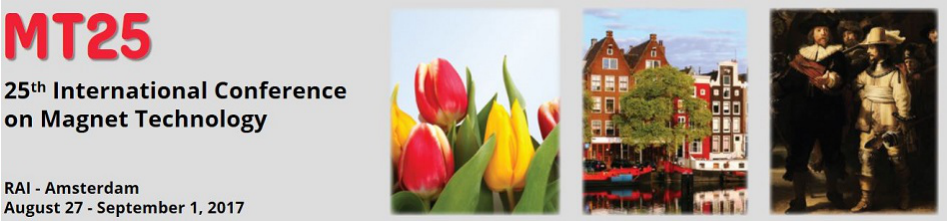

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Coupling loss in prototype CFETR CS conductors with different cable patterns, measurement and modeling

Wednesday, 30 August 2017 17:15 (15 minutes)

CFETR which stands for "China Fusion Engineering Test Reactor"is a new tokamak device to be built in China as a complimentary to ITER device. Its magnet system includes the Toroidal Field (TF), Center solenoid (CS) and Poloidal Field (PF) coils. The central solenoid consists of 6 coils consisting of Nb3Sn strands to be operated at a maximum magnetic field of about 14 T.
Among several prototype CFETR CS conductors proposed for optimising the cable design, three different pattern variations were experimentally tested and analysed with the JackPot cable model developed at the University of Twente. The conductors were manufactured at ASIPP (Institute of Plasma Physics, Chinese Academy of Sciences) according to the Twente cable design proposed for lower coupling loss with cable twist pitch ratio close-to-one and the new ASIPP cable design with triplet modification in the first stage. The Chinese Central Solenoid Model Coil (CSMC) cable pattern is tested and analysed as well being used as a baseline for comparison since its layout is close to that of ITER CS. The new ASIPP design is aimed at reducing strand deformation as much as possible while increasing the superconducting strand support but keeping similar stiffness as the ITER CS cable to avoid degradation of transport properties. The twist pitch of the two superconducting strands in the initial triplet is increased, reducing the dimple damage from large crossing angles frequently occurring when using short twist pitches. The results from experiments and simulations can be used for optimization of cabling patterns in terms of coupling loss, cabling deformation and transverse load.

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