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## **Novel Cavity Feature On Dipole Magnet Pole Face Improves Field Homogeneity While Reducing Coil Complexity**

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FEA simulation software OPERA 3D is used to develop a geometric cavity feature on the pole face at the beam entry and exit points of a dipole magnet. This cavity is incorporated into a prototype magnet designed at Stangenes Industries to improve field homogeneity along the beam arc to 0.1%. The magnet design handles beams entering at different angles, positions and beam energies. The optimized cavity lowers the cost and footprint of the magnet by allowing the coil to remain rectangular in shape. The magnet has been tested and installed at the beam line at LLNL as part of a compact accelerator creating radiographic images using quasi-mono-energetic fast neutrons. The dipole bends both 4 and 7.07 MeV D+ ion beam 66 degrees on a 457.2 mm radius. The magnet is also capable of bending the same beams in multiple trajectories depending on applied field strength. The field strength is adjustable up to 1.4 T center field with minimal pole saturation, but operates at 1.2T nominal.

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