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FCC RADIO TEST REPORT

Applicant's company	**Realtek Semiconductor Corp.**
Applicant Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan
FCC ID	**TX2-RTL8188EE**
Manufacturer's company	**Realtek Semiconductor Corp.**
Manufacturer Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan

Product Name	802.11b/g/n RTL8188EE NGFFCard
Brand Name	Realtek
Model No.	RTL8188EE
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Jan. 19, 2012
Final Test Date	Oct. 07, 2014
Submission Type	Class II Change

Statement

Test result included in this report is for the IEEE 802.11n and IEEE 802.11b/g 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 C63.10-2013**, **47 CFR FCC Part 15 Subpart C.**

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR211949-37	Rev. 01	Initial issue of report	Nov. 04, 2014

Certificate No.: CB10310187

1. CERTIFICATE OF COMPLIANCE

Product Name	:	802.11b/g/n RTL8188EE NGFFCard
Brand Name	:	Realtek
Model No.	:	RTL8188EE
Applicant	:	Realtek Semiconductor Corp.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jan. 19, 2012 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.

Sam Chen
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	8.97 dB
4.2	15.247(b)(3)	Peak Output Power	Complies	4.38 dB
4.3	15.247(d)	Radiated Emissions	Complies	0.03 dB
4.4	15.247(d)	Band Edge Emissions	Complies	0.52 dB
4.5	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	Fixed : WLAN (1TX, 1RX) ; Single : WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	see the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Peak Output Power	MCS0 (HT20): 25.50 dBm ; MCS0 (HT40): 24.52 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11b/g

Items	Description
Product Type	Fixed : WLAN (1TX, 1RX) ; Single : WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Peak Output Power	11b: 22.24 dBm ; 11g: 25.62 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Beamforming Function	☐ With beamforming	☒ Without beamforming

Antenna and Band width

Antenna	Single (TX)	
Band width Mode	20 MHz	40 MHz
IEEE 802.11b	V	X
IEEE 802.11g	V	X
IEEE 802.11n	V	V

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	1	MCS 0-7
802.11n (HT40)	1	MCS 0-7
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 2: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n		

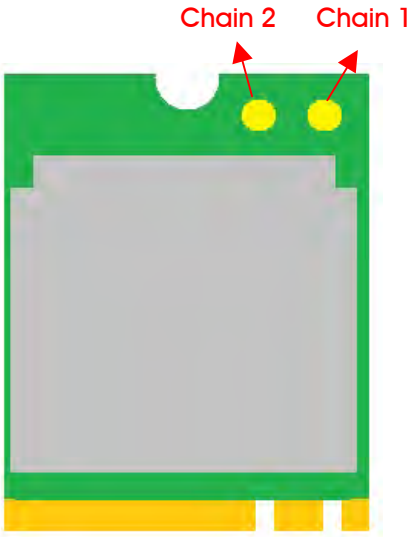
3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	LYNwave	ALA110-222050-300010	PIFA Antenna	I-PEX	3.5

Configuration	Type	Antenna Chain	Power Type	Description
Config. 2 Fixed	NGFF	2 chains	PCIE	The EUT supports 1TX/1RX function. Only Chain 1 could be used as transmitting antenna. Both Chain 1 and Chain 2 could be used as receiving antenna, but only one of them could receive at the same time.
			USB	
Config. 3 Single	NGFF	1 chain	PCIE	The EUT supports 1TX/1RX function. Only Chain 1 could be used as transmitting/ receiving antenna.
			USB	



3.4. Table for Carrier Frequencies

There are two bandwidth systems.

For 20MHz bandwidth systems, use Channel 1~Channel 11.

For 40MHz bandwidth systems, use Channel 3~Channel 9.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
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	-	-

3.5. Table for Test Modes

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

Test Items	Mode	Data Rate	Channel	Chain
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Conducted Output Power	802.11n HT20	MCS0	1/6/11	1
	802.11n HT40	MCS0	3/6/9	1
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Radiated Emissions 9kHz~1GHz	Normal Link	-	-	-
Radiated Emissions 1GHz~10th Harmonic	802.11n HT20	MCS0	1/6/11	1
	802.11n HT40	MCS0	3/6/9	1
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Band Edge Emissions	802.11n HT20	MCS0	1/6/11	1
	802.11n HT40	MCS0	3/6/9	1
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1

Based on original output power to test Radiated Emission and Band Edge Emission.

The following test modes were performed for all tests:

After pretest, Configuration 2 (Fixed) has been evaluated to be the worst case, so the measurement will follow this same test configuration

For Conducted Emission test:

Mode 1. NGFF + PCIE + Fixed + PIFA antenna

For Radiated Emission test:

Mode 1. NGFF + PCIE + Fixed + PIFA antenna

3.6. Table for Testing Locations

Test Site Location				
Address:	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			
Test Site No.	**Site Category**	**Location**	**FCC Reg. No.**	**IC File No.**
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: 211949-29

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. There are 3 configurations of the original EUT. For this project, only Fixed and Single type with PCI-E were modified: Change the antenna connector routing to switch Main port (Chain 1) with Aux port (Chain 2). 2. There is no change in existing RF relevant portion.	1. AC Power Line Conducted Emissions Measurement 2. Radiated Emissions Measurement 3. Emissions Measurement

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

For Radiated Emission test below 1GHz:

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	E2K4965AGNM
Mouse	Logitech	M-U0026	DoC
Earphone	E-BOOKI	E-EPC040	N/A
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Test fixture	Realtek	PCIE Adapter	N/A

For Radiated Emission test above 1GHz:

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	E2K4965AGNM
Test fixture	Realtek	PCIE Adapter	N/A

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC
Mouse	HP	FM100	DoC
Earphone	e-Power	S90W	N/A
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Test fixture	Realtek	PCIE Adapter	N/A

3.9. Table for Parameters of Test Software Setting

During testing, Channel and 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.

Power Parameters of IEEE 802.11n

Test Software Version	Realtek 11n 8188E PCIE WLAN MP Diagnostic Program 0.0002.0120.2012		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS0 HT20	DE9 TX=1	DE8 TX=1	DEB TX=1
Frequency	2422 MHz	2437 MHz	2452 MHz
MCS0 HT40	DE9	DEA	DEB

Power Parameters of IEEE 802.11b/g

Test Software Version	Realtek 11n 8188E PCIE WLAN MP Diagnostic Program 0.0002.0120.2012		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	DEC TX=1	DEB	DEC TX=1
IEEE 802.11g	DE9 TX=1	DE8 TX=1	DEB

3.10. EUT Operation during Test

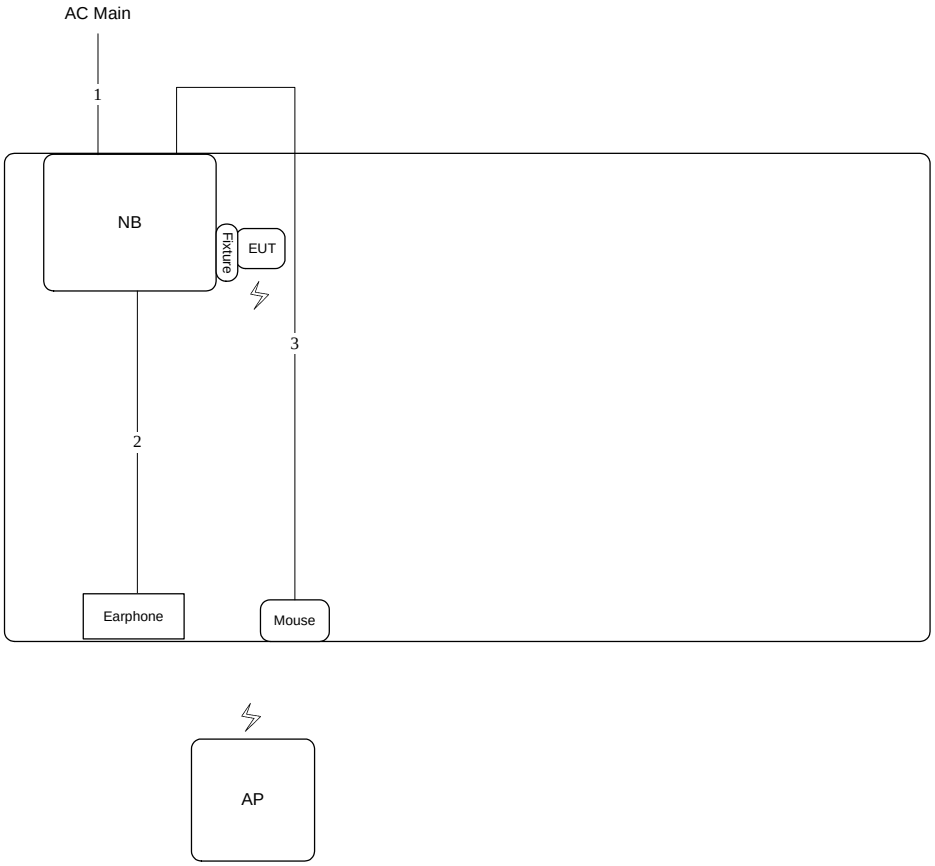
The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11n MCS0 HT20	1.000	1.000	100	0.00	0.01
802.11n MCS0 HT40	1.000	1.000	100	0.00	0.01
802.11b	1.000	1.000	100	0.00	0.01
802.11g	1.000	1.000	100	0.00	0.01

3.12. Test Configurations

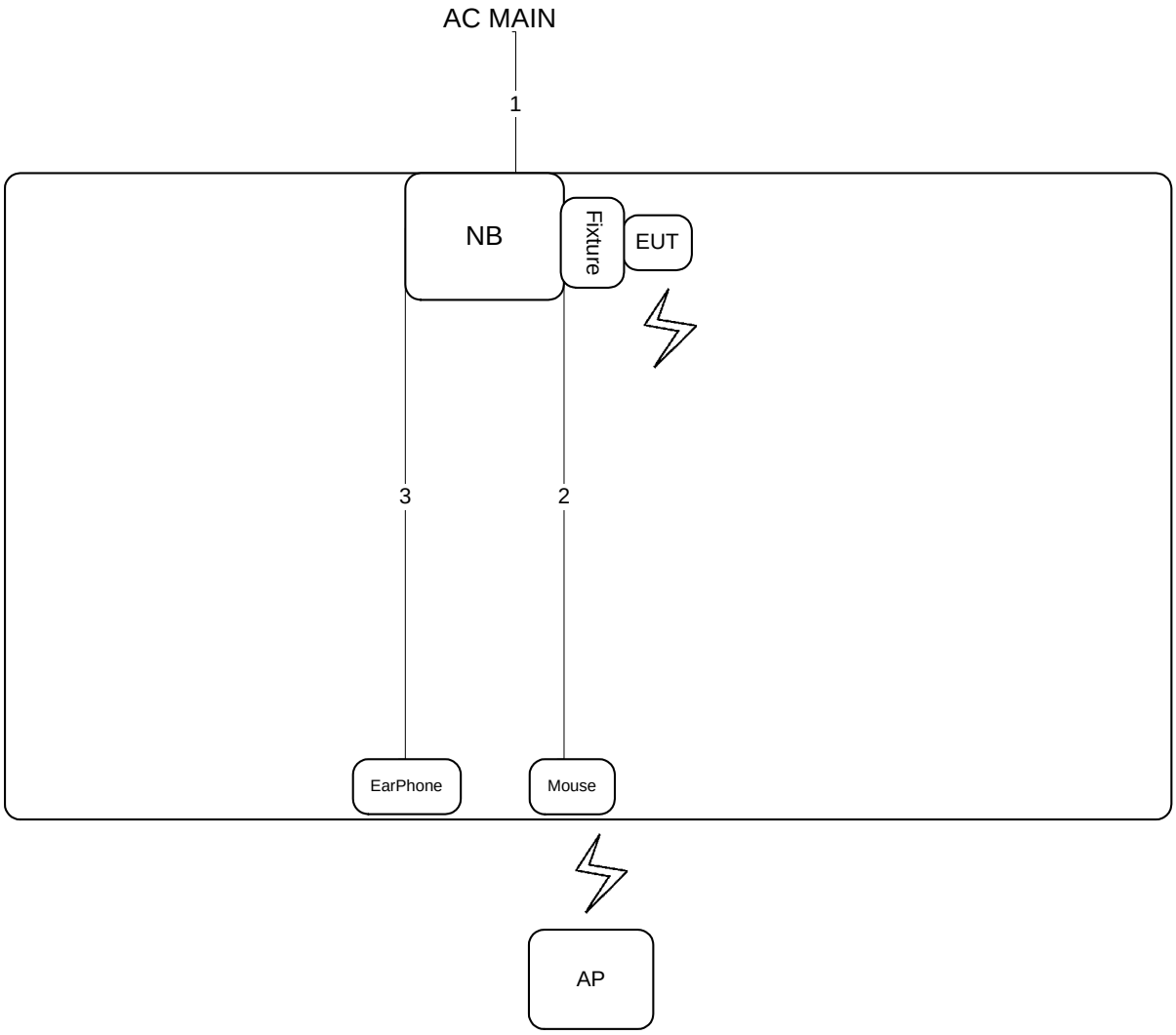
3.12.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Audio cable	No	1.4m
3	USB cable	Yes	1.8m

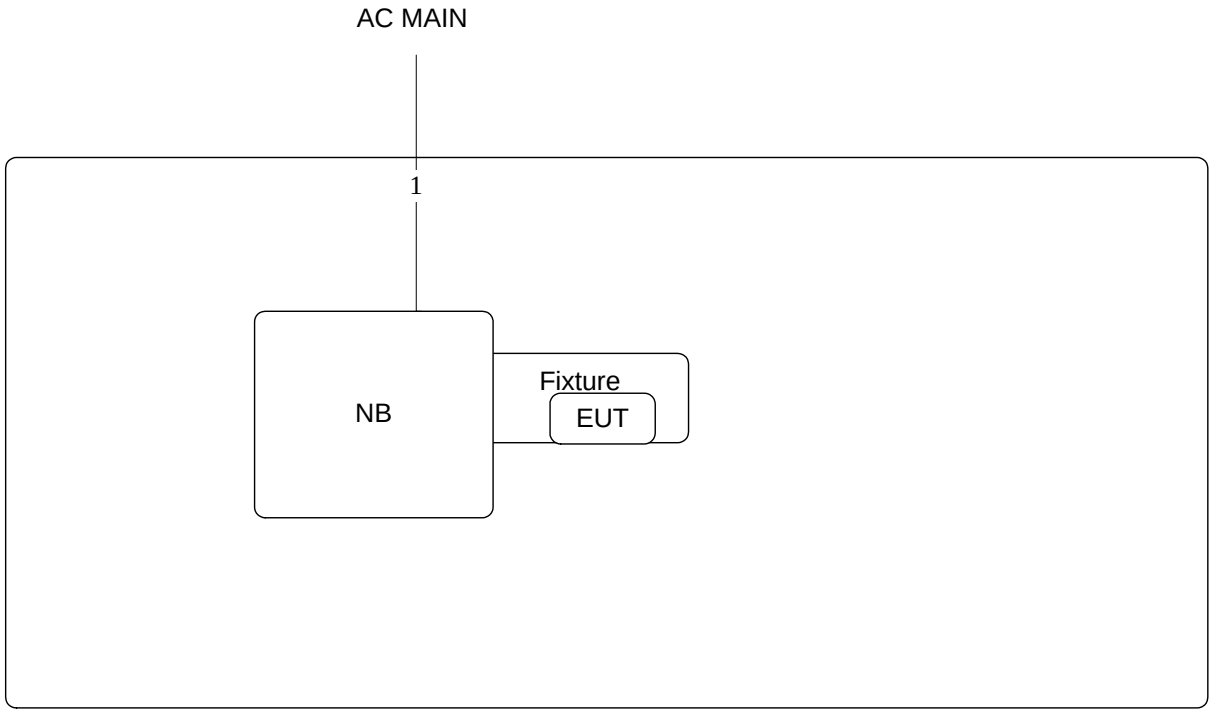
3.12.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	USB cable	No	1.8m
3	Audio cable	Yes	1.1m

Test Configuration: above 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. 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.

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

4.1.2. Measuring Instruments and Setting

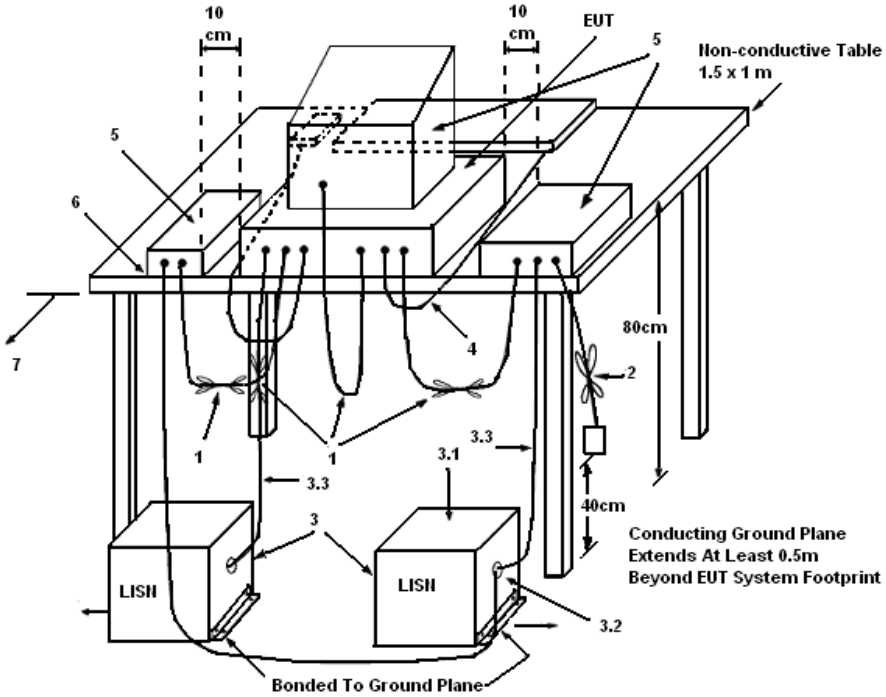
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. 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.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. 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.

4.1.5. Test Deviation

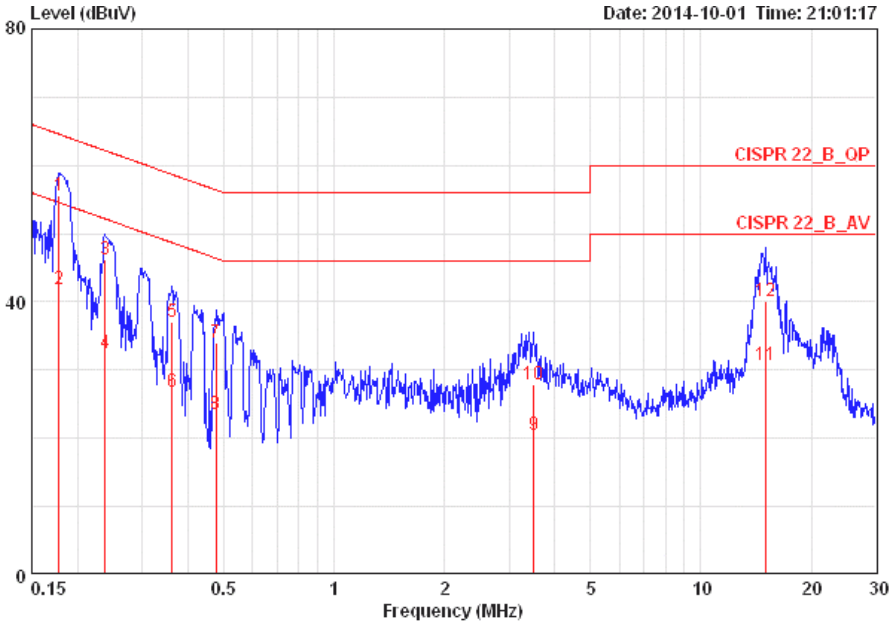
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

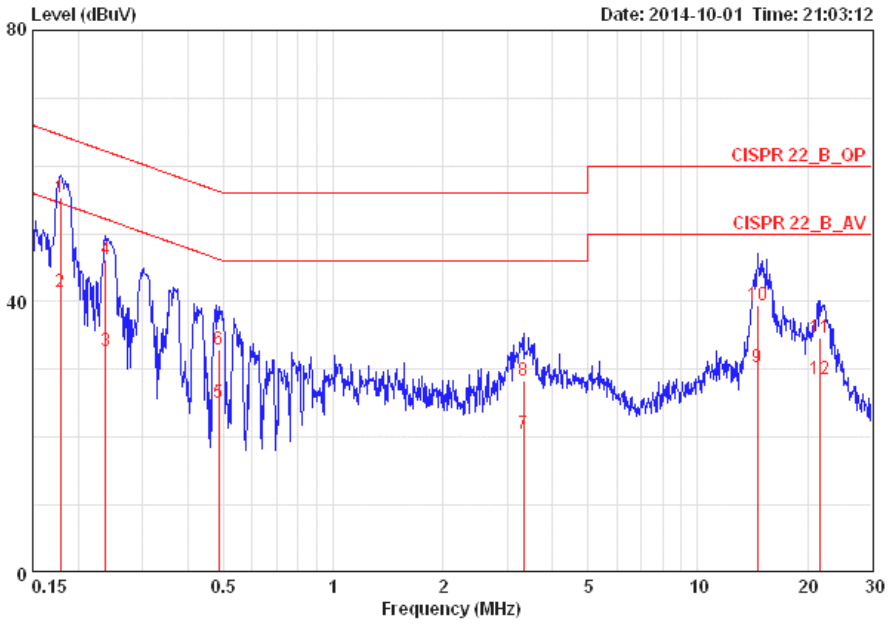
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	56%
Test Engineer	Hank Yang	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1	0.17772	55.62	-8.97	64.59	9.96	45.50	0.16	LINE	QP
2	0.17772	41.76	-12.83	54.59	9.96	31.64	0.16	LINE	AVERAGE
3	0.23784	46.25	-15.93	62.17	9.96	36.12	0.17	LINE	QP
4	0.23784	32.43	-19.75	52.17	9.96	22.30	0.17	LINE	AVERAGE
5	0.36146	37.11	-21.59	58.69	9.95	26.98	0.18	LINE	QP
6	0.36146	26.84	-21.86	48.69	9.95	16.71	0.18	LINE	AVERAGE
7	0.47612	34.01	-22.39	56.41	9.96	23.87	0.18	LINE	QP
8	0.47612	23.64	-22.76	46.41	9.96	13.50	0.18	LINE	AVERAGE
9	3.509	20.53	-25.47	46.00	10.06	10.18	0.29	LINE	AVERAGE
10	3.509	27.85	-28.15	56.00	10.06	17.50	0.29	LINE	QP
11	15.066	30.84	-19.16	50.00	10.34	20.05	0.45	LINE	AVERAGE
12	15.066	40.14	-19.86	60.00	10.34	29.35	0.45	LINE	QP

Temperature	25°C	Humidity	56%
Test Engineer	Hank Yang	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1	0.17866	55.46	-9.09	64.55	9.95	45.35	0.16	NEUTRAL	QP
2	0.17866	41.52	-13.03	54.55	9.95	31.41	0.16	NEUTRAL	AVERAGE
3	0.23784	32.79	-19.39	52.17	9.95	22.67	0.17	NEUTRAL	AVERAGE
4	0.23784	46.14	-16.04	62.17	9.95	36.02	0.17	NEUTRAL	QP
5	0.48632	25.15	-21.08	46.23	9.95	15.02	0.18	NEUTRAL	AVERAGE
6	0.48632	32.88	-23.35	56.23	9.95	22.75	0.18	NEUTRAL	QP
7	3.328	20.56	-25.44	46.00	10.04	10.23	0.29	NEUTRAL	AVERAGE
8	3.328	28.29	-27.71	56.00	10.04	17.96	0.29	NEUTRAL	QP
9	14.594	30.24	-19.76	50.00	10.30	19.50	0.44	NEUTRAL	AVERAGE
10	14.594	39.36	-20.64	60.00	10.30	28.62	0.44	NEUTRAL	QP
11	21.715	34.61	-25.39	60.00	10.40	23.67	0.53	NEUTRAL	QP
12	21.715	28.48	-21.52	50.00	10.40	17.54	0.53	NEUTRAL	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Peak Output Power Measurement

4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for 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-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

4.2.2. Measuring Instruments and Setting

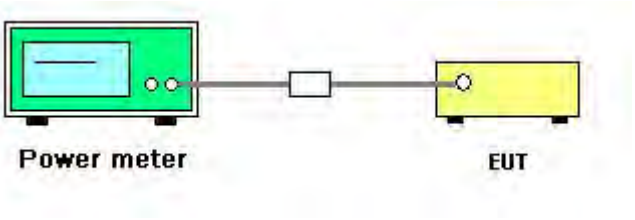
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Bandwidth	50MHz bandwidth is greater than the EUT emission bandwidth
Detector	Peak

4.2.3. Test Procedures

Spectrum Parameter	Setting
RF Output Power Method	☒ ANSI C63.10 clause 6.10.2.1 (a) power meter method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.2.1 (b) channel integration method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.1 Method 1 - spectral trace averaging
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.2 Method 2 - zero-span mode with trace averaging

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Peak Output Power

Temperature	25°C	Humidity	63%
Test Engineer	Sean Ku	Configurations	IEEE 802.11n
Test Date	Feb. 10, 2012		

Configuration IEEE 802.11n MCS0 HT20 / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	24.92	30.00	Complies
6	2437 MHz	25.50	30.00	Complies
11	2462 MHz	24.52	30.00	Complies

Configuration IEEE 802.11n MCS0 HT40 / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	24.52	30.00	Complies
6	2437 MHz	24.23	30.00	Complies
9	2452 MHz	23.82	30.00	Complies

Temperature	25°C	Humidity	63%
Test Engineer	Sean Ku	Configurations	IEEE 802.11b/g
Test Date	Feb. 10, 2012		

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	21.21	30.00	Complies
6	2437 MHz	22.05	30.00	Complies
11	2462 MHz	22.24	30.00	Complies

Configuration IEEE 802.11g / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	25.19	30.00	Complies
6	2437 MHz	25.62	30.00	Complies
11	2462 MHz	24.96	30.00	Complies

4.3. Radiated Emissions Measurement

4.3.1. Limit

30dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

4.3.2. Measuring Instruments and Setting

Please refer to section 5 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
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz / 300kHz for peak

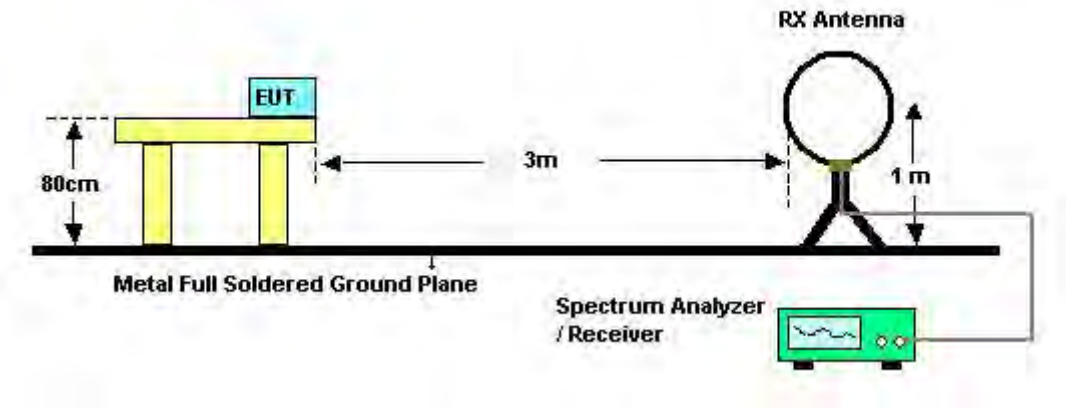
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.3.3. Test Procedures

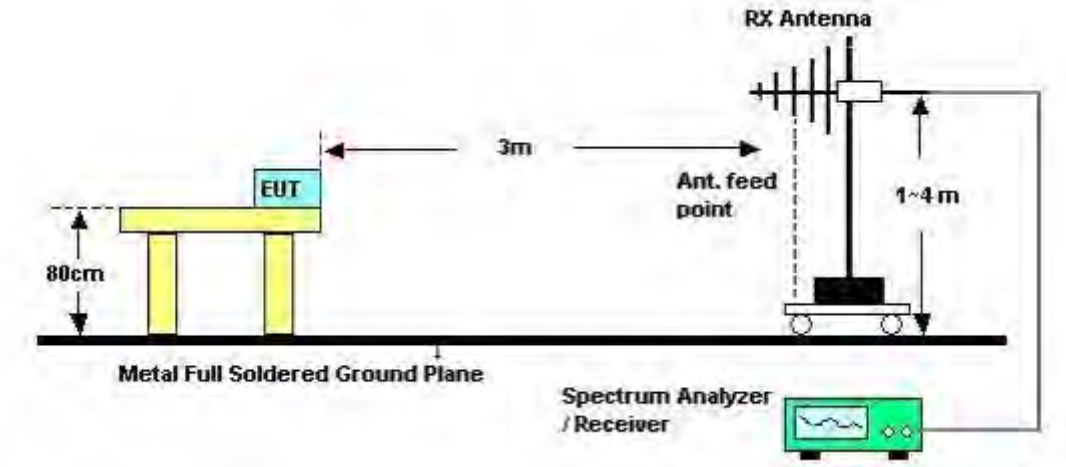
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. 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.
8. 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.
9. 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.

4.3.4. Test Setup Layout

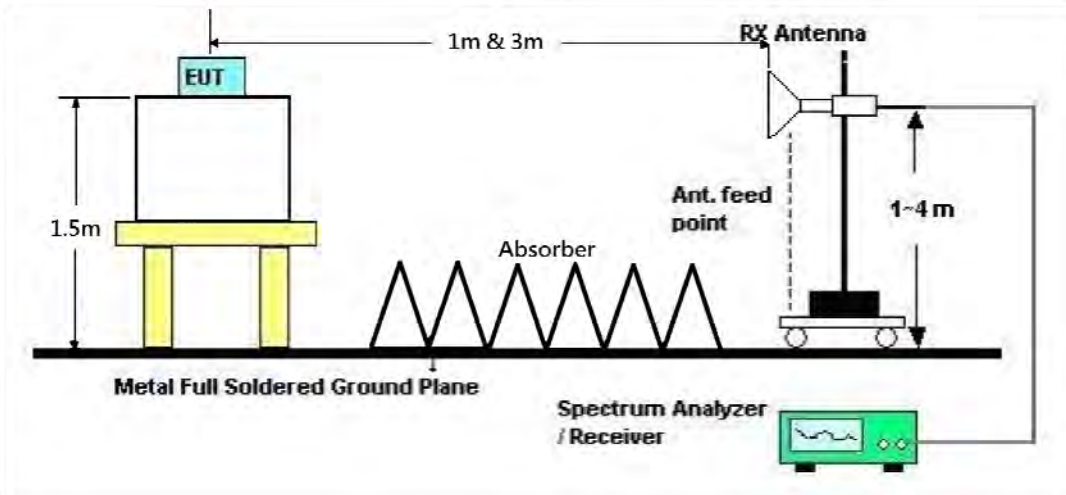
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	Normal Link
Test Date	Oct. 07, 2014		

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

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

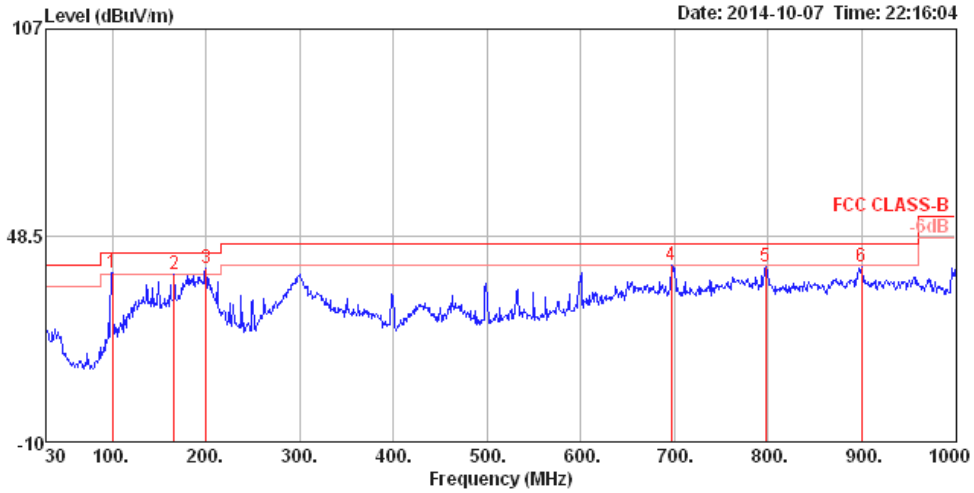
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.3.8. Results of Radiated Emissions (30MHz~1GHz)

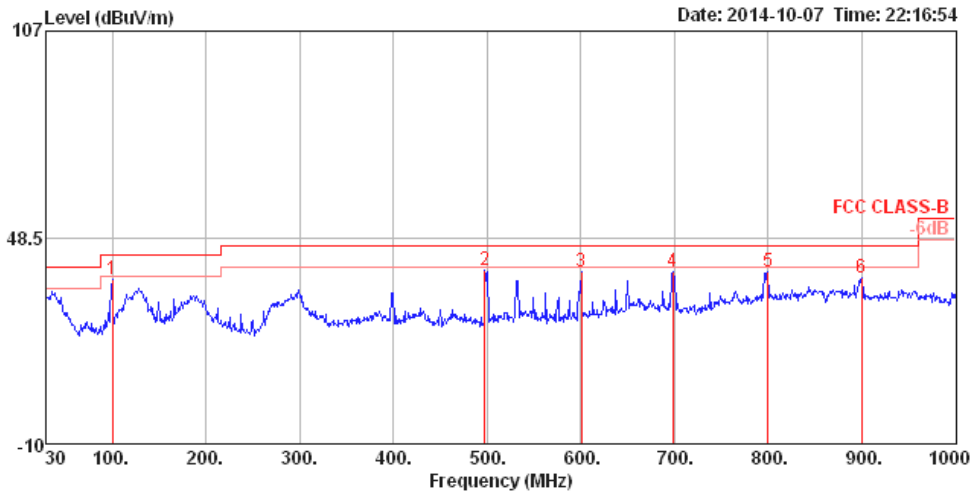
Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	Normal Link

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	99.84	38.04	43.50	-5.46	54.15	1.18	10.31	27.60	200	178	HORIZONTAL	Peak
2	165.80	37.61	43.50	-5.89	53.94	1.56	9.38	27.27	200	192	HORIZONTAL	Peak
3	199.75	39.16	43.50	-4.34	55.81	1.70	8.75	27.10	150	208	HORIZONTAL	Peak
4	696.39	40.11	46.00	-5.89	45.84	3.40	18.87	28.00	150	284	HORIZONTAL	Peak
5	797.27	39.65	46.00	-6.35	43.85	3.66	19.75	27.61	125	318	HORIZONTAL	Peak
6	900.09	39.60	46.00	-6.40	42.39	3.97	20.64	27.40	100	148	HORIZONTAL	Peak

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	99.84	36.62	43.50	-6.88	52.73	1.18	10.31	27.60	100	199	VERTICAL	Peak
2	497.54	39.37	46.00	-6.63	47.77	2.81	16.88	28.09	125	90	VERTICAL	Peak
3	600.36	38.77	46.00	-7.23	45.30	3.12	18.45	28.10	100	197	VERTICAL	Peak
4	698.33	38.58	46.00	-7.42	44.25	3.41	18.92	28.00	100	262	VERTICAL	Peak
5	800.18	38.79	46.00	-7.21	42.96	3.67	19.76	27.60	100	273	VERTICAL	Peak
6	900.09	37.05	46.00	-8.95	39.84	3.97	20.64	27.40	100	180	VERTICAL	Peak

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.

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

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT20 CH 1 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.99	43.22	54.00	-10.78	41.27	3.31	33.56	34.92	Average	100	316	HORIZONTAL
2	4823.99	43.22	74.00	-30.78	41.27	3.31	33.56	34.92	Peak	100	316	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.96	49.22	74.00	-24.78	47.27	3.31	33.56	34.92	Peak	100	64	VERTICAL
2	4824.00	44.48	54.00	-9.52	42.53	3.31	33.56	34.92	Average	100	64	VERTICAL

Temperature	24℃	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT20 CH 6 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.93	48.10	74.00	-25.90	46.03	3.33	33.66	34.92	Peak	100	67	HORIZONTAL
2	4873.95	44.99	54.00	-9.01	42.92	3.33	33.66	34.92	Average	100	67	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.97	44.04	54.00	-9.96	41.97	3.33	33.66	34.92	Average	100	114	VERTICAL
2	4874.00	49.07	74.00	-24.93	47.00	3.33	33.66	34.92	Peak	100	114	VERTICAL

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT20 CH 11 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.94	49.00	74.00	-25.00	46.80	3.35	33.76	34.91	Peak	100	64	HORIZONTAL
2	4923.98	45.61	54.00	-8.39	43.41	3.35	33.76	34.91	Average	100	64	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.99	49.28	74.00	-24.72	47.08	3.35	33.76	34.91	Peak	100	109	VERTICAL
2	4923.99	45.65	54.00	-8.35	43.45	3.35	33.76	34.91	Average	100	109	VERTICAL

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT40 CH 3 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4843.95	45.01	54.00	-8.99	43.02	3.32	33.59	34.92	Average	100	261	HORIZONTAL
2	4843.97	48.93	74.00	-25.07	46.94	3.32	33.59	34.92	Peak	100	261	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4843.93	45.50	54.00	-8.50	43.51	3.32	33.59	34.92	Average	100	104	VERTICAL
2	4843.99	49.42	74.00	-24.58	47.43	3.32	33.59	34.92	Peak	100	104	VERTICAL

Temperature	24℃	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT40 CH 6 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.97	47.46	74.00	-26.54	45.39	3.33	33.66	34.92	Peak	100	313	HORIZONTAL
2	4873.98	42.86	54.00	-11.14	40.79	3.33	33.66	34.92	Average	100	313	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.93	42.02	54.00	-11.98	39.95	3.33	33.66	34.92	Average	100	116	VERTICAL
2	4874.05	46.05	74.00	-27.95	43.98	3.33	33.66	34.92	Peak	100	116	VERTICAL

Temperature	24℃	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT40 CH 9 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4903.97	42.98	54.00	-11.02	40.82	3.34	33.73	34.91	Average	100	307	HORIZONTAL
2	4904.09	46.65	74.00	-27.35	44.49	3.34	33.73	34.91	Peak	100	307	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4903.91	48.69	74.00	-25.31	46.53	3.34	33.73	34.91	Peak	100	75	VERTICAL
2	4904.00	44.54	54.00	-9.46	42.38	3.34	33.73	34.91	Average	100	75	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11b CH 1 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.97	49.86	74.00	-24.14	47.91	3.31	33.56	34.92	Peak	100	234	HORIZONTAL
2	4823.98	46.66	54.00	-7.34	44.71	3.31	33.56	34.92	Average	100	234	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4824.00	53.97	54.00	-0.03	52.02	3.31	33.56	34.92	Average	117	75	VERTICAL
2	4824.00	55.23	74.00	-18.77	53.28	3.31	33.56	34.92	Peak	117	75	VERTICAL

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11b CH 6 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.94	52.69	74.00	-21.31	50.62	3.33	33.66	34.92	Peak	100	233	HORIZONTAL
2	4873.99	50.39	54.00	-3.61	48.32	3.33	33.66	34.92	Average	100	233	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Limit	Level	Loss	Factor	Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.99	53.73	54.00	-0.27	51.66	3.33	33.66	34.92	Average	100	109	VERTICAL
2	4873.99	55.48	74.00	-18.52	53.41	3.33	33.66	34.92	Peak	100	109	VERTICAL

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11b CH 11 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.96	46.78	54.00	-7.22	44.58	3.35	33.76	34.91	Average	104	235	HORIZONTAL
2	4924.07	49.35	74.00	-24.65	47.15	3.35	33.76	34.91	Peak	104	235	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.98	55.66	74.00	-18.34	53.46	3.35	33.76	34.91	Peak	104	95	VERTICAL
2	4923.98	53.75	54.00	-0.25	51.55	3.35	33.76	34.91	Average	104	95	VERTICAL

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11g CH 1 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.97	49.69	74.00	-24.31	47.74	3.31	33.56	34.92	Peak	110	97	HORIZONTAL
2	4824.01	44.99	54.00	-9.01	43.04	3.31	33.56	34.92	Average	110	97	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.94	44.38	54.00	-9.62	42.43	3.31	33.56	34.92	Average	100	284	VERTICAL
2	4824.08	48.70	74.00	-25.30	46.75	3.31	33.56	34.92	Peak	100	284	VERTICAL

Temperature	24℃	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11g CH 6 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4874.01	44.33	54.00	-9.67	42.26	3.33	33.66	34.92	Average	110	97	HORIZONTAL
2	4874.02	49.06	74.00	-24.94	46.99	3.33	33.66	34.92	Peak	110	97	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.98	44.83	54.00	-9.17	42.76	3.33	33.66	34.92	Average	100	261	VERTICAL
2	4874.00	50.10	74.00	-23.90	48.03	3.33	33.66	34.92	Peak	100	261	VERTICAL

Temperature	24℃	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11g CH 11 / Chain 1
Test Date	Aug. 21, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.84	49.57	74.00	-24.43	47.37	3.35	33.76	34.91	Peak	100	114	HORIZONTAL
2	4923.99	45.32	54.00	-8.68	43.12	3.35	33.76	34.91	Average	100	114	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.92	43.54	54.00	-10.46	41.34	3.35	33.76	34.91	Average	100	186	VERTICAL
2	4924.08	48.16	74.00	-25.84	45.96	3.35	33.76	34.91	Peak	100	186	VERTICAL

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.

4.4. Emissions Measurement

4.4.1. Limit

30dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

4.4.2. Measuring Instruments and Setting

Please refer to section 5 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
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average
RBW / VBW (30dBc in any 100 kHz bandwidth emission)	100 kHz / 300 kHz for Peak

4.4.3. Test Procedures

For Radiated band edges Measurement:

1. The test procedure is the same as section 4.3.3, only the freqeuncy range investigated is limited to 100MHz around band edges.

For Radiated Out of Band Emission Measurement:

1. Test was performed in accordance with **錯誤! 找不到參照來源。** for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10.1 Unwanted Emissions into Non-Restricted Frequency Bands Measurement Procedure.
2. The radiated emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.
   Only worst data of each operating mode is presented.

4.4.4. Test Setup Layout

For Radiated band edges Measurement:

This test setup layout is the same as that shown in section 4.3.4.

For Radiated Out of Band Emission Measurement:

This test setup layout is the same as that shown in section 4.3.4.

4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Band Edge and Fundamental Emissions

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT20 CH 1, 6, 11 / Chain 1
Test Date	Aug. 20, 2014		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2390.00	52.02	54.00	-1.98	21.31	2.22	28.49	0.00	265	150	Average	HORIZONTAL
2	2390.00	73.46	74.00	-0.54	42.75	2.22	28.49	0.00	265	150	Peak	HORIZONTAL
3	2406.20	99.42			68.67	2.22	28.53	0.00	265	150	Average	HORIZONTAL
4	2409.00	109.69			78.94	2.22	28.53	0.00	265	150	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2388.80	66.76	74.00	-7.24	36.06	2.21	28.49	0.00	Peak	116	273	HORIZONTAL
2	2390.00	51.23	54.00	-2.77	20.52	2.22	28.49	0.00	Average	116	273	HORIZONTAL
3	2431.80	99.78			68.99	2.23	28.56	0.00	Average	116	273	HORIZONTAL
4	2434.20	109.89			79.10	2.23	28.56	0.00	Peak	116	273	HORIZONTAL
5	2483.50	52.26	54.00	-1.74	21.33	2.26	28.67	0.00	Average	116	273	HORIZONTAL
6	2485.90	69.39	74.00	-4.61	38.46	2.26	28.67	0.00	Peak	116	273	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2437 MHz.

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2465.00	97.39			66.52	2.24	28.63	0.00	Average	143	274	HORIZONTAL
2	2465.20	107.26			76.39	2.24	28.63	0.00	Peak	143	274	HORIZONTAL
3	2483.50	50.48	54.00	-3.52	19.55	2.26	28.67	0.00	Average	143	274	HORIZONTAL
4	2485.10	71.12	74.00	-2.88	40.19	2.26	28.67	0.00	Peak	143	274	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS0 HT40 CH 3, 6, 9 / Chain 1
Test Date	Aug. 20, 2014		

Channel 3

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2388.80	71.58	74.00	-2.42	40.88	2.21	28.49	0.00	263	149	Peak	HORIZONTAL
2	2390.00	53.47	54.00	-0.53	22.76	2.22	28.49	0.00	263	149	Average	HORIZONTAL
3	2406.40	94.74			63.99	2.22	28.53	0.00	263	149	Average	HORIZONTAL
4	2412.00	103.90			73.15	2.22	28.53	0.00	263	149	Peak	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2422 MHz.

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2388.80	66.31	74.00	-7.69	35.61	2.21	28.49	0.00	Peak	121	269	HORIZONTAL
2	2390.00	47.64	54.00	-6.36	16.93	2.22	28.49	0.00	Average	121	269	HORIZONTAL
3	2446.20	94.63			63.79	2.24	28.60	0.00	Average	121	269	HORIZONTAL
4	2447.40	104.92			74.08	2.24	28.60	0.00	Peak	121	269	HORIZONTAL
5	2483.50	48.13	54.00	-5.87	17.20	2.26	28.67	0.00	Average	121	269	HORIZONTAL
6	2484.70	66.55	74.00	-7.45	35.62	2.26	28.67	0.00	Peak	121	269	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2437 MHz.

Channel 9

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2448.40	92.74			61.90	2.24	28.60	0.00	Average	148	283	HORIZONTAL
2	2462.40	101.66			70.79	2.24	28.63	0.00	Peak	148	283	HORIZONTAL
3	2483.50	46.16	54.00	-7.84	15.23	2.26	28.67	0.00	Average	148	283	HORIZONTAL
4	2485.90	61.60	74.00	-12.40	30.67	2.26	28.67	0.00	Peak	148	283	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2452 MHz.

Note:

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

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

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11b CH 1, 6, 11 / Chain 1
Test Date	Aug. 20, 2014 ~ Aug. 21, 2014		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.60	55.40	74.00	-18.60	24.70	2.21	28.49	0.00	Peak	100	352	VERTICAL
2	2390.00	45.05	54.00	-8.95	14.34	2.22	28.49	0.00	Average	100	352	VERTICAL
3	2411.00	104.16			73.41	2.22	28.53	0.00	Peak	100	352	VERTICAL
4	2411.20	100.36			69.61	2.22	28.53	0.00	Average	100	352	VERTICAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2436.20	103.89			73.10	2.23	28.56	0.00	Average	118	272	HORIZONTAL
2	2438.00	107.82			76.99	2.23	28.60	0.00	Peak	118	272	HORIZONTAL
3	2483.50	44.34	54.00	-9.66	13.41	2.26	28.67	0.00	Average	118	272	HORIZONTAL
4	2483.70	54.40	74.00	-19.60	23.47	2.26	28.67	0.00	Peak	118	272	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2437 MHz.

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2463.20	103.39			72.52	2.24	28.63	0.00	Peak	100	346	VERTICAL
2	2463.60	99.52			68.65	2.24	28.63	0.00	Average	100	346	VERTICAL
3	2483.50	45.67	54.00	-8.33	14.74	2.26	28.67	0.00	Average	100	346	VERTICAL
4	2486.70	56.16	74.00	-17.84	25.23	2.26	28.67	0.00	Peak	100	346	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	24°C	Humidity	58%
Test Engineer	Nick Peng	Configurations	IEEE 802.11g CH 1, 6, 11 / Chain 1
Test Date	Aug. 20, 2014		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.00	70.85	74.00	-3.15	40.15	2.21	28.49	0.00	Peak	144	90	HORIZONTAL
2	2390.00	53.22	54.00	-0.78	22.51	2.22	28.49	0.00	Average	144	90	HORIZONTAL
3	2405.60	109.21			78.46	2.22	28.53	0.00	Peak	144	90	HORIZONTAL
4	2409.40	99.72			68.97	2.22	28.53	0.00	Average	144	90	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2357.00	47.37	54.00	-6.63	16.76	2.19	28.42	0.00	Average	119	268	HORIZONTAL
2	2389.00	61.74	74.00	-12.26	31.04	2.21	28.49	0.00	Peak	119	268	HORIZONTAL
3	2443.00	99.17			68.33	2.24	28.60	0.00	Average	119	268	HORIZONTAL
4	2444.00	108.52			77.68	2.24	28.60	0.00	Peak	119	268	HORIZONTAL
5	2483.50	46.74	54.00	-7.26	15.81	2.26	28.67	0.00	Average	119	268	HORIZONTAL
6	2489.50	62.38	74.00	-11.62	31.42	2.26	28.70	0.00	Peak	119	268	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2437 MHz.

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2463.40	108.07			77.20	2.24	28.63	0.00	266	145	Peak	HORIZONTAL
2	2464.20	98.60			67.73	2.24	28.63	0.00	266	145	Average	HORIZONTAL
3	2483.50	50.55	54.00	-3.45	19.62	2.26	28.67	0.00	266	145	Average	HORIZONTAL
4	2483.50	73.48	74.00	-0.52	42.55	2.26	28.67	0.00	266	145	Peak	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

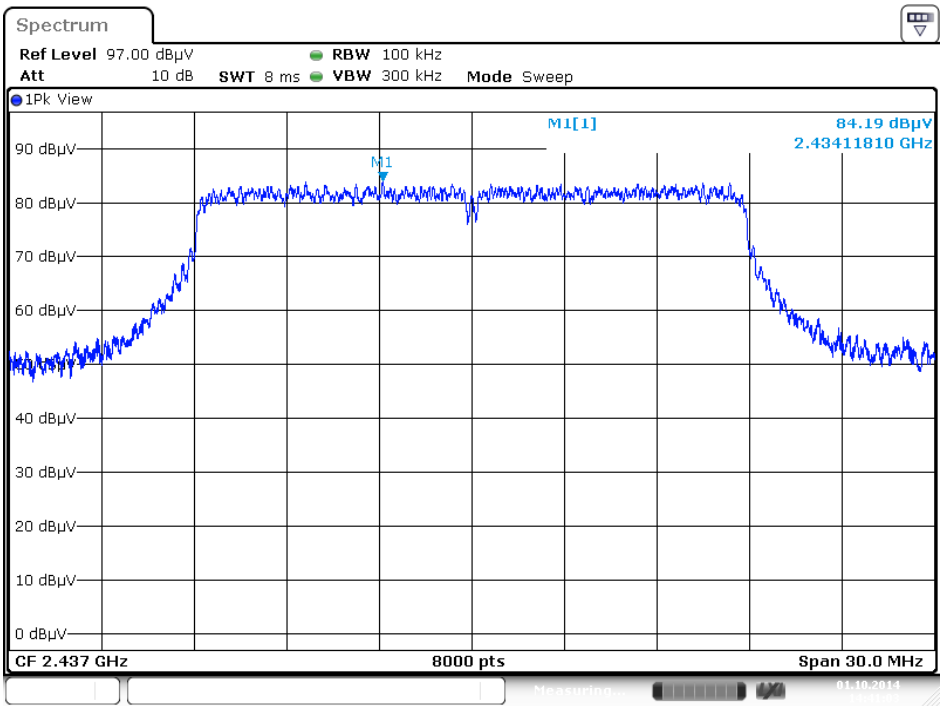
Note:

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

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

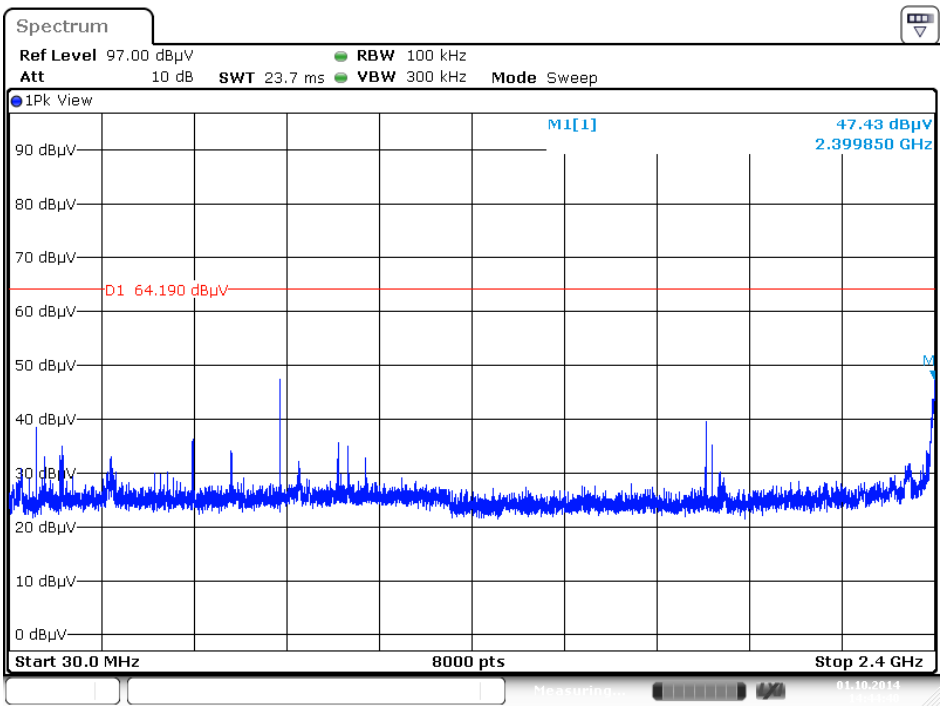
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11n MCS0 HT20 / Reference Level



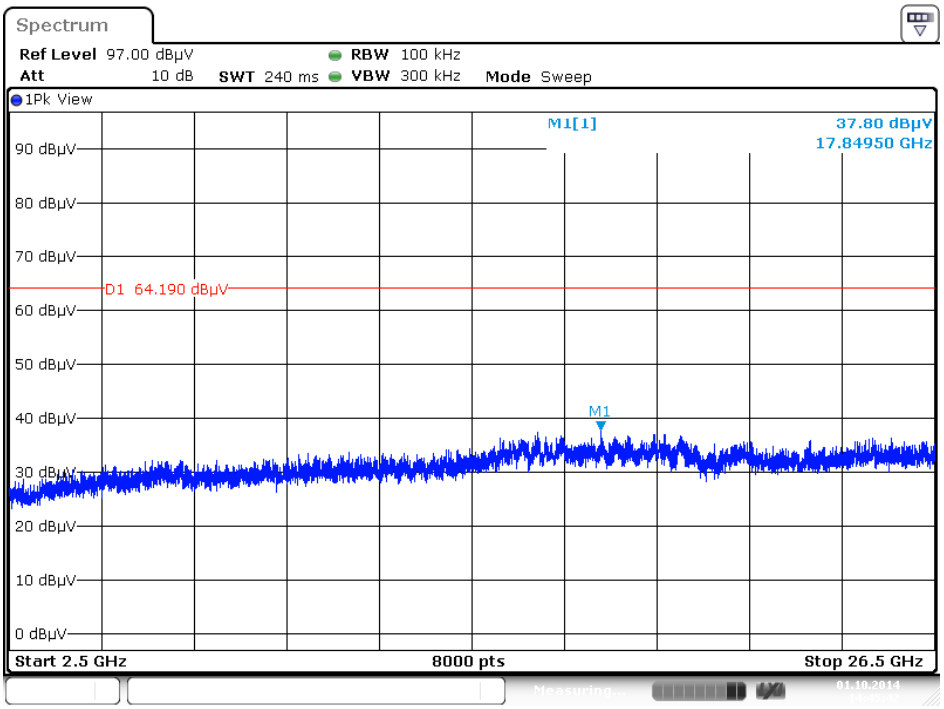
Date: 10.OCT.2014 14:41:03

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 30MHz~2400MHz (down 30dBc)



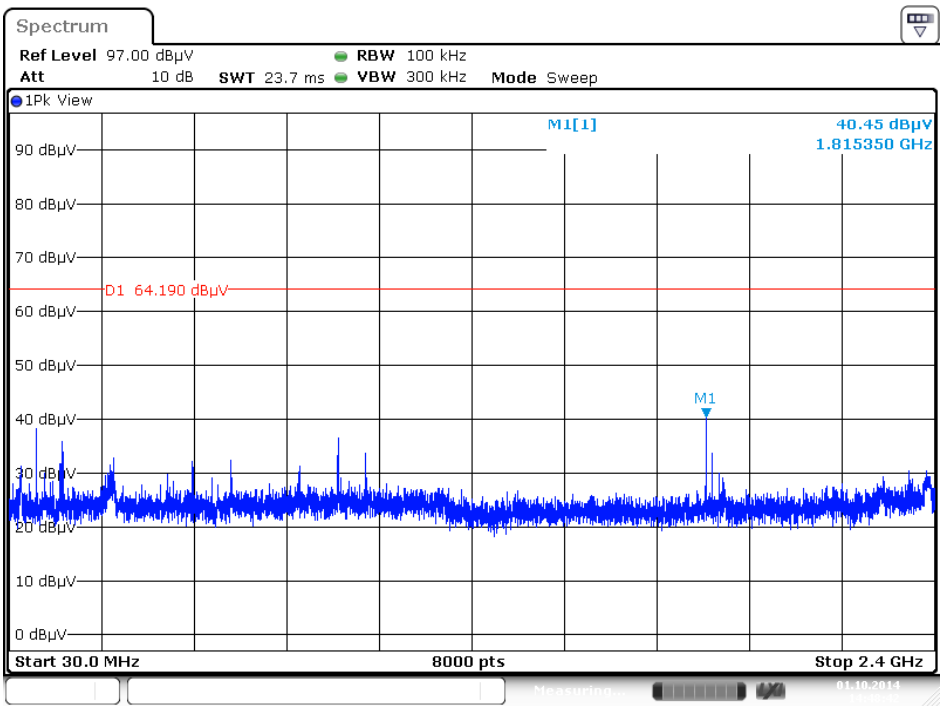
Date: 10.OCT.2014 14:44:40

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



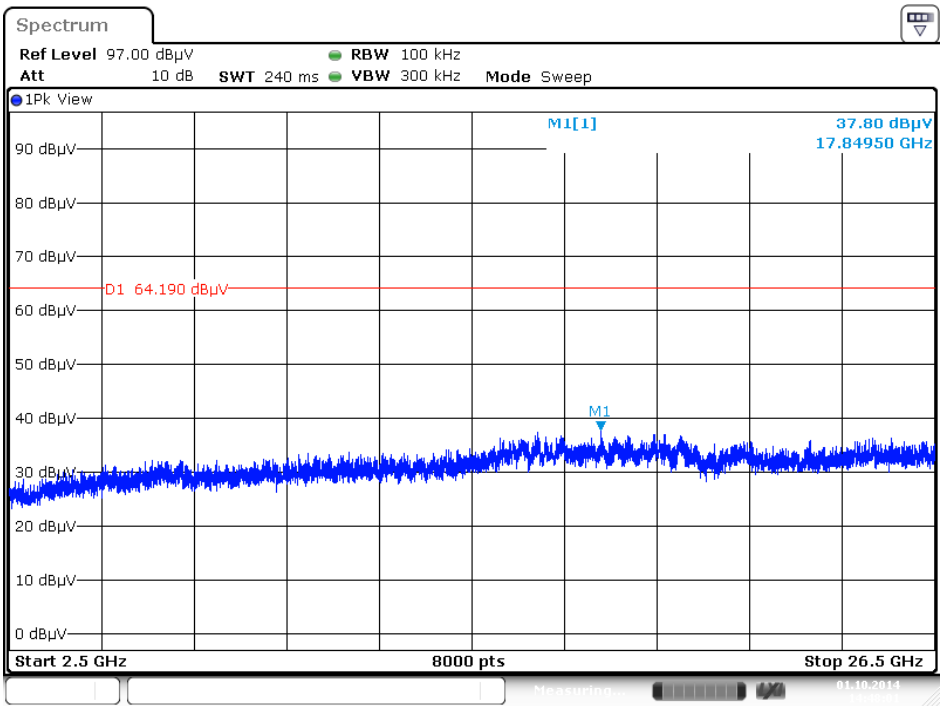
Date: 10.OCT.2014 14:45:42

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



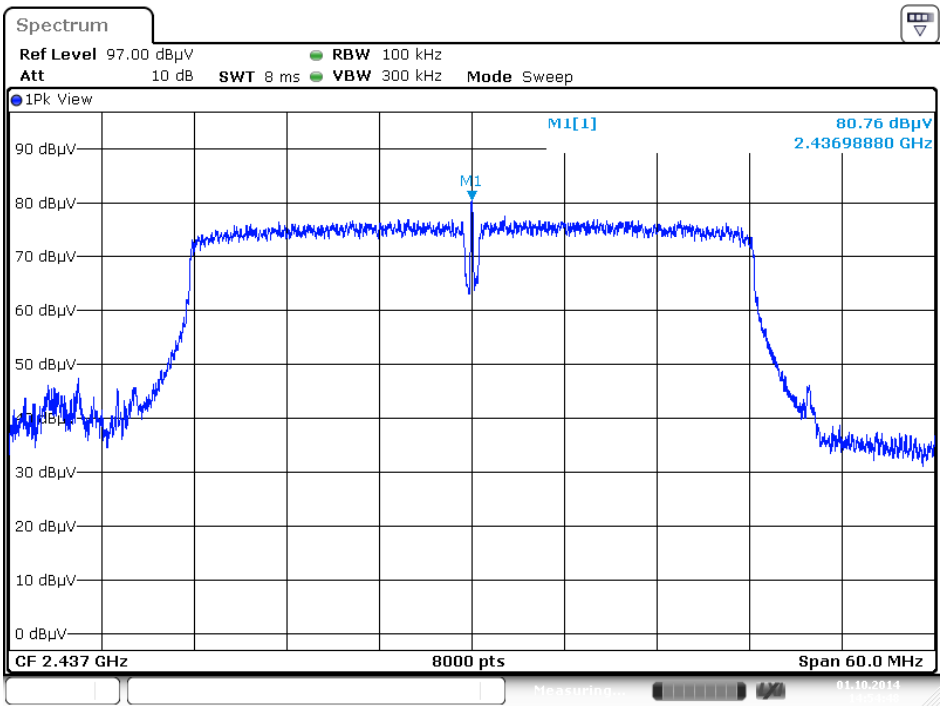
Date: 10.OCT.2014 14:48:43

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 2500MHz~26500MHz (down 30dBc)



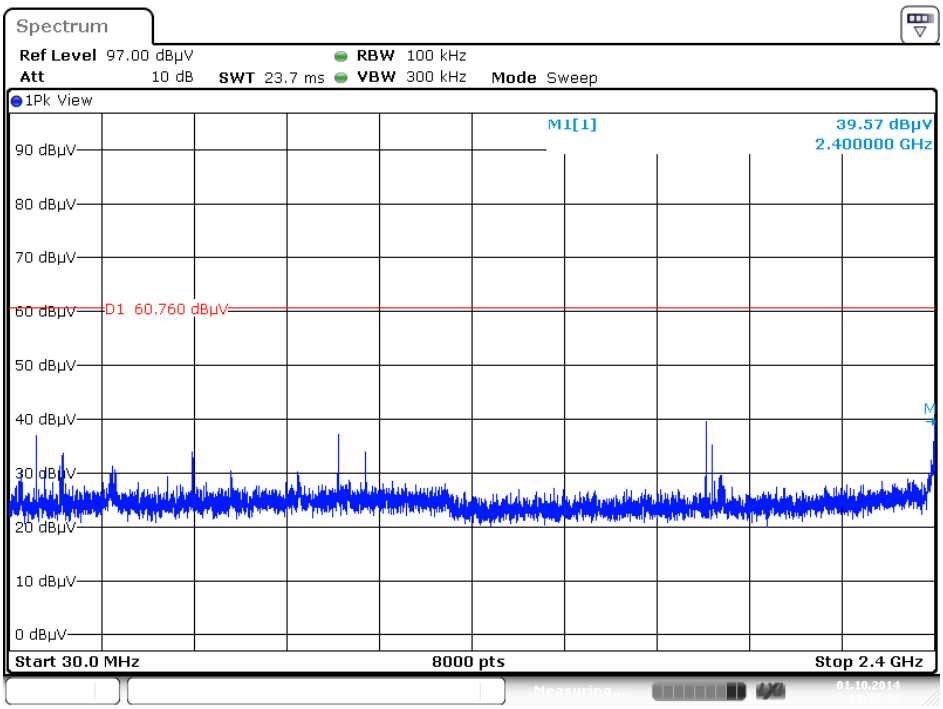
Date: 1.OCT.2014 14:48:01

Plot on Configuration IEEE 802.11n MCS0 HT40 / Reference Level



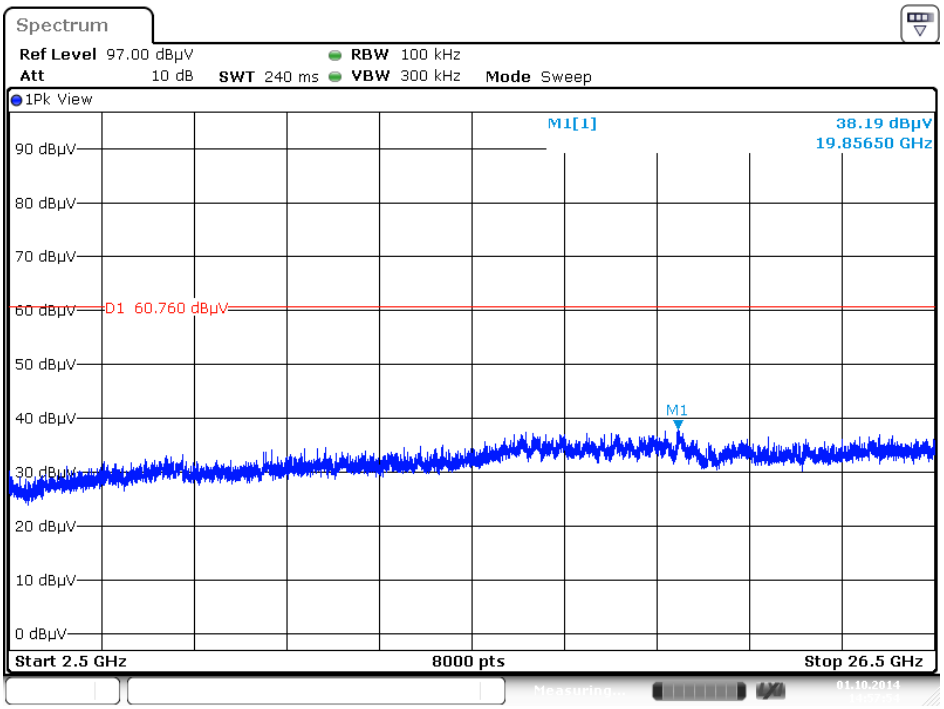
Date: 10.OCT.2014 14:54:49

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 3 / 30MHz~2400MHz (down 30dBc)



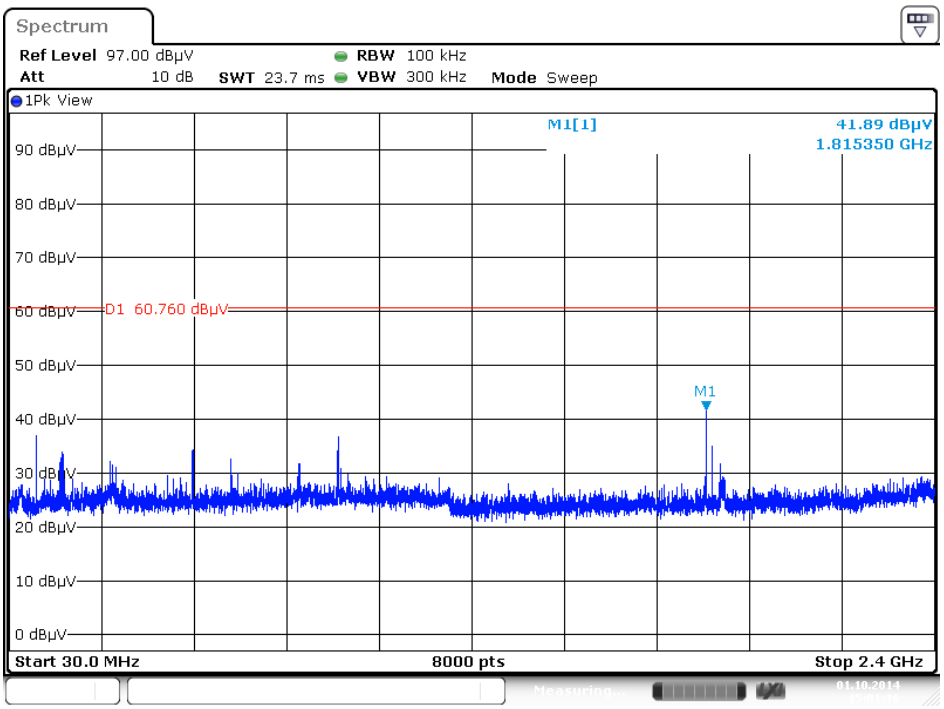
Date: 10.OCT.2014 14:57:23

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 3 / 2500MHz~26500MHz (down 30dBc)



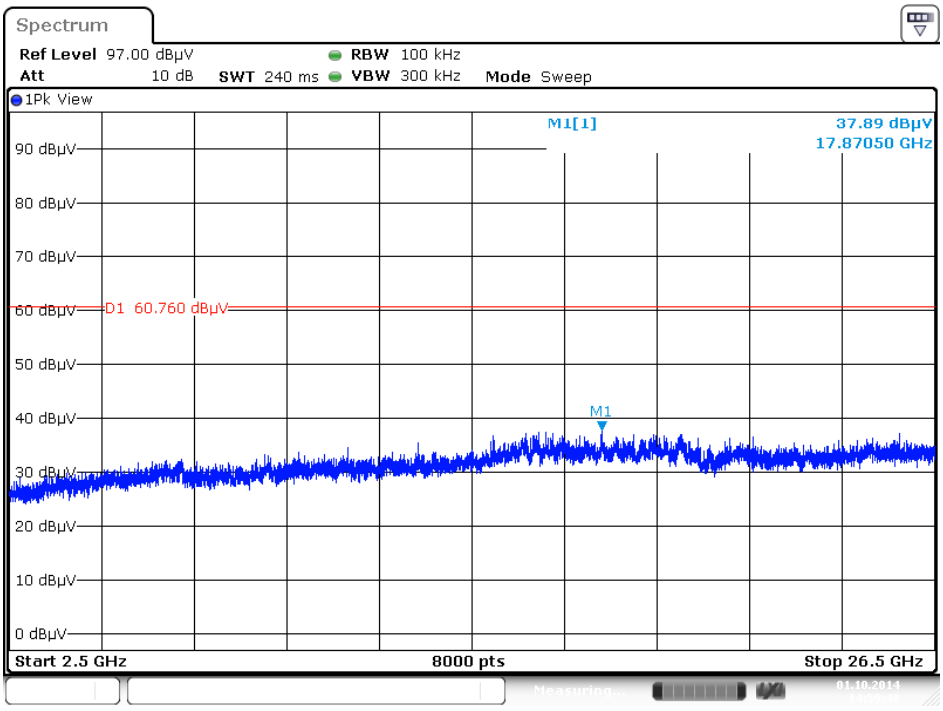
Date: 1.OCT.2014 14:57:54

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 9 / 30MHz~2400MHz (down 30dBc)



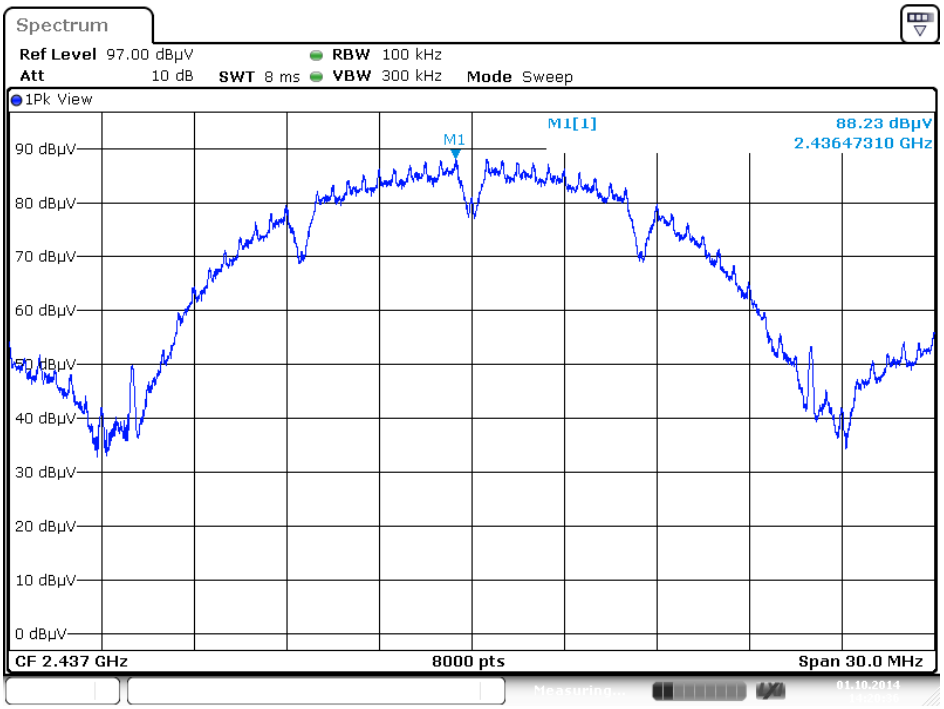
Date: 1.OCT.2014 15:01:17

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 9 / 2500MHz~26500MHz (down 30dBc)



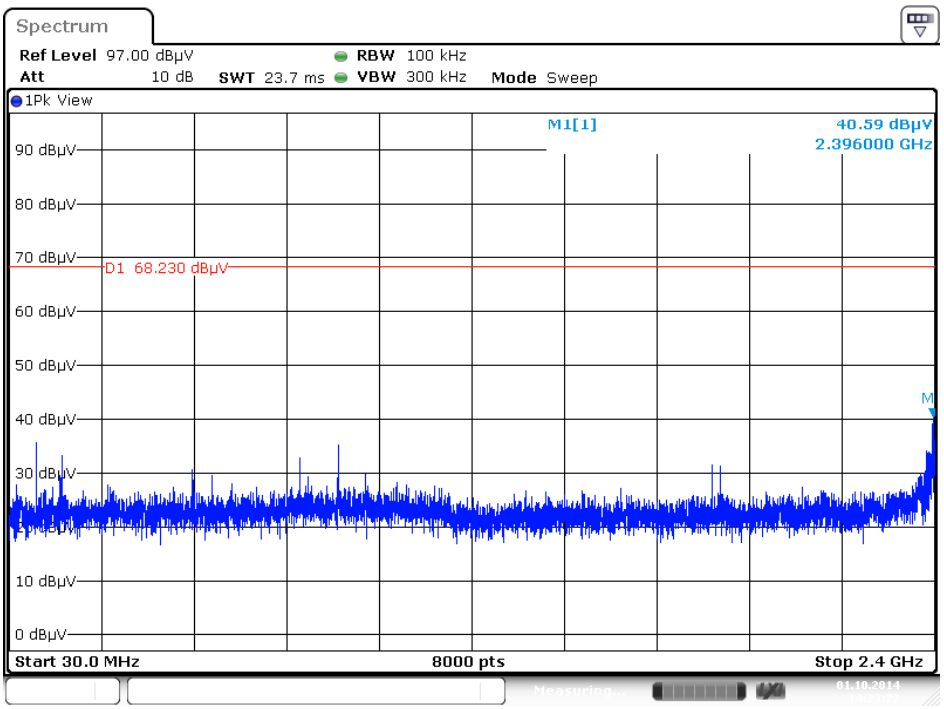
Date: 1.OCT.2014 14:59:48

Plot on Configuration IEEE 802.11b / Reference Level



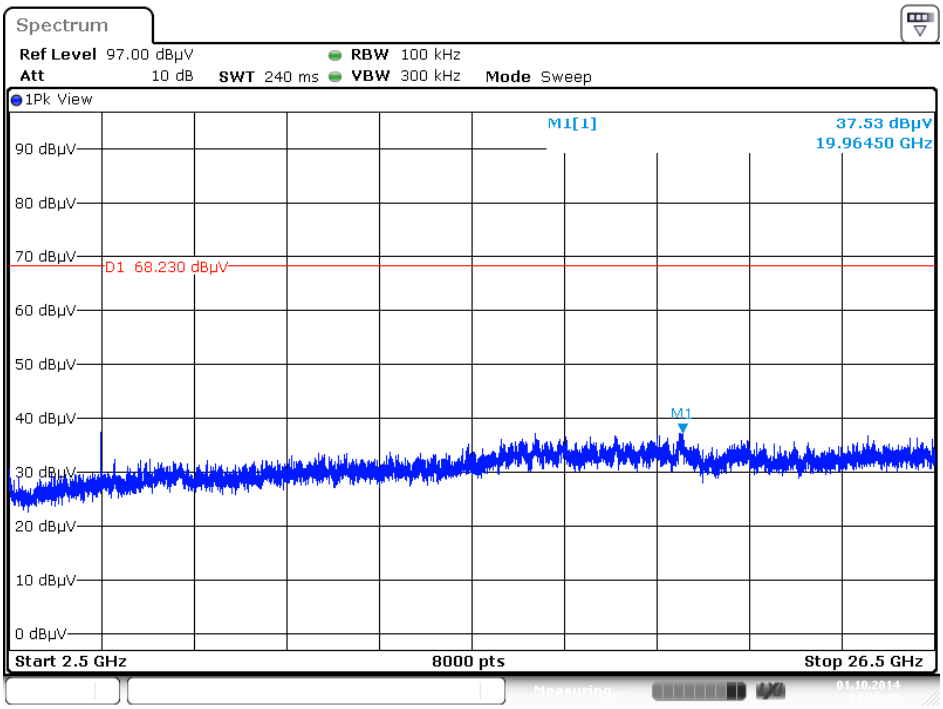
Date:10.OCT.2014 14:20:36

Plot on Configuration IEEE 802.11b / CH 1 / 30MHz~2400MHz (down 30dBc)



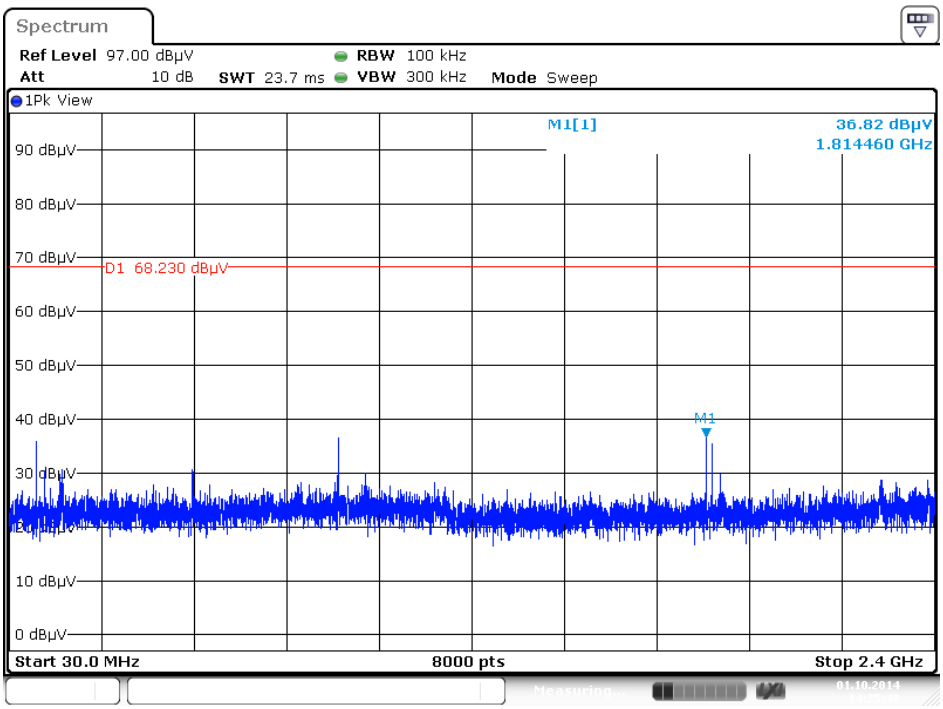
Date:10.OCT.2014 14:23:22

Plot on Configuration IEEE 802.11b / CH 1 / 2500MHz~26500MHz (down 30dBc)



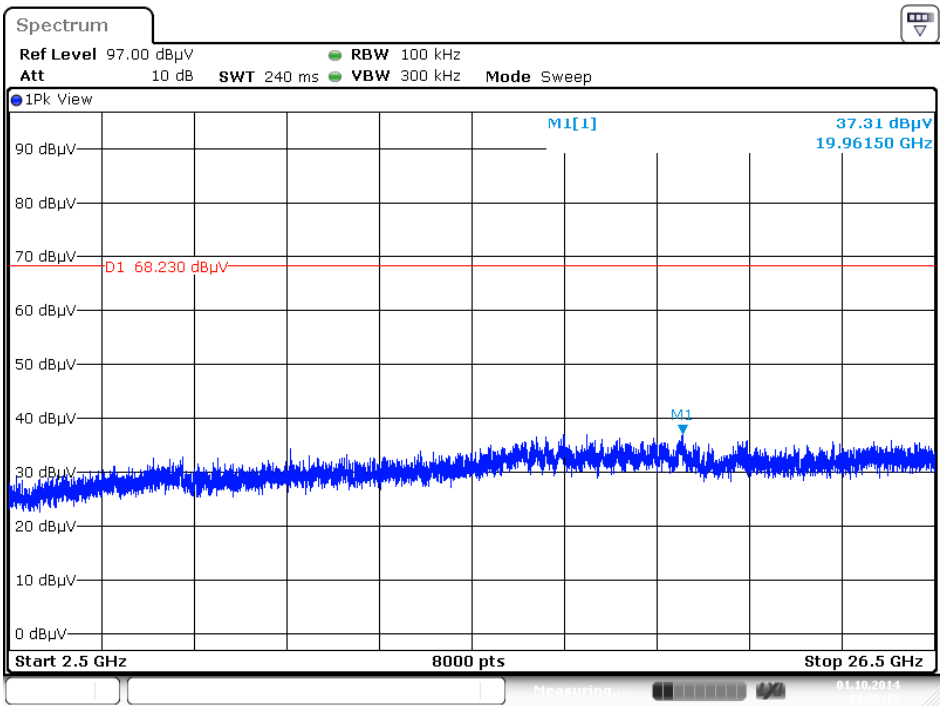
Date: 10.OCT.2014 14:23:48

Plot on Configuration IEEE 802.11b / CH 11 / 30MHz~2400MHz (down 30dBc)



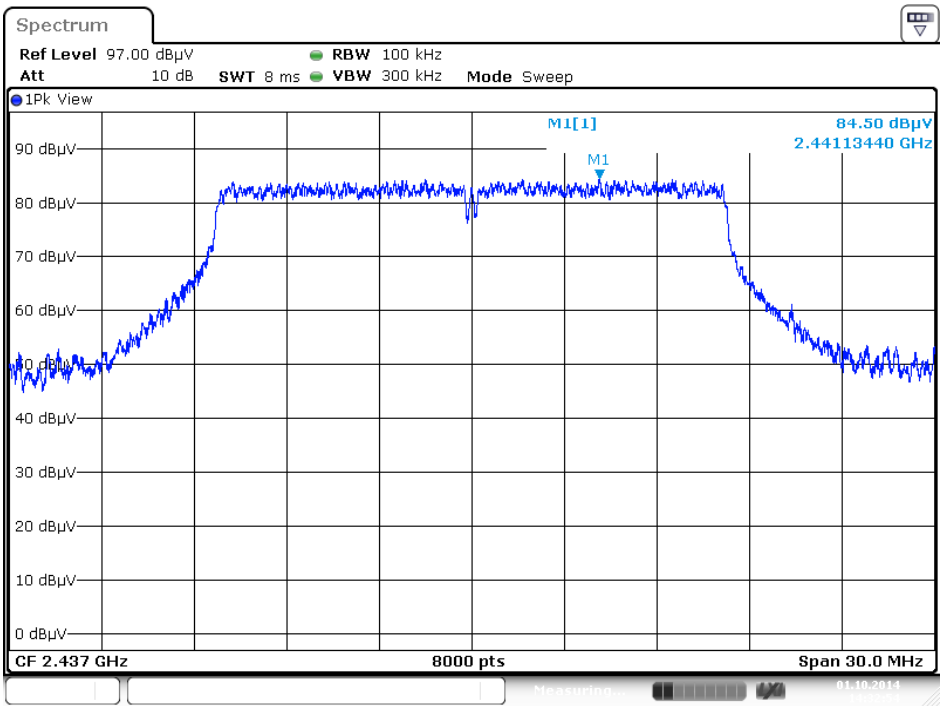
Date: 10.OCT.2014 14:25:48

Plot on Configuration IEEE 802.11b / CH 11 / 2500MHz~26500MHz (down 30dBc)



Date: 10.OCT.2014 14:25:15

Plot on Configuration IEEE 802.11g / Reference Level



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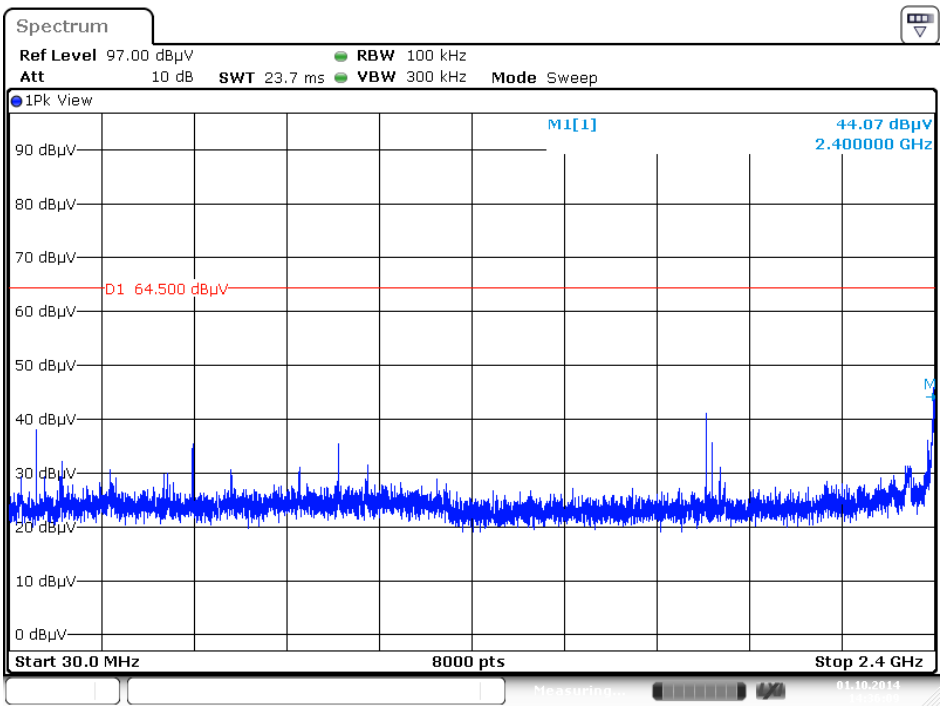
Plot on Configuration IEEE 802.11g / CH 1 / 30MHz~2400MHz (down 30dBc)



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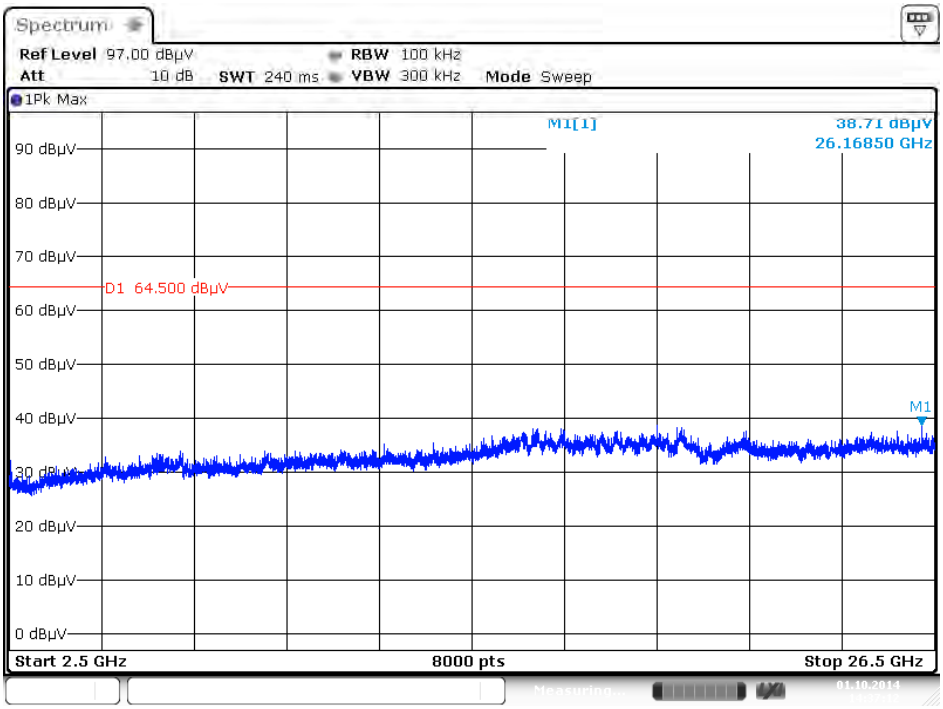
Plot on Configuration IEEE 802.11g / CH 1 / 2500MHz~26500MHz (down 30dBc)



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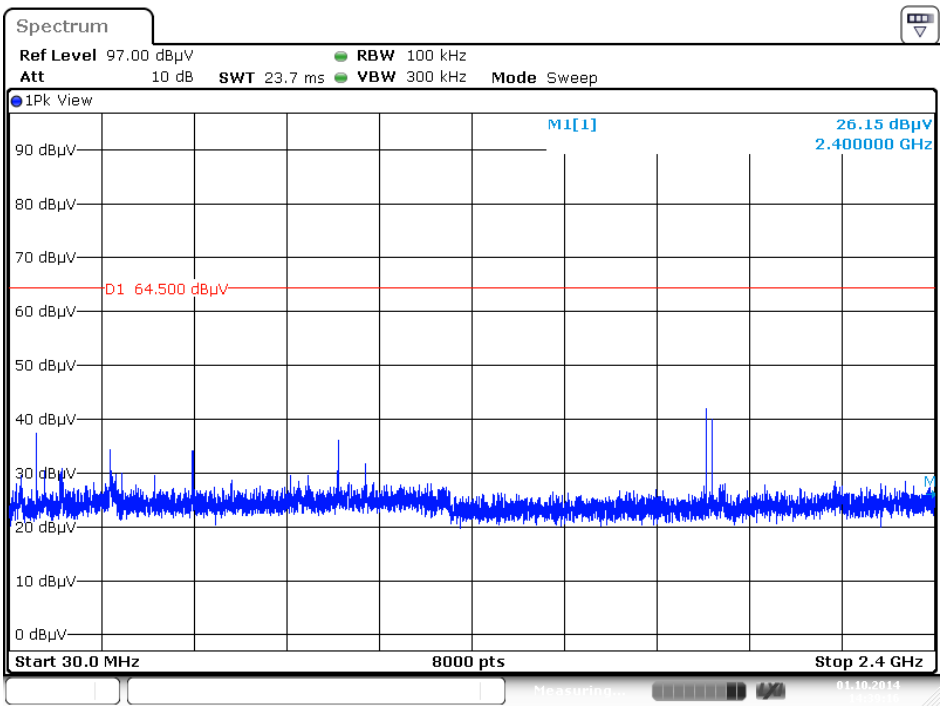
Plot on Configuration IEEE 802.11g / CH 11 / 30MHz~2400MHz (down 30dBc)



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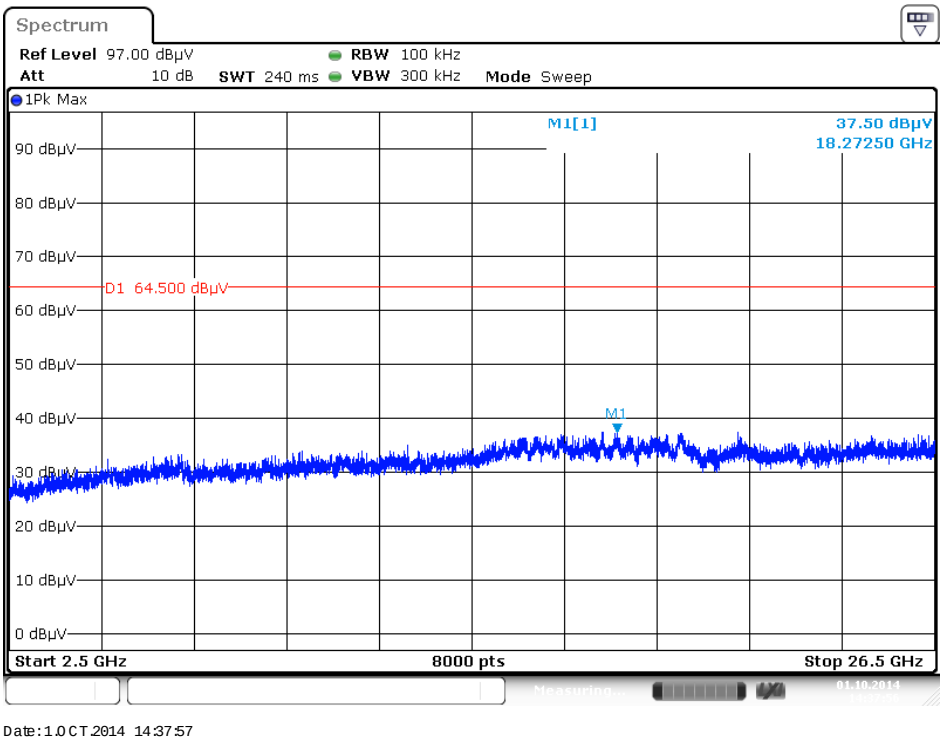
Plot on Configuration IEEE 802.11g / CH 11 / 2500MHz~26500MHz (down 30dBc)



4.5. Antenna Requirements

4.5.1. 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. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.5.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100355	9kHz ~ 2.75GHz	Apr. 23, 2014	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov. 23, 2013	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Nov. 23, 2013	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	Dec. 04, 2013	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 26, 2014	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 12, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 2013	Radiation (03CH01-CB)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Dec. 12, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO 2000	N/A	1 m - 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Sep. 26, 2011	Conducted (TH01-CB)
Thermo-Hygro Meter	N/A	HC 520	#1	15~70 degree	Nov. 02, 2011	Conducted (TH01-CB)
RF Power Divider	HP	11636A	00306	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	44100	1839	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	42100	17930	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)

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

"*" Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.4 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%