Under extreme energy conditions, of a higher order than those generated in current particle accelerators, the cross-section of charged particles in the vacuum field would become more evident in terms of measurement.

The cross-section of praons would tend to grow as the mass density of the charge considered - proton or electron - also increased.

This increase in the mass density of the particle would be a consequence of relativistic influences, such as Lorentz contraction (which would cause the mass to become more compressed, with the decrease in radius).

In particle accelerators, if protons travel at speeds approaching 100% of the speed of light, cross-sections of praons would be present along with the charge. In the event of conflicting data with the Standard Model, praons could be considered influential factors. Considering a proton, its cross-section in these situations is described by this formula:

$$\vartheta = \gamma \frac{\frac{\gamma m_p}{\gamma^2 \rho_0}}{R'_p} \quad (7)$$

Where γ is the Lorentz factor, m_p is the mass of the proton, ρ_0 is the density of the particle measured relative to its rest mass, and R'_p is the radius of the particle after the Lorentz contraction, that is:

$$R'_p = R_p \sqrt{1 - \frac{v^2}{c^2}} \quad (8)$$

In particle accelerators, the quantum fields of the proton are intensified at high speeds, increasing the cross-sectional area of praons. However, these will still exhibit slightly minute portions of the elementary charge (e).

3 Are praons really the only ones in the vacuum field?

Praons are considered the means of propagation of light, but what if they are not the only ones? We raise this question because, according to Abhayakoon [6], the contribution to the spin of protons is a small portion given by their quarks and another small portion given by gluons.

Considering the hypothesis that there are other particles besides praons, they should have a section close to the cross-section; a longitudinal section. In conjunction, these particles - known and unknown - would contribute to the electromagnetic nature of the charge and its properties. In other words, praons and these particles in longitudinal section should contribute to the total spin of protons.

In Figure 2, we see that the quantum field of the proton is associated with particles of the vacuum field. In addition to the cross-section of charged particles of the vacuum field, there is also another longitudinal section, which indicates more vacuum entities positioned on the vertical axis of the proton. Because these particles are located on the axis, we will call them "axisons".

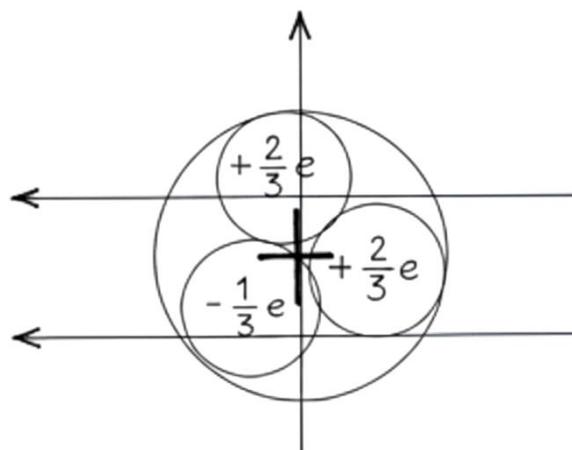


Fig 2. Cross-sectional and longitudinal views of particles in the vacuum field interacting with each other and with the proton.

In this case, the longitudinal section of the axisons would be larger than the cross-section of the praons in the proton bound to the atom, and would be defined as follows:

$$\mathcal{L} = \frac{4\pi^2 R_p \hbar}{m_p c} = 7,2 \cdot 10^{-30} m^2 \quad (9)$$

And axisons, as well as praons, would be influenced by the quantum fields of charges accelerated to speeds close to that of light in particle accelerators. The tendency is for the longitudinal section to be larger the greater the energy of the accelerated particle.

If the signature of praons in the vacuum field is confirmed in experiments, the next traces to be investigated will be those of axisons, which requires that the vacuum be perturbed by means of quantum fields.

4. Final Considerations

The hypothesis that the mass of particles or electric charges is a source of praons seems to be supported by the formulas that give them a quantum character.

And these same formulas allow us to derive the speed of light, which emerges from the structure of the vacuum field, composed of praons and axisons, which interact at specific points of the charge that contains them. In this sense, the factor c would not be an arbitrary constant of Special Relativity or of the universe, but a speed that is conditioned by the praon medium (cross-section), close to the hypothetical axisons (longitudinal section).

If axisons coexist with praons, the spatial arrangement of the former should contribute to the spin of subatomic particles, an important quantity in Quantum Mechanics. (Remember that the integral contribution to the spin of the proton is not yet fully clarified in experiments).

In this sense, axisons were proposed in this work in order to qualitatively describe the magnetic field of protons. Thus, axisons would be powered by the quantum fields of particles larger and heavier than themselves.

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