

FCC RADIO TEST REPORT

Applicant's company	NETGEAR, Inc.
Applicant Address	4500 Great America Parkway, Santa Clara, CA 95054, USA
FCC ID	PY308100078
Manufacturer's company	Ambit Microsystems (Shanghai) Ltd.
Manufacturer Address	No. 1925, Nanle Road, Songjiang Export Processing Zone, Shanghai, China

Product Name	RangeMax Duo Wireless-N Router
Brand Name	NETGEAR
Model Name	WNDR3300
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Received Date	Nov. 24, 2007
Final Test Date	Dec. 11, 2007
Submission Type	Original Equipment



Statement

Test result included is only for the 802.11b/g part and 802.11a (5725 ~ 5850MHz) 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.

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History of This Test Report

Original Issue Date: Feb. 29, 2008

Report No.: FR7N2806-01AD

☒ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



1. CERTIFICATE OF COMPLIANCE

Product Name : RangeMax Duo Wireless-N Router
Brand Name : NETGEAR
Model Name : WNDR3300
Applicant : NETGEAR, 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. 24, 2007 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.

A handwritten signature in blue ink that reads "Wayne Hsu 2.2.08".

Wayne Hsu

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	Rule Section	Description of Test	Result	Under Limit
4.1	15.207	AC Power Line Conducted Emissions	Complies	7.81 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	3.11 dB
4.3	15.247(e)	Power Spectral Density	Complies	8.81 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.29 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.12 dB
4.7	15.203	Antenna Requirements	Complies	-

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

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN
Radio Type	Intentional Transceiver
Power Type	From Adapter
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11a/g
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 / 5725 ~ 5850MHz
Channel Number	11b/g: 11 ; 11a: 7
Channel Band Width (99%)	11b: 13.10 MHz ; 11g: 16.47 MHz ; 11a: 16.34 MHz
Conducted Output Power	11b: 23.09 dBm ; 11g: 28.56 dBm ; 11a: 26.39 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Antenna & Band width (for Broadcom b/g chip_BCM4318)(1TX2RX)

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

Antenna & Band width (for Broadcom a/b/g/n chip_BCM2055) (2TX3RX)

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

3.2. Accessories

Power	Brand	Model	Rating
Adapter 1	NETGEAR	DSA-20P-10 US 120180	Input: 100-240VAC, 50/60Hz, 0.7A Output: 12VDC, 1.5A
Adapter 2	NETGEAR	MU18-2120150-A1	Input: 100-240VAC, 50/60Hz, 0.6A Output: 12VDC, 1.5A

3.3. Table for Filed Antenna

For 2.4GHz Band for Broadcomm b/g chip_BCM4318

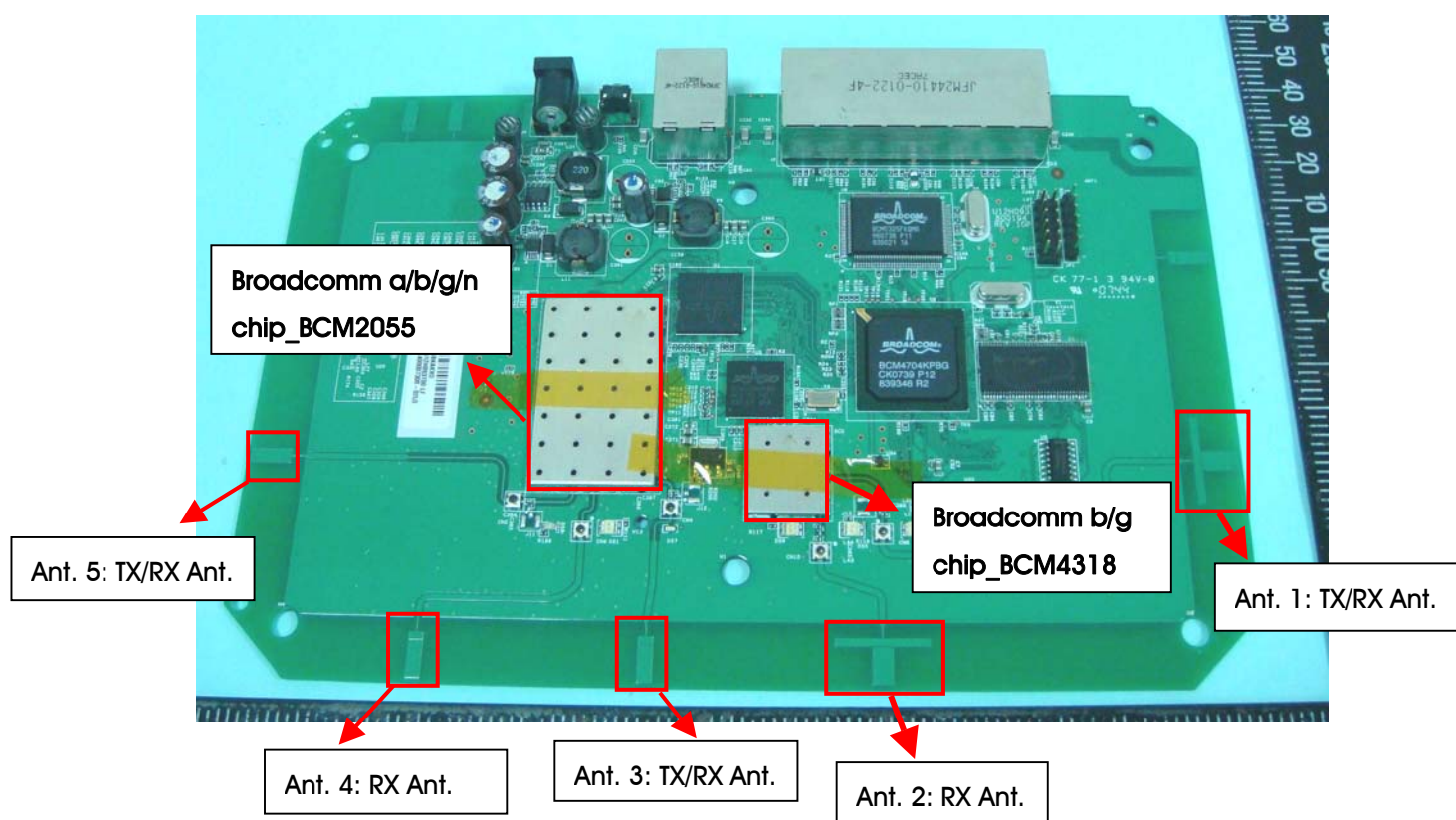
Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	-	-	Printed Antenna	NA	3.39	TX / RX Ant.
2	-	-	Printed Antenna	NA	4.37	RX Ant.

For 2.4GHz Band for Broadcomm a/b/g/n chip_BCM2055

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
3	-	-	Printed Antenna	NA	2.51	TX / RX Ant.
4	-	-	Printed Antenna	NA	3.45	RX Ant.
5	-	-	Printed Antenna	NA	2.51	TX / RX Ant.

For 5GHz Band for Broadcomm a/b/g/n chip_BCM2055

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
3	-	-	Printed Antenna	NA	6.92	TX / RX Ant.
4	-	-	Printed Antenna	NA	6.50	RX Ant.
5	-	-	Printed Antenna	NA	6.92	TX / RX Ant.



3.4. Table for Carrier Frequencies

Frequency Allocation for 802.11b/g

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		

Frequency Allocation for 802.11a

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5725~5850 MHz	149	5745 MHz	161	5805 MHz
	153	5765 MHz	165	5825 MHz
	157	5785 MHz		

3.5. Table for Test Modes

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

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Line Conducted Emissions	Normal Link	Auto	-	-
Maximum Peak Conducted Output Power	11b/BPSK	1 Mbps	1/6/11	1, 3
	11g/BPSK	6 Mbps	1/6/11	3/5/3+5
	11a/BPSK	6 Mbps	149/157/165	3/5/3+5
Power Spectral Density 6dB Spectrum Bandwidth	11b/BPSK	1 Mbps	1/6/11	1, 3
	11g/BPSK	6 Mbps	1/6/11	3+5
	11a/BPSK	6 Mbps	149/157/165	3+5
Radiated Emissions 9kHz~1GHz	Normal Link	Auto	-	-
Radiated Emissions 1GHz~10 th Harmonic	11b/BPSK	1 Mbps	1/6/11	1, 3
	11g/BPSK	6 Mbps	1/6/11	3+5
	11a/BPSK	6 Mbps	149/157/165	3+5
Band Edge Emissions	11b/BPSK	1 Mbps	1/11	1, 3
	11g/BPSK	6 Mbps	1/11	3+5
	11a/BPSK	6 Mbps	149/157/165	3+5

There have four test mode below:

Mode 1: Broadcomm b/g chip_BCM4318+Adapter 1

Mode 2: Broadcomm b/g chip_BCM4318+Adapter 2

Mode 3: Broadcomm a/b/g/n chip_BCM2055+Adapter 1

Mode 4: Broadcomm a/b/g/n chip_BCM2055+Adapter 2

Due to Mode 2 and Mode 4 generated the worst test result, so it was recorded in this report.

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH03-HY	SAC	Hwa Ya	101377	IC 4088	-
CO04-HY	Conduction	Hwa Ya	101377	IC 4088	-
TH01-HY	OVEN Room	Hwa Ya	-	-	-

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

Please refer section 6 for Test Site Address.

3.7. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	D505	E2K24GBRL
Notebook	DELL	D505	E2K24GBRL
Notebook	DELL	D400	E2K24GBRL

3.8. 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.

Power Parameters of IEEE 802.11b for BCM4318

Test Software Version	Telnet		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	18	19	18

Power Parameters of IEEE 802.11g for BCM4318

Test Software Version	Telnet		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11g	16	20	17

Power Parameters of IEEE 802.11b for BCM2055

Test Software Version	Telnet		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	4547	3535	4242

Power Parameters of IEEE 802.11g Ant. 3+Ant. 5 for BCM2055

Test Software Version	Telnet		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11g	3935	2D2B	3A38

Power Parameters of IEEE 802.11a Ant. 3+Ant. 5 for BCM2055

Test Software Version	Telnet		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	101d	101d	101d

During the test, the following programs under WIN XP were executed:

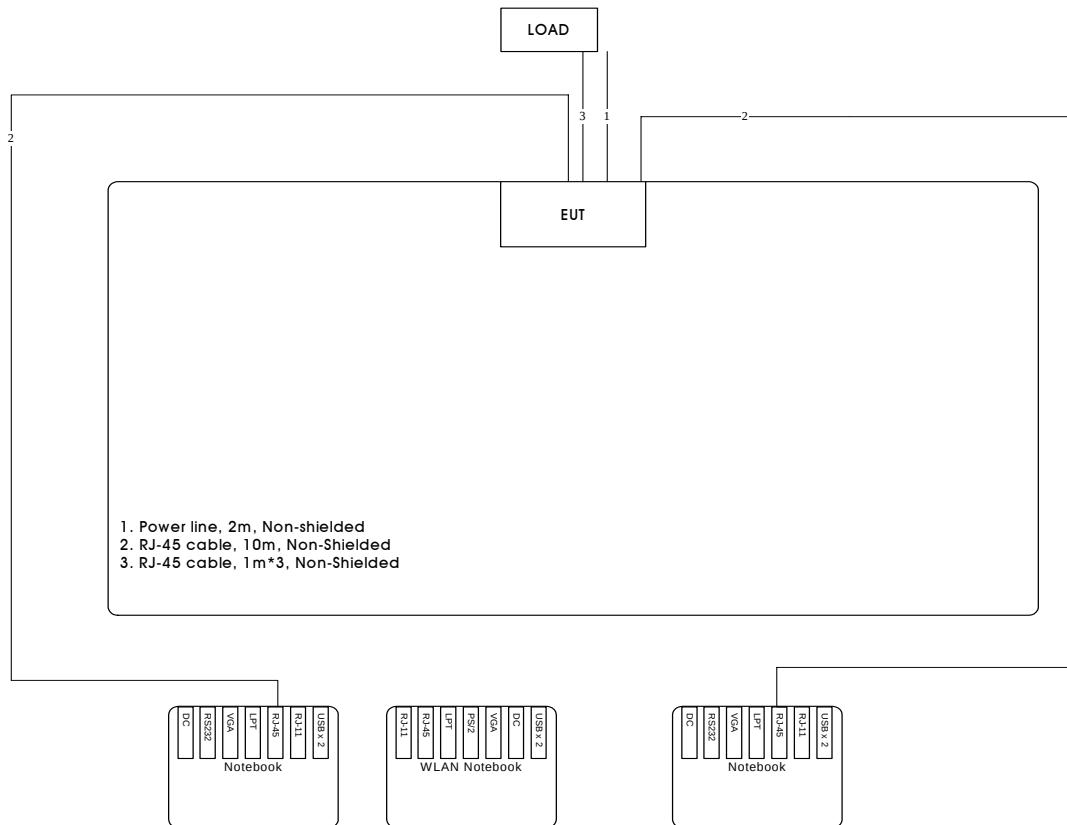
Executed "telnet" to control the EUT continuously transmit RF signal.

Executed "ping.exe" to link with the remote workstation to receive and transmit signal by LAN and WLAN.

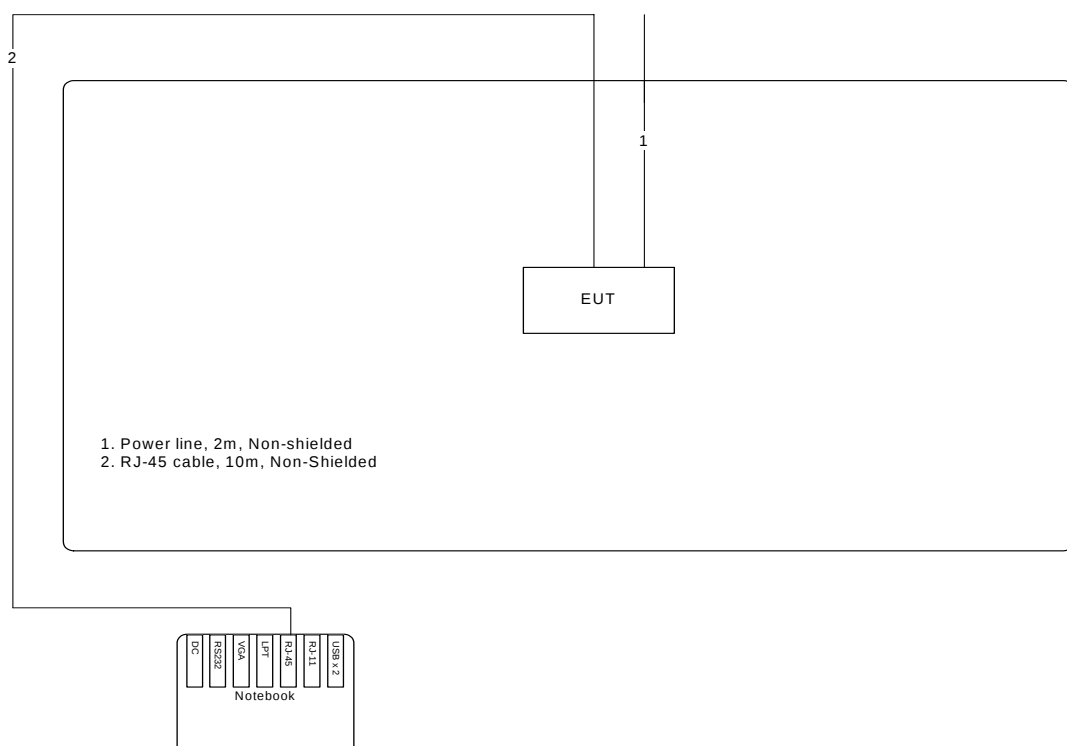
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

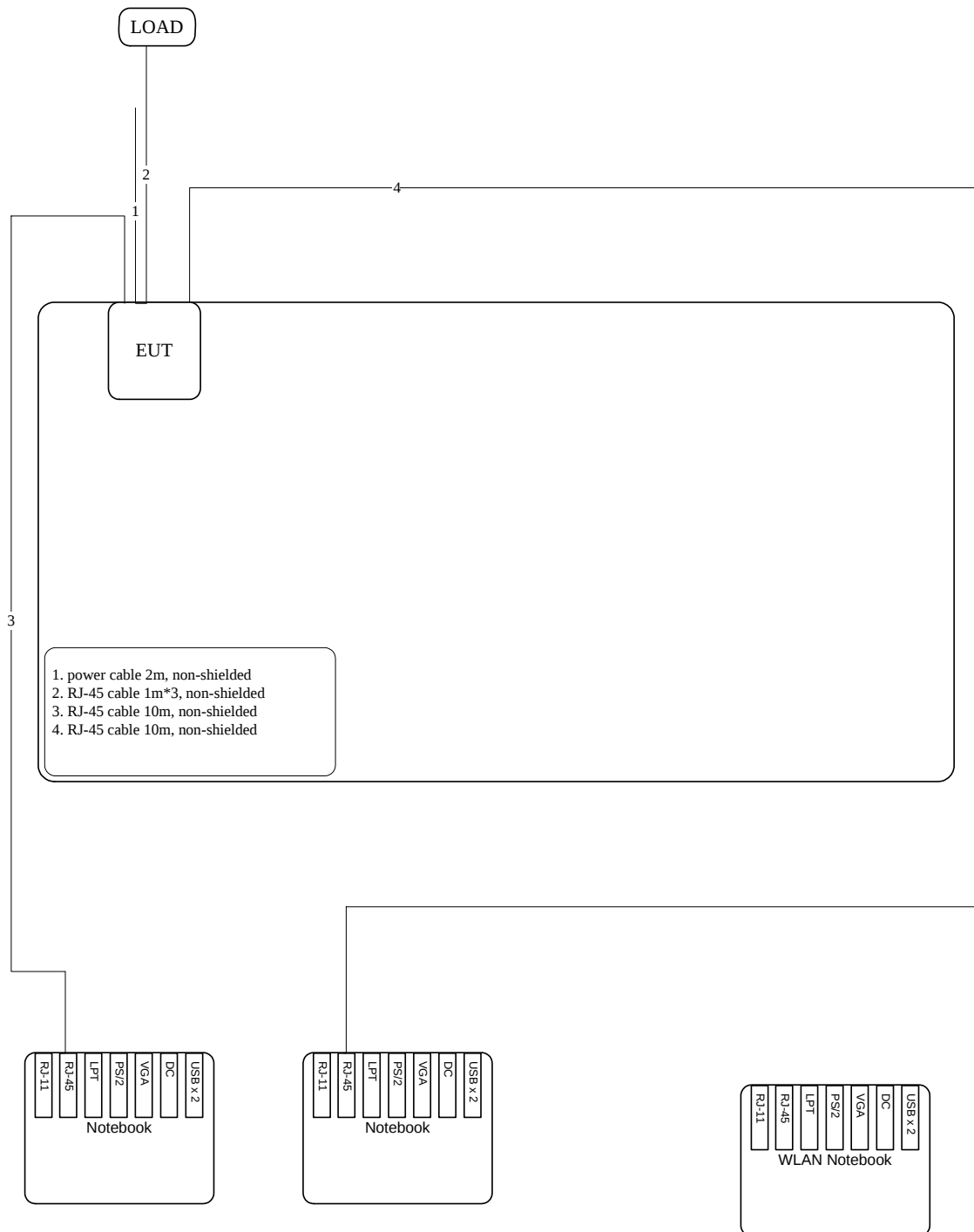
Test Configuration: 9KHz~1GHz



Test Configuration: above 1GHz



3.9.2. AC Power Line Conduction Emissions Test Configuration



4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

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

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

4.1.2. Measuring Instruments and Setting

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

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

4.1.3. Test Procedures

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



- (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 $50\ \Omega$. LISN can be placed on top of, or immediately beneath, reference ground plane.
 - (3.1) All other equipment powered from additional LISN(s).
 - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
 - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

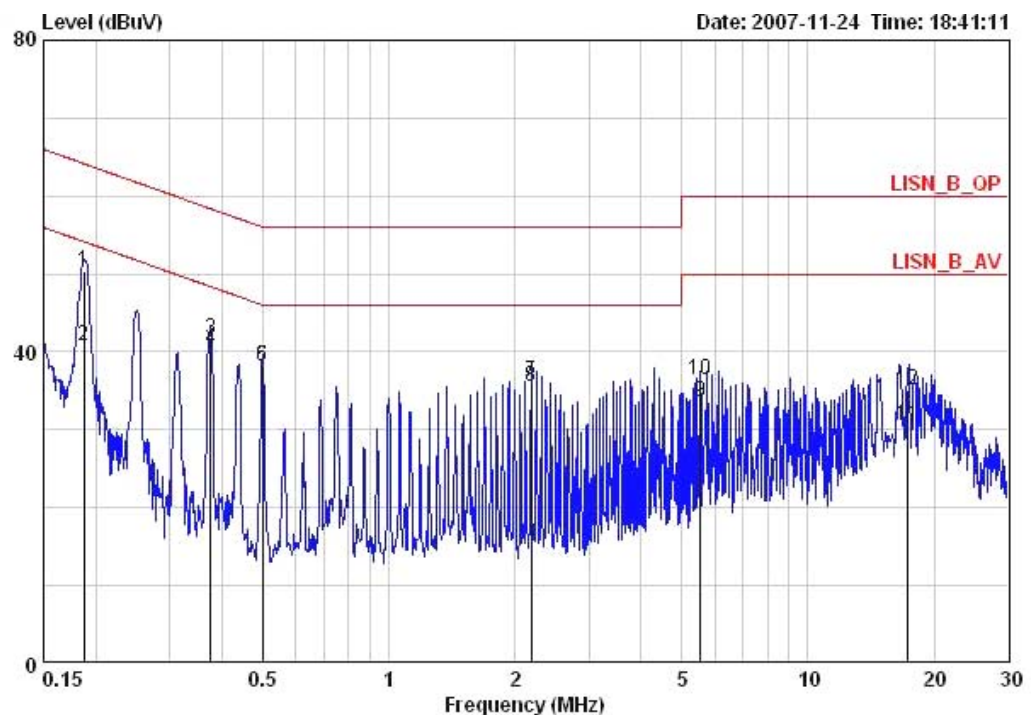
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

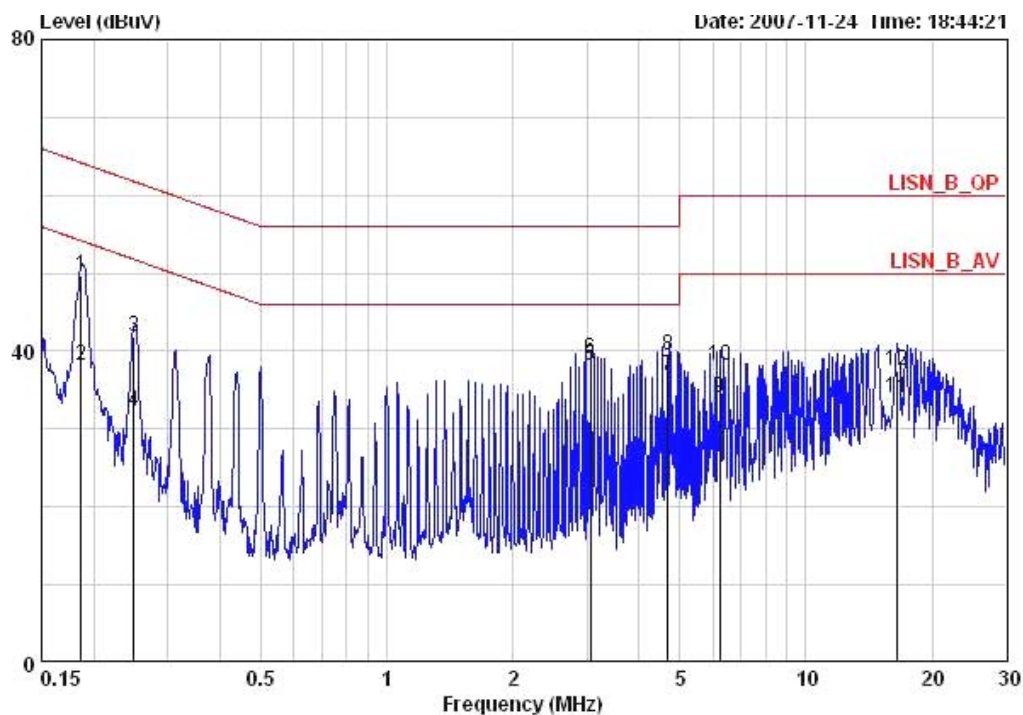
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23°C	Humidity	54%
Test Engineer	Barry Chen	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.18699	50.37	-13.80	64.17	50.02	0.15	0.20	QP	LINE
2	0.18699	40.77	-13.40	54.17	40.42	0.15	0.20	AVERAGE	LINE
3	0.37512	41.63	-16.76	58.39	41.33	0.10	0.20	QP	LINE
4	0.37512	40.43	-7.96	48.39	40.13	0.10	0.20	AVERAGE	LINE
5	0.49897	38.20	-17.82	56.02	37.92	0.08	0.20	QP	LINE
6	0.49897	38.17	-7.85	46.02	37.89	0.08	0.20	AVERAGE	LINE
7	2.184	36.20	-19.80	56.00	36.00	0.00	0.20	QP	LINE
8	2.184	35.52	-10.48	46.00	35.32	0.00	0.20	AVERAGE	LINE
9	5.553	33.56	-16.44	50.00	33.23	0.03	0.30	AVERAGE	LINE
10	5.553	36.47	-23.53	60.00	36.14	0.03	0.30	QP	LINE
11	17.286	30.50	-19.50	50.00	29.90	0.10	0.50	AVERAGE	LINE
12	17.286	35.20	-24.80	60.00	34.60	0.10	0.50	QP	LINE

Temperature	23°C	Humidity	54%
Test Engineer	Barry Chen	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 ☐	0.18659	49.63	-14.56	64.19	49.18	0.25	0.20	QP	NEUTRAL
2 ☐	0.18659	38.16	-16.03	54.19	37.71	0.25	0.20	AVERAGE	NEUTRAL
3	0.24958	41.79	-19.98	61.77	41.41	0.18	0.20	QP	NEUTRAL
4	0.24958	32.23	-19.54	51.77	31.85	0.18	0.20	AVERAGE	NEUTRAL
5 ☐	3.058	38.19	-7.81	46.00	37.88	0.10	0.21	AVERAGE	NEUTRAL
6 ☐	3.058	38.97	-17.03	56.00	38.66	0.10	0.21	QP	NEUTRAL
7 ☐	4.680	36.79	-9.21	46.00	36.39	0.10	0.30	AVERAGE	NEUTRAL
8 ☐	4.680	39.50	-16.50	56.00	39.10	0.10	0.30	QP	NEUTRAL
9 ☐	6.238	34.05	-15.95	50.00	33.60	0.10	0.35	AVERAGE	NEUTRAL
10	6.238	38.06	-21.94	60.00	37.61	0.10	0.35	QP	NEUTRAL
11 ☐	16.471	33.94	-16.06	50.00	33.44	0.10	0.40	AVERAGE	NEUTRAL
12	16.471	37.43	-22.57	60.00	36.93	0.10	0.40	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum Conducted Output Power Measurement

4.2.1. Limit

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

4.2.2. Measuring Instruments and Setting

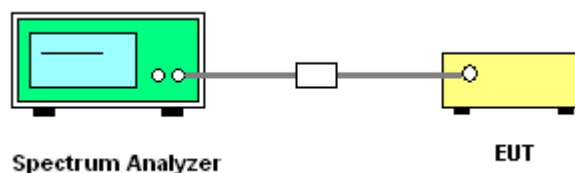
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1000 kHz
VB	3000 kHz
Detector	rms
Trace	MAX HOLD
Sweep Time	500ms

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with Test was performed in accordance with Measurement of Digital Transmission Systems Operating under Section 15.247 March 23, 2005.
3. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Maximum Peak Output Power

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11b/g / Mode 2

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	20.73	30.00	Complies
6	2437 MHz	23.09	30.00	Complies
11	2462 MHz	20.52	30.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	24.94	30.00	Complies
6	2437 MHz	28.56	30.00	Complies
11	2462 MHz	24.63	30.00	Complies

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11b/g / Mode 4

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	17.12	30.00	Complies
6	2437 MHz	20.26	30.00	Complies
11	2462 MHz	16.79	30.00	Complies

Configuration IEEE 802.11g Ant. 3

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	21.10	30.00	Complies
6	2437 MHz	23.12	30.00	Complies
11	2462 MHz	20.10	30.00	Complies

Configuration IEEE 802.11g Ant. 5

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	22.39	30.00	Complies
6	2437 MHz	23.51	30.00	Complies
11	2462 MHz	20.61	30.00	Complies

Configuration IEEE 802.11g Ant. 3+Ant. 5

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	24.80	30.00	Complies
6	2437 MHz	26.33	30.00	Complies
11	2462 MHz	23.37	30.00	Complies

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11a / Mode 4

Configuration IEEE 802.11a Ant. 3

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	23.28	29.08	Complies
157	5875 MHz	23.87	29.08	Complies
165	5825 MHz	23.35	29.08	Complies

Configuration IEEE 802.11a Ant. 5

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	23.10	29.08	Complies
157	5875 MHz	22.83	29.08	Complies
165	5825 MHz	21.47	29.08	Complies

Configuration IEEE 802.11a Ant. 3+Ant. 5

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	26.20	29.08	Complies
157	5875 MHz	26.39	29.08	Complies
165	5825 MHz	25.52	29.08	Complies

4.3. Power Spectral Density Measurement

4.3.1. Limit

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

4.3.2. Measuring Instruments and Setting

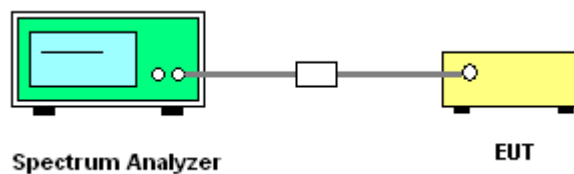
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser.
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. Measuring multiple antennas, the connector is required to link with Power Meter through a combiner.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Power Spectral Density

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11b/g / Mode 2

Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-4.97	8.00	Complies
6	2437 MHz	-3.59	8.00	Complies
11	2462 MHz	-4.11	8.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-8.70	8.00	Complies
6	2437 MHz	-3.54	8.00	Complies
11	2462 MHz	-7.76	8.00	Complies

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11a/b/g / Mode 4

Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-9.44	8.00	Complies
6	2437 MHz	-6.55	8.00	Complies
11	2462 MHz	-9.58	8.00	Complies

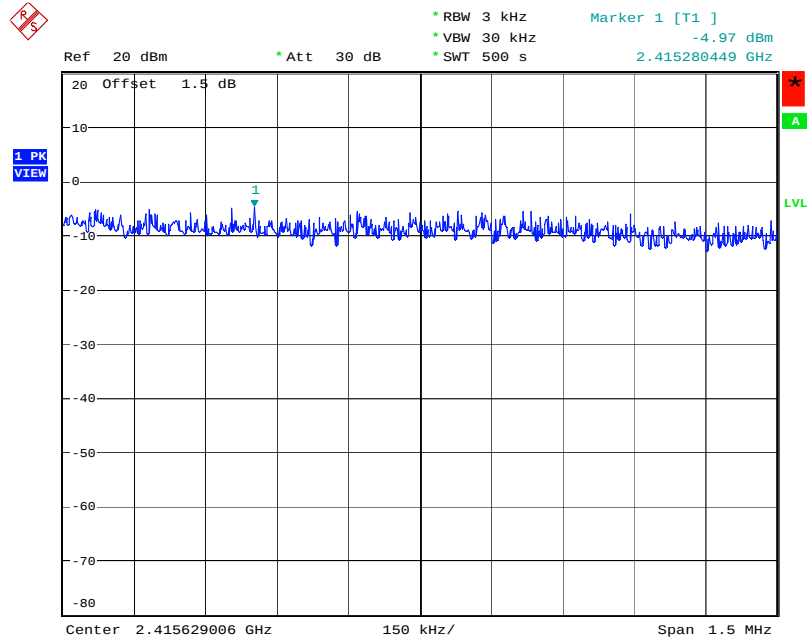
Configuration IEEE 802.11g Ant. 3+Ant. 5

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-1.90	8.00	Complies
6	2437 MHz	-0.81	8.00	Complies
11	2462 MHz	-6.32	8.00	Complies

Configuration IEEE 802.11a

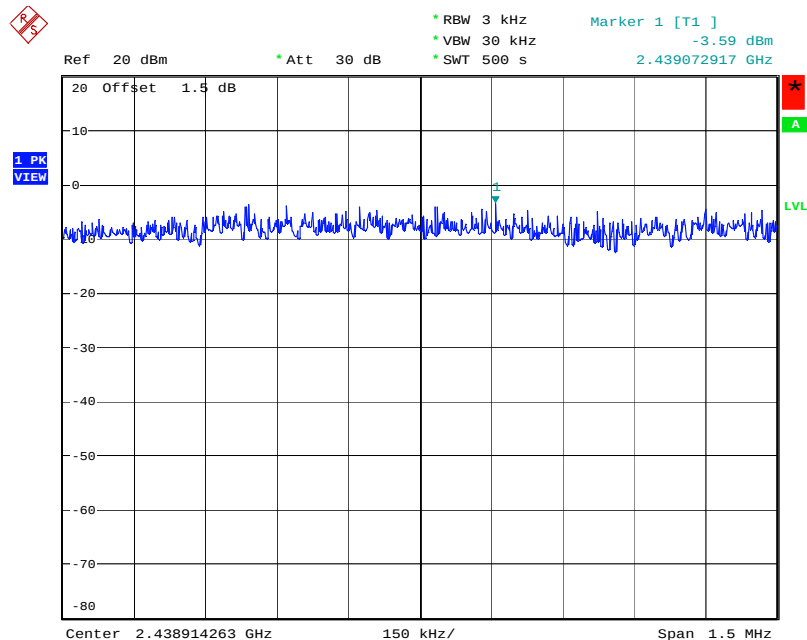
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-2.26	8.00	Complies
157	5785 MHz	-3.02	8.00	Complies
165	5825 MHz	-3.58	8.00	Complies

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



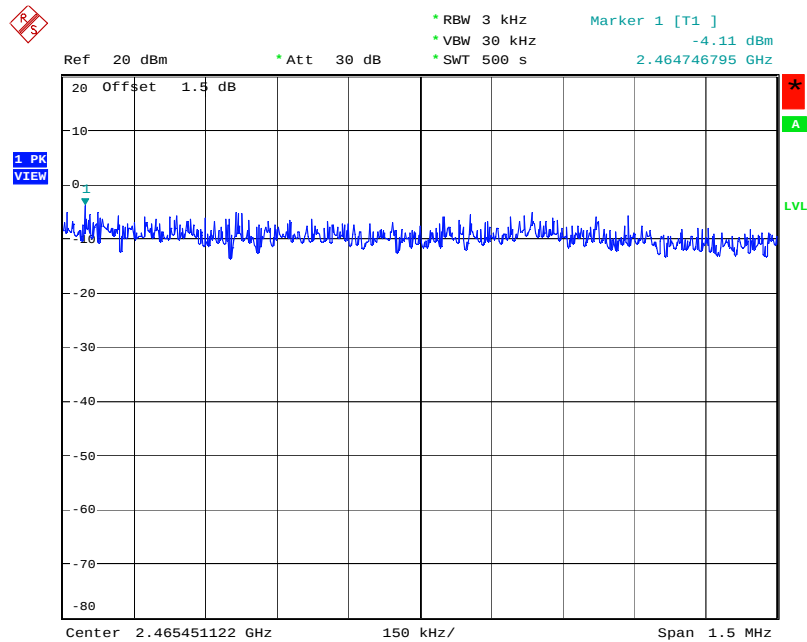
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Power Density Plot on Configuration IEEE 802.11b / 2437 MHz / Mode 2



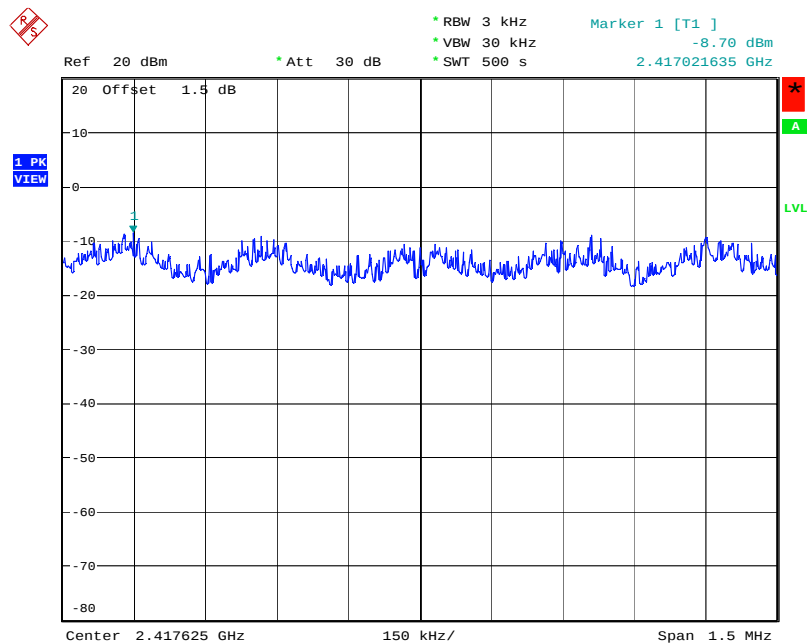
Date: 3.DEC.2007 09:51:40

Power Density Plot on Configuration IEEE 802.11b / 2462 MHz / Mode 2



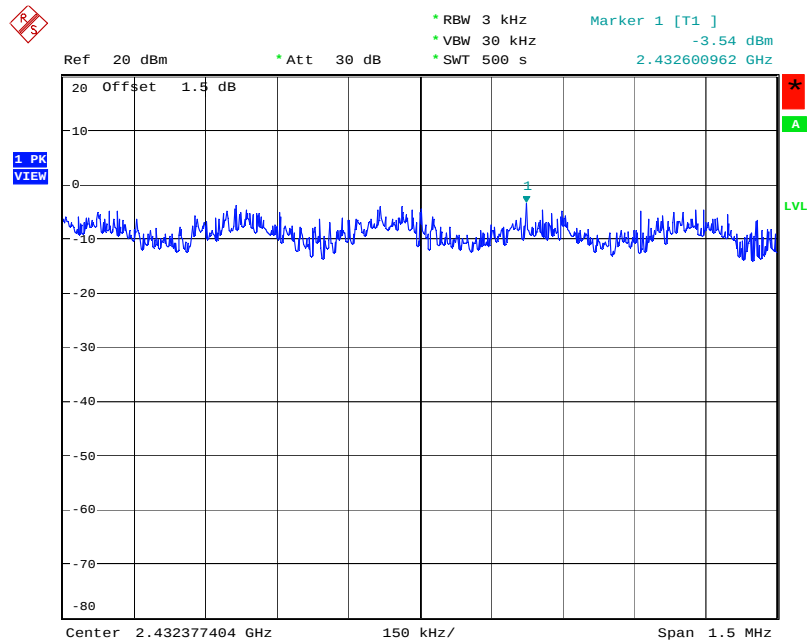
Date: 11.DEC.2007 10:10:55

Power Density Plot on Configuration IEEE 802.11g / 2412 MHz / Mode 2



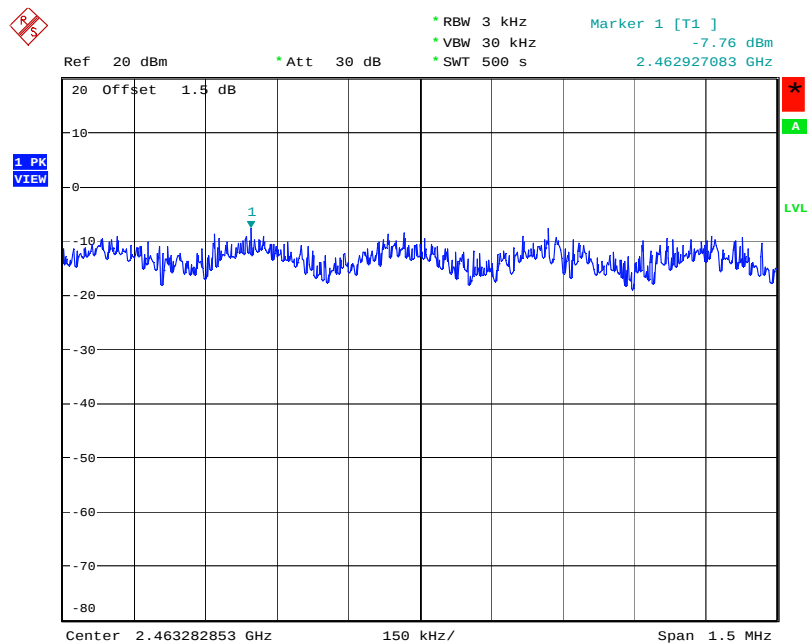
Date: 3.DEC.2007 09:57:31

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



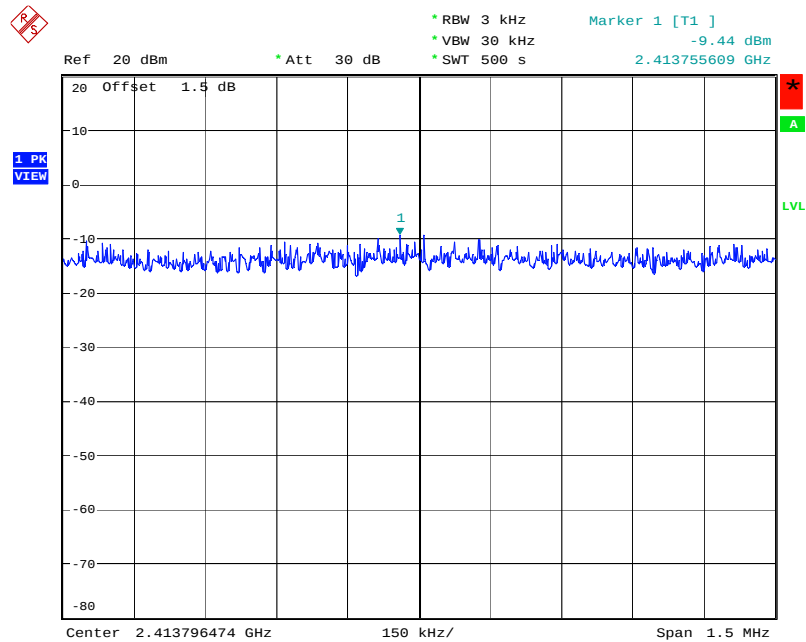
Date: 3.DEC.2007 09:59:03

Power Density Plot on Configuration IEEE 802.11g / 2462 MHz / Mode 2



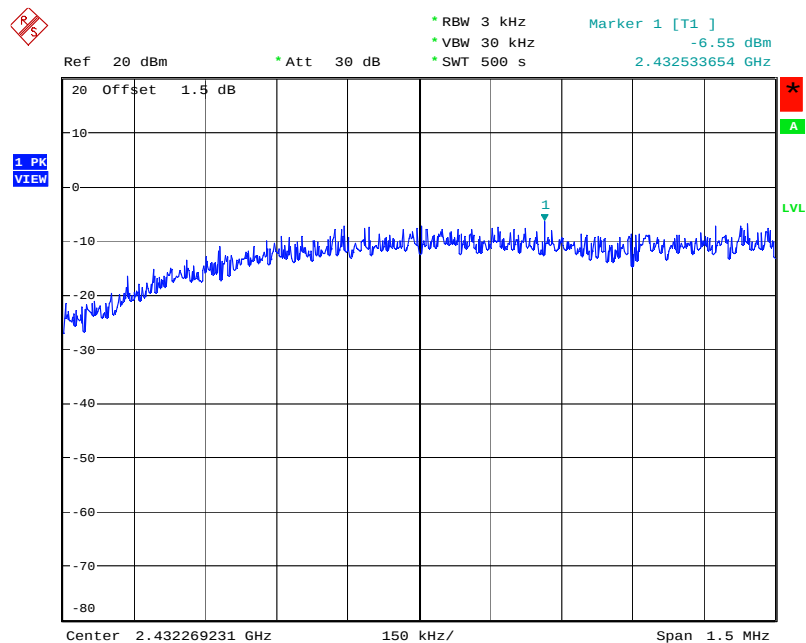
Date: 11.DEC.2007 10:13:02

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz / Mode 4



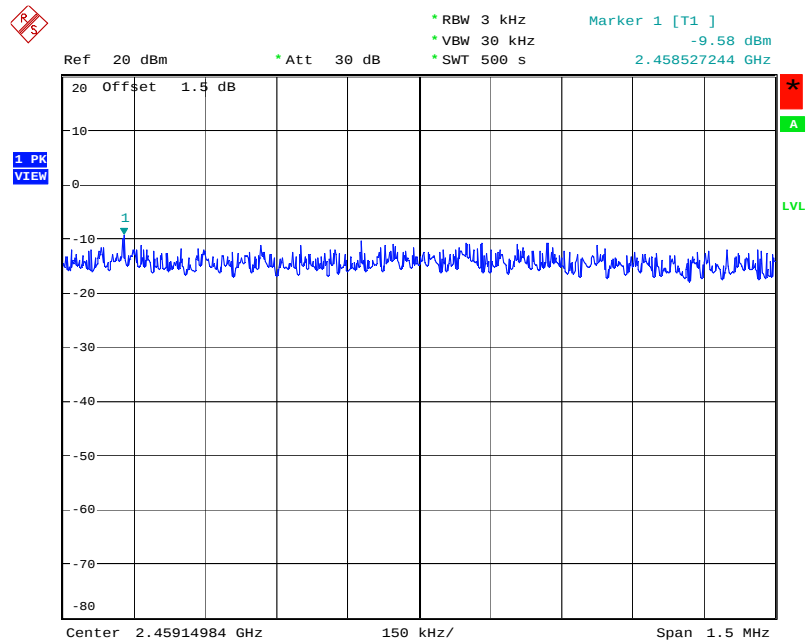
Date: 30.NOV.2007 13:05:24

Power Density Plot on Configuration IEEE 802.11b / 2437 MHz / Mode 4



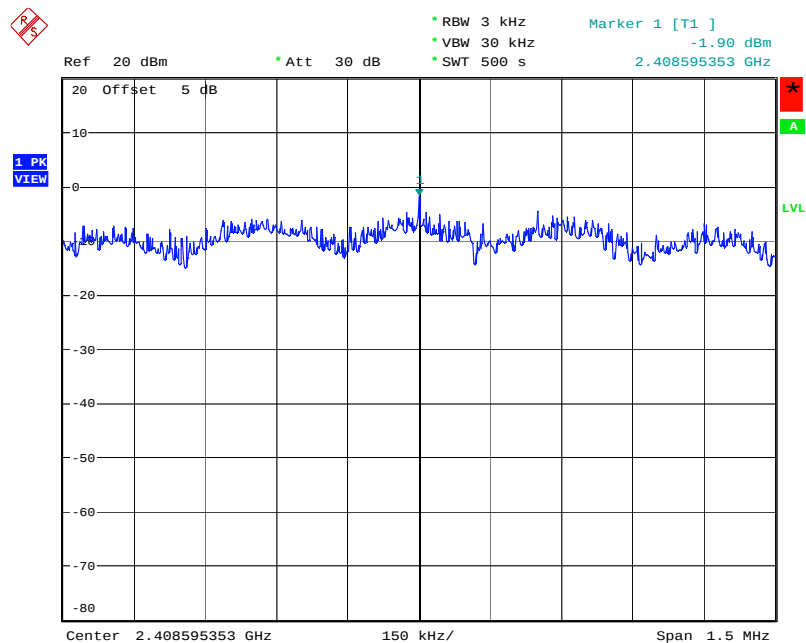
Date: 11.DEC.2007 09:37:27

Power Density Plot on Configuration IEEE 802.11b / 2462 MHz / Mode 4



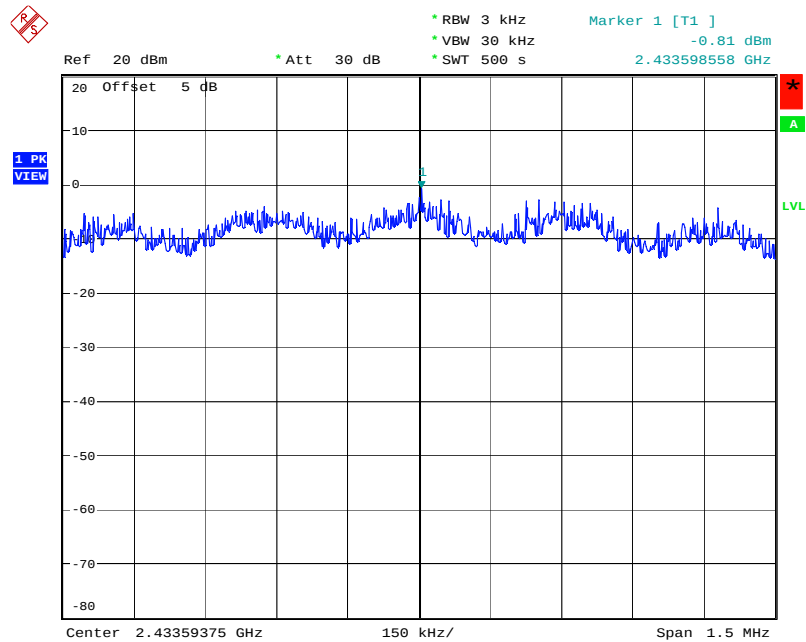
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Power Density Plot on Configuration IEEE 802.11g Ant. 3+Ant. 5 / 2412 MHz / Mode 4



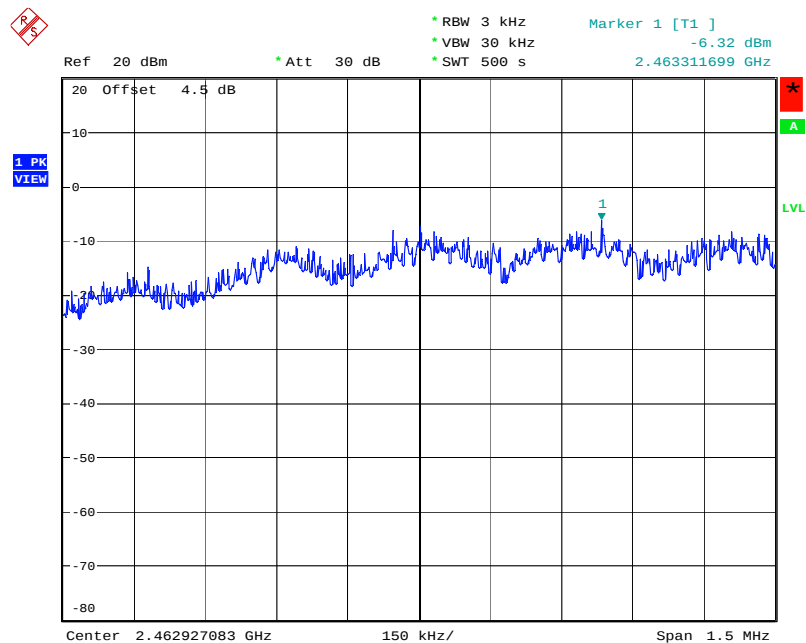
Date: 11.DEC.2007 09:43:17

Power Density Plot on Configuration IEEE 802.11g Ant. 3+Ant. 5 / 2437 MHz / Mode 4



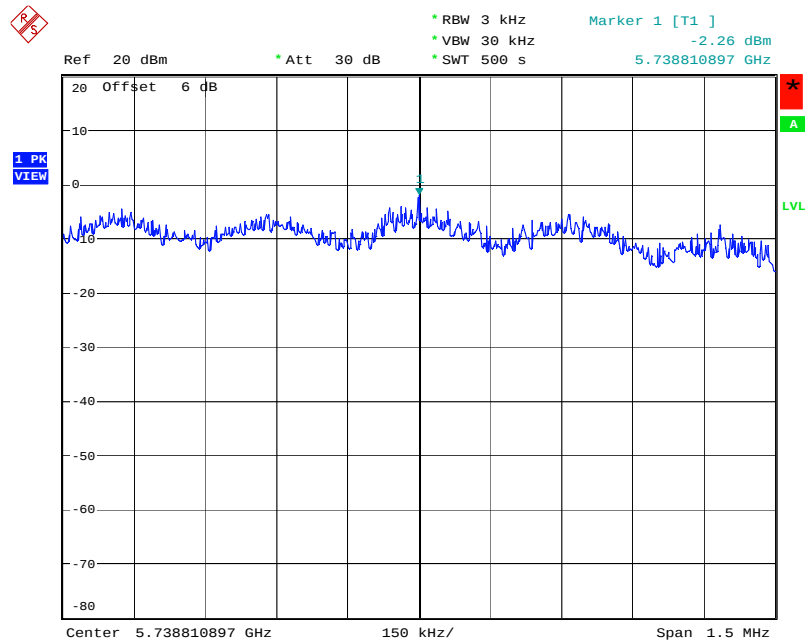
Date: 11.DEC.2007 09:45:15

Power Density Plot on Configuration IEEE 802.11g Ant. 3+Ant. 5 / 2462 MHz / Mode 4



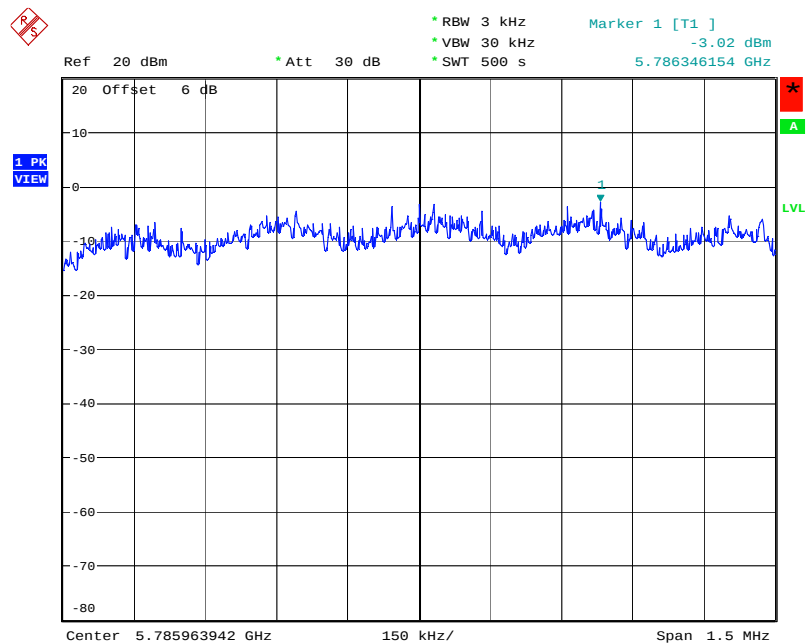
Date: 30.NOV.2007 14:03:52

Power Density Plot on Configuration IEEE 802.11a Ant. 3+Ant. 5 / 5745 MHz / Mode 4



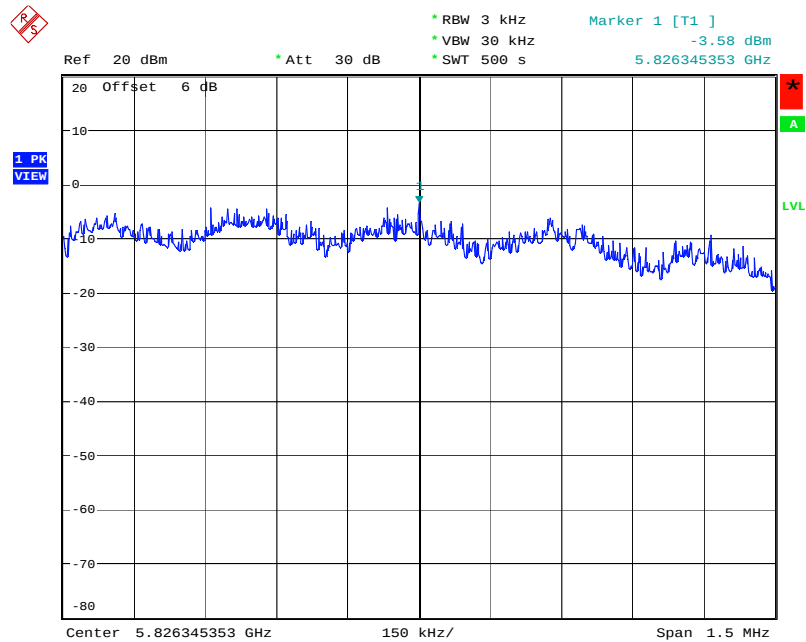
Date: 30.NOV.2007 15:47:24

Power Density Plot on Configuration IEEE 802.11a Ant. 3+Ant. 5 / 5785 MHz / Mode 4



Date: 30.NOV.2007 15:46:03

Power Density Plot on Configuration IEEE 802.11a Ant. 3+Ant. 5 / 5825 MHz / Mode 4



Date: 30.NOV.2007 15:43:53

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

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

4.4.2. Measuring Instruments and Setting

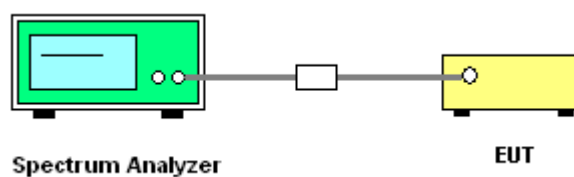
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.
4. Measuring multiple antennas, the connector is required to link with Power Meter through a combiner.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of 6dB Spectrum Bandwidth

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11b/g / Mode 2

Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.09	12.59	500	Complies
6	2437 MHz	10.12	12.62	500	Complies
11	2462 MHz	10.09	12.62	500	Complies

Configuration IEEE 802.11g

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.34	16.44	500	Complies
6	2437 MHz	16.37	16.47	500	Complies
11	2462 MHz	15.67	16.34	500	Complies

Temperature	23°C	Humidity	56%
Test Engineer	Barry Chen	Configurations	802.11a/b/g / Mode 4

Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.12	13.04	500	Complies
6	2437 MHz	10.12	13.10	500	Complies
11	2462 MHz	10.12	13.07	500	Complies

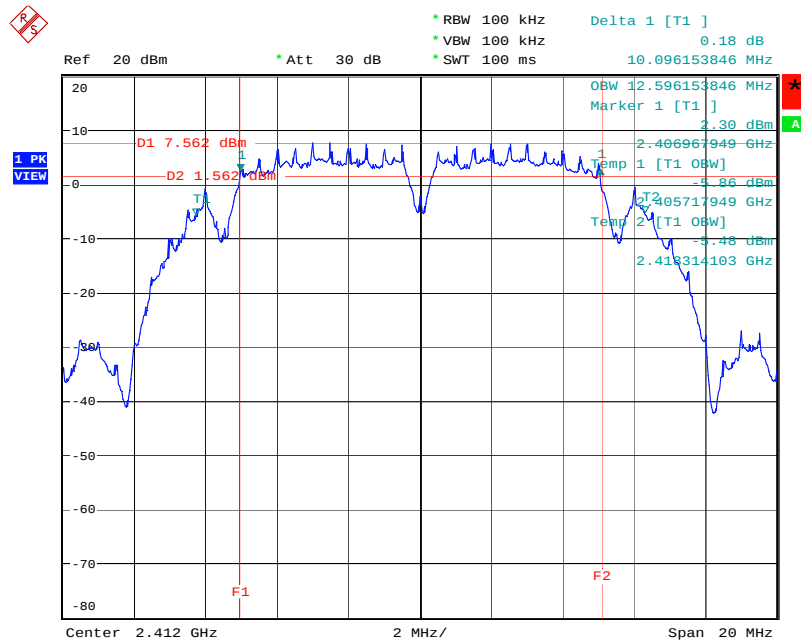
Configuration IEEE 802.11g Ant. 3+Ant. 5

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	15.09	16.12	500	Complies
6	2437 MHz	15.16	16.21	500	Complies
11	2462 MHz	13.78	16.34	500	Complies

Configuration IEEE 802.11a Ant. 3+Ant. 5

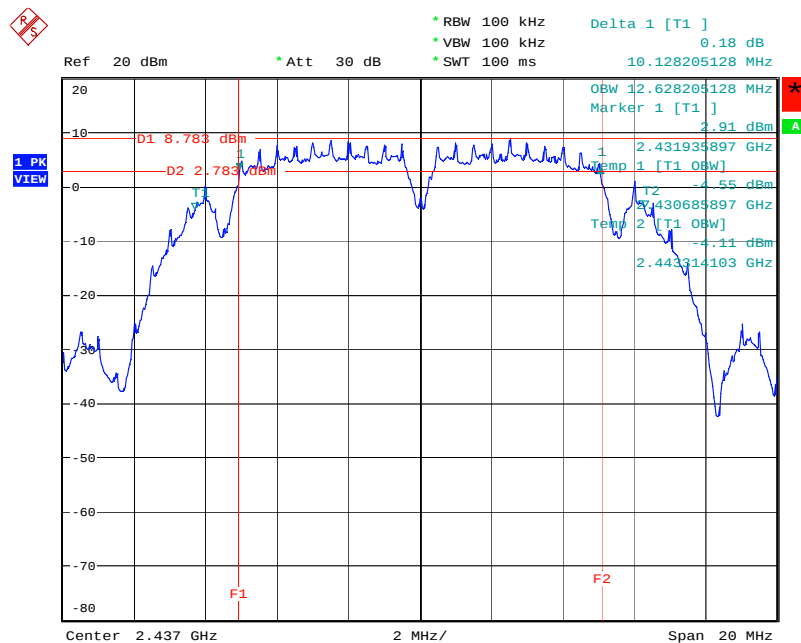
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	15.06	16.34	500	Complies
157	5785 MHz	15.06	16.28	500	Complies
165	5825 MHz	15.16	16.31	500	Complies

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz / Mode 2



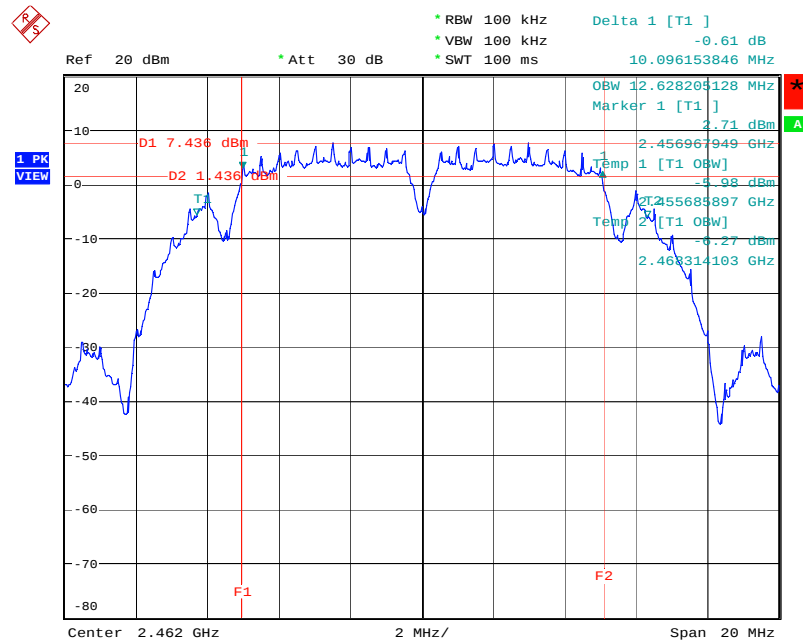
Date: 11.DEC.2007 10:08:36

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz / Mode 2



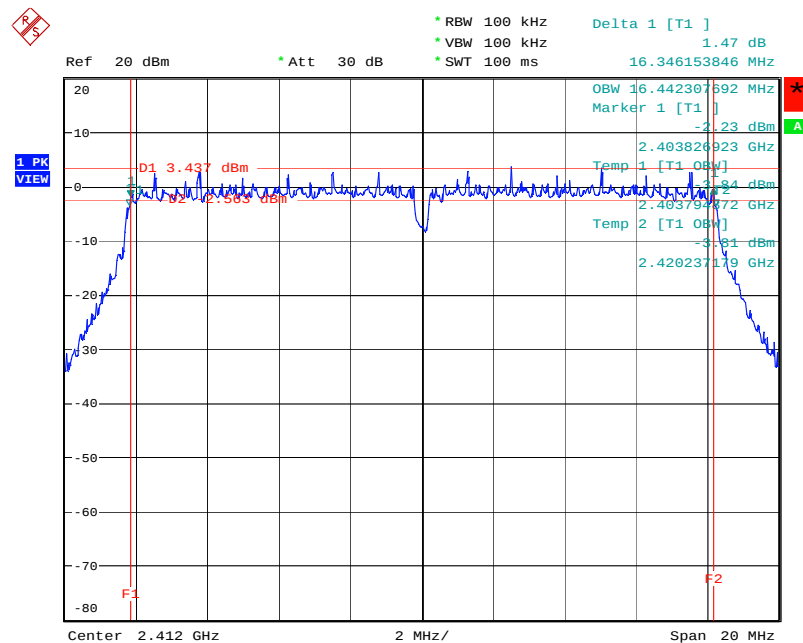
Date: 3.DEC.2007 09:51:23

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz / Mode 2



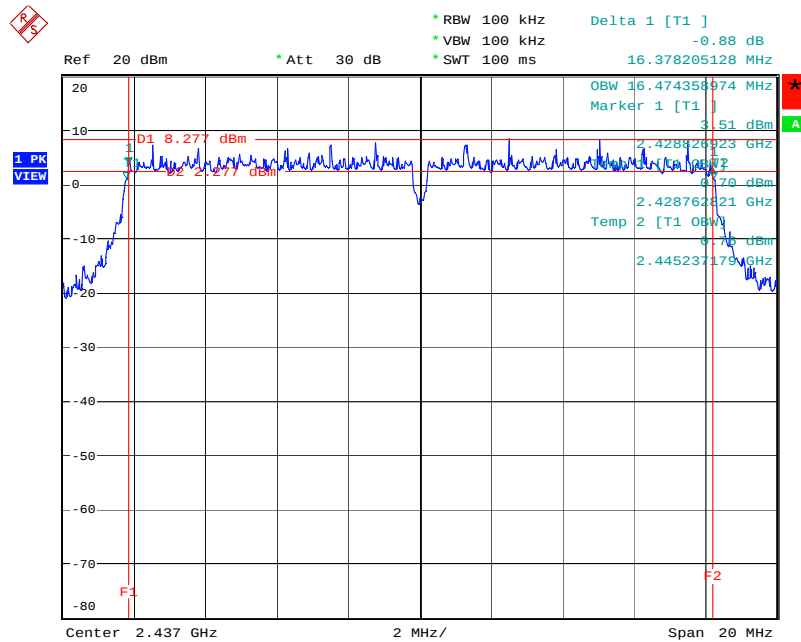
Date: 11.DEC.2007 10:10:39

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz / Mode 2



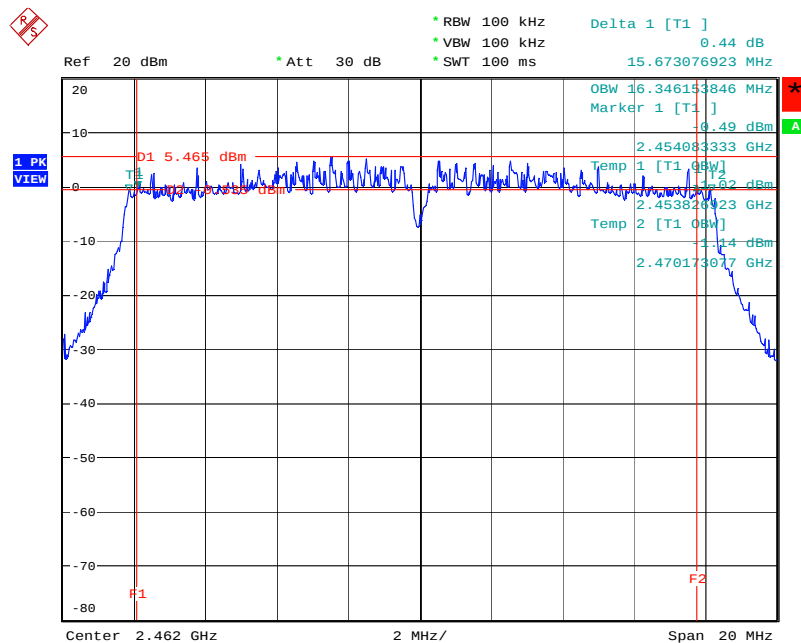
Date: 3.DEC.2007 09:57:06

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz / Mode 2



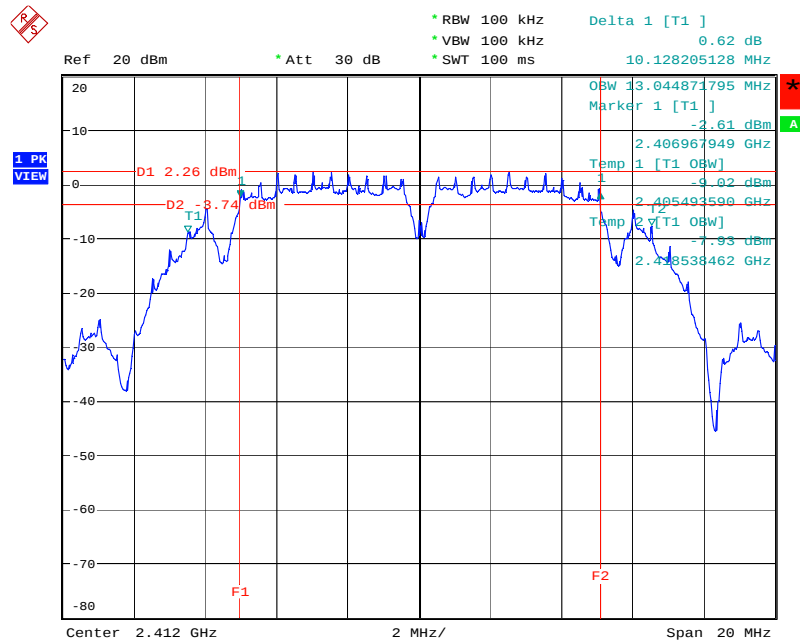
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6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2462 MHz / Mode 2



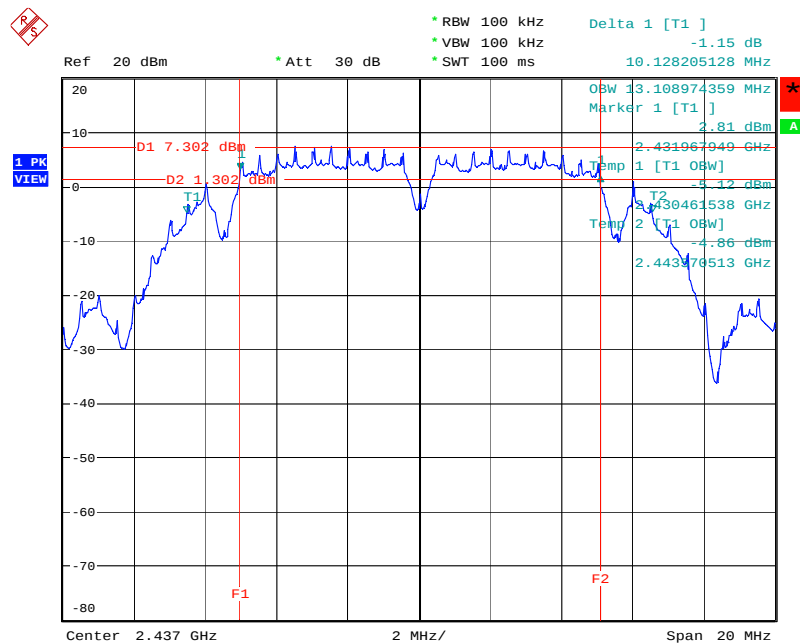
Date: 11.DEC.2007 10:12:47

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz / Mode 4



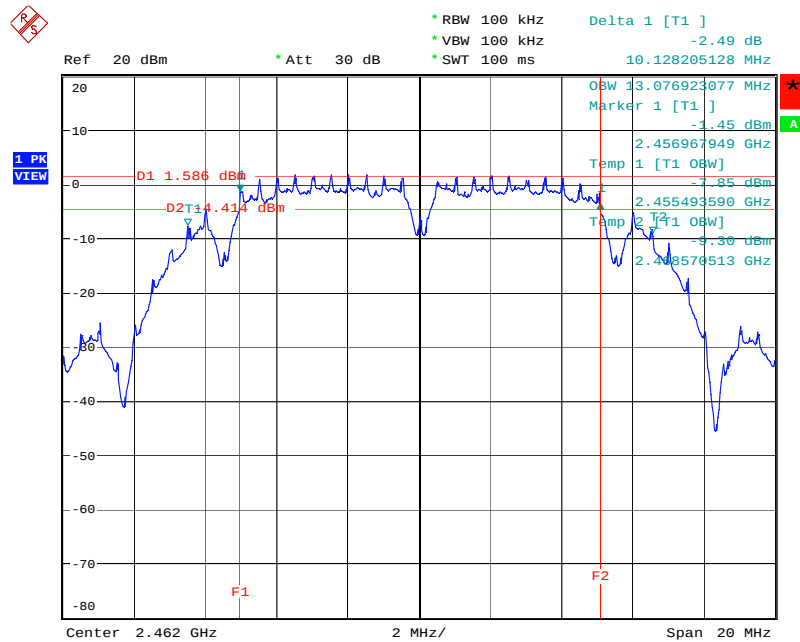
Date: 30.NOV.2007 13:04:59

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz / Mode 4



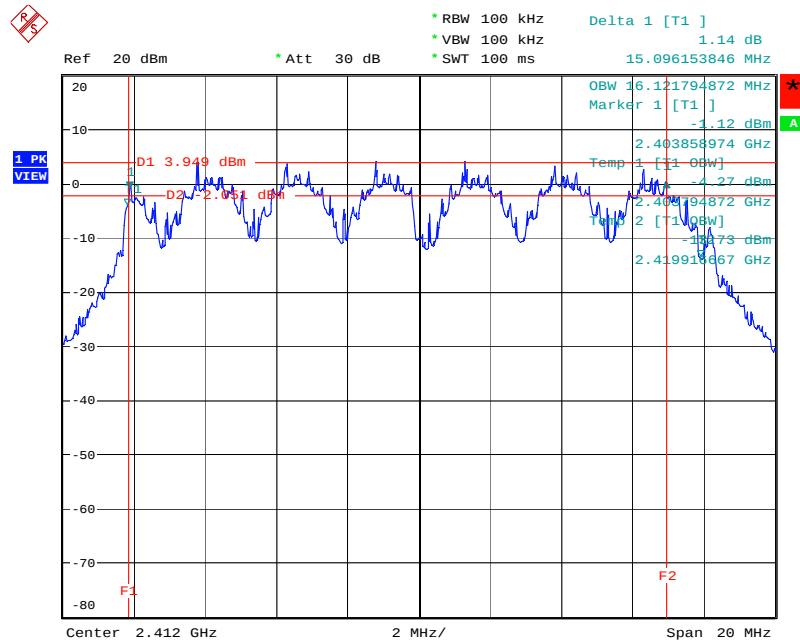
Date: 11.DEC.2007 09:37:10

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz / Mode 4



Date: 30.NOV.2007 13:12:42

6 dB Bandwidth Plot on Configuration IEEE 802.11g Ant. 3+Ant. 5 / 2412 MHz / Mode 4



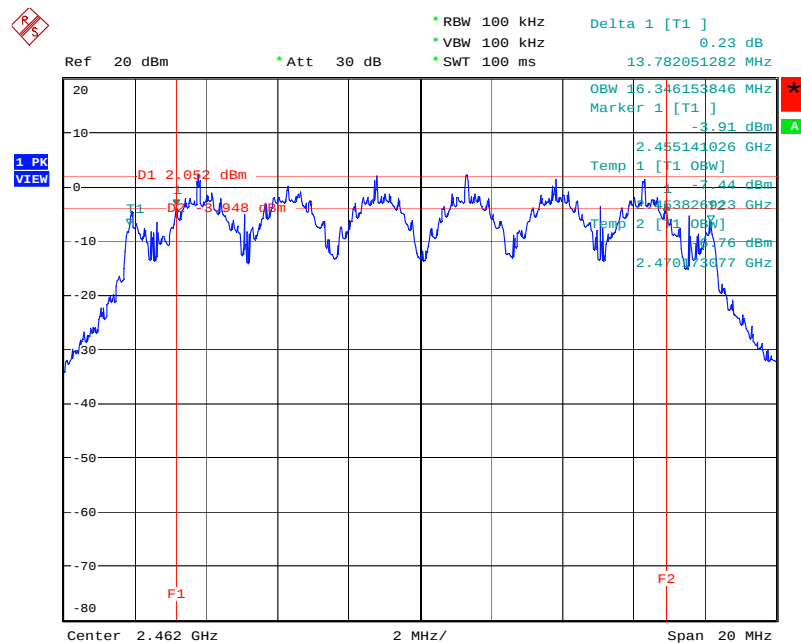
Date: 11.DEC.2007 09:42:52

6 dB Bandwidth Plot on Configuration IEEE 802.11g Ant. 3+Ant. 5 / 2437 MHz / Mode 4



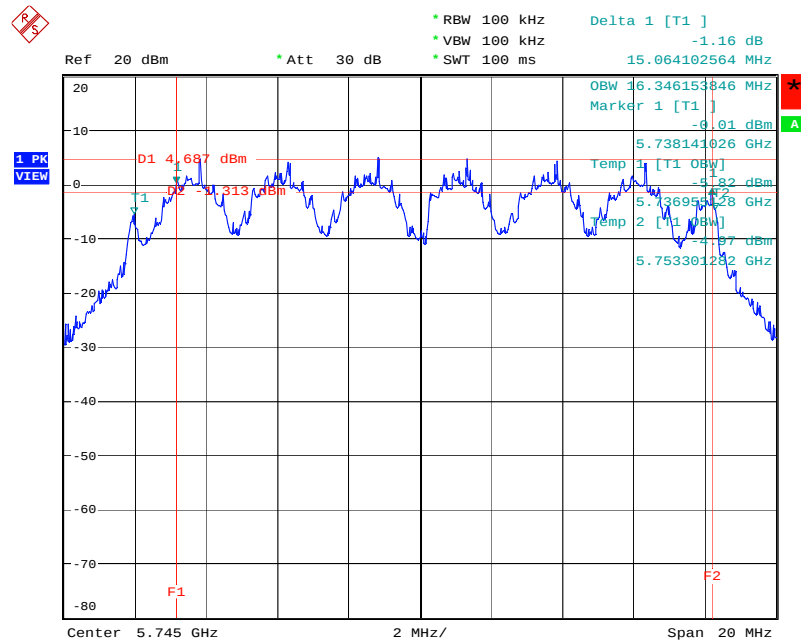
Date: 11.DEC.2007 09:44:59

6 dB Bandwidth Plot on Configuration IEEE 802.11g Ant. 3+Ant. 5 / 2462 MHz / Mode 4



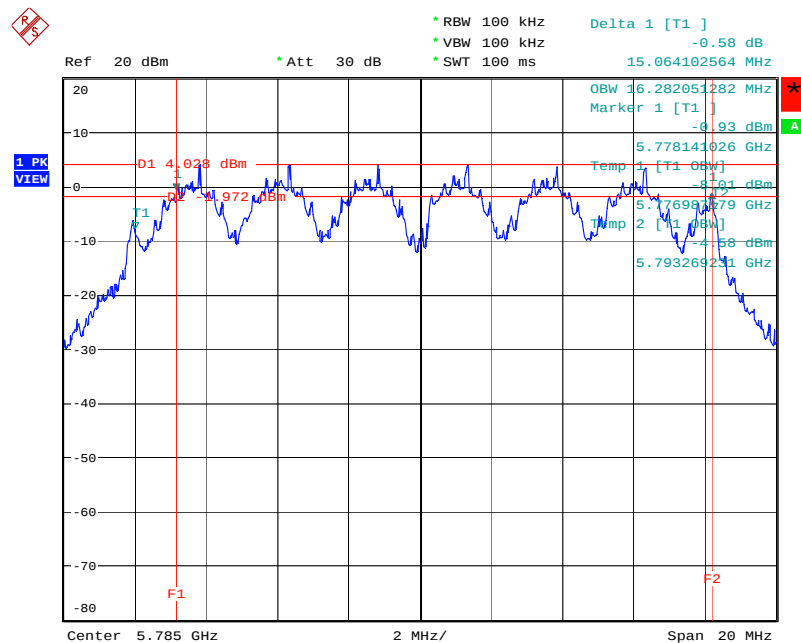
Date: 30.NOV.2007 14:03:37

6 dB Bandwidth Plot on Configuration IEEE 802.11a Ant. 3+Ant. 5 / 5745MHz / Mode 4



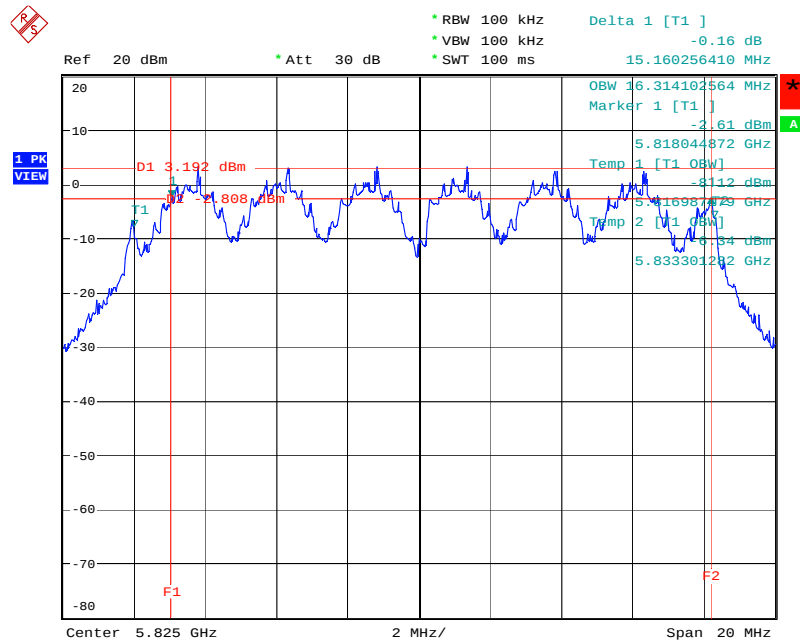
Date: 30.NOV.2007 15:46:58

6 dB Bandwidth Plot on Configuration IEEE 802.11a Ant. 3+Ant. 5 / 5785 MHz / Mode 4



Date: 30.NOV.2007 15:45:38

6 dB Bandwidth Plot on Configuration IEEE 802.11a Ant. 3+Ant. 5 / 5825MHz / Mode 4



Date: 30.NOV.2007 15:43:27

4.5. Radiated Emissions Measurement

4.5.1. Limit

20dBc 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

4.5.2. Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100KHz / 100KHz for peak

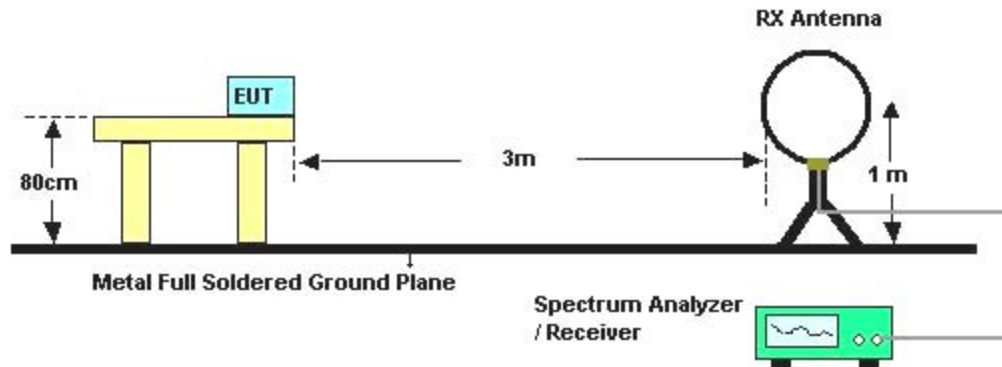
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

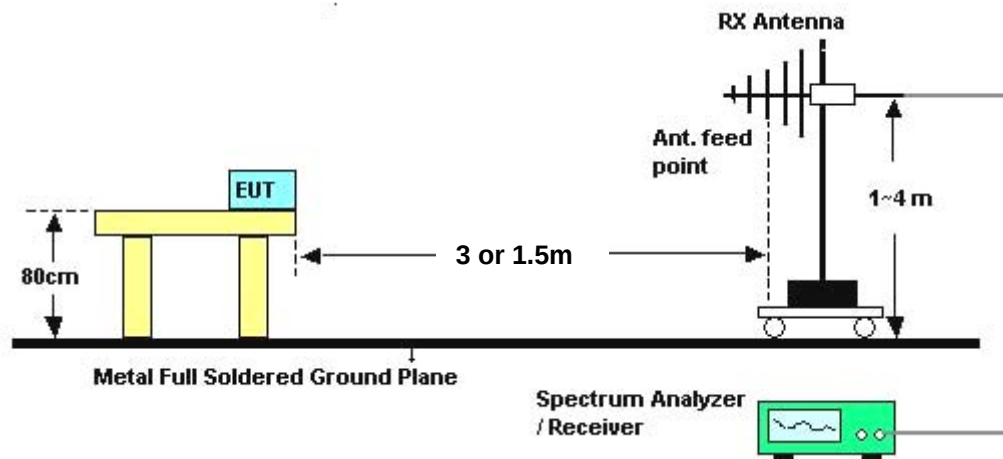
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.5.4. 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 1.5m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	23℃	Humidity	54%
Test Engineer	Barry Chen	Configurations	Normal Link

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.

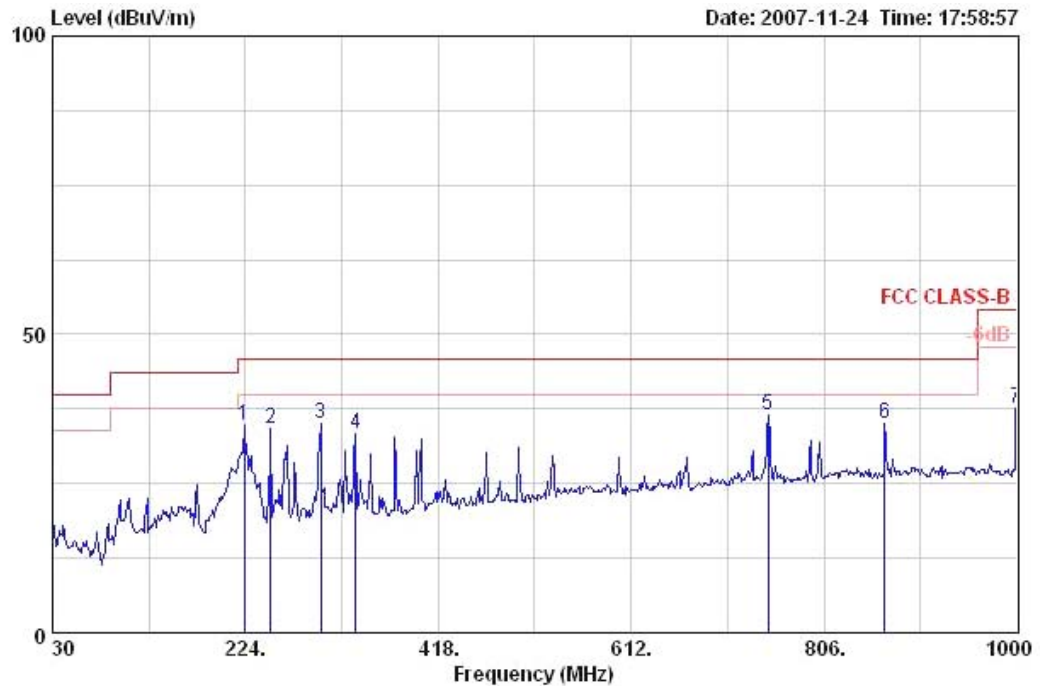
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

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

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

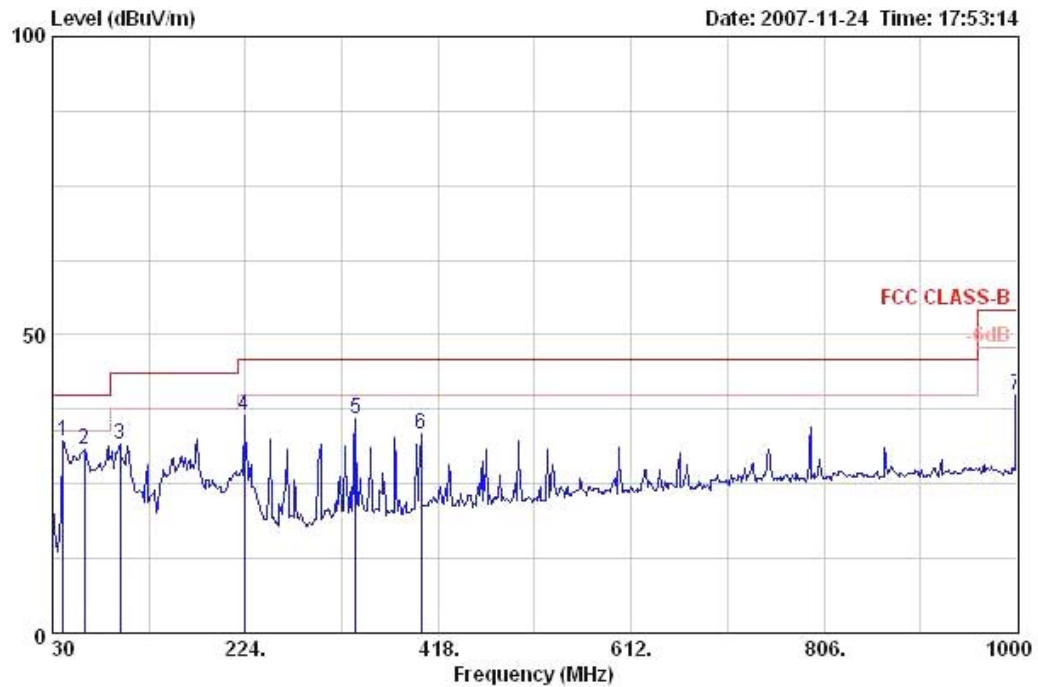
Temperature	23℃	Humidity	54%
Test Engineer	Barry Chen	Configurations	Normal Link / Mode 2

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna	Preamp	Cable	Table	Ant	
	MHz	dBUV/m	dB	dBUV/m	Level	Factor	Loss	Pos	Pos	Pol/Phase
					dBuV	dB/m	dB	deg	cm	
1	223.030	34.71	-11.29	46.00	51.06	8.91	27.05	1.79	100	HORIZONTAL
2	249.220	34.07	-11.93	46.00	47.61	11.56	27.00	1.90	100	HORIZONTAL
3	299.660	35.16	-10.84	46.00	47.06	12.90	26.90	2.10	100	HORIZONTAL
4	334.580	33.41	-12.59	46.00	44.42	13.97	27.14	2.17	100	HORIZONTAL
5	749.740	36.59	-9.41	46.00	40.82	20.07	27.80	3.50	100	HORIZONTAL
6	867.110	34.93	-11.07	46.00	38.51	20.43	27.47	3.47	100	HORIZONTAL
7	1000.000	37.69	-16.31	54.00	40.69	20.30	27.00	3.70	100	HORIZONTAL

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1	40.670	32.06	-7.94	40.00	47.71	11.45	27.80	0.70	Peak	236	100	VERTICAL
2	62.010	30.68	-9.32	40.00	52.64	4.95	27.75	0.84	Peak	0	400	VERTICAL
3	97.900	31.70	-11.80	43.50	48.20	9.95	27.61	1.16	Peak	0	400	VERTICAL
4	223.030	36.59	-9.41	46.00	52.94	8.91	27.05	1.79	Peak	0	400	VERTICAL
5	334.580	35.79	-10.21	46.00	46.80	13.97	27.14	2.17	Peak	0	400	VERTICAL
6	400.540	33.46	-12.54	46.00	42.81	15.95	27.61	2.31	Peak	0	400	VERTICAL
7	1000.000	39.85	-14.15	54.00	42.85	20.30	27.00	3.70	Peak	0	400	VERTICAL

Note:

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

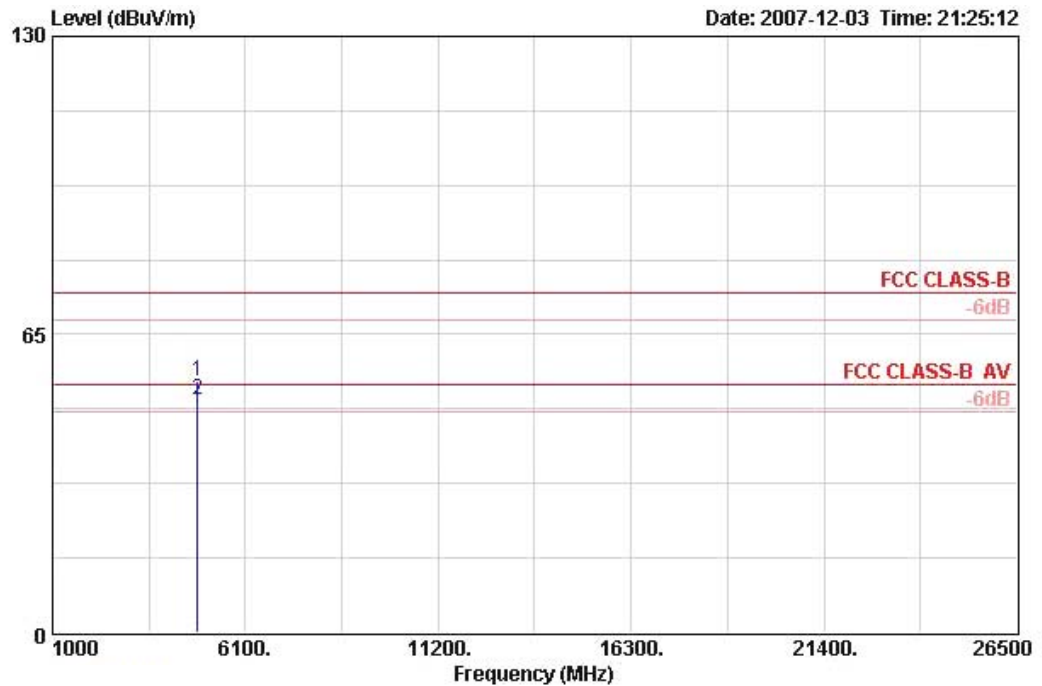
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

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

Temperature	23℃	Humidity	54%
Test Engineer	Barry Chen	Configurations	802.11b CH 1 Ant. A / Mode 2

Horizontal



	Freq	Level	Over Limit	Limit Line	Remark	Pol/Phase	Distance	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m			m	dBuV	dB/m	dB	dB
1	4823.960	54.80	-19.20	74.00	PEAK	HORIZONTAL	3	50.52	33.06	6.40	35.16
2 !	4824.030	50.86	-3.14	54.00	AVERAGE	HORIZONTAL	3	46.58	33.06	6.40	35.16