



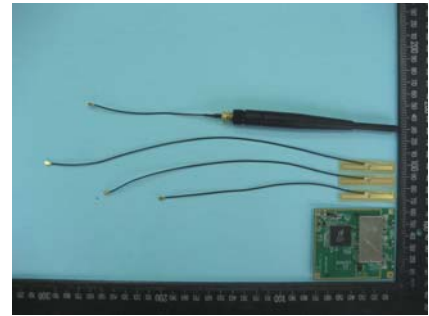
# SPORTON International Inc.

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## FCC RADIO TEST REPORT

Applicant's company	Hitron Technologies Inc.
Applicant Address	NO. 1-8, Lihsin 1st Rd. Hsinchu Science Park, Hsinchu, Taiwan 300
FCC ID	U4P-E45
Manufacturer's company	AboCom Systems, Inc
Manufacturer Address	No.77, Yu-Yih Rd., Chu-Nan, Miao-Lih County 35059, Taiwan R.O.C.

Product Name	WiFi module
Brand Name	Hitron Technologies, INC.
Model Name	E45
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	May 13, 2009
Final Test Date	May 25, 2009
Submission Type	Original Equipment



### Statement

**Test result included in this report is for the Draft n and 802.11b/g 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.



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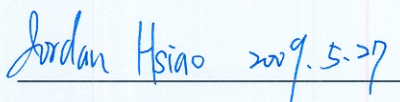
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## 1. CERTIFICATE OF COMPLIANCE

Product Name : WiFi module  
Brand Name : Hitron Technologies, INC.  
Model Name : E45  
Applicant : Hitron Technologies Inc.  
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on May 13, 2009 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.

  
Jordan Hsiao 2009.5.27

Jordan Hsiao

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	6.84 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	6.24 dB
4.3	15.247(e)	Power Spectral Density	Complies	3.95 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.08 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.08 dB
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±8.5×10 <sup>-8</sup>	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°C	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

### 3. GENERAL INFORMATION

#### 3.1. Product Details

##### Draft n

Items	Description
Product Type	WLAN (2TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	see the below table for draft n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for Draft n
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Channel Band Width (99%)	MCS0 (20MHz): 17.68 MHz ; MCS0 (40MHz): 36.16 MHz
Conducted Output Power	MCS0 (20MHz): 20.81 dBm ; MCS0 (40MHz): 20.50 dBm

##### 802.11b/g

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Channel Band Width (99%)	11b: 15.08 MHz ; 11g: 16.56 MHz
Conducted Output Power	11b: 17.55 dBm ; 11g: 23.76 dBm

##### Antenna & Band width

Antenna	Single (TX)		Two (TX)	
	20 MHz	40 MHz	20 MHz	40 MHz
802.11b	V	X	X	X
802.11g	V	X	X	X
Draft n	X	X	V	V

## Draft n spec

MCS Index	Nss	Modulation	R	NBPS	NCBPS		NDBPS		Datarate(Mbps)			
					20MHz	40MHz	20MHz	40MHz	800nsGI		400nsGI	
									20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150
8	2	BPSK	1/2	1	104	216	52	108	13.0	27.0	14.444	30
9	2	QPSK	1/2	2	208	432	104	216	26.0	54.0	28.889	60
10	2	QPSK	3/4	2	208	432	156	324	39.0	81.0	43.333	90
11	2	16-QAM	1/2	4	416	864	208	432	52.0	108.0	57.778	120
12	2	16-QAM	3/4	4	416	864	312	648	78.0	162.0	86.667	180
13	2	64-QAM	2/3	6	624	1296	416	864	104.0	216.0	115.556	240
14	2	64-QAM	3/4	6	624	1296	468	972	117.0	243.0	130.000	270
15	2	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0	144.444	300

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

### 3.2. Accessories

N/A

### 3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)	Remark
A-1	WANSHIH ELECTRONIC CO., LTD.	WPB106-A	PCB Antenna	I-PEX	4.93	TX/RX
A-2	WANSHIH ELECTRONIC CO., LTD.	WPB106-B	PCB Antenna	I-PEX	4.93	RX
A-3	WANSHIH ELECTRONIC CO., LTD.	WPB106-C	PCB Antenna	I-PEX	4.93	TX/RX
B	WANSHIH ELECTRONIC CO., LTD.	WSS001	Dipole Antenna	Reversed-SMA	3.00	TX/RX
C	WANSHIH ELECTRONIC CO., LTD.	WSS002	Dipole Antenna	Reversed-SMA	2.00	TX/RX

Note: The EUT has two types of antennas and three antenna connectors (J7, J6 and J5).

There are three kinds of collocations as follows:

**Type 1. EUT + PCB Antenna:** Ant. A-1 (J7) / Ant. A-2 (J6) / Ant. A-3 (J5)

**Type 2. EUT + Dipole Antenna + PCB Antenna:** Ant. B (J7) / Ant. A-2 (J6) / Ant. A-3 (J5)

**Type 3. EUT + Dipole Antenna + PCB Antenna:** Ant. C (J7) / Ant. A-2 (J6) / Ant. A-3 (J5)

Due to Ant. B and Ant. C is the same type antenna, only the higher gain antenna "Ant. B" was tested and recorded in this report.

**For 802.11b/g mode:**

Connector J7 can both transmit and receive signals.

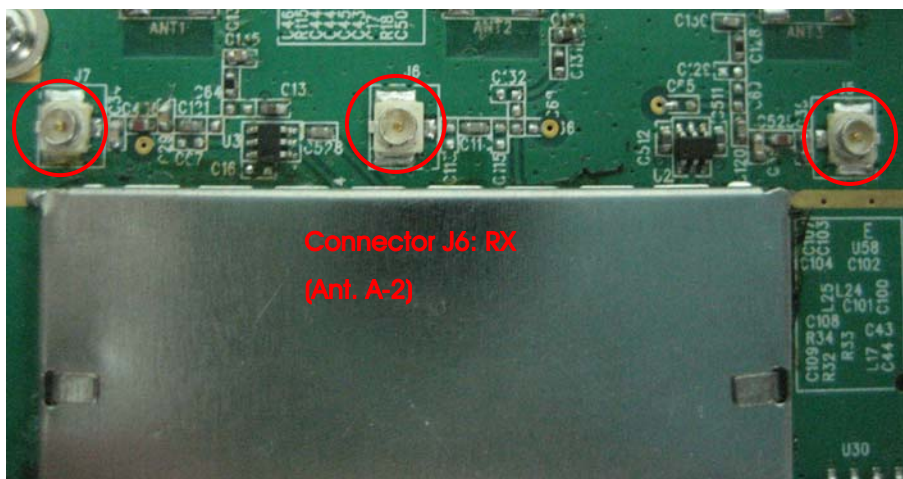
Connector J6 only can receive signals.

**For Draft n mode:**

Connector J5 and Connector J7 can both transmit simultaneously.

Connector J5, Connector J6 and Connector J7 can both receive simultaneously.

Connector J7: TX/RX  
(Ant. A-1 / Ant. B / Ant. C)



Connector J5: TX/RX  
(Ant. A-3)

Connector J6: RX  
(Ant. A-2)



### 3.4. Table for Carrier Frequencies

There are two bandwidth systems for draft n.

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

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

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz		

### 3.5. Table for Test Modes

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

Test Items	Mode	Data Rate	Channel	Antenna Connector
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Peak Conducted Output Power	MCS0/20MHz	6.5 Mbps	1/6/11	J5 / J7 / J5 + J7
	MCS0/40MHz	13.5 Mbps	3/6/9	
	11b/BPSK	1 Mbps	1/6/11	J7
	11g/BPSK	6 Mbps	1/6/11	
Power Spectral Density 6dB Spectrum Bandwidth	MCS0/20MHz	6.5 Mbps	1/6/11	J5 / J7 / J5 + J7
	MCS0/40MHz	13.5 Mbps	3/6/9	
	11b/BPSK	1 Mbps	1/6/11	J7
	11g/BPSK	6 Mbps	1/6/11	
Radiated Emissions 9kHz~1GHz	Normal Link	-	-	-
Radiated Emissions 1GHz~10 <sup>th</sup> Harmonic	MCS0/20MHz	6.5 Mbps	1/6/11	J5 / J7 / J5 + J7
	MCS0/40MHz	13.5 Mbps	3/6/9	
	11b/BPSK	1 Mbps	1/6/11	J7
	11g/BPSK	6 Mbps	1/6/11	
Band Edge Emissions	MCS0/20MHz	6.5 Mbps	1/11	J5 / J7 / J5 + J7
	MCS0/40MHz	13.5 Mbps	3/9	
	11b/BPSK	1 Mbps	1/11	J7
	11g/BPSK	6 Mbps	1/11	

Test Mode:

Mode 1: EUT + PCB Antenna

Mode 2: EUT + Dipole Antenna + PCB Antenna

### 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	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 Draft n MCS0 20MHz

Test Software Version	QA		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS0 20MHz	0E/12	11/16	0E/13
MCS0 40MHz	0A/0E	12/17	0D/11

#### Power Parameters of IEEE 802.11b/g

Test Software Version	QA		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	0C	0C	0B
IEEE 802.11g	10	1F	11

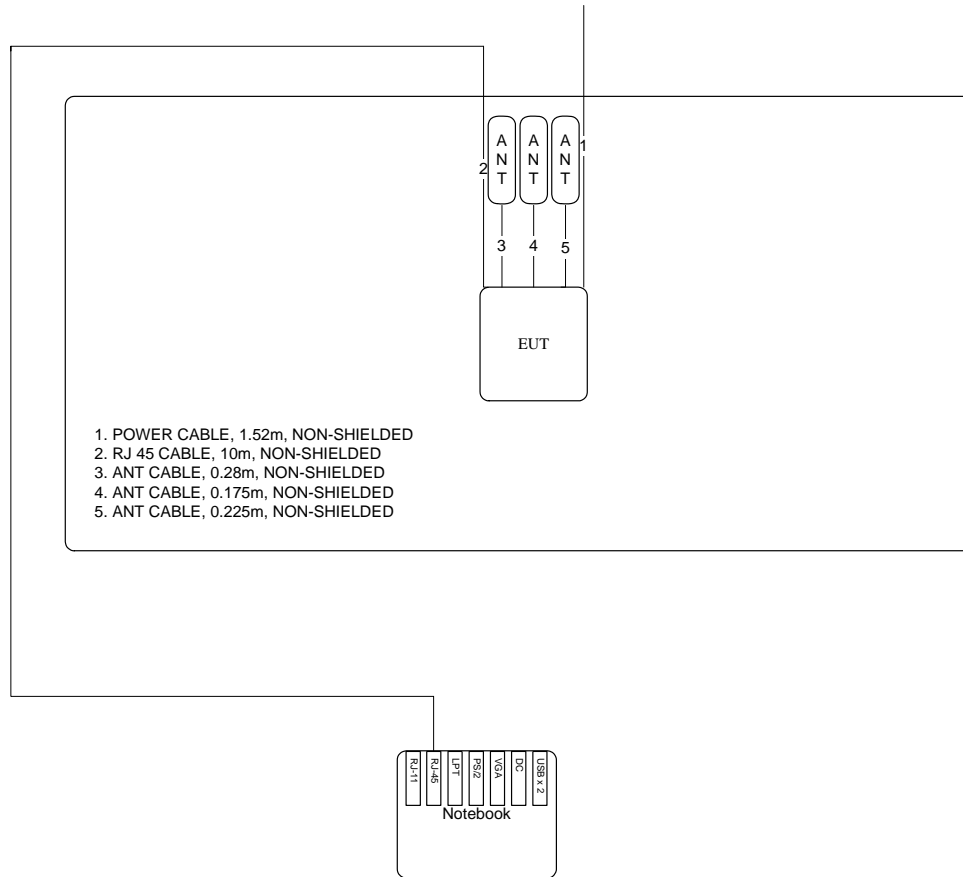
During the test, the following programs under WIN XP were executed:

At the same time, "QA" was executed the test program to control the EUT continuously transmit RF signal.

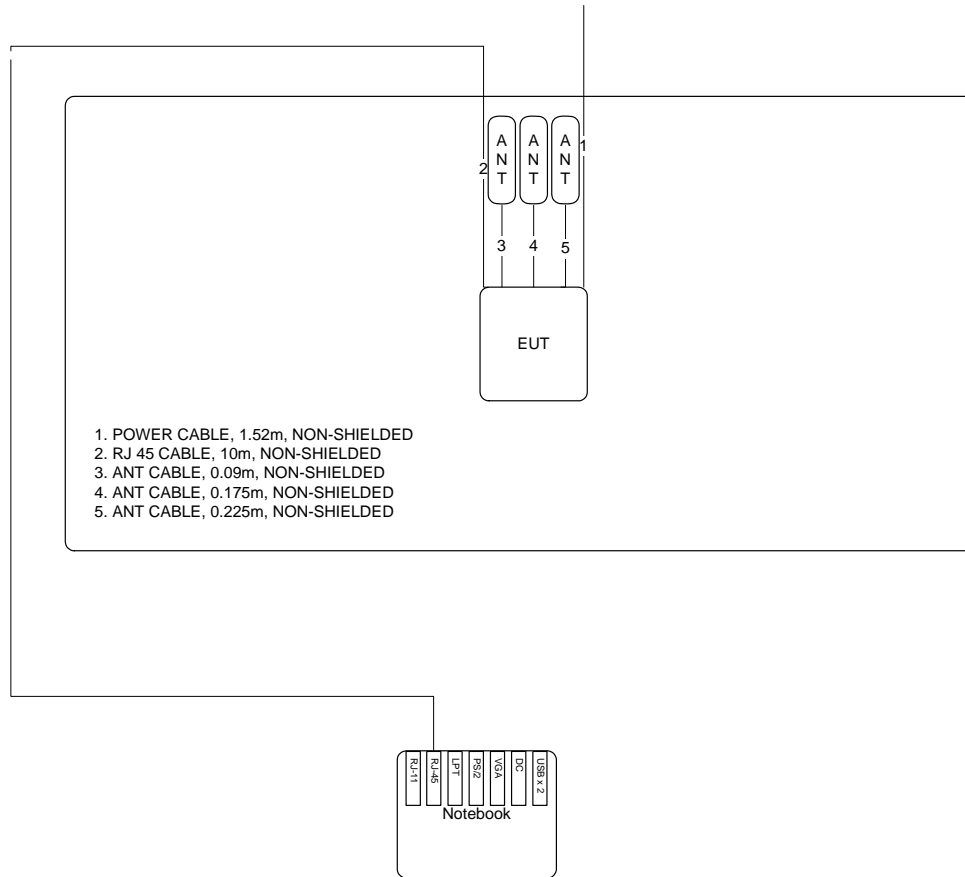
### 3.9. Test Configurations

#### 3.9.1. Radiation Emissions Test Configuration

Test Mode: Mode 1

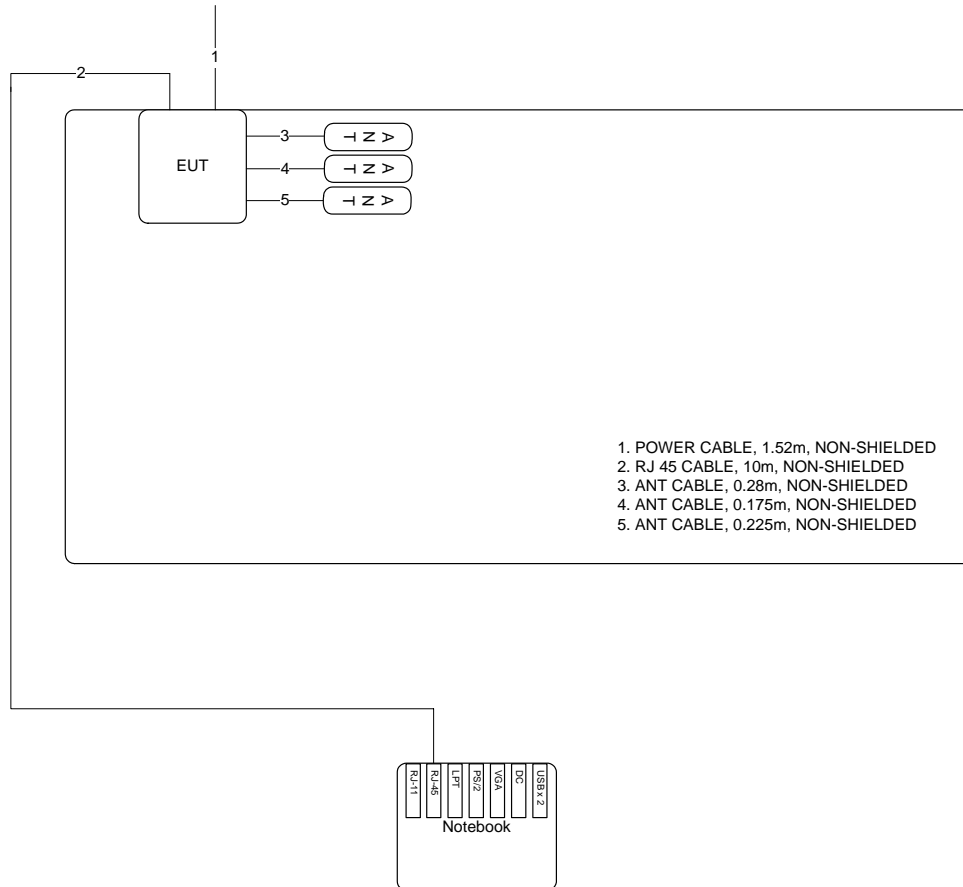


Test Mode: Mode 2

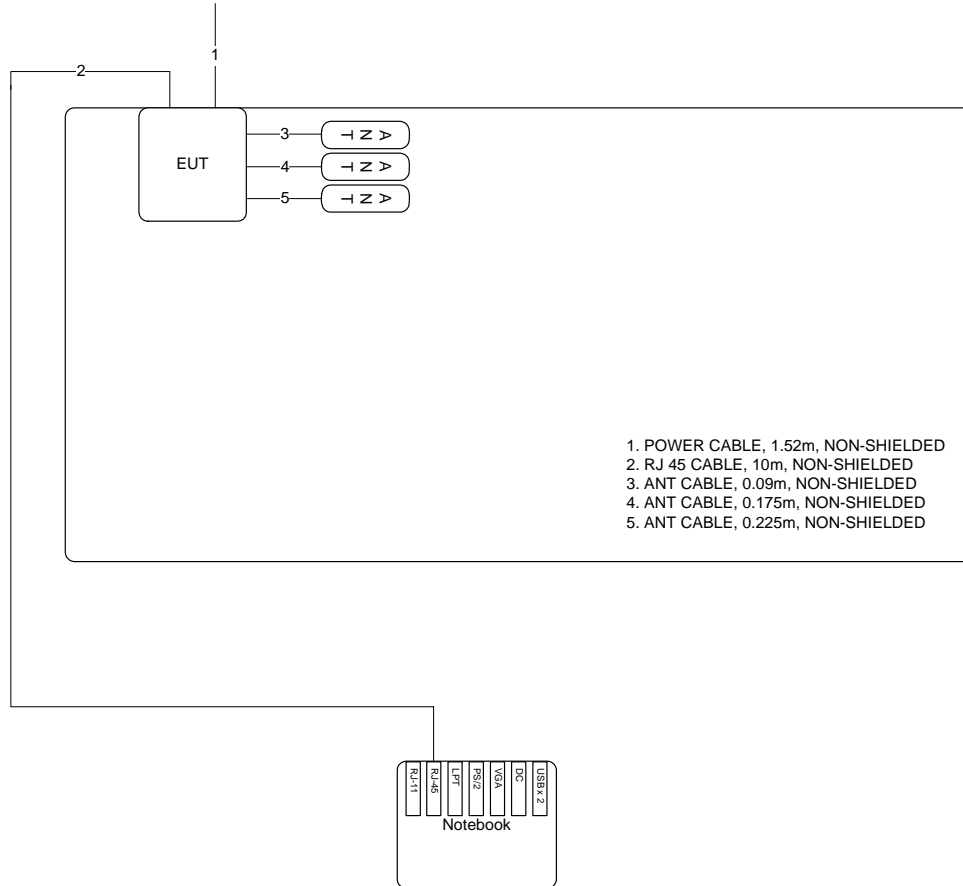


### 3.9.2. AC Power Line Conduction Emissions Test Configuration

Test Mode: Mode 1



Test Mode: Mode 2



## 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

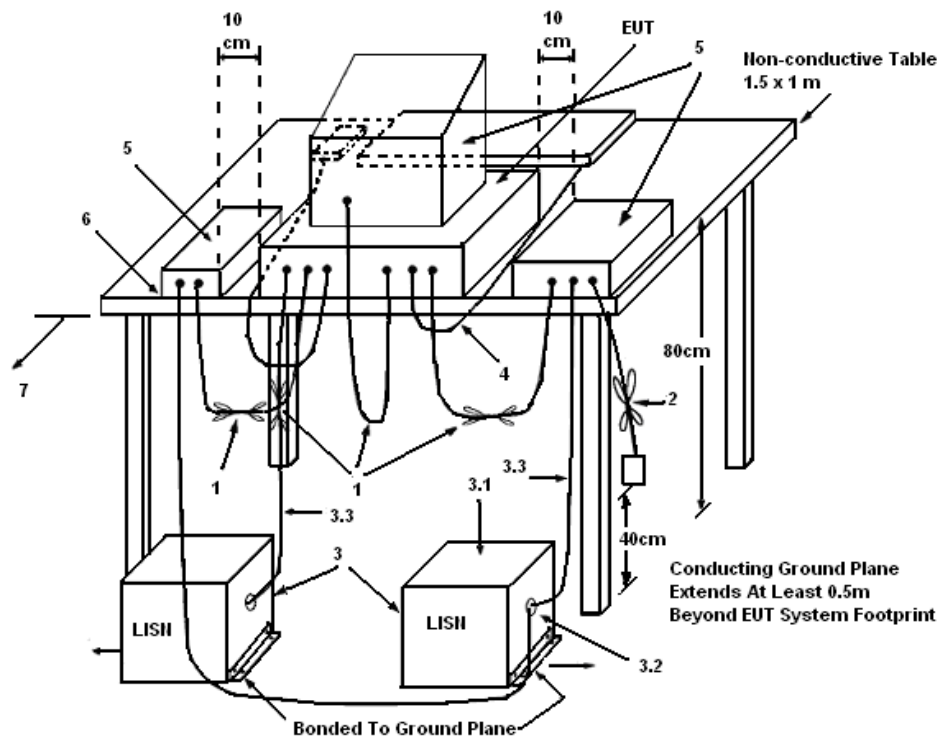
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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.

#### 4.1.4. Test Setup Layout



#### LEGEND:

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . 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.

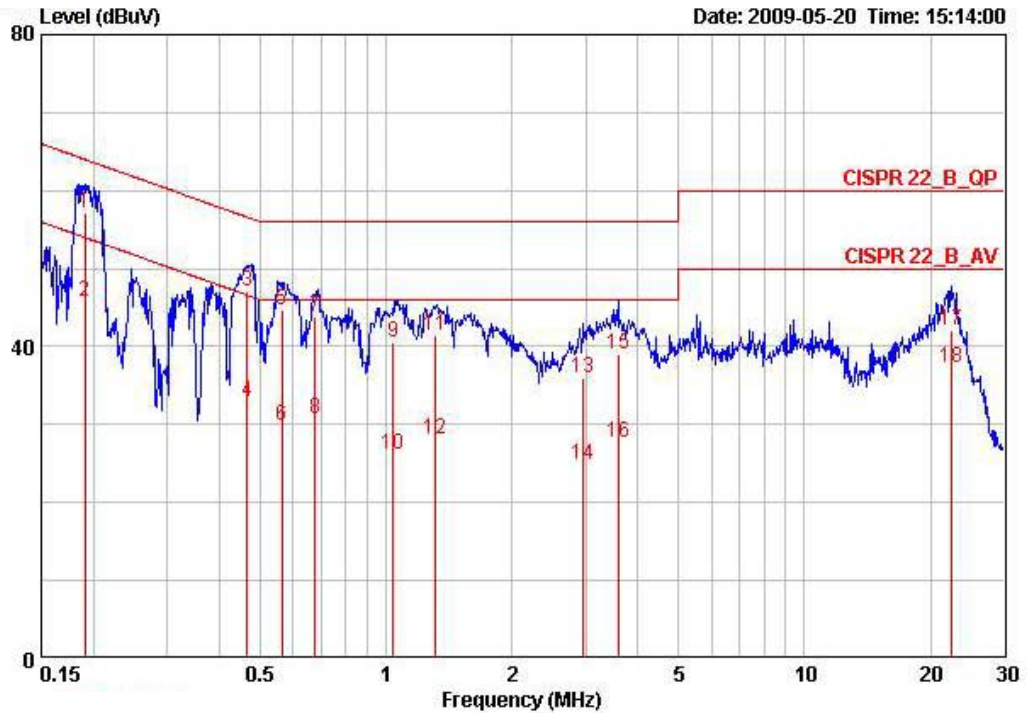
#### 4.1.6. EUT Operation during Test

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



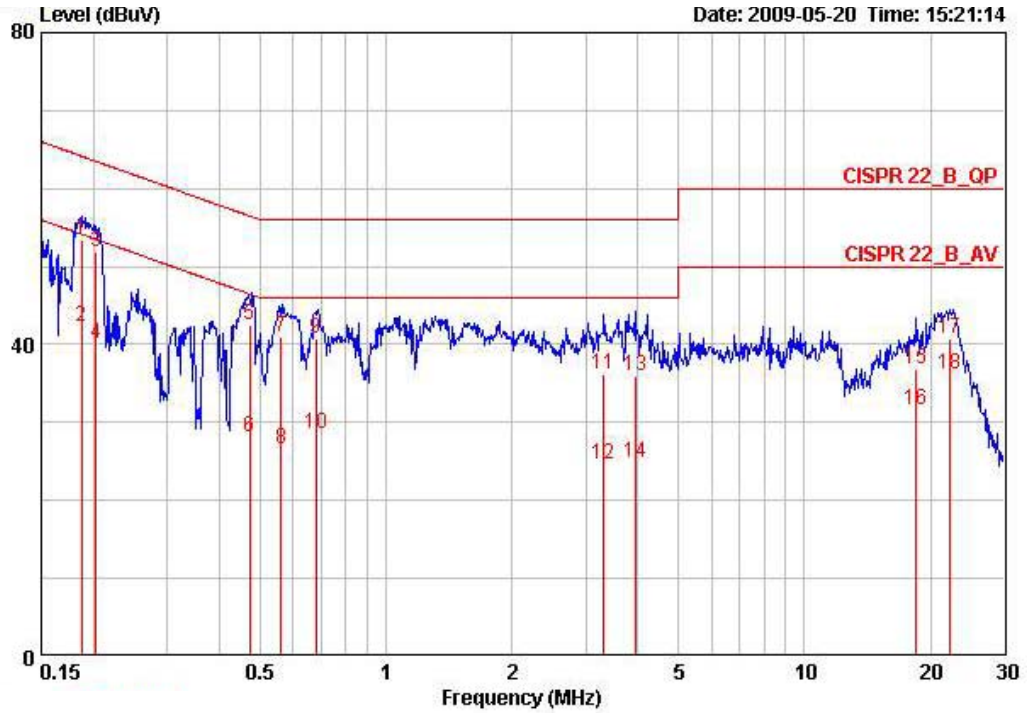
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25.3°C	Humidity	62%
Test Engineer	Howar Sung	Phase	Line
Configuration	Mode 1		



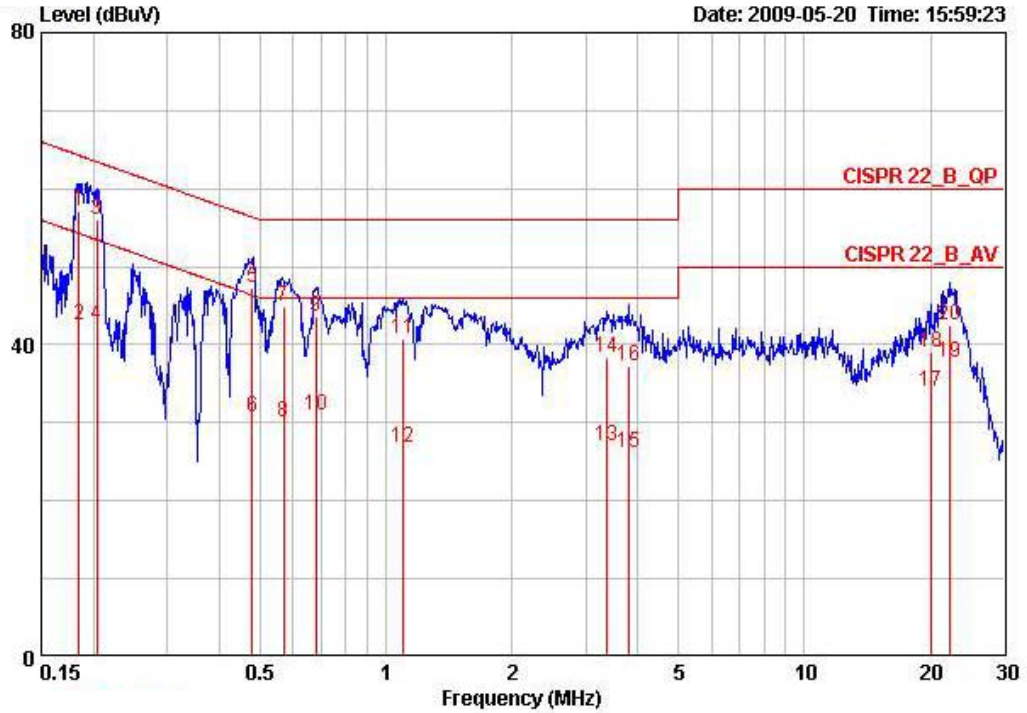
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.19119	57.14	-6.84	63.98	56.89	0.05	0.20	QP
2	0.19119	45.82	-8.16	53.98	45.57	0.05	0.20	AVERAGE
3	0.46545	47.05	-9.54	56.59	46.82	0.03	0.20	QP
4	0.46545	32.94	-13.65	46.59	32.71	0.03	0.20	AVERAGE
5	0.56466	44.67	-11.33	56.00	44.44	0.03	0.20	QP
6	0.56466	29.89	-16.11	46.00	29.66	0.03	0.20	AVERAGE
7	0.67550	43.87	-12.13	56.00	43.64	0.03	0.20	QP
8	0.67550	30.79	-15.21	46.00	30.56	0.03	0.20	AVERAGE
9	1.039	40.62	-15.38	56.00	40.40	0.03	0.19	QP
10	1.039	26.09	-19.91	46.00	25.87	0.03	0.19	AVERAGE
11	1.309	41.32	-14.68	56.00	41.15	0.04	0.13	QP
12	1.309	28.08	-17.92	46.00	27.91	0.04	0.13	AVERAGE
13	2.946	35.99	-20.01	56.00	35.71	0.08	0.20	QP
14	2.946	24.90	-21.10	46.00	24.62	0.08	0.20	AVERAGE
15	3.582	39.01	-16.99	56.00	38.62	0.09	0.30	QP
16	3.582	27.64	-18.36	46.00	27.25	0.09	0.30	AVERAGE
17	22.535	42.15	-17.85	60.00	40.66	0.99	0.50	QP
18	22.535	37.37	-12.63	50.00	35.88	0.99	0.50	AVERAGE

Temperature	25.3°C	Humidity	62%
Test Engineer	Howar Sung	Phase	Neutral
Configuration	Mode 1		



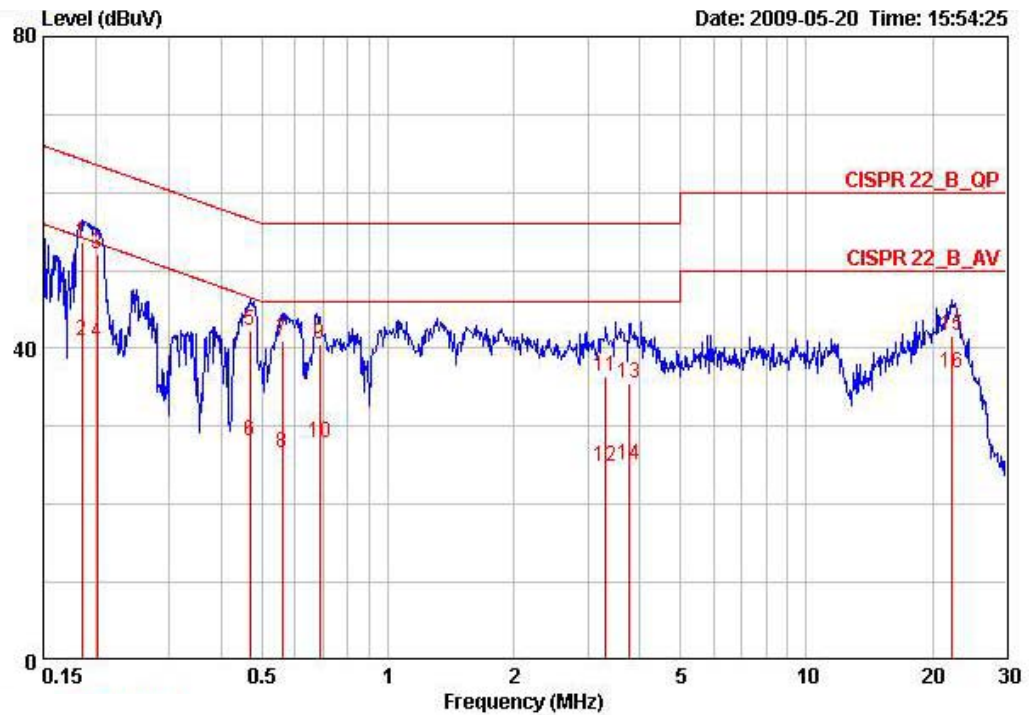
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18739	53.42	-10.74	64.15	53.13	0.09	0.20	QP
2	0.18739	42.31	-11.85	54.15	42.02	0.09	0.20	AVERAGE
3	0.20289	51.93	-11.56	63.49	51.65	0.08	0.20	QP
4	0.20289	40.11	-13.38	53.49	39.83	0.08	0.20	AVERAGE
5	0.47240	42.55	-13.93	56.47	42.30	0.07	0.18	QP
6	0.47240	28.17	-18.31	46.47	27.92	0.07	0.18	AVERAGE
7	0.56169	41.06	-14.94	56.00	40.79	0.07	0.20	QP
8	0.56169	26.50	-19.50	46.00	26.23	0.07	0.20	AVERAGE
9	0.67886	40.86	-15.14	56.00	40.59	0.07	0.20	QP
10	0.67886	28.61	-17.39	46.00	28.34	0.07	0.20	AVERAGE
11	3.317	36.25	-19.75	56.00	35.86	0.13	0.26	QP
12	3.317	24.61	-21.39	46.00	24.22	0.13	0.26	AVERAGE
13	3.944	35.89	-20.11	56.00	35.45	0.14	0.30	QP
14	3.944	24.85	-21.15	46.00	24.41	0.14	0.30	AVERAGE
15	18.524	36.79	-23.21	60.00	35.55	0.74	0.50	QP
16	18.524	31.66	-18.34	50.00	30.42	0.74	0.50	AVERAGE
17	22.298	40.86	-19.15	60.00	39.37	0.99	0.50	QP
18	22.298	36.21	-13.80	50.00	34.72	0.99	0.50	AVERAGE

Temperature	25.3°C	Humidity	62%
Test Engineer	Howar Sung	Phase	Line
Configuration	Mode 2		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18443	57.07	-7.22	64.28	56.81	0.06	0.20	QP
2	0.18443	42.50	-11.79	54.28	42.24	0.06	0.20	AVERAGE
3	0.20396	56.02	-7.43	63.45	55.77	0.05	0.20	QP
4	0.20396	42.60	-10.85	53.45	42.35	0.05	0.20	AVERAGE
5	0.47975	47.28	-9.07	56.34	47.12	0.03	0.13	QP
6	0.47975	30.80	-15.55	46.34	30.64	0.03	0.13	AVERAGE
7	0.56934	44.95	-11.05	56.00	44.72	0.03	0.20	QP
8	0.56934	30.19	-15.81	46.00	29.96	0.03	0.20	AVERAGE
9	0.67842	43.63	-12.37	56.00	43.40	0.03	0.20	QP
10	0.67842	30.95	-15.05	46.00	30.72	0.03	0.20	AVERAGE
11	1.094	40.71	-15.29	56.00	40.50	0.03	0.18	QP
12	1.094	26.89	-19.11	46.00	26.68	0.03	0.18	AVERAGE
13	3.381	27.09	-18.91	46.00	26.73	0.09	0.28	AVERAGE
14	3.381	38.28	-17.72	56.00	37.92	0.09	0.28	QP
15	3.799	26.15	-19.85	46.00	25.75	0.10	0.30	AVERAGE
16	3.799	37.35	-18.65	56.00	36.95	0.10	0.30	QP
17	20.056	34.02	-15.98	50.00	32.69	0.83	0.50	AVERAGE
18	20.056	38.92	-21.08	60.00	37.59	0.83	0.50	QP
19	22.298	37.78	-12.23	50.00	36.30	0.98	0.50	AVERAGE
20	22.298	42.55	-17.46	60.00	41.07	0.98	0.50	QP

Temperature	25.3°C	Humidity	62%
Test Engineer	Howar Sung	Phase	Neutral
Configuration	Mode 2		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18541	53.54	-10.70	64.24	53.25	0.09	0.20	QP
2	0.18541	40.90	-13.34	54.24	40.61	0.09	0.20	AVERAGE
3	0.20181	52.13	-11.41	63.54	51.85	0.08	0.20	QP
4	0.20181	40.76	-12.78	53.54	40.48	0.08	0.20	AVERAGE
5	0.46861	42.31	-14.23	56.54	42.04	0.07	0.20	QP
6	0.46861	28.05	-18.49	46.54	27.78	0.07	0.20	AVERAGE
7	0.55815	40.92	-15.08	56.00	40.65	0.07	0.20	QP
8	0.55815	26.61	-19.39	46.00	26.34	0.07	0.20	AVERAGE
9	0.68626	40.64	-15.36	56.00	40.37	0.07	0.20	QP
10	0.68626	27.93	-18.07	46.00	27.66	0.07	0.20	AVERAGE
11	3.296	36.51	-19.49	56.00	36.12	0.13	0.26	QP
12	3.296	24.80	-21.20	46.00	24.41	0.13	0.26	AVERAGE
13	3.759	35.53	-20.47	56.00	35.09	0.14	0.30	QP
14	3.759	25.03	-20.97	46.00	24.59	0.14	0.30	AVERAGE
15	22.298	41.57	-18.44	60.00	40.08	0.99	0.50	QP
16	22.298	36.79	-13.22	50.00	35.30	0.99	0.50	AVERAGE

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

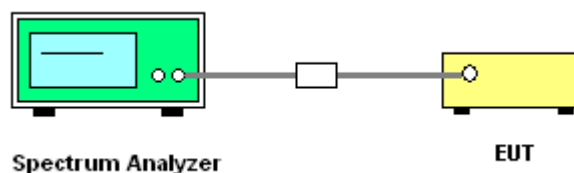
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1MHz
VB	3MHz
Detector	RMS
Trace	Max Hold
Sweep Time	Auto

### 4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. 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 Conducted Output Power

<b>Temperature</b>	23°C	<b>Humidity</b>	56%
<b>Test Engineer</b>	Alan Huang	<b>Configurations</b>	Draft n

##### Configuration Draft n MCS0 20MHz Antenna Connector J5

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.65	30.00	Complies
6	2437 MHz	17.85	30.00	Complies
11	2462 MHz	16.52	30.00	Complies

##### Configuration Draft n MCS0 20MHz Antenna Connector J7

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.70	30.00	Complies
6	2437 MHz	17.74	30.00	Complies
11	2462 MHz	16.01	30.00	Complies

##### Configuration Draft n MCS0 20MHz Antenna Connector J5 + J7

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	19.69	30.00	Complies
6	2437 MHz	20.81	30.00	Complies
11	2462 MHz	19.28	30.00	Complies

**Configuration Draft n MCS0 40MHz Antenna Connector J5**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	13.52	30.00	Complies
6	2437 MHz	17.55	30.00	Complies
9	2452 MHz	14.53	30.00	Complies

**Configuration Draft n MCS0 40MHz Antenna Connector J7**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	13.67	30.00	Complies
6	2437 MHz	17.42	30.00	Complies
9	2452 MHz	14.66	30.00	Complies

**Configuration Draft n MCS0 40MHz Antenna Connector J5 + J7**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	16.61	30.00	Complies
6	2437 MHz	20.50	30.00	Complies
9	2452 MHz	17.61	30.00	Complies

<b>Temperature</b>	23°C	<b>Humidity</b>	56%
<b>Test Engineer</b>	Alan Huang	<b>Configurations</b>	802.11b/g

**Configuration IEEE 802.11b Antenna Connector J7**

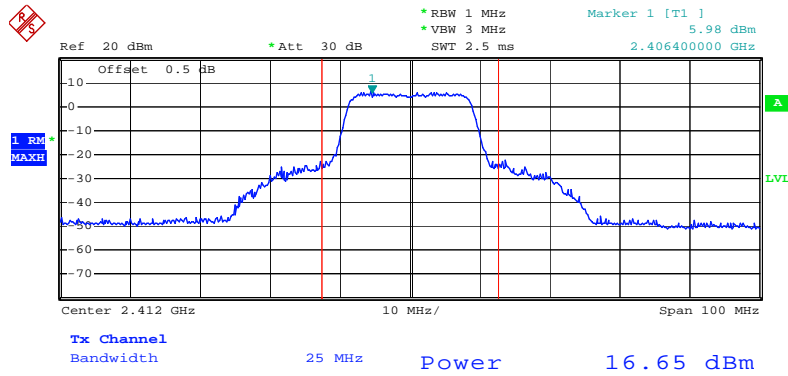
Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	17.55	30.00	<b>Complies</b>
6	2437 MHz	17.07	30.00	<b>Complies</b>
11	2462 MHz	16.26	30.00	<b>Complies</b>

**Configuration IEEE 802.11g Antenna Connector J7**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	17.92	30.00	<b>Complies</b>
6	2437 MHz	23.76	30.00	<b>Complies</b>
11	2462 MHz	17.59	30.00	<b>Complies</b>

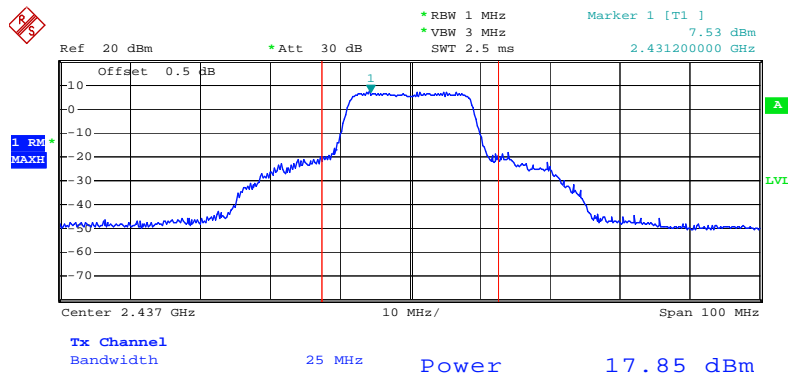


Conducted Output Power Plot on Configuration Draft n MCS0 20MHz Connector J5 / 2412 MHz



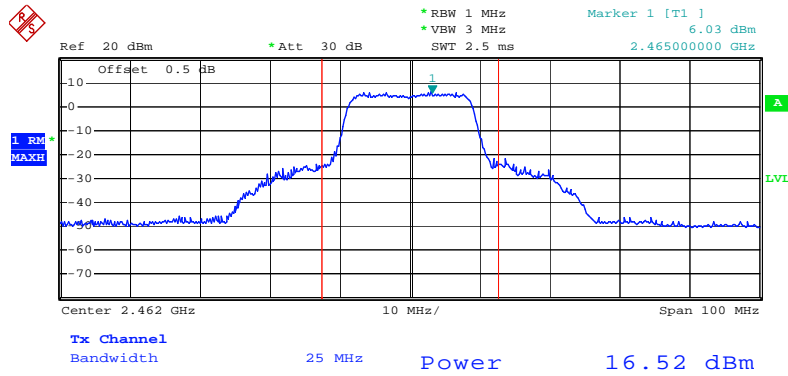
Date: 25.MAY.2009 15:48:25

Conducted Output Power Plot on Configuration Draft n MCS0 20MHz Connector J5 / 2437 MHz



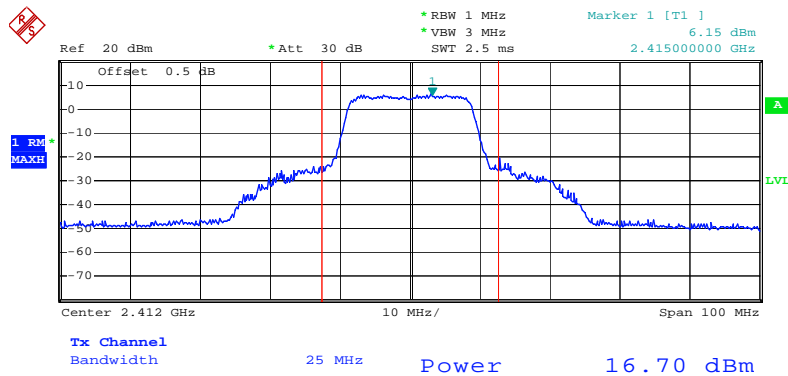
Date: 25.MAY.2009 15:53:21

Conducted Output Power Plot on Configuration Draft n MCS0 20MHz Connector J5 / 2462 MHz



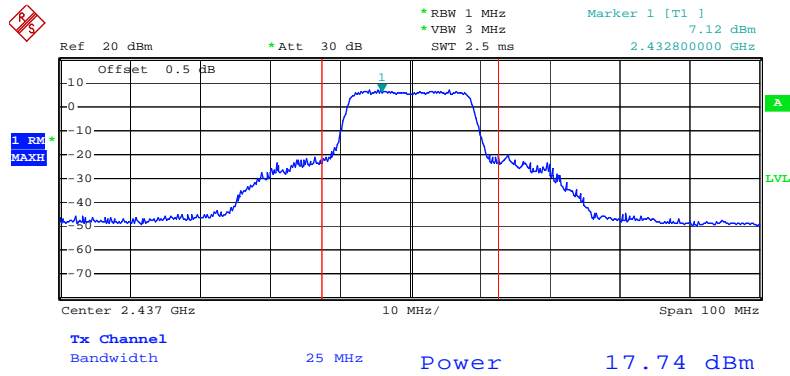
Date: 25.MAY.2009 15:57:45

Conducted Output Power Plot on Configuration Draft n MCS0 20MHz Connector J7 / 2412 MHz



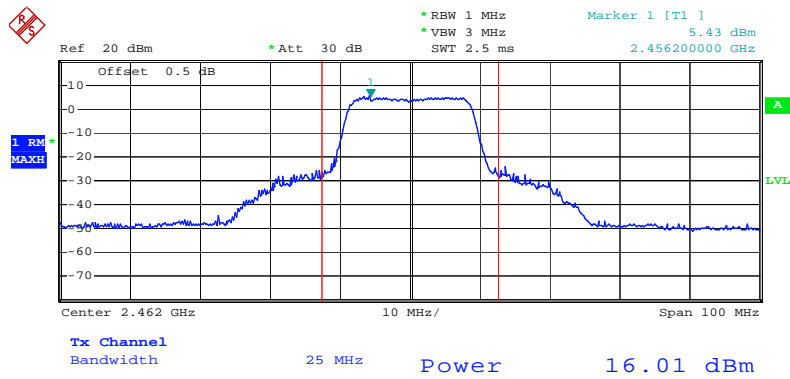
Date: 25.MAY.2009 15:50:16

Conducted Output Power Plot on Configuration Draft n MCS0 20MHz Connector J7 / 2437 MHz



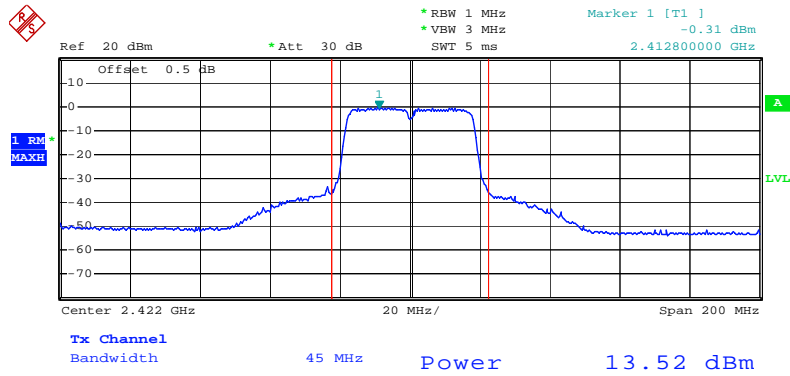
Date: 25.MAY.2009 15:54:12

Conducted Output Power Plot on Configuration Draft n MCS0 20MHz Connector J7 / 2462 MHz



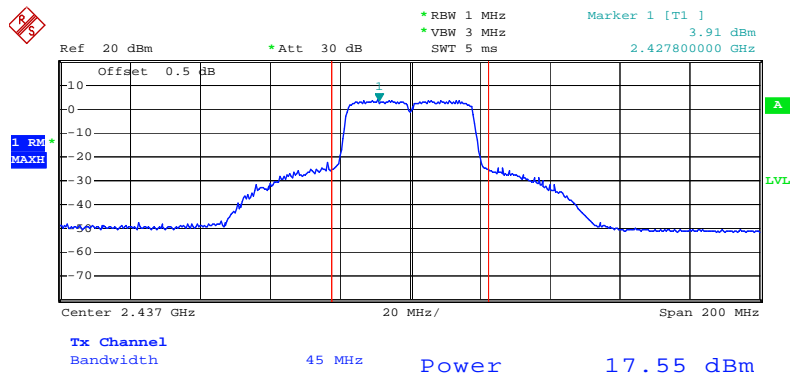
Date: 25.MAY.2009 15:58:54

Conducted Output Power Plot on Configuration Draft n MCS0 40MHz Connector J5 / 2422 MHz



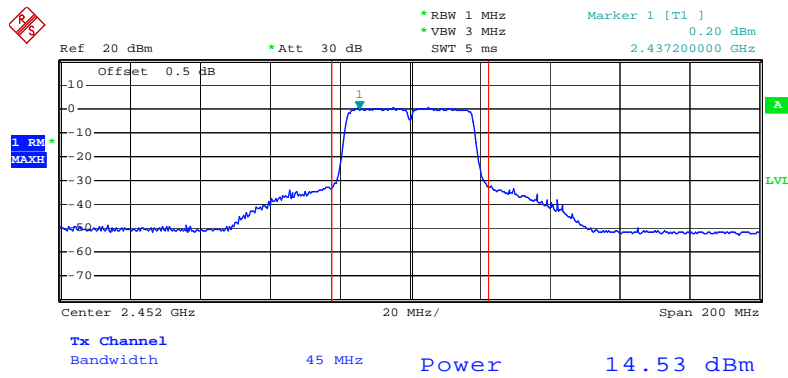
Date: 25.MAY.2009 16:03:13

Conducted Output Power Plot on Configuration Draft n MCS0 40MHz Connector J5 / 2437 MHz



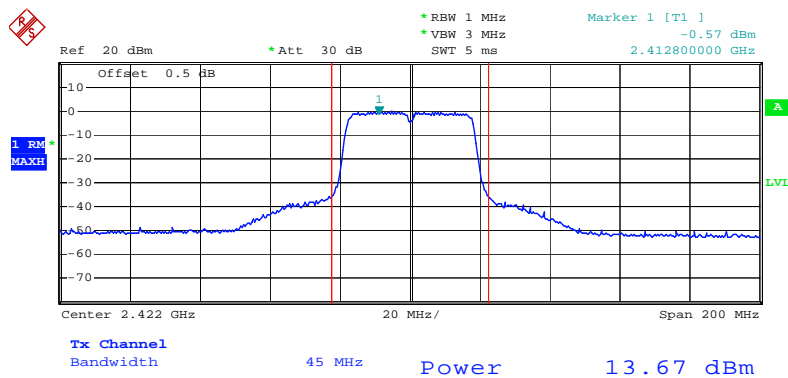
Date: 25.MAY.2009 16:06:36

Conducted Output Power Plot on Configuration Draft n MCS0 40MHz Connector J5 / 2452 MHz



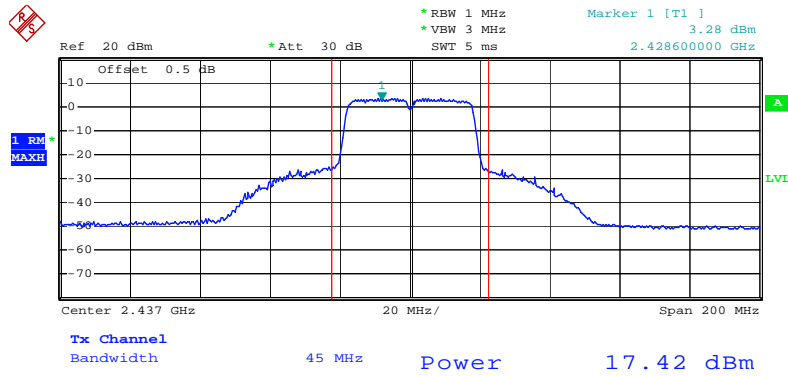
Date: 25.MAY.2009 16:09:39

Conducted Output Power Plot on Configuration Draft n MCS0 40MHz Connector J7 / 2422 MHz



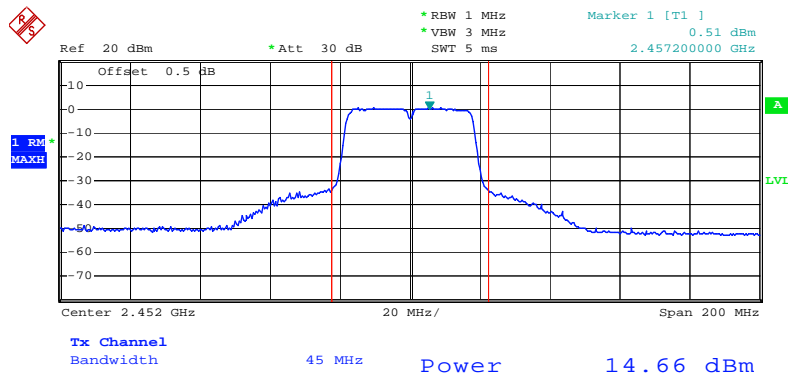
Date: 25.MAY.2009 16:03:56

Conducted Output Power Plot on Configuration Draft n MCS0 40MHz Connector J7 / 2437 MHz



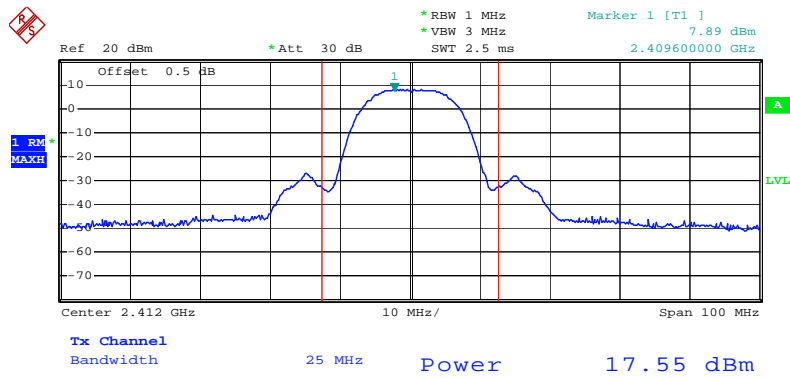
Date: 25.MAY.2009 16:07:38

Conducted Output Power Plot on Configuration Draft n MCS0 40MHz Connector J7 / 2452 MHz



Date: 25.MAY.2009 16:08:36

### Conducted Output Power Plot on Configuration IEEE 802.11b Connector J7 / 2412 MHz



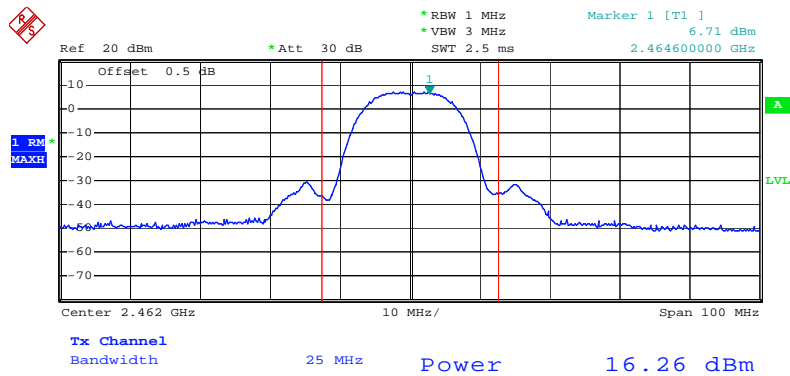
Date: 25.MAY.2009 15:28:10

### Conducted Output Power Plot on Configuration IEEE 802.11b Connector J7 / 2437 MHz



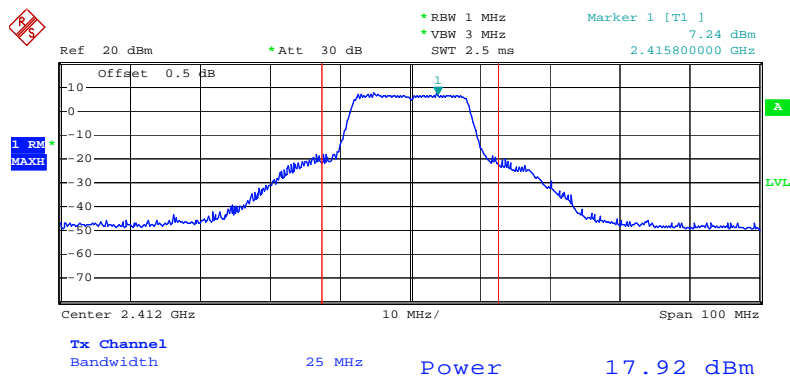
Date: 25.MAY.2009 15:29:55

### Conducted Output Power Plot on Configuration IEEE 802.11b Connector J7 / 2462 MHz



Date: 25.MAY.2009 15:31:36

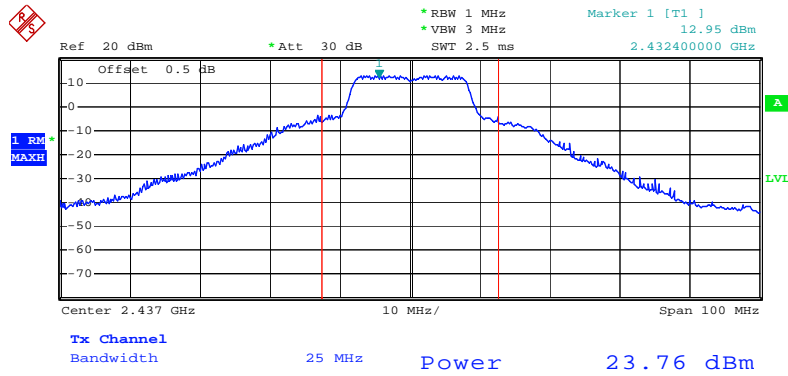
### Conducted Output Power Plot on Configuration IEEE 802.11g Connector J7 / 2412 MHz



Date: 25.MAY.2009 15:34:02

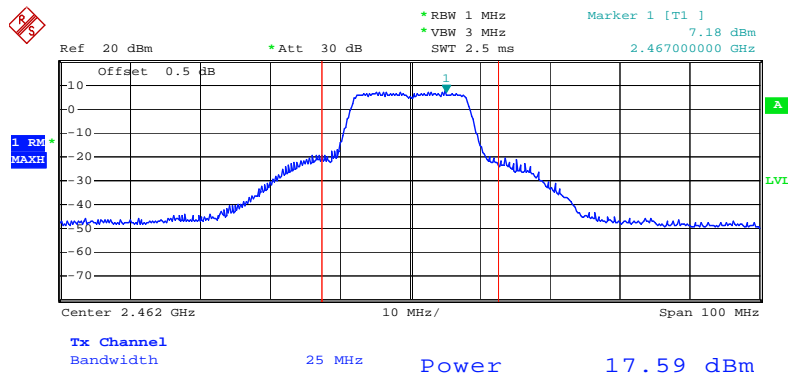


Conducted Output Power Plot on Configuration IEEE 802.11g Connector J7 / 2437 MHz



Date: 25.MAY.2009 15:38:00

Conducted Output Power Plot on Configuration IEEE 802.11g Connector J7 / 2462 MHz



Date: 25.MAY.2009 15:41:38

### 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

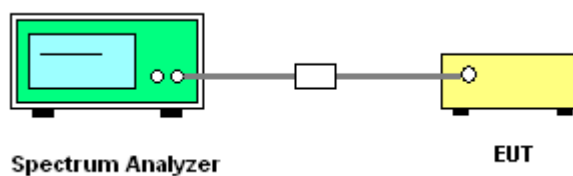
Please refer to section 5 of equipments list in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	30 kHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	10s

#### 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 30kHz and the sweep time to 10s and record the maximum peak value.
5. Measuring multiple antennas, the connector is required to link with spectrum analyser 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

<b>Temperature</b>	23°C	<b>Humidity</b>	56%
<b>Test Engineer</b>	Alan Huang	<b>Configurations</b>	Draft n

##### Configuration Draft n MCS0 20MHz Antenna Connector J5 + J7

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm)	Result
1	2412 MHz	-5.89	8.00	Complies
6	2437 MHz	-3.80	8.00	Complies
11	2462 MHz	-5.29	8.00	Complies

##### Configuration Draft n MCS0 40MHz Antenna Connector J5 + J7

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm)	Result
3	2422 MHz	-11.68	8.00	Complies
6	2437 MHz	-7.19	8.00	Complies
9	2452 MHz	-10.51	8.00	Complies

<b>Temperature</b>	23°C	<b>Humidity</b>	56%
<b>Test Engineer</b>	Alan Huang	<b>Configurations</b>	802.11b/g

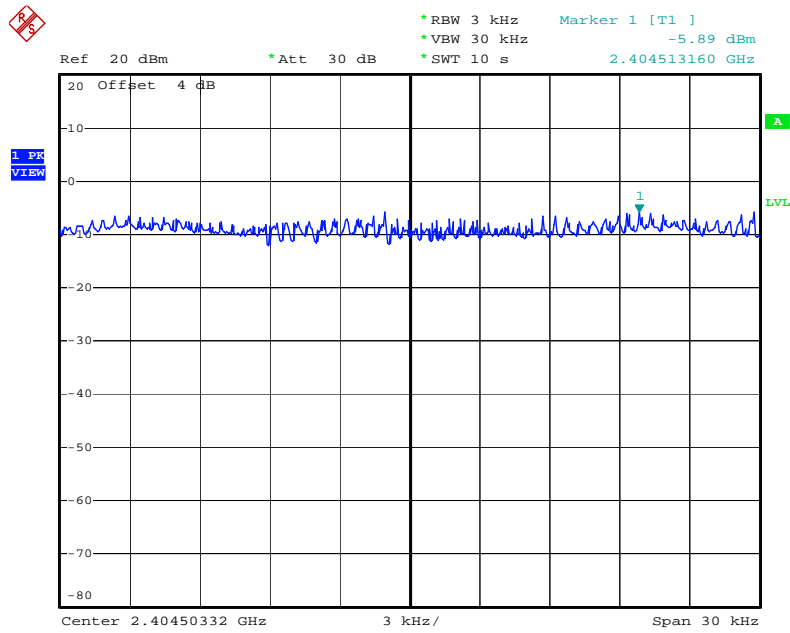
**Configuration IEEE 802.11b Antenna Connector J7**

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm)	Result
1	2412 MHz	4.05	8.00	Complies
6	2437 MHz	3.01	8.00	Complies
11	2462 MHz	-2.29	8.00	Complies

**Configuration IEEE 802.11g Antenna Connector J7**

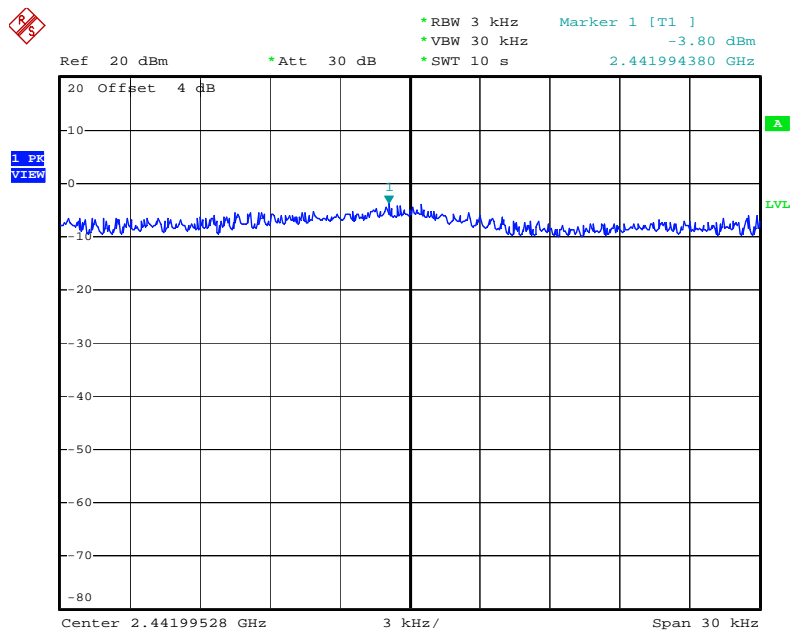
Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm)	Result
1	2412 MHz	-10.69	8.00	Complies
6	2437 MHz	-4.54	8.00	Complies
11	2462 MHz	-9.41	8.00	Complies

Power Density Plot on Configuration Drafft n MCS0 20MHz Connector J5 + J7 / 2412 MHz



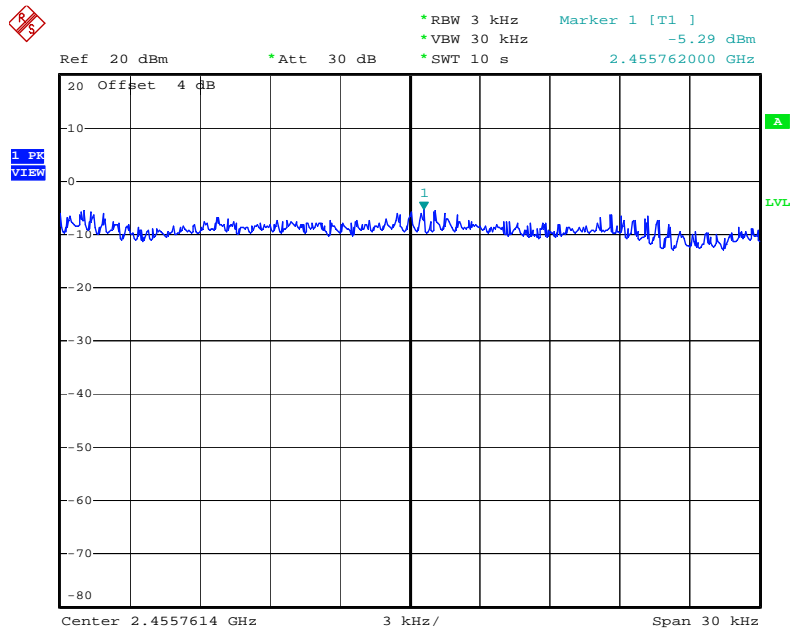
Date: 25.MAY.2009 16:59:42

Power Density Plot on Configuration Drafft n MCS0 20MHz Connector J5 + J7 / 2437 MHz



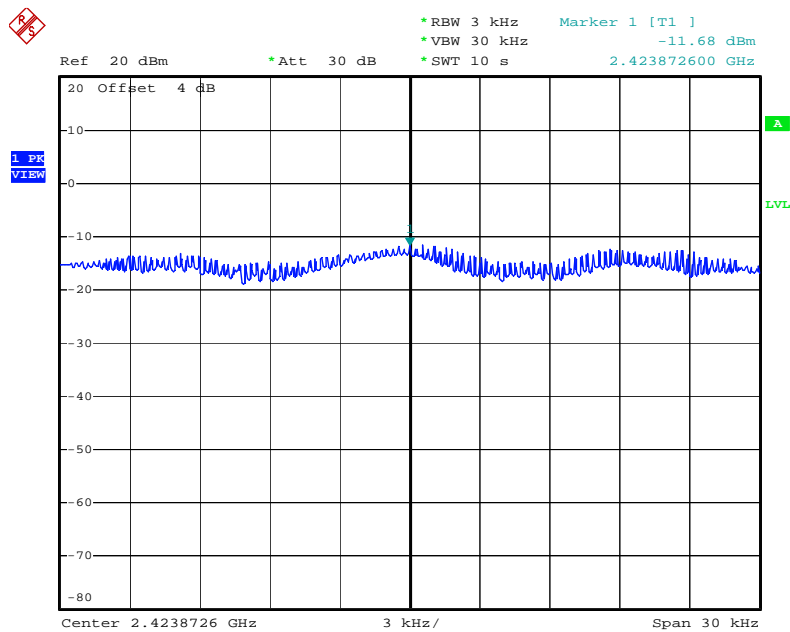
Date: 25.MAY.2009 16:57:38

**Power Density Plot on Configuration Draff n MCS0 20MHz Connector J5 + J7 / 2462 MHz**



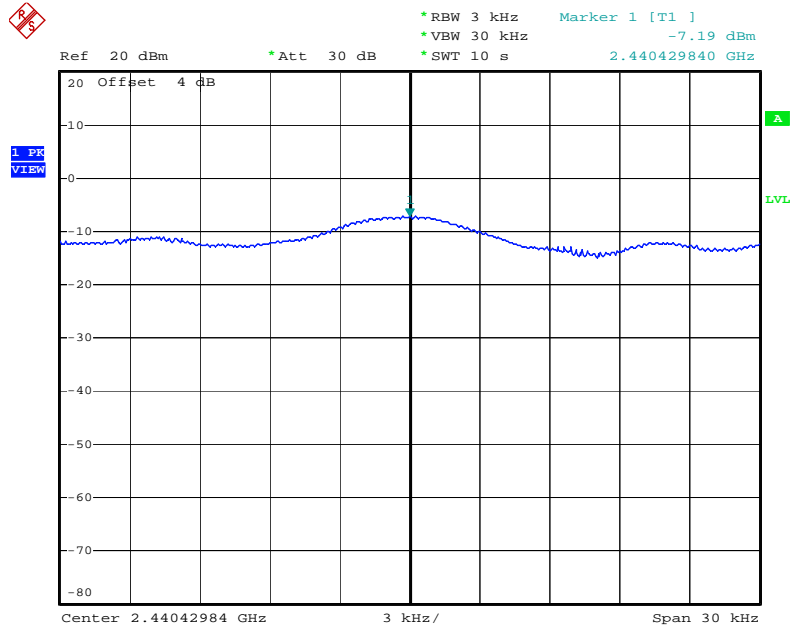
Date: 25.MAY.2009 16:55:11

**Power Density Plot on Configuration Draff n MCS0 40MHz Connector J5 + J7 / 2422 MHz**



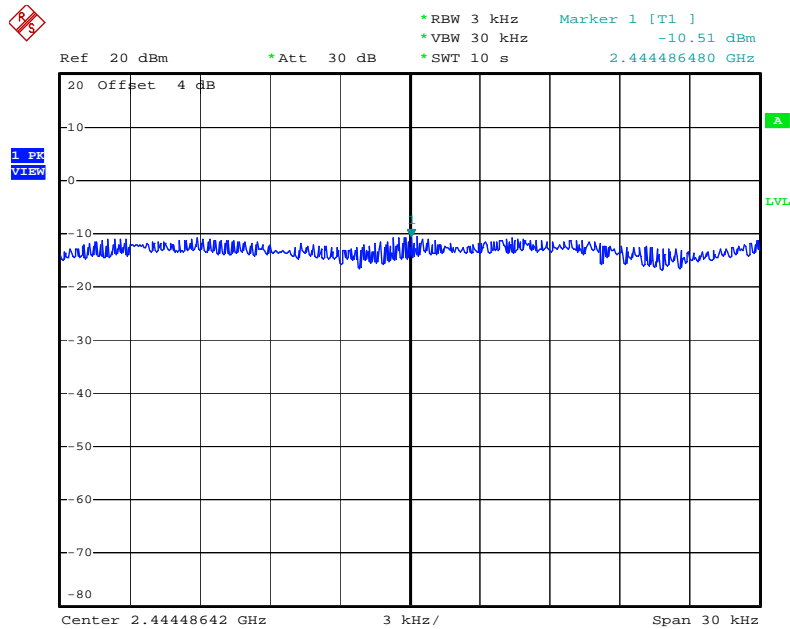
Date: 25.MAY.2009 17:03:27

### Power Density Plot on Configuration Drafft n MCS0 40MHz Connector J5 + J7 / 2437 MHz



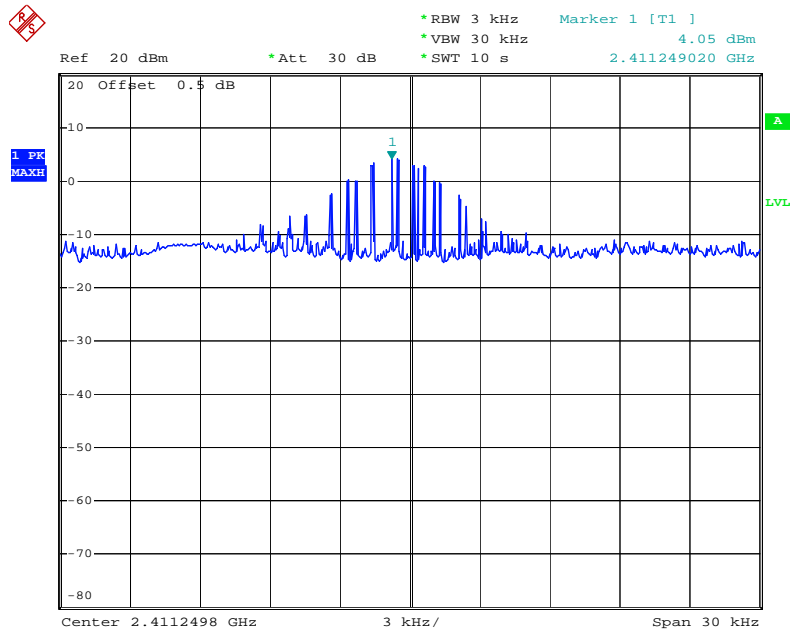
Date: 25.MAY.2009 17:06:04

### Power Density Plot on Configuration Drafft n MCS0 40MHz Connector J5 + J7 / 2452 MHz



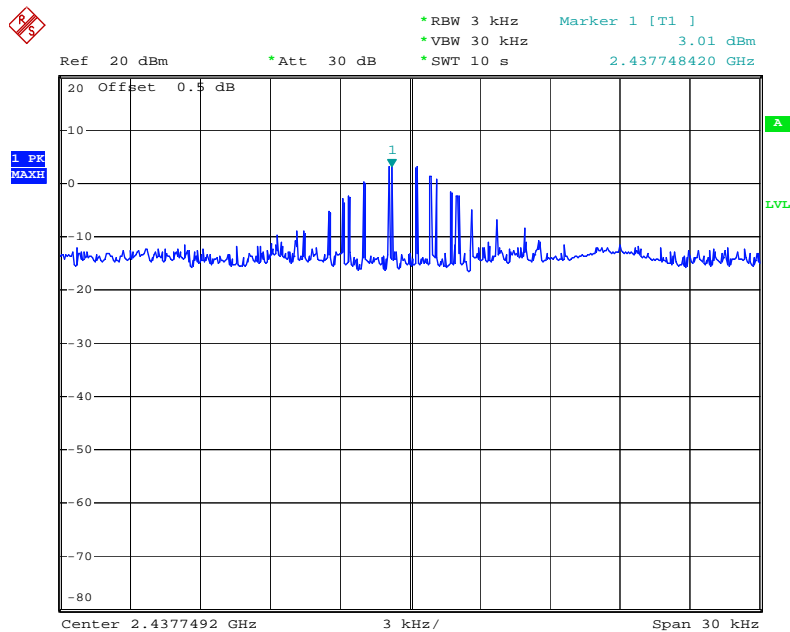
Date: 25.MAY.2009 17:09:43

### Power Density Plot on Configuration IEEE 802.11b Connector J7 / 2412 MHz



Date: 25.MAY.2009 20:48:07

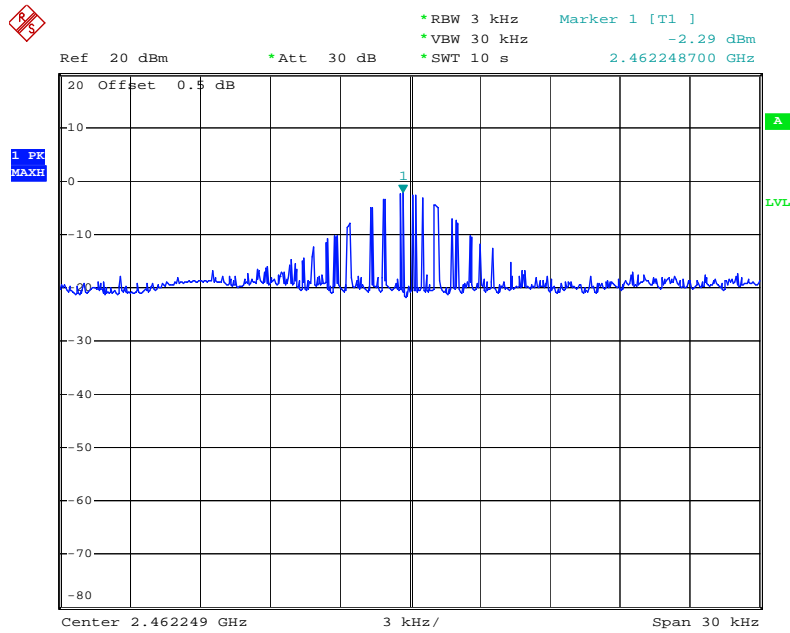
### Power Density Plot on Configuration IEEE 802.11b Connector J7 / 2437 MHz



Date: 25.MAY.2009 20:51:42

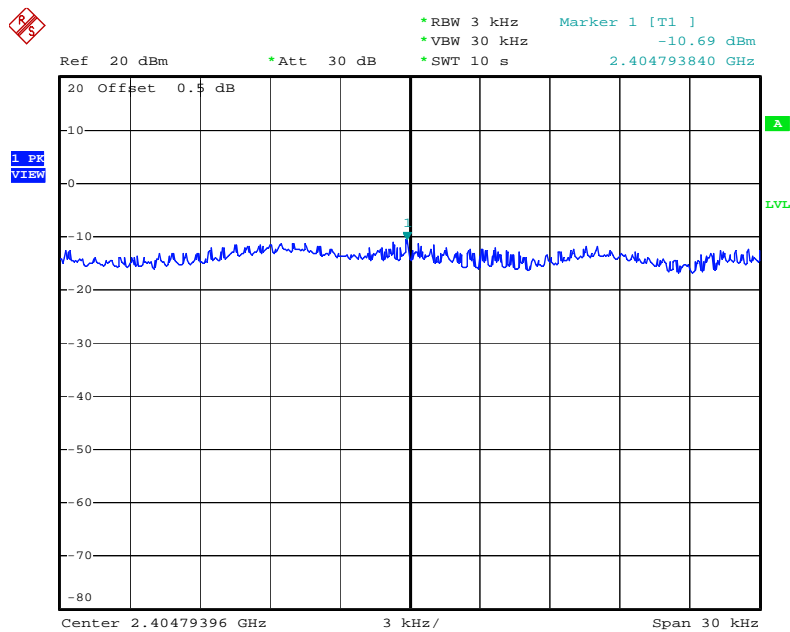


**Power Density Plot on Configuration IEEE 802.11b Connector J7 / 2462 MHz**



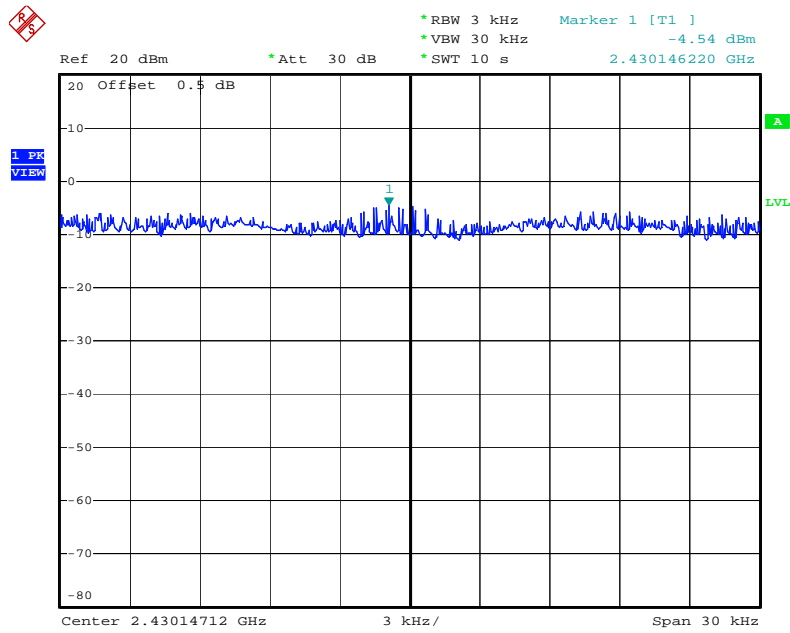
Date: 25.MAY.2009 20:59:33

**Power Density Plot on Configuration IEEE 802.11g Connector J7 / 2412 MHz**



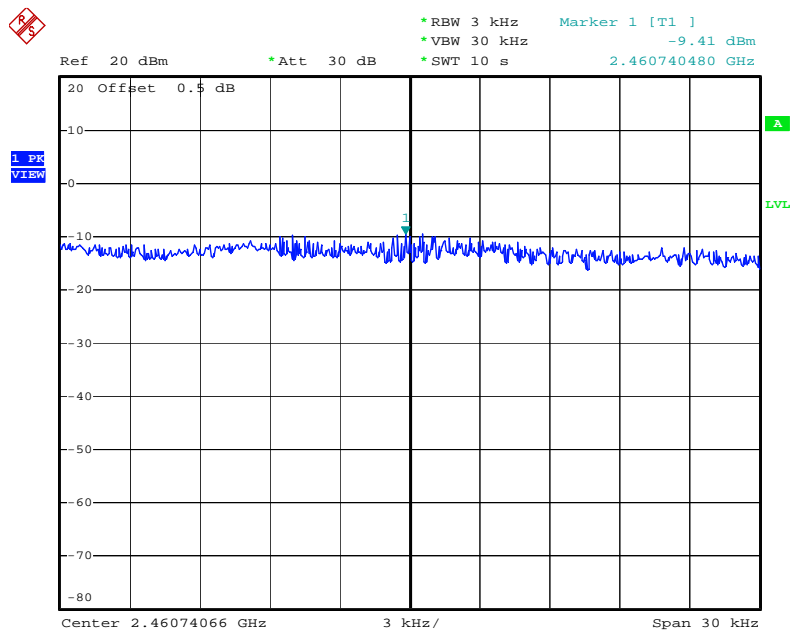
Date: 25.MAY.2009 16:35:36

**Power Density Plot on Configuration IEEE 802.11g Connector J7 / 2437 MHz**



Date: 25.MAY.2009 16:38:03

**Power Density Plot on Configuration IEEE 802.11g Connector J7 / 2462 MHz**



Date: 25.MAY.2009 16:40:25

## 4.4. 6dB Spectrum Bandwidth Measurement

### 4.4.1. Limit

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

### 4.4.2. Measuring Instruments and Setting

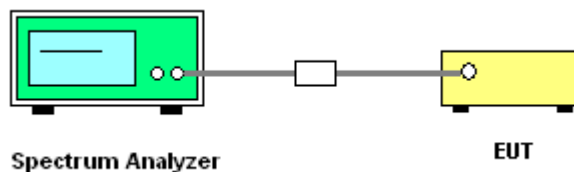
Please refer to section 5 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

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 spectrum analyzer 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

<b>Temperature</b>	23°C	<b>Humidity</b>	56%
<b>Test Engineer</b>	Alan Huang	<b>Configurations</b>	Draft n

##### Configuration Draft n MCS0 20MHz Antenna Connector J5 + J7

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	15.92	17.68	500	Complies
6	2437 MHz	10.04	14.60	500	Complies
11	2462 MHz	15.96	17.64	500	Complies

##### Configuration Draft n MCS0 40MHz Antenna Connector J5 + J7

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	26.32	36.16	500	Complies
6	2437 MHz	26.40	36.08	500	Complies
9	2452 MHz	30.08	32.96	500	Complies

<b>Temperature</b>	23°C	<b>Humidity</b>	56%
<b>Test Engineer</b>	Alan Huang	<b>Configurations</b>	802.11b/g

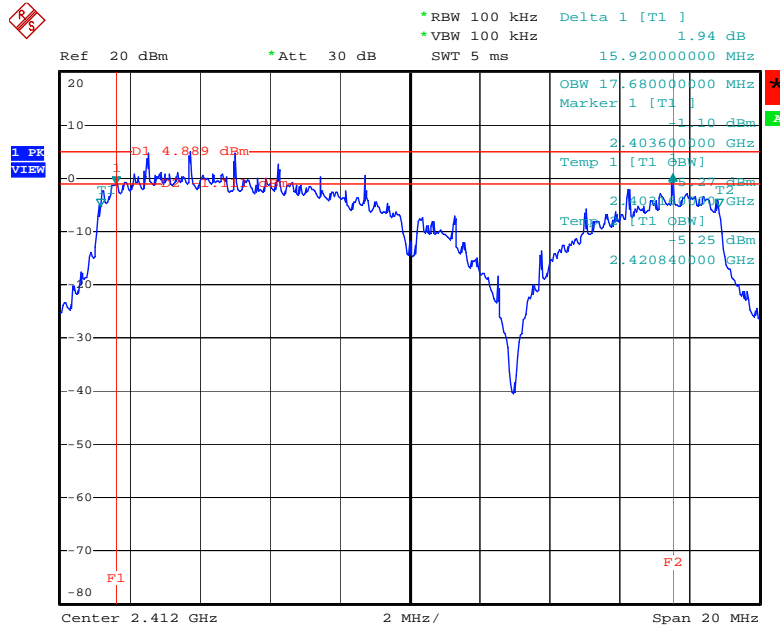
**Configuration IEEE 802.11b Antenna Connector J7**

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	13.00	15.08	500	Complies
6	2437 MHz	12.80	15.08	500	Complies
11	2462 MHz	12.60	15.08	500	Complies

**Configuration IEEE 802.11g Antenna Connector J7**

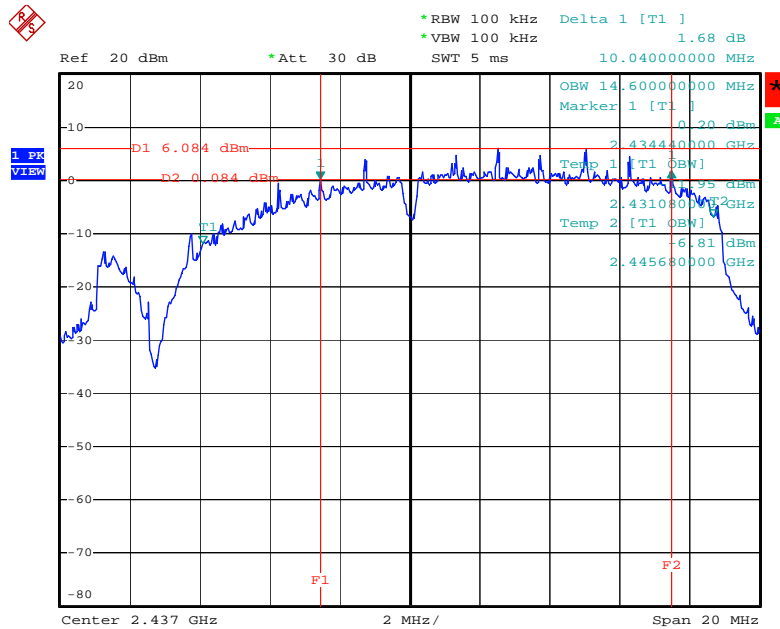
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.36	16.44	500	Complies
6	2437 MHz	16.28	16.56	500	Complies
11	2462 MHz	16.36	16.40	500	Complies

6 dB Bandwidth Plot on Configuration Draft n MCS0 20MHz Connector J5 + J7 / 2412 MHz



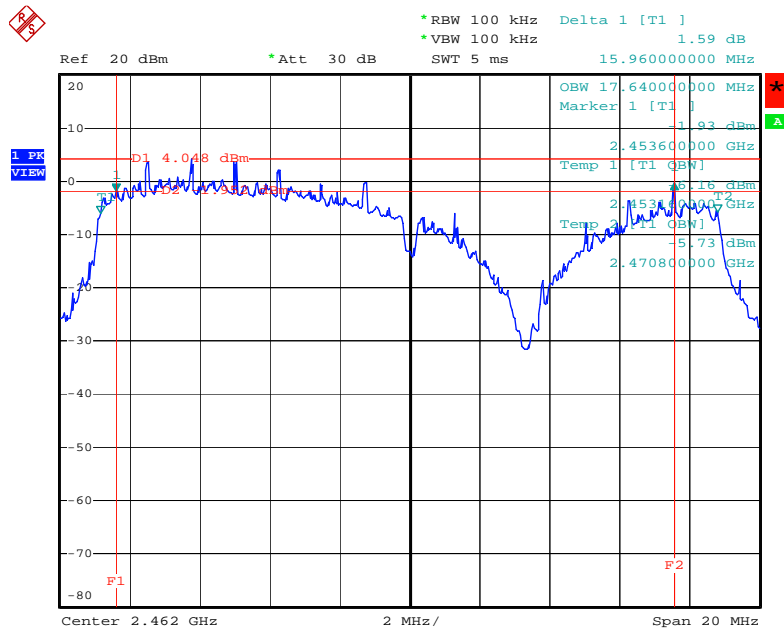
Date: 25.MAY.2009 16:58:15

6 dB Bandwidth Plot on Configuration Draft n MCS0 20MHz Connector J5 + J7 / 2437 MHz



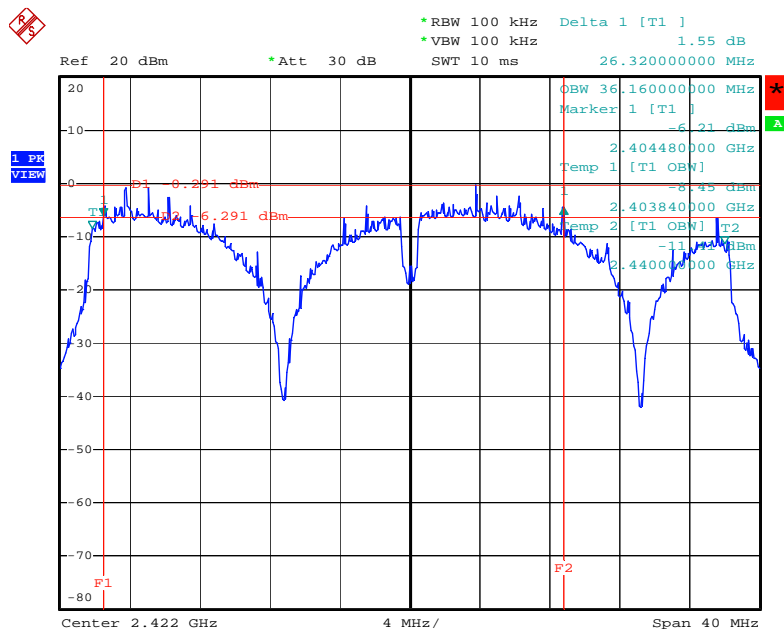
Date: 25.MAY.2009 16:56:10

6 dB Bandwidth Plot on Configuration Draft n MCS0 20MHz Connector J5 + J7 / 2462 MHz



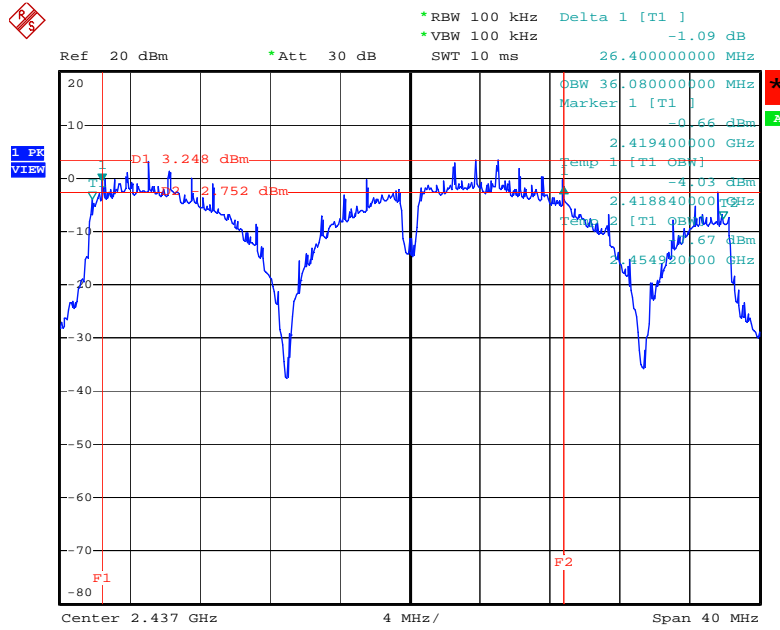
Date: 25.MAY.2009 16:53:44

6 dB Bandwidth Plot on Configuration Draft n MCS0 40MHz Connector J5 + J7 / 2422 MHz



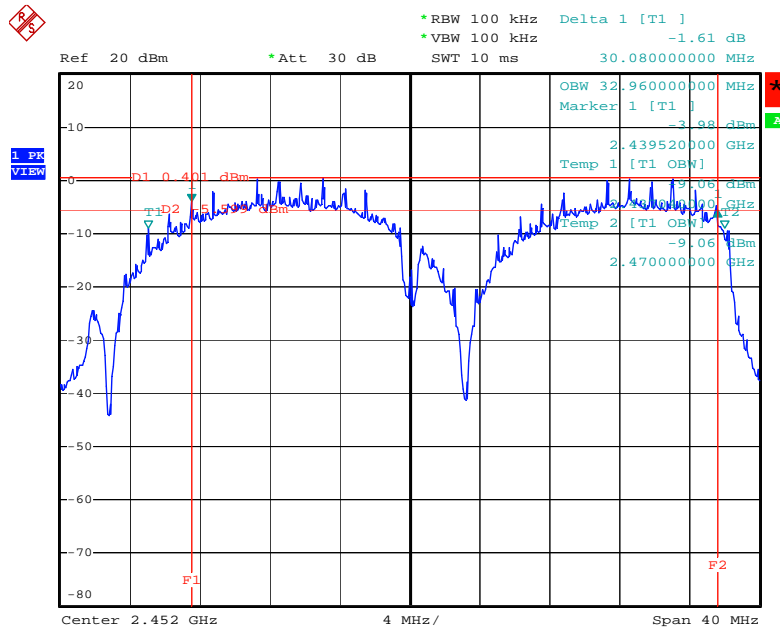
Date: 25.MAY.2009 17:02:00

6 dB Bandwidth Plot on Configuration Draft n MCS0 40MHz Connector J5 + J7 / 2437 MHz



Date: 25.MAY.2009 17:04:37

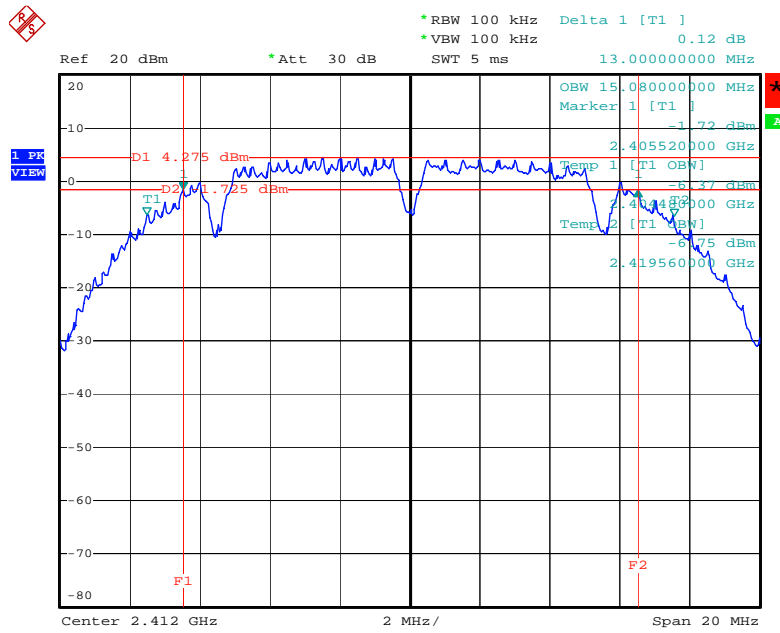
6 dB Bandwidth Plot on Configuration Draft n MCS0 40MHz Connector J5 + J7 / 2452 MHz



Date: 25.MAY.2009 17:08:16

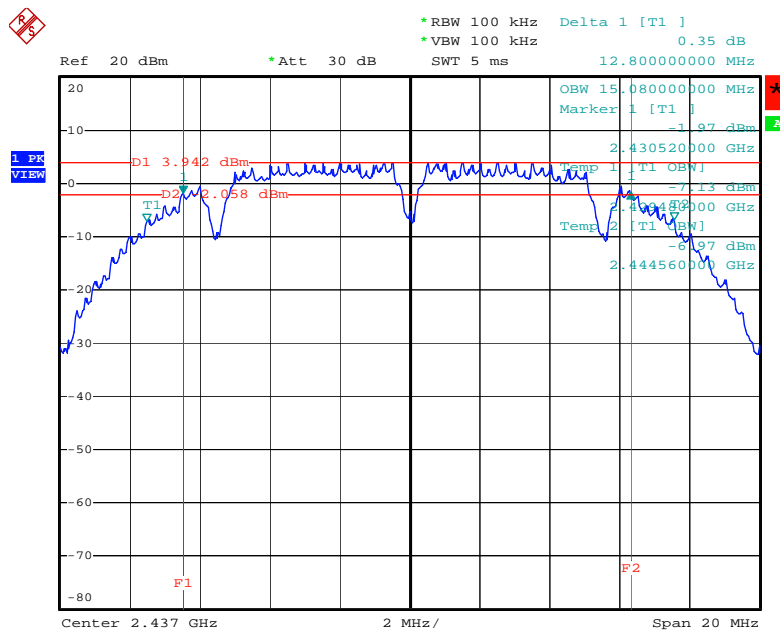


### 6 dB Bandwidth Plot on Configuration IEEE 802.11b Connector J7 / 2412 MHz



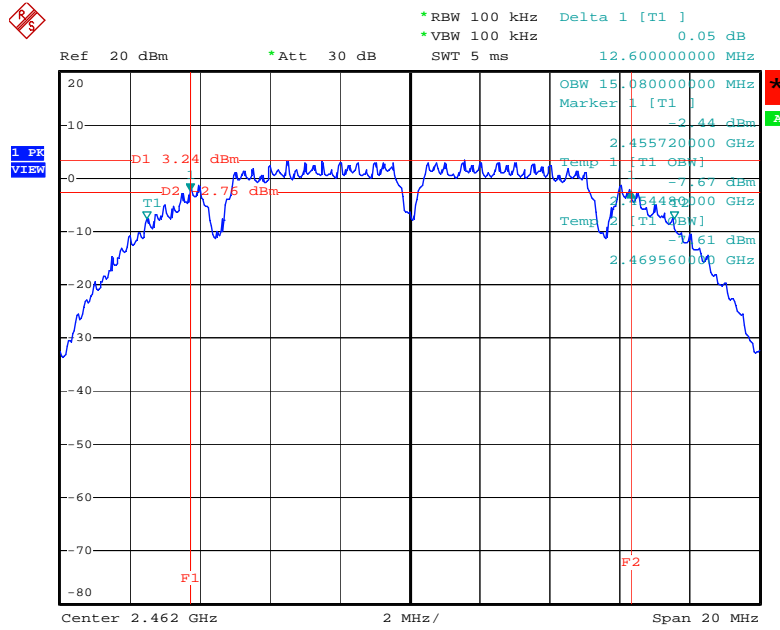
Date: 25.MAY.2009 16:24:26

### 6 dB Bandwidth Plot on Configuration IEEE 802.11b Connector J7 / 2437 MHz



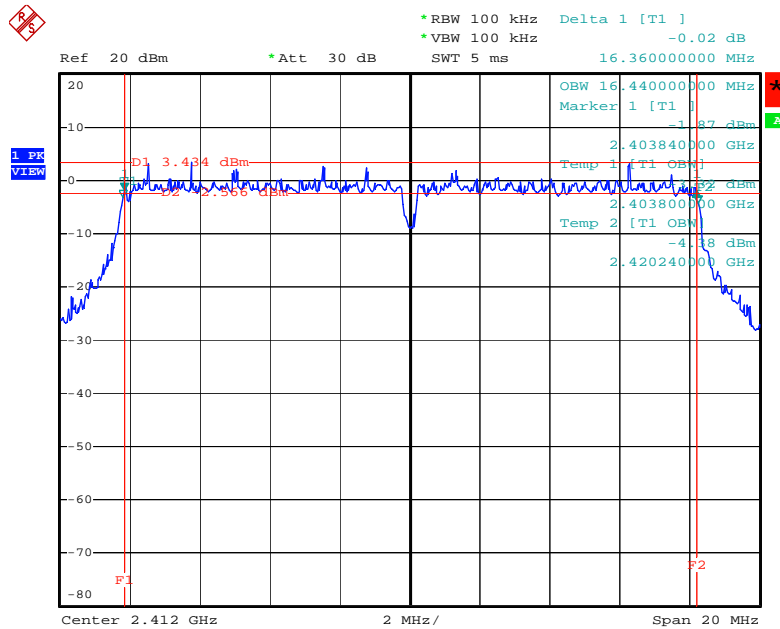
Date: 25.MAY.2009 16:26:59

6 dB Bandwidth Plot on Configuration IEEE 802.11b Connector J7 / 2462 MHz



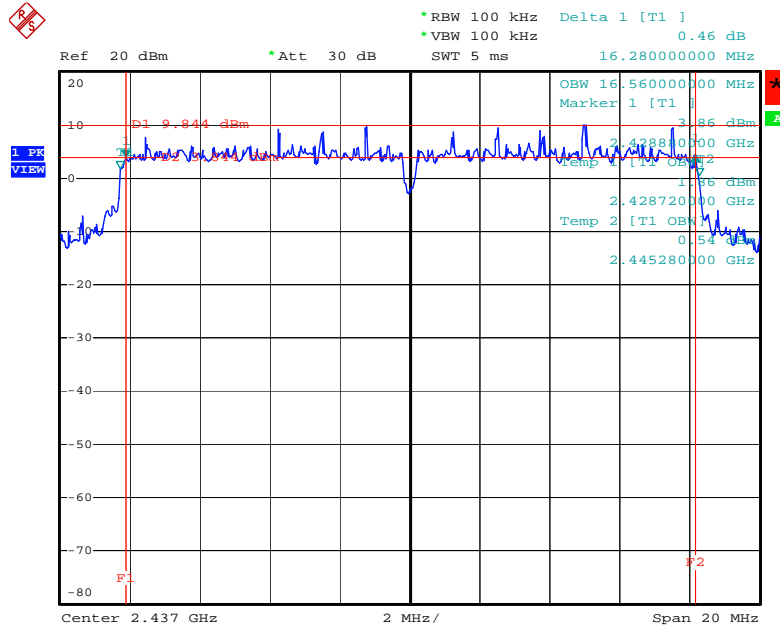
Date: 25.MAY.2009 16:29:33

6 dB Bandwidth Plot on Configuration IEEE 802.11g Connector J7 / 2412 MHz



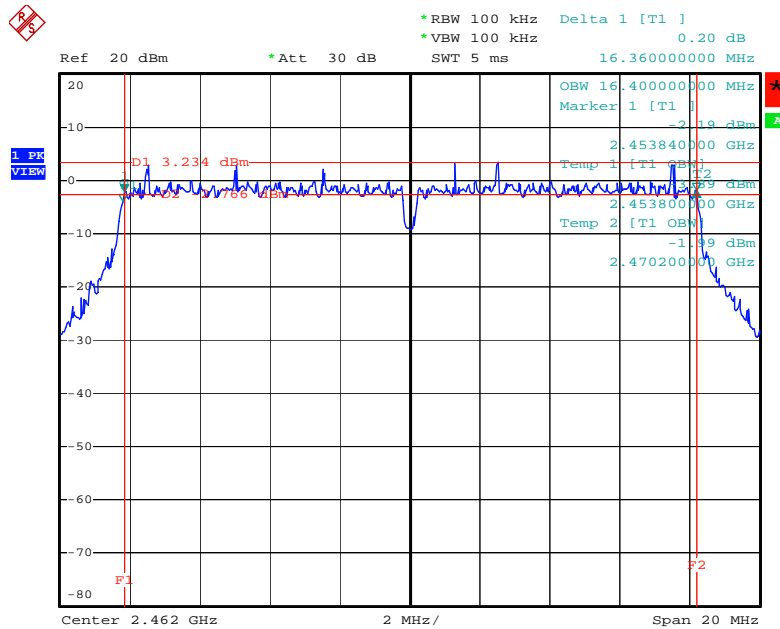
Date: 25.MAY.2009 16:34:09

6 dB Bandwidth Plot on Configuration IEEE 802.11g Connector J7 / 2437 MHz



Date: 25.MAY.2009 16:36:34

6 dB Bandwidth Plot on Configuration IEEE 802.11g Connector J7 / 2462 MHz



Date: 25.MAY.2009 16:38:58

## 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 / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for peak

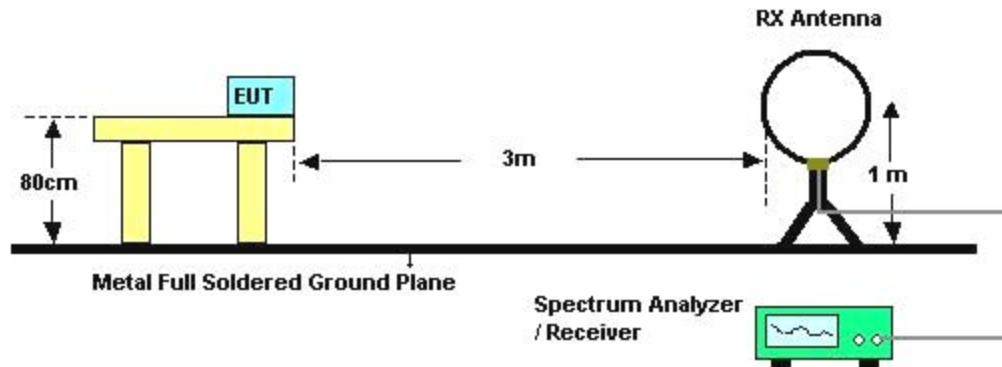
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

#### 4.5.3. Test Procedures

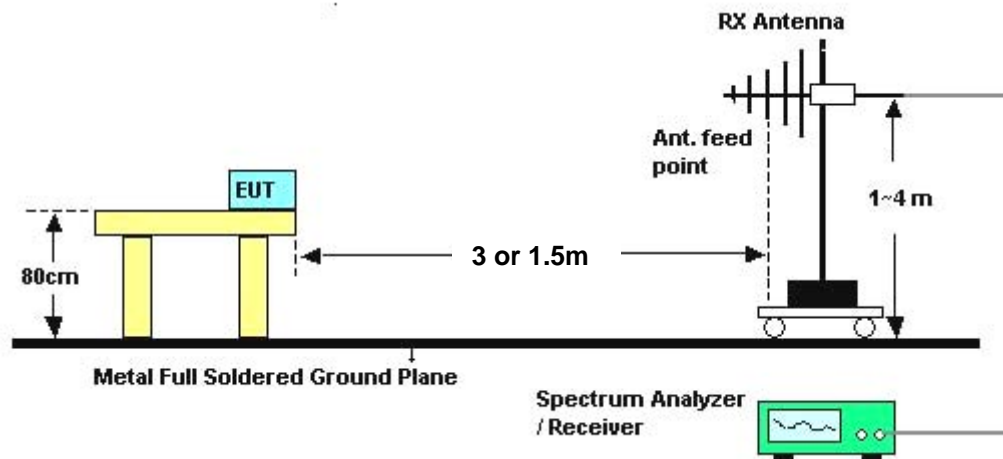
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

<b>Temperature</b>	25°C	<b>Humidity</b>	57%
<b>Test Engineer</b>	Johnson Chang	<b>Configurations</b>	Normal Link

<b>Freq. (MHz)</b>	<b>Level (dBuV)</b>	<b>Over Limit (dB)</b>	<b>Limit Line (dBuV)</b>	<b>Remark</b>
-	-	-	-	See Note

**Note:**

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

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

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