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Mon-Af-Po1.15-12 [43]: Design and Quench Analysis Study on a 9 T NbTi Superconducting Magnet for Large Bore EMPS

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A 9 T NbTi superconducting magnet with large bore is designed and will be fabricated for EMPS (Electro-Magnetic Property measurement System) whose sample space is 50 mm in diameter. To satisfy the large sample space of the system, winding bore of the magnet should be larger than 100 mm in diameter. Since the winding diameter is larger than that of conventional 9 T class NbTi superconducting magnets, wire selection and magnet design are very important and difficult in this research. Optimal design with genetic algorithm considering critical current, magnetic stress, thermal stability and field uniformity is carried out to develop 9 T large bore NbTi EMPS magnet. The design algorithm calculates the structure and dimensions of the magnet to minimize the total volume with satisfying the constraints related to the stability of the magnet. The magnet is composed of series connected three coaxial NbTi coils, of which the wire diameters are different. To evaluate thermal stability of the magnet, quench analysis is also implemented considering the two boundaries among adjacent three coaxial NbTi coils. The maximum hot spot temperature of the magnet is calculated based on the quench analysis model and the fabrication of the 9 T large bore NbTi magnet will be performed after design optimization.

Authors: JANG, Jae young (Korea Basic Science Institute); HWANG, Young Jin (Korea Basic Science Institute); CHOI, Yeon Suk (Korea Basic Science Institute)

Presenter: JANG, Jae young (Korea Basic Science Institute)

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