A.1: Optical fibre based analog signal isolation for Indus-2 Controls

Indus-2 timing system has been experiencing random problems due to high noise levels generated by pulsed power supplies. The noise is primarily conducted into the system even though all analog and digital signals are isolated. Recently an analog isolation layer was introduced for providing additional isolation to the setting reference of pulsed power supplies. The voltage references for setting pulsed power supplies are generated from a VME bus based isolated DAC card but this isolation was not sufficient to cope with the noise due to high EMI. For enhancing the system immunity to conducted EMI, optical fibre (OFBR) based signal interface was developed in Accelerator Control Section (ACS). Voltage (V) to Frequency (F) & F-to-V principle of signal transmission was adopted.

The analog signal is converted to frequency and transferred to the receiving end by OFBR/optical transmitter (OP-TX)/optical receiver (OP-RECV) assembly. At the receiving end the frequency signal is converted back to voltage signal. Further, depending on the system requirement, the voltage signal is converted into a 4-20mA current loop signal.

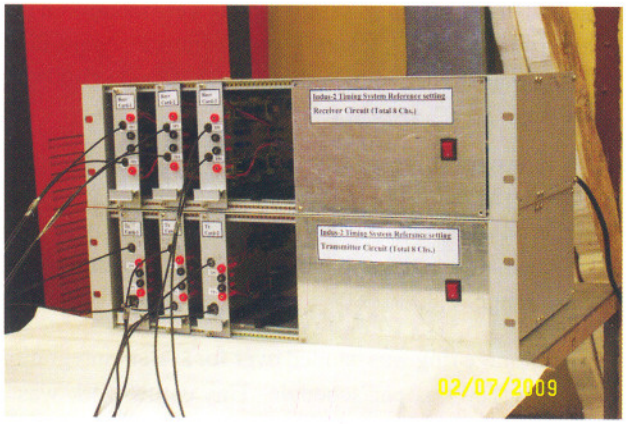

Fig. A.1.1: Optical fibre based isolator units

Transmitter and receiver parts are developed in two different cards with required protection, indication and test-points for each channel. Single ended 0-10V input is converted to 4-20 mA current loop output. Burr Brown make chip VFC32 is configured as V-F/F-V converter whereas HFBR 1521/2521 are used as optical transmitter/receiver. Plastic fibre is used for interfacing transmitter and receiver channels. XTR110 is used to generate current loop signal. The cards developed were tested /calibrated in the lab. A linearity of 0.019% and stability of 0.02% (10 hrs) could be achieved.

Two separate units (Fig. A.1.1), comprising transmitter and receiver cards, are developed. Voltage input of transmitter unit is given from the DAC card, whereas the current output from receiver unit is connected to the pulsed power supply reference input. Total six power supplies are interfaced by the assembly. All the units were tested with the actual load and found working satisfactorily. The system has been deployed for regular use.

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A.2: Activities during recent shutdown of Indus-2

In an electron storage ring, Photon Induced Desorption (PID) yield varies from 10^{-2} for a good chemically cleaned surface to 10^{-6} for the surface subjected to hundreds of ampere hours of beam cleaning. Installation of beam line front ends (BLFE) requires venting of the vacuum segments of storage ring, which almost nullifies the effect of beam cleaning and the beam life time is adversely affected. Therefore, it was decided to avoid venting of storage ring for installation of BLFEs in future and to install UHV gate valves (GV0) on all the twelve unused dipole radiation beam line ports of Indus-2. However, the high synchrotron radiation power density in Indus-2 necessitates that these gate valves were kept open during the machine operation and the radiation was made to fall on the water cooled end flanges, installed down stream. It was also decided that pending jobs on vacuum envelope are also taken up so that the storage ring is not vented for a few years to come. Accordingly, a shutdown of Indus-2 was planned, from June 1, 2009 to July 14, 2009. The following major activities were carried out :-

- Beam Line Front End (BLF) components were assembled in following 12 beam lines: BL - 1, 2, 3, 4, 6, 18, 19, 21, 22, 23, 24 and 26. Each beam line was provided with a Bellow chamber, Gate Valve (GV-0), Adopter chamber and Water Cooled Flange and their support structures. Thermocouples were installed to monitor temperature of end flanges using 160 channel Temperature Monitoring System. Pneumatic pressure lines were also provided to operate these valves. All