ELECTRODYNAMIC ANALOGIES IN ELECTRONICS AND PLASMAS

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In the report is considered Electrodynamic and Hydrodynamic analogies between Maxwell equations and Hydrodynamic equations for inviscid liquid. The problem of this analogy was stated by A. Zommerfeld (1956).

In this work the following formal transformations are made: ; 

(In electrodynamics  coincides with vector potential and  with the scalar potential; at that in case of the inviscid fluid and at absence of sources of mass excitation , . This explains experiments of Aronov and Bom..)

In this case

 (the law of full current)

All variables have standard forms fore electrodynamics and hydrodynamics.

They lead to equations;

 (Oersted law)

 (Biot –Savart Law)

Using Zhukowsky law for force on the cylindrical contour in the flow ,

one can obtain Amper law in the form

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Solving equations of Navier-Stokes and continuity for disturbance of inviscid weakly compressible liquid one can get a general wave equation including the longitudinal and the transverse part. At that the main put gives the longitudinal part in correspondence with N.Tesla conclusions. Indicated transformations lead to linearization of nonlinear hydrodynamic equations and to loose of Galilean invariance.

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