27th IEEE Symposium on Fusion Engineering



Contribution ID: 281

Type: Poster

Structural Stress Analysis of the CFETR CS Model Coil

Tuesday 6 June 2017 13:40 (2 hours)

CFETR (China Fusion Engineering Test Reactor) CS (Central Solenoid) model coil made with CICC (Cable in Conduit Conductor) superconductor had been developed in Institute of Plasma Physics, Chinese Academy of Sciences. The highest field of CS model coil is 12T, and the largest magnetic field change rate is 1.5T/S. CS model coil mainly consists of two Nb3Sn inner coils and three outer NbTi coils, buffer zone, feeders and joints, preload supports and so on. The inner diameter of the coil is 1500 mm, and the outer diameter is 3520 mm. Preliminary stress analyses were performed using coupled solver for simultaneous structural, thermal, and electromagnetic analysis. A global finite element model was created based on the initial design geometry data, and it was used to calculate the stresses and deformations of components. Numerical simulations were performed for room temperature condition, cool down to 4.5 K, and the operating current with 47 kA. Computational analysis led to the structural design of the coil, while the optimization was done during design process to verify structural integrity.

Eligible for student paper award?

No

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Session Classification: T.POS: Poster Session T

Track Classification: Magnets