FCC RADIO TEST REPORT

According to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	**DOMA (DMA) Mobile Broadband Router**
Brand Name	:	**Dovado**
Model	:	**DMA**
Filing Type	:	**New Application**
Applicant	:	**DOVADO FZ-LLC** Al-Thuraya Tower 1, suite 504, Dubai, 500422 United Arab Emirates
FCC ID	:	**X7V6291103272**
Manufacturer	:	**EDIMAX TECHNOLOGY CO., LTD.** No.3,Wu-Chuan 3rd Road,Wu-Ku Industrial Park, New Taipei City, Taiwan
Received Date	:	Sep. 30, 2011
Final Test Date	:	Dec. 27, 2011

Statement

Test result included is only for the 802.11b/g/n part of the product.

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

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

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

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

Testing Laboratory
1190

SPORTON International Inc.

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

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History of This Test Report

Original Issue Date: Apr. 19, 2012
Report No.: FR181654-02
■ No additional attachment.
□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

According to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	DOMA (DMA) Mobile Broadband Router
Brand Name	:	Dovado
Model	:	DMA
Applicant	:	DOVADO FZ-LLC Al-Thuraya Tower 1, suite 504, Dubai, 500422 United Arab Emirates

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Sep. 30, 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.

Wayne Hsu / Assistant Manager

SPORTON International Inc.

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

1 SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
3.1	15.207	AC Power Line Conducted Emissions	Complies	10.17 dB
3.2	15.247(b)(3)	Maximum Peak Output Power	Complies	7.86 dB
3.3	15.247(e)	Power Spectral Density	Complies	22.12 dB
3.4	15.247(a)(2)	6dB Spectrum Bandwidth Measurement	Complies	-
3.5	15.247(d)	Radiated Emissions	Complies	0.26 dB
3.6	15.247(d)	Band Edge Emissions	Complies	1.22 dB
3.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Peak Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth Measurement	$\pm 8.5\times 10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7℃	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

2 GENERAL INFORMATION

2.1 Product Details

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

Items	Description
Power Type	+5Vdc from adapter
Data Modulation Data Rate (Mbps)	DSSS for IEEE 802.11b (DBPSK / DQPSK / CCK) (1/2/ 5.5/11) OFDM for IEEE 802.11g (BPSK / QPSK / 16QAM / 64QAM) (6/9/12/18/24/36/48/54) See the below table for IEEE 802.11n
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11b/g/n (20MHz): 11 ; 11/n (40MHz): 7
Channel Band Width (99%)	802.11b/g : 11b: 14.92 MHz ; 11g: 16.48 MHz 802.11n : MCS 8 (20MHz) : 17.84 MHz ; MCS 8 (40MHz) : 36.08 MHz
Conducted Output Power	802.11b/g : 11b: 16.36 dBm ; 11g: 22.14 dBm 802.11n : MCS 8 (20MHz) : 21.68 dBm ; MCS 8 (40MHz) : 20.31 dBm

IEEE 802.11n Modulation Scheme

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

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

2.2 Accessories

Accessories Information				
Switching Adapter 1	Brand Name	DVE	Model Name	DSC-6PFA-05 FUS 050100
	Power Rating	I/P: 100-240V~50/60Hz 0.2A ; O/P: +5V 1A		
Switching Adapter 2	Brand Name	DVE	Model Name	DSA-12PFA-05 FUS 050200
	Power Rating	I/P: 100-240V~50/60Hz 0.5A ; O/P: +5V 2A		

2.3 Table for Filed Antenna

Antenna Category (Ant. Cat.)	
☒	External antenna (dedicated antennas)
	☒ Single Power Level (PL) with corresponding antenna(s). Power Level (PL): 1
	☒ Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type…)

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

Antenna General Information							
Antenna Port (Total 2 Port)				1(TX/RX), 2(TX/RX)			
Maximum RF Output Power Level (PL)				1			
Transmit Chains Power Distribution				☒ symmetrical distribution ☐ asymmetrical distribution			
Ant. No.	**PL**	**Ant. Port** [Ant No. *X* connect to Ant. Port *Y*]	**Ant. Cat.**	**Ant. Type**	**G_{ANT} (dBi)**	**DG (dBi)** [correlated] **N_{TX} = 1**	**DG (dBi)** [uncorrelated] **N_{TX} = 2**
1	1	1,2	External	Dipole	3	N/A	3
☒	EUT is consist of multiple antenna models assembly (multiple antenna models are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. Then Ant. No. 1 shall be performed the radiated test.						
☒	The equipment is normally installed and point-to-point or point-to-multipoint systems: Ant. No. 1						

Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain (DG) = G_{ANT} + 10 log(N) dBi
All transmit signals are completely uncorrelated, Directional Gain (DG)= G_{ANT}

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain (DG) =
$10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 /N]$ dBi
All transmit signals are completely uncorrelated, Directional Gain (DG) =
$10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10)/N}]$ dBi

2.4 Table for Carrier Frequencies

There are two bandwidth systems for IEEE 802.11b/g/n.
For IEEE 802.11b/g/n (20MHz) bandwidth systems use channel 1 ~ 11.
For IEEE 802.11n (40MHz) bandwidth systems use channel 3 ~ 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	-	-

2.5 Test Manner

a. The following test modes were performed for conducted and radiated below 1GHz test:
   Mode 1. EUT with Adapter: DVE/ DSC-6PFA-05 FEU 050100
   Mode 2. EUT with Adapter: DVE/ DSA-12PFA-05 FEU 050200

b. The following test mode was worst case for radiated above 1GHz test:
   Mode 1. EUT with Adapter: DVE/ DSC-6PFA-05 FEU 050100

2.6 Table for Test Modes

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

Test Items	Mode	Data Rate	Channel
AC Power Line Conducted Emissions Radiated Emissions Below 1GHz	Refer to section 2.5	-	-
Maximum Peak Output Power Power Spectral Density	11b/CCK	11 Mbps	1/6/11
	11g/BPSK	6 Mbps	1/6/11
	MCS 8 (20MHz)	13 Mbps	1/6/11
	MCS 8 (40MHz)	27 Mbps	3/6/9
6dB Spectrum Bandwidth	11b/CCK	1 1Mbps	1/6/11
	11g/BPSK	6 Mbps	1/6/11
	MCS 8 (20MHz)	13 Mbps	1/6/11
	MCS 8 (40MHz)	27 Mbps	3/6/9
Radiated Emissions Above 1GHz	11b/CCK	11 Mbps	1/6/11
	11g/BPSK	6 Mbps	1/6/11
	MCS 8 (20MHz)	13 Mbps	1/6/11
	MCS 8 (40MHz)	27 Mbps	3/6/9
Band Edge Emissions	11b/CCK	11Mbps	1/11
	11g/BPSK	6 Mbps	1/11
	MCS 8 (20MHz)	13 Mbps	1/11
	MCS 8 (40MHz)	27 Mbps	3/9

2.7 Table for Testing Locations

Test Site No.	Site Category	Location
CO04-HY	Conduction	Hwa Ya
TH01-HY	OVEN Room	Hwa Ya
03CH03-HY	SAC	Hwa Ya

Semi Anechoic Chamber (SAC).

2.8 Table for Supporting Units

Support Unit	Brand	Model	FCC ID	Remark
Notebook	DELL	E5520	N/A	Conducted Emissions
(USB) Mouse	Microsoft	1004	N/A	
iPod Nano	Apple	A1320	N/A	
3G Dongle	Telstra	7 Series	N/A	
Notebook (Remote Workstation)	DELL	INSPIRON 6400	DoC	
Radio Communication (Remote Workstation)	R&S®	CMU200	-	
Notebook	DELL	E5520	N/A	Radiated Emissions
(USB) Mouse	Microsoft	1004	N/A	
iPod Nano	Apple	A1199	N/A	
3G Dongle	Telstra	7 Series	N/A	
Radio Communication (Remote Workstation)	R&S®	CMU200	-	

2.9 Table for Parameters of Test Software Setting

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

For Single Chain:
Power Parameters of IEEE 802.11b/g

Test Software Version	Hyper Terminal		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	45	41	40
IEEE 802.11g	51	51	44

For Two Chains:
Power Parameters of IEEE 802.11n Port 1+Port 2

Test Software Version	Hyper Terminal		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n	49/49	49/49	46/46
Frequency	2422 MHz	2437 MHz	2452 MHz
IEEE 802.11n	46/46	46/46	43/43

2.10 EUT Operation during Test

Two executive programs, "EMITEST.exe" and "EMCTEST.exe" under WIN XP, which generates a complete line of continuously repeating “H“ pattern was used as the test software.

The program was executed as follows :

a. Turn on the power of all equipment.
b. The NB reads the test program from the hard disk drive and runs it.
c. The NB sends “H” messages to the panel and displays “H” patterns on the screen.
d. The NB sends "H" messages to the internal hard disk, and the hard disk reads and writes the message.
e. Repeat the steps from b to d.

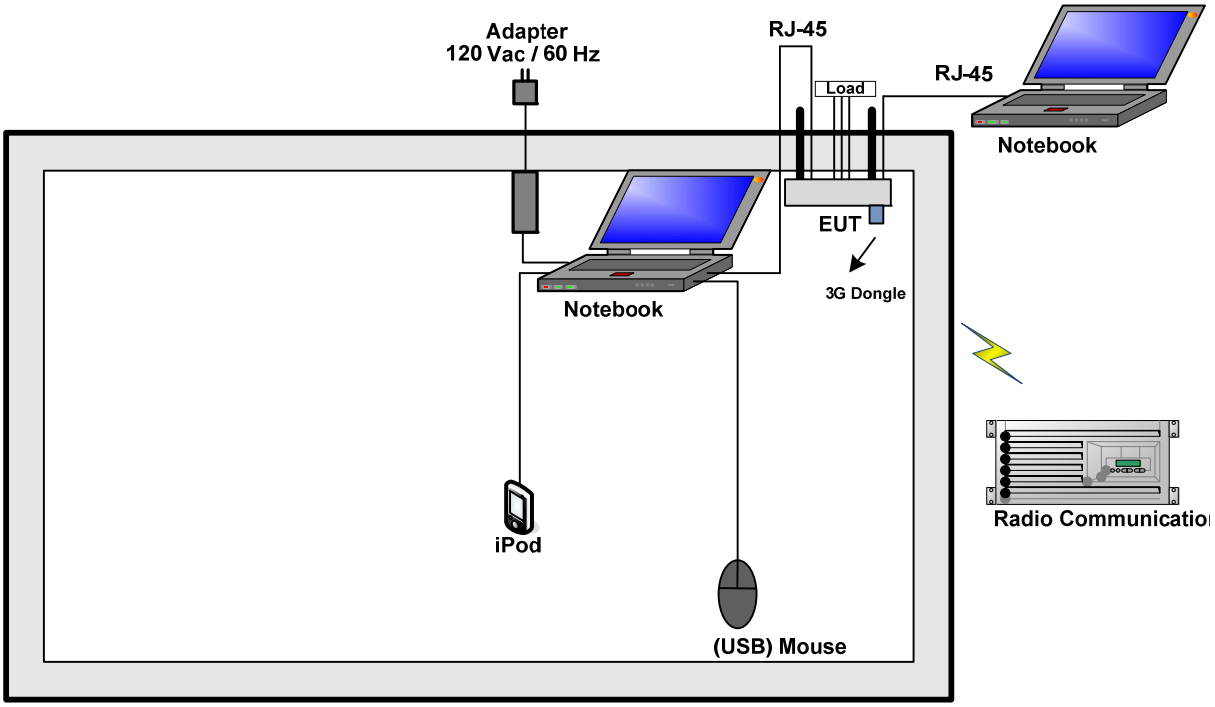
At the same time, the following programs were executed:

- Executed "Ping.exe" to link with the remote workstation to receive and transmit data by RJ45 or wireless.
- Open the Radio Communication in remote workstation and transmission to EUT by 3G Dongle.

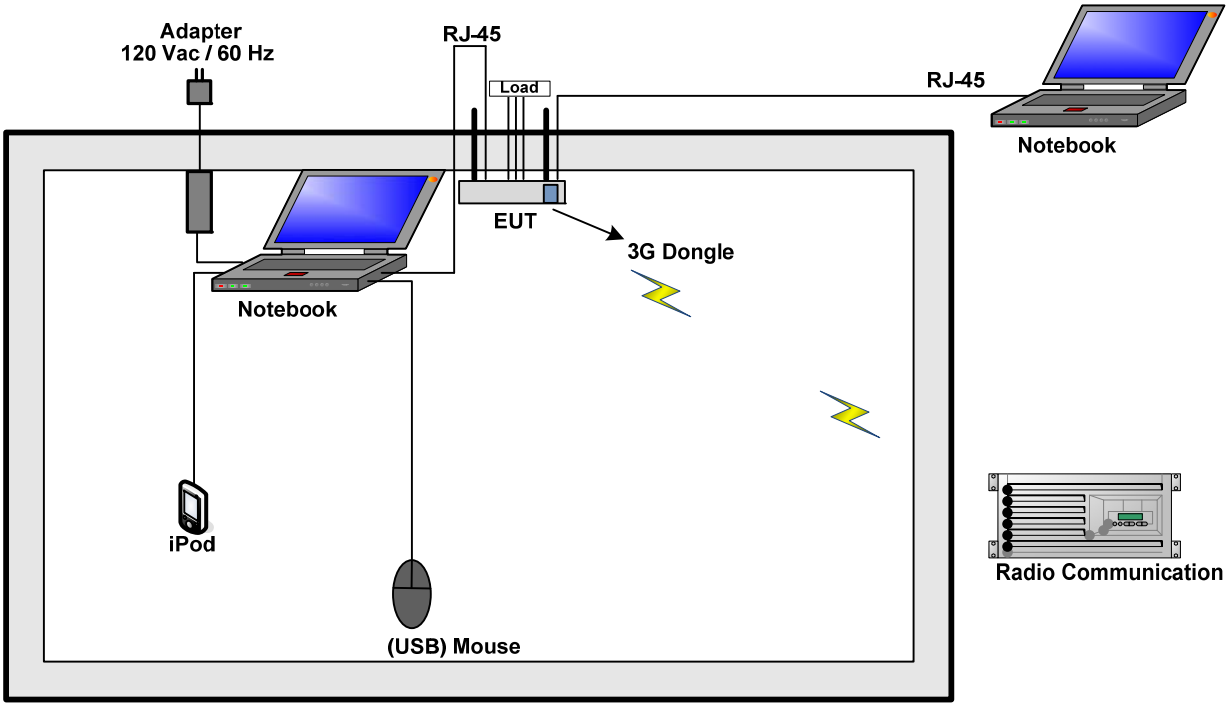
Only Conducted test use:
The Notebook executed “Hyper Terminal.exe” to EUT keep transmitting signals at fixed frequency via RJ45.

2.11 Test Configuration

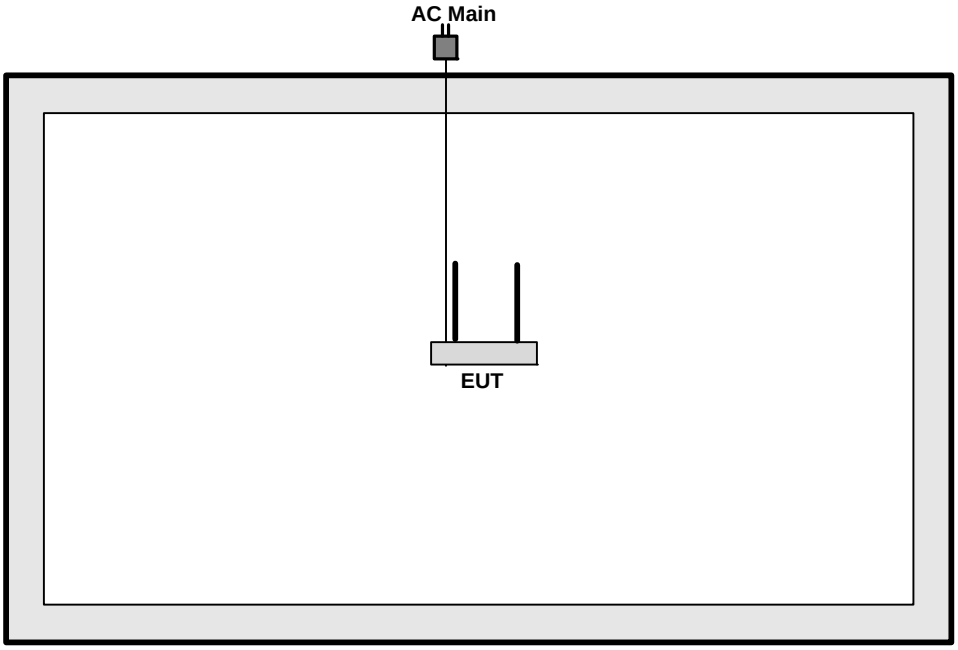
For conducted emissions



For radiated emissions 9kHz~1GHz



For radiated emissions above 1GHz



3 TEST RESULT

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit

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

Class B

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

3.1.2 Measuring Instruments and Setting

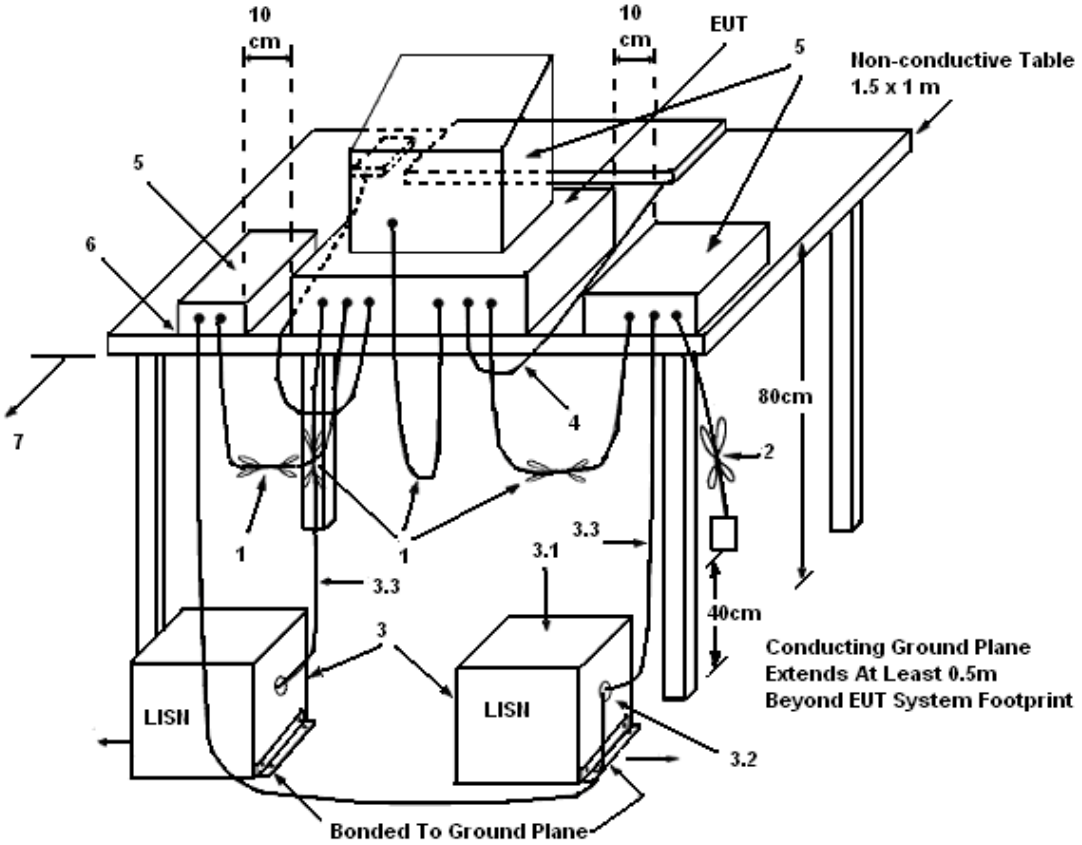
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

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

3.1.3 Test Procedures

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

3.1.4 Test Setup Layout



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

3.1.5 Test Deviation

There is no deviation with the original standard.

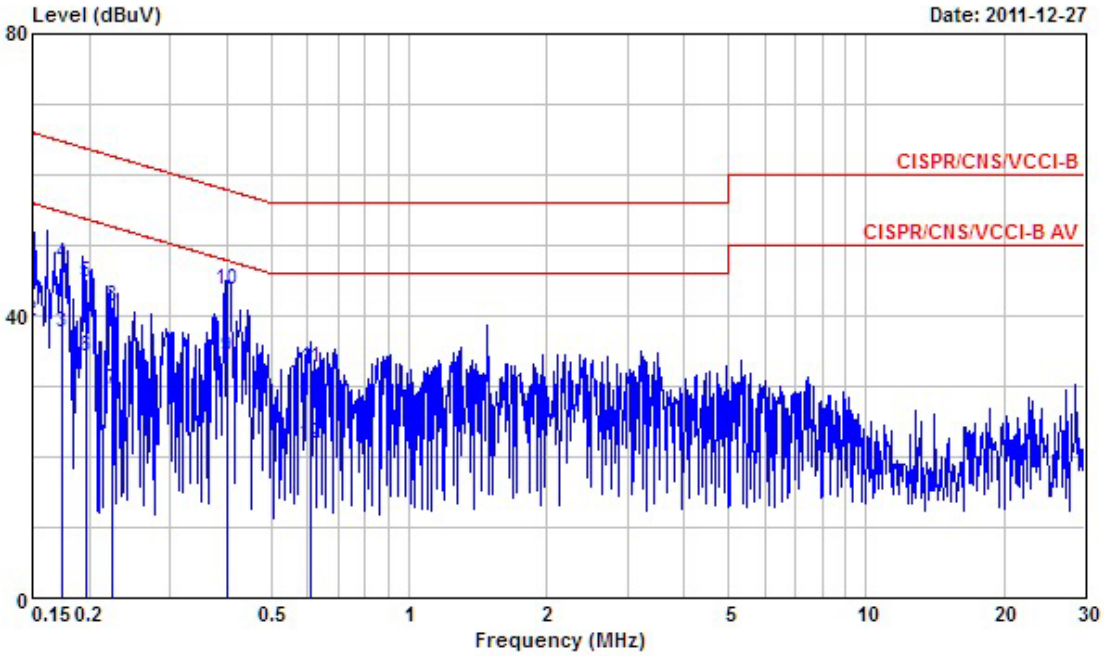
3.1.6 EUT Operation during Test

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

3.1.7 Results of AC Power Line Conducted Emissions Measurement

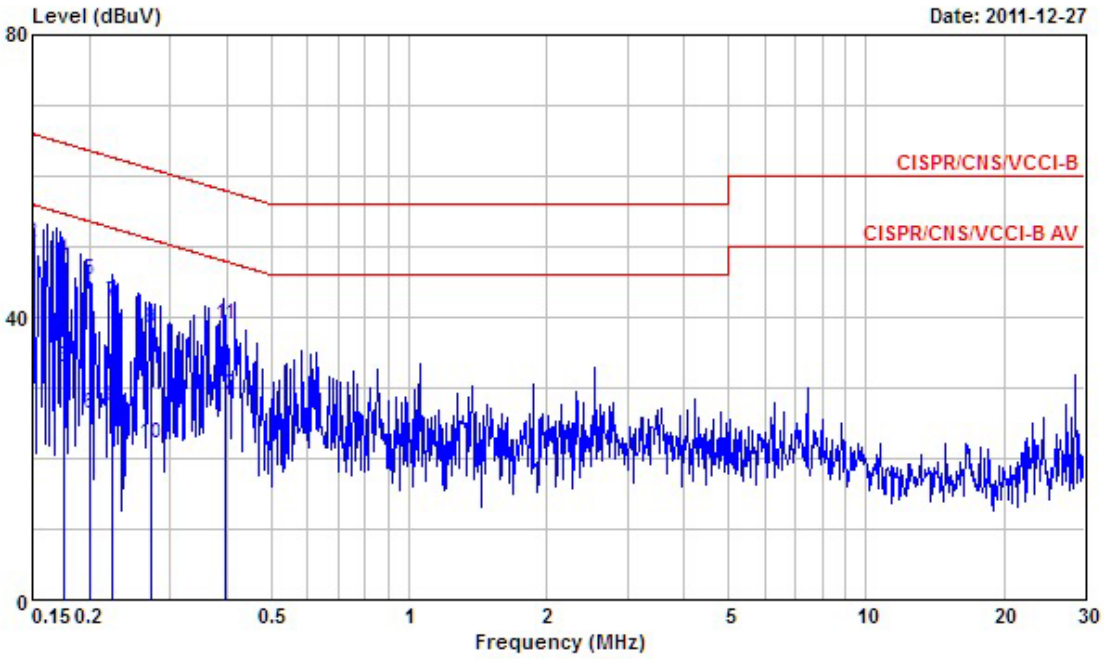
Final Test Date	Dec. 27, 2011	**Test Site No.**	CO04-HY
Temperature	24.5℃	**Humidity**	48%
Test Engineer	Assen	**Configuration**	Mode 1

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	50.20	-15.80	66.00	49.80	0.30	0.10	QP
2	0.1500000	39.22	-16.78	56.00	38.82	0.30	0.10	Average
3	0.1748630	37.60	-17.13	54.73	37.20	0.30	0.10	Average
4	0.1748630	47.48	-17.25	64.73	47.08	0.30	0.10	QP
5	0.1974380	44.72	-19.00	63.72	44.32	0.30	0.10	QP
6	0.1974380	34.16	-19.56	53.72	33.76	0.30	0.10	Average
7	0.2236320	29.49	-23.19	52.68	29.09	0.30	0.10	Average
8	0.2236320	41.20	-21.48	62.68	40.80	0.30	0.10	QP
9	0.4010020	34.21	-13.62	47.83	33.82	0.29	0.10	Average
10	0.4010020	43.77	-14.06	57.83	43.38	0.29	0.10	QP
11	0.6107510	32.66	-23.34	56.00	32.27	0.29	0.10	QP
12	0.6107510	21.87	-24.13	46.00	21.48	0.29	0.10	Average

Neutral

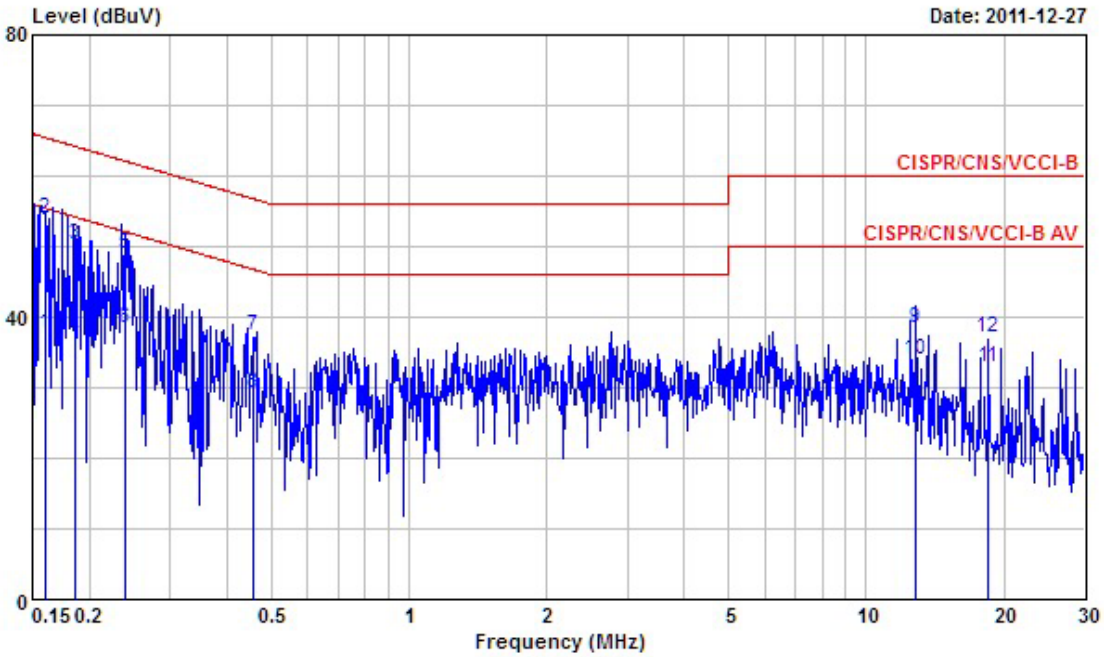


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	28.84	-27.16	56.00	28.47	0.27	0.10	Average
2	0.1500000	50.53	-15.47	66.00	50.16	0.27	0.10	QP
3	0.1756900	32.96	-21.73	54.69	32.60	0.26	0.10	Average
4	0.1756900	48.11	-16.58	64.69	47.75	0.26	0.10	QP
5	0.1999120	45.19	-18.42	63.61	44.84	0.25	0.10	QP
6	0.1999120	26.20	-27.41	53.61	25.85	0.25	0.10	Average
7	0.2231870	42.13	-20.57	62.70	41.78	0.25	0.10	QP
8	0.2231870	27.26	-25.44	52.70	26.91	0.25	0.10	Average
9	0.2725260	38.55	-22.49	61.04	38.20	0.25	0.10	QP
10	0.2725260	22.10	-28.94	51.04	21.75	0.25	0.10	Average
11	0.3973150	38.95	-18.96	57.91	38.61	0.24	0.10	QP
12	0.3973150	29.05	-18.86	47.91	28.71	0.24	0.10	Average

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

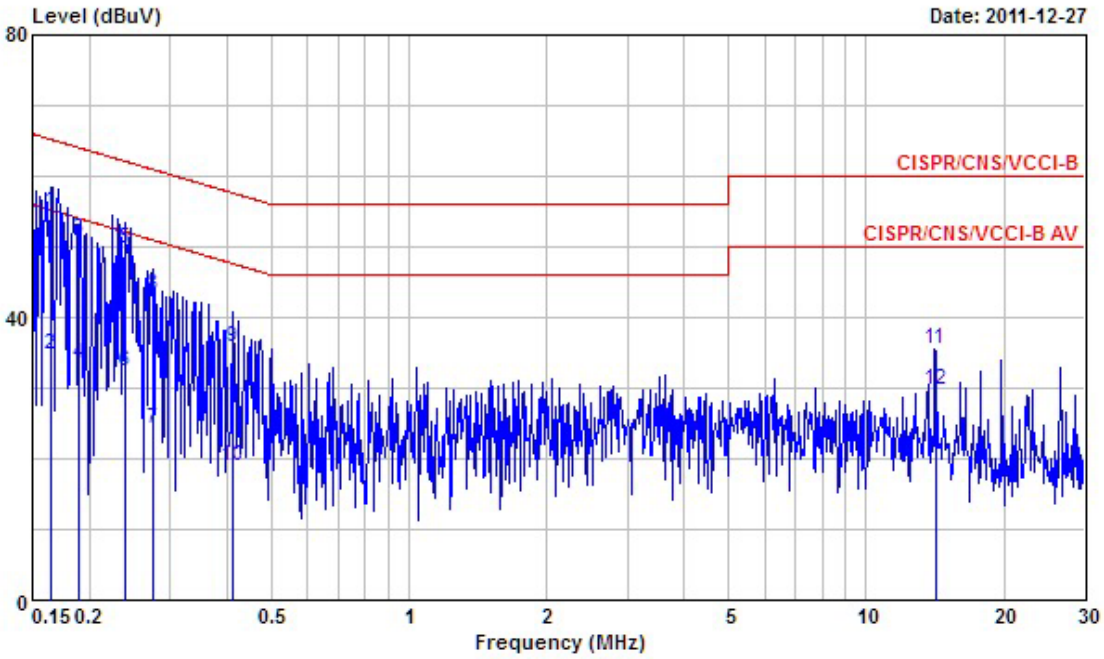
Final Test Date	Dec. 27, 2011	**Test Site No.**	CO04-HY
Temperature	24.5℃	**Humidity**	48%
Test Engineer	Assen	**Configuration**	Mode 2

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1600760	37.70	-17.76	55.46	37.34	0.30	0.06	Average
2	0.1600760	53.87	-11.59	65.46	53.51	0.30	0.06	QP
3	0.1855060	50.38	-13.86	64.24	50.06	0.30	0.02	QP
4	0.1855060	37.04	-17.20	54.24	36.72	0.30	0.02	Average
5	0.2397060	48.82	-13.29	62.11	48.47	0.30	0.05	QP
6	0.2397060	38.41	-13.70	52.11	38.06	0.30	0.05	Average
7	0.4571720	37.25	-19.49	56.74	36.79	0.29	0.17	QP
8	0.4571720	29.25	-17.49	46.74	28.79	0.29	0.17	Average
9	12.809	38.46	-21.54	60.00	37.58	0.50	0.38	QP
10	12.809	33.96	-16.04	50.00	33.08	0.50	0.38	Average
11	18.487	32.98	-17.02	50.00	32.12	0.57	0.29	Average
12	18.487	36.99	-23.01	60.00	36.13	0.57	0.29	QP

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.1641380	55.08	-10.17	65.25	54.76	0.26	0.06	QP
2	0.1641380	34.74	-20.51	55.25	34.42	0.26	0.06	Average
3	0.1888300	51.06	-13.03	64.09	50.79	0.25	0.02	QP
4	0.1888300	33.37	-20.72	54.09	33.10	0.25	0.02	Average
5	0.2391010	49.70	-12.43	62.13	49.40	0.25	0.05	QP
6	0.2391010	32.45	-19.68	52.13	32.15	0.25	0.05	Average
7	0.2744160	24.09	-26.89	50.98	23.75	0.25	0.09	Average
8	0.2744160	43.10	-17.88	60.98	42.76	0.25	0.09	QP
9	0.4104750	35.86	-21.78	57.64	35.43	0.24	0.19	QP
10	0.4104750	18.85	-28.79	47.64	18.42	0.24	0.19	Average
11	14.151	35.53	-24.47	60.00	34.65	0.43	0.45	QP
12	14.151	29.75	-20.25	50.00	28.87	0.43	0.45	Average

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

3.2 Maximum Peak Output Power Measurement

3.2.1 Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-multipoint antenna reduction operation, the limit has to be reduced by 1dB for every dB that the directional gain of the antenna exceeds 6dBi.

3.2.2 Measuring Instruments and Setting

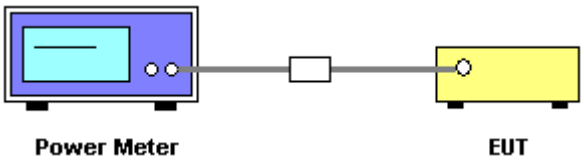
Please refer to section 4 of equipments list in this report. The following table is the setting of the power meter.

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

3.2.3 Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.
4. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula. (Only for IEEE 802.11n test)

3.2.4 Test Setup Layout



3.2.5 Test Deviation

There is no deviation with the original standard.

3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.2.7 Test Result of Maximum Peak Output Power

Final Test Date	Dec. 23, 2011	**Test Site No.**	TH01-HY
Temperature	23.1℃	**Humidity**	25%
Test Engineer	Ian	**Configurations**	802.11b/g/n

For Single Chain:
Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.36	30.00	**Complies**
6	2437 MHz	14.82	30.00	**Complies**
11	2462 MHz	13.99	30.00	**Complies**

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	21.98	30.00	**Complies**
6	2437 MHz	22.14	30.00	**Complies**
11	2462 MHz	19.23	30.00	**Complies**

For Two Chains:
Configuration of IEEE 802.11n (20MHz) Port 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.78	30.00	**Complies**
6	2437 MHz	14.99	30.00	**Complies**
11	2462 MHz	13.74	30.00	**Complies**

Configuration of IEEE 802.11n (20MHz) Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	19.98	30.00	**Complies**
6	2437 MHz	19.87	30.00	**Complies**
11	2462 MHz	17.85	30.00	**Complies**

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

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	21.68	30.00	**Complies**
6	2437 MHz	21.09	30.00	**Complies**
11	2462 MHz	19.27	30.00	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	14.98	30.00	**Complies**
6	2437 MHz	12.79	30.00	**Complies**
9	2452 MHz	12.32	30.00	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	18.81	30.00	**Complies**
6	2437 MHz	17.94	30.00	**Complies**
9	2452 MHz	16.25	30.00	**Complies**

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

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	20.31	30.00	**Complies**
6	2437 MHz	19.10	30.00	**Complies**
9	2452 MHz	17.73	30.00	**Complies**

3.3 Power Spectral Density Measurement

3.3.1 Limit

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

3.3.2 Measuring Instruments and Setting

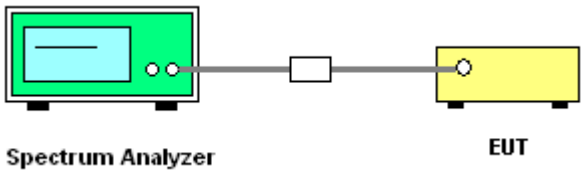
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.
5. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula. (Only for IEEE 802.11n test)

3.3.4 Test Setup Layout



3.3.5 Test Deviation

There is no deviation with the original standard.

3.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.3.7 Test Result of Power Spectral Density

Final Test Date	Dec. 23, 2011	**Test Site No.**	TH01-HY
Temperature	23.1℃	**Humidity**	25%
Test Engineer	Ian	**Configurations**	802.11b/g/n

For Single Chain:
Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-15.80	8.00	**Complies**
6	2437 MHz	-17.69	8.00	**Complies**
11	2462 MHz	-18.93	8.00	**Complies**

Configuration IEEE 802.11g

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-15.68	8.00	**Complies**
6	2437 MHz	-15.92	8.00	**Complies**
11	2462 MHz	-19.84	8.00	**Complies**

For Two Chains:
Configuration of IEEE 802.11n (20MHz) Port 1

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-17.21	8.00	**Complies**
6	2437 MHz	-20.96	8.00	**Complies**
11	2462 MHz	-21.53	8.00	**Complies**

Configuration of IEEE 802.11n (20MHz) Port 2

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-17.05	8.00	**Complies**
6	2437 MHz	-16.72	8.00	**Complies**
11	2462 MHz	-18.68	8.00	**Complies**

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

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-14.12	8.00	**Complies**
6	2437 MHz	-15.33	8.00	**Complies**
11	2462 MHz	-16.86	8.00	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-22.01	8.00	**Complies**
6	2437 MHz	-22.12	8.00	**Complies**
9	2452 MHz	-26.15	8.00	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 2

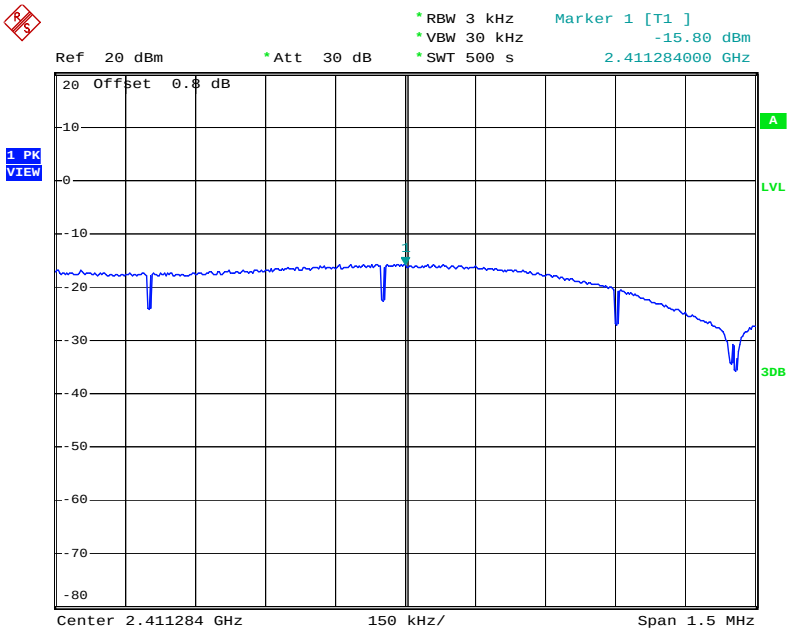
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-21.84	8.00	**Complies**
6	2437 MHz	-22.08	8.00	**Complies**
9	2452 MHz	-23.84	8.00	**Complies**

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

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-18.91	8.00	**Complies**
6	2437 MHz	-19.09	8.00	**Complies**
9	2452 MHz	-21.83	8.00	**Complies**

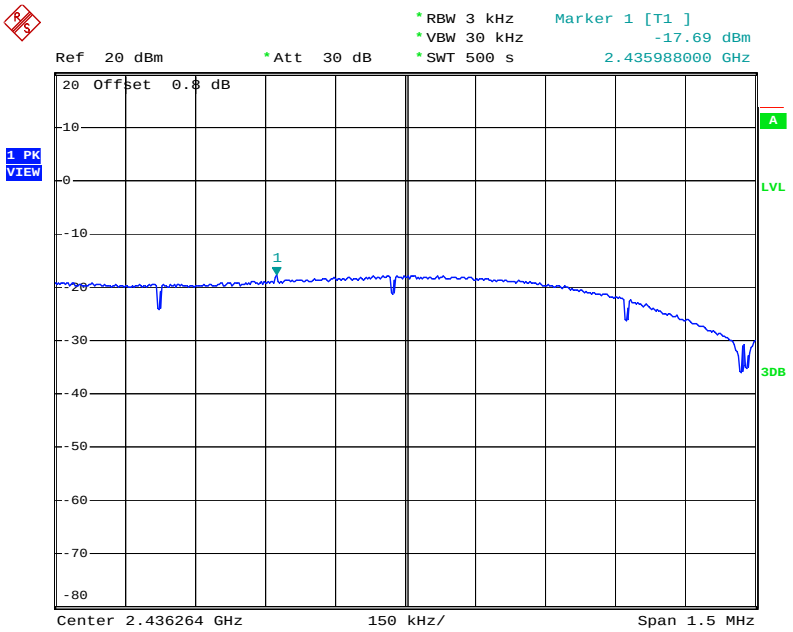
Power Density Plot

Configuration IEEE 802.11b 2412 MHz



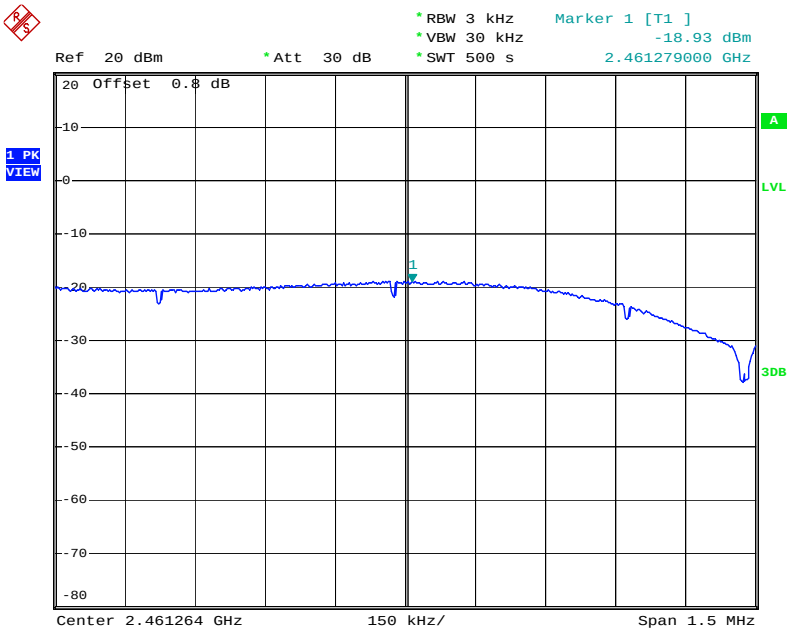
Date: 23.DEC.2011 11:03:22

Configuration IEEE 802.11b 2437 MHz



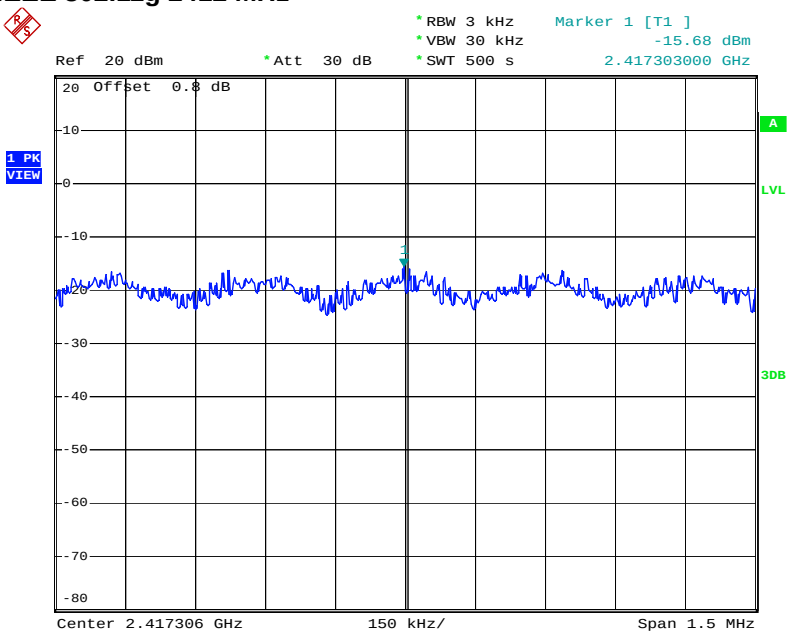
Date: 23.DEC.2011 16:35:47

Configuration IEEE 802.11b 2462 MHz



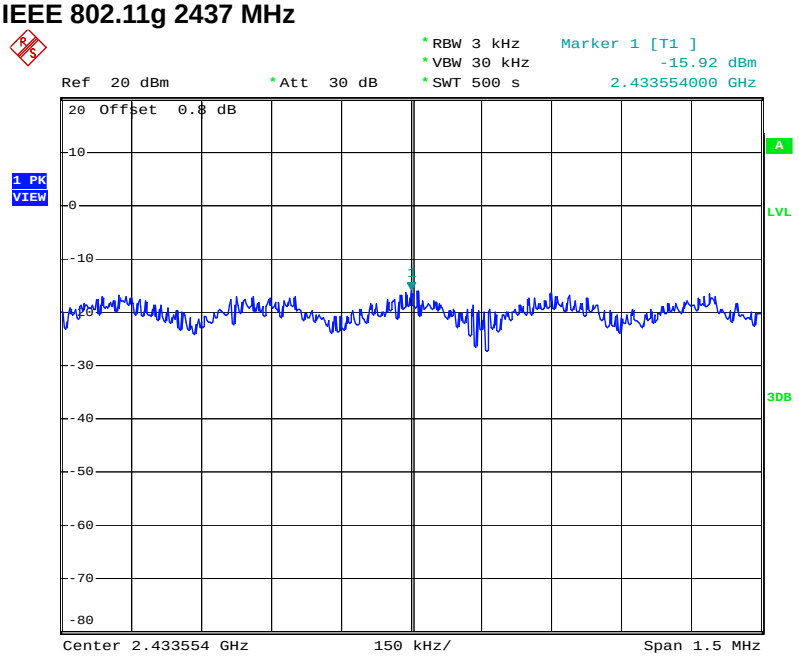
Date: 23.DEC.2011 17:58:24

Configuration IEEE 802.11g 2412 MHz



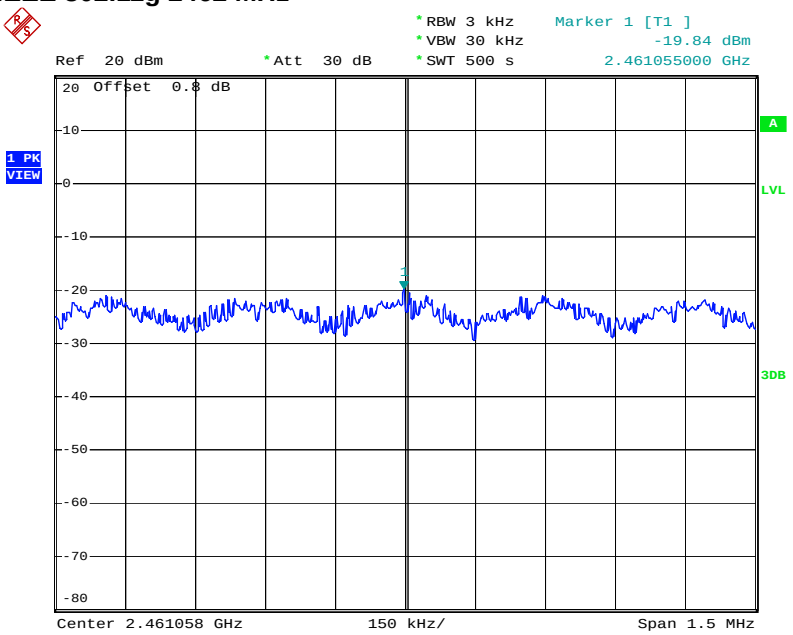
Date: 23.DEC.2011 11:29:40

Configuration IEEE 802.11g 2437 MHz



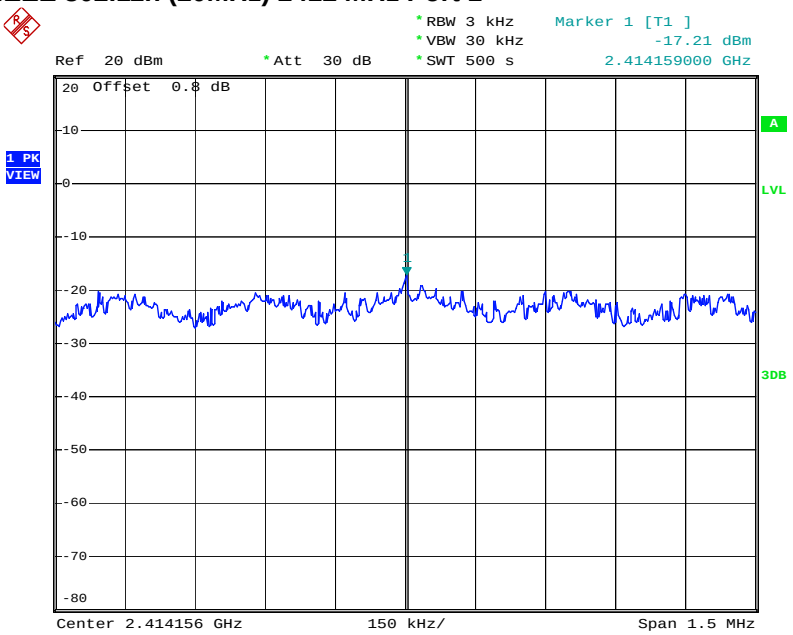
Date: 23.DEC.2011 16:56:23

Configuration IEEE 802.11g 2462 MHz



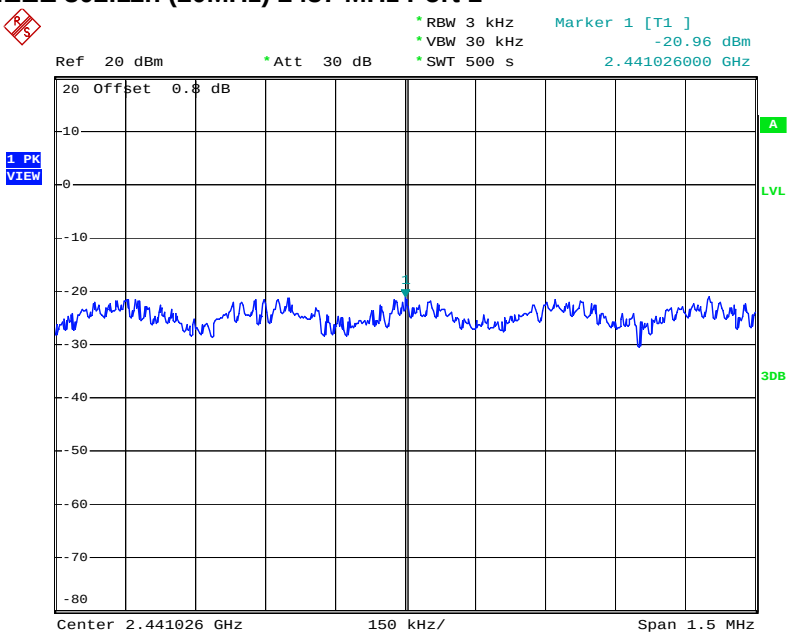
Date: 23.DEC.2011 17:47:43

Configuration IEEE 802.11n (20MHz) 2412 MHz Port 1



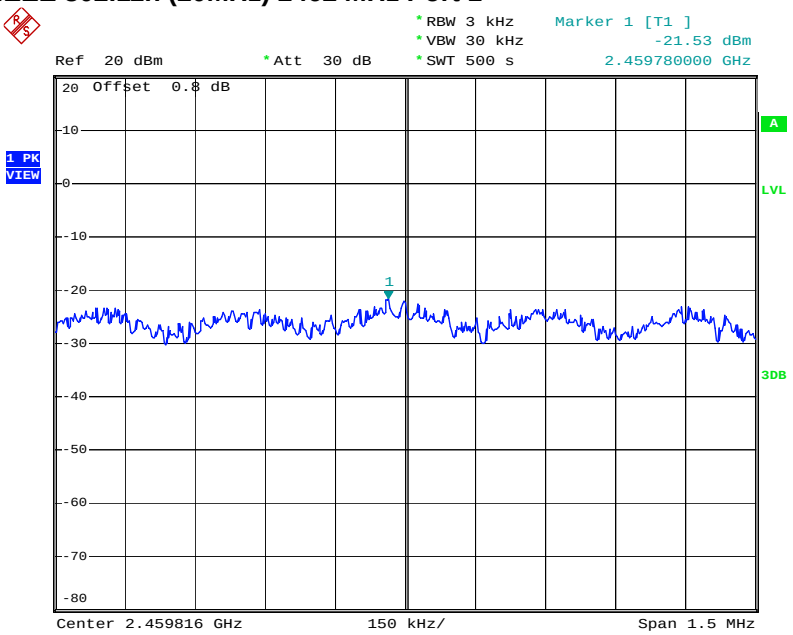
Date: 23.DEC.2011 13:54:48

Configuration IEEE 802.11n (20MHz) 2437 MHz Port 1



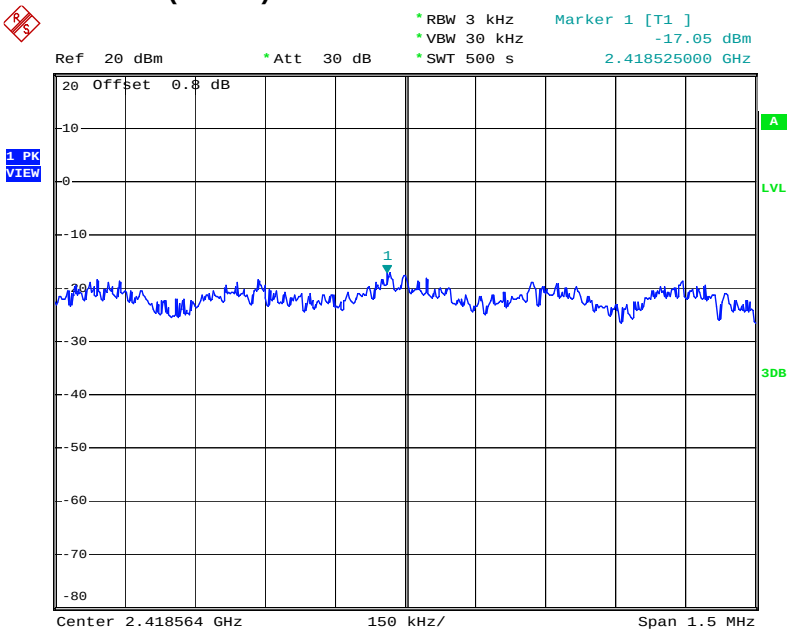
Date: 23.DEC.2011 17:08:00

Configuration IEEE 802.11n (20MHz) 2462 MHz Port 1



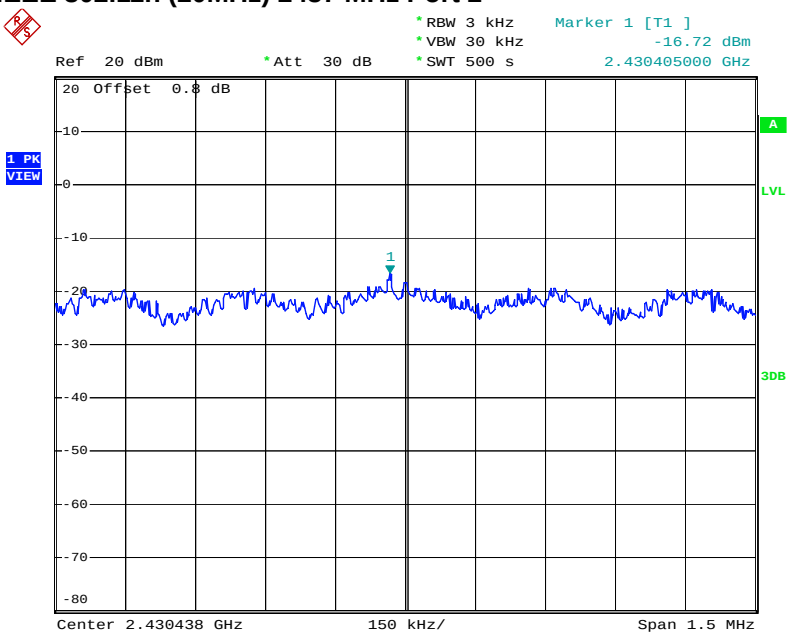
Date: 23.DEC.2011 17:28:36

Configuration IEEE 802.11n (20MHz) 2412 MHz Port 2



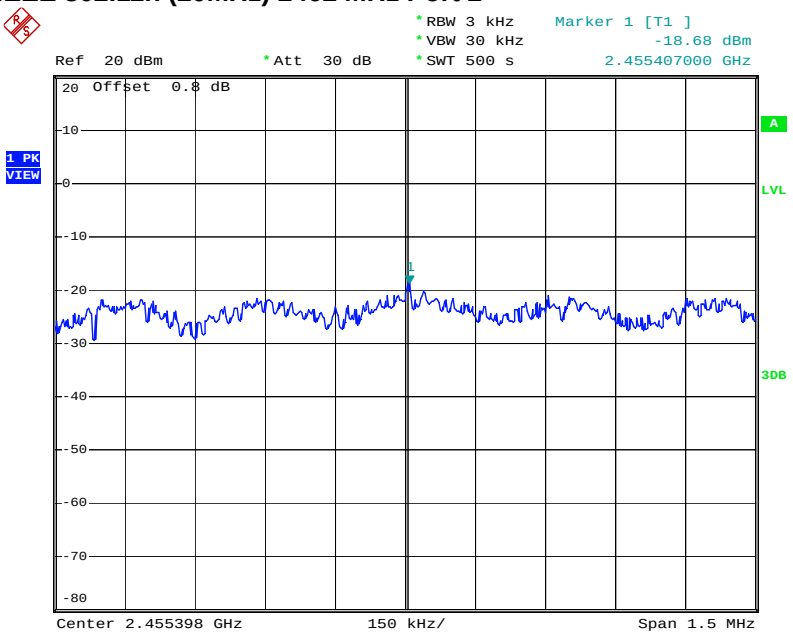
Date: 23.DEC.2011 14:00:04

Configuration IEEE 802.11n (20MHz) 2437 MHz Port 2



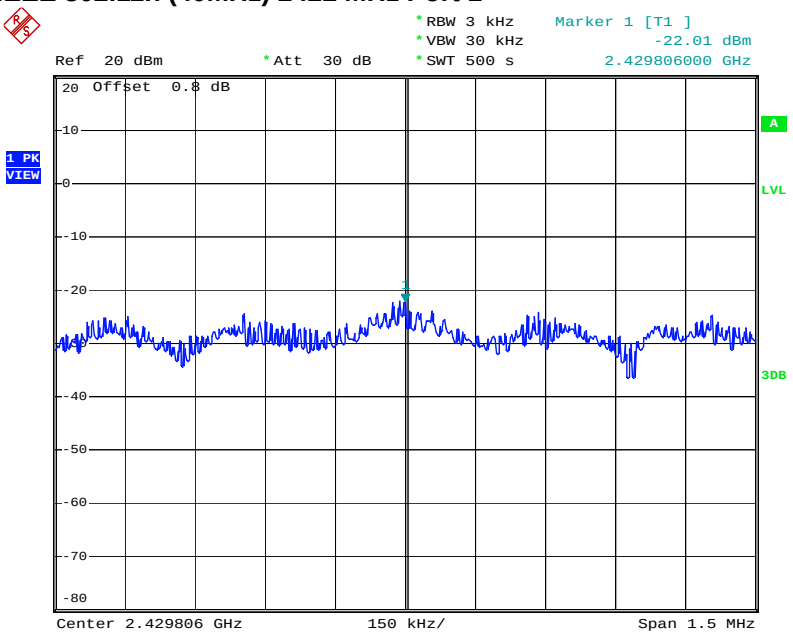
Date: 23.DEC.2011 17:19:32

Configuration IEEE 802.11n (20MHz) 2462 MHz Port 2



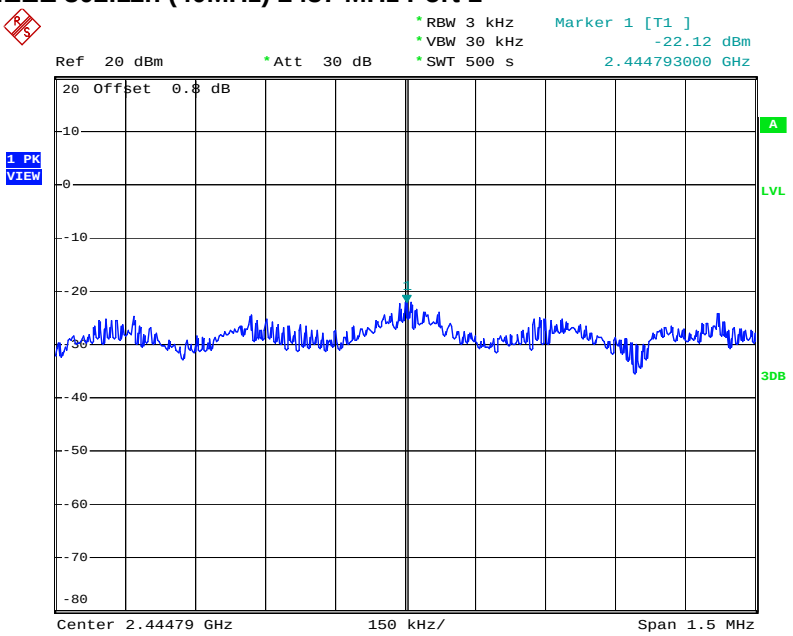
Date: 23.DEC.2011 17:35:48

Configuration IEEE 802.11n (40MHz) 2422 MHz Port 1



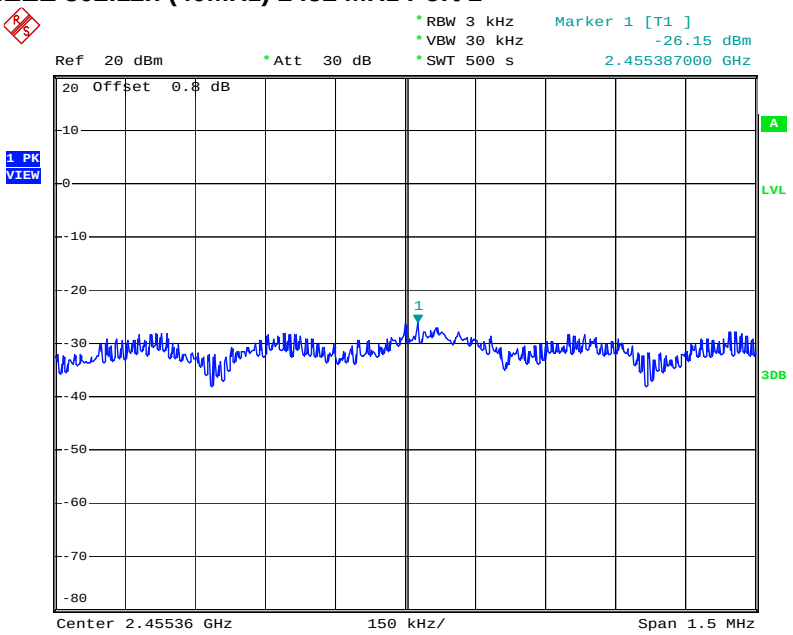
Date: 23.DEC.2011 14:56:25

Configuration IEEE 802.11n (40MHz) 2437 MHz Port 1



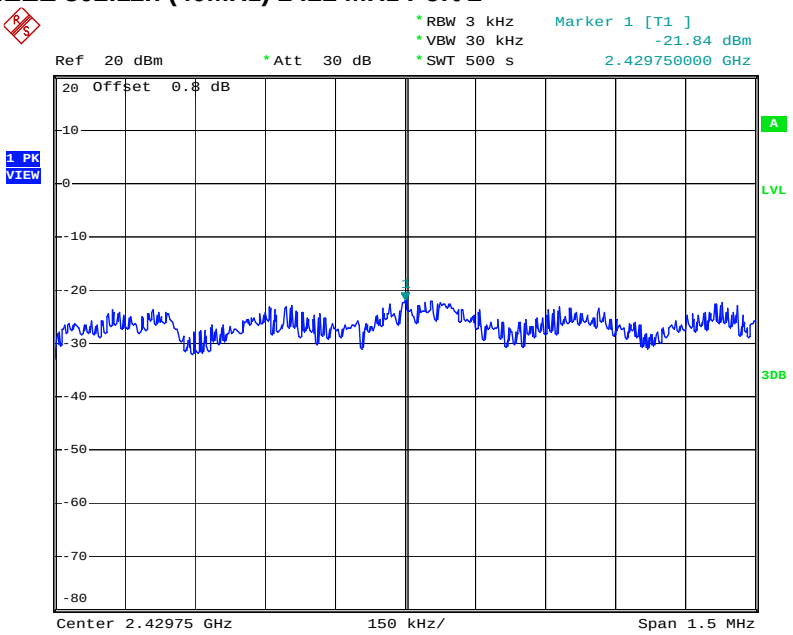
Date: 23.DEC.2011 15:42:46

Configuration IEEE 802.11n (40MHz) 2452 MHz Port 1



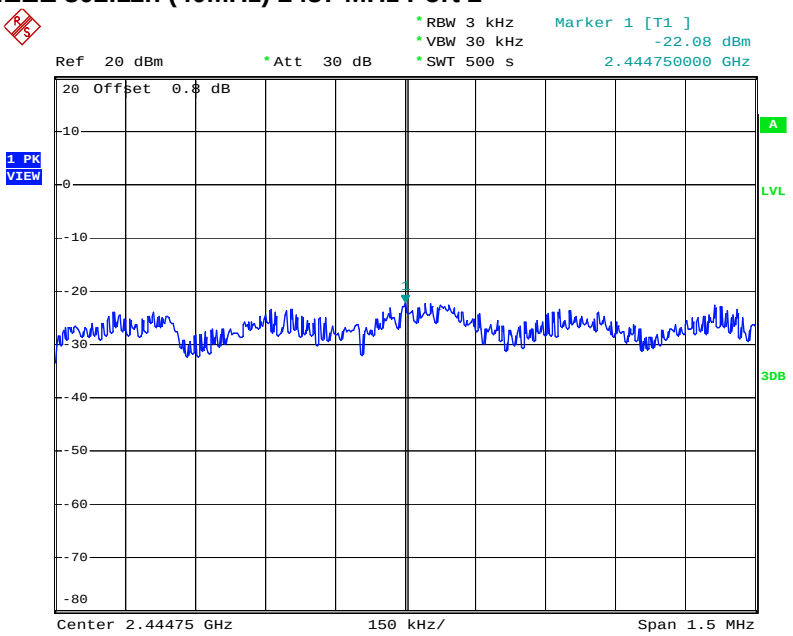
Date: 23.DEC.2011 15:57:09

Configuration IEEE 802.11n (40MHz) 2422 MHz Port 2



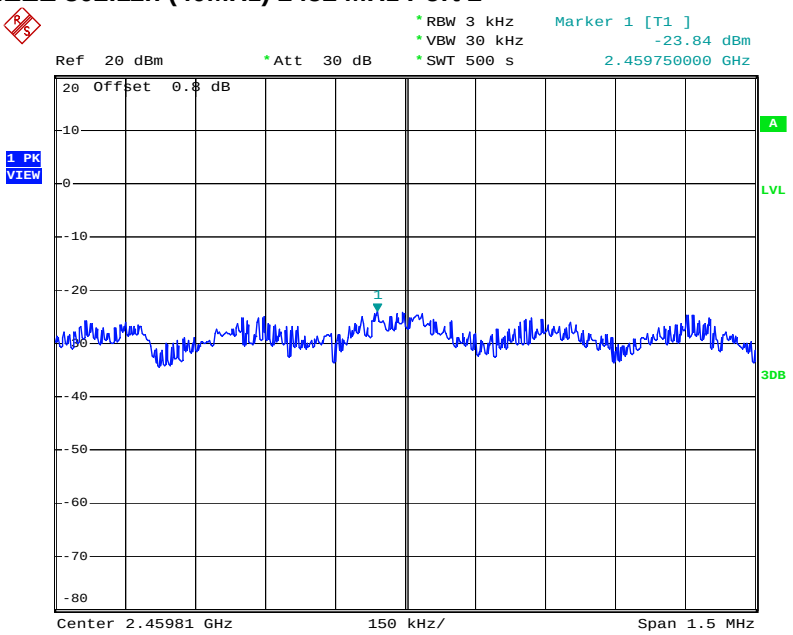
Date: 23.DEC.2011 15:36:32

Configuration IEEE 802.11n (40MHz) 2437 MHz Port 2



Date: 23.DEC.2011 15:48:35

Configuration IEEE 802.11n (40MHz) 2452 MHz Port 2



Date: 23.DEC.2011 16:02:48

3.4 6dB Spectrum Bandwidth Measurement

3.4.1 Limit

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

3.4.2 Measuring Instruments and Setting

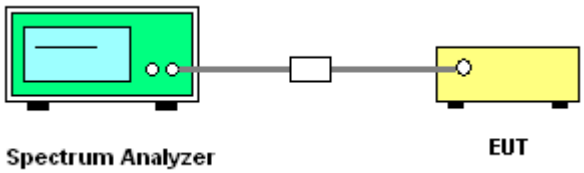
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.4.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. For 6dB Bandwidth the resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.
4. For 99% Occupied Bandwidth the resolution Bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.

3.4.4 Test Setup Layout



3.4.5 Test Deviation

There is no deviation with the original standard.

3.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.4.7 Test Result of 6dB Spectrum Bandwidth

Final Test Date	Dec. 23, 2011	**Test Site No.**	TH01-HY
Temperature	23.1℃	**Humidity**	25%
Test Engineer	Ian	**Configurations**	802.11b/g/n

For Single Chain:
Configuration IEEE 802.11b

Channel	Frequency	6dB Spectrum Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.12	14.84	500	**Complies**
6	2437 MHz	10.16	14.88	500	**Complies**
11	2462 MHz	10.12	14.92	500	**Complies**

Configuration IEEE 802.11g

Channel	Frequency	6dB Spectrum Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.56	16.48	500	**Complies**
6	2437 MHz	16.56	16.48	500	**Complies**
11	2462 MHz	16.56	16.48	500	**Complies**

For Two Chains:
Configuration of IEEE 802.11n (20MHz) Port 1

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

Configuration of IEEE 802.11n (20MHz) Port 2

Channel	Frequency	6dB Spectrum Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.68	17.64	500	**Complies**
6	2437 MHz	17.68	17.64	500	**Complies**
11	2462 MHz	17.72	17.64	500	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1

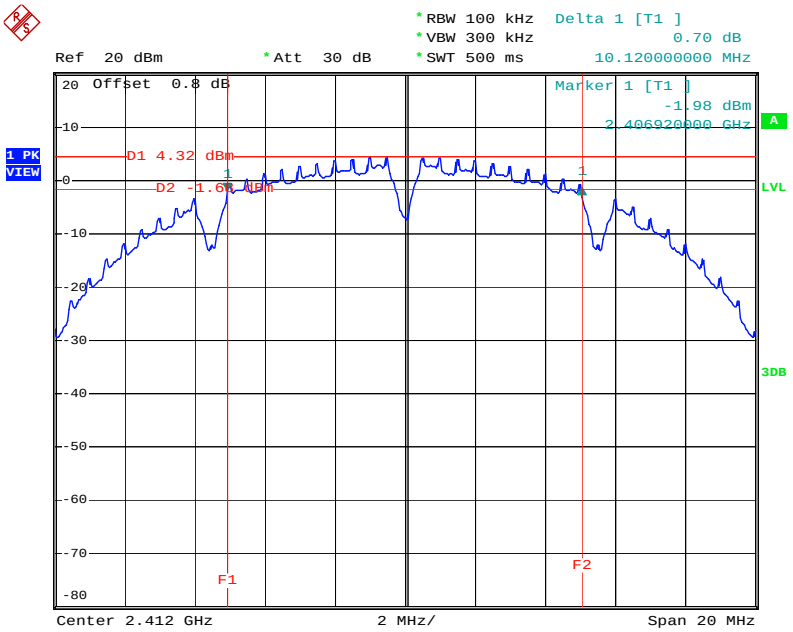
Channel	Frequency	6dB Spectrum Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.56	36.00	500	**Complies**
6	2437 MHz	36.56	36.08	500	**Complies**
9	2452 MHz	36.56	36.08	500	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 2

Channel	Frequency	6dB Spectrum Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.4	36.08	500	**Complies**
6	2437 MHz	36.4	36.08	500	**Complies**
9	2452 MHz	36.4	36.08	500	**Complies**

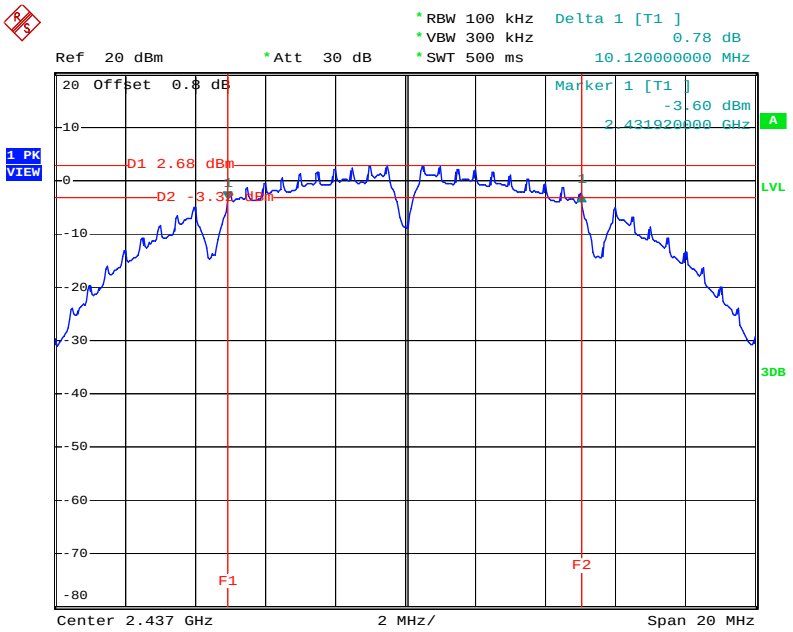
6 dB Bandwidth Plot

Configuration IEEE 802.11b 2412 MHz



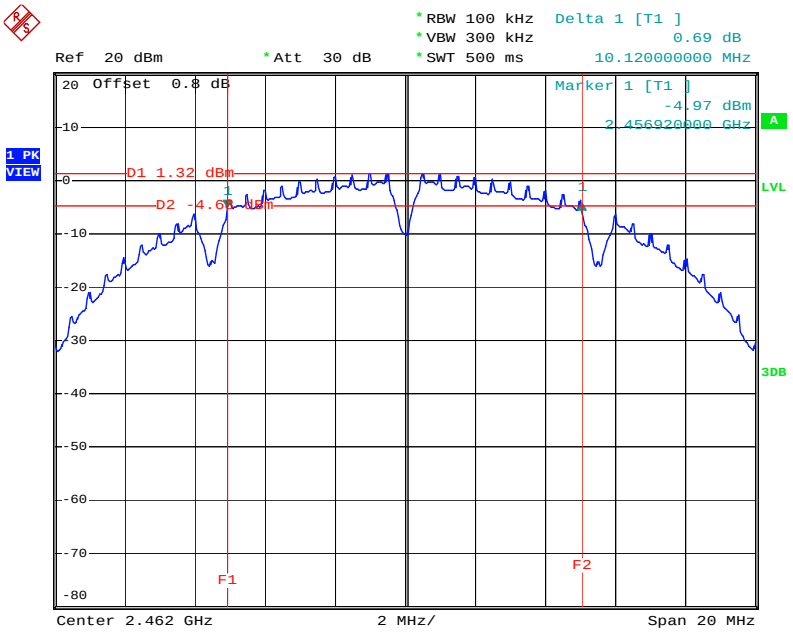
Date: 23.DEC.2011 11:01:25

Configuration IEEE 802.11b 2437 MHz



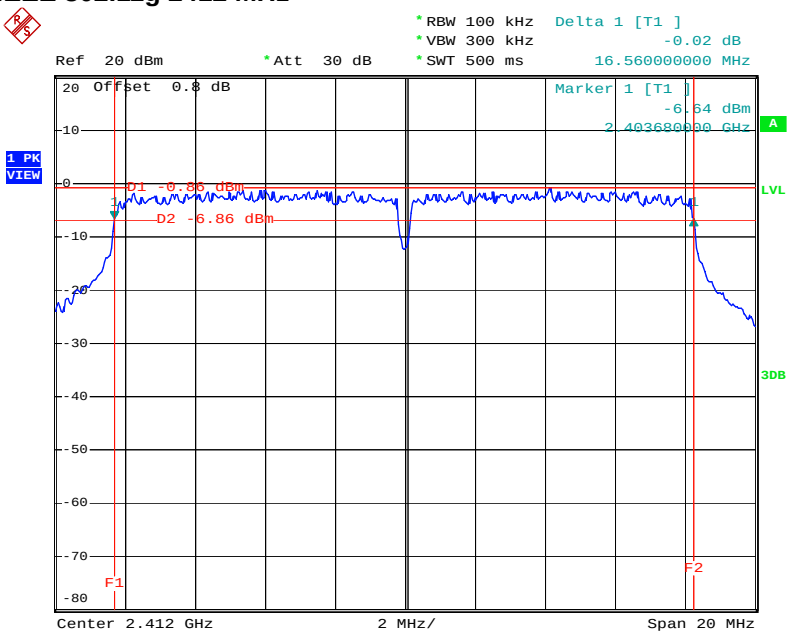
Date: 23.DEC.2011 16:23:53

Configuration IEEE 802.11b 2462 MHz



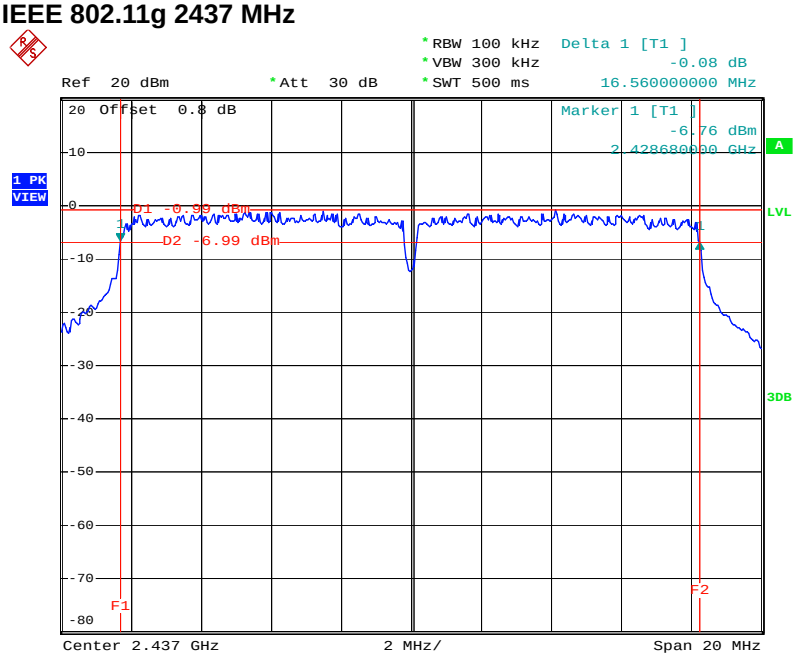
Date: 23.DEC.2011 17:56:34

Configuration IEEE 802.11g 2412 MHz



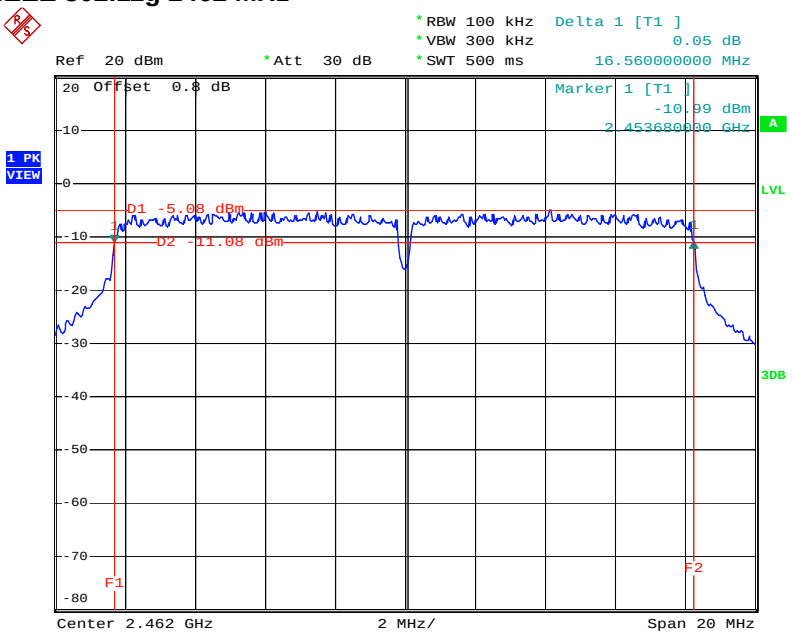
Date: 23.DEC.2011 11:28:07

Configuration IEEE 802.11g 2437 MHz



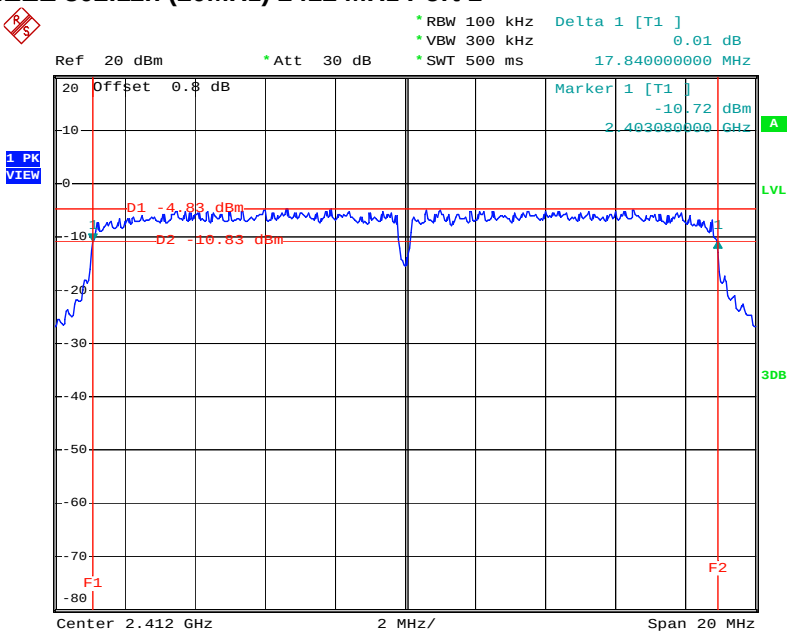
Date: 23.DEC.2011 16:55:36

Configuration IEEE 802.11g 2462 MHz



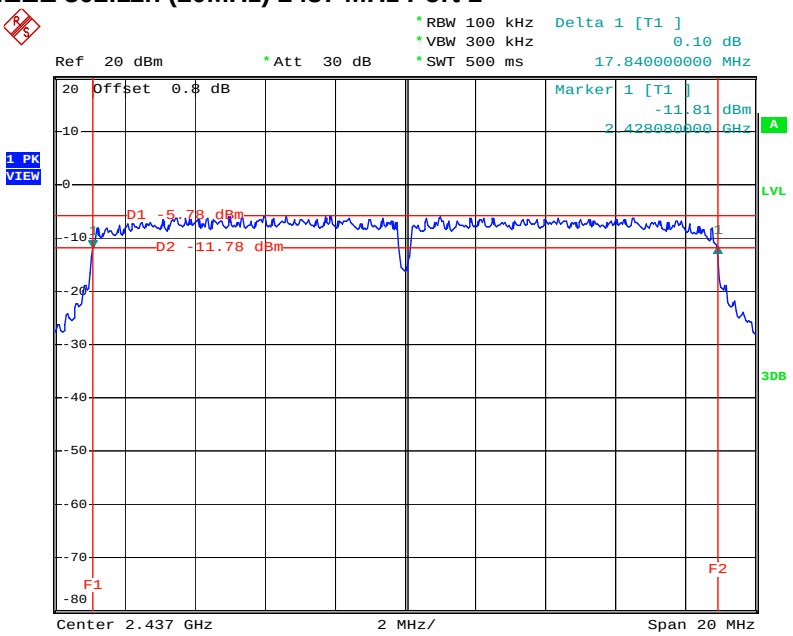
Date: 23.DEC.2011 17:46:09

Configuration IEEE 802.11n (20MHz) 2412 MHz Port 1



Date: 23.DEC.2011 13:53:11

Configuration IEEE 802.11n (20MHz) 2437 MHz Port 1



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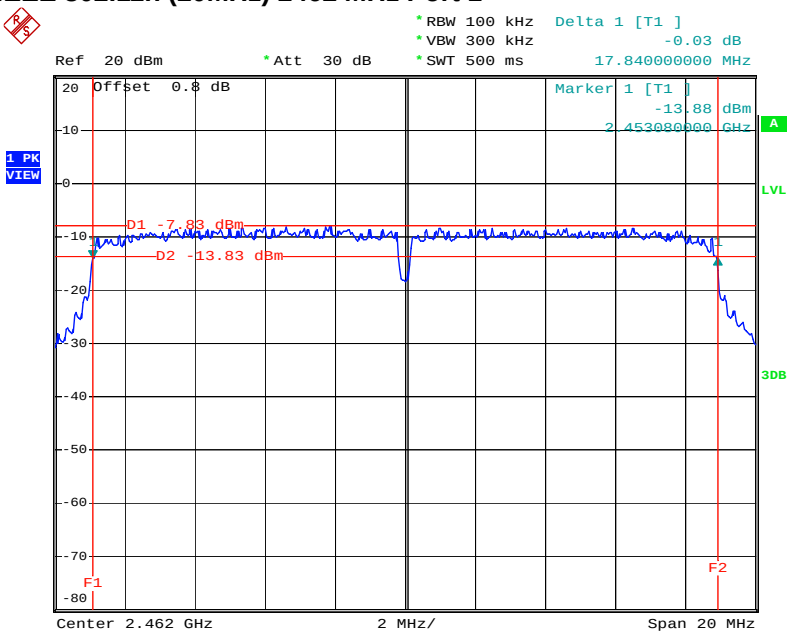

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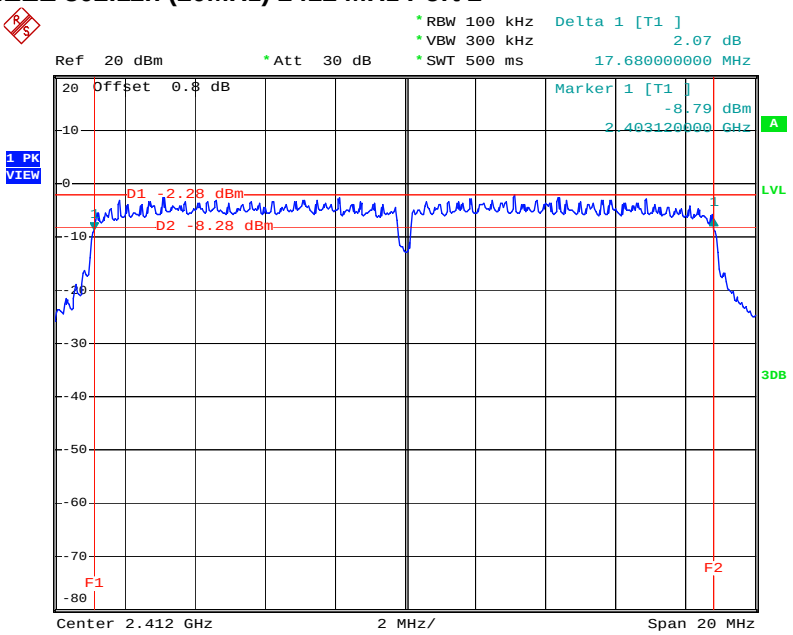

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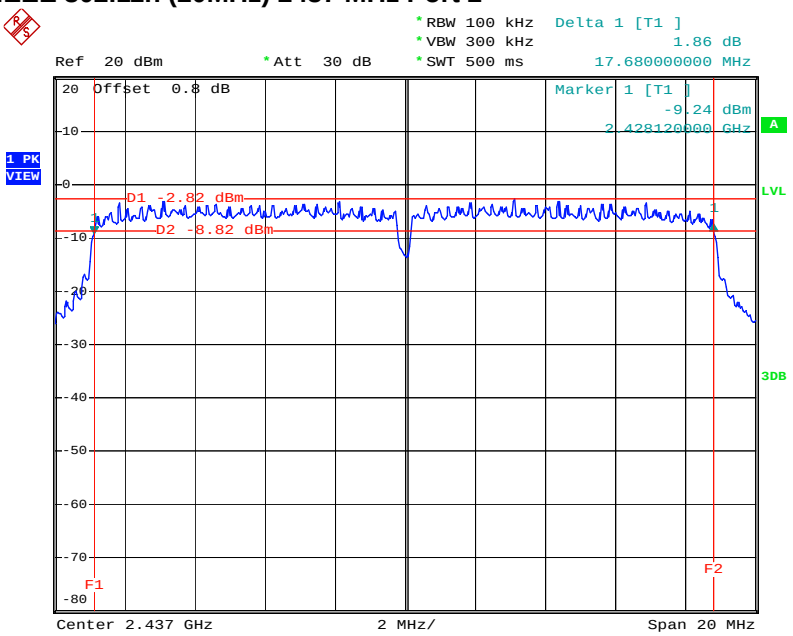

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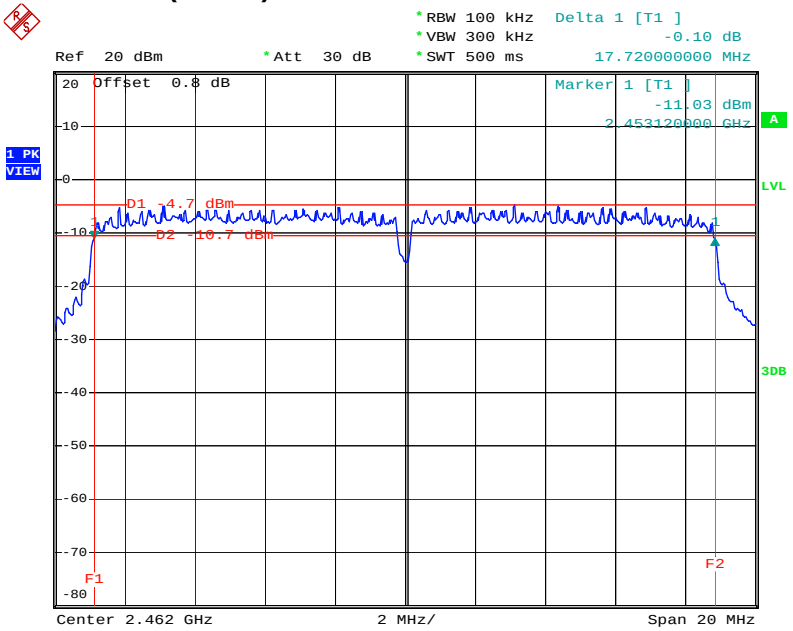
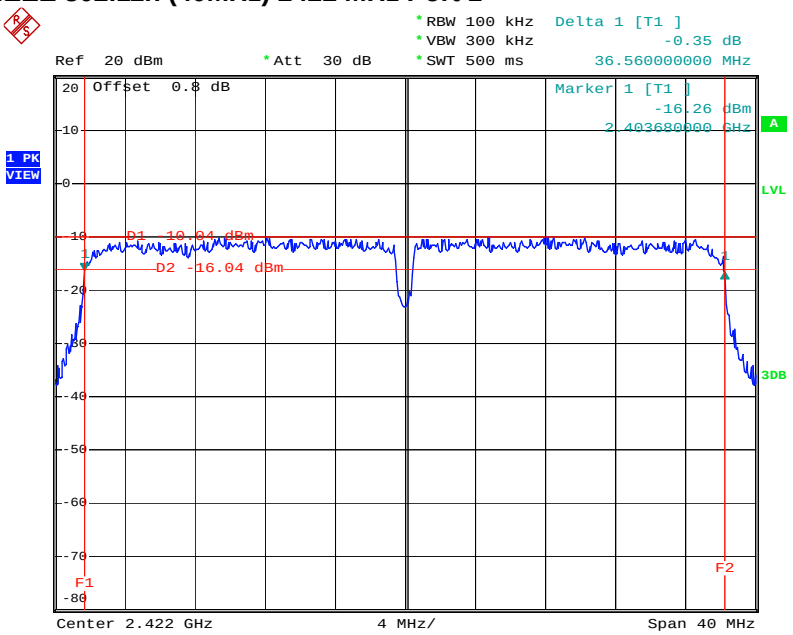
Configuration IEEE 802.11n (20MHz) 2462 MHz Port 2



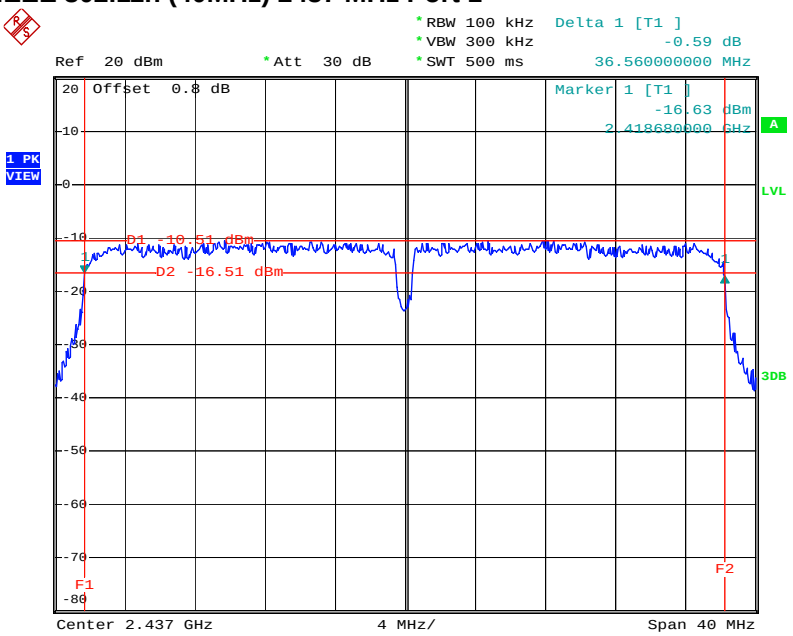
Date: 23.DEC.2011 17:33:58

Configuration IEEE 802.11n (40MHz) 2422 MHz Port 1



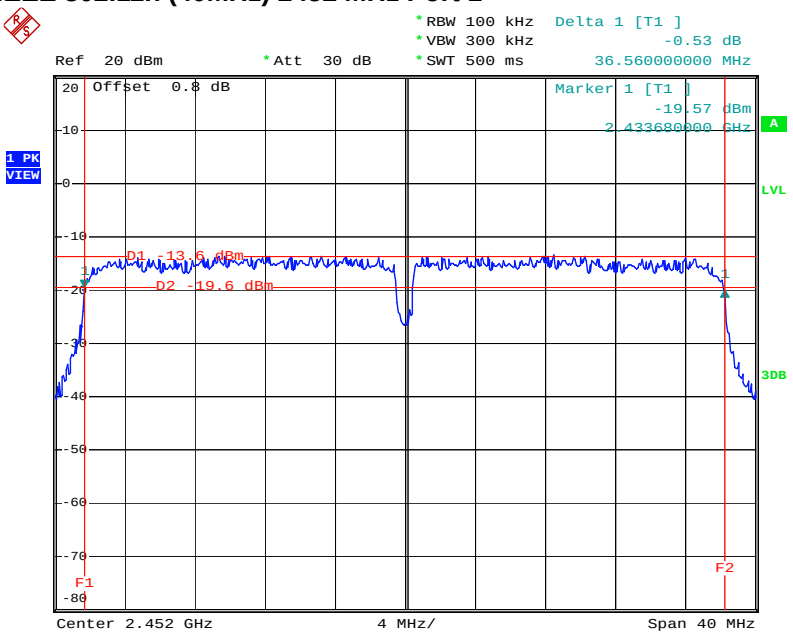
Date: 23.DEC.2011 14:54:32

Configuration IEEE 802.11n (40MHz) 2437 MHz Port 1



Date: 23.DEC.2011 15:41:24

Configuration IEEE 802.11n (40MHz) 2452 MHz Port 1



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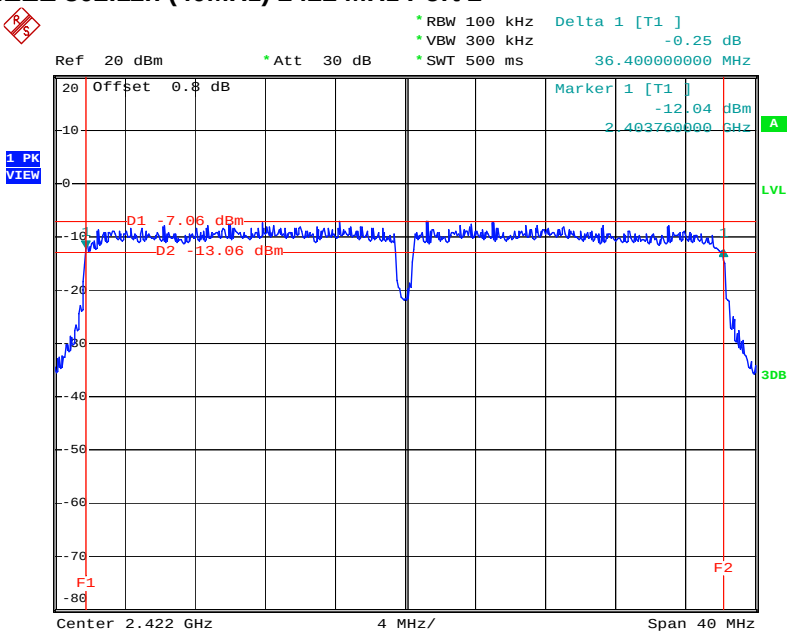
Configuration IEEE 802.11n (40MHz) 2422 MHz Port 2



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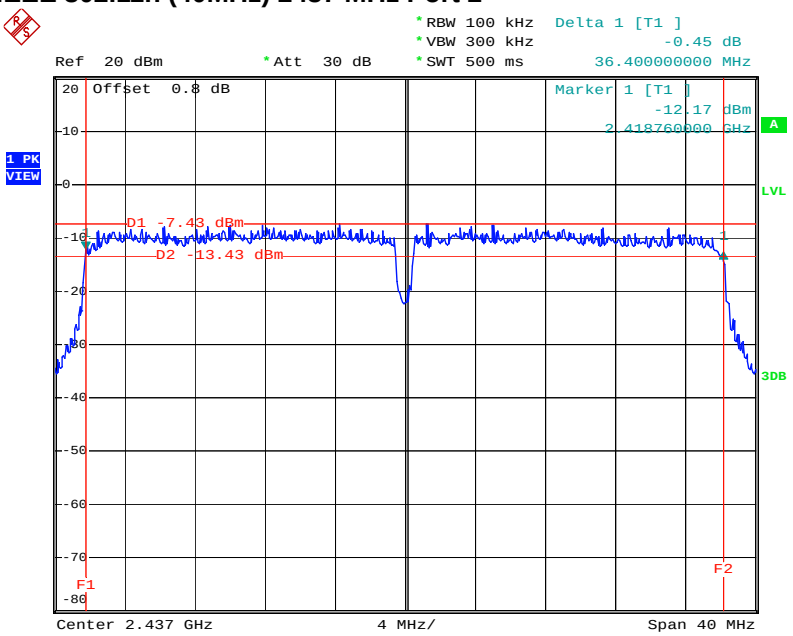
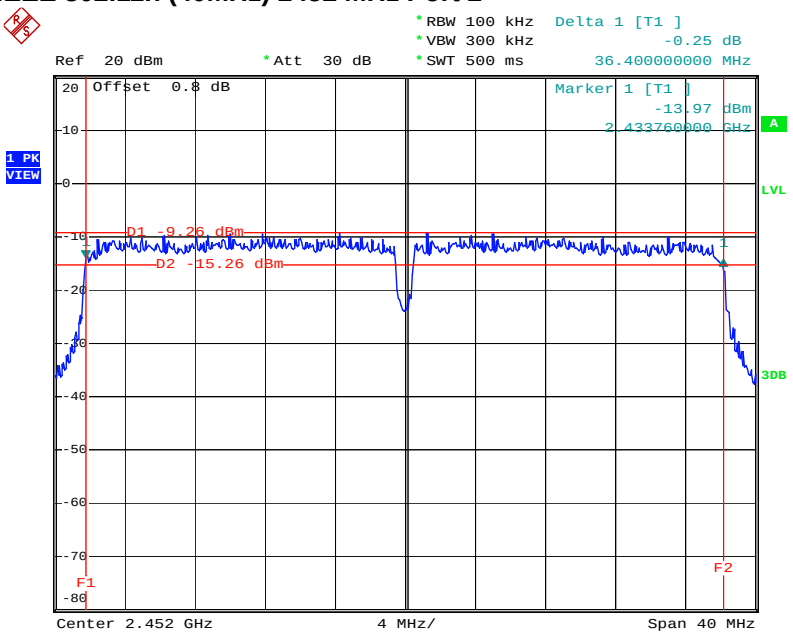
Configuration IEEE 802.11n (40MHz) 2437 MHz Port 2



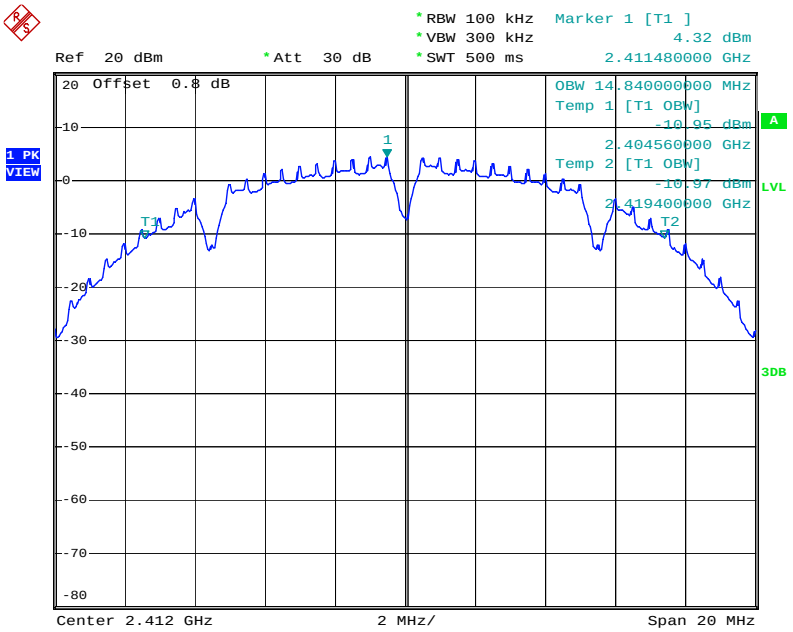
Date: 23.DEC.2011 15:47:19

Configuration IEEE 802.11n (40MHz) 2452 MHz Port 2



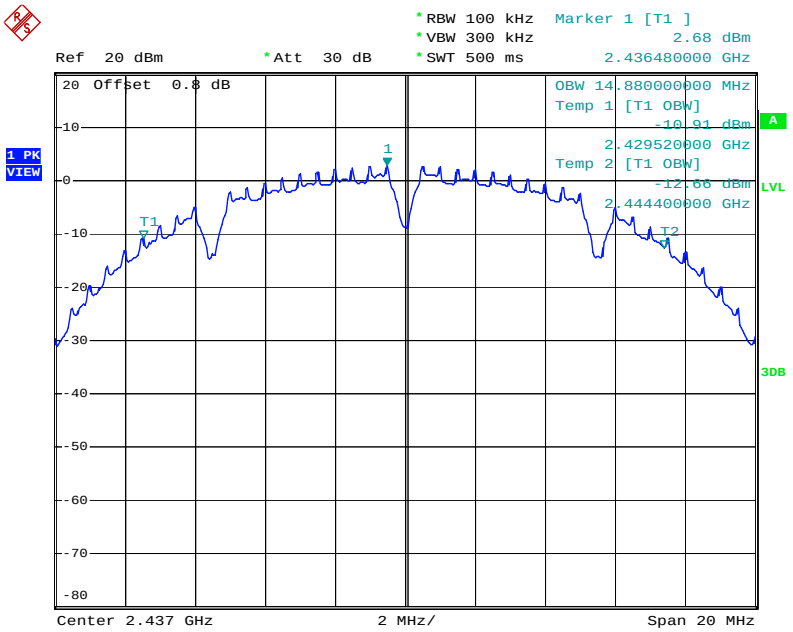
Date: 23.DEC.2011 16:01:10

99% Occupied Bandwidth Plot
Configuration IEEE 802.11b 2412 MHz



Date: 23.DEC.2011 11:01:36

Configuration IEEE 802.11b 2437 MHz



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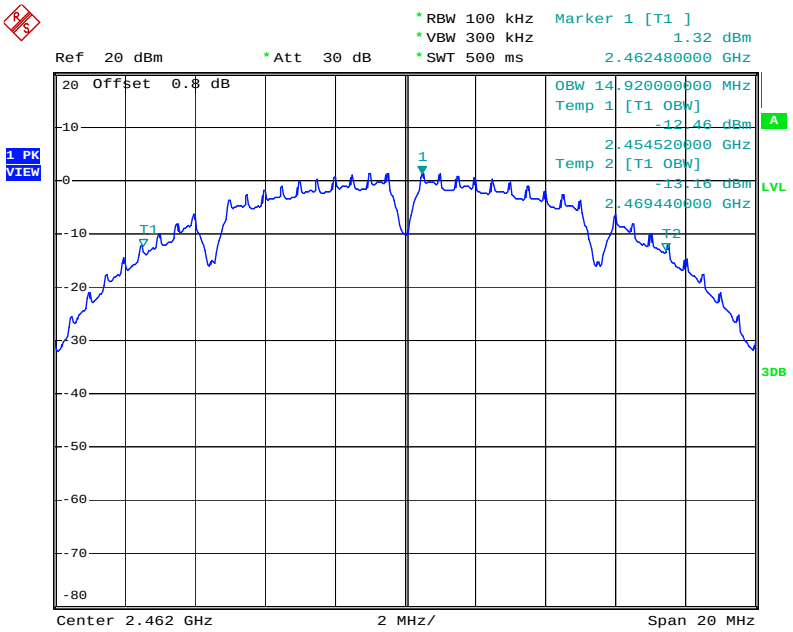
Configuration IEEE 802.11b 2462 MHz



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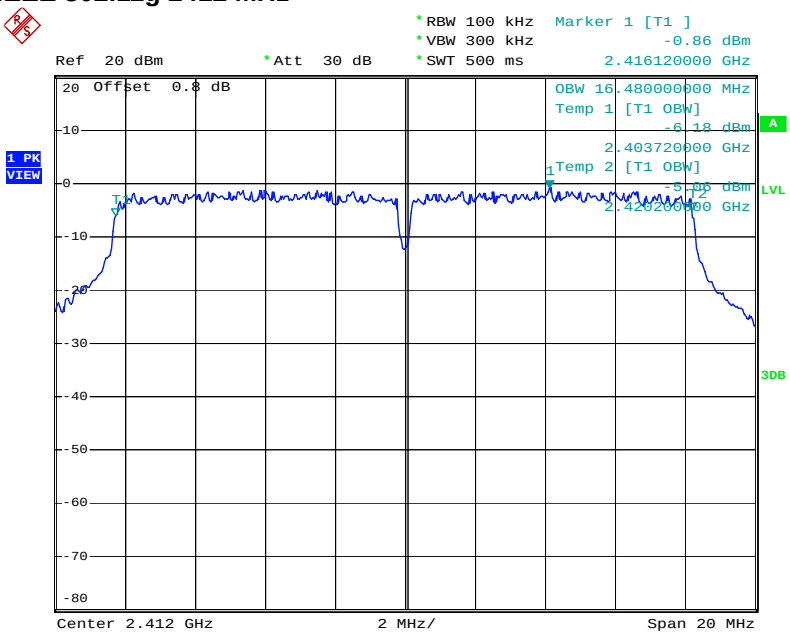
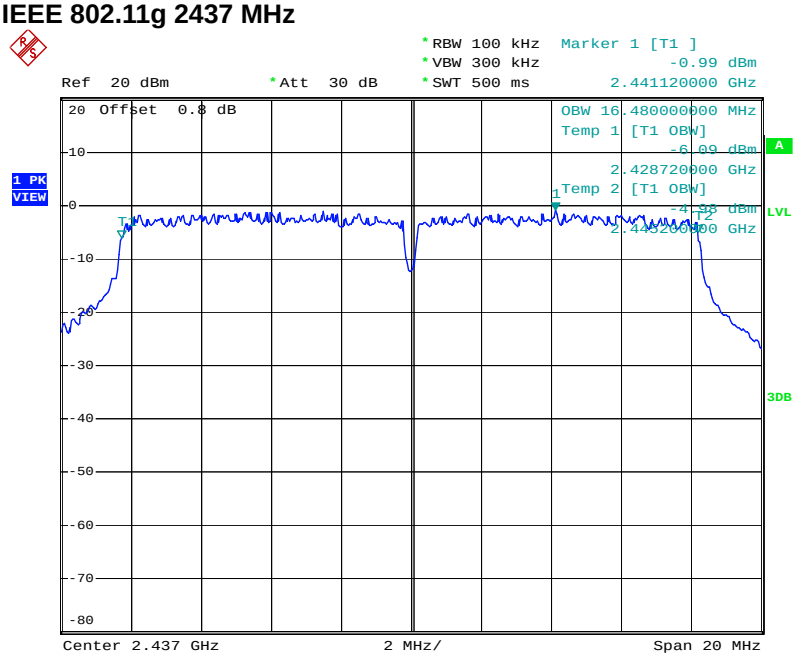
Configuration IEEE 802.11g 2412 MHz



Date: 23.DEC.2011 11:28:18

Configuration IEEE 802.11g 2437 MHz



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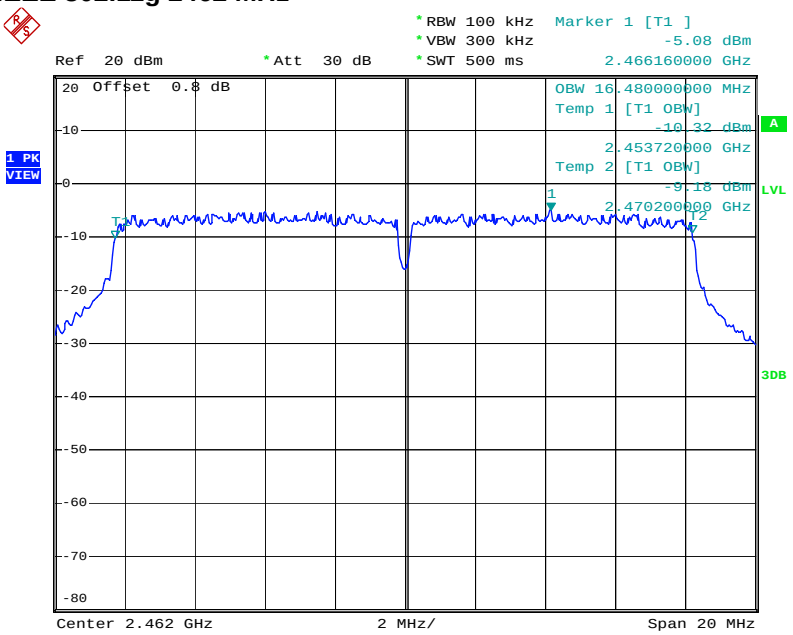
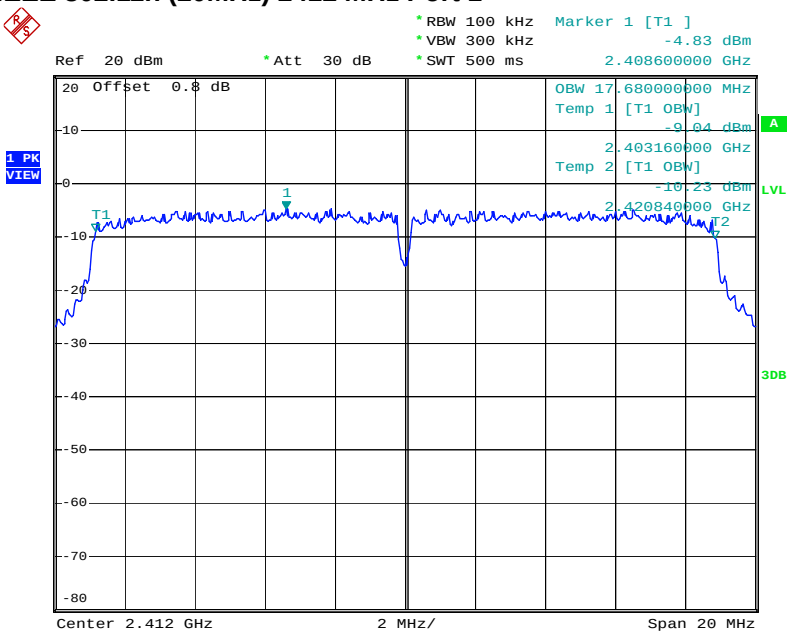
Configuration IEEE 802.11g 2462 MHz



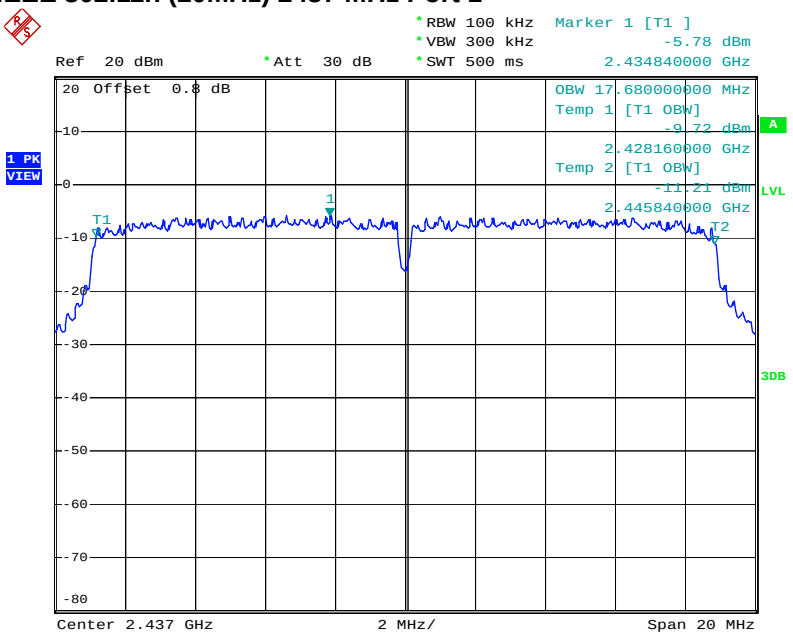
Date: 23.DEC.2011 17:46:22

Configuration IEEE 802.11n (20MHz) 2412 MHz Port 1



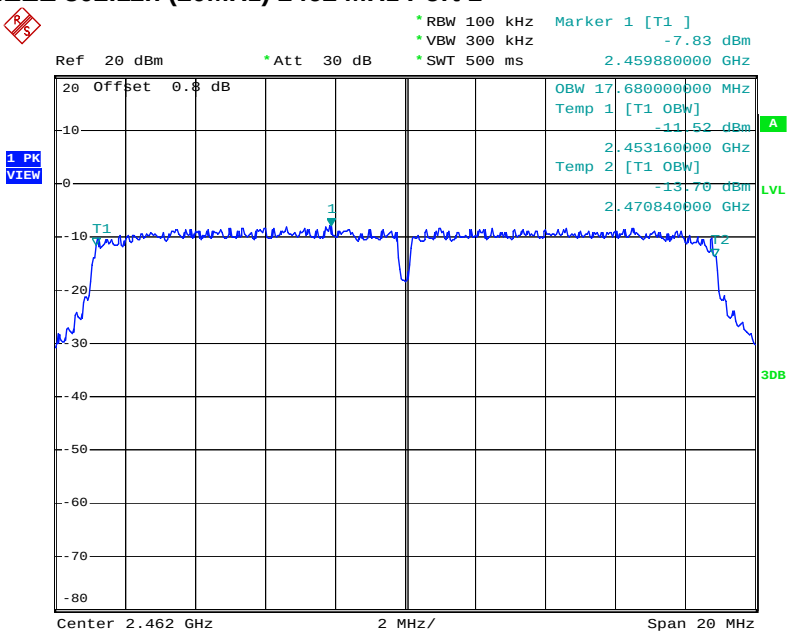
Date: 23.DEC.2011 13:53:21

Configuration IEEE 802.11n (20MHz) 2437 MHz Port 1



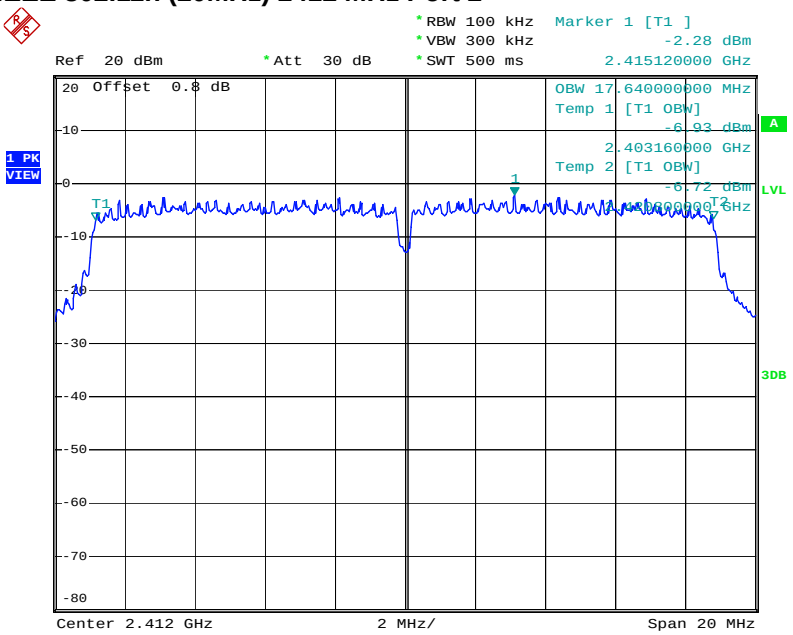
Date: 23.DEC.2011 17:06:42

Configuration IEEE 802.11n (20MHz) 2462 MHz Port 1



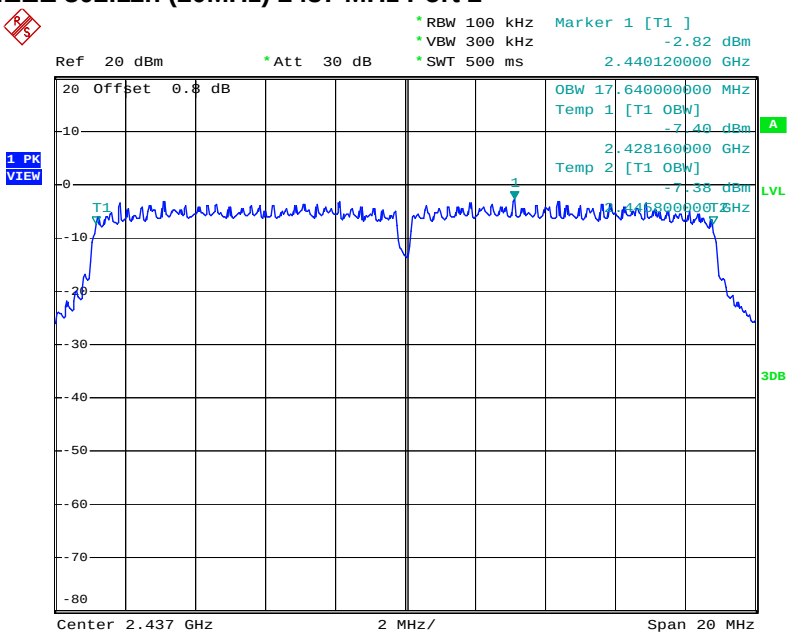
Date: 23.DEC.2011 17:26:42

Configuration IEEE 802.11n (20MHz) 2412 MHz Port 2



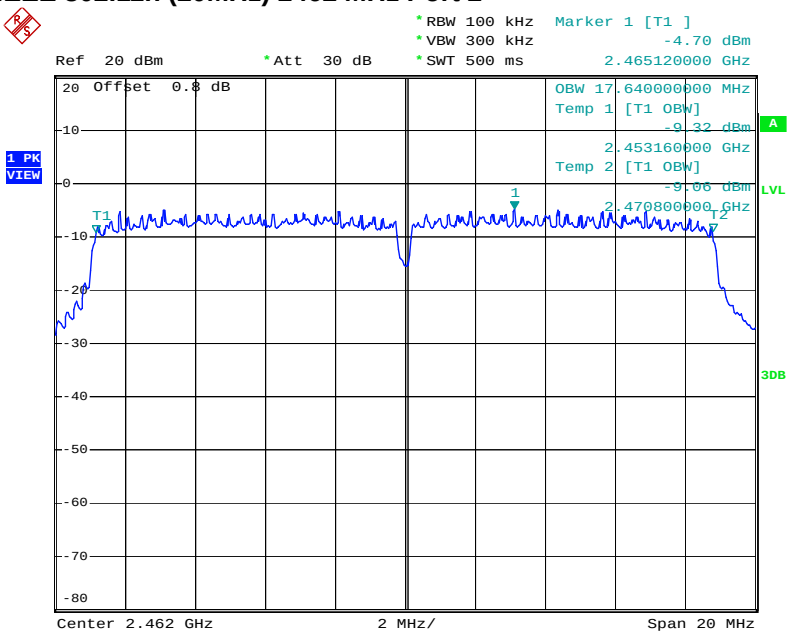
Date: 23.DEC.2011 13:58:32

Configuration IEEE 802.11n (20MHz) 2437 MHz Port 2



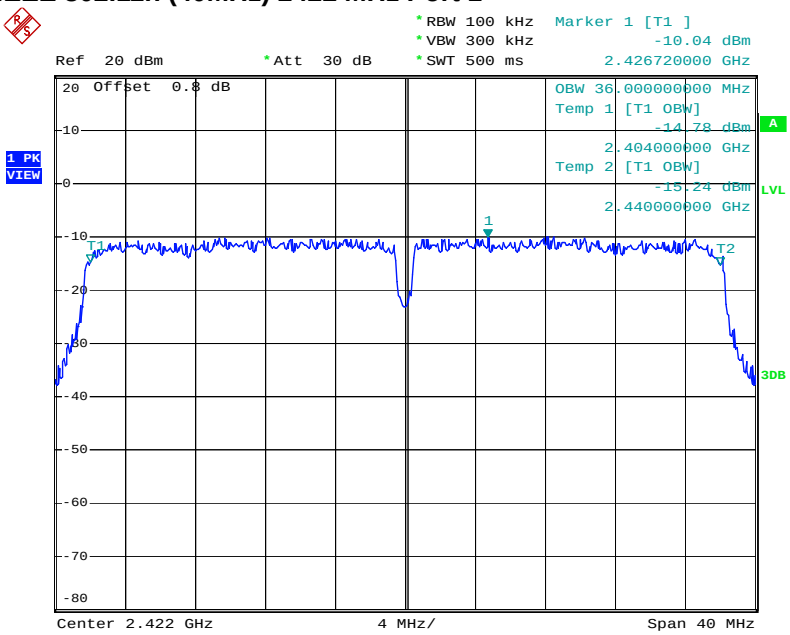
Date: 23.DEC.2011 17:18:53

Configuration IEEE 802.11n (20MHz) 2462 MHz Port 2



Date: 23.DEC.2011 17:34:07

Configuration IEEE 802.11n (40MHz) 2422 MHz Port 1



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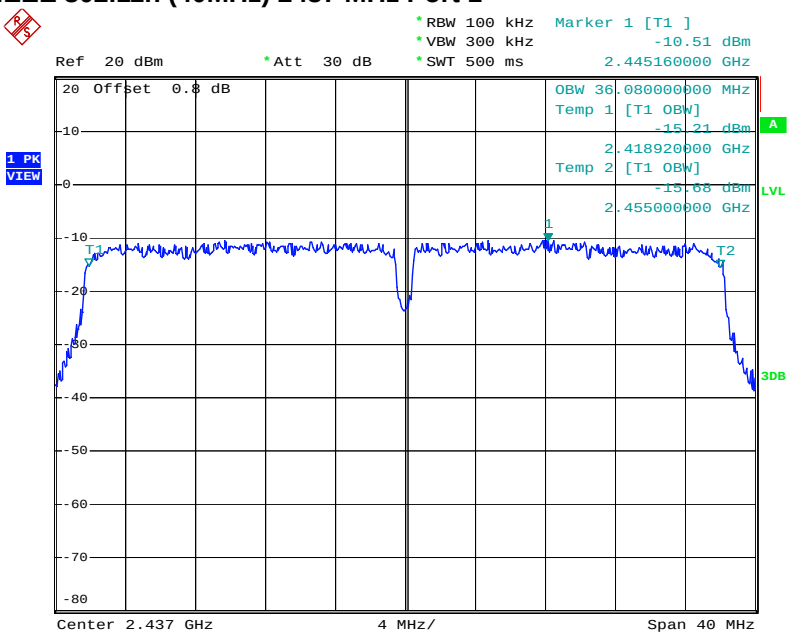
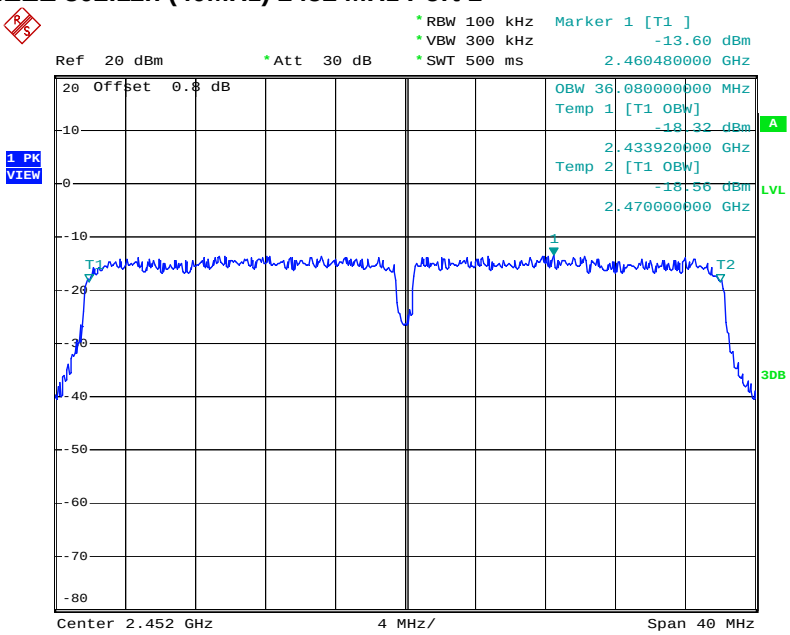
Configuration IEEE 802.11n (40MHz) 2437 MHz Port 1



Date: 23.DEC.2011 15:41:36

Configuration IEEE 802.11n (40MHz) 2452 MHz Port 1



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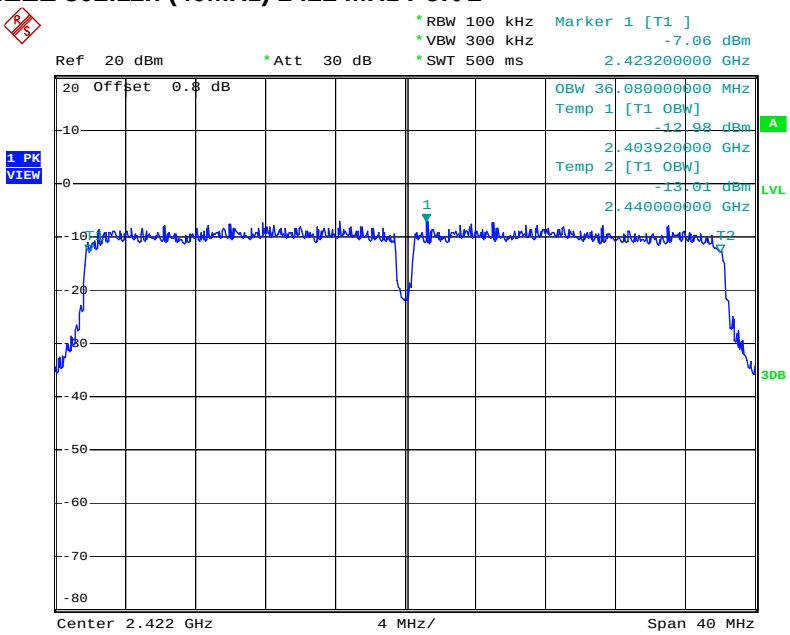
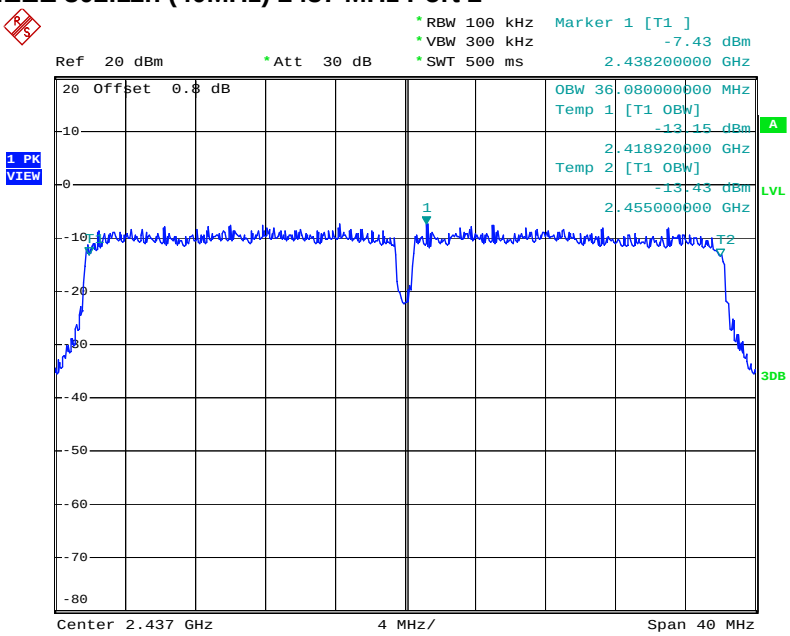
Configuration IEEE 802.11n (40MHz) 2422 MHz Port 2



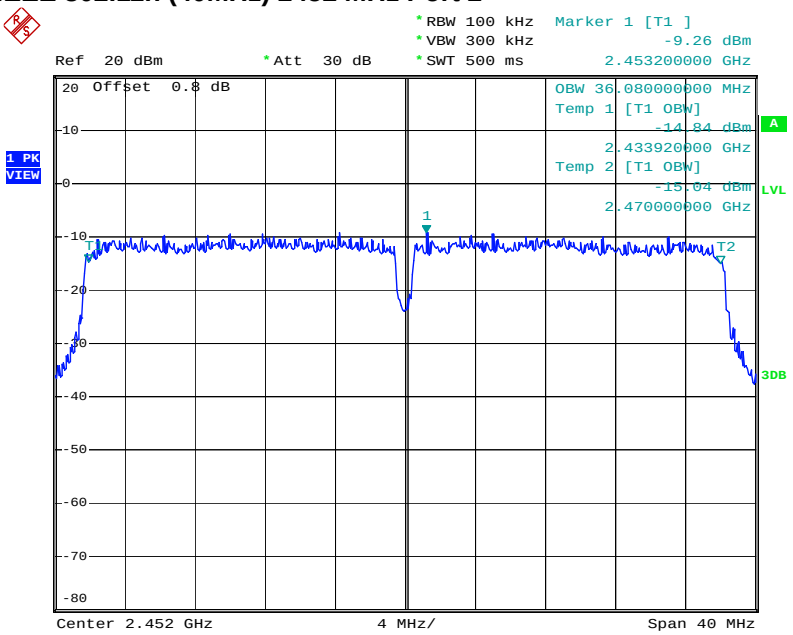
Date: 23.DEC.2011 15:34:36

Configuration IEEE 802.11n (40MHz) 2437 MHz Port 2



Date: 23.DEC.2011 15:47:28

Configuration IEEE 802.11n (40MHz) 2452 MHz Port 2



Date: 23.DEC.2011 16:01:20

3.5 Radiated Emissions Measurement

3.5.1 Limit

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

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

3.5.2 Measuring Instruments and Setting

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

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

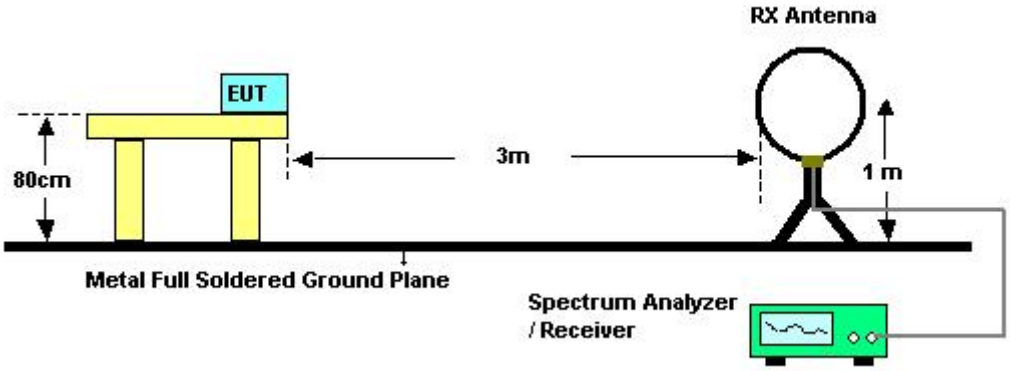
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.5.3 Test Procedures

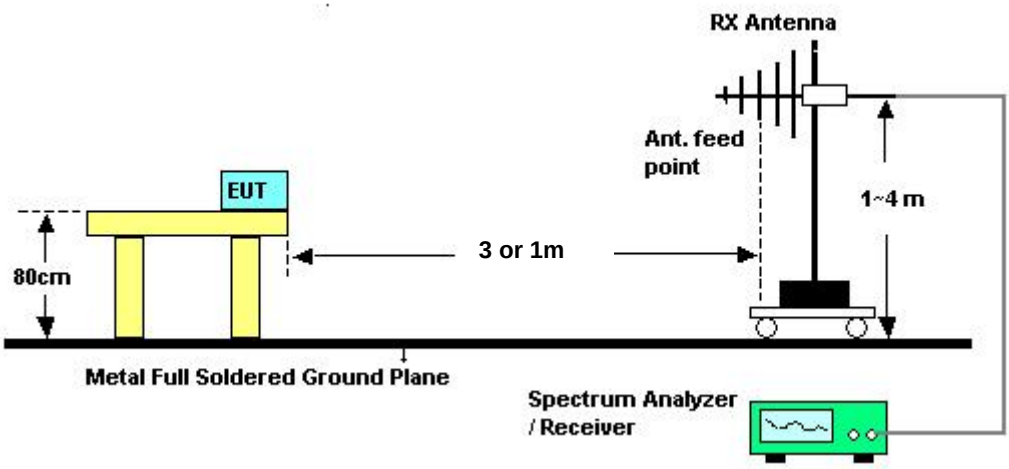
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

3.5.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



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

3.5.5 Test Deviation

There is no deviation with the original standard.

3.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Final Test Date	Dec. 13, 2011	**Test Site No.**	03CH03-HY
Temperature	24℃	**Humidity**	69%
Test Engineer	Daniel		

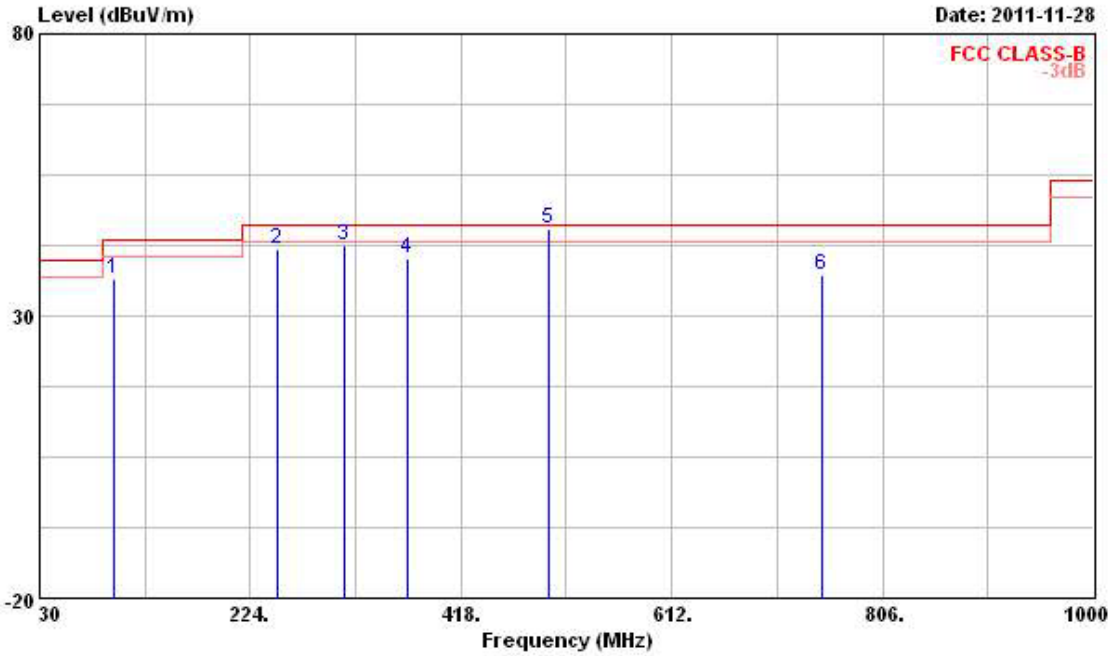
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

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

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

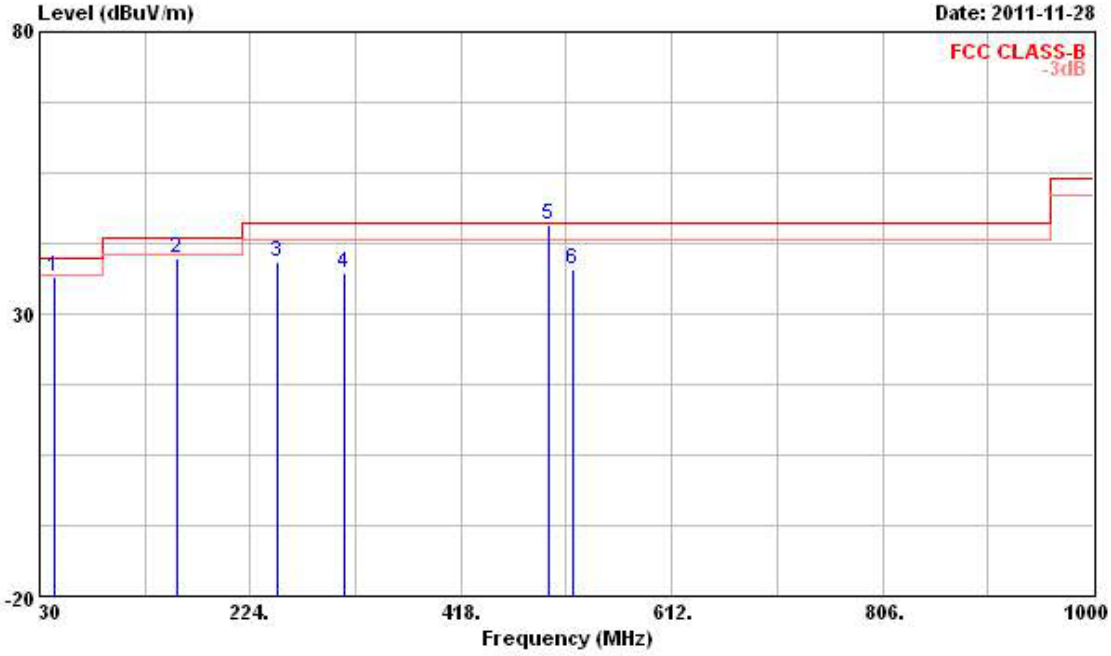
Final Test Date	Nov. 28, 2011	**Test Site No.**	03CH03-HY
Temperature	24℃	**Humidity**	69%
Test Engineer	Daniel	**Configuration**	Mode 1

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	97.900	36.43	-7.07	43.50	51.80	10.84	1.64	27.85	Peak	---	---
2 @	249.220	41.93	-4.07	46.00	53.48	12.97	2.77	27.29	Peak	---	---
3 @	311.300	42.55	-3.45	46.00	52.90	13.88	3.01	27.24	Peak	---	---
4	369.500	40.14	-5.86	46.00	49.75	14.78	3.27	27.66	Peak	---	---
5 @	498.510	45.32	-0.68	46.00	52.60	17.26	3.82	28.36	QP	---	---
6	749.740	37.31	-8.69	46.00	41.16	19.55	4.71	28.11	Peak	---	---

Vertical

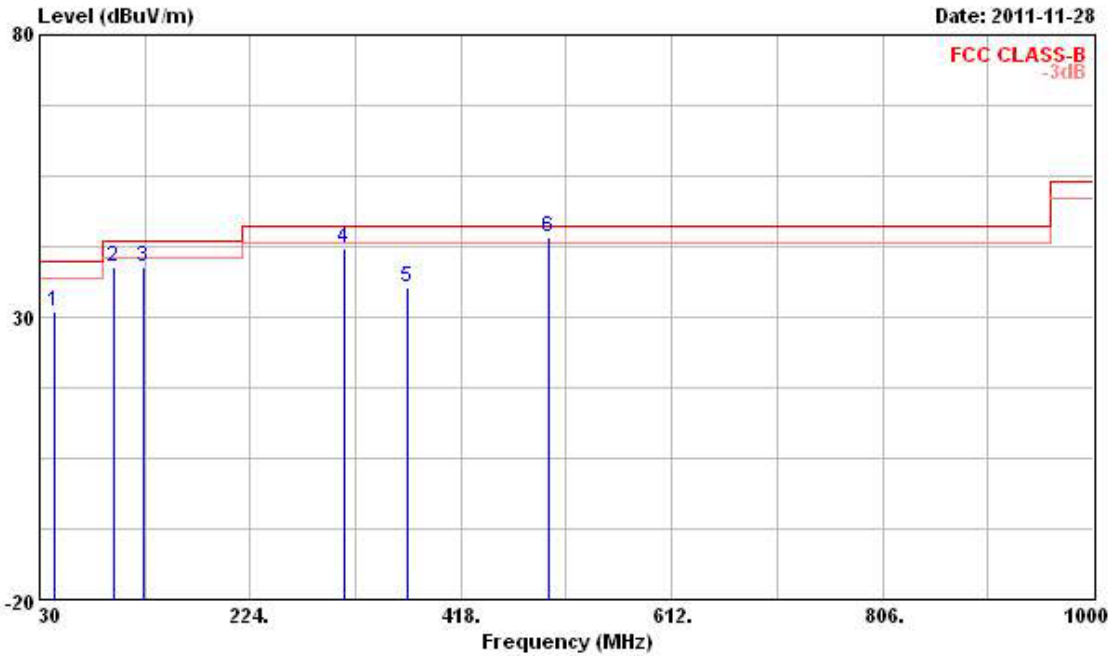


		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	@	43.580	36.44	-3.56	40.00	50.96	12.27	1.09	27.88	Peak	---	---
2	@	156.100	39.76	-3.74	43.50	54.66	10.64	2.06	27.60	Peak	---	---
3		249.220	39.24	-6.76	46.00	50.79	12.97	2.77	27.29	Peak	---	---
4		311.300	37.37	-8.63	46.00	47.72	13.88	3.01	27.24	Peak	---	---
5	@	498.510	45.74	-0.26	46.00	53.02	17.26	3.82	28.36	QP	---	---
6		520.820	37.77	-8.23	46.00	44.34	17.90	3.92	28.39	Peak	---	---

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

Final Test Date	Nov. 28, 2011	Test Site No.	03CH03-HY
Temperature	24℃	Humidity	69%
Test Engineer	Daniel	Configuration	Mode 2

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	43.580	30.88	-9.12	40.00	45.40	12.27	1.09	27.88	Peak	---	---
2 @	97.900	39.01	-4.49	43.50	54.38	10.84	1.64	27.85	Peak	---	---
3	125.060	38.80	-4.70	43.50	51.50	13.18	1.86	27.74	Peak	---	---
4 @	311.300	42.20	-3.80	46.00	52.55	13.88	3.01	27.24	QP	---	---
5	369.500	35.17	-10.83	46.00	44.78	14.78	3.27	27.66	QP	---	---
6 @	498.510	44.30	-1.70	46.00	51.58	17.26	3.82	28.36	QP	---	---