the general science journal

Dummy Waves Are Responsible For Gravity

9-02-06. By Yuri N. Keilman
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. They do not carry any energy or linear momentum. This fact was the main reason to deny their 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 surface (it is a vector) must be continuous across the surface.

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

where N_k is 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 the potential leads to the importance of dummy waves.

We think that the model of a point particle (formula (7) in the previous article) can not produce the potential that will constitute a dummy wave. For the sources and receptors of dummy waves, we have to look inside the elementary particle where it is possible to have a continuous field of current density. Previously, we called the inside region of an elementary particle a **material continuum**. We found that inside this region, a current density has to satisfy to the equation:

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

The constant is approximately reciprocal to the size of a proton. The waves that could originate in this region (dummy waves) should have a very high frequency.

Let us assume that we already have a plane dummy wave in a vacuum going in the positive direction of the z- axis (–inf.<z<0) with potentials $\Phi_1(z,t)$, $A_1(z,t)$. This wave interacts with a single particle at z=0. Let us consider some imaginary model that simplifies the situation. We represent the particle in plane symmetry by a thin layer of a material continuum (0<z<***a***) with the potentials $\Phi_2(z,t)$, $A_2(z,t)$ where ***a*** reflects the size of the particle. After that, there is again a vacuum region (***a***<z<+inf) with the potentials $\Phi_3(z,t)$, $A_3(z,t)$. We have:

$$\Phi_1 = \Phi_1^+ + \Phi_1^-; \quad \Phi_1^+ = F_1^+ e^{-ikz}; \quad \Phi_1^- = F_1^- e^{ikz}; \quad A_1 = \Phi_1^+ - \Phi_1^-$$
$$\Phi_2 = \Phi_2^+ + \Phi_2^-; \quad \Phi_2^+ = F_2^+ e^{-ik'z}; \quad \Phi_2^- = F_2^- e^{ik'z}; \quad k = \frac{\omega}{c}$$
$$A_2 = \frac{k}{k'}\left(\Phi_2^+ - \Phi_2^-\right); \quad \rho(z,t) = \frac{k_0^2}{4\pi}\left(\Phi_2^+ + \Phi_2^-\right); \quad (k')^2 = k_0^2 + k^2 \tag{4}$$
$$j(z,t) = \frac{ck_0^2 k}{4\pi k}\left(\Phi_2^+ - \Phi_2^-\right); \quad E = \frac{ik_0^2}{k'}\left(\Phi_2^+ - \Phi_2^-\right); \quad \Phi_3 = A_3 = F_3^+ e^{-ikz}$$

where we assume that all the functions depend on t through the factor exp(iωt). In the first region, the given incoming wave F_1^+ and some reflected wave F_1^- are present (both are dummy waves). In the second region two waves are present. They satisfy the equations:

$$\Phi_2'' + k^2\Phi_2 = -4\pi\rho; \quad A_2'' + k^2 A_2 = -\frac{4\pi}{c} j; \quad ik\Phi_2 + A_2' = 0 \tag{5}$$

To define all the waves, we have to satisfy the conditions on the boundaries. We find:

$$on\ z = a: \quad F_2^+ e^{-ik'a} = \frac{k+k'}{2k} F_3^+ e^{-ika}; \quad F_2^- e^{ik'a} = \frac{k-k'}{2k} F_3^+ e^{-ika}$$
$$on\ z = 0: \quad F_1^- = F_1^+ \frac{2ik_0^2 \sin(k'a)}{D}; \quad F_3^+ e^{-ika} = F_1^+ \frac{4kk'}{D} \tag{6}$$
$$D \equiv (k+k')^2 e^{ik'a} - (k-k')^2 e^{-ik'a}$$
$$F_2^+ = F_1^+ \frac{2k'(k+k')}{D} e^{ik'a}; \quad F_2^- = F_1^+ \frac{2k'(k-k')}{D} e^{-ik'a}$$

Here we find the amplitudes of reflected and transmitted waves and the amplitudes of both waves in the second region (only F_1^+ is considered to be real).

We notice from (4) that the electric field, charge density, and current density are different from zero inside the second region. That means that the material continuum produces kind of a physical response to the energy-less dummy waves. We also found previously that the energy-momentum tensor in a material continuum has the form (one-dimensional symmetry assumed):

$$T^{00} = \frac{1}{8\pi}E^2 - \frac{4\pi}{k_0^2 c^2}\left(c^2\rho^2 + j^2\right); \quad T^{11} = -\frac{1}{8\pi}E^2 - \frac{4\pi}{k_0^2 c^2}\left(c^2\rho^2 + j^2\right)$$
$$T^{22} = T^{33} = \frac{1}{8\pi}E^2 - \frac{4\pi}{k_0^2 c^2}\left(c^2\rho^2 - j^2\right); \quad T^{01} = -\frac{4\pi}{k_0^2 c^2} c\rho j \tag{7}$$

Since we use complex numbers – we have trouble: 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):

$$T^{11} = -\frac{k_0^2}{4\pi}\left(|F_2^+|^2 + |F_2^-|^2\right); \quad T^{01} = -\frac{k_0^2 k}{4\pi k'}\left(|F_2^+|^2 - |F_2^-|^2\right) \tag{8}$$

These time averages of the components appear to be independent of 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:

$$\frac{\partial}{c\partial t}\int_V T^{k0} dV = \oint_\Sigma T^{ki} d\Sigma_i \tag{9}$$

Where V is a 3-volume enclosed by the surface. Evaluating the surface integral we see that T^{k1} 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 k=1 the whole surface integral will be positive. That means that the boundary is the source of positive linear momentum T^{01} (which is absorbed by the electric field and current). In turn, the boundary itself will be getting the negative linear momentum per unit of time (which is force). This force will be directed towards the source of dummy waves. This would be the explanation of gravitation. But this explanation of gravitation fails because there is another (back) boundary, which will generate the same force, only in other direction. To explain gravitation, we have to find yet another mechanism that allows us to decrease the amplitude of the transmitted wave on its way from the front to the back boundary. Possibly, this is connected to the mechanism of generation of dummy waves inside the material continuum. We do not know this mechanism yet. Still, I think that what is presented above is a substantial advance on the way to explain gravity.