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TEST REPORT

FCC PART 15 SUBPART C 15.247 & RSS 247

Report Reference No. .....: **CTL1512213753-WF-01**

Compiled by: (position+printed name+signature)	Jacky Chen (File administrators)	Jacky chen
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Approved by: (position+printed name+signature)	Tracy Qi (Manager)	Tracy Qi

Product Name.....:	Smart home gateway
Model/Type reference .....:	FCL5320
List Model(s).....:	/
Trade Mark.....:	/
FCC ID.....:	2AG9G-FCL5320
Applicant's name .....:	**Flextronics America LLC**
Address of applicant .....:	3300 Holcomb Bridge Rd.Suite #290, Norcross GA 30092 US
Test Firm .....:	**Shenzhen CTL Testing Technology Co., Ltd.**
Address of Test Firm .....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test specification.....:	
Standard.....:	**47 CFR FCC Part 15 Subpart C 15.247 & RSS 247 Issue 1, May 2015**
TRF Originator .....:	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF .....:	Dated 2011-01
Date of Receipt.....:	Dec.22, 2015
Date of Test Date.....:	Dec.23, 2015–Jan. 06, 2016
Data of Issue.....:	Jan. 07, 2016
Result.....:	Positive

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TEST REPORT

Test Report No. :	CTL1512213753-WF-01	Jan. 07, 2016 Date of issue

Equipment under Test	:	Smart home gateway
Model /Type	:	FCL5320
Listed Models	:	/
Applicant	:	**Flextronics America LLC**
Address	:	3300 Holcomb Bridge Rd.Suite #290, Norcross GA 30092 US
Manufacturer	:	**Flextronics Manufacturing (Zhuhai) Co., Ltd.**
Address	:	Xin Qing Science & Technology industrial Park, Jing An Town, Zhuhai, PR China

Test result	Pass *

* In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

** Modified History **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2016-01-07	CTL1512213753-WF-01	Tracy Qi

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1. SUMMARY

1.1. 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

RSS-247-Issue 1: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

RSS-Gen Issue 4: General Requirements for Compliance of Radio Apparatus

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

ANSI C63.4: 2014: –American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz

1.2. Test Description

FCC and IC Requirements		
FCC Part 15.207 RSS-Gen 8.8	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2) RSS 247 5.2 (1)	6dB Bandwidth	PASS
FCC Part 15.247(d) RSS 247 5.5	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b) RSS 247 5.4 (4)	Maximum Conducted Output Power	PASS
FCC Part 15.247(e) RSS 247 5.2 (2)	Power Spectral Density	PASS
FCC Part 15.205/ 15.209 RSS-Gen 8.9	Radiated Emissions	PASS
FCC Part 15.247(d) RSS-Gen 8.10	Band Edge	PASS

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
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 and CISPR 22/EN 55022 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Smart home gateway
Model/Type reference:	FCL5320
Power supply:	AC 120V/60Hz
WIFI	
Supported type:	802.11b&g : SISO mode ； 802.11n(H20)&(H40)： MIMO mode
Modulation:	802.11b: DSSS 802.11g/802.11n(H20)/802.11n(H40): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz 802.11n(H40): 2422MHz~2452MHz
Channel number:	802.11b/802.11g/802.11n(H20): 11 802.11n(H40): 7
Channel separation:	5MHz
Antenna type:	PIFI Antenna
Antenna gain:	1.25dBi （Per ANT）； For MIMO mode directional gain :1.25+10log2=4.26dBi

Note: For more details, refer to the user's manual of the EUT.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

There are 11 channels provided to the EUT of WIFI and Channel 01/06/11 were selected for testing.

Operation Frequency WIFI：

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		

Note: The line display in grey were the channel selected for testing

Data Rate Used:

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

Test Items	Mode	Data Rate	Channel
Maximum Conducted Output Power Power Spectral Density 6dB Bandwidth Spurious RF conducted emission Radiated Emission 9kHz~1GHz& Radiated Emission 1GHz~10th Harmonic	11b/DSSS	1 Mbps	1/6/11
	11g/OFDM	6 Mbps	1/6/11
	11n(20MHz)/OFDM	6.5Mbps	1/6/11
	11n(40MHz)/OFDM	13.5 Mbps	3/6/9
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	6.5Mbps	1/11
	11n(40MHz)/OFDM	13.5 Mbps	3//9

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2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.12	2015/06/02	2016/06/01
LISN	R&S	ESH2-Z5	860014/010	2015/06/02	2016/06/01
Power Meter	Anritsu	ML2487B	110553	2015/06/02	2016/06/01
Power Sensor	Anritsu	MA2411B	100345	2015/05/21	2016/05/20
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2015/06/02	2016/06/01
EMI Test Receiver	R&S	ESCI	103710	2015/06/02	2016/06/01
Spectrum Analyzer	Agilent	E4407B	MY41440676	2015/05/21	2016/05/20
Controller	EM Electronics	Controller EM 1000	N/A	2015/05/21	2016/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2015/05/19	2016/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2015/05/19	2016/05/18
Amplifier	Agilent	8349B	3008A02306	2015/05/19	2016/05/18
Amplifier	Agilent	8447D	2944A10176	2015/05/19	2016/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2015/05/20	2016/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2015/05/20	2016/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2015/05/20	2016/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2015/06/02	2016/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2015/06/02	2016/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2015/06/02	2016/06/01
RF Cable	Megalon	RF-A303	N/A	2015/06/02	2016/06/01

The calibration interval was one year

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID:2AG9G-FCL5320 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

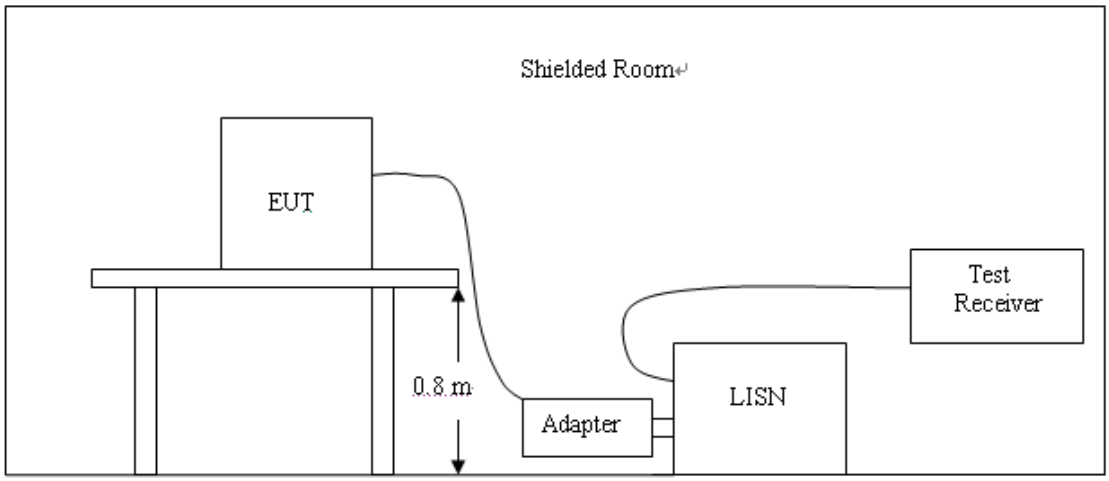
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS–Gen 8.8

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

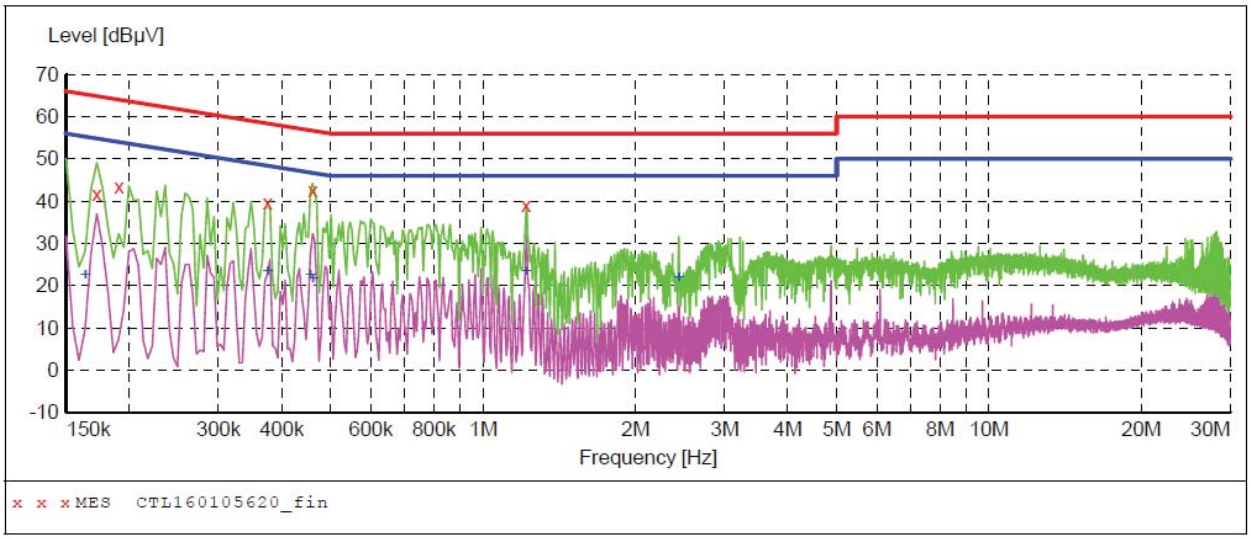
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. 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.

TEST RESULTS

Note: 802.11b /802.11g Ant 1 & ANT 2 mode and 802.11n (H20)/802.11n (H40) keeping MIMO mode all have been tested, only worse case 802.11b ANT 1 mode is reported.

Line:	L

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL160105620_fin"

1/5/2016 9:15PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.172501	41.70	10.2	65	23.1	QP	L1	GND
0.190501	43.40	10.2	64	20.6	QP	L1	GND
0.375001	39.50	10.2	58	18.9	QP	L1	GND
0.460501	42.40	10.2	57	14.3	QP	L1	GND
1.216501	39.10	10.3	56	16.9	QP	L1	GND

MEASUREMENT RESULT: "CTL160105620_fin2"

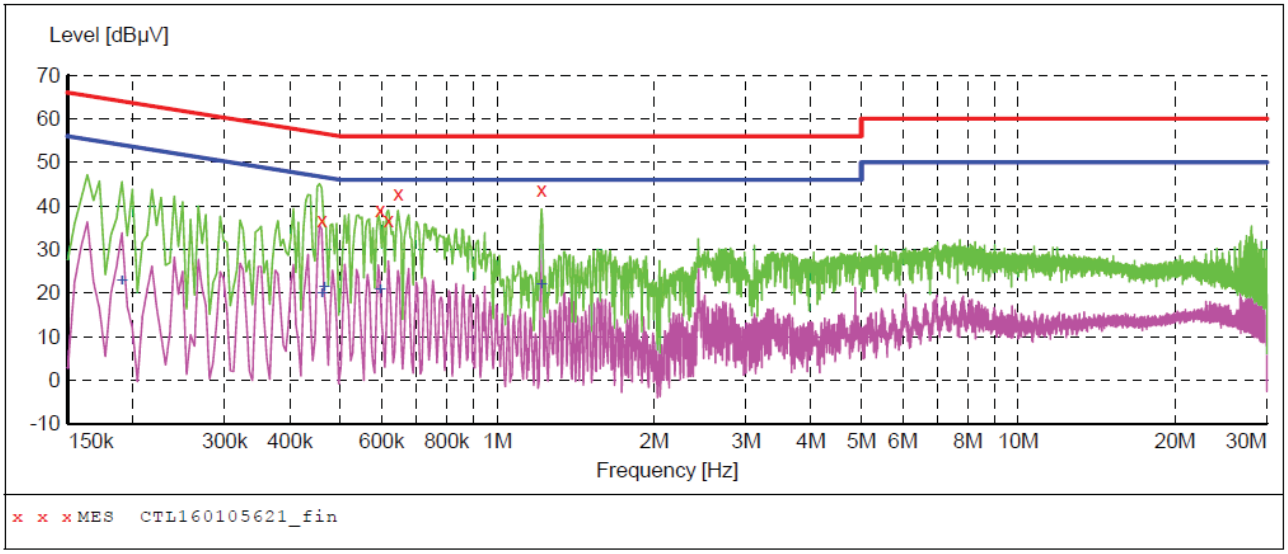
1/5/2016 9:15PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.163501	22.40	10.2	55	32.9	AV	L1	GND
0.375001	23.20	10.2	48	25.2	AV	L1	GND
0.456001	22.30	10.2	47	24.5	AV	L1	GND
0.460501	21.50	10.2	47	25.2	AV	L1	GND
1.216501	23.20	10.3	46	22.8	AV	L1	GND
2.436001	21.90	10.4	46	24.1	AV	L1	GND

Line:	N

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL160105621_fin"

1/5/2016 9:19PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.460501	36.70	10.2	57	20.0	QP	N	GND
0.595501	39.10	10.2	56	16.9	QP	N	GND
0.618001	36.60	10.2	56	19.4	QP	N	GND
0.645001	42.90	10.2	56	13.1	QP	N	GND
1.216501	43.60	10.3	56	12.4	QP	N	GND

MEASUREMENT RESULT: "CTL160105621_fin2"

1/5/2016 9:19PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190501	22.60	10.2	54	31.4	AV	N	GND
0.460501	19.90	10.2	47	26.8	AV	N	GND
0.465001	21.30	10.2	47	25.3	AV	N	GND
0.595501	20.60	10.2	46	25.4	AV	N	GND
1.216501	21.70	10.3	46	24.3	AV	N	GND

3.2. Radiated Emissions and Band Edge

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)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission

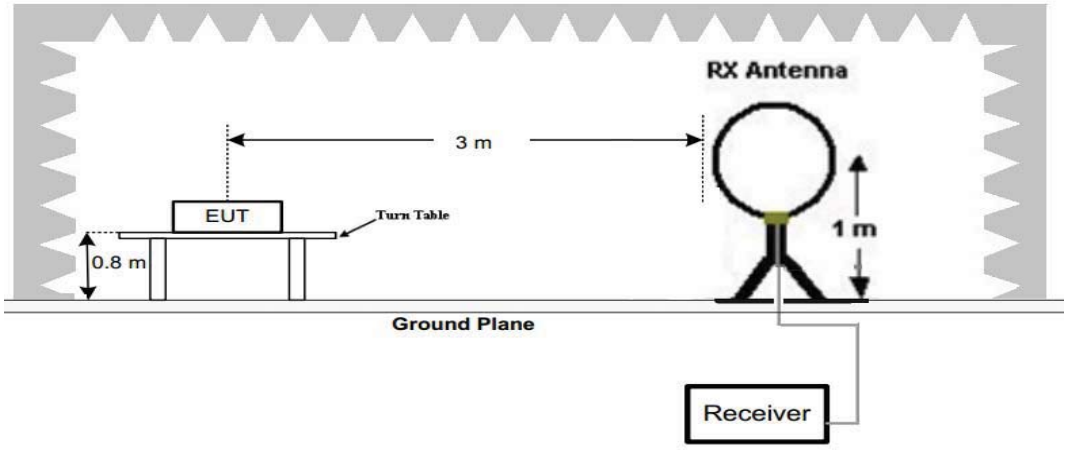
Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and Unwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Radiated emission limits

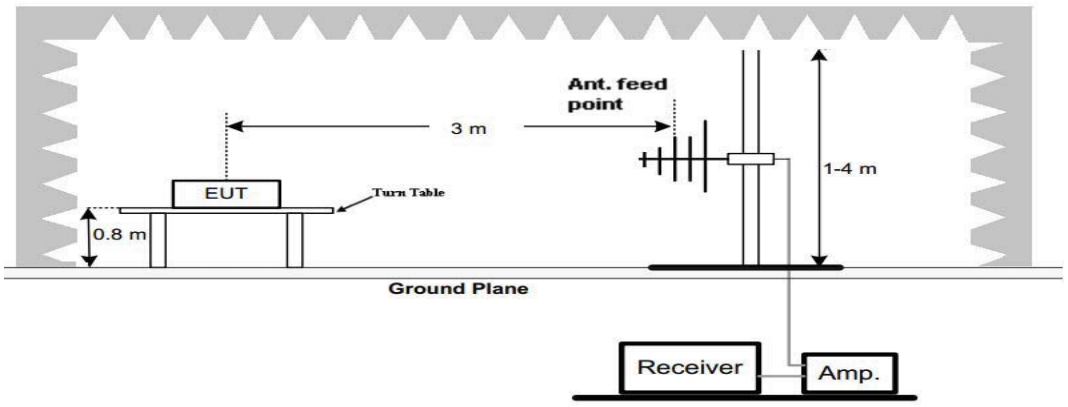
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

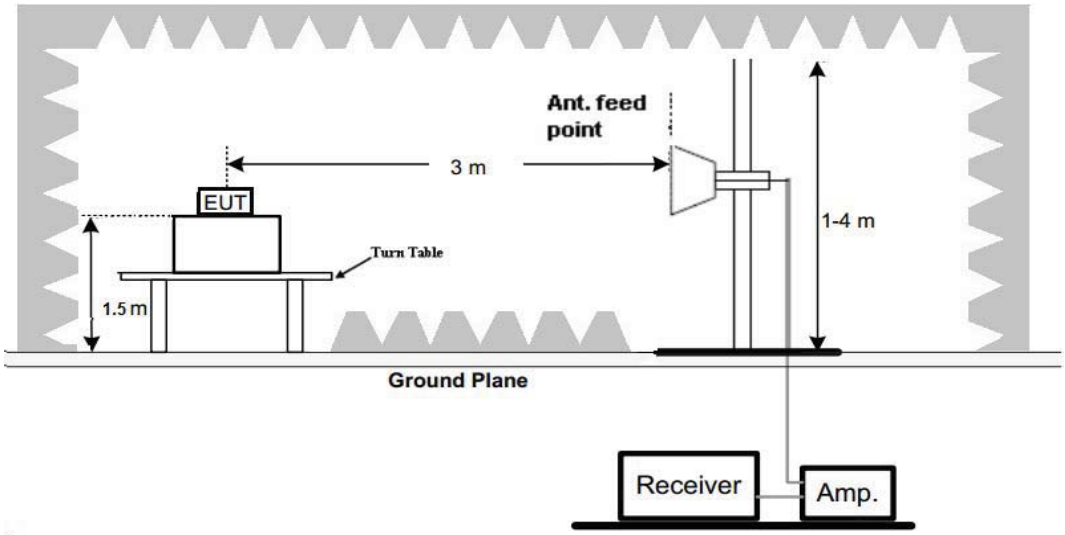
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
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.

TEST RESULTS

Remark:
1. We tested three channels (lowest/middle/highest) of each mode and recorded worst case for measurement below 1GHz.
2. For WIFI test we tested three channels (lowest/middle/highest) of each mode and recorded worst case at 802.11b mode above 1GHz.

For 9 KHz-30MHz

WIFI

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Result
0.16	55.78	103.52	47.74	PK	PASS
1.49	43.86	64.14	20.28	QP	PASS
15.75	52.54	69.54	17.00	QP	PASS
25.42	51.32	69.54	18.22	QP	PASS

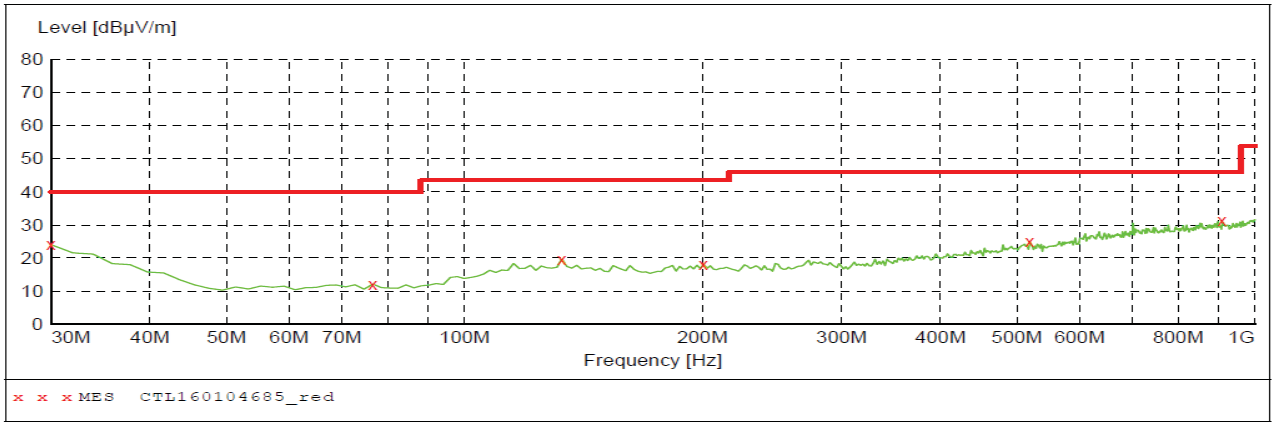
Note: 802.11b /802.11g Ant 1 & ANT 2 mode and 802.11n (H20)/802.11n (H40) keeping MIMO mode all have been tested, only worse case 802.11b ANT 1 mode is reported.

Note: 802.11b /802.11g Ant 1 & ANT 2 mode and 802.11n (H20)/802.11n (H40) keeping MIMO mode all have been tested, only worse case 802.11b ANT 1 mode is reported.

Test mode:	WIFI	Polarization:	Horizontal

SWEEP TABLE: "test (30M-1G)"

Short Description: Start Frequency	Stop Frequency	Detector	Field Strength Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL160104685_red"

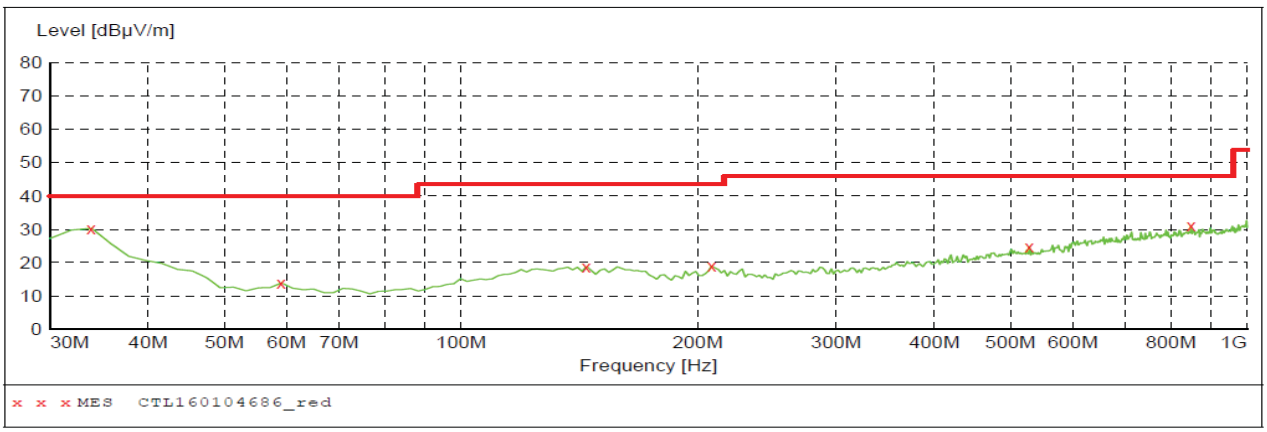
1/5/2016 9:44PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.00	20.8	40.0	16.0	---	0.0	0.00	HORIZONTAL
76.560000	12.10	8.3	40.0	27.9	---	0.0	0.00	HORIZONTAL
132.820000	19.70	14.4	43.5	23.8	---	0.0	0.00	HORIZONTAL
200.720000	18.10	14.1	43.5	25.4	---	0.0	0.00	HORIZONTAL
518.880000	25.00	20.3	46.0	21.0	---	0.0	0.00	HORIZONTAL
908.820000	31.40	26.1	46.0	14.6	---	0.0	0.00	HORIZONTAL

Test mode:	WIFI	Polarization:	Vertical

SWEEP TABLE: "test (30M-1G)"

Short Description: Start Frequency	Stop Frequency	Detector	Field Strength Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL160104686_red"

1/5/2016 9:45PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
33.880000	30.30	17.7	40.0	9.7	---	0.0	0.00	VERTICAL
59.100000	13.90	8.0	40.0	26.1	---	0.0	0.00	VERTICAL
144.460000	18.80	14.1	43.5	24.7	---	0.0	0.00	VERTICAL
208.480000	19.00	14.0	43.5	24.5	---	0.0	0.00	VERTICAL
528.580000	24.80	20.4	46.0	21.2	---	0.0	0.00	VERTICAL
848.680000	31.00	25.2	46.0	15.0	---	0.0	0.00	VERTICAL

For 1GHz to 25GHz

Note: 802.11b /802.11g Ant 1 & ANT 2 mode and 802.11n (H20)/802.11n (H40) keeping MIMO mode all have been tested, only worse case 802.11b ANT 1 mode is reported.

802.11b Mode (above 1GHz)

Frequency(MHz):				2412		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission 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	2412.00	101.58	PK	--	--	68.16	28.80	4.62	0.00	33.42
1	2412.00	90.57	AV	--	--	57.15	28.80	4.62	0.00	33.42
2	2390.00	39.85	PK	74	34.15	6.53	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54	--	--	--	--	--	--
3	2400.00	51.26	PK	74	22.74	17.87	28.78	4.61	0.00	33.39
3	2400.00	--	AV	54	--	--	--	--	--	--
4	4824.00	67.44	PK	74	6.56	62.89	33.52	6.92	35.89	4.55
4	4824.00	52.14	AV	54	1.86	47.59	33.52	6.92	35.89	4.55
5	5125.50	48.55	PK	74	25.45	41.34	34.38	7.10	34.28	7.21
5	5125.50	--	AV	54	--	--	--	--	--	--
6	7236.00	67.25	PK	74	6.75	55.98	37.10	9.19	35.02	11.27
6	7236.00	52.20	AV	54	1.8	40.93	37.10	9.19	35.02	11.27

Frequency(MHz):				2412		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission 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	2412.00	101.65	PK	--	--	68.23	28.80	4.62	0.00	33.42
1	2412.00	90.98	AV	--	--	57.56	28.80	4.62	0.00	33.42
2	2390.00	39.96	PK	74	34.04	6.64	28.72	4.60	0.00	33.32
2	2390.00	--	AV	54	--	--	--	--	--	--
3	2400.00	52.35	PK	74	21.65	18.96	28.78	4.61	0.00	33.39
3	2400.00	--	AV	54	--	--	--	--	--	--
4	4824.00	66.58	PK	74	7.42	62.03	33.52	6.92	35.89	4.55
4	4824.00	51.48	AV	54	2.52	46.93	33.52	6.92	35.89	4.55
5	5113.75	49.51	PK	74	24.49	42.33	34.36	7.10	34.27	7.18
5	5113.75	--	AV	54	--	--	--	--	--	--
6	7236.00	67.52	PK	74	6.48	56.25	37.10	9.19	35.02	11.27
6	7236.00	52.53	AV	54	1.47	41.26	37.10	9.19	35.02	11.27

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. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

Frequency(MHz):				2437		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission 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	2437.00	102.41	PK	--	--	68.91	28.85	4.65	0.00	33.50
1	2437.00	91.54	AV	--	--	58.04	28.85	4.65	0.00	33.50
2	4015.50	49.65	PK	74	24.35	44.97	33.07	6.40	34.79	4.68
2	4015.50	--	AV	54	--	--	--	--	--	--
3	4874.00	67.54	PK	74	6.46	61.30	33.59	6.95	34.30	6.24
3	4874.00	51.63	AV	54	2.37	45.39	33.59	6.95	34.30	6.24
4	5525.60	50.23	PK	74	23.77	42.08	34.76	7.33	33.93	8.15
4	5525.60	--	AV	54	--	--	--	--	--	--
5	7311.00	66.32	PK	74	7.68	54.66	37.44	9.22	35.00	11.66
5	7311.00	50.10	AV	54	3.9	38.44	37.44	9.22	35.00	11.66

Frequency(MHz):				2437		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission 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	2437.00	102.55	PK	--	--	69.05	28.85	4.65	0.00	33.50
1	2437.00	91.63	AV	--	--	58.13	28.85	4.65	0.00	33.50
2	3895.50	49.74	PK	74	24.26	45.04	33.29	6.29	34.87	4.70
2	3895.50	--	AV	54	--	--	--	--	--	--
3	4874.00	66.86	PK	74	7.14	60.52	33.59	6.95	34.20	6.34
3	4874.00	50.41	AV	54	3.59	44.07	33.59	6.95	34.20	6.34
4	5150.25	49.65	PK	74	24.35	42.24	34.44	7.12	34.14	7.41
4	5150.25	--	AV	54	--	--	--	--	--	--
5	7311.00	66.41	PK	74	7.59	54.75	37.44	9.22	35.00	11.66
5	7311.00	49.88	AV	54	4.12	38.22	37.44	9.22	35.00	11.66

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. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

Frequency(MHz):				2462		Polarity:			HORIZONTAL	
No.	Frequency (MHz)	Emission 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	2462.00	101.33	PK	--	--	67.76	28.89	4.68	0.00	33.57
1	2462.00	90.41	AV	--	--	56.84	28.89	4.68	0.00	33.57
2	2483.50	51.26	PK	74	22.74	17.63	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54	--	--	--	--	--	--
3	2500.00	40.21	PK	74	33.79	6.53	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54	--	--	--	--	--	--
4	4924.00	66.25	PK	74	7.75	61.47	33.71	6.98	35.91	4.78
4	4924.00	51.22	AV	54	2.78	46.44	33.71	6.98	35.91	4.78
5	5150.75	49.36	PK	74	24.64	42.09	34.44	7.12	34.28	7.27
5	5150.75	--	AV	54	--	--	--	--	--	--
6	7386.00	65.56	PK	74	8.44	53.68	37.61	9.25	34.98	11.88
6	7386.00	50.44	AV	54	3.56	38.56	37.61	9.25	34.98	11.88

Frequency(MHz):				2462		Polarity:			VERTICAL	
No.	Frequency (MHz)	Emission 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	2462.00	101.55	PK	--	--	67.98	28.89	4.68	0.00	33.57
1	2462.00	90.15	AV	--	--	56.58	28.89	4.68	0.00	33.57
2	2483.50	50.12	PK	74	23.88	16.49	28.93	4.70	0.00	33.63
2	2483.50	--	AV	54	--	--	--	--	--	--
3	2500.00	39.65	PK	74	34.35	5.97	28.96	4.72	0.00	33.68
3	2500.00	--	AV	54	--	--	--	--	--	--
4	4924.00	66.47	PK	74	7.53	61.69	33.71	6.98	35.91	4.78
4	4924.00	50.25	AV	54	3.75	45.47	33.71	6.98	35.91	4.78
5	5211.50	48.65	PK	74	25.35	41.26	34.55	7.15	34.31	7.39
5	5211.50	--	AV	54	--	--	--	--	--	--
6	7386.00	65.45	PK	74	8.55	53.57	37.61	9.25	34.98	11.88
6	7386.00	50.15	AV	54	3.85	38.27	37.61	9.25	34.98	11.88

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. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

3.3. Maximum Conducted Output Power

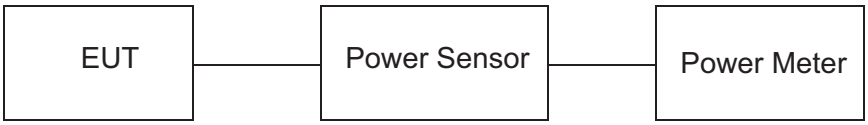
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

WIFI

Type	Channel	Output power Ant1 (dBm)	Output power Ant2 (dBm)	Output power Total (dBm)	Limit (dBm)	Result
802.11b	01	20.24	21.12	/	30.00	Pass
	06	20.43	21.25	/		
	11	20.83	21.46	/		
802.11g	01	21.67	22.85	/	30.00	Pass
	06	21.66	22.95	/		
	11	21.86	23.24	/		
802.11n(HT20) MIMO	01	20.61	21.82	24.27	30.00	Pass
	06	20.66	21.85	24.31		
	11	20.86	21.92	24.43		
802.11n(HT40) MIMO	03	20.25	21.18	23.75	30.00	Pass
	06	20.04	21.77	24.00		
	09	20.62	21.37	24.02		

Note: 1.The test results including the cable lose.

3.4. Power Spectral Density

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 Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW ≥ 3× RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
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 power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

Test Configuration

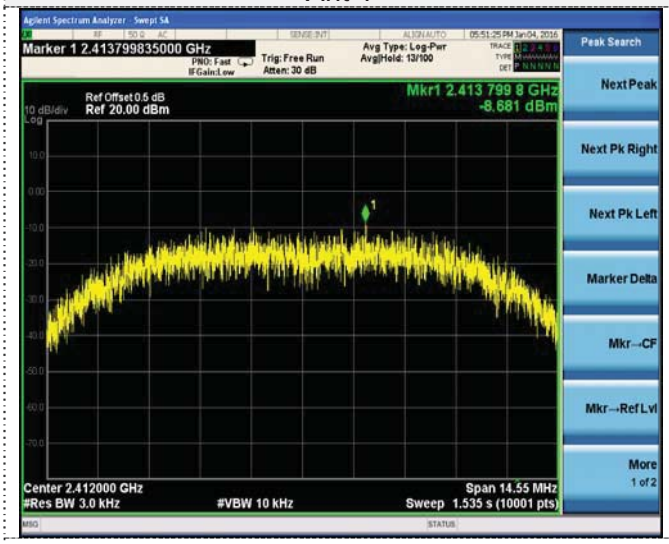
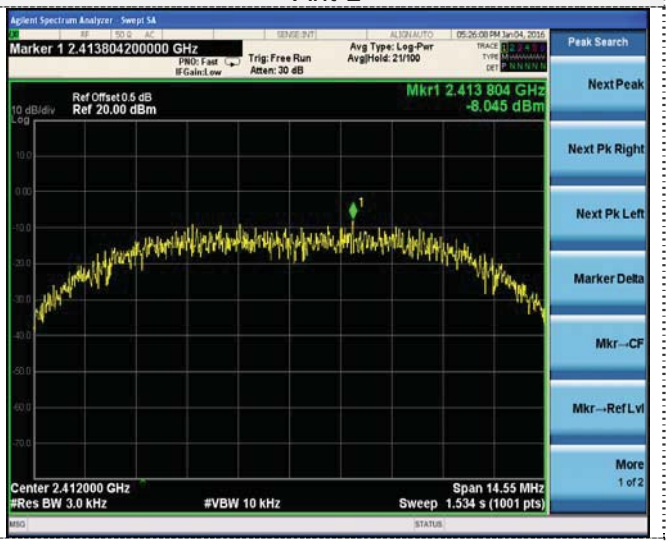
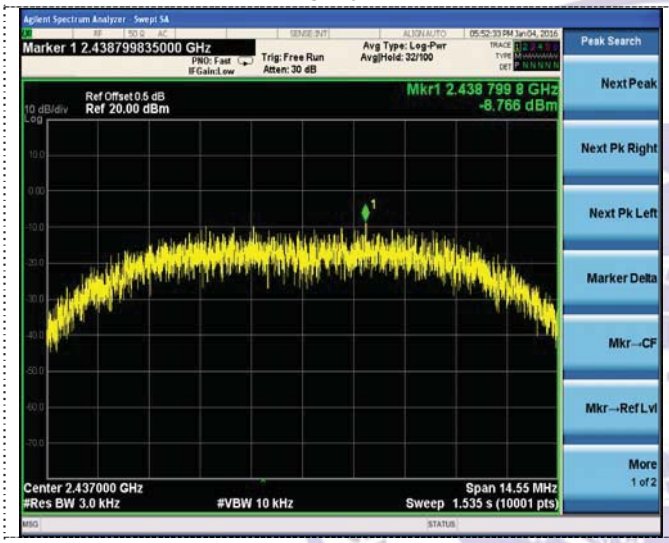
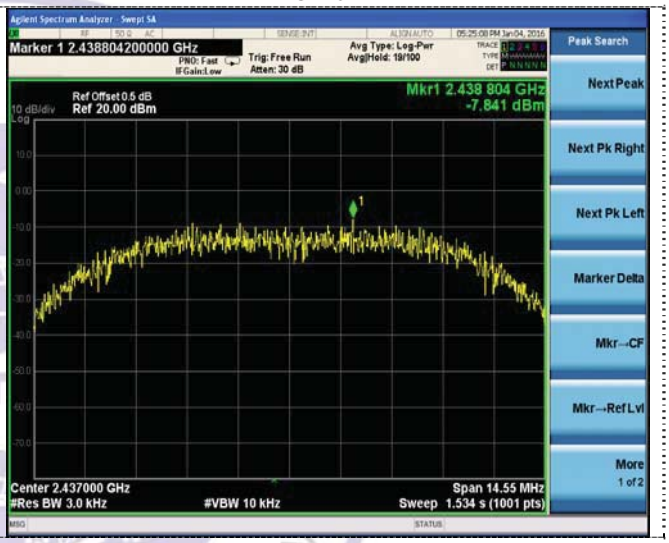
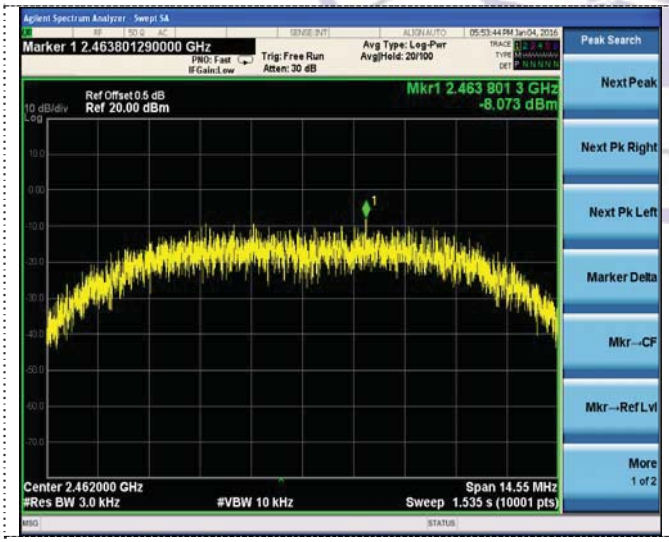
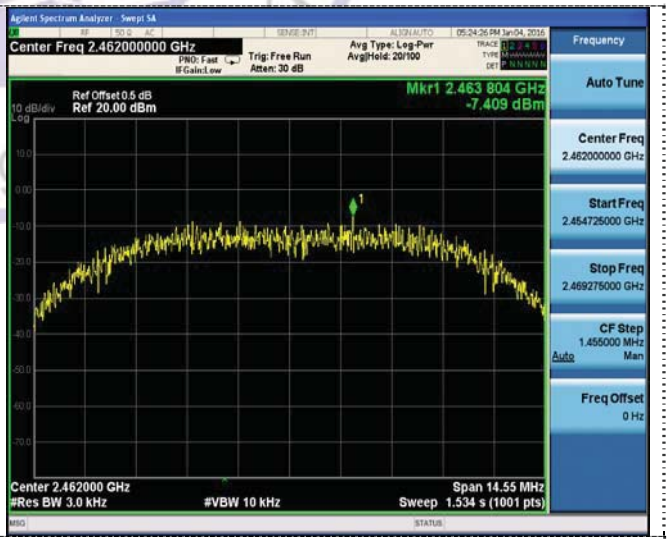
Test Results

WIFI

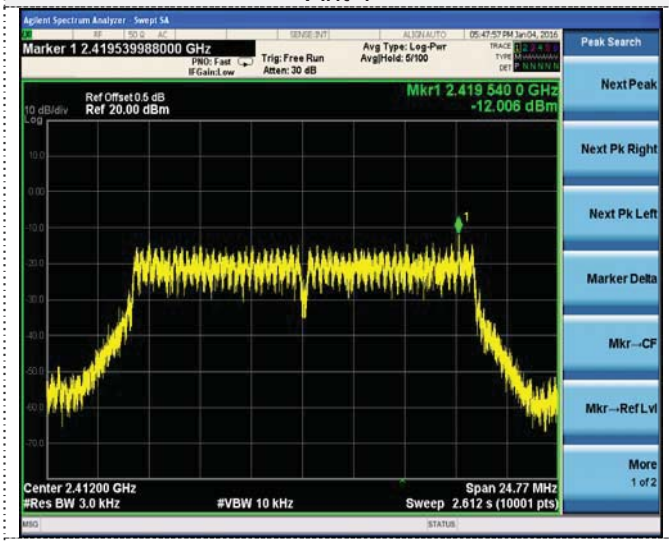
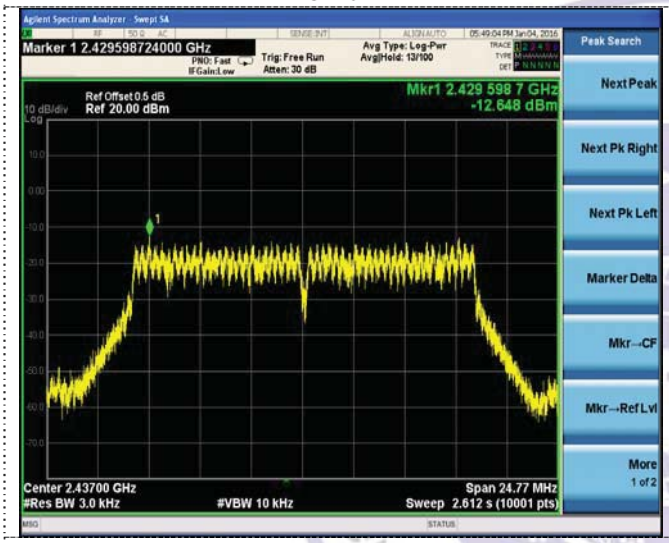
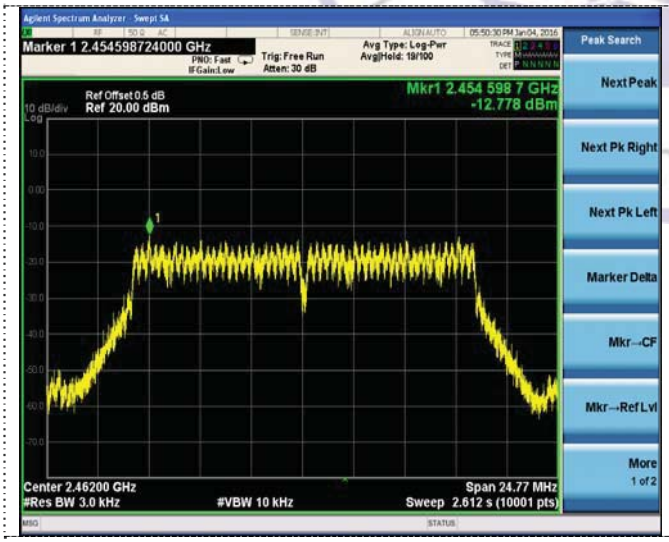
Type	Channel	Power Spectral Density Ant1 (dBm/3KHz)	Power Spectral Density Ant2 (dBm/3KHz)	Power Spectral Density Total (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	01	-8.681	-8.045	/	8.00	Pass
	06	-8.766	-7.841	/		
	11	-8.073	-7.409	/		
802.11g	01	-12.006	-12.646	/	8.00	Pass
	06	-12.648	-10.504	/		
	11	-12.778	-11.389	/		
802.11n(HT20) MIMO	01	-13.784	-13.312	-10.53	8.00	Pass
	06	-13.954	-13.271	-10.59		
	11	-13.794	-12.691	-10.20		
802.11n(HT40) MIMO	03	-17.613	-17.850	-14.72	8.00	Pass
	06	-18.255	-17.016	-14.58		
	09	-18.099	-18.223	-15.15		

Test plot as follows:

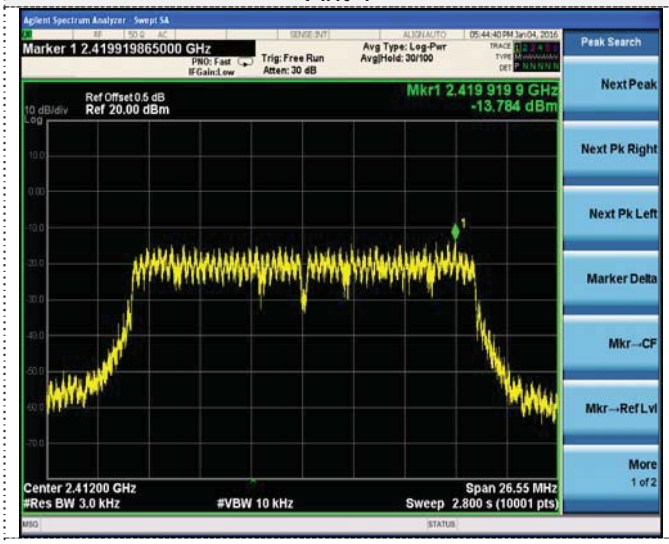
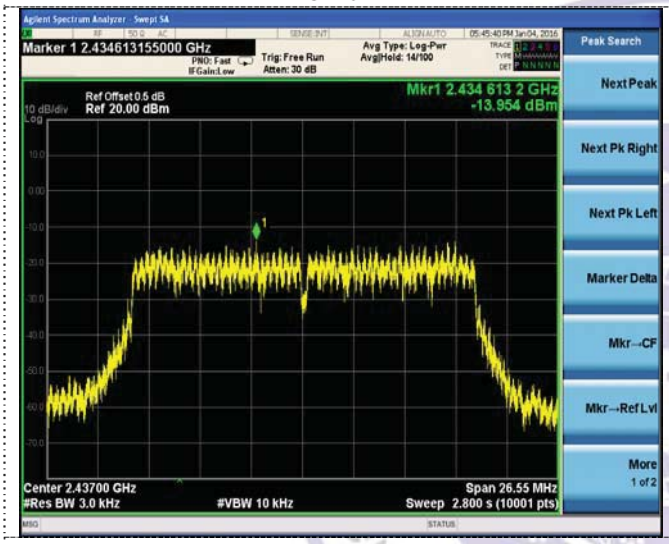
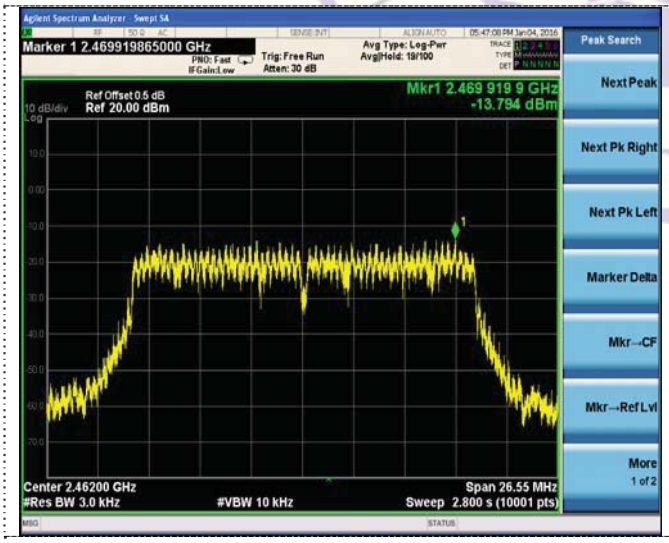
802.11b

Ant 1	Ant 2
	
CH01	CH01
	
CH06	CH06
	
CH11	CH11

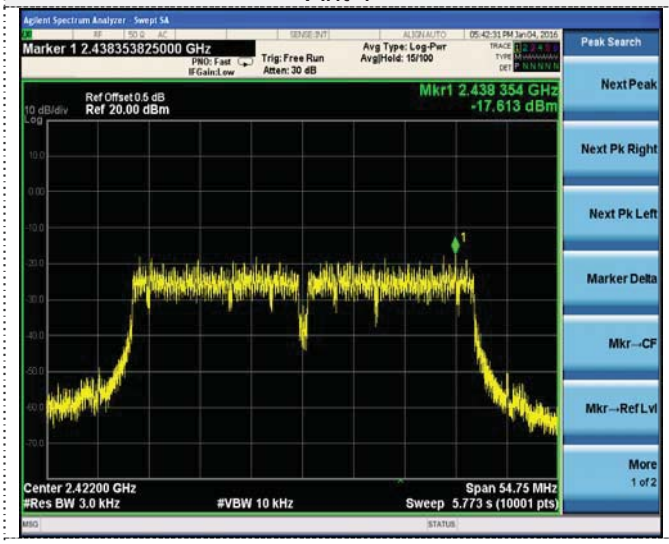
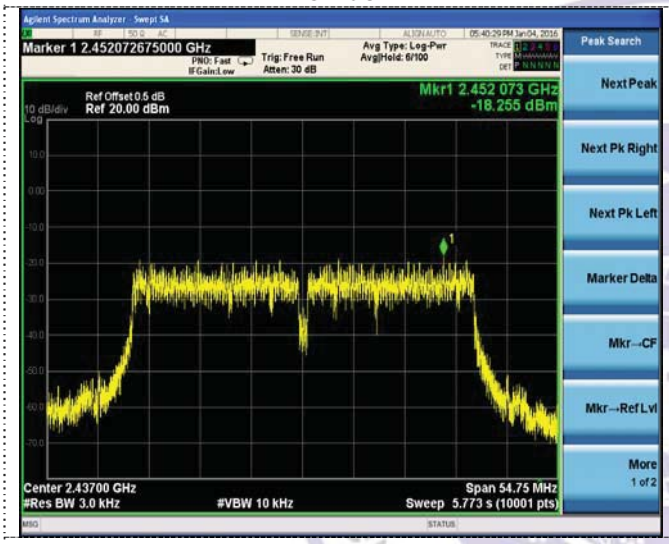
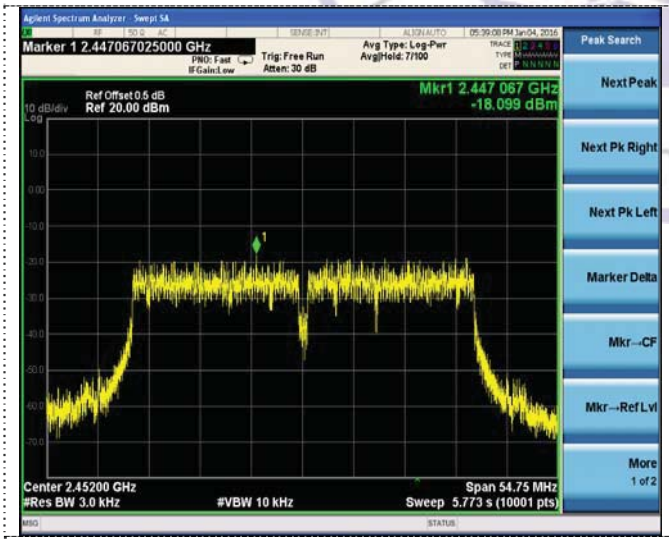
802.11g

Ant 1	*Ant 2*
	
CH01	*CH01*
	
CH06	*CH06*
	
CH11	*CH11*

802.11n(HT20)

Ant 1	Ant 2
	
CH01	CH01
	
CH06	CH06
	
CH11	CH11

802.11n(HT40)

Ant 1	Ant 2
	
CH03	CH03
	
CH06	CH06
	
CH09	CH09

3.5. 6dB Bandwidth

Limit

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

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 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Test Configuration

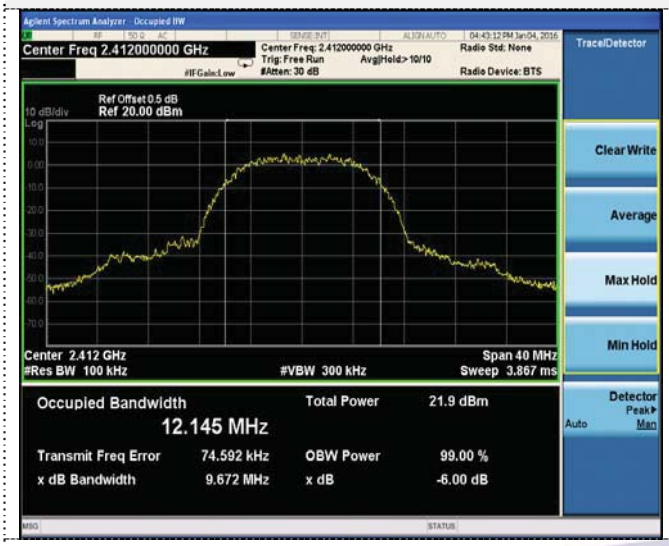
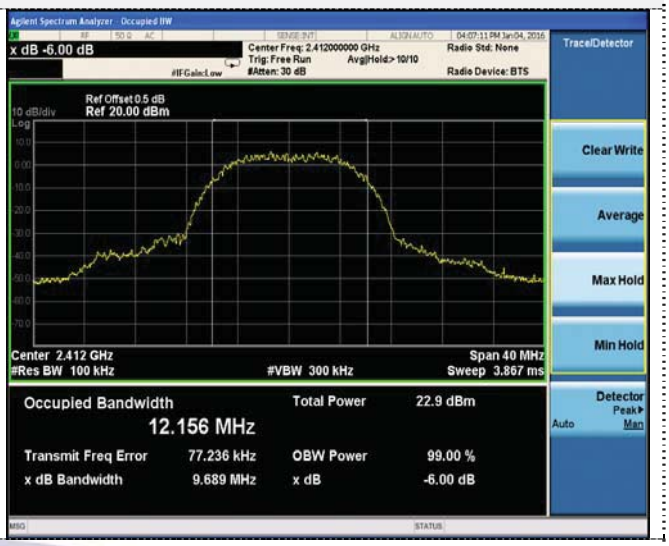
Test Results

WIFI

Type	Channel	6dB Bandwidth Ant1 (MHz)	6dB Bandwidth Ant2 (MHz)	Limit (KHz)	Result
802.11b	01	9.672	9.689	≥500	Pass
	06	9.138	9.656		
	11	9.660	9.660		
802.11g	01	16.51	16.44	≥500	Pass
	06	16.50	16.45		
	11	16.49	16.47		
802.11n(HT20)	01	17.67	17.67	≥500	Pass
	06	17.67	17.66		
	11	17.67	17.61		
802.11n(HT40)	03	36.43	36.43	≥500	Pass
	06	36.47	36.44		
	09	36.45	36.44		

Test plot as follows:

802.11b

Ant1	Ant2
	
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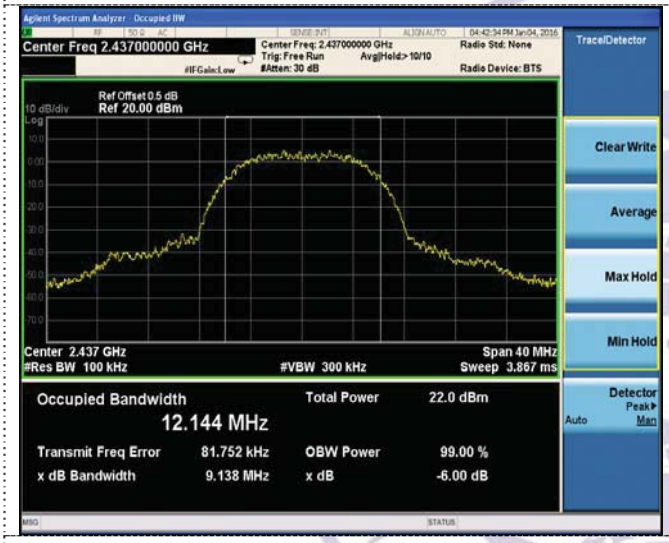
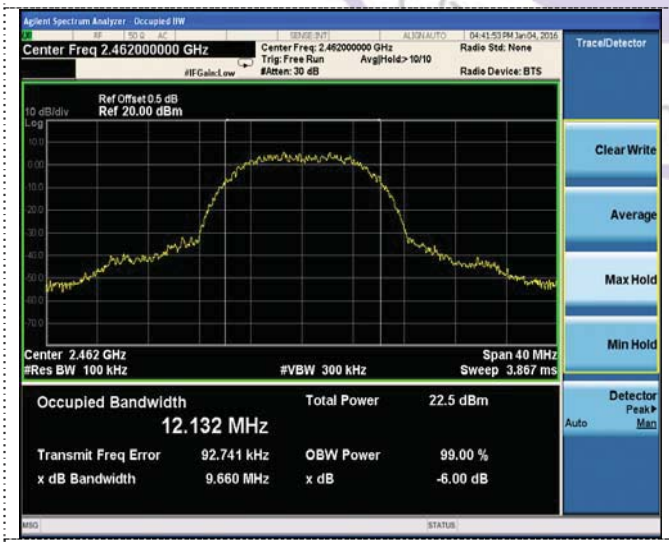
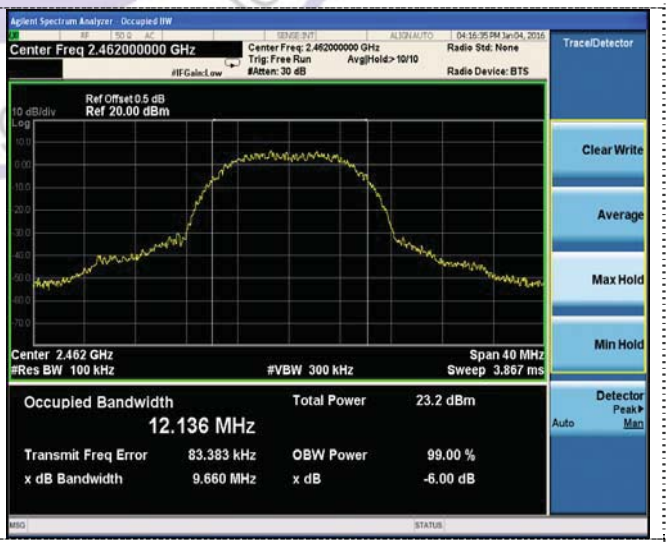
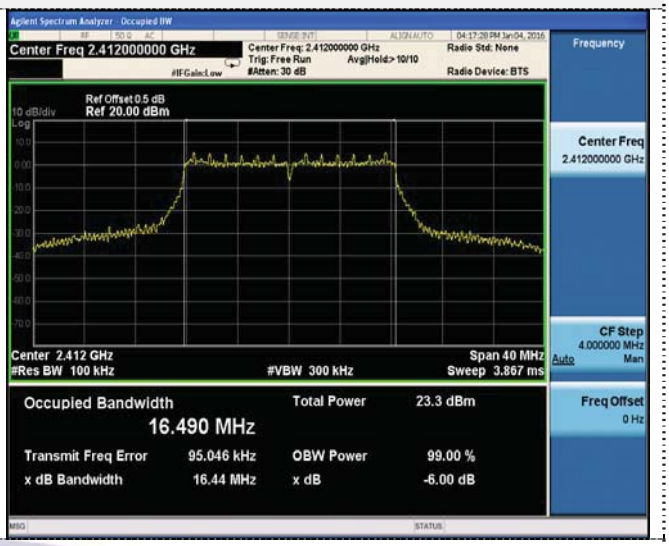
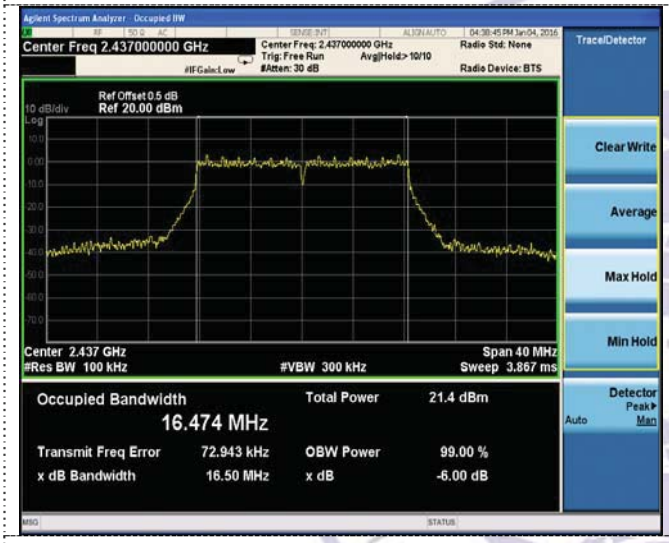
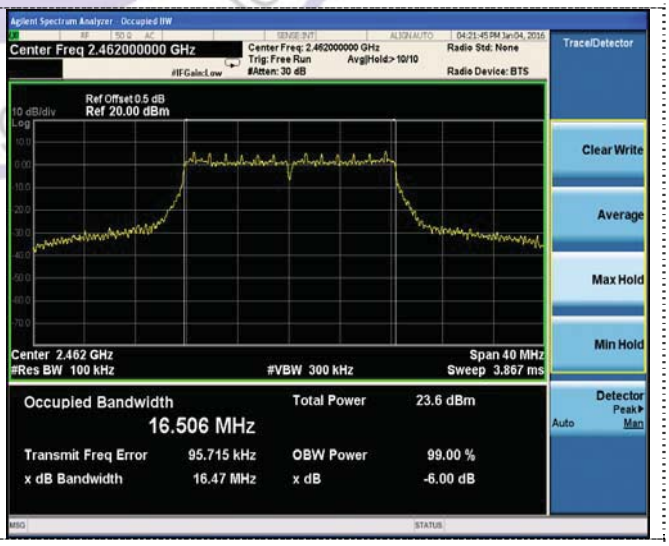
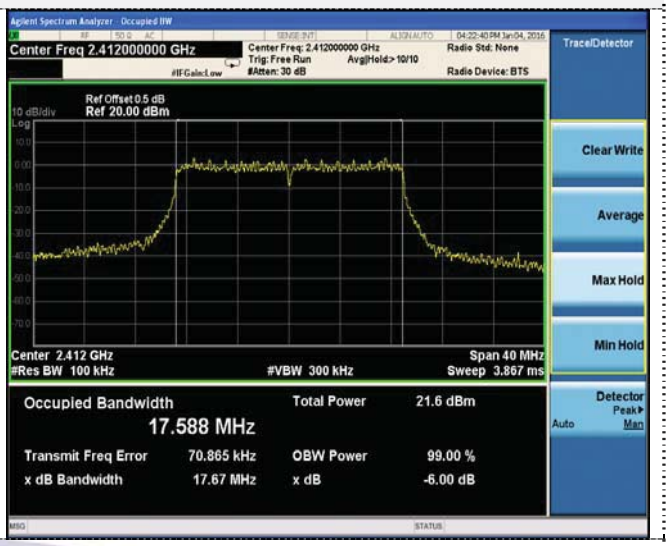
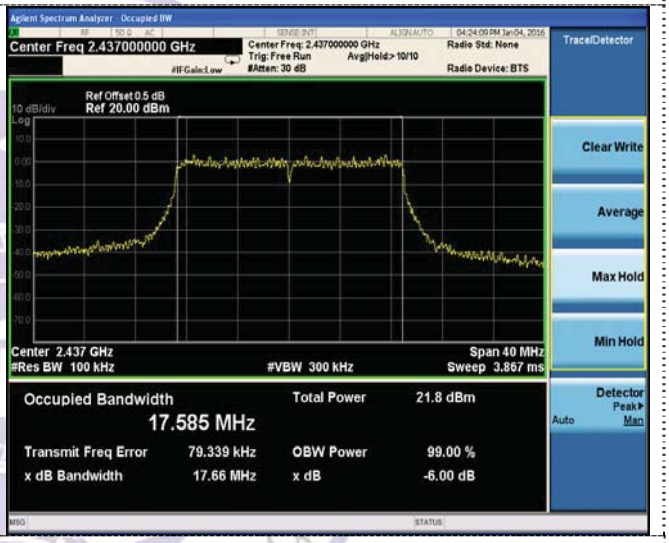
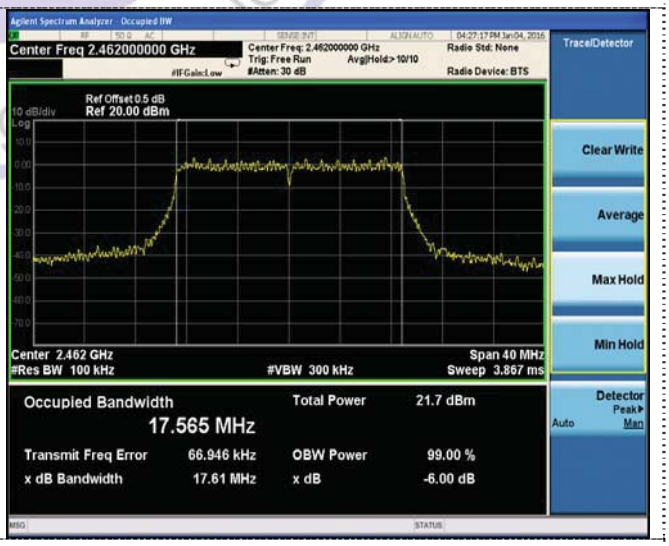
	
CH06	CH06
	
CH11	CH11

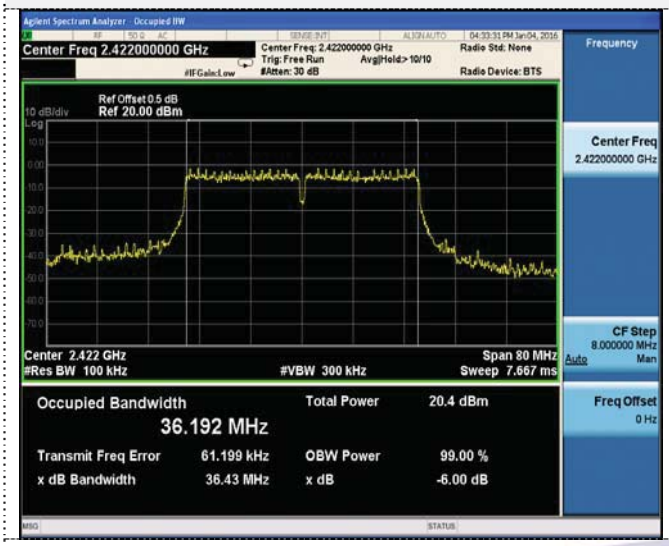
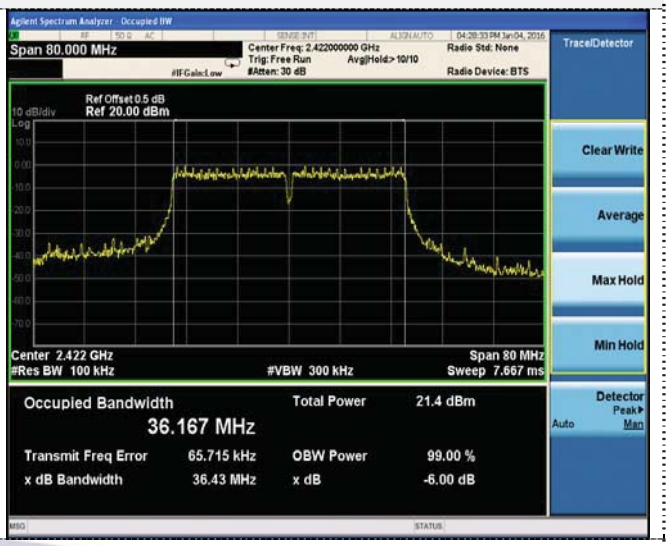
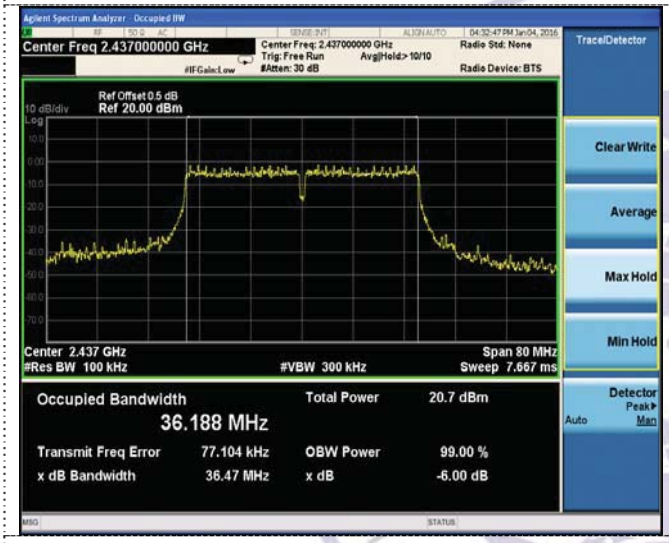
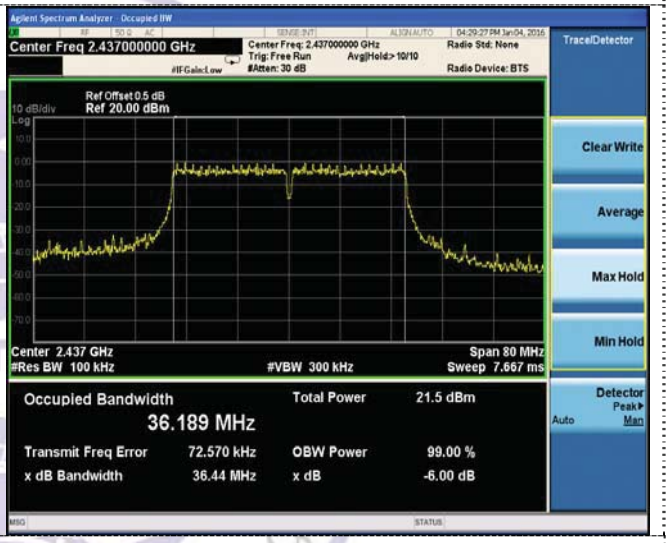
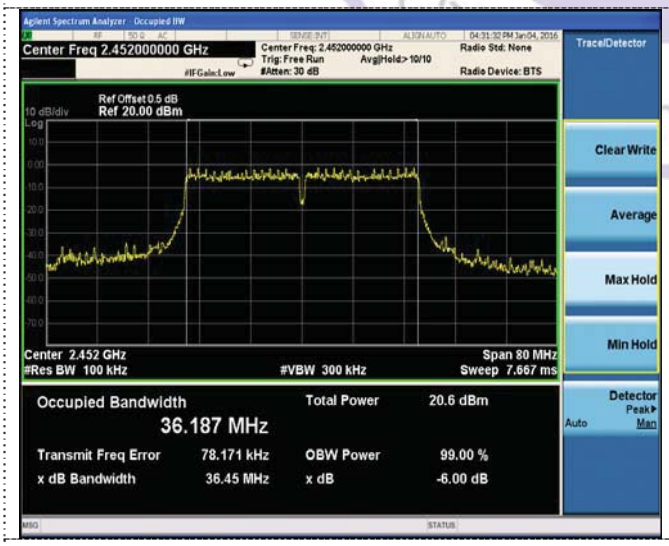
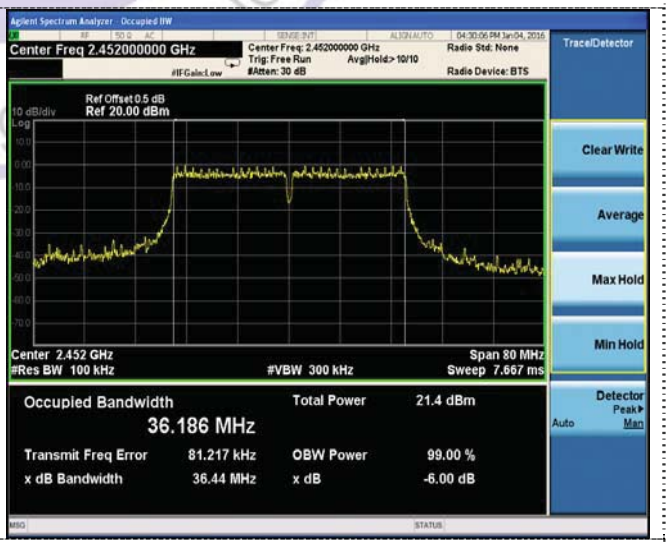
802.11g

Ant1	*Ant2*
	
CH01	*CH01*
	
CH06	*CH06*
	
CH11	*CH11*

802.11n(HT20)

Ant1	*Ant2*
	
CH01	*CH01*
	
CH06	*CH06*
	
CH11	*CH11*

802.11n(HT40)

Ant1	*Ant2*
	
CH01	*CH01*
	
CH06	*CH06*
	
CH11	*CH11*

3.6. Out-of-band Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section (b)(3) of §15.247 and RSS 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in §15.209(a) and RSS-Gen are not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration

Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Test plot as follows:

Ant1

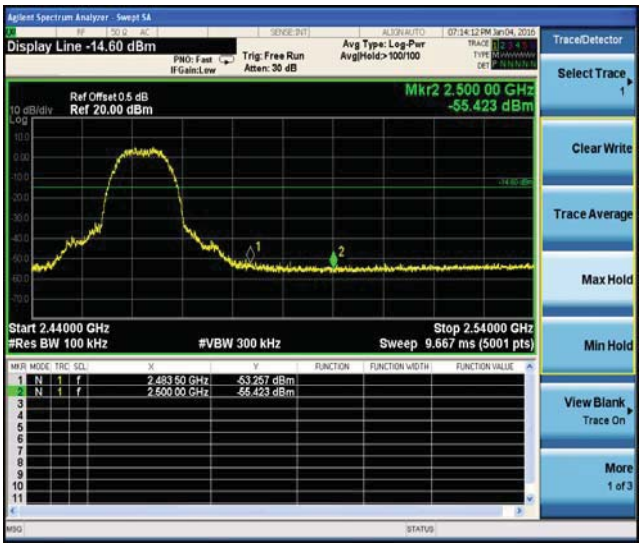
802.11b

CH01

CH06

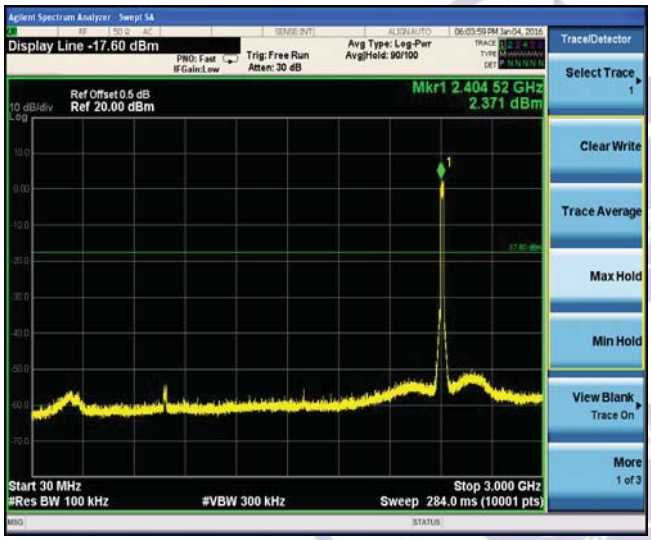
CH11

Left Band edge

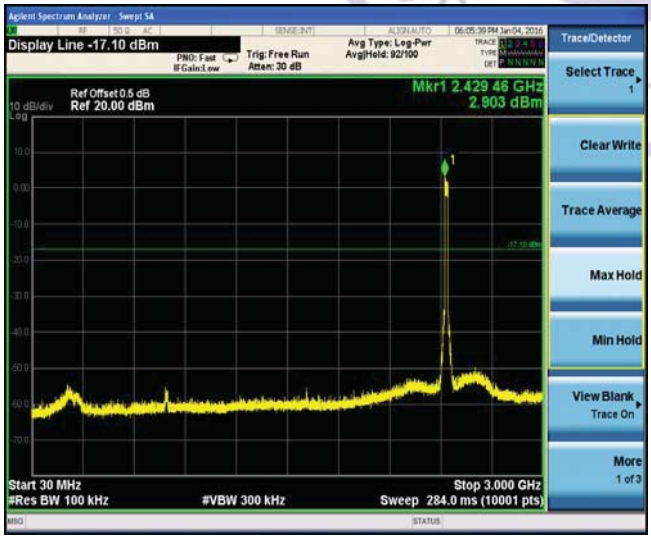


Right Band edge

802.11g



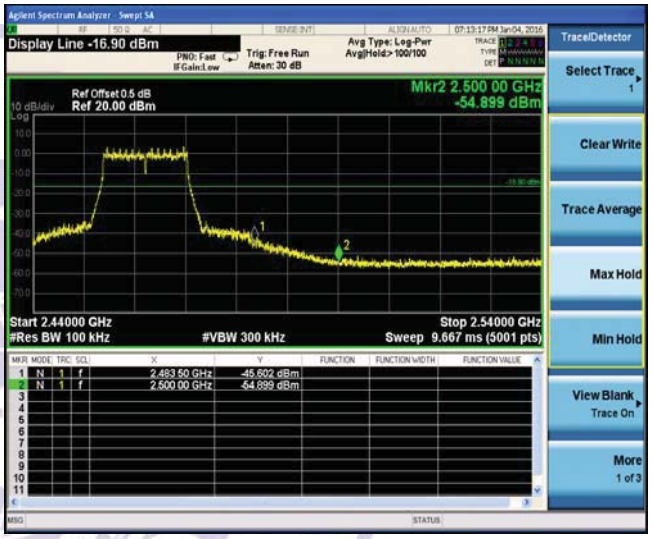
CH01



CH06

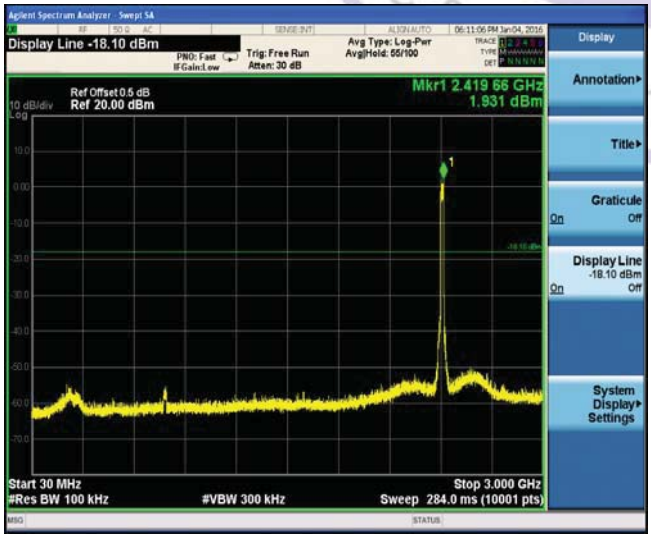
CH11

Left Band edge



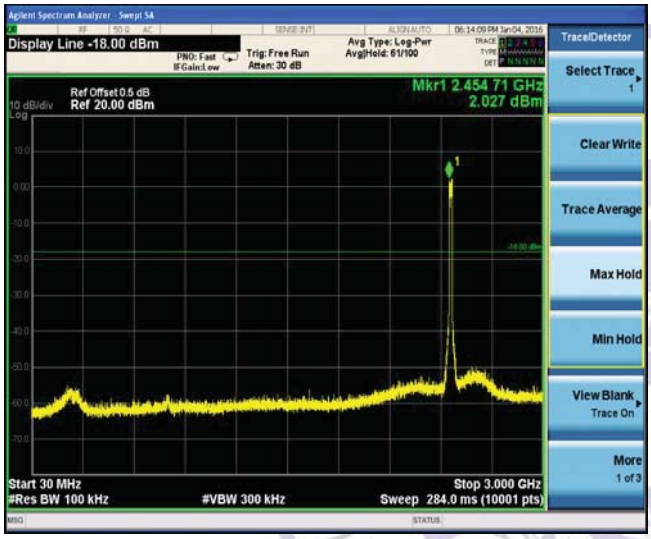
Right Band edge

802.11n(HT20)

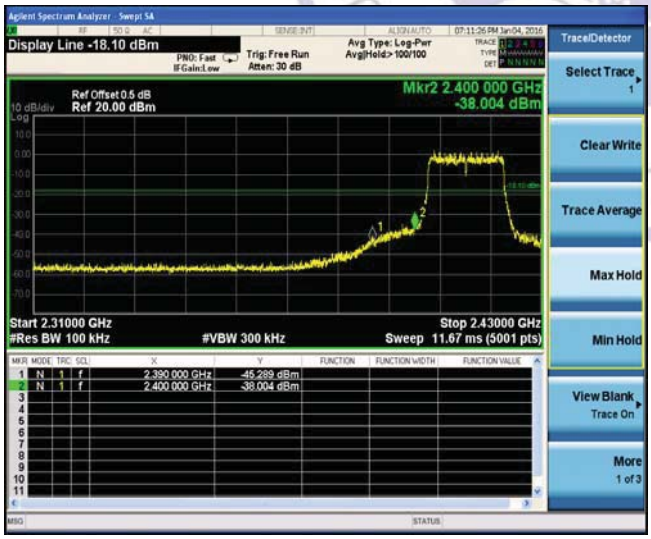


CH01

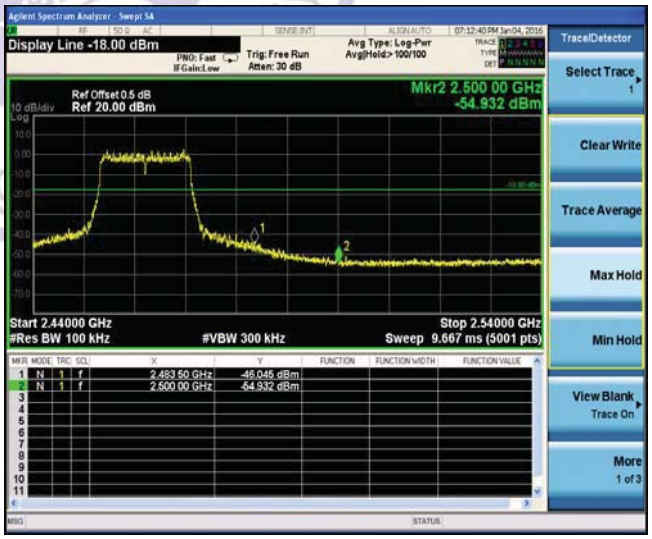
CH06



CH11

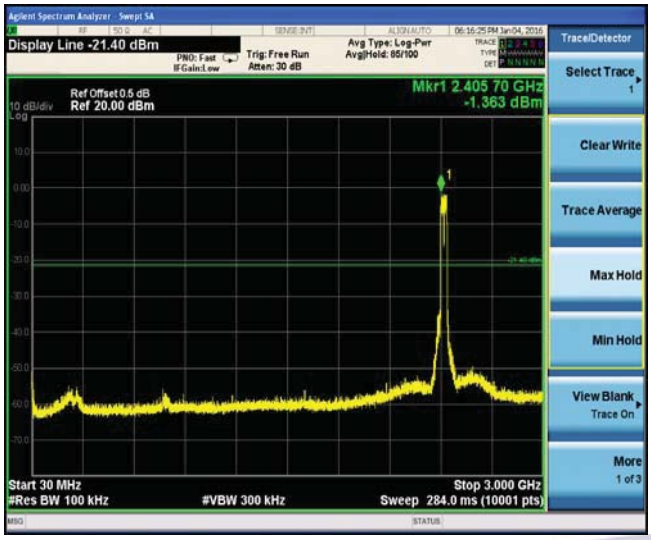


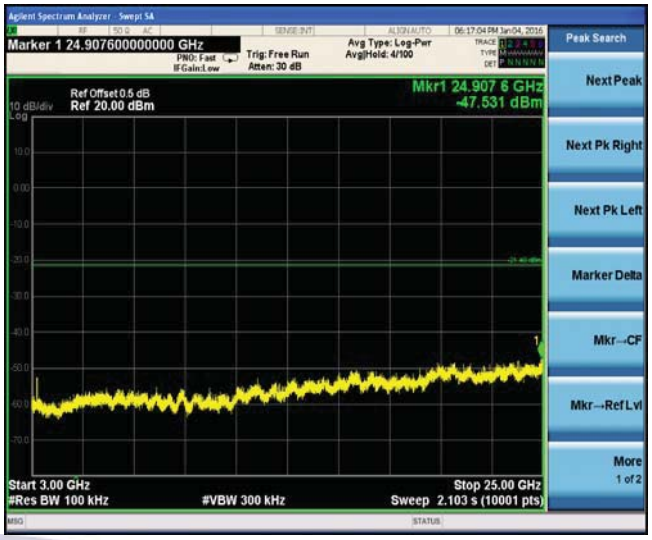
Left Band edge



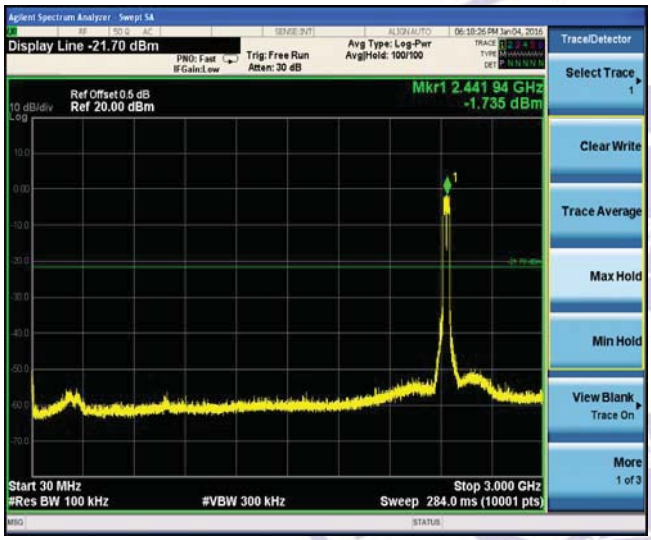
Right Band edge

802.11n(HT40)

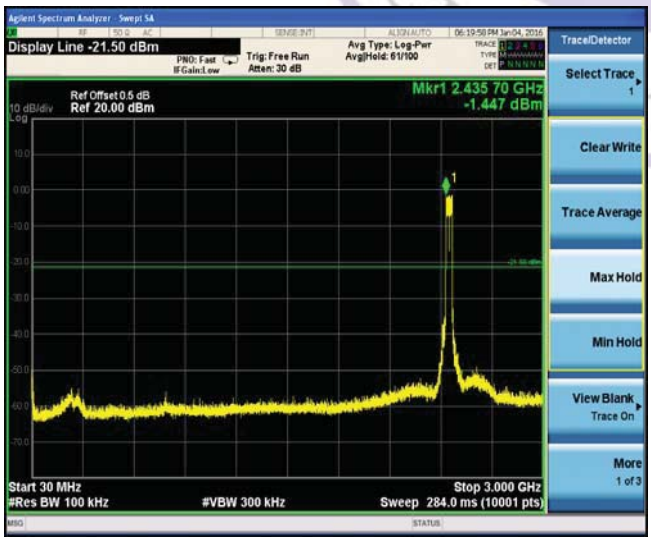




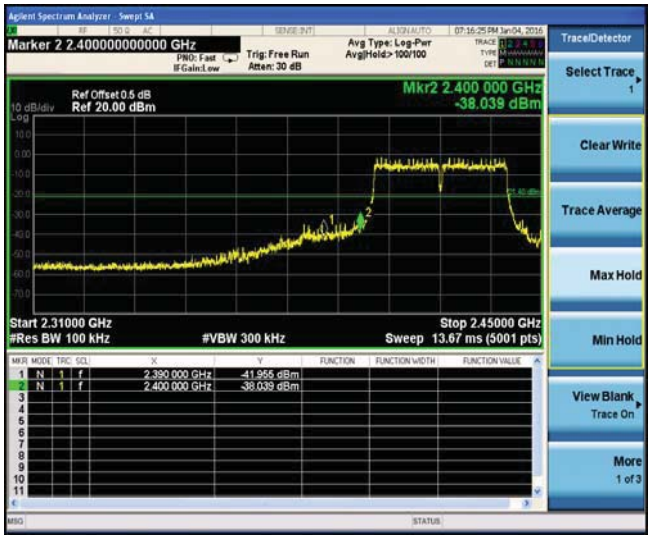
CH01



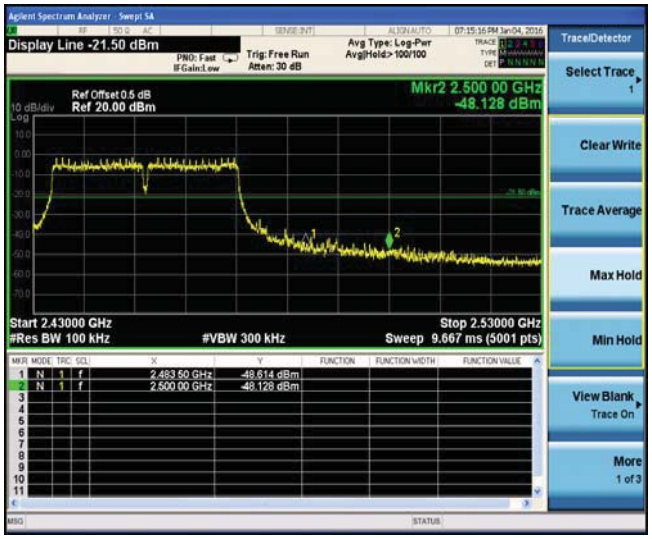
CH06



CH11



Left Band edge



Right Band edge

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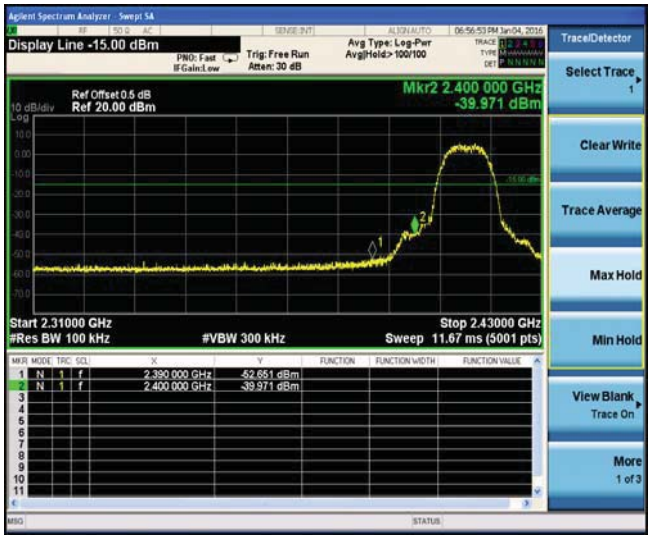
Ant2

802.11b

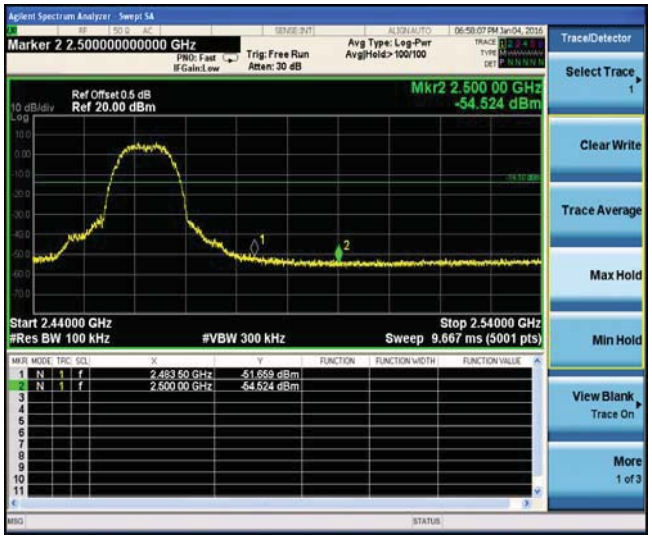
CH01

CH06

CH11



Left Band edge



Right Band edge

802.11g

CH01

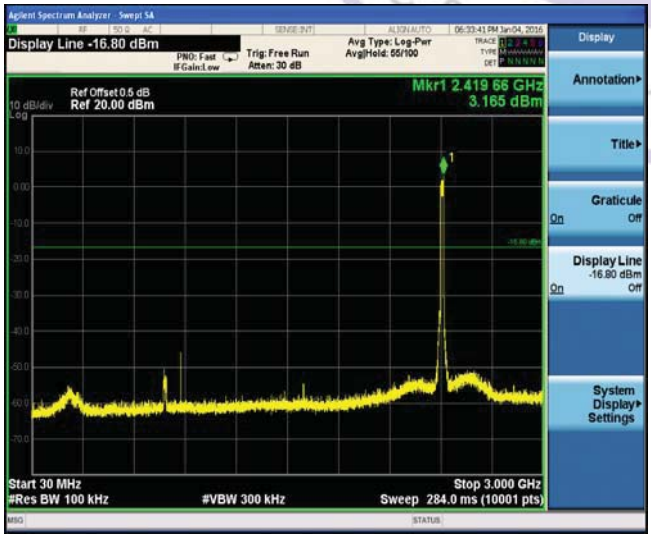
CH06

CH11

Left Band edge

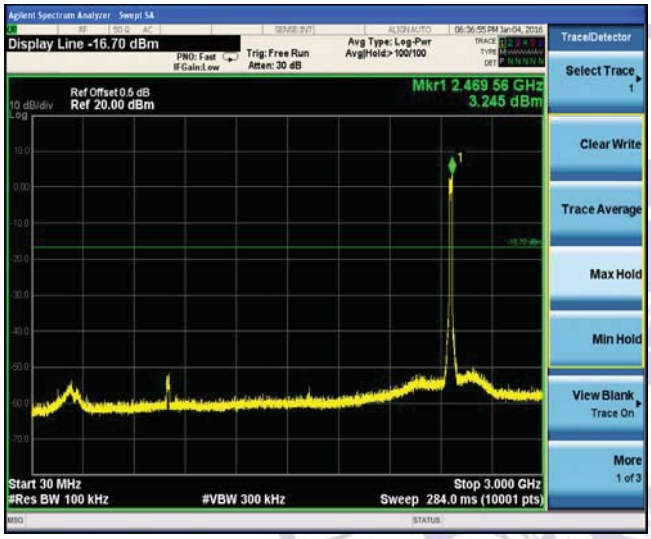
Right Band edge

802.11n(HT20)

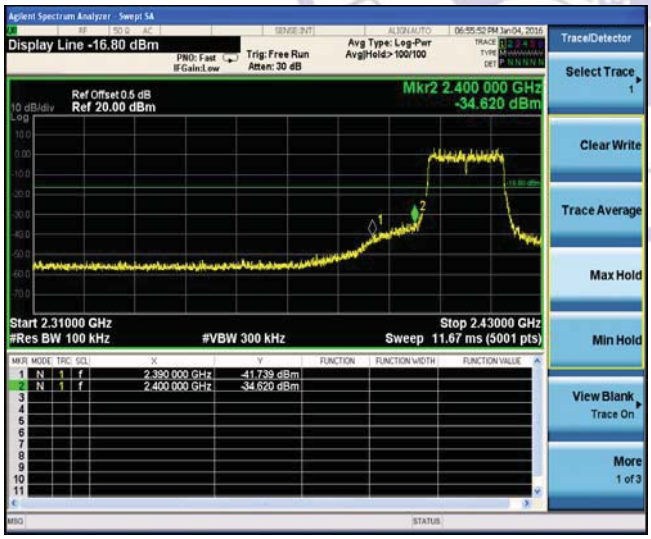


CH01

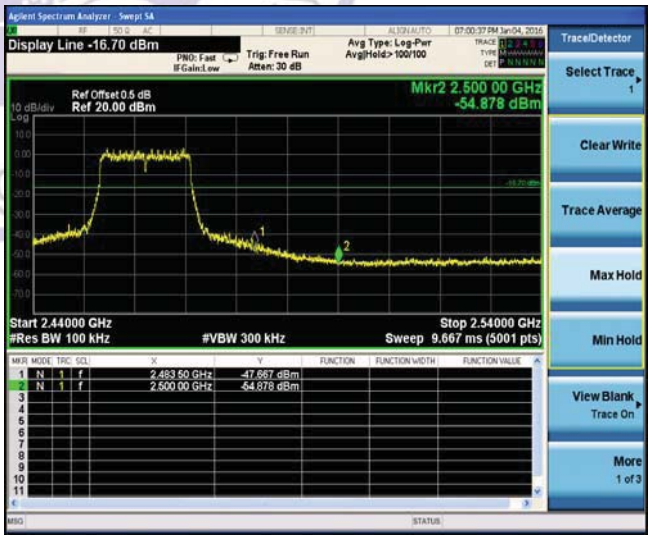
CH06



CH11

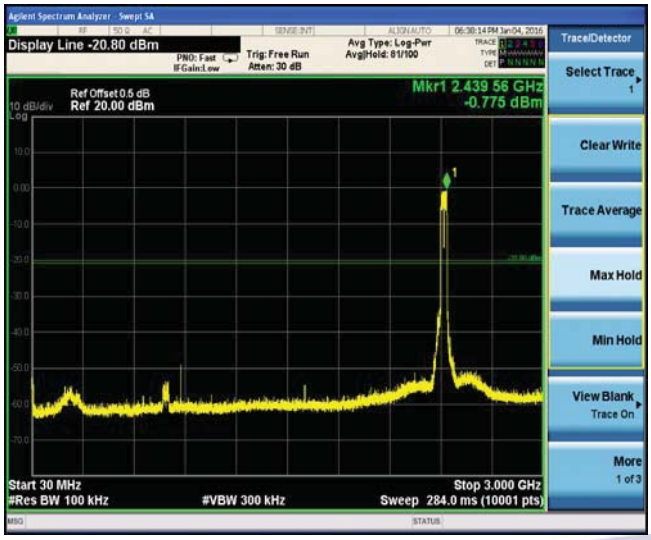


Left Band edge

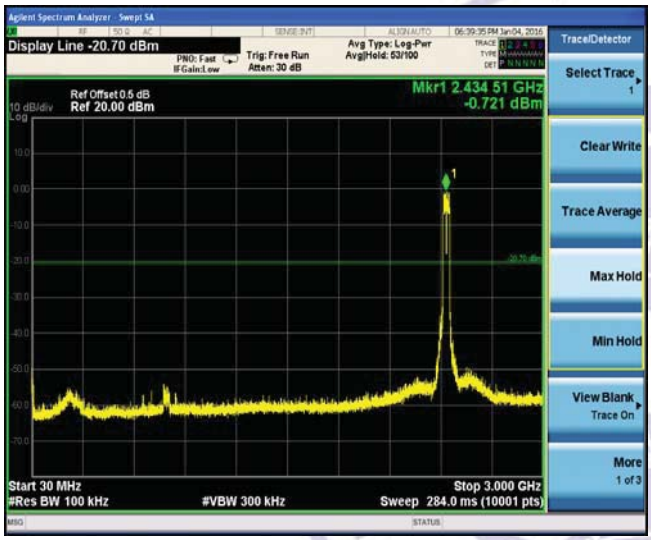


Right Band edge

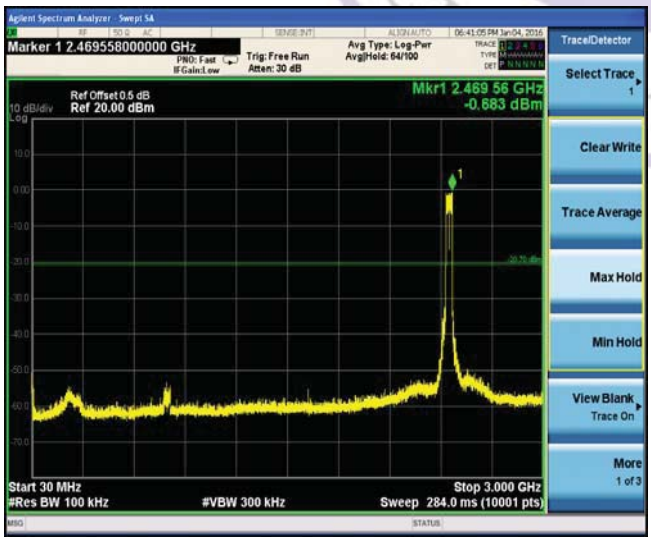
802.11n(HT40)

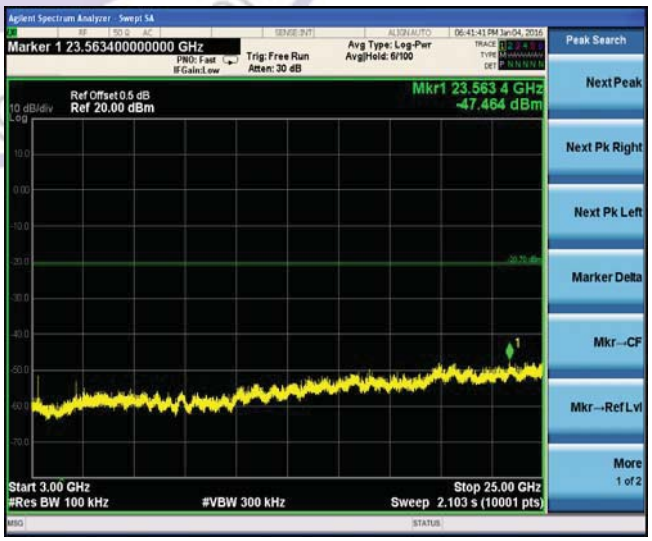


CH01

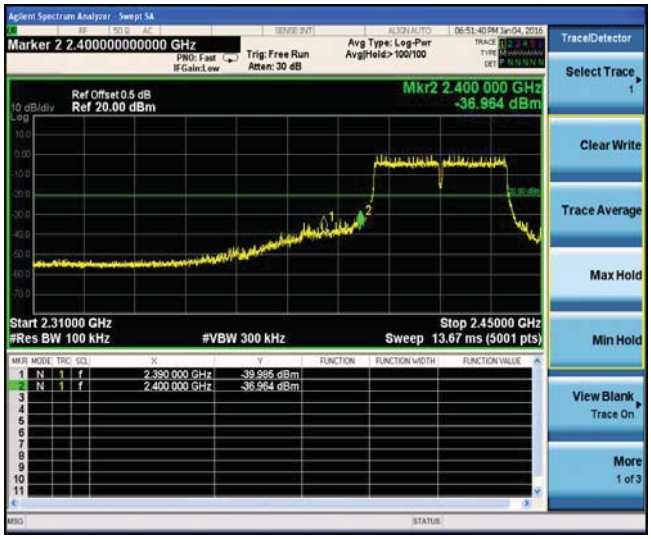


CH06

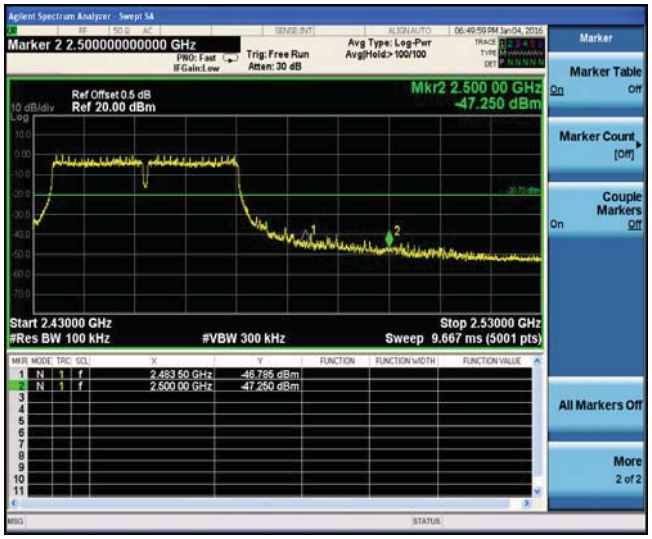




CH11



Left Band edge



Right Band edge

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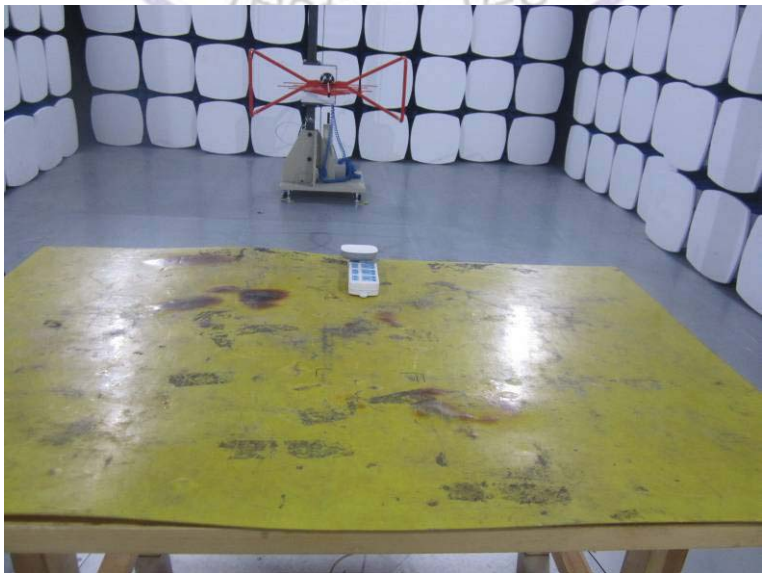
4. Test Setup Photos of the EUT



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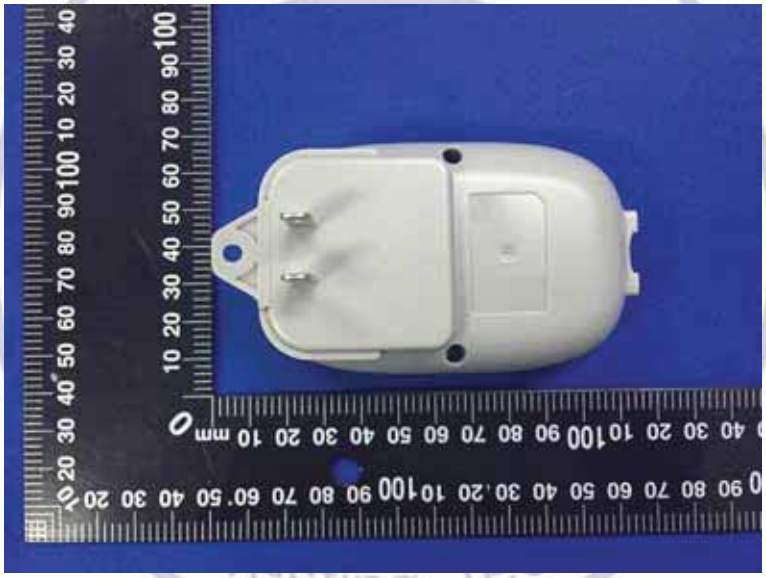
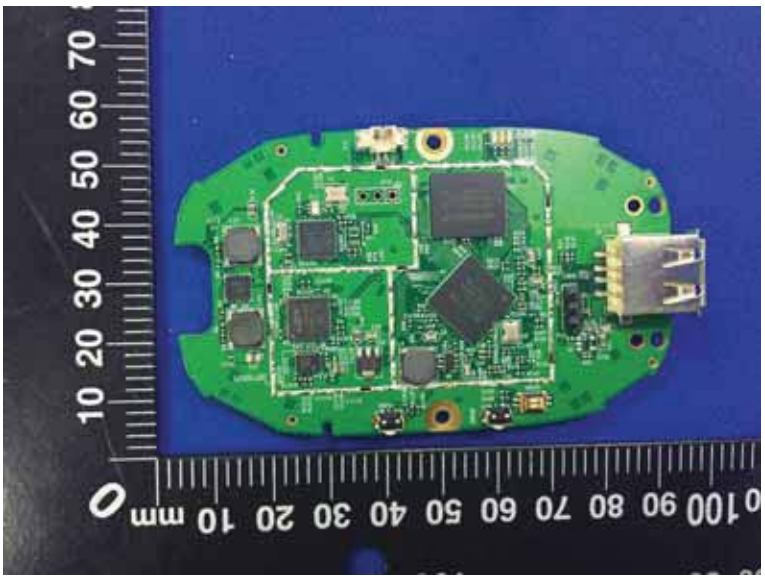
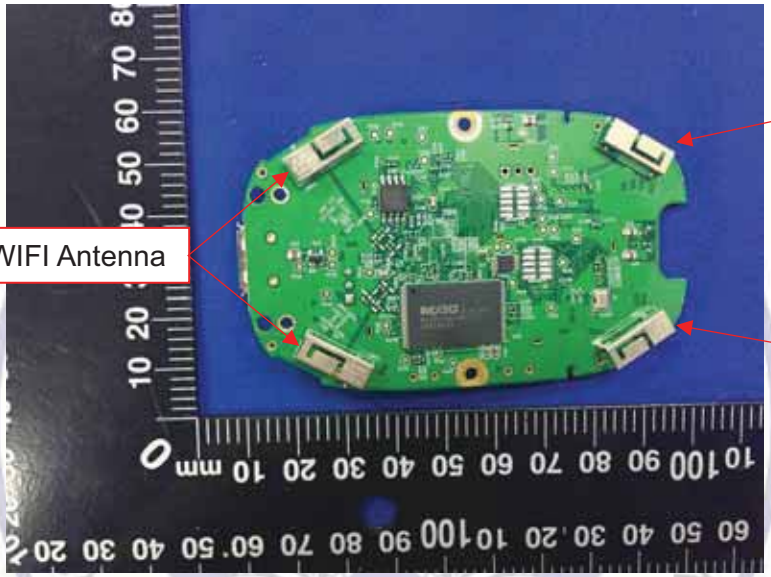
5. External and Internal Photos of the EUT

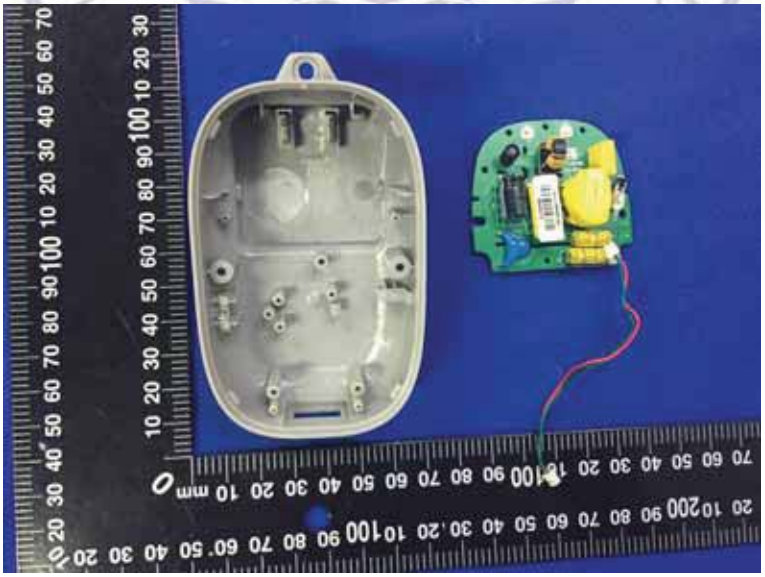
External Photos of EUT

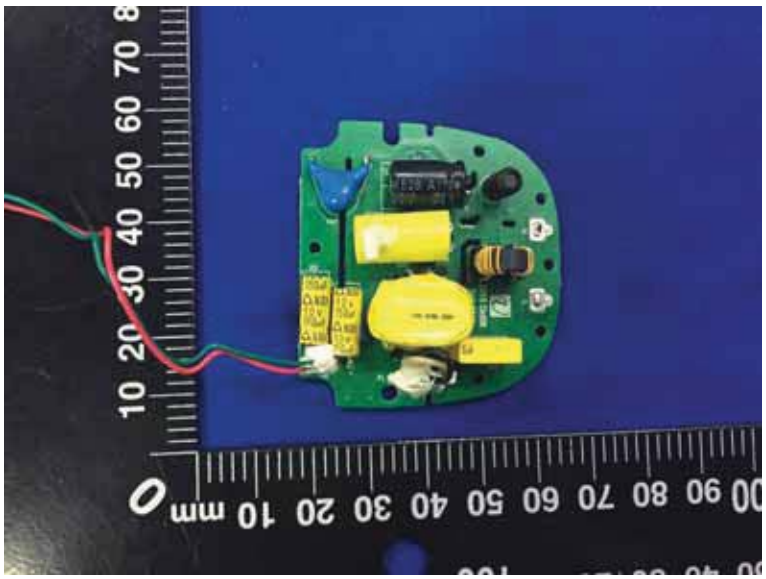


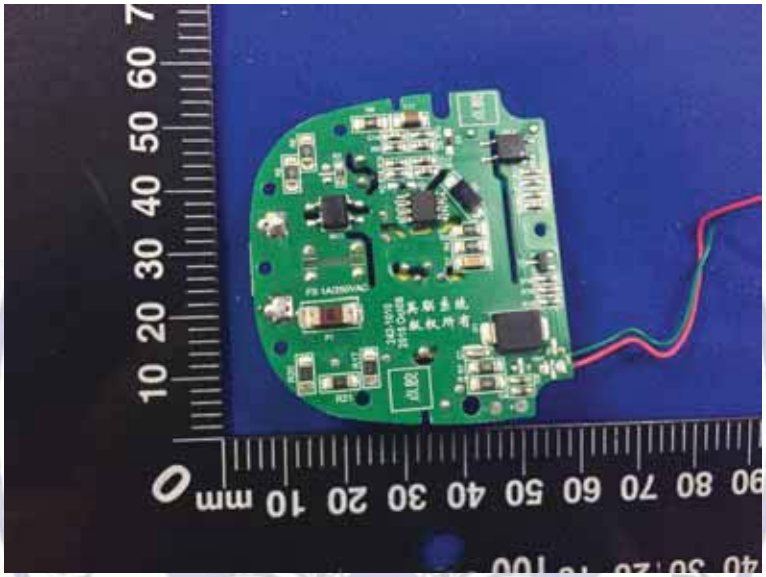
Internal Photos of EUT




BT Antenna
WIFI Antenna
ZigbeeAntenna







********** End of Report **********

CTL Testing Technology