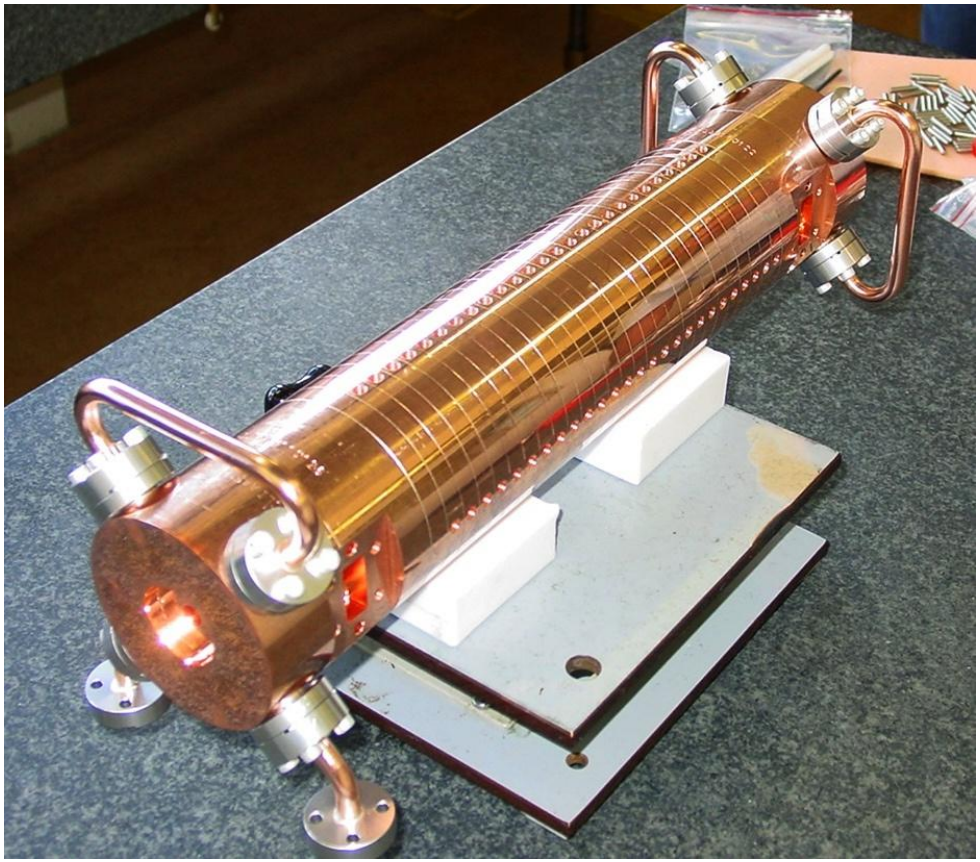
A (shortened) history of the RF measurements performed on the T24_vg18_disk structure



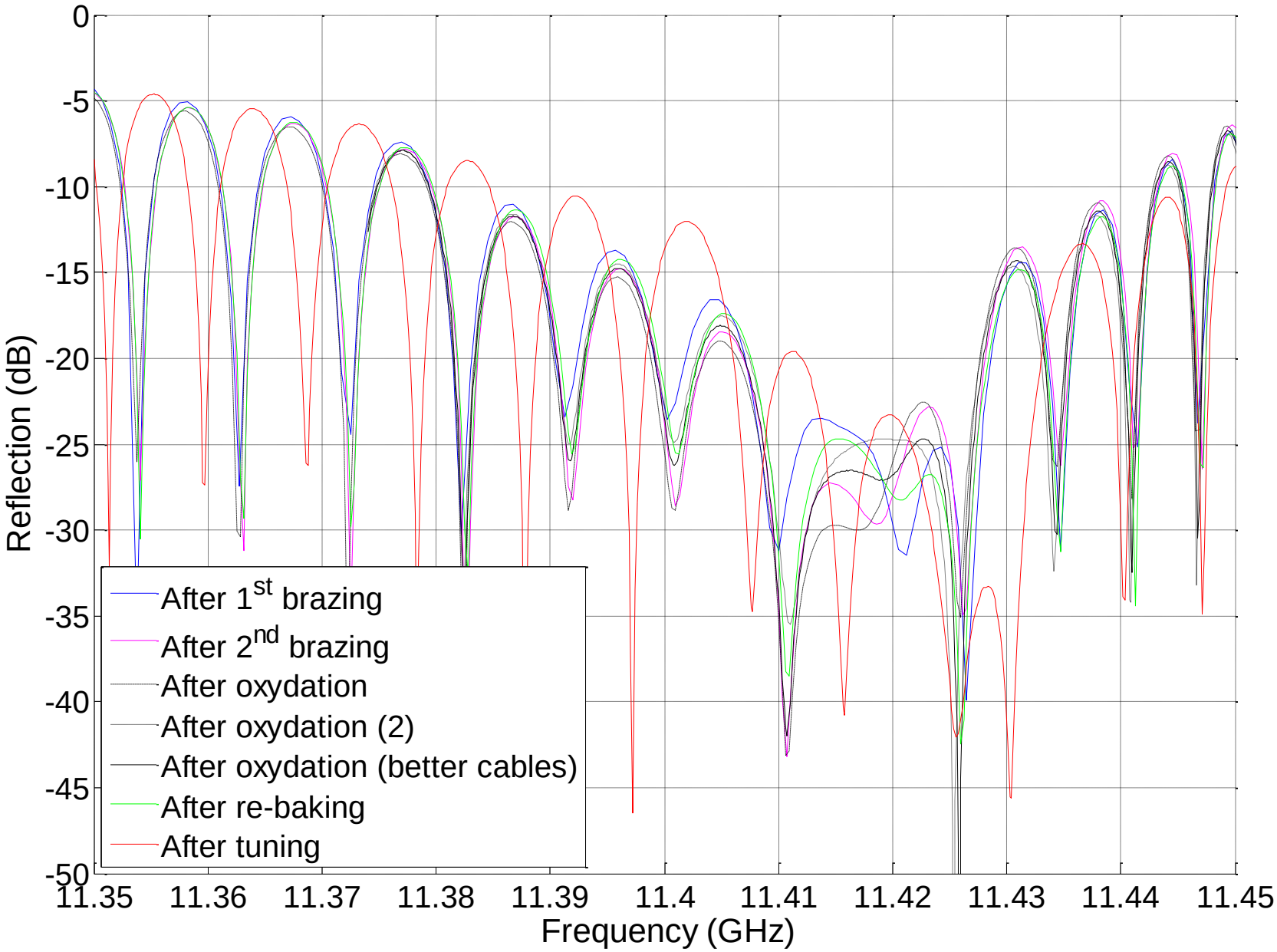
Mathias Gerbaux, Riccardo Zennaro, Andrey Olyunin

Key events

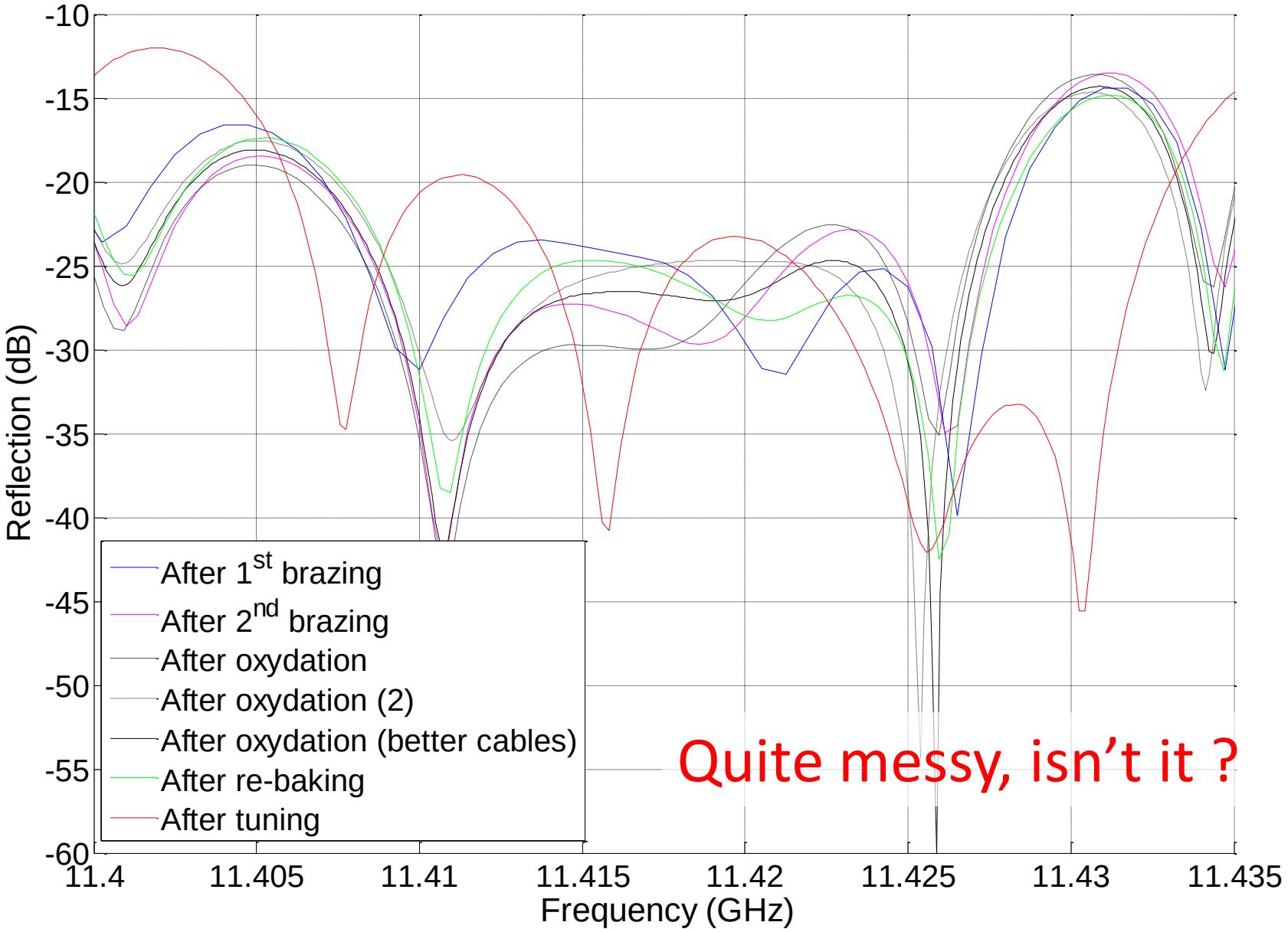
- Mid April : 1st brazing (regular cells)
- Around 20/04 : 2nd brazing (cooling water system)
- 16 and 17/05 : Oxidation in the « clean » room
- 19/05 : Problem with the network analyzer cables
- 27/05 : Baking at 650°
- 04/06 : Tuning
- 15/06 : Ready for shipping

S-parameters

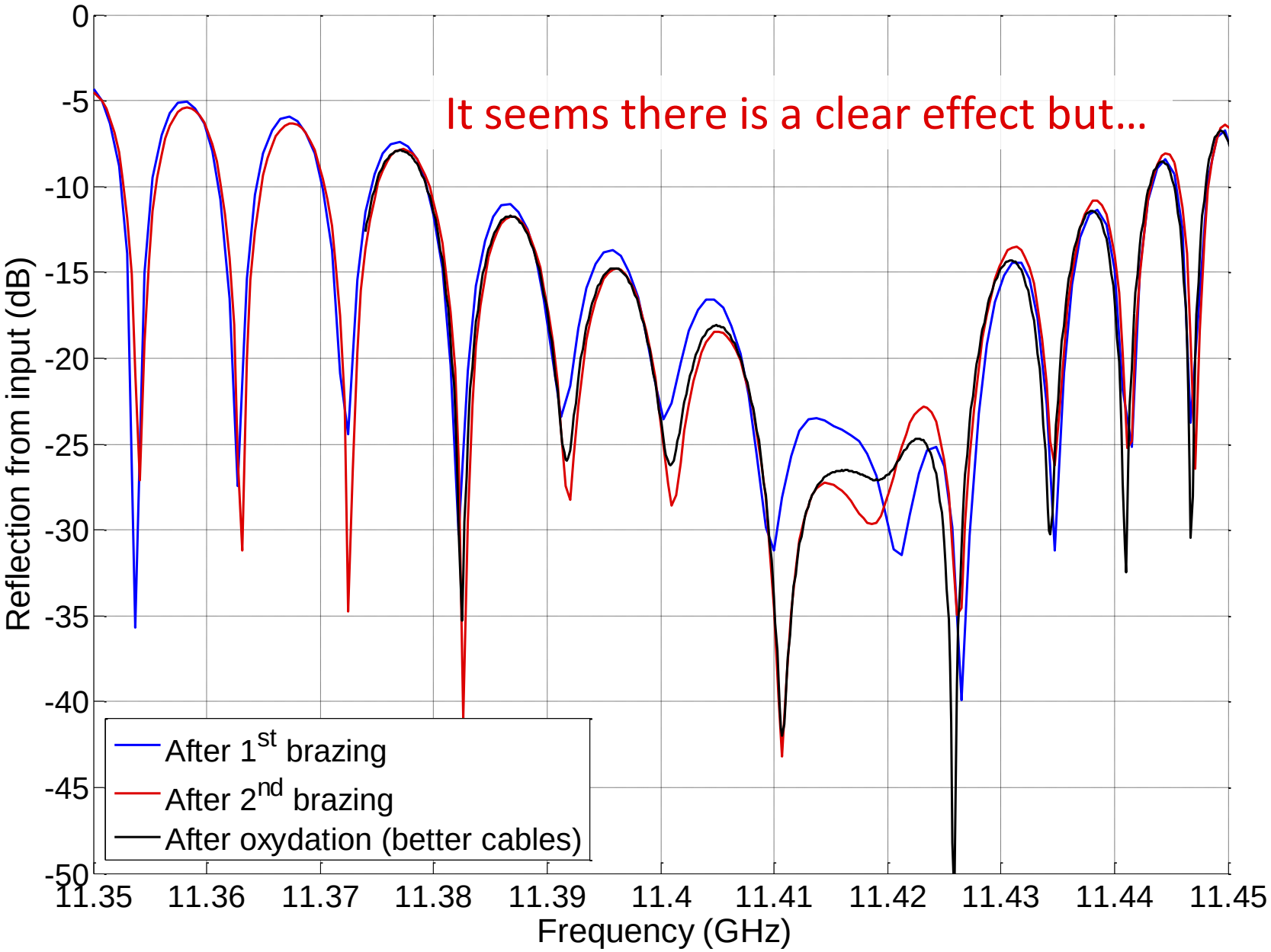
Some of the reflection measurements…



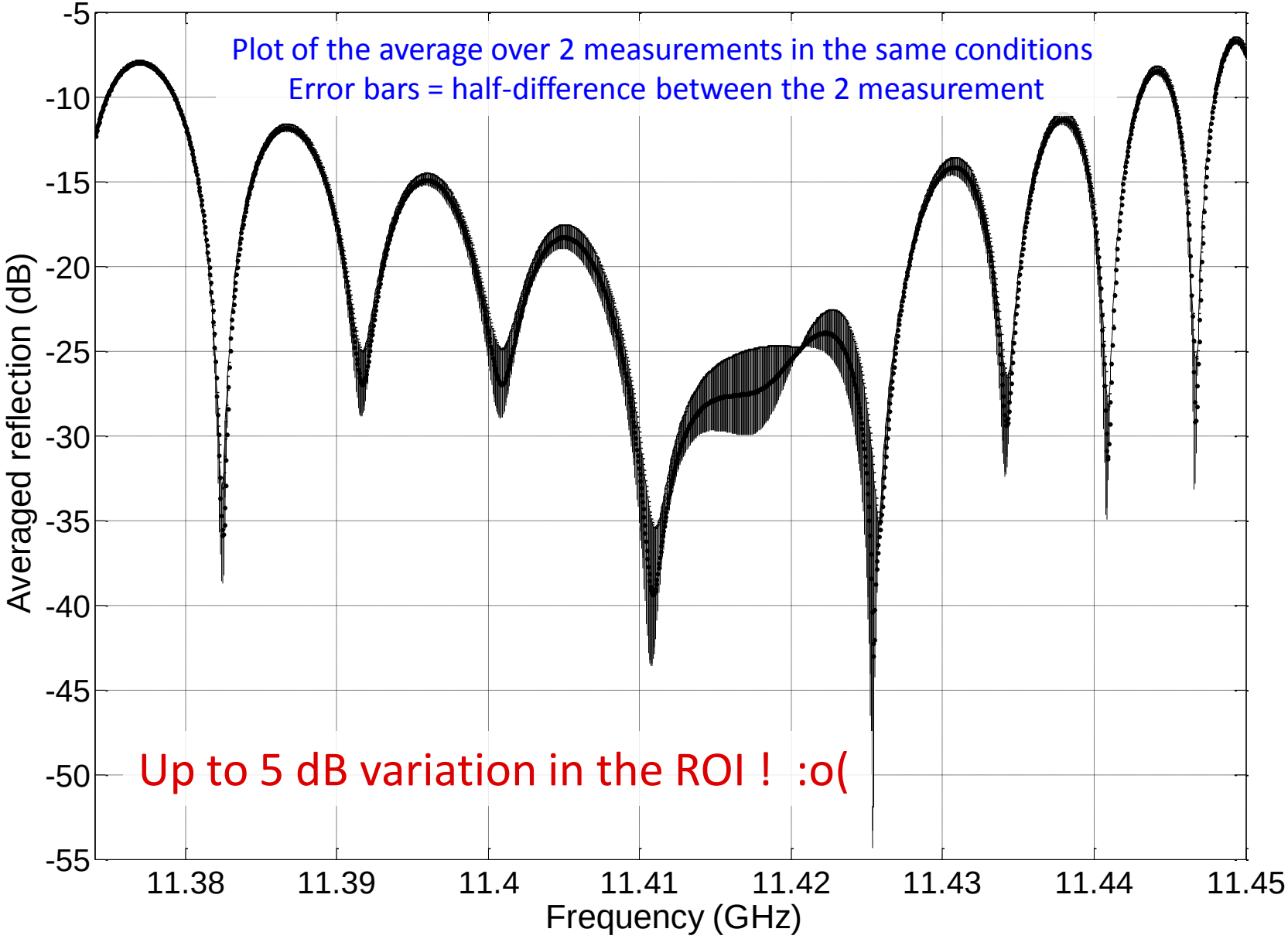
The same measurements (but closer)



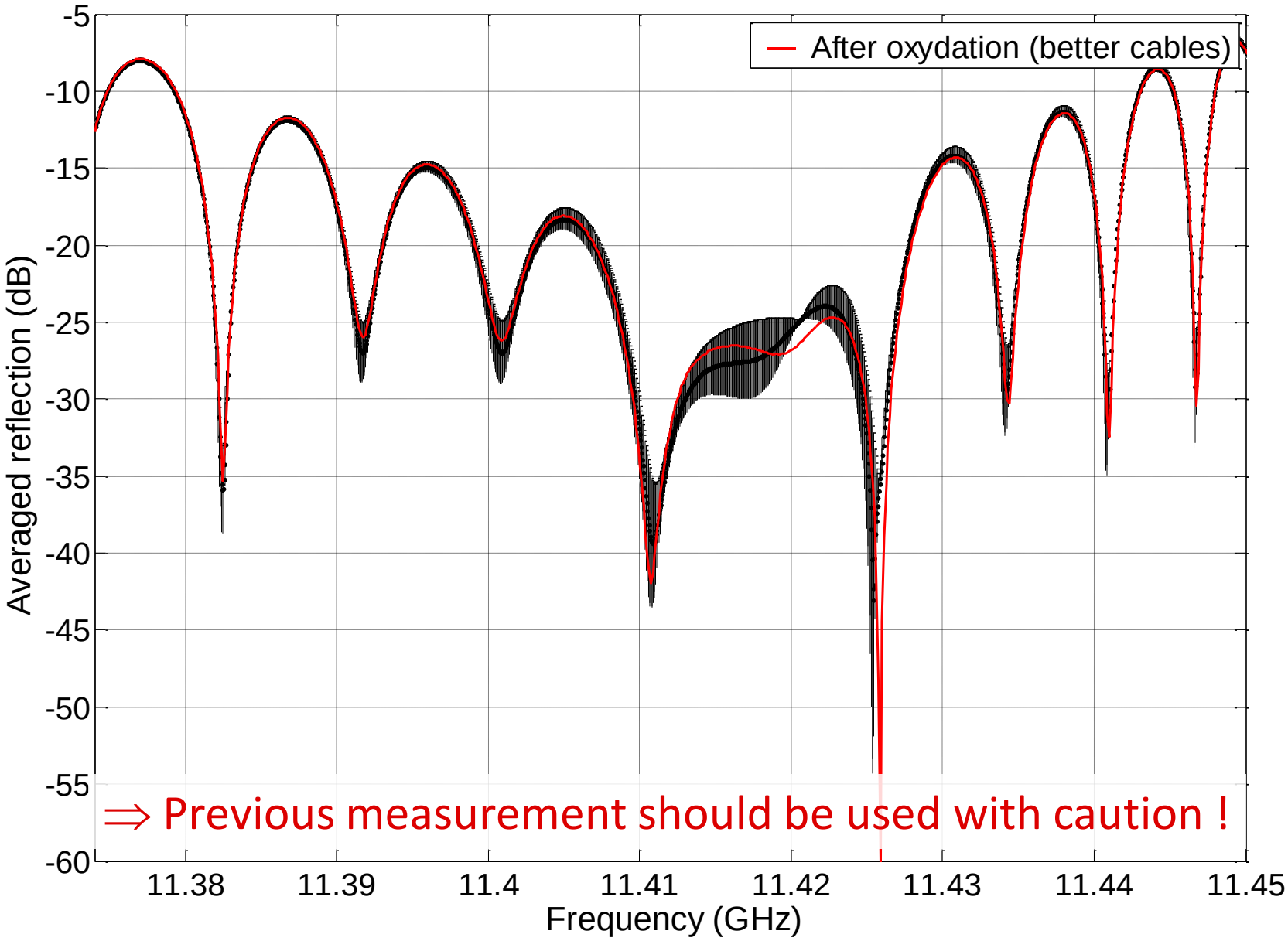
Effect of the brazing and oxidation



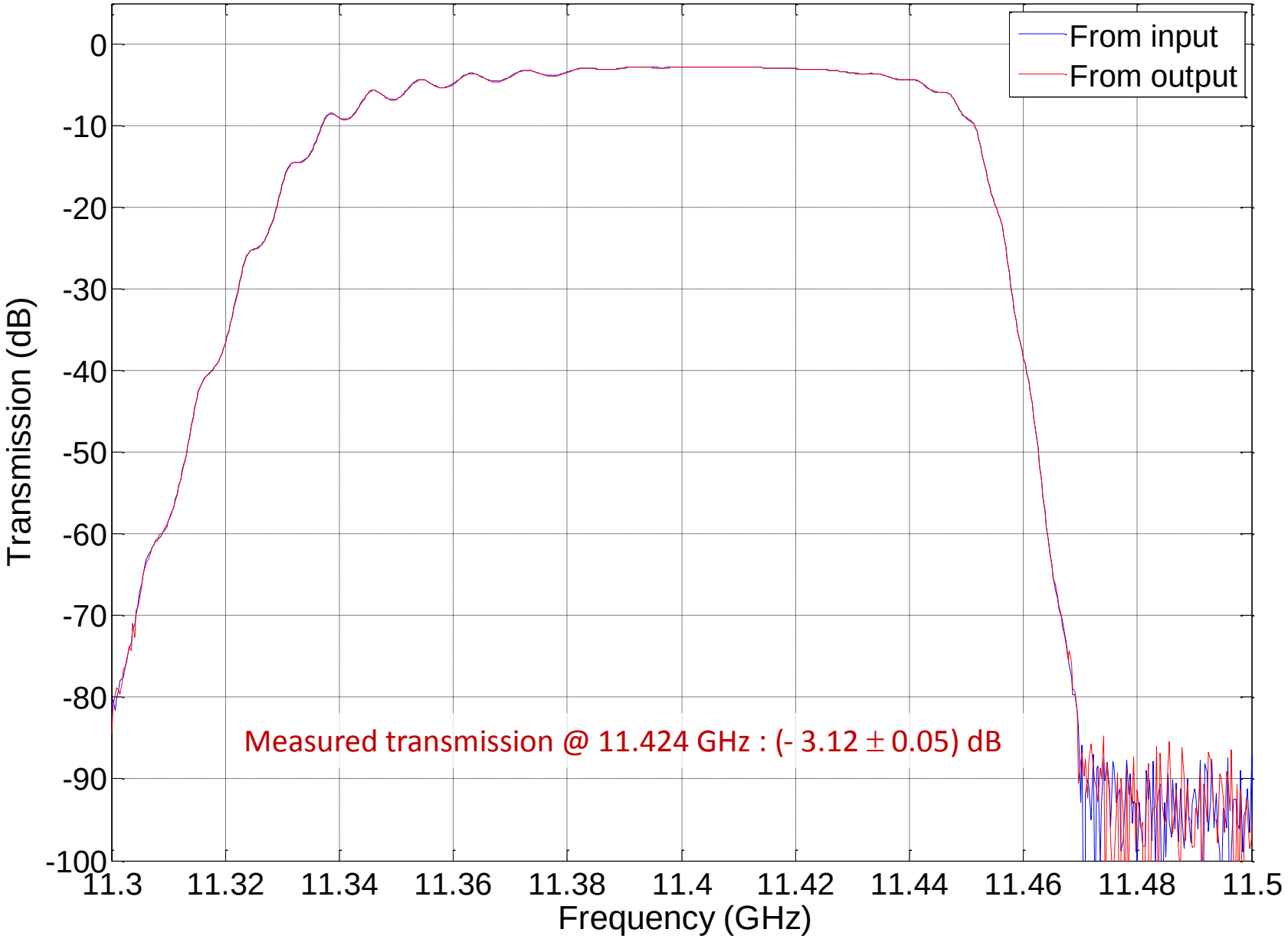
Problem with the network analyzer cables



With better (but older) cables

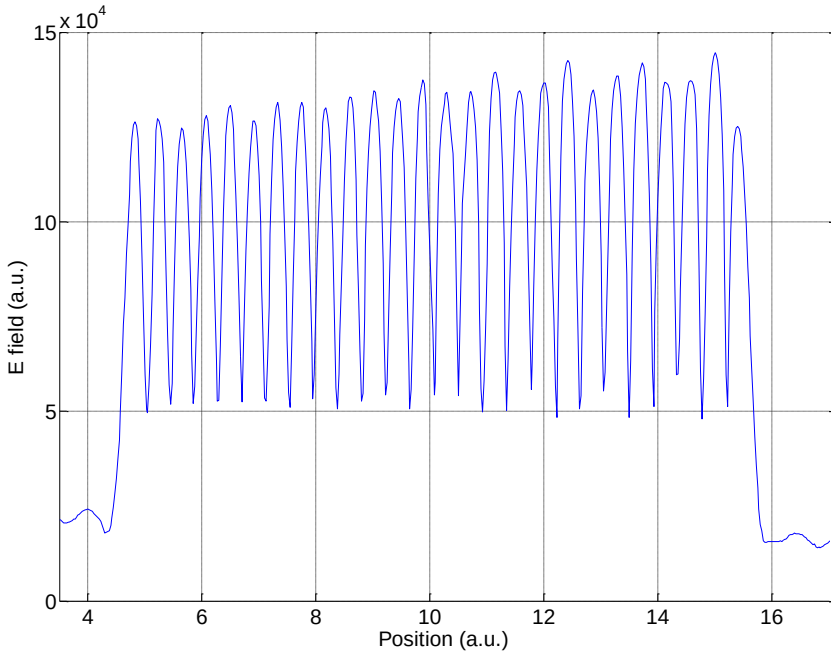


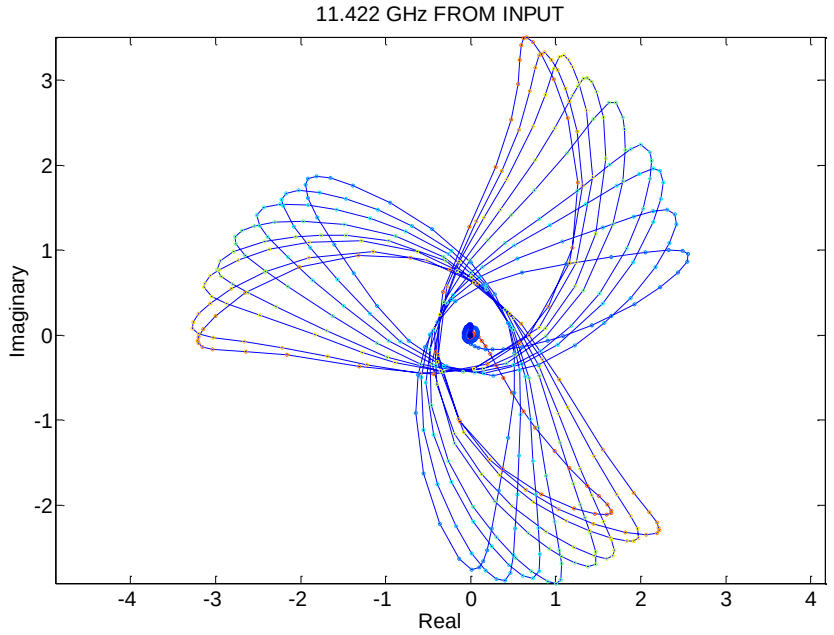
Transmission after re-baking



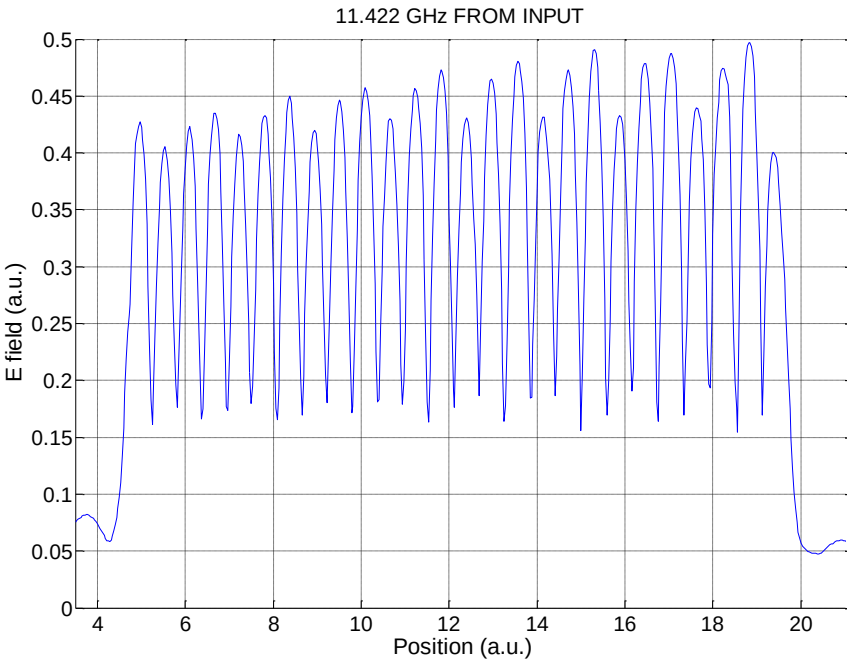
Bead pulling

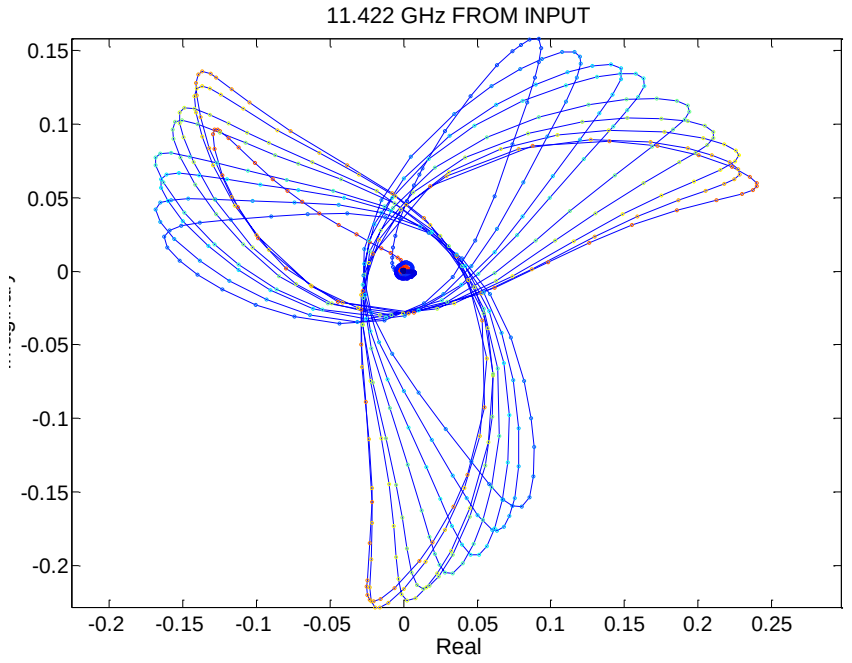
Bead pulling @ 11.422 GHz before 2nd brazing



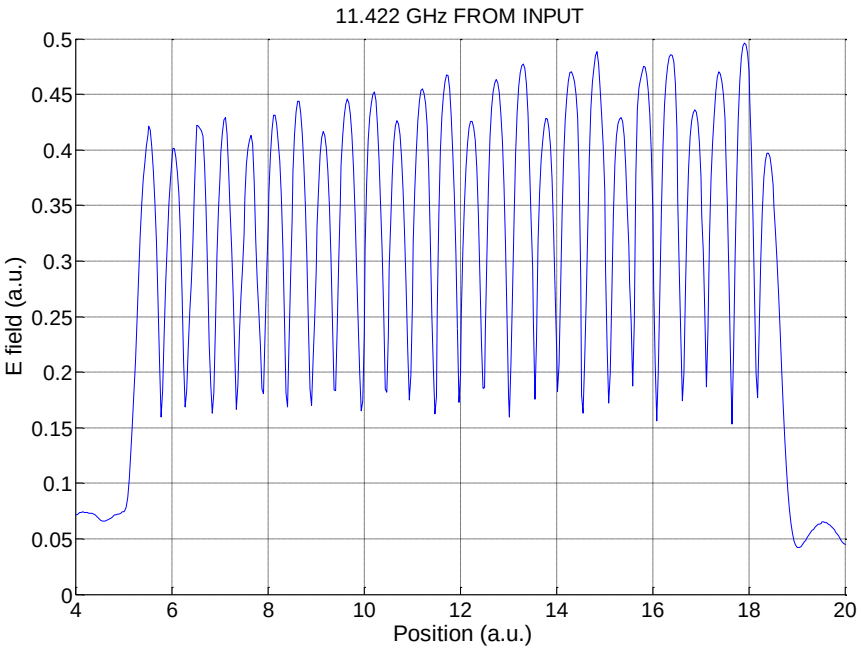


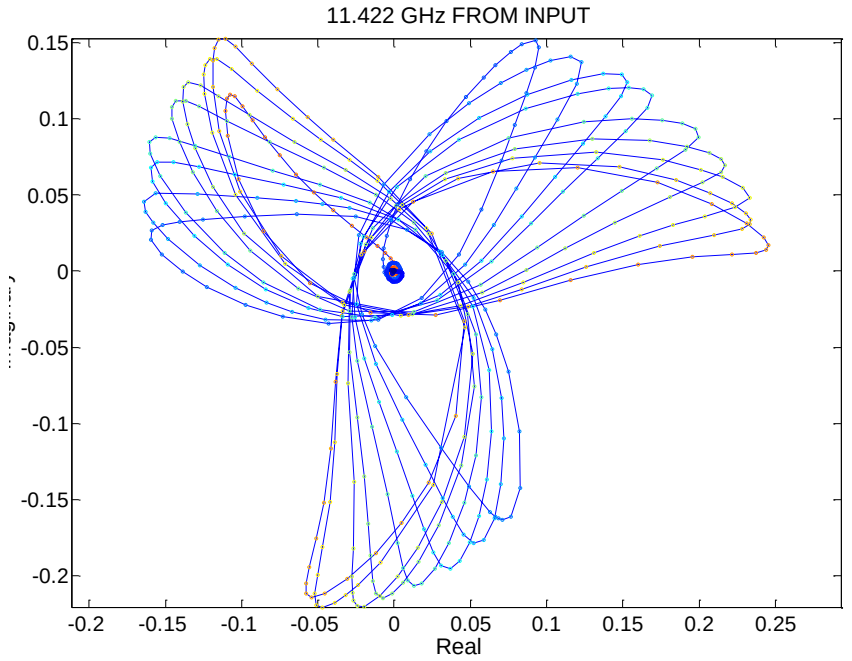
Bead pulling @ 11.422 GHz after 2nd brazing



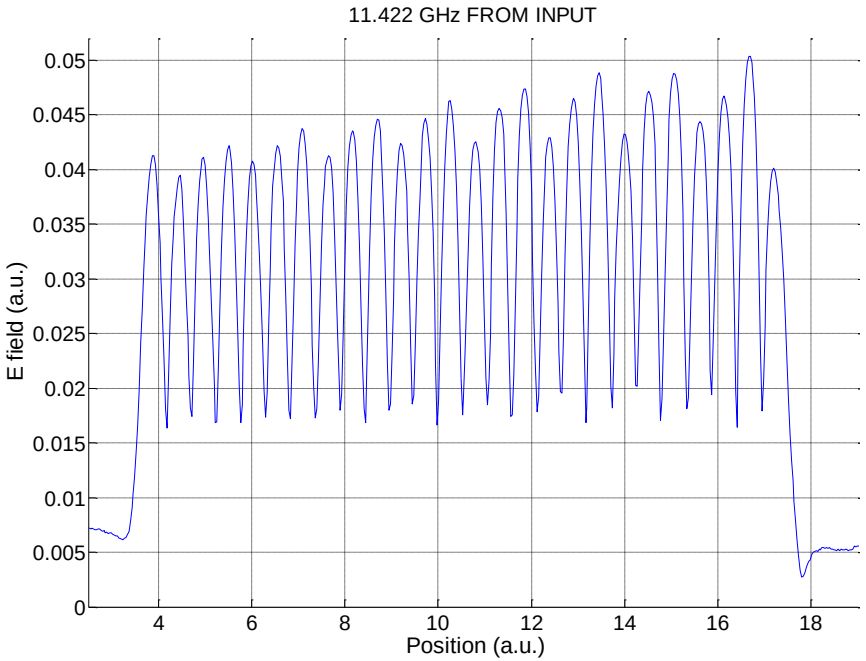


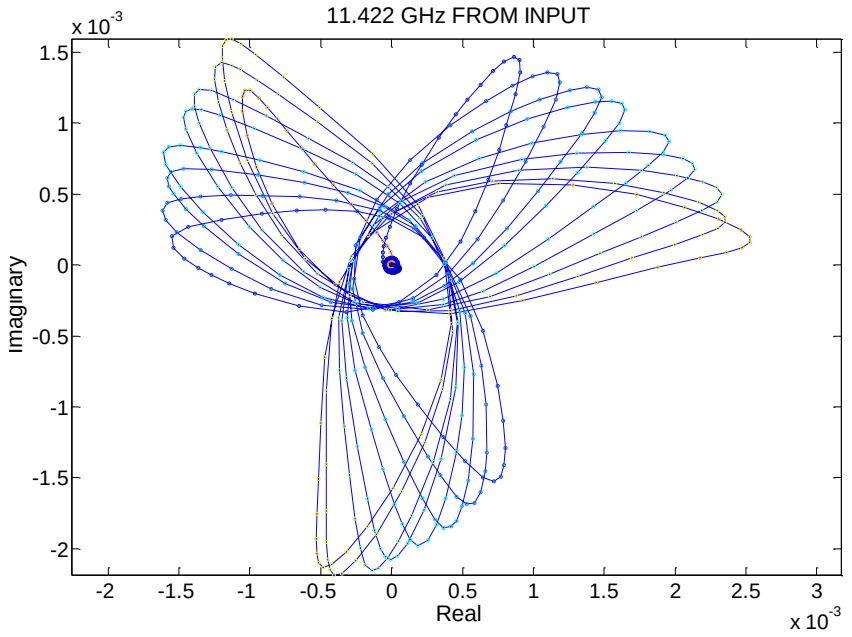
Bead pulling @ 11.422 GHz after oxidation



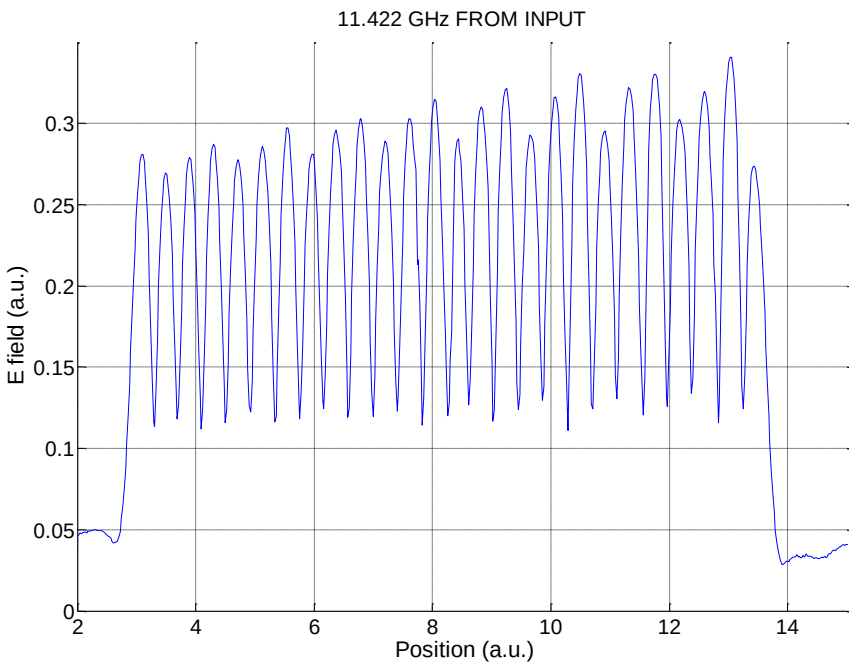


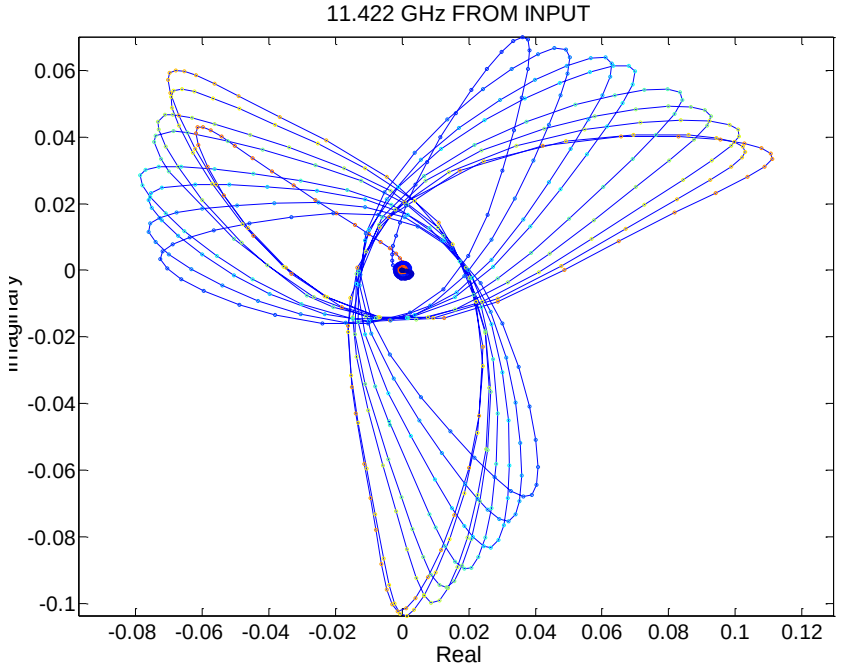
Bead pulling @ 11.422 GHz after oxidation and replacement of the bead





Bead pulling @ 11.422 GHz after rebaking





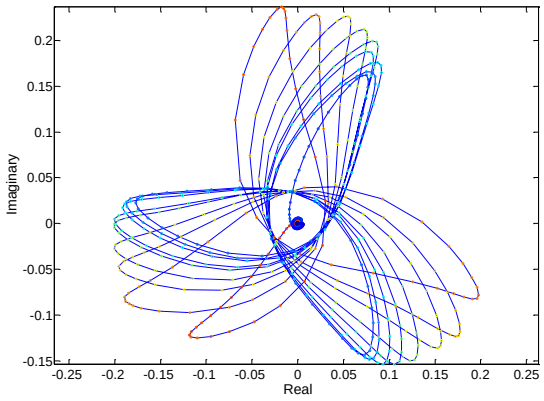
Tuning

- We can't tune individually each cell (we can only push, have no ruler in our bead pulling setup and the field at a given position is the result of the combined effect of all the cells).

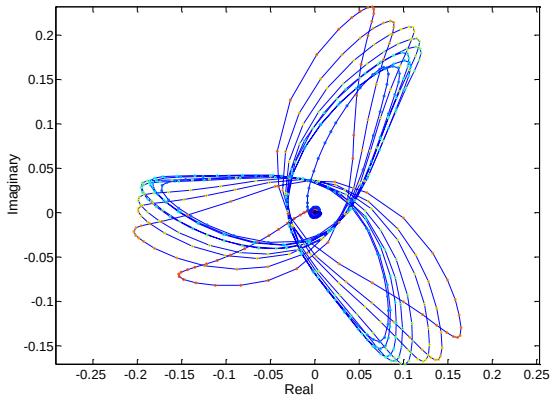
- The field configuration does not change dramatically for a small (1 MHz) frequency change. On the contrary, the phase advance per cell is much more sensitive.

- We hence take as a reference the frequency for which we are the closer from the 120° phase advance per cell.

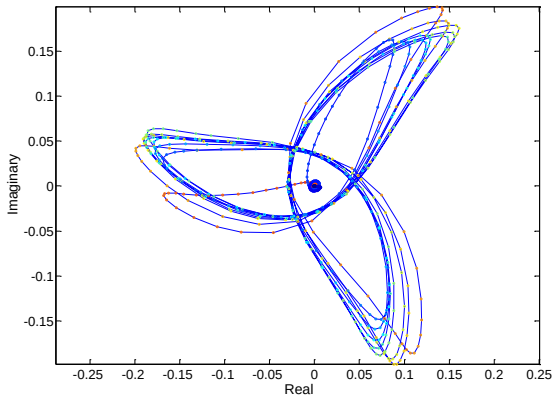
-1 MHz



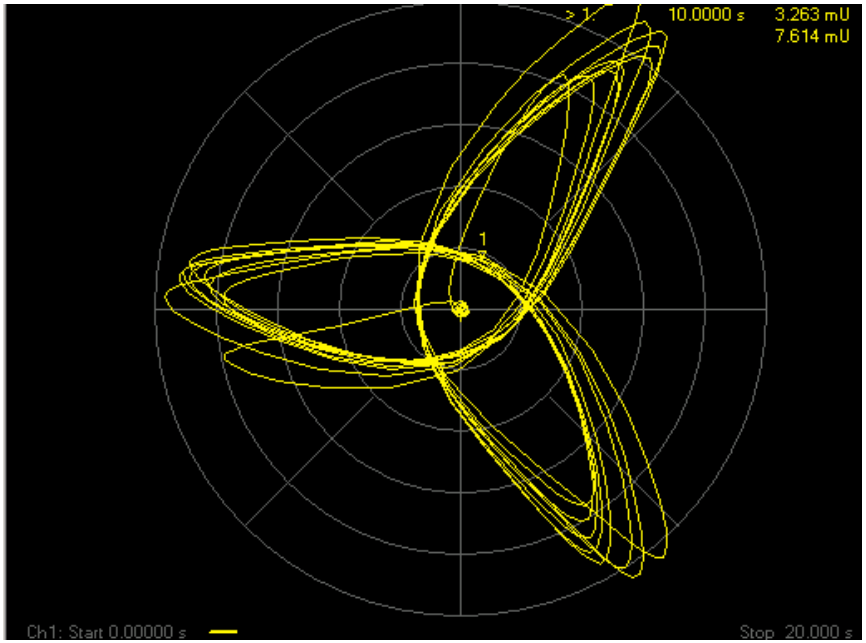
-500 kHz



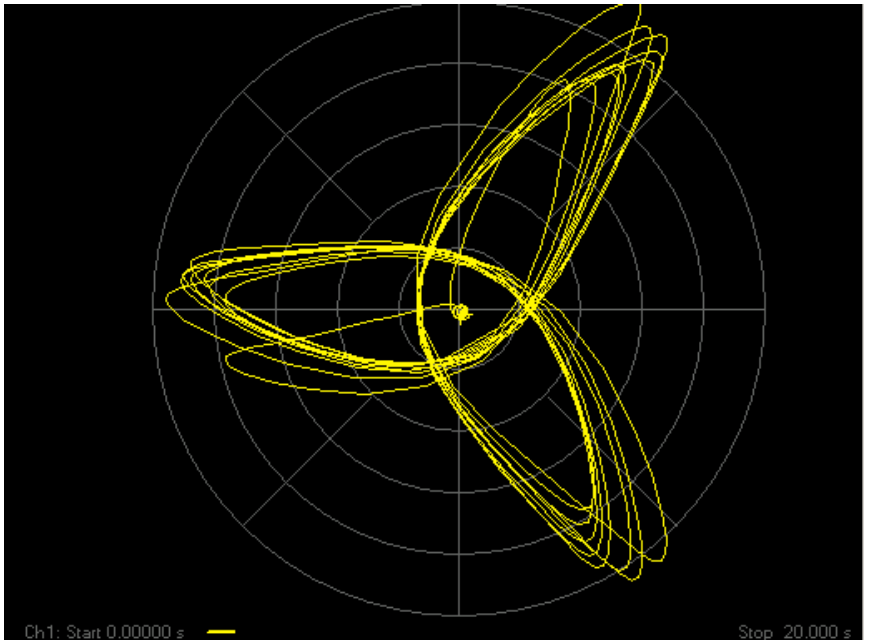
Best



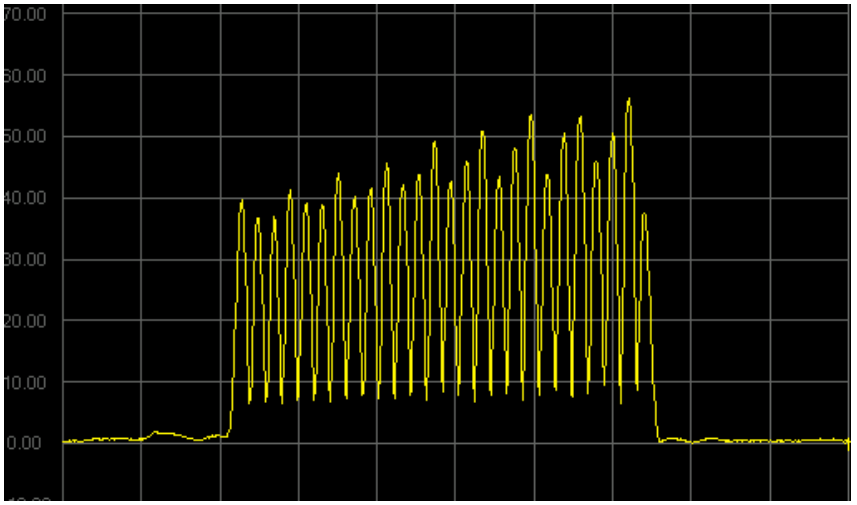
Effect of the screws and pins placing

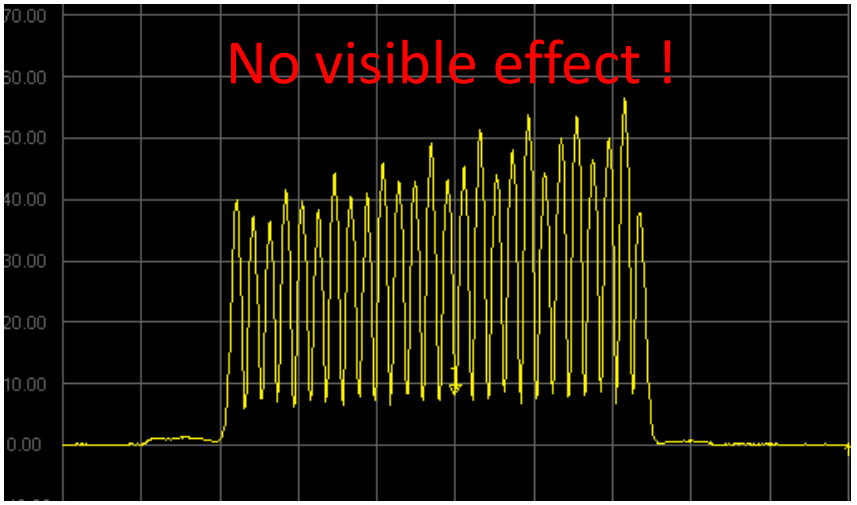


Bead pulling @ 11.421 Ghz at the beginning

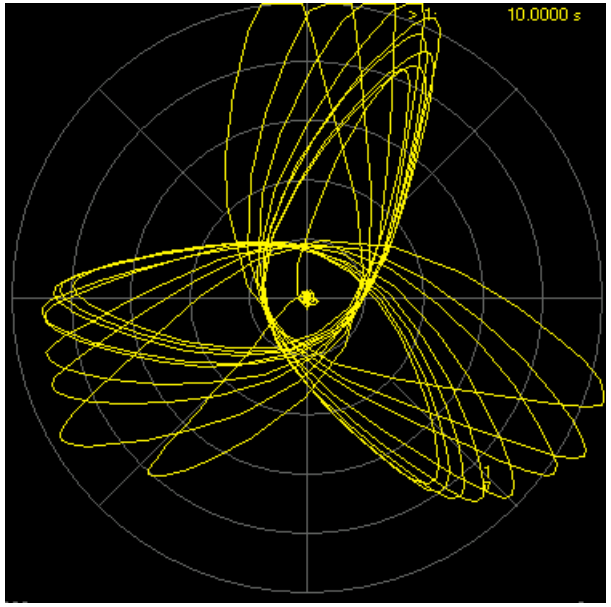


Bead pulling @ 11.421 Ghz after putting the pins ans screws

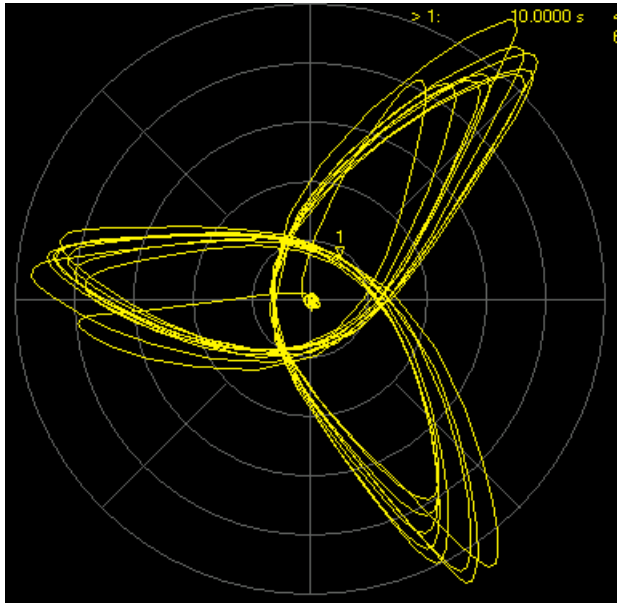




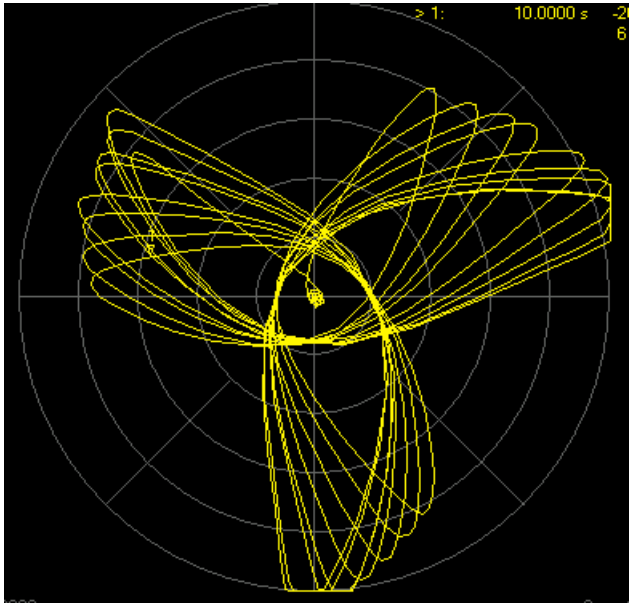
After 1st step (+ 1/8 turn)



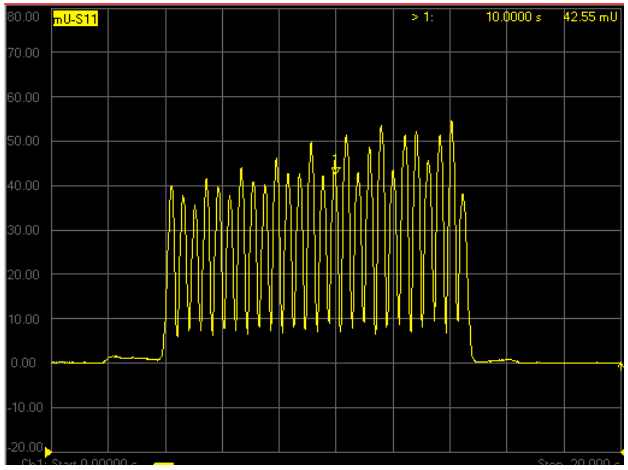
11.421 GHz

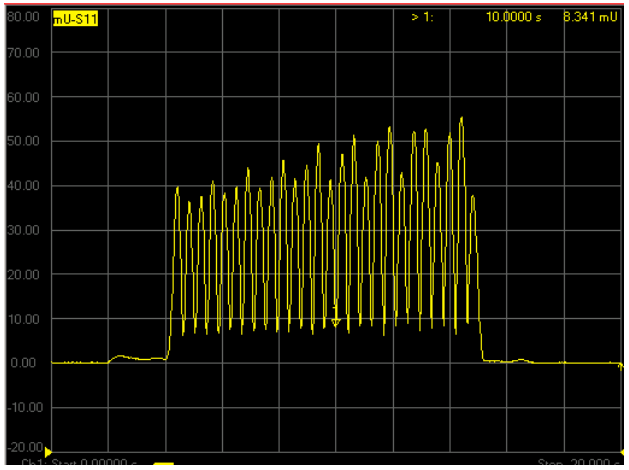


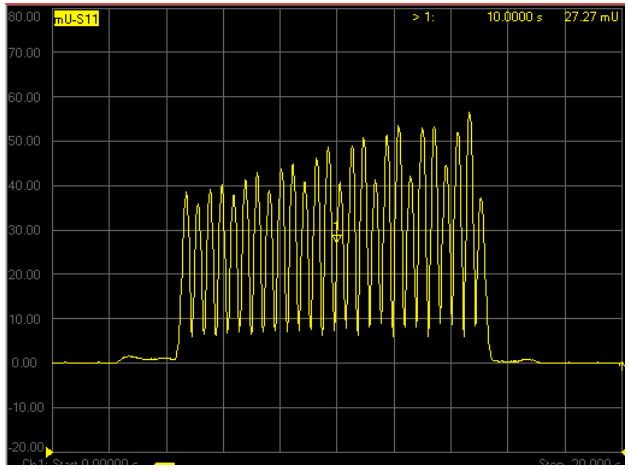
11.422GHz



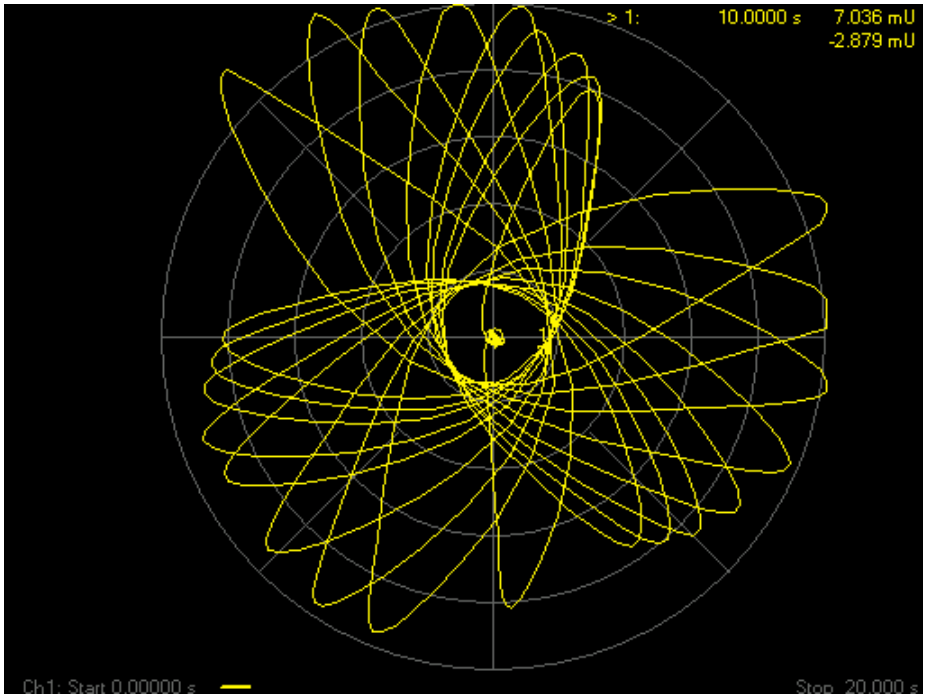
11.423 GHz



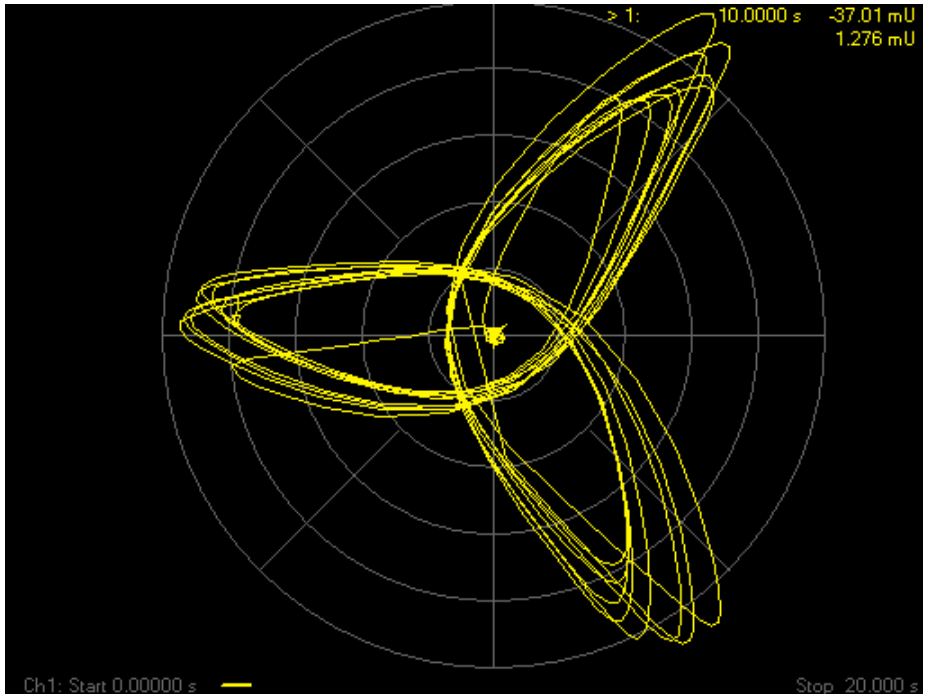




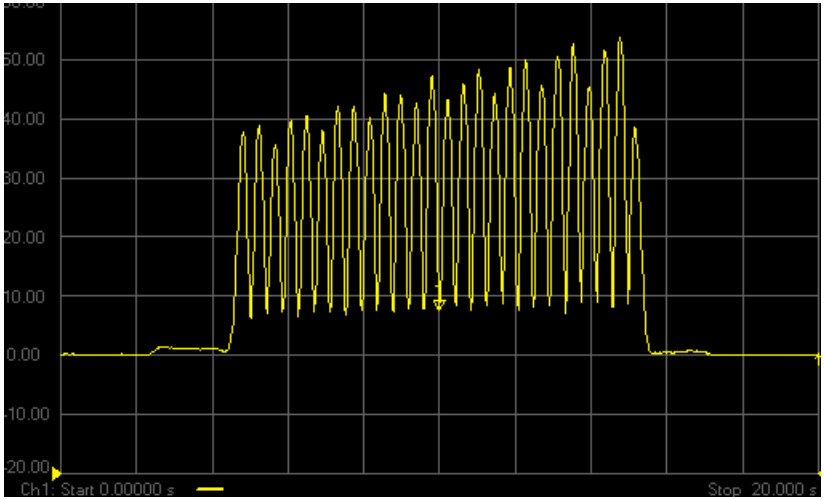
After 2nd step (+ another 1/8 turn)

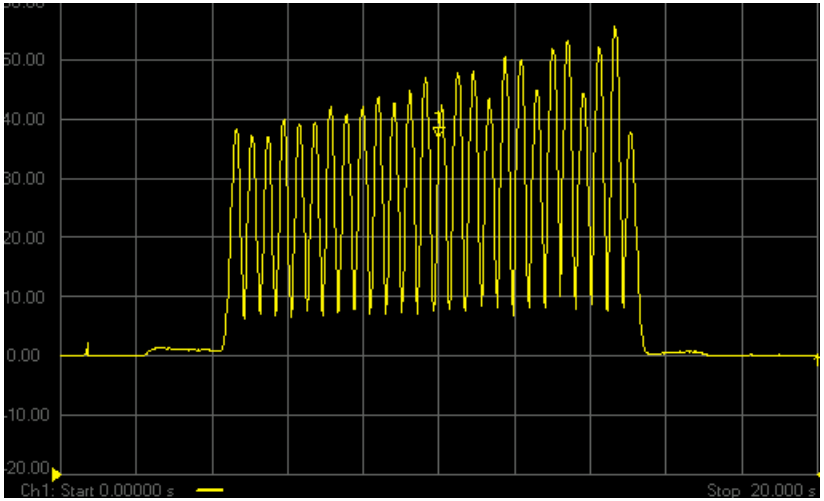


11.422GHz

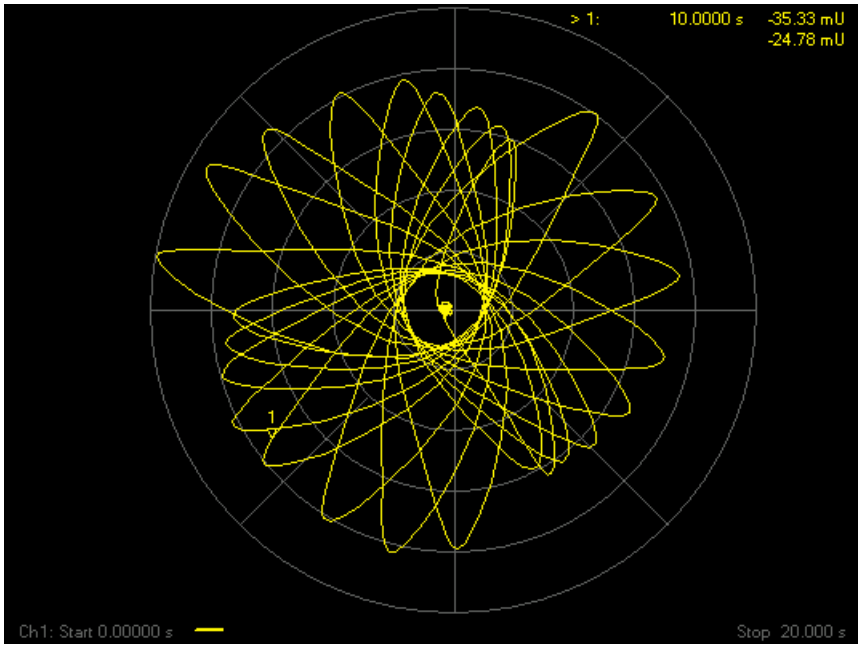


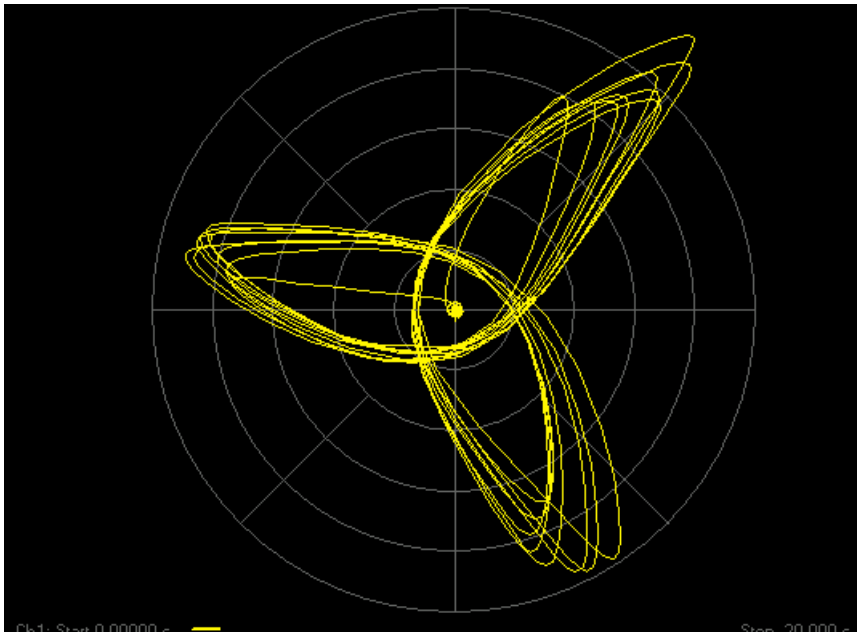
11.424 GHz





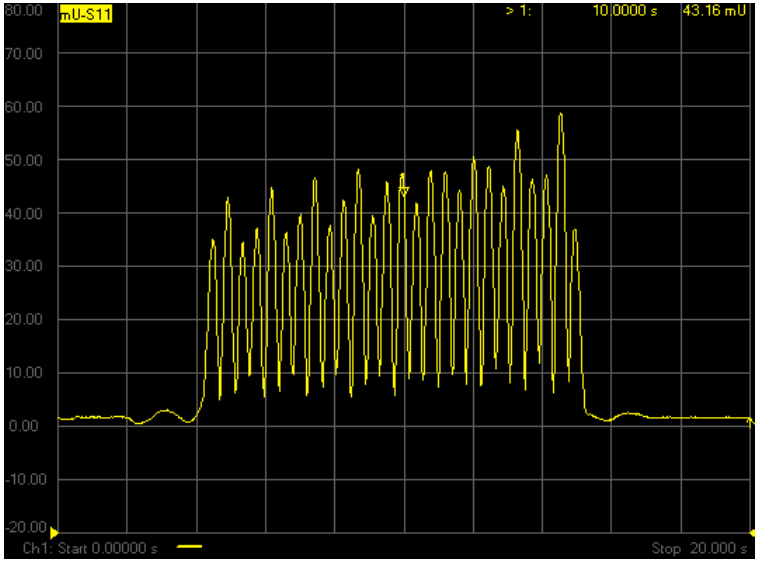
After 3rd step (+ another 1/8 turn except output matching cell)

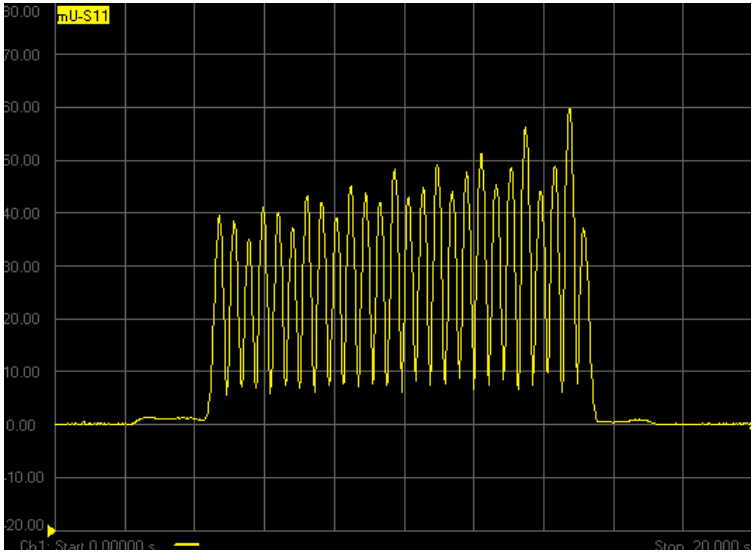




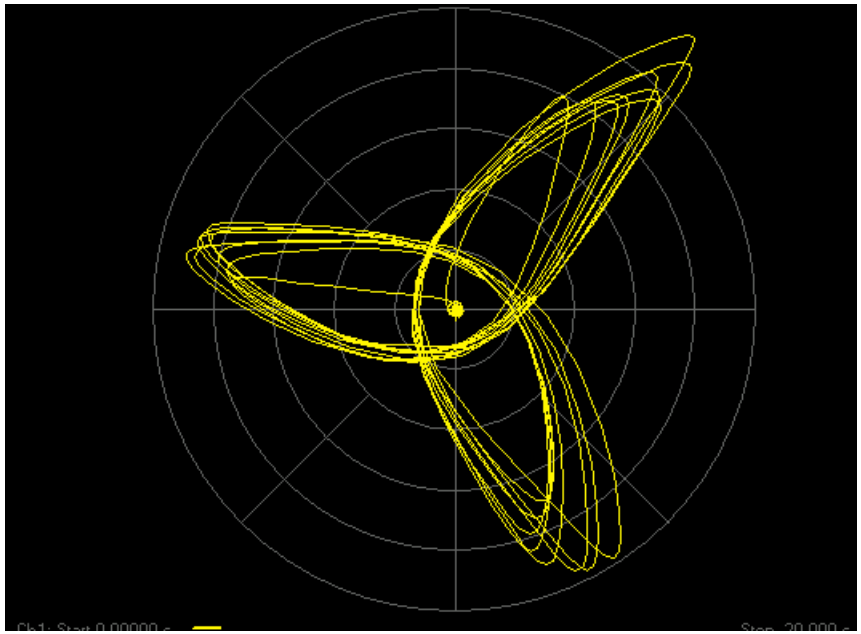
11.424GHz

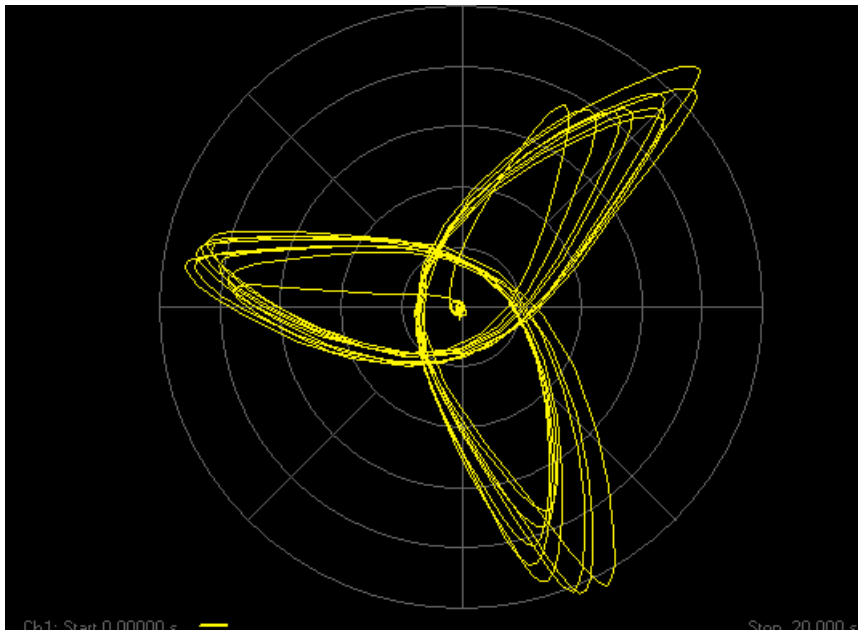
11.427 GHz





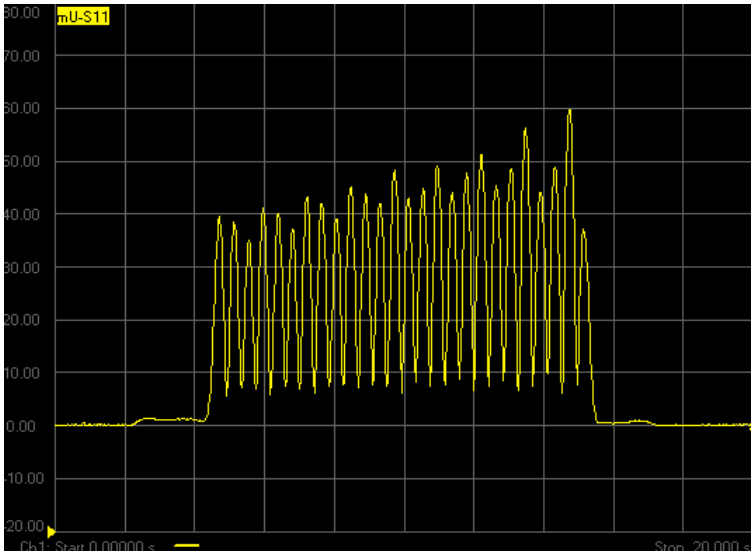
After 4th step (+ 1/8 turn only for the output matching cell)

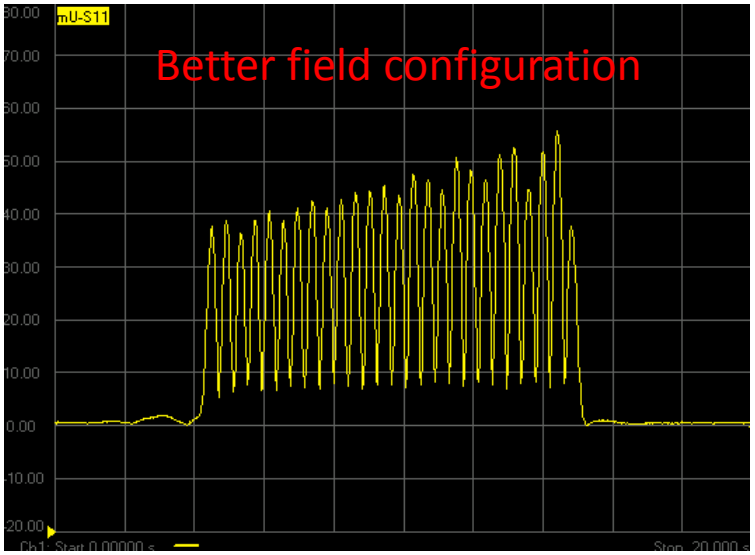




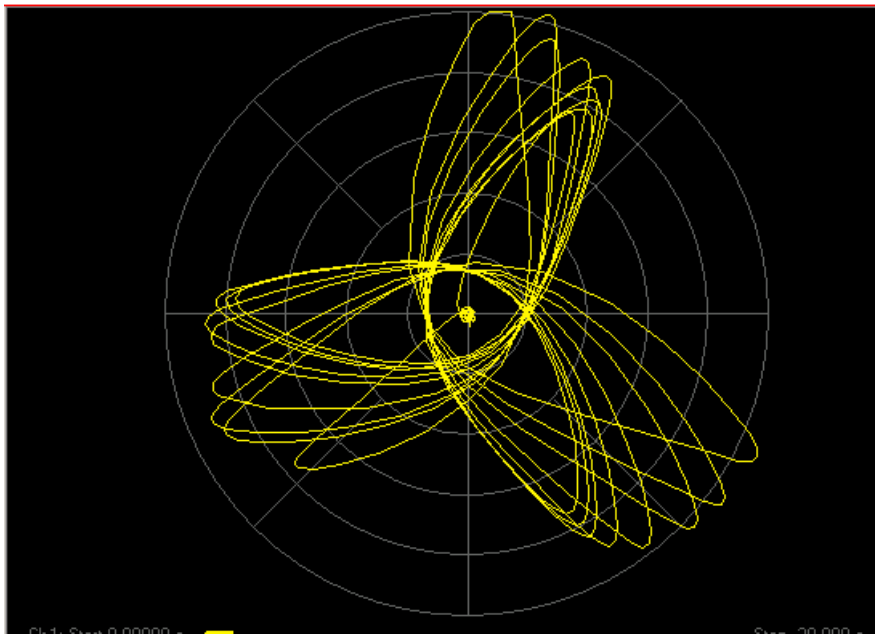
Before (11.427 GHz)

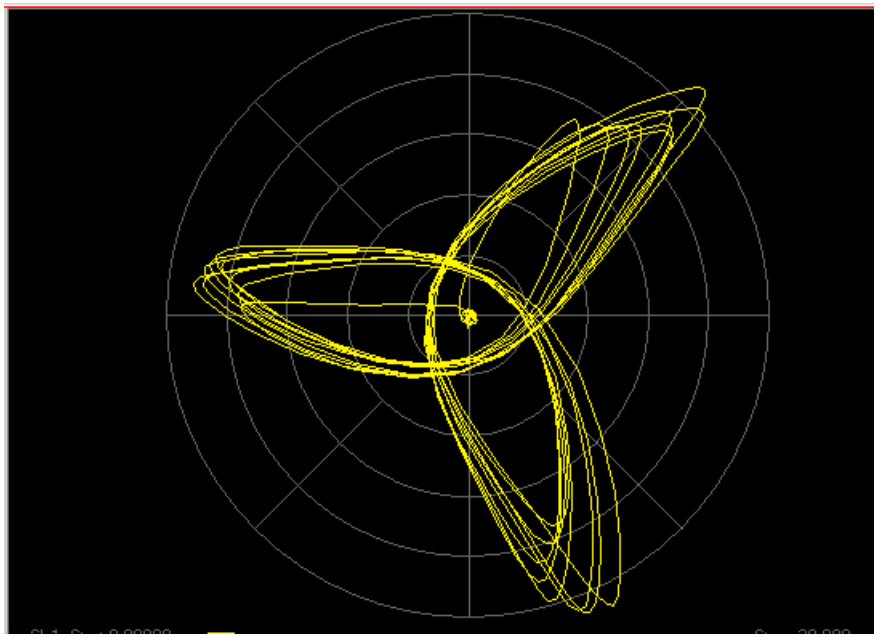
After (11.427 GHz)



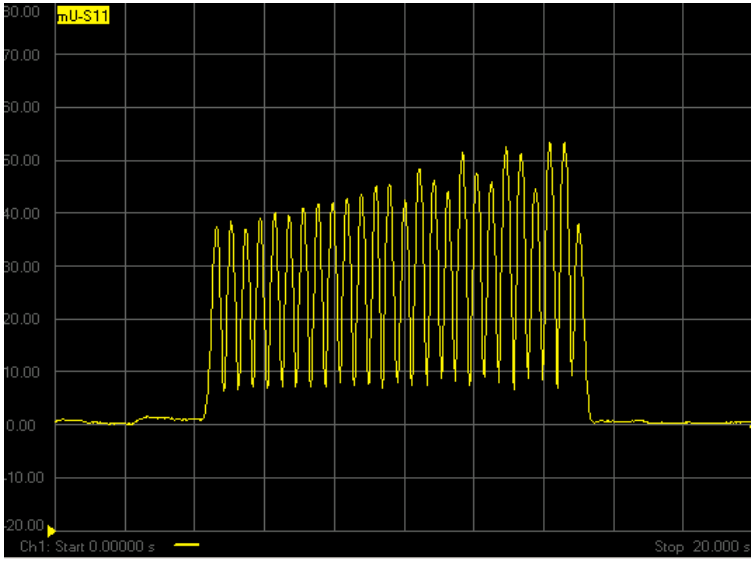


After 5th step (+ 1/16 turn only for the output matching cell)

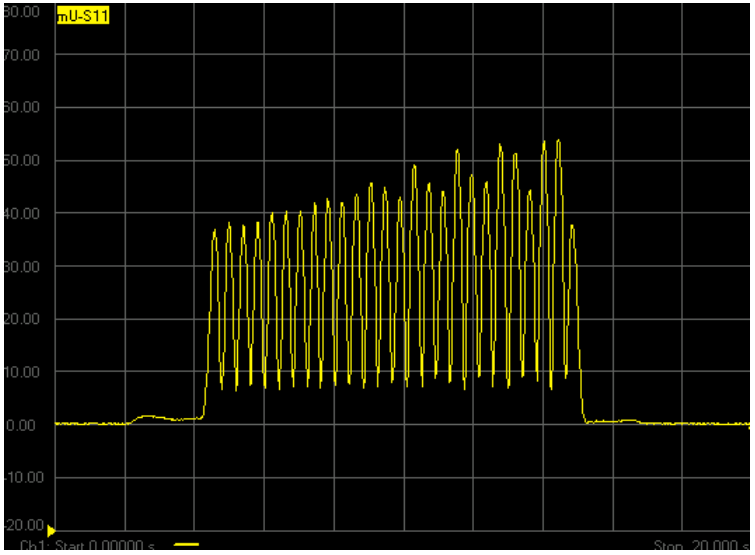




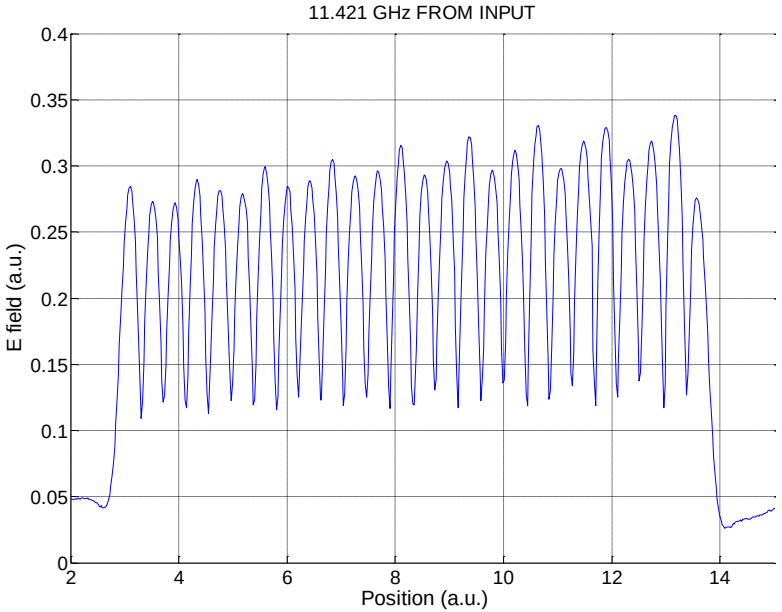
11.426GHz



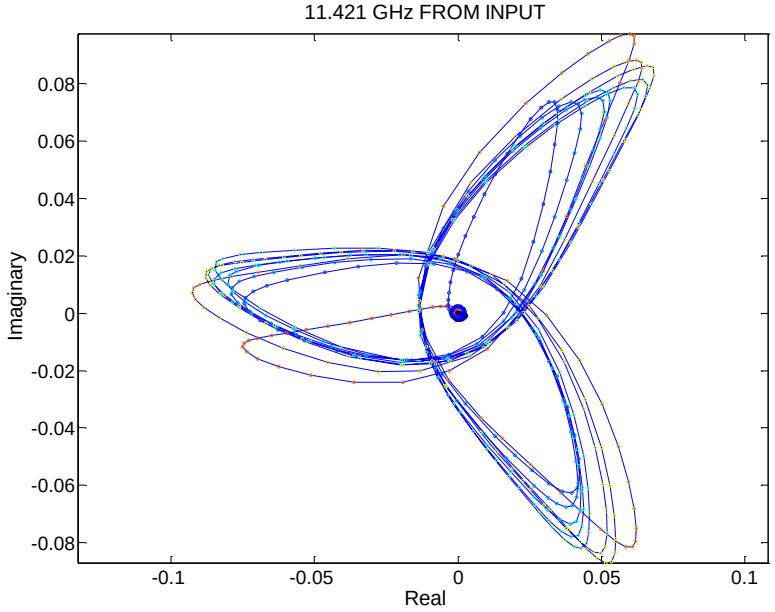
11.427 GHz

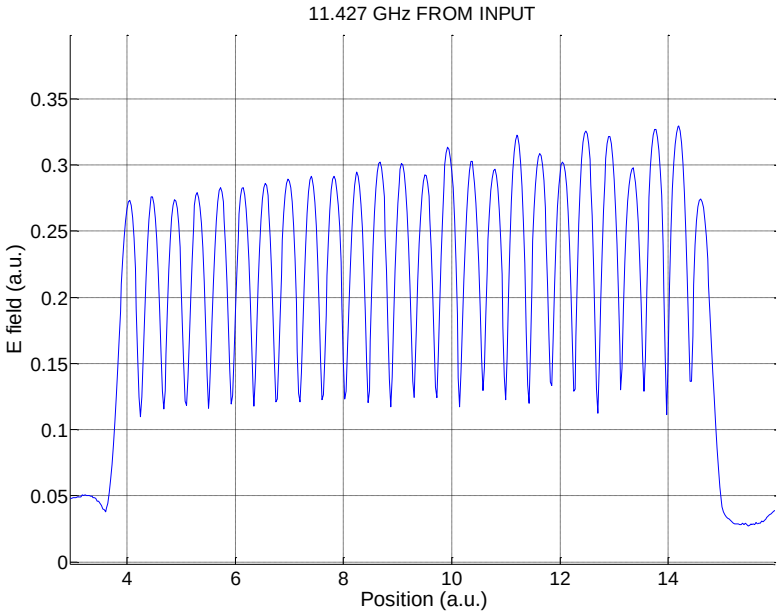


Before/after tuning

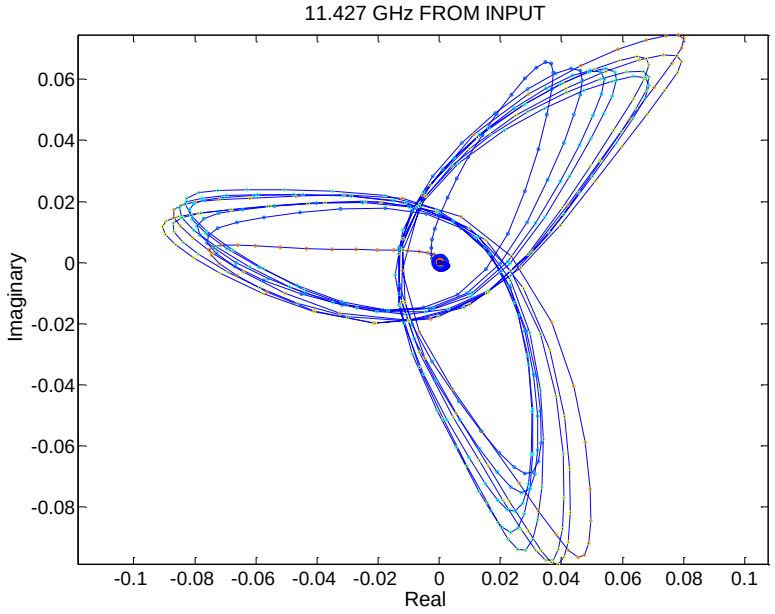


Before

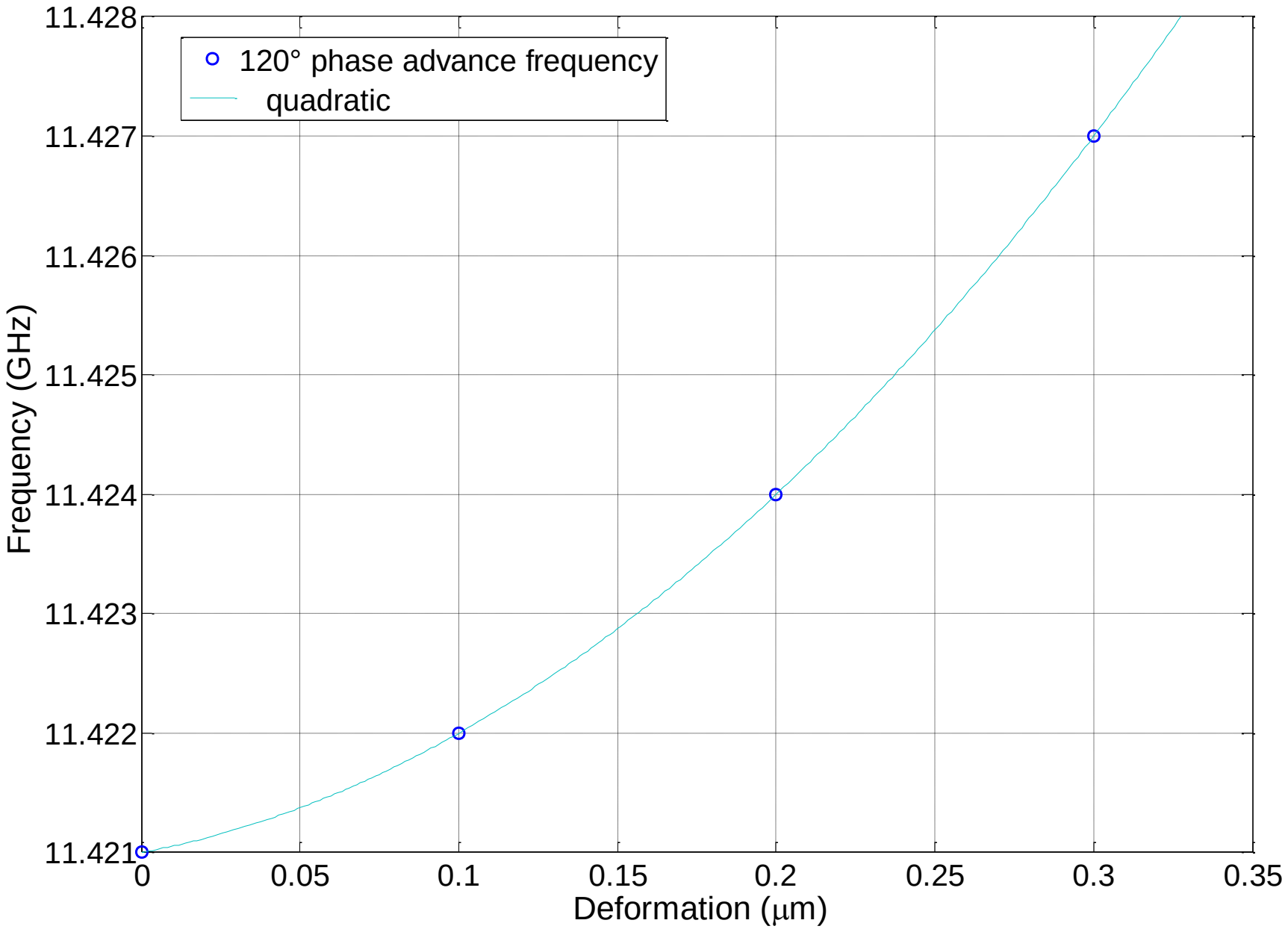




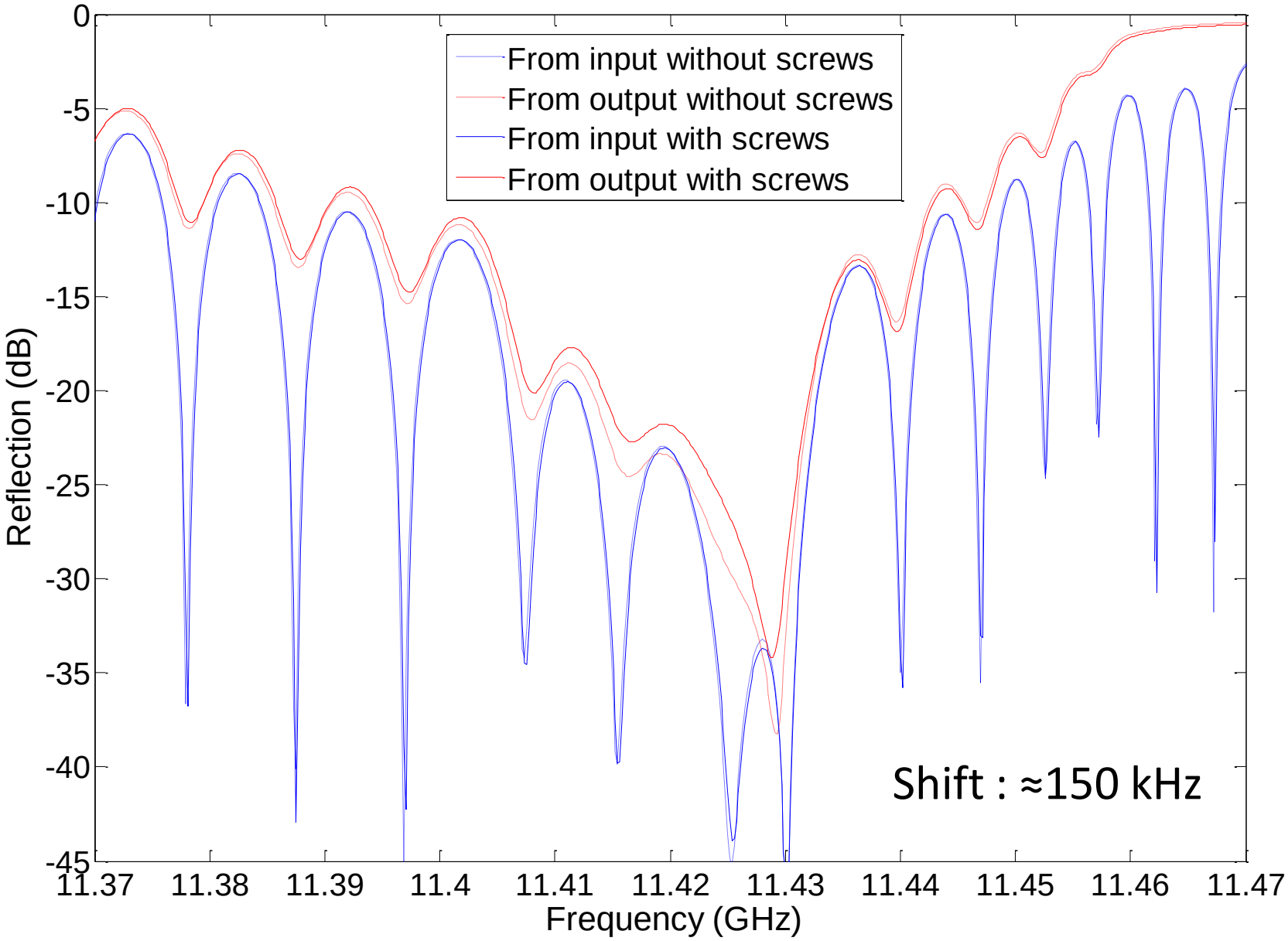
After



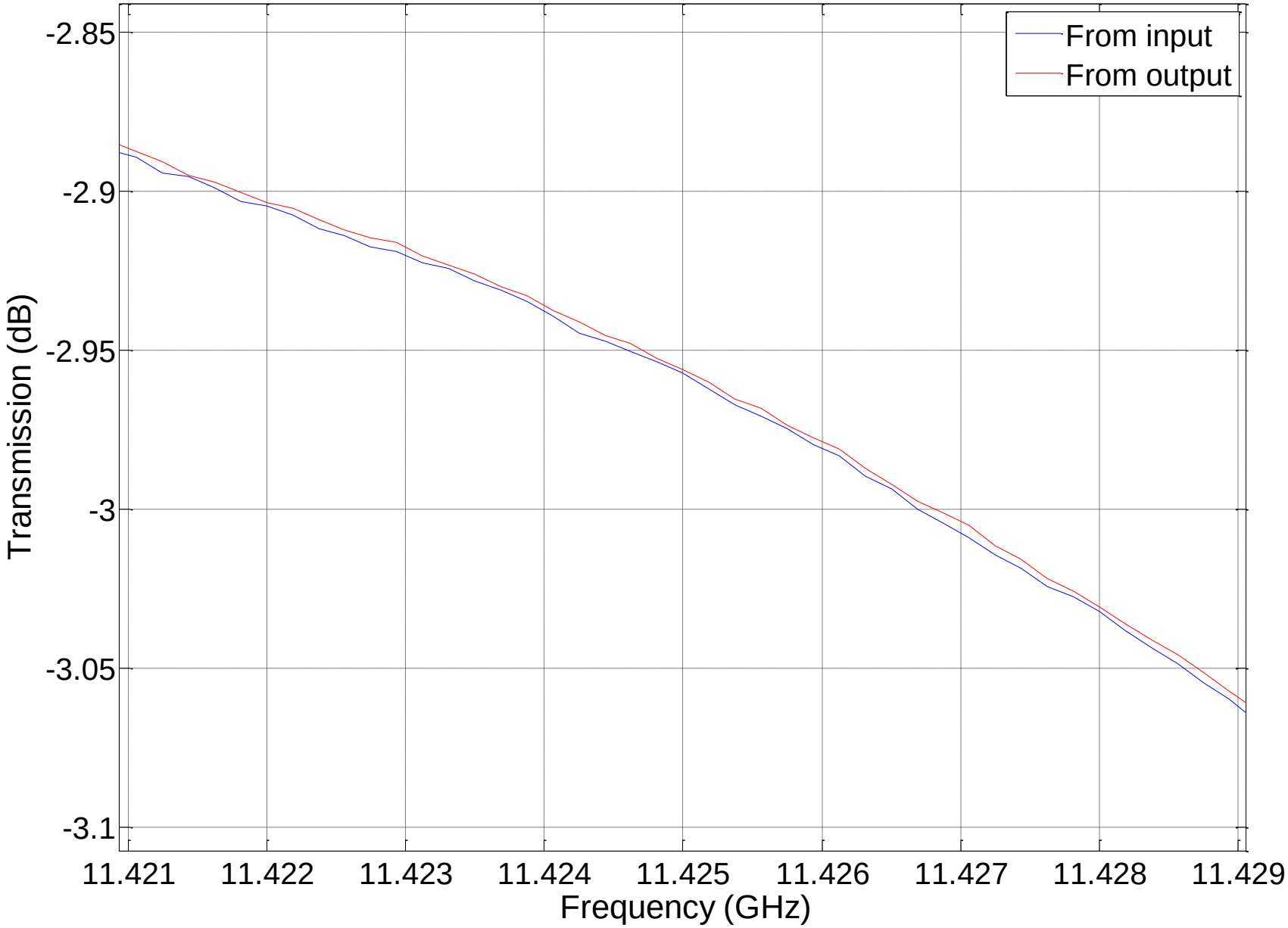
Change of the frequency vs depth of the screws



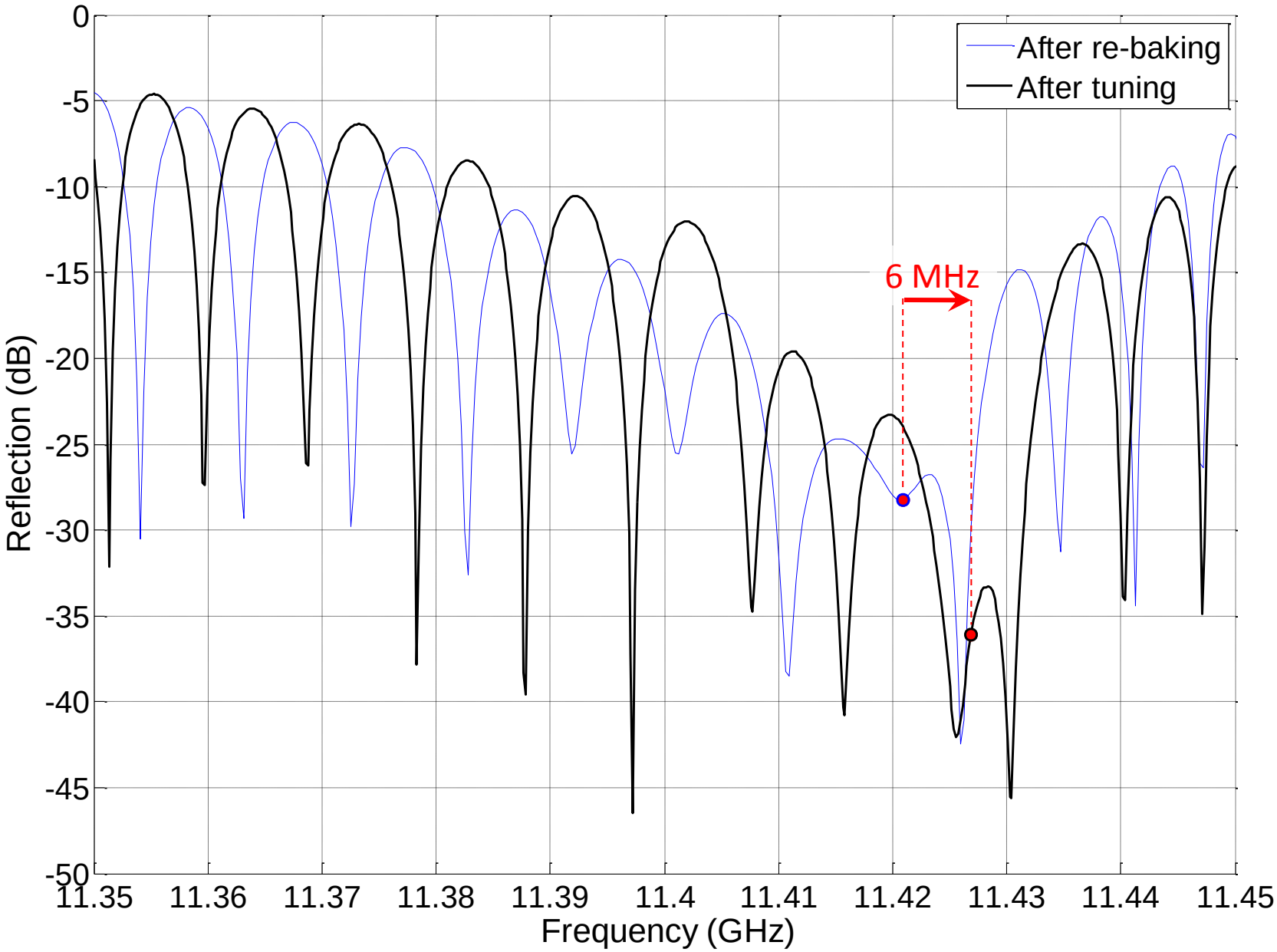
Effect of the screws removal on the S parameters



Transmission after screws removal

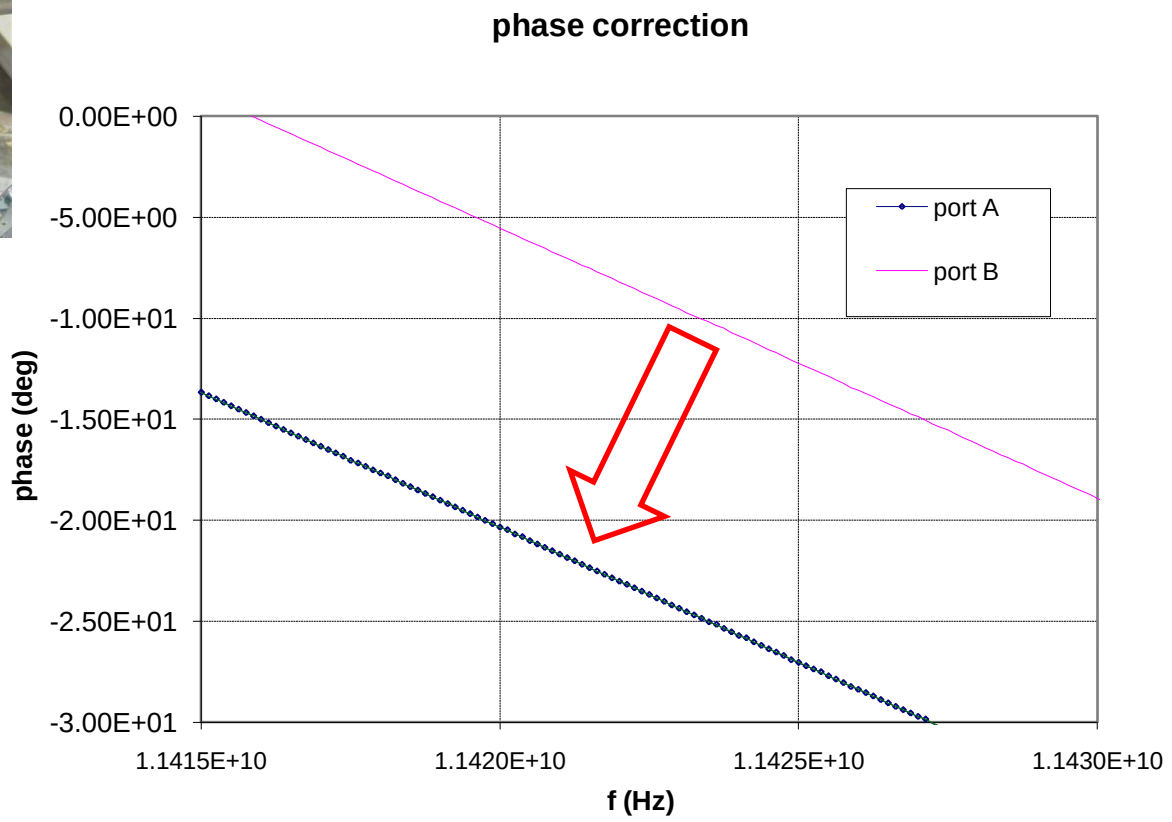


Reflection before and after tuning



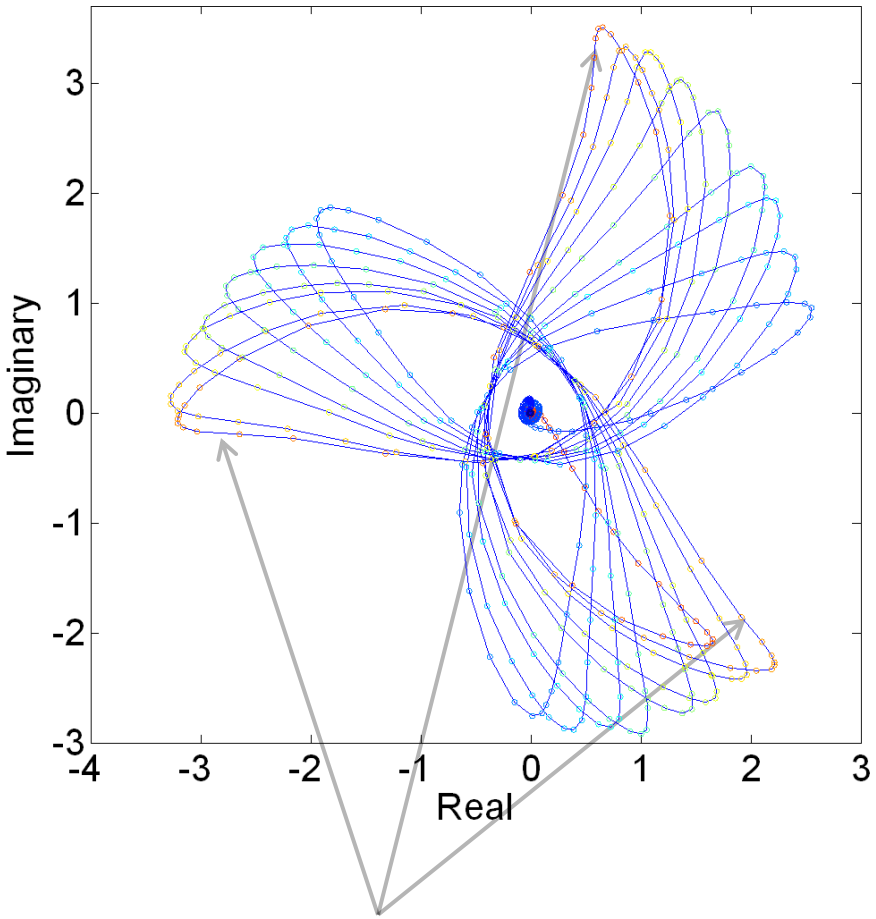
Miscellaneous

Phase correction for the waveguides of the tank



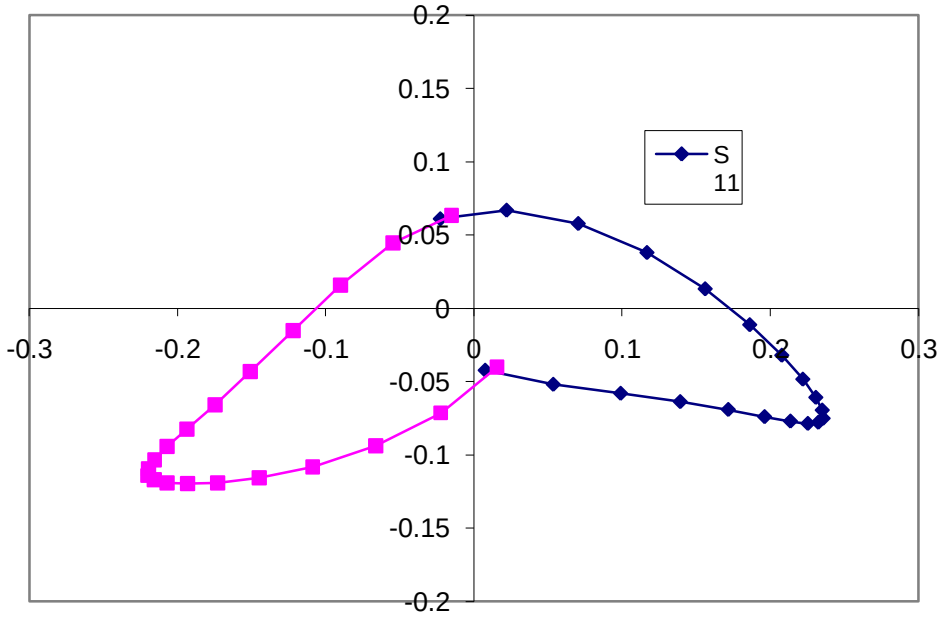
Asymmetry of the petals

Measurement



Marked asymmetry of the petals for the smallest aperture cells.

Riccardo's simulation



Bead diameter : 1.2 mm

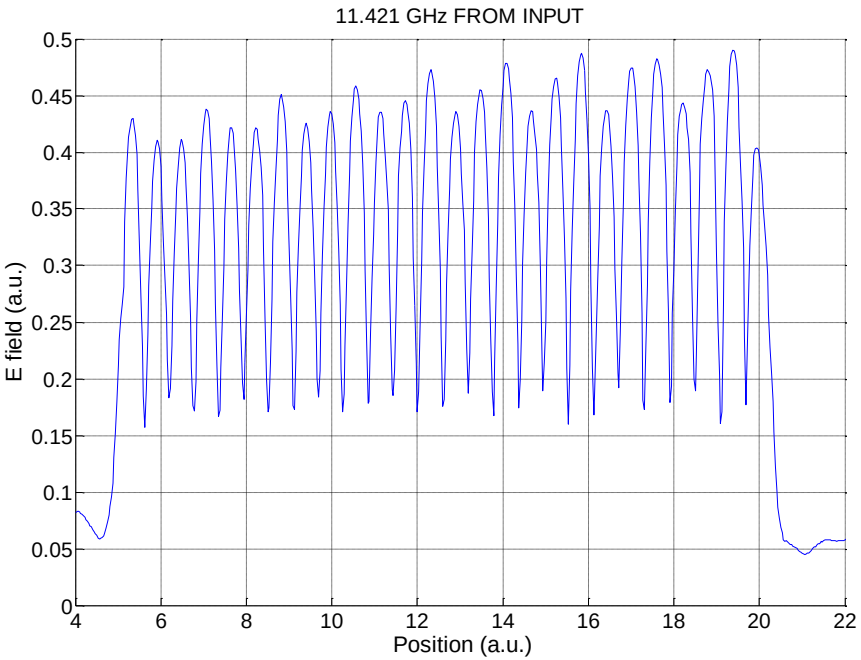
$\varepsilon_r = 20$

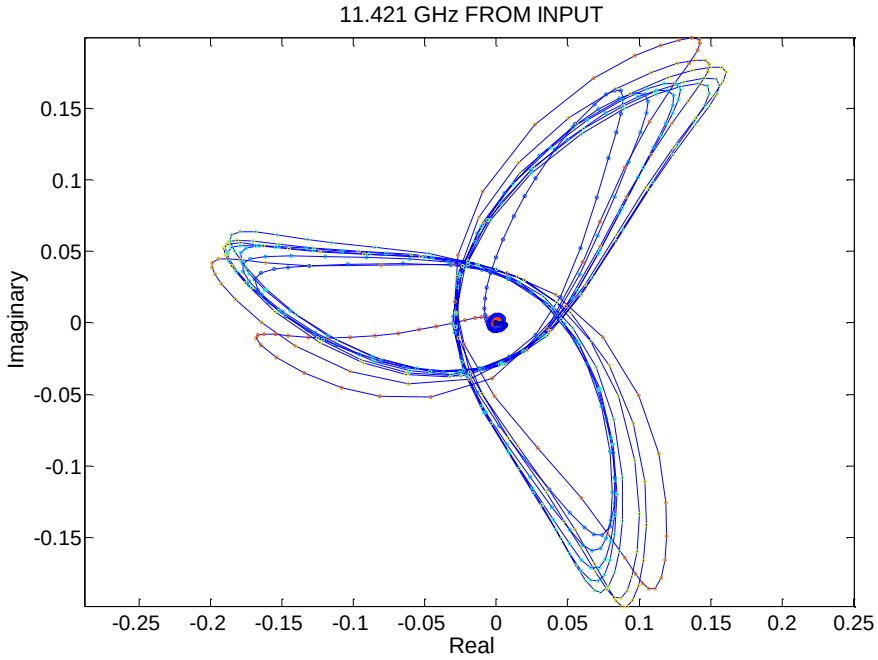
$\tan \delta = 0.1$

Conclusion

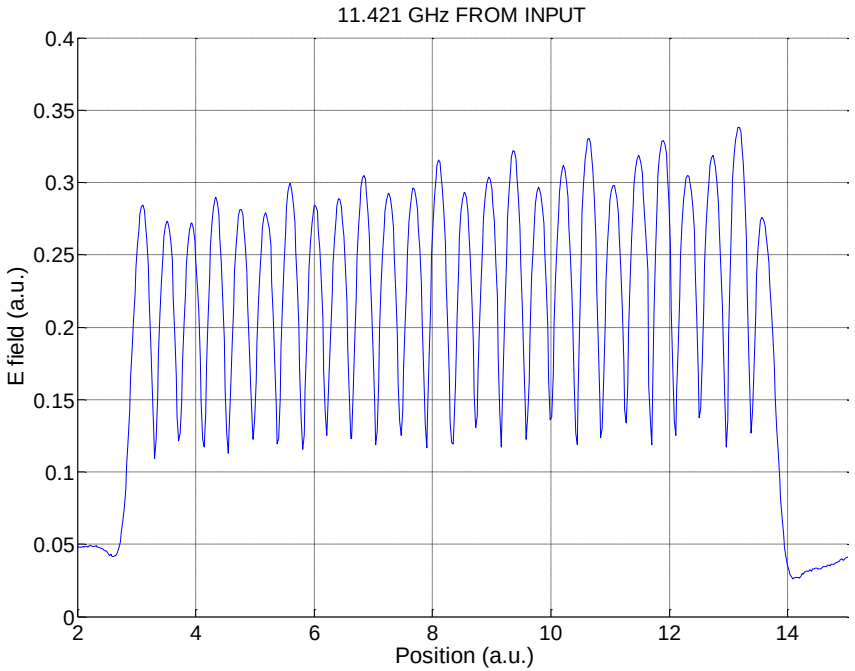
- « Measural harassment » of this structure.
- We have understood a few things thanks to these measurement :
  - asymmetry of the petals
  - non-linearity of the frequency shift with screws displacement
  - how to oxidize a structure within only 2 days
  - …
- Though not perfect, tuning worked well and was quite easy.
- Push-pull would be for sure easier and safer !
- Can't wait to have our new clean room !

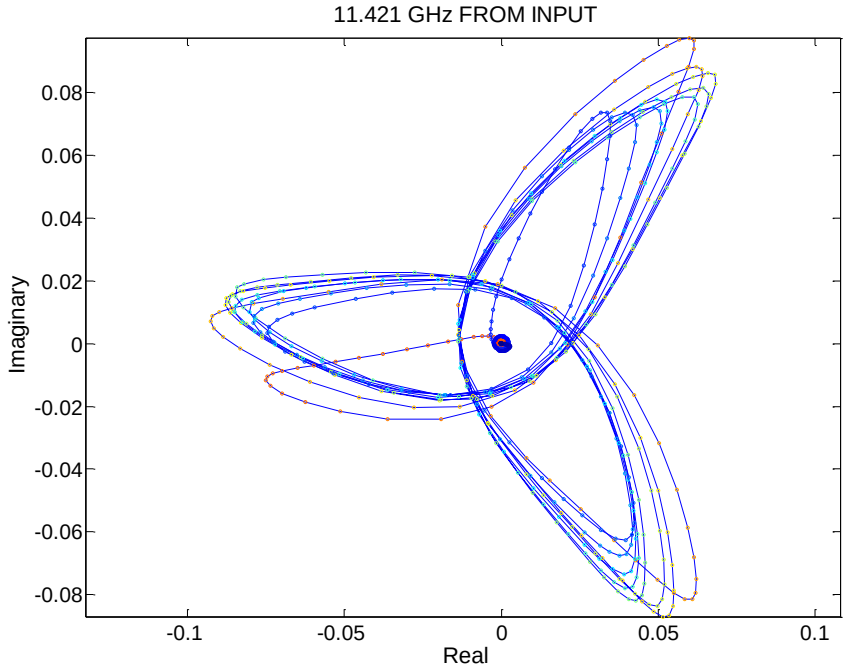
Bead pulling @ 11.421 GHz after 2nd brazing





Bead pulling @ 11.421 GHz after rebaking





The bead was changed before this measurement