

COUPLING IMPEDANCES FORM FACTORS (compared to the circular case)

E. Metral

**From CAS CERN 95-06
Wake fields and Impedance (p. 331)
L. Palumbo, V.G. Vaccaro and M. Zobov**

◆ **Extension to the elliptical pipe (in the ultra-relativistic limit) :**

(1) L. Palumbo, V.G. Vaccaro, “Coupling Impedance Between Circular Beam and a Lossy Vacuum Chamber in Particle Accelerators”, Il Nuovo Cimento Vol. 89 (1985).

◆ **Extension to the general pipe (in the ultra-relativistic limit) :**

(2) R.L. Gluckstern, J. van Zeijts, B. Zotter, “Coupling Impedance of Beam Pipes of General Cross Section”, CERN SL/AP 92-25 (1992).

(3) K. Yokoya, “Resistive Wall Impedance of Beam Pipes of General Cross Section”, KEK preprints 93-196 (1993).

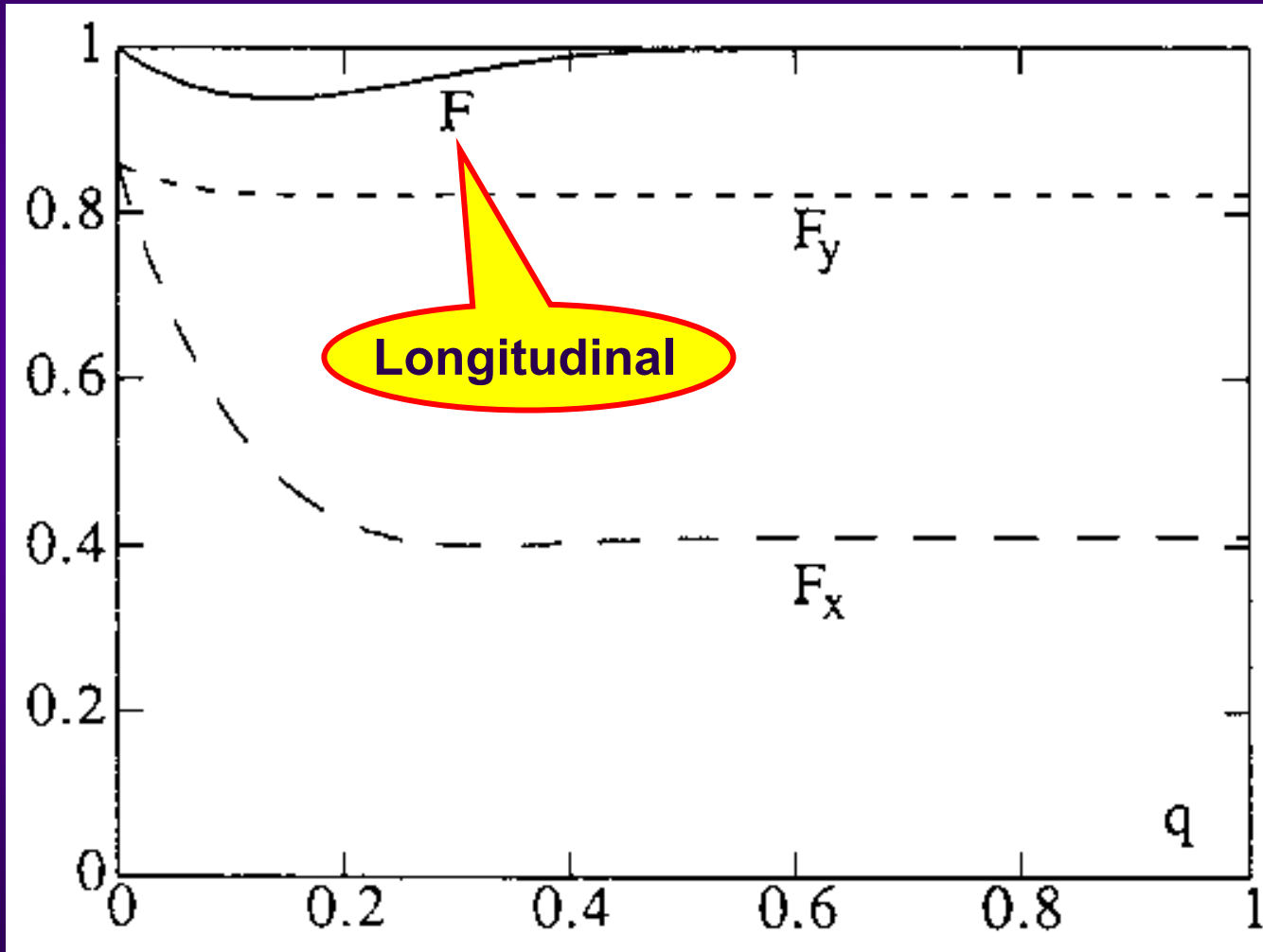
Form factors for a rectangular pipe :

$F(\lambda)$ and $F_{x,y}(\lambda)$ with $\lambda = \frac{b}{h}$

$$q = \frac{h-b}{h+b}$$

h = pipe half – width

b = pipe half – height

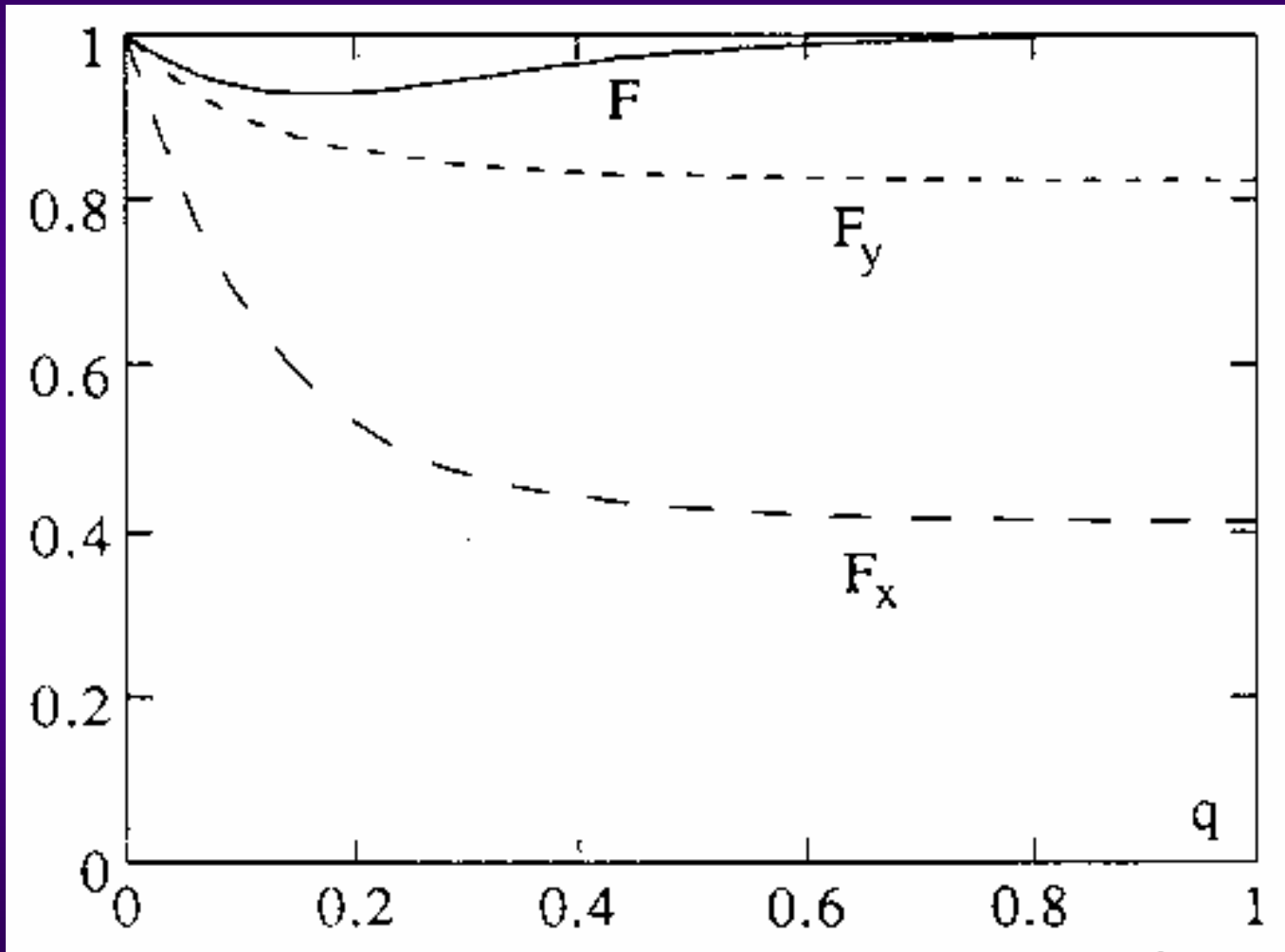


$$\frac{\pi^2}{12}$$

$$\frac{\pi^2}{24}$$

Form factors for an elliptical pipe :

$F(u_0)$ and $F_{x,y}(u_0)$ with $q = e^{-2u_0}$



$$\frac{\pi^2}{12}$$

$$\frac{\pi^2}{24}$$

Application to the case of the LHC collimators

$$F = 1$$

$$F_x = \frac{\pi^2}{24}$$

$$F_y = \frac{\pi^2}{12}$$