**MT29 Abstracts and Technical Program** 



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## Wed-Mo-Po.01-04: Design of Superconducting Quadrupole Magnets for a High Rigidity Spectrometer at FRIB

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With an enhanced magnetic rigidity of 8Tm, the High Rigidity Spectrometer (HRS), is proposed to enhance the scientific reach at the Facility for Rare Isotope Beams (FRIB). The HRS consists of High Transmission Beam Line (HBTL) section and Spectrometer Section (SPS). Lawrence Berkeley National Laboratory (LBNL) is responsible for designing the two large aperture quadrupole magnets, QSA and QSB in the SPS section. For QSB, it provides the quadrupole field up to 5.25T/m with the radius of aperture of 0.40m; Additionally, it includes sextupole and octupole coils with the fields up to 4.73T/m<sup>2</sup> and 8.61T/m<sup>3</sup> to tune the beam. The high order non-uniformity of quadrupole is required to be less than 1%. The quadrupole and high order corrector coils are independently-powered. The interaction between the quadrupole and the other coils significantly affects the magnetic forces to cover entire operation ranges. In this paper, we describe the magnet specification and a conceptual design with 2D and 3D magnetic and mechanical analysis, conductor selection, coil fabrication and magnet cold mass assembly plan, and quench analysis.

Author: YANG, Ye

**Co-authors:** Mr XU, Lianrong (Lawrence Berkeley National Laboratory); PRESTEMON, Soren; SHEN, Tengming; Dr XU, Ting (Facility for Rare Isotope Beams); DU, Xiaoji (Michigan State University); CHOI, Yoonhyuck (Facility for Rare Isotope Beams at Michigan State University)

Presenter: YANG, Ye

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