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Compact permanent magnets for small bore accelerators

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In synchrotron light sources, electromagnets are used to bend and accelerate electron beams. In 4th generation sources, the electron beam can fit in smaller bore accelerators, allowing the use of permanent magnets, which have many advantages over electromagnets. This poster focuses on the mechanical design, fabrication and testing of two compact permanent magnet systems, which have a 1:5 magnet to metal volume ratio. The first is a dipole-quadrupole magnet assembly, providing a 1 T dipole + 50 T/m quadrupole field to steer the electron. The second is an assembly to adjust a set of tuner and corrector permanent magnets. Regardless of the magnetic forces involved, the tuner magnets can rotate simultaneously and provide a ± 1 T/m quadrupole field for in situ quadrupole focusing strength adjustments, while corrector magnets can be oriented into a prescribed configuration to compensate for small field errors. Prototypes for the dipole-quadrupole, tuner and corrector holders were manufactured and tested, validating the conceptual design.

Footnotes

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Author: HUSCHKE, Christopher (Lawrence Berkeley National Laboratory)

Co-authors: ALLÉZY, Arnaud (Lawrence Berkeley National Laboratory); SCHLUETER, Ross (Lawrence Berkeley National Laboratory)

Presenter: HUSCHKE, Christopher (Lawrence Berkeley National Laboratory)

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