

Fabrication of a Circular Coil for the Study on the Magnetic Field Tolerance of TMP

Kyungmin Baik, Wan-Sup Cheung, Jong-Yeon Lim

Korea Research Institute of Standards and Science

Turbomolecular pump (TMP) is widely used to obtain and maintain high vacuum by spinning turbine rotors to migrate gas molecules to the exhaust of the pump. However, performance of the TMP has not been well observed when it is influenced by strong magnetic field. Such study may give useful information about magnetic field tolerance of TMP, development of magnetic shielding technique for key components of TMP, etc. For this purpose, magnetic field induced by a circular current source was firstly designed and investigated. Using spherical coordinates and vector potential, magnetic field throughout the space including axis of rotation was calculated. Due to the rotational symmetry of the circular current source, induced magnetic field is azimuthally symmetric and, thus, is analyzed by radial and polar components of the magnetic fields. In order to enhance the numerical accuracy for the calculation, magnetic field was expressed by complete elliptic integrals of first and second kinds. According to the calculation, when 1 A of DC-current passes through a 1 turned circular wire with 50 cm of diameter, overall magnitude of the induced magnetic field was about 0.02 Gauss, which was used to the determination of the current and the number of turns of wires to fabricate the coil for the study on the magnetic field tolerance of TMP.

Keywords: TMP, Magnetic field, Coil