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How do Neutral Photons Carry the Sign & Value of Charge?

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Abstract: Virtual field quanta carry an interaction between particles. The opinion is expressed that the difference between the fields of positive and negative charges, can be conditioned by the helical differences of the corresponding virtual photons. But some difficulties arise when one tries to explain the mechanism by which the very charge value is carried.

According to the modern representations learned from the quantum field theory, a force between two particles is transmitted by the exchange of virtual particles (field quanta). A charge is associated with every force and charged particles feel this force through the interaction with the virtual particle which carries this force.

Electrodynamics is the most habitual example. The particles which feel the force have an electric charge. Their interaction is described by the known Coulomb law shown here:

$$\vec{F}_C = \frac{e_1 e_2 \vec{r}}{r^3} \,. \tag{1}$$

This force is transmitted by the exchange of virtual photons with a spin of 1. Since photons themselves have no charge label, the only possibility for the difference between the transmission of the positive and negative charges, is that it may be connected with the direction of their spin (their helical nature). Suppose that the directions of the photon spin and the corresponding force line are coincident for a positive charge and opposite for a negative one. Then, the repulsion of the same charge is characterized by the anti-parallel spins of their photons on the line joining their charges. These spins are parallel in case of attraction.

Recall now that the photon's irradiation by moving charges is treated as a transformation of the virtual photons in real ones. Therefore, the photon helices emitted by the positive and negative charges must have opposite signs. In macroscopic language, the electromagnetic radiation (considered a photon's beam) will have a right or left polarization.

The discussed problem makes one ponder over another question. How do neutral photons carry the very charge value? It would seem, different (proportional) numbers of virtual photons must be up (in accordance with the principle of fields superposition) in order for there to be different charge values. But this picture contradicts the generally accepted representation that the infinite number of virtual photons form even the field of a solitary charge. Apparently, the only possibility to conserve the very notion 'virtual photon' consists in the assumption that the unit charge field is described by the finite number of such photons. And what kind of mysterious number would that be? The other possibility is connected with a proportional change of the momentum spectrum of virtual photons. However, it is hard to coordinate this with the above principle of superposition.

Relativistic gravidynamics [1,2] has much in common with electrodynamics. Recall that its initial characteristics are the Lorentz-invariant gravitational charge-mass and a 4-vector potential (the time component of which is Newton's potential). Its similarity with electrodynamics allows one to suppose that the quantum of a gravitational field graviton, has spin 1 (as does the photon). Newton's force

$$\vec{F}_N = -G\frac{m_1 m_2 \vec{r}}{r^3} \tag{2}$$

has another sign other than Coulomb's force since it describes the attraction of two identical (positive) charges. As a result, the anti-parallel spins of gravitons (on the line joining m_1 and m_2) are up to the gravitational interaction.

Conclusion: The difference between the fields of positive and negative charges can be explained by the helical ('sign labels') difference of corresponding virtual neutral photons. However, attempts to explain the mechanism for the carrying of that very charge, leads to contradictions.

References

[1] V.N.Strel'tsov, "On the Lorentz-Covariant Theory of Gravity", Apeiron **6,** 55 (1999).

[2] Idem, "Gravitational Consequences of Lorentz Covariance", Galilean Electrodynamics **12,** SI 2, 27 (2001).