

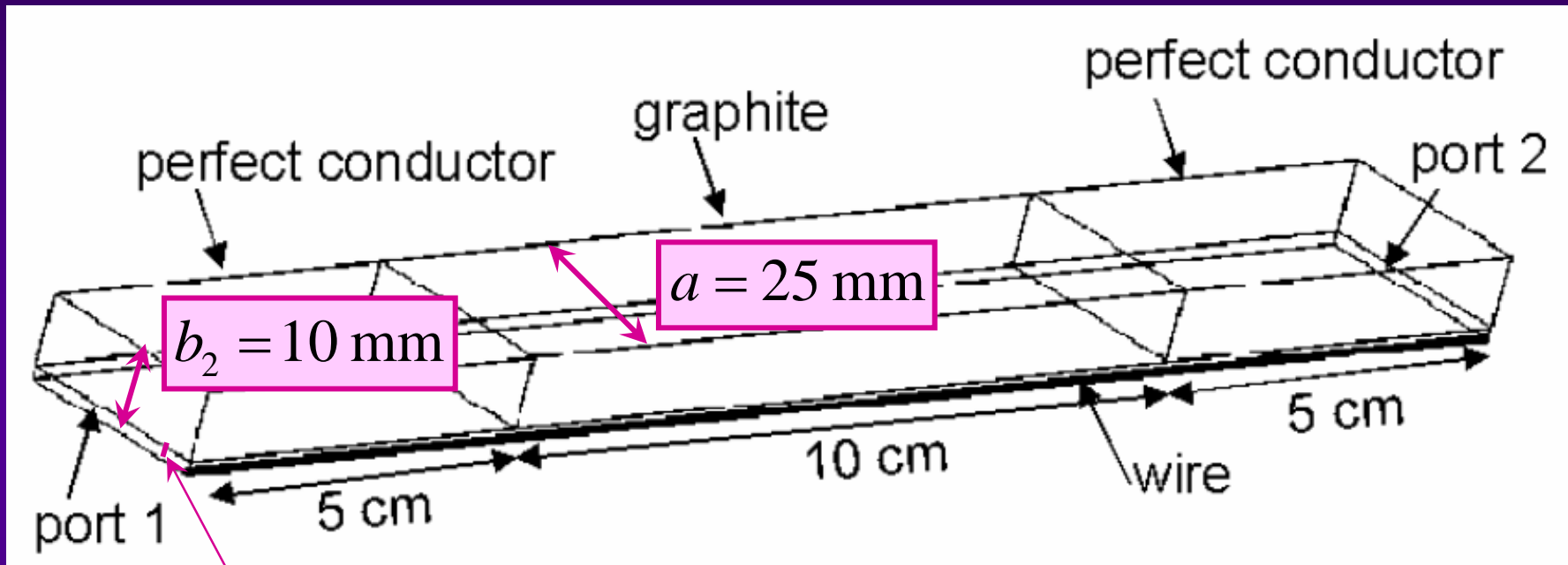
FIRST HFSS SIMULATIONS OF THE LHC COLLIMATORS

E. Métral

- ◆ **1st Goal: Reproduce the results from Tsutsui in his LHC Project Note 318 (Resistive wall impedance of a LHC collimator)**
⇒ Not yet a success, as shown after...
- ◆ **Next step: Simulate the PS kickers (with the classical 2 wire method, suspected to give wrong results in this case, and with a displaced wire)**

MODEL

(The quarter geometry used by Tsutsui for HFSS simulations)



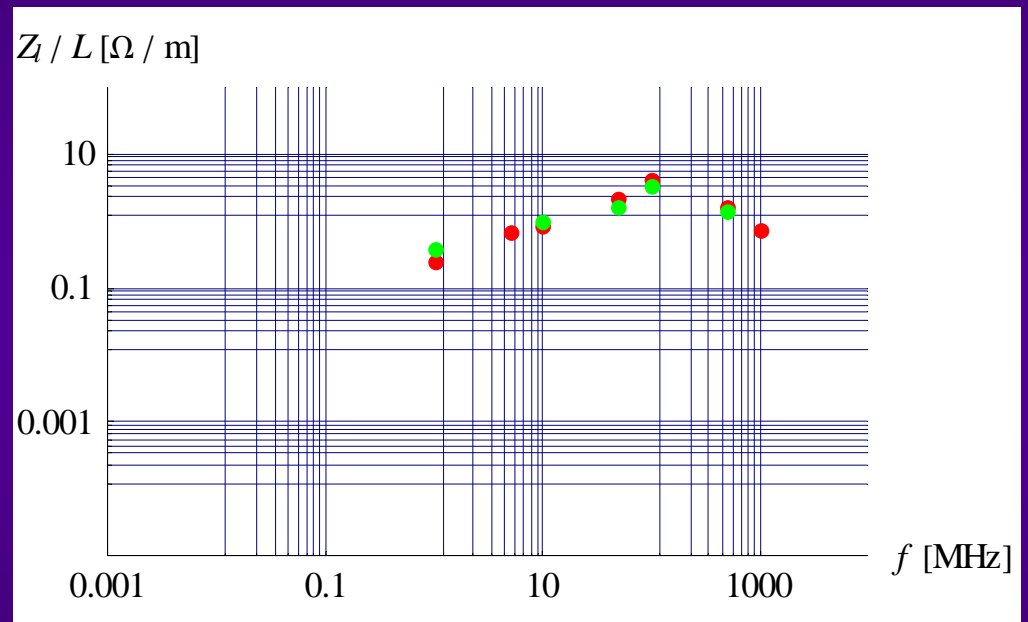
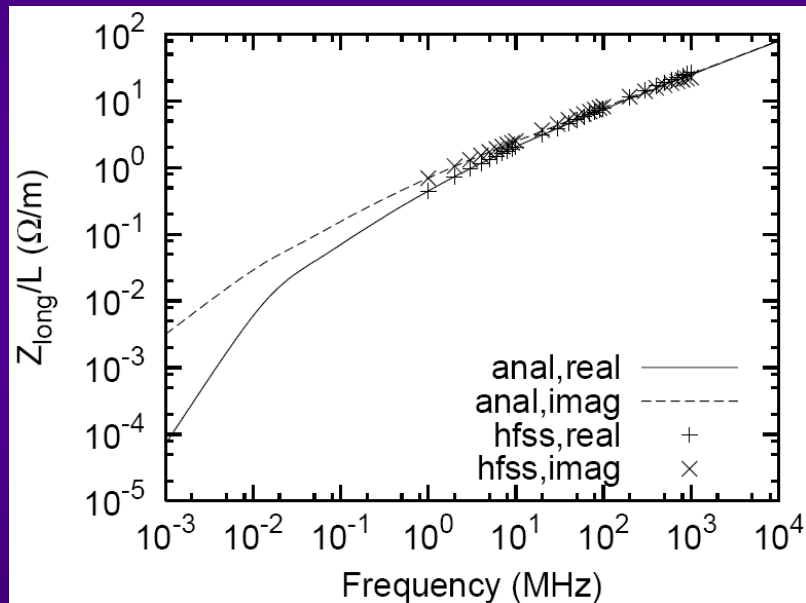
$b_1 = 1.5 \text{ mm}$

$\sigma_{\text{graphite}} = 7 \times 10^4 \Omega^{-1} \text{ m}^{-1}$

TSUTSUI'S RESULTS

MY (WITH THE HELP OF AG) RESULTS

LONGITUDINAL IMPEDANCE



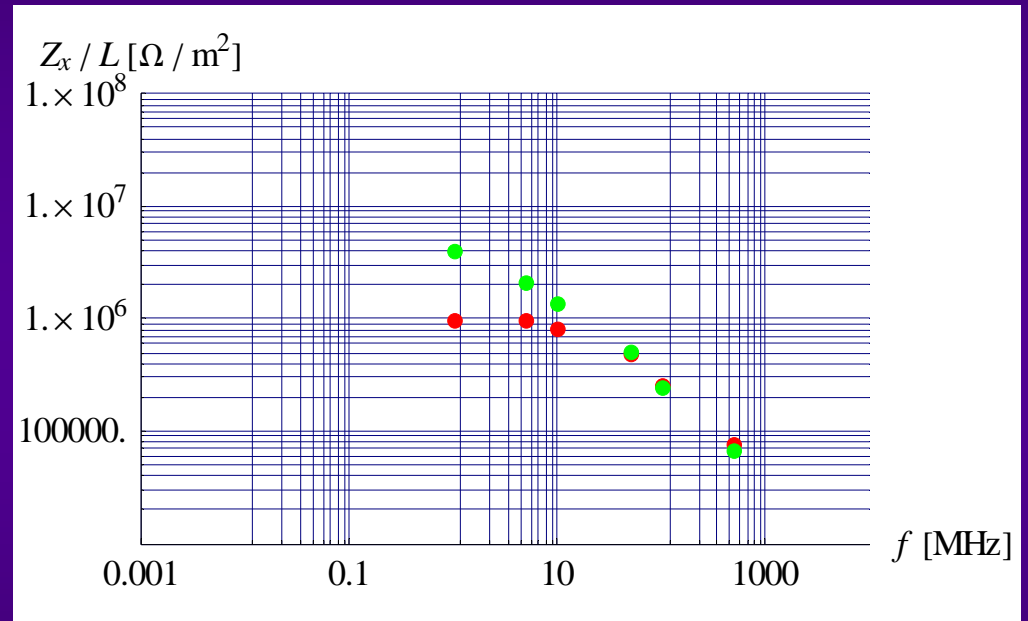
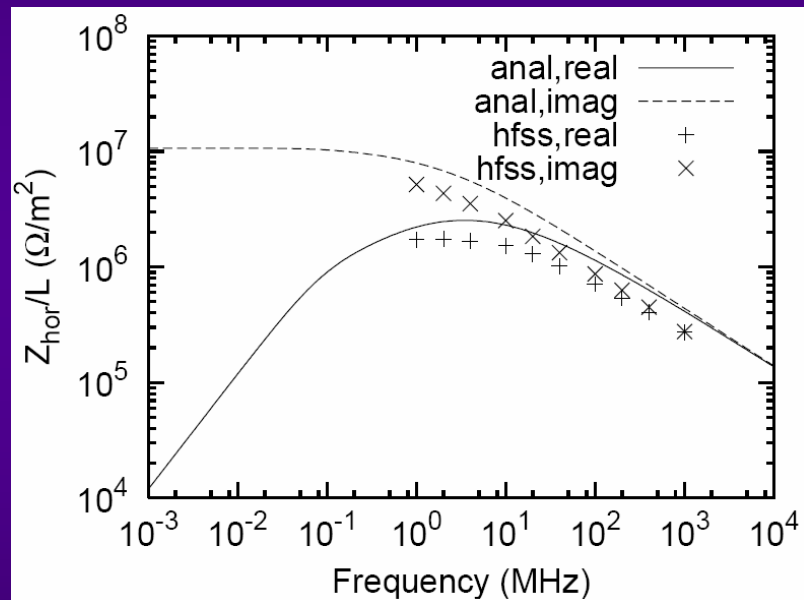
RED = REAL PART

GREEN = IMAGINARY PART

TSUTSUI'S RESULTS

MY (WITH THE HELP OF AG) RESULTS

HORIZONTAL IMPEDANCE



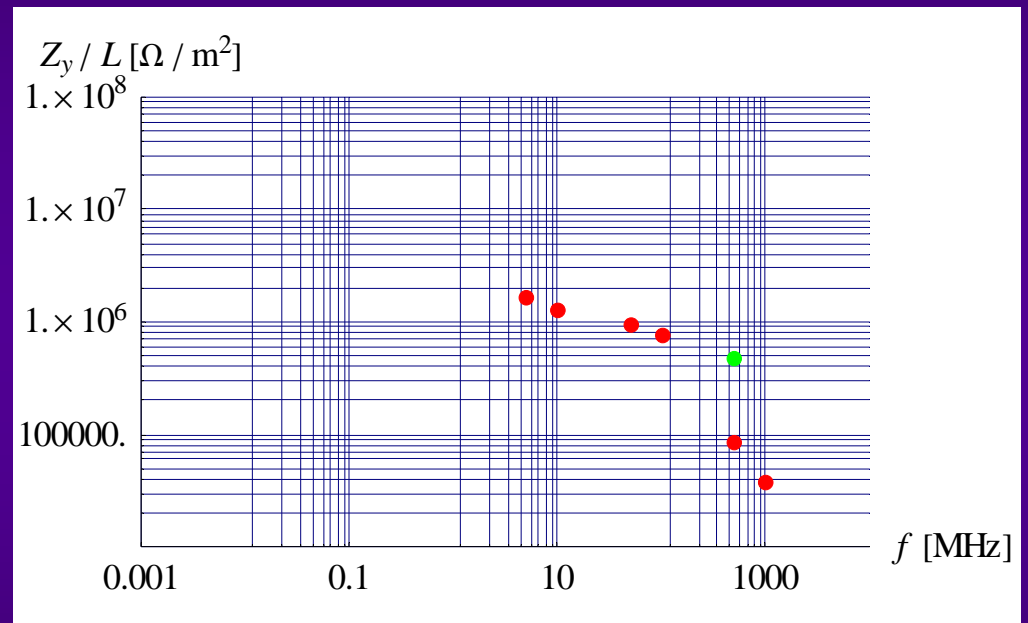
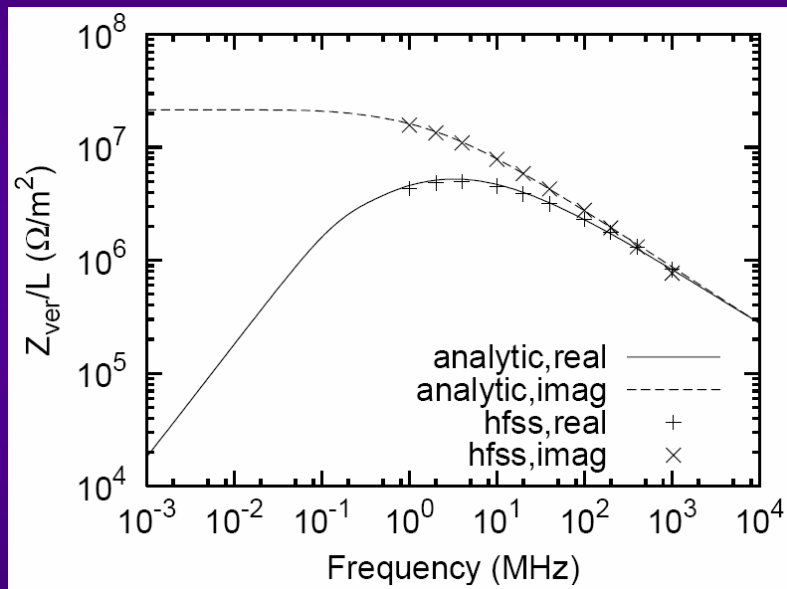
RED = REAL PART

GREEN = IMAGINARY PART

TSUTSUI'S RESULTS

MY (WITH THE HELP OF AG) RESULTS

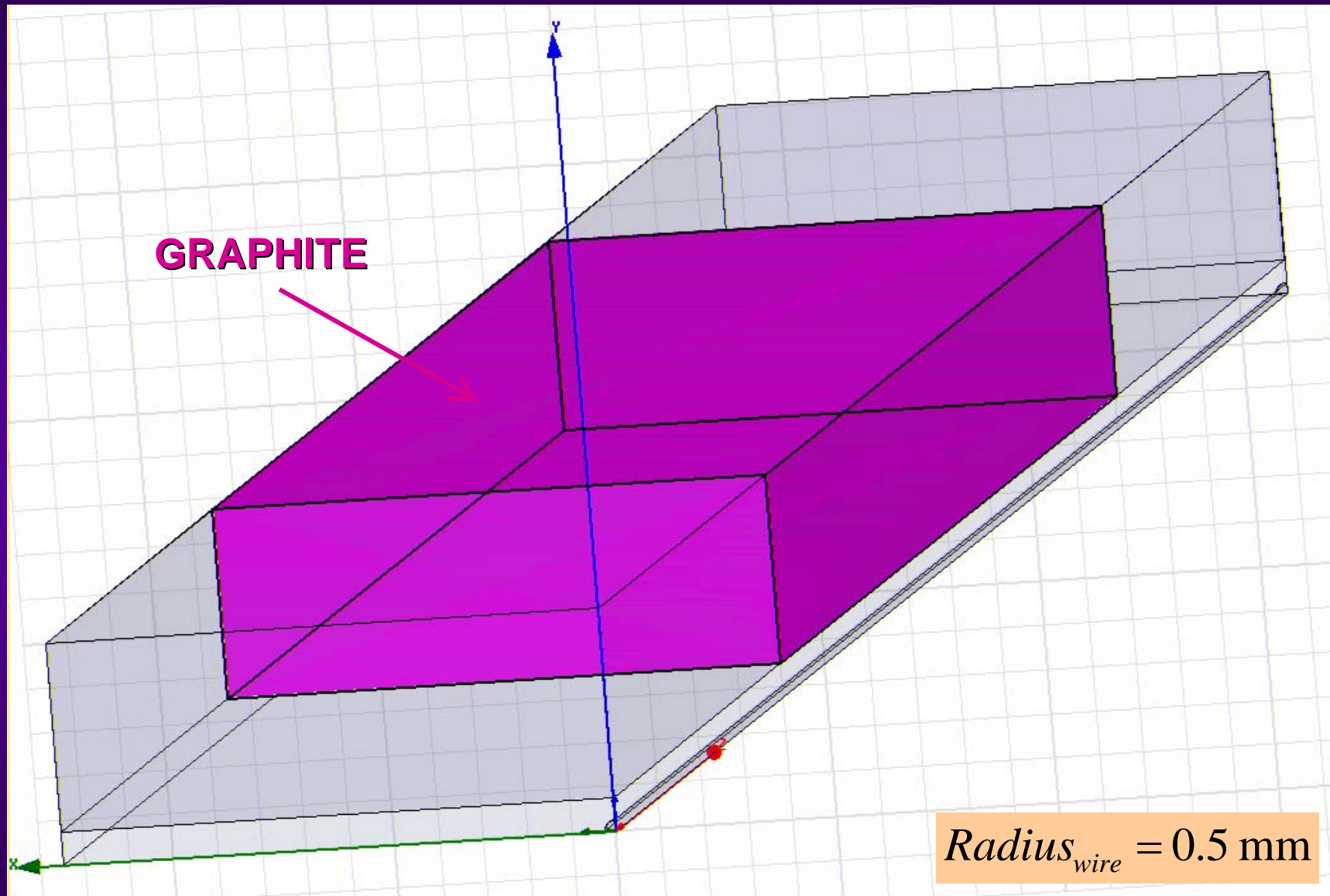
VERTICAL IMPEDANCE



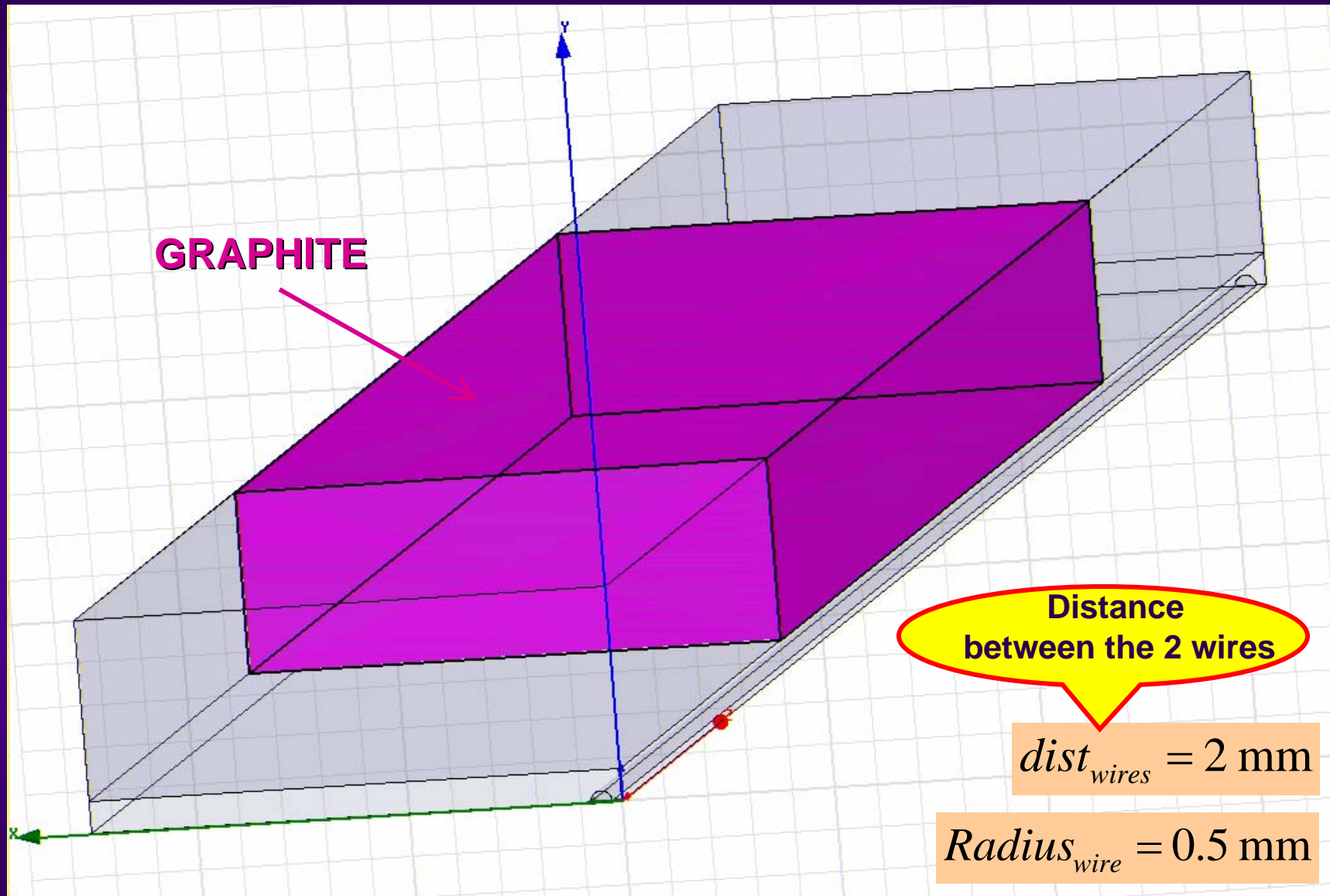
RED = REAL PART

GREEN = IMAGINARY PART

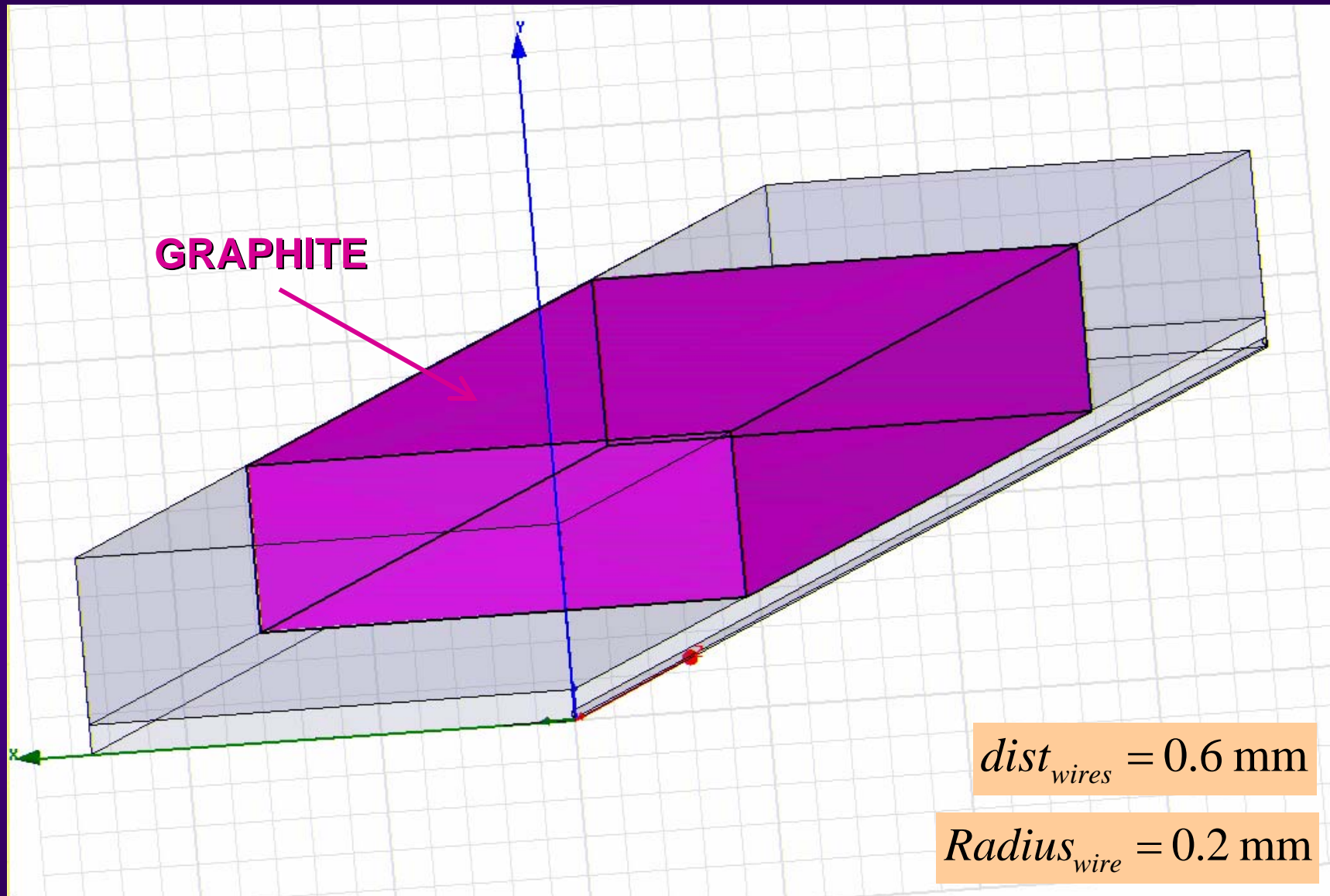
APPENDIX 1: L (coaxial wire method)



APPENDIX 2: X (double wire method)



APPENDIX 3: Y (double wire method)



APPENDIX 4: IMPEDANCE DEDUCED FROM THE SCATTERING PARAMETER S_{21}

◆ Longitudinal

$$Z_l = -2 Z_{ch} \log \left(\frac{S_{21}}{S_{REF}} \right)$$

Also computed with HFSS by Tsutsui

◆ Transverse

$$Z_{\perp} = -2 Z_{ch} \frac{c}{\omega \text{dist}_{wires}^2} \log \left(\frac{S_{21}}{S_{REF}} \right)$$

■ S_{21} is deduced from HFSS

$$Z_{ch} = 60 \log \left(1.27 \frac{b_1}{\text{Radius}_{wire}} \right)$$

$$S_{REF} = e^{-j\omega \frac{L}{c}}$$

■ S_{21} is deduced from HFSS

$$Z_{ch} = 120 \text{ArcCosh} \left(\frac{\text{dist}_{wires}}{2 \text{Radius}_{wire}} \right)$$

$$S_{REF} = e^{-j\omega \frac{L}{c}}$$