Ramp controller board: Salient features

- A24, D16 VME Slave
- Generates optically isolated memory scanning clock and timing pulses
- Also generates ramp start sequence,
- ON/OFF, reset and DC/RAMP mode control signals
- On board DC-DC conv. for isolated power

Reported by: P. Fatnani; fatnani@cat.ernet.in

A.12 VME based fast ADC

A VME based fast ADC card has been designed and developed. This card is a part of the digital signal processing based tune measurement system being developed for Indus-2 synchrotron radiation source. The beam response to a stimulus will be monitored by the strip line beam position monitor and digitized by the fast ADC card. The tune value will be obtained by computing FFT of the acquired data. The card employs a 10bit, 20MS/sec sampling ADC. The digitized data is stored in a 64K word fast static RAM. The number of samples to be taken and the trigger mode (external/internal) is programmable. The sampling rate is decided by an externally applied sampling clock. After receiving the trigger, required number of samples are digitized by the ADC and stored in the memory. The data is then read by the controller and transferred to a PC on serial bus. The GUI software has been written in visual basic language, which displays the acquired signal. It also has provision to evaluate FFT of the acquired signal and display frequency spectrum of the waveform. The number of points of FFT and window functions is selectable by the user. This card has been successfully tested up to a sampling clock frequency of 10MHz. Further improvements in the circuit design are underway.

(Reported by: T A Puntambekar; tushar@cat.ernet.in)

A.13 Planar transformer

Planar magnetic components are planar versions of conventional wire and/or foil wound magnetic components. Principal advantages of planar structure over conventional components include higher ratio of surface to volume ratio, better heat removal, smaller size, low-profile shape, better predictability as well as repeatability of parameters and lower leakage inductance. A planar transformer has been developed for a 1 kW power supply. The design parameters of the prototype transformer are as follows: turns ratio 6:1, number of primary and secondary turns = 18 and 3, respectively, peak flux density = 0.2, secondary RMS current 35A. Thickness of primary and secondary lead-frames is optimized to reduce skin and proximity effect. The windings operate at current densities of 15 A/mm^2. Total loss in the transformer is 25W giving 97.5% efficiency with $35^{\circ}C$ temperature rise at full load. The transformer was fabricated using low profile planar cores type – ELP 43. The overall dimensions of the transformer are 110mm length, 70mm width and 15mm thickness. A new technique of core-extension was evolved to help reduce temperature rise, AC losses and HF shielding. Fig. A.13.1 shows the prototype development. The developed planar transformers are successfully used in laser diode driver and dipole magnet power supply for FEL. They can also be used for development of high frequency, high-power-density power supplies for various applications.

Fig. A.13.1 Planar Transformers

(Reported by: M. B. Borage; mbb@cat.ernet.in)

A.14 Development of a Fast Closing Shutter

Fast Closing Shutter (FCS) is a vacuum safety device mounted on the front ends of beamline to protect the storage ring from sudden air rush from the experimental area. The FCS reduces the flow conductance. The shutter fully covers the beam aperture and permits a very low leak rate. The FCS is backed by a UHV gate valve. A prototype FCS has been developed with a total shutter closing time of 8.6msec. The shutter is closed and opened pneumatically and triggered by a solenoid coil.

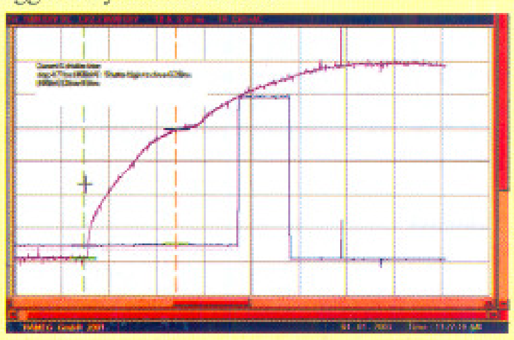

Fig. A.14.1 Out put of the shutter

The main parameters for the FCS are:

Closing Time	:	8.6msec (Total closing time)
Shutter Opening	:	35mm x 50mm (rectangular)
Leak rate (seat)	:	~1mbar.lit/sec
Leak rate (body)	:	better than 1 x 10^{-9}mbar.lit/sec
Air Pressure	:	5-7 bar
Connecting Flange	:	DN 63 CF
Material	:	SS 304L

Fig.A.14.1 shows the output screen of storage scope. Curve 'A' shows the current characteristics of the Actuating Solenoid and Curve 'B' shows the shutter timing indication from timing measurement setup. Total time from triggering (external) to closing of shutter is 8.6ms, which includes electronic delay, system inertia and shutter traversing time. Fig. A.14.2 shows the photograph of FCS.

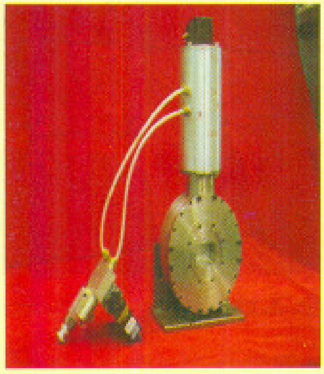

Fig. A.14.2 Fast Closing shutter

Reported by: S C Joshi; scjoshi@cat.ernet.in

A.15 Magnetic measurement of Indus-2 magnets

Indus-2 is a 2.5GeV synchrotron light source under construction at CAT, Indore. The storage ring has a circumference of 172.2781m. Storage ring has 8 unit cells. Each unit cell consists of 2 dipole, 9 quadrupole and 4 sextupole magnets. Thus the whole magnet system consists of 16 Dipole (Bending Magnet), 72 Quadrupole, 32 Sextupole and about 100 Corrector magnets. The fabrication of magnets is complete. At present magnetic measurements of various magnets are being carried out in the laboratory. All the close type Quadrupole magnets have been qualified (magnetic) successfully. All the corrector magnets are also tested. Magnetic measurements of the Dipole Magnets are being carried out.

Dipole magnet

A computer controlled 3-D CMM with a Hall probe attachment is being used for the measurements of the Dipole magnet. The scanning volume of this system is 3000x800x600mm^3. The prototype Dipole magnet at the measurement bench is shown in fig.A.15.1.

Fig.A.15.1 Prototype Dipole magnet with the CMM at the location of measurement.

In the year of 2001, the results of the magnetic measurement for the prototype Dipole Magnet were reported. This time the results of the series Dipole magnets of Indus-2 are being presented. The field quality observed so far for the Dipole Magnets is well within the limit of beam physics requirements. Fig.A.15.2 shows the variation of the integrated field with radius at the highest beam energy level of 2.5GeV. The highest beam energy of 2.5GeV corresponds to dipole field value of 1.5T. The integrated $\Delta B/B$ at the injection level (0.6GeV) is ~ 4 x 10^{-4} whereas at the highest level of energy it is ~7.3 x 10^{-4} over the (horizontal) good field region of ±32mm.

The maximum variation in the effective length with excitation is found <10 mm. Fig.A.15.3 shows the transfer function (ratio of integrated field to current) at different current level. The magnet core shows 8.6% saturation at the highest excitation level.

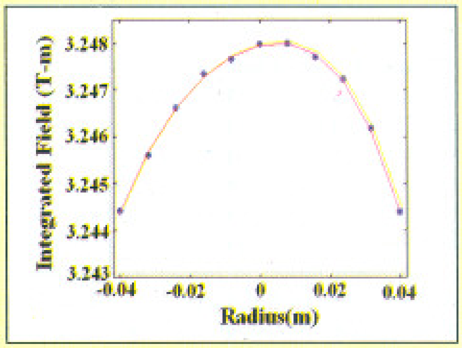

Fig.A.15.2 Integrated Field Vs. Radius at the Highest Energy level.