HF–EPR Experimental Results of Plasmonic Enhancement

Lorenzo Tesi (USTUTT)

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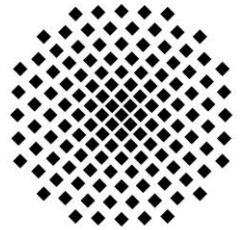
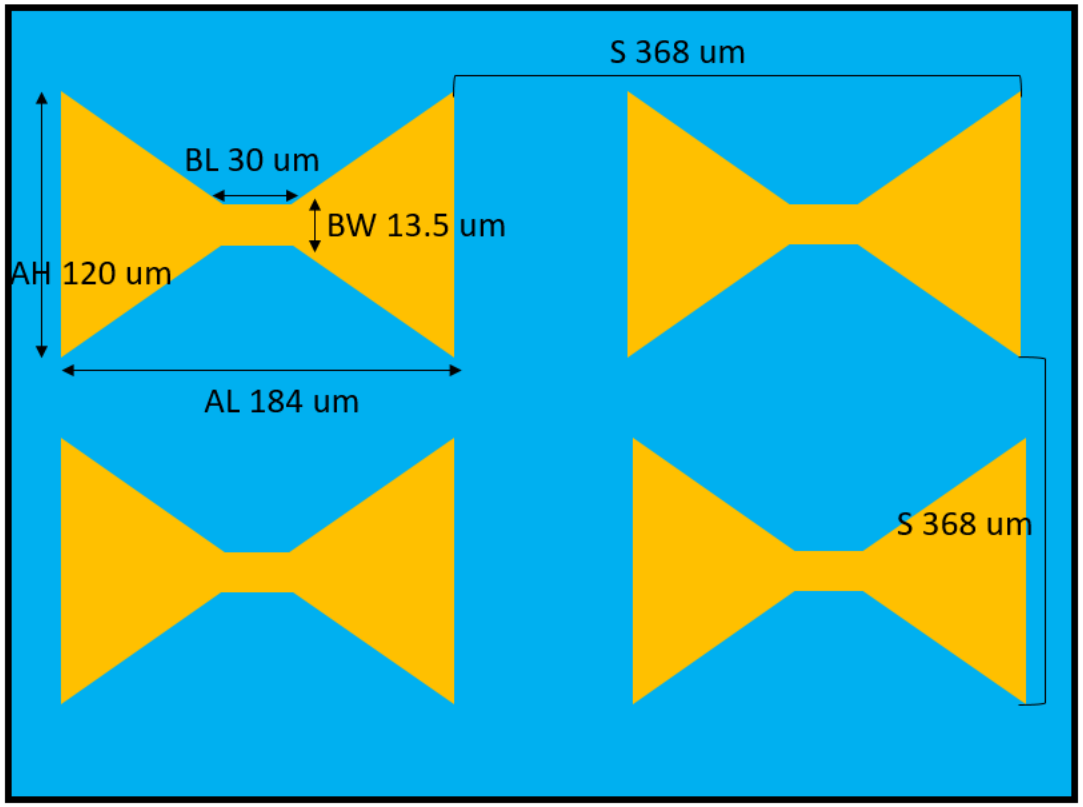


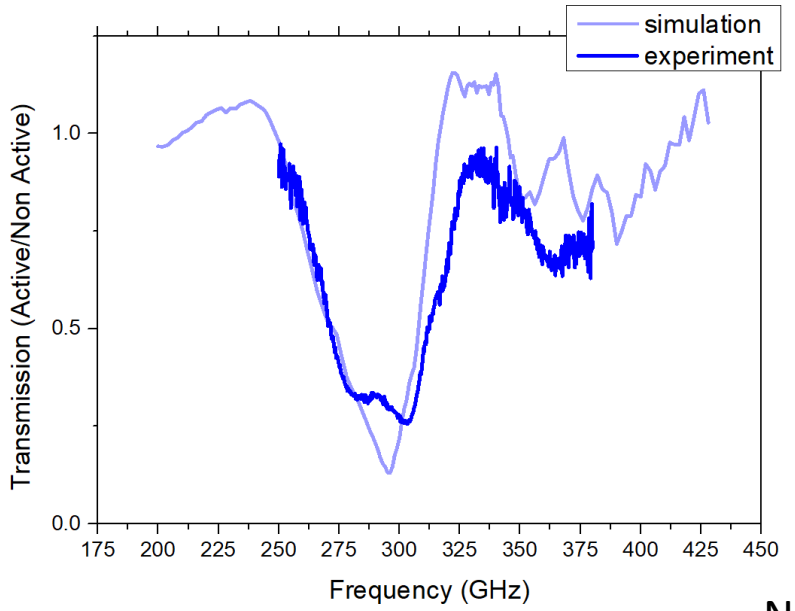
Universität Stuttgart

Antenna design and THz transmission characterization

7x7 antennas (Thickness 140nm)

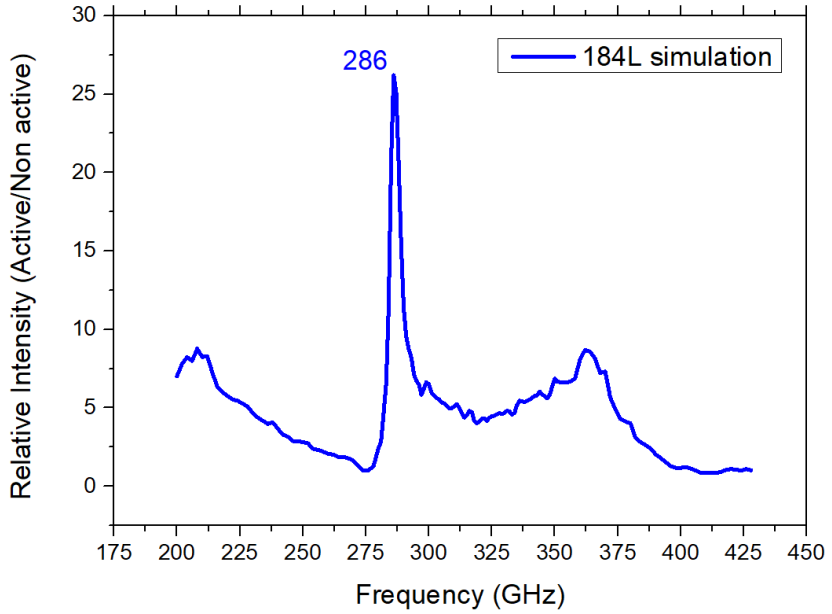


Quartz substrate (0001)K 500um thick and 3x3 square

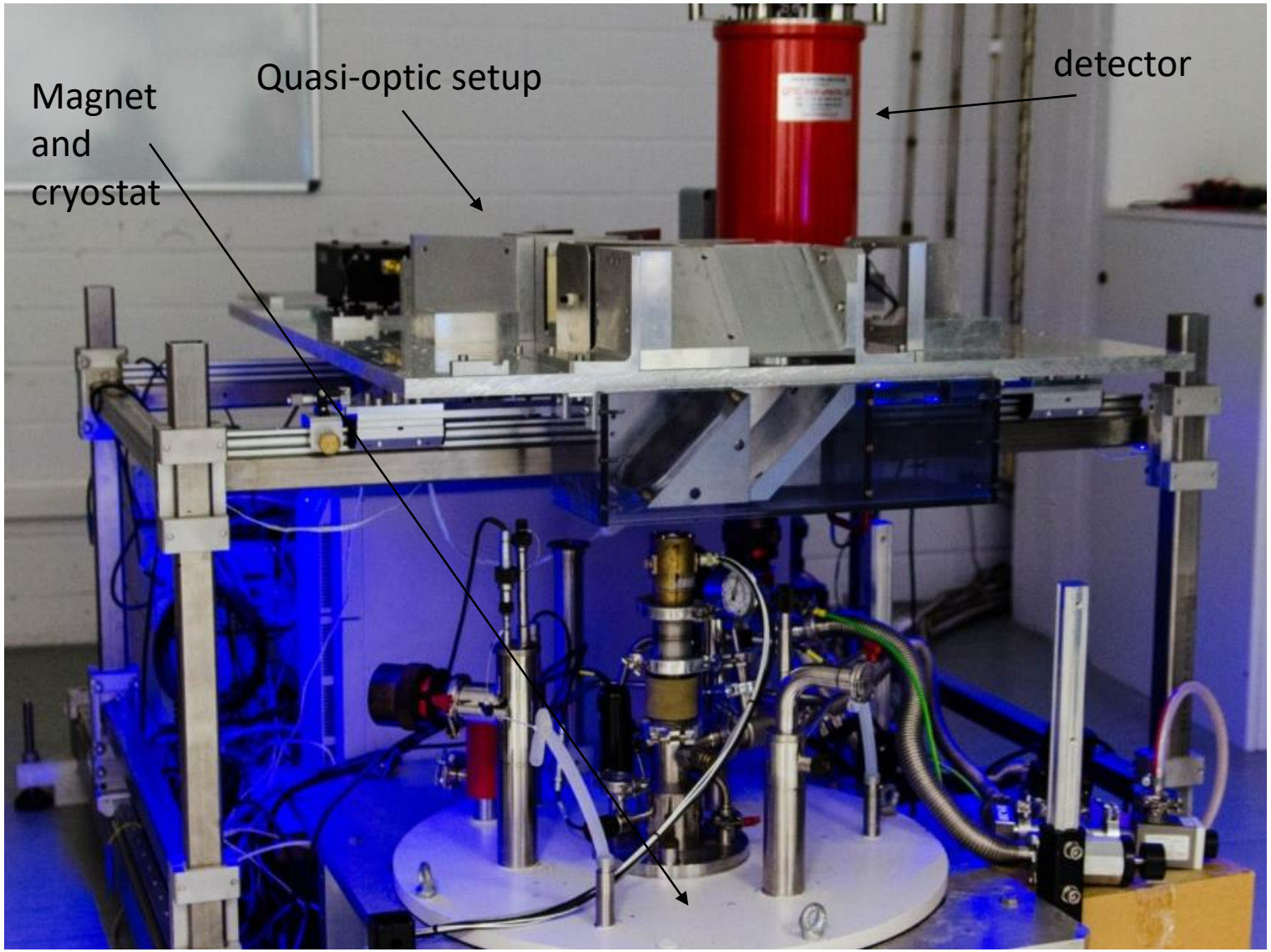


Far Field Simulation and Experiment

Near Field Simulation



High Field Electron Paramagnetic Resonance Spectroscopy



Analysis of the HFEPR results

Sample: TEMPOL 5% dispersed in PMMA and spin coated (film thickness 330nm)

TEMPOL has an electronic spin ½ with Landè factor g = 2

Measurements:

Active position

- Field/Frequency Maps (FFDMR) at **155°** and **245°** (T = 10 K)

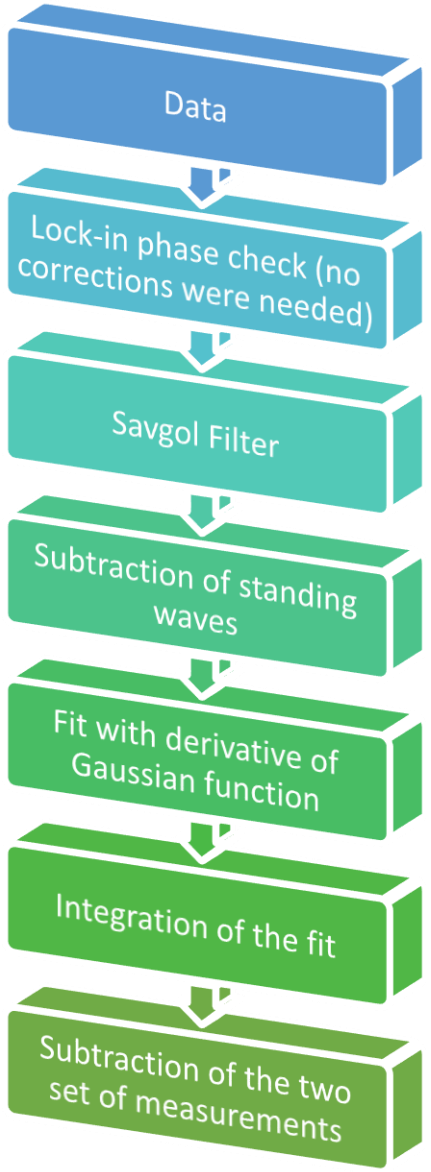
Non-Active position

Non-Active position

- Angle/Frequency Maps (AFDMR) at **287 GHz** and **310 GHz** (T = 10 K)

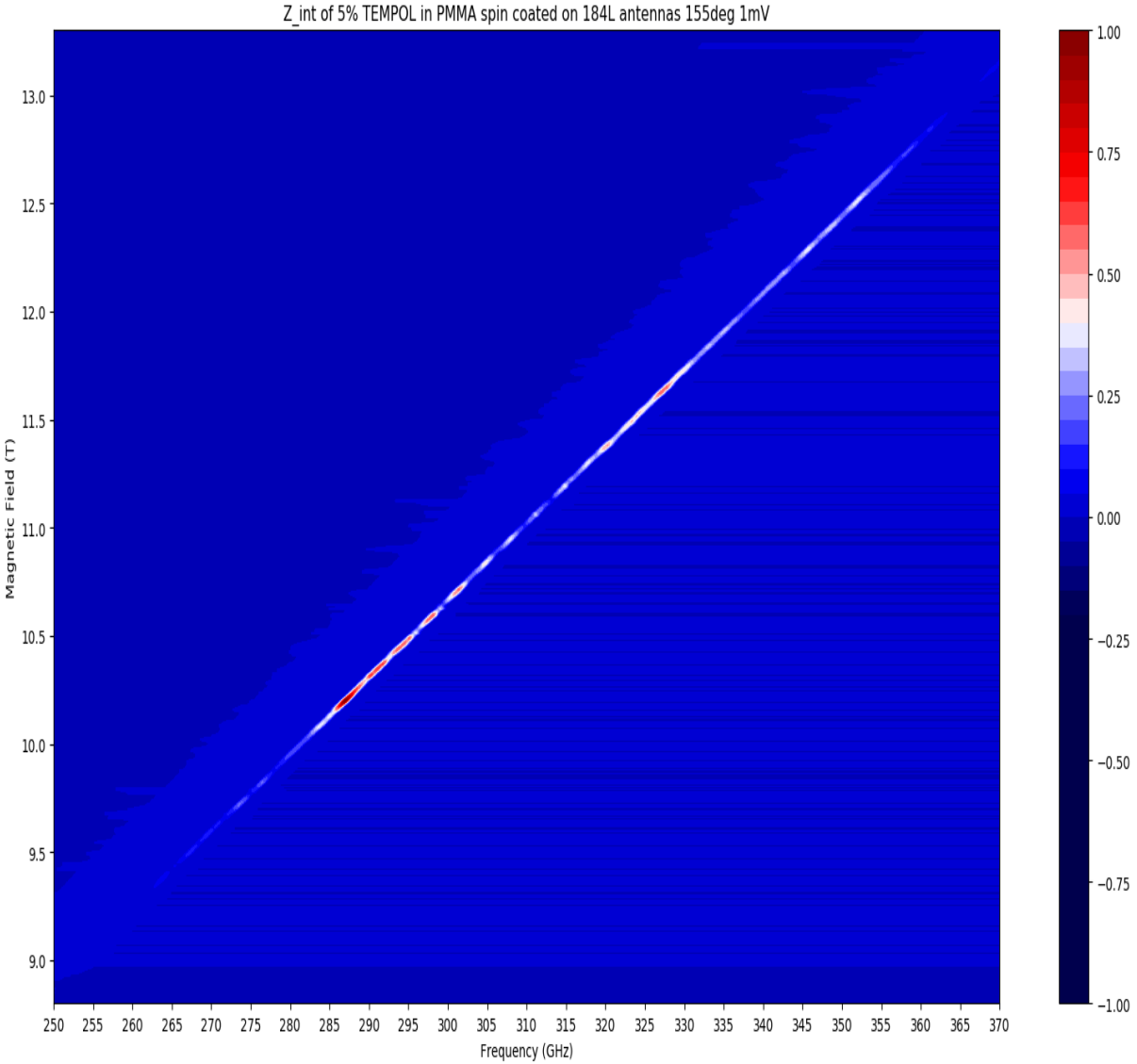
Active position

Analysis protocol:

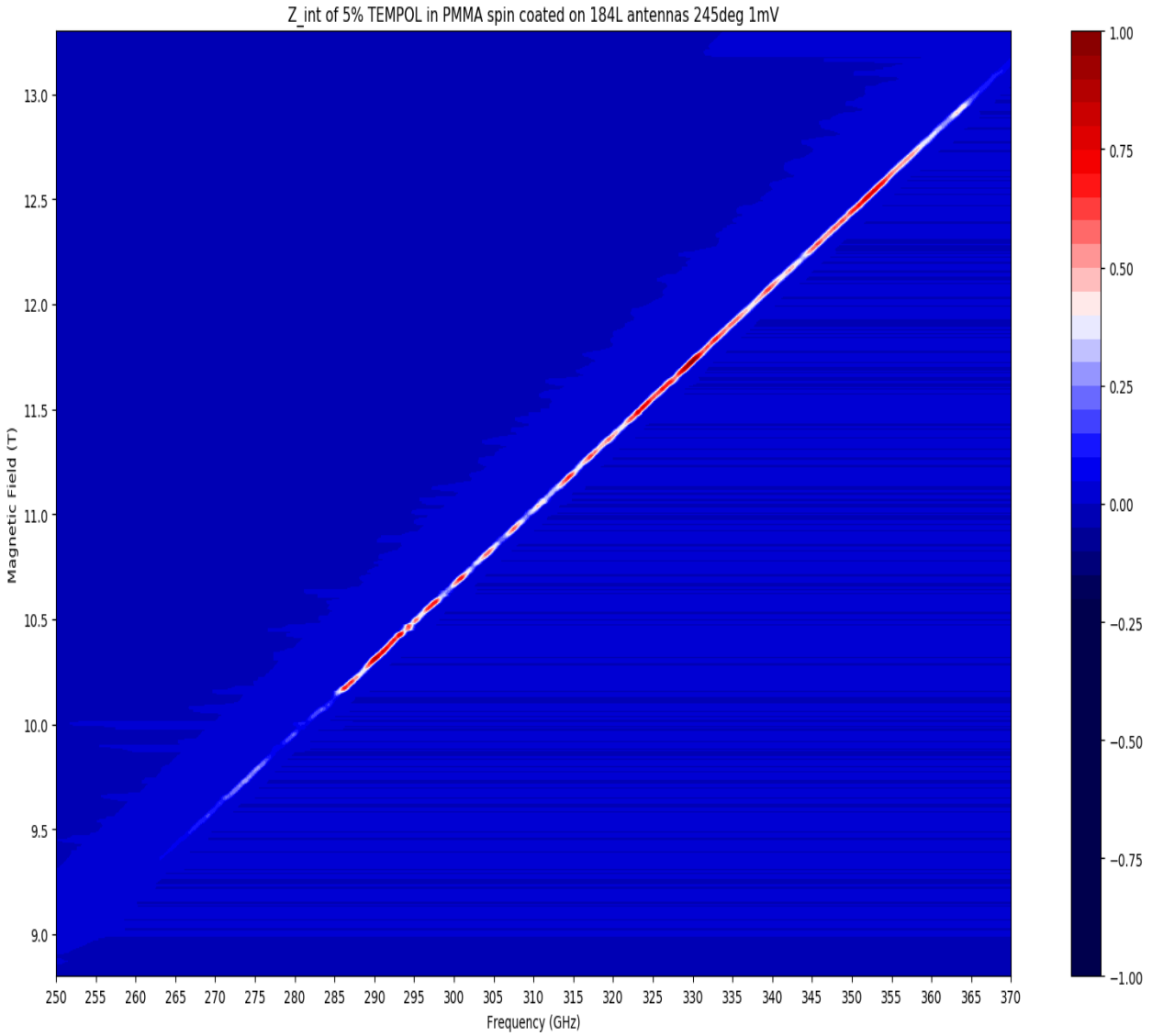


FFDMR Maps

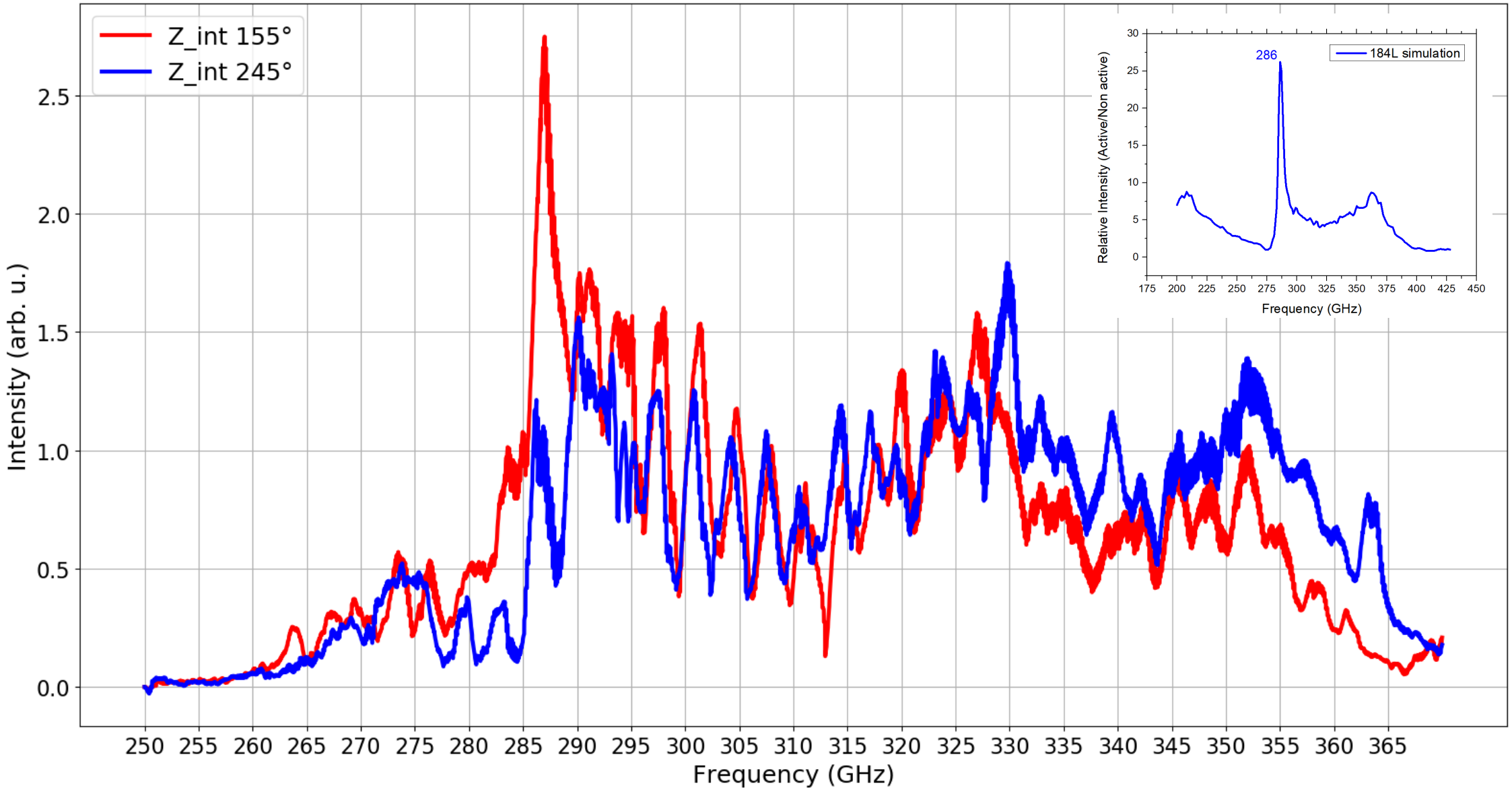
Active Position



Non-active Position

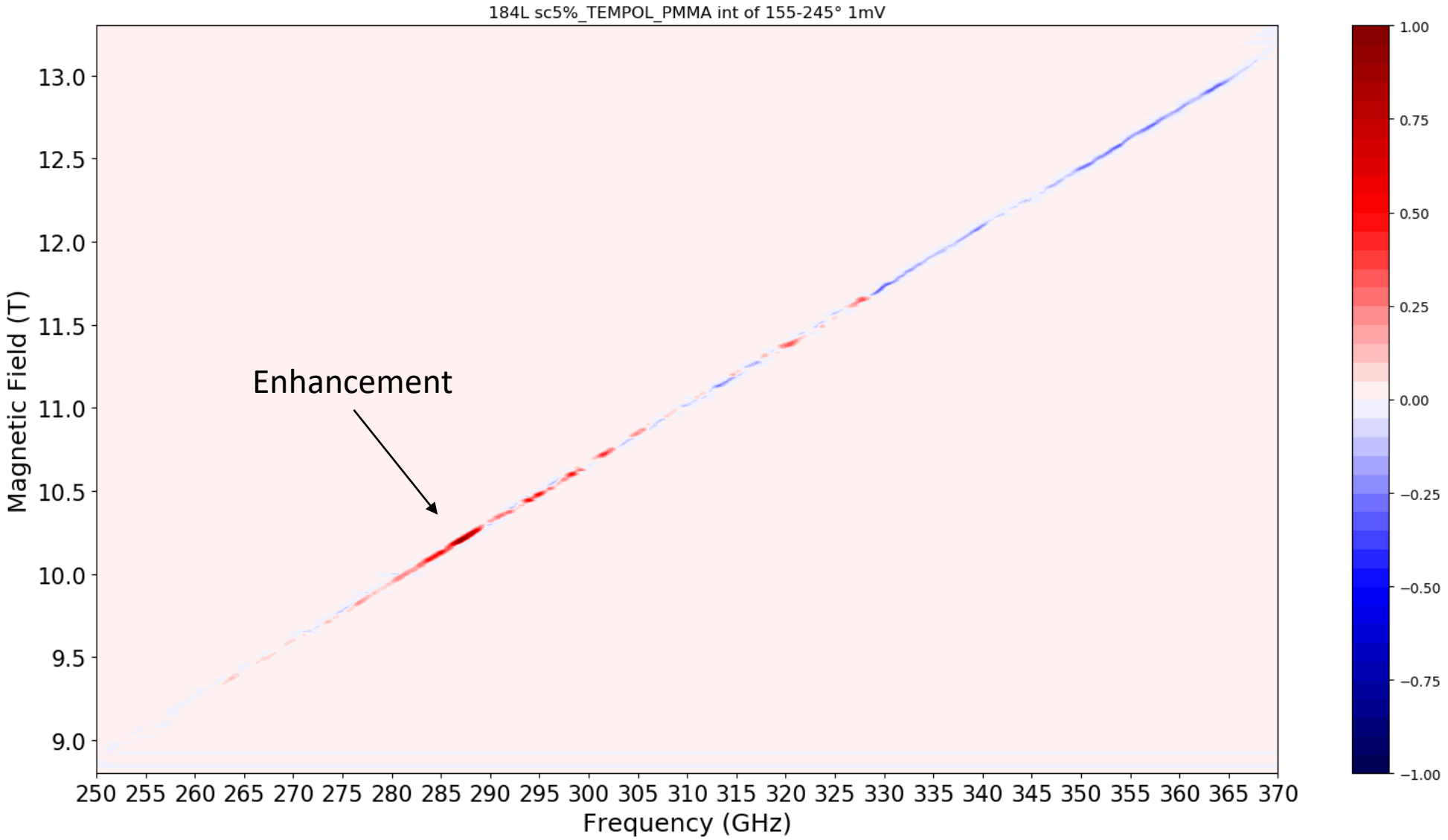


Results from the FFDMR Maps



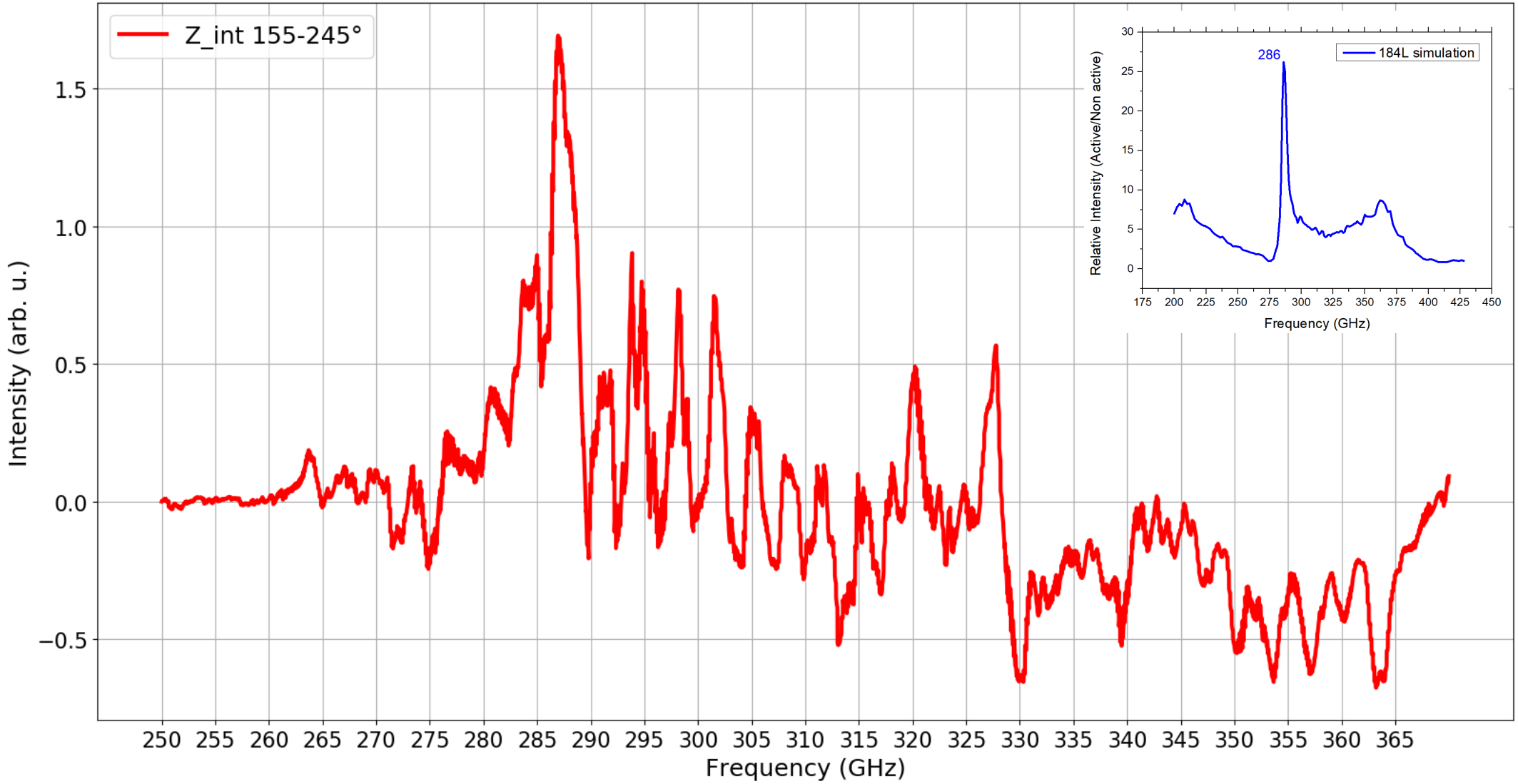
FFDMR Maps

Active – Non active Position

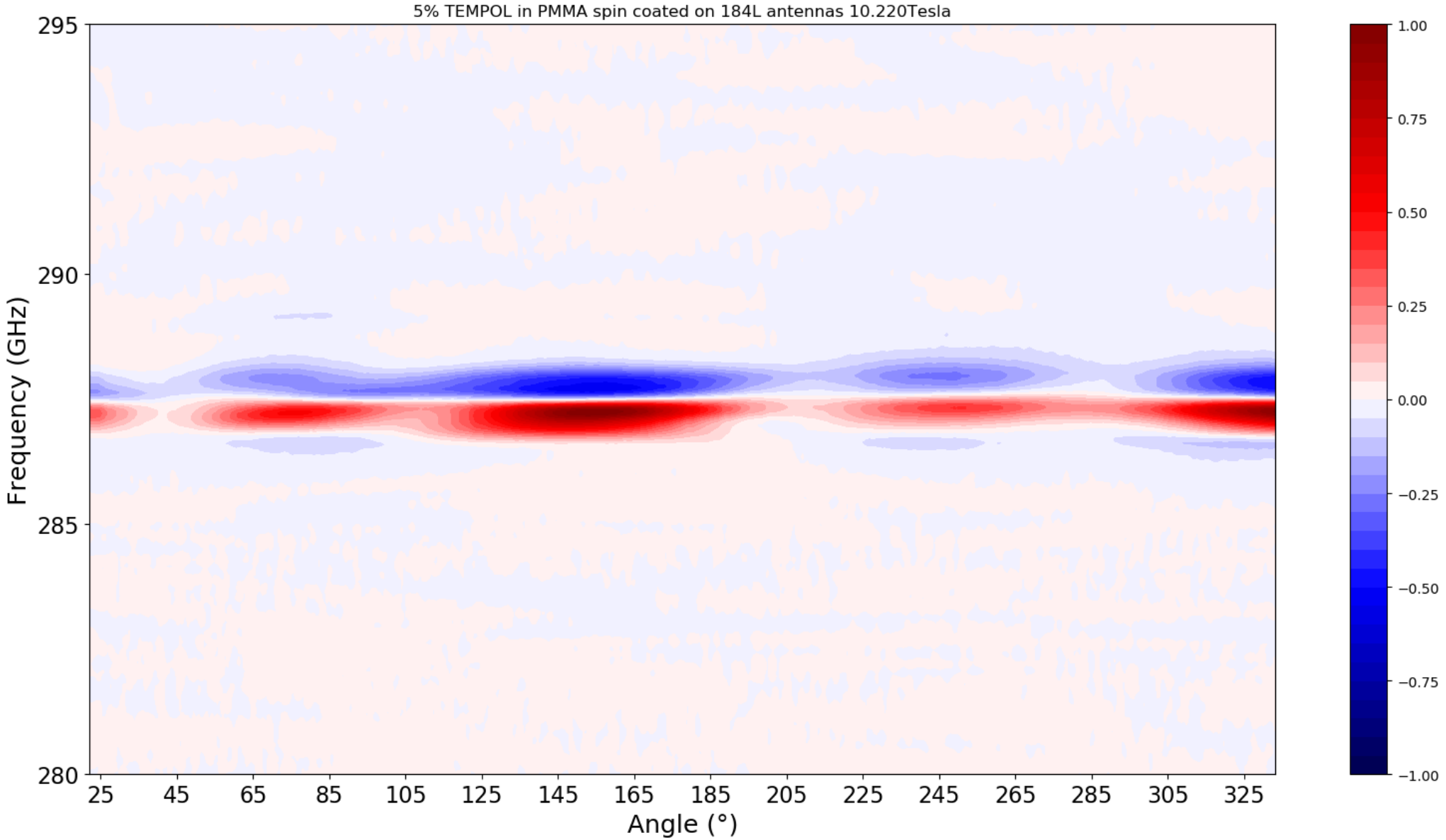


Results from the FFDMR Maps

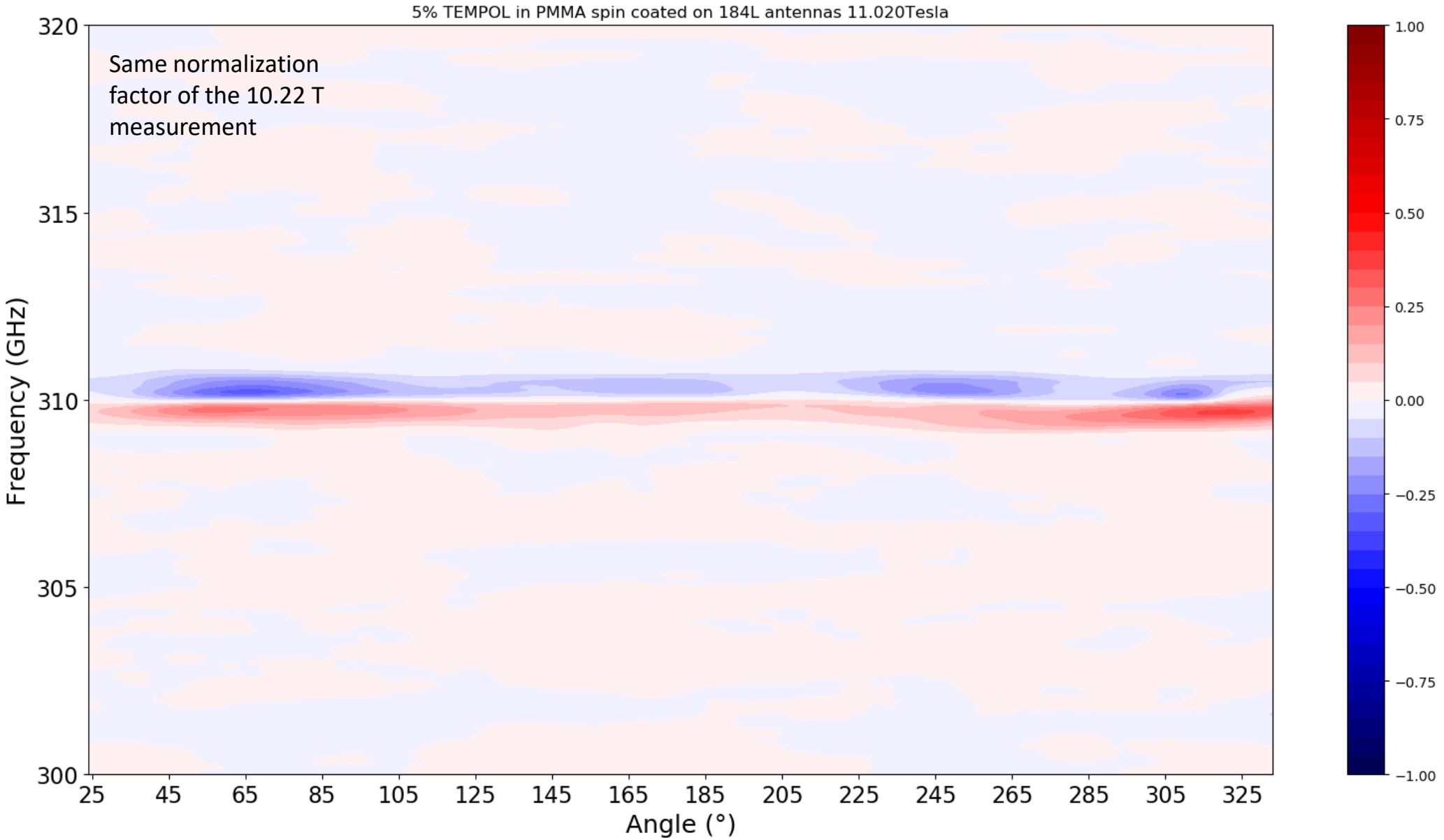
Active – Non active Position



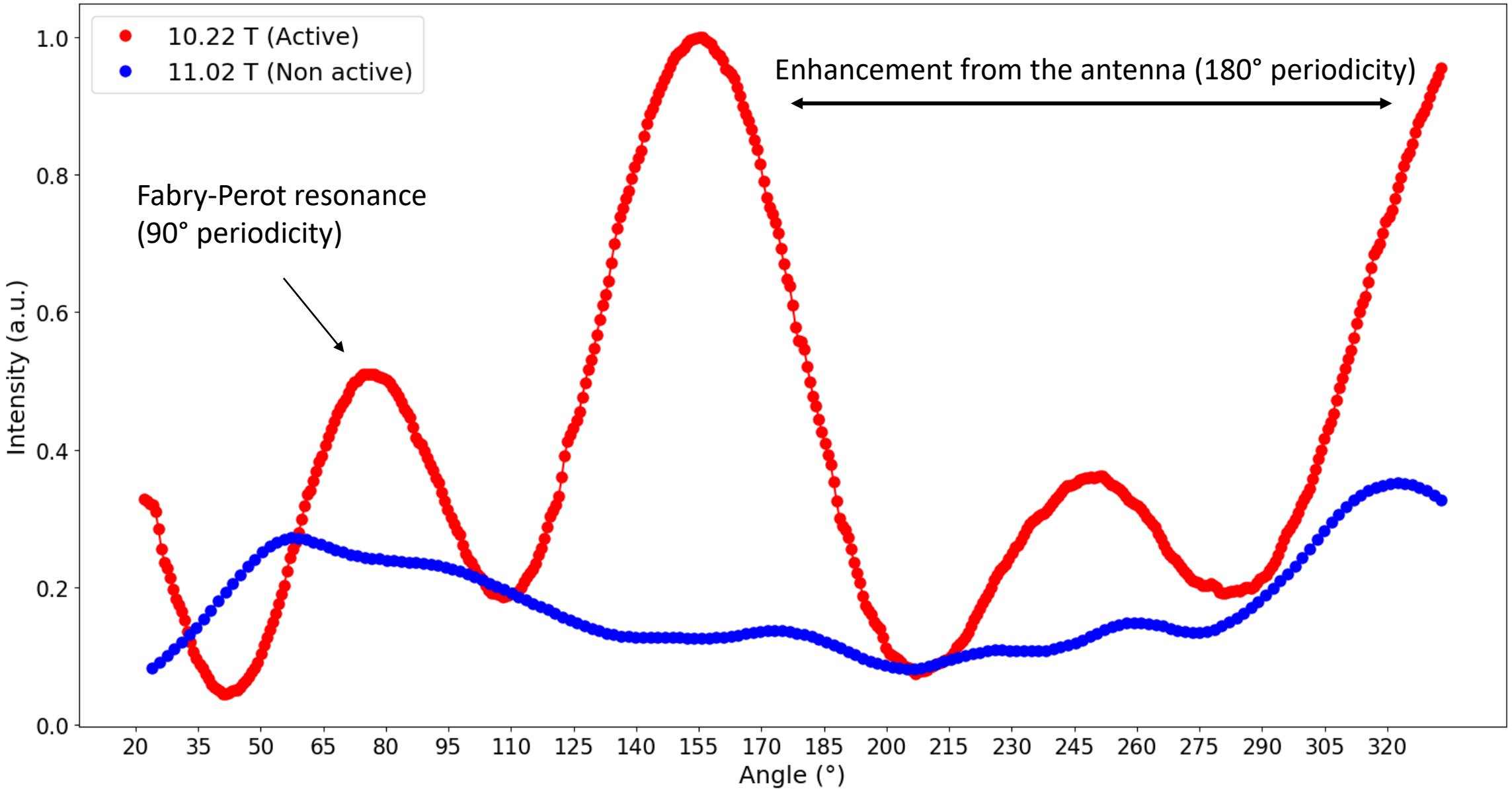
AFDMR Maps (Active position)



AFDMR Maps (Non-Active position)



Results from AFDMR Maps



Analysis of the HFEPR results

Sample: TEMPOL 5% dispersed in PMMA and spin coated **on bare quartz** (film thickness ca. 400nm)

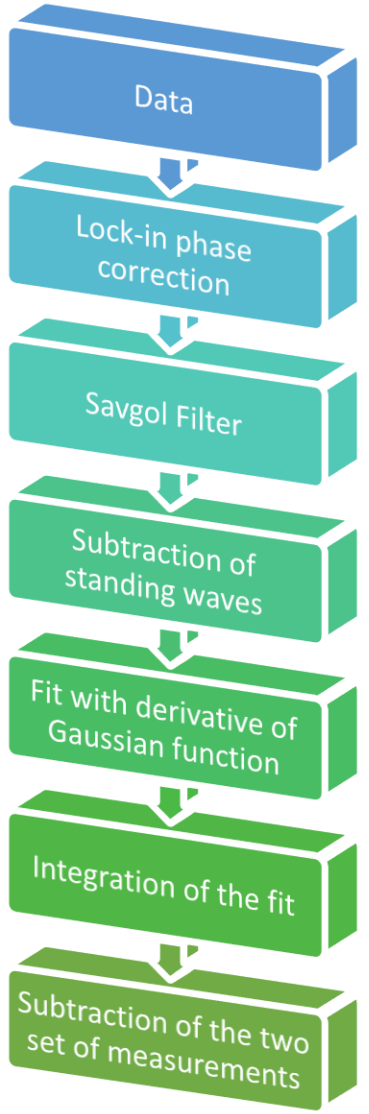
Measurements:

- Field/Frequency Maps (FFDMR) at **186°** and **276°** (T = 10 K)

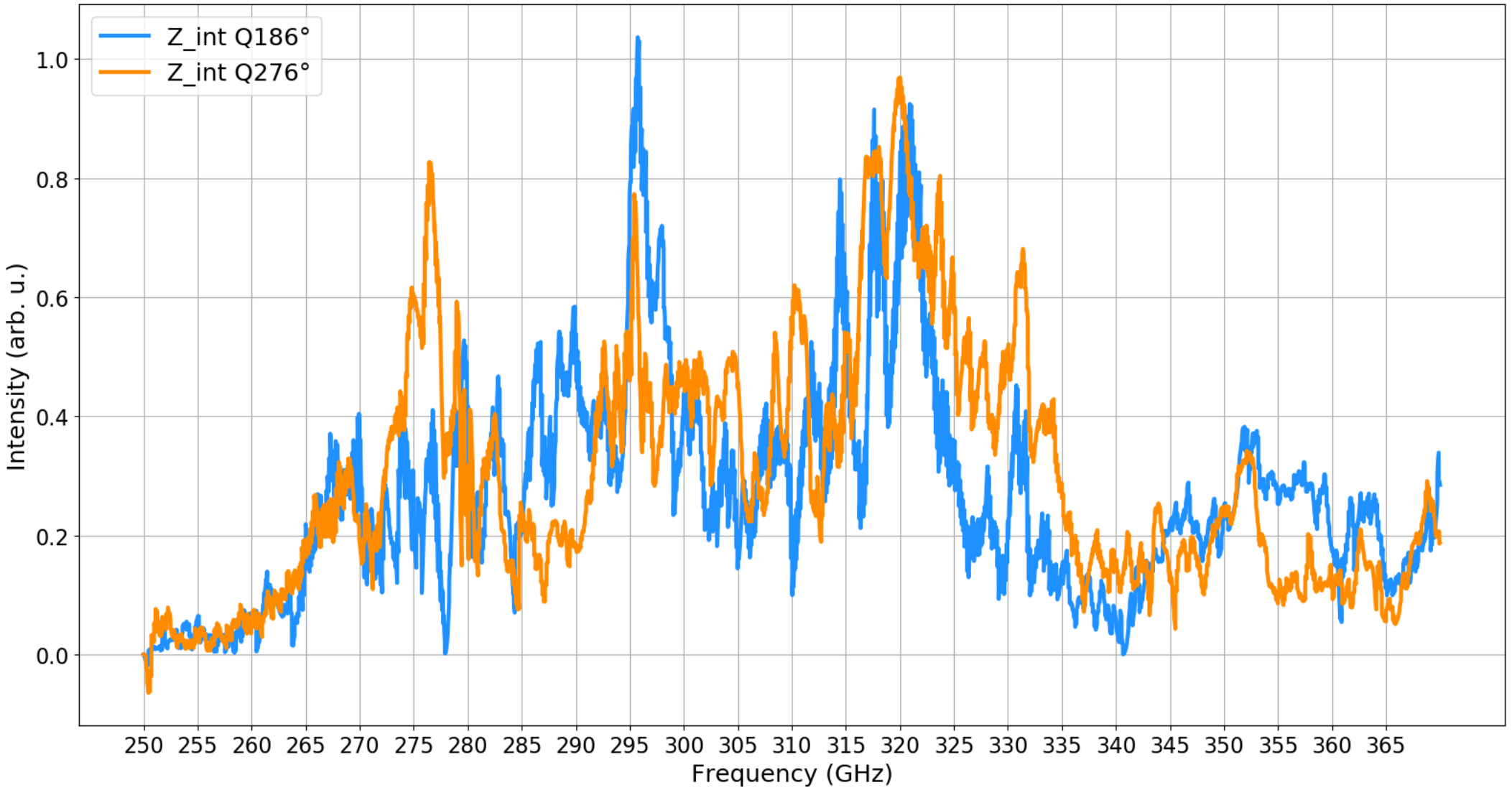
circa previous non-Active position

circa previous Active position

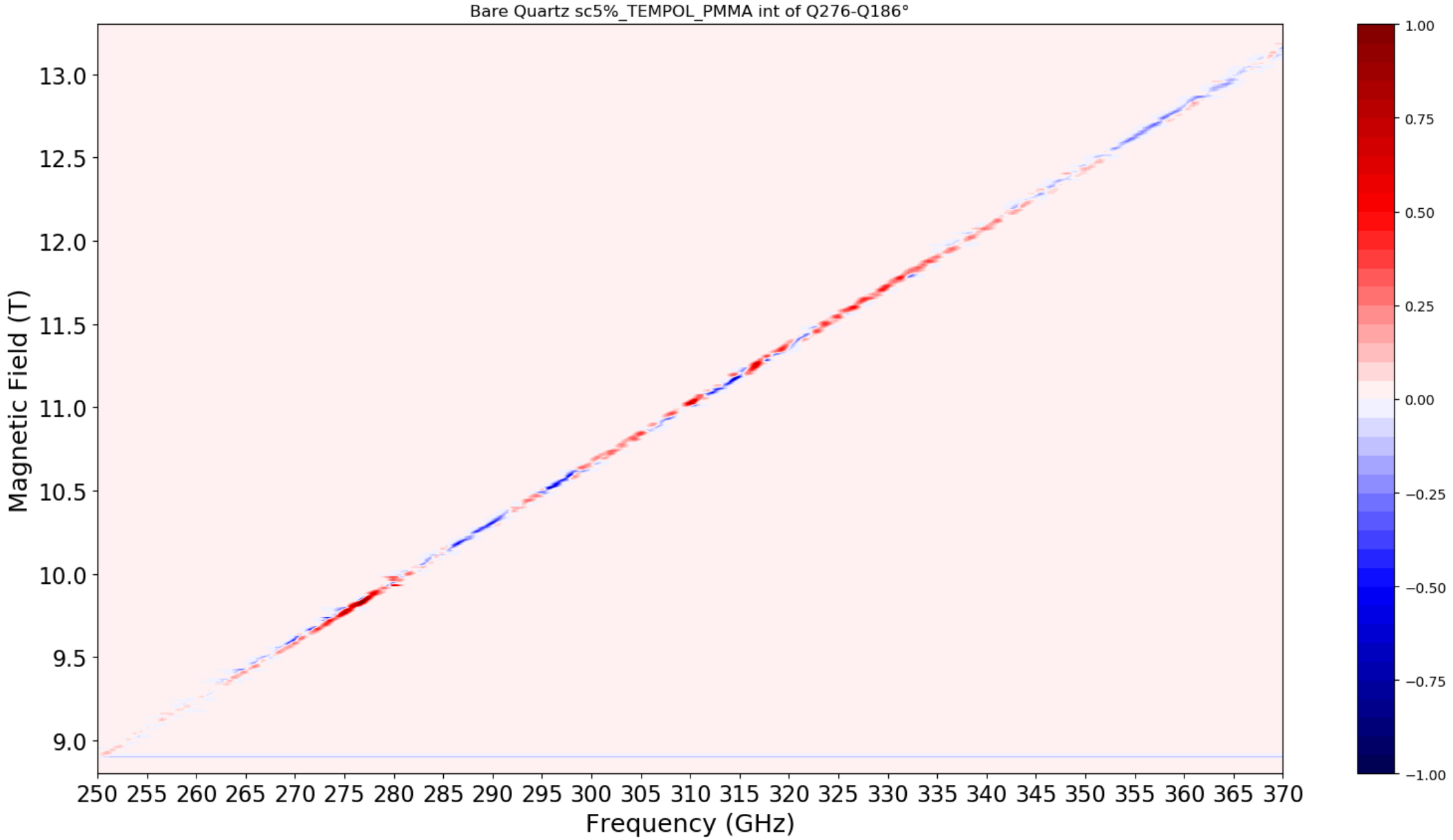
Analysis protocol:



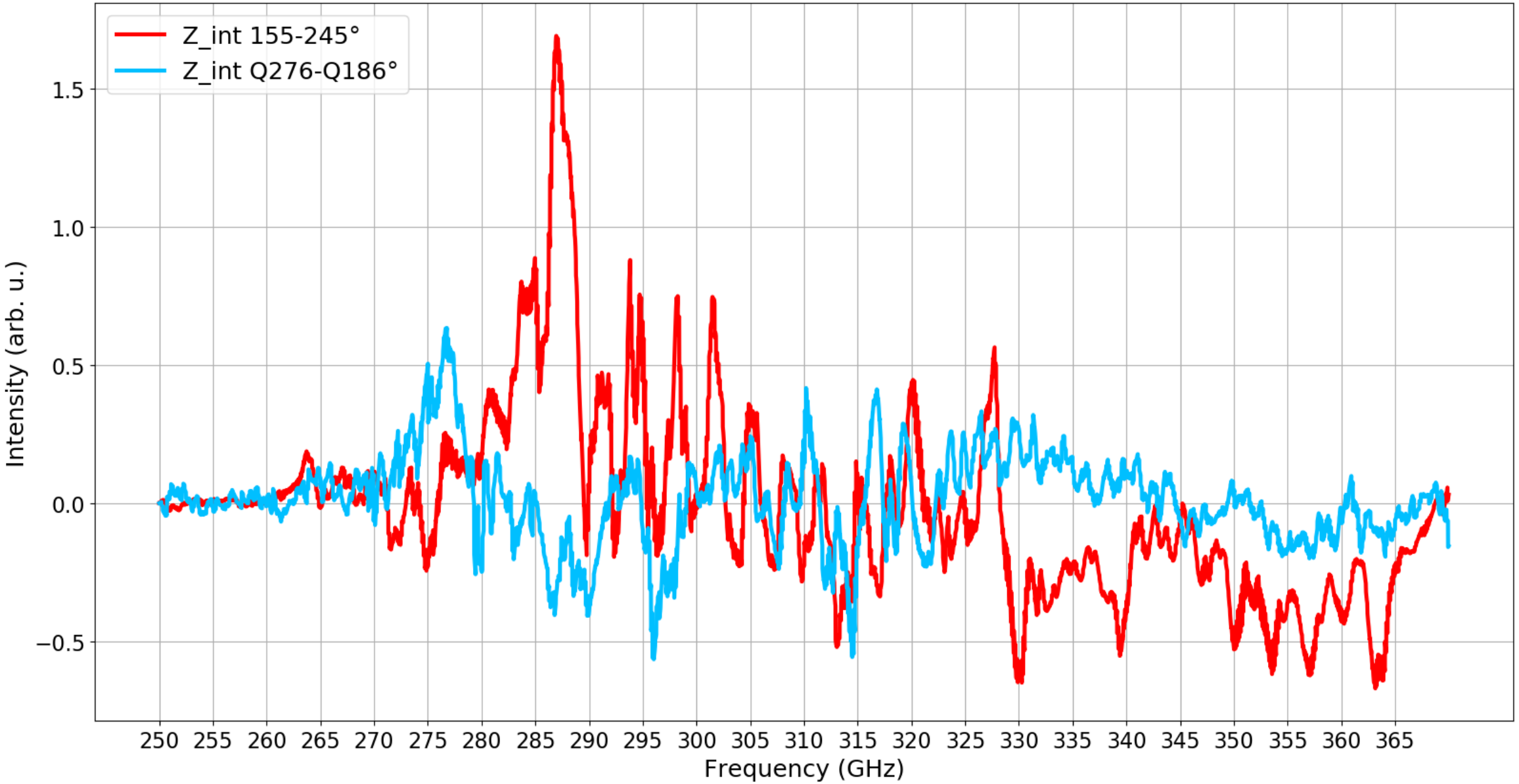
Results from the FFDMR Maps



FFDMR Maps


Bare Quartz sc5%_TEMPOL_PMMA int of Q276-Q186°
Magnetic Field (T)
13.0
12.5
12.0
11.5
11.0
10.5
10.0
9.5
9.0
250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370
Frequency (GHz)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00

Results from the FFDMR Maps



Conclusions and perspectives

- FFDMR Maps show a difference of behaviour when antennas are in active or non-active position, in particular an enhancement is observed in active-position at the expected frequency;
- AFDMR Maps show an enhancement with 180° periodicity, in agreement with antennas symmetries. A further 90° periodicity is evidenced an attributed to Fabry-Perot resonaces in quartz;
- FFDMR Maps of a sample without antennas show no enhancement;
- Perspectives: Self-Assembled Monolayer of radicals or magnetic molecules addressed directly on top of the antennas: