Optimization

W. Meng (4/2/2008)

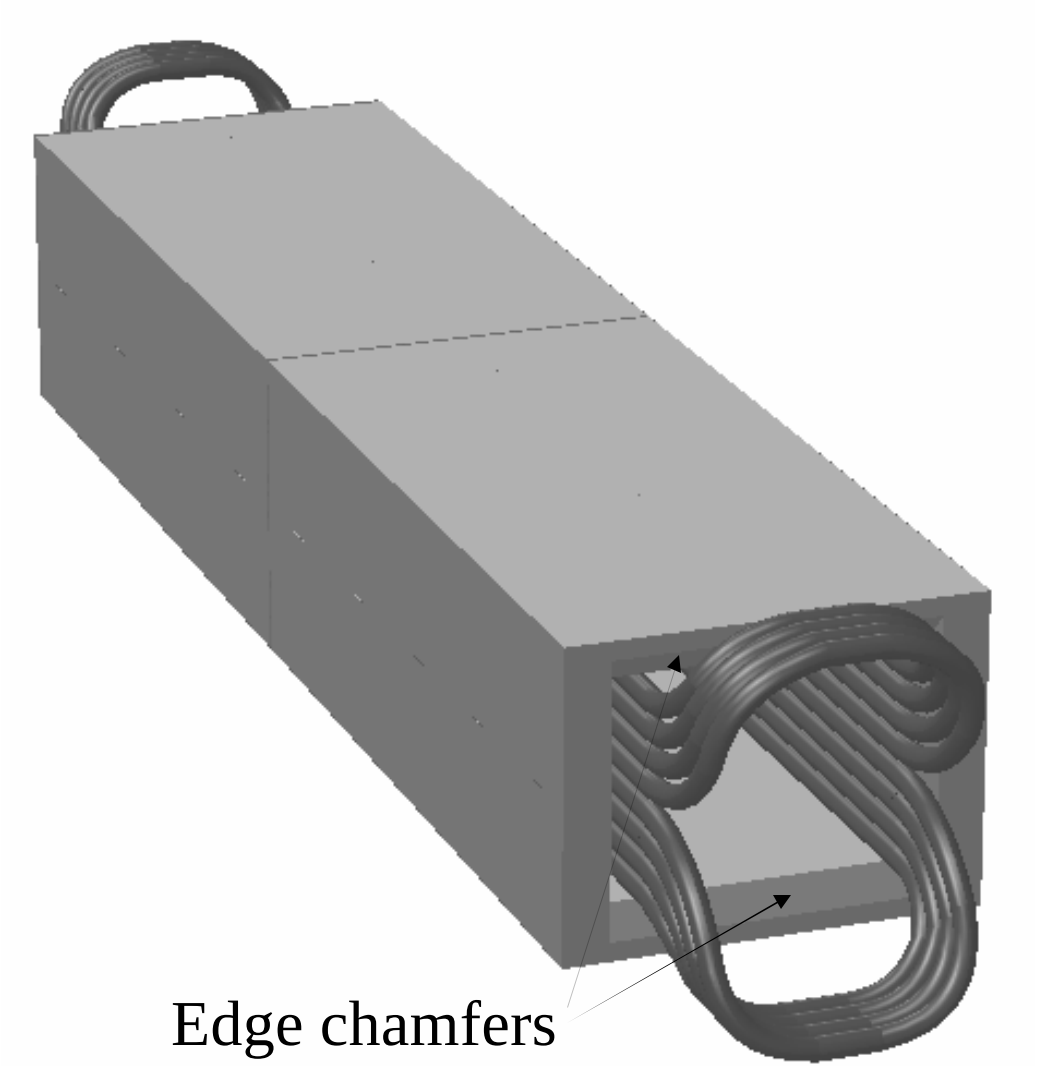
(1) Based on the selected New England Litz Wire geometry: d=0.5 inch, with round cross-section

(2) Based on the real winding end crossing configuration from 3d engineering design of the coil mandrels

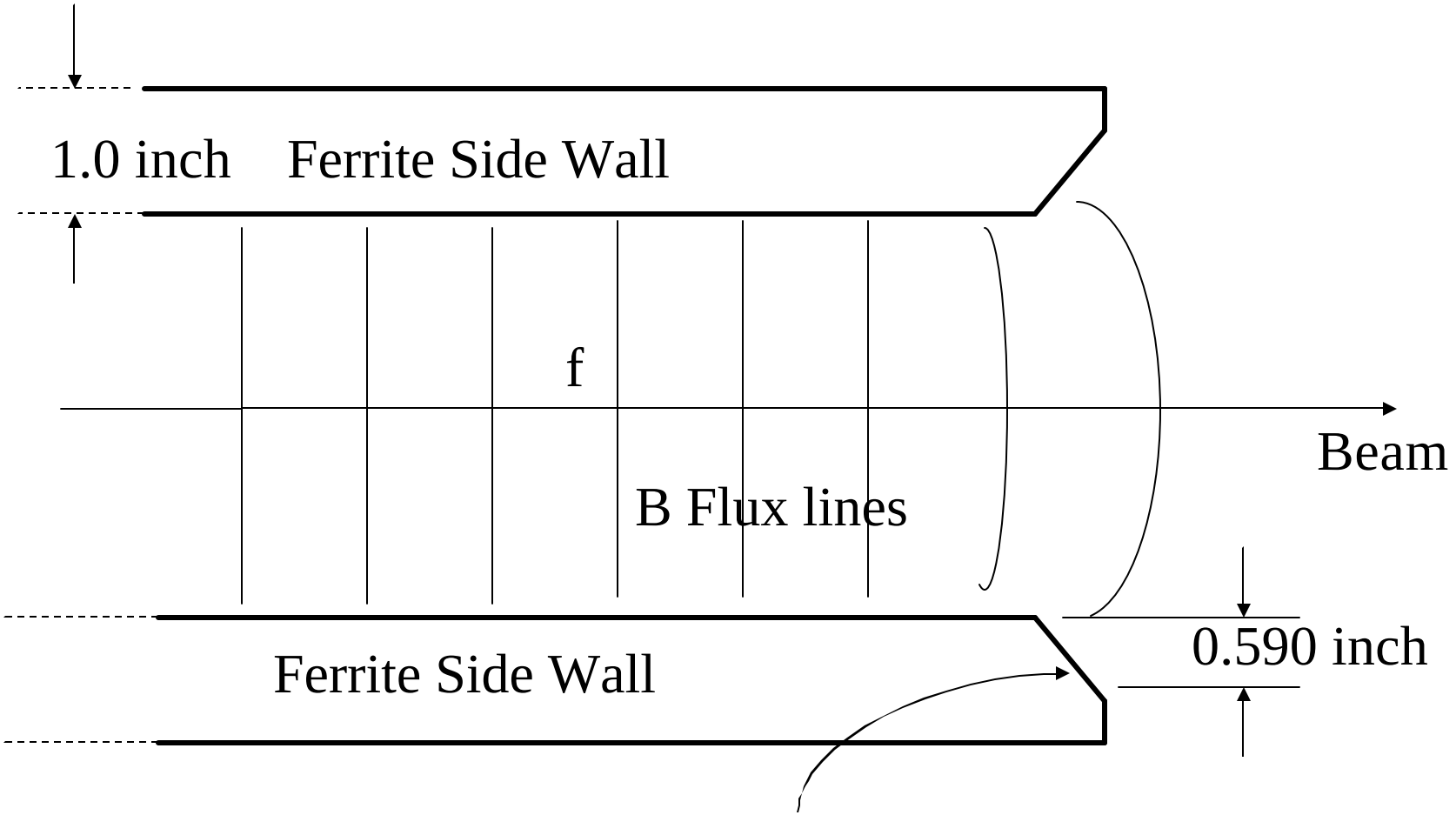
(3) Edge chamfers (on ferrite core) are applied and optimized to minimize the integrated first allowed high order component b3 (6-pole)

(3d simulations up to December 2007 were done by using simplified 8-turn square cross-section “saddle coils”.)

3d View – coil-end and edge chamfers



Top view (assuming field in horizontal direction)



Four (4) Edge chamfers (45 degree) per magnet, should be machined on four (4) longer-side of window inner edges.

Final(?) Parameters (calculated)

Current: Io = 118.58 A --- amplitude of I = Io*sin(2pft)
Central field: Bo = 99.085 Gauss
Integrated dipole field = 100.58 Gauss-meter
Dipole magnetic (or effective) length = 1.015 meter
Ratio of integrated 6-pole to dipole < 1E-4 (@R=2 cm)
Stored magnetic energy = 0.6433 Joule (per magnet at peak)
Self-inductance = 9.150E-5 H = 91.50 μH (per magnet)

Note:
Ferrite (cmd5005) thickness (1.0 inch), length (0.92 m), and window size (0.12 x 0.176 m) remain unchanged. Additional machined edge chamfers (0.590x0.590 inch) are required.