A.13: Restoration of Pulsed Septum Magnets for Indus-2

The electrical short of thick septum coil with core was detected in August 2009. It was also noticed that along with the coils, the cores were also damaged. Subsequently new coils with 90° corner were fabricated and alumina coated. Electrically, these coils also failed at 800 V. After extensive studies, we fabricated new coils without notch at the inside 90° corner edge with rounding radius ≤0.75 mm. They were alumina coated with fine powder (5-22 μm) using manipulator fixtures and optimized D-Gun process at SSCT, Hyderabad. Magnetic field homogeneity strongly depends on coil profile. In view of modified coil profile, we performed the pulse simulation on septum magnet using Flux2D and ANSYS. In this report, a brief overview of magnetic simulation of septum magnet with old (sharp edge) and new rounded edge coil, pulsed magnetic testing and analysis were presented.

New septum coil has been modified with round corner for better alumina coating (250 micron) on the surfaces to withstand 1 kV between magnet core and coil as shown in Fig. A.13.1

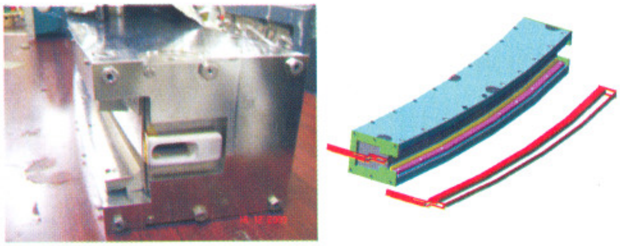

Fig. A.13.1: Thick septum magnet with round coil

Pulse magnetizations of Ni-Fe laminations and yoke have been measured at 100 μs using in house developed bench. Measured results are shown in Fig. A.13.2.

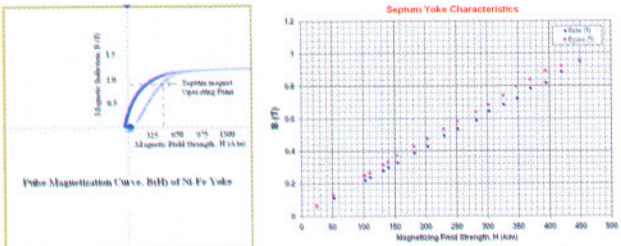

Fig. A.13.2: Magnet operating point at 1.1 T

Nonlinear transient electromagnetic field analysis was performed on the thick septum magnet (with sharp and round edge coil) using Flux2D and ANSYS for its homogeneity, stray fields outside the septum edge and on the circulating beam axis. Simulated results are shown in Fig. A.13.3. Pulsed magnetic measurements were performed with point and ∫B.dl coil on thin and thick septum magnets placed on the platform together with mu metal screen for transverse homogeneity in midplanes, longitudinal profile, effective magnetic length and integral leakage field outside the septum edge towards circulating beam axis. Figure A.13.4 shows measured pulsed magnetic field waveforms.

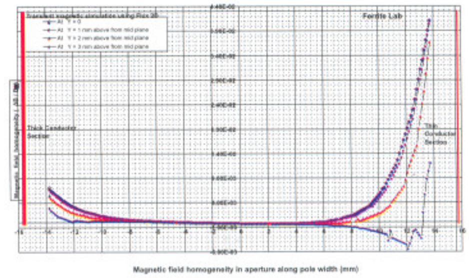

Fig. A.13.3: Simulated response of thick septum magnet with modified section

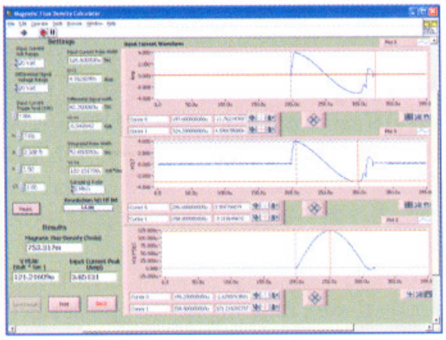

Fig. A.13.4: Pulsed Magnetic Waveform for Thick Septum magnet using 14 bit digitizer

Thick septum magnet has been rotated by 0.205 degree about the entry target point of thin septum magnet to get 3.01 mm linear movement of extreme end of mu metal towards design orbit. Stray B field of the order of < 0.7 G-m has been measured on circulation beam axis as shown in Fig. A.13.5.

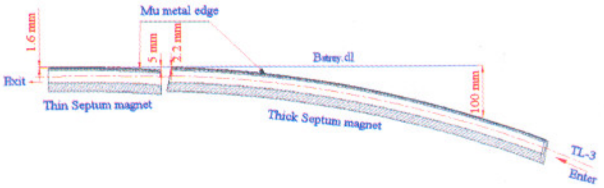

Fig. A.13.5: Combined ∫B_{stray}.dl of septum magnets assembled on new base plate

Modified septum magnet now working entirely successfully during injection of e beam in Indus 2.

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