THE NUMERICAL SIMULATION OF THE SOLENOID TYPE MAGNETIC FIELD DETECTOR

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Magnetic systems are very important parts [1-4]. To create the necessary configuration of magnetic field, the repeated solution of nonlinear boundary value problem of magnetostatics is needed. In the present work, we consider the problem of creation of homogeneous map of magnetic system of solenoidal type (see Fig.1). As a result of optimization, the geometric parameters of magnetic system were chosen in such a way so as to get maximal size of the domain of homogeneity of the magnetic field. Due to symmetry, in the modeling only 1/24 part of the geometry with corresponding boundary conditions. The calculations were performed by the method of finite elements on tetrahedral mesh with 5 000 000 elements. It is seen that maximal value of magnetic field is reached in the corner points (1.3 T). The field in the center of magnetic system $B_{center} = 0.5\,T$. On Fig. 2   the domains with the degrees of homogeneity of magnetic field of 0.5% is shown. The black continuous line shows the homogeneity 0.1 % is needed. On Fig. 2 the scale of magnetic field has site from 0.998 – 1.002 T.
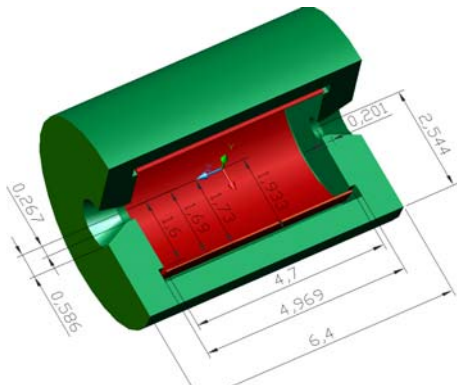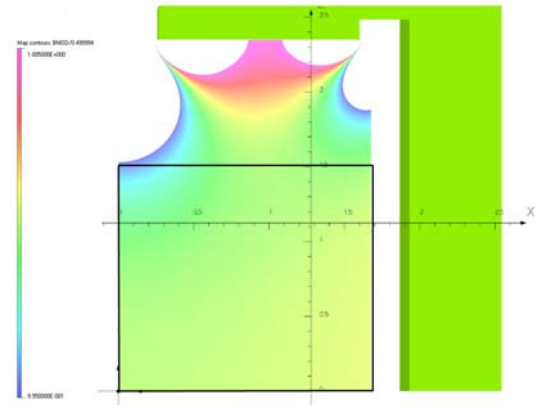

Fig.1 Magnet

Fig.2 Field homogeneity is ± 0.5

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