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Excitation Effect Analysis of a Novel HTS Controllable Reactor with Orthogonally Configured Core Based on dynamic Inductance

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The controllable reactor is one of the most effective methods for compensating reactive power. A novel high temperature superconducting (HTS) controllable reactor with orthogonally configured core has been proposed, analyzed, and developed. However, for the controllable reactor with dynamic inductance, the excitation analysis based on field circuit coupled method is inefficient and the excitation parameters optimization is more difficult. In this paper, an excitation system containing voltage source converter (VSC) and Buck-Boost converter is established. The reactor is built as a self-defined nonlinear element in system model based on the dynamic inductance. The inductance matrix, core saturation, leakage magnetic field at HTS winding, and total magnetic flux in the excitation core are included in the self-defined element. The parameters of the excitation system have been optimized easily. The simulation result of the output characteristic of the reactor is consistent with the experimental observations of the prototype. The dynamic inductance method is proved to be fast and effective.

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