IL1
Antenna Report

Quanta Antenna Design Center

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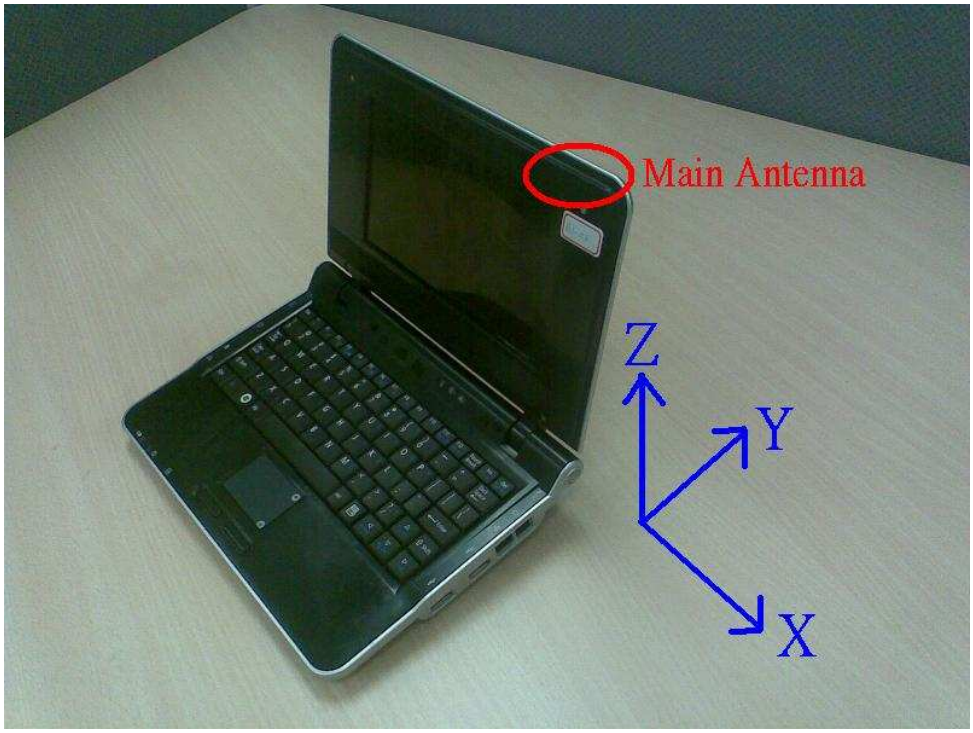
1 Introduction

The purpose of this report is to judge the transmitting and receiving capability of the antennas inside the notebook PC. For this reason, we may need to know the impedance bandwidth (VSWR) and radiation pattern (2D/3D). In this report, we will systematically show all the values mentioned above, and summary will be drawn in the end.

2 General description

IL1 model is a 7" wide screen notebook PC platform which support WLAN wireless functions Base on the customer's requirement specification for notebook computer antennas, which needs to cover WLAN (802,11a/b/g) frequency bands. There is only main Antenna element and antenna type is PIFA type.

Antenna placement



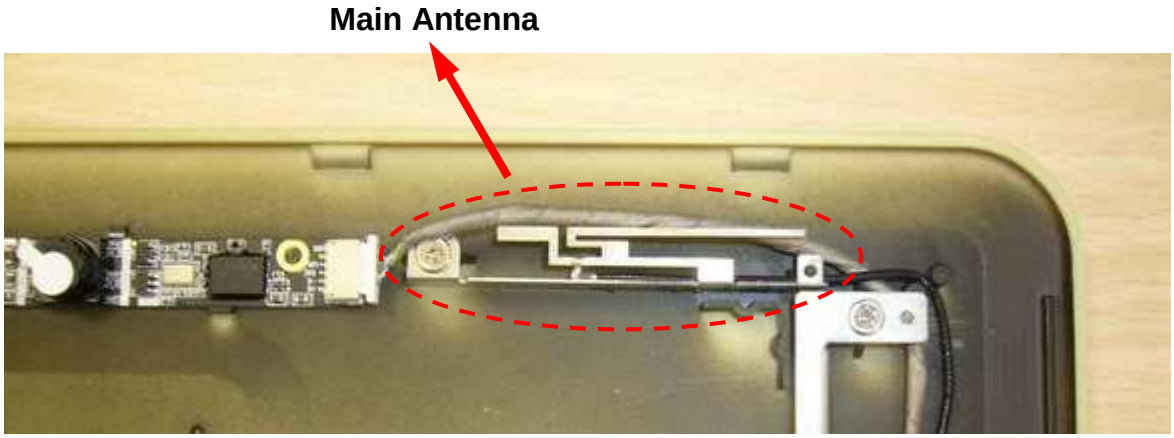


Fig. 1 Antenna Placement

3 Antenna characteristics

3.1 WLAN antenna

3.1.1 Main antenna

3.1.1.1 Description

The antenna is made by metal sheet. Main antenna is allocated in the upper right side of LCD screen. Main antennas cover IEEE 802.11 a/b/g frequency bands, the volume is 49*6.6*5mm (L*W*H). The antenna dimensions are illustrated in Figure 2. Coaxial cable O.D. is 1.13mm and length is 300mm.

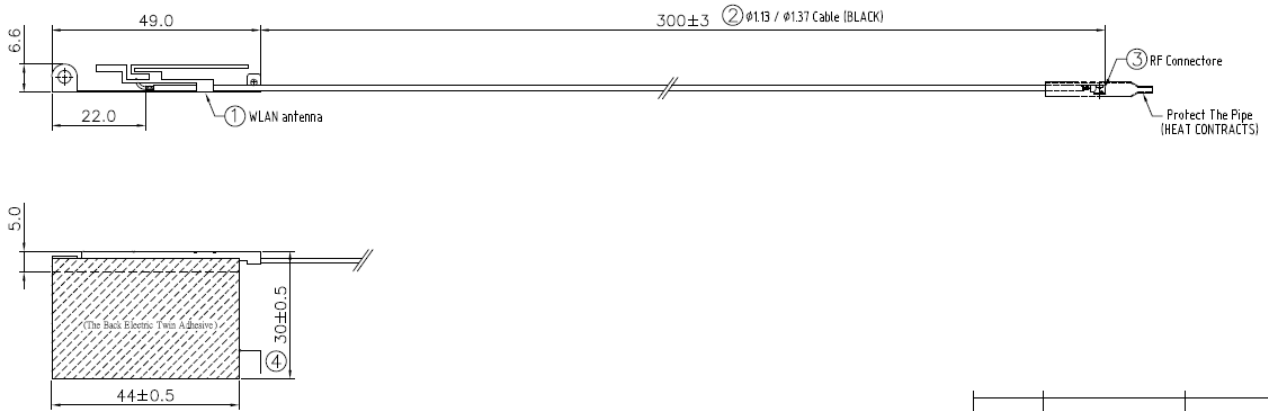
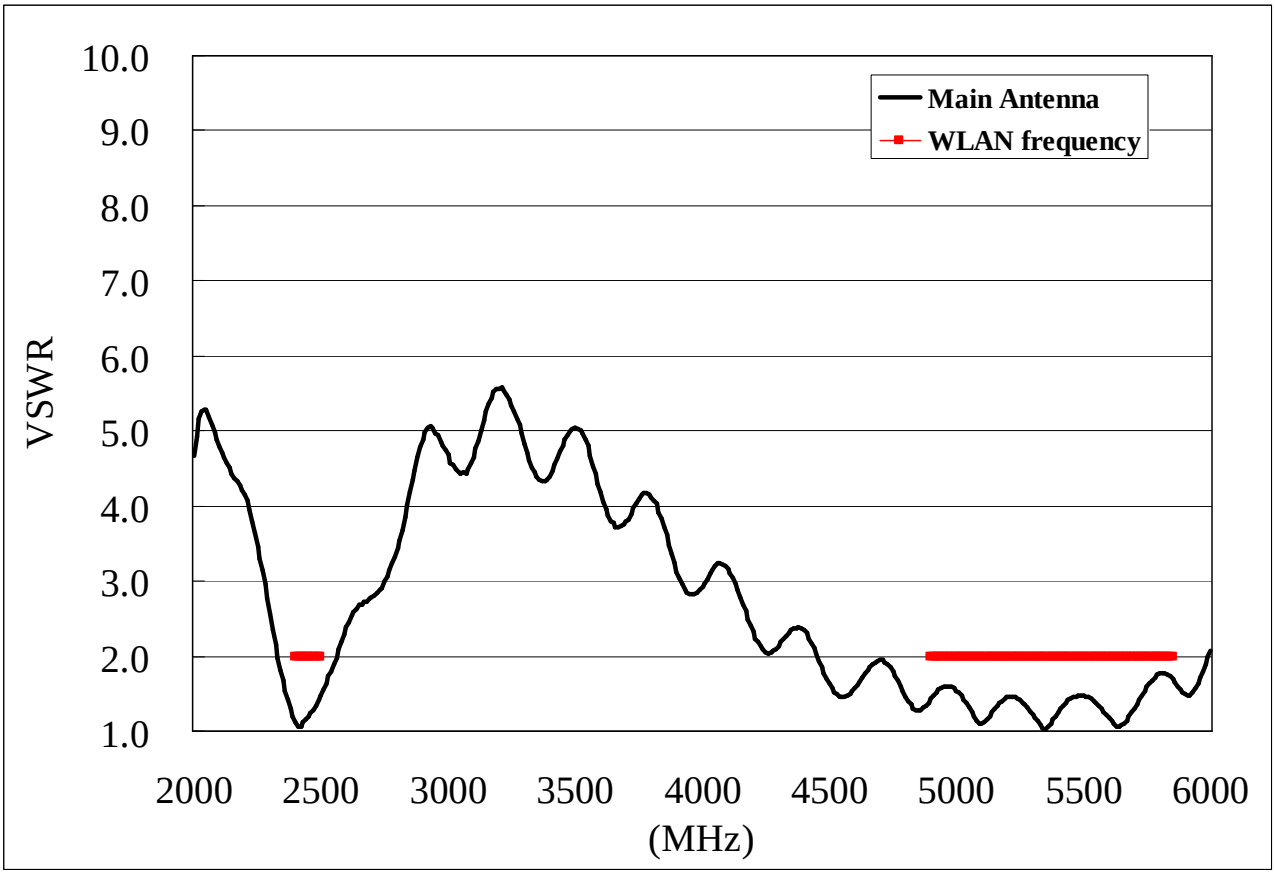


Figure 2 Antenna Dimensions

3.1.1.2 VSWR

For better impedance matching, we need to be sure that the antenna is totally in-band and shows a wide enough bandwidth. With return loss (or VSWR), we can easily tell if the design meets the basic requirement. To measure the return loss, we need to cut the connection between antenna feed-in and RF car-kit, and attach a coaxial cable at the feed-in point. Then, by click the coaxial cable onto a network analyzer (such as Agilent 8753ES), we can measure the return loss without difficulties.



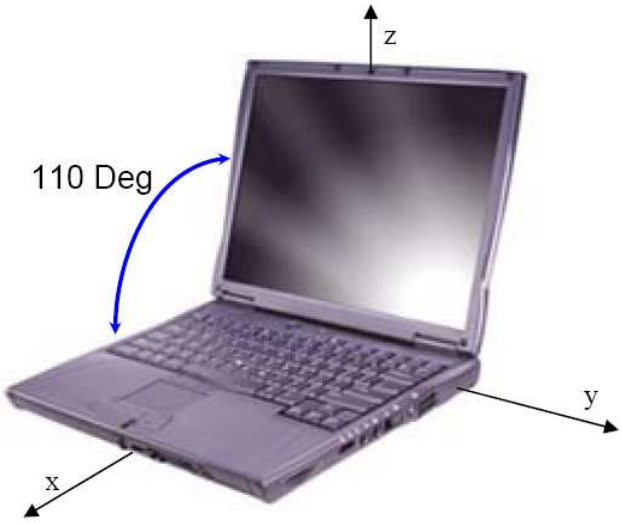
Frequency (MHz)	2412	2437	2462	4900	5150	5350	5470	5725	5875
Main	1.07	1.16	1.29	1.43	1.30	1.02	1.46	1.42	1.69

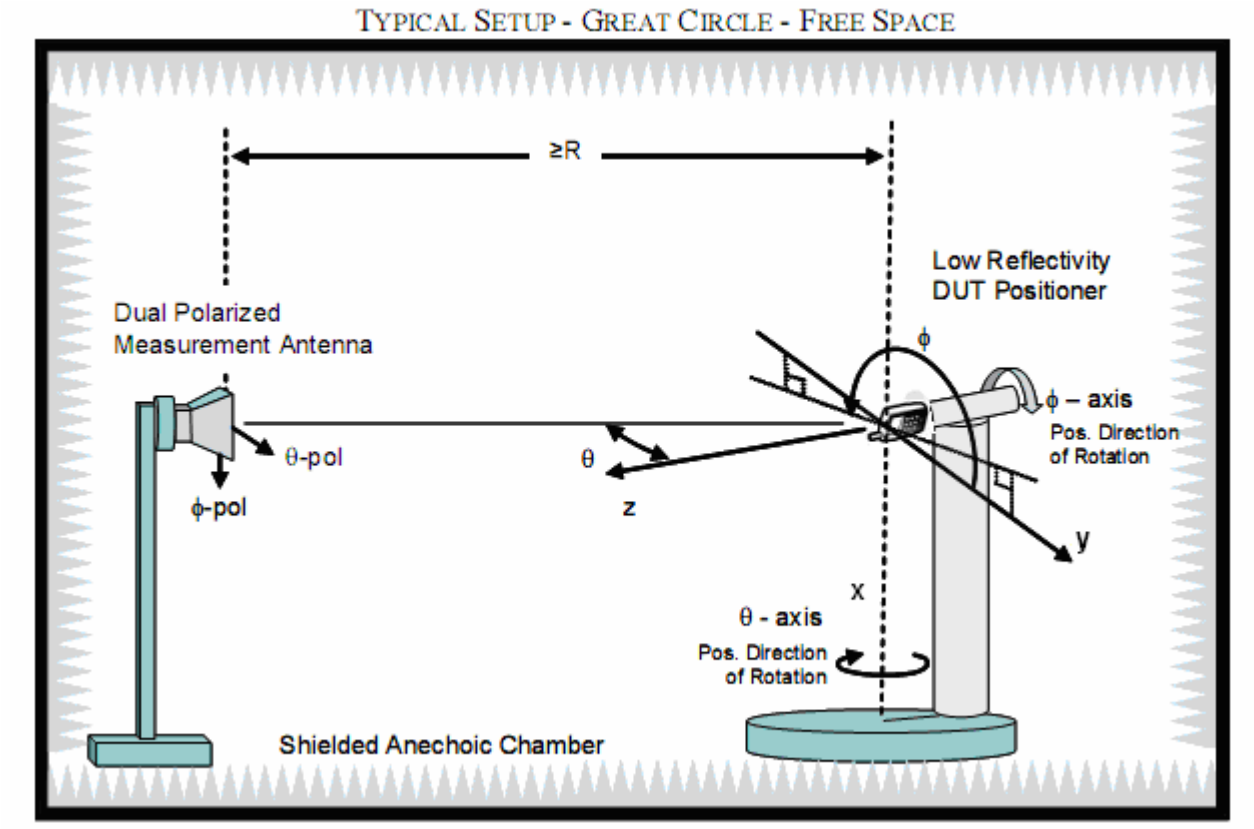
VSWR table

3.1.1.3 Passive

The antenna gain measurement we made here thoroughly follows ***CTIA Test Plan for Mobile Station Over The Air Performance ver 2.2***. In the test plan, CTIA defines the total radiated power (TRP) and total isotropic sensitivity (TIS) measurements / specs in different modes (“free space”, “talk mode”, and “dial mode”) and different bands. The term TRP is, in fact, the spherical effective isotropic radiated power, which CTIA claims to be a better indication of mobile performance comparing to traditional peak effective isotropic radiated power (EIRP) in additional spatial coverage concern. Yet the term TIS is the spherical effective radiated receiver sensitivity. Just like TRP, TIS also includes the coverage concern. Following are the configurations for both “free space” and “talk mode” measurements.

Free Space Configuration





Following passive free space patterns are measured in the first and last frequency point for low and high frequency band, respectively. Each graph contains 3D pattern, 2D (H, E1, E2) patterns, efficiency, and peak gain.

Passive peak gain (X-Y plane)

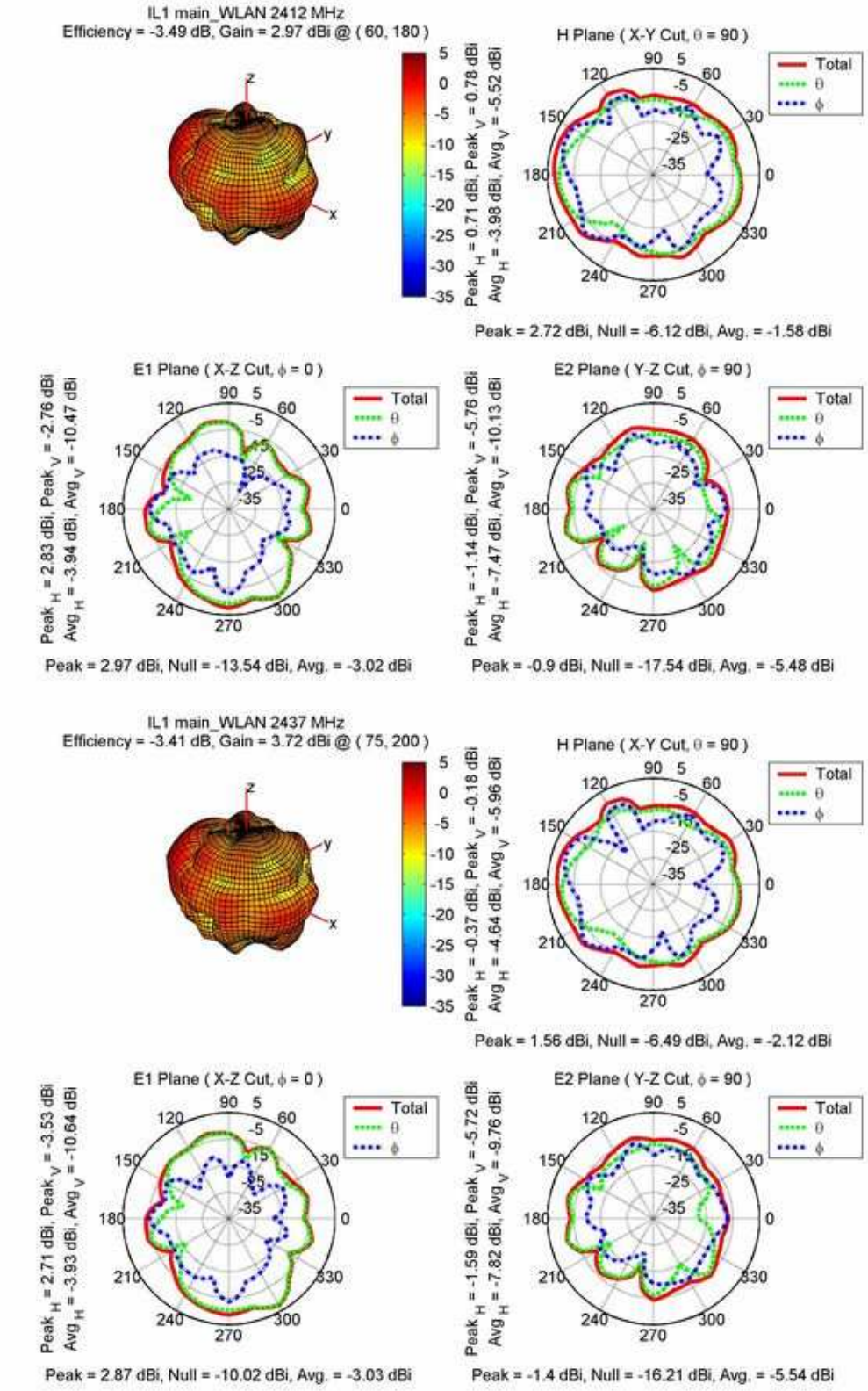
	Main		
Frequency (MHz)	H (dBi)	V (dBi)	H+V (dBi)
2412	0.71	0.78	2.72
2437	-0.37	-0.18	1.56
2462	-0.13	0.1	1.07
4900	-0.44	-1.7	0.26
5150	-2.75	-2.41	-0.56
5350	-1.79	-1.84	-0.29
5470	-0.19	-0.99	0.6
5725	-1.12	-1.71	0.06
5875	-0.7	-2.74	1.14

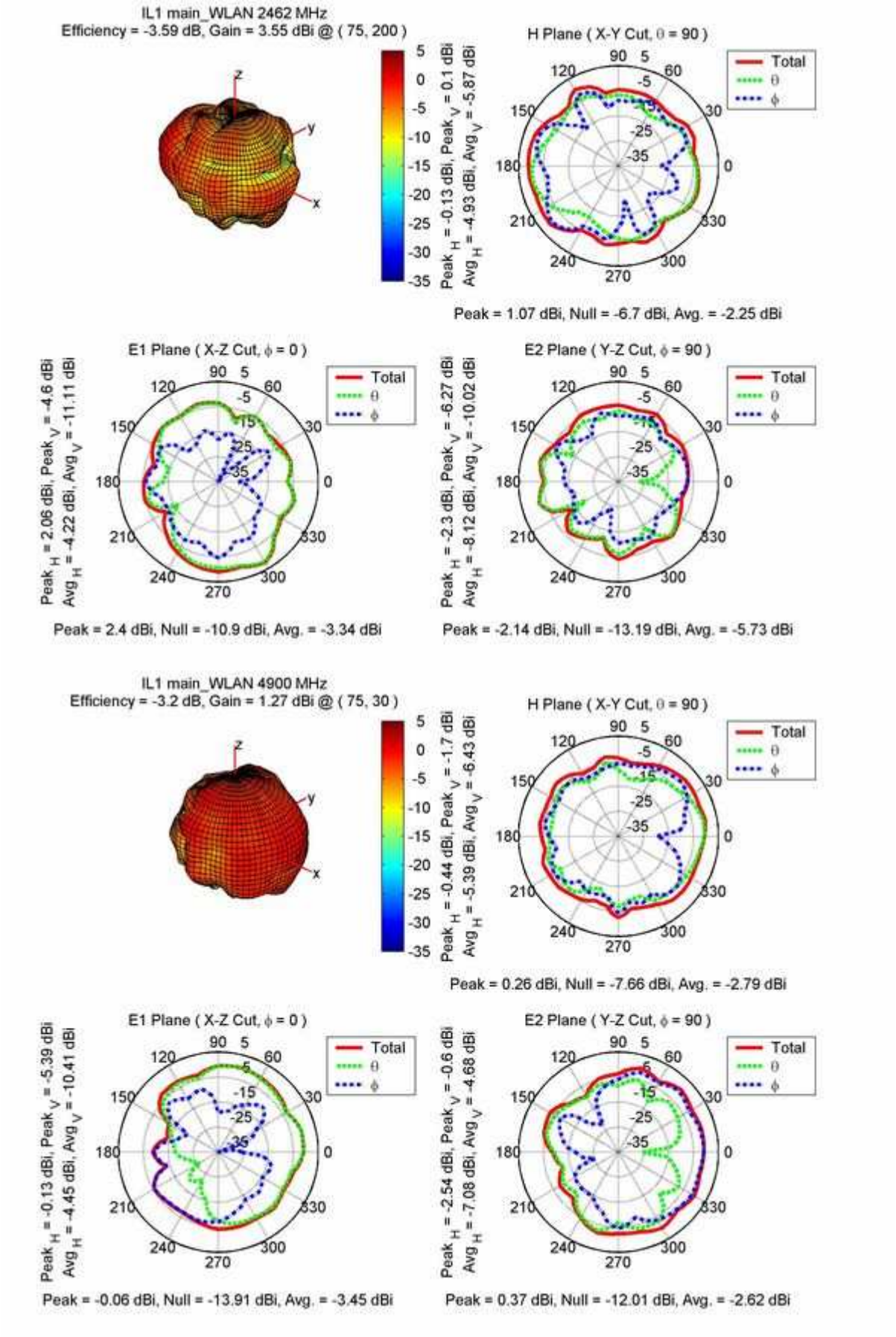
Passive average gain (X-Y plane)

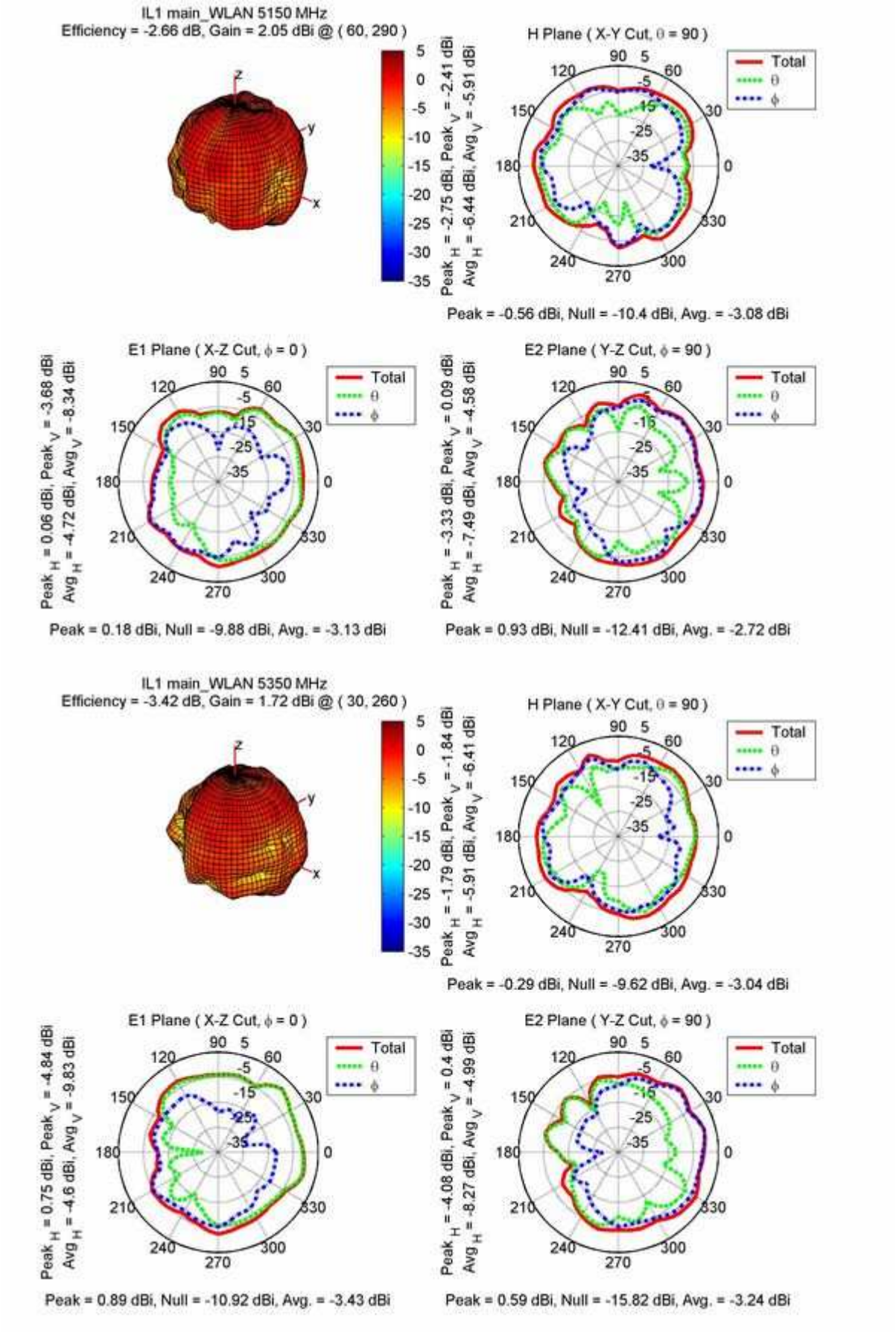
	Main		
Frequency (MHz)	H (dBi)	V (dBi)	H+V (dBi)
2412	-3.98	-5.52	-1.58
2437	-4.64	-5.96	-2.12
2462	-4.93	-5.87	-2.25
4900	-5.39	-6.43	-2.79
5150	-6.44	-5.91	-3.08
5350	-5.91	-6.41	-3.04
5470	-5.39	-6.23	-2.71
5725	-5.42	-6.8	-2.91
5875	-5.85	-6.87	-3.17

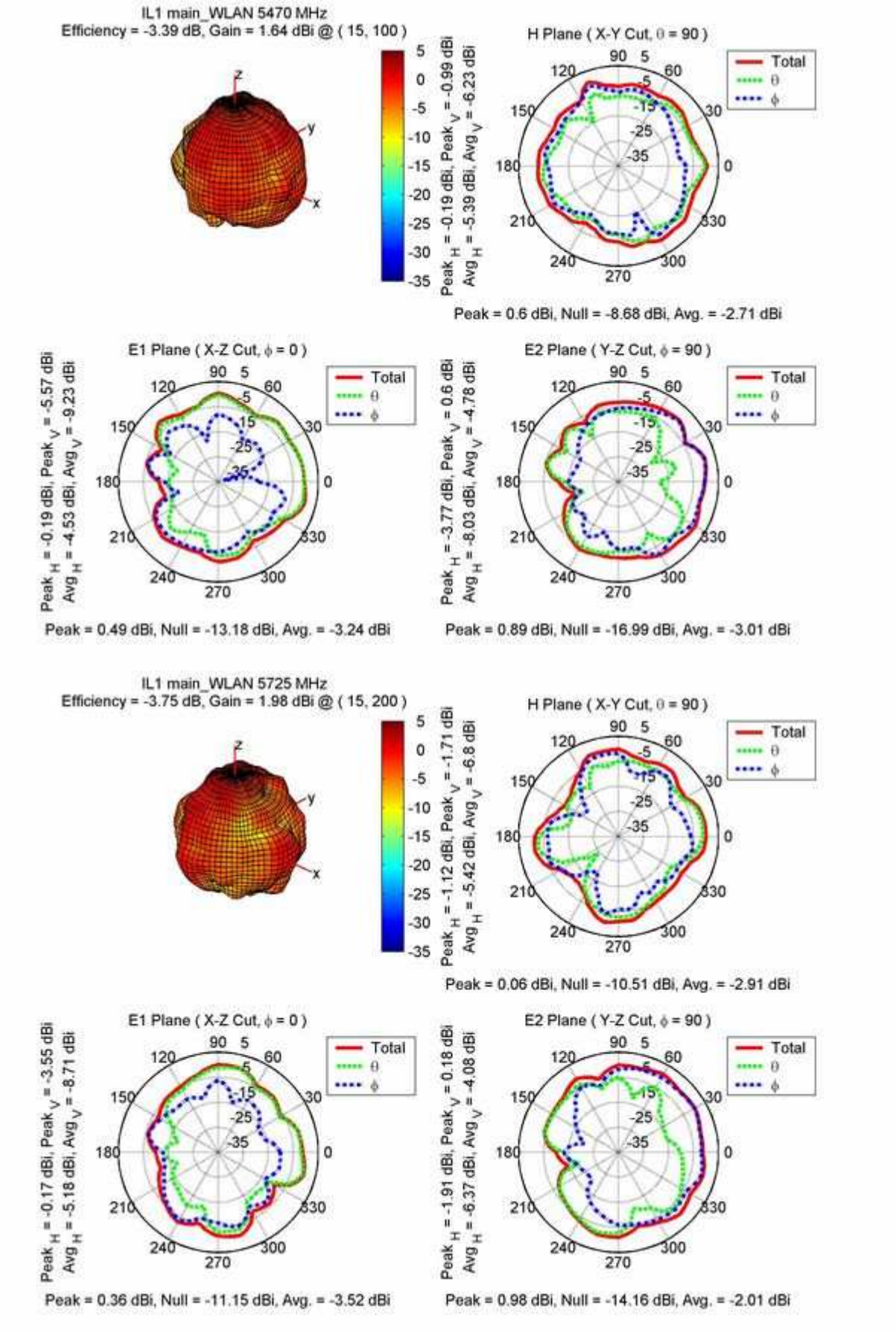
Antenna Pattern

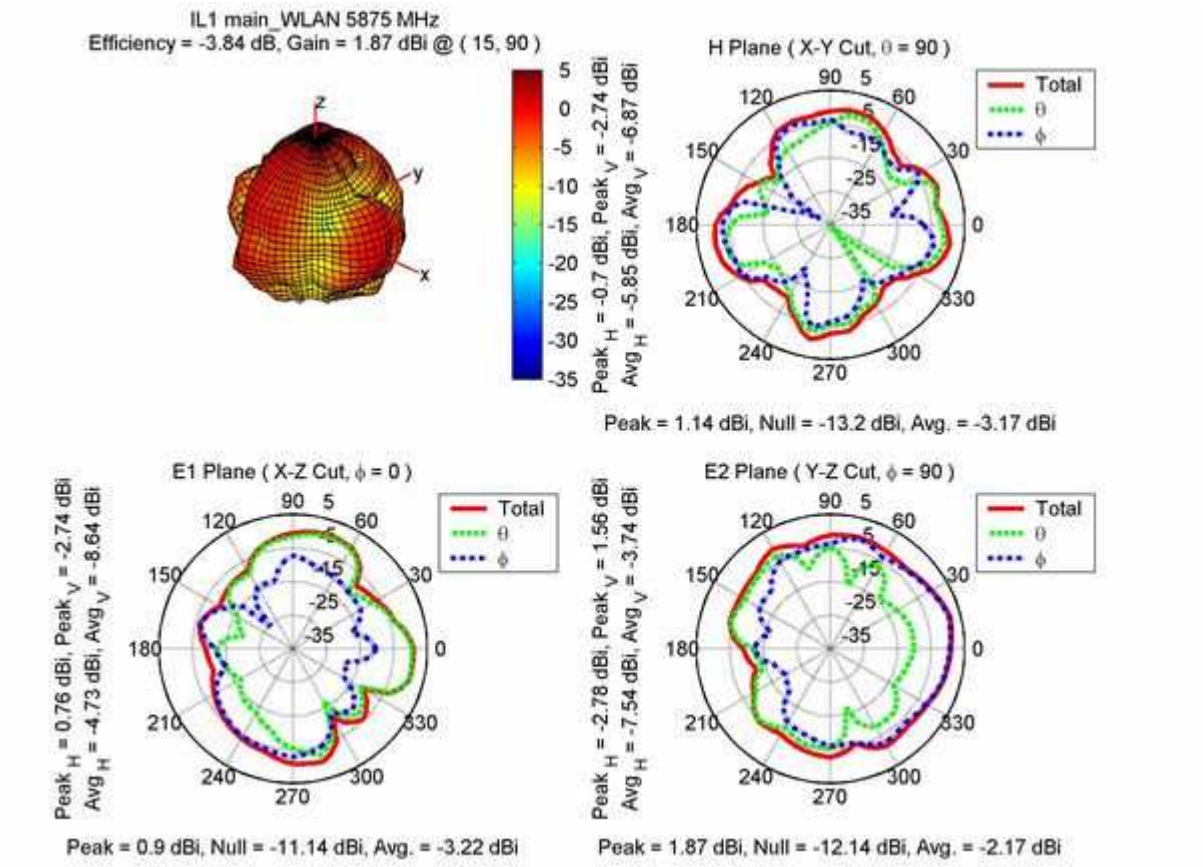
Main antenna




IL1 main_WLAN 2462 MHz
Efficiency = -3.59 dB, Gain = 3.55 dBi @ (75, 200)
Peak H = -0.13 dBi, Peak V = 0.1 dBi
Avg H = -4.93 dBi, Avg V = -5.87 dBi
H Plane (X-Y Cut, θ = 90)
Total
θ
ϕ
Peak = 1.07 dBi, Null = -6.7 dBi, Avg. = -2.25 dBi
E1 Plane (X-Z Cut, ϕ = 0)
Peak H = 2.06 dBi, Peak V = -4.6 dBi
Avg H = -4.22 dBi, Avg V = -11.11 dBi
Peak = 2.4 dBi, Null = -10.9 dBi, Avg. = -3.34 dBi
E2 Plane (Y-Z Cut, ϕ = 90)
Peak H = -2.3 dBi, Peak V = -6.27 dBi
Avg H = -8.12 dBi, Avg V = -10.02 dBi
Peak = -2.14 dBi, Null = -13.19 dBi, Avg. = -5.73 dBi
IL1 main_WLAN 4900 MHz
Efficiency = -3.2 dB, Gain = 1.27 dBi @ (75, 30)
Peak H = -0.44 dBi, Peak V = -1.7 dBi
Avg H = -5.39 dBi, Avg V = -6.43 dBi
H Plane (X-Y Cut, θ = 90)
Peak = 0.26 dBi, Null = -7.66 dBi, Avg. = -2.79 dBi
E1 Plane (X-Z Cut, ϕ = 0)
Peak H = -0.13 dBi, Peak V = -5.39 dBi
Avg H = -4.45 dBi, Avg V = -10.41 dBi
Peak = -0.06 dBi, Null = -13.91 dBi, Avg. = -3.45 dBi
E2 Plane (Y-Z Cut, ϕ = 90)
Peak H = -2.54 dBi, Peak V = -0.6 dBi
Avg H = -7.08 dBi, Avg V = -4.68 dBi
Peak = 0.37 dBi, Null = -12.01 dBi, Avg. = -2.62 dBi


IL1 main_WLAN 5150 MHz
Efficiency = -2.66 dB, Gain = 2.05 dBi @ (60, 290)
Peak H = -2.75 dBi, Peak V = -2.41 dBi
Avg H = -6.44 dBi, Avg V = -5.91 dBi
H Plane (X-Y Cut, θ = 90)
Total
θ
ϕ
Peak = -0.56 dBi, Null = -10.4 dBi, Avg. = -3.08 dBi
E1 Plane (X-Z Cut, ϕ = 0)
Peak H = 0.06 dBi, Peak V = -3.68 dBi
Avg H = -4.72 dBi, Avg V = -8.34 dBi
Peak = 0.18 dBi, Null = -9.88 dBi, Avg. = -3.13 dBi
E2 Plane (Y-Z Cut, ϕ = 90)
Peak H = -3.33 dBi, Peak V = 0.09 dBi
Avg H = -7.49 dBi, Avg V = -4.58 dBi
Peak = 0.93 dBi, Null = -12.41 dBi, Avg. = -2.72 dBi
IL1 main_WLAN 5350 MHz
Efficiency = -3.42 dB, Gain = 1.72 dBi @ (30, 260)
Peak H = -1.79 dBi, Peak V = -1.84 dBi
Avg H = -5.91 dBi, Avg V = -6.41 dBi
H Plane (X-Y Cut, θ = 90)
Total
θ
ϕ
Peak = -0.29 dBi, Null = -9.62 dBi, Avg. = -3.04 dBi
E1 Plane (X-Z Cut, ϕ = 0)
Peak H = 0.75 dBi, Peak V = -4.84 dBi
Avg H = -4.6 dBi, Avg V = -9.83 dBi
Peak = 0.89 dBi, Null = -10.92 dBi, Avg. = -3.43 dBi
E2 Plane (Y-Z Cut, ϕ = 90)
Peak H = -4.08 dBi, Peak V = 0.4 dBi
Avg H = -8.27 dBi, Avg V = -4.99 dBi
Peak = 0.59 dBi, Null = -15.82 dBi, Avg. = -3.24 dBi


IL1 main_WLAN 5470 MHz
Efficiency = -3.39 dB, Gain = 1.64 dBi @ (15, 100)
Peak H = -0.19 dBi, Peak V = -0.99 dBi
Avg H = -5.39 dBi, Avg V = -6.23 dBi
H Plane (X-Y Cut, θ = 90)
Total
θ
ϕ
Peak = 0.6 dBi, Null = -8.68 dBi, Avg. = -2.71 dBi
E1 Plane (X-Z Cut, ϕ = 0)
Peak H = -0.19 dBi, Peak V = -5.57 dBi
Avg H = -4.53 dBi, Avg V = -9.23 dBi
Peak = 0.49 dBi, Null = -13.18 dBi, Avg. = -3.24 dBi
E2 Plane (Y-Z Cut, ϕ = 90)
Peak H = -3.77 dBi, Peak V = 0.6 dBi
Avg H = -8.03 dBi, Avg V = -4.78 dBi
Peak = 0.89 dBi, Null = -16.99 dBi, Avg. = -3.01 dBi
IL1 main_WLAN 5725 MHz
Efficiency = -3.75 dB, Gain = 1.98 dBi @ (15, 200)
Peak H = -1.12 dBi, Peak V = -1.71 dBi
Avg H = -5.42 dBi, Avg V = -6.8 dBi
Peak = 0.06 dBi, Null = -10.51 dBi, Avg. = -2.91 dBi
Peak H = -0.17 dBi, Peak V = -3.55 dBi
Avg H = -5.18 dBi, Avg V = -8.71 dBi
Peak = 0.36 dBi, Null = -11.15 dBi, Avg. = -3.52 dBi
Peak H = -1.91 dBi, Peak V = 0.18 dBi
Avg H = -6.37 dBi, Avg V = -4.08 dBi
Peak = 0.98 dBi, Null = -14.16 dBi, Avg. = -2.01 dBi


IL1 main_WLAN 5875 MHz
Efficiency = -3.84 dB, Gain = 1.87 dBi @ (15, 90)
Peak H = -0.7 dBi, Peak V = -2.74 dBi
Avg H = -5.85 dBi, Avg V = -6.87 dBi
H Plane (X-Y Cut, θ = 90)
Total
θ
ϕ
Peak = 1.14 dBi, Null = -13.2 dBi, Avg. = -3.17 dBi
E1 Plane (X-Z Cut, ϕ = 0)
Peak H = 0.76 dBi, Peak V = -2.74 dBi
Avg H = -4.73 dBi, Avg V = -8.64 dBi
Peak = 0.9 dBi, Null = -11.14 dBi, Avg. = -3.22 dBi
E2 Plane (Y-Z Cut, ϕ = 90)
Peak H = -2.78 dBi, Peak V = 1.56 dBi
Avg H = -7.54 dBi, Avg V = -3.74 dBi
Peak = 1.87 dBi, Null = -12.14 dBi, Avg. = -2.17 dBi