



Radiantum

WIRELESS PERFORMANCE MATTERS

**Tri Plus Grupa
#2318 – Alloyhub
Measurement report
4-Aug-22
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SUMMARY

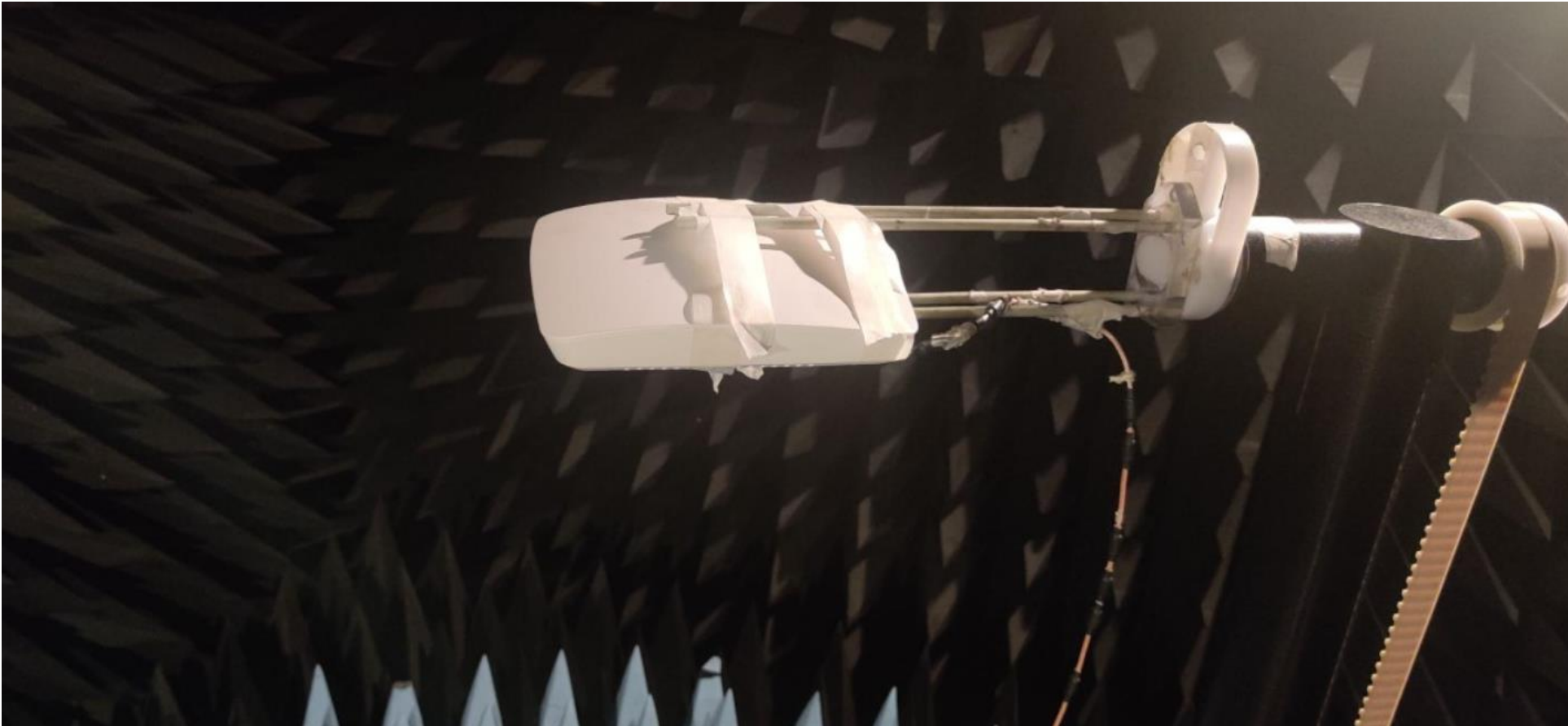
- All antennas tuned and results presented
 - LTE main
 - LTE Diversity
 - Z-wave
 - Dual band WiFi
- All antennas have very good performance

PROJECT SCOPE/TARGETS

- Antenna tuning and matching circuit design
- Measure all antennas in free space
- Deliver new matching circuit values
- Good performance in all bands

DUTs

- LTE hub



EFFICIENCY AND TRP TEST SETUP

- Passive (efficiency & gain) and active (TRP & EIRP) measurements are done at anechoic antenna chamber
- Chamber size is 3x3x5m



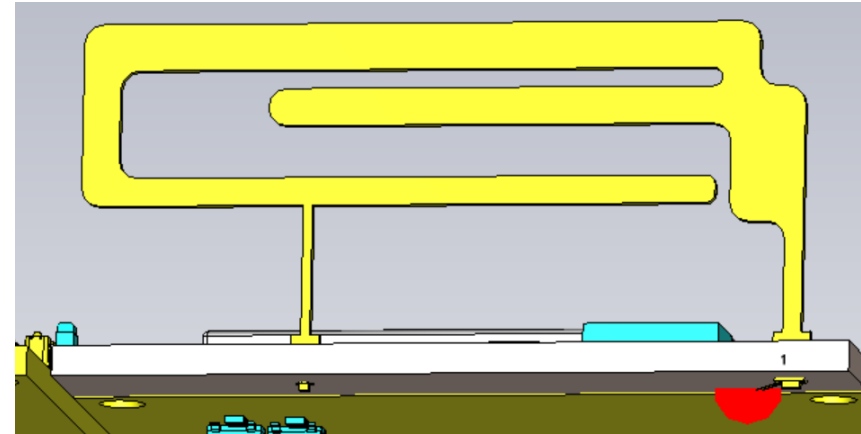
S11 TEST SETUP

- Antenna tuning (S11) was measured with VNA
- Measurements were done at free space

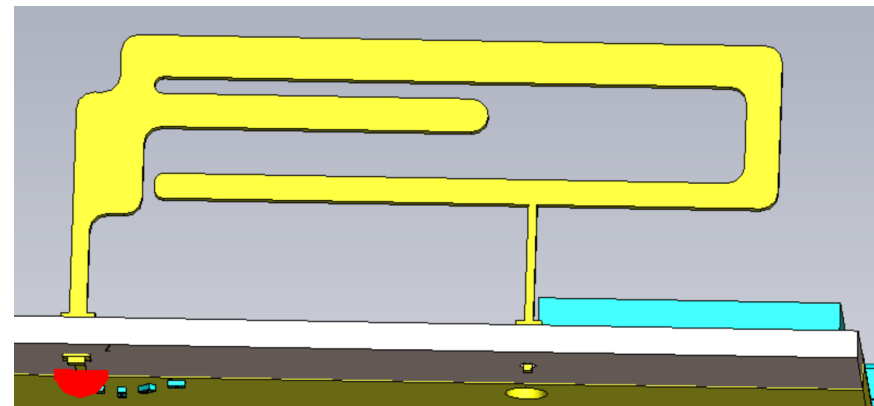


LTE antennas

- Metal strip antennas
 - Main
 - Diversity



Main LTE

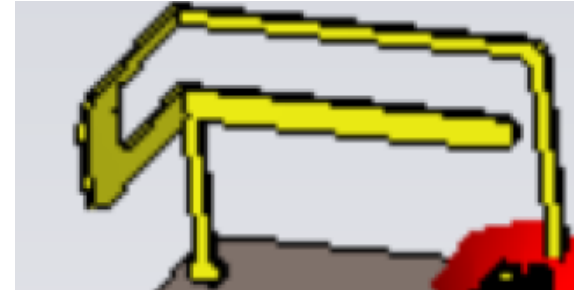


Diversity LTE

WIFI & Z-Wave antennas

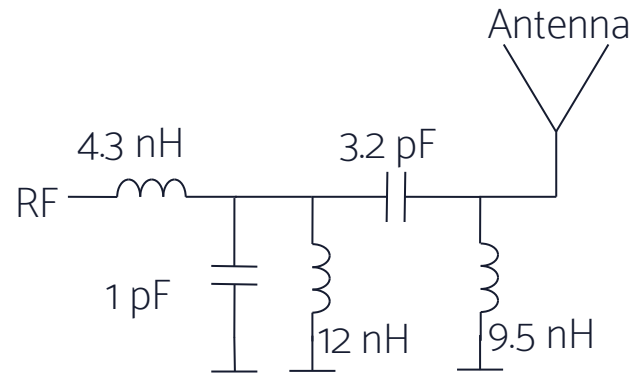


WIFI LTE

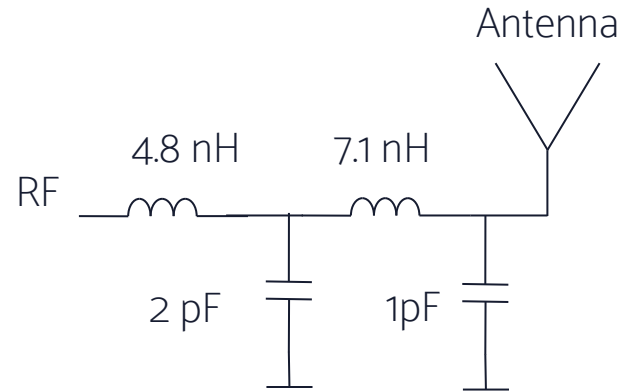


Z-wave Antenna

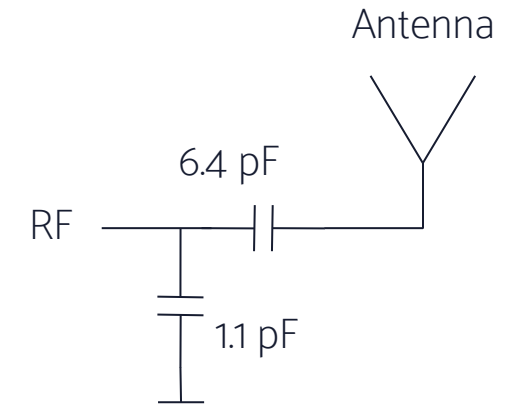
NEW MATCHING COMPONENTS



LTE Main antenna

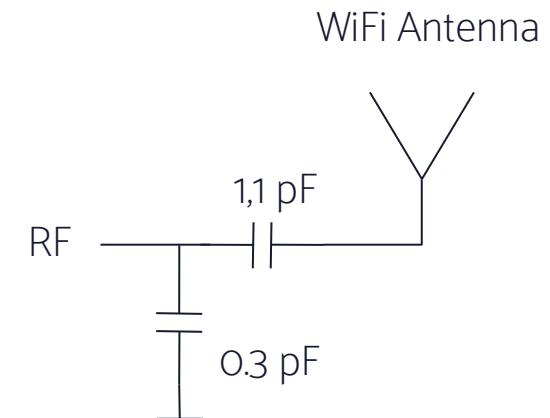


LTE Div antenna

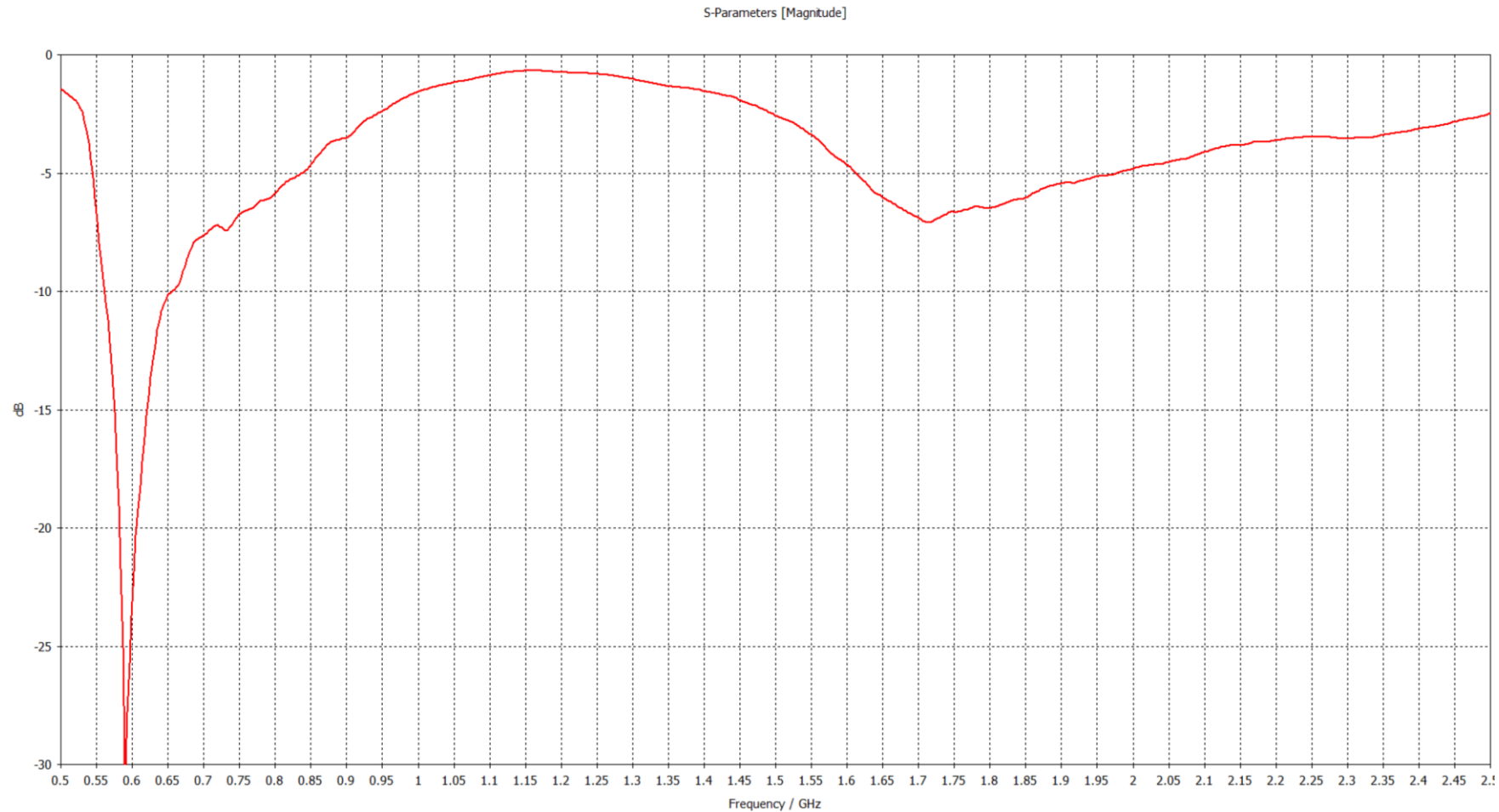


Z-wave antenna

- Murata GJM15 capacitors
- Murata LQW15 coils

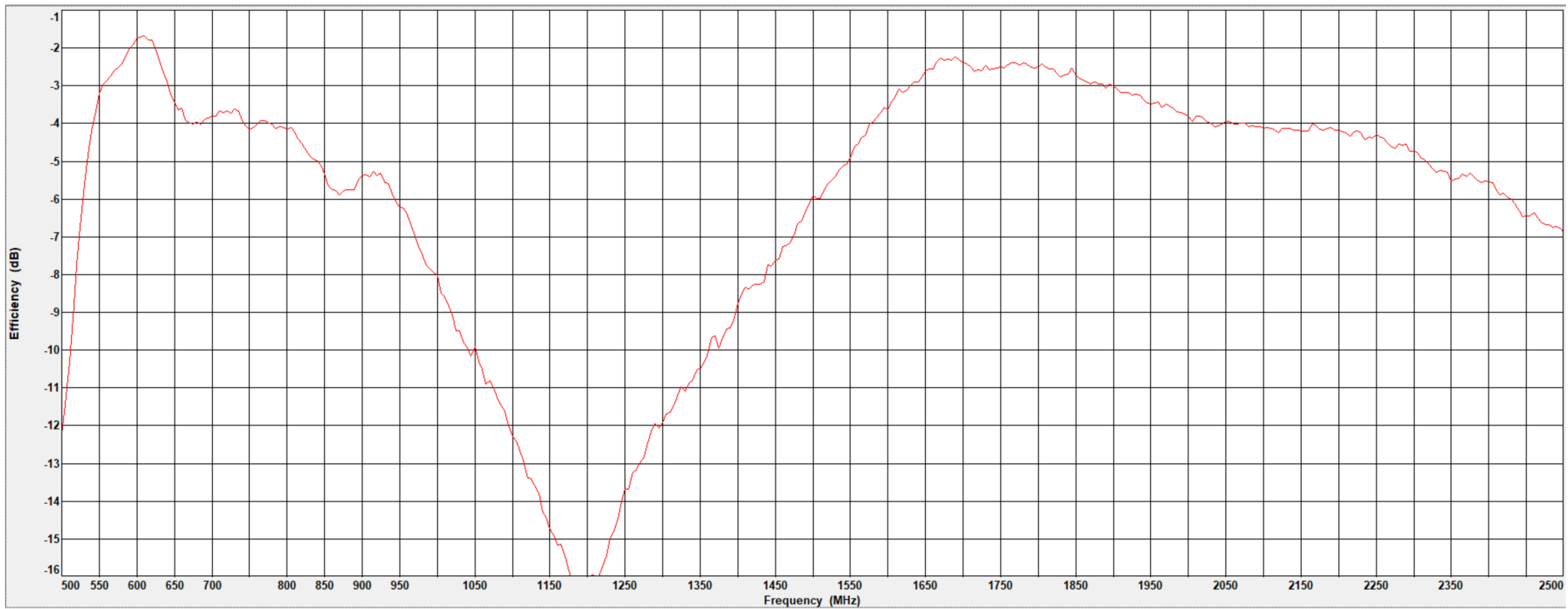


LTE Main S11 RESULTS

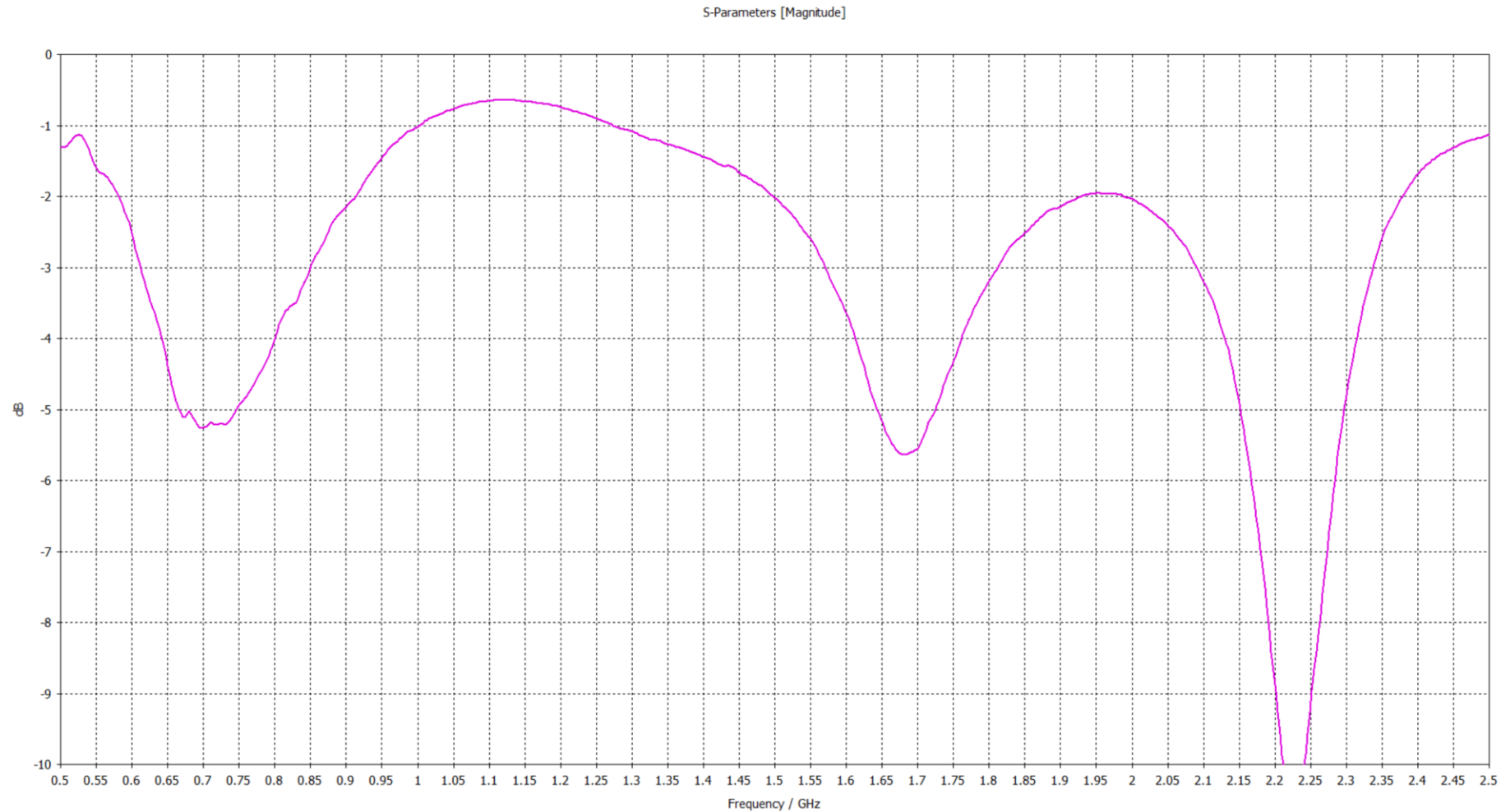


LTE main antenna efficiency

- 600-700 MHz efficiency is not correct, because chamber calibration accuracy. There might be ~2 dB difference to real performance

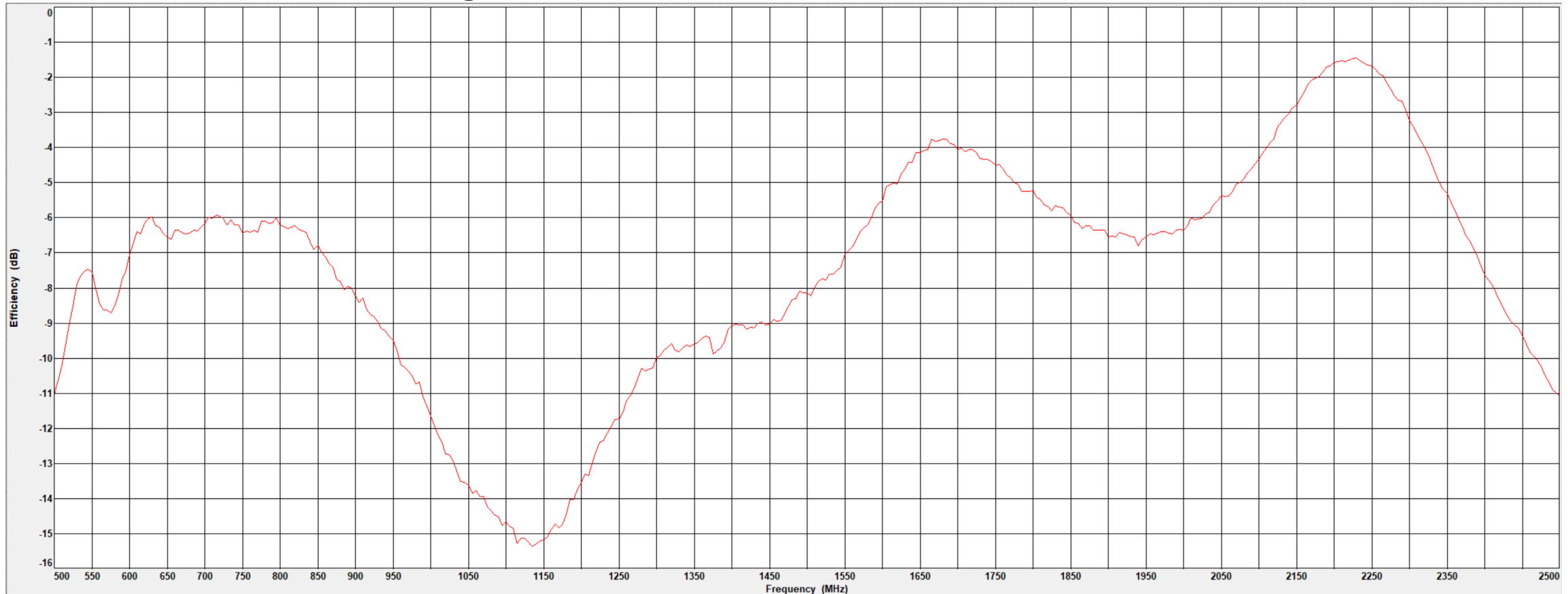


LTE Div S11 RESULTS

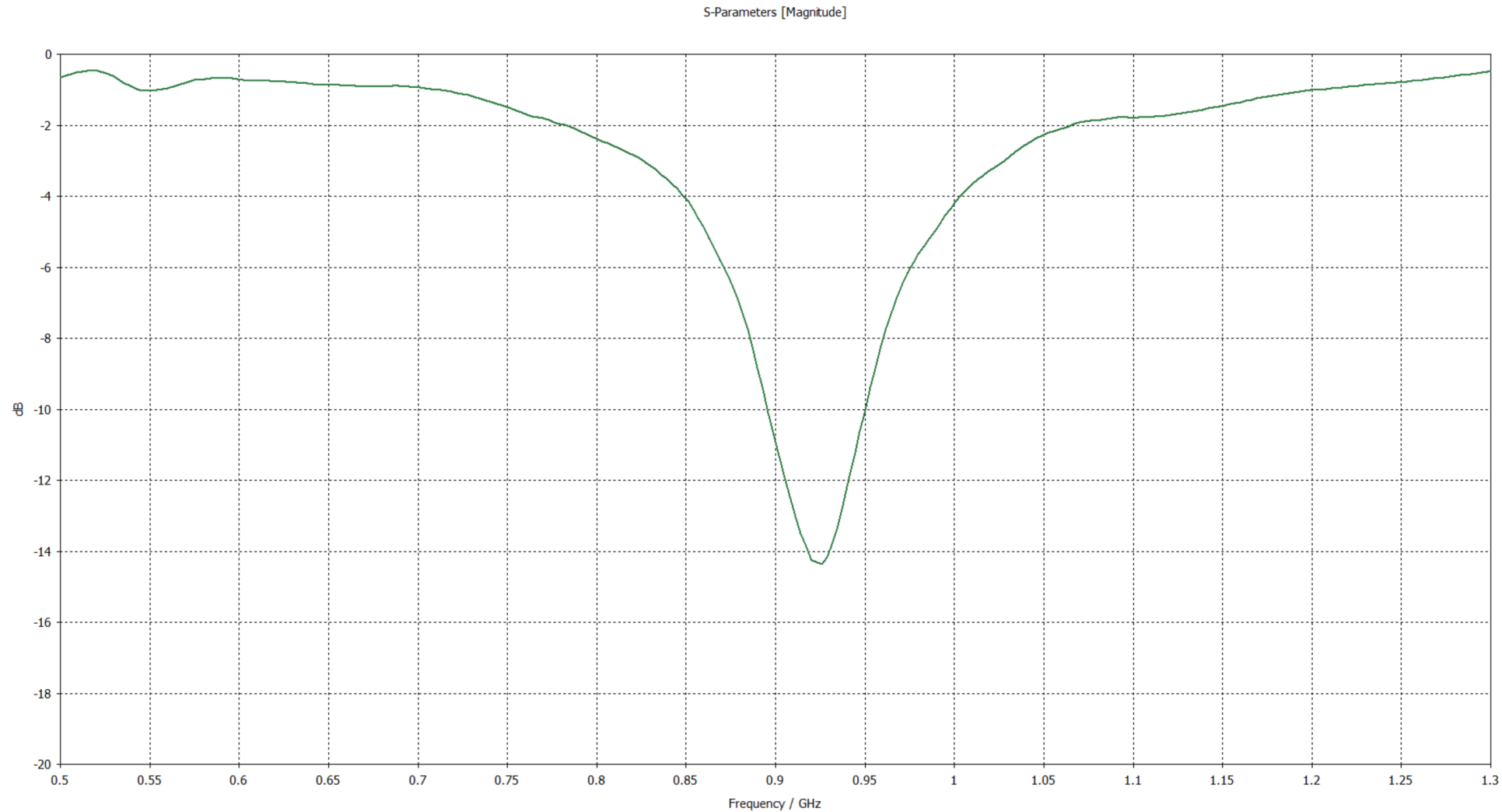


LTE div antenna efficiency

- 600-700 MHz efficiency is not correct, because chamber calibration accuracy. There might be ~2 dB difference to real performance

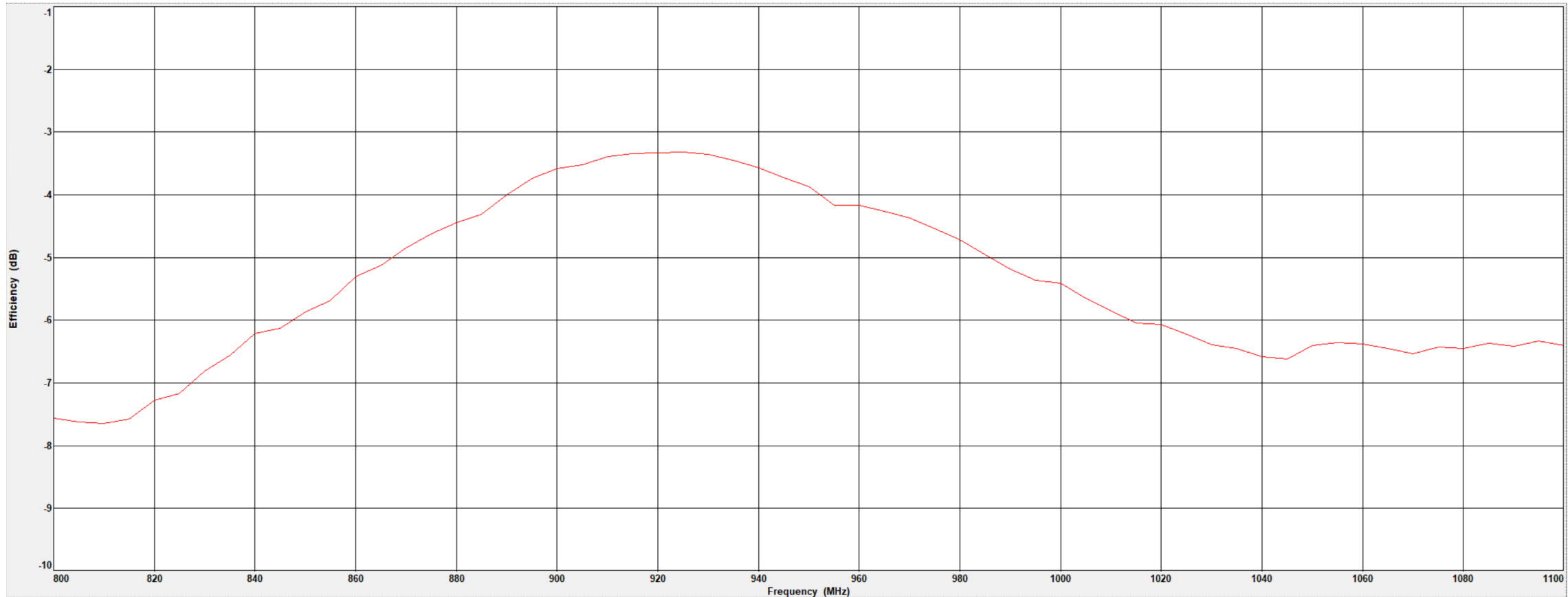


Z-Wave S11 RESULTS

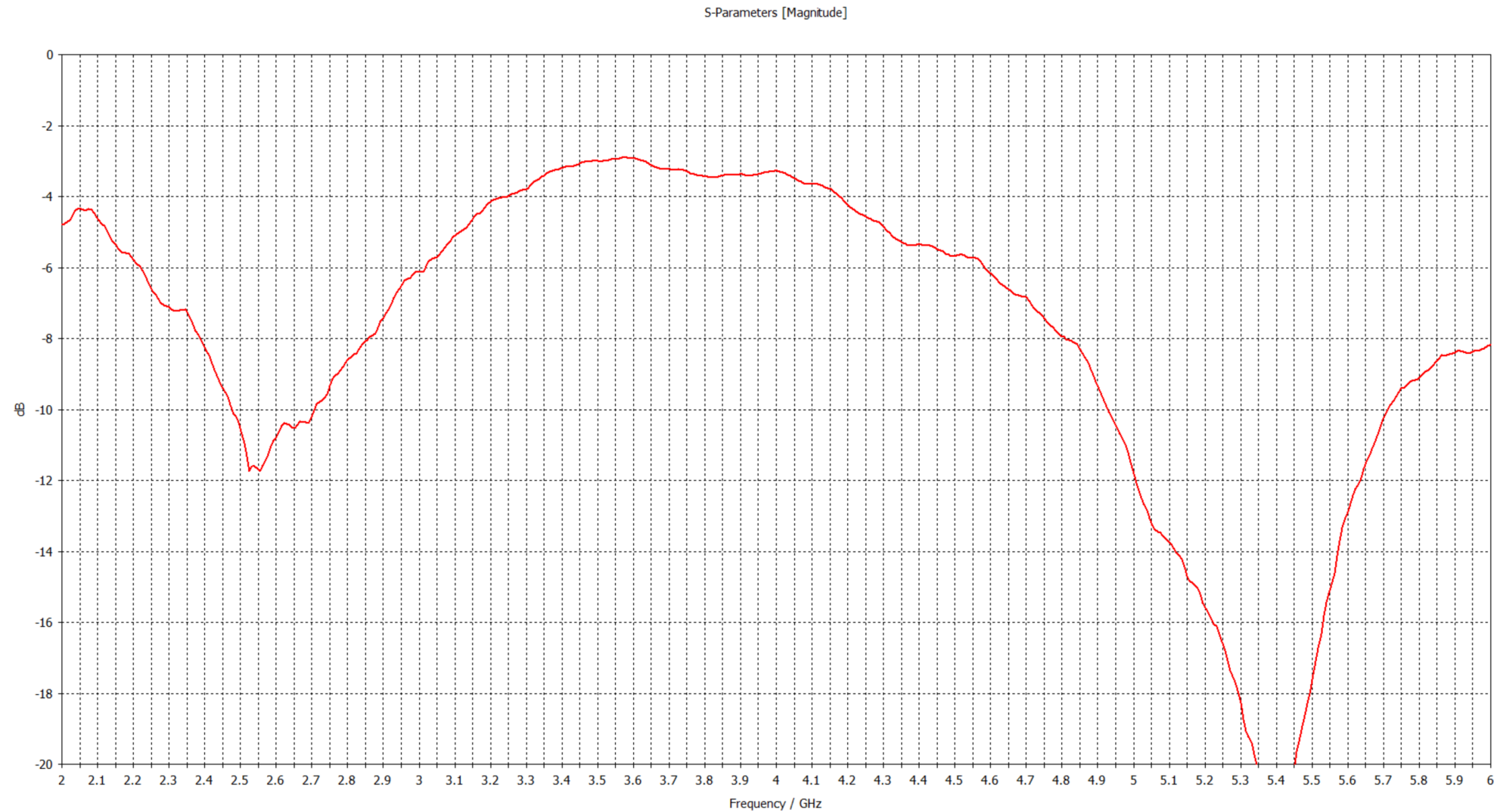


Z-wave antenna efficiency

- Good efficiency with wide BW

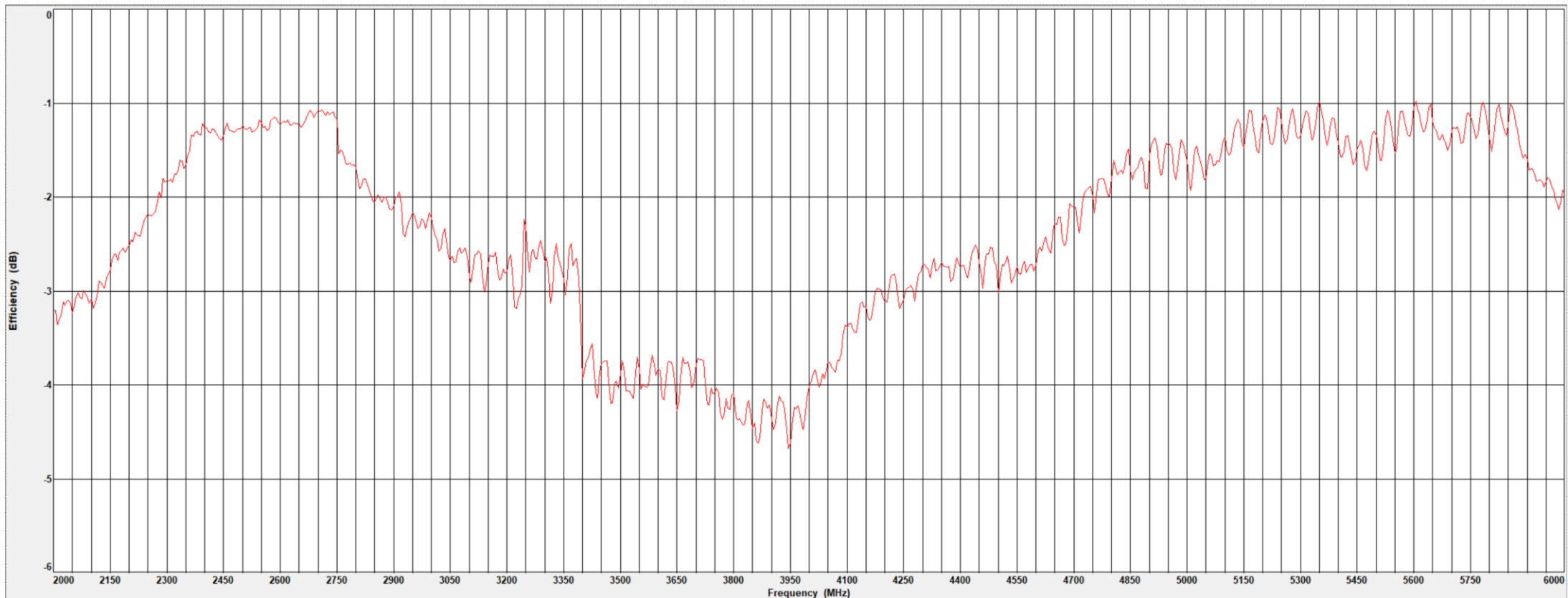


WiFi S11 RESULTS

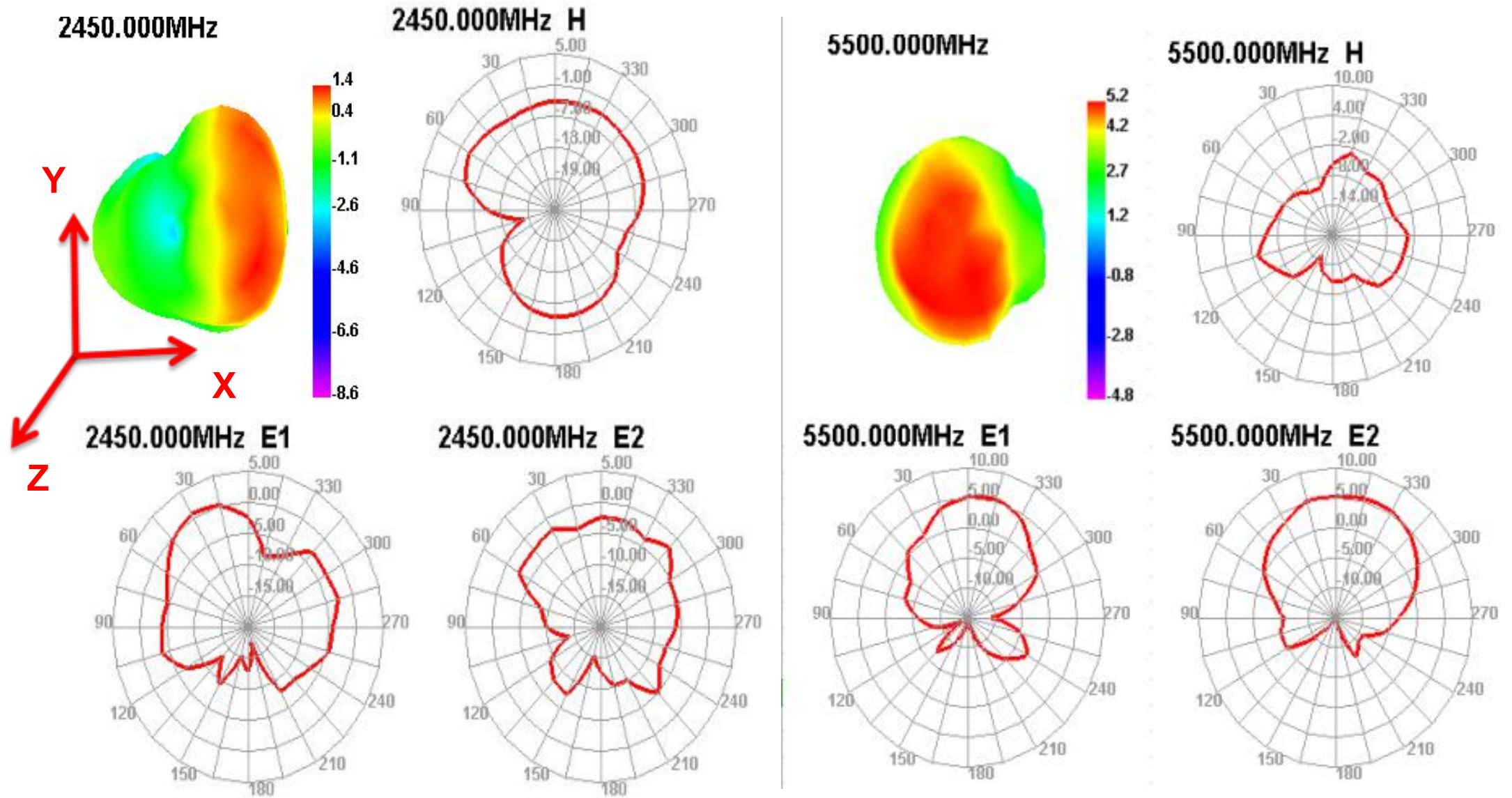


WiFi antenna efficiency

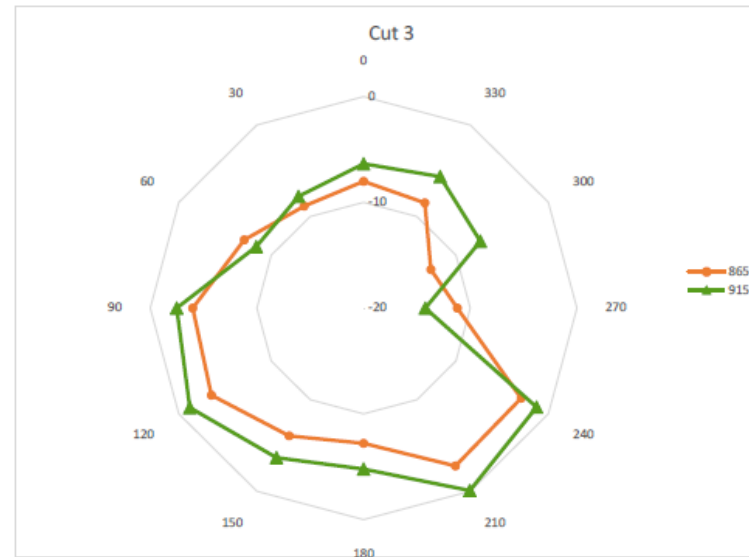
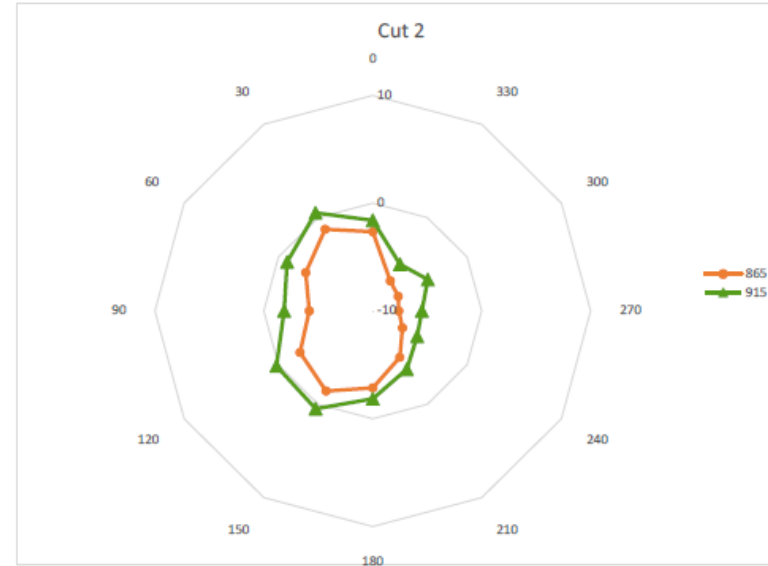
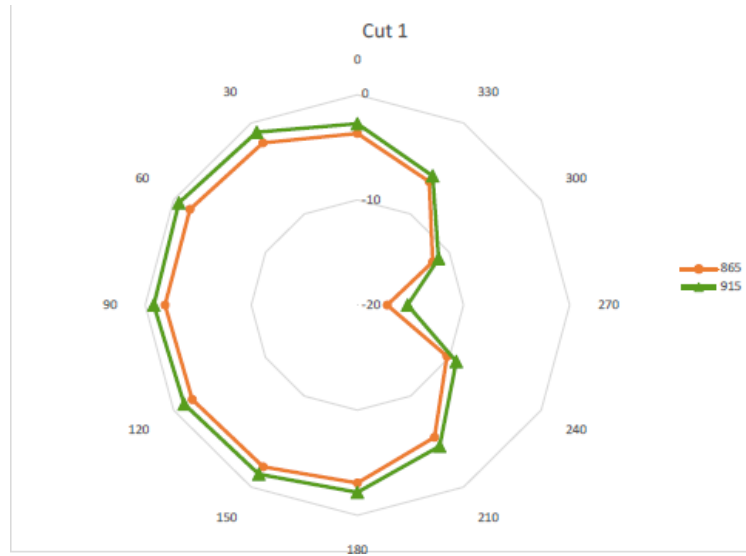
- Good radiation in both WiFi bands



BT/WIFI Antenna test result



Z-wave Antenna test result



WIFI 2.4G (Efficiency and Gain Test Data)

Passive Test For WIFI2400										
Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)	Gain (dBd)	UHS (%)	DHS (%)	Max (dB)	Min (dB)	Attenut Hor	Attenut Ver
2400	45.43	-3.43	2.4	0.25	17.056	28.372	2.4	-11.53	48.5	49.05
2410	44.85	-3.48	2.28	0.13	16.694	28.156	2.28	-13.17	48.56	49.2
2420	44.57	-3.51	2.24	0.09	16.595	27.975	2.24	-14.56	48.71	49.26
2430	41.99	-3.77	1.96	-0.19	15.76	26.234	1.96	-16.39	48.7	49.24
2440	39.62	-4.02	2.28	0.13	15.099	24.518	2.28	-18.1	48.77	49.27
2450	38.55	-4.14	2.36	0.21	15.046	23.503	2.36	-19.15	48.81	49.22
2460	37	-4.32	1.89	-0.26	14.904	22.093	1.89	-18.76	48.6	49.13
2470	36.89	-4.33	1.92	-0.23	15.367	21.521	1.92	-20.92	48.68	49.03
2480	39.63	-4.02	2.14	0.19	16.925	22.707	2.14	-17.83	48.8	49.18
2490	44.17	-3.55	2.68	0.77	18.944	25.224	2.68	-14.84	49.09	49.47
2500	46.51	-3.32	3.00	0.96	19.826	26.684	3.11	-12.52	49.11	49.59

Passive Test For WIFI-5G										
Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)	Gain (dBd)	UHS (%)	DHS (%)	Max (dB)	Min (dB)	Directivity (dBi)	Beamwidth (3dB)
5150	59.68	-2.24	3.66	-0.49	28.434	31.243	3.66	-16.03	3.9	30
5250	51.82	-2.85	4.36	-0.79	23.534	28.289	4.36	-20.7	4.21	30
5350	56.43	-1.48	5.98	0.05	24.365	32.068	5.98	-19.63	4.68	0
5450	65.18	-0.86	4.00	0.93	27.891	37.29	4.00	-14.85	4.94	0
5550	72.43	-1.4	4.99	0.84	32.516	39.917	4.99	-15.95	4.39	30
5650	76.98	-1.14	4.89	0.74	36.844	40.137	4.89	-18.31	4.02	60
5750	78.76	-1.04	4.92	0.87	38.14	40.618	4.92	-19.04	4.06	0
5850	69.32	-1.59	4.93	0.78	31.032	38.284	4.93	-12.45	4.52	60

GLOSSARY

- S11 (Reflection coefficient) – power reflected by impedance mismatch
- Radiation (rad.) efficiency - antenna efficiency excluding mismatch loss
- Total efficiency - antenna efficiency including mismatch loss
- System total efficiency - antenna efficiency including mismatch loss, including matching and losses from external matching network
- TRP (total radiated power) – power radiated from the antenna, including all losses
- EIRP (effective isotropic radiated power) – power radiated from the antenna to the strongest beam direction compared to isotropic radiator
- ERP (effective radiated power) power radiated from the antenna to the strongest beam direction compared to ideal half wavelength dipole. $ERP\ (dB) = EIRP\ (dB) - 2,15\ dB$
- TIS (total isotropic sensitivity) - total available receive performance of a device with a real antenna