Electron Linac

4K-2K cryo-insert test setup for producing 2K liquid He

Design of a 4K-2K test setup for validating cryogenic circuitries to produce and deliver 2K liquid helium to Injector Cryomodule (ICM) of superconducting electron linac is completed (Fig. 1) and fabricated at VECC workshop. The test set up will be used for evaluating the effectiveness of the conversion of 4K liquid helium (LHe) to 2K superfluid helium, the overall performance of the cryogenic layout and thermosyphon circuits, designed for ICM. The test-set up consists of LHe reservoirs, cryostat chamber, heat exchanger, Joule Thomson (JT) Valve and thermosyphon circuit etc. Design of all the components for the 4K-2K test set up including design of heat exchanger, selection of pump and JT valve have also been carried out.

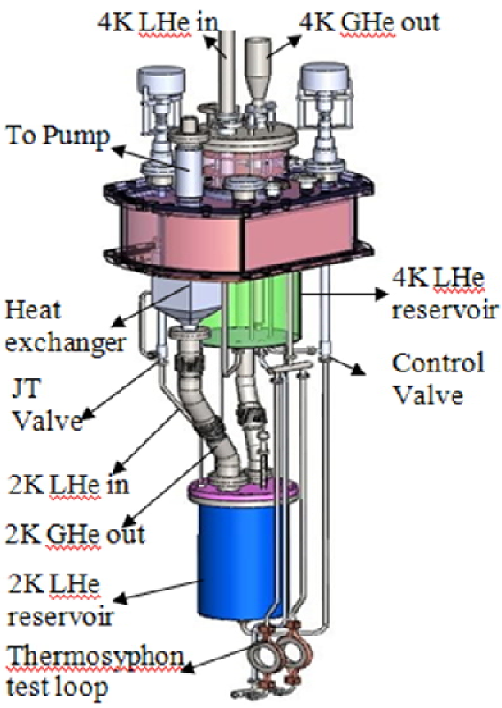

Fig. 1: Model of 4K-2K test setup

Optimisation of heater for e-linac 2K system

Niobium superconducting radiofrequency cavities are generally operated at around 2 K temperature to achieve a high quality factor by reducing residual surface losses. 2 K temperature is produced by lowering down the pressure of the helium by employing a sub-atmospheric vacuum pumping system. The cavities are immersed in liquid helium bath, maintained in the helium chamber. A tubular heat exchanger type heater is designed for warming up the helium gas coming out from the cold helium chamber to 300 K before it enters the pumping system. The flow diagram is given in Fig. 1. Current is passed through the tubes of the heater (Fig. 2) so as to let the tube banks themselves act as heating element. Helium gas, passing through the tubes, absorbs the heat and warms up to the desired temperature.

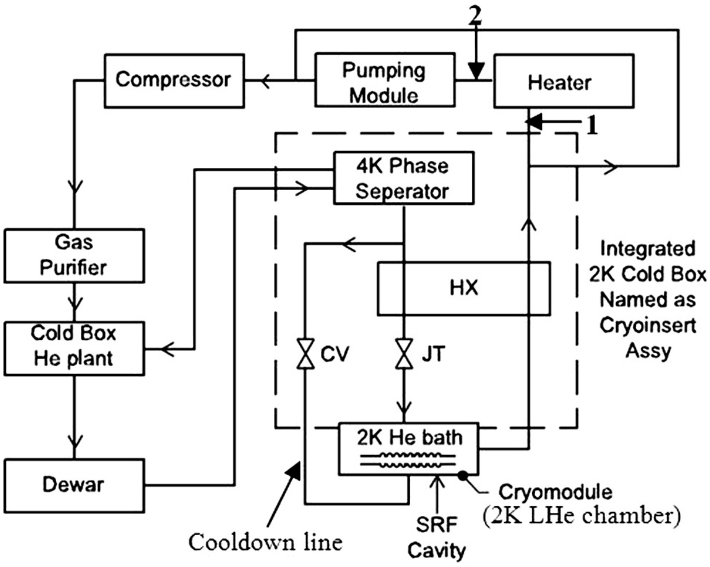

Fig. 1: Cryogenic system flow diagram

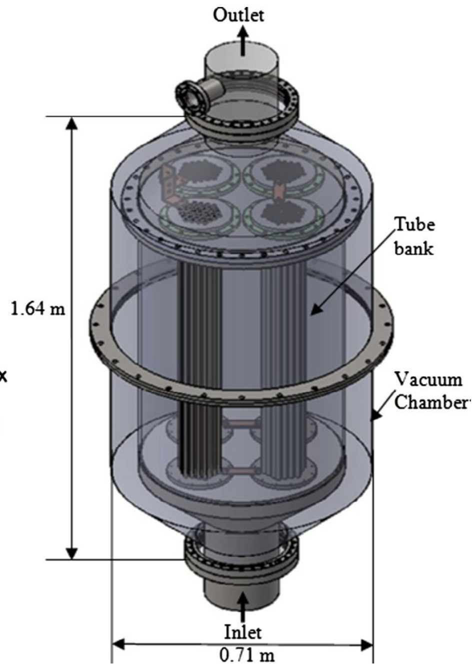

Fig. 2: Model of heater

Rocker Arm Tuner for SCRF Cavity

A SCRF cavity requires adjustment facility for its frequency for proper beam acceleration. This adjustment is performed by changing the cavity shape using two tuners. Design of a rocker arm tuner was carried out as the driving motor can be mounted outside the cryogenic environment. Several transient structural analyses have been performed with different materials and geometries of these flexures of the tuner for finalizing the design (Fig. 1). The position of thermal intercepts was optimized by simulation for reducing heat leak into the superconducting cavity assemblies. The motor with linear drive and bellow assembly, mounted on the vacuum tank of CCM, provide the linear flexibility, after cool-down alignment and vacuum tightness. Fabrication and assembly of this tuner was carried out at VECC work shop (Fig. 2). Testing of the assembly is being carried out with equivalent cavity stiffness and dummy copper cavity to check the frequency tuning.

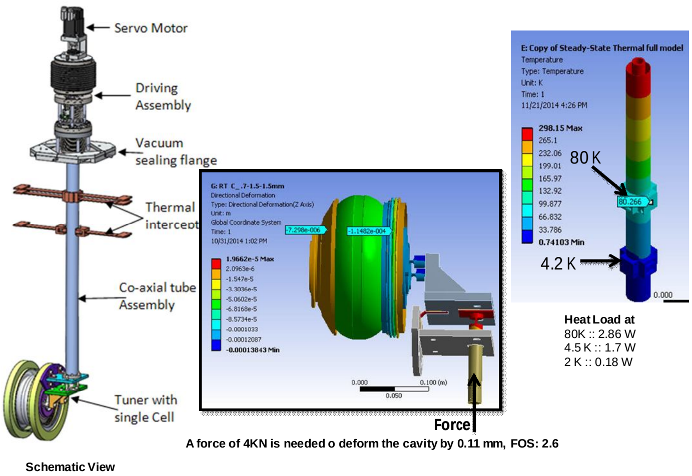

Fig. 1: Design of rock arm tuner

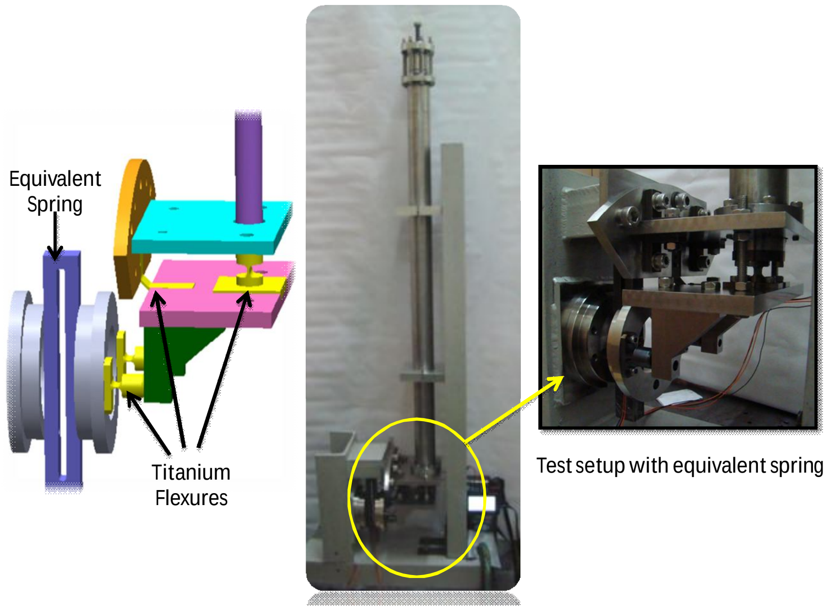

Fig. 2: Fabrication of rocker arm tuner