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Measurement of magnetic field deviation and the effect at HIMAC synchrotron

At HIMAC synchrotron, the status of device is monitored to ensure the reliability of beam for therapy by operators and control systems. Although we are monitoring a current output of each power supplies of dipole and quadrupole magnets, we have been aware that there is a difference between the monitoring current and the actual magnetic fields through information from a beam. However, we could not know the actual magnet field and handle the problem with theoretical support, because we had no suitable monitoring system for magnetic fields. So we have developed an NMR system to directly measure dipole magnets fields both injection and extraction fields, thus we have become able to deduce quadrupole magnet fields from comparing the dipole field with measurements of beam behavior. This has made us possible to know a long term drift of magnetic fields and lag of a magnetic field from a current of pattern operated magnets in synchrotron. As a result, we can correct a change of beam behavior caused by magnet field change. In addition, due to the measurement of the magnetic fields deviation, we will be able to optimize the synchrotron current pattern without special skills of experienced operators. In this report, we will present the method and the results of the measurement and perspective into the future.

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