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Development of permanent magnets replacing electromagnets at NSRRC

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Integrating permanent magnets as substitutes for large electromagnets offers advantages such as energy savings, space efficiency, and low maintenance. An electromagnetic dipole magnet on the TPS transfer line is proposed to be replaced by a permanent magnet. This permanent magnet will be hybridized with an electrical coil to allow fine tuning of the magnetic field. Additionally, an NMR system is integrated into the magnet to monitor long-term field variations. The magnetic circuit design for the 1m-long permanent magnet has been preliminarily completed. Currently, the prototype-1 magnet with 0.15 m employs adhesive technology to bond small magnetic blocks into larger ones. The magnetic field strength and uniformity of prototype-1 meet the design specifications. NiFe material has also been used for temperature compensation. During the development process, some assembly procedures and mechanical designs were revised. The prototype-2 is currently in production. This paper presents the magnetic circuit design, the mechanism design, the magnet prototype and the field measurement result of the permanent dipole magnet.

Footnotes

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