the general science journal

Difficult Statements

Yuri N. Keilman, 12-10-06
Email: AltSci@basicisp.net

In the previous article we stated the physical existence of yet another type of wave in Classical Electrodynamics (CED). Before, these waves were looked upon as mathematical garbage. These waves do not carry any energy or linear momentum . This fact was the main reason to deny them physical reality. But not only energy and linear momentum are physically important. Previously, we found that on any disruption surface:

a) The tangent components of the electromagnetic potential A^k must be continuous across the surface. The component of potential that is perpendicular to the surface might have a jump.
b) The scalar product of the energy-momentum tensor on the normal to the disruption surface (it is a vector) must be continuous across the surface.

$$T^{ka} N_a \quad continuous \tag{1}$$

where N_k is a normal to the surface. This requirement goes along with energy-momentum conservation:

$$T^{ka}{}_{|a} = 0 \tag{2}$$

The importance of the boundary conditions for potential identifies the importance of Dummy Waves. The physical significance of Dummy Waves -- is one of the difficult statements (it may appear in future that it is physical nonsense).

We think that Dummy Waves of a very high frequency are constantly generated inside massive elementary particles. The "intensity" (rather amplitude, because there is no energy flow associated with a Dummy Wave) of these waves is proportional to the mass of the particle. About frequency, we can say only that the wavelength should be related to the size of a proton.

In the previous article, we discussed a case of full plane symmetry (to simplify calculations). We took a plane Dummy Wave incident on a thin (size a) layer of the "material continuum" and we found the transmitted and reflected waves and all fields inside this layer.
[Reminder: we called the inside region of an elementary particle the **material continuum**. We found that inside this region, a current density has to satisfy to the equation:

$$\Box j^k = -k_0^2 j^k; \quad k_0 \approx 7 \cdot 10^{13} cm^{-1} \tag{3}$$

otherwise Maxwell's equations are in full force inside the elementary particle]. This exact solution is very important because it shows how the material continuum (or an elementary particle) can react to a Dummy Wave. We saw that it induces the electric field, the field of charge density, and the field of current density. All these things do require energy to exist.

[Reminder: We also found previously that the energy-momentum tensor in a material continuum has the form (one-dimensional symmetry assumed):

$$T^{00} = \frac{1}{8\pi}E^2 - \frac{2\pi}{k_0^2 c^2}\left(c^2\rho^2 + j^2\right); \quad T^{11} = -\frac{1}{8\pi}E^2 - \frac{2\pi}{k_0^2 c^2}\left(c^2\rho^2 + j^2\right)$$
$$T^{22} = T^{33} = \frac{1}{8\pi}E^2 - \frac{2\pi}{k_0^2 c^2}\left(c^2\rho^2 - j^2\right); \quad T^{01} = -\frac{4\pi}{k_0^2 c^2}c\rho j \qquad (4)]$$

From (4), we see that the energy density can be negative inside the material continuum. May be we are getting positive and negative energy that the whole balance still remains zero? Or (since the (1) is broken at the boundaries z=0 and z=a) are we getting energy from "nothing"? This is the second "hard" question. We have to investigate it to the full possible extent.

Let us remind all of the important results of the previous article:
Since we use complex numbers – we have a problem: to actually calculate a time average of the energy-momentum tensor we have to take the real parts of the physical values, multiply them and then take the time average. The result will be equal to ½ multiplied by the real part of the product of the first complex amplitude on the conjugate of the second complex amplitude. The result of the calculation is (we do not keep the factor ½):

$$T^{11} = -(F_1^+)^2 \frac{2k_0^4}{\pi |D|^2}(k_0^2 + 2k^2); \quad T^{01} = -(F_1^+)^2 \frac{4k_0^2 k^2 k'^2}{\pi |D|^2}$$
$$T^{00} = (F_1^+)^2 \frac{2k_0^6}{\pi |D|^2}\cos(2k'(a-z)) \qquad (5)$$

The first two time averages of the tensor components appear to be independent of z. The energy density depends on z. Now we turn to (1). The jump of T^{11} on the boundary means that there will be no conservation of linear momentum and also there will be no conservation of energy because of the jump of T^{01}. If we take a small closed surface Σ around the boundary z=0 we can write:

$$\frac{\partial}{c\partial t}\int_V T^{m0} dV = \oint_\Sigma T^{mn} d\Sigma_n \qquad (6)$$

Where V is a 3-volume enclosed by the surface. Evaluating the surface integral we see that T^{m1} only differs from zero on the right side of the boundary where $d\Sigma_1=-1$ (minus because it is a covariant component of the normal to the surface). For both m=0 and m=1 (because both T11 and T01 are negative) the whole surface integral will be positive. That means that the boundary will be the source of a positive linear momentum /energy (which will be absorbed by the electric field and current). In turn, (for the sake of conservation,) the boundary itself (and the elementary particle) will be getting a negative linear momentum per unit of time (which is force). This force will be directed towards the source of dummy waves. At the boundary z=a everything will be reversed: the particle will be subject to the equal force in positive direction of z axis.

At first glance it looks like the conservation of energy and momentum takes place (of course we have to include the particle that enforces the positions of the boundaries in the energy balance). We have the constant flows of energy and linear momentum and what is taken from the boundary z=0 is given back to the boundary z=a. Although, one thing is strange: if a boundary does not move, then one can give or take a linear momentum (equivalent to a force) but one can not give or take energy. That rather means that the energy appears at the one boundary and disappears at the other.

What if a part of the energy is lost in this way? Then less energy will arrive at the boundary z=a. That means that less linear momentum will be given to the boundary. This will result in the net force in the negative direction of the z axis. This will explain gravitation.

Now let us turn to T^{00} from (5). If k'a=π/4, then only positive energy density is present inside the particle. If k'a=π/2, then the positive and negative energies are present but the full energy on length a is zero. The energy (if it is positive as in the case, k'a=π/4) can be lost by the radiation of electromagnetic waves (not Dummy Waves). It can be assumed that this radiation is spherically symmetric. This way we are arriving at two results:

1. Explanation of gravitation.
2. Free source of energy in the form of electromagnetic waves that accompany the phenomenon of gravitation.

If so then we do not need to invite nuclear reactions to explain the source of stellar energy. We can modify the simplified example that was calculated above by adding yet another incident Dummy Wave with the same amplitude but coming from another direction of the z axis. In this case the net gravitational force will be zero but the creation of free energy will double. This condition would correspond to the center of a star.

Our last statement in this article is that the conservation of energy and momentum can be actually broken in connection with gravity and with it, the physics of stars (and planets) – the most dangerous statement one can ever make.

Appendix

This appendix is about terminology. "Dummy Waves" does not sound too comfortable. Also, the division into two physical realms does not sound right – the realm of the electromagnetic field and the realm of potential. Everything that is going on in the realm of the electromagnetic field has its reflection in the realm of potential. But not everything that is going on in the realm of potential has its reflection in the realm of electromagnetic field. That means that the physical realm of potential has priority. Also because of mandatory "conservation of potential" I propose to rename the term "potential" to the term "ether" and "ether current". These terms should be analogous to the terms "charge" and "current". The conservation of potential will turn into ether conservation.

We have two kinds of plane "etheral waves" in a vacuum:

$$A^0 = 0; \quad A^x = \Phi^\pm; \quad E_x = -ik\Phi^\pm; \quad H_y = \mp ik\Phi^\pm$$
$$A^0 = \Phi^\pm; \quad A^z = \pm\Phi^\pm; \qquad \Phi^\pm \equiv e^{i(\omega t \mp kz)}$$

The first one is a transverse etheral wave (because the ether current is perpendicular to the direction wave propagation). The electric and magnetic fields as well as energy and linear momentum are just consequences. The second one (called above, the Dummy Wave) is longitudinal etheral wave (because the ether current is in the direction of wave propagation). Both waves satisfy the ether conservation law.