A.5 Development of efficiently cooled drift-tubes for high energy SFDTL RF cavities

The drift tubes are very important components of a typical SFDTL type of accelerating structure, as the beam passes through the center of the drift tube and the beam accelerates between the gaps of two drift tubes. The drift tube receives the maximum heat flux; hence development of efficient cooling schemes for drift tubes needs a combined approach of thermal design and fabrication feasibility. Different types of hydraulic channels for increasing over all heat transfer coefficient were studied at Advanced Accelerator Module Development Division of RRCAT. A six cooling channel drift tube was fabricated using hydrogen brazing and subsequently vacuum brazed and tested for UHV compatibility. The brazing of such drift tube is difficult because of six precision components are to be joined simultaneously to meet UHV requirement. Fig.A.5.1 shows cut section of the optimized design for six channels cooling in one brazing step fabrication.

Fig.A.5.1 Cut view of the six-channeled drift-tube.

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A.6 Experimental setup for RF characterization of pillbox cavity

Most cavity resonators used in electron and proton accelerators are derived from the simple cylindrical or pillbox cavity. Comparison of the results for RF frequencies and other parameter are done between numerical techniques and experiments at Advanced Accelerator Module Development Division of RRCAT. Further, a piston tuner arrangement as shown in Fig.A.6.1 is attached to this cavity through vertical port. This tuner system has 50 mm diameter piston attached to the stepper motor. This arrangement can give 25 micron movement in one step. Total stroke length is 70 mm. Here 50 mm inward and 20 mm outward movement is set. Results of fundamental frequency perturbation and theoretical magnetic field calculations are shown in Fig.A.6.2.

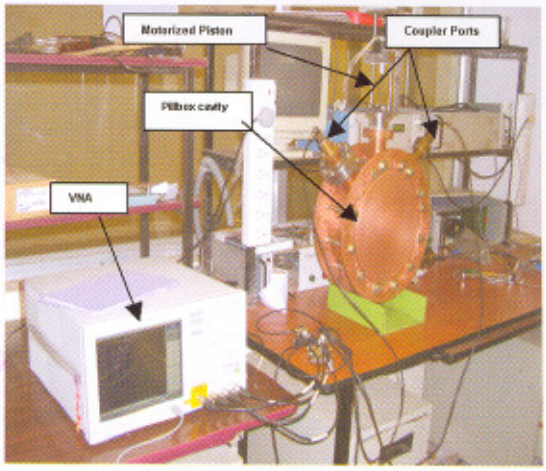

Fig.A.6.1: Experimental setup of Pillbox cavity RF testing.

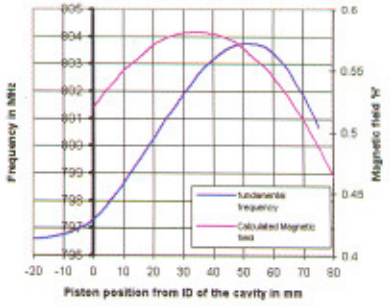

Fig.A.6.2: Displacement of piston tuner vs. fundamental frequency in pillbox cavity compared with calculated magnetic field inside the cavity.

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A.7 Prototype compound motion compact precision jacks

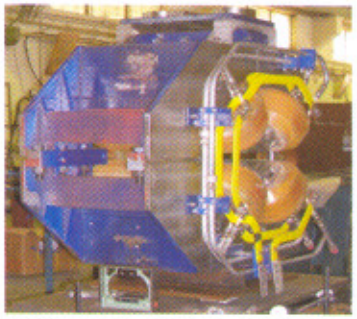

Fig.A.7.1: Performance testing of prototype precision movement compact jack system, mounted below a quadrupole magnet.

Prototype compound motion compact precision jacks (each of capacity 500 kg) have been developed at Advanced Accelerator Module Development Division of RRCAT, for