Broad class of problems exists in that is necessary to compute steady and pseudo-steady magnetic fields in presence of ideal conductors. Now used methods have general lack – they can be used in particular cases. Important circle of problems is computing magnetic fields in presence of thin plates. Known integral equations of the second kind lose sense at transition from plates to conductive open-ended surfaces. And difficulties of calculation are practically insuperable in case of usage finite elements method.

Model for density of surface currents by the way integral equation of the first kind appears applicable. Similar equations for density of eddy currents was used till now in scalar form only for axisymmetrical and planar problems, without the sufficient theoretical basis. There are no mentions of attempts to use vector equations of the first kind in literature. Classical theory indicates instability of such equations. However, we demonstrated, that by selection of an eligible pair of the Hilbert spaces equations of the first kind prove to be correct for rather broad class of surfaces – carriers.

Numerical method for solving next integral equation is examined and based one's arguments on facts:

$$\frac{\mu}{4\pi}\iint_S \frac{\overline{\sigma}(N)}{r_{NM}} dS_N = -\overline{A}^0(M) + \overline{C}(M),\ M \in S,$$
$$div\overline{\sigma}_S = 0.$$

Here $\overline{A}^0$ - vector potential of a nonperturbed magnetic field, S - median surface of plate, that's borders satisfy to condition of Lipschitz, S can include holes, μ - absolute magnetic permeability of medium, $\overline{C}$ - some field, that satisfy to condition $\mathbf{rot}_n \overline{C} = 0$.

The simple form of kernel open broad possibilities to optimization numerical algorithm. Special basis fields suggested in this work reduce considerable numerical dimension of problem and provide rarefied form of matrix of linear algebraic equations system, which get by using method of Ritz's sequences. Four-fold integrals, which one arise by founding elements of the matrix, prove to be table. The effective procedure for matrix construction was built on the ground of their analytical form.