# CLASSIC DARK MATTER THEORY WITH EXPERIMENTAL CONFIRMATIONS, EXACT SOLUTIONS AND PRACTICAL APPLICATIONS

M.Ja. Ivanov
*Central Institute of Aviation Motors (CIAM)*
*Moscow, 111116, 2 Aviamotornaya St., Russia*

Classic mechanical simulation of Dark Matter (DM) is considered. Proposed DM model bases on the Newtonian approach of gaseous compressible medium. As confirmation of our simulation we present the special experimental results on the temperature dependence for propagation velocity of electromagnetic fronts. The main conclusion of this experimental study is marked exceed of the speed value $2.998 \cdot 10^8$ m/s for electromagnetic front, which went inside a hot tube. The velocity propagation of electromagnetic front was increasing with temperature growth. Theoretical part of our study contains dimensional analysis, thermodynamically compatible conservation laws and some exact solutions. We demonstrate also practical application of this simulation for air breathing engines design.

**Introduction.** The $\pi$ - theorem by E. Buckingham [1] and accurate application of the physics dimensional analysis [2-4] allow additionally getting good confirmations of the classic Dark Matter (DM) theory, which was developed in [5-8]. The main result of the dimensional analysis is the presence in a free space, containing the equilibrium radiation with the temperature $T = 2.735\ K$, material medium with the particle of non-zero mass $m = 5.6 \cdot 10^{-40}\ kg = 3 \cdot 10^{-4}\ eV$. This medium may consider as the classic ether, or the mass "photon" gas, or the DM medium. With the point of our view these different media may seeing as the same medium. By that the week perturbation velocity in this medium should be proportional to the square root from its temperature. This fact withdraws the limitation on a propagation velocity of week perturbations and allows the superluminal motion (without violation of the causality principle). Here relevantly one gives the analogy with the classic gas dynamics, which allows the motion with supercritical velocities.

**Dimensional analysis.** Discovery of the finite dimensional value $T = 2.735\ K$ in a free space with the characteristic speed $c = 2{,}998 \cdot 10^8\ m/s$ leads automatically from the dimensional analysis [1-4] to a new dimension characteristic value, namely, the finite rest mass $m$ of cosmic space particles. Write three dimensionless parameters by Buckingham $\pi_1$, $\pi_2$ and $\pi_3$ as

$$\pi_1 = \frac{kT}{mc^2} \sim 1\ , \quad \pi_2 = \frac{p}{\rho c^2} \sim 1\ , \quad \pi_3 = \frac{\pi_2}{\pi_1} = \frac{p}{nkT} = 1\ ,$$

where $k = 1.38 \cdot 10^{-23}\ kg/(m/s)^2/K$ is the Boltzmann constant $p$-pressure, $\rho$-density, $n=\rho/m$-concentration. The parameter $\pi_1$ gives the finite rest mass $m$ of DM particles, $\pi_2$ is the correct relation for positive (no negative) cosmic pressure and $\pi_3$ presents the state equation of the DM medium. For the adiabatic constant $\kappa = 4/3$ the exact value $m = \kappa kT/c^2 = 5.6 \cdot 10^{-40} kg = 3 \cdot 10^{-4} eV$ [5-8].

The dimensional analysis shows us also that $c \sim sqrt(T)$.

**Ground experiment.** In our talk we present results of the special ground experiments for confirmation of our analysis, where study the temperature dependence for propagation velocity of electromagnetic front [9]. Modulated laser impulse is created in laboratory conditions by gas charge He-Ne laser LGN-207A on wave length $\lambda$=632,8 nm. The impulse propagates in an air medium in

hollow metal tube of circular cross section with temperature up to 550 K. The initial impulse was divided on two rays by optical prism and after these rays were registries by the two laving photodiodes LFD-2-A with signal transfer on two channel oscilloscope GDS-710042. The time shift is fixed for ray fronts, which propagated in hot hollow metal tube with length 1.5 m. The main results of this study are marked exceed on 10-40% of velocity value $2.998 \cdot 10^8$ m/s for electromagnetic front, which went inside the hot tube. The velocity propagation of electromagnetic front was increasing with temperature growth.

**Hidden mass boson**. An important next step is to postulate the structure of DM particles, which allows explaining the large number of nature effects. Following [5-8], we consider a whole electrically neutral DM particle in the form of a dipole consisting of two parts with positive and negative charge equaled to about $5 \cdot 10^{-29}$ Coulomb. Thus, we actually introduce the new hidden mass boson (HMB) [10] with some analogy of the Higgs boson [11]. In this case the issue of physical vacuum polarization is extremely clear. In an external electric field orientation of the HMBs takes on power lines of the electric field, partly compensating for the external field. Thus, we obtain a physical interpretation of the Maxwell's displacement current in a free space. Further, the energy flux vector of the electromagnetic field – the Umov-Pointing vector indicates the direction of the HMB polarization under the influence of an external electromagnetic field. In particular, when a capacitor without insulator between plates is charging HMBs are moving from outer space in the capacitor plate space, providing in this case the displacement current. Also we get nature interpretation electric induction and self-induction phenomena. Another important process of electron-positron pair birth in the physical vacuum in the collision of two sufficiently intense electromagnetic pulse should be interpreted as a break in a certain (sufficiently large) number of dipoles – HMBs and followed concentration of their parts with the same sign of charge at the centers of the electron and positron under the influence of forces including non-electromagnetic nature. When implementing this scenario the HMBs will determine the birth mass of baryonic matter in the physical vacuum.

The poster presented the full system of conservation laws for the medium motion [10, 12] and their some exact solutions [13]. We demonstrated also a few practical applications of this simulation for air breathing engines design [12, 14].

## References


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