A.8: Global Slow Orbit Feedback Control system for Indus-2.

In Indus-2, a global Slow Orbit FeedBack (SOFB) system is developed and integrated with the machine control. This system attenuates global orbit distortion in both horizontal as well as vertical plane induced by different sources of errors such as misalignment of magnets due to environmental temperature changes as well as other slow vibration sources. The system block diagram for horizontal plane is shown in fig.A.8.1.

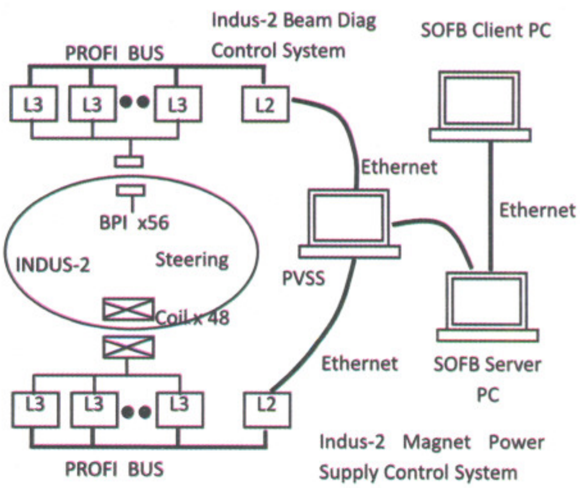
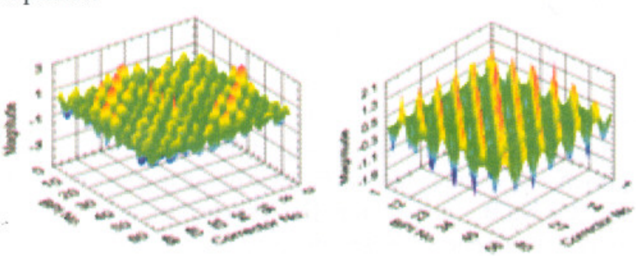


Fig.A.8.1: SOFB Control System Scheme: H- plane

The system reads beam position data from 56 beam position indicators (BPI) in each plane (Vertical and Horizontal) and calculates the correction values for 40 correctors in vertical plane and 48 correctors in horizontal plane using PID algorithm. The parameter decoupling matrix is calculated using singular value decomposition over measured system response matrix in both the planes. Figure A.8.2 shows the measured system response matrices for both the planes.



(a) (b)

Fig.A.8.2 Measured system response matrix for (a) horizontal plane, and (b) vertical plane

The SOFB control system software comprises of three modules a) PVSS server module b) LabVIEW based client GUI and c) Control Software Module. The PVSS server module implements the functionality for decoding the commands obtained from Lab VIEW based client GUI. The control software module implements reading from BPIs and writing of different parameter values of horizontal and vertical plane slow corrector power supplies under different mode of operations, directly through PVSS Data Points. Figure A.8.3 shows the screenshot of SOFB software GUI.

Fig.A.8.3: SOFB Control System GUI

The LabVIEW based client GUI module implements the graphical user interface. Control software module implements the PID based feedback control loop for controlling the closed orbit. It comprises of 4 pages (Main page, Control setting page, COD Algorithm Setting Page and Controls Analysis page) for handling the reference orbit definition, active BPI and active corrector definition, loading of machine response matrix, analyzing and generating the SVD based decoupling matrix, active corrector matrix loading, setting different parameters for PID and control loop rate and starting/ stopping of feedback control loops. For coupled and uncoupled response matrix measurements, a separate module is developed with the sample averaging and intermittent reference orbit sampling features to get better response matrix measurement data in the presence of BPI noise and slow system drift condition.

With system in operation and corrections applied every 20 seconds, the orbit variations observed up to ±150 μ mare now brought below ± 30μm in both the planes.

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