SOLUTION OF A THREE-DIMENSIONAL PROBLEM TO THE MHD FLOW OVER THE ROUGHNESS ELEMENTS IN A STRONG MAGNETIC FIELD

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In the designing of the present reactor tokamak the value of the Hartmann boundary layer in a strong magnetic field becomes commensurable with the size of the roughness of the surface of a channels wall. Therefore, it is need to study the influence of the roughness of the surface on the MHD flow of the conducting metal, which is planed to use in the system of the cooling of the reactor.

In paper [1] two-dimensional MHD problem on the flow of conducting fluid in the half space z
$geq0$, arising in the consequence of the roughness of the boundary in the form $z = \chi_0 \cos\frac{\pi x}{2L} \cos\frac{\pi y}{2L_1} y$, is solved. The external magnetic field is parallel to the z axis and the boundary $z = 0$ is not conducting.

In this report the similar problem is solved in linear approximation on the conditions, that the angle between external magnetic field and z-axis isnt equal to zero and the boundary $z = 0$ is conducting. As a result of the interaction of the external magnetic field and the given external current, three-dimensional flow arises.

The simple asymptotic formulae for the velocity of flow and induced current are obtained for a strong magnetic field. At Hartmann number Ha $\geq$ 10 these formulae practically coincide with the analytical solution of the problem, obtained in the form of double integrals. The numerical results for the velocity of fluid and for the streamlines of induced current are obtained using package "Mathematica".

REFERENCES

1. M.YA. ANTIMIROV, O.A. LIELAUSIS, E.S. LIGERE, A.YA. SHISHKO. Linear approximation to the flow over roughness elements in a strong magnetic field. In *Fifth International Pamir Conference on Fundamental and Applied MHD* (Ramatuelle, France, 2002) vol. 1, pp. 19–22.