On Estimating the Electromagnetic Pollution

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The problem of artificial electromagnetic background in cities is of the same importance as problems of chemical, acoustic, thermal *etc*. pollutions. Known field methods of the electromagnetic pollution evaluating are not quite adequate if the electromagnetic influences onto biological objects are analyzed, because those are essentially quantum systems (e.g., field formalism cannot take into account the Aharonov-Bohm effect). A self-sufficient potential formalism [1] is more promising. This theory predicts the existence of so-called *Zero Magnetic* (*ZM*) or *Potential* (*P*) electromagnetic potential oscillations. However, there are no experimental confirmations of those yet.

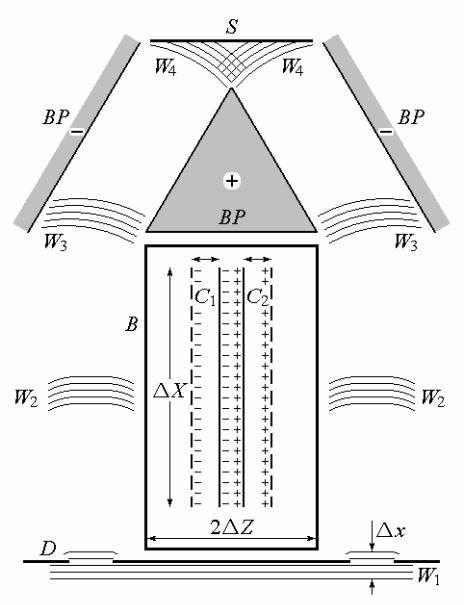

Fig. 1

A mental experiment is proposed in this paper to observe the *ZM* waves (Fig. 1). A short planar electron wavepacket W_1 falls with velocity v_{ex} on the diaphragm *D* having two slots. Two charged sheets C_1 and C_2 with surface densities of charge $-\sigma$ and $+\sigma$ are placed behind the diaphragm transversely to one. The sizes of the sheets in both dimensions $(\Delta X, \Delta Y)$ are much greater then length of the wavepacket Δx. The sheets are surrounded with an impenetrable for electrons potential barrier *B* of $2\Delta Z << \Delta X, \Delta Y$ in width. Initially, the sheets are placed almost together, so electromagnetic potentials the left and the right of ones are practically zero. When parts of the wavepacket passed through the slots move close to the middle of the sheets length ΔX (W_2), the sheets are drawn apart for a time of $\Delta t << \Delta X / v_{ex}$; then ones are returned to their initial positions. After an interval of order $\Delta Z / c$ (c is the light velocity), components A_t и A_z of the potential four-vector become non-zero for the wavepacket part locations. Component A_z does not vary the electron wave phase, while component A_t gives the phase shift about $-eA_t\Delta t/\hbar$. Both parts of the wavepacket passed the sheets full length ΔX (W_3) are deflected with the biprism *BP* producing interference figure (W_4) on the screen *S*. The *z* coordinates of the interference fringes have to vary depending on were the sheets moved during the wavepacket passing or no. Known experimental results of the Aharonov-Bohm effect examinations give a good chance that outcome of the described above mental experiment would be successful.

The fact that the variation of the potential from the relocated sheets C_1 and C_2 reaches the parts of the electron wavepacket W_2 only after the time of order $\Delta Z / c$ (not instantaneously) means that some wave process occurs between the sheets and the wavepacket parts. This cannot be described from the position of the field formalism, because electromagnetic field of the charged sheets does not affect the electron wavepacket at all. This is the *ZM* wave of electromagnetic potential.

The experimental validating the one of basic consequences of the potential formalism enables way to more realistic estimating the electromagnetic pollution after-effects.

References

1. Gritsunov A.V. Self-Sufficient Potential Formalism in Describing Electromagnetic Interactions // Radioelectronics and Communications Systems. – 2009. – V. 52. – No. 12. – P. 649-659.