Test Report

Industry Canada RSS-Gen Issue 3/RSS-210 Issue 8
FCC Part15 Subpart C

Product Name	:	IP-STB
Model No.	:	2400X
FCC ID	:	TC22400X
IC	:	5959A-2400X

Applicant	:	Roku Inc.
Address	:	12980 Saratoga Ave, Suite D Saratoga, CA 95070

Date of Receipt	:	01/09/2011
Test Date	:	20/05/2011~ 30/05/2011
Issued Date	:	07/09/2011
Report No.	:	119S001R-RF-US-P05V01
Report Version	:	V1.1

This report was based on Quietek report No: 116S062R

Test Report Certification

Issued Date : 07/09/2011
Report No. : 119S001R-RF-US-P05V01

QuieTek

Product Name	:	IP-STB
Applicant	:	Roku Inc.
Address	:	12980 Saratoga Ave, Suite D Saratoga, CA 95070
Manufacturer	:	Ambit Mircosystems(Shanghai) LTD.
Address	:	1925, Nanle Road, Songjiang Export Processing Zone, Shanghai, China 201613
Model No.	:	2400X
FCC ID	:	TC22400X
IC	:	5959A-2400X
EUT Voltage	:	100-240Vac +/-10%
Brand Name	:	Roku
Applicable Standard	:	FCC CFR Title 47 Part 15 Subpart C: 2008 ANSI C63.4: 2009; ANSI C63.10: 2009 Industry Canada RSS-Gen Issue 3/RSS-210 Issue 8
Test Result	:	Complied
Performed Location	:	Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park Loufeng Hi-Tech Development Zone., Suzhou, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098 FCC Registration Number: 800392; IC Lab Code: 4075B

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(Engineering Supervisor: Marlin Chen)

Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	**:**	**BSMI, NCC, TAF**
Germany	**:**	**TUV Rheinland**
Norway	**:**	**Nemko, DNV**
USA	**:**	**FCC, NVLAP**
Japan	**:**	**VCCI**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : http://www.quietek.com/tw/ctg/cts/accreditations.htm
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

HsinChu Testing Laboratory :
No.75-2, 3rd Lin, Wangye Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C.
TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : service@quietek.com

NVLAP Lab Code : 200347-0

Testing Laboratory 1313

LinKou Testing Laboratory :
No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen, Lin-Kou Shiang, Taipei, Taiwan, R.O.C.
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NVLAP Lab Code: 200533-0

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NVLAP Lab Code : 200743-0

Testing Laboratory 1596

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1. General Information

1.1. EUT Description

Product Name	IP-STB
Brand Name	Roku
Model No.	2400X
EUT Voltage	100-240Vac +/-10%
Frequency Range	802.11b/g/n(20MHz): 2412~2462MHz
Channel Number	802.11b/g/n(20MHz): 11
Type of Modulation	802.11b: DSSS
	802.11g/n: OFDM
Data Rate	802.11g: 6/9/12/18/24/36/48/54 Mbps
	802.11b: 1/2/5.5/11 Mbps
	802.11n: up to 150 Mbps
Channel Control	Auto
Antenna Delivery	1*Tx + 1*Rx
Antenna Type	Chip Antenna
Peak Antenna Gain	2dBi

Note: The different of 3000X, 3050X, 3100X, 2400X as show bellow:

	Giga Good Direct	Giga Better Retail	Giga Best Direct / Retail	Giga 720 Retail
Model Number	3000X	3050X	3100X	2400X
Resolution	720p	1080p	1080p	720p
SOC	BCM 2835	BCM 2835	BCM 2835	BCM 2835
DRAM	128MB	256MB	256MB	256MB
NAND	256MB	256 MB	256 MB	256 MB
WiFi Network	BRCM 4336 1x1 SB	BRCM 4336 1x1 SB	BRCM 4336 1x1 SB	BRCM 4336 1x1 SB
Bluetooth	BRCM 20702	BRCM 20702	BRCM 20702	
Micro SD Slot	x	x	x	
Composite Video + L/R Audio	Mini-jack	Mini-jack	Mini-jack	Mini-jack
HDMI	x	x	x	X
Ethernet 10/100			x	
USB 2.0 Host			x	
Reset Button	x	x	x	x
DC IN	x	x	x	x
LED	x	x	x	x
Remote	11 button IR AAA Battery	11 button IR AAA Battery	RF AA Battery	11 button IR AAA Battery

Component	
AC Adapter #1	Manufacturer: Ampower Technology Co., Ltd M/N: AAL-00 Input: 100-240V~50/60Hz 0.25A Output: 5Vdc, 1.5A
AC Adapter #2	Manufacturer: Foxlink M/N: FA-0521500SUA Input: 100-240V~50/60Hz 0.25A Output: 5Vdc, 1.5A
AC Adapter #3	Manufacturer: Ampower Technology Co., Ltd M/N: AAL-01 Input: 100-240V~50/60Hz 0.25A Output: 5Vdc, 1A
AC Adapter #4	Manufacturer: Foxlink M/N: FA-0521000SUA Input: 100-240V~50/60Hz 0.15A Output: 5Vdc, 1.0A
AC Adapter #5	Manufacturer: DVE M/N: DSA-9PFB-05 FUS 050100 Input: 100-240V~50/60Hz 0.3A Output: 5Vdc, 1A
AC Adapter #6	Manufacturer: DVE M/N: DSA-12PFA-05 FUS 052150 Input: 100-240V~50/60Hz 0.5A Output: 5.2Vdc, 1.5A

Note1: AC Adapter #1&#2&#6 are used for 3100X, AC Adapter #3&#4&#5 are used for 3000X/3050X/2400X.

Note2: In this report, we choose 3100X with AC Adapter #1 for all RF testing.

For 2.4GHz Band

802.11b/g/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz	04	2427 MHz
05	2432 MHz	06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	10	2457 MHz	11	2462 MHz	N/A	N/A

802.11 b/g/n Antenna List

Antenna	Manufacturer	Model No.	Peak Gain
Chip Antenna	Walsin	RFANT8010080A3T	2.4GHz: 2dBi

1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit by 802.11b
Mode 2: Transmit by 802.11g
Mode 3: Transmit by 802.11n(20MHz)

Note:

1. Regards to the frequency band operation: the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. This device is a composite device in accordance with Part 15 Subpart B regulations. The function for the receiver was measured and made a test report that the report number is 119S001R-RF-US-P01V03.

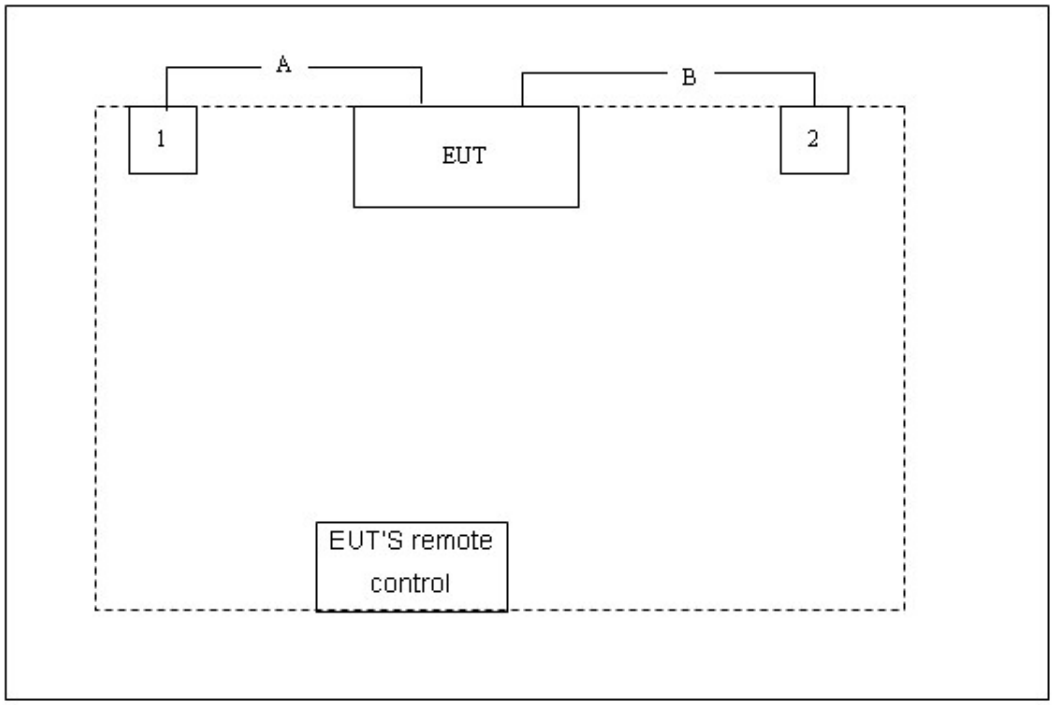
1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	LCD Monitor	Lenovo	L2361PWA	3M03896A0520853	Non-Shielded, 1.8m
2	TV	TCL	1475S	01000481106AG1855	Non-Shielded, 1.8m

1.4. Configuration of Tested System

Connection Diagram (2400X)



Signal Cable Type		Signal cable Description
A	HDMI Cable	Shielded, 1.5m
B	AV Cable	Shielded, 1.8m

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Input some commands in Console window Notebook, then make EUT HDMI/AV display.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.209	Yes	No
RF Antenna Conducted Spurious	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2008 15.247(d)	Yes	No
Operation Frequency Range of 20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2008 15.215(c)	Yes	No
Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(a)(2)	Yes	No
Power Output	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(b)(3)	Yes	No
Power Spectral Density	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(e)	Yes	No

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	RSS-Gen Issue 3 December 2010 Section 7.2.2	Yes	No
Radiated Emission	RSS-210 Issue 8 December 2010 Section 2.7 Table 2 and Table 3	Yes	No
RF Antenna Conducted Spurious	RSS-210 Issue 8 December 2010 Section A8.5	Yes	No
Radiated Emission Band Edge	RSS-210 Issue 8 December 2010 Section A8.5	Yes	No
Occupied Bandwidth	RSS-Gen Issue 3 December 2010 Section 4.6.1 and 4.6.2 RSS-210 Issue 8 December 2010 Section A8.2(1)	Yes	No
Power Output	RSS-210 Issue 8 December 2010 Section A8.4(4)	Yes	No
Power Spectral Density	RSS-210 Issue 8 December 2010 Section A8.2(2)	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

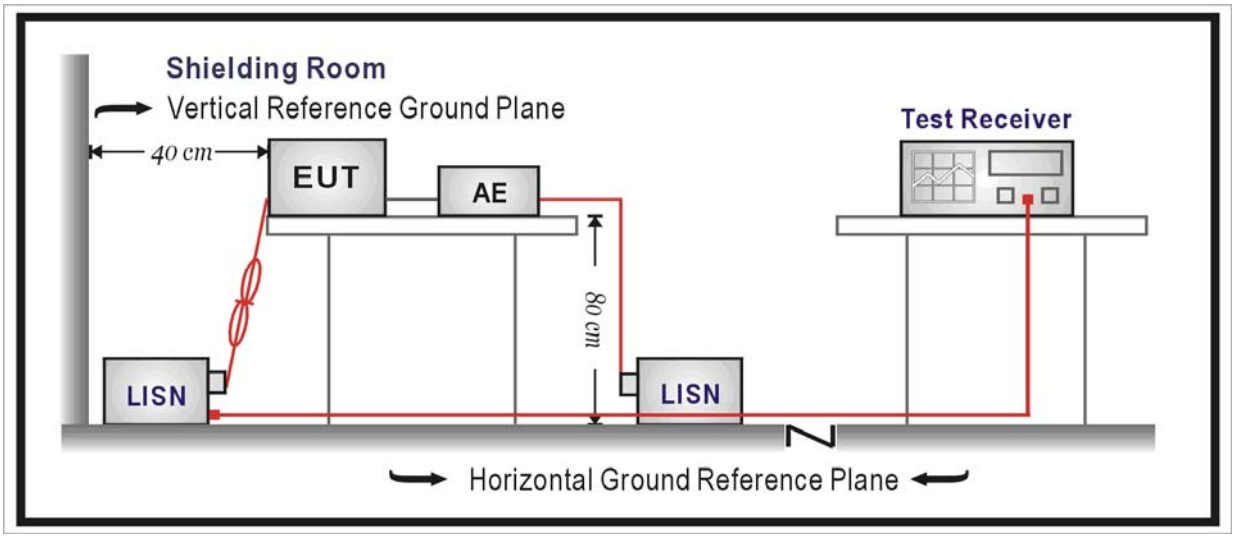
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
EMI Test Receiver	R&S	ESCI	100726	2012.04.23
Two-Line V-Network	R&S	ENV216	100043	2011.06.18
Two-Line V-Network	R&S	ENV216	100044	2011.09.07
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2012.05.05
50ohm Termination	SHX	TF2	07081401	2011.09.27
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2012.01.14

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

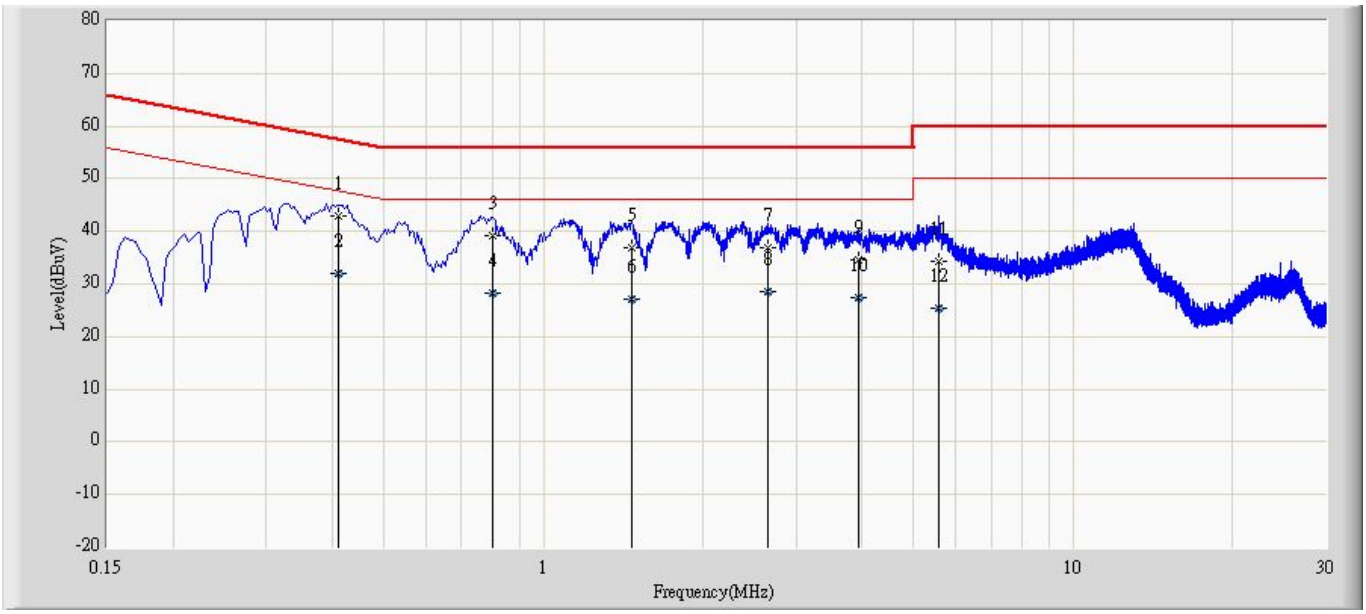
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

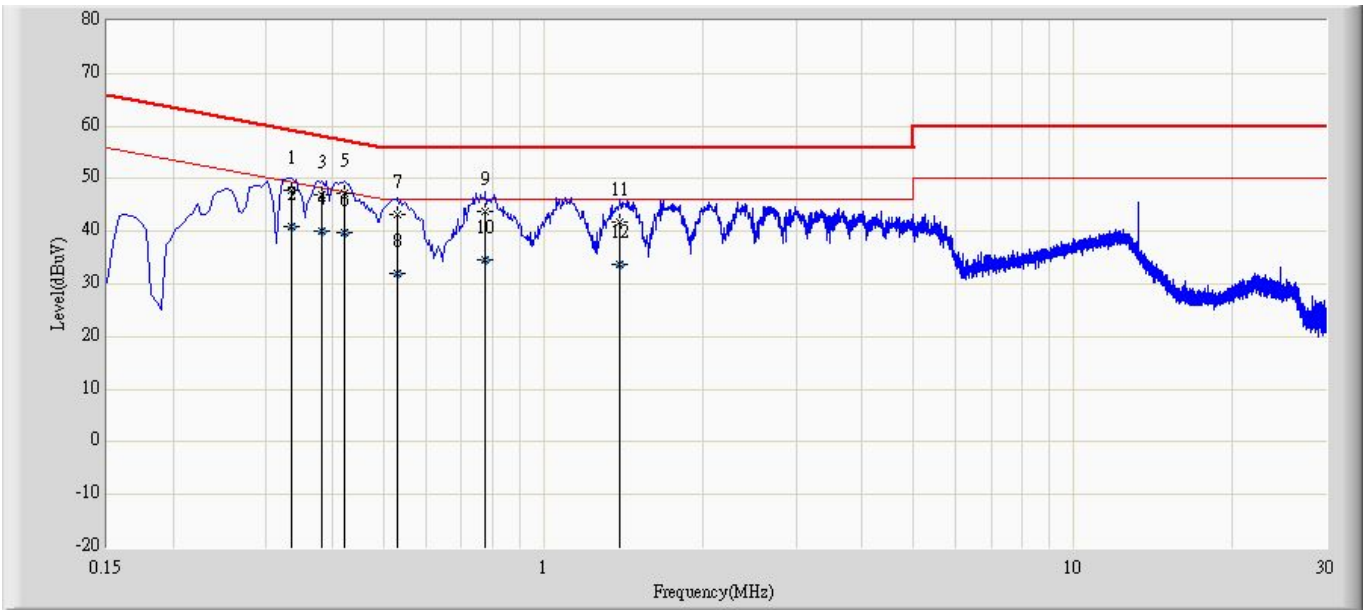
3.6. Test Result

Engineer: Jack	
Site: TR1	Time: 2011/05/26 - 10:33
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.410	42.905	33.233	-14.744	57.648	9.671	QP
2		0.410	31.976	22.305	-15.672	47.648	9.671	AV
3		0.802	39.100	29.410	-16.900	56.000	9.690	QP
4		0.802	28.325	18.635	-17.675	46.000	9.690	AV
5		1.470	36.997	27.287	-19.003	56.000	9.710	QP
6		1.470	27.075	17.365	-18.925	46.000	9.710	AV
7		2.646	36.871	27.130	-19.129	56.000	9.741	QP
8		2.646	28.531	18.790	-17.469	46.000	9.741	AV
9		3.930	34.738	24.945	-21.262	56.000	9.792	QP
10		3.930	27.325	17.533	-18.675	46.000	9.792	AV
11		5.573	34.315	24.466	-25.685	60.000	9.849	QP
12		5.573	25.420	15.571	-24.580	50.000	9.849	AV

Engineer: Jack	
Site: TR1	Time: 2011/05/26 - 10:42
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.334	47.878	38.177	-11.474	59.351	9.701	QP
2		0.334	40.850	31.149	-8.502	49.351	9.701	AV
3		0.382	46.974	37.277	-11.261	58.236	9.698	QP
4		0.382	40.172	30.474	-8.064	48.236	9.698	AV
5		0.422	47.349	37.644	-10.060	57.409	9.705	QP
6	*	0.422	39.731	30.026	-7.677	47.409	9.705	AV
7		0.530	43.279	33.579	-12.721	56.000	9.700	QP
8		0.530	32.149	22.449	-13.851	46.000	9.700	AV
9		0.778	43.926	34.226	-12.074	56.000	9.700	QP
10		0.778	34.678	24.978	-11.322	46.000	9.700	AV
11		1.394	41.795	32.075	-14.205	56.000	9.720	QP
12		1.394	33.862	24.142	-12.138	46.000	9.720	AV

4. Radiated Emission

4.1. Test Equipment

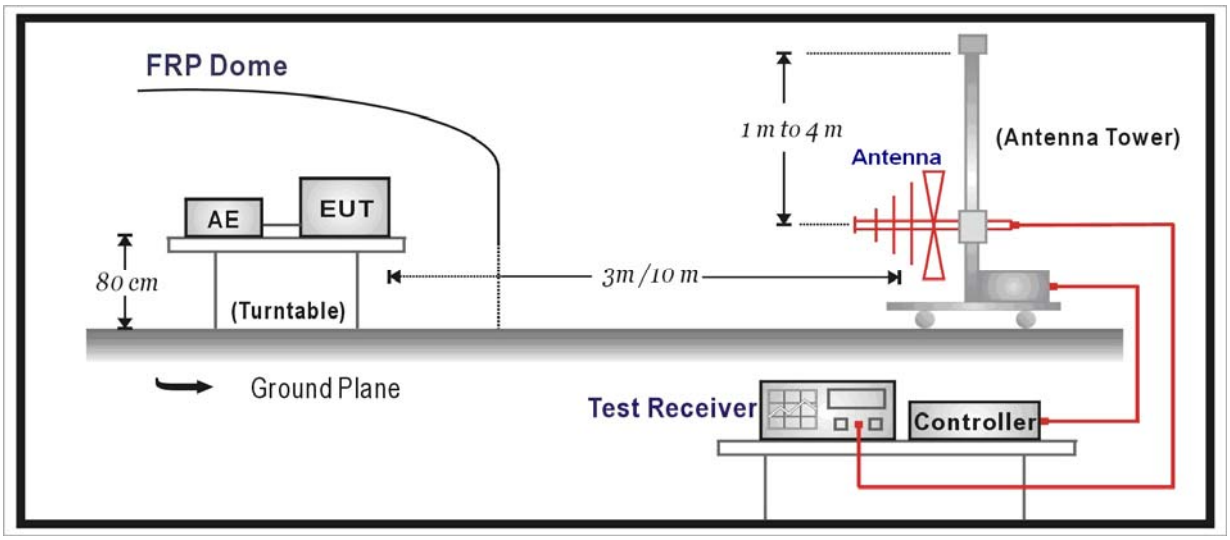
☒Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2012.04.23
EMI Test Receiver	R&S	ESCI	100906	2012.01.15
Preamplifier	Quietek	AP-180C	CHM-0602013	2012.03.07
Preamplifier	QuieTek	AP-040G	CHM-0906001	2012.05.05
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2011.10.18
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2012.06.11
High-Pass Filter	Wainwright	WHKX2.8/18G-12SS	SN1	2012.03.03
High-Pass Filter	Wainwright	WHKX7.0/18G-8SS	SN16	2012.03.03
Lowpass Filter	Wainwright	WLKS4500-9SS	SN2	2012.03.03
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2012.01.14

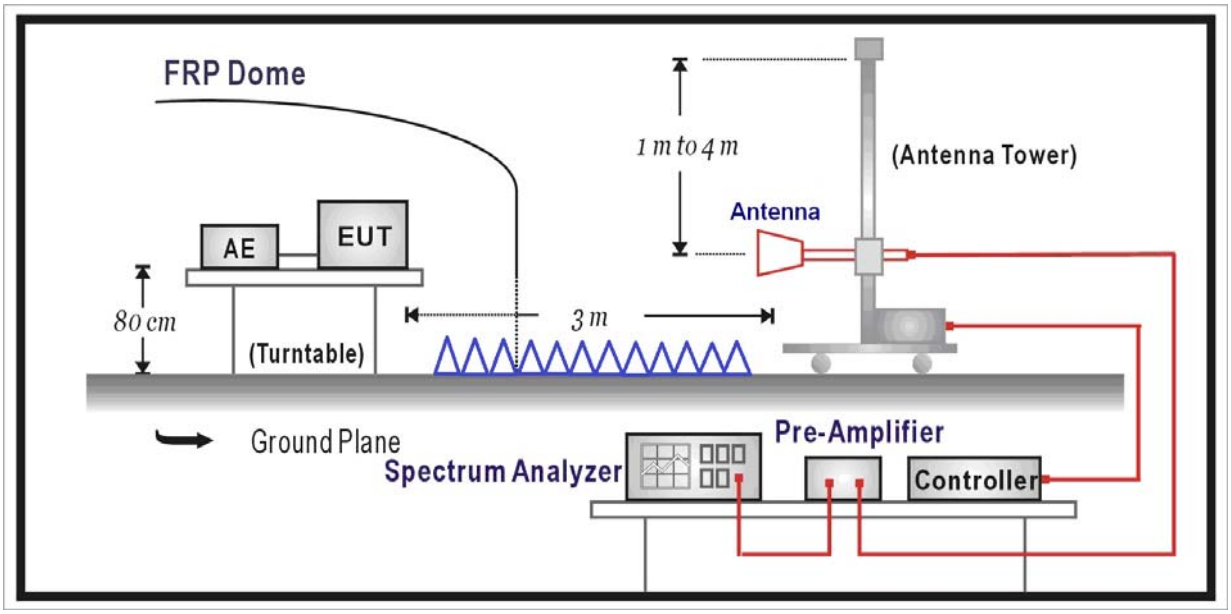
Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

4.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

802.11b

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	2412.0	78.9	30.4	109.3	Fundamental	/	PK
	V	36.8	13.0	14.8	27.8	40.0	-12.2	QP
	V	455.0	18.8	18.4	37.2	46.0	-8.8	QP
	V	3167.5	36.5	-5.2	31.3	54(Note1)	-22.7	PK
	H	4825.0	37.8	-0.5	37.3	54(Note1)	-16.7	PK
	V	7239.0	38.0	6.9	44.9	54(Note1)	-9.1	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK
6	H	2437.0	78.7	30.4	109.1	Fundamental	/	PK
	V	194.4	12.5	10.3	22.8	43.5	-20.7	QP
	V	511.2	8.7	19.5	28.2	46	-17.8	QP
	V	3167.5	36.5	-5.2	31.3	54(Note1)	-22.7	PK
	V	4876.0	39.1	-0.4	38.7	54(Note1)	-15.3	PK
	H	7315.5	36.8	7.0	43.8	54(Note1)	-10.2	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK
11	H	2462.0	78.8	30.4	109.2	Fundamental	/	PK
	V	455.0	18.8	18.4	37.2	46	-8.8	QP
	V	875.1	7.5	23.4	30.9	46	-15.1	QP
	V	3167.5	36.8	-5.2	31.6	54(Note1)	-22.4	PK
	H	7383.5	36.9	6.8	43.7	54(Note1)	-10.3	PK
	H	4927.0	43.4	-0.6	42.8	54(Note1)	-11.2	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK

Note 1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

802.11g

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	2412.0	78.1	30.3	108.4	Fundamental	/	PK
	H	500.0	9.5	19.4	28.9	46	-17.1	QP
	V	47.1	11.7	9.6	21.3	40	-18.7	QP
	H	3167.5	37.1	-5.1	32.0	54(Note1)	-22.0	PK
	V	4816.5	36.7	-0.5	36.2	54(Note1)	-17.8	PK
	H	7236.0	35.7	7.0	42.7	54(Note1)	-11.3	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK
6	H	2436.9	76.5	31	107.5	Fundamental	/	PK
	H	636.7	5.8	21.3	27.1	46	-18.9	QP
	H	625.0	5.8	21.2	27.0	46	-19.0	QP
	H	3167.5	36.7	-5.2	31.5	54(Note1)	-22.5	PK
	H	7307.0	43.2	7.1	50.3	54(Note1)	-3.7	PK
	V	4876.0	37.7	-0.4	37.3	54(Note1)	-16.7	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK
11	H	2462.0	75.5	30.4	105.9	Fundamental	/	PK
	H	830.9	6.3	23.1	29.4	46	-16.6	QP
	H	698.1	6.4	21.7	28.1	46	-17.9	QP
	V	3167.5	37.4	-5.1	32.3	54(Note1)	-21.7	PK
	H	7386.0	35.8	6.8	42.6	54(Note1)	-11.4	PK
	H	4918.5	38.6	-0.5	38.1	54(Note1)	-15.9	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK

Note 1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn’t be performed.

802.11n(20MHz)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	2412.0	76.4	30.3	106.7	Fundamental	/	PK
	H	340.5	11.0	15.7	26.7	46	-19.3	QP
	H	568.8	5.7	20.9	26.6	46	-19.4	QP
	V	3040.0	37.7	-5.4	32.3	54(Note1)	-21.7	PK
	V	4824.0	35.2	-0.5	34.7	54(Note1)	-19.3	PK
	H	7236.0	35.4	7.0	42.4	54(Note1)	-11.6	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK
6	H	2436.9	76.3	30.5	106.8	Fundamental	/	PK
	H	455.0	11.8	18.4	30.2	46	-15.8	QP
	H	732.9	6.1	22.4	28.5	46	-17.5	QP
	H	3133.5	37.2	-5.1	32.1	54(Note1)	-21.9	PK
	H	4884.5	40.0	-0.4	39.6	54(Note1)	-14.4	PK
	V	7307.0	45.4	7.1	52.5	54(Note1)	-1.5	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK
11	H	2462.1	76.2	30.4	106.6	Fundamental	/	PK
	H	500.0	9.8	19.4	29.2	46	-16.8	QP
	H	875.1	6.3	23.4	29.7	46	-16.3	QP
	V	3176.0	37.7	-5.6	32.1	54(Note1)	-21.9	PK
	H	4924.0	36.9	-0.5	36.4	54(Note1)	-17.6	PK
	H	7386.0	35.5	6.8	42.3	54(Note1)	-11.7	PK
	H	24000.0	59.1	-8.9	50.2	54(Note1)	-3.8	PK

Note 1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn’t be performed.

5. RF Antenna Conducted Spurious

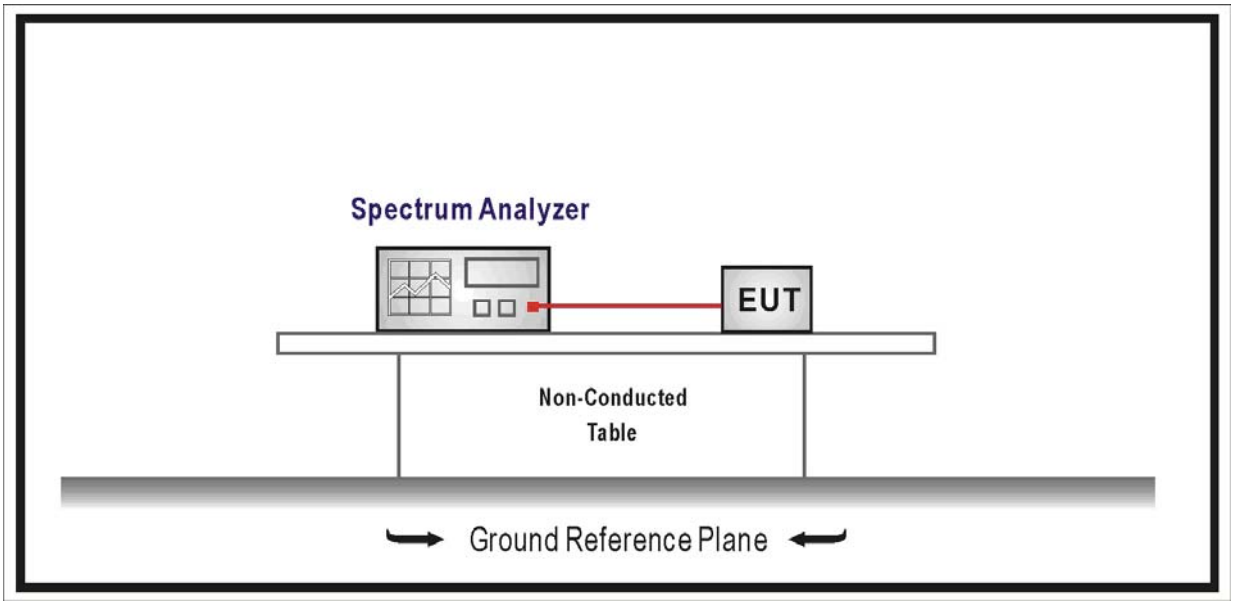
5.1. Test Equipment

RF Antenna Conducted Spurious / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.4. Test Procedure

The EUT was tested according to DTS test procedure of ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

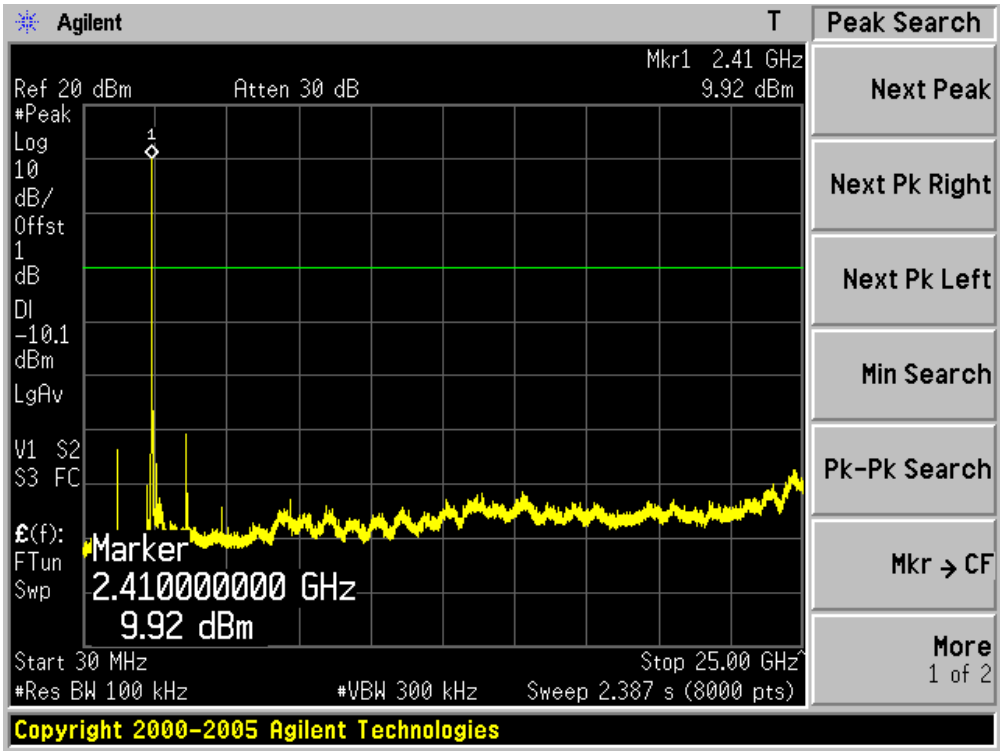
5.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

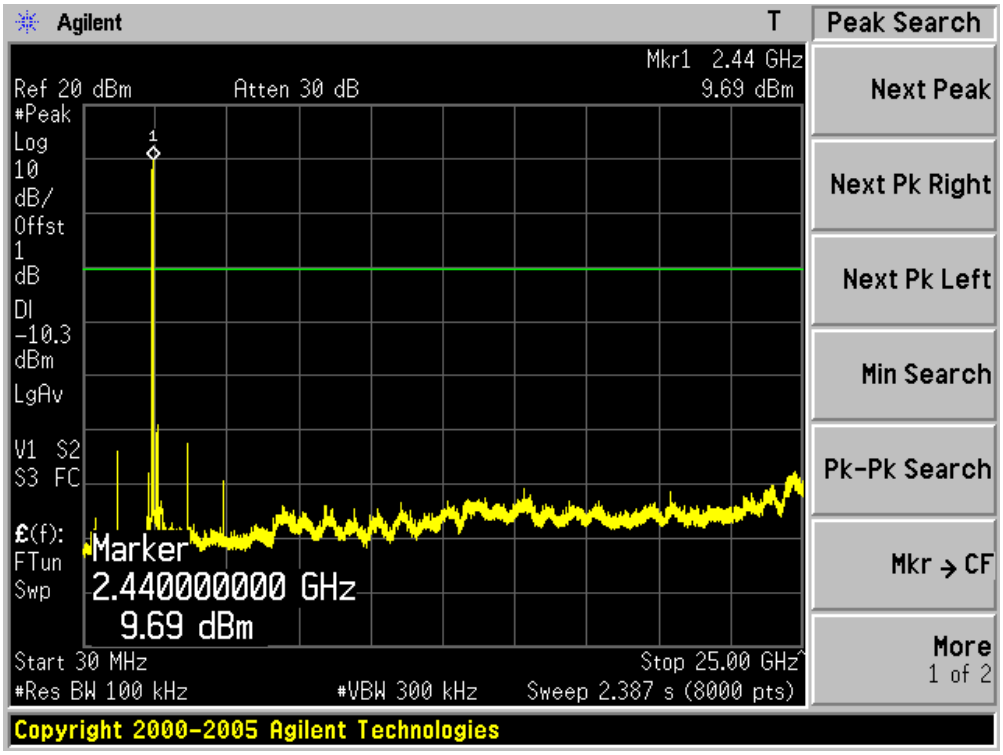
5.6. Test Result

Product	:	IP-STB
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

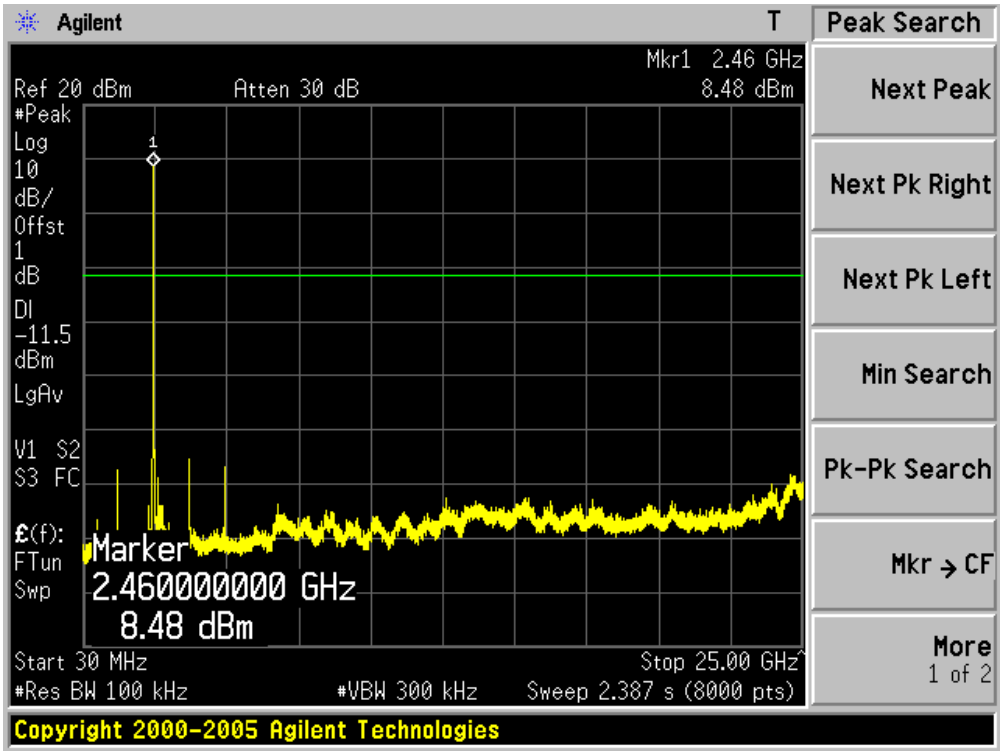
Channel 01 (2412MHz)



Channel 06 (2437MHz)

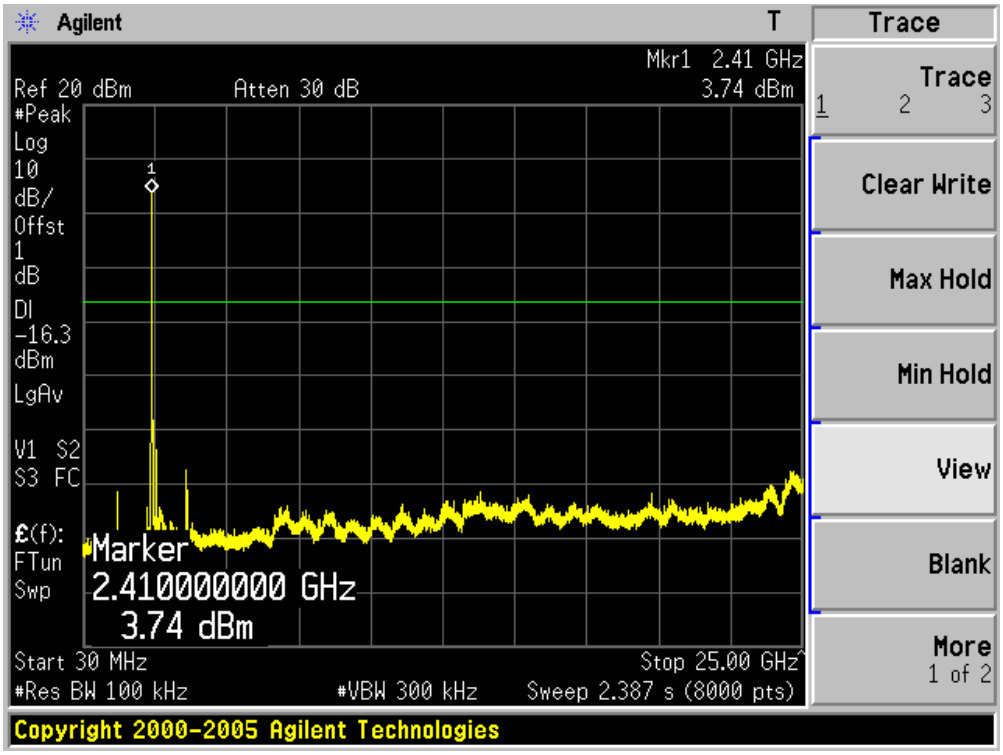


Channel 11 (2462MHz)

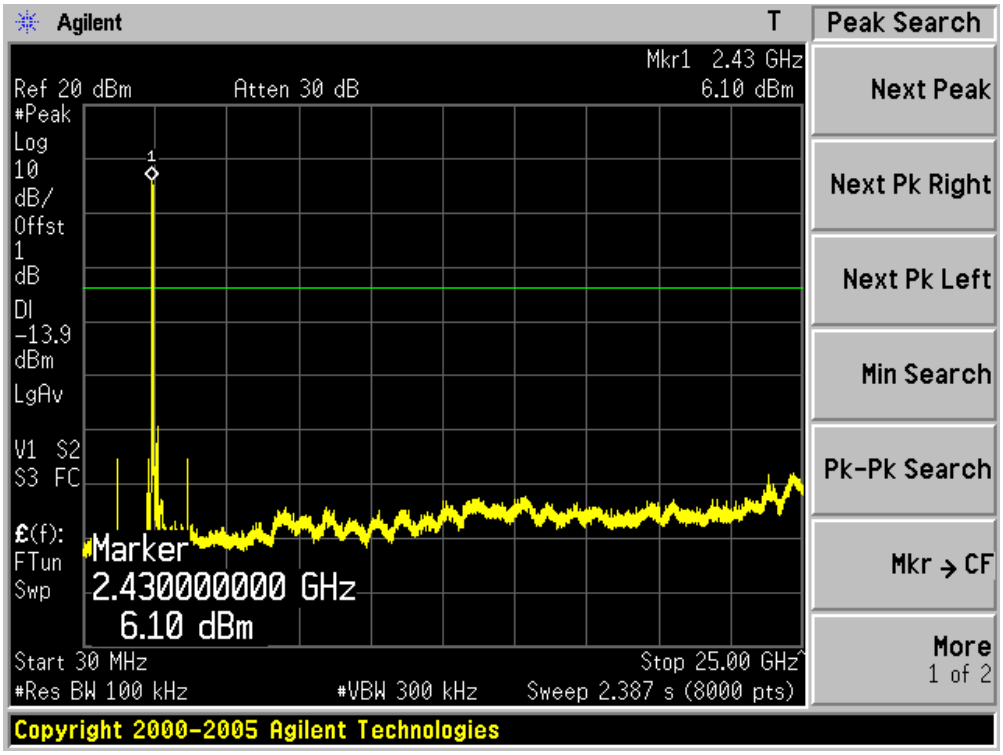


Product	:	IP-STB
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

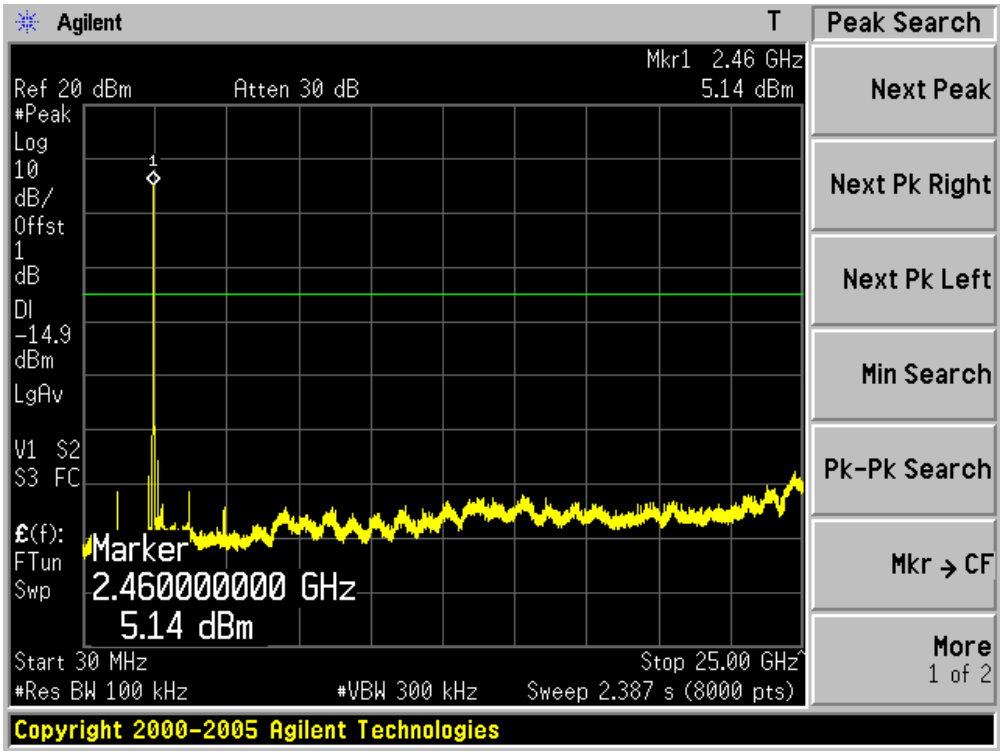
Channel 01 (2412MHz)



Channel 06 (2437MHz)

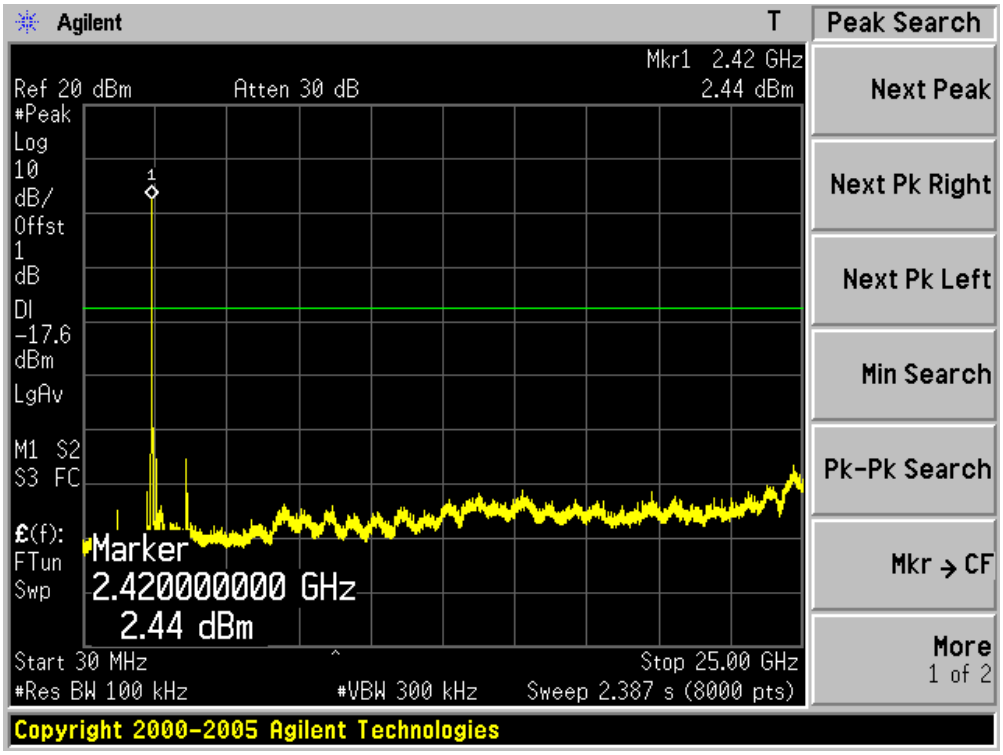


Channel 11 (2462MHz)

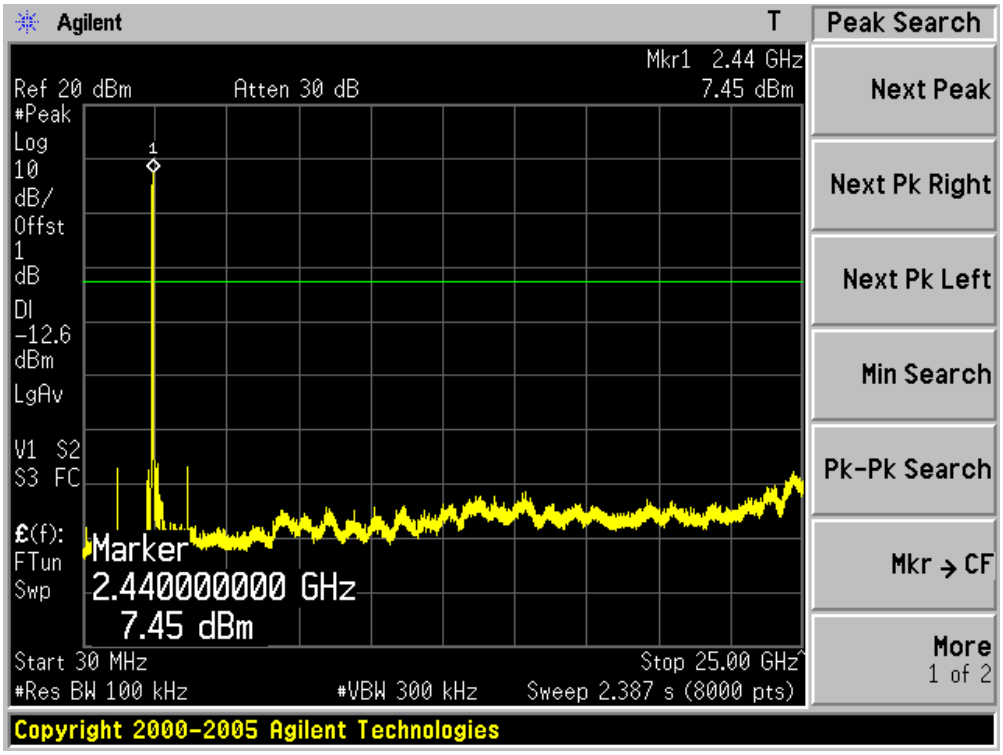


Product	:	IP-STB
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n (20MHz)

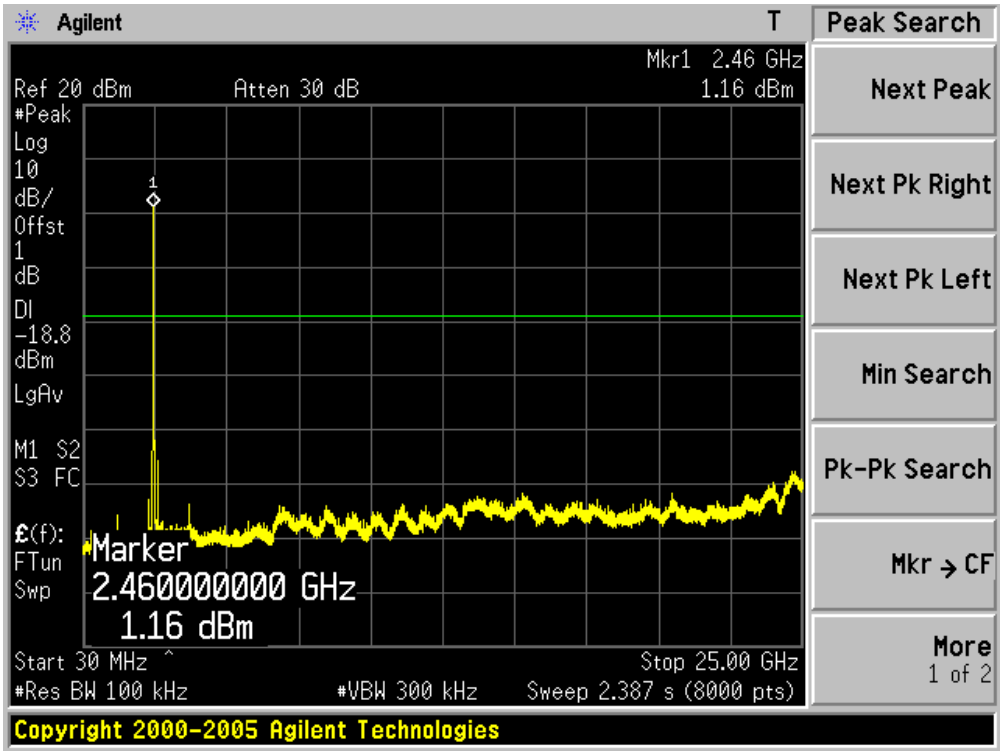
Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



6. Radiated Emission Band Edge

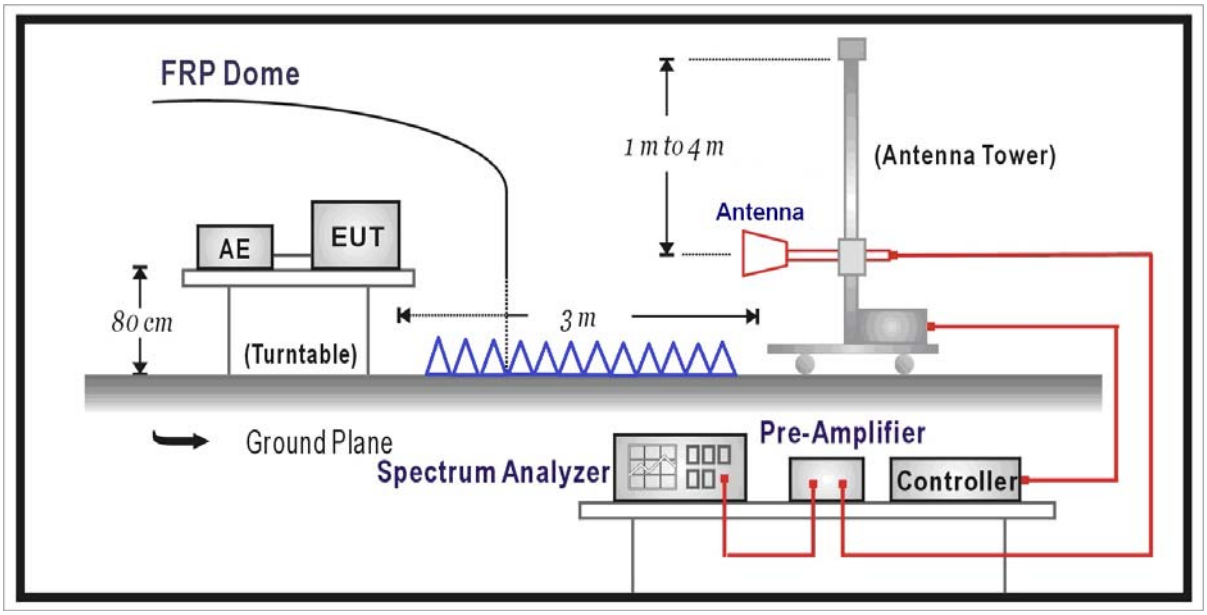
6.1. Test Equipment

☒Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2012.04.23
EMI Test Receiver	R&S	ESCI	100573	2012.04.23
Preamplifier	Quietek	AP-025C	CHM-0511006	2012.04.12
Preamplifier	Quietek	AP-180C	CHM-0602013	2012.03.07
Bilog Type Antenna	Schaffner	CBL6112B	2932	2011.10.18
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2012.06.11
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2012.05.05
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2012.01.14

Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.4. Test Procedure

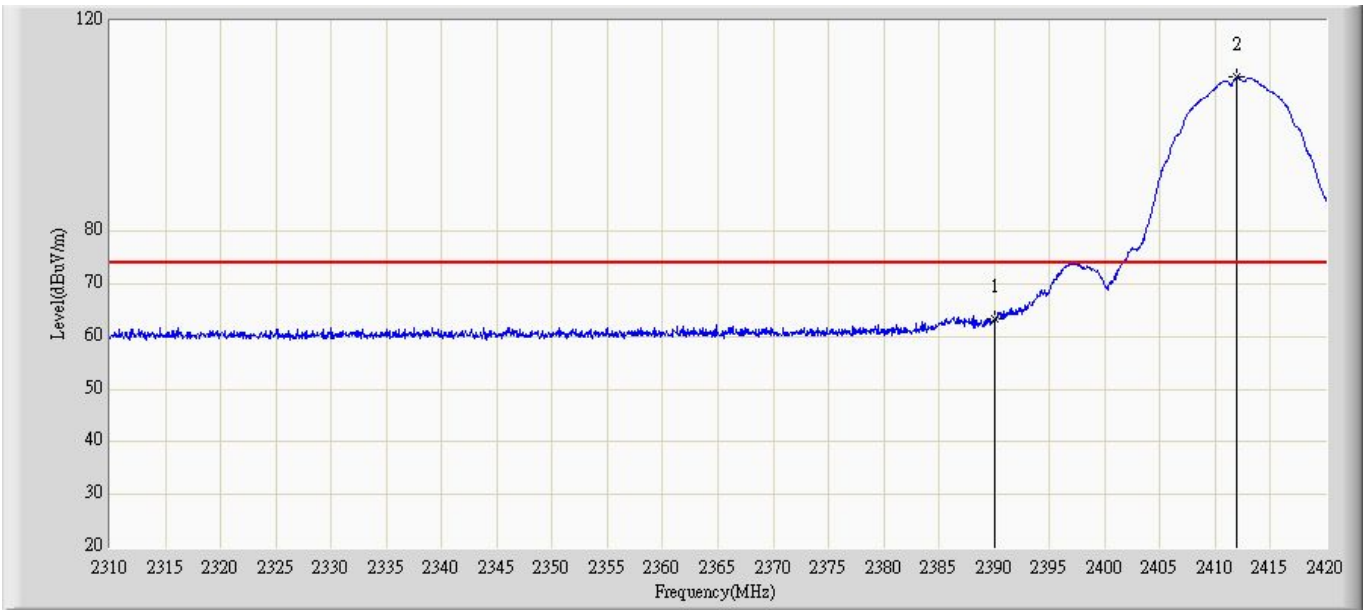
The EUT was setup according to ANSI C63.4, 2009 and tested according to ANSI C63.10 for compliance to FCC 47CFR 15.247 requirements.
The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

6.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

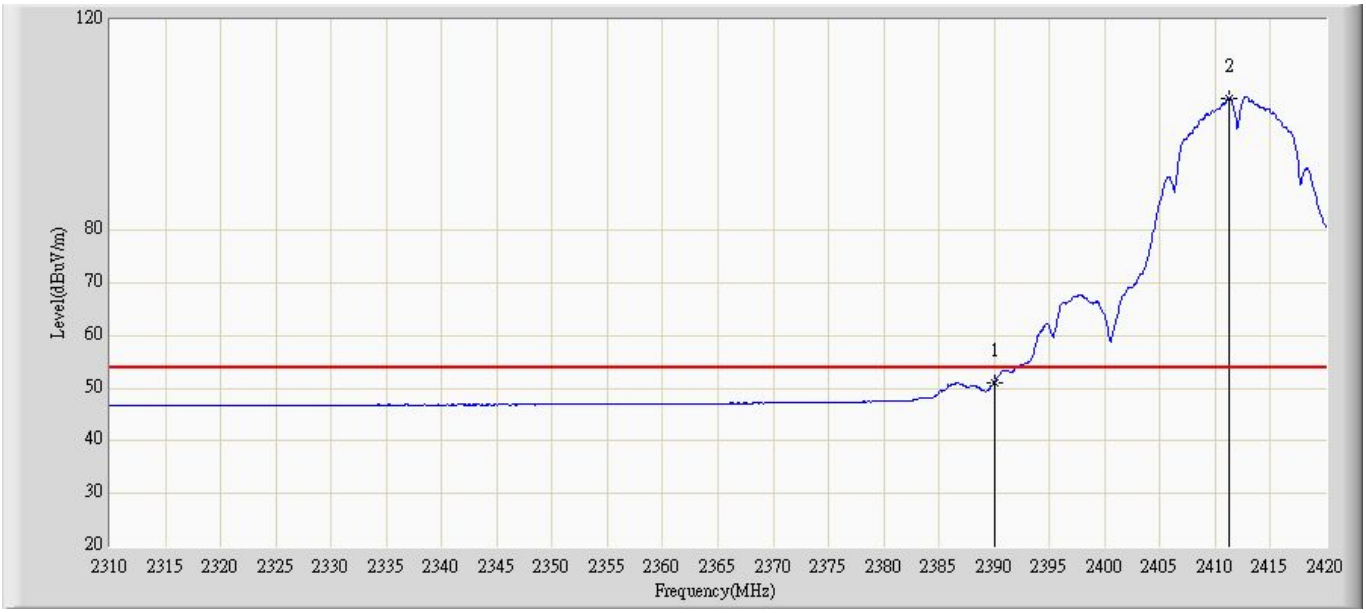
6.6. Test Result

Profile: 115S035R	Page No.: 1
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 08:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



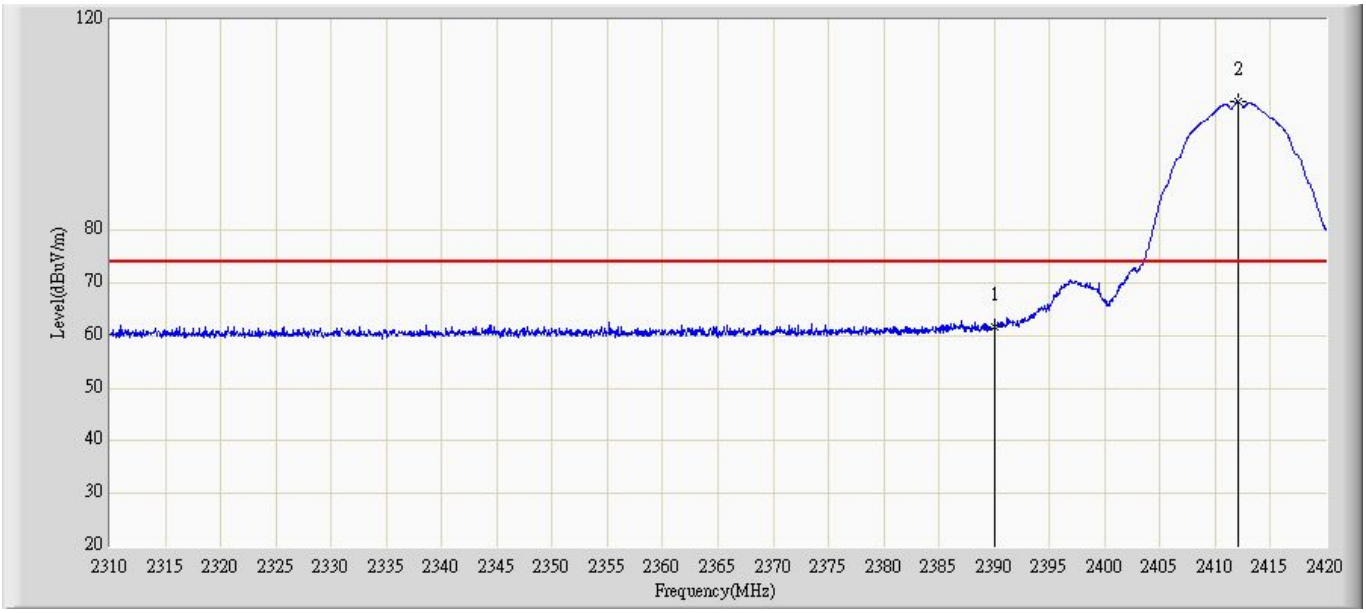
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	63.303	32.903	-10.697	74.000	30.400	PK
2		*	2411.970	109.293	78.922	N/A	N/A	30.371	PK

Profile: 115S035R	Page No.: 2
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 08:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



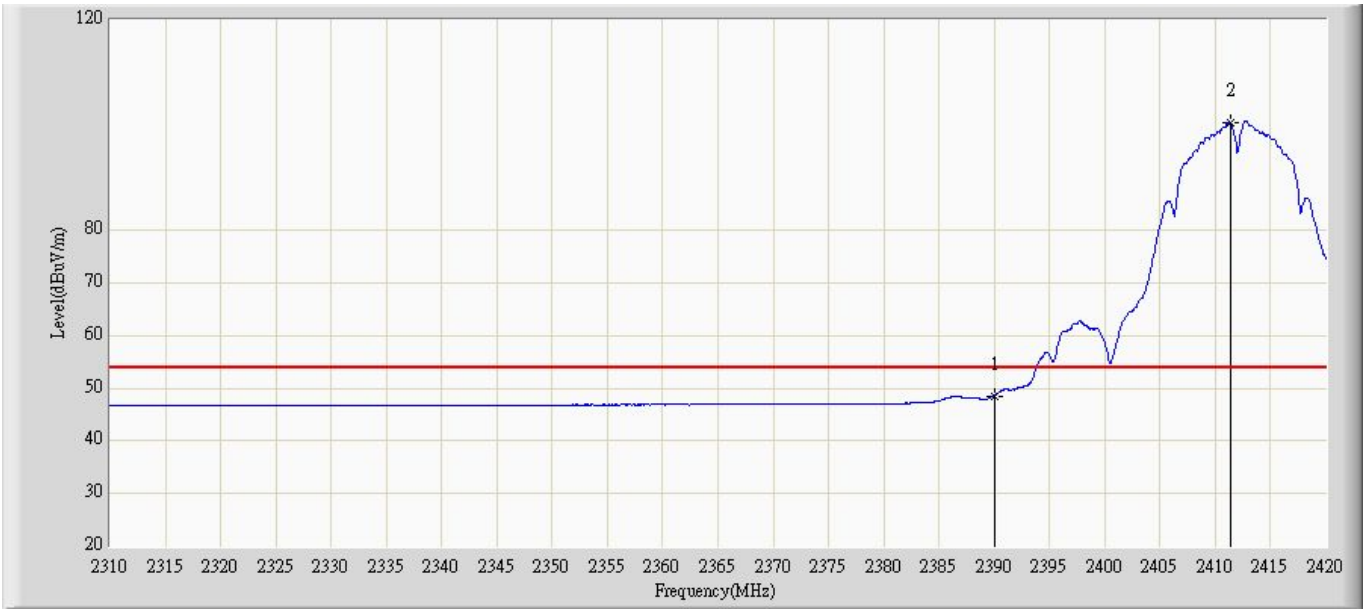
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	51.117	20.717	-2.883	54.000	30.400	AV
2		*	2411.200	105.109	74.739	N/A	N/A	30.370	AV

Profile: 115S035R	Page No.: 3
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 08:52
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



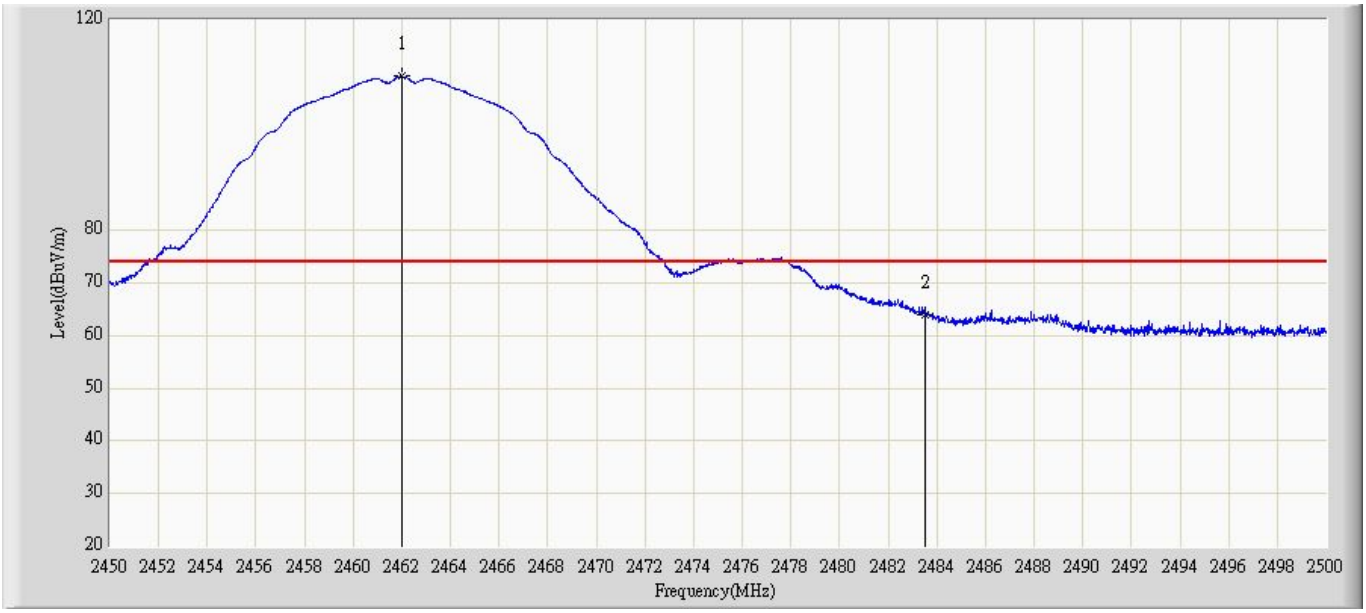
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	61.650	31.250	-12.350	74.000	30.400	PK
2		*	2412.080	104.352	73.981	N/A	N/A	30.371	PK

Profile: 115S035R	Page No.: 4
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 08:57
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	48.577	18.177	-5.423	54.000	30.400	AV
2		*	2411.365	100.458	70.088	N/A	N/A	30.371	AV

Profile: 115S035R	Page No.: 5
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 09:03
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	

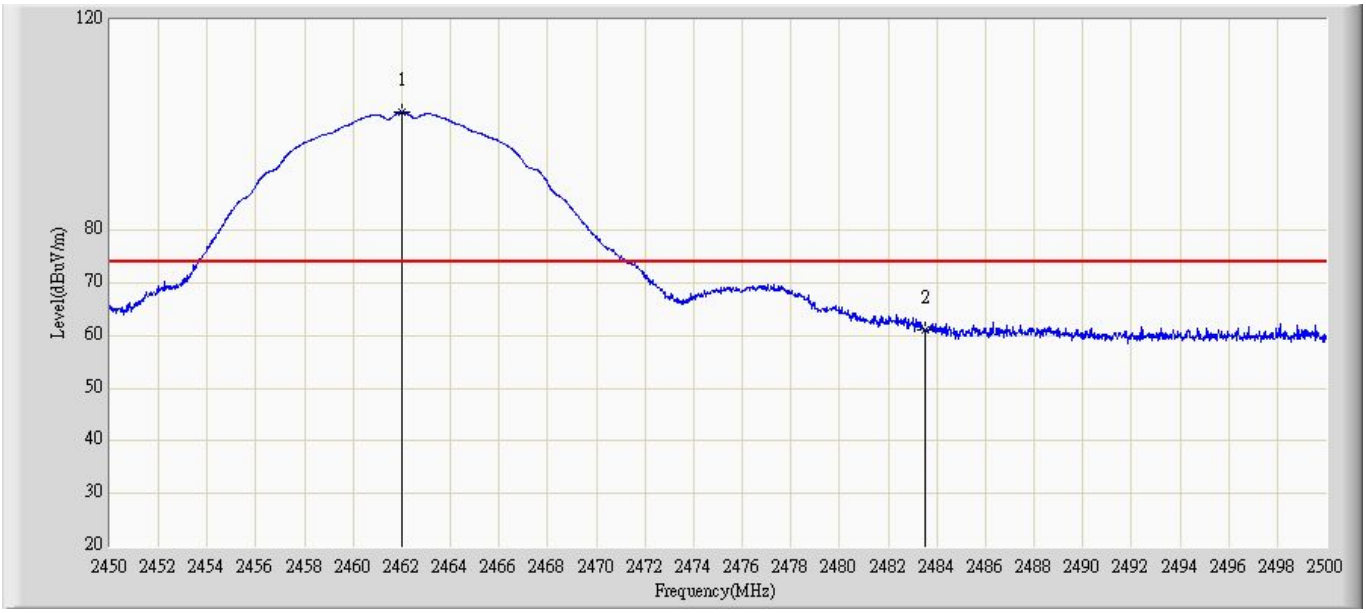


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2462.025	109.230	78.830	N/A	N/A	30.400	PK
2			2483.500	64.021	33.599	-9.979	74.000	30.422	PK

Profile: 115S035R	Page No.: 6
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 09:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	

No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.175	105.429	75.030	N/A	N/A	30.399	AV
2			2483.500	53.248	22.826	-0.752	54.000	30.422	AV

Profile: 115S035R	Page No.: 7
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:01
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	

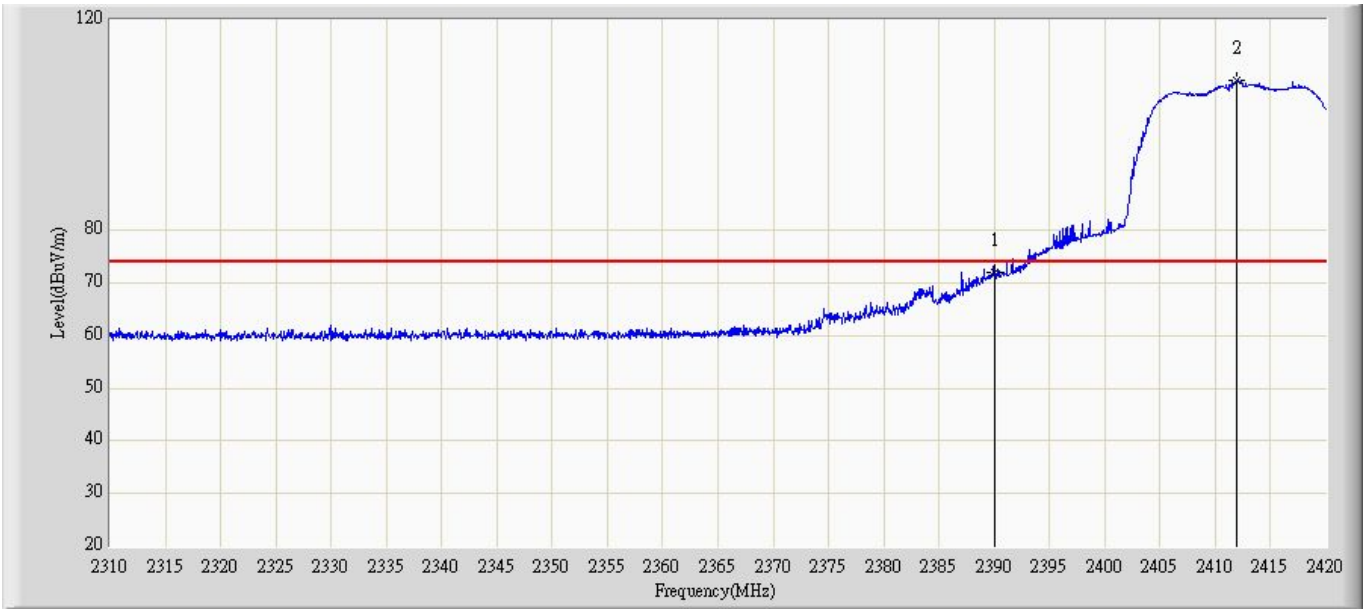


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2462.000	102.476	72.076	N/A	N/A	30.400	PK
2			2483.500	61.113	30.691	-12.887	74.000	30.422	PK

Profile: 115S035R	Page No.: 8
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	

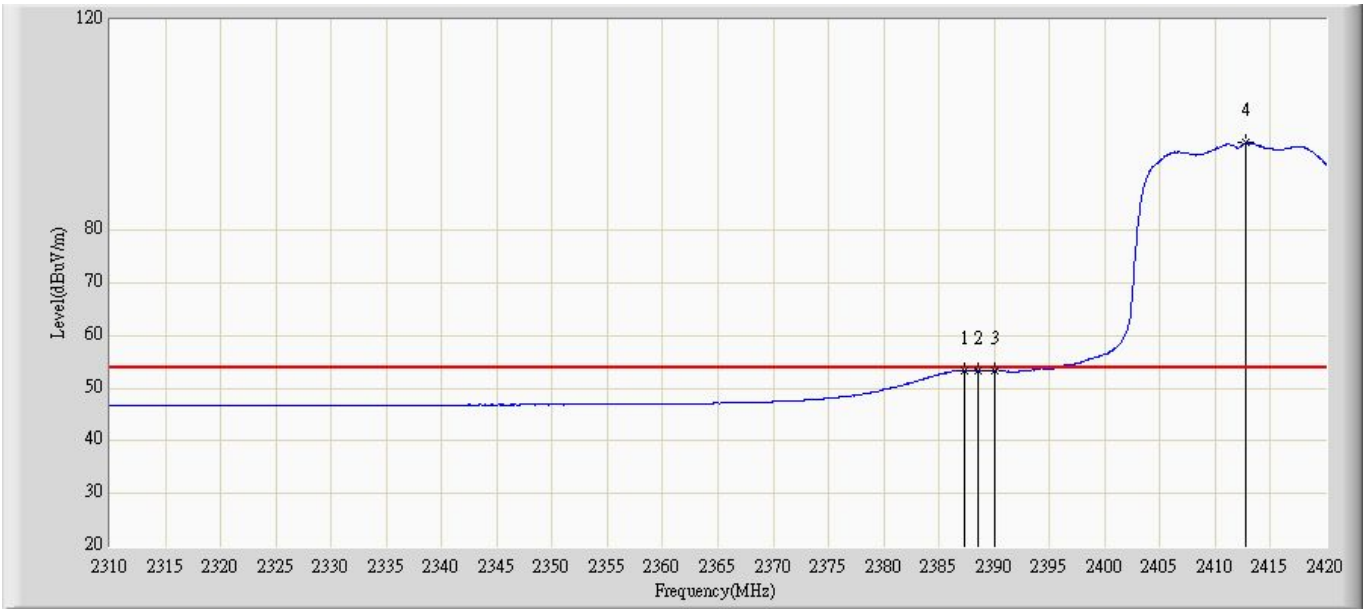
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.400	98.452	68.053	N/A	N/A	30.399	AV
2			2483.500	49.779	19.357	-4.221	54.000	30.422	AV

Profile: 115S035R	Page No.: 9
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2412MHz by 802.11g	



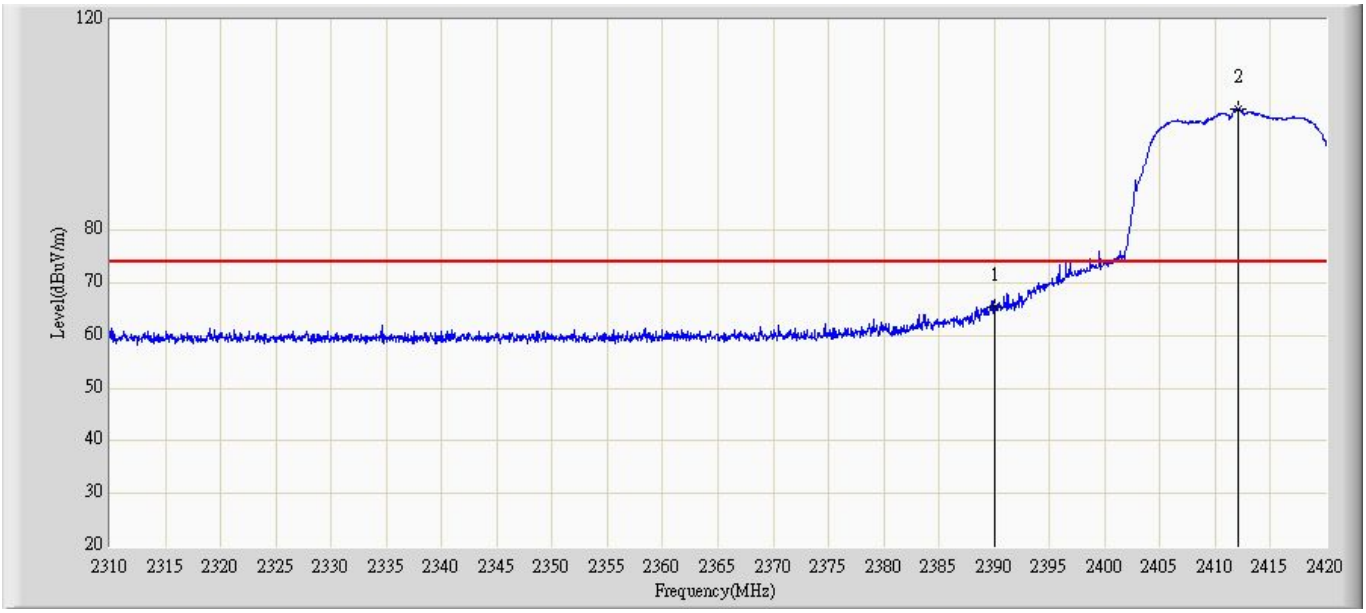
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	72.060	41.660	-1.940	74.000	30.400	PK
2		*	2411.970	108.424	78.053	N/A	N/A	30.371	PK

Profile: 115S035R	Page No.: 10
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2412MHz by 802.11g	



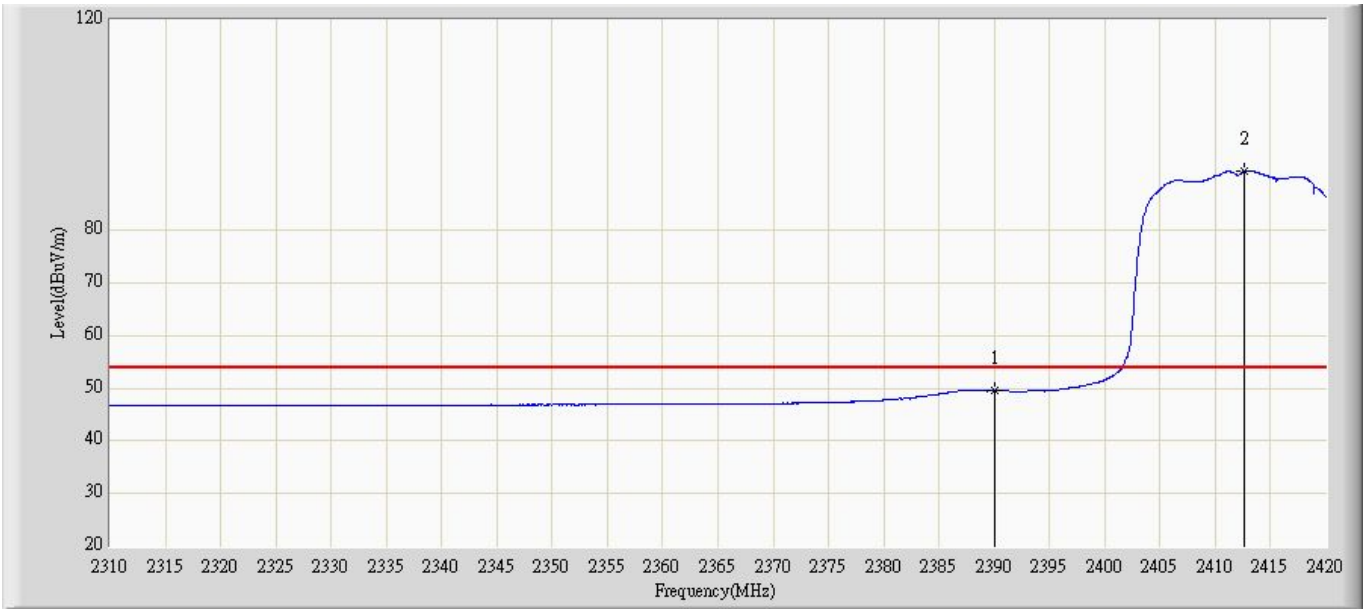
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2387.275	53.405	23.005	-0.595	54.000	30.400	AV
2			2388.540	53.387	22.987	-0.613	54.000	30.400	AV
3			2390.000	53.322	22.922	-0.678	54.000	30.400	AV
4		*	2412.740	96.597	66.225	N/A	N/A	30.372	AV

Profile: 115S035R	Page No.: 11
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:15
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2412MHz by 802.11g	



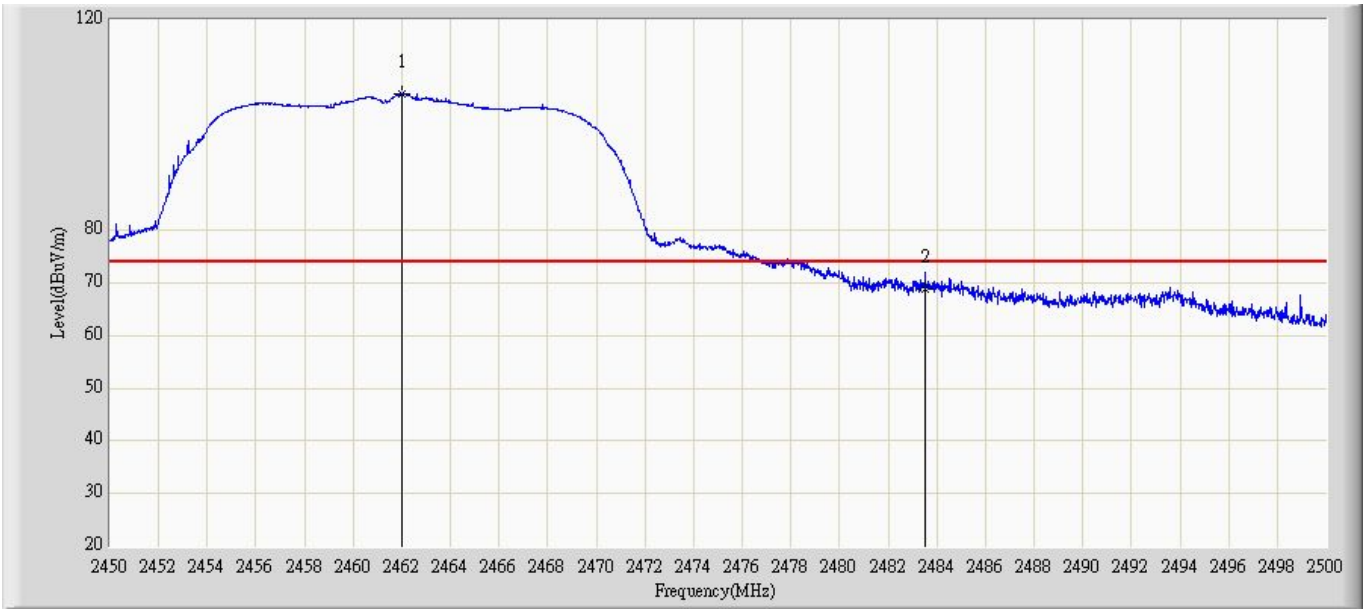
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	65.464	35.064	-8.536	74.000	30.400	PK
2		*	2412.080	103.138	72.767	N/A	N/A	30.371	PK

Profile: 115S035R	Page No.: 12
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:17
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2412MHz by 802.11g	



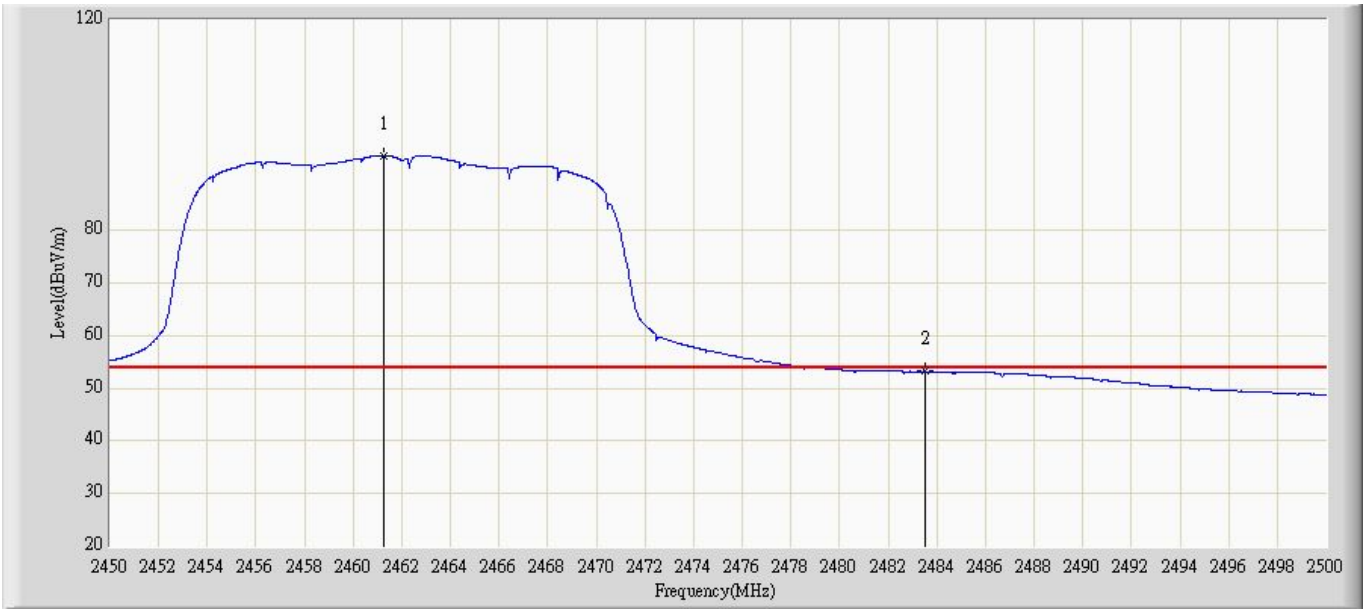
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.617	19.217	-4.383	54.000	30.400	AV
2		*	2412.630	91.275	60.903	N/A	N/A	30.372	AV

Profile: 115S035R	Page No.: 13
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



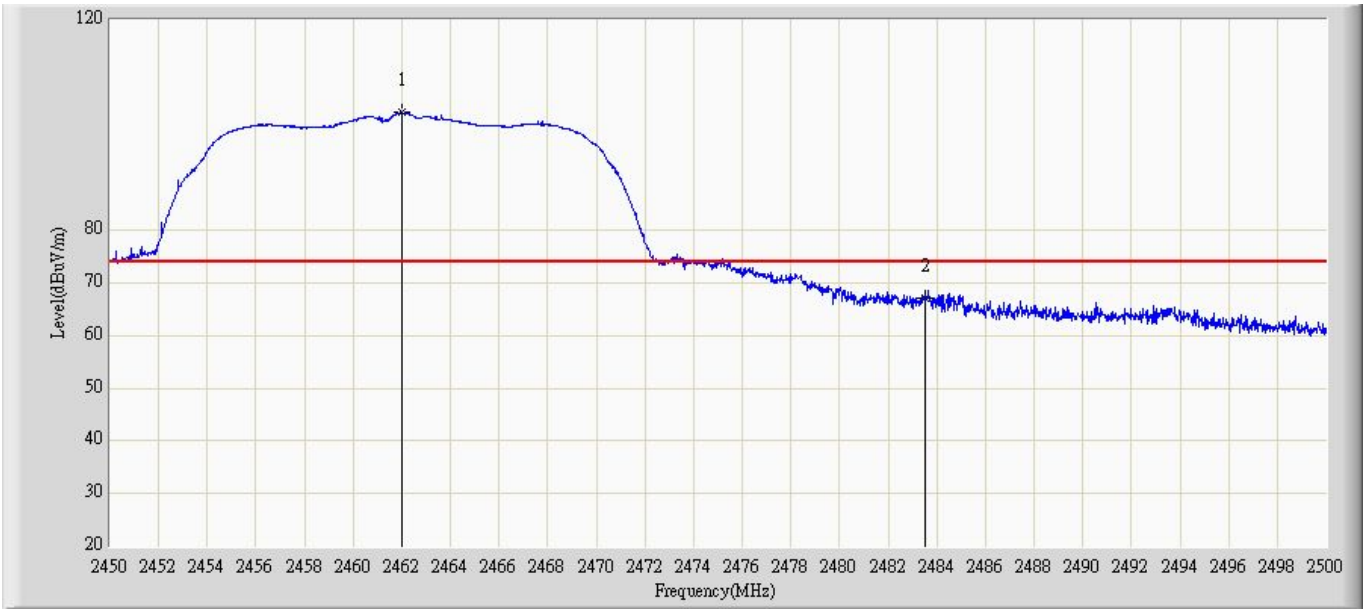
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.975	105.893	75.493	N/A	N/A	30.400	PK
2			2483.500	68.814	38.392	-5.186	74.000	30.422	PK

Profile: 115S035R	Page No.: 14
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



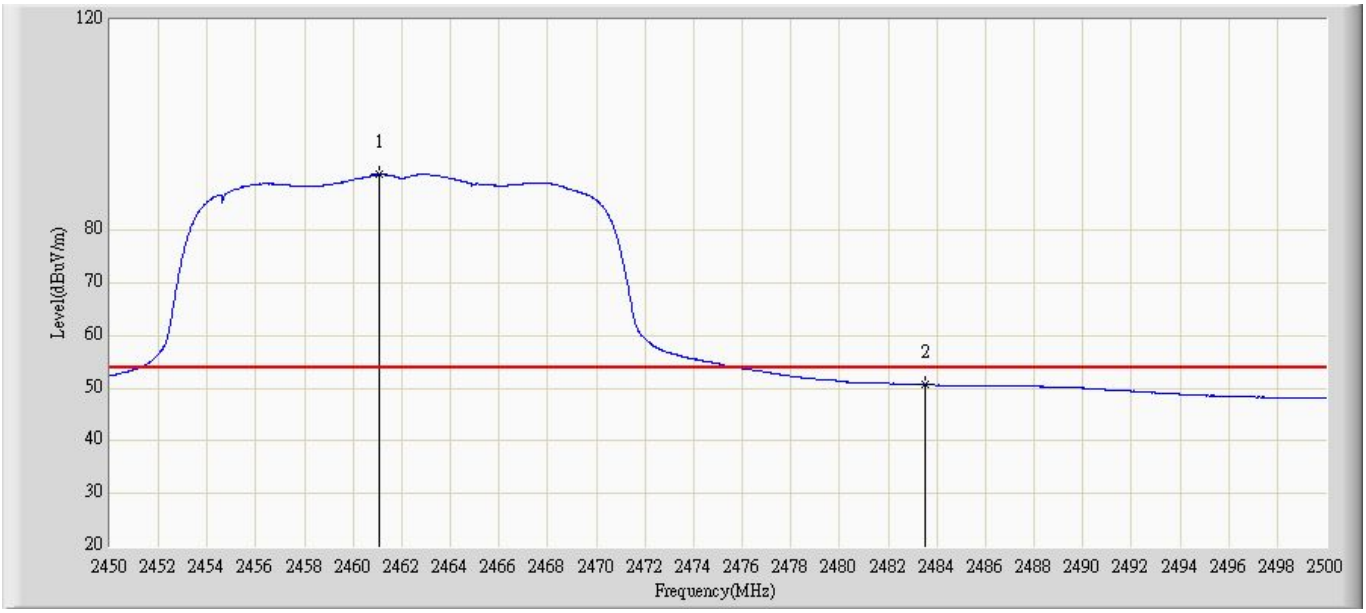
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.250	94.256	63.857	N/A	N/A	30.399	AV
2			2483.500	53.197	22.775	-0.803	54.000	30.422	AV

Profile: 115S035R	Page No.: 15
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:41
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



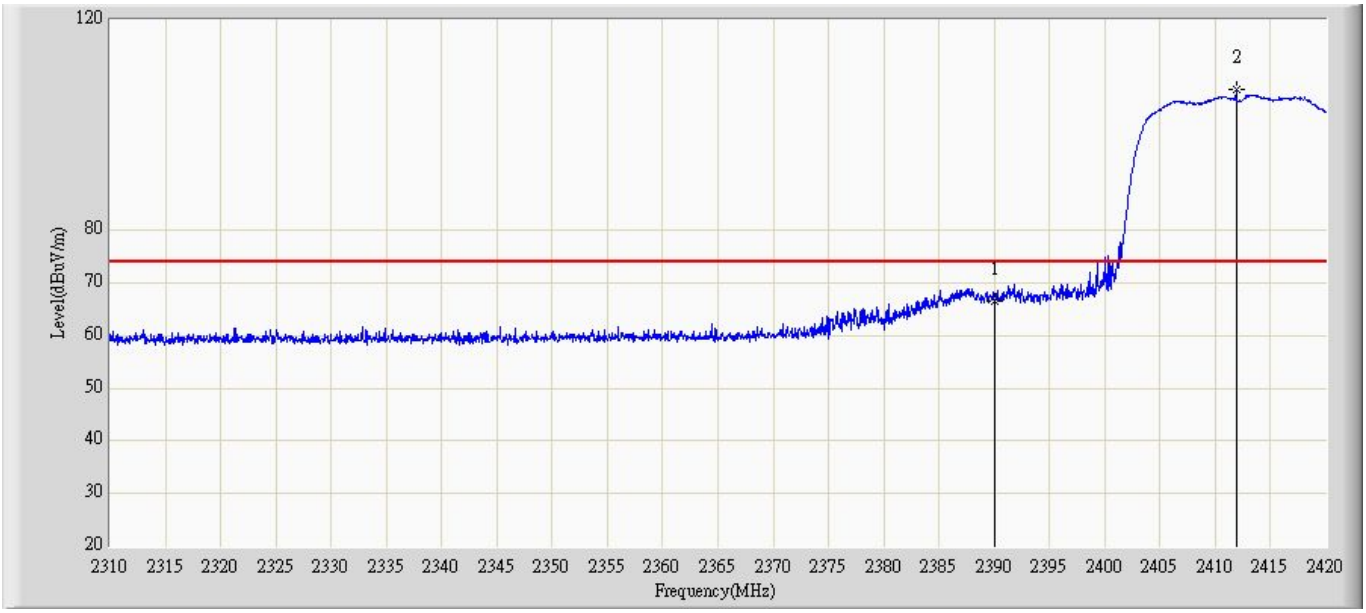
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2462.025	102.333	71.933	N/A	N/A	30.400	PK
2			2483.500	66.993	36.571	-7.007	74.000	30.422	PK

Profile: 115S035R	Page No.: 16
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:43
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



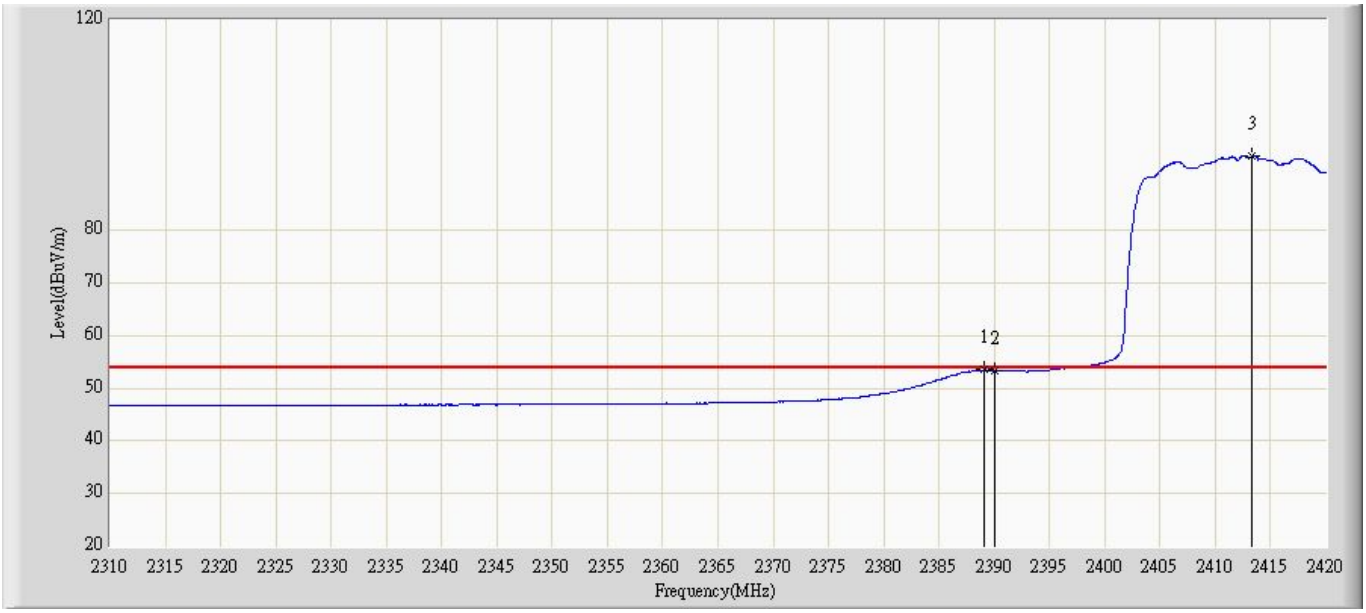
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.100	90.604	60.205	N/A	N/A	30.399	AV
2			2483.500	50.654	20.232	-3.346	54.000	30.422	AV

Profile: 115S035R	Page No.: 17
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:44
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n(20MHz)	



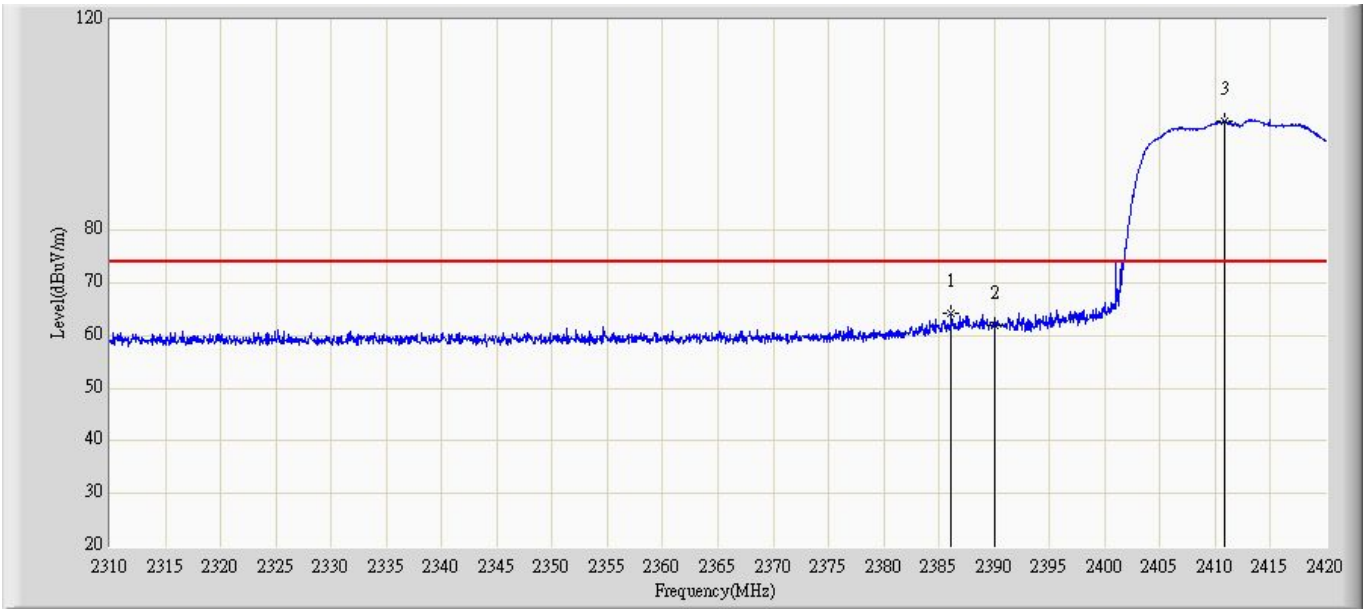
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	66.605	36.205	-7.395	74.000	30.400	PK
2		*	2411.860	106.749	76.378	N/A	N/A	30.371	PK

Profile: 115S035R	Page No.: 18
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n(20MHz)	



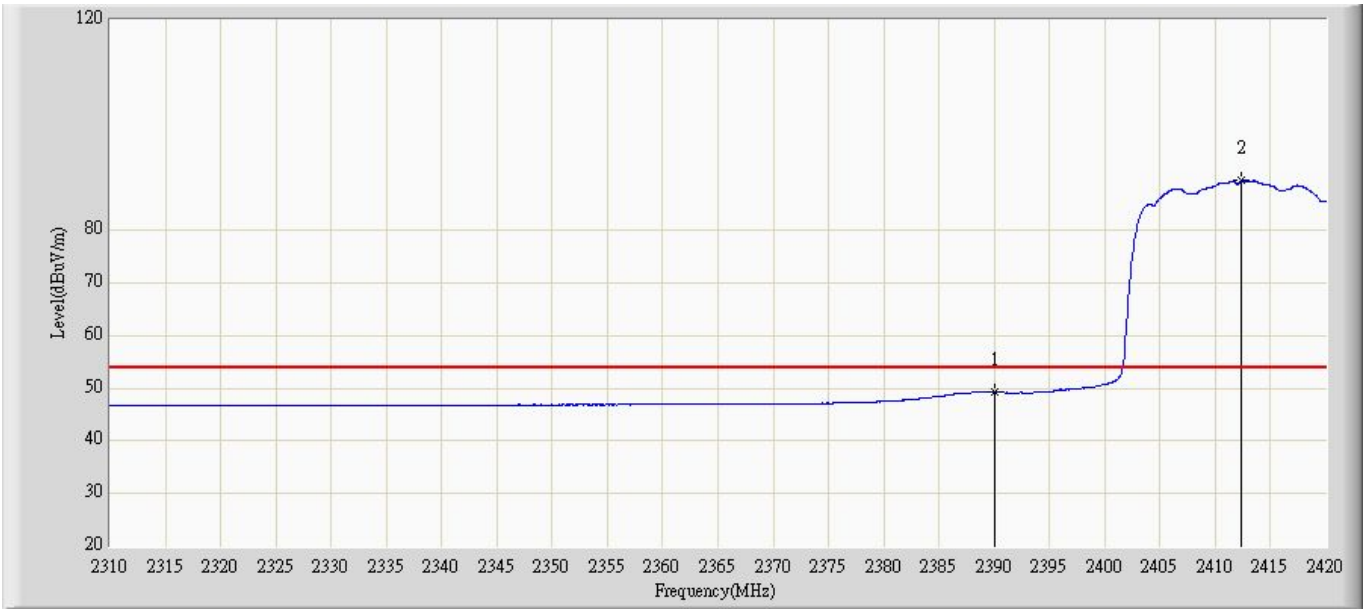
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2389.145	53.485	23.085	-0.515	54.000	30.400	AV
2			2390.000	53.375	22.975	-0.625	54.000	30.400	AV
3		*	2413.290	94.070	63.697	N/A	N/A	30.373	AV

Profile: 115S035R	Page No.: 19
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:56
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n(20MHz)	



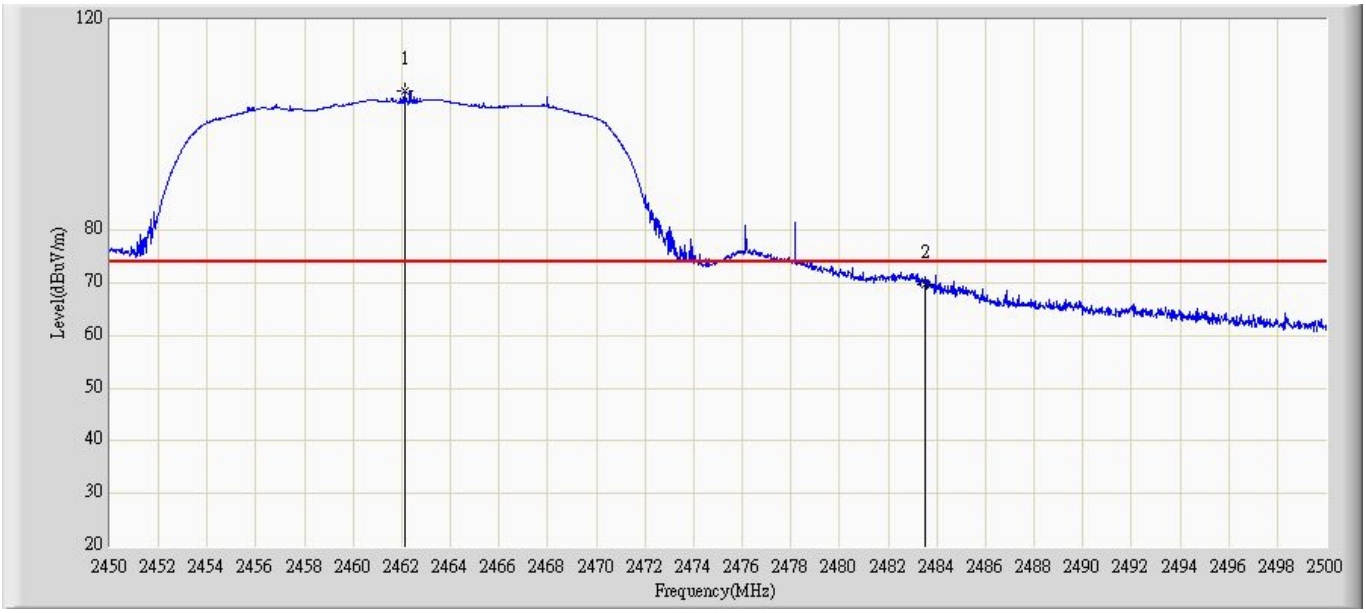
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2386.065	64.257	33.857	-9.743	74.000	30.400	PK
2			2390.000	61.832	31.432	-12.168	74.000	30.400	PK
3		*	2410.870	100.735	70.365	N/A	N/A	30.370	PK

Profile: 115S035R	Page No.: 20
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:57
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n(20MHz)	



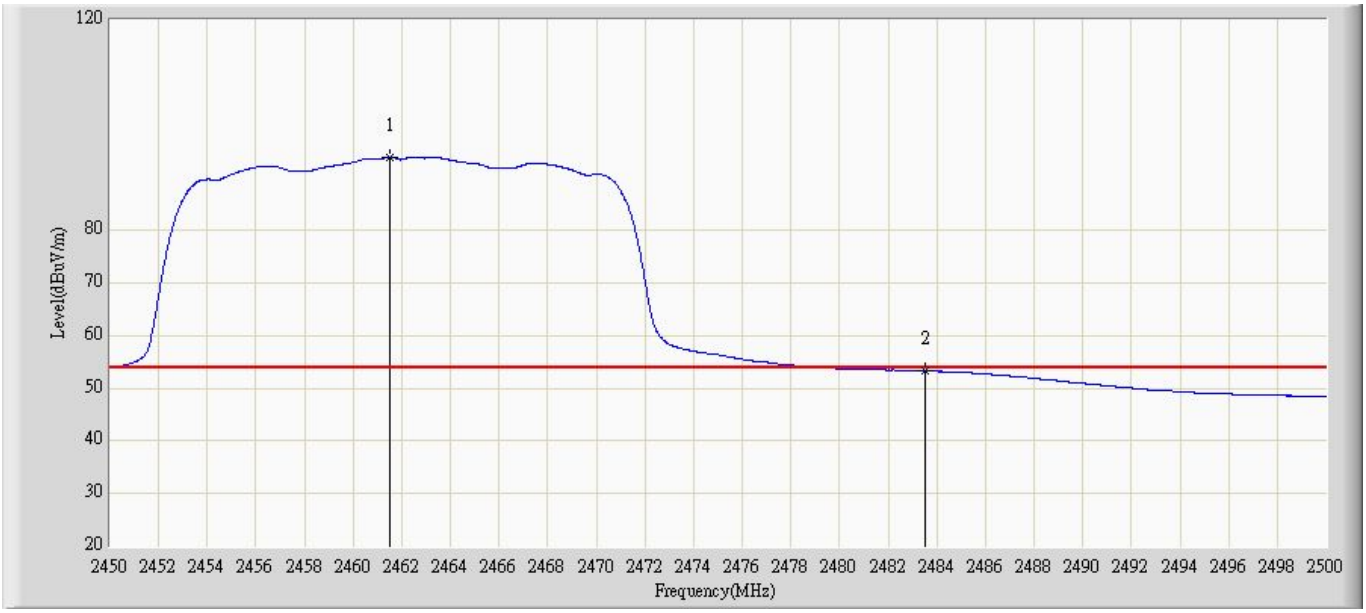
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.215	18.815	-4.785	54.000	30.400	AV
2		*	2412.355	89.418	59.046	N/A	N/A	30.371	AV

Profile: 115S035R	Page No.: 21
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 10:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n(20MHz)	



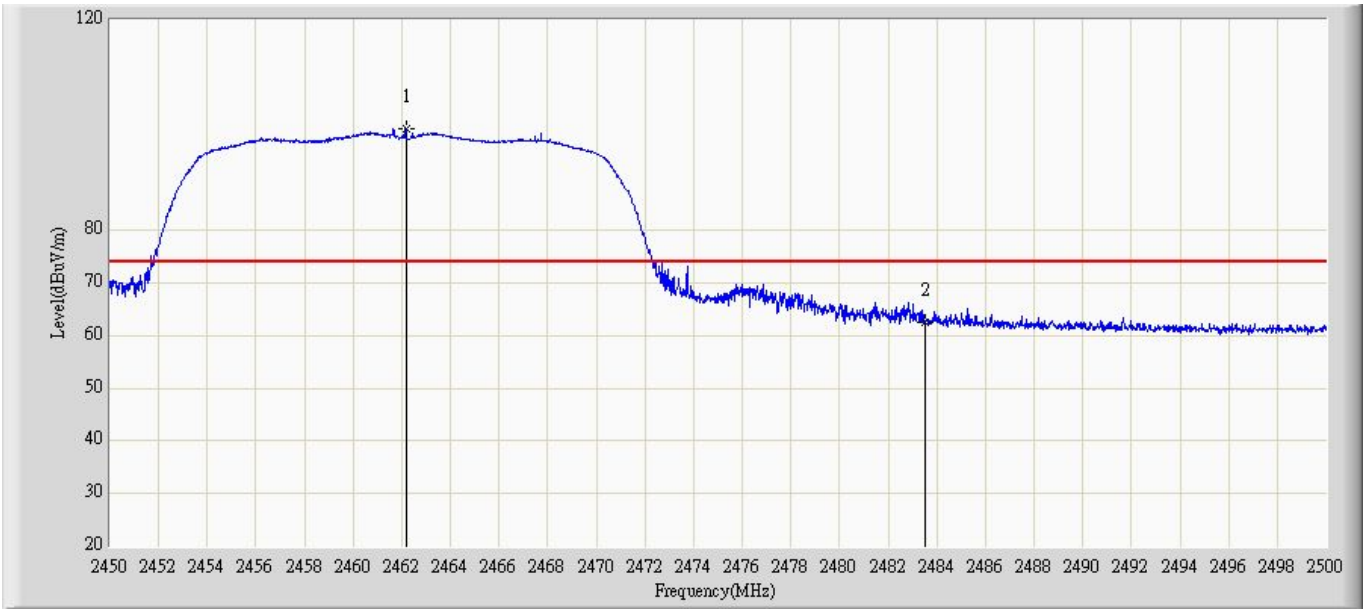
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2462.100	106.607	76.207	N/A	N/A	30.400	PK
2			2483.500	69.830	39.408	-4.170	74.000	30.422	PK

Profile: 115S035R	Page No.: 22
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 11:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n(20MHz)	



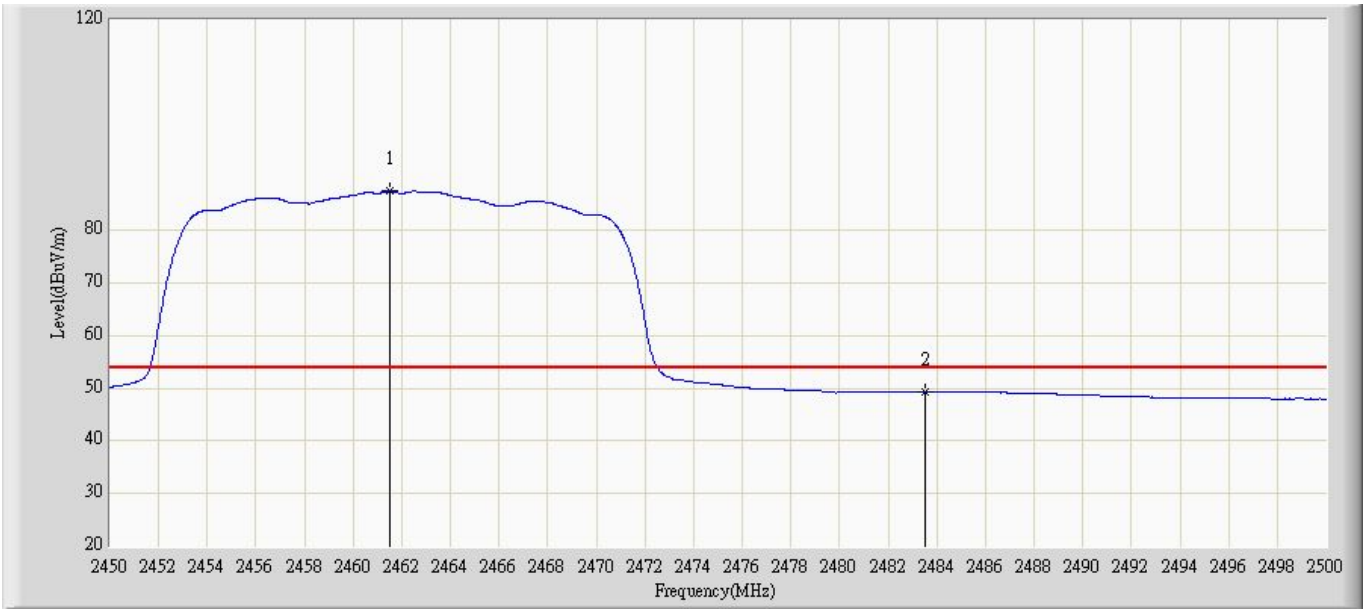
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.475	93.889	63.490	N/A	N/A	30.399	AV
2			2483.500	53.317	22.895	-0.683	54.000	30.422	AV

Profile: 115S035R	Page No.: 23
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 11:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n(20MHz)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2462.175	99.245	68.845	N/A	N/A	30.400	PK
2			2483.500	62.650	32.228	-11.350	74.000	30.422	PK

Profile: 115S035R	Page No.: 24
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 11:06
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n(20MHz)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2461.475	87.452	57.053	N/A	N/A	30.399	AV
2			2483.500	49.324	18.902	-4.676	54.000	30.422	AV

7. Operation Frequency Range of 20dB Bandwidth

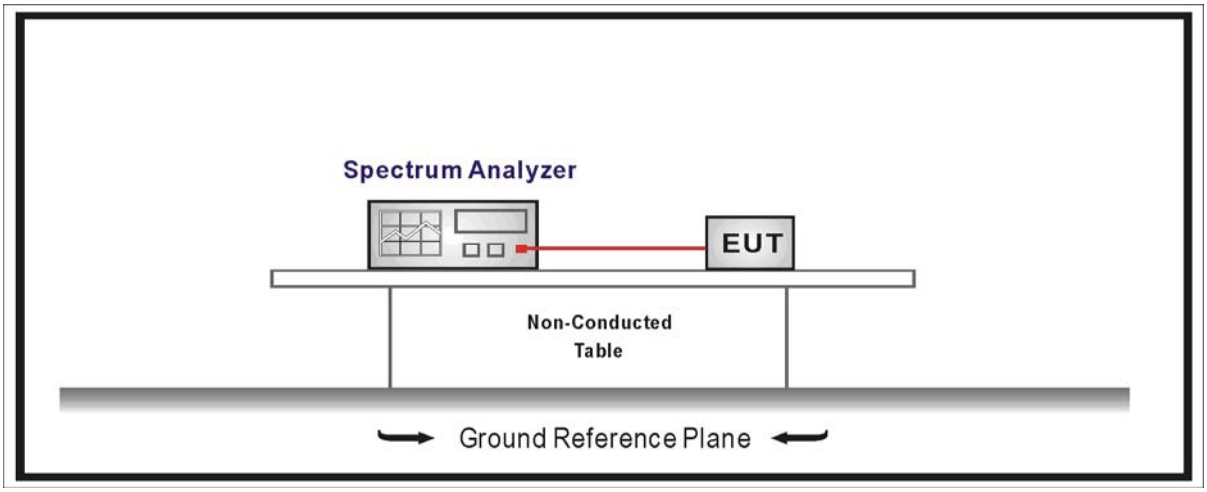
7.1. Test Equipment

Operation Frequency Range of 20dB Bandwidth / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

20 dB bandwidth of the emission is contained within the operation frequency band.

7.4. Test Procedure

The EUT was tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 100 kHz, Span greater than RBW.

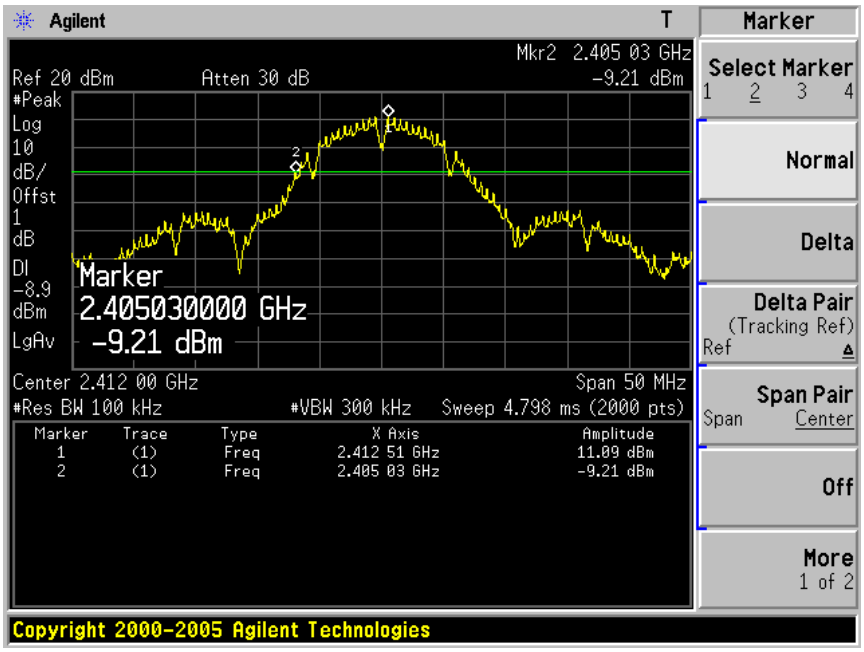
7.5. Uncertainty

The measurement uncertainty is defined as ± 1 kHz

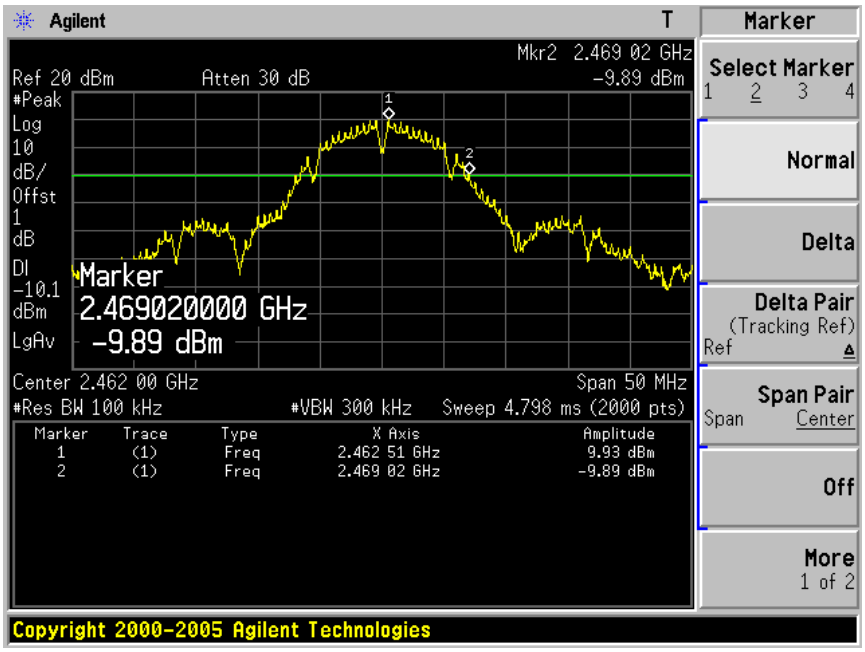
7.6. Test Result

Product	:	IP-STB
Test Item	:	Operation Frequency Range of 20dB Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel 01 (2412MHz)

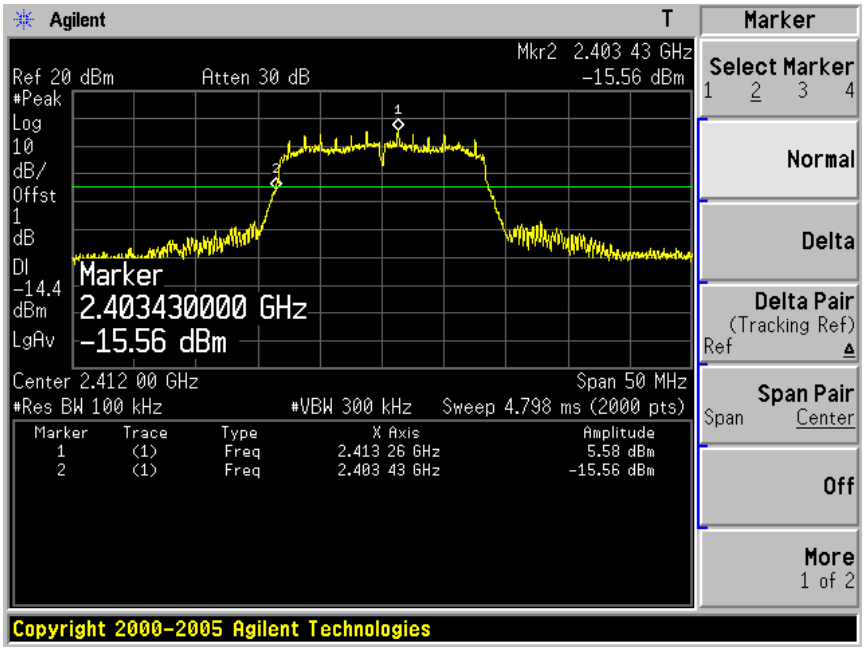


Channel 11 (2462MHz)

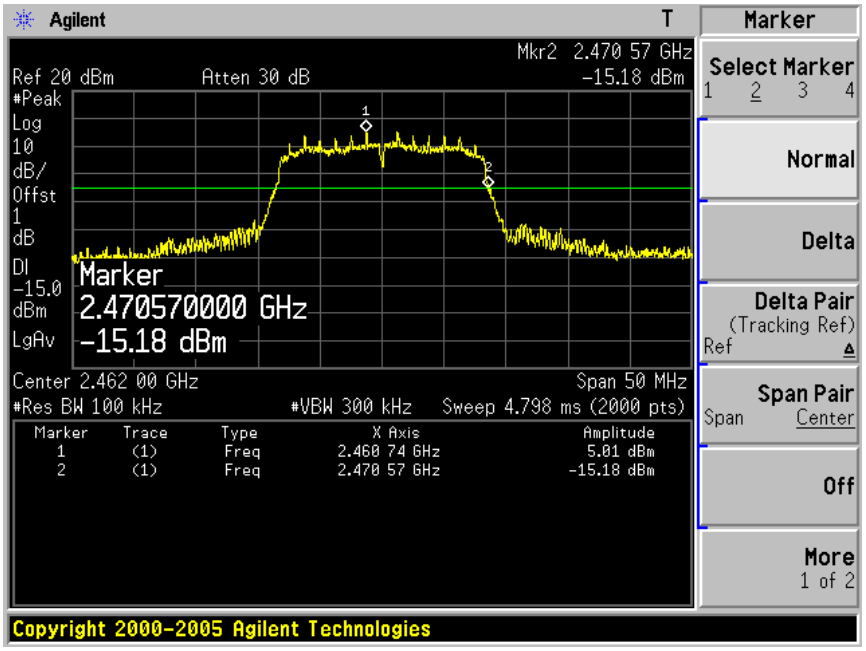


Product	:	IP-STB
Test Item	:	Operation Frequency Range of 20dB Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel 01 (2412MHz)

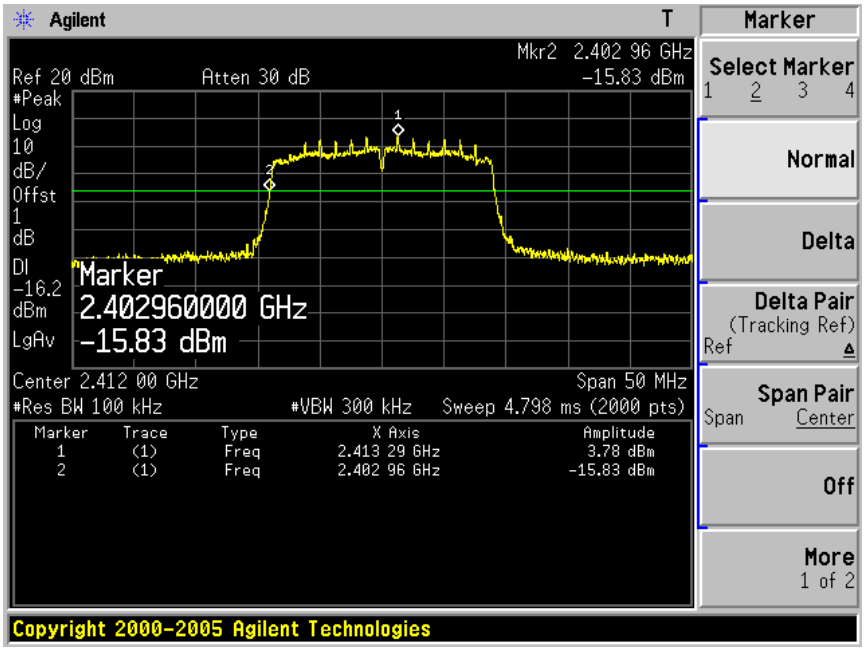


Channel 11 (2462MHz)

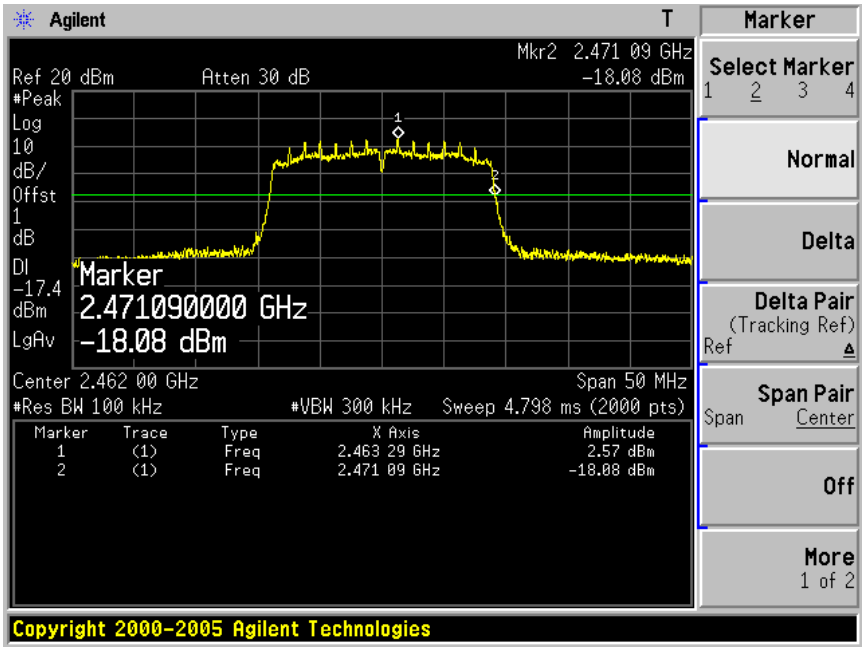


Product	:	IP-STB
Test Item	:	Operation Frequency Range of 20dB Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n (20MHz)

Channel 01 (2412MHz)



Channel 11 (2462MHz)



8. Occupied Bandwidth

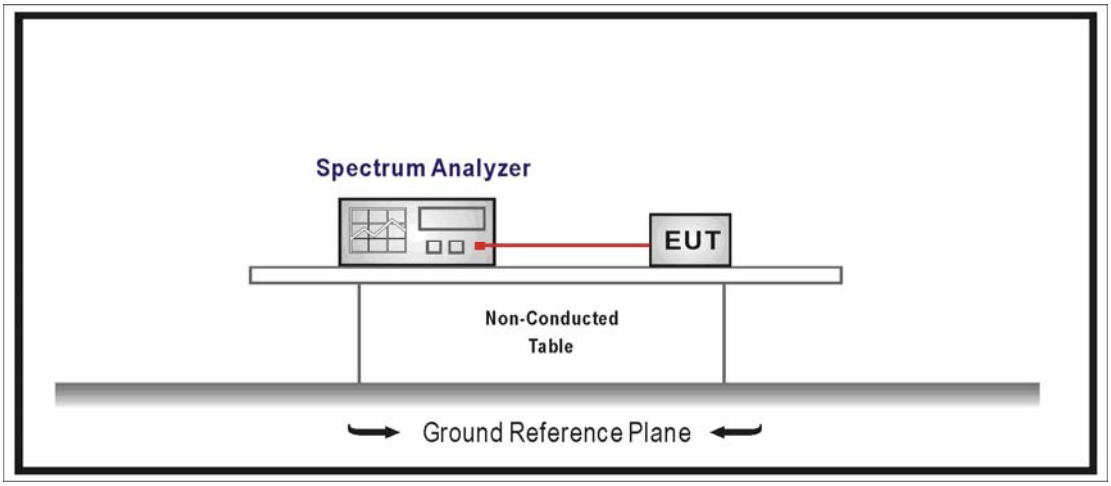
8.1. Test Equipment

Occupied Bandwidth / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

The minimum 6 dB bandwidth shall be at least 500 kHz.

8.4. Test Procedure

The EUT was tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 100 kHz, Span greater than RBW.

8.5. Uncertainty

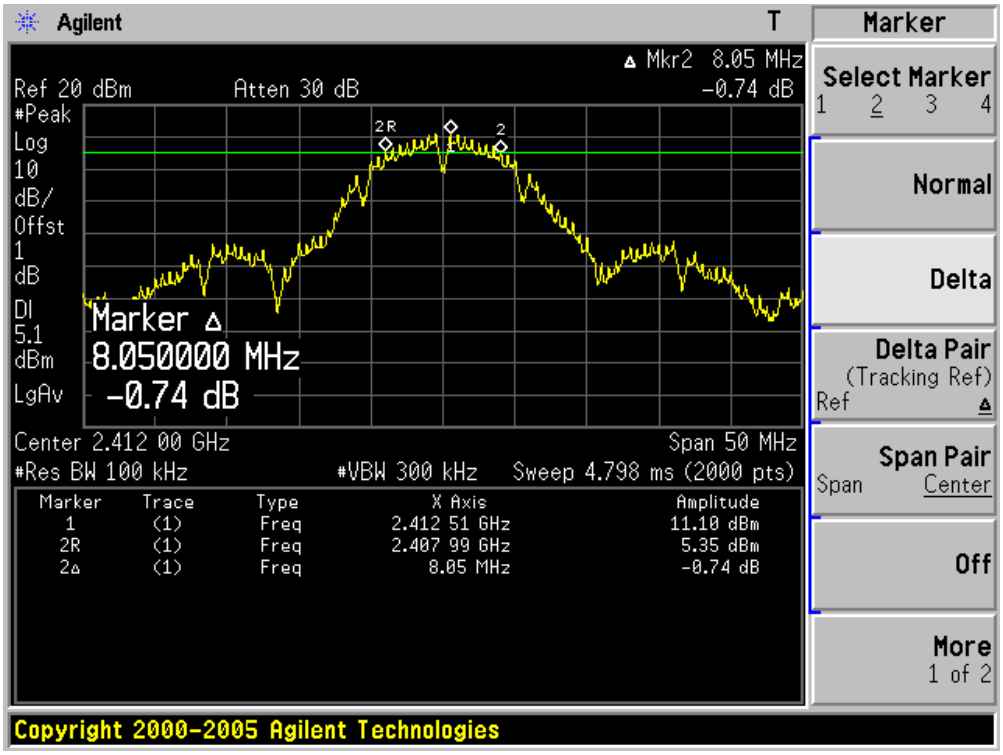
The measurement uncertainty is defined as ± 1 kHz

8.6. Test Result

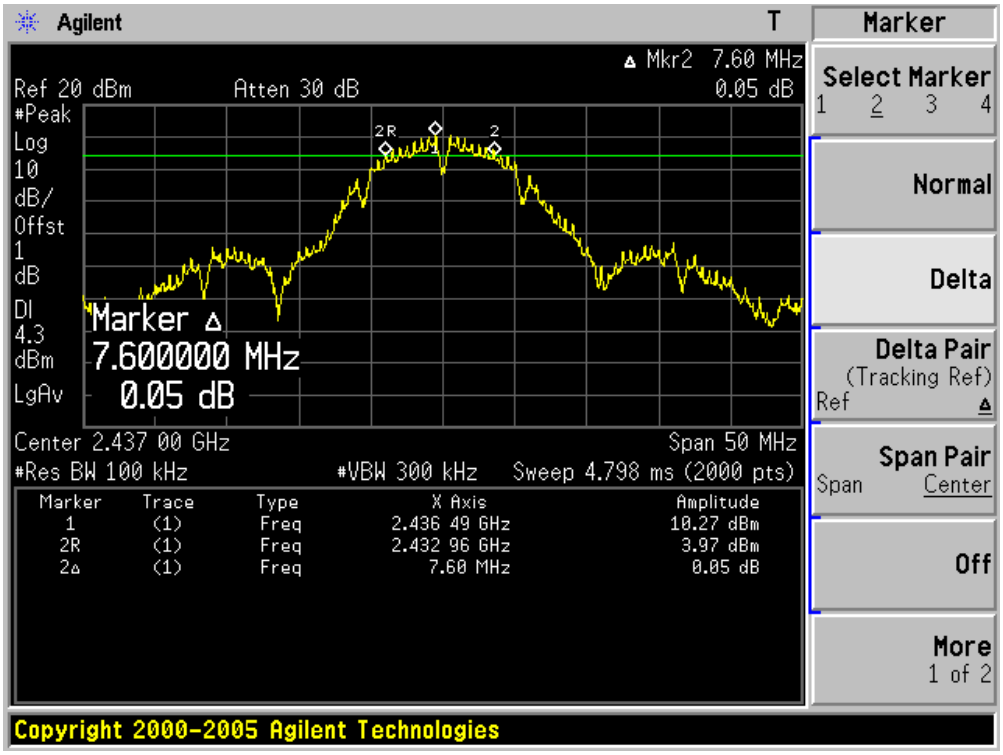
Product	:	IP-STB
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b (Chain 100)

Channel No.	Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Result
01	2412	8050	500	Pass
06	2437	7600	500	Pass
11	2462	7580	500	Pass

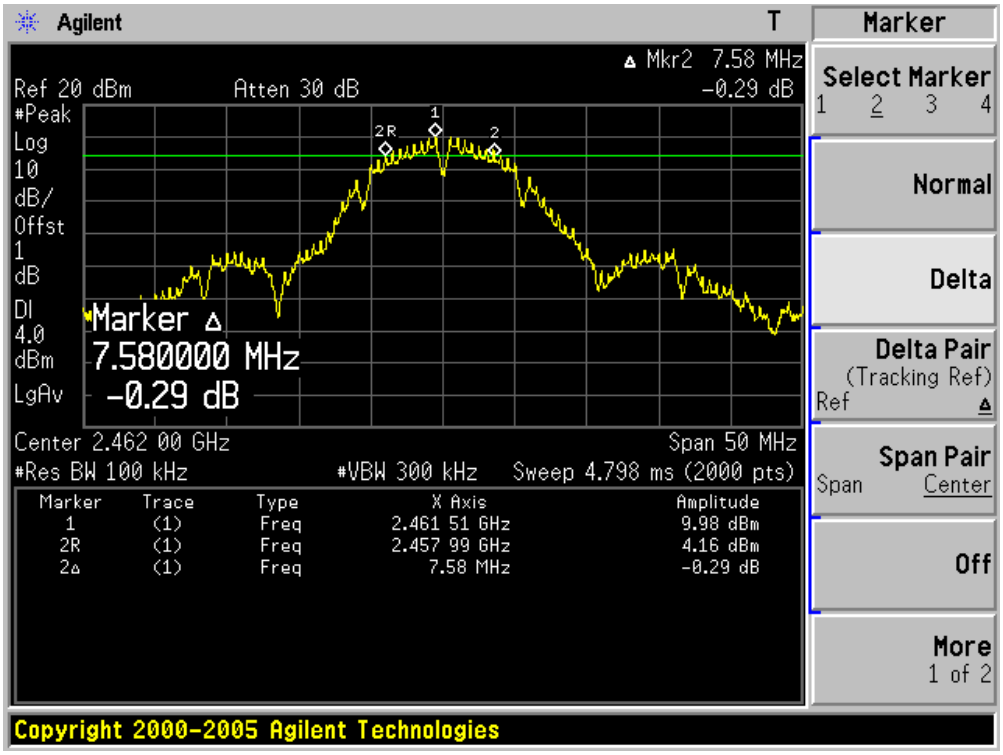
Channel 01 (2412MHz)



Channel 06 (2437MHz)



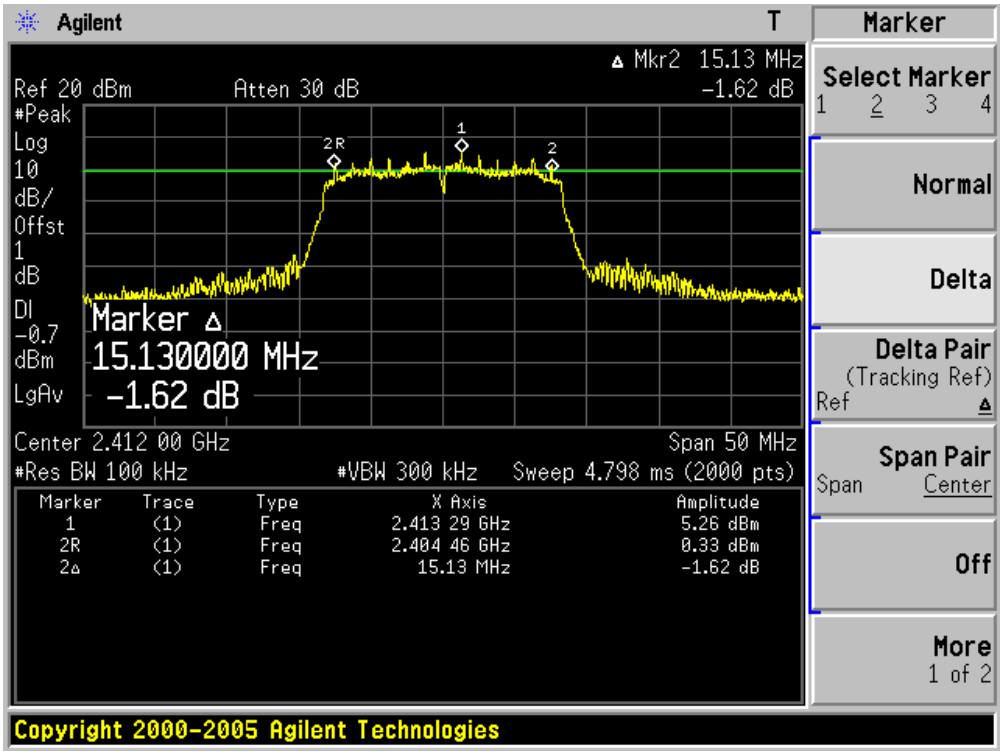
Channel 11 (2462MHz)



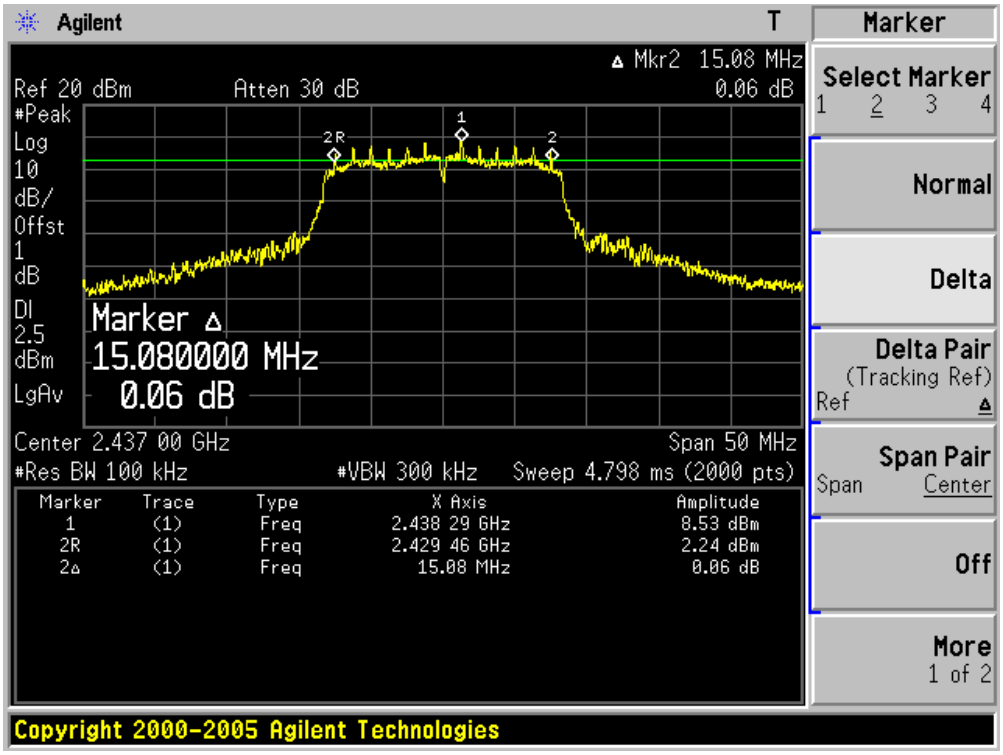
Product	:	IP-STB
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel No.	Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Result
01	2412	15130	500	Pass
06	2437	15080	500	Pass
11	2462	15110	500	Pass

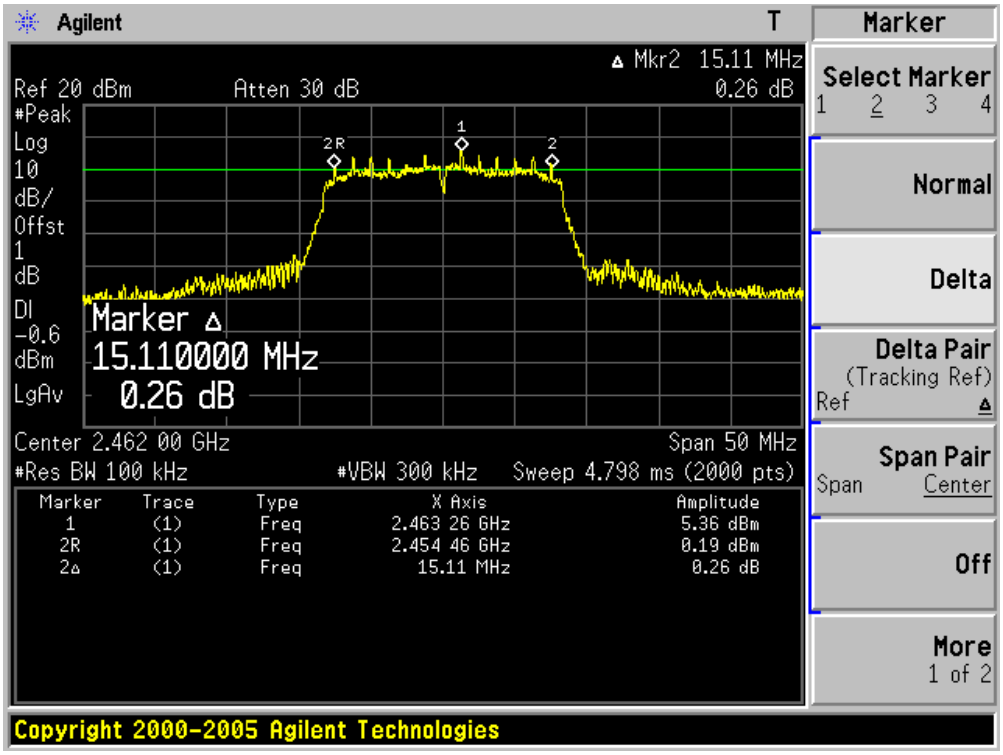
Channel 01 (2412MHz)



Channel 06 (2437MHz)



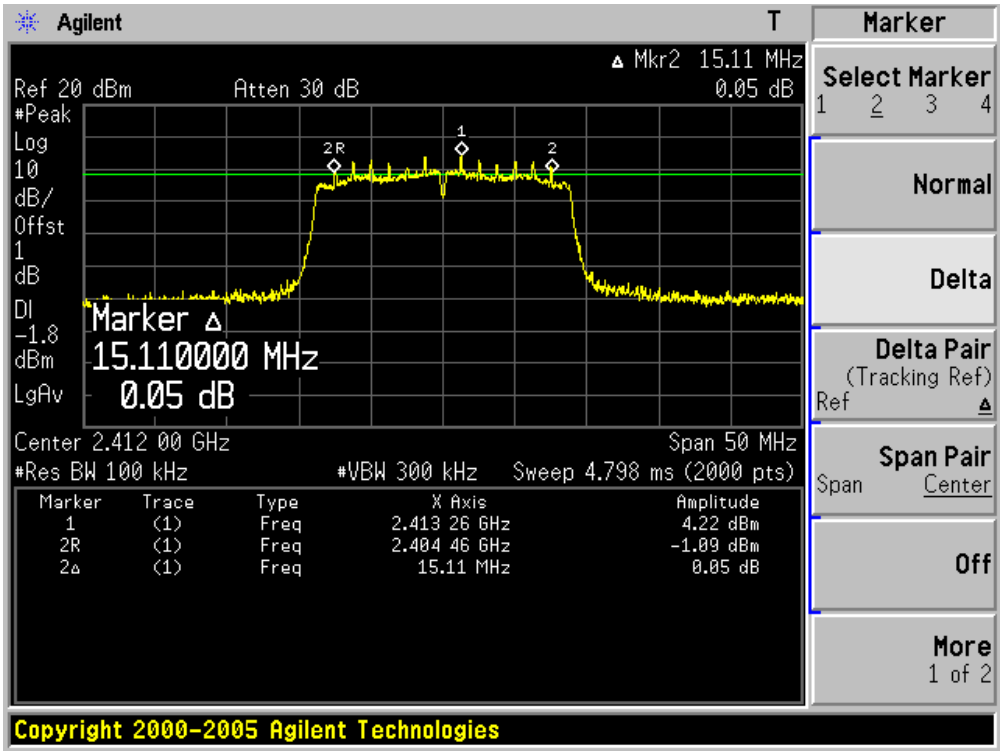
Channel 11 (2462MHz)



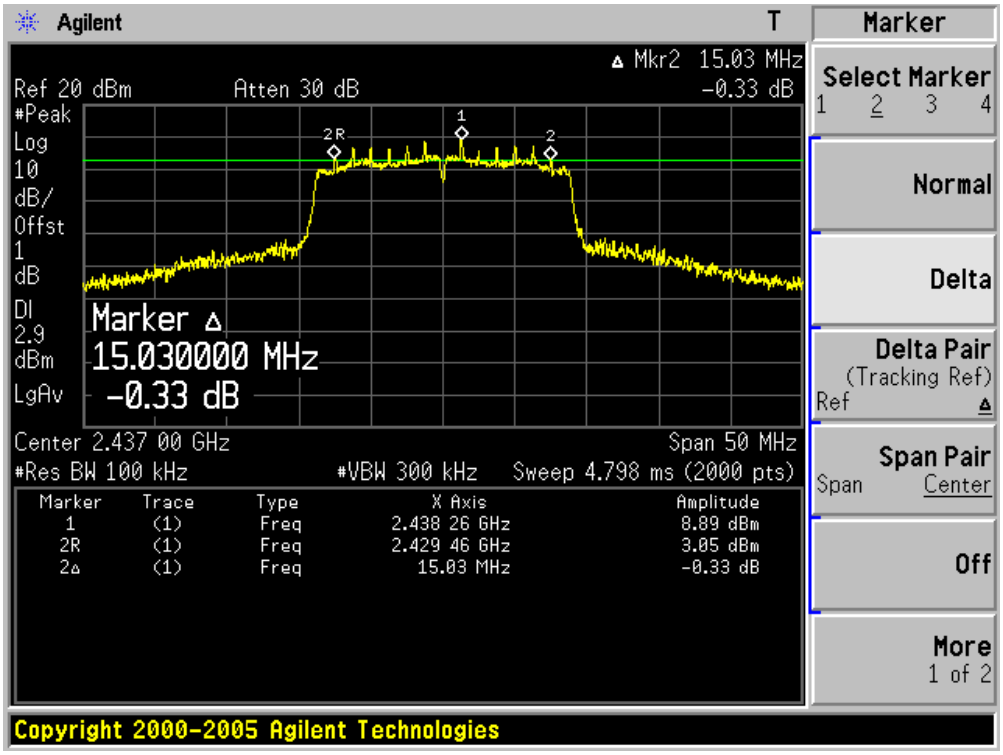
Product	:	IP-STB
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n (20MHz)

Channel No.	Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Result
01	2412	17360	500	Pass
06	2437	17380	500	Pass
11	2462	17480	500	Pass

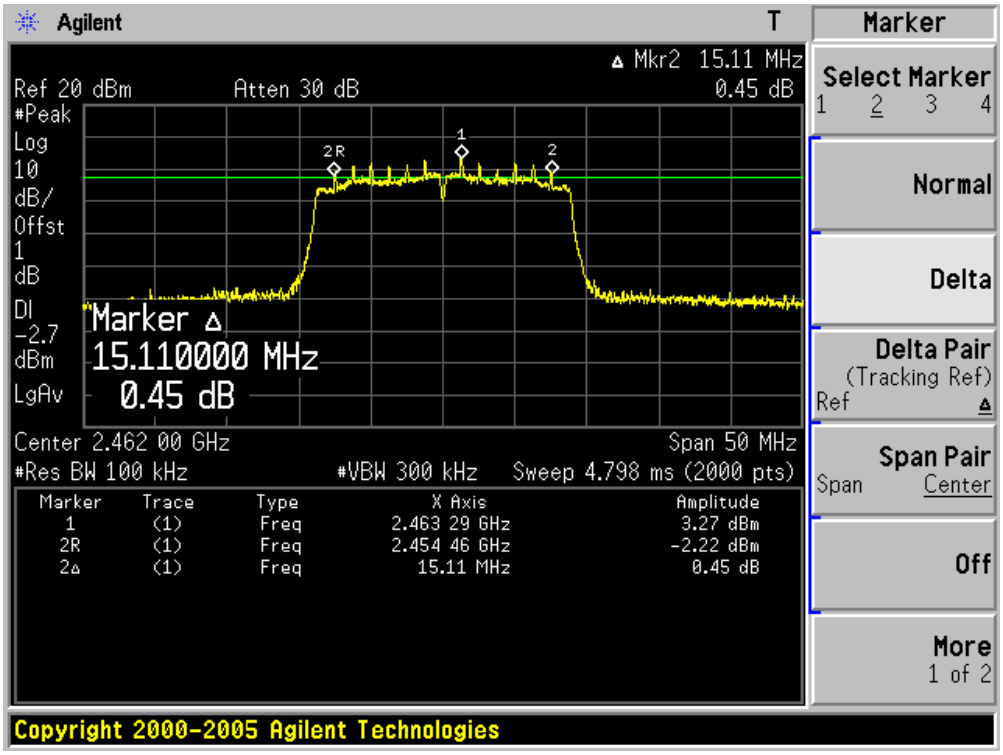
Channel 01 (2412MHz)



Channel 06 (2437MHz)



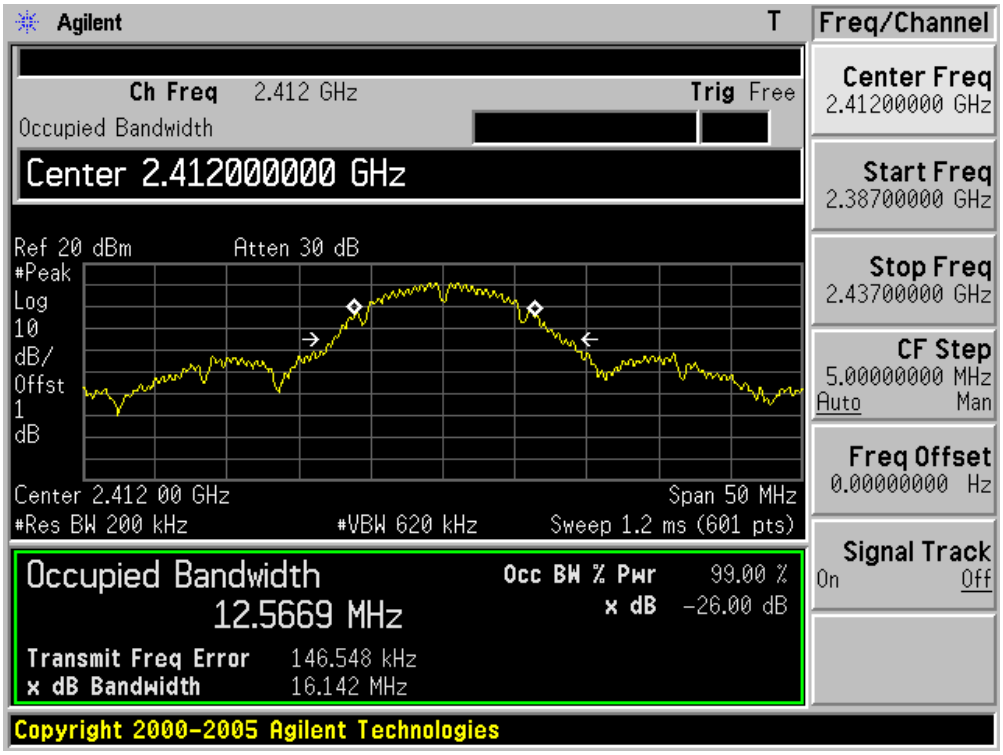
Channel 11 (2462MHz)



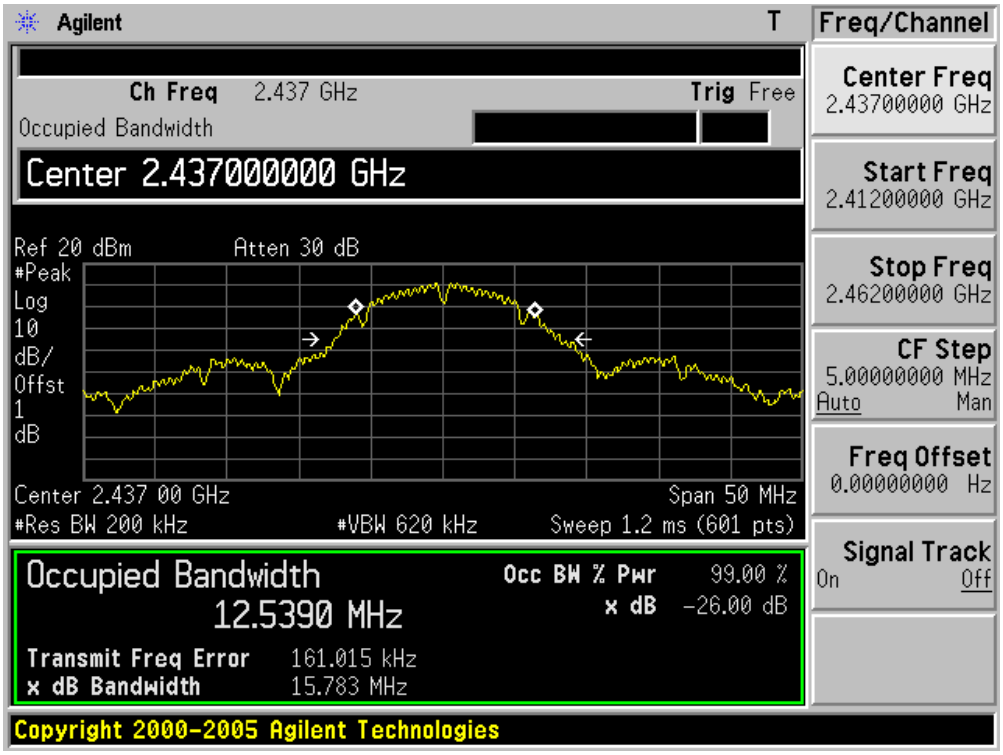
Product	:	IP-STB
Test Item	:	99% Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter by 802.11b

Channel No.	Frequency (MHz)	99% Bandwidth (kHz)
01	2412	1256.69
06	2437	1253.90
11	2462	1248.25

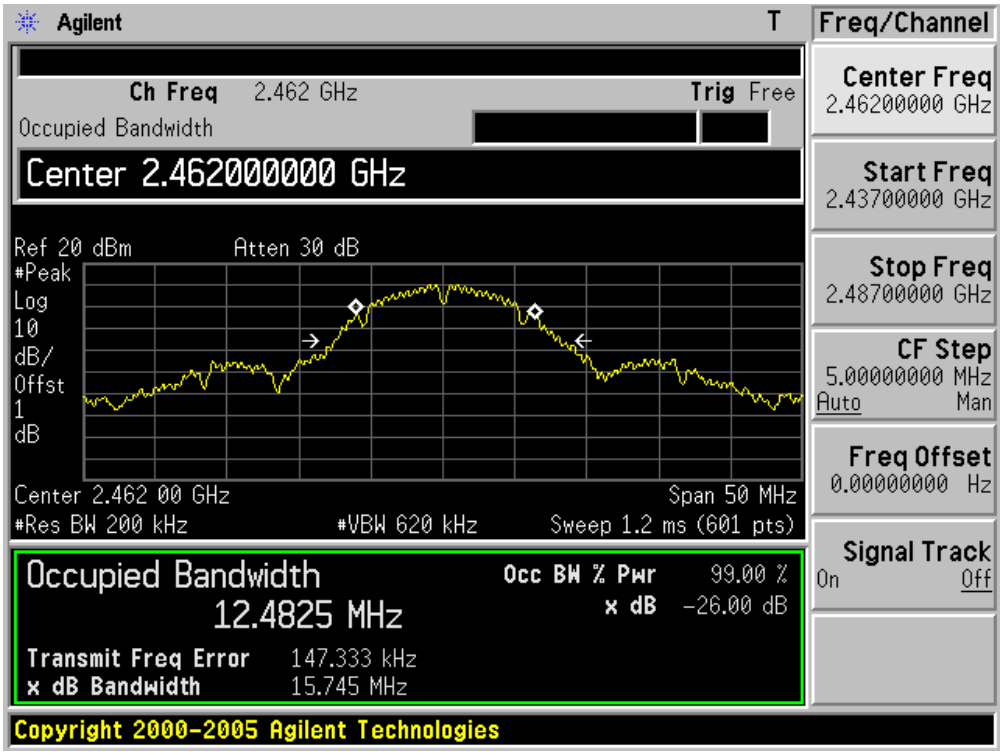
Channel 01 (2412MHz)



Channel 06 (2437MHz)



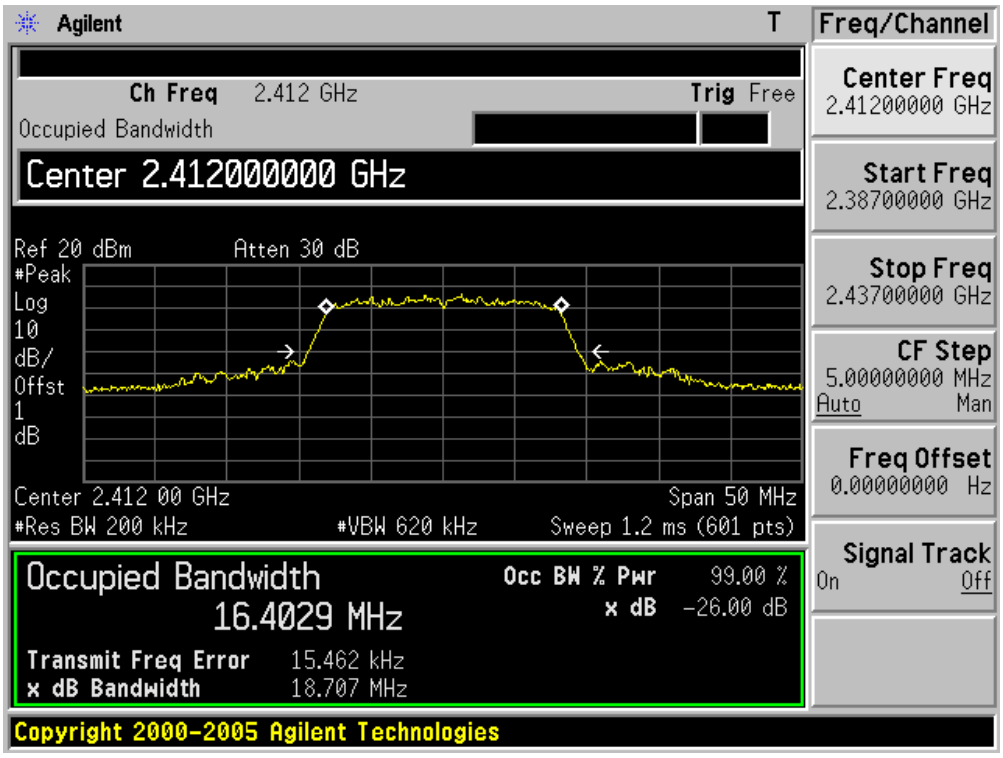
Channel 11 (2462MHz)



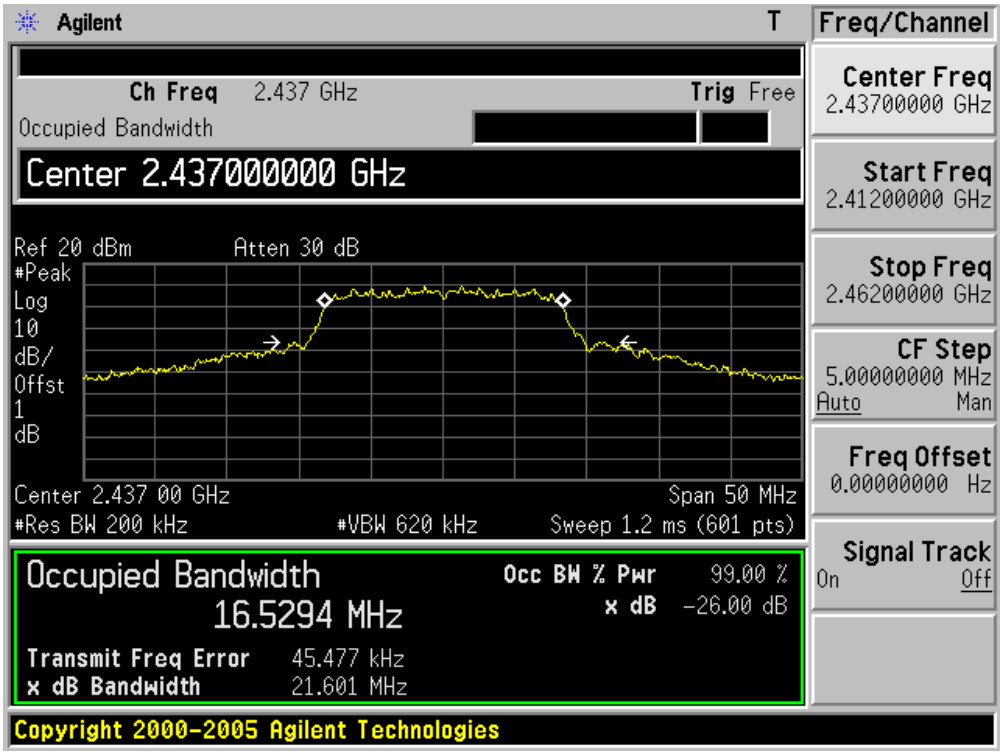
Product	:	IP-STB
Test Item	:	99% Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter by 802.11g

Channel No.	Frequency (MHz)	99% Bandwidth (kHz)
01	2412	1640.29
06	2437	1652.94
11	2462	1643.44

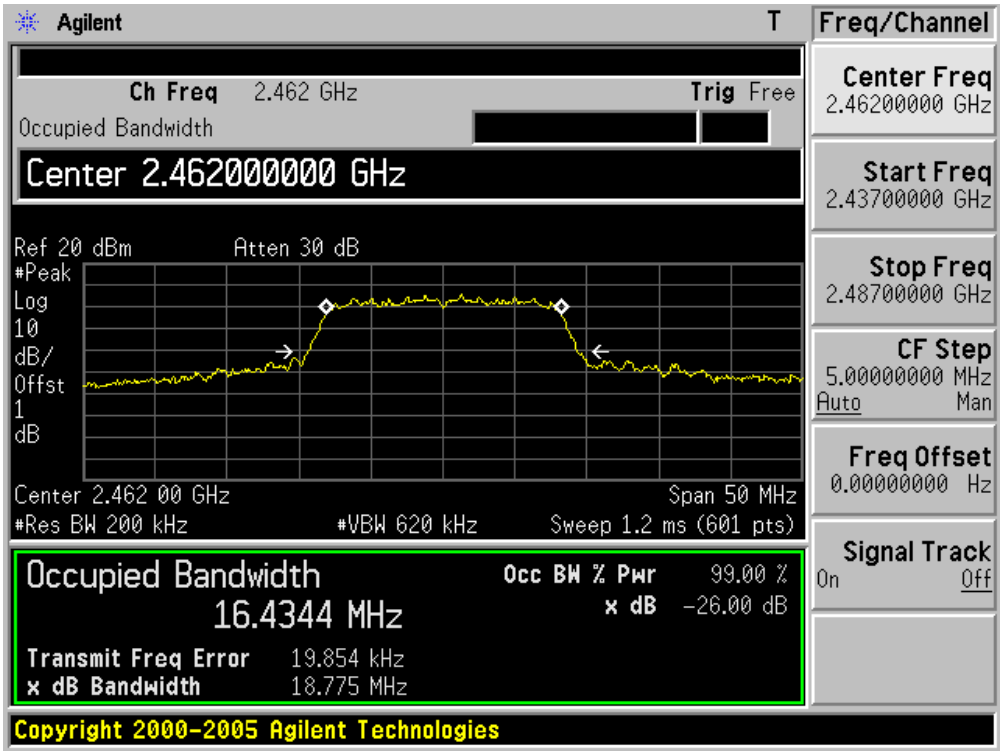
Channel 01(2412MHz)



Channel 06 (2437MHz)



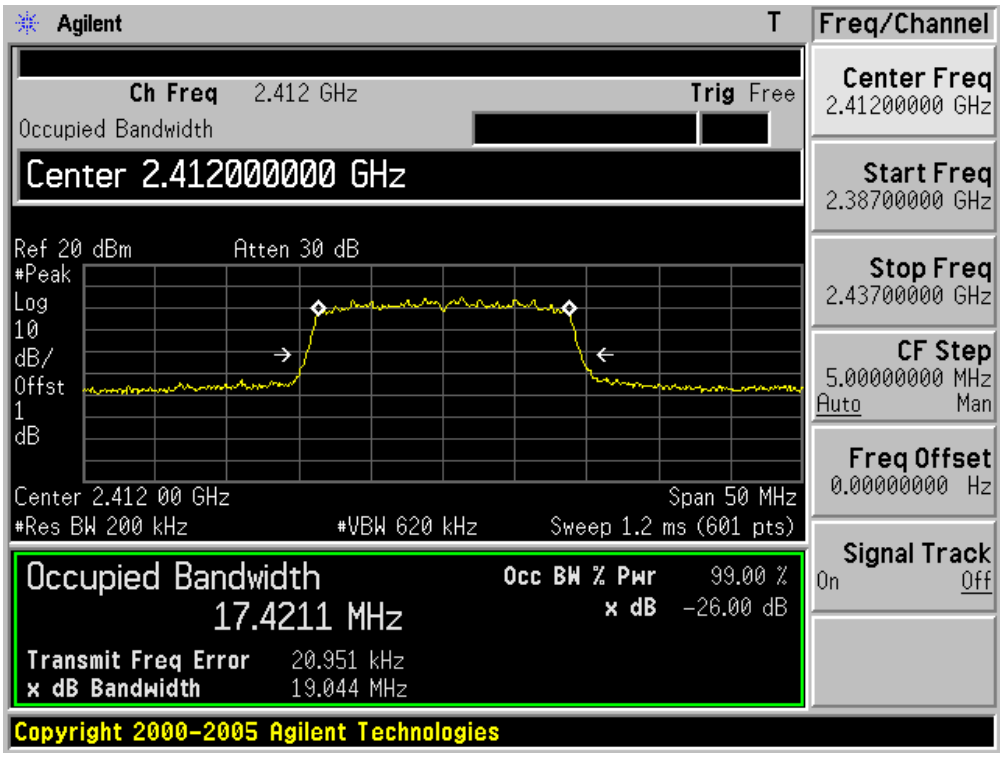
Channel 11 (2462MHz)



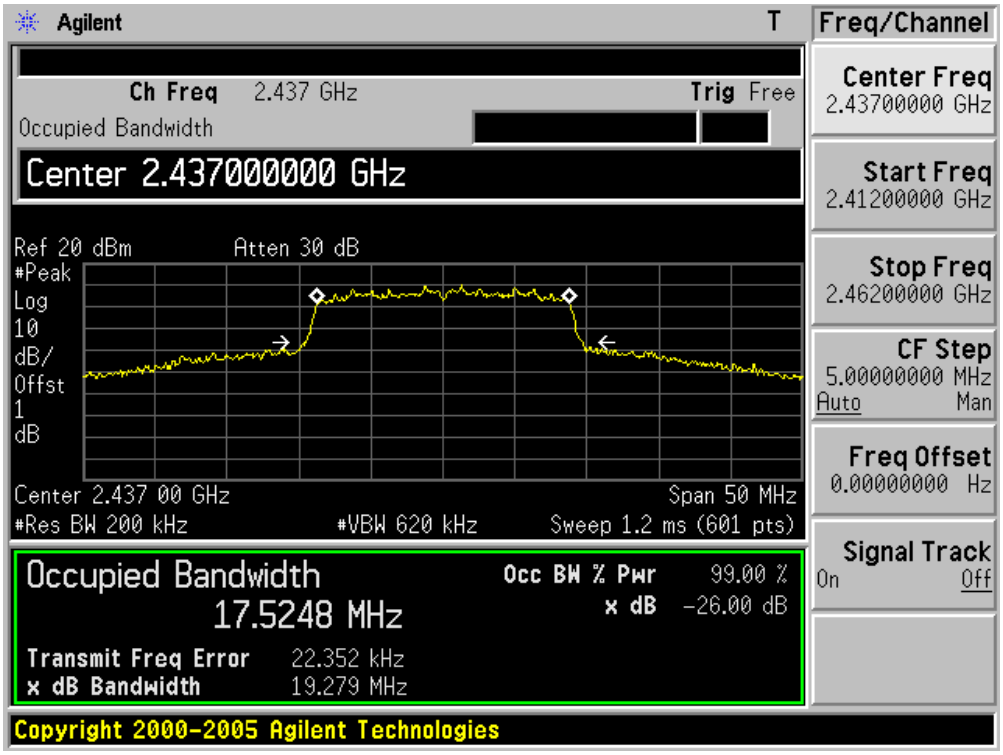
Product	:	IP-STB
Test Item	:	99% Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter by 802.11n(20MHz)

Channel No.	Frequency (MHz)	99% Bandwidth (kHz)
01	2402	1742.11
06	2441	1752.48
11	2480	1743.89

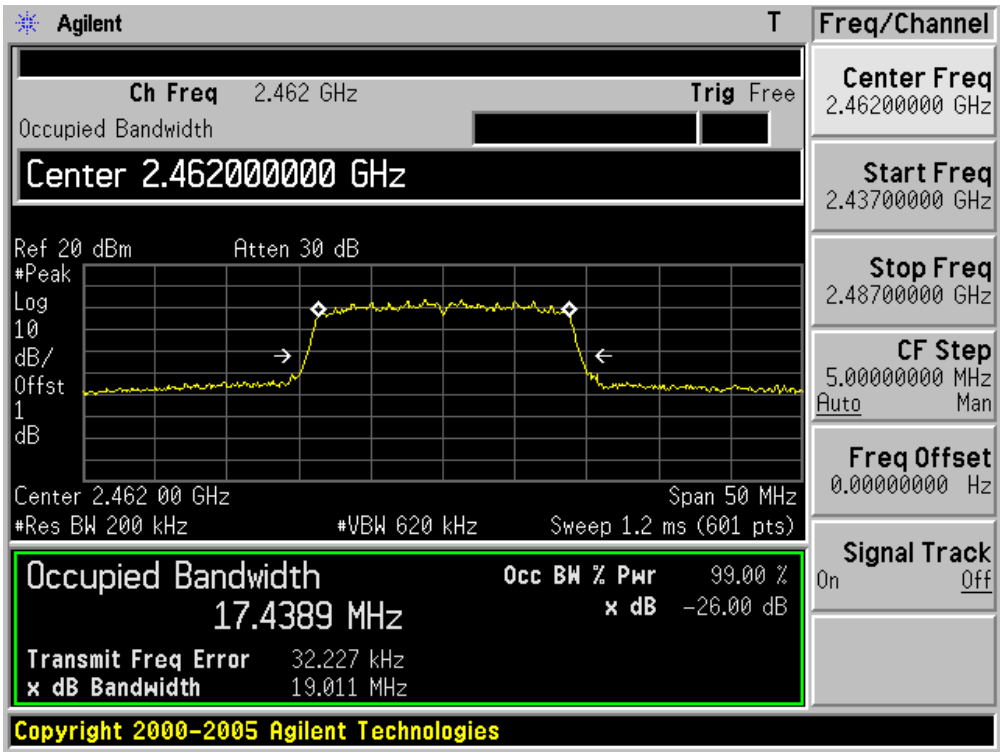
Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



9. Power Output

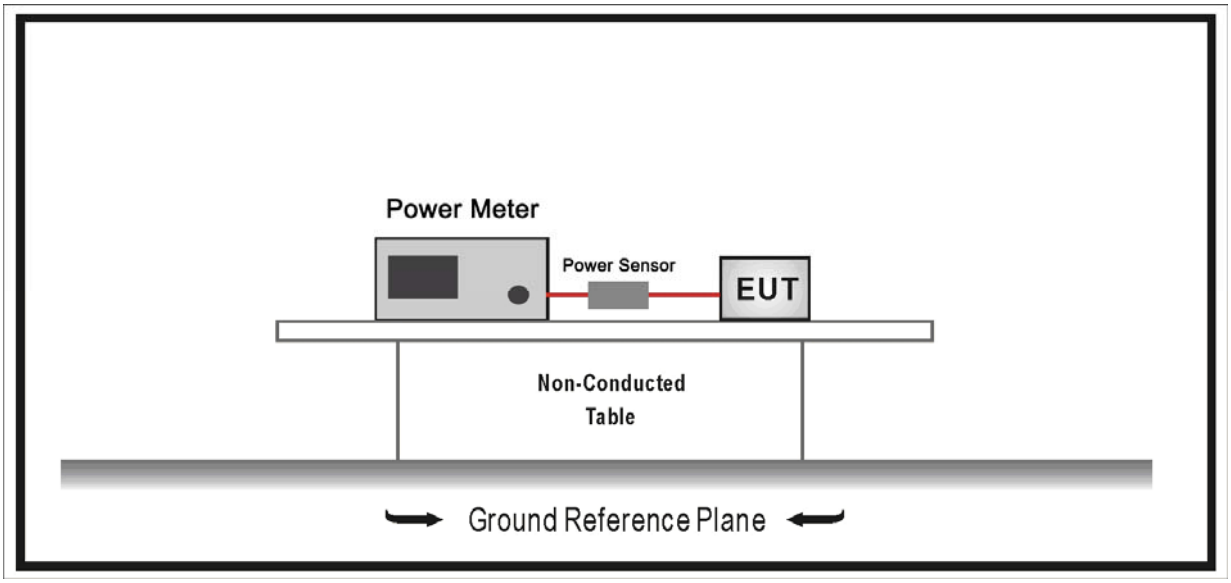
9.1. Test Equipment

Power Output / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Wideband Peak Power Meter	Anritsu	ML2495A	0905006	2012.01.12
Power Sensor	Anritsu	MA2411B	0846014	2012.01.12
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. Limit

The maximum peak power shall be less 1 Watt (30dBm).

Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

9.4. Test Procedure

The EUT was tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements.

Use the wideband power meter to test peak power and record the result.

9.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

9.6. Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (blue marker) for final test of each channel.

MCS Index for 802.11n	Spatial Streams	Data Rate (Mbps)						
		802.11b	802.11g		20MHz Bandwidth			
					800ns GI	400ns GI		
0	1	1	6		6.5	7.2		
1	1	2	9		13.0	14.4		
2	1	5.5	12		19.5	21.7		
3	1	11	18		26.0	28.9		
4	1	---	24		39.0	43.3		
5	1	---	36		52.0	57.8		
6	1	---	48		58.5	65.0		
7	1	---	54		65.0	72.2		

Power output at various data rates:

Test Mode	Bandwidth	Frequency (MHz)	Channel	Data Rate	Peak Power (dBm)
802.11b	20	2437	6	1	20.45
				5.5	19.81
				11	19.76
802.11g	20	2437	6	6	20.75
				24	20.02
				54	19.81
802.11n	20	2437	6	HT0	20.53
				HT4	19.81
				HT7	19.72

Product	:	IP-STB
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Total Power (dBm)	Limit (dBm)	Result
1	2412	20.74	20.74	30.00	Pass
6	2437	20.45	20.45	30.00	Pass
11	2462	19.65	19.65	30.00	Pass

Product	:	IP-STB
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit by 802.11g

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Total Power (dBm)	Limit (dBm)	Result
1	2412	17.68	17.68	30.00	Pass
6	2437	20.75	20.75	30.00	Pass
11	2462	17.61	17.61	30.00	Pass

Product	:	IP-STB
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit by 802.11n(20MHz)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Total Power (dBm)	Limit (dBm)	Result
1	2412	16.23	16.23	30.00	Pass
6	2437	20.53	20.53	30.00	Pass
11	2462	15.26	15.26	30.00	Pass

10. Power Spectral Density

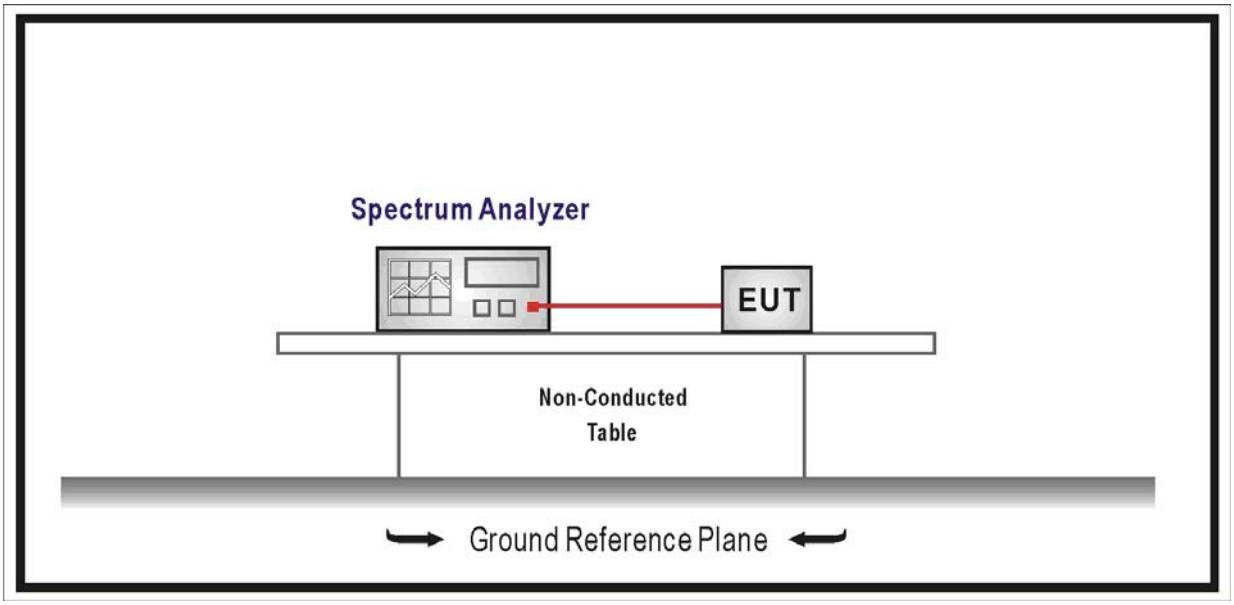
10.1. Test Equipment

Power Spectral Density / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

10.2. Test Setup



10.3. Limit

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

10.4. Test Procedure

The EUT was tested according to ANSI C63.10: 2009 for compliance to FCC 47CFR 15.247 requirements.
Set RBW= 3 kHz, Set VBW≧ 10 kHz, Sweep time=100s, Set detector=Peak detector.

10.5. Uncertainty

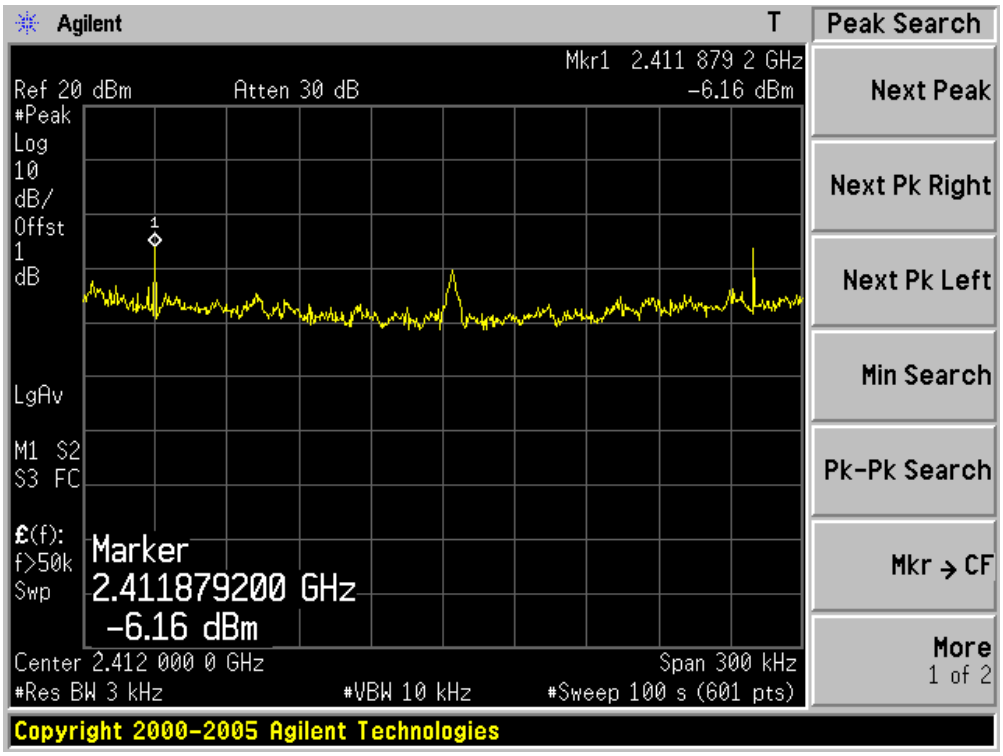
The measurement uncertainty is defined as ± 1.27 dB

10.6. Test Result

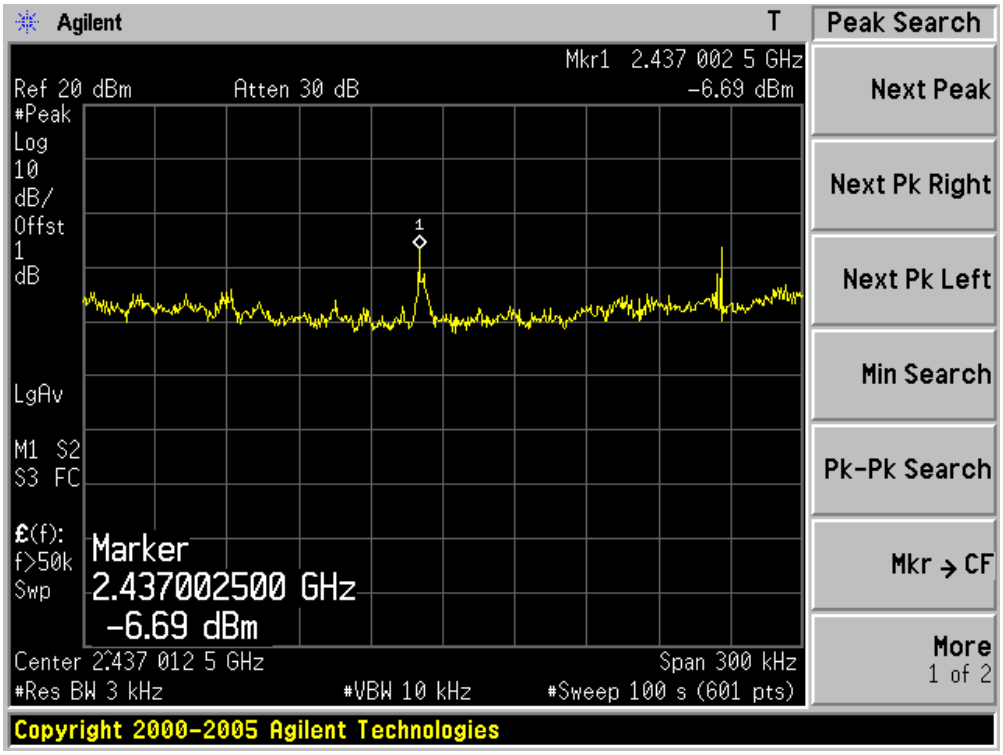
Product	:	IP-STB
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel No.	Frequency (MHz)	Measurement PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Result
01	2412	-6.16	-6.16	8	Pass
06	2437	-6.69	-6.69	8	Pass
11	2462	-8.20	-8.20	8	Pass

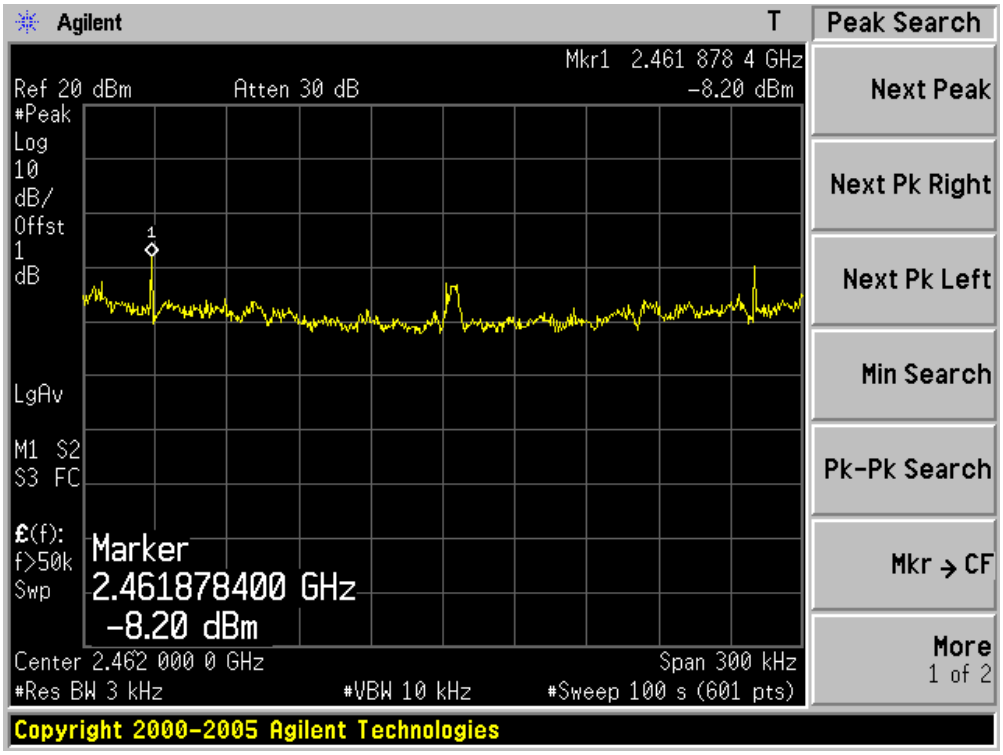
Channel 01 (2412MHz)



Channel 06 (2437MHz)



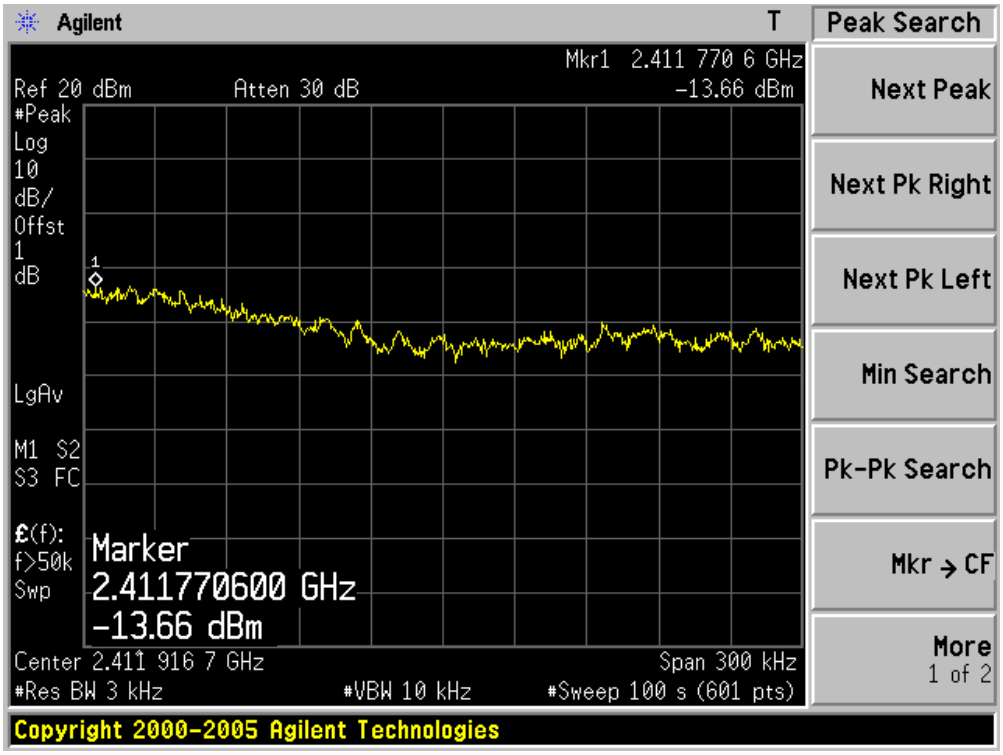
Channel 11 (2462MHz)



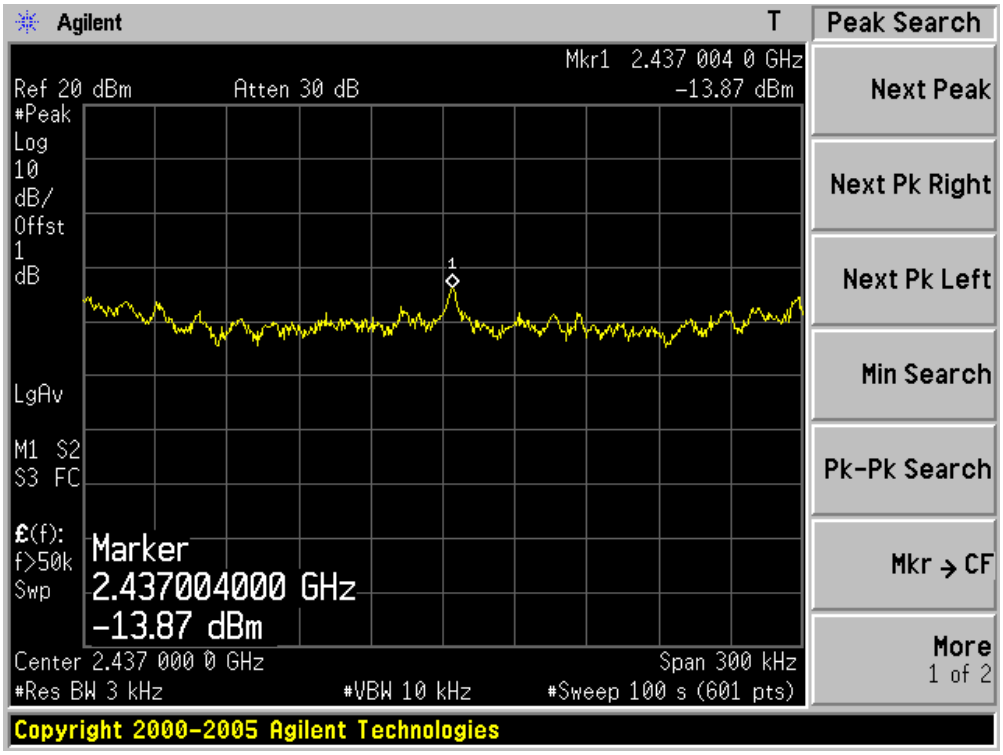
Product	:	IP-STB
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel No.	Frequency (MHz)	Measurement PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Result
01	2412	-13.66	-13.66	8	Pass
06	2437	-13.87	-13.87	8	Pass
11	2462	-10.75	-10.75	8	Pass

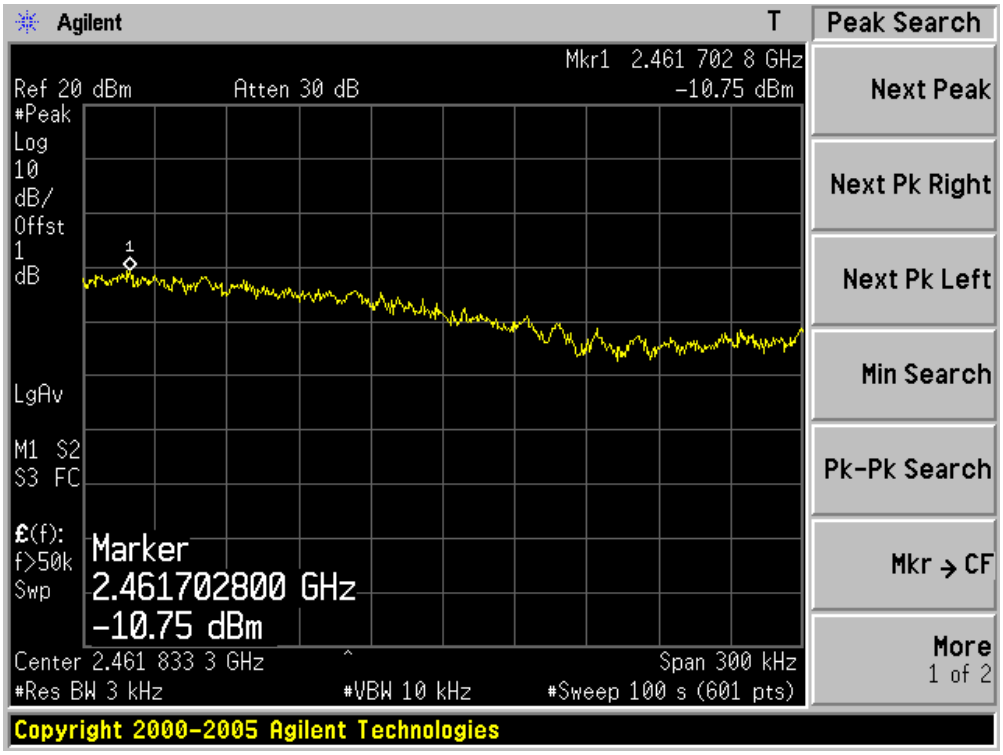
Channel 01 (2412MHz)



Channel 06 (2437MHz)



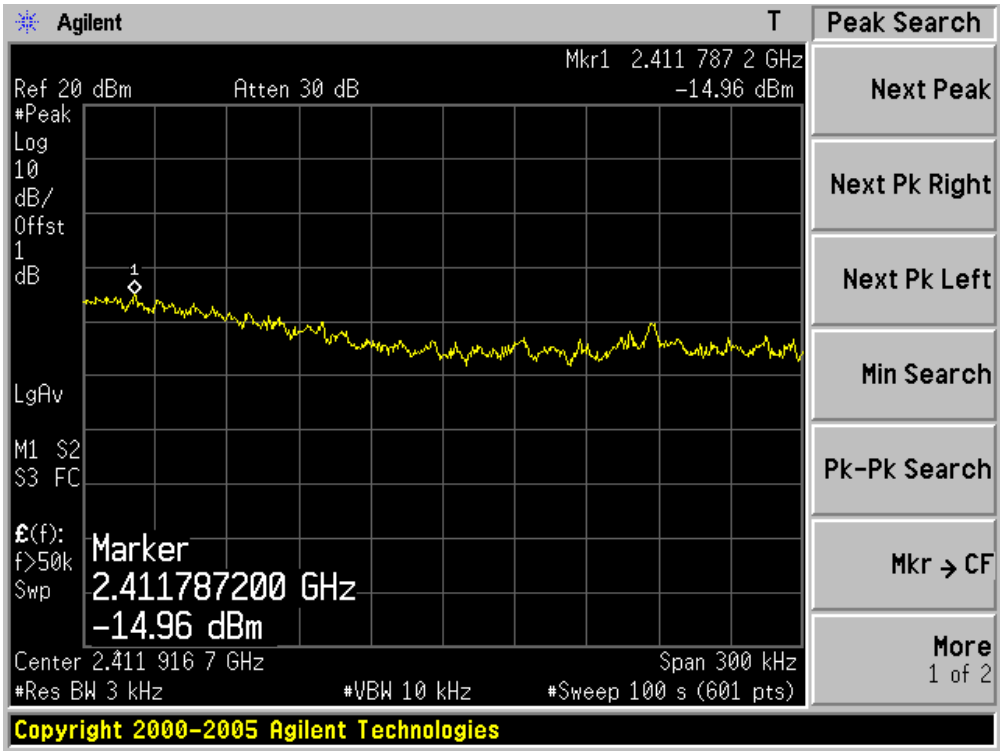
Channel 11 (2462MHz)



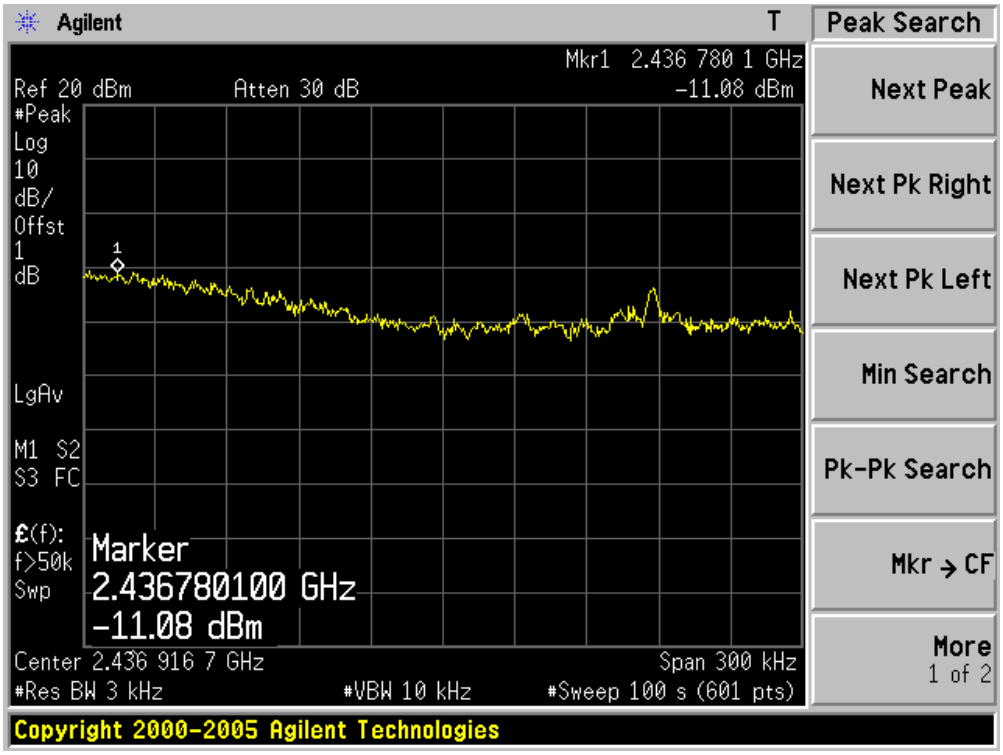
Product	:	IP-STB
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n(20MHz)

Channel No.	Frequency (MHz)	Measurement PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Result
01	2412	-14.96	-14.96	8	Pass
06	2437	-11.08	-11.08	8	Pass
11	2462	-15.90	-15.90	8	Pass

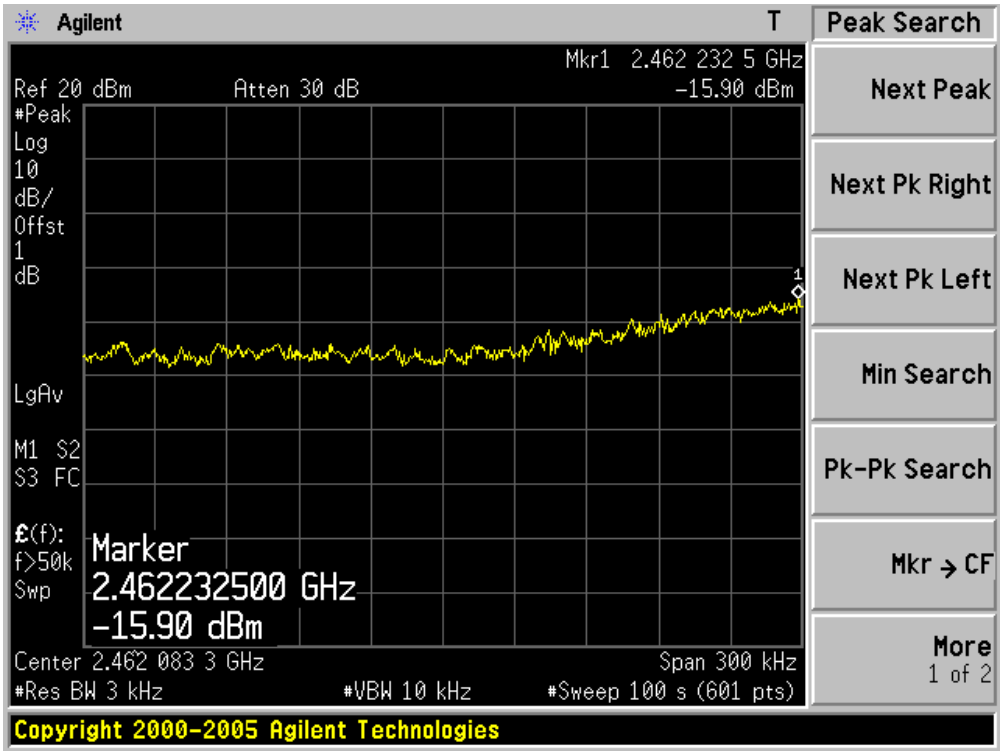
Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



11. Receiver Spurious Emission for Industry Canada RSS-Gen Requirement

11.1. Test Equipment

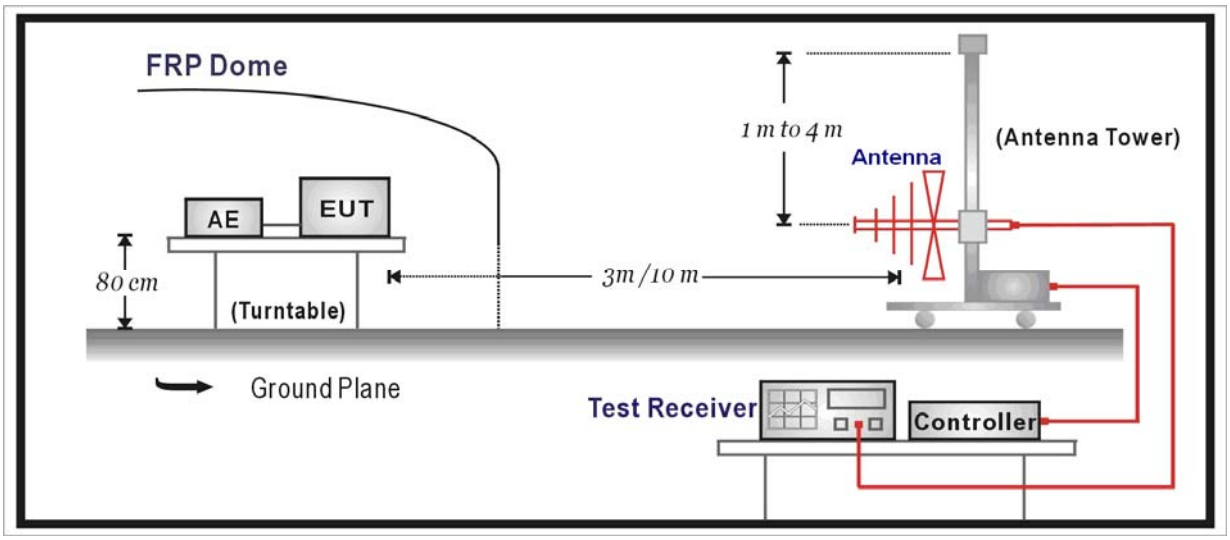
☒Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2012.04.23
EMI Test Receiver	R&S	ESCI	100906	2012.01.15
Preamplifier	Quietek	AP-180C	CHM-0602013	2012.03.07
Preamplifier	QuieTek	AP-040G	CHM-0906001	2012.05.05
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2011.10.18
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2012.06.11
High-Pass Filter	Wainwright	WHKX2.8/18G-12SS	SN1	2012.03.03
High-Pass Filter	Wainwright	WHKX7.0/18G-8SS	SN16	2012.03.03
Lowpass Filter	Wainwright	WLKS4500-9SS	SN2	2012.03.03
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2012.01.14

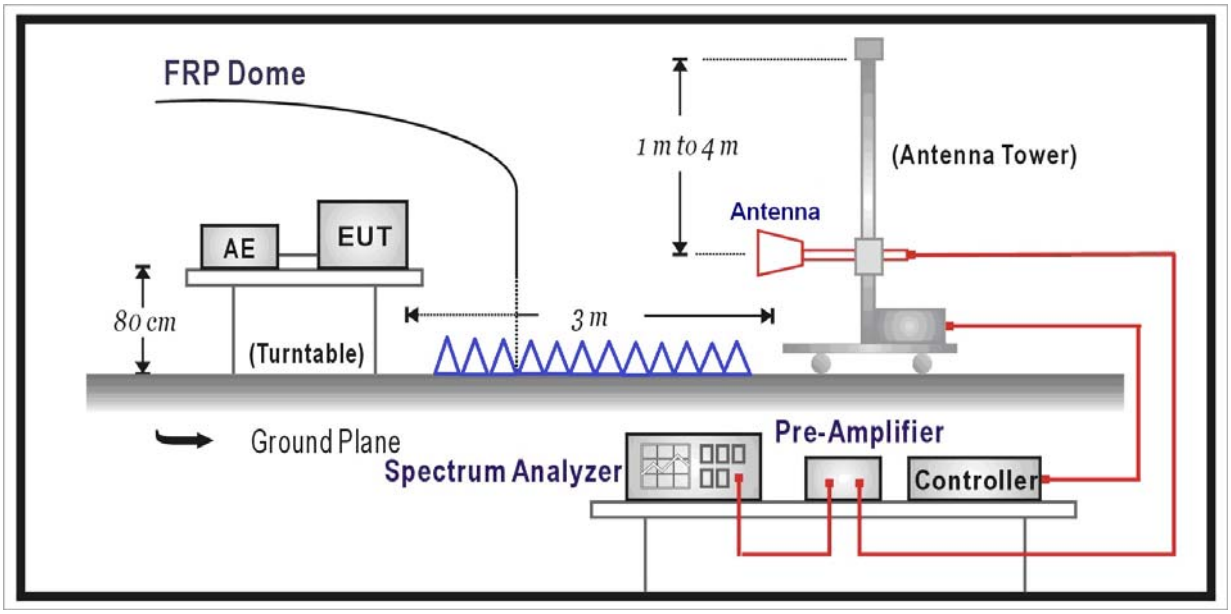
Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

11.2. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



11.3. Limit

FCC Part 15 Subpart B Paragraph 15.109 & RSS-GEN		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

11.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

11.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

11.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:
Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;
Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.
Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

Receive by 802.11b

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	31.7	5.4	17.6	23.0	40	-17.0	QP
	V	38.4	11.0	13.9	24.9	40	-15.1	QP
	H	1187.0	37.9	-10.6	27.3	54(Note1)	-26.7	PK
	V	1085.0	37.8	-10.8	27.0	54(Note1)	-27.0	PK
6	H	330.8	9.5	15.6	25.1	46	-20.9	QP
	V	500.0	7.0	19.4	26.4	46	-19.6	QP
	H	1442.0	37.2	-9.6	27.6	54(Note1)	-26.4	PK
	V	1263.5	37.4	-10.1	27.3	54(Note1)	-26.7	PK
11	H	500.1	8.9	19.5	28.4	46	-17.6	QP
	V	649.7	5.8	21.4	27.2	46	-18.8	QP
	H	1688.5	37.4	-9.7	27.7	54(Note1)	-26.3	PK
	V	1365.5	37.6	-9.6	28.0	54(Note1)	-26.0	PK

Note1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn’t be performed.

Receive by 802.11g

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
3	H	42.4	5.5	11.7	17.2	46	-28.8	QP
	V	43.5	10.8	11.2	22.0	46	-24.0	QP
	H	1000.0	39.8	-10.8	29.0	54(Note1)	-25.0	PK
	V	1263.5	37.0	-10.1	26.9	54(Note1)	-27.1	PK
6	H	249.9	22.6	-13.7	8.9	46	-37.1	QP
	V	409.8	23.3	-18.3	5.0	46	-41.0	QP
	H	1280.5	36.6	-10	26.6	54(Note1)	-27.4	PK
	V	1586.5	36.9	-9.5	27.4	54(Note1)	-26.6	PK
9	H	114.6	5.6	12.4	18.0	43.5	-25.5	QP
	V	75.0	18.6	6.7	25.3	40.0	-14.7	QP
	H	1476.0	37.3	-9.6	27.7	54(Note1)	-26.3	PK
	V	1850.0	38.0	-9.2	28.8	54(Note1)	-25.2	PK

Note1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn’t be performed.

Receive by 802.11n(20MHz)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	116.7	5.6	12.5	18.1	43.5	-25.4	QP
	V	75.0	18.5	6.7	25.2	40.0	-14.8	QP
	H	1102.0	37.6	-10.7	26.9	54(Note1)	-27.1	PK
	V	1068.0	38.0	-10.8	27.2	54(Note1)	-26.8	PK
6	H	338.7	11.0	15.7	26.7	46	-19.3	QP
	V	270.8	8.2	14.0	22.2	46	-23.8	QP
	H	1272.0	37.3	-10.0	27.3	54(Note1)	-26.7	PK
	V	1272.0	38.6	-10.0	28.6	54(Note1)	-25.4	PK
11	H	500.0	9.1	19.5	28.6	46	-17.4	QP
	V	500.0	6.9	19.5	26.4	46	-19.6	QP
	H	1569.5	37.0	-9.5	27.5	54(Note1)	-26.5	PK
	V	1467.5	38.4	-9.5	28.9	54(Note1)	-25.1	PK

Note1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn’t be performed.