



FCC TEST REPORT

for

47 CFR Part 15 Subpart C and RSS-210

Equipment : **U.S. Robotics Wireless Maxg Router (for Router)**
U.S. Robotics Wireless Maxg Access Point (for Access Point)

Trade Name : **USR**

Model No. : **USR5461 (for Router)**
USR5451 (for Access Point)

FCC ID : **IXM-RTGBR02 (for Router)**
IXM-APGBR02 (for Access Point)

IC ID : **550A-15023 (for Router)**
550A-15024 (for Access Point)

Filing Type : **Certification**

Applicant : **Universal Scientific Industrial Co., Ltd.**
141, Lane 351, Taiping Road, Sec. 1, Tsao Tuen, Nan-Tou,
Taiwan

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- **Certificate or Test Report must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of U.S. government.**
- The data shown in this test report were carried out on Dec. 16, 2004 at **Sporton International Inc. LAB.**

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History of this test report

Original Report Issue Date: Dec. 21, 2004

☒ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



1. General Description of Equipment under Test

1.1. Applicant

Universal Scientific Industrial Co., Ltd.

141, Lane 351, Taiping Road, Sec. 1, Tsao Tuen, Nan-Tou, Taiwan

1.2 Manufacturer

Universal Scientific Industrial Co., Ltd.

141, Lane 351, Taiping Road, Sec. 1, Tsao Tuen, Nan-Tou, Taiwan

1.3 Basic Description of Equipment under Test

Equipment	: U.S. Robotics Wireless Maxg Router/U.S. Robotics Wireless Maxg Access Point
Trade Name	: USR
Model No.	: USR5461/USR5451
FCC ID	: IXM-RTGBR02/IXM-APGBR02
IC ID	: 550A-15023/550A-15024
Power Supply Type	: Switching and Linear
AC Power Cord	: AC 120V, Non-shielded, Wall-mount, 1.8 meter, 2 pin
Adapter	: ① Switch Adapter: AMC / AMDD-20050-1500 ② Switch Adapter: FAIRWAY / TC10A-050 ③ Linear Adapter; OEM / AD-051A

**1.4 Feature of Equipment under Test**

Product Feature & Specification				
1. Modulation Type/Data Rate	802.11b: CCK / 11 Mbps 802.11g: OFDM / 54 Mbps			
2. Freq.Range/Carrier Freqs.	2400 MHz ~ 2483.5 MHz			
3. Number o f Channels	USA/Canada: 11	V	European: 13	
	Japan: 13, 14		Other:	
4. Carrier Frequency of each channel	$2412 + (n-1) \times 5 \text{ MHz}; n = 1 \sim 11$			
5. Channel Spacing	5 MHz			
6. Maximum Output Power to Antenna (Normal condition)	802.11b: 19.57 dBm 802.11g: 17.23 dBm			
7. Type of Antenna Connector	NA (for PCB Antenna) / Reverse SMA (for Dipole Antenna)			
8. Antenna Type	PCB Antenna and Dipole Antenna			
9. Antenna Gain	2 dBi (for PCB Antenna) / 2, 3, 5 dBi (for Dipole Antenna)			
10. Function Type	Transmitter		Transceiver	V
11. Power Rating (DC/AC , Voltage)	DC 5V			



2 Test Configuration of Equipment under Test

2.1 Test Manner

- The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.
- For spurious emission below 1GHz, only one channel of each application was tested because it is not related to channel selection.
- The EUT is programmed to transmit signal continuously for all testings.
- Frequency range investigated: conduction 150 kHz to 30 MHz, radiation 30 MHz to 25000MHz.
- Router and Access Point have the same main board, antenna and RF portion, only the port number and the driver are different. Therefore, the radiated emission testings are mainly focused on Router.
- There are 3 dipole antennas, only the highest gain (5 dBi) Dipole was tested.
- One of the testing modes from Router+5 dBi Dipole antenna was tested for AP+2 dBi PCB antenna.

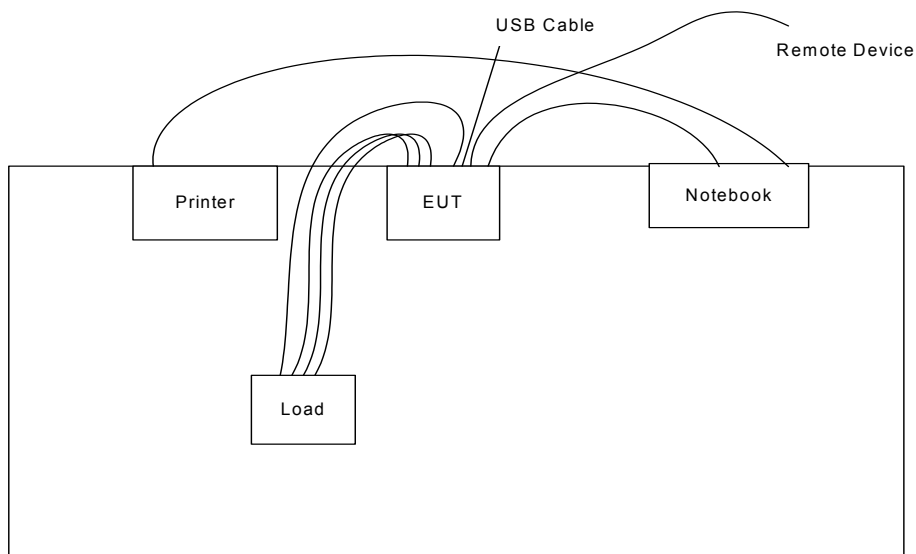
2.2 Test Mode

Application	802.11b		802.11g	
Data Rate	11 Mbps		54 Mbps	
Item	Router	Access Point	Router	Access Point
Radiated Emission	Mode 1: Tx CH06 (Below 1GHz; 5dBi)		Mode 5: Tx CH01 (5dBi)	Mode 8: Tx CH06 (Below 1 GHz; 5dBi)
	Mode 2: Tx Ch01 (5dBi)		Mode 6: Tx CH06 (5dBi)	Mode 9: Tx CH06 (Above 1GHz; 2dBi, PCB)
	Mode 3: Tx CH06 (5dBi)		Mode 7: Tx CH11 (5dBi)	
	Mode 4: Tx CH11 (5dBi)			

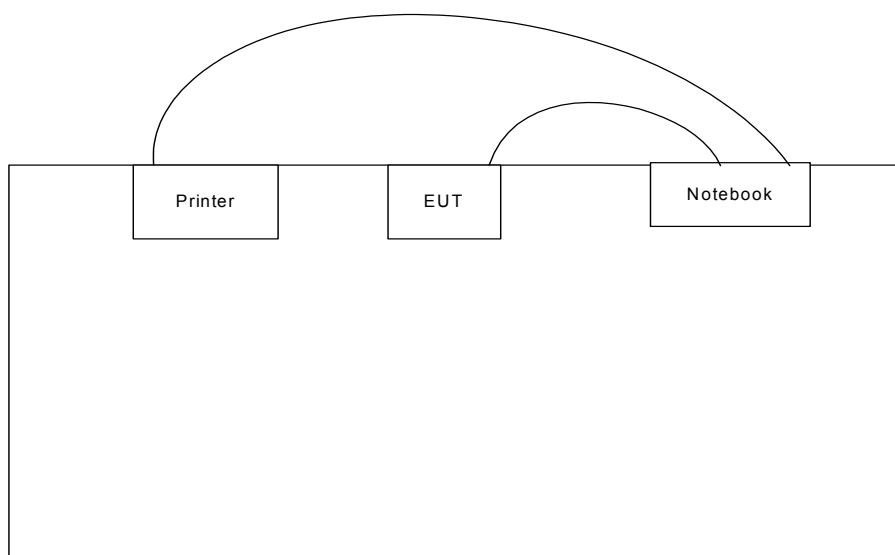
Application	802.11b	802.11g
Data Rate	11 Mbps	54 Mbps
Conducted Emission	Mode 1: Link Mode for Access Point + AD-051A (Linear) Mode 2: Link Mode for Router + AMDD-20050-1500 (Switch 1) Mode 3: Link Mode for Router + TC10A-050 (Switch 2)	

2.3 Connection Diagram of Test System

<Router>



<AP>



2.4 Ancillary Equipment List

Item	Equipment	Model No.	Serial No.
1.	Notebook (DELL)	PP05L	N/A
2.	Printer (EPSON)	STYLUS COLRO C680	N/A



3. RF Utility

The programmed RF Utility is either installed in EUT or Notebook to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testings.



4. General Information of Test

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-318-0055

Test Site No : CO01-HY, 03CH06-HY

4.1 Test Voltage

120V/ 60Hz

4.2 Standard for Methods of Measurement

ANSI C63.4-2003

4.3 Test in Compliance with

47 CFR Part 15 Subpart C and RSS-210

4.4 Frequency Range Investigated

- a. Conduction: from 150 kHz to 30 MHz
- b. Radiation: from 30 MHz to 25000 MHz

4.5 Test Distance

The test distance of radiated emission from antenna to EUT is 3 m.



5. Test Data and Test Result

5.1 List of Measurements and Examinations

FCC Rule	IC RSS-210 Issue 5	Description of Test	Result
15.207	§ 6.6	Conducted Emission	Pass
15.247(a)(2)	Amendment 1	6dB Bandwidth	Pass
15.247(b)	§ 6.2.2 (o) (b) & Amendment 1	Maximum Peak Output Power	Pass
15.209(a)	§ 6.3	Radiated Emission	Pass
15.247 (c)	§ 6.3	100kHz Bandwidth of Frequency Band Edges	Pass
15.247(d)	§ 6.2.2 (o) (b) & Amendment 1	Power Spectral Density	Pass
15.203 15.247(b)(4)	NA	Antenna Requirement	Pass

5.2 6dB Bandwidth Measurement

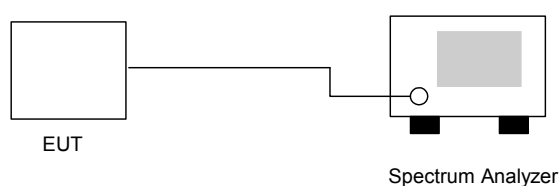
5.2.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.2.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz.
3. The 6 dB bandwidth is defined as the frequency range where the power is higher than the peak power minus 6dB.

5.2.3 Test Setup Layout :



5.2.4 Test Result :

- Application Type : 802.11b
- Temperature : 26°C
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	10.70	0.5	Mode 1
06	2437	10.50	0.5	Mode 2
11	2462	10.90	0.5	Mode 3



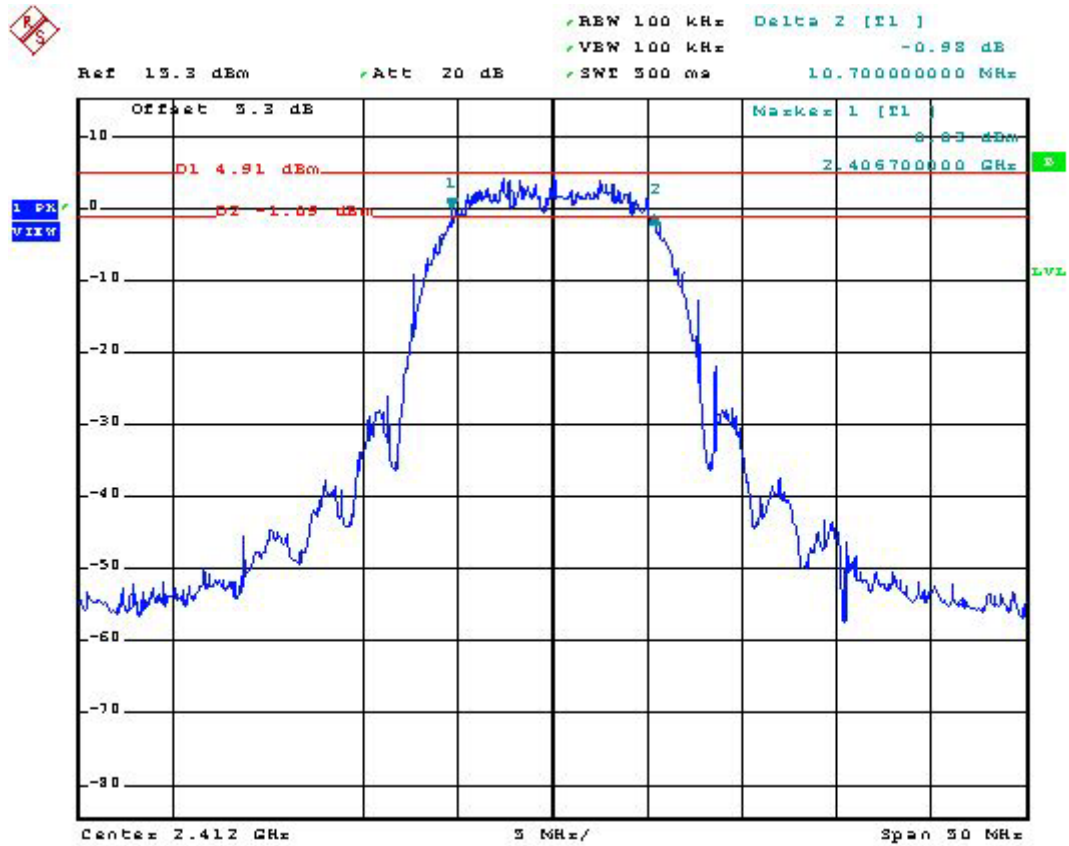
- Application Type : 802.11g
- Temperature : 26°C
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	16.30	0.5	Mode 4
06	2437	16.30	0.5	Mode 5
11	2462	16.20	0.5	Mode 6



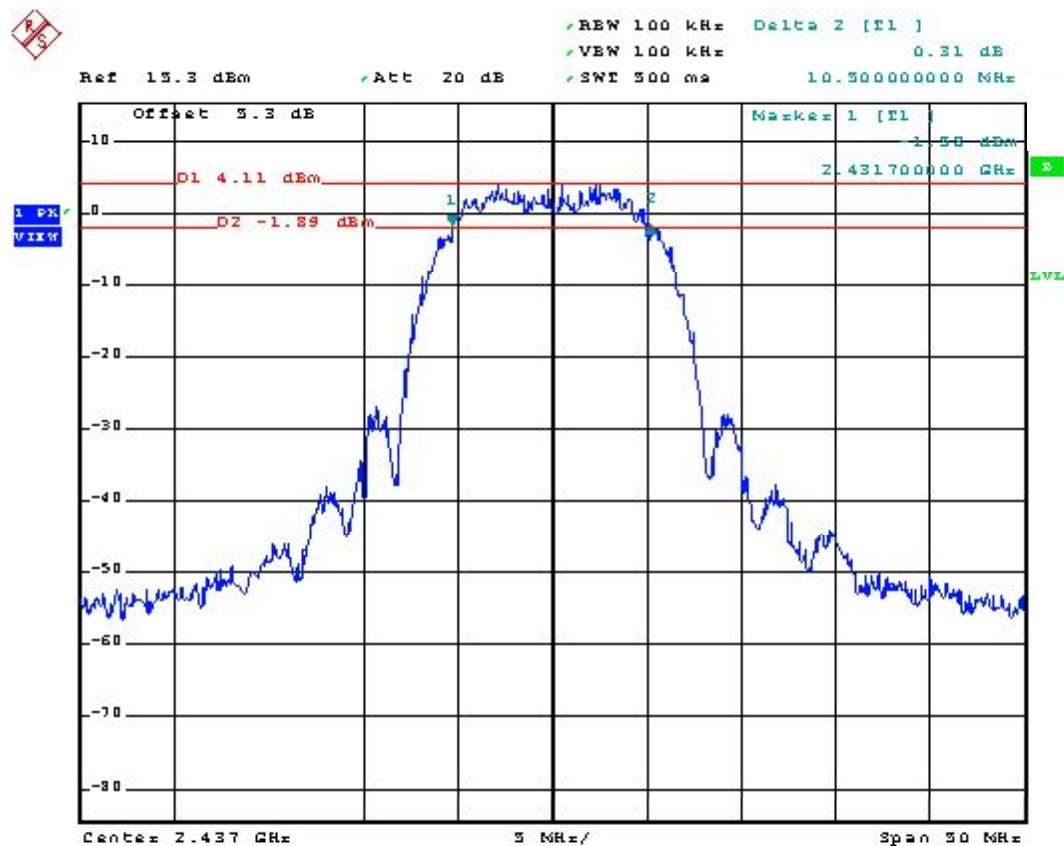
5.2.5 6dB Bandwidth

Mode 1 : 802.11b Tx CH01 (2412MHz)



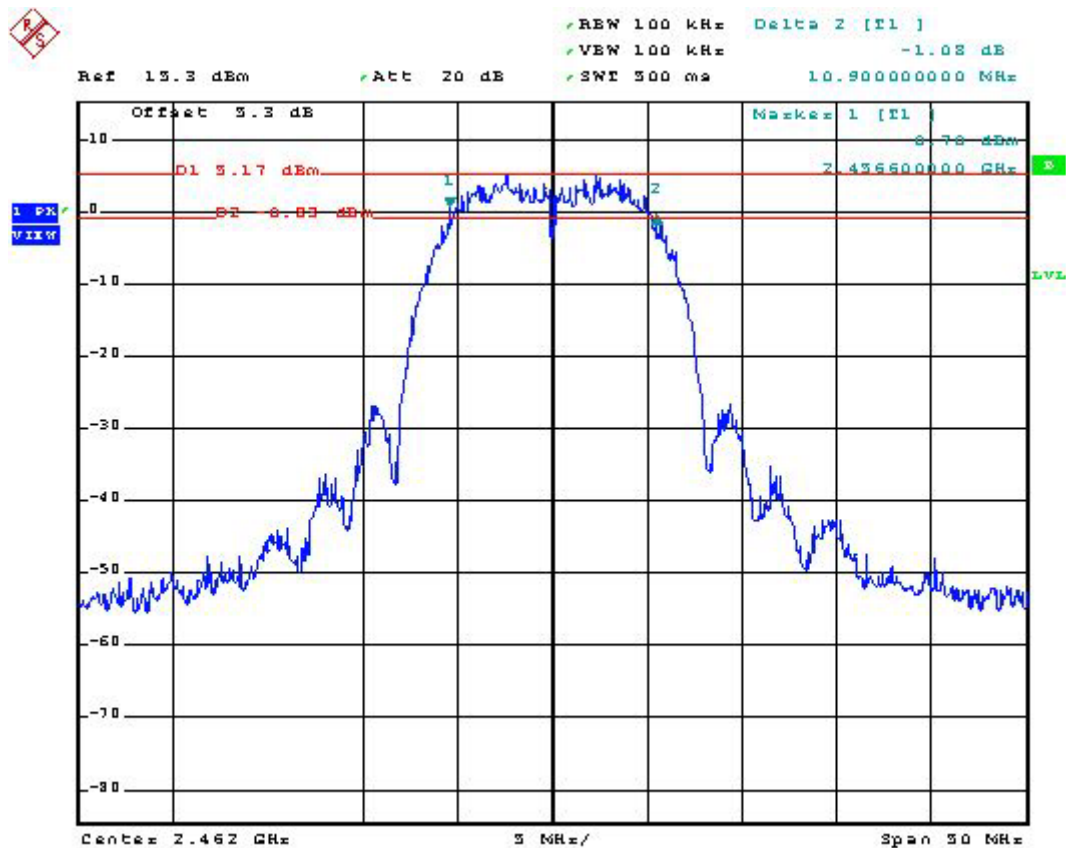


Mode 2 : 802.11b Tx CH06 (2437MHz)



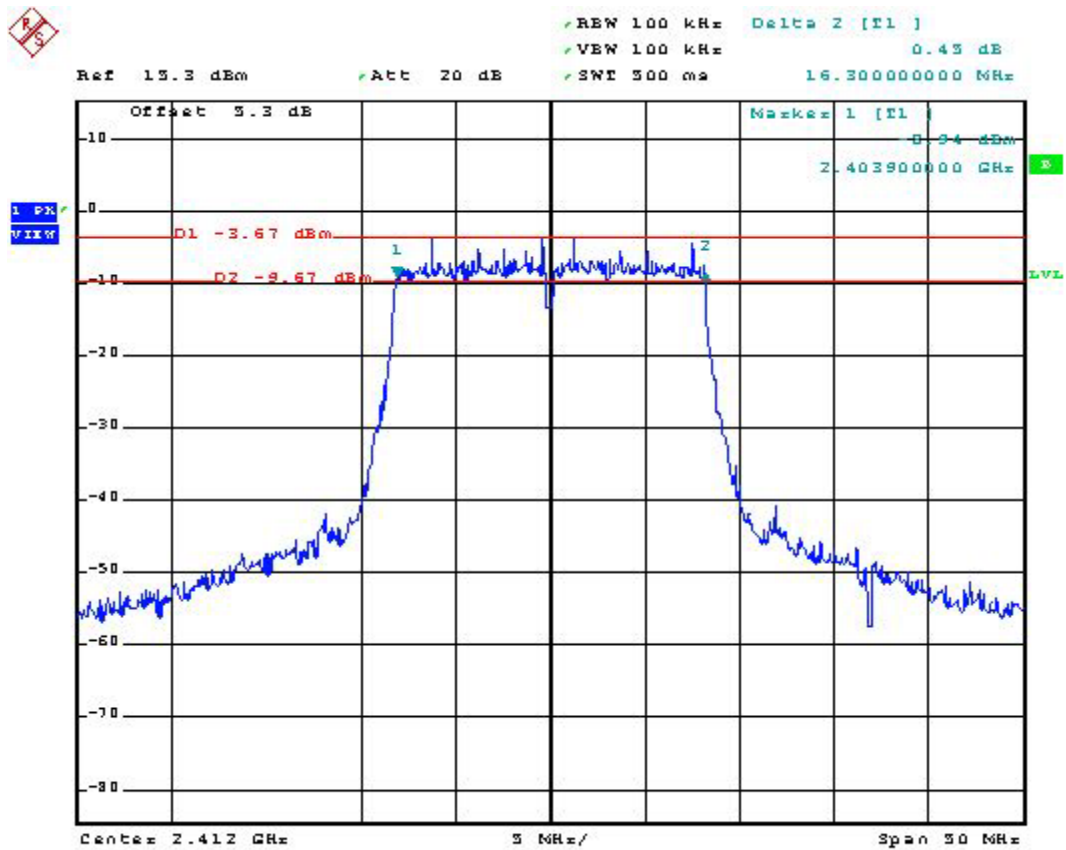


Mode 3 : 802.11b Tx CH11(2462MHz)



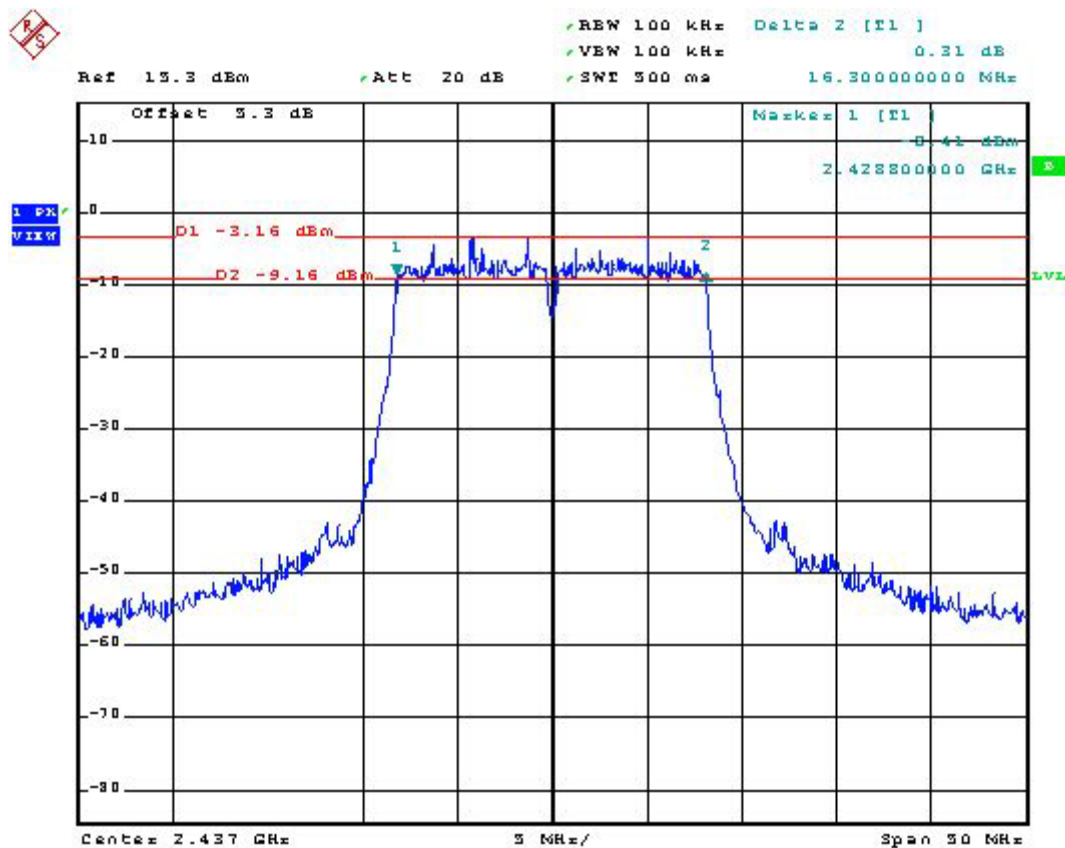


Mode 4 : 802.11g Tx CH01 (2412MHz)



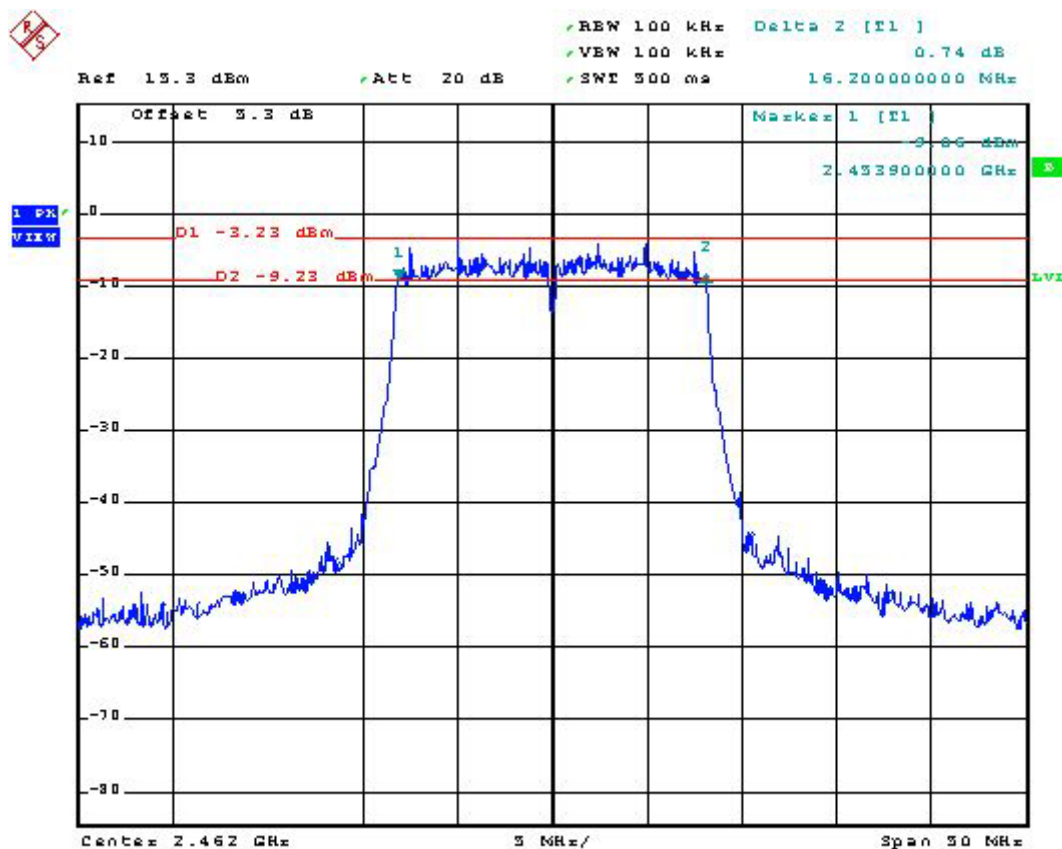


Mode 5 : 802.11g Tx CH06 (2437MHz)





Mode 6 : 802.11g Tx CH11(2462MHz)



5.3 Power Spectral Density Measurement

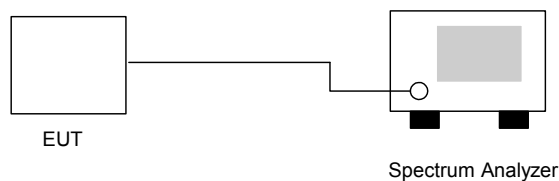
5.3.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.3.2 Test Procedure :

1. The transmitter output was connected to spectrum analyzer directly.
2. The spectrum analyzer's resolution bandwidth was set at 3kHz RBW and 30kHz VBW as that of the fundamental frequency. Set the sweep time=span/3kHz.
3. The power spectral density was measured and recorded.
4. The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

5.3.3 Test Setup Layout :



5.3.4 Test Result :

- Application Type : 802.11b
- Temperature : 26°C,
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-6.57	8	Mode 1
06	2437	-6.78	8	Mode 2
11	2462	-8.73	8	Mode 3

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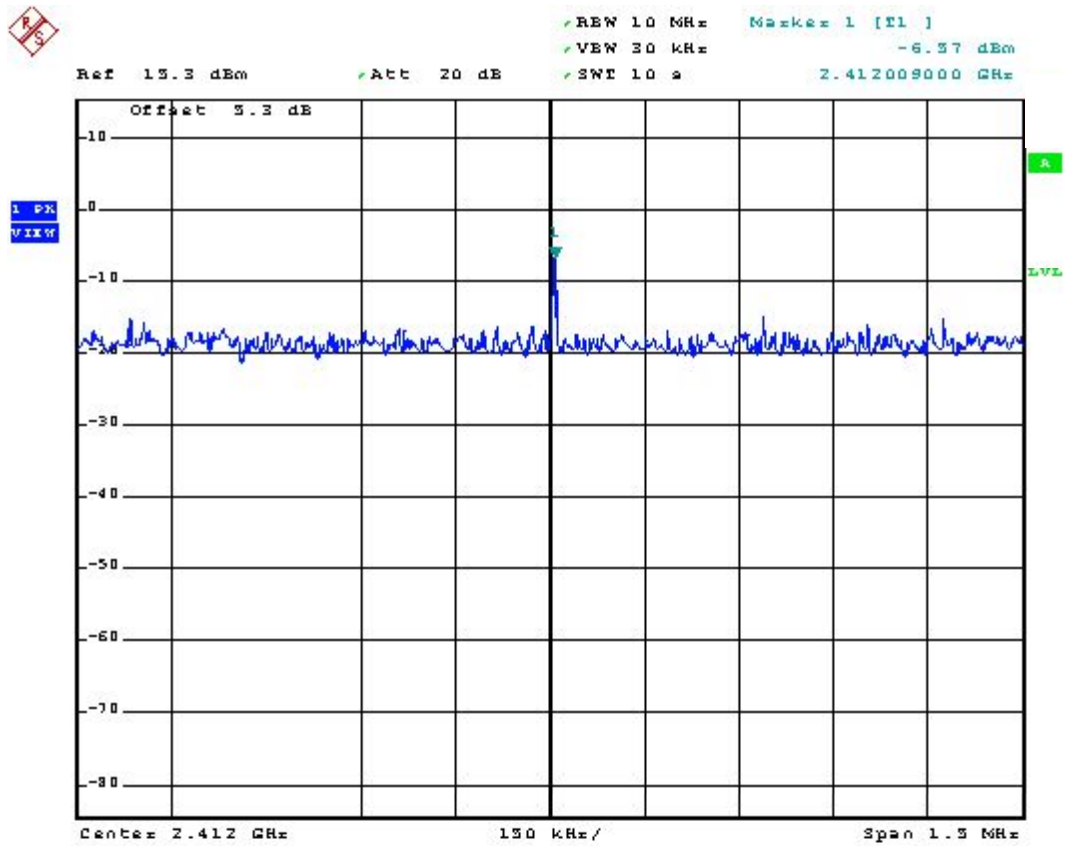
- Application Type : 802.11g
- Temperature : 26°C,
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-13.71	8	Mode 4
06	2437	-13.05	8	Mode 5
11	2462	-12.89	8	Mode 6



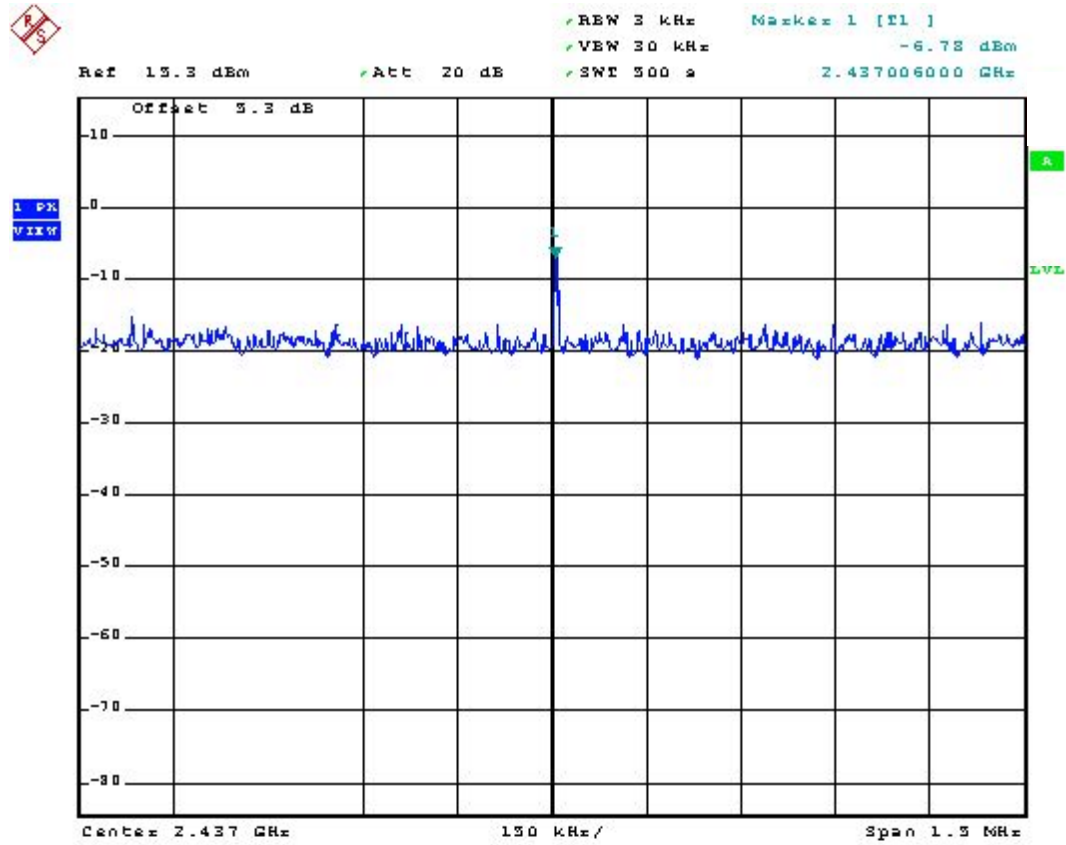
5.3.5 Power Spectral Density

Mode 1 : 802.11b Tx CH01(2412MHz)

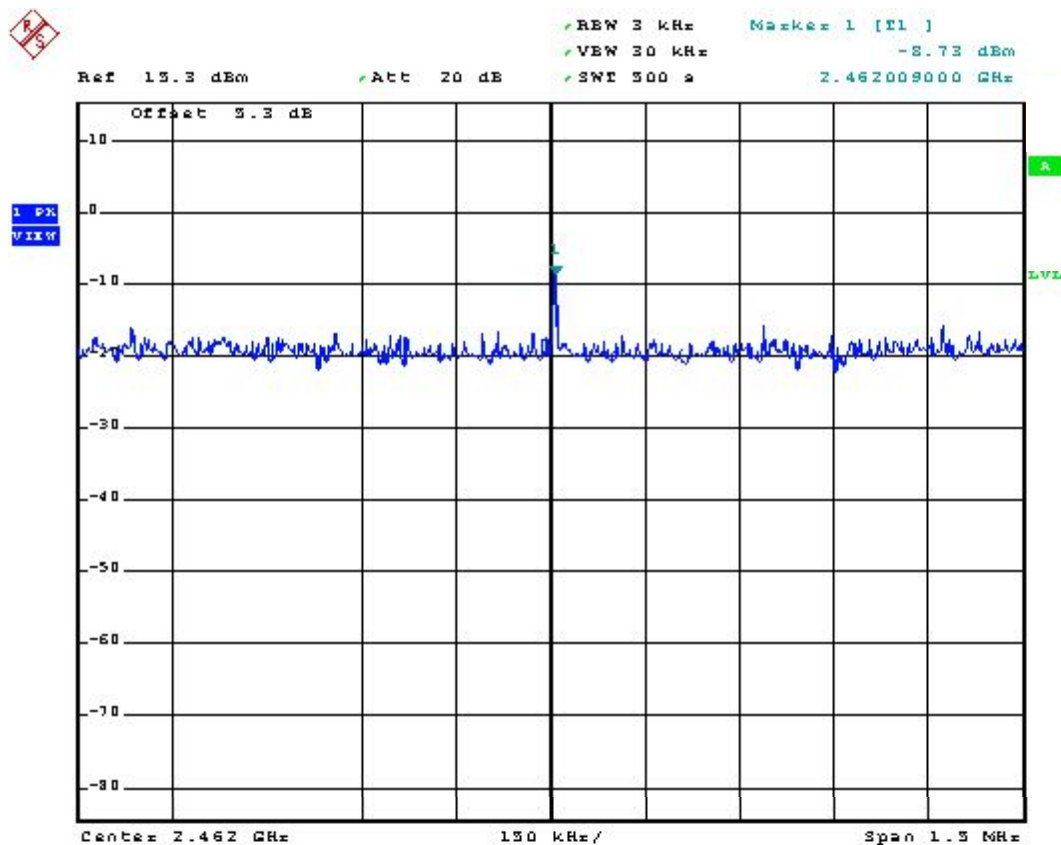




Mode 2 : 802.11b Tx CH06 (2437MHz)

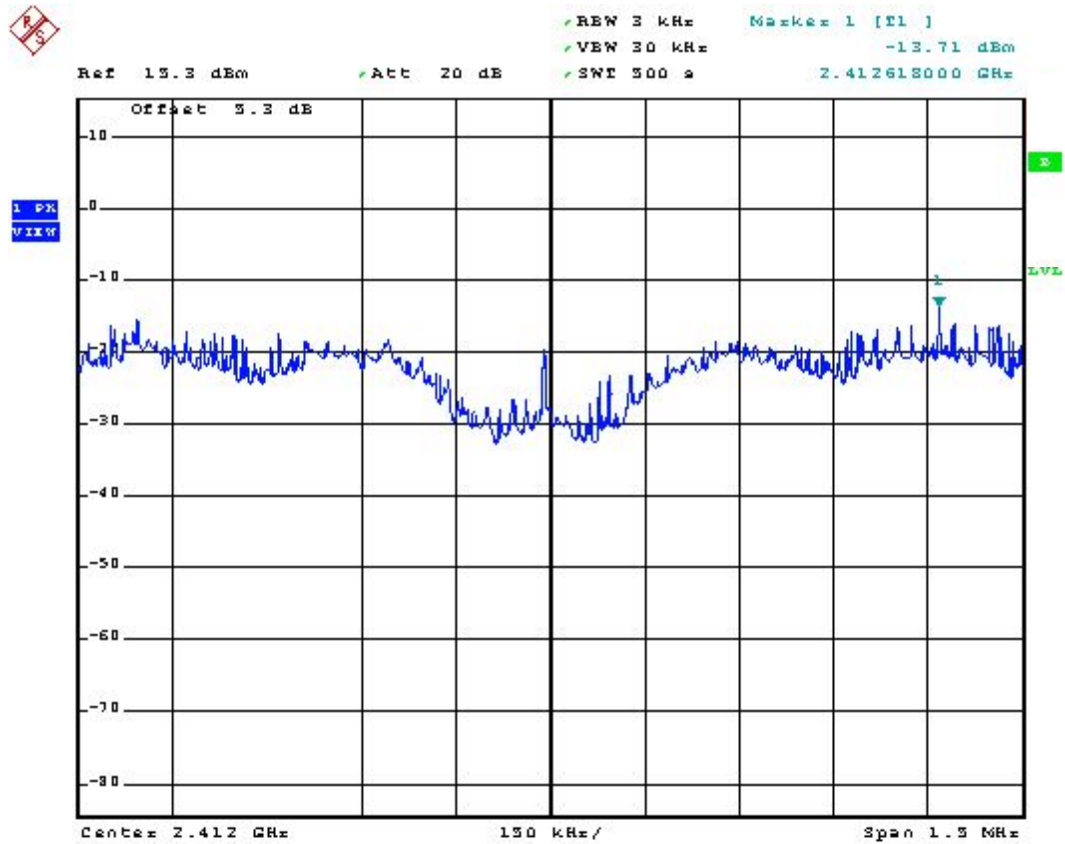


Mode 3 : 802.11b Tx CH11 (2462MHz)



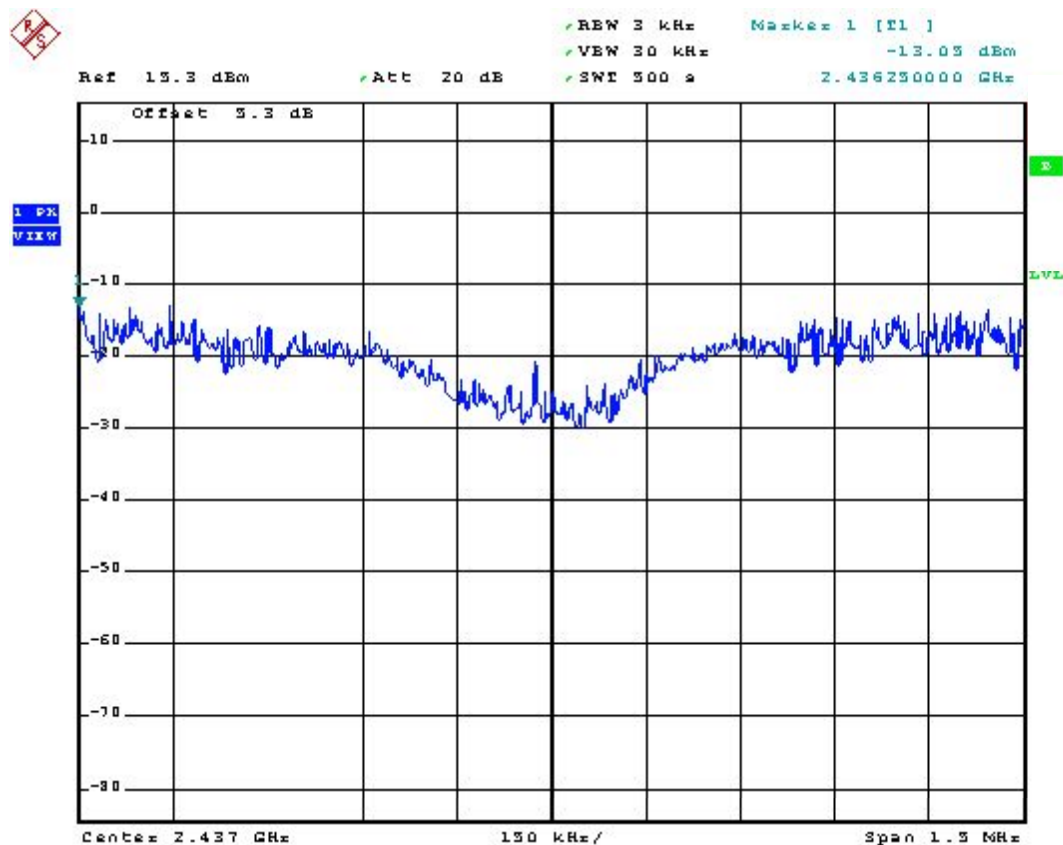


Mode 4 : 802.11g Tx CH01(2412MHz)



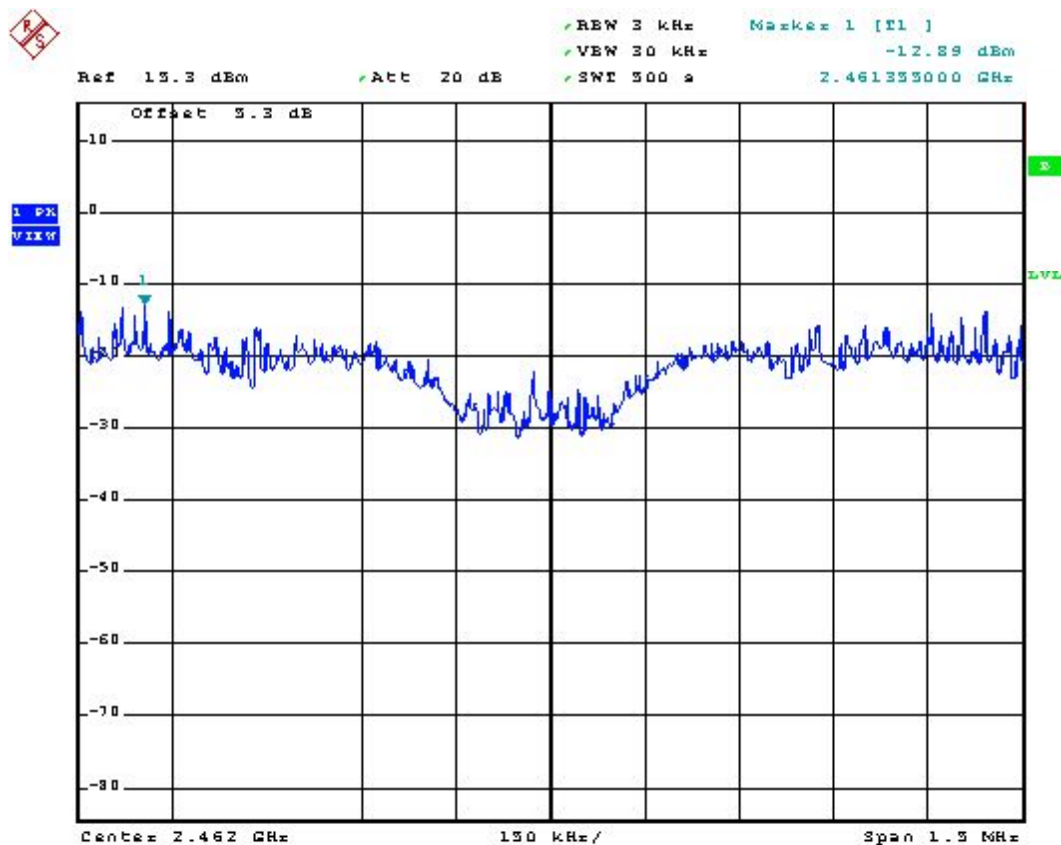


Mode 5 : 802.11g Tx CH06 (2437MHz)





Mode 6 : 802.11g Tx CH11 (2462MHz)





5.4 Band Edges Measurement

5.4.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.4.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100 kHz bandwidth from band edge.
3. The band edges was measured and recorded.

5.4.3 Test Result :

- Application Type : 802.11b & g
- Temperature : 24°C,
- Relative Humidity : 47%
- Test Enginner : Jay

- Test Result in lower band (Channel 1) : PASS
- Test Result in higher band (Channel 11) : PASS

5.4.4 Note on Band Edge Emission

➤802.11b

CH01 (Horizontal)

Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Detect
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2390.00	62.94	-11.06	74.00	66.47	28.40	35.25	3.32	Peak
2390.00	40.40	-13.60	54.00	43.93	28.40	35.25	3.32	Average

CH01 (Vertical)

Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Detect
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2390.00	61.65	-12.35	74.00	65.18	28.40	35.25	3.32	Peak
2390.00	42.22	-11.78	54.00	45.75	28.40	35.25	3.32	Average

**CH11 (Horizontal)**

Frequency	Level	Over	Limit	Read	Antenna	Preamp	Cable	Detect
(MHz)	(dBuV/m)	Limit	Line	Level	Factor	Factor	Loss	Mode
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2483.50	51.54	-22.46	74.00	54.94	28.48	35.26	3.38	Peak
2483.50	39.88	-14.12	54.00	43.28	28.48	35.26	3.38	Average

CH11 (Vertical)

Frequency	Level	Over	Limit	Read	Antenna	Preamp	Cable	Detect
(MHz)	(dBuV/m)	Limit	Line	Level	Factor	Factor	Loss	Mode
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2484.00	55.64	-18.36	74.00	59.04	28.48	35.26	3.38	Peak
2484.00	43.78	-10.22	54.00	47.18	28.48	35.26	3.38	Average

➤802.11g**CH01 (Horizontal)**

Frequency	Level	Over	Limit	Read	Antenna	Preamp	Cable	Detect
(MHz)	(dBuV/m)	Limit	Line	Level	Factor	Factor	Loss	Mode
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2390.00	62.96	-11.04	74.00	66.48	28.40	35.25	3.32	Peak
2390.00	40.32	-13.68	54.00	43.85	28.40	35.25	3.32	Average

CH01 (Vertical)

Frequency	Level	Over	Limit	Read	Antenna	Preamp	Cable	Detect
(MHz)	(dBuV/m)	Limit	Line	Level	Factor	Factor	Loss	Mode
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2390.00	67.66	-6.34	74.00	71.18	28.40	35.25	3.32	Peak
2390.00	43.68	-10.32	54.00	47.21	28.40	35.25	3.32	Average



CH11 (Horizontal)

Frequency	Level	Over	Limit	Read	Antenna	Preamp	Cable	Detect
(MHz)	(dBuV/m)	Limit	Line	Level	Factor	Factor	Loss	Mode
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2483.50	63.59	-10.41	74.00	66.98	28.48	35.26	3.38	Peak
2483.50	39.71	-14.29	54.00	43.11	28.48	35.26	3.38	Average

CH11 (Vertical)

Frequency	Level	Over	Limit	Read	Antenna	Preamp	Cable	Detect
(MHz)	(dBuV/m)	Limit	Line	Level	Factor	Factor	Loss	Mode
(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV)	(dB)	(dB)	(dB)	Mode
2483.50	70.62	-3.38	74.00	74.02	28.48	35.26	3.38	Peak
2483.50	45.98	-8.07	54.00	49.33	28.48	35.26	3.38	Average

* Remark: The data above can refer to radiated emission in section 6.



5.4.5 20dB Band Edge

802.11b Tx CH01 (2412MHz)

