About Magnetic Monopoles

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Abstract

The hypothesis of intrinsic magnetic monopoles states that these are elementary particles with magnetic charges and electric spins. Magnetic monopoles can be generated by splitting a photon in a strong magnetic field. According to this concept at least a magnetic lepton, magnetic baryon, magnetically neutral monopole and its antiparticles exist. This article discloses the basic properties of intrinsic magnetic monopoles.

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Introduction

According to the concept of intrinsic magnetic monopoles [1] the photon can split into monopole-antimonopole pairs. Depending on the energy of the photon, magnetic leptons or magnetic barions should be generated. Magnetic leptons refer to electric leptons, i.e., electrons and positrons. Magnetic barions refer to electric barions, i.e., protons, neutrons and their anti-particles. Magnetic particles differ from electric ones only by charge. The electric charge may be plus or minus. The magnetic charge may be N (north pole) or S (south pole).

The magnetic charge of a magnetic lepton (anti-lepton) is the quantum of a magnetic field source. The magnetic charge of magnetic particles is opposite to magnetic charge of anti-particles.

Basic properties

Electric particles have an electric charge plus or minus and magnetic momentum. In this case the electric field is potential, but the magnetic field is solenoidal. The electric neutron (ordinary) has both a plus and minus charge which mutually compensate each other. Therefore the common electric charge of the neutron is zero.

Magnetic particles have magnetic charges, usually called north or south poles, and electric momentum. In this case electric field is solenoidal, but magnetic field is potential. The magnetic neutron has both isolated north and south poles (charges) which mutually compensate each other. Therefore the common magnetic charge of the magnetic neutron is zero.

The electric neutron decays [2] to a proton and an electron. The anti-neutron decays to an anti-proton with a negative charge and a positron with a positive charge.

Accordingly the magnetic neutron should decay to the magnetic proton and to the magnetic lepton with opposite magnetic charges (poles). The magnetic anti-neutron should decay to the magnetic anti-proton and to the magnetic anti-lepton with an opposite magnetic charge.

The common property of all said particles is mass and therefore a gravity field. The leptons have rest mass equal to 0.511 MeV. The charged baryons have mass equal to 938 MeV. The neutral baryons have mass equal to 939.5 MeV. The anti-particles differ from ordinary particles by an opposite sign of mass, charge, parity and local time flow [3].

Mutual interaction of particles

Theoretically there is a possible existence of four types [4] of Universes, i.e., an electric Universe, a magnetic Universe and their Antiverses which are built up from antimatter.

It is impossible to find out in which type of a Universe the observer is located. All laws of physics, properties of particles and therefore those of matter in each particular type of a Universe are the same. The only differences are in the interaction between the particles of different types of Universes.

Generally matter annihilates with antimatter. In particular, annihilation is possible only in cases when conservation laws are not violated. Therefore an electric lepton (electron) can annihilate only with an electric anti-lepton (positron), but cannot annihilate with an electric baryon (proton) or an electric anti-baryon (anti-proton). In the first variant all conservation laws are valid. Under the last two variants annihilation is impossible because of the violation of baryon number conservation.

The annihilation of ordinary particles with magnetic particles violates the electric and magnetic charge conservation laws. For this reason, ordinary (electric) matter cannot annihilate with magnetic matter or antimatter. Magnetic particles can annihilate only with opposite magnetic particles (antiparticles).

The electromagnetic interaction between ordinary particles and magnetic particles requires additional research. In ordinary matter the electric field is potential and the magnetic field is solenoidal, but in magnetic matter the electric field is solenoidal and the magnetic field is potential. The interaction between the potential and solenoidal fields is unclear and may be very weak. The interaction of magnetic and electric particles may be limited to the orientation of the solenoidal field towards the potential field.

Gravity and nuclear (strong) interactions are common for all types of particles. There is no reason why electric or magnetic forces should affect the gravity or nuclear forces.

Size of magnetic monopoles

The force between electric elementary charges (electrons) is determined by the Coulomb law: $F_E = e^2 / 4\pi\varepsilon_0 r^2$, (1)

where: e – charge of electron;

ε_0 – permittivity of vacuum;

r – distance between charges.

The force between magnetic elementary charges is similar:

$$F_M = e_M^2 / 4\pi\mu_0 r^2 , \qquad (2)$$

where: e_M – charge of monopole;

μ_0 – permeability of vacuum;

r – distance between charges.

Electric forces and magnetic forces are equal: $F_E = F_M$.

Therefore from equations (1 and 2): $e^2 \mu_0 = e_M^2 \varepsilon_0$ (3)

In the SI system the permeability was defined exactly: $\mu_0 = 4\pi\ 10^{-7}$ H/m.

because: $c^2 = 1/ (\mu_0\ \varepsilon_0)$, from equation (3) follows:

$e_M = \mu_0\ c\ e = 4\pi\ 10^{-7}*3\ 10^8 * 1.6\ 10^{-19} \sim 6\ 10^{-17}$ Wb,

where: c – speed of light.

The difference of magnitude between electric and magnetic charges arises from the permeability definition in the SI system. Therefore the above difference does not exist in nature. It is reasonable to define the permeability as equal to the permittivity: $\mu_0 = \varepsilon_0$. In this case the speed of light is $c = 1/\mu_0 = 1/\varepsilon_0$. It simplifies many equations of the electromagnetic theory.

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