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Design and Test of a half-aperture Canted-Cosine-Theta multipole Prototype Magnet For the HIAF Fragment Separator

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A novel Canted-Cosine-Theta (CCT) coil technology is first proposed and applied to the HIAF (High Intensity heavy-ion Accelerator Facility) fragment separator, which can offer the absence of multipole components and meet the requirements of high magnetic stiffness (25 Tm). In this paper, a half-aperture CCT multipole prototype was built and successfully tested by the Superconducting Magnet Group at Institute of Modern Physics (IMP). This magnet consists of four CCT formers that produces the gradients of 20T/m@500A and 120T/m2@385A, with a clear bore diameter of 200 mm. Two types of superconducting cables are chosen and wound into the grooves of formers. The goal of the R&D of prototype is to verify the fabrication process, including coil winding, joints, assembly and impregnation. The detailed design and analysis for the half-aperture prototype magnet will be presented, along with results for the first set of tests.

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