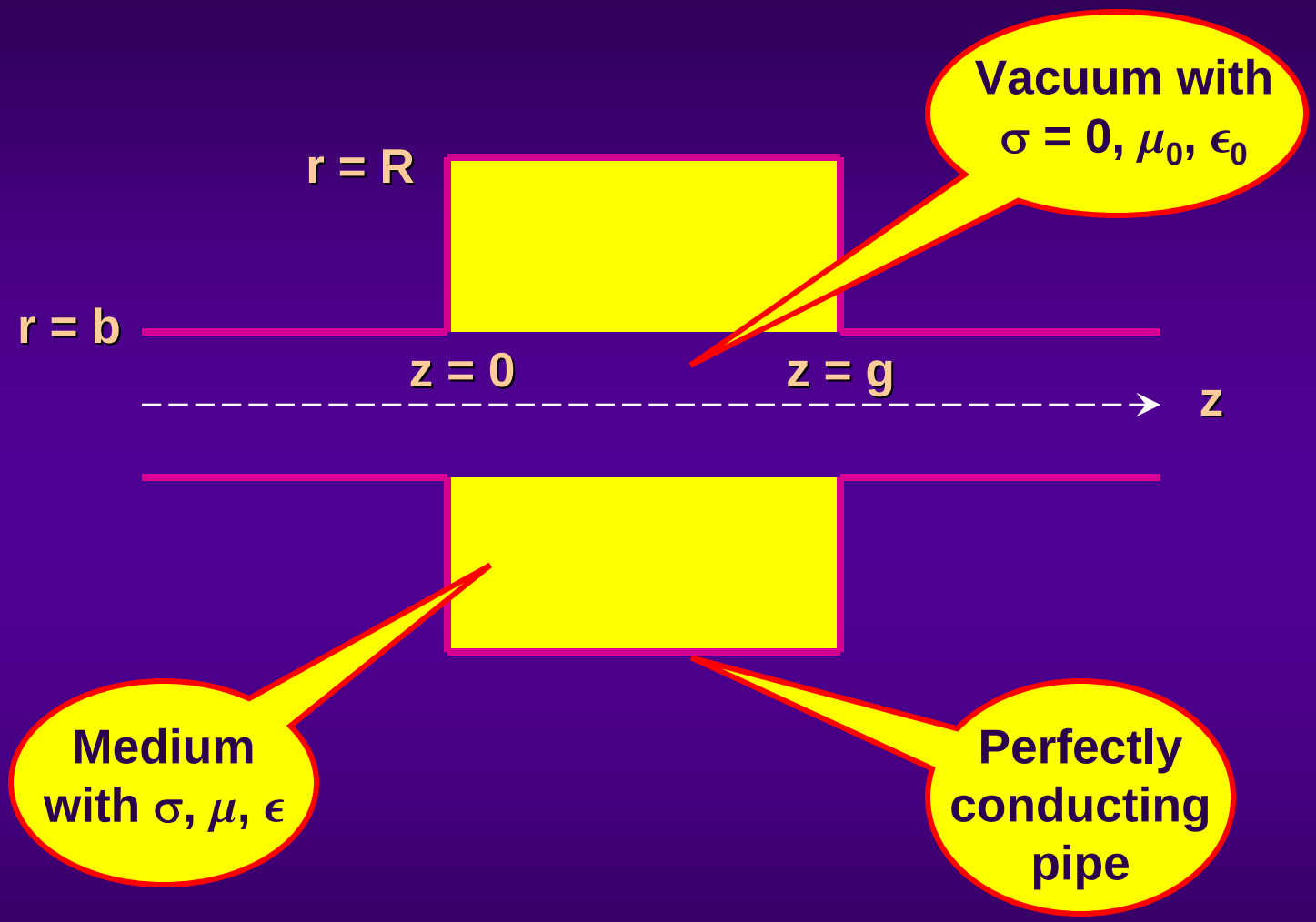
TRANSVERSE RESISTIVE-WALL IMPEDANCE OF A RESISTIVE TUBE WITH FINITE LENGTH (2)

Elias Métral

- **1st theory done by R.L. Gluckstern and B. Zotter (09-08-2006)**
  - **See RLC meeting 12/09/06**
  - **Scan in nmax and lmax ($\Longrightarrow$ truncated matrices)**
  - **Scan in length g (and then renormalization per unit length)**
  - **Analytical formula for nmax = lmax = 0**
- **2nd (more refined) theory done by R.L. Gluckstern and B. Zotter (20-10-2006)**
  - **Scan in nmax and lmax ($\Longrightarrow$ truncated matrices)**
  - **Analytical formula for nmax = lmax = 0**
  - **Scan in length g (and then renormalization per unit length)**

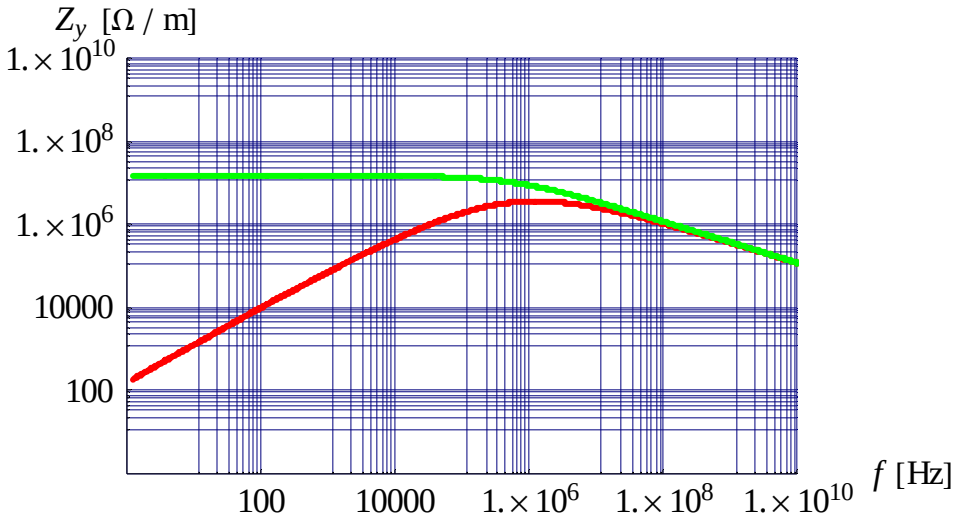
GEOMETRY OF THE PROBLEM



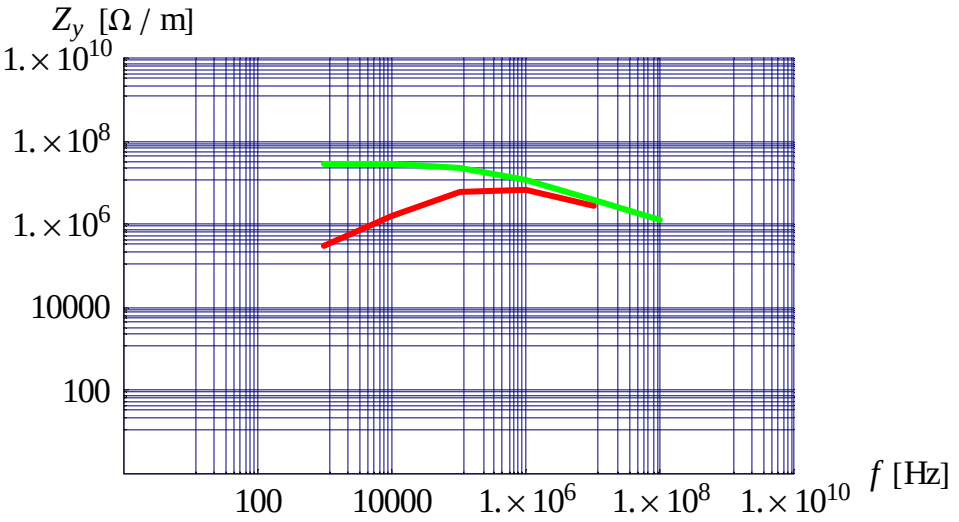
1st THEORY

- **Application to the case of a LHC collimator**
  - **Length = g = 1 m**
  - **Half gap = b = 2 mm**
  - **Resistivity = 10 μΩm**
  - **Wall thickness = R = 2.5 cm**

INFINITE LENGTH COMPUTATION

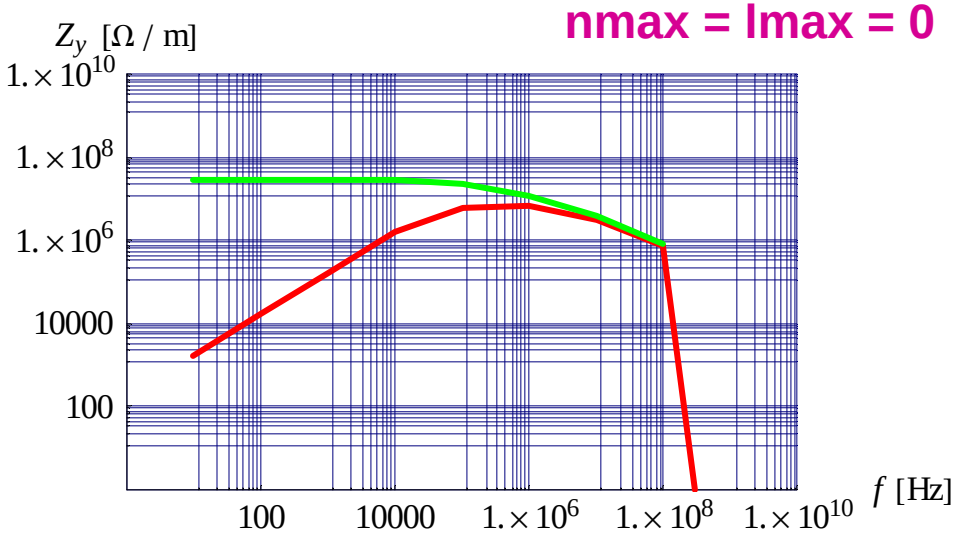


FINITE LENGTH COMPUTATION (with nmax = lmax = 10)

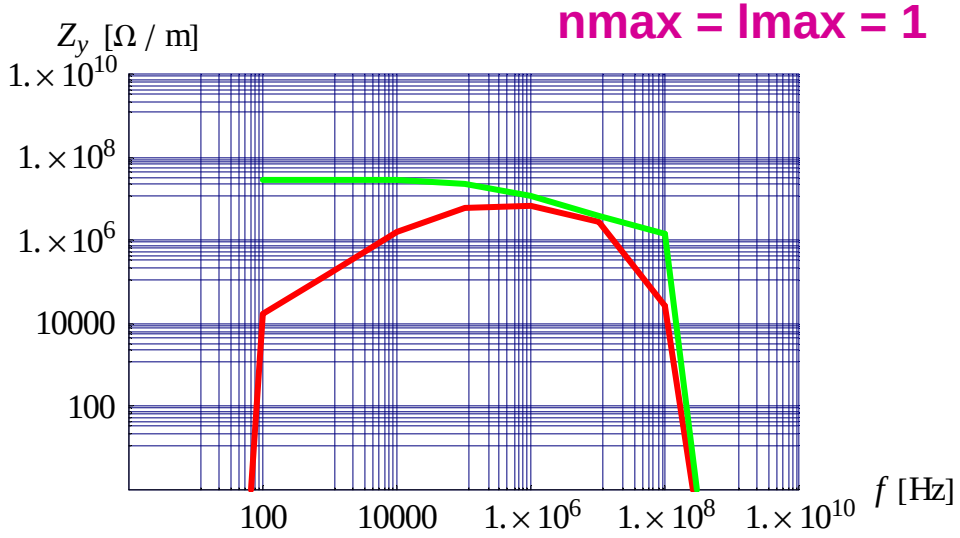


Scan in nmax (= lmax here) for the case of a LHC collimator

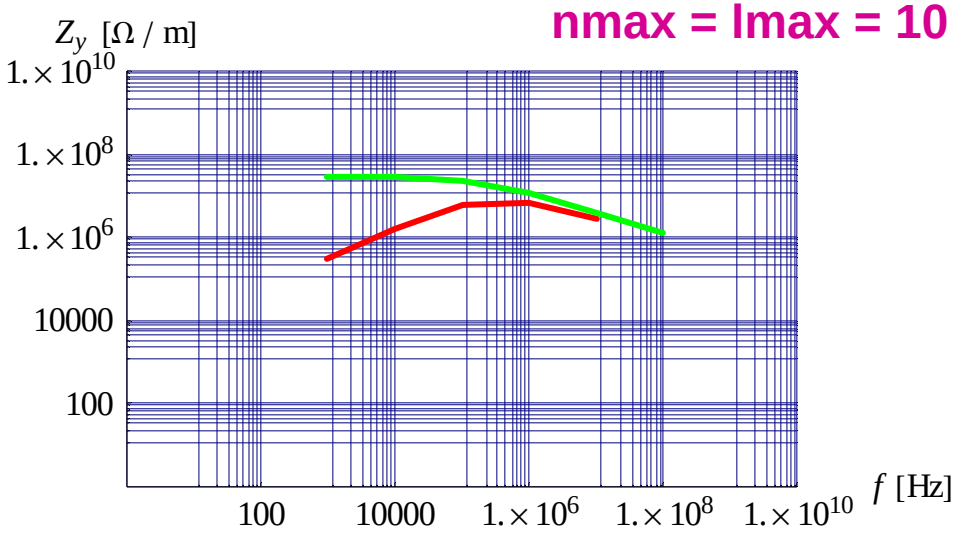
nmax = lmax = 0



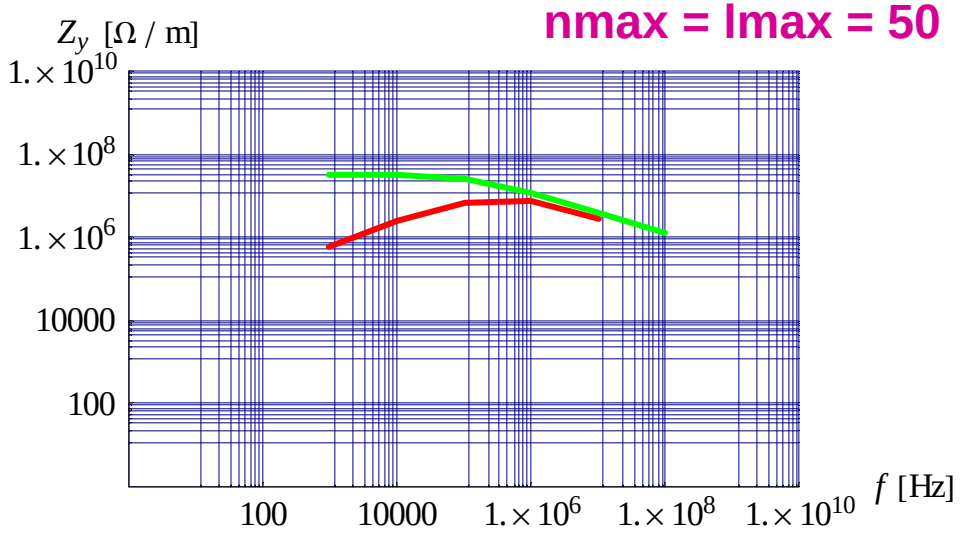
nmax = lmax = 1



nmax = lmax = 10

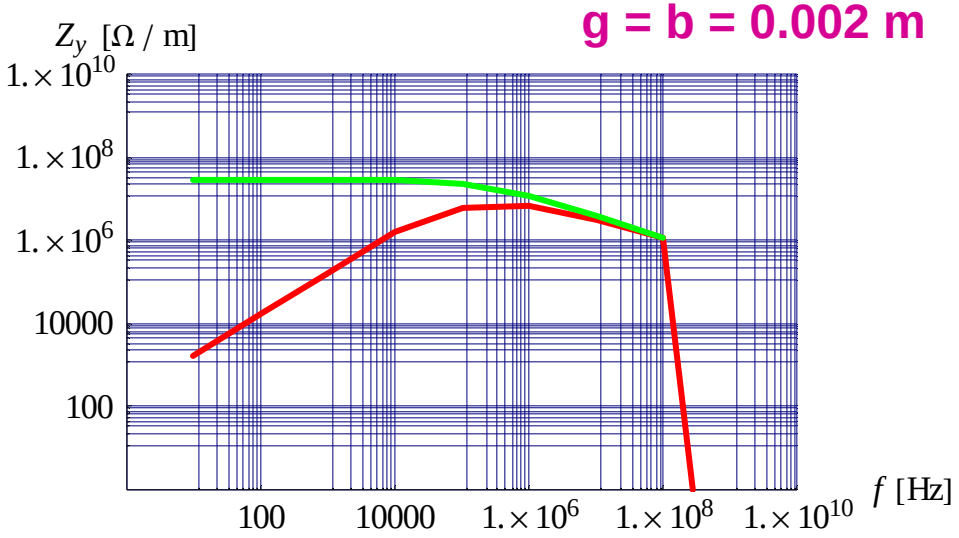


nmax = lmax = 50

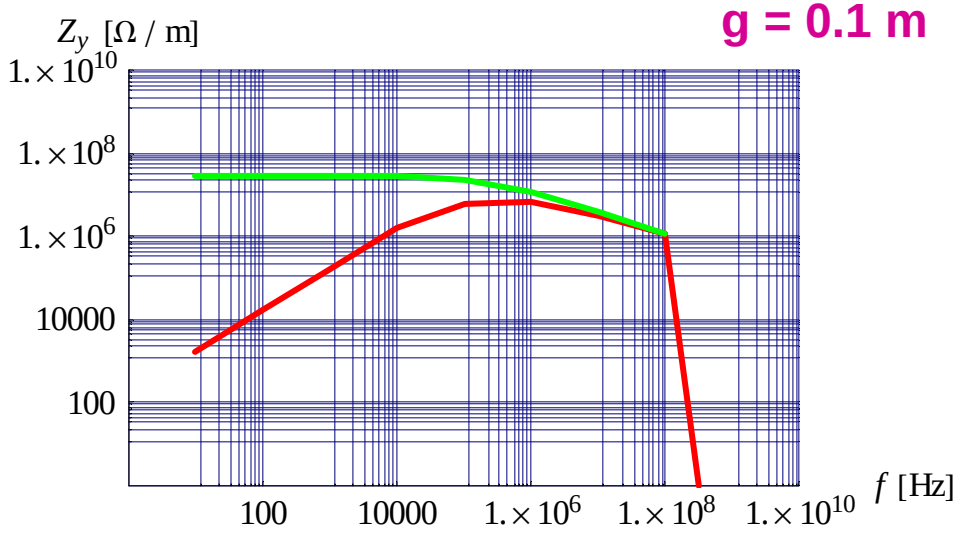


- **Scan in g for the case of a LHC collimator (and then renormalization per unit length) and nmax = lmax = 0**

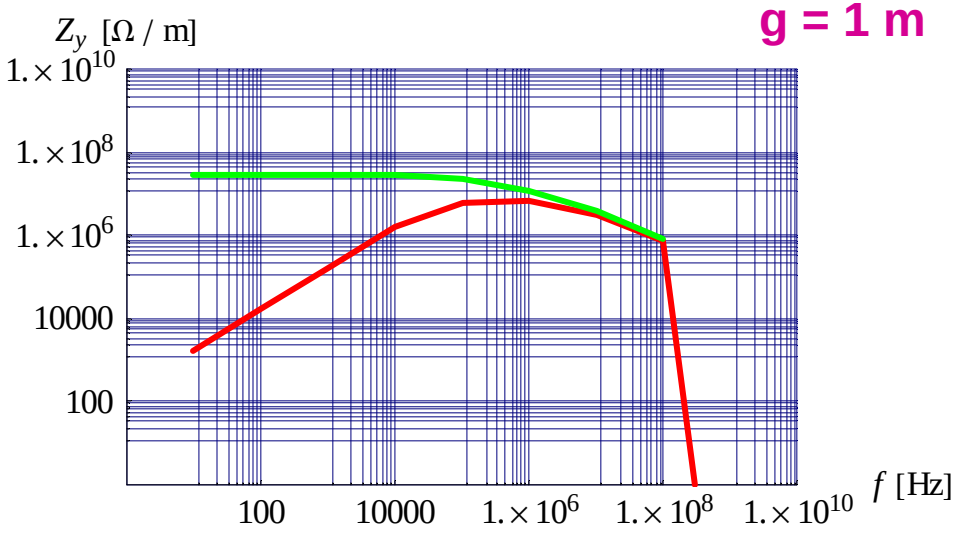
g = b = 0.002 m



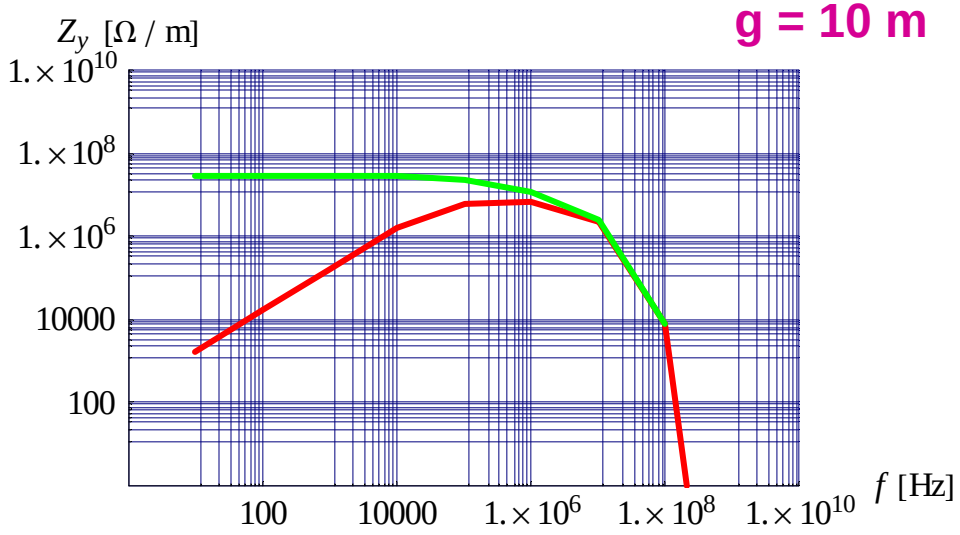
g = 0.1 m



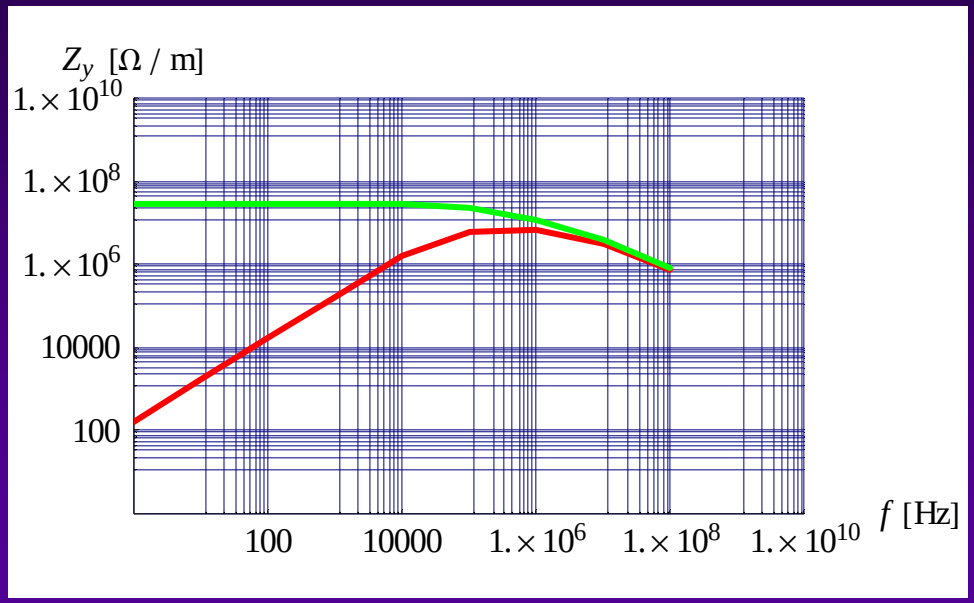
g = 1 m



g = 10 m



- **Analytical formula taking into account only nmax = lmax = 0**

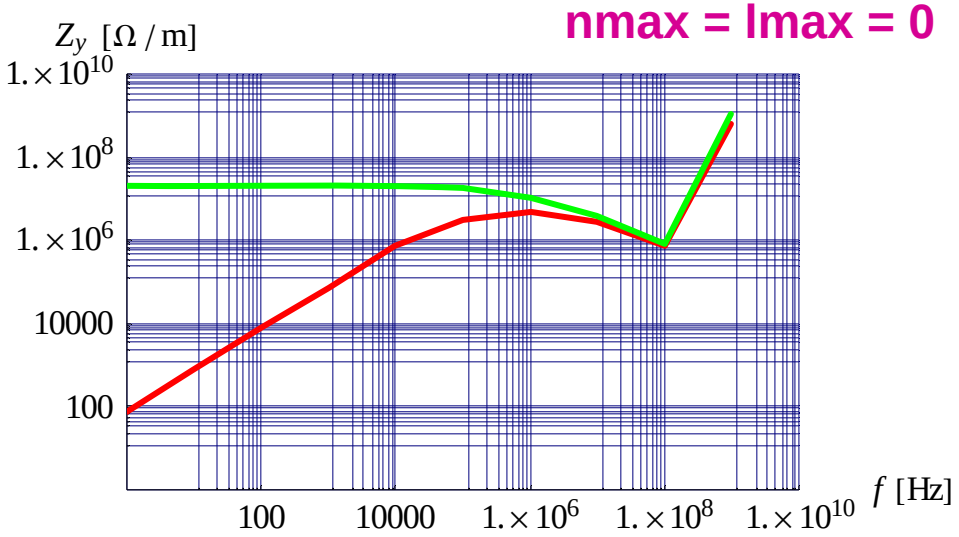


⇒ **The fact that we have no result above ~ 10^8 Hz is due to the fact that then S(α_0b) and S'(α_0b) are then equal to 0 with Mathematica, and we need to compute the ratio S'(α_0b) / S(α_0b). We should try to find approximation of these Bessel functions for high frequency…**

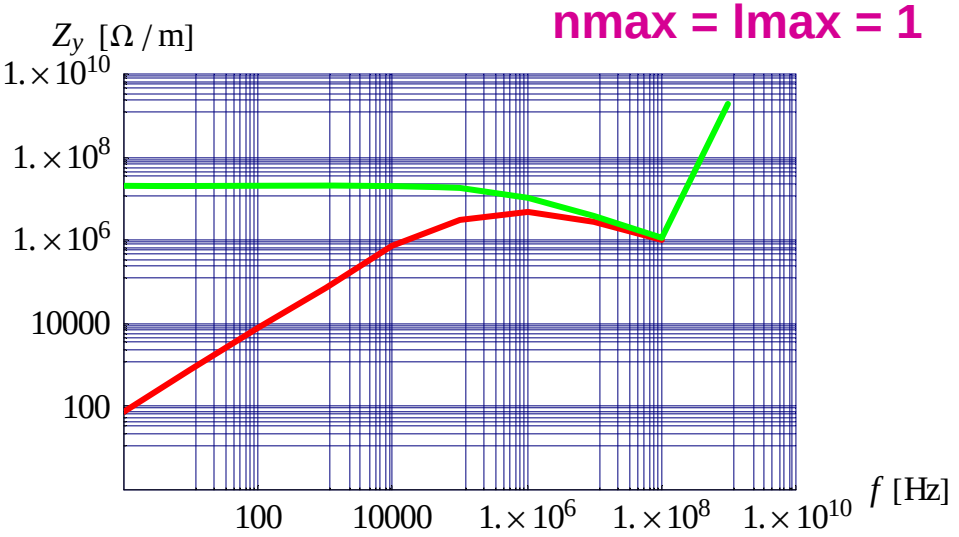
2nd THEORY

- **Scan in nmax (= lmax here) for the case of a LHC collimator**

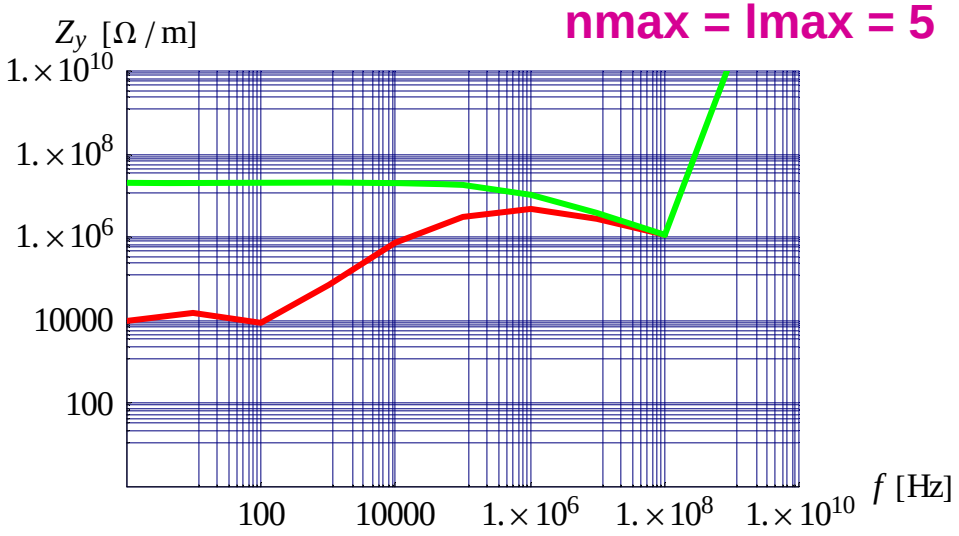
nmax = lmax = 0



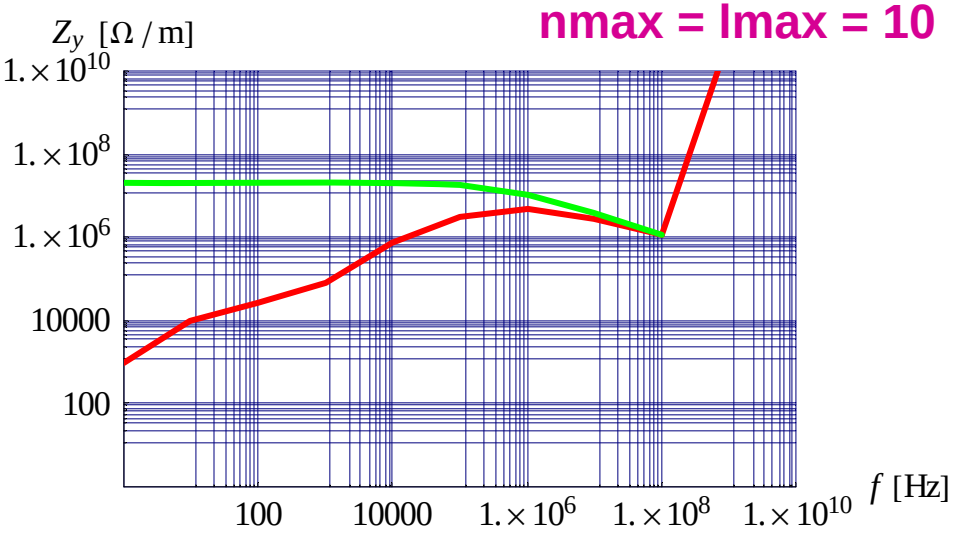
nmax = lmax = 1



nmax = lmax = 5



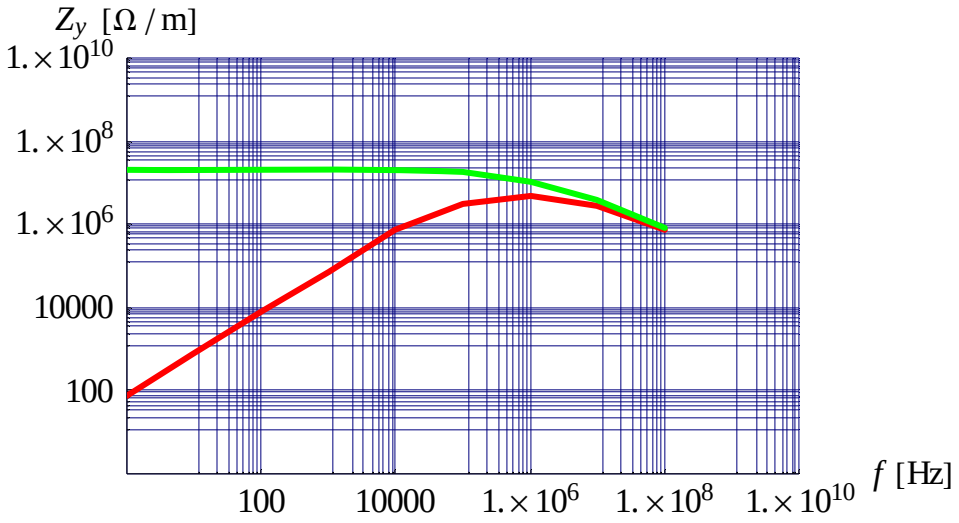
nmax = lmax = 10



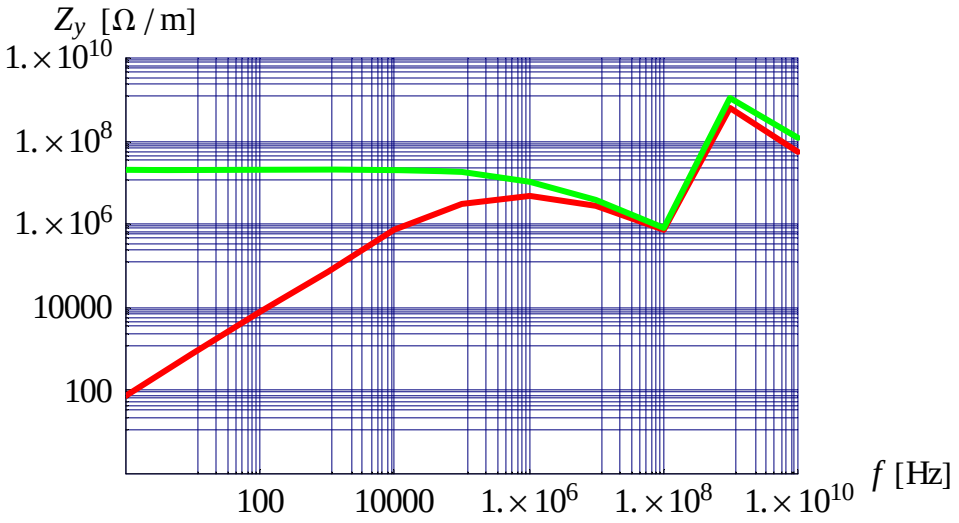
- **Analytical formula taking into account only nmax = lmax = 0**

My result = Gluckstern's result divided by $-\pi k^2 g^2$

ANALYTICAL RESULT

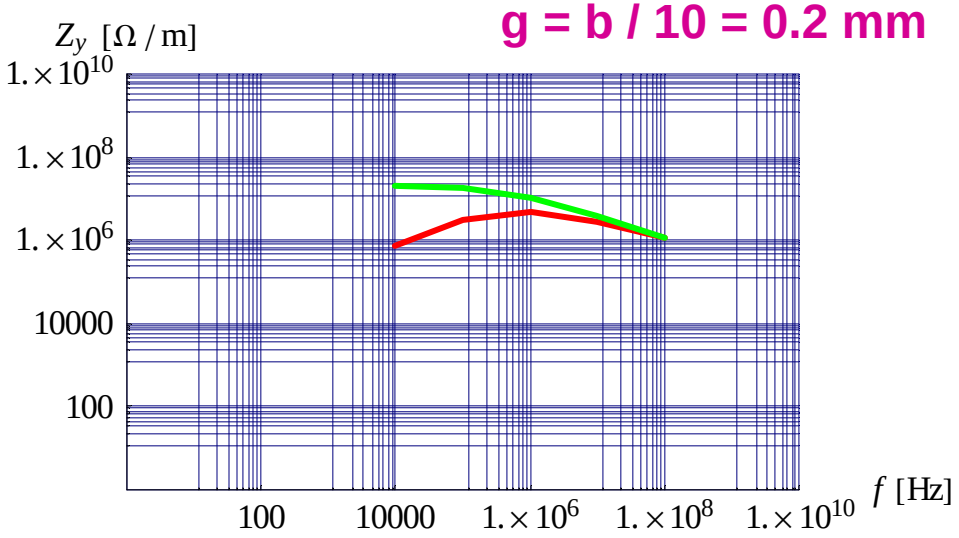


NUMERICAL RESULT

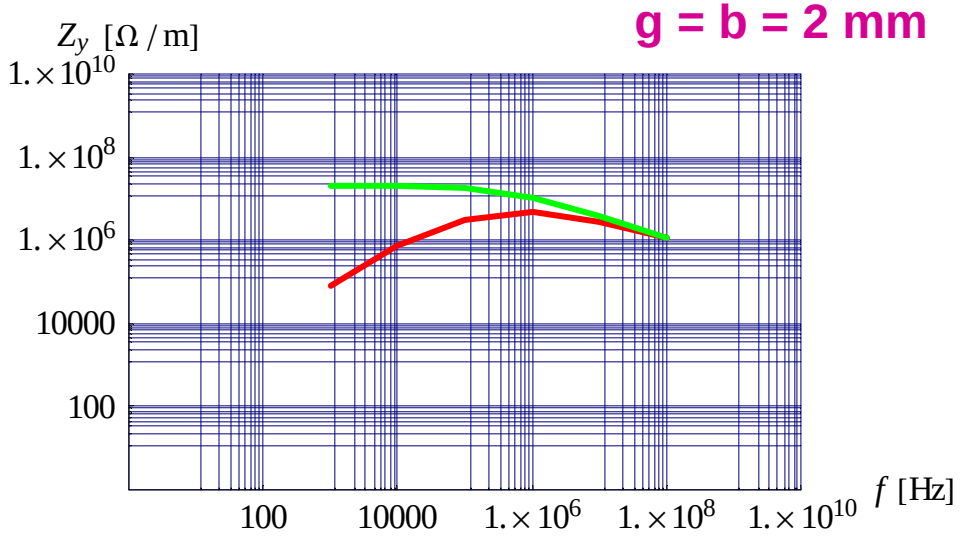


- **Scan in g for the case of a LHC collimator (and then renormalization per unit length) and nmax = lmax = 0**

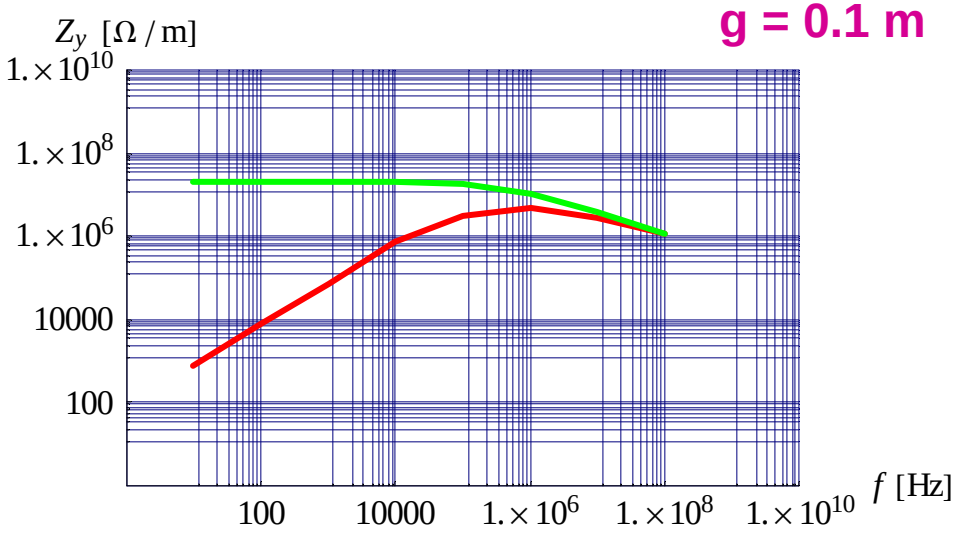
g = b / 10 = 0.2 mm



g = b = 2 mm



g = 0.1 m



g = 1 m