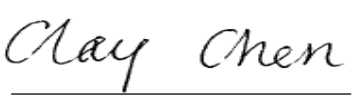
EMC
TEST REPORT

Report No. : EME-040603
Model No. : WR404
Issued Date : Aug. 4, 2004

Applicant : AboCom Systems, Inc.
1F, No. 21, Yanfa 2nd Rd., SBIP, HsinChu City 300, Taiwan

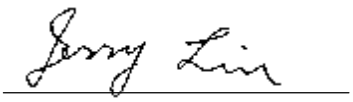
Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan

Project Engineer



Clay Chen

Reviewed By



Jerry Liu

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Summary of Tests

802.11g Wireless VPN Router -Model: WR404
FCC ID: MQ4WR404

Test	Reference	Results
Minimum 6dB Bandwidth test	15.247(a)(2)	Complies
Maximum Output Power test	15.247(b)	Complies
Radiated Spurious Emission test	15.205, 15.209	Complies
Power Spectrum Density test	15.247(d)	Complies
Power Line Conducted Emission test	15.207	Complies

1. General information

1.1 Identification of the EUT

Applicant	: AboCom Systems, Inc.
Product	: 802.11g Wireless VPN Router
Model No.	: WR404
FCC ID.	: MQ4WR404
Frequency Range	: 2400 MHz to 2483.5MHz
Channel Number	: 11 Channels
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: DSSS, OFDM
Rated Power	: 120Vac, 60Hz with Adapter
Power Cord	: N/A
Sample Received	: June 23, 2004
Test Date(s)	: June 23, 2004 to July 30, 2004

1.2 Additional information about the EUT

The 802.11g Wireless VPN Router is a multi-function device providing the following services:

- Shared Broadband Internet Access for all LAN users.
- 4-Port Switching Hub for 10BaseT or 100BaseT connections.
- Wireless Access Point for 802.11b and 802.11g Wireless Stations.

The Wireless VPN router incorporates many advanced features, carefully designed to provide sophisticated functions while being easy to use.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

1.3 Antenna description

The EUT has two types of antenna, one is permanently connected, and the other one can be replaced.

Antenna 1: Permanently connected antenna.

Antenna Gain : 1.74dBi

Antenna Type : Chip Antenna

Connector Type : N/A

Antenna 2: Antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : 2dBi

Antenna Type : Dipole Antenna

Connector Type : SMA (Reverse)

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.
Notebook	DELL	PP01L	CN-06P83-48643-33V-0112
Wireless LAN Card	BUFFALO	WLI-CB-G54A	0007407964D4
AC Adapter	DVE	OSA-0151A-05	N/A

1. Data Cable: RJ-45 Cable 10m Length
2. Dummy Load: 50Ω

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section § 15.205、§15.207、§15.209、§15.247 and ANSI C63.4/2001.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

During the conduction test, the EUT was linked with the wireless LAN Card.

During the other tests, the EUT was transmitted continuously.

After verifying the maximum output power, we found the maximum output power was occurred at 11Mbps data rate in 802.11b and 54Mbps data rate in 802.11g. The final test data was executed under this condition and recorded in this report individually.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Last Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	6/16/2004
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	6/24/2004
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	7/19/2004
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/20/2003
Horn Antenna	EMCO	1GHz~18GHz	3115	EC332	10/15/2003
Horn Antenna	SCHWARZBECK	15GHz~40GHz	BBHA 9170	EC351	6/21/2004
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC350	6/21/2004
Turn Table	HDGmbH	N/A	DS 420S	EP317-3	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP317-2	N/A
Pre-Amplifier	MITER	100MHz~26.5GHz	919981	EC373	5/13/2004
Pre-Amplifier	MITER	26GHz~40GHz	828825	EC374	5/13/2004
Crystal Detector	Agilent	10MHz~18GHz	8472B	-	N/A
Signal Generator	Rohde & Schwarz	20MHz~27GHz	SMR27	EC354	8/16/2003
Two Channel Digital Storage Oscilloscope	Tektronix	N/A	TDS1012	-	8/16/2003
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	1/20/2004

Note: The above equipments are within the valid calibration period.

3. Minimum 6dB Bandwidth test

3.1 Operating environment

Temperature:	25	℃
Relative Humidity:	56	%
Atmospheric Pressure	1023	hPa

3.2 Test setup & procedure

The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth is in the following Table.

3.3 Measured data of Minimum 6dB Bandwidth test results

Test Mode: 802.11b operation mode (DSSS Modulation)

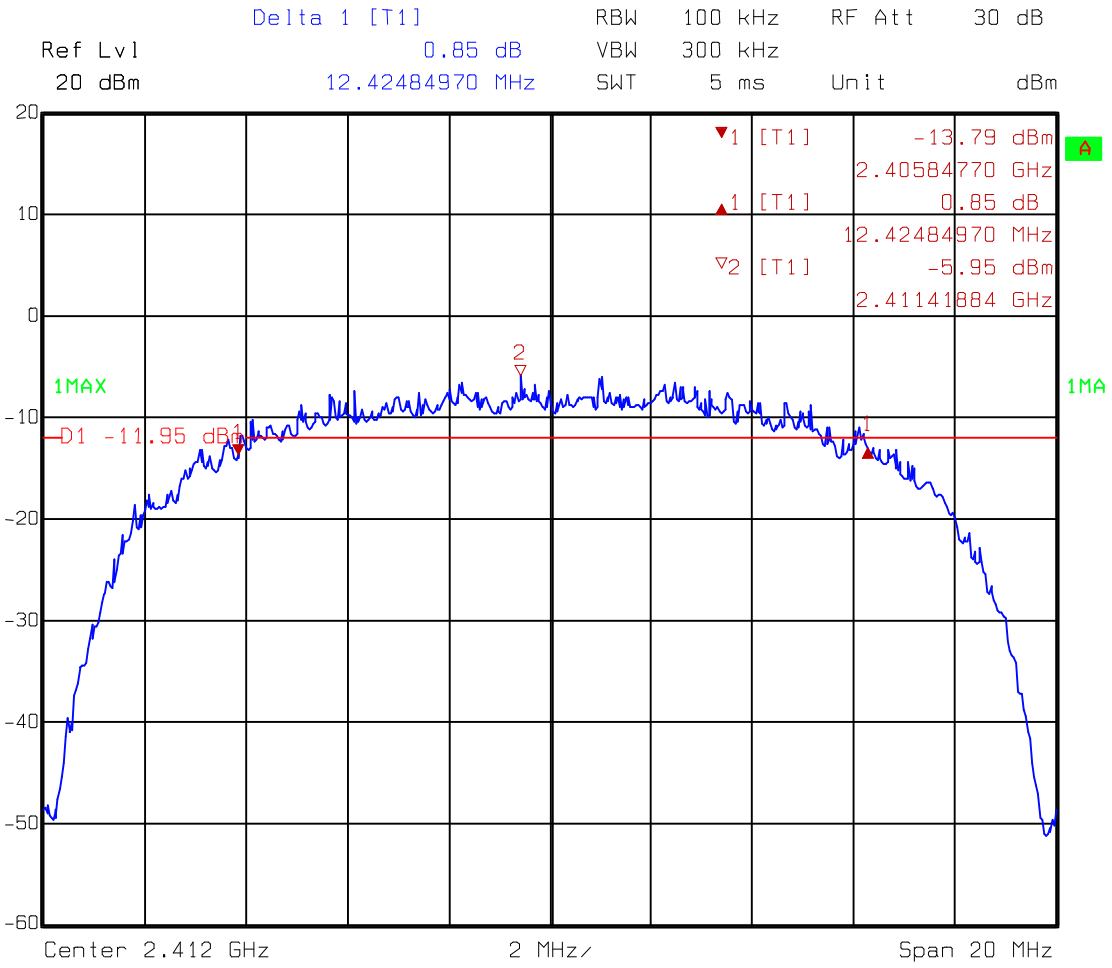
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1	2412	12.42485	＞500kHz
6	2437	12.10421	＞500kHz
11	2462	12.42485	＞500kHz

Test Mode: 802.11g operation mode (OFDM Modulation)

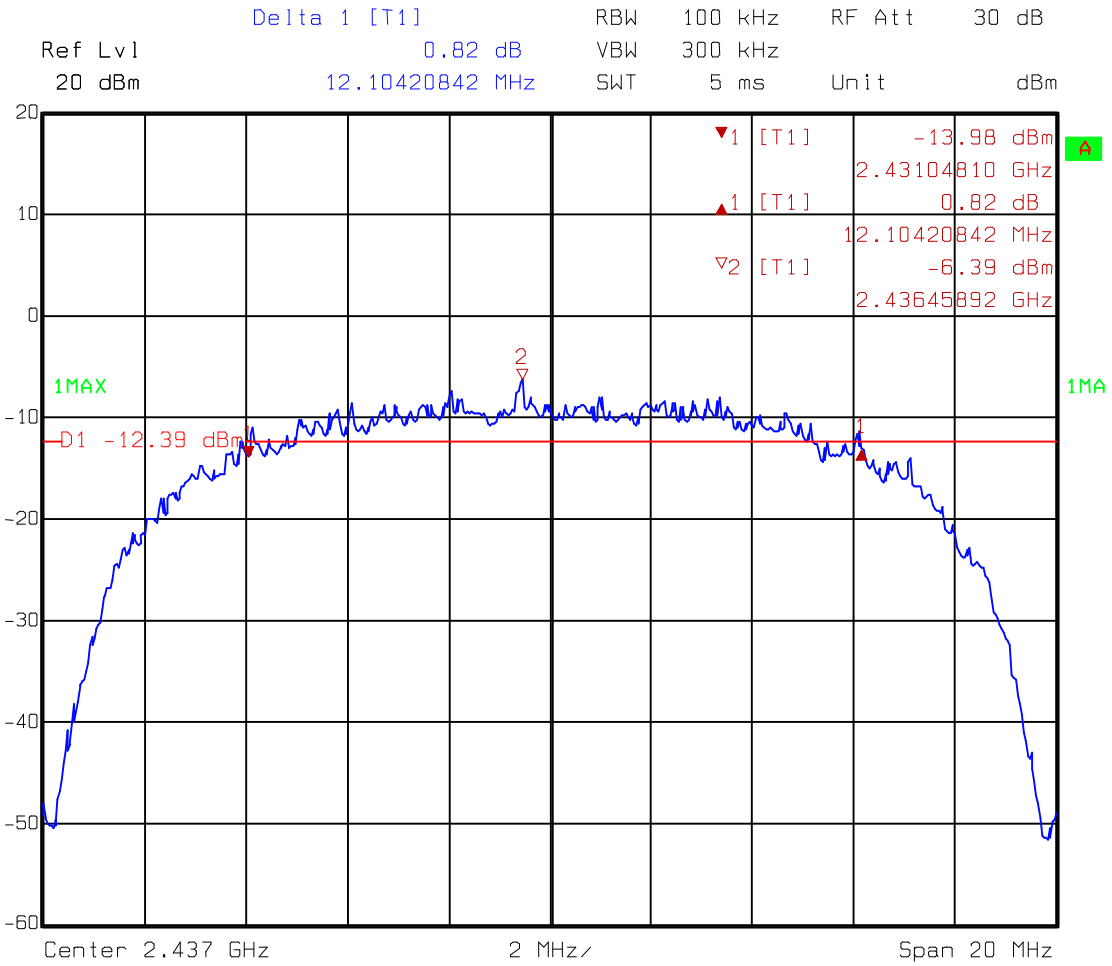
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1	2412	16.47295	＞500kHz
6	2437	16.47295	＞500kHz
11	2462	16.47295	＞500kHz

Please see the plot below.

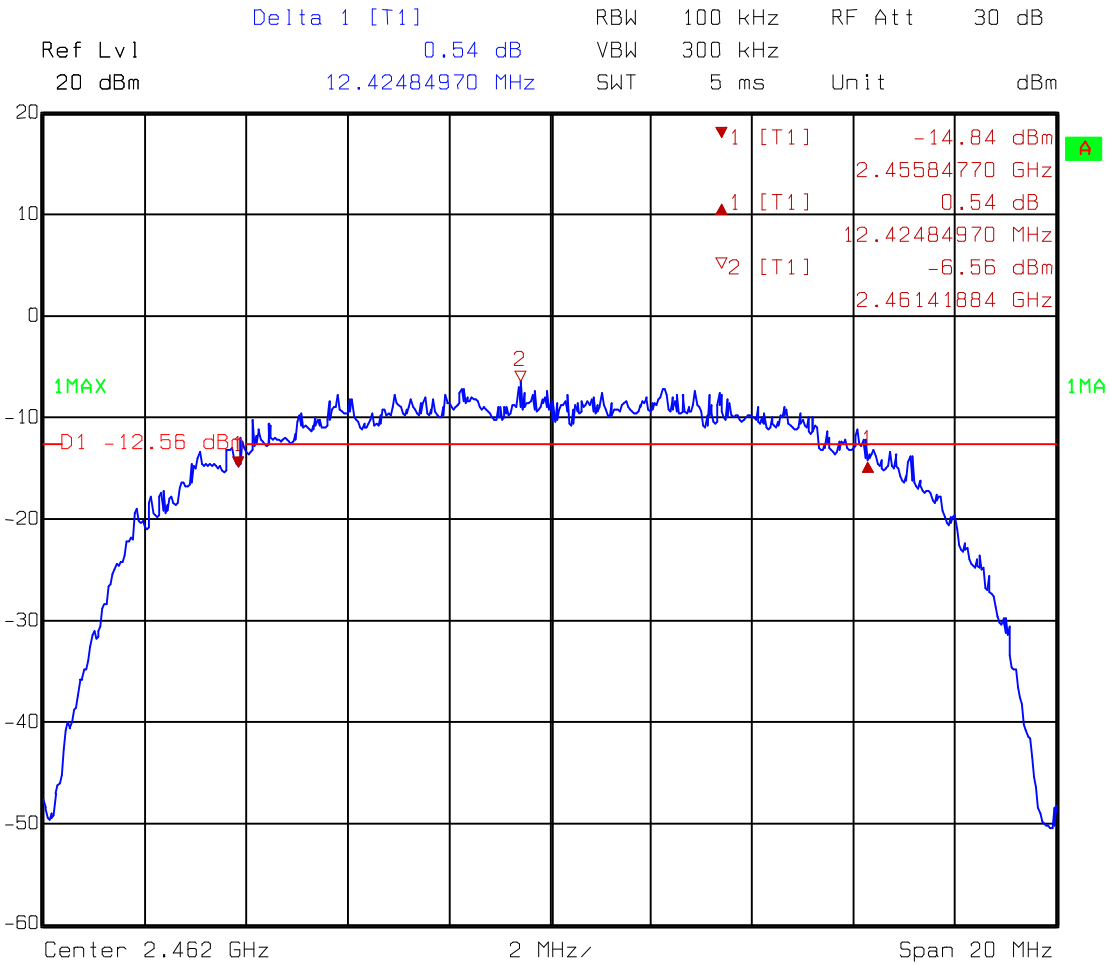
Test Mode: 802.11b operation mode (DSSS Modulation)



Comment A: 6dB bandwidth at low channel (EC365) 802.11b
Date: 03.JUL.2004 11:35:14

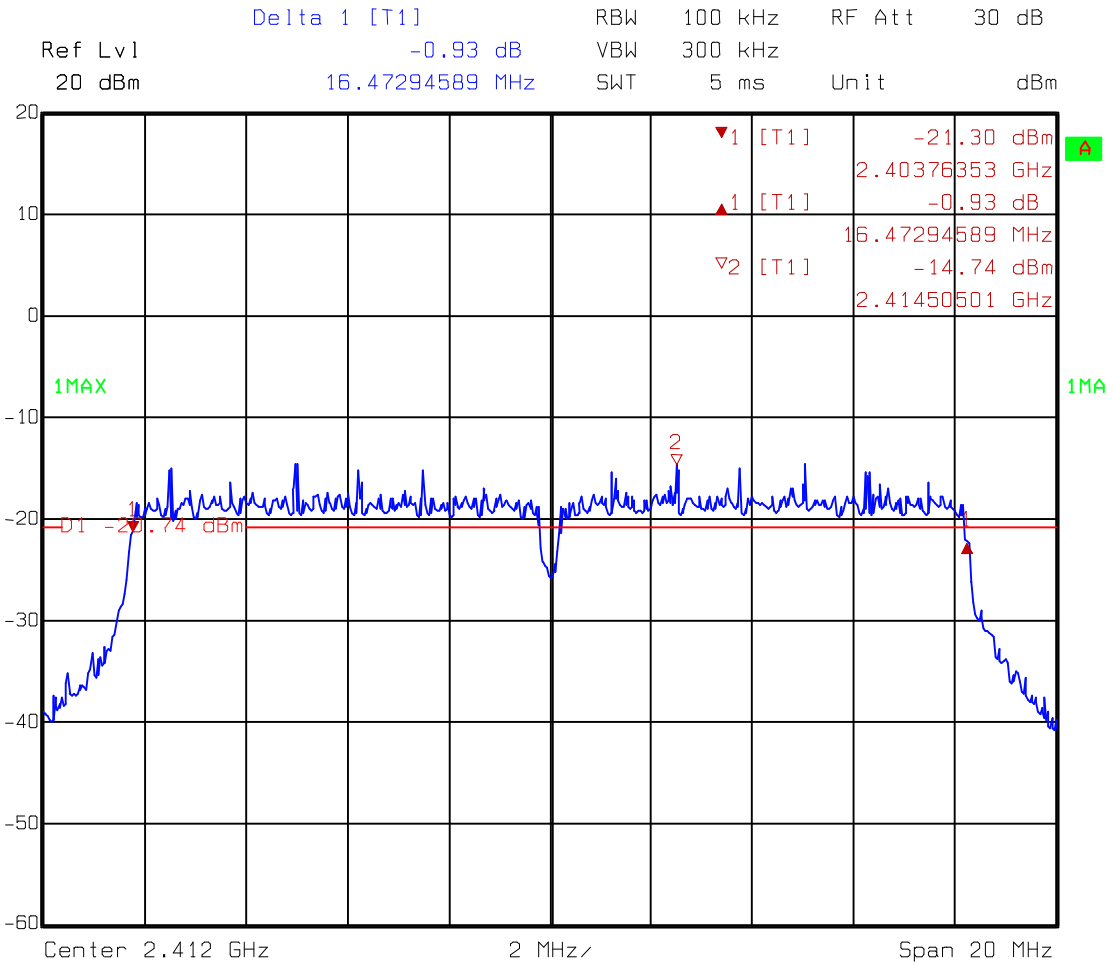


Comment A: 6dB bandwidth at middle channel (EC365) 802.11b
Date: 03.JUL.2004 11:30:43

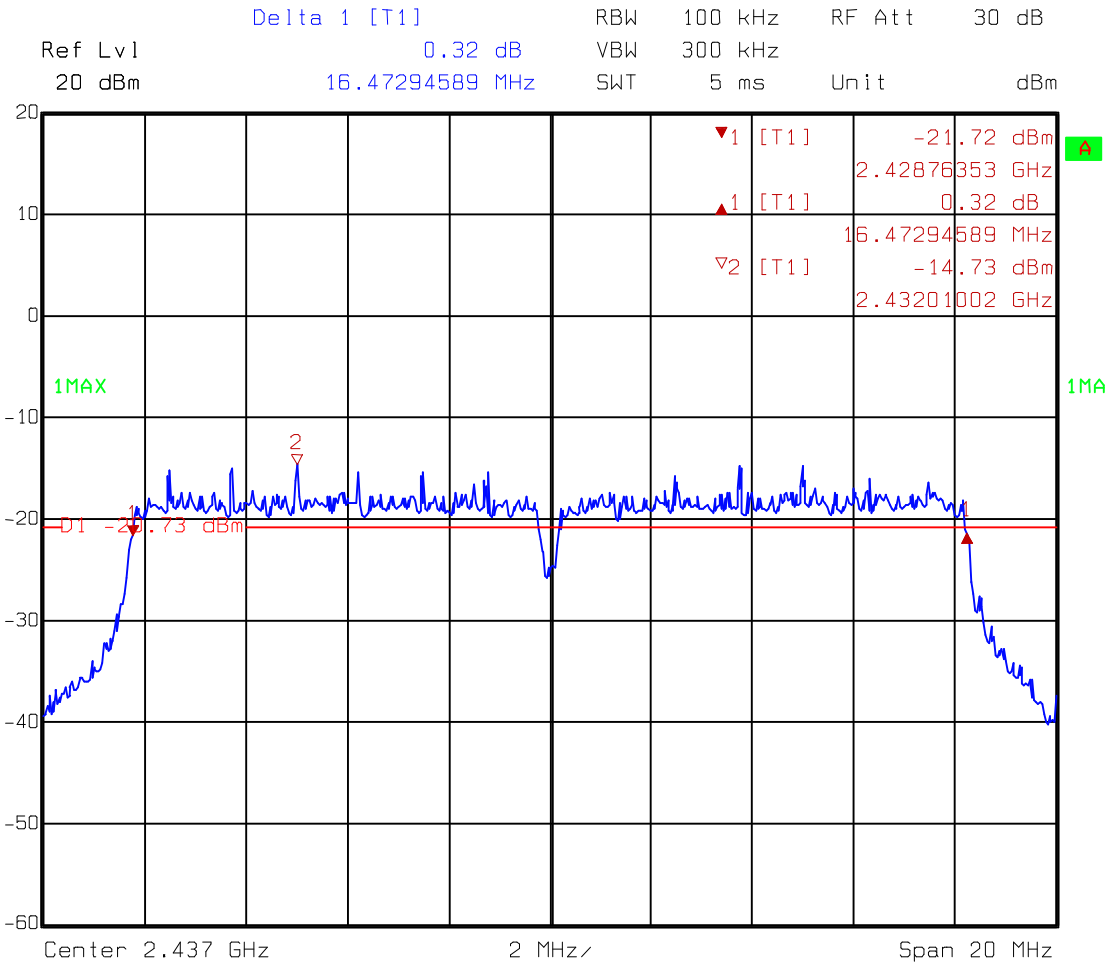


Comment A: 6dB bandwidth at high channel (EC365) 802.11b
Date: 03.JUL.2004 11:32:37

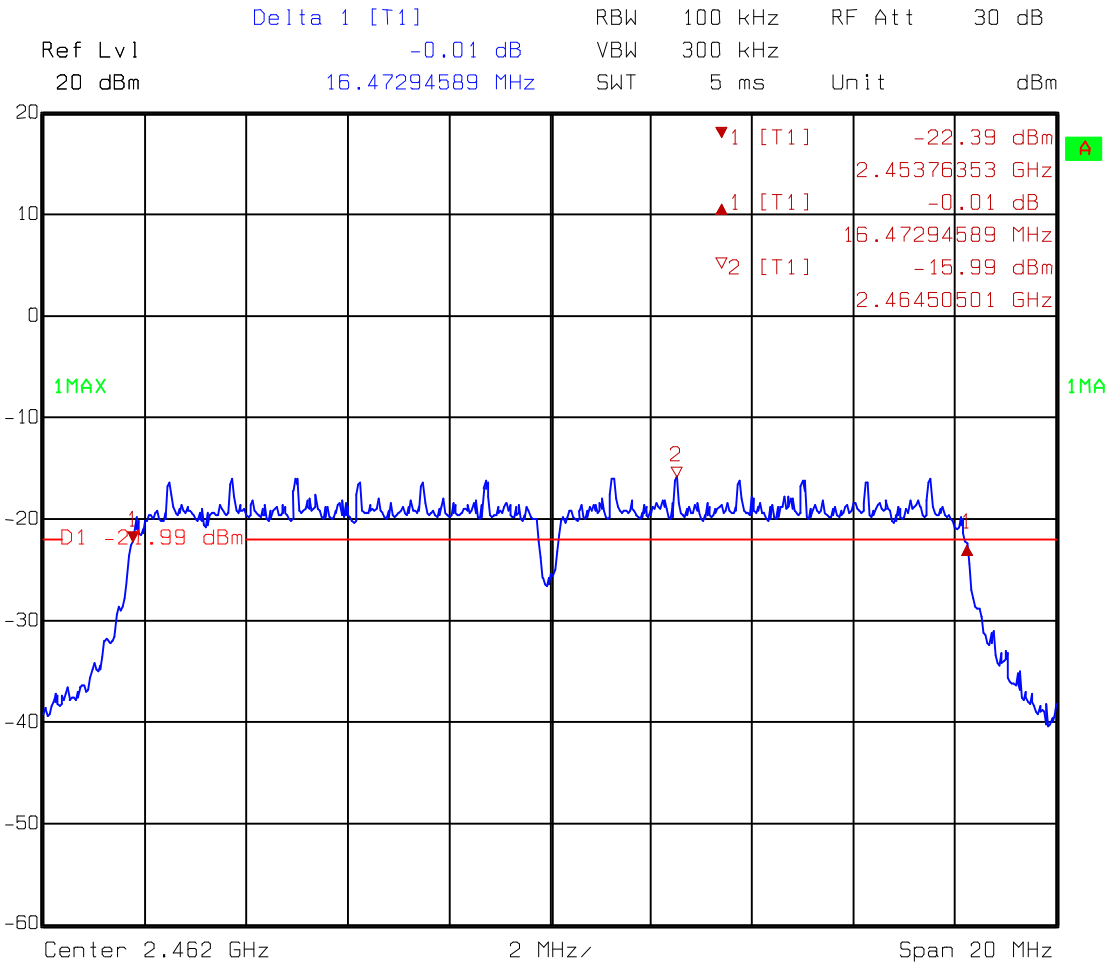
Test Mode: 802.11g operation mode (OFDM Modulation)



Comment A: 6dB bandwidth at low channel (EC365) 802.11g
Date: 03.JUL.2004 11:36:40



Comment A: 6dB bandwidth at middle channel (EC365) 802.11g
Date: 03.JUL.2004 11:38:22



Comment A: 6dB bandwidth at high channel (EC365) 802.11g
Date: 03.JUL.2004 11:16:12

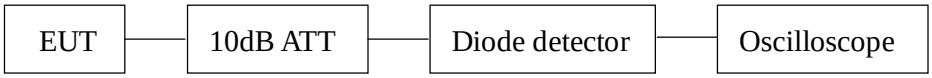
4. Maximum Output Power test

4.1 Operating environment

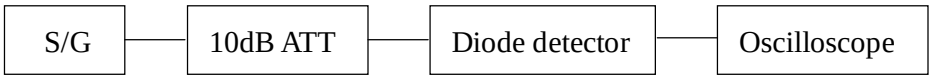
Temperature:	20	℃
Relative Humidity:	52	%
Atmospheric Pressure	1023	hPa

4.2 Test setup & procedure

A:



B:



1. The output of the transmitter via a 10 dB attenuator and coupled to a diode detector.
2. The output of the diode detector connected to the vertical channel of and oscilloscope. The observed trace of the oscilloscope shall be recorded as “A”.
3. The transmitter replaced by a signal generator. The output frequency of the signal made equal to the center of the frequency range occupied by the transmitter and unmodulated.
4. The output of the signal generator raised to reach the peak of trace “A” named X.
5. The signal generator output level X (dBm) is the transmitter peak output power.

4.3 Measured data of Maximum Output Power test results

Test Mode: 802.11b operation mode (DSSS Modulation)

Channel	Frequency (MHz)	Reading (dBm)	Output Power		Limit (dBm)
			(dBm)	(mW)	
1	2412	21.16	21.16	130.62	30
6	2437	20.75	20.75	118.85	30
11	2462	20.93	20.93	123.88	30

Test Mode: 802.11g operation mode (OFDM Modulation)

Channel	Frequency (MHz)	Reading (dBm)	Output Power		Limit (dBm)
			(dBm)	(mW)	
1	2412	20.72	20.72	118.03	30
6	2437	20.18	20.18	104.23	30
11	2462	20.47	20.47	111.43	30

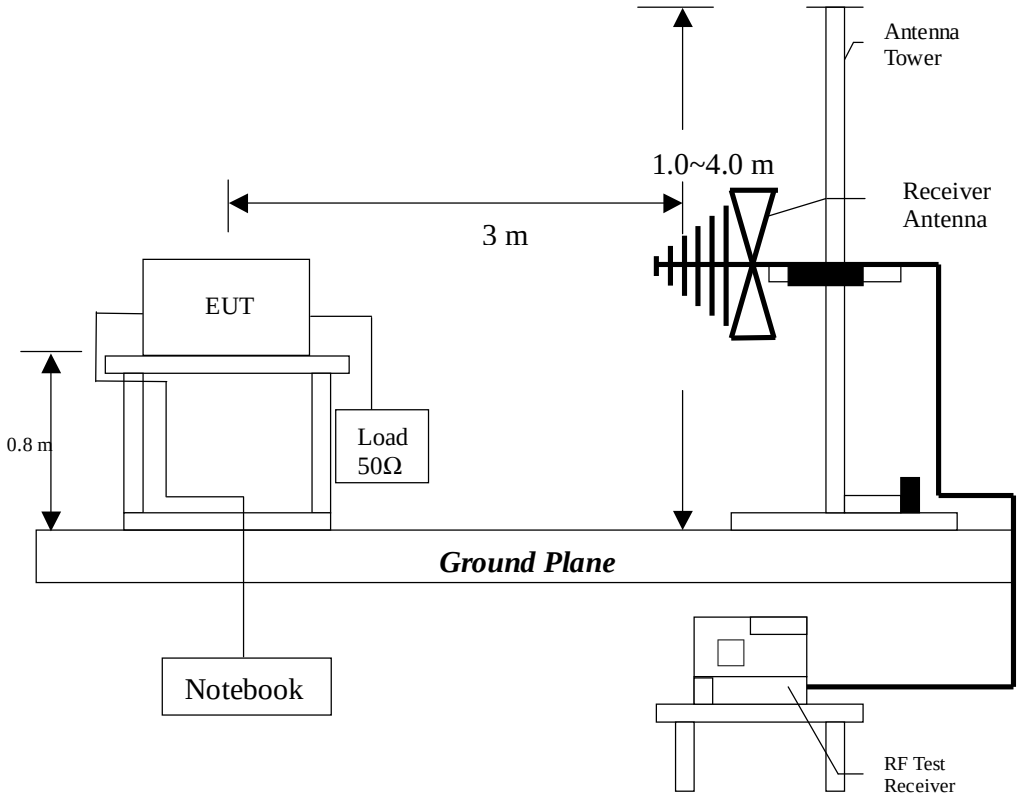
5. Radiated Emission test

5.1 Operating environment

Temperature:	24	℃	(10-40℃)
Relative Humidity:	49	%	(10-90%)
Atmospheric Pressure	1022	hPa	(860-1060hPa)

5.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

The EUT configuration please refers to the "Spurious set-up photo.pdf".

5.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of radiated emission measurement is ±4.98 dB.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.02 dB.

5.4 Radiated spurious emission test data

5.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed the 802.11b and 802.11g transmitting continuously modes with channel 1,6,and 11, the worst case was occurred in 802.11b Tx at channel 1 and 802.11g Tx at channel 1.

EUT : WR404
Worst case Condition : 802.11b Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
41.140	QP	V	12.96	15.60	28.56	40.00	-11.44	100.00	57.00
100.010	QP	V	10.92	27.00	37.92	43.50	-5.58	165.00	12.00
133.350	QP	V	13.34	18.50	31.84	43.50	-11.66	100.00	289.00
165.840	QP	V	14.92	19.80	34.72	43.50	-8.78	157.00	241.00
199.980	QP	V	12.03	22.80	34.83	43.50	-8.67	101.00	222.00
400.020	QP	V	16.94	18.70	35.64	46.00	-10.36	142.00	302.00
100.010	QP	H	10.92	30.80	41.72	43.50	-1.78	189.00	106.00
200.020	QP	H	11.52	25.80	37.32	43.50	-6.18	122.00	120.00
250.000	QP	H	13.17	19.90	33.07	46.00	-12.93	125.00	106.00
400.040	QP	H	16.94	27.40	44.34	46.00	-1.66	100.00	325.00
365.040	QP	H	15.81	19.00	34.81	46.00	-11.19	100.00	207.00
350.000	QP	H	15.60	25.00	40.60	46.00	-5.40	100.00	204.00

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss

EUT : WR404
Worst case Condition : 802.11g Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
40.800	QP	V	12.96	15.10	28.06	40.00	-11.94	100.00	57.00
100.020	QP	V	10.92	22.70	33.62	43.50	-9.88	147.00	157.00
132.770	QP	V	13.34	20.70	34.04	43.50	-9.46	205.00	20.00
165.870	QP	V	14.92	18.80	33.72	43.50	-9.78	155.00	143.00
140.040	QP	V	14.27	22.70	36.97	43.50	-6.53	104.00	110.00
400.010	QP	V	16.94	17.70	34.64	46.00	-11.36	211.00	212.00
100.010	QP	H	10.92	30.60	41.52	43.50	-1.98	158.00	111.00
165.840	QP	H	14.92	21.70	36.62	43.50	-6.88	154.00	172.00
200.020	QP	H	11.52	25.10	36.62	43.50	-6.88	110.00	177.00
250.010	QP	H	13.17	25.70	38.87	46.00	-7.13	204.00	207.00
350.000	QP	H	15.60	19.50	35.10	46.00	-10.90	262.00	58.00
400.030	QP	H	16.94	25.10	42.04	46.00	-3.96	252.00	106.00

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss

5.4.2 Measurement results: frequency above 1GHz

The radiated spurious emissions at

Frequency (MHz)	Margin
2088.000	-0.14

are less than uncertainty. This is within the stated measurement uncertainty; this may affect compliance determined in other test arrangements.

EUT : WR404
Test Condition : 802.11b Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
4076.050	PK	V	39.61	35.572	44.988	40.95	74.00	-33.05	179.00	251.00
4076.050	AV	V	39.61	35.572	38.498	34.46	54.00	-19.54	179.00	251.00

Remark:
1. Corrected Level = Reading Level + Correction Factor + Average Factor − Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

EUT : WR404
Test Condition : 802.11b Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
4126.080	PK	V	39.61	35.572	46.218	42.18	74.00	-31.82	175.00	259.00
4126.080	AV	V	39.61	35.572	40.718	36.68	54.00	-17.32	175.00	259.00

Remark:
1. Corrected Level = Reading Level + Correction Factor + Average Factor − Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

EUT : WR404
Test Condition : 802.11b Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
2088.000	PK	V	39.55	30.372	68.388	59.21	74.00	-14.79	173.00	0.00
2088.000	AV	V	39.55	30.372	63.038	53.86	54.00	-0.14	173.00	0.00
4176.030	PK	V	39.61	35.572	46.698	42.66	74.00	-31.34	173.00	264.00
4176.030	AV	V	39.61	35.572	41.628	37.59	54.00	-16.41	173.00	264.00

Remark:
1. Corrected Level = Reading Level + Correction Factor + Average Factor − Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

The radiated spurious emissions at

Frequency(MHz)	Margin
2087.890	-0.03

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

EUT : WR404
Test Condition : 802.11g Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
4075.970	PK	V	39.61	35.57	45.00	40.96	74.00	-33.04	181.00	254.00
4075.970	AV	V	39.61	35.57	38.95	34.91	54.00	-19.09	181.00	254.00

Remark:
1. Corrected Level = Reading Level + Correction Factor + Average Factor − Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

EUT : WR404
Test Condition : 802.11g Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
4126.000	PK	V	39.61	35.57	46.67	42.63	74.00	-31.37	140.00	253.00
4126.000	AV	V	39.61	35.57	41.58	37.54	54.00	-16.46	140.00	253.00

Remark:
1. Corrected Level = Reading Level + Correction Factor + Average Factor − Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

EUT : WR404
Test Condition : 802.11g Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
2087.890	PK	V	39.55	30.37	68.93	59.75	74.00	-14.25	174.00	360.00
2087.890	AV	V	39.55	30.37	63.15	53.97	54.00	-0.03	174.00	360.00
4175.920	PK	V	39.61	35.57	46.97	42.93	74.00	-31.07	159.00	256.00
4175.920	AV	V	39.61	35.57	41.73	37.69	54.00	-16.31	159.00	256.00

Remark:
1. Corrected Level = Reading Level + Correction Factor + Average Factor − Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level
For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV

6. Power Spectrum Density test

6.1 Operating environment

Temperature:	24	℃
Relative Humidity:	55	%
Atmospheric Pressure	1023	hPa

6.2 Test setup & procedure

The power spectrum density per FCC §15.247(d) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 1.5 MHz, and the sweep time set at 500 seconds. Power Density was read directly and cable loss (2.13dB)/external attenuator (10dB) correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

6.3 Measured data of Power Spectrum Density test results

Test Mode: 802.11b operation mode (DSSS Modulation)

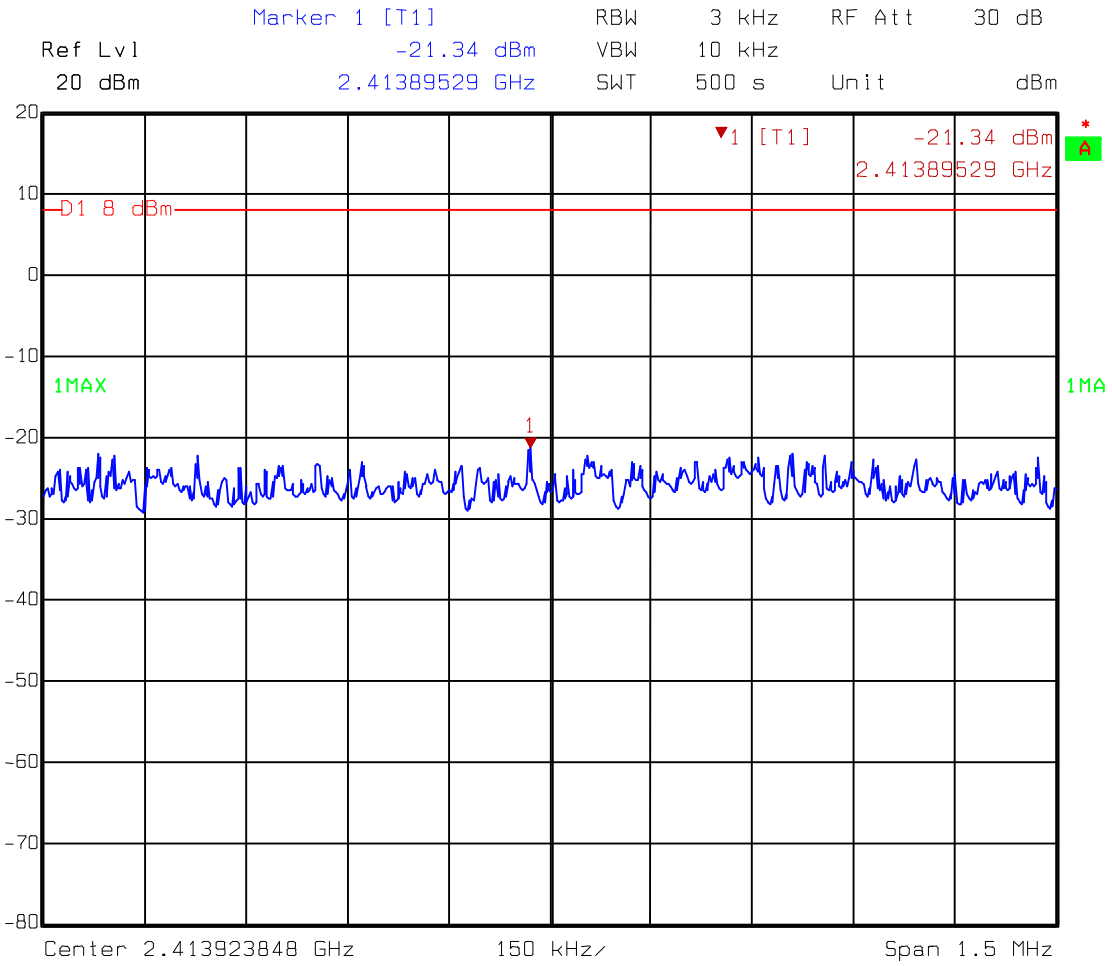
Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
Low	2412	-9.21	8
Middle	2437	-9.72	8
High	2462	-10.07	8

Test Mode: 802.11g operation mode (OFDM Modulation)

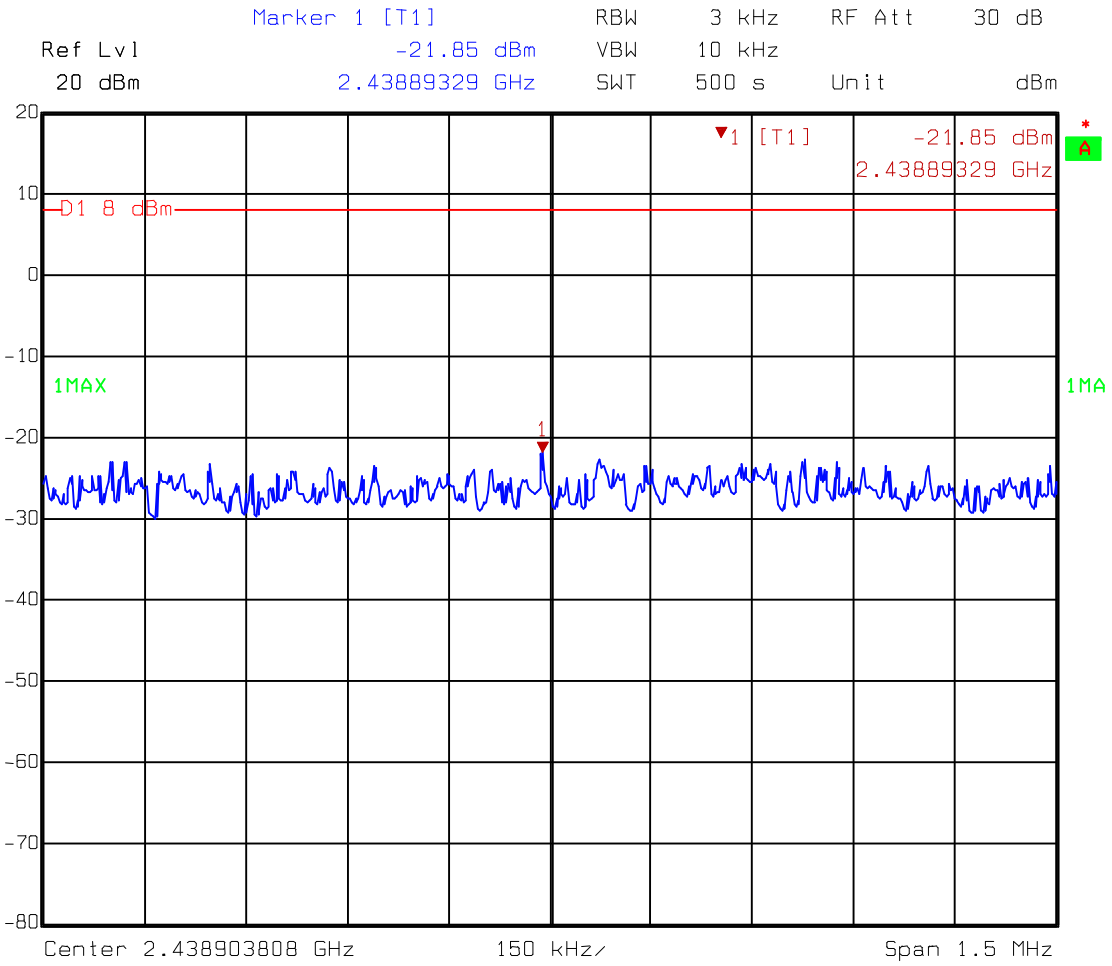
Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
Low	2412	-16.46	8
Middle	2437	-16.66	8
High	2462	-17.18	8

Please see the plot below.

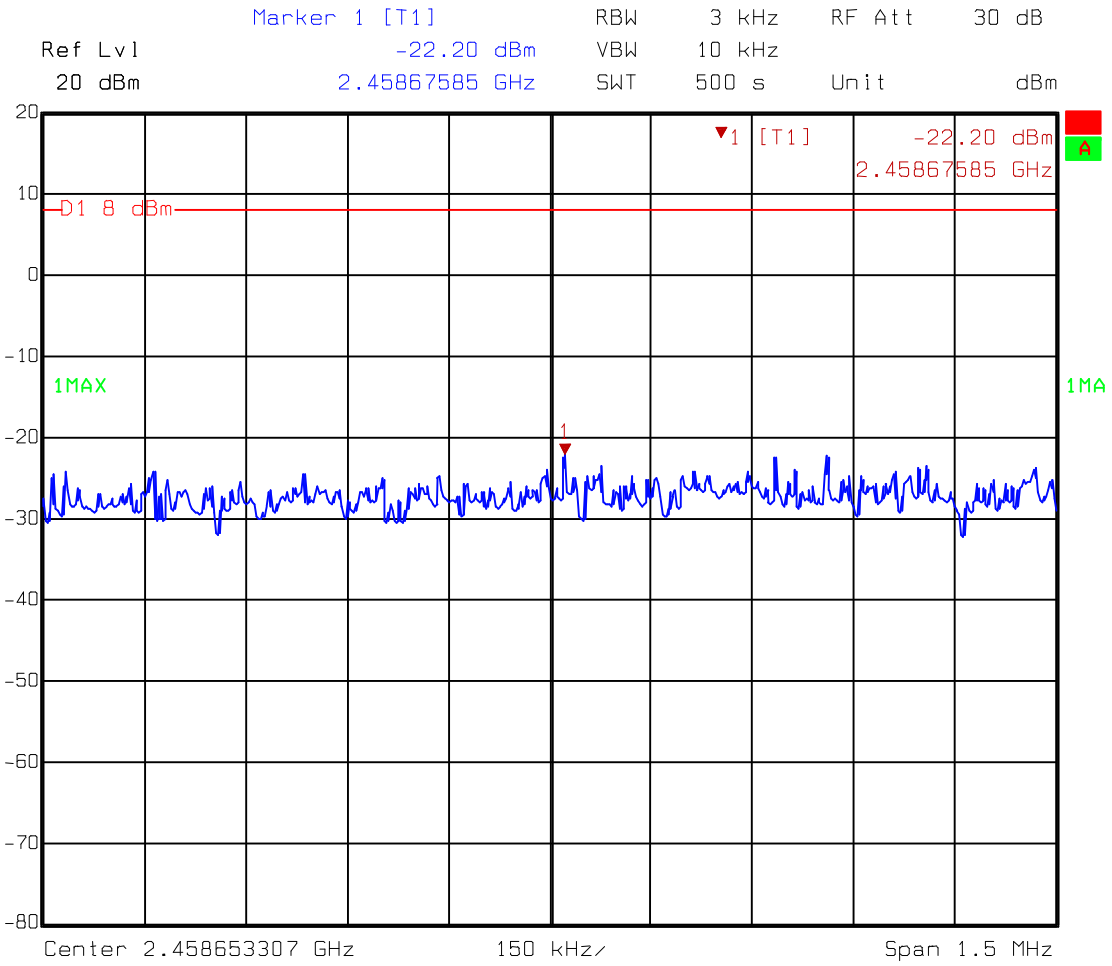
Test Mode: 802.11b operation mode (DSSS Modulation)



Comment A: Power spectrum density at low channel
ATT=10dB CL=2.13dB (EC365) 802.11b
Date: 03.JUL.2004 13:25:37

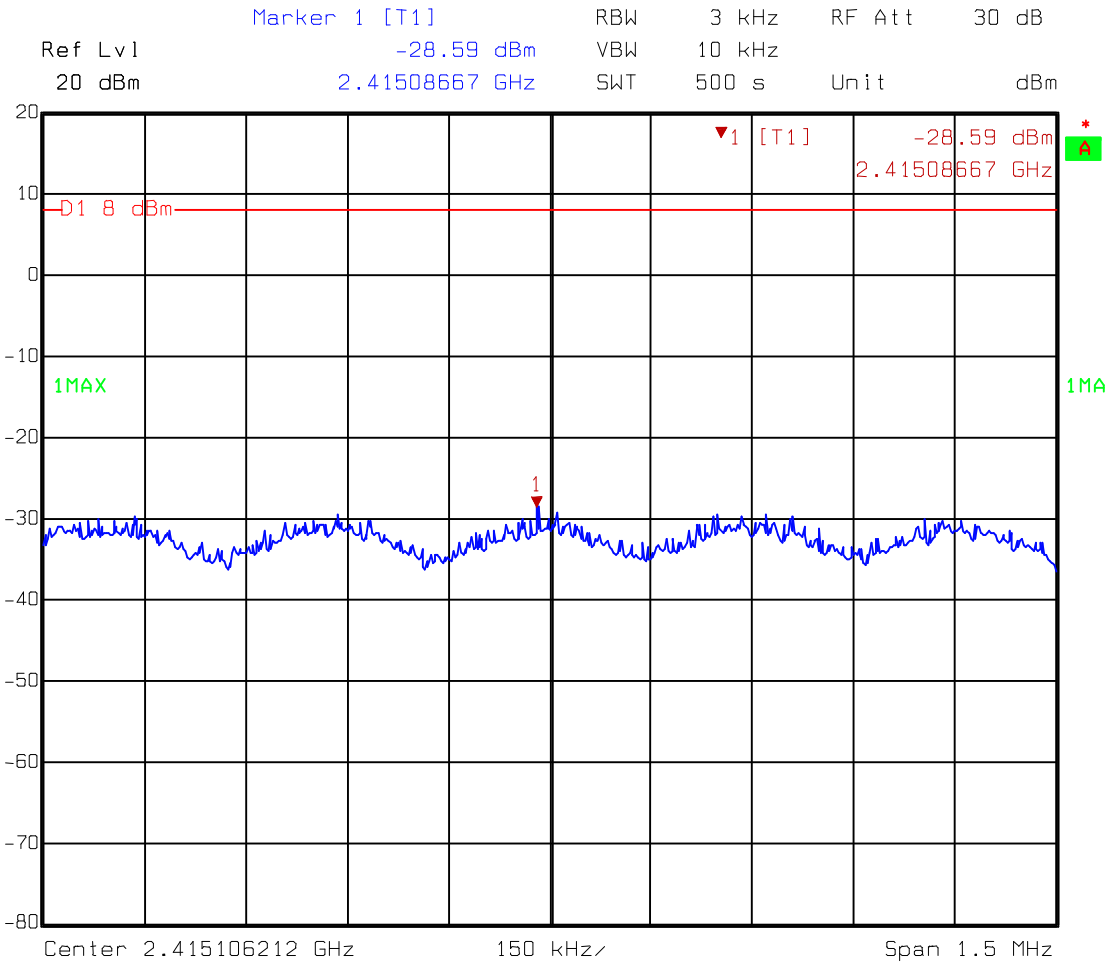


Comment A: Power spectrum density at middle channel
ATT=10dB CL=2.13dB (EC365) 802.11b
Date: 03.JUL.2004 13:27:49

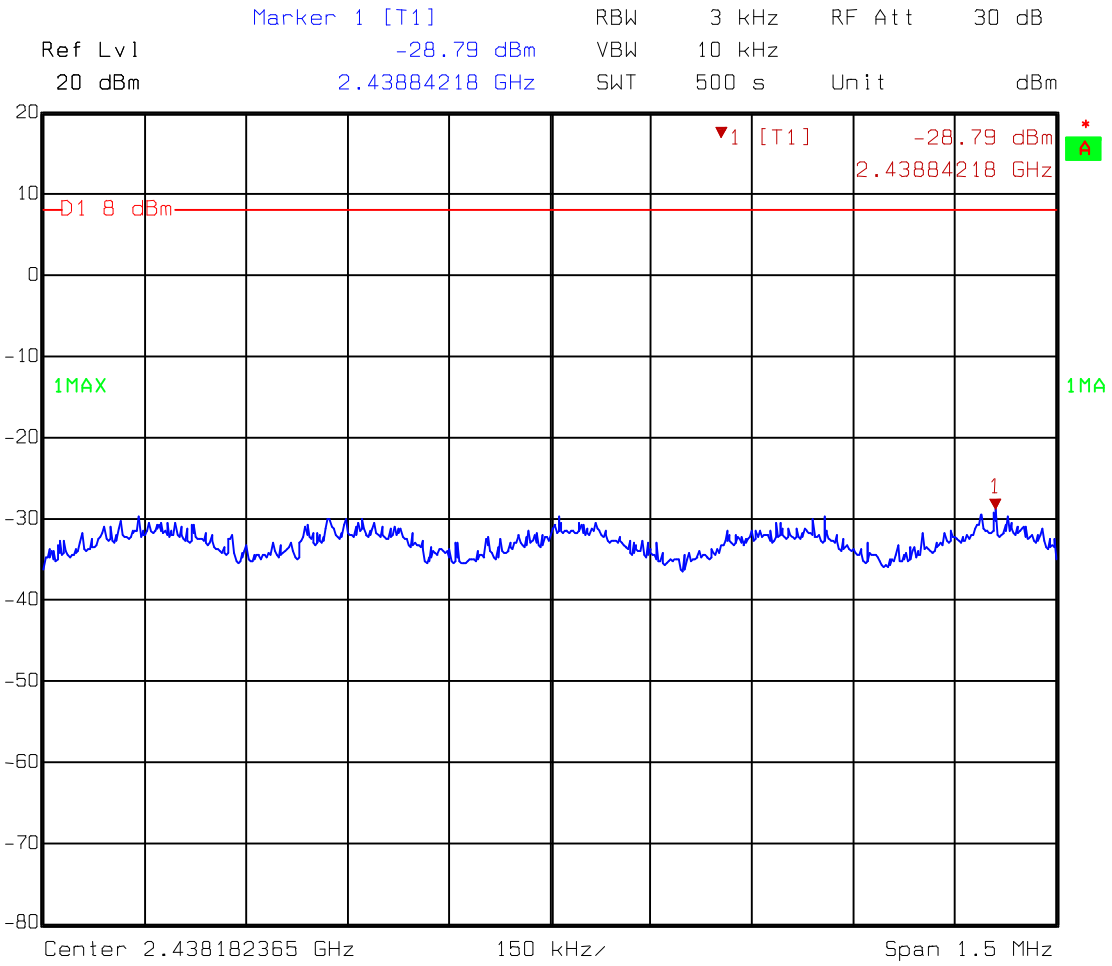


Comment A: Power spectrum density at high channel
ATT=10dB CL=2.13dB (EC365) 802.11b
Date: 03.JUL.2004 13:29:24

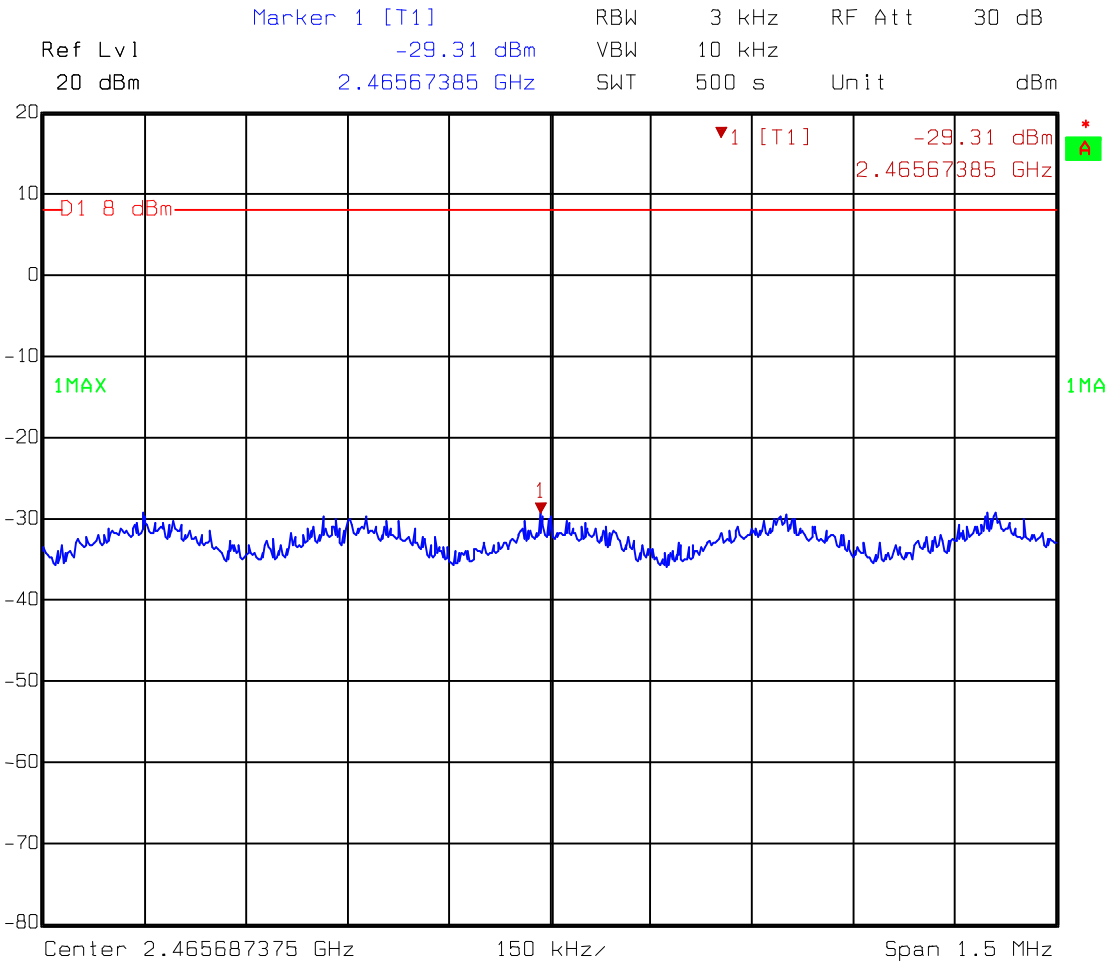
Test Mode: 802.11g operation mode (OFDM Modulation)



Comment A: Power spectrum density at low channel
ATT=10dB CL=2.13dB (EC365) 802.11g
Date: 03.JUL.2004 13:36:36



Comment A: Power spectrum density at middle channel
ATT=10dB CL=2.13dB (EC365) 802.11g
Date: 03.JUL.2004 13:33:47



Comment A: Power spectrum density at high channel
ATT=10dB CL=2.13dB (EC365) 802.11g
Date: 03.JUL.2004 13:31:58

7. Emission on the band edge §FCC 15.247(C)

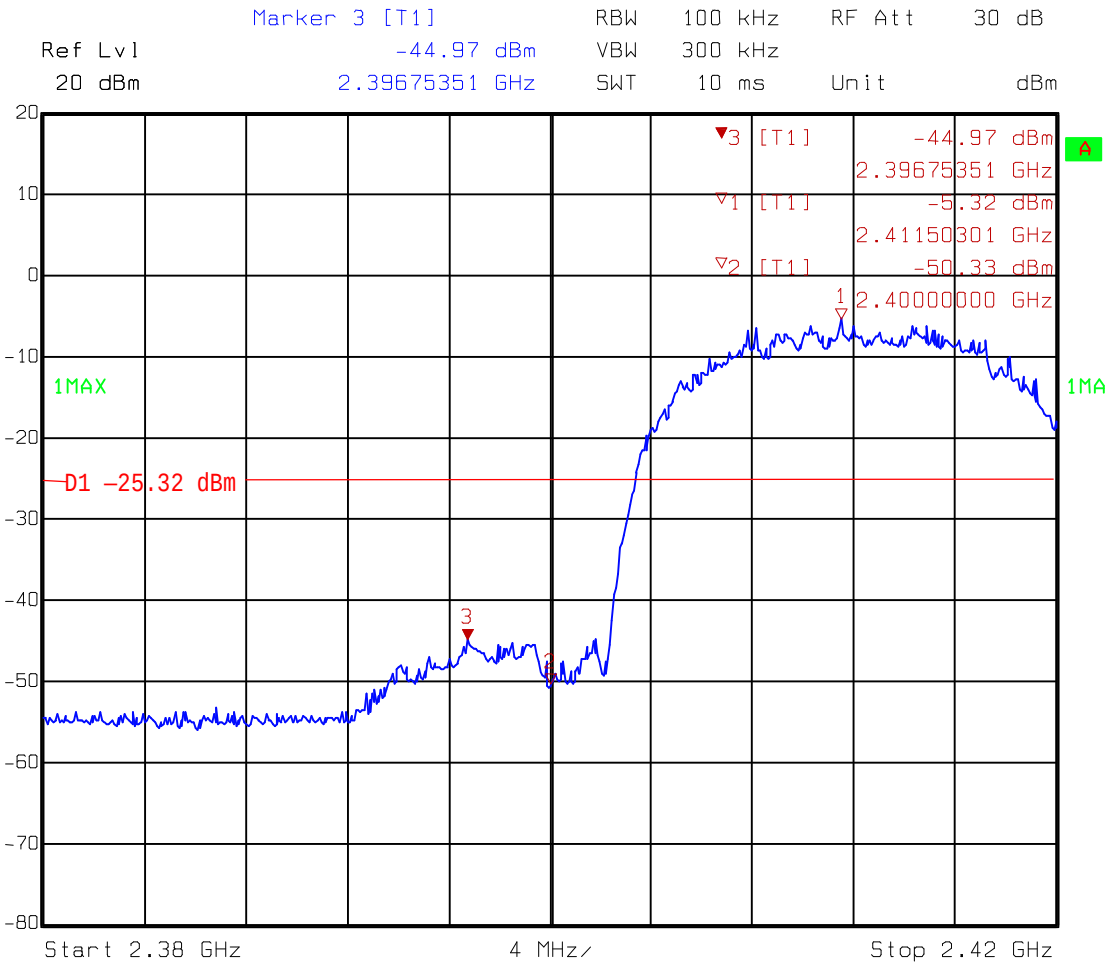
In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

When the fundamental emission exceeded the reference level, the suitable external attenuator was used. And relative compensation was added by spectrum reference offset.

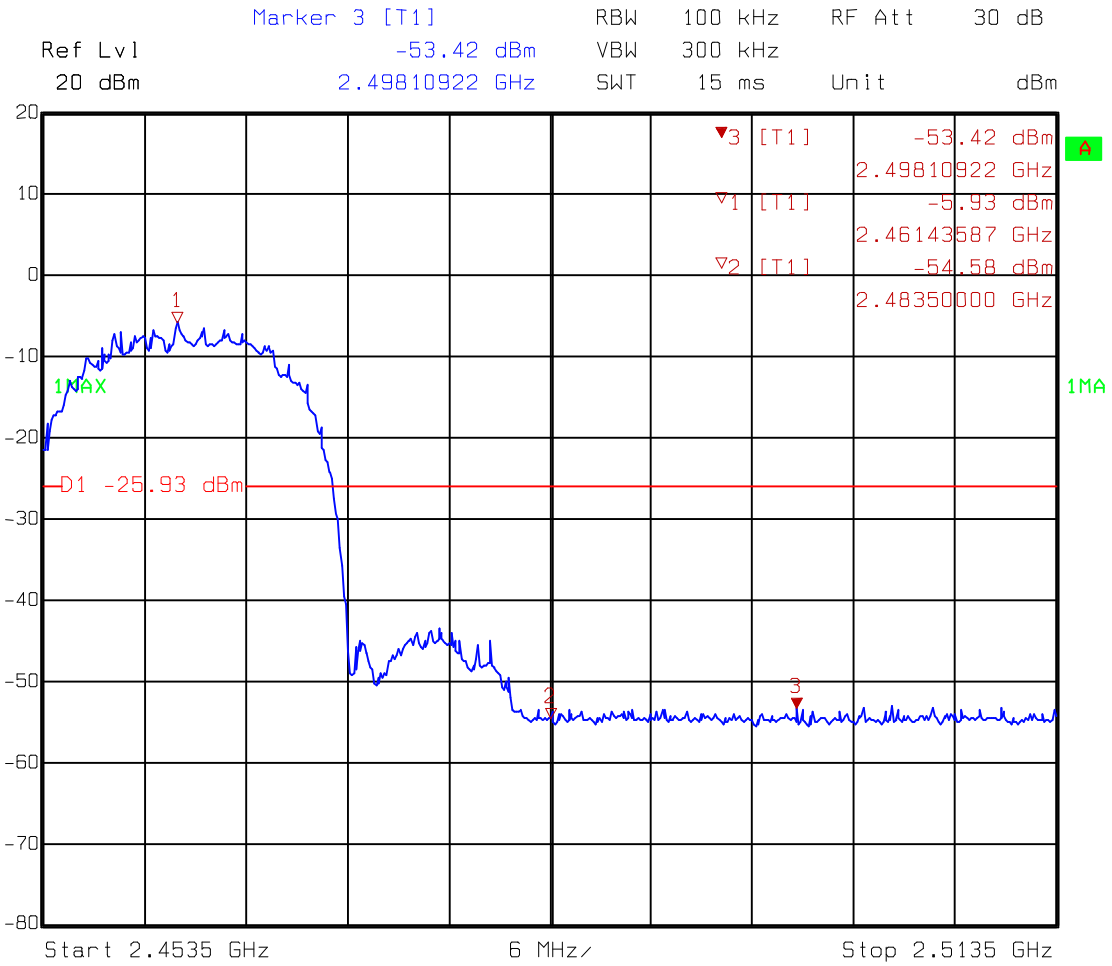
Please see the plot below.

7.1 Band-edge (Conducted method)

Test Mode: 802.11b operation mode (DSSS Modulation)

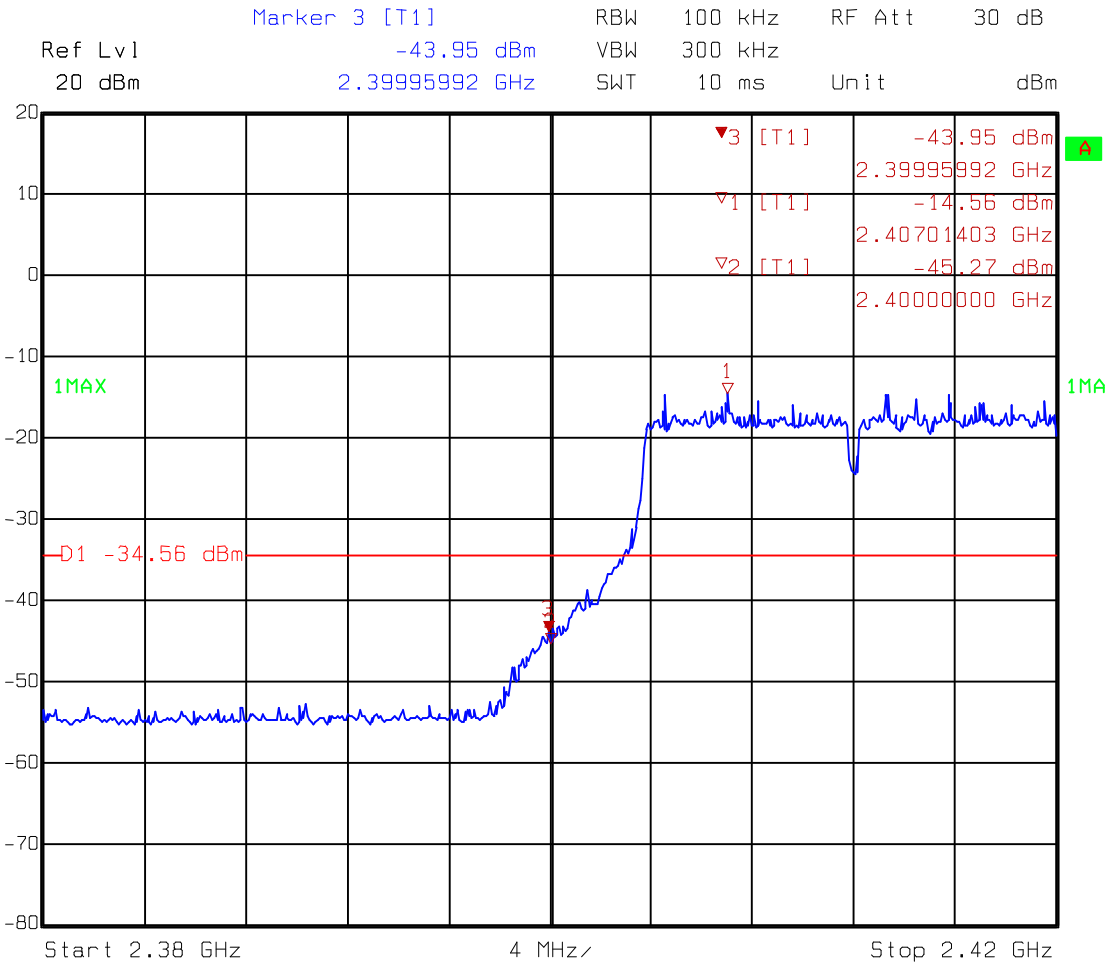


Comment A: Band-edge at low channel (EC365) 802.11b
Date: 03.JUL.2004 13:22:38



Comment A: Band-edge at high channel (EC365) 802.11b
Date: 03.JUL.2004 13:18:20

Test Mode: 802.11g operation mode (OFDM Modulation)

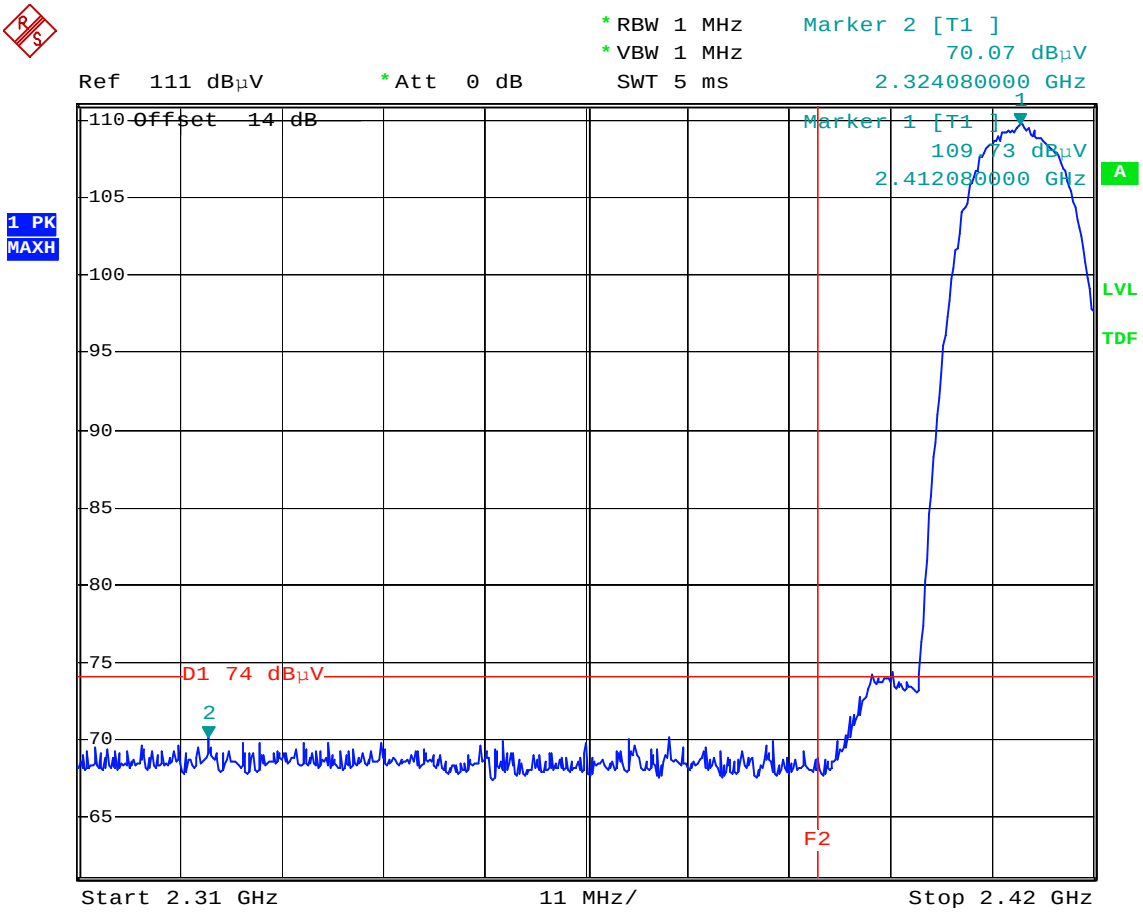


Comment A: Band-edge at low channel (EC365) 802.11g
Date: 03.JUL.2004 11:43:00

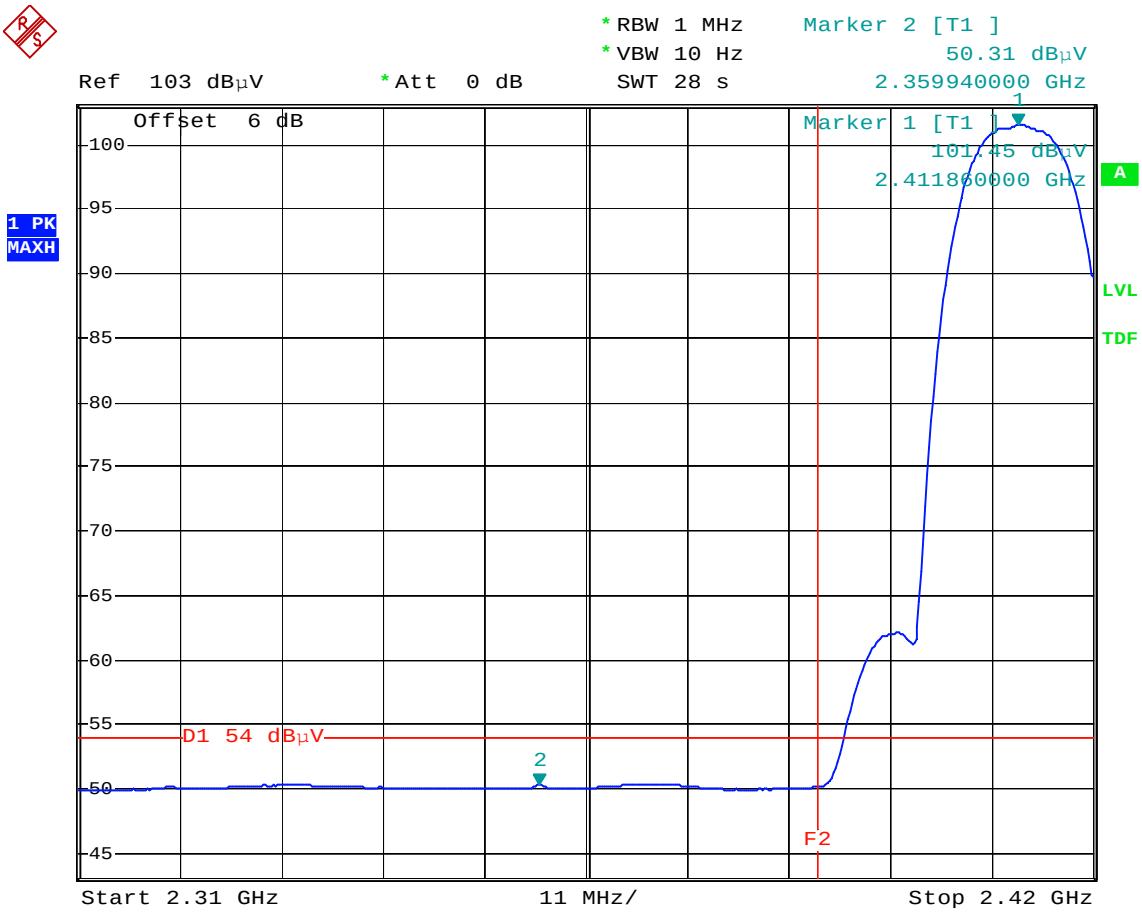
Comment A: Band-edge at high channel (EC365) 802.11g
Date: 03.JUL.2004 13:20:24

7.2 Band-edge (Radiated method)

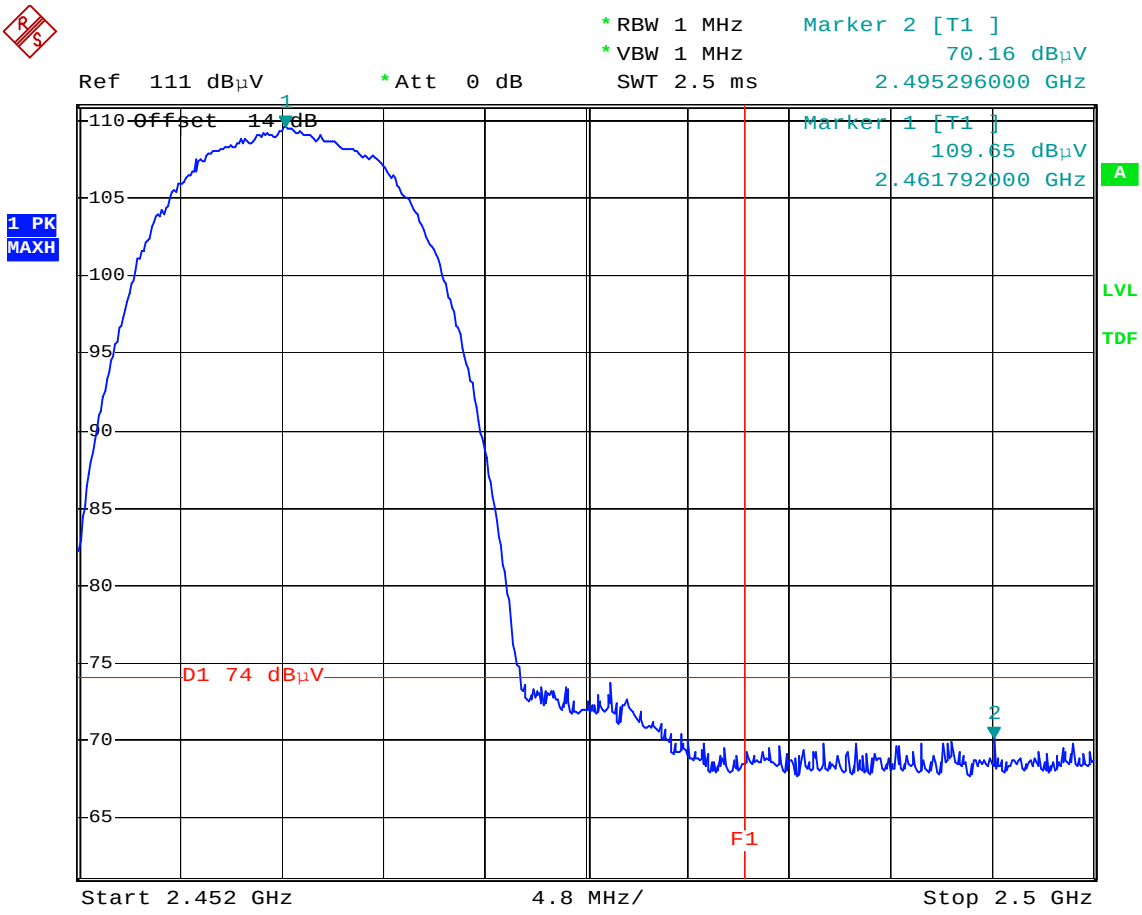
Test Mode: 802.11b operation mode (DSSS Modulation)



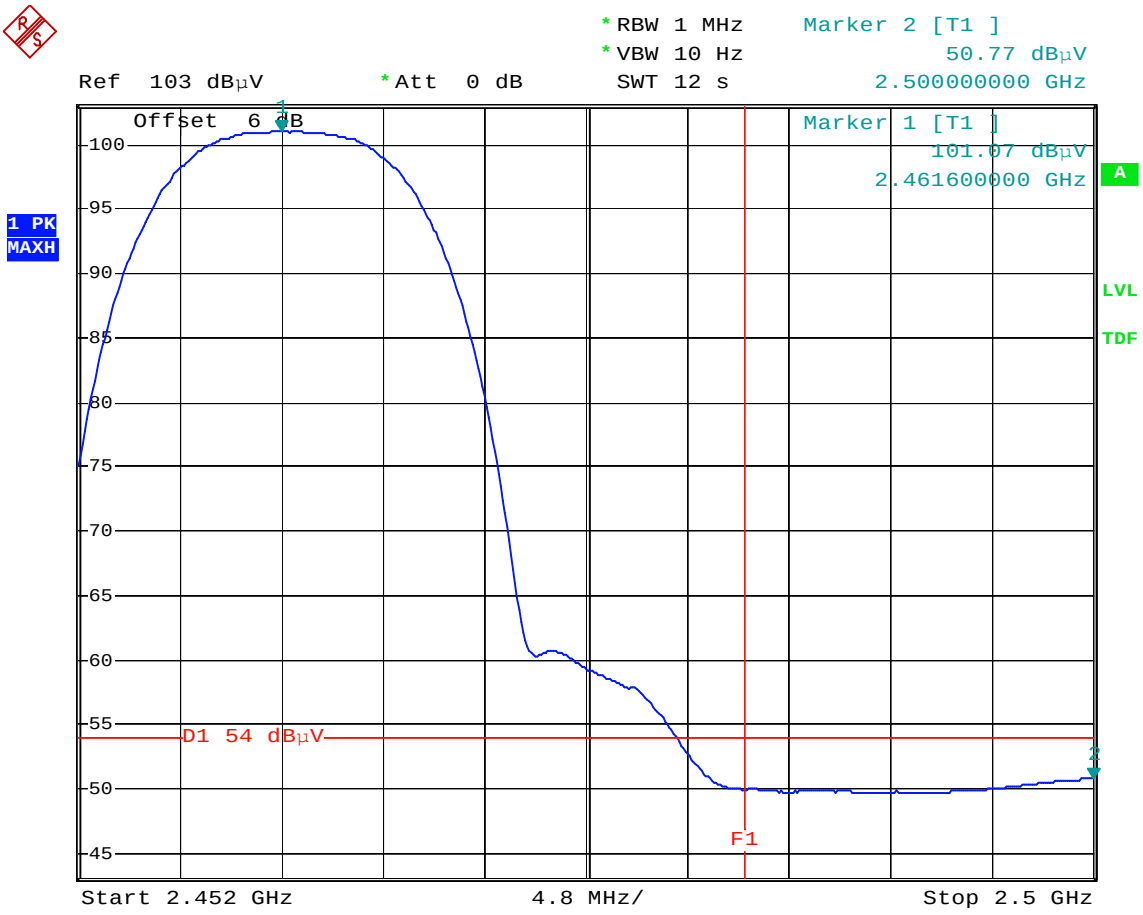
Comment: Band-edge test at low channel
Comment: Peak detector F2=2390MHz 802.11b external Att.=14dB
Date: 19.AUG.2004 11:41:43



Comment: Band-edge test at low channel
Comment: Average detector F2=2390MHz 802.11b external Att.=6dB
Date: 19.AUG.2004 11:51:14

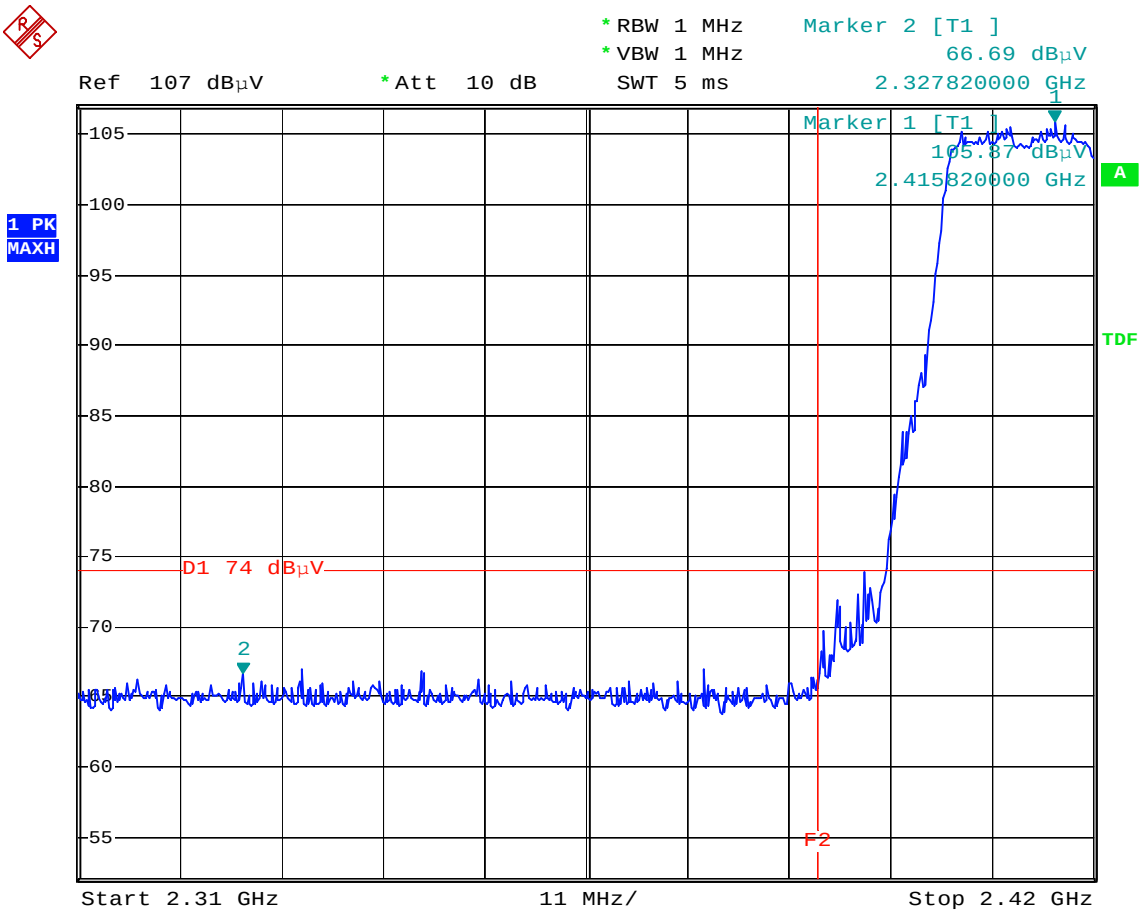


Comment: Band-edge test at high channel
Comment: Peak detector F1=2483.5MHz 802.11b external Att.=14dB
Date: 19.AUG.2004 11:57:22

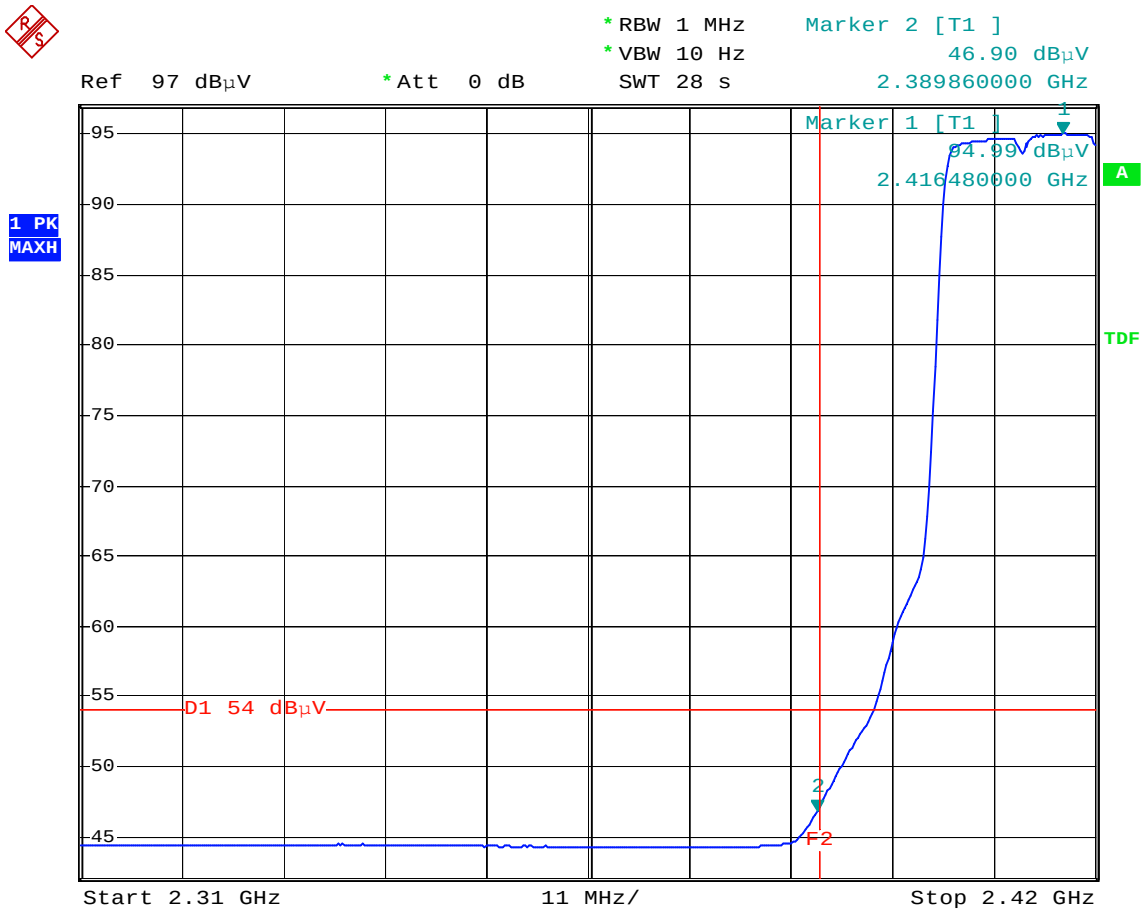


Comment: Band-edge test at high channel
Comment: Average detector F1=2483.5MHz 802.11b external Att.=6dB
Date: 19.AUG.2004 12:05:17

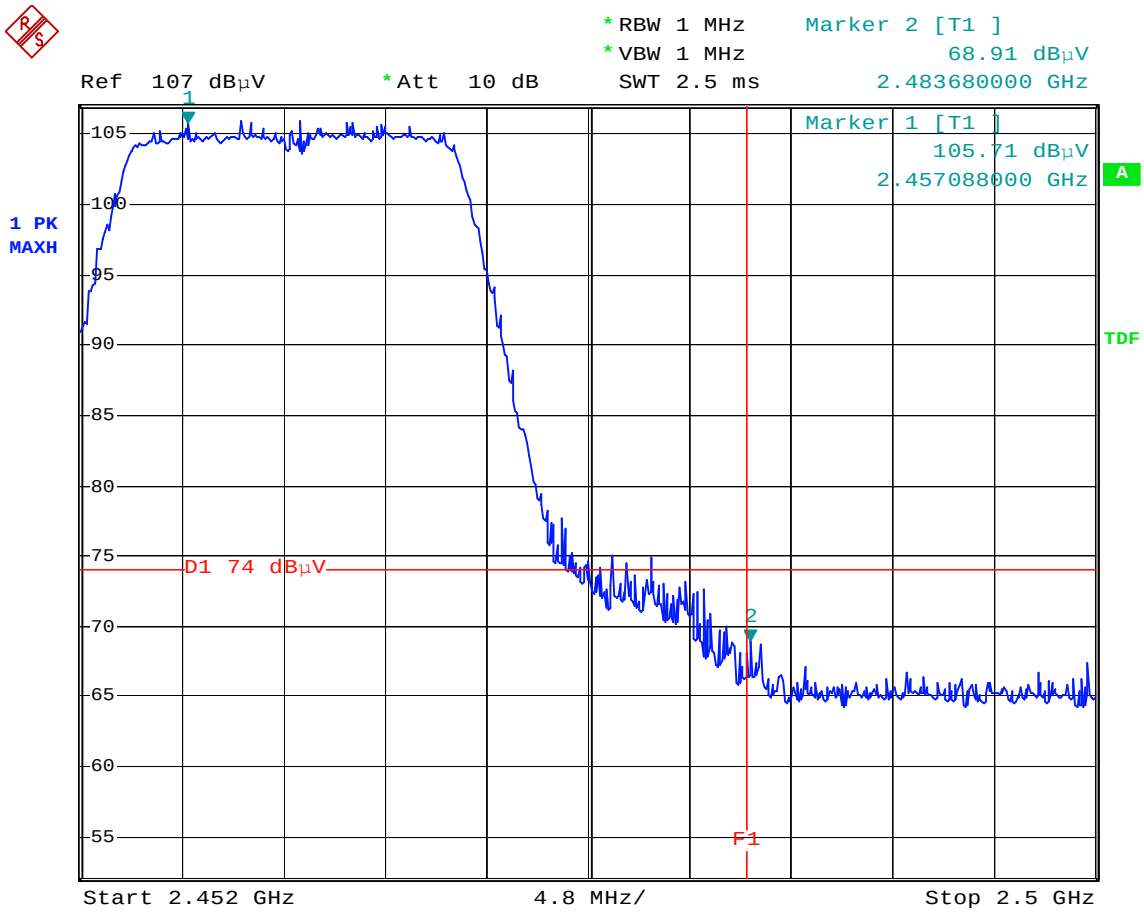
Test Mode: 802.11g operation mode (OFDM Modulation)



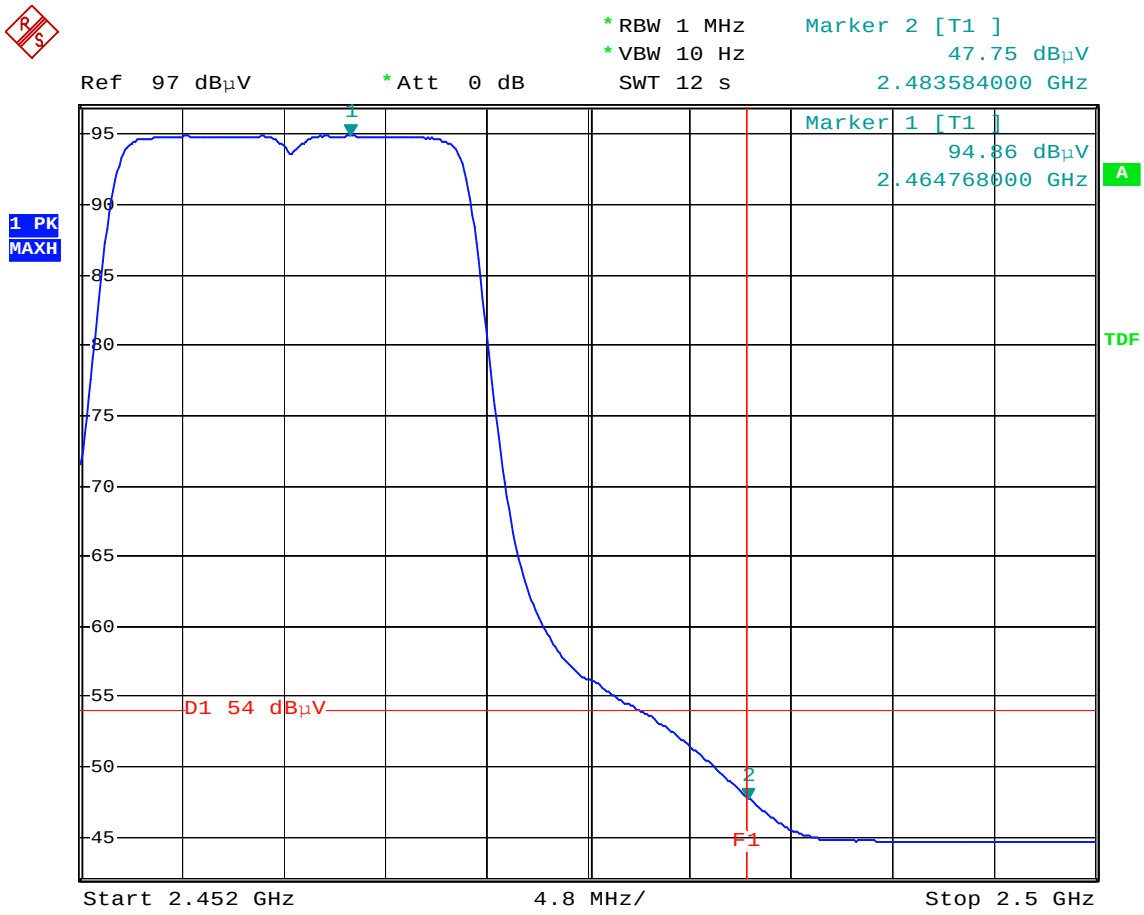
Comment: Band-edge test at low channel
Comment: Peak detector F2=2390MHz 802.11g
Date: 1.JUL.2004 22:53:52



Comment: Band-edge test at low channel
Comment: Average detector F2=2390MHz 802.11g
Date: 1.JUL.2004 22:55:16



Comment: Band-edge test at high channel
Comment: Peak detector F1=2483.5MHz 802.11g
Date: 1.JUL.2004 22:50:27



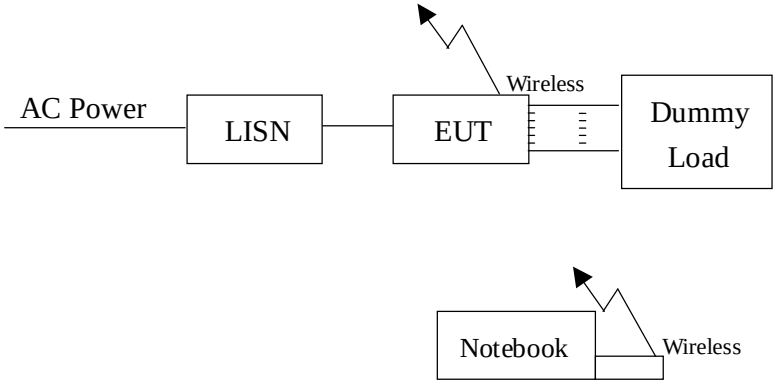
Comment: Band-edge test at high channel
Comment: Average detector F1=2483.5MHz 802.11g
Date: 1.JUL.2004 22:51:28

8. Power Line Conducted Emission test §FCC 15.207

8.1 Operating environment

Temperature:	24	℃	(10-40℃)
Relative Humidity:	52	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1061hPa)

8.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement. The AC power conducted emissions was invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

The EUT configuration please refers to the “Conducted set-up photo.pdf”.

Please see the plot below.

Emission Limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

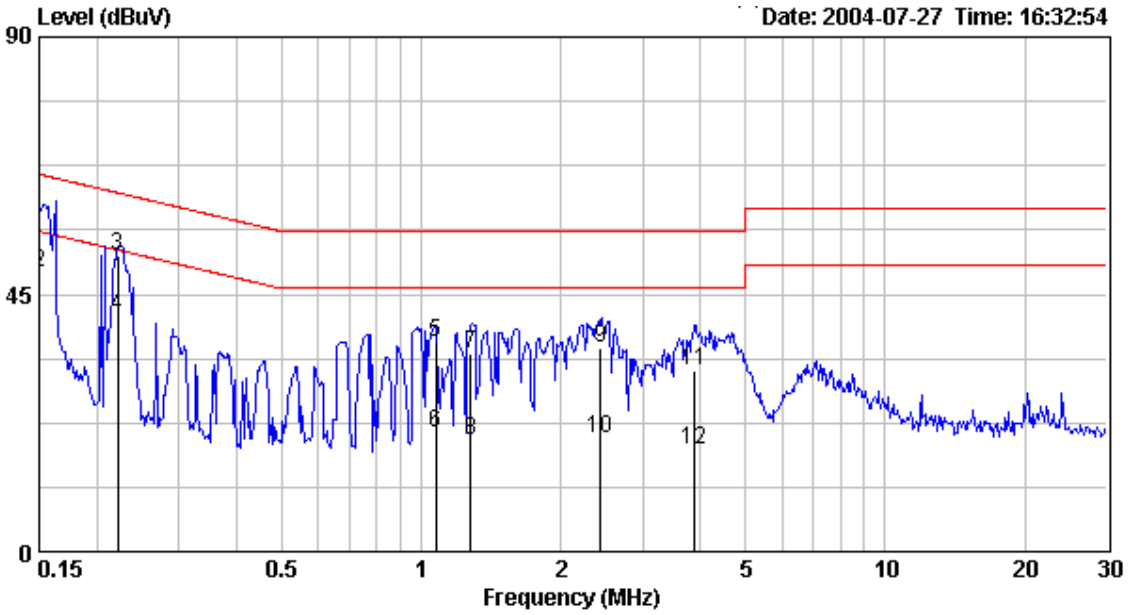
8.3 Power Line Conducted Emission test data

The test was performed with 802.11b and 802.11g Normal operating modes, the worst case was occurred in 802.11g Normal operating mode.

Phase:	Line
Model No.:	WR404
Worst Case Condition:	802.11g Normal operation

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.150	0.10	57.44	66.00	48.68	56.00	-8.56	-7.32
0.222	0.10	51.71	62.76	41.28	52.76	-11.05	-11.48
1.074	0.10	36.64	56.00	20.88	46.00	-19.36	-25.12
1.279	0.10	34.67	56.00	19.49	46.00	-21.33	-26.51
2.439	0.12	35.72	56.00	19.75	46.00	-20.28	-26.25
3.872	0.19	31.68	56.00	17.95	46.00	-24.32	-28.05

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: WR404
Worst Case Condition: 802.11g Normal operation

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.154	0.10	60.93	65.80	50.13	55.80	-4.87	-5.67
0.222	0.10	53.35	62.76	44.29	52.76	-9.41	-8.47
1.078	0.10	37.63	56.00	20.46	46.00	-18.37	-25.54
1.279	0.10	36.24	56.00	22.02	46.00	-19.76	-23.98
2.539	0.13	39.71	56.00	26.11	46.00	-16.29	-19.89
3.998	0.20	36.13	56.00	20.78	46.00	-19.87	-25.22

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)