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COMMENT TO THE "REANALYSIS OF THE EÖTVÖS EXPERIMENT"

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ABSTRACT

We point out that the deviation from the null results in the Eötvös experiment is correlated significantly with the baryon charge of the used materials, without such relation to their lepton charge.

АННОТАЦИЯ

Показано, что в эксперименте Этвеша отклонение от нулевого результата с достоверностью коррелирует с барионным зарядом веществ и не коррелирует с лептонным зарядом.

KIVONAT

Megmutatjuk, hogy az Eötvös kísérletben a null-eredményektől való eltérés szignifikánsan a használt anyagok bariontöltésével korrelál, ilyen korreláció a leptontöltésükkel nincs.

In a recent letter [1] the data of the Eötvös experiment [2] were reanalized. The authors of Ref. 1. pointed out that according to the old data there is evidence for the presence of non-Newtonian coupling in the classical gravitational potential. They found a strong correlation between the deviations of the relative accelerations from the null results and the baryon number per unit mass of the used materials. They got linear relationship between $\Delta\kappa$ and $\Delta(B/\mu)$, where $\Delta\kappa = (a_1-a_2)/g$, $\Delta(B/\mu) = B_1/\mu_1-B_2/\mu_2$. Here a_1-a_2 is the measured acceleration difference of the two materials and B/μ is the baryon charge per atomic mass in units of atomic hydrogen.

Due to a sign error in the reanalysis [3] the interpretation of the surprising correlation can change, but it doesn't affect the correlation itself.

It is evident to look for correlations with other baryon like uncompensated charges. An important candidate would be the lepton charge: it occurs as a part of gauge symmetry B-L in a lot of left-right symmetric low energy and grand unified models.

The data for $\Delta\kappa$, $\Delta(B/\mu)$ and $\Delta(L/\mu)$ are given in Table I. The least-squares fit gives the following coefficients of the $\Delta\kappa$, $\Delta(B/\mu)$, $\Delta(L/\mu)$ plane

$$\begin{aligned} \Delta\kappa &= a\cdot\Delta(B/\mu) + b + c\cdot\Delta(L/\mu) \\ a &= (5.43\pm2.52)\cdot10^{-6} \\ b &= (-2\pm636)\cdot10^{-11} \\ c &= (2.6\pm54.6)\cdot10^{-9} \\ \sigma &= 3.48\cdot10^{-10} \end{aligned} \tag{1}$$

and the $\Delta\kappa$, $\Delta(B/\mu)$ line:

$$\begin{aligned} \Delta\kappa &= a'\cdot\Delta(B/\mu) + b' \\ a' &= (5.39\pm1.79)\cdot10^{-6} \\ b' &= (1.2\pm27.1)\cdot10^{-10} \\ \sigma &= 3.48\cdot10^{-10} \,. \end{aligned} \tag{2}$$

The values of σ are given by the formula

$$\sigma = \left(\frac{\sum_{i=1}^{N} h_i^2}{N\cdot(N-1)}\right)^{1/2}$$

where the h_i-s are the errors of the fit in the $\Delta\kappa$ values.

Because the lepton coefficient c is less then the baryon coefficient by three orders of magnitude and the computed parameter intervals for a, b are stable enough for the extension of the parameter space we conclude that the deviations $\Delta\kappa$ do not correlate with the lepton charge of the used materials.

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Table I. Summary of EPF results along with the computed value of $\Delta(B/\mu)$ and $\Delta(L/\mu)$ [4]

Materials compared	$10^8 \cdot \Delta\kappa$	$10^3 \cdot \Delta(B/\mu)$	$10^2 \cdot \Delta(L/\mu)$
Cu-Pt	+0.4±0.2	+0.93	5.65
Magnalium-Pt	+0.4±0.1	+0.50	8.31
Ag-Fe-SO_4	0.0±0.2	0.00	0.00
Asbestos-Cu	-0.3±0.2	-0.73	4.88
$CuSO_4 \cdot 5H_2O$-Cu	-0.5±0.2	-0.85	5.23
$CuSO_4$(solution)-Cu	-0.7±0.2	-1.45	8.50
Water-Cu	-1.0±0.2	-1.70	9.87

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