

OTA Test Report – Main Report

LEGO System A/S
Model: PEL – 1



Prepared for: LEGO System A/S
Aastvej 1
Billund
7190
Denmark

COMMERCIAL-IN-CONFIDENCE

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SIGNATURE			
NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Philip Harrison	Chief Engineer (RF)	Authorised Signatory	02 December 2025

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TÜV SÜD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuvsud.com/en

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom



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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	12 June 2025
2	Changed Model name from "P11 AB Version 1.1" to "PEL - 1"	12 November 2025
3	Test Setup Photos have been moved to Appendix.	02 December 2025

Table 1

1.2 Introduction

Applicant	LEGO System A/S
Manufacturer	LEGO System A/S
DUT/Sample Identification	Refer to section 1.3.2
Test Specification/Issue/Date	CTIA 01.52 Version 4.0.0 (2022-02)
Date of Test	05-June-2025
Name of Engineer(s)	Thilanka Sanjaya
Related Documents	CTIA 01.71 Version 4.0.2 (2024-05) CTIA 01.90 Version 4.0.0 (2022-02)



1.3 Product Information

1.3.1 Technical Description

The device under test (DUT) was a LEGO brick.

1.3.2 Identification of the DUT

The table below details identification of the DUT(s) that have been used to carry out the testing within this report.

Model: PEL - 1			
Serial Number	Hardware Version	Software Version	Firmware
AB1.1-STD	HW4	N/A	2.15-EMC FW

Table 2

1.3.3 DUT Modification Record

The table below details modifications made to the DUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to DUT	Modification Fitted By	Date Modification Fitted
Model: PEL - 1			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3



2 Test Details

2.1 Test Location

TÜV SÜD conducted the following tests at our Concorde Park Test Laboratory.

Office Address:

TÜV SÜD
Concorde Park
Concorde Way
Fareham
Hampshire
PO15 5FG
United Kingdom

2.2 Environmental Conditions

Ambient Temperature: 22.7 °C
Relative Humidity: 50.4 %

2.3 Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
OTA Chamber 19	ETS-Lindgren	AMS-8947	6603	12	27-Sep-2025
Spectrum Analyser	Anritsu	MS2830A	6572	12	14-May-2026
EMQuest Software	ETS Lindgren	V1.17	6689	-	Software
Humidity & Temperature meter	R.S Components	1364	6348	12	09-Apr-2026

Table 4

2.4 Measurement Uncertainty

Parameter	Measurement Uncertainty (dB)
Total Radiated Power – Free Space	1.74

Table 5

2.5 Test Method

This test was performed in accordance with CTIA 01.52 Version 4.0.0 Section 4.



2.6 Deviations from the Standard

The following deviations from the applicable test standard were made during testing:

- RF Instrument Measurement Settings – Certain measurement settings were adjusted from the standard configuration to optimize measurement accuracy. Additionally, the DUT was set into a continuous test mode and did not communicate with signalling equipment as is usual for CTIA tests.
- Bluetooth LE Test Frequencies – CTIA Test Plan 01.52 Table 4.1-3 requests testing the three Bluetooth “advertising channels” of 37 (2402 MHz), 38 (2426 MHz) and 39 (2480 MHz). The customer requested testing a centre channel nearer the middle of the band to characterize antenna performance over a more even frequency spread. Therefore, the DUT was tested on channels 37 (2402 MHz), 17 (2440 MHz) and 39 (2480 MHz).



2.7 Test Results

2.7.1 Test Frequency: 2402 MHz

2.7.1.1 Summary

Total Radiated Power	-10.62	dBm
Peak EIRP	-7.83	dBm
Antenna directivity	2.79	dBi
Antenna efficiency	-15.62	dB
Antenna gain*	-12.83	dBi

Table 6

*Note:

This value depends on the antenna port input power. The manufacturer has declared the antenna port input power to be 5.0 dBm.



2.7.1.2 Measured Data

Vertical (Theta) Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81
-165°	-8.74	-9.61	-10.54	-12.01	-14.98	-19.06	-22.73	-20.35	-16.99	-15.1	-13.47	-12.9	-13.4
-150°	-8.79	-9.29	-10.27	-11.92	-14.47	-18.18	-23.75	-25.18	-20.61	-17.66	-16.33	-16.12	-16.86
-135°	-9.67	-9.91	-10.73	-11.91	-13.60	-16.03	-19.05	-22.36	-23.4	-21.8	-20.68	-20.65	-22.35
-120°	-9.94	-10.00	-10.60	-11.29	-12.38	-13.93	-15.67	-17.61	-19.21	-19.62	-19.56	-19.67	-20.52
-105°	-11.42	-11.59	-11.91	-12.12	-12.73	-13.62	-14.57	-15.41	-16	-16.26	-16.18	-16.35	-16.21
-90°	-12.58	-12.58	-13.01	-13.08	-13.01	-13.16	-13.31	-13.43	-13.46	-13.37	-13.41	-13.54	-13.45
-75°	-14.64	-14.33	-13.80	-13.54	-13.45	-13.19	-12.73	-12.28	-11.96	-11.82	-11.74	-11.68	-11.63
-60°	-15.26	-15.46	-15.39	-14.93	-14.07	-12.94	-11.80	-10.92	-10.4	-10.23	-10.27	-10.41	-10.44
-45°	-16.68	-18.40	-20.31	-20.11	-17.55	-15.04	-13.27	-12.06	-11.13	-10.42	-9.98	-9.87	-9.88
-30°	-15.66	-18.08	-22.70	-26.89	-20.62	-16.20	-13.52	-11.78	-10.59	-9.84	-9.52	-9.6	-10.2
-15°	-13.44	-15.77	-20.15	-29.78	-23.97	-17.37	-13.95	-11.88	-10.64	-9.97	-9.77	-10.05	-10.91
0°	-14.20	-14.20	-14.20	-14.20	-14.20	-14.20	-14.20	-14.2	-14.2	-14.2	-14.2	-14.2	-14.2
15°	-10.91	-12.26	-14.44	-17.96	-24.54	-30.98	-21.09	-16.5	-13.92	-12.48	-11.87	-12.03	-13.44
30°	-10.20	-11.09	-12.62	-15.01	-18.89	-25.41	-25.94	-20.2	-17.02	-15.32	-14.57	-14.59	-15.66
45°	-9.88	-10.57	-11.69	-13.37	-15.82	-19.58	-24.94	-24.32	-19.68	-16.99	-15.79	-15.62	-16.68
60°	-10.44	-10.70	-11.31	-12.43	-14.07	-16.24	-18.49	-19.37	-18.46	-16.93	-15.62	-14.94	-15.26
75°	-11.63	-11.86	-12.38	-13.26	-14.26	-15.19	-15.89	-16.03	-15.69	-14.98	-14.21	-13.96	-14.64
90°	-13.45	-13.54	-13.59	-13.62	-14.02	-14.46	-14.37	-14.04	-13.7	-13.43	-13.3	-12.95	-12.58
105°	-16.21	-16.67	-16.80	-16.45	-15.60	-14.80	-13.98	-13.12	-12.4	-12.04	-11.86	-11.56	-11.42
120°	-20.52	-21.14	-19.90	-17.66	-15.74	-14.11	-12.58	-11.67	-11	-10.43	-10.09	-9.82	-9.94
135°	-22.35	-26.29	-33.05	-24.14	-19.21	-16.06	-14.10	-12.76	-11.5	-10.58	-9.91	-9.41	-9.67
150°	-16.86	-19.40	-22.73	-23.72	-19.39	-16.07	-13.81	-11.78	-10.46	-9.44	-8.6	-8.33	-8.79
165°	-13.40	-14.41	-16.40	-20.43	-20.80	-18.73	-14.89	-12.99	-11.66	-9.72	-8.64	-8.25	-8.74
180°	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81	-12.81

Table 7



Horizontal (Phi) Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36
-165°	-21.8	-18.56	-15.14	-12.76	-11.44	-10.56	-10.24	-11.23	-13.71	-16.18	-19.75	-22.26	-19.56
-150°	-25.36	-19.99	-15.36	-12.65	-11.19	-10.46	-10.47	-11.24	-12.61	-15.05	-19.08	-22.67	-19.94
-135°	-30.31	-22.95	-17.01	-14.05	-12.51	-11.70	-11.67	-12.28	-13.64	-15.92	-19.72	-24.51	-21.08
-120°	-29.65	-23.61	-16.82	-13.74	-11.99	-11.12	-11.11	-11.55	-12.61	-14.67	-18.10	-23.65	-22.94
-105°	-33.28	-22.35	-16.22	-13.47	-12.07	-11.36	-11.38	-11.82	-12.82	-14.77	-17.96	-23.45	-24.29
-90°	-33.59	-21.81	-16.32	-13.28	-11.80	-11.31	-11.29	-11.70	-12.58	-14.23	-17.38	-22.72	-27.27
-75°	-29.45	-20.18	-15.65	-13.63	-12.73	-12.15	-11.91	-12.27	-13.35	-15.27	-18.44	-24.84	-27.79
-60°	-25.71	-17.65	-14.10	-12.43	-11.65	-11.12	-10.95	-11.44	-12.72	-14.85	-18.10	-23.76	-28.81
-45°	-20.23	-15.83	-13.38	-12.05	-11.65	-12.07	-13.11	-14.48	-16.16	-18.76	-23.67	-35.26	-24.54
-30°	-19.21	-15.14	-12.85	-11.68	-11.36	-11.71	-12.53	-13.77	-15.58	-18.51	-23.88	-31.58	-20.11
-15°	-16.92	-13.55	-11.62	-10.60	-10.29	-10.62	-11.6	-13.32	-16.05	-20.81	-32.59	-24.82	-17.90
0°	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45	-14.45
15°	-17.90	-14.56	-12.59	-11.47	-10.97	-11.03	-11.64	-12.96	-15.34	-19.76	-30.86	-24.03	-16.92
30°	-20.11	-16.05	-13.62	-12.17	-11.45	-11.42	-12.08	-13.49	-15.87	-20.03	-29.49	-26.81	-19.21
45°	-24.54	-18.71	-15.52	-13.58	-12.39	-11.86	-11.93	-12.66	-14.26	-17.19	-22.61	-29.94	-20.23
60°	-28.81	-19.97	-15.73	-13.30	-11.87	-11.05	-10.91	-11.57	-12.93	-15.07	-18.83	-27.63	-25.71
75°	-27.79	-20.17	-16.04	-13.65	-12.20	-11.28	-10.92	-11.36	-12.45	-14.16	-17.26	-24.04	-29.45
90°	-27.27	-19.74	-15.32	-12.76	-11.39	-10.92	-10.80	-10.75	-11.25	-12.82	-15.76	-20.95	-33.59
105°	-24.29	-18.65	-15.16	-12.96	-11.62	-10.92	-10.81	-11.00	-11.50	-12.76	-15.32	-20.21	-33.28
120°	-22.94	-17.72	-14.29	-12.34	-11.34	-10.75	-10.58	-10.65	-11.19	-12.46	-14.86	-19.47	-29.65
135°	-21.08	-16.79	-14.06	-12.67	-11.67	-11.22	-11.07	-11.28	-12.15	-13.61	-16.01	-20.64	-30.31
150°	-19.94	-15.83	-13.26	-11.36	-10.51	-10.34	-10.48	-10.93	-11.71	-13.11	-15.70	-20.20	-25.36
165°	-19.56	-15.85	-12.74	-11.22	-11.16	-10.81	-11.35	-12.19	-12.72	-14.07	-16.34	-21.03	-21.80
180°	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36	-13.36

Table 8



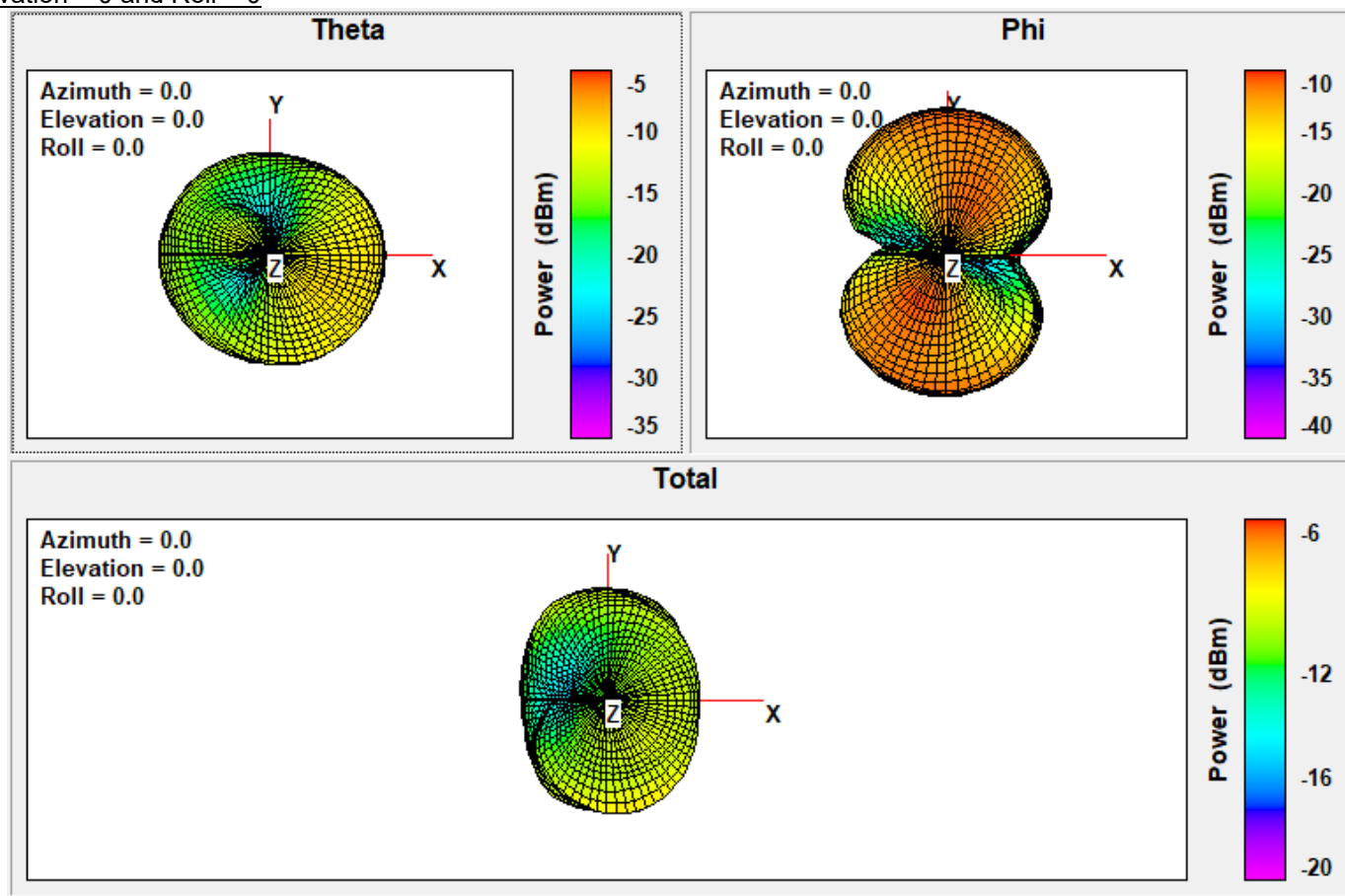
Total Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06
-165°	-8.53	-9.08	-9.25	-9.36	-9.85	-9.98	-10.00	-10.73	-12.04	-12.60	-12.55	-12.43	-12.46
-150°	-8.69	-8.93	-9.09	-9.26	-9.52	-9.78	-10.27	-11.06	-11.97	-13.15	-14.48	-15.25	-15.12
-135°	-9.64	-9.70	-9.81	-9.84	-10.01	-10.33	-10.94	-11.87	-13.20	-14.92	-17.16	-19.16	-18.66
-120°	-9.89	-9.82	-9.67	-9.34	-9.17	-9.29	-9.81	-10.59	-11.76	-13.47	-15.76	-18.21	-18.56
-105°	-11.40	-11.24	-10.54	-9.73	-9.38	-9.33	-9.68	-10.24	-11.11	-12.44	-13.96	-15.58	-15.58
-90°	-12.55	-12.09	-11.35	-10.17	-9.35	-9.13	-9.17	-9.47	-9.98	-10.77	-11.95	-13.04	-13.28
-75°	-14.50	-13.33	-11.62	-10.57	-10.07	-9.63	-9.29	-9.26	-9.59	-10.20	-10.90	-11.47	-11.53
-60°	-14.88	-13.41	-11.69	-10.49	-9.68	-8.93	-8.34	-8.16	-8.39	-8.95	-9.60	-10.21	-10.37
-45°	-15.09	-13.92	-12.58	-11.42	-10.66	-10.30	-10.18	-10.09	-9.95	-9.83	-9.80	-9.86	-9.74
-30°	-14.07	-13.35	-12.42	-11.55	-10.87	-10.39	-9.99	-9.65	-9.39	-9.29	-9.36	-9.57	-9.77
-15°	-11.83	-11.51	-11.05	-10.55	-10.11	-9.79	-9.61	-9.53	-9.54	-9.62	-9.75	-9.91	-10.12
0°	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31
15°	-10.12	-10.25	-10.41	-10.59	-10.78	-10.98	-11.17	-11.37	-11.56	-11.73	-11.82	-11.77	-11.83
30°	-9.77	-9.89	-10.08	-10.35	-10.73	-11.25	-11.91	-12.65	-13.40	-14.06	-14.43	-14.34	-14.07
45°	-9.74	-9.95	-10.19	-10.46	-10.77	-11.18	-11.72	-12.37	-13.16	-14.08	-14.97	-15.46	-15.09
60°	-10.37	-10.21	-9.97	-9.83	-9.82	-9.90	-10.21	-10.90	-11.86	-12.89	-13.93	-14.71	-14.88
75°	-11.53	-11.27	-10.83	-10.44	-10.10	-9.80	-9.72	-10.09	-10.77	-11.54	-12.47	-13.55	-14.50
90°	-13.28	-12.61	-11.36	-10.16	-9.50	-9.33	-9.22	-9.08	-9.29	-10.10	-11.35	-12.31	-12.55
105°	-15.58	-14.54	-12.89	-11.35	-10.16	-9.43	-9.10	-8.92	-8.92	-9.37	-10.24	-11.01	-11.40
120°	-18.56	-16.09	-13.24	-11.22	-9.99	-9.10	-8.46	-8.12	-8.08	-8.32	-8.84	-9.37	-9.89
135°	-18.66	-16.33	-14.00	-12.37	-10.97	-9.99	-9.32	-8.94	-8.80	-8.83	-8.96	-9.09	-9.64
150°	-15.12	-14.25	-12.80	-11.11	-9.98	-9.31	-8.82	-8.32	-8.03	-7.89	-7.83	-8.06	-8.69
165°	-12.46	-12.06	-11.18	-10.73	-10.71	-10.16	-9.76	-9.56	-9.15	-8.36	-7.96	-8.03	-8.53
180°	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06	-10.06

Table 9

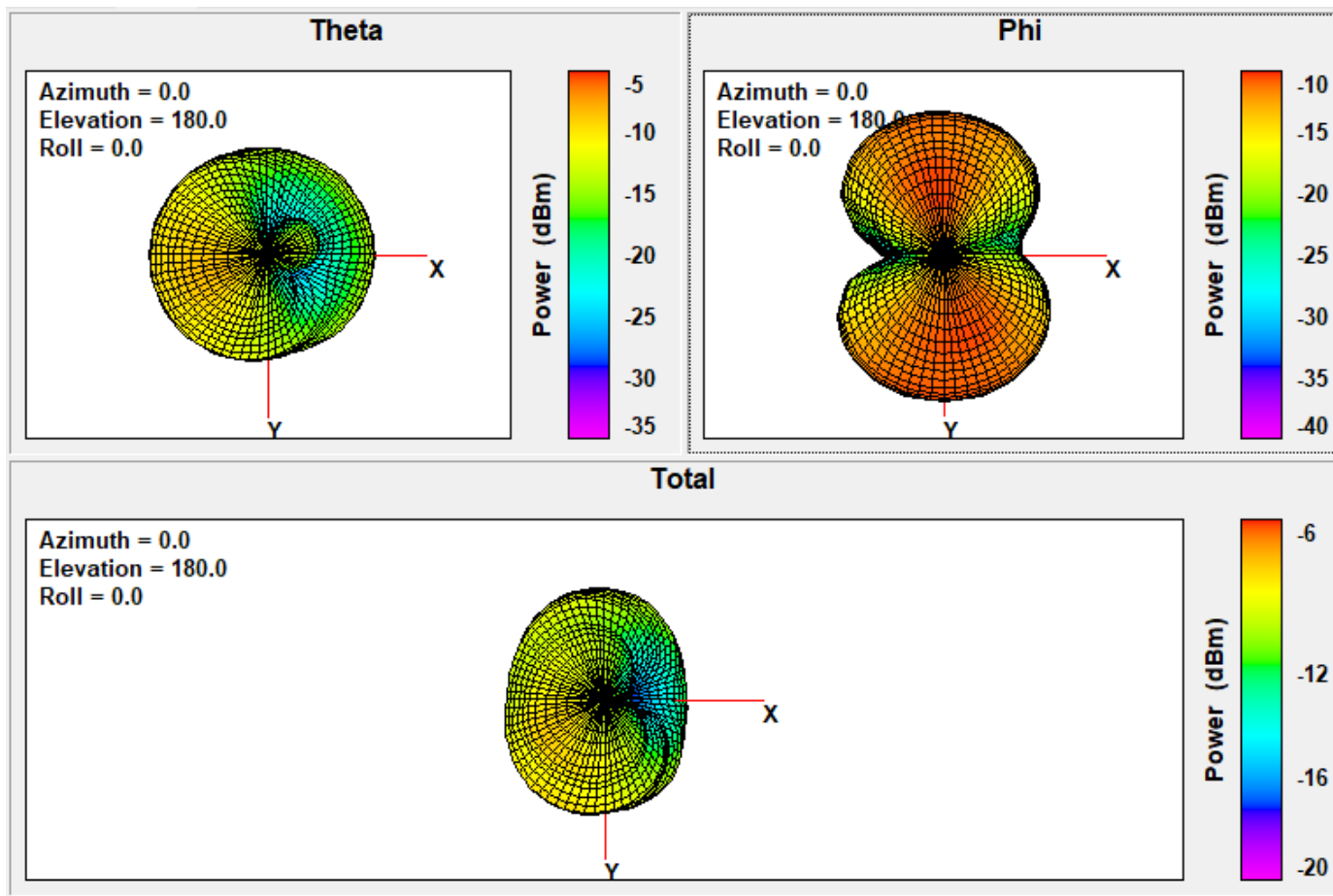
2.7.1.3 Radiation Pattern

Azimuth = 0, Elevation = 0 and Roll = 0



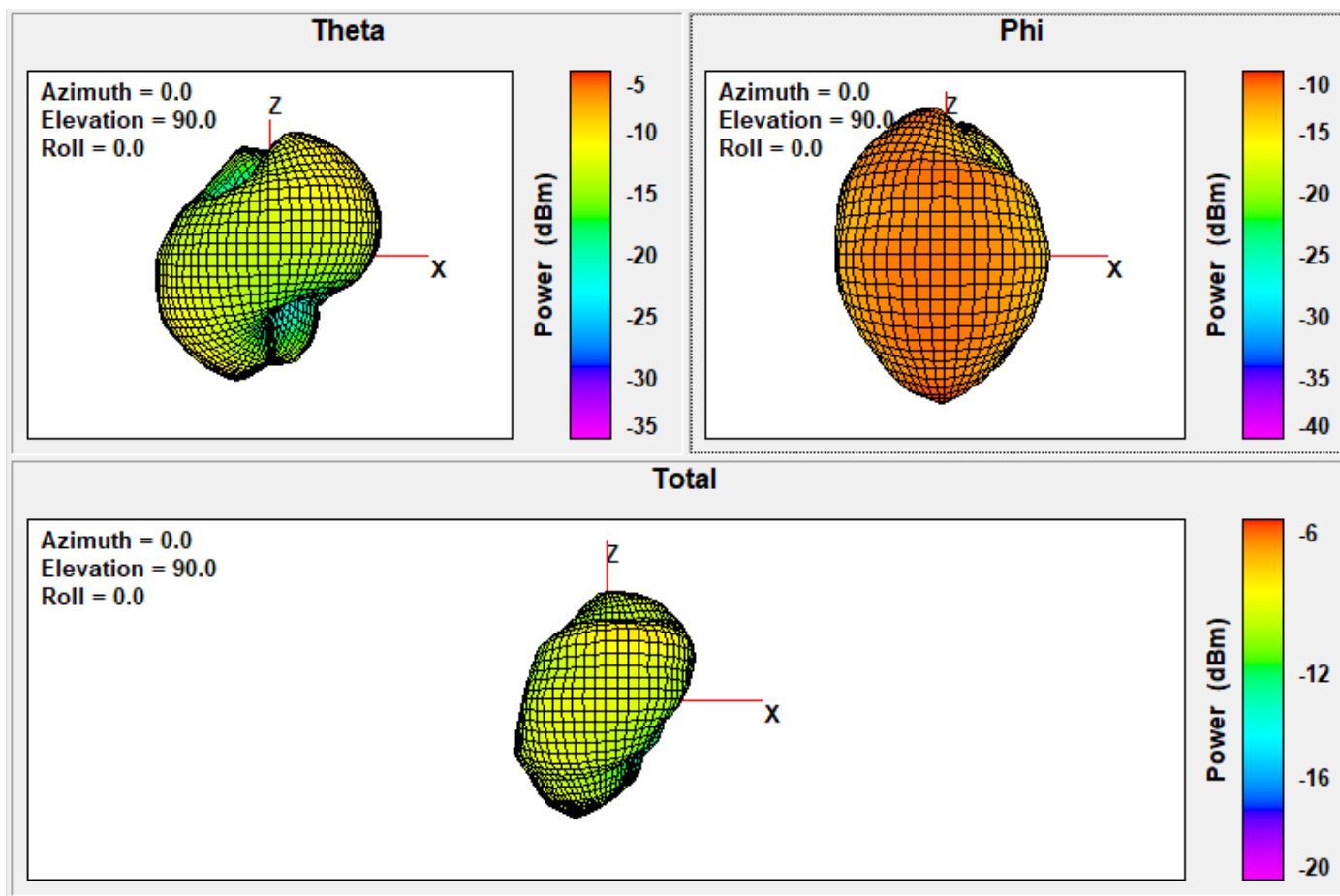
Plot 1

Azimuth = 0, Elevation = 180 and Roll = 0



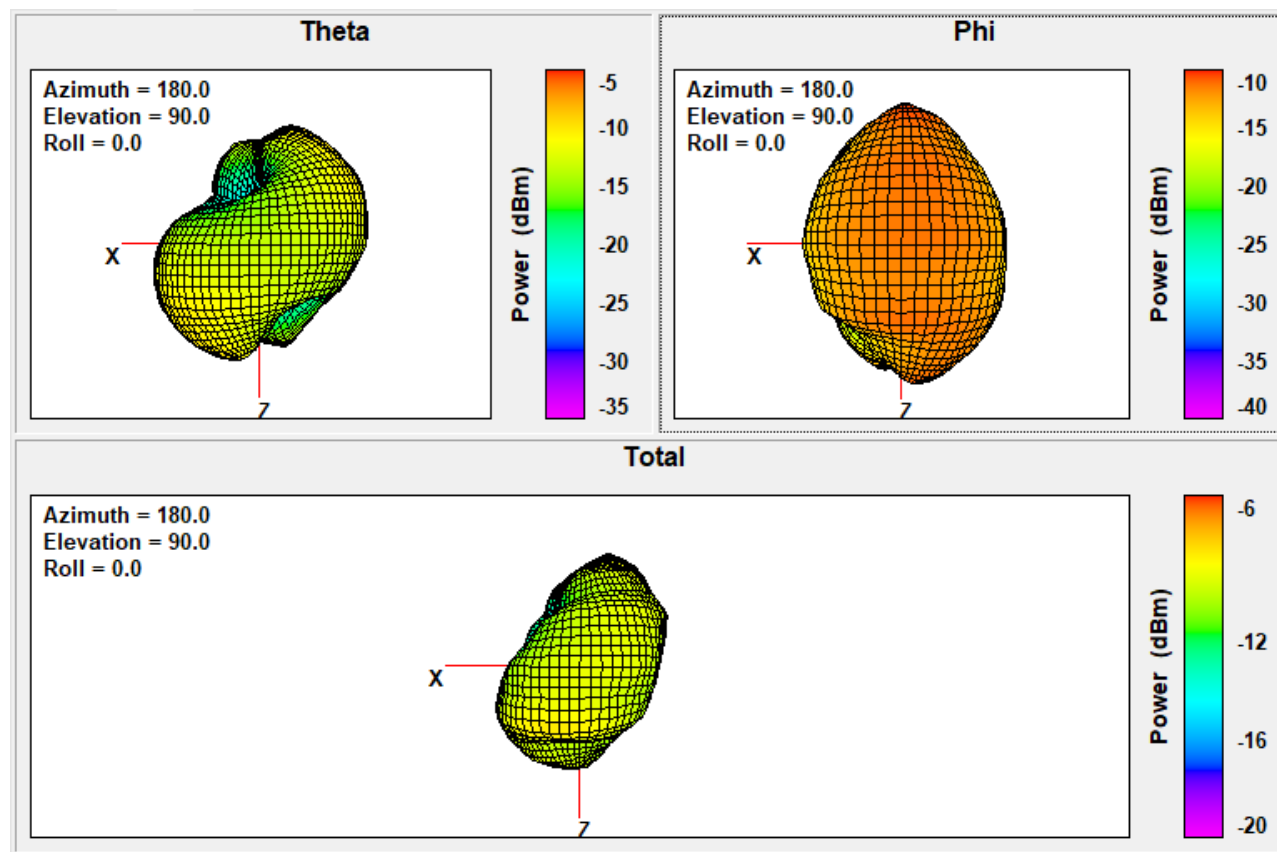
Plot 2

Azimuth = 0, Elevation = 90 and Roll = 0



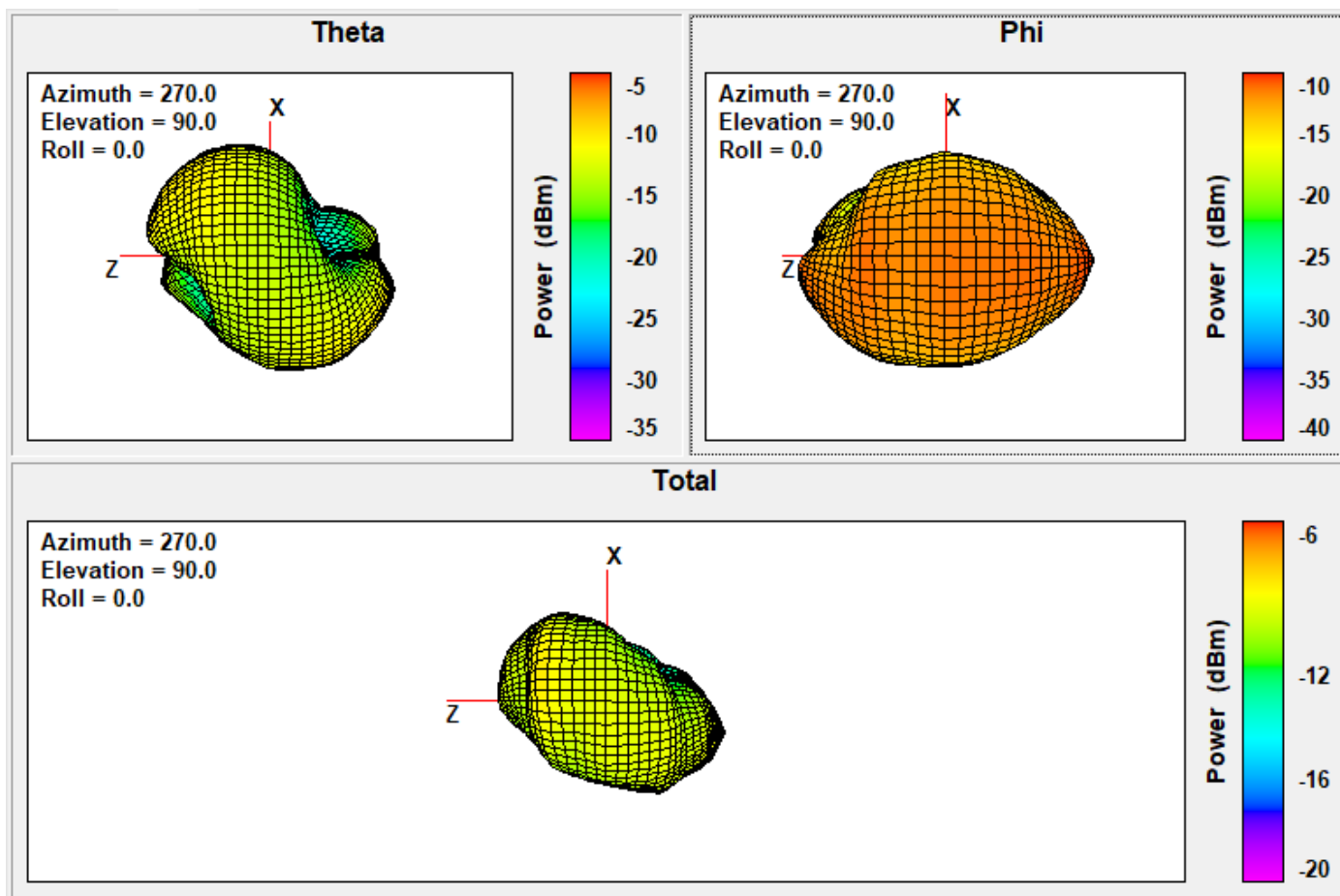
Plot 3

Azimuth = 180, Elevation = 90 and Roll = 0



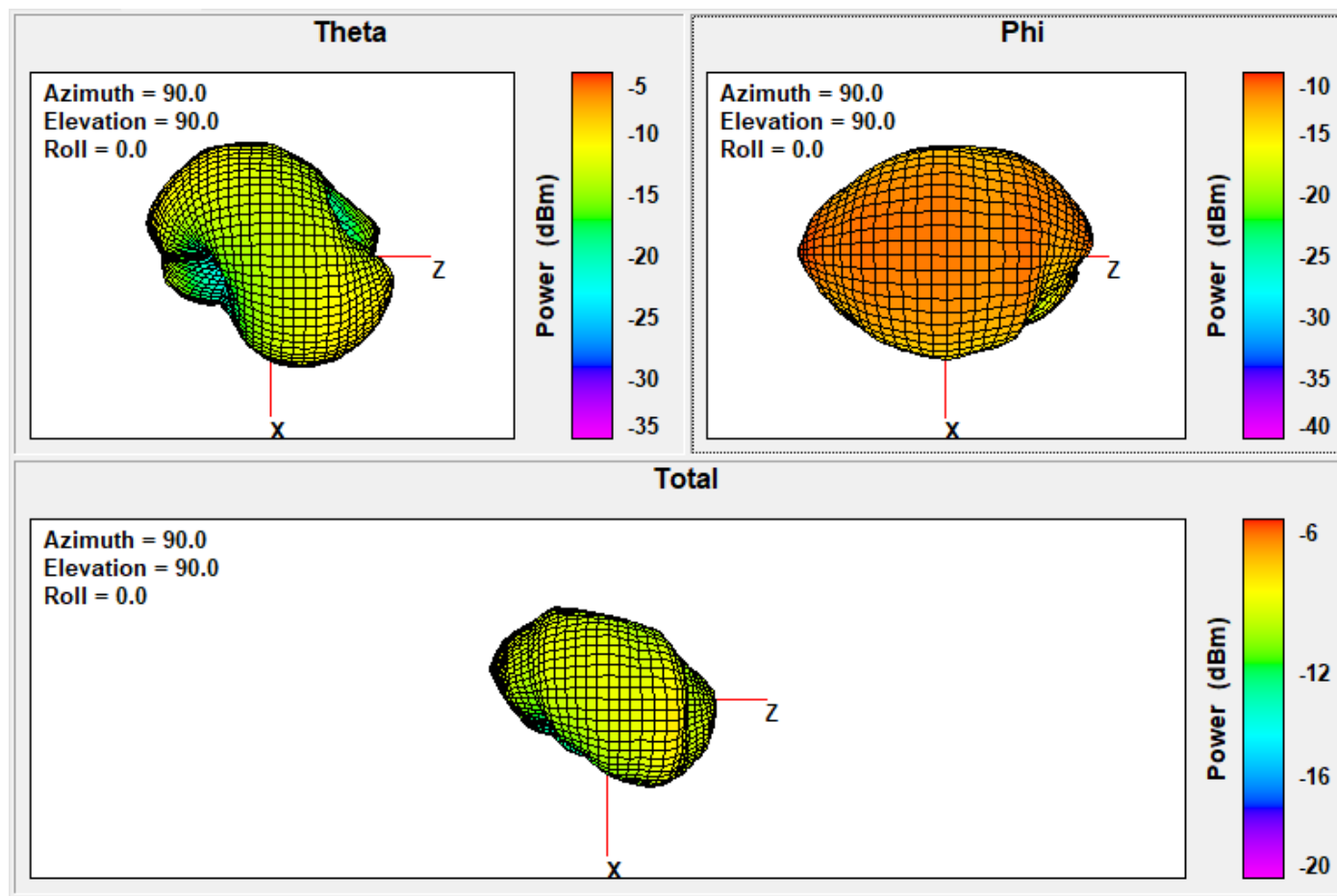
Plot 4

Azimuth = 270, Elevation = 90 and Roll = 0



Plot 5

Azimuth = 90, Elevation = 90 and Roll = 0



Plot 6



2.7.2 Test Frequency: 2439.7 MHz

2.7.2.1 Summary

Total Radiated Power	-10.73	dBm
Peak EIRP	-8.08	dBm
Antenna directivity	2.65	dBi
Antenna efficiency	-15.73	dB
Antenna gain*	-13.08	dBi

Table 10

*Note:

This value depends on the antenna port input power. The manufacturer has declared the antenna port input power to be 5.0 dBm.



2.7.2.2 Measured Data

Vertical (Theta) Power (dBm)

Theta \ Phi	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09
-165°	-8.84	-9.42	-10.14	-11.39	-13.87	-17.47	-23.81	-28.21	-20.12	-16.17	-13.87	-12.93	-13.10
-150°	-8.85	-9.05	-9.66	-10.94	-12.94	-15.71	-20.17	-25.89	-22.93	-18.62	-16.00	-14.95	-15.16
-135°	-9.66	-9.65	-10.21	-11.05	-12.37	-14.32	-16.87	-20.18	-22.69	-21.50	-19.56	-18.39	-18.02
-120°	-10.03	-10.02	-10.24	-10.67	-11.58	-12.89	-14.70	-16.72	-18.40	-18.79	-17.75	-17.14	-17.22
-105°	-11.40	-11.40	-11.21	-11.44	-12.08	-12.82	-13.81	-14.69	-15.29	-15.61	-15.33	-15.16	-15.24
-90°	-12.44	-12.57	-12.58	-12.48	-12.66	-12.98	-13.19	-13.24	-13.29	-13.26	-13.11	-13.26	-13.89
-75°	-13.20	-12.90	-12.96	-13.27	-13.36	-13.14	-12.87	-12.65	-12.44	-12.26	-12.06	-11.70	-11.42
-60°	-14.46	-14.95	-15.47	-15.46	-14.70	-13.56	-12.52	-11.76	-11.25	-10.93	-10.70	-10.55	-10.49
-45°	-15.46	-16.39	-17.74	-18.61	-17.76	-15.82	-13.90	-12.38	-11.32	-10.68	-10.32	-10.16	-10.07
-30°	-17.98	-21.06	-26.28	-26.61	-20.89	-17.03	-14.50	-12.81	-11.76	-11.17	-10.94	-10.98	-10.85
-15°	-16.31	-18.94	-23.80	-31.50	-23.70	-18.41	-15.35	-13.37	-12.06	-11.28	-10.98	-11.15	-11.42
0°	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14	-15.14
15°	-11.42	-12.53	-14.38	-17.45	-22.56	-27.33	-21.71	-17.68	-15.49	-14.42	-14.16	-14.58	-16.31
30°	-10.85	-11.48	-12.62	-14.45	-17.30	-21.65	-25.81	-22.22	-18.43	-16.32	-15.47	-15.62	-17.98
45°	-10.07	-10.41	-11.18	-12.56	-14.78	-18.15	-22.73	-23.54	-20.08	-17.44	-15.84	-15.12	-15.46
60°	-10.49	-10.74	-11.38	-12.42	-13.92	-15.91	-17.98	-19.06	-18.14	-16.49	-15.30	-14.65	-14.46
75°	-11.42	-11.67	-12.26	-13.11	-14.36	-15.73	-16.43	-16.18	-15.36	-14.44	-13.74	-13.22	-13.20
90°	-13.89	-13.90	-13.94	-14.17	-14.56	-14.98	-15.21	-14.80	-13.91	-13.16	-12.74	-12.40	-12.44
105°	-15.24	-15.55	-16.35	-17.20	-17.03	-16.19	-15.26	-14.15	-13.06	-12.20	-11.52	-11.13	-11.40
120°	-17.22	-17.73	-18.38	-18.38	-17.14	-15.49	-13.94	-12.60	-11.64	-11.00	-10.48	-10.04	-10.03
135°	-18.02	-19.41	-22.19	-25.55	-23.92	-19.47	-16.27	-14.34	-12.77	-11.55	-10.74	-10.02	-9.66
150°	-15.16	-16.52	-19.53	-25.97	-30.52	-20.93	-16.64	-13.59	-11.69	-10.30	-9.20	-8.75	-8.85
165°	-13.10	-13.71	-15.28	-19.18	-25.74	-26.25	-19.30	-15.63	-13.89	-11.56	-9.75	-8.85	-8.84
180°	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09	-13.09

Table 11



Horizontal (Phi) Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73
-165°	-29.79	-23.46	-17.86	-14.40	-12.31	-10.94	-10.29	-10.79	-12.54	-14.52	-17.80	-25.16	-26.00
-150°	-28.24	-25.81	-17.83	-14.05	-12.04	-10.91	-10.54	-10.82	-11.76	-13.60	-16.91	-23.16	-24.78
-135°	-24.94	-31.11	-19.97	-15.77	-13.47	-12.17	-11.69	-11.78	-12.52	-14.05	-16.83	-21.82	-24.74
-120°	-22.94	-32.26	-19.78	-15.42	-12.87	-11.58	-11.16	-11.11	-11.61	-13.02	-15.38	-19.34	-23.79
-105°	-23.91	-27.46	-18.75	-15.08	-12.93	-11.80	-11.41	-11.35	-11.81	-13.00	-15.04	-18.52	-23.48
-90°	-25.20	-25.40	-17.96	-14.54	-12.91	-11.97	-11.50	-11.46	-11.90	-12.97	-14.86	-18.06	-23.55
-75°	-26.16	-23.14	-18.07	-15.26	-13.34	-12.29	-11.94	-12.04	-12.57	-13.74	-16.01	-20.20	-25.15
-60°	-31.98	-20.89	-16.48	-13.94	-12.21	-11.27	-11.12	-11.53	-12.37	-13.74	-15.98	-19.79	-32.37
-45°	-23.99	-17.70	-14.58	-13.02	-12.37	-12.14	-12.18	-12.64	-13.79	-15.84	-19.32	-26.32	-31.01
-30°	-20.40	-16.24	-13.98	-12.69	-11.98	-11.74	-11.97	-12.80	-14.38	-16.96	-21.20	-29.37	-24.27
-15°	-18.94	-15.81	-13.96	-13.00	-12.63	-12.78	-13.45	-14.74	-16.89	-20.60	-27.92	-27.97	-20.46
0°	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56	-15.56
15°	-20.46	-16.50	-14.12	-12.74	-12.16	-12.26	-13.05	-14.69	-17.49	-22.36	-32.93	-25.07	-18.94
30°	-24.27	-18.63	-15.41	-13.45	-12.35	-11.96	-12.24	-13.25	-15.23	-18.74	-25.58	-28.47	-20.40
45°	-31.01	-20.59	-16.05	-13.51	-12.10	-11.47	-11.55	-12.35	-13.94	-16.49	-20.87	-30.17	-23.99
60°	-32.37	-22.97	-17.32	-14.31	-12.66	-11.86	-11.57	-11.64	-12.42	-14.34	-17.70	-23.52	-31.98
75°	-25.15	-22.25	-17.23	-14.22	-12.59	-11.88	-11.56	-11.41	-11.85	-13.30	-15.92	-20.29	-26.16
90°	-23.55	-21.09	-16.91	-14.11	-12.32	-11.29	-10.90	-11.01	-11.34	-12.15	-14.08	-17.63	-25.20
105°	-23.48	-20.06	-16.15	-13.85	-12.34	-11.41	-10.84	-10.86	-11.33	-12.19	-13.84	-16.92	-23.91
120°	-23.79	-19.41	-15.69	-13.17	-11.75	-11.00	-10.67	-10.74	-10.97	-11.77	-13.47	-16.52	-22.94
135°	-24.74	-19.22	-15.34	-13.46	-12.25	-11.55	-11.30	-11.37	-11.96	-13.04	-14.90	-18.35	-24.94
150°	-24.78	-18.37	-14.49	-12.06	-10.80	-10.44	-10.39	-10.64	-11.35	-12.49	-14.54	-18.42	-28.24
165°	-26.00	-18.63	-14.16	-11.91	-11.40	-11.06	-11.13	-12.02	-12.70	-13.77	-15.55	-20.73	-29.79
180°	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73	-13.73

Table 12



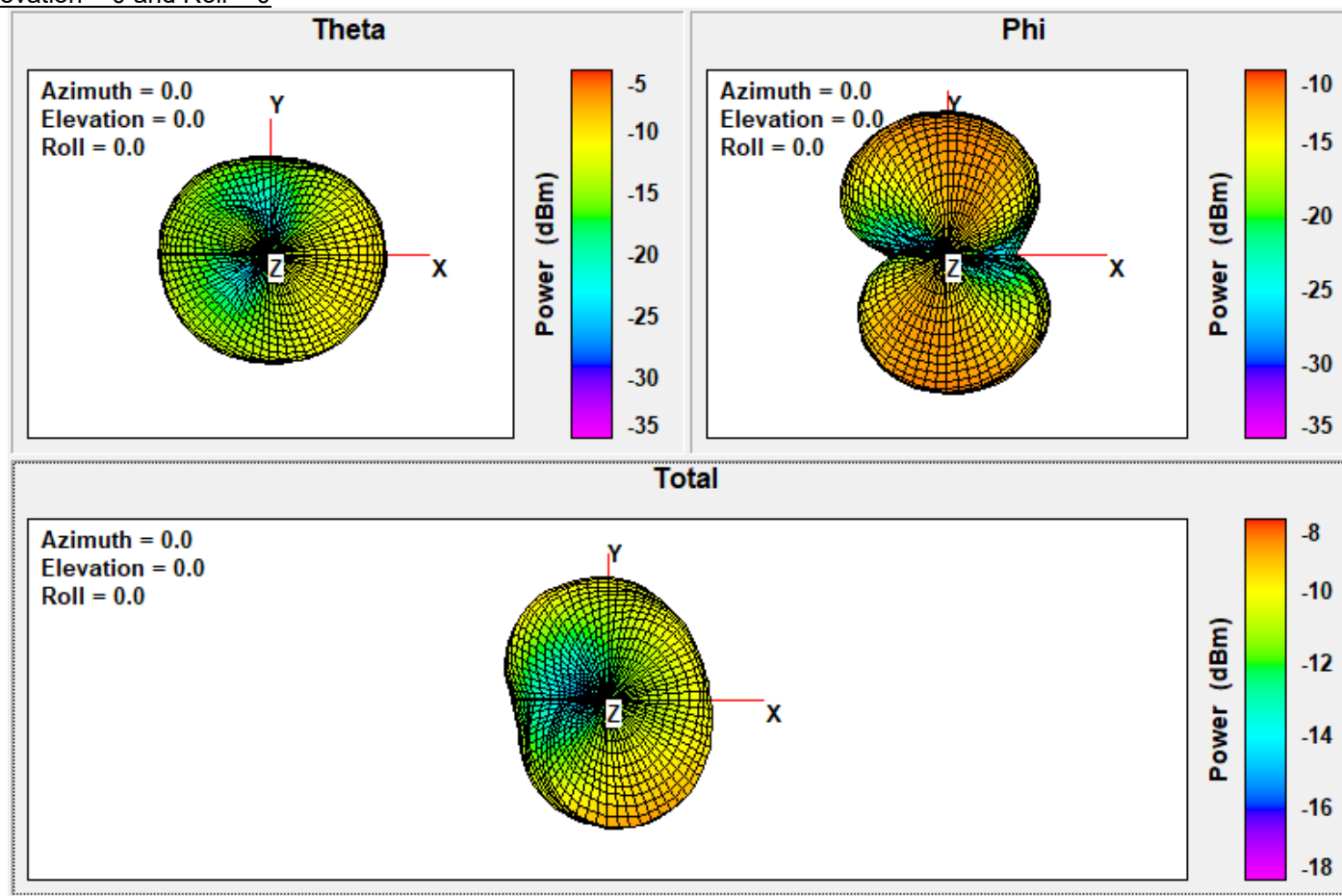
Total Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39
-165°	-8.81	-9.26	-9.46	-9.63	-10.01	-10.07	-10.11	-10.71	-11.84	-12.26	-12.39	-12.68	-12.89
-150°	-8.80	-8.96	-9.04	-9.21	-9.46	-9.67	-10.09	-10.69	-11.44	-12.41	-13.42	-14.34	-14.71
-135°	-9.53	-9.62	-9.78	-9.79	-9.87	-10.11	-10.54	-11.19	-12.12	-13.34	-14.97	-16.77	-17.18
-120°	-9.82	-9.99	-9.78	-9.41	-9.17	-9.18	-9.57	-10.05	-10.79	-12.00	-13.40	-15.09	-16.35
-105°	-11.16	-11.30	-10.50	-9.88	-9.47	-9.27	-9.44	-9.69	-10.20	-11.11	-12.17	-13.51	-14.63
-90°	-12.21	-12.35	-11.48	-10.38	-9.77	-9.44	-9.25	-9.25	-9.53	-10.10	-10.89	-12.01	-13.44
-75°	-12.99	-12.51	-11.79	-11.14	-10.34	-9.68	-9.37	-9.33	-9.49	-9.92	-10.59	-11.13	-11.24
-60°	-14.38	-13.97	-12.94	-11.63	-10.27	-9.26	-8.75	-8.63	-8.77	-9.10	-9.57	-10.06	-10.46
-45°	-14.89	-13.99	-12.87	-11.96	-11.27	-10.60	-9.94	-9.50	-9.37	-9.52	-9.80	-10.06	-10.04
-30°	-16.01	-15.00	-13.73	-12.51	-11.46	-10.61	-10.05	-9.79	-9.86	-10.16	-10.55	-10.91	-10.66
-15°	-14.42	-14.09	-13.54	-12.93	-12.31	-11.73	-11.29	-10.99	-10.83	-10.80	-10.89	-11.06	-10.91
0°	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33	-12.33
15°	-10.91	-11.07	-11.24	-11.48	-11.78	-12.13	-12.50	-12.92	-13.37	-13.77	-14.10	-14.21	-14.42
30°	-10.66	-10.71	-10.78	-10.91	-11.15	-11.52	-12.05	-12.73	-13.53	-14.36	-15.06	-15.40	-16.01
45°	-10.04	-10.01	-9.95	-10.00	-10.22	-10.63	-11.23	-12.03	-13.00	-13.93	-14.65	-14.98	-14.89
60°	-10.46	-10.49	-10.39	-10.25	-10.24	-10.42	-10.68	-10.92	-11.39	-12.27	-13.32	-14.12	-14.38
75°	-11.24	-11.31	-11.06	-10.62	-10.37	-10.38	-10.34	-10.16	-10.25	-10.82	-11.68	-12.44	-12.99
90°	-13.44	-13.14	-12.17	-11.13	-10.28	-9.74	-9.53	-9.50	-9.43	-9.62	-10.35	-11.26	-12.21
105°	-14.63	-14.23	-13.24	-12.20	-11.07	-10.16	-9.50	-9.19	-9.10	-9.18	-9.51	-10.12	-11.16
120°	-16.35	-15.48	-13.82	-12.03	-10.65	-9.68	-8.99	-8.56	-8.29	-8.36	-8.71	-9.15	-9.82
135°	-17.18	-16.30	-14.52	-13.20	-11.97	-10.90	-10.10	-9.59	-9.33	-9.22	-9.33	-9.42	-9.53
150°	-14.71	-14.34	-13.31	-11.89	-10.75	-10.06	-9.47	-8.86	-8.51	-8.25	-8.08	-8.30	-8.80
165°	-12.89	-12.49	-11.68	-11.17	-11.24	-10.93	-10.52	-10.45	-10.25	-9.51	-8.74	-8.57	-8.81
180°	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39	-10.39

Table 13

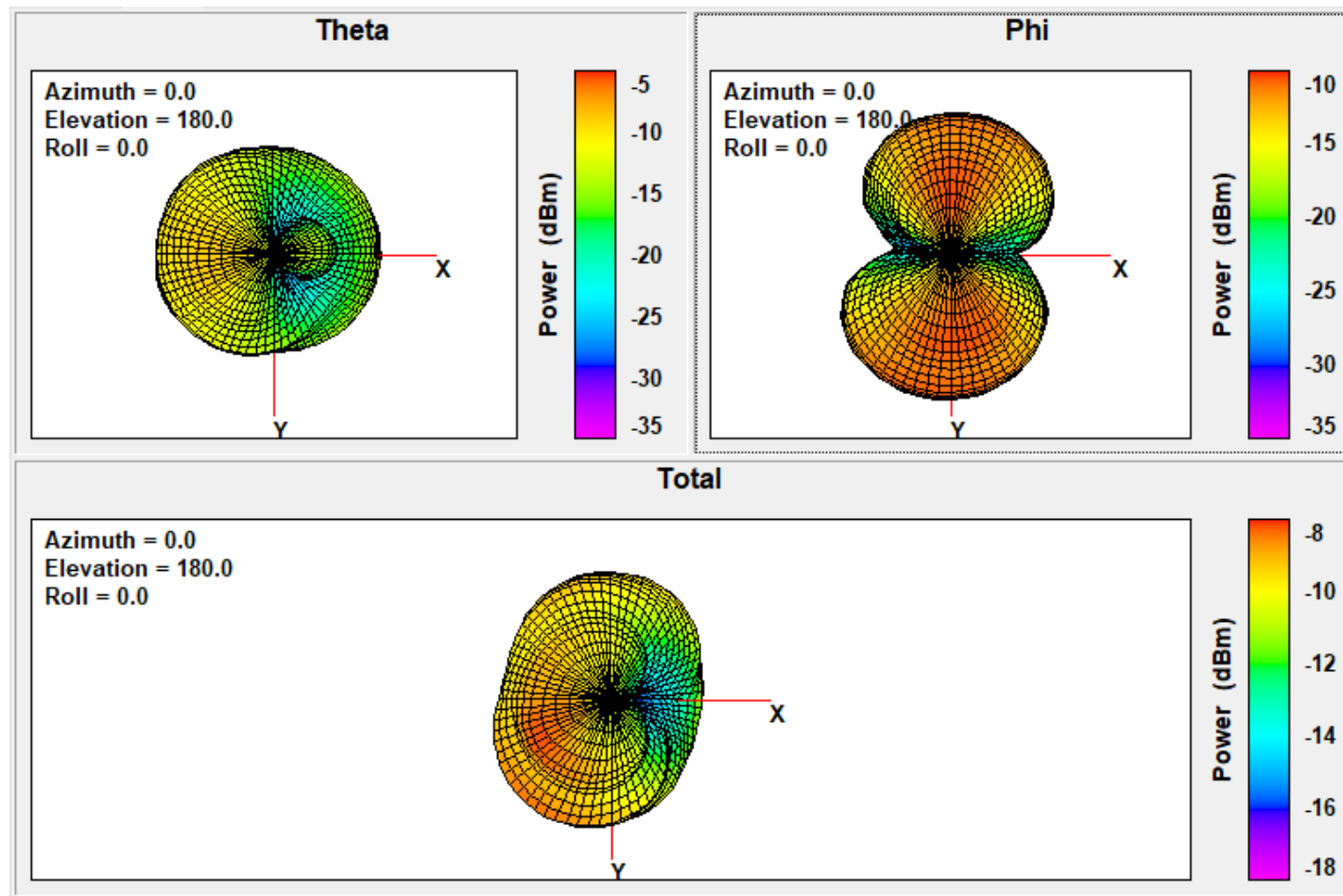
2.7.2.3 Radiation Pattern

Azimuth = 0, Elevation = 0 and Roll = 0



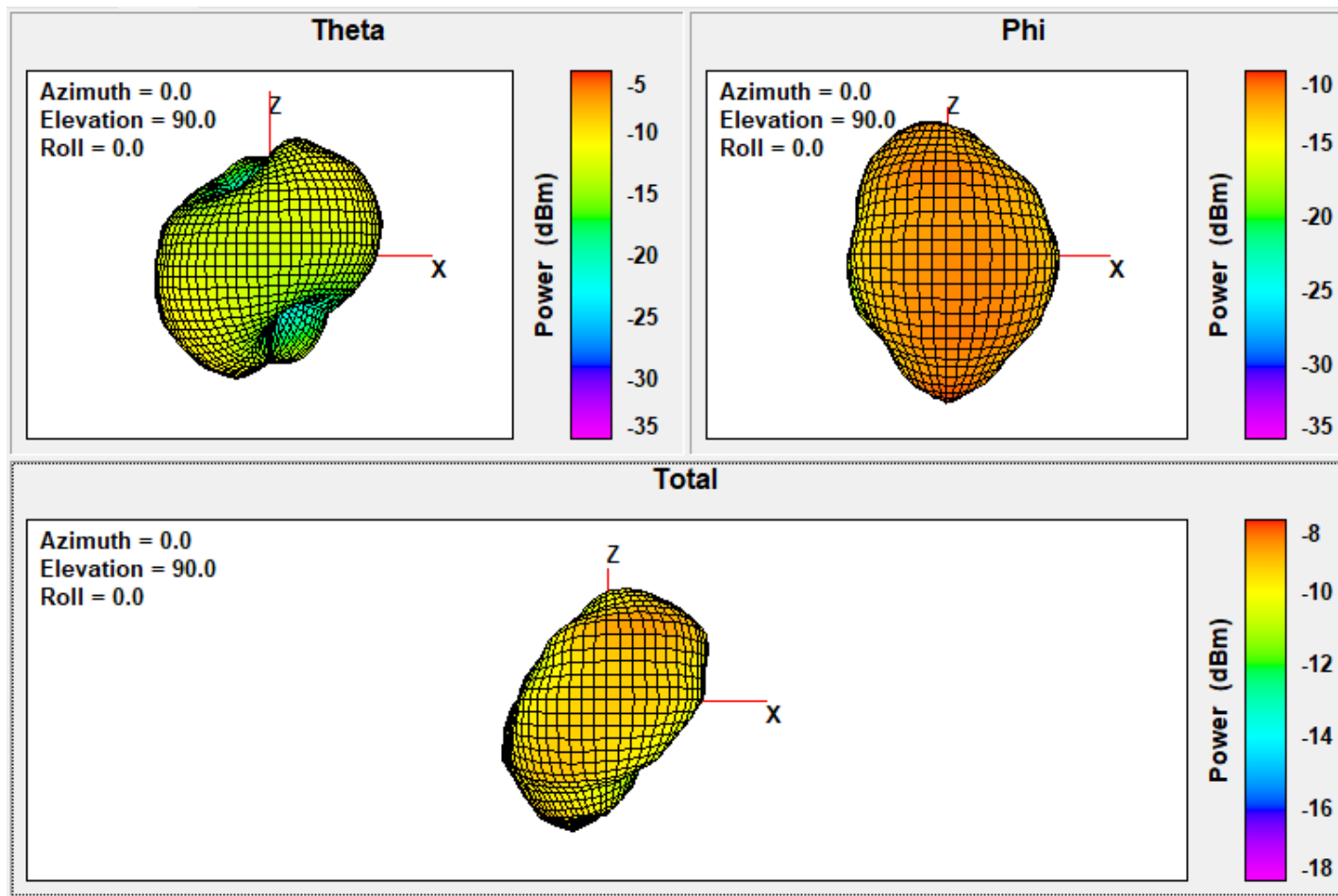
Plot 7

Azimuth = 0, Elevation = 180 and Roll = 0



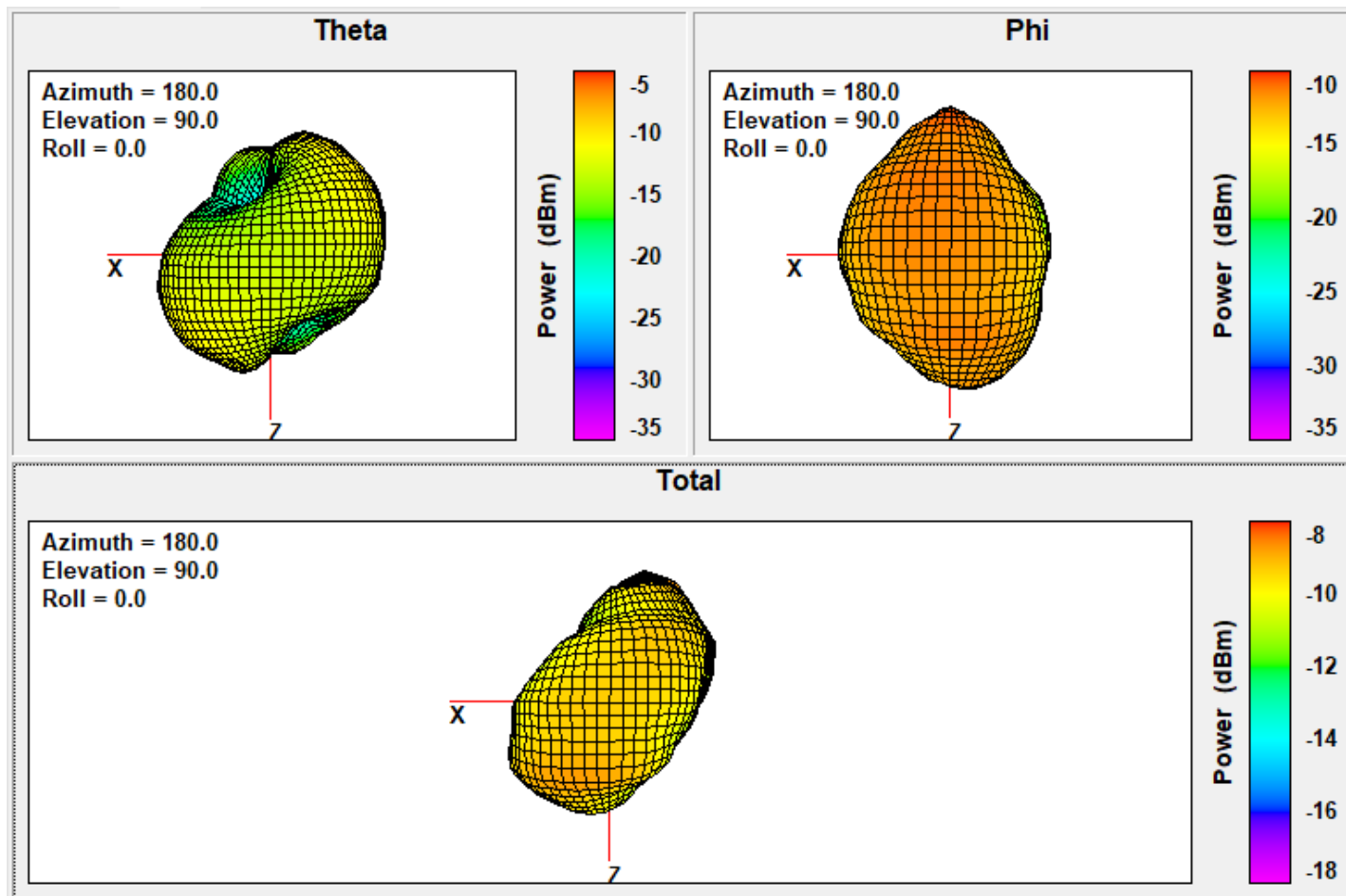
Plot 8

Azimuth = 0, Elevation = 90 and Roll = 0



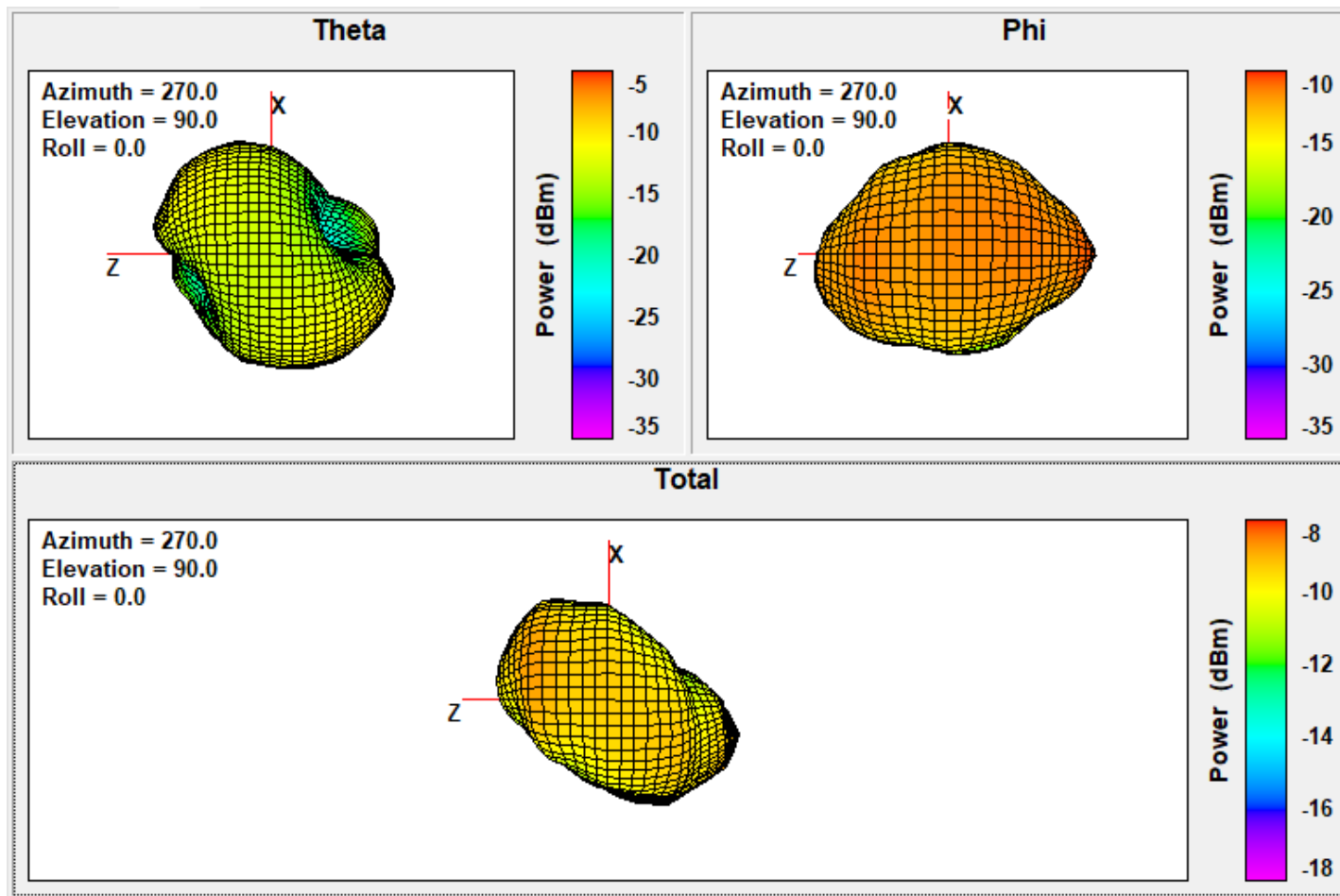
Plot 9

Azimuth = 180, Elevation = 90 and Roll = 0



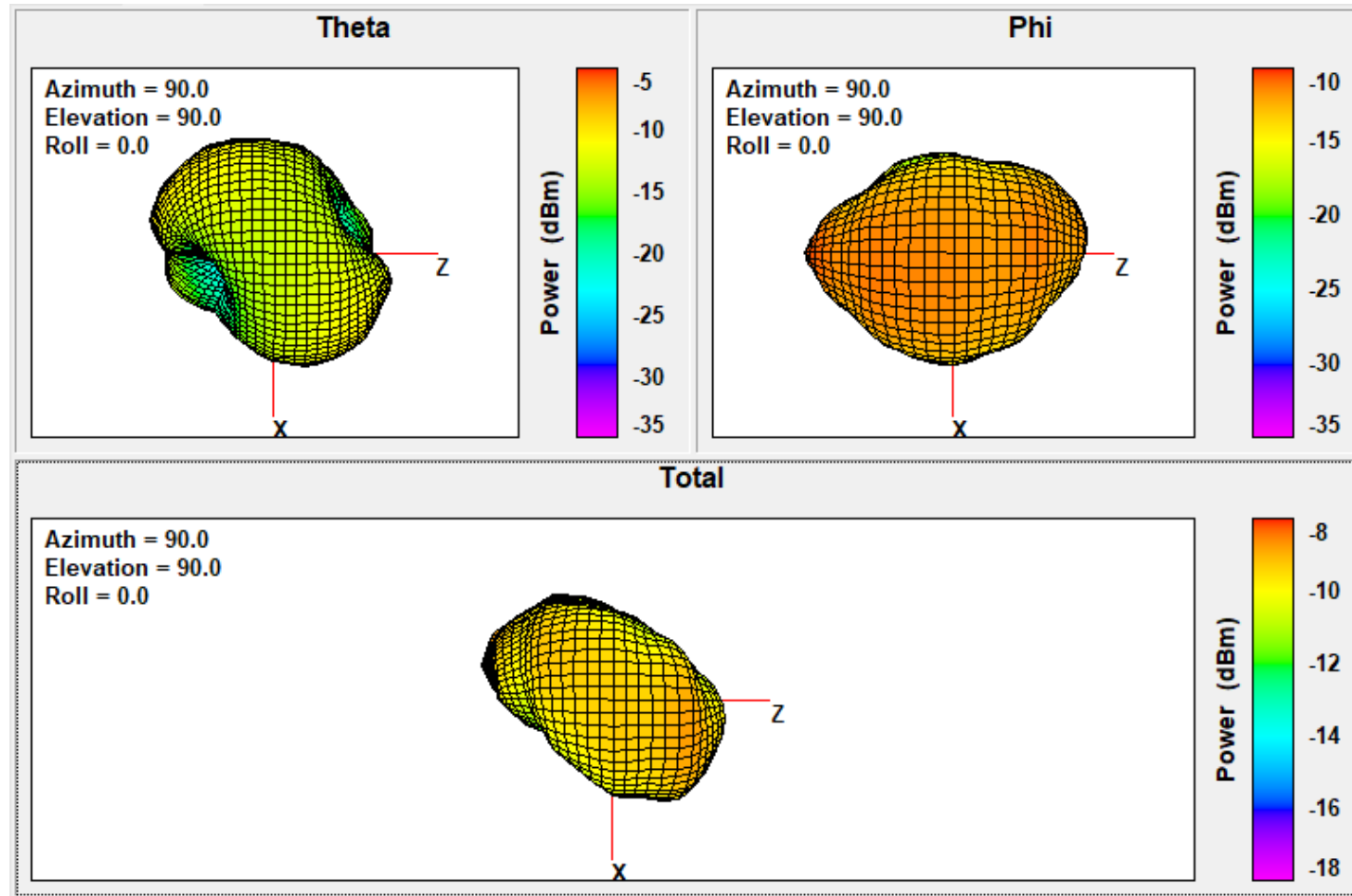
Plot 10

Azimuth = 270, Elevation = 90 and Roll = 0



Plot 11

Azimuth = 90, Elevation = 90 and Roll = 0



Plot 12



2.7.3 Test Frequency: 2479.6 MHz

2.7.3.1 Summary

Total Radiated Power	-12.57	dBm
Peak EIRP	-9.90	dBm
Antenna directivity	2.66	dBi
Antenna efficiency	-17.57	dB
Antenna gain*	-14.90	dBi

Table 14

*Note:

This value depends on the antenna port input power. The manufacturer has declared the antenna port input power to be 5.0 dBm.



2.7.3.2 Measured Data

Vertical (Theta) Power (dBm)

Theta \ Phi	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02
-165°	-10.47	-10.61	-10.85	-11.64	-13.52	-16.01	-20.53	-30.31	-23.93	-17.70	-14.63	-13.05	-12.61
-150°	-10.61	-10.47	-10.70	-11.59	-13.05	-15.26	-18.93	-24.15	-23.59	-18.80	-15.59	-14.01	-13.46
-135°	-11.44	-11.23	-11.47	-11.98	-13.05	-14.72	-17.27	-20.73	-22.59	-20.18	-17.45	-15.95	-15.01
-120°	-11.76	-11.50	-11.29	-11.66	-12.49	-13.69	-15.62	-17.97	-19.52	-19.21	-17.36	-16.17	-16.30
-105°	-12.61	-12.28	-12.11	-12.60	-13.36	-14.23	-15.32	-16.53	-17.25	-17.48	-17.53	-16.97	-16.58
-90°	-13.43	-13.27	-13.03	-13.42	-14.05	-14.51	-15.02	-15.45	-15.70	-16.05	-16.25	-16.17	-16.76
-75°	-14.39	-14.37	-14.69	-14.66	-14.50	-14.54	-14.67	-14.88	-14.97	-14.80	-14.60	-14.55	-14.87
-60°	-15.95	-16.30	-16.59	-16.37	-15.70	-15.01	-14.47	-14.09	-13.77	-13.47	-13.25	-13.30	-13.53
-45°	-17.67	-18.54	-19.28	-19.27	-18.33	-16.94	-15.61	-14.58	-13.88	-13.35	-12.95	-12.76	-12.39
-30°	-18.92	-21.45	-25.10	-25.75	-21.81	-18.48	-16.31	-14.87	-13.85	-13.11	-12.65	-12.61	-12.74
-15°	-18.96	-22.18	-28.32	-32.85	-24.21	-19.63	-16.89	-15.12	-14.04	-13.49	-13.41	-13.79	-14.48
0°	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32	-16.32
15°	-14.48	-15.88	-18.06	-21.52	-27.21	-29.56	-23.70	-20.01	-17.88	-16.79	-16.54	-17.13	-18.96
30°	-12.74	-13.77	-15.57	-18.33	-22.63	-29.31	-29.46	-23.83	-20.56	-18.68	-17.80	-17.83	-18.92
45°	-12.39	-13.10	-14.45	-16.47	-19.24	-23.15	-27.50	-25.34	-21.19	-18.66	-17.41	-17.01	-17.67
60°	-13.53	-13.97	-14.70	-15.77	-17.52	-19.98	-22.31	-22.16	-19.82	-17.62	-16.33	-15.76	-15.95
75°	-14.87	-15.36	-15.94	-16.75	-18.15	-19.61	-20.08	-19.11	-17.30	-15.78	-15.02	-14.61	-14.39
90°	-16.76	-16.92	-17.56	-18.50	-19.02	-19.16	-18.82	-17.95	-16.78	-15.43	-14.26	-13.73	-13.43
105°	-16.58	-17.21	-18.79	-21.00	-22.01	-21.18	-19.23	-17.22	-15.68	-14.48	-13.42	-12.78	-12.61
120°	-16.30	-16.87	-18.70	-21.43	-22.53	-20.76	-18.28	-16.17	-14.49	-13.26	-12.30	-11.64	-11.76
135°	-15.01	-15.77	-17.45	-20.59	-25.86	-27.71	-21.94	-18.41	-16.07	-14.39	-13.23	-12.11	-11.44
150°	-13.46	-13.98	-15.59	-18.47	-24.40	-33.49	-23.65	-18.24	-15.27	-13.20	-11.65	-10.97	-10.61
165°	-12.61	-12.62	-13.42	-15.95	-20.77	-28.69	-28.74	-20.56	-17.43	-14.48	-12.02	-10.65	-10.47
180°	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02	-14.02

Table 15



Horizontal (Phi) Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66
-165°	-27.06	-35.34	-24.21	-18.24	-14.96	-13.10	-11.84	-11.71	-12.73	-14.25	-16.67	-21.41	-29.05
-150°	-22.60	-33.80	-24.02	-17.85	-14.78	-12.93	-11.91	-11.64	-12.05	-13.25	-15.68	-20.60	-27.42
-135°	-22.28	-32.77	-26.40	-20.05	-16.53	-14.50	-13.39	-12.94	-13.24	-14.52	-17.04	-21.28	-23.55
-120°	-21.24	-31.49	-27.30	-19.97	-16.21	-14.19	-12.91	-12.40	-12.67	-13.76	-15.92	-19.19	-21.24
-105°	-22.76	-30.57	-24.80	-19.33	-16.23	-14.47	-13.27	-12.80	-13.01	-13.94	-15.94	-18.80	-20.89
-90°	-24.88	-29.63	-22.51	-18.86	-16.45	-14.90	-13.89	-13.36	-13.56	-14.41	-16.08	-18.51	-20.56
-75°	-25.44	-29.55	-23.93	-19.38	-16.94	-15.74	-15.03	-14.56	-14.49	-15.34	-17.46	-20.69	-21.32
-60°	-33.69	-25.01	-20.04	-17.27	-15.93	-15.56	-15.49	-15.35	-15.47	-16.29	-18.12	-20.96	-24.10
-45°	-26.69	-21.37	-18.65	-16.94	-15.73	-15.05	-15.04	-15.73	-17.13	-19.41	-23.12	-27.53	-25.38
-30°	-22.63	-19.07	-17.04	-15.91	-15.51	-15.77	-16.61	-17.88	-19.60	-22.06	-26.31	-29.60	-22.55
-15°	-20.32	-17.56	-15.97	-15.13	-14.92	-15.29	-16.27	-18.04	-20.99	-26.08	-34.87	-26.31	-20.82
0°	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72	-16.72
15°	-20.82	-17.80	-16.00	-14.96	-14.55	-14.73	-15.52	-17.05	-19.68	-24.39	-32.16	-25.81	-20.32
30°	-22.55	-18.41	-16.13	-14.95	-14.58	-14.87	-15.73	-17.24	-19.66	-23.78	-32.06	-29.14	-22.63
45°	-25.38	-19.84	-16.74	-15.07	-14.28	-14.12	-14.47	-15.31	-16.92	-19.72	-24.62	-34.02	-26.69
60°	-24.10	-19.99	-17.03	-15.21	-14.15	-13.70	-13.93	-14.69	-15.76	-17.48	-20.40	-25.25	-33.69
75°	-21.32	-18.61	-16.11	-14.40	-13.41	-13.13	-13.46	-14.06	-14.70	-15.99	-18.48	-22.31	-25.44
90°	-20.56	-18.09	-15.42	-13.96	-13.24	-13.00	-12.82	-13.07	-13.83	-14.67	-16.07	-18.76	-24.88
105°	-20.89	-18.03	-15.00	-13.35	-12.65	-12.53	-12.61	-12.71	-13.26	-14.21	-15.61	-17.99	-22.76
120°	-21.24	-18.14	-15.20	-13.37	-12.36	-12.00	-11.94	-12.20	-12.65	-13.41	-14.77	-17.01	-21.24
135°	-23.55	-19.43	-15.96	-14.11	-13.07	-12.55	-12.49	-12.75	-13.27	-14.14	-15.60	-18.04	-22.28
150°	-27.42	-21.44	-16.42	-13.57	-12.07	-11.55	-11.44	-11.58	-12.15	-13.06	-14.70	-17.66	-22.60
165°	-29.05	-23.68	-17.02	-13.84	-12.81	-12.36	-12.16	-12.67	-13.36	-14.01	-15.00	-18.66	-27.06
180°	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66	-14.66

Table 16



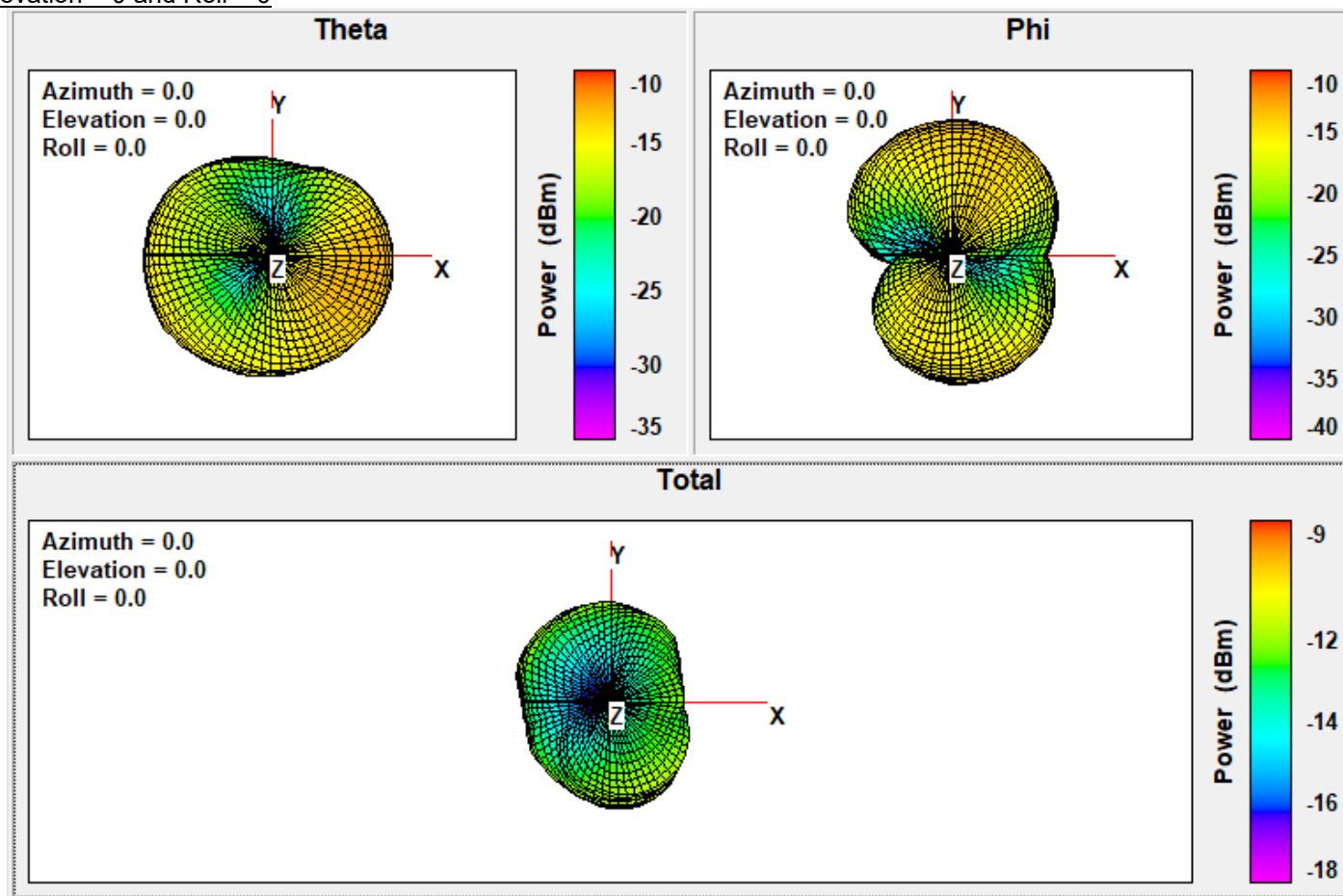
Total Power (dBm)

Phi Theta	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
-180°	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31
-165°	-10.38	-10.60	-10.65	-10.78	-11.17	-11.30	-11.29	-11.65	-12.41	-12.63	-12.52	-12.46	-12.51
-150°	-10.34	-10.45	-10.50	-10.67	-10.82	-10.93	-11.12	-11.40	-11.76	-12.18	-12.63	-13.15	-13.29
-135°	-11.09	-11.20	-11.33	-11.35	-11.44	-11.60	-11.90	-12.27	-12.76	-13.48	-14.23	-14.83	-14.44
-120°	-11.29	-11.46	-11.18	-11.06	-10.96	-10.92	-11.05	-11.34	-11.85	-12.67	-13.57	-14.41	-15.09
-105°	-12.20	-12.21	-11.88	-11.76	-11.55	-11.34	-11.17	-11.26	-11.62	-12.35	-13.66	-14.78	-15.21
-90°	-13.13	-13.17	-12.57	-12.33	-12.08	-11.69	-11.41	-11.27	-11.49	-12.15	-13.15	-14.17	-15.25
-75°	-14.06	-14.24	-14.20	-13.40	-12.54	-12.09	-11.84	-11.71	-11.71	-12.05	-12.79	-13.60	-13.98
-60°	-15.87	-15.75	-14.97	-13.79	-12.80	-12.26	-11.94	-11.67	-11.53	-11.65	-12.02	-12.62	-13.16
-45°	-17.16	-16.72	-15.95	-14.94	-13.83	-12.88	-12.30	-12.11	-12.19	-12.39	-12.56	-12.62	-12.17
-30°	-17.38	-17.09	-16.41	-15.48	-14.59	-13.91	-13.44	-13.11	-12.83	-12.59	-12.47	-12.52	-12.31
-15°	-16.58	-16.27	-15.72	-15.06	-14.44	-13.93	-13.56	-13.33	-13.24	-13.26	-13.38	-13.55	-13.57
0°	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50	-13.50
15°	-13.57	-13.73	-13.90	-14.09	-14.32	-14.59	-14.91	-15.27	-15.68	-16.09	-16.42	-16.58	-16.58
30°	-12.31	-12.49	-12.83	-13.31	-13.95	-14.72	-15.55	-16.38	-17.08	-17.51	-17.64	-17.52	-17.38
45°	-12.17	-12.26	-12.43	-12.70	-13.08	-13.61	-14.26	-14.90	-15.54	-16.15	-16.65	-16.93	-17.16
60°	-13.16	-13.00	-12.70	-12.47	-12.50	-12.78	-13.34	-13.98	-14.32	-14.54	-14.90	-15.29	-15.87
75°	-13.98	-13.68	-13.02	-12.41	-12.15	-12.25	-12.61	-12.88	-12.79	-12.87	-13.40	-13.93	-14.06
90°	-15.25	-14.46	-13.35	-12.65	-12.23	-12.06	-11.85	-11.85	-12.05	-12.02	-12.06	-12.54	-13.13
105°	-15.21	-14.59	-13.48	-12.66	-12.18	-11.97	-11.76	-11.40	-11.29	-11.33	-11.37	-11.64	-12.20
120°	-15.09	-14.45	-13.59	-12.74	-11.96	-11.46	-11.03	-10.73	-10.46	-10.33	-10.35	-10.53	-11.29
135°	-14.44	-14.22	-13.63	-13.23	-12.85	-12.42	-12.02	-11.71	-11.44	-11.25	-11.25	-11.12	-11.09
150°	-13.29	-13.27	-12.97	-12.36	-11.83	-11.52	-11.19	-10.73	-10.43	-10.12	-9.90	-10.13	-10.34
165°	-12.51	-12.29	-11.84	-11.76	-12.16	-12.26	-12.07	-12.01	-11.93	-11.23	-10.25	-10.01	-10.38
180°	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31	-11.31

Table 17

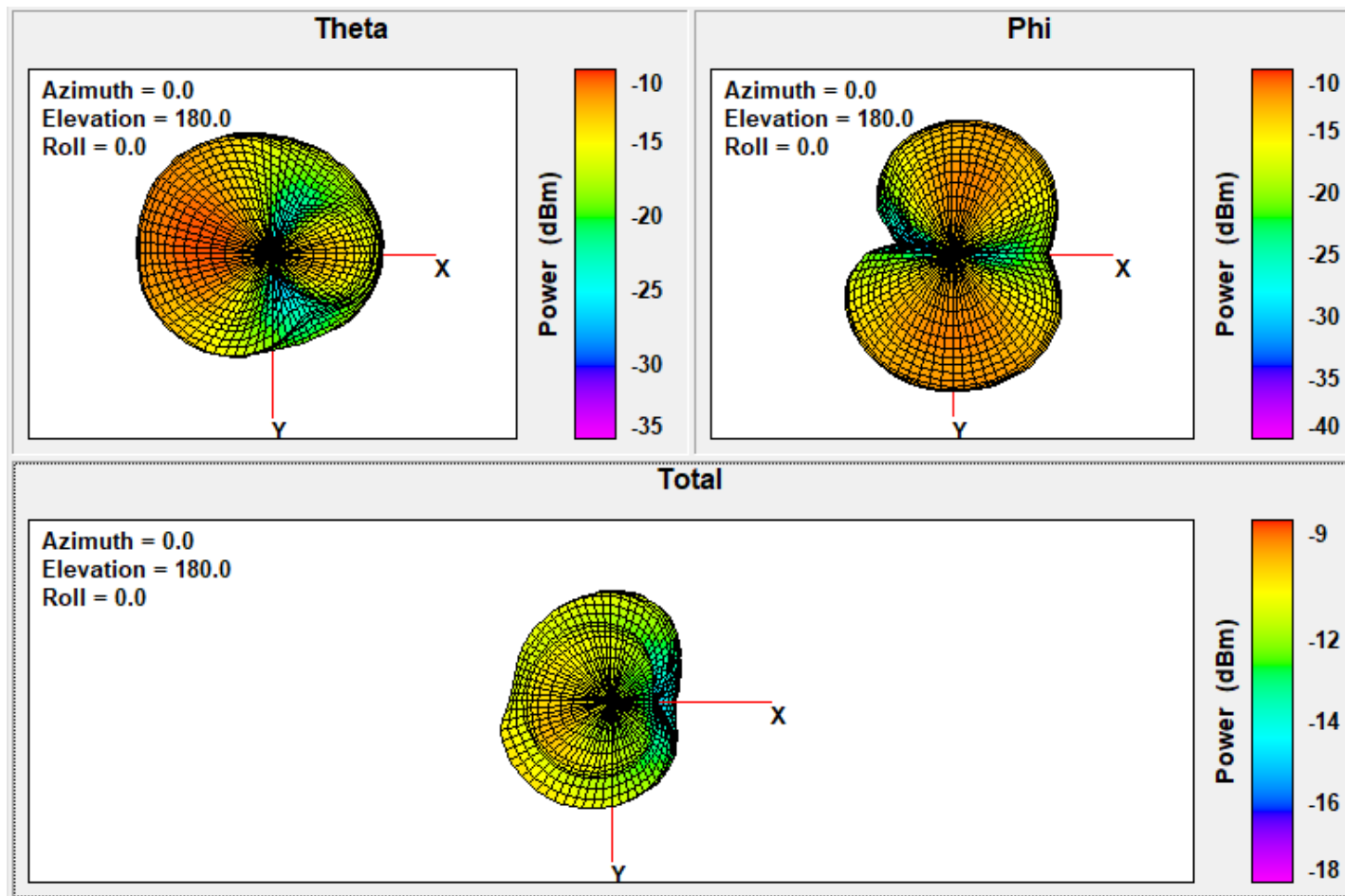
2.7.3.3 Radiation Pattern

Azimuth = 0, Elevation = 0 and Roll = 0



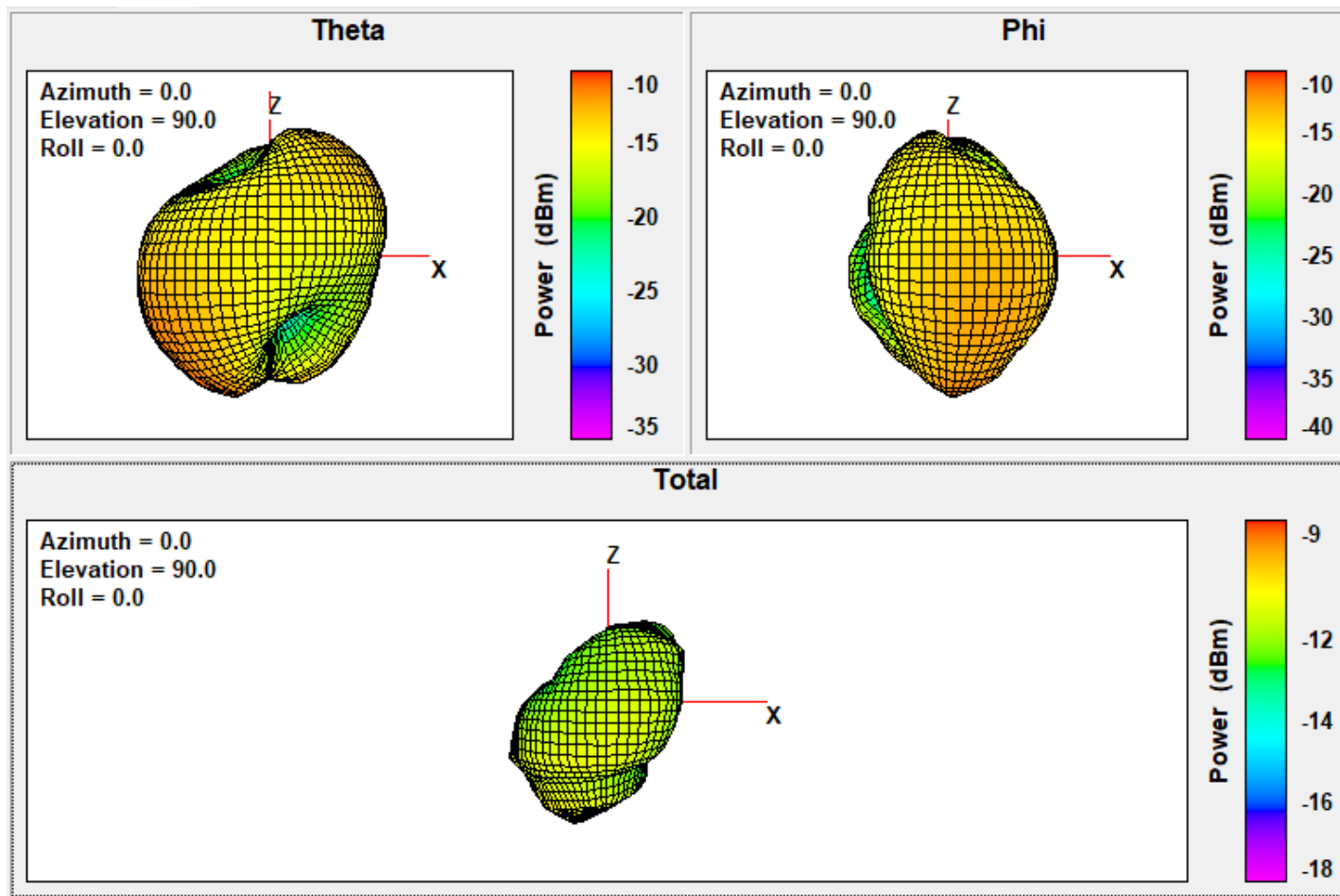
Plot 13

Azimuth = 0, Elevation = 180 and Roll = 0



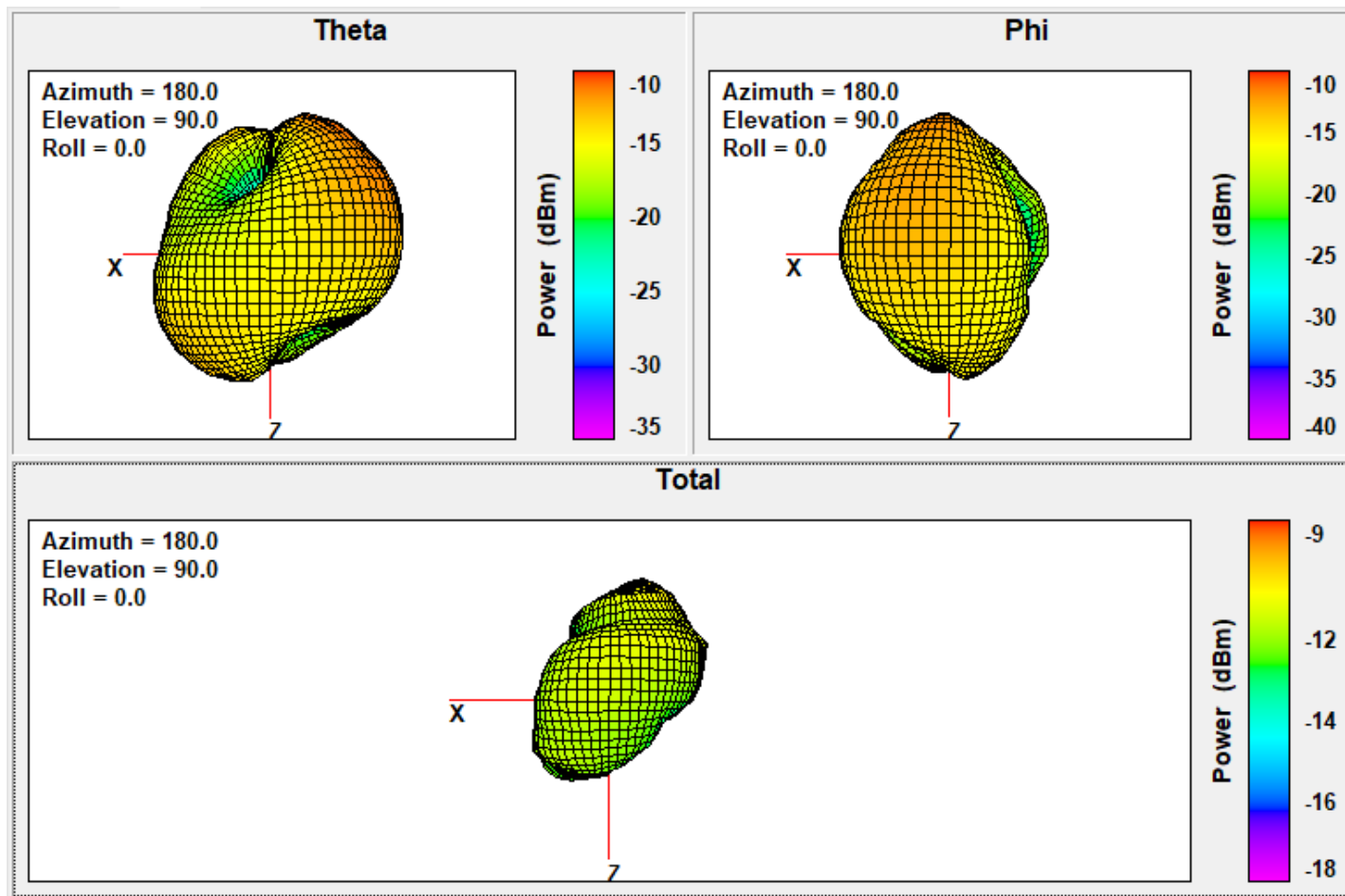
Plot 14

Azimuth = 0, Elevation = 90 and Roll = 0



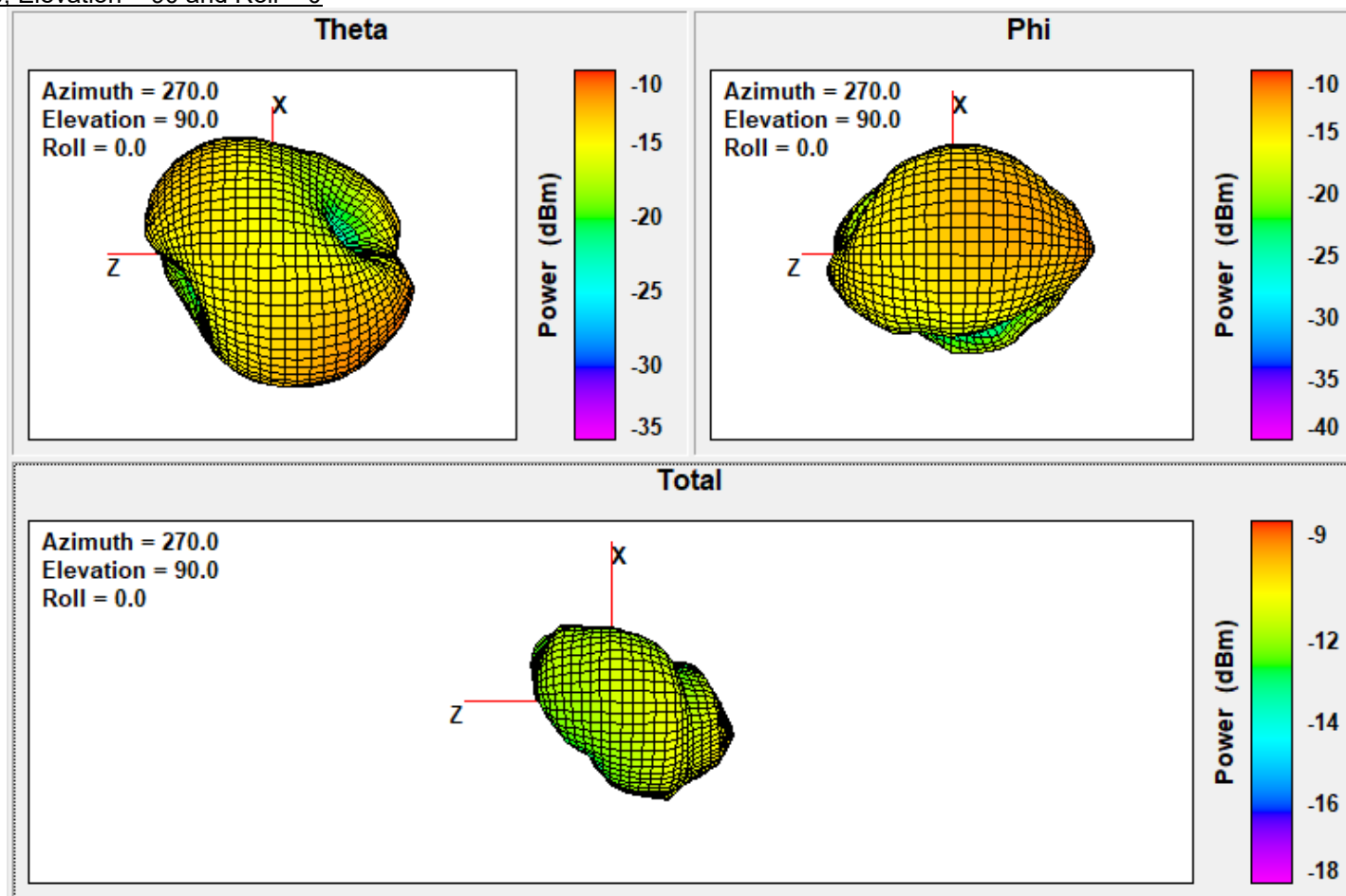
Plot 15

Azimuth = 180, Elevation = 90 and Roll = 0



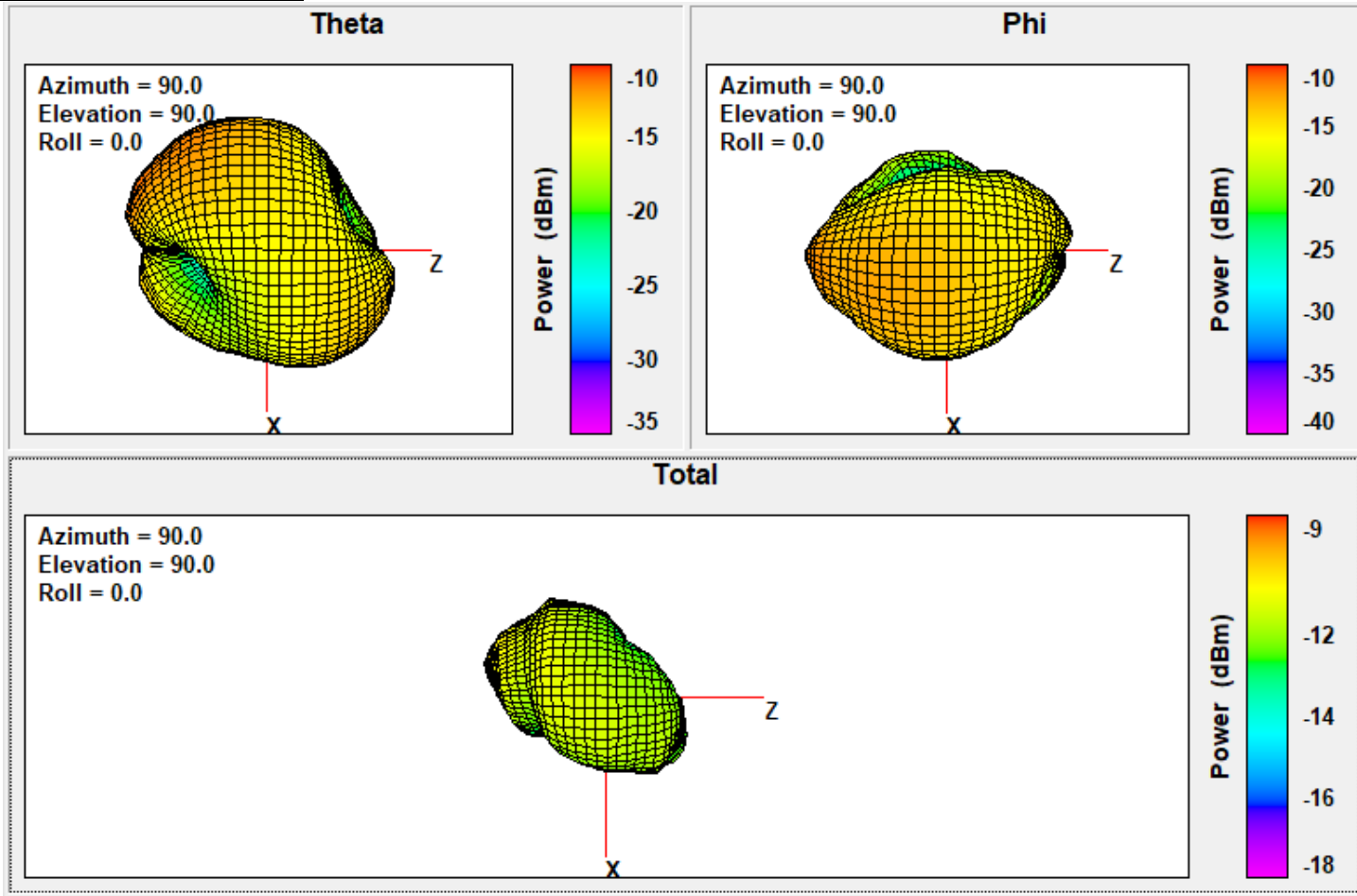
Plot 16

Azimuth = 270, Elevation = 90 and Roll = 0



Plot 17

Azimuth = 90, Elevation = 90 and Roll = 0



Plot 18