

EMC TEST REPORT


Report No. : EME-060072**Model No. : SDW11b****Issued Date : Jan. 20, 2006**

Applicant : AboCom Systems, Inc.
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Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
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Project Engineer



Marx Yan

Reviewed By



Kevin Chen

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Summary of Tests**SD WLAN Card -Model: SDW11b
FCC ID: MQ4-SDW11B**

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	: SD WLAN Card
Model No.	: SDW11b
FCC ID.	: MQ4-SDW11B
Frequency Range	: 2412MHz ~ 2462MHz
Channel Number	: 11 channels
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: DSSS
Rated Power	: 2.7Vdc ~ 3.6Vdc
Power Cord	: N/A
Sample Received	: Feb. 16, 2005
Test Date(s)	: Feb. 16, 2005 ~ Mar. 4, 2005

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

The EUT is a SD WLAN Card that complies with the IEEE 802.11b standard on wireless LANs (Revision B)

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

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : -0.95 dBi max

Antenna Type : PCB Printed antenna

Connector Type : N/A

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.
PDA	DELL	Axim TM X30	CN-0M3839-70166-41S-A4HF

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 C63.4/2003.

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

Plug the EUT into PDA. Power on the PDA then run the test program “PPC_RFtest”.

The EUT was transmitted continuously during the test.

With individual verifying, the maximum output power were found at 11Mbps data rate for 802.11b mode. The final tests were executed under these conditions recorded in this report individually.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	04/13/2005
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	07/14/2005
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/13/2005
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/18/2005
Horn Antenna	EMCO	1GHz~18GHz	3115	EC338	08/16/2005
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/08/2005
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC368	05/20/2005
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	4/13/2005
Pre-Amplifier	MITEQ	26GHz~40GHz	828825	EC374	1/28/2006
Wideband Peak Power Meter/ Sensor	Anritsu	100MHz~18GHz	ML2497A/ MA2491A	EC396	10/18/2005
Controller	HDGmbH	N/A	HD 100	EP317-1	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP317-2	N/A
Turn Table	HDGmbH	N/A	DS 420S	EP317-3	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/14/2006

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

3. Minimum 6dB Bandwidth test

3.1 Operating environment

Temperature: 23 °C
Relative Humidity: 58 %
Atmospheric Pressure: 1023 hPa

3.2 Test setup & procedure

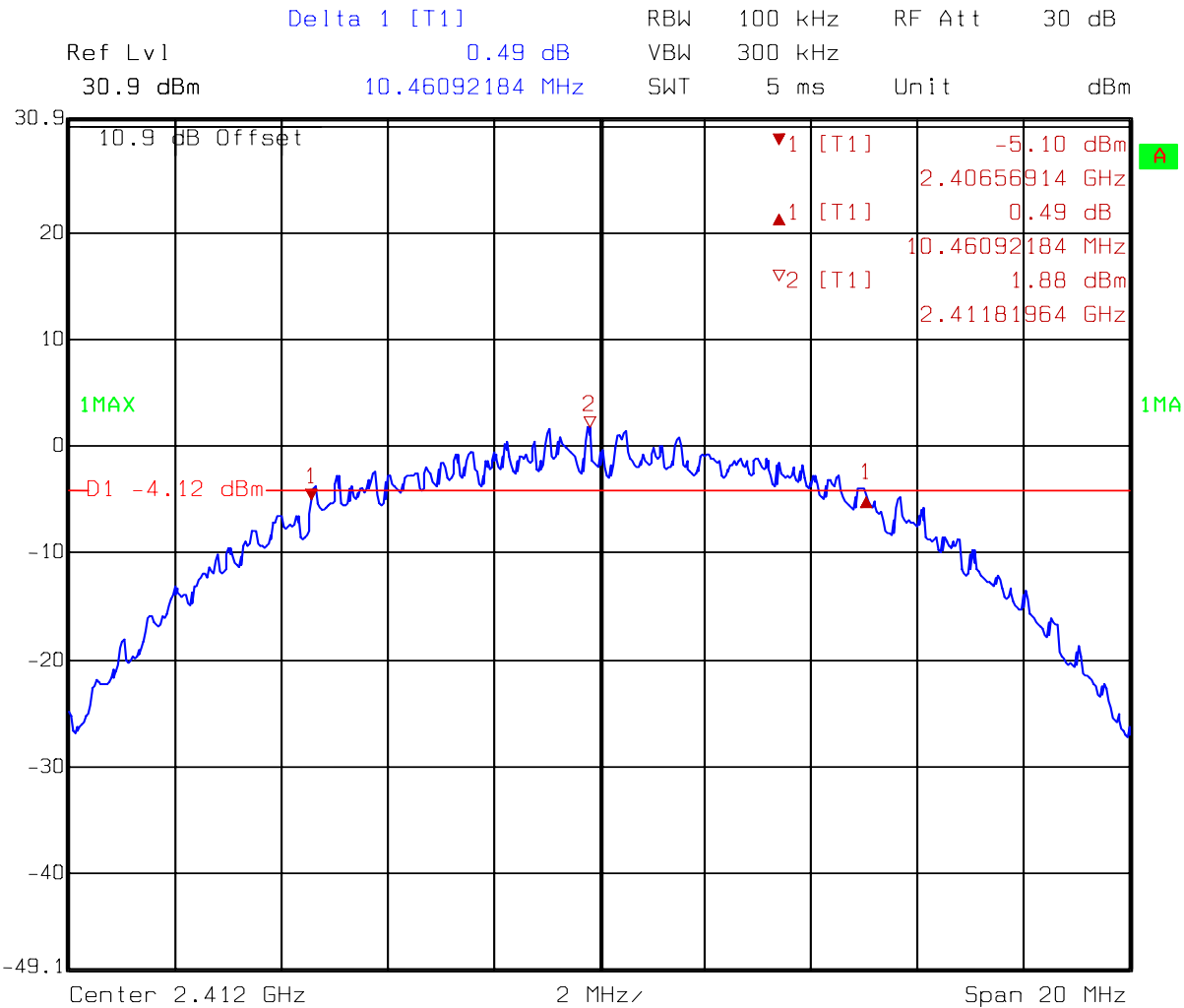
The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth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

3.3 Measured data of Minimum 6dB Bandwidth test results

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1 (lowest)	2412.00	10.46	> 500kHz
6 (middle)	2437.00	9.98	> 500kHz
11 (highest)	2462.00	10.50	> 500kHz

Please see the plot below.

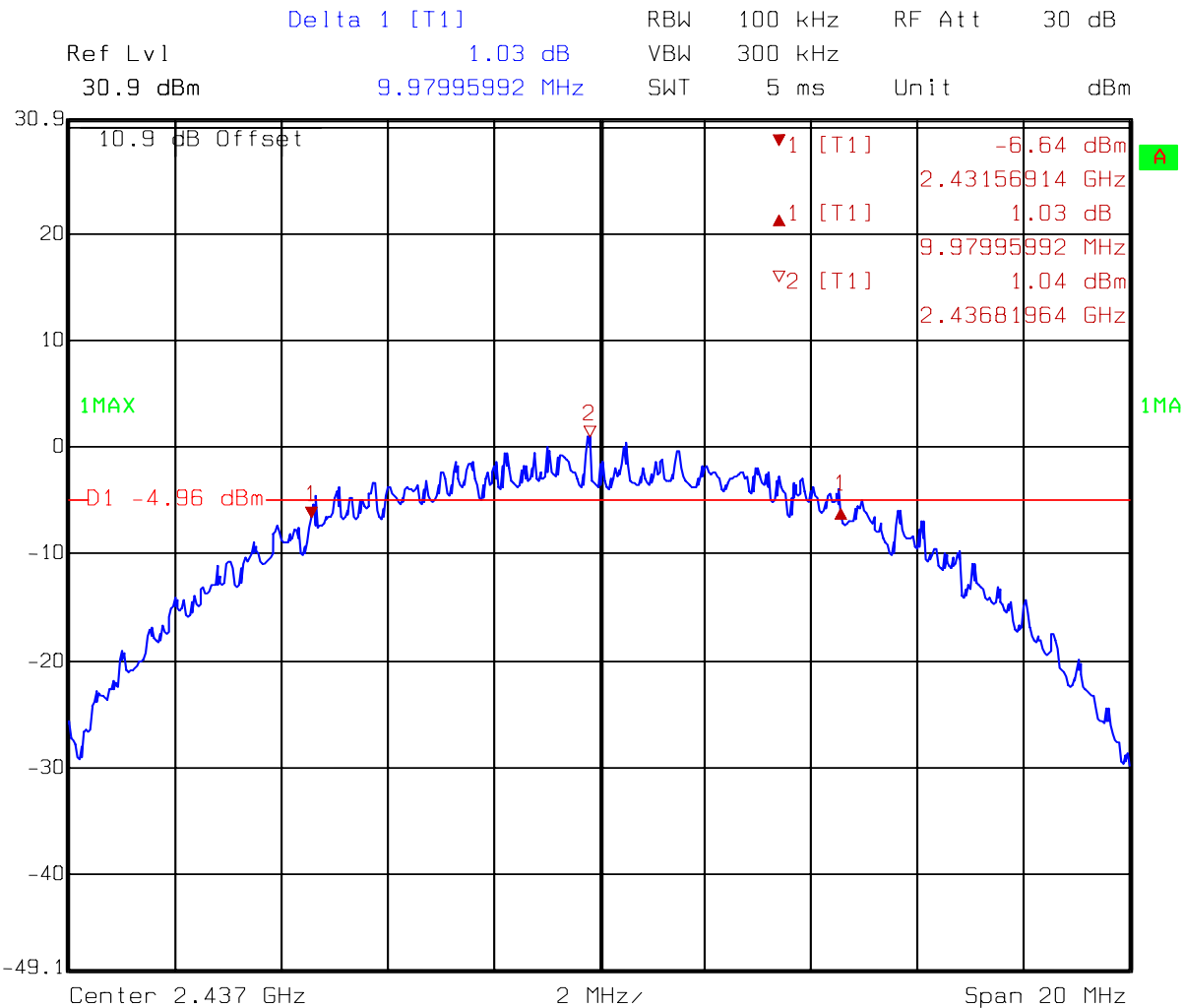
Test Mode: Tx at channel 1



Comment A: 6dB bandwidth at low channel (EC365) 802.11b

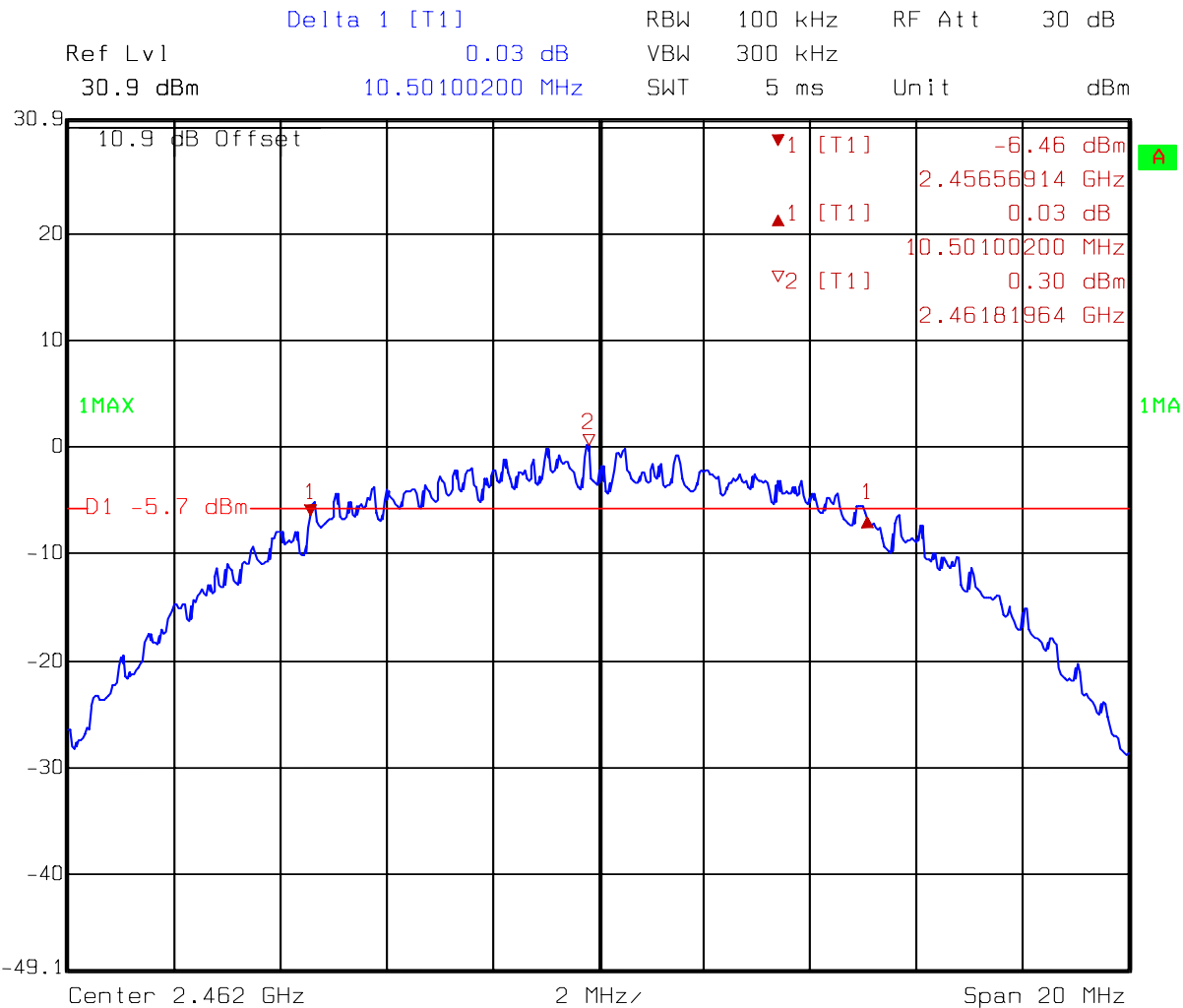
Date: 01.MAR.2005 14:42:02

Test Mode: Tx at channel 6



Comment A: 6dB bandwidth at middle channel (EC365) 802.11b
Date: 01.MAR.2005 15:01:27

Test Mode: Tx at channel 11



Comment A: 6dB bandwidth at high channel (EC365) 802.11b

Date: 01.MAR.2005 14:56:54

4. Maximum Output Power test

4.1 Operating environment

Temperature: 23 °C
Relative Humidity: 55 %
Atmospheric Pressure: 1023 hPa

4.2 Test setup & procedure

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Power was read directly and cable loss correction (0.87 dB) 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).

4.3 Measured data of Maximum Output Power test results

Channel	Freq. (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
				(dBm)	(mW)	
1 (lowest)	2412	0.87	10.95	11.82	15.21	1
6 (middle)	2437	0.87	12.03	12.90	19.50	1
11 (highest)	2462	0.87	10.62	11.49	14.09	1

Remark:

Conducted Peak Output Power = Reading + C.L.

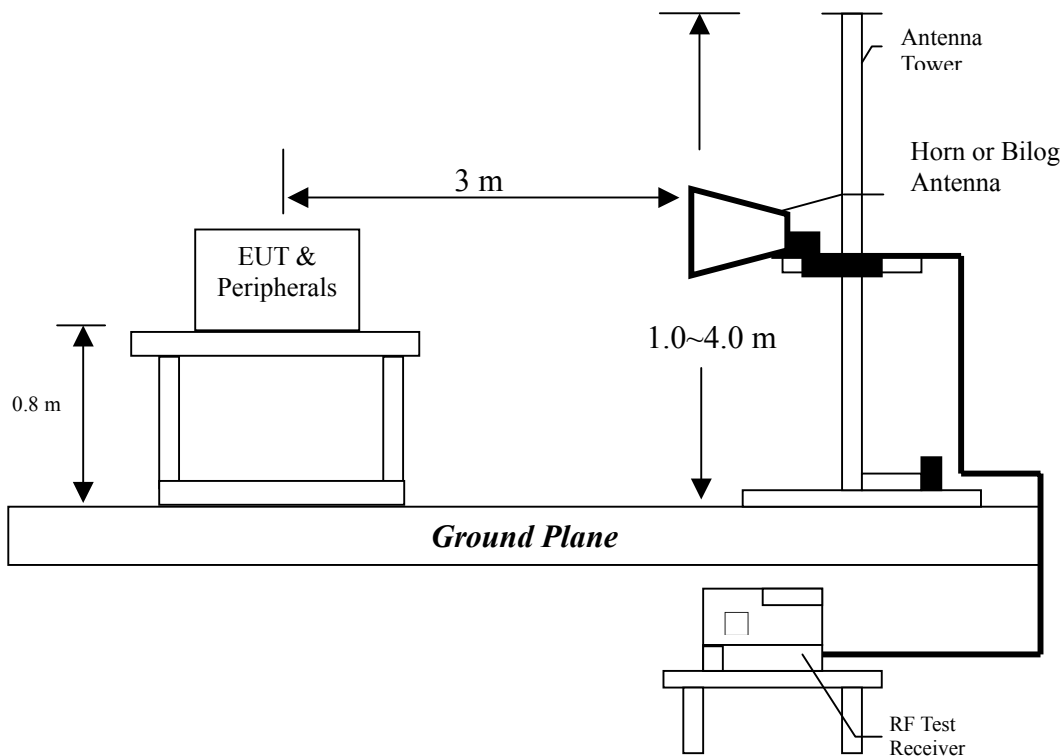
5. Radiated Emission test

5.1 Operating environment

Temperature: 23 °C
Relative Humidity: 58 %
Atmospheric Pressure: 1023 hPa

5.2 Test setup & procedure

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



Radiated emissions were investigated 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 refer 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.

5.4 Radiated spurious emission test data

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

The test was performed on EUT under 802.11b continuously transmitting mode. Channel 1, 6, 11 were verified. The worst case occurred at 802.11b Tx channel 1.

EUT : SDW11b
Worst Case : 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 (m)	Turn Table angle (degree)
47.500	QP	V	13.05	19.2	32.25	40	-7.75	1	139
92.100	QP	V	10.03	16.9	26.93	43.5	-16.57	1	323
249.200	QP	V	12.85	18.2	31.05	46	-14.95	1	150
392.800	QP	V	16.4	7.6	24	46	-22.00	1	106
563.500	QP	V	19.99	6.5	26.49	46	-19.51	1	316
710.900	QP	V	22.22	8.3	30.52	46	-15.48	2.46	268
392.800	QP	H	16.4	12.7	29.10	46	-16.9	2.33	49
441.300	QP	H	17.86	7.3	25.16	46	-20.84	2.19	129
466.500	QP	H	18.21	7.6	25.81	46	-20.19	2.27	92
489.800	QP	H	18.61	9	27.61	46	-18.39	1.84	181
540.200	QP	H	19.6	8.2	27.80	46	-18.20	1.83	45
710.900	QP	H	22.22	7.5	29.72	46	-16.28	2.15	27

Remark:

1. Corrected Level = Reading Level + Correction Factor

2. Correction Factor = Antenna Factor + Cable Loss

5.4.2 Measurement results: frequency above 1GHz

EUT : SDW11b

Test Condition : 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 (m)	Turn Table angle (degree)
4824.000	PK	V	32.27	35.74	51.67	55.15	74	-18.85	2.47	131.2
4824.000	AV	V	32.27	35.74	46.06	49.54	54	-4.46	2.47	131.2

Remark:

1. Corrected Level = Reading + Correction 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 is:

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 : SDW11b

Test Condition : 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 (m)	Turn Table angle (degree)
4874.060	PK	V	32.27	35.74	52.67	56.15	74	-17.85	3.45	23.74
4874.060	AV	V	32.27	35.74	47.4	50.88	54	-3.12	2.72	206.35

Remark:

1. Corrected Level = Reading Level + Correction 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 is:

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 : SDW11b
Test Condition : 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 (m)	Turn Table angle (degree)
4923.980	PK	V	32.27	35.74	54.61	58.09	74	-15.91	1.96	251.06
4923.980	AV	V	32.27	35.74	48.37	51.85	54	-2.15	2.88	24.39

Remark:

1. Corrected Level = Reading Level + Correction 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 is:

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: 21 °C
Relative Humidity: 51 %
Atmospheric Pressure 1023 hPa

6.2 Test setup & procedure

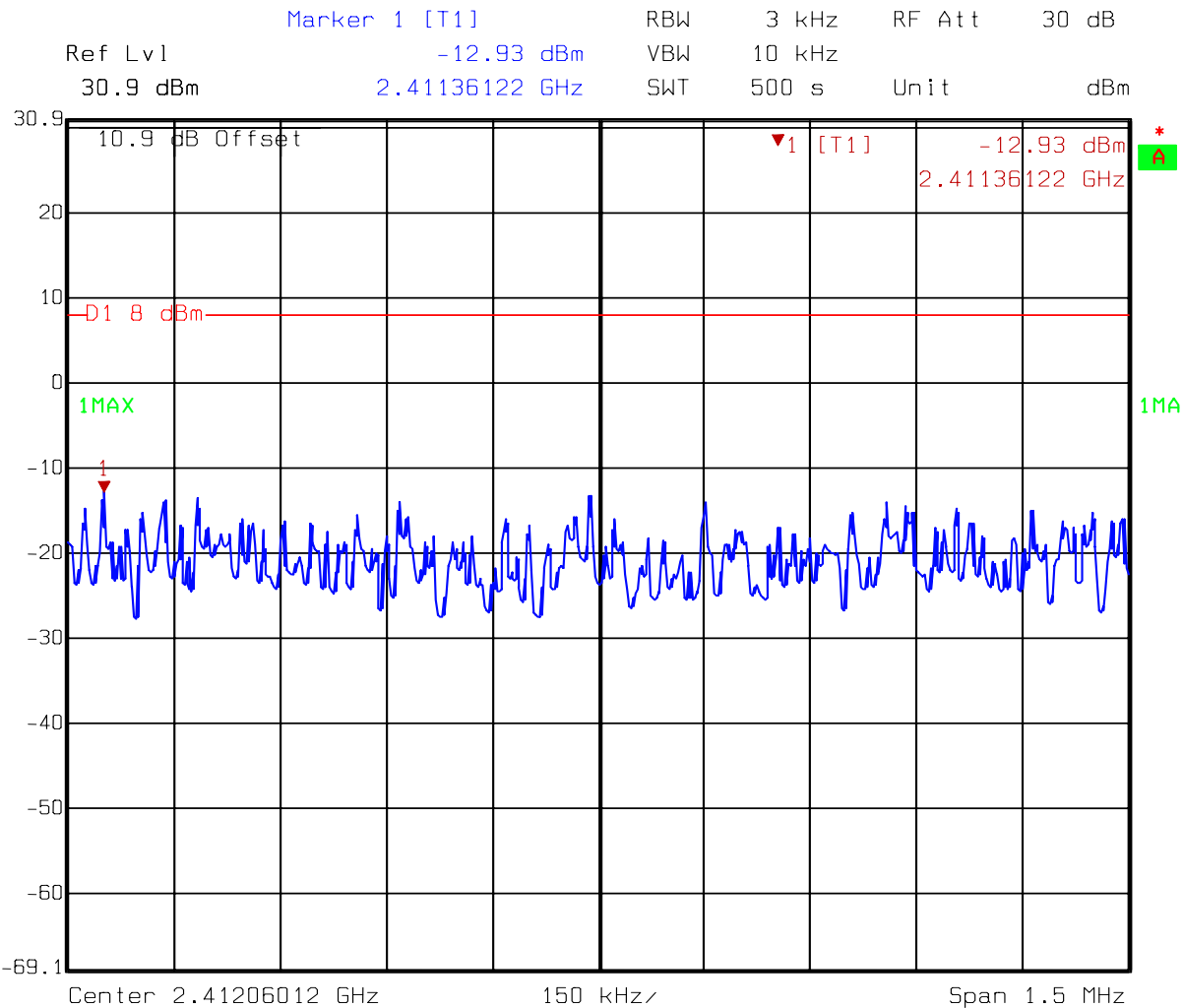
The power spectrum density per FCC §15.247(d) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 1.5 MHz, and the sweep time set at 500 seconds. Power Density was read directly correction 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

Channel	Frequency (MHz)	Measured level (dBm)	Calculated level (dBm)	Limit (dBm)
1 (lowest)	2412	-12.93	-12.93	8
6 (middle)	2437	-13.49	-13.49	8
11 (highest)	2462	-14.63	-14.63	8

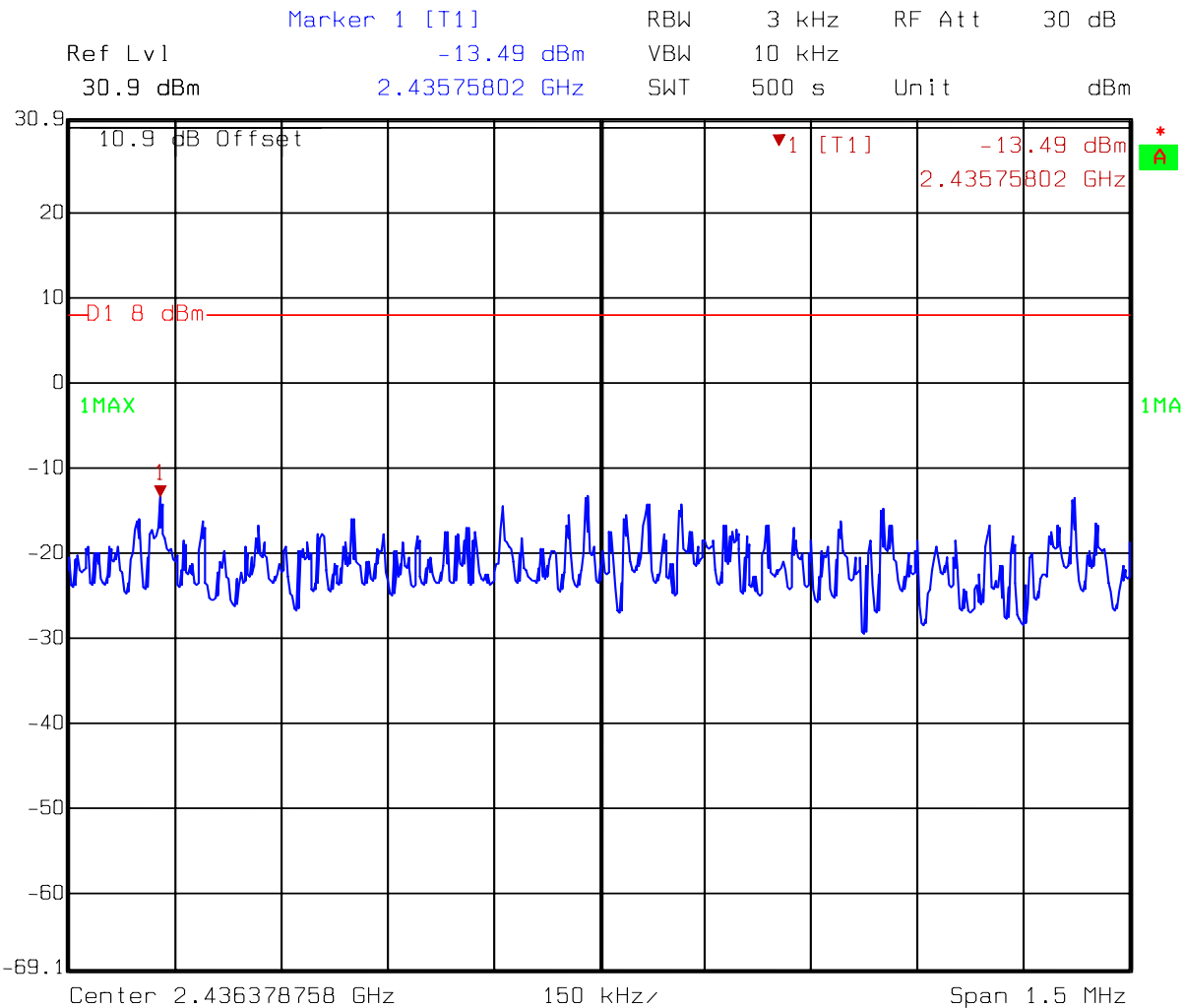
Please see the plot below.

Test Mode: Tx at channel 1



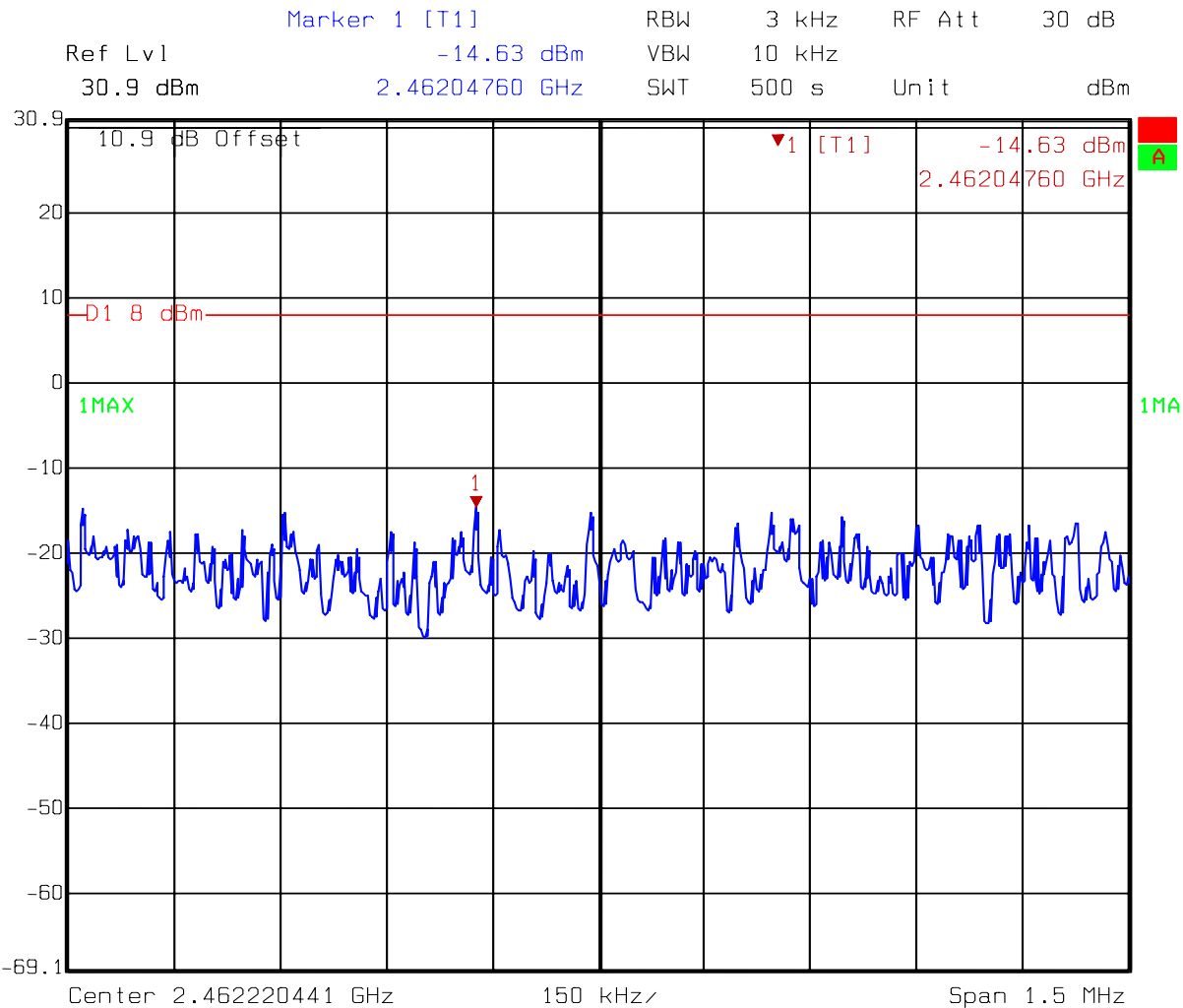
Comment A: Power spectrum density at low channel (EC365) 802.11b
Date: 01.MAR.2005 15:14:30

Test Mode: Tx at channel 6



Comment A: Power spectrum density at Middle channel (EC365) 802.11b
Date: 01.MAR.2005 15:19:06

Test Mode: Tx at channel 11



Comment A: Power spectrum density at high channel (EC365) 802.11b
 Date: 01.MAR.2005 15:26:32

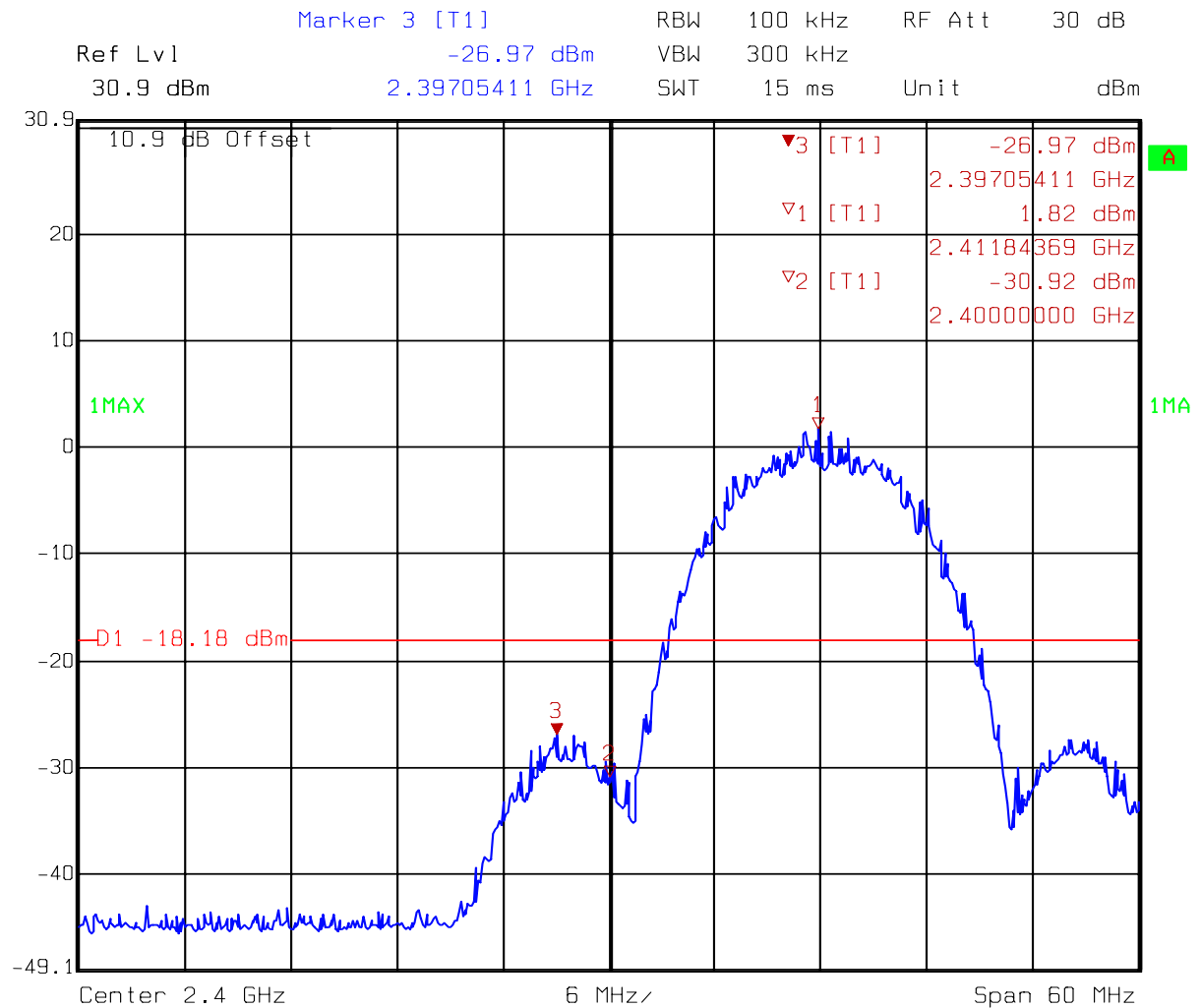
7. Emission on the band edge §FCC 15.247(C)

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.

Please see the plot below.

7.1 Band-edge (Conducted method)

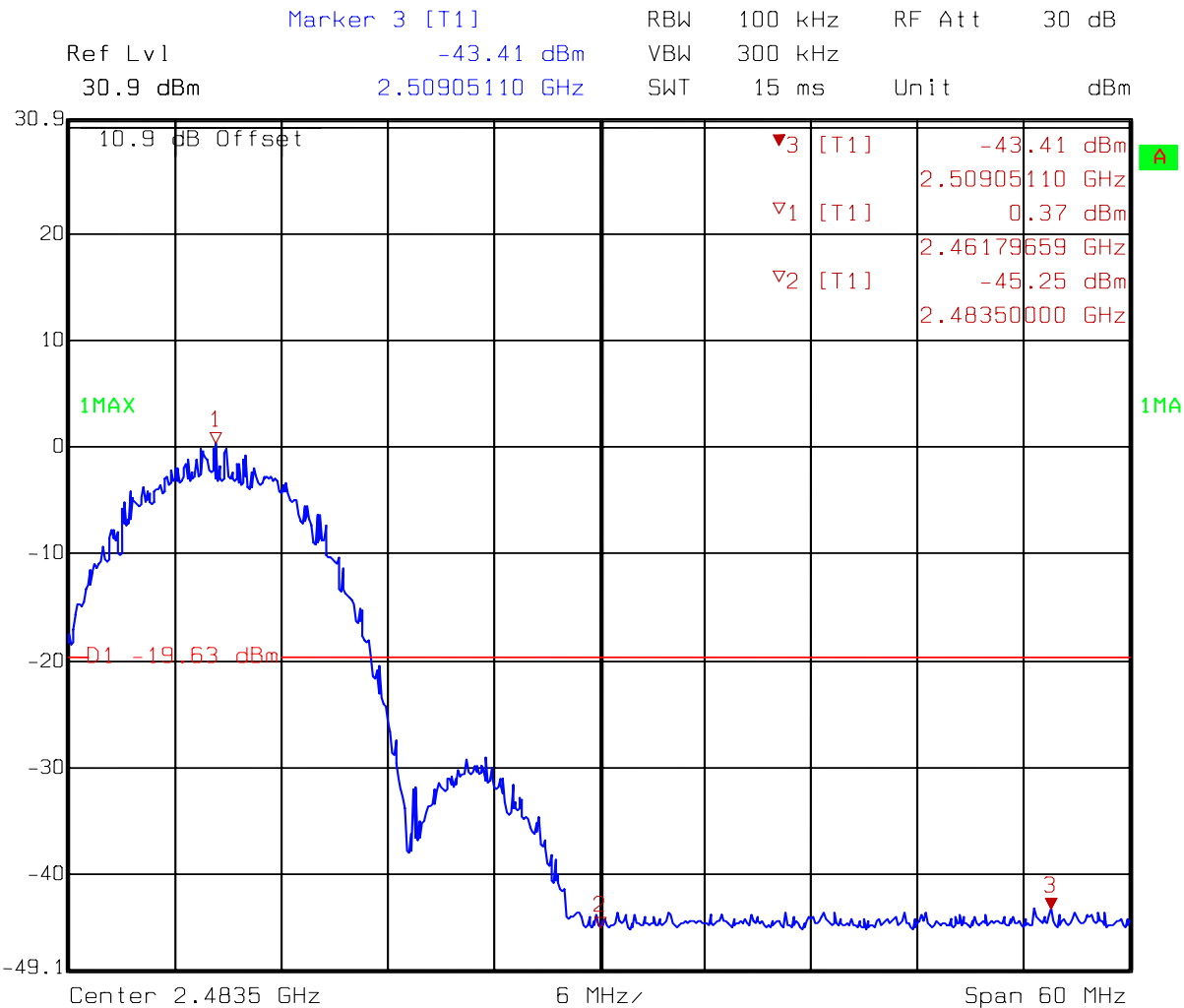
Test Mode: Tx at channel 1



Comment A: Band-edge at low channel (EC365) 802.11b

Date: 01.MAR.2005 15:47:05

Test Mode: Tx at channel 11

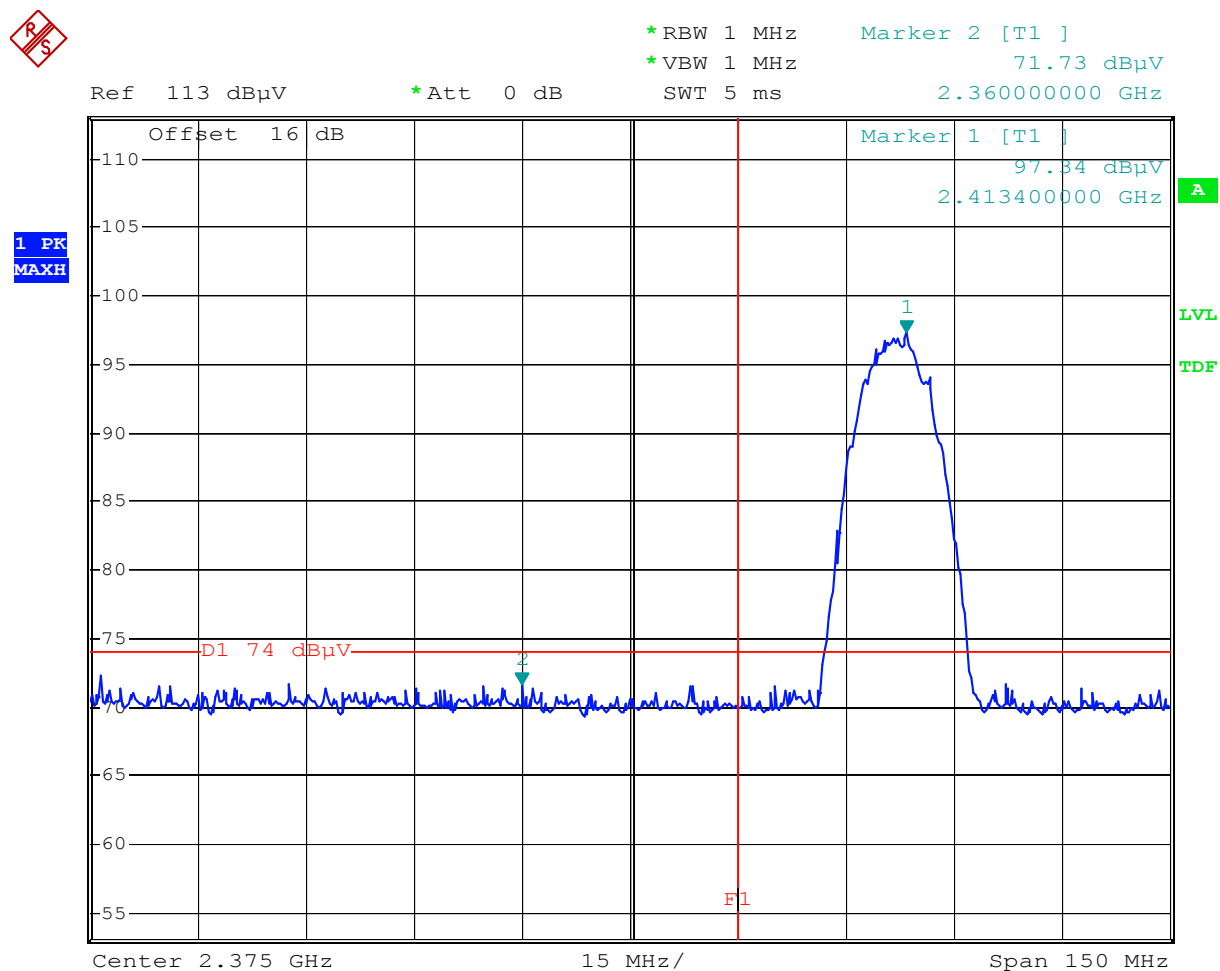


Comment A: Band-edge at high channel (EC365) 802.11b

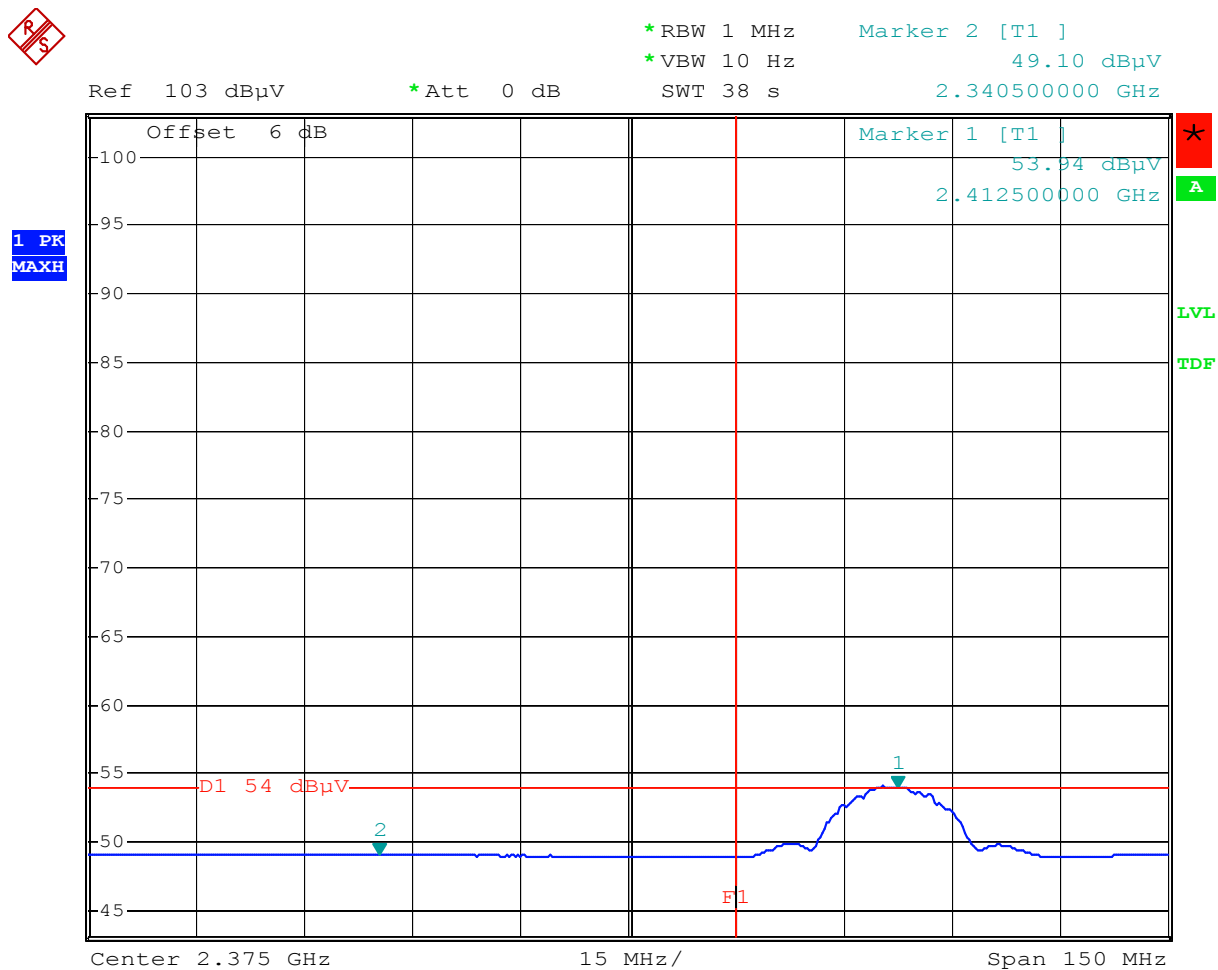
Date: 01.MAR.2005 15:40:47

7.2 Band-edge (Radiated method)

Test Mode: Tx at channel 1

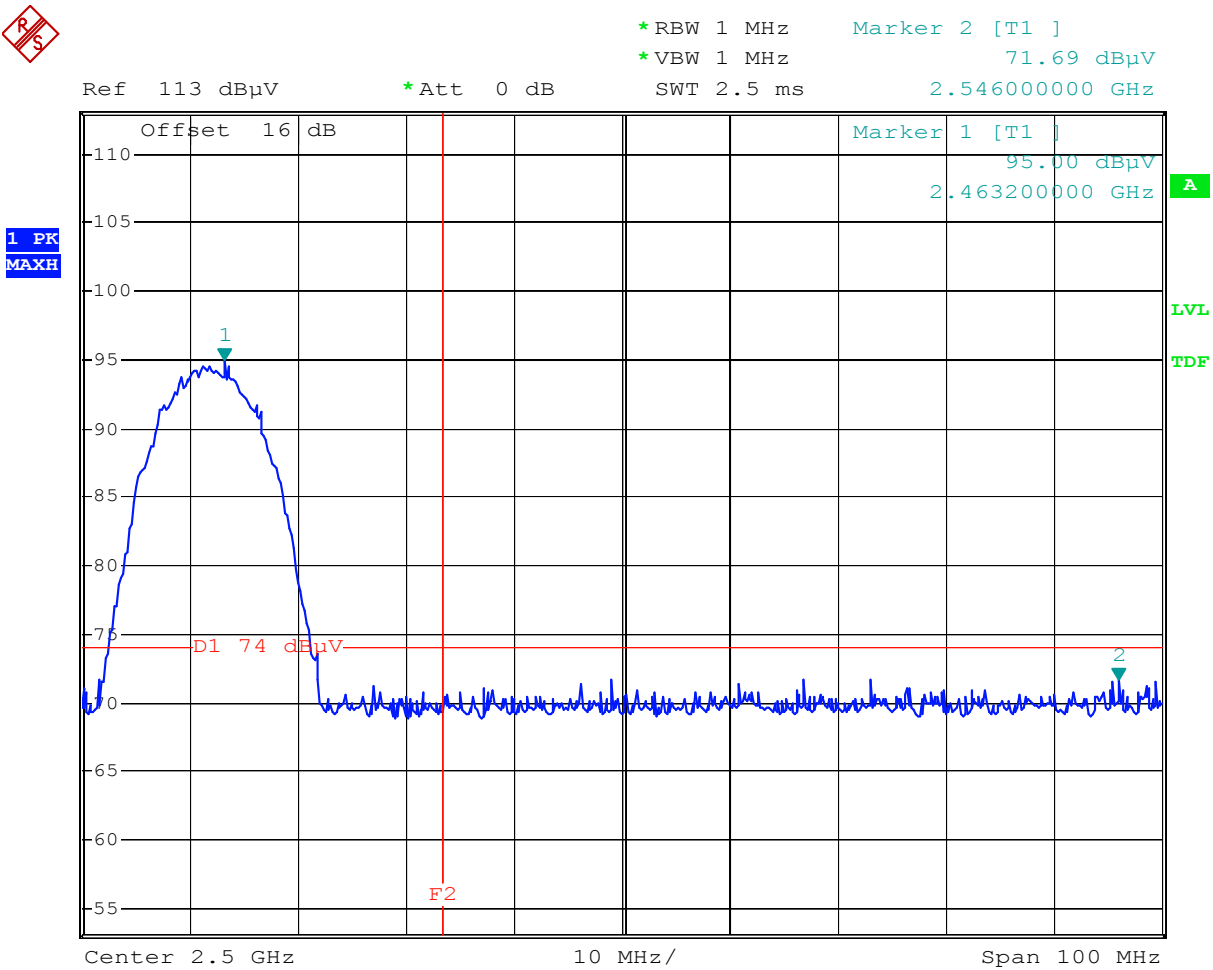


Comment: Band-edge Test at ch1
 Comment: Peak Detetor F1=2390MHz ATT=16dB
 Date: 9.MAR.2005 15:46:05

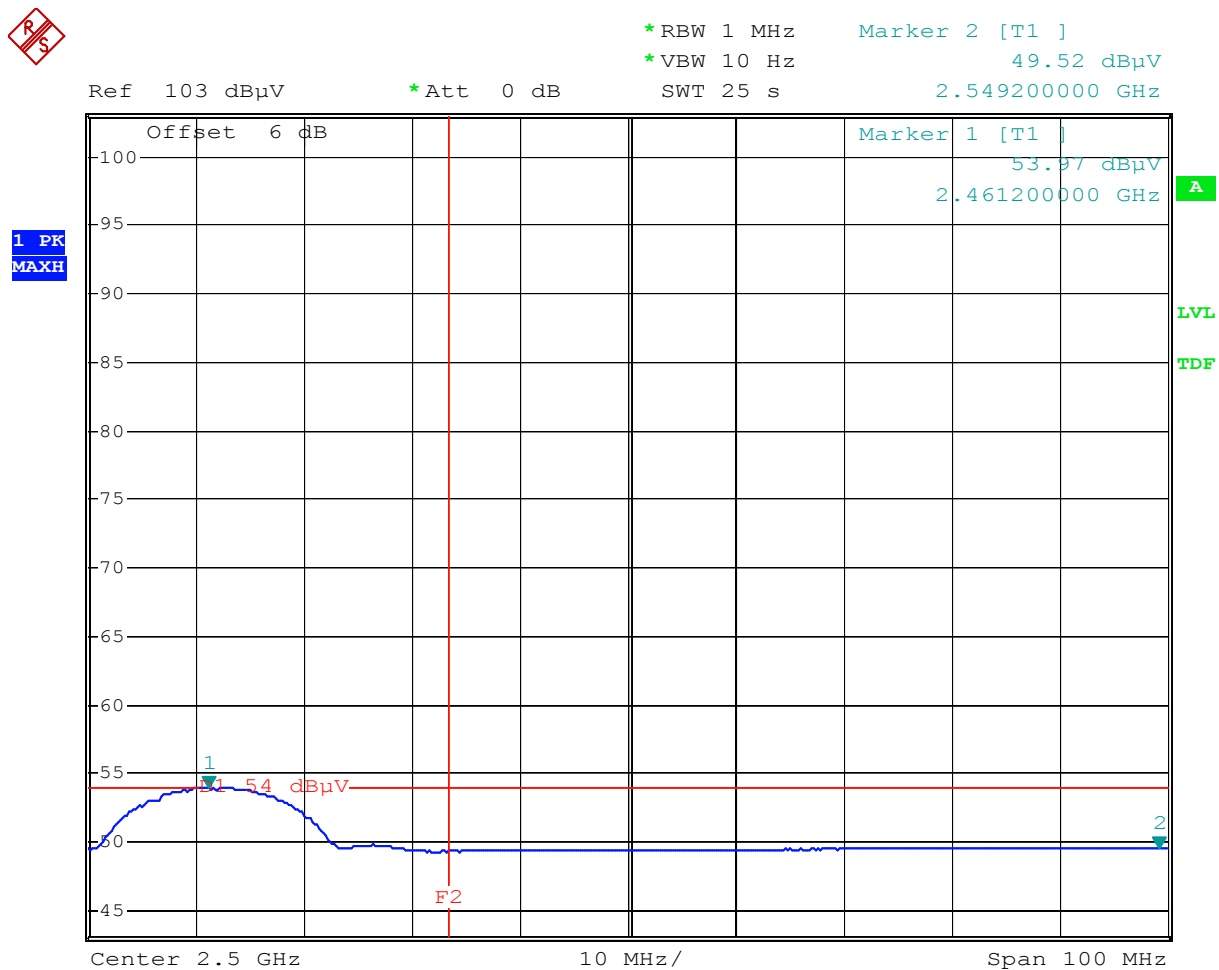


Comment: Band-edge Test at ch1
 Comment: Average Detetor F1=2390MHz ATT=6dB
 Date: 9.MAR.2005 15:51:30

Test Mode: Tx at channel 11



Comment: Band-edge Test at ch11
 Comment: Peak Detetor F2=2483.5MHz ATT=16dB
 Date: 9.MAR.2005 15:58:20



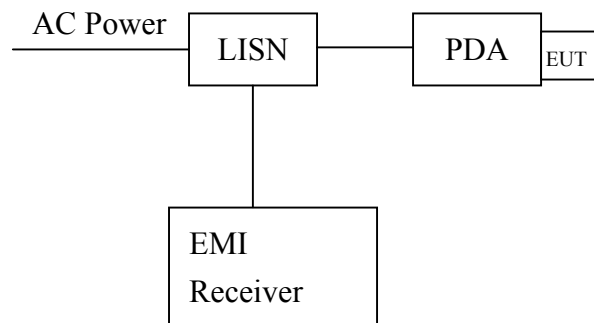
Comment: Band-edge Test at ch11
 Comment: Average Detetor F2=2483.5MHz ATT=6dB
 Date: 9.MAR.2005 15:56:28

8. Power Line Conducted Emission test §FCC 15.207

8.1 Operating environment

(10-40°C)	23	°C
(10-90%)	55	%
Atmospheric Pressure	1023	hPa

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 C63.4/2003 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

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

8.3 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.

8.4 Uncertainty of Conducted Emission

Expanded uncertainty (k=2) of conducted emission measurement is ± 2.6 dB.

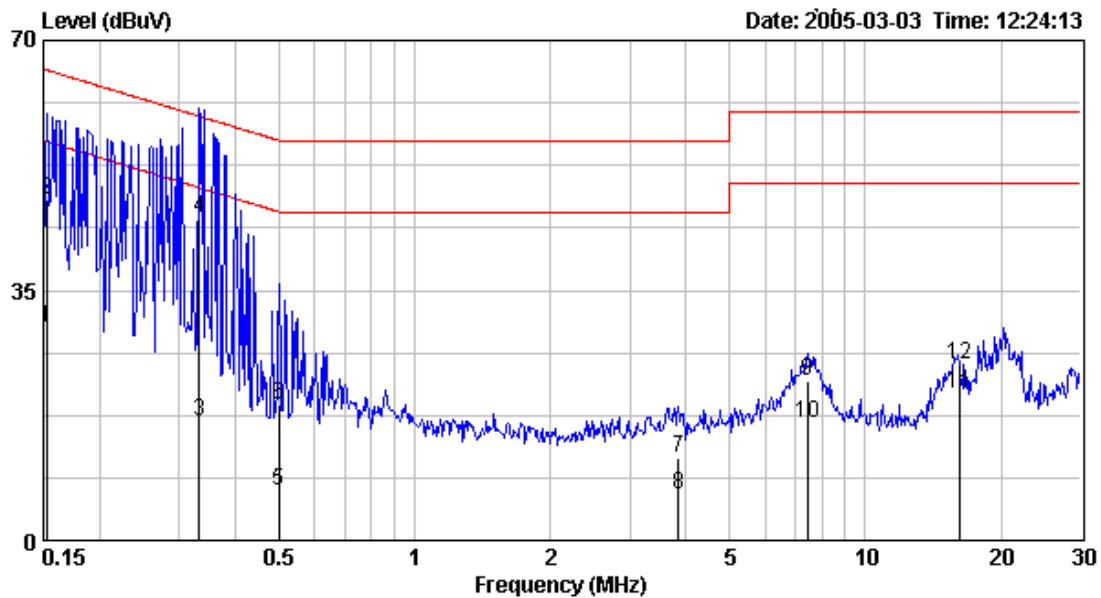
8.5 Power Line Conducted Emission test data

Phase: Line
 Model No.: SDW11b
 Test Condition: Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.152	0.10	47.76	65.87	29.77	55.87	-18.11	-26.10
0.333	0.10	45.18	59.38	16.70	49.38	-14.20	-32.68
0.500	0.10	19.09	56.01	6.94	46.01	-36.92	-39.07
3.842	0.23	11.64	56.00	6.36	46.00	-44.36	-39.64
7.443	0.39	22.30	60.00	16.38	50.00	-37.70	-33.62
16.122	0.85	24.56	60.00	20.55	50.00	-35.44	-29.45

Remark:

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



Phase: Neutral
 Model No.: SDW11b
 Test Condition: Normal operating mode

Frequency (MHz)	Corr. Factor (dB)	Level	Limit	Level	Limit	Margin	
		Qp (dBuV)	Qp (dBuV)	AV (dBuV)	Av (dBuV)	Qp	Av
0.150	0.10	46.57	66.00	27.96	56.00	-19.43	-28.04
0.335	0.10	45.58	59.32	19.64	49.32	-13.74	-29.68
0.480	0.10	21.06	56.34	6.79	46.34	-35.28	-39.55
1.732	0.11	12.14	56.00	8.29	46.00	-43.86	-37.71
7.503	0.28	23.03	60.00	16.05	50.00	-36.98	-33.96
15.616	0.55	25.74	60.00	20.86	50.00	-34.26	-29.14

Remark:

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

