

# Beam based measurements of cavities impedance (C80, C10)

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# Outline

- **Introduction**
- **Measurement principle**
- **C80**
- **C10**
- **Conclusions**

# Introduction

**C80**



Is the new PSpice model of the amplifier chain reproducing the beam cavity interaction throughout the complete power range?



Measure the system with the beam until it starts to compress

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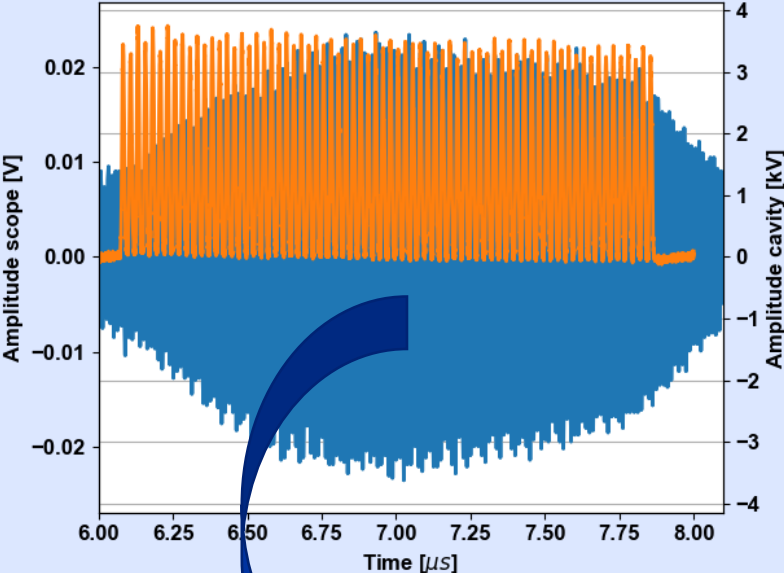
**C10**



What are the dynamics of the impedance when the gap relay is switched on ?

Is the shunt impedance with wideband feedback around  $500 \Omega$  ?

# Measurement principle (for C80-88)



While the 40 MHz cavities and C80-89 and C80-08 follow the bunch rotation program

Current calibration

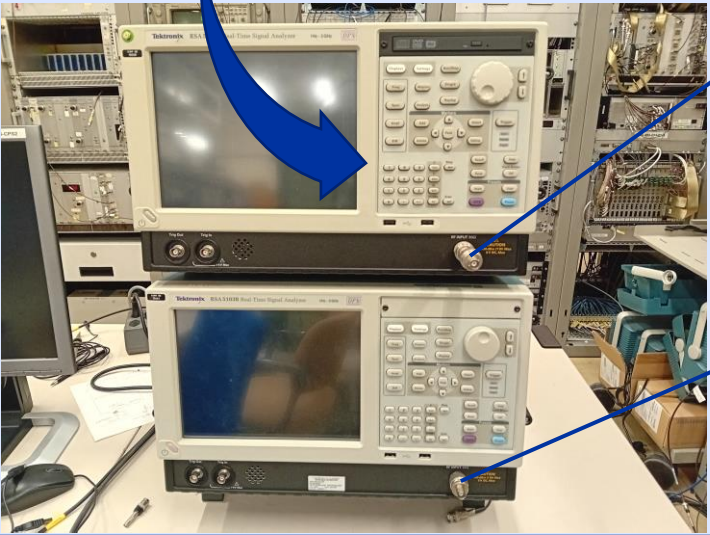
$$\propto I(80 \text{ MHz}) \longrightarrow I(80 \text{ MHz})$$

Voltage Calibration

$$\propto V(80 \text{ MHz}, I(80 \text{ MHz})) \longrightarrow V(80 \text{ MHz}, I(80 \text{ MHz}))$$

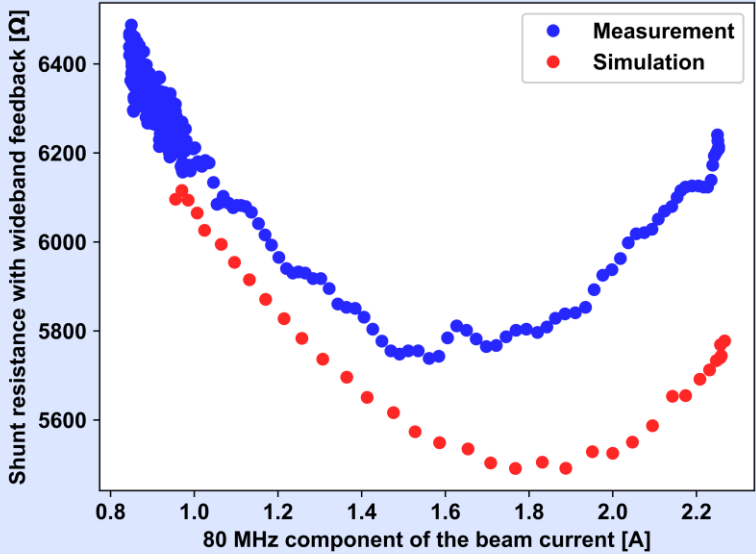


$$R_s(I(80 \text{ MHz})) = \frac{V(80 \text{ MHz}, I(80 \text{ MHz}))}{I(80 \text{ MHz})}$$

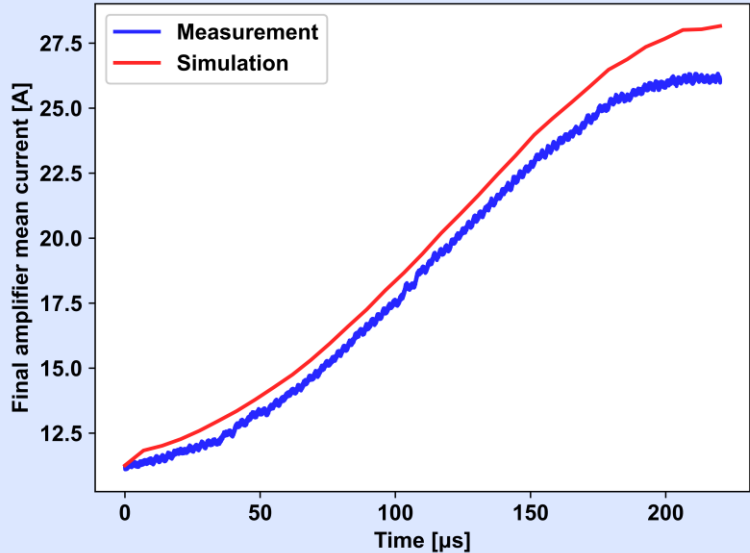


# Results (for C80-88)

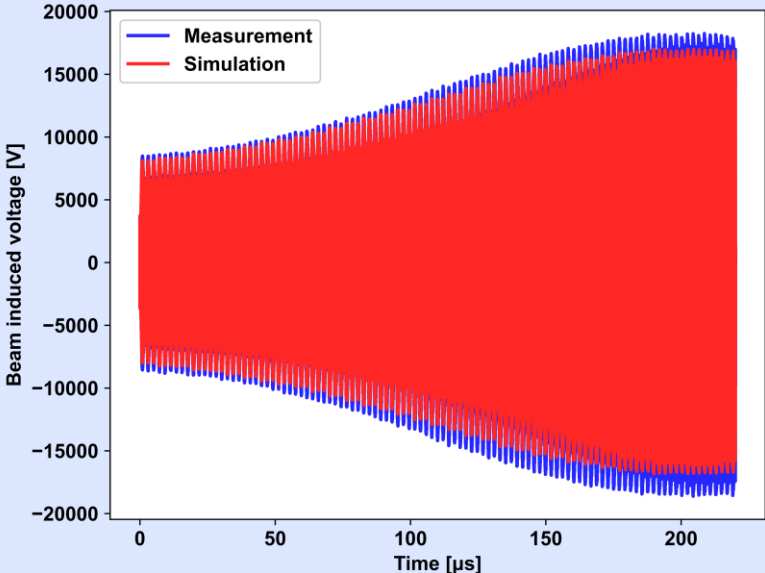
### Compression of the shunt resistance



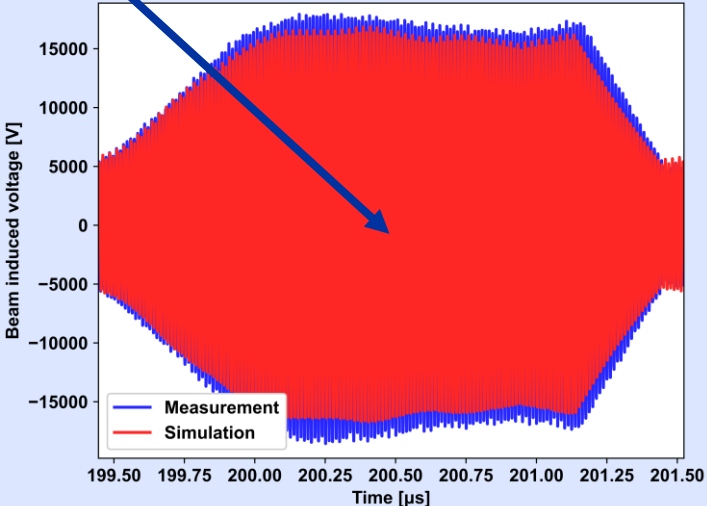
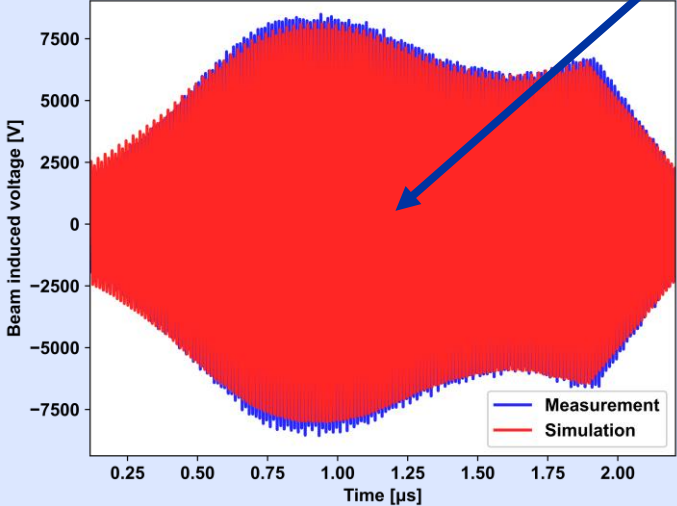
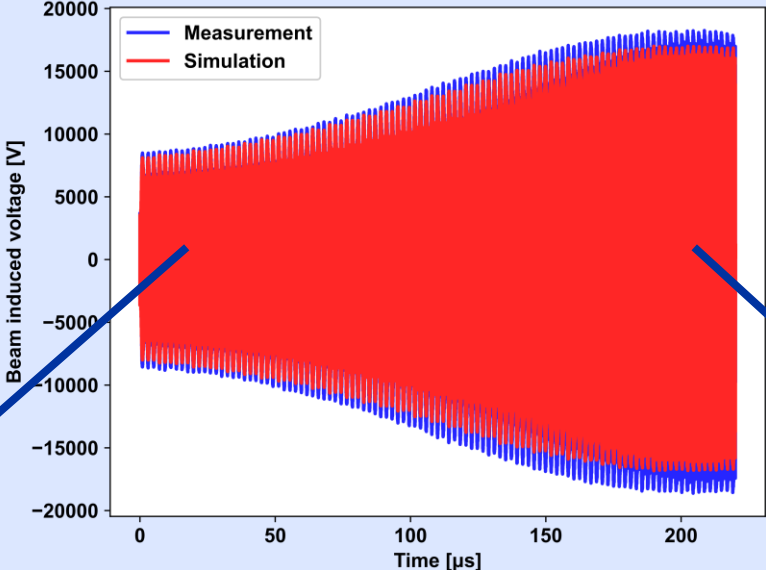
### Anodic current during BR



### Induced voltage in C80-88 during BR

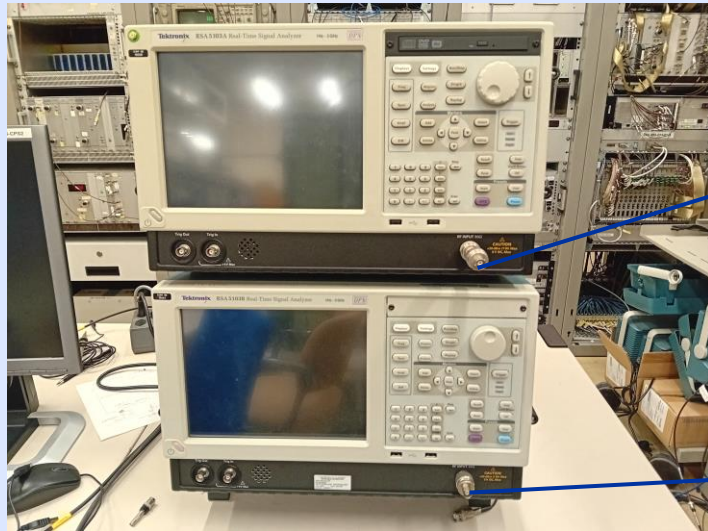


# Results (for C80-88)



All good !!

# Measurement principle (for C10)



While the gap relays are switched on

$$\propto I(\omega)$$

Current calibration

$$I(\omega)$$

Voltage Calibration

$$\propto V(\omega)$$

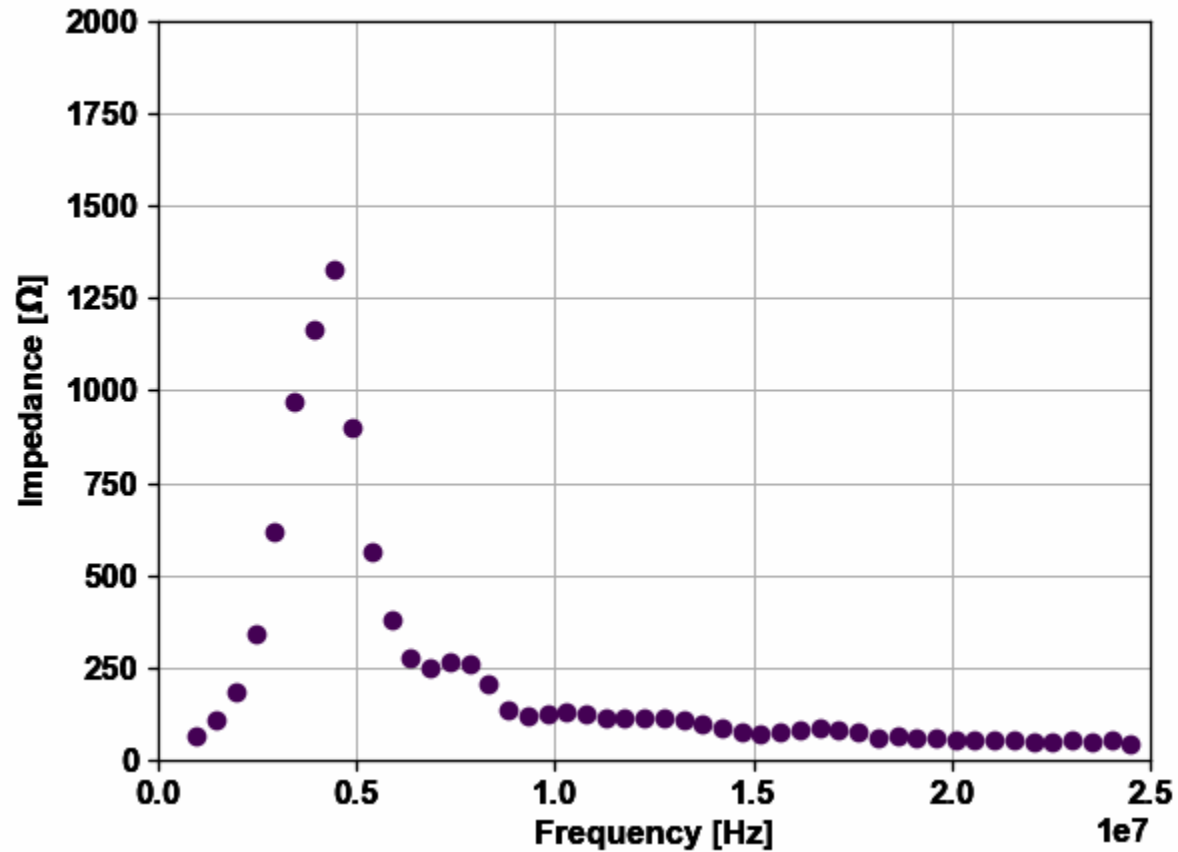
$$V(\omega)$$



$$Z(\omega) = \frac{V(\omega)}{I(\omega)}$$

# Results: Dynamic impedance behavior

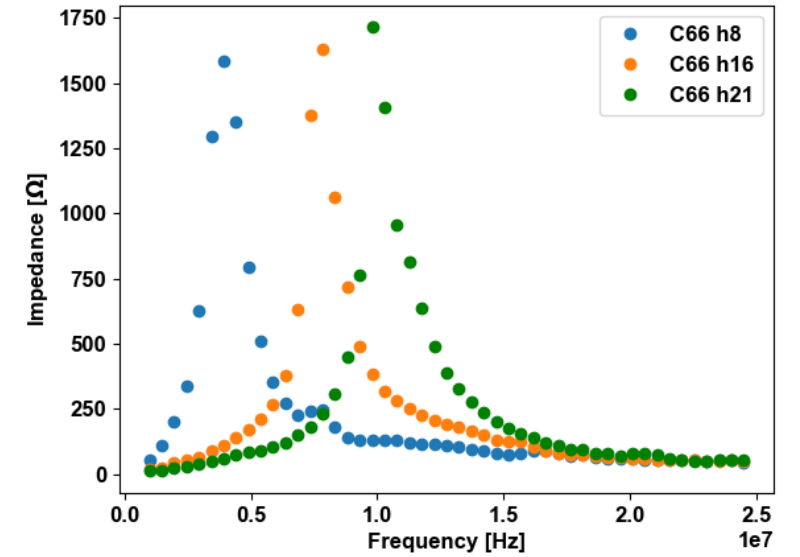
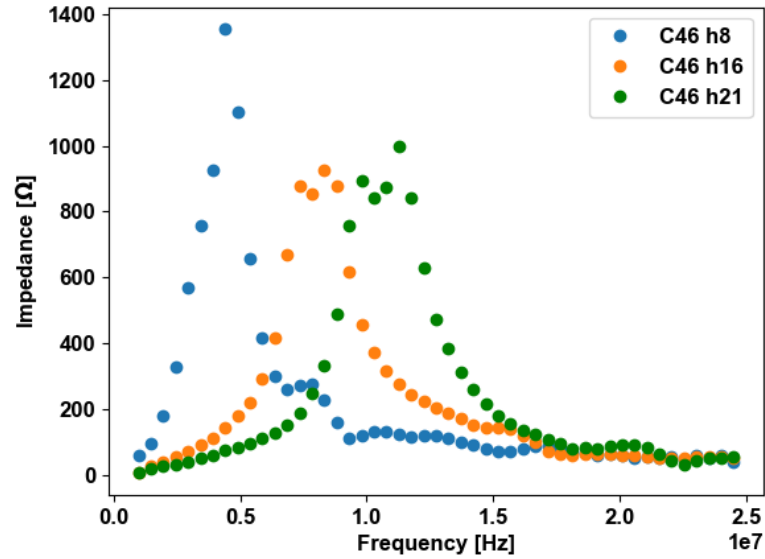
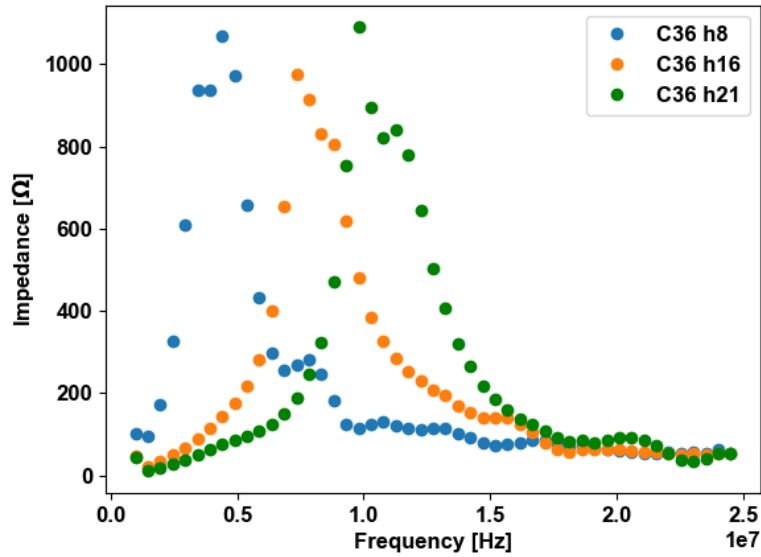
Example of cavity 56 – tuned on h8





# Results: wideband feedback only

A few cavities for illustration

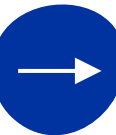


1

Impedance is too high!! Factor 2-3, depending on cavities

2

Issues with calibration of voltage due to cable compensator: measurements to be repeated but central frequency is reliable



Impedances of C10 have been measured, but some issues to be tackled/understood next year

# Conclusion

**C80**

The new PSpice model reproduces correctly the dynamic impedance behavior

→ No more measurement to be redone

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**C10**



Impedance is too high: work will be done on the RF side to better estimate the impedance and tune the loop

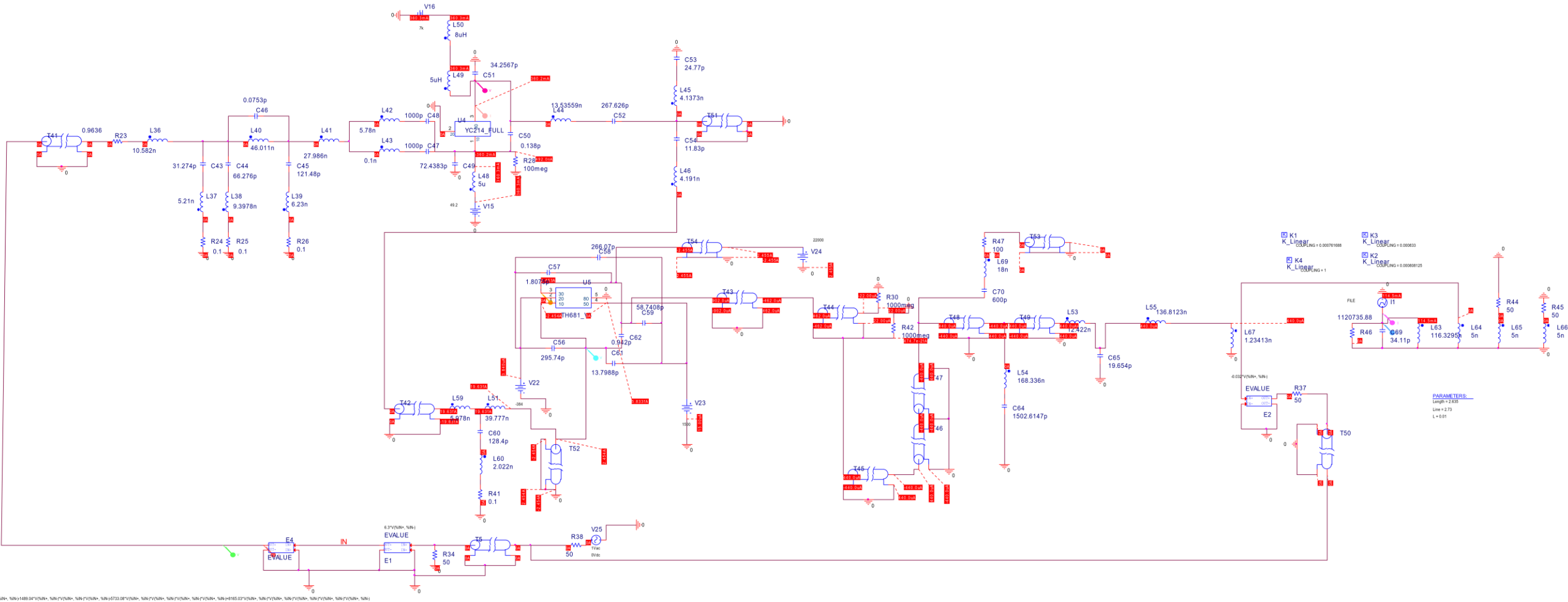
→ Need to remeasure the impedances

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**In general, we did not experience any relevant problem**

# Backup Slides

# Pspice model (for C80-88)



# Power limitations (for C80-88)

