



UL Korea, Ltd

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Project: 08CA44119
File: E218836
Date: 09.01.2008
Model: WPU-7700

FCC Test Report

Part 15 Subpart C

For

UniData Communication Systems Inc

3F, Burim-Bldg, 837-6, Bangbae 4-Dong, Seocho-Gu, Seoul, 137-835, Korea

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TEST SUMMARY

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 C Section 15.247: 2007			
Test #	Requirement – Test	Reference standards	Verdict
1	Antenna requirement and Directional gain of the antenna	15.203, 15.247 (b) (4)	Complied
2	6 dB Bandwidth	15.247 (a) (2)	Complied
3	Maximum Peak Output Power	15.247 (b) (3)	Complied
4	Spurious emission, Band Edge and Restricted bands	15.247 (d), 15.205(a), 15.209(a)	Complied
5	Power Density	15.247(e)	Complied
6	Conducted Emission	15.207(a)	Complied
Note: This product has been tested in accordance with the measurement procedures specified in FCC Part 15 Subpart C: 2007 at the SK Tech EMC Laboratory and the test results has been shown to be complied with the EMC requirements specified in the standard above.			

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea, Ltd. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

The equipment under test has

☒ Met the technical requirements

☐ Not met the technical requirements



Tested by
Sung Hoon, Baek, Associate Project Engineer
Conformity Assessment Services - 3014ASEO
UL Korea Ltd.
September 05, 2008



Reviewed by
Kyungyong, Kim, Section Manager
Conformity Assessment Services - 3014ASEO
UL Korea Ltd.
September 08, 2008

TEST REPORT DETAILS

Tests Performed By: UL Korea Ltd.
33rd FL. GFC Bldg. 737 Yeoksam-dong,
Kangnam-ku, Seoul, 135-984, Korea

Test Site: SK TECH CO., LTD.
820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

The test facility was deemed to have the environment and capabilities necessary to perform the tests included in the test package.

Applicant: UniData Communication Systems, Inc.
3F, Burim-Bldg, 837-6, Bangbae 4-Dong, Seocho-Gu, Seoul, 137-835, Korea

Applicant Contact: Na, Kyung Ju
Title: Development Group Manager
Phone: 82-2-3443-3390 (Ext.333)
E-mail: Kij2000@udsystems.com

Product Type: WLAN IP Phone

FCC ID: SQMWPU-7700

Model Number: WPU-7700

Trademark: 

Product standards: FCC Part 15 Subpart C: 2007

Sample Serial Number: None (Proto type)

Sample Receive Date: August 21, 2008

Testing Start Date: August 21, 2008

Date Testing Complete: August 28, 2008

Test Report Date: September 1, 2008

Overall Results: Compliant

UL Korea Ltd. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports.

Report Directory

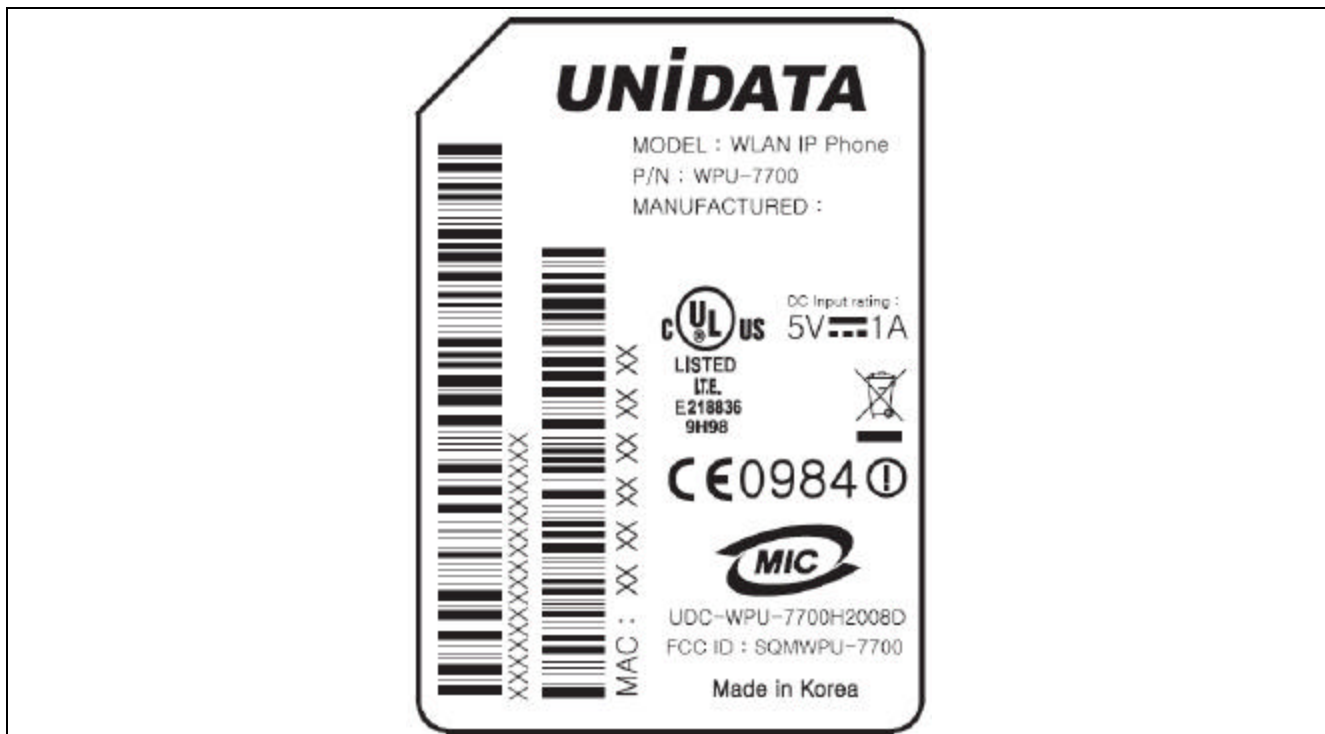
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1. EQUIPMENT UNDER TEST (EUT)

1.1 Specification

Item	Description
Wireless	IEEE 802.11b/g supported
	Range of Frequency in Use: 2.412~2.472GHz
	Channel: 1~11(FCC)
	Output power: 19.19 dBm (802.11b), 20.24 dBm (802.11g)
	RX sensitivity: -82dBm@ 11Mbps
Type of Modulation	IEEE 802.11b: DSSS (DBPSK - 1Mbps, DQPSK - 2Mbps, CCK - 5.5/11 Mbps) IEEE 802.11g: OFDM (BPSK - 6/9Mbps, QPSK - 12/18Mbps, 16QAM 24/36Mbps, 64QAM - 48/54Mbps)
Dimensions (mm)	138(H) x 48(W) x 22(T), Weight: 106g (Approx.)
Adapter	Input: 100-240V, 0.3A, 50/60Hz. Output: d.c. 5V, 2A
Antenna	Frequency Range: 2400 MHz to 2483 MHz
	V.S.W.R < 2.4
	Gain (Max), H-Plane: 0.5 dBi
	Radiation Patten: Omni-Directional
	Polarization: Linear

1.2 Equipment Marking Plate



1.3 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	WLAN IP Phone	UniData Communication System Inc.	WPU-7700	-
EUT	Cradle	UniData Communication System Inc.	-	-
EUT	AC/DC Adapter	Dailim Korea Co., Ltd.	IT-DL0520	-
AE	Notebook	DELL	PP22L	-
Note: EUT – Equipment Under Test, AE – Auxiliary/Associated Equipment, SIM – Simulator (Not Subjected to Test)				

1.4 Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Shielded	Comments
1	Battery charging input	DC	-	-	Connected with AC/DC Adapter through the cradle.
2	Mini-USB	DC	1.8	Shielded	Connected with Notebook for Battery charging.
Note: *AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

1.5 Power Interface:

Rated (#)	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	3.7 V	1,250mAh	-	DC	-	Internal rechargeable Battery
2	120 V	-	-	60Hz	Single	External AC/DC Adapter Input: 100-240 Vac, 50-60Hz, 0.3A, Output: 5 Vdc, 2A
3	5.0 V	-	-	DC	-	Mini USB port, Used for Battery charging

1.6 EUT Internal operating Frequency

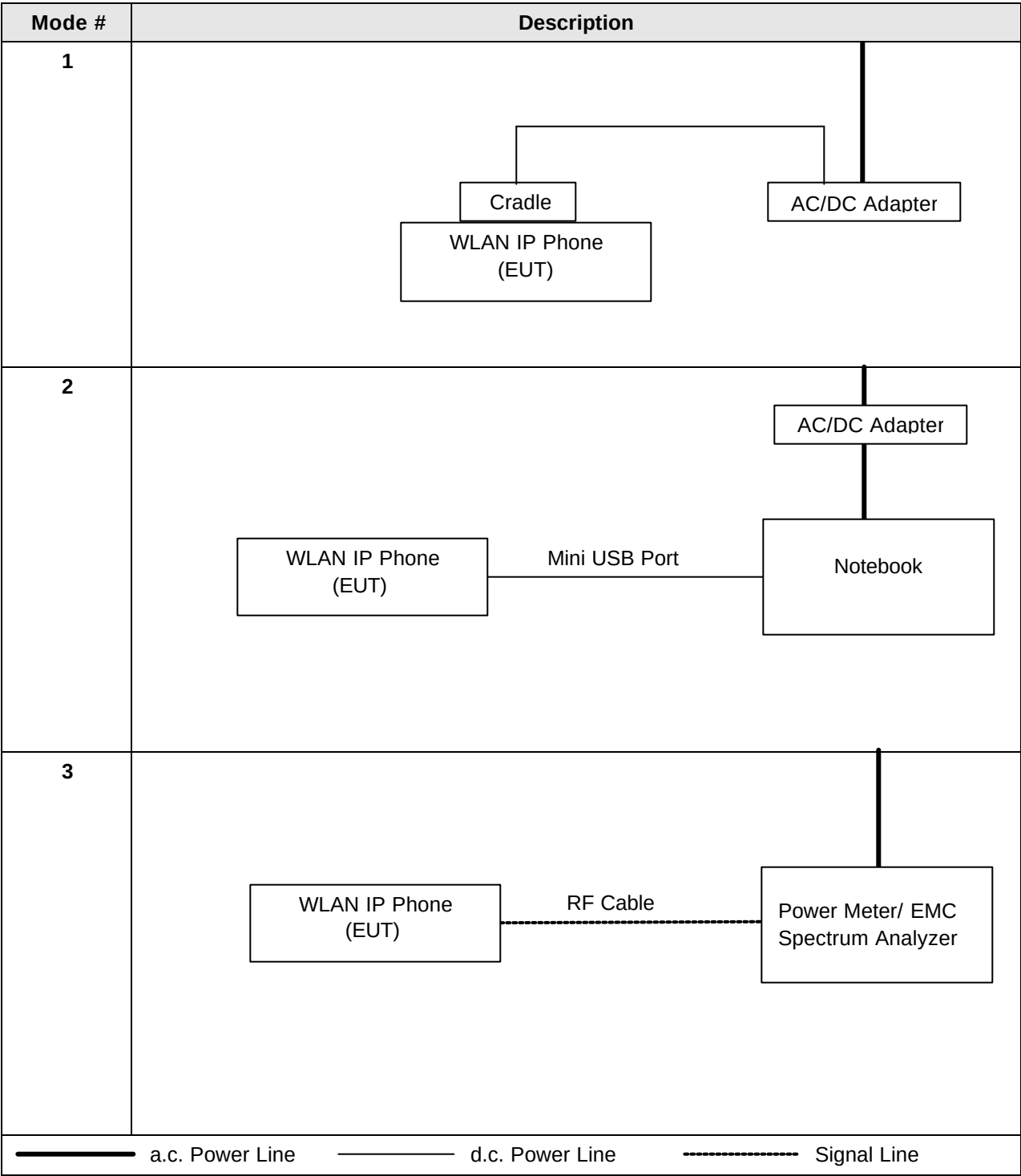
Frequency (MHz)	Description	Frequency (MHz)	Description
12.288 MHz	System Clock	-	-
66.00 MHz	Memory Clock	-	-

2. EUT OPERATION MODES:

2.1. Mode of Data Speed and Modulation

Mode #	Modulation Operating	Frequency	Channel	Data Speed	Modulation	Tested
1	IEEE802.11b	2412 MHz	1	1Mbps, 2Mbps, 5.5Mbps, 6Mbps, 9Mbps, 11Mbps	DSSS (DBPSK - 1Mbps, DQPSK - 2Mbps, CCK - 5.5/11 Mbps)	11Mbps
		2437 MHz	6			
		2462 MHz	11			
2	IEEE802.11g	2412 MHz	1	12Mbps, 24 Mbps, 36 Mbps, 48&54 Mbps	OFDM (BPSK - 6/9Mbps, QPSK - 12/18Mbps, 16QAM 24/36Mbps, 64QAM - 48/54Mbps)	12M Mbps
		2437 MHz	6			
		2462 MHz	11			
Note: All the configuration described above have been investigated during the preliminary testing (6dB bandwidth and maximum peak output power) and selected two data speed (11 Mbps, 12Mbps) as worst case condition for final measurement.						

3. TEST CONFIGURATIONS:



4. RESULT OF TESTING

Clause	FCC Part 15 C test requirements	Results
15.203, 15.247(b)(4)	Antenna Requirement	Complied
15.247(a)(2)	6dB Bandwidth	Complied
15.247(b)(3), (4)	Maximum Peak Output Power	Complied
15.247(d), 15.205(a), 15.209(a)	Spurious Emission, Band Edge, and Restricted bands	Complied
15.247(e)	Peak Power Spectral Density	Complied
15.207(a)	AC Power Line Conducted Emissions	Complied
Note: This product has been tested in accordance with the measurement procedures specified in FCC Part 15 Subpart C: 2007 at the SK Tech EMC Laboratory and the test results has been shown to be complied with the FCC requirements specified in the standard above.		

5. ANTENNA REQUIREMENT

According to 15.203 and 15.247(b) (4) of FCC Part 15		
According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.		
Test Result Description:		
Item	Requirement	Description
Antenna Requirement	Section 15.203	The transmitter has a permanently attached internal antenna (Model: KIN-WIFI-UK701).
Directional gain of the antenna	Section 15.247 (b) (4)	The directional gain of the antenna is maximum 0.5 dBi according to the Antenna specification.

Figure 1. Photo of Antenna Port.

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.	
	

6. 6dB BANDWIDTH

TEST: According to 15.247 (a) (2) of FCC Part 15, systems using digital modulation techniques may operate in the 2400~2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 KHz.					
Method	Place the EUT on the table and set it in the transmitting mode and remove the antenna from the EUT and than connect a low loss RF cable from the antenna port to the spectrum analyzer. Set the spectrum analyzer as RBW=100 KHz, VBW ≥ RBW, Span >> RBW, Sweep=Auto and mark the peak frequency and –6dB (upper and lower) frequency. Repeat until all the rest channels are investigated.				
Parameters recorded during the test		Laboratory Ambient Temperature		22° C	
		Relative Humidity		40 %	
		Frequency range		Measurement Point	
Fully configured sample scanned over the following frequency range		2400~2483.5 MHz		Antenna port	
Configuration Settings					
Power Interface Mode # (See Section 1.5)		EUT Operation Mode # (See 2.1)		Test Configurations Mode # (See Section 2.2)	
1		1, 2		1	
Test Equipments					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2008.02	2009.02
Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2008.07	2009.07

Table 1. 6dB Bandwidth Measured Data

Results Descriptions:					
Modulation #	Operating Frequency	Transfer Rate	6dB Bandwidth	Limit	Test Result
802.11b	2412 MHz	11 Mbps	10.00 MHz	= 500 kHz	Pass
	2437 MHz	11 Mbps	10.02 MHz	= 500 kHz	Pass
	2462 MHz	11 Mbps	9.98 MHz	= 500 kHz	Pass
802.11g	2412 MHz	12 Mbps	16.63 MHz	= 500 kHz	Pass
	2437 MHz	12 Mbps	16.58 MHz	= 500 kHz	Pass
	2462 MHz	12 Mbps	16.58 MHz	= 500 kHz	Pass

Figure 2. Lowest Channel, 6dB Bandwidth Measured plots.

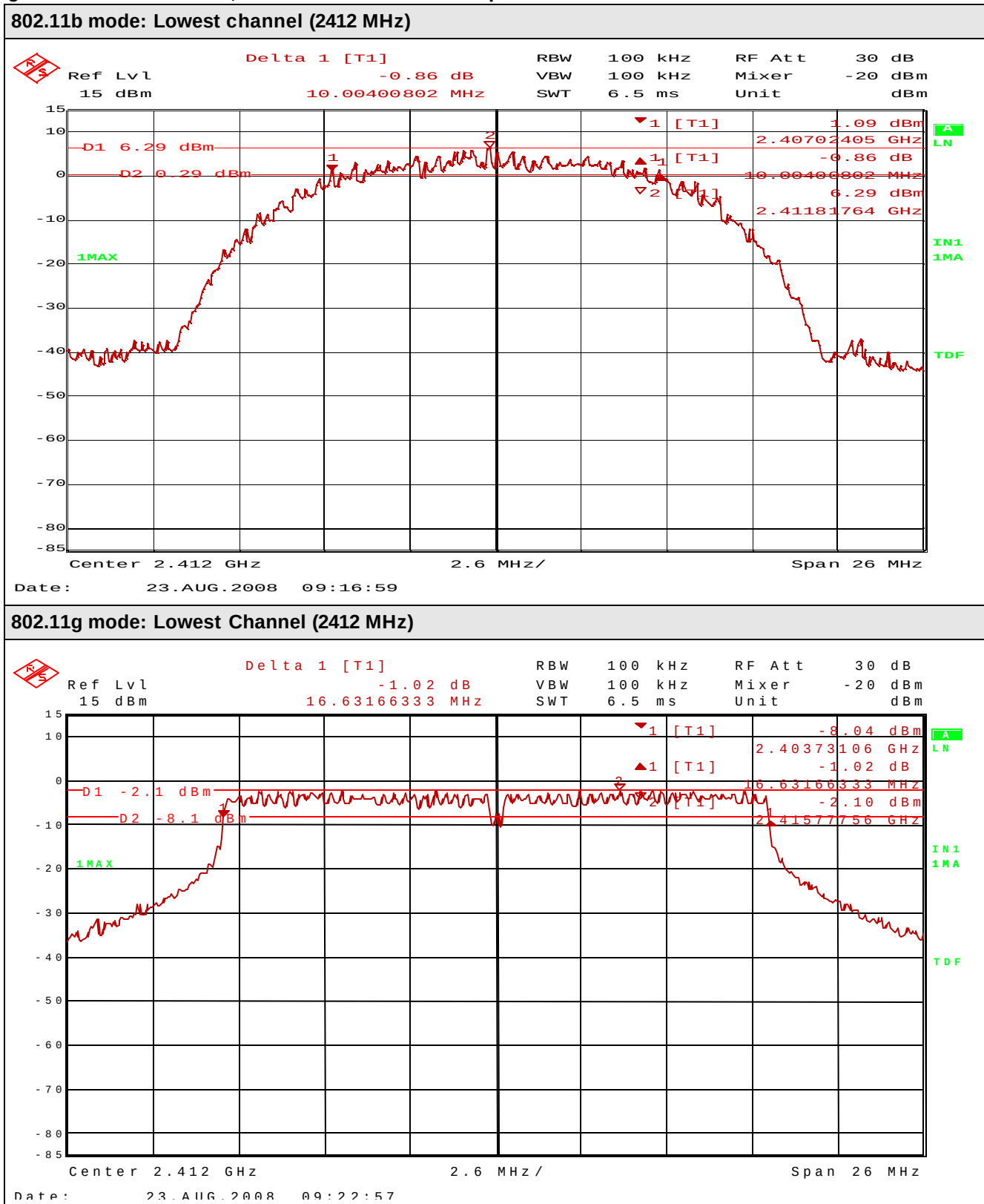


Figure 3. Middle Channel, 6dB Bandwidth Measured plots.

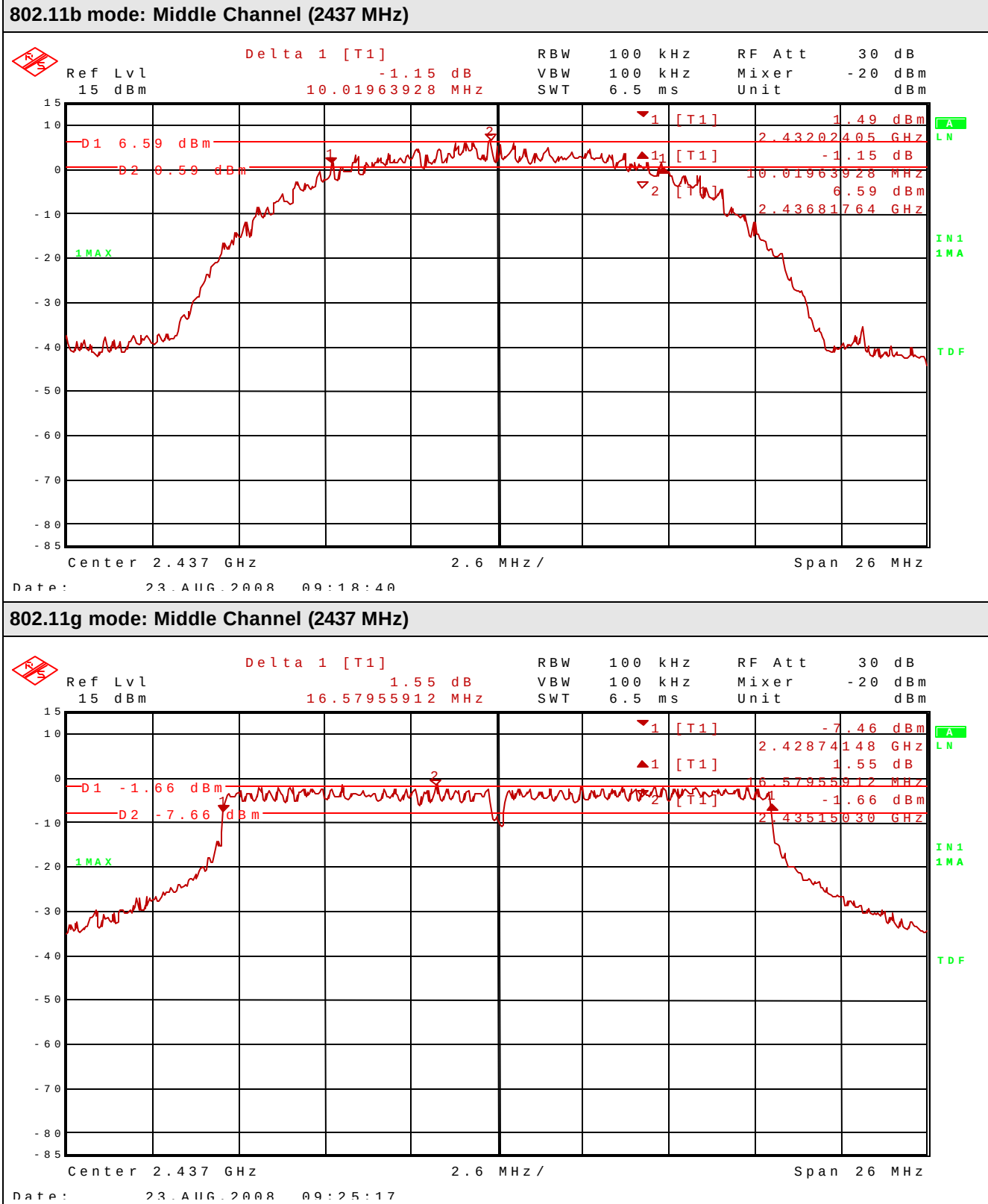
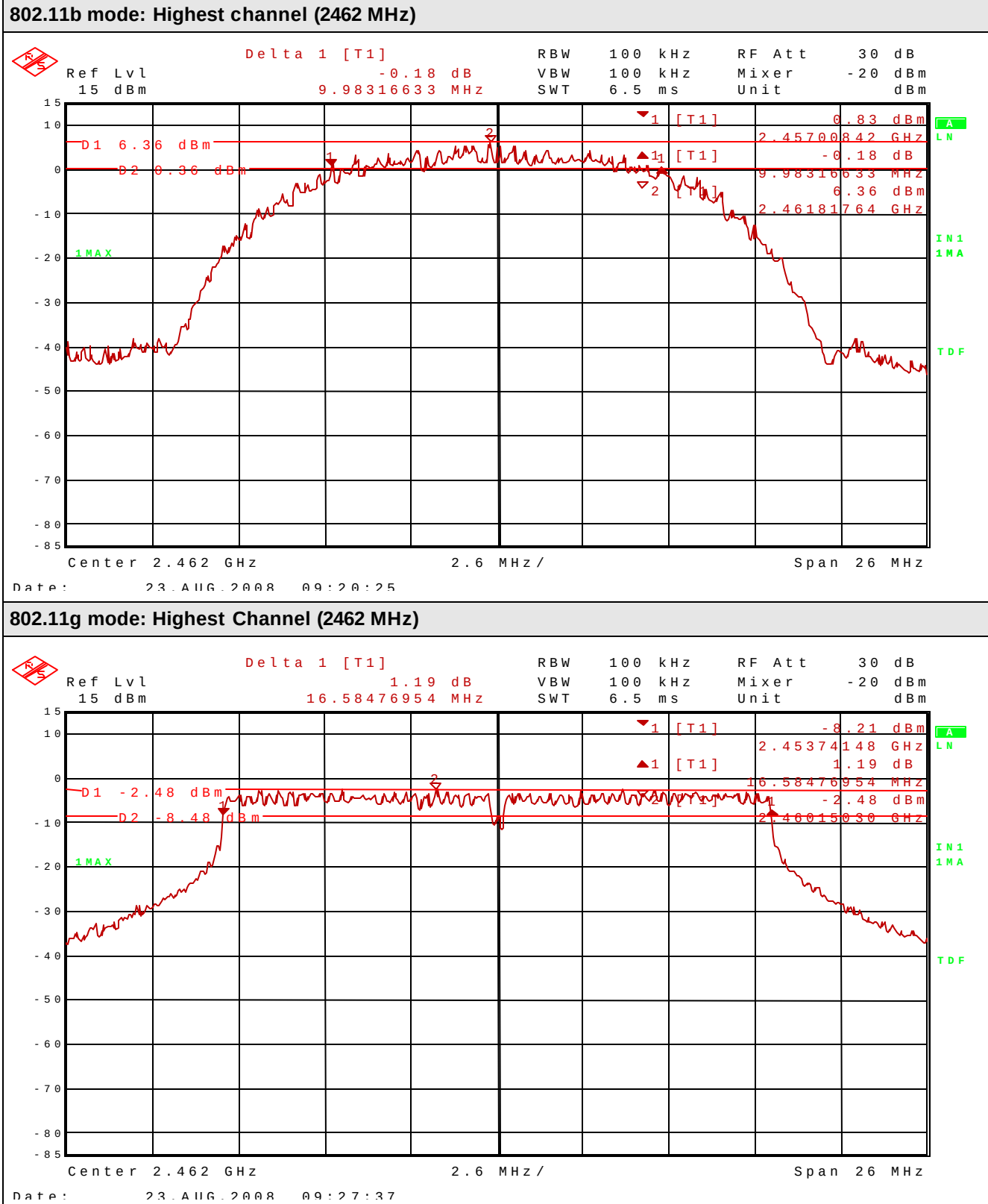


Figure 4. Highest Channel, 6dB Bandwidth Measured plots.



7. MAXIMUM PEAK OUTPUT POWER

TEST: According to §15.247(b)(3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.					
Method		The Maximum Peak Power was measured with a power meter connected to the antenna port.			
Parameters recorded during the test		Laboratory Ambient Temperature		22 °C	
		Relative Humidity		40 %	
		Frequency range		Measurement Point	
Fully configured sample scanned over the following frequency range		2412 MHz to 2462 MHz		Antenna port	
Configuration Settings					
Power Interface Mode # (See Section 1.5)		EUT Operation Mode # (See 2.1)		Test Configurations Mode # (See Section 2.2)	
1		1, 2		1	
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2008.02	2009.02
Hygro/Thermo Graph	SATO	PC-5000TRH-II -		2008.07	2009.07

Table 2. Maximum Peak Output Power Measured Data

Modulation	Operating Frequency [MHz]	Data Speed	Average Power		Peak Power		Limit	Result
			[dBm]	[W]	[dBm]	[W]		
802.11b	2412 MHz	11 Mbps	16.66	0.046	18.88	0.077	1 W	Pass
	2437 MHz		17.07	0.051	19.19	0.083	1 W	Pass
	2462 MHz		16.53	0.045	18.83	0.076	1 W	Pass
802.11g	2412 MHz	12 Mbps	12.50	0.018	20.24	0.106	1 W	Pass
	2437 MHz		12.86	0.019	20.14	0.103	1 W	Pass
	2462 MHz		12.34	0.017	20.15	0.104	1 W	Pass
Note: Peak Power Level = Peak Power Level + Cable loss								

8. CONDUCTED SPURIOUS, BAND EDGE EMISSIONS

TEST: According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement						
		Frequency range			Measurement Point	
Fully configured sample scanned over the following frequency range		30 MHz to 25GHz			Antenna port	
Configuration Settings						
Power Interface Mode # (See Section 1.5)		EUT Operation Mode # (See 2.1)			Test Configurations Mode # (See Section 2.2)	
1		1, 2			1	
Limits of Conducted Spurious and Band Edge						
Modulation	Operating Frequency [MHz]	Data Speed	Peak Power		Spurious emission Limit	Result
			[dBm]	[dBm]		
802.11b	2412 MHz	11 Mbps	18.88	18.88	- 20 dBc (Peak Power)	Pass
	2437 MHz		19.19	19.19		Pass
	2462 MHz		18.83	18.83		Pass
802.11g	2412 MHz	12 Mbps	20.24	20.24		Pass
	2437 MHz		20.14	20.14		Pass
	2462 MHz		20.15	20.15		Pass
Test Equipment Used						
Description		Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver		Rohde&Schwarz	ESIB40	100277	2008.02	2009.02
Hygro/Thermo Graph		SATO	PC-5000TRH-II	-	2008.07	2009.07

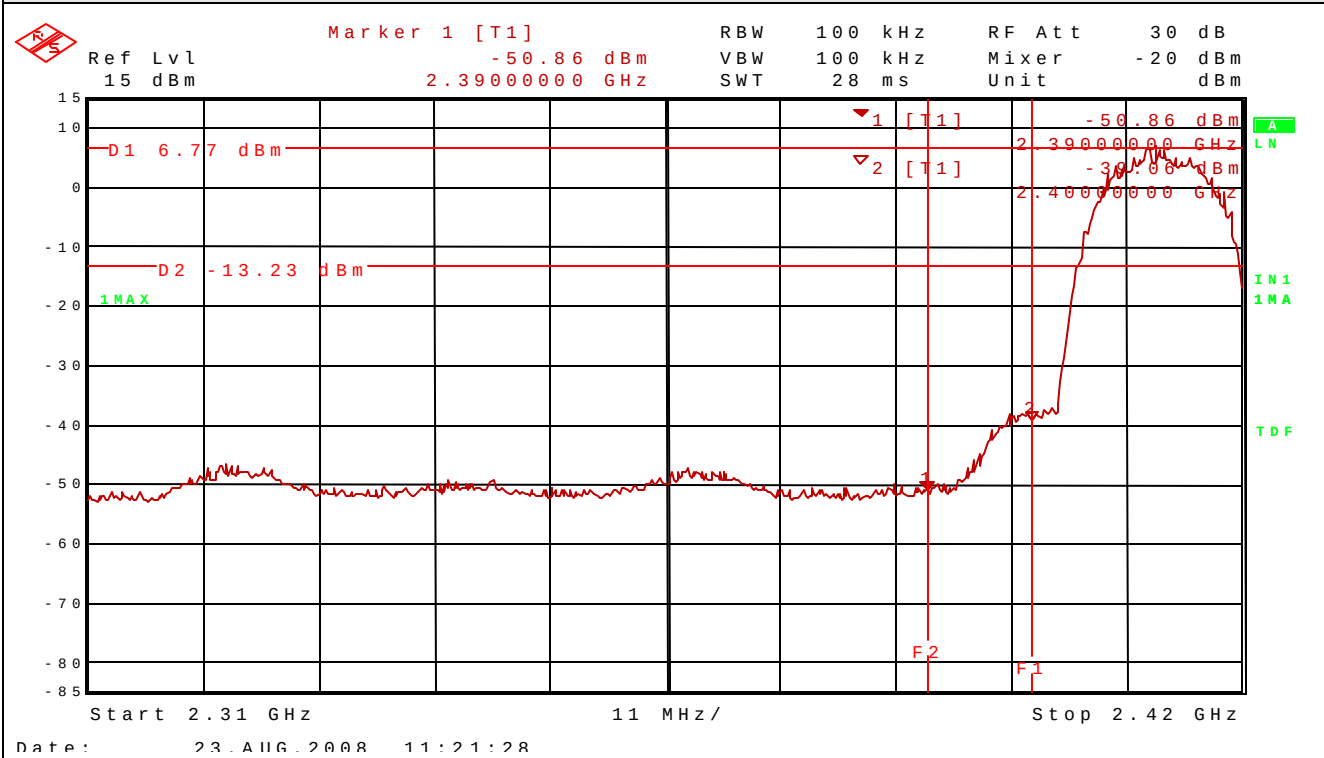
Table 3. Measured values of the Conducted Spurious data.

Frequency	Receiver Bandwidth	Reading	ATT	CL	Actual	Limit	Margin
[MHz]	[kHz]	[dB(μV)]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Note: 1. The test results were under required limit with 20 dB more.

Figure 5. 802.11b mode, Band Edge Measured plots.

802.11b mode: Lowest Channel (2412 MHz)



802.11b mode: Highest Channel (2462 MHz)

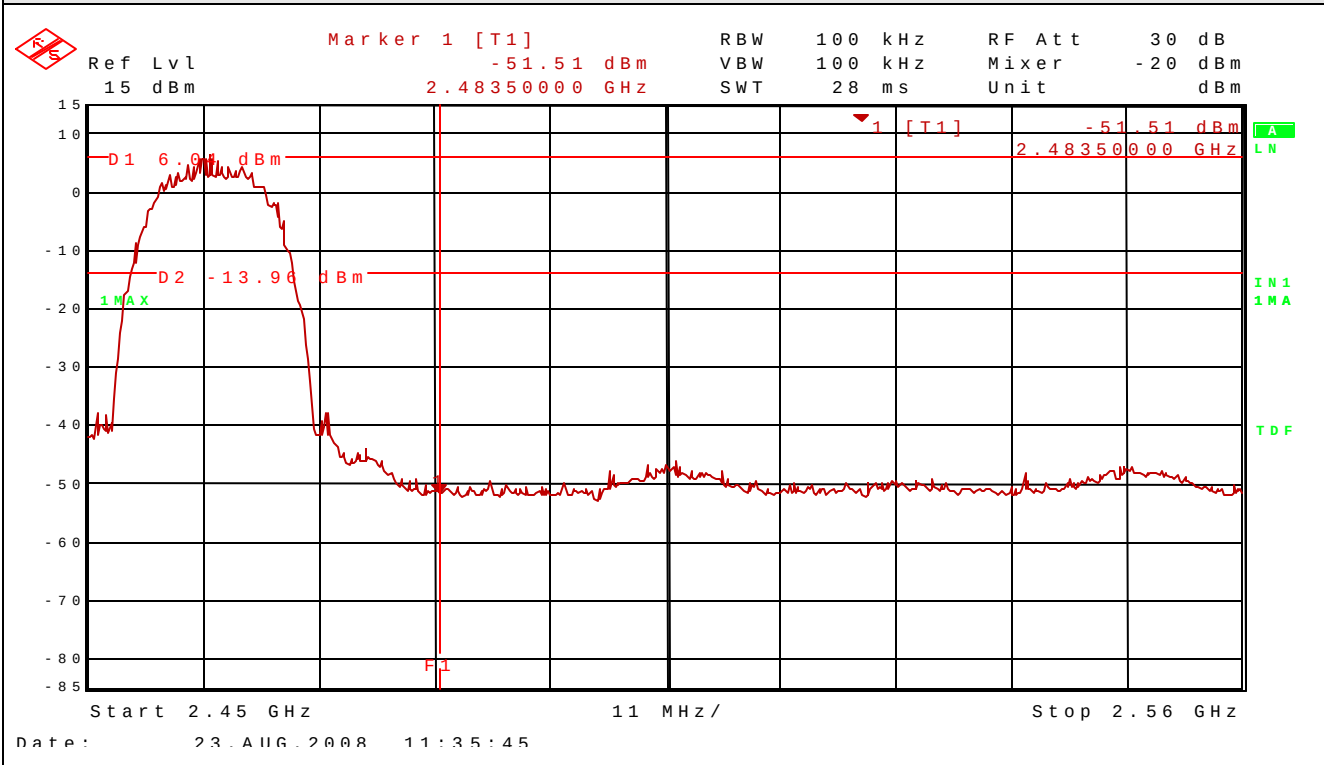


Figure 6. 802.11g Mode, Band Edge Measured plots.

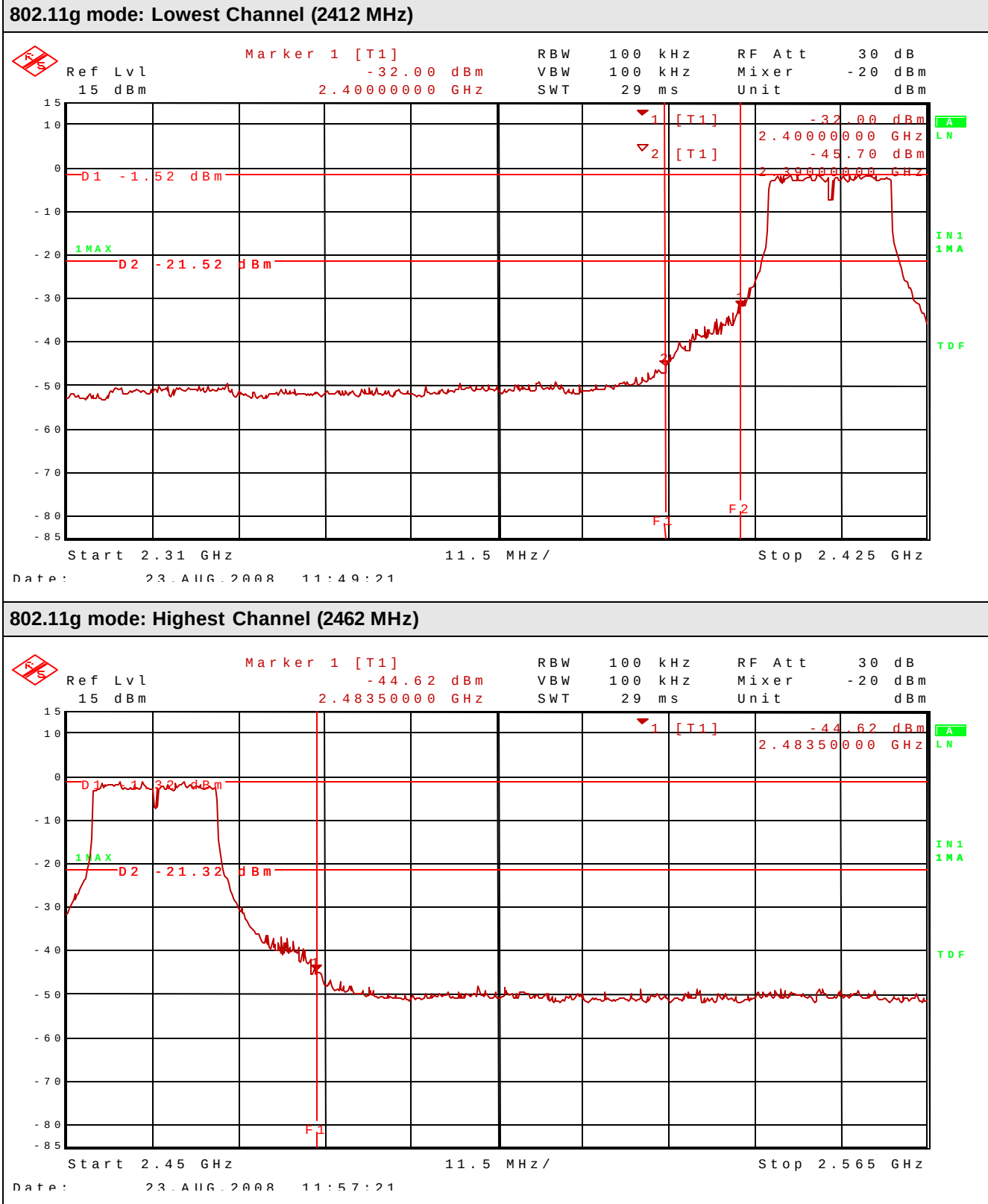
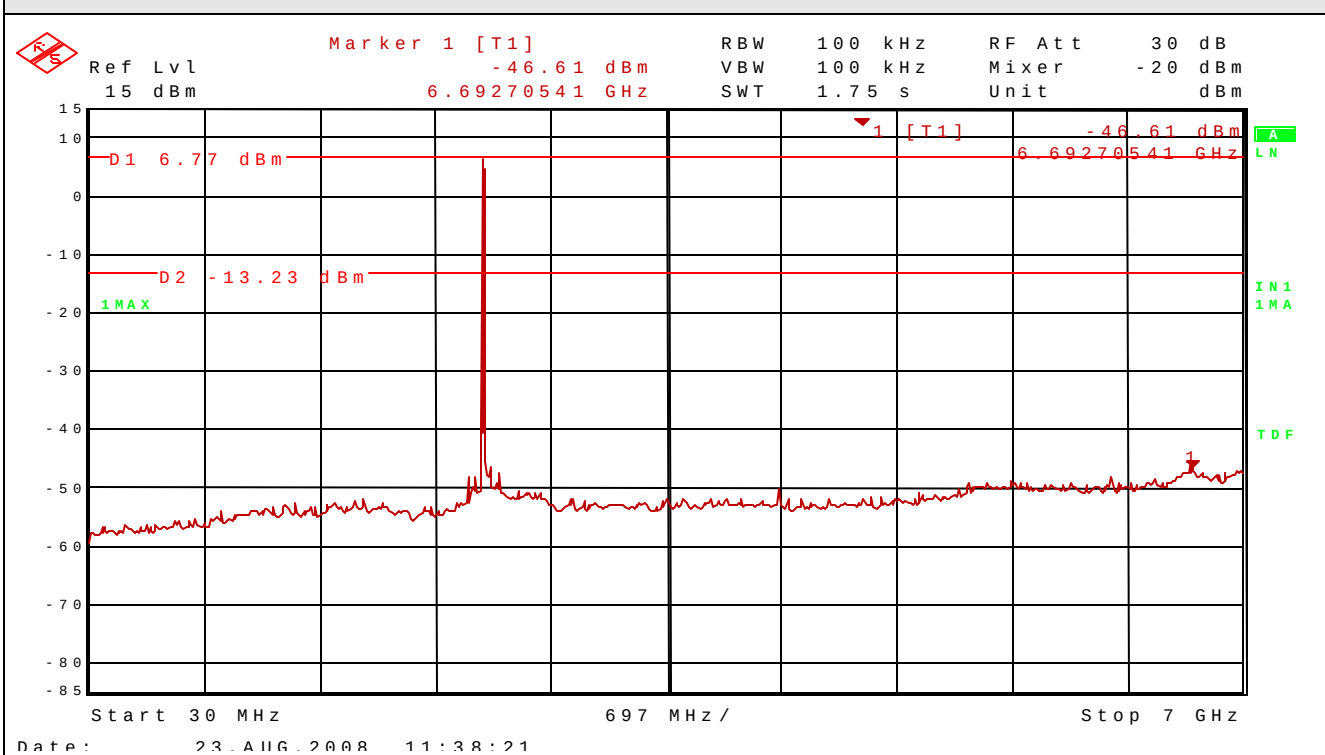


Figure 7. 802.11b, Lowest Channel, Spurious RF conducted emissions Measured plots.

802.11b: Lowest Channel (2412 MHz): 30 MHz ~ 7 GHz



802.11b: Lowest Channel (2412 MHz): 7 GHz ~ 25 GHz

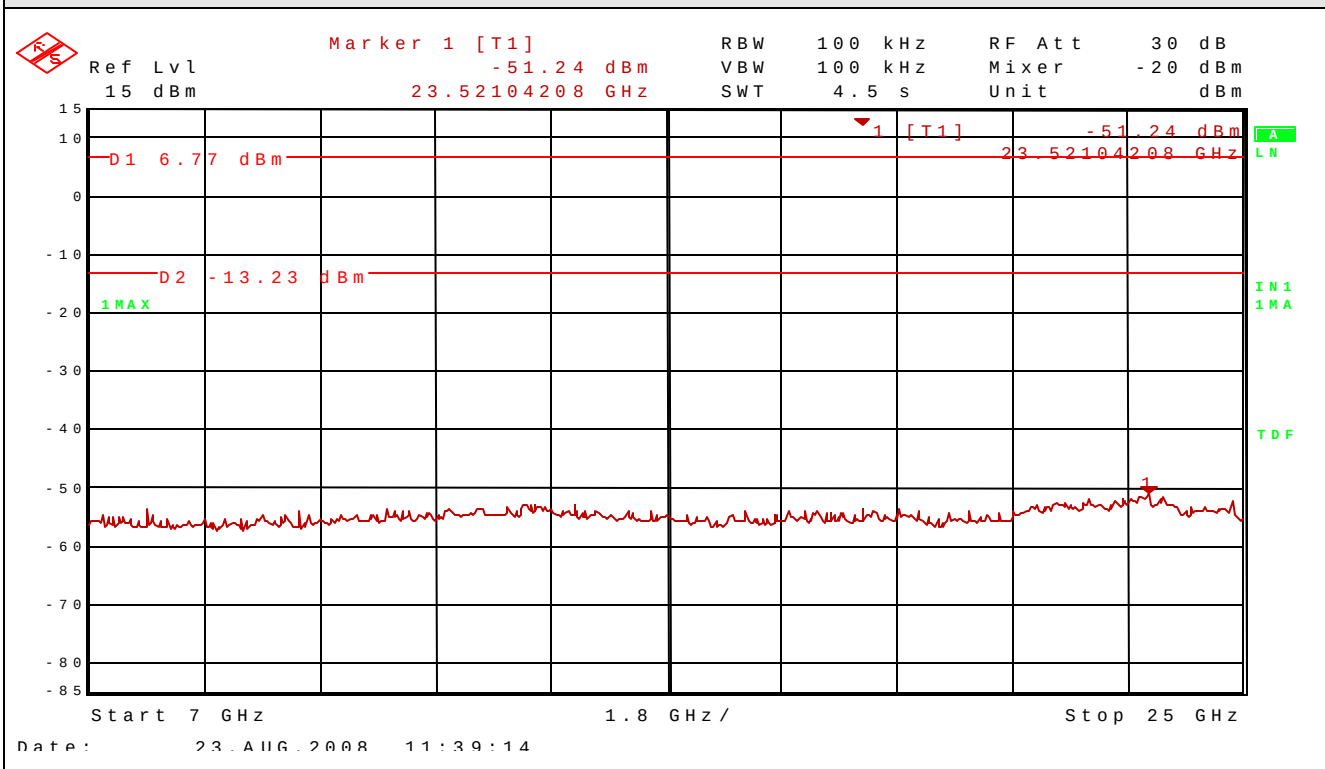
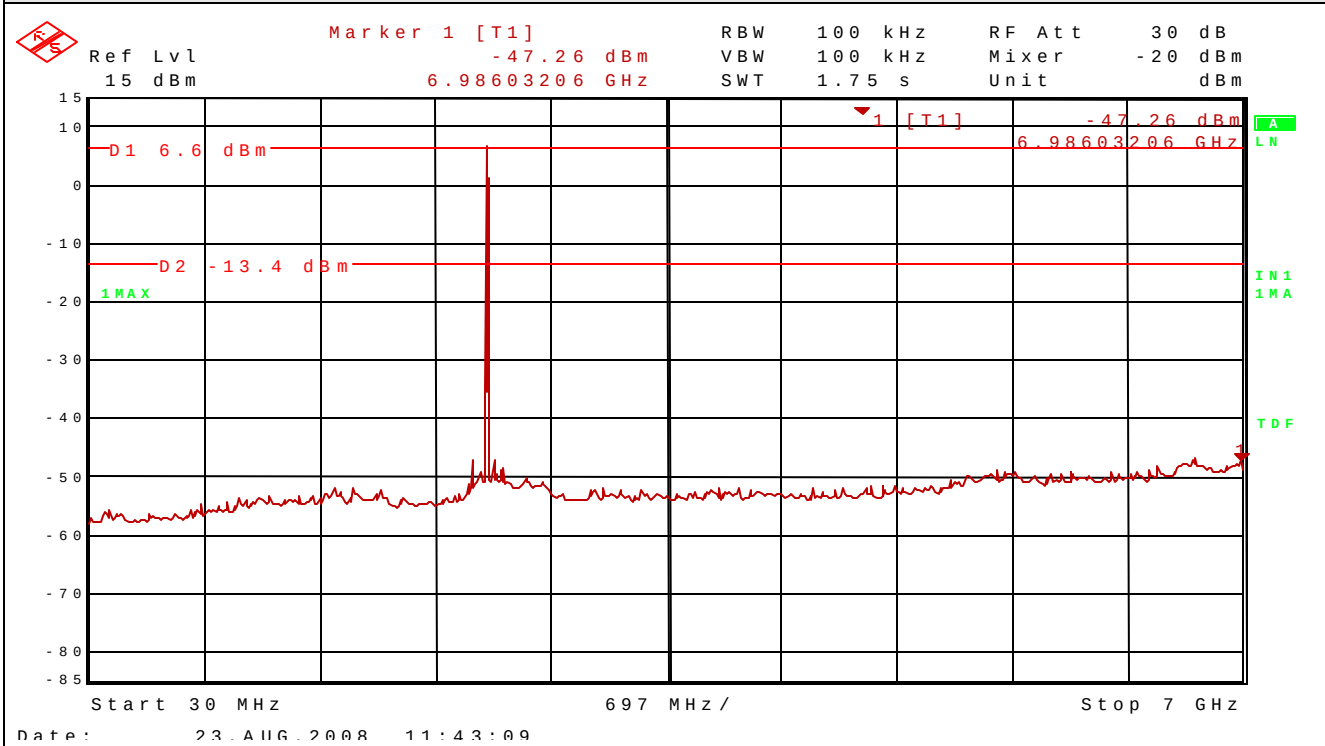


Figure 8. 802.11b Middle Channel, Spurious RF conducted emissions Measured plots.

802.11b: Middle Channel (2437 MHz): 30 MHz ~ 7 GHz



802.11b: Middle Channel (2437 MHz): 7 GHz ~ 25 GHz

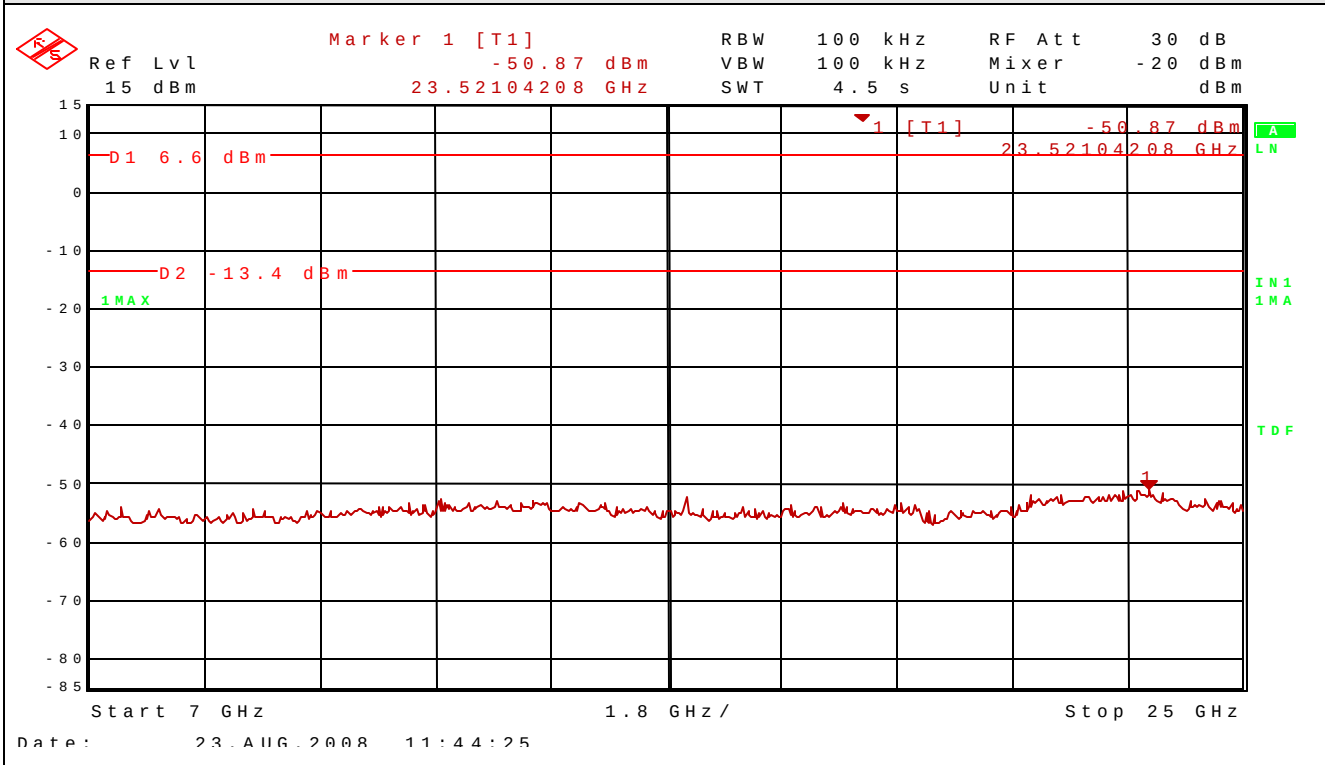


Figure 9. 802.11b Highest Channel, Spurious RF conducted emissions Measured plots.

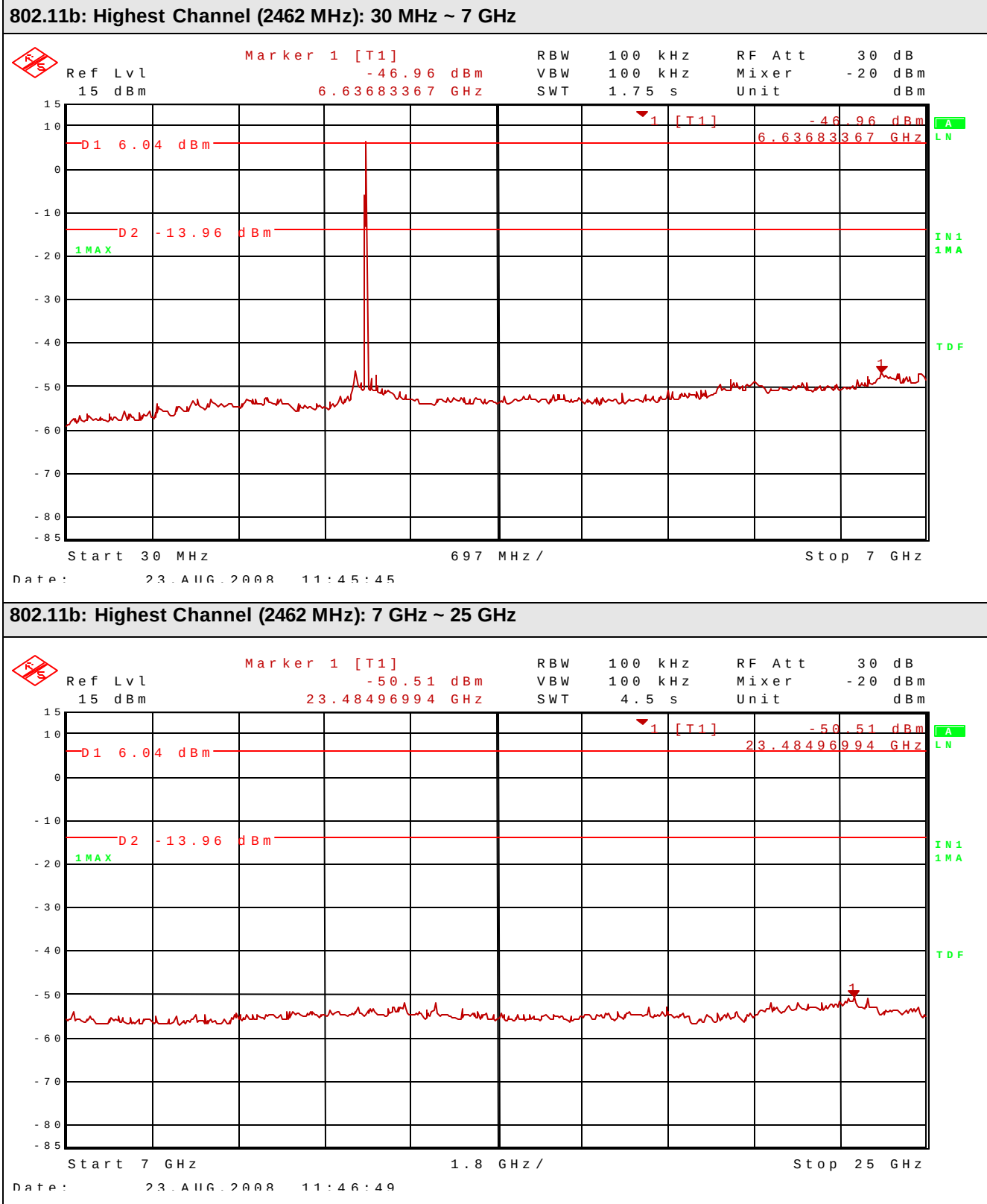
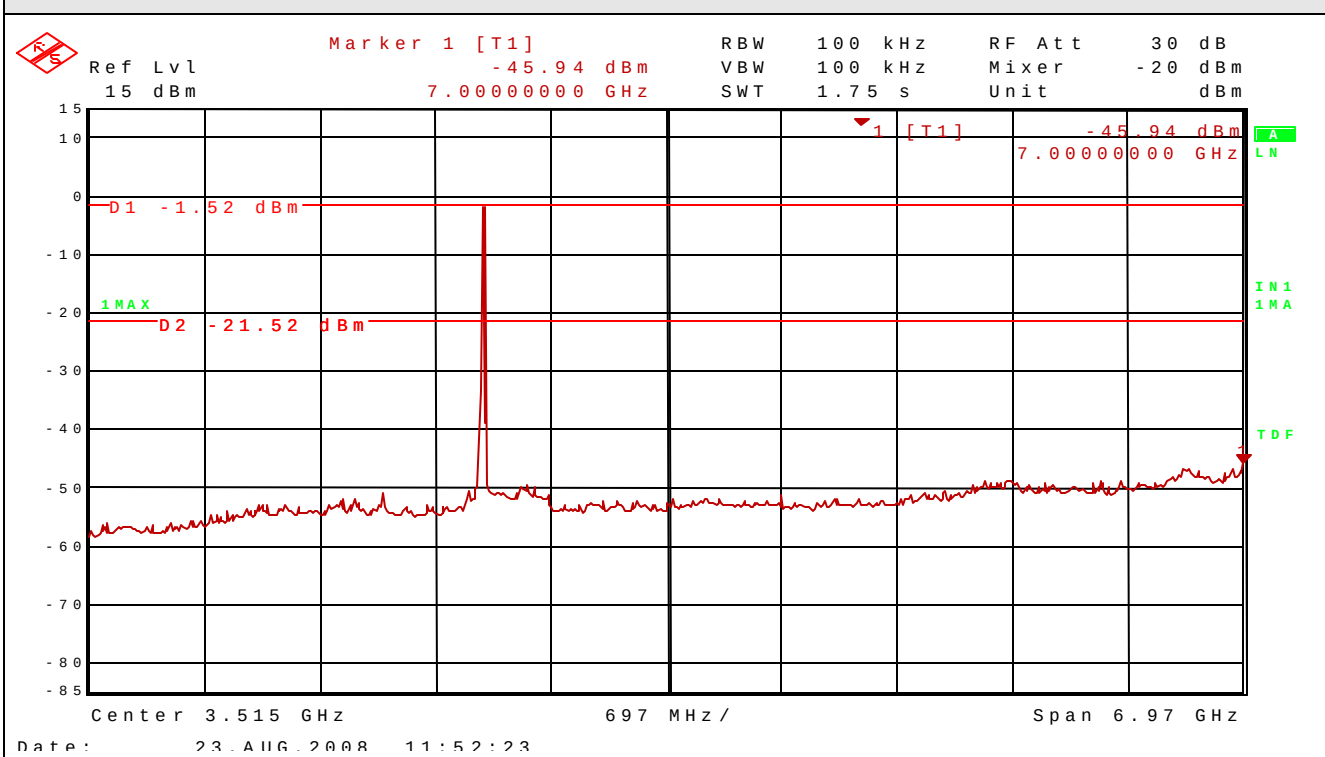


Figure 10. 802.11g Lowest Channel, Spurious RF conducted emissions Measured plots.

802.11g: Lowest Channel (2412 MHz): 30 MHz ~ 7 GHz



802.11g: Lowest Channel (2412 MHz): 7 GHz ~ 25 GHz

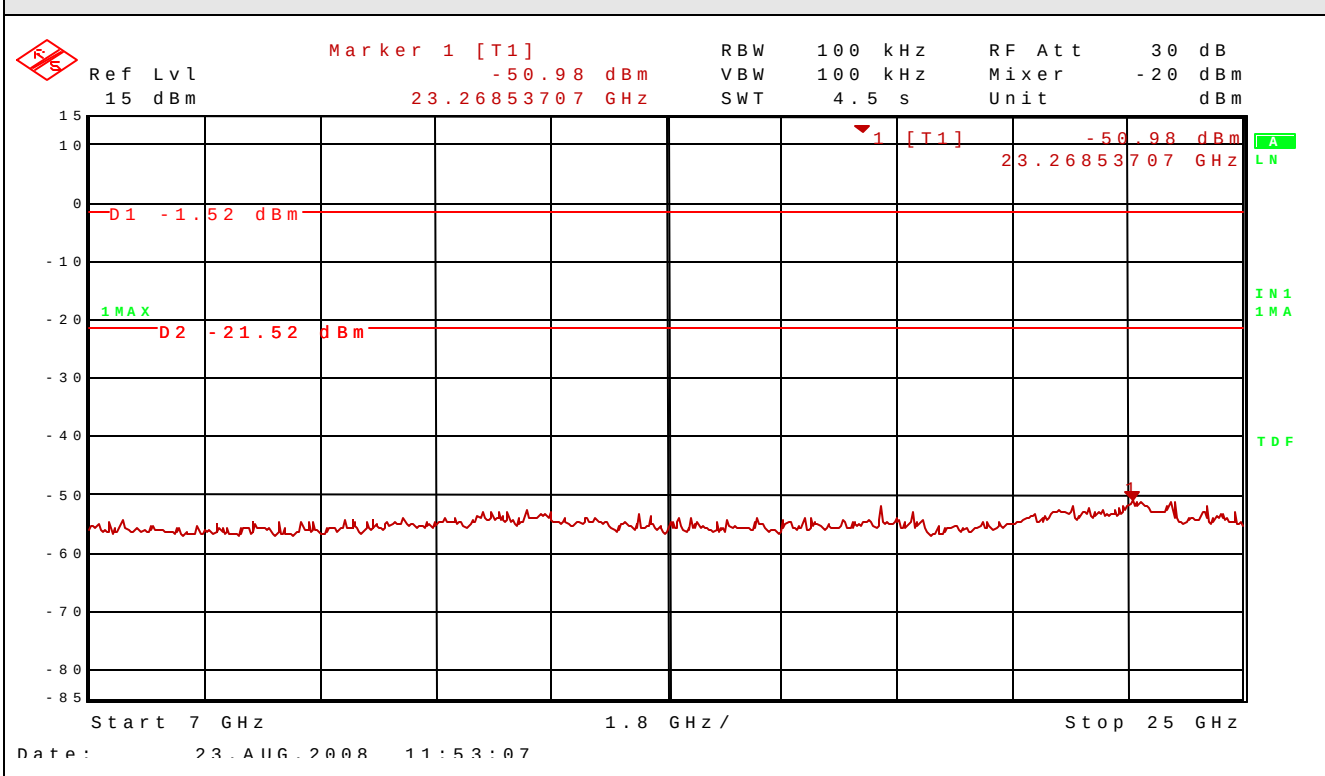
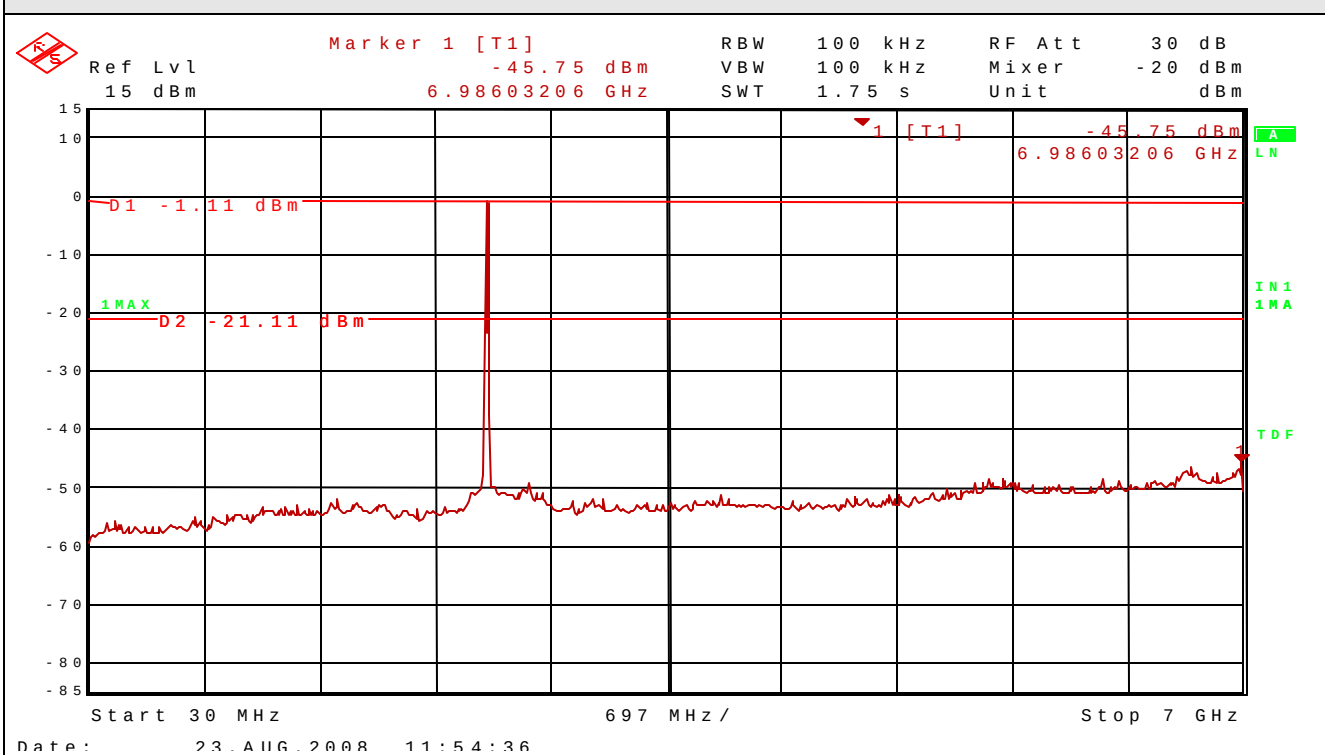


Figure 11. 802.11g Middle Channel, Spurious RF conducted emissions Measured plots.

802.11g: Middle Channel (2437 MHz): 30 MHz ~ 7 GHz



802.11g: Middle Channel (2437 MHz): 7 GHz ~ 25 GHz

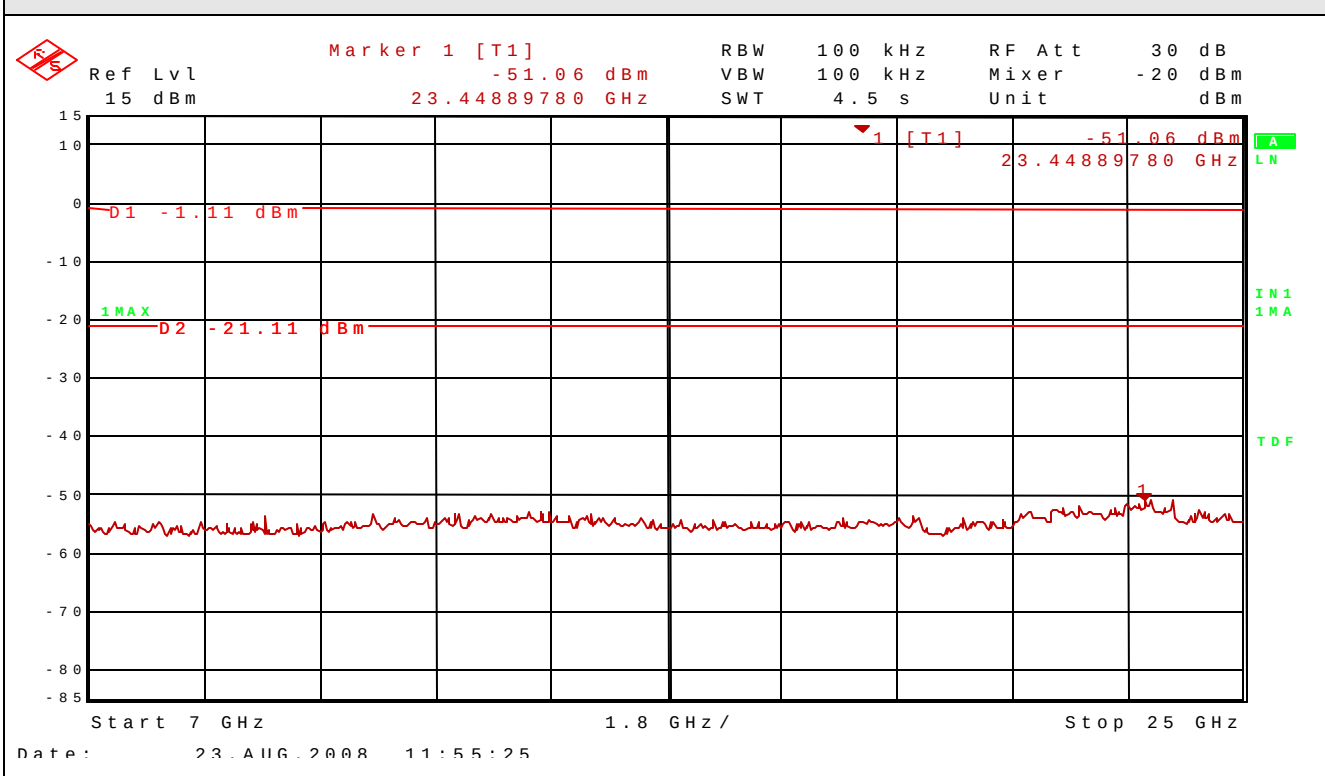
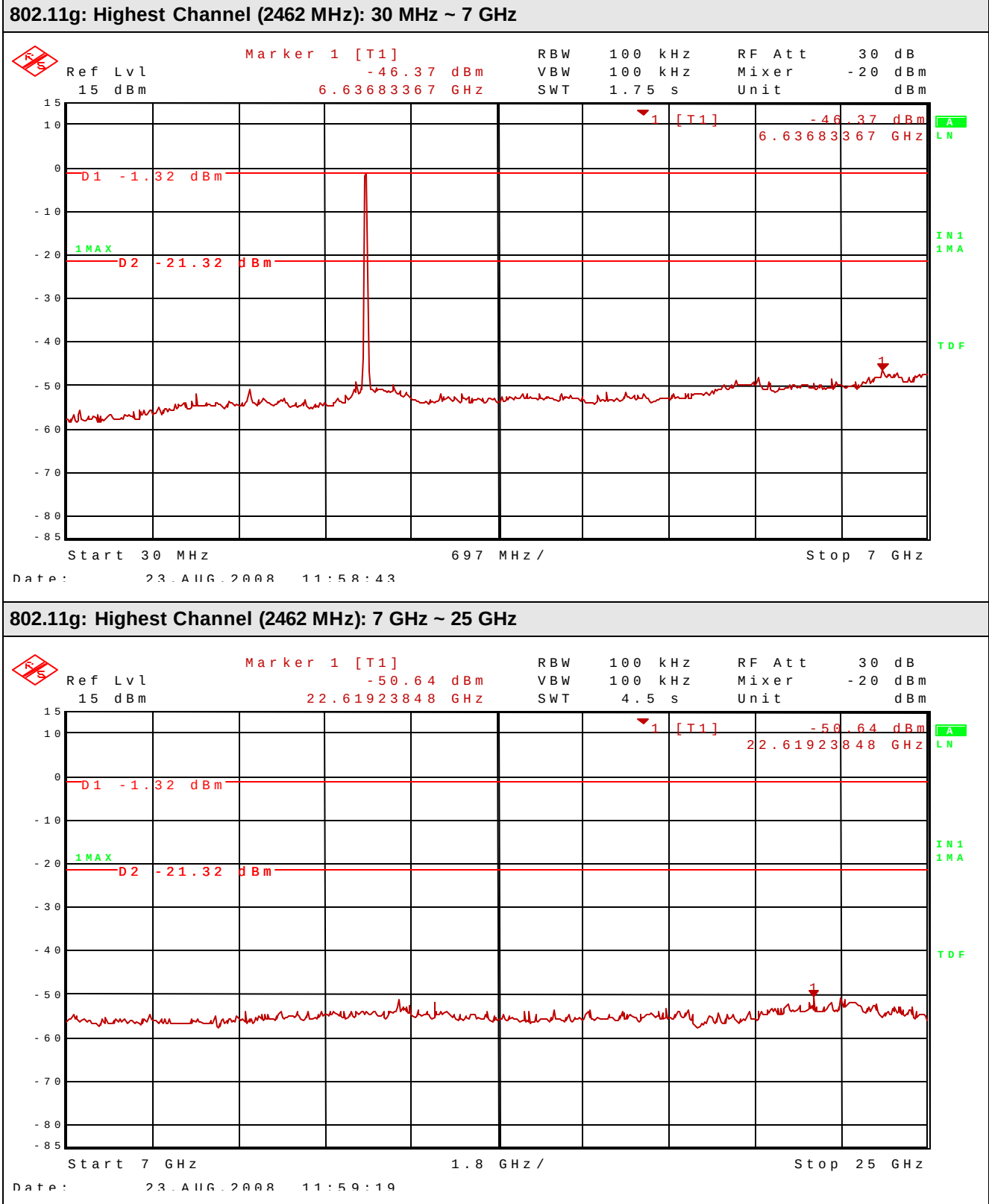


Figure 12. 802.11g Highest Channel, Spurious RF conducted emissions Measured plots.



9. RADIATED SPURIOUS, RESTRICTED BANDS AND BAND EDGE EMISSIONS

TEST: According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below		
Method	Measurements were made at Open area test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (Quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Parameters recorded during the test	Laboratory Ambient Temperature	23.0 °C
	Relative Humidity	55.0 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 960 MHz	3 meter measurement distance
	Above 960 MHz	
Limit of FCC 15.209(a)		
Frequency (MHz)	Field strength (µV/m @ 3m)	Field strength (dBµV/m @ 3m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0
Supplementary information: EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Y-plan. Therefore only test data of this Y-plan was used for radiated test.		
EUT Configuration Settings		
Power Interface Mode # (See Section 1.5)	EUT Operation Mode # (See 2.1)	Test Configurations Mode # (See Section 2.2)
2	1, 2	1

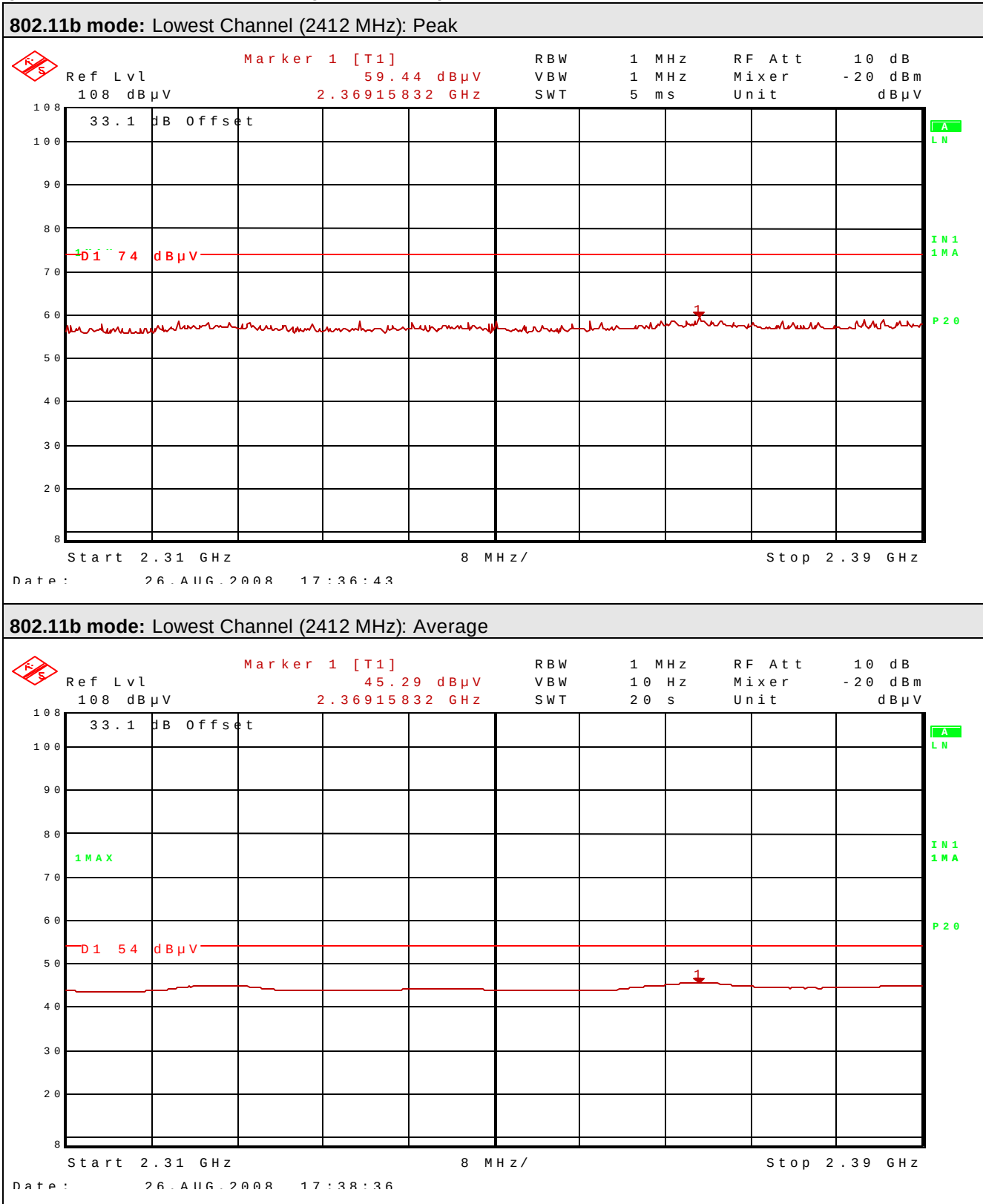
Project Number: 08CA44119
Model Number: WPU-7700

File Number E218836

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Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2008.02	2009.02
Pre-amplifier	HP	8447F	3113A05153	2008.07	2009.07
High Pass Filter	Wainwright	WHKX3.0/18G	8	2008.07	2009.07
TRILOG Broadband Antenna	Schwarzbeck	VULB9168	9168-189	2008.09	2008.09
Horn Antenna	EMCO	3115	00056768	2008.06	2009.06
Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2008.07	2009.07

Figure 13. 802.11b mode, Band Edge Measured plots.



802.11b mode: Highest Channel (2462 MHz): Peak

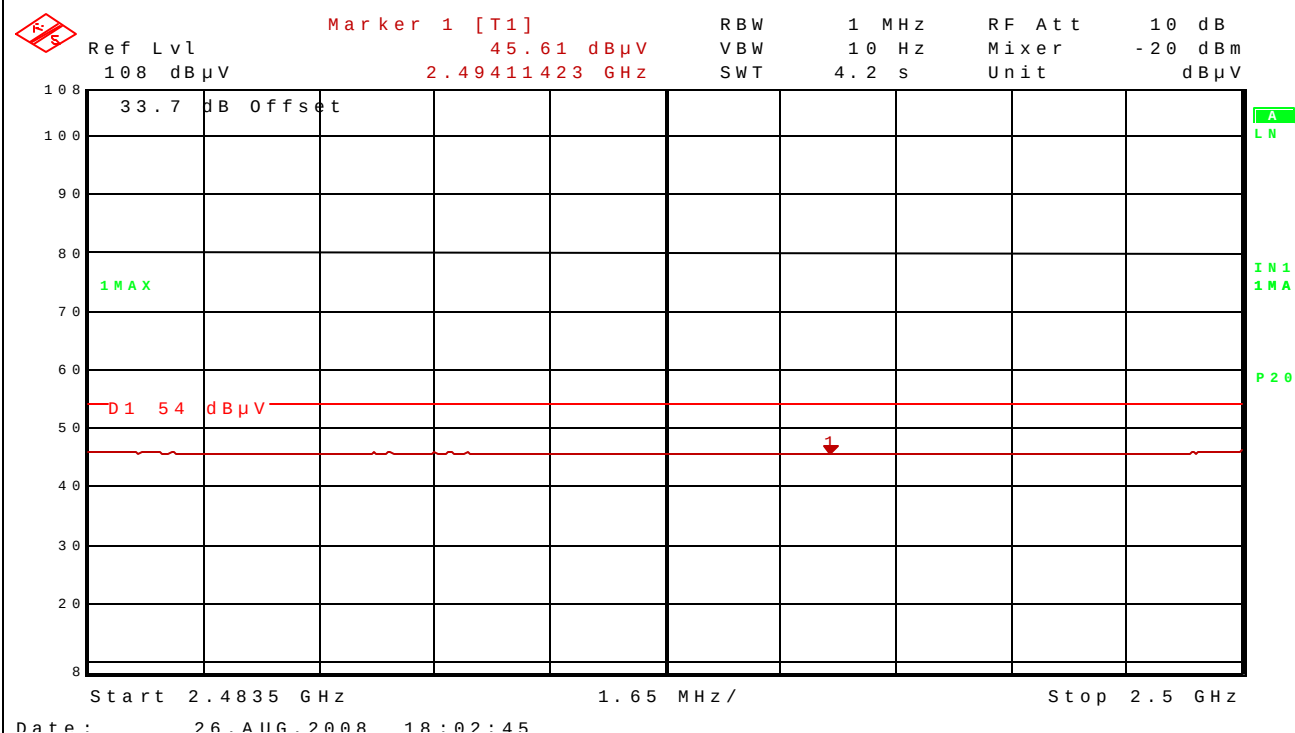
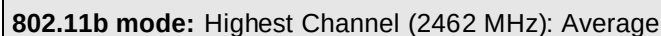


Figure 15. 802.11g Mode, Band Edge Measured plots.

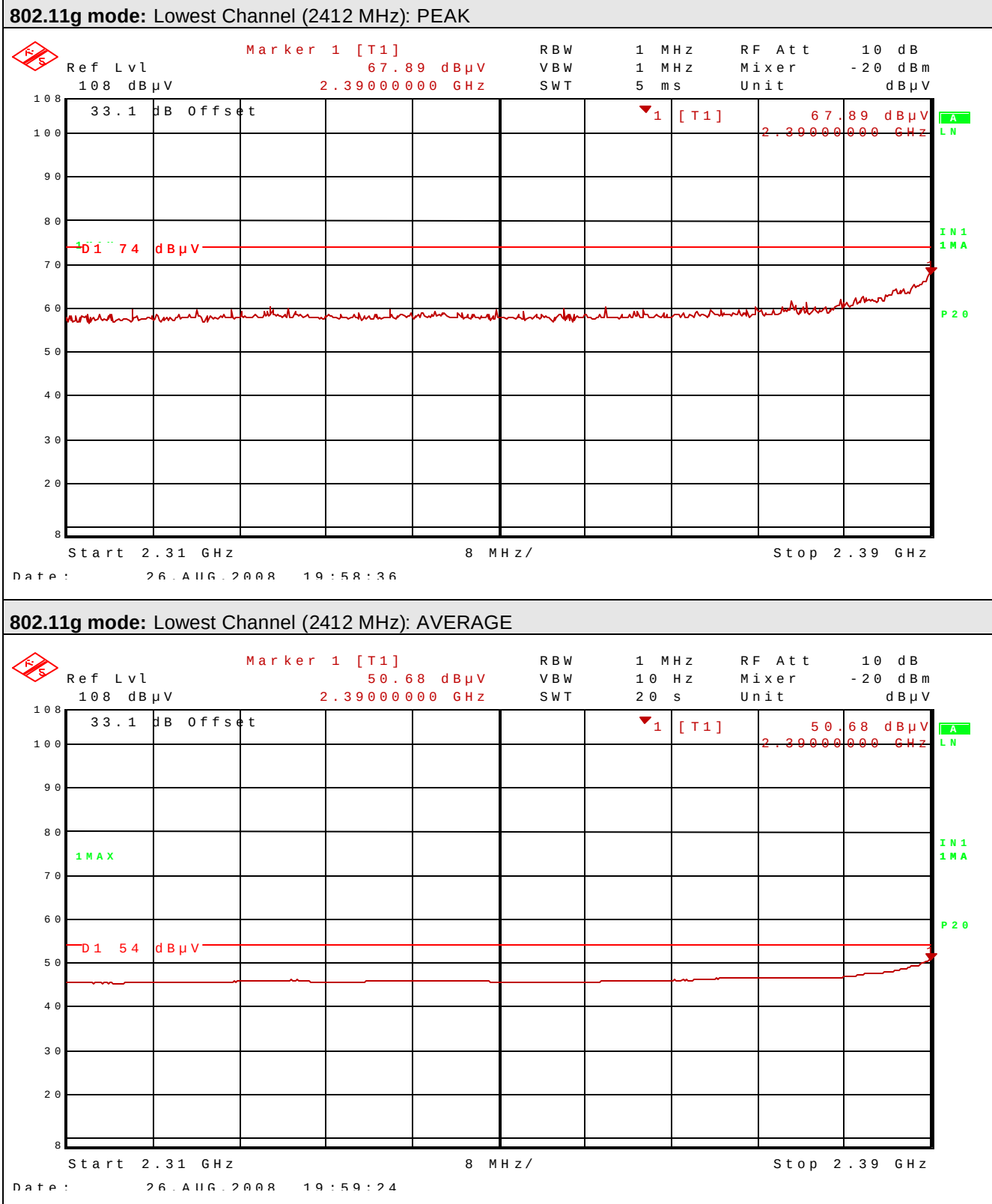
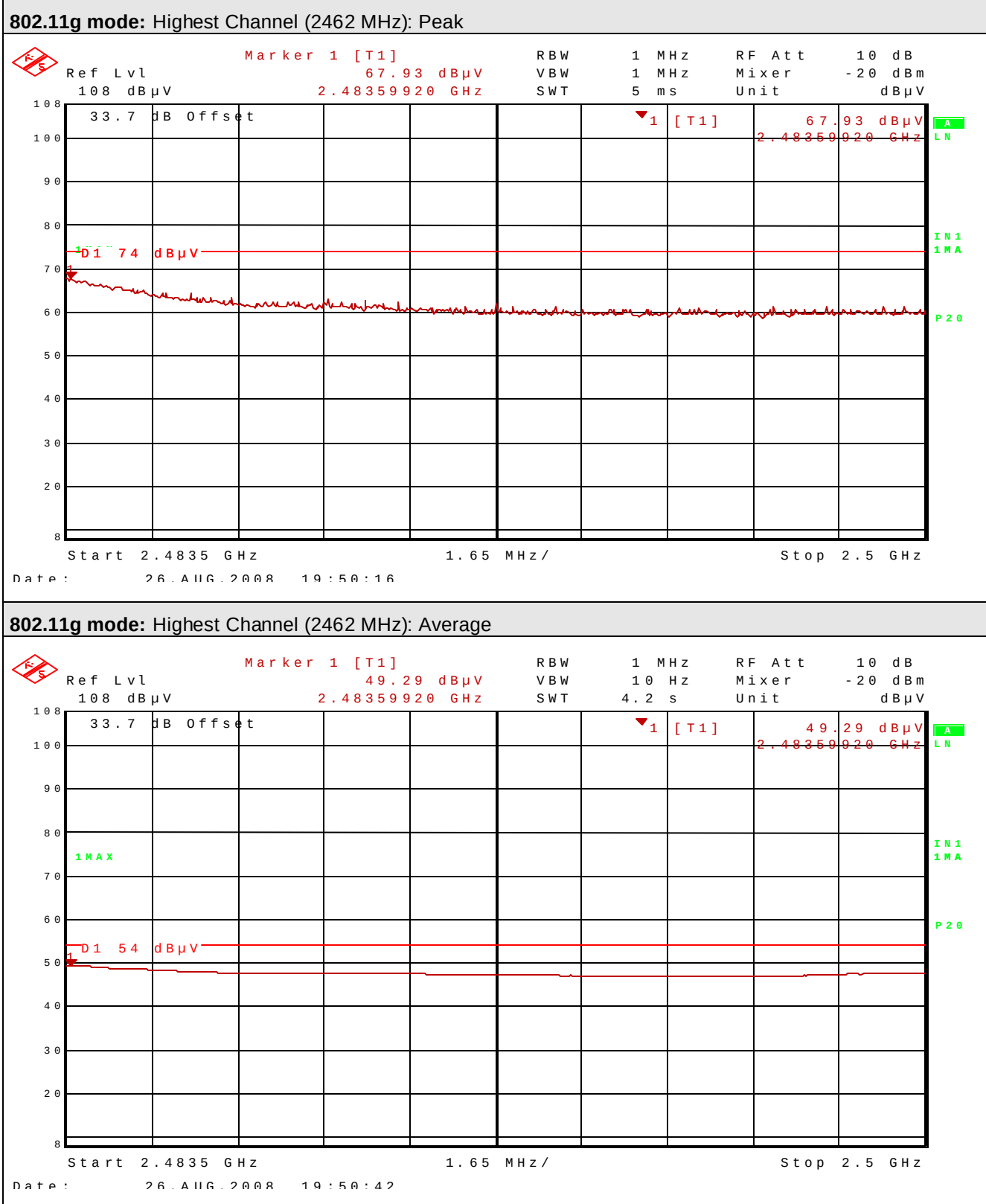


Figure 16. 802.11g Mode, Band Edge Measured plots.



**Table 4. Measured values of the Field strength of Radiated spurious emission
Operating 802.11b mode**

Quasi-peak data, emissions below 1000 MHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[Degree]	[dB(μV)]	[dB]	[dB]	[dB(1/m)]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1. The test results were under required limit with 20 dB margins or more.
2. No Emission was detected over all frequency.

**Table 5. Measured values of the Field strength of Radiated spurious emission,
Operating 802.11b mode**

Average data, emissions above 1000 MHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[Degree]	[dB(μV)]	[dB]	[dB]	[dB(1/m)]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Channel 1												
2412.00	1000	H	1.98	191	68.63	-	-	28.16	4.96	101.75	-	-
4824.00	1000	V	1.54	228	8.90	0.00	0.9	33.74	7.04	50.58	54.00	3.42
Channel 6												
2437.00	1000	H	1.00	189	68.28	-	-	28.16	4.96	101.40	-	-
4874.00	1000	V	1.77	187	9.10	0.00	0.9	33.83	7.16	50.99	54.00	3.01
Channel 11												
2462.00	1000	H	1.77	8	69.81	-	-	28.52	5.22	103.55	-	-
4924.00	1000	V	1.61	49	7.54	0.00	0.9	33.83	7.16	49.43	54.00	4.57

Margin (dB) = Limit – Actual
[Actual = Reading – Amp Gain + Attenuator + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Insertion Loss of HPF, AF/CL = Antenna Factor and Cable Loss
3. Operating Frequency was measured without HPF and amplifier.

**Table 6. Measured values of the Field strength of spurious emission (Radiated),
Operating 802.11b mode**

Peak data, emissions above 1000 MHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[Degree]	[dB(μV)]	[dB]	[dB]	[dB(1/m)]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Channel 1												
2412.00	1000	H	1.98	191	76.00	-	-	28.16	4.96	109.12	-	-
4824.00	1000	H	1.37	214	18.09	0.00	0.9	33.74	7.04	59.77	74.00	14.23
Channel 6												
2437.00	1000	H	1.00	189	75.62	-	-	28.16	4.96	108.74	-	-
4874.00	1000	V	1.77	187	17.34	0.00	0.9	33.83	7.16	59.23	74.00	14.77
Channel 11												
2462.00	1000	H	1.77	8	77.19	-	-	28.52	5.22	110.93	-	-
4924.00	1000	V	1.61	49	17.18	0.00	0.9	33.83	7.16	59.07	74.00	14.93
Margin (dB) = Limit – Actual [Actual = Reading – Amp Gain + Attenuator + AF + CL] 1. H = Horizontal, V = Vertical Polarization 2. ATT = Insertion Loss of HPF, AF/CL = Antenna Factor and Cable Loss 3. Operating Frequency was measured without HPF and amplifier.												

**Table 7. Measured values of the Field strength of Radiated spurious emission.
Operating 802.11g mode**

Quasi-peak data, emissions below 1000 MHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[Degree]	[dB(μV)]	[dB]	[dB]	[dB(1/m)]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1. The test results were under required limit with 20 dB margins or more.
2. No Emission was detected over all frequency.

**Table 8. Measured values of the Field strength of Radiated spurious emission,
Operating 802.11g mode**

Average data, emissions above 1000 MHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[Degree]	[dB(μV)]	[dB]	[dB]	[dB(1/m)]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Channel 1												
2412.00	1000	H	1.46	82	63.52	-	-	28.16	4.96	96.64	-	-
4824.00	1000	V	1.55	224	8.72	0.00	0.9	33.74	7.04	50.40	54.00	3.60
Channel 6												
2437.00	1000	H	1.93	247	62.78	-	-	28.16	4.96	95.90	-	-
4874.00	1000	V	1.77	187	8.97	0.00	0.9	33.83	7.16	50.86	54.00	3.14
Channel 11												
2462.00	1000	H	1.69	91	61.96	-	-	28.52	5.22	95.70	-	-
4924.00	1000	V	1.64	47	7.73	0.00	0.9	33.83	7.16	49.62	54.00	4.38

Margin (dB) = Limit – Actual
[Actual = Reading – Amp Gain + Attenuator + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Insertion Loss of HPF, AF/CL = Antenna Factor and Cable Loss
3. Operating Frequency was measured without HPF and amplifier.

Table 9. Measured values of the Field strength of Radiated spurious emission (Radiated), Operating 802.11g mode

Peak data, emissions above 1000 MHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[Degree]	[dB(μV)]	[dB]	[dB]	[dB(1/m)]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Channel 1												
2412.00	1000	H	1.98	191	76.00	-	-	28.16	4.96	109.12	-	-
4824.00	1000	H	1.37	214	18.09	0.00	0.9	33.74	7.04	59.77	74.00	14.23
Channel 6												
2437.00	1000	H	1.00	189	75.62	-	-	28.16	4.96	108.74	-	-
4874.00	1000	V	1.77	187	17.34	0.00	0.9	33.83	7.16	59.23	74.00	14.77
Channel 11												
2462.00	1000	H	1.77	8	77.19	-	-	28.52	5.22	110.93	-	-
4924.00	1000	V	1.61	49	17.18	0.00	0.9	33.83	7.16	59.07	74.00	14.93
Margin (dB) = Limit – Actual [Actual = Reading – Amp Gain + Attenuator + AF + CL] 1. H = Horizontal, V = Vertical Polarization 2. ATT = Insertion Loss of HPF, AF/CL = Antenna Factor and Cable Loss 3. Operating Frequency was measured without HPF and amplifier.												

10. PEAK POWER SPECTRAL DENSITY

TEST: According to 15.247(e) of FCC Part 15, for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmission.					
Method	The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time=span/3kHz. The power spectral density was measured and recorded. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.				
Parameters recorded during the test			Laboratory Ambient Temperature		10 to 40 °C
			Relative Humidity		10 to 90 %
Fully configured sample scanned over the following frequency range			2412 MHz to 2462 MHz		Antenna Port
EUT Configuration Settings:					
Power Interface Mode # (See Section 1.5)			EUT Operation Mode # (See 2.1)		Test Configurations Mode # (See Section 2.2)
1			1, 2		1
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2008.02	2009.02
Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2008.07	2009.07

Table 10. Measured values of the Peak Power Spectral Density

Modulation	Operating frequency	Transfer Rate	Reading (PPSD)	Limit
802.11b	2412 MHz	11 Mbps	-7.25 dBm	8.0 dBm
	2437 MHz	11 Mbps	-6.88 dBm	8.0 dBm
	2462 MHz	11 Mbps	-7.17 dBm	8.0 dBm
802.11g	2412 MHz	12 Mbps	-13.51 dBm	8.0 dBm
	2437 MHz	12 Mbps	-14.46 dBm	8.0 dBm
	2462 MHz	12 Mbps	-15.27 dBm	8.0 dBm

Figure 17. Plot of the Peak Power Spectral Density, Lowest Channel

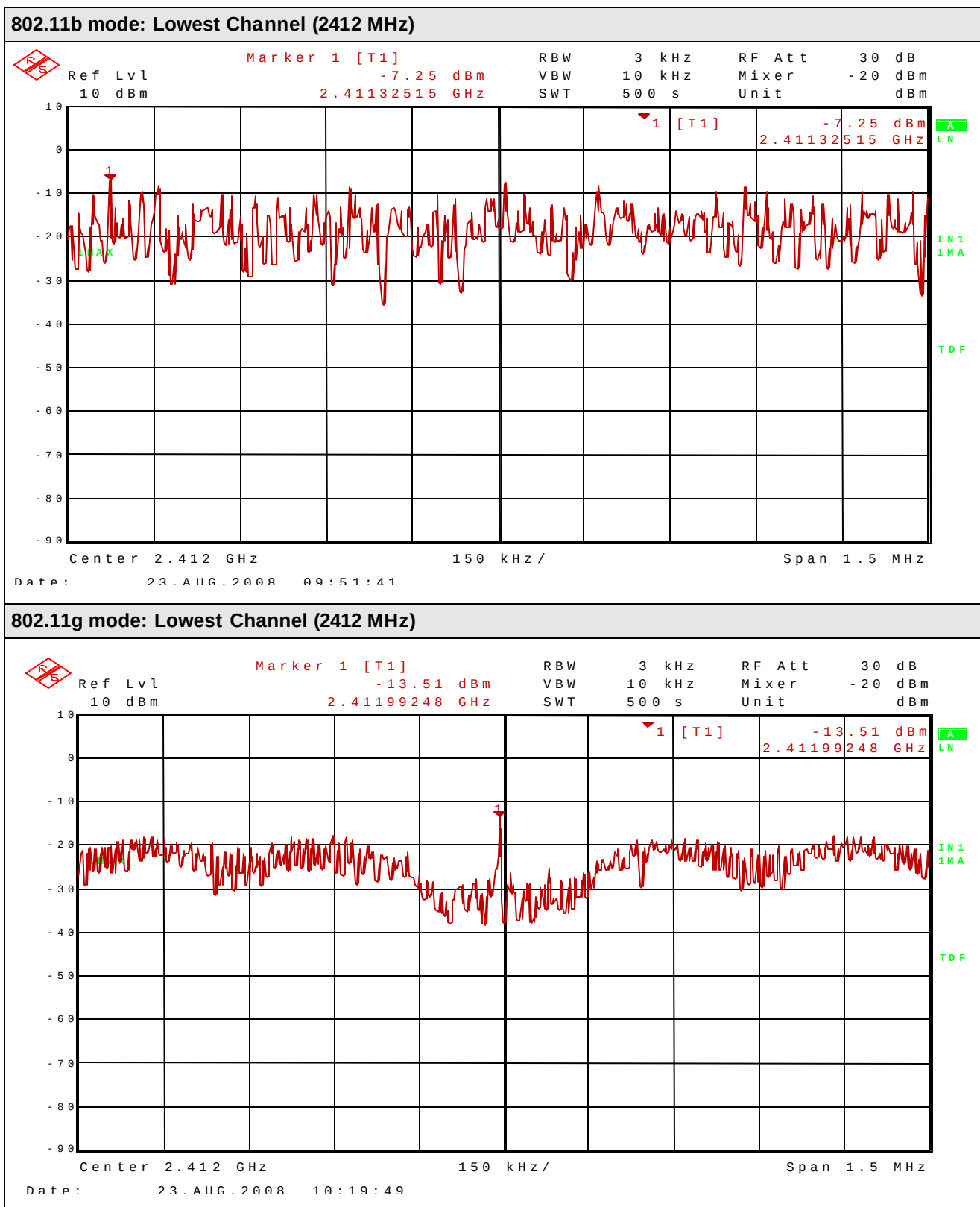


Figure 18. Plot of the Peak Power Spectral Density, Middle Channel

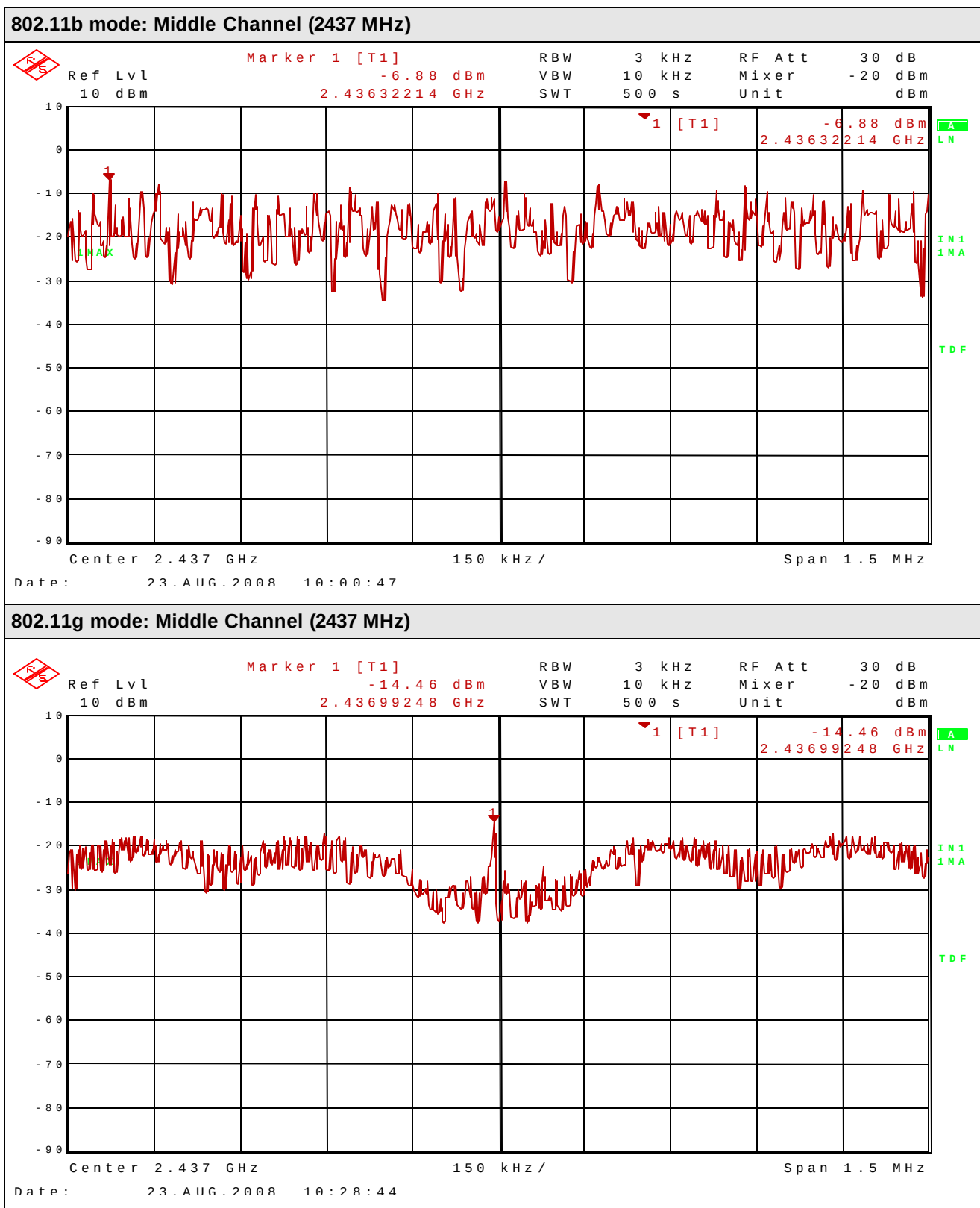
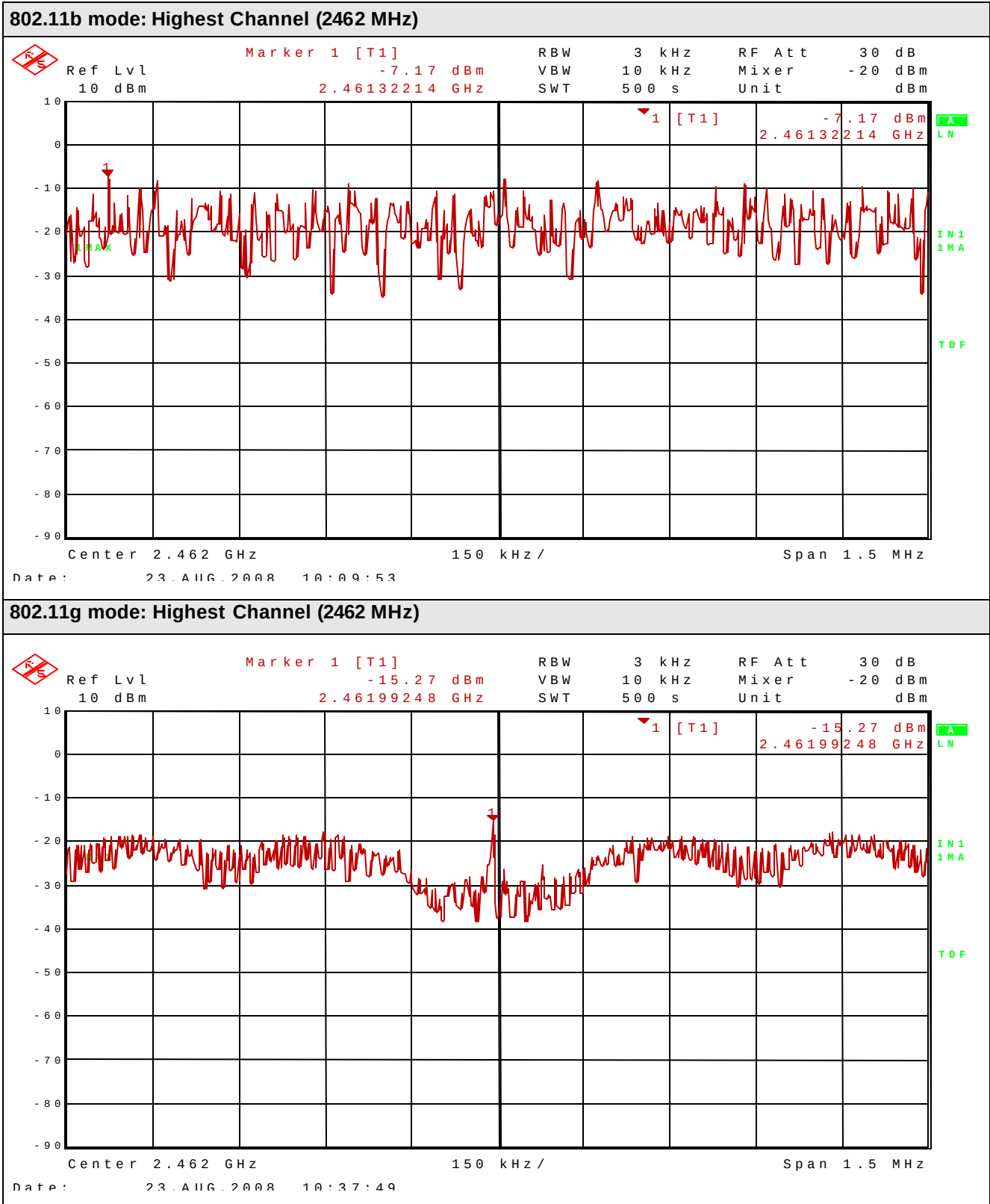


Figure 19. Plot of the Peak Power Spectral Density, Highest Channel



11.CONDUCTED EMISSION TEST

TEST: Limits of mains terminal disturbance voltage					
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.				
Parameters recorded during the test		Laboratory Ambient Temperature		22.3 °C	
		Relative Humidity		48.0 %	
-		Frequency range on each side of line		Measurement Point	
Fully configured sample scanned over the following frequency range		150 kHz to 30 MHz		AC Mains	
Limits:					
Frequency (MHz)	Limit (dBµV)				
	Quasi-Peak	Result	Average	Result	
0.15 to 0.50	66 to 56	Pass	56 to 49	Pass	
0.50 to 5.0	56	Pass	46	Pass	
5.0 to 30	60	Pass	50	Pass	
Note: Decreases with the logarithm of the frequency.					
EUT Configuration Settings:					
Power Interface Mode # (See Section 1.5)		EUT Operation Mode # (See 2.1)		Test Configurations Mode # (See Section 2.2)	
2		802.11b and 802.11g Mode		3	
Conducted Emissions Test Equipment:					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
LISN	Rohde&Schwarz	ESH2-Z5	834549/011	2008.07	2009.07
EMI Test Receiver	Rohde&Schwarz	ESHS10	862970/019	2008.07	2009.07

Figure 20. Conducted Emissions Graph of 802.11b Mode

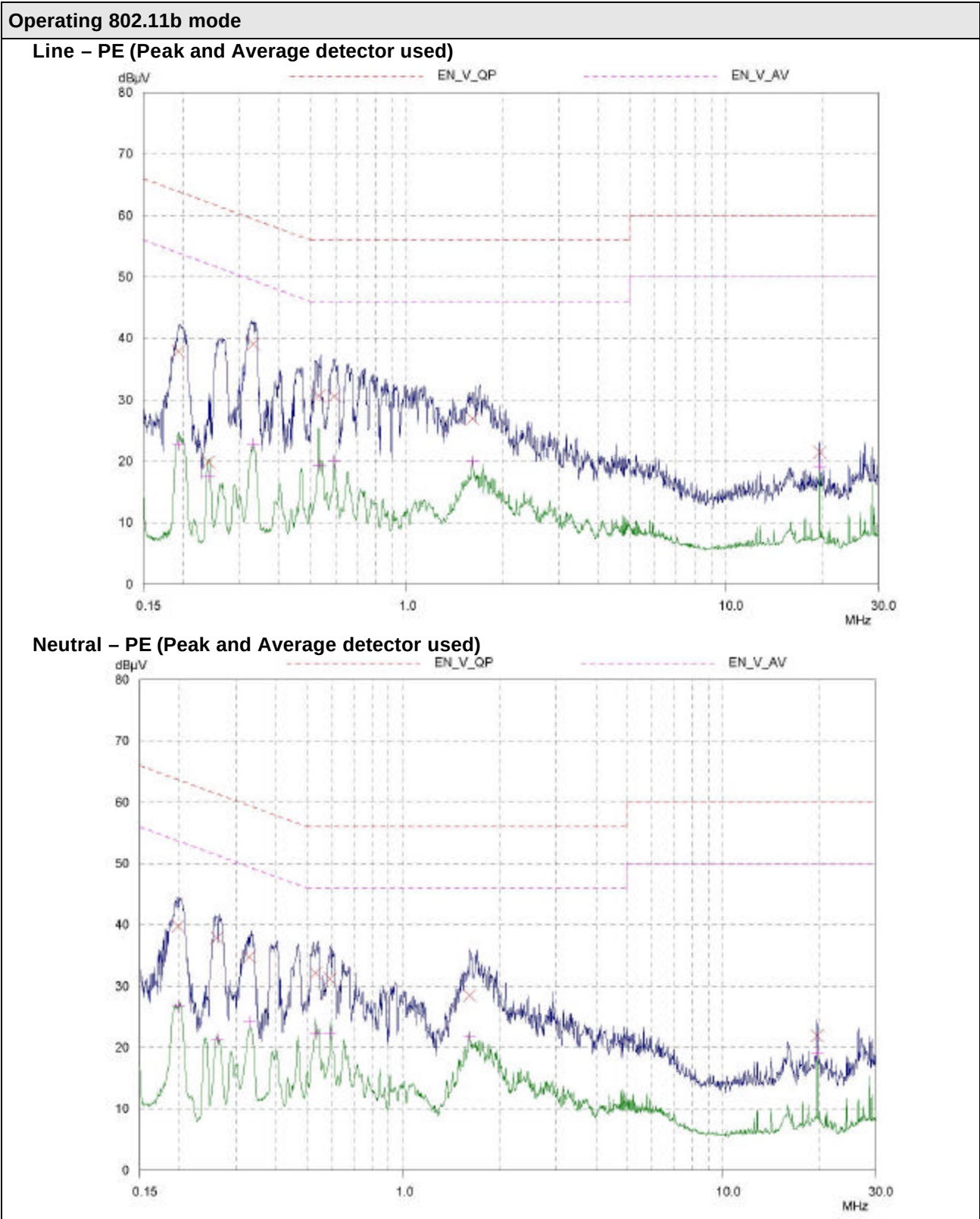


Table 11. Measured values of the AC Power Line Conducted Emissions, Operating 802.11b mode

Quasi -peak Data							
Frequency [MHz]	Reading [dBμV]	L / N	CF [dB]	CL [dB]	Actual [dBμV]	Limit [dBμV]	Margin [dB]
19.710	21.92	N	0.55	0.31	22.78	60.00	37.22
1.613	28.49	N	0.14	0.07	28.70	56.00	27.30
0.592	31.22	N	0.12	0.05	31.39	56.00	24.61
0.534	32.16	N	0.12	0.05	32.33	56.00	23.67
0.332	39.08	L	0.12	0.02	39.22	59.40	20.18
0.262	37.86	N	0.14	0.02	38.02	61.36	23.34
0.240	19.88	L	0.12	0.02	20.02	62.09	42.07
0.198	39.81	N	0.14	0.02	39.97	63.71	23.74
Average Data							
0.198	26.77	N	0.14	0.02	26.93	53.71	26.78
0.240	17.46	L	0.12	0.02	17.60	52.09	34.49
0.262	21.33	N	0.14	0.02	21.49	51.36	29.87
0.331	24.14	N	0.14	0.02	24.30	49.44	25.14
0.534	22.38	N	0.12	0.05	22.55	46.00	23.45
0.592	22.38	N	0.12	0.05	22.55	46.00	23.45
1.613	21.67	N	0.14	0.07	21.88	46.00	24.12
19.710	19.14	L	0.67	0.31	20.12	50.00	29.88
Margin (dB) = Limit – Actual [Actual = Reading + CF + CL] L/N = LINE / NEUTRAL CF/CL = Correction Factor and Cable Loss							

Figure 21. Conducted Emissions Graph of 802.11g Mode

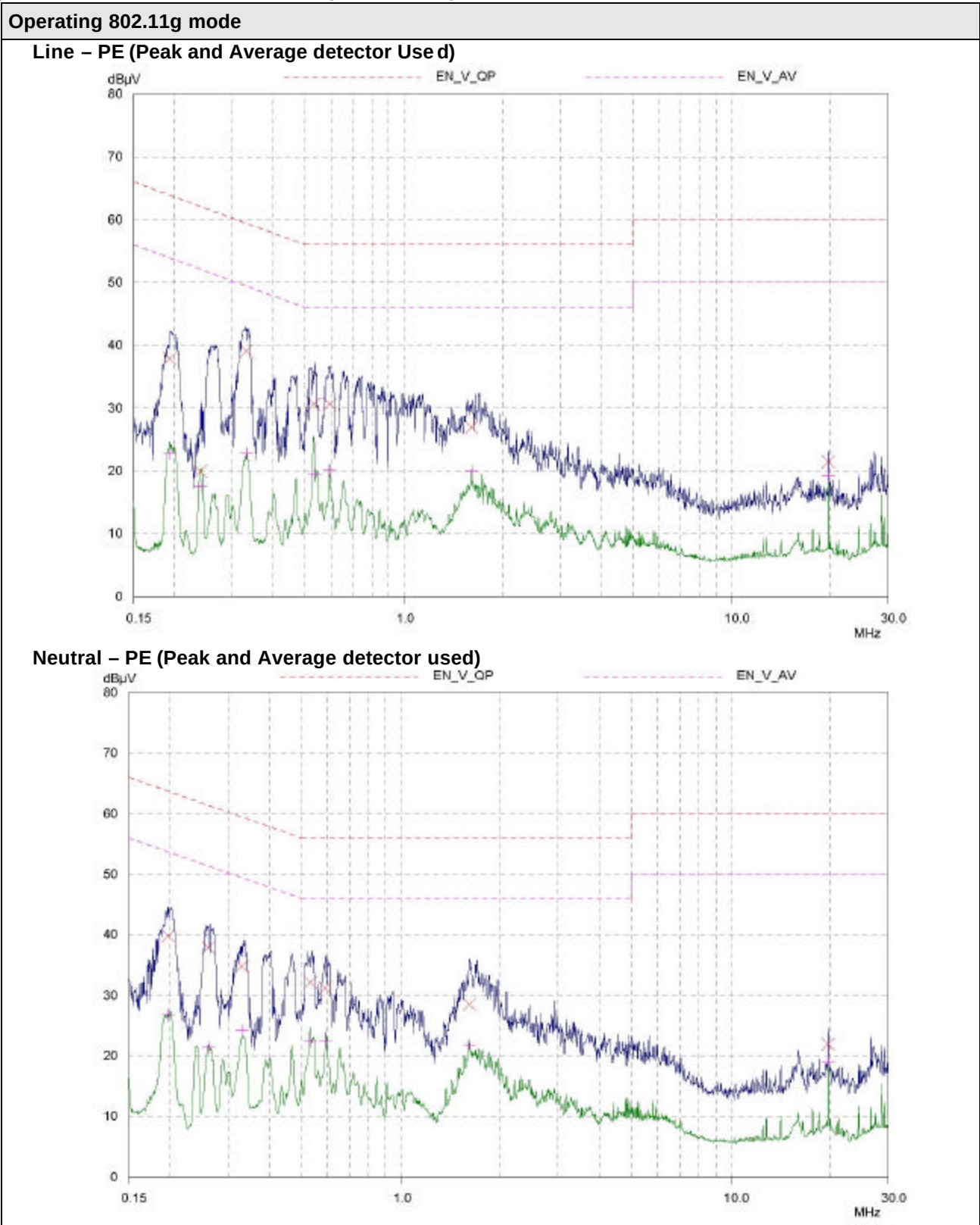


Table 12. Measured values of the AC Power Line Conducted Emissions, Operating 802.11g mode

Quasi -peak Data							
Frequency [MHz]	Reading [dBμV]	L / N	CF [dB]	CL [dB]	Actual [dBμV]	Limit [dBμV]	Margin [dB]
0.195	39.24	N	0.14	0.02	39.40	63.81	24.41
0.261	37.35	N	0.14	0.02	37.51	61.39	23.88
0.328	40.05	L	0.12	0.02	40.19	59.50	19.31
0.466	31.49	L	0.12	0.02	31.63	56.58	24.95
0.532	33.50	N	0.12	0.05	33.67	56.00	22.33
0.540	29.26	L	0.13	0.05	29.44	56.00	26.56
0.597	32.06	N	0.12	0.05	32.23	56.00	23.77
1.620	26.56	N	0.14	0.07	26.77	56.00	29.23
19.710	21.92	N	0.55	0.31	22.78	60.00	37.22
Average Data							
0.195	26.45	N	0.14	0.02	26.61	53.81	27.20
0.261	20.92	N	0.14	0.02	21.08	51.39	30.31
0.327	25.23	N	0.14	0.02	25.39	49.53	24.14
0.466	15.85	L	0.12	0.02	15.99	46.58	30.59
0.532	20.51	N	0.12	0.05	20.68	46.00	25.32
0.540	16.75	L	0.13	0.05	16.93	46.00	29.07
0.597	20.88	N	0.12	0.05	21.05	46.00	24.95
1.620	18.52	N	0.14	0.07	18.73	46.00	27.27
19.710	19.45	N	0.55	0.31	20.31	50.00	29.69
Margin (dB) = Limit – Actual [Actual = Reading + CF + CL] L/N = LINE / NEUTRAL CF/CL = Correction Factor and Cable Loss							

12. APPENDIX A

MEASUREMENT UNCERTAINTIES

Measurement Item	Combined Standard Uncertainty U_c	Expanded Uncertainty $U = k \cdot U_c$ ($k = 1.96$)
Conducted RF power	± 1.49 dB	± 2.92 dB
Radiated disturbance	± 2.30 dB	± 4.51 dB
Conducted disturbance	± 1.96 dB	± 3.84 dB