

The momentum and gravity

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Abstract: *The linear momentum is retardation effect of interaction and mass itself is an uncompensated screening of interaction from outer space that can be characterized by the acceleration parameter a_0 .*

Keywords: *momentum, retardation, interaction, gravitational constant, mass*

The translational momentum (movement) is caused by finite speed of interaction. This is (like radiation, magnetic vector potential, “photon”) retarded action of an advancing potential (like Mach's principle [1], “wave function collapse”). The movement modifies potential and then it is followed by a next retarded action. The retardation formulation [2] of interactions (from electric charge or mass) cannot mean a non-conservation of momentum. It is wrong interpretation that counts retardation and momentum together (wrongly twice) or with pseudointeraction [3] leading to some (fictitious or hypothesized) violations (of equivalences introduced by a definition).

We can write a following potential

$$\varphi = \frac{1}{4\pi\epsilon_0} \frac{Q}{r + r_0 - ct + \frac{1}{2}a_0t^2 - \dots}$$

which is displaced (size r_0 corresponds to the attractive strong interaction and prevents to a singularity of potential in particles) retarded (c corresponds to the electromagnetic interaction) decelerated (small acceleration a_0 – roughly 10^{-40} relatively to accelerations for particles in atoms – corresponds to the “tired light” or “expanding Universe” that generates “equivalent” attractive gravitational interaction and critical density like “cosmological constant”) potential. Other terms (such as jerk) should be included. This potential can be rewritten in the form of potential energy or potential momentum as

$$\frac{2\pi N_i e \varphi}{hc} = N_i k$$

where N_i is number of elementary charges (or it can be written for each charge separately with $N=1$) and e , h and c are fixed constants by the SI convention (unit definitions and thus also mathematical introductions of “physical” quantities). We can see that a reciprocal value of the wave vector/momentum or wavenumber is simply

$$\frac{\alpha}{N_i k} = \frac{1}{N_i N_j} \left(r + r_0 - ct + \frac{1}{2}a_0t^2 - \dots \right)$$

i.e. a number of waves with a non-linear relation between space and time (or the dispersion relation related to a given distribution of particles in the Universe). Coefficients of this polynomial are parameters of our reality (they can change with position or can be temporary) and determine “laws” and pseudoparticles. Other “physical laws” (e.g. Ohm's law) are rather conventional (subjective) than real. Thus this extended (displaced retarded decelerated) retardation formulation can fully describe “relativity” (“spacetime”) problems (rather than e.g. complicated “Modified inertia by a Hubble-scale Casimir effect” [4]). The statistical (“quantum”) interpretation (“simplification”) of reality is not necessary [5] and can be confusing [6].

It should be noted, that the strong equivalence principle and performed experimental tests are not about a constitution of the potential generating body (generated gravitational potential and accelerations are independent on the testing body). The massive potential generating body does not change much in its mass and constitution with time (and observations and measurements, including balances, are often based on the standard gravitational parameter GM and the kinetic energy from the virial theorem). Then for example one can not resolve, whether a generated potential is proportional to the number of baryons (or elementary charges and whether their modification generates gravity) or e.g. to the “mass” with “mass deficit” (isotopically pure materials are very expensive for potential generating bodies). It is also related to inconsistency (uncertainty) problems associated with measurements of the Newton gravitational constant G using relatively small (replacable) generating bodies.

The Brown-Gabrielse invariance theorem (corresponding to the quadratic sum of energies) is used to measure (in dynamical field traps) ratio of “masses” (including “mass deficit”) as a value equal to the ratio of frequencies/energies (including ratios of invariant charges). However these measurements are about (“stored”) energies (including binding energies) because geometry of trajectories (i.e. acceleration etc.) determined by generated field is eliminated in results. Also other dynamic (retarded potential) methods (such as the Larmor frequency) measure ratios e/E (or better e/ω without any physical interpretation).

When the gravitational “mass” (i.e. energy) of objects is compared via balances, then object from a material with larger binding energy will consist (at balance) more (gravitational) nucleons. Then, from product “ GM ”, material (such as hydrogen) without binding energy (less nucleons) corresponds to smaller gravitational constant, that can be estimated $G \approx 6.64 \cdot 10^{-11} \text{ kg}^{-1} \text{ m}^3 \text{ s}^{-2}$ (gravity is an isotope dependent property and can not be a fundamental force or an “additional dimension” and the “spacetime” metric deformations are invalid concept with singularities). Then the Sun has more nuclei and its model must be reevaluated (“dark matter” is not needed).

We can see that some chemical relation of “source mass” in “big G ” measurements can be resolved by an analysis of all experiments [7] with claimed uncertainty better than 100 ppm (without Pontikis 1972 and Michaelis 1995 that was reevaluated). A simple average of different laboratories for copper (Quinn 2013, Newman 2013) is numerically 6.6750 ± 0.0004 and for steel (Karagioz 1998, Gundlach 2000, Tu 2009) is 6.6735 ± 0.0007 . There is another laboratory (Armstrong 2003), where both materials were used with average result about 6.6739 (between them). Another material is tungsten (Luther 1982, Park 2010 and MAGIA 2014 experiment with larger uncertainty) with range 6.6723 ± 0.0004 (on the opposite side from CODATA value then copper). Only one such laboratory used mercury (Schlamminger 2006) with result 6.6743.

The binding energies (the main source of the cosmic microwave background radiation used to evaluate ratio of “dark matter”) per nucleon of these materials are as follows: tungsten 8.0 MeV, copper 8.75 MeV, steel 8.78 MeV and mercury 8.9 MeV. The difference for tungsten and copper is 0.08 % of nucleon. The measured corresponding relative difference in G is 0.04 %. However nuclear radii are also changed (differs from ideal liquid model) and

then gravity generating acceleration a_0 (corresponding to the “size of observable Universe”) acts differently for different type of nucleons (corresponds to the large number ratio of these sizes).

Finally, the deeply rooted concept of “mass” (for matter from “Mother Earth” with fields) should be abandoned (and also momentum) to better understand particles (without need of “imaginary mass”) and whole reality (without need of a “new physics”).

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