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## Coil Dominated Superconducting Multiplets for the HIAF Fragment Separator Using the Canted-Cosine-Theta (CCT) geometry

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The fragment separator of the HIAF (High Intensity Heavy-ion Accelerator Facility) project called HFERS requires quadrupoles with high gradients (11.4 T/m) and large bores (gap width of 160 mm). The iron dominated magnets with superconducting coils have been widely used in the similar facilities such as A1900, BigRIPS, Super-FRS and RISP with the advantages of low request for coils installation precision, simple fabrication and low cost, but they have large cold mass and helium containment, which result in long time cooling-down and big pressure rise after a quench. In addition, due to iron saturation, the field quality is hard to guarantee in the whole field range. A new coil dominated design based on Canted-Cosine-Theta geometry is presented for HFERS, which is expected to overcome these problems. The design superimposes several layers of oppositely wound helical windings to generate high quality quadrupole. Sextupole and steerig dipole can also be easily intergrated to reduce the length of cryostat. This paper describes the detailed design of HFERS multiplets based on CCT concept and reports on the construction of a subscale prototype.

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