

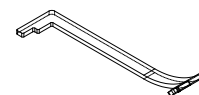
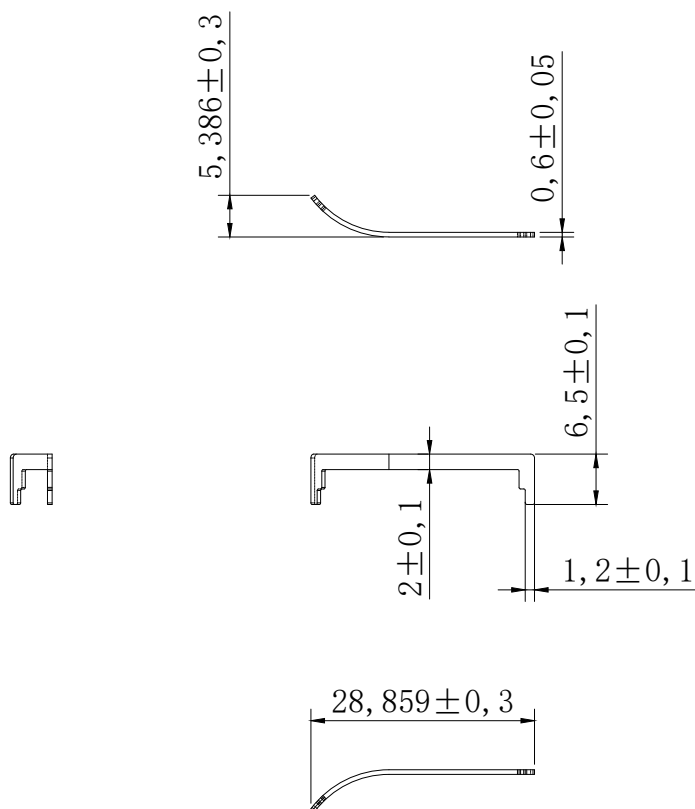


Radiantum

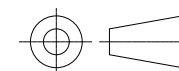
WIRELESS PERFORMANCE MATTERS

Tri Plus Grupa
#2099 Alloyfusion Lite / Plus
Alloylite Antenna Measurements
06/04/2023
Matti Lahdenperä, Janne Heiskanen

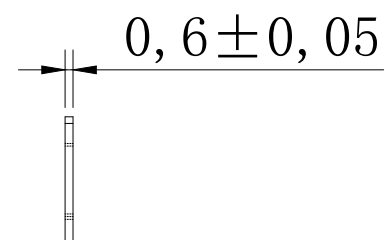
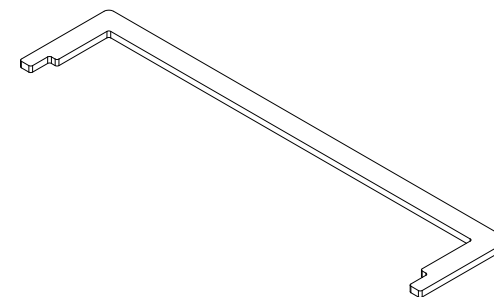
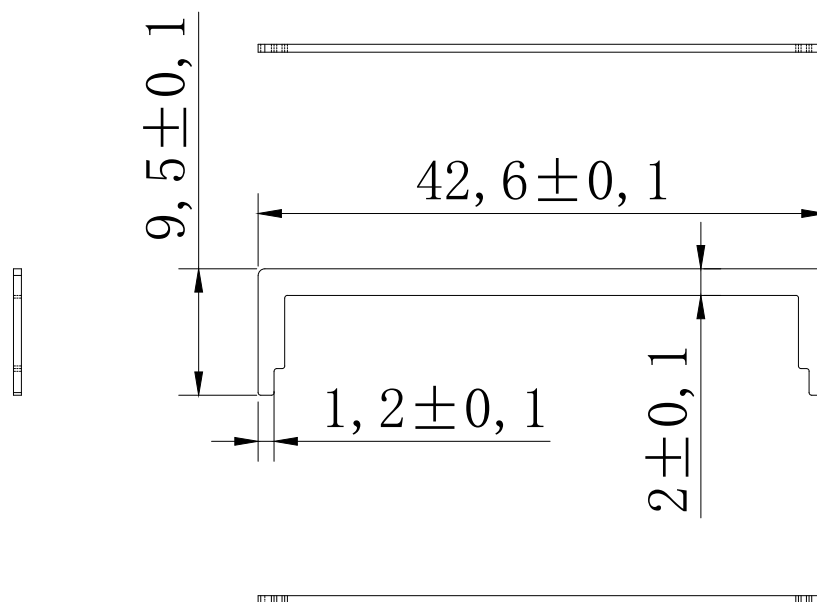
ANT_AFL_LTE1天线



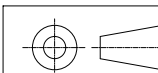
材质：磷铜
表面处理：镀锡



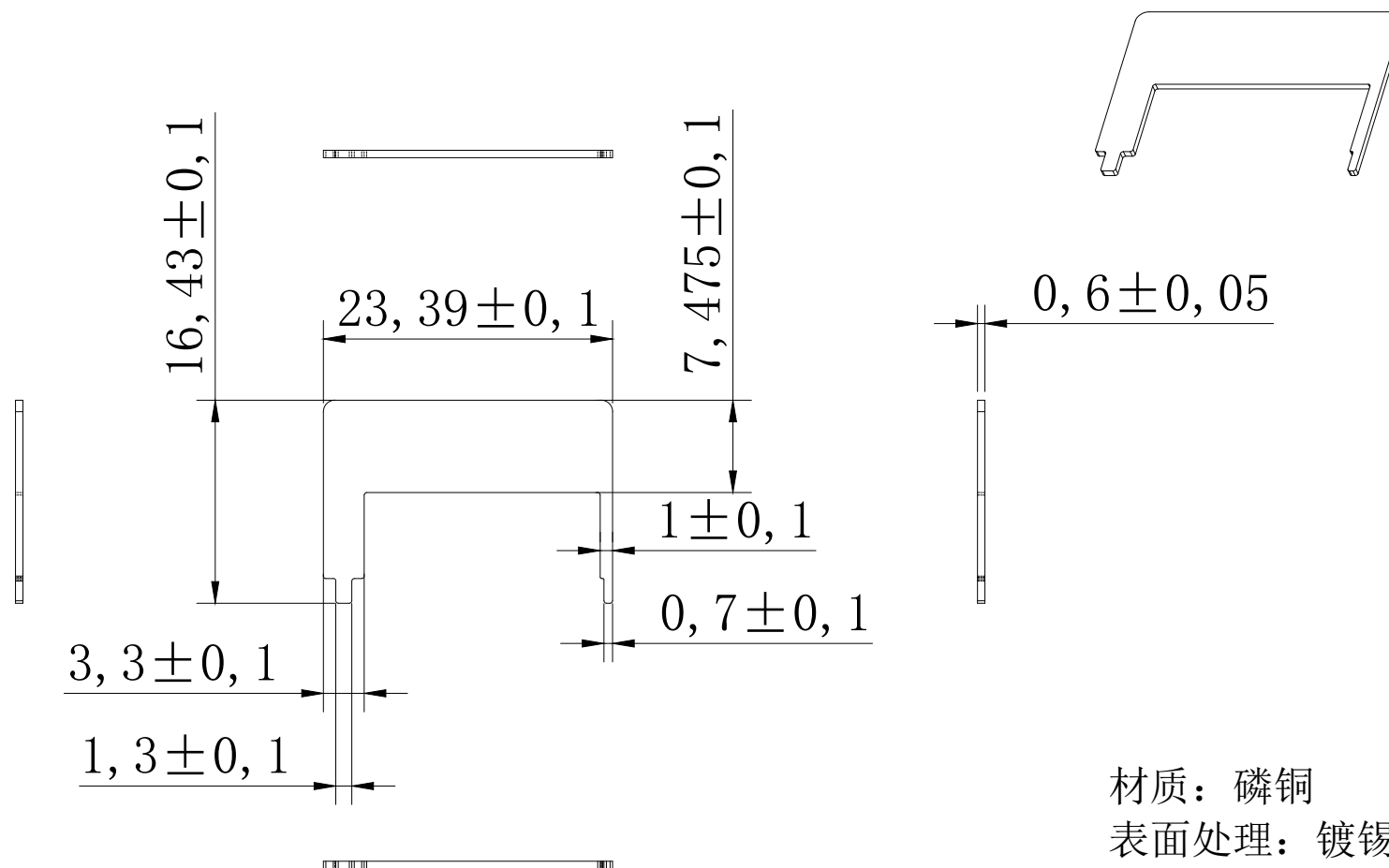
ANT_AFL_ZW天线



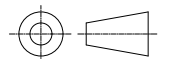
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表面处理：镀锡



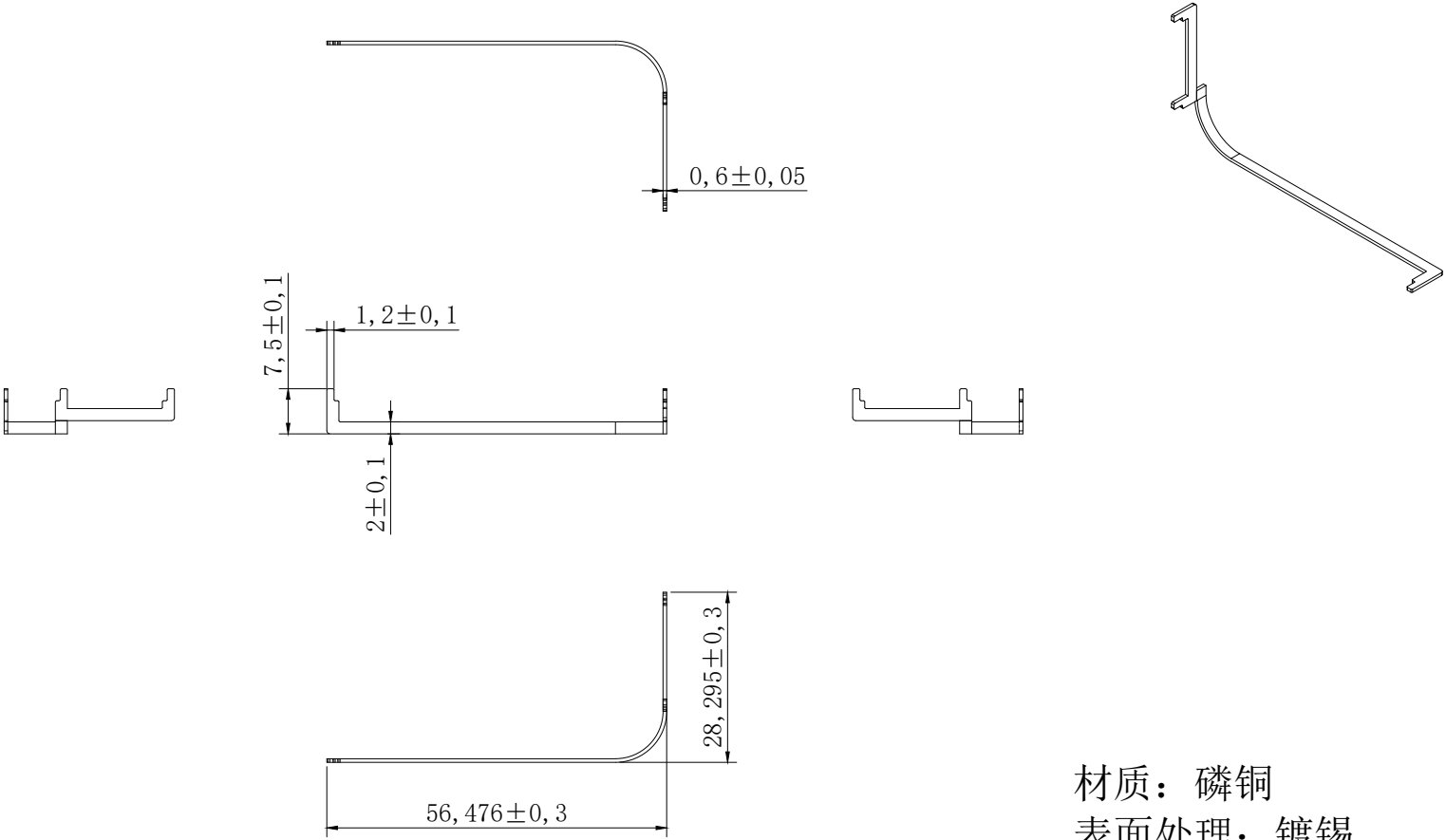
ANT_AFL_Thread天线



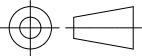
材质：磷铜
表面处理：镀锡



ANT_AFL_LTE2 (SH07) 天线



材质：磷铜
表面处理：镀锡



LTE MAIN ANTENNA SUMMARY

LTE Main Antenna	LTE B2	LTE B4	LTE B5	LTE B12
Frequency (MHz)	1850 - 1990	1710 - 1755, 2110 - 2155	824 - 894	699 - 746
Return Loss (dB)	-4.8 - -3.5	-9.8 - -2.5	-6.5 - -3.3	-4.8 - -2.8
Efficiency (dB)	-3.7 - -4.9	-2.3 - -3.7	-3.7 - -5.9	-5.0 - -7.1
Gain, MAX (dBi)	-0.30 @ 1990MHz	2.08 @ 2165MHz	0.37 @ 820MHz	-0.91 @ 750MHz
Gain, Typical (dBi)	-0.72	0.05	-0.77	-1.90

LTE DIV ANTENNA SUMMARY

LTE Main Antenna	LTE B2	LTE B4	LTE B5	LTE B12
Frequency (MHz)	1850 - 1990	1710 - 1755, 2110 - 2155	824 - 894	699 - 746
Return Loss (dB)	-16.2 - -4.2	-5.7 - -2.1	-2.1 - -1.9	-4.0 - -1.8
Efficiency (dB)	-2.7 - -4.3	-2.7 - -4.8	-9.5 - 10.9	-8.8 - 12.1
Gain, MAX (dBi)	0.50 @ 1985MHz	-0.41 @ 2160MHz	-6.99 @ 845MHz	-5.83 @ 699MHz
Gain, Typical (dBi)	-0.04	-0.61	-7.32	-7.12

WiFi ANTENNA SUMMARY

WiFi Antenna	2.4GHz Band	5GHz Band
Frequency (MHz)	2400 – 2485	5160 – 5885
Return Loss (dB)	-10.7 – -9.7	-15.3 – -8.9
Efficiency (dB)	-3.4 – -4.2	-1.5 – -2.7
Gain, MAX (dBi)	1.43	3.59

THREAD ANTENNA SUMMARY

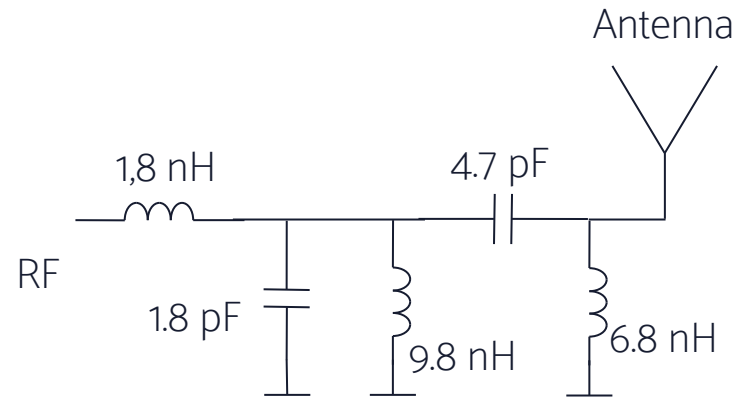
Thread Antenna	2.4GHz Band
Frequency (MHz)	2400 – 2485
Return Loss (dB)	-25.6 – -11.3
Efficiency (dB)	-3.5 – -3.9
Gain, MAX (dBi)	1.76

Z-WAVE ANTENNA SUMMARY

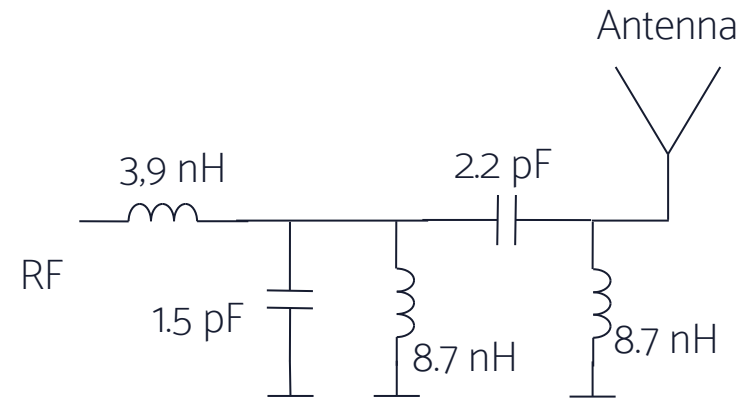
Z-WAVE Antenna	916MHz Band
Frequency (MHz)	902-928
Return Loss (dB)	-19.8
Efficiency (dB)	-4.1
Gain, MAX (dBi)	-0.9 @ 916MHz

NEW MATCHING COMPONENTS 1

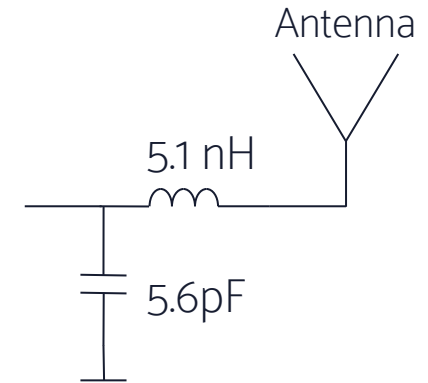
Main antenna



Diversity antenna



Z-Wave

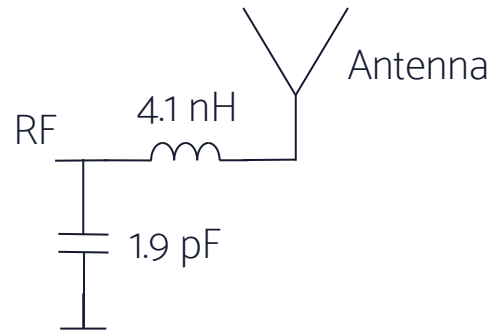
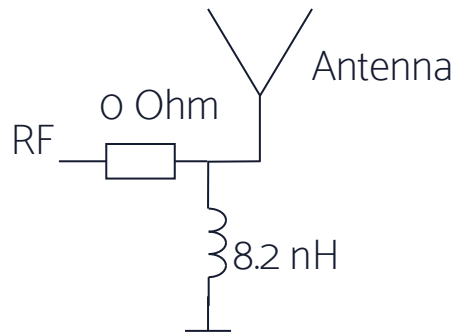


- Capacitors: Murata GJM15
- Inductors: Murata LQW15 series

NEW MATCHING COMPONENTS 2

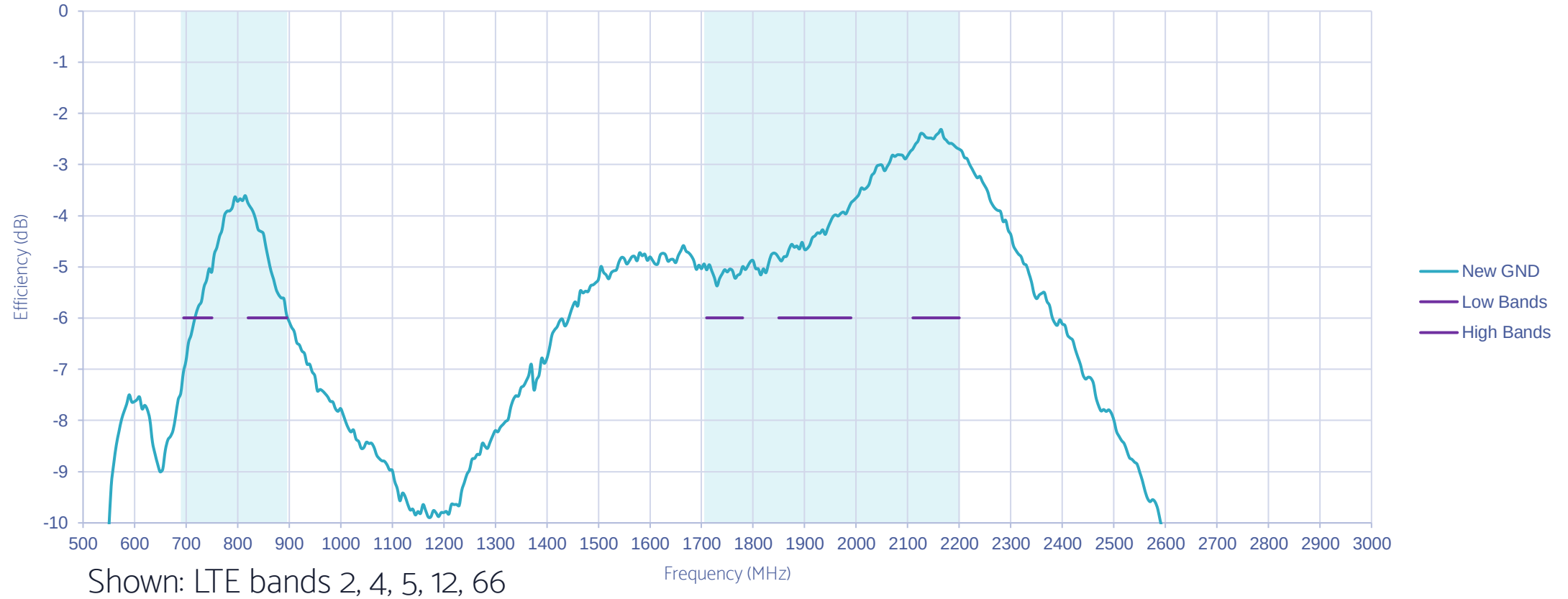
WiFi

Thread

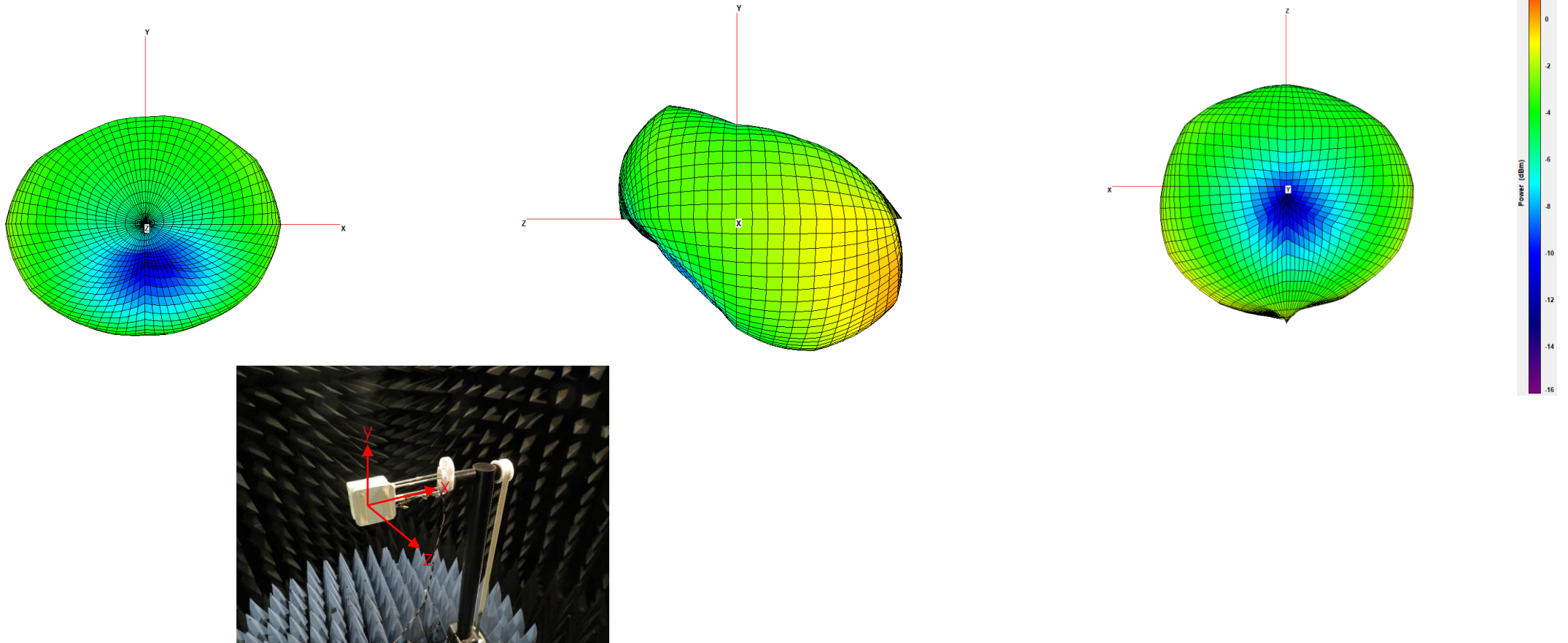


- Capacitors: Murata GJM15
- Inductors: Murata LQW15 series

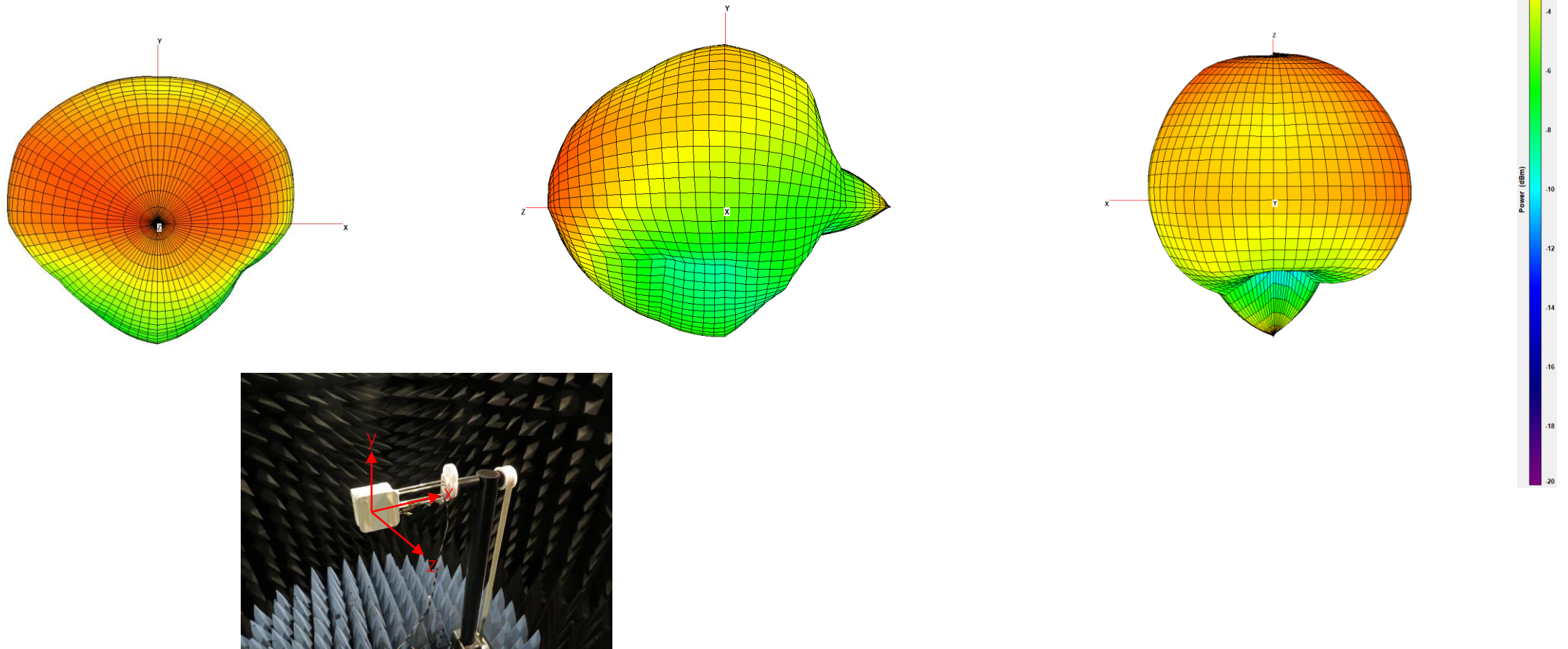
LTE MAIN MEASURED EFFICIENCY



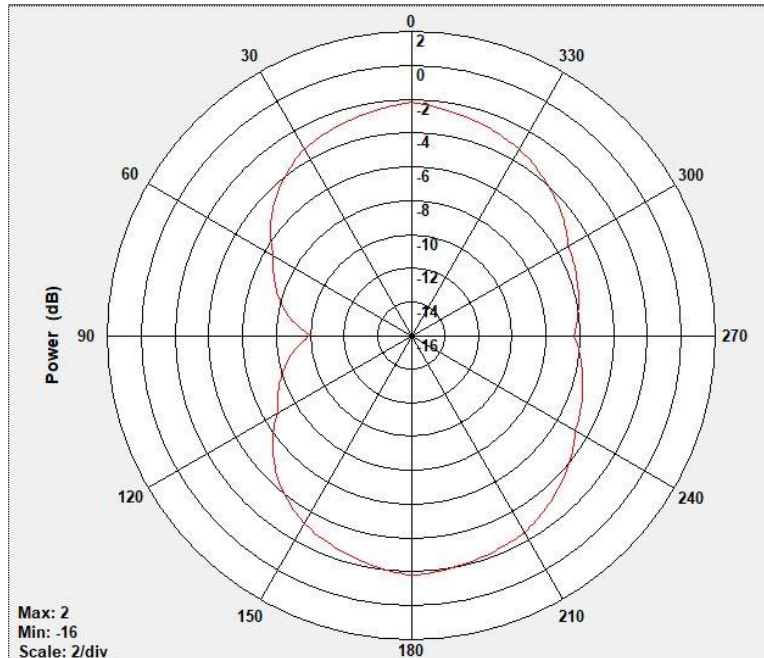
LTE DIV ANTENNA 3D PATTERNS, 825MHz



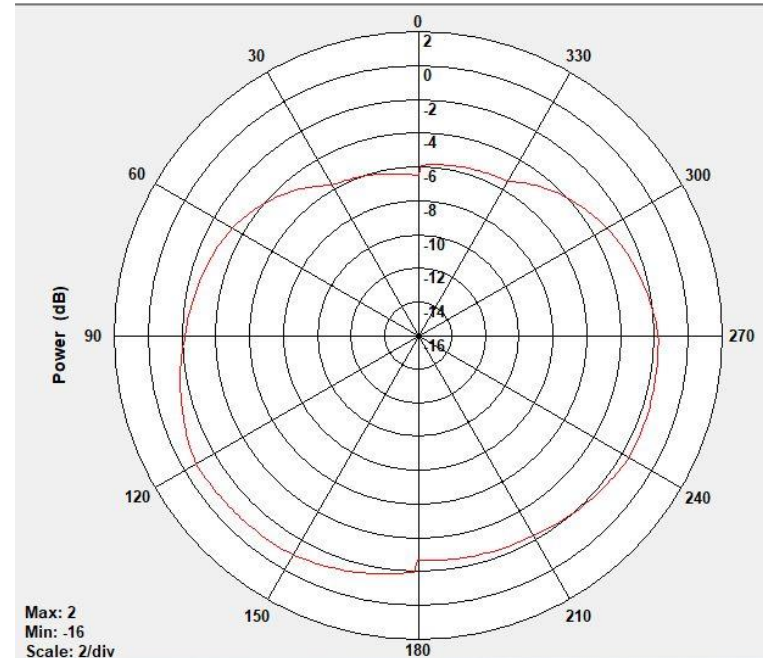
LTE DIV ANTENNA 3D PATTERNS, 1875MHz



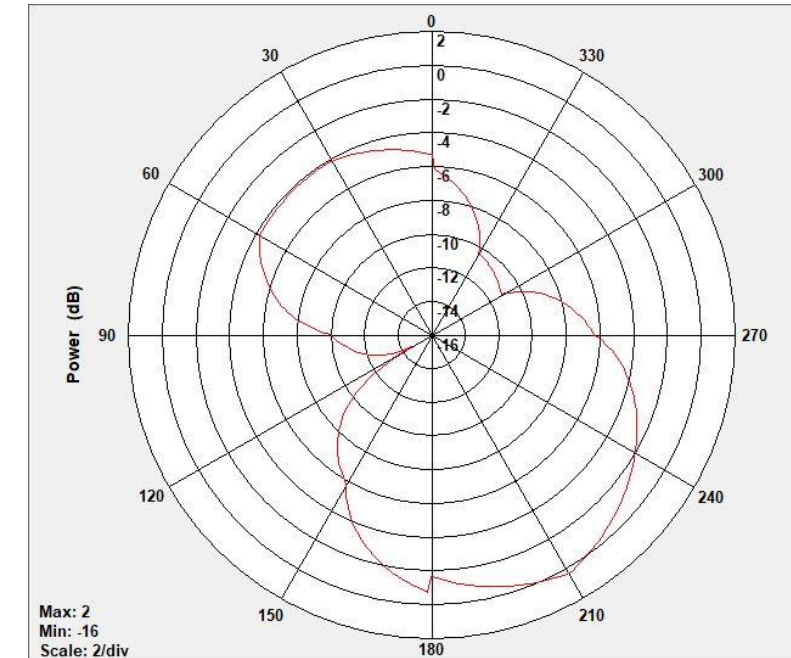
LTE MAIN ANTENNA 2D PATTERNS, 825MHz



Theta 0 (XY-plane)

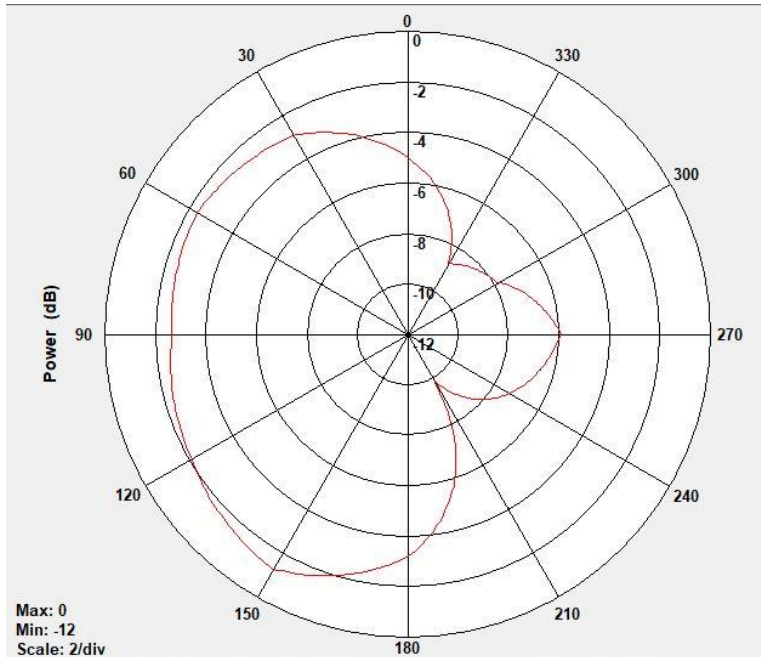


Phi 0 (ZX-plane)

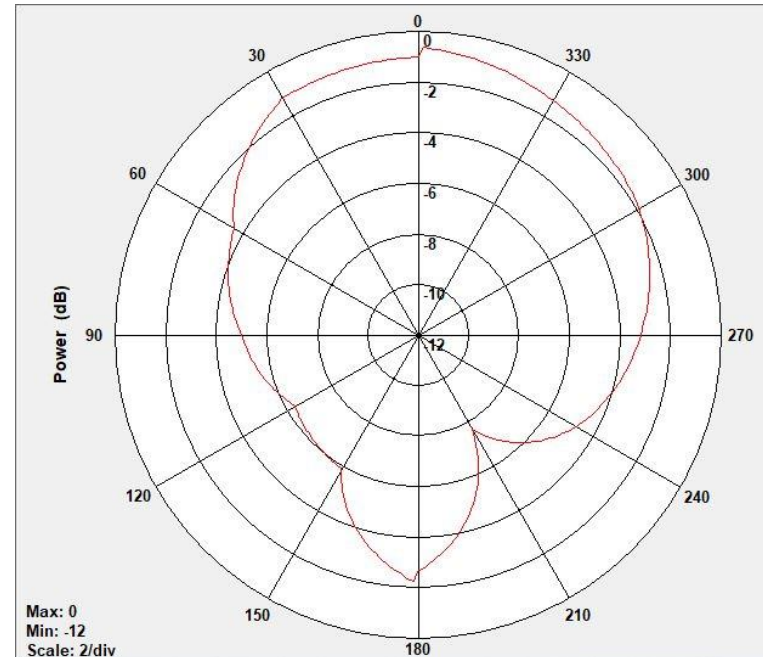


Phi 90 (YZ-plane)

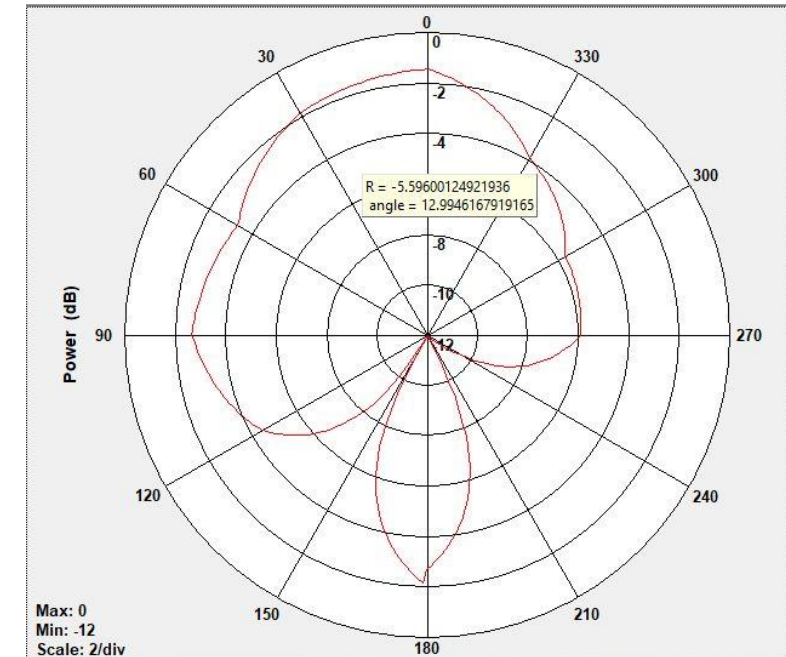
LTE MAIN ANTENNA 2D PATTERNS, 1875MHz



Theta 0 (XY-plane)

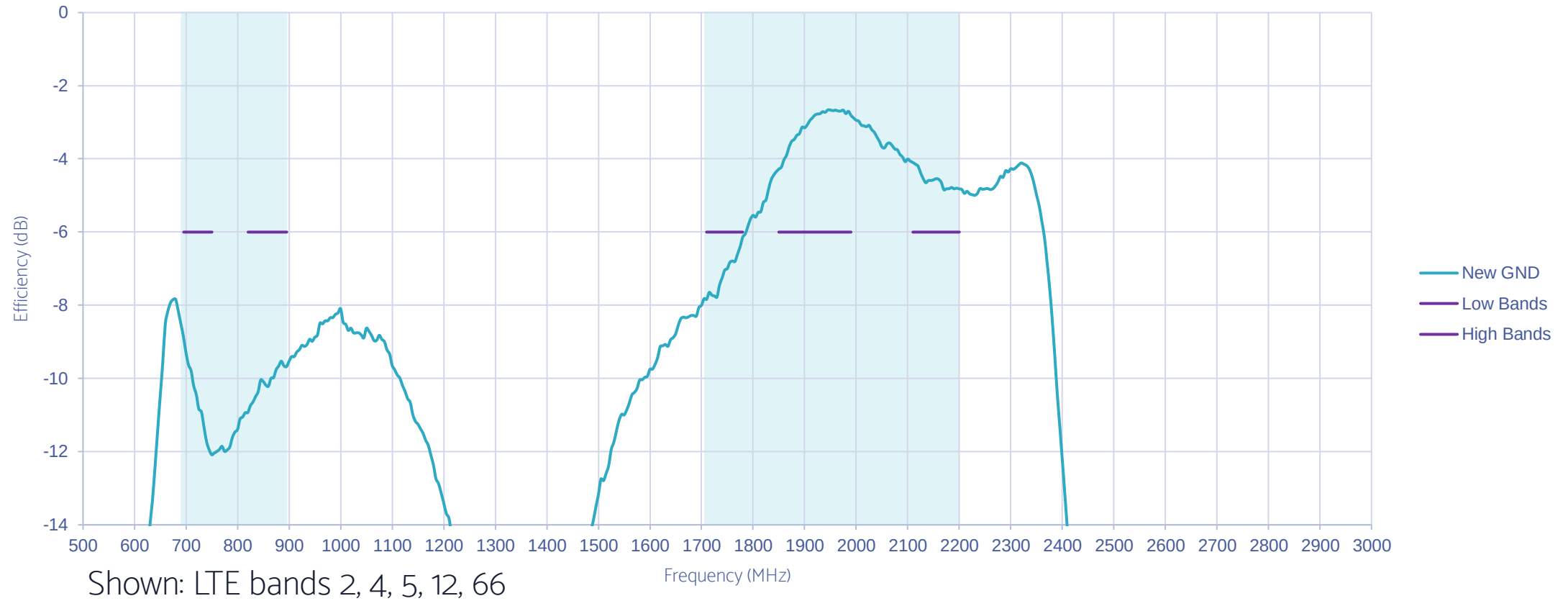


Phi 0 (ZX-plane)

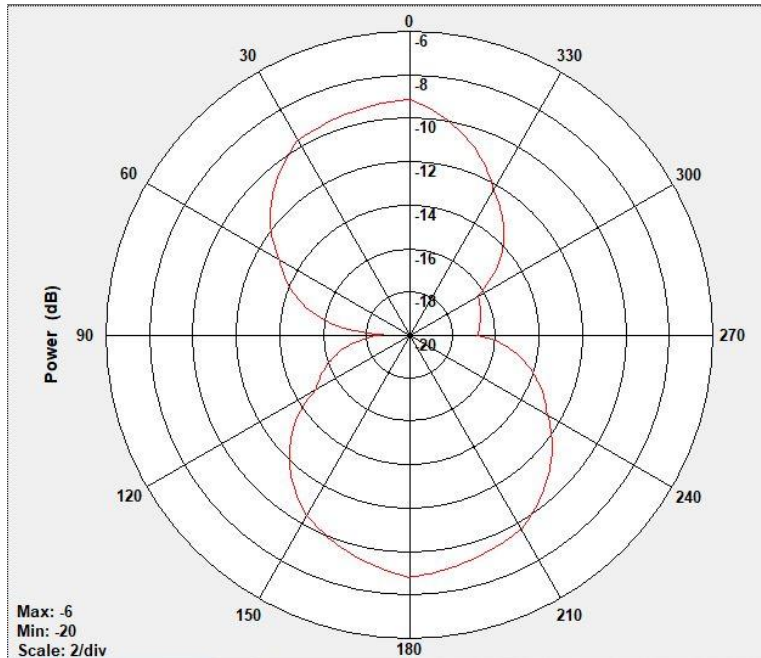


Phi 90 (YZ-plane)

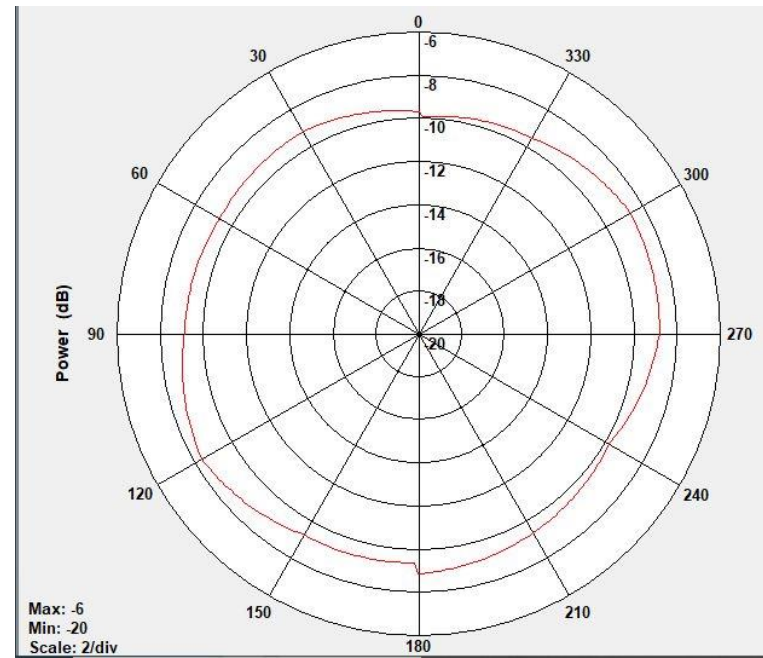
LTE DIV MEASURED EFFICIENCY



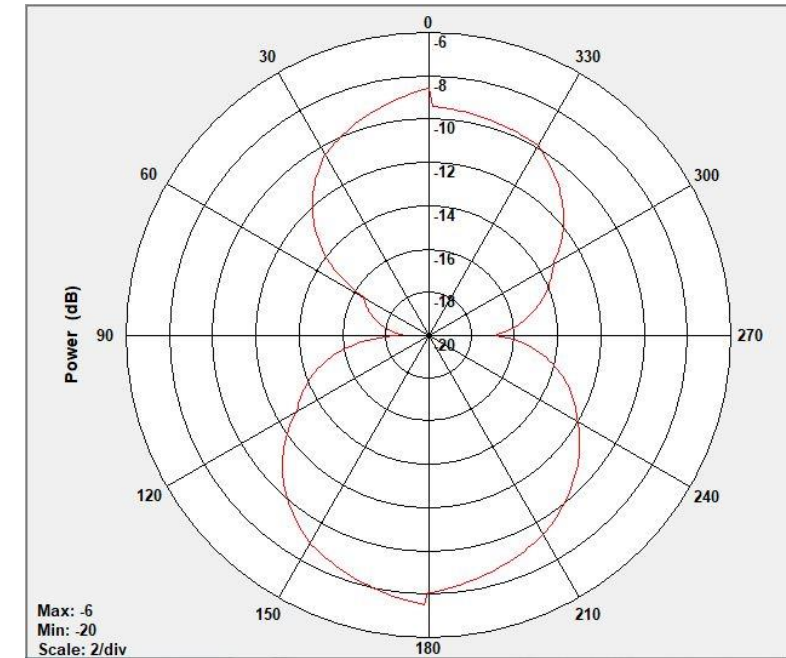
LTE DIV ANTENNA 2D PATTERNS, 825MHz



Theta 0 (XY-plane)

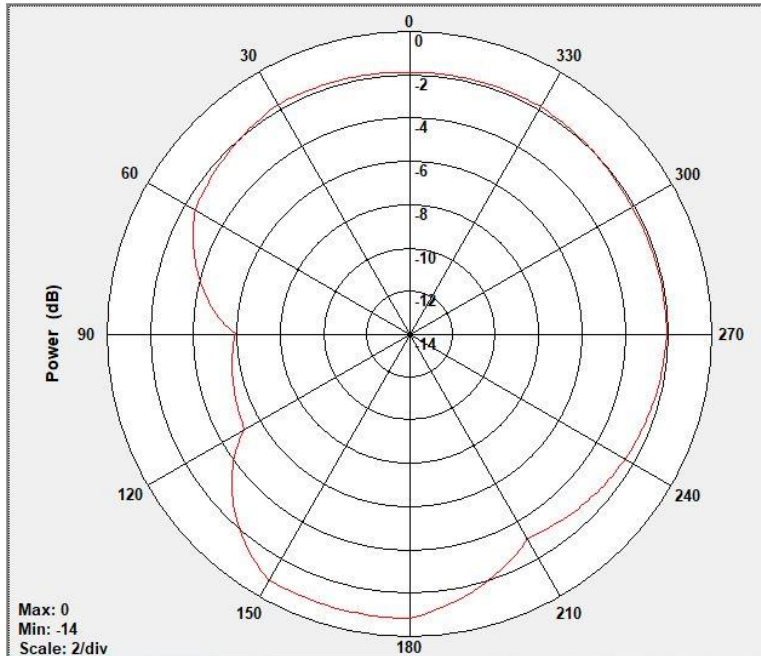


Phi 0 (ZX-plane)

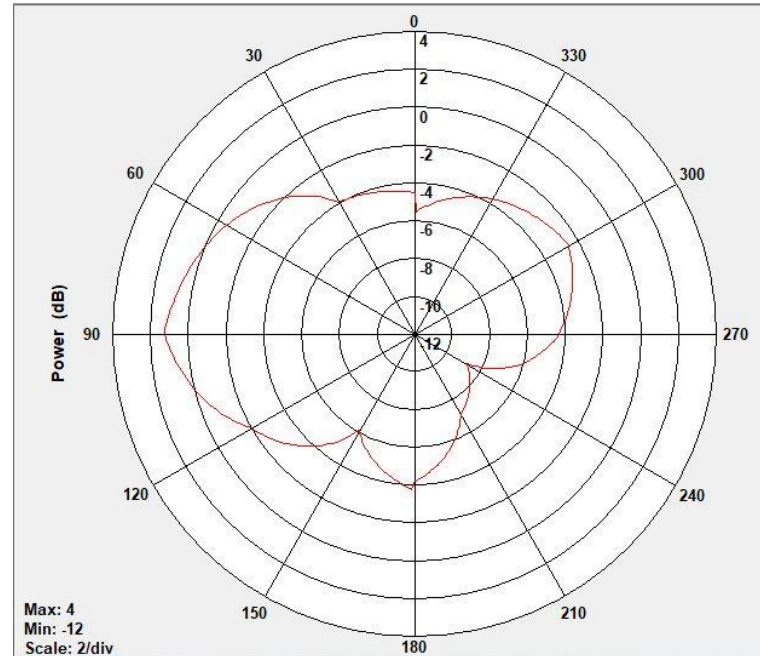


Phi 90 (YZ-plane)

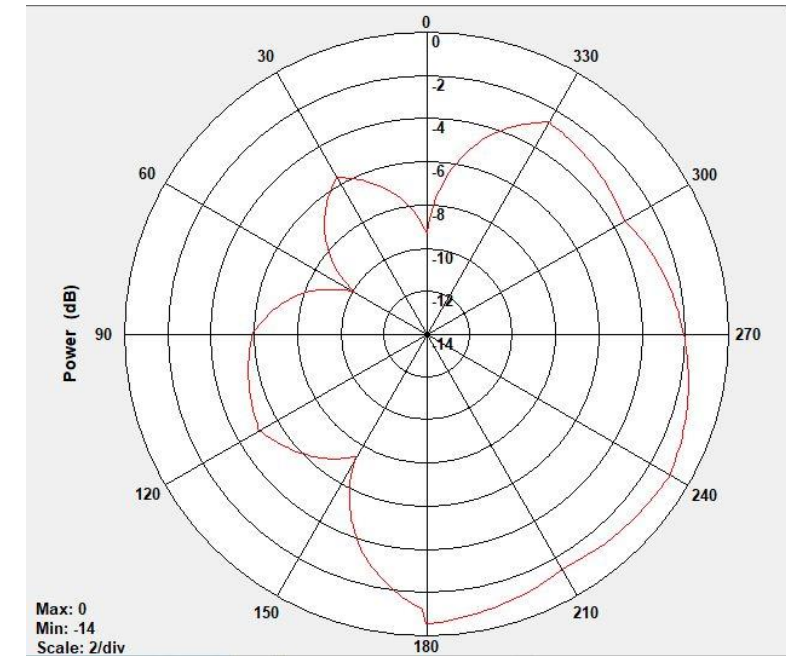
LTE DIV ANTENNA 2D PATTERNS, 1875MHz



Theta 0 (XY-plane)

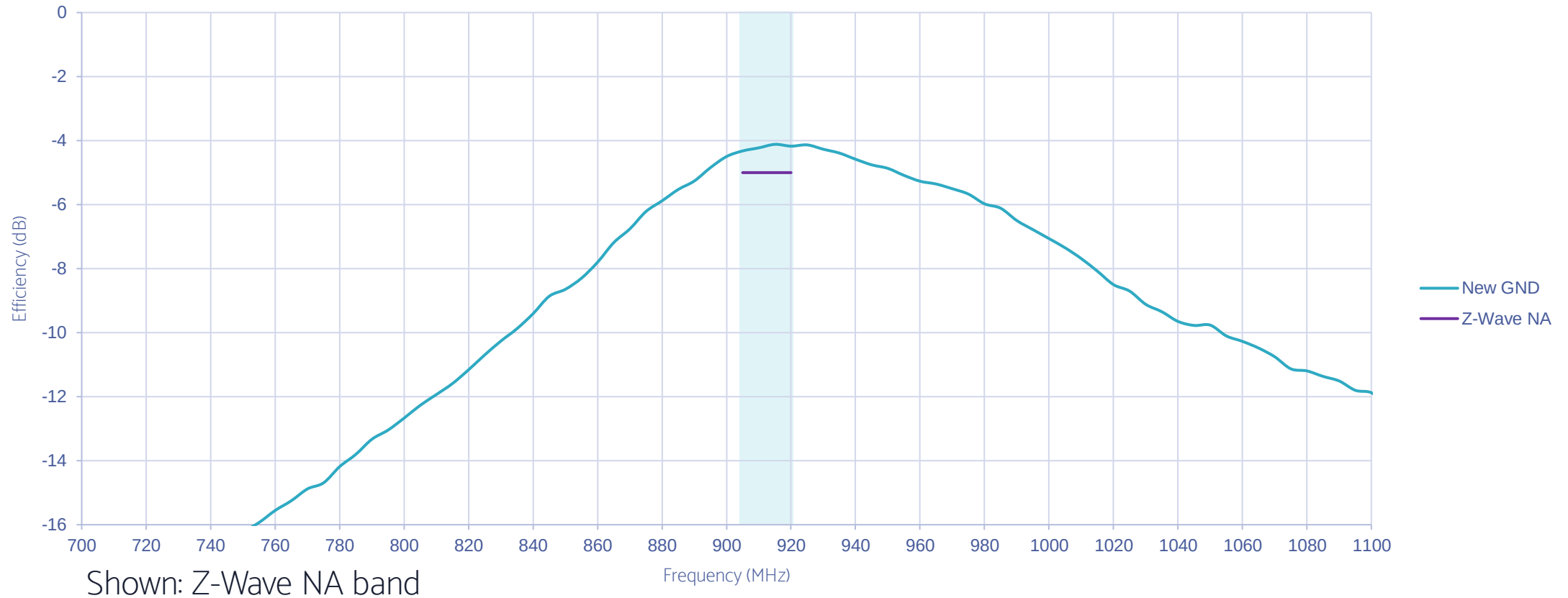


Phi 0 (ZX-plane)

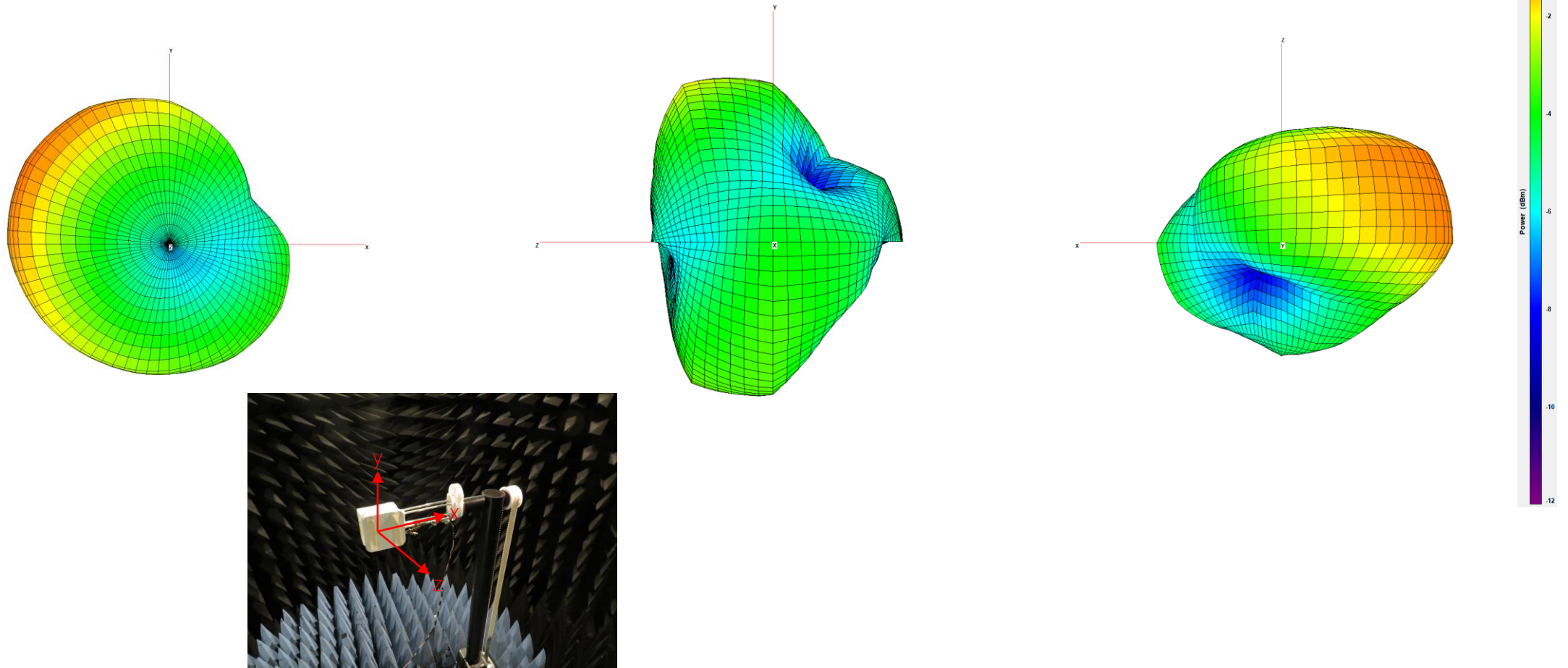


Phi 90 (YZ-plane)

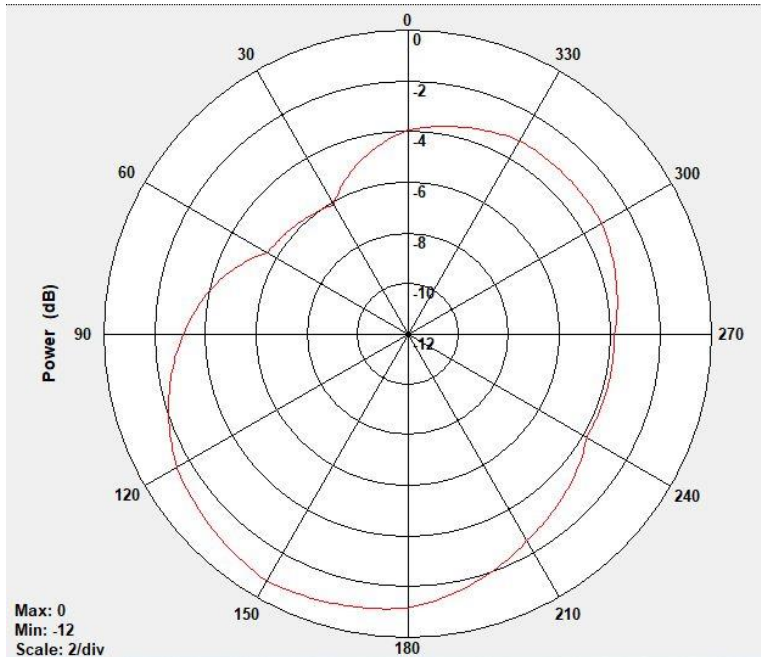
Z-WAVE MEASURED EFFICIENCY



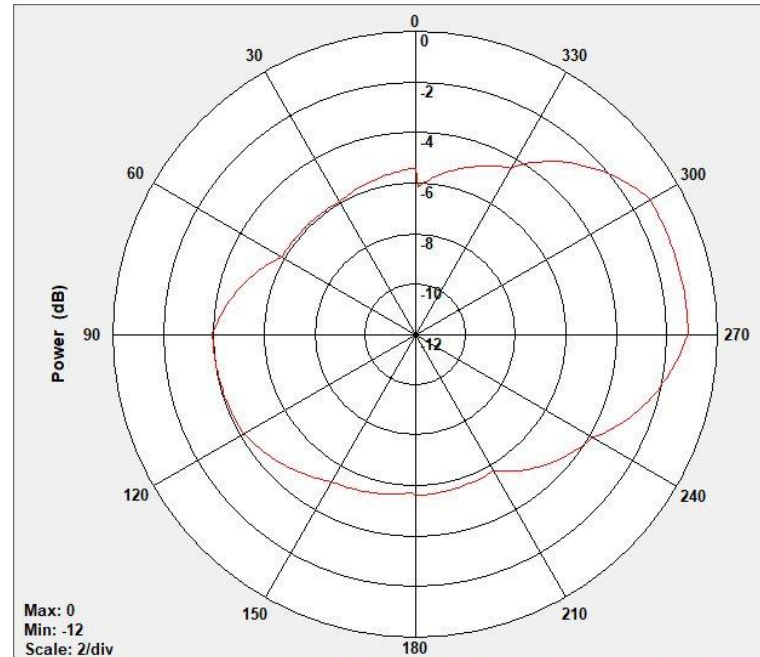
Z-WAVE ANTENNA 3D PATTERNS, 916MHz



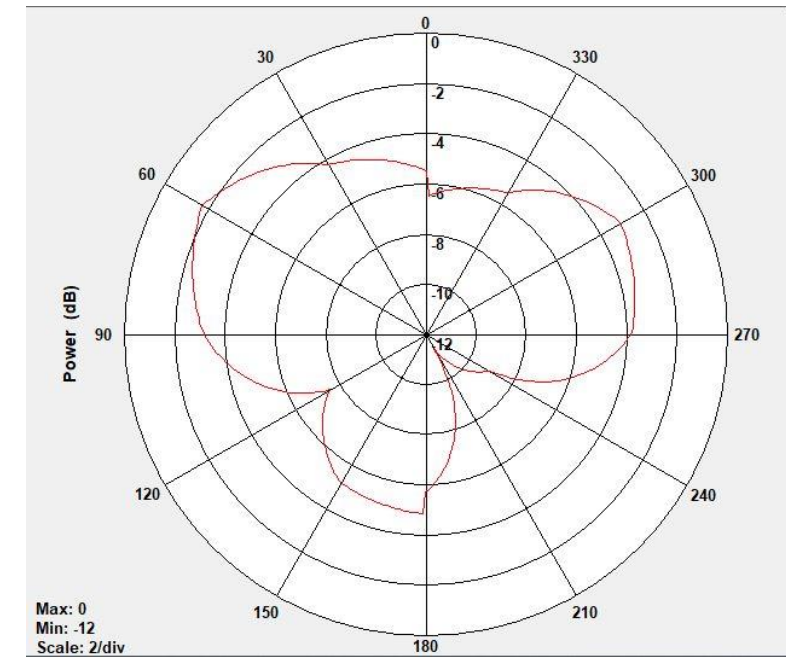
Z-WAVE ANTENNA 2D PATTERNS, 916MHz



Theta 0 (XY-plane)

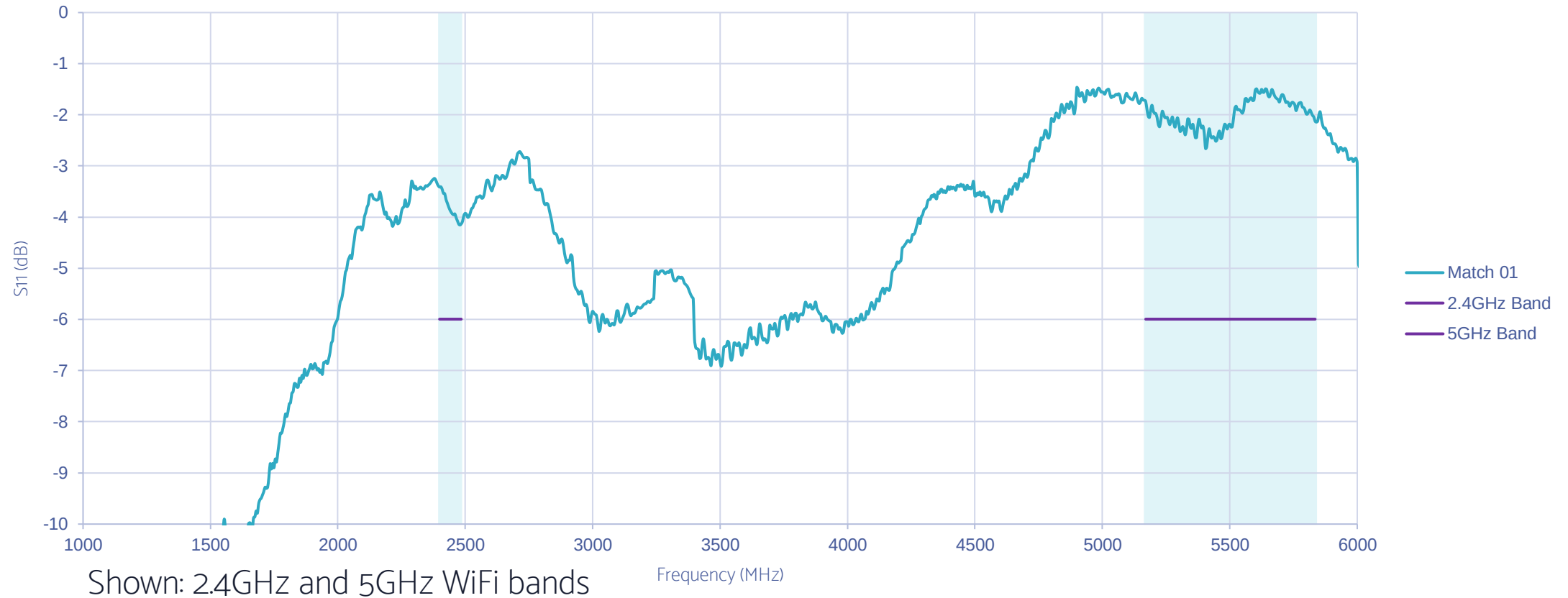


Phi 0 (ZX-plane)

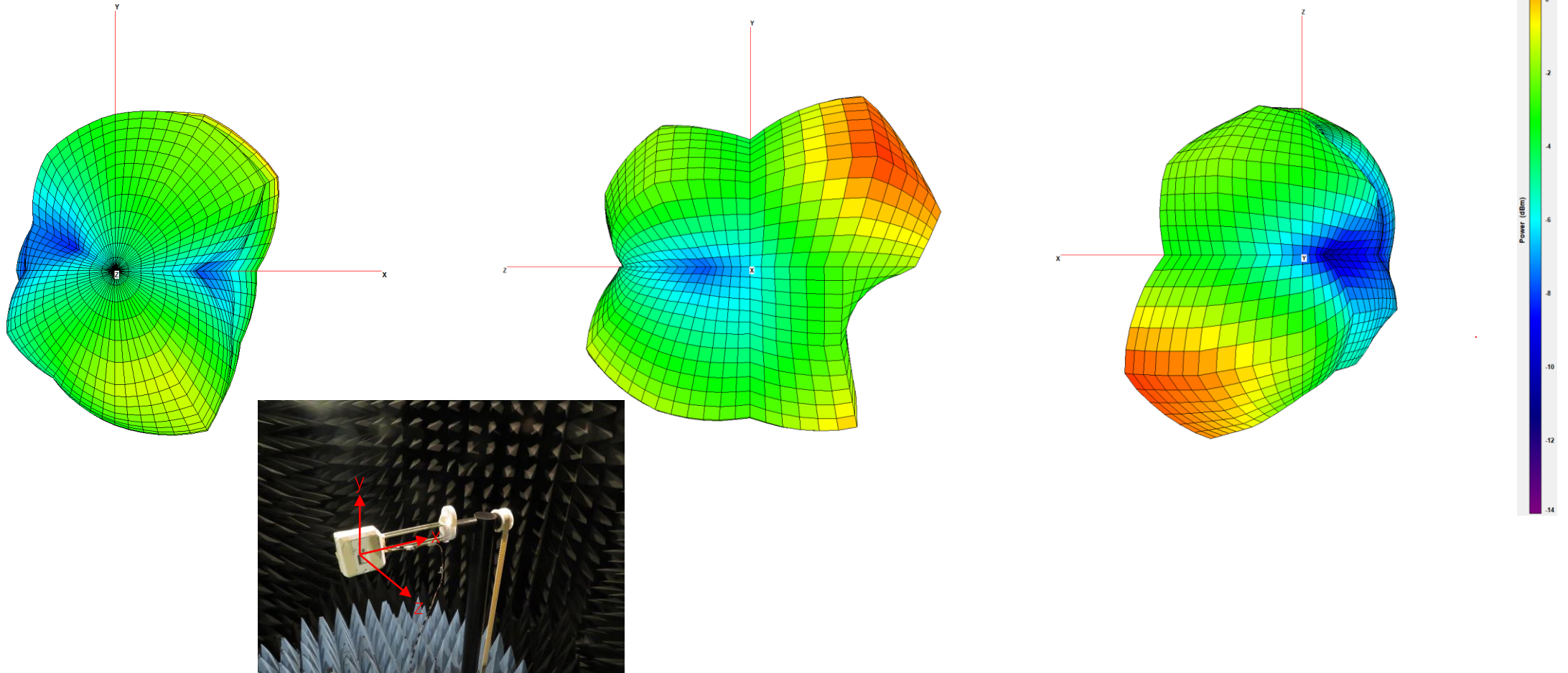


Phi 90 (YZ-plane)

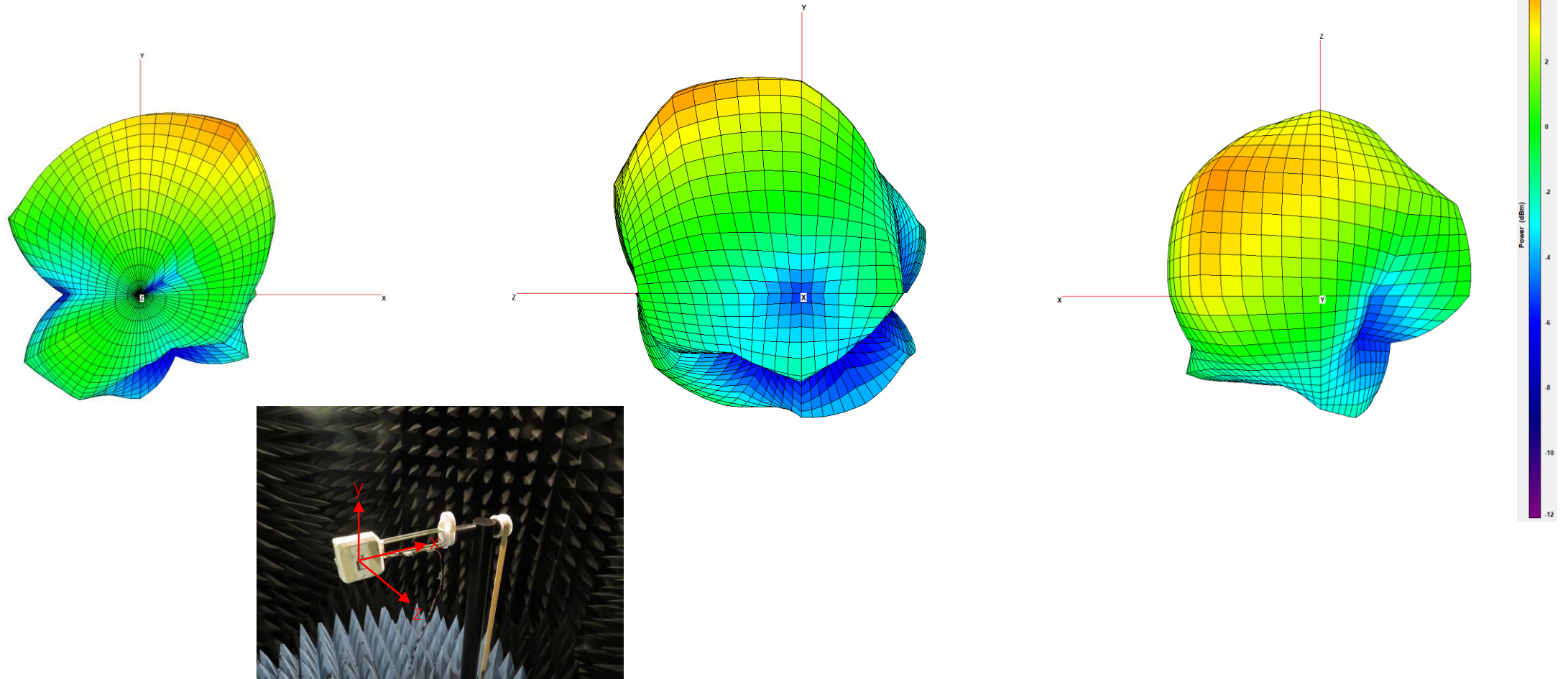
WiFi MEASURED EFFICIENCY



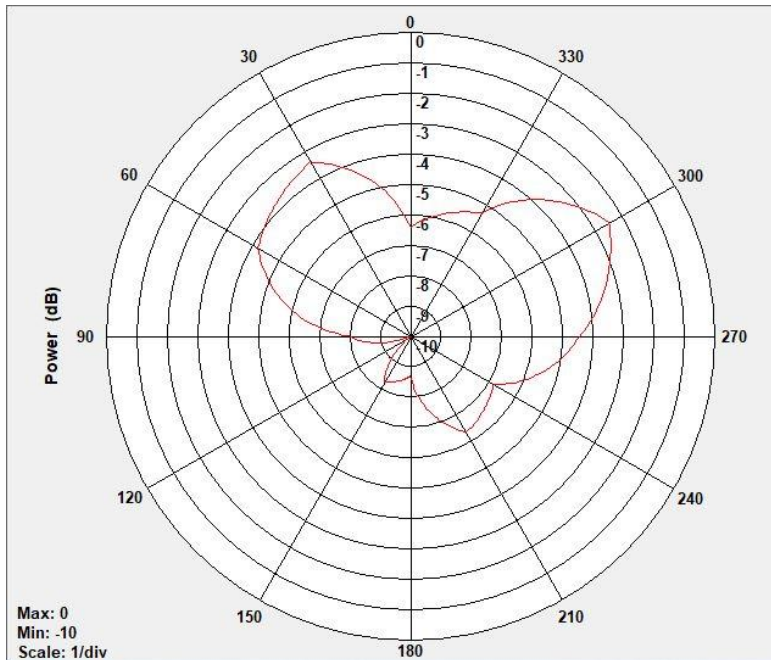
WiFi ANTENNA 3D PATTERNS, 2460MHz



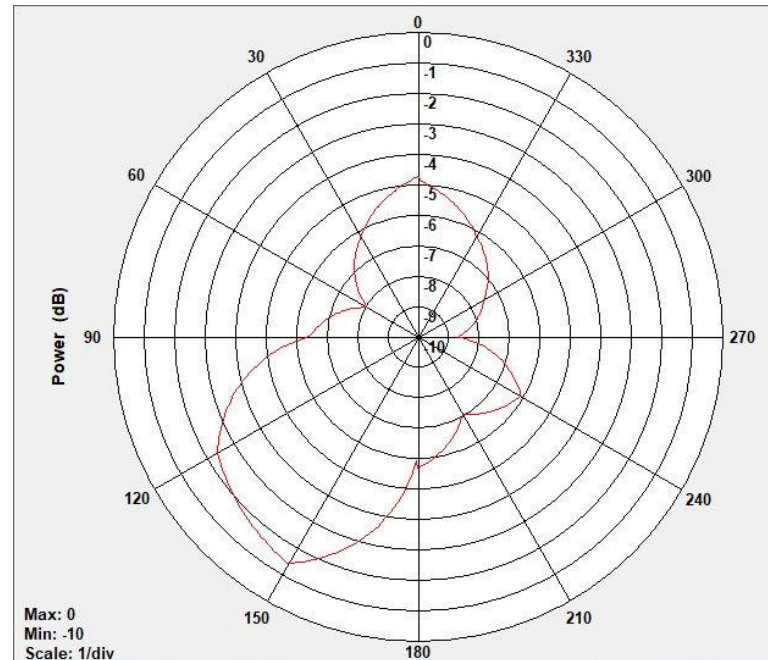
WiFi ANTENNA 3D PATTERNS, 5645MHz



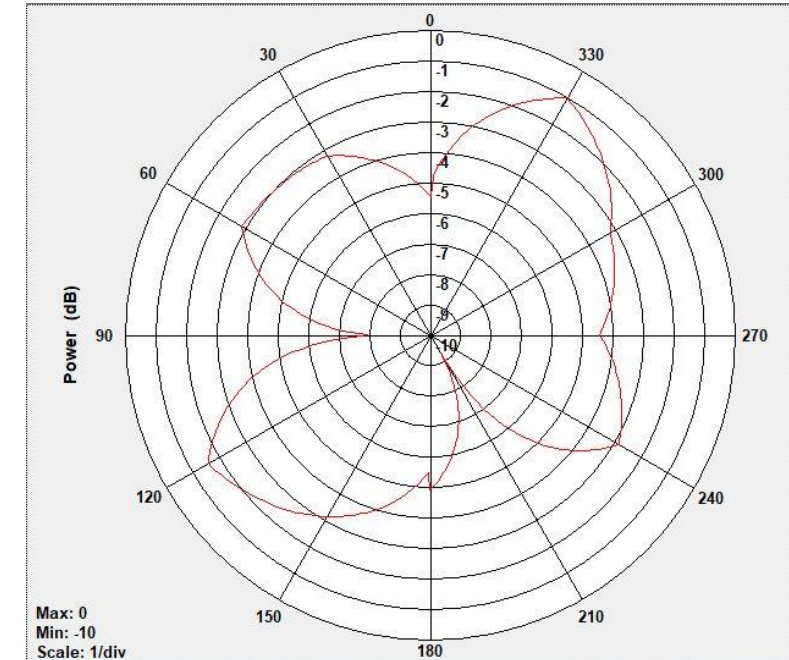
WiFi ANTENNA 2D PATTERNS, 2460MHz



Theta 0 (XY-plane)

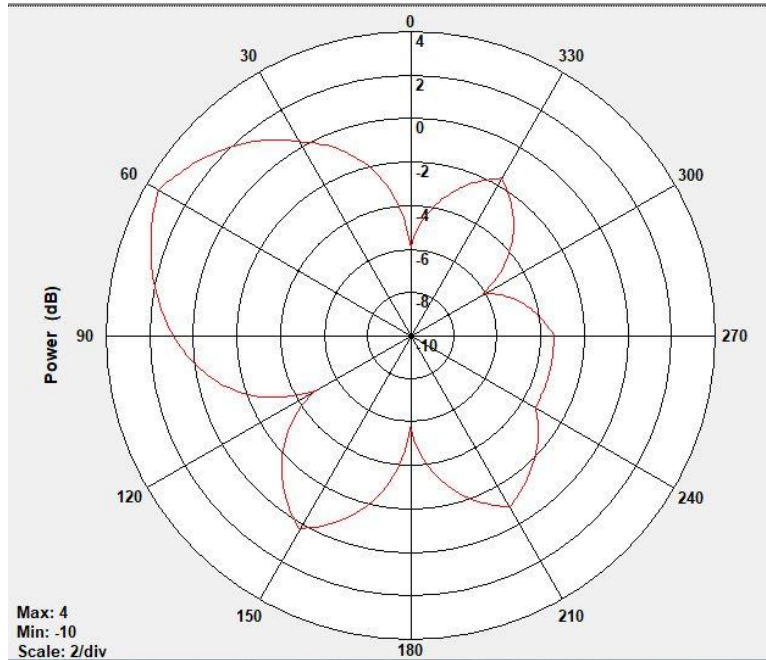


Phi 0 (ZX-plane)

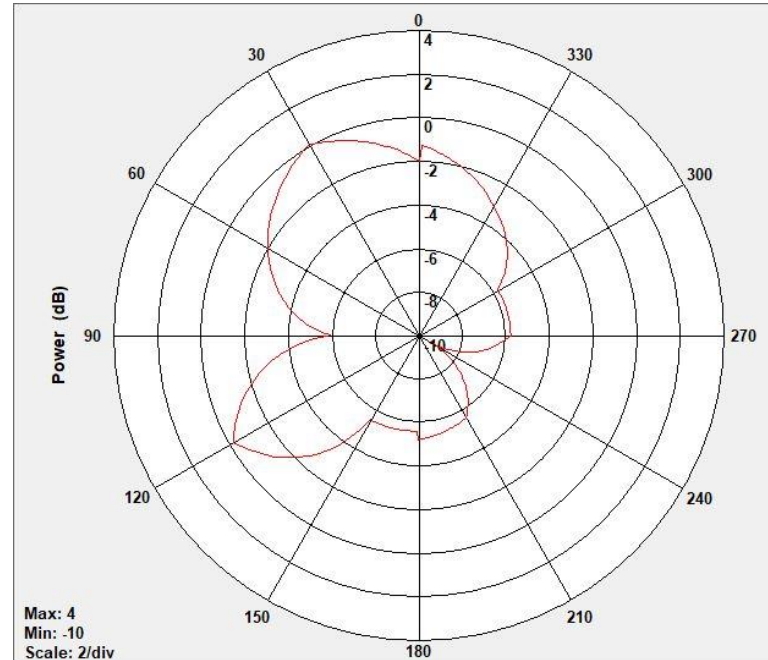


Phi 90 (YZ-plane)

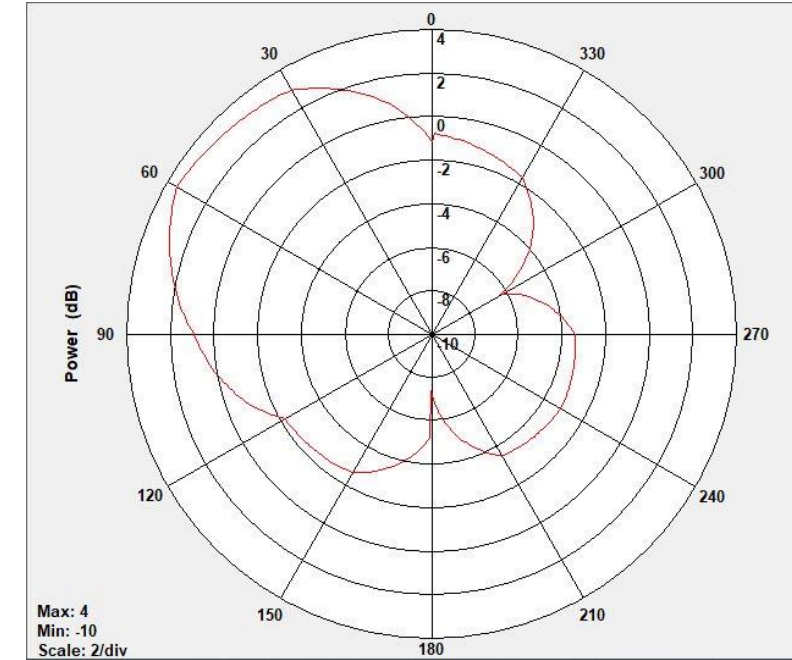
WiFi ANTENNA 2D PATTERNS, 5645MHz



Theta 0 (XY-plane)

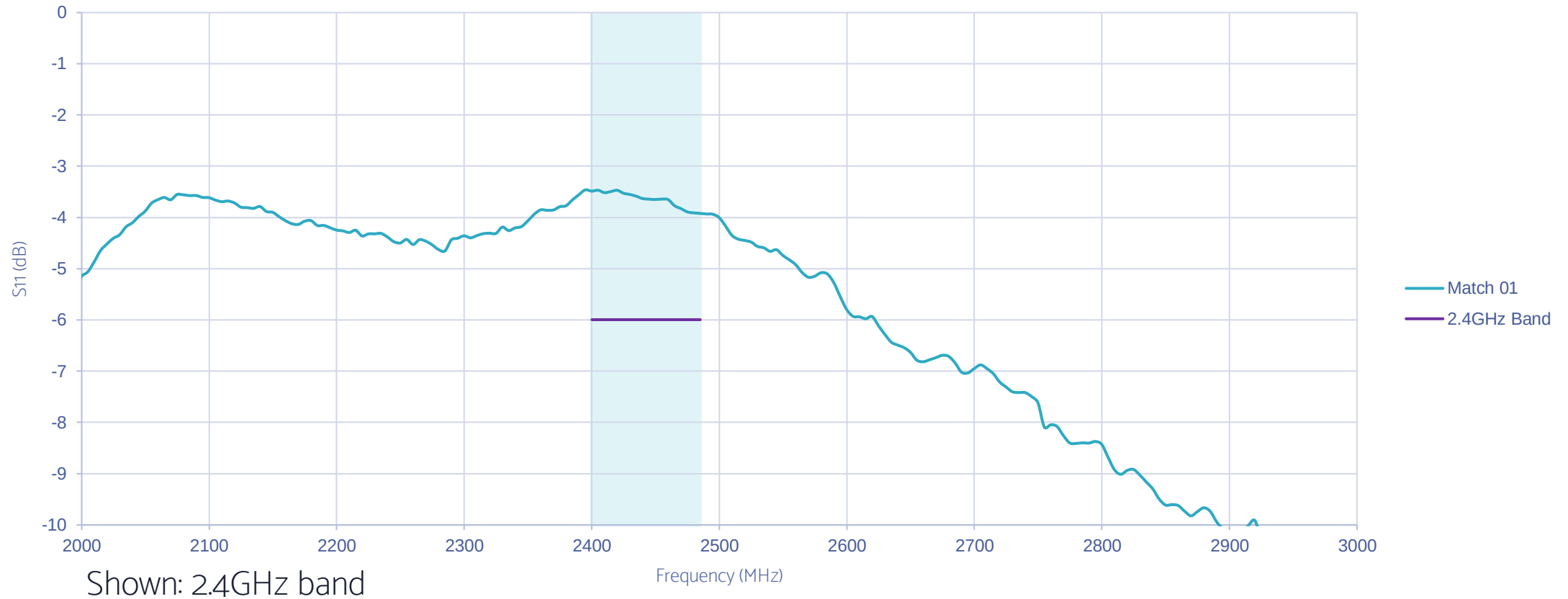


Phi 0 (ZX-plane)

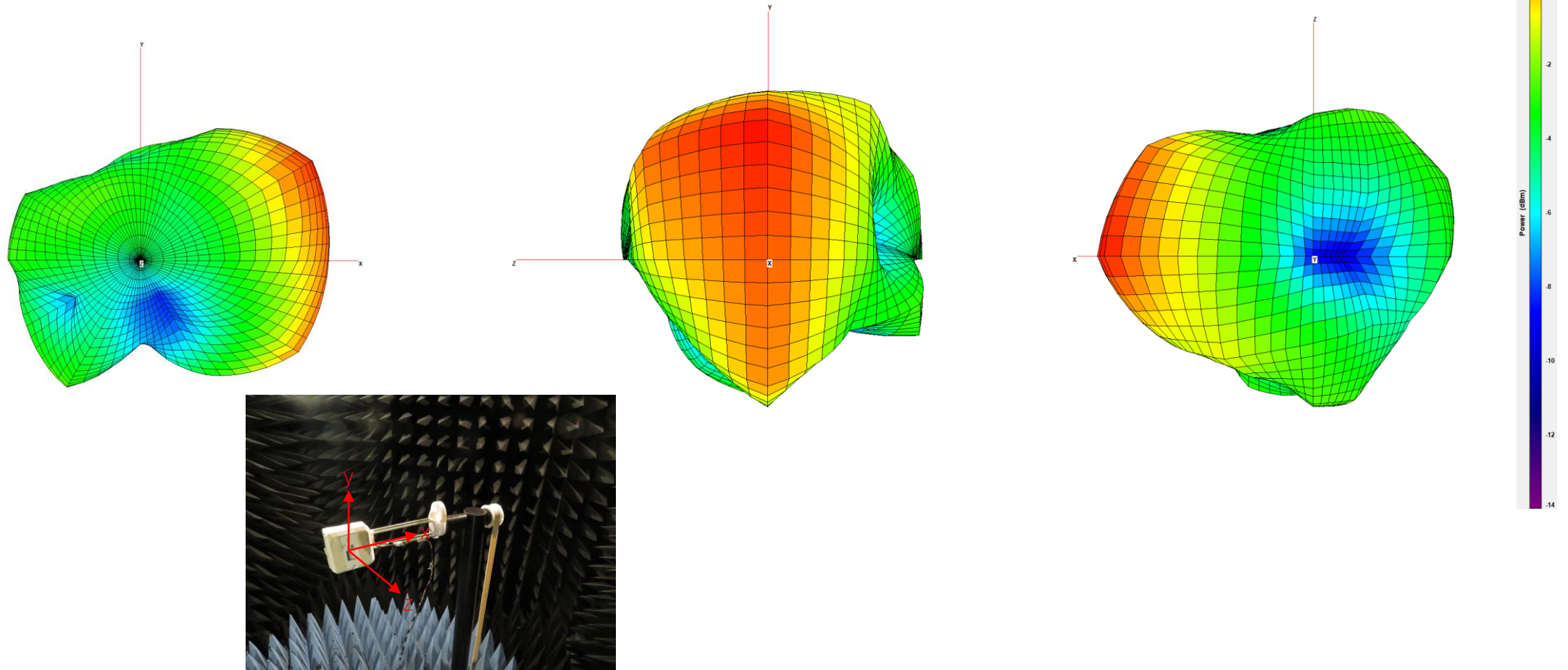


Phi 90 (YZ-plane)

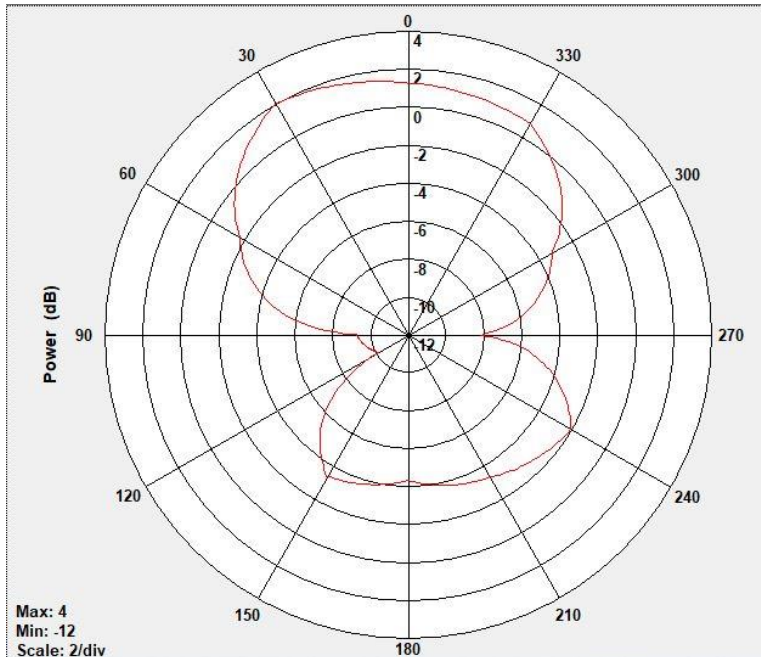
THREAD MEASURED EFFICIENCY



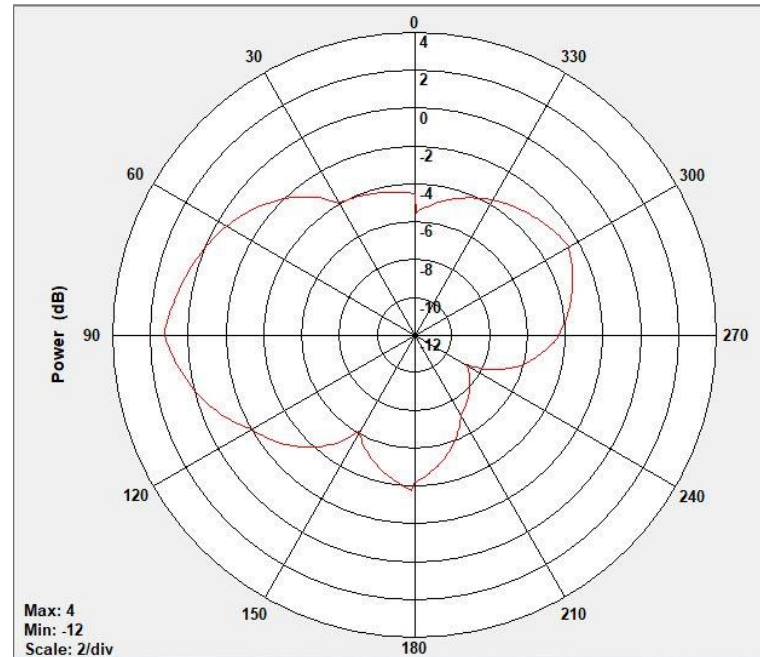
THREAD ANTENNA 3D PATTERNS, 2420MHz



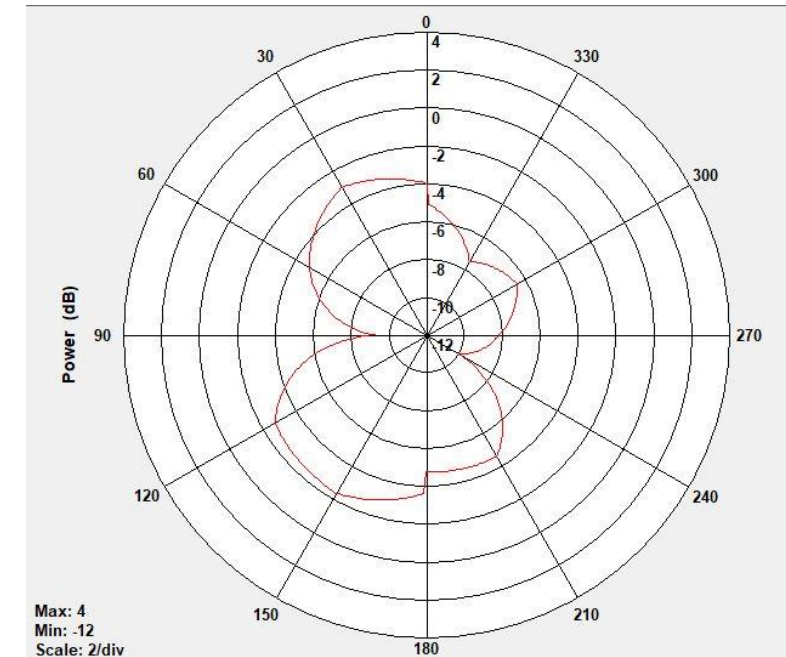
THREAD ANTENNA 2D PATTERNS, 2420MHz



Theta 0 (XY-plane)



Phi 0 (ZX-plane)



Phi 90 (YZ-plane)

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