The Field Nature of Spin for Electromagnetic Particle

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The electromagnetic field model of elementary particle with spin is considered [1,2,3]. The particle in this approach is a space localized solution of a nonlinear field model.

There are the four main observed parameters of elementary particle: mass, spin, charge, and magnetic moment. They appear naturally in the presented approach when the long-range interaction between the particles is considered with the help of a perturbation method [4]. The mass and the spin are calculated as the integrals from energy and angular momentum densities accordingly. They characterize the particle solution near a localization region. But the charge and the magnetic moment characterize a behavior of the particle solution field at infinity [4].

The various static electromagnetic field configurations with spin are considered:

- Bidyon contains two point dyon singularities [1,2].
- Configuration obtained from Coulomb field by space shift with complex number parameter [5]. It has a disk-shaped singularity of the electromagnetic field.
- Configuration with toroidal symmetry. It has a ring singularity of the electromagnetic field.

All these configurations are solutions of the linear electrodynamics model. They are finite spins calculated as the integrals from the spin densities. In each case a value of the calculated spin is proportional to the square of the full charge. The spin is independent of the characteristic size parameter for the field configuration, i.e. the distance between the dyons or the radius of the disk or the radius of the ring.

A modification of the particle solution for the case of the nonlinear model is discussed.

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