

12th Beam Telescopes and Test Beams Workshop



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Team Myriad Magnets - A Radially and Rotationally Adjustable Magnetic Mangle for High Energy Particle Beams

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Our magnetic mangle, a multifunctional variant of the Halbach cylinder designed for 100MeV –10GeV electron beams, was nominated as one of the winners of the 2023 Beamline for School (BL4S) competition. As a result, we were selected to testing it on the T10 beamline of CERN, Geneva, in September 2023. Analysis of the experimental results shows deflections well within the margin of error of our GEANT4 simulations and confirms the viability of our magnetic mangle as a low-cost alternative to electromagnets. The compact (20cmx20cmx35cm, less than 5 kg) and low-cost mangle consists of 8 diametrically-magnetized magnets encased and arranged in a circle; it was entirely designed by us at our high school, Phillips Exeter Academy, where the first prototype was 3D printed. Each magnet can be rotated to generate a dipole or a quadrupole field inside the array, and the magnets can be moved radially inward or outward to modify the field's strength. The very weak magnetic field outside the array makes the mangle safe to use near other electronics, and a viable alternative to electromagnets for narrowing or deflecting particle beams.

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