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# TEST REPORT

## FCC PART 15.247

Report Reference No .....: **CTL1707198021-WF**

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Approved by: ( position+printed name+signature)	Ivan Xie (Manager)	<i>Ivan Xie</i>

<b>Product Name</b> .....	Projector
<b>Model/Type reference</b> .....	P1+
<b>Trade Mark</b> .....	N/A
<b>FCC ID</b> .....	2AHK3-P1
<b>Applicant's name</b> .....	<b>Sichuan Dowlab Electronics Technology Co., Ltd.</b>
<b>Address of applicant</b> .....	No.1 Wenjia Strict, Qingyang District, Chengdu, Sichuan, China
<b>Test Firm</b> .....	<b>Shenzhen CTL Testing Technology Co., Ltd.</b>
<b>Address of Test Firm</b> .....	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
<b>Test specification</b> .....	
Standard.....	<b>FCC Part 15.247:</b> Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
TRF Originator .....	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF .....	Dated 2011-01
<b>Date of Receipt</b> .....	July 07, 2017
<b>Date of Test Date</b> .....	July 07, 2017–July 13, 2017
<b>Data of Issue</b> .....	July 13, 2017
<b>Result</b> .....	Pass
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# TEST REPORT

Test Report No. :	CTL1707198021-WF	July 13, 2017 Date of issue
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Equipment under Test : Projector

Model /Type : P1+

Applicant : **Sichuan Dowlab Electronics Technology Co., Ltd.**

Address : No.1 Wenjia Strict, Qingyang District, Chengdu,  
Sichuan, China

Manufacturer : **Sichuan Dowlab Electronics Technology Co., Ltd.**

Address : No.1 Wenjia Strict, Qingyang District, Chengdu,  
Sichuan, China

<b>Test result</b>	<b>Pass *</b>
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\* In the configuration tested, the EUT complied with the standards specified page 5.

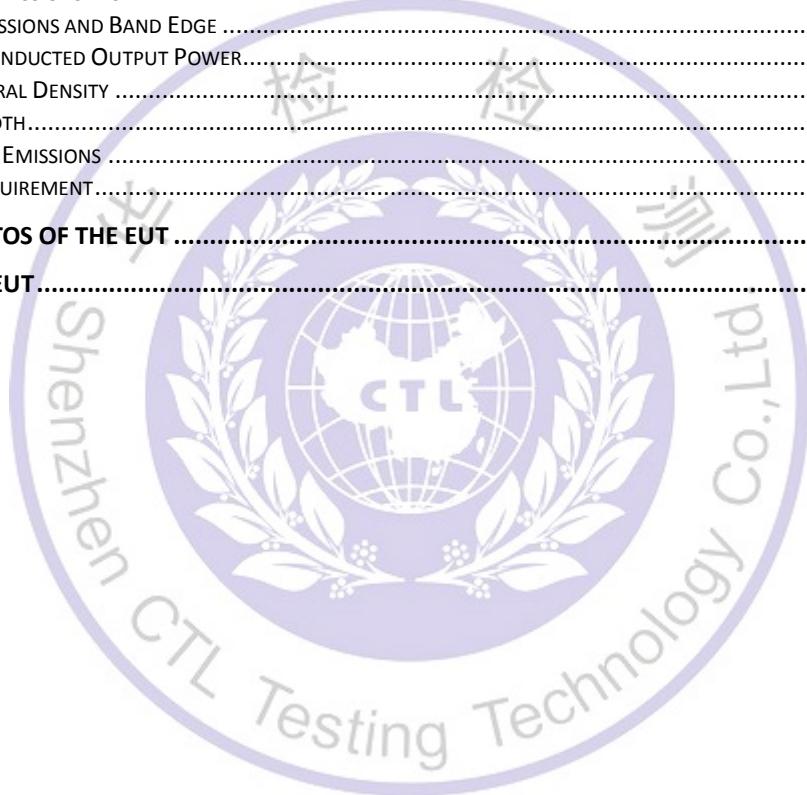
The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## **\*\* Modified History \*\***



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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

[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 Range of 9 kHz to 40GHz

[KDB558074 D01 V03r05](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

## 1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2)	6dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Conducted Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	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 Disturbance 0.15~30MHz	±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:	Projector
Model/Type reference:	P1+
Power supply:	DC 3.7V from battery
<b>WIFI :</b>	
Supported type:	802.11b/802.11g/802.11n(H20)/802.11n(H40)
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:	Internal antenna
Antenna gain:	0dBi

Note: For more details, please 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 and Channel 01/06/11 were selected for WIFI test.

#### Operation Frequency WIFI :

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	<b>2412</b>	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	<b>11</b>	<b>2462</b>
5	2432		
<b>6</b>	<b>2437</b>		
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	13.5Mbps	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	13.5Mbps	3/9

**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	2017/05/20	2018/05/19
LISN	R&S	ESH2-Z5	860014/010	2017/05/20	2018/05/19
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2017/05/20	2018/05/19
EMI Test Receiver	R&S	ESCI	103710	2017/05/20	2018/05/19
Spectrum Analyzer	Agilent	E4407B	MY41440676	2017/05/20	2018/05/19
Spectrum Analyzer	Agilent	N9020	US46220290	2017/05/20	2018/05/19
Power Meter	Anritsu	ML2487B	110553	2017/05/20	2018/05/19
Power Sensor	Anritsu	MA2411B	100345	2017/05/20	2018/05/19
Controller	EM Electronics	Controller EM 1000	N/A	2017/05/20	2018/05/19
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2017/05/20	2018/05/19
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2017/05/20	2018/05/19
Amplifier	Agilent	8349B	3008A02306	2017/05/20	2018/05/19
Amplifier	Agilent	8447D	2944A10176	2017/05/20	2018/05/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2017/05/20	2018/05/19
High-Pass Filter	K&L	9SH10-2700/X1 2750-O/O	N/A	2017/05/20	2018/05/19

High-Pass Filter	K&L	41H10-1375/U1 2750-O/O	N/A	2017/05/20	2018/05/19
Coaxial Cables	HUBER+SUHN ER	SUCOFLEX 104PEA-10M	10m	2017/05/20	2018/05/19
Coaxial Cables	HUBER+SUHN ER	SUCOFLEX 104PEA-3M	3m	2017/05/20	2018/05/19
Coaxial Cables	HUBER+SUHN ER	SUCOFLEX 104PEA-3M	3m	2017/05/20	2018/05/19
RF Cable	Megalon	RF-A303	N/A	2017/05/20	2018/05/19

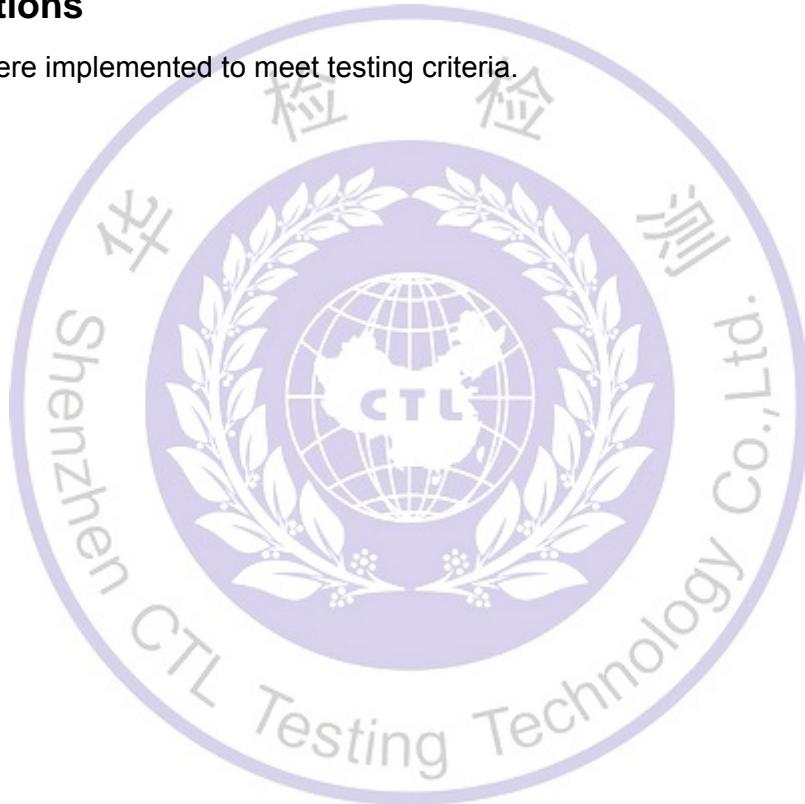
The calibration interval was one year

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

This submittal(s) (test report) is intended 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

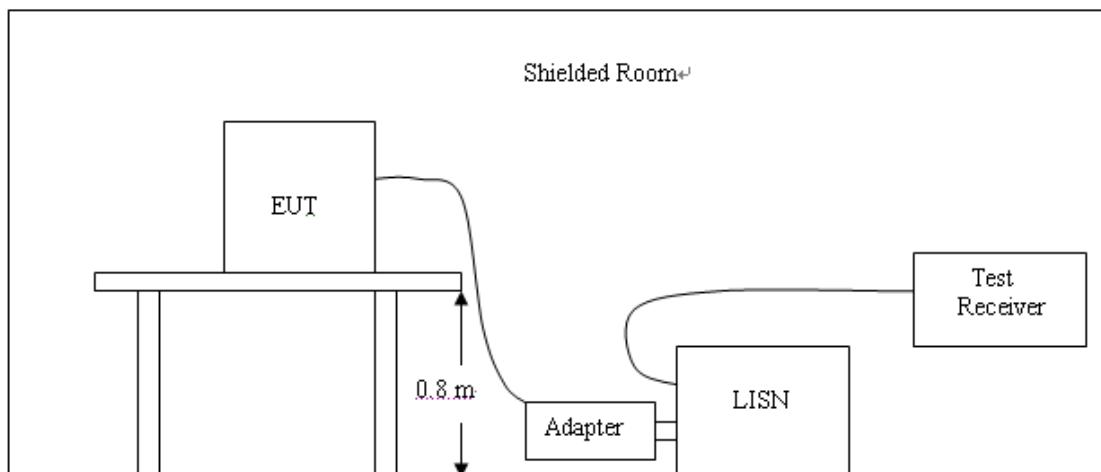
##### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

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

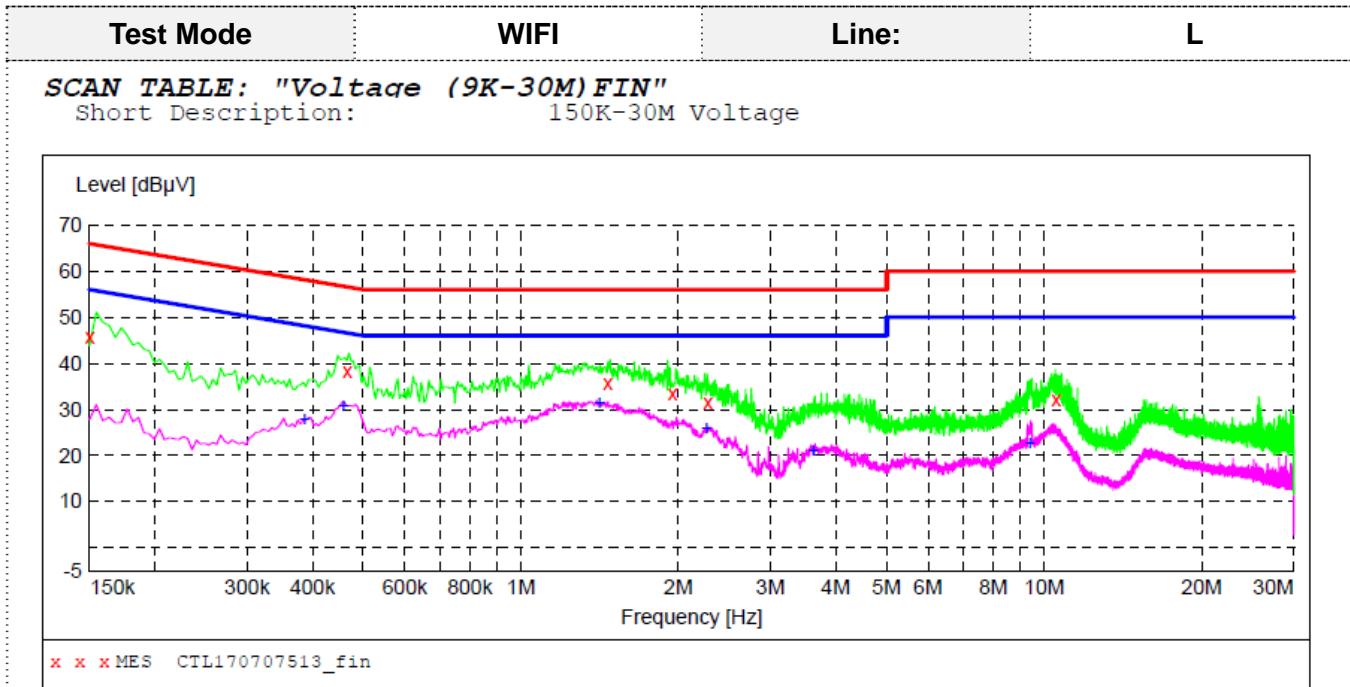


##### TEST PROCEDURE

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

Remark:802.11b/802.11g/802.11n(H20)/802.11n(H40) mode all have been tested ,only worse case of 802.11b High Channel was reported.



### **MEASUREMENT RESULT: "CTL170707513\_fin"**

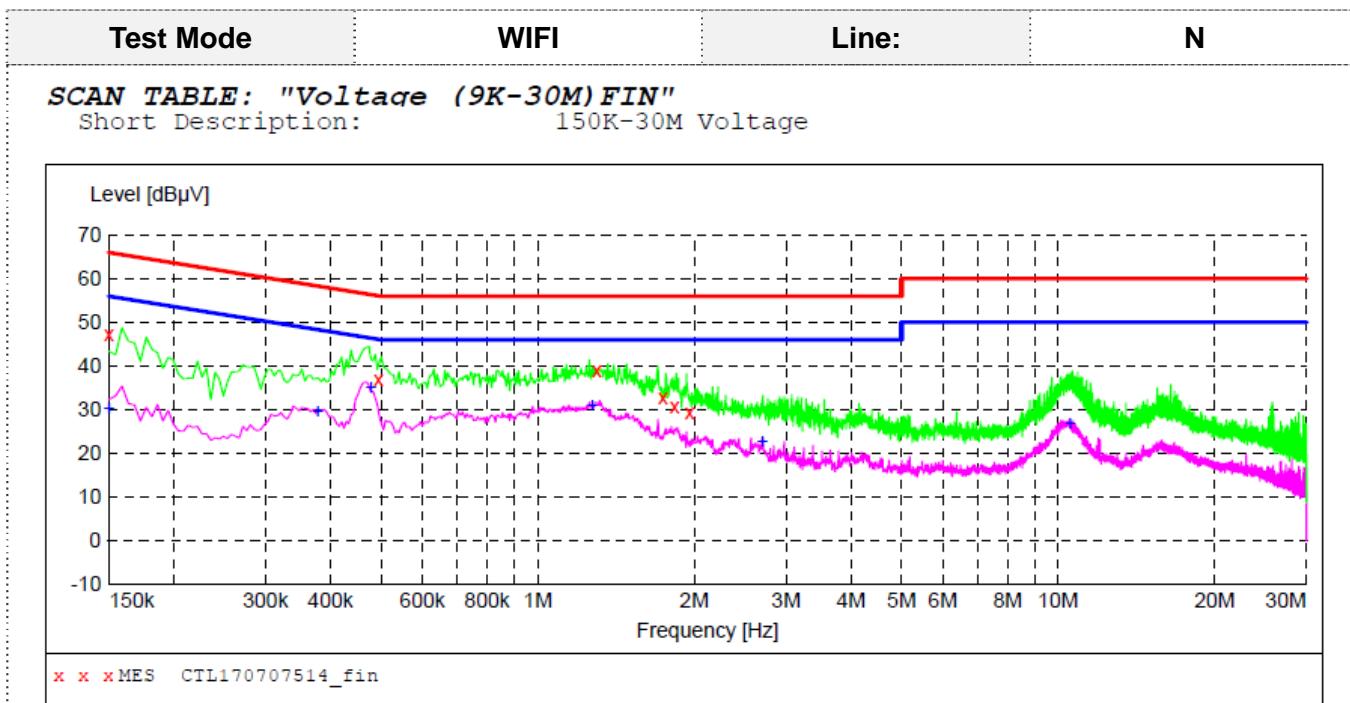
7/7/2017 13:22

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.150000	45.70	10.2	66	20.3	QP	L1	GND
0.466000	38.20	10.2	57	18.4	QP	L1	GND
1.466000	35.60	10.3	56	20.4	QP	L1	GND
1.952000	33.60	10.3	56	22.4	QP	L1	GND
2.276000	31.40	10.4	56	24.6	QP	L1	GND
10.526000	32.20	10.6	60	27.8	QP	L1	GND

### **MEASUREMENT RESULT: "CTL170707513\_fin2"**

7/7/2017 13:22

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.386000	27.90	10.2	48	20.2	AV	L1	GND
0.458000	30.80	10.2	47	15.9	AV	L1	GND
1.412000	31.60	10.3	46	14.4	AV	L1	GND
2.264000	26.00	10.4	46	20.0	AV	L1	GND
3.620000	21.30	10.4	46	24.7	AV	L1	GND
9.392000	22.70	10.6	50	27.3	AV	L1	GND

**MEASUREMENT RESULT: "CTL170707514\_fin"**

7/7/2017 13:25

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.150000	47.30	10.2	66	18.7	QP	N	GND
0.494000	37.00	10.2	56	19.1	QP	N	GND
1.298000	39.10	10.3	56	16.9	QP	N	GND
1.742000	32.90	10.3	56	23.1	QP	N	GND
1.832000	30.80	10.3	56	25.2	QP	N	GND
1.958000	29.20	10.3	56	26.8	QP	N	GND

**MEASUREMENT RESULT: "CTL170707514\_fin2"**

7/7/2017 13:25

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.150000	30.50	10.2	56	25.5	AV	N	GND
0.378000	29.80	10.2	48	18.5	AV	N	GND
0.478000	35.00	10.2	46	11.4	AV	N	GND
1.274000	31.10	10.3	46	14.9	AV	N	GND
2.702000	22.70	10.4	46	23.3	AV	N	GND
10.532000	26.90	10.6	50	23.1	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.

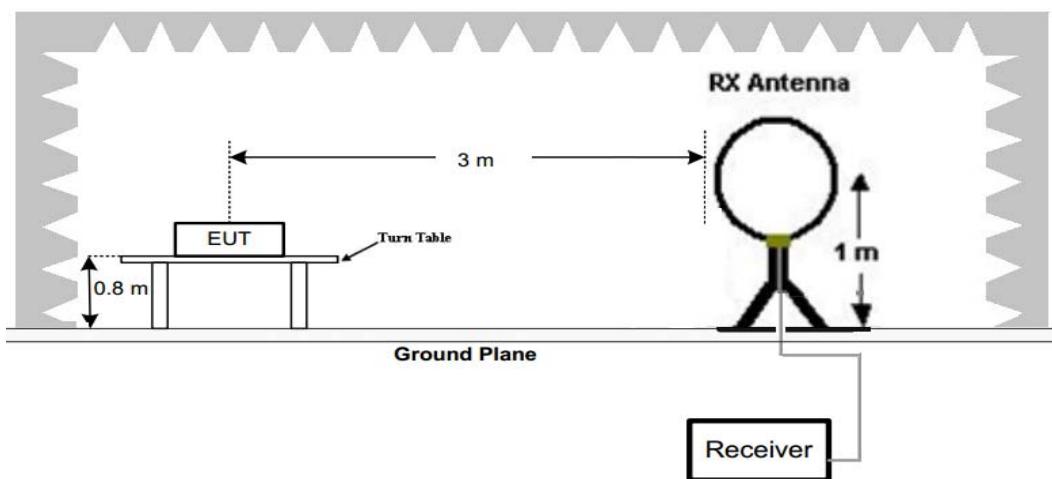
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

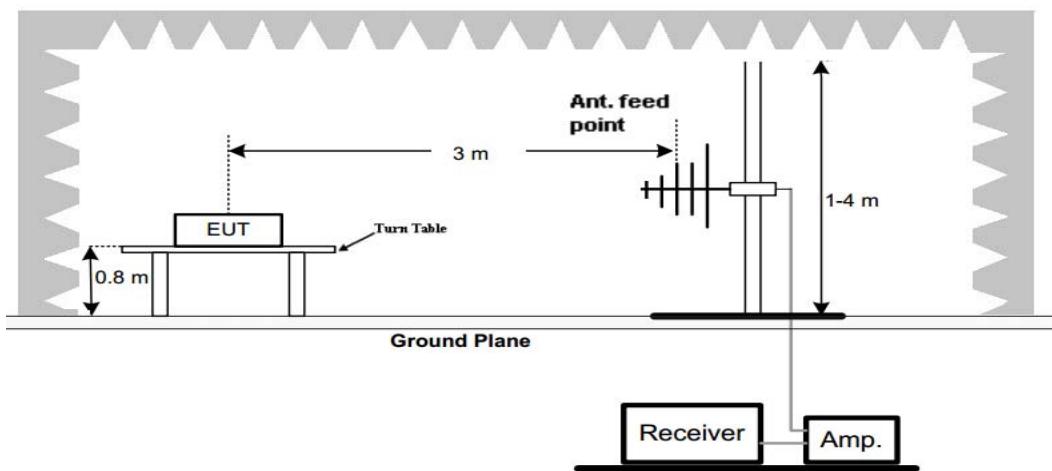
Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	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

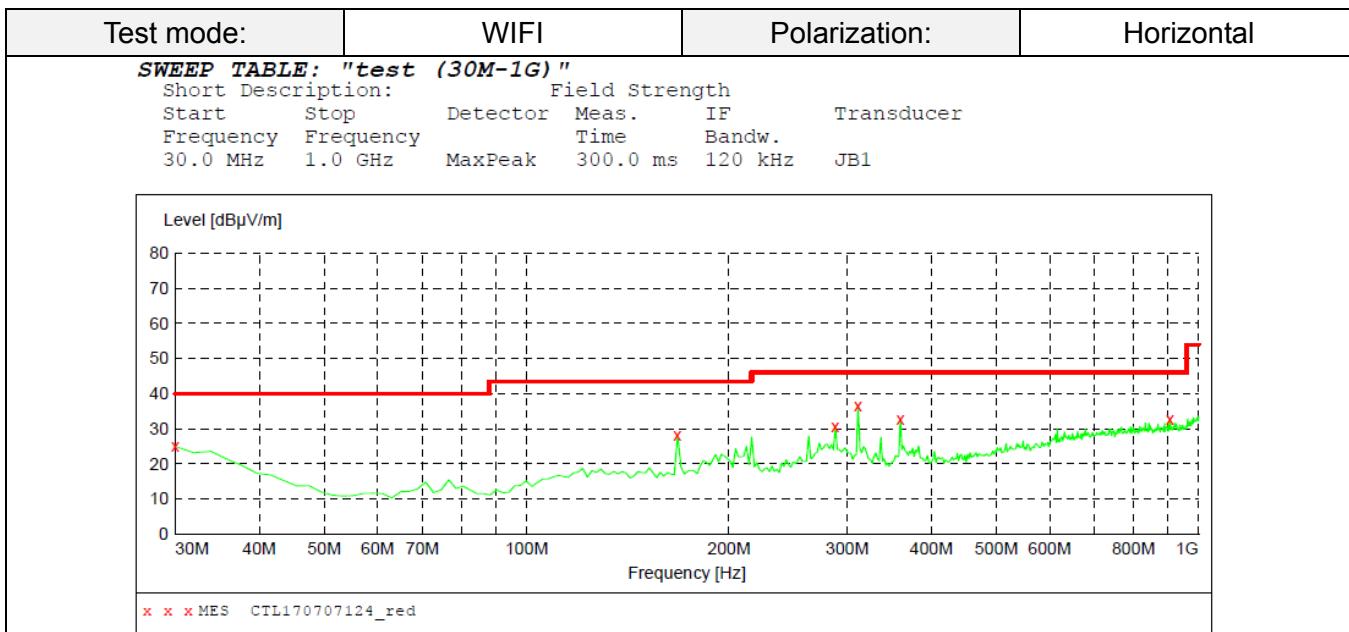
1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C 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

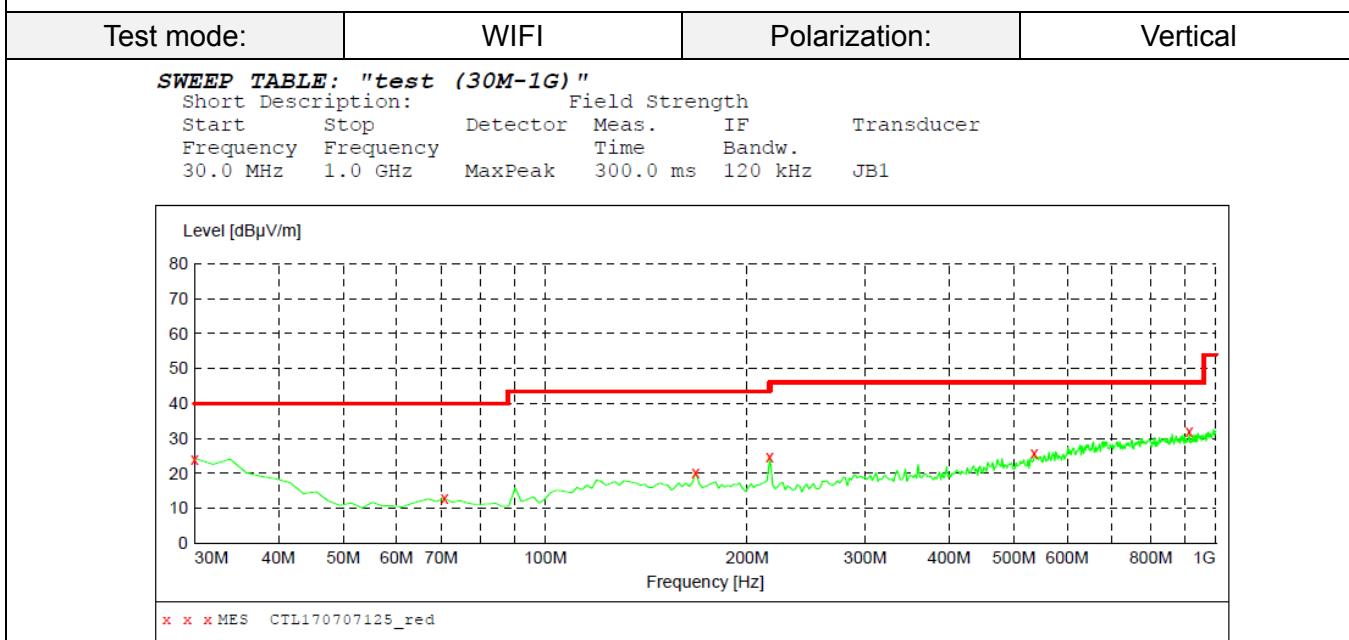
Remark:

1. All three channels (lowest/middle/highest) of each mode were measured below 1GHz and recorded worst case at 802.11b low channel.
2. All three channels (lowest/middle/highest) of each mode were measured above 1GHz and recorded worst case at 802.11b mode.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

## For 30MHz-1GHz

**MEASUREMENT RESULT: "CTL170707124\_red"**

7/7/2017 9:17AM									
Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization	
MHz	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB		cm	deg		
30.000000	24.90	22.1	40.0	15.1	---	0.0	0.00	HORIZONTAL	
167.740000	28.10	14.5	43.5	15.4	---	0.0	0.00	HORIZONTAL	
288.020000	30.50	15.7	46.0	15.5	---	0.0	0.00	HORIZONTAL	
311.300000	36.70	16.4	46.0	9.3	---	0.0	0.00	HORIZONTAL	
359.800000	32.70	17.5	46.0	13.3	---	0.0	0.00	HORIZONTAL	
906.880000	32.90	26.4	46.0	13.1	---	0.0	0.00	HORIZONTAL	

**MEASUREMENT RESULT: "CTL170707125\_red"**

7/7/2017 9:18AM									
Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization	
MHz	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB		cm	deg		
30.000000	24.20	22.1	40.0	15.8	---	0.0	0.00	VERTICAL	
70.740000	12.80	9.0	40.0	27.2	---	0.0	0.00	VERTICAL	
167.740000	20.30	14.5	43.5	23.2	---	0.0	0.00	VERTICAL	
216.240000	24.80	14.4	46.0	21.2	---	0.0	0.00	VERTICAL	
536.340000	25.70	21.5	46.0	20.3	---	0.0	0.00	VERTICAL	
912.700000	31.90	26.5	46.0	14.1	---	0.0	0.00	VERTICAL	

**For 1GHz to 25GHz****802.11b Mode (above 1GHz)**

Note: 802.11b/802.11g/802.11n (H20)/ 802.11n (H40) all have been tested, only worse case 802.11b is reported

Frequency(MHz):		2412		Polarity:			HORIZONTAL	
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 (dB/m)
4824.00	59.27	PK	74	14.73	54.72	33.52	6.92	35.89
4824.00	51.41	AV	54	2.59	46.86	33.52	6.92	35.89
5125.75	48.85	PK	74	25.15	41.65	34.38	7.10	34.28
5125.75	--	AV	54	--	--	--	--	--
7236.00	47.13	PK	74	26.87	35.86	37.1	9.19	35.02
7236.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2412		Polarity:			VERTICAL	
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 (dB/m)
4824.00	58.84	PK	74	15.16	54.29	33.52	6.92	35.89
4824.00	50.01	AV	54	3.99	45.46	33.52	6.92	35.89
5125.75	49.08	PK	74	24.92	41.88	34.38	7.10	34.28
5125.75	--	AV	54	--	--	--	--	--
7236.00	48.44	PK	74	25.56	37.17	37.1	9.19	35.02
7236.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2437		Polarity:			HORIZONTAL	
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 (dB/m)
4874.00	59.16	PK	74	14.84	52.92	33.59	6.95	34.3
4874.00	50.43	AV	54	3.57	44.19	33.59	6.95	34.3
5215.50	48.29	PK	74	25.71	40.69	34.56	7.15	34.11
5215.50	--	AV	54	--	--	--	--	--
7311.00	47.88	PK	74	26.12	36.22	37.44	9.22	35
7311.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2437		Polarity:			VERTICAL	
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 (dB/m)
4874.00	58.24	PK	74	15.76	51.9	33.59	6.95	34.2
4874.00	49.96	AV	54	4.04	43.62	33.59	6.95	34.2
5215.50	50.22	PK	74	23.78	43.32	34.07	7.05	34.22
5215.50	--	AV	54	--	--	--	--	--
7311.00	49.09	PK	74	24.91	37.43	37.44	9.22	35
7311.00	--	AV	54	--	--	--	--	--

Frequency(MHz):			2462		Polarity:			HORIZONTAL	
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 (dB/m)
4924.00	59.32	PK	74	14.68	53.55	33.71	6.98	35.91	4.78
4924.00	50.74	AV	54	3.26	43.73	33.71	6.98	35.91	4.78
5110.50	48.37	PK	74	25.63	41.24	34.34	7.09	34.27	7.17
5110.50	--	AV	54	--	--	--	--	--	--
7386.00	49.27	PK	74	24.73	37.4	37.61	9.25	34.98	11.88
7386.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2462		Polarity:			VERTICAL	
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 (dB/m)
4924.00	60.02	PK	74	13.98	55.24	33.71	6.98	35.91	4.78
4924.00	51.67	AV	54	2.33	46.89	33.71	6.98	35.91	4.78
5110.50	49.05	PK	74	24.95	41.88	34.34	7.09	34.27	7.17
5110.50	--	AV	54	--	--	--	--	--	--
7386.00	48.81	PK	74	25.19	36.93	37.61	9.25	34.98	11.88
7386.00	--	AV	54	--	--	--	--	--	--

## 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; RMS detector is for AV value.

## **Results of Band Edges Test (Radiated)**

Note: 802.11b/802.11g/802.11n (H20)/ 802.11n (H40) all have been tested, only worse case 802.11b is reported

Frequency(MHz):		2412		Polarity:			HORIZONTAL		
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)	
2412.00	115.69	PK	--	--	82.3	28.78	4.61	0	33.39
2412.00	106.15	AV	--	--	72.76	28.78	4.61	0	33.39
2363.75	44.26	PK	74	29.74	11.18	28.52	4.56	0	33.08
2363.75	--	AV	54	--	--	--	--	--	--
2390.00	59.61	PK	74	14.39	26.29	28.72	4.60	0	33.32
2390.00	51.47	AV	54	2.53	18.15	28.72	4.60	0	33.32
2400.00	60.25	PK	74	13.75	26.86	28.78	4.61	0	33.39
2400.00	51.12	AV	54	2.88	17.73	28.78	4.61	0	33.39

Frequency(MHz):		2412		Polarity:			VERTICAL		
Frequency (MHz)	Emission	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)	
	Level (dBuV/m)								
2412.00	115.89	PK	--	82.5	28.78	4.61	0	33.39	
2412.00	108.04	AV	--	74.65	28.78	4.61	0	33.39	
2357.75	43.92	PK	74	30.08	10.84	28.52	4.56	0	33.08
2357.75	--	AV	54	--	--	--	--	--	--
2390.00	58.81	PK	74	15.19	25.49	28.72	4.60	0	33.32
2390.00	51.96	AV	54	2.04	18.64	28.72	4.60	0	33.32
2400.00	59.42	PK	74	14.58	26.03	28.78	4.61	0	33.39
2400.00	50.14	AV	54	3.86	16.75	28.78	4.61	0	33.39

Frequency(MHz):		2462		Polarity:			HORIZONTAL		
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)	
2462.00	114.93	PK	--	--	81.31	28.92	4.7	0	33.62
2462.00	106.89	AV	--	--	73.27	28.92	4.7	0	33.62
2483.50	42.75	PK	74	31.25	9.12	28.93	4.7	0	33.63
2483.50	--	AV	54	--	--	--	--	--	--
2486.75	43.03	PK	74	30.97	9.39	28.94	4.71	0	33.64
2486.75	--	AV	54	--	--	--	--	--	--
2500.00	42.19	PK	74	31.81	8.51	28.96	4.72	0	33.68
2500.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):		2462		Polarity:		VERTICAL			
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)	
2462.00	115.71	PK	--	--	82.09	28.92	4.7	0	33.62
2462.00	106.25	AV	--	--	72.63	28.92	4.7	0	33.62
2483.50	43.04	PK	74	30.96	9.41	28.93	4.7	0	33.63
2483.50	--	AV	54	--	--	--	--	--	--
2486.75	42.99	PK	74	31.01	9.35	28.94	4.71	0	33.64
2486.75	--	AV	54	--	--	--	--	--	--
2500.00	43.07	PK	74	30.93	9.39	28.96	4.72	0	33.68
2500.00	--	AV	54	--	--	--	--	--	--

## 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; RMS 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 PK (dBm)	Limit (dBm)	Result
802.11b	01	9.63	30.00	
	06	9.45		
	11	9.03		
802.11g	01	9.58	30.00	
	06	9.09		
	11	9.25		
802.11n(HT20)	01	9.16	30.00	
	06	9.23		
	11	9.04		
802.11n(HT40)	03	9.12	30.00	
	06	9.07		
	09	9.10		

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

### 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  $\geq$  3 kHz.
3. Set the VBW  $\geq 3 \times$  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

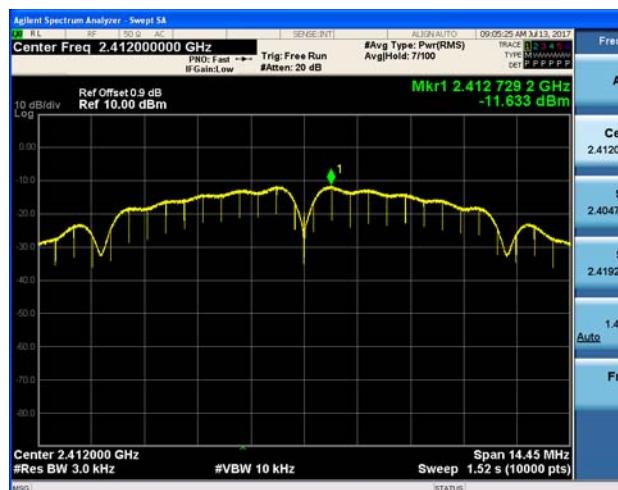


#### Test Results

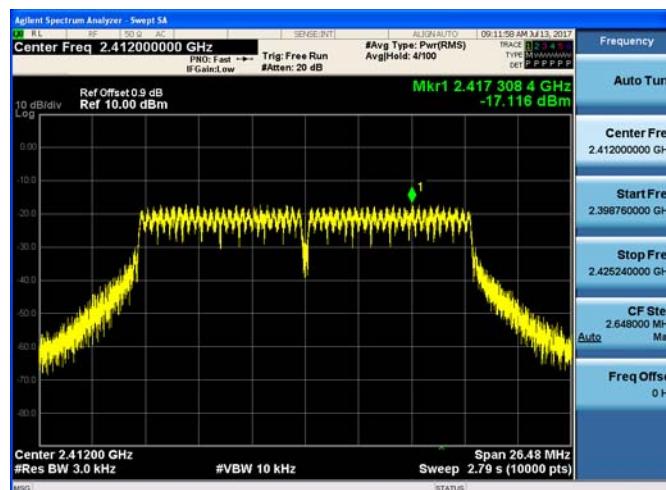
Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	01	-11.633	8.00	Pass
	06	-11.698		
	11	-12.438		
802.11g	01	-17.116	8.00	Pass
	06	-16.722		
	11	-16.843		
802.11n(HT20)	01	-16.042	8.00	Pass
	06	-16.302		
	11	-15.991		
802.11n(HT40)	03	-17.628	8.00	Pass
	06	-17.680		
	09	-18.171		

Test plot as follows:

802.11b



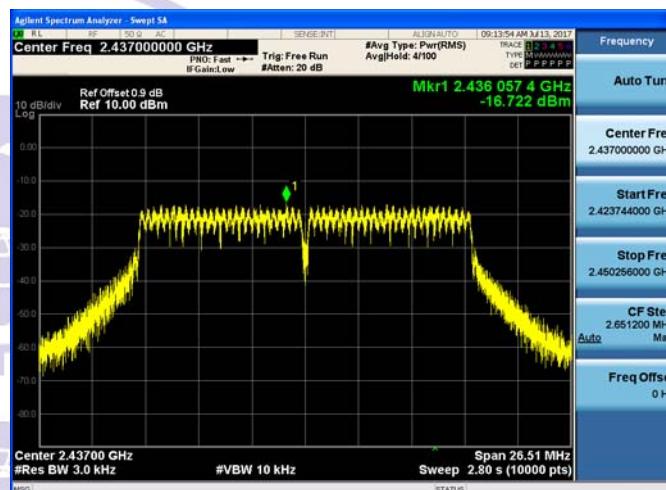
802.11g



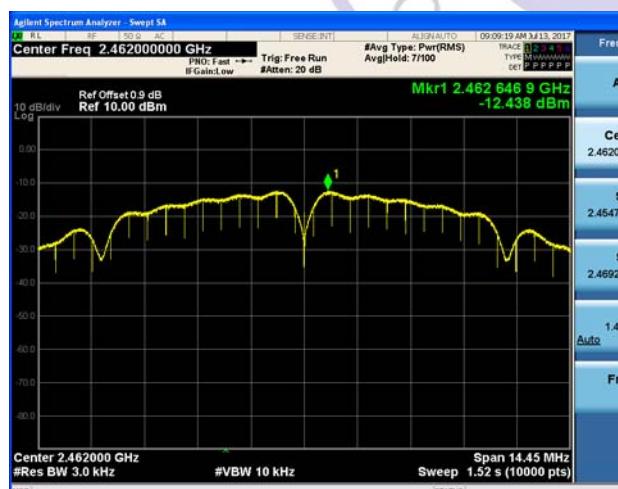
CH01



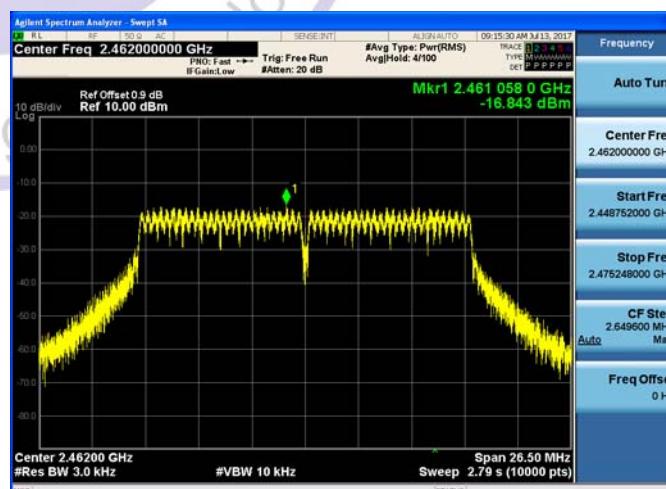
CH01



CH06



CH06



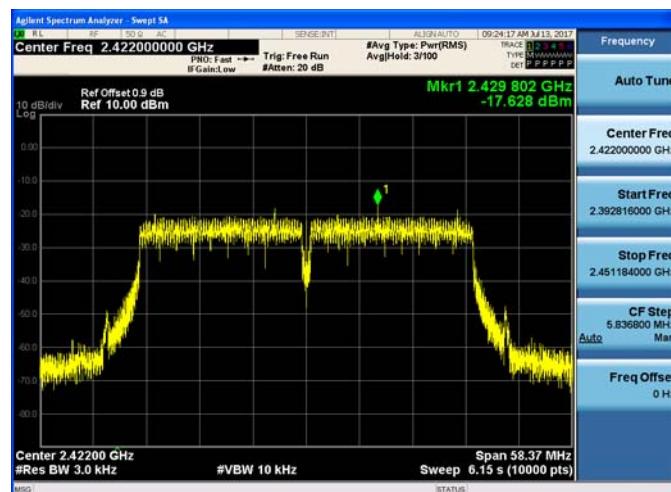
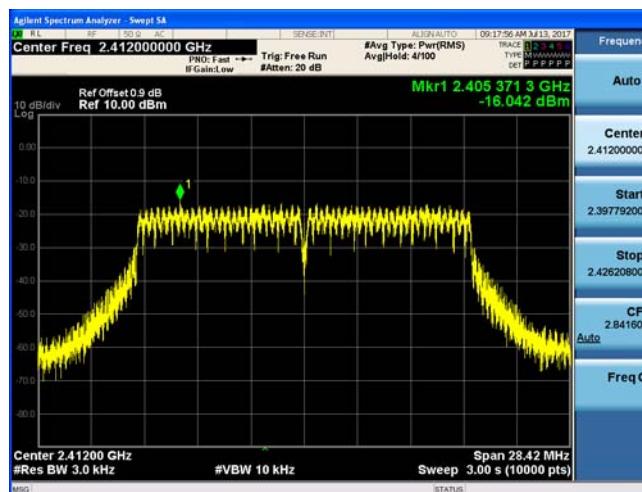
CH11



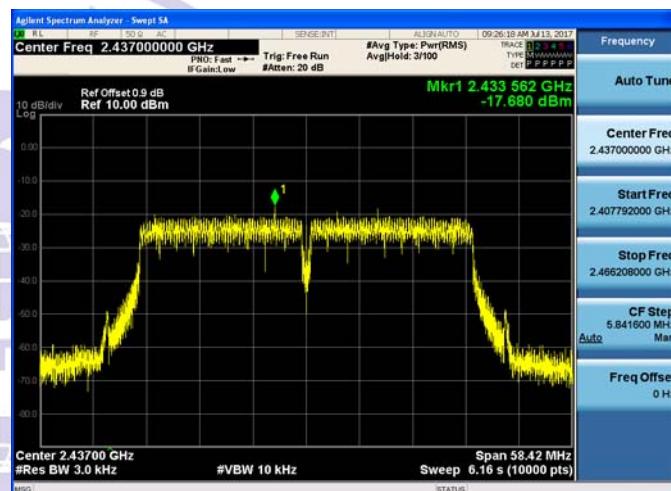
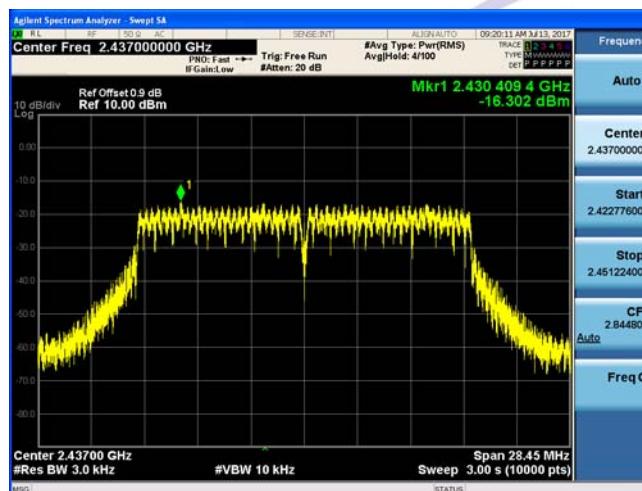
CH11

## 802.11n(HT20)

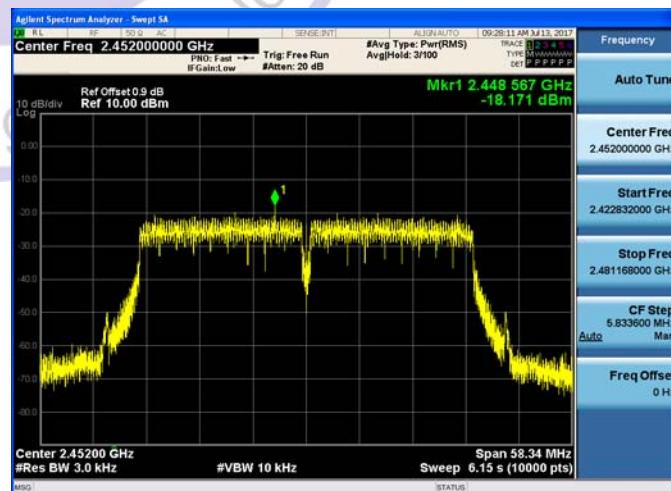
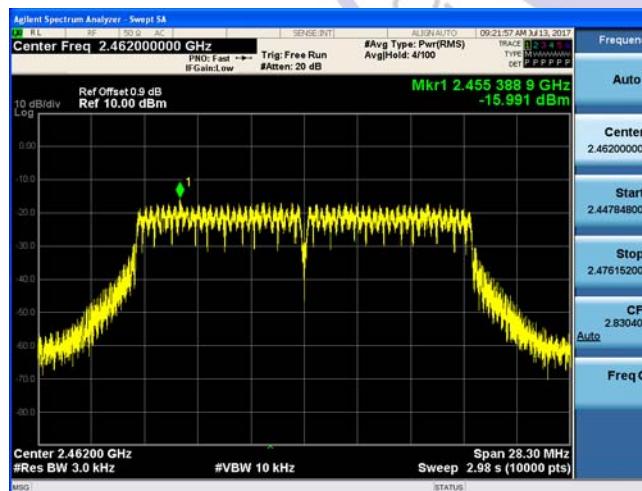
## 802.11n(HT40)



CH01



CH06



CH11

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

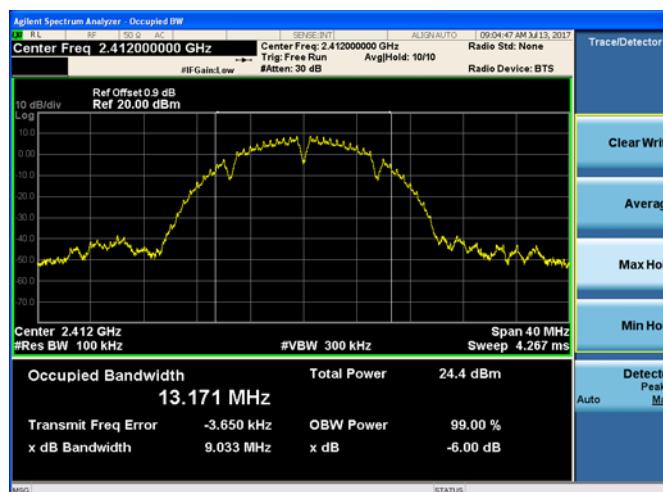


#### Test Results

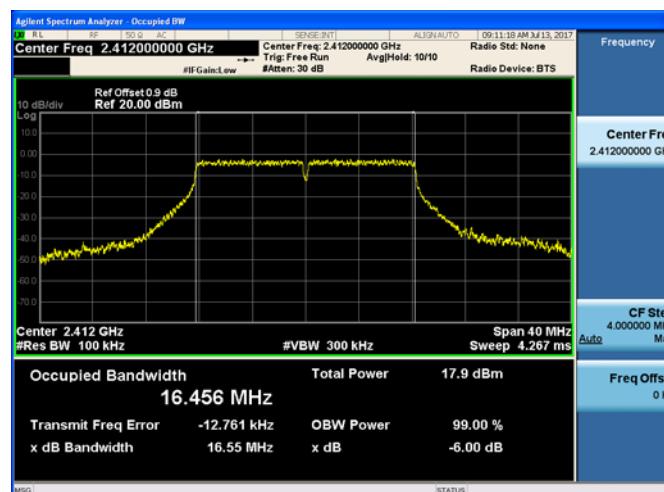
Type	Channel	6dB Bandwidth (MHz)	99% OBW (MHz)	Limit (KHz)	Result
802.11b	01	9.033	13.171	$\geq 500$	Pass
	06	9.038	13.196		
	11	9.034	13.140		
802.11g	01	16.55	16.456	$\geq 500$	Pass
	06	16.57	16.458		
	11	16.56	16.451		
802.11n(HT20)	01	17.76	17.642	$\geq 500$	Pass
	06	17.78	17.643		
	11	17.69	17.634		
802.11n(HT40)	03	36.48	36.101	$\geq 500$	Pass
	06	36.51	36.119		
	09	36.46	36.080		

Test plot as follows:

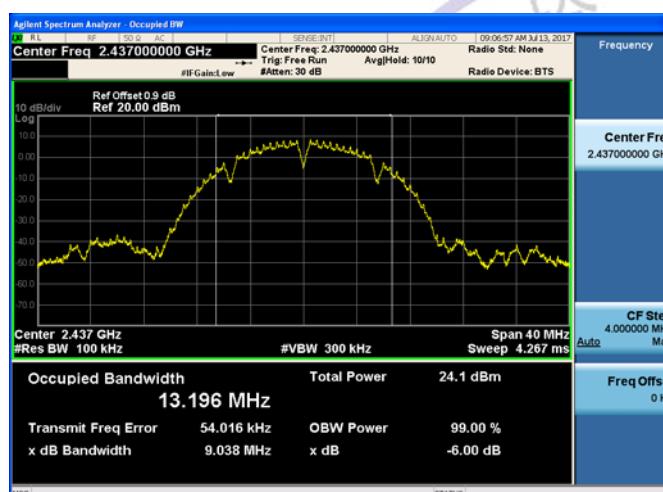
802.11b



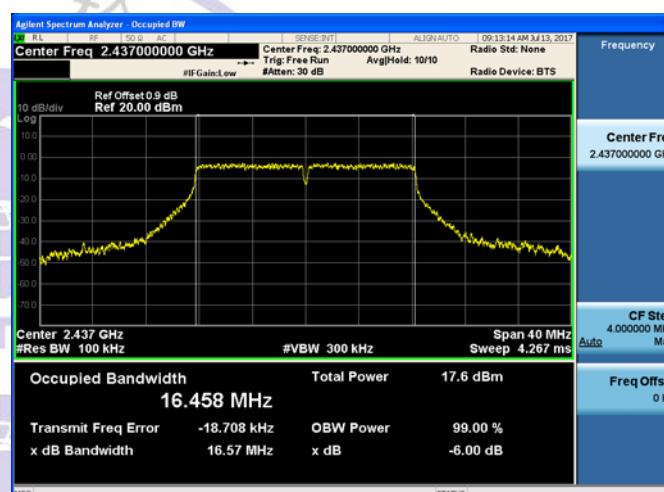
802.11g



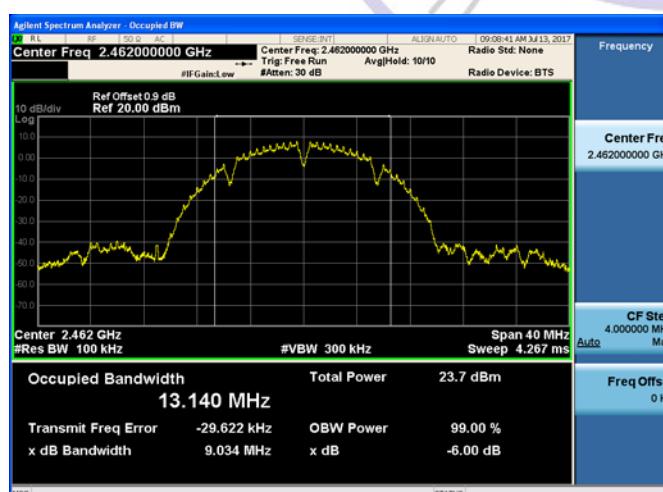
CH01



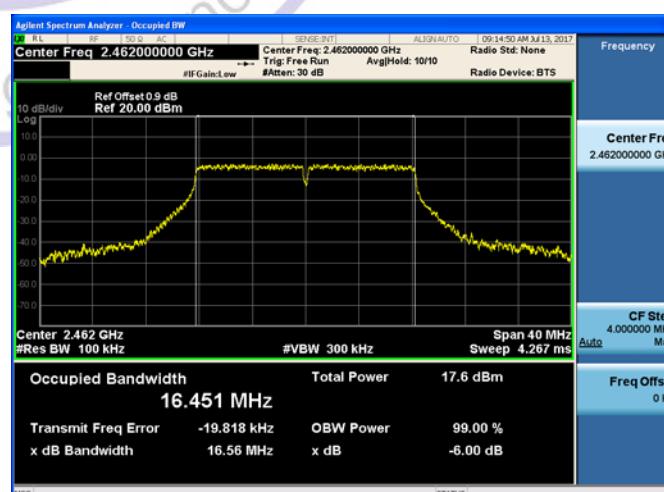
CH01



CH06



CH06

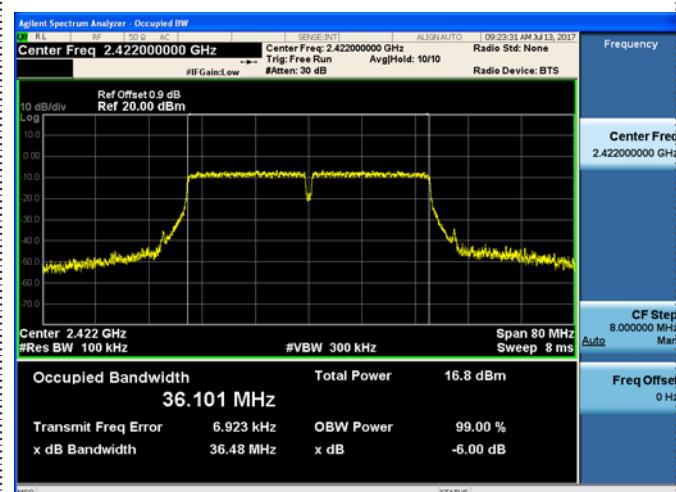
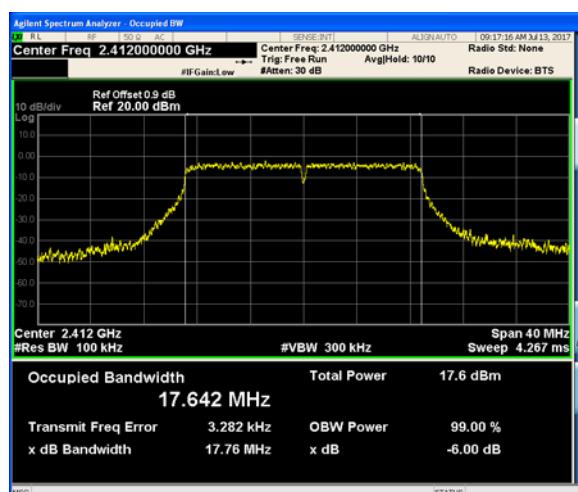


CH11

CH11

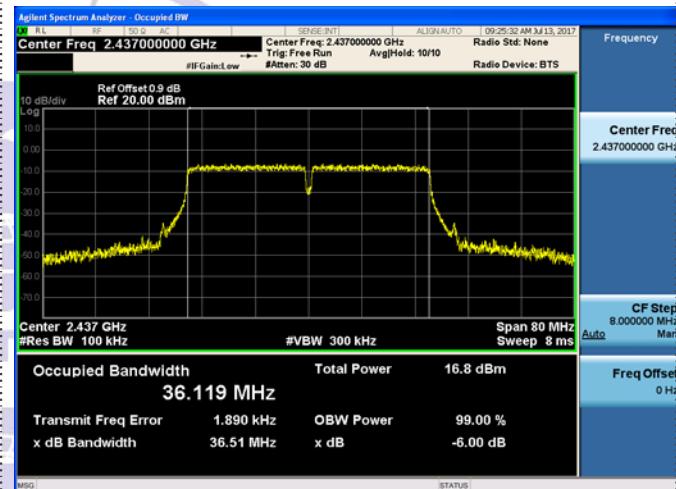
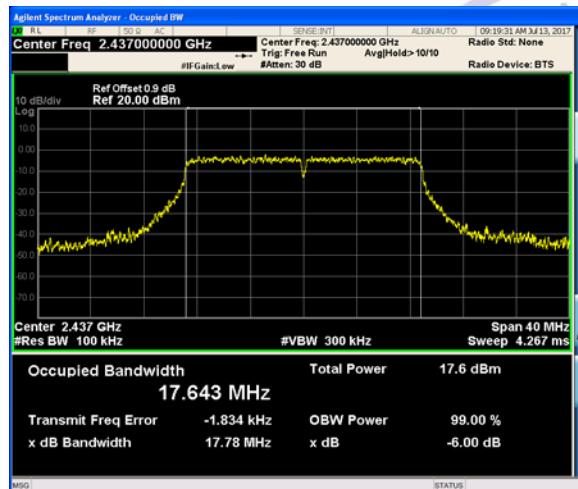
## 802.11n(HT20)

## 802.11n(HT40)



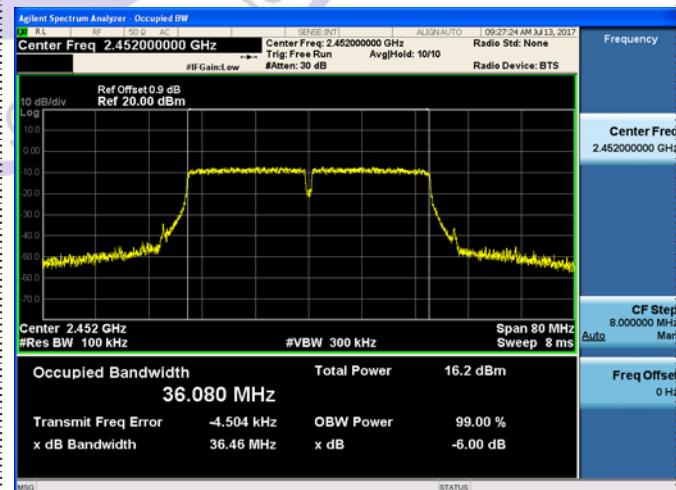
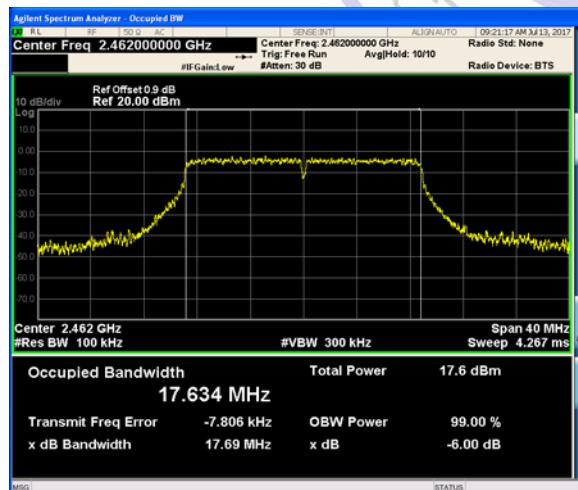
CH01

CH03



CH06

CH09



CH11

CH09

### 3.6. Out-of-band Emissions

#### Limit

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.

#### 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.

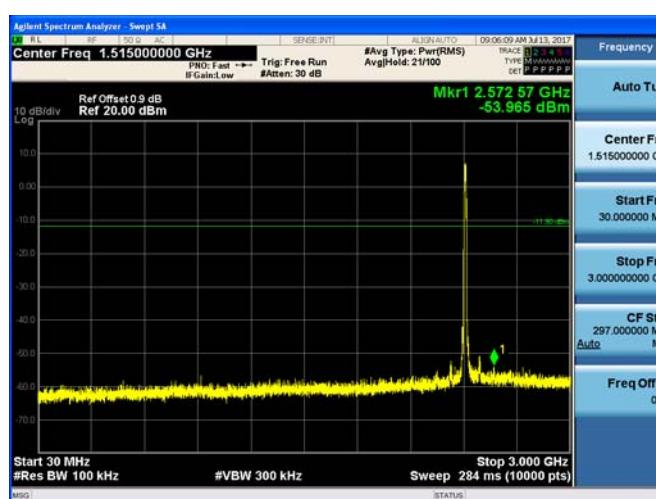
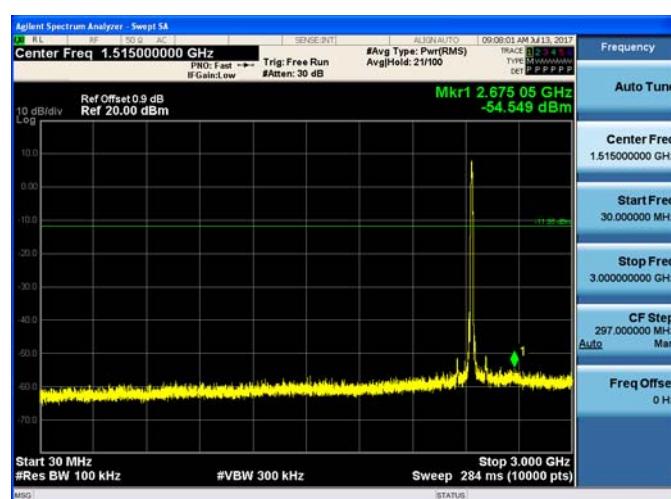
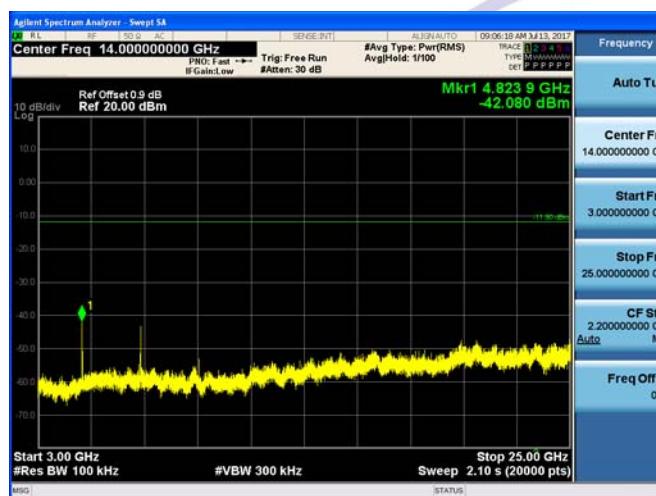
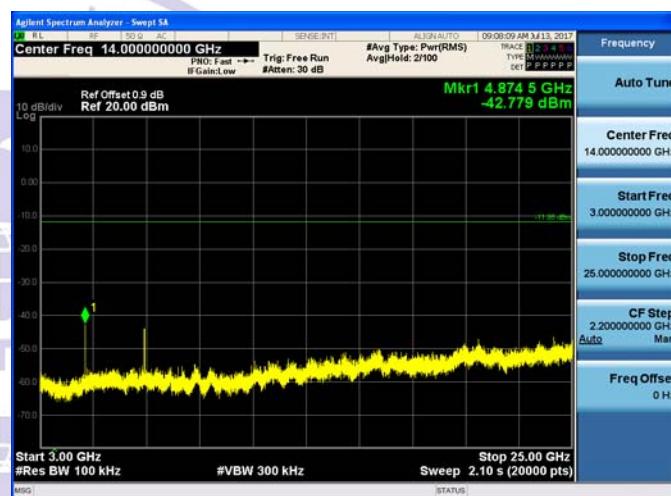
#### Test Configuration

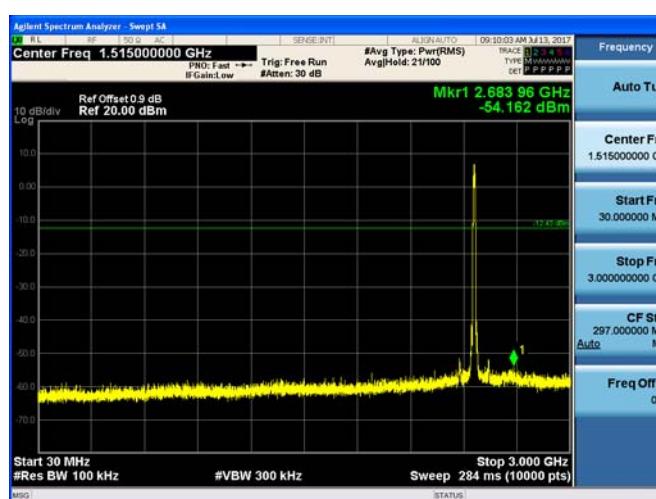
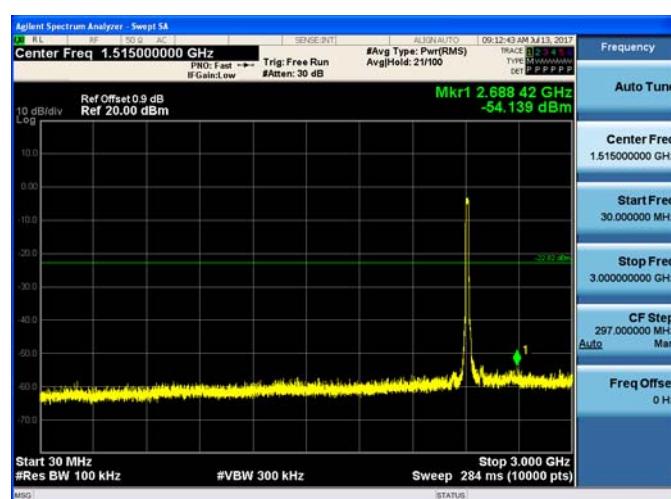
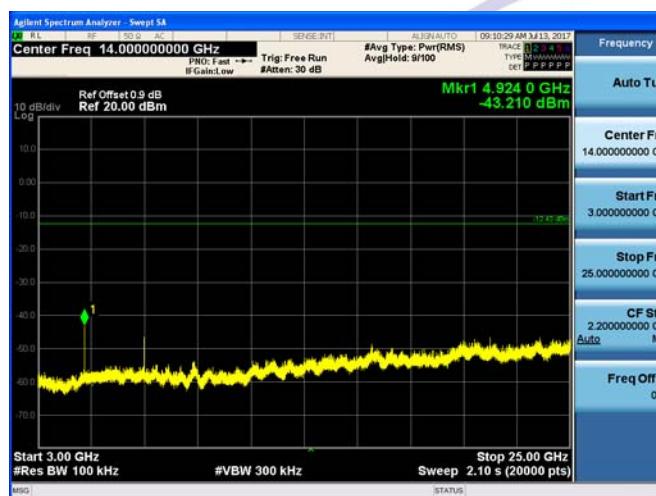
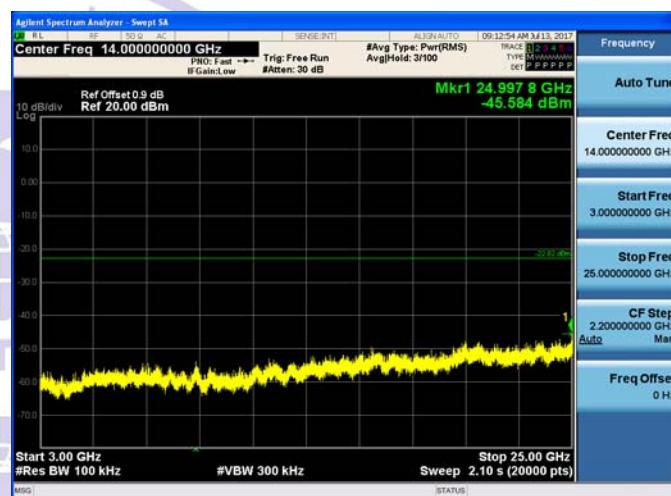


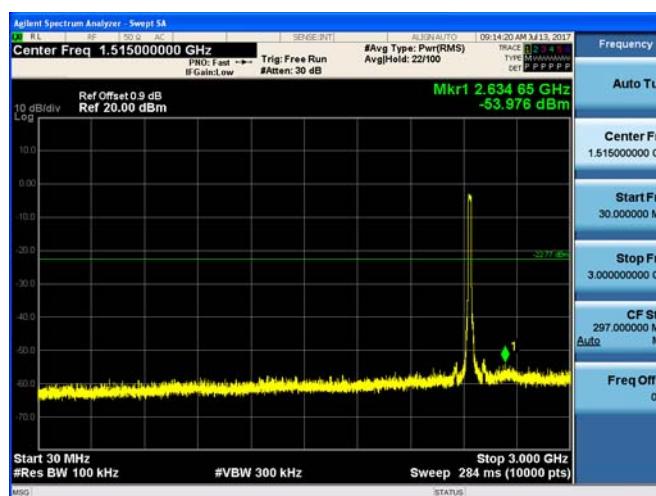
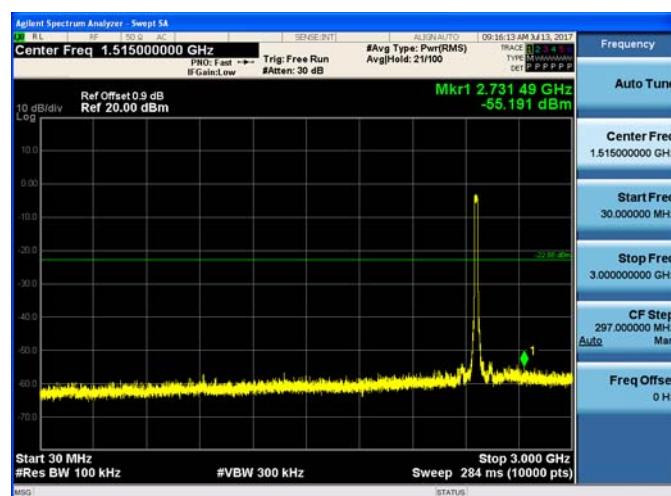
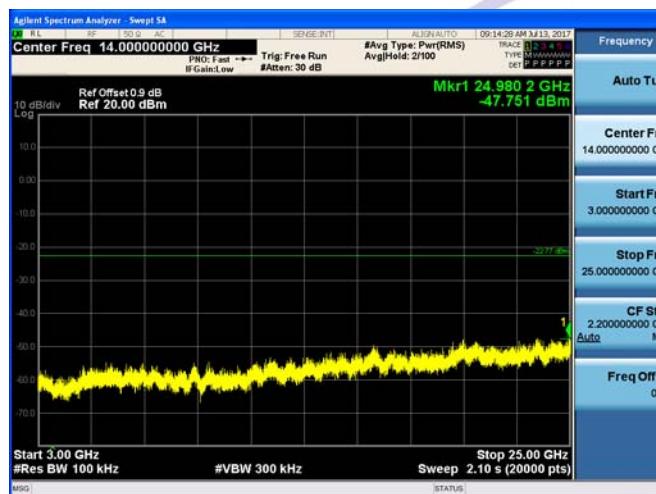
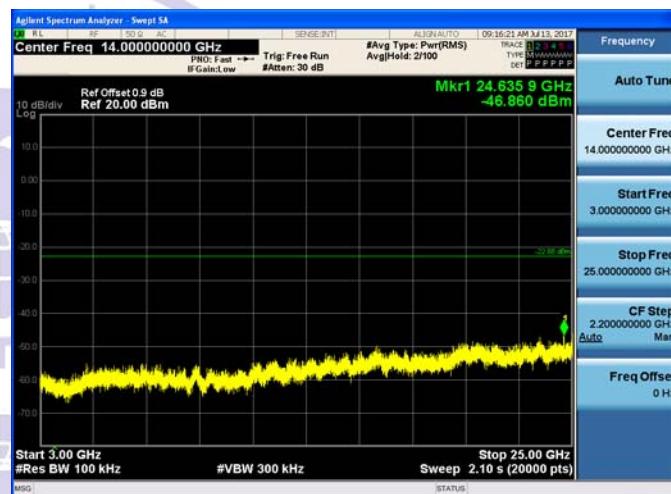
#### Test Results

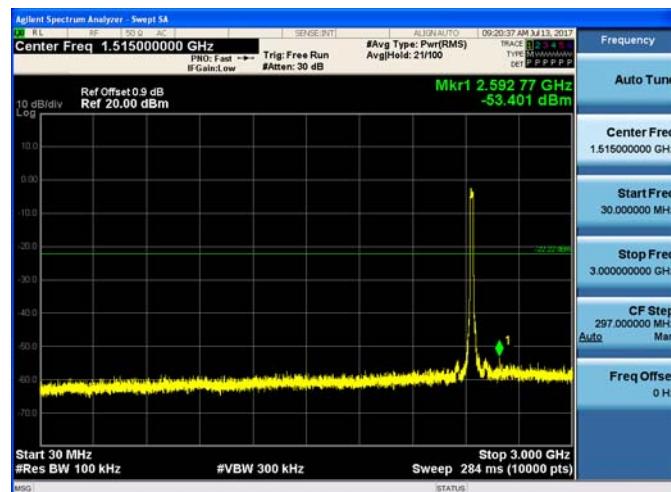
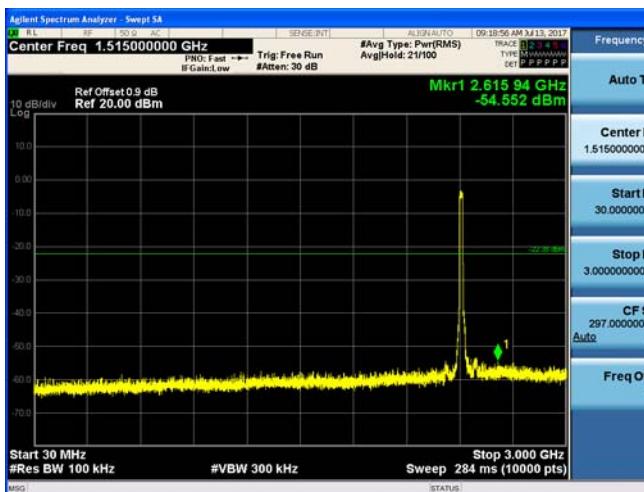
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Test plot as follows:

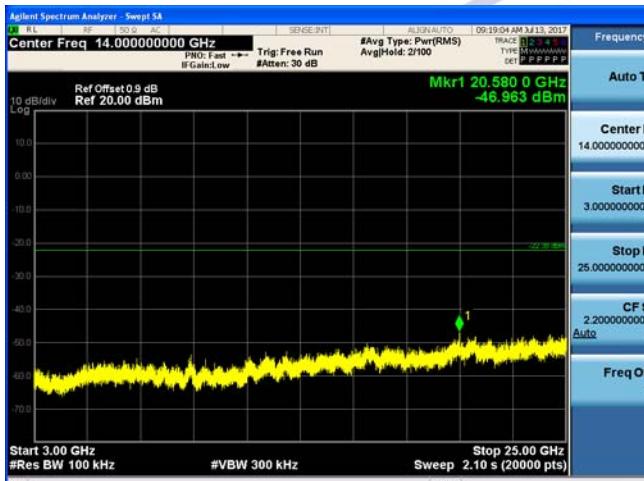
**802.11b CH01****802.11b CH06****30MHz-3GHz****30MHz-3GHz****3GHz-25GHz****3GHz-25GHz**

**802.11b CH11****802.11g CH01****30MHz-3GHz****30MHz-3GHz****3GHz-25GHz****3GHz-25GHz**

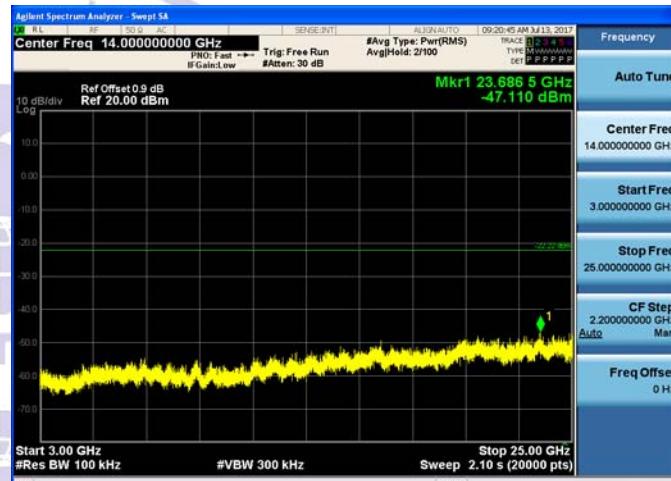
**802.11g CH06****802.11g CH11****30MHz-3GHz****30MHz-3GHz****3GHz-25GHz****3GHz-25GHz**



30MHz-3GHz

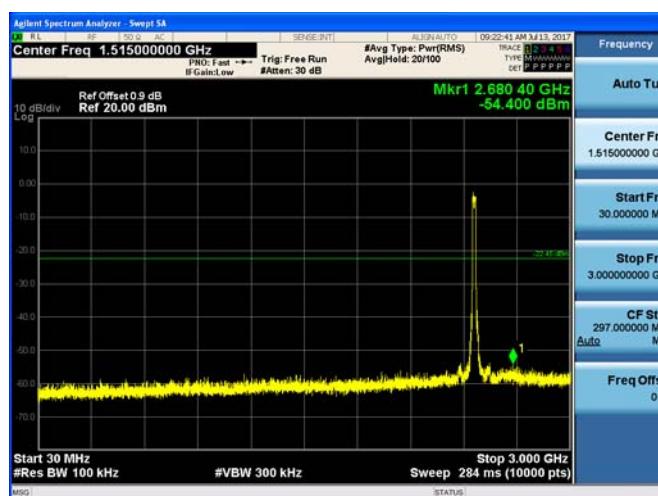
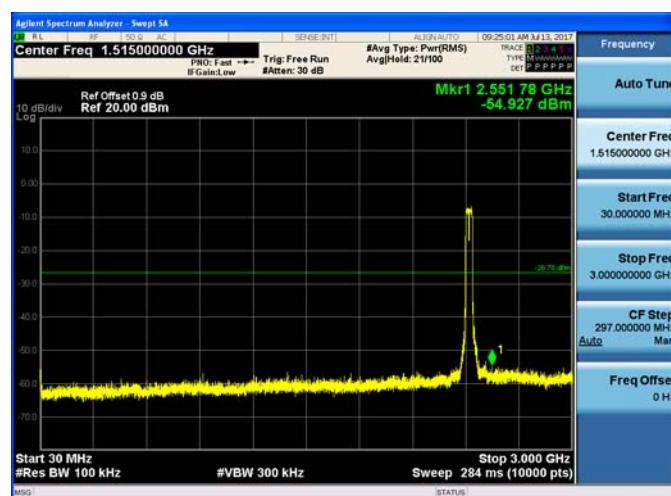
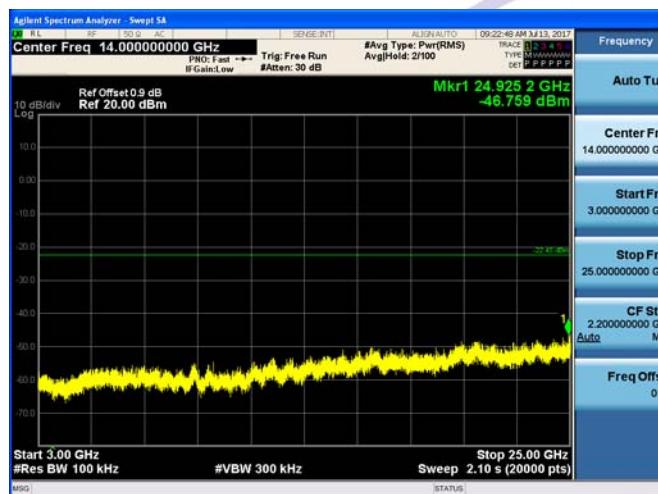
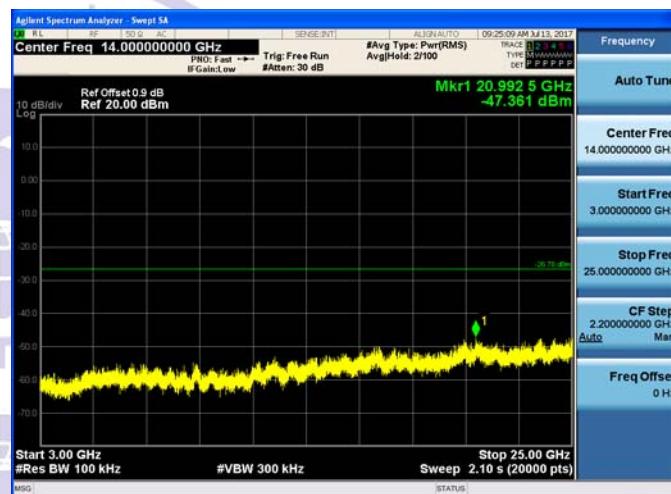


30MHz-3GHz



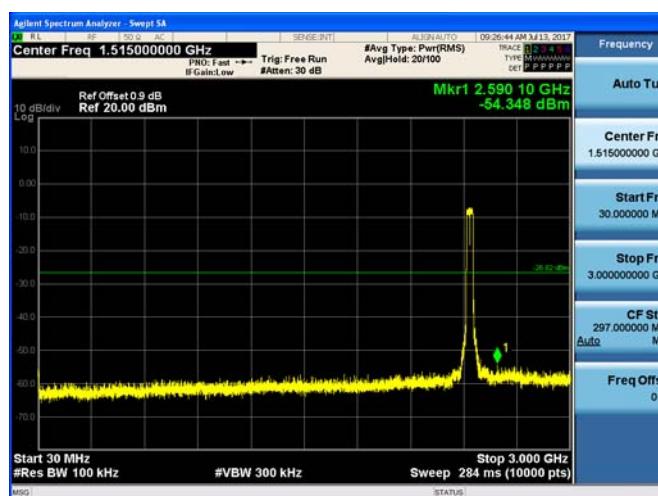
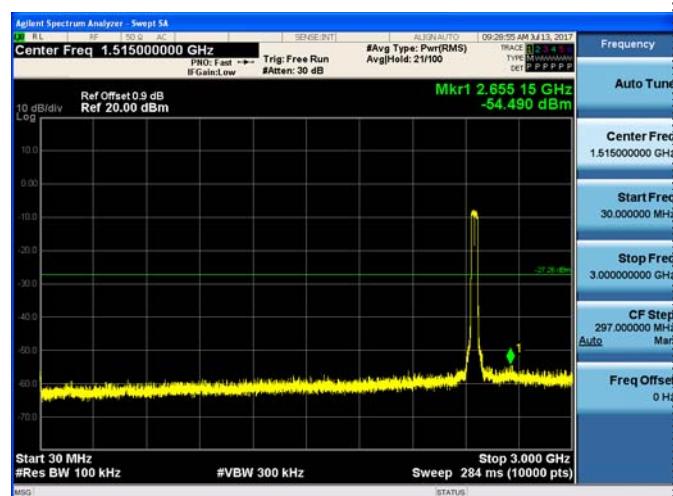
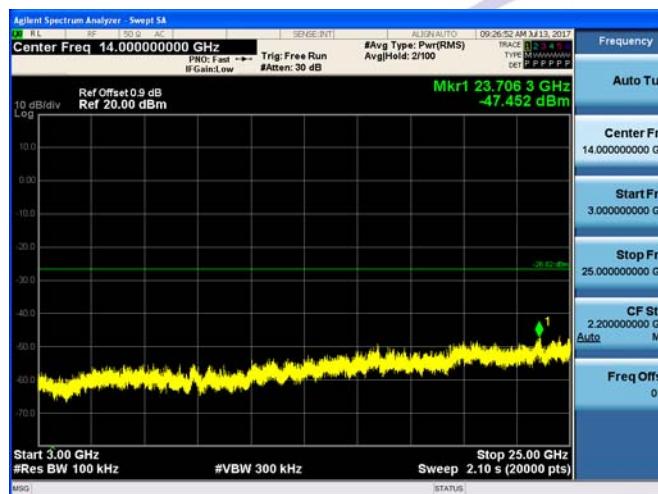
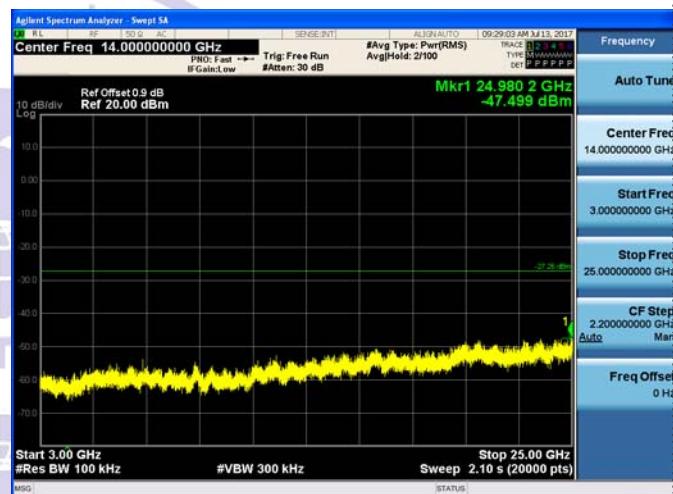
3GHz-25GHz

3GHz-25GHz

**802.11n(HT20) CH11****802.11n(HT40) CH03****30MHz-3GHz****30MHz-3GHz****3GHz-25GHz**

CTL Testing Technology

**3GHz-25GHz**

**802.11n(HT40) CH06****802.11n(HT40) CH09****30MHz-3GHz****30MHz-3GHz****3GHz-25GHz****3GHz-25GHz**

### Band-edge Measurements for RF Conducted Emissions:

**802.11b**



Left bandedge

Right bandedge

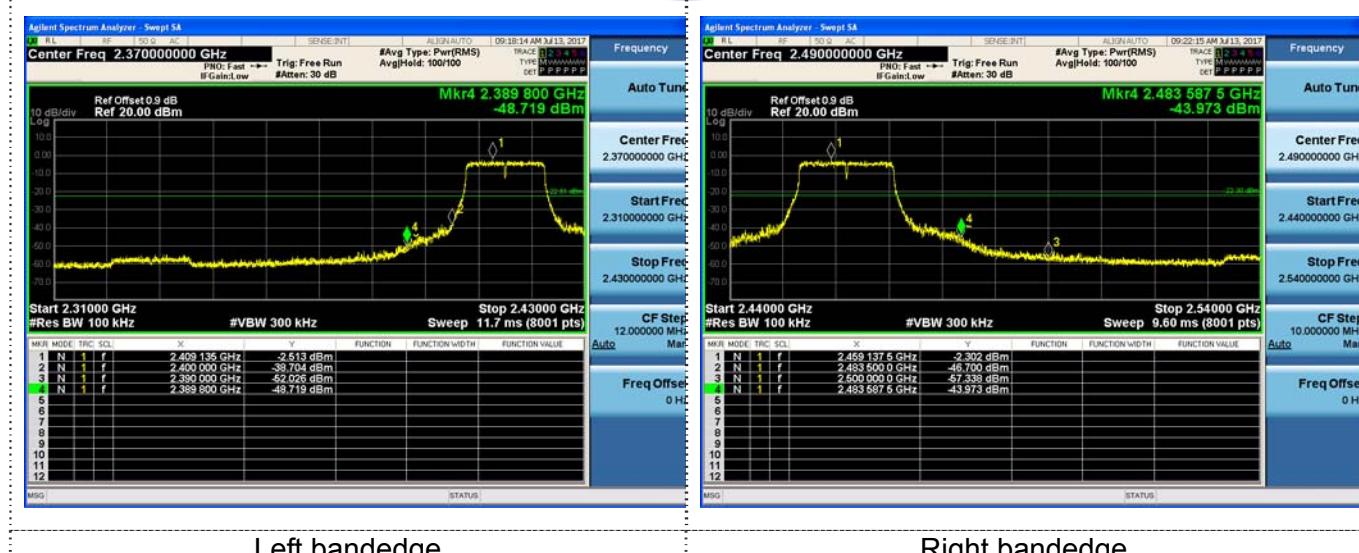
**802.11g**



Left bandedge

Right bandedge

**802.11n(HT20)**



Left bandedge

Right bandedge

## 802.11n(HT40)



Left bandedge

Right bandedge



### 3.7. Antenna Requirement

#### Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

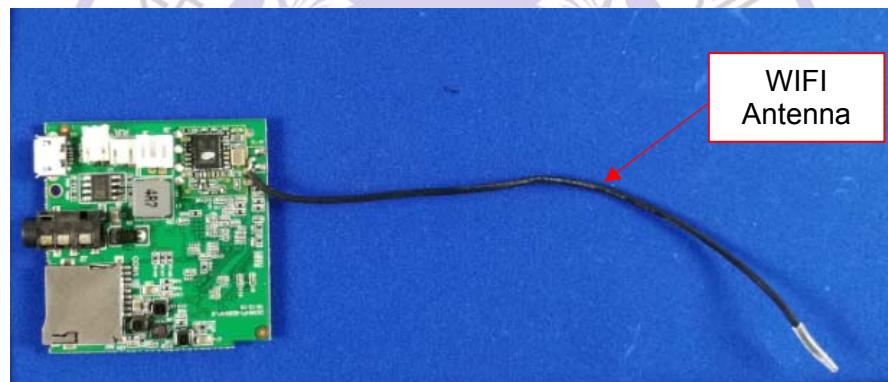
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

**FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):**

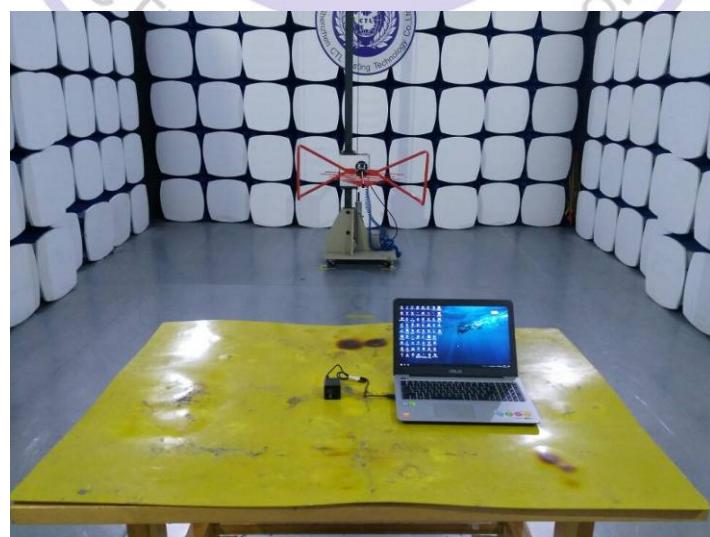
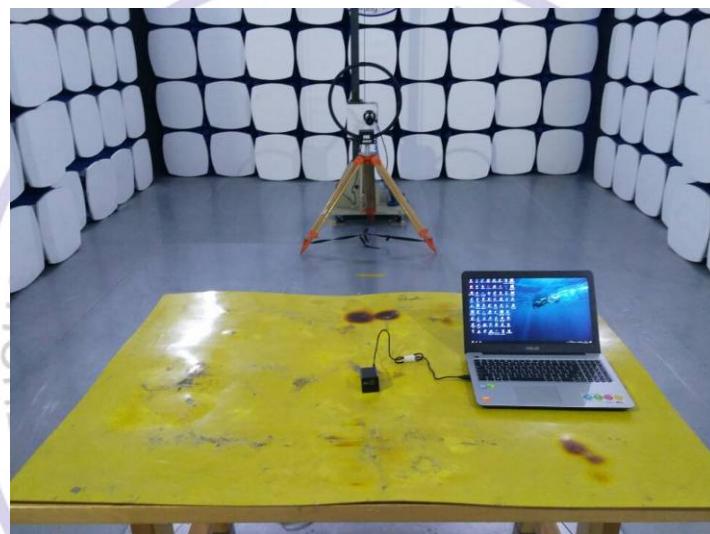
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

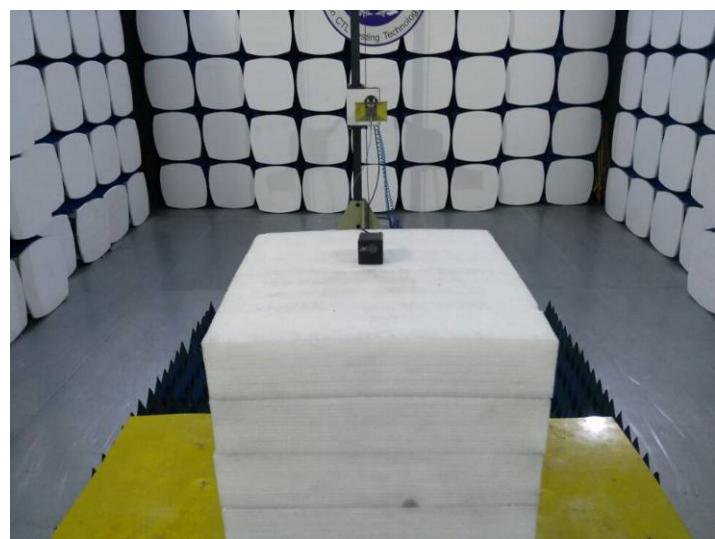
#### Test Result:

The maximum gain of antenna was 0dBi.



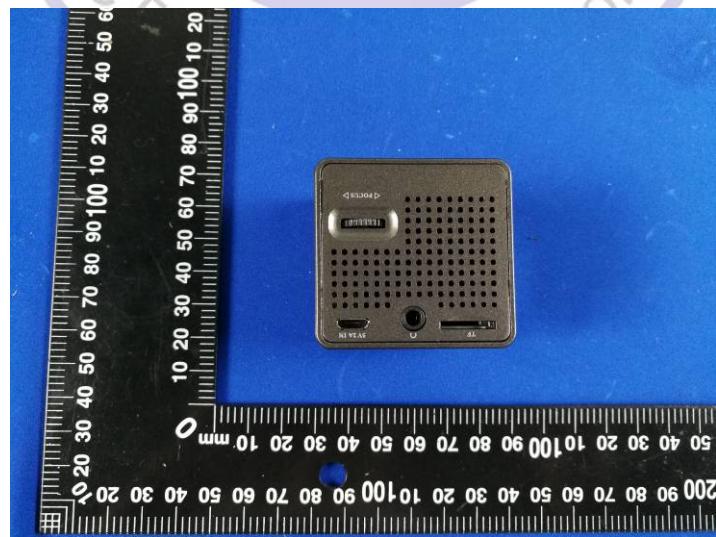
## 4. Test Setup Photos of the EUT

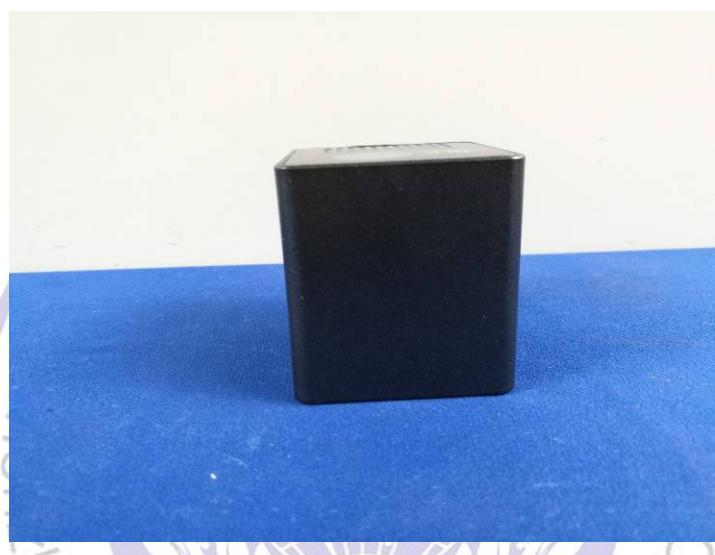


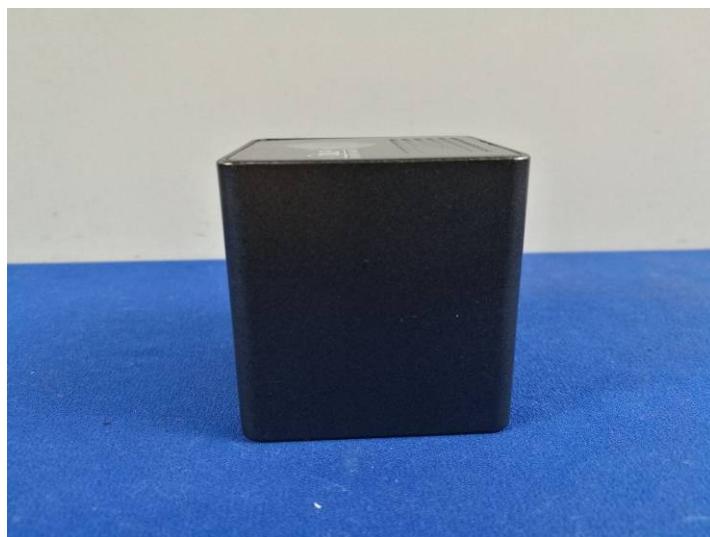


## 5. Photos of the EUT

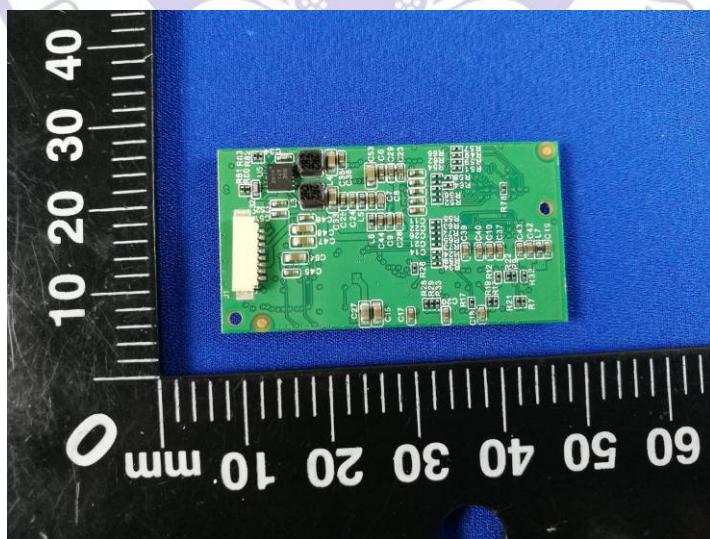
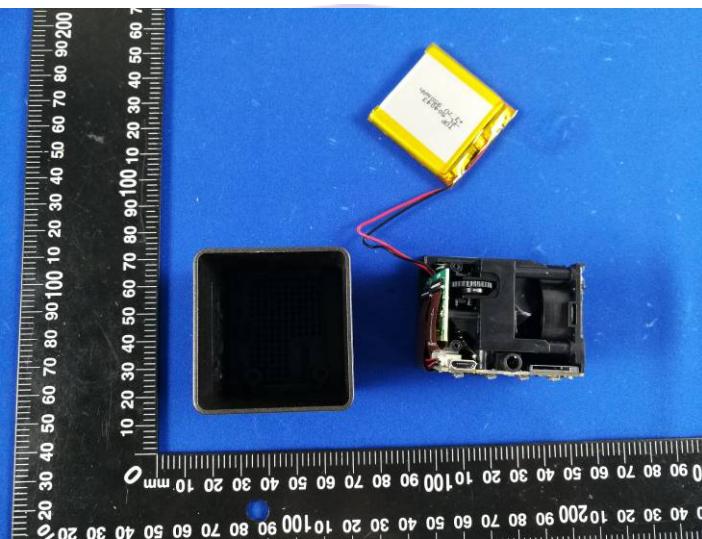
### External Photos of EUT

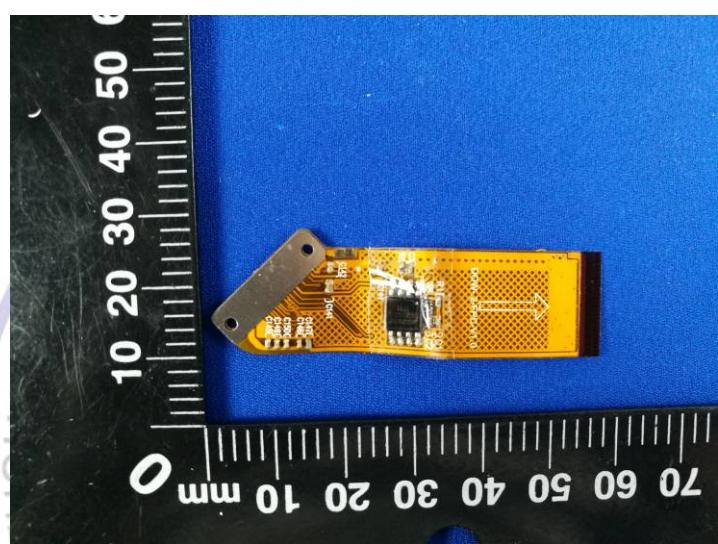
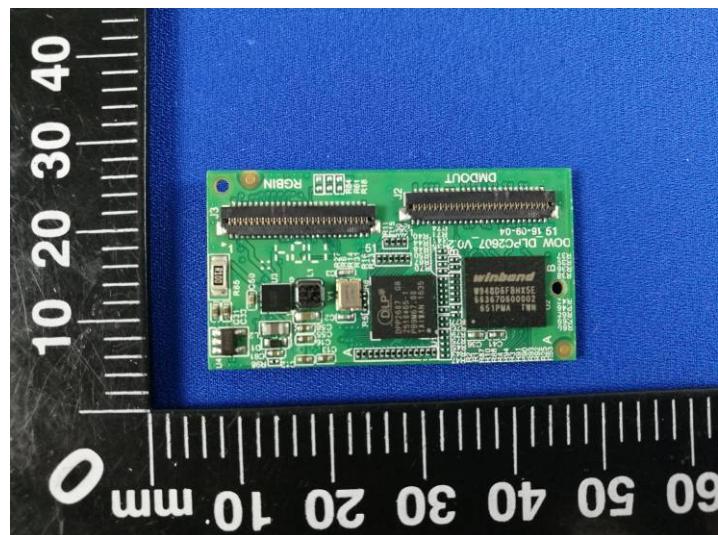


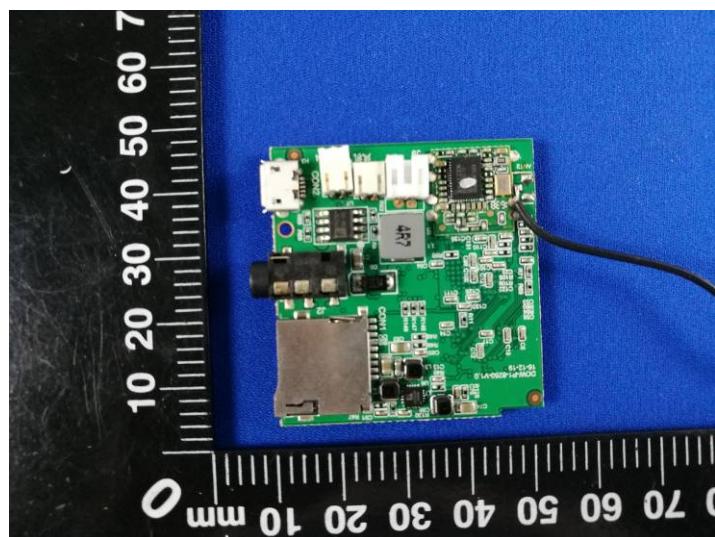


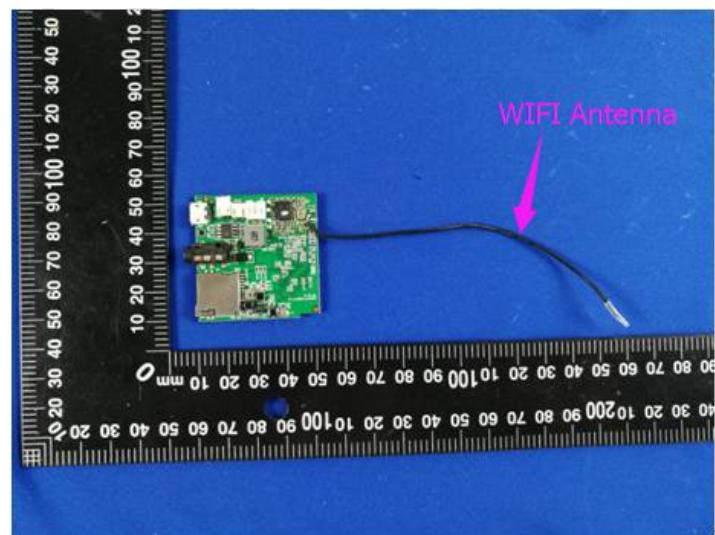


Internal Photos of EUT









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

