THEORETICAL SUBSTANTIATION OF THE INVENTION

(From «ELECTRODYNAMICS IN THE FIELD THEORY AND THE MATTER»)

Thus, the macroscopical vortex possesses all a characteristics, which are inherent for such steady elementary particles as electron and a proton.

Annihilation process has with all evidence special value for studying of electromagnetic vortices. It is a question that us the answer to a question interests: what's cooking at a meeting of two vortices with different electric charges and parallel magnetic moments, both opposite spin (rotation directions)? The solution of this direct problem answers and on return: as there is a birth of pair vortices from one powerful fluctuation of an electromagnetic field.

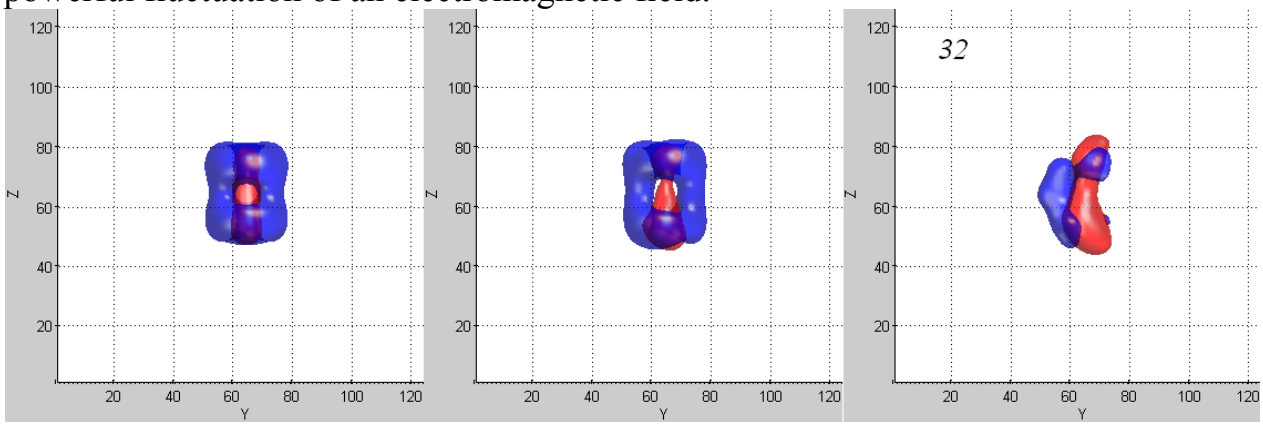

Fig. 18
Annihilation of two vortices along the general axis

Evolution of energy density of electric (a red silhouette) and magnetic (a dark blue silhouette) fields at an annihilation of system from two electromagnetic vortices along their general axis is shown in a Fig. 18.

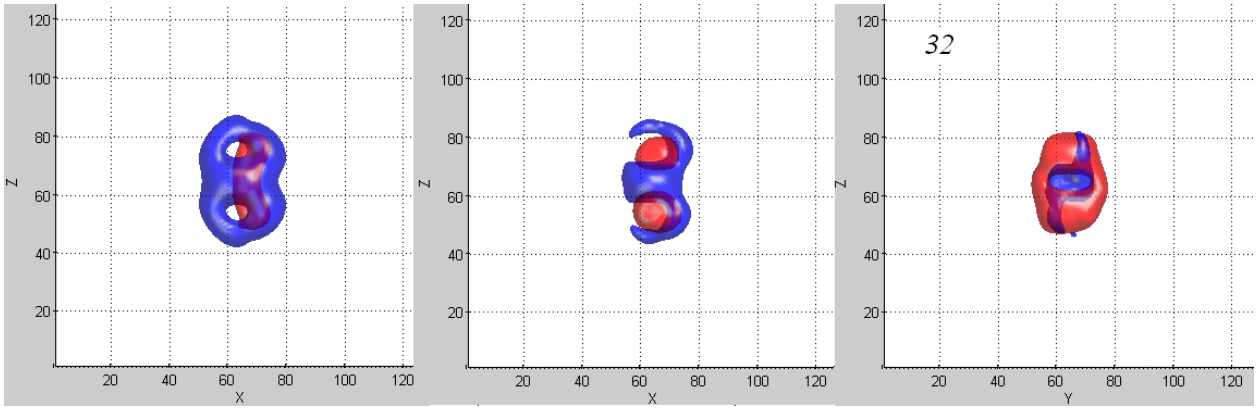

Fig. 19
Annihilation of two vortices in the general plane

The simplest and, probably, the most natural process of annihilation along the general axis are illustrated in a Fig. 18. However and more difficult situations cannot be excluded, if, for example process annihilation occurs in the presence of the third bodies or field configurations. One of such situations can lead to annihilation under any other foreshortening. The annihilation of vortices in the general plane is shown by the same technique in a Fig. 19. In the third position, i.e. on 32nd cycle, we see specific a collapsing configuration, which is closed by ring electric field. Naturally, it then too is compressed and breaks up to standing waves.

Drawings shows, that annihilation time is equally approximately only quarters of the period of a vortex that corresponds to a turn corner $\pi/2$. It means, that we see annihilation as extremely fast process, which in this case transforms the most complicated two-ring vortical system for very short time into one soliton of a usual standing wave (a sign: electric and magnetic fields are spatially divided). Naturally, from this follows, that the most usual soliton of a standing wave can give rise in return process to pair of vortices without a shade of mysticism and any wonderful interventions hereafter forces. Also it is the beginning of self-organizing of a matter.

So, we have shown consistently in this Chapter as electrodynamics can explain the electromagnetic nature of elementary particles. And it appears, that it is not necessary for this purpose to invent "models" and exotic hypotheses. Known properties of elementary particles and of an electromagnetic field are quite sufficient in detail to understand this difficult, but a solved problem. And a physic science can and should remain on materialistic positions.

6. About generation of macroscopical vortices in experiment

The numerical experiments made by us testify that basically the electromagnetic vortex can be initiated in the conditions of experiment by means of simple microwave technology. And for this purpose there are two ways of construction of the corresponding device. The first way is based on a reconstruction in laboratory conditions of the natural phenomenon of type of a fireball. A concrete physical support for such experiments is very specific property of arising plasma to have strong local excess of an indicator of refraction over 1 in a discharge zone. Opened and reliably registered by A.G.Askarjan effect of self-focusing of powerful laser radiation [12] testifies to it. The second way is more radical. Specially created configuration of medium for vortex initialization can be realized in it. For example, such medium can consist of two phases of one substance, or something similar.

The technique of calculations offered by us removes practically all initial questions to techniques of statement of experiments. Now it is possible to transfer business in hands of experimenters. The full success is guaranteed by only three components: laboratory, магнетрон and radio-engineer. This engineer can create necessary atmospheric conditions by means of the conditioner or a vacuum cleaner. It

is good, if he looks at Landau's verses «the field Theory» with irony. And it is even better, if it is absolutely not familiar with them.

The generator of the vortical electromagnetic field, which scheme it is presented in a Fig. 20, can form an experiment basis. Such design is described in the application for the invention [13].

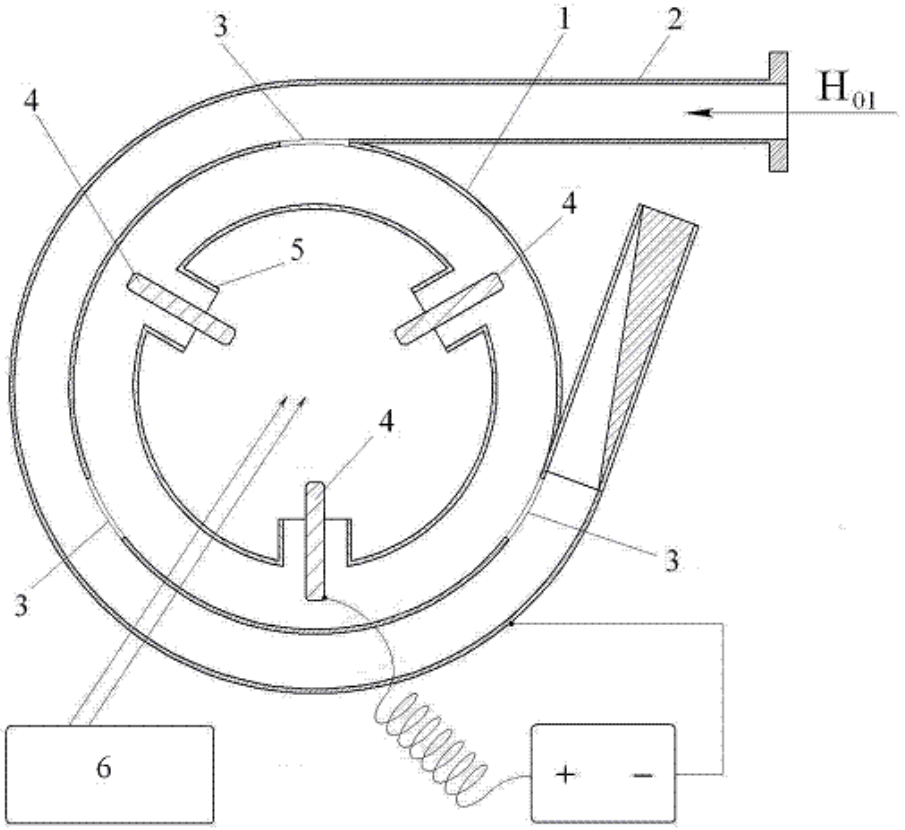

Fig.20
Device for generation of a macroscopical vortex

Here:

1 - the ring resonator on a wave of type H_{01},
2 - an entrance wave-guide,
3 - apertures of connection,
4 - probes of connection,
5 - open pieces of wave-guides,
6 - an ionizing radiation source.

Here it is supposed, that the axis of a bend of wave-guides is parallel to their wide wall.

Average phase speed in the resonator 1 should be less, than in a wave-guide 2 for the delay account on internal elements 4 and 5. If it is not enough of it, it is possible to enter an additional delay by dielectric. Magnetron with $\lambda = 5 \div 10$ sm can serve as source of microwave energy.

Experiment such is important for acknowledgement of the effect and studying of concrete characteristics of an electromagnetic vortex. But it is necessary to note as well utilitarian utility of such device.

The matter is that not only the electromagnetic vortexes possesses unique properties, but especially the annihilate pair from them.

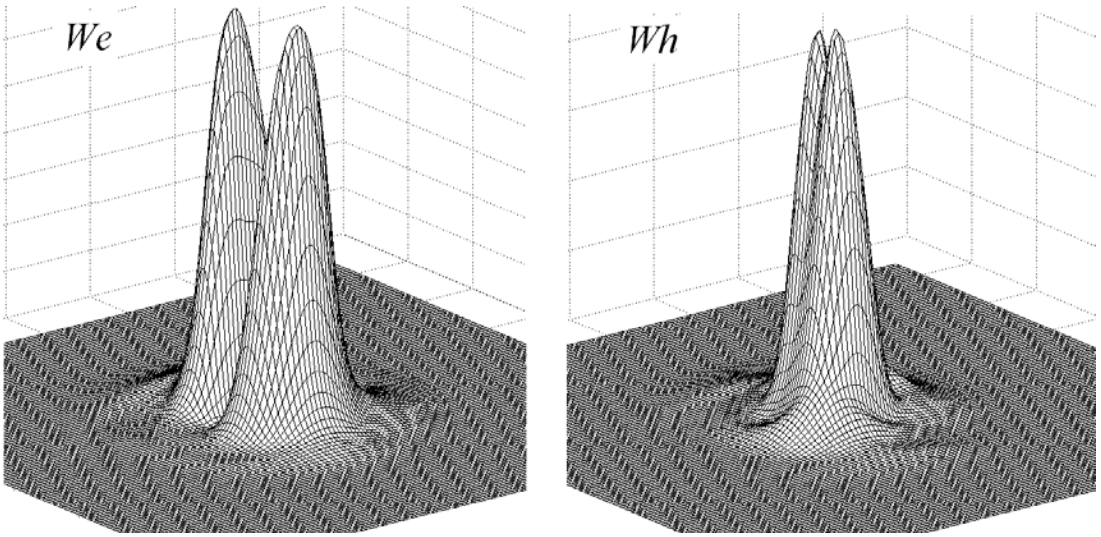

Fig. 21
Spatial energies distribution of electric and magnetic fields in an annihilation plane.

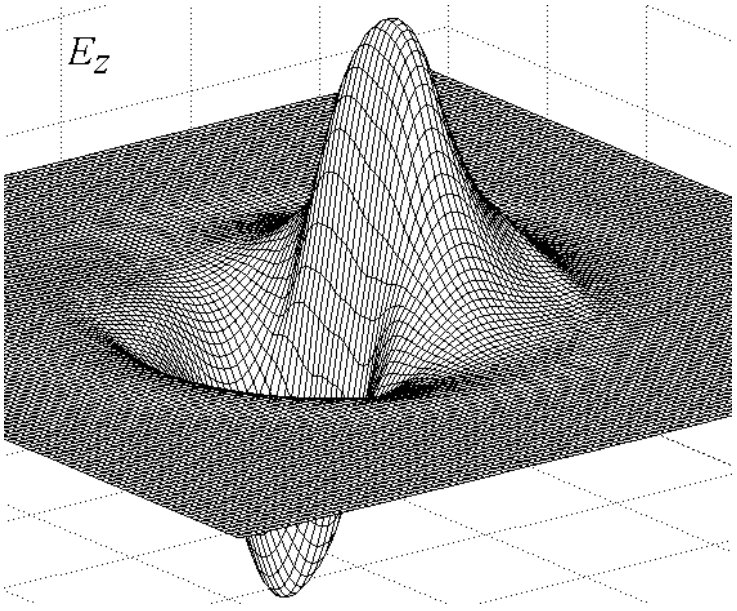

Fig. 22
Spatial distribution of electric field in an annihilation plane.

Distribution of electric and magnetic energy is presented in a Fig. 21 at an annihilation of vortices in the general plane as it is shown in a Fig. 19 (a cycle 32). It is possible to see in a Fig. 22 the distribution electric field z-components in the same place with the account of its sign. The particular characteristic very high gradient of this field is visible in the system center that testifies about maximum here the pressure-initiating breakdown. It is natural, as also other foreshortening of annihilation can be picked up if necessary for experiments.

Let's estimate time of an annihilation of the system illustrated in a Fig. 19, a Fig. 21 and a Fig. 22. It as we already marked, has the order of size equal approximately to a quarter of the period of rotation. If we use magnetron from the microwave oven, then frequency will be equal 2,45 GHz, and λ =0,122 m. Diameter of each fireball on this frequency is equal approximately λ, and energy has an order of size of 10 kilojoules. Accordingly time of an annihilation of pair of such vortices on a period quarter can be estimated in size of $1*10^{-10}$ second. Naturally, all energy of two vortices will be allocated in a small zone for such short time interval. But no kind of hydrodynamic instability will have time to develop still. Let's compare: the plasma instability in well-studied lightning arrester of z-pinch type have time of formation of instability considerably большее, than 10^{-7} seconds. And this size at least on 3 orders is more than time of an annihilation of vortices with frequency 2,45 GHz.

Hence, the annihilation of two electromagnetic vortices gives basic possibility on 2-4 orders to increase pulse density of energy (and, accordingly, temperature) in the category in comparison with other methods. Such parameters of investigated unique physical process will help to expand strongly our knowledge of high-temperature reactions and to find of them new applications for them (see Application № PCT/RU2007/000428, [13]).