LINEAR AND NONLINEAR INVERSE SOURCE PROBLEMS OF ACTIVE SHIELDING

S.V. Utyuzhnikov*, V.S. Ryaben'kii** and A. Turan*

**School of Mechanical Aerospace and Civil Engineering, University of Manchester, P.O. Box 88, Manchester, M60 1QD, U.K.*
s.utyuzhnikov@manchester.ac.uk

***Keldysh Institute of Applied Mathematics of Russian Academy of Sciences, Miusskaya Square4, 125047, Russia*

The problem of active shielding of some domain from the effect of the field generated in another domain is considered. The active shielding is realized via the implementation of additional sources in such a way that the total contribution of all sources leads to the desirable effect. Mathematically the problem is reduced to seeking the source terms satisfying some *a priori* described requirements and belongs to the class of inverse source problems. From the application standpoint, this problem can be closely related to the active shielding of noise, active vibration control and active scattering.

The solution of the problem of active shielding in the differential and finite-difference formulations is obtained under some general conditions. In contrast to many other approaches, it does not require either the knowledge of Green's function or any information on source distribution and surrounding medium. It is also important that along with undesirable field to be shielded a desirable filed is accepted in the analysis. The solution of the problem requires only the knowledge of the total field on the perimeter of the shielded domain. The active shielding sources are obtained for both linear and nonlinear statements of the problem. In the case of the system of first-order equations the active shielding source term is represented in the form of a single layer. Particular examples of the Helmholtz equation, acoustics equations, Maxwell equations and Euler equations are considered.