## A.2: Development of upgraded stripline kickers for Indus-2

Development of upgraded horizontal and vertical stripline kickers for Indus-2 has been carried out by Beam Diagnostics Section of Indus Operations, Beam Dynamics & Diagnostics Division. These kickers will replace the existing stripline kickers installed in Indus-2 to enhance the performance of the transverse bunch-by-bunch feedback system used to suppress coupled bunch instabilities.

The upgraded striplines are designed to have transverse shunt impedance of $\geq$ 20 kΩ for vertical plane and $\geq$ 10 kΩ for horizontal plane, power handling capacity of up to 125 W, power reflection less than 1% over the entire operating bandwidth up to 253 MHz at input ports, minimum possible loss factor to minimize the heating of the kicker due to beam, resonance free structure below cut off frequency, thermal and structural deformation within 50 μm, structural integrity, leak rate better then $1X10^{-10}$ mbar l/s and ultimate pressure in the range of $10^{-10}$ mbar for ultra-high vacuum compatibility.

The physics design of kickers was carried out using electromagnetic simulation tool CST Studio suite to achieve the characteristic and design parameters. CST model of vertical kicker is shown in Fig. A.2.1.

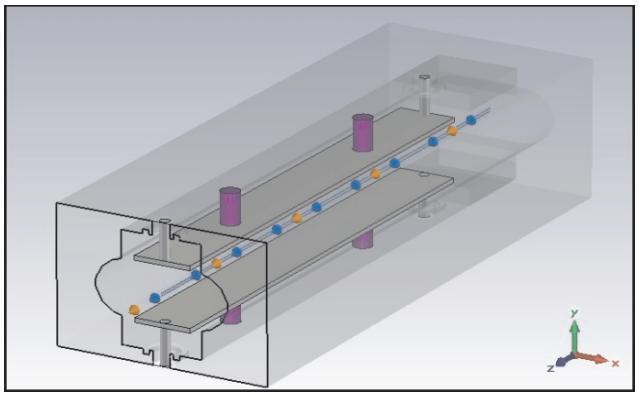

*Fig. A.2.1: Model of vertical stripline kicker*

Minimum wall thickness of 2 mm for housing chamber along the axial weld seam was decided by FEM simulation. FEM simulation has also helped in deciding the holding and supporting scheme of OFE copper strip to limit the deformation within 50 μm. Deformation pattern of housing chamber subjected to 1 atm external pressure is shown in Fig. A.2.2.

The housing chamber of striplines was made in two identical halves by machining SS 316L plate. The race track type cross-sectional profile of Indus-2 beam duct was produced using CNC milling machine with surface finish of 0.8 μm and profile tolerance better than 100 μm (Fig. A.2.3). The two halves are welded along the axial seam using tungsten inert gas welding. Machinable ceramic is used to fabricate specially designed supports that not only hold the copper strip in the intended position but also insulate the copper strip from its housing.

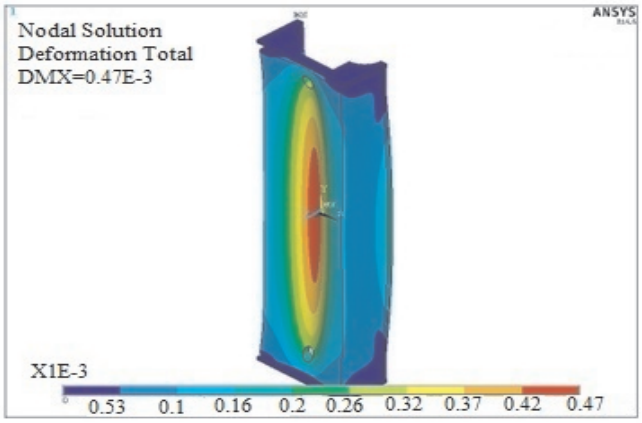


*Fig. A.2.2: Deformation of housing chamber.*

N-type feed-through have been used to feed maximum RF power of 125 W at each end of the strip. An experimental study was carried out to decide the process parameters for welding joint between housing chamber and the N- type feed-through so that leak rate better then $1X10^{-10}$ mbar l/s can be achieved. A 0.8 mm thick weld lip was machined on inner profile of housing chamber to weld it to 0.8 mm thick sleeve of N-type feed-through.

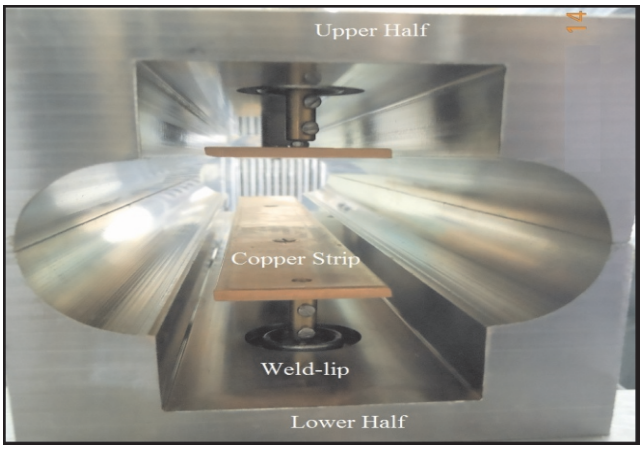


*Fig. A.2.3: Assembly of strips in housing chamber.*

Vacuum qualification of stripline kicker has been carried out and designed parameters have been verified.

Stripline kickers were fabricated and processed in-house at Accelerator Component Design and Fabrication Section and Chemical Treatment Facility.

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