Asymmetric Electrodynamic System: Displacement Opportunities

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In the article was scrutinized an elementary asymmetric electrodynamic system (AES). existence of such systems directly follows from the dual field theory based on the hexadimensional space-time $R_6^{(3,3)}$. Let us note that the said theory operates the direct product of the coordinate and the impulse spaces $R_6^{(3,3)} \times (R_6^{(3,3)})^*$ with the symmetry group $GL(6,R) \times (GL(6,R))^*$. It is shown in the paper that existence of systems of this kind is a consequence of the renowned Noether theorem on connection of space-time symmetries with the conservation laws for an arbitrary physical system.

In view of existence of such connection there is an opportunity to influence at the account of one of the conserved quantities, for instance, of the moment of impulse or charge, another preserved quantity, for instance, the energy impulse. Change of the energy impulse will lead to occurrence of the force acting on the system and, consequently, to displacement of such system. For a physical in which an electric charge is used as an oscillating physical quantity is applied a term «asymmetric electrodynamic system». Direct in the article is analyses a case of change of the energy impulse as well as is cruised a problem of influence of an asymmetric electrodynamic system on the flow of time in its immediate proximity, which in its turn is reflected on characteristics of electromagnetic emission and the velocity of propagation of electromagnetic oscillations. Further in the article are cited several possible schedules of asymmetric electrodynamic systems. Let us mention that the experimental proof of the given theoretical arguments will allow to use the systems of such kind in various engineering devices by designing aircraft.

1. Introduction

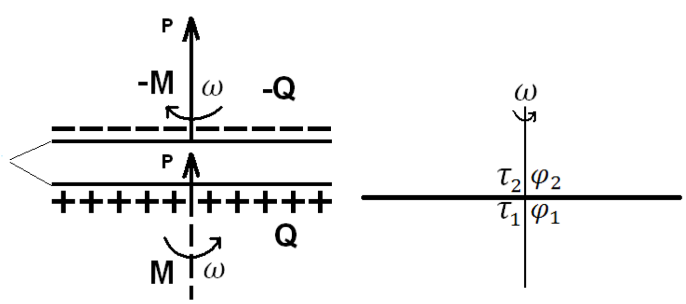

Fig. 1.1. AES system condenser plate

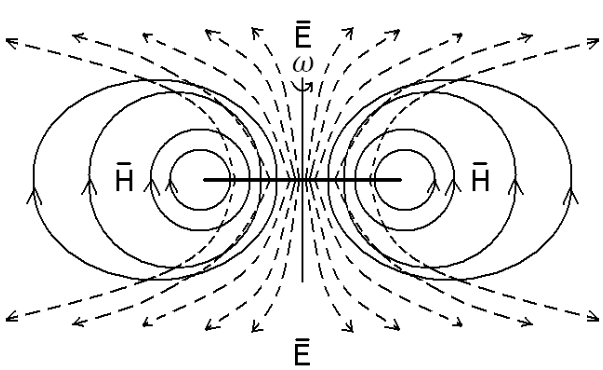

Fig. 1.2. Configuration of electric and magnetic fields of rotating plate

Let us consider a very simple asymmetric electrodynamic system: an AES (Figures 1.1 and 1.2) representing a condenser in a simplified form the armature of which (disc-shaped plates) are charged with charges of different signs and are rotation in opposite directions. Such systems are of considerable interest for development of theoretical and applied aspects connected with development of the unified field theory based on hexadimensional space-time [1-4]. It is worthy of note that it was N.A. Kosyrev [5, p. 260] to point out the possibility of availability of effects connected with asymmetric electrodynamics.

2. Theoretical Prerequisites for Existence of Asymmetric Electrodynamic Systems

General view of operation (in linear approximation) for each physical system can be written down in the following way:

$$S = \frac{1}{h} \cdot \int (p_i dx^i + M d\phi + L d\phi) + (exchange\ \ terms) \tag{2.1}$$

where p_i are the components of energy-momentum, x^i – space-time coordinates, M – singular momentum, L – charge, ϕ – angular parameter. The operation (2.1) is invariant to space-time transformations that leads to certain laws: those of conservation of energy-momentum, of angular momentum and charge (E. Noether's theorem). Let us assume that at a certain initial instant of time an asymmetric thermodynamic system represents an uncharged condenser in a state of rest. In this case:

$$S = \frac{1}{h} \cdot \alpha(1) \int \left(\delta_j^i p_i + m_j^i p_i + l_j^i p_i \right) dx^j$$

or
$$S=\frac{1}{h}\cdot\alpha(1)\int\left(p_i dx^i+Md\phi+Ld\phi\right) \tag{2.2}$$

where δ^i_j are Kronecker deltas, m^i_j – rotation matrix, l^i_j – scale transformation matrix. (2) can also be written down in the form of a differential:

$$\delta S=\frac{1}{h}\cdot(p_i dx^i+Md\phi+Ld\phi)=0\,, \tag{2.3}$$

at that, for a symmetric case are fulfilled the conditions as follows:

$$p_i dx^i=0\,,\ \ Md\phi=0\,,\ \ Ld\phi=0 \tag{2.4}$$

Further, let the system at the expense of internal sources of energy be transferred in an asymmetric state: the disc-shaped condensers acquire positive charges and be set into rotation in opposite directions. The law of preservation of preservation of action requires that action should not be changed. Consequently, also in this state $\tilde{S}=0$. But in this case (2.4) is not fulfilled:

$$p_i dx^i\neq 0\,,\ \ Md\phi\neq 0\,,\ \ Ld\phi\neq 0 \tag{2.5}$$

On the grounds of (2.3) and (2.5) the formula (2.2) will be rearranged in the following way:

$$\delta p_i=-(\delta M\cdot\frac{d\phi}{dx^i}+\delta L\cdot\frac{d\phi}{dx^i})\,. \tag{2.6}$$

As the plates rotate in opposite directions, will be fulfilled the equality

$$\delta M\cdot\frac{d\phi}{dx^i}=0 \tag{2.7}$$

Consequently, with the account of the equality (2.7) will be written (2.6) in the form

$$\delta p_i=\delta L\cdot\frac{d\phi}{dx^i} \tag{2.8}$$

On the grounds of SPT-symmetry of physical laws [6, p. 132] is clear that rotation of the negatively charged disc to one side is equivalent to rotation of the positively charged disc to other side. Thus, in spit

$$F_{ij}=\frac{\partial p_i}{\partial x^j}=\frac{\partial\varphi}{\partial x^j}\int(\delta^m_i l^k_m J_k dx^i) \tag{2.10}$$

where J_k is a hexadimensional density vector of the currents of the fundamental field, F_{ij} – force tensor, the value $\frac{d\varphi}{dx^i}$ is in this case construed as the angular velocity of rotation.

3. The Case of Uniformly Charged Condenser Plates

The formula for the force acting onto the system (2.10) (figure 1.1) in three-dimensional denotations will be written down in the form as follows:

$$\tilde{\mathbf{F}}=\frac{4\cdot\pi\cdot\tilde{\chi}}{c}\cdot\boldsymbol{\omega}\cdot\oint\mathbf{J}d\mathbf{l} \tag{3.1}$$

where $\mathbf{J}$ is the current density, $d\mathbf{l}$ – integration element, $\tilde{\chi}$ – proportionality factor characterizing the vacuum properties, $\mathbf{F}$ – the force acting onto the rotating plate of the condenser, c – light velocity. For the case of uniform distribution of the charge on the condenser plate and taking account that

$$(\mathbf{J}\cdot d\mathbf{l})=\rho\cdot(\mathbf{v}\cdot d\mathbf{l})=\rho\cdot v\cdot dl=\rho\cdot v=\rho\cdot\omega\cdot r\cdot dl=\rho\cdot\omega\cdot\frac{l}{2\pi}\cdot dl$$

the integral (3.1) is calculated easily:

$$\begin{aligned}F_z&=\frac{4\cdot\pi\cdot\tilde{f}}{c}\cdot\omega\cdot\int_0^{2\pi\cdot R}\rho\cdot\omega\cdot\frac{l}{2\pi}dl\\&=\frac{4\cdot\pi\cdot\tilde{f}}{c}\cdot\omega\cdot\frac{\rho\cdot\omega\cdot l^2}{4\cdot\pi}\Bigg|_0^{2\pi\cdot R}\\&=\frac{4\cdot\pi^2\cdot\tilde{f}\cdot\rho\cdot\omega^2\cdot R^2}{c}=\frac{4\cdot\pi\cdot\tilde{f}}{c}\cdot\rho\cdot\omega^2\cdot S\end{aligned} \tag{3.2}$$

where ρ – is the density of electric charge on discs, $S=\pi\cdot R^2$ – the area of the plates, ω – the angular velocity of rotating plates. The introduced factor $\tilde{f}$ is in the general case the function of the mass of the condenser plates, the velocity of displacement relative to isotropic microwave radiation, geometric shape of rotating plates and vacuum properties:

$$\tilde{f}=\tilde{f}(m_0,v) \tag{3.3}$$

where m_0 – is the rest mass of the plates with which in this case is identified the magnetic charge and which should be necessarily taken into account in the general case.

The general formula for the force with the account of the aforesaid will be written down in the form

$$\mathbf{F}=\frac{4\cdot\pi\cdot f}{c}\cdot\boldsymbol{\omega}\cdot\oint(\boldsymbol{\rho}\cdot d\mathbf{S})\cdot(\boldsymbol{\mu}\cdot d\mathbf{S})\cdot\mathbf{v}d\mathbf{l} \tag{3.4}$$

where $\boldsymbol{\rho}$, $\boldsymbol{\mu}$ – the surface vector charge density, $f=f(v)$ – the factor dependent on the velocity of motion. With the help of transformation of vector analysis the contour integral (3.4) is reduced to the volume integral:

$$\mathbf{F}=\frac{4\cdot\pi\cdot f}{c}\cdot\boldsymbol{\omega}\cdot\iiint(rot_x\mathbf{J}(m)\cdot\mathbf{E}+rot_x\mathbf{J}(e)\cdot\mathbf{H})dV \tag{3.5}$$

where $\mathbf{J}(m)$ is the current determined by magnetic charge, $\mathbf{J}(e)$ – the current determined by the electric charge, $\mathbf{H}$ – intensity of static magnetic field connected with magnetic charge, $\mathbf{E}$ – intensity of static electric field connected with electric charge.

4. Various Equivalent Approaches of Interpretation of Asymmetric Electrodynamic Systems

On the grounds of configuration of primary and secondary electric and magnetic fields (figures 4.1–4.4) we have: $\varphi_1\sim\int(\mathbf{E}-\mathbf{H})^2dV$, $\varphi_2\sim\int(\mathbf{E}+\mathbf{H})^2dV$, $\Delta\varphi=4\int(\mathbf{E}\cdot\mathbf{H})dV$.

Availability of a density gradient of energy of electromagnetic field is equivalent to occurrence of gravitational potentials which leads to emergence of force $F_z=\frac{\partial\varphi}{\partial z}=\cdot grad\varphi$ and as a result to displacement of the system along the symmetry axis. Let us note that toroidal magnetic field appears by rotation of a charged plate it is reputed that induced magnetic charges occur by rotation of the plate. Rotation of those induced charges leads to appearance of secondary eddy electric fields.

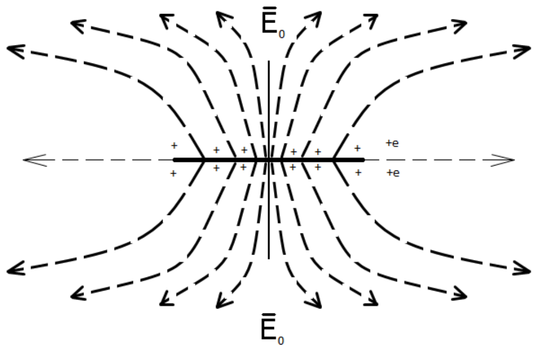

Fig. 4.1. Configuration of static electric field of charged plate at rest

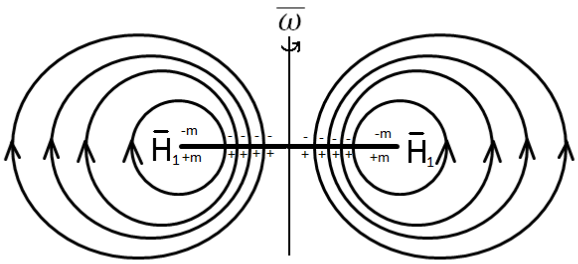

Fig. 4.2. Configuration of static magnetic field of uniformly rotating charged plate

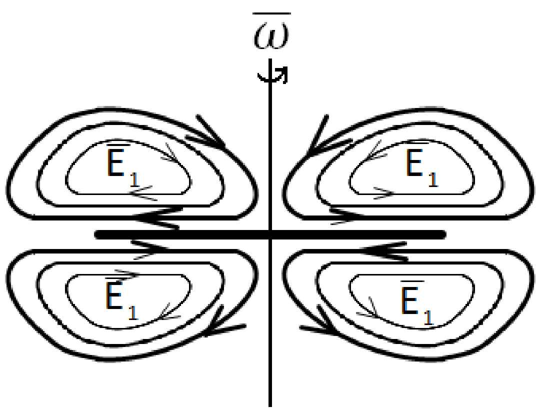

Fig. 4.3. Eddy electric field determined by rotation of induced magnetic charges

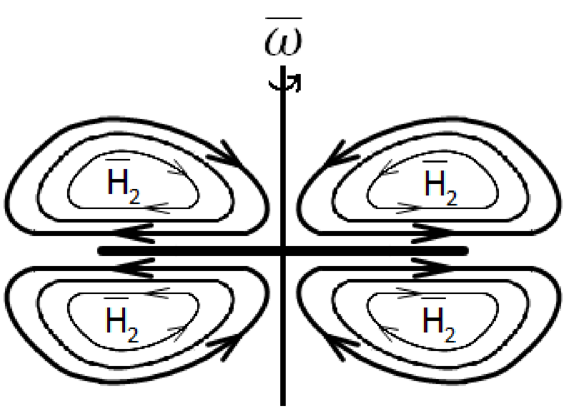

Fig. 4.4. Secondary magnetic field determined by eddy electric field

On the grounds of the two examined approaches, using vector analysis one can prove the identity of the following formulas:

$$\begin{aligned}\mathbf{F} &= \frac{4\cdot\pi\cdot f}{c}\cdot\boldsymbol{\omega}\cdot\oint(\boldsymbol{\rho}\cdot d\mathbf{S})\cdot(\boldsymbol{\mu}\cdot d\mathbf{S})\cdot\mathbf{v}d\mathbf{l} = \\ &= \frac{4\cdot\pi\cdot f}{c}\cdot\boldsymbol{\omega}\cdot\iiint\left(rot_x\mathbf{J}(m)\cdot\mathbf{E} + rot_x\mathbf{J}(e)\cdot\mathbf{H}\right)dV = \\ &= \frac{2\cdot\gamma}{c\cdot\sqrt{\sigma(m)\cdot\sigma(e)}}\cdot\mathbf{n}\cdot\iiint\left(rot_x\mathbf{H}\cdot\mathbf{E} + rot_x\mathbf{E}\cdot\mathbf{H}\right)dV = \\ &= \frac{4\cdot\gamma\cdot\pi}{c\cdot\sqrt{\sigma(m)\cdot\sigma(e)}}\cdot\mathbf{n}\cdot\iint\deg(EM)_s\,d\mathbf{S}\end{aligned} \tag{4.1}$$

where

$$\begin{aligned}\deg(EM)_{ij} &= \frac{1}{2\pi}\cdot\int\left(\frac{\partial E_i}{\partial x^k}H_j + E_i\frac{\partial H_j}{\partial x^k}\right)dx^k = \\ &= \frac{1}{2\pi}\cdot\int\det\begin{pmatrix} E_i & -H_j \\ \frac{\partial E_i}{\partial x^k} & \frac{\partial H_j}{\partial x^k}\end{pmatrix}dx^k\end{aligned} \tag{4.2}$$

It is easy to show that (4.2) can be presented in the following form:

$$\deg(EM)_{ij} = \frac{1}{2\pi}\cdot\int\frac{1}{\left(E_iE^i - H_iH^i\right)}\det\begin{pmatrix} E_i & -H_j \\ \frac{\partial E_i}{\partial x^k} & \frac{\partial H_j}{\partial x^k}\end{pmatrix}dx^k \tag{4.3}$$

The value $E_iE^i - H_iH^i = k = inv$ is an invariant of electromagnetic (fundamental) field and is reflected only on the constant. The difference in signs in determination of a usual degree of the vector field is connected with psuedo-Eucledian space-time. So, for example, it is known that [6, p. 516]:

$$\chi = 2\deg(EM)_{ij} = 2 - 2g\ , \tag{4.4}$$

where χ – is the Euler characteristic, g – number of handles in hyperplanes orthogonal to unit vector $s = (s_k) = \left(\varepsilon_{ijk}dx^i dx^j\right)$. In our case every handle is connected with a pair of electric charges located on the plates. Preceding from the nature of electric charge the structures of fundamental objects of matter [7] will be written down [6, p. 529]:

$$\deg(EM)_{ij} = \{E_i, H_j\} \tag{4.5}$$

Let us also note that the Gauss-Bonnet theorem is correct [6, p. 516]:

$$\chi = 2\deg(EM)_{ij} = 2 - 2g = \frac{1}{2\pi}\int RdS$$

where $R = g^{ij}R_{ij}$. The Ricci curvative tensor and the scalar curvature, as is well-known, enter the Einstein field equations in the four-dimensional space-time. The degree of the vectored field coincides with the linking coefficient of the electric and magnetic components of the electromagnetic field, and the coefficients f and γ are interconnected by means of the following formula:

$$\gamma = 2\cdot\pi\cdot\omega\cdot\sqrt{\sigma(m)\cdot\sigma(e)}\cdot f$$

where $\sigma(e)$ is differential electric resistance, $\sigma(m)$ – differential magnetic resistance. These values enter the formula of differential Ohm laws. For isotropic medium:

$$\mathbf{E} = \sigma(e)\mathbf{J}(e) \quad \text{or} \quad E_i = \sigma(e)_i^j \, j(e)_j$$

$$\mathbf{H} = \sigma(m)\mathbf{J}(m) \quad \text{or} \quad H_i = \sigma(m)_i^j \, j(m)_j \tag{4.6}$$

The difference of gravitational potentials leads to difference of the clock time located to different sides of rotating condenser plates.

From (3.1) and (3.2) for uniformly charged disc the potentials difference of the clock time may be represented in the form:

$$\begin{aligned}\Delta\tau &= \tau_0\left(\frac{\varphi_2-\varphi_1}{c^2}\right) = \tau_0\frac{a\cdot\Delta z}{c^2} = \\ &= \tau_0\frac{4\cdot\pi\cdot\tilde{f}\cdot\omega\cdot\oint(\mathbf{J}\cdot d\mathbf{l})}{m\cdot c^3}\cdot\Delta z = \\ &= \tau_0\frac{4\cdot\pi\cdot\tilde{f}\cdot\rho\cdot v^2\cdot S}{m\cdot R^2\cdot c^3}\cdot\Delta z\end{aligned} \tag{4.7}$$

where a – is the acceleration acting on the system, Δz – thickness of a plate, v – linear velocity of rotation of the plates, τ_0 – the clock time by resting discs, $\Delta\tau$ – the clock time difference. This effect can also be established by observation of displacement in spectral lines of two sources of light located on the opposite sides of the disc which can be determined according to the formula [8, p. 324]:

$$\Delta\omega = \frac{\phi_1-\phi_2}{c^2}\omega \tag{4.8}$$

5. Conclusion

In the article is stated a mathematical model of a simplest asymmetric electrodynamic system. Let us as an example take a look at the construction (figure 5.1) bringing into effect nonuniform distribution of the charge.

If we will use a liquid, a gas or plasma instead of solid elements of the plates, we can obtain an adaptive asymmetric electrodynamic system (AAES). Such systems will enable to alter the geometry of the moving elements of the AES (figure 5.2).

As inert mass (magnetic charge) enters the definition of inertial force, it disappears in equations of motion, and motion of the system of rotating plates like motion of a body in a gravity field (motion according to geodesic lines [6, 8]). It is worthy of note that if the material of the plates conducts electric current, then it is possible to reach the above described effect by means of circulation of excess current in this conductor without bringing into rotation the AES elements. At present it has been established by experiment that the phenomenon of superconductivity occurs for the majority of materials at rather low temperatures. In the superconductivity theory is used a pairing parameter which in the simplest case for the hydrogen atom [9, p. 263] has the form:

$$\Delta = \frac{mv^2}{2} - \frac{e^2}{4\pi\varepsilon_0 r} = W - U = -\frac{e^2}{8\pi\varepsilon_0 r}.$$

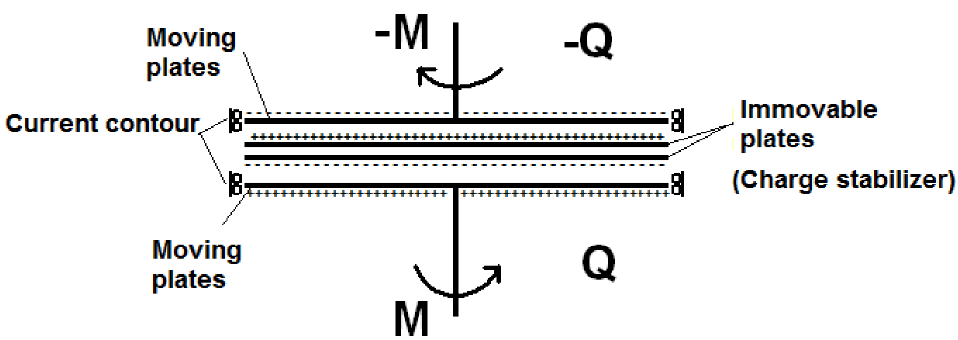

Fig. 5.1. Drawing of an AES enabling to create random distribution of density of electric charge on moving plates

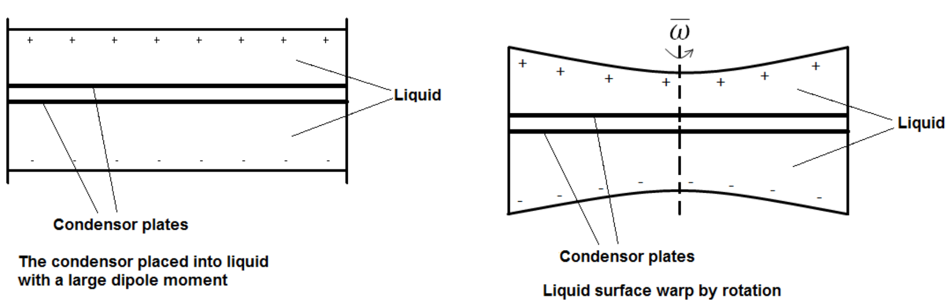

Fig. 5.2. Drawing of a liquid-based adaptive asymmetric electrodynamic system with a large dipole moment

One can easily see that the said parameter id the difference of kinetic energy of motion of electrons and the potential interaction energy. As it is known the conducting elements slides into a superconducting state at the expense of cooling (decrease of kinetic energy). Alongside with this it is possible to slide to the superconducting state at the expense of increase of potential energy of interaction. This transition will be equivalent to imposition of excess electric charge to AES elements. By a certain critical value of electric field intensity E_k the conducting plate will spontaneously slide into the superconducting state. Therefore, the system of many electric charges of the plate in this state will be perceived as a single particle possessing excess electric charge and magnetic moment connected with circulation of the charge about a closed contour. The system of electric and magnetic fields will be similar to the system of fields in figure 1.1. But if the plate is made of a non-conducting material it will come in rotation. The configuration of fields and all the effects are similar in both cases. For ideally conducting (electric resistance $R=0$) and ideally non-conducting ($R=\infty$) disc-shaped plates it impossible to determine whether the plate is rotation or whether current is circulation around it. Such systems as follows from the above stated executes accelerated motion. This acceleration will occur until the system gets into the equilibrium with the environment.

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