Dummy septum impedance measurements

S. Persichelli, J. Kuczerowski, O. Berrig

Dummy septum meeting

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Acknowledgements

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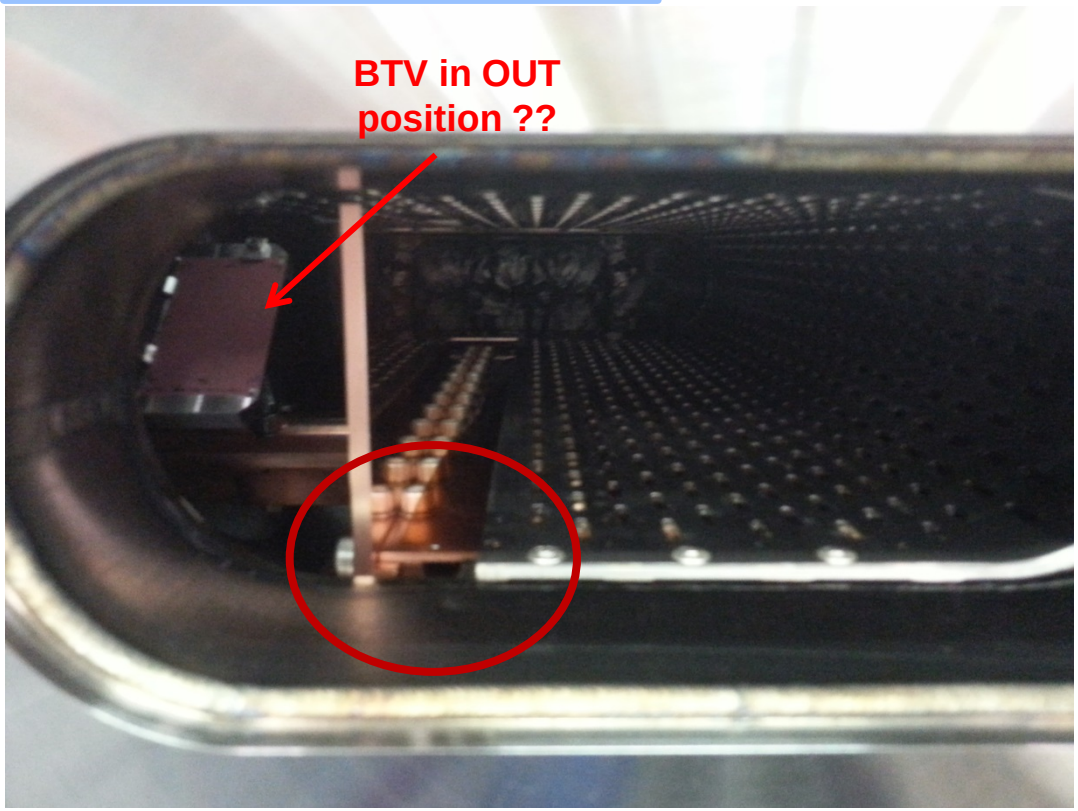
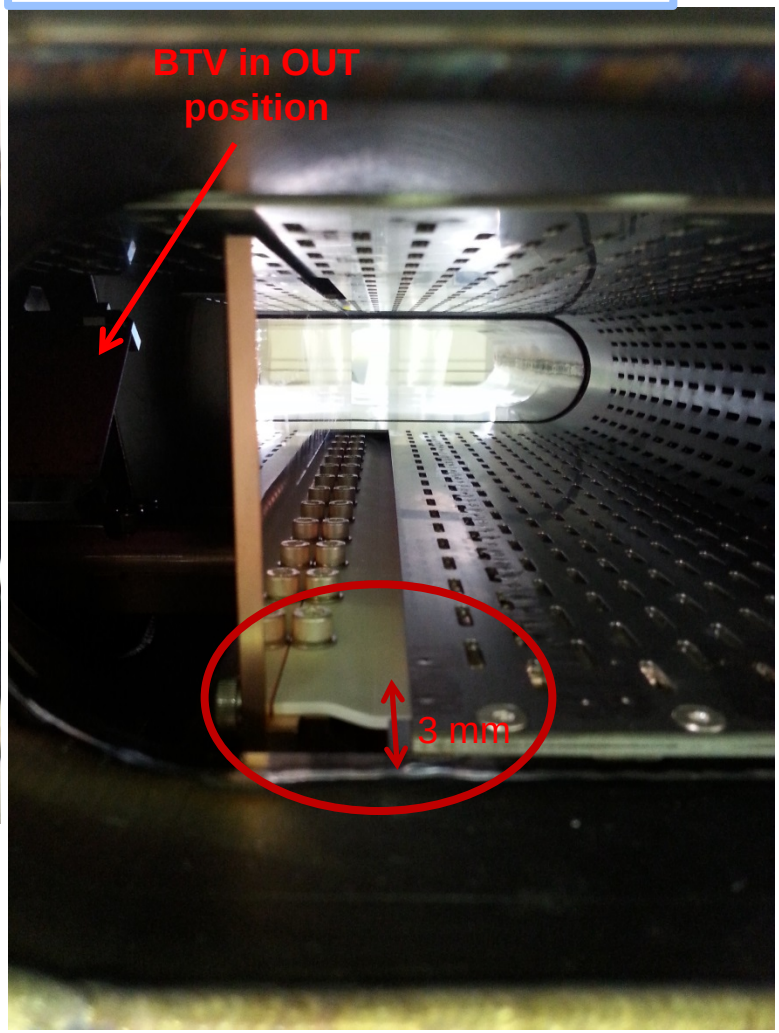
Dummy Septum: impedance measurement

Design differences

First measurement 7/11/2013



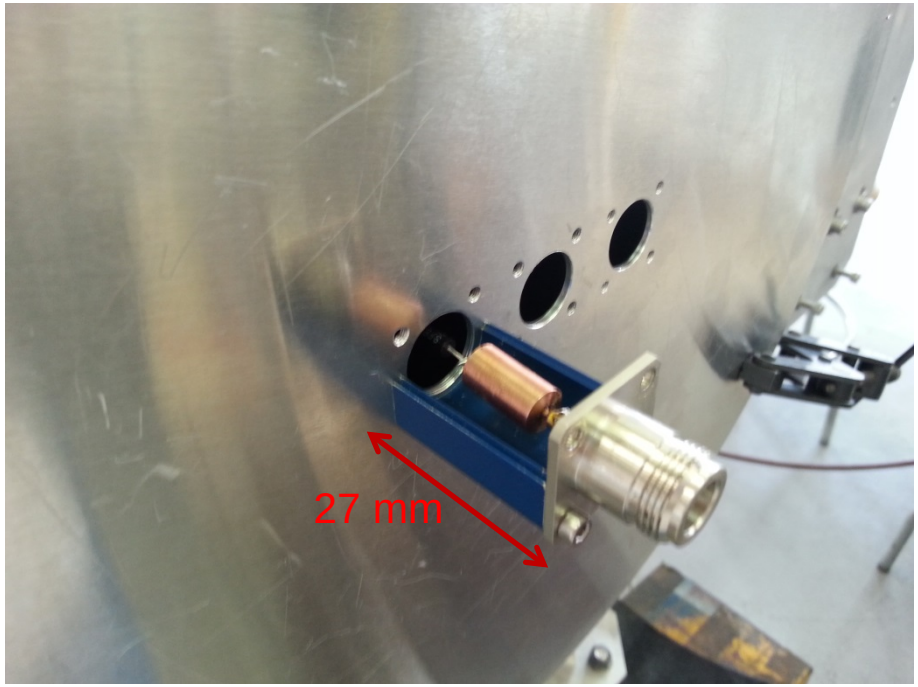
Second measurement 8/1/2014



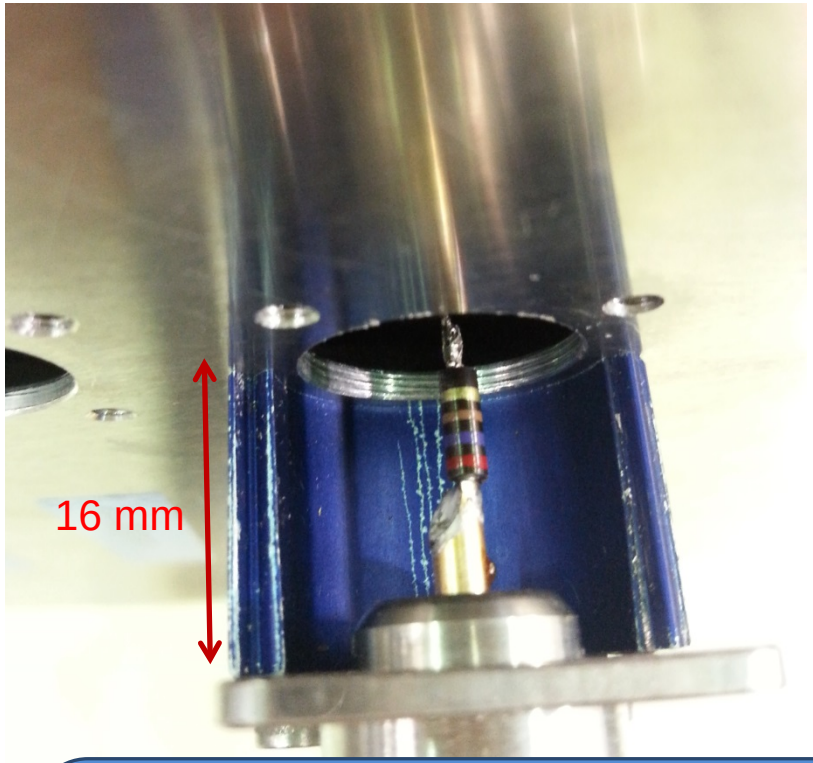
Dummy Septum: impedance measurement

Measurement setup differences

First measurement 7/11/2013



Second measurement 8/1/2014



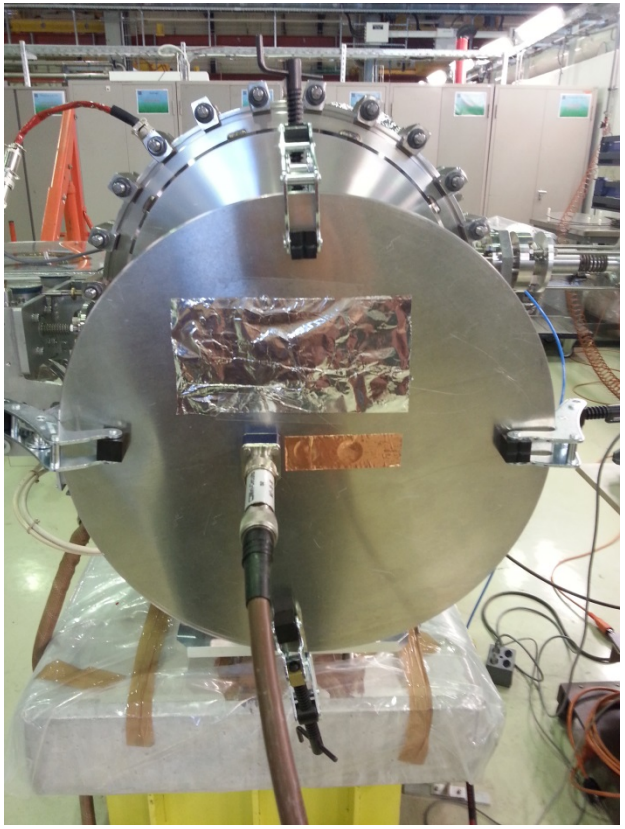
Sucobox length = 27mm
Sucobox <u>with</u> cylinder inside
Metal film resistance
R_s= 261 Ω ± 1%

Sucobox length = 16mm
Sucobox <u>without</u> cylinder inside
Carbon resistances
R_{s1}= 276 Ω R_{s2}= 281 Ω

Dummy Septum: impedance measurement

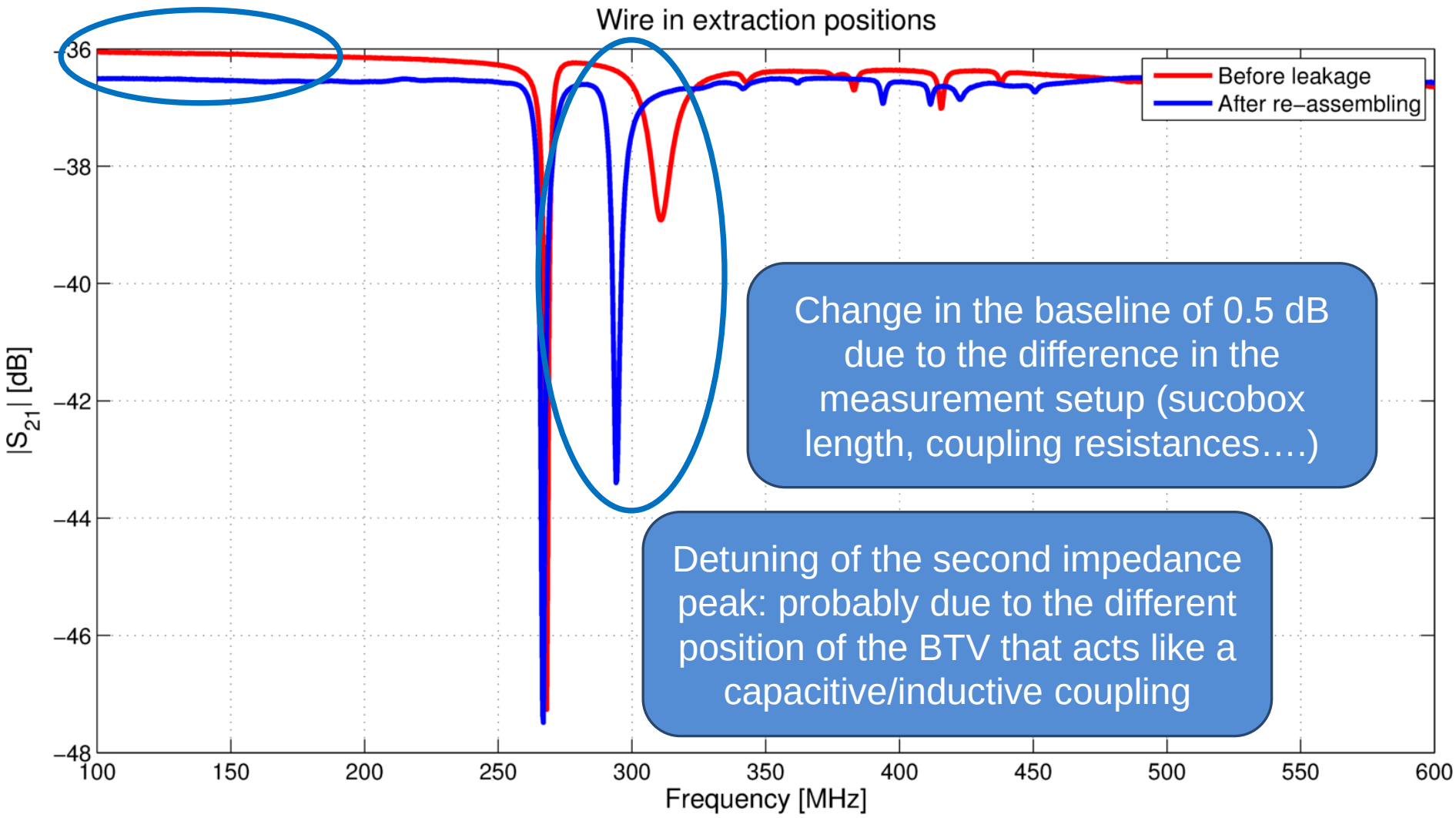
Differences between the two measurement setup

x2 10 dB attenuators have been used for both measurements



Dummy Septum: impedance measurement

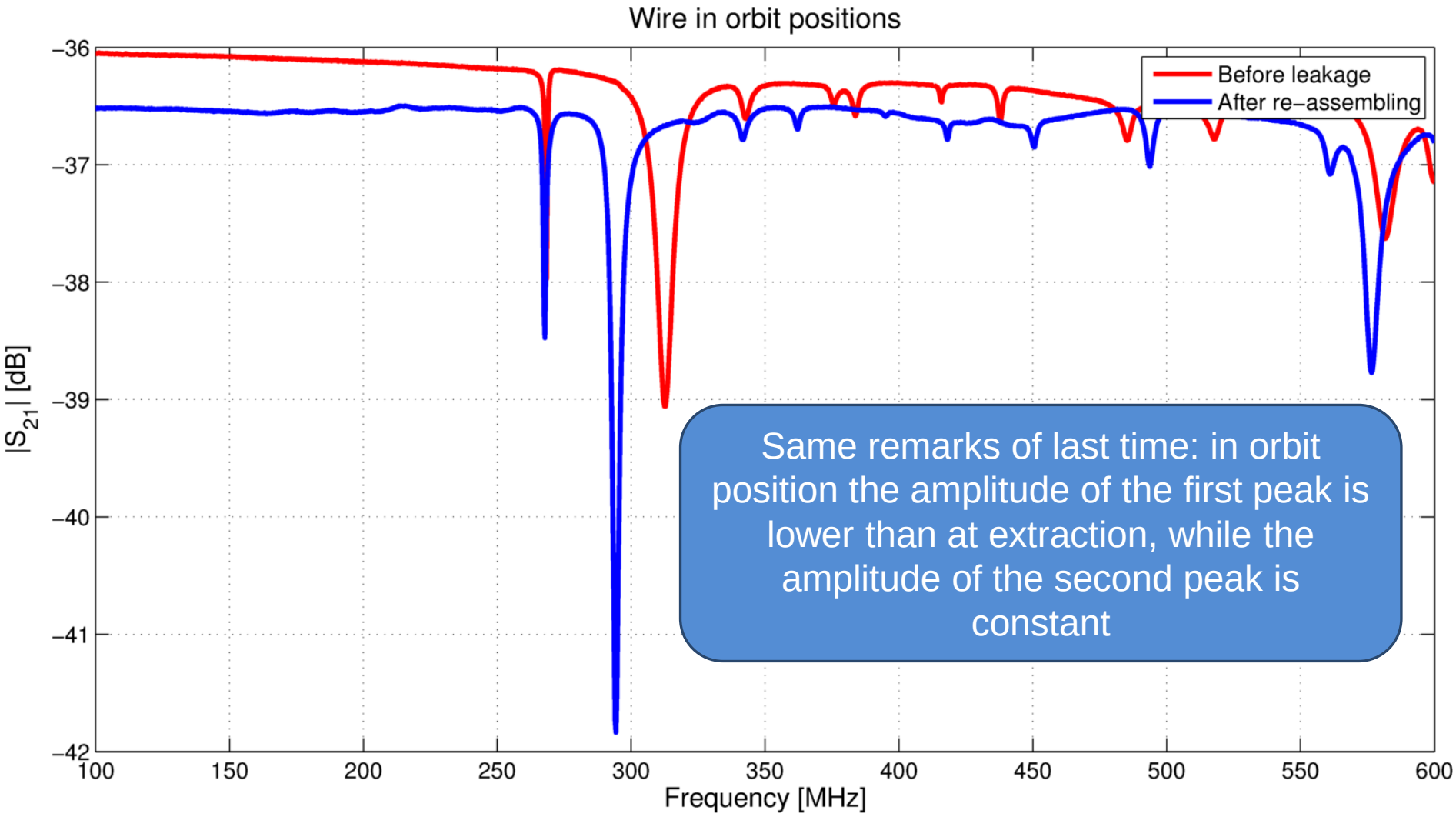
Extraction



Change in the baseline of 0.5 dB due to the difference in the measurement setup (sucobox length, coupling resistances….)

Detuning of the second impedance peak: probably due to the different position of the BTV that acts like a capacitive/inductive coupling

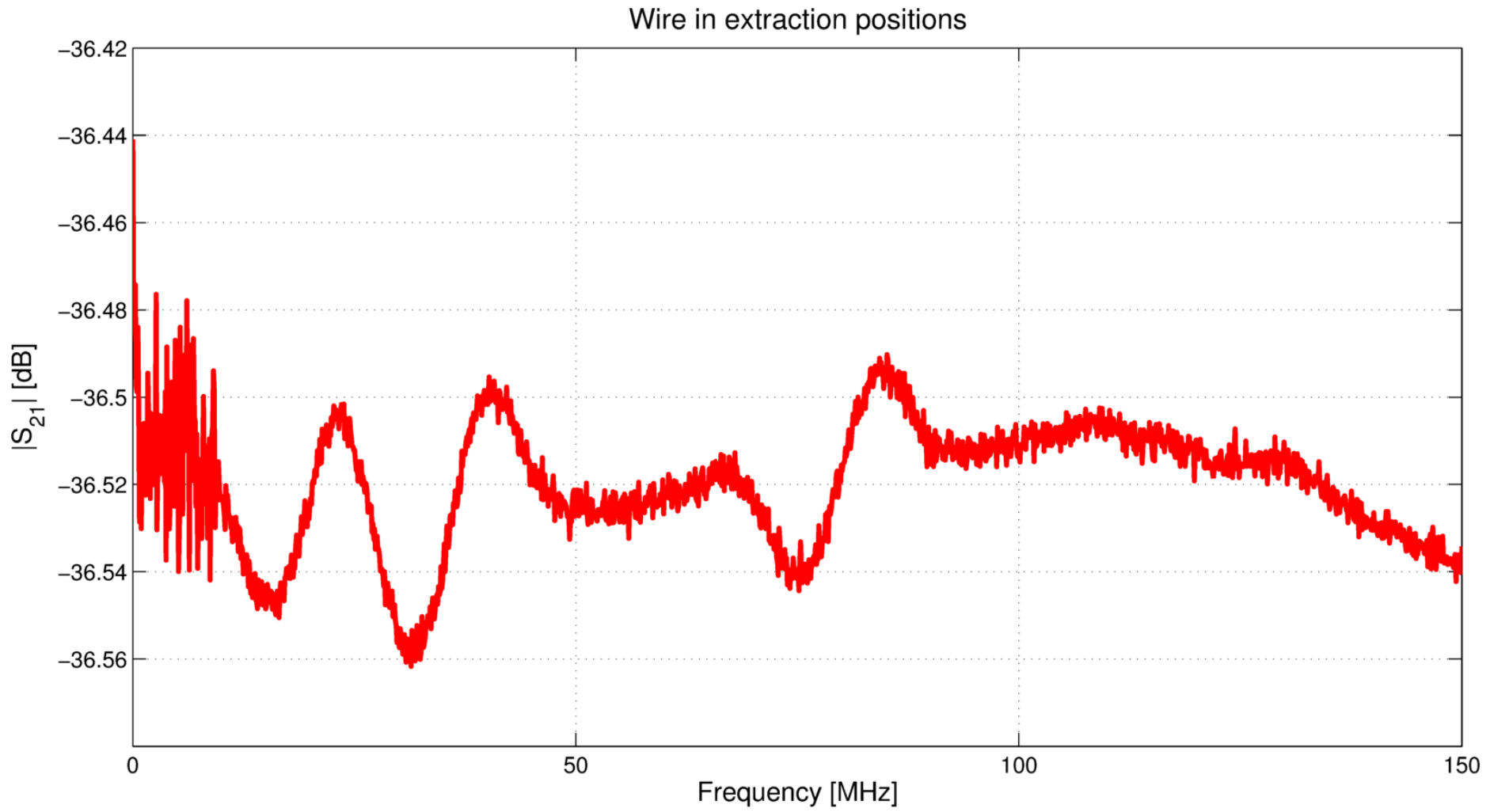
Dummy Septum: impedance measurement



Same remarks of last time: in orbit position the amplitude of the first peak is lower than at extraction, while the amplitude of the second peak is constant

Dummy Septum: impedance measurement

Low frequency S_{21}



This time also, it seems that the wire cannot excite trapped modes below 100 MHz!

Conclusions

Conclusions of the last meeting are still valid!

- Thanks to the sliding contact low frequency modes that are potential source of coupled bunch instability do not appear to be excited.

- Both longitudinal and transverse measurements show that the first trapped mode in the dummy septum has a frequency of 270 MHz, too high to be a source of coupled bunch instability in the PS.

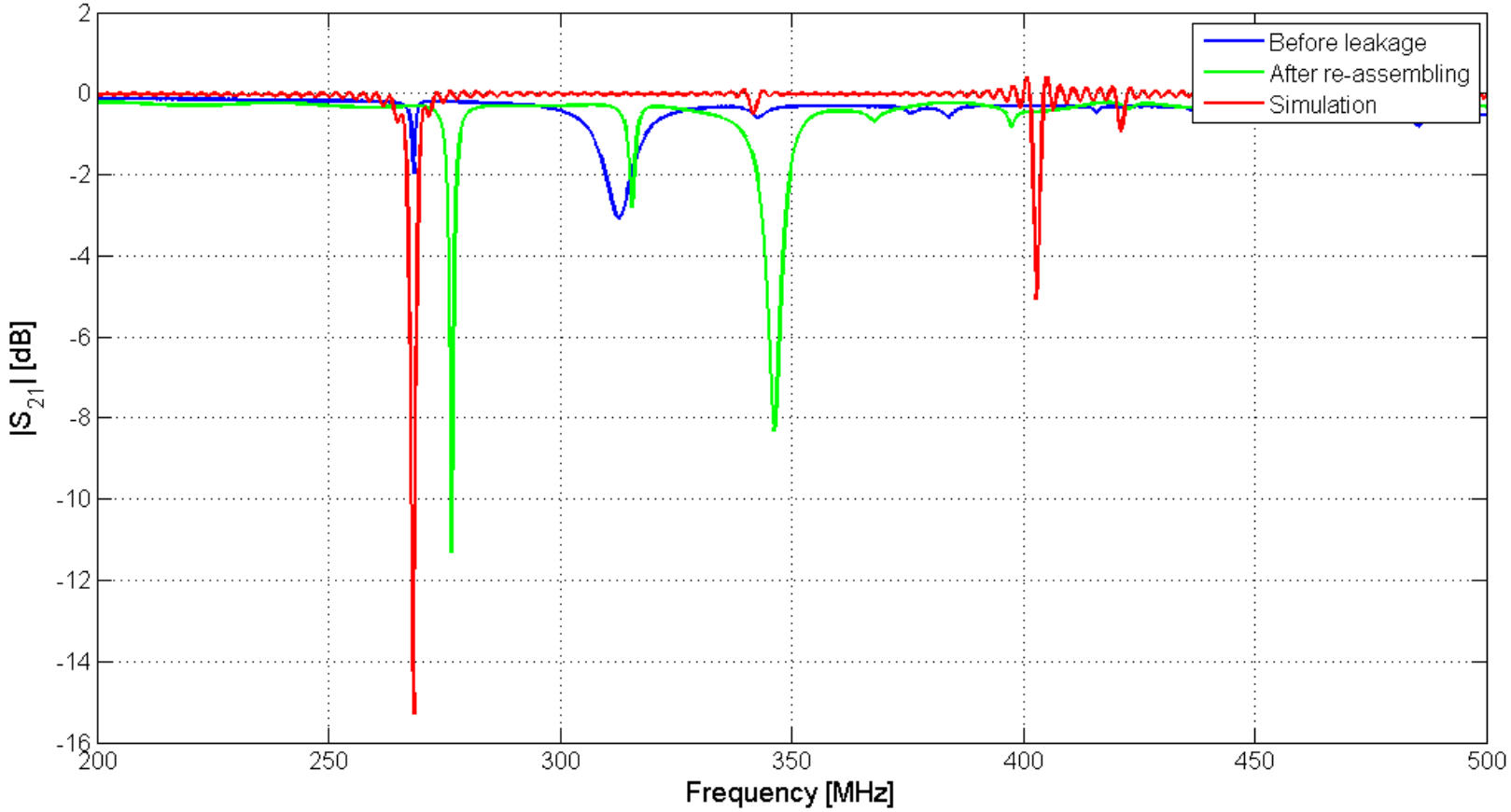
- Longitudinal and transverse measurements are in agreement with simulation performed with CST both in time and in frequency domain.

- For the broadband impedance, the effective longitudinal impedance was already predicted to be negligible compared to the imaginary part of the total impedance (longitudinal and transverse) measured for the PS .

- For the trapped modes, the resonance around 270 MHz is not believed to be source of operational issues:

    - *Heating* : the first mode is inside the beam spectrum and the power at 270 MHz is -40 dB at extraction. Thanks to the cooling system this is not predicted to be an issue.

    - *Longitudinal instabilities*: when the beam is in the orbiting position, the shunt impedance of the first mode is 66 Ω, and the impact is expected to be limited. When the beam is few mm far from the blade the shunt impedance is 21 kΩ, but anyway the beam is going to approach the blade only for a limited time.
      The growth rates of the instability, for mode 0, are negligible for this mode, in particular when we compared them to the extraction time of 6 ms (3 synchrotron periods).


Before leakage
After re-assembling
Simulation
|S21| [dB]
Frequency [MHz]
2
0
-2
-4
-6
-8
-10
-12
-14
-16
200
250
300
350
400
450
500