

Measurement of earth's magnetic field with a spherical Neodymium magnet

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The purpose of this study was to establish a simple method for measuring the earth's magnetic field with a spherical neodymium magnet. In a previous study, we found that the magnetic dipole moment of a spherical neodymium magnet can be derived from magnetic force between the two spherical neodymium magnets. This method for determining the magnetic dipole moment is called method A. On the other hand, when a magnet is hung by a thread freely, the horizontal oscillation of the magnet is known to be approximated as a simple harmonic motion. It is possible to estimate the magnetic dipole moment of the magnet from the period of oscillation, the inertial moment of the magnet, and the horizontal component of earth's magnetic field at a point on the earth's surface. This method for determining the magnetic dipole moment is called method B. By method B, we measured the period of oscillation of a spherical neodymium magnet and determined the magnetic dipole moment of its magnet. The value of the magnetic dipole moment determined from method B in this experiment was identical to that determined from method A in our previous study. This result demonstrates that the value of the magnetic dipole moment we obtained is reliable. In conclusion, it is possible to know the horizontal component of earth's magnetic field at any place on earth easily by measuring the period of oscillation of a spherical neodymium magnet, which has an already known magnetic dipole moment and inertial moment of its magnet. Simple method B, which we have devised, is also applicable to determine the magnetic field in space.

Keywords: Earth's magnetic field, Magnetic dipole moment, Spherical neodymium magnet