

## **Experiments and Up-gradation status in SST-1**

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Post successful commissioning, Steady State Superconducting (SST-1) Tokamak at the Institute for Plasma Research (IPR) had concluded a series of initial experiments achieving plasma currents up to  $\sim 75$  kA in a central field of 1.5 T for a duration up to  $\sim 500$  ms. SST-1 plasmas in these experimental campaigns were assisted with ECH pre-ionization in both second harmonic and fundamental modes and were driven with an initial induced ohmic field of  $\sim 0.35$  V/m. Essential SST-1 plasma characteristics such as the 'break-down and start-up scenario's, the comparative delay in the 'break-down times' between ECH second harmonic assisted discharges and the fundamental modes, the non-linear seed electrons interactions with the ECH microwave fields, the consistent evolutions of the plasma flux surfaces, the evolutions of the 'shafranov parameters' and plasma inductances, the radial and vertical centroid evolutions of the plasma column, the supra-thermal electron interactions with the toroidal plasma column in specific discharges, the early MHD signatures in the plasma columns etc have been successfully validated with the experimental results. These baseline results have qualified SST-1 plasmas. Presently, SST-1 is undergoing an up-gradation in few of its essential core subsystems and is preparing towards the LHCD coupling and lengthening of the SST-1 ohmic plasma discharges. The earlier SST-1 campaigns have also technologically demonstrated a versatile new regime of cryo-stable operation of cable-in-conduit-conductor wound superconducting magnet being cooled with 'Two-phase helium' contrary to the popular apprehension of 'thermo-acoustic instabilities' limiting the superconducting operations.

In the present ongoing first phase of up-gradation; SST-1 is getting equipped with CFC first wall, a feed back and control system based on the 'R' and 'Z' centroid locations of the plasmas, a density feedback and control, a supersonic molecular beam injection both from the in-board and outboard sides of SST-1 plasma actuated and controlled apart from installing radial control coils in eight segments. The SST-1 will also be equipped with additional diagnostics such as fast retracting Langmuir probes, additional electromagnetic diagnostics, precise multi channel Thomson scattering, FIR interferometry, improved reflectometry, fast imaging diagnostics and ion temperature measurement diagnostics. SST-1 would now aim at long duration plasma with non inductive current drive in both circular and elongated shapes.