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Fri-Af-Po.06-07: Optimization design and mechanical analysis of a 5 T iron-based superconducting insert coil for high field application

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Iron-based superconductor, owing to their exceptionally high upper critical fields and relatively simple fabrication processes, exhibit significant application potential for high-field superconducting magnets. This research designed a 5 T iron-based superconducting high-field insert coil operating in the 28 T background magnetic field. An optimization strategy was applied to refine the electromagnetic structural parameters and minimize overall superconducting tape cost, while a robust support structure was developed to ensure mechanical integrity. Simulation comparing different co-wound materials, epoxy impregnation schemes, and binding strategies were conducted to ensure the stress-strain levels of the iron-based superconducting tape remain within acceptable limits. This study primarily addresses mechanical challenges encountered by iron-based superconducting high-field insert coils and aims to promote the practical application of iron-based superconductor in high magnetic field area.

Key word: iron-based superconductor, high-filed insert coil, mechanical analysis, optimization design

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