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**Performance and Cost Optimization of Superconducting Focusing Quadrupoles
for HIF Experiments***

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The Heavy Ion Fusion (HIF) program is progressing through a series of physics and technology demonstrations leading to an inertial fusion power plant. The High Current Experiment (HCX) is exploring the physics of intense beams with high line-charge density. It will be followed by a source-to-target Integrated Beam Experiment (IBX) to study all the beam manipulations required by a fusion driver. Superconducting focusing quadrupoles are being developed for the HCX and the IBX, in order to study the magnetic transport issues in realistic driver conditions. A baseline quadrupole design was selected following design studies and test results of model magnets. Optimization of the baseline design led to the development of a first prototype in 2003. This magnet achieved a conductor-limited gradient of 132 T/m in a 70 mm bore without training, with measured field errors at the 0.1% level. Based on these results, the design was adjusted to improve the field quality, and changes in the fabrication procedures were implemented in a second prototype to reduce the production cost. We discuss the latest design features, the magnet fabrication experience and the test results.

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