

TCLIA/TCTV transverse BB impedance versus gap size

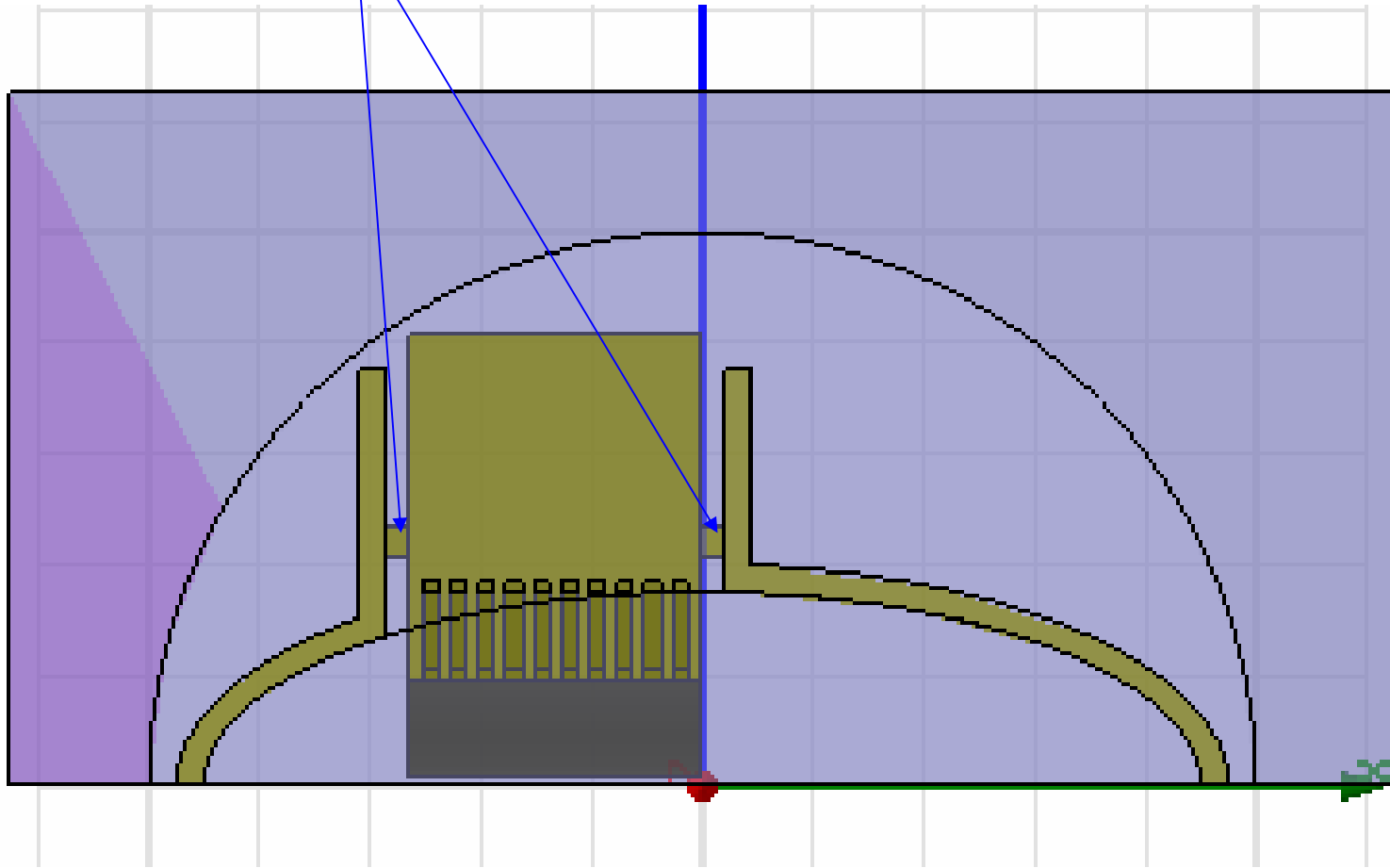
A. Grudiev

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RLC meeting

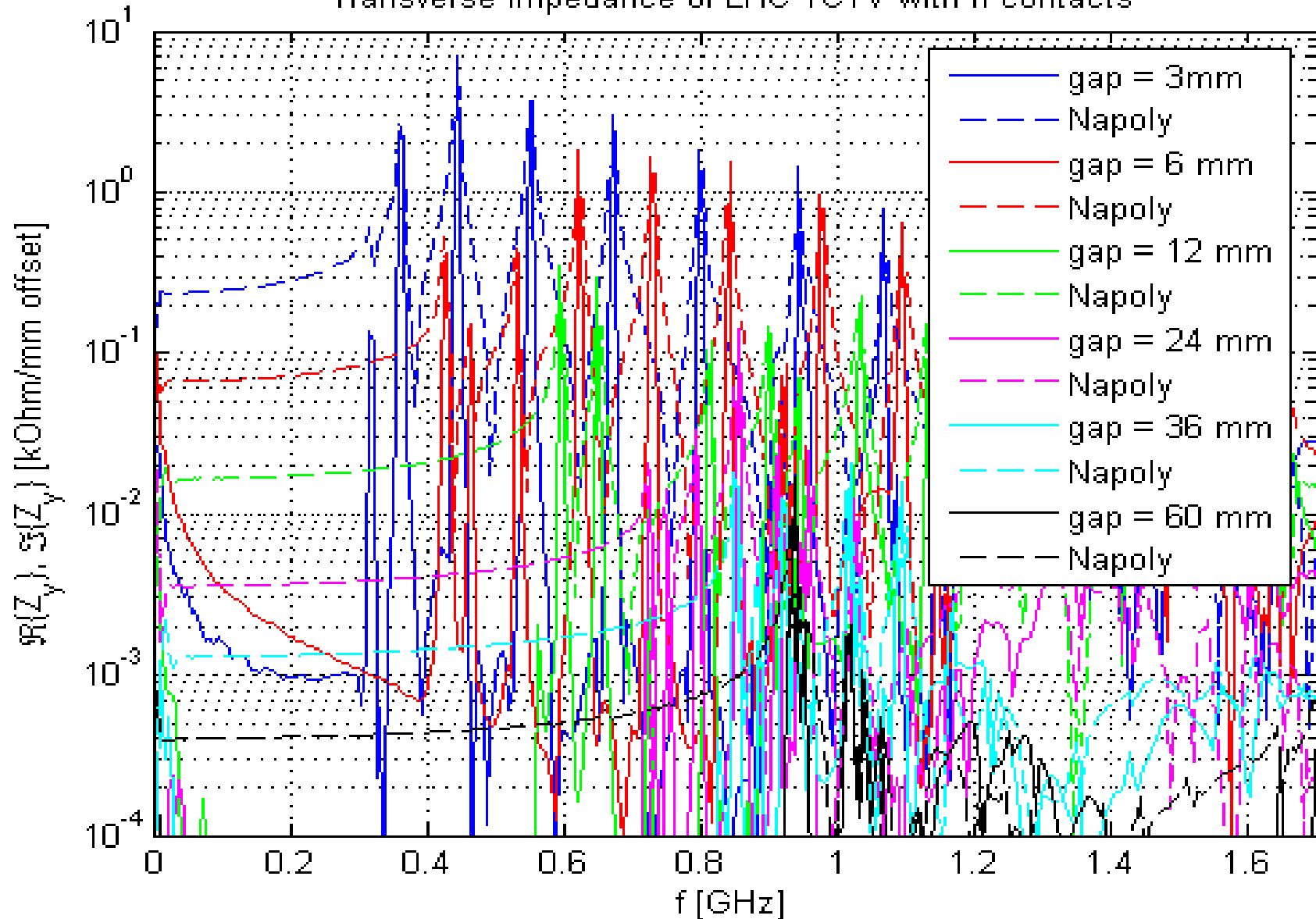
Dipole trapped mode damping

Sliding rf contacts



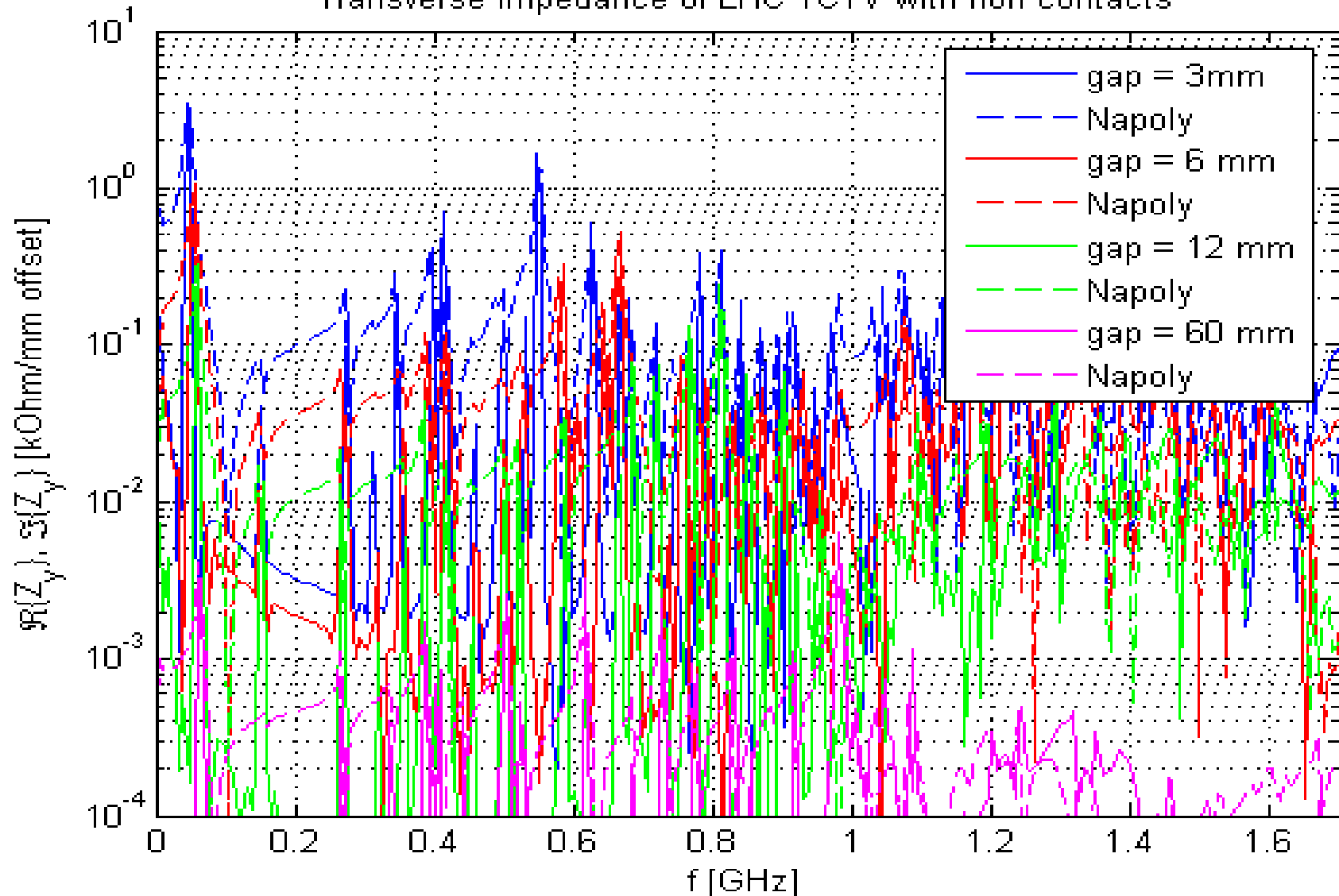
Transverse impedance of the TCTV with rf contacts for different gap size

Transverse Impedance of LHC TCTV with rf contacts



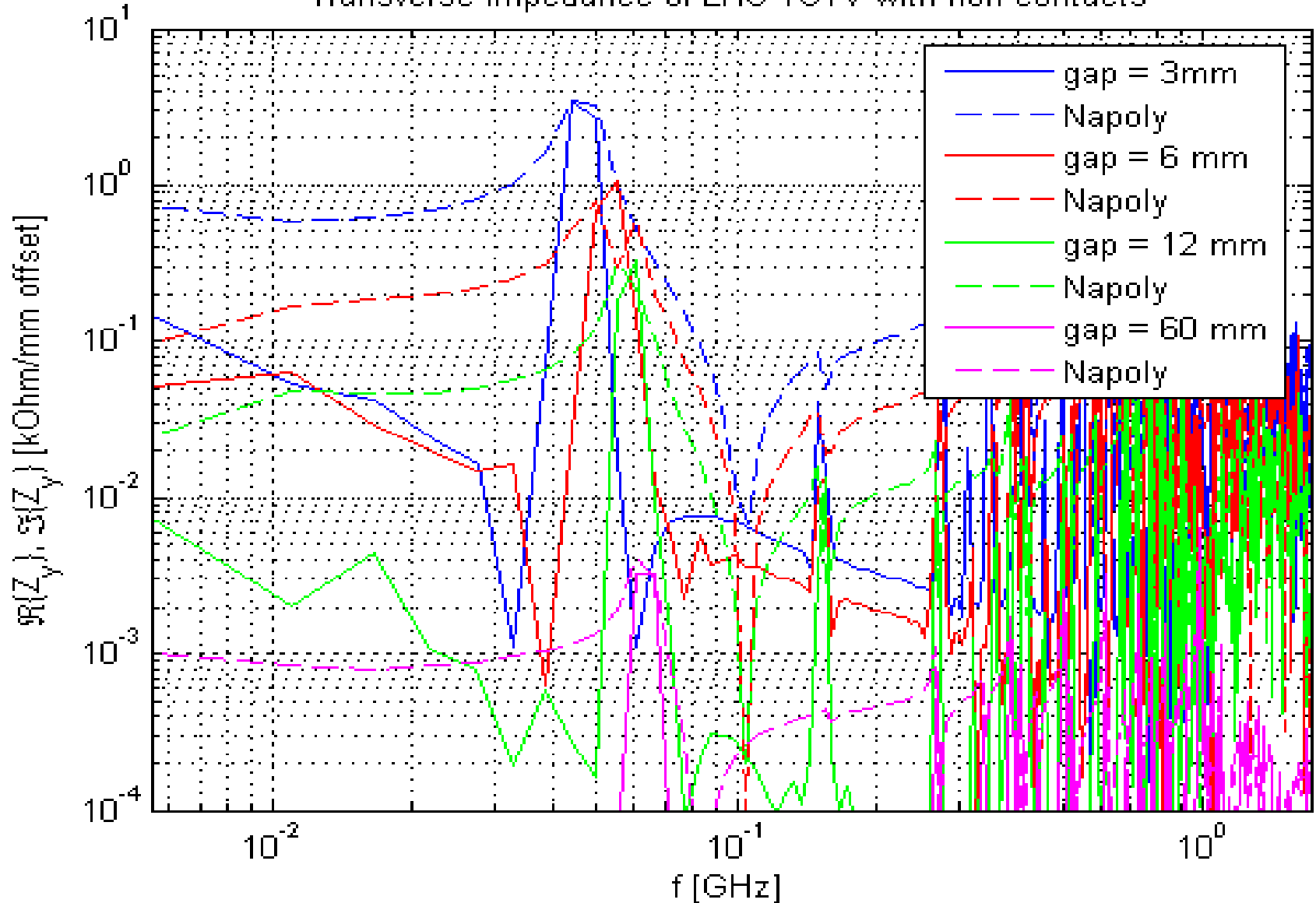
Transverse impedance of the TCTV without rf contacts for different gap size

Transverse Impedance of LHC TCTV with norf contacts



Transverse impedance of the TCTV without rf contacts for different gap size (log-log scale)

Transverse Impedance of LHC TCTV with norf contacts



Broad Band impedance of the TCTV/TCLI for different gap size

BB transverse impedance
of a cylindrical taper,
Yokoya 1988, CERN SL/90-88

$$Z_T^{(1)} = -\frac{iZ_0}{2\pi} 2I_1;$$

$$I_1 = \theta \left(\frac{1}{a} - \frac{1}{b} \right);$$

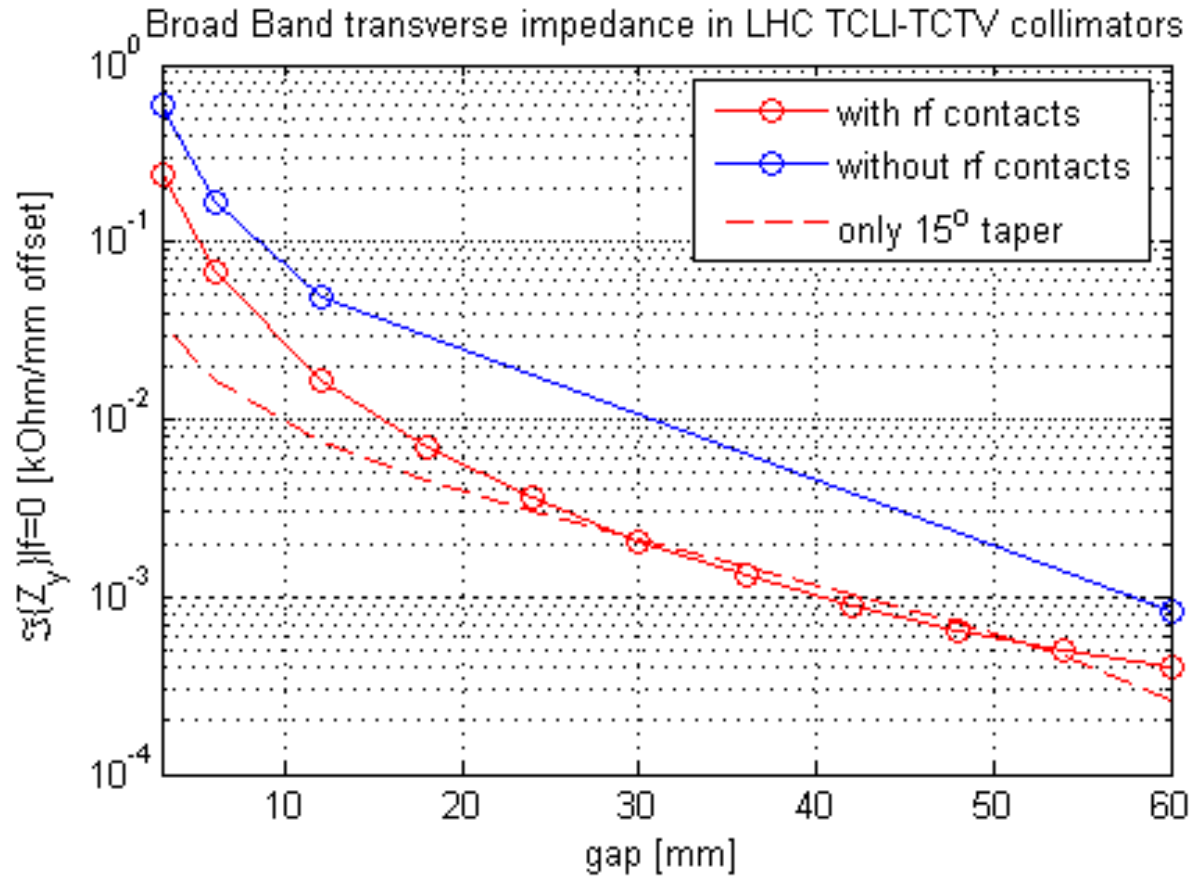
$$\theta = 15^\circ;$$

$$a = 3 \text{ mm};$$

$$b = 70 \text{ mm};$$

$$Z_T^{(1)} = 20 \text{ k}\Omega / \text{m}$$

For parallel plate geometry: $Z_y^{(1)} = Z_T^{(1)} \times 1.64 = 35 \text{ k}\Omega / \text{m}$



Conclusions

- TCTV/TCLI Collimator with rf contacts between the jaws and the beam screen provide about 2 times lower transverse Broad Band impedance than without rf contacts.
- On the other hand, transverse impedance of the collimators without the rf contacts is lower than with rf contacts at frequencies above 0.1 GHz
- In summary, the overall effect is that opening the slots between the jaws and the beam screen redistributes the imaginary part of the transverse impedance from being constant up to about 0.4 GHz (classical BB impedance) to the step-wise distribution: 2 times higher at frequencies below 0.1 GHz and lower for frequencies above.