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Test Report

Company: Telex Communications
8601 East Cornhusker Highway
Lincoln, NE 68505
Contact: Roger Cox
Product: 2480AA
FCC ID: B5D-AP200MW

Test Report No: R030904-05a

APPROVED BY: Steve Cass
General Manager

A handwritten signature in black ink, appearing to read "Steve Cass", written over a horizontal line.

Doug Kramer
Test Engineer

A handwritten signature in black ink, appearing to read "Doug Kramer", written over a horizontal line.

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1.0 Summary of test results

1.1 Test Results

Test	Test Specification	Results
CFR 47, FCC Part 15.203	Part 15.203	Complies
CFR 47, FCC Part 15.207	Part 15.207, Class B	Complies
CFR 47, FCC Part 15.209	Part 15.109, Class B	Complies
CFR 47, FCC Part 15.247	Parts 15.209 and 15.247	Complies

1.2 Test Methods

1.2.1 Conducted Emissions

Measurements of conducted emissions to the limits set in CFR 47 Part 15.207 were conducted using the methods shown in ANSI/IEEE C63.4, 2001. Several configurations were examined the results presented represent a worst-case scenario. The EUT was placed on a wooden table approximately 80 centimeters high, positioned 40 centimeters from the vertical ground plane and 80 centimeters or more away from any other conductive surface.

1.2.2 Radiated Emissions

Compliance to CFR 47 Parts 15.109/209 and 15.247 was tested in accordance with the methods of ANSI/IEEE C63.4, 2001. Several configurations were examined the results presented represent a worst-case scenario. The EUT was mounted on a wooden table 80 centimeters high and centered on a 4 meter diameter turntable. The table was rotated to maximize emissions. All measurements below 18GHz were taken at a distance of 3 meters from the EUT. Measurements above 18GHz were made at a distance of 1 meter.

2.0 Description

2.1 Equipment under test

The DSSS transmitter and receiver of the EUT is powered via a PCMCIA interface to the LAN interface PCB. The transmitter and receiver of the EUT are connected to a 14.5 dBi sector antenna (Telex model 2444AA) through a 15 foot length of Times Microwave LMR-400 cable. The transmitter and receiver may use separate similar antennas in a diversity mode. The LAN interface PCB is connected to an outdoor-rated Ethernet cable (CAT-5) from which it receives both data and DC power. The DSSS transmitter and receiver consists of a PCMCIA radio card, Senao model NL-2511CD PLUS EXT2 (FCC ID: NI3-2511CD-PLUS3). A 9.5dBi omni antenna (Telex model 2439AA-1) with 3 feet of Times Microwave LMR-400 cable was also tested. The EUT is powered by an 18V DC Globtek power supply through a Power over Ethernet (PoE) adapter box.

2.1.1 Identification: 2480AA

2.1.2 EUT received date: 10 March 2004

2.1.3 EUT tested dates: 11th – 28th March 2004

2.1.4 Manufacturer: Telex Communications

2.1.5 Serial number: MAC 00026F01F90F

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC registered lab. This site has been fully described in a report submitted to the FCC office, and accepted in a letter dated May 4, 2001.

2.3 Special equipment or setup

The transmit mode was a continuous RF on setting at 11Mbps and power F0. The EUT is a diversity receiver. One 14.5dBi antenna was connected to the dual purpose TX/RX port and the other 14.5dBi antenna was connected to the RX only port. The 9.5dBi antenna was only tested when connected to the dual purpose TX/RX port.

3.0 Test equipment used

<i>Serial #</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Last cal.</i>
1654	EMCO	3142B	Biconilog antenna	03-May-03
6415	EMCO	3115	DRG Horn	29-Apr-03
2576	EMCO	3116	DRG Horn	29-Apr-03
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	02-Jul-03
100007	Rohde & Schwarz	ESIB7	EMI Test Receiver	26-May-03
082001/003	Rohde & Schwarz	TS-PR18	Preamplifier	N/A
2575	Rohde & Schwarz	ES-K1	Software v1.60	N/A
836679/010	Rohde & Schwarz	ESH3-Z5	Artificial Mains	29-Apr-03
200332488	Trilithic	23042	High pass filter	N/A

4.0 Detailed Results

Radiated emissions measurements were made by first using a spectrum analyzer getting a rough signal spectrum, any points were then measured using a CISPR 16 compliant receiver with the following bandwidth setting:

30MHz - 1GHz: 120kHz IF bandwidth, 60kHz steps

Above 1GHz: 1MHz IF bandwidth, 500kHz steps

Conducted measurements were made using a CISPR 16 compliant receiver with the IF bandwidth set to 9kHz taking 5kHz steps through the range 150kHz to 30MHz.

All results shown are corrected to incorporate cables losses, antenna factors, and any amplification.

4.1 FCC Part 15.203 Antenna Requirement

The antenna is attached to the 2480AA via an N-type connector. The 2480AA and antennas must be professionally installed. Other antennas and their specifications to be used with the 2480AA are in Appendix G.

4.2 FCC Part 15.207 Conducted Emissions

The EUT was tested with the transmitter operating with a continuous RF signal. The RF output was into a 50ohm RF load. The setup can be seen in Figures 3 and 4. The results can be seen in Figure 27. The worst case emission was at 390kHz on the Line conductor. The quasi-peak value at 390kHz was 48.9dBuV which is 9.1dB under the limit. The plot shown in Figure 27 is a composite worst-case of the Line and Neutral conductors.

4.3 FCC Part 15.109 Radiated Emissions, Receive only

The EUT was found to not produce any emissions in excess of the Class 'B' limits. The test setup can be seen in Figure 1 for the 14.5dBi antennas and Figure 2 for the 10dBi antenna. More information on the radiated emissions can be found in Section 4.4. The transmitter was not active for these measurements. Appendix C shows the measured values denoted by a red '+' or blue '+' in Figures 25 and 26. The red '+' is the quasi-peak or average measurement while

the blue '+' in Figures 25 and 26 show the peak values. No values were found to be in excess of the limits. A table of the values can be seen in Appendix C. All measurements were made at a distance of 3 meters.

4.4 FCC Parts 15.209 and 15.247 Radiated Emissions, Transmit only

The EUT was tested with the transmitter operating with a continuous RF signal at three frequencies in the lower, middle and upper portions of the band. The frequencies chosen were Channel 1 (2.412GHz), Channel 5 (2.432GHz), and Channel 11 (2.462GHz). No spurious emissions were noted above 18GHz. Appendix B shows the worst-case emissions for each channel in the ranges of 30MHz – 1GHz, 1GHz – 3GHz, and 3GHz – 18GHz while the EUT was transmitting. Figures 5 through 15 show the emissions plots for the 14.5dBi antennas. Figures 6-16 show the emissions plots for the 9.5dBi antenna. The peak and quasi-peak measurements below 1GHz were found not to exceed the limits. The peak and average measurements between 1GHz and 3GHz did not exceed limits outside of the transmitters operating band. The peak and average measurement between 3GHz and 18GHz did not exceed the limits. The test setup can be seen in Figure 1 for the 14.5dBi antennas and Figure 2 for the 9.5dBi antenna. The EUT was mounted on a table 80 centimeters above a ground plane. Appendix D contains the results of testing the 3 transmitter frequencies. Appendix B shows the measured values denoted by a red '+' or a blue '+' in Figures 5 through 26. The red '+' is the quasi-peak or average measurement while the blue '+' in Figures 5 through 26 show the peak values.

4.5 Bandedge and Conducted Power Measurements

The EUT was tested at Channel 1 and Channel 11 for the bandedge measurements. The EUT was tested on Channels 1, 5 and 11 for the conducted power measurements. Appendix F shows the results and the plots of bandedge and conducted power measurements. The radiated peak and average values were tested with the antenna centered on the turntable. The maximum calculated emission with the 14.5dBi antenna in the 2.31GHz – 2.39GHz restricted band is 63.14dBuV/m for peak and 55.70dBuV/m for average. The bandedge average measurement for channel 1 is in excess of the 54dBuV/m limit. The figures in Appendix F show that the product does comply with the bandedge requirements. The maximum calculated emission with the 14.5dBi antenna in the 2.4835GHz – 2.5GHz restricted band is 56.46dBuV/m for peak and 45.08dBuV/m for average. The maximum emission in the upper restricted band fell within 2MHz of 2.4835GHz as shown in Figures 43 and 44.

	Channel		
	1	5	11
6dB Bandwidth	9.9 MHz	9.9 MHz	9.9 MHz
Maximum Power	19.9 dBm	20.4 dBm	20.1 dBm
Maximum PSD	-5.72 dBm	-5.10 dBm	-5.26 dBm

Appendix A: Photos

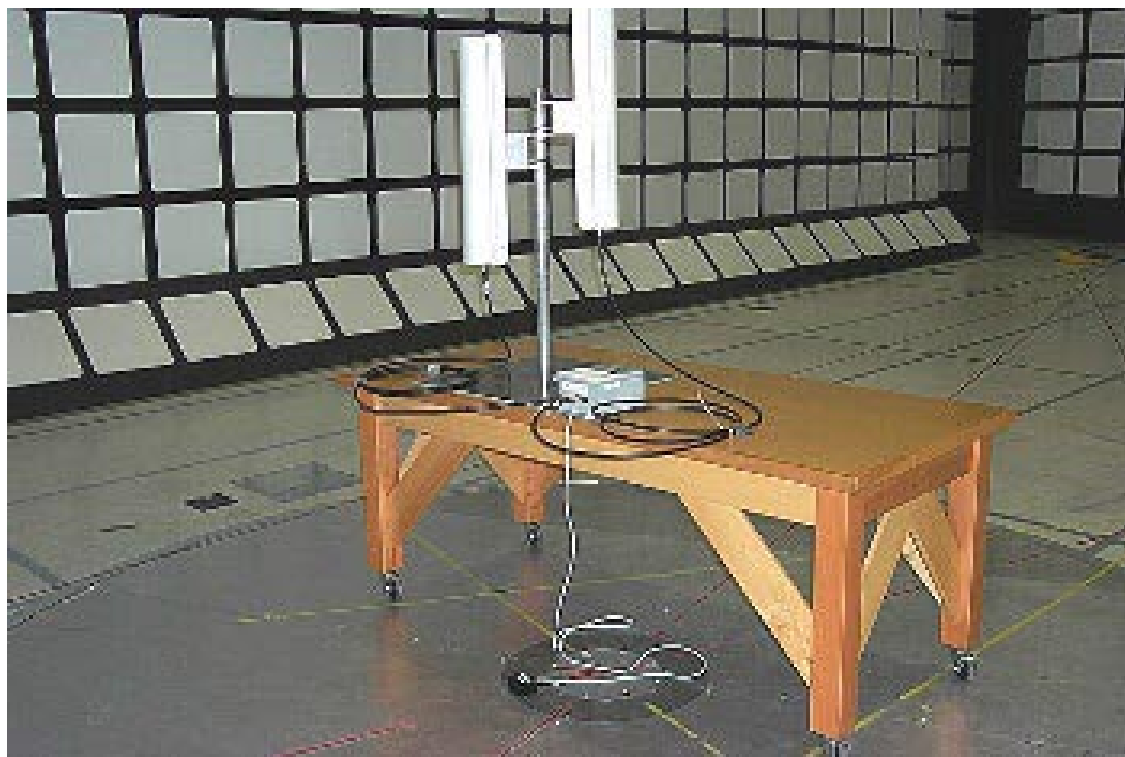


Figure 1 Radiated Emissions Test Setup - 14.5dBi Panels



Figure 2 Radiated Emissions Test Setup - 9.5dBi Omni



Figure 3 Conducted Emissions Test Setup

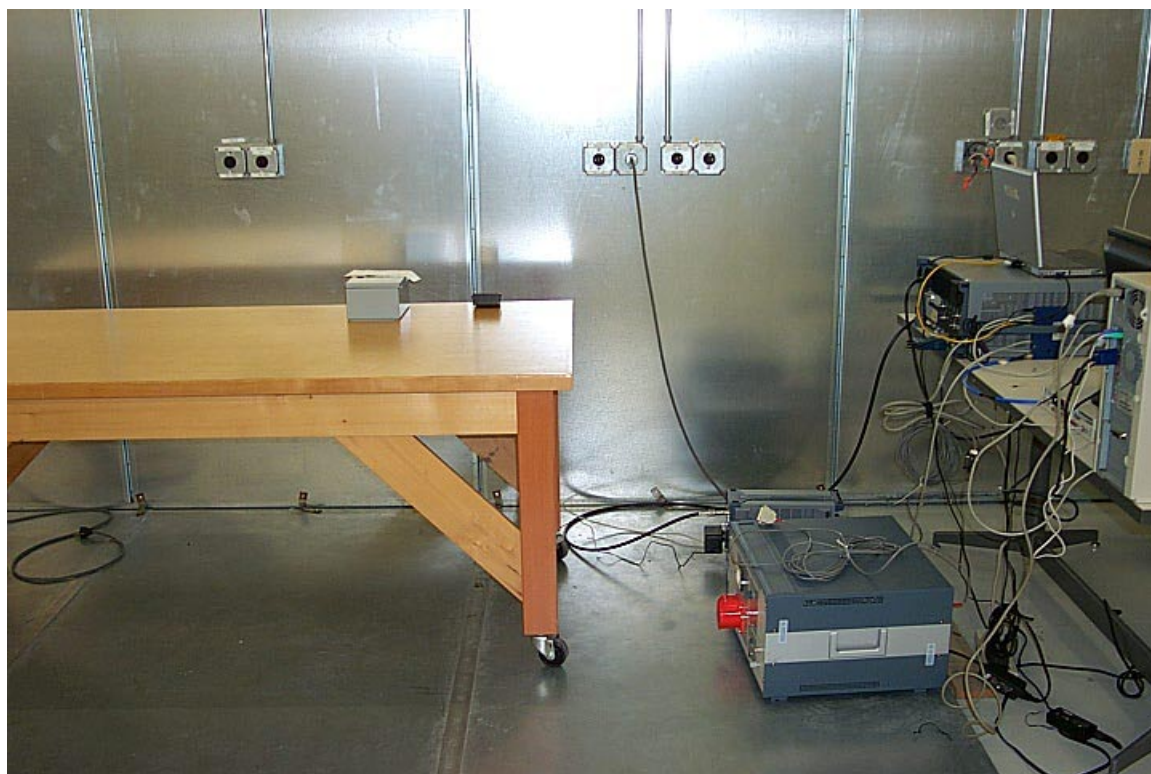


Figure 4 Conducted Emissions Test Setup

Appendix B: Emissions Plots

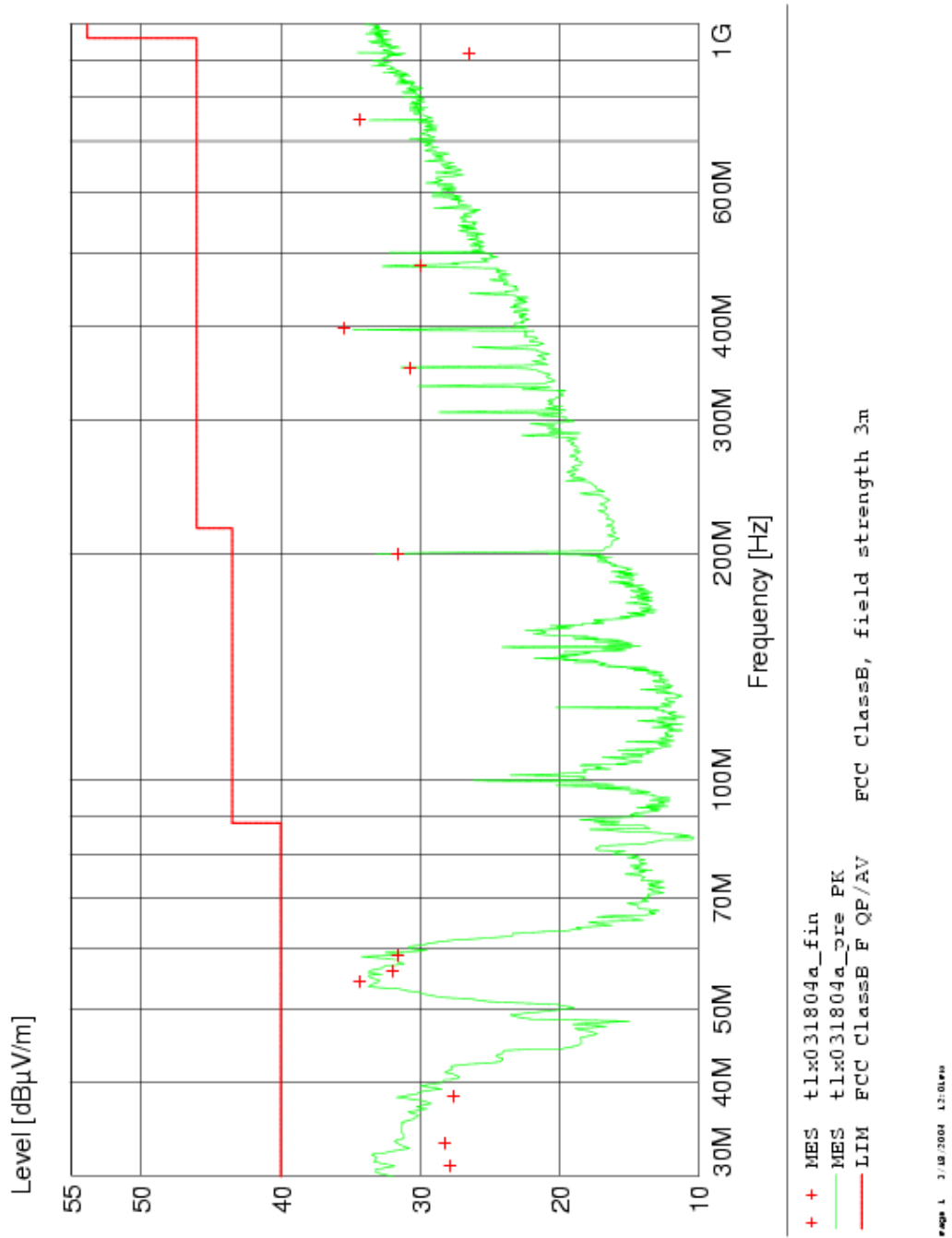


Figure 5 Radiated Emissions Plot 14.5dBi Panel, Channel 1, 30MHz - 1GHz

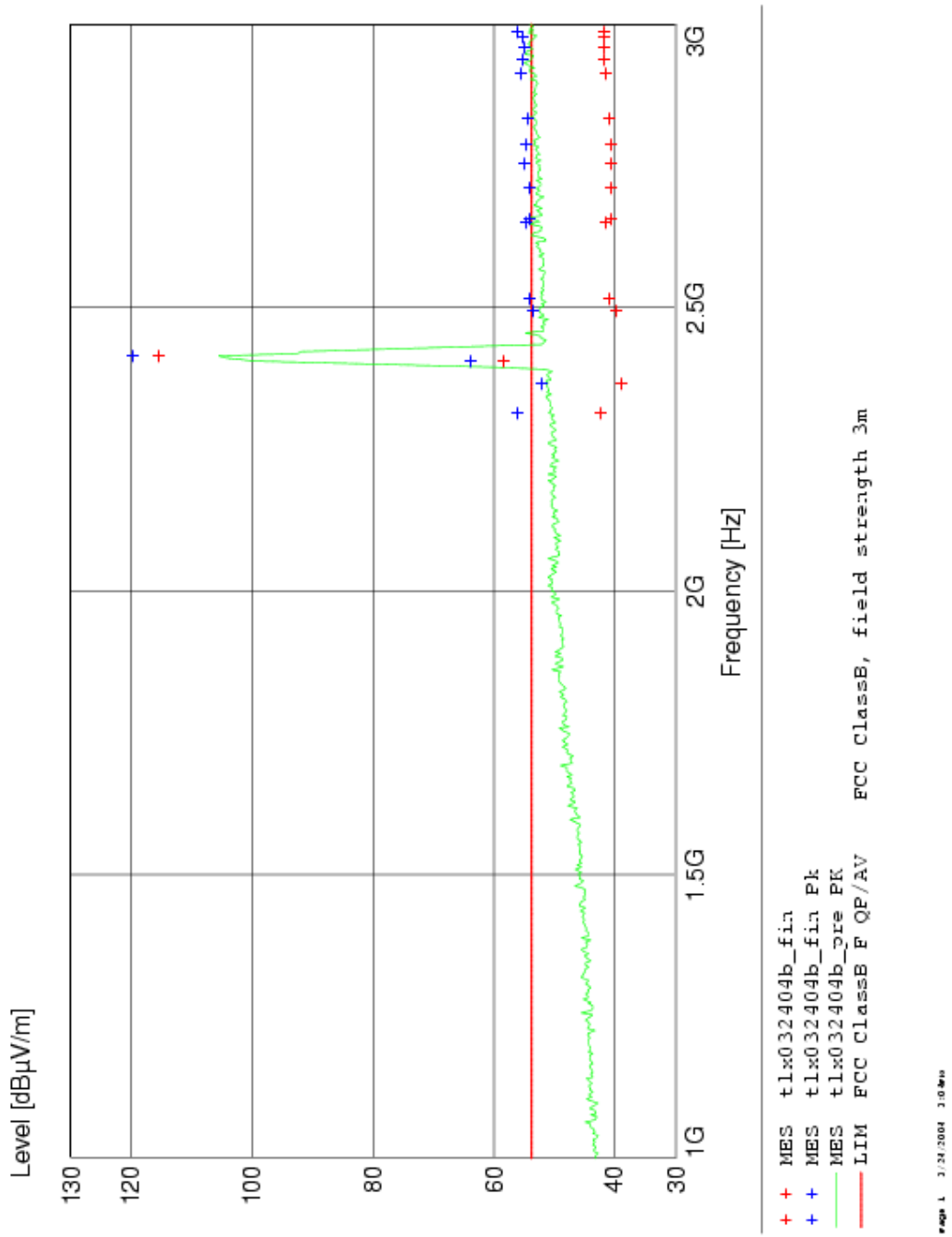


Figure 6 Radiated Emissions Plot 14.5dBi Panel, Channel 1, 1GHz - 3GHz

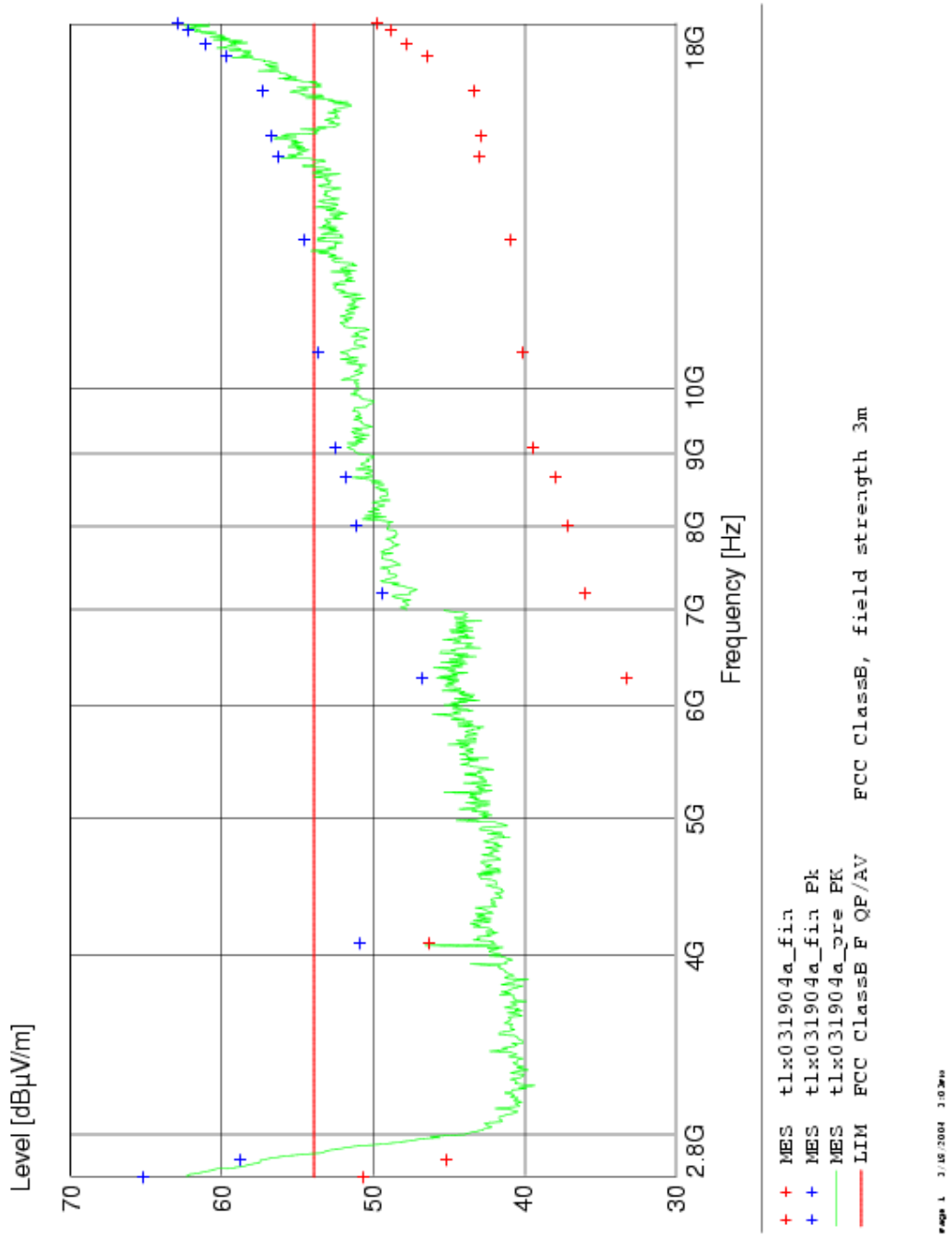


Figure 7 Radiated Emissions Plot 14.5dBi Panel, Channel 1, 2.8GHz - 18GHz

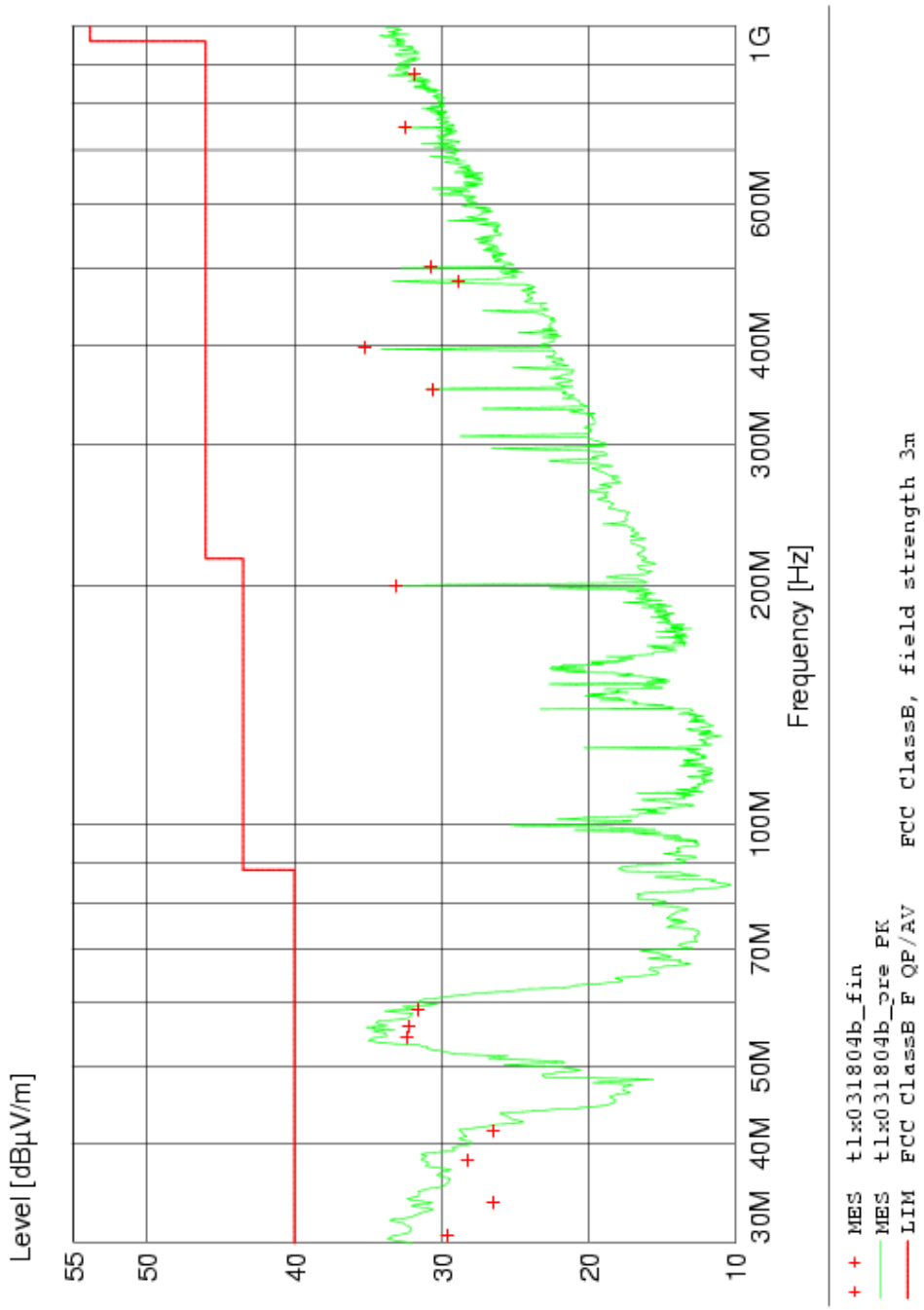


Figure 8 Radiated Emissions Plot 14.5dBi Panel, Channel 5, 30MHz - 1GHz

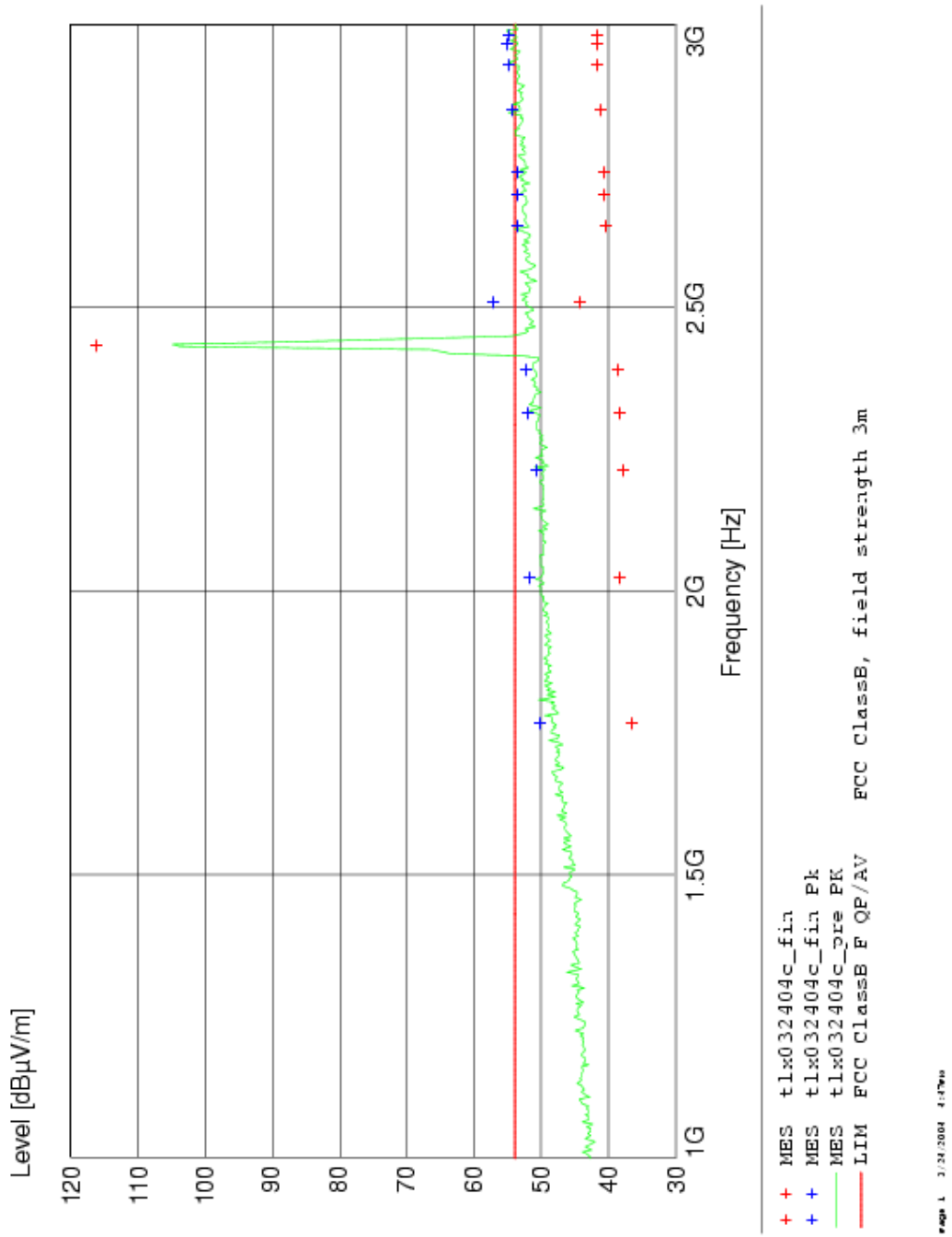


Figure 9 Radiated Emissions Plot 14.5dBi Panel, Channel 5, 1GHz - 3GHz

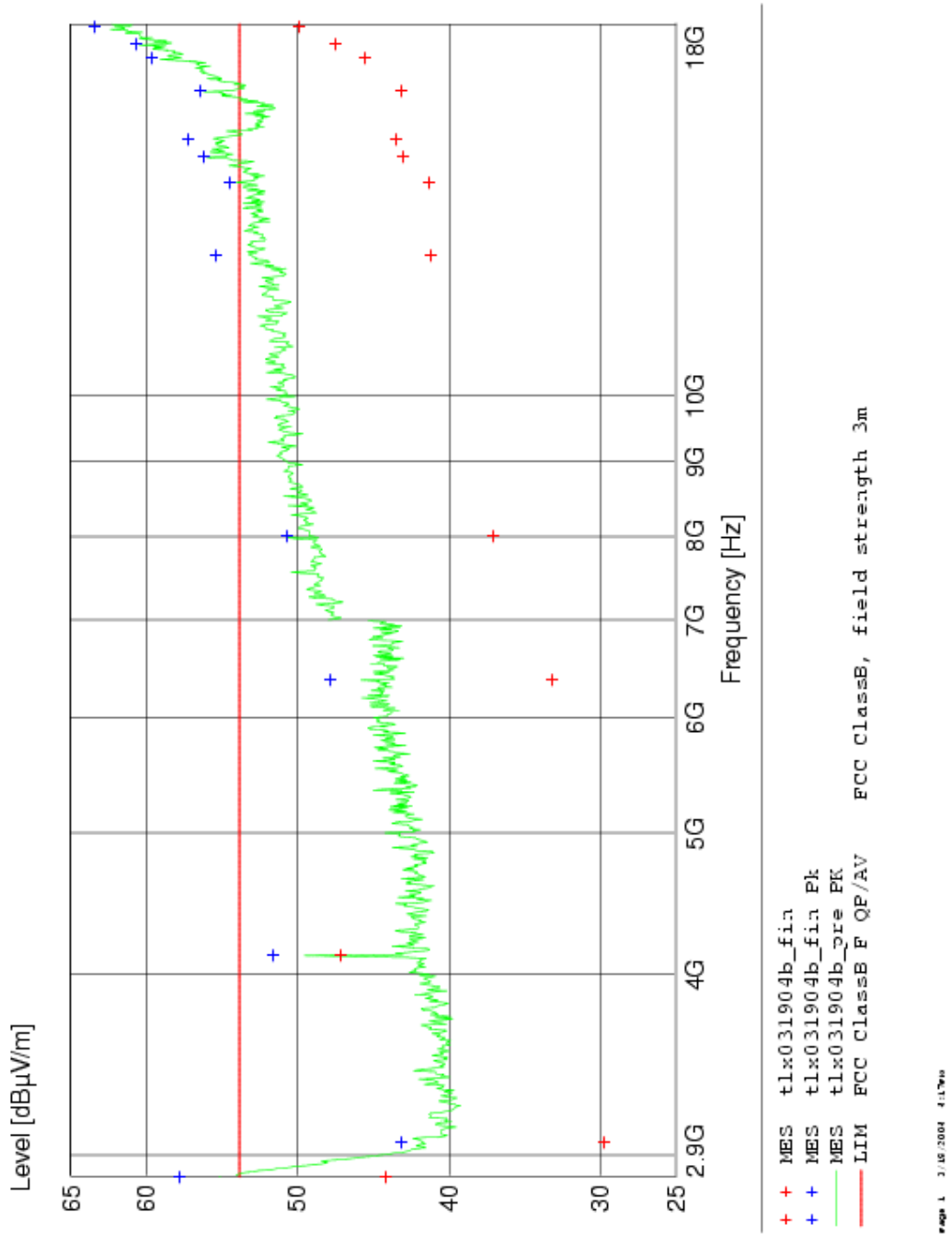


Figure 10 Radiated Emissions Plot 14.5dBi Panel, Channel 5, 2.9GHz - 18GHz

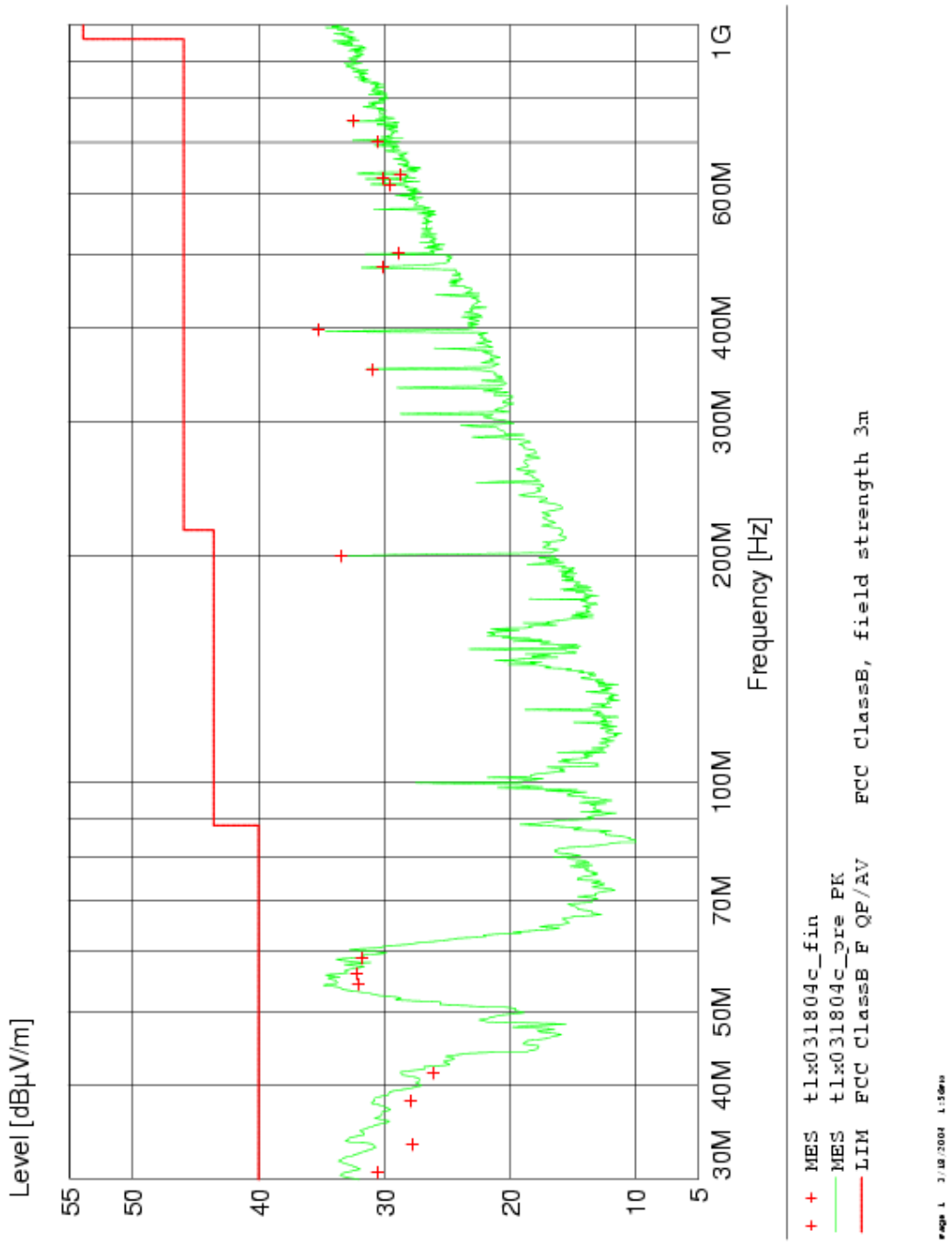


Figure 11 Radiated Emissions Plot 14.5dBi Panel, Channel 11, 30MHz - 1GHz

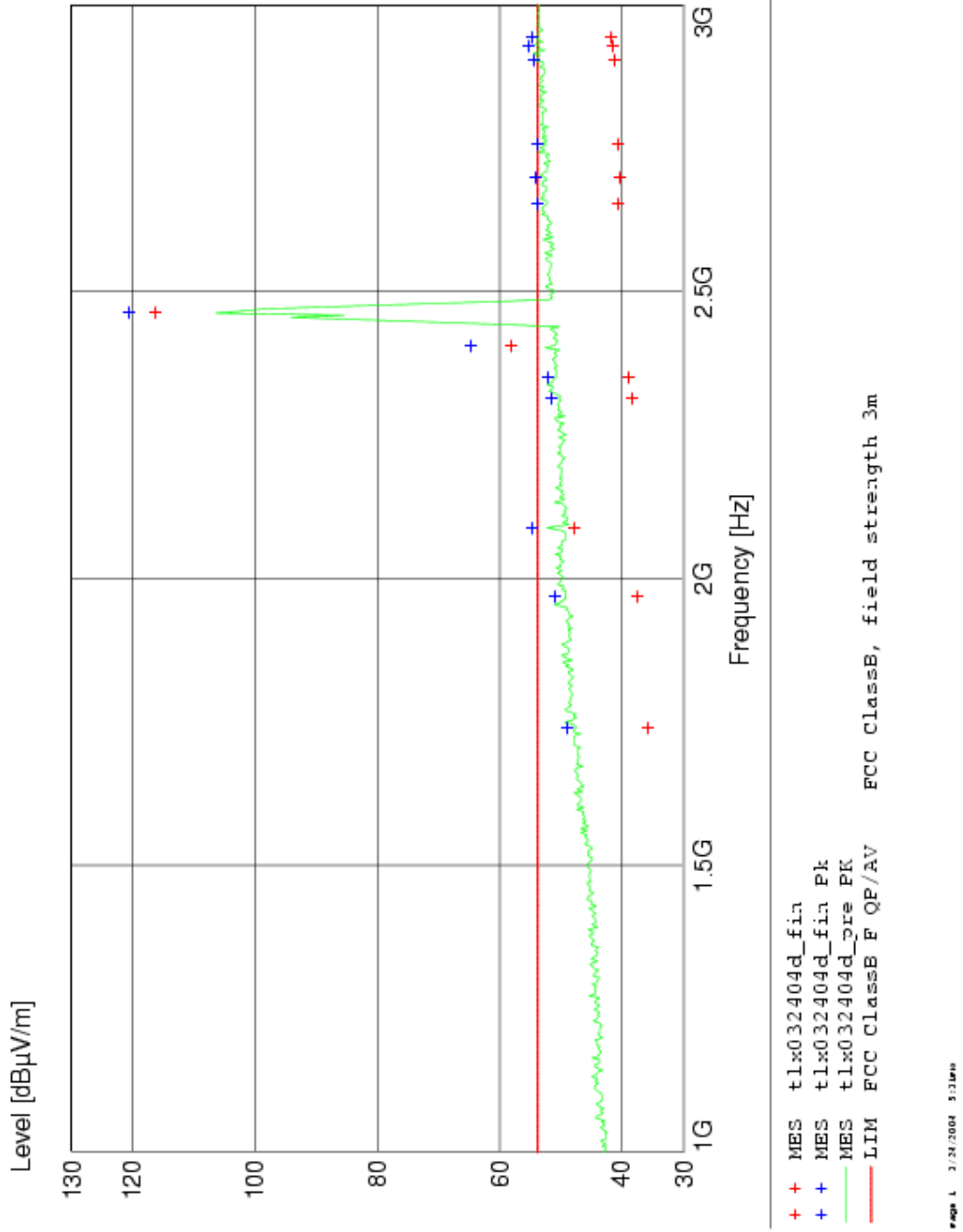


Figure 12 Radiated Emissions Plot 14.5dBi Panel, Channel 11, 1GHz - 3GHz

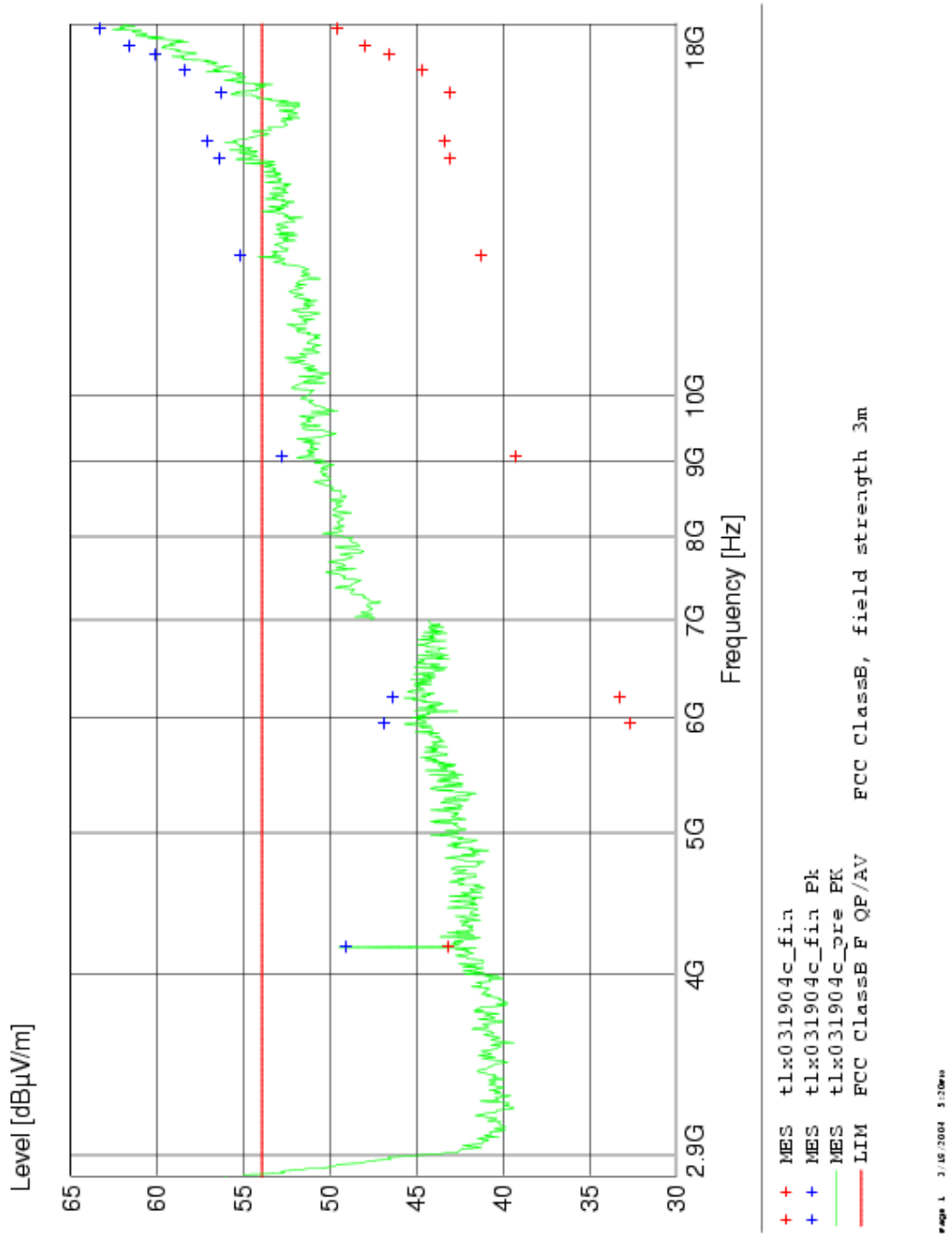


Figure 13 Radiated Emissions Plot 14.5dBi Panel, Channel 11, 2.9GHz - 18GHz

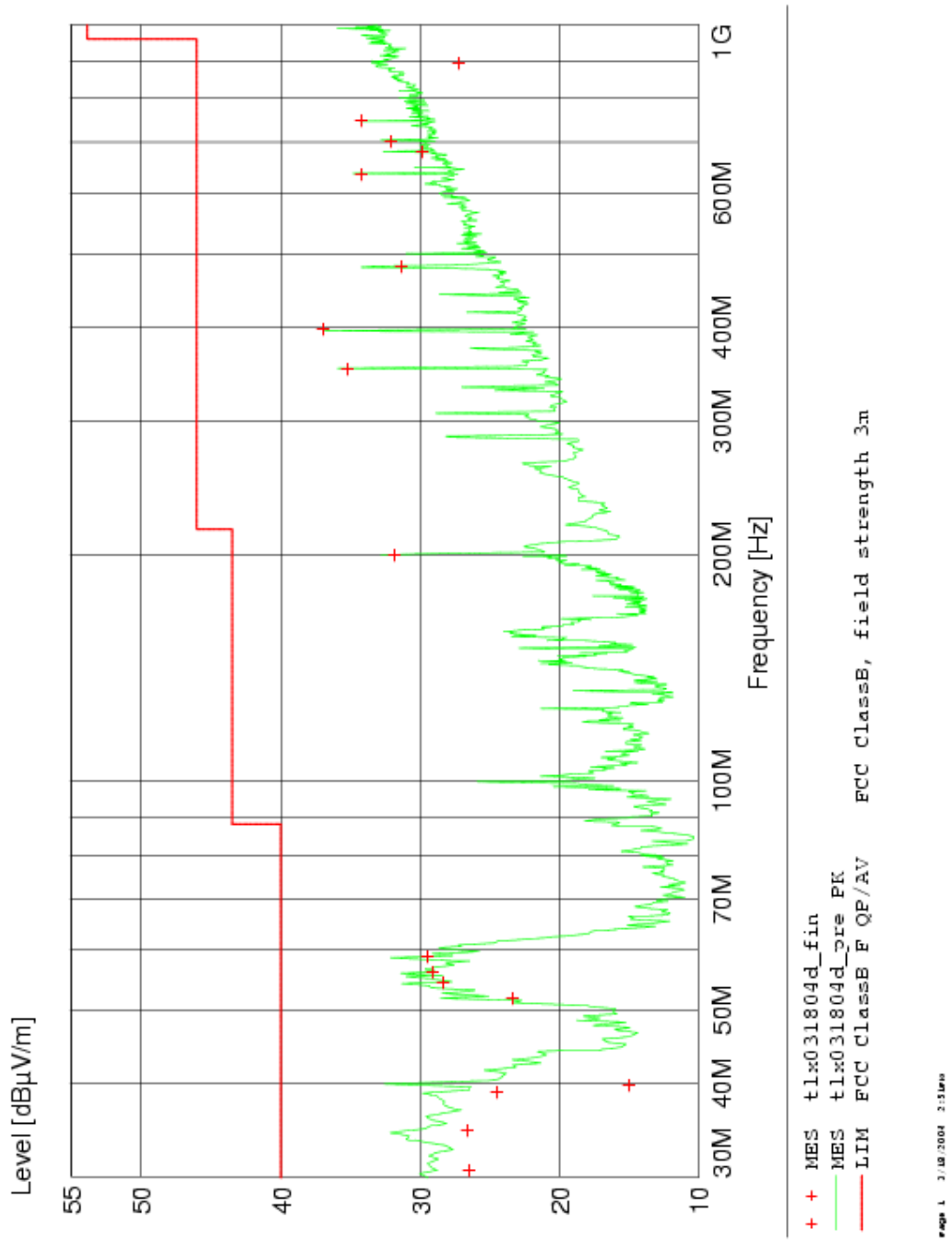


Figure 14 Radiated Emissions Plot 14.5dBi Panel, Receive Only, 30MHz - 1GHz

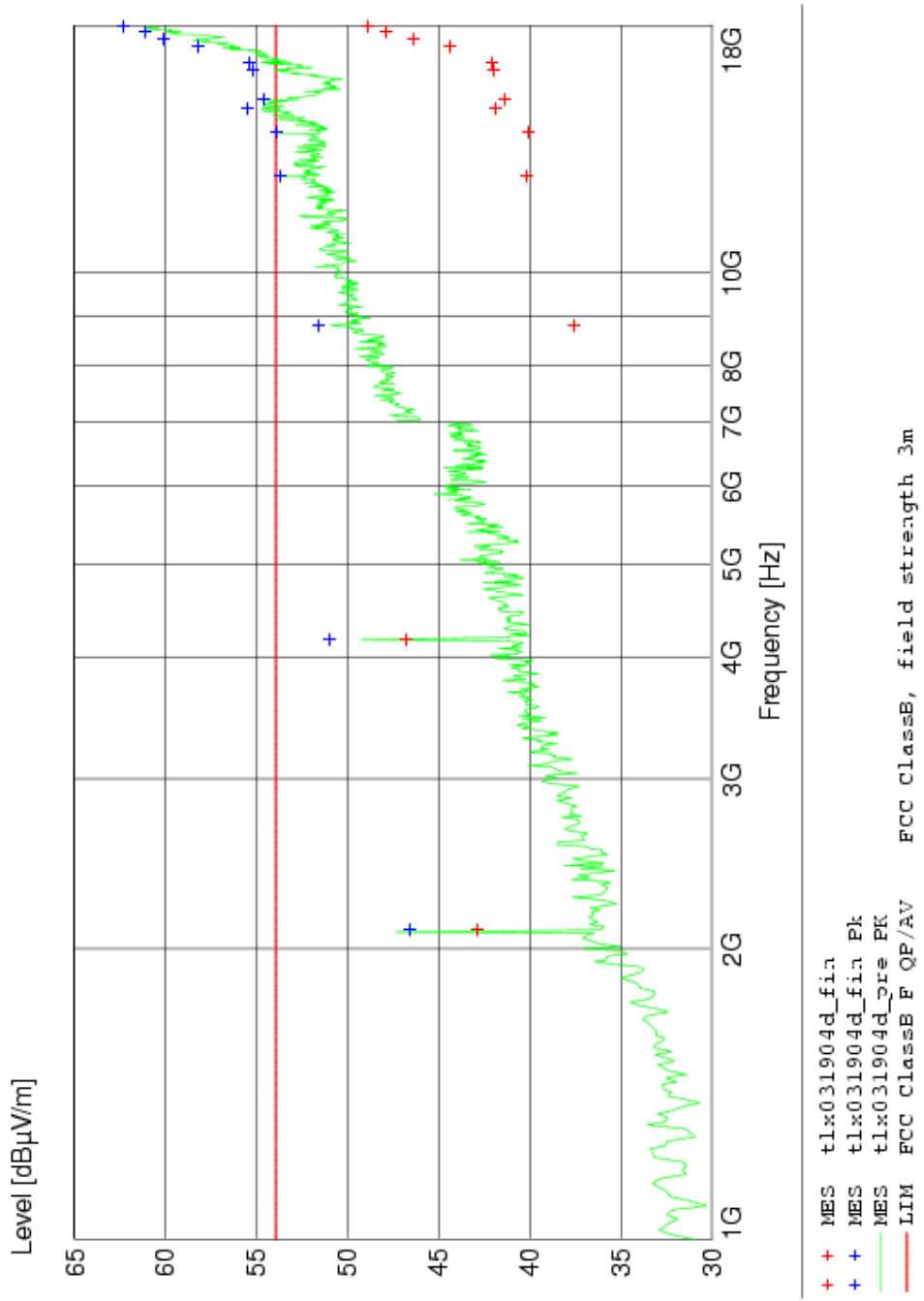


Figure 15 Radiated Emissions Plot 14.5dBi Panel, Receive Only, 1GHz - 18GHz

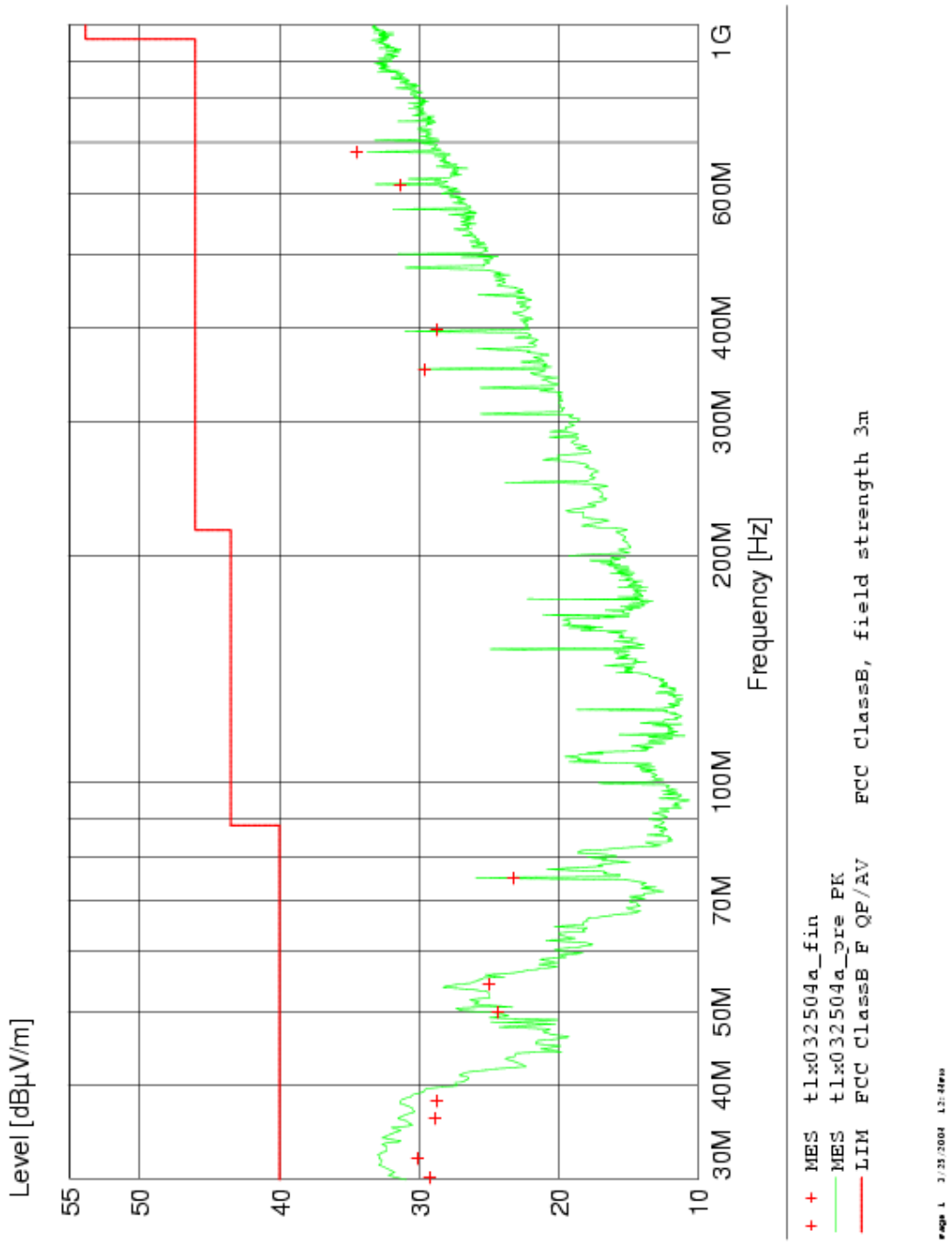


Figure 16 Radiated Emissions Plot 9.5dBi Omni, Channel 1, 30MHz - 1GHz

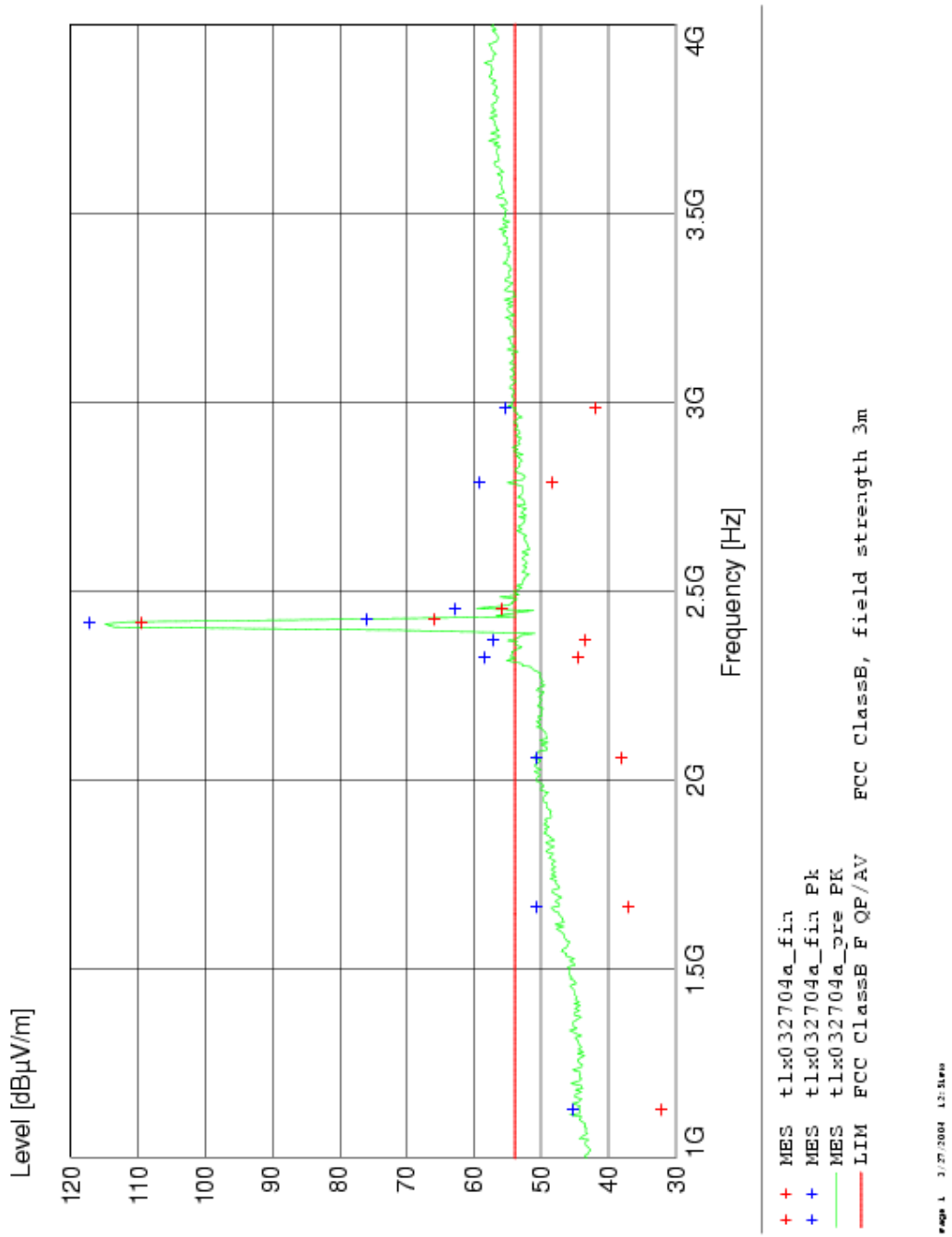


Figure 17 Radiated Emissions Plot 9.5dBi Omni, Channel 1, 1GHz - 4GHz

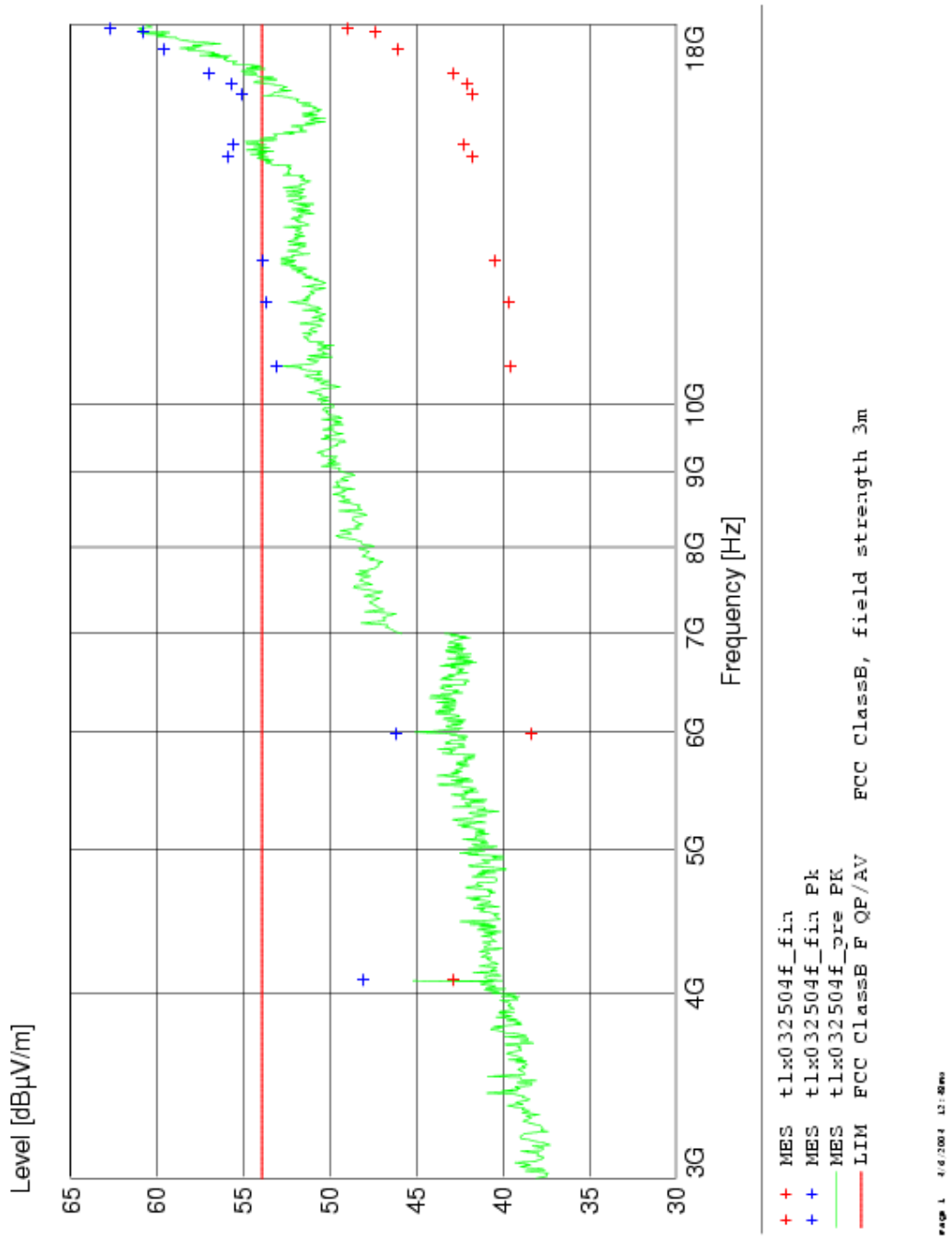


Figure 18 Radiated Emissions Plot 9.5dBi Omni, Channel 1, 3GHz - 18GHz

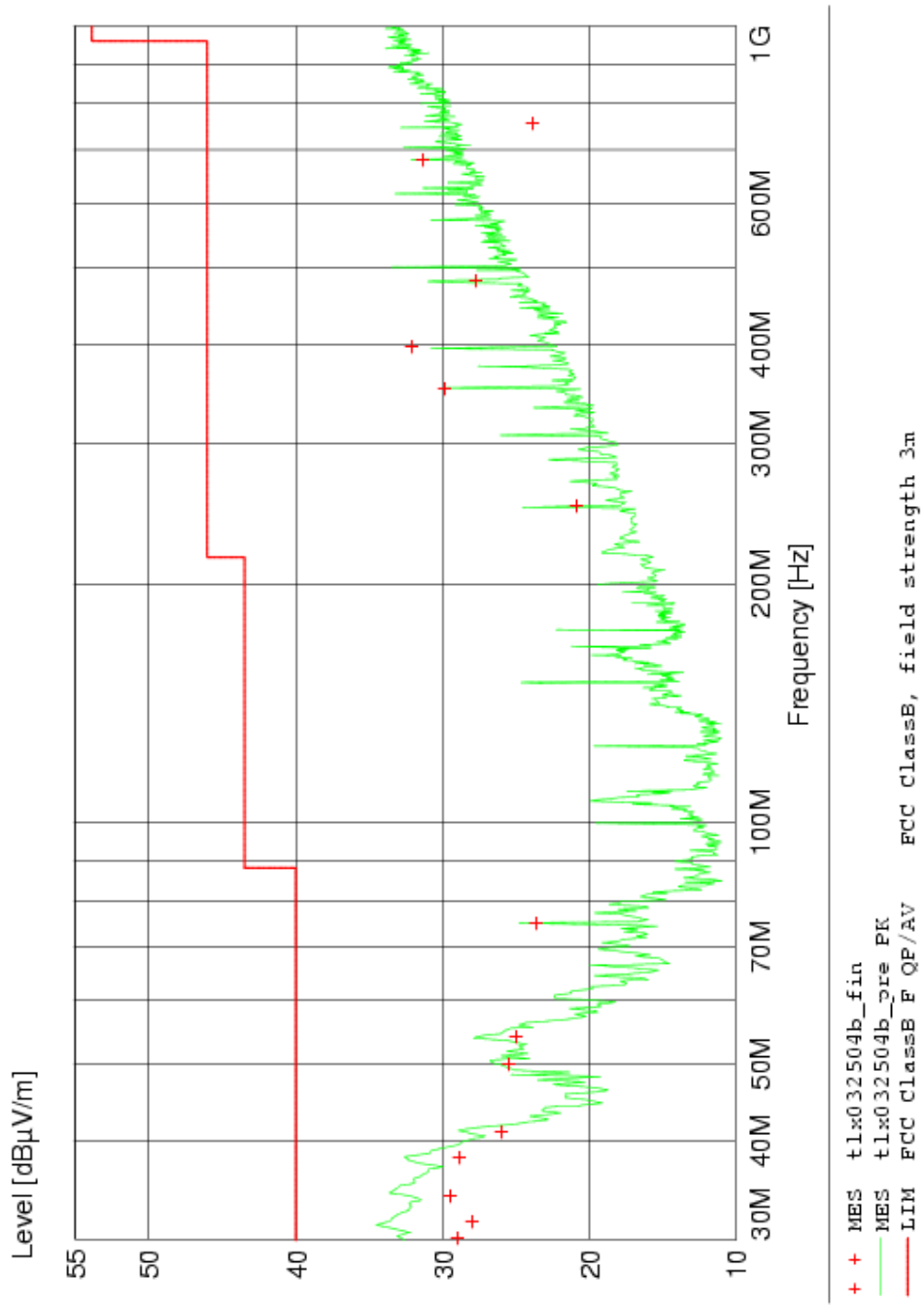


Figure 19 Radiated Emissions Plot 9.5dBi Omni, Channel 5, 30MHz - 1GHz

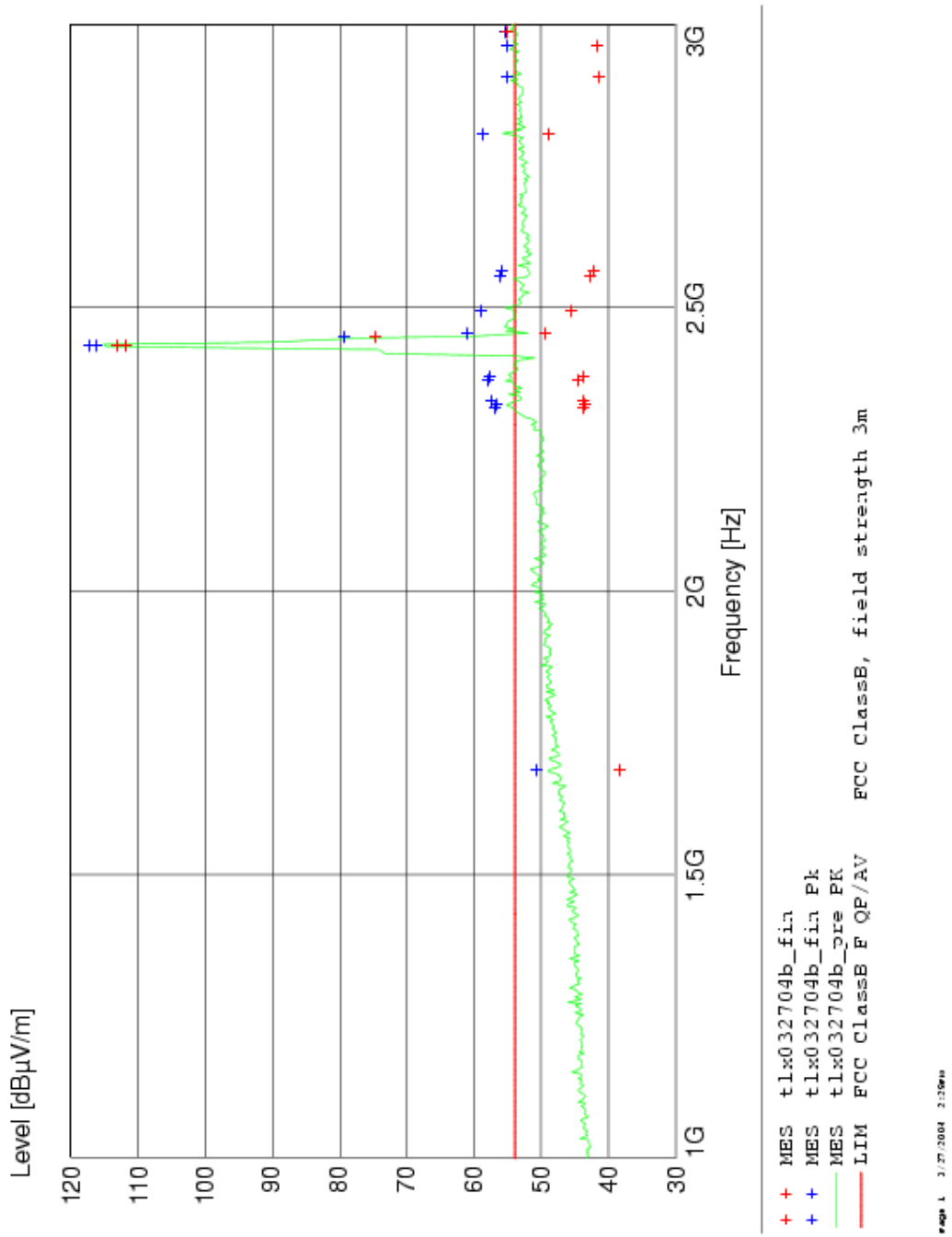


Figure 20 Radiated Emissions Plot 9.5dBi Omni, Channel 5, 1GHz - 3GHz

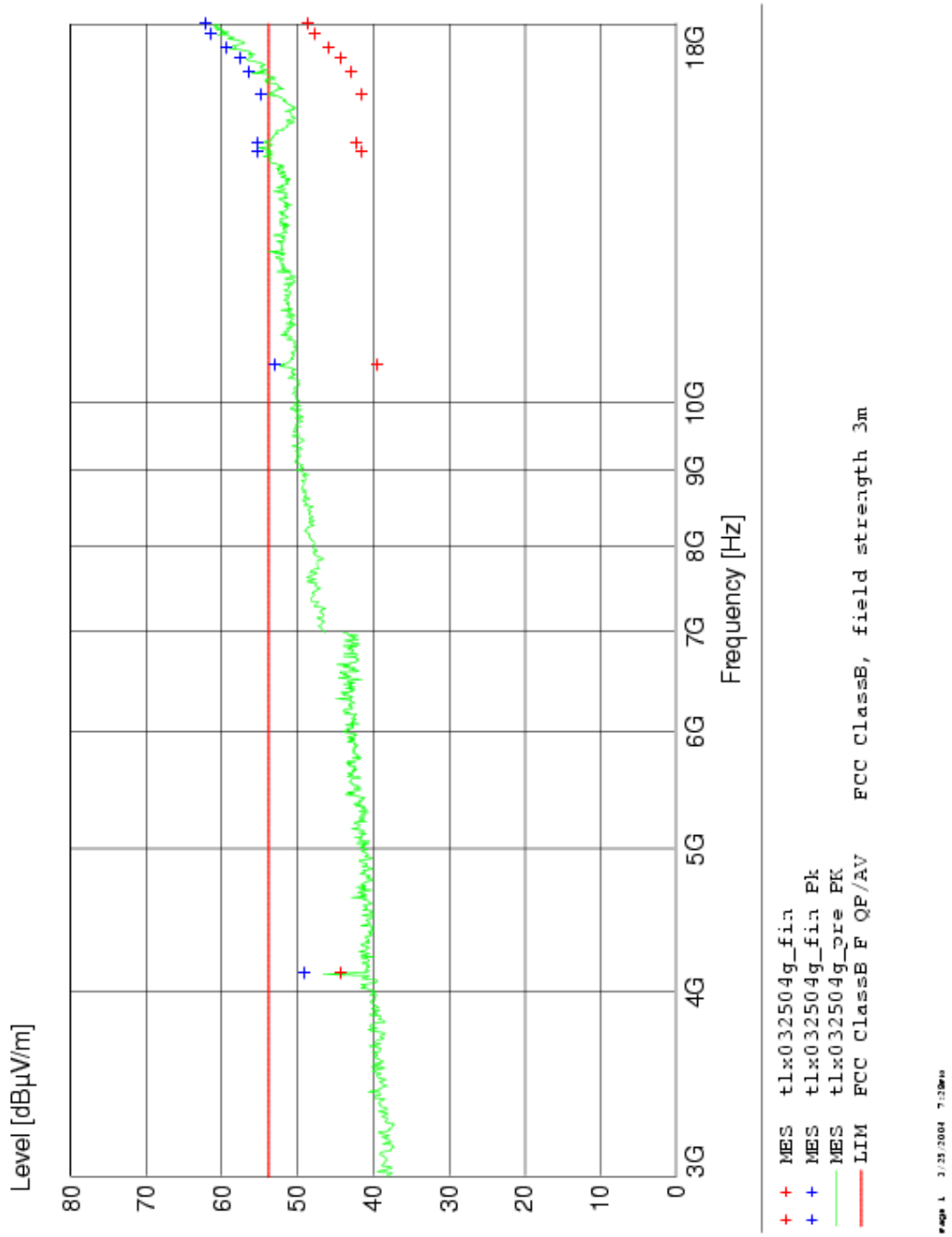


Figure 21 Radiated Emissions Plot 9.5dBi Omni, Channel 5, 3GHz - 18GHz

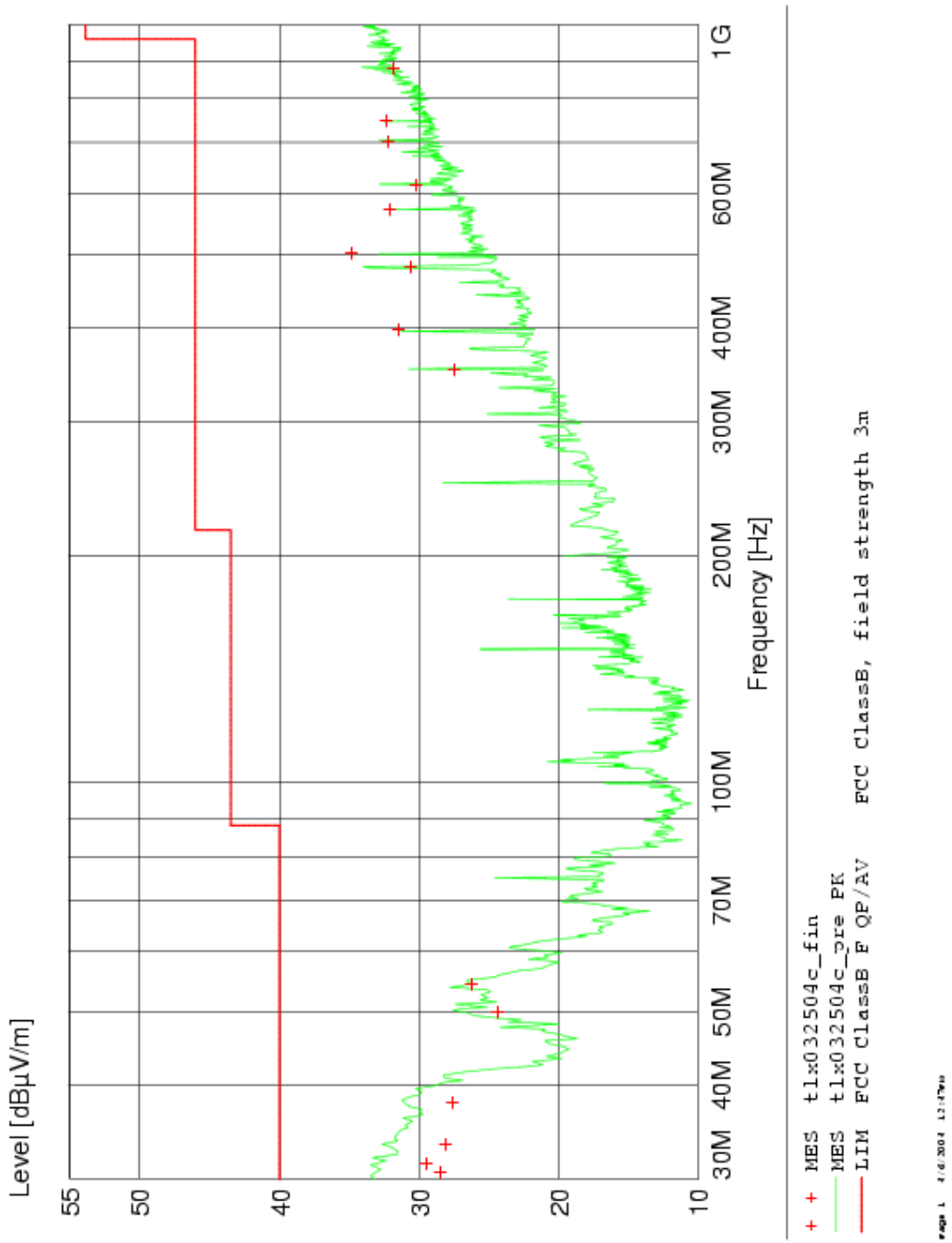


Figure 22 Radiated Emissions Plot 9.5dBi Omni, Channel 11, 30MHz - 1GHz

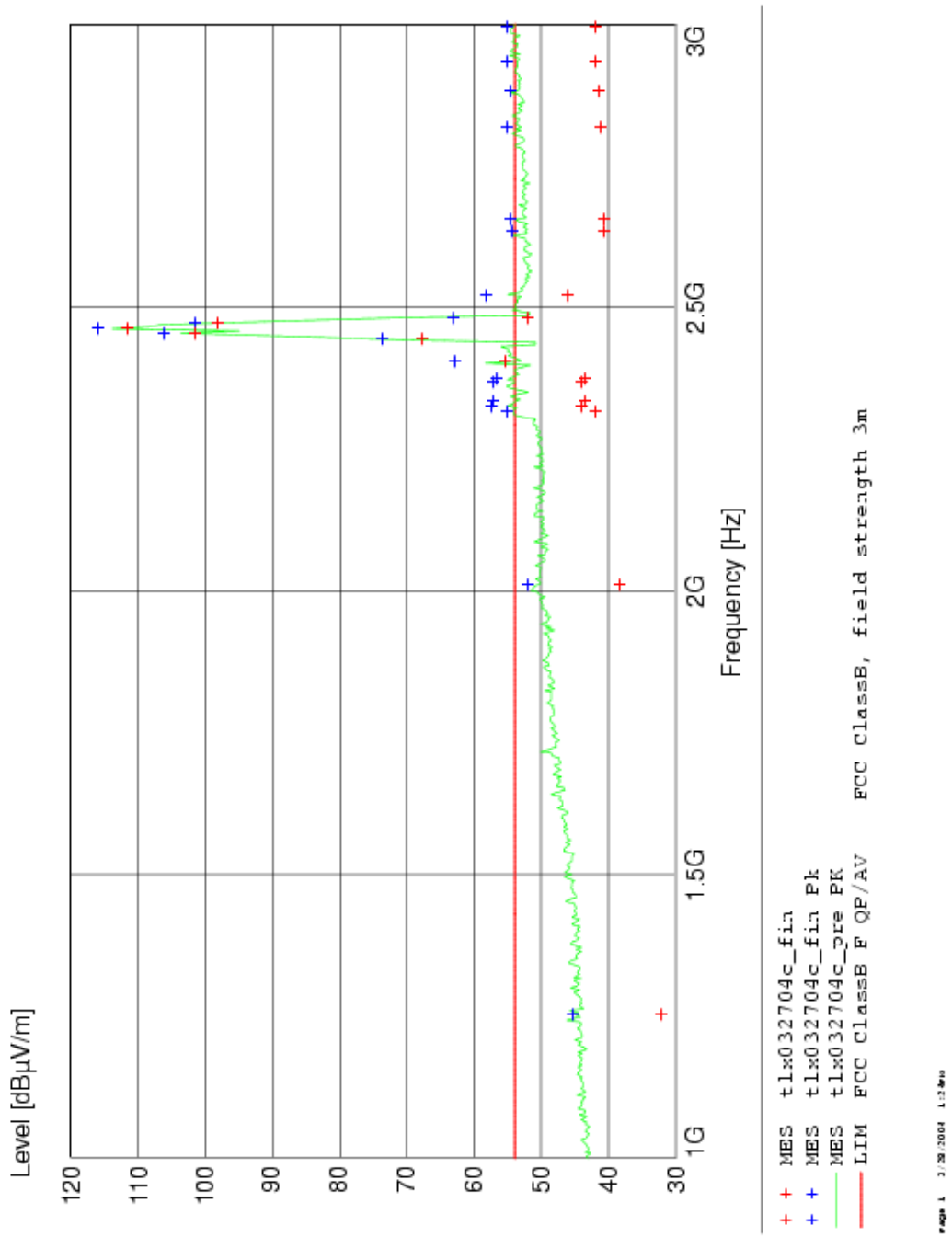


Figure 23 Radiated Emissions Plot 9.5dBi Omni, Channel 11, 1GHz - 3GHz

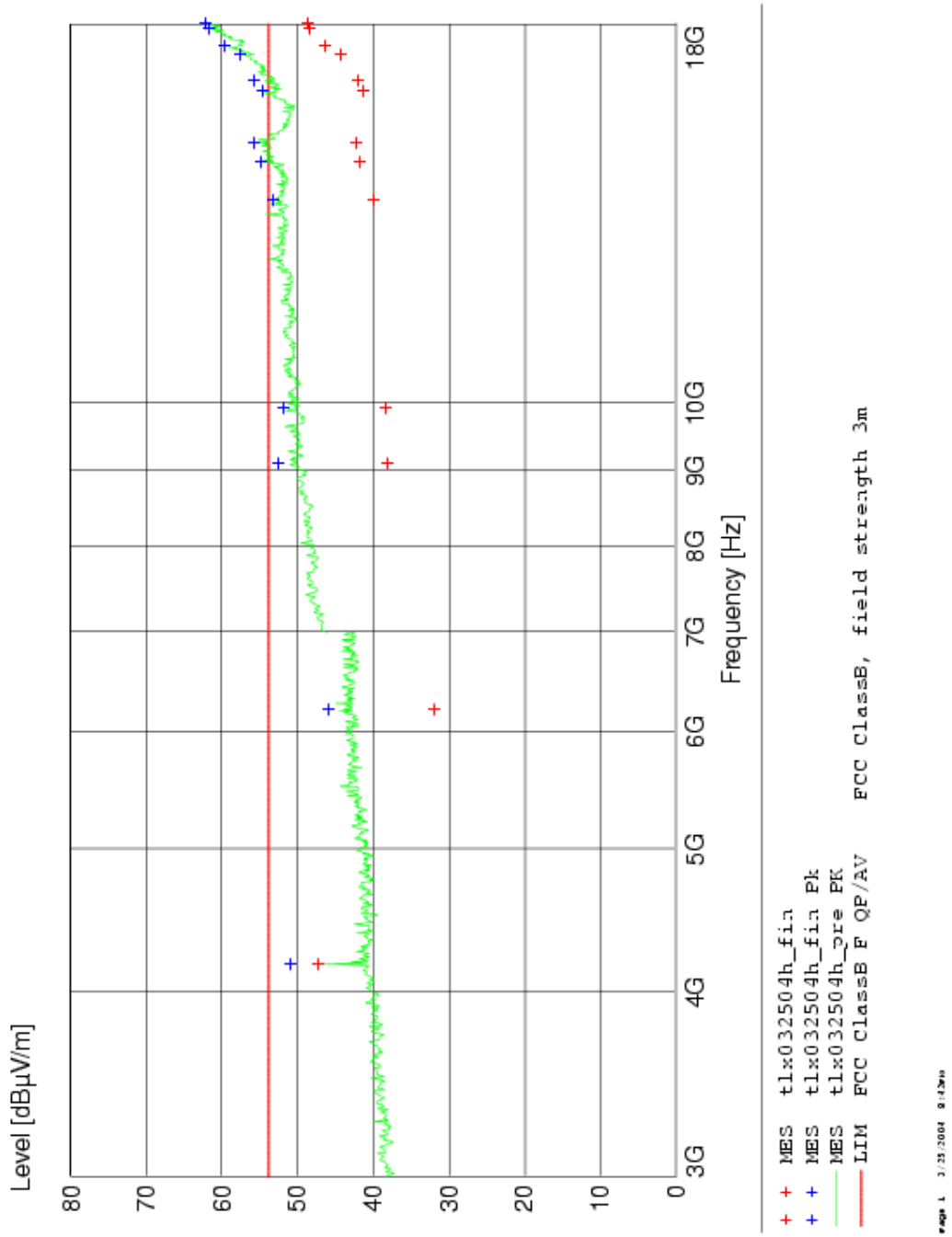


Figure 24 Radiated Emissions Plot 9.5dBi Omni, Channel 11, 3GHz - 18GHz

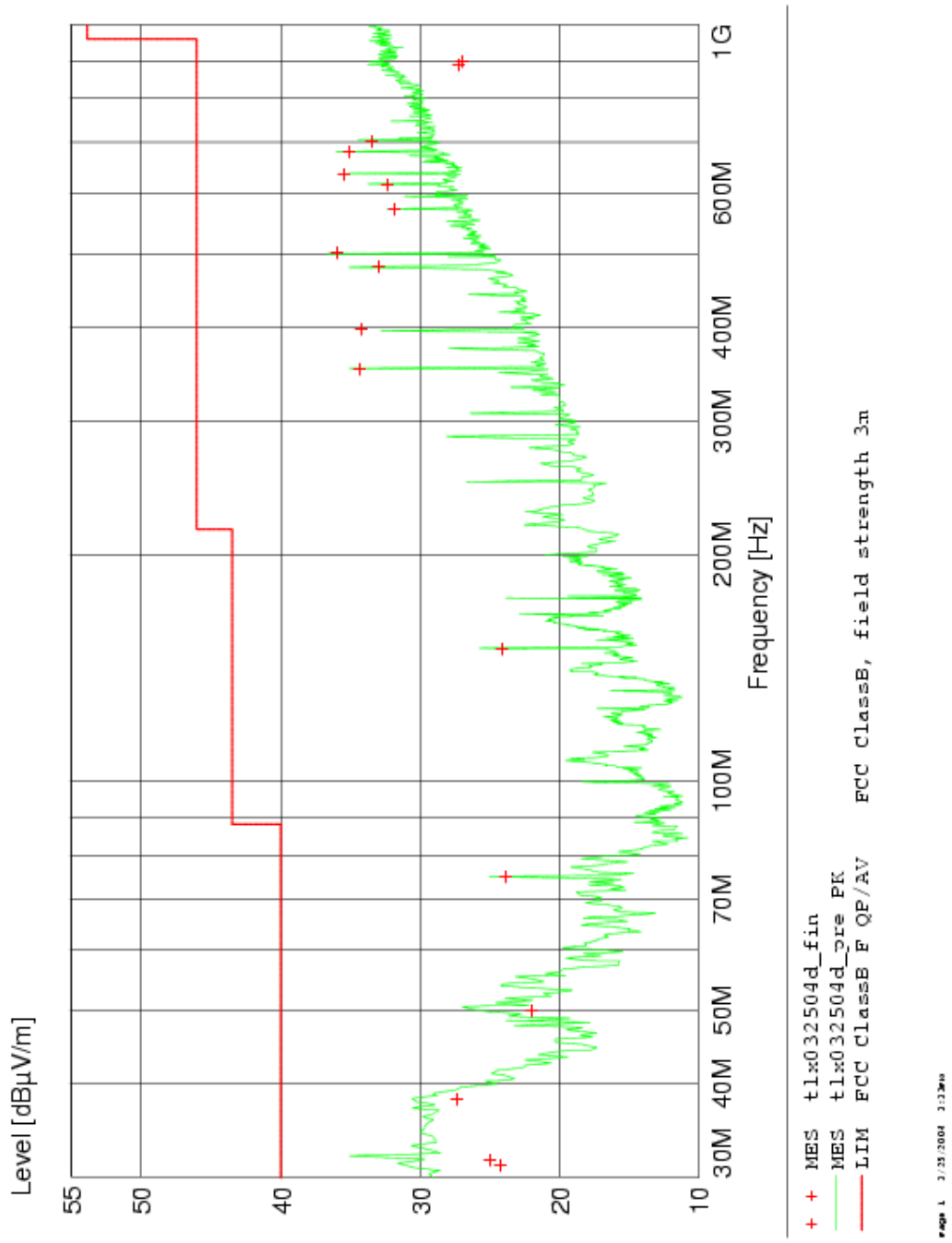


Figure 25 Radiated Emissions Plot 9.5dBi Omni, Receive Only, 30MHz - 1GHz

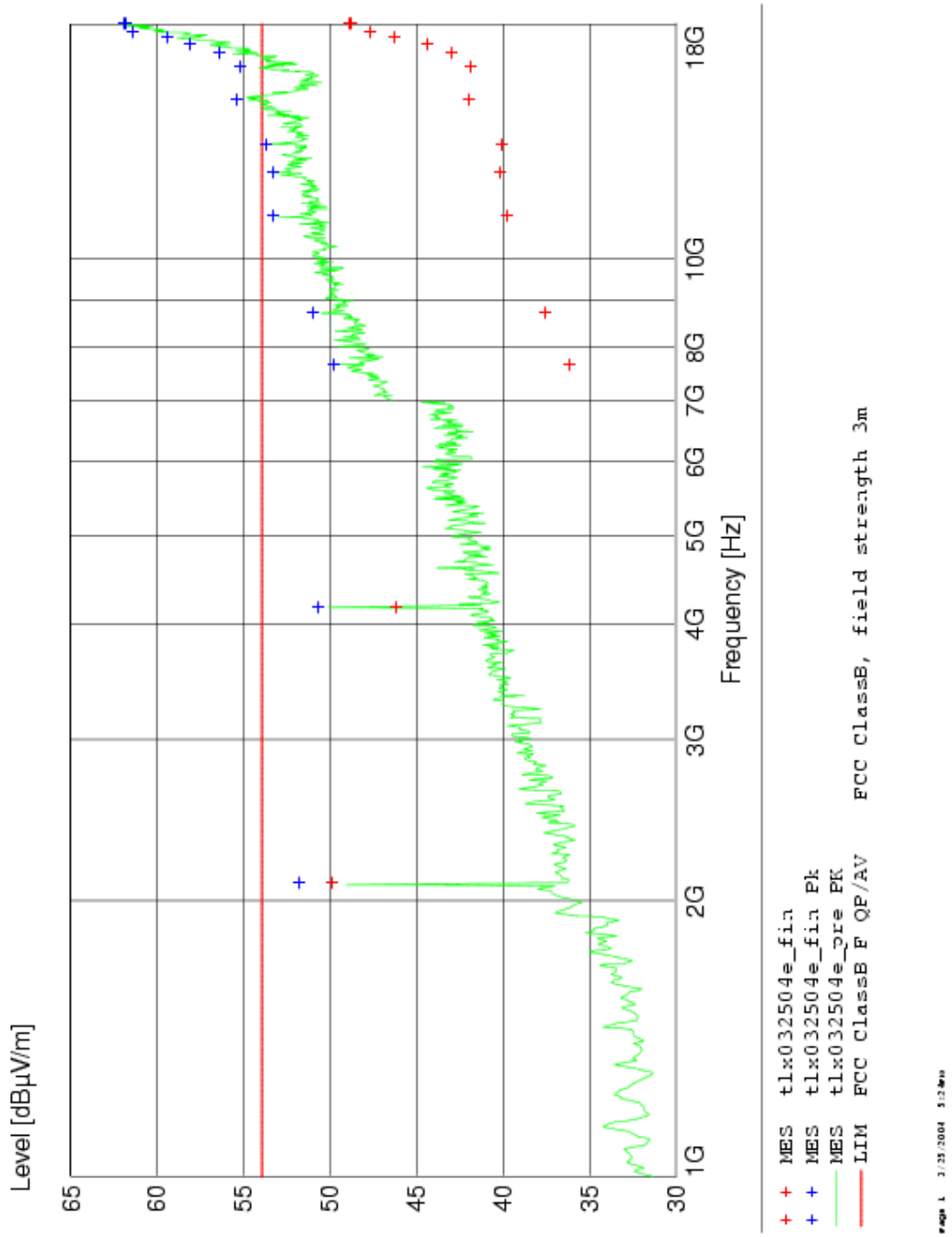


Figure 26 Radiated Emissions Plot 9.5dBi Omni, Receive Only, 1GHz - 18GHz

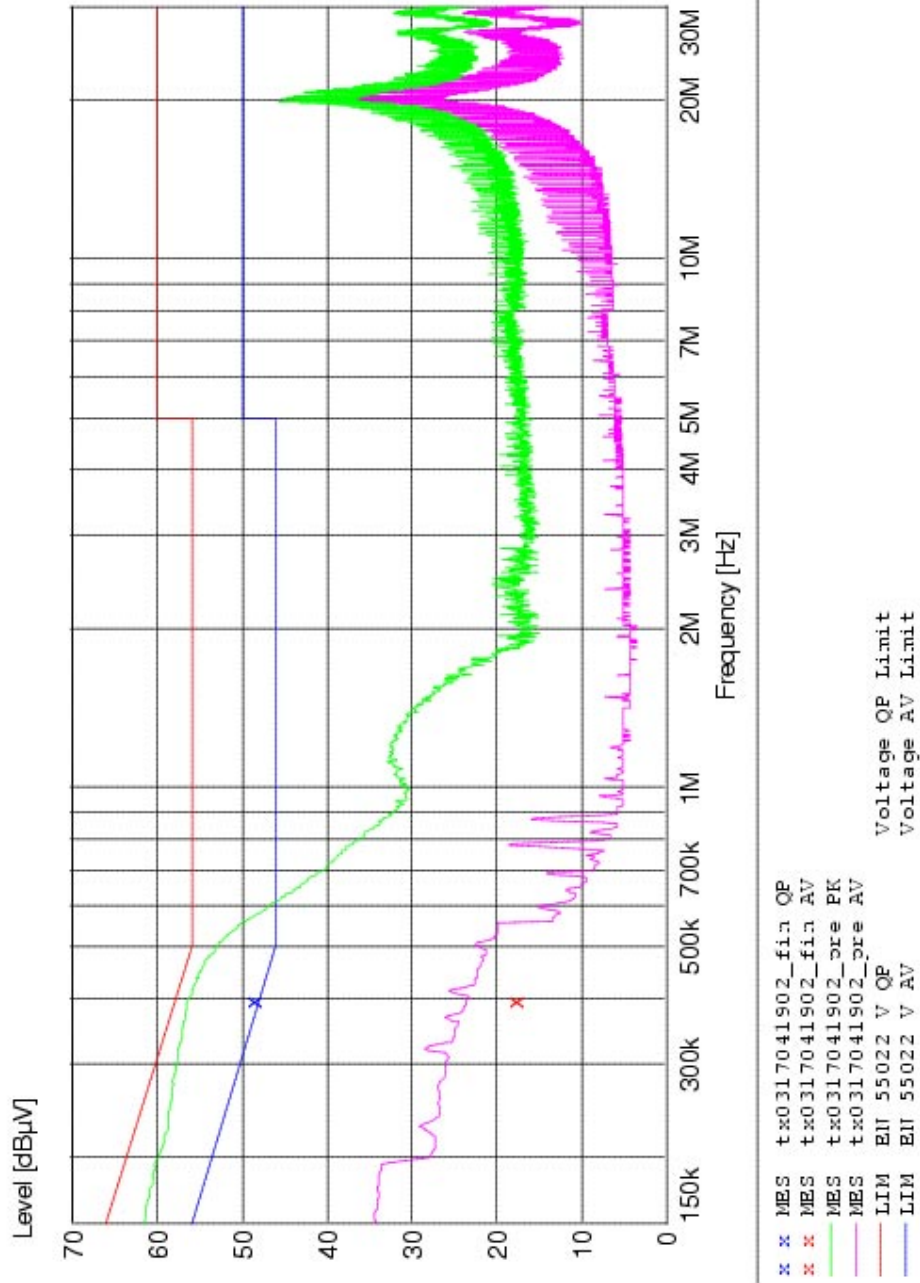


Figure 27 Conducted Emissions Plot

Appendix C: Emissions Results, Receive, 3-Meter Measurement Distance

14.5dBi Antenna Receive Only QuasiPeak Results 30M-1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
30.66	26.76	8.36	17.8	-0.6	40	13.2	101	359	VERT
34.68	26.91	10.79	15.5	-0.7	40	13.1	99	93	VERT
38.94	24.75	10.84	13.2	-0.7	40	15.2	104	50	VERT
39.84	15.18	1.71	12.8	-0.7	40	24.8	350	197	VERT
51.72	23.61	13.37	9.3	-0.9	40	16.4	100	359	VERT
54.18	28.5	18.22	9.4	-0.9	40	11.5	99	0	VERT
55.98	29.3	19.42	9	-0.9	40	10.7	101	29	VERT
58.74	29.63	20.92	7.8	-0.9	40	10.4	150	27	VERT
199.98	32.1	19.7	10.6	-1.8	43.5	11.4	99	145	VERT
351.96	35.5	17.52	15.6	-2.4	46	10.5	122	87	VERT
396	37.1	17.76	16.8	-2.6	46	8.9	115	216	VERT
479.58	31.49	10.3	18.4	-2.8	46	14.5	99	123	VERT
637.98	34.43	11.05	20.2	-3.2	46	11.6	101	208	VERT
682.02	30.05	4.91	21.8	-3.3	46	15.9	204	104	VERT
703.98	32.4	7.06	21.9	-3.4	46	13.6	100	32	VERT
748.5	34.43	9.11	21.8	-3.5	46	11.6	100	38	VERT
891.6	27.45	-0.91	24.4	-3.9	46	18.6	377	29	HORI

14.5dBi Antenna Receive Only Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
2087.5	42.98	37.69	29.6	24.3	53.9	10.9	100	167	VERT
4175.5	46.98	34.48	34.4	21.9	53.9	6.9	106	221	HORI
8790.5	37.72	15.92	40	18.2	53.9	16.2	227	112	HORI
12559	40.33	16.03	41.4	17.1	53.9	13.6	120	191	HORI
13915	40.15	15.15	42.1	17.1	53.9	10.8	149	286	VERT
14717.5	41.95	16.3	42.9	17.3	53.9	11.9	349	214	HORI
15089	41.5	16.47	42.5	17.5	53.9	12.4	357	356	VERT
16146	42.05	18.35	40.4	16.7	53.9	11.8	399	171	VERT
16463	42.2	17.49	41.3	16.6	53.9	11.7	400	120	VERT
17107.5	44.57	15.64	43.8	14.9	53.9	9.3	349	71	VERT
17373	46.51	16	44.9	14.4	53.9	7.4	99	73	HORI
17715	48.04	16.01	46.4	14.3	53.9	5.9	106	33	HORI
17933	49.08	15.76	47.3	14	53.9	4.8	100	172	VERT

14.5dBi Antenna Receive Only Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
2087.5	46.69	41.4	29.6	24.3	74	27.3	100	167	VERT
4175.5	51.13	38.64	34.4	21.9	74	22.9	106	221	HORI
8790.5	51.76	29.96	40	18.2	74	22.2	227	112	HORI
12559	53.88	29.59	41.4	17.1	74	20.1	120	191	HORI
13915	53.99	28.96	42.1	17.1	74	20.0	149	286	VERT
14717.5	55.61	29.96	42.9	17.3	74	18.4	349	214	HORI
15089	54.74	29.71	42.5	17.5	74	19.3	357	356	VERT
16146	55.37	31.67	40.4	16.7	74	18.6	399	171	VERT
16463	55.46	30.75	41.3	16.6	74	18.5	400	120	VERT
17107.5	58.39	29.46	43.8	14.9	74	15.6	349	71	VERT
17373	60.23	29.71	44.9	14.4	74	13.8	99	73	HORI
17715	61.24	29.21	46.4	14.3	74	12.8	106	33	HORI
17933	62.41	29.08	47.3	14	74	11.6	100	172	VERT

9.5dBi Antenna Receive only QuasiPeak Results 30MHz -
1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
31.14	24.46	6.34	17.5	-0.6	40	15.5	122	26	VERT
31.68	25.27	7.48	17.2	-0.6	40	14.7	149	213	VERT
38.1	27.6	13.26	13.6	-0.7	40	12.4	99	99	VERT
49.98	22.29	12.09	9.3	-0.9	40	17.7	149	125	VERT
75	24.02	16.17	6.8	-1.1	40	16	100	250	VERT
150	24.34	13.94	8.8	-1.6	43.5	19.2	201	125	HORI
351.96	34.55	16.57	15.6	-2.4	46	11.4	129	70	VERT
396	34.43	15.09	16.8	-2.6	46	11.6	135	199	VERT
479.58	33.22	12.03	18.4	-2.8	46	12.8	99	47	VERT
499.98	36.23	14.83	18.5	-2.9	46	9.8	99	122	VERT
571.98	32.08	9.52	19.5	-3.1	46	13.9	105	264	VERT
615.96	32.56	8.2	21.2	-3.2	46	13.4	220	0	VERT
637.98	35.7	12.32	20.2	-3.2	46	10.3	217	29	VERT
681.96	35.25	10.11	21.8	-3.3	46	10.7	236	329	VERT
703.98	33.67	8.33	21.9	-3.4	46	12.3	100	349	VERT

9.5dBi Antenna Receive only Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
2087.5	50	44.71	29.6	24.3	53.9	3.9	106	155	VERT
4175.5	46.31	33.81	34.4	21.9	53.9	7.6	106	225	HORI
7646.5	36.29	16.51	38.9	19.1	53.9	17.6	156	130	HORI
8727	37.72	16.19	39.9	18.4	53.9	16.2	178	243	HORI
11117.5	39.82	16.47	40.8	17.4	53.9	14.1	350	28	VERT
12422	40.3	16.44	41.2	17.3	53.9	13.6	149	311	VERT
13302.5	40.17	15.54	42.1	17.5	53.9	13.7	371	6	VERT
14883.5	42.13	16.04	43	16.9	53.9	11.8	381	169	HORI
16150	42.04	18.33	40.4	16.7	53.9	11.9	249	301	HORI
16706.5	43.13	16.7	42.2	15.8	53.9	10.8	256	93	HORI
17091.5	44.56	15.79	43.8	15	53.9	9.3	399	359	HORI
17381	46.4	15.87	44.9	14.4	53.9	7.5	191	30	HORI
17668	47.74	16.18	46.1	14.6	53.9	6.2	100	130	HORI
17935	49.04	15.7	47.3	14	53.9	4.9	149	69	VERT
17985	48.93	15.23	47.5	13.8	53.9	5	149	0	VERT

9.5dBi Antenna Receive only Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
2087.5	51.9	46.61	29.6	24.3	74	22.1	106	155	VERT
4175.5	50.88	38.39	34.4	21.9	74	23.1	106	225	HORI
7646.5	49.86	30.09	38.9	19.1	74	24.1	156	130	HORI
8727	51.11	29.59	39.9	18.4	74	22.9	178	243	HORI
11117.5	53.44	30.09	40.8	17.4	74	20.6	350	28	VERT
12422	53.35	29.46	41.2	17.3	74	20.7	149	311	VERT
13302.5	53.85	29.21	42.1	17.5	74	20.2	371	6	VERT
14883.5	55.55	29.46	43	16.9	74	18.5	381	169	HORI
16150	55.25	31.54	40.4	16.7	74	18.8	249	301	HORI
16706.5	56.52	30.09	42.2	15.8	74	17.5	256	93	HORI
17091.5	58.23	29.46	43.8	15	74	15.8	399	359	HORI
17381	59.49	28.96	44.9	14.4	74	14.5	191	30	HORI
17668	61.52	29.96	46.1	14.6	74	12.5	100	130	HORI
17935	62.03	28.69	47.3	14	74	12.0	149	69	VERT
17985	61.99	28.3	47.5	13.8	74	12.0	149	0	VERT

Appendix D: Emissions Results, Transmit, 3-Meter Measurement Distance

14.5dBi Antenna Channel 1 QuasiPeak Results 30M-1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
31.02	28.08	9.9	17.6	-0.6	40	11.9	101	9	VERT
33.18	28.47	11.53	16.3	-0.6	40	11.5	98	86	VERT
38.28	27.78	13.54	13.6	-0.7	40	12.2	101	99	VERT
54.18	34.63	24.34	9.4	-0.9	40	5.4	100	17	VERT
55.98	32.2	22.32	9	-0.9	40	7.8	99	36	VERT
58.68	31.77	23.03	7.8	-0.9	40	8.2	149	37	VERT
199.98	31.85	19.45	10.6	-1.8	43.5	11.7	120	145	VERT
352.02	30.9	12.92	15.6	-2.4	46	15.1	126	103	VERT
396	35.69	16.35	16.8	-2.6	46	10.3	119	221	VERT
479.52	30.27	9.08	18.4	-2.8	46	15.7	99	28	VERT
748.5	34.54	9.23	21.8	-3.5	46	11.5	100	33	VERT
917.04	26.77	-0.91	23.7	-4	46	19.2	100	156	HORI

14.5dBi Antenna Channel 1 Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
2313.5	42.85	6.35	30.1	-6.4	53.9	11.1	150	162	VERT
2363	39.27	2.65	30.2	-6.4	53.9	14.6	278	148	HORI
2403.5	58.81	22.09	30.3	-6.4	95.92	37.11	371	28	HORI
2413	115.92	79.14	30.3	-6.5	115.92	0	150	144	VERT
2492.5	40.25	3.25	30.5	-6.5	53.9	13.6	291	176	HORI
2512	41.21	4.12	30.5	-6.5	53.9	12.7	150	244	VERT
2647.5	41.75	3.95	31	-6.8	53.9	12.2	156	134	VERT
2654.5	41.03	3.2	31	-6.8	53.9	12.9	314	339	VERT
2709	40.91	2.76	31.2	-6.9	53.9	13	249	66	HORI
2752	41.06	2.63	31.3	-7.1	53.9	12.8	141	212	HORI
2786	41.2	2.7	31.5	-7	53.9	12.7	150	111	VERT
2832.5	41.5	2.84	31.6	-7.1	53.9	12.4	398	183	HORI
2911.5	41.88	2.98	31.8	-7.1	53.9	12	249	250	VERT
2936.5	42.09	2.94	31.9	-7.2	53.9	11.8	350	242	VERT
2957	42.1	2.81	32	-7.3	53.9	11.8	400	237	VERT
2957.5	42.16	2.87	32	-7.3	53.9	11.7	119	275	VERT
2975	42.21	2.84	32	-7.4	53.9	11.7	399	3	HORI
2984.5	42.19	2.77	32.1	-7.4	53.9	11.7	350	223	HORI
4075.5	46.51	33.27	34.2	21	53.9	7.4	106	249	VERT
6263.5	33.4	14.99	36.8	18.4	53.9	20.5	165	57	HORI
7168.5	36.14	16.92	38.2	19	53.9	17.8	399	298	VERT
8012	37.25	15.77	39.1	17.6	53.9	16.7	100	332	HORI
8655	38.11	15.92	39.8	17.6	53.9	15.8	249	36	HORI
9093	39.58	15.98	40.4	16.8	53.9	14.3	370	143	VERT
10591.5	40.29	16.06	40.6	16.4	53.9	13.6	278	358	VERT
12689	41.12	15.95	41.6	16.4	53.9	12.8	149	35	HORI
14522	43.23	16.29	42.9	16	53.9	10.7	399	69	VERT
14985	42.97	15.57	43	15.6	53.9	10.9	249	75	HORI
16158.5	43.45	18.26	40.4	15.3	53.9	10.4	191	53	HORI
17072.5	46.59	15.97	43.7	13.1	53.9	7.3	166	7	HORI
17391	47.97	15.79	45	12.8	53.9	5.9	349	165	HORI
17795	48.96	15.22	46.7	13	53.9	4.9	191	120	VERT
17999.5	49.8	15.22	47.6	13	53.9	4.1	399	124	VERT

14.5dBi Antenna Channel 1 Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
2313.5	56.5	19.98	30.1	-6.4	74	17.5	150	162	VERT
2363	52.67	16.05	30.2	-6.4	74	21.3	278	148	HORI
2403.5	64.18	27.46	30.3	-6.4	100.16	35.98	371	28	HORI
2413	120.16	83.38	30.3	-6.5	120.16	0.0	150	144	VERT
2492.5	53.93	16.93	30.5	-6.5	74	20.1	291	176	HORI
2512	54.57	17.48	30.5	-6.5	74	19.4	150	244	VERT
2647.5	55.14	17.34	31	-6.8	74	18.9	156	134	VERT
2654.5	54.51	16.68	31	-6.8	74	19.5	314	339	VERT
2709	54.57	16.42	31.2	-6.9	74	19.4	249	66	HORI
2752	55.37	16.93	31.3	-7.1	74	18.6	141	212	HORI
2786	55.02	16.52	31.5	-7	74	19.0	150	111	VERT
2832.5	54.83	16.17	31.6	-7.1	74	19.2	398	183	HORI
2911.5	56.05	17.06	31.8	-7.1	74	18.0	249	250	VERT
2936.5	55.46	16.3	31.9	-7.2	74	18.5	350	242	VERT
2957	55.33	16.05	32	-7.3	74	18.7	400	237	VERT
2957.5	55.34	16.05	32	-7.3	74	18.7	119	275	VERT
2975	55.8	16.42	32	-7.4	74	18.2	399	3	HORI
2984.5	56.62	17.2	32.1	-7.4	74	17.4	350	223	HORI
4075.5	51.02	37.77	34.2	21	74	23.0	106	249	VERT
6263.5	46.89	28.48	36.8	18.4	74	27.1	165	57	HORI
7168.5	49.58	30.36	38.2	19	74	24.4	399	298	VERT
8012	51.19	29.71	39.1	17.6	74	22.8	100	332	HORI
8655	51.9	29.71	39.8	17.6	74	22.1	249	36	HORI
9093	52.68	29.08	40.4	16.8	74	21.3	370	143	VERT
10591.5	53.82	29.59	40.6	16.4	74	20.2	278	358	VERT
12689	54.76	29.59	41.6	16.4	74	19.2	149	35	HORI
14522	56.4	29.46	42.9	16	74	17.6	399	69	VERT
14985	56.83	29.46	43	15.6	74	17.2	249	75	HORI
16158.5	57.49	32.3	40.4	15.3	74	16.5	191	53	HORI
17072.5	59.83	29.21	43.7	13.1	74	14.2	166	7	HORI
17391	61.26	29.08	45	12.8	74	12.7	349	165	HORI
17795	62.31	28.56	46.7	13	74	11.7	191	120	VERT
17999.5	63.15	28.56	47.6	13	74	10.9	399	124	VERT

14.5dBi Antenna Channel 5 QuasiPeak Results 30M-1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
30.66	29.8	11.4	17.8	-0.6	40	10.2	101	267	VERT
33.72	26.74	10.1	16	-0.6	40	13.3	100	83	VERT
38.1	28.45	14.12	13.6	-0.7	40	11.6	99	99	VERT
41.4	26.77	13.92	12.1	-0.7	40	13.2	101	116	VERT
54.18	32.53	22.25	9.4	-0.9	40	7.5	100	14	VERT
55.98	32.48	22.61	9	-0.9	40	7.5	100	53	VERT
58.68	31.78	23.04	7.8	-0.9	40	8.2	185	38	VERT
199.98	33.32	20.92	10.6	-1.8	43.5	10.2	99	161	VERT
352.02	30.82	12.84	15.6	-2.4	46	15.2	123	90	VERT
396	35.45	16.1	16.8	-2.6	46	10.6	117	217	VERT
479.82	29.04	7.84	18.4	-2.8	46	17	102	36	VERT
500.04	31.01	9.61	18.5	-2.9	46	15	98	67	VERT
748.5	32.62	7.3	21.8	-3.5	46	13.4	100	224	VERT
870.66	32.14	4.59	23.7	-3.8	46	13.9	149	285	HORI

14.5dBi Antenna Channel 5 Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1766	36.74	2.86	28.4	-5.4	53.9	17.2	249	329	HORI
2023	38.54	3.14	29.5	-5.9	53.9	15.4	249	310	HORI
2212.5	38.06	1.96	29.9	-6.2	53.9	15.8	249	278	VERT
2313.5	38.71	2.19	30.1	-6.4	53.9	15.2	249	222	HORI
2388.5	39	2.32	30.3	-6.4	53.9	14.9	201	359	HORI
2433	116.45	79.55	30.4	-6.5	116.45	0	150	125	VERT
2508	44.51	7.45	30.5	-6.5	53.9	9.4	149	77	VERT
2641.5	40.8	3.03	31	-6.8	53.9	13.1	150	318	HORI
2697	40.85	2.79	31.2	-6.9	53.9	13	381	345	HORI
2738	40.86	2.46	31.3	-7.1	53.9	13	249	286	HORI
2848.5	41.44	2.69	31.6	-7.1	53.9	12.5	191	45	HORI
2925.5	41.98	2.9	31.9	-7.2	53.9	11.9	371	231	HORI
2962.5	41.92	2.62	32	-7.3	53.9	12	156	138	HORI
2980	42.01	2.61	32	-7.4	53.9	11.9	150	11	VERT
2893.5	44.29	19.02	31.8	6.5	53.9	9.6	400	134	VERT
3060	29.84	18.25	32.3	20.7	53.9	24.1	100	32	VERT
4115.5	47.35	34.03	34.3	21	53.9	6.5	99	233	VERT
6362.5	33.39	15.28	36.8	18.7	53.9	20.5	201	359	VERT
7987	37.19	15.81	39.1	17.7	53.9	16.7	169	19	VERT
12477	41.34	16.03	41.3	16	53.9	12.6	381	238	HORI
13993	41.35	15.24	42.1	16	53.9	12.5	100	241	HORI
14579	43.16	16.11	42.9	15.9	53.9	10.7	399	272	HORI
14983	43.56	16.19	43	15.6	53.9	10.3	100	235	VERT
16191	43.24	17.97	40.5	15.3	53.9	10.7	178	254	VERT
17036.5	45.65	15.65	43.5	13.5	53.9	7.3	250	28	VERT
17413.5	47.68	15.56	45.1	12.9	53.9	6.2	150	228	HORI
17889.5	50	16.03	47.1	13.1	53.9	3.9	169	252	HORI

14.5dBi Antenna Channel 5 Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1766	50.56	16.68	28.4	-5.4	74	23.4	249	329	HORI
2023	52.08	16.68	29.5	-5.9	74	21.9	249	310	HORI
2212.5	51.2	15.07	29.9	-6.2	74	22.8	249	278	VERT
2313.5	52.29	15.77	30.1	-6.4	74	21.7	249	222	HORI
2388.5	52.45	15.77	30.3	-6.4	74	21.6	201	359	HORI
2433	120.83	83.93	30.4	-6.5	120.83	0.0	150	125	VERT
2508	57.56	20.5	30.5	-6.5	74	16.4	149	77	VERT
2641.5	53.81	16.05	31	-6.8	74	20.2	150	318	HORI
2697	53.83	15.77	31.2	-6.9	74	20.2	381	345	HORI
2738	53.84	15.49	31.3	-7.1	74	20.2	249	286	HORI
2848.5	54.51	15.77	31.6	-7.1	74	19.5	191	45	HORI
2925.5	55.13	16.05	31.9	-7.2	74	18.9	371	231	HORI
2962.5	55.49	16.17	32	-7.3	74	18.5	156	138	HORI
2980	55.17	15.77	32	-7.4	74	18.8	150	11	VERT
2893.5	57.96	32.68	31.8	6.5	74	16.0	400	134	VERT
3060	43.33	31.74	32.3	20.7	74	30.7	100	32	VERT
4115.5	51.71	38.39	34.3	21	74	22.3	99	233	VERT
6362.5	47.92	29.82	36.8	18.7	74	26.1	201	359	VERT
7987	50.84	29.46	39.1	17.7	74	23.2	169	19	VERT
12477	55.53	30.22	41.3	16	74	18.5	381	238	HORI
13993	54.68	28.56	42.1	16	74	19.3	100	241	HORI
14579	56.38	29.34	42.9	15.9	74	17.6	399	272	HORI
14983	57.34	29.96	43	15.6	74	16.7	100	235	VERT
16191	56.55	31.28	40.5	15.3	74	17.5	178	254	VERT
17036.5	59.73	29.71	43.5	13.5	74	14.3	250	28	VERT
17413.5	60.81	28.69	45.1	12.9	74	13.2	150	228	HORI
17889.5	63.56	29.59	47.1	13.1	74	10.4	169	252	HORI

14.5dBi Antenna Channel 11 QuasiPeak Results 30M-1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
30.66	30.83	12.43	17.8	-0.6	40	9.2	99	72	VERT
33.42	27.99	11.19	16.2	-0.6	40	12	101	78	VERT
38.1	28.05	13.72	13.6	-0.7	40	11.9	101	75	VERT
41.52	26.37	13.57	12.1	-0.7	40	13.6	98	73	VERT
54.18	32.25	21.97	9.4	-0.9	40	7.7	100	0	VERT
55.98	32.47	22.6	9	-0.9	40	7.5	100	29	VERT
58.68	32.06	23.32	7.8	-0.9	40	7.9	262	50	VERT
199.98	33.68	21.28	10.6	-1.8	43.5	9.8	98	172	VERT
352.02	31.24	13.25	15.6	-2.4	46	14.8	117	92	VERT
396	35.46	16.12	16.8	-2.6	46	10.5	123	223	VERT
479.52	30.32	9.13	18.4	-2.8	46	15.7	99	130	VERT
499.98	29.13	7.73	18.5	-2.9	46	16.9	99	64	VERT
615.96	29.75	5.39	21.2	-3.2	46	16.3	98	211	VERT
627	30.38	6.34	20.8	-3.2	46	15.6	109	11	VERT
637.98	28.94	5.56	20.2	-3.2	46	17.1	178	113	VERT
703.98	30.75	5.41	21.9	-3.4	46	15.2	201	72	HORI
748.5	32.74	7.42	21.8	-3.5	46	13.3	102	225	VERT

14.5dBi Antenna Channel 11 Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1740	36.34	2.63	28.3	-5.4	53.9	17.6	399	224	HORI
1966	37.89	2.86	29.3	-5.8	53.9	16	201	242	HORI
2088	48.15	12.54	29.6	-6	53.9	5.8	150	189	VERT
2312	38.73	2.21	30.1	-6.4	53.9	15.2	99	0	HORI
2350	39.25	2.66	30.2	-6.4	53.9	14.6	269	27	HORI
2403	58.48	21.77	30.3	-6.4	96.73	38.25	150	92	VERT
2463	116.73	79.73	30.4	-6.6	116.73	0	150	117	VERT
2650.5	40.94	3.13	31	-6.8	53.9	13	99	298	HORI
2699.5	40.8	2.73	31.2	-6.9	53.9	13.1	214	201	HORI
2755	40.91	2.47	31.4	-7.1	53.9	13	107	201	HORI
2901.5	41.73	2.82	31.8	-7.1	53.9	12.2	291	157	HORI
2928	41.99	2.89	31.9	-7.2	53.9	11.9	400	65	HORI
2942	42.06	2.86	31.9	-7.3	53.9	11.8	301	135	HORI
4175.5	43.24	29.8	34.4	21	53.9	10.7	141	267	VERT
5934.5	32.73	12.3	36.7	16.2	53.9	21.2	350	263	HORI
6191.5	33.37	14.85	36.8	18.3	53.9	20.5	128	309	VERT
9070.5	39.44	15.93	40.4	16.9	53.9	14.5	371	117	HORI
12465	41.36	16.19	41.2	16.1	53.9	12.5	371	345	VERT
14511	43.17	16.25	42.9	16	53.9	10.7	301	280	HORI
14937	43.55	16.17	43	15.6	53.9	10.4	150	202	VERT
16119.5	43.19	18.11	40.3	15.3	53.9	10.7	256	0	VERT
16709.5	44.81	16.67	42.2	14.1	53.9	9.1	381	309	HORI
17118.5	46.71	15.6	43.9	12.8	53.9	7.2	169	70	VERT
17365	48.09	15.96	44.9	12.7	53.9	5.8	100	34	VERT
17861.5	49.71	15.8	47	13.1	53.9	4.2	350	37	VERT

14.5dBi Antenna Channel 11 Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1740	49.35	15.63	28.3	-5.4	74	24.7	399	224	HORI
1966	51.33	16.3	29.3	-5.8	74	22.7	201	242	HORI
2088	55.2	19.58	29.6	-6	74	18.8	150	189	VERT
2312	51.87	15.35	30.1	-6.4	74	22.1	99	0	HORI
2350	52.51	15.91	30.2	-6.4	74	21.5	269	27	HORI
2403	65.07	28.35	30.3	-6.4	101.07	36.0	150	92	VERT
2463	121.07	84.07	30.4	-6.6	121.07	0.0	150	117	VERT
2650.5	54.11	16.3	31	-6.8	74	19.9	99	298	HORI
2699.5	54.5	16.42	31.2	-6.9	74	19.5	214	201	HORI
2755	54.49	16.05	31.4	-7.1	74	19.5	107	201	HORI
2901.5	54.82	15.91	31.8	-7.1	74	19.2	291	157	HORI
2928	55.52	16.42	31.9	-7.2	74	18.5	400	65	HORI
2942	54.97	15.77	31.9	-7.3	74	19.0	301	135	HORI
4175.5	49.2	35.75	34.4	21	74	24.8	141	267	VERT
5934.5	47	26.56	36.7	16.2	74	27.0	350	263	HORI
6191.5	46.48	27.97	36.8	18.3	74	27.5	128	309	VERT
9070.5	52.97	29.46	40.4	16.9	74	21.0	371	117	HORI
12465	55.26	30.09	41.2	16.1	74	18.7	371	345	VERT
14511	56.51	29.59	42.9	16	74	17.5	301	280	HORI
14937	57.21	29.84	43	15.6	74	16.8	150	202	VERT
16119.5	56.36	31.28	40.3	15.3	74	17.6	256	0	VERT
16709.5	58.49	30.36	42.2	14.1	74	15.5	381	309	HORI
17118.5	60.19	29.08	43.9	12.8	74	13.8	169	70	VERT
17365	61.71	29.59	44.9	12.7	74	12.3	100	34	VERT
17861.5	63.5	29.59	47	13.1	74	10.5	350	37	VERT

9.5dBi Antenna Channel 1 QuasiPeak Results 30MHz - 1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
30.24	29.41	10.76	18.1	-0.6	40	10.6	101	97	VERT
32.04	30.33	12.74	17	-0.6	40	9.7	100	356	VERT
36.12	29.12	13.77	14.7	-0.7	40	10.9	98	143	VERT
38.1	28.91	14.58	13.6	-0.7	40	11.1	101	359	VERT
49.98	24.58	14.37	9.3	-0.9	40	15.4	99	59	VERT
54.12	25.26	14.98	9.4	-0.9	40	14.7	101	61	VERT
75	23.5	15.65	6.8	-1.1	40	16.5	98	250	VERT
351.96	29.82	11.84	15.6	-2.4	46	16.2	132	74	VERT
396	28.88	9.54	16.8	-2.6	46	17.1	149	205	VERT
615.96	31.62	7.26	21.2	-3.2	46	14.4	217	0	VERT
681.96	34.66	9.52	21.8	-3.3	46	11.3	259	28	VERT

9.5dBi Antenna Channel 1 Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1125	32.57	1.83	26.5	-4.3	53.9	21.3	201	359	VERT
1665	37.42	4.12	28	-5.3	53.9	16.5	150	205	VERT
2055.5	38.28	2.75	29.5	-6	53.9	15.6	358	99	VERT
2324.5	44.82	8.28	30.1	-6.4	53.9	9.1	100	98	VERT
2369	43.79	7.16	30.2	-6.4	53.9	10.1	106	162	VERT
2413	109.81	73.03	30.3	-6.5	109.81	0	129	123	VERT
2427	66.37	29.51	30.4	-6.5	89.81	23.44	128	171	VERT
2453	56.08	19.08	30.4	-6.6	89.81	33.73	128	239	VERT
2786	48.83	10.35	31.5	-7	53.9	5.1	150	122	VERT
2983	42.3	2.88	32.1	-7.4	53.9	11.6	337	56	VERT
4075.5	43.01	30.72	34.2	22	53.9	10.9	128	254	VERT
5992	38.5	12.59	36.7	17.2	53.9	15.4	371	155	VERT
10582	39.68	16.07	40.6	17	53.9	14.2	150	178	VERT
11711	39.78	16.47	40.6	17.2	53.9	14.1	350	330	VERT
12466	40.58	16.13	41.2	16.8	53.9	13.3	106	173	VERT
14665	41.91	16.24	42.9	17.3	53.9	12	370	358	HORI
14948.5	42.41	16.23	43	16.8	53.9	11.5	141	87	HORI
16133	41.87	18.22	40.4	16.7	53.9	12	169	322	VERT
16445.5	42.19	17.64	41.2	16.7	53.9	11.7	227	226	HORI
16694	43.06	16.66	42.2	15.8	53.9	10.8	141	345	VERT
17322.5	46.17	15.8	44.7	14.3	53.9	7.7	371	7	VERT
17775	47.58	15.01	46.6	14.1	53.9	6.3	399	88	HORI
17901.5	49.13	16.03	47.2	14.1	53.9	4.8	278	209	VERT

9.5dBi Antenna Channel 1 Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1125	45.54	14.8	26.5	-4.3	74	28.5	201	359	VERT
1665	51.05	17.76	28	-5.3	74	23.0	150	205	VERT
2055.5	51.03	15.49	29.5	-6	74	23.0	358	99	VERT
2324.5	58.69	22.15	30.1	-6.4	74	15.3	100	98	VERT
2369	57.4	20.76	30.2	-6.4	74	16.6	106	162	VERT
2413	117.54	80.76	30.3	-6.5	117.54	0.0	129	123	VERT
2427	76.24	39.38	30.4	-6.5	97.54	21.3	128	171	VERT
2453	63.17	26.17	30.4	-6.6	97.54	34.4	128	239	VERT
2786	59.63	21.15	31.5	-7	74	14.4	150	122	VERT
2983	55.72	16.3	32.1	-7.4	74	18.3	337	56	VERT
4075.5	48.18	35.88	34.2	22	74	25.8	128	254	VERT
5992	46.3	26.82	36.7	17.2	74	27.7	371	155	VERT
10582	53.19	29.59	40.6	17	74	20.8	150	178	VERT
11711	53.8	30.49	40.6	17.2	74	20.2	350	330	VERT
12466	54.03	29.59	41.2	16.8	74	20.0	106	173	VERT
14665	56.02	30.36	42.9	17.3	74	18.0	370	358	HORI
14948.5	55.76	29.59	43	16.8	74	18.2	141	87	HORI
16133	55.19	31.54	40.4	16.7	74	18.8	169	322	VERT
16445.5	55.83	31.28	41.2	16.7	74	18.2	227	226	HORI
16694	57.15	30.75	42.2	15.8	74	16.9	141	345	VERT
17322.5	59.7	29.34	44.7	14.3	74	14.3	371	7	VERT
17775	60.87	28.3	46.6	14.1	74	13.1	399	88	HORI
17901.5	62.82	29.71	47.2	14.1	74	11.2	278	209	VERT

9.5dBi Antenna Channel 5 QuasiPeak Results 30MHz - 1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
30.24	29.25	10.6	18.1	-0.6	40	10.7	115	101	VERT
31.62	28.2	10.37	17.2	-0.6	40	11.8	139	66	VERT
34.08	29.62	13.17	15.8	-0.6	40	10.4	98	113	VERT
38.1	29.04	14.71	13.6	-0.7	40	11	100	108	VERT
41.1	26.21	13.24	12.2	-0.7	40	13.8	104	109	VERT
49.98	25.73	15.53	9.3	-0.9	40	14.3	101	88	VERT
53.94	25.15	14.87	9.4	-0.9	40	14.9	102	89	VERT
75	23.86	16.01	6.8	-1.1	40	16.1	99	281	VERT
249.96	21.02	6.32	12.7	-2	46	25	99	351	VERT
351.96	30.12	12.14	15.6	-2.4	46	15.9	135	74	VERT
396	32.28	12.94	16.8	-2.6	46	13.7	138	195	VERT
478.8	27.97	6.8	18.4	-2.8	46	18	100	55	VERT
681.96	31.5	6.37	21.8	-3.3	46	14.5	240	29	VERT
754.92	24.14	-1.16	21.8	-3.5	46	21.9	249	21	HORI

9.5dBi Antenna Channel 5 Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1682.5	38.85	5.48	28.1	-5.3	53.9	15	149	197	VERT
2320	44.13	7.6	30.1	-6.4	53.9	9.8	106	83	VERT
2329	43.65	7.1	30.2	-6.4	53.9	10.3	100	6	VERT
2334.5	44.23	7.67	30.2	-6.4	53.9	9.7	106	74	VERT
2372.5	44.76	8.12	30.2	-6.4	53.9	9.1	115	105	VERT
2375	44.08	7.44	30.2	-6.4	53.9	9.8	115	296	VERT
2430.5	112.29	75.41	30.4	-6.5	113.19	0.9	128	108	VERT
2433	113.19	76.29	30.4	-6.5	113.19	0	128	111	VERT
2446.5	75.1	38.12	30.4	-6.6	93.19	18.09	119	107	VERT
2454	49.77	12.77	30.4	-6.6	53.9	4.1	128	127	VERT
2493	45.82	8.82	30.5	-6.5	53.9	8.1	128	115	VERT
2554.5	43.2	5.81	30.7	-6.7	53.9	10.7	128	143	VERT
2563	42.55	5.13	30.7	-6.7	53.9	11.3	141	181	VERT
2806	49.09	10.56	31.5	-7	53.9	4.8	128	127	VERT
2905	41.85	2.92	31.8	-7.1	53.9	12	141	175	HORI
2961.5	42.05	2.74	32	-7.3	53.9	11.8	400	101	VERT
2986.5	55.48	16.05	32.1	-7.4	53.9	-1.6	250	322	VERT
4115.5	44.7	32.34	34.3	22	53.9	9.2	119	318	VERT
10585	39.75	16.11	40.6	17	53.9	14.1	357	350	HORI
14729.5	41.92	16.27	42.9	17.3	53.9	12	119	73	HORI
14963.5	42.39	16.22	43	16.8	53.9	11.5	349	135	HORI
16115.5	41.75	18.16	40.3	16.7	53.9	12.1	399	214	VERT
16689.5	43.01	16.63	42.2	15.8	53.9	10.9	350	359	HORI
17074	44.45	15.92	43.7	15.2	53.9	9.5	314	141	VERT
17336	46.23	15.83	44.8	14.3	53.9	7.7	265	343	VERT
17721	48.02	15.94	46.4	14.3	53.9	5.9	399	291	HORI
17993	48.98	15.24	47.6	13.8	53.9	4.9	349	6	HORI

9.5dBi Antenna Channel 5 Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1682.5	51.13	17.76	28.1	-5.3	74	22.9	149	197	VERT
2320	57.29	20.76	30.1	-6.4	74	16.7	106	83	VERT
2329	56.92	20.37	30.2	-6.4	74	17.1	100	6	VERT
2334.5	57.71	21.15	30.2	-6.4	74	16.3	106	74	VERT
2372.5	58.29	21.65	30.2	-6.4	74	15.7	115	105	VERT
2375	58.05	21.4	30.2	-6.4	74	16.0	115	296	VERT
2430.5	116.64	79.75	30.4	-6.5	117.47	0.8	128	108	VERT
2433	117.47	80.57	30.4	-6.5	117.47	0.0	128	111	VERT
2446.5	79.64	42.66	30.4	-6.6	97.47	17.8	119	107	VERT
2454	61.38	24.38	30.4	-6.6	74	12.6	128	127	VERT
2493	59.15	22.15	30.5	-6.5	74	14.9	128	115	VERT
2554.5	56.58	19.19	30.7	-6.7	74	17.4	128	143	VERT
2563	56.04	18.62	30.7	-6.7	74	18.0	141	181	VERT
2806	59.03	20.5	31.5	-7	74	15.0	128	127	VERT
2905	55.24	16.3	31.8	-7.1	74	18.8	141	175	HORI
2961.5	55.22	15.91	32	-7.3	74	18.8	400	101	VERT
2986.5	55.86	16.42	32.1	-7.4	74	18.1	250	322	VERT
4115.5	49.53	37.18	34.3	22	74	24.5	119	318	VERT
10585	53.23	29.59	40.6	17	74	20.8	357	350	HORI
14729.5	55.61	29.96	42.9	17.3	74	18.4	119	73	HORI
14963.5	55.64	29.46	43	16.8	74	18.4	349	135	HORI
16115.5	55.13	31.54	40.3	16.7	74	18.9	399	214	VERT
16689.5	56.73	30.36	42.2	15.8	74	17.3	350	359	HORI
17074	57.86	29.34	43.7	15.2	74	16.1	314	141	VERT
17336	59.61	29.21	44.8	14.3	74	14.4	265	343	VERT
17721	61.67	29.59	46.4	14.3	74	12.3	399	291	HORI
17993	62.43	28.69	47.6	13.8	74	11.6	349	6	HORI

9.5dBi Antenna Channel 11 QuasiPeak Results 30MHz - 1GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
30.66	28.72	10.32	17.8	-0.6	40	11.3	145	40	VERT
31.5	29.66	11.76	17.3	-0.6	40	10.3	101	0	VERT
33.48	28.39	11.62	16.1	-0.6	40	11.6	113	67	VERT
37.92	27.83	13.41	13.7	-0.7	40	12.2	99	132	VERT
50.04	24.68	14.48	9.3	-0.9	40	15.3	105	99	VERT
54.18	26.42	16.13	9.4	-0.9	40	13.6	102	75	VERT
351.96	27.73	9.75	15.6	-2.4	46	18.3	159	291	VERT
396	31.75	12.41	16.8	-2.6	46	14.3	134	253	VERT
479.64	30.79	9.6	18.4	-2.8	46	15.2	100	51	VERT
499.98	34.99	13.59	18.5	-2.9	46	11	100	220	VERT
571.98	32.32	9.76	19.5	-3.1	46	13.7	99	267	VERT
616.02	30.51	6.14	21.2	-3.2	46	15.5	250	0	VERT
703.98	32.42	7.08	21.9	-3.4	46	13.6	101	209	HORI
748.5	32.54	7.22	21.8	-3.5	46	13.5	249	173	VERT
878.04	32.12	4.06	24.2	-3.9	46	13.9	249	297	VERT

9.5dBi Antenna Channel 11 Average Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1254.5	32.52	1.26	26.8	-4.5	53.9	21.4	394	215	HORI
2010.5	38.75	3.4	29.4	-5.9	53.9	15.1	99	347	HORI
2316.5	42.32	5.79	30.1	-6.4	53.9	11.6	99	169	VERT
2326.5	44.43	7.89	30.1	-6.4	53.9	9.5	106	54	VERT
2335	43.93	7.37	30.2	-6.4	53.9	10	100	72	VERT
2368.5	44.4	7.77	30.2	-6.4	53.9	9.5	106	105	VERT
2374	43.91	7.27	30.2	-6.4	53.9	10	100	164	VERT
2403	55.88	19.16	30.3	-6.4	91.9	36.02	119	108	VERT
2444	68.01	31.05	30.4	-6.6	91.9	23.89	128	111	VERT
2456	101.68	64.68	30.4	-6.6	111.9	10.22	120	152	VERT
2463	111.9	74.9	30.4	-6.6	111.9	0	129	39	VERT
2470	98.51	61.51	30.4	-6.6	111.9	13.39	129	120	VERT
2482	52.18	15.18	30.5	-6.5	91.9	39.72	119	141	VERT
2520.5	46.28	9.12	30.6	-6.6	53.9	7.6	141	197	VERT
2635	40.91	3.17	31	-6.8	53.9	13	130	50	HORI
2654.5	41.1	3.26	31	-6.8	53.9	12.8	301	67	HORI
2815.5	41.61	3.04	31.5	-7	53.9	12.3	149	0	VERT
2881.5	41.67	2.82	31.7	-7.1	53.9	12.2	119	319	VERT
2933	42.2	3.06	31.9	-7.2	53.9	11.7	278	130	VERT
2994	42.2	2.73	32.1	-7.4	53.9	11.7	269	229	HORI
4175.5	47.43	34.94	34.4	21.9	53.9	6.5	119	193	VERT
6195	32.08	14.36	36.8	19.1	53.9	21.8	399	9	HORI
9086.5	38.4	16.03	40.4	18.1	53.9	15.5	115	204	HORI
9886	38.62	16.02	40.7	18.1	53.9	15.3	150	192	HORI
13680	40.3	15.8	42.2	17.7	53.9	13.6	400	7	VERT
14537.5	42	16.43	42.9	17.3	53.9	11.9	400	350	HORI
14950.5	42.52	16.34	43	16.8	53.9	11.4	191	134	VERT
16215	41.67	17.83	40.6	16.8	53.9	12.2	214	252	HORI
16469.5	42.29	17.51	41.3	16.5	53.9	11.6	100	122	VERT
17146	44.68	15.55	44	14.9	53.9	9.2	350	179	VERT
17375.5	46.55	16.03	44.9	14.4	53.9	7.3	327	172	HORI
17846	48.59	15.66	46.9	14	53.9	5.3	399	209	HORI
17989	49.03	15.32	47.6	13.8	53.9	4.9	269	226	VERT

9.5dBi Antenna Channel 11 Peak Results 1GHz - 18GHz

Frequency	Level	Measured	Transd	Cables	Limit	Margin	Height	Angle	Pol.
MHz	dB μ V/m	dB μ V	dB	dB	dB μ V/m	dB	cm	deg	
1254.5	45.67	14.4	26.8	-4.5	74	28.3	394	215	HORI
2010.5	52.28	16.93	29.4	-5.9	74	21.7	99	347	HORI
2316.5	55.44	18.91	30.1	-6.4	74	18.6	99	169	VERT
2326.5	57.82	21.27	30.1	-6.4	74	16.2	106	54	VERT
2335	57.59	21.02	30.2	-6.4	74	16.4	100	72	VERT
2368.5	57.53	20.89	30.2	-6.4	74	16.5	106	105	VERT
2374	57.02	20.37	30.2	-6.4	74	17.0	100	164	VERT
2403	63.02	26.3	30.3	-6.4	96.26	33.2	119	83	VERT
2444	74.14	37.18	30.4	-6.6	96.26	22.1	128	111	VERT
2456	106.51	69.51	30.4	-6.6	116.26	9.8	120	152	VERT
2463	116.26	79.26	30.4	-6.6	116.26	0.0	129	39	VERT
2470	101.61	64.61	30.4	-6.6	116.26	14.7	129	120	VERT
2482	63.3	26.3	30.5	-6.5	116.26	53.0	119	141	VERT
2520.5	58.43	21.27	30.6	-6.6	74	15.6	141	197	VERT
2635	54.54	16.81	31	-6.8	74	19.5	130	50	HORI
2654.5	54.9	17.06	31	-6.8	74	19.1	301	67	HORI
2815.5	55.25	16.68	31.5	-7	74	18.8	149	0	VERT
2881.5	54.89	16.05	31.7	-7.1	74	19.1	119	319	VERT
2933	55.43	16.3	31.9	-7.2	74	18.6	278	130	VERT
2994	55.52	16.05	32.1	-7.4	74	18.5	269	229	HORI
4175.5	51.26	38.76	34.4	21.9	74	22.7	119	193	VERT
6195	46.33	28.61	36.8	19.1	74	27.7	399	9	HORI
9086.5	52.72	30.36	40.4	18.1	74	21.3	115	204	HORI
9886	52.07	29.46	40.7	18.1	74	21.9	150	192	HORI
13680	53.58	29.08	42.2	17.7	74	20.4	400	7	VERT
14537.5	55.15	29.59	42.9	17.3	74	18.9	400	350	HORI
14950.5	56.01	29.84	43	16.8	74	18.0	191	134	VERT
16215	54.99	31.15	40.6	16.8	74	19.0	214	252	HORI
16469.5	56.05	31.28	41.3	16.5	74	18.0	100	122	VERT
17146	57.83	28.69	44	14.9	74	16.2	350	179	VERT
17375.5	59.98	29.46	44.9	14.4	74	14.0	327	172	HORI
17846	62.01	29.08	46.9	14	74	12.0	399	209	HORI
17989	62.41	28.69	47.6	13.8	74	11.6	269	226	VERT

Appendix E: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF - (-CF + AG) + AV$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dB μ V is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dB μ V/m.

$$FS = 55 + 12 - (-1.1 + 20) + 0 = 48.1 \text{ dB}\mu\text{V/m}$$

The 48.1 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(48.1 \text{ dB}\mu\text{V/m})/20] = 254.1 \mu\text{V/m}$$

Appendix F: Bandedge and Conducted Power Measurements

This appendix contains information about the signal of interest in relation to the restricted bands of 2.31GHz to 2.39GHz and 2.4835GHz to 2.5GHz. The following tables show the calculated restricted band values based on the measured values from the antennas that were tested with the Times Microwave LMR-400 coax cable.

14.5dBi panel w/15ft LMR-400 cable

Restricted Band Calculated Values (dBuV/m)		
Channel	Peak	Average
1	63.14	55.70
11	56.46	45.08

9.5dBi omni w/3ft LMR-400 cable

Restricted Band Calculated Values (dBuV/m)		
Channel	Peak	Average
1	57.72	51.01
11	51.83	41.04

It is shown in the calculation above that the bandedge average measurement for channel 1 with the 14.5dBi antenna is in excess of the 54dB μ V/m limit. The figures in this appendix show that the product does comply with the bandedge requirements. As can be seen in Figure 30, the spurious emission at 2.37GHz is not detectable with 100kHz RBW and is more than 40dB below the fundamental signal. Figure 31 shows that a 10kHz RBW is required to clearly see the 2.37GHz signal above the noise floor. Figure 32 is measured with a 1kHz RBW at 45.49dBuV/m, which is more than 8dB below the limit.

The following tables show the calculated restricted band measurements of the antenna and coax cable combinations listed in Appendix G. The 15 foot length of LMR-400 has a loss of 1.2dB from 2.3GHz – 2.5GHz. The 3 foot length of LMR-400 has a loss of 0.4dB from 2.3GHz – 2.5GHz. These values are calculated by taking the corresponding value from the tested antenna then subtracting the differences in the gain and adding in the difference between the coax cable used.

For example:

14.5dBi panel Channel 1 Peak value = 63.14dBuV/m

Difference in gain to 12dBi panel = 2.5dB

Difference in coax cable losses = 0.8dB

12dBi panel Channel 1 Peak value is $63.14\text{dBuV/m} - 2.5\text{dB} + 0.8\text{dB} = 61.44\text{dBuV/m}$

14dBi panel w/15ft LMR-400 cable

Restricted Band Calculated Values (dBuV/m)		
Channel	Peak	Average
1	62.64	55.20
11	55.96	44.58

12dBi panel w/3ft LMR-400 cable

Restricted Band Calculated Values (dBuV/m)		
Channel	Peak	Average
1	61.44	54.00
11	54.76	43.38

7.5dBi omni w/3ft LMR-400 cable

Restricted Band Calculated Values (dBuV/m)		
Channel	Peak	Average
1	55.72	49.01
11	49.83	39.04

The following tables show where the above numbers were generated from based on the measured radiated and conducted values from the EUT. Calculated values are denoted by an ‘*’. The figures referenced in the table below denote the plot from which the measured value is taken.

The tables below show the detailed restricted band calculations for the 14.5dBi panel and 9.5dBi omni antennas.

14.5dBi Panel

Radiated		Radiated				
Channel	Peak (dBuV/m)	Fig.	Average (dBuV/m)	Fig.		
1	120.61	28	115.64	29		
11	122.11	35	116.76	36		
Conducted Peak						
Channel	100kHz RBW (dBm)	Fig.	RestBand (dBm)	Fig.	Freq (Ghz)	1MHz RBW(dBm)
1	6.19	41	-51.28	41	2.3706	0
11	6.61	43	-53.63	43	2.4837	12.02
Conducted Average						
Channel	100kHz RBW (dBm)	Fig.	RestBand (dBm)	Fig.	Freq (Ghz)	1MHz RBW (dBm)
1	-2.98	42	-62.92	42	2.3706	0
11	-2.08	44	-64.4	44	2.4837	7.28
Delta dB*						
Channel	Peak (dB)	Average (dB)				
1	57.47	59.94				
11	60.24	62.32				
Mhz from BandEdge						
Channel	Peak (Mhz)	Average (Mhz)				
1	19.40	19.40				
11	0.20	0.20				
BW Delta dB (1MHz vs 100kHz)*						
Channel	Peak (dB)	Average (dB)				
1	0.00	0.00				
11	5.41	9.36				
Restricted Band Calculated Values (dBuV/m)*						
Channel	Peak	Average				
1	63.14	55.70				
11	56.46	45.08				

Restricted Bands		
	Freq (Ghz)	
	Minimum	Maximum
Lower	2.3100	2.3900
Upper	2.4835	2.5000

Limits (dBuV/m)	
Average	54
Peak	74

9.5dBi Omni

Radiated		Radiated				
Channel	Peak (dBuV/m)	Fig.	Average (dBuV/m)	Fig.		
1	115.19	37	110.95	38		
11	117.48	39	112.72	40		
Conducted Peak						
Channel	100kHz RBW (dBm)	Fig.	RestBand (dBm)	Fig.	Freq (Ghz)	1MHz RBW(dBm)
1	6.19	41	-51.28	41	2.3706	0
11	6.61	43	-53.63	43	2.4837	12.02
Conducted Average						
Channel	100kHz RBW (dBm)	Fig.	RestBand (dBm)	Fig.	Freq (Ghz)	1MHz RBW (dBm)
1	-2.98	42	-62.92	42	2.3706	0
11	-2.08	44	-64.4	44	2.4837	7.28
Delta dB*						
Channel	Peak (dB)	Average (dB)				
1	57.47	59.94				
11	60.24	62.32				
Mhz from BandEdge						
Channel	Peak (Mhz)	Average (Mhz)				
1	19.40	19.40				
11	0.20	0.20				
BW Delta dB (1MHz vs 100kHz)*						
Channel	Peak (dB)	Average (dB)				
1	0.00	0.00				
11	5.41	9.36				
Restricted Band Calculated Values (dBuV/m)*						
Channel	Peak	Average				
1	57.72	51.01				
11	51.83	41.04				

Restricted Bands		
	Freq (Ghz)	
	Minimum	Maximum
Lower	2.3100	2.3900
Upper	2.4835	2.5000

Limits (dBuV/m)	
Average	54
Peak	74

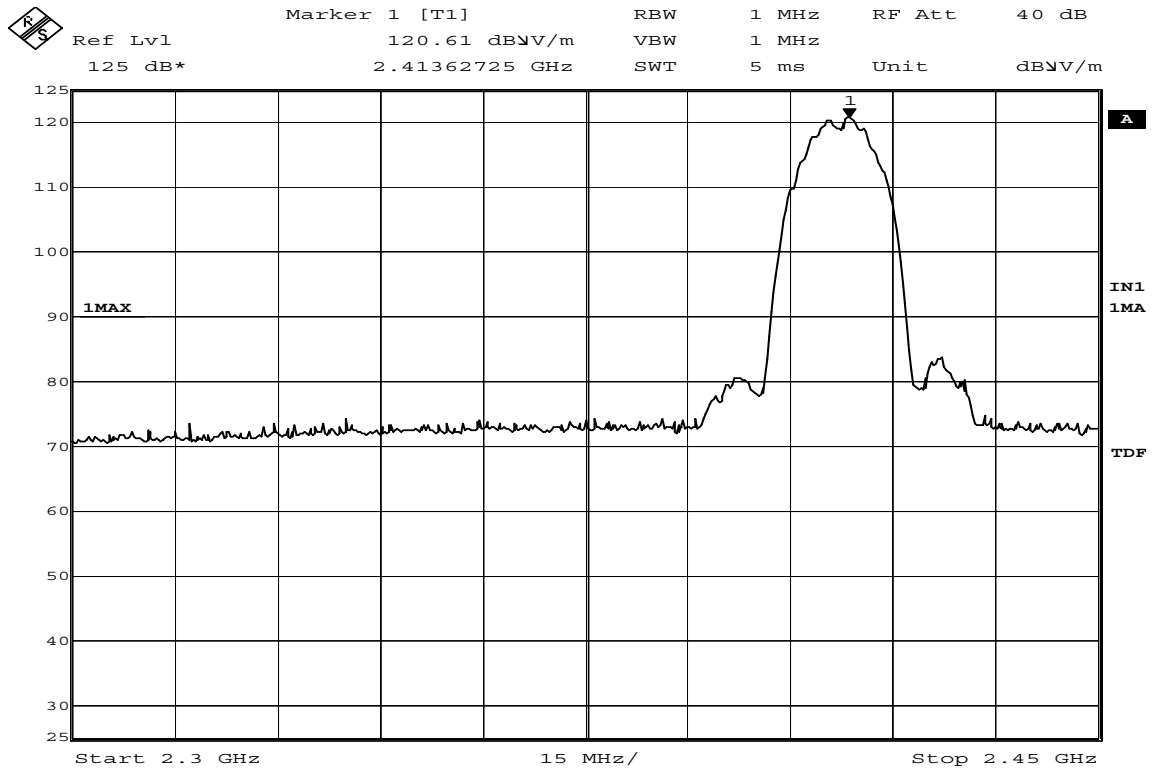


Figure 28 14.5dBi Panel Radiated Peak Plot Channel 1

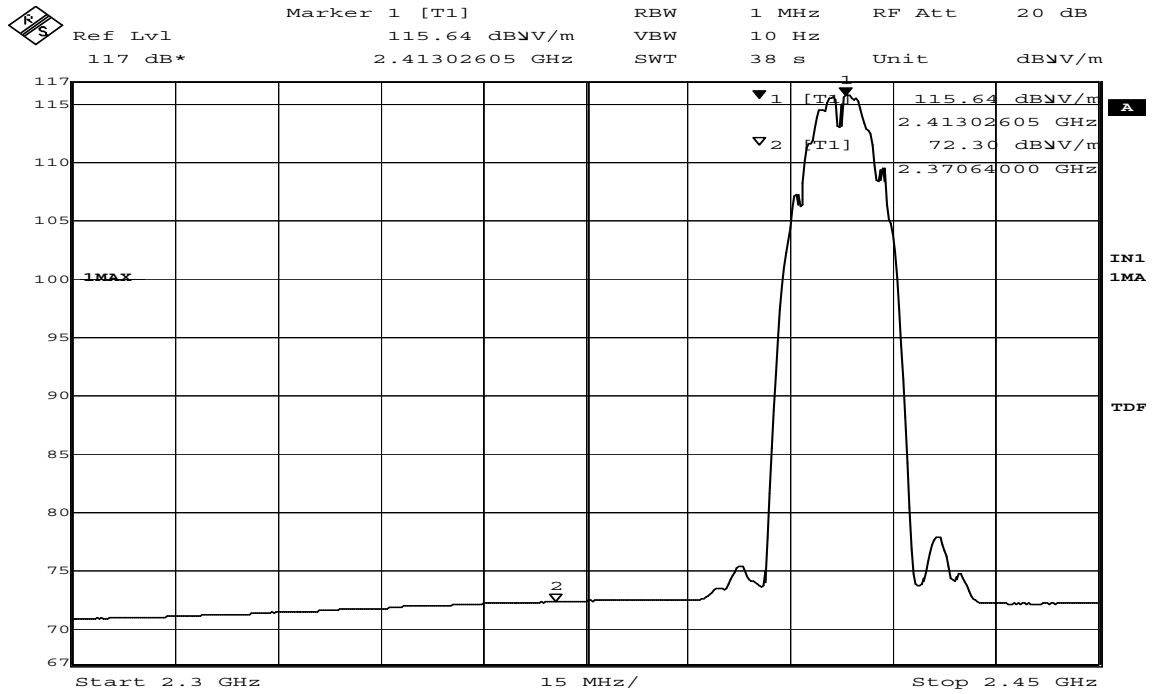
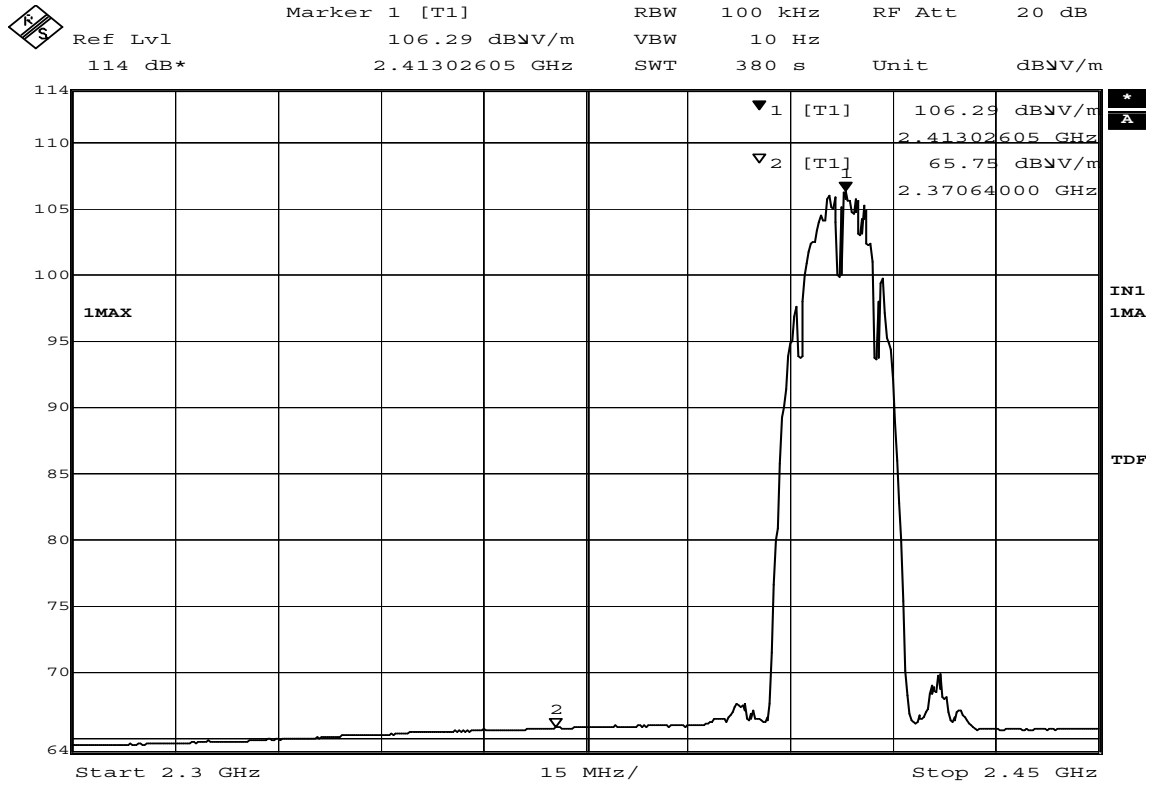
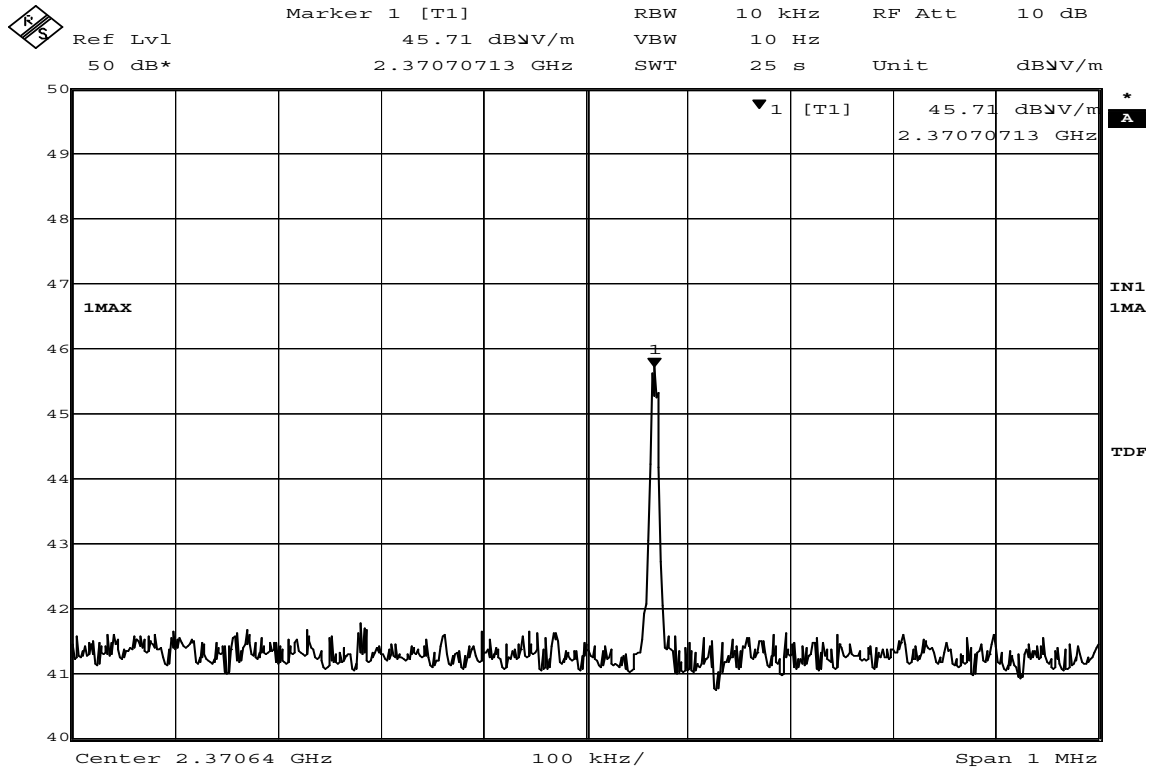


Figure 29 14.5dBi Radiated Average Plot Channel 1



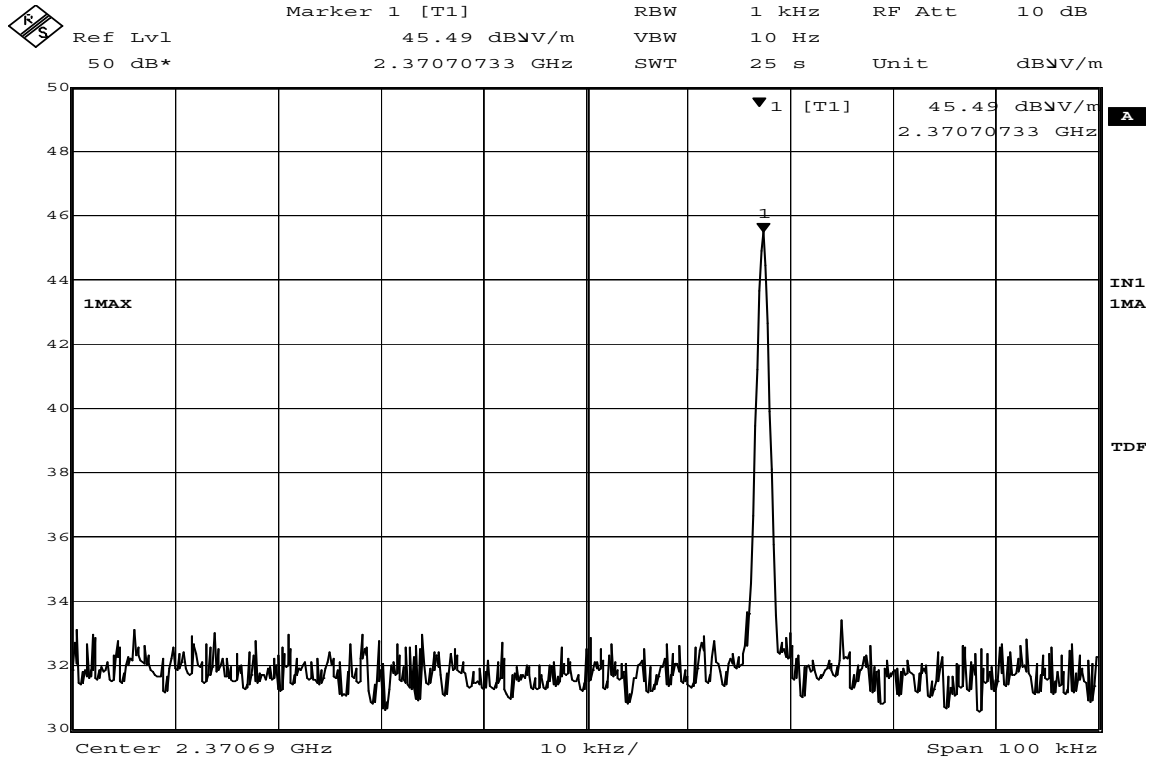
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Figure 30 14.5dBi Panel Radiated Average Plot Channel 1 RBW=100kHz



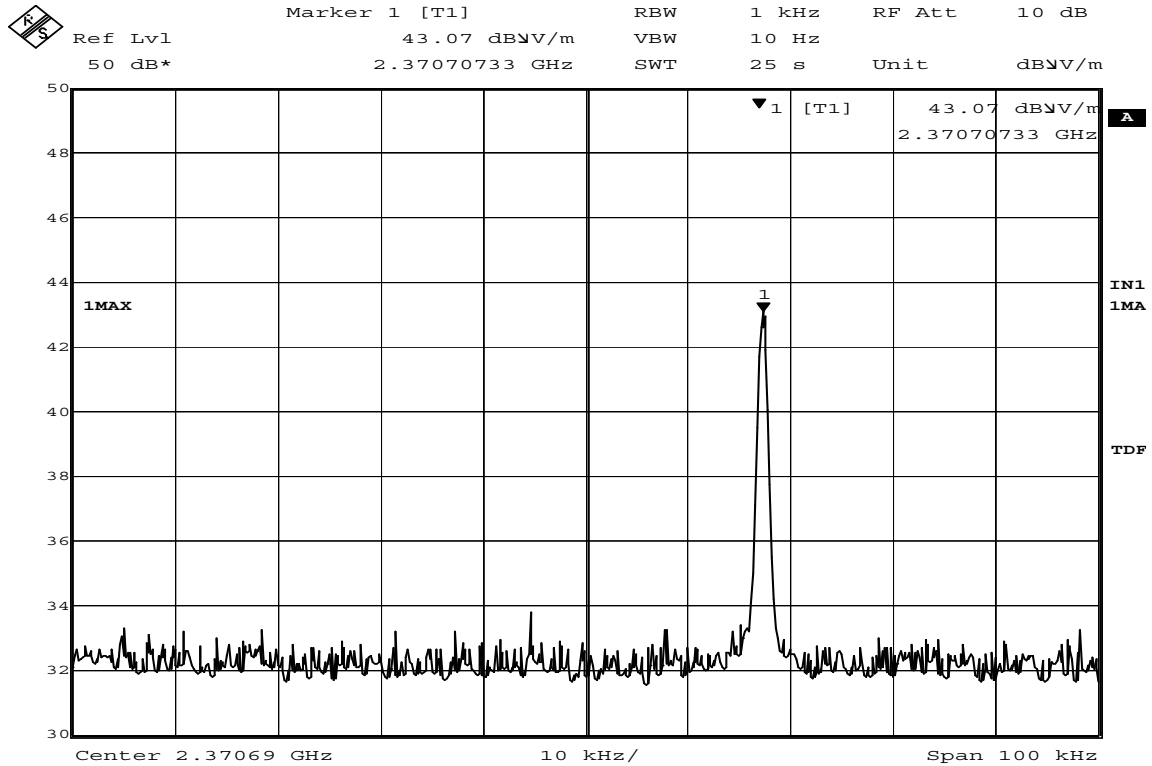
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Figure 31 14.5dBi Panel Radiated Average Plot Channel 1 RBW=10kHz



Date: 12.MAR.2004 11:21:48

Figure 32 14.5dBi Panel Radiated Average Plot Channel 1 RBW=1kHz



Date: 12.MAR.2004 11:20:01

Figure 33 14.5dBi Panel Radiated Average Plot Channel 1 RBW=1kHz, 3dB Attenuation

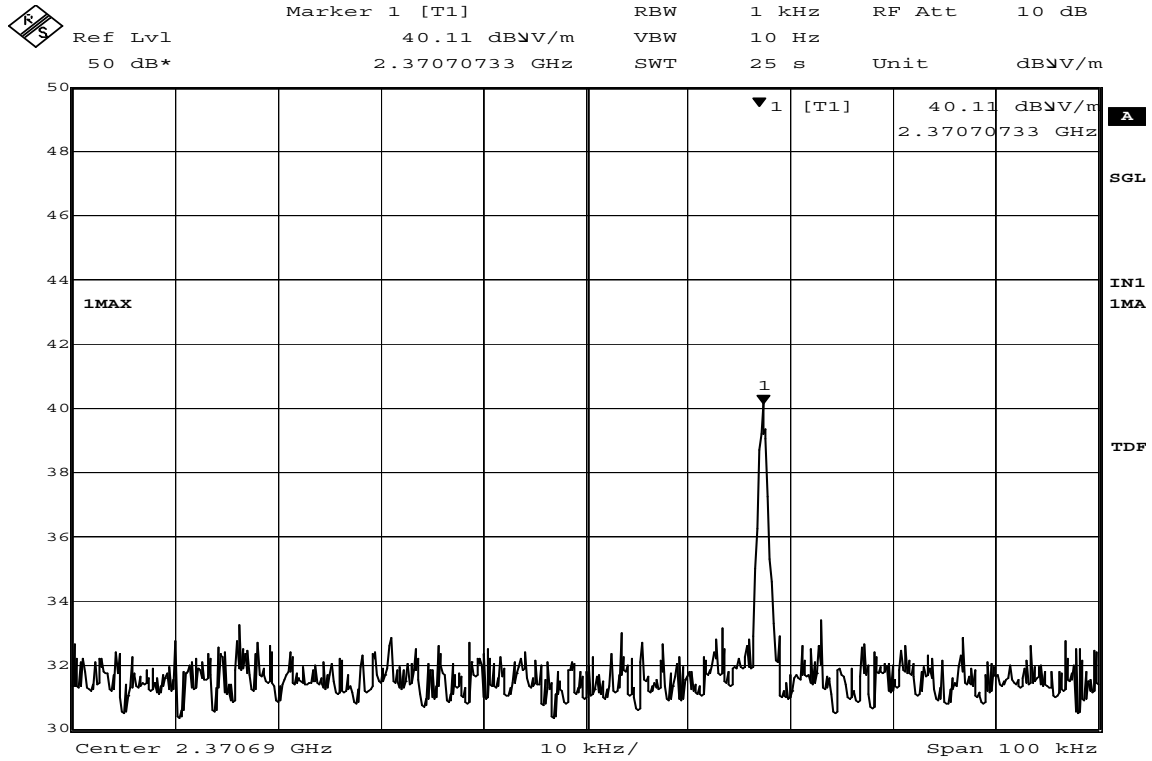


Figure 34 14.5dBi Panel Radiated Average Plot Channel 1 RBW=1kHz, 6dB Attenuation

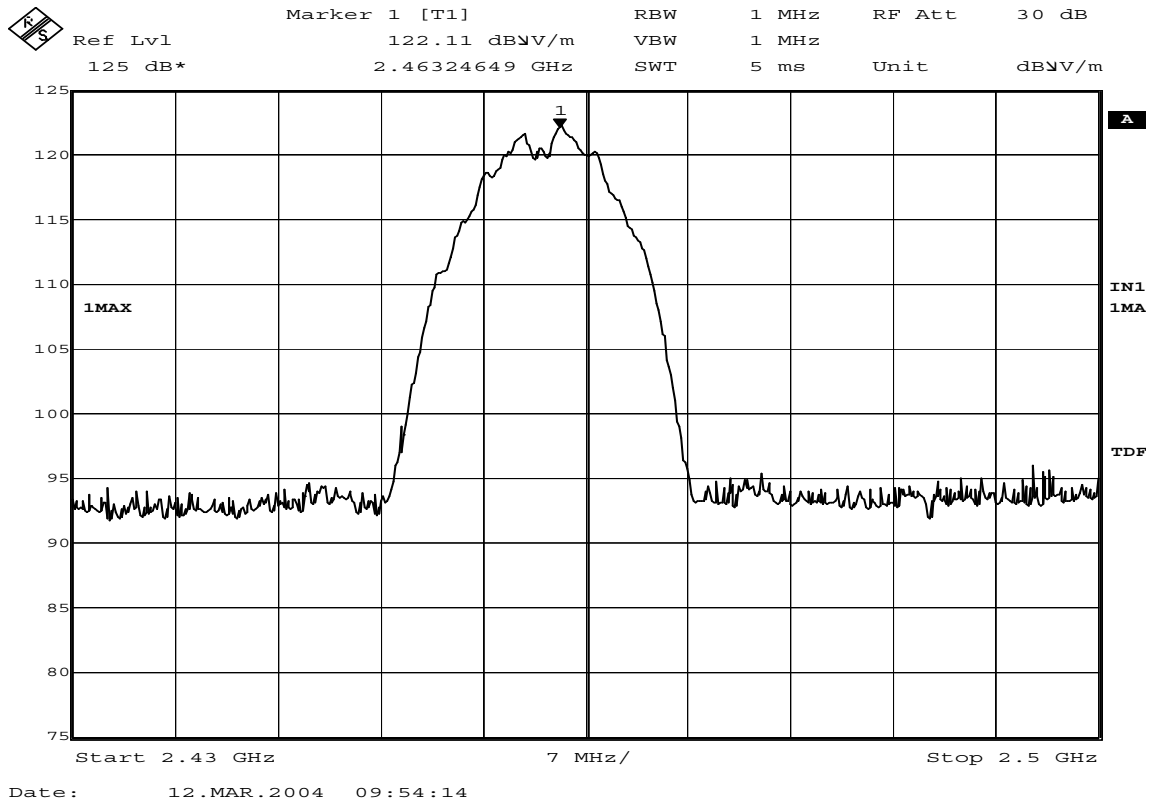


Figure 35 14.5dBi Panel Radiated Peak Plot Channel 11

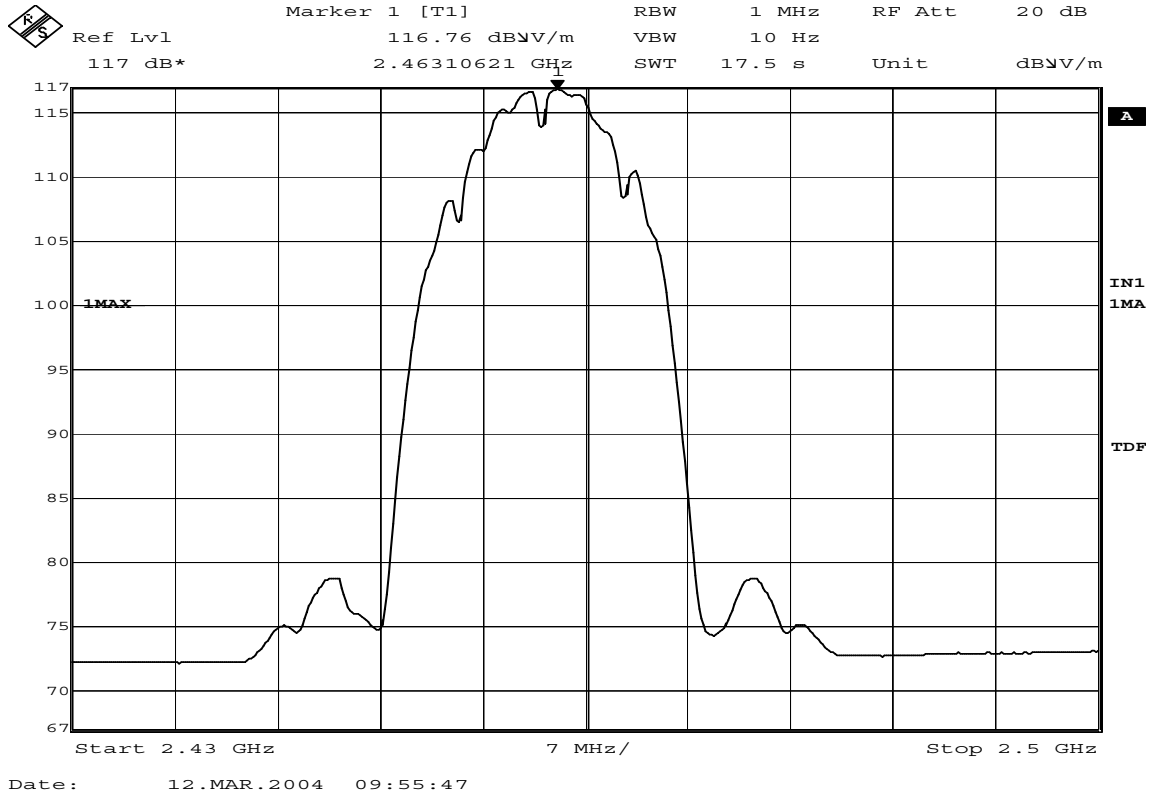


Figure 36 14.5dBi Radiated Average Plot Channel 11

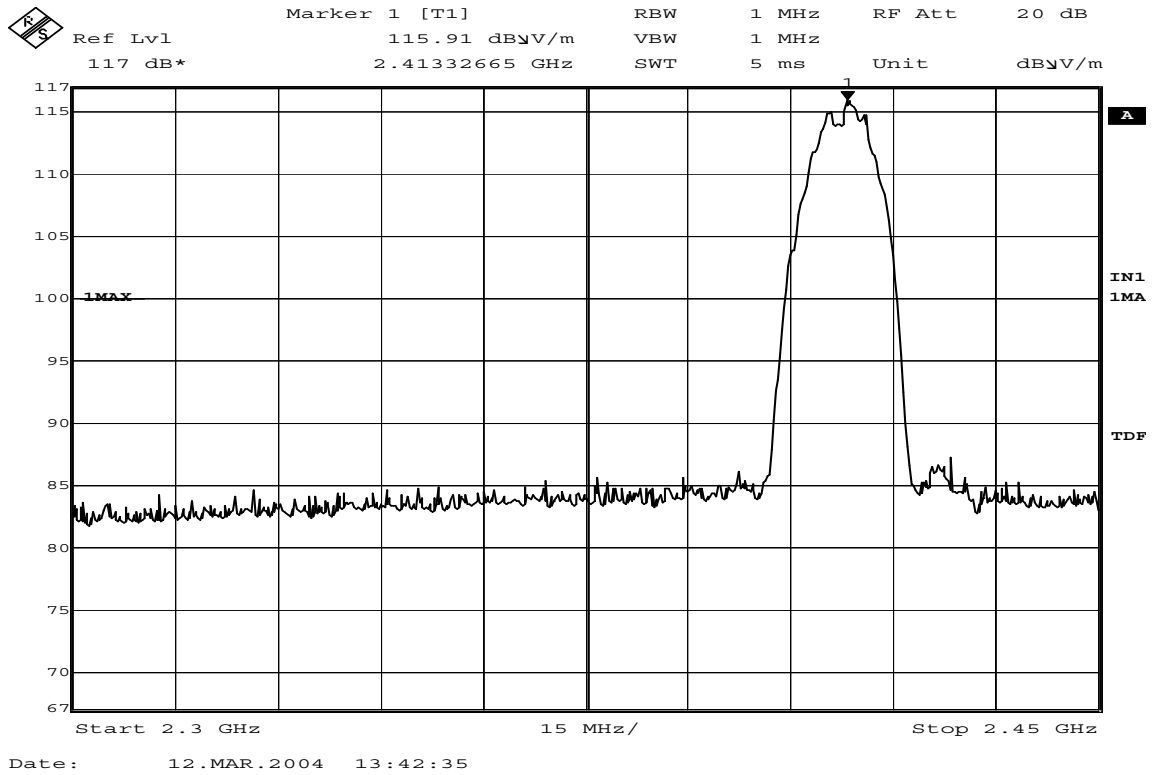
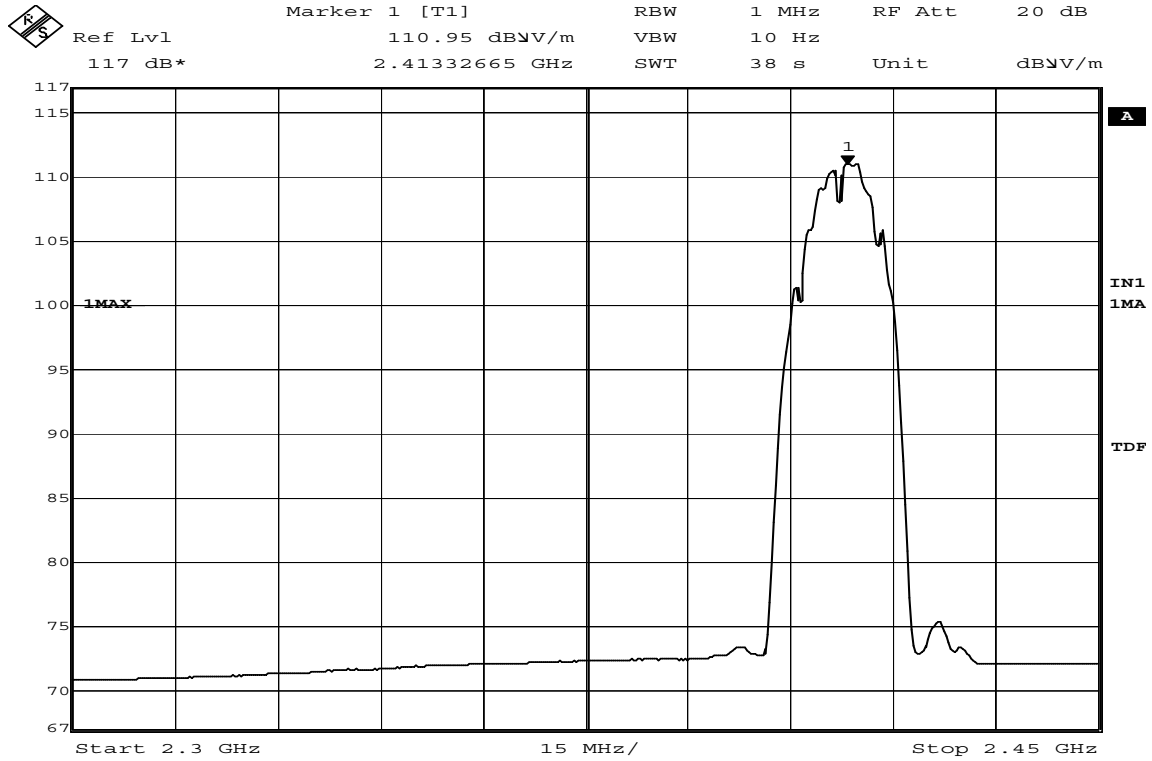
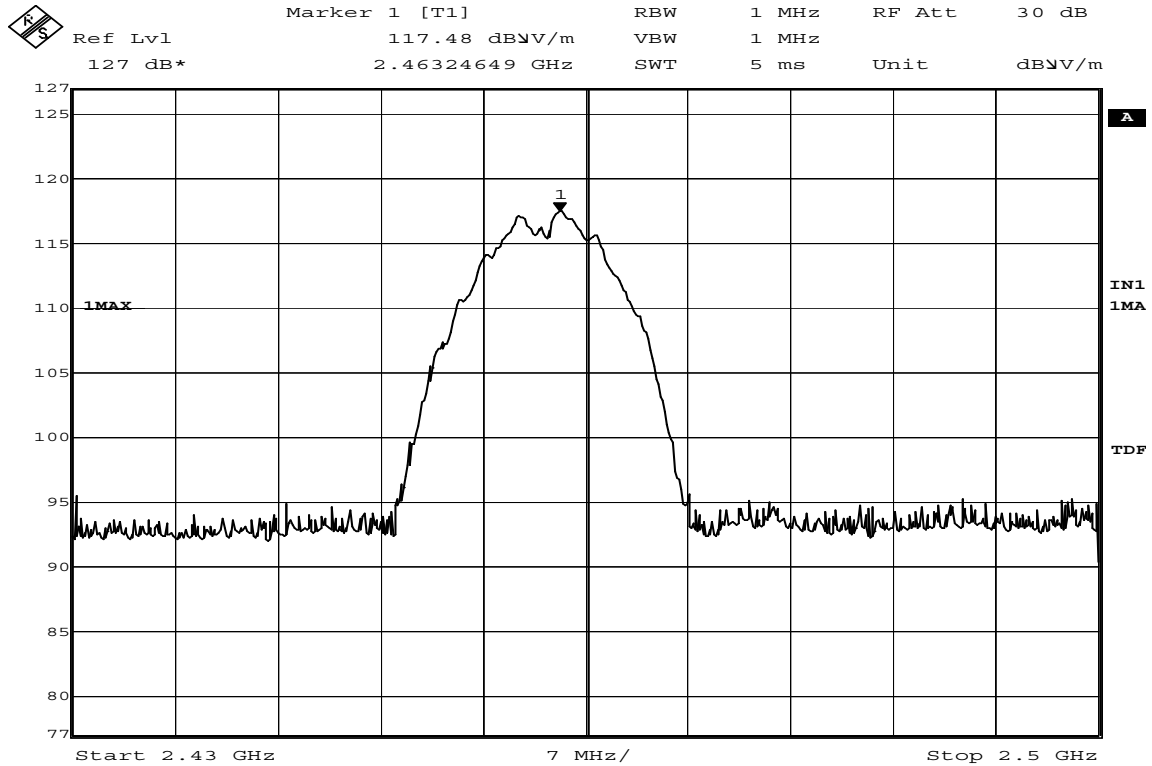


Figure 37 9.5dBi Omni Radiated Peak Plot Channel 1



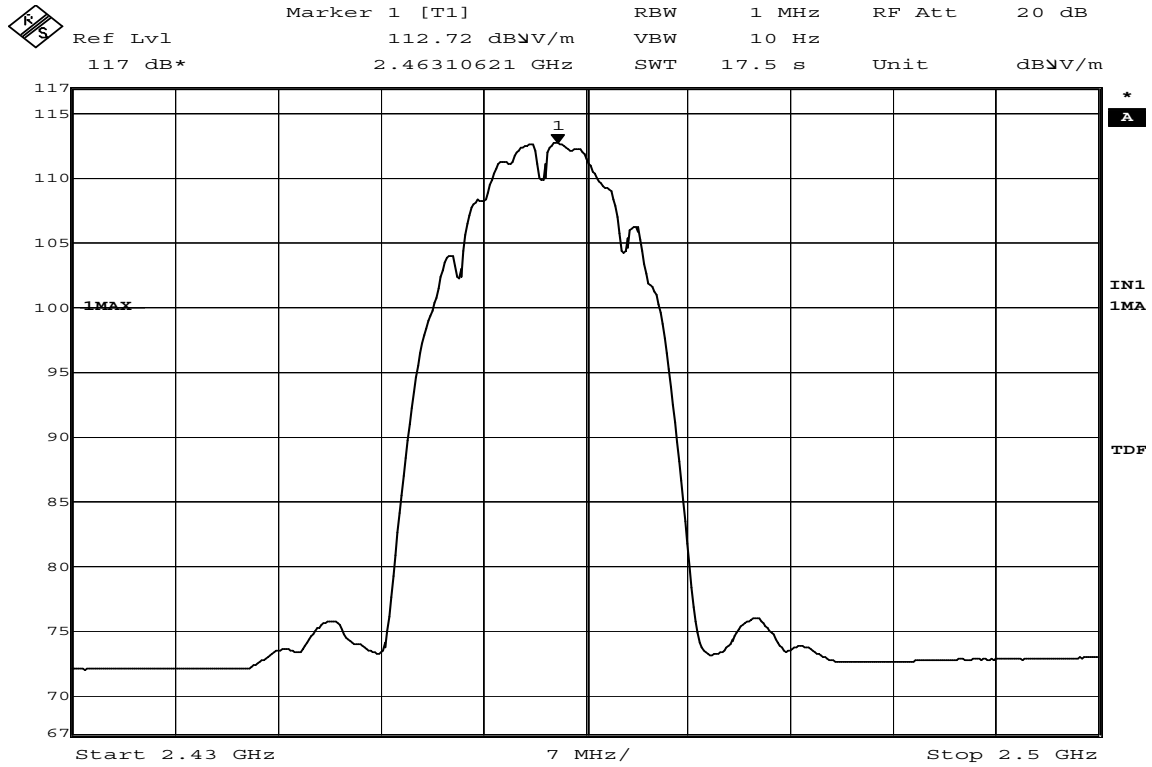
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Figure 38 9.5dBi Omni Radiated Average Plot Channel 1



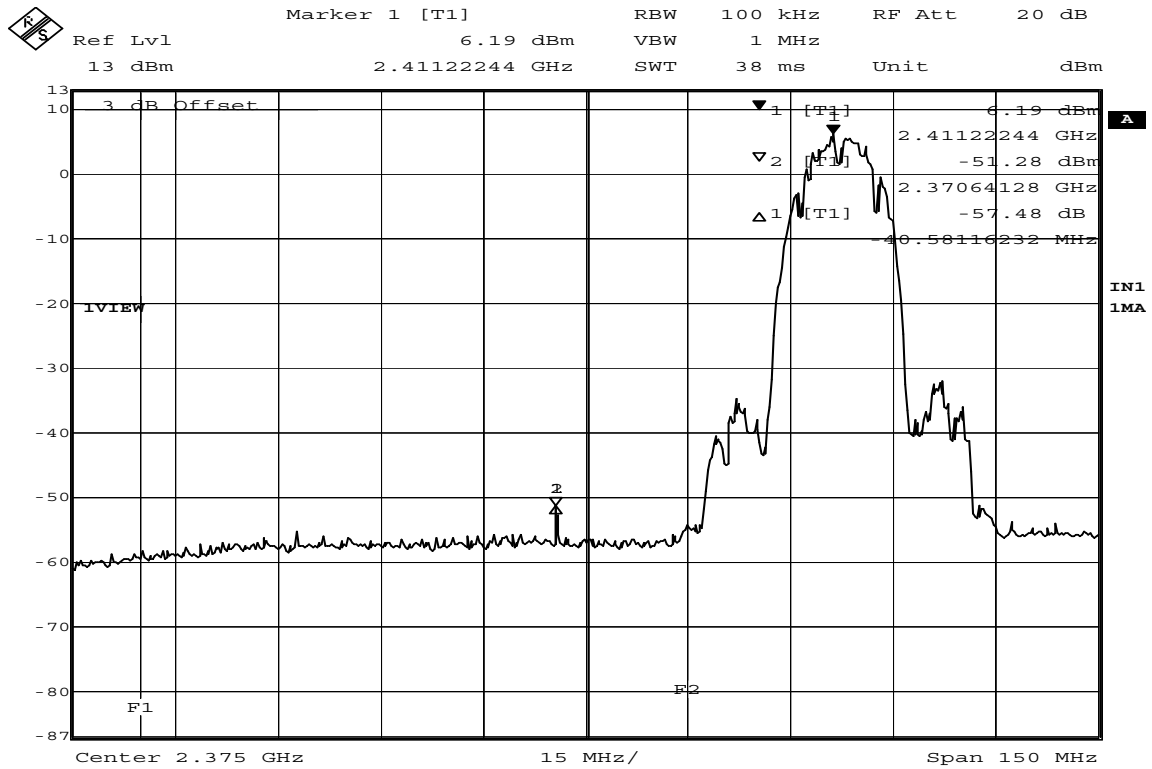
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Figure 39 9.5dBi Omni Radiated Peak Plot Channel 11



Date: 12.MAR.2004 13:55:57

Figure 40 9.5dBi Omni Radiated Average Plot Channel 11



Date: 11.MAR.2004 14:46:21

Figure 41 Conducted Peak Plot Channel 1 RBW=100kHz

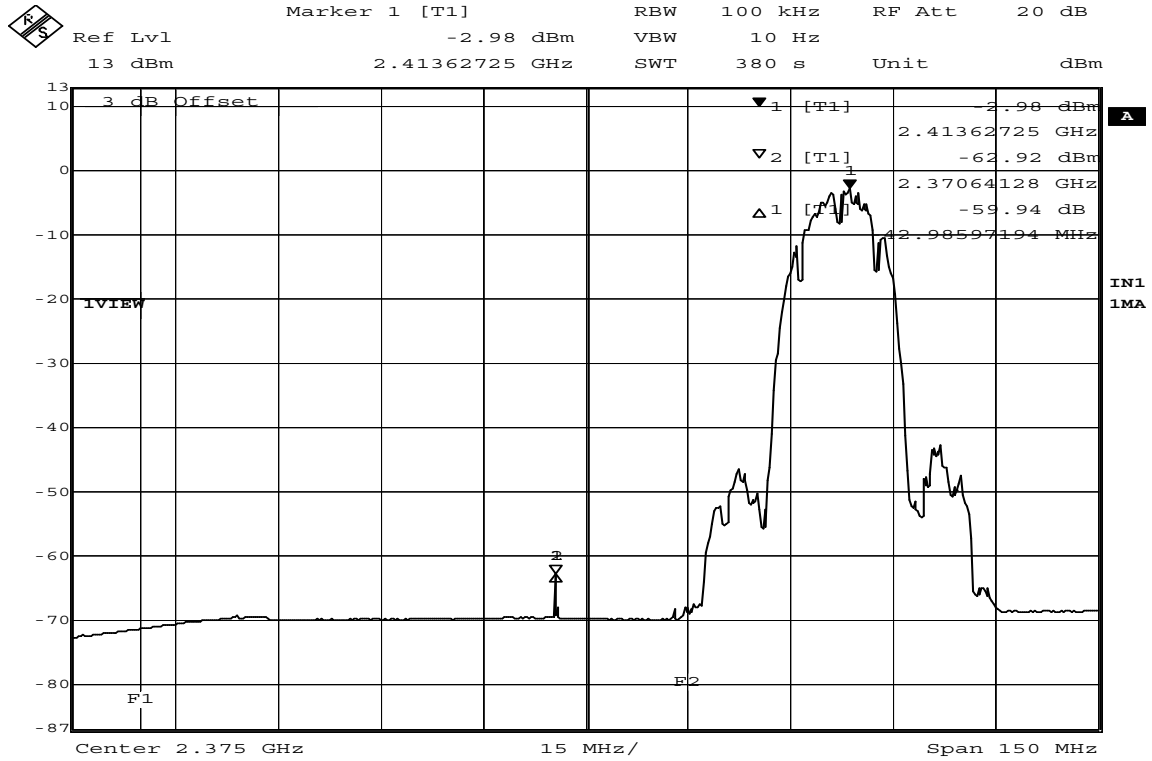


Figure 42 Conducted Average Plot Channel 1 RBW=100kHz

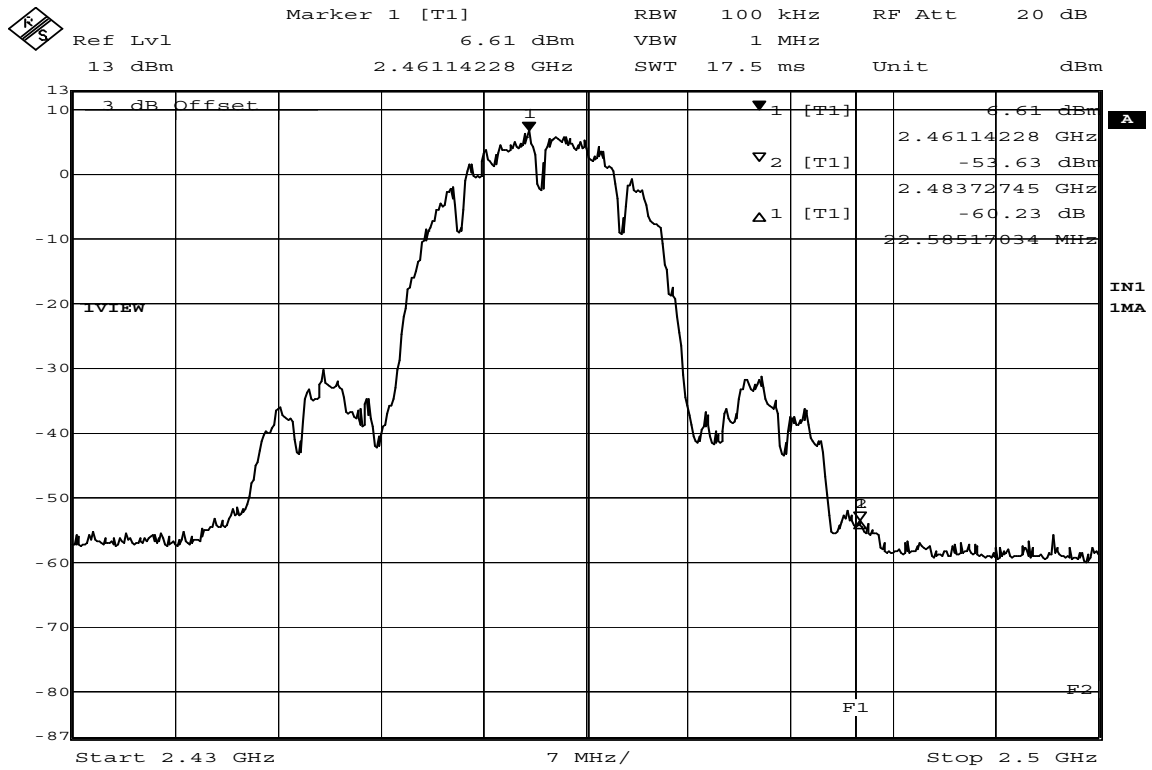


Figure 43 Conducted Peak Plot Channel 11 RBW=100kHz

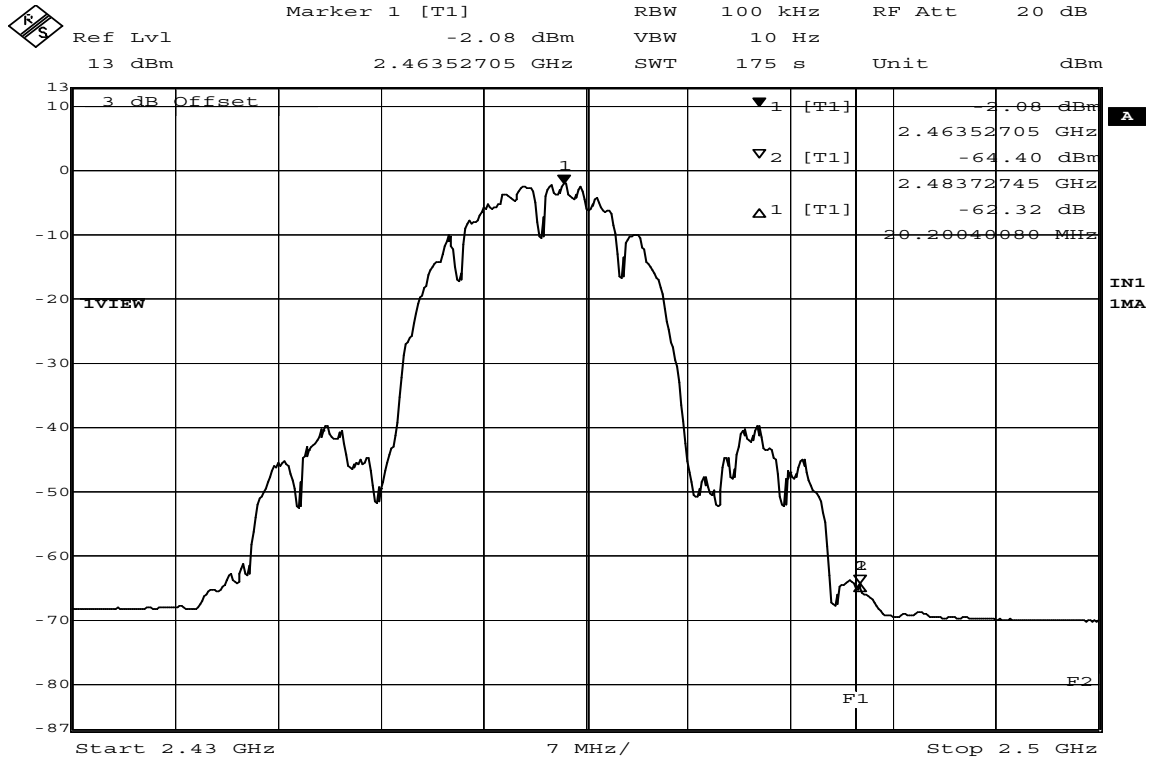


Figure 44 Conducted Average Plot Channel 11 RBW=100kHz

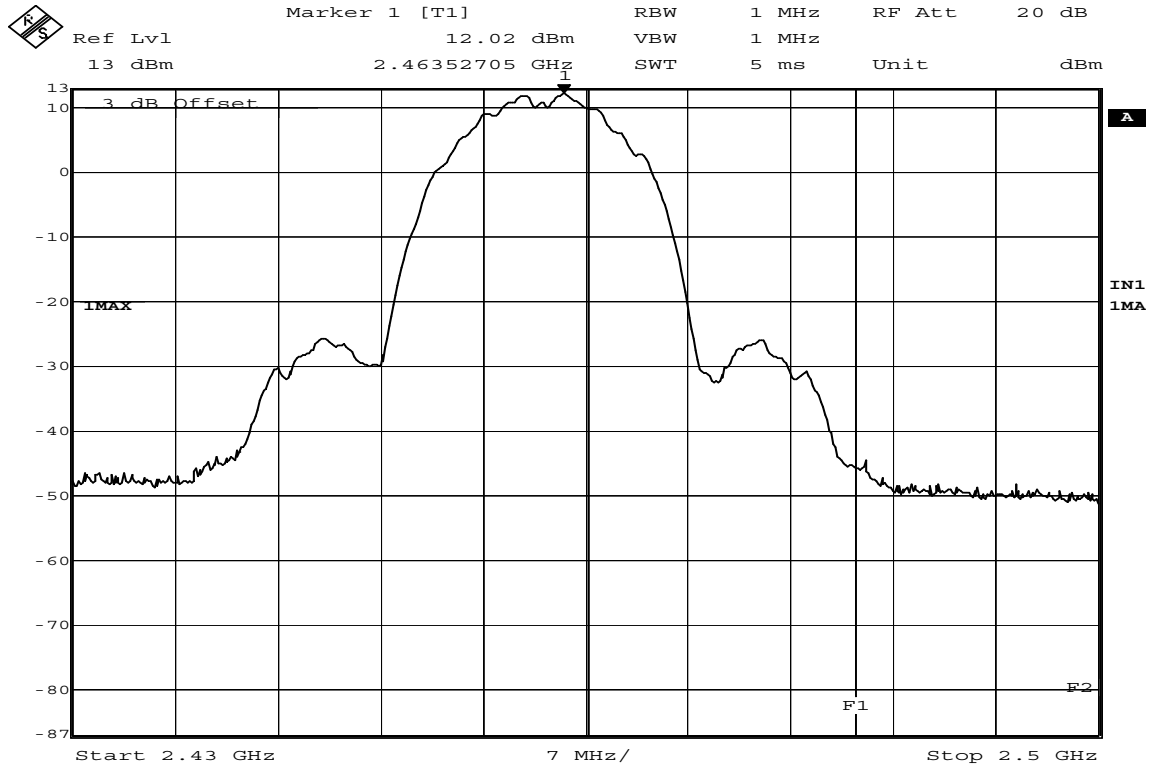
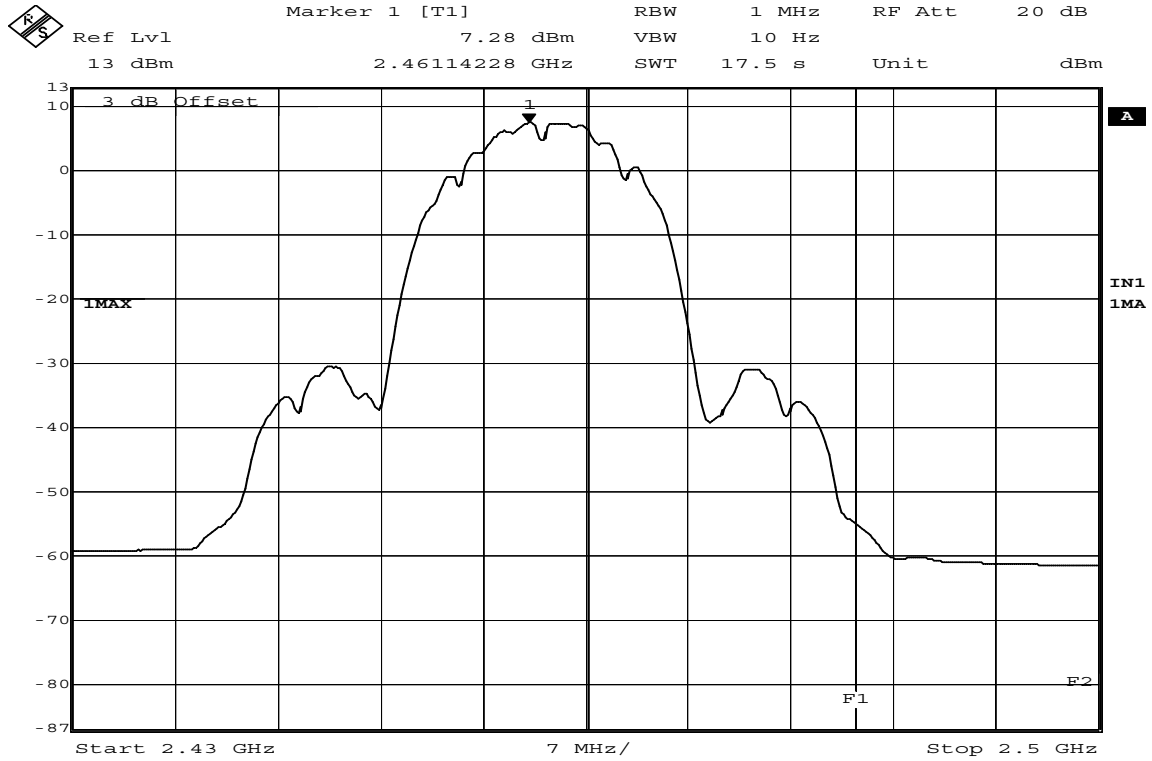
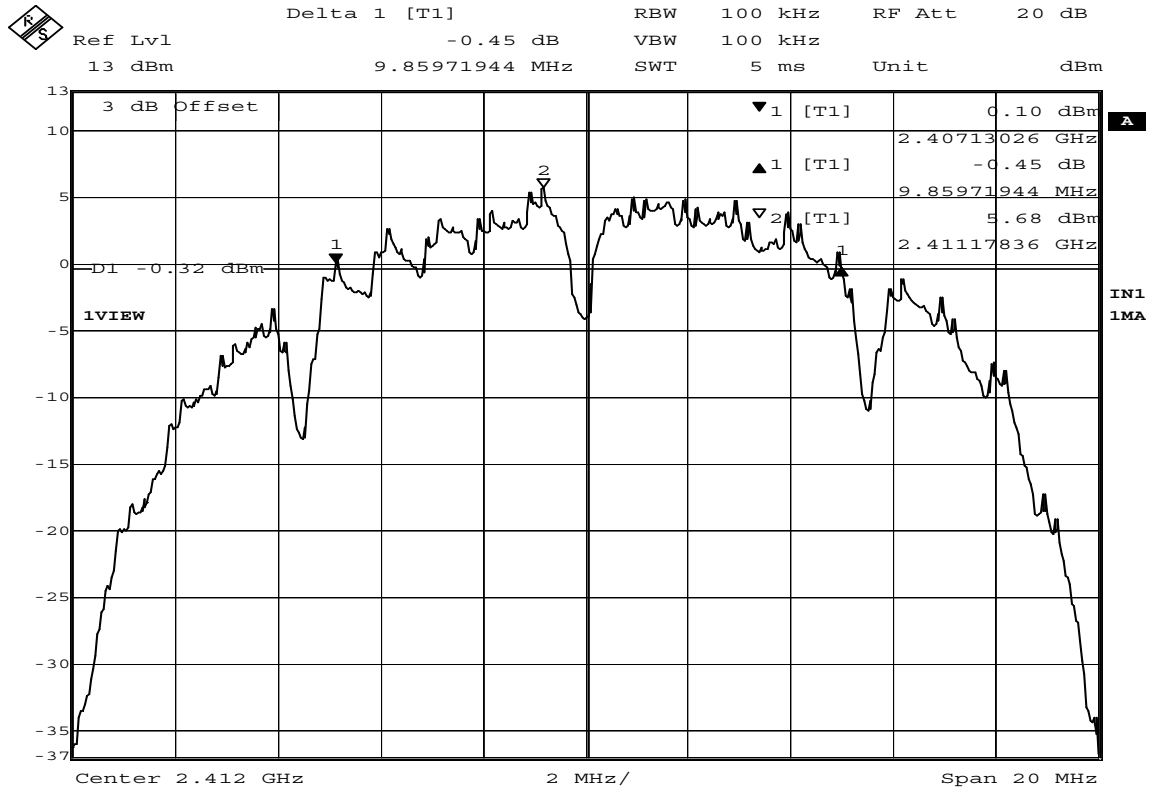


Figure 45 Conducted Peak Plot Channel 11 RBW=1MHz



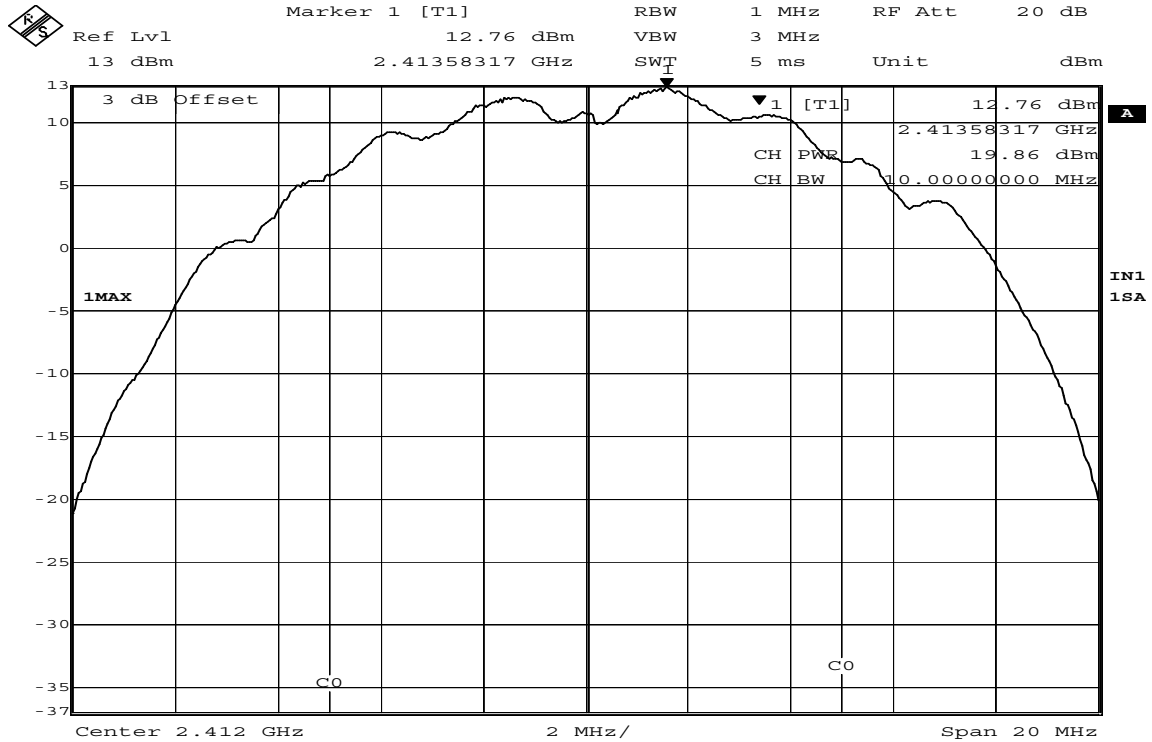
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Figure 46 Conducted Average Plot Channel 11 RBW=1MHz



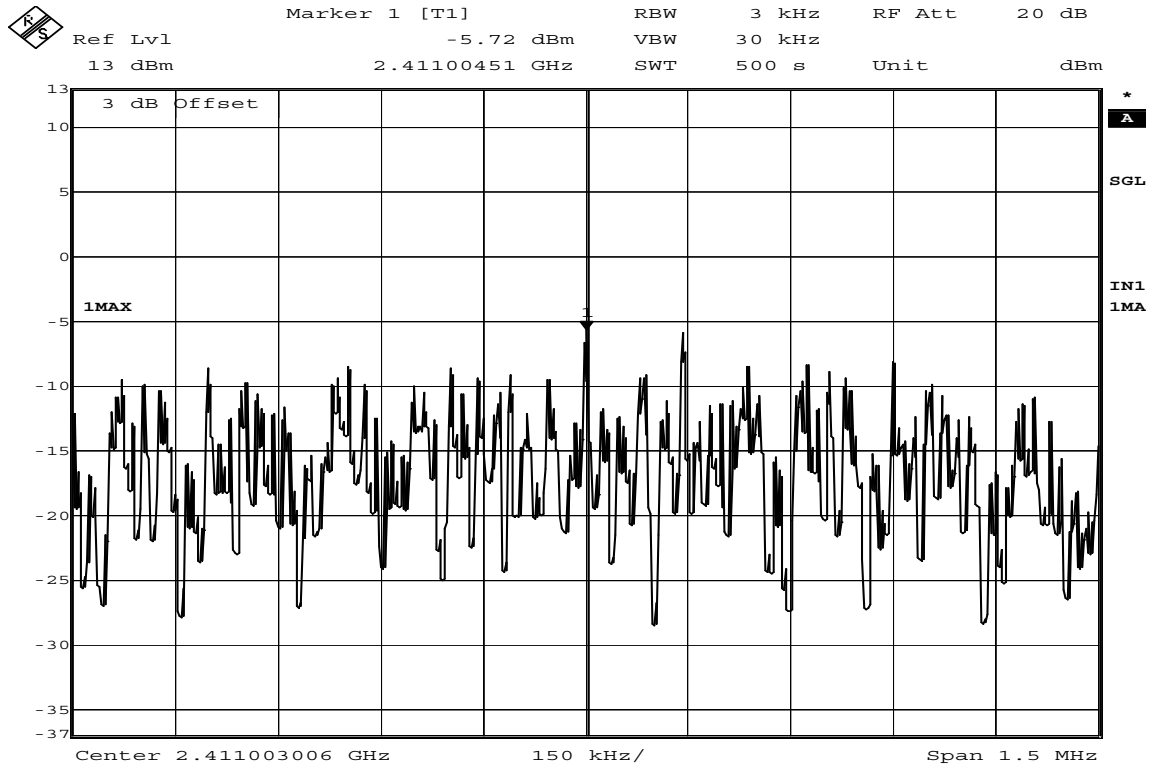
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Figure 47 Conducted 6dB Bandwidth Channel 1



Date: 11.MAR.2004 15:04:32

Figure 48 Conducted Channel Power Channel 1



Date: 11.MAR.2004 15:17:55

Figure 49 Conducted Power Spectral Density Channel 1

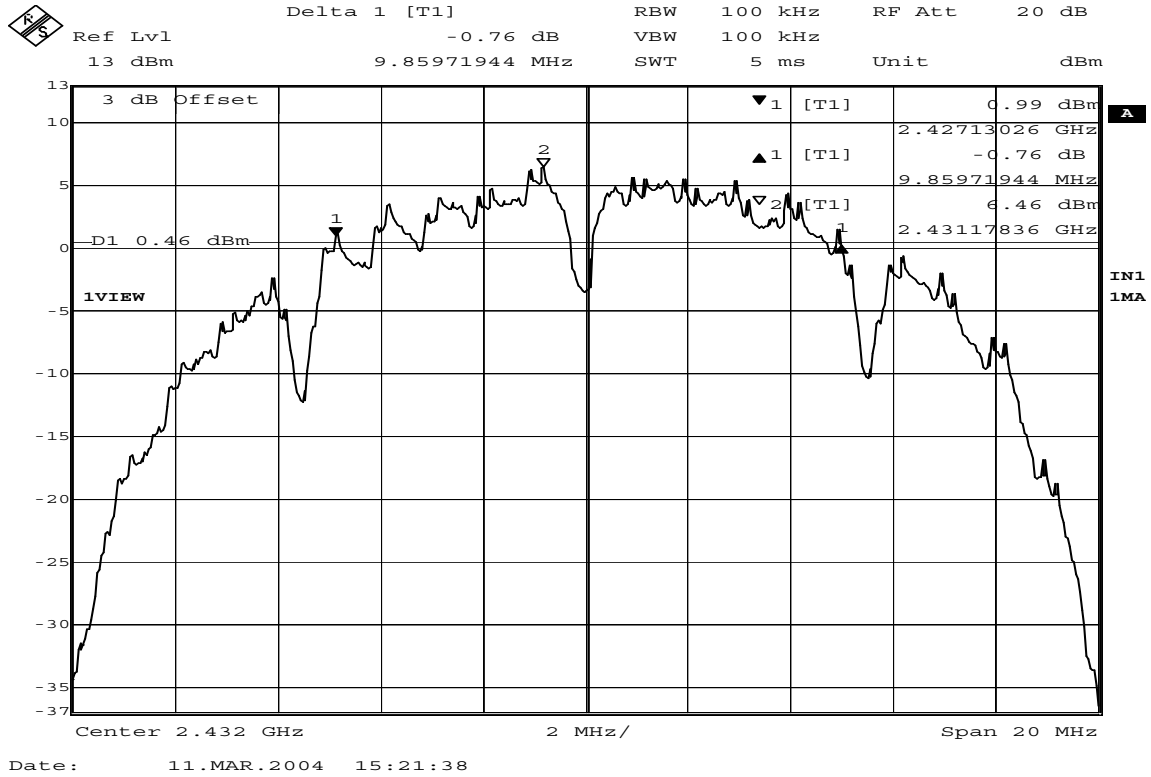


Figure 50 Conducted 6dB Bandwidth Channel 5

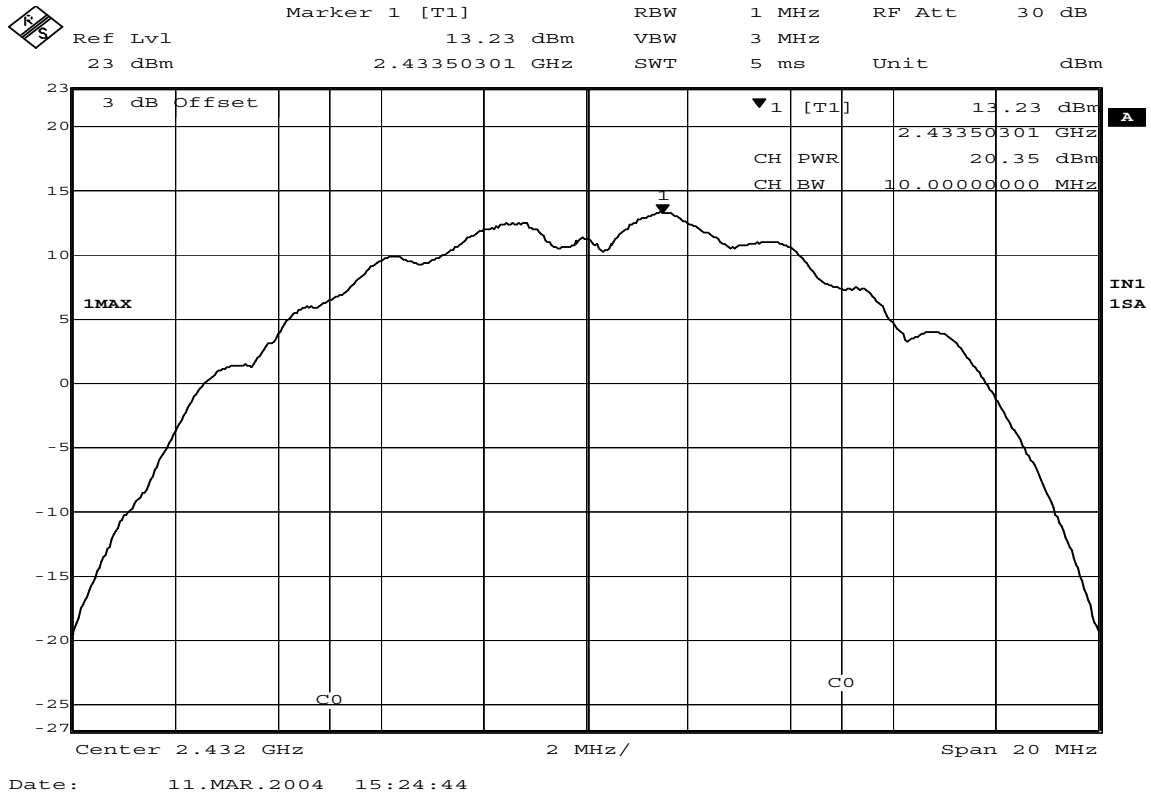


Figure 51 Conducted Channel Power Channel 5

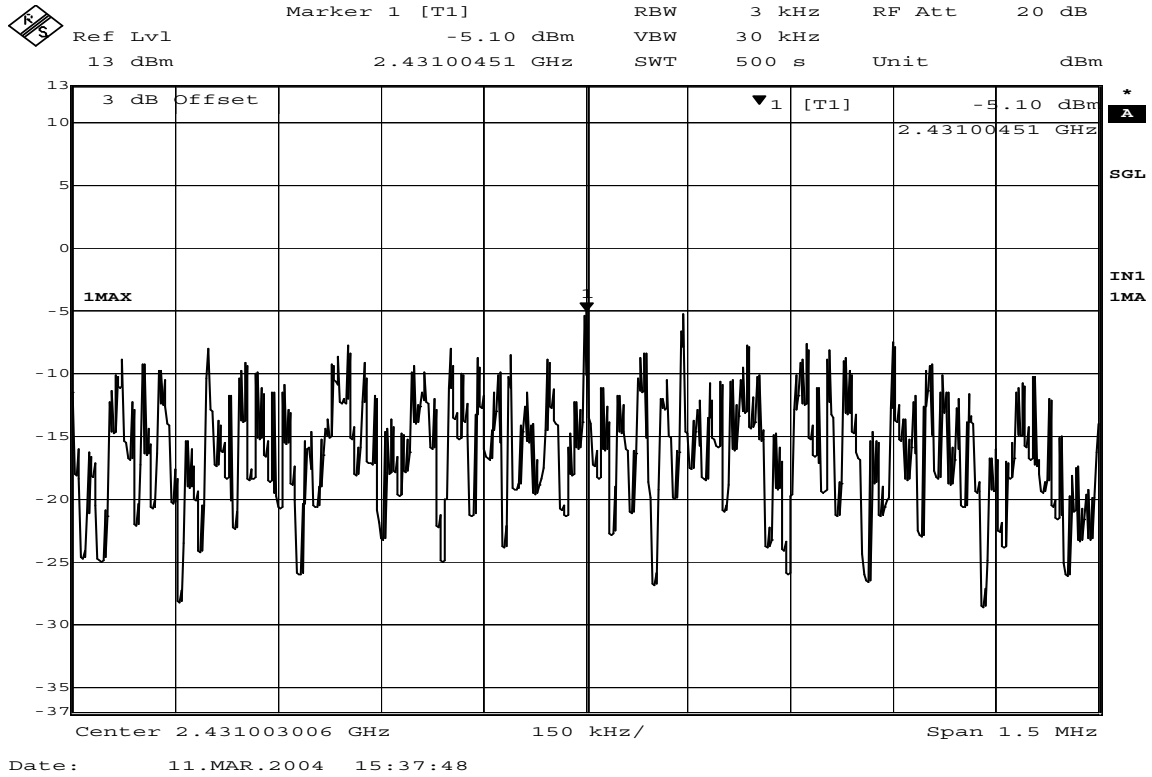


Figure 52 Conducted Power Spectral Density Channel 5

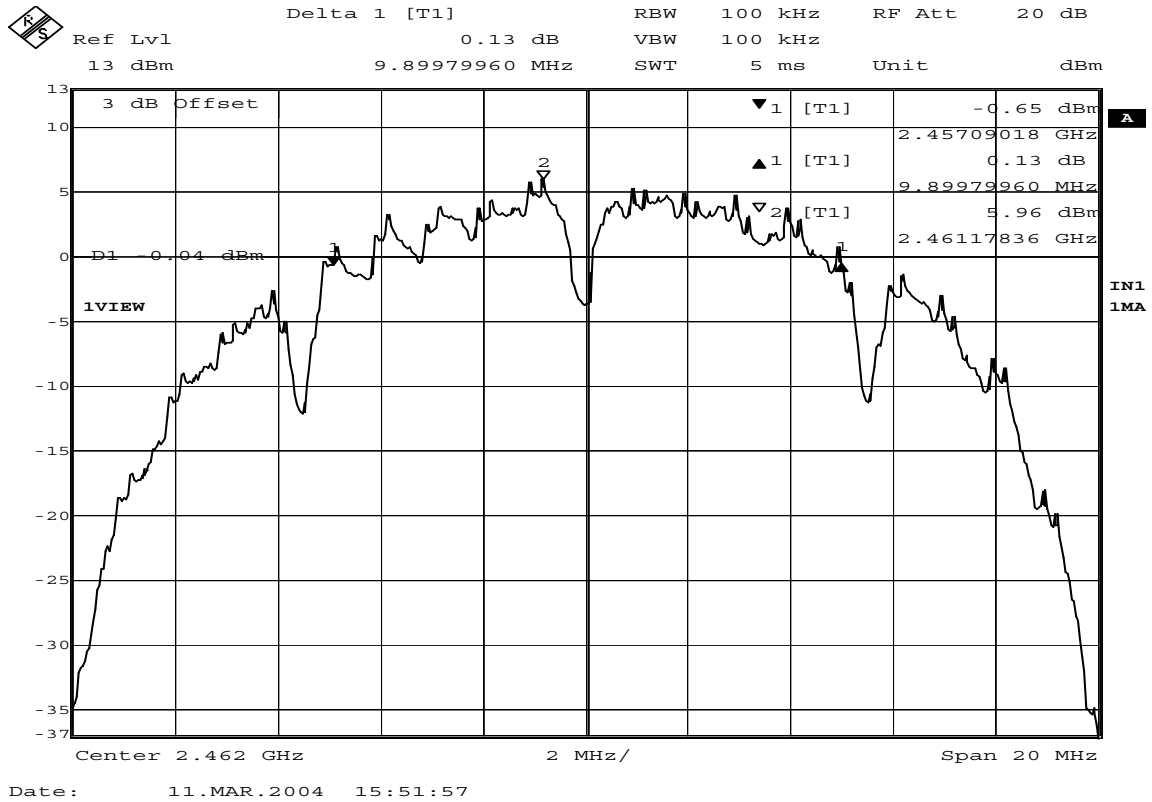


Figure 53 Conducted 6dB Bandwidth Channel 11

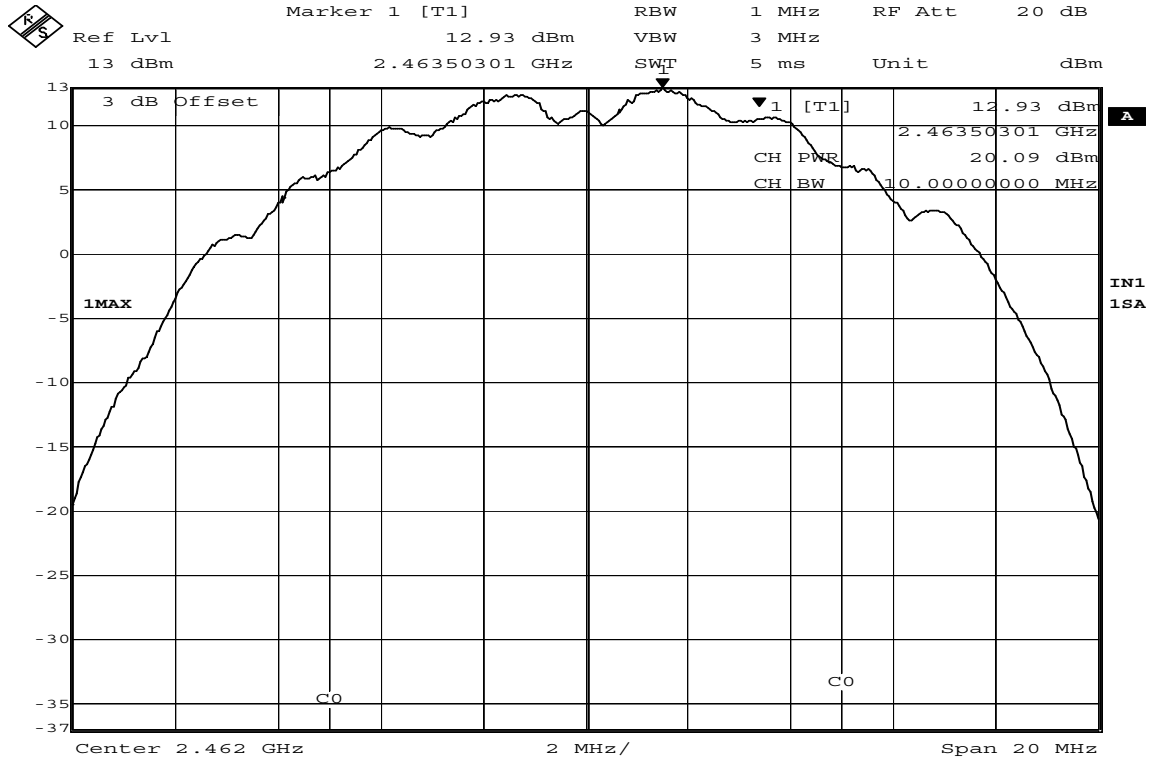


Figure 54 Conducted Channel Power Channel 11

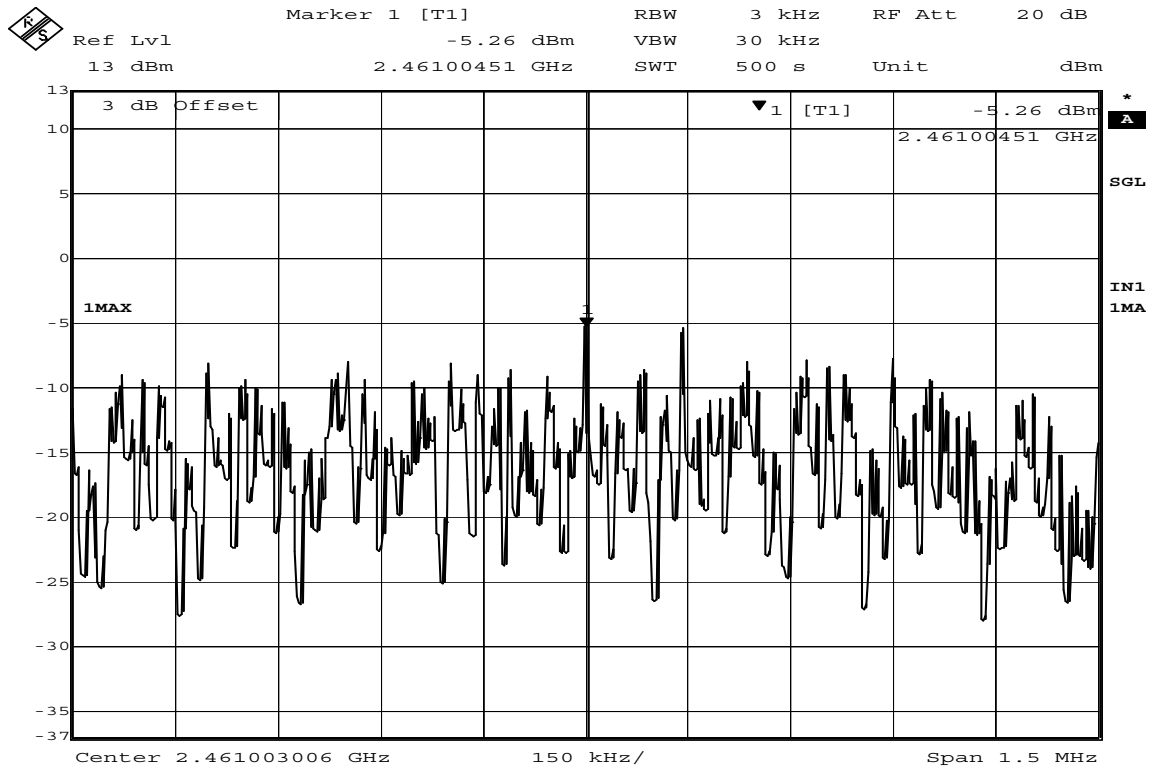


Figure 55 Conducted Power Spectral Density Channel 11

Appendix G: Specifications of Antennas

Telex Model	Gain (dBi)	Antenna Type	Polarization	Cable	Cable Length (ft.)	Azimuth Beamwidth (degrees)
2444AA	14.5	Sector	Vertical	LMR400	15	96 degrees
2442AA	14	Sector	Vertical	LMR400	15	60 degrees
2443AA	12	Sector	Vertical	LMR400	3	125 degrees
2445AA	12	Sector	Horizontal	LMR400	3	90 degrees
2439AA-1	9.5	Omni	Vertical	LMR400	3	Not Applicable
2437AA	7.5	Omni	Vertical	LMR400	3	Not Applicable

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