



SPORTON LAB.

Certificate No: ER232843AC

CERTIFICATE



EQUIPMENT : 802.11abgn, USB module

MODEL NO. : WUBR-508N

APPLICANT : SparkLAN Communications, Inc.

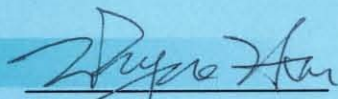
8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,
Taipei City 11493, Taiwan



I HEREBY

CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in **ETSI EN 300 328 V1.7.1 (2006-10)**. Testing was carried out on **Apr. 26, 2012** at SPORTON International Inc. LAB.


Wayne Hsu
Assistant Manager



CE RADIO TEST REPORT

According to

ETSI EN 300 328 V1.7.1 (2006-10)

Equipment : 802.11abgn, USB module
Brand Name : SparkLAN
Model No. : WUBR-508N
Filing Type : New Application
Applicant : SparkLAN Communications, Inc.
Manufacturer : 8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,
Taipei City 11493, Taiwan
Received Date : Mar. 29, 2012
Final Test Date : Apr. 26, 2012

Statement

Test result included in this report is only for printed antenna (802.11b/g/n) of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in ETSI EN 300 328 V1.7.1 (2006-10).

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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History of This Test Report

Original Issue Date: May 15, 2012

Report No.: ER232843AC

■ No additional attachment.

□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



CERTIFICATE OF COMPLIANCE

According to

ETSI EN 300 328 V1.7.1 (2006-10)

Equipment : 802.11abgn, USB module

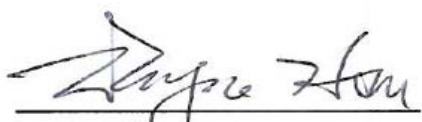
Brand Name : SparkLAN

Model No. : WUBR-508N

Applicant : SparkLAN Communications, Inc.

8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,
Taipei City 11493, Taiwan

Sporton International as requested by the applicant to evaluate the Radio Spectrum essential requirements of the product sample received on Mar. 29, 2012 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested standard(s). The data recorded as well as the test configuration specified is true and accurate for showing the sample's Radio Spectrum nature.


Wayne Hsu / Assistant Manager

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



1. SUMMARY OF THE TEST RESULT

Applied Standard: ETSI EN 300 328 V1.7.1 (2006-10)				
Part	Standard Clause	Description of Test	Result	Under Limit
3.1	5.7.2	Equivalent Isotropic Radiated Power	Complies	0.17 dB
3.2	5.7.3	Power Spectral Density	Complies	2.79 dB
3.3	5.7.4	Frequency Range	Complies	-
3.4	5.7.5	Transmitter Spurious Emissions	Complies	13.26 dB
3.5	5.7.6	Receiver Spurious Emissions	Complies	3.22 dB

Test Items	Uncertainty	Remark
Equivalent Isotropic Radiated Power (Conducted)	±0.8dB	Confidence levels of 95%
Power Spectral Density (Conducted)	±1.0dB	Confidence levels of 95%
Frequency Range	±8.5×10 ⁻⁸	Confidence levels of 95%
Spurious Emissions – 30MHz~1000MHz (Radiated)	±2.6dB	Confidence levels of 95%
Spurious Emissions – 1GHz~ 18GHz (Radiated)	±2.6dB	Confidence levels of 95%
Temperature	±0.7℃	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%



2. GENERAL INFORMATION

2.1 Product Details

There are three types of the EUT. The difference between these three types is connector; we chose the full function type to test. Only the radio detail of IEEE 802.11b/g/n is shown in this report. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

Items	Description
Power Type	From system
Data Modulation Data Rate (Mbps)	DSSS for IEEE 802.11b (DBPSK / DQPSK / CCK) (1/2/ 5.5/11) OFDM for IEEE 802.11g (BPSK / QPSK / 16QAM / 64QAM) (6/9/12/18/24/36/48/54) See the below table for IEEE 802.11n
Frequency Band	2400 ~ 2483.5MHz
Channel Number	11b/g/n (20MHz): 13 ; 11/n (40MHz): 9
EIRP Output Power	802.11b/g : 11b: 19.70 dBm ; 11g: 19.83 dBm 802.11n : MCS 8 (20MHz) : 19.26 dBm ; MCS 8 (40MHz) : 19.31 dBm

IEEE 802.11n Modulation Scheme

MCS	Spatial	Modulation	Coding Rate	Data rate(Mbps)	
Index	Streams	Type	Type	20 MHz channel 800nsGI	40 MHz channel 800nsGI
0	1	BPSK	1/2	6.5	13.5
1	1	QPSK	1/2	13	27
2	1	QPSK	3/4	19.5	40.5
3	1	16-QAM	1/2	26	54
4	1	16-QAM	3/4	39	81
5	1	64-QAM	2/3	52	108
6	1	64-QAM	3/4	58.5	121.5
7	1	64-QAM	5/6	65	135
8	2	BPSK	1/2	13	27
9	2	QPSK	1/2	26	54
10	2	QPSK	3/4	39	81
11	2	16-QAM	1/2	52	108
12	2	16-QAM	3/4	78	162
13	2	64-QAM	2/3	104	216
14	2	64-QAM	3/4	117	243
15	2	64-QAM	5/6	130	270

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	guard interval

2.2 Medium Access Protocol Implemented

The 802.11 standard ensures that all stations, both radio-based network interface cards (NICs) and access points, implement access methods for sharing the air medium. When installing wireless LANs (WLAN), most people don't give much thought to these mechanisms. A solid understanding of 802.11's medium access methods, however, will enable you to deal more effectively with issues such as radio frequency interference, denial of services attacks and throughput issues.

Distributed Coordination Function (DCF)

The 802.11 standard makes it mandatory that all stations implement the DCF, a form of carrier sense multiple access with collision avoidance (CSMA/CA). CSMA is a contention-based protocol making certain that all stations first sense the medium before transmitting. The main goal is to avoid having stations transmit at the same time, which results in collisions and corresponding retransmissions.

If a station wanting to send a frame senses energy above a specific threshold on the medium (which could mean the transmission of another station), the station wanting access will wait until the medium is idle before transmitting the frame. The collision avoidance aspect of the protocol pertains to the use of acknowledgements that a receiving station send to the sending station to verify error-free reception. Think of this process of accessing the medium as a meeting where everyone is polite and each person only speaks when no one else is talking. In addition, everyone who understands what the person is saying nods their head in agreement.

The DCF protocol is somewhat more complex than this, though. For example, an 802.11 station utilizes information it gains from other frames that stations are sending over the wireless network. In the control field of each frame, there is a duration field that a sending station places a value in, to indicate how long the station will require the medium. As part of making a decision on whether to transmit a frame, a station must see that the time associated with the duration value of the last frame sent has expired, as well as sense that no physical transmission is taking place. The duration field enables stations to reserve the medium for subsequent frames of some specific 802.11-defined frame exchanges (e.g., RTS/CTS).

Because of its nature, DCF supports the transmission of asynchronous signals. A distinguishing factor of asynchronous signaling is that there are no timing requirements between data carrying frames. For example, the DCF protocol doesn't make any attempt to deliver a series of data frames within any timeframe or at any instant in time. As a result, there is a random amount of delay between each data frame transmission. This form of synchronization is effective for network applications, such as e-mail, Web browsing and VPN access to corporate applications.

DCF Protocol Issues

The DCF protocol is the heart of many WLAN troubles. RF interference is probably the biggest problem. If a source of RF interference (e.g., cordless phone or other WLAN) is present, the DCF can block stations from transmitting for as long as the interfering signal is present. The stations sense enough energy on the medium and wait patiently, in most cases for just a few seconds or minutes. Of course this causes the throughput of the network to drop significantly. That's why you should perform an RF site survey in the facility before installing a WLAN.

Similar to the impact of typical RF interference, someone could implement a denial of service attack, which is a deliberate action to instill RF interference at a level high enough to block a majority of the stations from transmitting. Again, all of the stations will not transmit because they respectfully follow the DCF protocol.

2.3 Table for Filed Antenna

Antenna Category (Ant. Cat.)	
☒	Integral antenna (antenna permanently attached)
☒	Temporary RF connector provided

Transmitter Outputs & Receiver Inputs Information			
Modulation	Transmitter Outputs	Receiver Inputs	Transmitter Output Signals
802.11b/g	1	1	-
802.11n HT20 / HT40	2	2	-

Antenna General Information									
Antenna Port (Total 2 Port)					1(TX/RX), 2(TX/RX)				
Maximum RF Output Power Level (PL)					1				
Transmit Chains Power Distribution					☒ symmetrical distribution ☐ asymmetrical distribution				
Ant. No.	PL	Ant. Port [Ant No. X connect to Ant. Port Y]	Ant. Cat.	Ant. Type	Brand	Model	G _{ANT} (dBi)	DG (dBi) [correlated] N _{TX} = 1	DG (dBi) [uncorrelated] N _{TX} = 2
1	1	1	Internal	Printed	SparkLAN	WUBR-508N	3.79	N/A	3.8
	1	2	Internal	Printed	SparkLAN	WUBR-508N	3.79		
☒ EUT is consist of multiple antenna models assembly (multiple antenna models are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. Then Ant. No. <u>1</u> shall be performed the radiated test.									
☒ The equipment is normally installed and point-to-point or point-to-multipoint systems: Ant. No. <u>1</u>									
Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows: Any transmit signals are correlated, Directional Gain (DG) = G _{ANT} + 10 log(N) dBi All transmit signals are completely uncorrelated, Directional Gain (DG)= G _{ANT}									
Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows: Any transmit signals are correlated, Directional Gain (DG) = 10 log[(10 ^{G_{1/20}} + 10 ^{G_{2/20}} + ... + 10 ^{G_{N/20}}) ² / N] dBi All transmit signals are completely uncorrelated, Directional Gain (DG) = 10 log[(10 ^{G_{1/10}} + 10 ^{G_{2/10}} + ... + 10 ^{G_{N/10}}) / N] dBi									

**The EUT was pre-tested antenna port 1 and antenna port 2 for single chain, the worst case was antenna port 2. therefore only the test data recorded in this report.



2.4 Table for Carrier Frequencies

There are two bandwidth systems for IEEE 802.11b/g/n.

For IEEE 802.11b/g/n (20MHz) bandwidth systems use Channel 1 ~ 13.

For IEEE 802.11n (40MHz) bandwidth systems use Channel 3 ~ 11.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400 ~ 2483.5MHz	1	2412 MHz	8	2447 MHz
	2	2417 MHz	9	2452 MHz
	3	2422 MHz	10	2457 MHz
	4	2427 MHz	11	2462 MHz
	5	2432 MHz	12	2467 MHz
	6	2437 MHz	13	2472 MHz
	7	2442 MHz	-	-

2.5 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel
Equivalent Isotropic Radiated Power Power Spectral Density	11b/CCK	1 Mbps	1/7/13
	11g/BPSK	6 Mbps	
	MCS 8 (20MHz)	13 Mbps	1/7/13
	MCS 8 (40MHz)	27 Mbps	3/5/11
Frequency Range	11b/CCK	1 Mbps	1/13
	11g/BPSK	6 Mbps	
	MCS 8 (20MHz)	13 Mbps	1/13
	MCS 8 (40MHz)	27 Mbps	3/11
Transmitter/ Receiver Spurious Emissions (30MHz~1GHz)	11b/CCK	1 Mbps	13
	11g/BPSK	6 Mbps	
	MCS 8 (20MHz)	13 Mbps	13
	MCS 8 (40MHz)	27 Mbps	11
Transmitter/ Receiver Spurious Emissions (1GHz~12.75GHz)	11b/CCK	1 Mbps	1/13
	11g/BPSK	6 Mbps	
	MCS 8 (20MHz)	13 Mbps	1/13
	MCS 8 (40MHz)	27 Mbps	3/11

2.6 Table for Testing Locations

Test Site No.	Site Category	Location	Test Site No.	Site Category	Location
05CH01-HY	FAC	Hwa Ya	TH01-HY	OVEN Room	Hwa Ya

Fully Anechoic Chamber (FAC).

2.7 Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E5520	DoC

2.8 Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the applicant and is going to be fixed on the firmware of the final end product.

For Single Chain:

Power Parameters of IEEE 802.11b/g Port 2

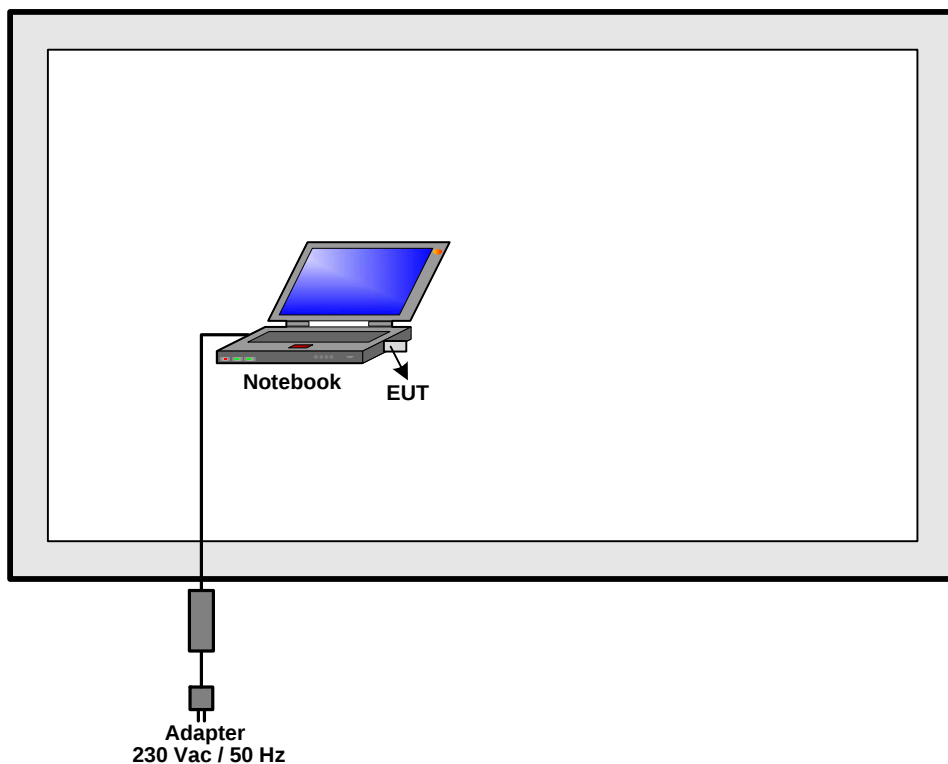
Test Software Version	RT 5x7x QA		
Frequency	2412 MHz	2442 MHz	2472 MHz
IEEE 802.11b	0B	0D	0F
IEEE 802.11g	12	13	14

For Two Chains:

Power Parameters of IEEE 802.11n Port 1 + Port 2

Test Software Version	RT 5x7x QA		
Frequency	2412 MHz	2442 MHz	2472 MHz
IEEE 802.11n (20MHz)	0E/0D	0E/0D	0E/0F
Frequency	2422 MHz	2432 MHz	2462 MHz
IEEE 802.11n (40MHz)	0E/0D	0E/0D	0E/0F

2.9 Test Configurations



3. TEST RESULT

3.1 Equivalent Isotropic Radiated Power Measurement

3.1.1 Limit

The equivalent isotropic radiated power is defined as the total power of the transmitter. The equivalent isotropic radiated power shall be equal to or less than -10dBW (100 mW) e.i.r.p. This limit shall apply for any combination of power level and intended antenna assembly.

3.1.2 Measuring Instruments and Setting

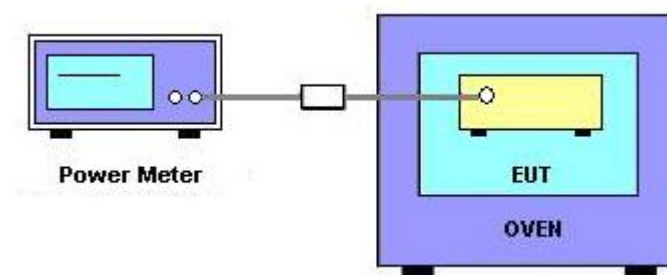
Please refer to section 4 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Average Sensor	MA2411B

3.1.3 Test Procedures

1. Conducted measurement method was performed.
2. A wide band power meter with a matched thermocouple detector was used to directly measure the output power from the RF output port of the EUT.
3. The EIRP = $A + G + 10 \cdot \log(1/x)$, where A is the average power measured in (1), G is the gain of the antenna of the EUT in dBi and x is the duty cycle of the EUT.
4. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range. These measurements shall also be performed at normal and extreme test conditions.
5. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula. (Only for IEEE 802.11n test)

3.1.4 Test Setup Layout



3.1.5 Test Deviation

There is no deviation with the original standard.

3.1.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



3.1.7 Test Result

Final Test Date	Apr. 26, 2012	Test Site No.	TH01-HY
Temperature	25.9°C	Humidity	30%
Test Engineer	Ian	Configurations	802.11b/g/n

For Single Chain:

Configuration IEEE 802.11b Port 2

Test Conditions					Average EIRP power (dBm)		
					Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	17.00	17.55	17.25	
T min (°C)	0	V max (V)	253	18.94	19.70	19.51	
		V min (V)	207	18.94	19.70	19.51	
T max (°C)	55	V max (V)	253	14.71	14.74	14.03	
		V min (V)	207	14.71	14.74	14.03	
Max mean Power					19.70		
Limits					20dBm (-10dBW)		
Result					Complies		

Configuration IEEE 802.11g Port 2

Test Conditions				Average EIRP power (dBm)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	17.57	17.74	17.34
T min (°C)	0	V max (V)	253	19.83	19.78	19.77
		V min (V)	207	19.83	19.78	19.77
T max (°C)	55	V max (V)	253	14.70	14.65	14.09
		V min (V)	207	14.70	14.65	14.09
Max mean Power				19.83		
Limits				20dBm (-10dBW)		
Result				Complies		



For Two Chains:

Configuration of IEEE 802.11n (20MHz) Port 1

Test Conditions				Average EIRP power (dBm)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	13.65	13.70	13.76
T min (°C)	0	V max (V)	253	16.24	16.35	16.15
		V min (V)	207	16.24	16.35	16.15
T max (°C)	55	V max (V)	253	11.66	11.49	11.20
		V min (V)	207	11.66	11.49	11.20
Max mean Power				16.35		
Limits				20dBm (-10dBW)		
Result				Complies		

Configuration of IEEE 802.11n (20MHz) Port 2

Test Conditions				Average EIRP power (dBm)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	14.62	13.57	13.64
T min (°C)	0	V max (V)	253	16.02	16.15	16.01
		V min (V)	207	16.02	16.15	16.01
T max (°C)	55	V max (V)	253	11.00	10.31	9.70
		V min (V)	207	11.00	10.31	9.70
Max mean Power				16.15		
Limits				20dBm (-10dBW)		
Result				Complies		

Configuration of IEEE 802.11n (20MHz) Port 1 + Port 2

Test Conditions				Average EIRP power (dBm)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	17.17	16.65	16.71
T min (°C)	0	V max (V)	253	19.14	19.26	19.09
		V min (V)	207	19.14	19.26	19.09
T max (°C)	55	V max (V)	253	14.35	13.95	13.52
		V min (V)	207	14.35	13.95	13.52
Max mean Power				19.26		
Limits				20dBm (-10dBW)		
Result				Complies		



Configuration of IEEE 802.11n (40MHz) Port 1

Test Conditions				Average EIRP power (dBm)		
				Ch. 3	Ch. 5	Ch. 11
T nom (°C)	20	V nom (V)	230	13.64	13.41	12.76
T min (°C)	0	V max (V)	253	16.22	16.38	16.15
		V min (V)	207	16.22	16.38	16.15
T max (°C)	55	V max (V)	253	11.78	11.60	11.14
		V min (V)	207	11.78	11.60	11.14
Max mean Power				16.38		
Limits				20dBm (-10dBW)		
Result				Complies		

Configuration of IEEE 802.11n (40MHz) Port 2

Test Conditions				Average EIRP power (dBm)		
				Ch. 3	Ch. 5	Ch. 11
T nom (°C)	20	V nom (V)	230	13.91	13.40	13.54
T min (°C)	0	V max (V)	253	16.33	16.22	16.14
		V min (V)	207	16.33	16.22	16.14
T max (°C)	55	V max (V)	253	10.17	10.21	9.90
		V min (V)	207	10.17	10.21	9.90
Max mean Power				16.33		
Limits				20dBm (-10dBW)		
Result				Complies		

Configuration of IEEE 802.11n (40MHz) Port 1 + Port 2

Test Conditions				Average EIRP power (dBm)		
				Ch. 3	Ch. 5	Ch. 11
T nom (°C)	20	V nom (V)	230	16.79	16.42	16.18
T min (°C)	0	V max (V)	253	19.29	19.31	19.16
		V min (V)	207	19.29	19.31	19.16
T max (°C)	55	V max (V)	253	14.06	13.97	13.57
		V min (V)	207	14.06	13.97	13.57
Max mean Power				19.31		
Limits				20dBm (-10dBW)		
Result				Complies		



3.2 Maximum Spectral Power Density Measurement

3.2.1 Limit

The maximum spectral power density is defined as the highest level of power in Watts per Hertz generated by the transmitter within the power envelope. For wide band modulations other than FHSS (e.g. DSSS, OFDM, etc.), the maximum spectrum power density is limited to 10mW per MHz e.i.r.p.

3.2.2 Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer and power meter.

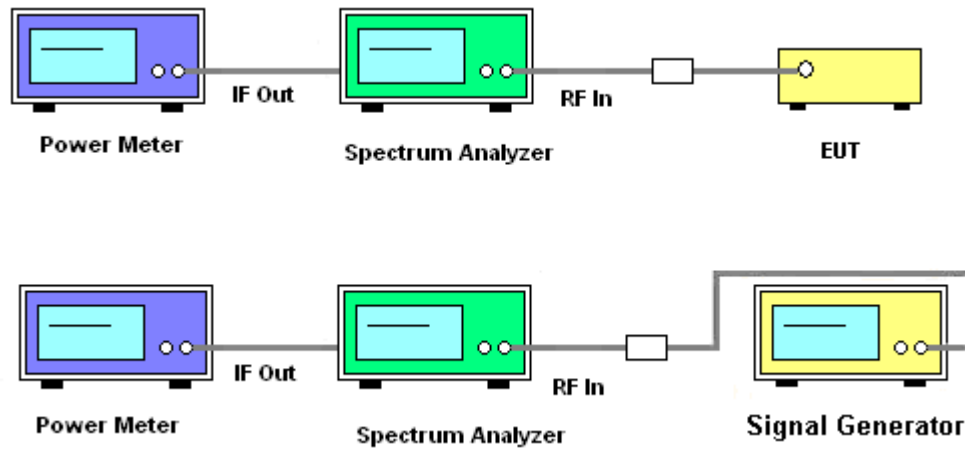
Spectrum Analyzer	Setting
Attenuation	20~30dB
Span Frequency	0 MHz
RB	1 MHz
VB	1 MHz
Detector	Positive Peak
Trace	Max Hold
Sweep Time	Auto

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Average Sensor	MA2411B

3.2.3 Test Procedures

1. Pre-calibration for the spectrum analyzer has to be done first through a CW signal at the measured carrier frequency with strength of 10dBm.
2. A power meter is connected to the IF output port of the spectrum analyzer.
3. Adjust the spectrum analyzer to have the center frequency the same with the measured carrier. RBW=VBW=1MHz, detector mode is positive peak. Turn off the averaging function and use zero spans.
4. The calibrating signal power shall be reduced to 0 dBm and it shall be verified that the power meter reading also reduces by 10 dB.
5. Connect the equipment to be measured. Using the following settings of the spectrum analyzer in combination with "max hold" function, find the frequency of highest power output in the power envelope: center frequency equal to operating frequency; RBW & VBW: 1 MHz; detector mode: positive peak; averaging: off; span: 3 times the spectrum width; amplitude: adjust for middle of the instrument's range. The frequency found shall be recorded.
6. Set the center frequency of the spectrum analyzer to the found frequency and switch to zero span. The power meter indicates the measured power density (D). The maximum spectral power density e.i.r.p. is calculated from the above measured power density (D), the observed duty cycle factor (x), and the applicable antenna assembly gain "G" in dBi, according to the formula: $PD = D + G + 10 \log (1/x)$.
7. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range.
8. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula. (Only for IEEE 802.11n test)

3.2.4 Test Setup Layout



3.2.5 Test Deviation

There is no deviation with the original standard.

3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



3.2.7 Test Result

Final Test Date	Apr. 26, 2012	Test Site No.	TH01-HY
Temperature	25.9°C	Humidity	30%
Test Engineer	Ian	Configurations	802.11b/g/n

For Single Chain:

Configuration IEEE 802.11b Port 2

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	6.15	7.21	6.42
Limits				10dBm / MHz		
Result				Complies		

Configuration IEEE 802.11g Port 2

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	5.61	5.14	5.15
Limits				10dBm / MHz		
Result				Complies		



For Two Chains:

Configuration of IEEE 802.11n (20MHz) Port 1

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	1.29	1.33	0.34
Limits				10dBm / MHz		
Result				Complies		

Configuration of IEEE 802.11n (20MHz) Port 2

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	1.18	1.33	0.08
Limits				10dBm / MHz		
Result				Complies		

Configuration of IEEE 802.11n (20MHz) Port 1 + Port 2

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 1	Ch. 7	Ch. 13
T nom (°C)	20	V nom (V)	230	4.25	4.34	3.22
Limits				10dBm / MHz		
Result				Complies		

Configuration of IEEE 802.11n (40MHz) Port 1

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 3	Ch. 5	Ch. 11
T nom (°C)	20	V nom (V)	230	-1.42	-1.83	-2.63
Limits				10dBm / MHz		
Result				Complies		

Configuration of IEEE 802.11n (40MHz) Port 2

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 3	Ch. 5	Ch. 11
T nom (°C)	20	V nom (V)	230	-1.79	-1.46	-2.82
Limits				10dBm / MHz		
Result				Complies		

Configuration of IEEE 802.11n (40MHz) Port 1 + Port 2

Test Conditions				Maximum EIRP Spectral Power Density (dBm/MHz)		
				Ch. 3	Ch. 5	Ch. 11
T nom (°C)	20	V nom (V)	230	1.41	1.37	0.29
Limits				10dBm / MHz		
Result				Complies		

3.3 Frequency Range Measurement

3.3.1 Limit

The frequency range of the equipment is determined by the lowest and highest frequencies occupied by the power envelope.

f_H is the highest frequency of the power envelope; it is the frequency furthest above the frequency of maximum power where the output power drops below the level of -80 dBm/Hz e.i.r.p. spectral power density (-30 dBm if measured in a 100 kHz bandwidth).

f_L is the lowest frequency of the power envelope; it is the frequency furthest below the frequency of maximum power where the output power drops below the level equivalent to -80 dBm/Hz e.i.r.p. spectral power density (or -30 dBm if measured in a 100 kHz bandwidth). For all equipment, the frequency range shall lie within the band 2.4 GHz to 2.4835 GHz ($f_L > 2.4$ GHz and $f_H < 2.4835$ GHz).

3.3.2 Measuring Instruments and Setting

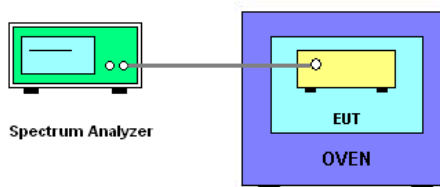
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Analyzer	Setting
Attenuation	20~30dB
Span Frequency	40MHz
RB	100 kHz
VB	100 kHz
Detector	Average
Trace	Average 50 sweeps

3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Antenna gain was compensated on the spectrum analyzer.
3. Place the spectrum analyzer in detector averaging mode with a minimum of 50 sweeps and activate transmitter with modulation applied.
4. Select lowest operating frequency of the equipment under test.
5. Find lowest frequency below the operating frequency at which spectral power density drops below -80 dBm/Hz e.i.r.p. (-30 dBm if measured in a 100 kHz bandwidth). This frequency, f_L , shall be recorded.
6. Select the highest operating frequency of the equipment under test.
7. Find the highest frequency at which the spectral power density drops below -80 dBm/Hz e.i.r.p. (-30 dBm if measured in a 100 kHz bandwidth). This frequency, f_H , shall be recorded.
8. These measurements shall also be performed at normal and extreme test conditions.
9. Measuring multiple antennas, the connectors are required to link with Spectrum Analyzer through a combiner. (Only for IEEE 802.11n test)

3.3.4 Test Setup Layout



3.3.5 Test Deviation

There is no deviation with the original standard.

3.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



3.3.7 Test Result

Final Test Date	Apr. 26, 2012	Test Site No.	TH01-HY
Temperature	25.9°C	Humidity	30%
Test Engineer	Ian	Configurations	802.11b/g/n

For Single Chain:
Configuration IEEE 802.11b Port 2

Test Conditions					Frequency range (MHz)	
					f _L Ch. 1	f _H Ch. 13
T nom (°C)	20	V nom (V)	230	2403.1928	2480.6712	
T min (°C)	0	V max (V)	253	2403.1287	2480.9305	
		V min (V)	207	2403.1287	2480.9305	
T max (°C)	55	V max (V)	253	2403.7996	2480.2744	
		V min (V)	207	2403.7996	2480.2744	
Min. f _L / Max. f _H Band Edges				2403.1287	2480.9305	
Limits				f _L > 2400.0 MHz	f _H < 2483.5 MHz	
Result				Complies		

Configuration IEEE 802.11g Port 2

Test Conditions					Frequency range (MHz)	
					f _L Ch. 1	f _H Ch. 13
T nom (°C)	20	V nom (V)	230	2402.9591	2480.8482	
T min (°C)	0	V max (V)	253	2402.9294	2481.3206	
		V min (V)	207	2402.9294	2481.3206	
T max (°C)	55	V max (V)	253	2403.2573	2480.5860	
		V min (V)	207	2403.2573	2480.5860	
Min. f _L / Max. f _H Band Edges				2402.9294	2481.3206	
Limits				f _L > 2400.0 MHz	f _H < 2483.5 MHz	
Result				Complies		



For Two Chains:

Configuration of IEEE 802.11n (20MHz) Port 1 + Port 2

Test Conditions					Frequency range (MHz)	
					f _L Ch. 1	f _H Ch. 13
T nom (°C)	20	V nom (V)	230	2402.8190	2481.0911	
T min (°C)	0	V max (V)	253	2402.5218	2481.2372	
		V min (V)	207	2402.5218	2481.2372	
T max (°C)	55	V max (V)	253	2402.9429	2480.9576	
		V min (V)	207	2402.9429	2480.9576	
Min. f _L / Max. f _H Band Edges				2402.5218	2481.2372	
Limits				f _L > 2400.0 MHz	f _H < 2483.5 MHz	
Result				Complies		

Configuration of IEEE 802.11n (40MHz) Port 1 + Port 2

Test Conditions					Frequency range (MHz)		
					f _L Ch. 3	f _H Ch. 11	
T nom	(°C)	20	V nom	(V)	230	2403.4655	2480.4362
T min	(°C)	0	V max	(V)	253	2403.4567	2480.5393
			V min	(V)	207	2403.4567	2480.5393
T max	(°C)	55	V max	(V)	253	2403.6011	2480.2987
			V min	(V)	207	2403.6011	2480.2987
Min. f _L / Max. f _H Band Edges					2403.4567	2480.5393	
Limits					f _L > 2400.0 MHz	f _H < 2483.5 MHz	
Result					Complies		

3.4 Transmitter Spurious Emissions Measurement

3.4.1 Limit

Transmitter spurious emissions are emissions outside the frequency range(s) of the equipment when the equipment is in Transmit mode and/or in Standby mode.

The spurious emissions of the transmitter shall not exceed the values in tables 1 and 2 in the indicated bands.

Table 1 Transmitter limits for narrowband spurious emissions

Frequency Range (MHz)	Operating Mode (dBm)	Standby Mode (dBm)
30~1000	-36	-57
1000~12750	-30	-47
1800~1900 / 5150~5300	-47	-47

Table 2 Transmitter limits for wideband spurious emissions

Frequency Range (MHz)	Operating Mode (dBm/Hz)	Standby Mode (dBm/Hz)
30~1000	-86	-107
1000~12750	-80	-97
1800~1900 / 5150~5300	-97	-97

3.4.2 Measuring Instruments and Setting

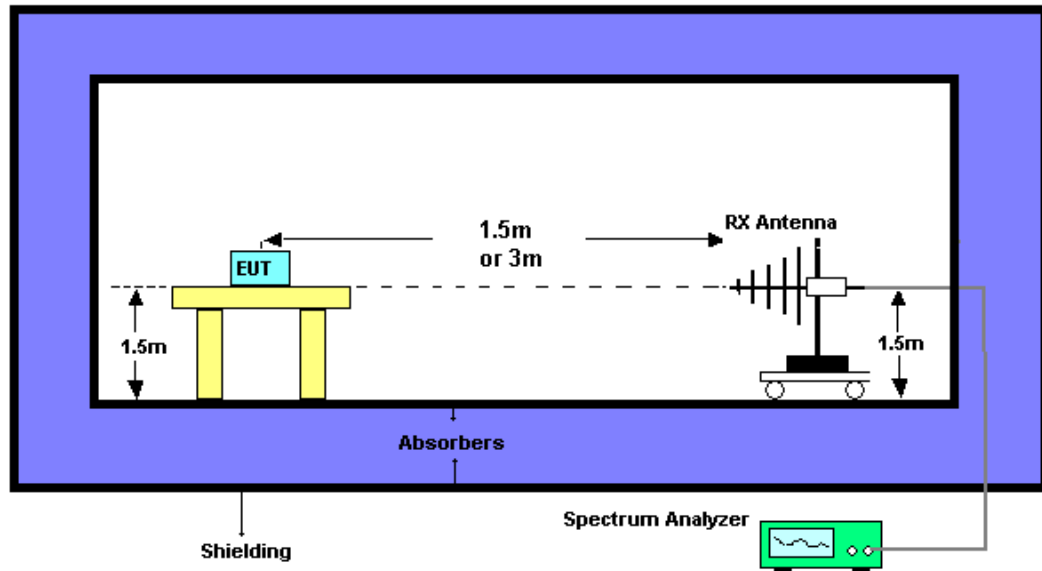
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	30 MHz
Stop Frequency	12750 MHz
Detector	Positive Peak
Span	100 MHz
Sweep Time	1s
RB / VB	100 kHz / 30 kHz

3.4.3 Test Procedures

1. The EUT was placed on the top of the turntable in fully anechoic chamber.
2. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. This measurement shall be repeated with the transmitter in standby mode where applicable.
4. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. For 1~12.75GHz measurement, the receiving Horn antenna was placed 1.5 meters far away from the turntable.
5. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
6. Replace the EUT by standard antenna and feed the RF port by signal generator.
7. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
8. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
9. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
10. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30 kHz. If the level of this emission does not change by more than 2 dB, then it is taken as narrowband emission, otherwise, wideband emission.
11. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

3.4.4 Test Setup Layout



3.4.5 Test Deviation

There is no deviation with the original standard.

3.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.4.7 Results of Standby Mode Spurious Emissions

In the initial investigation on standby mode and receiving mode, no significant differences in spurious emissions were observed between these 2 modes. Therefore, test data for standby mode was omitted in this section.

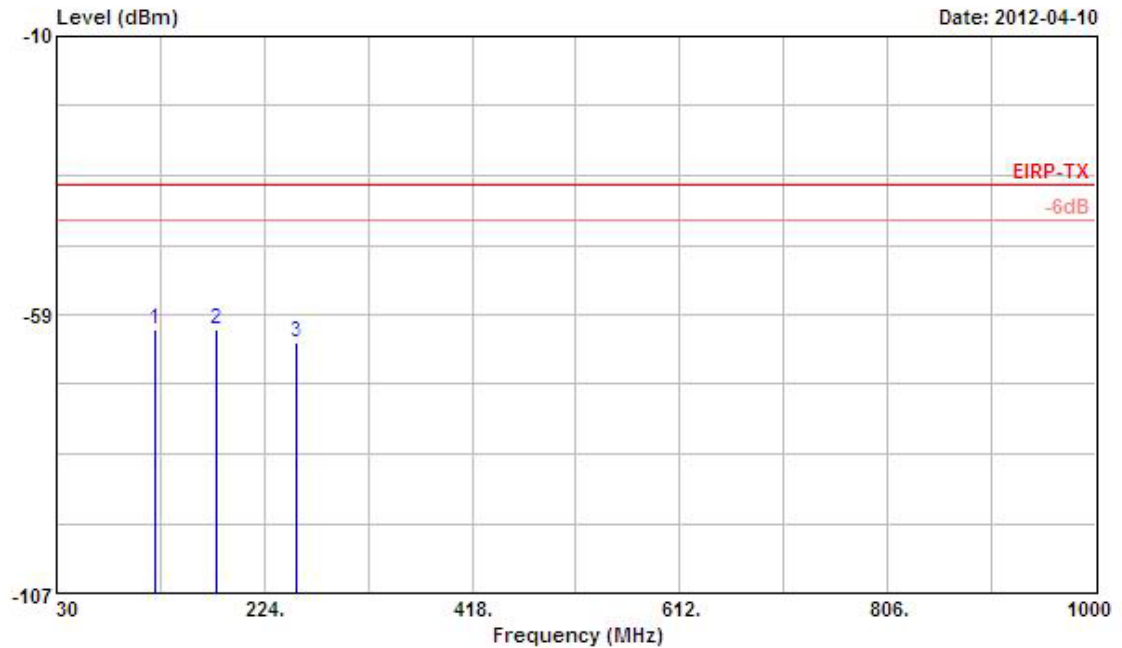


3.4.8 Results of Transmitter Spurious Emissions Below 1GHz

For Single Chain:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11g / Ch. 13

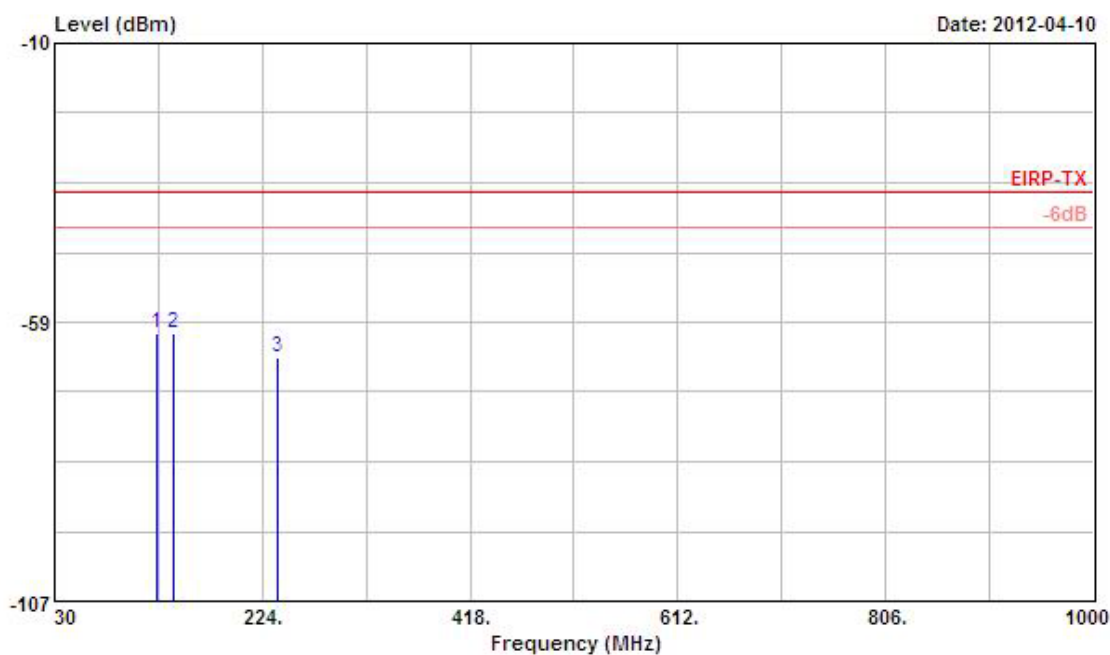
Horizontal



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	121.180	-61.18	-25.18	-36.00	-58.64	-2.54
2	179.380	-60.96	-24.96	-36.00	-57.17	-3.79
3	254.070	-63.28	-27.28	-36.00	-61.56	-1.72



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	126.030	-60.37	-24.37	-36.00	-58.51	-1.86
2	141.550	-60.48	-24.48	-36.00	-58.79	-1.69
3	237.580	-64.57	-28.57	-36.00	-60.44	-4.13

Note:

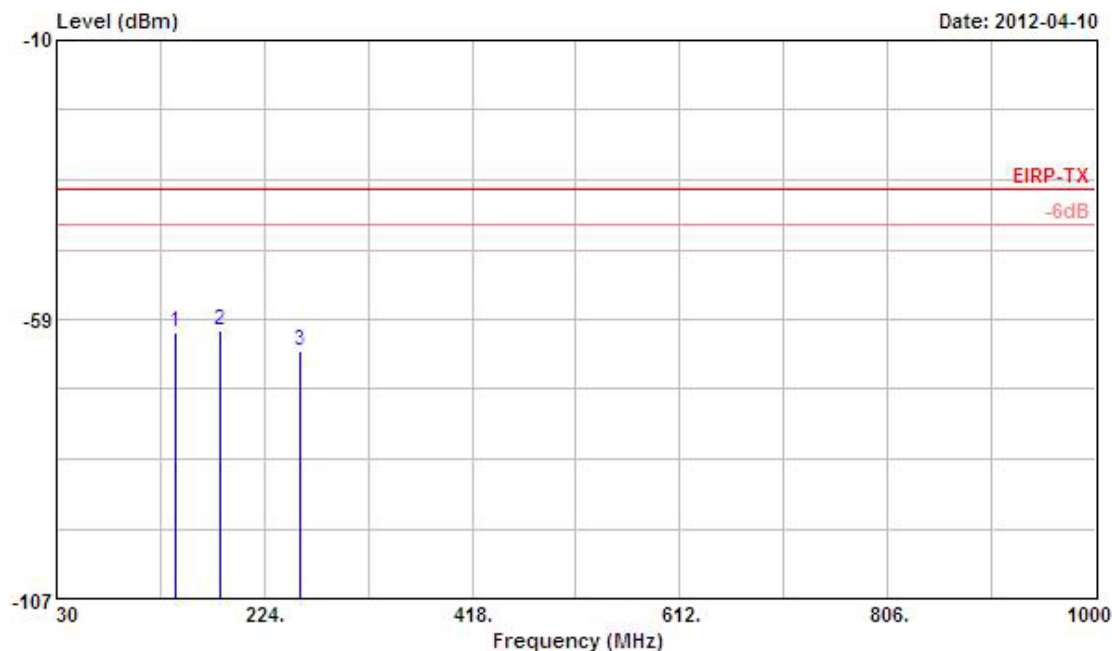
The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



For Two Chains:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 13 (20MHz)

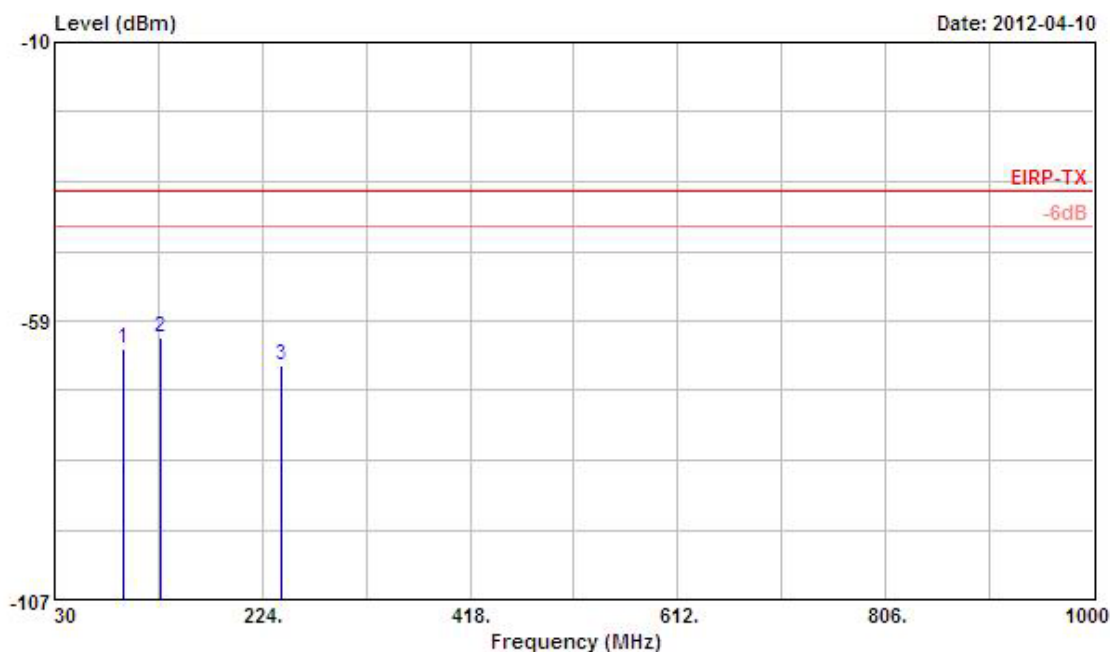
Horizontal



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1	141.550	-60.89	-24.89	-36.00	-59.66	-1.23
2	183.260	-60.28	-24.28	-36.00	-56.10	-4.18
3	256.980	-63.95	-27.95	-36.00	-62.96	-0.99



Vertical



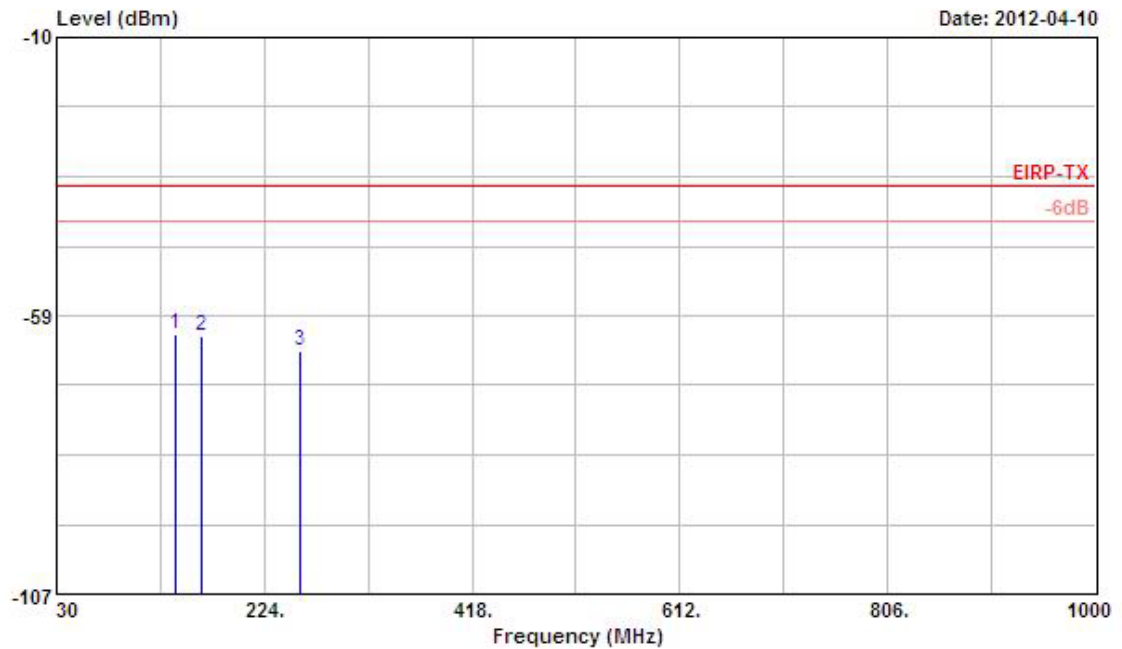
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	94.990	-63.41	-27.41	-36.00	-60.62	-2.79
2	128.940	-61.47	-25.47	-36.00	-59.93	-1.54
3	241.460	-66.39	-30.39	-36.00	-62.59	-3.80

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



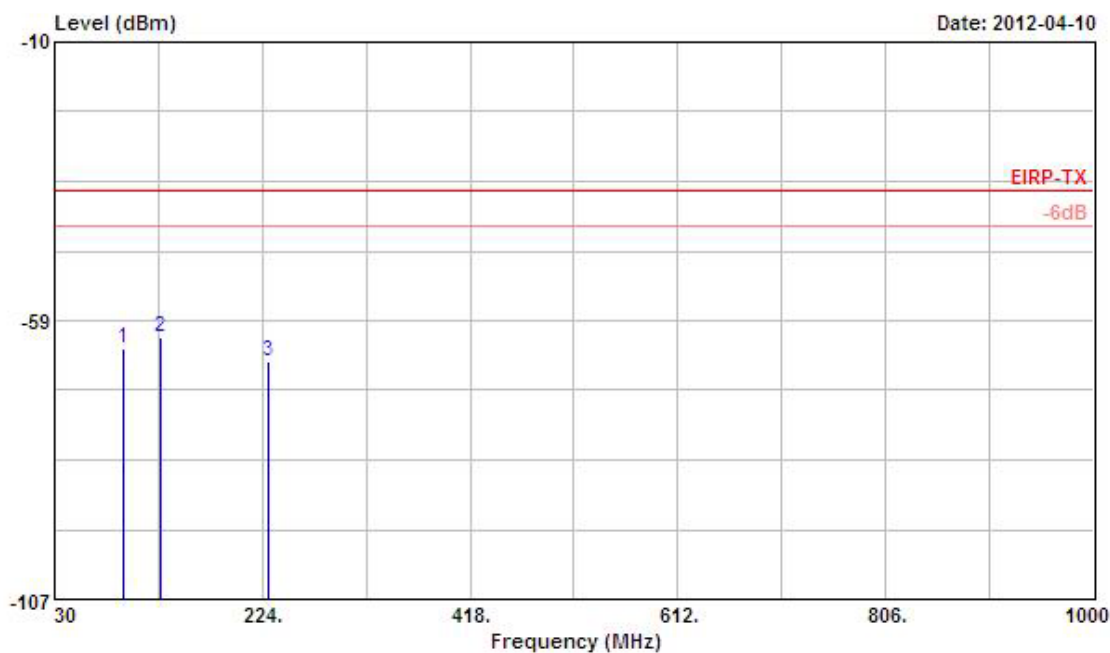
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 11 (40MHz)

Horizontal

	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	141.550	-61.78	-25.78	-36.00	-60.55	-1.23
2	164.830	-62.07	-26.07	-36.00	-59.24	-2.83
3	256.980	-64.55	-28.55	-36.00	-63.56	-0.99



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	94.990	-63.34	-27.34	-36.00	-60.55	-2.79
2	128.940	-61.42	-25.42	-36.00	-59.88	-1.54
3	229.820	-65.51	-29.51	-36.00	-60.83	-4.68

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.

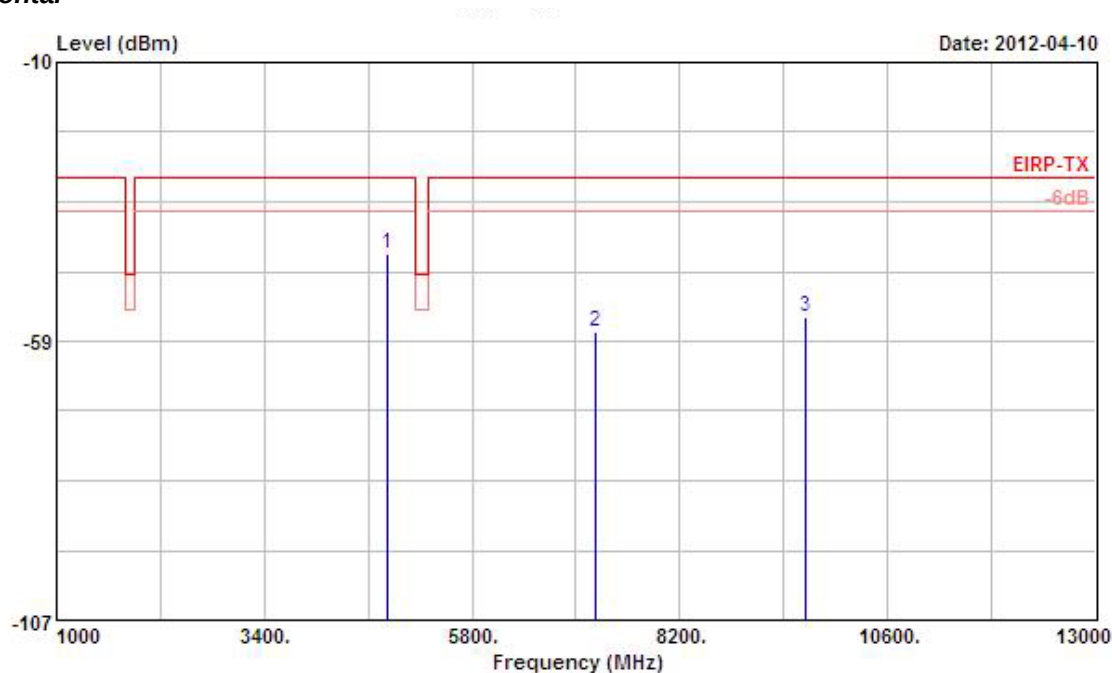


3.4.9 Results of Transmitter Spurious Emissions Above 1GHz

For Single Chain:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11b / Ch. 1

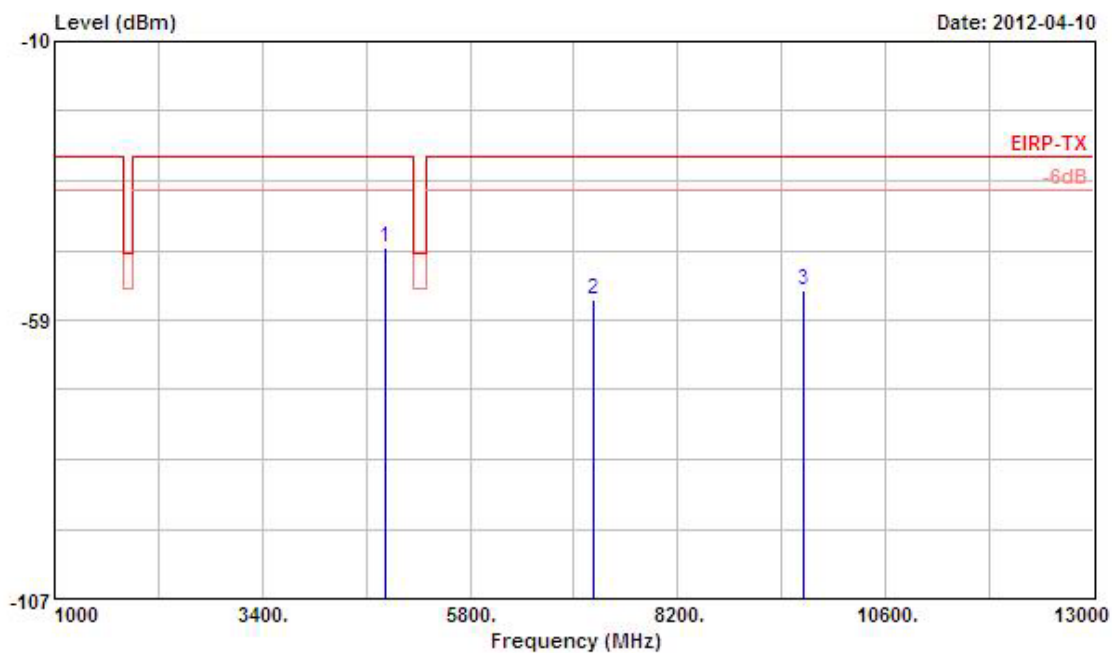
Horizontal



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dB	dBm	dB		
1	4824.000	-43.26	-13.26	-30.00	-53.48	10.22
2	7236.000	-56.73	-26.73	-30.00	-70.95	14.22
3	9648.000	-54.27	-24.27	-30.00	-70.69	16.42



Vertical



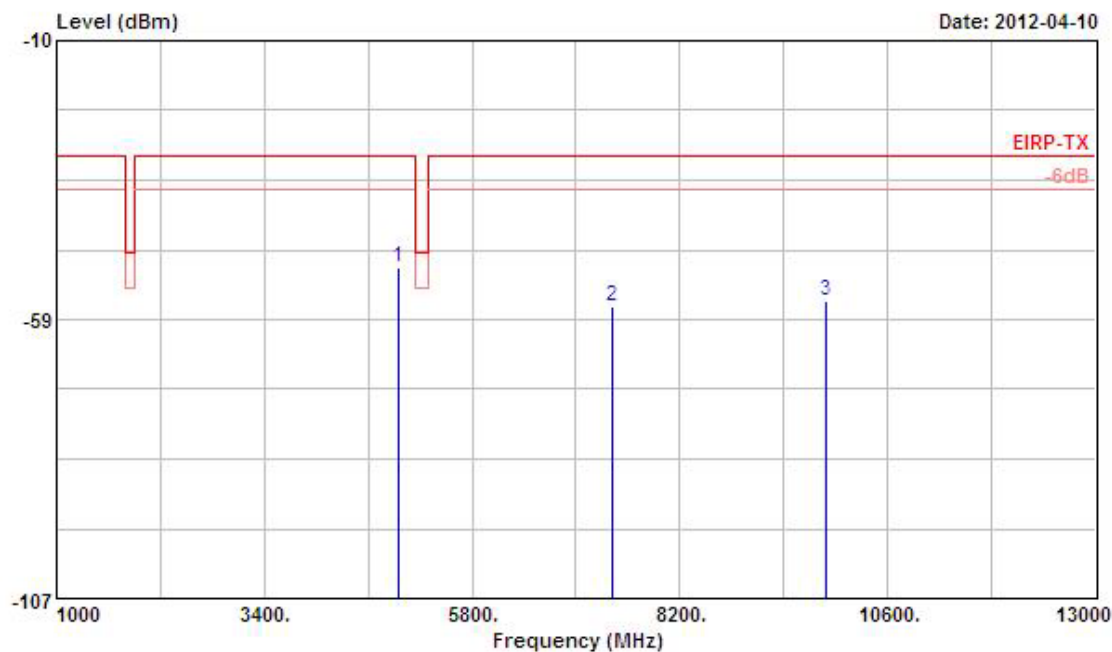
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1	4824.000	-45.76	-15.76	-30.00	-56.76	11.00
2	7236.000	-55.01	-25.01	-30.00	-70.71	15.70
3	9648.000	-53.32	-23.32	-30.00	-71.47	18.15

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



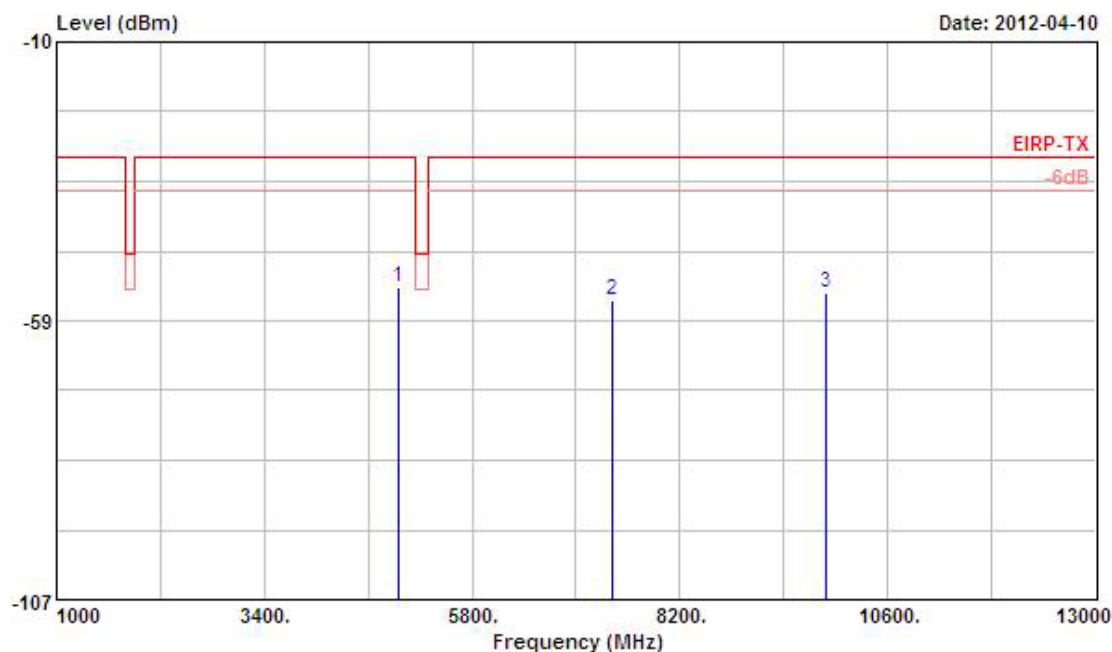
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11b / Ch. 13

Horizontal

	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4944.000	-49.58	-19.58	-30.00	-60.32	10.74
2	7416.000	-56.31	-26.31	-30.00	-70.96	14.65
3	9888.000	-55.23	-25.23	-30.00	-71.07	15.84



Vertical



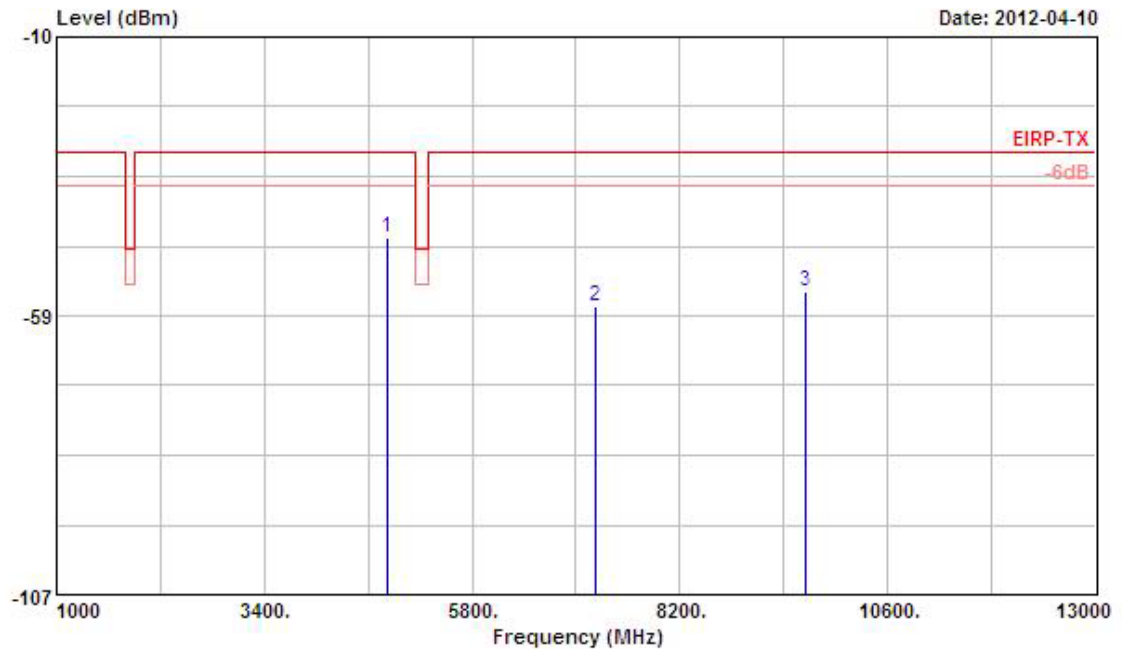
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4944.000	-52.71	-22.71	-30.00	-64.32	11.61
2	7416.000	-55.03	-25.03	-30.00	-70.91	15.88
3	9888.000	-53.75	-23.75	-30.00	-70.90	17.15

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



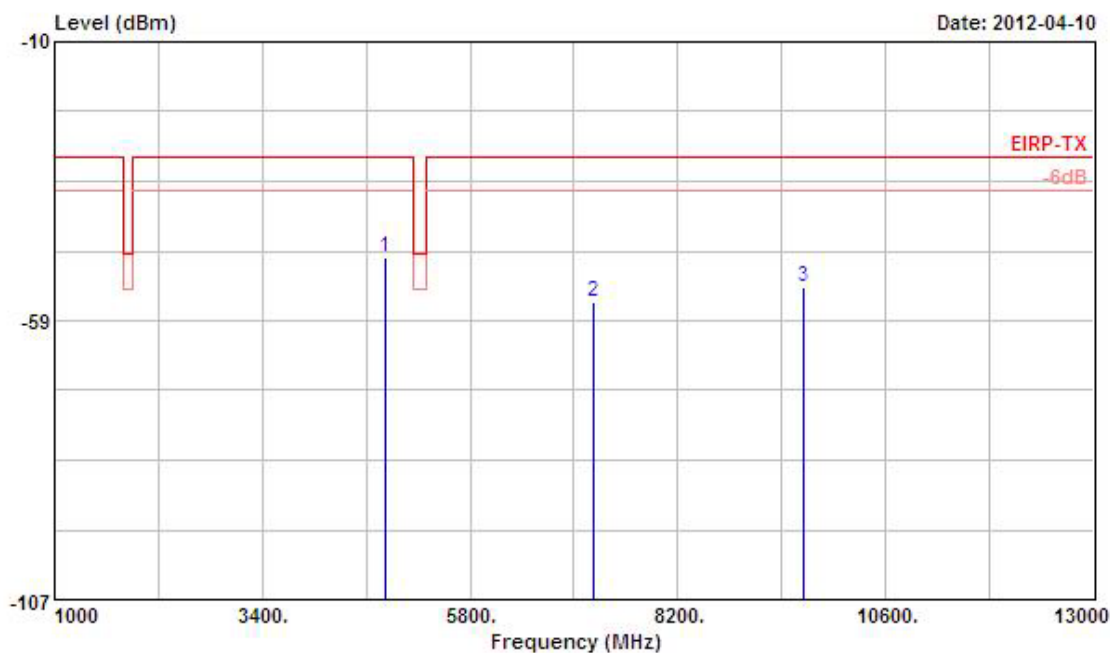
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11g / Ch. 1

Horizontal

	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4824.000	-45.07	-15.07	-30.00	-55.29	10.22
2	7236.000	-56.80	-26.80	-30.00	-71.02	14.22
3	9648.000	-54.36	-24.36	-30.00	-70.78	16.42



Vertical



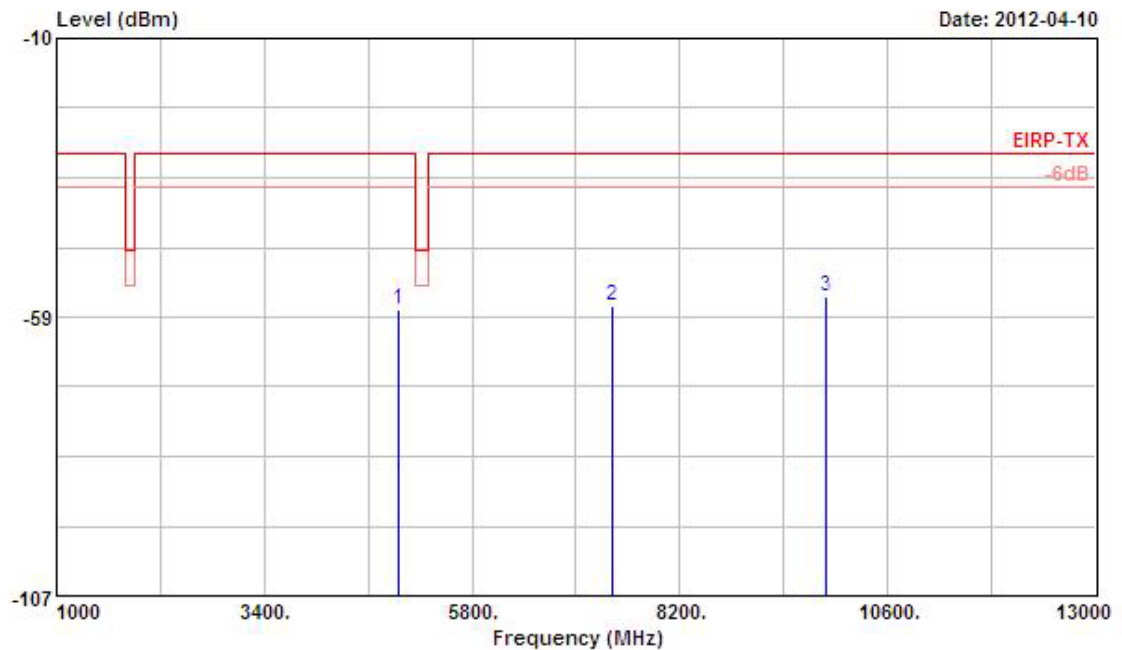
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dB			dBm	dB
1	4824.000	-47.36	-17.36	-30.00	-58.36	11.00
2	7236.000	-55.15	-25.15	-30.00	-70.85	15.70
3	9648.000	-52.70	-22.70	-30.00	-70.85	18.15

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



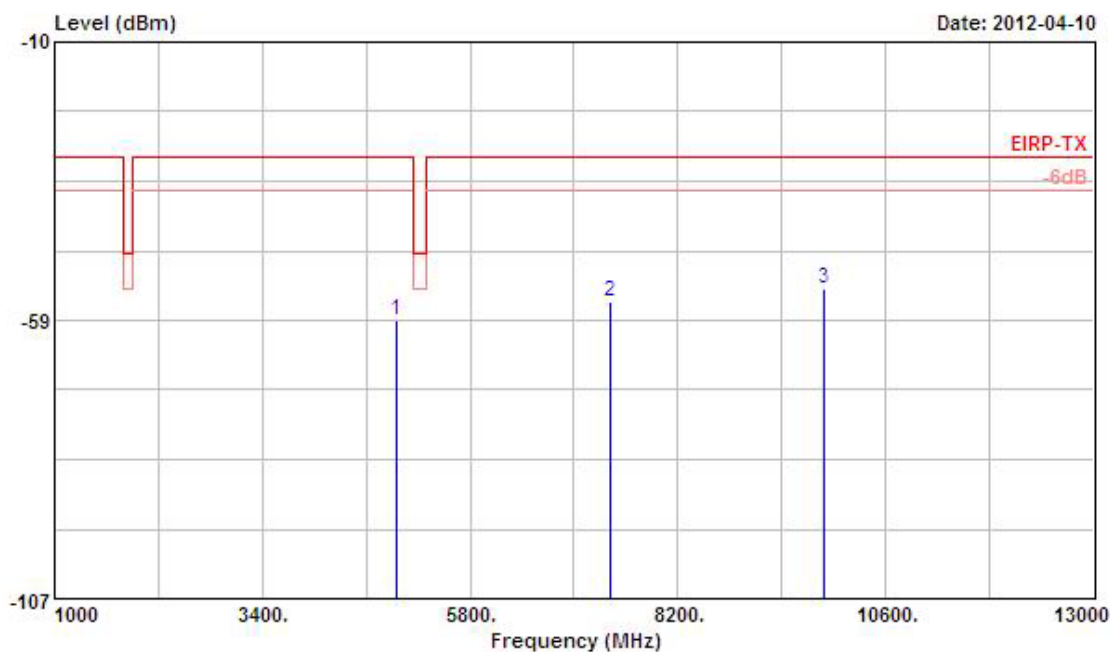
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11g / Ch. 13

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	4944.000	-57.26	-27.26	-30.00	-68.00	10.74
2	7416.000	-56.56	-26.56	-30.00	-71.21	14.65
3	9888.000	-54.88	-24.88	-30.00	-70.72	15.84



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4944.000	-58.60	-28.60	-30.00	-70.21	11.61
2	7416.000	-55.42	-25.42	-30.00	-71.30	15.88
3	9888.000	-53.16	-23.16	-30.00	-70.31	17.15

Note:

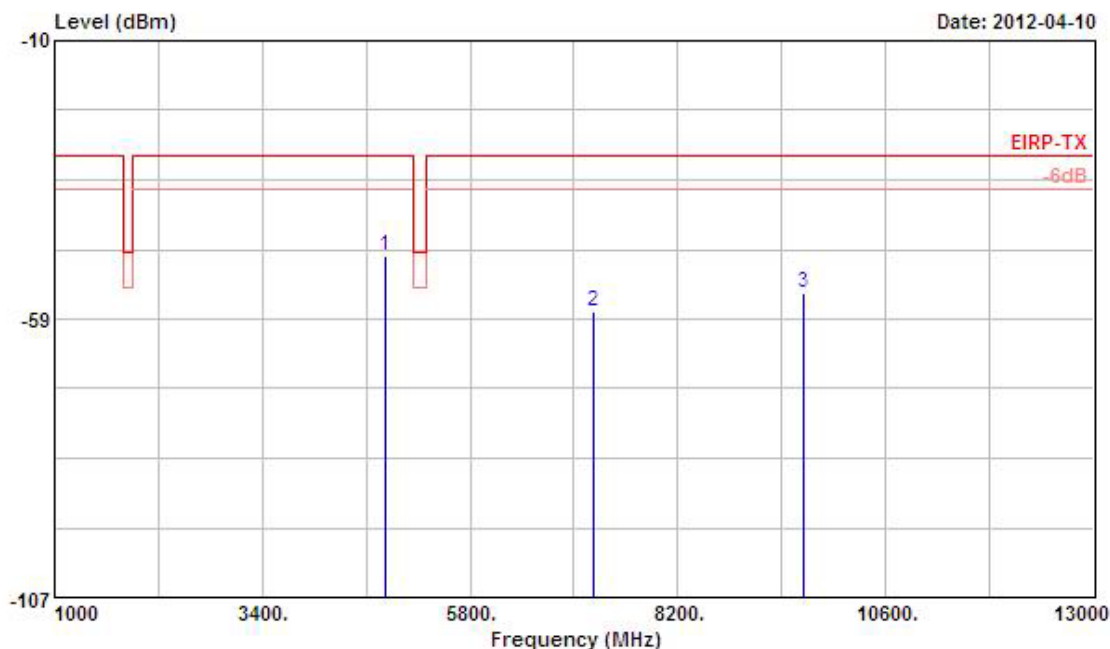
The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



For Two Chains:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 1 (20MHz)

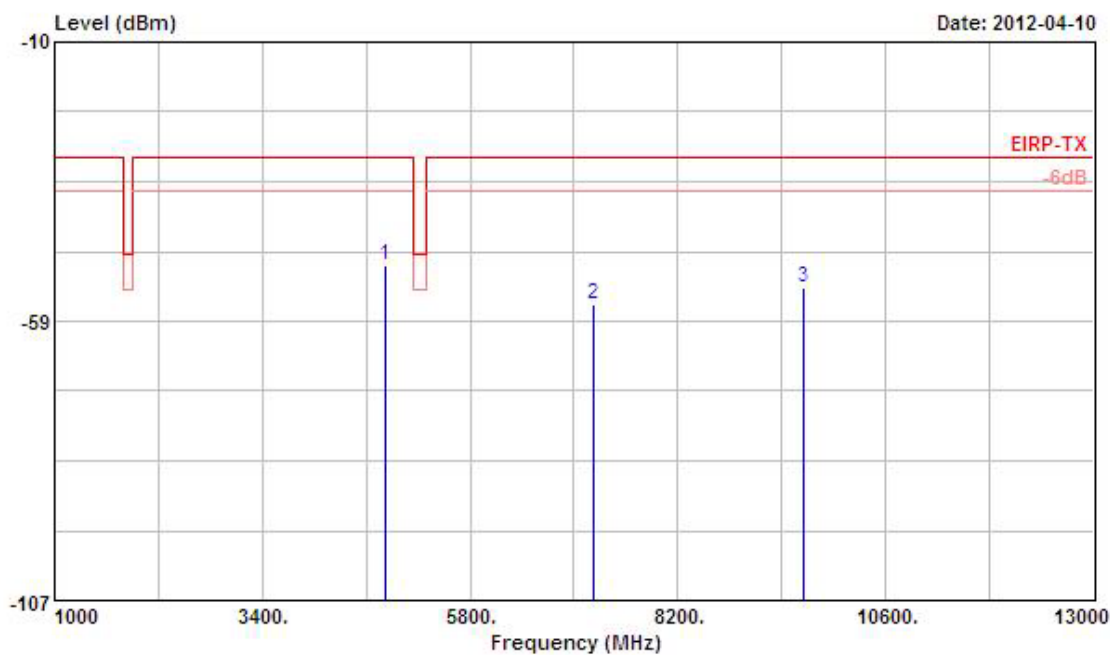
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	4824.000	-47.57	-17.57	-30.00	-57.79	10.22
2	7236.000	-57.25	-27.25	-30.00	-71.47	14.22
3	9648.000	-53.95	-23.95	-30.00	-70.37	16.42



Vertical



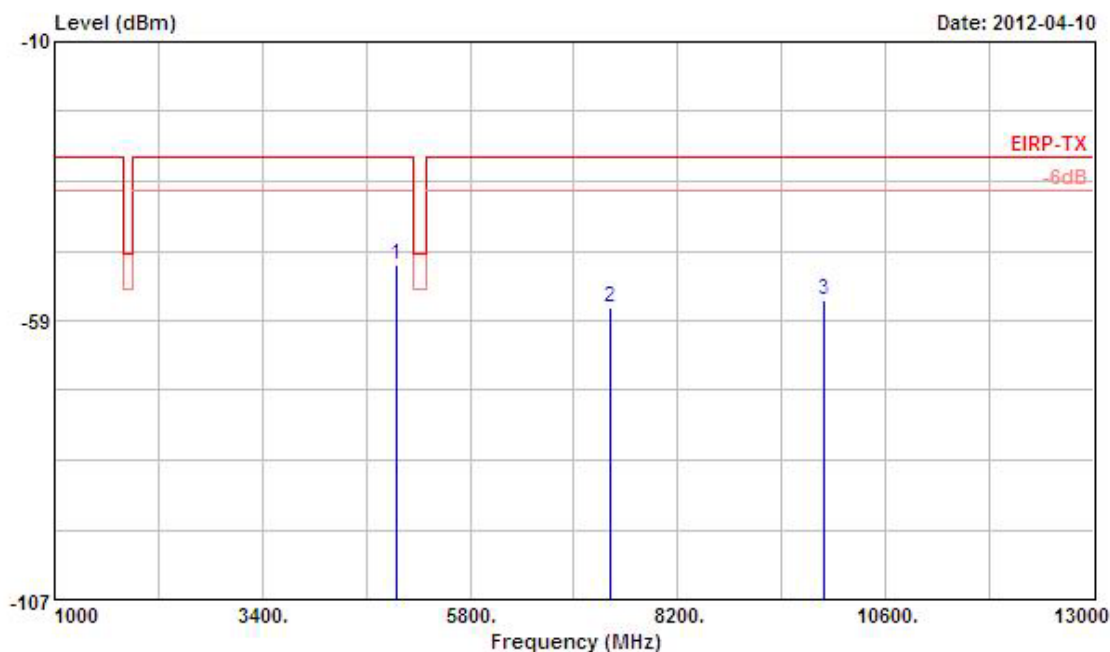
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4824.000	-48.81	-18.81	-30.00	-59.81	11.00
2	7236.000	-55.50	-25.50	-30.00	-71.20	15.70
3	9648.000	-52.82	-22.82	-30.00	-70.97	18.15

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



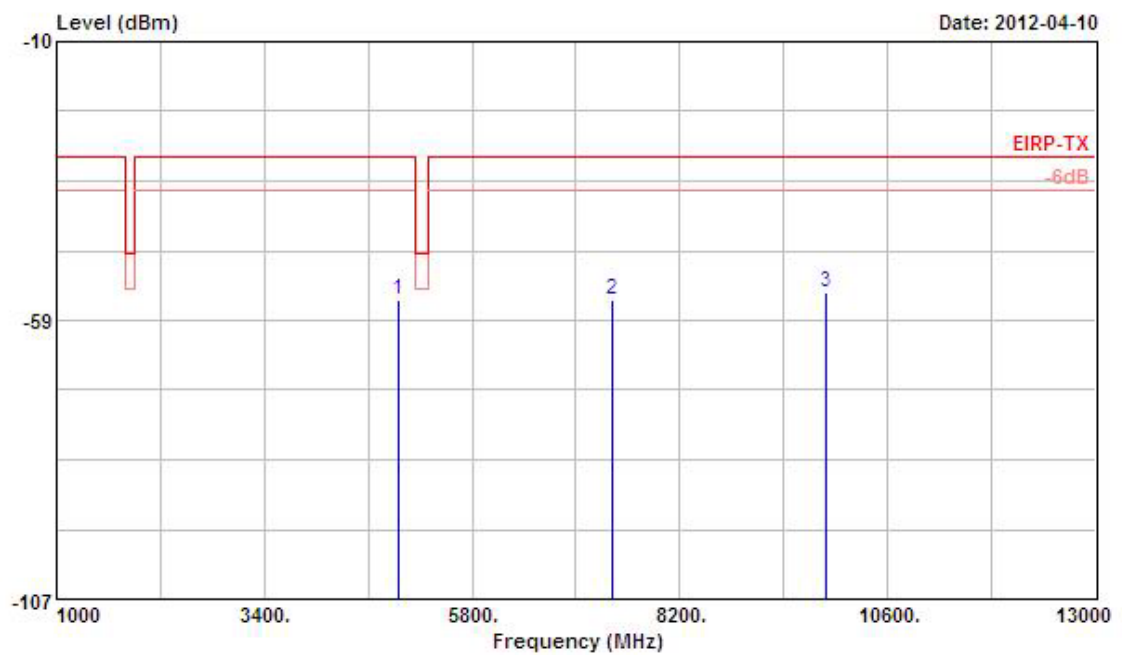
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 13 (20MHz)

Horizontal

	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4944.000	-48.81	-18.81	-30.00	-59.55	10.74
2	7416.000	-56.09	-26.09	-30.00	-70.74	14.65
3	9888.000	-54.82	-24.82	-30.00	-70.66	15.84



Vertical



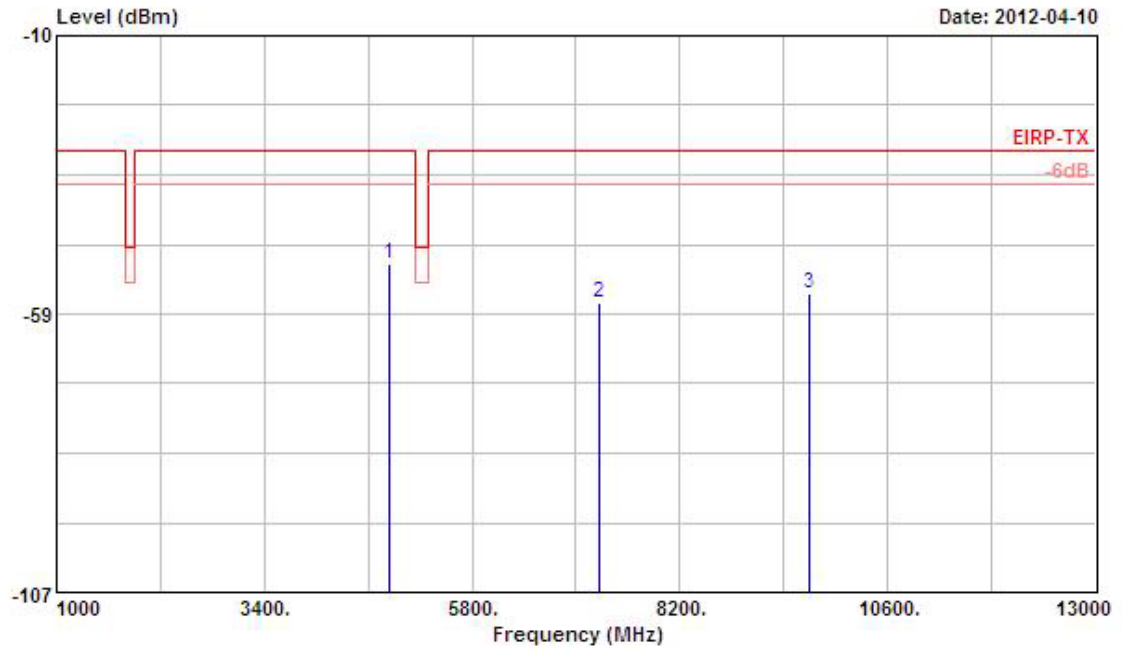
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4944.000	-55.07	-25.07	-30.00	-66.68	11.61
2	7416.000	-55.09	-25.09	-30.00	-70.97	15.88
3	9888.000	-53.55	-23.55	-30.00	-70.70	17.15

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



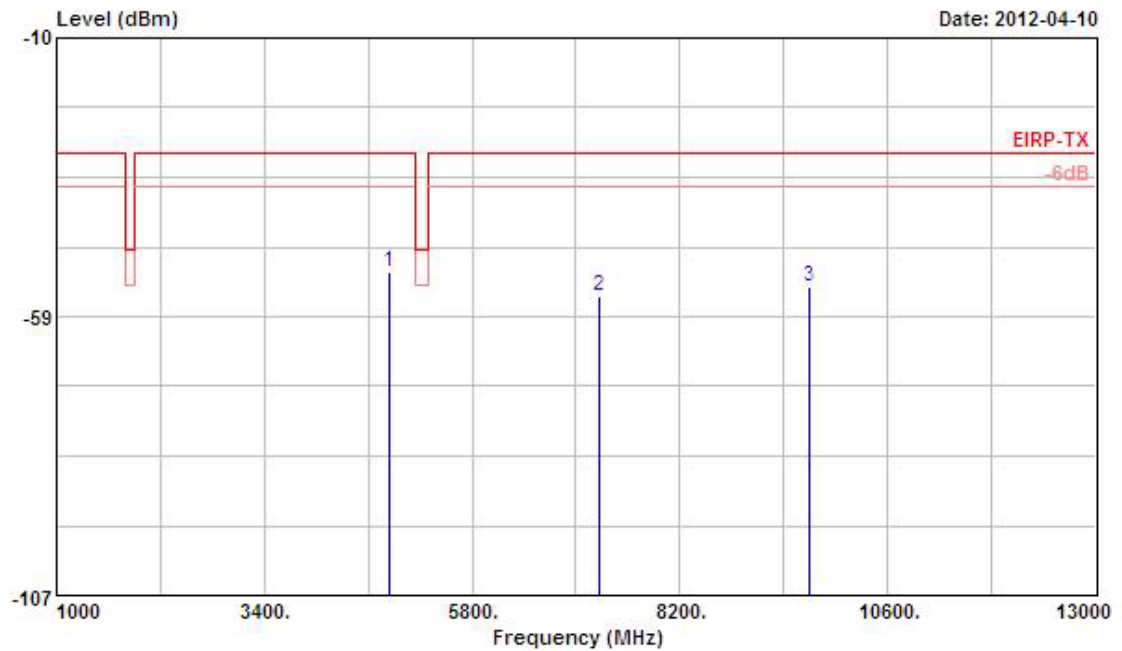
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 3 (40MHz)

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	4844.000	-49.74	-19.74	-30.00	-60.06	10.32
2	7266.000	-56.62	-26.62	-30.00	-70.90	14.28
3	9688.000	-54.98	-24.98	-30.00	-71.29	16.31



Vertical



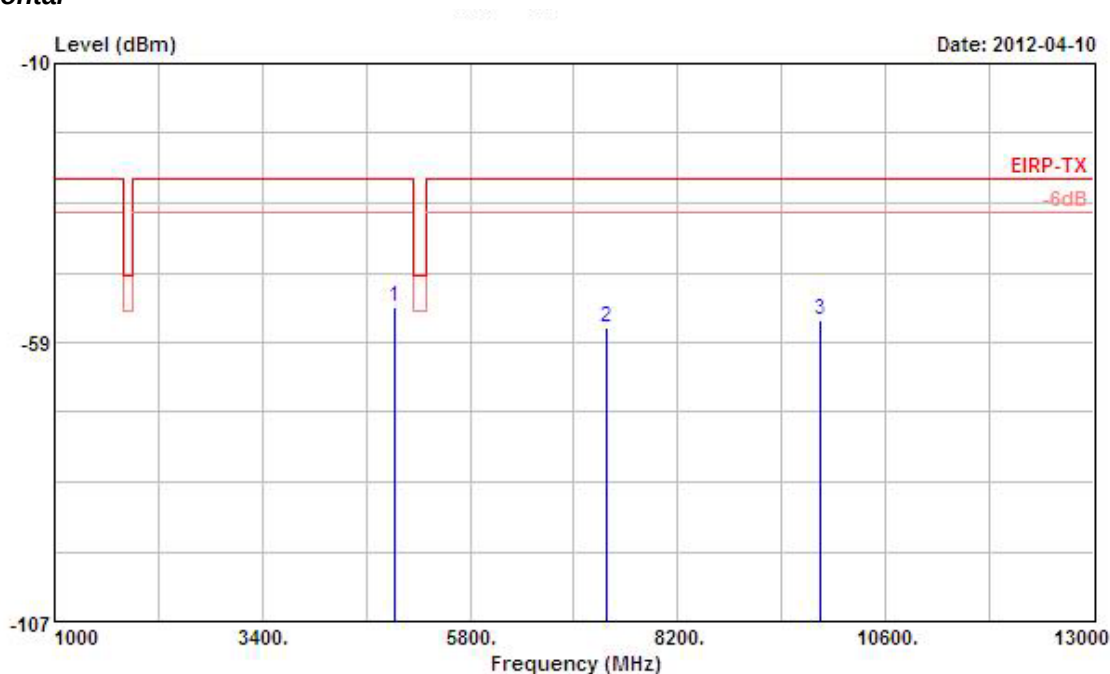
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1	4844.000	-50.77	-20.77	-30.00	-61.89	11.12
2	7266.000	-55.02	-25.02	-30.00	-70.75	15.73
3	9688.000	-53.48	-23.48	-30.00	-71.43	17.95

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



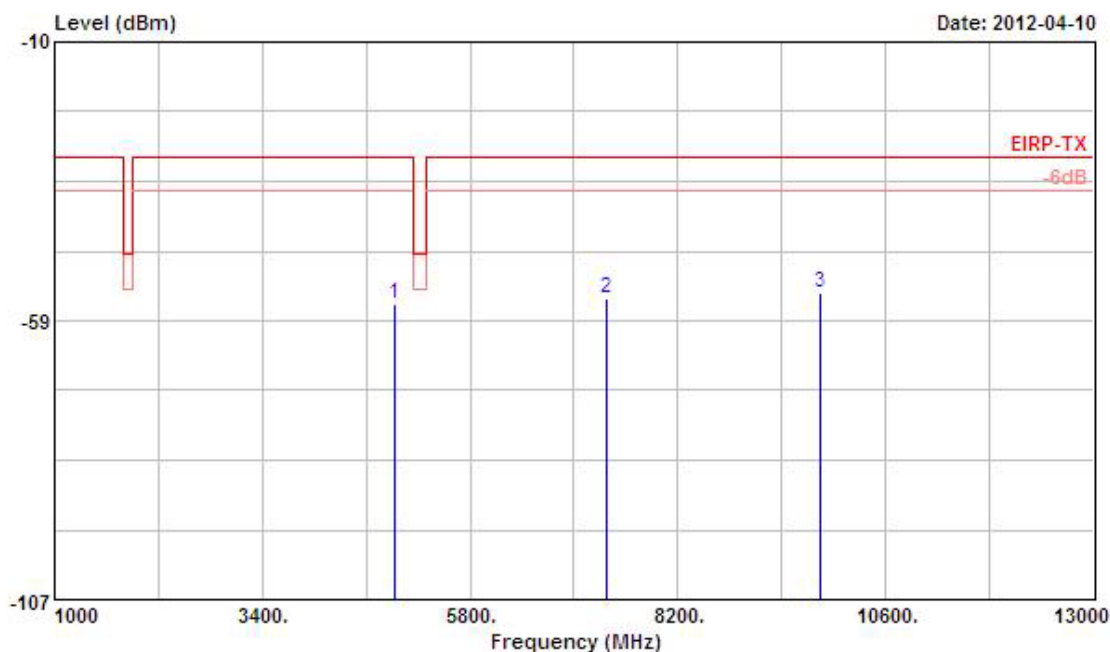
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 11 (40MHz)

Horizontal

	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	4924.000	-52.23	-22.23	-30.00	-62.87	10.64
2	7386.000	-55.95	-25.95	-30.00	-70.48	14.53
3	9848.000	-54.54	-24.54	-30.00	-70.50	15.96



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1	4924.000	-55.60	-25.60	-30.00	-67.08	11.48
2	7386.000	-54.72	-24.72	-30.00	-70.55	15.83
3	9848.000	-53.60	-23.60	-30.00	-70.95	17.35

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.

3.5 Receiver Spurious Emissions Measurement

3.5.1 Limit

Receiver spurious emissions are emissions at any frequency when the equipment is in receiving mode. The spurious emissions of the receiver shall not exceed the values in tables 1 and 2 below in the indicated bands.

Table 1 Receiver limits for narrowband spurious emissions

Frequency Range (MHz)	Limit (dBm)
30~1000	-57
1000~12750	-47

Table 2 Receiver limits for wideband spurious emissions

Frequency Range (MHz)	Limit (dBm)
30~1000	-107
1000~12750	-97

3.5.2 Measuring Instruments and Setting

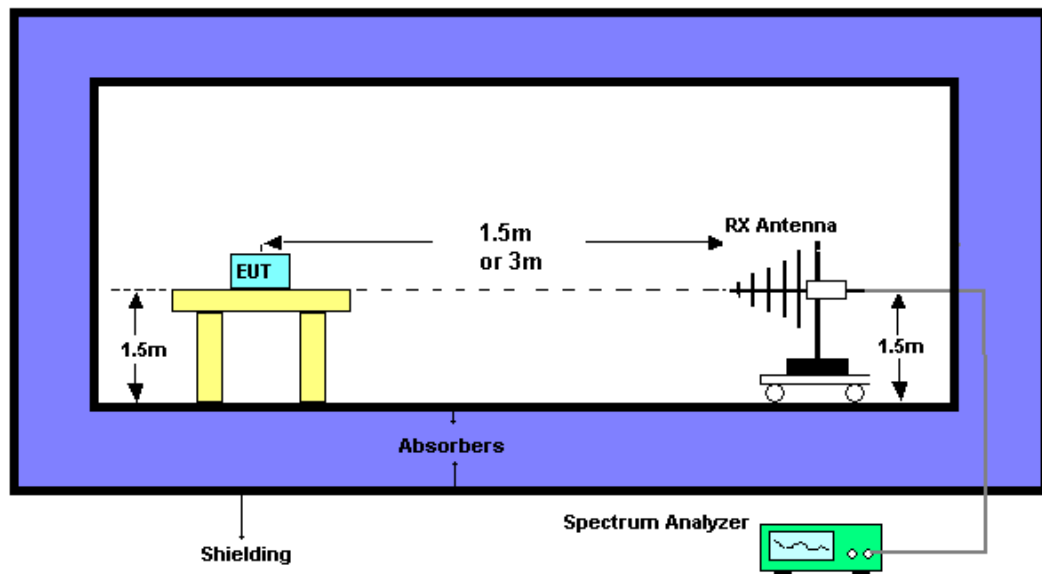
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Analyzer	Setting
Attenuation	Auto
Start Frequency	30 MHz
Stop Frequency	12750 MHz
Detector	Positive Peak
Span	100 MHz
Sweep Time	1s
RB / VB	100 kHz / 30 kHz

3.5.3 Test Procedures

1. The EUT was placed on the top of the turntable in fully anechoic chamber.
2. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. For 1~12.75GHz measurement, the receiving Horn antenna was placed 1.5 meters far away from the turntable.
4. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
5. Replace the EUT by standard antenna and feed the RF port by signal generator.
6. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
7. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
8. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
9. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

3.5.4 Test Setup Layout



3.5.5 Test Deviation

There is no deviation with the original standard.

3.5.6 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.

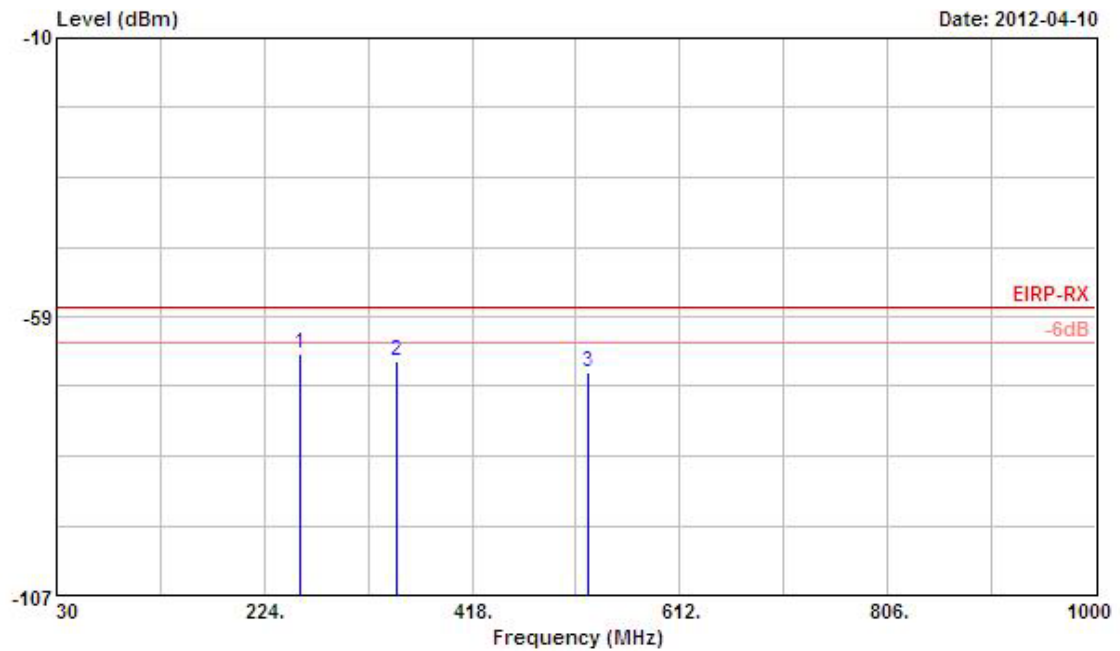


3.5.7 Results of Receiver Spurious Emissions Below 1GHz

For Single Chain:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11g / Ch. 13

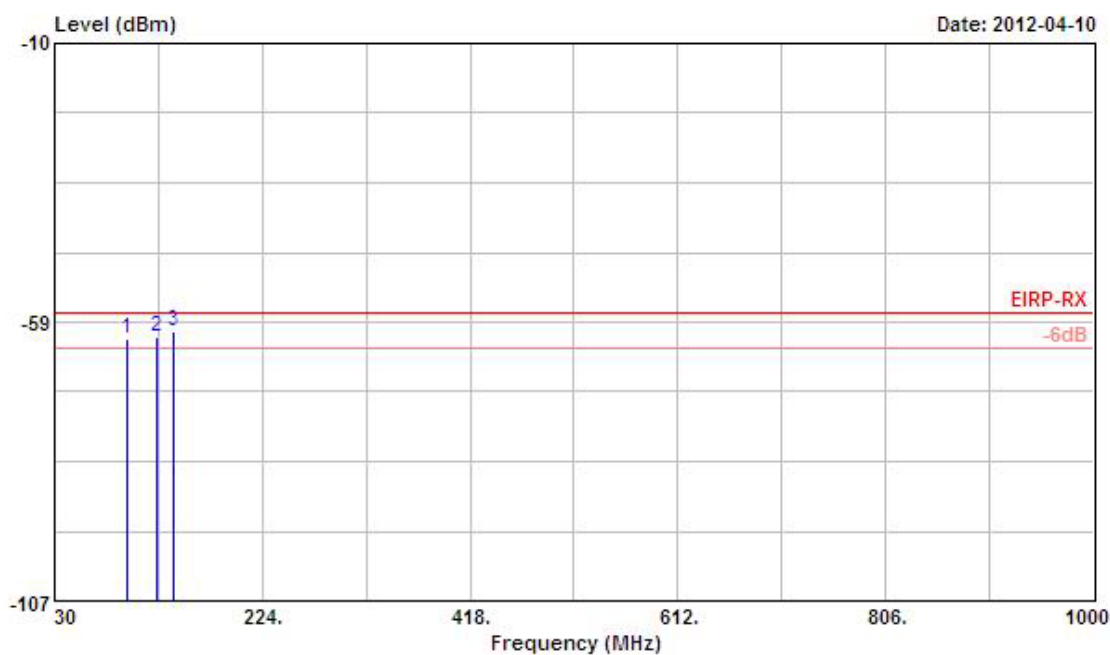
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	256.980	-64.89	-7.89	-57.00	-63.90	-0.99
2	347.190	-66.26	-9.26	-57.00	-66.26	0.00
3	525.670	-68.33	-11.33	-57.00	-72.55	4.22



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1	97.900	-61.39	-4.39	-57.00	-58.44	-2.95
2	125.060	-60.96	-3.96	-57.00	-59.00	-1.96
3	141.550	-60.22	-3.22	-57.00	-58.53	-1.69

Note:

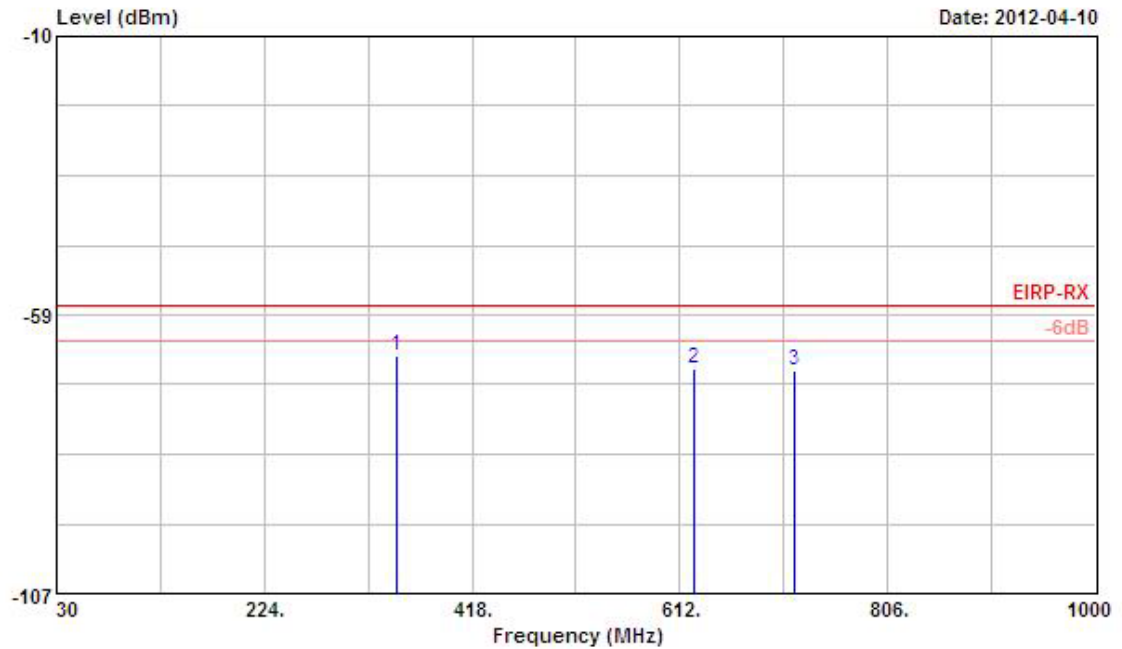
The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



For Two Chains:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 13 (20MHz)

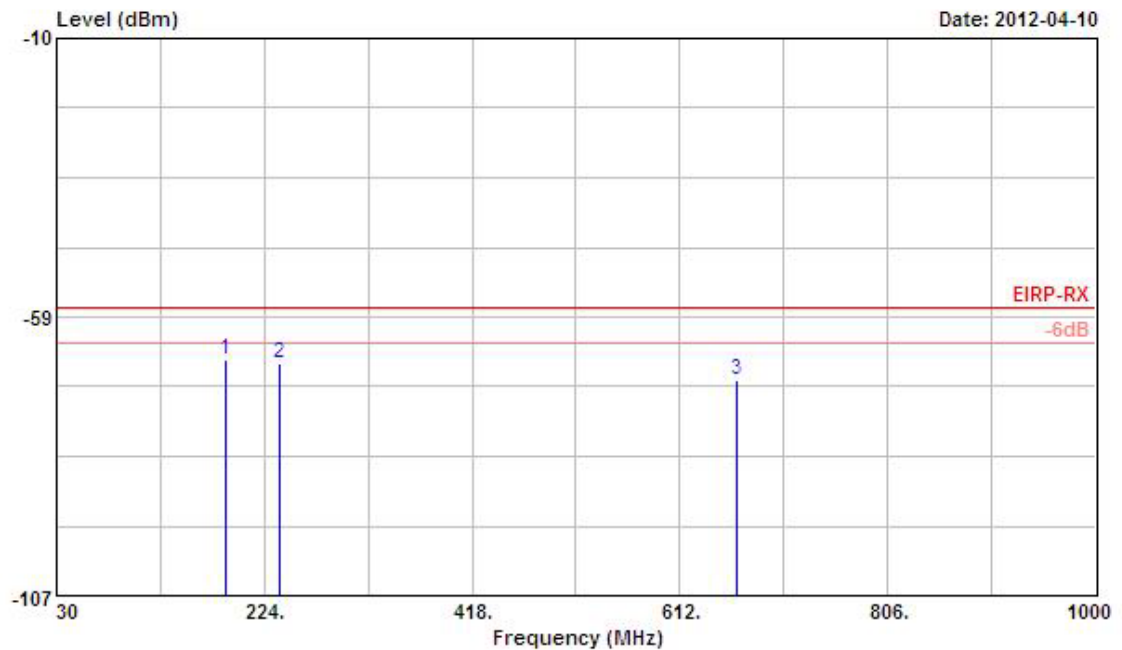
Horizontal



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	347.190	-65.66	-8.66	-57.00	-65.66	0.00
2	625.580	-67.88	-10.88	-57.00	-72.72	4.84
3	718.700	-68.07	-11.07	-57.00	-75.48	7.41



Vertical



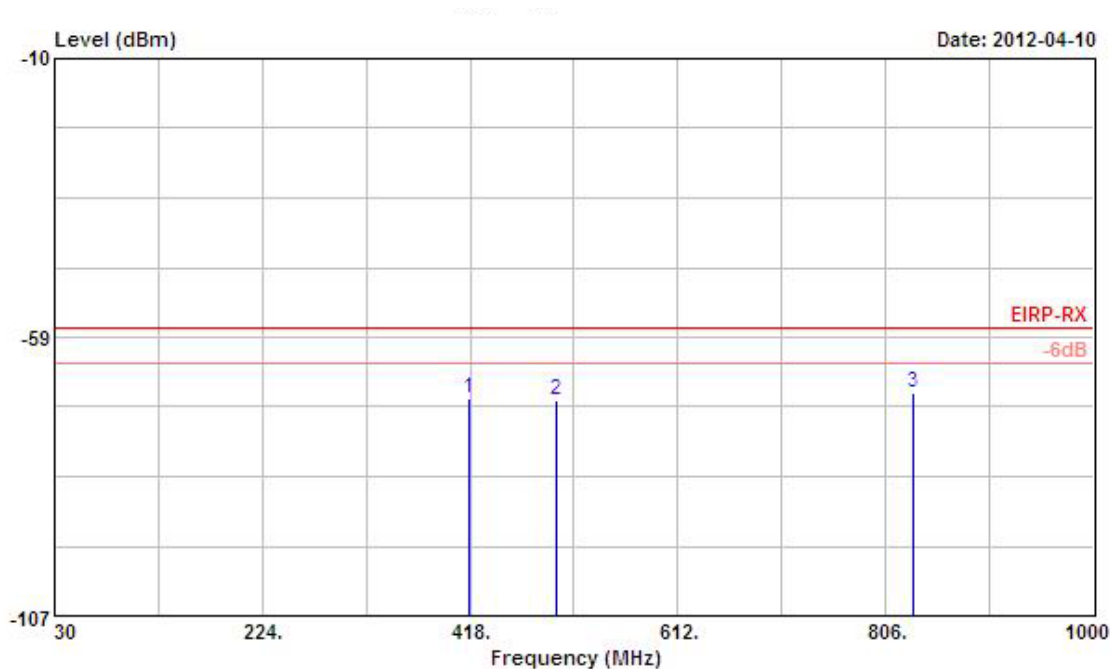
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1 @	188.110	-66.09	-9.09	-57.00	-61.50	-4.59
2 @	238.550	-66.47	-9.47	-57.00	-62.41	-4.06
3 @	665.350	-69.39	-12.39	-57.00	-74.98	5.59

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



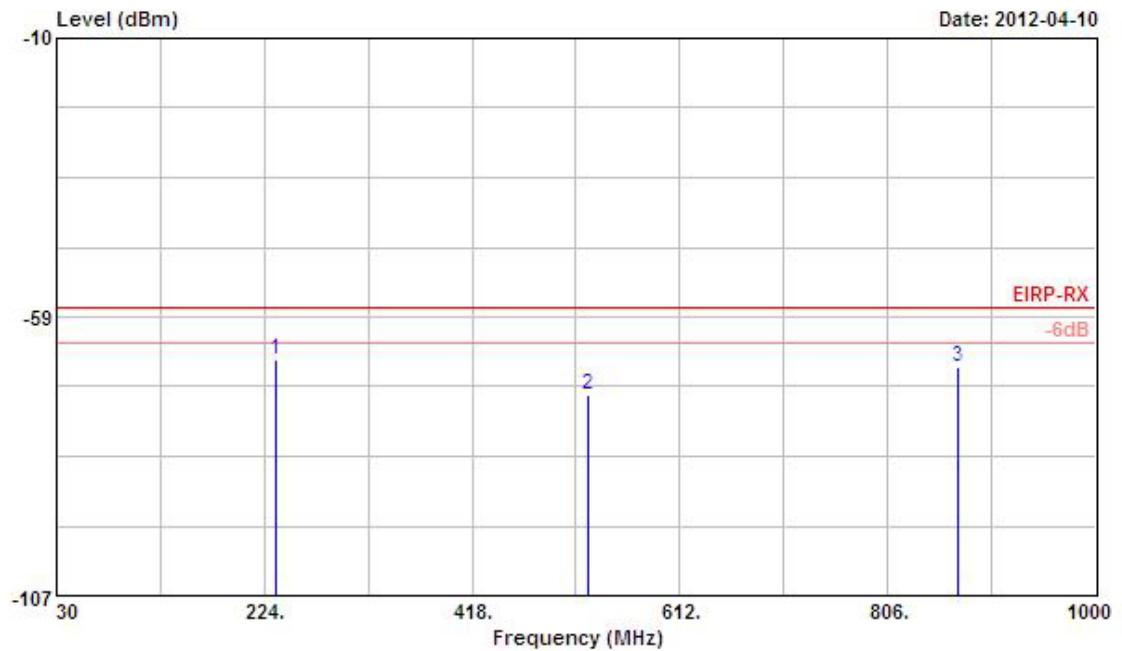
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 11 (40MHz)

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1 @	417.030	-69.21	-12.21	-57.00	-71.30	2.09
2 @	498.510	-69.39	-12.39	-57.00	-71.99	2.60
3 @	831.220	-68.30	-11.30	-57.00	-76.99	8.69



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1 @	234.670	-65.86	-8.86	-57.00	-61.53	-4.33
2 @	525.670	-72.17	-15.17	-57.00	-76.03	3.86
3 @	870.990	-67.29	-10.29	-57.00	-76.63	9.34

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.

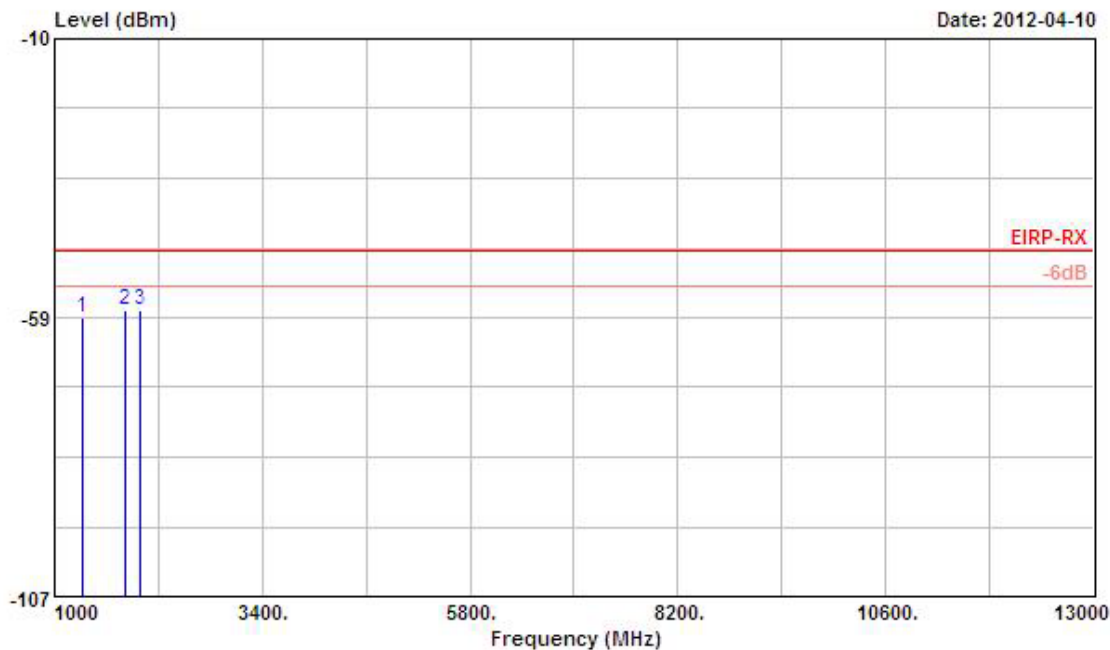


3.5.8 Results of Receiver Spurious Emissions Above 1GHz

For Single Chain:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11b / Ch. 1

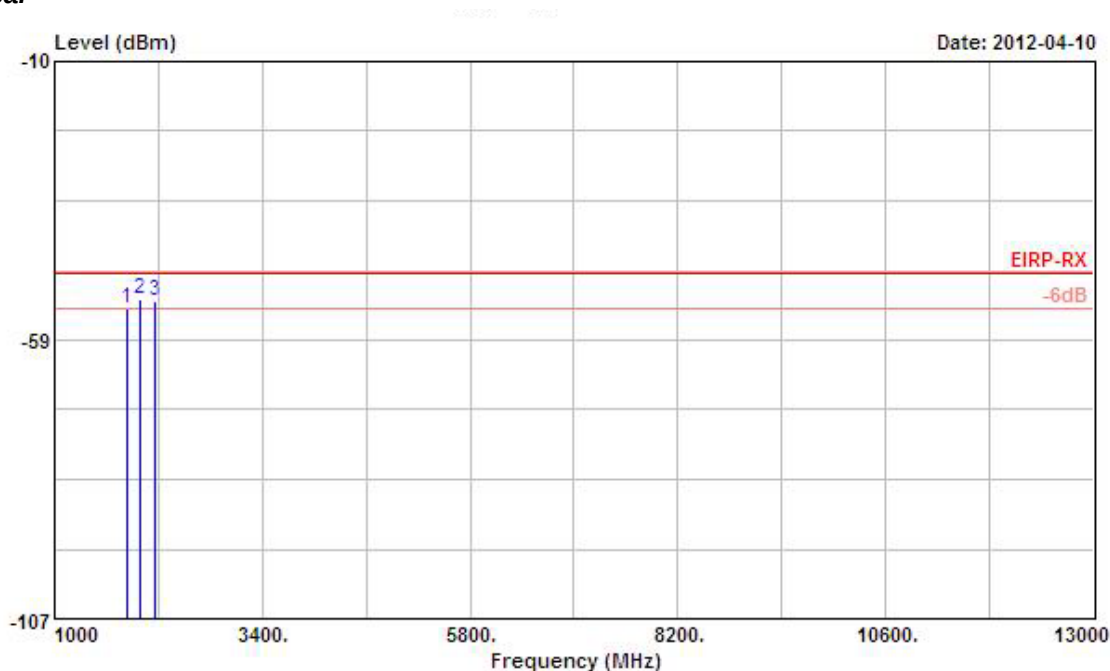
Horizontal



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1 @	1315.000	-58.65	-11.65	-47.00	-57.32	-1.33
2 @	1815.000	-57.34	-10.34	-47.00	-60.17	2.83
3 @	1990.000	-57.08	-10.08	-47.00	-61.74	4.66



Vertical



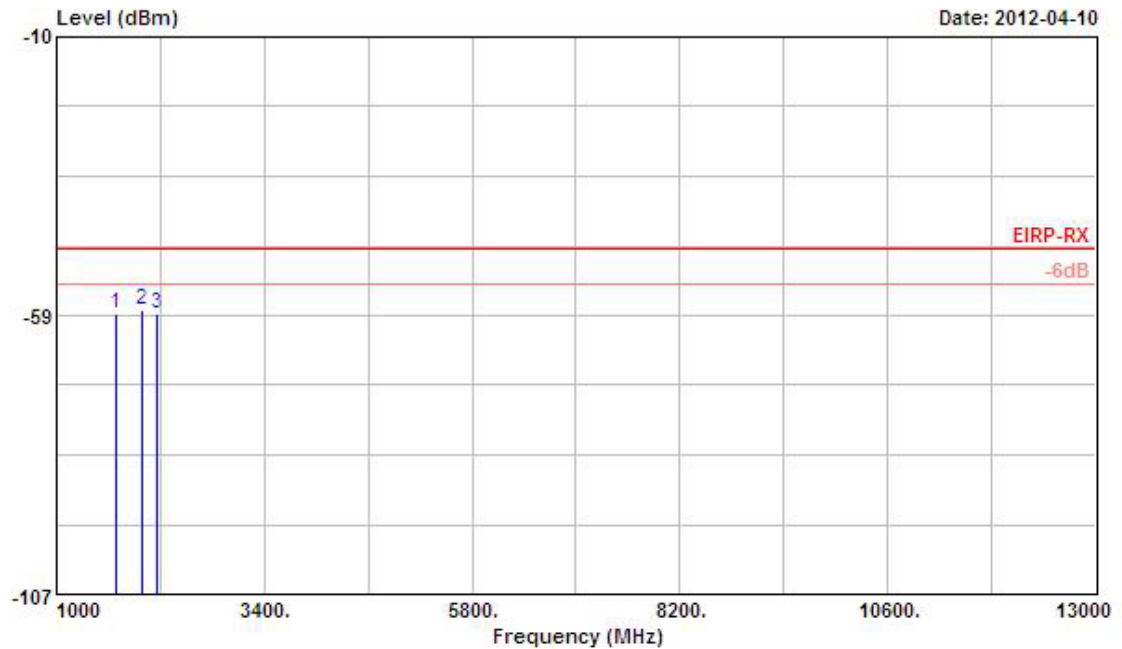
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1 @	1830.000	-53.13	-6.13	-47.00	-56.01	2.88
2 @	1990.000	-51.39	-4.39	-47.00	-55.80	4.41
3 @	2155.000	-51.78	-4.78	-47.00	-56.20	4.42

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



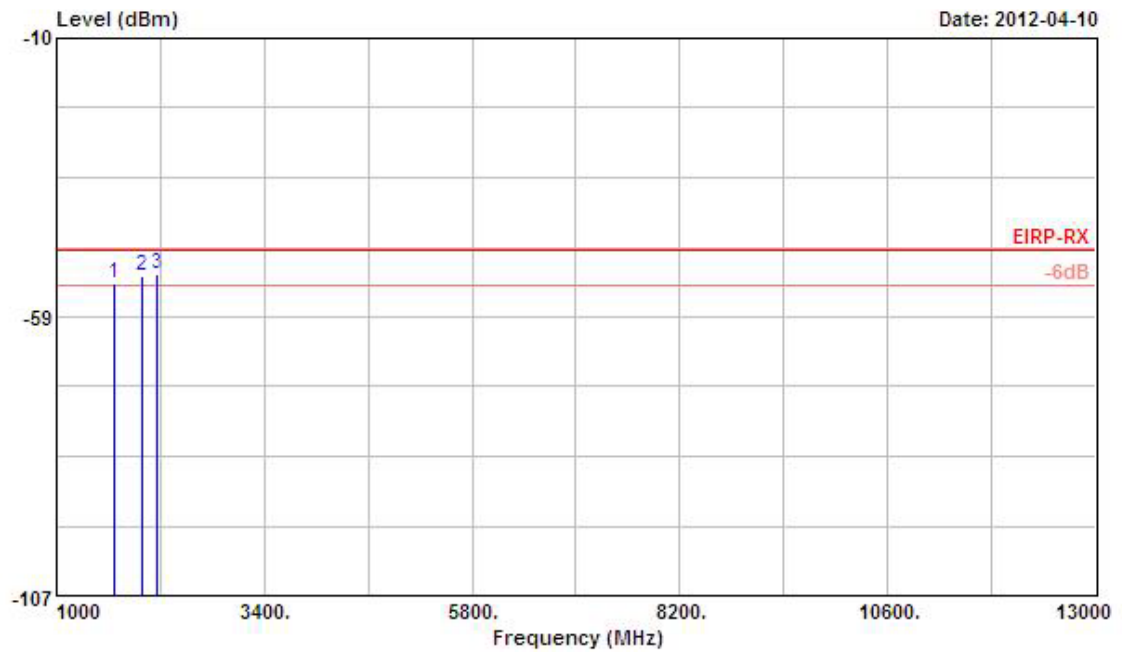
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11g / Ch. 13

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	1690.000	-58.33	-11.33	-47.00	-59.84	1.51
2	1990.000	-57.41	-10.41	-47.00	-62.07	4.66
3	2150.000	-58.26	-11.26	-47.00	-62.89	4.63



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	1655.000	-52.82	-5.82	-47.00	-53.90	1.08
2	1990.000	-51.39	-4.39	-47.00	-55.80	4.41
3	2155.000	-51.03	-4.03	-47.00	-55.45	4.42

Note:

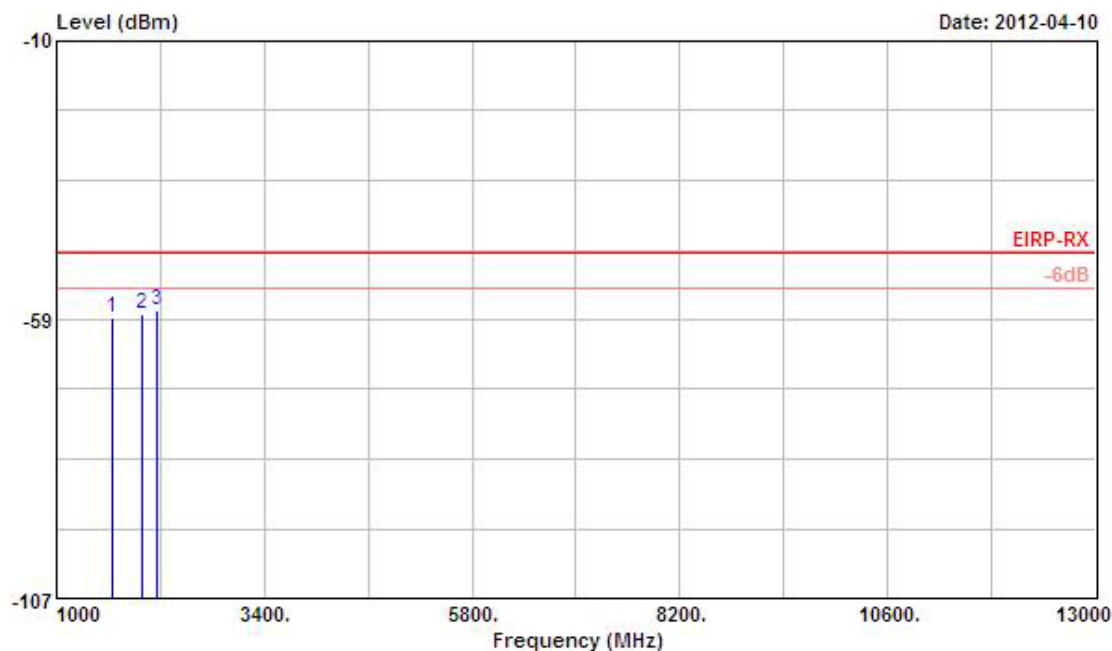
The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



For Two Chains:

Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 1 (20MHz)

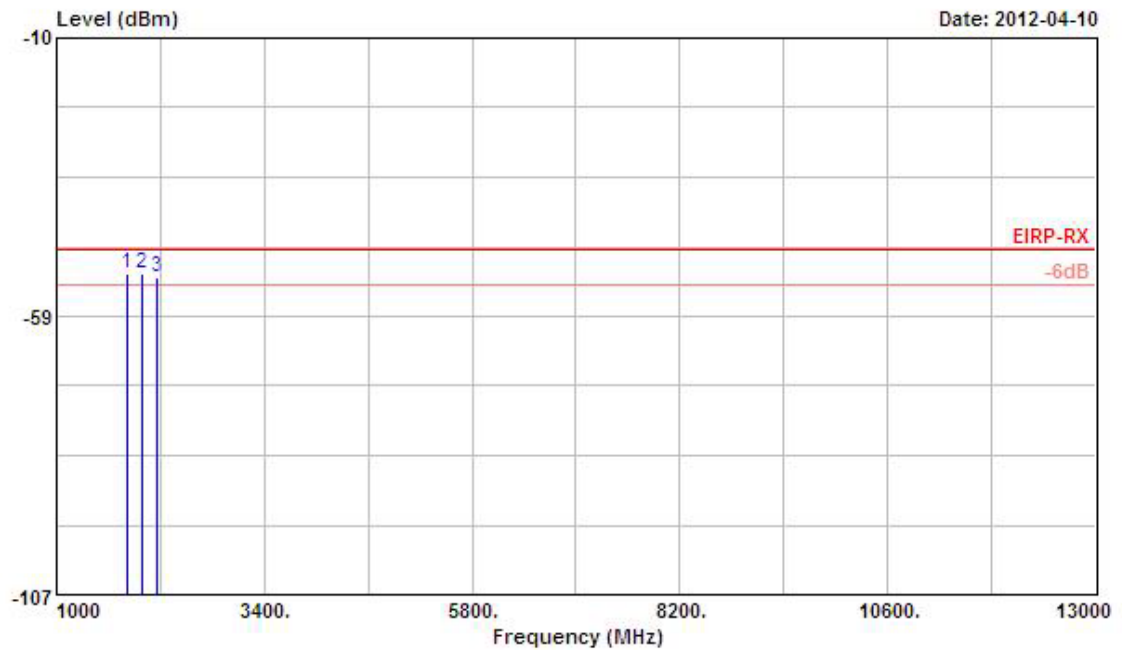
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	1650.000	-58.16	-11.16	-47.00	-59.15	0.99
2	1990.000	-57.43	-10.43	-47.00	-62.09	4.66
3	2155.000	-56.85	-9.85	-47.00	-61.48	4.63



Vertical



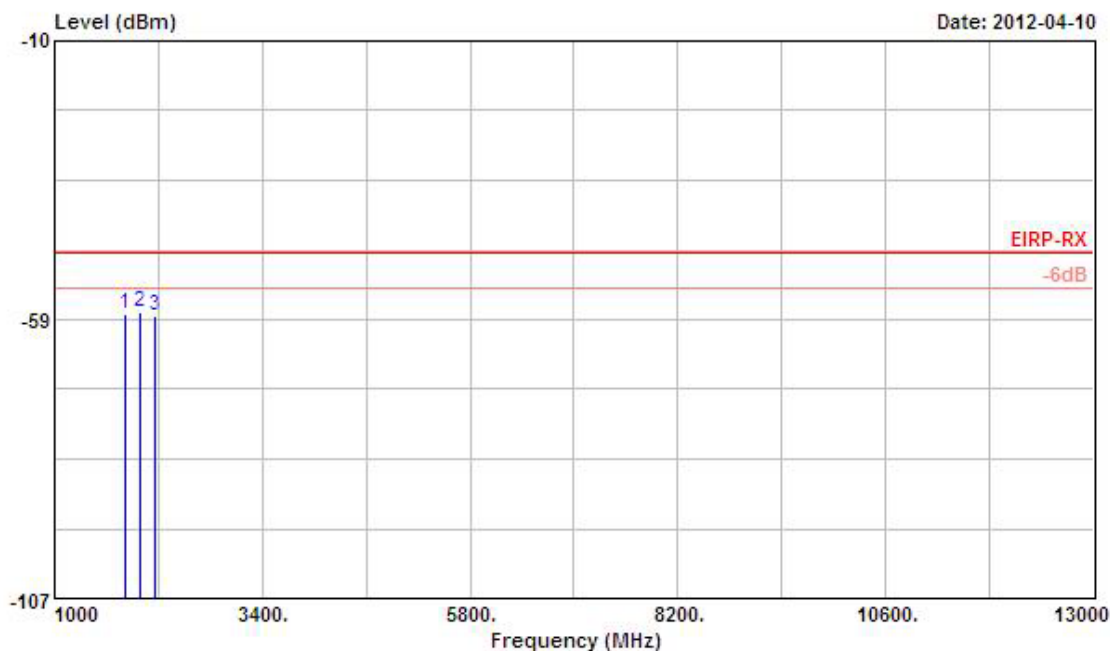
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	1815.000	-51.20	-4.20	-47.00	-53.82	2.62
2	1990.000	-51.18	-4.18	-47.00	-55.59	4.41
3	2155.000	-51.75	-4.75	-47.00	-56.17	4.42

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



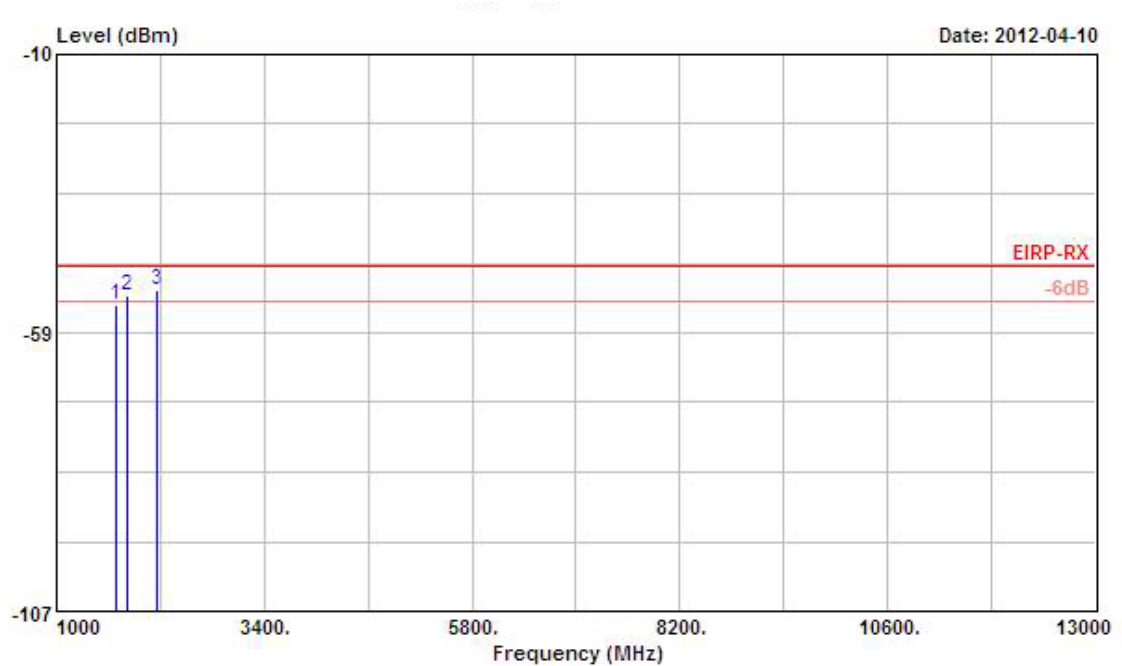
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 13 (20MHz)

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1 @	1815.000	-57.45	-10.45	-47.00	-60.28	2.83
2 @	1990.000	-57.35	-10.35	-47.00	-62.01	4.66
3 @	2155.000	-57.89	-10.89	-47.00	-62.52	4.63



Vertical



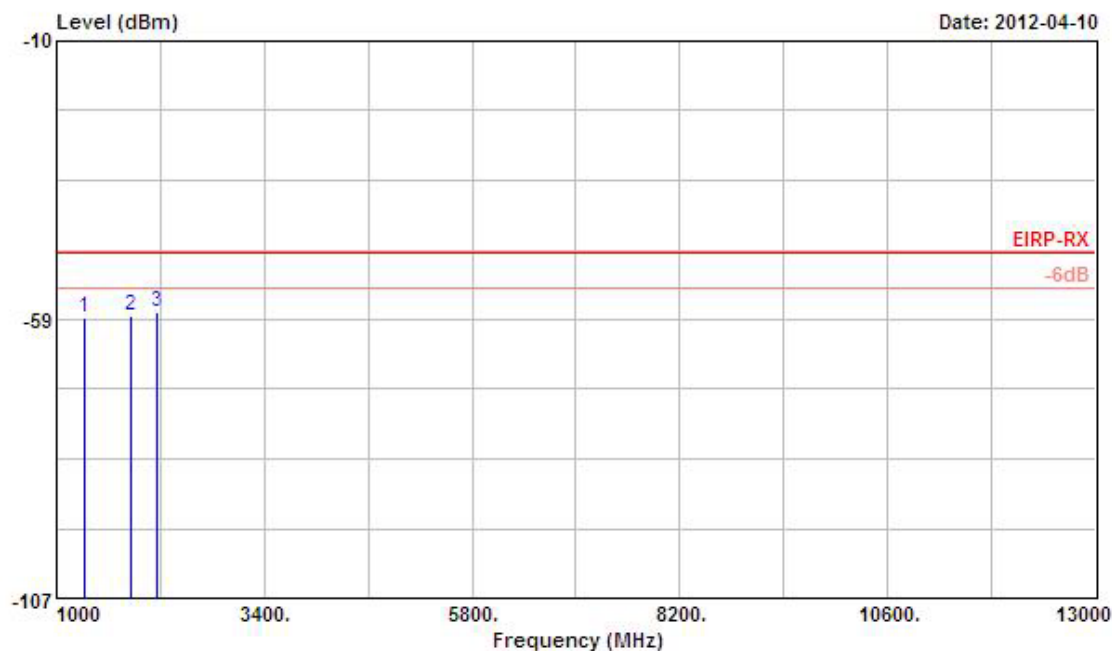
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
			dB	dBm	dBm	dB
1	1695.000	-53.78	-6.78	-47.00	-55.12	1.34
2	1815.000	-51.93	-4.93	-47.00	-54.55	2.62
3	2150.000	-51.07	-4.07	-47.00	-55.49	4.42

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



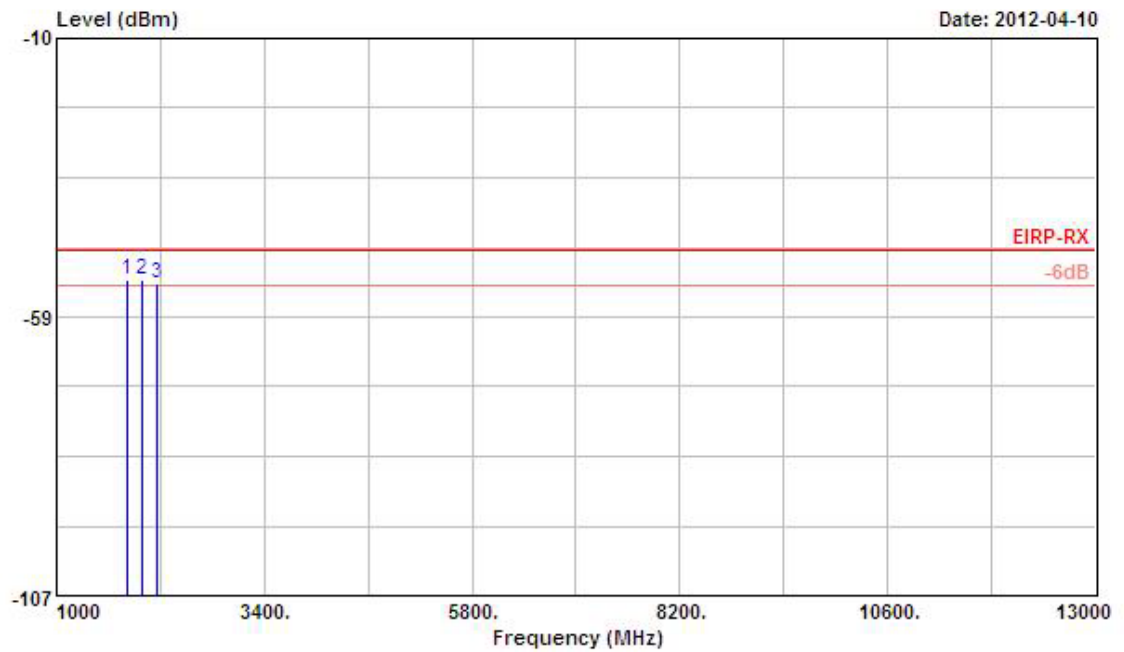
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 3 (40MHz)

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1	1330.000	-58.05	-11.05	-47.00	-56.85	-1.20
2	1855.000	-57.73	-10.73	-47.00	-61.08	3.35
3	2150.000	-57.14	-10.14	-47.00	-61.77	4.63



Vertical



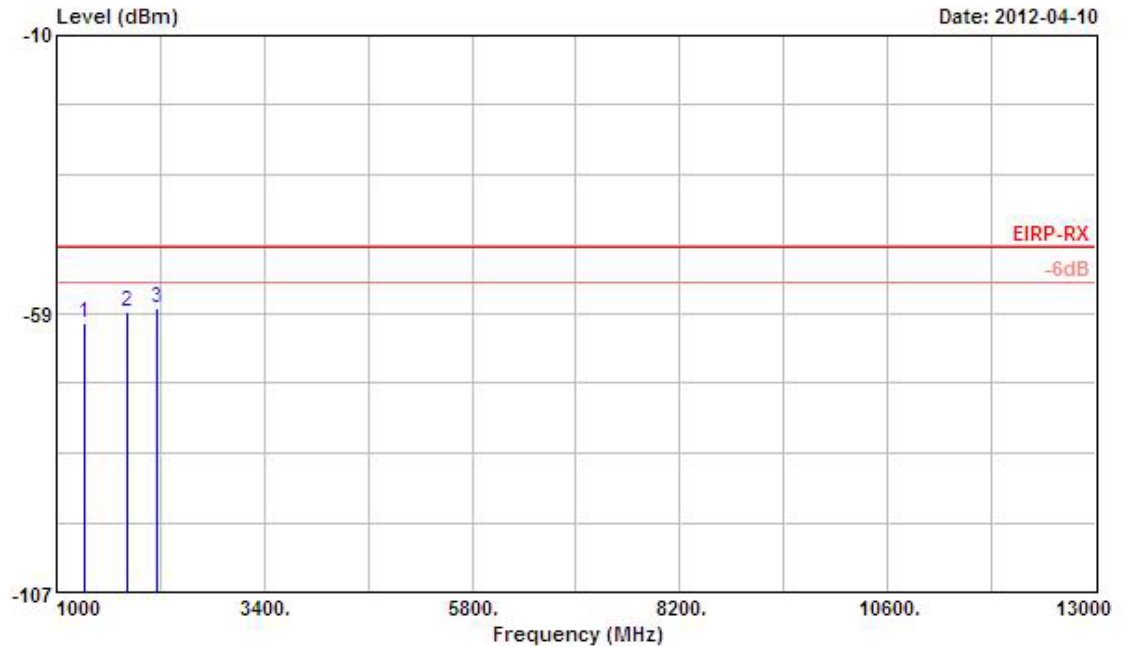
	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1 @	1815.000	-51.95	-4.95	-47.00	-54.57	2.62
2 @	1990.000	-52.10	-5.10	-47.00	-56.51	4.41
3 @	2155.000	-52.69	-5.69	-47.00	-57.11	4.42

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.



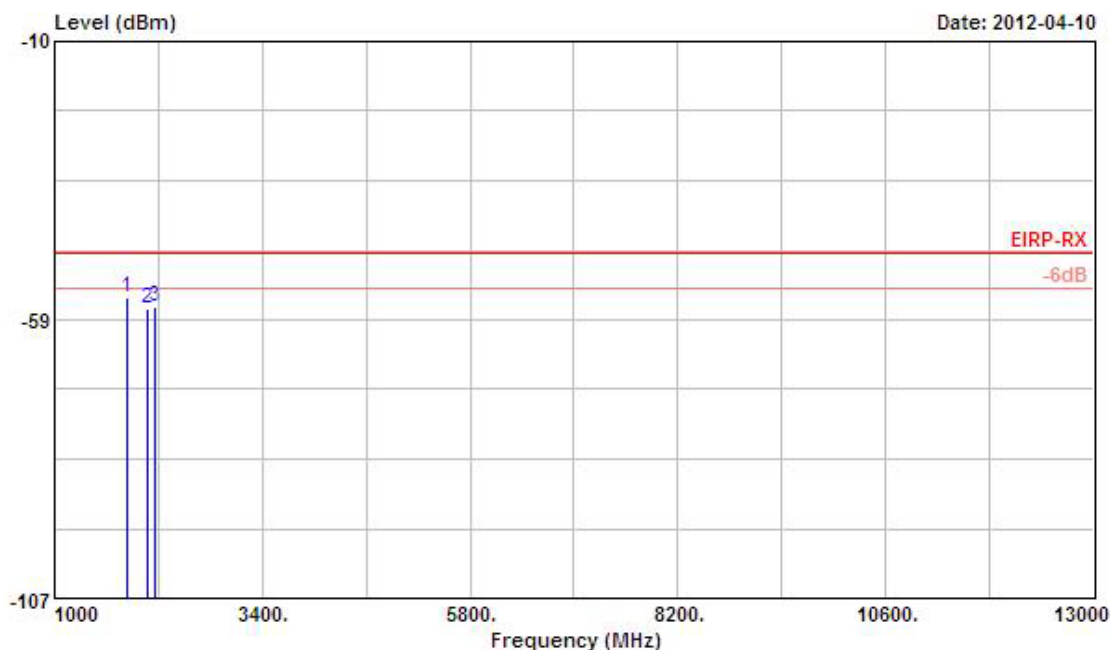
Final Test Date	Apr. 10, 2012	Test Site No.	05CH01-HY
Temperature	26°C	Humidity	56%
Test Engineer	Eric	Configuration	802.11n / Ch. 11 (40MHz)

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor
	MHz	dBm	dB	dBm	dBm	dB
1 @	1330.000	-60.05	-13.05	-47.00	-58.85	-1.20
2 @	1815.000	-58.13	-11.13	-47.00	-60.96	2.83
3 @	2155.000	-57.55	-10.55	-47.00	-62.18	4.63



Vertical



	Freq	Level	Over	Limit	Read	
	MHz	dBm	Limit	Line	Level	Factor
		dBm	dB	dBm	dBm	dB
1	1828.000	-54.76	-7.76	-47.00	-57.38	2.62
2	2070.000	-56.62	-9.62	-47.00	-61.03	4.41
3	2158.000	-56.12	-9.12	-47.00	-60.54	4.42

Note:

The amplitude of spurious emissions that is lower by more than 6dB below the permissible value need not to be reported. Except fundamental harmonic emissions, other emissions listed have been verified and are narrow band spurious emissions.

4. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP 40	100305	9KHz ~ 40GHz	Feb. 21, 2012	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 03, 2011	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Dec. 07, 2011	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 07, 2011	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jun. 16, 2011	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jun. 20, 2011	Conducted (TH01-HY)
RF Cable-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 03, 2011	Conducted (TH01-HY)
RF Cable-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 03, 2011	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Jun. 09, 2011*	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is two year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSEK30	100189	9kHz ~ 40GHz	Dec. 02, 2011	Radiation (05CH01-HY)
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	Jun. 22, 2011	Radiation (05CH01-HY)
Amplifier	Agilent	8449B	3008A02096	1GHz ~ 26.5GHz	Mar. 20, 2012	Radiation (05CH01-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2737	25MHz ~ 2GHz	Oct. 22, 2011	Radiation (05CH01-HY)
Horn Antenna	COM-POWER	AH-118	10091	1GHz ~ 18GHz	Feb. 15, 2012	Radiation (05CH01-HY)
RF Cable-R03m	Jye Bao	RG142	CB031	30MHz ~ 1GHz	Feb. 08, 2012	Radiation (05CH01-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	05CH01-HY	1GHz ~ 26.5GHz	Feb. 08, 2012	Radiation (05CH01-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170221	15GHz ~ 40GHz	Dec. 22, 2011	Radiation (05CH01-HY)
Turn Table	HD	DS 420	420/655/12	0 ~ 360 degree	N/A	Radiation (05CH01-HY)
Antenna Mast	HD	MA 240	240/569/12	1 ~ 4 m	N/A	Radiation (05CH01-HY)

Note: Calibration Interval of instruments listed above is one year.



5. TEST LOCATION

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei 221, Taiwan, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973
LINKOU	ADD : No. 30-2, Dingfu Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C. TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei 114, Taiwan, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei 235, Taiwan, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 nd Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

6. TAF CERTIFICATE OF ACCREDITATION


財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate No. : L1190-111208

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	: ISO/IEC 17025:2005
Accreditation Number	: 1190
Originally Accredited	: December 15, 2003
Effective Period	: January 10, 2010 to January 09, 2013
Accredited Scope	: Testing Field, see described in the Appendix
Specific Accreditation Program	: Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities


Jay-San Chen
President, Taiwan Accreditation Foundation
Date : December 08, 2011

P1, total 24 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix



Appendix A. Test Photos

1 Photographs of Radiated Emissions Test Configuration

FRONT VIEW



REAR VIEW



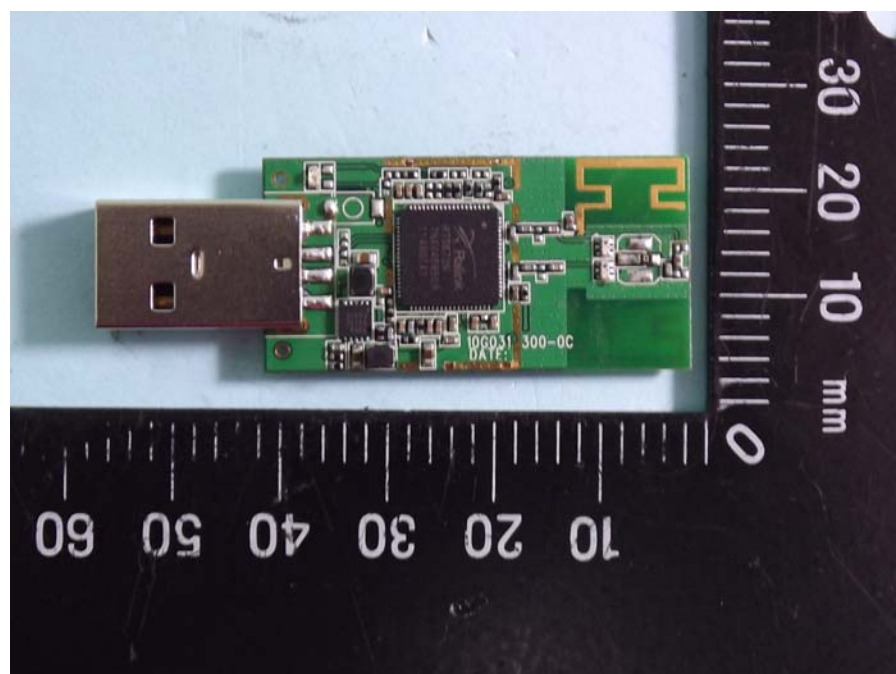
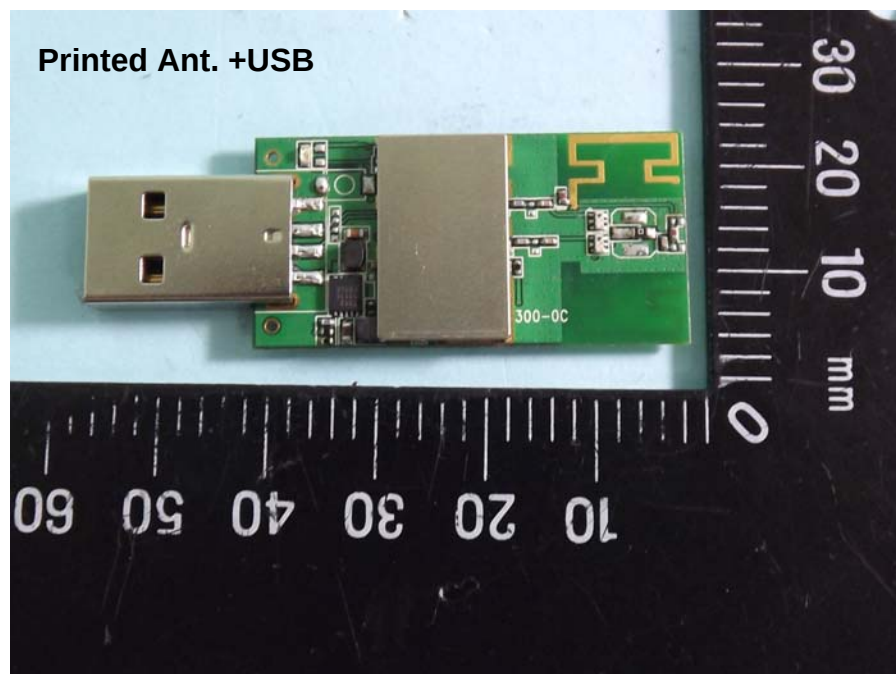
BILOG ANTENNA

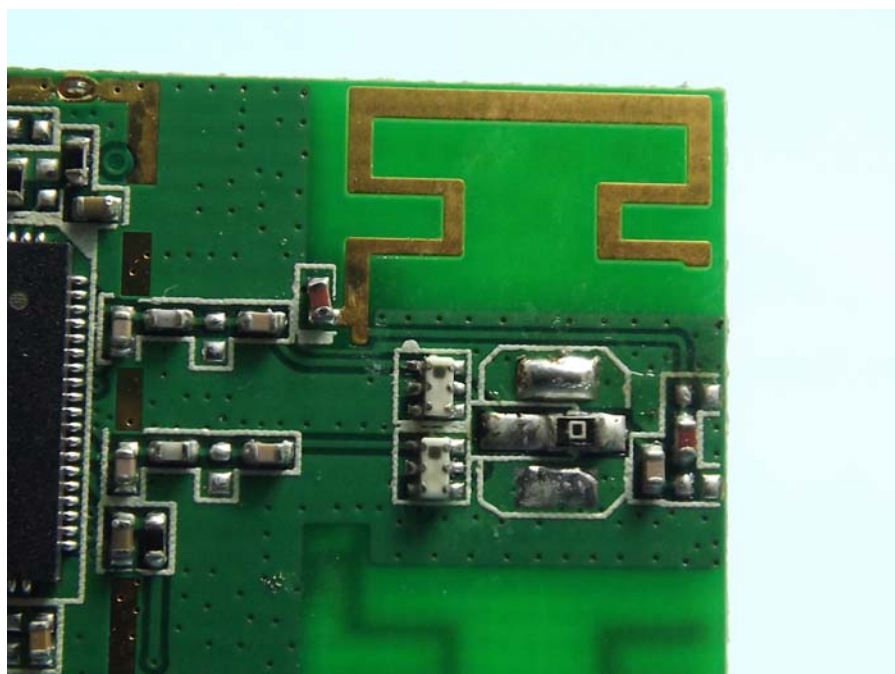


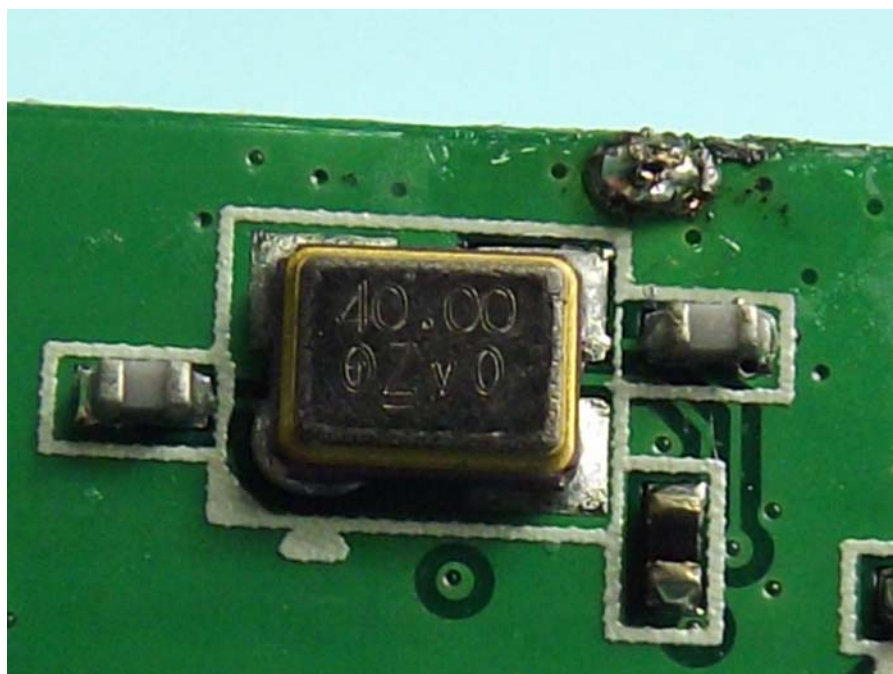
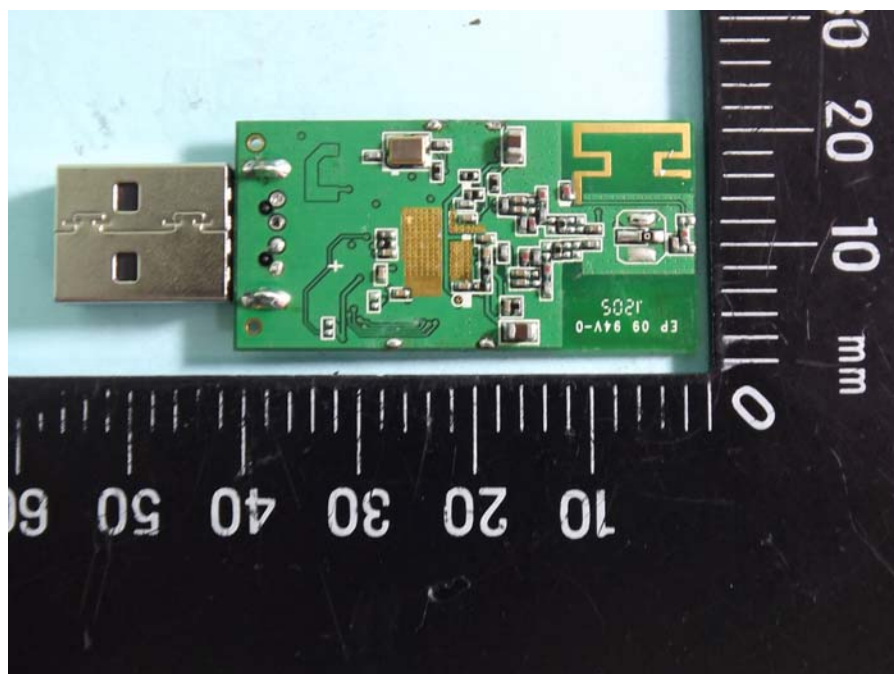
HORN ANTENNA

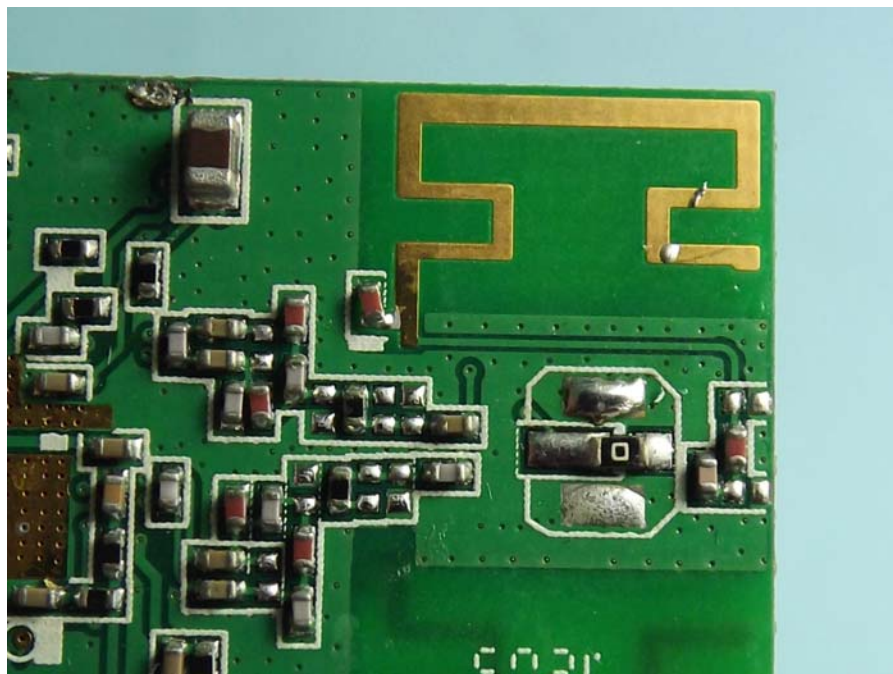


APPENDIX B. Photographs of EUT

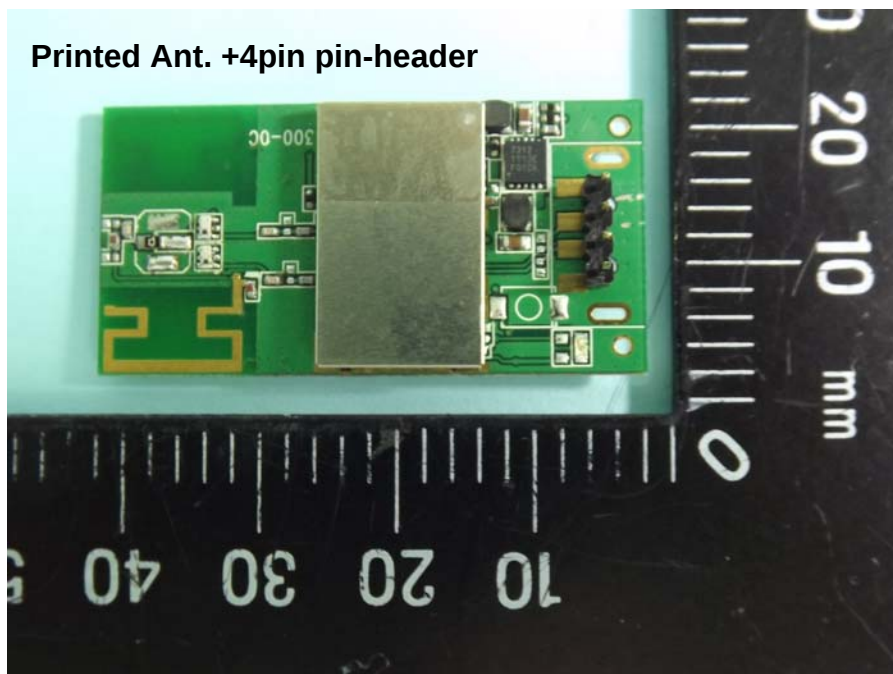


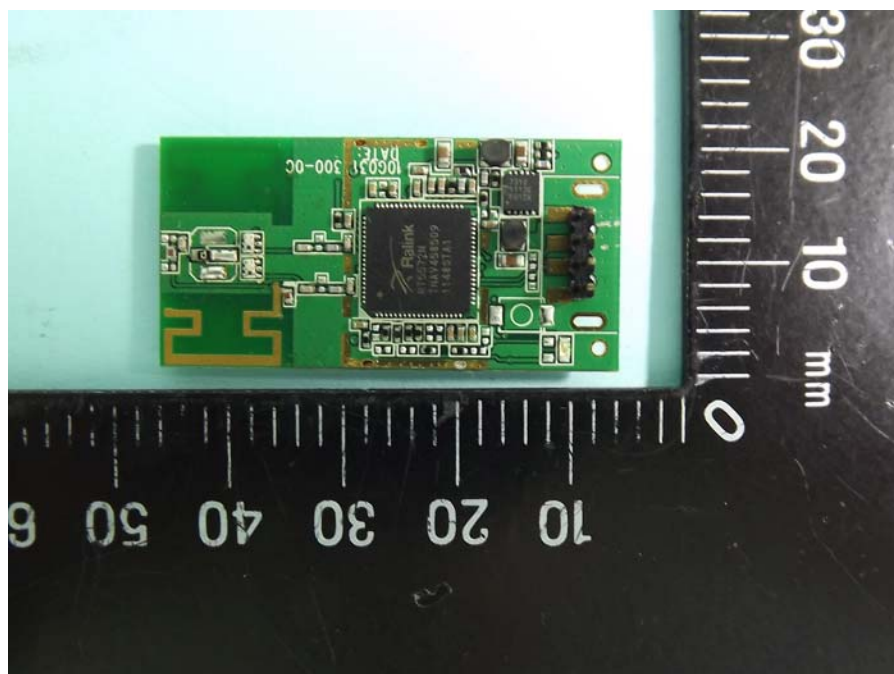


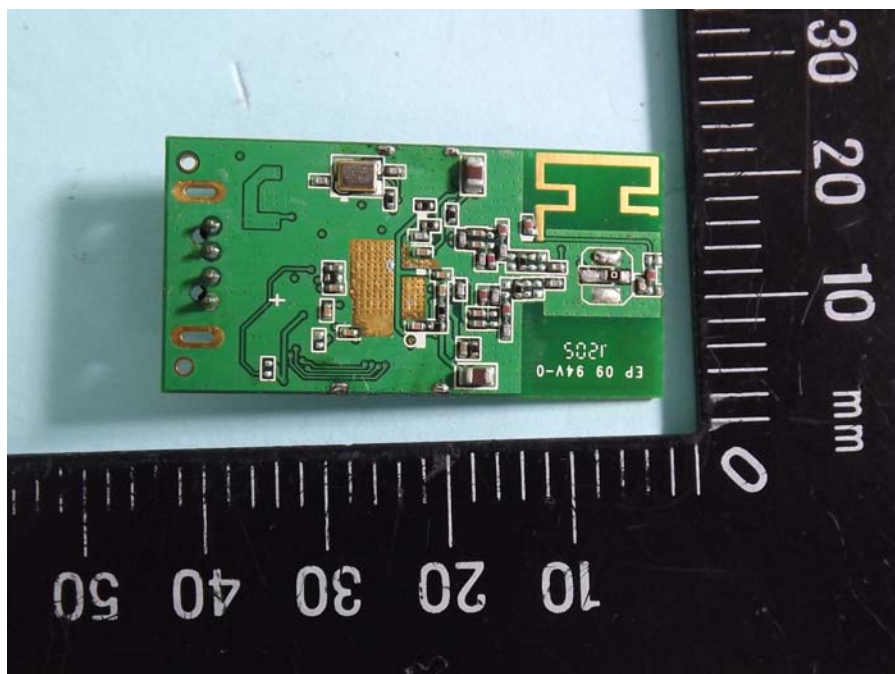
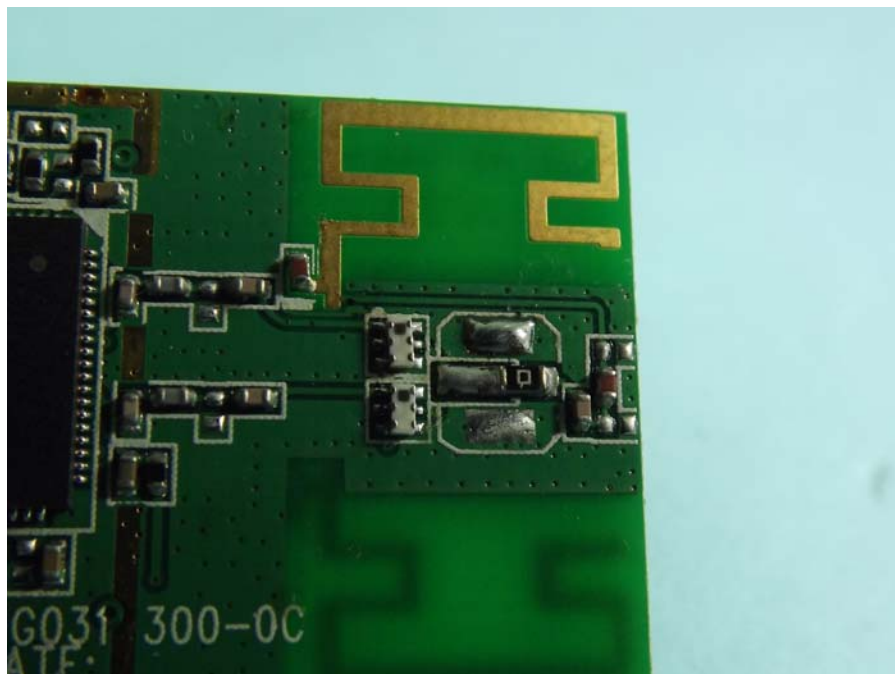


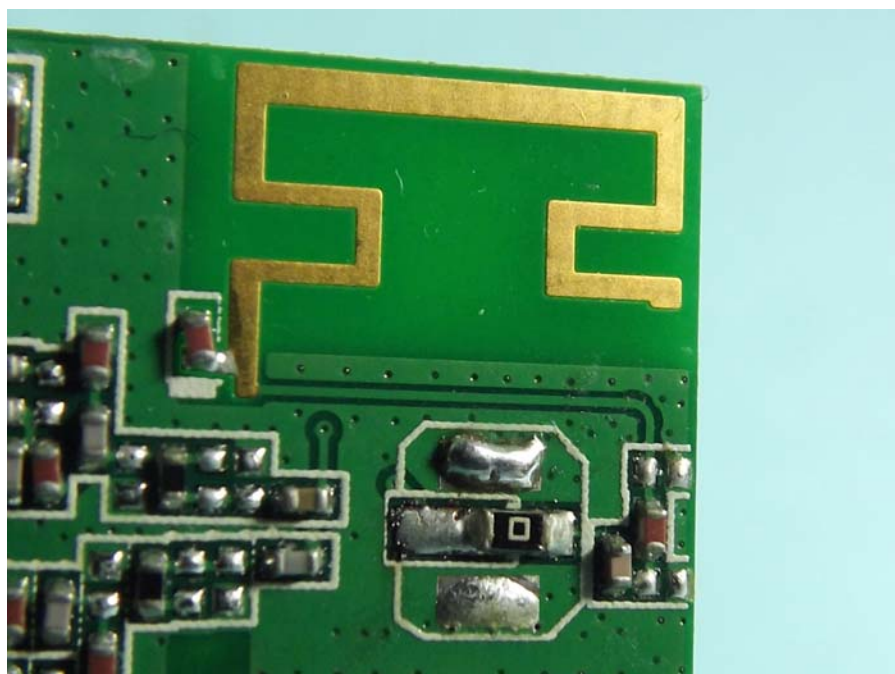
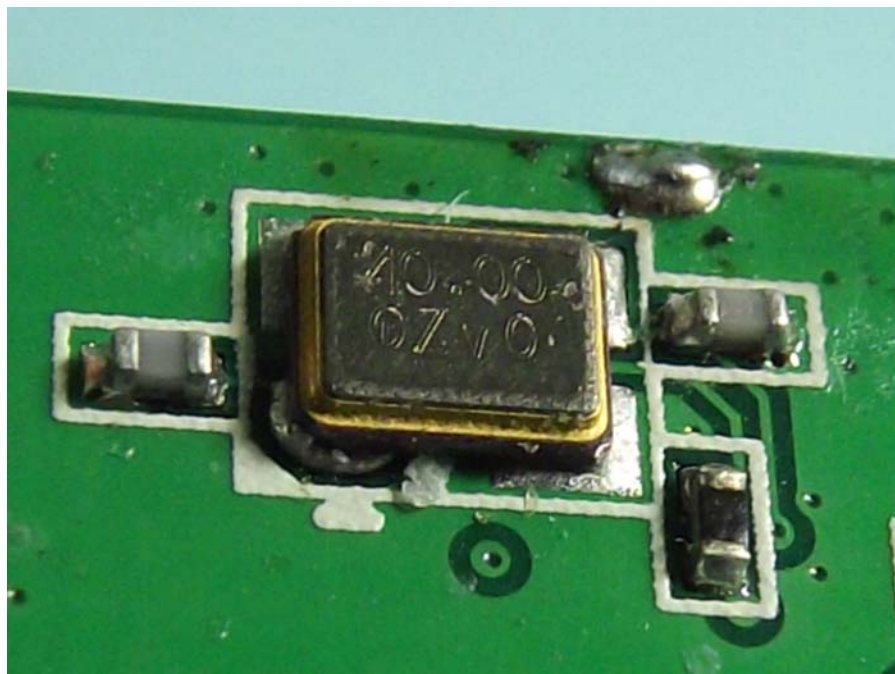


Printed Ant. +4pin pin-header









Printed Ant. +4pin wafer con

