DESIGN REQUIREMENT, QUALIFICATION TESTS AND INTEGRATION OF A THIN SOLID LUBRICANT FILM OF MOS2 FOR COLD MASS SUPPORT STRUCTURE OF THE STEADY STATE SUPERCONDUCTING TOKAMAK SST-1.

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The SST-1 is a super conducting tokamak, which is in the final phase of assembly and commissioning. The super conducting magnet system of SST1 comprises of Toroidal field (TF) and Poloidal field (PF) coils. The 16 TF coils are nosed and clamped towards the in-board side and are supported toroidally with inter-coil structure at the out-board side, forming a rigid body system. The 9 PF coils are clamped on the TF coils structure. The integrated system of TF coils & PF coils forms the cold mass of @ 50 Ton weight. This cold mass is accommodated inside the cryostat and freely supported on the rigid support ring at 16 locations and support ring in-turn supported on 8 columns of machine support structure. During the operation this cold mass attains a cryogenic temperature of 4.2K in the hostile environment of high vacuum. The thermal excursion of cold mass and its supporting structure during this cool down results into severe frictional forces at the supporting surfaces. There is a design requirement of introducing a thin layer of solid lubricant film of MOS2 having coefficient of friction 0.05 between the sliding surfaces to control the stress contribution due to the friction.

To ascertain the compatibility of molybdenum disulphide (MOS2) as a solid lubricant in high vacuum and very low temperature environment, we have carried out qualification tests on various samples and measured the coefficient of friction in both the room temperature conditions and at high vacuum & after thermal shocking to 4.2K temperatures. After successful qualification tests actual components are fabricated and integrated in the cold mass support structure assembly. This paper presents the design requirement, qualification tests performed and details about the integration of thin solid lubricant film of MOS2.