Simulations of the gun frequency shift for different cathode spring parameters.

Cathode spring conductivity investigation

Gun frequency shift vs. number of spring leafs

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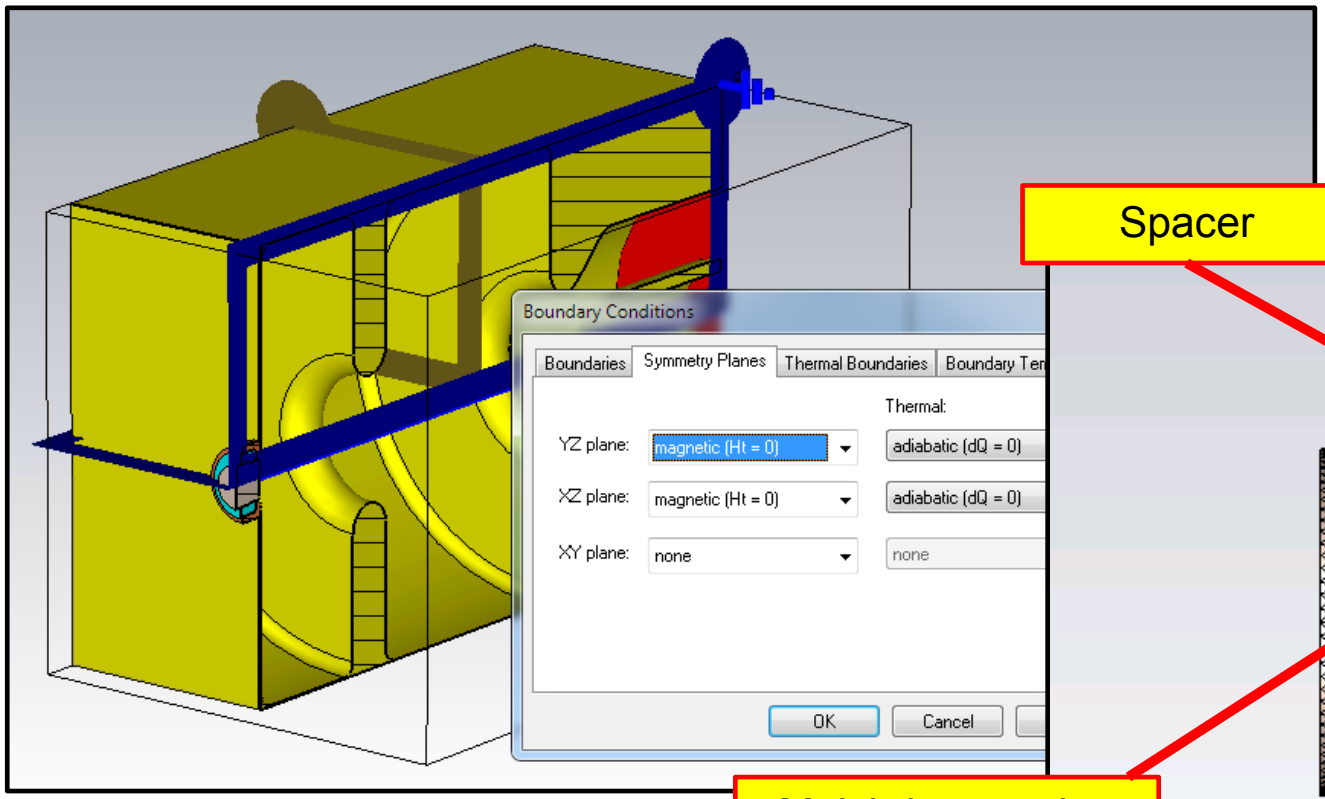
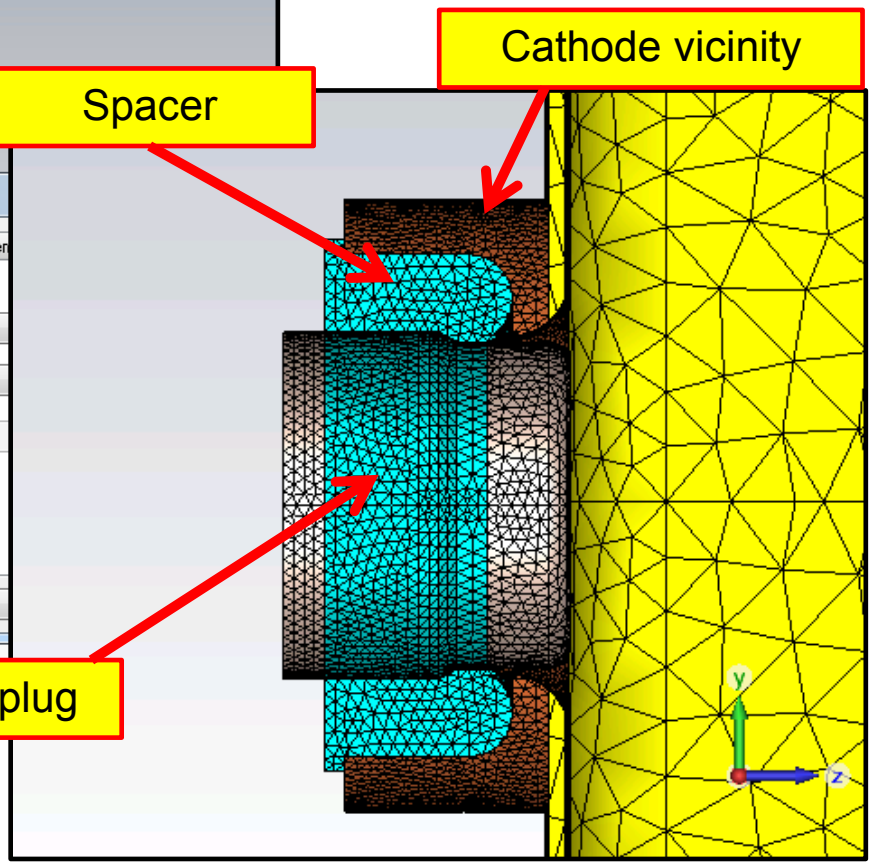
DESY

Model for simulations

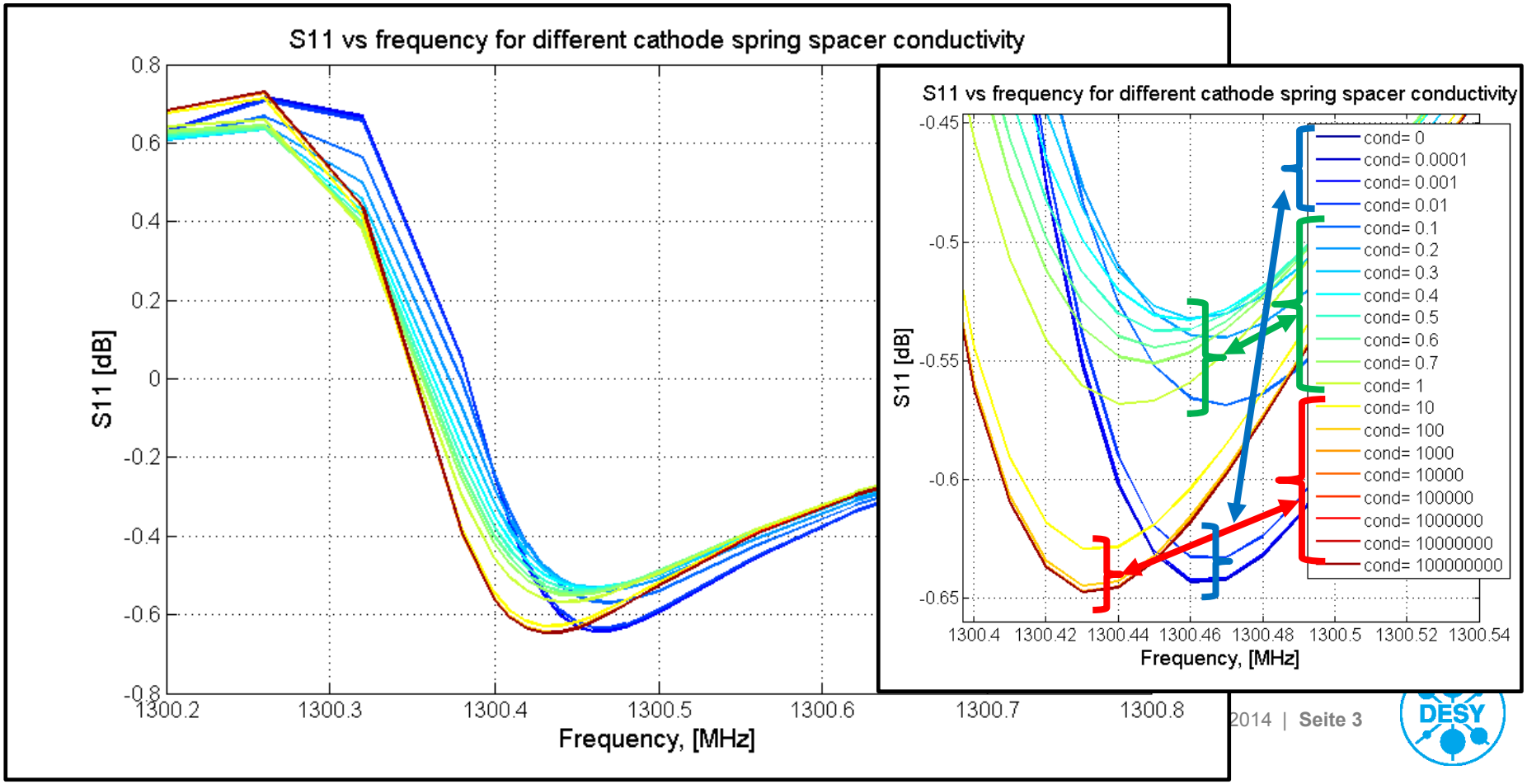
- 1.6 cell gun cavity with port at the coaxial part of coupler
- YZ and XZ plane symmetry
- Old cathode vicinity design, material: copper
- Molybdenum plug
- Spacer between cathode vicinity and cathode plug with adjustable conductivity



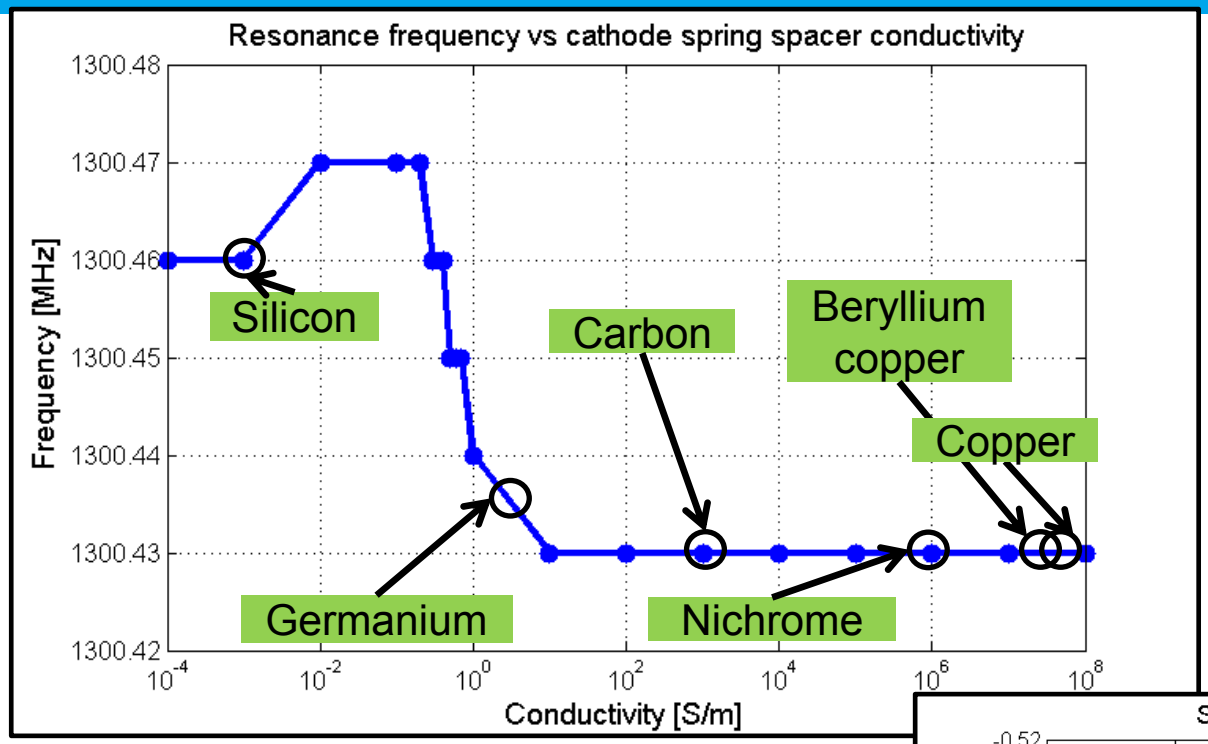


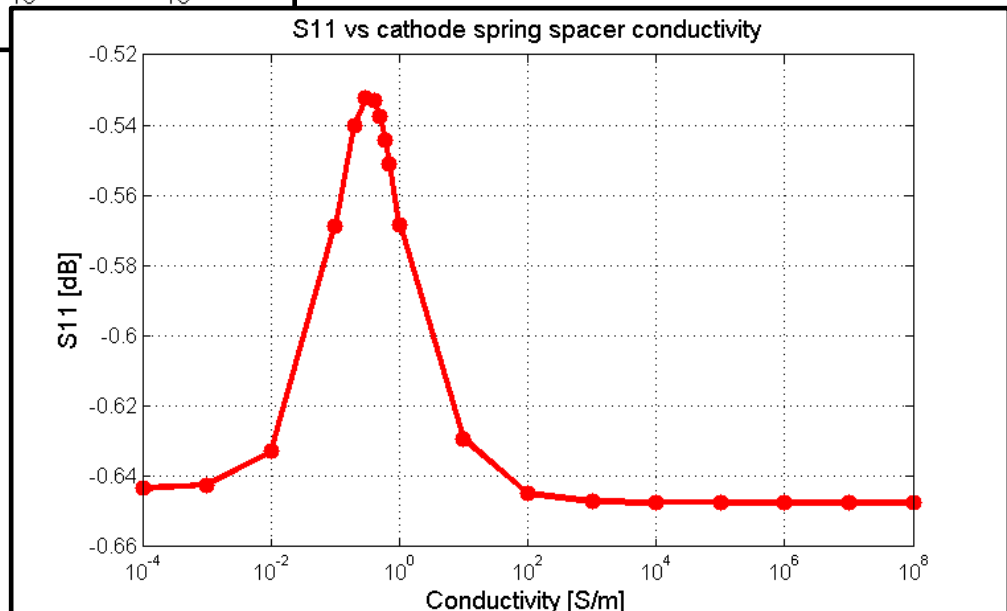
Results of simulations

- RF field simulations where done for different ‘Cathode spring spacer’ conductivity (from 0 to 10^8 S/m, for Cu is $5.8*10^7$ S/m, for **BeCu** is **$1.218*10^7$** S/m)
- Solver for simulations: F-solver (frequency domain)
- Measurement output S_{11} parameter vs frequency.
- Processing of the results:
  Minimal values of curves taken to make dependences of Frequency and S_{11} vs conductivity



Results of simulations



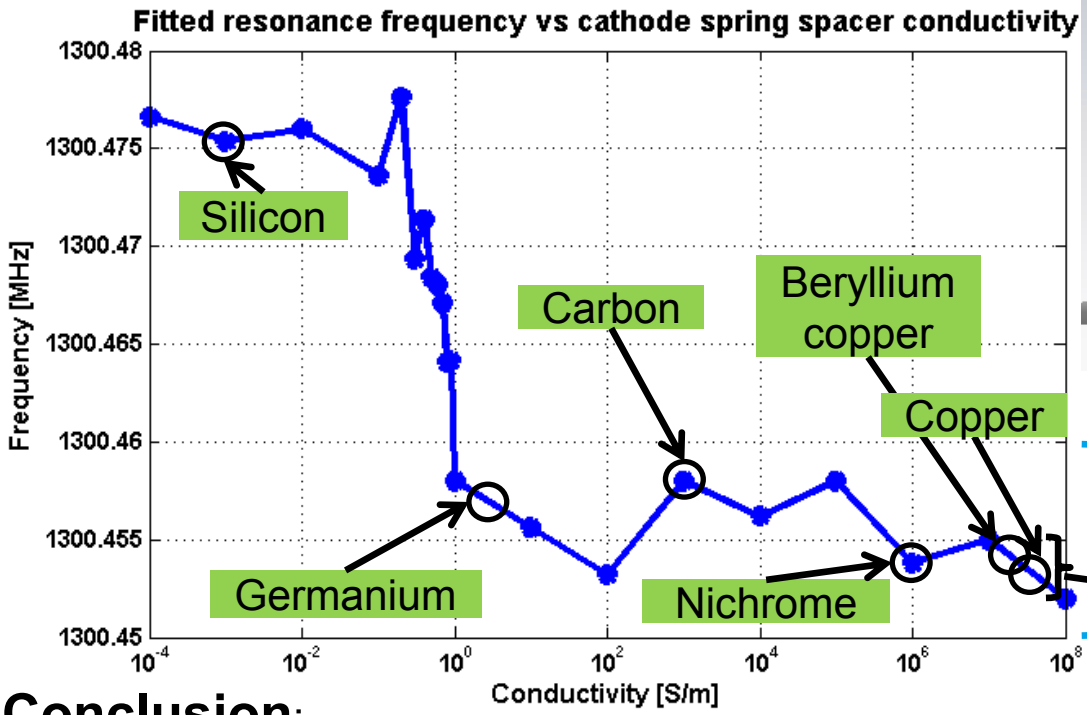


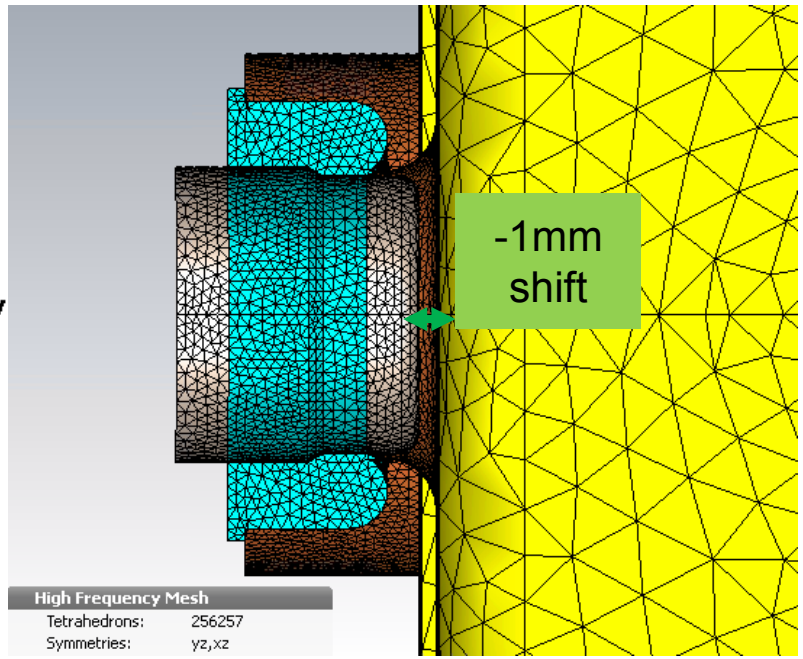
Conclusion:

According to simulations if BeCu spring would change conductivity from $1.2*10^7$ S/m to $5.8*10^7$ S/m (Cu conductivity) it will make not difference in the wall resonance temperature.

Results of simulations with shifted cathode to -1mm

Shift of the cathode to -1mm gives frequency shift and higher fields in the cathode spring spacer area -> higher dependency of the frequency shift on conductivity.





22kHz/deg-> ~0.5 deg

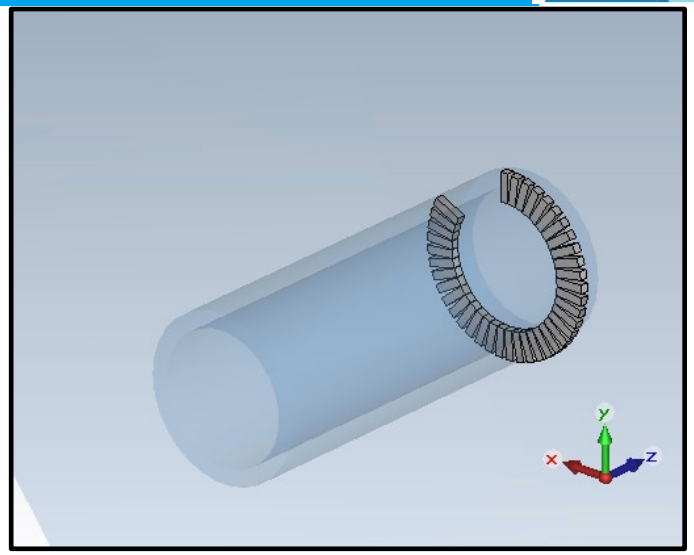
22kHz/deg-> **~0.07 deg** – difference between Cu and BeCu

Conclusion:

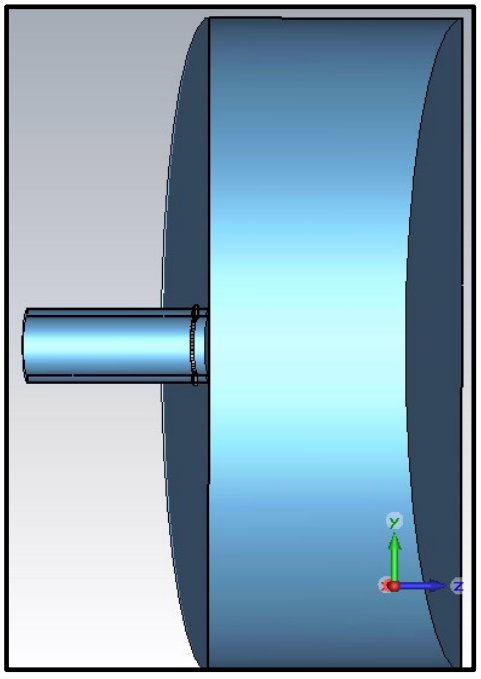
According to simulations if BeCu spring would change conductivity from $1.2*10^7$ S/m to $5.8*10^7$ S/m (Cu conductivity) it will make **0.07** deg difference in the wall resonance temperature.

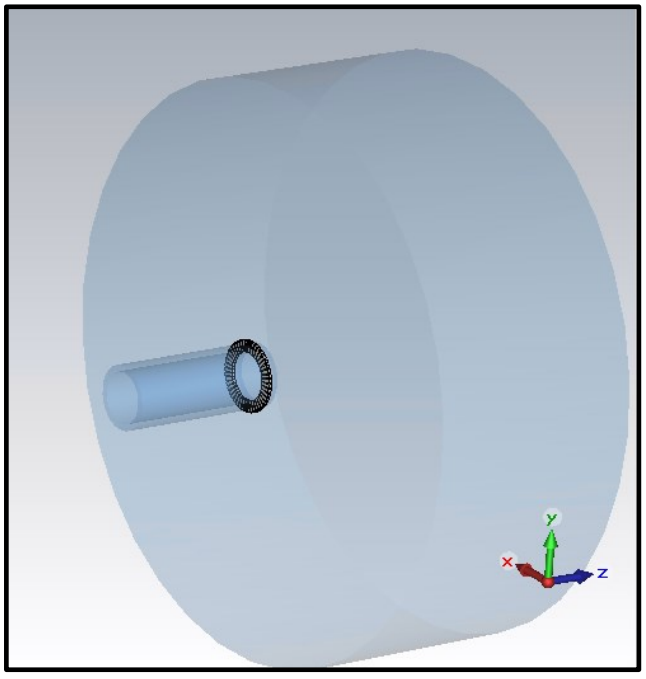
Model for different number of spring leafs simulations

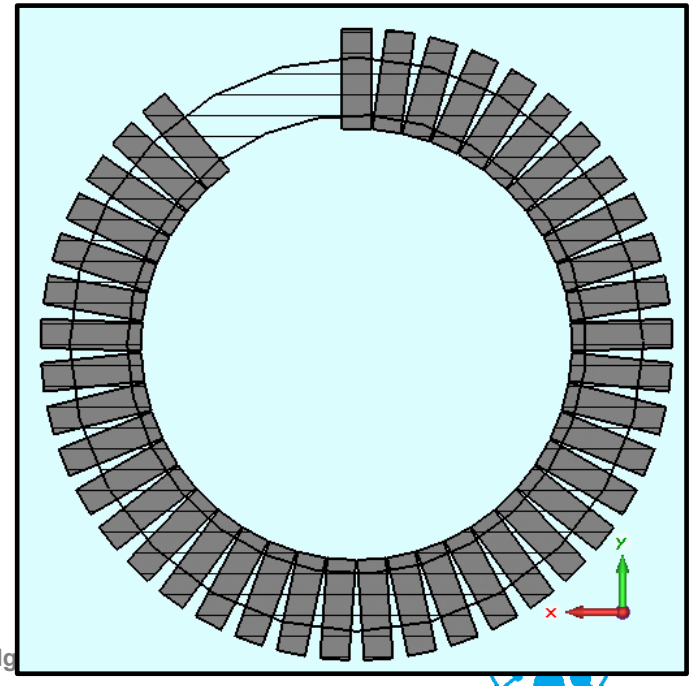
Geometry parameter	Value, mm
Cavity radius	90
Cavity length	70
Cathode vicinity radius	10
Cathode radius	8
Coaxial tube length (Cathode part)	50



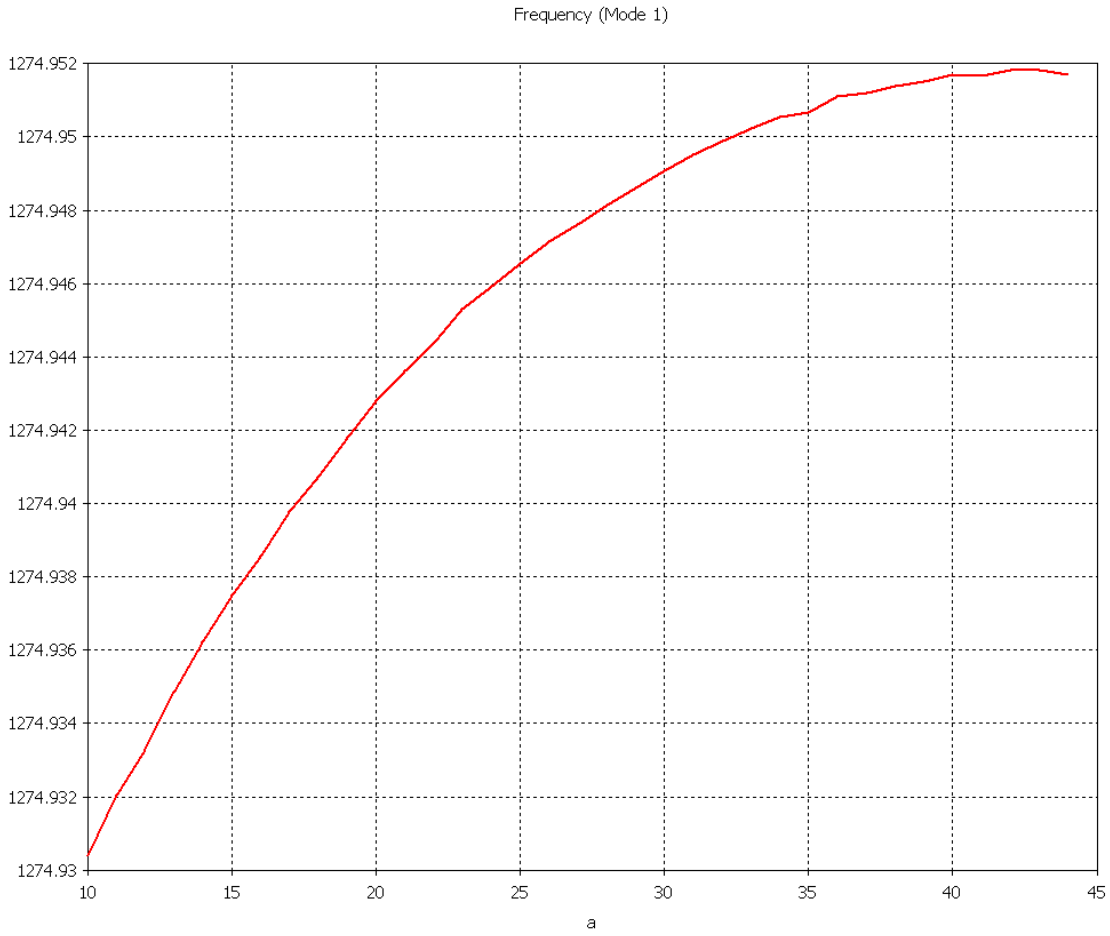
Frequency of initial model: 1274.95 MHz







Results of different number of spring leafs simulations



Conclusion:

Frequency of the main mode (TM_{010}) drops down within decreasing number of cathode spring leafs.