A Note on the Interaction between Particles

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The interaction between particles is carried out by the exchange of real particles.

Key words: real force carriers.

The interaction between particles is produced by forces. In the case of the classical electric vector field, for example, the force is exerted across the so-called lines of force. By convention, the electric lines of force are directed outward for positive electric charges and inward for negative electric charges. Then, two electric charges of the same sign repel each other because their lines of force go in opposite directions, and two electric charges of different sign attract each other because their lines of force go in the same direction. Then, in the last case, when the two approaching opposite charges arrive at the same point, the lines of force are closed becoming free particles. These free particles are real photons (or real electromagnetic waves). This is what happens with an oscillating electric dipole when radiates electromagnetic waves. Therefore, we may consider that the lines of force of the classical vector fields are real carrier particles of the forces.

In a recent note on the classical vector fields [1], we have obtained the laws of Coulomb, Biot-Savart and Newton, defining the corresponding field as proportional, k, to the number of lines of force per unit area, N/S, per solid angle, S/r^2:

$$\vec{\Phi} = k\frac{N}{S}\frac{S}{r^2}\vec{u}_r = k\frac{N}{r^2}\vec{u}_r \tag{1}$$

Thus, for example, for the electric field produced by the source electric charge, q_1, it would be

$$\vec{E}_1 = k_e\frac{N}{S}\frac{S}{r_1^2}\vec{u}_r = k_e\frac{N}{r_1^2}\vec{u}_r = \frac{1}{4\pi\varepsilon_0}\frac{q_1}{r_1^2}\vec{u}_r \tag{2}$$

ε_0 being the electric permittivity of the vacuum, with

$$k_e N = \frac{1}{4\pi\varepsilon_0}q_1 \tag{3}$$

And the electric force on a test electric charge, q_2, would be

$$\vec{F}_{e12} = q_2\vec{E}_1 = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r_{12}^2}\vec{u}_r \tag{4}$$

But now, N would be the number of real force carriers; photons, for the electric and magnetic fields, and gravitons, for the gravitational field. Naturally, the real force carriers are emitted but also absorbed by the particles. Thus, an electron, for example, emits and adsorbs photons and gravitons. We think, therefore, that it is an error to consider the forces as the exchange of virtual particles. The particles exchanged are real. There are no virtual particles.

In summary, the interaction between particles is carried out by the exchange of real particles.

[1] José Francisco García Juliá, A Note on the Classical Vector Fields, February 13, 2013.
http://vixra.org/pdf/1302.0081v1.pdf