Inertial Mass: a Changing Entity?

Weber vs. Einstein, Weber plus Einstein or none?

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Mikhailov claims to have measured changes in the electron's inertial mass when located inside a uniformly charged spherical shell [1,2]. The above mass, calculated by Assis [3] founded on Weber's force [4] becomes $m_W = m_o(1 - qV/3c^2)$ for a charge q placed in a region of Coulomb's potential V.

In page 161 of [1] Mikhailov states:

> *"So, if q and V have same (opposite) signs there is a decrease (increase) of the particle's effective mass."*

Then, for $q = -e$ and $V = k(Q/R) > 0$, we get a mass increase yielding $m = m_o(1 + eV/3m_oc^2) > m_o$.

We remember now that also Einstein's mass-energy equivalence, $m_E = Energy/c^2$, allows us to predict the electron mass-electrostatic potential dependence, of the same order of magnitude but opposite in sign. As a matter of fact, we have described the *electronic mass defect* taking place in the atomic electron [5].

Let us consider an electron inside a positively charged spherical shell of charge Q, radius R producing a potential $V = k(Q/R) > 0$. The mutual electrostatic potential energy is $-eV < 0$, so that a positive work must be supplied to carry the electron to infinite.

Einstein's above described effect takes the form $m_E = -\text{eV}/c^2 < 0$, i.e., a **mass-defect** takes place arriving to an effective inertial mass $m = m_o + m_E = m_o(1 - \text{eV}/m_o c^2) < m_o$.

According to our former analysis we add to Mikhailov statement:

"So, if q and V have same (opposite) signs there is an increase (decrease) of the particle's effective mass."

Besides if both Weber and Einstein were right, the whole measurable effect would become $m = m_o + m_W + m_E \approx m_o(1 - 2\text{eV}/3c^2)$.

Curiously, in a recent paper [6] Junginger and Popovic claim to have found a null-effect on this regard when measuring on a slightly modified Mikhailov setup. Consequently, if confirmed, the Junginger and Popovic experiment will disprove at once both, Weber and Einstein's models.

Einstenian mass defect was successfully applied in gravitational interaction allowing a clear explanation of the red shift [7,8,9].

References

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