Comment on Mikhailov's Article

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Mikhailov's [1] experiment, succinctly described in the following paper, may well be a landmark.

The Bohm-Aharonov effect displays physicality of a *fieldless* magnetic potential, but it is gauge invariant due to use of a closed line integral. The "electron radius problem" and the "atomic electric mass defect" do select, via Einstein's mass-energy equivalence, the Coulomb gauge as an integration condition, but the electrostatic potential is not fieldless in them.

For these reasons both Assis [2] and de Beauregard [3] have repeatedly stressed that it would be highly significant to weigh the *effective mass* of a point charge – say an electron – inside the *fieldless Coulomb potential* V enclosed in a charged sphere. A contribution of an extra mass Δm *equivalent* (up to some factor) to the mutual energy $-eV$ would be evidenced, *this amounting to a measurement of the fieldless potential* V.

Mikhailov now steps in as the first to test this claim, and succinctly describes his work in the following article. Intending to verify Assis' [2] prediction that $\Delta m = -\frac{1}{3}c^{-2}eV$ he finds $\Delta m = -\frac{1}{2}c^{-2}eV$. *This may well be the right result* because, in Darwin's [4] semi-relativistic electrodynamics, the *effective masss* μ of an electron of rest mass m feeling the electric potential V of the other charges is $\mu = m + \frac{1}{2}c^{-}2(mv^2 - eV)$.

What Mikhailov measures is *the guided electron's effective momentum* $\mu\mathbf{v}$*, its modified inertial response* to an alternating emf. Plotting the ratio $(-e/c^2m)V$ for values of V ranging from - 2000 to + 2000 Volts he clearly finds, as said before, $\Delta m = -\frac{1}{2}c^{-2}eV$. Incidentally his choice of an insulating rather than a conducting sphere is felicitous, avoiding eddy currents and an electric field induced by the oscillating circuit.

Let us hope that his cursorily described measurement will be confirmed by other workers, so that his paper will be remembered as a landmark.

Let it be recalled that not only de Broglie [5], but also Brillouin [6] and Lucas [7] have argued that Einstein's mass-energy equivalence law selects the Coulomb gauge as an integration condition. Also, that the 1967 "hidden momentum in magnets [8,9,10]" similarly selects the magnetic gauge via action-reaction.

References

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