The effect OF experimental data preprocessing on the accuracy of recovering the current flowing through a tube from data on the electric field strength, measured on its inner surface

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When transporting a megaampere current pulse from the generator to the load, metal cylindrical electrodes are used. The overall performance of the entire installation depends on their conductive properties and mechanical destruction of the electrode; mathematical modeling is used to optimize the geometry and the choice of electrode material. To close the system of MHD equations in the simulation of the processes occurring in the electrode material, the data on the total current flowing through the electrode are necessary; experimental measurement of this data is difficult due to the installation configuration.

The method described in [1] is used to restore the current profile using the electric field, measured on the inner surface of the electrode, for hollow cylinders with a wall thickness exceeding the thickness of the skin layer. The influence of the measurement error of the electric field strength at various stages of a pulse flowing through an electrode on the accuracy of current recovery is investigated. The preliminary processing of experimental data is proposed to reduce the manual work on the correction of the restored curve, the results of current recovery and the accuracy of the data obtained for test modes are presented. For a series of experimental modes, taking into account the proposed treatment, the current has been restored, the evolutions of temperature and electrical conductivity distributions of the electrode material over the thickness of the tube are presented.

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References

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