

## INTERACTION OF MASSES WITH ETHER

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In a general evaluation of inertial motion, one should take into account that all bodies move in ether, or otherwise in the ether medium [1]. This refers to both cosmic bodies and micro-particles. The above assessment of the body's inertia pertains to velocities that are much lower than the velocity  $C$ , of electromagnetic waves (light) in ether. A body moving in the ether medium with a velocity that is virtually much lower than light velocity does not interact with the ether medium [2]. A physical body moving uniformly in the ether medium does not experience resistance. The ether resembles an ideal medium displaying no frictional effects. D'Alembert referred to the possibility of a body maintaining uniform linear motion in an ideal liquid experiencing no resistance at all [3]. But at the same time the ether has certain characteristics similar to a specific solid body [1].

Revealing the peculiarities and properties of the ether medium has been taking place for a very long period of time. The first assumptions about the existence of the luminiferous and all-pervasive medium were formulated in ancient Greece. Newton considered the ether to be responsible for transmission of gravitational effects: "To suppose that one body can act on the other one that is at some distance from it through vacuum without any "moderator"...- is so absurd to me that, to my mind, not a single person that has the slightest idea of philosophical matters can believe this" [4]. James Clerk Maxwell revealed the distinction of the ether from the well-known media. "The ether differs from ordinary matter. When light moves through the air then it is obvious that the medium through which the light travels is not the air itself, because, first, the air cannot transmit shear waves and compression waves transmitted by it propagate a million times slower than light"... "Whatever difficulties we faced attempting to elaborate a notion of the ether structure, there is no doubt that interplanetary and interstellar spaces are not empty, but filled with a material substance or body that is the largest and most homogenous known" [5] (Reversed translation from Russian).

In what follows, the discovery of electromagnetic waves by G. Hertz attached some new and very important properties to the ether. Besides transmission of gravitational effects, the influence of static electric charges, force of magnets, the ether can transmit electromagnetic waves. It possesses dielectric and magnetic permeability, wave resistance, specific density. Sunlight appeared to be a set of electromagnetic waves. Infrared and ultraviolet rays and hard X-rays are transmitted by the same carrier – the ether or, to put it otherwise, the ether medium.

More recently, through observation of the Earth-geostationary satellite system, it was corroborated that electromagnetic wave velocity in free space is determined only by the properties of the ether medium [6]. No matter with what velocity the source may move, the velocity of electromagnetic waves emanating from it, is equal to the speed of light in the ether. In this case, the influence of the Earth's motion on the aberration of electromagnetic waves from a source placed on a satellite was found. This allowed one to measure the parameters of the absolute motion of the Earth and solar system without astronomic stellar observations. The

obtained values of the orbital component of the Earth velocity (29.4 km/s), right ascension of the Earth apex (270°) and its declination (89.5°), as well as the velocities of absolute motion of the Solar system agree with those well-known from observational astronomy. This result is direct proof of the fact that the velocity of the uniformly moving laboratory coordinate system (in our case the Earth) can be actually measured with the device in which the radiator source (geostationary satellite) and receiver (antenna of a terrestrial telescope) are at rest relative to each other and to the same coordinate system. That is to say, the ether medium in interstellar space can be taken as an independent coordinate system.

The interaction of a physical body (particle) moving with near-light speed is most conspicuous in the phenomenon called the Cherenkov effect. This effect was first registered in transparent water surrounding radioactive materials emitting high-energy particles. The effect lies in the emission of light quanta by a particle, if the particle, for instance, an electron moves with speed  $V$ , exceeding light phase velocity  $V_f$  in this medium. In this case the following condition is met [7]:

$$V > V_f = \frac{C}{n(\omega)}, \quad (1)$$

where  $C$  is the speed of light in vacuo (ether medium),  $n$  is the refraction index at frequency  $\omega$ . This effect lies in the fact that a particle emits light within a certain dispersion cone. The cone angle  $\theta$  is determined by the relation between the phase speed of light in the medium and the movement of a charged particle in it,

$$\theta = \arccos \frac{V_f}{V} \quad (2)$$

The relations (1) and (2) were obtained on the basis of analogies with the effects arising when bodies move in gases with a speed close to the speed of sound in gas. V.L. Ginzburg [7] pointed out that such analogies are useful: “Analogies; a transfer of notions from one field into another are of great importance in the development of physics and (doubtless) in other sciences. Therefore for fruitful work in science it is very important to have a broad outlook and not to limit oneself by narrow specialization as is often the case”. The cone of the arising emission (2) is similar to Mach cone that restricts the front of the shock wave in the gas medium (air) when a body moves with the supersonic speed. A shock wave in gas arises as the velocity of body exceeds the speed of sound, i.e. when condition (1) is met.

The Cherenkov effect has been registered in transparent media in which the velocity of electromagnetic waves is lower than their speed in ether. There are some works in which the motion of particles with supraluminal speeds has been registered experimentally [8]. In the experiments, a Cherenkov radiation in the motion of a lead ion beam was observed. The speed of the particles was found to exceed light speed by  $(1.00006-1.0047)C$ . There is also A. Sommerfeld’s work in which the motion of a charge in the vacuum (i.e. in the ether) with supraluminal speed is considered [9]. The author obtained the result that such a charge must radiate.

So the particle moving with near-light speed radiates. This means that it loses motion energy and inertia. Thus, the particle's speed, travelling faster than light, is finite. Besides, the

mass of the moving particle (body) depends on the speed, if this speed approaches that of light, i.e., the speed with which electromagnetic oscillations propagate in the ether. Numerous experiments show that the body's mass depends on its velocity in the ether medium. This dependence is expressed by the following formula [10]:

$$m = \frac{m_0}{\sqrt{1 - \frac{V^2}{C^2}}}, \quad (3)$$

where  $m_0$  is the mass of the particle at rest,  $m$  is the mass of the particle moving in relation to the ether medium,  $V$  is the particle's velocity,  $C$  is the speed of light.

The dependence (3) shows that as the particle speed approaches light speed one, can observe the phenomena similar to those arising when a body's speed approaches sound speed in gases. It is also useful here to apply the analogue method mentioned by V.L. Ginzburg. But a fundamental difference exists between these phenomena. As a body moves in gas, the gas flows around it. When moving in the ether medium, the ether medium moves through the physical body [11]. In this case the ether medium interacts immediately with every elementary particle constituting the physical body, possessing mass – with electrons, protons, neutrons etc.

As particle speed approaches light speed, its mass becomes equal to  $m$  (3). If we slow down this particle its speed again becomes equal to  $m_0$  – i.e. to the mass at rest. Most likely, this means that the mass of the particle itself, independent of its speed in the ether, is equal to  $m_0$ . The additional mass equal to  $m_e = m - m_0$  is the associated mass of the ether.

Formula (3) allows the conclusion that motion in the ether medium is possible with a minor difference between  $V$  and  $C$ . But this motion cannot last for a long time with speed  $V = C$ , since in this case the energy and mass of the particle will become infinitely great. The mass-energy conservation law denies infinitely great masses for any bodies. This suggests that physical bodies cannot move through the ether medium with light speed over long periods.

The last mentioned conclusion has an important consequence – photons, light quanta that always propagate with the velocity  $C$  cannot have mass and consequently, they are the waves perturbing the ether medium and propagating in it. As is known, photons (quanta) have a wide spectrum of varying frequencies, from thermal to X-rays. An infinite number of photons (quanta) of different frequencies propagate in the ether in all directions and are received by devices as electromagnetic waves, light and X-rays.

## Conclusion

In conclusion, note the dissimilarities of inertia (kinetic energy) of bodies moving with a speed much lower than light speed, from that of the bodies moving with the near-light speed. As to the bodies moving with low speeds, one can note that a body does not possess inertia in relation to another body relative to which it does not move. The greater is the mass and speed of a body, the higher is its inertia in relation to another body. The body's inertia will be different in relation to other bodies moving with varying speeds. Therefore the motion inertia of every specific body has a lot of values depending on the relation to the other body from which it is assessed.

When bodies (particles) move with near-light speed, Newton's laws are broken. The moving bodies interact with the ether. Their inertia substantially increases. Just as in motion at

low speeds, the body's inertia can be assessed in relation to another body. But in motion with near-light speed, the body's inertia can also be assessed in relation to the ether medium itself. In our opinion, in motion with near-light speed, part of the ether mass carried along joins the body's mass. The motion of bodies in ether cannot last long with a speed equal to the speed of electromagnetic waves in ether, since in this case, the inertia energy and mass of the particle will become infinitely great.

Finally, the separation of the notions related to mass (inertness) and motion (inertia) of a physical body makes these fundamental categories clearer and more explainable. The so-called “mystery of inertial forces” disappears. From this viewpoint, Mach principle [12] – “the inertial force of any body is caused by its gravitational interaction with all remote masses of the universe” is also subject to criticism. Due to an assessment variability of the inertia force including that of cosmic bodies in relation to every other, this principle is not obvious. At the same time, owing to the equivalence of the notions of “inertness” and “mass” and some properties of the ether, one should state that the gravitation force at any specific point of the universe is determined by all cosmic masses contained in the universe. These masses include all visible and invisible forms wherever they are. In the context of the ether medium theory, the last mentioned statement is reliable. The ether medium transfers the gravitational action (as well as other field types) from one physical body to another. Every physical body distorts the ether medium in its vicinity [11]. The attracting force decreases inversely with the squared distance from a spherical body. It rapidly becomes weaker with distance. At the same time, due to the ether medium, this force does not cease its action however great the astronomical distance.

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