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FTP/P7-23: SST-1 Magnet System Progress Towards Device Assembly

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Steady State Superconducting (SST-1) Magnet system comprises of sixteen superconducting Toroidal Field (TF) Magnets, nine superconducting Poloidal Field (PF) Magnets, resistive central solenoid (CS) and compensating magnets, resistive Vertical Field (VF) equilibrium magnets, resistive in-vessel feedback coils and radial control coils. The magnet system could only be partially commissioned in 2006 because of leaks appearing at cold in the helium circuit of magnets. Since then, under the SST-1 Mission mandate, all sixteen TF magnets have been completely refurbished with modified leak-tight joints, enhanced insulation resistances, new manifolds and case cooling shields. To validate the integrated performance of these modifications, each TF magnet was tested in its self field in representative helium flow conditions (4 bar, 4.5 K, 16 g/s at the inlet) with full transport currents of 10 kA (2.2 T self field). The normal zone propagation characteristics of the winding packs, electronics for fail-proof quench detection and magnet protection aspects were also experimentally established in these campaigns. Following these successful validations, all TF magnets have been assembled on the SST-1 machine shell. All superconducting PF magnets have also been suitably modified and assembled. Refurbishment and testing of damaged divertor coil using bridge type joints and modifications of all joints in the outer PF magnets are some of the important experimental and process modifications carried out on the PF magnet system. The central solenoid was also successfully tested for representative operational scenarios of SST-1. A pair of single turn radial control coils meant for controlling the null during the plasma break-down and for providing radial control to the plasma has also been designed and would be installed shortly inside the SST-1 vacuum vessel. The integrated engineering commissioning and testing of the entire magnet system of SST-1 is envisaged during the 'engineering validation phase' of the SST-1 towards the middle of 2012.

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