

# EMC TEST REPORT

**Report No.** : EME-050700  
**Model No.** : XI-830M  
**Issued Date** : Aug. 8, 2005

**Applicant** : Z-Com, Inc.  
7F-2, No.9, Prosperity RD.I,  
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**Test By** : Intertek Testing Services Taiwan Ltd.  
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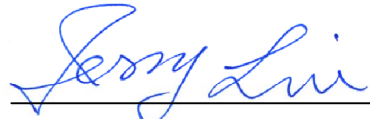
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Project Engineer



Marx Yan

Reviewed By



Jerry Liu

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**Summary of Tests**

**XI-830M 802.11b wireless CF module-Model: XI-830M  
FCC ID: M4Y-XI830M**

Test	Reference	Results
Minimum 6dB Bandwidth test	15.247(a)(2)	Complies
Maximum Output Power test	15.247(b)	Complies
Power Spectrum Density test	15.247(e)	Complies
Emission on the Band Edge test	15.247(d)	Complies
AC Power Line Conducted Emission test	15.207	Complies

## 1. General information

### 1.1 Identification of the EUT

Applicant	: Z-Com, Inc.
Product	: XI-830M 802.11b wireless CF module
Model No.	: XI-830M
FCC ID.	: M4Y-XI830M
Frequency Range	: 2412~2462 MHz
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	: 3.3Vdc
Power Cord	: N/A
Sample Received	: July 1, 2005
Test Date(s)	: July 1, 2005 ~ Aug. 4, 2005

A FCC DoC report has been generated for the client.

### 1.2 Additional information about the EUT

The EUT is an XI-830M 802.11b wireless CF module.

The EUT meets special requirements for full modular approval on FCC Public Notice DA 00-1407 and the device is only for OEM integrator, please refer the test result in this report.

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 : 2.0dBi max

Antenna Type : Dipole antenna

Connector Type : UFL

### 1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Notebook PC	HP	XE <sub>3</sub>	TW20705468	C5F7NFCMCC1518X
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved

## **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**

The EUT was supplied with 3.3Vdc from Notebook PC.

Settle the EUT into Notebook via PCMCIA interface extended card. Run the test program “PRISM test Utility” under Windows OS, which provided by manufacturer.

The EUT was operated in the status of continuously transmitting during all the tests.

After verifying, the maximum output power was found at 11Mbps data rate. 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	04/17/2006
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	07/13/2006
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/12/2006
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/18/2005
Horn Antenna	SCHWARZBECK	1GHz~18GHz	BBHA 9120 D	EC371	12/22/2007
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/08/2007
Bilog Antenna	SCHWARZBECK	25MHz~2GHz	VULB 9168	EC347	12/23/2007
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	12/30/2005
Pre-Amplifier	MITEQ	26GHz~40GHz	828825	EC374	01/28/2006
Wideband Peak Power Meter/ Sensor	Anritsu	100MHz~18GHz	ML2497A/ MA2491A	EC396	10/18/2005
Controller	HDGmbH	N/A	CM 100	EP346	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP347	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/13/2006

Note: 1. The above equipments are within the valid calibration period.

2. The test antennas (receiving antenna) are calibration per 3 years.

### 3. Minimum 6dB Bandwidth test

#### 3.1 Operating environment

Temperature: 25 °C  
Relative Humidity: 60 %  
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

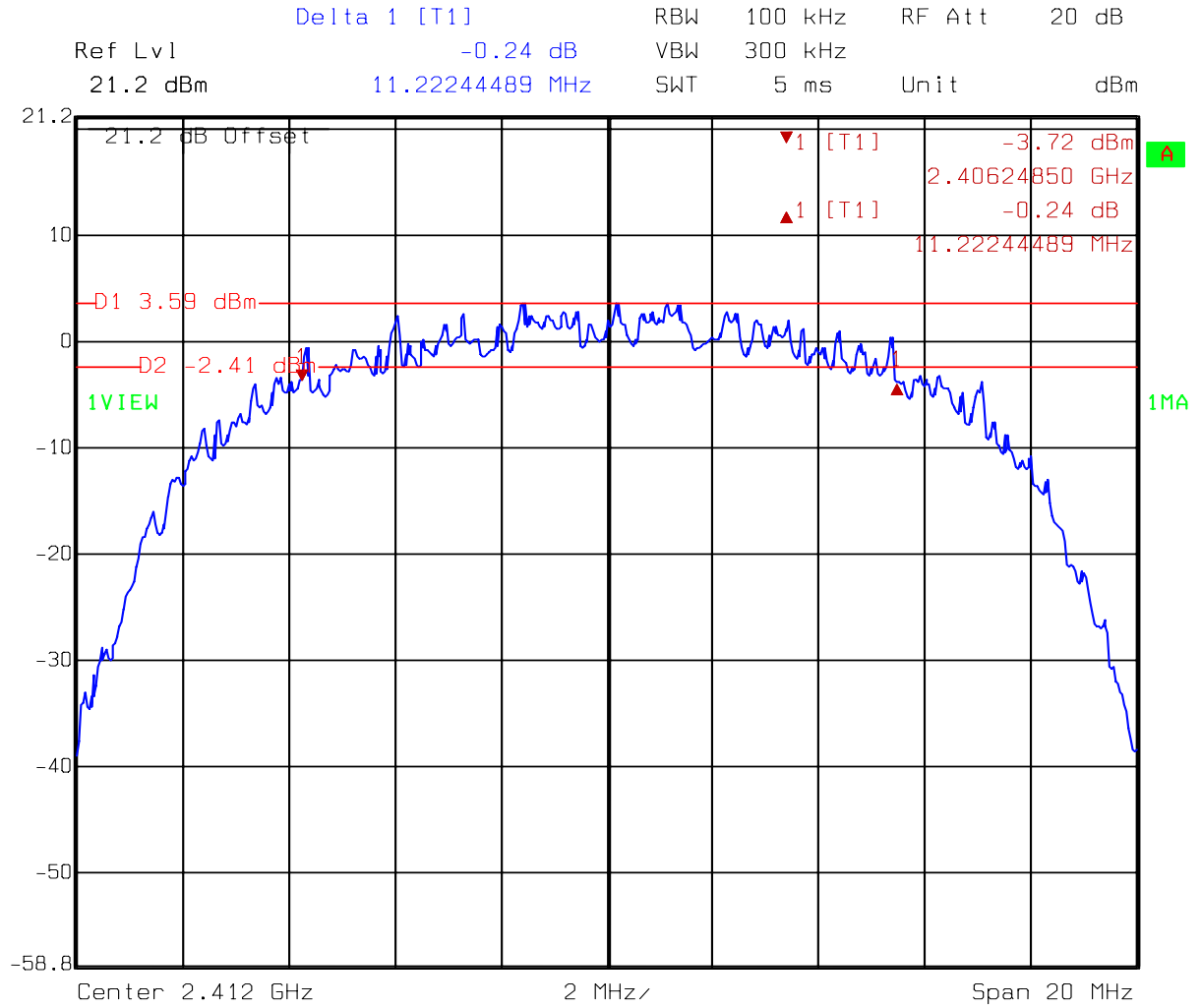
Test Mode: 802.11b (DSSS Modulation) operating mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1 (lowest)	2412	11.222	> 500kHz
6 (middle)	2437	11.222	> 500kHz
11 (highest)	2462	11.222	> 500kHz

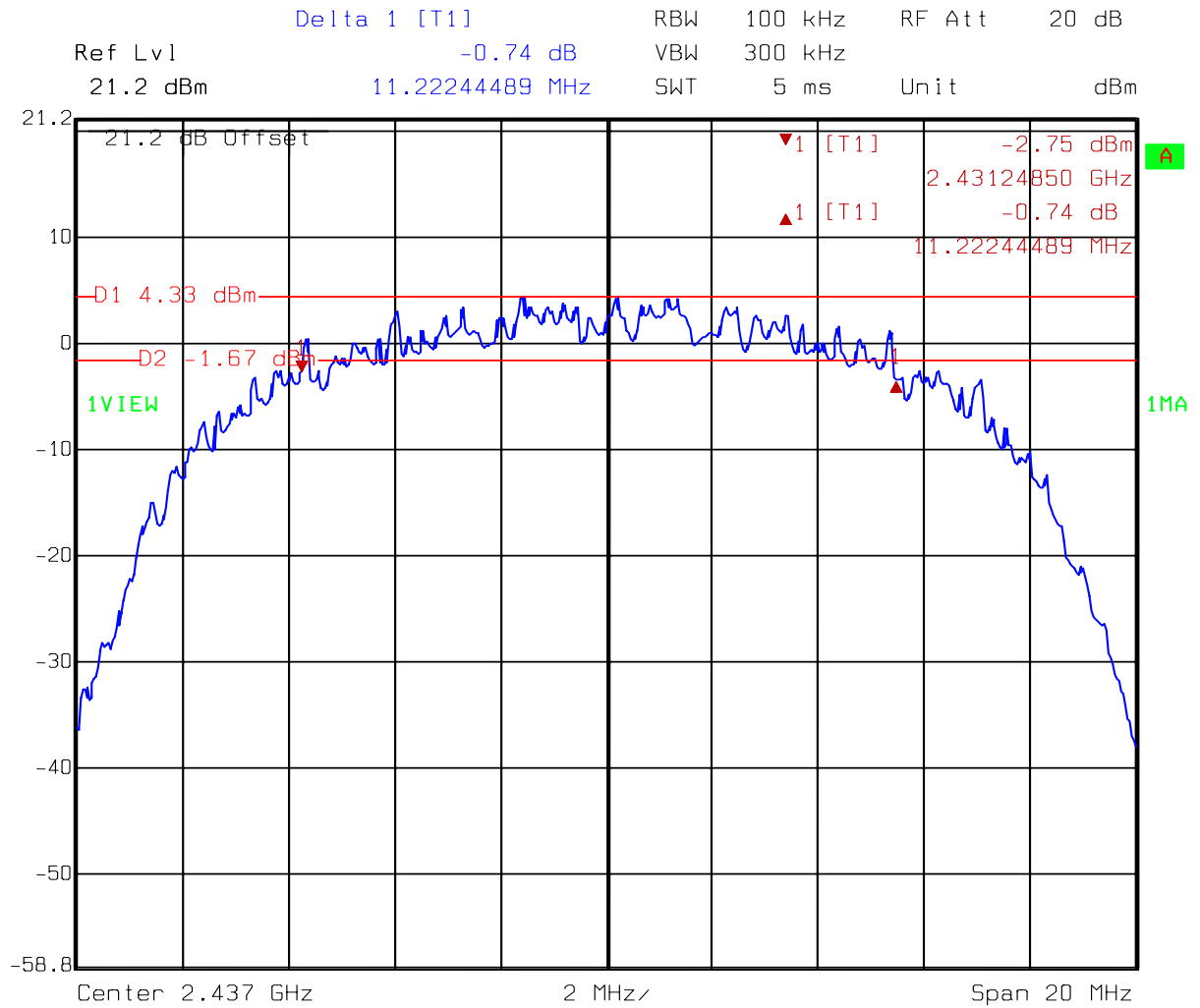
Please see the plot below.



**Test Mode: 802.11b(DSSS Modulation) operating mode**



Comment A: 6dB bandwidth at ch 1 (EC365)  
Date: 08.JUL.2005 15:26:28



Comment A: 6dB bandwidth at ch 6 (EC365)  
Date: 08.JUL.2005 15:29:45



#### 4. Maximum Output Power test

##### 4.1 Operating environment

Temperature: 25 °C  
 Relative Humidity: 60 %  
 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 (1.2 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	1.2	16.00	17.20	52.48	30
6 (middle)	2437	1.2	16.95	18.15	65.313	30
11 (highest)	2462	1.2	17.20	18.40	69.18	30

Remark:

Conducted Peak Output Power = Reading + C.L.

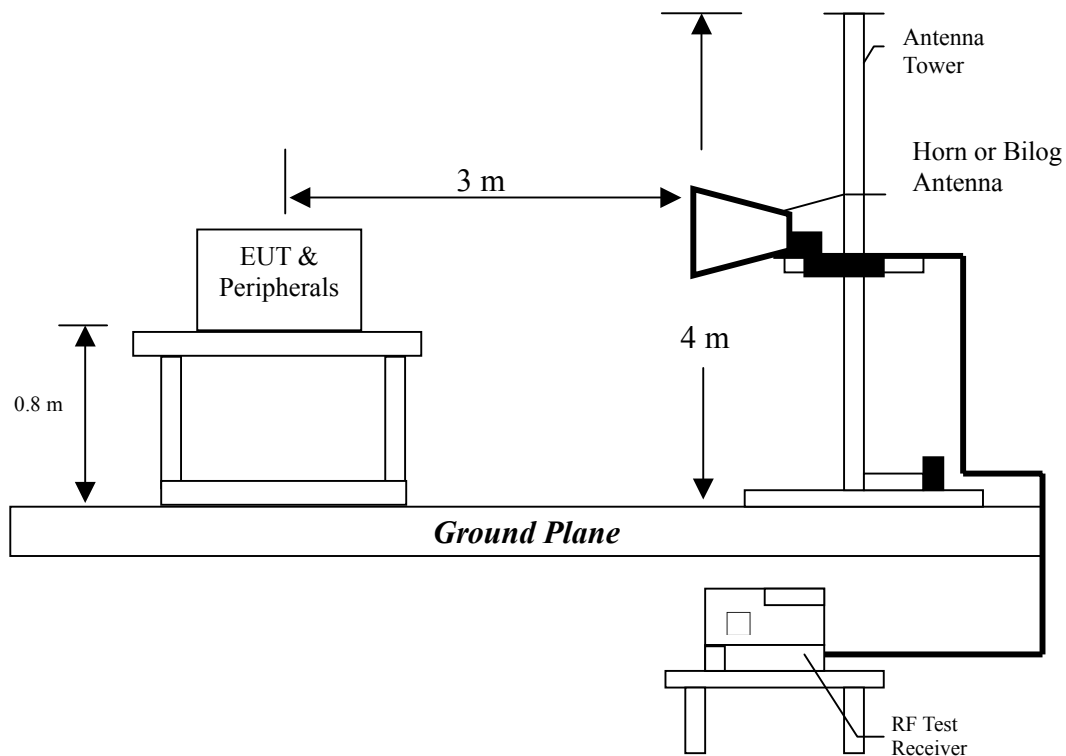
## 5. Radiated Emission test

### 5.1 Operating environment

Temperature:	23	°C
Relative Humidity:	53	%
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 3 meters 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 $\mu$ 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 up to 1 GHz

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

EUT : XI-830M  
 Worst Case Condition : Tx at low channel

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	132.82	QP	11.39	26.10	37.49	43.50	-6.01	100	248
V	163.86	QP	15.70	23.17	38.87	43.50	-4.63	100	284
V	175.50	QP	14.96	24.08	39.04	43.50	-4.47	100	20
V	198.78	QP	12.00	31.25	43.25	43.50	-0.25	100	171
V	231.76	QP	12.18	31.70	43.88	46.00	-2.12	100	94
V	262.80	QP	12.76	29.54	42.30	46.00	-3.70	100	135
H	64.92	QP	12.99	25.14	38.13	40.00	-1.87	400	23
H	142.52	QP	13.24	25.16	38.40	43.50	-5.11	400	356
H	175.50	QP	13.48	29.75	43.23	43.50	-0.27	400	54
H	241.46	QP	12.36	30.75	43.11	46.00	-2.89	400	5
H	274.44	QP	13.21	28.49	41.70	46.00	-4.31	400	217
H	340.40	QP	14.32	26.99	41.31	46.00	-4.70	262	22

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

#### **5.4.2 Measurement results: frequency above 1GHz**

The test was performed on EUT under continuously transmitting mode channel 1, 6, 11 were verified.

EUT : XI-830M

Test Condition : Tx at low, middle and high channel

#### **Test Result:**

No Spurious emissions were found over the original noise floor of the spectrum analyzer in the frequency range 30MHz to 25GHz.

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: 25 °C  
Relative Humidity: 60 %  
Atmospheric Pressure 1023 hPa

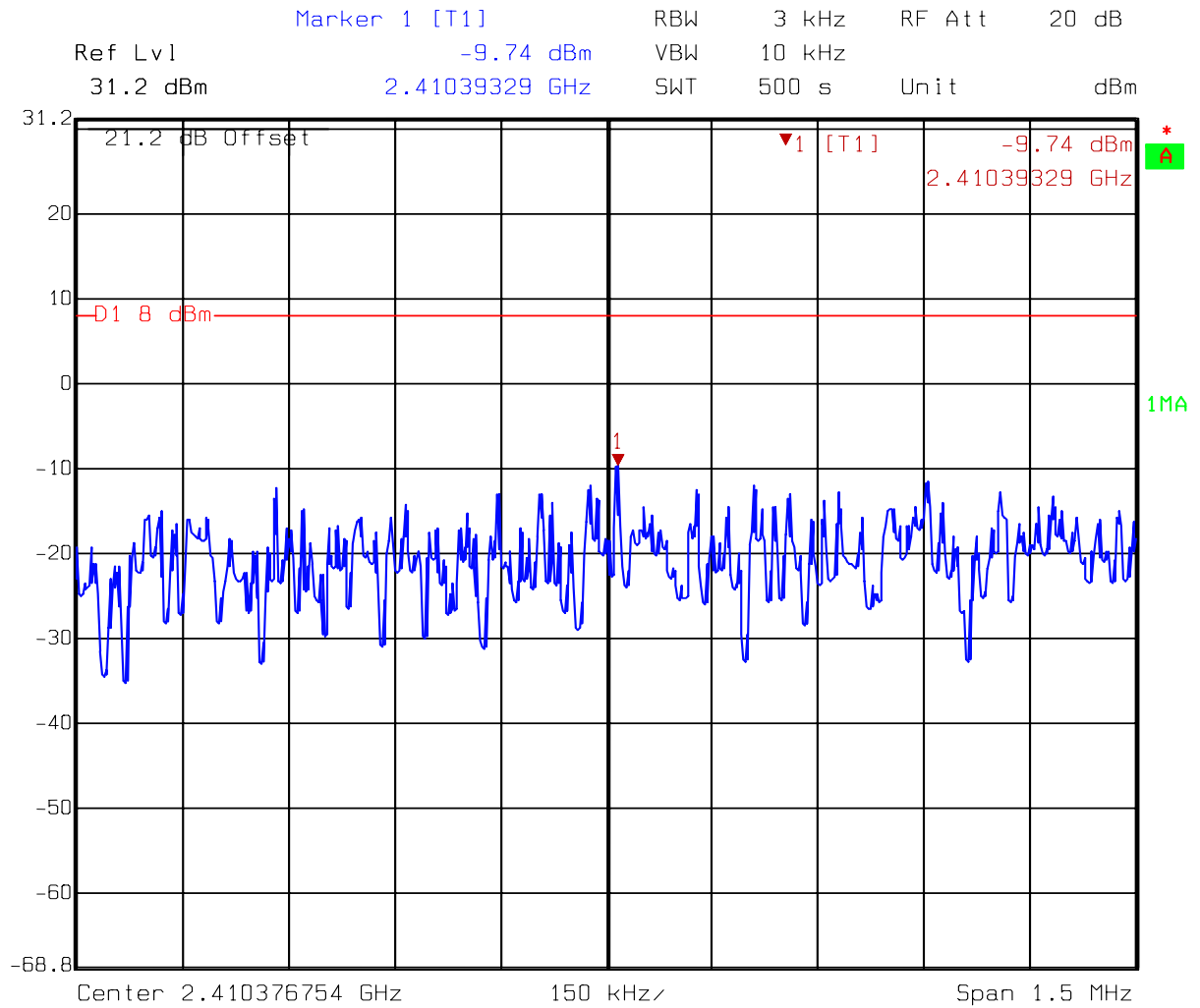
### 6.2 Test setup & procedure

The power spectrum density per FCC §15.247(e) 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. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

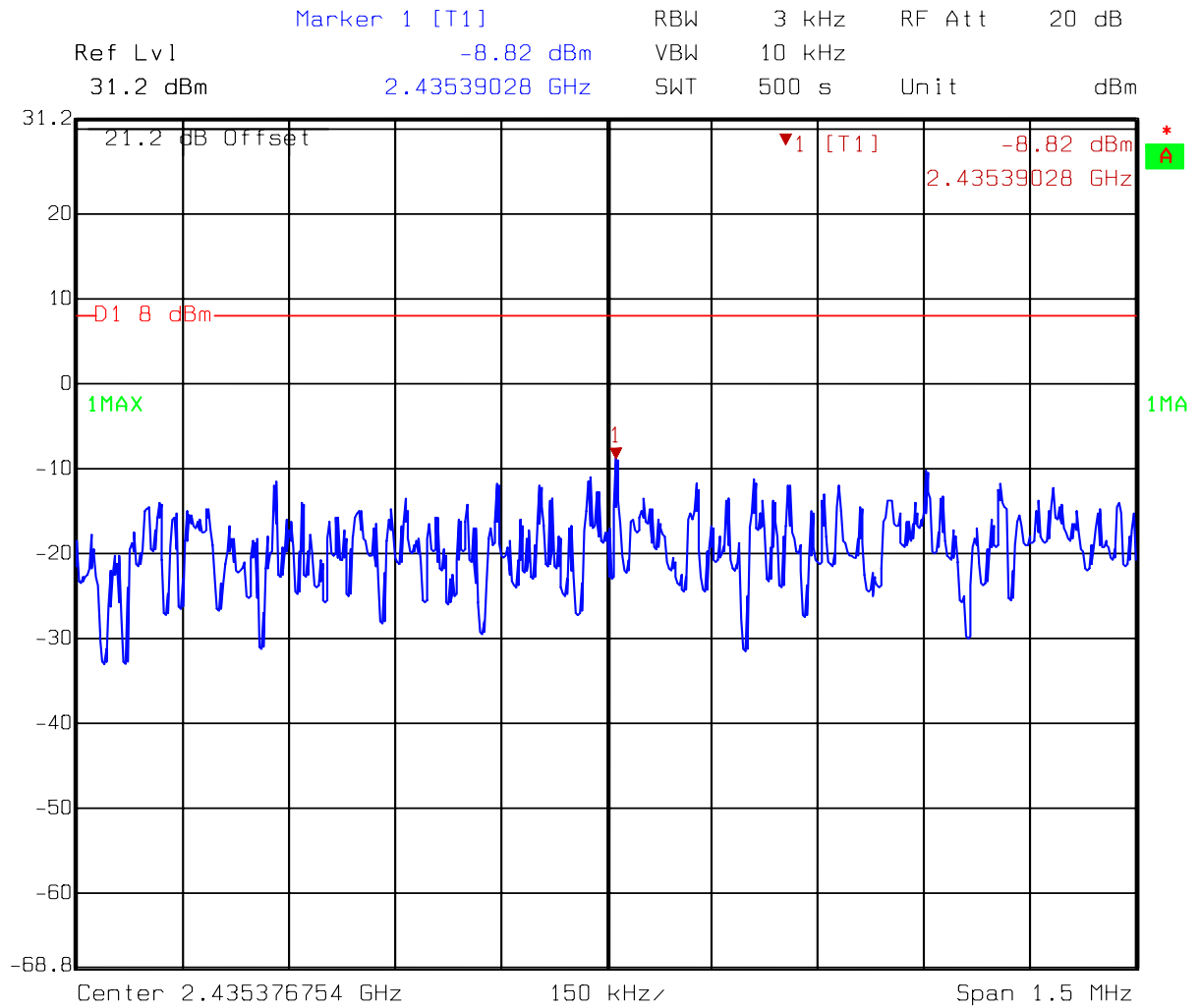
### 6.3 Measured data of Power Spectrum Density test results

Channel	Frequency (MHz)	Power spectrum density (dBm)	Limit (dBm)
1 (lowest)	2410.393	-9.74	8
6 (middle)	2435.390	-8.82	8
11 (highest)	2460.390	-8.50	8

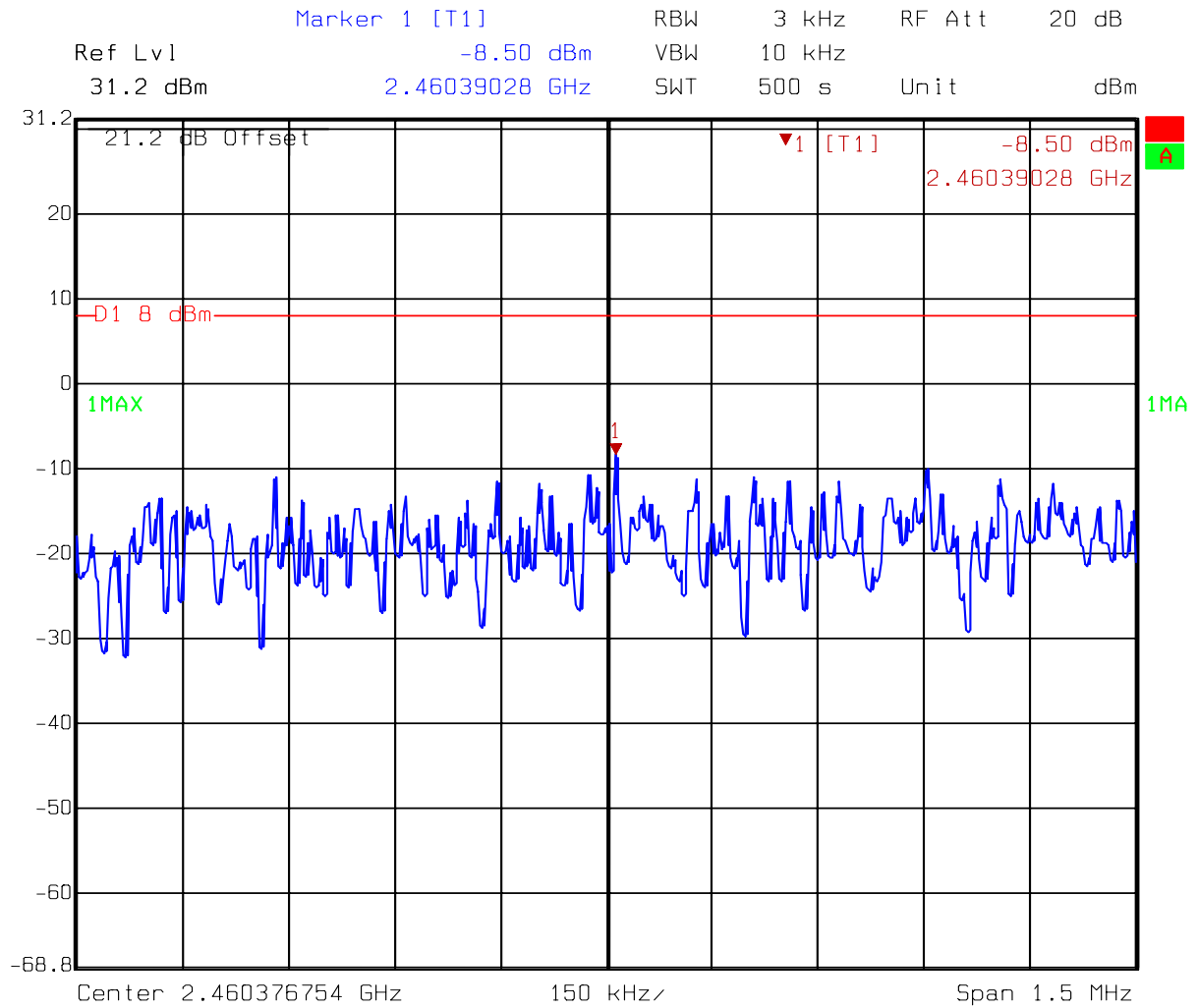
Please see the plot below.



Comment A: Power spectral density at low channel  
 Date: 08.JUL.2005 16:44:37



Comment A: Power spectral density at middle channel  
Date: 08.JUL.2005 16:43:01



Comment A: Power spectral density at high channel  
Date: 08.JUL.2005 16:40:58

## 7. Emission on the band edge

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.

### 7.1 Operating environment

Temperature:	23	°C
Relative Humidity:	53	%
Atmospheric Pressure	1023	hPa

### 7.2 Test setup & procedure

The output of EUT was connected to spectrum analyzer via a 50ohm cable.

The setting of spectrum analyzer is:

Peak: RBW = VBW = 100KHz  
Average : RBW = 1MHz, VBW = 10Hz

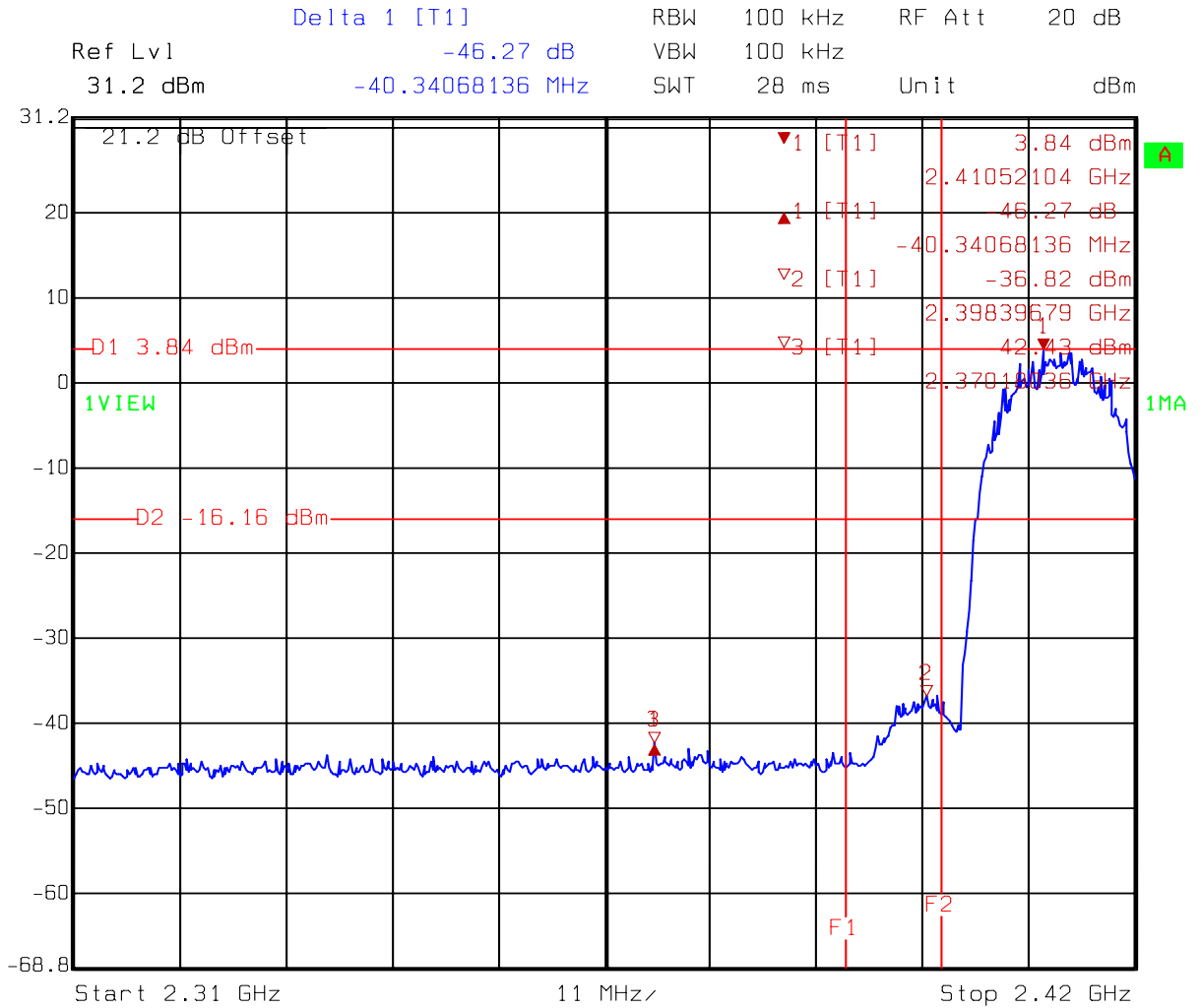
Please see the test plot below.

**7.3 Test Result**

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental @3m (dBuV/m)	Between Carrier Max. Power and Local Max. Emission in Restrict Band (dBc)			
		A	B			
1 (lowest)	PK	109.55	46.27	63.28	74	-10.72
	AV	99.79	52.44	47.35	54	-6.65
11 (highest)	PK	112.26	48.10	64.16	74	-9.84
	AV	103.28	52.68	50.6	54	-3.40

Remark: 1.  $C = A - B$

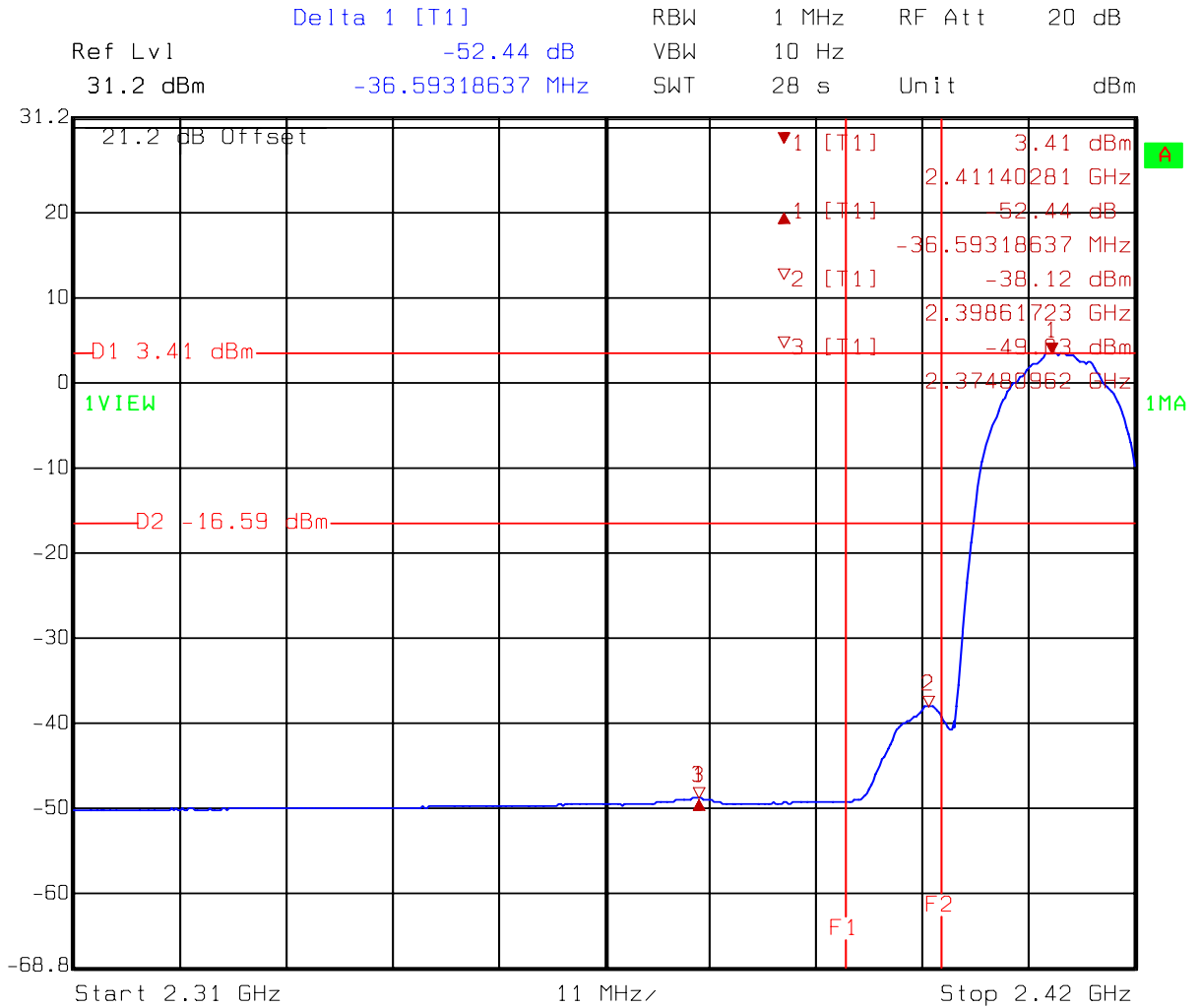
2.  $E = C - D$



Comment A: Band-edge at ch1 (EC365) 802.11b

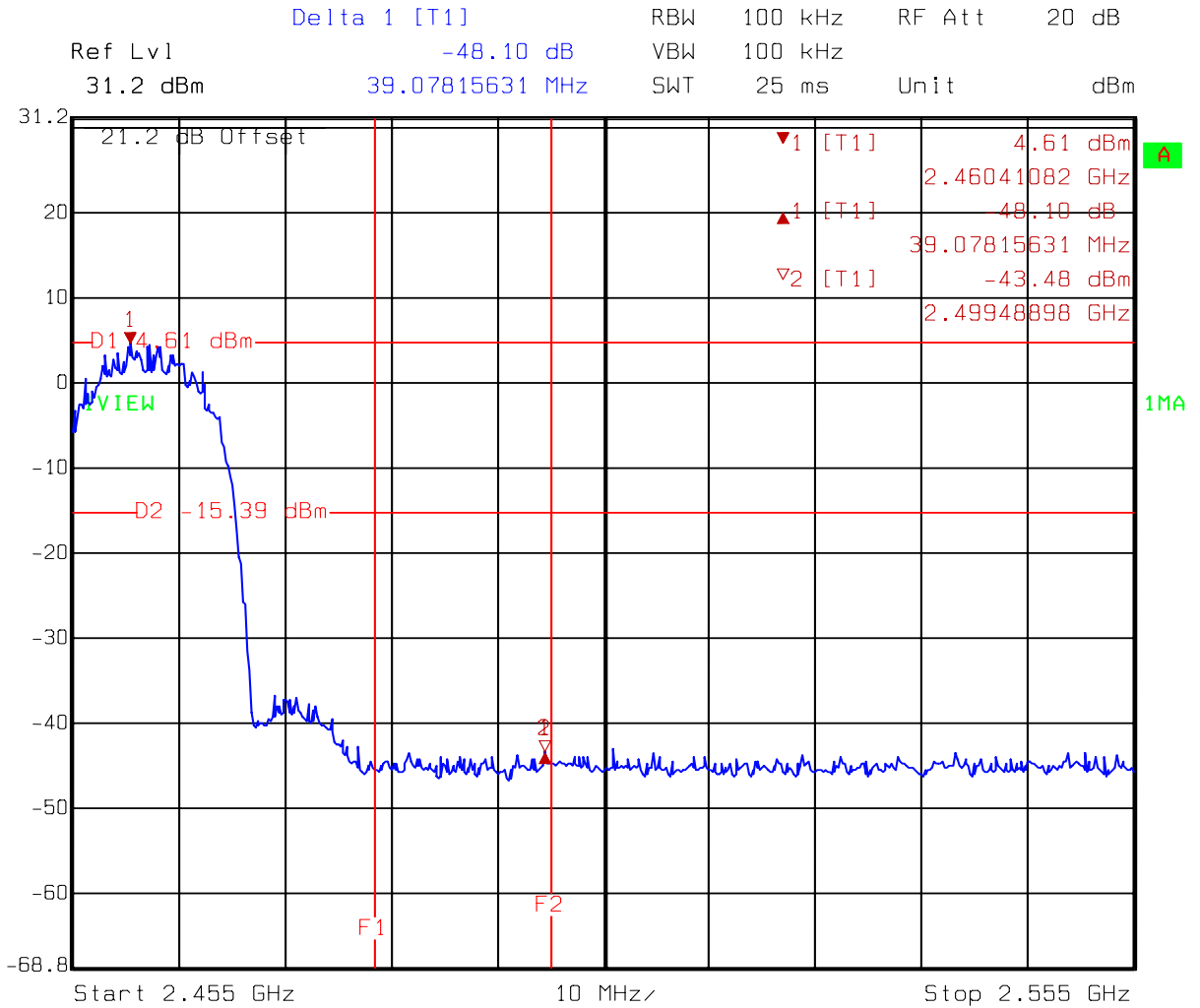
F1=2390MHz, F2=2400MHz

Date: 08.JUL.2005 16:20:00



Comment A: Band-edge at ch1 (EC365) 802.11b  
 F1=2390MHz, F2=2400MHz  
 Date: 08.JUL.2005 16:25:28

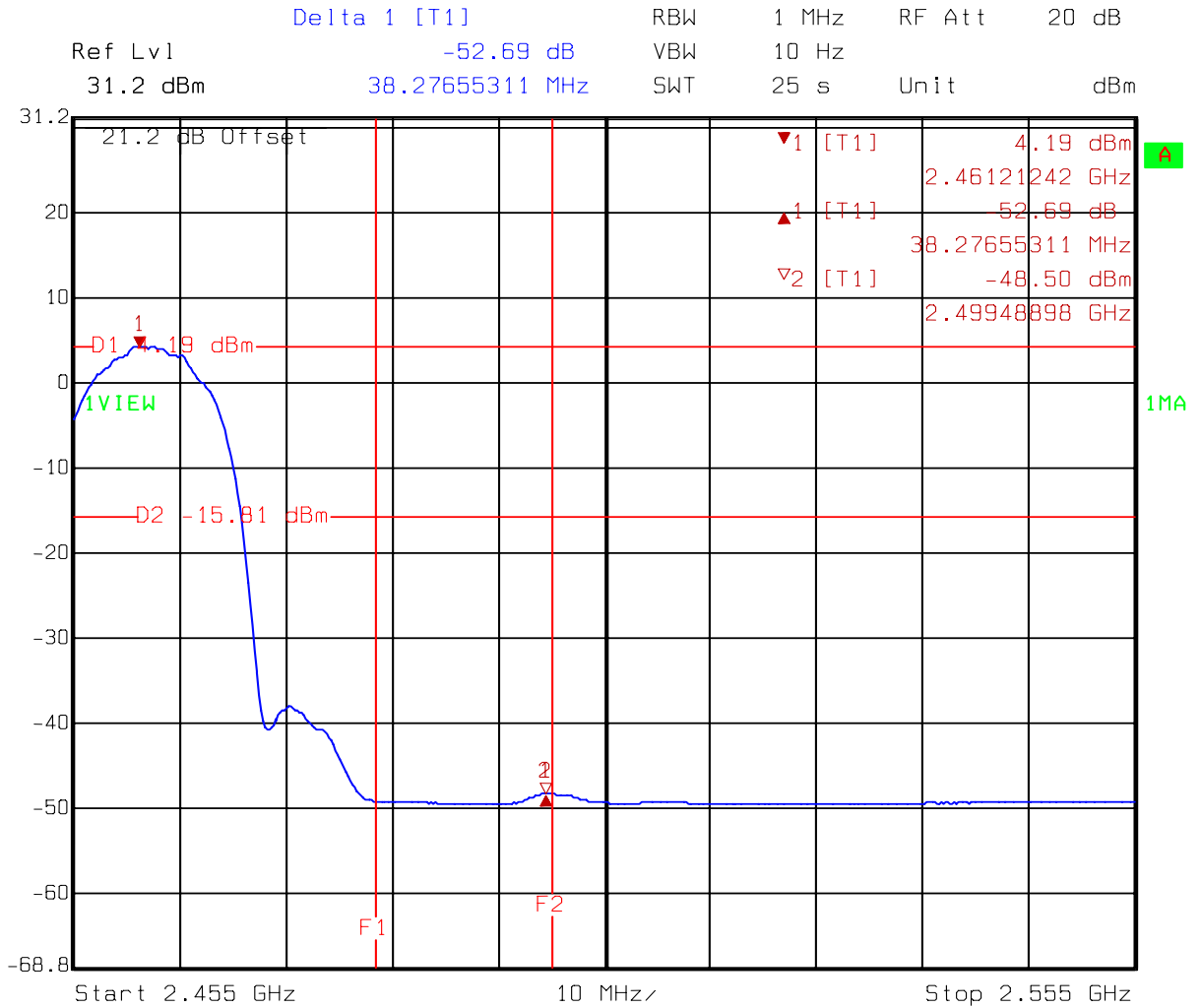




Comment A: Band-edge at ch11 (EC365) 802.11b

F1=2483.5MHz, F2=2500MHz

Date: 08.JUL.2005 16:32:33



Comment A: Band-edge at ch11 (EC365) 802.11b

F1=2483.5MHz, F2=2500MHz

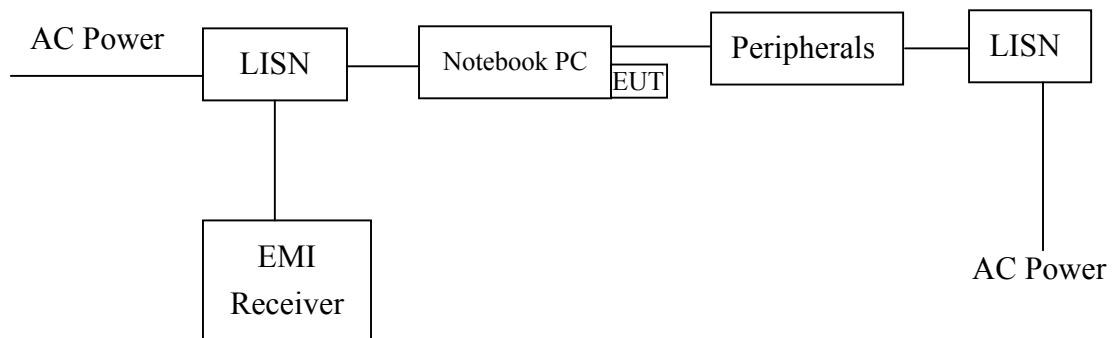
Date: 08.JUL.2005 16:36:36

## 8. Power Line Conducted Emission test §FCC 15.207

### 8.1 Operating environment

Temperature: 23 °C  
Relative Humidity: 60 %  
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  $\pm 2.6$  dB.

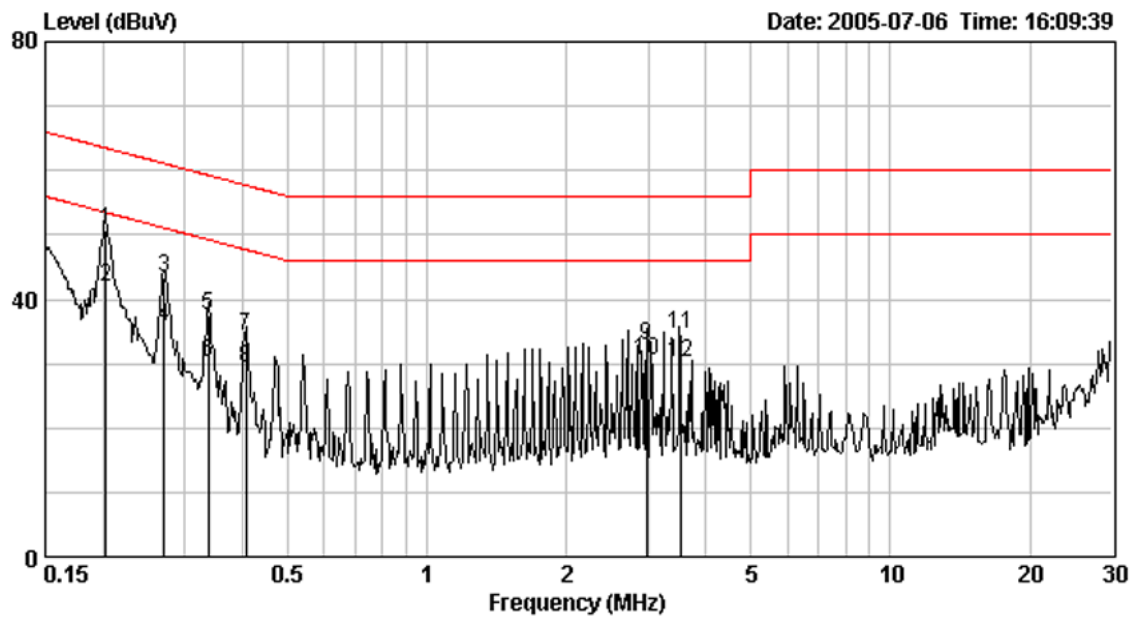
## 8.5 Power Line Conducted Emission test data

Phase: Line  
 Model No.: XI-830M  
 Test Condition: Floating

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.203	0.10	50.65	63.49	41.84	53.49	-12.84	-11.65
0.271	0.10	43.40	61.10	35.82	51.10	-17.70	-15.28
0.338	0.10	37.65	59.25	30.29	49.25	-21.60	-18.96
0.406	0.10	34.31	57.73	29.45	47.73	-23.42	-18.28
2.977	0.15	32.79	56.00	30.38	46.00	-23.21	-15.62
3.519	0.18	34.71	56.00	30.15	46.00	-21.29	-15.85

Remark:

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



Phase: Neutral  
 Model No.: XI-830M  
 Test Condition: Floating

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.203	0.10	49.86	63.49	40.47	53.49	-13.63	-13.02
0.271	0.10	43.86	61.10	34.93	51.10	-17.24	-16.17
0.338	0.10	35.89	59.25	27.66	49.25	-23.36	-21.59
0.406	0.10	34.11	57.73	27.78	47.73	-23.62	-19.95
2.706	0.14	33.72	56.00	30.89	46.00	-22.28	-15.11
2.977	0.15	33.60	56.00	30.86	46.00	-22.40	-15.14

Remark:

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

