TEST REPORT

FCC PART 15 SUBPART C 15.247

Report Reference No.....:	**CTA-01-160700301**	
FCC ID.....:	**2AI52-ARES-G100**	
Compiled by (position+printed name+signature)..:	File administrators Kevin Liu	kevin . Liu
Supervised by (position+printed name+signature)..:	Project Engineer Eric Wang	Eric Wang
Approved by (position+printed name+signature)..:	Technical Director Eric Wang	Eric Wang
Date of issue.....:	Jul. 19, 2016	

Representative Laboratory Name .:	**Shenzhen CTA Testing Technology Co., Ltd.**
Address .....:	Room 520,5th Floor，No.1053 Xixiang Baoyuan Road，Baoan District,Shenzhen,China
Testing Laboratory Name .....:	**Dongguan Yaxu (AiT) Technology Limited**
Address .....:	No. 22,JinQianLing Street 3, JiTiGang Village, Huang-Jiang Town, DongGuan, Guangdong, 523757 China
Applicant's name.....:	**MAD Gaze (Shen Zhen) Limited**
Address .....:	Room 201,Building A,NO.1 Qianwan Road 1,Shenzhen and Hongkong Cooperation Zone, Qianhai, Shenzhen, China
Test specification .....**:**	
Standard .....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**
TRF Originator.....:	Shenzhen CTA Testing Technology Co., Ltd.

Test item description .....:	Smart Glasses
Trade Mark .....:	MAD Gaze
Manufacturer.....:	**MAD Gaze (Shen Zhen) Limited**
Model/Type reference.....:	Ares G100
Listed Models .....:	/
Modulation Type.....:	DSSS(CCK,DQPSK,DBPSK),OFDM(64QAM,16QAM,QPSK, BPSK)
Operation Frequency.....:	From 2412MHz to 2462MHz
Rating .....:	DC 3.70V
Hardware version .....:	J7201_PCB_V1.2
Software version .....:	V1.0
Result.....:	**PASS**

TEST REPORT

Test Report No. :	CTA-01-160700301	Jul. 19, 2016 Date of issue

Equipment under Test	:	Smart Glasses
Model /Type	:	Ares G100
Listed Models	:	/
Applicant	:	**MAD Gaze (Shen Zhen) Limited**
Address	:	Room 201,Building A,NO.1 Qianwan Road 1,Shenzhen and Hongkong Cooperation Zone, Qianhai, Shenzhen, China
Manufacturer	:	**MAD Gaze (Shen Zhen) Limited**
Address	:	Room 201,Building A,NO.1 Qianwan Road 1,Shenzhen and Hongkong Cooperation Zone, Qianhai, Shenzhen, China

Test Result:	**PASS**

Revison History

Revision	Issue Date	Revisions	Revised By
V1.0	2016-07-19	Initial Issue	Eric Wang

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices

KDB558074 D01 V03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Jun. 22, 2016
Testing commenced on	:	Jul. 01, 2016
Testing concluded on	:	Jul. 18, 2016

2.2 Product Description

The **MAD Gaze (Shen Zhen) Limited**'s Model: Ares G100 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Smart Glasses
Model Number	Ares G100
Operation Frequency	2412-2462MHz
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Antenna Type	Ceramic antenna
Hardware version	J7201_PCB_V1.2
Software version	V1.0
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.15VDC to 4.26VDC (nominal: 3.70VDC)

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.70V

2.4 Description of the test mode

The application provider specific test software to control sample in continuous TX and RX (Duty Cycle >98%) For testing meet KDB558074 test requirement.

The EUT support IEEE 802.11b/g/n protocol with 13 channels but only use 11 channels in USA, and the test carried out at the lowest channel, middle channel and highest channel

2.4.1 Channel List:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	**2412**	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	**11**	**2462**
5	2432		
6	**2437**		
7	2442		

2.4.2 Test Modes

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H 11n HT40_L, 11n HT40_M, 11n HT40_H
Maximum Peak Conducted Output Power	Measurement Method	FCC KDB 558074§9.1.2
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H 11n HT40_L, 11n HT40_M, 11n HT40_H
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H 11n HT40_L, 11n HT40_M, 11n HT40_H
Unwanted Emissions into Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074§11.0.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H 11n HT40_L, 11n HT40_M, 11n HT40_H
Unwanted Emissions into Restricted Frequency Bands (Conducted)	Measurement Method	FCC KDB 558074§12.2, Conducted (antenna-port).
	Test Environment	NTNV
	EUT Configuration	11b_L, 11b_H 11g_L, 11g_H 11n HT20_L, 11n HT20_H 11n HT40_L, 11n HT40_H
Unwanted Emissions into Restricted	Measurement Method	FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port).
	Test Environment	NTNV
	EUT Configuration	11b_L, 11b_H 11g_L, 11g_H 11n HT20_L, 11n HT20_H 11n HT40_L, 11n HT40_H

Test Case	Test Conditions	
	Configuration	Description
AC Power Line Conducted Emissions	Measurement Method	AC mains conducted.
	Test Environment	NTNV
	EUT Configuration	11b_M (Worst Conf.).

Note: 1. For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

2. Typical working modes for each IEEE 802.11mode are selected to perform tests. The manufacturer provide special test software to control TX duty cycle >98% for TX test; recorded worst case at difference data rate as follows:

Test Mode	Test Modes Description
11b	IEEE 802.11b with data rate of 1 Mbps using SISO mode.
11g	IEEE 802.11g with data rate of 6 Mbps using SISO mode.
11n HT20	IEEE 802.11n with data date of MCS0 and bandwidth of 20MHz using SISO mode.
11n HT40	IEEE 802.11n with data date of MCS7 and bandwidth of 40MHz using SISO mode.

2.4.3 EUT operation mode

Test Mode	RF Ch.	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]
11b	L	Ch No. 1 / 2412MHz	---	20
	M	Ch No. 6 / 2437 MHz	---	20
	H	Ch No. 11/ 2462MHz	---	20
11g	L	Ch No. 1 / 2412MHz	---	20
	M	Ch No. 6 / 2437 MHz	---	20
	H	Ch No. 11/ 2462MHz	---	20
11n HT20	L	Ch No. 1 / 2412MHz	---	20
	M	Ch No. 6 / 2437 MHz	---	20
	H	Ch No. 11/ 2462MHz	---	20
11n HT40	L	Ch No. 3/ 2422MHz	---	40
	M	Ch No. 6 / 2437 MHz	---	40
	H	Ch No. 9/ 2452 MHz	---	40

2.5 Test Environments

NOTE: The values used in the test report maybe stringent than the declared.

Environment Parameter	Selected Values During Tests		
NTNV	Temperature	Voltage	Relative Humidity
	Ambient	3.70VDC	Ambient

2.6 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.7 Internal Identification of AE used during the test

AE ID*	Description
AE1	Notebook

Mode:R510V
Trade: ASUS
*AE ID: is used to identify the test sample in the lab internally.

2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AI52-ARES-G100** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.9 Modifications

No modifications were implemented to meet testing criteria.

2.10 Note

1. The EUT is a Smart Glasses with WiFi function, The functions of the EUT listed as below:

	Test Standards	Reference Report
WiFi	FCC Part 15 C 15.247	CTA-01-160700301

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
IEEE 802.11b	√	—	—	—
IEEE 802.11g	√	—	—	—
IEEE 802.11n HT20	√	—	—	—
IEEE 802.11n HT40	√	—	—	—

3. The EUT incorporates a SISO function, Physically, the EUT provides one completed transmitter and one completed receiver.

Modulation Mode	TX Function
IEEE 802.11b	1TX
IEEE 802.11g	1TX
IEEE 802.11n HT20	1TX
IEEE 802.11n HT40	1TX

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Dongguan Yaxu (AiT) Technology Limited
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4, CISPR 22/EN 55022 and CISPR16-1-4:2010 SVSWR requirements.

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2005 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on Apr. 18, 2013

FCC- Registration No: 248337

The 3m Semi-Anechoic Chamber, 3m/10m Open Area Test Site and Shielding Room of Dongguan Yaxu (AiT) Technology Limited have been registered by Federal Communications Commission (FCC) on Aug.29, 2014.

Industry Canada(IC)-Registration No: IC6819A

The 3m Semi-Anechoic Chamber and 3m/10m Open Area Test Site of Dongguan Yaxu (AiT) Technology Limited have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing on Oct. 01, 2014.

VCCI- Registration No: 2705

The 3m/10m Open Area Test Site, Shielding Room and 3m Chamber of Dngguan Yaxu (AiT) technology Limited have been registered by Voluntary Control Council for Interference on Nov. 21, 2012. The Telecommunication Ports Conducted Disturbance Measurement of Asia Institute Technology (Dongguan) Limited have been registered by Voluntary Control Council for Interference on May. 13, 2013.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4 Test Description

Test Item	FCC Part No.	Requirements	Verdict
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	PASS
Maximum Peak Conducted Output Power	15.247(b)(3)	For directional gain:< 30dBm – (G[dBi] –6 [dB]),peak; Otherwise :< 30dBm, peak.	PASS
Maximum Power Spectral Density Level	15.247(e)	For directional gain :< 8dBm/3 kHz – (G[dBi] –6[dB]), peak. Otherwise :< 8dBm/3 kHz, peak.	PASS
Band Edges Compliance	15.247(d)	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Non-Restricted Frequency Bands	15.247(d)	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Restricted Frequency Bands (Conducted)	15.247(d) 15.209	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Restricted Frequency Bands (Radiated)	15.247(d) 15.209	FCC Part 15.209 field strength limit	PASS
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit	PASS

Remark: The measurement uncertainty is not included in the test result.

3.5 Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	802.11b	☒ Lowest ☒ Middle ☒ Highest	802.11b	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(e)	Power spectral density	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(a)(1)	Spectrum bandwidth – 6 dB bandwidth	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(b)(1)	Maximum output power	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.247(d)	Band edge compliance conducted	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.205	Band edge compliance radiated	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions conducted	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions radiated	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	802.11b	-/-	802.11b	-/-	☒	☐	☐	☐	complies
§15.207	Conducted Emissions < 30 MHz	802.11b	-/-	802.11b	-/-	☒	☐	☐	☐	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

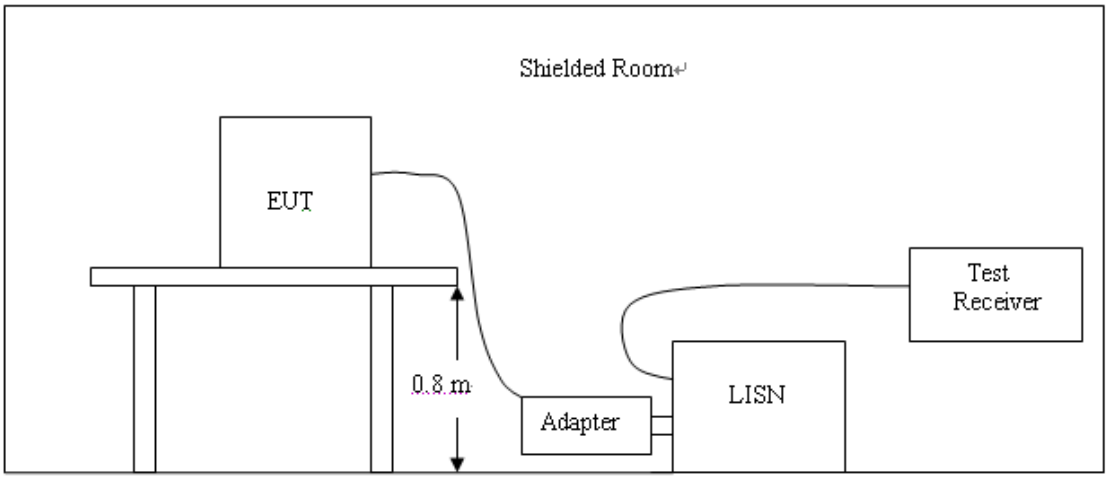
3.6 Equipments Used during the Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	ADVANTEST	R3182	150900201	2016/06/29	2017/06/28
2	EMI Measuring Receiver	R&S	ESR	101660	2016/06/29	2017/06/28
3	Low Noise Pre Amplifier	Tsj	MLA-10K01-B01-27	1205323	2016/06/29	2017/06/28
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2016/06/29	2017/06/28
5	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2016/06/29	2017/06/28
6	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2016/06/29	2017/06/28
7	SHF-EHF Horn	SCHWARZBECK	BBHA9170	BBHA9170367	2016/06/29	2017/06/28
8	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016/06/29	2017/06/28
9	EMI Test Receiver	R&S	ESCI	100124	2016/06/29	2017/06/28
10	LISN	Kyoritsu	KNW-242	8-837-4	2016/06/29	2017/06/28
11	LISN	Kyoritsu	KNW-407	8-1789-3	2016/06/29	2017/06/28
12	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2016/06/29	2017/06/28
13	Loop Antenna	ARA	PLA-1030/B	1029	2016/06/29	2017/06/28
14	Radiated Cable 1# (30MHz-1GHz)	FUJIKURA	5D-2W	01	2016/06/29	2017/06/28
15	Radiated Cable 2# (1GHz -25GHz)	FUJIKURA	10D2W	02	2016/06/29	2017/06/28
16	Conducted Cable 1#(9KHz-30MHz)	FUJIKURA	1D-2W	01	2016/06/29	2017/06/28
17	Power Meter	Anritsu	ML2495A	N/A	2016/06/29	2017/06/28
18	Power sensor	Anritsu	MA2411B	N/A	2016/06/29	2017/06/28
19	Signal Analyzer	Agilent	N9020A	MY49430428	2016/06/07	2017/06/06

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2014;
2. Support equipment, if needed, was placed as per ANSI C63.4-2014;
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009
4. The EUT received DC5V power from the PC power adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

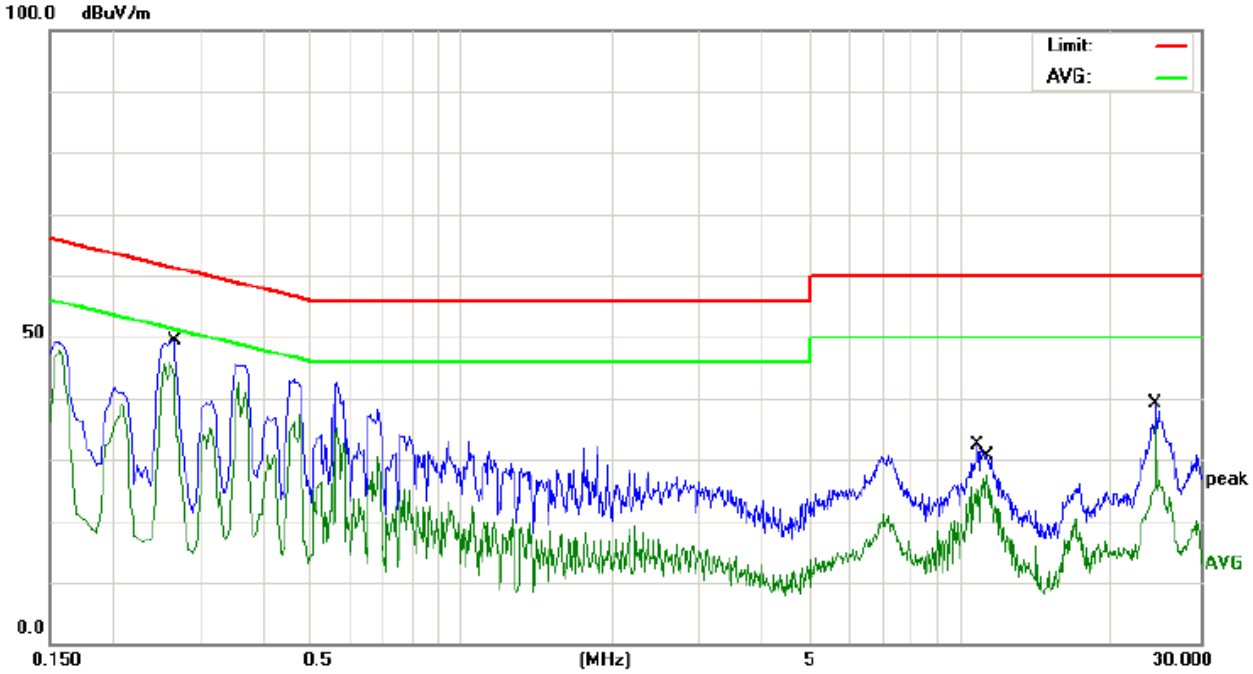
Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

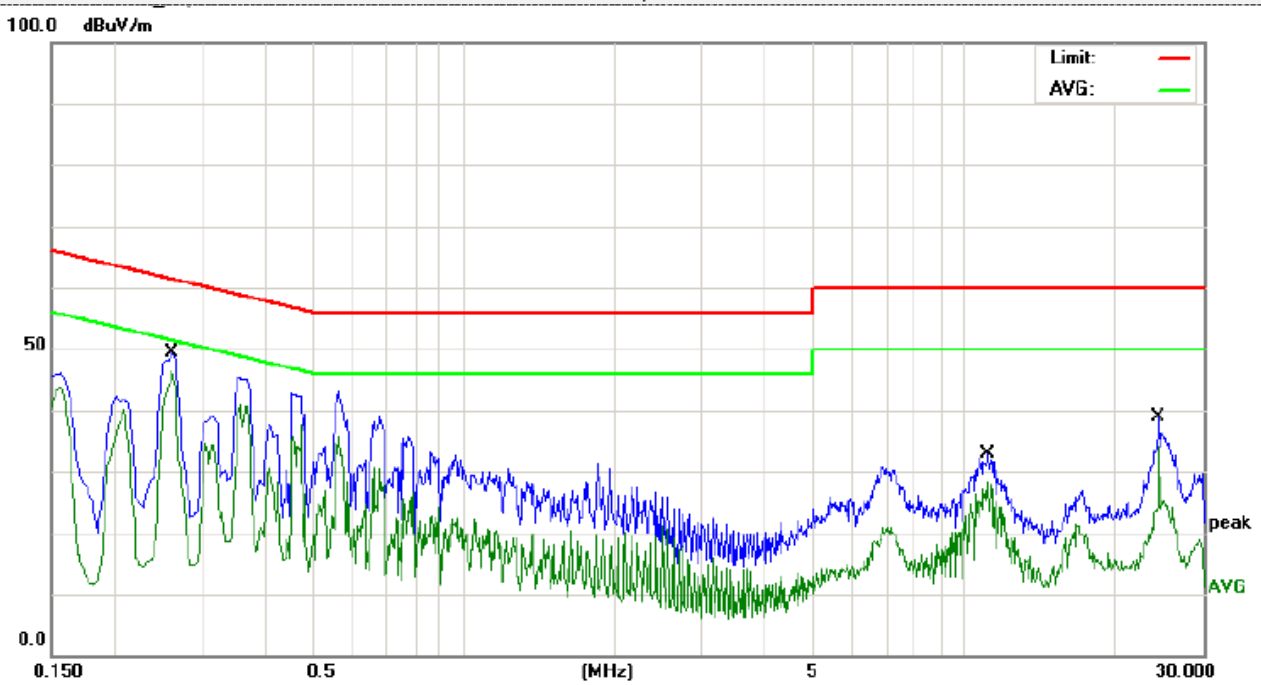
The AC Power Conducted Emission measurement is performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test modes and channels.

Line:	L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.2620	44.05	1.82	45.87	51.36	-5.49	AVG	
2		0.2660	47.55	1.81	49.36	61.24	-11.88	QP	
3		10.7700	22.12	10.28	32.40	60.00	-27.60	QP	
4		11.2340	16.98	10.30	27.28	50.00	-22.72	AVG	
5		24.4900	37.11	2.11	39.22	60.00	-20.78	QP	
6		24.4900	33.19	2.11	35.30	50.00	-14.70	AVG	

Line:	N

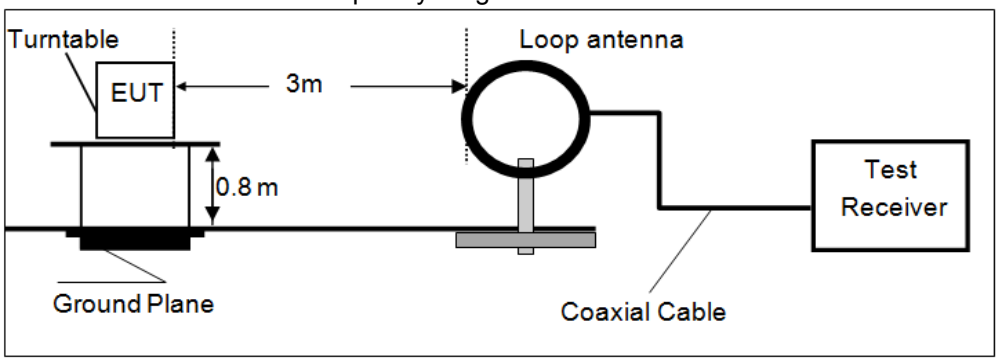


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.2620	47.59	1.82	49.41	61.36	-11.95	QP	
2	*	0.2620	44.54	1.82	46.36	51.36	-5.00	AVG	
3		11.1020	18.03	10.30	28.33	50.00	-21.67	AVG	
4		11.1700	22.61	10.30	32.91	60.00	-27.09	QP	
5		24.4900	36.85	2.11	38.96	60.00	-21.04	QP	
6		24.4900	32.07	2.11	34.18	50.00	-15.82	AVG	

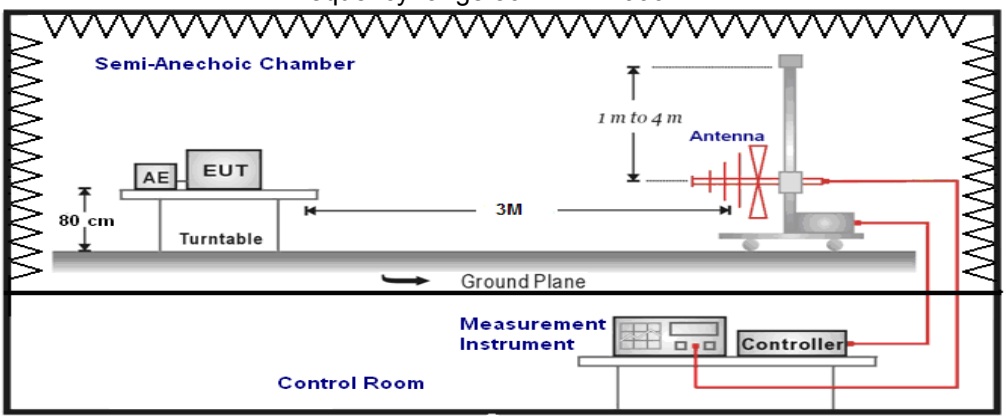
4.2 Radiated Emission

TEST CONFIGURATION

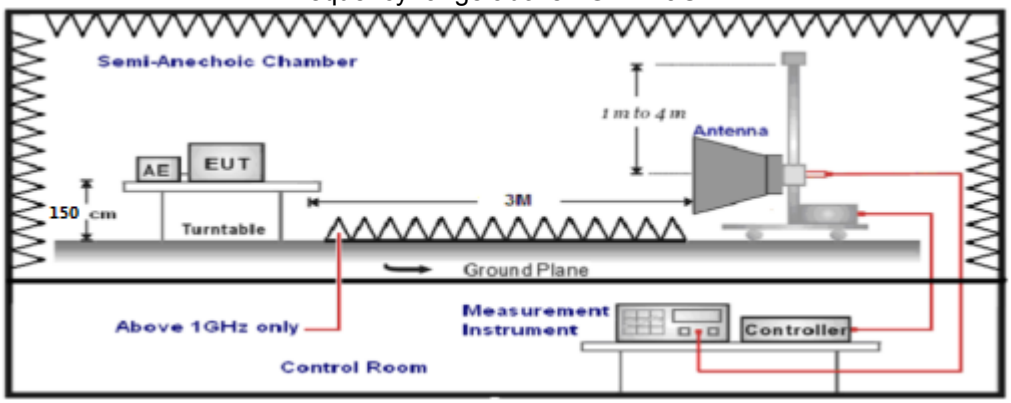
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3

1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

More procudre as follows;

1) Sequence of testing 9 kHz to 30 MHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna height is 1.0 meter.
--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:
--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height changes from 1 to 4 meter.
--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height scan range is 1 meter to 2.5 meter.
--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 1 meter.
--- The EUT was set into operation.

Premeasurement:
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.
Final measurement:
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	300	20log(2400/F(KHz))+80	2400/F(KHz)
0.49-1.705	30	20log(24000/F(KHz))+40	24000/F(KHz)
1.705-30	30	20log(30)+40	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

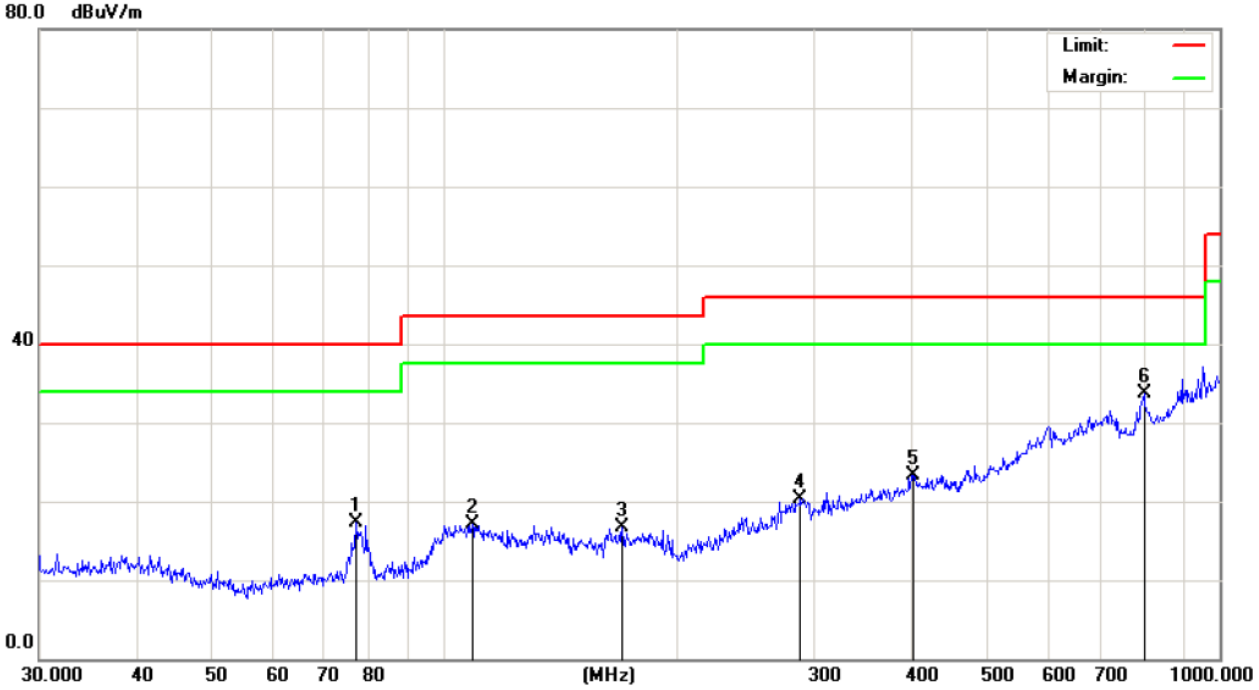
Remark:
1. The radiated measurement are performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test mode and channel.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4. We tested both battery powered and powered by adapter charging mode at three orientate ons, recorded worst case at powered by adapter charging mode.
5. "---" means not recorded as emission levels lower than limit.
6. Margin= Limit - Level

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Result
11.78	45.26	69.54	24.28	QP	PASS
22.69	49.56	69.54	19.98	QP	PASS

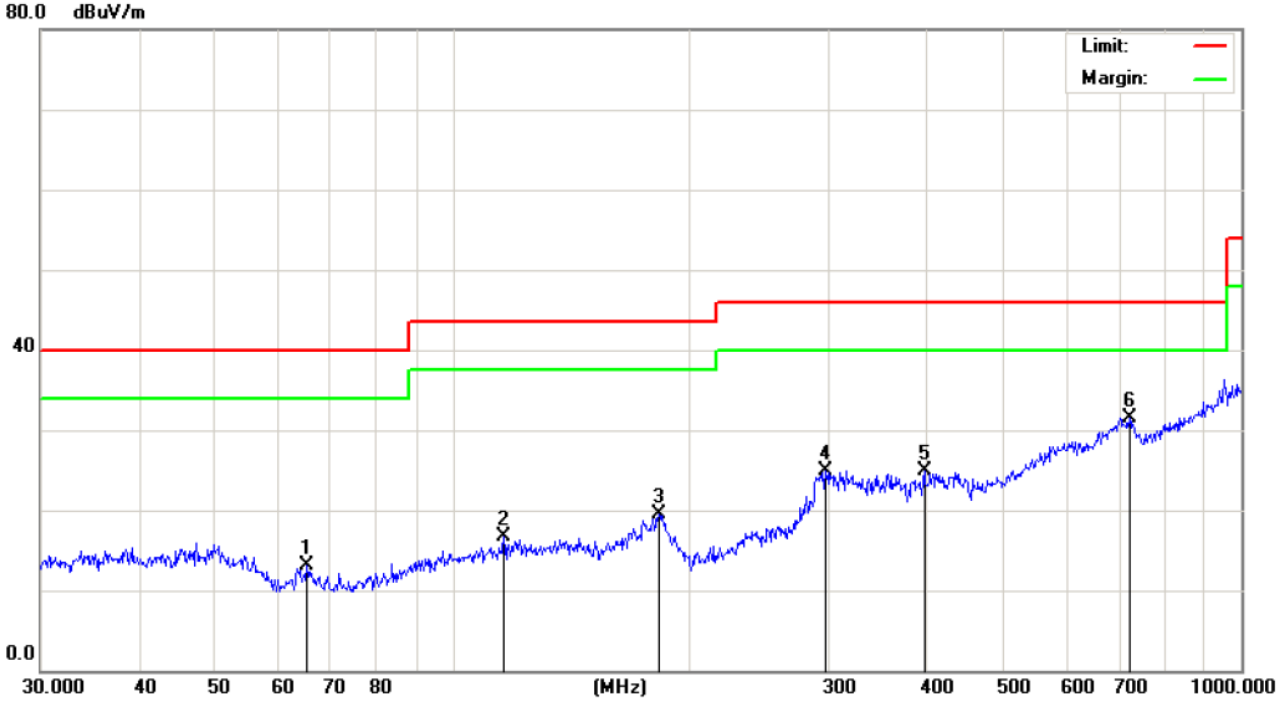
For 30MHz to 1000MHz

Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		76.7808	36.43	-19.16	17.27	40.00	-22.73	QP
2		108.6470	30.62	-13.44	17.18	43.50	-26.32	QP
3		169.5990	32.11	-15.34	16.77	43.50	-26.73	QP
4		287.9904	30.78	-10.45	20.33	46.00	-25.67	QP
5		403.2500	29.46	-6.14	23.32	46.00	-22.68	QP
6	*	798.9797	30.20	3.44	33.64	46.00	-12.36	QP

Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		65.3432	30.68	-17.50	13.18	40.00	-26.82	QP
2		116.1321	31.79	-15.10	16.69	43.50	-26.81	QP
3		182.5592	30.90	-11.36	19.54	43.50	-23.96	QP
4		297.2241	34.90	-9.98	24.92	46.00	-21.08	QP
5		396.2415	31.97	-7.06	24.91	46.00	-21.09	QP
6	*	721.7259	31.94	-0.41	31.53	46.00	-14.47	QP

For 1GHz to 25GHz

Note:We tested IEEE 802.11b, IEEE 802.11g and IEEE 802.11n HT20 and rcorded the worst case at the 11b Mode.

802.11b Mode(above 1GHz)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b--2412MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824.00	55.89	PK	74.00	18.11	51.34	33.52	6.92	35.89	4.55
1	4824.00	47.25	AV	54.00	6.75	42.70	33.52	6.92	35.89	4.55
2	7236.00	40.24	PK	74.00	33.76	28.97	37.10	9.19	35.02	11.27
2	7236.00	--	AV	54.00	--	--	--	--	--	--

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b--2412MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824.00	56.11	PK	74.00	17.89	51.56	33.52	6.92	35.89	4.55
1	4824.00	48.36	AV	54.00	5.64	43.81	33.52	6.92	35.89	4.55
2	7236.00	40.87	PK	74.00	33.13	29.60	37.10	9.19	35.02	11.27
2	7236.00	--	AV	54.00	--	--	--	--	--	--

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b--2437MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874.00	56.14	PK	74.00	17.86	49.90	33.59	6.95	34.30	6.24
1	4874.00	48.52	AV	54.00	5.48	42.28	33.59	6.95	34.30	6.24
2	7311.00	40.28	PK	74.00	33.72	26.53	37.44	9.22	32.91	13.75
2	7311.00	--	AV	54.00	--	--	--	--	--	--

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b--2437MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874.00	56.56	PK	74.00	17.44	50.32	33.59	6.95	34.30	6.24
1	4874.00	49.11	AV	54.00	4.89	42.87	33.59	6.95	34.30	6.24
2	7311.00	40.96	PK	74.00	33.04	27.21	37.44	9.22	32.91	13.75
2	7311.00	--	AV	54.00	--	--	--	--	--	--

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

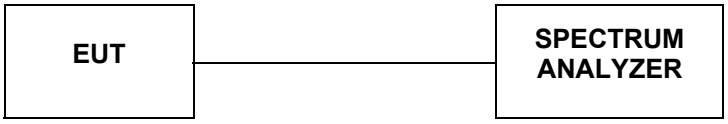
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b--2462MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924.00	55.14	PK	74.00	18.86	50.36	33.71	6.98	35.91	4.78
1	4924.00	48.12	AV	54.00	5.88	43.34	33.71	6.98	35.91	4.78
2	7386.00	40.23	PK	74.00	33.77	28.35	37.61	9.25	34.98	11.88
2	7386.00	--	AV	54.00	--	--	--	--	--	--

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b--2462MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924.00	55.26	PK	74.00	18.74	50.48	33.71	6.98	35.91	4.78
1	4924.00	48.35	AV	54.00	5.65	43.57	33.71	6.98	35.91	4.78
2	7386.00	40.14	PK	74.00	33.86	28.26	37.61	9.25	34.98	11.88
2	7386.00	--	AV	54.00	--	--	--	--	--	--

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

4.3 Duty Cycle

TEST CONFIGURATION



LIMIT

The Maximum Peak Output Power Measurement is 30dBm.
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%).

TEST PROCEDURE

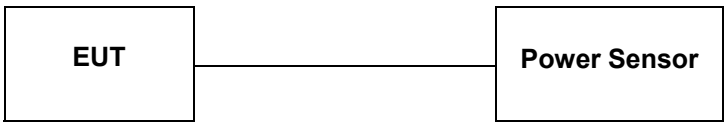
a. A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on and off times of the transmitted signal.
b. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

TEST RESULTS

The Manufacturer provide specific software to control WLAN work at 100% continuous transmit;

4.4 Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03:
PKPM1 Peak power meter method: The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
Maximum conducted (average) output power: As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
1. The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
2. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.
Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
IEEE 802.11 b	1	2412	10.26	30	PASS
	6	2437	10.55		
	11	2462	10.11		
IEEE 802.11 g	1	2412	12.02	30	PASS
	6	2437	12.87		
	11	2462	12.53		
IEEE 802.11 n HT20	1	2412	12.16	30	PASS
	6	2437	12.71		
	11	2462	12.66		
IEEE 802.11 n HT40	3	2122	12.47	30	PASS
	6	2437	12.92		
	9	2452	12.05		

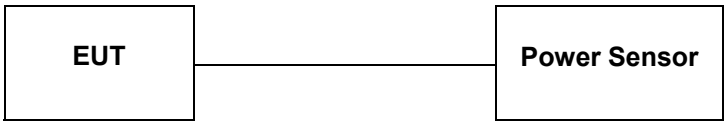
Remark:
1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20; 13.5Mbps at IEEE 802.11 n HT40*

4.5 Maximum Average Power

LIMIT

Only for report

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03 Section 9.2.3.1 Method AVGPM (Measurement using an RF average power meter):

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
   1) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
   2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
   3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.

c) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

d) Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

TEST RESULTS

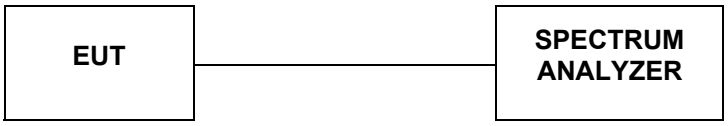
Test Mode	Channel	Frequency (MHz)	Measured Output Average Power (dBm)	Verdict
IEEE 802.11 b	1	2412	9.14	PASS
	6	2437	9.37	
	11	2462	8.89	
IEEE 802.11 g	1	2412	8.56	PASS
	6	2437	9.22	
	11	2462	9.01	
IEEE 802.11 n HT20	1	2412	8.59	PASS
	6	2437	9.14	
	11	2462	8.98	
IEEE 802.11 n HT40	3	2122	8.32	PASS
	6	2437	8.25	
	9	2452	8.51	

Remark:

1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20; 13.5Mbps at IEEE 802.11 n HT40*

4.6 Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 558074 D01 V03 Method PKPSD (peak PSD) this procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

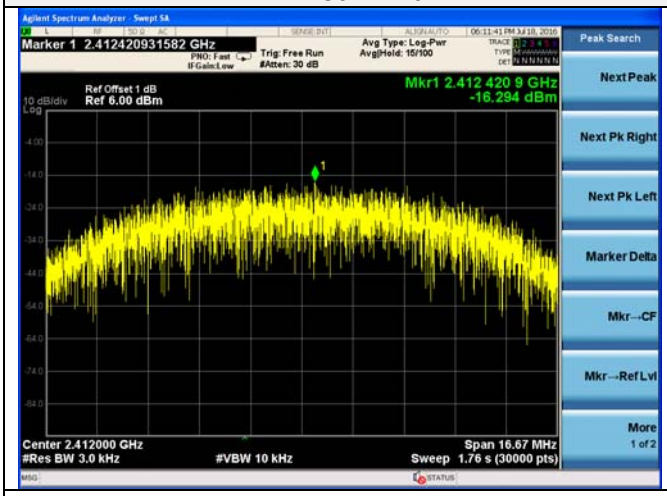
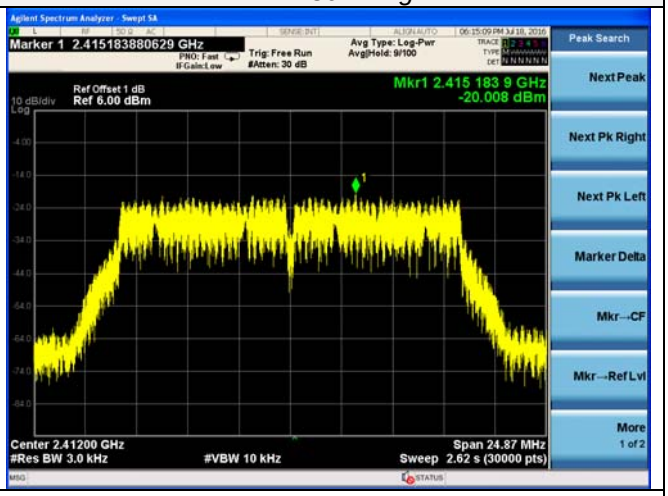
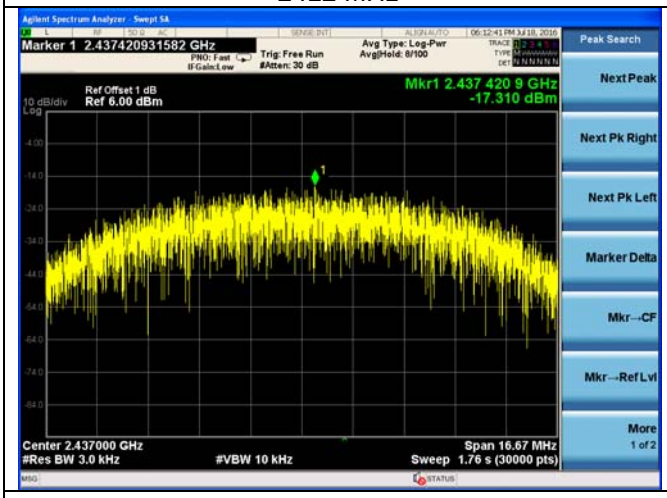
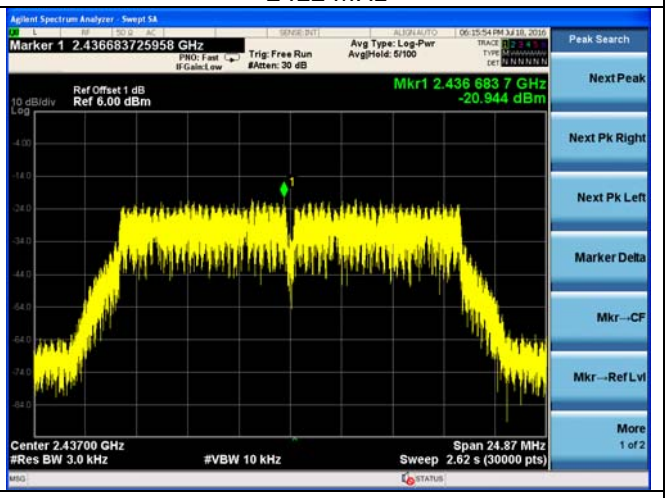
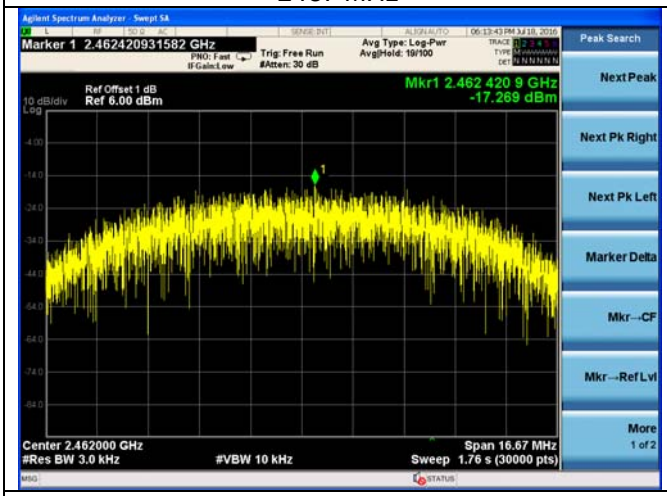
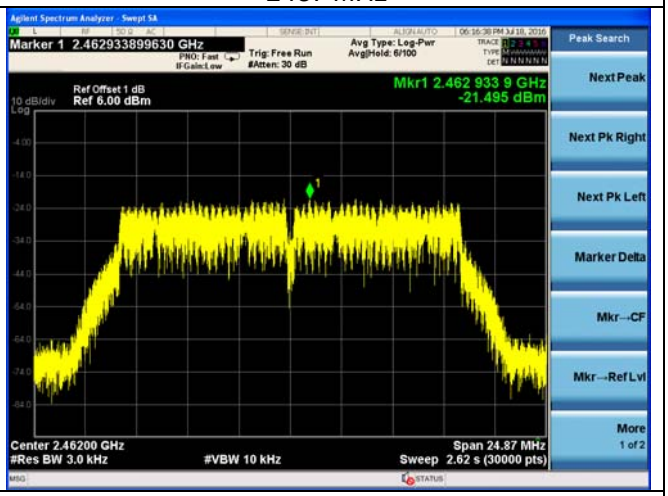
LIMIT

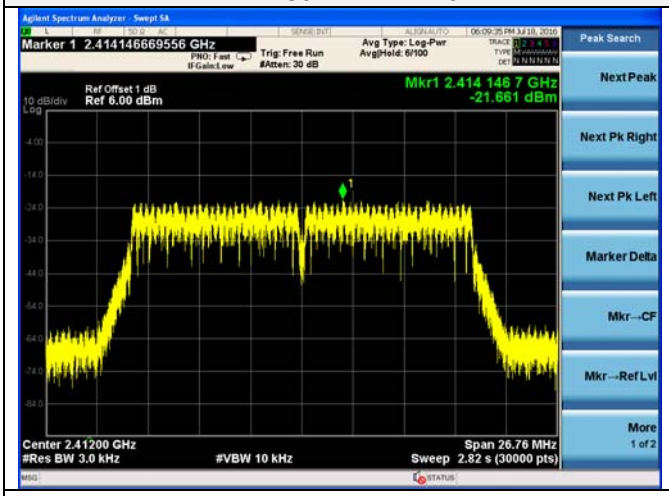
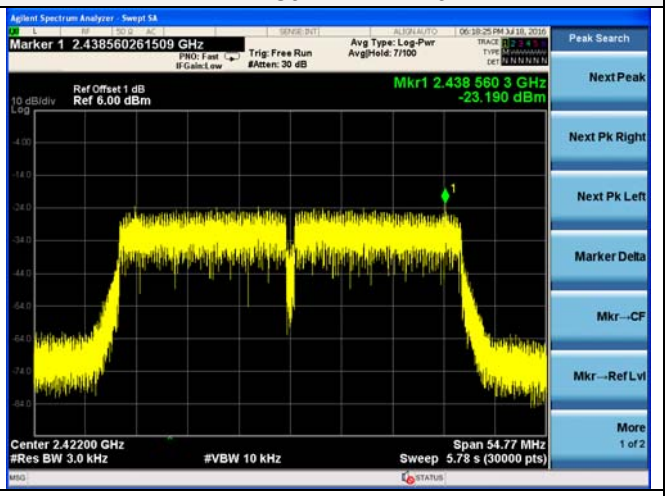
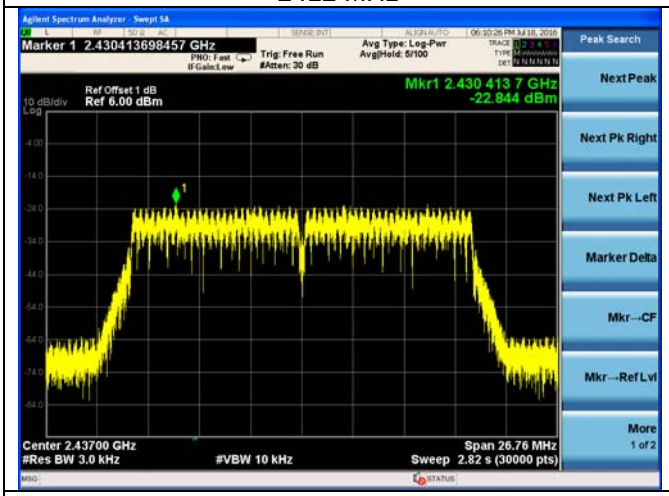
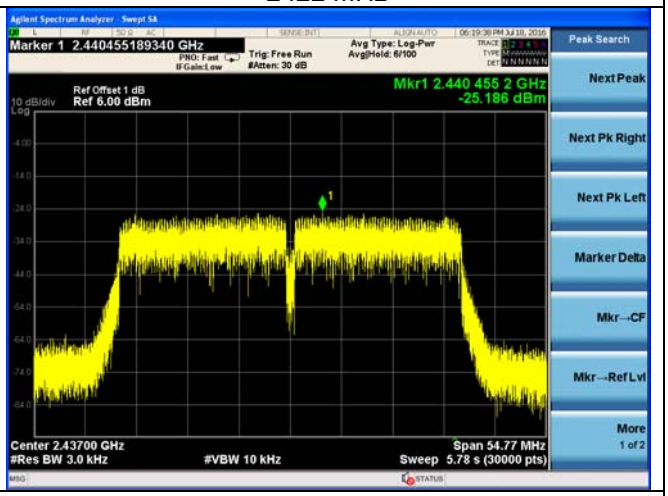
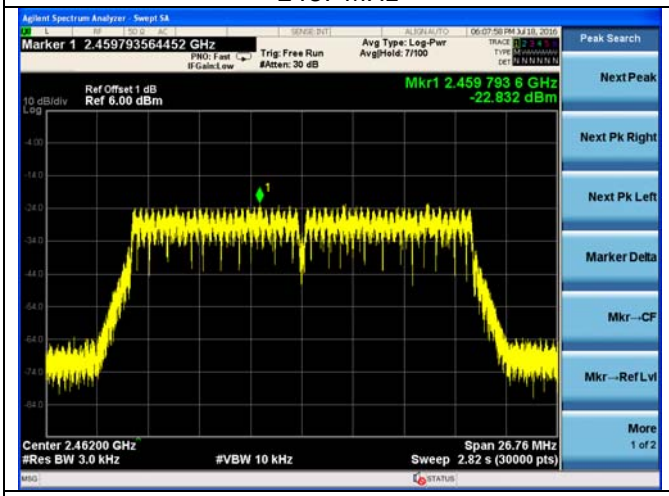
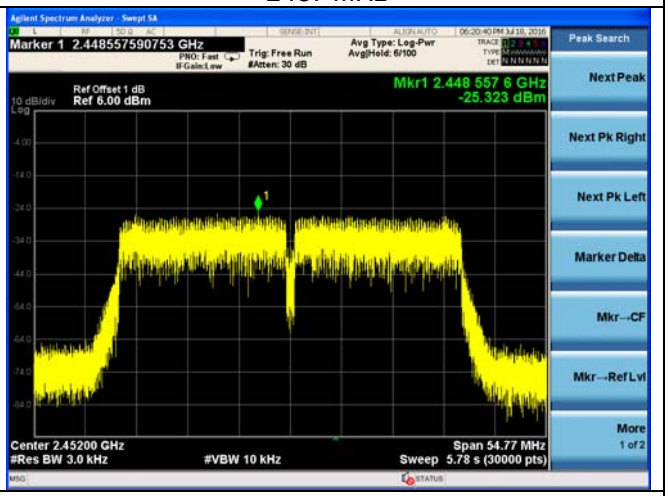
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/3KHz)	Limits (dBm/3KHz)	Verdict
IEEE 802.11 b	1	2412	-16.294	8	PASS
	6	2437	-17.310		
	11	2462	-17.269		
IEEE 802.11 g	1	2412	-20.008	8	PASS
	6	2437	-20.944		
	11	2462	-21.495		
IEEE 802.11 n HT20	1	2412	-21.661	8	PASS
	6	2437	-22.844		
	11	2462	-22.832		
IEEE 802.11 n HT40	3	2422	-23.190	8	PASS
	6	2437	-25.186		
	9	2452	-25.323		

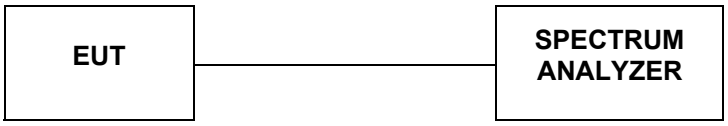
Remark:
1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20; 13.5Bbps at IEEE 802.11 n HT40;*
4. *please refer to following plots;*

Peak Power Spectral Density	
IEEE 802.11 b	*IEEE 802.11 g*
	
2412 MHz	*2412 MHz*
	
2437 MHz	*2437 MHz*
	
2462 MHz	*2462 MHz*

Peak Power Spectral Density	
IEEE 802.11 n HT20	IEEE 802.11 n HT40
	
2412 MHz	2422 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2452 MHz

4.7 Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100 kHz and VBW= 300 KHz to measure the peak field strength, and measure frequency range from 9 KHz to 25GHz.

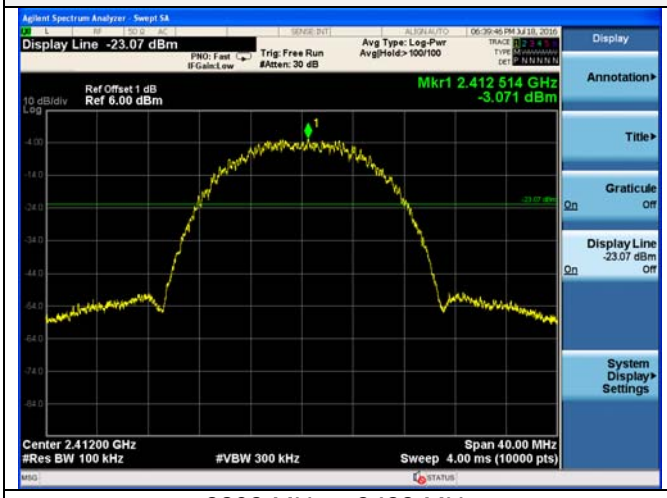
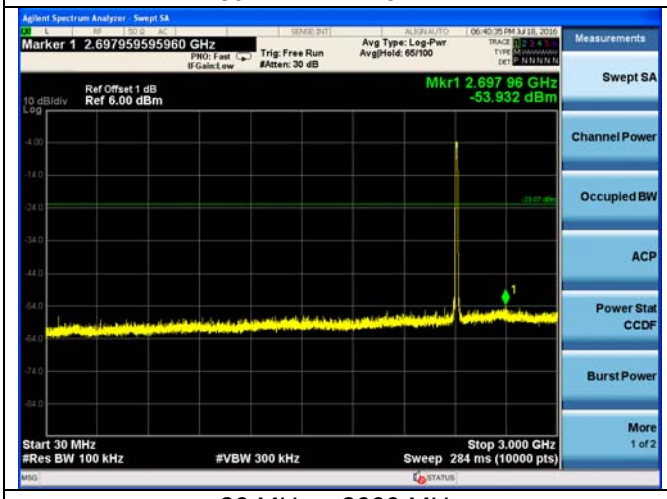
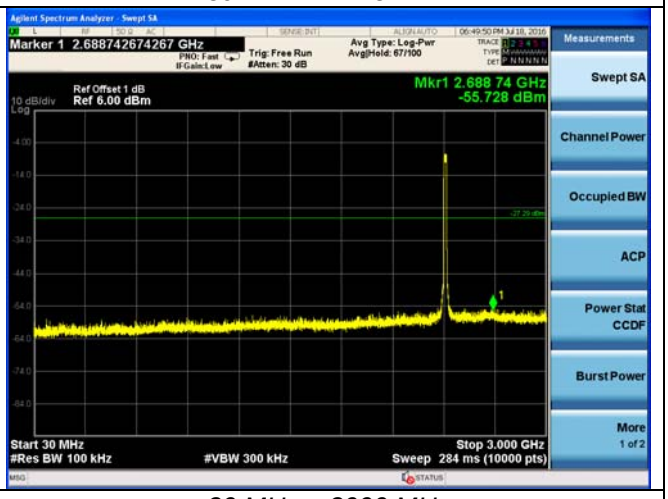
LIMIT

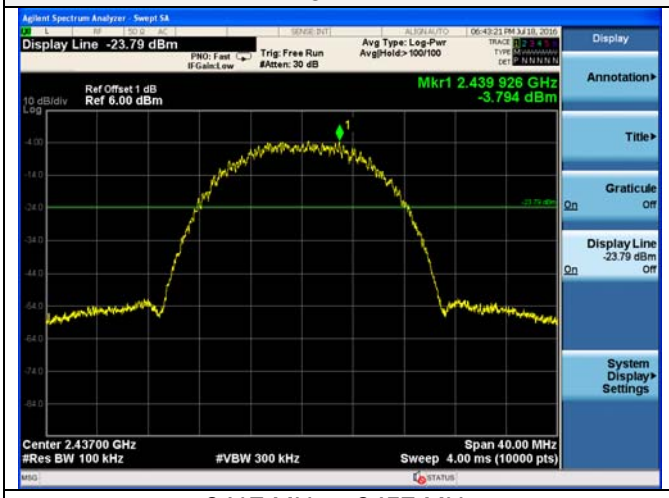
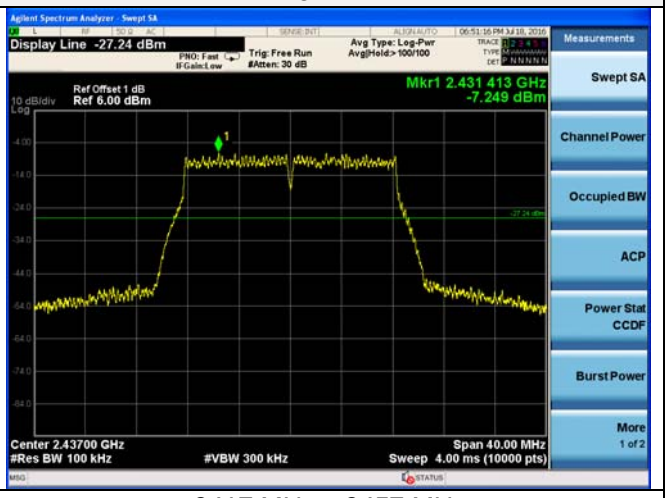
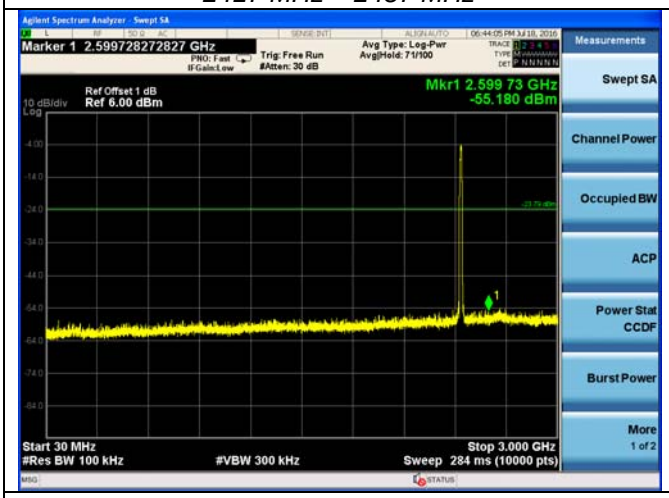
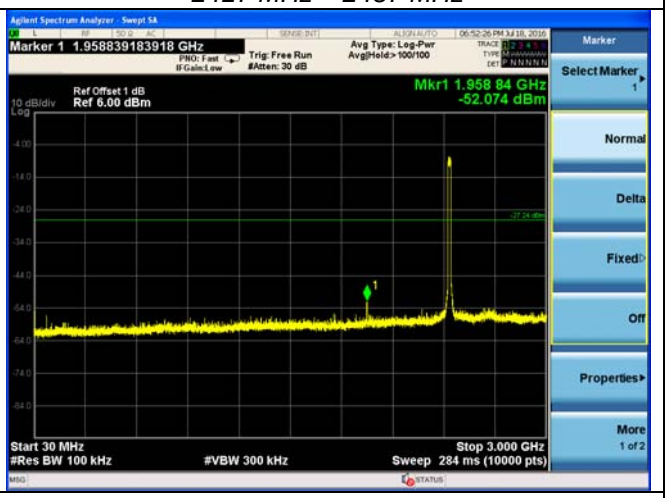
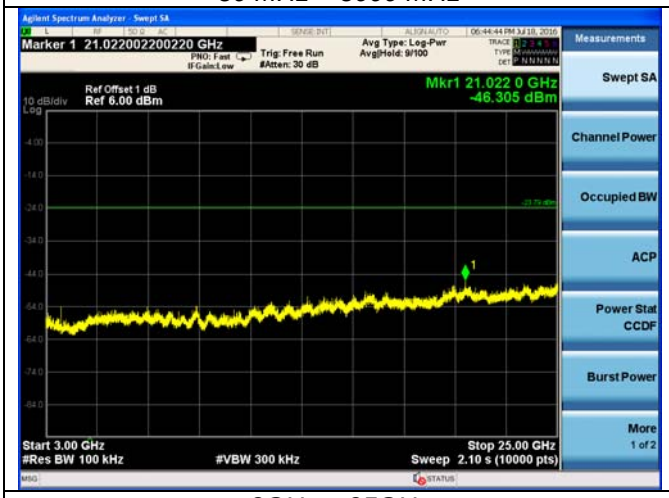
1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

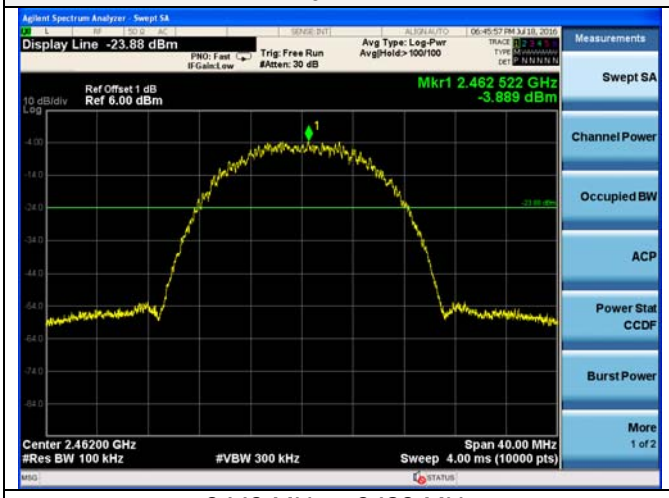
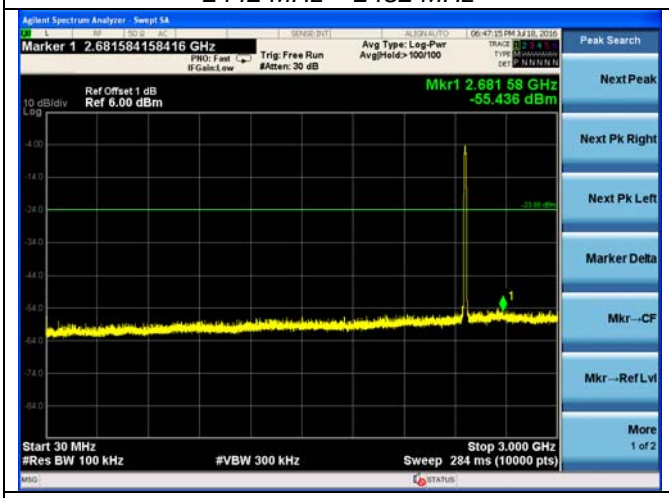
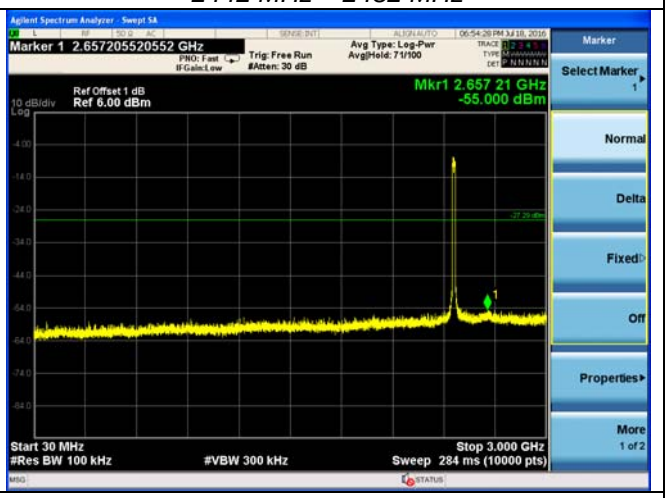
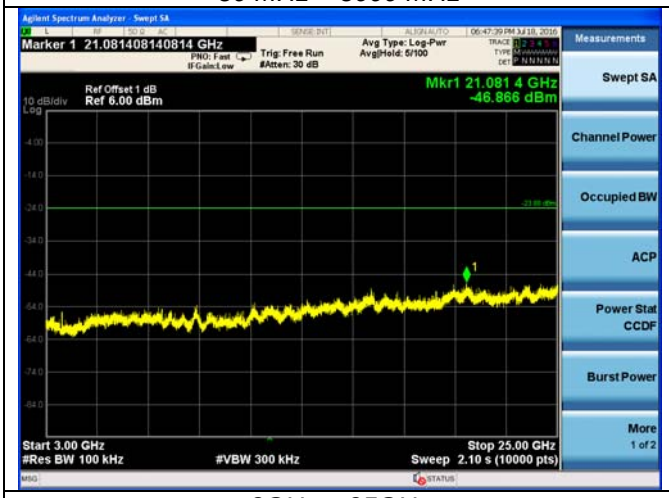
TEST RESULTS

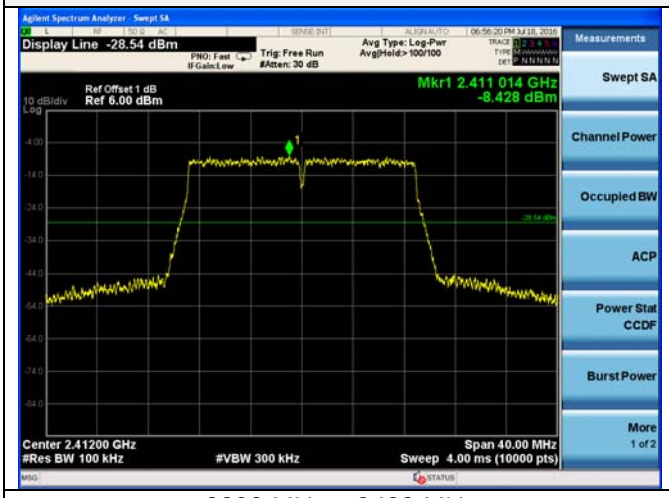
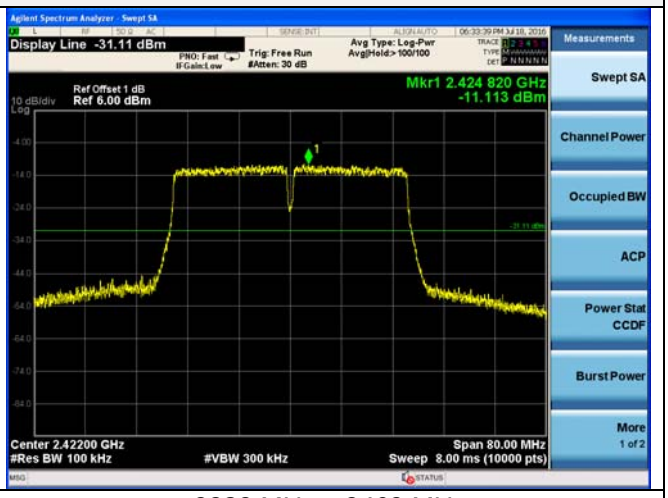
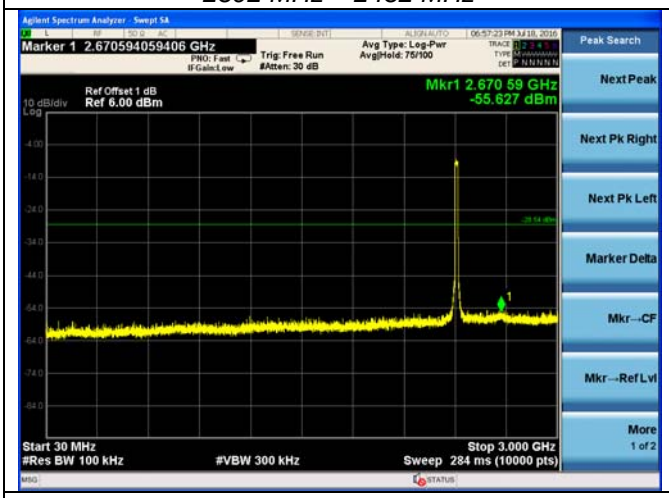
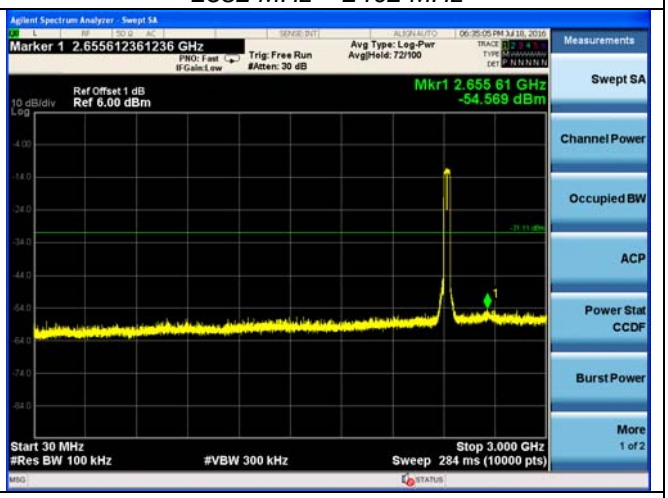
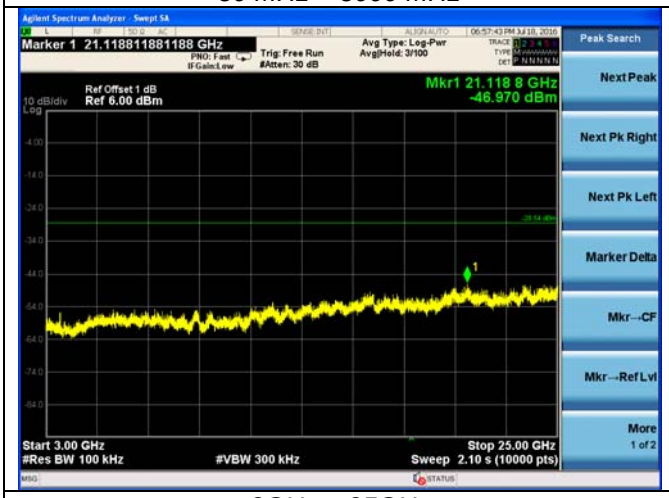
Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBc)	Limits (dBc)	Verdict
IEEE 802.11 b	1	2412	<-20dBc	-20	PASS
	6	2437	<-20dBc	-20	
	11	2462	<-20dBc	-20	
IEEE 802.11 g	1	2412	<-20dBc	-20	PASS
	6	2437	<-20dBc	-20	
	11	2462	<-20dBc	-20	
IEEE 802.11 n HT20	1	2412	<-20dBc	-20	PASS
	6	2437	<-20dBc	-20	
	11	2462	<-20dBc	-20	
IEEE 802.11 n HT20	3	2422	<-20dBc	-20	PASS
	3	2437	<-20dBc	-20	
	9	2452	<-20dBc	-20	

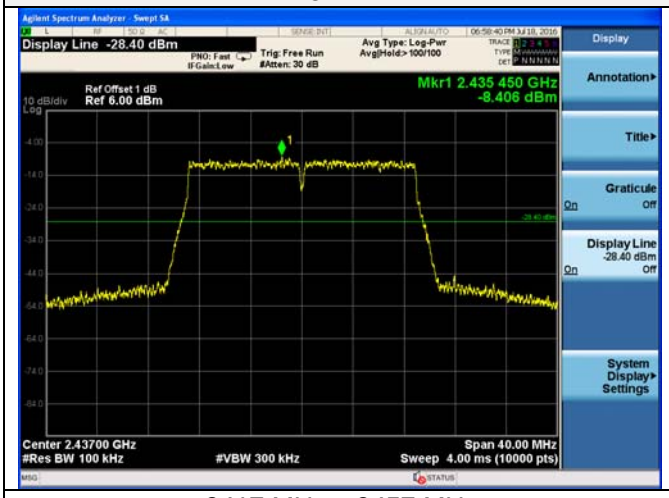
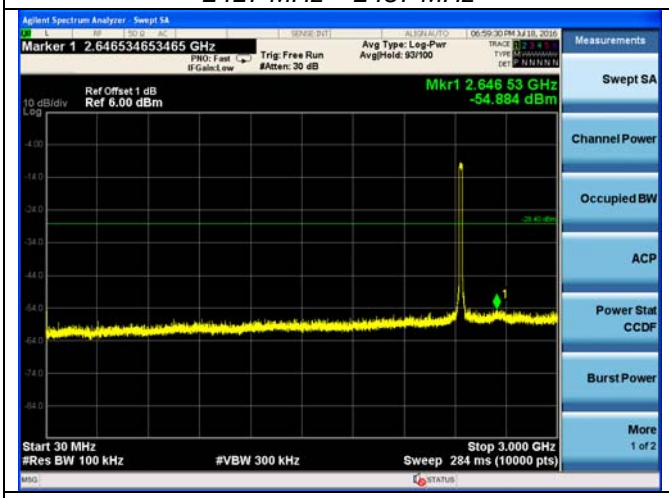
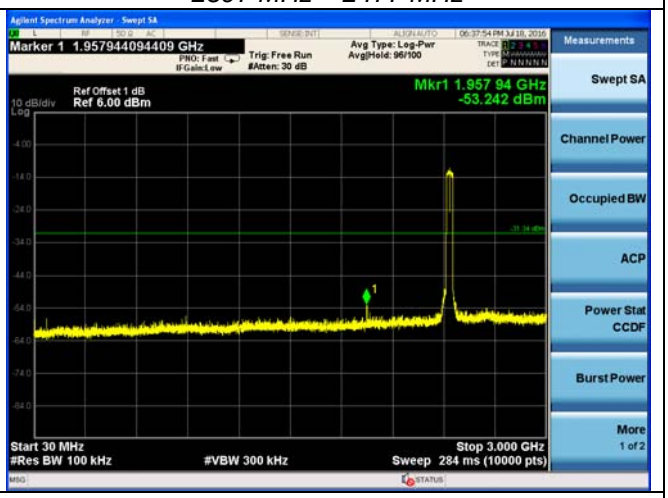
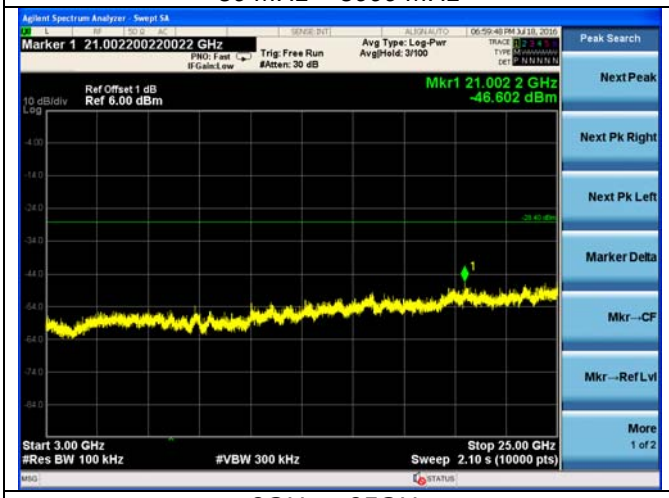
Remark:
1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20;*
4. *"---" means that the fundamental frequency not for 15.209 limits requirement.*
5. *please refer to following plots;*

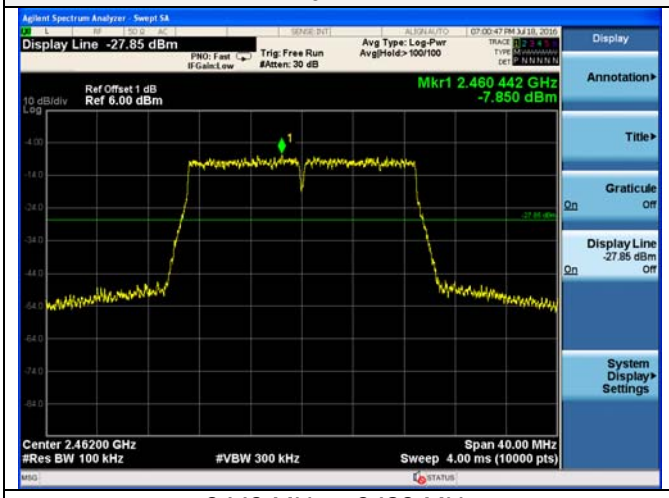
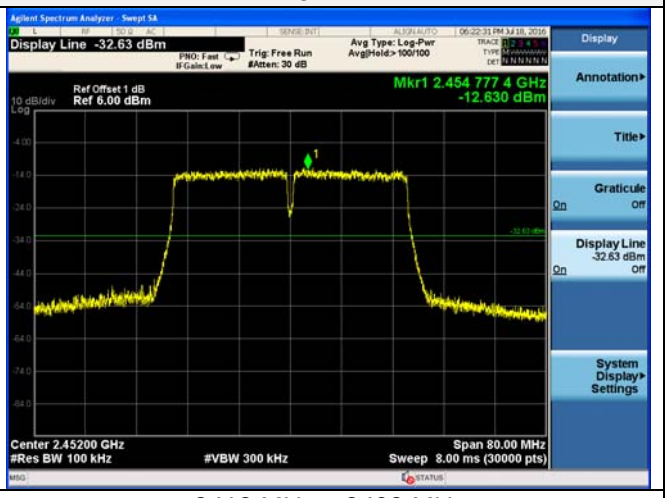
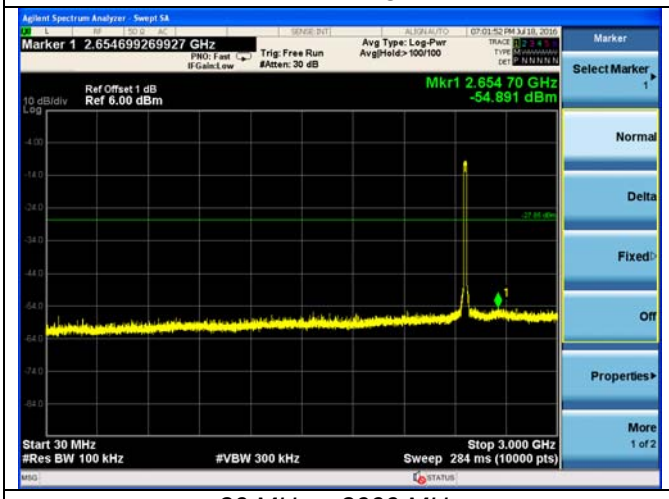
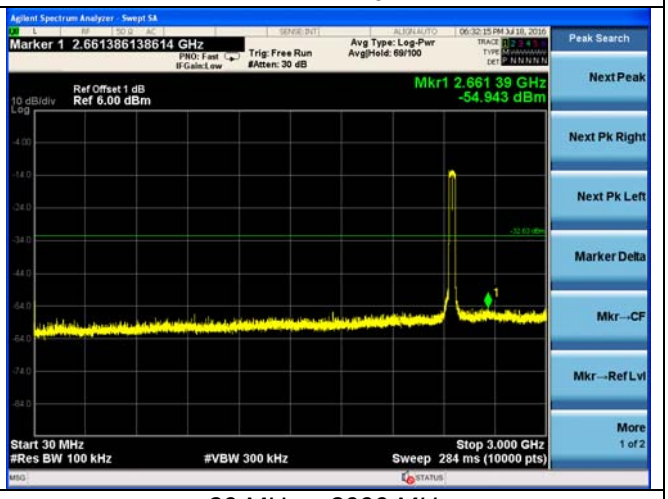
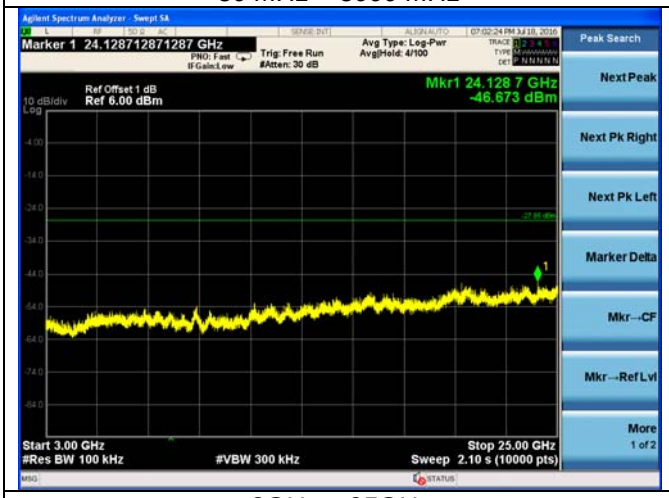
Band-edge Masurements for RF Conducted Emissions	
IEEE 802.11 b	*IEEE 802.11 g*
2412 MHz	*2412 MHz*
	
2392 MHz – 2432 MHz	*2392 MHz – 2432 MHz*
	
30 MHz – 3000 MHz	*30 MHz – 3000 MHz*
	
3GHz – 25GHz	*3GHz – 25GHz*

Band-edge Masurements for RF Conducted Emissions	
IEEE 802.11 b	*IEEE 802.11 g*
2437 MHz	*2437 MHz*
	
2417 MHz – 2457 MHz	*2417 MHz – 2457 MHz*
	
30 MHz – 3000 MHz	*30 MHz – 3000 MHz*
	
3GHz – 25GHz	*3GHz – 25GHz*

Band-edge Masurements for RF Conducted Emissions	
IEEE 802.11 b	*IEEE 802.11 g*
2462 MHz	*2462 MHz*
	
2442 MHz – 2482 MHz	*2442 MHz – 2482 MHz*
	
30 MHz – 3000 MHz	*30 MHz – 3000 MHz*
	
3GHz – 25GHz	*3GHz – 25GHz*

Band-edge Masurements for RF Conducted Emissions	
IEEE 802.11 n HT20	*IEEE 802.11 n HT40*
2412 MHz	*2422 MHz*
	
2392 MHz – 2432 MHz	*2382 MHz – 2462 MHz*
	
30 MHz – 3000 MHz	*30 MHz – 3000 MHz*
	
3GHz – 25GHz	*3GHz – 25GHz*

Band-edge Masurements for RF Conducted Emissions	
IEEE 802.11 n HT20	*IEEE 802.11 n HT40*
2437 MHz	*2437 MHz*
	
2417 MHz – 2457 MHz	*2397 MHz – 2477 MHz*
	
30 MHz – 3000 MHz	*30 MHz – 3000 MHz*
	
3GHz – 25GHz	*3GHz – 25GHz*

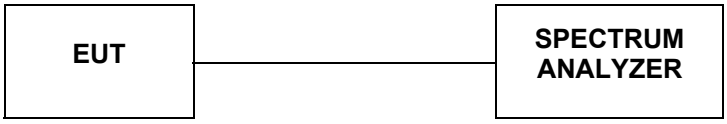
Band-edge Masurements for RF Conducted Emissions	
IEEE 802.11 n HT20	*IEEE 802.11 n HT40*
2462 MHz	*2452 MHz*
	
2442 MHz – 2482 MHz	*2412 MHz – 2492 MHz*
	
30 MHz – 3000 MHz	*30 MHz – 3000 MHz*
	
3GHz – 25GHz	*3GHz – 25GHz*

4.8 Band-edge Measurement for RF Conducted Emissions

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 558074 D01 V03 for Antenna-port conducted measurement.

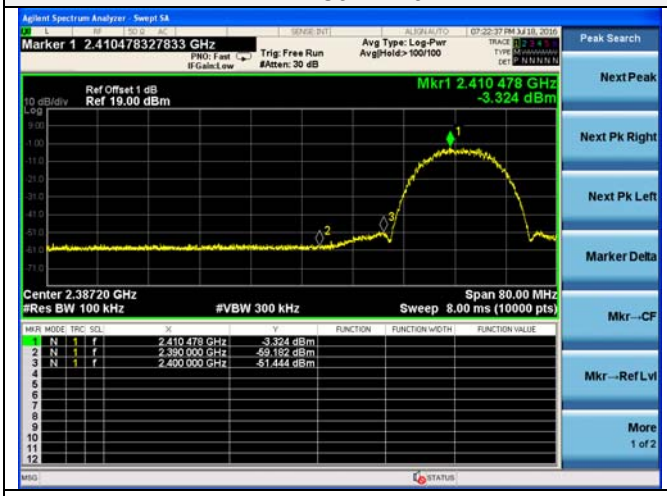
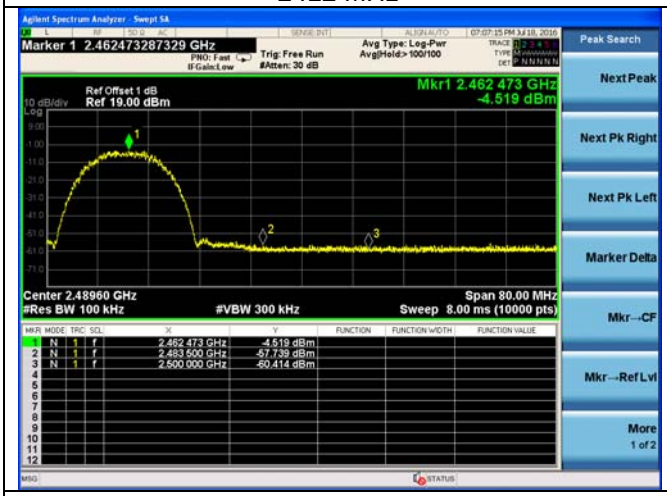
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge,
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Conductd Band-edge Emission (dBc)	Limits (dBc)	Verdict
IEEE 802.11 b	1	2412	<-20dBc	-20	PASS
	11	2462	<-20dBc	-20	
IEEE 802.11 g	1	2412	<-20dBc	-20	PASS
	11	2462	<-20dBc	-20	
IEEE 802.11 n HT20	1	2412	<-20dBc	-20	PASS
	11	2462	<-20dBc	-20	
IEEE 802.11 n HT40	3	2422	<-20dBc	-20	PASS
	9	2452	<-20dBc	-20	

Remark:

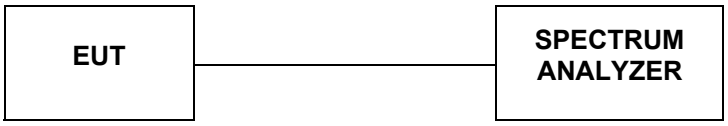
1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20; 13.5Mbps at IEEE 802.11 n HT40*
4. *"---" means that the fundamental frequency not for 15.209 limits requirement.*
5. *please refer to following plots;*

Band-edge Measurements for RF Conducted Emissions	
IEEE 802.11 b	*IEEE 802.11 g*
	
2412 MHz	*2412 MHz*
	
2462 MHz	*2462 MHz*

Band-edge Measurements for RF Conducted Emissions	
IEEE 802.11 n HT20	*IEEE 802.11 n HT40*
	
2412 MHz	*2422 MHz*
	
2462 MHz	*2452 MHz*

4.9 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

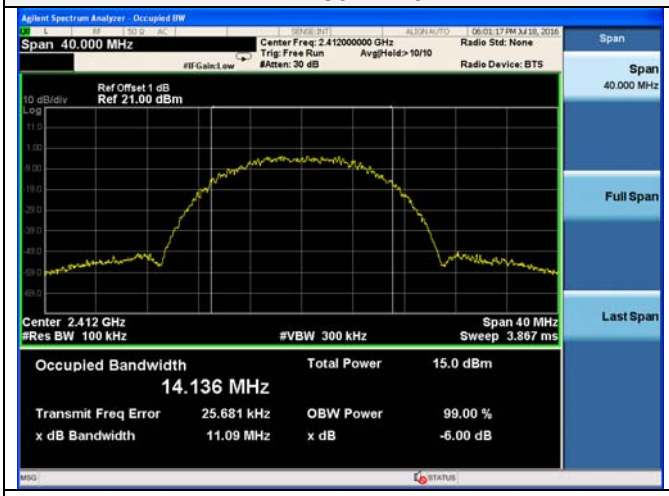
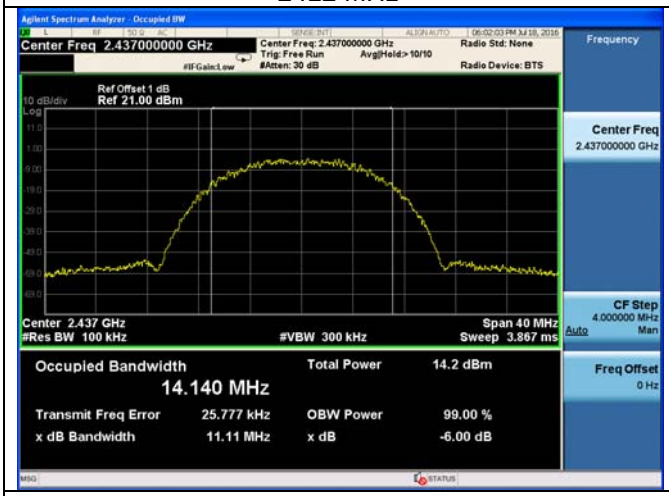
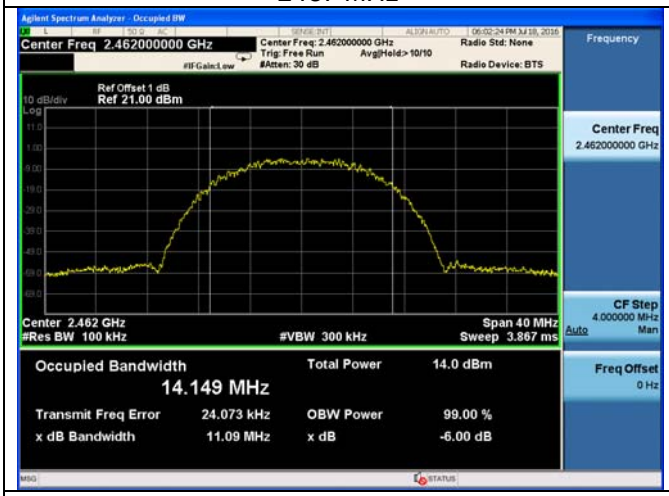
LIMIT

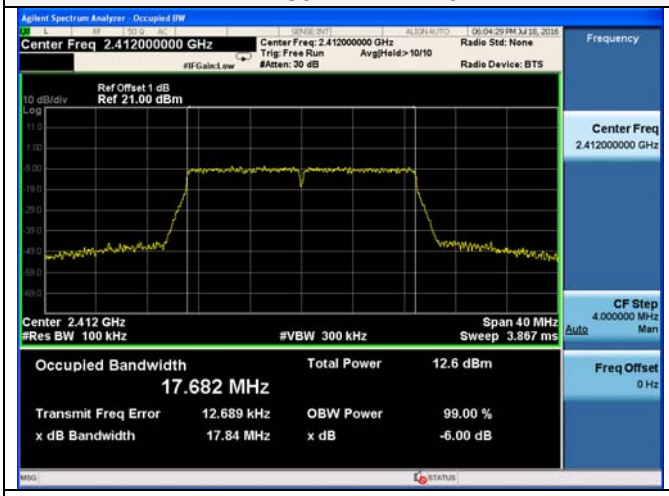
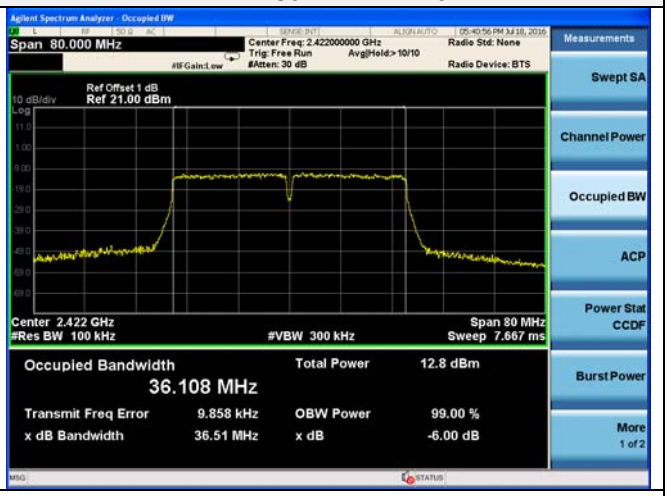
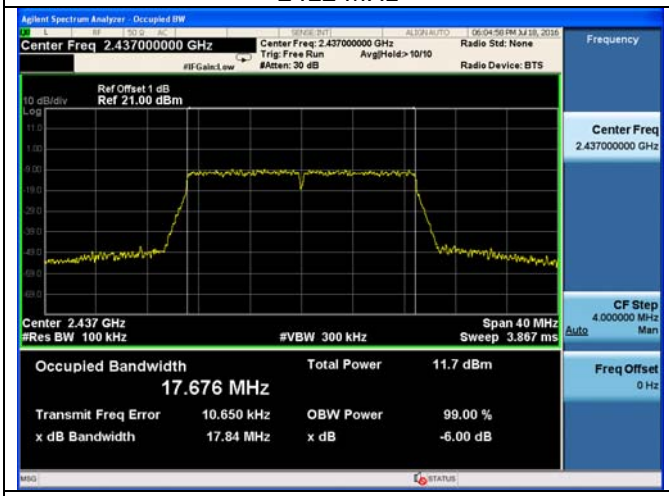
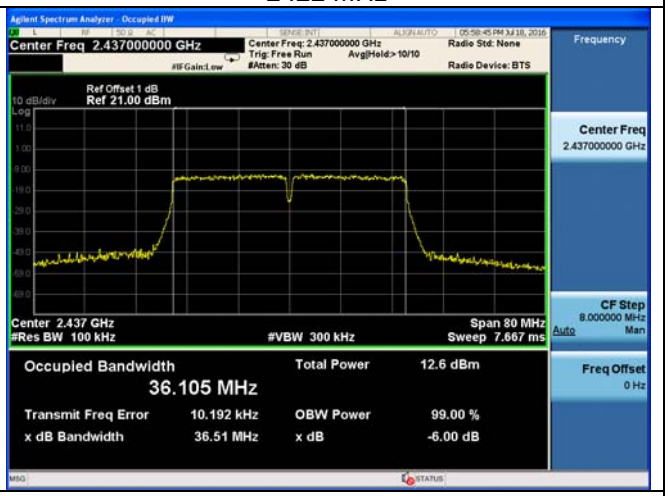
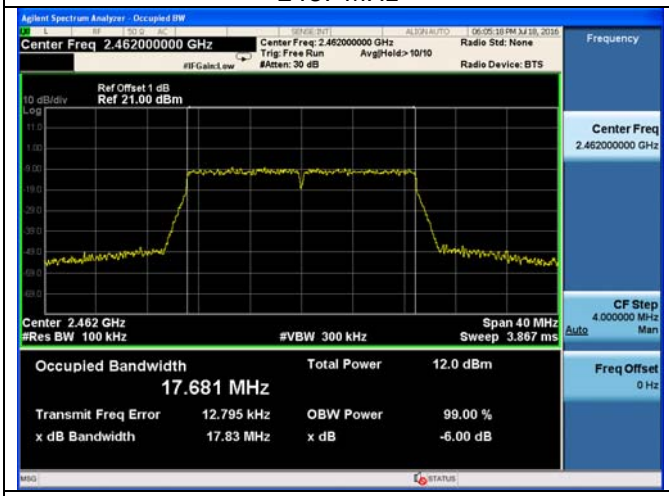
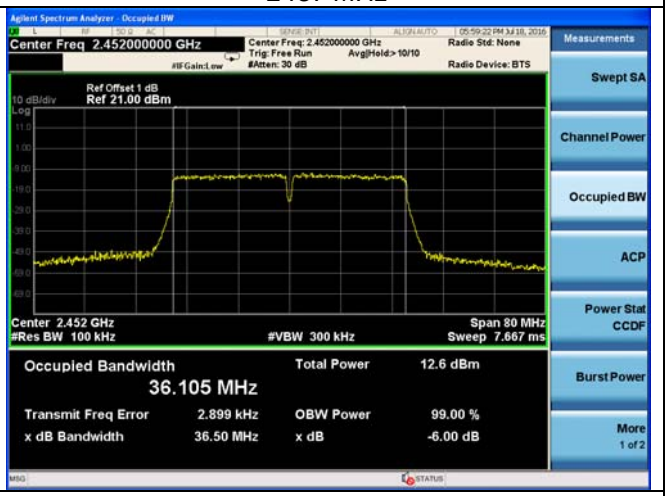
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Limits (MHz)	Verdict
IEEE 802.11 b	1	2412	11.09	≥0.5000	PASS
	6	2437	11.11		
	11	2462	11.09		
IEEE 802.11 g	1	2412	16.58	≥0.5000	PASS
	6	2437	16.57		
	11	2462	16.58		
IEEE 802.11 n HT20	1	2412	17.84	≥0.5000	PASS
	6	2437	17.84		
	11	2462	17.83		
IEEE 802.11 n HT40	3	2422	36.51	≥0.5000	PASS
	6	2452	36.51		
	9	2462	36.50		

Remark:
1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20;*
4. *please refer to following plots;*

6 dB Bandwidth	
IEEE 802.11 b	*IEEE 802.11 g*
	
2412 MHz	*2412 MHz*
	
2437 MHz	*2437 MHz*
	
2462 MHz	*2462 MHz*

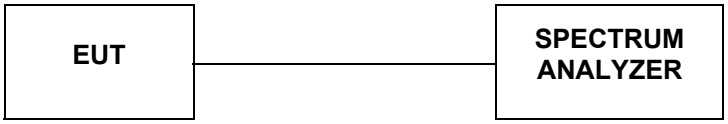
6 dB Bandwidth	
IEEE 802.11 n HT20	IEEE 802.11 n HT40
	
2412 MHz	2422 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2452 MHz

4.10 Band-edge Measurements for Radiated Emissions

TEST REQUIREMENT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 558074 D01 V03 for Antenna-port conducted measurement. Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=10Hz for Peak detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:
    $E = EIRP – 20\log D + 104.8$

where:
E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.

11. Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12. Compare the resultant electric field strength level to the applicable regulatory limit.
13. Perform radiated spurious emission test dures until all measured frequencies were complete.

LIMIT

Below -20dB of the highest emission level in operating band.
Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

TEST RESULTS

IEEE 802.11 b							
Frequency (MHz)	**Conducted Power (dBm)**	**Antenna Gain (dBi)**	**Ground Reflection Factor (dB)**	**Covert Radiated E Level At 3m (dBuV/m)**	**Detector**	**Limit (dBuV/m)**	**Verdict**
2390.000	-50.484	2.00	0.00	46.77	Peak	74.00	PASS
2390.000	-60.804	2.00	0.00	34.45	AV	54.00	PASS
2483.500	-50.127	2.00	0.00	45.13	Peak	74.00	PASS
2483.500	-60.656	2.00	0.00	34.60	AV	54.00	PASS

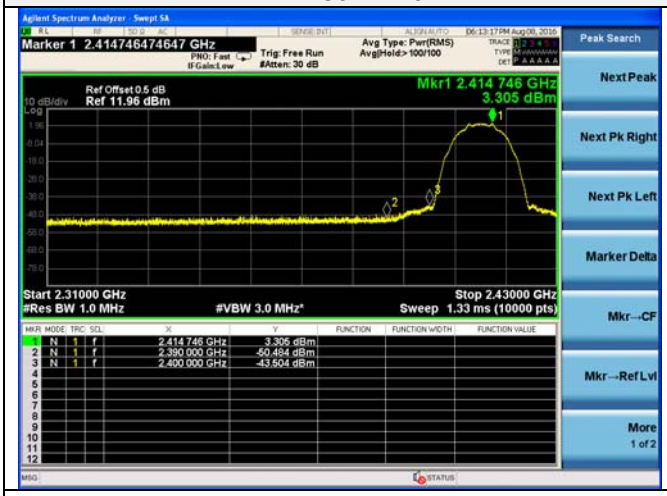
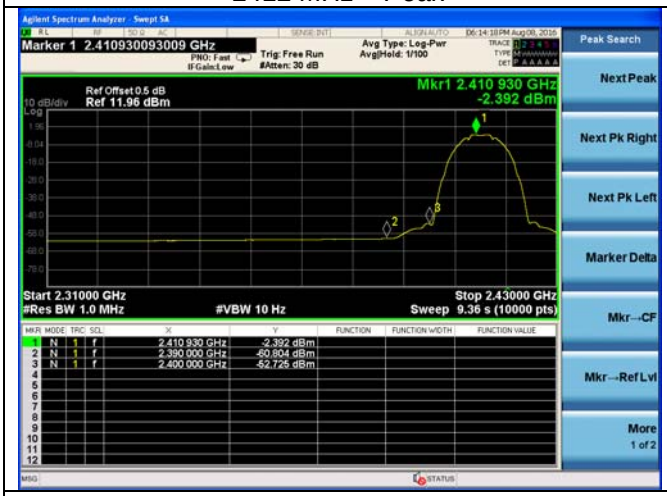
IEEE 802.11 g							
Frequency (MHz)	**Conducted Power (dBm)**	**Antenna Gain (dBi)**	**Ground Reflection Factor (dB)**	**Covert Radiated E Level At 3m (dBuV/m)**	**Detector**	**Limit (dBuV/m)**	**Verdict**
2390.000	-44.191	2.00	0.00	53.07	Peak	74.00	PASS
2390.000	-56.644	2.00	0.00	38.61	AV	54.00	PASS
2483.500	-46.661	2.00	0.00	48.60	Peak	74.00	PASS
2483.500	-57.119	2.00	0.00	38.14	AV	54.00	PASS

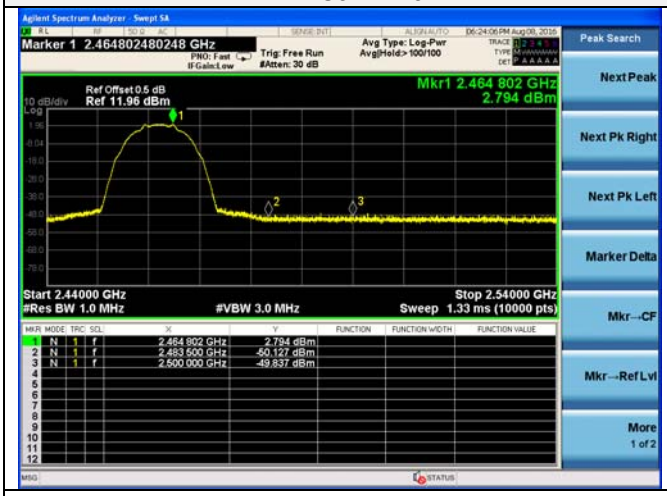
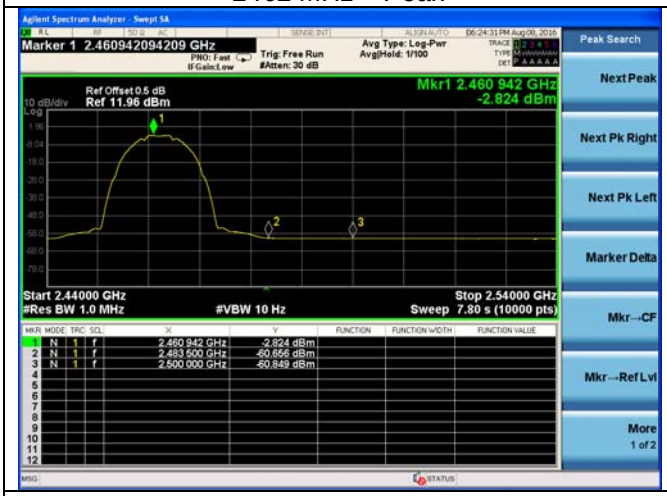
IEEE 802.11n HT20							
Frequency (MHz)	**Conducted Power (dBm)**	**Antenna Gain (dBi)**	**Ground Reflection Factor (dB)**	**Covert Radiated E Level At 3m (dBuV/m)**	**Detector**	**Limit (dBuV/m)**	**Verdict**
2390.000	-40.853	2.00	0.00	56.40	Peak	74.00	PASS
2390.000	-55.274	2.00	0.00	39.98	AV	54.00	PASS
2483.500	-45.941	2.00	0.00	49.32	Peak	74.00	PASS
2483.500	-56.286	2.00	0.00	38.97	AV	54.00	PASS

IEEE 802.11n HT40							
Frequency (MHz)	**Conducted Power (dBm)**	**Antenna Gain (dBi)**	**Ground Reflection Factor (dB)**	**Covert Radiated E Level At 3m (dBuV/m)**	**Detector**	**Limit (dBuV/m)**	**Verdict**
2390.000	-39.414	2.00	0.00	57.84	Peak	74.00	PASS
2390.000	-50.943	2.00	0.00	44.31	AV	54.00	PASS
2483.500	-44.832	2.00	0.00	50.43	Peak	74.00	PASS
2483.500	-55.707	2.00	0.00	39.55	AV	54.00	PASS

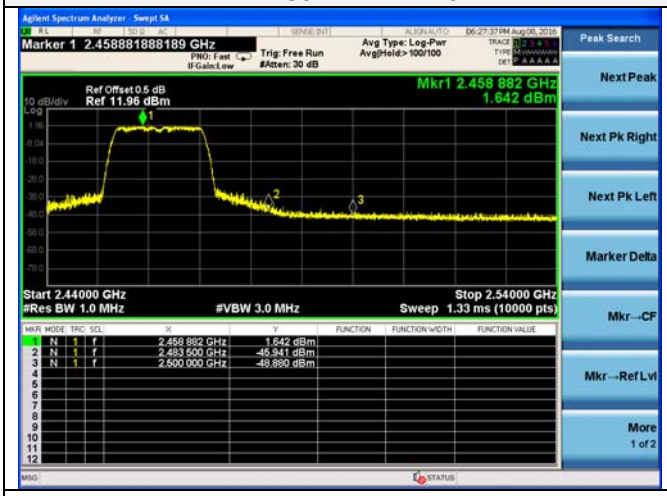
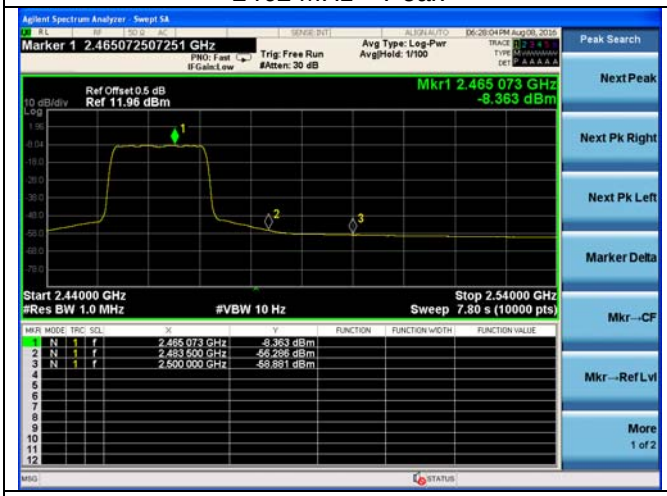
Remark:

1. *Measured output power at difference data rate for each mode and recorded woest case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 1Mbps at IEEE 802.11 b; 6Mbps at IEEE 802.11 g; 6.5Mbps at IEEE 802.11 n HT20; 13.5Mbps at IEEE 802.11 n HT40*
4. *"---" means that the fundamental frequency not for 15.209 limits requirement.*
5. *please refer to following plots;*

Band-edge Measurements for Radiated Emissions	
IEEE 802.11 b	*IEEE 802.11 g*
	
2412 MHz – Peak	*2412 MHz – Peak*
	
2412 MHz – Average	*2412 MHz – Average*

Band-edge Measurements for Radiated Emissions	
IEEE 802.11 b	*IEEE 802.11 g*
	
2462 MHz – Peak	*2462 MHz – Peak*
	
2462 MHz – Average	*2462 MHz – Average*

Band-edge Measurements for Radiated Emissions	
IEEE 802.11 n HT20	*IEEE 802.11 n HT40*
	
2412 MHz – Peak	*2422 MHz – Peak*
	
2412 MHz – Average	*2422 MHz – Average*

Band-edge Measurements for Radiated Emissions	
IEEE 802.11 n HT20	*IEEE 802.11 n HT20*
	
2462 MHz – Peak	*2452 MHz – Peak*
	
2462 MHz – Average	*2452 MHz – Average*

4.11 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.For normal WLAN devices, the DSSS mode is used.

The WLAN and BT share same antenan and maximum antenna gain is 1.0dBi;

Conducted power refer ANSI C63.10 :2013 Section 11.9 Output power test procedure for DTS devices
Radiated power refer to ANSI C63.10 :2013 Section 6.6.4 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

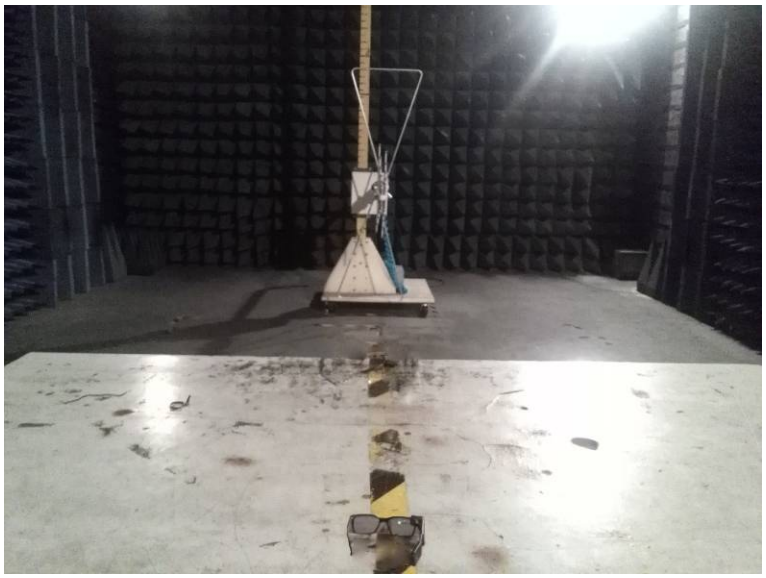
Limits

FCC	IC
Antenna Gain	
6 dBi	

Results

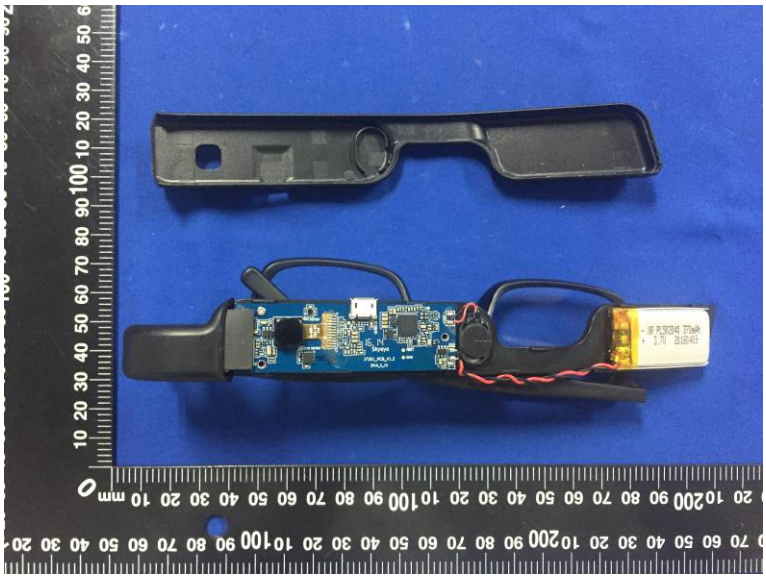
T_{nom}	V_{nom}	Lowest Channel 2412 MHz	Middle Channel 2437 MHz	Highest Channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		7.33	7.59	7.08
Radiated power [dBm] Measured with DSSS modulation		6.57	8.03	7.34
Gain [dBi] Calculated		-0.76	0.44	0.26
Measurement uncertainty		± 0.6 dB (cond.) / ± 2.56 dB (rad.)		

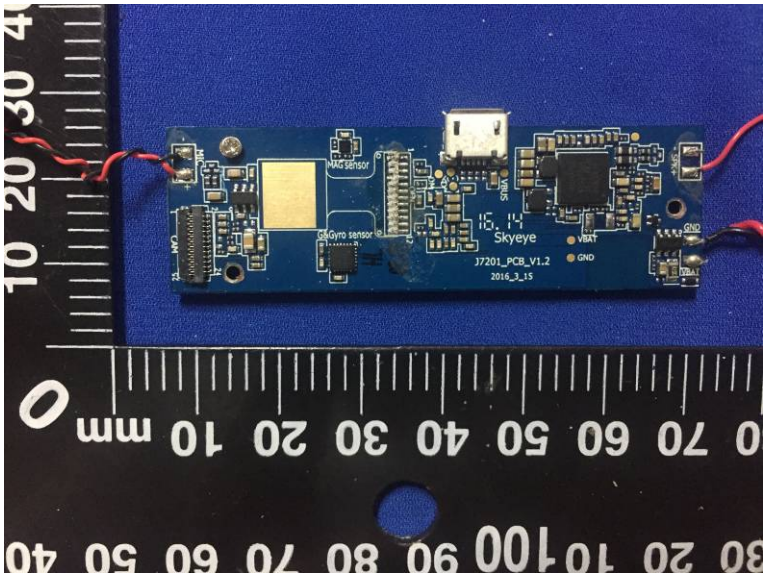
5 Test Setup Photos of the EUT

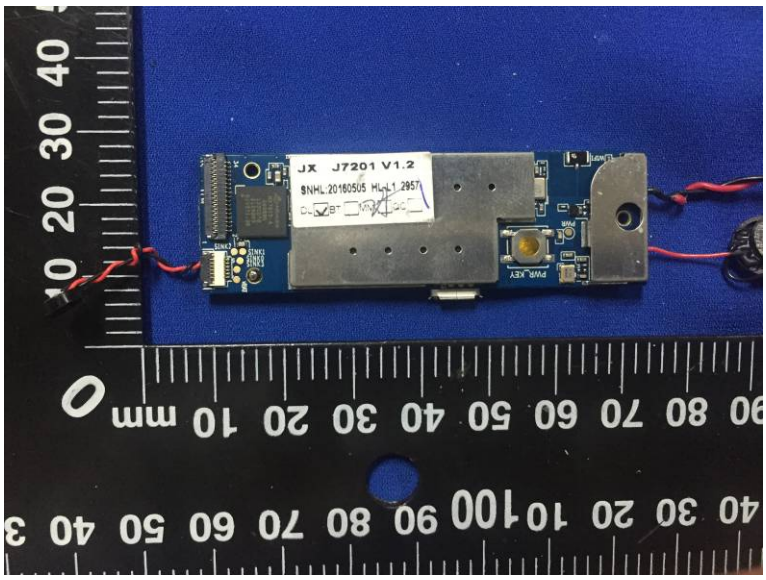


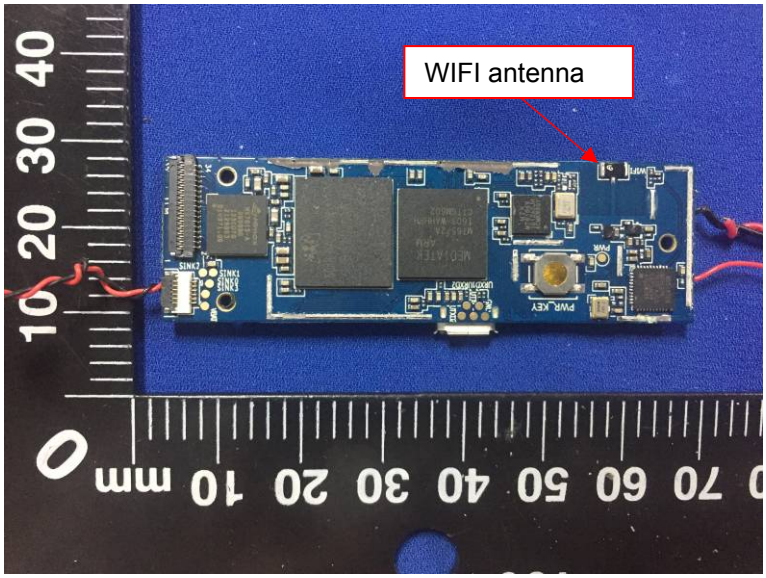
6 External Photos of the EUT

7 Internal Photos of the EUT









.....End of Report.....