

**Three Dimensional Field Analysis of Helical Snake Magnets for RHIC,** T. KATAYAMA, T. KAWAGUCHI, M. OKAMURA, T. TOMINAKA - RIKEN-RHIC Spin Project - A joint project between RIKEN and Brookhaven National Laboratory (BNL), is started from 1995 as 5 years venture. The accelerator aspect of this project is to accelerate polarized proton beams to the top energy of 250 GeV at RHIC. For this purpose, it is necessary to develop superconducting magnet of helical structure as a Siberian Snake for the control of the polarized beams. The Snake magnets consist of four helical dipole magnets twisted by 360 deg. and are expected to reach the magnetic field strength of approximately 4 T. The planned bore radius of coil and length of magnets are 50 mm and 2400 mm, respectively. Design of helical coils with use of Rutherford cable, current of 3 kA, is in progress at RIKEN. In this design work, it is shown that the 2 dimensional, 2D, analysis was insufficient to estimate the multipole components, fringing field and longitudinal component of the field. Then we calculate 3D magnetic field using computer code TOSCA. Also the analysis of beam orbit and spin motion of polarized proton in Siberian Snakes are done using the results of 3D calculation. In this paper, details of field calculation and spin dynamics will be presented.