

RESISTIVE WALL EFFECTIVE IMPEDANCE OF AN LHC COLLIMATOR

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PARAMETERS USED

◆ Machine and Beam

$$p = 7 \text{ TeV}/c$$

$$M = 3564$$

$$N_b = 1.1 \times 10^{11} \text{ p/b}$$

$$Q_s = 2.12 \times 10^{-3}$$

$$Q_y = 59.32$$

$$\tau_b = 1 \text{ ns}$$

$$\xi_y = 0$$

$$\alpha_1 = 3 \times 10^{-4}$$

⇔

$$\gamma_t = 57.7$$

Same as used by H. Tsutsui in his LHC Project Note "Resistive wall impedance of an LHC collimator"

◆ Collimator (graphite)

$$b = 2 \text{ mm}$$

$$l = 20 \text{ m}$$

$$\rho \approx 14.3 \times 10^{-6} \Omega \text{ m}$$

I used $\rho = 18.1818 \times 10^{-6} \Omega \text{ m}$
in my previous computations

RESULTS

Resistive wall vertical effective impedance of the LHC collimator used in my previous computations on head-tail modes, for mode $m = 0$ and most critical coupled-bunch mode number n ($n = 3365$ for real part of the impedance, and $n = 3505$ for imaginary part of the impedance) \Rightarrow See Minutes of the LCE meeting 23/05/2003

$$\text{Re}\left(Z_{RW}^y / l\right)_{\text{eff}} \approx 0.09 \text{ M}\Omega / m^2$$

$$\text{Im}\left(Z_{RW}^y / l\right)_{\text{eff}} \approx 1.2 \text{ M}\Omega / m^2$$

The inductive bypass is included in the above formulae as well as the Yokoya factor for parallel plates ($\pi^2 / 12$)

Good agreement with the results from H. Tsutsui

H. Tsutsui's RESULTS

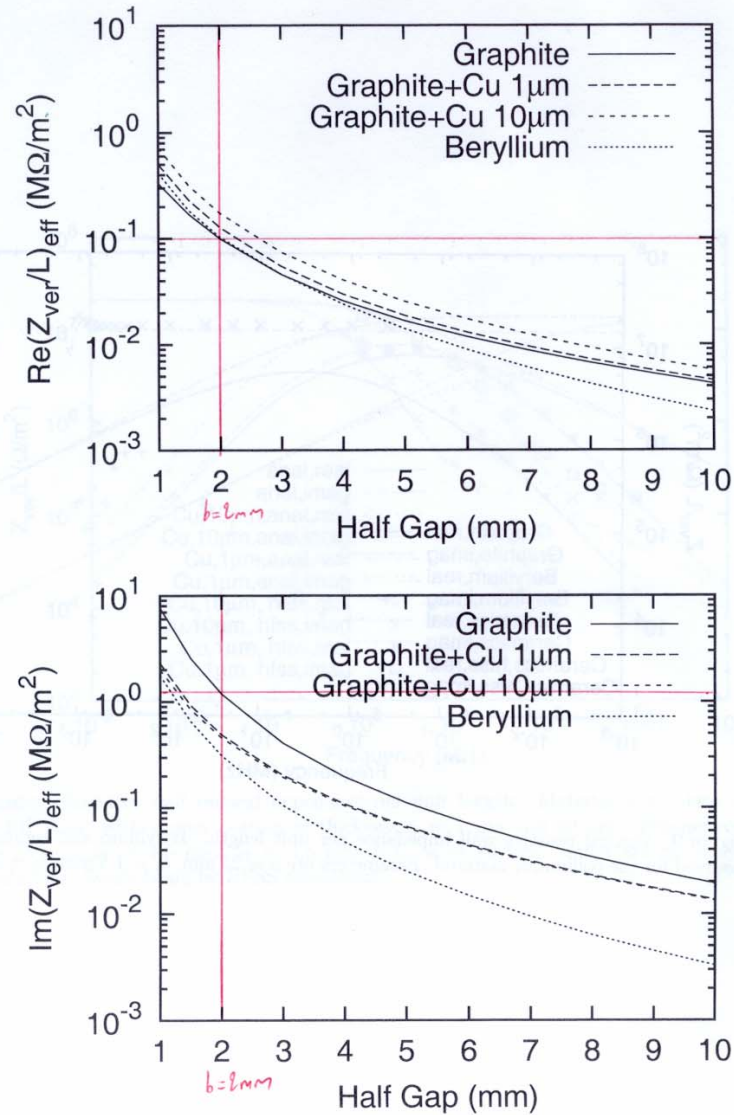


Figure 10: Vertical effective impedance of the collimator as a function of the gap size. Bunch length is 0.25 nsec.