Neutrino Mass, Radius and Maximal Velocity

The Cern neutrino velocity-faster- than- light experiment calls into question the basic assumptions of Relativity and Quantum theory. Einstein's 1905 interpretation of the 1903 Kaufmann experiment as being due to an increase of electron mass to infinity when the electron velocity increased to the speed of light now seems mistaken. (The Einstein Lorentz factor $\sqrt{1-v^2/c^2}$ applied to time dilation and space contraction is also called into question.)

Another interpretation regarding mass that now seems more plausible is that, as the electron is accelerated, there is an increase in its magnetic responsiveness which becomes non linear as the velocities approach the speed of light, Thus estimates of mass and mass energy of neutrinos and beta electrons, muons etc from their deflections in a magnetic field are subject to revision.

The recent Cern neutrino experiment suggests that neutrino mass does not increase to infinity at the speed of light and that superluminal velocities are possible.

For this and other reasons given below, we consider a model of the electron as a core mass, $m_e = 9.1(10^{-31})kg.$ of charge, $+e = +1.602(10^{-19})C.$ and a much smaller orbital mass, m_0, of charge, $-2e$, (or vice versa) moving at a virtual or actual superluminal velocity. One implication that tends to validate the model is that the speed of light can be written then, as a function of the electric constant and the electron radius without involving the magnetic constant.

That is, an electric field applied to an electron acts on the electron but also on the orbital mass, m_0, of charge, -2e, inside the electron, circling the electron mass, m_e, of charge, +e, say in the XY plane at a radius of approximately, 10^{-15} meters. Consider the classical central force projected on the X axis which acts half the time in the same direction, half the time in the opposite direction as an exterior force, $-2eE_x$: Thus, $F = -2E_x \pm 9\left(10^9\right)\left(2e^2\right)\left(R^{-2}\right)$ where $R = (a)\left(10^{-15}\right)$ meters. The force component in the x direction is

$$(F)(x/R) = eE_x \pm \left[(9)(2)(2.56)/a^3\right]\left[10^{9-38+30+15}\right][x] = eE_x \pm c^2 x, \text{ if } a = 1.724$$

We obtain a value for R = $1.724(10^{-15})$, the electron radius, implying the elasticity of charge inside the electron is equal to the speed of light squared. The Cern faster –than- light neutrino implies a smaller effective radius for this neutrino. We can determine the small mass, m_0, of the, $-2e$, charged particle orbiting inside the electron by considering the similarity between electric dipoles and magnetic dipoles. The magnetic attraction of parallel current carrying wire segments, $ds.ds'$ of cross section area, A, r meters apart, is attributable to the attraction of $nAds$ electric dipoles, erv/c inside the free electrons with drift velocity, v, and inside lattice nuclei:

$10^{-7} ii'dsds'/r^2 = 9\left(10^9\right)(neArv/c)(neArv'/c)/r^4$ where $rv/c = R\varepsilon/(1-\varepsilon)$ The

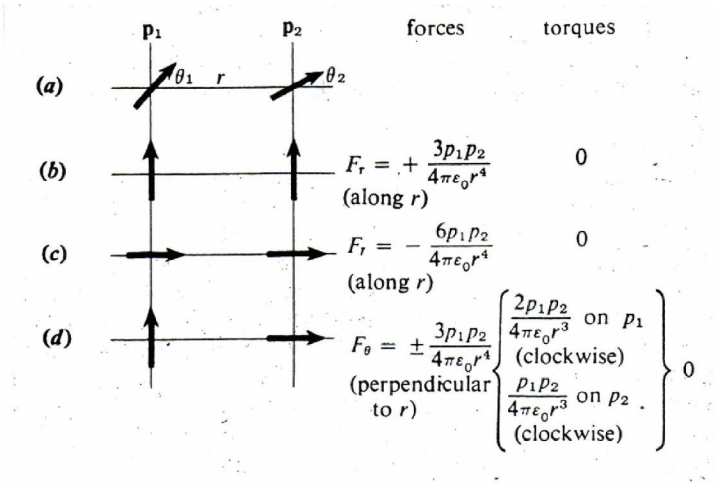
dipole moment increases as the wires are drawn further apart because the transverse dipole from one wire creates a force at right angles to the longitudinal force driving the current in the other wire. The effect of longitudinal force in one wire tending to increase the transverse ellipse is thus reduced by the transverse force from the other wire, tending to create a longitudinal ellipse.

If we interpose a piece of insulated metal between two such parallel wires the dipoles in the current carrying wires will pull the dipoles inside the free electrons and inside the lattice nuclei in the current carrying wires in the same direction with an inverse square force which is stronger than the inverse cubed force on the free electrons. Thus a redistribution of free electrons does not cancel the electric dipole dipole force (ie the magnetic force) between the parallel wires. There is no shielding effect.

Dipoles are created inside lattice nuclei as masses, $m_{0,}$ of charge, $-e$, circling a nuclear core mass, of charge, $+30e$, in the case of copper, with a net charge, $29e$, are excited to ellipses by the applied field, E. The dipoles are created in the lattice nuclei and the free electrons, during small time intervals between thermal collisions as shown below. Note that the dipoles produced by the ellipses in the nuclei and in the electrons are in the same direction. The dipole lengths are the distance between the average center of orbiting negative charge and the positive core.

We can use the same value of, R, that we obtained above for the electron since the nuclear radius is close enough to the electron radius to permit a first estimate of the orbital small mass inside the nucleus and inside the electron. When an ellipse is produced, $R\varepsilon/(1-\varepsilon)$, is the distance between the center of negative charge and the positive core. The eccentricity of the ellipse is, ε. The following diagram shows the forces between parallel and collinear dipoles corresponding respectively to collinear and parallel current segments.

(1)



For example, suppose our parallel wires are, $r = 2cm.$ apart, of copper with a $2mm.$ diameter of cross section area, $A = (3.14)(1^2)(10^{-3})^2$. Suppose the current in each wire is one Ampere. Then, $1 = nAev_e = (8.47)(3.14)(1.6)(10^{28-6-19})(v_e)$ $= 4.255(10^4)(v_e)$. So $v_e = (2.35)(10^{-5})m./s.$ The implied value of, E, is obtained from $v_e = eEt/m_e = (2)(1.6)(10^{-19})(E)(10^{-14})/(9)(10^{-31})$ where we put, $t = 2(10^{-14})$ seconds, so that the resistivity of copper is as observed, $\rho_C = m_e/ne^2t$. Thus $E = (9)(2.35)(10^{-31-5})/(3.2)(10^{33}) = (6.6)(10^{-3})V./m.$ The transverse dipoles per unit length produced in the wire by this longitudinal E field are $rv_e/c = (2.35/\sqrt{3})(10^{-15}) = R\varepsilon/(1-\varepsilon) = 10^{-15}\varepsilon/(1-\varepsilon)$ implying that $\varepsilon/(1-\varepsilon) \approx 2.35$; so by trial and error, .9/.1 = 9 and .8/.2 = 4 and .7/.3 = 2.33. So, $\varepsilon = .7$ for $E = (6.6)(10^3)V./m.$ and $v_e = (2.35)10^{-5}\, m./s.$ with, i and i' both equal to one Ampere and wire diameter $= 2mm.$, for a separation of wires, $r = 2cm.$.

The effect of E_x on the orbital charge inside the electron is to produce an ellipse of eccentricity, ε, with major axis perpendicular to the X axis,. The increase in orbital velocity required for an ellipse of eccentricity, ε, is, $eEt/m_0 =$ $v_1 - v_0 = (1+\varepsilon)^{1/2} v_0 - v_0 = (1+\varepsilon/2)v_0 - v_0 = v_0\varepsilon/2$. This follows from the formula, $(m\rho^2)(v_0^2/k\rho) = 1 + \varepsilon\cos\alpha$ where, $k = (9)(10^9)e^2$ and, ρ, is the distance from a stationary central charged particle to a moving charged mass, m, etc.. The central force on $m_0 : m_0v_0^2/R = (9)(10^9)(2e^2)/R^2$ implies

1) $v_0 = \left[(9)(10^9)(2e^2)/Rm_0\right]^{1/2} = \left[(9)(2)(2.56)/1.724\right]^{1/2}\left[10^{(9-38+15)/2}\right]/m_0^{1/2}$
$= 5.17(10^{-7})m_0^{-1/2}$ where ε = .7 for E=6.61(10^{-3})

And from the applied force 2eE on m_0,

2) $2eEt/m_0 = v_0\varepsilon/2$ where ε = .7 for E=6.61(10^{-3})

Putting these equations containing, u_0, together, we obtain,
$210^{-28}\, eEt/m_0 = .35 \times 5.17 \times 10^{-7}/m_0^{1/2}$ so
$m_0^{1/2} = 2 \times 1.602 \times 6.61 \times 2 \times 10^{-19-3-14}/(.35 \times 5.17 \times 10^{-7}) = 2.34 \times 10^{-28}$. So
$m_0 \approx 5.5 \times 10^{-56}\, kg., v_0 \approx (\varepsilon/2) \times 6.62 \times 10^{-7} \times m_0^{-1/2} \approx 10^{21}\, m./s., f_0 \approx 10^{35}$. If ε = .99 instead of, .7, $m_0 = 7.75 \times 10^{-56}$ kg..

When $\varepsilon = 1$, the orbital charged mass inside the electron is excited to the escape velocity, $2^{1/2}v_0$, and energy. The electron at velocity,c, and the neutrino at a higher velocity, comes apart. Such an escape velocity and energy, we propose, occurs during pair production and annihilation, associated with photons of energy, $1.022MeV = 2m_ec^2$.

Comparable increases in eccentricity and charge polarization near the elastic limit, ε =1, require greater E fields and electron velocities than increases at lesser eccentricities, Hence there is less than the expected deflection in the magnetic field of the mass spectrometer, of faster electrons. This is incorrectly attributed to their increased mass. Charged particles of smaller effective radius and so with a greater elastic constant are less deflected in a magnetic field than particles with the same mass but a smaller elastic constant. Thus some of the accepted mass and energy estimates of hadrons and leptons from radioactive atoms and high energy collisions are larger than they should be. The neutrino mass estimates added to the energies of a beta electron spectrum, being constant, imply the neutrino mass energy associated with the overestimated maximal beta electron energy is less than it should be.

The total energy of the electron as a circular orbital system is, $-1/2m_0v_0^2$, but at escape velocity it is, $-m_0v_0^2$ -$m_0\upsilon_0^2$. That is, $m_ov_0^2 = m_ec^2$. For an orbital system with a greater elastic constant and smaller effective radius, such as the electron neutrino and perhaps the muon and muon neutrino etc, the escape velocity, total energy and deflection in a magnetic field for the same mass and velocity, will be different than that for the electron.

Pair production can be viewed as excitation by a high energy photon of a figure eight orbiting, $-2e$, mass, m_0, around two electron core masses, each, of charge, $+e$. The, $+e$, core could be a composite particle of core $+2e$ and smaller orbital mass –e. The orbiting mass of charge, $-2e$, is excited to the escape velocity and energy from one, $+e$, core only to be pulled around the neighboring, $+e$ core, forming an electron, and leaving behind an unstable lone electron core which in 10 to 100ns is subject to annihilation.

Annihilation can be viewed as the sharing of the orbital mass of charge, $-2e$, from one electron by a positron, an electron core mass of charge, $+e$,. The positron electric field excites a nearby electron's orbital mass to an escape velocity and energy as it attracts the same orbital mass. The sharing of the electron's orbital mass of charge, $-2e$, by two electron core masses of charge, $+e$, results in "annihilation" ie a neutral particle of twice the electron mass. Could this annihilation neutrino be the same as the electron neutrino ?

That it could be, follows from the following argument: The neutrino rest mass which added to the maximal mass energy of the associated beta electron must be a constant is under-estimated because the mass of the associated beta electron is overestimated. Another reason is the Cowan Reines measurement of coincident positron electron annihilation gamma rays and neutron capture gamma rays from the reaction, $v_e + p^+ \rightarrow n^0 + e^+$, $v_e = (2e^- + e^+) + e^+$. The parenthetical terms combine with the proton, p^+, to form the neutron, n^0, leaving the lone positron, e^+. The electron neutrino description here is that of the annihilation neutrino.

The muon neutrino could be some other less stable combination of the Gell - Man quark like, $-2e, +e, -e, +2e,$ particles that could decay into the electron

neutrino, then be excited into the muon neutrino, then decay again etc., as in Pontecorvo's model of neutrino oscillation. The orbital model of subnuclear particles helps explain neutrino oscillation and faster than light neutrinos.

References

"Light Speed Measurements From Bradley to the GPS System" Proceedings of the NPA, vol 8 pp507-517(2011), R.N. Sansbury,
"Test of an Anomalous Magnetic Effect" Rev. Sci. Instr. 56, 415(1985), R. N. Sansbury US Patent USA 1355195(1983) R. N. Sansbury
"Detection of the Free Neutrino: A Confirmation" C.L. Cowan, Jr., F. Reines, F.B.Harrison,, H.W.Kruse, and A.D. Mcguire, Science 124,103 (1956)

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