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Report No.: 1503RSU02201
Report Version: V01
Issue Date: 05-05-2015

MEASUREMENT REPORT
FCC PART 15.247 WLAN 802.11b/g/n

FCC ID:	2AEHLXCM-SLT
APPLICANT:	EXIEM TECHNOLOGIES, LLC
Application Type:	Certification
Product:	SMARTLINK TPMS TABLET
Model No.:	XCM-SLT
Brand Name:	EXIEM
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15.247
Test Procedure(s):	ANSI C63.10-2009, KDB 558074 D01v03r02
Test Date:	Apr. 01 ~ May. 05, 2015

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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 D01v03r02. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date
1503RSU02201	Rev. 01	Initial report	05-05-2015

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Description Page

§2.1033 General Information

Applicant:	EXIEM TECHNOLOGIES, LLC
Applicant Address:	2851 Massachusetts Avenue, Cincinnati, OH 45225, United States
Manufacturer:	Suzhou Sate Auto Electronic Co., Ltd.
Manufacturer Address:	No.36 Building, Yangtai Road, Suzou Industrial Park, Suzhou, Jiangsu, P.R.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 No.:	XCM-SLT
FCC ID:	2AEHLXCM-SLT
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

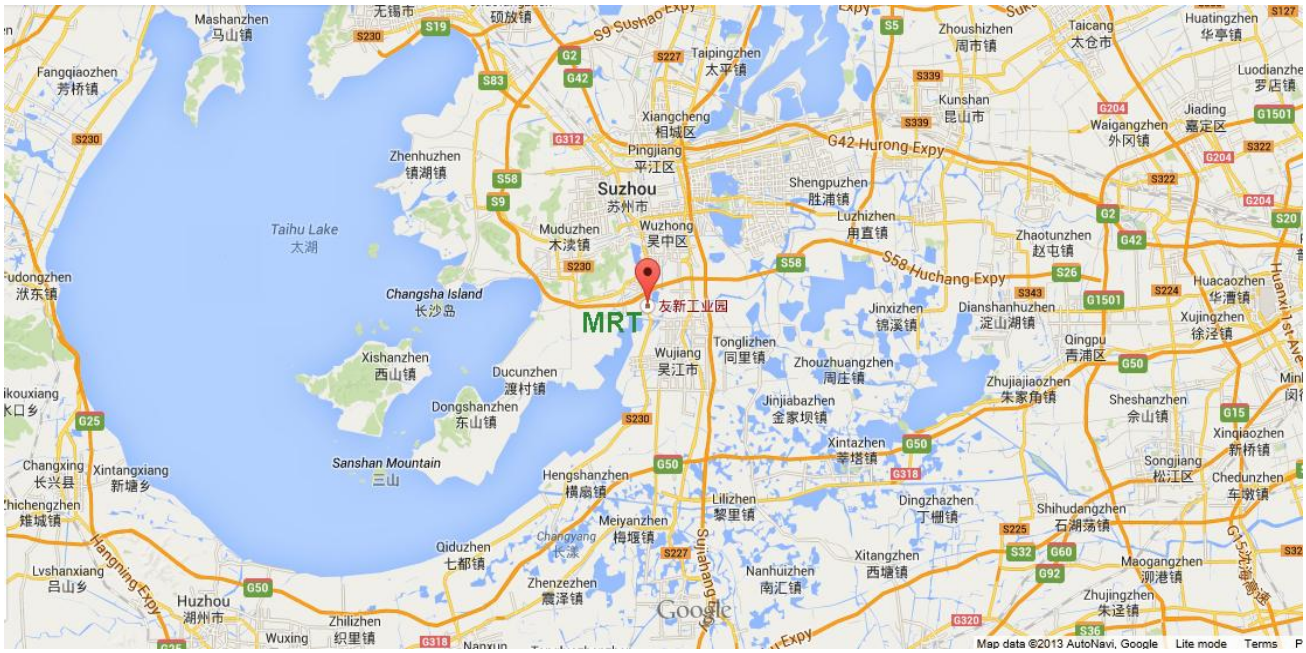
1. INTRODUCTION

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	SMARTLINK TPMS TABLET
Model No.	XCM-SLT
Frequency Range	802.11b/g/n-HT20: 2412 ~ 2462 MHz 802.11n-HT40: 2422 ~ 2452MHz
Maximum Output Power	802.11b: 10.84dBm; 802.11g: 18.60dBm; 802.11n-HT20: 18.08dBm; 802.11n-HT40: 17.87dBm.
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM
Antenna Type	Internal
Antenna Gain	1.0dBi

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:
802.11b/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 D01v03r02. 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 - 100%
- 802.11g - 100%
- 802.11n-HT20 - 100%
- 802.11n-HT40 - 100%

2.3. Test Configuration

The **SMARTLINK TPMS TABLET FCC ID: 2AEHLXCM-SLT** was tested per the guidance of KDB 558074 D01v03r02. 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. Test Software

The test utility software used during testing was engineering order by applicant.

Final Power Parameter Value of the test software.

Test Mode	Test Frequency (MHz)	Power Parameter Value
802.11b	2412	10.0
	2437	10.0
	2462	10.0
802.11g	2412	11.5
	2437	11.5
	2462	11.5
802.11n-HT20	2412	10.5
	2437	11.0
	2462	11.0
802.11n-HT40	2422	10.0
	2437	10.0
	2452	10.0

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 D01v03r02 were used in the measurement of the **SMARTLINK TPMS TABLET FCC ID: 2AEHLXCM-SLT.**

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

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. 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. 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 receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. 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 data exchange speed, 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 were 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.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2009 at Clause 4.3.

Line conducted emissions test results are shown in Section 7.8.

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 1GHz 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. A 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 **SMARTLINK TPMS TABLET is permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **SMARTLINK TPMS TABLET FCC ID: 2AEHLXCM-SLT** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2015/11/07
Temperature/ Meter Humidity	Anymetre	TH101B	MRTSUE06047	1 year	2015/11/14

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2015/10/09
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Preamplifier	Agilent	83017A	MRTSUE06020	1 year	2015/12/13
Preamplifier	MRT	AP01G18	MRTSUE06019	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/14

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/04/23
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2015/10/15
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06048	1 year	201511/14

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: 4.18dB 1GHz ~ 25GHz: 4.76dB

7. TEST RESULT

7.1. Summary

Company Name: **EXIEM TECHNOLOGIES, LLC**
FCC ID: **2AEHLXCM-SLT**
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
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 7.6 & 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

Notes:

1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. 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.

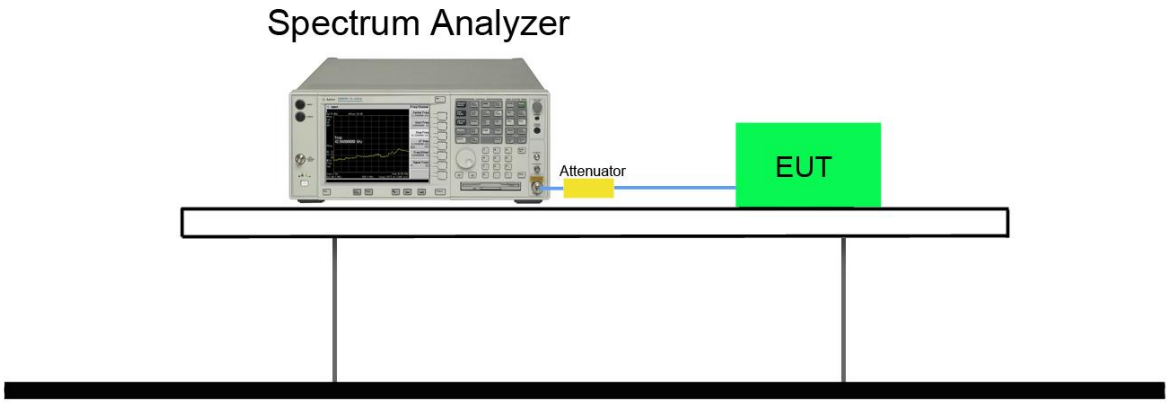
7.2.2. Test Procedure used

KDB 558074 D01v03r02 - 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

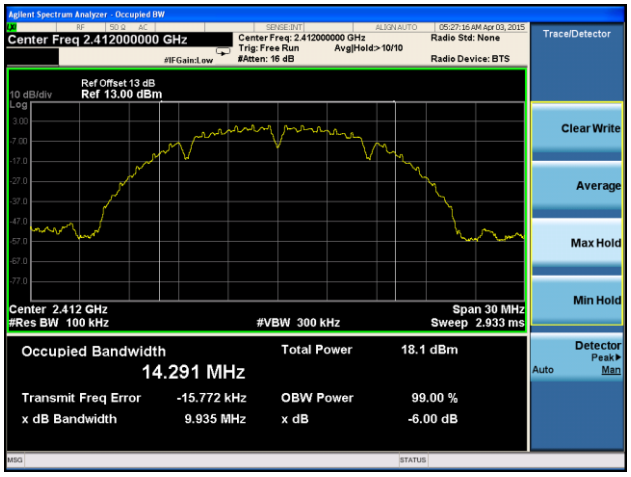


7.2.5. Test Result

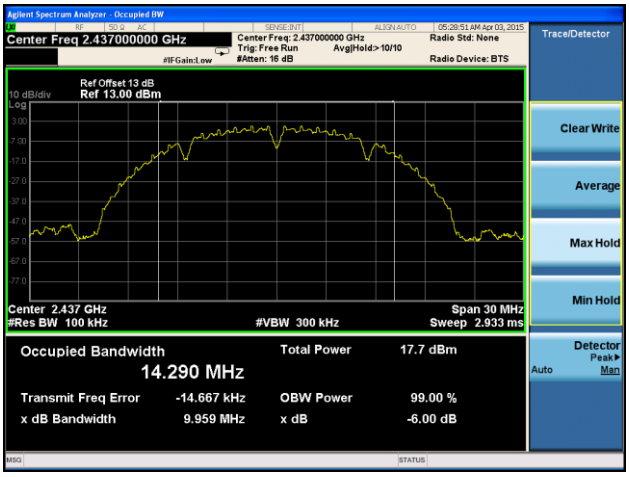
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1	01	2412	9.94	≥ 0.5	Pass
802.11b	1	06	2437	9.96	≥ 0.5	Pass
802.11b	1	11	2462	9.95	≥ 0.5	Pass
802.11g	6	01	2412	16.61	≥ 0.5	Pass
802.11g	6	06	2437	16.61	≥ 0.5	Pass
802.11g	6	11	2462	16.62	≥ 0.5	Pass
802.11n-HT20	6.5	01	2412	17.82	≥ 0.5	Pass
802.11n-HT20	6.5	06	2437	17.82	≥ 0.5	Pass
802.11n-HT20	6.5	11	2462	17.83	≥ 0.5	Pass
802.11n-HT40	13.5	03	2422	36.49	≥ 0.5	Pass
802.11n-HT40	13.5	06	2437	36.50	≥ 0.5	Pass
802.11n-HT40	13.5	09	2452	36.50	≥ 0.5	Pass

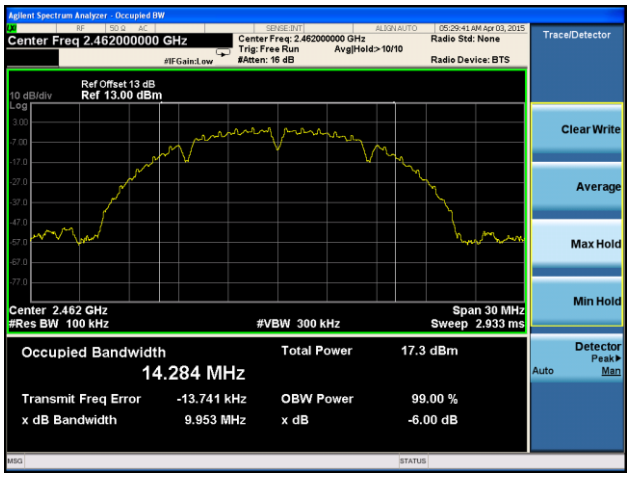
802.11b 6dB Bandwidth

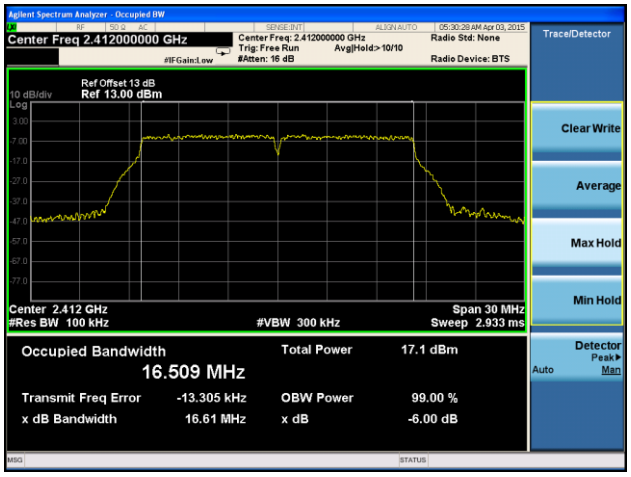
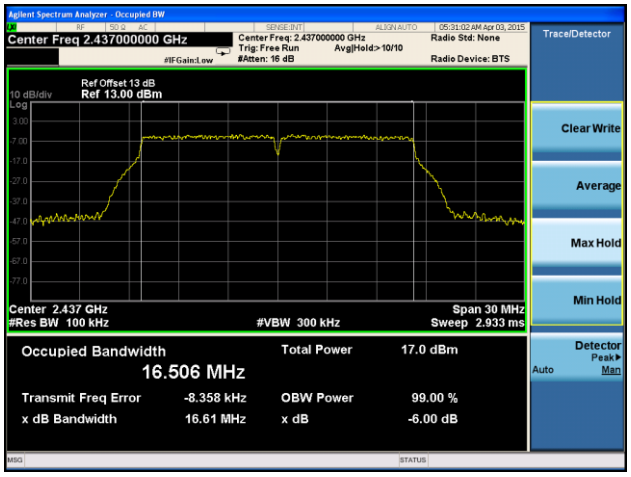
Channel 01 (2412MHz)

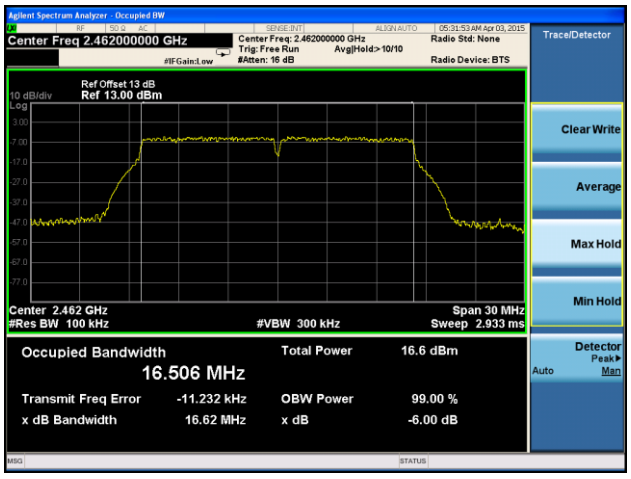


Channel 06 (2437MHz)



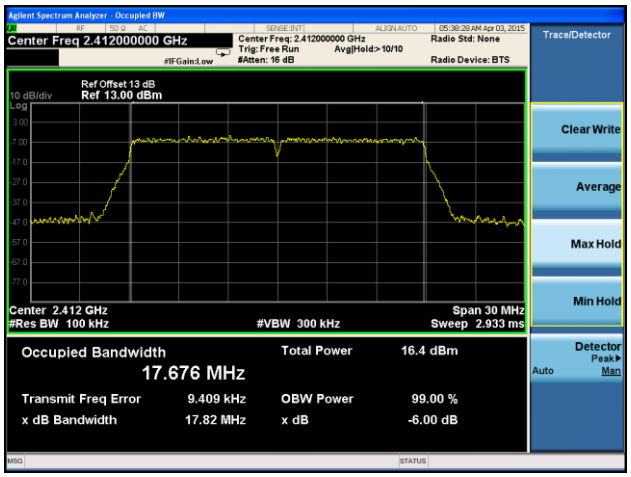
Channel 11 (2462MHz)	
	

802.11g 6dB Bandwidth	
Channel 01 (2412MHz)	**Channel 06 (2437MHz)**
	

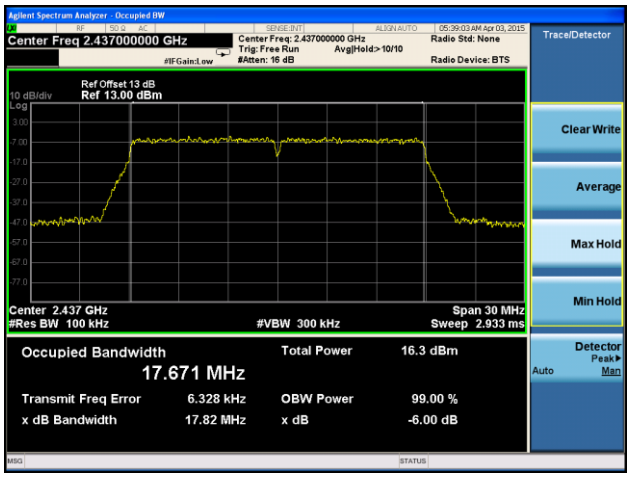
Channel 11 (2462MHz)	
	

802.11n-HT20 6dB Bandwidth

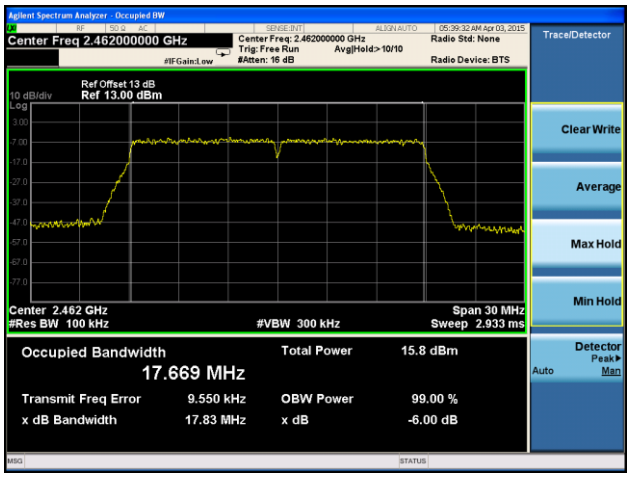
Channel 01 (2412MHz)



Channel 06 (2437MHz)

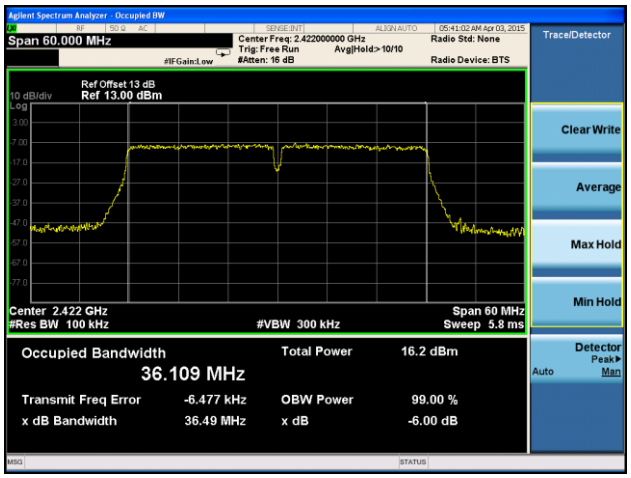


Channel 11 (2462MHz)

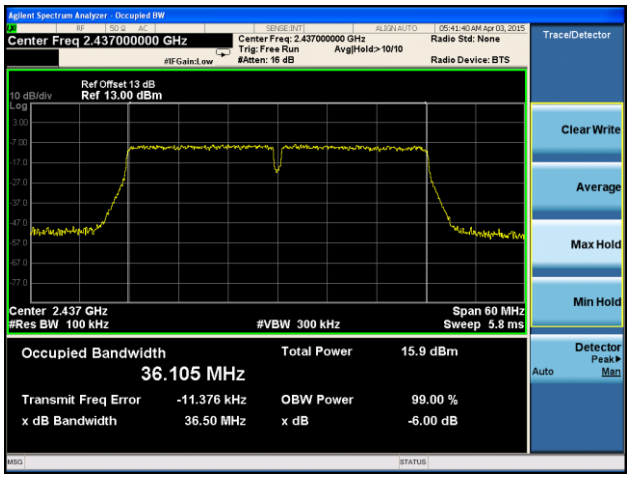


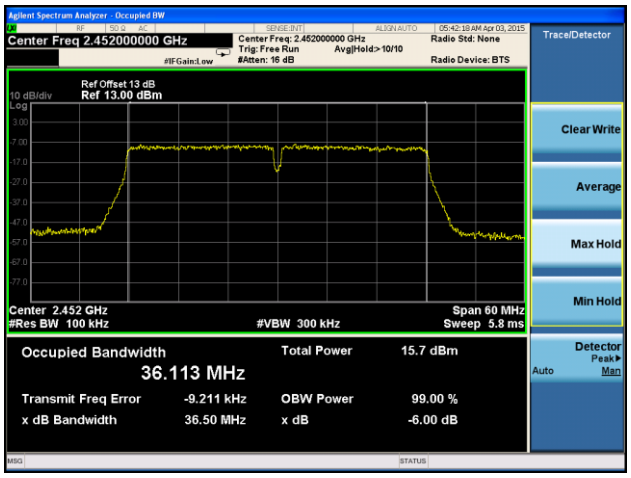
802.11n-HT40 6dB Bandwidth

Channel 03 (2422MHz)



Channel 06 (2437MHz)



Channel 9 (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

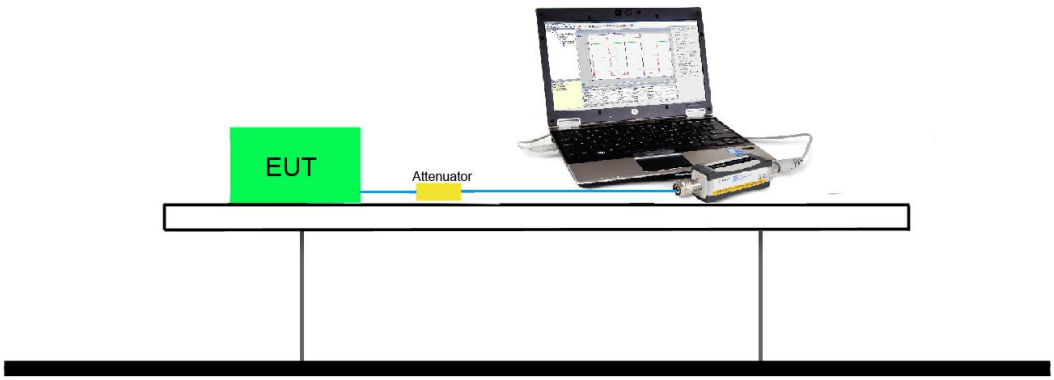
KDB 558074 D01v03r02 - Section 9.1.2 PKPM1 Peak Power Method (for signals with BW ≤ 50MHz)

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.

7.3.4. Test Setup



7.3.5. Test Result of Output Power

Output power at various data rates:

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate (Mbps)	Peak Power (dBm)
802.11b	20	6	2437	1	10.76
				5.5	10.25
				11	10.06
802.11g	20	6	2437	6	19.60
				24	18.68
				54	18.53
802.11n	20	6	2437	6.5	18.29
				39	18.06
				65	17.73
802.11n	40	6	2437	13.5	17.60
				81	17.34
				135	17.11

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
11b	1	01	2412	10.84	≤ 30	Pass
11b	1	06	2437	10.76	≤ 30	Pass
11b	1	11	2462	10.55	≤ 30	Pass
11g	6	01	2412	19.45	≤ 30	Pass
11g	6	06	2437	19.60	≤ 30	Pass
11g	6	11	2462	18.87	≤ 30	Pass
11n-HT20	6.5	01	2412	18.21	≤ 30	Pass
11n-HT20	6.5	06	2437	18.29	≤ 30	Pass
11n-HT20	6.5	11	2462	19.08	≤ 30	Pass
11n-HT40	13.5	03	2422	17.84	≤ 30	Pass
11n-HT40	13.5	06	2437	17.60	≤ 30	Pass
11n-HT40	13.5	09	2452	18.87	≤ 30	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
11b	1	01	2412	8.83	≤ 30	Pass
11b	1	06	2437	8.71	≤ 30	Pass
11b	1	11	2462	8.52	≤ 30	Pass
11g	6	01	2412	8.95	≤ 30	Pass
11g	6	06	2437	8.88	≤ 30	Pass
11g	6	11	2462	8.66	≤ 30	Pass
11n-HT20	6.5	01	2412	8.80	≤ 30	Pass
11n-HT20	6.5	06	2437	8.87	≤ 30	Pass
11n-HT20	6.5	11	2462	8.62	≤ 30	Pass
11n-HT40	13.5	03	2422	8.66	≤ 30	Pass
11n-HT40	13.5	06	2437	8.68	≤ 30	Pass
11n-HT40	13.5	09	2452	8.62	≤ 30	Pass

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

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

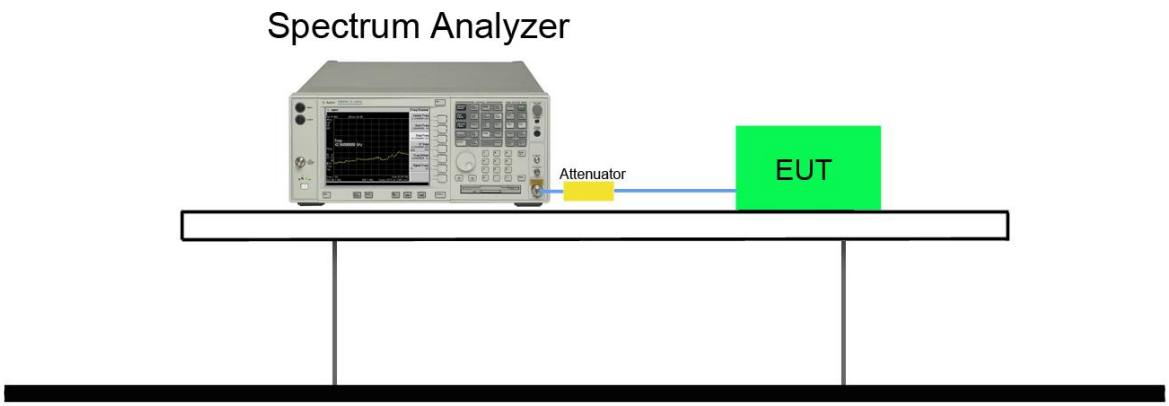
7.4.2. Test Procedure Used

KDB 558074 D01v03r02 - Section 10.2 Method PKPSD

7.4.3. Test Setting

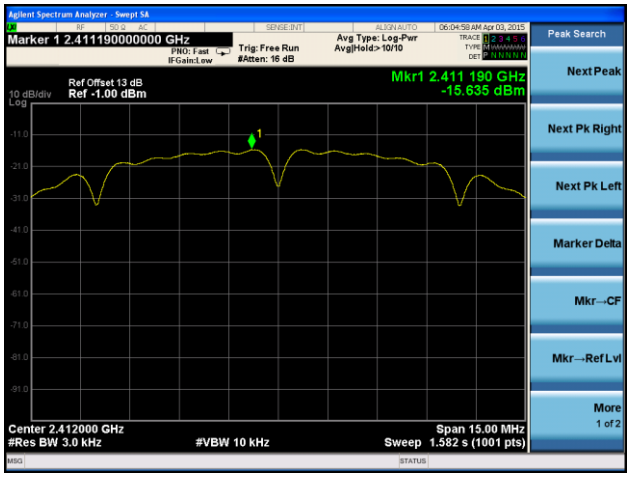
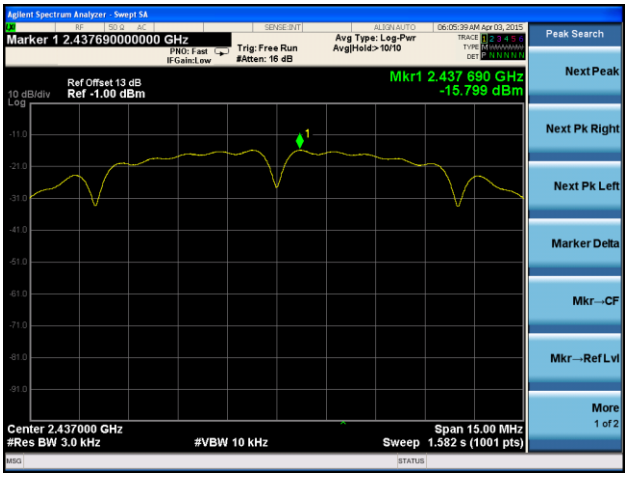
1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

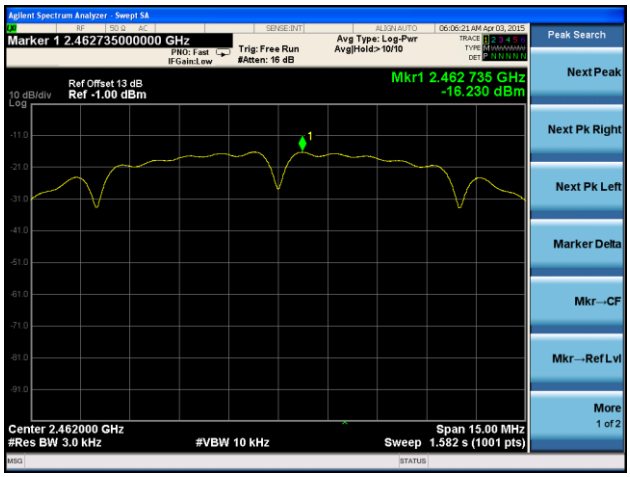
7.4.4. Test Setup

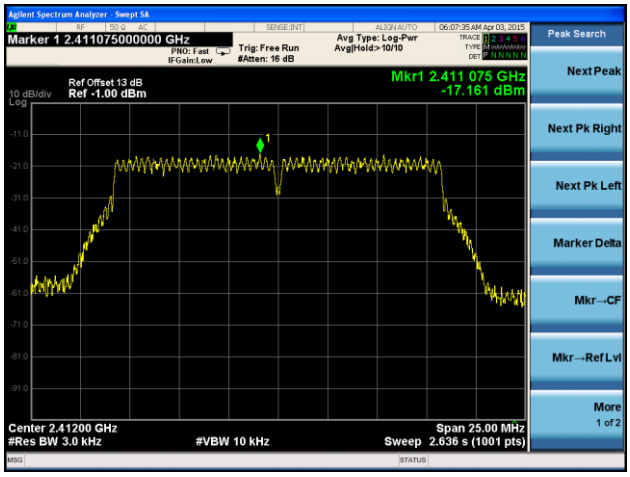
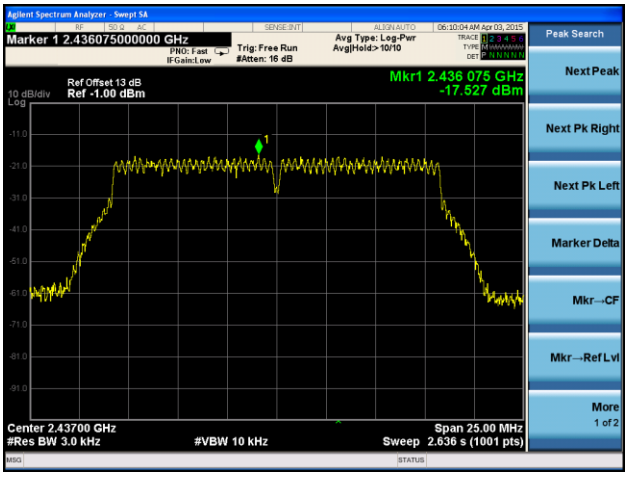
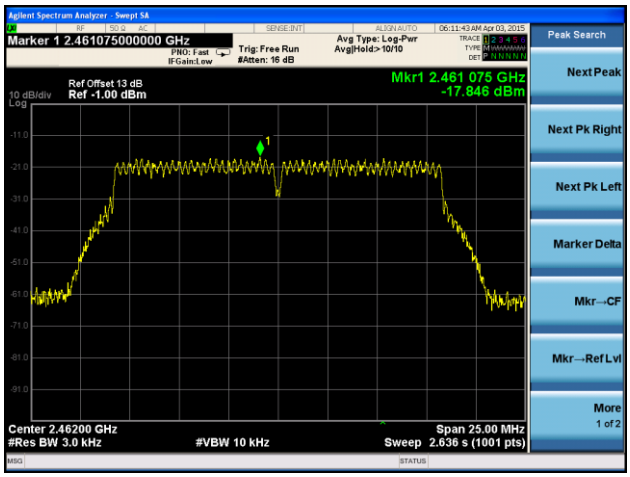


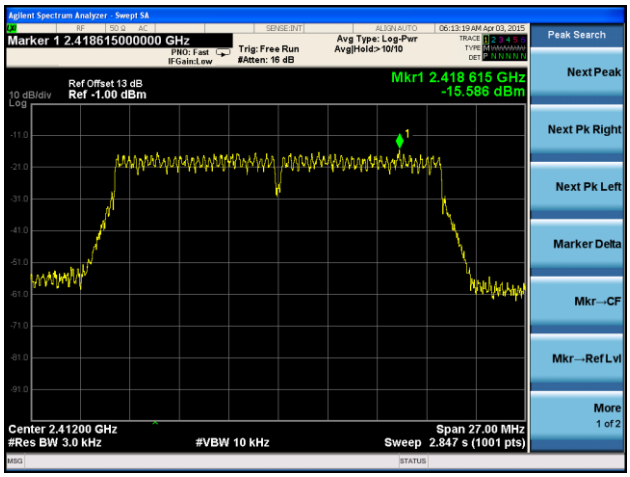
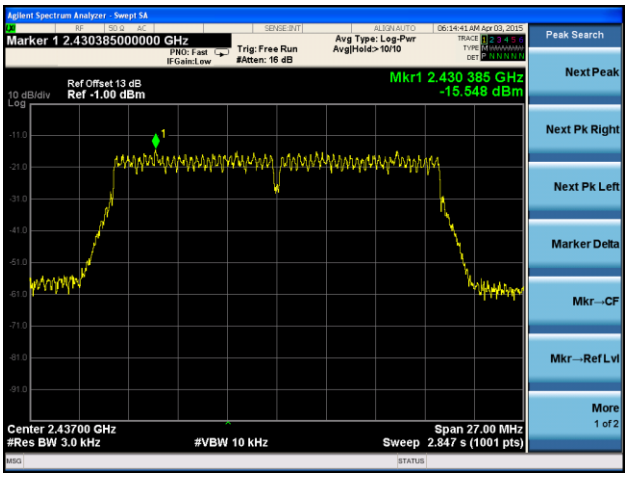
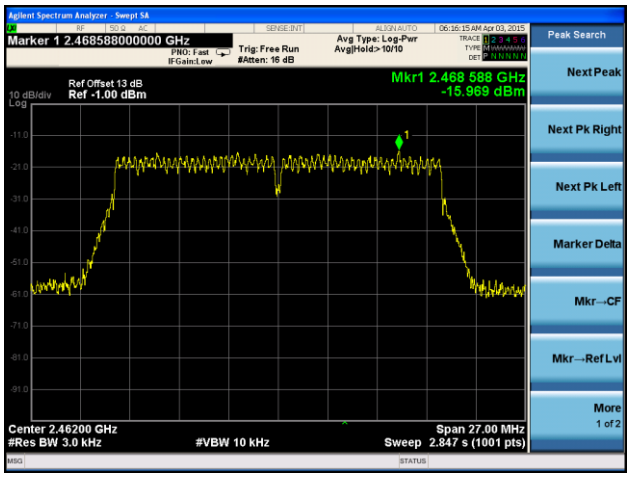
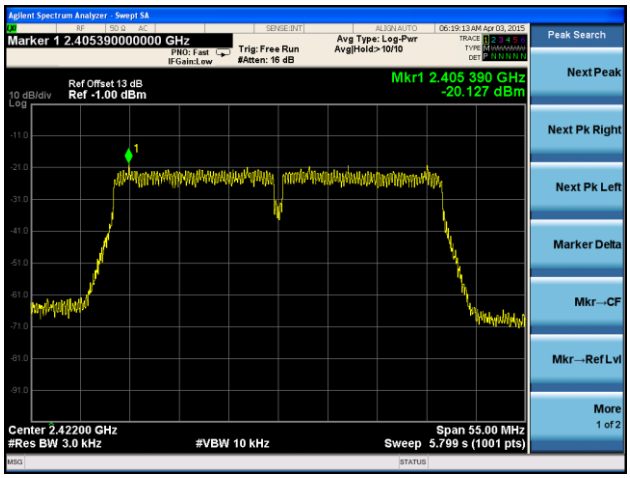
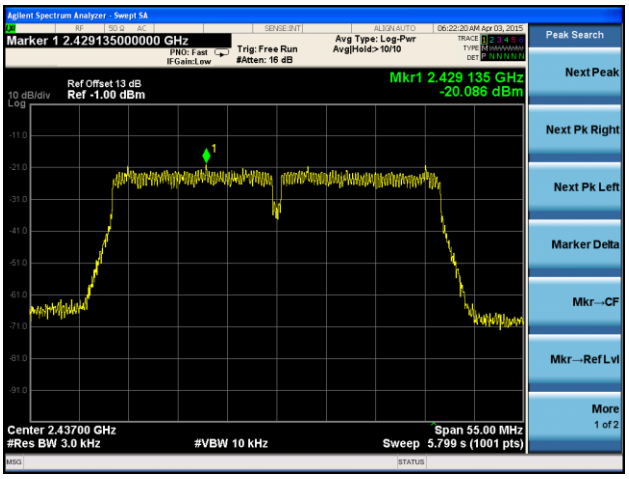
7.4.5. Test Result

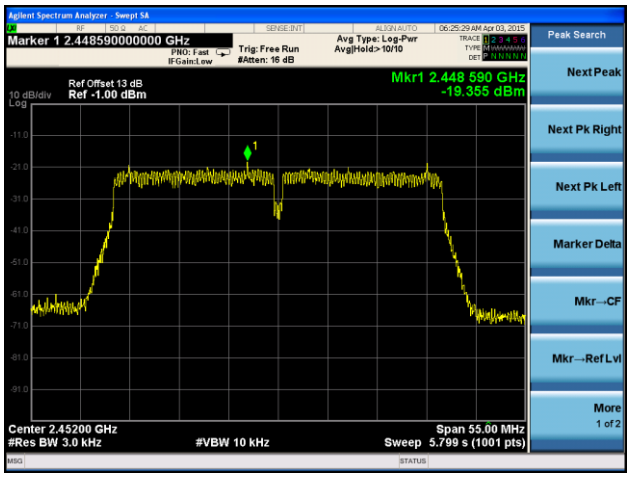
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
11b	1	01	2412	-15.64	≤ 8	Pass
11b	1	06	2437	-15.80	≤ 8	Pass
11b	1	11	2462	-16.23	≤ 8	Pass
11g	6	01	2412	-17.16	≤ 8	Pass
11g	6	06	2437	-17.53	≤ 8	Pass
11g	6	11	2462	-17.85	≤ 8	Pass
11n-HT20	6.5	01	2412	-15.59	≤ 8	Pass
11n-HT20	6.5	06	2437	-15.55	≤ 8	Pass
11n-HT20	6.5	11	2462	-15.97	≤ 8	Pass
11n-HT40	13.5	03	2422	-20.13	≤ 8	Pass
11n-HT40	13.5	06	2437	-20.09	≤ 8	Pass
11n-HT40	13.5	09	2452	-19.36	≤ 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 D01v03r02 - Section 11.2 & Section 11.3

7.5.3. Test Settitng

1. Reference level measurement

(a) Set instrument center frequency to DTS channel center frequency

(b) Set the span to ≥ 1.5 times the DTS bandwidth

(c) Set the RBW = 100 kHz

(d) Set the VBW ≥ 3 x RBW

(e) Detector = peak

(f) Sweep time = auto couple

(g) Trace mode = max hold

(h) Allow trace to fully stabilize

2. Emission level measurement

(a) Set the center frequency and span to encompass frequency range to be measured

(b) RBW = 100kHz

(c) VBW = 300kHz

(d) Detector = Peak

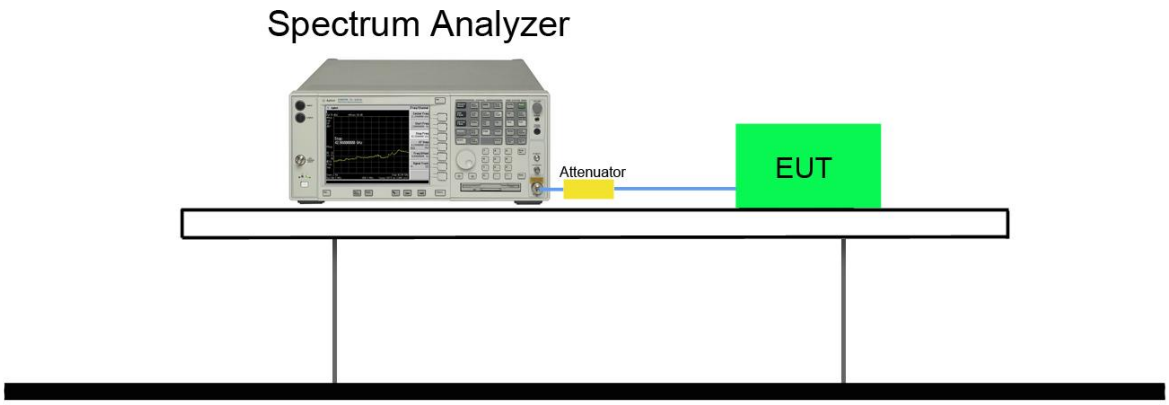
(e) Number of sweep points ≥ 2 x Span/RBW

(f) Trace mode = max hold

(g) Sweep time = auto couple

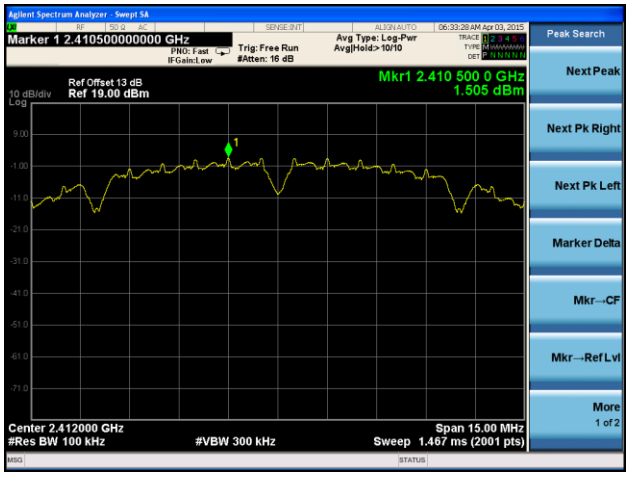
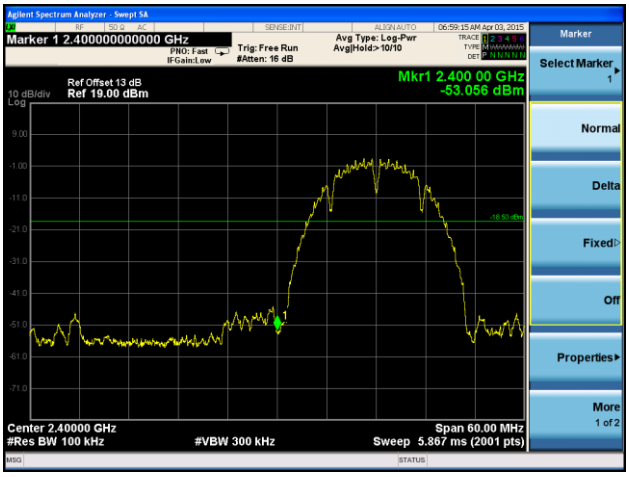
(h) The trace was allowed to stabilize

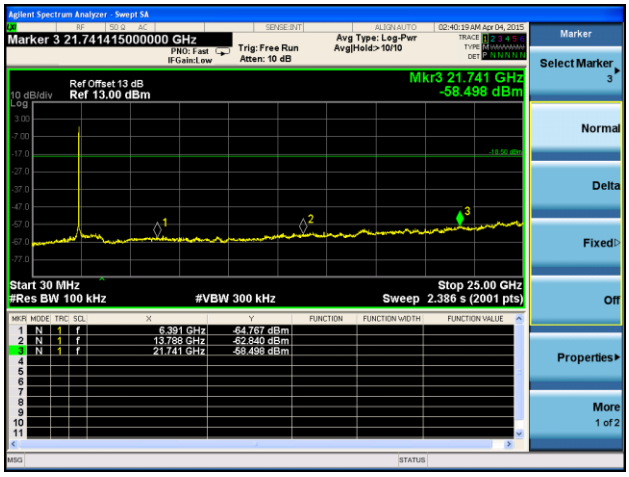
7.5.4. Test Setup



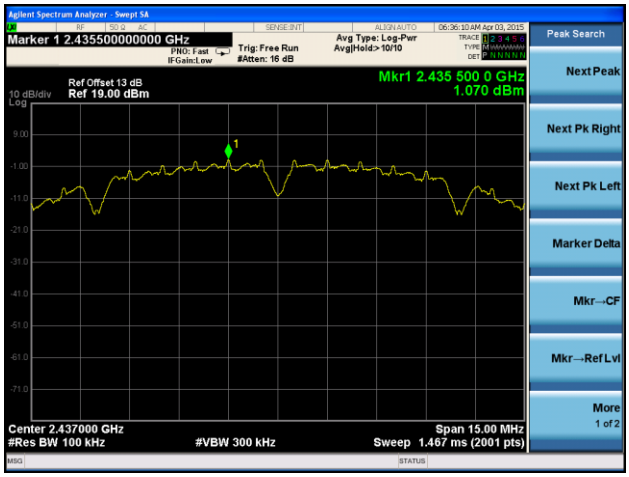
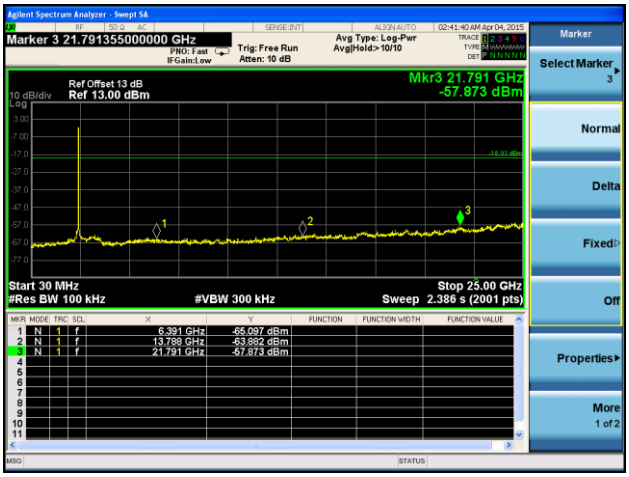
7.5.5. Test Result

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

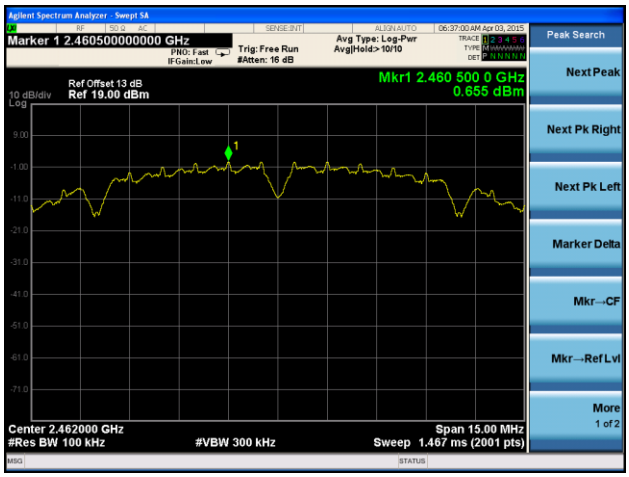
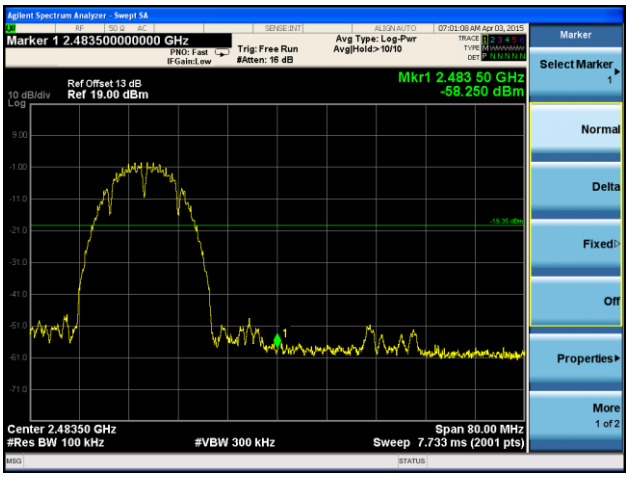
802.11b Out-of-Band Emissions	
Channel 01 (2412MHz)	
100kHz PSD reference Level	Low Band Edge
	

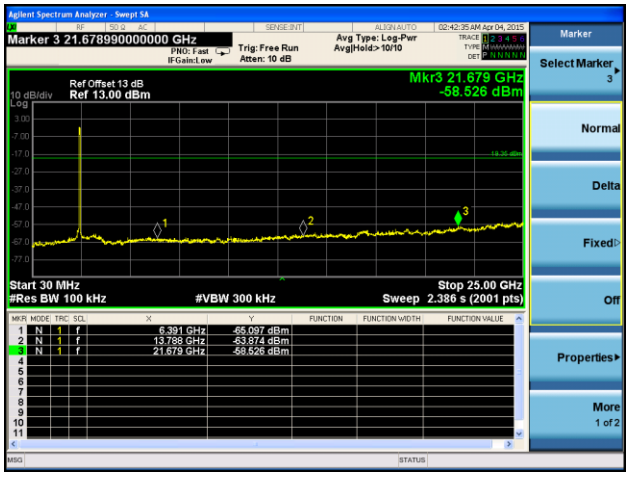
Spurious Emission 30MHz ~ 25GHz	
	

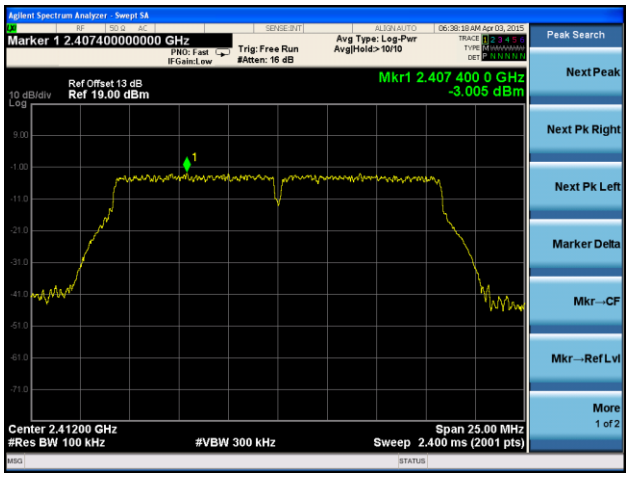
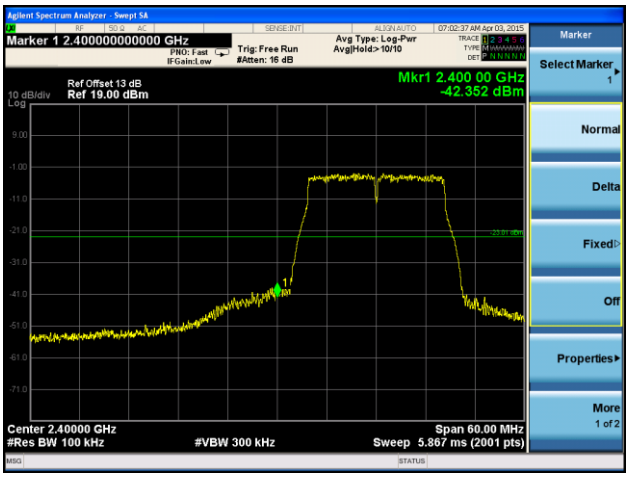
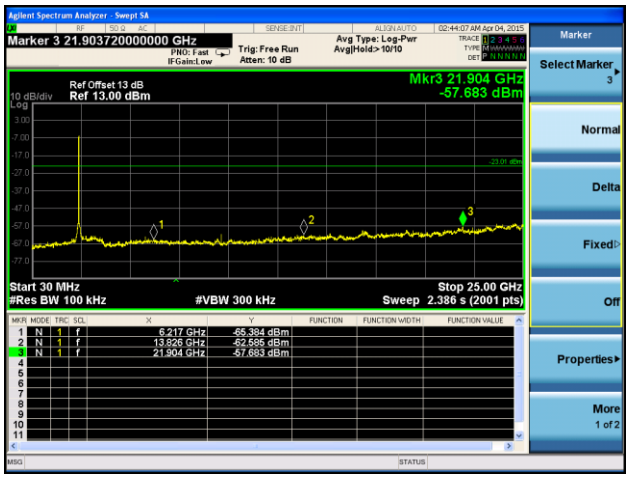
Channel 06 (2437MHz)

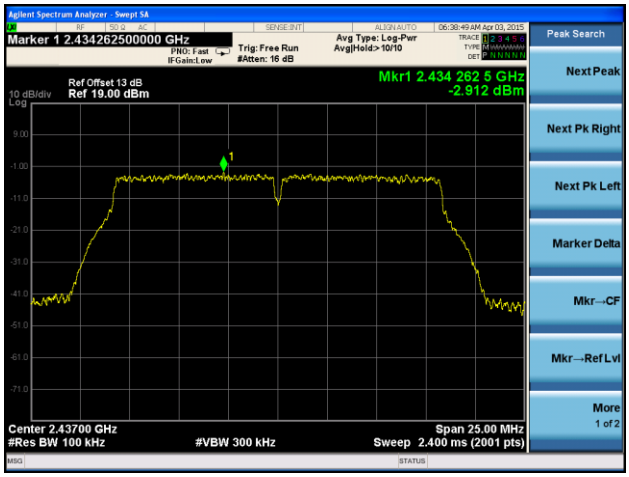
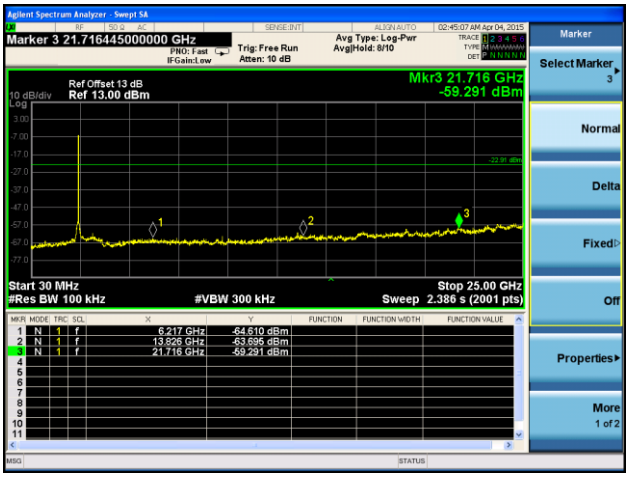
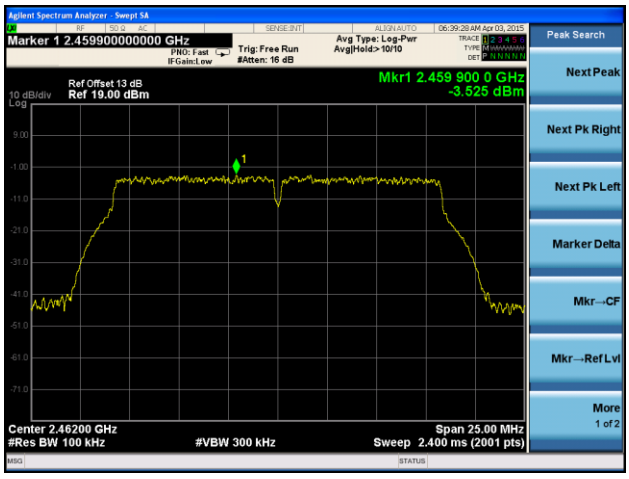
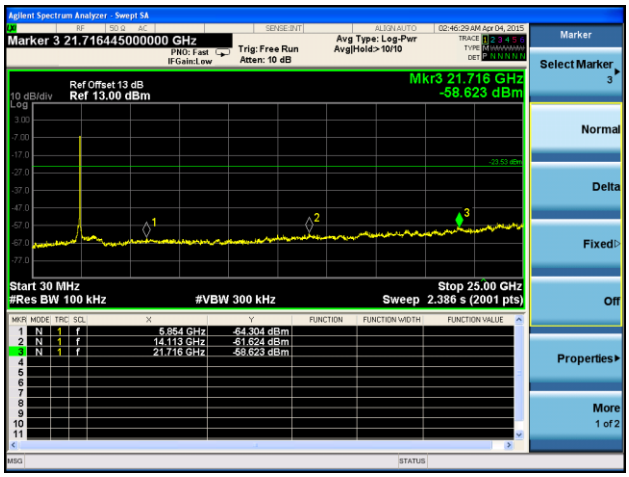
100kHz PSD reference Level	Spurious Emission 30MHz ~ 25GHz
	

Channel 11 (2462MHz)

100kHz PSD reference Level	High Band Edge
	

Spurious Emission 30MHz ~ 25GHz	
	

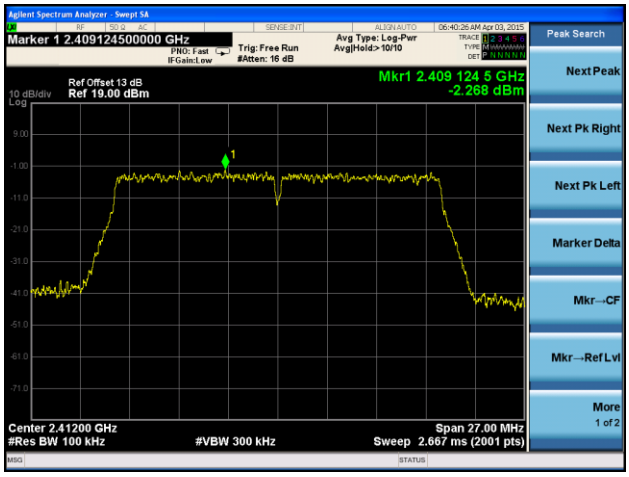
802.11g Out-of-Band Emissions	
Channel 01 (2412MHz)	
100kHz PSD reference Level	Low Band Edge
	
Spurious Emission 30MHz ~ 25GHz	
	

Channel 06 (2437MHz)	
100kHz PSD reference Level	**Spurious Emission 30MHz ~ 25GHz**
	
Channel 11 (2462MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 25GHz	
	

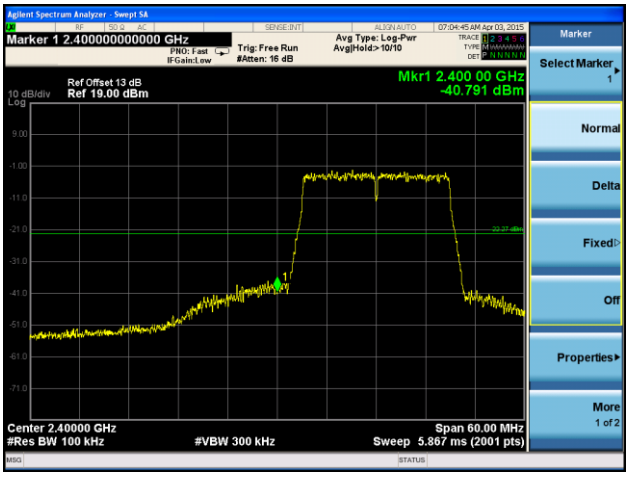
802.11n-HT20 Out-of-Band Emissions

Channel 01 (2412MHz)

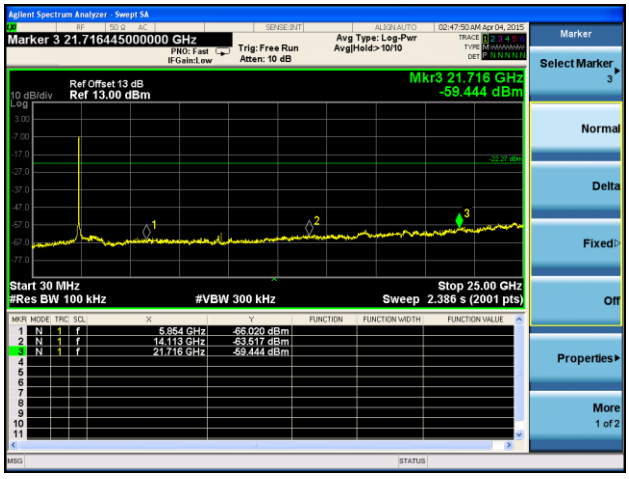
100kHz PSD reference Level



Low Band Edge

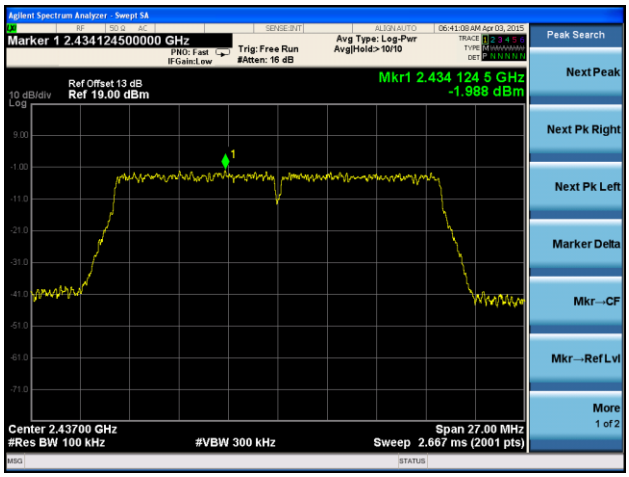


Spurious Emission 30MHz ~ 25GHz

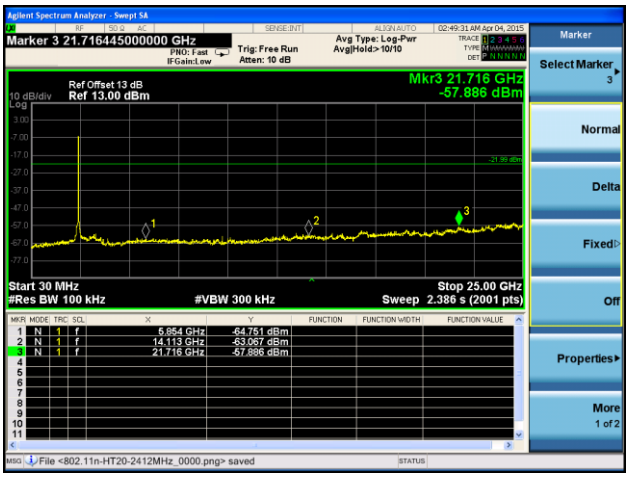


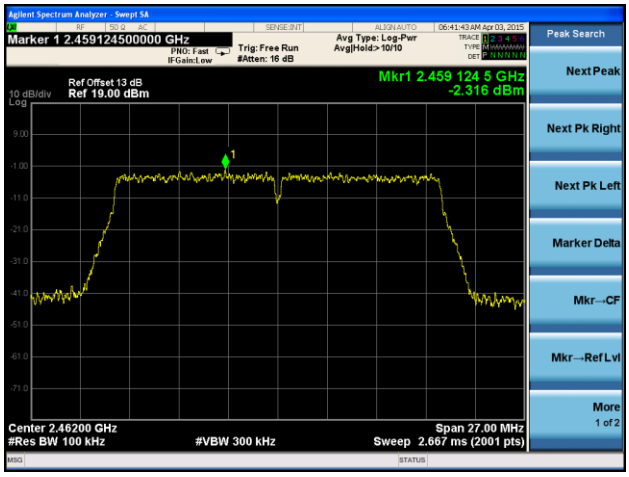
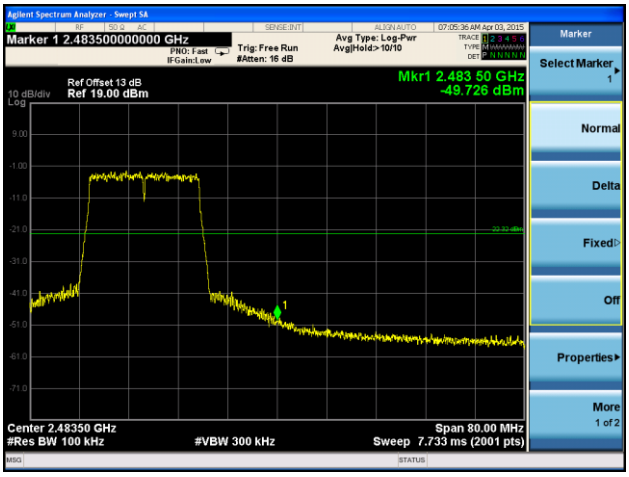
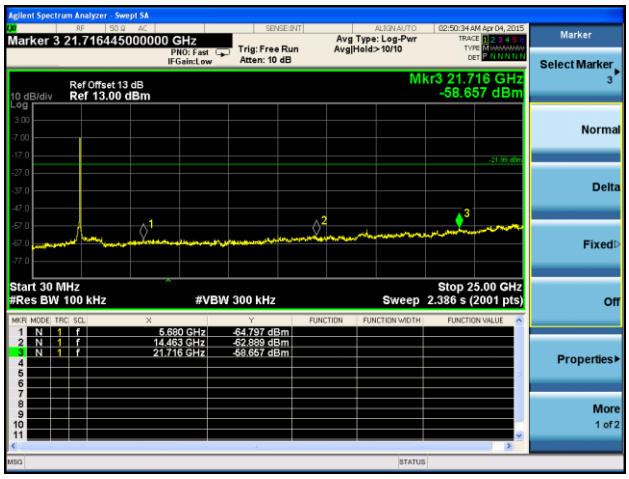
Channel 06 (2437MHz)

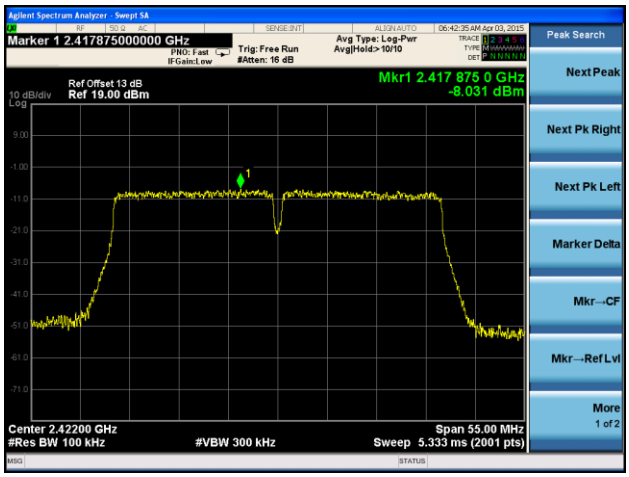
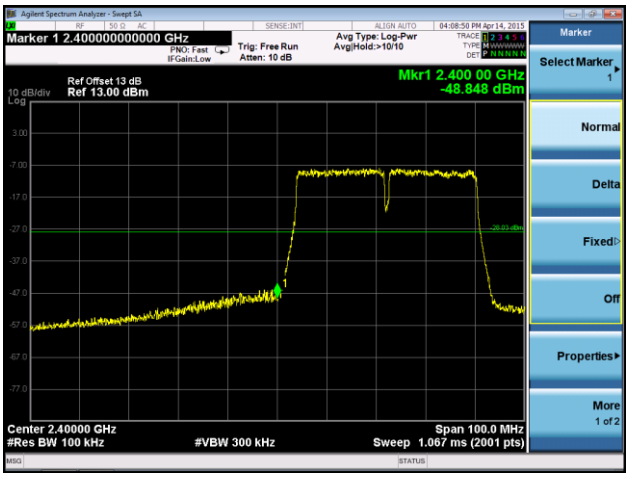
100kHz PSD reference Level



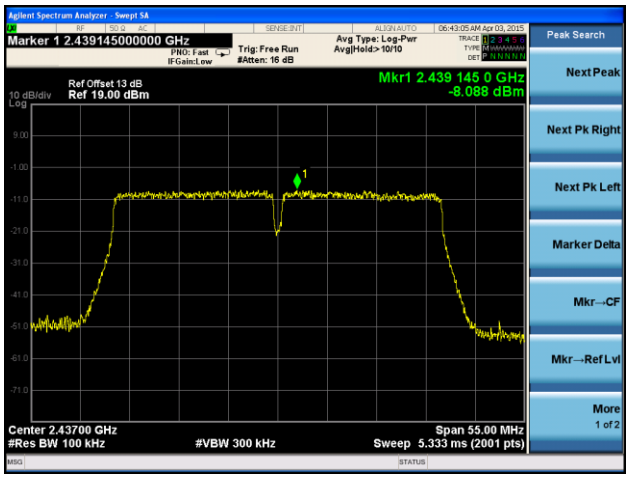
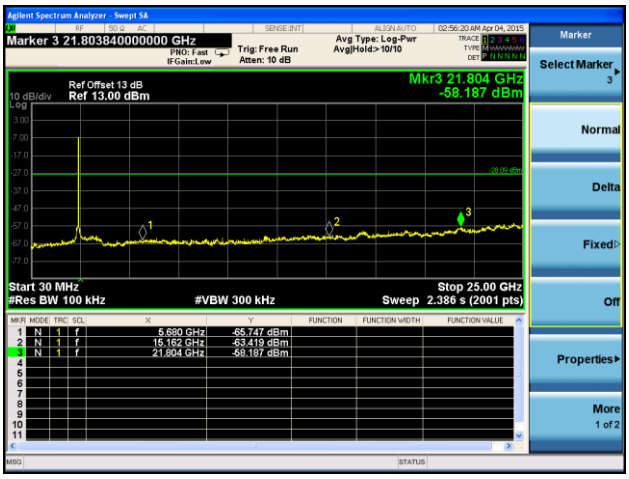
Spurious Emission 30MHz ~ 25GHz

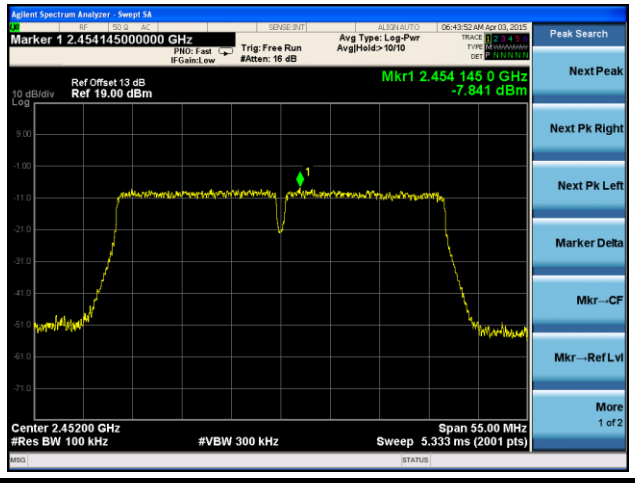
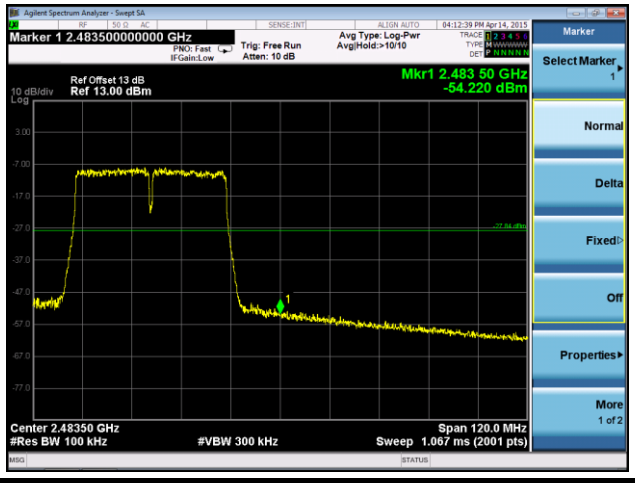


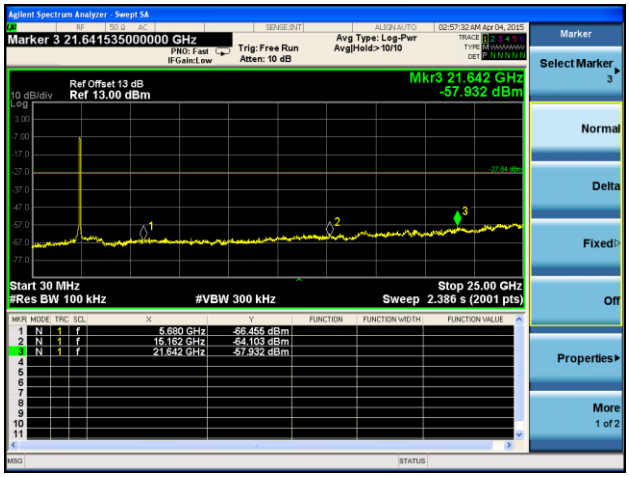
Channel 11 (2462MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 25GHz	
	

802.11n-HT40 Out-of-Band Emissions	
Channel 03 (2422MHz)	
100kHz PSD reference Level	**Low Band Edge**
	

Spurious Emission 30MHz ~ 25GHz	
	

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

Channel 09 (2452MHz)	
100kHz PSD reference Level	High Band Edge
	

Spurious Emission 30MHz ~ 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 D01v03r02 - Section 12.2.3 (quasi-peak measurements)

KDB 558074 D01v03r02 - Section 12.2.4 (peak power measurements)

KDB 558074 D01v03r02 - Section 12.2.5 (average power measurements)

7.6.3. Test Setting

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v03r02

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple

6. Trace mode = max hold

7. Trace was allowed to stabilize

Table 1—RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 D01v03r02

1. RBW = 1MHz.

2. VBW ≥ 3 x RBW.

3. Detector = RMS, if span/(# of points in sweep) ≤ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

4. Averaging type = power (*i.e.*, RMS).

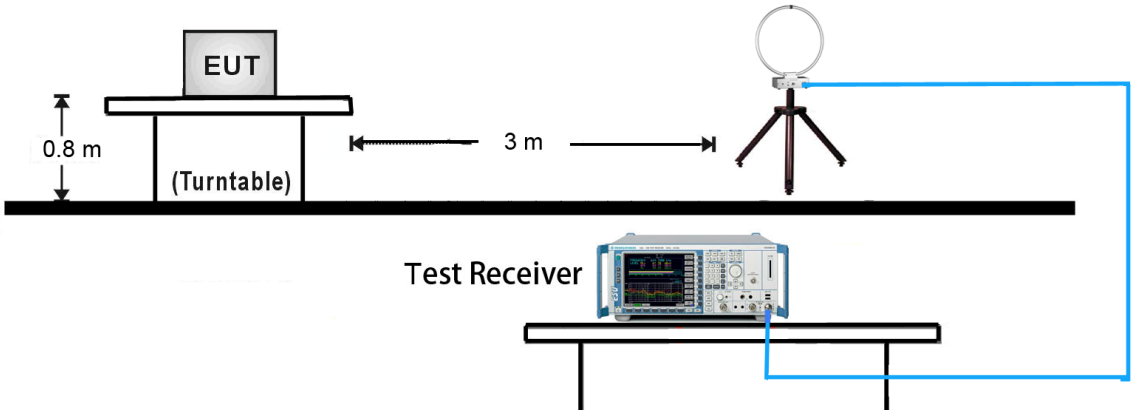
- As an alternative, the detector and averaging type may be set for linear voltage averaging.
- Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.

5. Sweep time = auto.

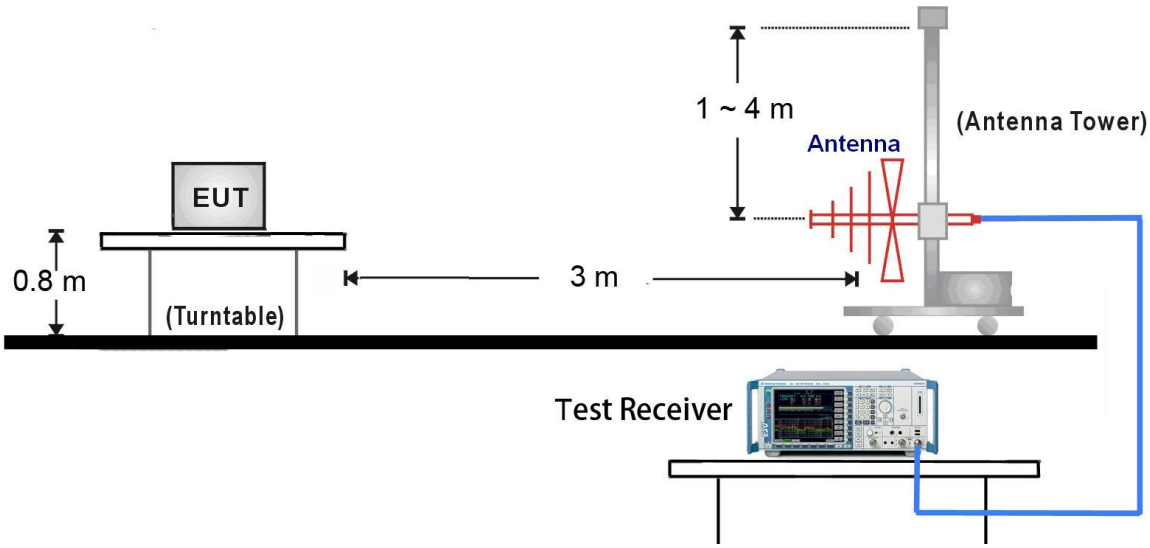
6. Perform a trace average of at least 100 traces.

7.6.4. Test Setup

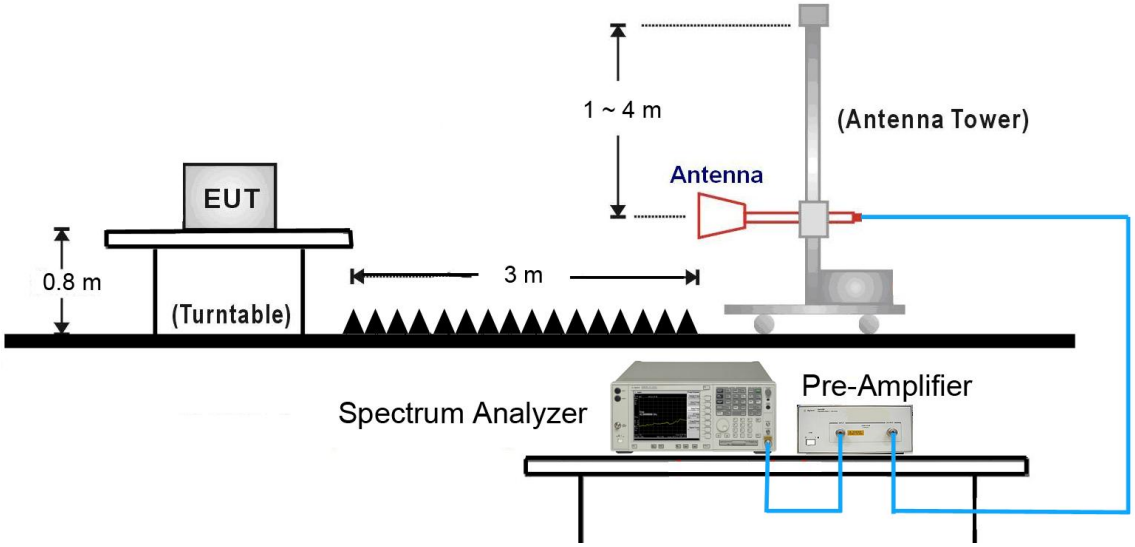
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 25GHz Test Setup:



7.6.5. Test Result

Test Mode:	802.11b	Test Site:	AC1
Test Channel:	01	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4825.0	51.0	2.7	53.7	74.0	-20.3	Peak	Horizontal
*	6352.4	37.6	5.2	42.8	81.1	-38.3	Peak	Horizontal
	8426.4	36.2	8.2	44.4	74.0	-29.6	Peak	Horizontal
*	9225.4	35.6	9.7	45.3	81.1	-35.8	Peak	Horizontal
	4825.0	43.8	2.7	46.5	74.0	-27.5	Peak	Vertical
*	6253.4	36.1	4.7	40.8	81.1	-40.3	Peak	Vertical
	8472.3	37.7	8.2	45.9	74.0	-28.1	Peak	Vertical
*	9625.7	35.6	10.9	46.5	81.1	-34.6	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (101.1dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11b	Test Site:	AC1
Test Channel:	06	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	49.1	2.7	51.8	74.0	-22.2	Peak	Horizontal
*	6547.4	36.1	5.9	42.0	82.4	-40.4	Peak	Horizontal
	8152.4	36.5	8.4	44.9	74.0	-29.1	Peak	Horizontal
*	9635.5	35.1	11.0	46.1	82.4	-36.3	Peak	Horizontal
	4947.8	35.9	2.8	38.7	74.0	-35.3	Peak	Vertical
*	6589.8	35.5	6.0	41.5	82.4	-40.9	Peak	Vertical
	8247.3	36.1	8.1	44.2	74.0	-29.8	Peak	Vertical
*	9658.4	34.3	11.0	45.3	82.4	-37.1	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (102.4dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11b	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. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4927.0	49.7	2.8	52.5	74.0	-21.5	Peak	Horizontal
*	6523.4	35.5	5.9	41.4	83.4	-42.0	Peak	Horizontal
	8472.4	36.3	8.2	44.5	74.0	-29.5	Peak	Horizontal
*	9678.9	34.9	10.9	45.8	83.4	-37.6	Peak	Horizontal
	4927.0	44.2	2.8	47.0	74.0	-27.0	Peak	Vertical
*	6872.4	36.1	6.4	42.5	83.4	-40.9	Peak	Vertical
	8247.2	36.5	8.1	44.6	74.0	-29.4	Peak	Vertical
*	9658.6	35.1	11.0	46.1	83.4	-37.3	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (103.4dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11g	Test Site:	AC1
Test Channel:	01	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4825.0	46.1	2.7	48.8	74.0	-25.2	Peak	Horizontal
*	6147.8	36.2	4.5	40.7	83.7	-43.0	Peak	Horizontal
	8482.6	36.5	8.3	44.8	74.0	-29.2	Peak	Horizontal
*	9657.8	34.9	11.0	45.9	83.7	-37.8	Peak	Horizontal
	4725.7	36.5	2.4	38.9	74.0	-35.1	Peak	Vertical
*	6253.9	35.8	4.7	40.5	83.7	-43.2	Peak	Vertical
	8472.4	36.2	8.2	44.4	74.0	-29.6	Peak	Vertical
*	9635.3	34.9	11.0	45.9	83.7	-37.8	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (103.7dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11g	Test Site:	AC1
Test Channel:	06	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	43.1	2.7	45.8	74.0	-28.2	Peak	Horizontal
*	6025.8	35.5	4.1	39.6	83.8	-44.2	Peak	Horizontal
	8248.6	35.8	8.1	43.9	74.0	-30.1	Peak	Horizontal
*	9625.4	34.4	10.9	45.3	83.8	-38.5	Peak	Horizontal
	4876.0	39.2	2.7	41.9	74.0	-32.1	Peak	Vertical
*	6152.3	35.8	4.6	40.4	83.8	-43.4	Peak	Vertical
	8248.6	35.7	8.1	43.8	74.0	-30.2	Peak	Vertical
*	9626.9	35.0	11.0	46.0	83.8	-37.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (103.8dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

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. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4927.0	46.0	2.8	48.8	74.0	-25.2	Peak	Horizontal
*	6253.4	36.2	4.7	40.9	84.3	-43.4	Peak	Horizontal
	7383.5	39.0	7.9	46.9	74.0	-27.1	Peak	Horizontal
*	9626.4	35.0	11.0	46.0	84.3	-38.3	Peak	Horizontal
	4927.0	41.1	2.8	43.9	74.0	-30.1	Peak	Vertical
*	6153.3	35.6	4.6	40.2	84.3	-44.1	Peak	Vertical
	7625.4	36.2	8.0	44.2	74.0	-29.8	Peak	Vertical
*	9635.6	34.0	11.0	45.0	84.3	-39.3	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (104.3dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT20	Test Site:	AC1
Test Channel:	01	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4825.0	45.6	2.7	48.3	74.0	-25.7	Peak	Horizontal
*	6025.4	36.1	4.2	40.3	83.4	-43.1	Peak	Horizontal
	8327.0	35.5	8.0	43.5	74.0	-30.5	Peak	Horizontal
*	9625.4	34.7	10.9	45.6	83.4	-37.8	Peak	Horizontal
	4816.5	40.0	2.7	42.7	74.0	-31.3	Peak	Vertical
*	6275.0	35.4	4.8	40.2	83.4	-43.2	Peak	Vertical
	8095.4	36.4	8.6	45.0	74.0	-29.0	Peak	Vertical
*	9625.4	34.8	10.9	45.7	83.4	-37.7	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (103.4dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	802.11n-HT20	Test Site:	AC1
Test Channel:	06	Test Engineer:	Roy Cheng
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4867.5	45.2	2.7	47.9	74.0	-26.1	Peak	Horizontal
*	6254.9	35.6	4.7	40.3	83.5	-43.2	Peak	Horizontal
	8247.9	36.4	8.1	44.5	74.0	-29.5	Peak	Horizontal
*	9683.8	34.5	10.9	45.4	83.5	-38.1	Peak	Horizontal
	4876.0	39.0	2.7	41.7	74.0	-32.3	Peak	Vertical
*	6048.6	36.3	4.1	40.4	83.5	-43.1	Peak	Vertical
	8359.7	36.0	8.0	44.0	74.0	-30.0	Peak	Vertical
*	9685.4	35.1	10.9	46.0	83.5	-37.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (103.5dBμV/m).

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)