



SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	Atop Technologies, Inc
Applicant Address	1TH FL 30 R&D RD II, SCIENCE-BASED INDUSTRIAL PARK, HSINCHU 300 TAIWAN
FCC ID	RPV-AW-SW5502
Manufacturer's company	Atop Technologies, Inc
Manufacturer Address	1TH FL 30 R&D RD II, SCIENCE-BASED INDUSTRIAL PARK, HSINCHU 300 TAIWAN

Product Name	Industrial Wireless Device
Brand Name	ATOP
Model No.	SW5501, SW5501-TB, SW5501-Sis, SW5502, SW5502-TB, SW5502-Sis, AW5500, AW5501, AW5501-TB, AW5501-Sis, AW5502, AW5502-TB, AW5502-Sis, MW5501, MW5501-TB, MW5501-Sis, MW5502, MW5502-TB, MW5502-Sis, SW1501T, SW1501, SW1502T, SW1502, AW1500, AW5500C, AW5501C, AW5502C, AW5502C-TB, SW5501C, SW5502C, SW5502C-TB, SW1501S, SW1501S1, MW5501C, MW5502C, MW5502C-TB, MW1501S, MW1501S1, GW91W-Maxi-CA, GW91W-SDK-CA, SW5501C-T1, SW5501C-Wn, SW5501C-Wn-T1, SW5502C-T1, SW5502C-Wn, SW5502C-Wn-T1, SW5502C-TB-T1, SW5502C-TB-Wn, SW5502C-TB-Wn-T1, AW5500C-T1, AW5500C-Wn, AW5500C-Wn-T1, AW5501C-T1, AW5501C-Wn, AW5501C-Wn-T1, AW5502C-T1, AW5502C-Wn, AW5502C-Wn-T1, AW5502C-TB-T1, AW5502C-TB-Wn, AW5502C-TB-Wn-T1.
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Nov. 03, 2011
Final Test Date	Jul. 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 C63.10-2009, 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.



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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1N0918-05AA	Rev. 01	Initial issue of report	Jul. 21, 2014

1. CERTIFICATE OF COMPLIANCE

Product Name : Industrial Wireless Device
Brand Name : ATOP
Model No. : SW5501,SW5501-TB,SW5501-Sis,SW5502,SW5502-TB,SW5502-Sis,AW5500,AW5501,AW5501-TB,AW5501-Sis,AW5502,AW5502-TB,AW5502-Sis,MW5501,MW5501-TB,MW5501-Sis,MW5502,MW5502-TB,MW5502-Sis,SW1501T,SW1501,SW1502T,SW1502,AW1500,AW5500C,AW5501C,AW5502C,AW5502C-TB,SW5501C,SW5502C,SW5502C-TB,SW1501S,SW1501S1,MW5501C,MW5502C,MW5502C-TB,MW1501S,MW1501S1,GW91W-Maxi-CA,GW91W-SDK-CA,SW5501C-T1,SW5501C-Wn,SW5501C-Wn-T1,SW5502C-T1,SW5502C-Wn,SW5502C-Wn-T1,SW5502C-TB-T1,SW5502C-TB-Wn,SW5502C-TB-Wn-T1,AW5500C-T1,AW5500C-Wn,AW5500C-Wn-T1,AW5501C-T1,AW5501C-Wn,AW5501C-Wn-T1,AW5502C-T1,AW5502C-Wn,AW5502C-Wn-T1,AW5502C-TB-T1,AW5502C-TB-Wn,AW5502C-TB-Wn-T1.
Applicant : Atop Technologies, Inc
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 Nov. 03, 2011 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.



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	15.247(b)(3)	Maximum Conducted Output Power	Complies	5.53 dB
4.2	15.247(e)	Power Spectral Density	Complies	10.47 dB
4.3	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.4	15.247(d)	Emission Measurement	Complies	-
4.5	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
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
Channel Band Width (99%)	MCS8 (HT20): 21.60 MHz ; MCS8 (HT40): 36.64 MHz
Maximum Conducted Output Power	MCS8 (HT20): 24.47 dBm ; MCS8 (HT40): 18.28 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11b/g

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
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
Channel Band Width (99%)	11b: 14.08 MHz ; 11g: 18.40 MHz
Maximum Conducted Output Power	11b: 20.00 dBm ; 11g: 20.96 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)		Two (TX)	
Band width Mode	20 MHz	40 MHz	20 MHz	40 MHz
IEEE 802.11b	V	X	X	X
IEEE 802.11g	V	X	X	X
IEEE 802.11n	X	X	V	V

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 8-15
802.11n (HT40)	2	MCS 8-15
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

Power	Brand Holder	Model	Rating
Adapter	SOLYTECH ENTERPRISE CORPORATION	AD1724C	INPUT: 100-240V~0.5A, 50-60Hz OUTPUT: 24V, 0.63A, Max. 15W
Other			
OMNI Antenna*2			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)		Cable loss	True Gain (dBi)
1	JOYMAX	TWX-614XRSXX-999	OMNI Antenna	Reversed-SMA	2.4GHz	3	1	2
					5GHz	5	2	3
2	JOYMAX	TWX-614XRSXX-999	OMNI Antenna	Reversed-SMA	2.4GHz	3	1	2
					5GHz	5	2	3

Note: The EUT has two antennas.

For 2.4GHz function:

For IEEE 802.11bg mode (1TX/1RX):

Only Chain 1 can be used as transmitting antenna and receiving antenna.

For IEEE 802.11n mode (2TX/2RX):

Chain 1 and Chain 2 could transmit/receive simultaneously.

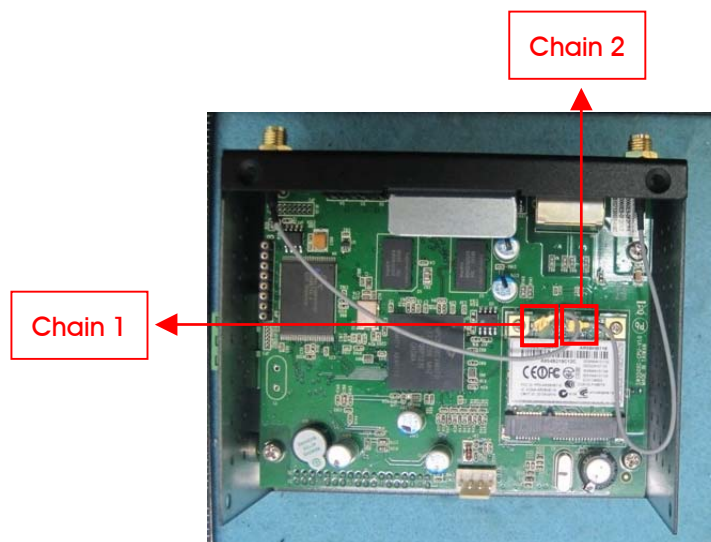
For 5GHz function:

For IEEE 802.11a mode (1TX/1RX):

Only Chain 1 can be used as transmitting antenna and receiving antenna.

For IEEE 802.11n mode (2TX/2RX):

Chain 1 and Chain 2 could transmit/receive simultaneously.



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
Maximum Conducted Output Power	802.11n HT20	MCS8	1/6/11	1+2
	802.11n HT40	MCS8	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Power Spectral Density	802.11n HT20	MCS8	1/6/11	1+2
	802.11n HT40	MCS8	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
6dB Spectrum Bandwidth	802.11n HT20	MCS8	1/6/11	1+2
	802.11n HT40	MCS8	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Emission Measurement	802.11n HT20	MCS8	1/6/11	1+2
	802.11n HT40	MCS8	3/6/9	1+2
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1

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
TH01-CB	OVEN Room	Hsin Chu	-	-

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

3.7. Table for Multiple Listing and Class II Change

The brand/model names in the following table are all refer to the identical product.

Wireless Mode: Client

Software: Serial Device Server

Model Name	Top Board	Bottom Board	Serial DB9 Type	Serial TB5 Type	Antenna	Band
SW5501 SW1501	Same	Same (One Serial)	Yes	No	2	2.4G+5G
SW5501-TB	Same	Same (One Serial)	No	Yes	2	2.4G+5G
SW5501-Sis	Same	Same (One Serial, isolation function)	No	Yes	2	2.4G+5G
SW5502 SW1502	Same	Same (Two Serial)	Yes	No	2	2.4G+5G
SW5502-TB	Same	Same (Two Serial)	No	Yes	2	2.4G+5G
SW5502-Sis	Same	Slight Different (Two Serial, isolation function)	No	Yes	2	2.4G+5G
SW1501T	Reverse male and female connector of top and bottom					
SW1502T	Reverse male and female connector of top and bottom					
SW5501C	With UART Minus one led	One serial	Yes	No	2	2.4G+5G
SW5501C-T1	With UART Minus one led	One serial	Yes	No	1	2.4G+5G
SW5501C-Wn	With UART Minus one led	One serial	Yes	No	2	2.4G
SW5501C-Wn-T1	With UART Minus one led	One serial	Yes	No	1	2.4G

SW5502C	With UART	Two serial-DB9	Yes	No	2	2.4G+5G
SW5502C-T1	With UART	Two serial-DB9	Yes	No	1	2.4G+5G
SW5502C-Wn	With UART	Two serial-DB9	Yes	No	2	2.4G
SW5502C-Wn-T1	With UART	Two serial-DB9	Yes	No	1	2.4G
SW5502C-TB	With UART	Two serial-TB5	No	Yes	2	2.4G+5G
SW5502C-TB-T1	With UART	Two serial-TB5	No	Yes	1	2.4G+5G
SW5502C-TB-Wn	With UART	Two serial-TB5	No	Yes	2	2.4G
SW5502C-TB-Wn-T1	With UART	Two serial-TB5	No	Yes	1	2.4G
SW1501S	Mini Size	Mini size with one serial	Yes	No	1	2.4G+5G
SW1501S1		Mini size with one serial& unique connector	No	NO	1	2.4G+5G
GW91W-Maxi-CA						
GW91W-SDK-CA						

Wireless Mode: Master

Software: Access Point

Model Name	Top Board	Bottom Board	Serial DB9 Type	Serial TB5 Type	Antenna	Band
AW5500	Same	Same (No Serial)	No	No	2	2.4G+5G
AW1500						
AW5501	Same	Same (One Serial)	Yes	No	2	2.4G+5G
AW5501-TB	Same	Same (One Serial)	No	Yes	2	2.4G+5G
AW5501-Sis	Same	Same (One Serial, isolation function)	No	Yes	2	2.4G+5G
AW5502	Same	Same (Two Serial)	Yes	No	2	2.4G+5G
AW5502-TB	Same	Same (Two Serial)	No	Yes	2	2.4G+5G
AW5502-Sis	Same	Slight Different (Two Serial, isolation function)	No	Yes	2	2.4G+5G
AW5500C	Without UART	No serial	No	No	2	2.4G+5G
AW5500C-T1	Without UART	No serial	No	No	1	2.4G+5G
AW5500C-Wn	Without UART	No serial	No	No	2	2.4G
AW5500C-Wn-T1	Without UART	No serial	No	No	1	2.4G
AW5501C	With UART Minus one led	One serial	Yes	Yes	2	2.4G+5G
AW5501C-T1	With UART Minus one led	One serial	Yes	Yes	1	2.4G+5G

AW5501C-Wn	With UART Minus one led	One serial	Yes	Yes	2	2.4G
AW5501C-Wn-T1	With UART Minus one led	One serial	Yes	Yes	1	2.4G
AW5502C	With UART	Two serial-DB9	Yes	No	2	2.4G+5G
AW5502C-T1	With UART	Two serial-DB9	Yes	No	1	2.4G+5G
AW5502C-Wn	With UART	Two serial-DB9	Yes	No	2	2.4G
AW5502C-Wn-T1	With UART	Two serial-DB9	Yes	No	1	2.4G
AW5502C-TB	With UART	Two serial-TB5	No	Yes	2	2.4G+5G
AW5502C-TB-T1	With UART	Two serial-TB5	No	Yes	1	2.4G+5G
AW5502C-TB-Wn	With UART	Two serial-TB5	No	Yes	2	2.4G
AW5502C-TB-Wn-T1	With UART	Two serial-TB5	No	Yes	1	2.4G

Wireless Mode: Client

Software: Modbus Gateway

Model Name	Top Board	Bottom Board	Serial DB9 Type	Serial TB5 Type	Antenna	Band
MW5501	Same	Same (One Serial)	Yes	Yes	2	2.4G+5G
MW5501-TB	Same	Same (One Serial)	No	Yes	2	2.4G+5G
MW5501-Sis	Same	Same (One Serial, isolation function)	No	Yes	2	2.4G+5G
MW5502	Same	Same (Two Serial)	Yes	No	2	2.4G+5G
MW5502-TB	Same	Same (Two Serial)	No	Yes	2	2.4G+5G
MW5502-Sis	Same	Slight Different (Two Serial, isolation function)	No	Yes	2	2.4G+5G
MW5501C	With UART	One Serial	Yes	Yes	2	2.4G+5G
MW5502C	With UART	Two Serial-DB9	Yes	No	2	2.4G+5G
MW5502C-TB	With UART	Two Serial-TB5	No	Yes	2	2.4G+5G
MW1501S	Mini Size	Mini size with one Serial	Yes	No	2	2.4G+5G
MW1501S1	Mini Size	Mini size with one Serial and unique connector	No	No	2	2.4G+5G

From the above models, model Name: AW5502-TB was selected as representative model for the test and its data was recorded in this report.

This product is an extension of original one reported under Sporton project number: 1N0918 and 1N0918-01.

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

Modifications	Performance Checking
1. Follow KDB 558074 D01 v03r02 and KDB 662911 D01 v02r01 tests. 2. There is no change in hardware or in existing RF relevant portion.	1. Maximum Conducted Output Power 2. Power Spectral Density 3. 6dB Spectrum Bandwidth 4. Emission Measurement 5. Maximum Permissible Exposure

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	E2KWM3945ABG

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC

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	DOS		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS8 HT20	13	24	18
Frequency	2422 MHz	2437 MHz	2452 MHz
MCS8 HT40	10	15	14

Power Parameters of IEEE 802.11b/g

Test Software Version	DOS		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	18	20	20
IEEE 802.11g	14	21	17

3.10. EUT Operation during Test

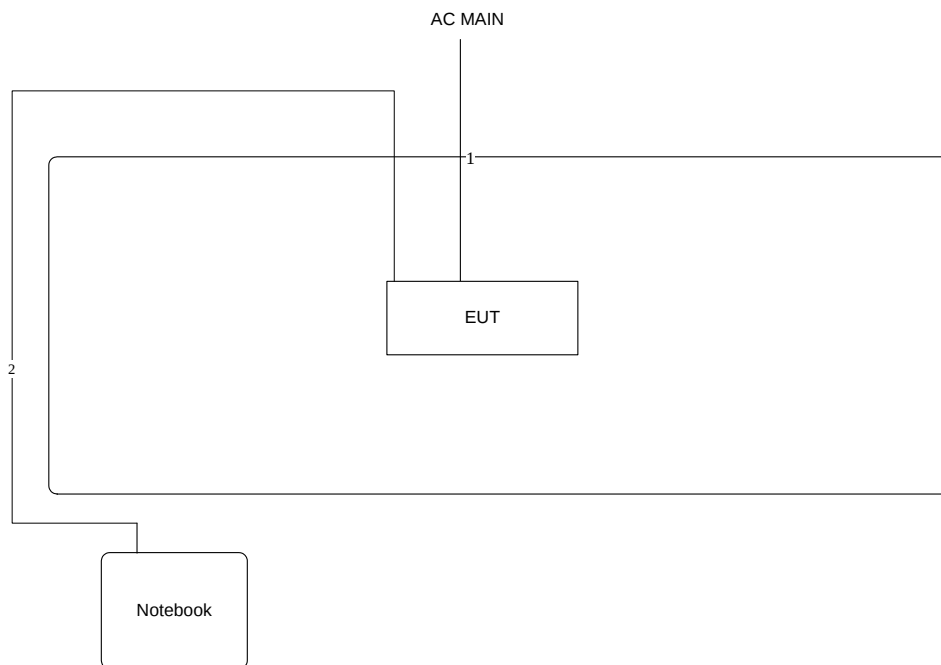
The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time(ms)	On+Off Time(ms)	Duty Cycle(%)	1/T Minimum VBW (kHz)
802.11n MCS8 HT20	1.010	1.030	98.06	0.01
802.11n MCS8 HT40	0.508	0.532	95.49	1.97
802.11b	1.000	1.000	100	0.01
802.11g	2.110	2.150	98.14	0.01

3.12. Test Configurations

3.12.1. Emissions Measurement



Item	Connection	Shielded	Length(m)
1	Power cable	No	1.75m
2	RJ-45 cable	No	10m

4. TEST RESULT

4.1. Maximum Conducted Output Power Measurement

4.1.1. 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.

4.1.2. Measuring Instruments and Setting

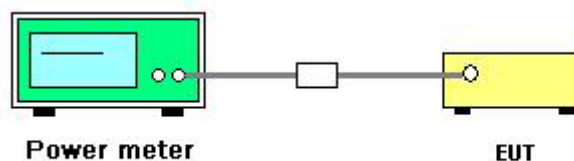
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

4.1.3. 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.

4.1.4. Test Setup Layout



4.1.5. Test Deviation

There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.1.7. Test Result of Maximum Conducted Output Power

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n
Test Date	Jul. 03, 2014		

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
1	2412 MHz	12.61	13.05	15.85	30.00	Complies
6	2437 MHz	20.46	22.28	24.47	30.00	Complies
11	2462 MHz	17.45	17.30	20.39	30.00	Complies

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
3	2422 MHz	9.33	10.00	12.69	30.00	Complies
6	2437 MHz	15.09	15.45	18.28	30.00	Complies
9	2452 MHz	13.98	14.78	17.41	30.00	Complies

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g
Test Date	Jul. 03, 2014		

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	17.42	30.00	Complies
6	2437 MHz	20.00	30.00	Complies
11	2462 MHz	19.70	30.00	Complies

Configuration IEEE 802.11g / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	13.54	30.00	Complies
6	2437 MHz	20.96	30.00	Complies
11	2462 MHz	16.93	30.00	Complies

4.2. Power Spectral Density Measurement

4.2.1. 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.

4.2.2. Measuring Instruments and Setting

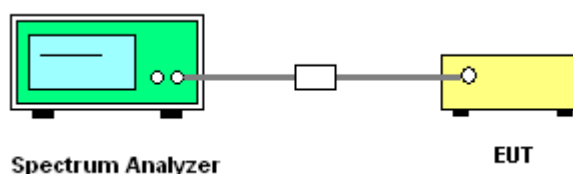
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.2.3. 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 $\leq 8 \text{ dBm}$.

4.2.4. 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 Power Spectral Density

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS8 HT20

Channel	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
1	2412 MHz	-13.84	-13.01	-10.39	8.00	Complies
6	2437 MHz	-6.25	-4.82	-2.47	8.00	Complies
11	2462 MHz	-8.46	-8.21	-5.32	8.00	Complies

Configuration IEEE 802.11n MCS8 HT40

Channel	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
3	2422 MHz	-18.26	-17.79	-15.01	8.00	Complies
6	2437 MHz	-13.99	-13.49	-10.72	8.00	Complies
9	2452 MHz	-14.32	-14.00	-11.15	8.00	Complies

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)	Result
1	2412 MHz	-6.38	8.00	Complies
6	2437 MHz	-4.18	8.00	Complies
11	2462 MHz	-4.38	8.00	Complies

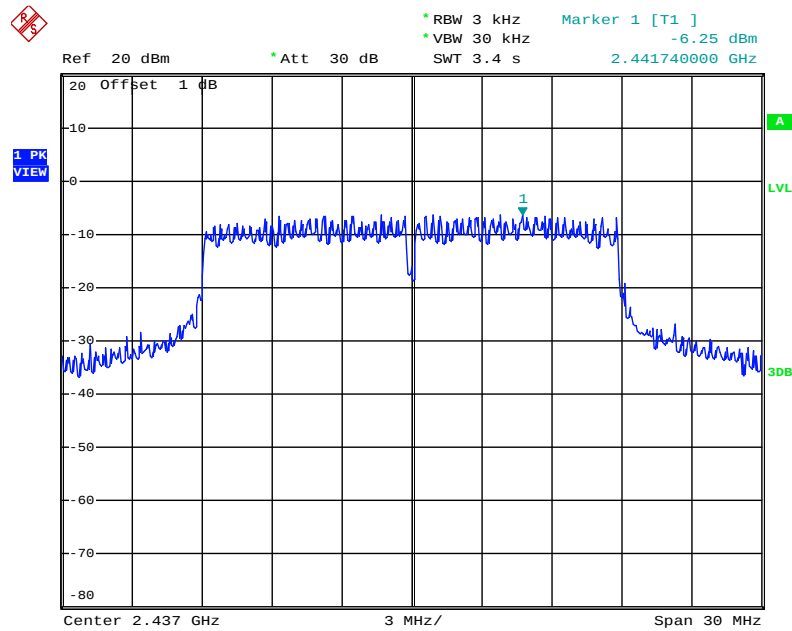
Configuration IEEE 802.11g / Chain 1

Channel	Frequency	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)	Result
1	2412 MHz	-10.84	8.00	Complies
6	2437 MHz	-5.28	8.00	Complies
11	2462 MHz	-8.96	8.00	Complies

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

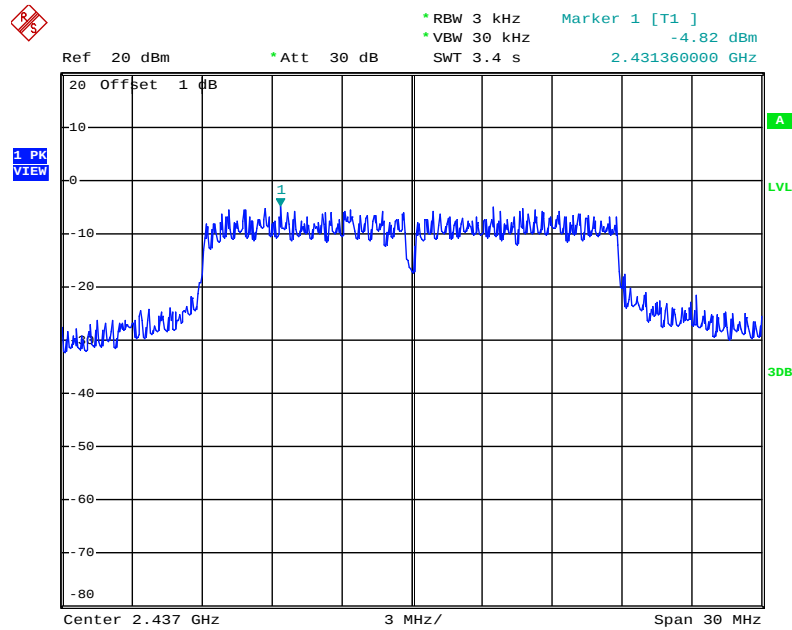
For plots, only the channel with worse result was shown.

Power Density Plot on Configuration IEEE 802.11n MCS8 HT20 / 2437 MHz / Chain 1



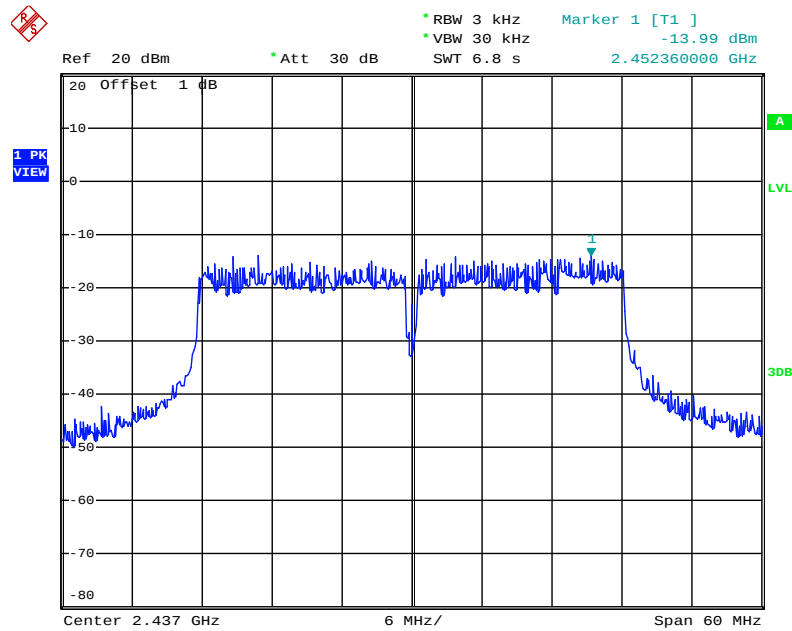
Date: 3.JUL.2014 21:18:06

Power Density Plot on Configuration IEEE 802.11n MCS8 HT20 / 2437 MHz / Chain 2



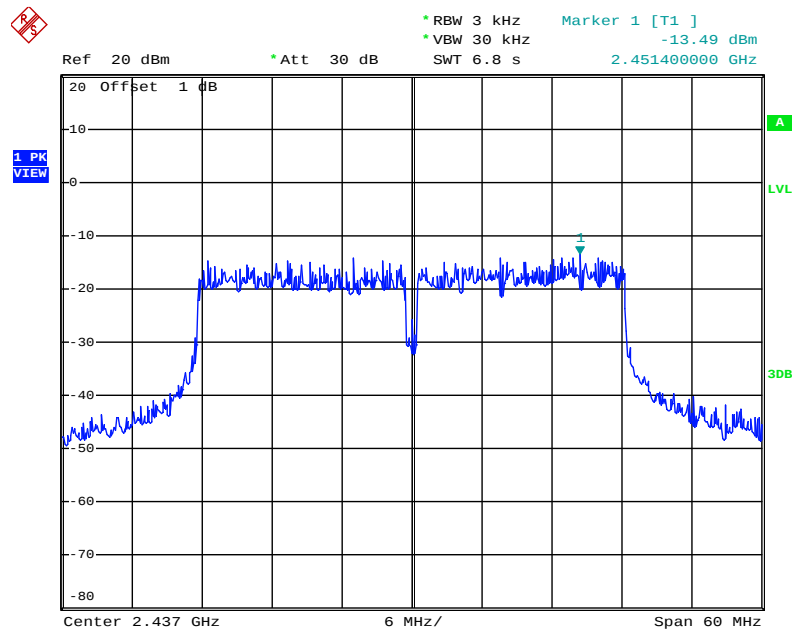
Date: 3.JUL.2014 21:16:29

Power Density Plot on Configuration IEEE 802.11n MCS8 HT40 / 2437 MHz / Chain 1



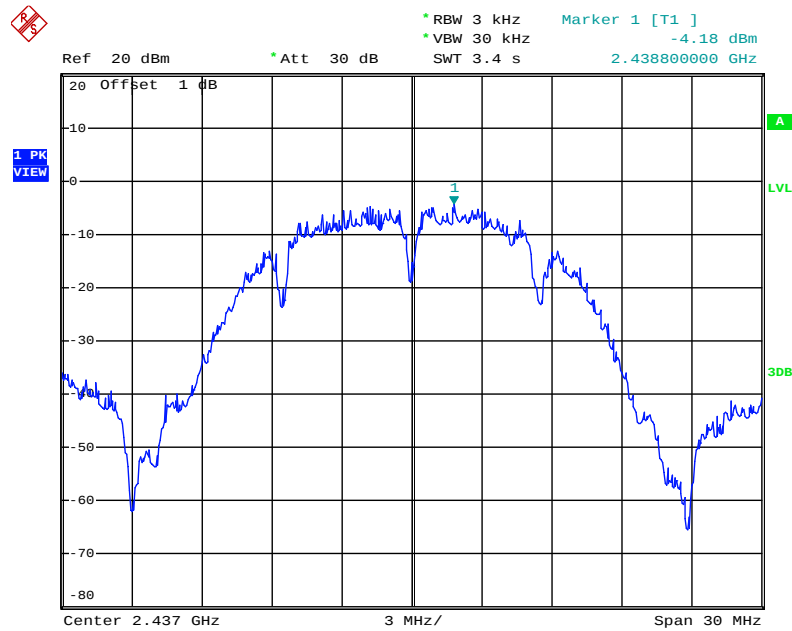
Date: 3.JUL.2014 21:21:59

Power Density Plot on Configuration IEEE 802.11n MCS8 HT40 / 2437 MHz / Chain 2



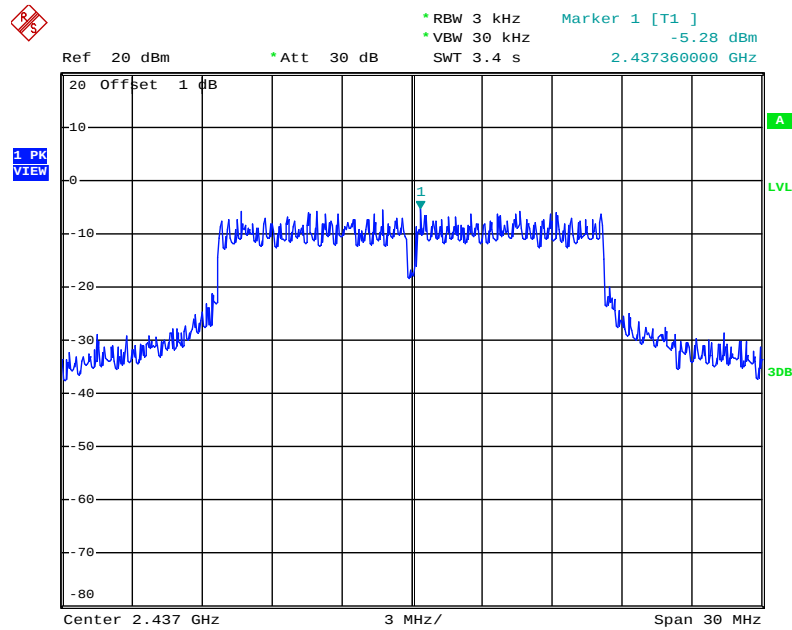
Date: 3.JUL.2014 21:21:45

Power Density Plot on Configuration IEEE 802.11b / 2437 MHz / Chain 1



Date: 3.JUL.2014 21:10:01

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



Date: 3.JUL.2014 21:12:27

4.3. 6dB Spectrum Bandwidth Measurement

4.3.1. Limit

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

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 Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

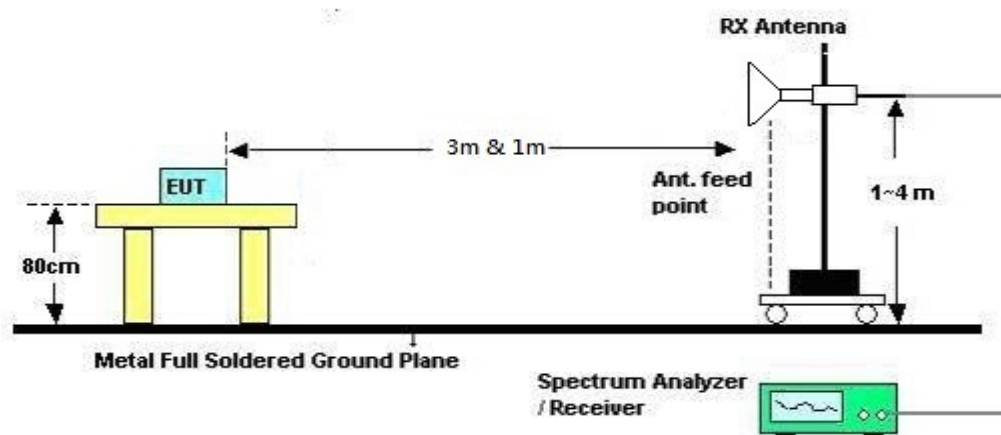
4.3.3. Test Procedures

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.

4.3.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:



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 6dB Spectrum Bandwidth

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.68	17.84	500	Complies
6	2437 MHz	17.60	21.60	500	Complies
11	2462 MHz	17.60	18.08	500	Complies

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.48	36.64	500	Complies
6	2437 MHz	36.48	36.48	500	Complies
9	2452 MHz	35.84	36.64	500	Complies

Temperature	26°C	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.08	14.08	500	Complies
6	2437 MHz	10.08	14.08	500	Complies
11	2462 MHz	10.00	14.08	500	Complies

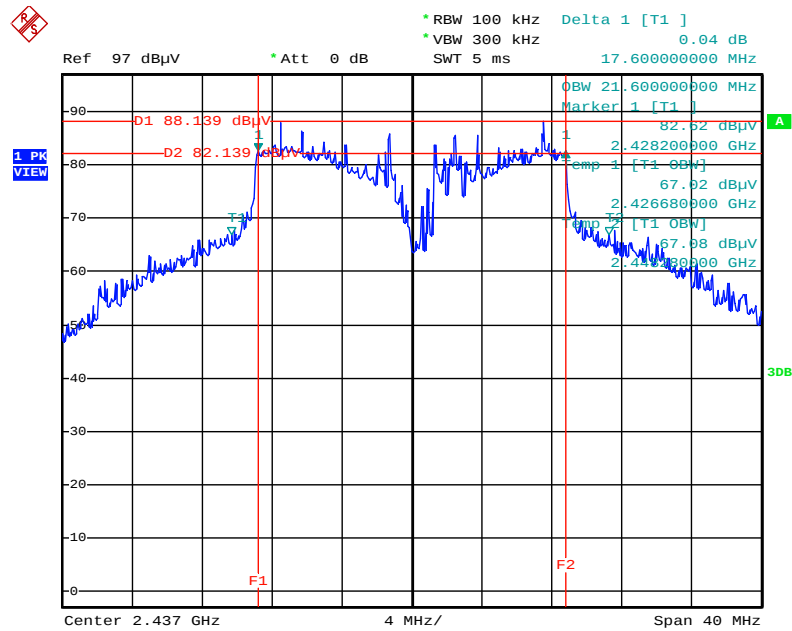
Configuration IEEE 802.11g / Chain 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.32	16.56	500	Complies
6	2437 MHz	16.32	18.40	500	Complies
11	2462 MHz	16.32	16.56	500	Complies

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

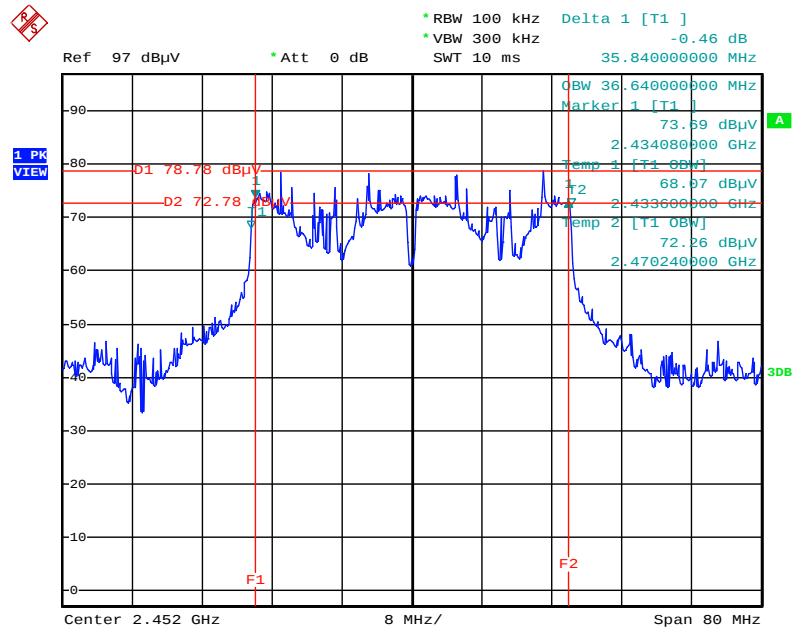
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT20 / 2437 MHz / Chain 1 + Chain 2



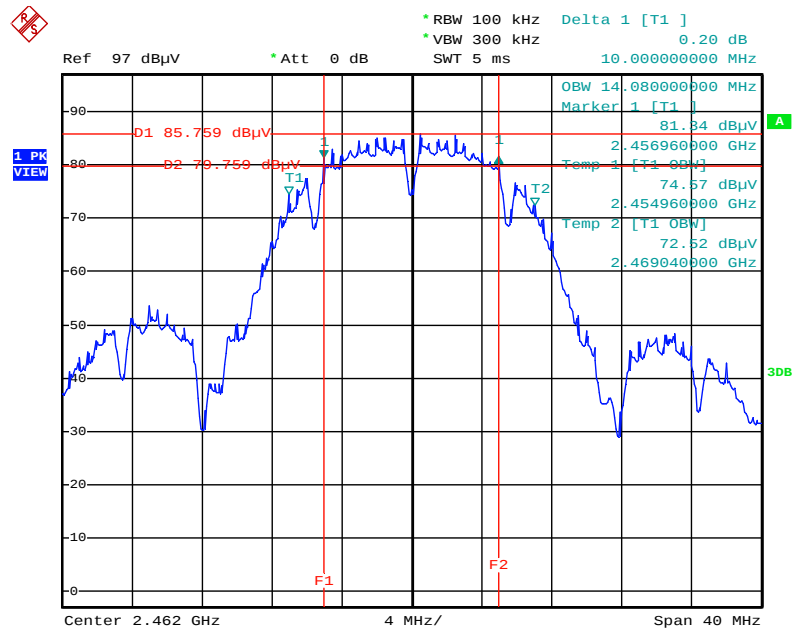
Date: 3.JUL.2014 20:53:17

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT40 / 2452 MHz / Chain 1 + Chain 2



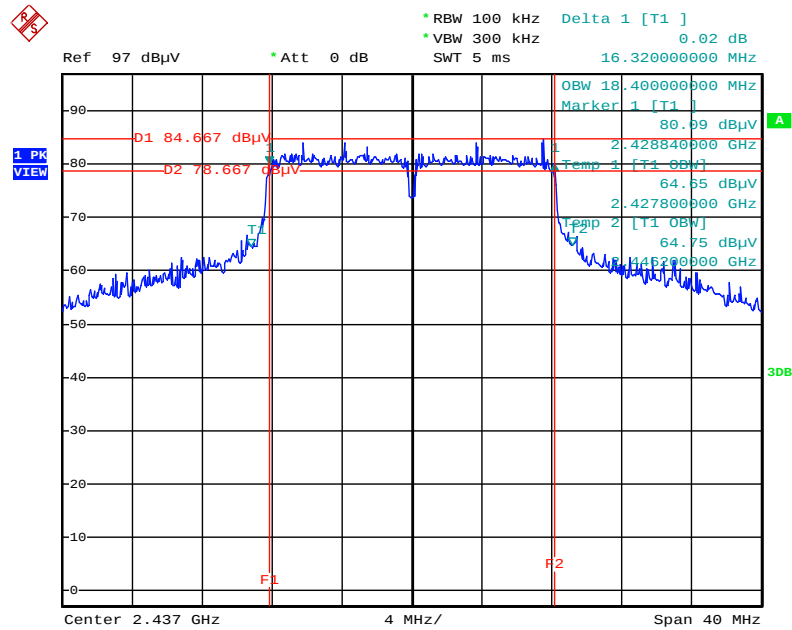
Date: 3.JUL.2014 20:56:48

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz / Chain 1



Date: 3.JUL.2014 20:44:25

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz / Chain 1



Date: 3.JUL.2014 20:46:27

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, Please refer to section 3.11 for Average
RBW / VBW (30dBc in any 100 kHz bandwidth emission)	100 kHz / 300 kHz for Peak

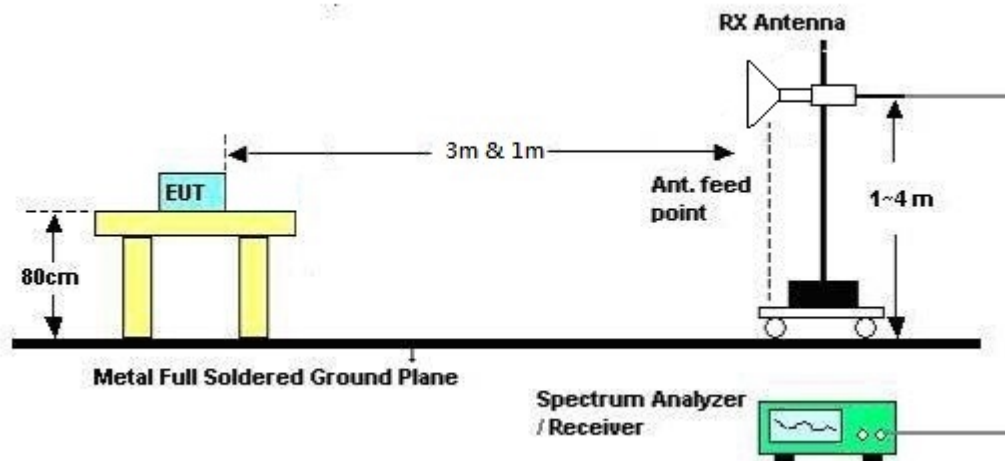
4.4.3. Test Procedures

For Radiated Out of Band Emission Measurement:

- 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.
- The radiated emission test is performed on each TX port of operating mode without summing or adding $10\log(N)$ since the limit is relative emission limit.
Only worst data of each operating mode is presented.

4.4.4. Test Setup Layout

For Radiated Out of Band Emission Measurement:



4.4.5. Test Deviation

There is no deviation with the original standard.

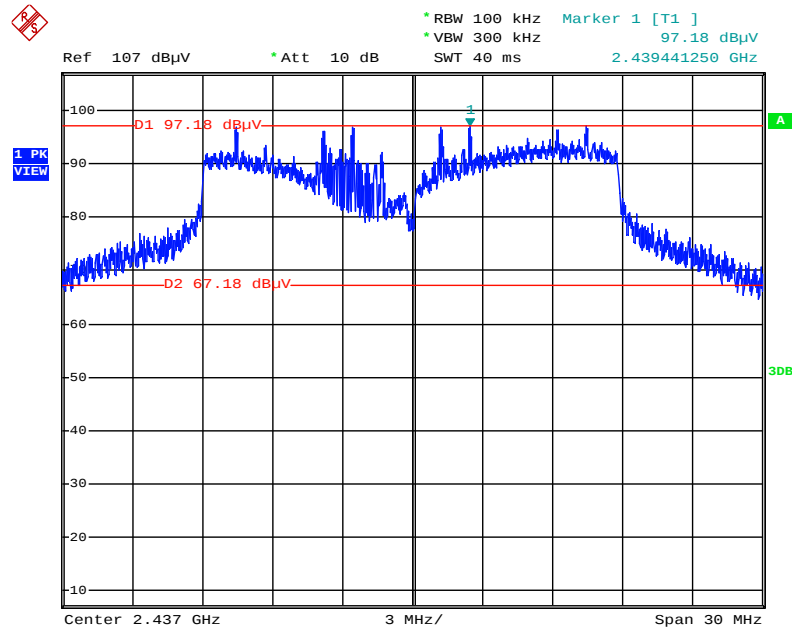
4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result

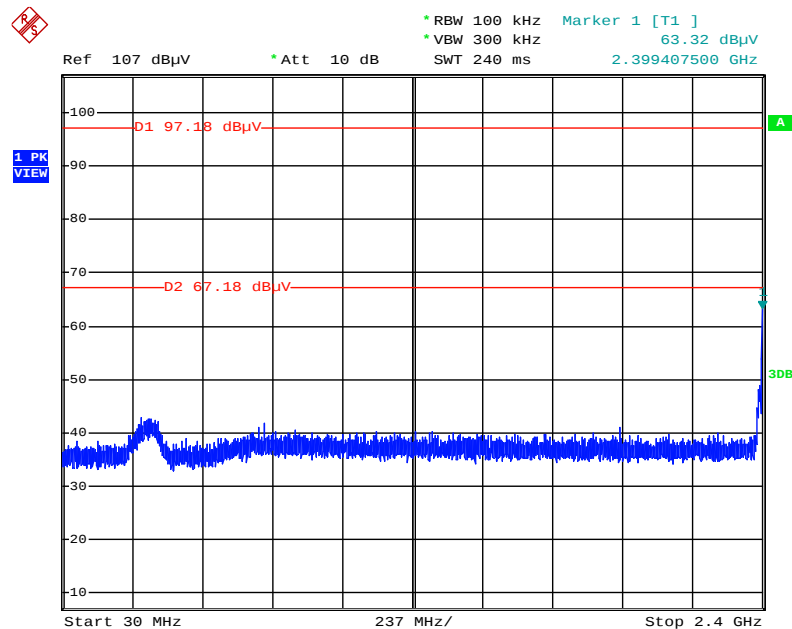
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11n MCS8 HT20 / Reference Level



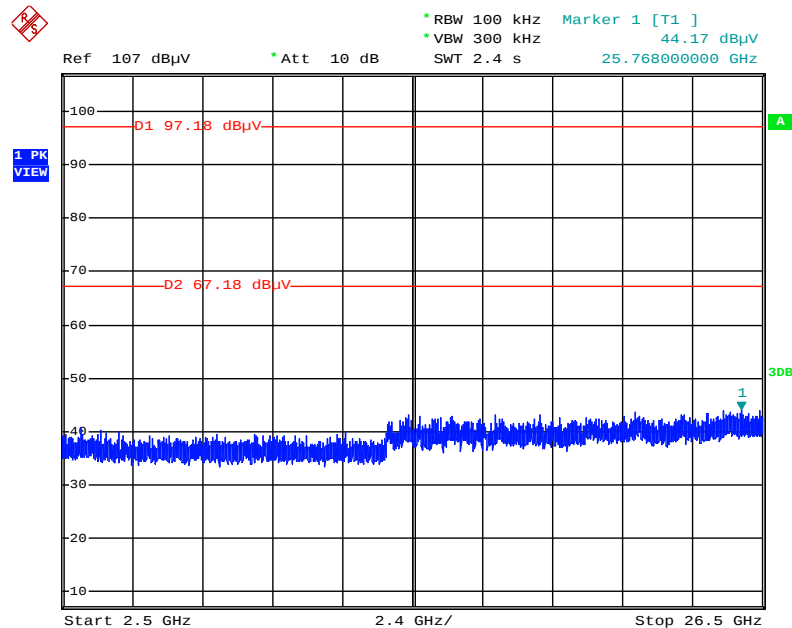
Date: 7.JUL.2014 19:58:13

Plot on Configuration IEEE 802.11n MCS8 HT20 / CH 1 / 30MHz~2400MHz (down 30dBc)



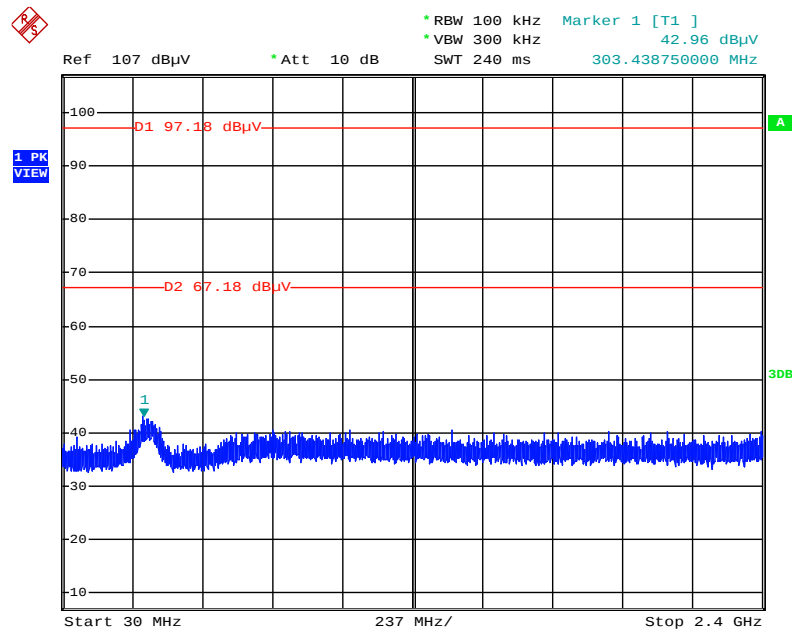
Date: 7.JUL.2014 20:00:15

Plot on Configuration IEEE 802.11n MCS8 HT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



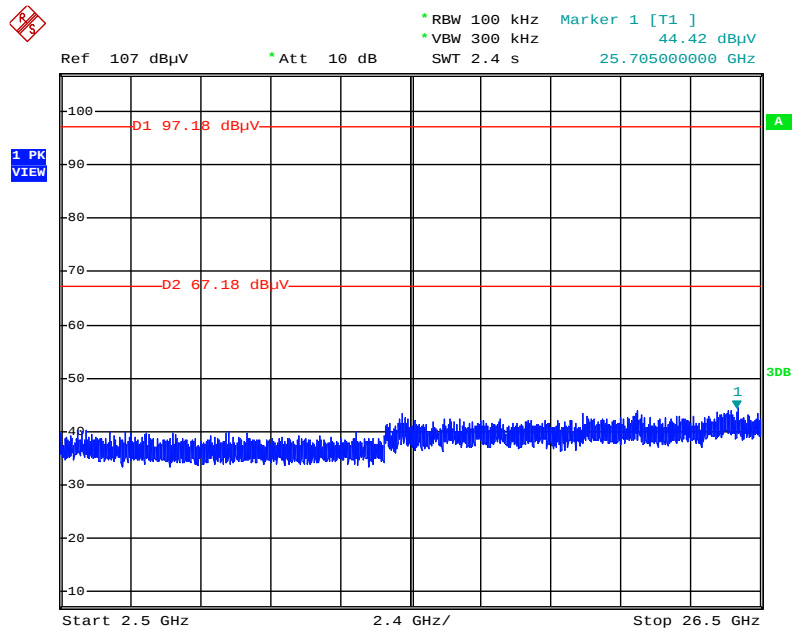
Date: 7.JUL.2014 20:01:01

Plot on Configuration IEEE 802.11n MCS8 HT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



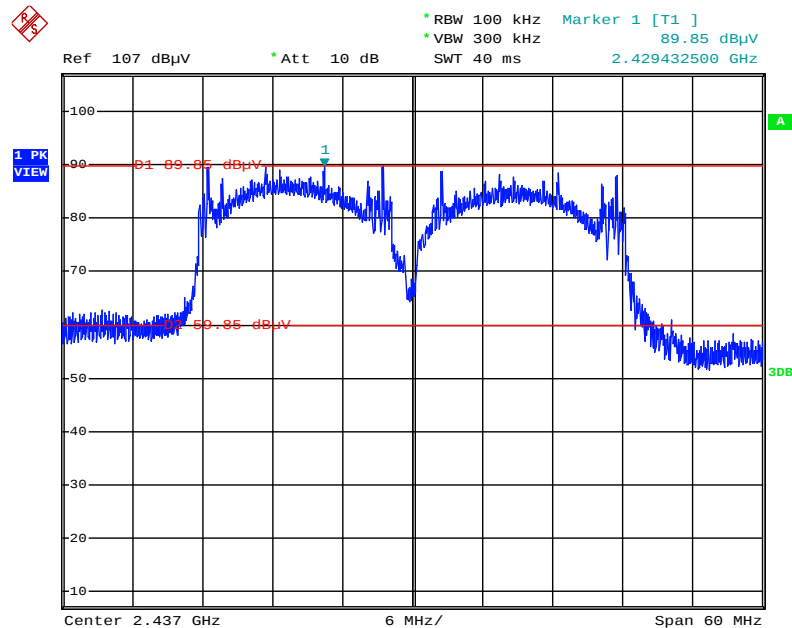
Date: 7.JUL.2014 20:03:10

Plot on Configuration IEEE 802.11n MCS8 HT20 / CH 11 / 2500MHz~26500MHz (down 30dBc)



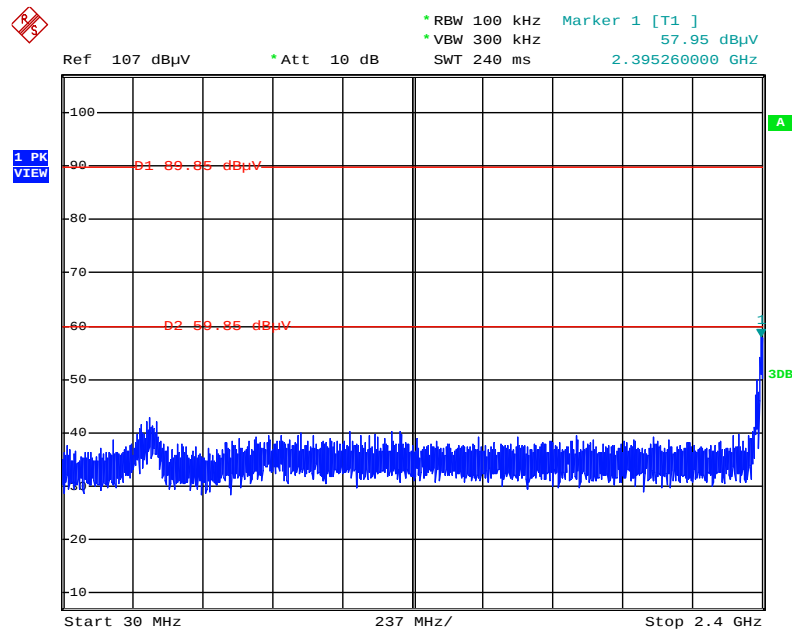
Date: 7.JUL.2014 20:03:54

Plot on Configuration IEEE 802.11n MCS8 HT40 / Reference Level



Date: 7.JUL.2014 20:10:28

Plot on Configuration IEEE 802.11n MCS8 HT40 / CH 3 / 30MHz~2400MHz (down 30dBc)



Date: 7.JUL.2014 20:12:47



Ref 107 dBμV * Att 10 dB * RBW 100 kHz * VBW 300 kHz * Marker 1 [T1] 44.89 dBμV
SWT 2.4 s 25.483000000 GHz

1 PK VIEW

D1 89.85 dBμV
D2 50.85 dBμV

1

Start 2.5 GHz 2.4 GHz/ Stop 26.5 GHz

Ref 107 dBμV * Att 10 dB * RBW 100 kHz Marker 1 [T1] 47.00 dBμV
 * VBW 300 kHz 2.398518750 GHz
 SWT 240 ms

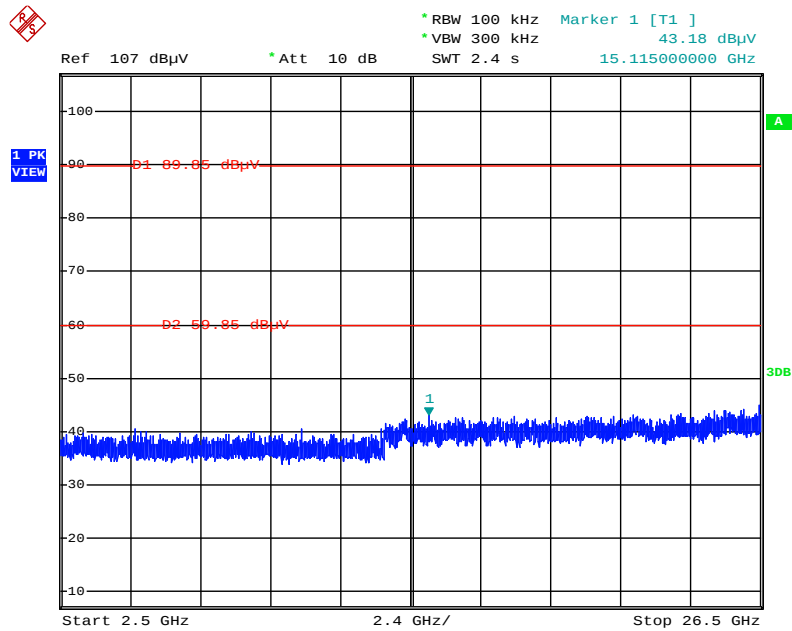
1 PK VIEW

M1 89.85 dBμV
 M2 59.85 dBμV

Start 30 MHz 237 MHz/ Stop 2.4 GHz

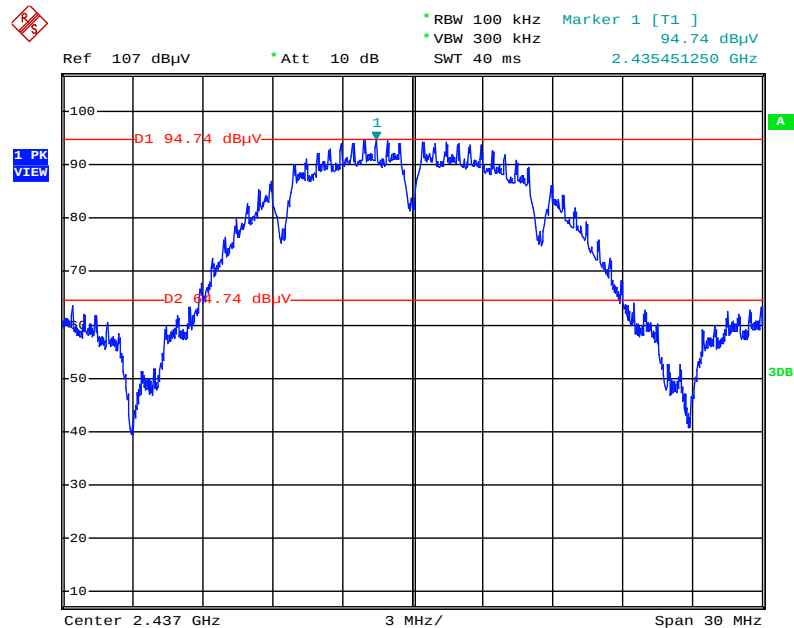
Issued Date : Jul. 21, 2014

Plot on Configuration IEEE 802.11n MCS8 HT40 / CH 9 / 2500MHz~26500MHz (down 30dBc)



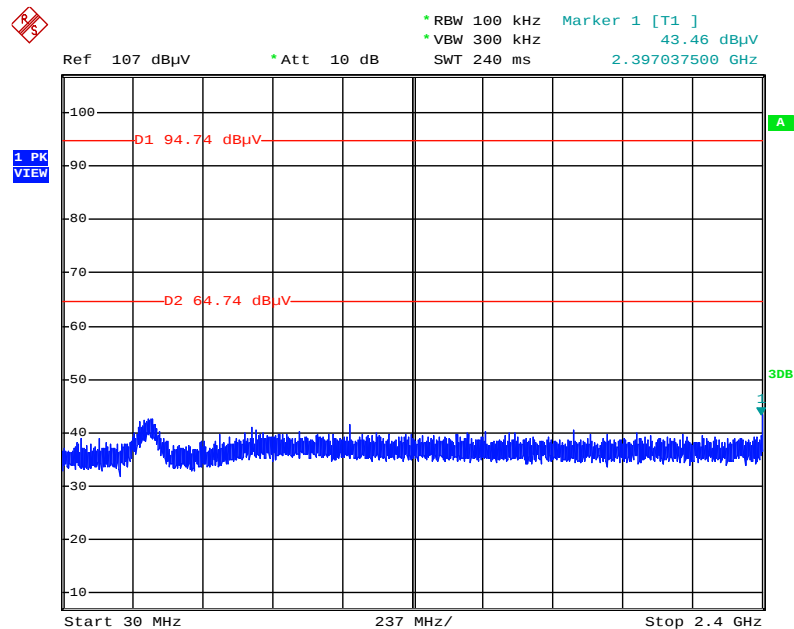
Date: 7.JUL.2014 20:17:02

Plot on Configuration IEEE 802.11b / Reference Level



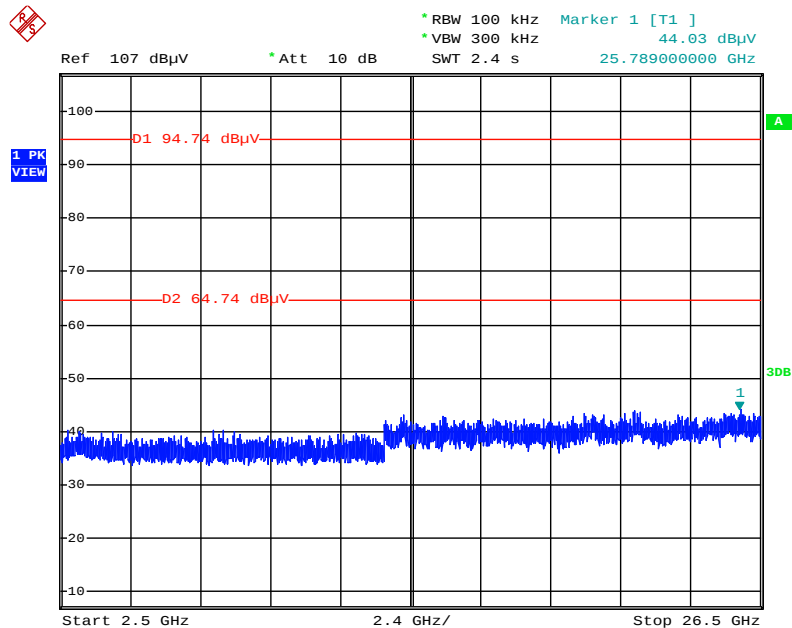
Date: 7.JUL.2014 19:36:23

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



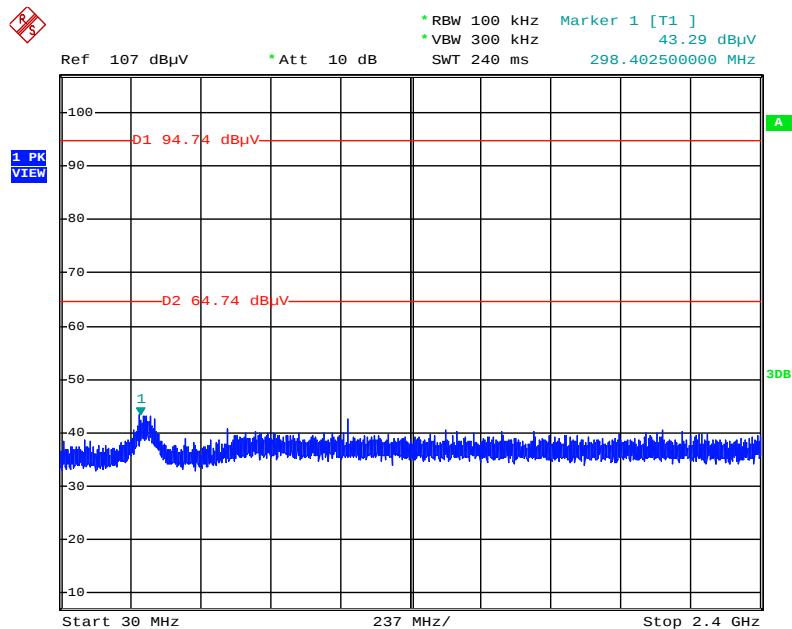
Date: 7.JUL.2014 19:39:38

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



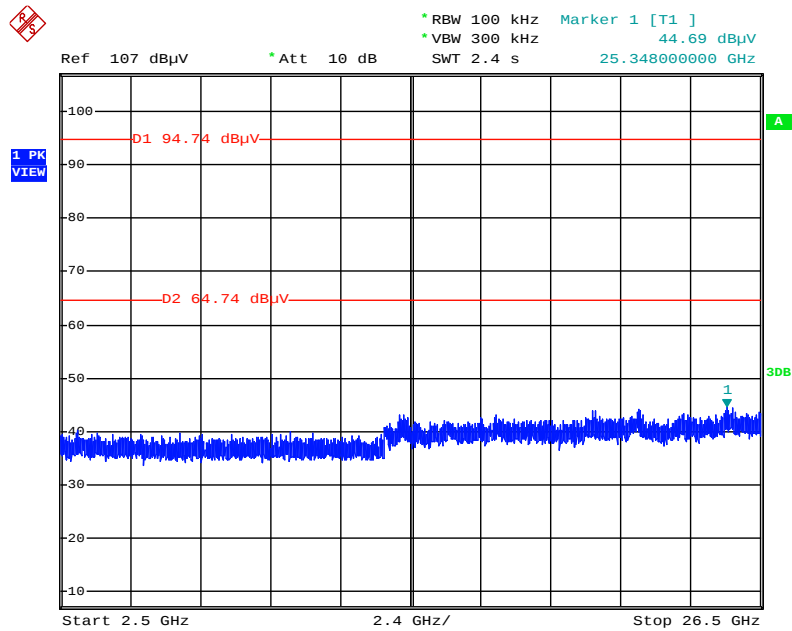
Date: 7.JUL.2014 19:40:20

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



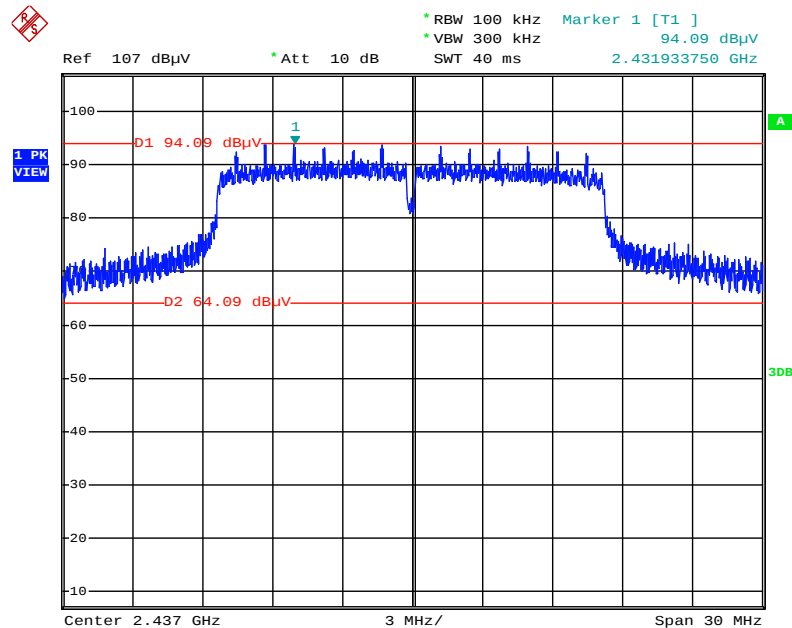
Date: 7.JUL.2014 19:41:44

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



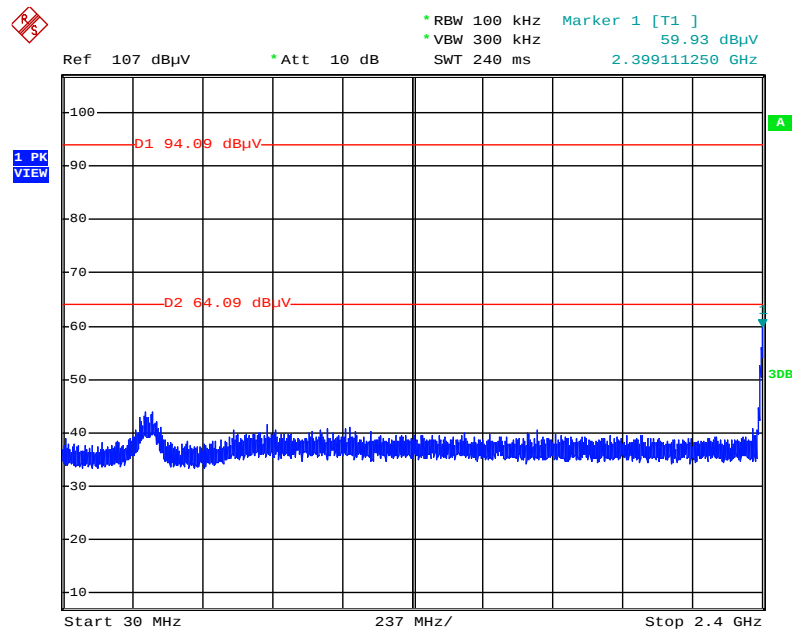
Date: 7.JUL.2014 19:42:35

Plot on Configuration IEEE 802.11g / Reference Level



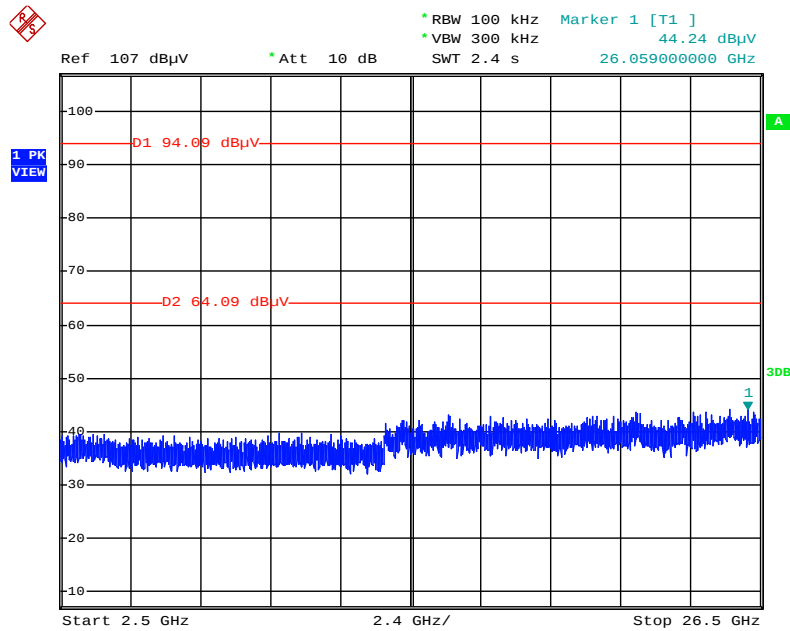
Date: 7.JUL.2014 19:45:31

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



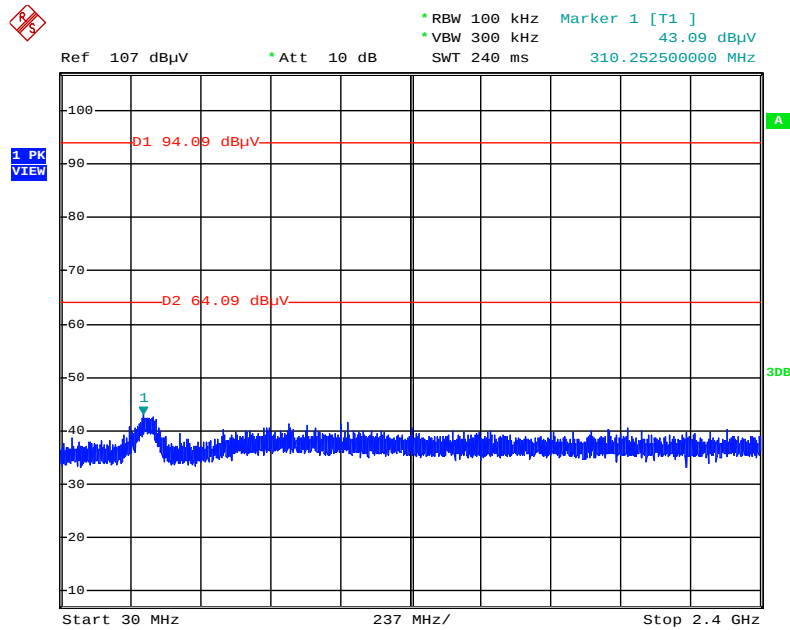
Date: 7.JUL.2014 19:47:07

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



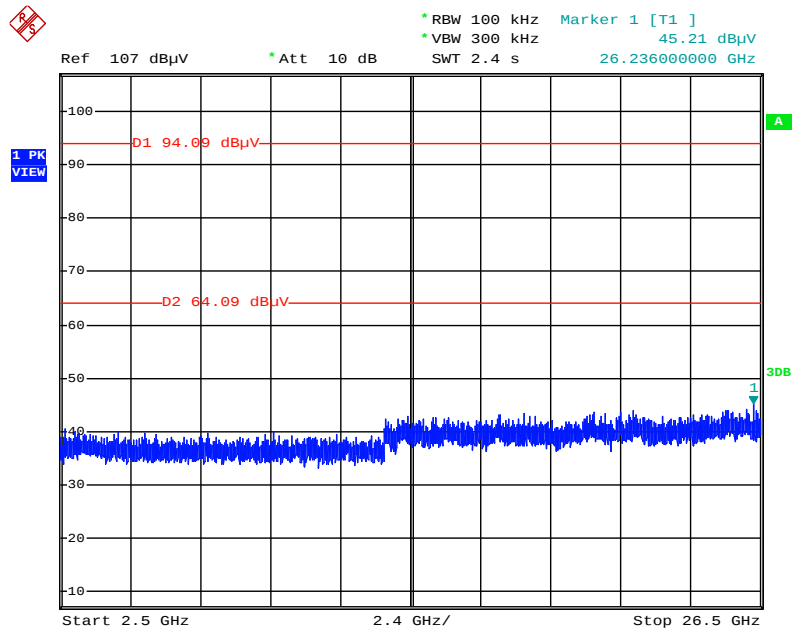
Date: 7.JUL.2014 19:47:53

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



Date: 7.JUL.2014 19:50:57

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



Date: 7.JUL.2014 19:51:40

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
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Oct. 23, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 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	CO2000	N/A	1 m - 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 18, 2013	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
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%