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FCC RADIO TEST REPORT

Applicant's company	SEIKO EPSON CORPORATION
Applicant Address	3-3-5 Owa Suwa-shi Nagano-Ken 392-8502, Japan
FCC ID	BKMAE-7122
Manufacturer's company	Arcadyan Technology Corporation
Manufacturer Address	No.8, Sec.2, Guangfu Rd.,Hsinchu, 30071 Taiwan

Product Name	WN7122BEP
Brand Name	EPSON
Model No.	WN7122BEP
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Jan. 14, 2015
Final Test Date	Feb. 11, 2015
Submission Type	Original Equipment

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, KDB 558074 D01 v03r02 and KDB 662911 D01 v02r01.

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



Table of Contents

1. VERIFICATION OF COMPLIANCE	1
2. SUMMARY OF THE TEST RESULT	2
3. GENERAL INFORMATION	3
3.1. Product Details.....	3
3.2. Accessories.....	4
3.3. Table for Filed Antenna.....	5
3.4. Table for Carrier Frequencies	5
3.5. Table for Test Modes	6
3.6. Table for Testing Locations.....	6
3.7. Table for Supporting Units	7
3.8. Table for Parameters of Test Software Setting	8
3.9. EUT Operation during Test	8
3.10. Duty Cycle	8
3.11. Test Configurations	9
4. TEST RESULT	12
4.1. AC Power Line Conducted Emissions Measurement.....	12
4.2. Maximum Conducted Output Power Measurement.....	16
4.3. Power Spectral Density Measurement	18
4.4. 6dB Spectrum Bandwidth Measurement	24
4.5. Radiated Emissions Measurement	30
4.6. Emissions Measurement	46
4.7. Antenna Requirements	60
5. LIST OF MEASURING EQUIPMENTS	61
6. MEASUREMENT UNCERTAINTY.....	63
APPENDIX A. PHOTOGRAPHS OF EUT.....	A1 ~ A4
APPENDIX B. TEST PHOTOS.....	B1 ~ B8
APPENDIX C. MAXIMUM PERMISSIBLE EXPOSURE.....	C1 ~ C3

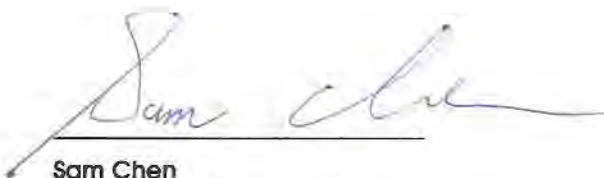
History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR510764	Rev. 01	Initial issue of report	Mar. 06, 2015

1. VERIFICATION OF COMPLIANCE

Product Name : WN7122BEP
Brand Name : EPSON
Model No. : WN7122BEP
Applicant : SEIKO EPSON CORPORATION
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. 14, 2015 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	10.54 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	10.58 dB
4.3	15.247(e)	Power Spectral Density	Complies	14.60 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	3.08 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.56 dB
4.7	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	5V DC
Modulation	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n: see the below table
Data Modulation	IEEE 802.11b: DSSS (BPSK / QPSK / CCK) IEEE 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	IEEE 802.11b: DSSS (1/ 2/ 5.5/11) IEEE 802.11g: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n: see the below table
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth
Channel Band Width (99%)	IEEE 802.11b: 14.52 MHz IEEE 802.11g: 17.04 MHz IEEE 802.11n MCS0 (HT20): 17.88 MHz
Maximum Conducted Output Power	IEEE 802.11b: 19.42 dBm IEEE 802.11g: 18.84 dBm IEEE 802.11n MCS0 (HT20): 18.75 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	Two (TX)
Band width Mode	20 MHz
IEEE 802.11b	V
IEEE 802.11g	V
IEEE 802.11n	V

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 0-15
Note 1: IEEE Std. 802.11n modulation consists of HT20 (HT: High Throughput). Then EUT support HT20.		
Note 2: Modulation modes consist of below configuration: HT20 IEEE 802.11n		

3.2. Accessories

N/A

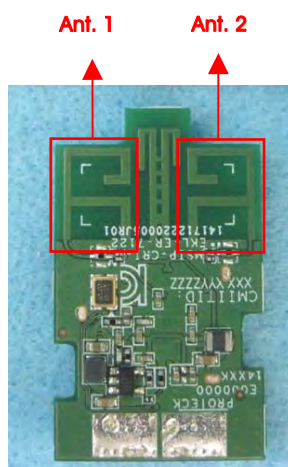
3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	-	-	Printed Antenna	N/A	0.32
2	-	-	Printed Antenna	N/A	0.31

Note: The EUT has two antennas.

For IEEE 802.11b/g/n mode (2TX/2RX)

Ant. 1 and Ant. 2 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

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

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	Antenna
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Conducted Output Power	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
Power Spectral Density	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
6dB Spectrum Bandwidth	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
Radiated Emissions 9kHz~1GHz	Normal Link	-	-	-
Radiated Emissions 1GHz~10 th Harmonic	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
Band Edge Emissions	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2

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
TH01-CB	OVEN Room	Hsin Chu	-	-

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

3.7. Table for Supporting Units

For Test Site No: 03CH01-CB

For Radiation emissions below 1GHz test:

Support Unit	Brand	Model	FCC ID
AP Router	Planex	GW-AP54SGX	KA220030603014-1
NB	DELL	M1330	DoC
NB	DELL	E4300	DoC
Mouse	HP	FM100	DoC
Earphone	E-BOOKI	E-EPC040	N/A
Test fixture	Arcadyan	WN7122B-PE Test Board	N/A

For Radiation emissions above 1GHz test:

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
Test fixture	Arcadyan	WN7122B-PE Test Board	N/A

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
AP Router	Planex	GW-AP54SGX	KA220030603014-1
NB	DELL	E6430	DoC
NB	DELL	E4300	DoC
Mouse	HP	FM100	DoC
Earphone	e-Power	S90W	N/A
Test fixture	Arcadyan	WN7122B-PE Test Board	N/A

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
Test fixture	Arcadyan	WN7122B-PE Test Board	N/A

3.8. 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.

Test Software Version	MT7603 QA V0.0.0.68		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	2412 MHz	2437 MHz	2462 MHz
802.11b	1D	1D	1D
802.11g	1D	1D	1D
802.11n MCS0 HT20	1D	1D	1D

3.9. EUT Operation during Test

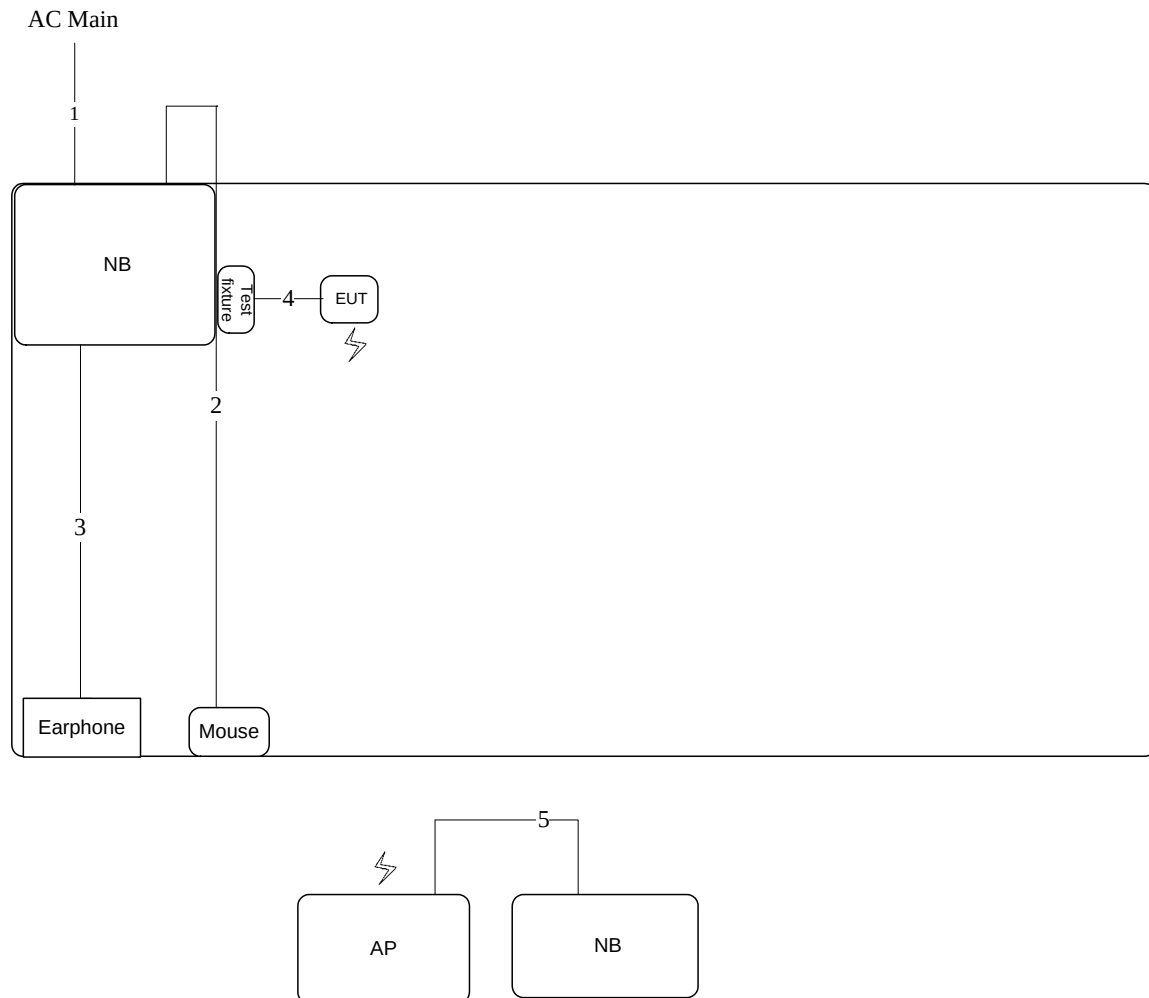
The EUT was programmed to be in continuously transmitting mode.

3.10. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11b	8.438	8.605	98.05	0.09	0.01
802.11g	1.398	1.553	90.05	0.46	0.72
802.11n MCS0 HT20	1.307	1.467	89.09	0.50	0.77

3.11. Test Configurations

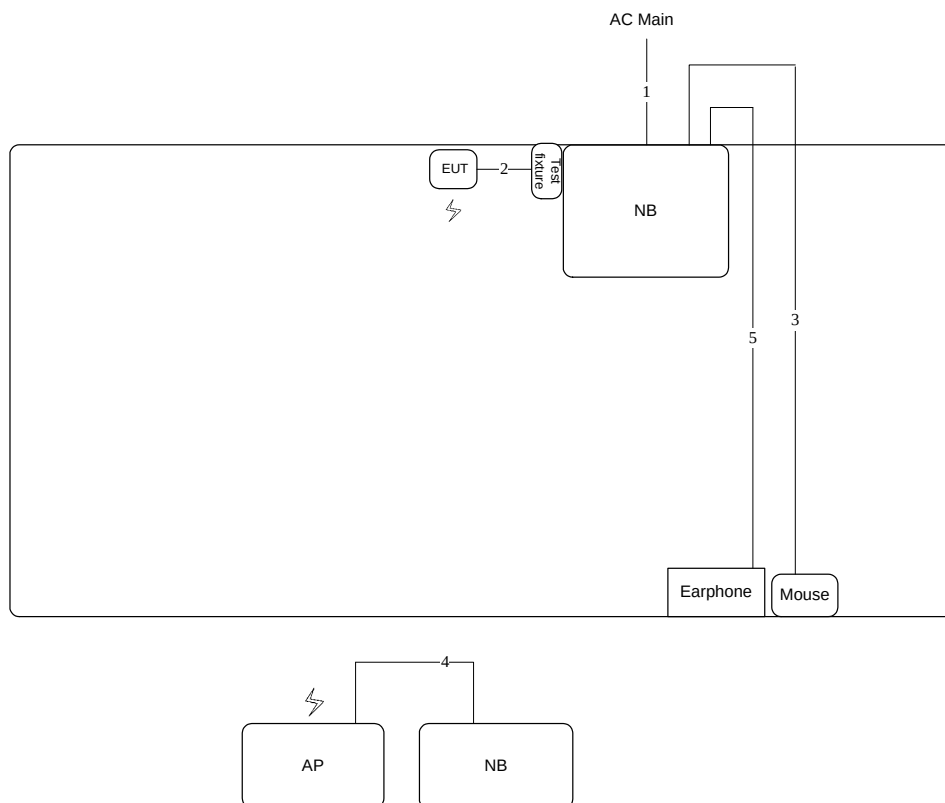
3.11.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	USB cable	Yes	1.8m
3	Audio cable	No	1.4m
4	Console cable	No	0.15m
5	RJ-45 cable	No	1.5m

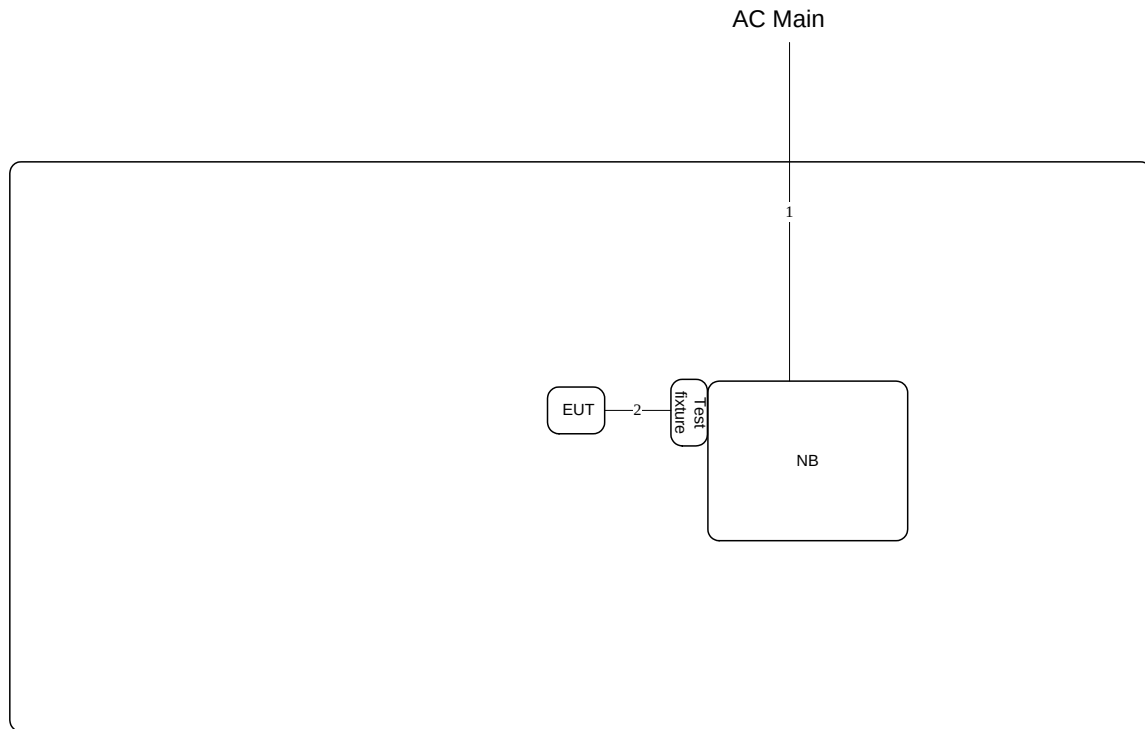
3.11.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Console cable	No	0.15m
3	USB cable	Yes	1.8m
4	RJ-45 cable	No	1m
5	Audio cable	No	1.4m

Test Configuration: above 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	Console cable	No	0.15m

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

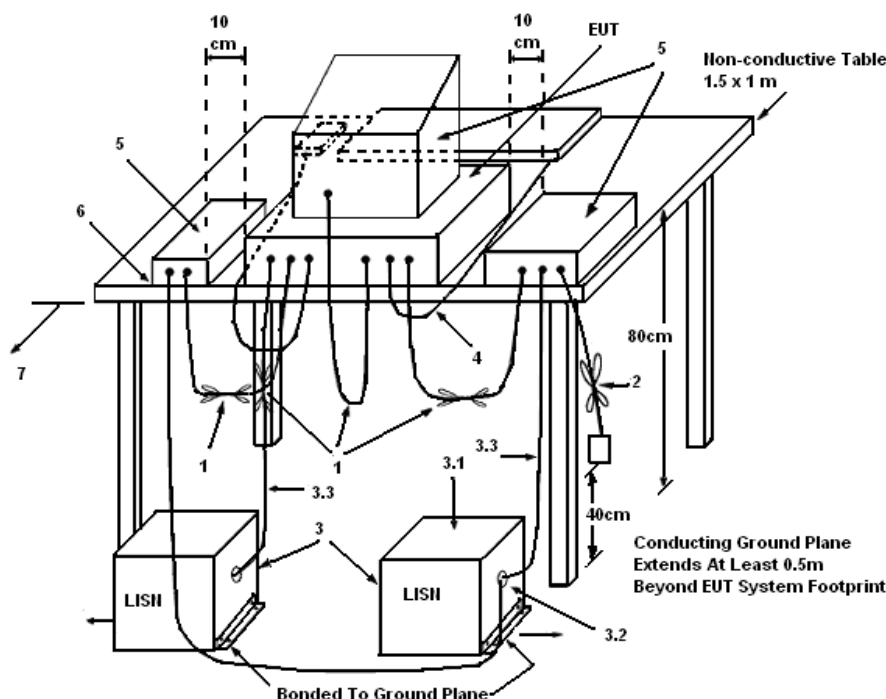
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

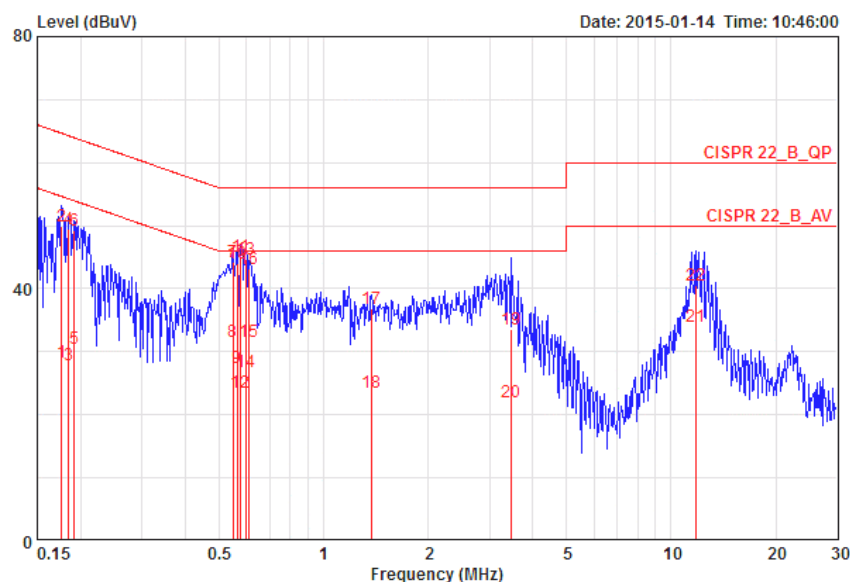
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

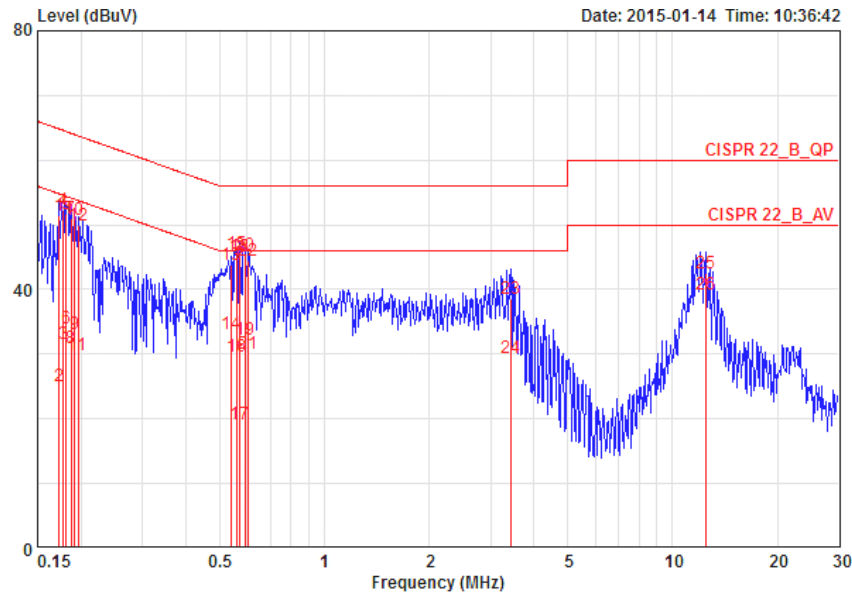
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	22°C	Humidity	56%
Test Engineer	Parody Lin	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over	Limit	Read	LISN	Cable		
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark	Pol/Phase
			dB	dBuV	dBuV	dB	dB		
1	0.17584	28.25	-26.43	54.68	18.31	9.78	0.16	AVERAGE	LINE
2	0.17584	49.86	-14.82	64.68	39.92	9.78	0.16	QP	LINE
3	0.18443	27.93	-26.35	54.28	17.99	9.78	0.16	AVERAGE	LINE
4	0.18443	49.47	-14.81	64.28	39.53	9.78	0.16	QP	LINE
5	0.19140	30.44	-23.53	53.98	20.50	9.78	0.16	AVERAGE	LINE
6	0.19140	49.28	-14.69	63.98	39.34	9.78	0.16	QP	LINE
7	0.54934	44.36	-11.64	56.00	34.40	9.77	0.19	QP	LINE
8	0.54934	31.71	-14.29	46.00	21.75	9.77	0.19	AVERAGE	LINE
9	0.56409	27.57	-18.43	46.00	17.61	9.77	0.19	AVERAGE	LINE
10	0.56409	44.11	-11.89	56.00	34.15	9.77	0.19	QP	LINE
11	0.57617	45.23	-10.77	56.00	35.27	9.77	0.19	QP	LINE
12	0.57617	23.58	-22.42	46.00	13.62	9.77	0.19	AVERAGE	LINE
13	0.59794	44.66	-11.34	56.00	34.70	9.77	0.19	QP	LINE
14	0.59794	26.81	-19.19	46.00	16.85	9.77	0.19	AVERAGE	LINE
15	0.61075	31.54	-14.46	46.00	21.58	9.77	0.19	AVERAGE	LINE
16	0.61075	43.17	-12.83	56.00	33.21	9.77	0.19	QP	LINE
17	1.374	36.79	-19.21	56.00	26.81	9.76	0.22	QP	LINE
18	1.374	23.60	-22.40	46.00	13.62	9.76	0.22	AVERAGE	LINE
19	3.472	33.50	-22.50	56.00	23.49	9.72	0.29	QP	LINE
20	3.472	21.98	-24.02	46.00	11.97	9.72	0.29	AVERAGE	LINE
21	11.745	33.96	-16.04	50.00	24.00	9.57	0.40	AVERAGE	LINE
22	11.745	40.48	-19.52	60.00	30.52	9.57	0.40	QP	LINE

Temperature	22°C	Humidity	56%
Test Engineer	Parody Lin	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over	Limit	Read	LISN	Cable		
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark	Pol/Phase
			dB	dBuV	dBuV	dB	dB		
1	0.17307	51.37	-13.44	64.81	41.29	9.92	0.16	QP	NEUTRAL
2	0.17307	25.01	-29.80	54.81	14.93	9.92	0.16	AVERAGE	NEUTRAL
3	0.17772	31.54	-23.05	54.59	21.46	9.92	0.16	AVERAGE	NEUTRAL
4	0.17772	52.30	-12.29	64.59	42.22	9.92	0.16	QP	NEUTRAL
5	0.18152	51.58	-12.83	64.42	41.50	9.92	0.16	QP	NEUTRAL
6	0.18152	34.01	-20.40	54.42	23.93	9.92	0.16	AVERAGE	NEUTRAL
7	0.18739	51.06	-13.09	64.15	40.98	9.92	0.16	QP	NEUTRAL
8	0.18739	30.97	-23.18	54.15	20.89	9.92	0.16	AVERAGE	NEUTRAL
9	0.19140	33.15	-20.82	53.98	23.07	9.92	0.16	AVERAGE	NEUTRAL
10	0.19140	50.77	-13.20	63.98	40.69	9.92	0.16	QP	NEUTRAL
11	0.19654	29.95	-23.80	53.76	19.87	9.92	0.16	AVERAGE	NEUTRAL
12	0.19654	49.88	-13.87	63.76	39.80	9.92	0.16	QP	NEUTRAL
13	0.54068	43.86	-12.14	56.00	33.76	9.91	0.19	QP	NEUTRAL
14	0.54068	33.18	-12.82	46.00	23.08	9.91	0.19	AVERAGE	NEUTRAL
15 @	0.55815	45.46	-10.54	56.00	35.36	9.91	0.19	QP	NEUTRAL
16	0.55815	29.55	-16.45	46.00	19.45	9.91	0.19	AVERAGE	NEUTRAL
17	0.57313	19.09	-26.91	46.00	8.99	9.91	0.19	AVERAGE	NEUTRAL
18	0.57313	45.04	-10.96	56.00	34.94	9.91	0.19	QP	NEUTRAL
19	0.59164	32.26	-13.74	46.00	22.16	9.91	0.19	AVERAGE	NEUTRAL
20 @	0.59164	45.39	-10.61	56.00	35.29	9.91	0.19	QP	NEUTRAL
21	0.60431	30.15	-15.85	46.00	20.05	9.91	0.19	AVERAGE	NEUTRAL
22	0.60431	44.52	-11.48	56.00	34.42	9.91	0.19	QP	NEUTRAL
23	3.417	38.55	-17.45	56.00	28.39	9.87	0.29	QP	NEUTRAL
24	3.417	29.50	-16.50	46.00	19.34	9.87	0.29	AVERAGE	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum Conducted 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

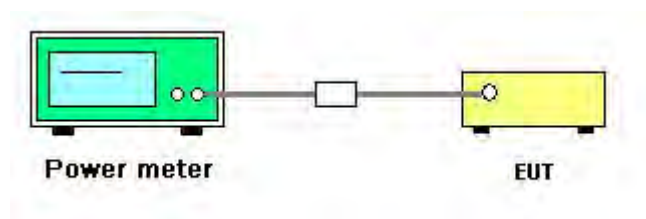
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

4.2.3. Test Procedures

1. Test procedures refer KDB 558074 D01 v03r02 section 9.2.3.2 Measurement using a power meter (PM).
2. Multiple antenna systems was performed in accordance with KDB 662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
3. This procedure provides an alternative for determining the RMS output power using a broadband RF average power meter with a thermocouple detector.

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 Maximum Conducted Output Power

Temperature	26°C	Humidity	63%
Test Engineer	Jim Huang	Test Date	Feb. 04, 2015

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Antenna 1	Antenna 2	Total		
802.11b	2412 MHz	16.15	16.21	19.19	30.00	Complies
	2437 MHz	16.57	16.25	19.42	30.00	Complies
	2462 MHz	16.58	16.05	19.33	30.00	Complies
802.11g	2412 MHz	15.51	15.67	18.60	30.00	Complies
	2437 MHz	15.95	15.56	18.77	30.00	Complies
	2462 MHz	16.03	15.62	18.84	30.00	Complies
802.11n MCS0 HT20	2412 MHz	15.32	15.65	18.50	30.00	Complies
	2437 MHz	15.78	15.61	18.71	30.00	Complies
	2462 MHz	15.76	15.72	18.75	30.00	Complies

4.3. Power Spectral Density Measurement

4.3.1. 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.

4.3.2. Measuring Instruments and Setting

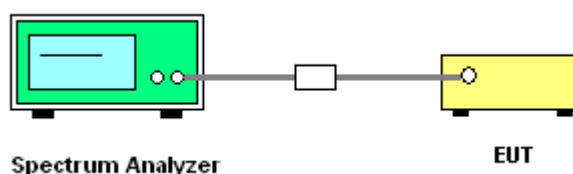
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS channel bandwidth.
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100\text{kHz}$
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple

4.3.3. Test Procedures

1. Test was performed in accordance with KDB 558074 D01 v03r02 for Performing Compliance Measurements on Digital Transmission Systems (DTS) - section 10.2 Method PKPSD (peak PSD) and KDB 662911 D01 v02r01 section In-Band Power Spectral Density (PSD) Measurements option (b) Measure and sum spectral maximal across the outputs.
2. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
3. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$ (use of a greater number of measurement points than this minimum requirement is recommended).
4. Use the peak marker function to determine the maximum level in any 3 kHz band segment within the fundamental EBW.
5. The resulting PSD level must be $\leq 8 \text{ dBm}$.

4.3.4. Test Setup Layout



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. Test Result of Power Spectral Density

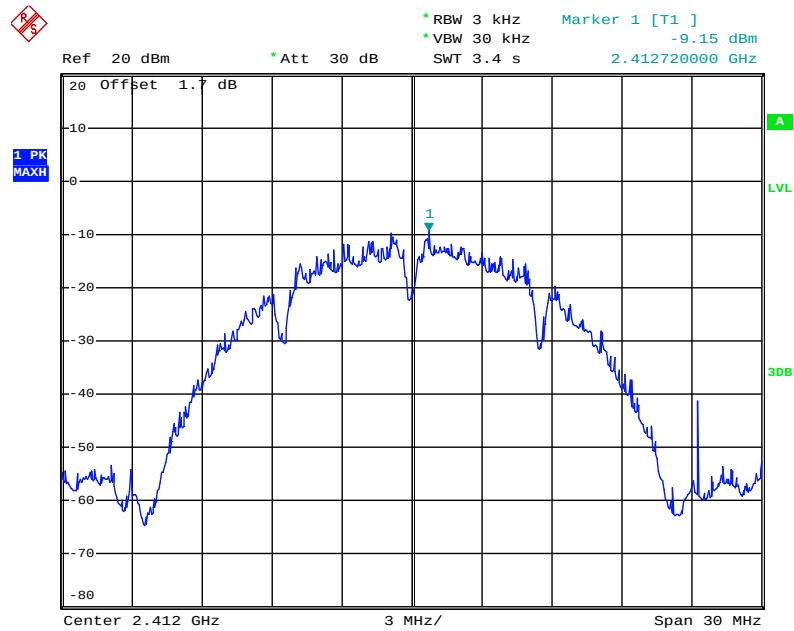
Temperature	26°C	Humidity	63%
Test Engineer	Jim Huang		

Mode	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Antenna 1	Antenna 2	Total		
802.11b	2412 MHz	-9.15	-10.12	-6.60	8.00	Complies
	2437 MHz	-9.70	-10.36	-7.01	8.00	Complies
	2462 MHz	-9.77	-11.28	-7.45	8.00	Complies
802.11g	2412 MHz	-11.74	-12.77	-9.21	8.00	Complies
	2437 MHz	-10.13	-11.72	-7.84	8.00	Complies
	2462 MHz	-11.73	-10.21	-7.89	8.00	Complies
802.11n MCS0 HT20	2412 MHz	-12.00	-12.75	-9.35	8.00	Complies
	2437 MHz	-11.35	-10.52	-7.90	8.00	Complies
	2462 MHz	-11.25	-9.82	-7.47	8.00	Complies

Note: All the test values were listed in the report.

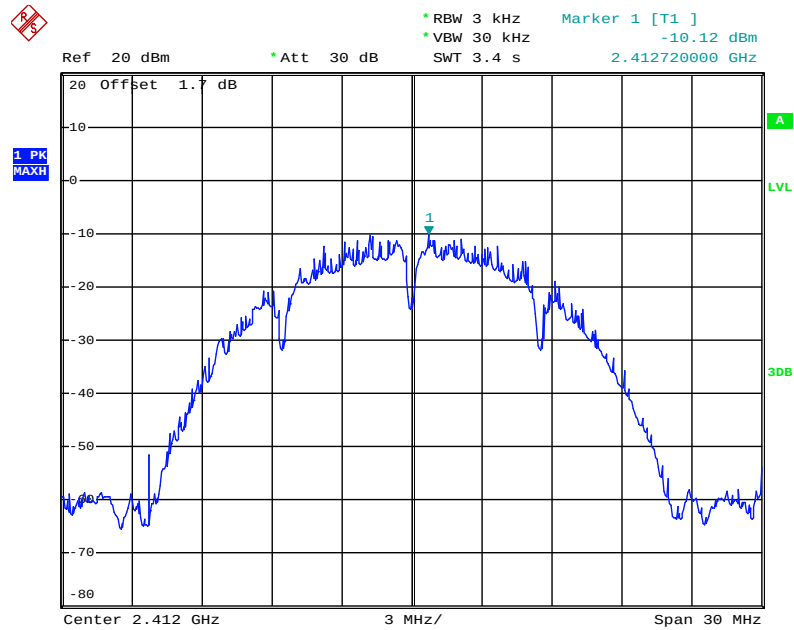
For plots, only the channel with worse result was shown.

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz / Antenna 1



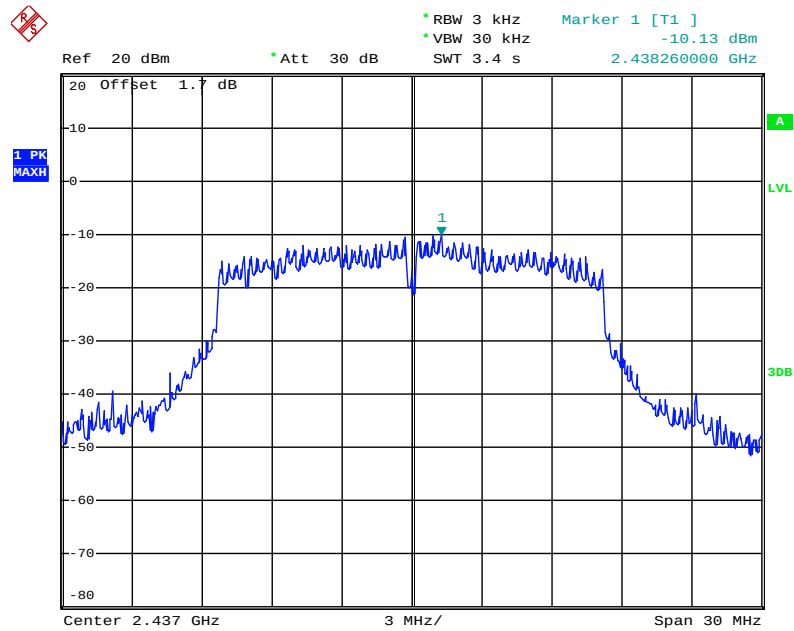
Date: 4.FEB.2015 21:47:10

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz / Antenna 2



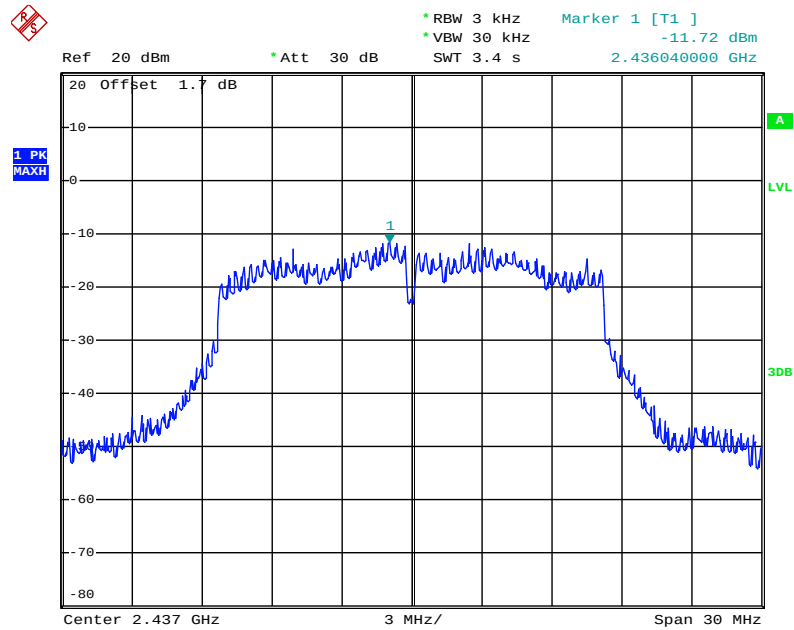
Date: 4.FEB.2015 21:51:04

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz / Antenna 1



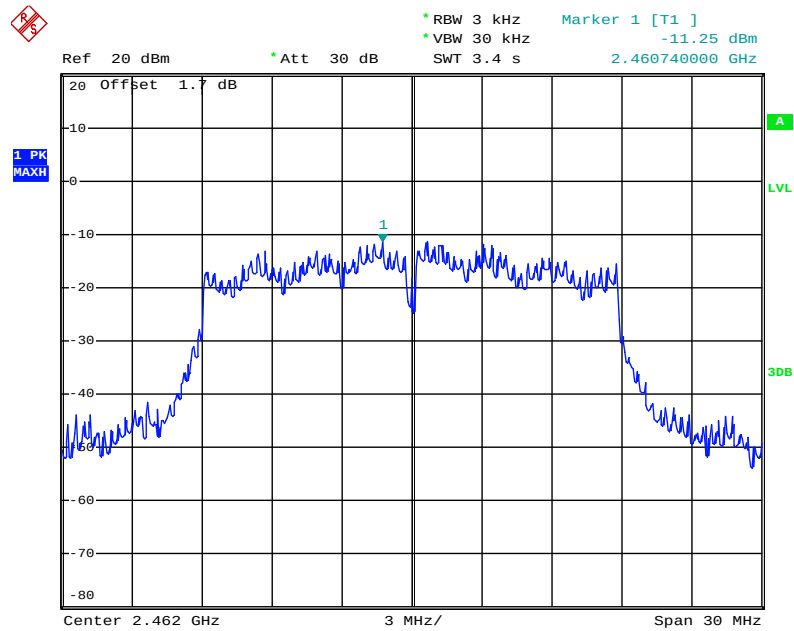
Date: 4.FEB.2015 22:05:36

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz / Antenna 2



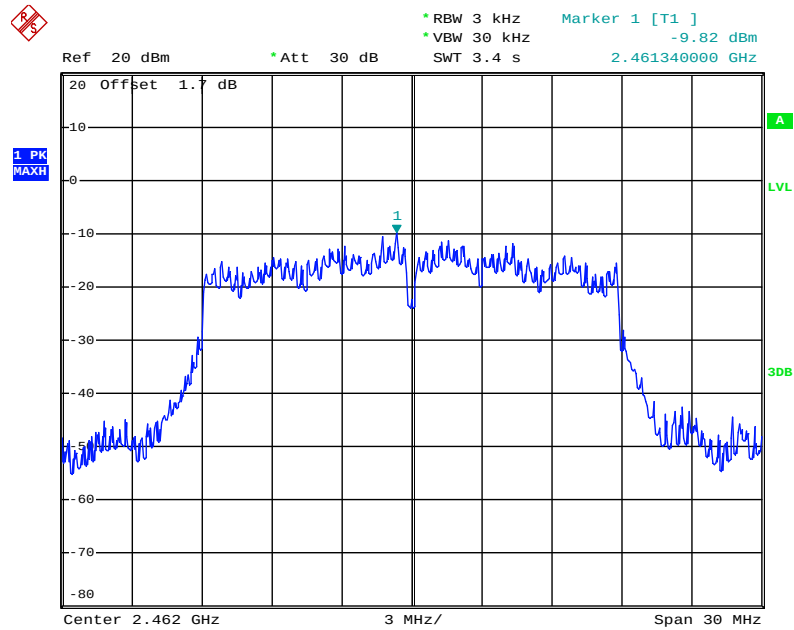
Date: 4.FEB.2015 22:06:07

Power Density Plot on Configuration IEEE 802.11n MCS0 HT20 / 2462 MHz / Antenna 1



Date: 4.FEB.2015 22:10:28

Power Density Plot on Configuration IEEE 802.11n MCS0 HT20 / 2462 MHz / Antenna 2



Date: 4.FEB.2015 22:11:10

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

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

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.

6dB Spectrum Bandwidth	
Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth	
Spectrum Parameters	Setting
Span	1.5 times to 5.0 times the OBW
RBW	1 % to 5 % of the OBW
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold

4.4.3. Test Procedures

For Radiated 6dB Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB 558074 D01 v03r02 for Performing Compliance Measurements on Digital Transmission Systems (DTS) - section 8.0 DTS bandwidth= > 8.1 Option 1.
3. Multiple antenna system was performed in accordance with KDB 662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. Measured the spectrum width with power higher than 6dB below carrier.

4.4.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.5.4.

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 6dB Spectrum Bandwidth

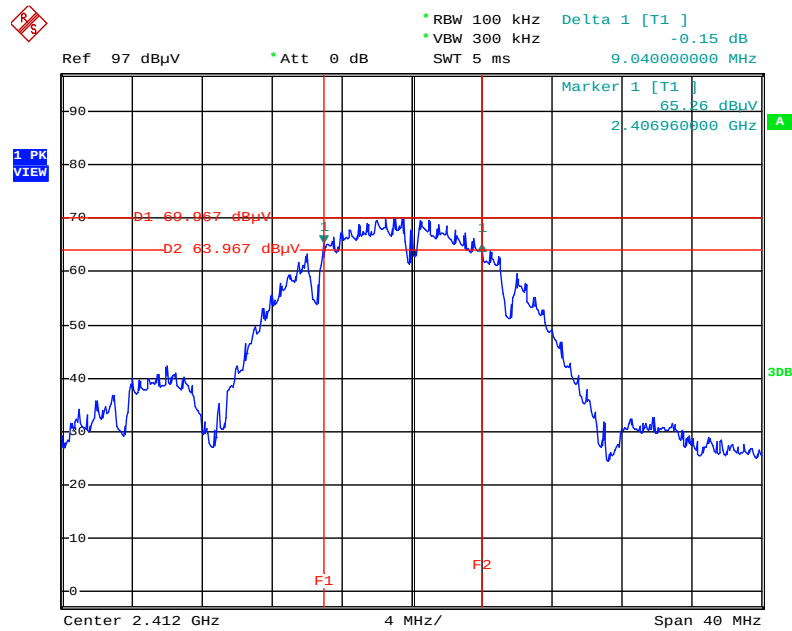
Temperature	26°C	Humidity	63%
Test Engineer	Jim Huang		

Mode	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11b	2412 MHz	9.04	14.40	500	Complies
	2437 MHz	9.44	14.40	500	Complies
	2462 MHz	9.60	14.52	500	Complies
802.11g	2412 MHz	11.04	17.04	500	Complies
	2437 MHz	11.68	17.04	500	Complies
	2462 MHz	15.12	17.04	500	Complies
802.11n MCS0 HT20	2412 MHz	15.12	17.88	500	Complies
	2437 MHz	13.84	17.88	500	Complies
	2462 MHz	13.92	17.88	500	Complies

Note: All the test values were listed in the report.

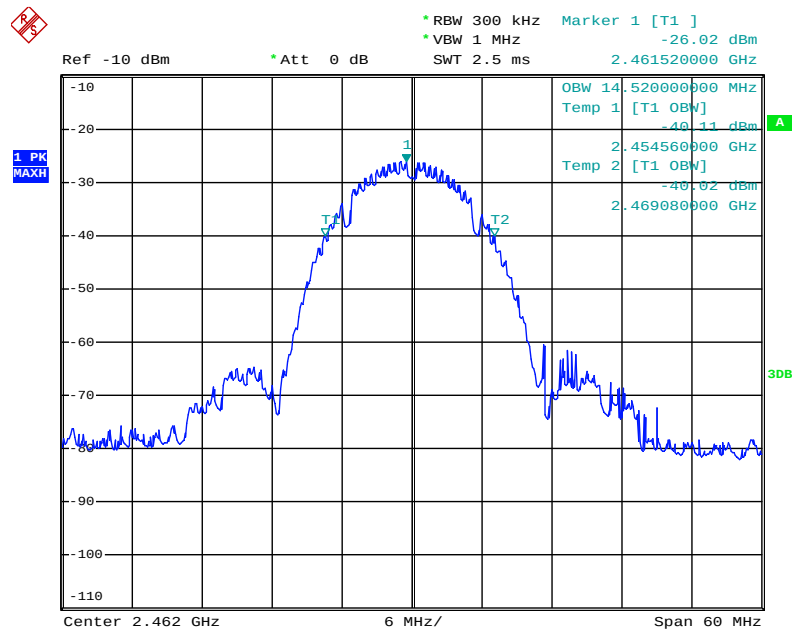
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz / Antenna 1 + Antenna 2



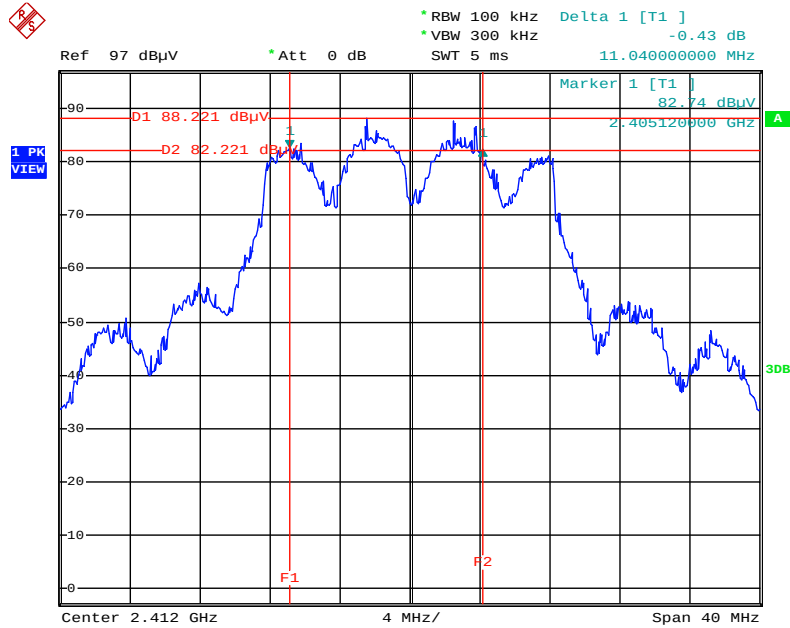
Date: 4.FEB.2015 22:38:36

99% Occupied Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz / Antenna 1 + Antenna 2



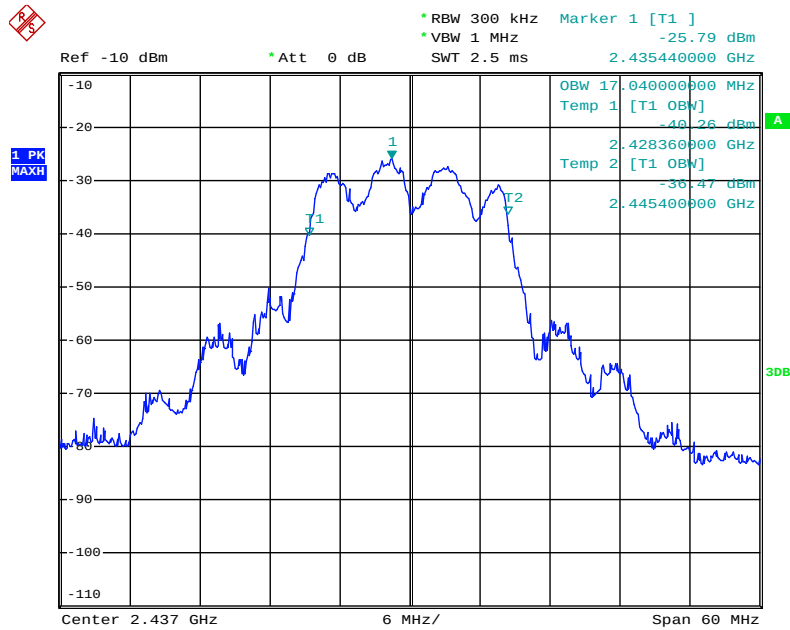
Date: 4.FEB.2015 22:50:49

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz / Antenna 1 + Antenna 2



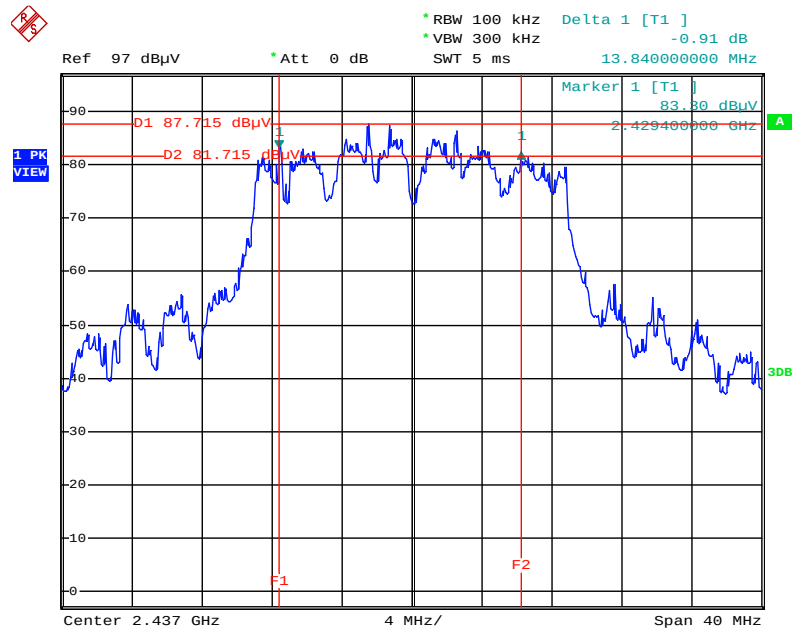
Date: 4.FEB.2015 22:42:10

99% Occupied Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz / Antenna 1 + Antenna 2



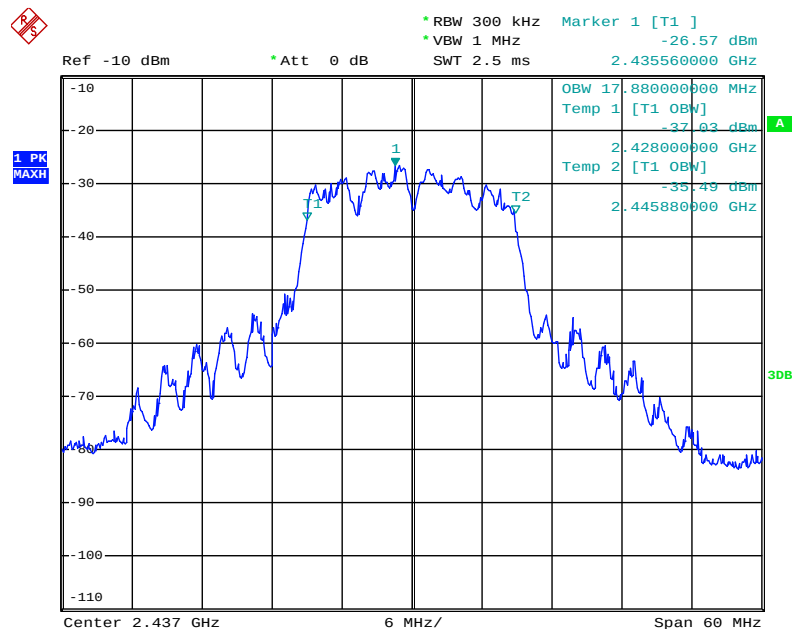
Date: 4.FEB.2015 22:53:11

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT20 / 2437 MHz / Antenna 1 + Antenna 2



Date: 4.FEB.2015 22:43:56

99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT20 / 2437 MHz / Antenna 1 + Antenna 2



Date: 4.FEB.2015 22:54:29

4.5. Radiated Emissions Measurement

4.5.1. 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 (microvolts/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

4.5.2. 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

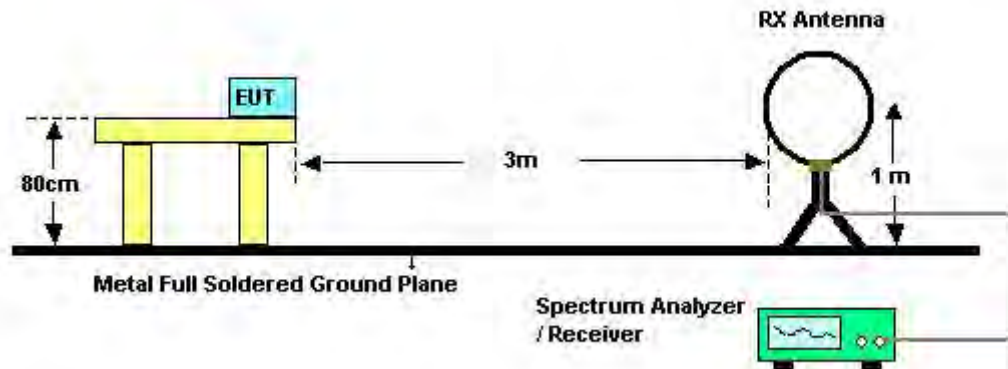
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

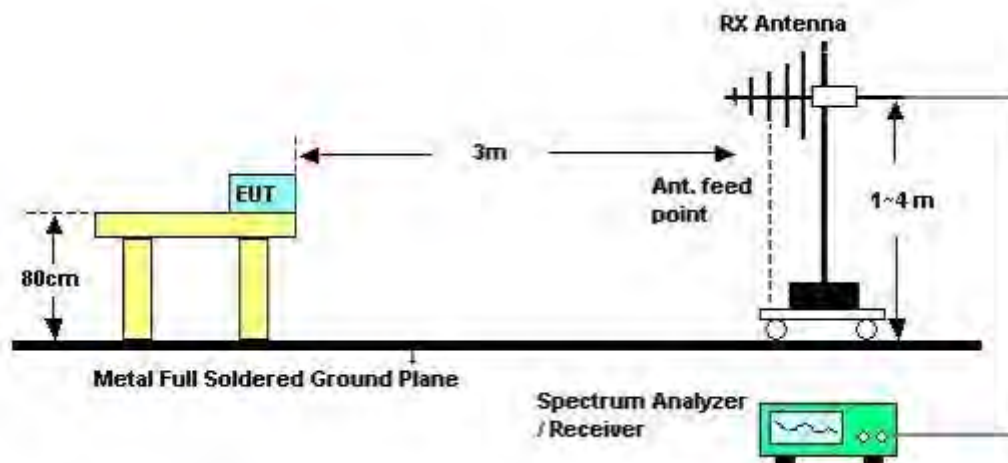
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.5.4. Test Setup Layout

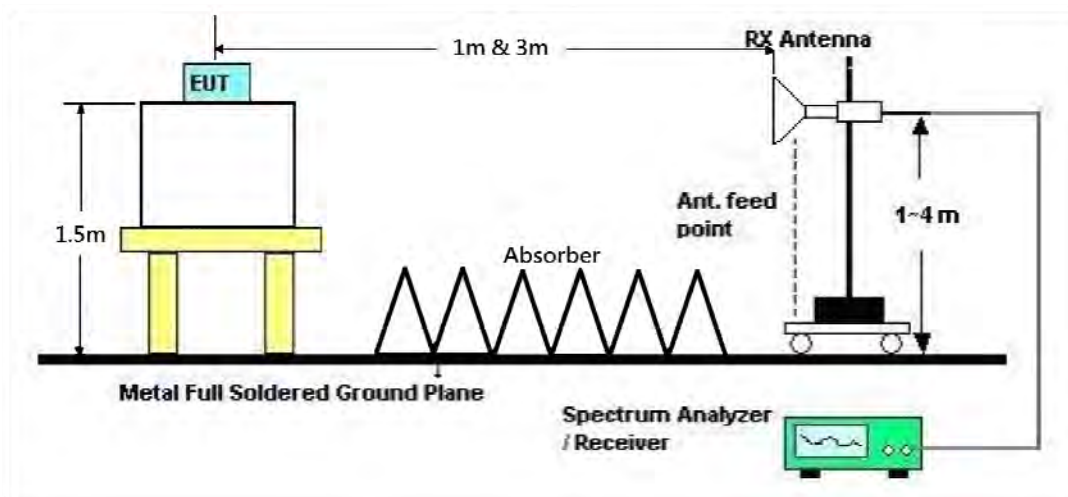
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	Normal Link
Test Date	Feb. 11, 2015		

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.

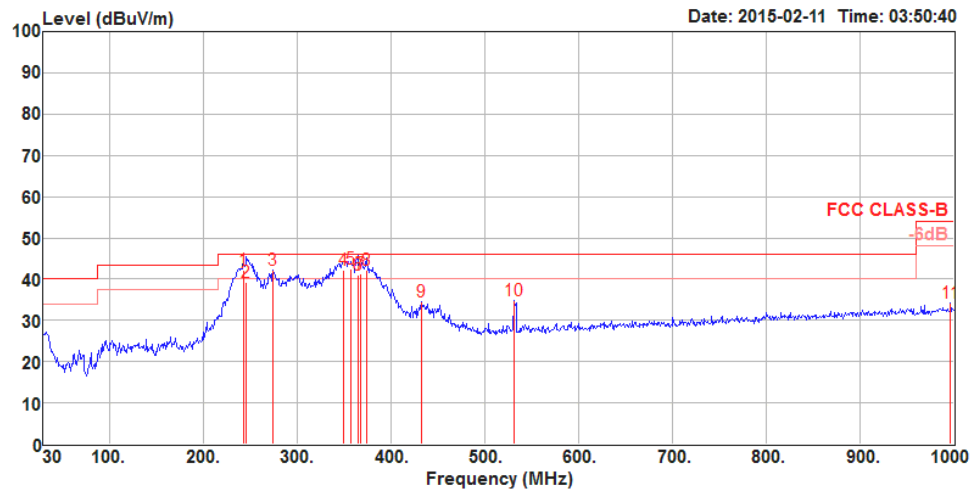
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

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

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

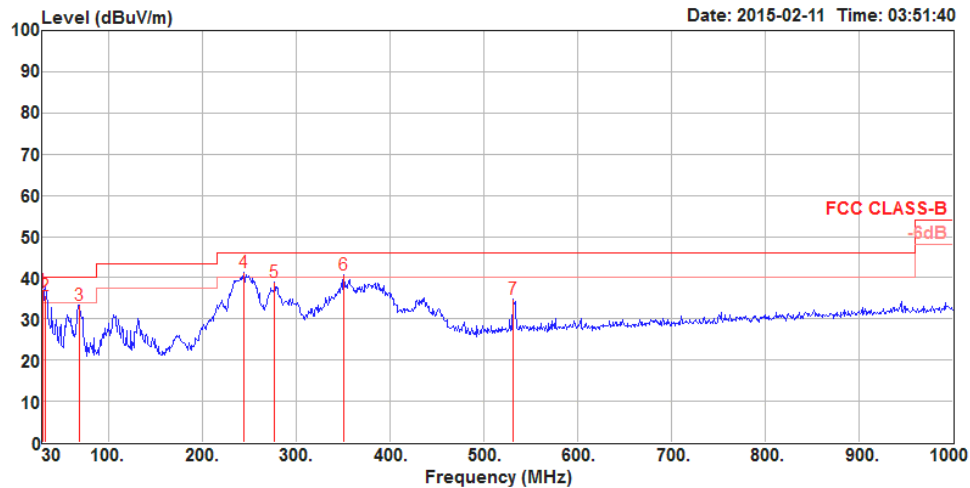
Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	Normal Link

Horizontal



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	243.40	42.15	46.00	-3.85	60.49	1.36	12.45	32.15	125	146 QP	HORIZONTAL
2	246.31	39.30	46.00	-6.70	57.41	1.37	12.65	32.13	116	174 QP	HORIZONTAL
3	274.44	42.22	46.00	-3.78	59.44	1.43	13.55	32.20	125	159 Peak	HORIZONTAL
4	350.10	42.30	46.00	-3.70	57.51	1.63	15.30	32.14	100	158 Peak	HORIZONTAL
5	357.86	42.35	46.00	-3.65	57.34	1.65	15.49	32.13	100	158 Peak	HORIZONTAL
6	364.65	41.02	46.00	-4.98	55.84	1.66	15.65	32.13	100	156 QP	HORIZONTAL
7	367.56	41.42	46.00	-4.58	56.17	1.67	15.72	32.14	100	153 QP	HORIZONTAL
8	374.35	42.06	46.00	-3.94	56.58	1.69	15.89	32.10	100	158 QP	HORIZONTAL
9	432.55	34.48	46.00	-11.52	47.91	1.82	16.89	32.14	100	125 Peak	HORIZONTAL
10	531.49	34.72	46.00	-11.28	46.50	2.02	18.36	32.16	100	42 Peak	HORIZONTAL
11	996.12	34.13	54.00	-19.87	39.55	2.73	22.28	30.43	100	302 Peak	HORIZONTAL

Vertical



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	30.00	36.92	40.00	-3.08	48.63	0.43	20.10	32.24	100	230 OP	VERTICAL
2	32.91	35.85	40.00	-4.15	49.30	0.48	18.30	32.23	100	140 QP	VERTICAL
3	69.77	33.48	40.00	-6.52	58.30	0.72	6.80	32.34	200	15 Peak	VERTICAL
4	244.37	41.24	46.00	-4.76	59.51	1.36	12.51	32.14	200	103 Peak	VERTICAL
5	277.35	38.89	46.00	-7.11	56.11	1.44	13.53	32.19	150	132 Peak	VERTICAL
6	351.07	40.66	46.00	-5.34	55.84	1.63	15.33	32.14	100	120 Peak	VERTICAL
7	531.49	34.92	46.00	-11.08	46.68	2.02	18.38	32.16	150	50 Peak	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.

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11b CH 1 / Antenna 1 + Antenna 2
Test Date	Jan. 17, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4823.95	41.05	54.00	-12.95	36.99	5.87	33.39	35.20 Average	100	302	HORIZONTAL
2	4824.15	48.65	74.00	-25.35	44.59	5.87	33.39	35.20 Peak	100	302	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss 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	48.02	74.00	-25.98	43.96	5.87	33.39	35.20 Peak	100	37	VERTICAL
2	4823.97	39.74	54.00	-14.26	35.68	5.87	33.39	35.20 Average	100	37	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11b CH 6 / Antenna 1 + Antenna 2
Test Date	Jan. 17, 2015		

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	40.67	54.00	-13.33	36.47	5.92	33.48	35.20	Average	100	301	HORIZONTAL
2	4874.11	47.89	74.00	-26.11	43.69	5.92	33.48	35.20	Peak	100	301	HORIZONTAL
3	7310.18	38.60	54.00	-15.40	30.39	7.13	36.51	35.43	Average	100	254	HORIZONTAL
4	7310.82	51.21	74.00	-22.79	43.00	7.13	36.51	35.43	Peak	100	254	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	40.00	54.00	-14.00	35.80	5.92	33.48	35.20	Average	100	38	VERTICAL
2	4874.05	47.32	74.00	-26.68	43.12	5.92	33.48	35.20	Peak	100	38	VERTICAL
3	7309.49	50.82	74.00	-23.18	42.61	7.13	36.51	35.43	Peak	100	174	VERTICAL
4	7310.18	36.76	54.00	-17.24	28.55	7.13	36.51	35.43	Average	100	174	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11b CH 11 / Antenna 1 + Antenna 2
Test Date	Jan. 17, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamplifier Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4923.92	38.95	54.00	-15.05	34.60	5.97	33.58	35.20	Average	100	308 HORIZONTAL
2	4923.94	46.85	74.00	-27.15	42.50	5.97	33.58	35.20	Peak	100	308 HORIZONTAL
3	7385.22	39.99	54.00	-14.01	31.67	7.17	36.61	35.46	Average	100	253 HORIZONTAL
4	7386.21	51.33	74.00	-22.67	43.01	7.17	36.61	35.46	Peak	100	253 HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamplifier Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4923.95	39.96	54.00	-14.04	35.61	5.97	33.58	35.20	Average	100	39 VERTICAL
2	4923.96	48.38	74.00	-25.62	44.03	5.97	33.58	35.20	Peak	100	39 VERTICAL
3	7384.85	50.71	74.00	-23.29	42.39	7.17	36.61	35.46	Peak	100	173 VERTICAL
4	7386.68	37.42	54.00	-16.58	29.10	7.17	36.61	35.46	Average	100	173 VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11g CH 1 / Antenna 1 + Antenna 2
Test Date	Jan. 18, 2015		

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	4820.73	45.47	74.00	-28.53	41.41	5.87	33.39	35.20	Peak	100	257	HORIZONTAL
2	4824.06	33.36	54.00	-20.64	29.30	5.87	33.39	35.20	Average	100	257	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	4824.83	33.23	54.00	-20.77	29.17	5.87	33.39	35.20	Average	100	189	VERTICAL
2	4833.58	46.88	74.00	-27.12	42.81	5.88	33.39	35.20	Peak	100	189	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11g CH 6 / Antenna 1 + Antenna 2
Test Date	Jan. 18, 2015		

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	4867.37	33.04	54.00	-20.96	28.89	5.90	33.45	35.20	Average	100	176	HORIZONTAL
2	4872.37	45.74	74.00	-28.26	41.54	5.92	33.48	35.20	Peak	100	176	HORIZONTAL
3	7315.10	49.57	74.00	-24.43	41.36	7.13	36.51	35.43	Peak	100	279	HORIZONTAL
4	7318.18	37.14	54.00	-16.86	28.92	7.14	36.51	35.43	Average	100	279	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	4865.31	46.68	74.00	-27.32	42.53	5.90	33.45	35.20	Peak	100	128	VERTICAL
2	4867.27	33.18	54.00	-20.82	29.03	5.90	33.45	35.20	Average	100	128	VERTICAL
3	7310.20	49.91	74.00	-24.09	41.70	7.13	36.51	35.43	Peak	100	250	VERTICAL
4	7318.53	37.00	54.00	-17.00	28.78	7.14	36.51	35.43	Average	100	250	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11g CH 11 / Antenna 1 + Antenna 2
Test Date	Jan. 18, 2015		

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	4925.91	32.65	54.00	-21.35	28.30	5.97	33.58	35.20	Average	100	247	HORIZONTAL
2	4928.92	46.31	74.00	-27.69	41.96	5.97	33.58	35.20	Peak	100	247	HORIZONTAL
3	7381.50	49.89	74.00	-24.11	41.57	7.16	36.61	35.45	Peak	100	276	HORIZONTAL
4	7388.98	37.52	54.00	-16.48	29.20	7.17	36.61	35.46	Average	100	276	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	4920.72	45.43	74.00	-28.57	41.12	5.97	33.54	35.20	Peak	100	242	VERTICAL
2	4928.34	32.28	54.00	-21.72	27.93	5.97	33.58	35.20	Average	100	242	VERTICAL
3	7383.45	49.55	74.00	-24.45	41.24	7.16	36.61	35.46	Peak	100	148	VERTICAL
4	7383.47	37.25	54.00	-16.75	28.94	7.16	36.61	35.46	Average	100	148	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11n MCS0 HT20 CH 1 / Antenna 1 + Antenna 2
Test Date	Jan. 18, 2015		

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	4825.12	32.76	54.00	-21.24	28.70	5.87	33.39	35.20	Average	100	285	HORIZONTAL
2	4827.77	45.43	74.00	-28.57	41.37	5.87	33.39	35.20	Peak	100	285	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	4825.36	33.05	54.00	-20.95	28.99	5.87	33.39	35.20	Average	100	175	VERTICAL
2	4829.00	46.49	74.00	-27.51	42.43	5.87	33.39	35.20	Peak	100	175	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11n MCS0 HT20 CH 6 / Antenna 1 + Antenna 2
Test Date	Jan. 18, 2015		

Horizontal

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp		A/Pos	T/Pos	
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	Factor	Remark	cm	deg	Pol/Phase
1	4872.83	33.64	54.00	-20.36	29.44	5.92	33.48	35.20	Average	100	117	HORIZONTAL
2	4876.29	47.20	74.00	-26.80	43.00	5.92	33.48	35.20	Peak	100	117	HORIZONTAL
3	7311.79	50.11	74.00	-23.89	41.90	7.13	36.51	35.43	Peak	100	185	HORIZONTAL
4	7315.78	36.90	54.00	-17.10	28.68	7.14	36.51	35.43	Average	100	185	HORIZONTAL

Vertical

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp		A/Pos	T/Pos	
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	Factor	Remark	cm	deg	Pol/Phase
1	4877.06	46.19	74.00	-27.81	41.99	5.92	33.48	35.20	Peak	100	285	VERTICAL
2	4878.58	32.80	54.00	-21.20	28.60	5.92	33.48	35.20	Average	100	285	VERTICAL
3	7314.81	36.86	54.00	-17.14	28.65	7.13	36.51	35.43	Average	100	233	VERTICAL
4	7315.66	50.47	74.00	-23.53	42.25	7.14	36.51	35.43	Peak	100	233	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11n MCS0 HT20 CH 11 / Antenna 1 + Antenna 2
Test Date	Jan. 18, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.01	45.47	74.00	-28.53	41.12	5.97	33.58	35.20	Peak	100	196	HORIZONTAL
2	4928.63	32.44	54.00	-21.56	28.09	5.97	33.58	35.20	Average	100	196	HORIZONTAL
3	7383.39	37.46	54.00	-16.54	29.15	7.16	36.61	35.46	Average	100	274	HORIZONTAL
4	7390.81	50.04	74.00	-23.96	41.72	7.17	36.61	35.46	Peak	100	274	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamplifier Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4924.06	32.97	54.00	-21.03	28.62	5.97	33.58	35.20	Average	100	286	VERTICAL
2	4927.77	45.00	74.00	-29.00	40.65	5.97	33.58	35.20	Peak	100	286	VERTICAL
3	7381.58	49.96	74.00	-24.04	41.64	7.16	36.61	35.45	Peak	100	125	VERTICAL
4	7383.53	37.31	54.00	-16.69	28.99	7.17	36.61	35.46	Average	100	127	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.

4.6. Emissions Measurement

4.6.1. 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

4.6.2. 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

4.6.3. Test Procedures

For Radiated band edges Measurement:

1. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around band edges.

For Radiated Out of Band Emission Measurement:

1. Test was performed in accordance with KDB 558074 D01 v03r02 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.

4.6.4. Test Setup Layout

For Radiated band edges Measurement:

This test setup layout is the same as that shown in section 4.5.4.

For Radiated Out of Band Emission Measurement:

This test setup layout is the same as that shown in section 4.5.4.

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11b CH 1, 6, 11 / Antenna 1 + Antenna 2
Test Date	Jan. 17, 2015		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	2382.67	47.08	54.00	-6.92	14.99	4.08	28.01	0.00 Average	100	124	HORIZONTAL
2	2382.79	60.56	74.00	-13.44	28.47	4.08	28.01	0.00 Peak	100	124	HORIZONTAL
3	2411.20	102.39			70.19	4.11	28.09	0.00 Average	100	124	HORIZONTAL
4	2411.20	106.41			74.21	4.11	28.09	0.00 Peak	100	124	HORIZONTAL

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

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	2387.96	58.78	74.00	-15.22	26.64	4.09	28.05	0.00 Peak	145	38	HORIZONTAL
2	2390.00	47.18	54.00	-6.82	15.04	4.09	28.05	0.00 Average	145	38	HORIZONTAL
3	2436.36	102.96			70.66	4.12	28.18	0.00 Average	145	38	HORIZONTAL
4	2437.96	107.16			74.85	4.13	28.18	0.00 Peak	145	38	HORIZONTAL
5	2484.46	47.26	54.00	-6.74	14.84	4.16	28.26	0.00 Average	145	38	HORIZONTAL
6	2487.03	59.61	74.00	-14.39	27.15	4.16	28.30	0.00 Peak	145	38	HORIZONTAL

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

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	2461.36	108.20			75.84	4.14	28.22	0.00 Peak	100	324	HORIZONTAL
2	2462.64	103.84			71.48	4.14	28.22	0.00 Average	100	324	HORIZONTAL
3	2484.44	64.87	74.00	-9.13	32.45	4.16	28.26	0.00 Peak	100	324	HORIZONTAL
4	2486.39	47.56	54.00	-6.44	15.10	4.16	28.30	0.00 Average	100	324	HORIZONTAL

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11g CH 1, 6, 11 / Antenna 1 + Antenna 2
Test Date	Jan. 17, 2015		

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	2389.56	68.38	74.00	-5.62	36.24	4.09	28.05	0.00	Peak	109	322	HORIZONTAL
2	2390.00	52.87	54.00	-1.13	20.73	4.09	28.05	0.00	Average	109	322	HORIZONTAL
3	2410.08	110.12			77.92	4.11	28.09	0.00	Peak	109	322	HORIZONTAL
4	2410.40	100.25			68.05	4.11	28.09	0.00	Average	109	322	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	2389.04	48.51	54.00	-5.49	16.37	4.09	28.05	0.00	Average	100	321	HORIZONTAL
2	2389.04	59.29	74.00	-14.71	27.15	4.09	28.05	0.00	Peak	100	321	HORIZONTAL
3	2435.08	110.74			78.44	4.12	28.18	0.00	Peak	100	321	HORIZONTAL
4	2435.72	100.75			68.45	4.12	28.18	0.00	Average	100	321	HORIZONTAL
5	2483.82	60.07	74.00	-13.93	27.65	4.16	28.26	0.00	Peak	100	321	HORIZONTAL
6	2484.14	48.63	54.00	-5.37	16.21	4.16	28.26	0.00	Average	100	321	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	2461.36	112.00			79.64	4.14	28.22	0.00	Peak	114	319	HORIZONTAL
2	2461.68	102.18			69.82	4.14	28.22	0.00	Average	114	319	HORIZONTAL
3	2483.50	51.62	54.00	-2.38	19.20	4.16	28.26	0.00	Average	114	319	HORIZONTAL
4	2483.50	64.52	74.00	-9.48	32.10	4.16	28.26	0.00	Peak	114	319	HORIZONTAL

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

Temperature	26°C	Humidity	68%
Test Engineer	Lucas Huang / Gino Huang	Configurations	IEEE 802.11n MCS0 HT20 CH 1, 6, 11 / Antenna 1 + Antenna 2
Test Date	Jan. 17, 2015 ~ Jan. 20, 2015		

Channel 1

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2388.80	68.30	74.00	-5.70	35.44	4.37	28.49	0.00	243	101	Peak	HORIZONTAL
2	2390.00	53.44	54.00	-0.56	20.54	4.41	28.49	0.00	243	100	Average	HORIZONTAL
3	2411.60	99.18			66.24	4.41	28.53	0.00	243	100	Average	HORIZONTAL
4	2414.00	108.43			75.49	4.41	28.53	0.00	243	101	Peak	HORIZONTAL

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

Channel 6

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2387.12	60.17	74.00	-13.83	28.03	4.09	28.05	0.00	Peak	100	320	HORIZONTAL
2	2390.00	48.75	54.00	-5.25	16.61	4.09	28.05	0.00	Average	100	320	HORIZONTAL
3	2436.68	100.28			67.97	4.13	28.18	0.00	Average	100	320	HORIZONTAL
4	2438.92	109.96			77.65	4.13	28.18	0.00	Peak	100	320	HORIZONTAL
5	2483.50	48.74	54.00	-5.26	16.32	4.16	28.26	0.00	Average	100	320	HORIZONTAL
6	2484.78	60.15	74.00	-13.85	27.73	4.16	28.26	0.00	Peak	100	320	HORIZONTAL

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

Channel 11

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2459.44	100.59			68.23	4.14	28.22	0.00	Average	100	325	HORIZONTAL
2	2464.56	109.95			77.59	4.14	28.22	0.00	Peak	100	325	HORIZONTAL
3	2484.12	66.12	74.00	-7.88	33.70	4.16	28.26	0.00	Peak	100	325	HORIZONTAL
4	2484.44	52.85	54.00	-1.15	20.43	4.16	28.26	0.00	Average	100	325	HORIZONTAL

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

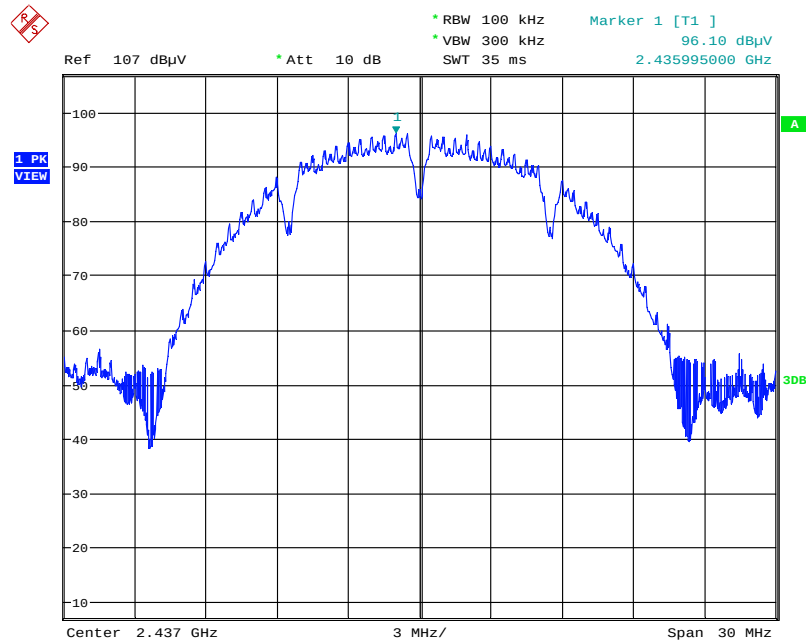
Note:

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

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

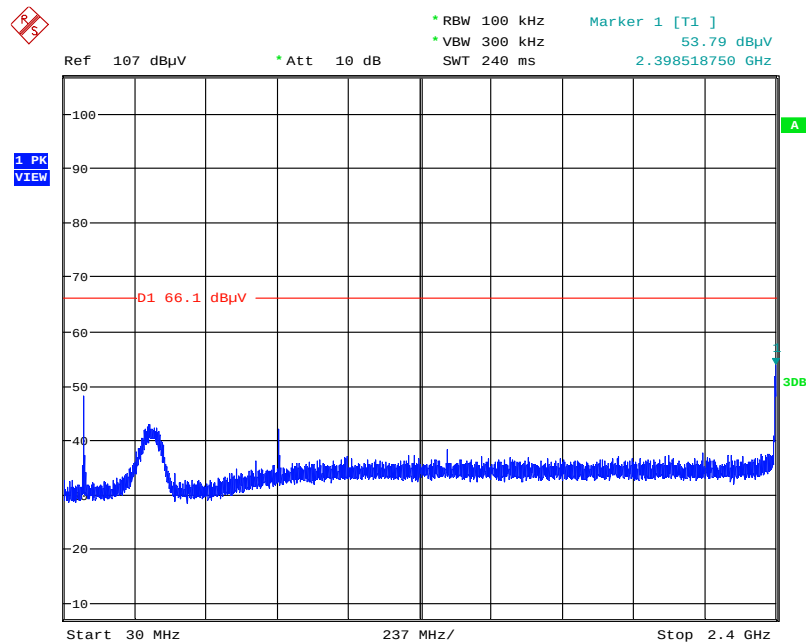
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11b / Reference Level



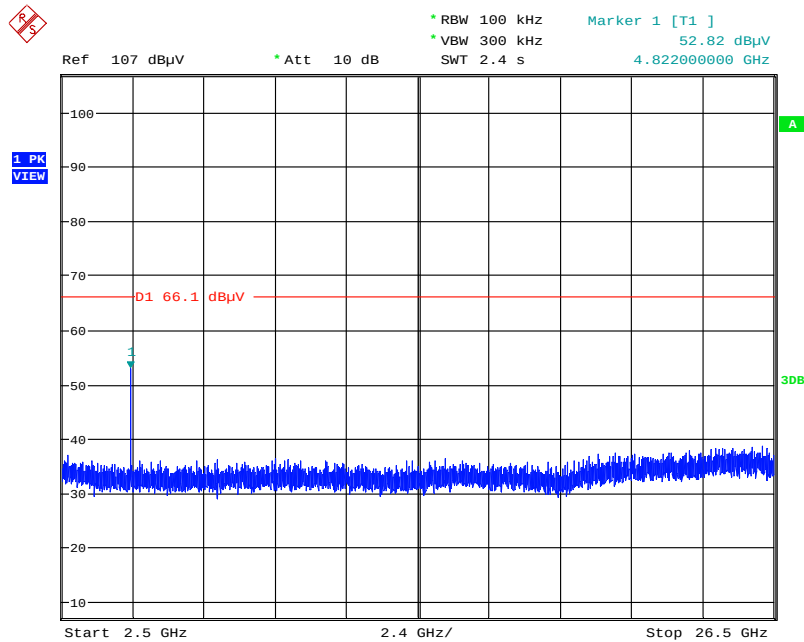
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Plot on Configuration IEEE 802.11b / CH 1 / 30MHz~2400MHz (down 30dBc)



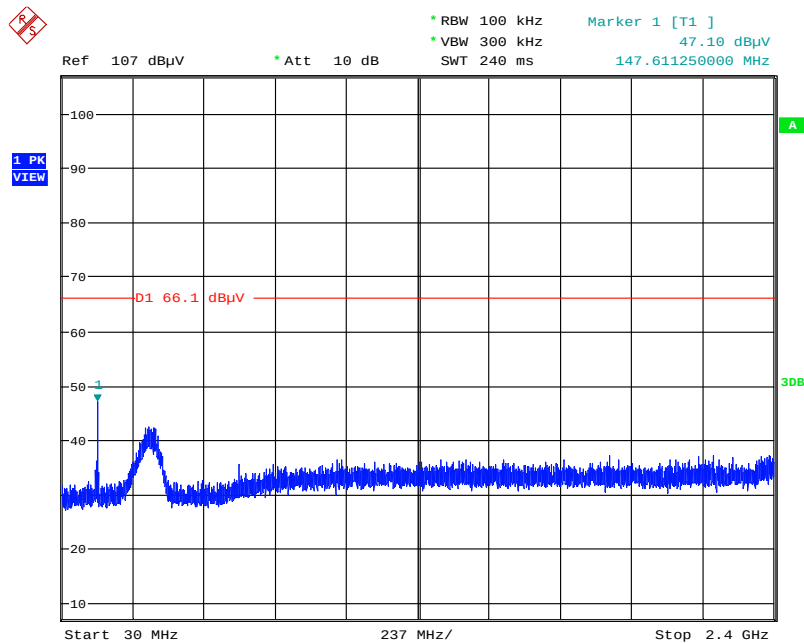
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Plot on Configuration IEEE 802.11b / CH 1 / 2500MHz~26500MHz (down 30dBc)



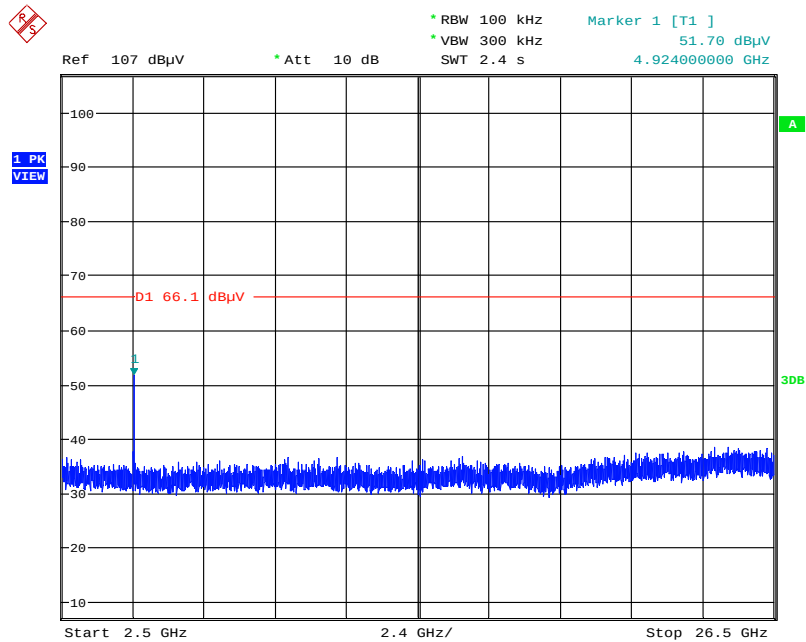
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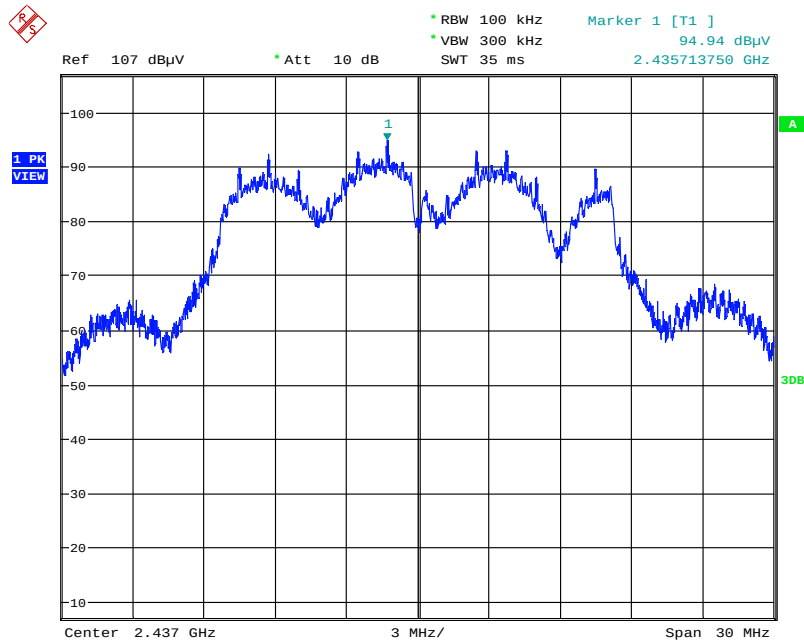
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Plot on Configuration IEEE 802.11b / CH 11 / 2500MHz~26500MHz (down 30dBc)



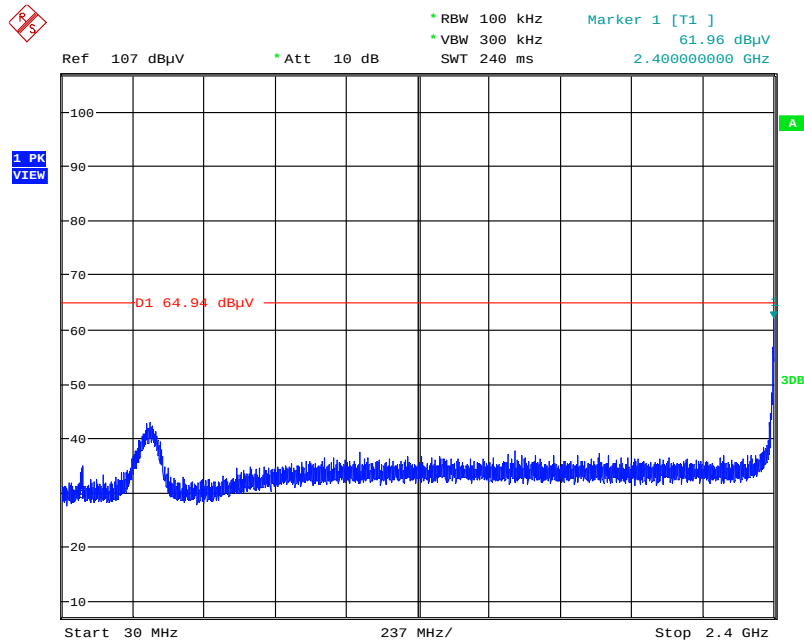
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Plot on Configuration IEEE 802.11g / Reference Level



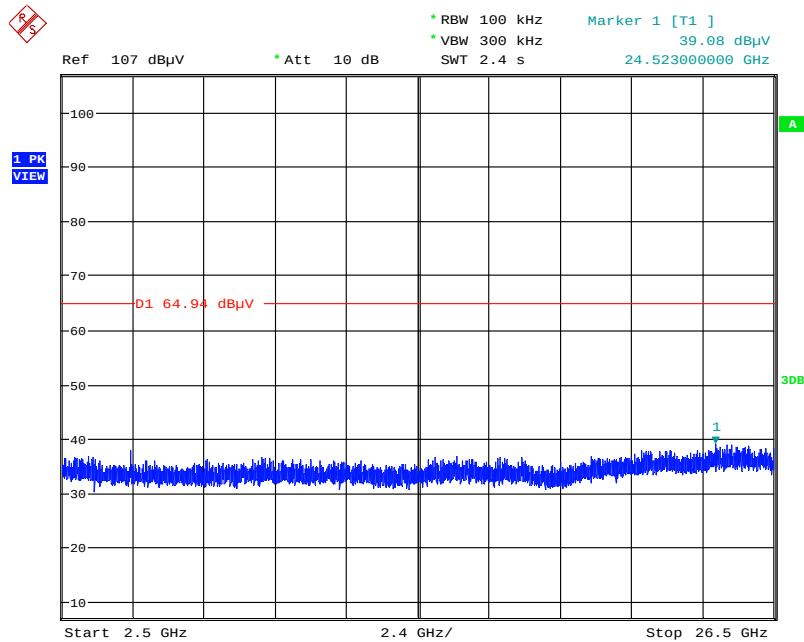
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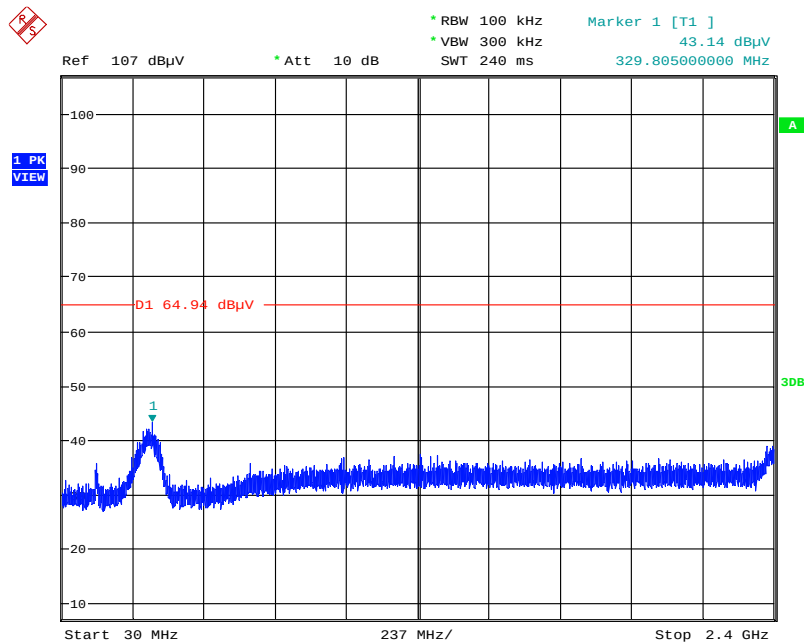
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Plot on Configuration IEEE 802.11g / CH 1 / 2500MHz~26500MHz (down 30dBc)



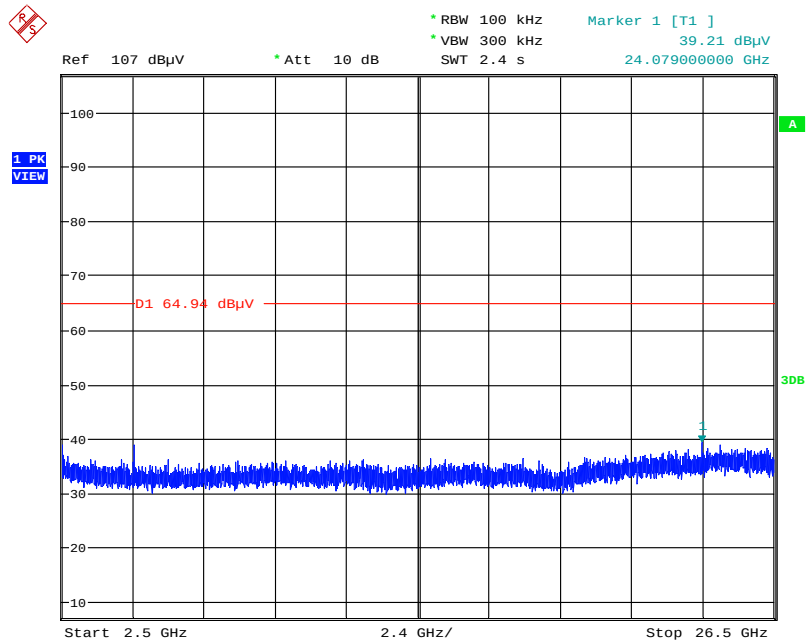
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Plot on Configuration IEEE 802.11g / CH 11 / 30MHz~2400MHz (down 30dBc)



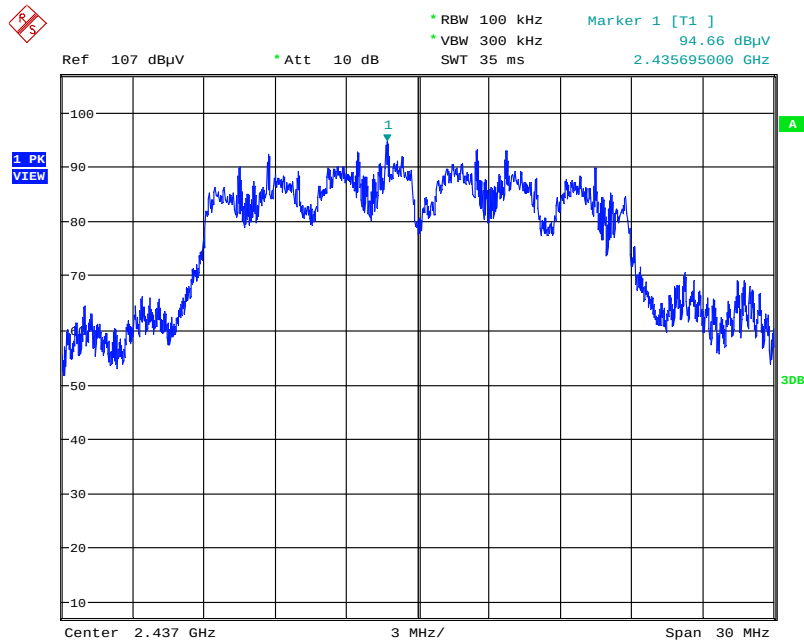
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Plot on Configuration IEEE 802.11g / CH 11 / 2500MHz~26500MHz (down 30dBc)



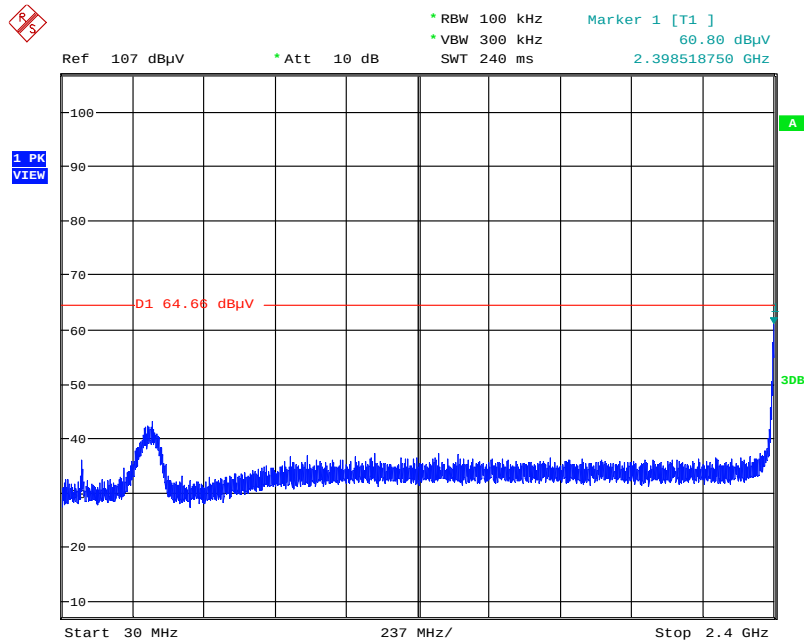
Date: 18.JAN.2015 07:34:32

Plot on Configuration IEEE 802.11n MCS0 HT20 / Reference Level



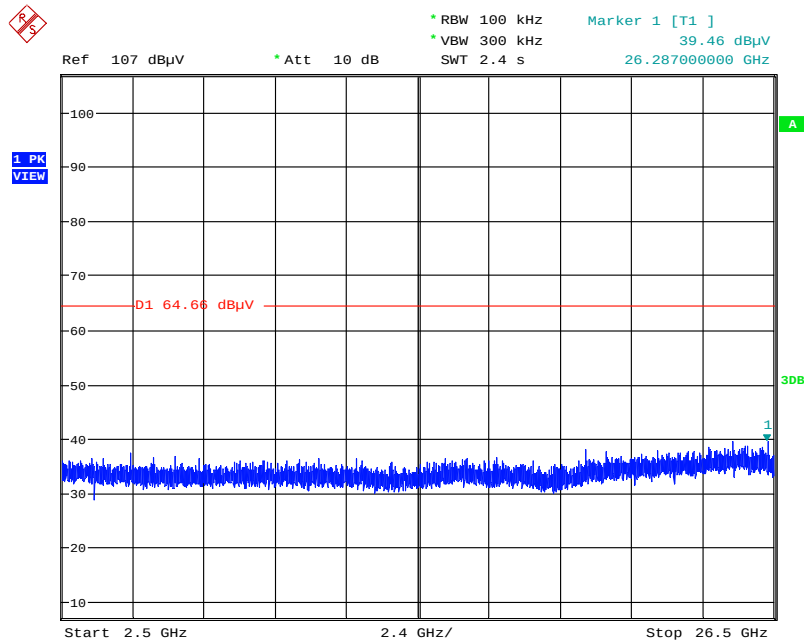
Date: 18. JAN. 2015 07:35:38

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



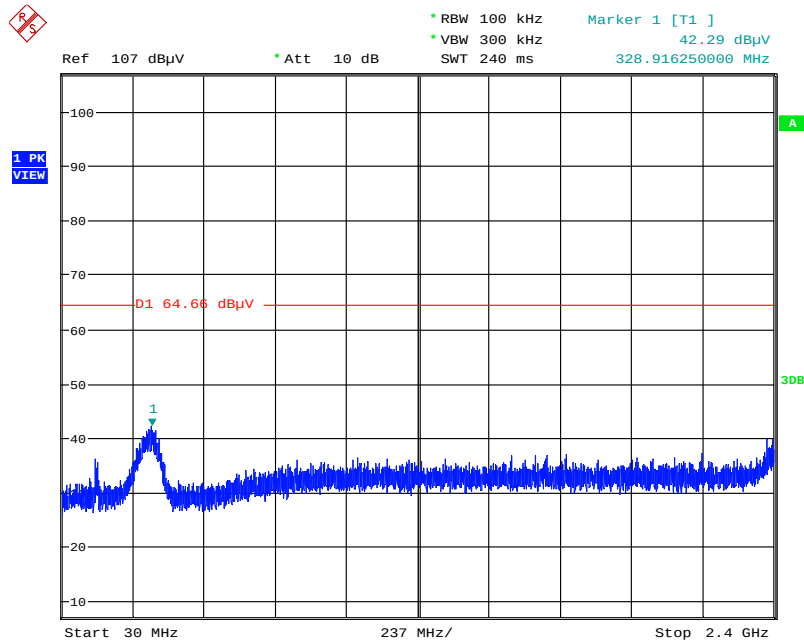
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Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



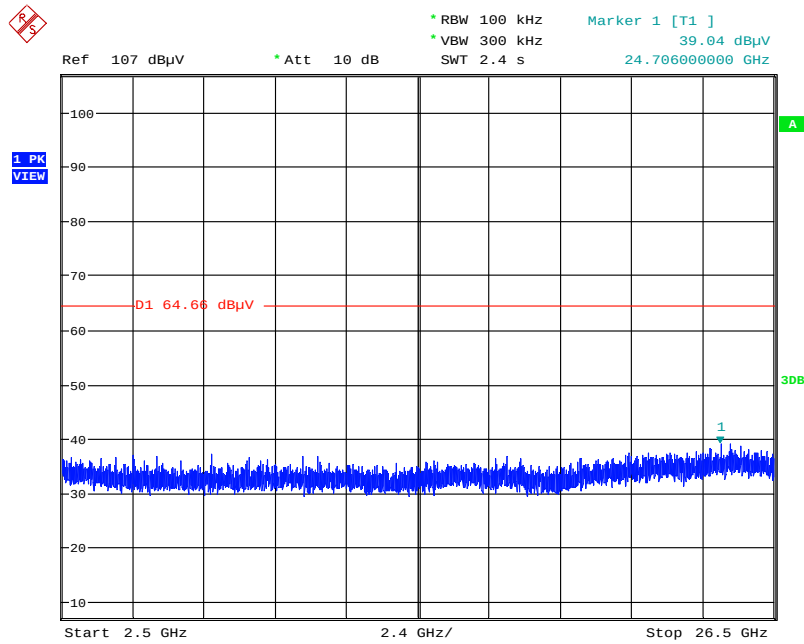
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Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



Date: 18.JAN.2015 07:37:57

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



Date: 18.JAN.2015 07:38:31

4.7. Antenna Requirements

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

4.7.2. 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	Dec. 02, 2014	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 02, 2014	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	Dec. 04, 2014	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 26, 2014	Radiation (03CH01-CB)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz - 30 MHz	Jul. 28, 2014	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Oct. 28, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSV40	101026	9kHz ~ 40GHz	Aug. 28, 2014	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESR26	101289	9kHz~26GHz	Aug. 22, 2014	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. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz - 26.5 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz - 26.5 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 12, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz - 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz - 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz - 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz - 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz - 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)

Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 03, 2014	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410002	50MHz~18GHz	Nov. 03, 2014	Conducted (TH01-CB)

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

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%