MEASUREMENT REPORT

FCC PART 15.247 WLAN 802.11b/g/n

FCC ID:	2ABRTINU007D
APPLICANT:	INGO Devices S.L.

Application Type:	Certification
Product:	Tablet PC
Brand Name:	INGO Kids
Model No.:	INU007D, INU008D
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15.247
Test Procedure(s):	ANSI C63.10-2009, KDB 558074 D01v03r01
Test Date:	January 23 ~ 24, 2014

Reviewed By : Sunny Sun
(Engineer: Sunny Sun)

Approved By : Robin Wu
(Manager: Robin Wu)

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 D01v03r01. Test results reported herein relate only to the item(s) tested.

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Description Page

Revision History

Report No.	Version	Description	Issue Date
1401RSU00901	Rev. 01	Initial report	01-24-2014
1401RSU00901	Rev. 02	Modified the duty cycle	01-26-2014

§2.1033 General Information

Applicant:	INGO Devices S.L.
Applicant Address:	Bernat Metge, 77-79, 08205 Sabadell, BARCELONA, SPAIN
Manufacturer:	SHENZHEN HUARUIAN TECHNOLOGY CO., LTD
Manufacturer Address:	HUARUIAN BUILDING, THE THIRD INDUSTRIAL PARK, GUSHU, XIXIANG, BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part 15.247
Model Name:	INU007D, INU008D
FCC ID:	2ABRTINU007D
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Digital Transmission System (DTS)
Date(s) of Test:	January 23 ~ 24, 2014
Test Report S/N:	1401RSU00901

1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Tablet PC
Brand Name	INGO Kids
Model No.	INU007D, INU008D
Frequency Range	2412 ~ 2462 MHz
Maximum Output Power	802.11b: 10.54dBm 802.11g: 18.83dBm 802.11n-HT20: 19.24dBm 802.11n-HT40: 19.06dBm
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM
Antenna Type	Internal
Peak Antenna Gain	0.6dBi

Note: They are only different marketing requirement.

Channel List for 802.11b/g/n-HT20

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

Channel List for 802.11n-HT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	N/A	N/A	N/A	N/A

2.2. Device Capabilities

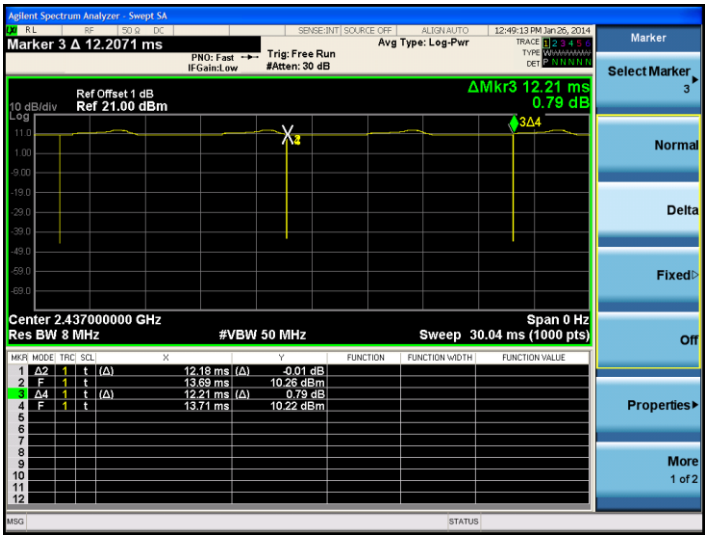
This device contains the following capabilities:

802.11/b/g/n WLAN (DTS)

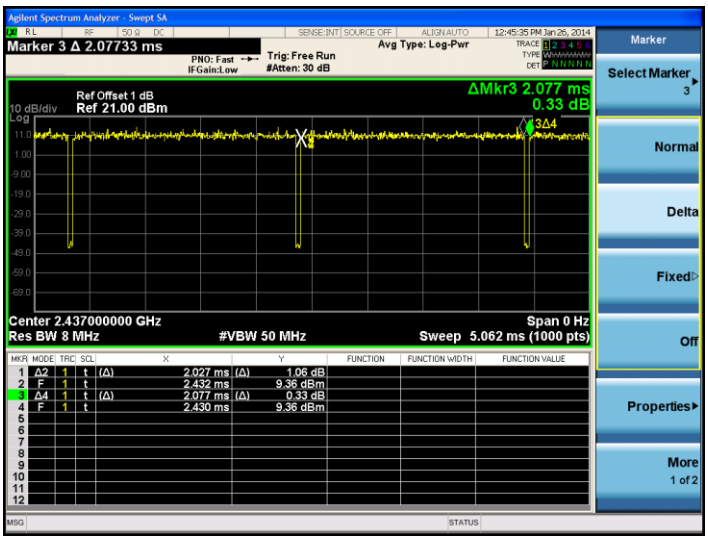
Note: 2.4GHz WLAN (DTS) operation is possible in 20MHz, and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of KDB 558074 D01v03r01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

- 802.11b - 99.75%
- 802.11g/n 20MHz Bandwidth - 97.59%
- 802.11n 40MHz Bandwidth - 96.50%

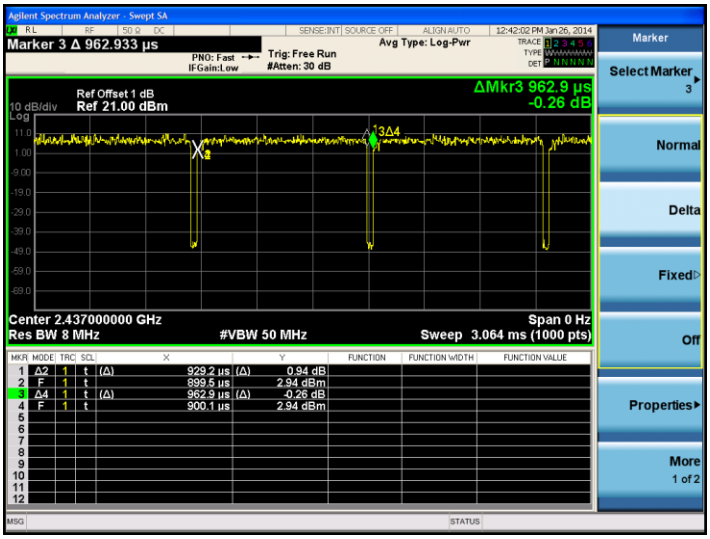
802.11b Duty Cycle:



802.11g/n 20MHz Bandwidth Duty Cycle:



802.11n 40MHz Bandwidth Duty Cycle:



2.3. Test Configuration

The Tablet PC FCC ID: 2ABRTINU007D was tested per the guidance of KDB 558074 D01v03r01. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.5. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

2.6. Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.
Adapter	Supply by MRT	HSU50600F

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009), and the guidance provided in KDB 558074 D01v03r01 were used in the measurement of the **Tablet PC FCC ID: 2ABRTINU007D.**

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.9.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GH absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB BeamWidth of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antenna of the Tablet PC is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **Tablet PC FCC ID: 2ABRTINU007D** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATA

AC Conducted Emissions Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	2014/11/08
Two-Line V-Network	R&S	ENV216	101683	2014/11/08
Two-Line V-Network	R&S	ENV216	101684	2014/11/08
Temperature/ Meter Humidity	Anymetre	TH101B	SR2-01	2014/11/15

Radiated Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	2014/11/08
Preamplifier	MRT	AP01G18	1310002	2014/12/14
Preamplifier	MRT	AP18G40	1310003	2014/10/07
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	2014/11/24
Bilog Period Antenna	Schwarzbeck	VULB9162	9162-047	2014/11/24
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	2014/11/24
Horn Antenna	Schwarzbeck	BBHA9170	9170-549	2014/12/11
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	2014/11/15

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	2014/11/08
Power Meter	Agilent	U2021XA	MY52450003	2014/12/14
Temperature/Humidity Meter	Anymetre	TH101B	TR3-01	2014/11/15

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: ± 3.46dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: ± 4.2dB 1GHz ~ 40GHz: ± 4.8dB

7. TEST RESULT

7.1. Summary

Company Name: **INGO Devices S.L.**
FCC ID: **2ABRTINU007D**
FCC Classification: **Digital Transmission System (DTS)**
Data Rate(s) Tested: **1Mbps ~ 11Mbps (b);**
6Mbps ~ 54Mbps (g);
6.5/7.2Mbps ~ 65/72.2Mbps (n - HT20);
13.5/15Mbps ~ 135/150Mbps (n - HT40)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 1Watt		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm / 3kHz Band		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc(Peak)		Pass	Section 7.5 & 7.6
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.7 & 7.8
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.9

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. 6dB Bandwidth Measurement

7.2.1. Test Limit

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

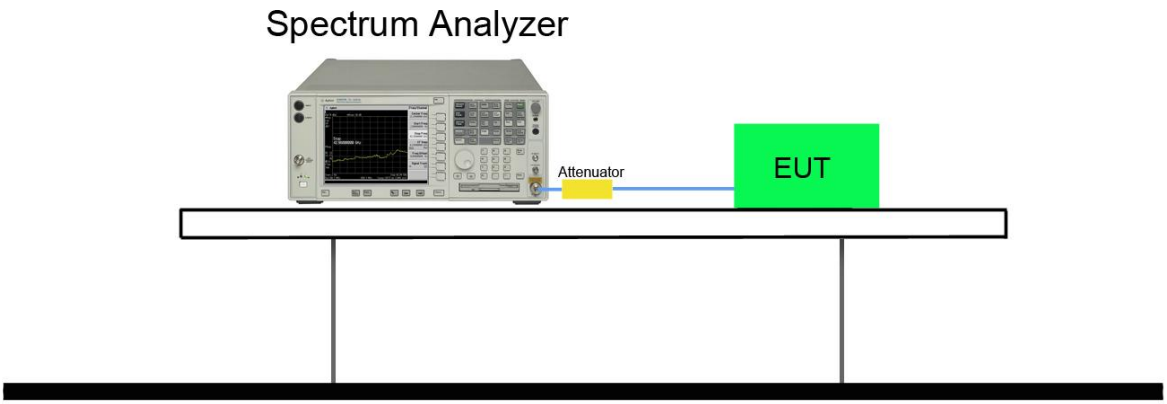
7.2.2. Test Procedure used

KDB 558074 D01v03r01 – Section 8.2 Option 2

7.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

7.2.4. Test Setup

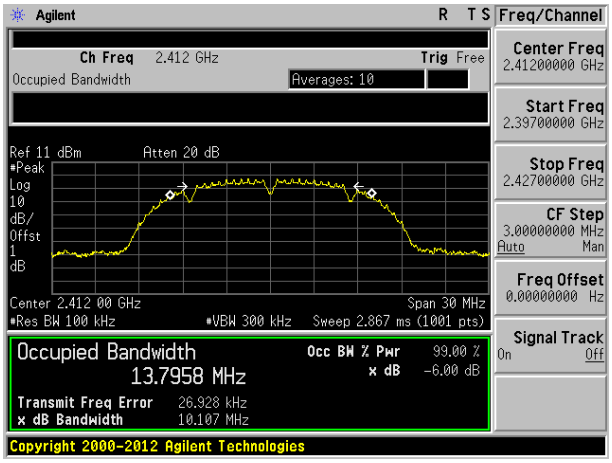


7.2.5. Test Result

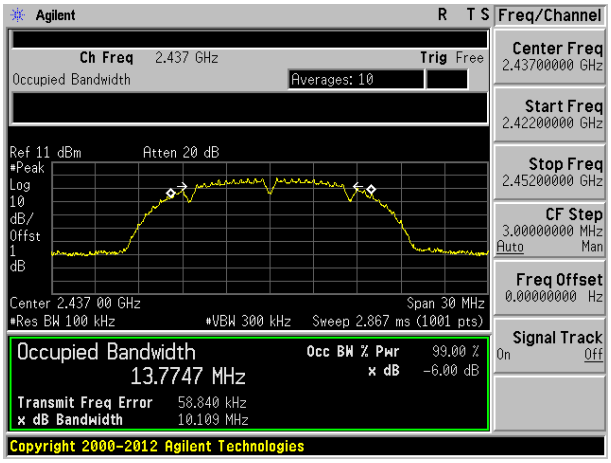
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1	01	2412	10.107	≥0.5	Pass
802.11b	1	06	2437	10.109	≥0.5	Pass
802.11b	1	11	2462	10.119	≥0.5	Pass
802.11g	6	01	2412	16.383	≥0.5	Pass
802.11g	6	06	2437	16.381	≥0.5	Pass
802.11g	6	11	2462	16.386	≥0.5	Pass
802.11n-HT20	6.5/7.2	01	2412	17.351	≥0.5	Pass
802.11n-HT20	6.5/7.2	06	2437	17.348	≥0.5	Pass
802.11n-HT20	6.5/7.2	11	2462	17.612	≥0.5	Pass
802.11n-HT40	13.5/15	03	2422	36.166	≥0.5	Pass
802.11n-HT40	13.5/15	06	2437	36.099	≥0.5	Pass
802.11n-HT40	13.5/15	09	2452	36.412	≥0.5	Pass

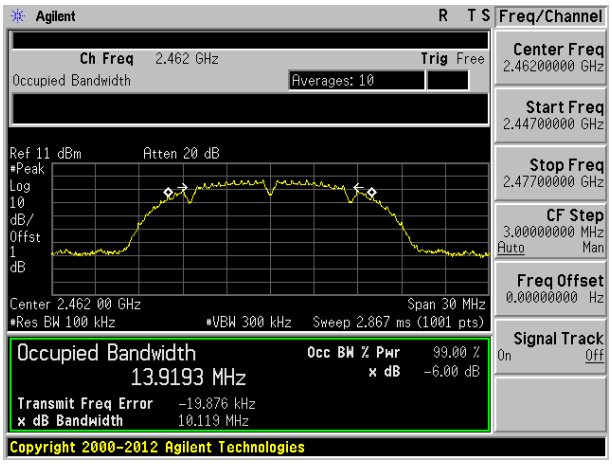
802.11b 6dB Bandwidth

Channel 01 (2412MHz)

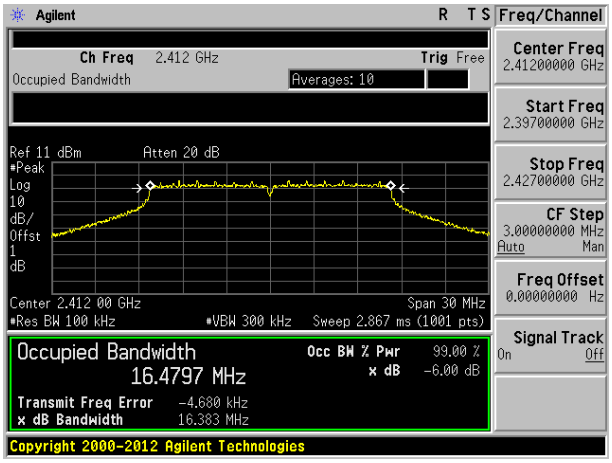
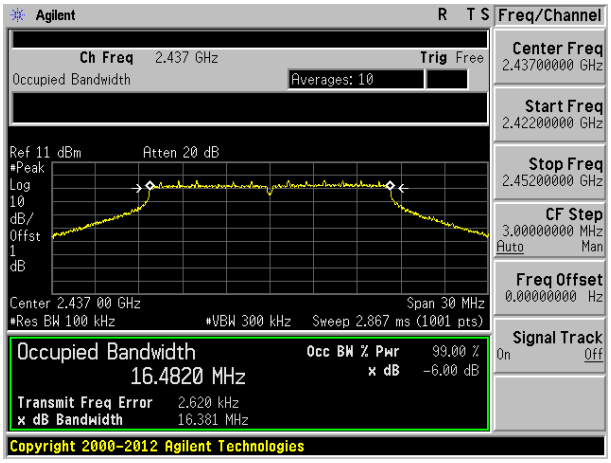


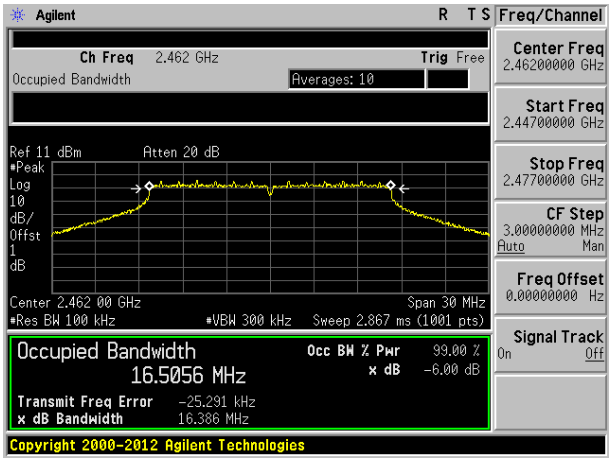
Channel 06 (2437MHz)



Channel 11 (2462MHz)	
	

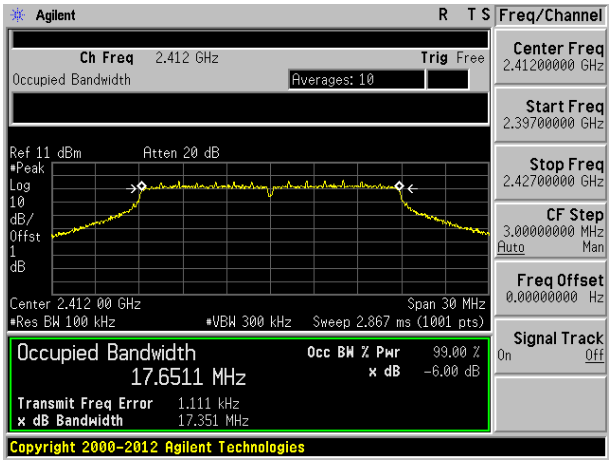
802.11g 6dB Bandwidth

Channel 01 (2412MHz)	Channel 06 (2437MHz)
	

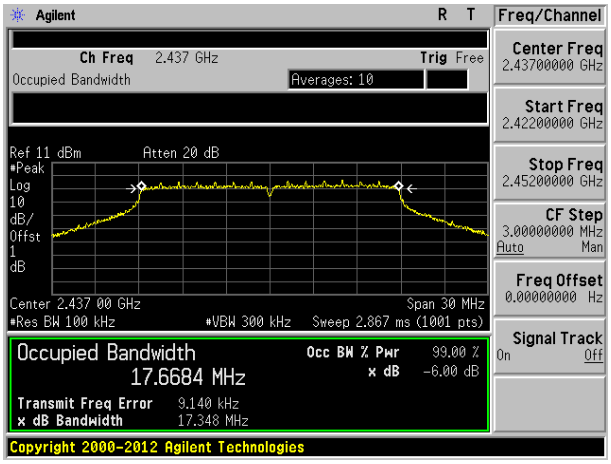
Channel 11 (2462MHz)	
	

802.11n-HT20 6dB Bandwidth

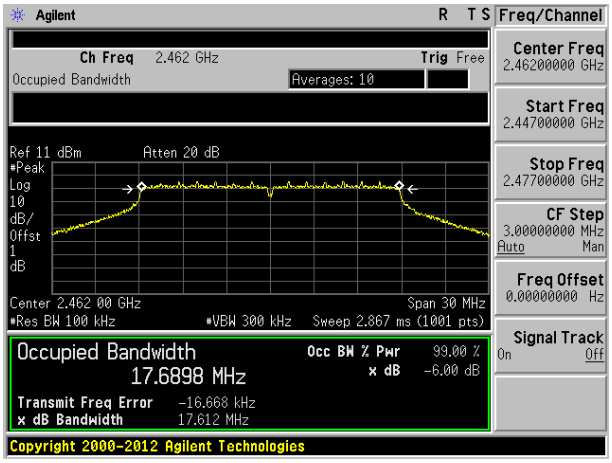
Channel 01 (2412MHz)



Channel 06 (2437MHz)

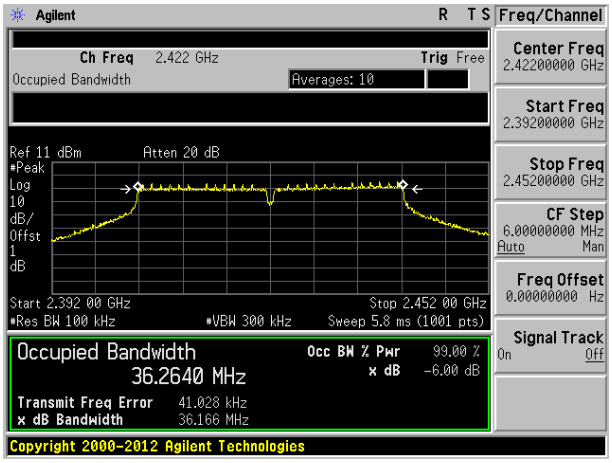


Channel 11 (2462MHz)

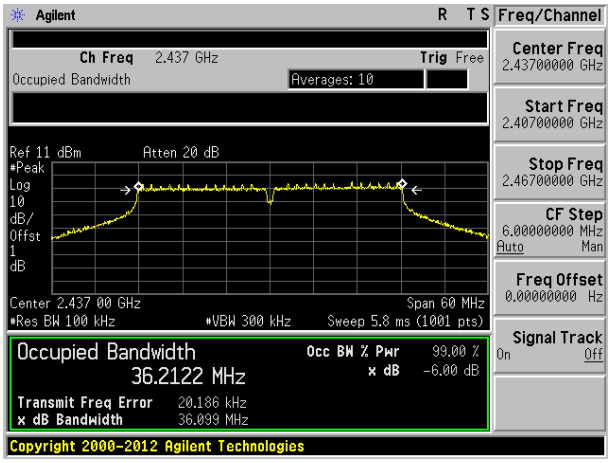


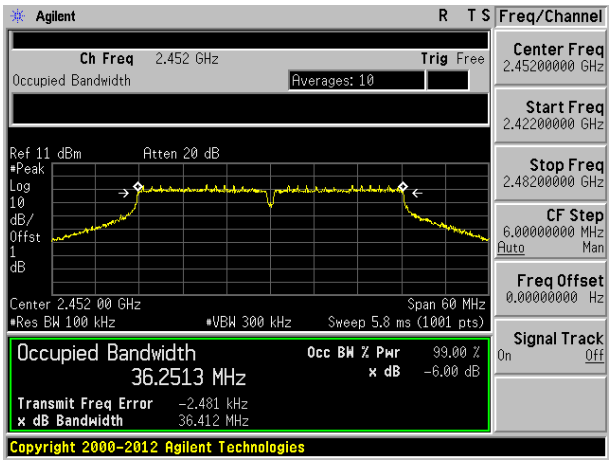
802.11n-HT40 6dB Bandwidth

Channel 03 (2422MHz)



Channel 06 (2437MHz)



Channel 09 (2452MHz)	
	

7.3. Output Power Measurement

7.3.1. Test Limit

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

7.3.2. Test Procedure Used

KDB 558074 D01v03r01 - Section 9.1.3 PKPM1 Peak Power Method (for signals with BW ≤ 50MHz)

7.3.3. Test Setting

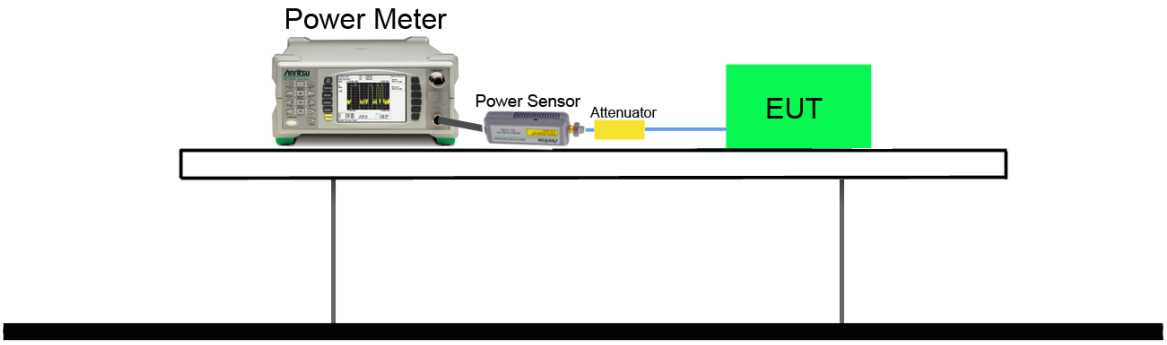
Method PKPM1 (Peak Power Measurement of Signals with DTS BW ≤ 50MHz)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Average Power Measurements for Signals With Any Channel BW)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

7.3.4. Test Setup



7.3.5. Test Result of Output Power

Output power at various data rates:

Test Mode	Bandwidth	Frequency (MHz)	Channel	Data Rate (Mbps)	Peak Power (dBm)
802.11b	20	2437	6	1	10.51
				5.5	10.17
				11	9.83
802.11g	20	2437	6	6	18.83
				24	17.92
				54	16.58
802.11n	20	2437	6	6.5/7.2(MCS0)	19.24
				39/43.3(MCS4)	18.34
				65/72.2(MCS7)	17.97
802.11n	40	2437	6	13.5/15(MCS0)	19.06
				81/90(MCS4)	18.13
				135/150(MCS7)	17.84

Test Result of Peak Output Power

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
11b	1	1	1	2412	9.95	≤30	Pass
11b	1	1	6	2437	10.51	≤30	Pass
11b	1	1	11	2462	10.54	≤30	Pass
11g	1	6	1	2412	18.01	≤30	Pass
11g	1	6	6	2437	18.83	≤30	Pass
11g	1	6	11	2462	18.21	≤30	Pass
11n-HT20	1	6.5/7.2	1	2412	18.24	≤30	Pass
11n-HT20	1	6.5/7.2	6	2437	19.24	≤30	Pass
11n-HT20	1	6.5/7.2	11	2462	19.02	≤30	Pass
11n-HT40	1	13.5/15	3	2422	19.01	≤30	Pass
11n-HT40	1	13.5/15	6	2437	19.06	≤30	Pass
11n-HT40	1	13.5/15	9	2452	18.97	≤30	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
11b	1	1	1	2412	8.43	≤30	Pass
11b	1	1	6	2437	9.04	≤30	Pass
11b	1	1	11	2462	9.03	≤30	Pass
11g	1	6	1	2412	8.43	≤30	Pass
11g	1	6	6	2437	8.64	≤30	Pass
11g	1	6	11	2462	8.61	≤30	Pass
11n-HT20	1	6.5/7.2	1	2412	8.87	≤30	Pass
11n-HT20	1	6.5/7.2	6	2437	9.21	≤30	Pass
11n-HT20	1	6.5/7.2	11	2462	9.04	≤30	Pass
11n-HT40	1	13.5/15	3	2422	9.02	≤30	Pass
11n-HT40	1	13.5/15	6	2437	9.21	≤30	Pass
11n-HT40	1	13.5/15	9	2452	8.96	≤30	Pass

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

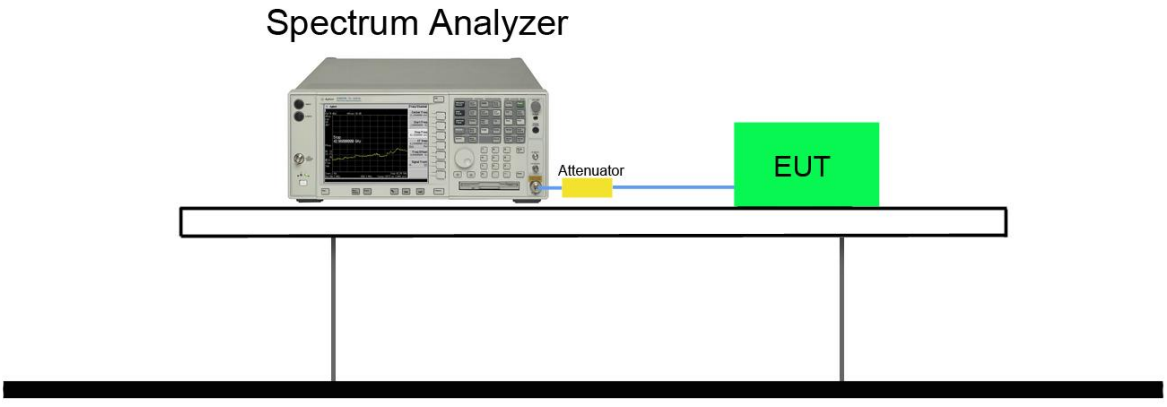
7.4.2. Test Procedure Used

KDB 558074 D01v03r01 - Section 10.2 Method PKPSD

7.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

7.4.4. Test Setup

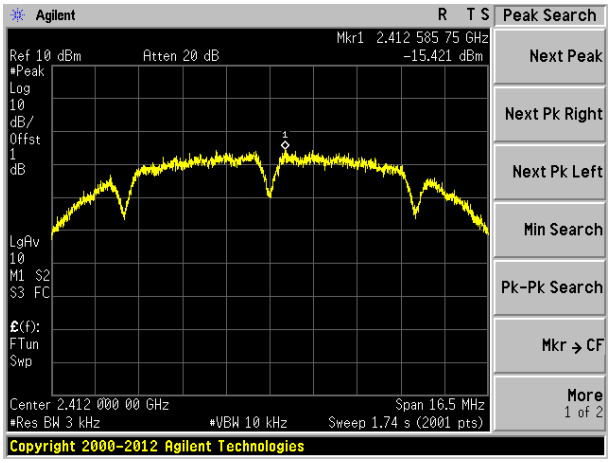


7.4.5. Test Result

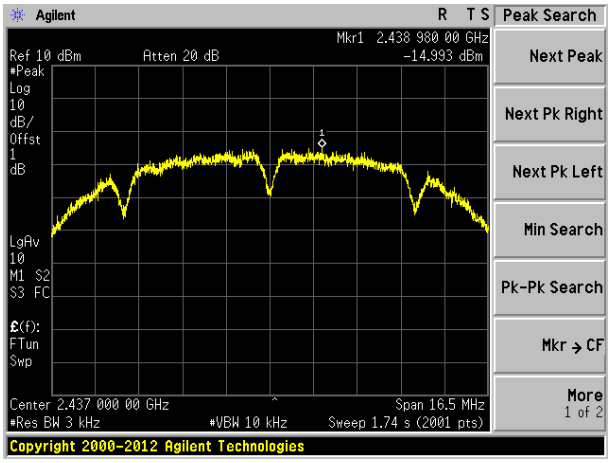
Test Mode	N_{Tx}	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm)	Limit (dBm / 3kHz)	Result
11b	1	1	1	2412	-15.421	≤8	Pass
11b	1	1	6	2437	-14.993	≤8	Pass
11b	1	1	11	2462	-15.547	≤8	Pass
11g	1	6	1	2412	-16.279	≤8	Pass
11g	1	6	6	2437	-16.492	≤8	Pass
11g	1	6	11	2462	-16.595	≤8	Pass
11n-HT20	1	6.5/7.2	1	2412	-15.868	≤8	Pass
11n-HT20	1	6.5/7.2	6	2437	-16.307	≤8	Pass
11n-HT20	1	6.5/7.2	11	2462	-17.207	≤8	Pass
11n-HT40	1	13.5/15	3	2422	-17.950	≤8	Pass
11n-HT40	1	13.5/15	6	2437	-16.808	≤8	Pass
11n-HT40	1	13.5/15	9	2452	-19.627	≤8	Pass

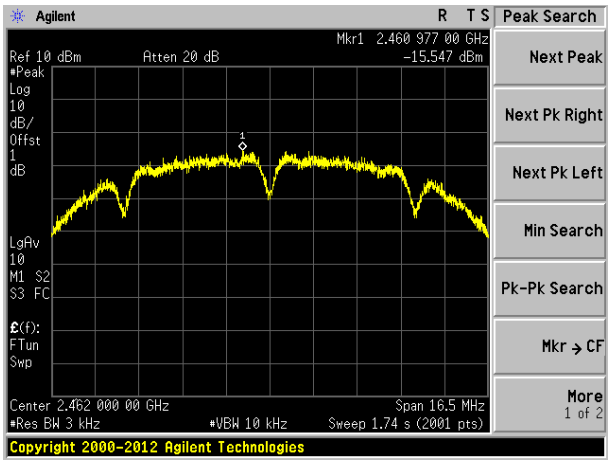
802.11b PSD

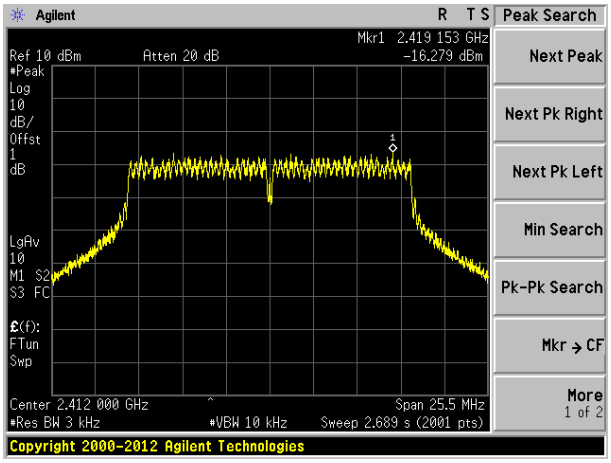
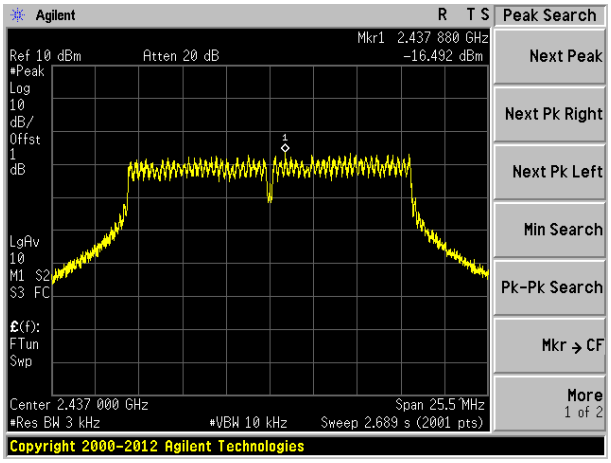
Channel 01 (2412MHz)

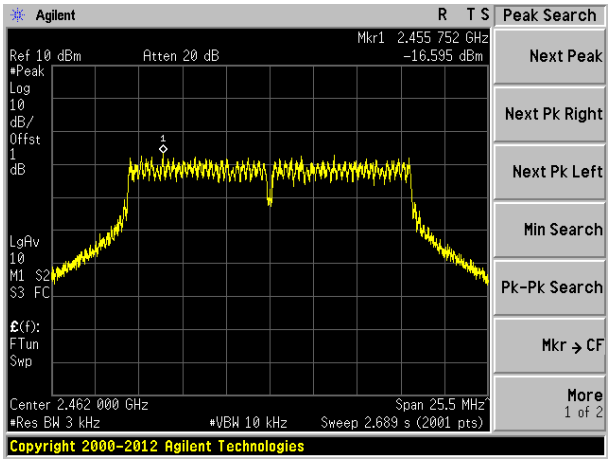


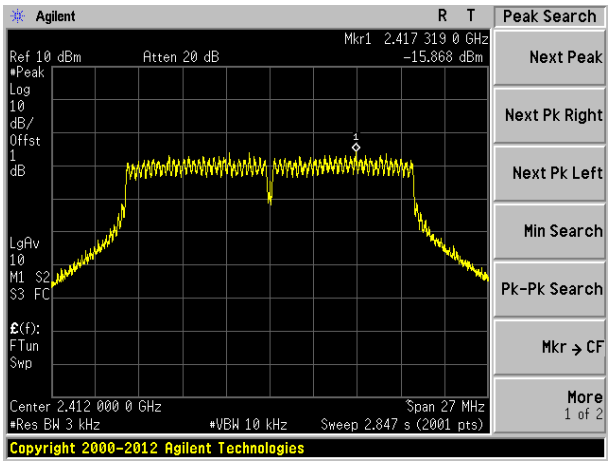
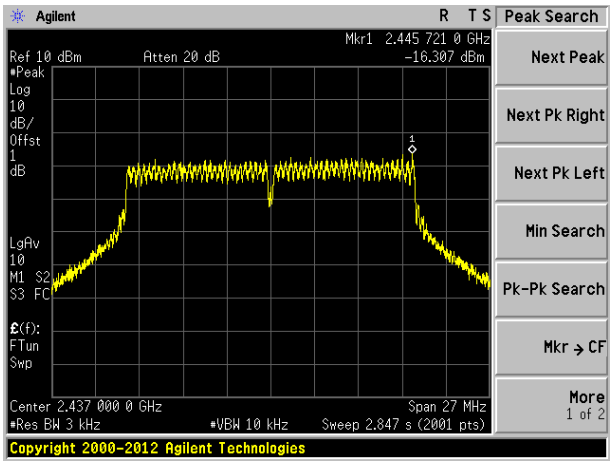
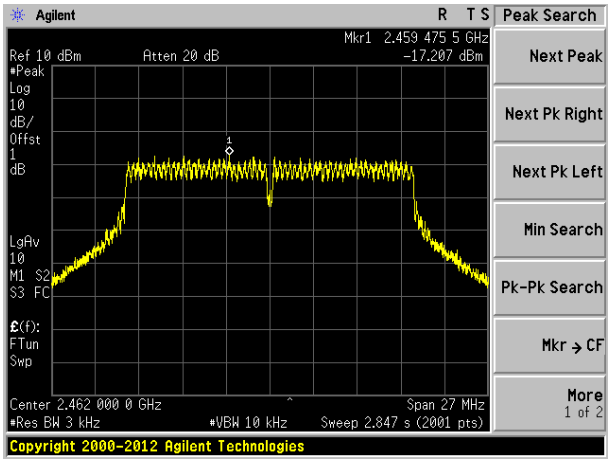
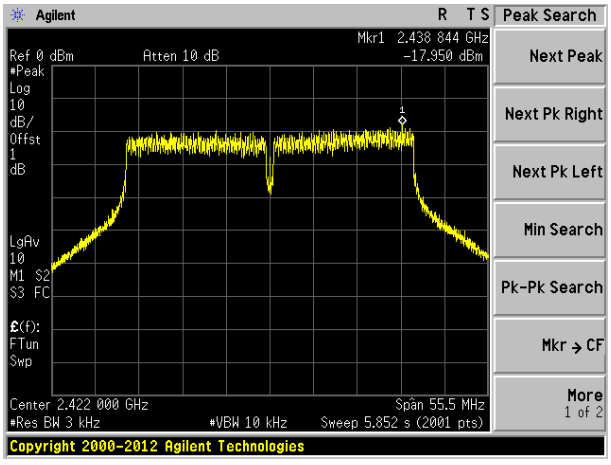
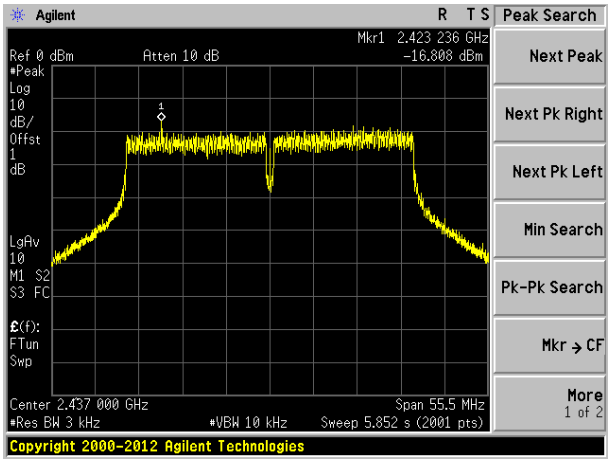
Channel 06 (2437MHz)

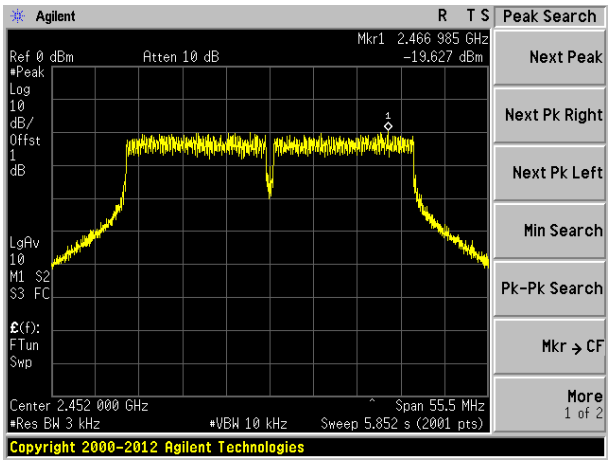


Channel 11 (2462MHz)	
	

802.11g PSD	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	

Channel 11 (2462MHz)	
	

802.11n-HT20 PSD	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	
Channel 11 (2462MHz)	
	
802.11n-HT40 PSD	
Channel 03 (2422MHz)	**Channel 06 (2437MHz)**
	

Channel 09 (2452MHz)	
	

7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure (Section 9.1).

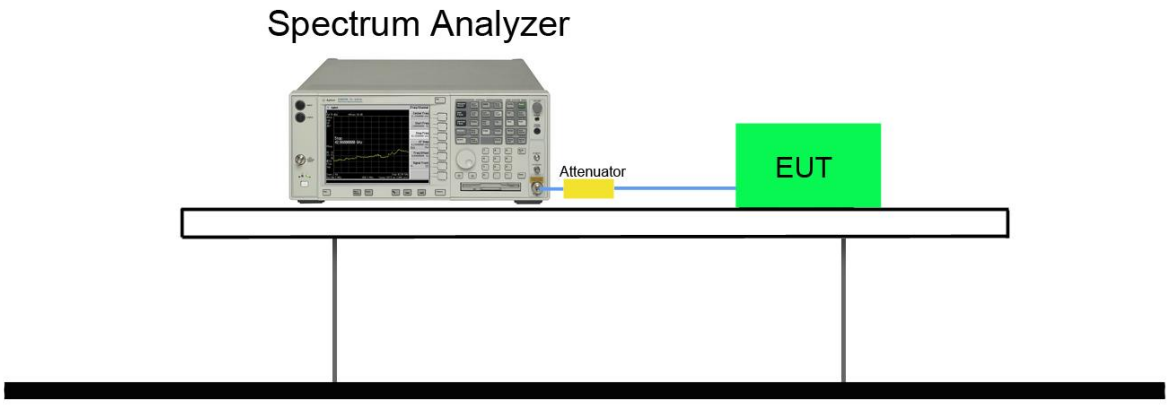
7.5.2. Test Procedure Used

KDB 558074 D01v03r01 – Section 11.3

7.5.3. Test Settitng

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Number of sweep points ≥ 2 x Span/RBW
6. Trace mode = max hold
7. Sweep time = auto couple
8. The trace was allowed to stabilize

7.5.4. Test Setup



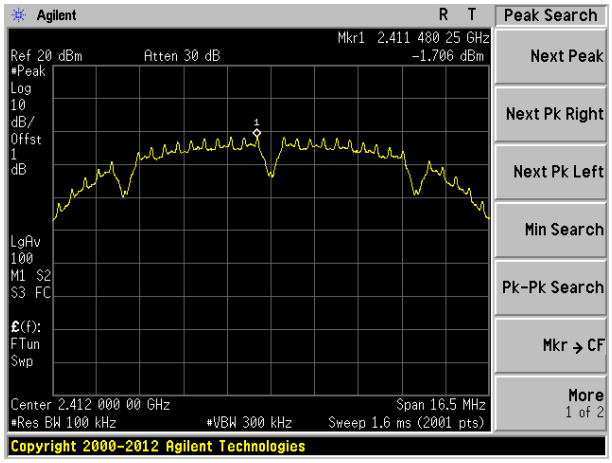
7.5.5. Test Result

Test Mode	N_{Tx}	Data Rate	Channel No.	Frequency (MHz)	Limit	Result
802.11b	1	1Mbps	01	2412	20dBc	Pass
802.11b	1	1Mbps	06	2437	20dBc	Pass
802.11b	1	1Mbps	11	2462	20dBc	Pass
802.11g	1	6Mbps	01	2412	20dBc	Pass
802.11g	1	6Mbps	06	2437	20dBc	Pass
802.11g	1	6Mbps	11	2462	20dBc	Pass
802.11n-HT20	1	6.5/7.2Mbps	01	2412	20dBc	Pass
802.11n-HT20	1	6.5/7.2Mbps	06	2437	20dBc	Pass
802.11n-HT20	1	6.5/7.2Mbps	11	2462	20dBc	Pass
802.11n-HT40	1	13.5/15Mbps	03	2422	20dBc	Pass
802.11n-HT40	1	13.5/15Mbps	06	2437	20dBc	Pass
802.11n-HT40	1	13.5/15Mbps	09	2452	20dBc	Pass

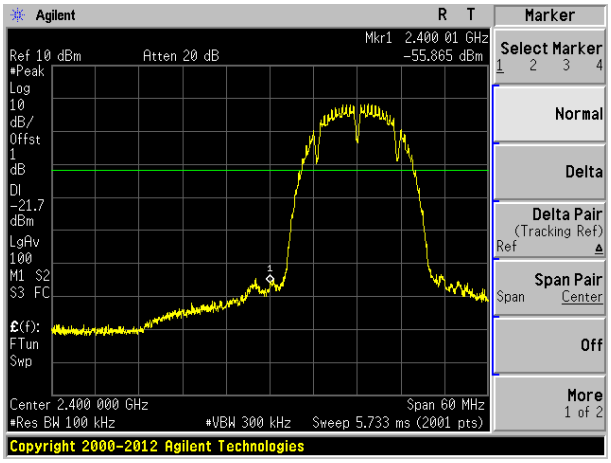
802.11b Out-of-Band Emissions

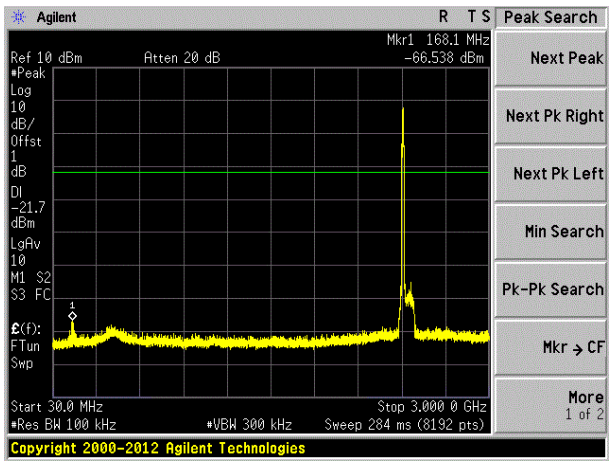
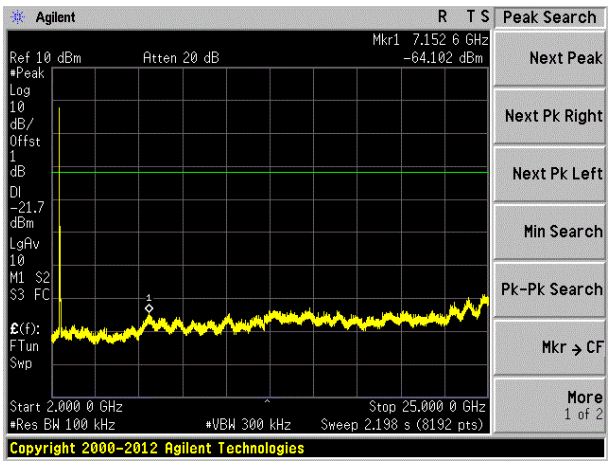
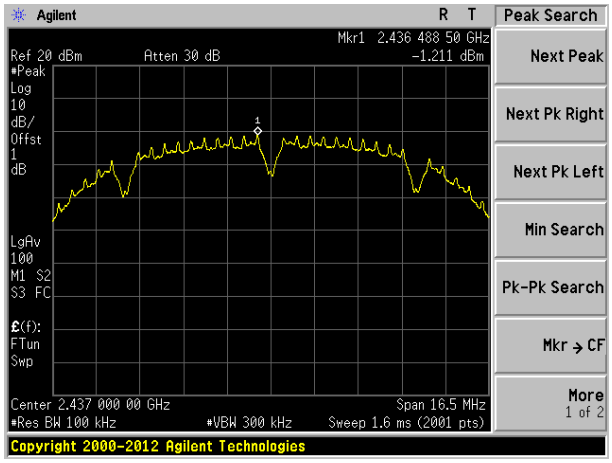
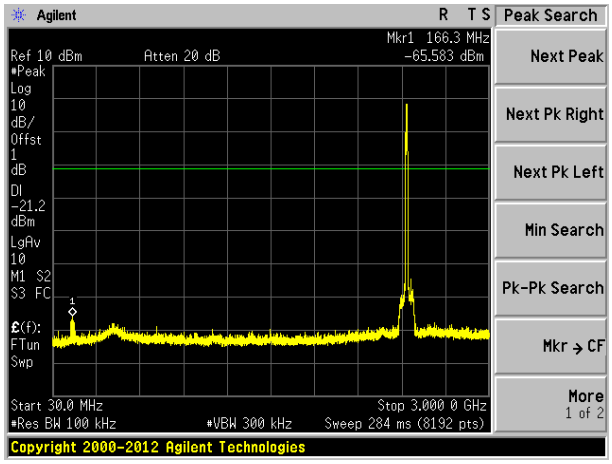
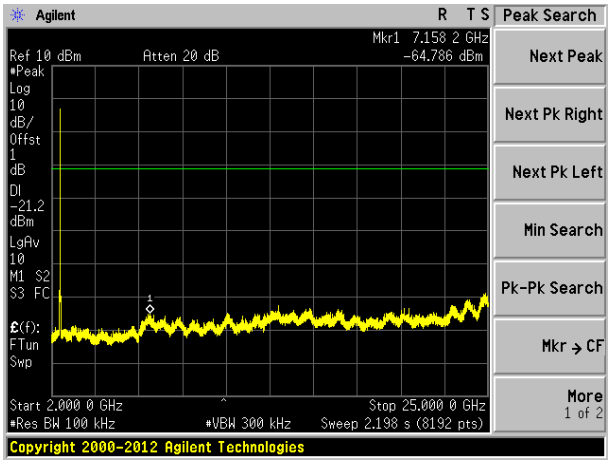
Channel 01 (2412MHz)

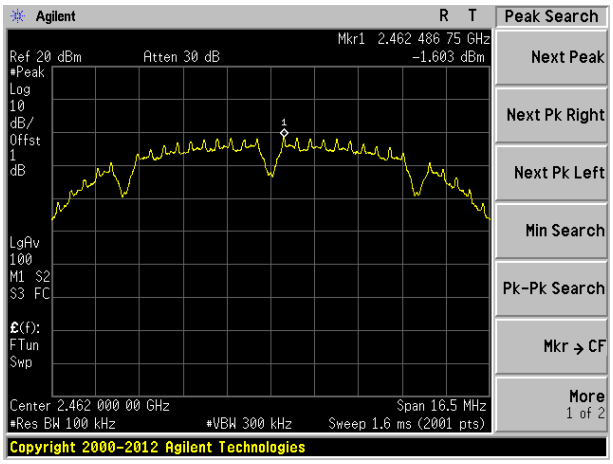
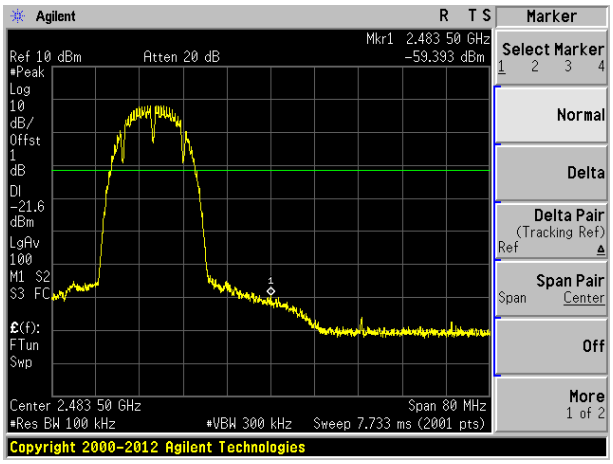
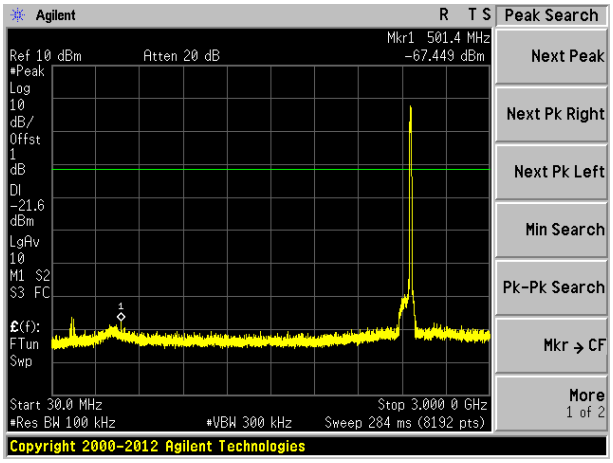
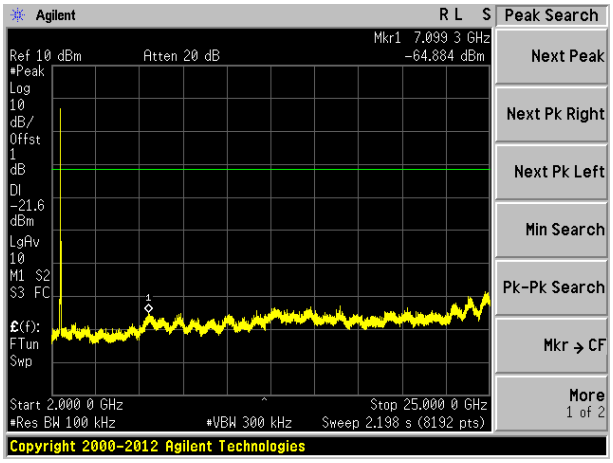
100kHz PSD reference Level



Low Band Edge



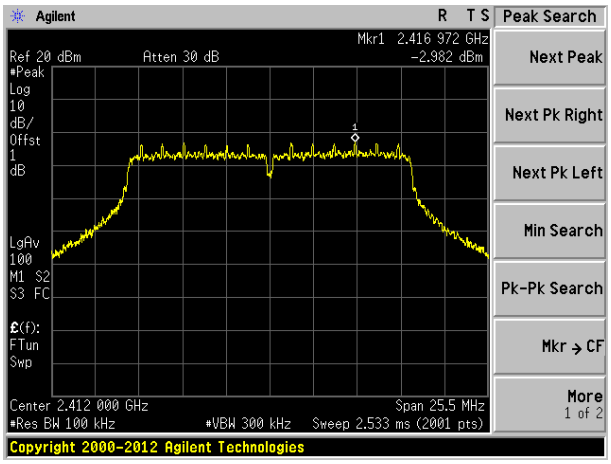
Spurious Emission 30MHz ~ 3GHz	Spurious Emission 2GHz ~ 25GHz
	
Channel 06 (2437MHz)	
100kHz PSD reference Level	
	
Spurious Emission 30MHz ~ 3GHz	**Spurious Emission 2GHz ~ 25GHz**
	

Channel 11 (2462MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 3GHz	**Spurious Emission 2GHz ~ 25GHz**
	

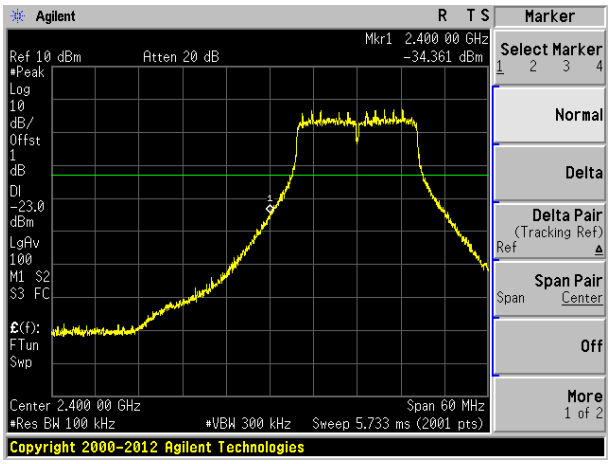
802.11g Out-of-Band Emissions

Channel 01 (2412MHz)

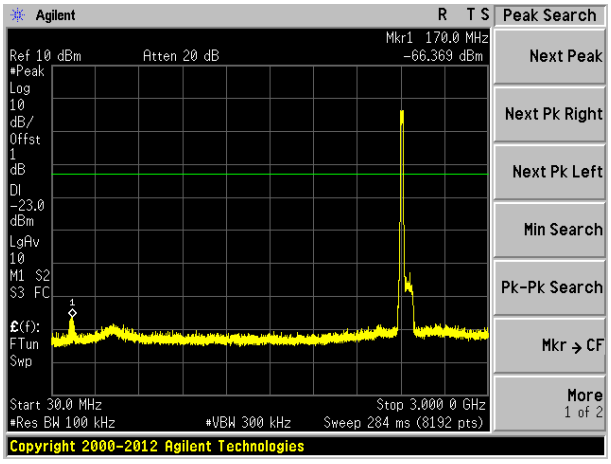
100kHz PSD reference Level



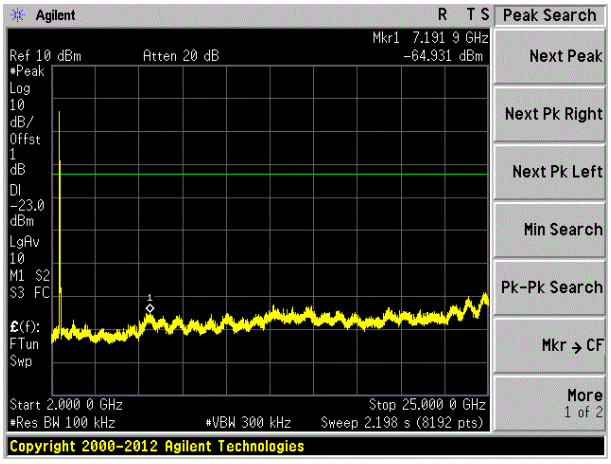
Low Band Edge



Spurious Emission 30MHz ~ 3GHz

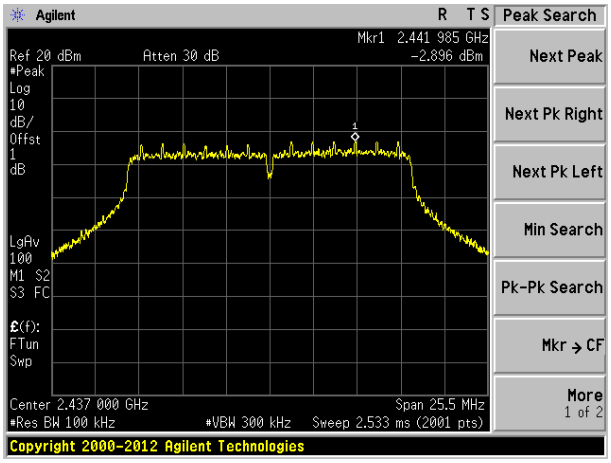


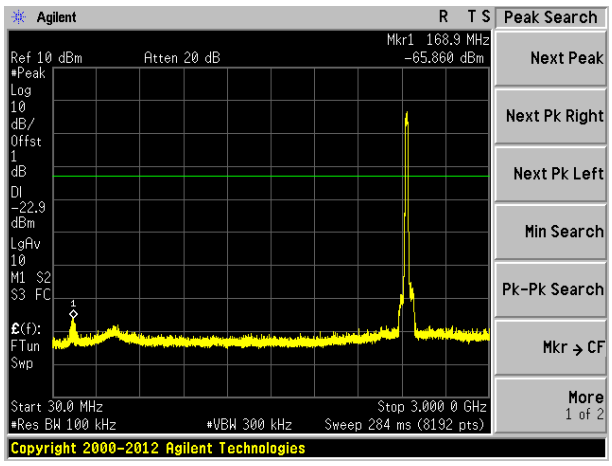
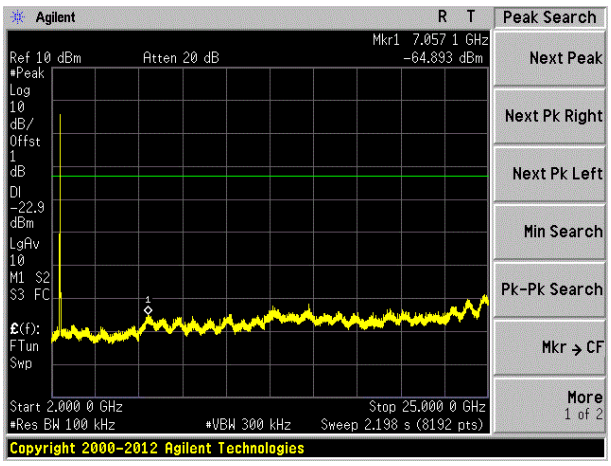
Spurious Emission 2GHz ~ 25GHz



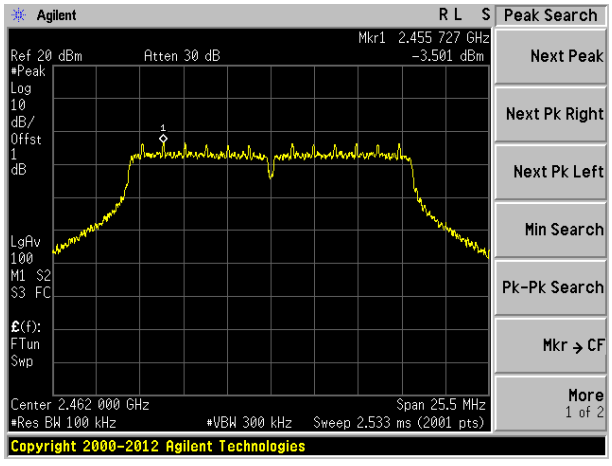
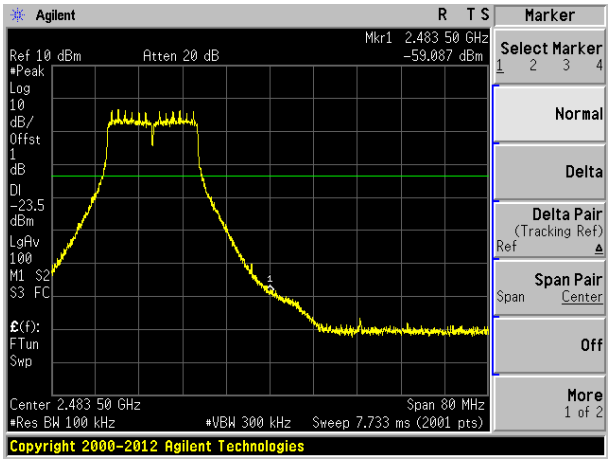
Channel 06 (2437MHz)

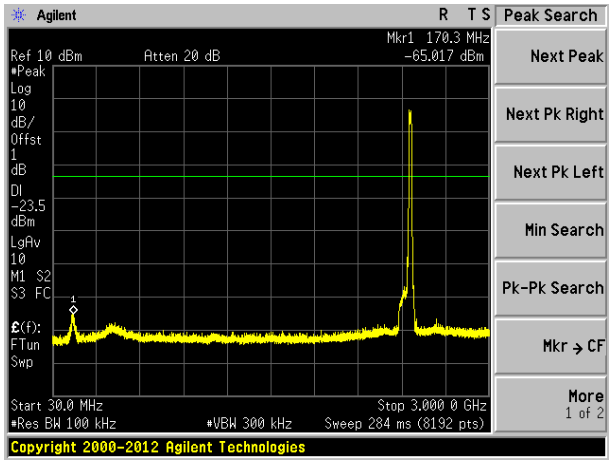
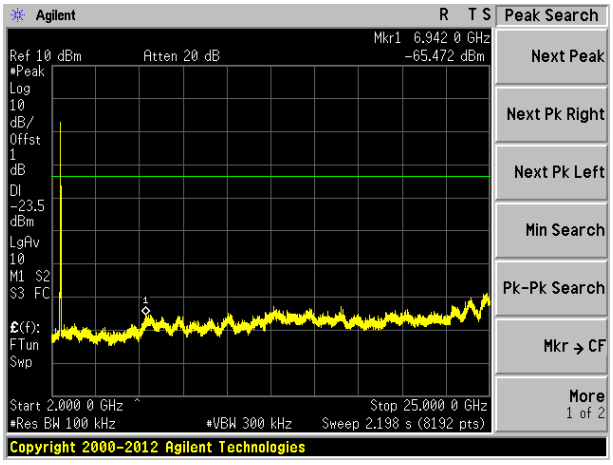
100kHz PSD reference Level



Spurious Emission 30MHz ~ 3GHz	Spurious Emission 2GHz ~ 25GHz
	

Channel 11 (2462MHz)

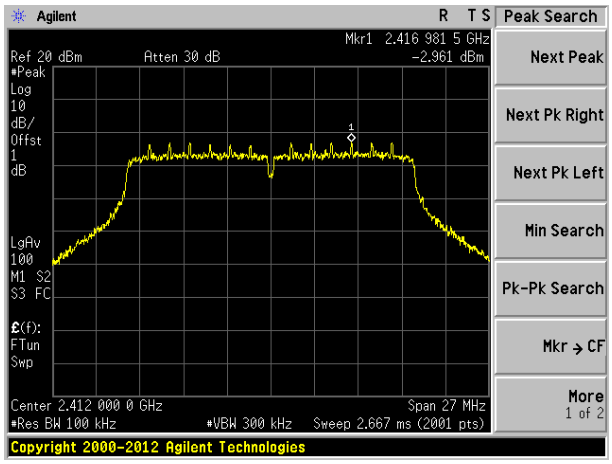
100kHz PSD reference Level	High Band Edge
	

Spurious Emission 30MHz ~ 3GHz	Spurious Emission 2GHz ~ 25GHz
	

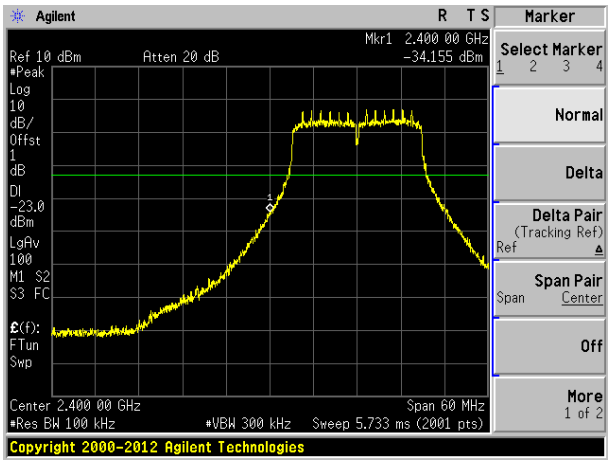
802.11n-HT20 Out-of-Band Emissions

Channel 01 (2412MHz)

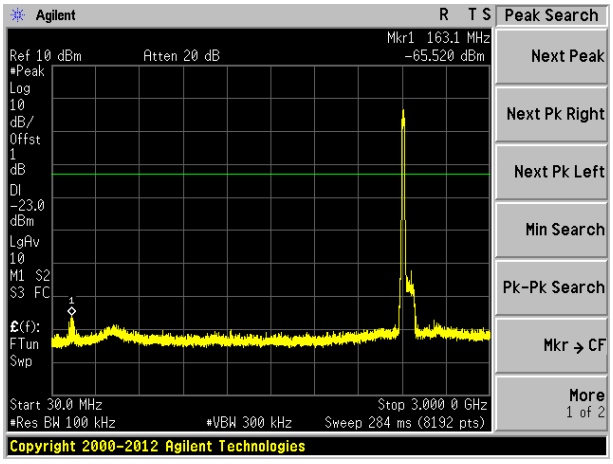
100kHz PSD reference Level



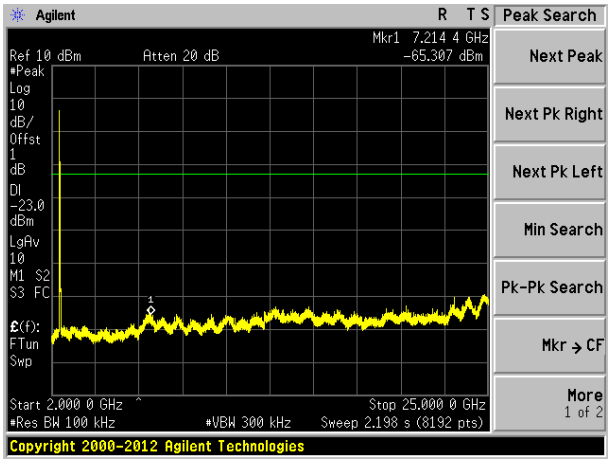
Low Band Edge



Spurious Emission 30MHz ~ 3GHz

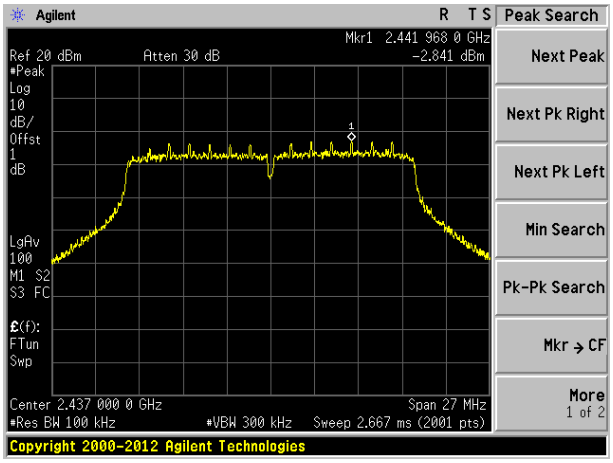


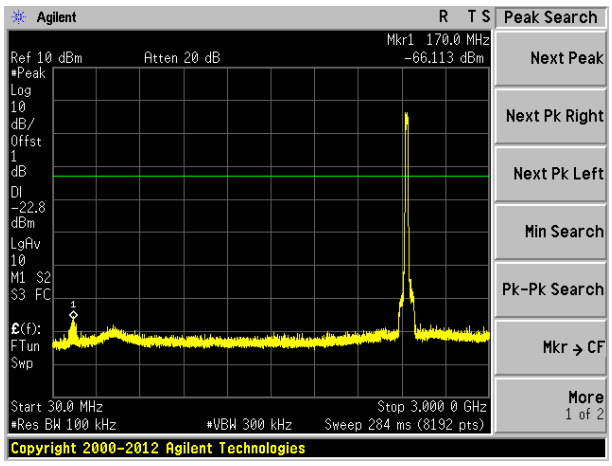
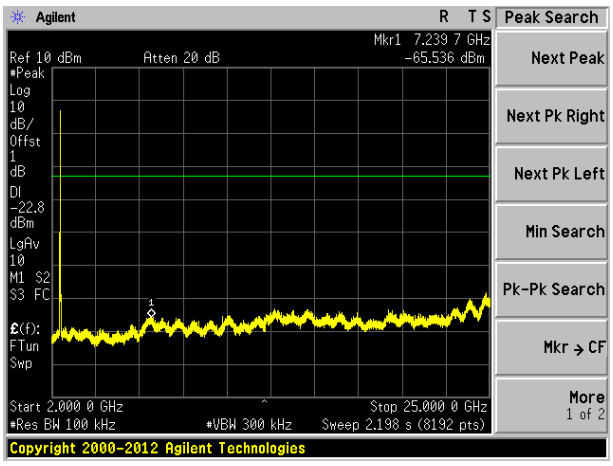
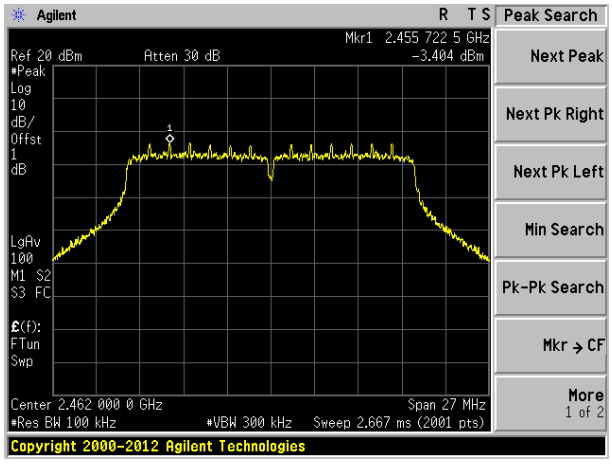
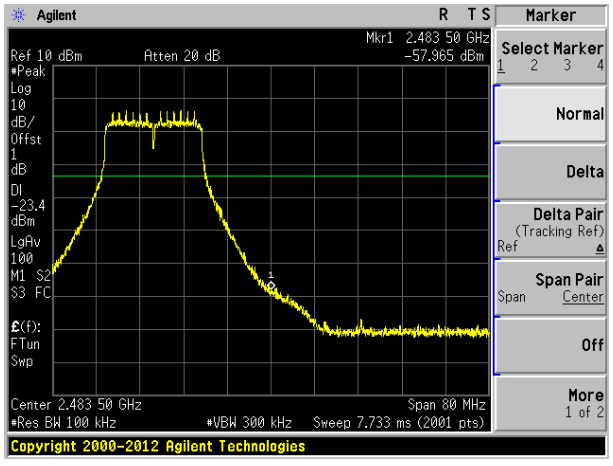
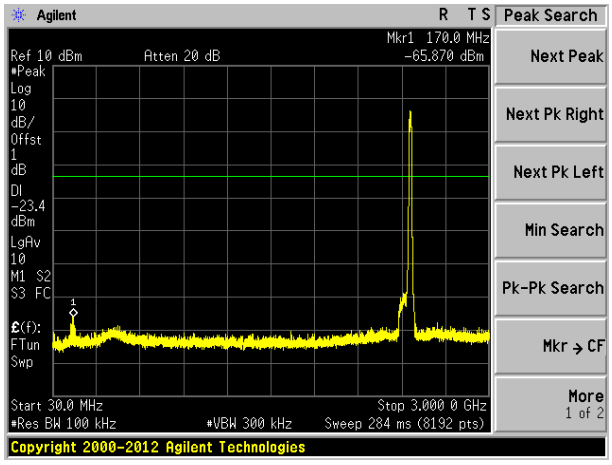
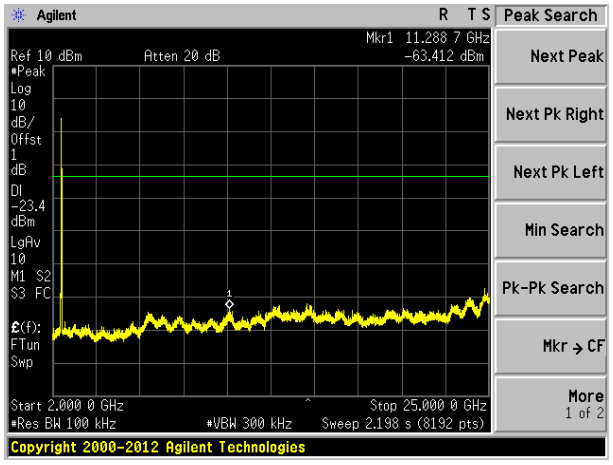
Spurious Emission 2GHz ~ 25GHz



Channel 06 (2437MHz)

100kHz PSD reference Level

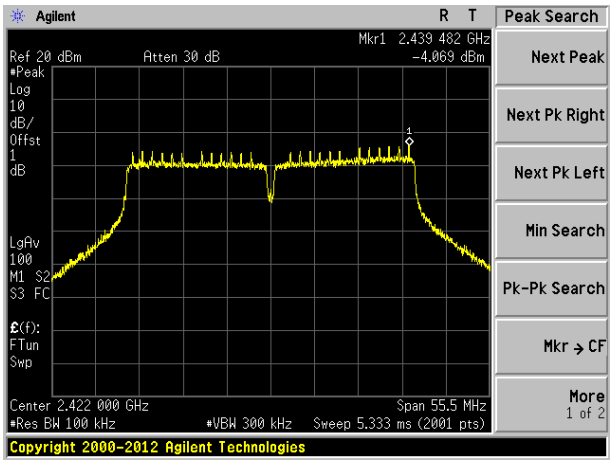


Spurious Emission 30MHz ~ 3GHz	Spurious Emission 2GHz ~ 25GHz
	
Channel 11 (2462MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 3GHz	**Spurious Emission 2GHz ~ 25GHz**
	

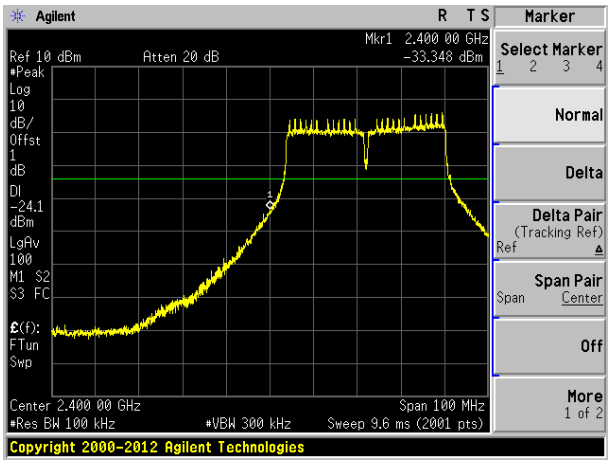
802.11n-HT40 Out-of-Band Emissions

Channel 03 (2422MHz)

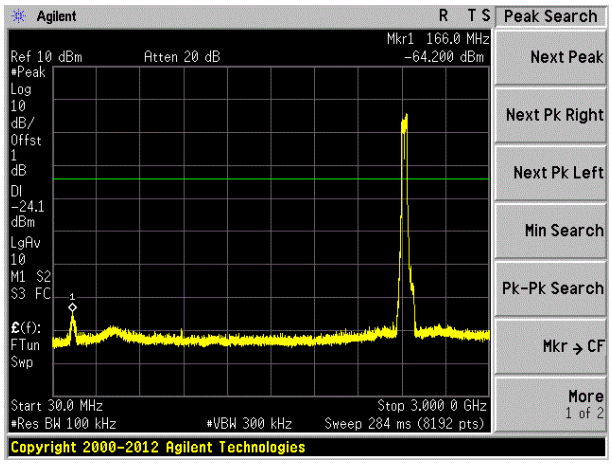
100kHz PSD reference Level



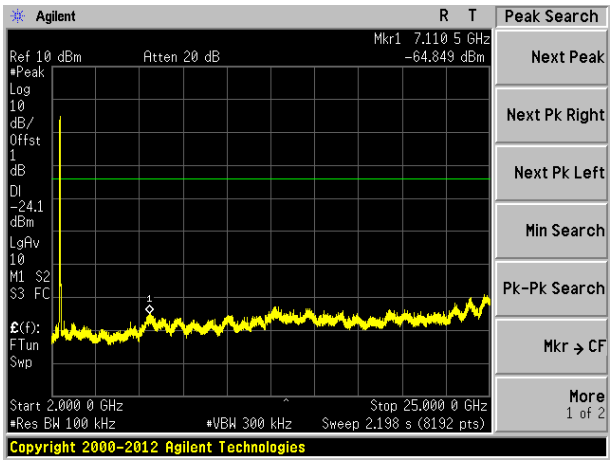
Low Band Edge



Spurious Emission 30MHz ~ 3GHz

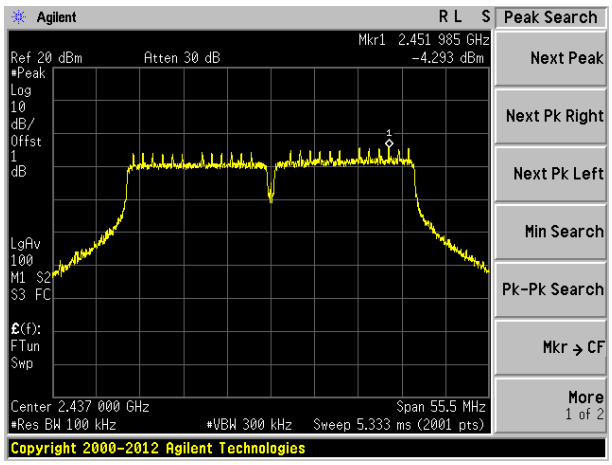


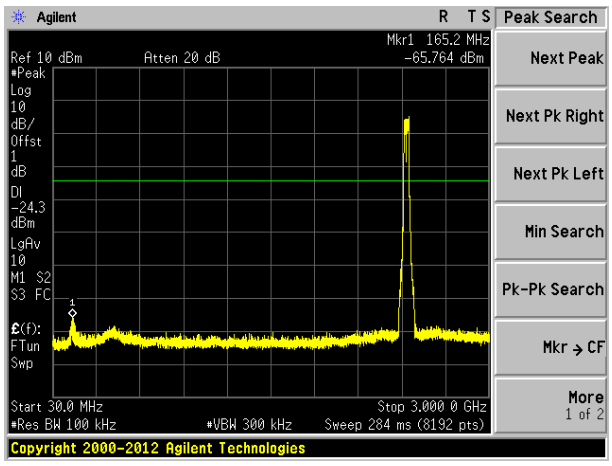
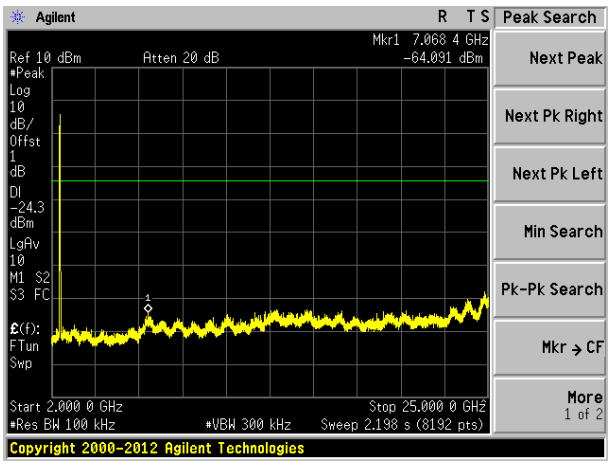
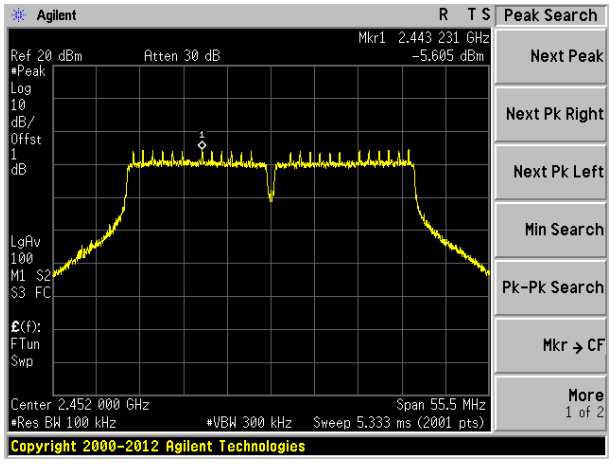
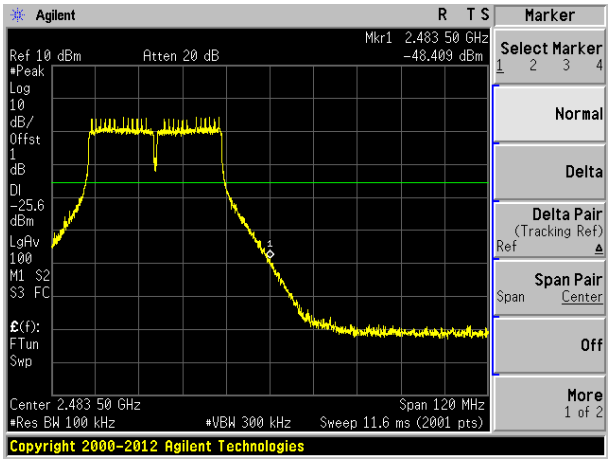
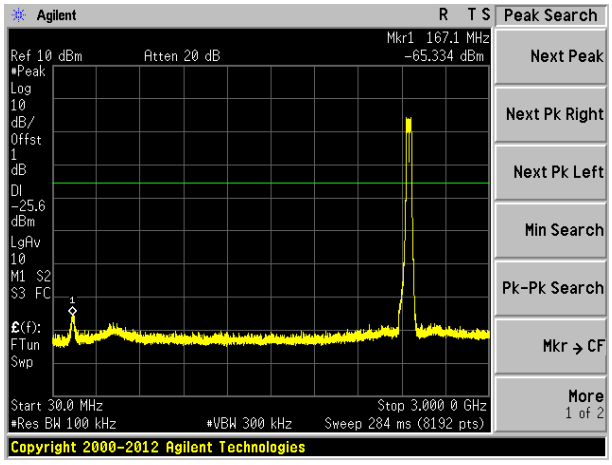
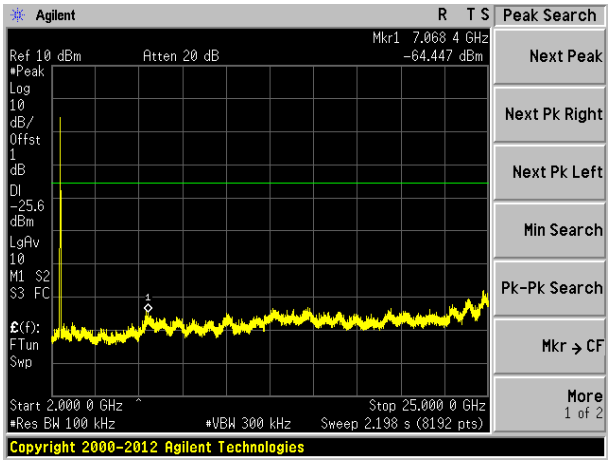
Spurious Emission 2GHz ~ 25GHz



Channel 06 (2437MHz)

100kHz PSD reference Level



Spurious Emission 30MHz ~ 3GHz	Spurious Emission 2GHz ~ 25GHz
	
Channel 09 (2452MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 3GHz	**Spurious Emission 2GHz ~ 25GHz**
	

7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [V/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2. Test Procedure Used

KDB 558074 D01v03r01 – Section 12.2.3 (quasi-peak measurements)

KDB 558074 D01v03r01 – Section 12.2.4 (peak power measurements)

KDB 558074 D01v03r01 – Section 12.2.5 (average power measurements)

7.6.3. Test Setting

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v03r01

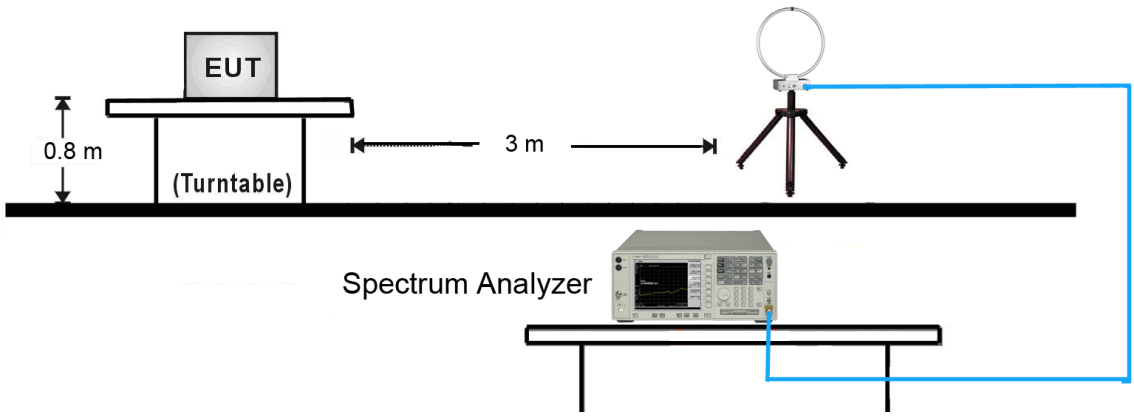
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 D01v03r01

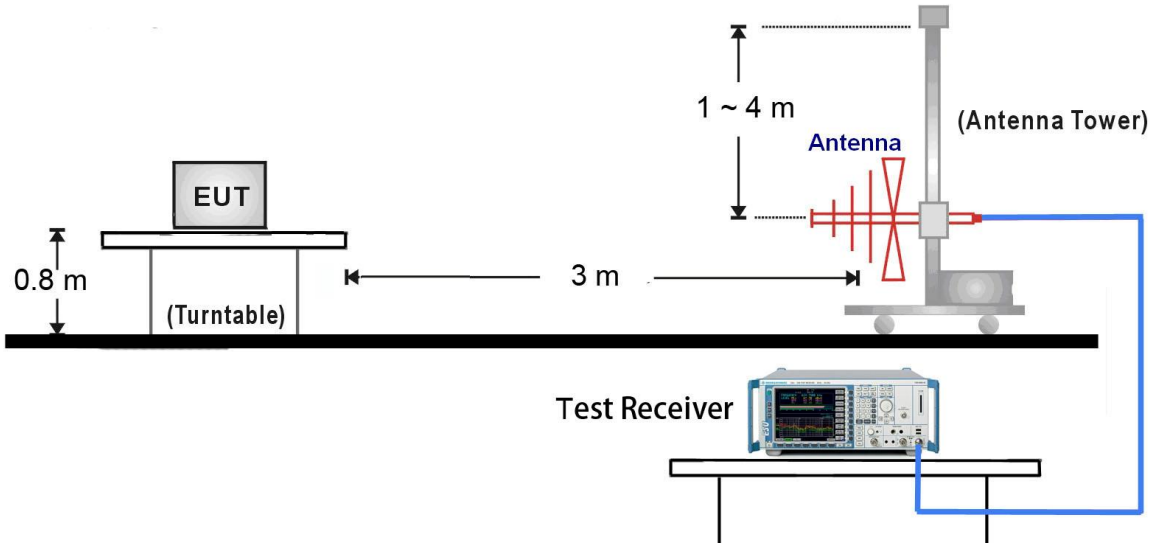
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be > 2 x span/RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

7.6.4. Test Setup

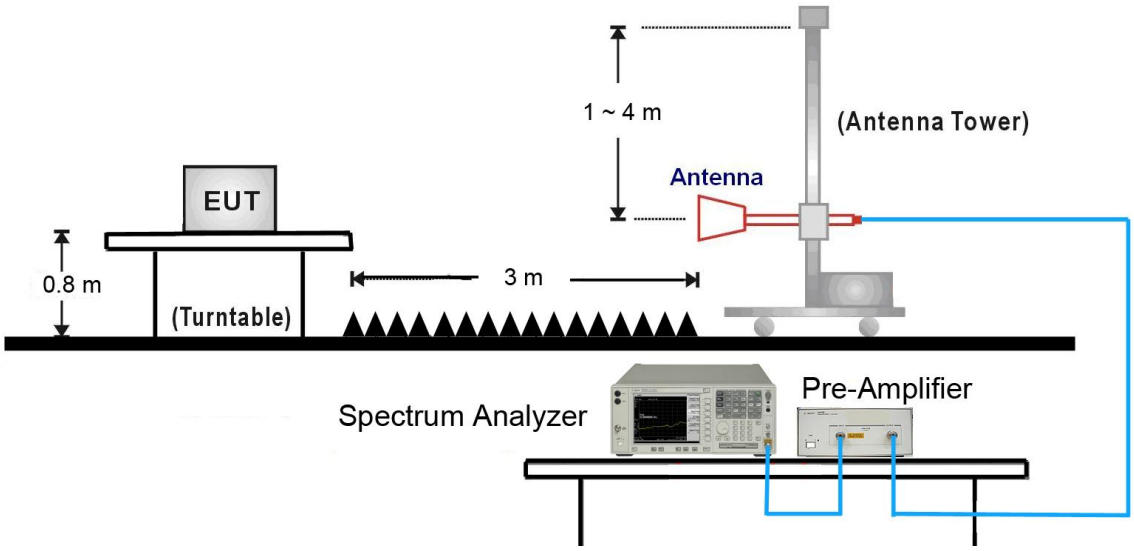
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



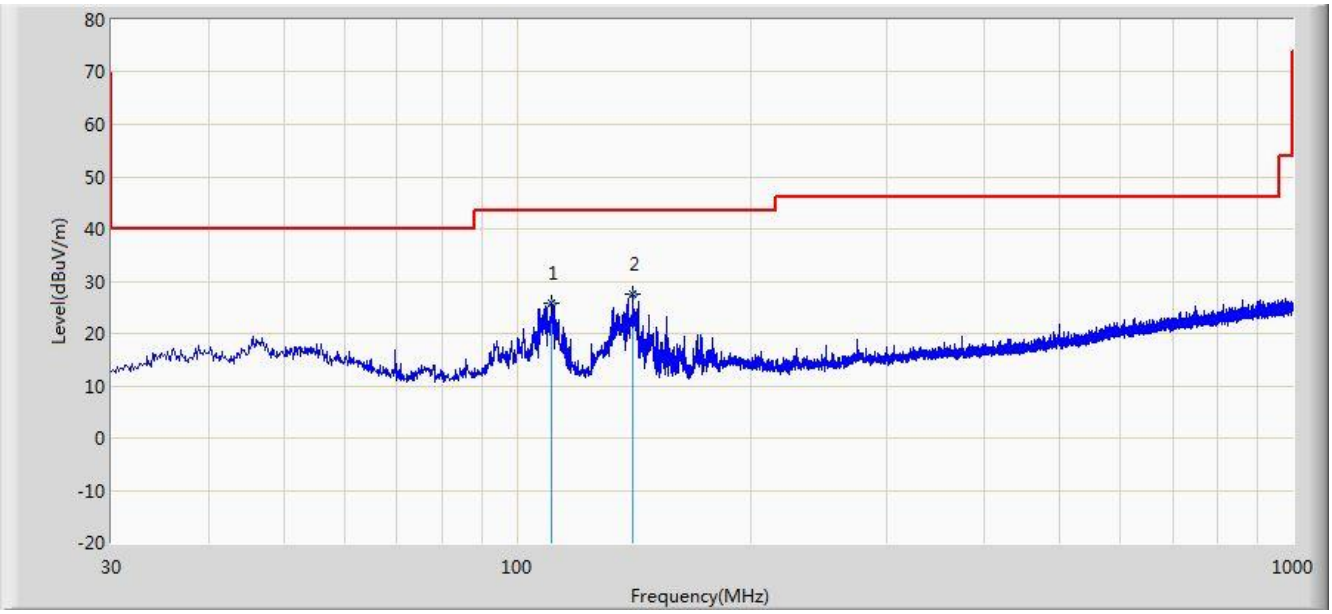
7.6.5. Test Result

Test Mode:	802.11g	Test Site:	AC1
Test Channel:	11	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. **The worst case of Radiated Spurious Emission**		

Mark	Frequency (MHz)	Reading Level (dBμV/m)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	3315.6	35.4	3.2	38.6	98.9	-60.3	Peak	Horizontal
*	4413.5	35.7	5.5	41.2	98.9	-57.7	Peak	Horizontal
	4924.0	35.2	6.7	41.9	74.0	-32.1	Peak	Horizontal
	7386.0	34.1	14.1	48.2	74.0	-25.8	Peak	Horizontal
*	3153.4	35.7	3.6	39.3	98.9	-59.6	Peak	Vertical
*	4409.4	35.7	5.5	41.2	98.9	-57.7	Peak	Vertical
	4924.0	35.0	6.7	41.7	74.0	-32.3	Peak	Vertical
	7386.0	33.9	14.1	48.0	74.0	-26.0	Peak	Vertical
Note: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (118.9dBμV/m).								

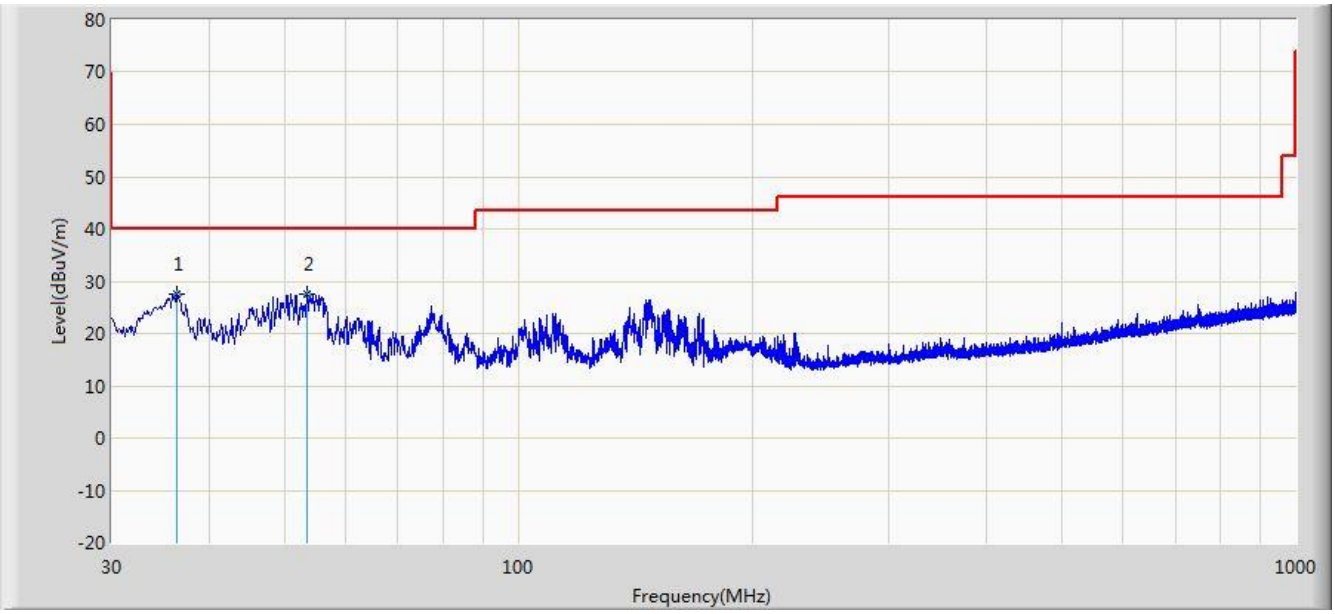
The worst case of Radiated Emission below 1GHz:

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 17:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11g Channel 2437MHz	



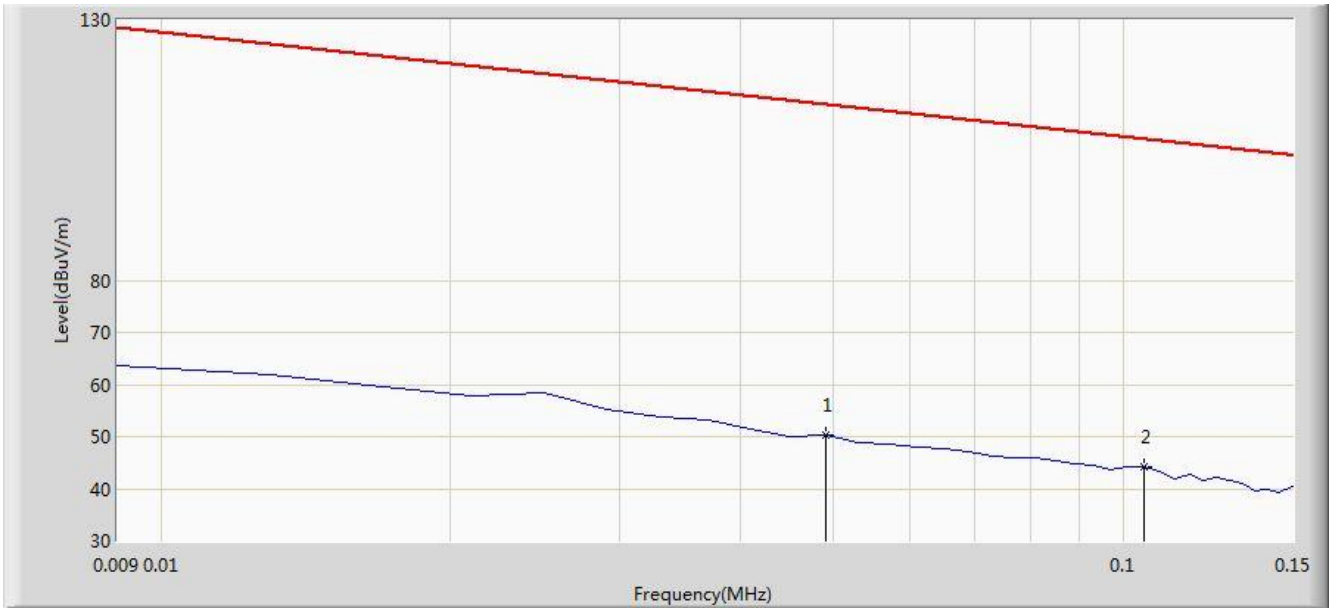
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			110.753	25.839	13.321	-17.661	43.500	12.518	QP
2		*	141.186	27.585	18.426	-15.915	43.500	9.159	QP

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 17:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11g Channel 2437MHz	



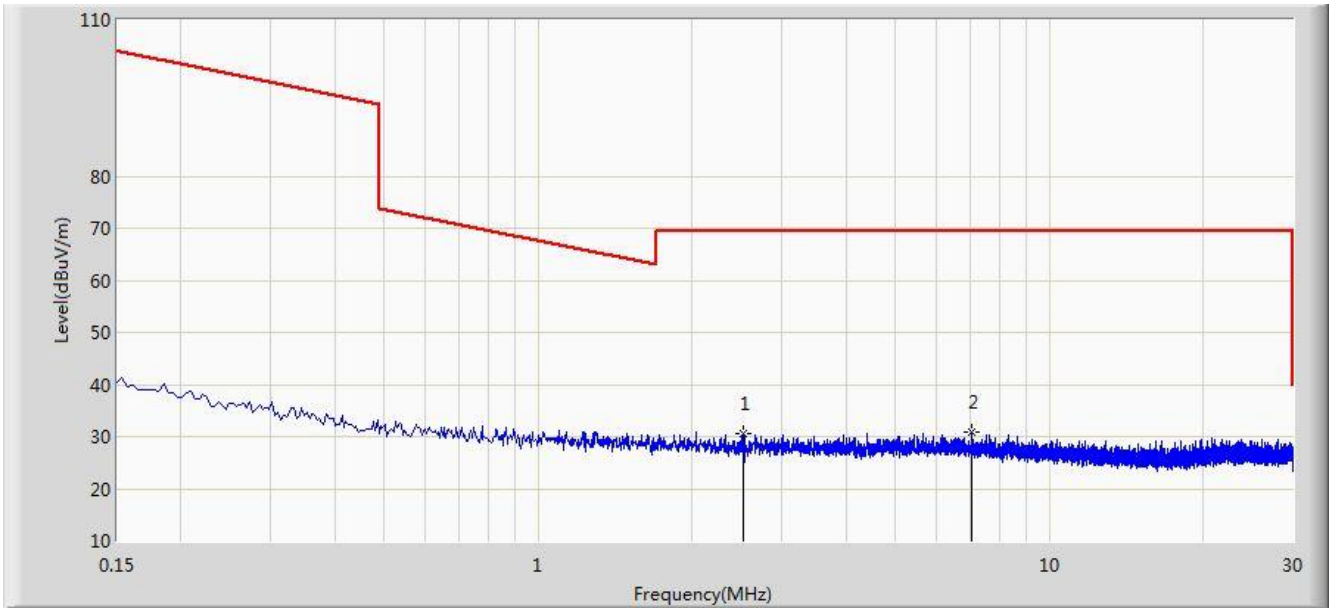
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			36.305	27.410	14.385	-12.590	40.000	13.025	QP
2		*	53.522	27.440	12.753	-12.560	40.000	14.687	QP

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 16:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: FMZB1519_0.009-30MHz	Polarity: Face On
EUT: Tablet PC	Power: By Battery
Note: There is the ambient noise within frequency range 9kHz~30MHz.	



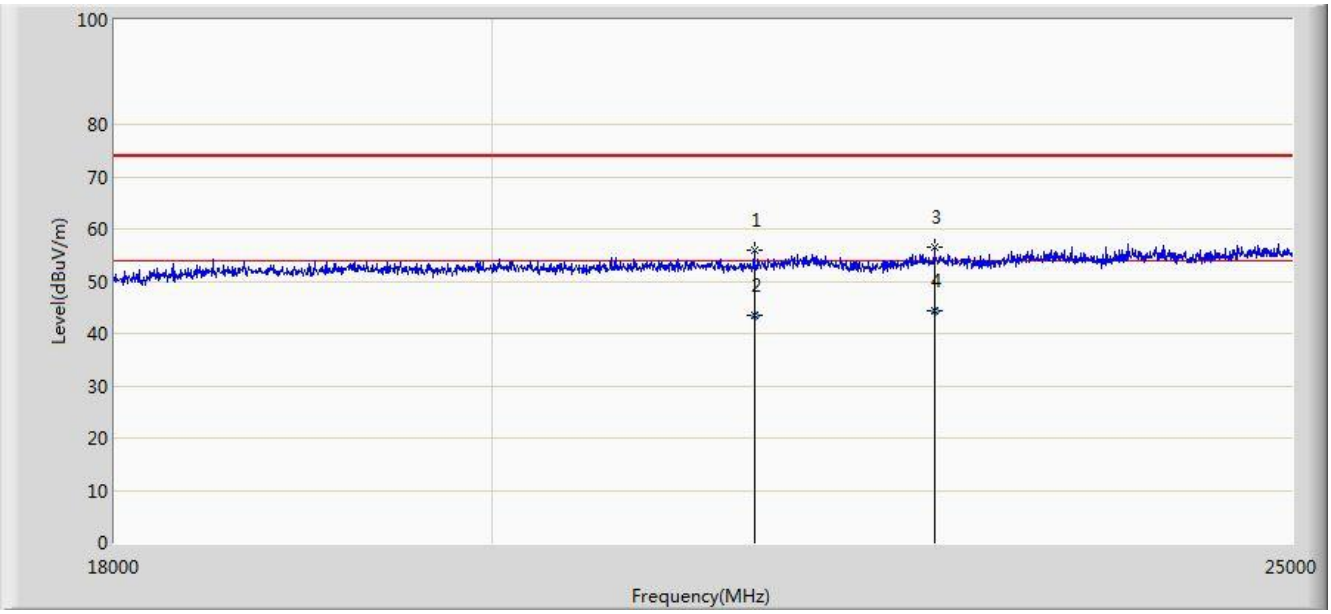
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			0.049	50.367	29.861	-63.422	113.789	20.505	PK
2		*	0.105	44.143	23.996	-63.029	107.173	20.147	PK

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 16:41
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: FMZB1519_0.009-30MHz	Polarity: Face On
EUT: Tablet PC	Power: By Battery
Note: There is the ambient noise within frequency range 9kHz~30MHz.	



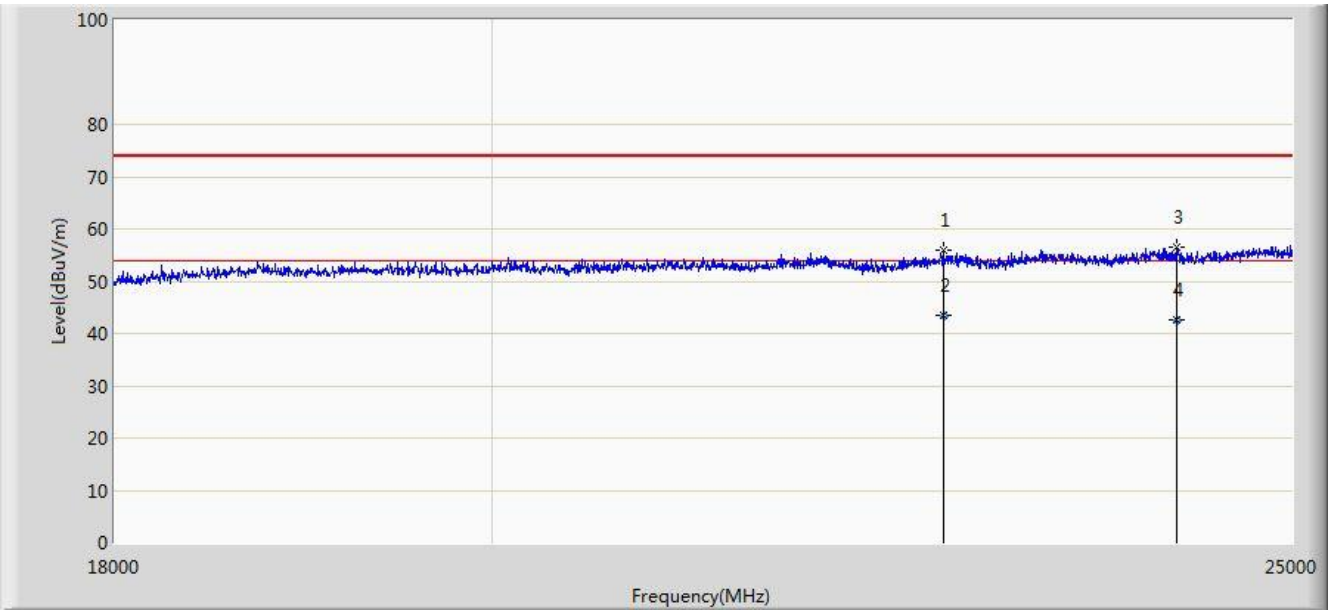
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2.513	30.495	10.336	-39.005	69.500	20.159	PK
2		*	7.041	30.974	10.579	-38.526	69.500	20.395	PK

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 17:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9170_18-40GHz	Polarity: Horizontal
EUT: Tablet PC	Power: By Battery
Note: There is the ambient noise within frequency range 18 ~ 25GHz.	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			21517.500	55.869	17.883	-18.131	74.000	37.986	PK
2			21517.650	43.351	5.365	-10.649	54.000	37.986	AV
3			22630.500	56.509	18.223	-17.491	74.000	38.286	PK
4		*	22630.540	44.310	6.024	-9.690	54.000	38.286	AV

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 17:43
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9170_18-40GHz	Polarity: Vertical
EUT: Tablet PC	Power: By Battery
Note: There is the ambient noise within frequency range 18 ~ 25GHz.	

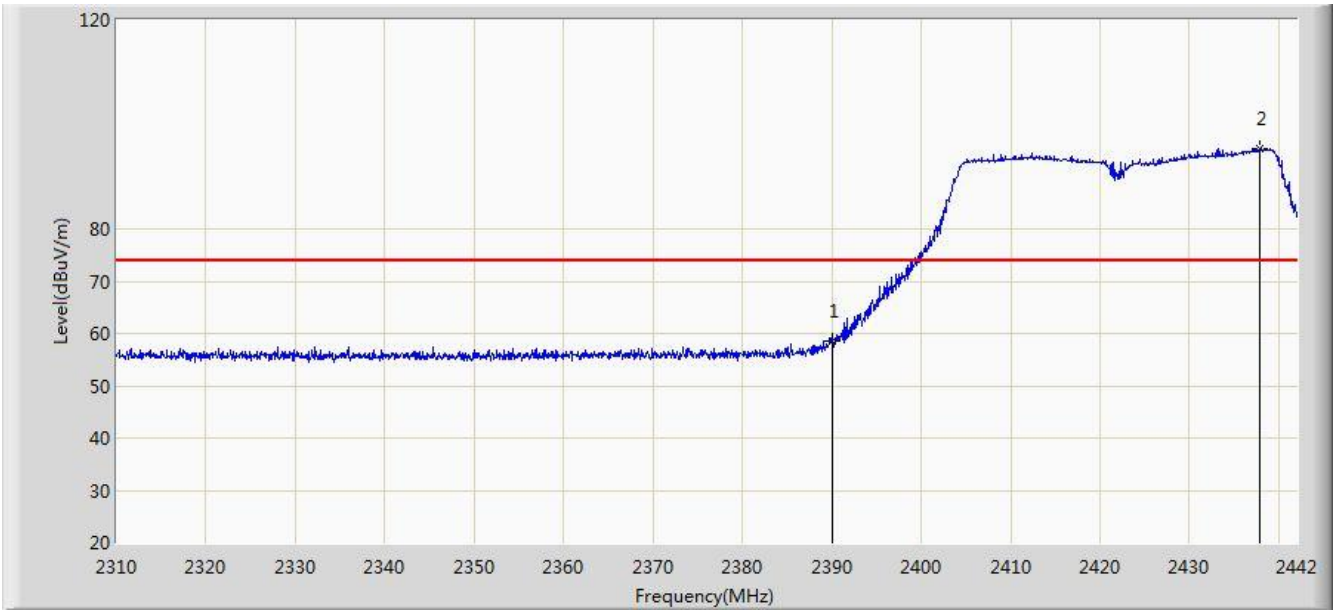


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			22686.500	55.811	17.457	-18.189	74.000	38.354	PK
2		*	22686.540	43.598	5.244	-10.402	54.000	38.354	AV
3			24205.500	56.430	17.607	-17.570	74.000	38.823	PK
4			24205.658	42.518	3.695	-11.482	54.000	38.823	AV

7.7. Radiated Restricted Band Edge Measurement

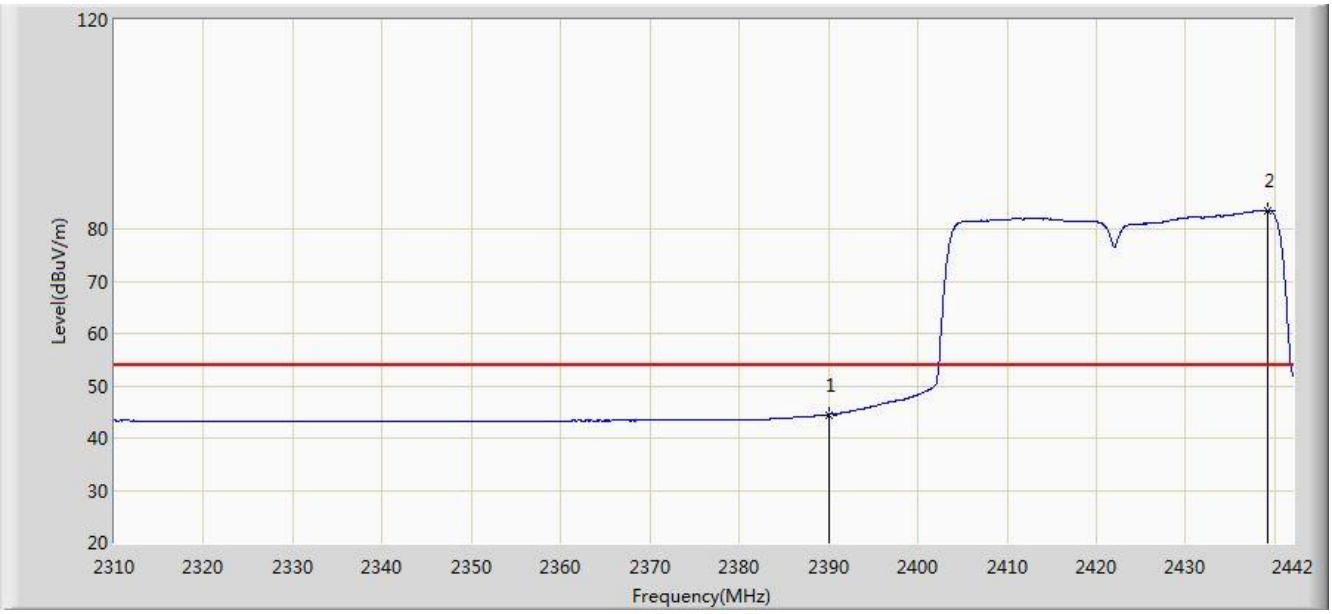
7.7.1. Test Result

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:15
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2422MHz	



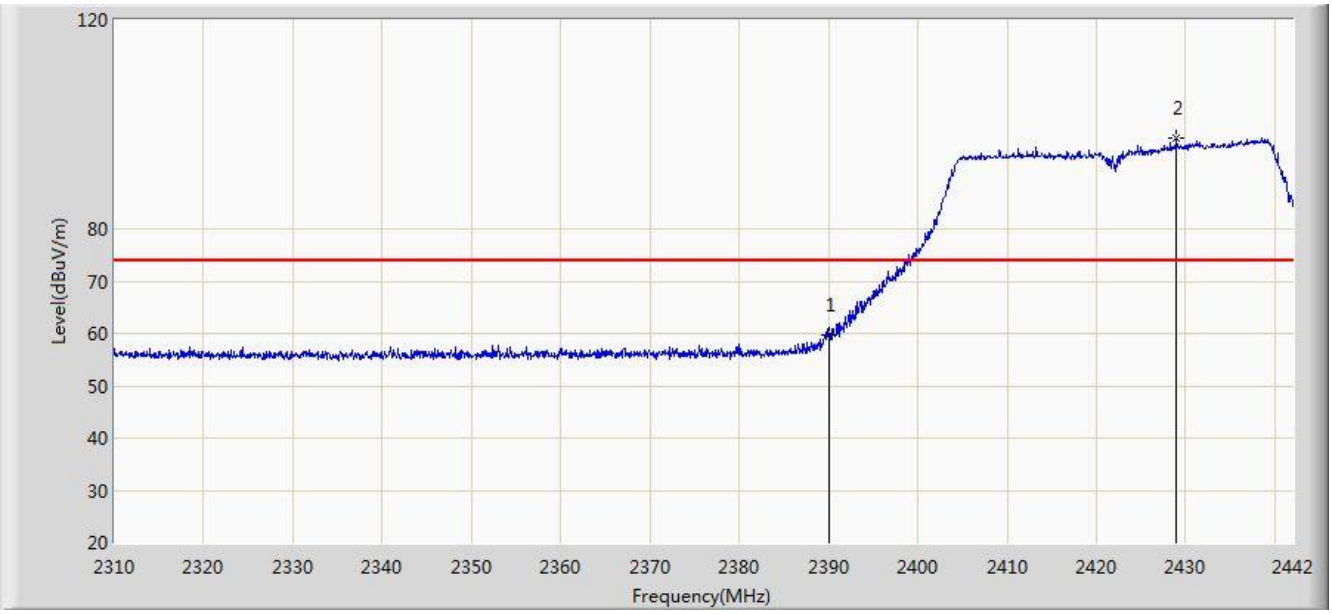
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	58.576	27.892	-15.424	74.000	30.684	PK
2		*	2437.908	95.447	64.845	N/A	N/A	30.602	PK

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2422MHz	



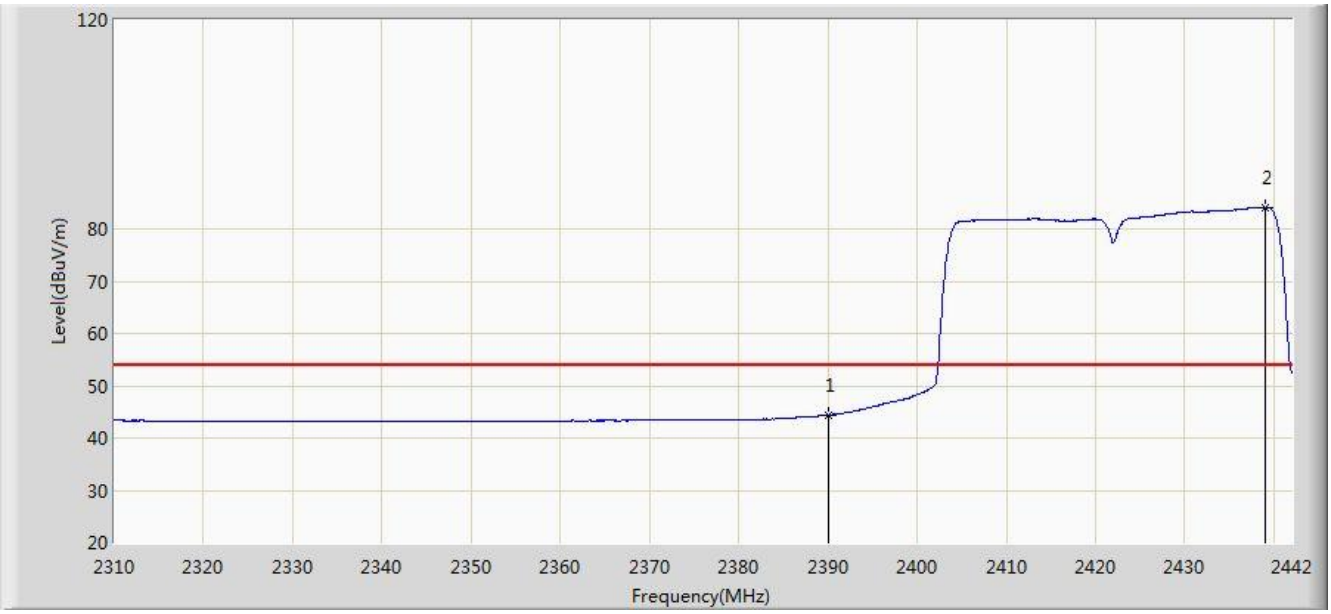
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	44.455	13.771	-9.545	54.000	30.684	AV
2		*	2439.162	83.599	52.999	N/A	N/A	30.600	AV

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2422MHz	



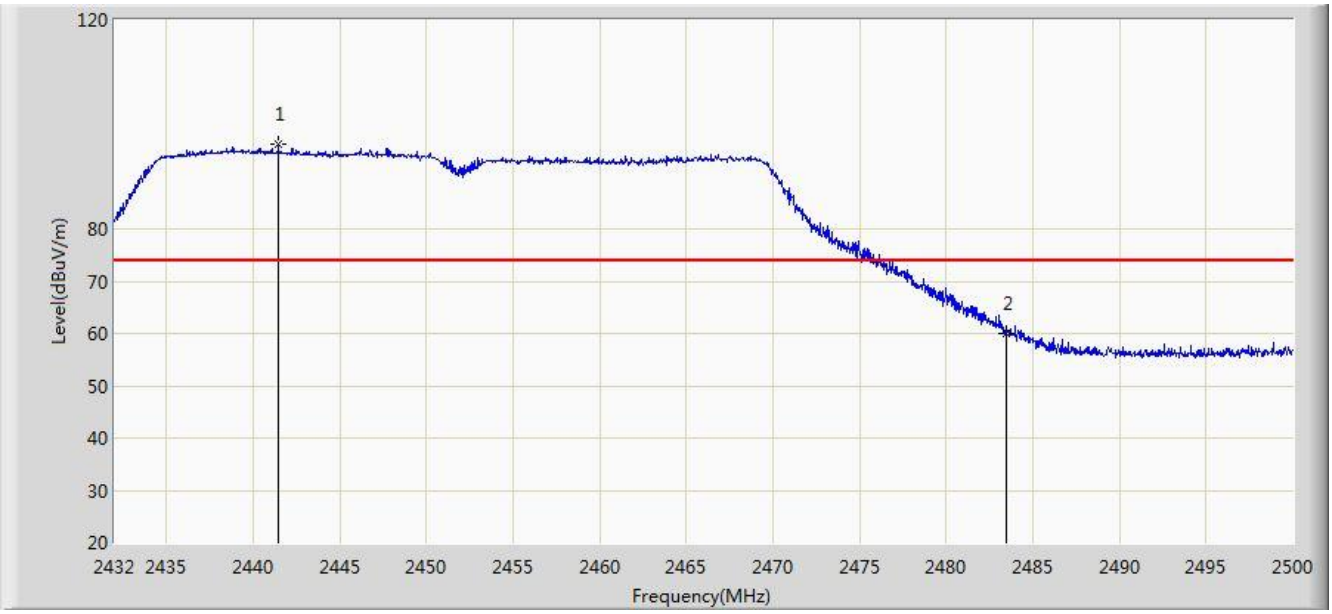
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	59.824	29.140	-14.176	74.000	30.684	PK
2		*	2428.998	97.350	66.732	N/A	N/A	30.619	PK

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2422MHz	



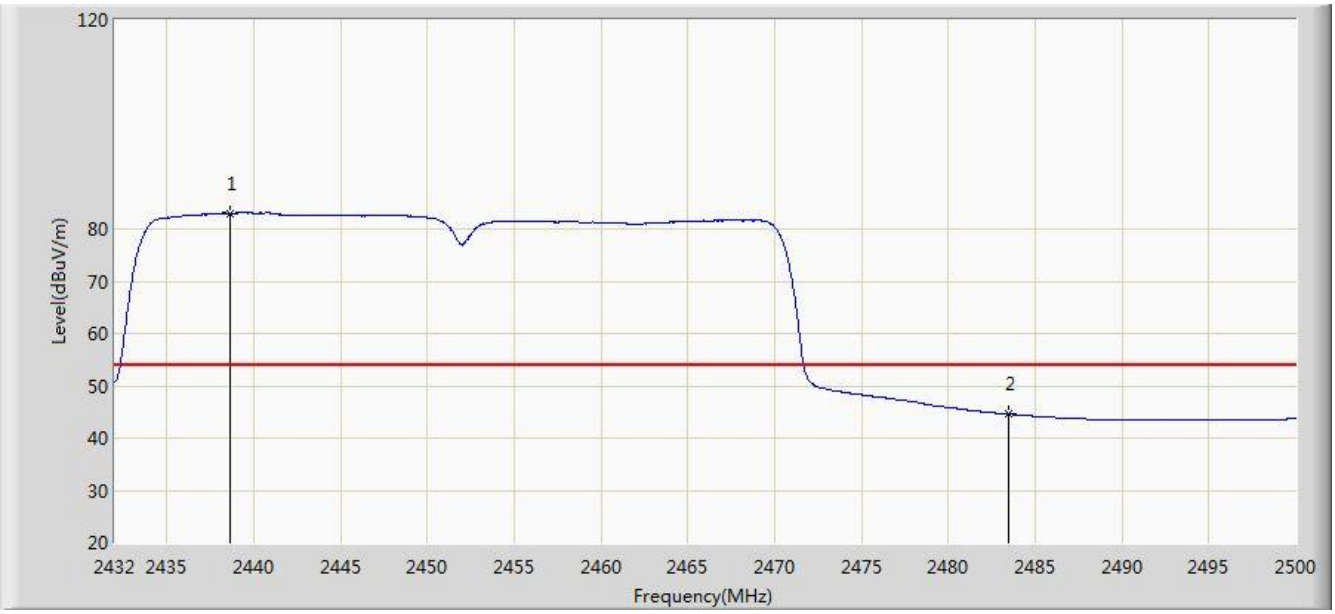
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	44.380	13.696	-9.620	54.000	30.684	AV
2		*	2438.964	84.166	53.566	N/A	N/A	30.600	AV

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2452MHz	



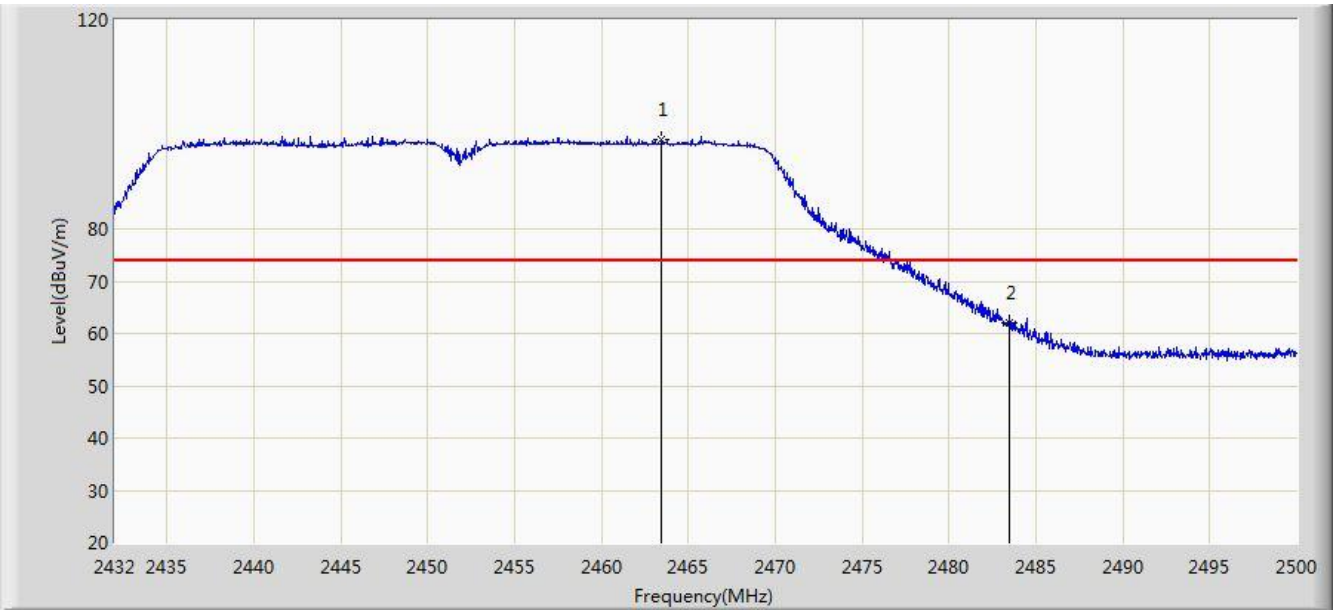
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2441.452	96.209	65.613	N/A	N/A	30.596	PK
2			2483.500	60.125	29.452	-13.875	74.000	30.673	PK

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:28
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2452MHz	



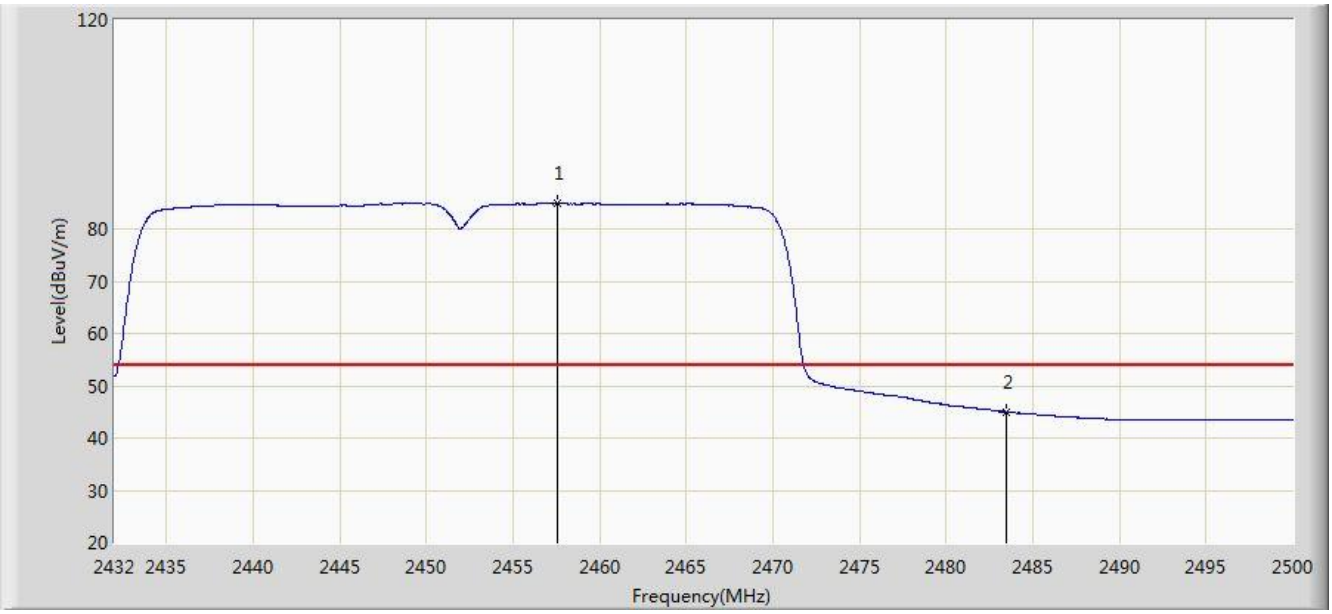
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2438.664	82.956	52.355	N/A	N/A	30.601	AV
2			2483.500	44.555	13.882	-9.445	54.000	30.673	AV

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2452MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2463.484	97.246	66.632	N/A	N/A	30.615	PK
2			2483.500	62.016	31.343	-11.984	74.000	30.673	PK

Engineer: Roy Cheng	
Site: AC1	Time: 2014/01/23 - 10:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Tablet PC	Power: By Battery
Worst Case Mode: 802.11n-HT40 Channel 2452MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2457.534	84.870	54.265	N/A	N/A	30.604	AV
2			2483.500	45.013	14.340	-8.987	54.000	30.673	AV

7.8. AC Conducted Emissions Measurement

7.8.1. Test 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 0.15MHz to 0.5MHz.

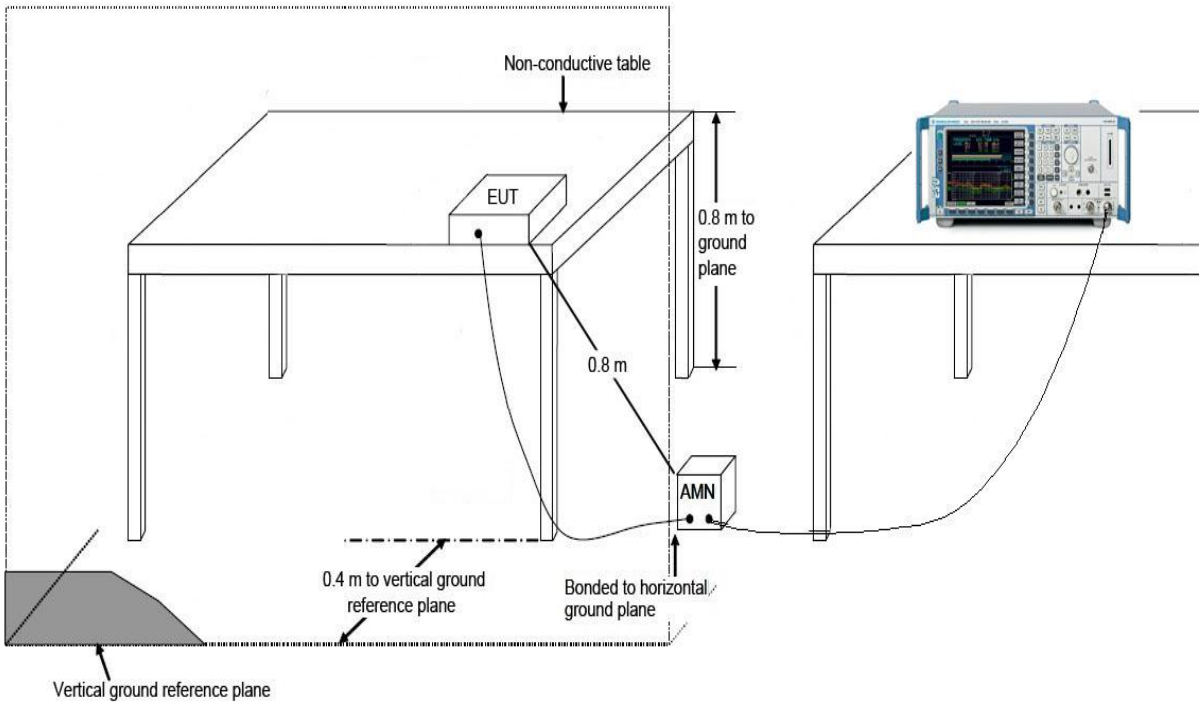
7.8.2. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to KDB 558074 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.

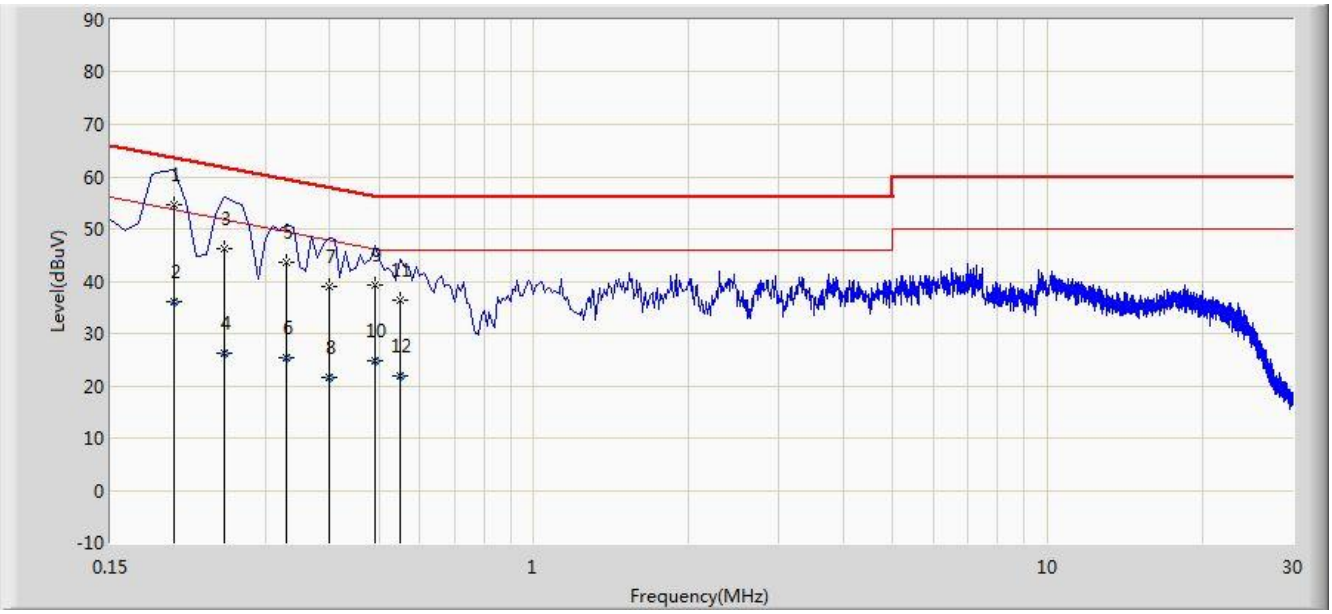
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

7.8.3. Test Setup



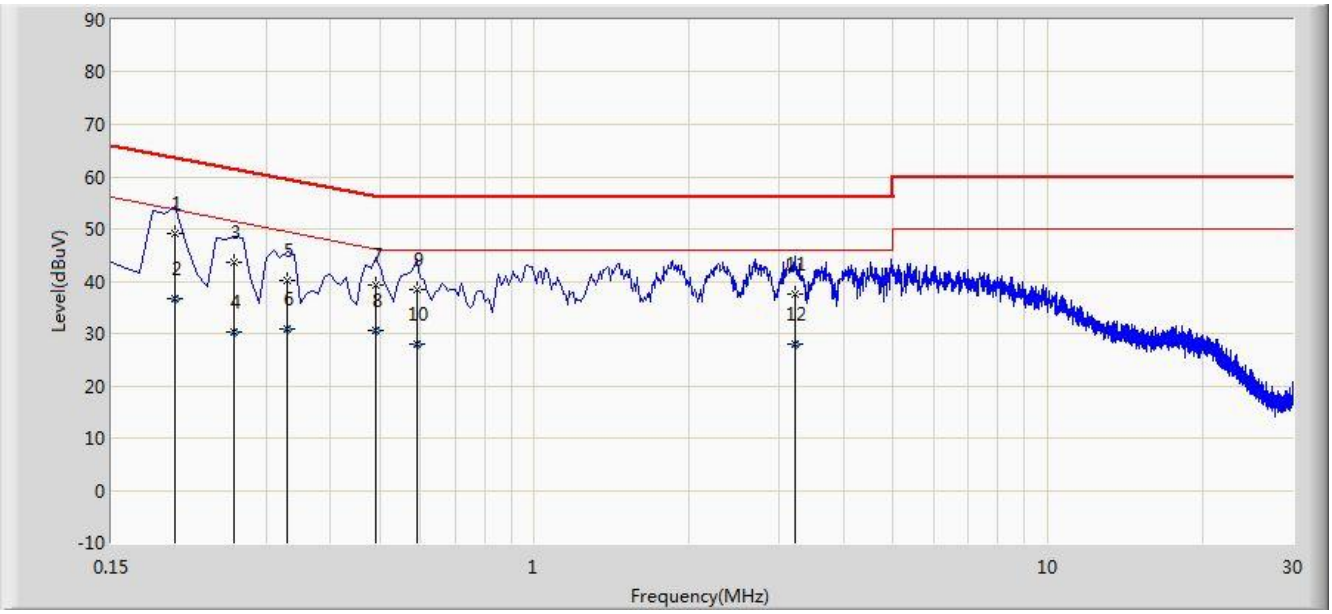
7.8.4. Test Result

Engineer: Roy Cheng	
Site: SR2	Time: 2014/01/23 - 18:32
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Tablet PC	Power: AC 120V/60Hz
Note: Normal Operation	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor	Type
1		*	0.200	54.608	44.609	-9.003	63.611	9.999	QP
2			0.200	36.037	26.038	-17.574	53.611	9.999	AV
3			0.250	46.328	36.364	-15.429	61.757	9.964	QP
4			0.250	26.288	16.324	-25.469	51.757	9.964	AV
5			0.330	43.628	33.600	-15.823	59.451	10.028	QP
6			0.330	25.428	15.400	-24.023	49.451	10.028	AV
7			0.400	38.885	28.800	-18.968	57.853	10.085	QP
8			0.400	21.685	11.600	-26.168	47.853	10.085	AV
9			0.490	39.258	29.100	-16.910	56.168	10.158	QP
10			0.490	24.758	14.600	-21.410	46.168	10.158	AV
11			0.550	36.341	26.200	-19.659	56.000	10.141	QP
12			0.550	21.741	11.600	-24.259	46.000	10.141	AV

Engineer: Roy Cheng	
Site: SR2	Time: 2014/01/23 - 18:47
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Tablet PC	Power: AC 120V/60Hz
Note: Normal Operation	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor	Type
1		*	0.200	49.211	39.200	-14.399	63.611	10.011	QP
2			0.200	36.611	26.600	-16.999	53.611	10.011	AV
3			0.260	43.508	33.500	-17.923	61.431	10.008	QP
4			0.260	30.308	20.300	-21.123	51.431	10.008	AV
5			0.330	40.160	30.100	-19.291	59.451	10.060	QP
6			0.330	30.960	20.900	-18.491	49.451	10.060	AV
7			0.490	39.279	29.100	-16.889	56.168	10.179	QP
8			0.490	30.679	20.500	-15.489	46.168	10.179	AV
9			0.590	38.337	28.200	-17.663	56.000	10.137	QP
10			0.590	27.937	17.800	-18.063	46.000	10.137	AV
11			3.210	37.474	27.600	-18.526	56.000	9.874	QP
12			3.210	28.074	18.200	-17.926	46.000	9.874	AV

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Tablet PC FCC ID:**

2ABRTINU007D is in compliance with Part 15C of the FCC Rules.

The End