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First Experiments in SST-1

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Steady State Superconducting Tokamak (SST-1) has been commissioned after the successful experimental and engineering validations of its critical sub-systems. During the engineering validation phase'of SST-1; the cryostat was demonstrated to be leak tight to superconducting magnets system operations in all operational scenarios, the 80 K thermal shield was demonstrated to be uniformly cooled without regions ofthermal run away and hot spots', the superconducting Toroidal Field (TF) magnets were demonstrated to be cooled to their nominal operational conditions and charged up to 1.5 T of field at the major radius, the assembled SST-1 machine shell was demonstrated to be a graded, stress-strain optimized and distributed thermo-mechanical device and the integrated vacuum vessel was demonstrated to be UHV compatible etc. Subsequently, field error components'in SST-1 were measured to be acceptable towards plasma discharges. A successful break-down in SST-1 was obtained in SST-1 in June 2013 assisted with electron cyclotron pre-ionization in second harmonic mode, thus marking theFirst Plasma'in SST-1 and arrival of SST-1 into the league of contemporary steady state devices as well.
Subsequent to the first plasma, both physical experiments and boosting of engineering parameters in SST-1 have begun. A successful plasma start-up with E ~ 0.4 V/m, plasma current in excess of 50 kA for 100 ms assisted with ECH pre-ionization in second harmonic at a field of 0.75 T have been achieved. Lengthening the plasma pulse duration with LHCD, plasma current boosting up with ECH assisted pre-ionization in fundamental mode at 1.5 T apart from advance plasma physics experiments are presently being attempted in SST-1. In parallel, SST-1 has demonstrated in unique fashion pure cold gas cooling based nominal operations of its vapour cooled TF current leads up to 4650 A corresponding to 1.5 T of field in the plasma major radius. SST-1 has also achieved the distinction of being the only superconducting Tokamak in the world where the cable-in-conduit-conductor (CICC) based TF magnets are operated with helium cooling in Two-Phase mode during the plasma discharges up to 2.0 T of field at the plasma major radius.

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