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Numeric Analysis of the Rib geometry effect on multipole magnetic fields

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The present paper presents the effect of the secondary magnetic field by the ribs on the vacuum beam tube in the SIS100 superconducting dipole magnet. The beam tube and its components are the objects closest to the accelerated beam and exposed to the same magnetic field with the accelerated beam. Therefore, the influence on the magnetic field of the beam tube and its components on the magnetic field should be clarified for the beam operation. The ribs have geometrically long length with the direction of the applied magnetic field. This geometric structure increases the effect of the permeability of the material on the magnetic field quality. Since the ribs are located periodically in the beam direction, we compare the pattern of the magnetic fields in the plane with and without rib in the direction of the magnetic field. The effect of the ribs appears noticeably in the area more than half of the radius of the beam dynamics area. The beam direction magnetic field, which is perpendicular to the applied dipole field, is also generated. Due to the geometric shape of the rib, the phenomenon of a small permeability appears remarkably. The field effect should be also considered in rib design procedure.

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