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Basic Design and Progress of Central Solenoid Model Coil for CFETR

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The Central Solenoid Model Coil (CSMC) project of China Fusion Engineering Test Reactor (CFETR) began in 2014 and the purpose is to develop and verify the related manufacture technology of the larger-scalar superconducting magnet. The CICC (Cable-in-Conduit-Conductor) is chosen for CFETR CSMC as the best conductor type because of 12 T field and 1.5 m inner diameter design requirement. The CFETR CSMC consists of two type coaxial solenoid coils named Nb3Sn coil in the high field region and NbTi coil in the low field region in order to optimize the manufacturing cost effectively. The maximum field of the Nb3Sn and NbTi coil can reach to 12 T and 6.1 T respectively when the operating current is 47.65 kA. In this paper, the basic design aim and operation requirements of CFETR CSMC are summarized firstly. Secondly, the characteristics of superconducting strands and CICCs including the NbTi and Nb3Sn conductor are described in details. Subsequently, the basic structure design and main features of CFETR CSMC are presented in the third part. The DC, AC and stability performance measurement of Nb3Sn CICC sample, as the most important stage assessment, are performed in SUTLAN test facility and some meaningful conclusions are summed up in the last.

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