positioning and alignment of small accelerator components such as quadrupole and sextupole magnets, SFDTL tanks etc. These jacks can be anchored below the components and positioned (its magnetic axis and mid plane) precisely with typical accelerator alignment tolerances of 0.1 mm in linear and 0.2 mrads in rotational position w.r.t their true position in the ring. The designed movement system uses combination of three identical compound motion precision jacks similar to the support system of main dipole magnets of Indus-2. Fig.A.7.1 shows the performance testing of precision movement jack system, mounted below the quadrupole magnet

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A.8 Design and prototype fabrication of an eccentric wheels based motorized alignment mechanism for accelerator components

A remote alignment/ or alignment correction becomes essential for proton LINAC components of medium and high energy, as they become source of radiation because of residual radioactivity and hence become inaccessible. Very high order of alignment accuracy is required to meet the stringent requirement of beam loss. An eccentric wheel mechanism based alignment system has been fabricated at Advanced Accelerator Module Development Division of RRCAT as shown in Fig. A.8.1.

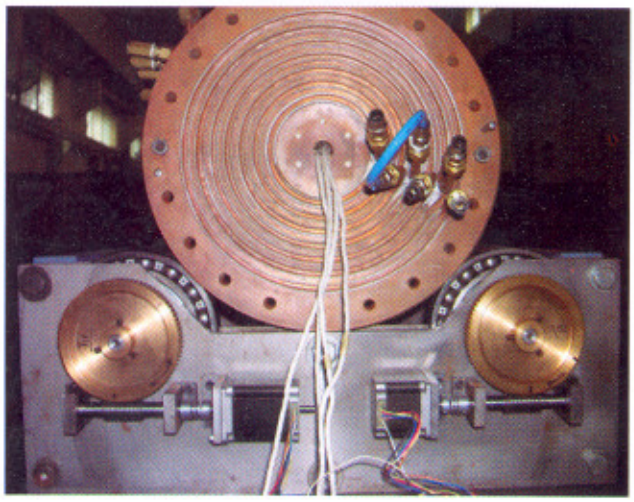

Fig.A.8.1: SFDTL supported on eccentric wheel base alignment system.

The mechanism consists of two sets of two eccentric wheels, one at each end. With the combination of the movements of these wheels it is possible to have very precise movement in a small area in front and in the back plane. With the combination of these movements, two linear (X-Y) and two rotary (pitch and yaw) degrees of freedom is achieved, which is highly suitable for such applications. The eccentric wheels are moved by stepper motor through precision worm and wheel to achieve high resolution of movement. If we operate the eccentric wheels within the range of 43.26 degree to 223.26 degree (in this combination/ design), the direction of force on the worm-wheel does not change and hence the backlash effect can be avoided.

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A.9 Stranded water-cooled cables for rapid cycling magnet coils

The presence of eddy currents in low frequency (~100 Hz) rapid cycling magnets is a source of technical difficulties and the key issue is the reduction of eddy current loss. In order to keep the magnet coil losses at reasonable levels, it is generally necessary to use a special water-cooled stranded cable for operating frequencies above 10 Hz as the macroscopic eddy current losses are proportional to the square of the frequency and the square of the magnetic field. The magnetic field inhomogeneity resulting due to eddy current loss is less and also low operating costs of magnets with stranded coils. Few prototype 6 meters length stranded water-cooled cables using bare / enameled aluminum strands for testing have been indigenously developed at Advanced Accelerator Module Development Division of RRCAT. Fig.A.9.1 shows the details of water-cooled stranded cable showing aluminum strands in various layers. The development of 50 meters continuous length water-cooled aluminum stranded cable is in progress.

Fig.A.9.1: Water-cooled stranded cable, showing strands in various layers.

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