Lienard-Wiechert potentials as a source of dark matter and dark energy

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Abstract—Liénard-Wiechert potentials describe the electromagnetic field of charged point particle moving along a given trajectory. In the new study, we will try to answer the question of whether a moving charged particle can generate dark matter and dark energy. We get an affirmative answer, yes it can.

The Liénard–Wiechert potentials describe the classical electromagnetic effect of a moving electric point charge in terms of the 4-potential A_i as

$$A_i = e\frac{u_i}{R_j u^j} \tag{1}$$

Here R_j denotes the 4-vector from the retarded position of the charge to the measurement point, and u^j denotes the 4-velocity of the moving point charge [1]. We chose the Liénard-Wiechert potential written as a 4-potentials A_i since a 4-tensor of mass M_{ik} was obtained in a recent paper [2] in the form

$$M_{ik} = m\delta_{ik} - \frac{e}{c^2}\left(\frac{\partial A_k}{\partial u^i} - \frac{\partial A_i}{\partial u^k}\right) \tag{2}$$

which contains the derivatives of the 4-potentials A_i with respect to the 4- velocity u^k . Here m is the usual mass, and all other off-diagonal elements of the tensor are components of dark matter and dark energy. Using expression (1) for the 4-potentials A_i it is easy to verify that if $i \neq k$ then $\frac{\partial A_i}{\partial u^k} = e\frac{-u_i R_k}{(R_j u^j)^2}$, and therefore the 4-tensor of mass (2) takes the form

$$M_{ik} = m\delta_{ik} + \frac{e^2}{c^2}\frac{(u_k R_i - u_i R_k)}{(R_j u^j)^2} \tag{3}$$

which answers the earlier question of whether a moving charge can create dark matter and dark energy - yes, it can. Now let's note a very important property of dark matter and dark energy created by a moving charge - the independence of dark matter and dark energy from the sign of the particle's charge. If we consider the structure of the 4-tensor of mass, written in the general form (2), then we can assume that dark matter and dark energy depend on the sign of the charge, since they are proportional to e , but the Liénard–Wiechert potentials used in our calculations also depends on the sign of the charge e , which together leads to independence from the sign of the moving charge (3). As an example, both an electron and a proton moving along the same given trajectory create the same amount of dark matter and dark energy.

It is interesting to consider how the new theory of dark matter and dark energy affects the physics of our Solar system. The solar wind continuously emanates from the Sun and consists mainly of protons and electrons, according to the new theory, each proton and electron creates dark matter and dark energy and therefore all space around the Sun is saturated with dark matter and dark energy. The Earth moves through dark matter and dark energy created by the Sun, but it is not yet theoretically possible to explain how this affects the earth's motion, one of the difficulties is that dark matter and dark energy are non-diagonal elements of the 4-tensor of mass. Now, in an exaggerated way, we can

say that the Earth does not feel dark matter and dark energy, just as a person does not feel the air on the Earth.

CONCLUSION

A charged point particle moving along a given trajectory with an electromagnetic field described by the Liénard–Wiechert potentials creates dark matter and dark energy around itself.

REFERENCES

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Yuri Mahotin. Currently on sabbatical due to health problems, unemployed. His current interests include the theory of dark matter and dark energy, as well as the theory and application of differenceless derivatives. Previously, he worked at Oracle Corp., Silvaco, Inc., Synopsys, Inc., and in Russia and the former USSR. He graduated from the Physics and Engineering Department of the Novosibirsk Electrotechnical Institute in 1984.