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Modeling the KSTAR PF magnet system –an engineering work for the optimal operation

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Extending the development of a pilot of SUPERMAGNET model of the KSTAR PF magnet, the thermo-hydraulic analysis has been emerged as an essential part to study the performance of the superconducting magnet in KSTAR tokamak. Showing the possibility of a good simulator of superconducting tokamak, we develop a coupled CICC network of the full-scale central solenoids (PF1UL ˜ PF7UL of KSTAR) in the framework of SUPERMAGNET code which enables orchestration of the individual solvers in CryoSoft 8.0 package. Into the model of the magnet system, autonomous heat load generation is included with validated two-tau model of coupling loss. It's a work for the physical simulator whose attempt is the reliable analysis when investigating the parametric model for real-time application. Hence, the feasibility and shortcoming is discussed as the performance issue of simulation comparing with the experimental data. The numerical stability, which is related to the 1-D flow connection to the volume node, is carefully investigated on the preliminary work to upgrade the cryo-network solver. For an attempt at a similar type of modification, we also present the applicability of user-defined component (compressor) and its connection scheme paying attention to the consistence of its dynamical behaviour.

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