FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	**802.11n,Dual Band, Wireless LAN PCI Express Half Mini Card**
Model No.	:	**WPEA-121N**
Brand Name	:	**Sparklan**
Filing Type	:	**New Application**
Applicant Manufacturer	:	**SparkLAN Communications, Inc** 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan.
FCC ID	:	**RYK-WPEA121N**
Received Date	:	Mar. 19, 2011
Final Test Date	:	Apr. 30, 2011

Statement

Test result included is only for the 802.11n (5725~5850 MHz / 2400~2483.5MHz) 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 **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

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 02, 2011
Report No.: FR131667AI

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	802.11n,Dual Band, Wireless LAN PCI Express Half Mini Card
Model No.	:	WPEA-121N
Brand Name	:	Sparklan
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 EMC performance of the product sample received on Mar. 19, 2011 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

2011.5.12

Wayne Hsu / Vice 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: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
3.1	15.207	AC Power Line Conducted Emissions	Complies	12.86 dB
3.2	15.247(b)(3)	Maximum Peak Output Power	Complies	5.14 dB
3.3	15.247(e)	Power Spectral Density	Complies	4.00 dB
3.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
3.5	15.247(d)	Radiated Emissions	Complies	1.14 dB
3.6	15.247(d)	Band Edge Emissions	Complies	1.48 dB
3.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Peak Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	$\pm 8.5\times10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	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

Only the radio detail of IEEE 802.11n is shown in this report. For more detailed features description, please refer to the specifications or user's manual.

Items	Description
Power Type	Power from host
Modulation Data Rate (Mbps)	See the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Frequency Range	5725 ~ 5850MHz / 2400 ~ 2483.5MHz
Channel Number	5G- 5 for 20MHz bandwidth ; 2 for 40MHz bandwidth 2.4G- 11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Channel Band Width (99%)	5G- 2TX- MCS 8 (20MHz) : 17.80 MHz ; MCS 8 (40MHz) : 36.32 MHz 2.4G- 2TX- MCS 8 (20MHz) : 17.72 MHz ; MCS 8 (40MHz) : 36.32 MHz
Conducted Output Power	5G- 2TX- MCS 8 (20MHz) : 24.86 dBm ; MCS 8 (40MHz) : 24.31 dBm 2.4G- 2TX- MCS 8 (20MHz) : 22.06 dBm ; MCS 8 (40MHz) : 20.77 dBm

2.2 Table for Filed Antenna

Antenna & Bandwidth

Antenna Mode	Two Chain	
Bandwidth Mode	20 MHz	40 MHz
802.11n (5725~5850 MHz)	V	V
802.11n (2400~2483.5MHz)	V	V

Ant.	Antenna Type	Connector	Gain (dBi)	Remark
A	Dipole Antenna	Reversed-SMA	2.00	TX / RX
B	Dipole Antenna	Reversed-SMA	2.00	TX / RX

Note: IEEE 802.11n used two antennas are for signal transmitting and receiving.
(2T2R Spatial Multiplexing MIMO configuration)

IEEE 802.11n Modulation Scheme

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps) 800nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0
8	2	BPSK	1/2	1	104	216	52	108	13.0	27.0
9	2	QPSK	1/2	2	208	432	104	216	26.0	54.0
10	2	QPSK	3/4	2	208	432	156	324	39.0	81.0
11	2	16-QAM	1/2	4	416	864	208	432	52.0	108.0
12	2	16-QAM	3/4	4	416	864	312	648	78.0	162.0
13	2	64-QAM	2/3	6	624	1296	416	864	104.0	216.0
14	2	64-QAM	3/4	6	624	1296	468	972	117.0	243.0
15	2	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0

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

2.3 Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency (20MHz)	Channel No.	Frequency (40MHz)
5725~5850 MHz	149	5745 MHz	151	5755 MHz
	153	5765 MHz	159	5795 MHz
	157	5785 MHz	-	-
	161	5805 MHz	-	-
	165	5825 MHz	-	-

Frequency Band	Channel No.	Frequency (20MHz)	Channel No.	Frequency (20MHz)
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz	-	-

Frequency Band	Channel No.	Frequency (40MHz)
2400~2483.5MHz	3	2422 MHz
	4	2427 MHz
	5	2432 MHz
	6	2437 MHz
	7	2442 MHz
	8	2447 MHz
	9	2452 MHz

2.4 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 the entire possible configuration 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	Antenna
AC Power Line Conducted Emissions Radiated Emissions Below 1GHz	Normal Mode	Auto	-	-
Maximum Peak Output Power Power Spectral Density	MCS 8 (20MHz)	13 Mbps	5G-149/157/165 2.4G-1/6/11	A/B A+B
	MCS 8 (40MHz)	27 Mbps	5G-151/159 2.4G-3/6/9	
6dB Spectrum Bandwidth	MCS 8 (20MHz)	13 Mbps	5G-149/157/165 2.4G-1/6/11	A/B
	MCS 8 (40MHz)	27 Mbps	5G-151/159 2.4G-3/6/9	
Radiated Emissions Above 1GHz	MCS 8 (20MHz)	13 Mbps	5G-149/157/165 2.4G-1/6/11	A+B
	MCS 8 (40MHz)	27 Mbps	5G-151/159 2.4G-3/6/9	A+B
Band Edge Emissions	MCS 8 (20MHz)	13 Mbps	5G-149/165 2.4G-1/11	A/B
	MCS 8 (40MHz)	27 Mbps	5G-151/159 2.4G-3/6/9	

2.5 Table for Testing Locations

Test Site No.	Site Category	Location
CO01-HY	Conduction	Hwa Ya
TH01-HY	OVEN Room	Hwa Ya
03CH02-HY	SAC	Hwa Ya

Semi Anechoic Chamber (SAC).

2.6 Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	PP20L	DoC
(USB) Mouse	Microsoft	1004	DoC
iPod nano	Apple	A1051	N/A
Wireless AP (Remote workstation)	D-Link	DNS-G120	N/A

** The EUT tested with test fixture in this report.
** The wireless AP supporting unit only tested by AC power conducted emission.
** For the radiated emissions only tested by using notebook.

2.7 Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer 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 customer and is going to be fixed on the firmware of the final end product.

For Two Chain:
Power Parameters of IEEE 802.11n-5G Ant. A+Ant. B

Test Software Version	ART2-GUI		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n(20MHz)	30.5/30.5	20/20	17/17
Frequency	5755 MHz	5795 MHz	-
IEEE 802.11n(40MHz)	31.5/31.5	20.5/20.5	-

Power Parameters of IEEE 802.11n-2.4G Ant. A+Ant. B

Test Software Version	ART2-GUI		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n(20MHz)	10.5/10.5	10.5/10.5	10/10
Frequency	2422 MHz	2437 MHz	2452 MHz
IEEE 802.11n(40MHz)	09/09	09/09	08/08

2.8 EUT Operation during Test

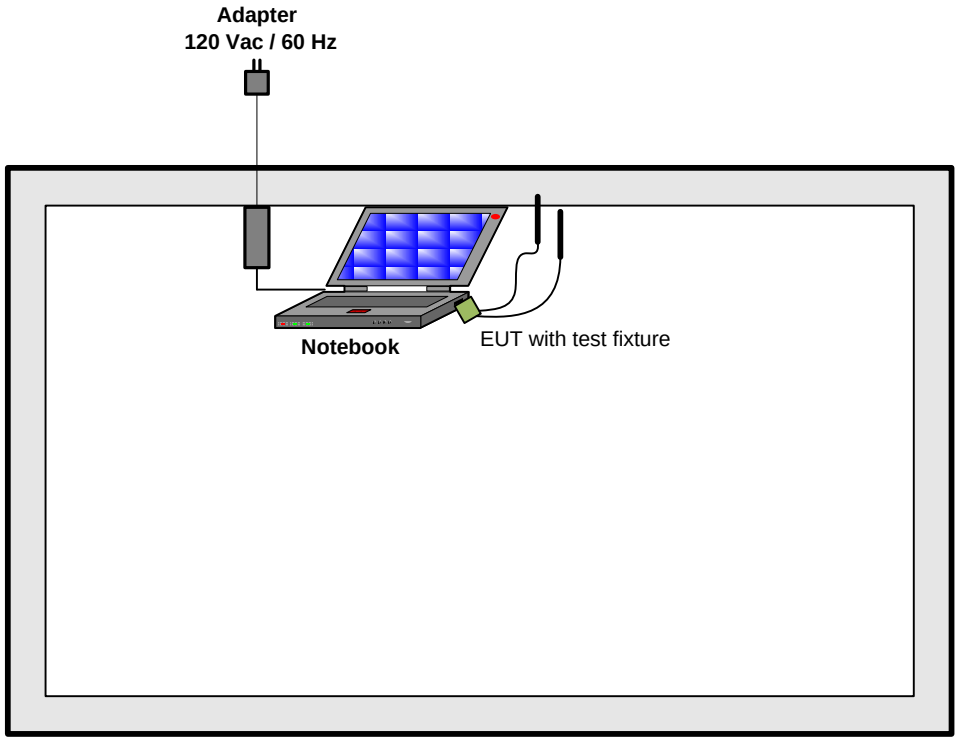
An executive program, “EMCTEST.EXE” under Win XP, which generates a complete line of continuously repeating "H" pattern was used as the test software.
The program was executed as follows :
a. Turn on the power of all equipment.
b. The NB sends "H" messages to the panel and displays "H" patterns on the screen.

At the same time, the following programs were executed:
- Executed "WiFi" to link with the remote workstation to receive and transmit data.
- Executed "ping" to link with the remote workstation to receive and transmit data by WLAN.
- Executed “ART2-GUI” to keep transmitting signals at fixed frequency. (Only for radio tested.)

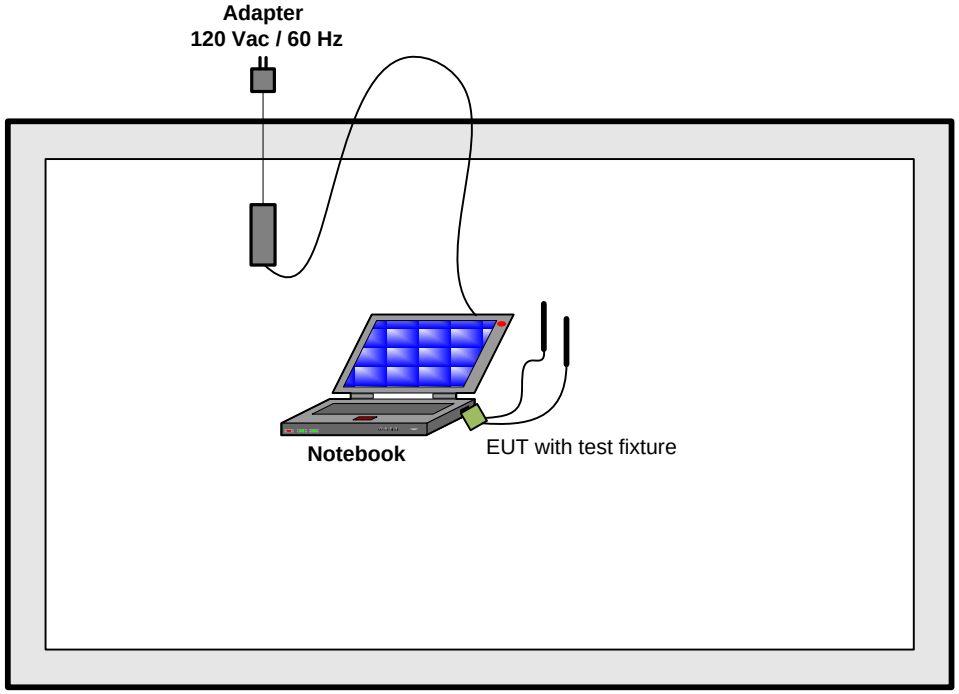
2.9 Test Configuration

2.9.1 Radiation Emissions Test Configuration

For radiated emissions 9kHz~1GHz



For radiated emissions above 1GHz



3 TEST RESULT

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Class B

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

3.1.2 Measuring Instruments and Setting

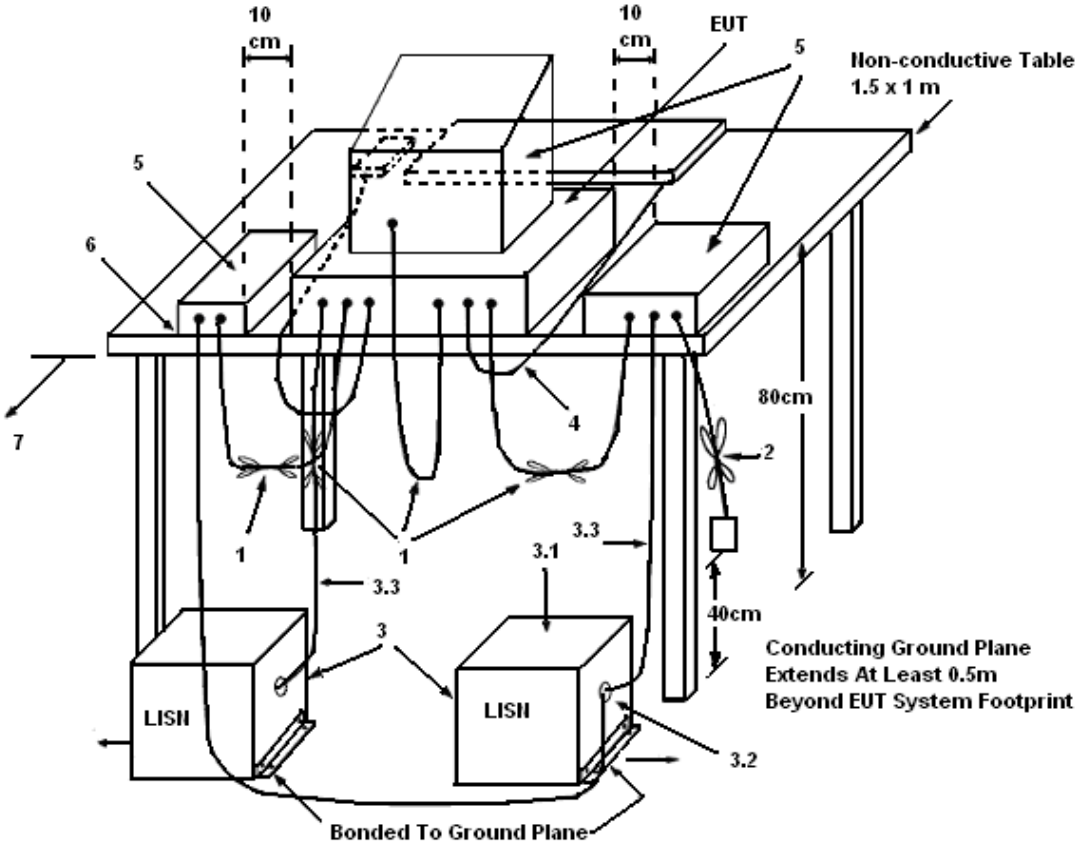
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.1.3 Test Procedures

1. The EUT warm up about 15 minutes then start test.
2. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. The measurement has to be done between each power line and ground at the power terminal.

3.1.4 Test Setup Layout



LEGEND:
(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.
(3.1) All other equipment powered from additional LISN(s).
(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
(3.3) LISN at least 80 cm from nearest part of EUT chassis.
(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
(5) Non-EUT components of EUT system being tested.
(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

3.1.5 Test Deviation

There is no deviation with the original standard.

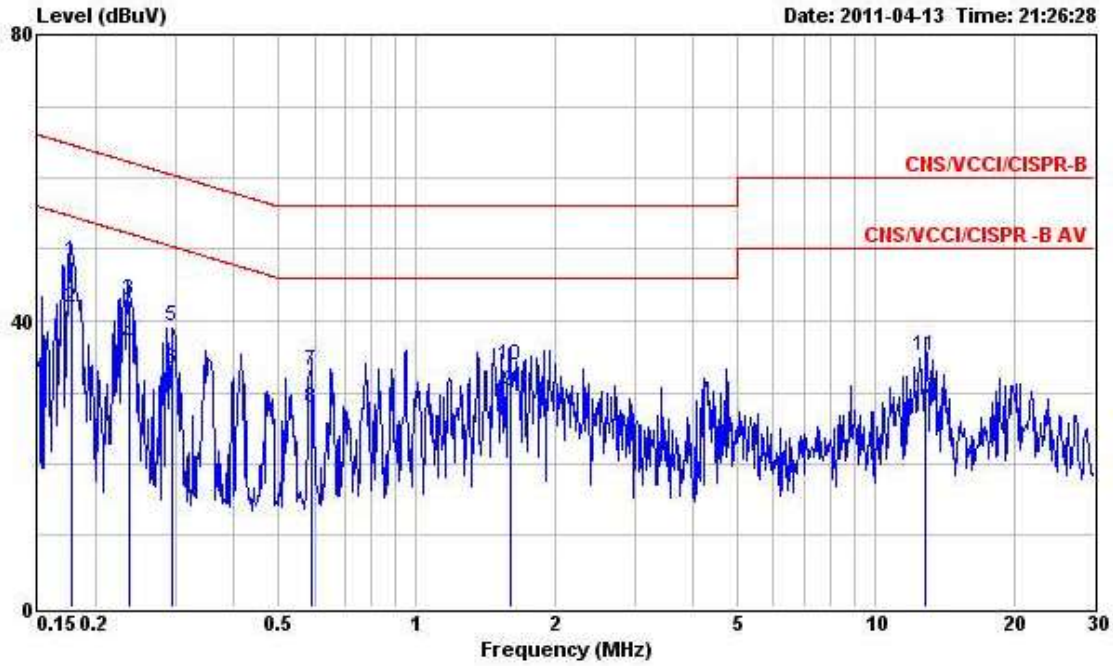
3.1.6 EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

3.1.7 Results of AC Power Line Conducted Emissions Measurement

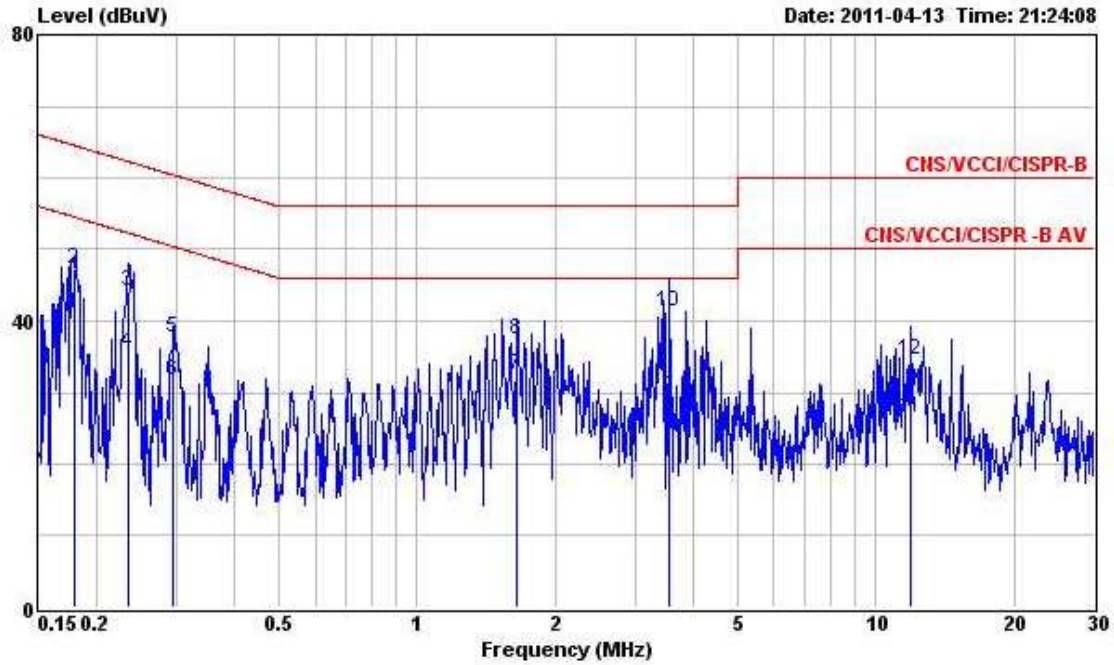
Final Test Date	Apr. 13, 2011	**Test Site No.**	CO01-HY
Temperature	21.2℃	**Humidity**	51.9%
Test Engineer	David	**Configuration**	Normal Mode

Line



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.178	48.42	-16.16	64.58	48.24	0.08	0.10	QP
2	0.178	41.72	-12.86	54.58	41.54	0.08	0.10	Average
3	0.238	42.93	-19.25	62.18	42.75	0.08	0.10	QP
4	0.238	36.65	-15.53	52.18	36.47	0.08	0.10	Average
5	0.294	39.11	-21.30	60.41	38.91	0.09	0.11	QP
6	0.294	33.30	-17.11	50.41	33.10	0.09	0.11	Average
7	0.592	32.91	-23.09	56.00	32.33	0.10	0.48	QP
8	0.592	27.74	-18.26	46.00	27.16	0.10	0.48	Average
9	1.596	30.04	-15.96	46.00	29.52	0.12	0.40	Average
10	1.596	33.90	-22.10	56.00	33.38	0.12	0.40	QP
11	12.867	35.01	-24.99	60.00	34.57	0.31	0.13	QP
12	12.867	29.14	-20.86	50.00	28.70	0.31	0.13	Average

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.179	41.02	-13.51	54.53	40.86	0.06	0.10	Average
2	0.179	47.26	-17.27	64.53	47.10	0.06	0.10	QP
3	0.234	44.28	-18.03	62.31	44.12	0.06	0.10	QP
4	0.234	35.68	-16.63	52.31	35.52	0.06	0.10	Average
5	0.294	37.59	-22.82	60.41	37.41	0.07	0.11	QP
6	0.294	31.66	-18.75	50.41	31.48	0.07	0.11	Average
7	1.650	32.38	-13.62	46.00	31.92	0.10	0.36	Average
8	1.650	37.32	-18.68	56.00	36.86	0.10	0.36	QP
9	3.540	29.31	-16.69	46.00	29.06	0.13	0.12	Average
10	3.540	41.25	-14.75	56.00	41.00	0.13	0.12	QP
11	11.870	26.50	-23.50	50.00	26.06	0.29	0.15	Average
12	11.870	34.52	-25.48	60.00	34.08	0.29	0.15	QP

Note:
Level = Read Level + LISN Factor + Cable Loss.

3.2 Maximum Peak Output Power Measurement

3.2.1 Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-multipoint antenna reduction operation, the limit has to be reduced by 1dB for every dB that the directional gain of the antenna exceeds 6dBi. Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

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 power meter.

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

3.2.3 Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.
4. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula.

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 of Maximum Peak Output Power

Final Test Date	Apr. 30, 2011	**Test Site No.**	TH01-HY
Temperature	26℃	**Humidity**	62%
Test Engineer	Ian	**Configurations**	802.11n

Configuration of IEEE 802.11n-5G Ant. A (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	20.74	30.00	**Complies**
157	5785 MHz	21.13	30.00	**Complies**
165	5825 MHz	21.54	30.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. B (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	21.67	30.00	**Complies**
157	5785 MHz	22.36	30.00	**Complies**
165	5825 MHz	22.14	30.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. A+Ant. B (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	24.24	30.00	**Complies**
157	5785 MHz	24.80	30.00	**Complies**
165	5825 MHz	24.86	30.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. A (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	20.61	30.00	**Complies**
159	5795 MHz	20.58	30.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. B (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	21.89	30.00	**Complies**
159	5795 MHz	21.85	30.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. A+Ant. B (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	24.31	30.00	**Complies**
159	5795 MHz	24.27	30.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	19.52	30.00	**Complies**
6	2437 MHz	19.16	30.00	**Complies**
11	2462 MHz	19.07	30.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. B (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	18.53	30.00	**Complies**
6	2437 MHz	18.25	30.00	**Complies**
11	2462 MHz	18.47	30.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A+Ant. B (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	22.06	30.00	**Complies**
6	2437 MHz	21.74	30.00	**Complies**
11	2462 MHz	21.79	30.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	18.16	30.00	**Complies**
6	2437 MHz	17.87	30.00	**Complies**
9	2452 MHz	17.15	30.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. B (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	17.32	30.00	**Complies**
6	2437 MHz	16.84	30.00	**Complies**
9	2452 MHz	16.43	30.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A+Ant. B (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	20.77	30.00	**Complies**
6	2437 MHz	20.40	30.00	**Complies**
9	2452 MHz	19.82	30.00	**Complies**

3.3 Power Spectral Density Measurement

3.3.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

3.3.2 Measuring Instruments and Setting

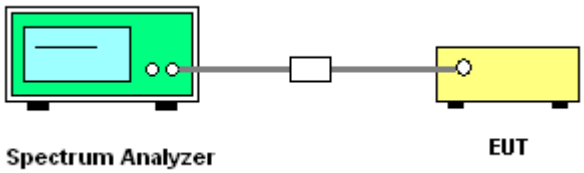
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	1.5MHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	500s

3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set RBW of spectrum analyzer to 3 kHz and VBW to 30 kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.
5. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula.

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 of Power Spectral Density

Final Test Date	Apr. 30, 2011	**Test Site No.**	TH01-HY
Temperature	26℃	**Humidity**	62%
Test Engineer	Ian	**Configuration**	802.11n

Configuration of IEEE 802.11n-5G Ant. A (20MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-10.88	8.00	**Complies**
157	5785 MHz	-7.28	8.00	**Complies**
165	5825 MHz	-9.51	8.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. B (20MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-10.38	8.00	**Complies**
157	5785 MHz	-6.75	8.00	**Complies**
165	5825 MHz	-10.14	8.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. A+Ant. B (20MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-7.61	8.00	**Complies**
157	5785 MHz	-4.00	8.00	**Complies**
165	5825 MHz	-6.80	8.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. A (40MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	-12.40	8.00	**Complies**
159	5795 MHz	-12.07	8.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. B (40MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	-11.85	8.00	**Complies**
159	5795 MHz	-11.42	8.00	**Complies**

Configuration of IEEE 802.11n-5G Ant. A+Ant. B (40MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	-9.11	8.00	**Complies**
159	5795 MHz	-8.72	8.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A (20MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-16.10	8.00	**Complies**
6	2437 MHz	-20.41	8.00	**Complies**
11	2462 MHz	-19.14	8.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. B (20MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-16.81	8.00	**Complies**
6	2437 MHz	-16.04	8.00	**Complies**
11	2462 MHz	-17.37	8.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A+Ant. B (20MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-13.43	8.00	**Complies**
6	2437 MHz	-14.69	8.00	**Complies**
11	2462 MHz	-15.16	8.00	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A (40MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-19.86	8.00	**Complies**
6	2437 MHz	-20.25	8.00	**Complies**
9	2452 MHz	-22.16	8.00	**Complies**

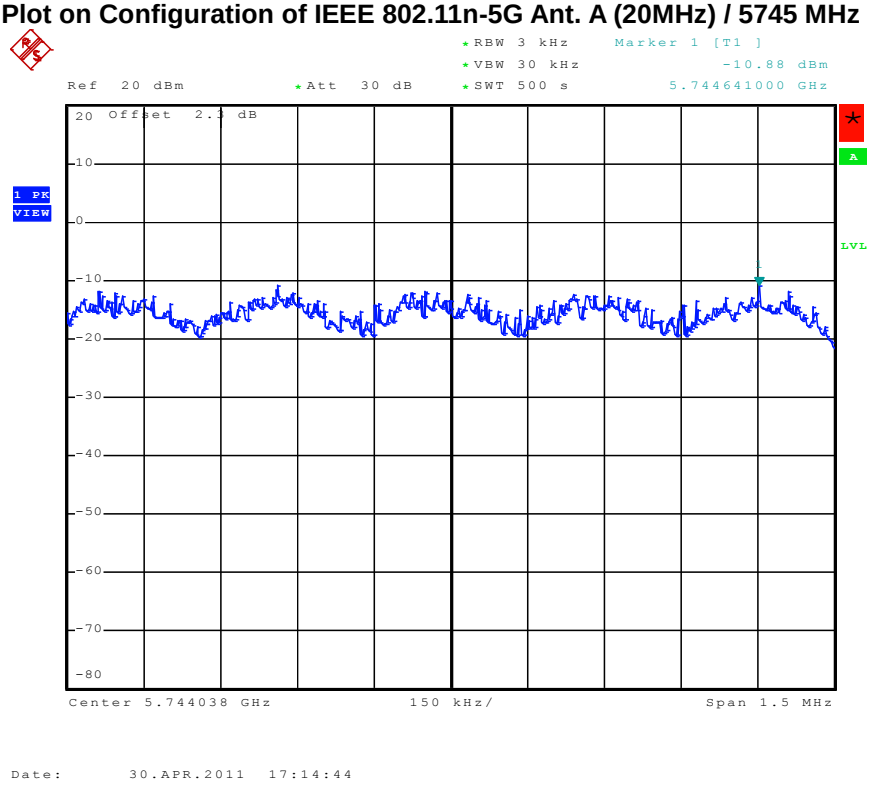
Configuration of IEEE 802.11n-2.4G Ant. B (40MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-19.75	8.00	**Complies**
6	2437 MHz	-20.93	8.00	**Complies**
9	2452 MHz	-21.10	8.00	**Complies**

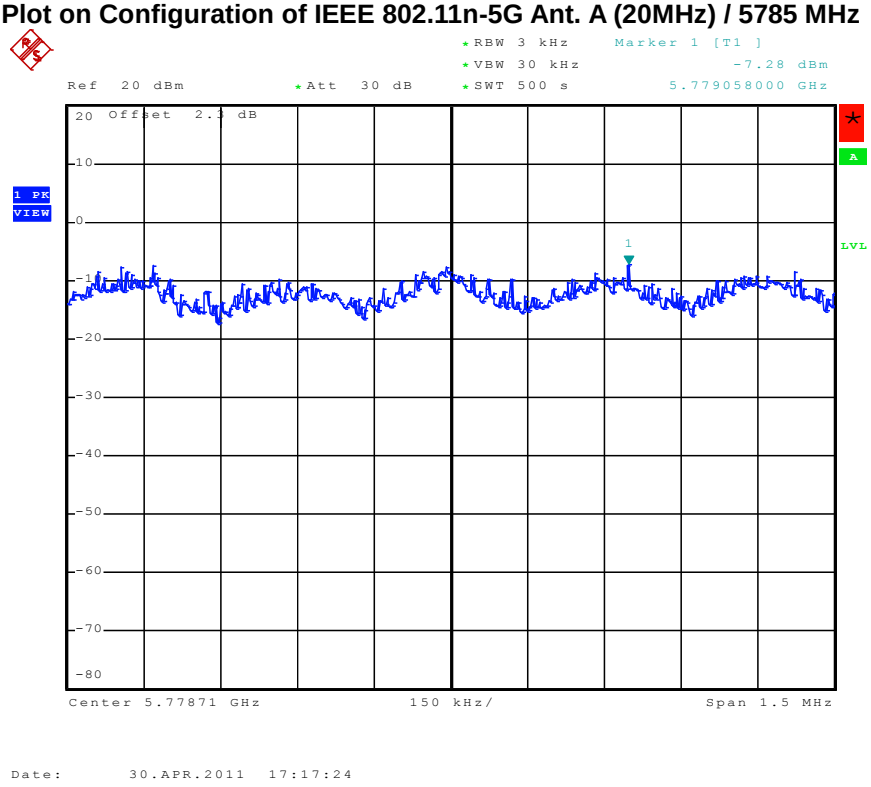
Configuration of IEEE 802.11n-2.4G Ant. A+Ant. B (40MHz)

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-16.79	8.00	**Complies**
6	2437 MHz	-17.57	8.00	**Complies**
9	2452 MHz	-18.59	8.00	**Complies**

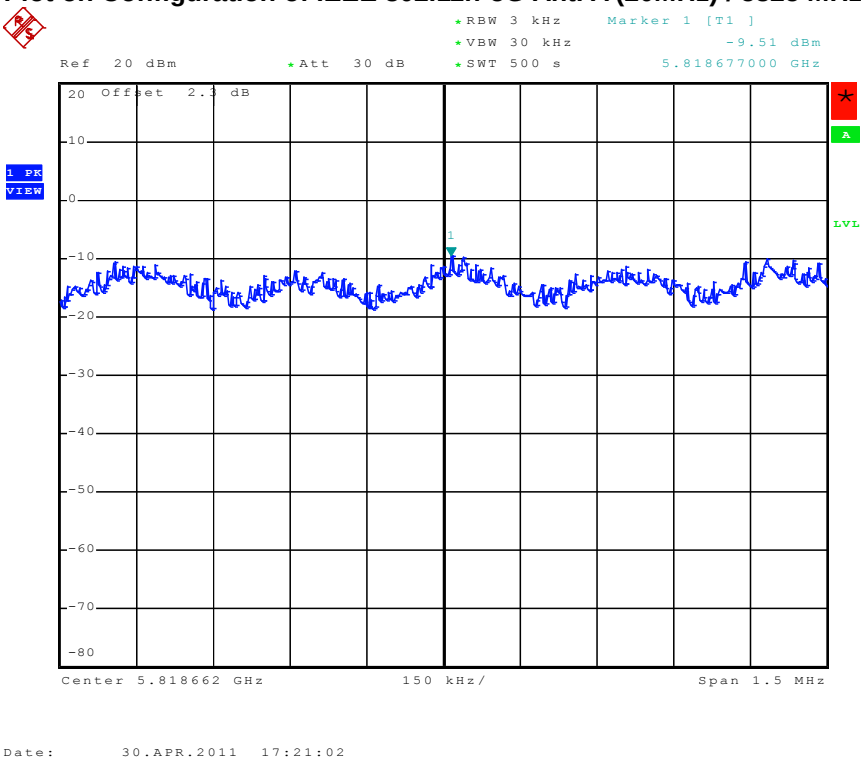
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5745 MHz



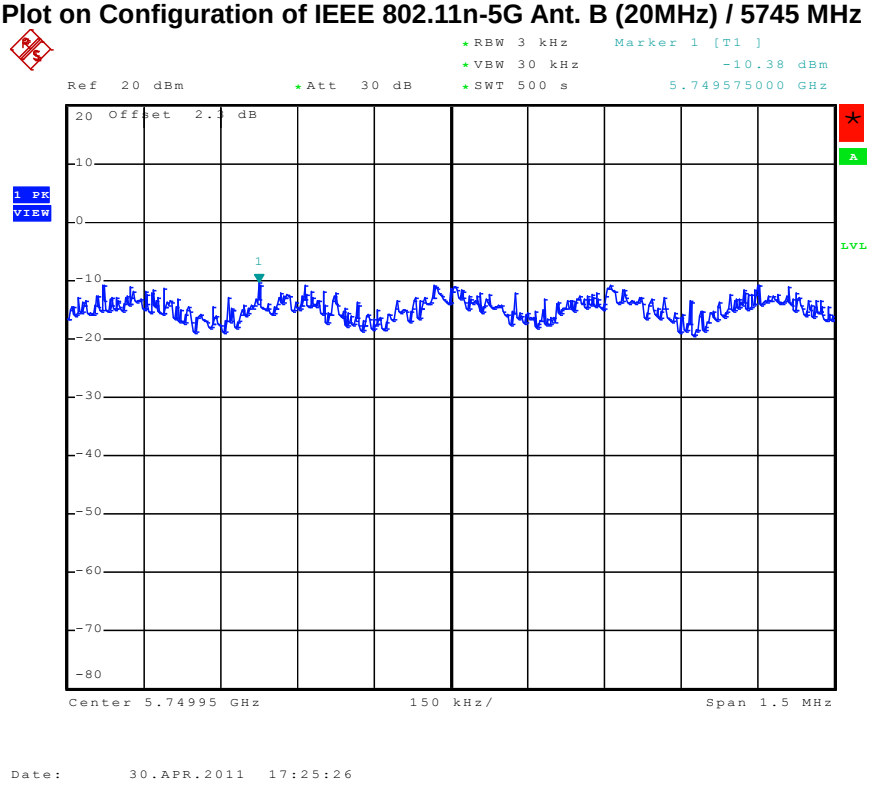
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5785 MHz



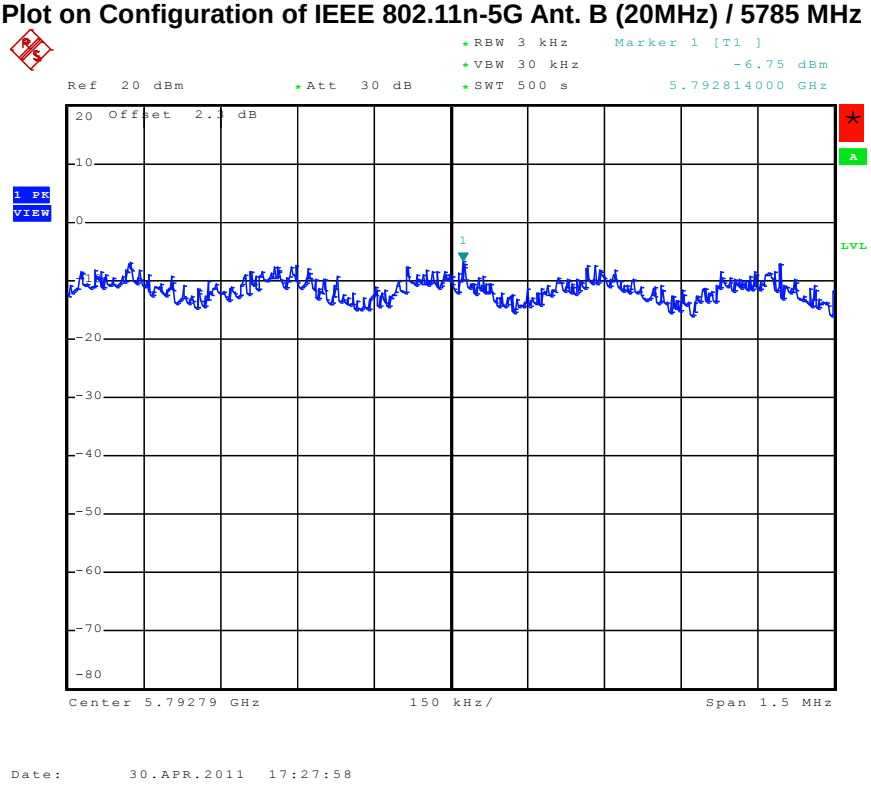
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5825 MHz



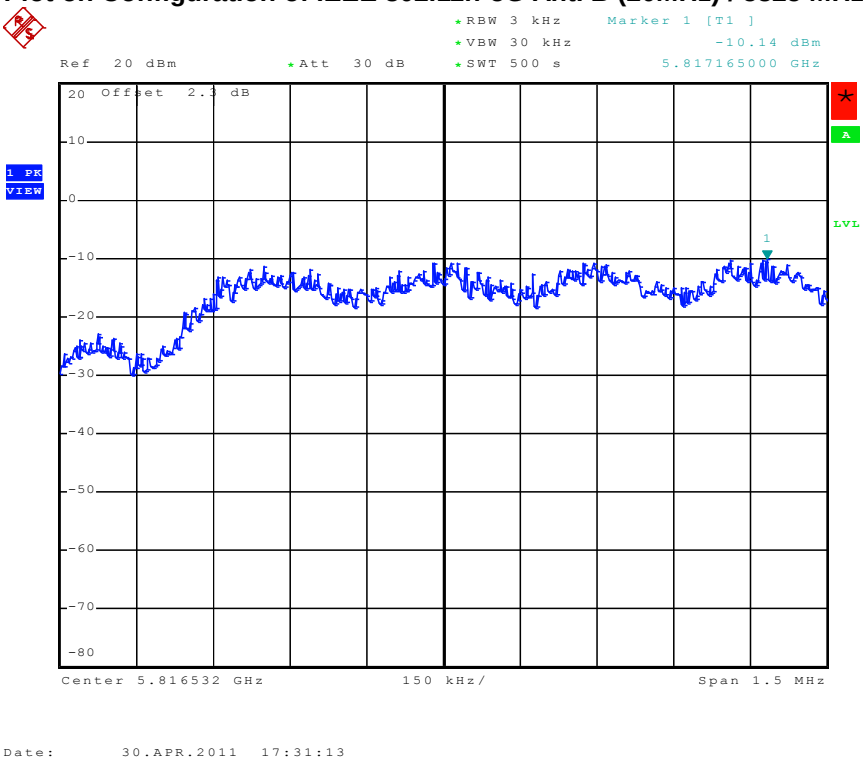
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5745 MHz



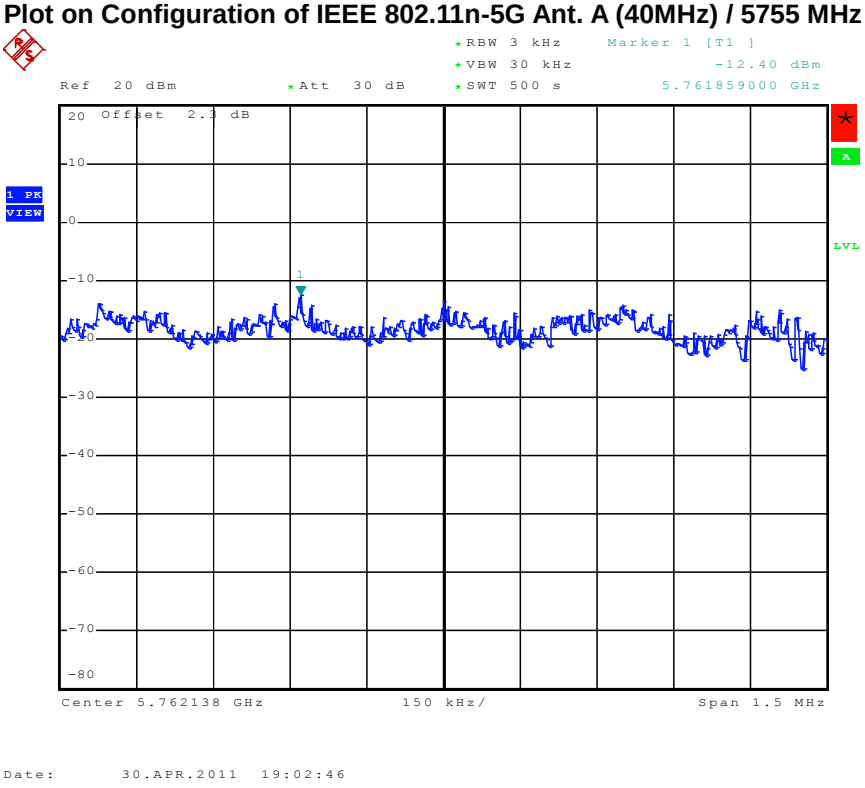
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5785 MHz



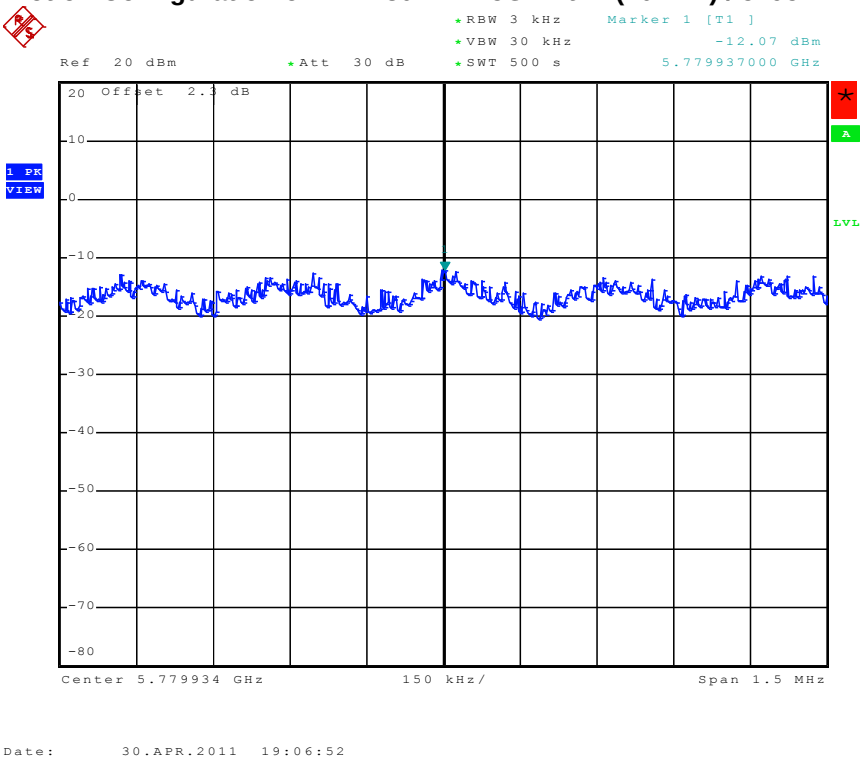
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5825 MHz



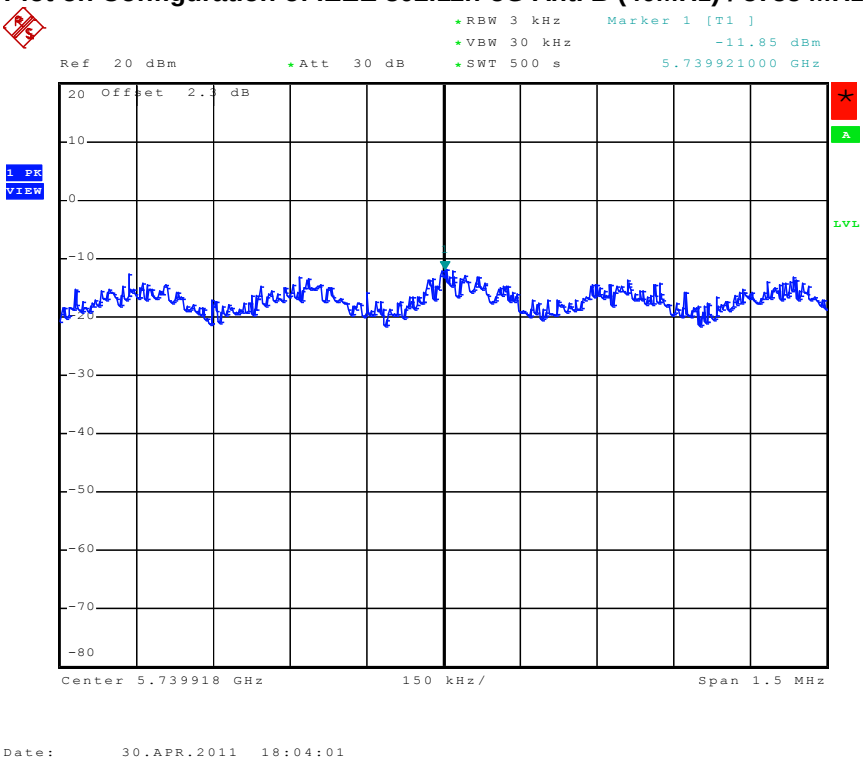
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. A (40MHz) / 5755 MHz



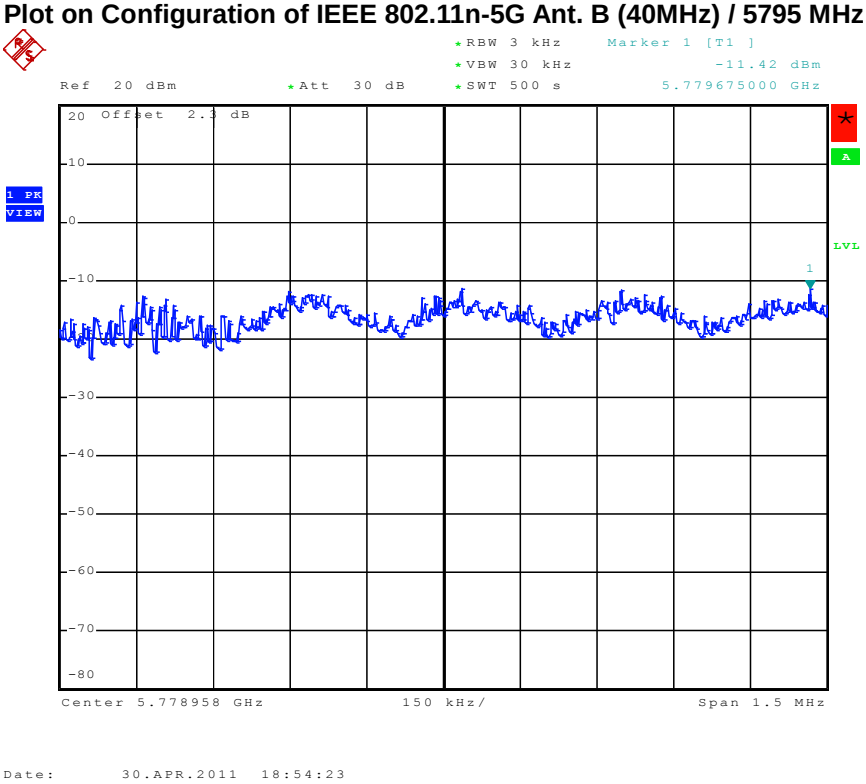
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. A (40MHz) / 5795 MHz



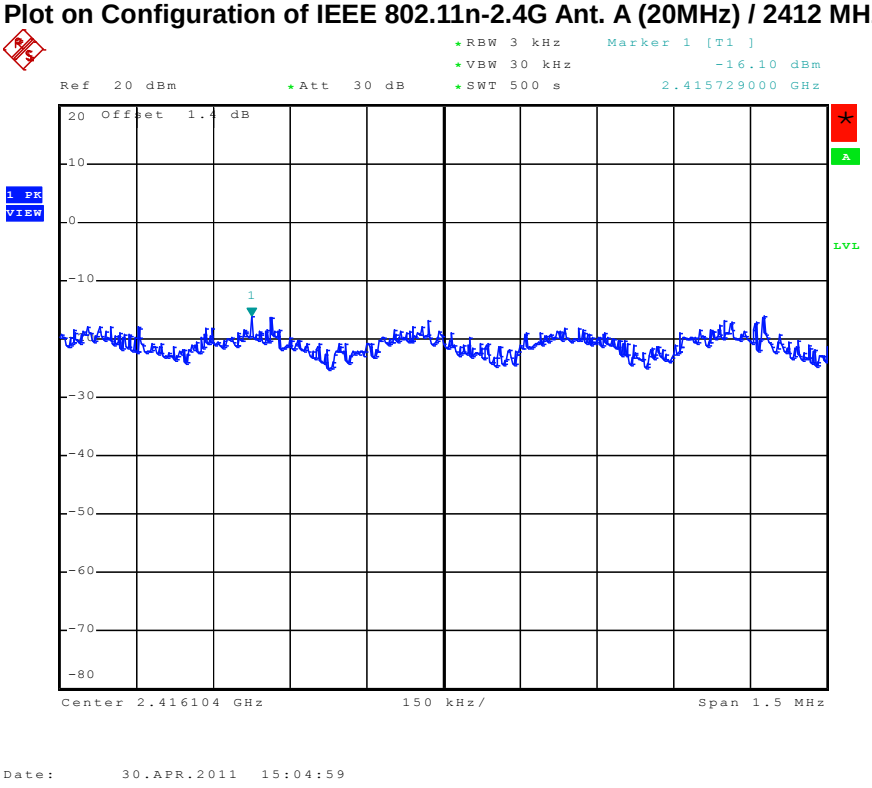
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. B (40MHz) / 5755 MHz



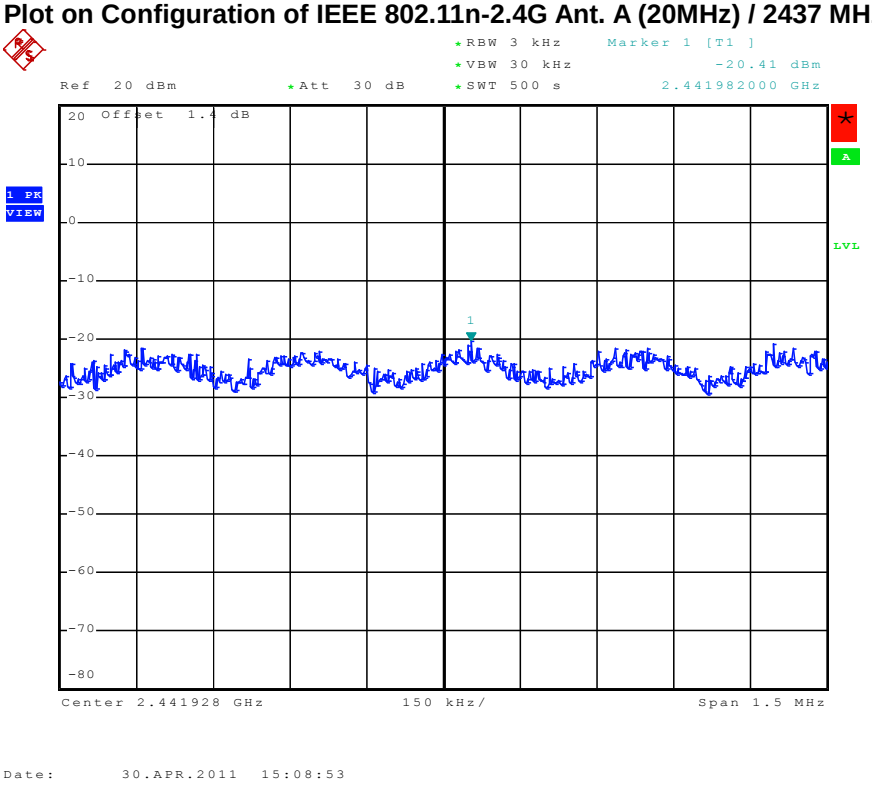
Power Density Plot on Configuration of IEEE 802.11n-5G Ant. B (40MHz) / 5795 MHz



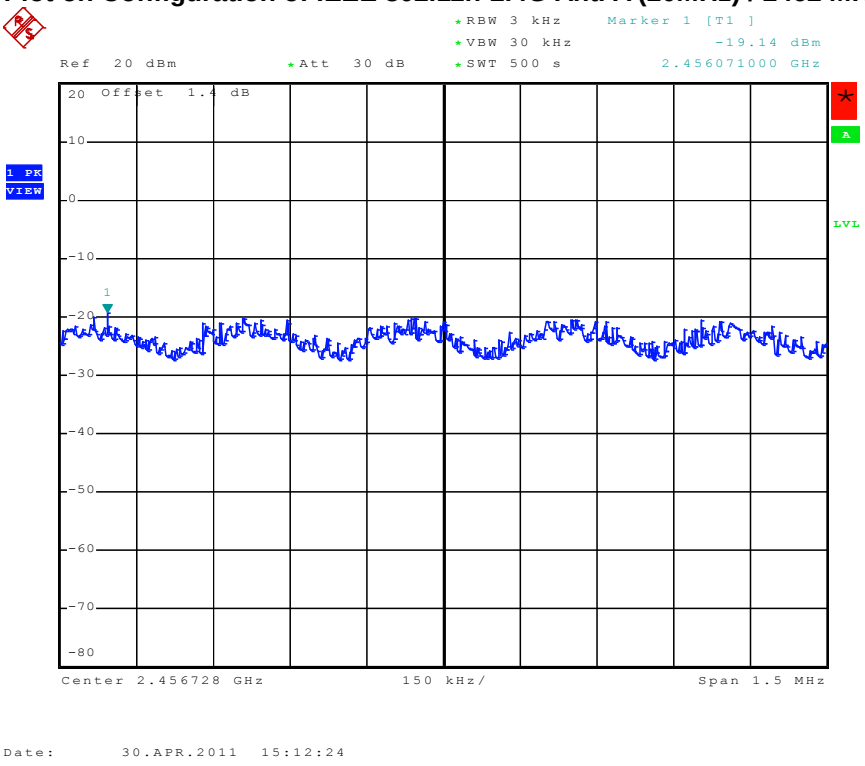
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2412 MHz



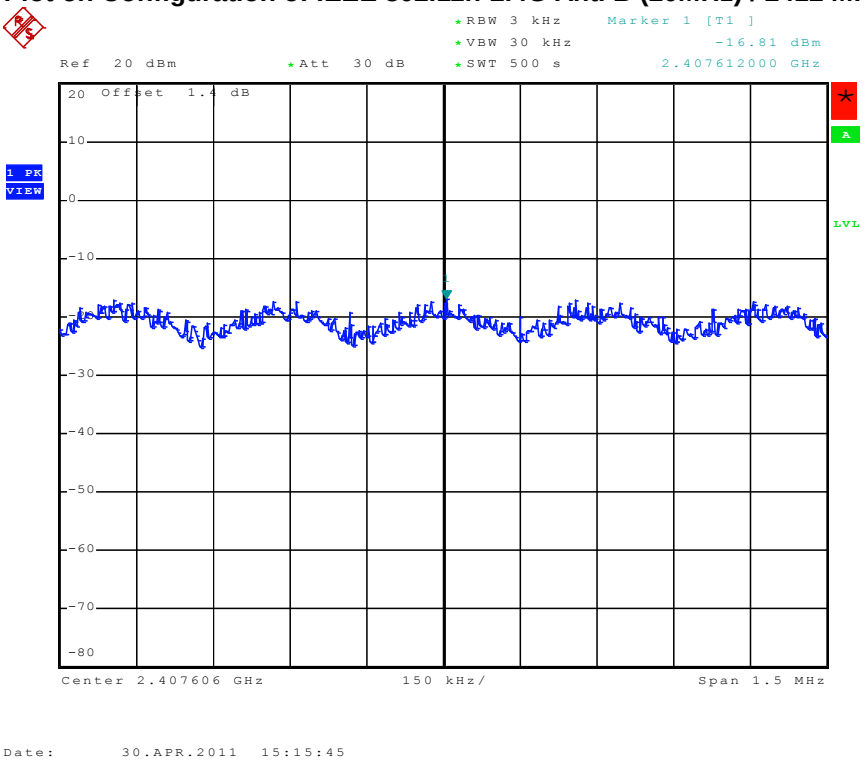
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2437 MHz



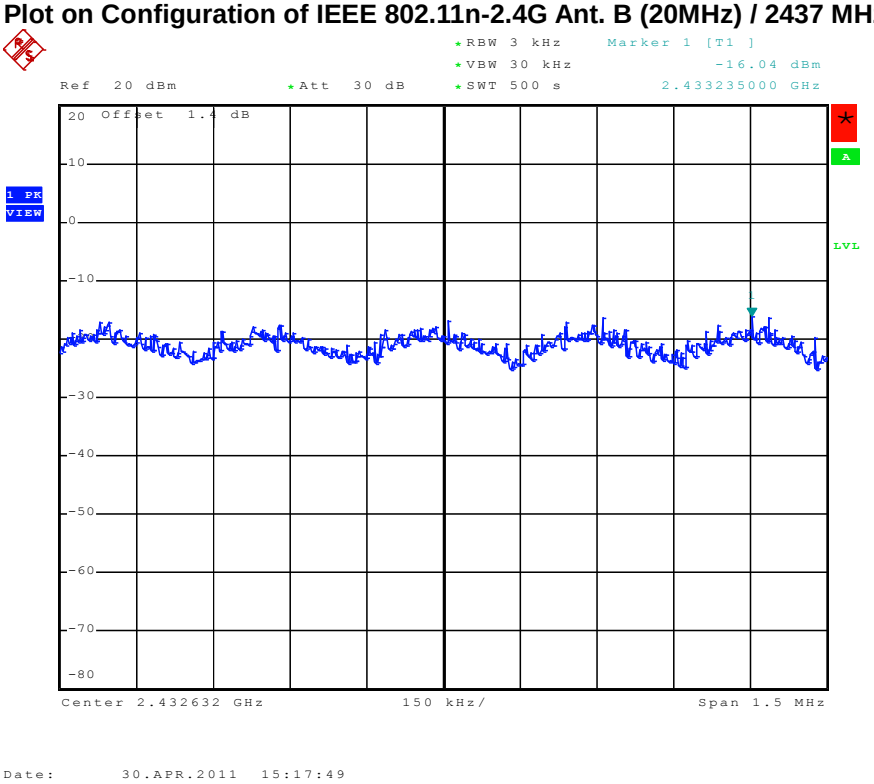
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2462 MHz



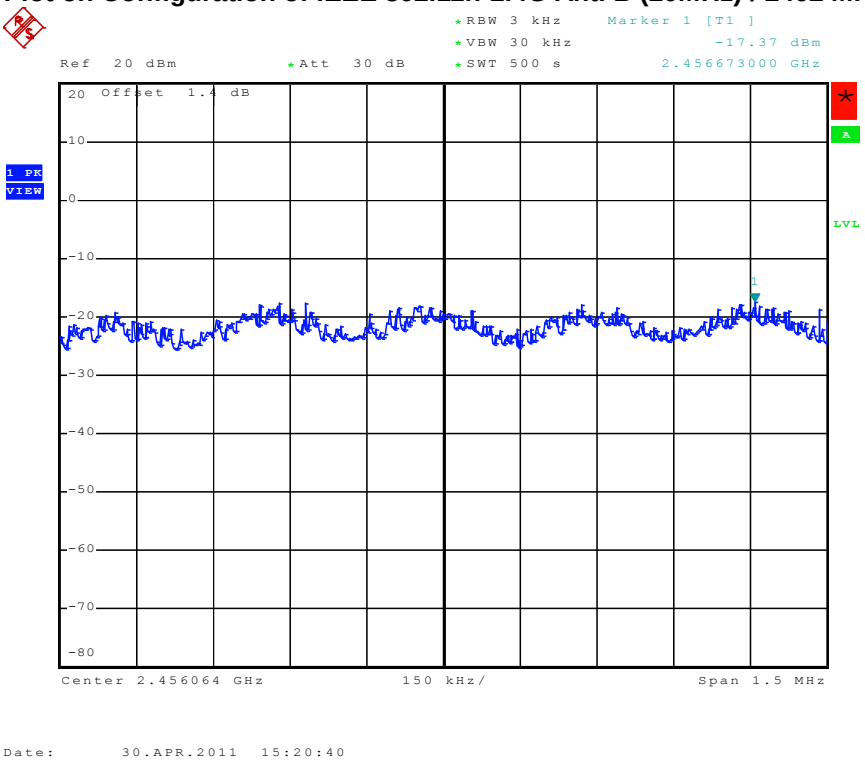
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2412 MHz



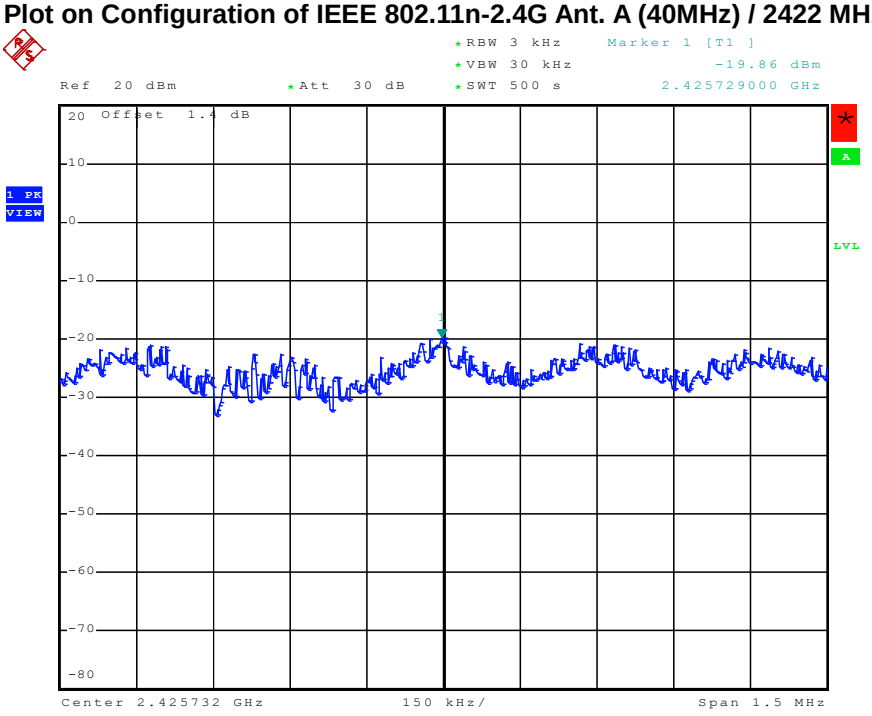
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2437 MHz



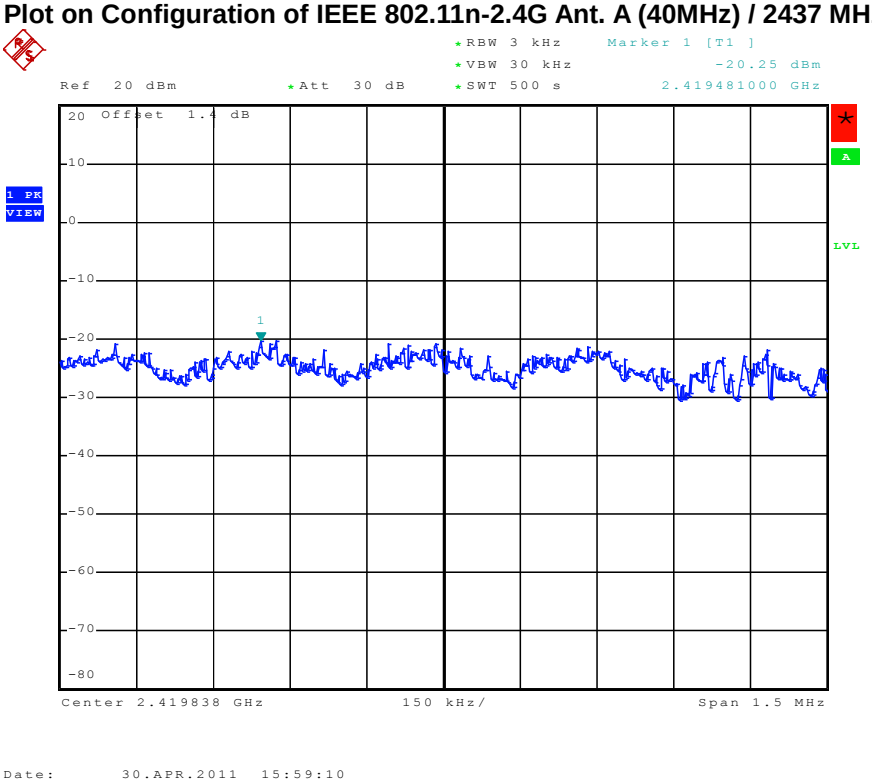
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2462 MHz



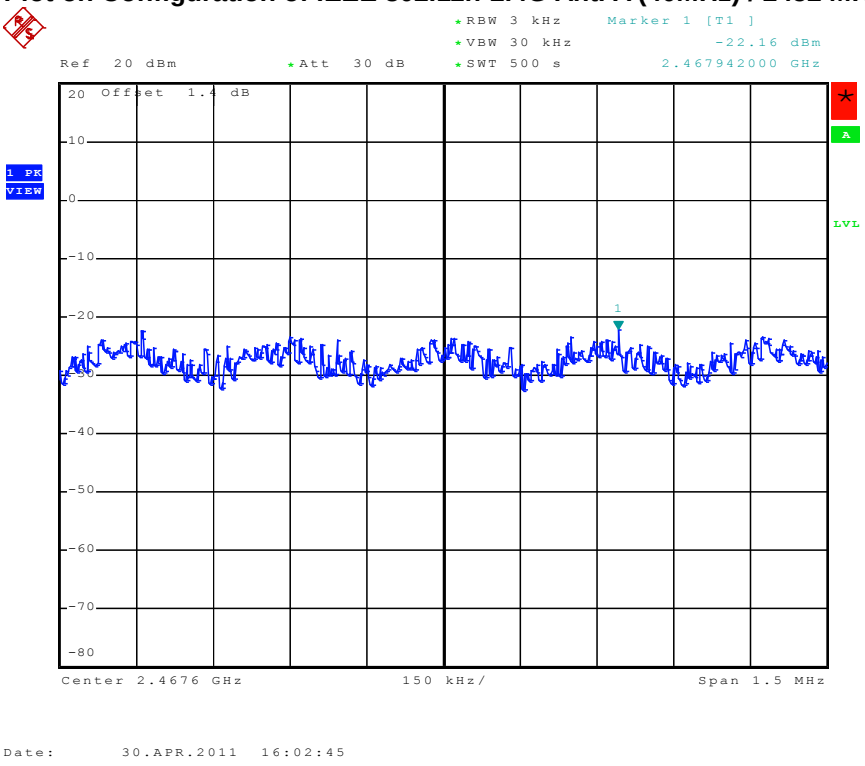
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2422 MHz



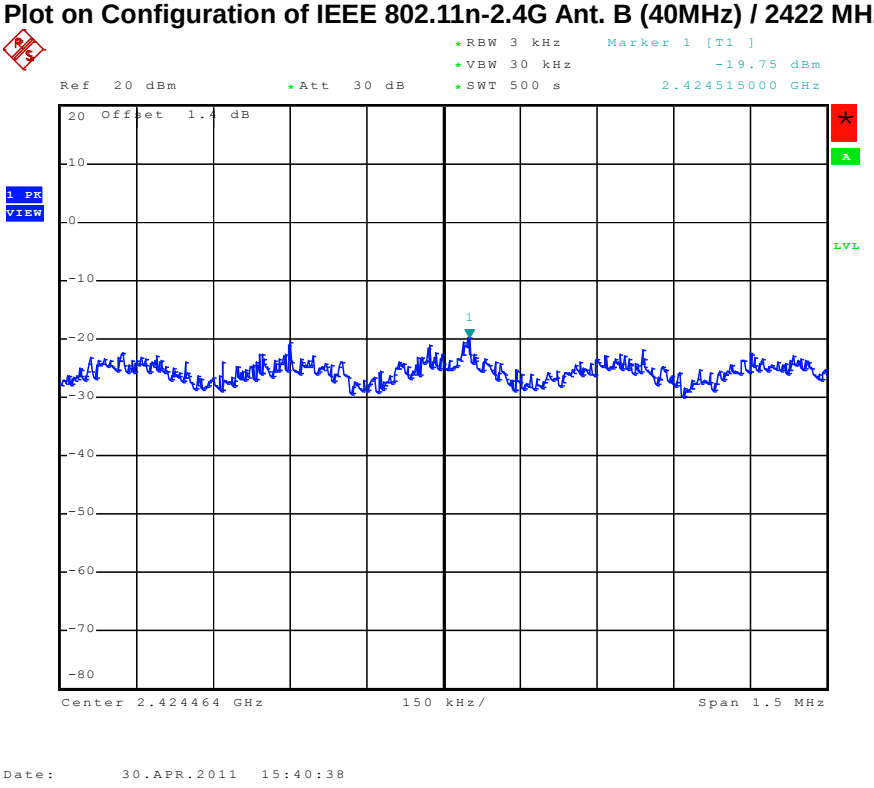
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2437 MHz



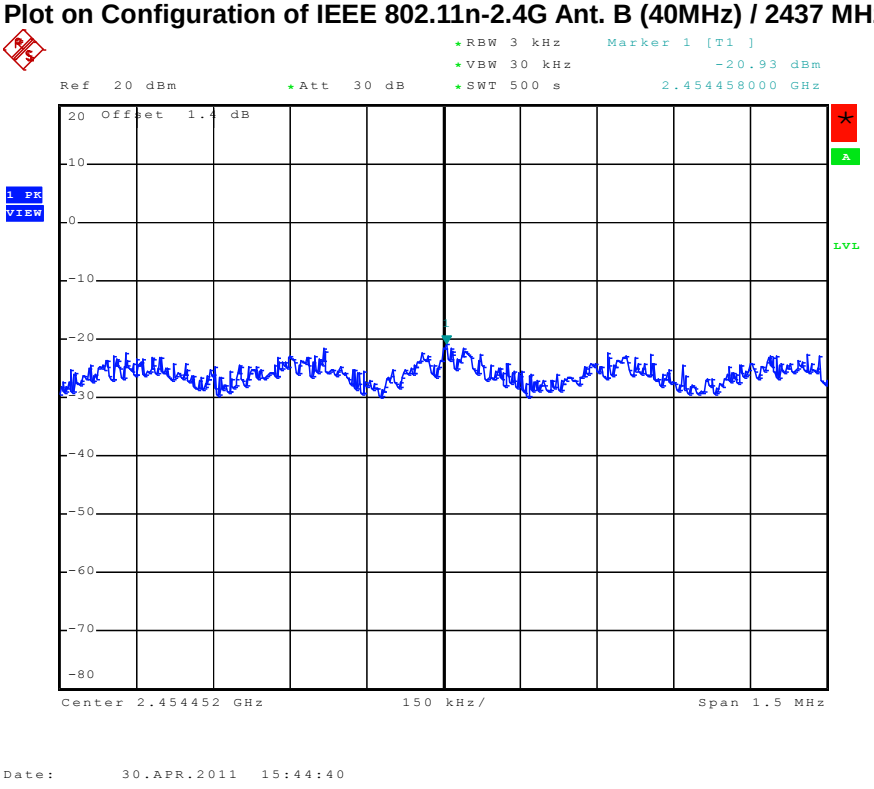
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2452 MHz



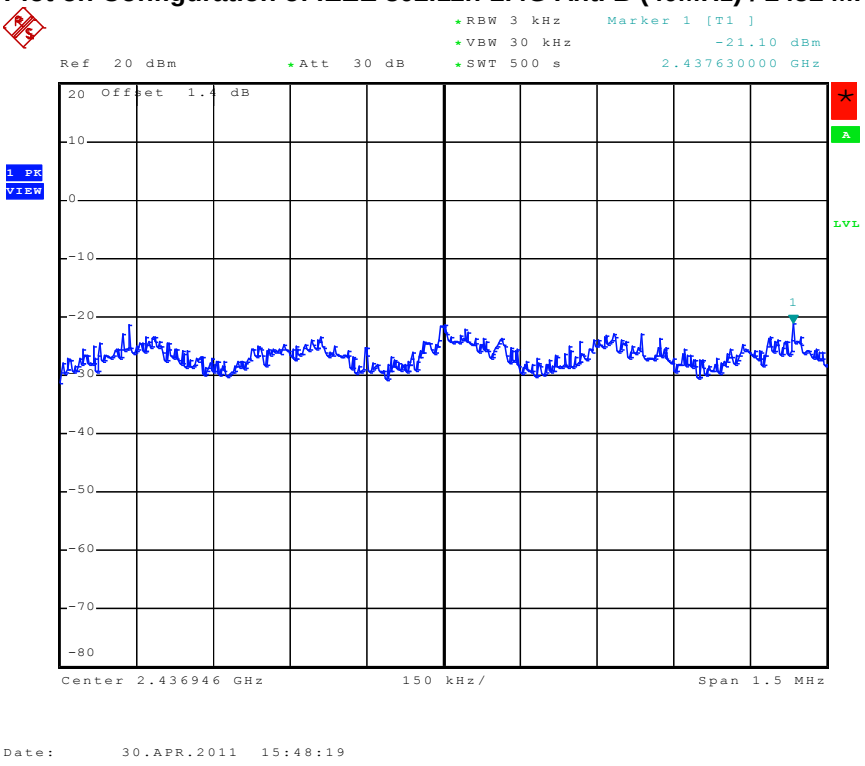
Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2422 MHz



Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2437 MHz



Power Density Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2452 MHz



3.4 6dB Spectrum Bandwidth Measurement

3.4.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

3.4.2 Measuring Instruments and Setting

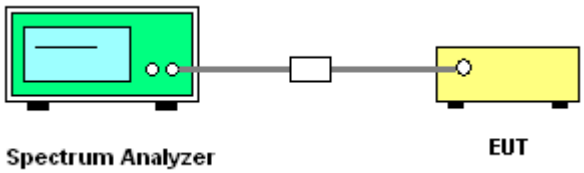
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.4.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.

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 Test Result of 6dB Spectrum Bandwidth

Final Test Date	Apr. 30, 2011	**Test Site No.**	TH01-HY
Temperature	26℃	**Humidity**	62%
Test Engineer	Ian	**Configuration**	802.11n

Configuration of IEEE 802.11n-5G Ant. A (20MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	17.80	17.76	500	Complies
157	5785 MHz	17.72	17.80	500	Complies
165	5825 MHz	17.64	17.76	500	Complies

Configuration of IEEE 802.11n-5G Ant. B (20MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	17.68	17.76	500	Complies
157	5785 MHz	17.64	17.76	500	Complies
165	5825 MHz	17.76	17.72	500	Complies

Configuration of IEEE 802.11n-5G Ant. A (40MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	36.48	36.24	500	**Complies**
159	5795 MHz	36.48	36.32	500	**Complies**

Configuration of IEEE 802.11n-5G Ant. B (40MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	36.48	36.32	500	**Complies**
159	5795 MHz	36.48	36.24	500	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. A (20MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.76	17.72	500	**Complies**
6	2437 MHz	17.72	17.68	500	**Complies**
11	2462 MHz	17.72	17.68	500	**Complies**

Configuration of IEEE 802.11n-2.4G Ant. B (20MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.72	17.68	500	**Complies**
6	2437 MHz	17.72	17.72	500	**Complies**
11	2462 MHz	17.76	17.72	500	**Complies**

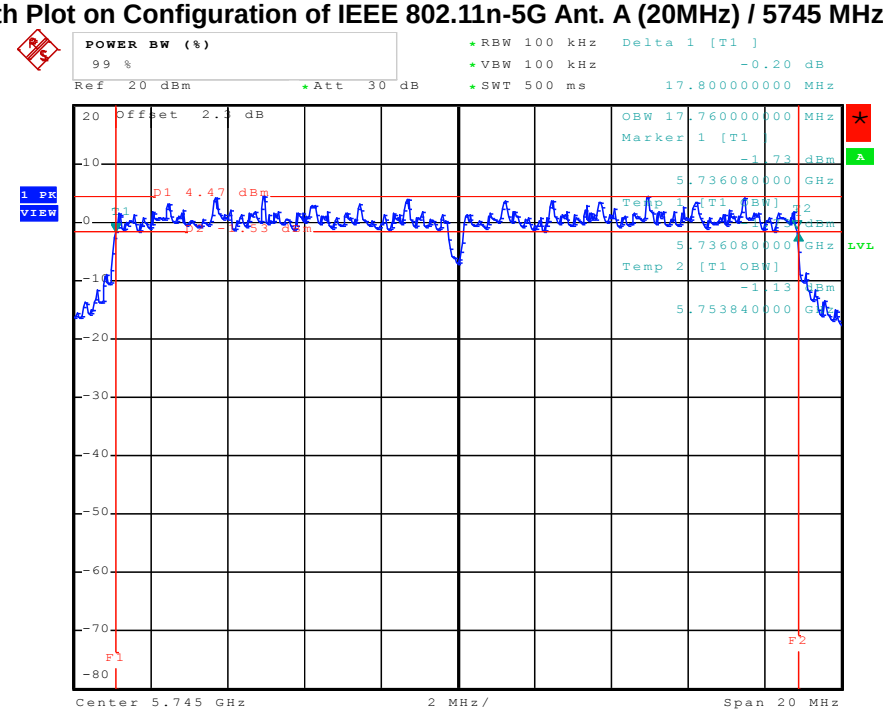
Configuration of IEEE 802.11n-2.4G Ant. A (40MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.56	36.32	500	**Complies**
6	2437 MHz	36.56	36.32	500	**Complies**
9	2452 MHz	36.56	36.32	500	**Complies**

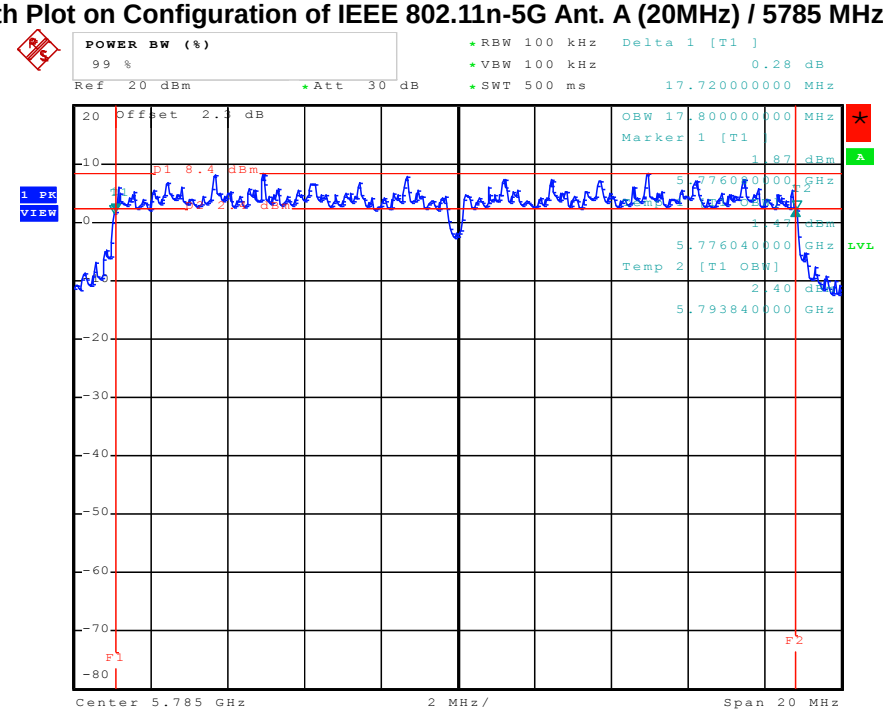
Configuration of IEEE 802.11n-2.4G Ant. B (40MHz)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.48	36.24	500	**Complies**
6	2437 MHz	36.56	36.32	500	**Complies**
9	2452 MHz	36.56	36.32	500	**Complies**

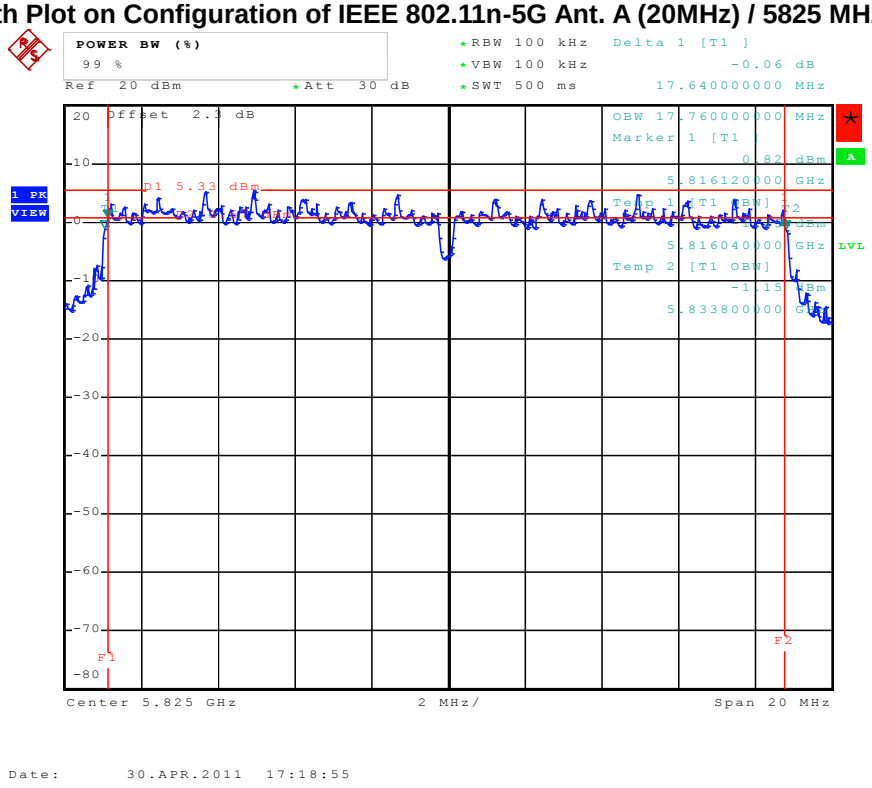
6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5745 MHz



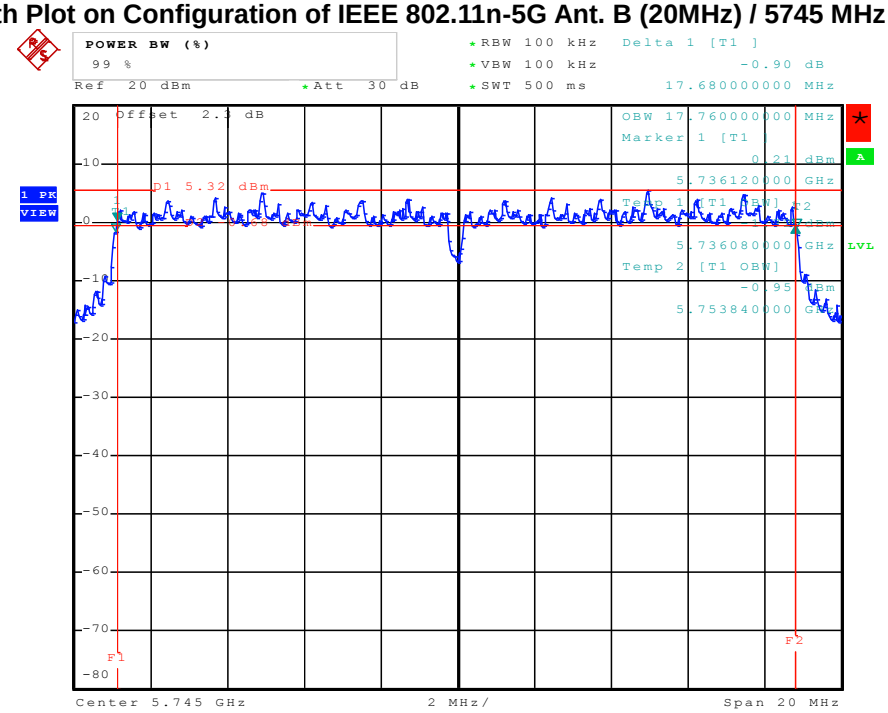
6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5785 MHz



6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5825 MHz

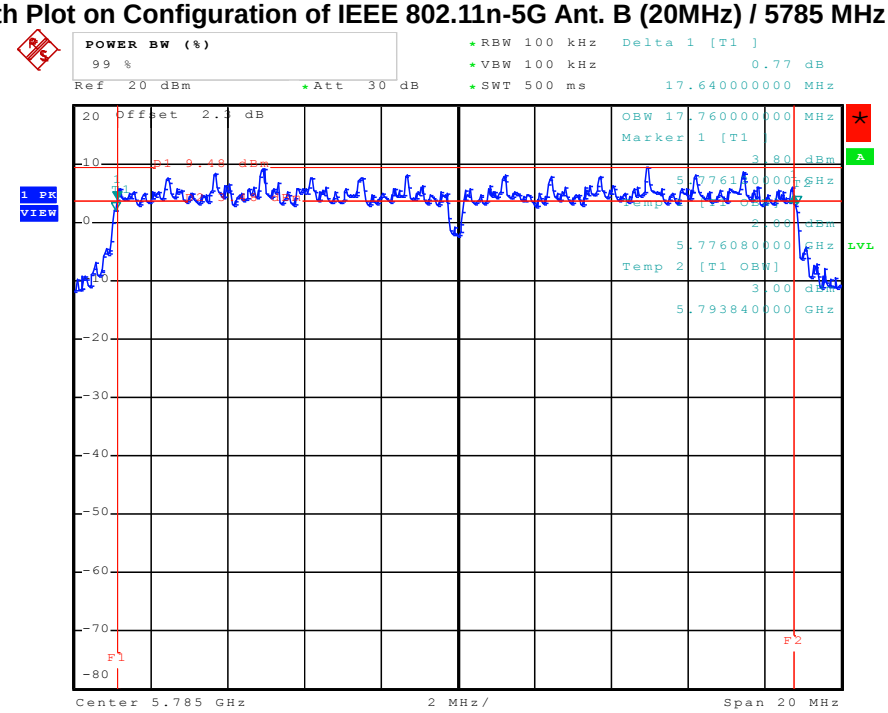


6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5745 MHz



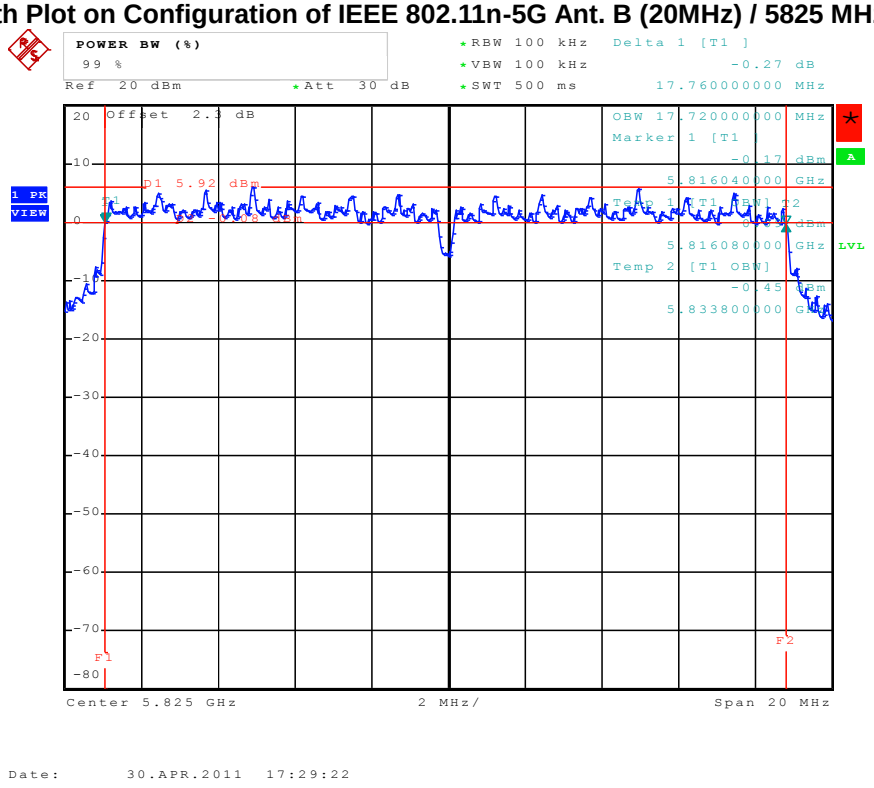
Date: 30.APR.2011 17:23:38

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5785 MHz

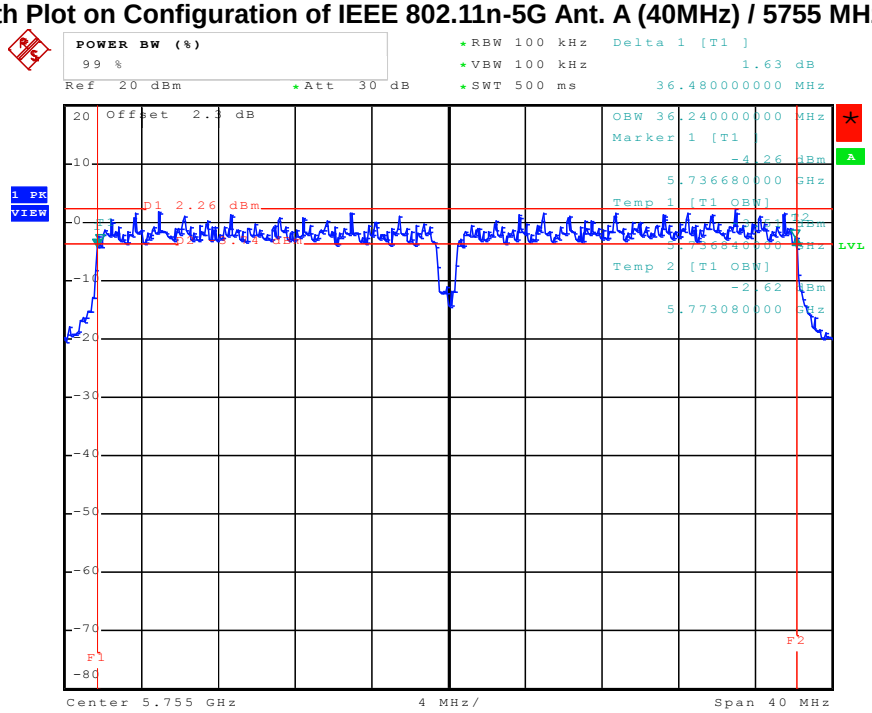


Date: 30.APR.2011 17:27:05

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5825 MHz

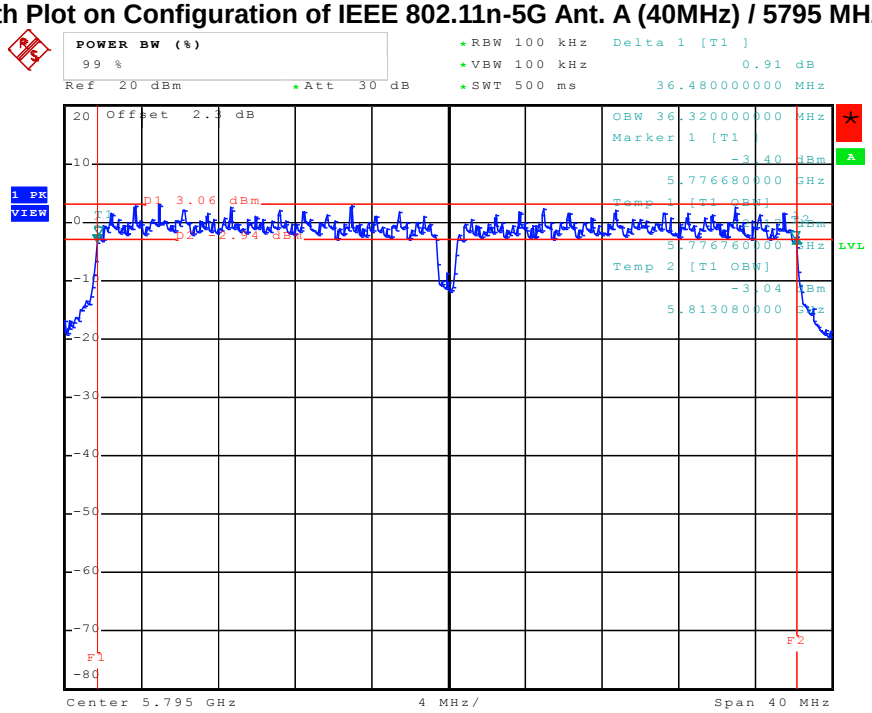


6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. A (40MHz) / 5755 MHz



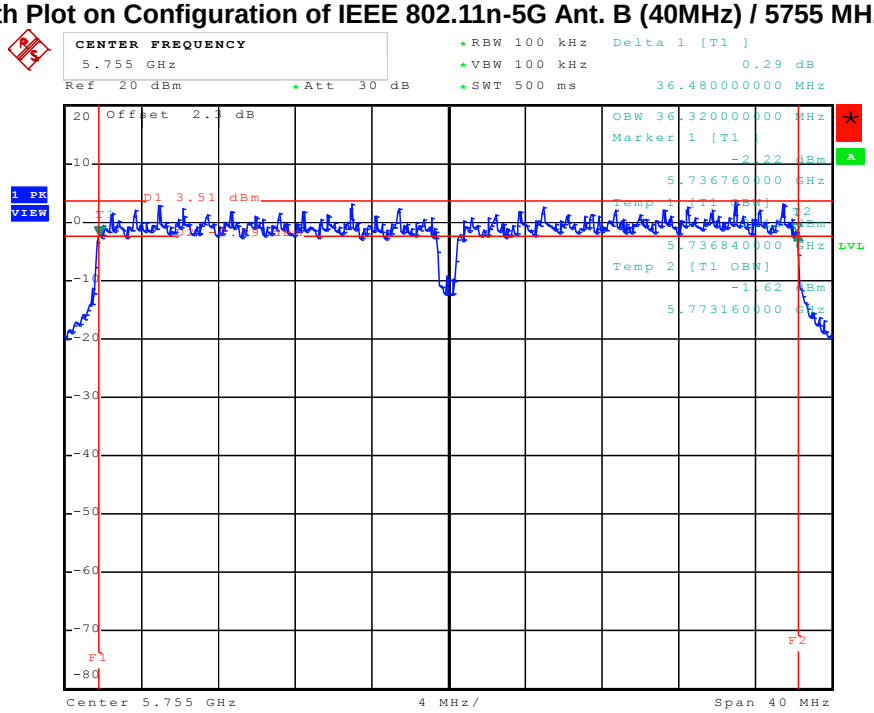
Date: 30.APR.2011 19:00:14

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. A (40MHz) / 5795 MHz



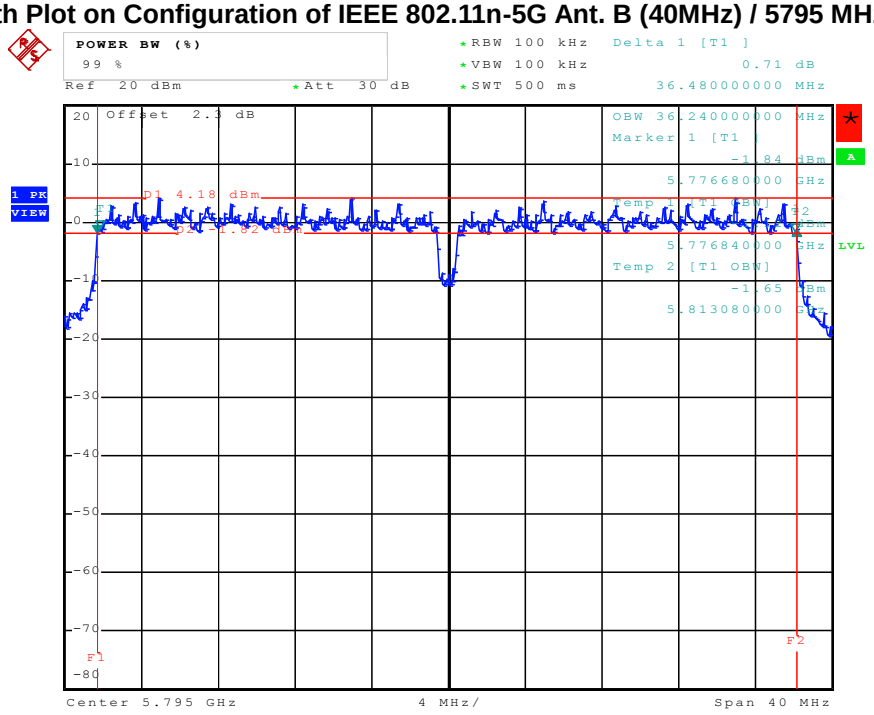
Date: 30.APR.2011 19:04:28

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. B (40MHz) / 5755 MHz



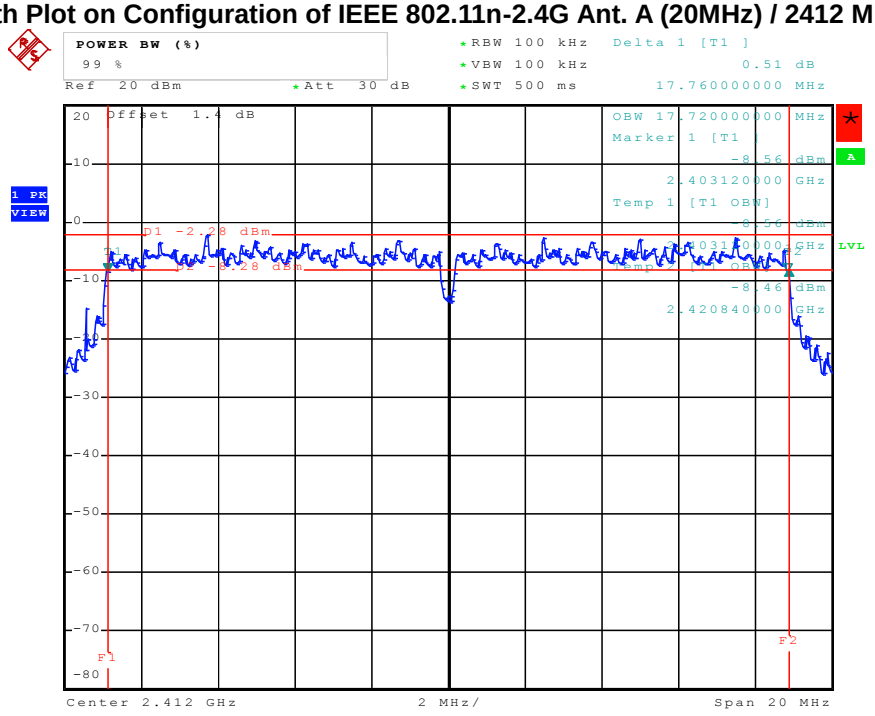
Date: 30.APR.2011 18:01:39

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-5G Ant. B (40MHz) / 5795 MHz



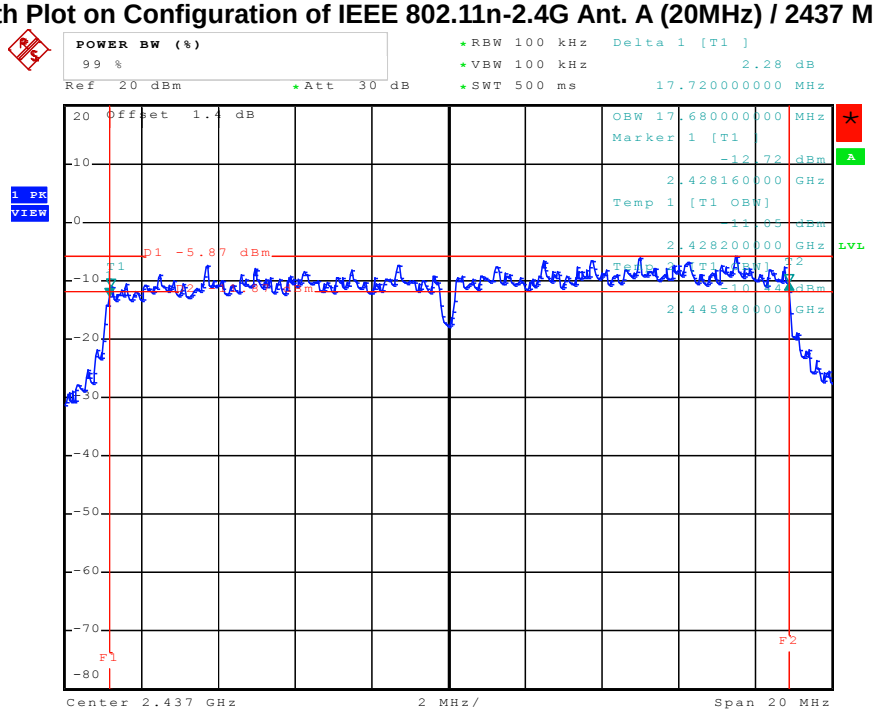
Date: 30.APR.2011 18:53:12

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2412 MHz



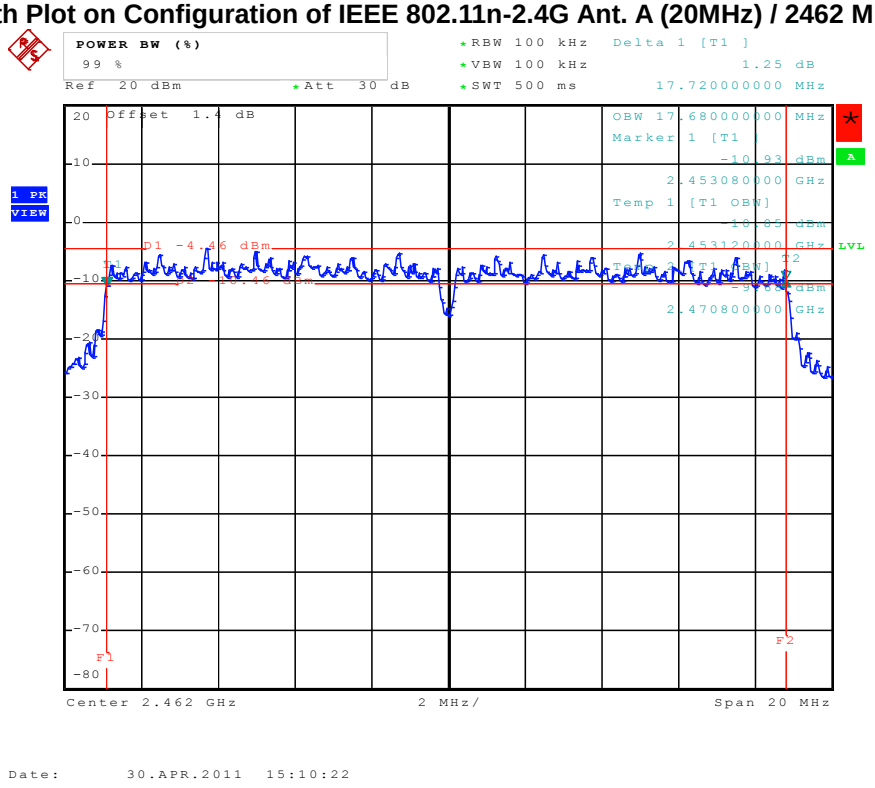
Date: 30.APR.2011 15:02:34

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2437 MHz

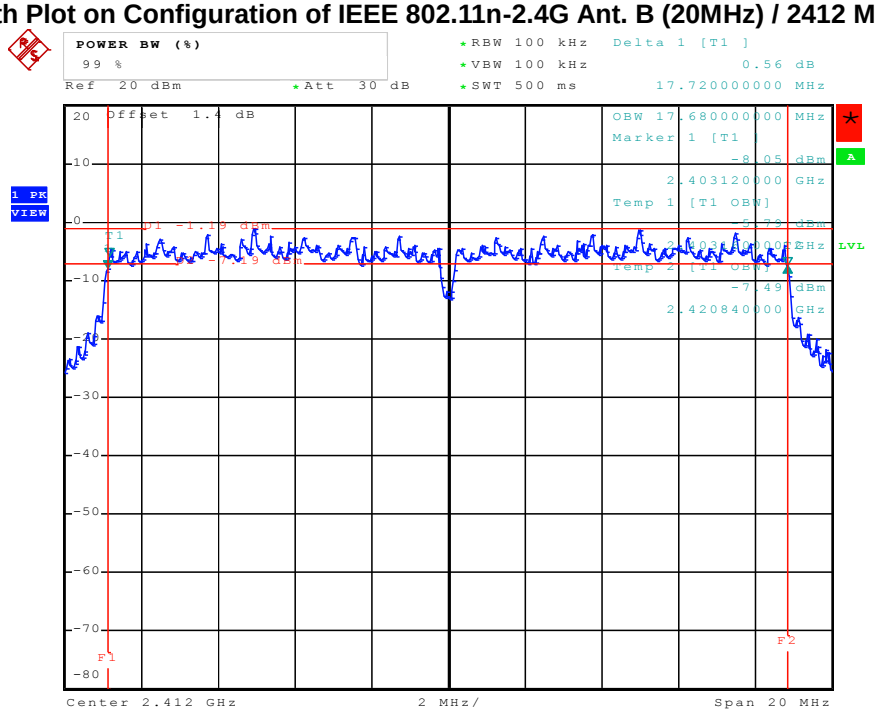


Date: 30.APR.2011 15:08:04

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2462 MHz

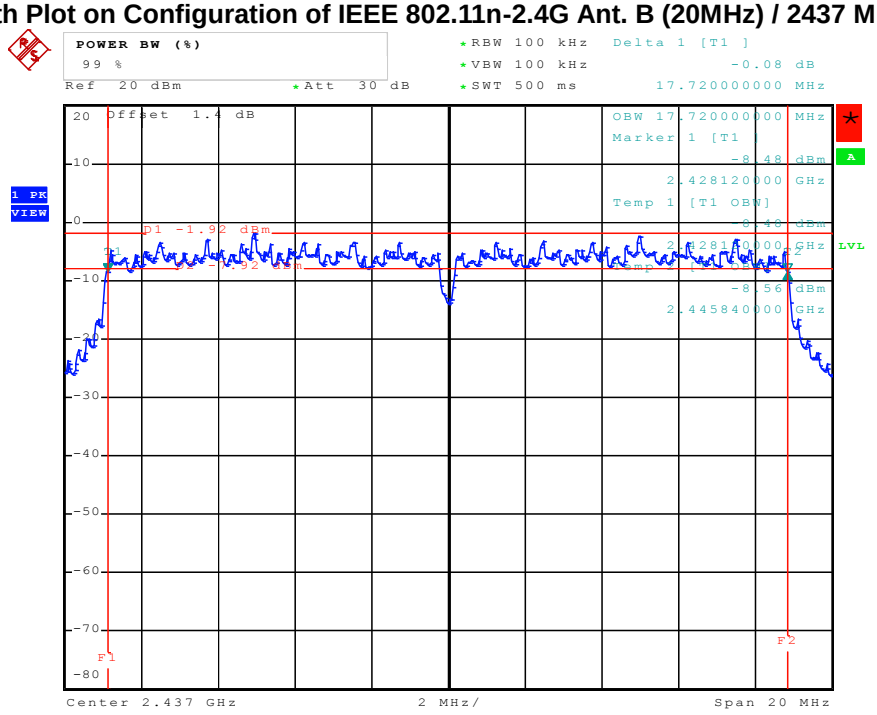


6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2412 MHz



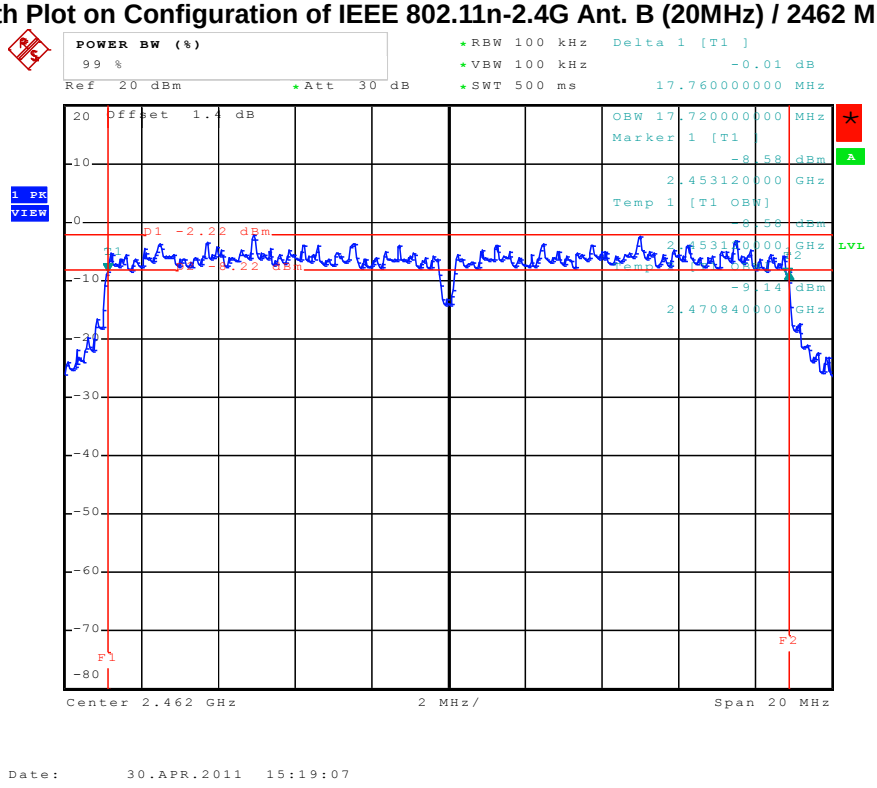
Date: 30.APR.2011 15:14:09

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2437 MHz

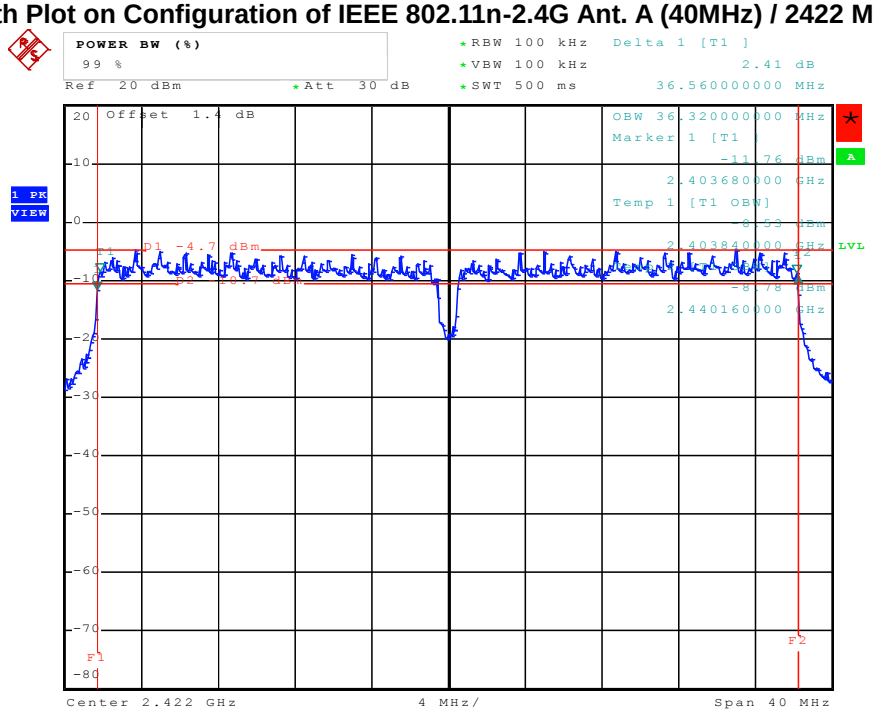


Date: 30.APR.2011 15:16:55

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2462 MHz

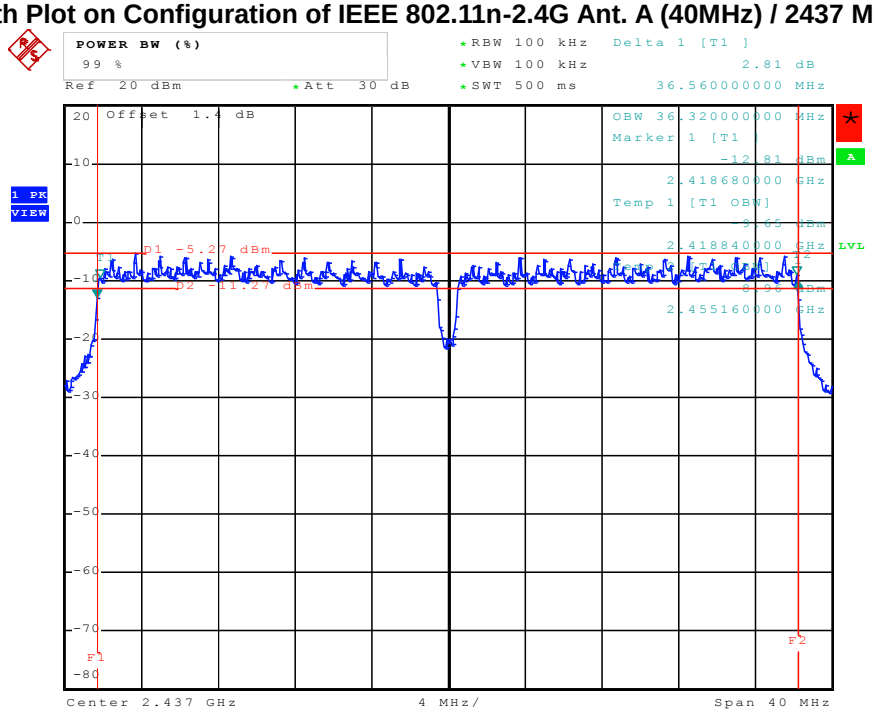


6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2422 MHz



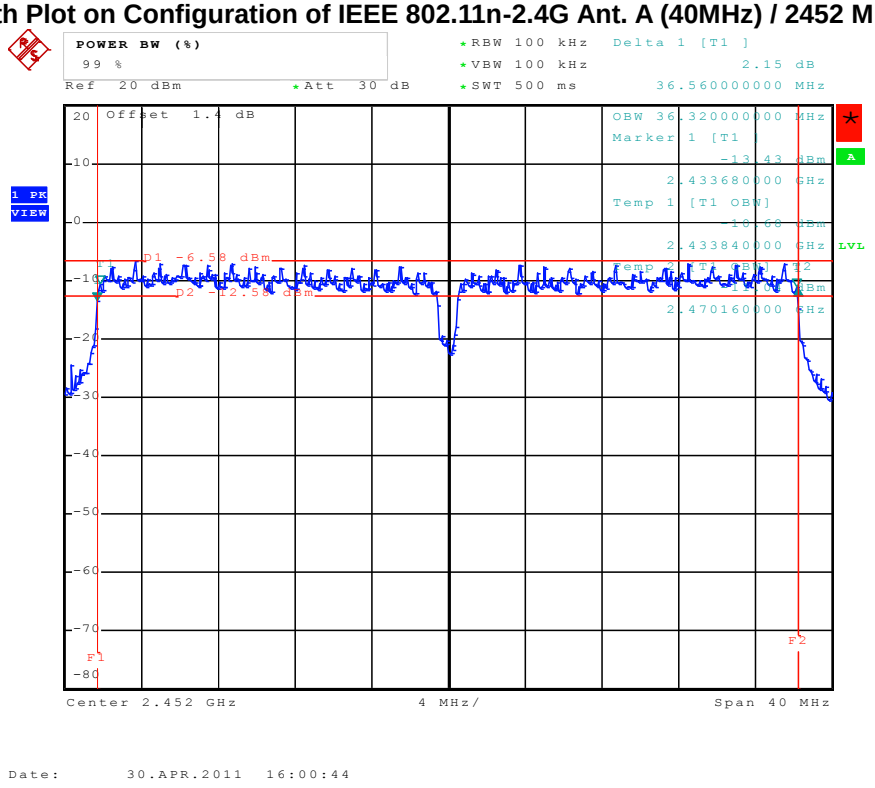
Date: 30.APR.2011 15:54:41

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2437 MHz

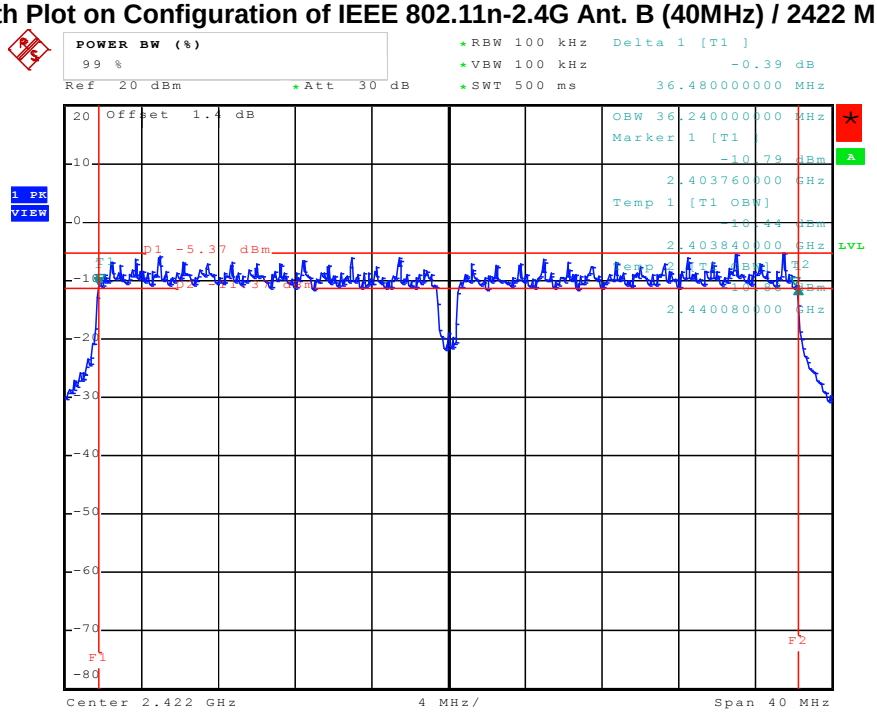


Date: 30.APR.2011 15:58:05

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2452 MHz

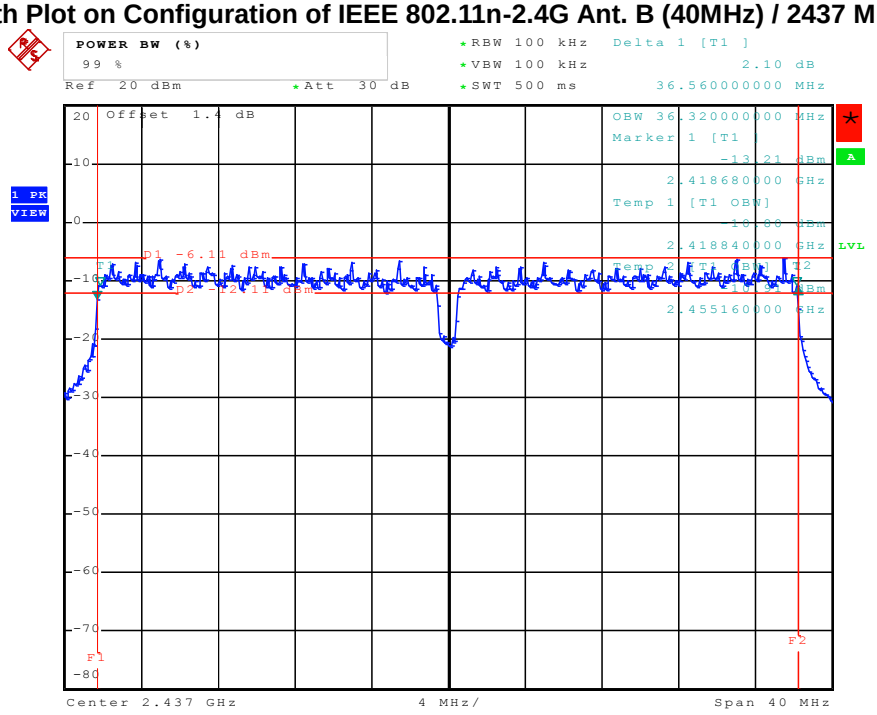


6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2422 MHz



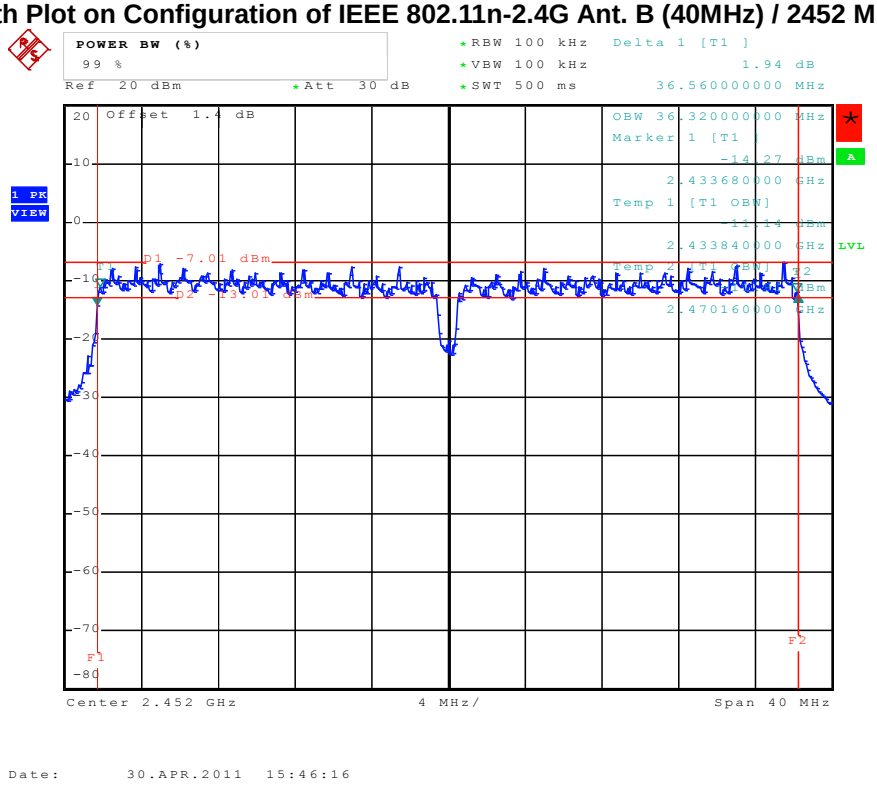
Date: 30.APR.2011 15:38:24

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2437 MHz



Date: 30.APR.2011 15:43:30

6 dB Bandwidth Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2452 MHz



3.5 Radiated Emissions Measurement

3.5.1 Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

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 spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak

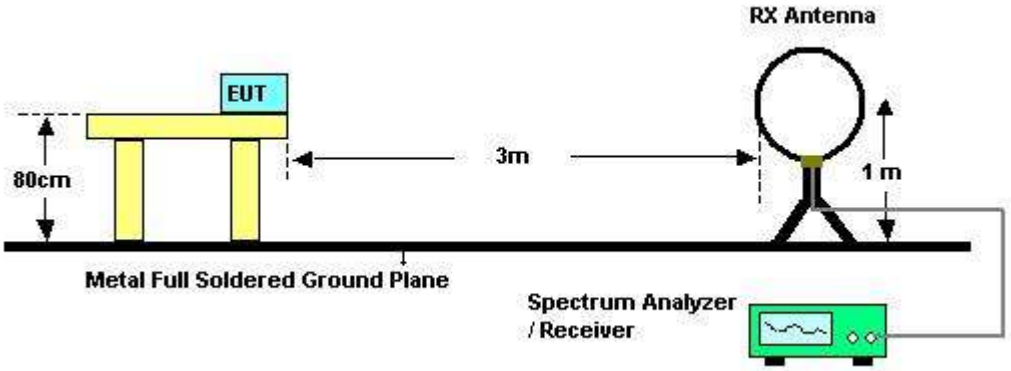
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.5.3 Test Procedures

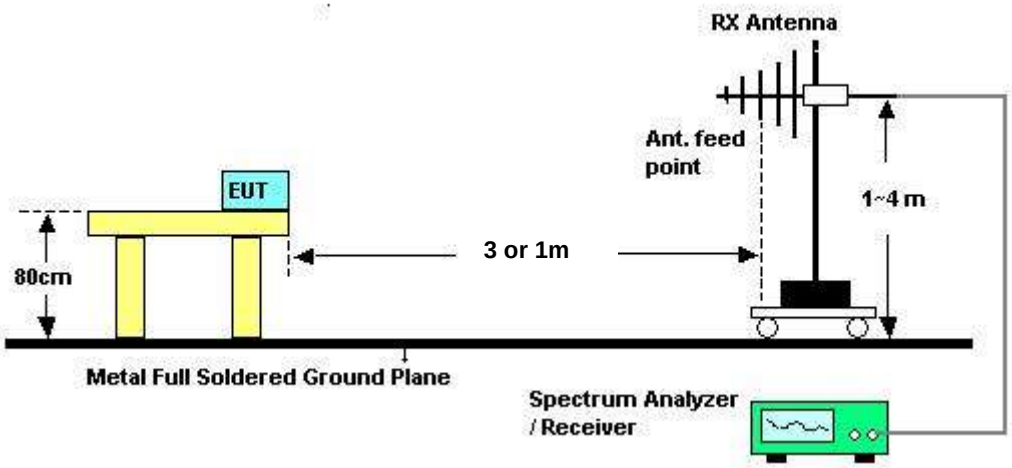
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

3.5.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.
Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

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 transmitting mode.

3.5.7 Results of Radiated Emissions (9kHz~30MHz)

Final Test Date	Mar. 26, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel		

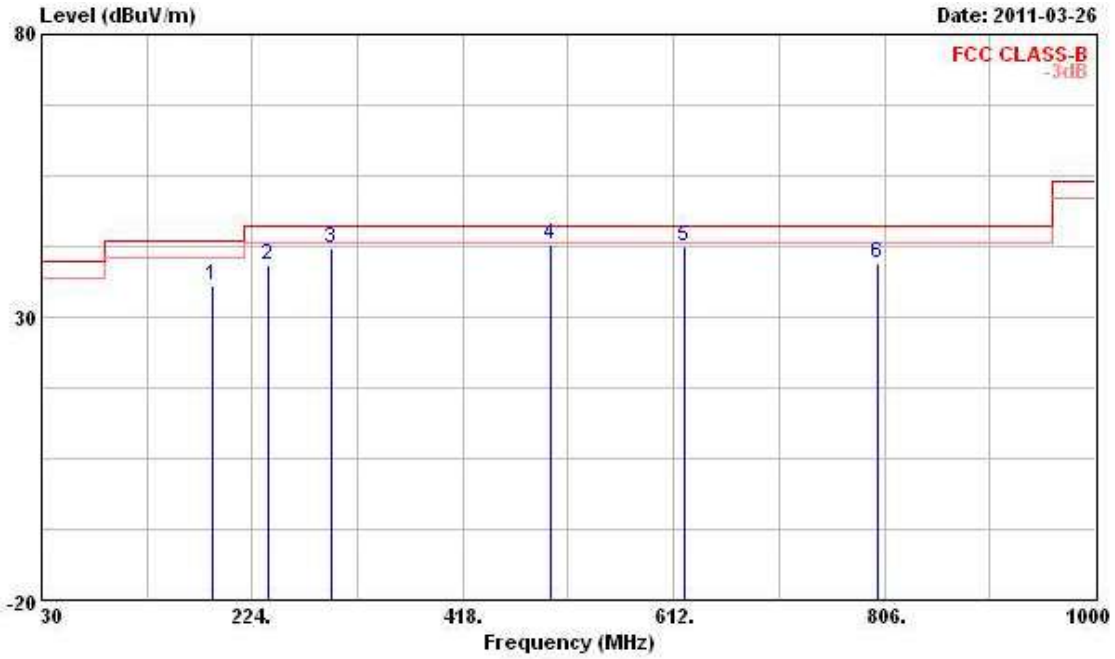
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

3.5.8 Results of Radiated Emissions (30MHz~1GHz)

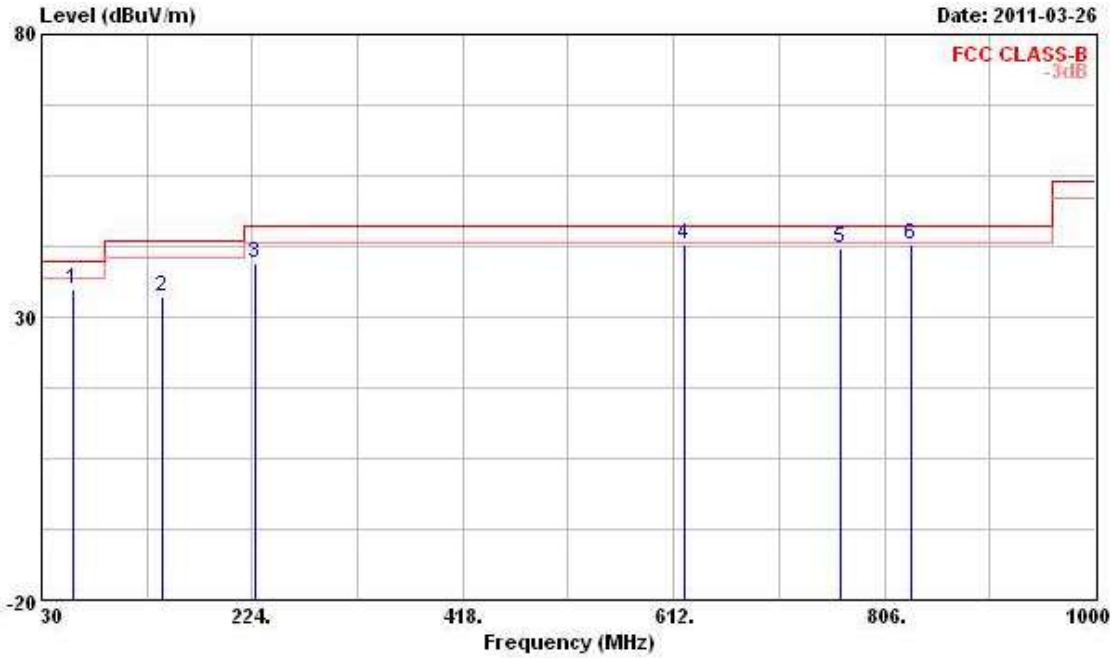
Final Test Date	Mar. 26, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configurations**	Normal Mode

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	187.140	35.70	-7.80	43.50	50.24	10.41	2.24	27.19	Peak
2	238.550	39.24	-6.76	46.00	50.89	12.62	2.60	26.87	Peak
3	296.750	42.08	-3.92	46.00	52.31	13.66	2.90	26.79	Peak
4	498.510	42.68	-3.32	46.00	49.82	17.26	3.78	28.18	QP
5	621.700	42.48	-3.52	46.00	46.61	19.89	4.12	28.14	Peak
6	800.180	39.51	-6.49	46.00	42.19	20.27	4.77	27.72	Peak

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	59.100	34.81	-5.19	40.00	53.95	7.38	1.24	27.76	Peak
2	141.550	33.49	-10.01	43.50	47.22	11.78	1.96	27.47	Peak
3	225.940	39.41	-6.59	46.00	51.62	12.21	2.51	26.93	Peak
4	621.700	42.94	-3.06	46.00	47.07	19.89	4.12	28.14	Peak
5	766.230	42.23	-3.77	46.00	45.63	19.79	4.64	27.83	QP
6	831.220	42.85	-3.15	46.00	45.43	20.19	4.83	27.60	Peak

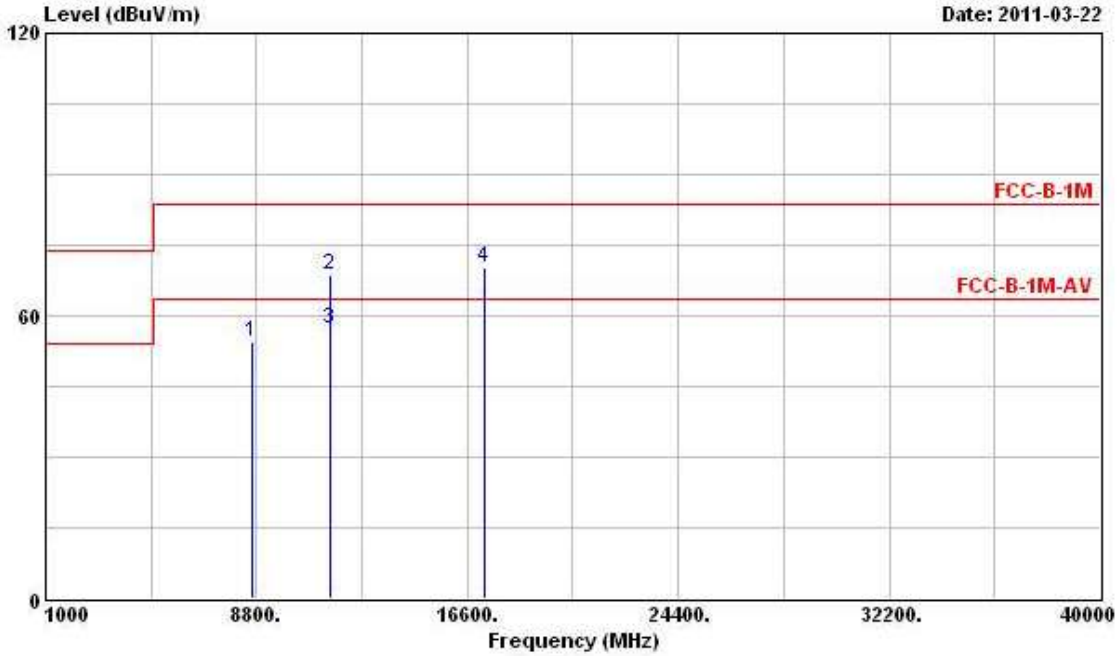
Note:
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.5.9 Results for Radiated Emissions (1GHz~10th Harmonic)

For Two Chain:

Final Test Date	Mar. 22, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ch. 149 (20MHz)

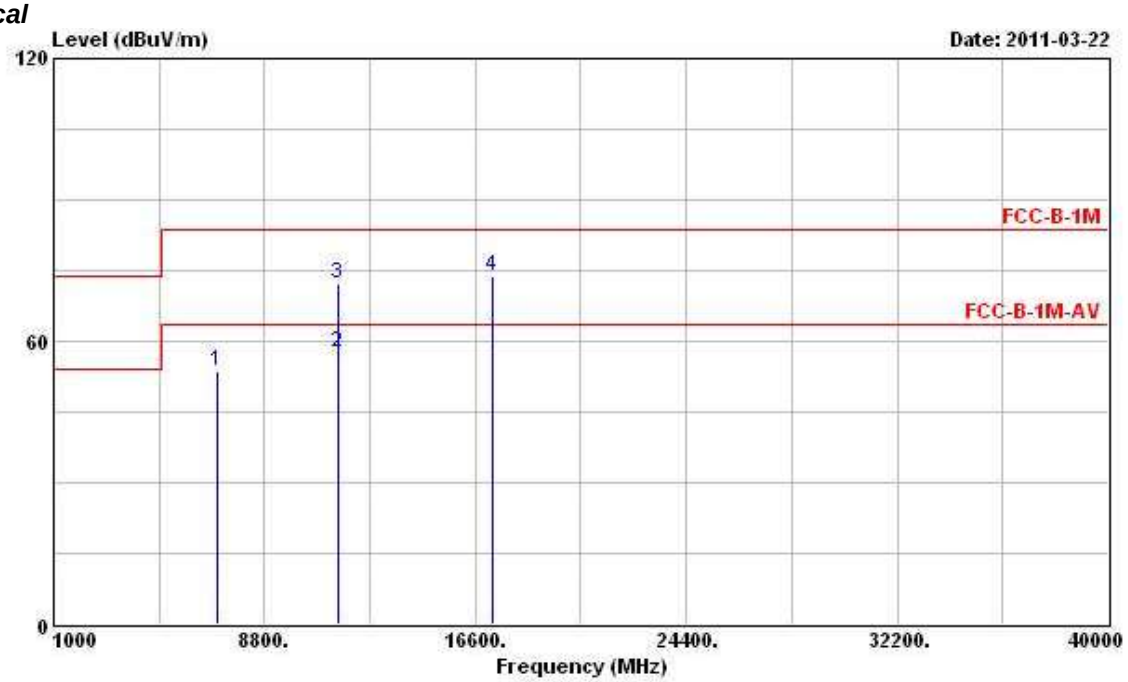
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8612.000	54.64			44.58	38.41	5.99	34.34	Peak
2	11490.000	68.75	-14.79	83.54	55.17	40.59	6.63	33.64	Peak
3	11490.000	57.28	-6.26	63.54	43.70	40.59	6.63	33.64	Average
4	17235.000	70.08			50.20	43.56	8.55	32.23	Peak

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

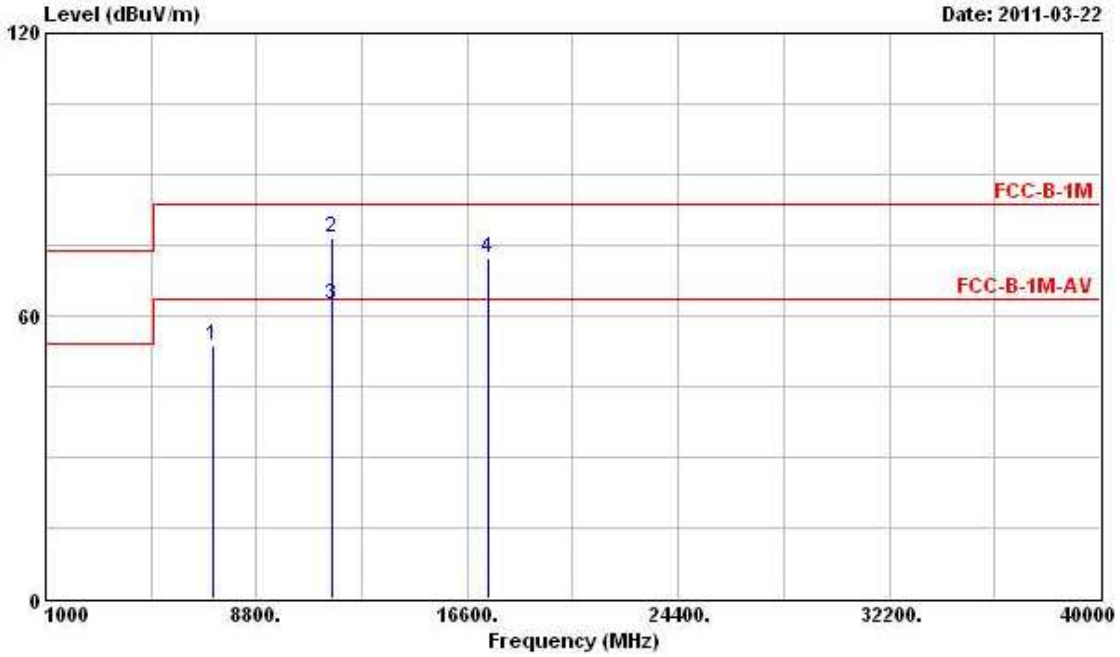


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7044.000	53.78			44.65	37.81	5.60	34.28	Peak
2	11490.000	57.69	-5.85	63.54	44.11	40.59	6.63	33.64	Average
3	11490.000	72.40	-11.14	83.54	58.82	40.59	6.63	33.64	Peak
4	17235.000	73.66			53.78	43.56	8.55	32.23	Peak

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 22, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ch. 157 (20MHz)

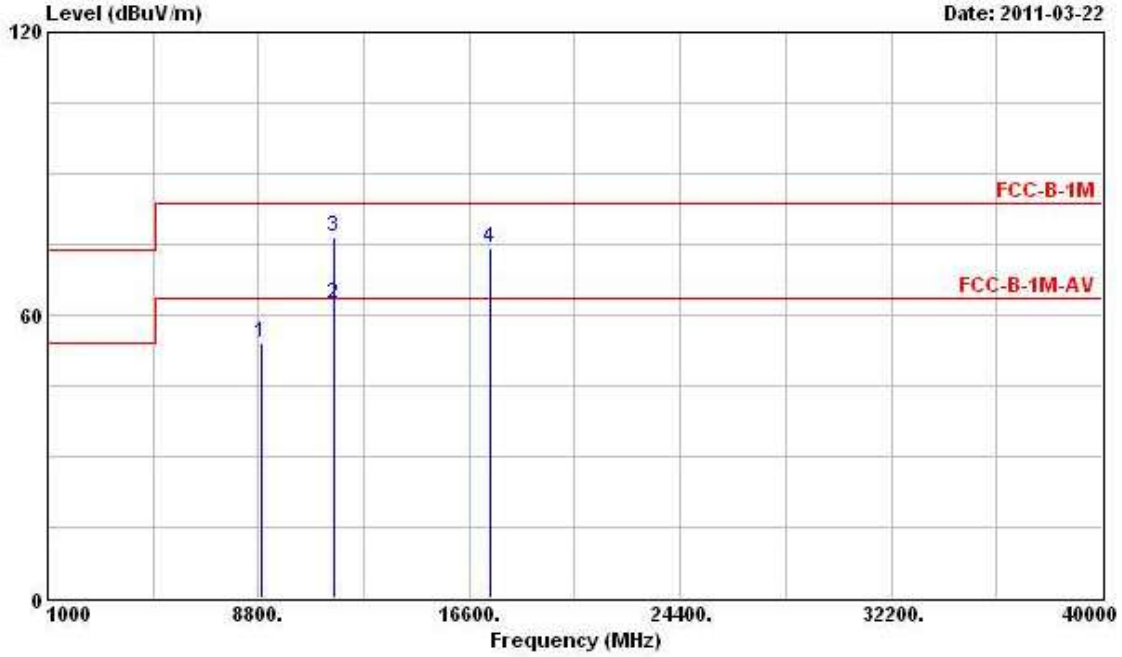
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7157.500	53.66			44.49	37.83	5.62	34.28	Peak
2	11570.000	76.58	-6.96	83.54	62.95	40.63	6.63	33.63	Peak
3	@11570.000	62.40	-1.14	63.54	48.77	40.63	6.63	33.63	Average
4	17355.000	72.10			52.31	43.49	8.50	32.20	Peak

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

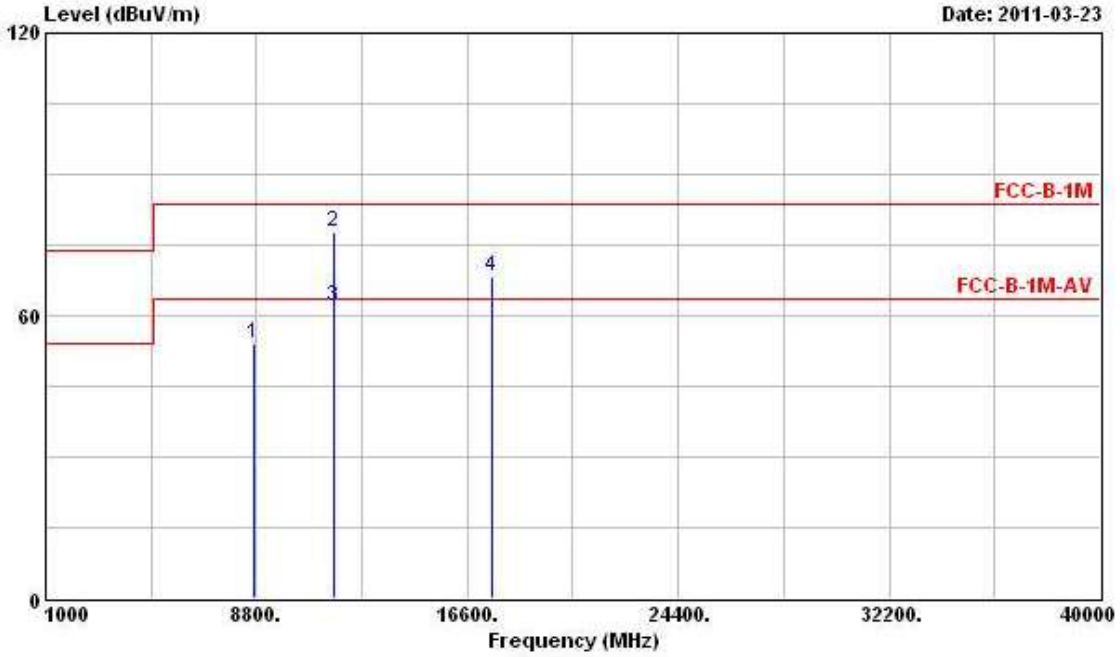


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8940.000	53.95			44.32	38.15	6.14	34.66	Peak
2	@11570.000	62.25	-1.29	63.54	48.62	40.63	6.63	33.63	Average
3	11570.000	76.49	-7.05	83.54	62.86	40.63	6.63	33.63	Peak
4	17355.000	74.29			54.50	43.49	8.50	32.20	Peak

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 23, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ch. 165 (20MHz)

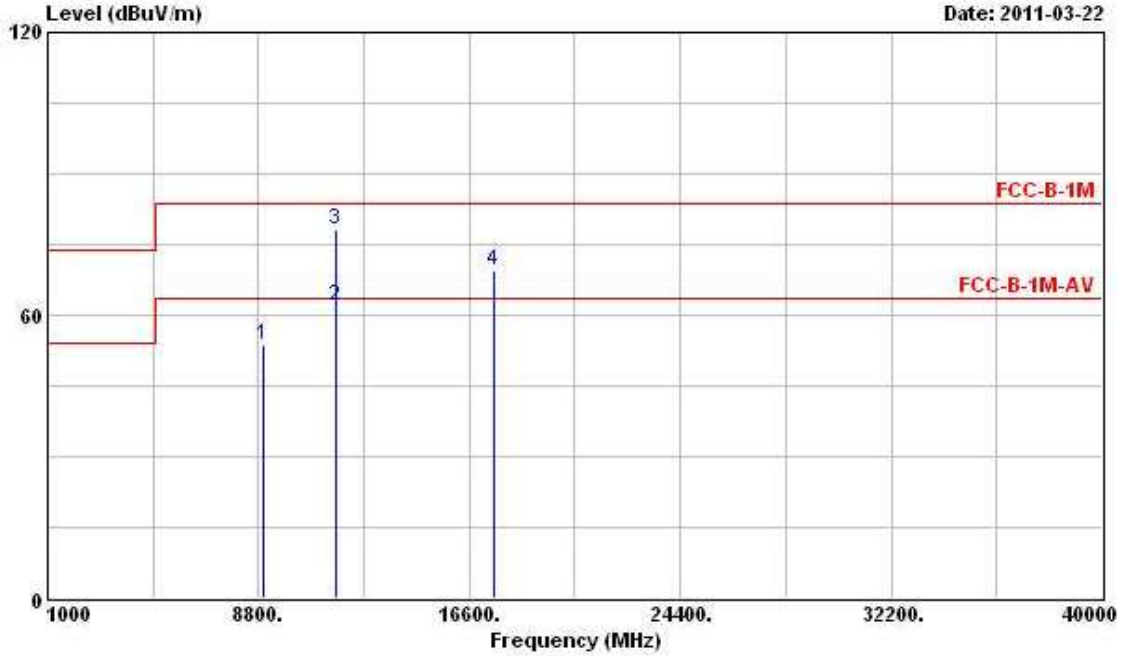
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8716.000	54.23			44.30	38.33	6.04	34.44	Peak
2	11650.000	77.64	-5.90	83.54	63.94	40.66	6.64	33.60	Peak
3	@11650.000	62.07	-1.47	63.54	48.37	40.66	6.64	33.60	Average
4	17475.000	68.32			48.62	43.42	8.44	32.16	Peak

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

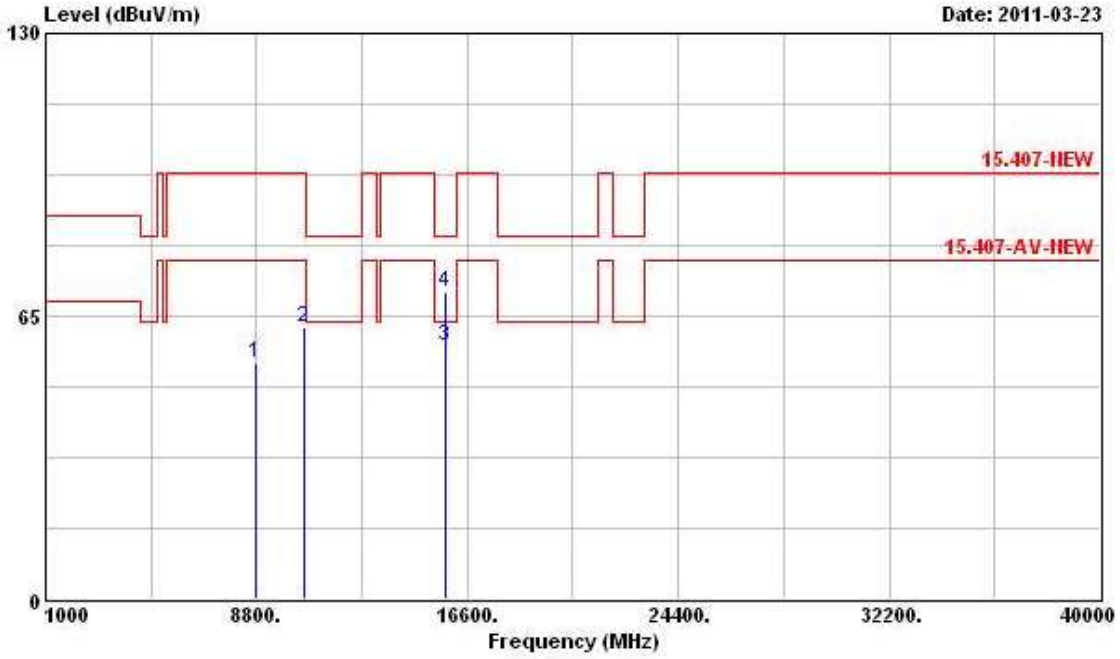


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8980.000	53.54			43.96	38.13	6.16	34.71	Peak
2	@11650.000	62.15	-1.39	63.54	48.45	40.66	6.64	33.60	Average
3	11650.000	78.05	-5.49	83.54	64.35	40.66	6.64	33.60	Peak
4	17475.000	69.33			49.63	43.42	8.44	32.16	Peak

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 23, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ch. 151 (40MHz)

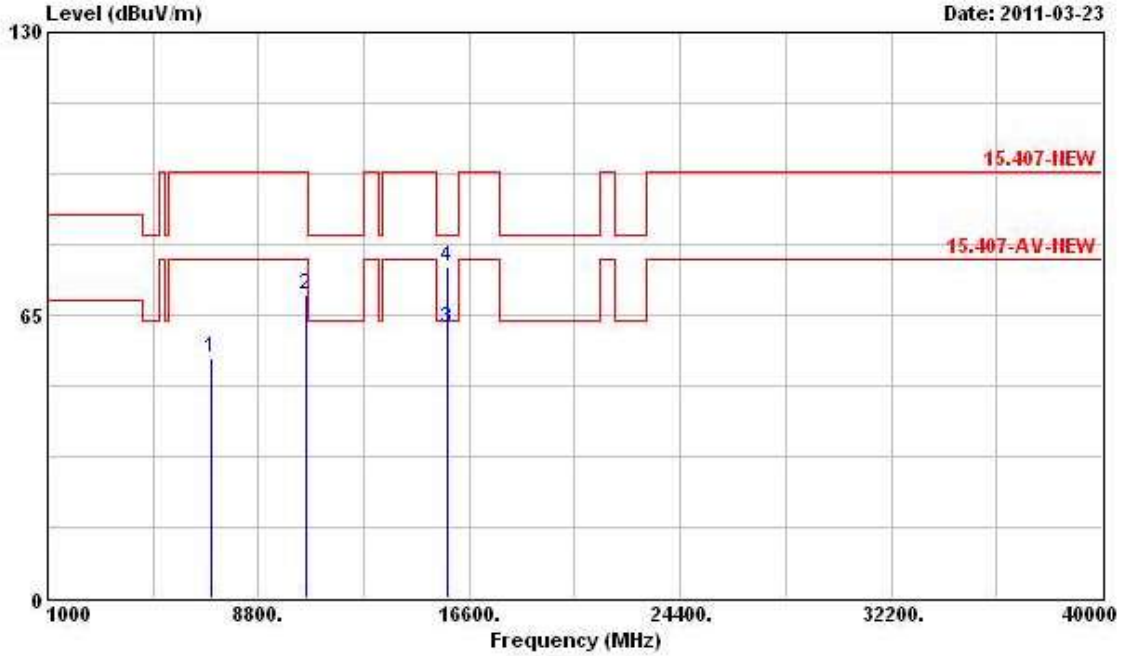
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8804.000	54.26			44.44	38.26	6.08	34.52	Peak
2	10540.000	62.27	------	------	49.24	40.12	6.88	33.97	Peak
3	15810.000	58.35	-5.19	63.54	40.16	42.86	8.46	33.13	Average
4	15810.000	70.72	-12.82	83.54	52.53	42.86	8.46	33.13	Peak

Note: The items 1 and 2 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

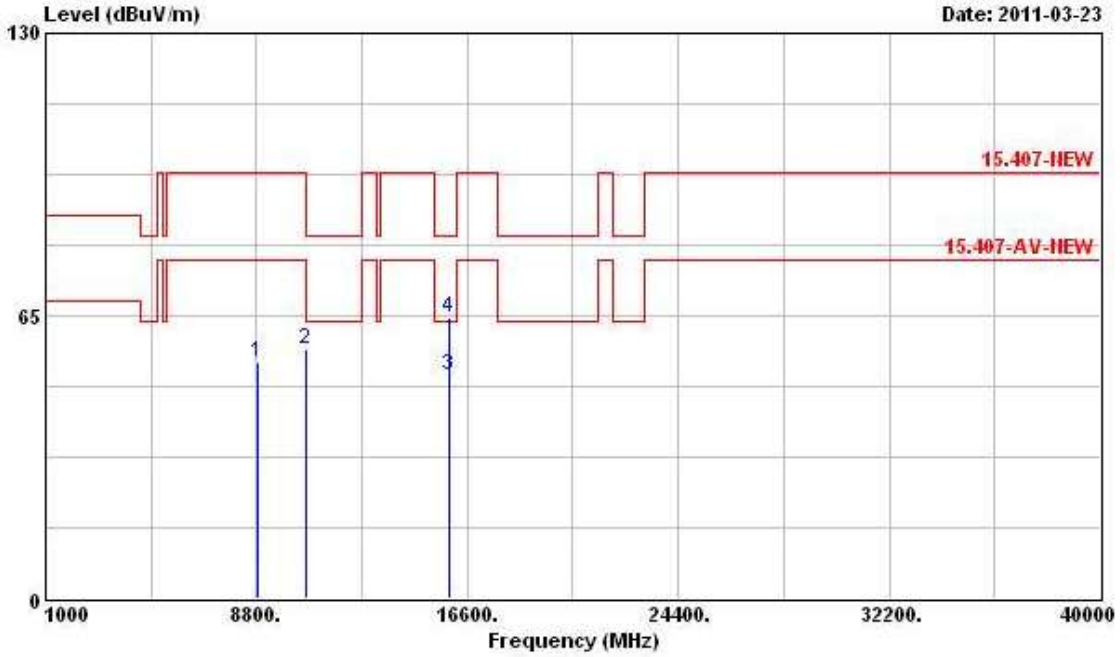


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7024.000	54.97			45.85	37.80	5.60	34.28	Peak
2	10540.000	69.88			56.85	40.12	6.88	33.97	Peak
3	@15810.000	61.80	-1.74	63.54	43.61	42.86	8.46	33.13	Average
4	15810.000	76.17	-7.37	83.54	57.98	42.86	8.46	33.13	Peak

Note: The items 1 and 2 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 23, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ch. 159 (40MHz)

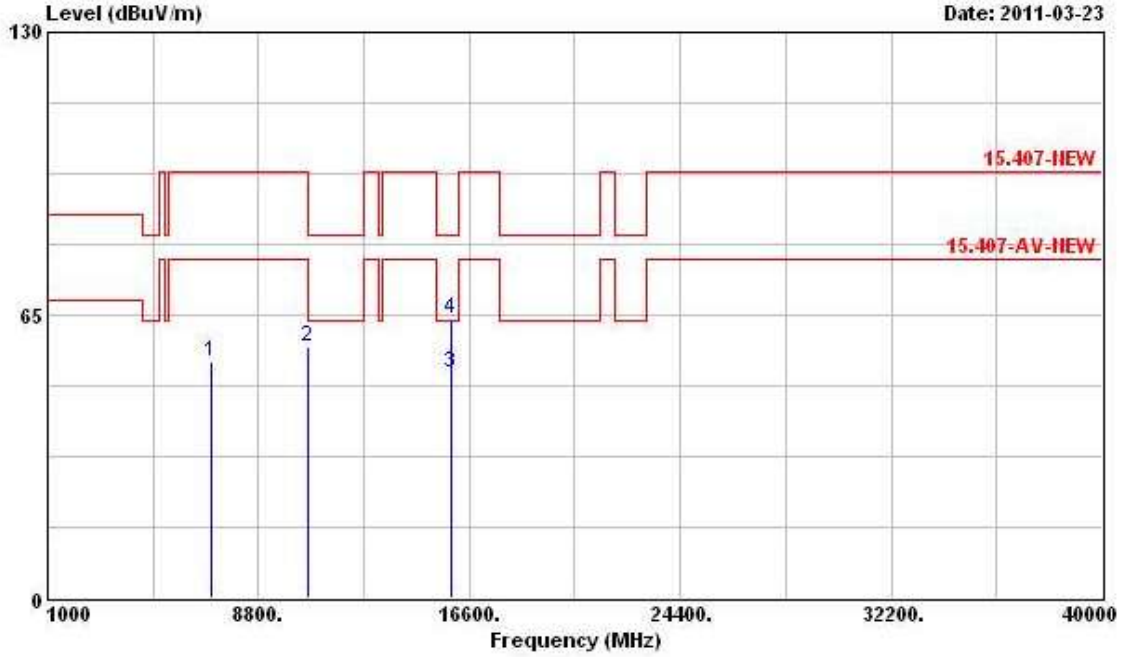
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8814.000	54.30			44.49	38.25	6.08	34.52	Peak
2	10620.000	57.12	-6.42	63.54	43.89	40.17	6.93	33.87	PK
3	15930.000	51.37	-12.17	63.54	33.25	42.89	8.47	33.24	Average
4	15930.000	64.37	-19.17	83.54	46.25	42.89	8.47	33.24	Peak

Note: The item 1 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

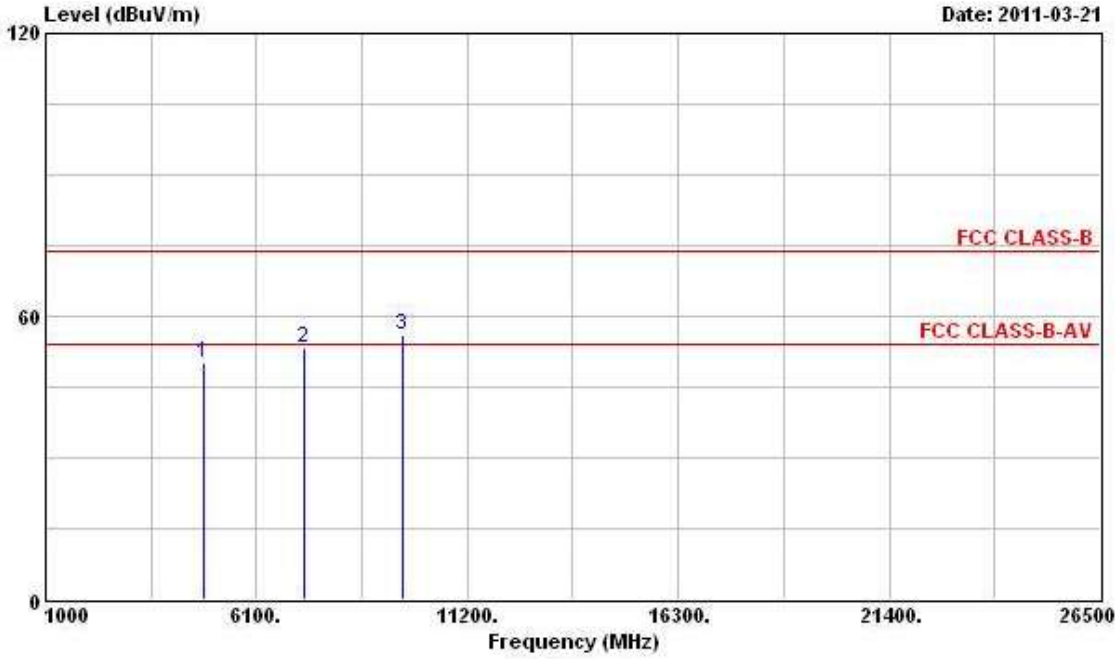


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7060.000	54.31			45.18	37.81	5.60	34.28	Peak
2	10620.000	57.67	-5.87	63.54	44.44	40.17	6.93	33.87	PK
3	15930.000	51.61	-11.93	63.54	33.49	42.89	8.47	33.24	Average
4	15930.000	64.17	-19.37	83.54	46.05	42.89	8.47	33.24	Peak

Note: The item 1 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 21, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ch. 1 (20MHz)

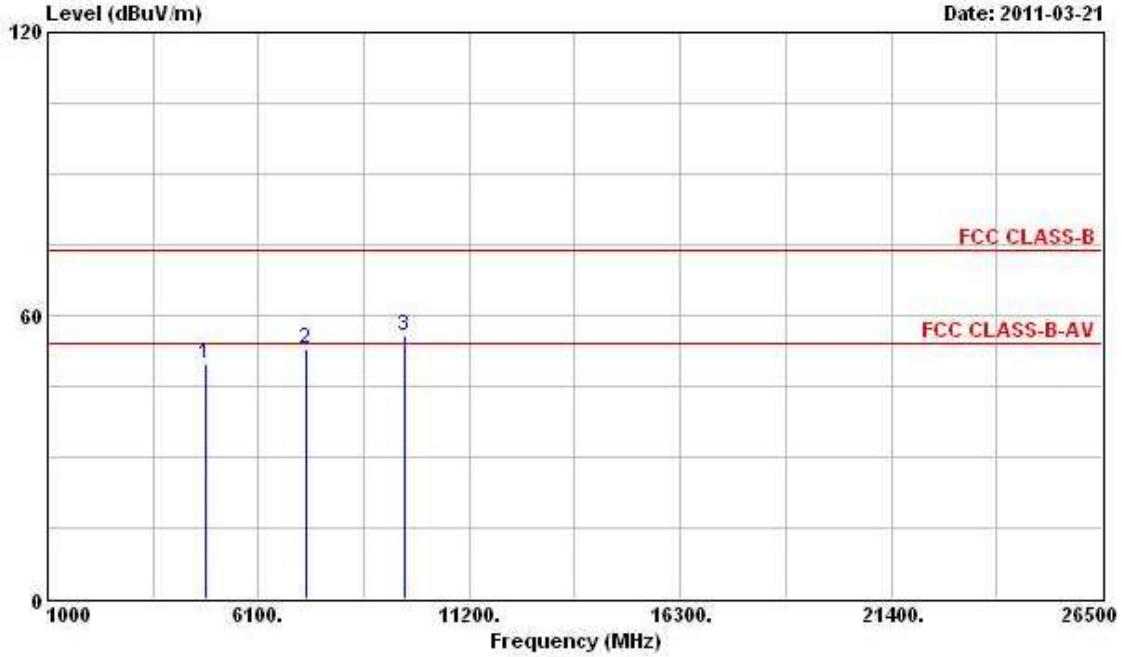
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4824.000	50.18	-3.82	54.00	44.35	35.76	4.58	34.51	PK
2	7236.000	53.40			44.21	37.85	5.63	34.29	Peak
3	9648.000	55.89			44.79	39.39	6.34	34.63	Peak

Note: The items 2 and 3 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

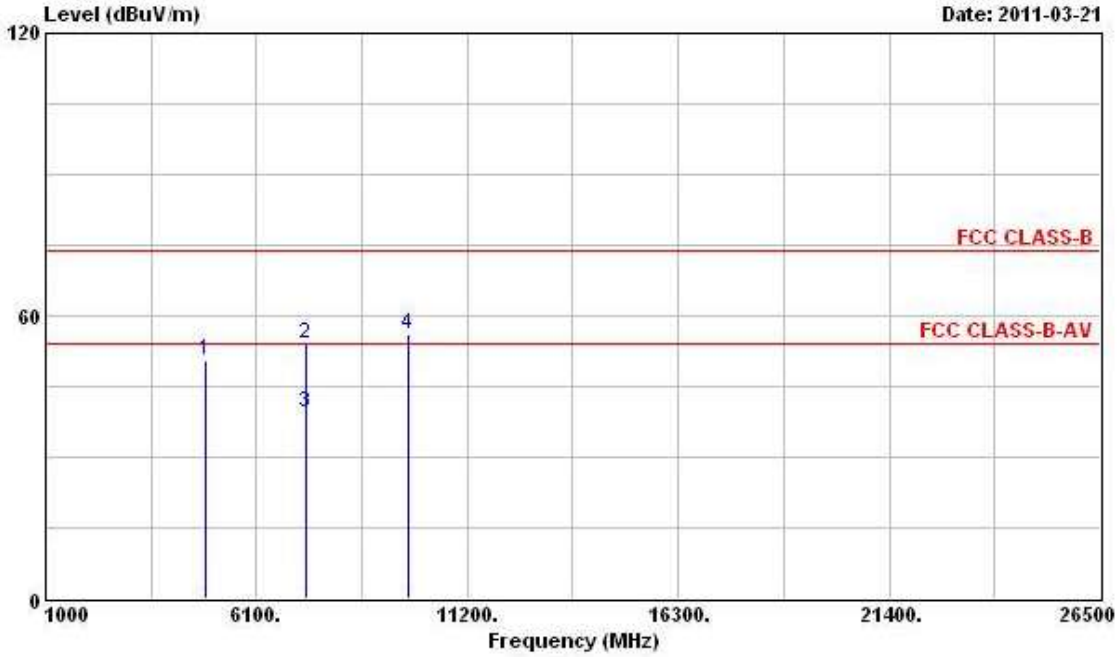


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4824.000	49.69	-4.31	54.00	44.49	35.13	4.58	34.51	PK
2	7236.000	52.86			44.62	36.90	5.63	34.29	Peak
3	9648.000	55.51			45.21	38.59	6.34	34.63	Peak

Note: The items 2 and 3 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 21, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ch. 6 (20MHz)

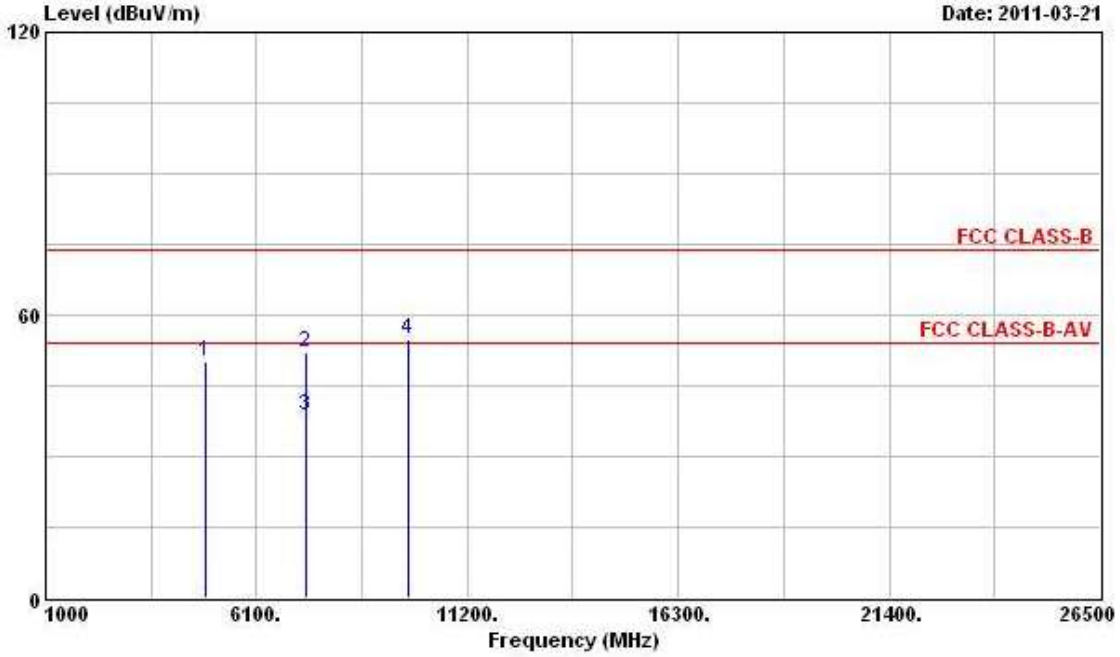
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4874.000	50.44	-3.56	54.00	44.45	35.83	4.61	34.45	PK
2	7311.000	54.05	-19.95	74.00	44.84	37.86	5.64	34.29	Peak
3	7311.000	39.37	-14.63	54.00	30.16	37.86	5.64	34.29	Average
4	9748.000	55.99	-----	-----	44.70	39.51	6.36	34.58	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

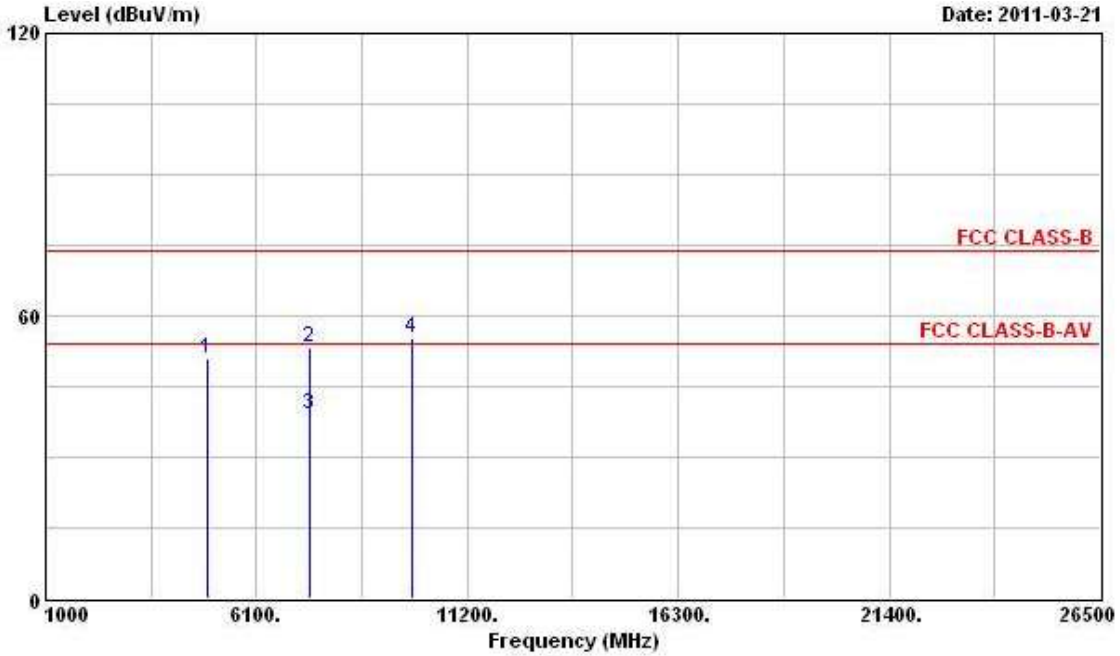


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4874.000	49.98	-4.02	54.00	44.64	35.18	4.61	34.45	PK
2	7311.000	52.25	-21.75	74.00	43.98	36.92	5.64	34.29	Peak
3	7311.000	38.67	-15.33	54.00	30.40	36.92	5.64	34.29	Average
4	9748.000	54.84			44.35	38.71	6.36	34.58	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 21, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ch. 11 (20MHz)

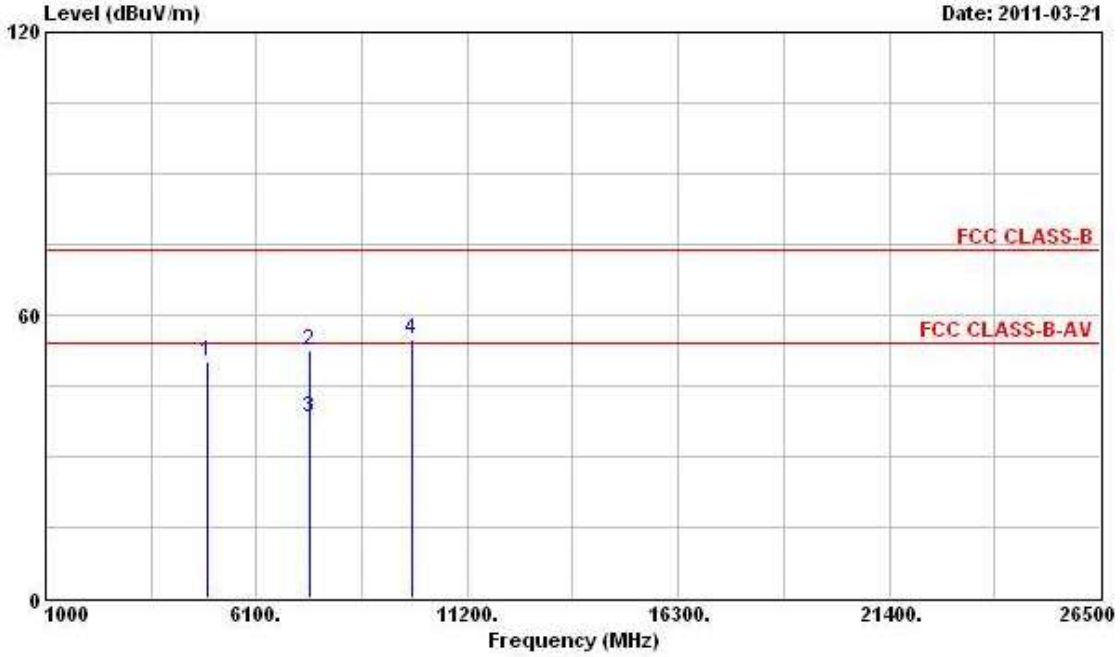
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4924.000	50.93	-3.07	54.00	44.73	35.90	4.68	34.38	PK
2	7386.000	53.22	-20.78	74.00	43.98	37.88	5.65	34.29	Peak
3	7386.000	39.14	-14.86	54.00	29.90	37.88	5.65	34.29	Average
4	9848.000	55.44			43.99	39.61	6.38	34.54	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

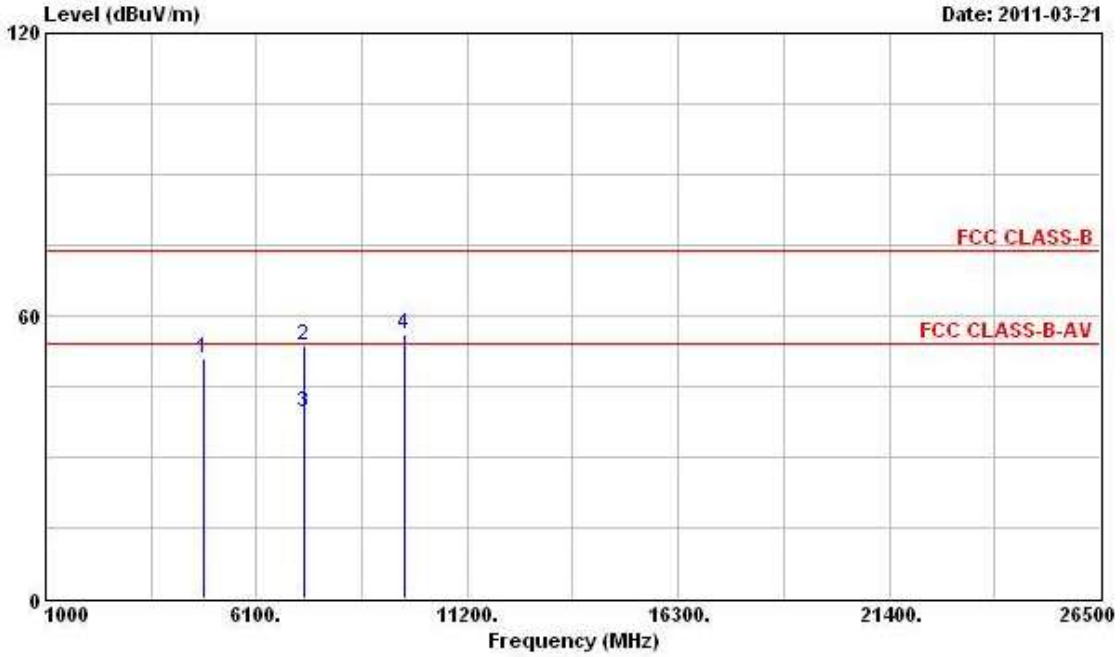


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4924.000	50.32	-3.68	54.00	44.79	35.23	4.68	34.38	PK
2	7386.000	52.49	-21.51	74.00	44.17	36.96	5.65	34.29	Peak
3	7386.000	38.36	-15.64	54.00	30.04	36.96	5.65	34.29	Average
4	9848.000	54.79			44.14	38.81	6.38	34.54	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 21, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ch. 3 (40MHz)

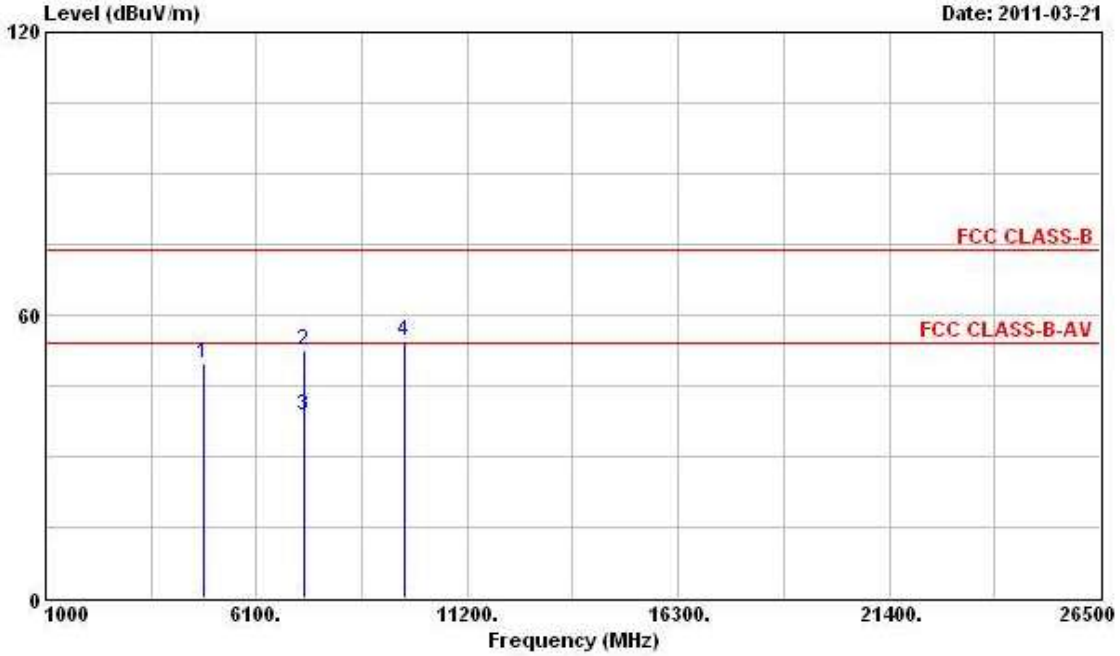
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4844.000	50.74	-3.26	54.00	44.83	35.78	4.61	34.48	PK
2	7266.000	53.77	-20.23	74.00	44.57	37.86	5.63	34.29	Peak
3	7266.000	39.34	-14.66	54.00	30.14	37.86	5.63	34.29	Average
4	9688.000	55.88			44.70	39.43	6.35	34.60	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

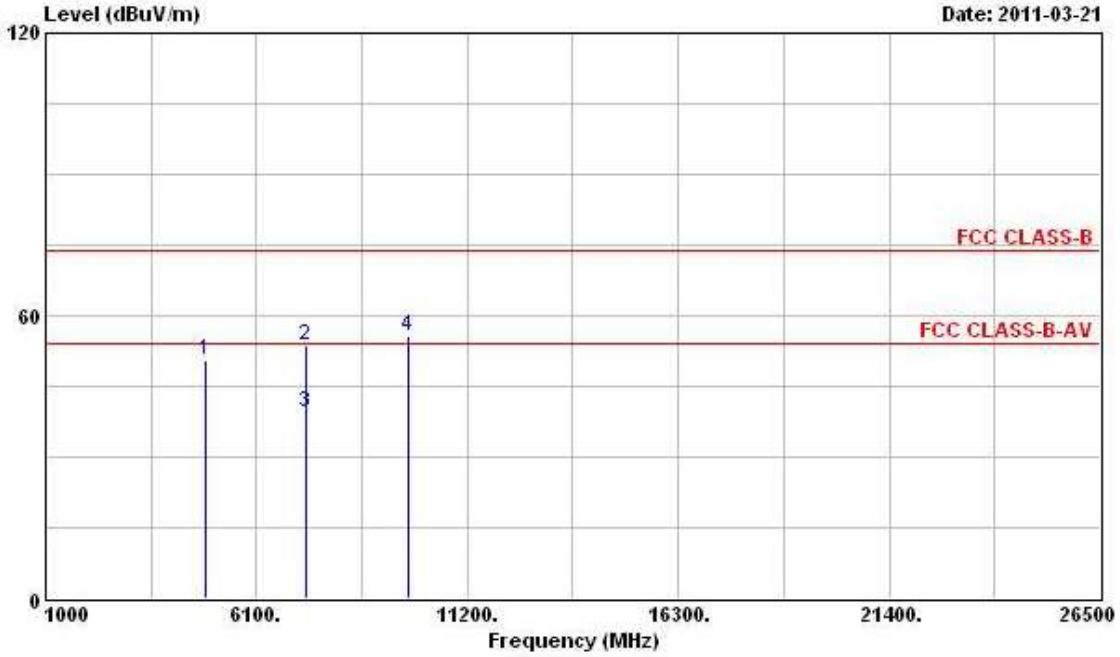


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4844.000	49.68	-4.32	54.00	44.41	35.14	4.61	34.48	PK
2	7266.000	52.47	-21.53	74.00	44.22	36.91	5.63	34.29	Peak
3	7266.000	38.66	-15.34	54.00	30.41	36.91	5.63	34.29	Average
4	9688.000	54.45			44.07	38.63	6.35	34.60	PK

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 21, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ch. 6 (40MHz)

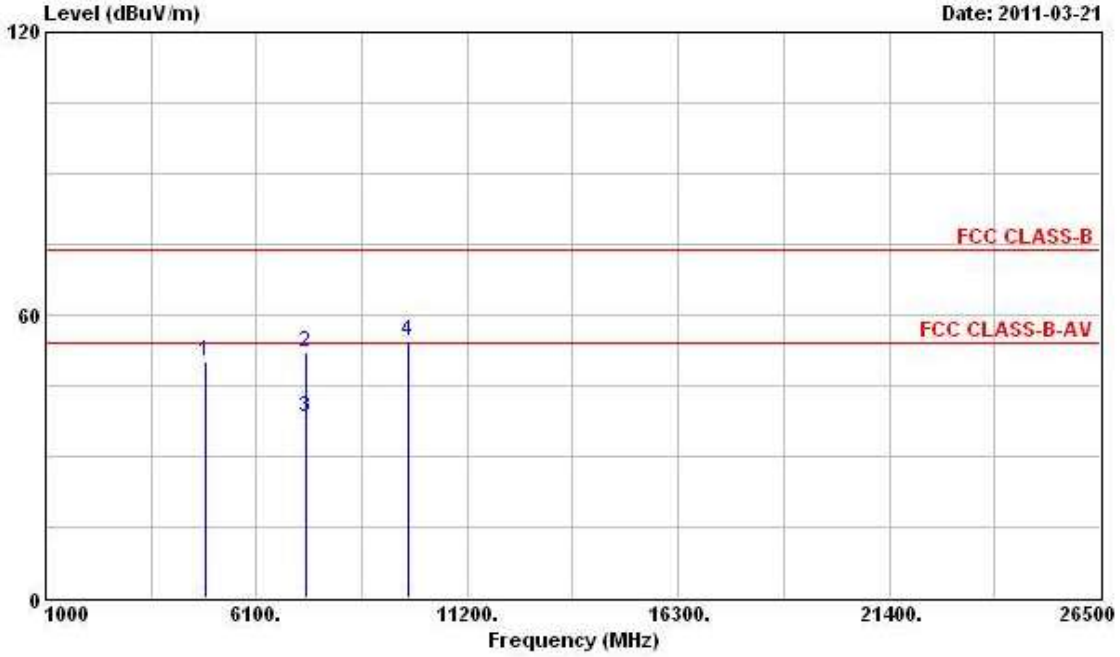
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4874.000	50.43	-3.57	54.00	44.44	35.83	4.61	34.45	PK
2	7311.000	53.79	-20.21	74.00	44.58	37.86	5.64	34.29	Peak
3	7311.000	39.39	-14.61	54.00	30.18	37.86	5.64	34.29	Average
4	9748.000	55.80			44.51	39.51	6.36	34.58	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

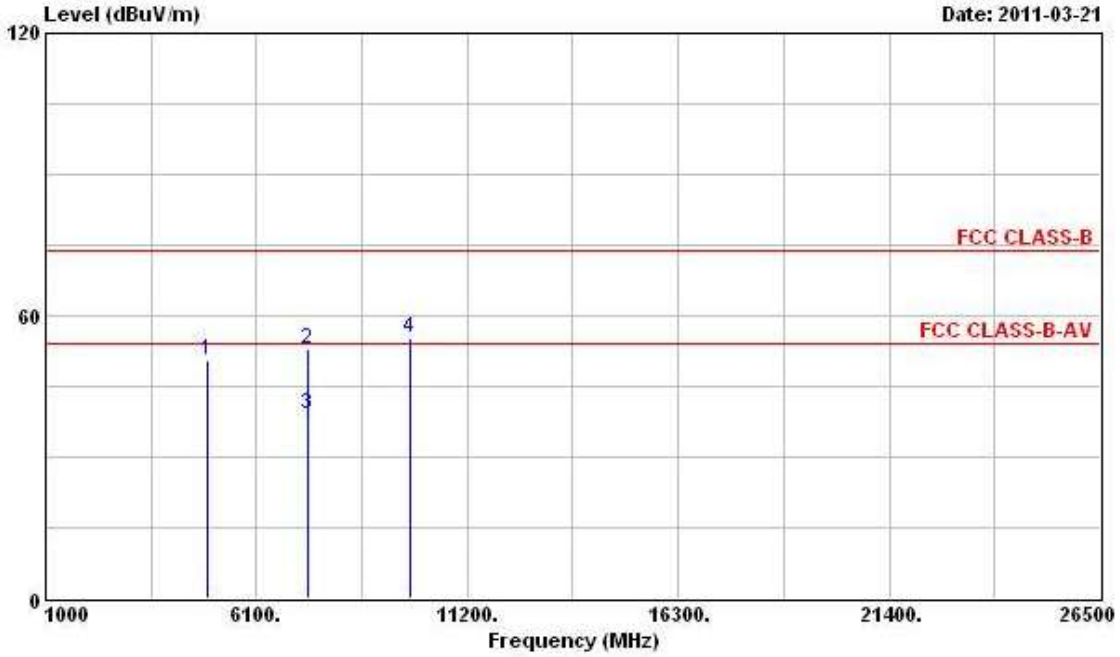


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4874.000	50.12	-3.88	54.00	44.78	35.18	4.61	34.45	PK
2	7311.000	52.19	-21.81	74.00	43.92	36.92	5.64	34.29	Peak
3	7311.000	38.48	-15.52	54.00	30.21	36.92	5.64	34.29	Average
4	9748.000	54.38			43.89	38.71	6.36	34.58	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Mar. 21, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ch. 9 (40MHz)

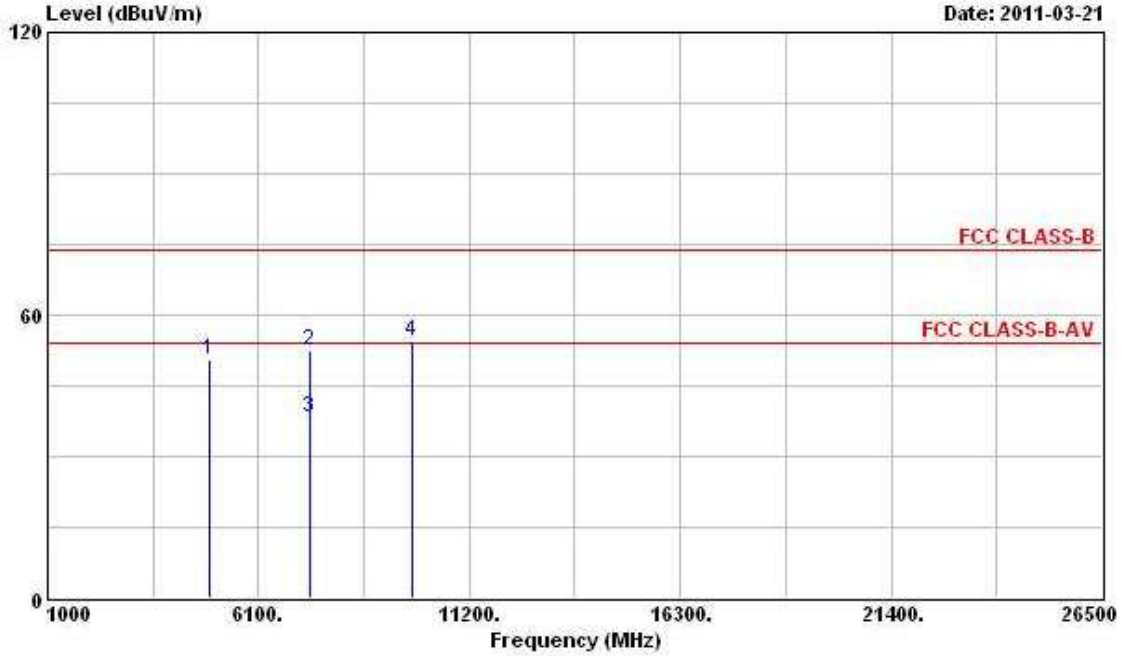
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4904.000	50.44	-3.56	54.00	44.34	35.88	4.64	34.42	PK
2	7356.000	52.76	-21.24	74.00	43.54	37.87	5.64	34.29	Peak
3	7356.000	39.00	-15.00	54.00	29.78	37.87	5.64	34.29	Average
4	9808.000	55.23			43.85	39.57	6.37	34.56	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4904.000	50.47	-3.53	54.00	45.04	35.21	4.64	34.42	PK
2	7356.000	52.45	-21.55	74.00	44.16	36.94	5.64	34.29	Peak
3	7356.000	38.11	-15.89	54.00	29.82	36.94	5.64	34.29	Average
4	9808.000	54.58			44.00	38.77	6.37	34.56	Peak

Note: The item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.6 Band Edge and Fundamental Emissions Measurement

3.6.1 Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.6.2 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 Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak

3.6.3 Test Procedures

1. The test procedure is the same as section 3.5.3; only the frequency range investigated is limited to 100MHz around band edges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

3.6.4 Test Setup Layout

This test setup layout is the same as that shown in section 3.5.4.

3.6.5 Test Deviation

There is no deviation with the original standard.

3.6.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.6.7 Test Result of Band Edge and Fundamental Emissions

For Two Chain:

Final Test Date	Mar. 23, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ant. A+Ant. B Ch. 149, 157, 165 (20MHz)

Channel 149

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5724.970	79.01			37.00	36.97	5.04	0.00	Average
2 @	5752.340	110.57			68.49	37.01	5.07	0.00	Average
1 @	5723.500	98.05			56.04	36.97	5.04	0.00	Peak
2 @	5748.210	124.87			82.81	36.99	5.07	0.00	Peak

The item 2 is fundamental emissions and the item 1 ais on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 157

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	5724.820	59.87			17.86	36.97	5.04	0.00	Average
2 @	5779.900	113.42			71.30	37.03	5.09	0.00	Average
3	5850.790	59.49			17.27	37.11	5.11	0.00	Average
1	5722.100	76.37			34.36	36.97	5.04	0.00	Peak
2 @	5777.350	127.55			85.45	37.03	5.07	0.00	Peak
3	5850.110	74.17			31.95	37.11	5.11	0.00	Peak

The item 2 is fundamental emissions and the items 1 and 3 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 165

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5817.530	109.33			67.15	37.07	5.11	0.00	Average
2 @	5850.090	69.02			26.80	37.11	5.11	0.00	Average
1 @	5821.490	123.24			81.04	37.09	5.11	0.00	Peak
2 @	5850.000	89.10			46.88	37.11	5.11	0.00	Peak

The item 1 is fundamental emissions and the item 2 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Final Test Date	Mar. 23, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	5G 802.11n Ant. A+ Ant. B Ch. 151, 159 (40MHz)

Channel 151

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5724.700	81.41			39.40	36.97	5.04	0.00	Average
2 @	5770.600	107.27			65.17	37.03	5.07	0.00	Average
1 @	5725.000	98.36			56.35	36.97	5.04	0.00	Peak
2 @	5766.200	122.14			80.06	37.01	5.07	0.00	Peak

The item 2 is fundamental emissions and the item 1 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 159

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5779.800	109.64			67.52	37.03	5.09	0.00	Average
2 @	5850.000	72.71			30.49	37.11	5.11	0.00	Average
1 @	5780.300	125.12			83.00	37.03	5.09	0.00	Peak
2 @	5850.000	91.65			49.43	37.11	5.11	0.00	Peak

The item 1 is fundamental emissions and the item 2 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Final Test Date	Mar. 19, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ant. A+ Ant. B Ch. 1, 6, 11(20MHz)

Channel 1

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	2390.000	52.20	-1.80	54.00	17.15	32.03	3.02	0.00	Average
2 @	2417.540	97.18			62.07	32.09	3.02	0.00	Average
1	2389.610	68.66	-5.34	74.00	33.61	32.03	3.02	0.00	Peak
2 @	2416.970	111.26			76.15	32.09	3.02	0.00	Peak

The item 2 is fundamental emissions.

Channel 6

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	2442.050	96.31			61.05	32.21	3.05	0.00	Average
1 @	2442.050	110.45			75.19	32.21	3.05	0.00	Peak

The item 1 is fundamental emissions.

Channel 11

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	2467.130	96.73			61.37	32.28	3.08	0.00	Average
2 @	2483.500	52.34	-1.66	54.00	16.92	32.34	3.08	0.00	Average
1 @	2468.650	111.40			76.04	32.28	3.08	0.00	Peak
2	2483.850	70.86	-3.14	74.00	35.44	32.34	3.08	0.00	Peak

The item 1 is fundamental emissions.

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Final Test Date	Mar. 19, 2011	**Test Site No.**	03CH02-HY
Temperature	23℃	**Humidity**	51.5%
Test Engineer	Daniel	**Configuration**	2.4G 802.11n Ant. A+ Ant. B Ch. 3, 6, 9 (40MHz)

Channel 3

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	2390.000	52.52	-1.48	54.00	17.47	32.03	3.02	0.00	Average
2 @	2407.850	91.36			56.25	32.09	3.02	0.00	Average
1 @	2390.000	71.93	-2.07	74.00	36.88	32.03	3.02	0.00	Peak
2 @	2411.650	107.50			72.39	32.09	3.02	0.00	Peak

The item 2 is fundamental emissions.

Channel 6

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	2450.220	91.52			56.26	32.21	3.05	0.00	Average
1 @	2454.020	107.66			72.33	32.28	3.05	0.00	Peak

The item 1 is fundamental emissions.

Channel 9

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	2466.940	90.12			54.76	32.28	3.08	0.00	Average
2 @	2483.500	52.49	-1.51	54.00	17.07	32.34	3.08	0.00	Average
1 @	2466.940	106.12			70.76	32.28	3.08	0.00	Peak
2 @	2484.420	71.44	-2.56	74.00	36.02	32.34	3.08	0.00	Peak

The item 1 is fundamental emissions.

Note:

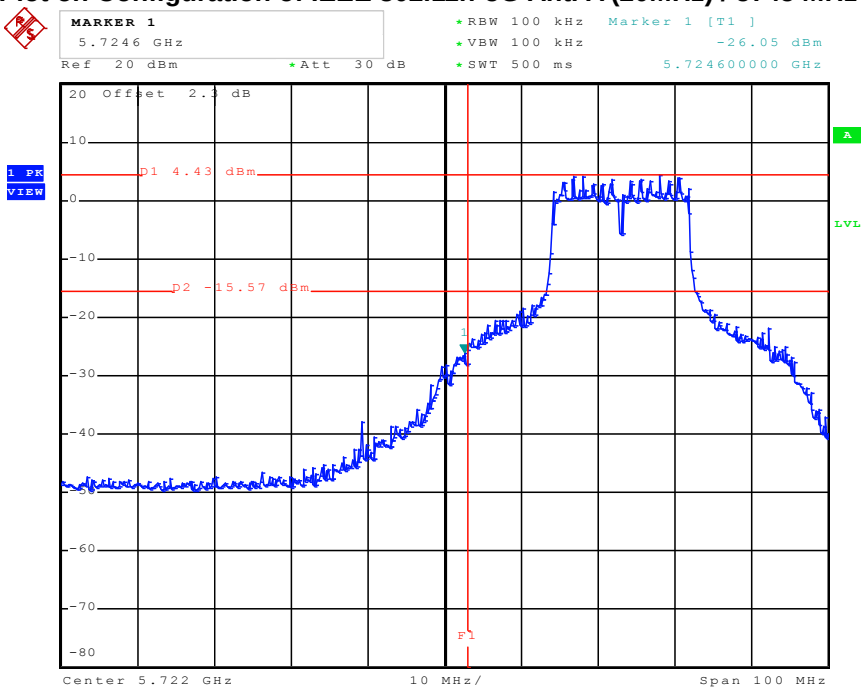
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

For Emission not in Restricted Band

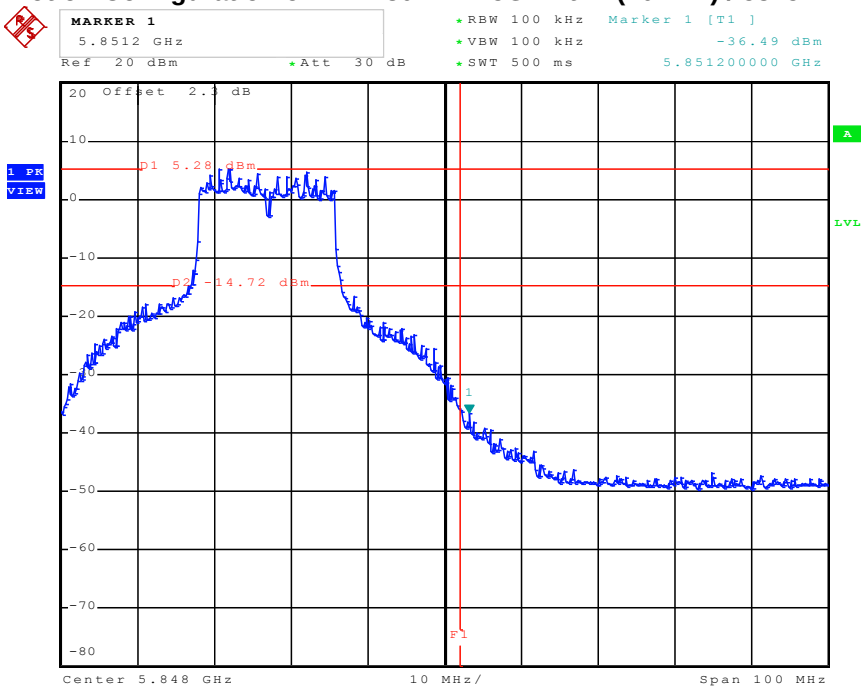
Final Test Date	Apr. 30, 2011	**Test Site No.**	TH01-HY
Temperature	26℃	**Humidity**	62%
Test Engineer	Ian	**Configuration**	802.11n

Low Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5745 MHz



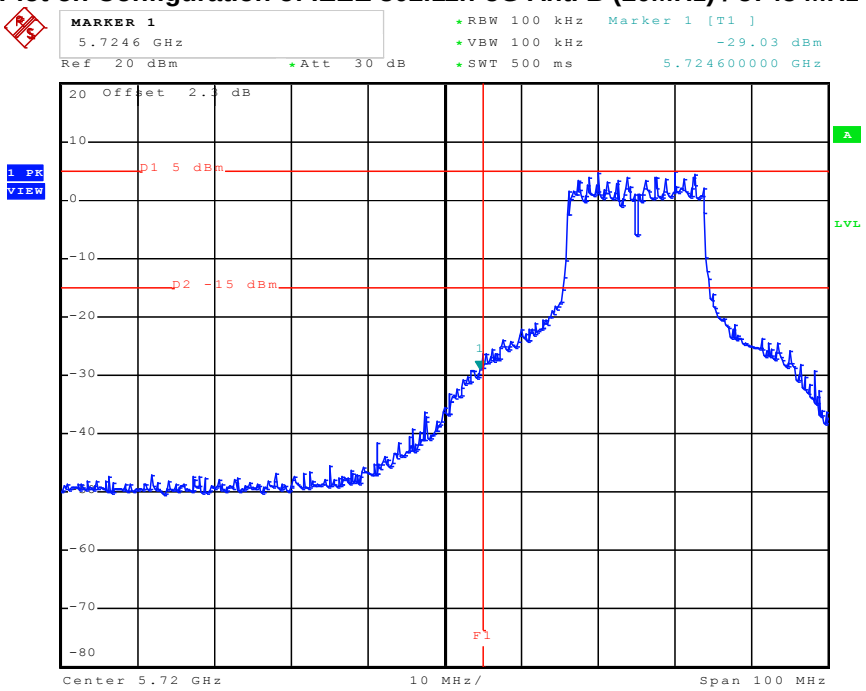
Date: 30.APR.2011 17:13:34

High Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. A (20MHz) / 5825 MHz



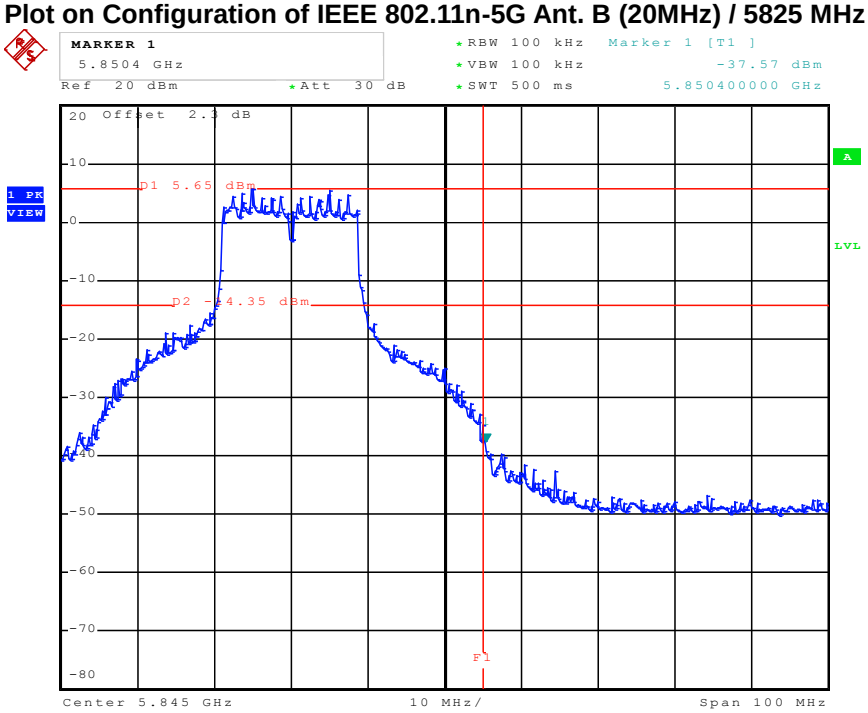
Date: 30.APR.2011 17:20:05

Low Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5745 MHz



Date: 30.APR.2011 17:24:27

High Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. B (20MHz) / 5825 MHz



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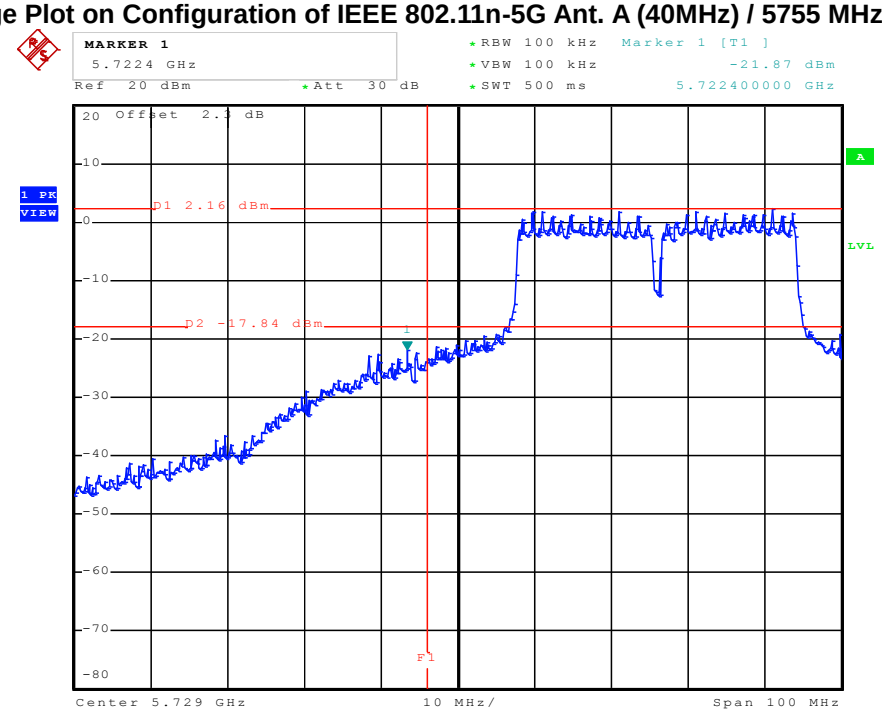
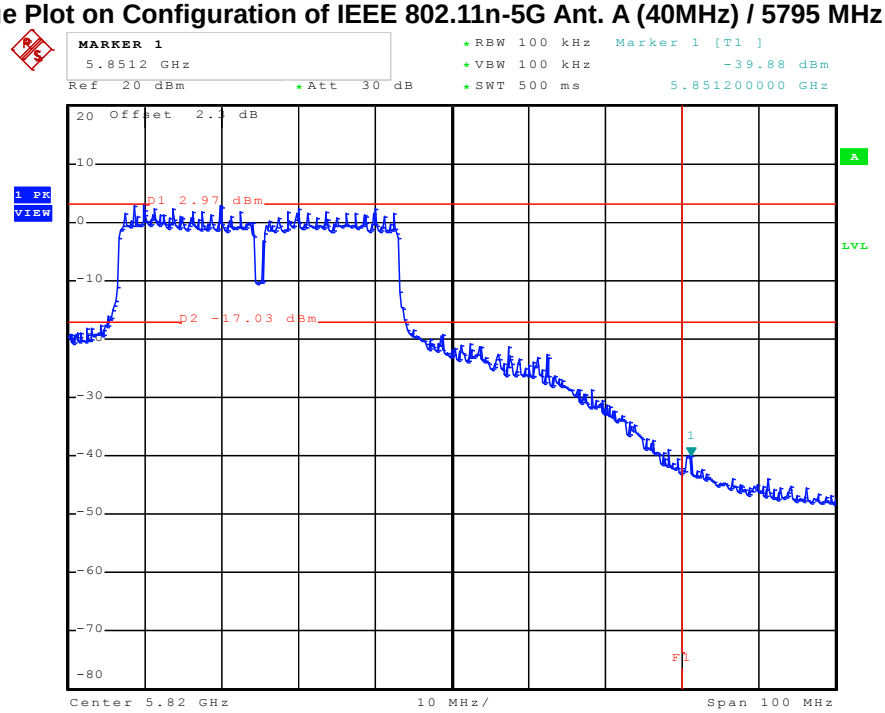
Low Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. A (40MHz) / 5755 MHz



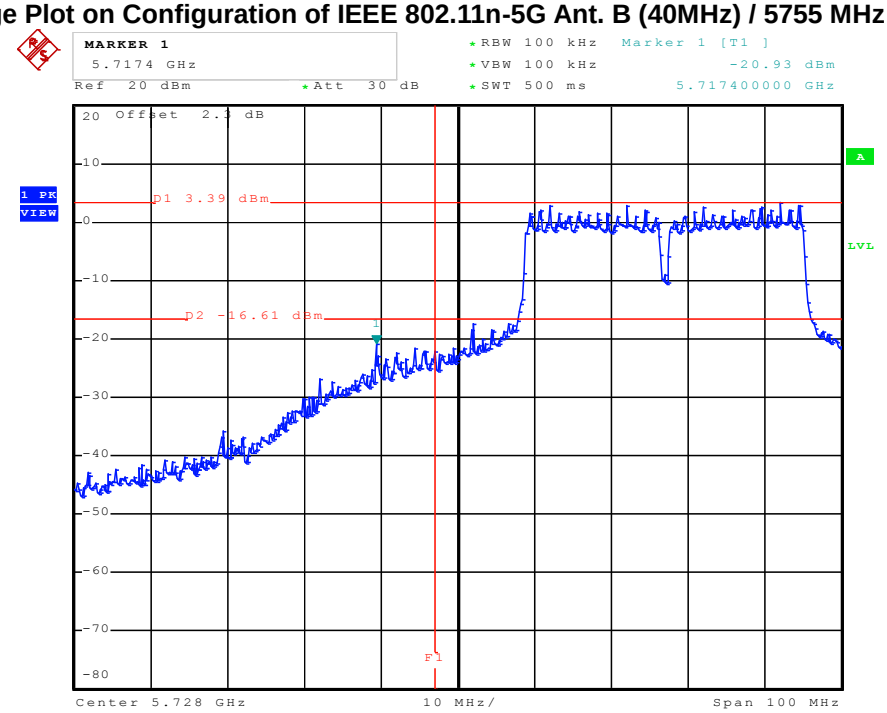
Date: 30.APR.2011 19:01:15

High Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. A (40MHz) / 5795 MHz

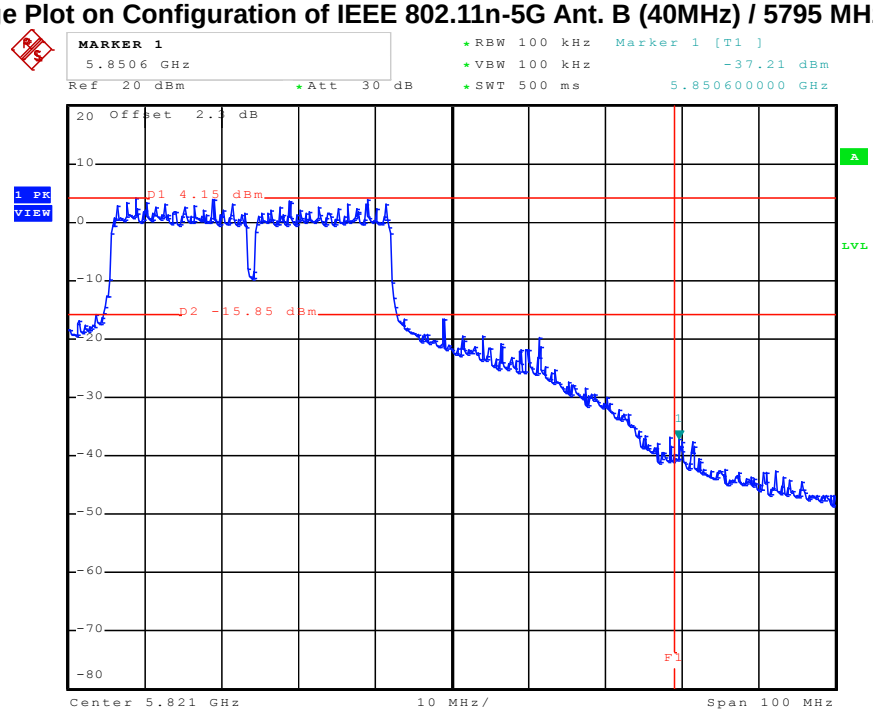


Date: 30.APR.2011 19:05:45

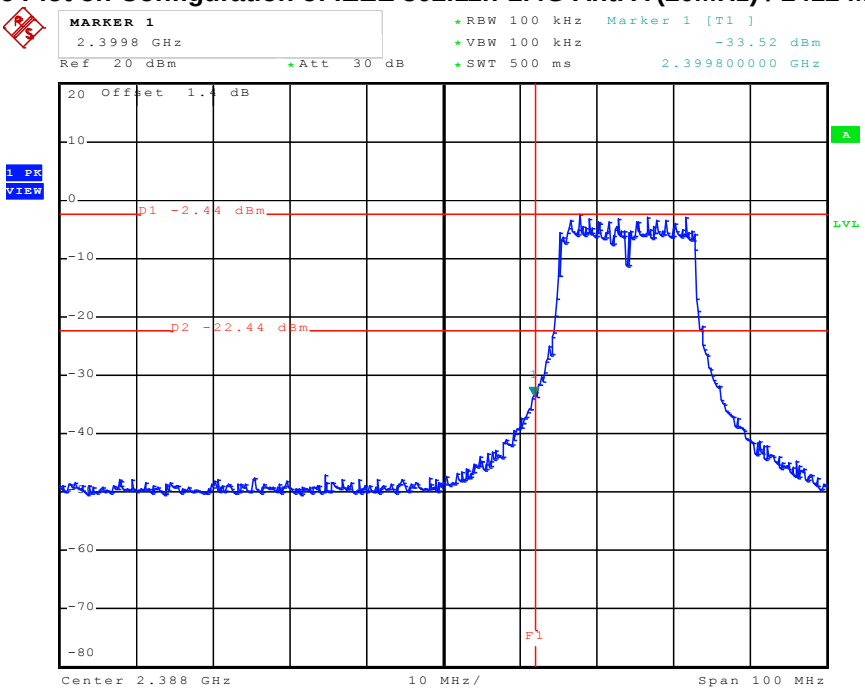
Low Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. B (40MHz) / 5755 MHz



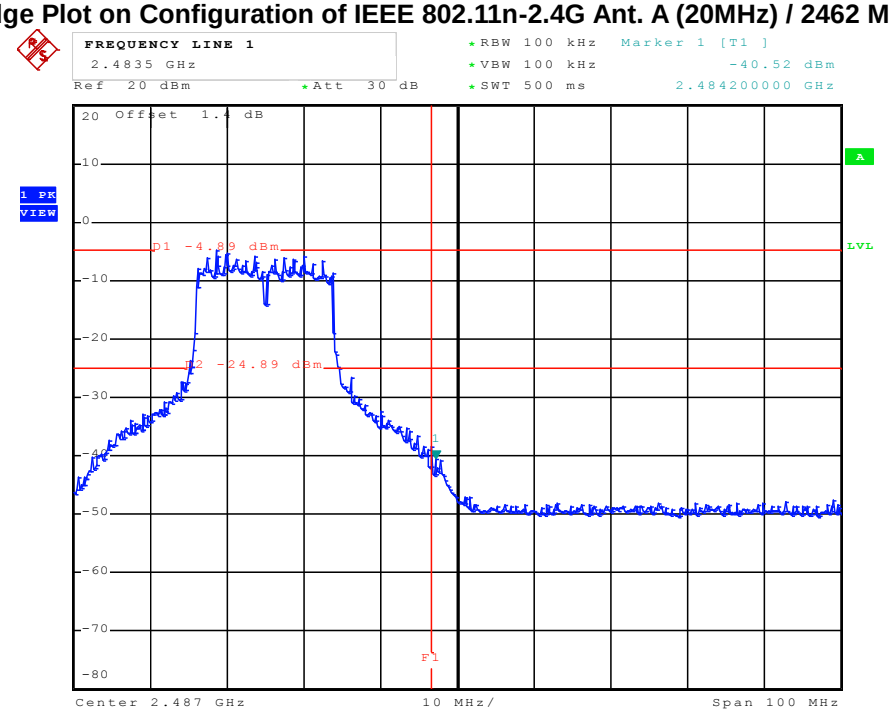
High Band Edge Plot on Configuration of IEEE 802.11n-5G Ant. B (40MHz) / 5795 MHz



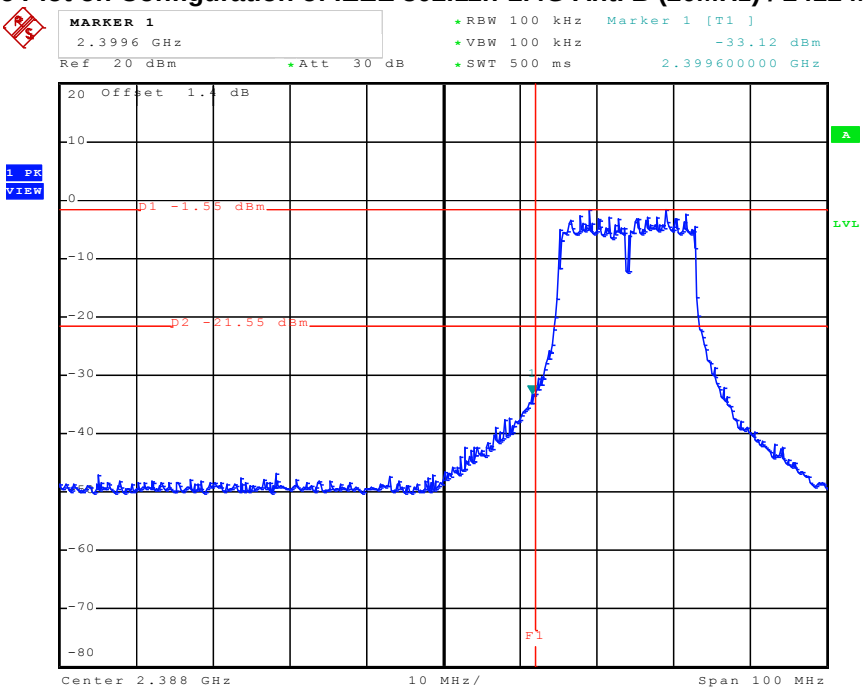
Low Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2412 MHz



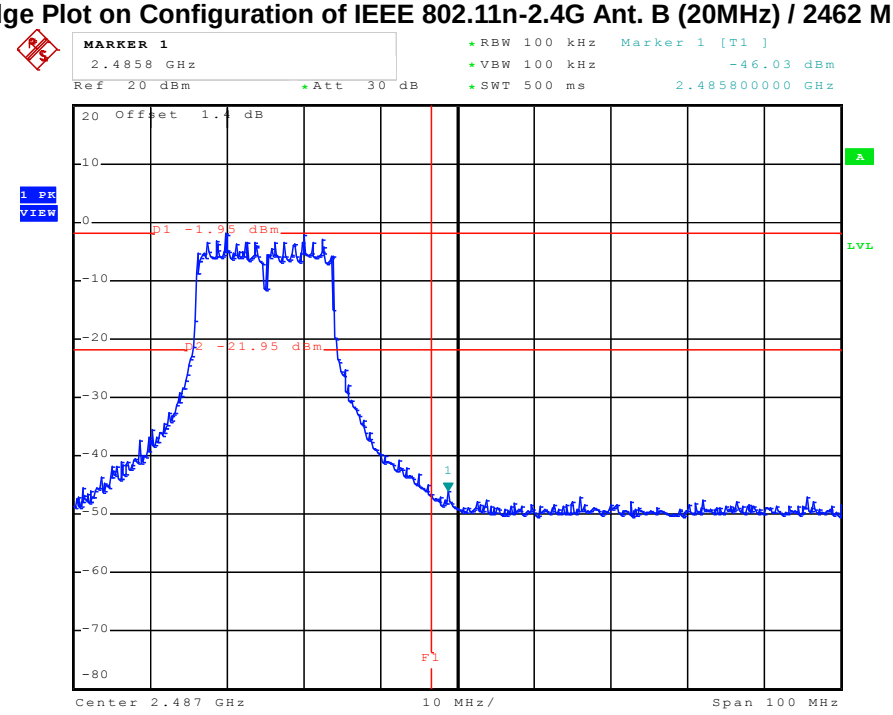
High Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. A (20MHz) / 2462 MHz



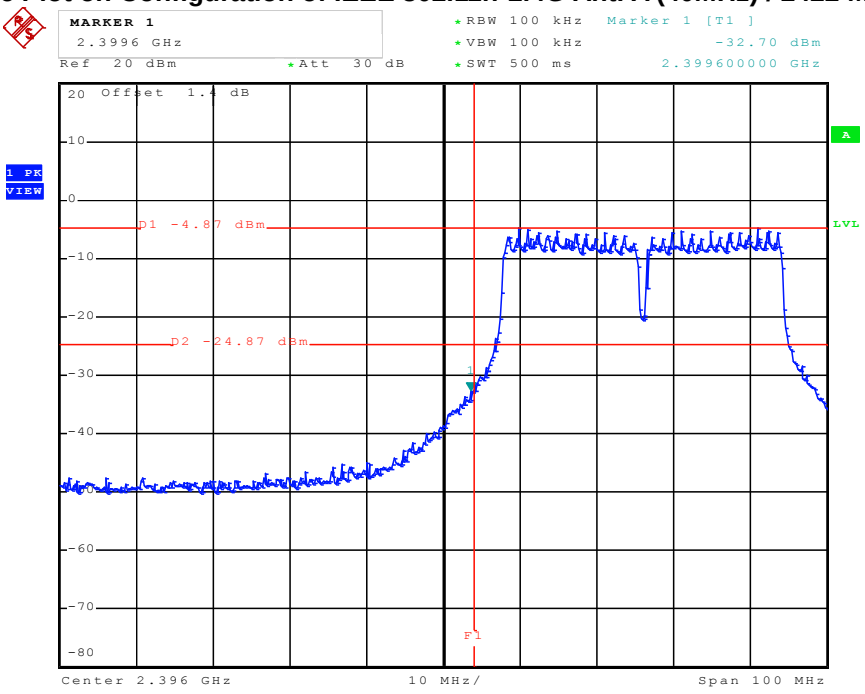
Low Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2412 MHz



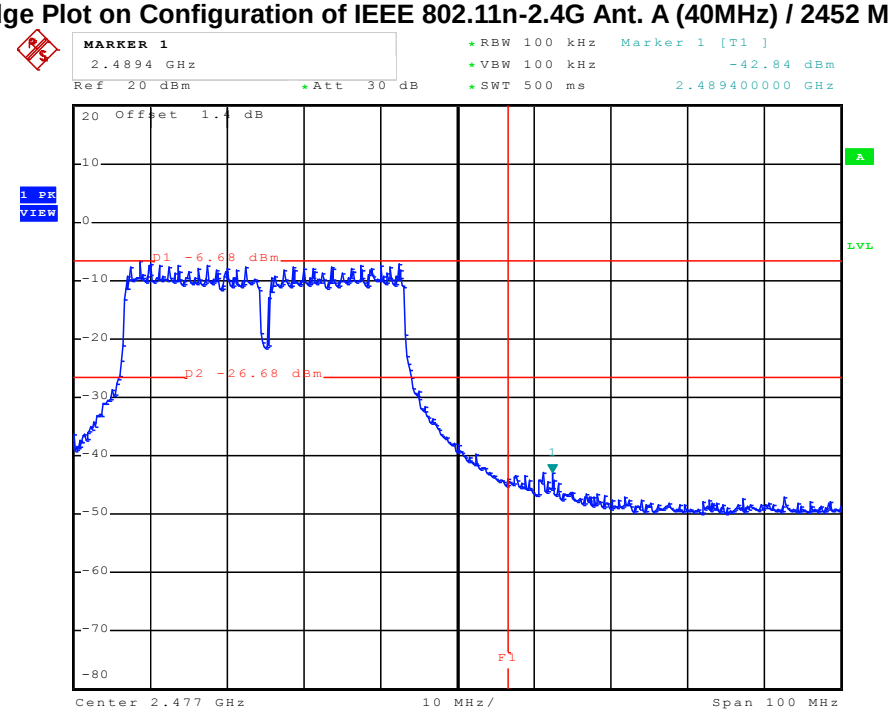
High Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. B (20MHz) / 2462 MHz



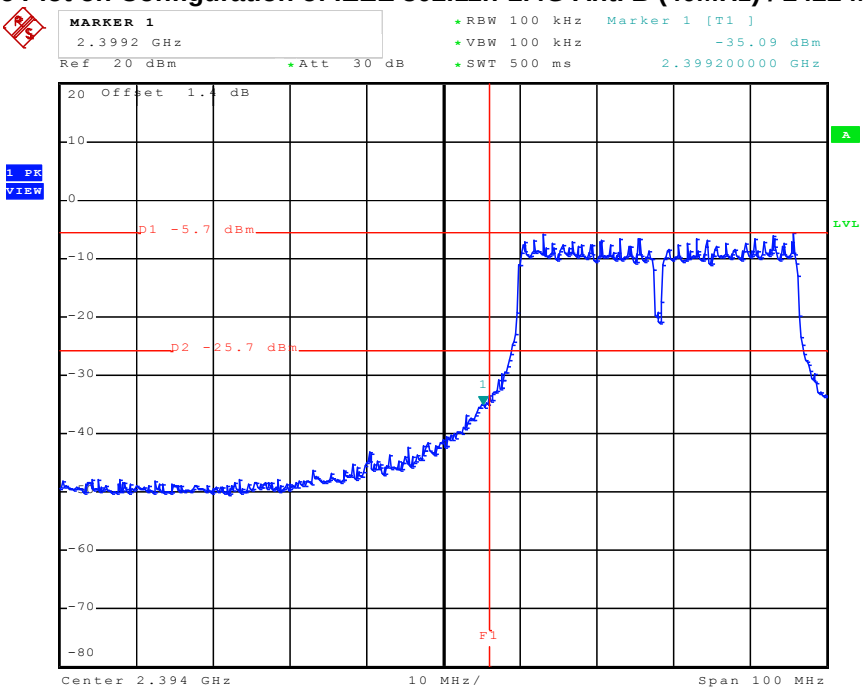
Low Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2422 MHz



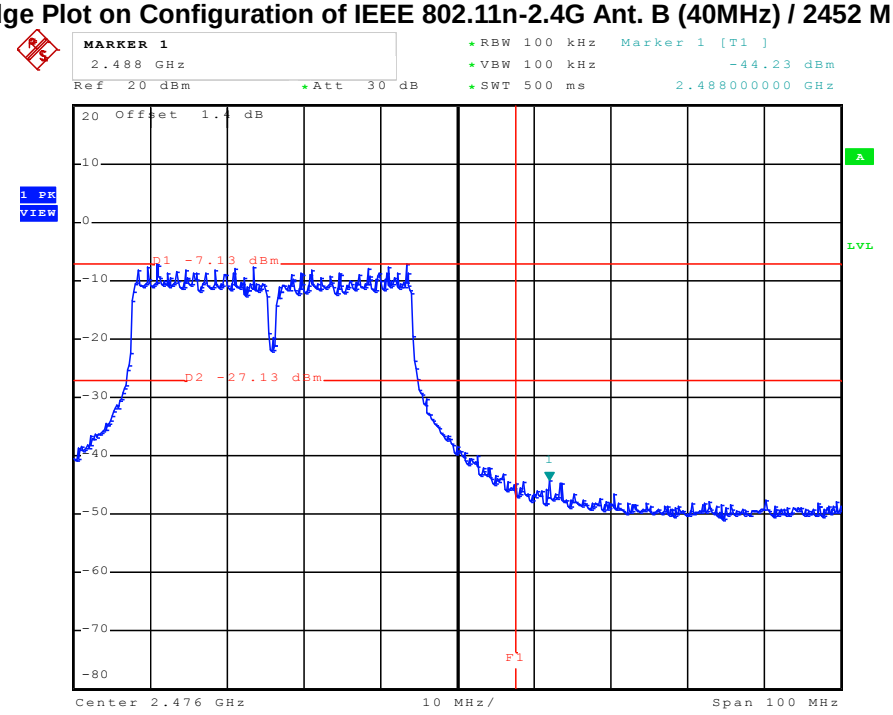
High Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. A (40MHz) / 2452 MHz



Low Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2422 MHz



High Band Edge Plot on Configuration of IEEE 802.11n-2.4G Ant. B (40MHz) / 2452 MHz



3.7 Antenna Requirements

3.7.1 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

3.7.2 Antenna Connector Construction

Please refer to section 2.2 in this test report; antenna connector complied with the requirements.

4 LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9kHz – 2.75GHz	Sep. 14, 2010	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz – 30MHz	Jan. 31, 2011	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9kHz – 30MHz	Mar. 01, 2011	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 – 60Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	9kHz – 30MHz	Mar. 02, 2011	Conduction (CO01-HY)
Isolation Transformer	Erika Fiedler OHG	D-65396 Walluf	58	45MHz-2.15GHz	N/A	Conduction (CO01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSU26.5	100015	20Hz ~ 26.5GHz	Nov. 19, 2010	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-S	MAB0103-001	N/A	Oct. 22, 2010	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 02, 2010	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 02, 2010	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 19, 2010	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	0917017	300MHz~40GHz	Dec. 03, 2010	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	0949003	300MHz~40GHz	Dec. 03, 2010	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	Jul. 26, 2010*	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	FSP40	100004	9 kHz - 40 GHz	Nov. 17, 2010	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30 MHz - 1 GHz 3m	May 01, 2010	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100 kHz – 1.3 GHz	Jul. 23, 2010	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz – 26.5 GHz	Jul. 23, 2010	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz~18GHz	Nov. 11, 2010	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Mar. 07, 2011	Radiation (03CH02-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX106	03CH02-HY	1GHz~40GHz	Mar. 07, 2011	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30 MHz - 2 GHz	Oct. 16, 2010	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0 - 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 m - 4 m	N/A	Radiation (03CH02-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	Jul. 29, 2010*	Radiation (03CH02-HY)

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

5 TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, 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	:	886-3-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd 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

Certificate No. : L1190-110111

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

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 Arrangment with Foreign Authorities

Jay-San Chen
President, Taiwan Accreditation Foundation
Date : January 11, 2011

P1, total 24 pages

Appendix A. Maximum Permissible Exposure

1. Maximum Permissible Exposure

1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

1.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)
P = Peak RF output power (W)
G = EUT Antenna numeric gain (numeric)
d = Separation distance between radiator and human body (m)
The formula can be changed to

Pd = $\frac{30 \times P \times G}{377 \times d^2}$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

1.3. Calculated Result and Limit

Antenna Type : Dipole Antenna
Max Conducted Power for IEEE 802.11n (20MHz) port A: 21.54dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	2	1.584893	21.54	142.5608	**0.0450**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 22.36dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	2	1.584893	22.36	172.1869	**0.0543**

IEEE 802.11n (20MHz) port A + port B Power Density = 0.0450 + 0.0543 = 0.0993 (mW/cm2)

Max Conducted Power for IEEE 802.11n (40MHz) port A: 20.61dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	2	1.584893	20.61	115.0800	**0.0363**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 21.87dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5G	20	2	1.584893	21.87	153.8155	**0.0485**

IEEE 802.11n (40MHz) port A + port B Power Density = 0.0363 + 0.0485 = 0.0848 (mW/cm2)

Max Conducted Power for IEEE 802.11n (20MHz) port A: 19.52dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	2	1.584893	19.52	89.5365	**0.0282**

Max Conducted Power for IEEE 802.11n (20MHz) port B: 18.53dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	2	1.584893	18.53	71.2853	**0.0225**

IEEE 802.11n (20MHz) port A + port B Power Density = 0.0282 + 0.0225 = 0.0507 (mW/cm2)

Max Conducted Power for IEEE 802.11n (40MHz) port A: 18.16dBm

Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	2	1.584893	18.16	65.4636	**0.0207**

Max Conducted Power for IEEE 802.11n (40MHz) port B: 17.32dBm

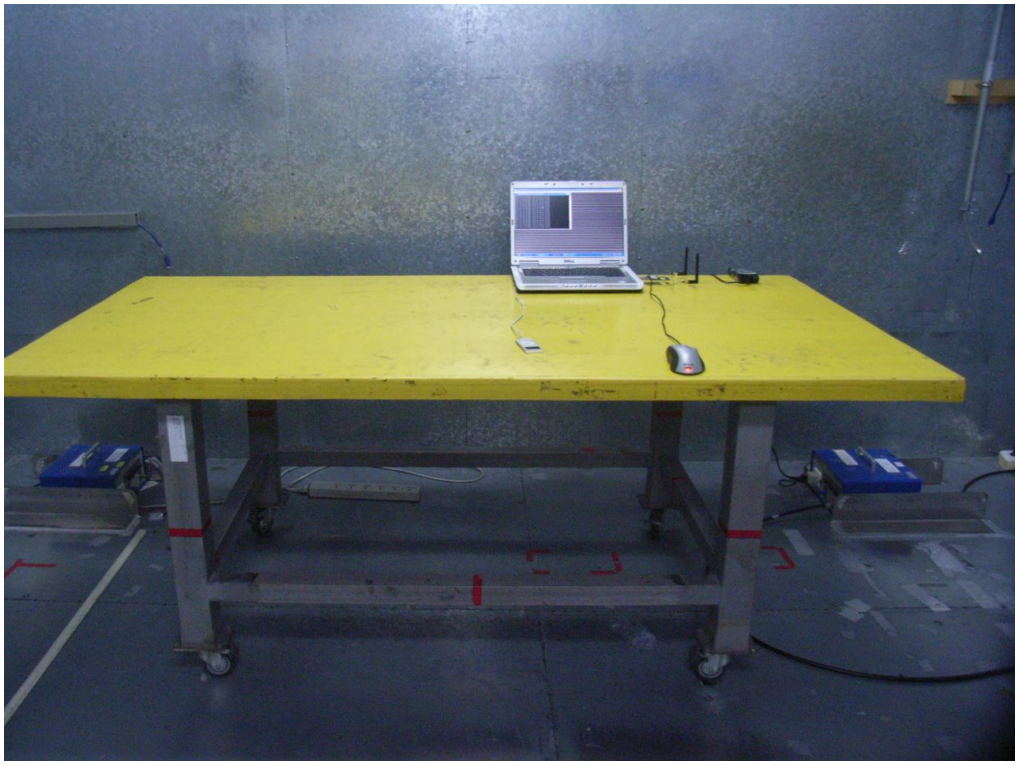
Test Mode	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
2.4G	20	2	1.584893	17.32	53.9511	**0.0170**

IEEE 82.11n (40MHz) port A + port B Power Density = 0.0207 + 0.0170 = 0.0377 (mW/cm2)

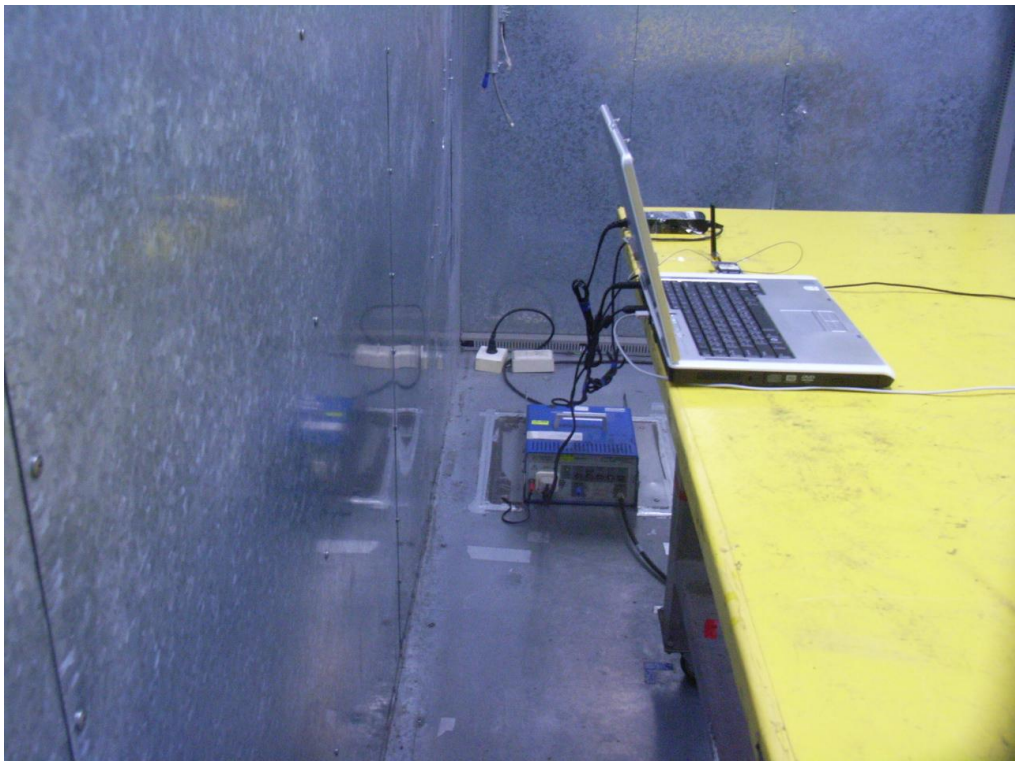
Appendix B. Test Photos

1 Photographs of Conducted Emissions Test Configuration

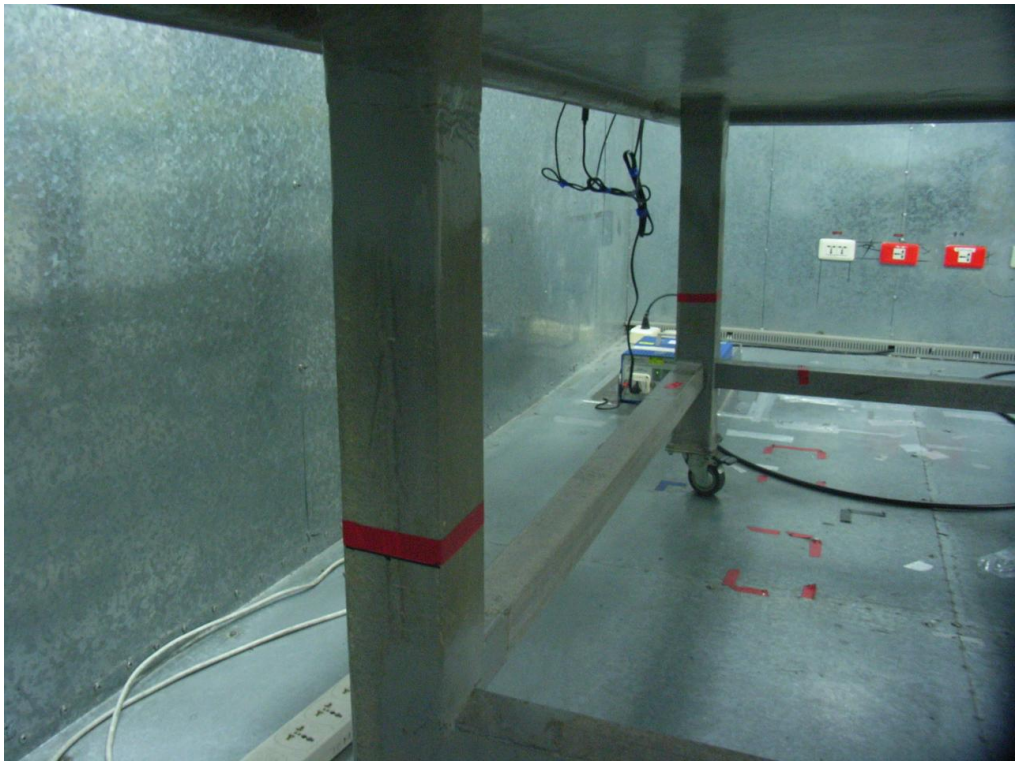
FRONT VIEW



REAR VIEW



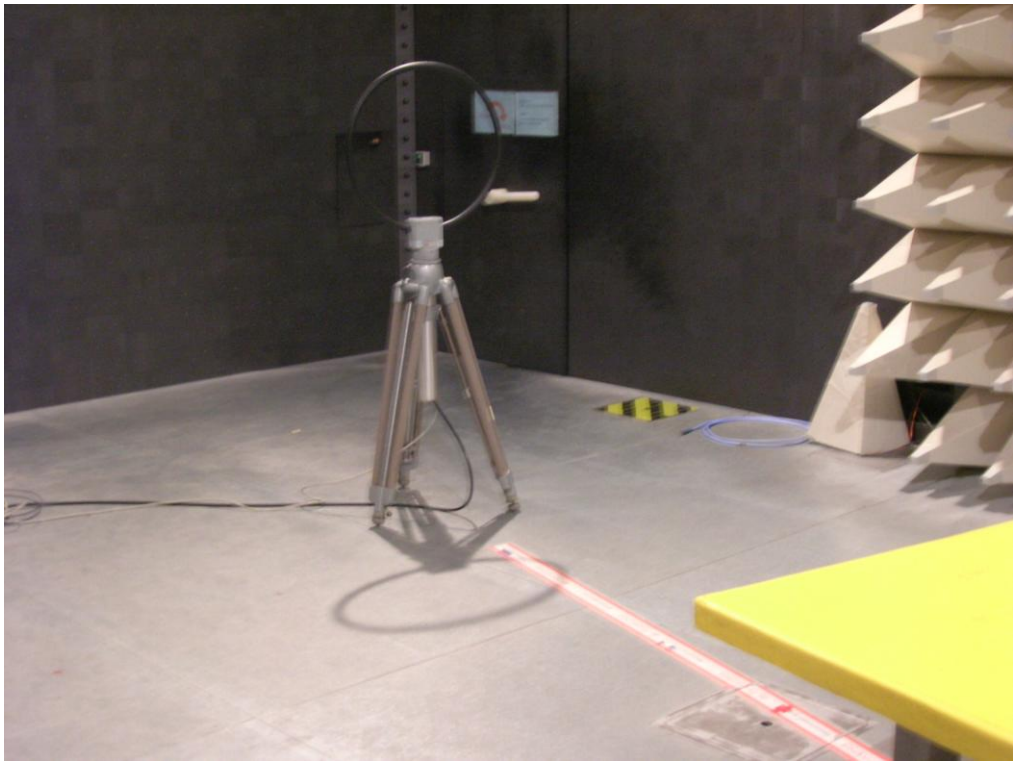
SIDE VIEW



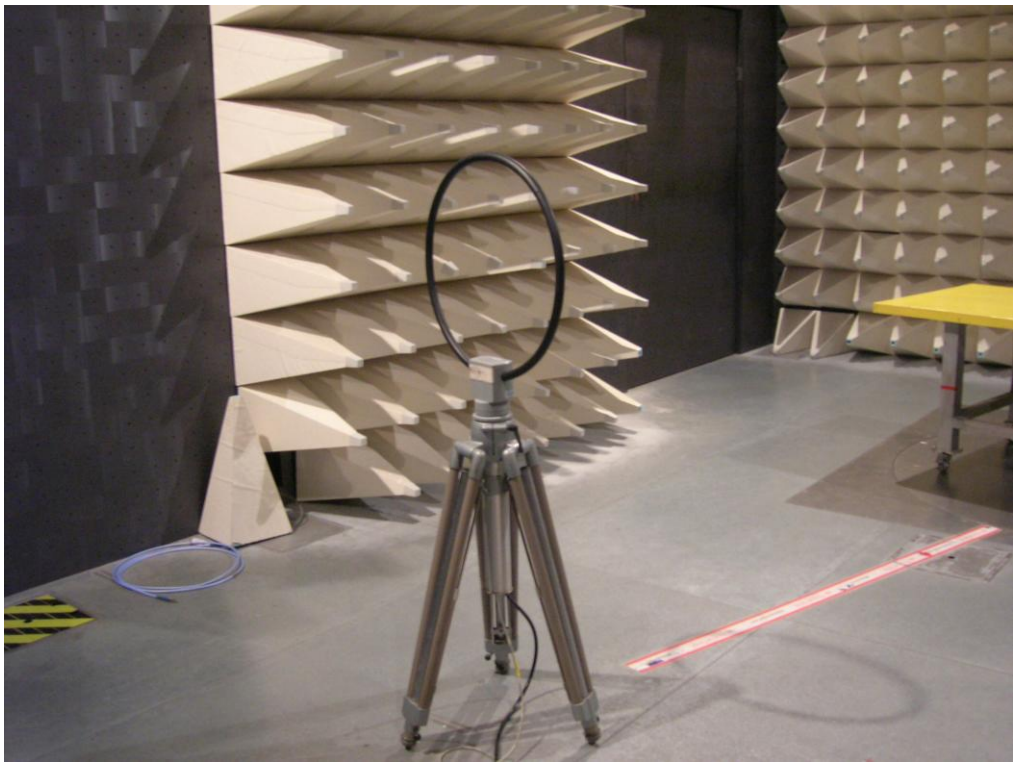
2 Photographs of Radiated Emissions Test Configuration

For radiated emissions 9kHz~30MHz

FRONT VIEW

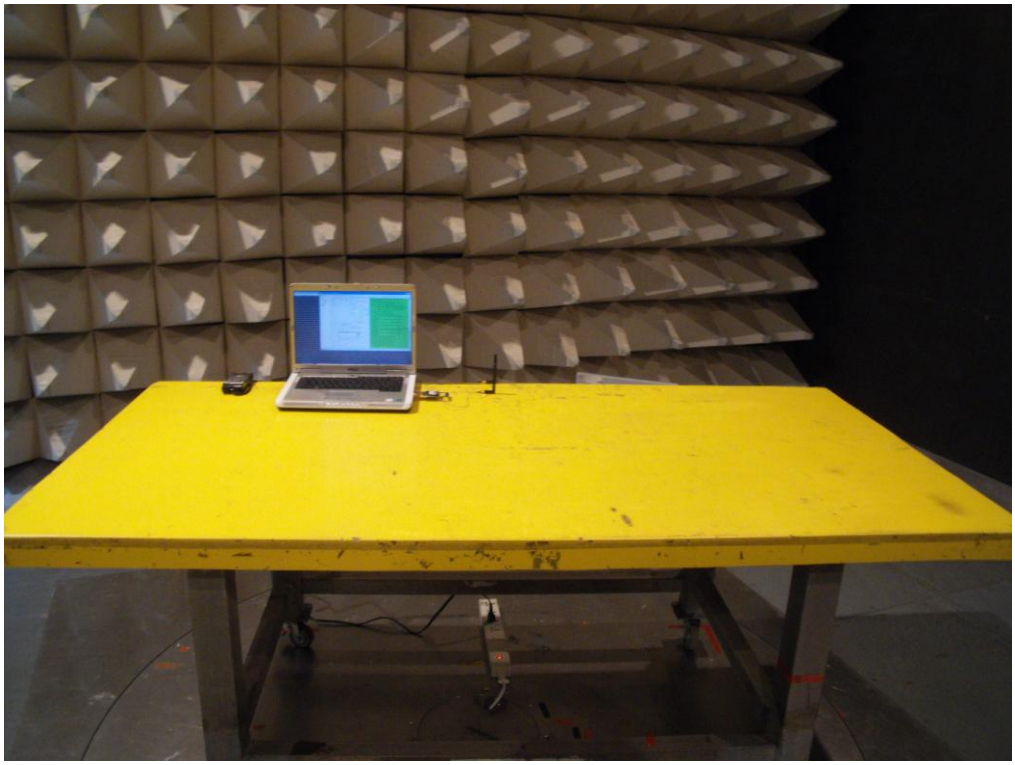


REAR VIEW

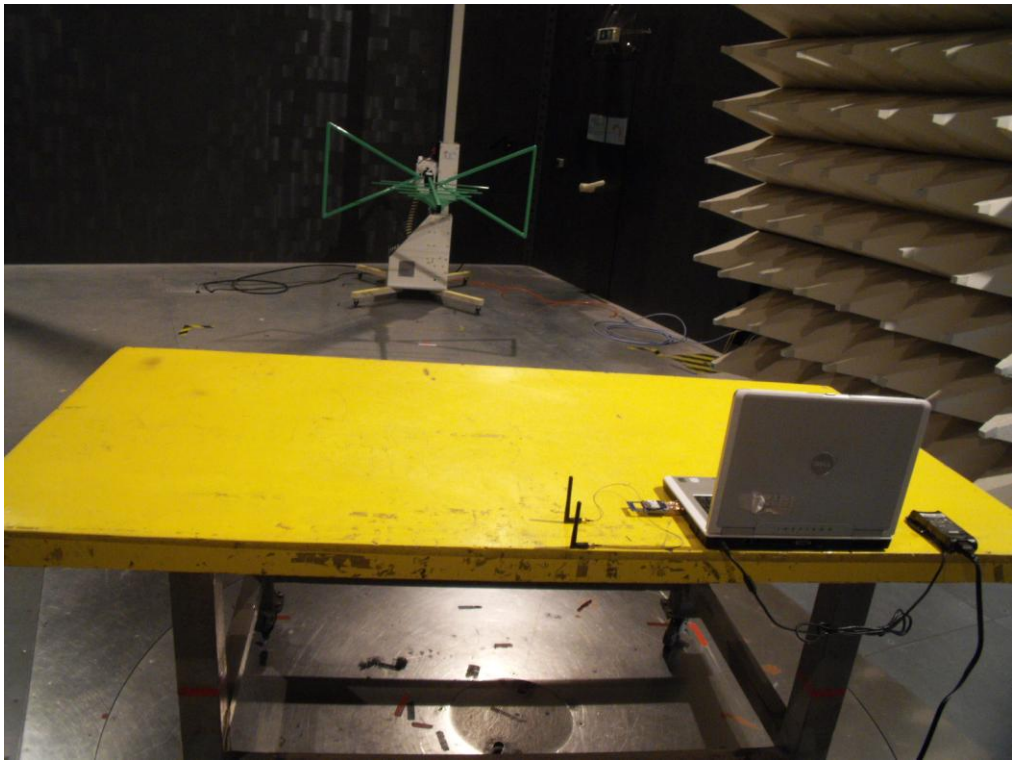


For radiated emissions 30MHz~1GHz

FRONT VIEW

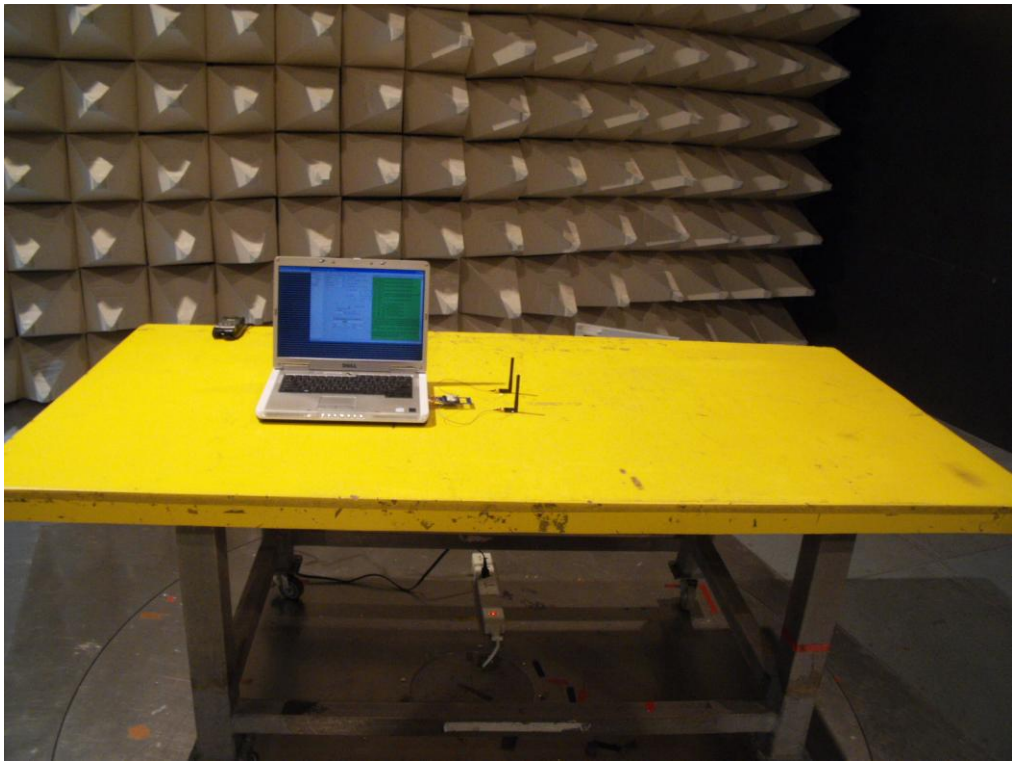


REAR VIEW

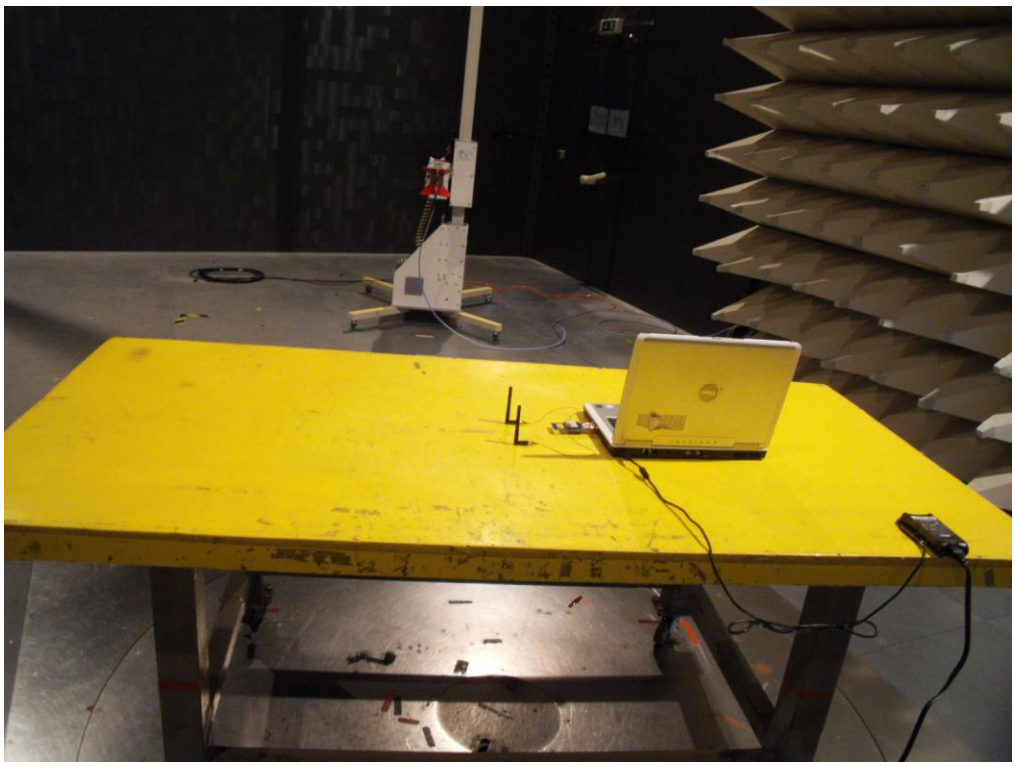


For radiated emissions above 1GHz

FRONT VIEW

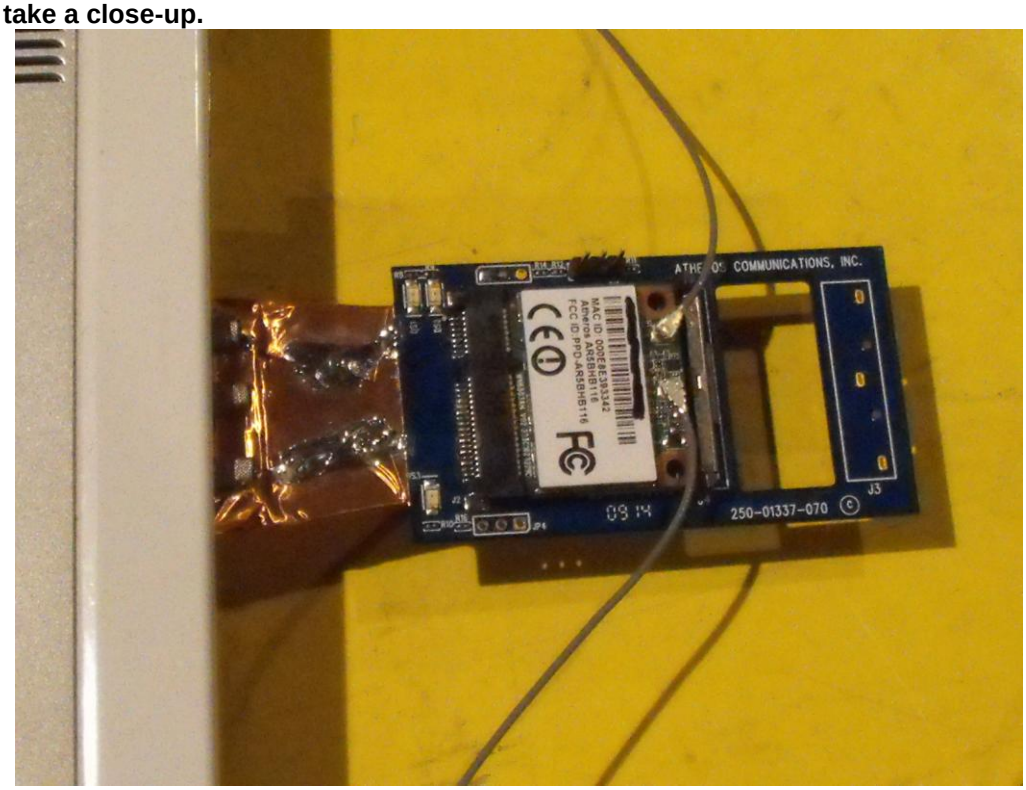


REAR VIEW

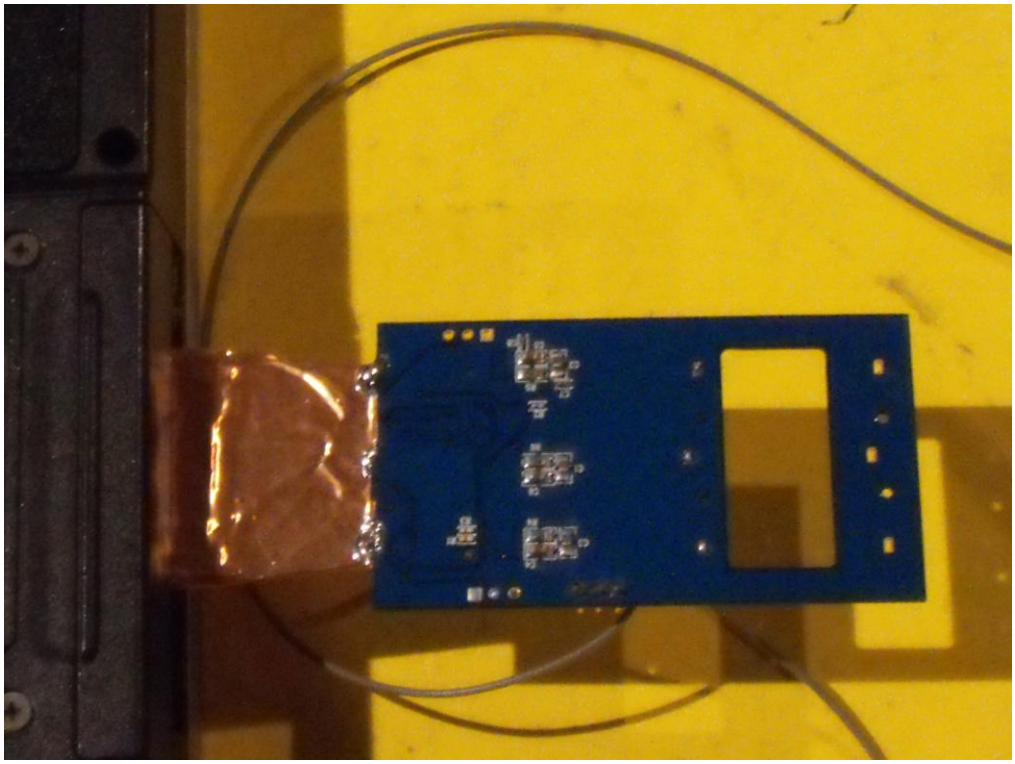


EUT with test fixture take a close-up.

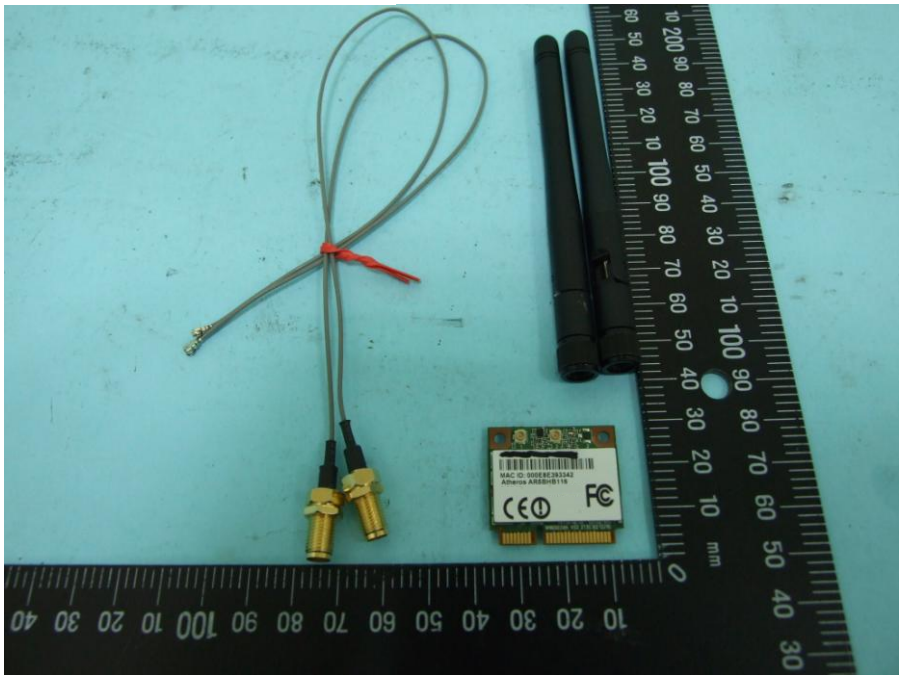
FRONT VIEW

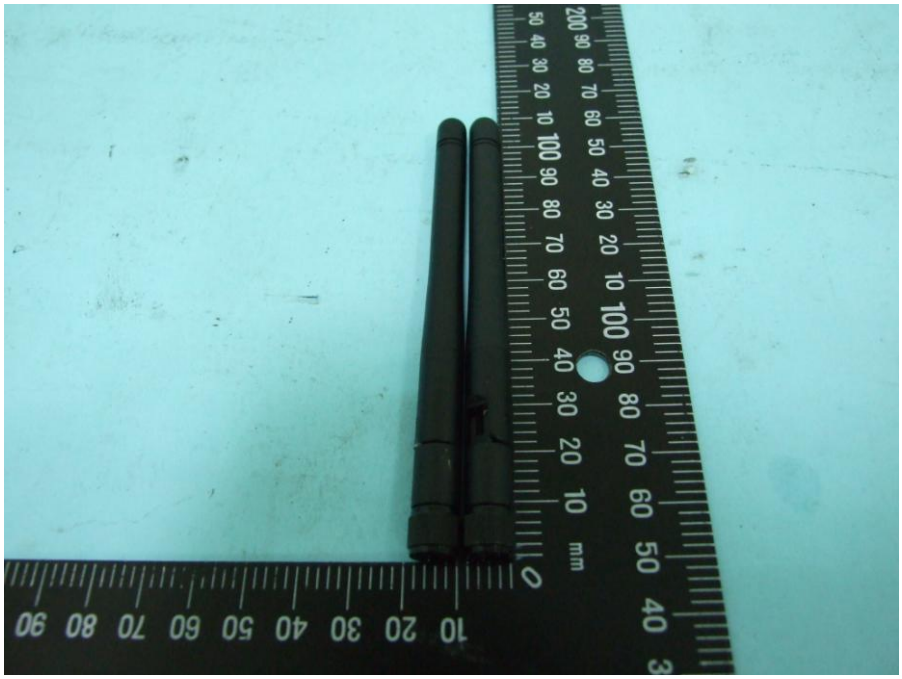


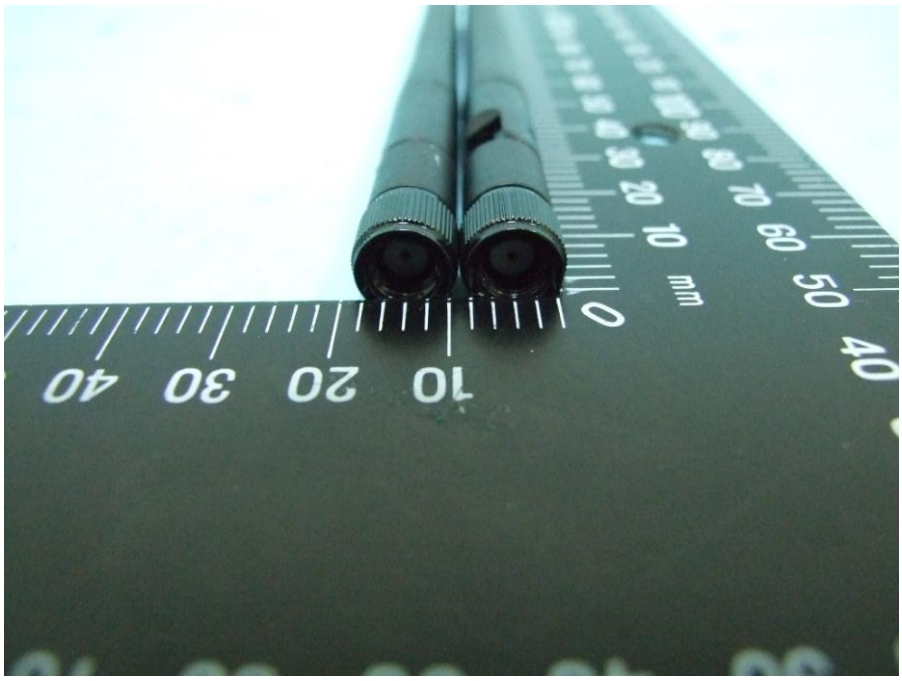
REAR VIEW

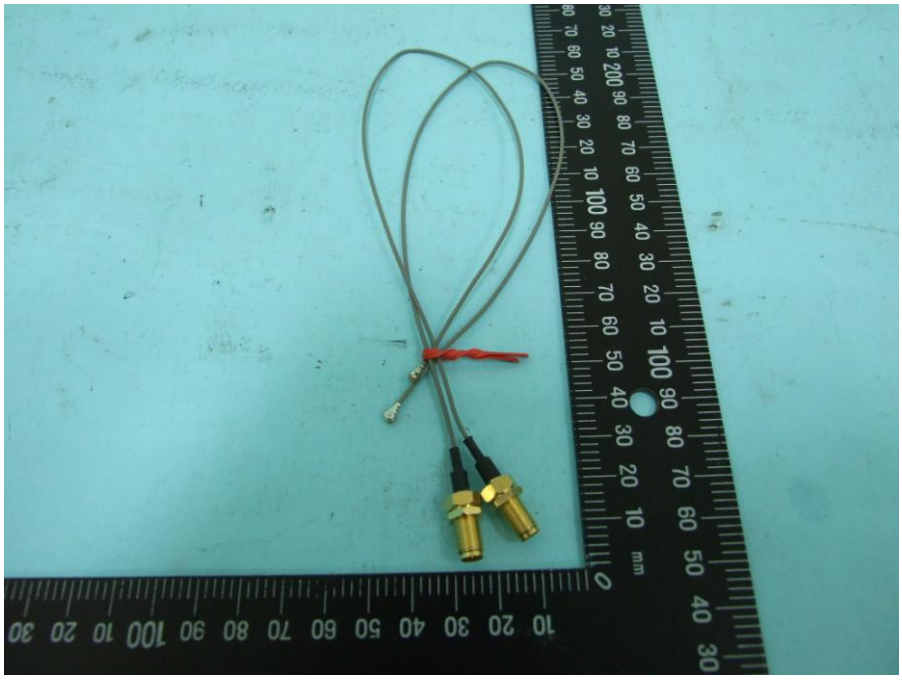


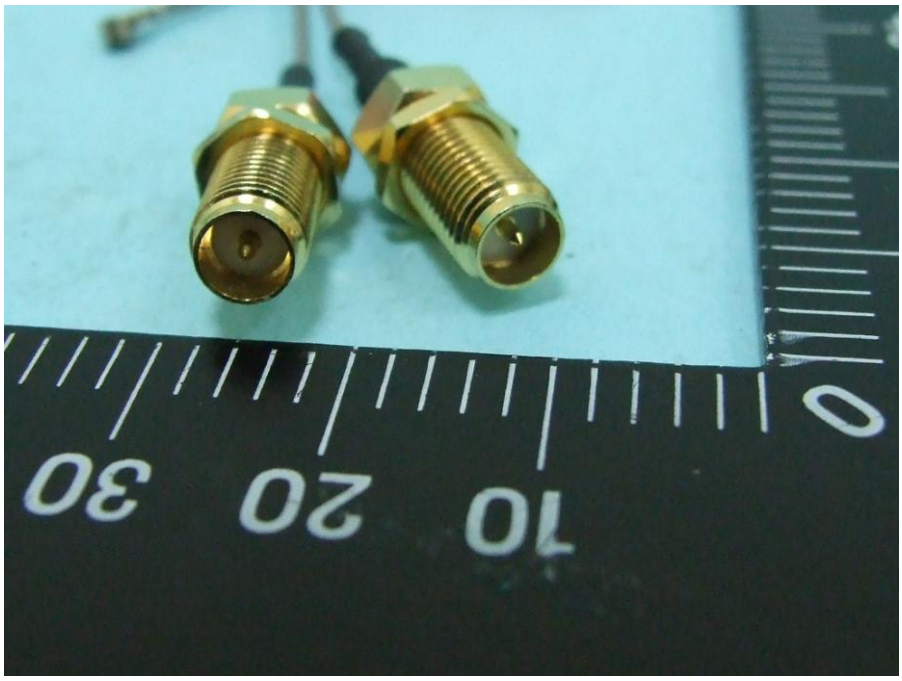
APPENDIX C. Photographs of EUT









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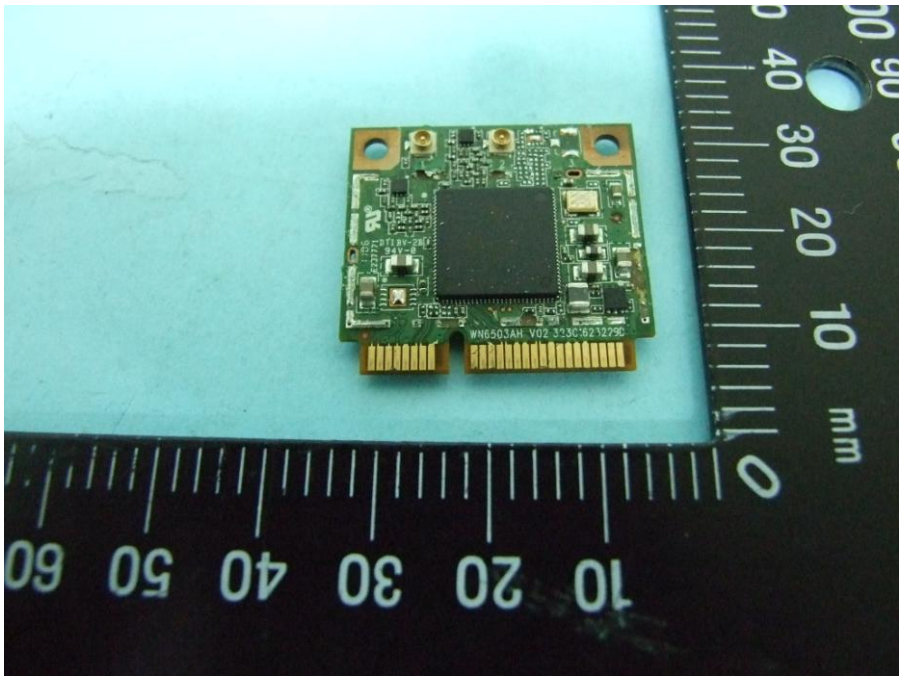
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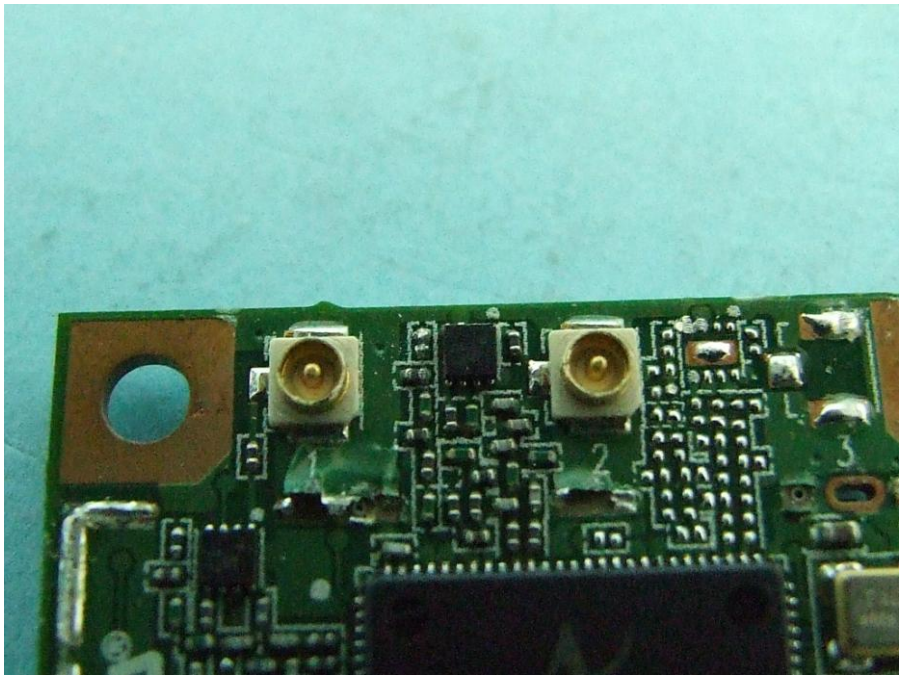


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TAIWAN
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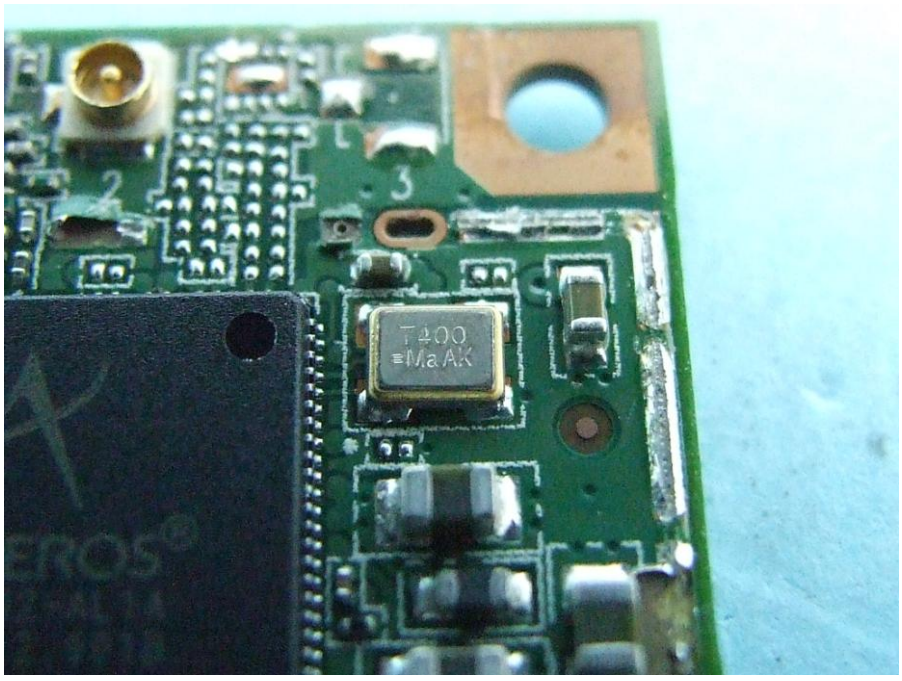
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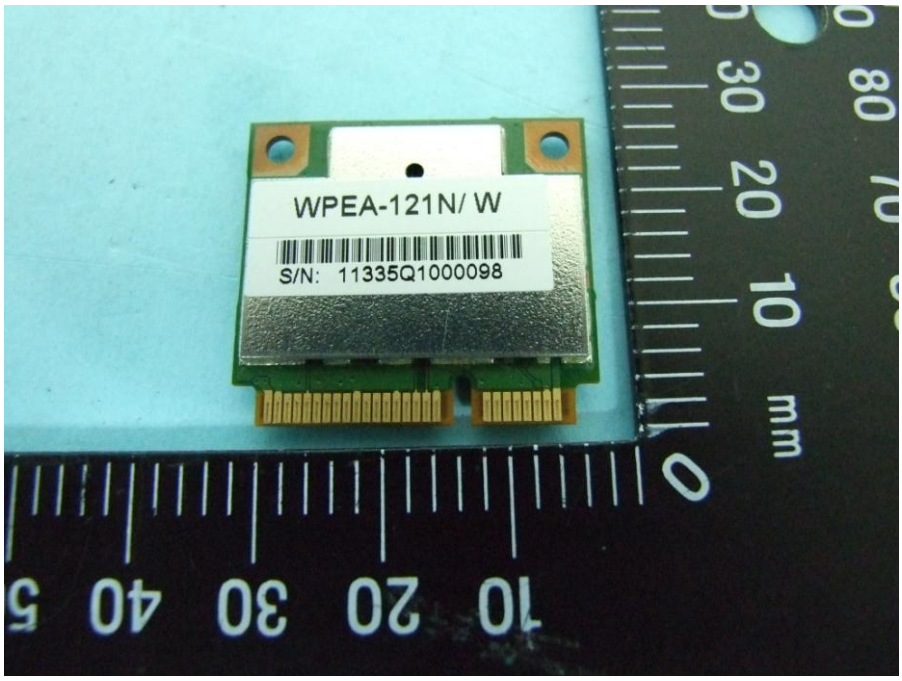
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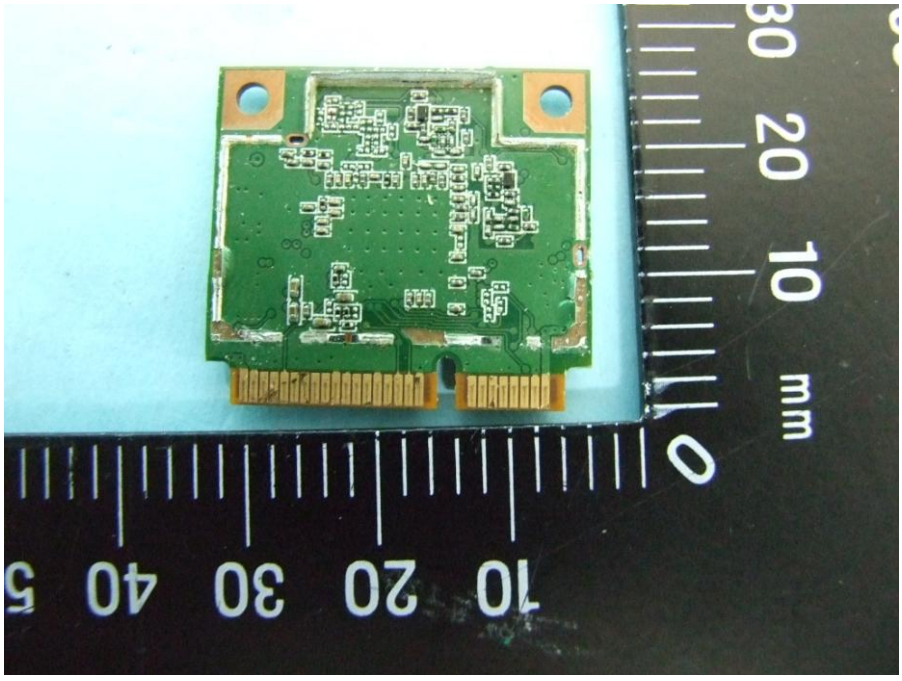
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