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New Spiral Beam Screen Design for the FCC-hh Injection Kicker Magnets

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The injection kicker system for the Future Circular Collider (FCC-hh) must satisfy demanding requirements. To achieve low pulse ripple and fast field rise and fall times, the injection system will use ferrite loaded transmission line type magnets. The beam coupling impedance of the kicker magnets is crucial, as this can be a dominant contribution to beam instabilities. In addition, interaction of the high intensity beam with the real part of the longitudinal beam coupling impedance can result in high power deposition in the ferrite yoke. This gives a significant risk that the ferrite yoke will exceed its Curie temperature: hence, a suitable beam screen will be a critical feature. In this paper, we present a novel concept - a spiral beam screen. The fundamental advantage of the new design is a significant reduction of the maximum voltage induced on the screen conductors, thus decreased probability of electrical breakdown. In addition, the longitudinal beam coupling impedance is optimized to minimize power deposition in the magnet. This paper introduces the conventional and spiral beam designs and discusses the advantages of the spiral design.

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