

The ITER Magnets: Design and Construction Status

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Abstract - The ITER magnet procurement is now well underway. The magnet systems consist of 4 superconducting coil sets (toroidal field (TF), poloidal field (PF), central solenoid (CS) and correction coils (CC)) which use both NbTi and Nb₃Sn-based conductors. The magnets sit at the core of the ITER machine and are tightly integrated with each other and the main vacuum vessel. The total weight of the system is about 10000 t, of which about 500 t are Nb₃Sn strands and 250 t, NbTi. The reaction of the magnetic forces is a delicate balance that requires tight control of tolerances and the use of high-strength, fatigue-resistance steel forgings. Integration and support of the coils and their supplies, while maintaining the necessary tolerances and clearance gaps, have been completed in steps, the last being the inclusion of the feeder systems. Twenty-one procurement agreements have now been signed with 6 of the ITER Domestic Agencies for all of the magnets together with the supporting feeder subsystems. All of them except one (for the CS coils) are so-called Build to Print agreements where the IO provides the detailed design including full three-dimensional CAD models. The production of the first components is underway (about 175 t of Nb₃Sn strand was finished by July 2011) and manufacturing prototypes of TF coil components are being completed. The paper will present a design overview and the manufacturing status.

Index Terms - Magnetic confinement, Superconducting magnets, Fusion reactors

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