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Numerical Simulation of Magnetic Shield for Manned Space ight

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Humankind, who lives in the Earth, had been protected from cosmic rays by the atmosphere and magnetic field of the Earth. After the middle of 20th century, we widened our sphere of influence to the cosmic space, which is outside the atmosphere and geospace. As a result, we and our civilization are now directly exposed to danger of the cosmic rays. As one of means to defend the spacecraft and our bodies, the artificial magnetic shield has been proposed. However, it has not been quantitatively discussed how the efficiency of the magnetic shield depends on the parameters such as the coil current.

In the present study, we numerically discuss the magnetic shield using dipole magnetic field for high energy cosmic rays. The numerical results show that amount of cosmic rays going in magnetic shield takes the maximum value with a certain magnetic dipole moment. In addition, the value of the coil current to make the effective magnetic shield discussed here is realistic, in contrast to the magnetic sail. On the other hand, a half of cosmic rays enter at the vicinity of the magnetic pole, while the other cosmic rays circularly move around the magnetic shield due to the magnetic gradient drift.

Keywords: Magnetic Shield, Cosmic ray