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# TEST REPORT

## FCC PART 15.247

Report Reference No. .... : **CTL1612072101-WF01**

Compiled by: ( position+printed name+signature)	Allen Wang (File administrators)	<u>Allen Wang</u>
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Approved by: ( position+printed name+signature)	Ivan Xie (Manager)	<u>Ivan Xie</u>

**Product Name** ..... : Mobile Phone

**Model/Type reference** ..... : i50F

**List Model(s)** ..... : N/A

**Trade Mark** ..... : FreshFun

**FCC ID** ..... : 2ALCI-FRESHFUNDI50F

**Applicant's name** ..... : **Ruio Communication Technology Co.,Ltd**

**Address of applicant** ..... : Room 2501, Broadgate Software Building, No.1003 Keyuan Road, High-Tech Park, Nanshan District, Shenzhen, Guangdong, China

**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 ..... : **FCC Part 15.247:** 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

**Date of Receipt** ..... : Feb. 16, 2017

**Date of Test Date** ..... : Feb. 17, 2017–Mar. 06, 2017

**Data of Issue** ..... : Mar. 07, 2017

**Result** ..... : Pass

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# TEST REPORT

<b>Test Report No. :</b>	<b>CTL1612072101-WF01</b>	<b>Mar. 07, 2017</b>
		<b>Date of issue</b>

Equipment under Test : Mobile Phone

Model /Type : i50F

Listed Models : N/A

**Applicant** : **Ruio Communication Technology Co.,Ltd**

Address : Room 2501, Broadgate Software Building, No,1003  
Keyuan Road, High-Tech Park, Nanshan District,  
Shenzhen, Guangdong, China

**Manufacturer** : **Ruio Communication Technology Co.,Ltd**

Address : Room 2501, Broadgate Software Building, No,1003  
Keyuan Road, High-Tech Park, Nanshan District,  
Shenzhen, Guangdong, China

<b>Test result</b>	<b>Pass *</b>
--------------------	---------------

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

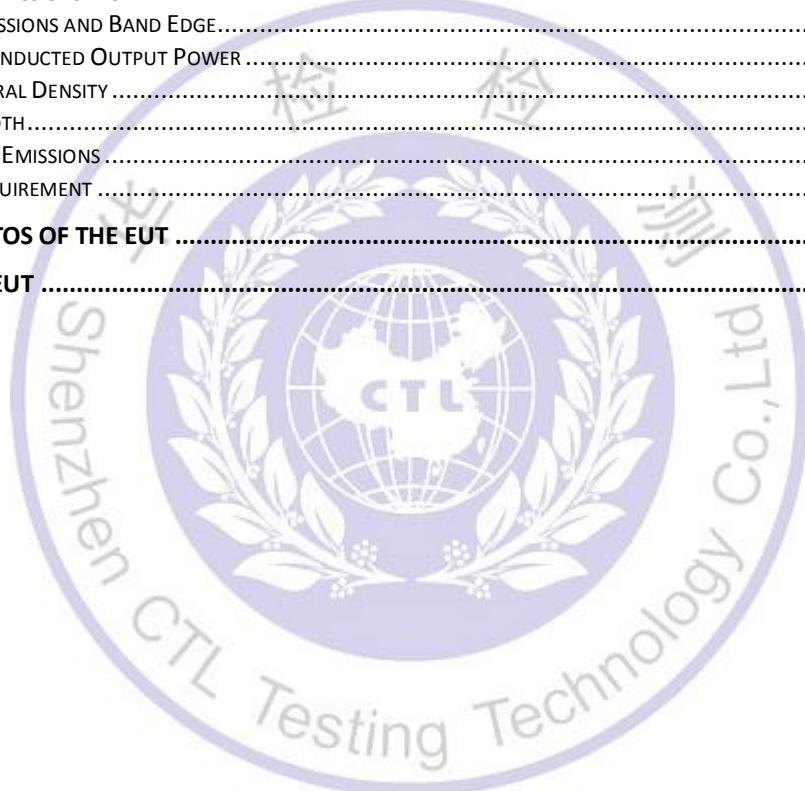
The test report merely corresponds to the test sample.

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:	Mobile Phone
Model/Type reference:	i50F
Power supply:	DC 3.8V 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): 9
Channel separation:	5MHz
Antenna type:	FPC antenna
Antenna gain:	0dBi
<b>Bluetooth:</b>	
Supported type:	Version 4.0 for low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Antenna type:	FPC 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.

All test performed at the low, middle and high of operational frequency range of each mode.

### Operation Frequency WIFI :

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

### Operation Frequency List BT4.0 :

Channel	Frequency (MHz)
<b>00</b>	<b>2402</b>
02	2404
03	2406
:	:
<b>19</b>	<b>2440</b>
:	:
37	2476
38	2478
<b>39</b>	<b>2480</b>

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	3560.6550.1 2	2016/06/02	2017/06/01
LISN	R&S	ESH2-Z5	860014/010	2016/06/02	2017/06/01
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	103710	2016/06/02	2017/06/01
Spectrum Analyzer	Agilent	E4407B	MY41440676	2016/05/21	2017/05/20
Spectrum Analyzer	Agilent	N9020	US46220290	2017/01/16	2018/01/17
Power Meter	Anritsu	ML2487B	110553	2016/06/02	2017/06/01
Power Sensor	Anritsu	MA2411B	100345	201/05/21	2017/05/20
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
High-Pass Filter	K&L	9SH10-2700/X1 2750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U1 2750-O/O	N/A	2016/05/20	2017/05/19
Coaxial Cables	HUBER+SUHN ER	SUCOFLEX 104PEA-10M	10m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHN ER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHN ER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
RF Cable	Megalon	RF-A303	N/A	2016/06/02	2017/06/01

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

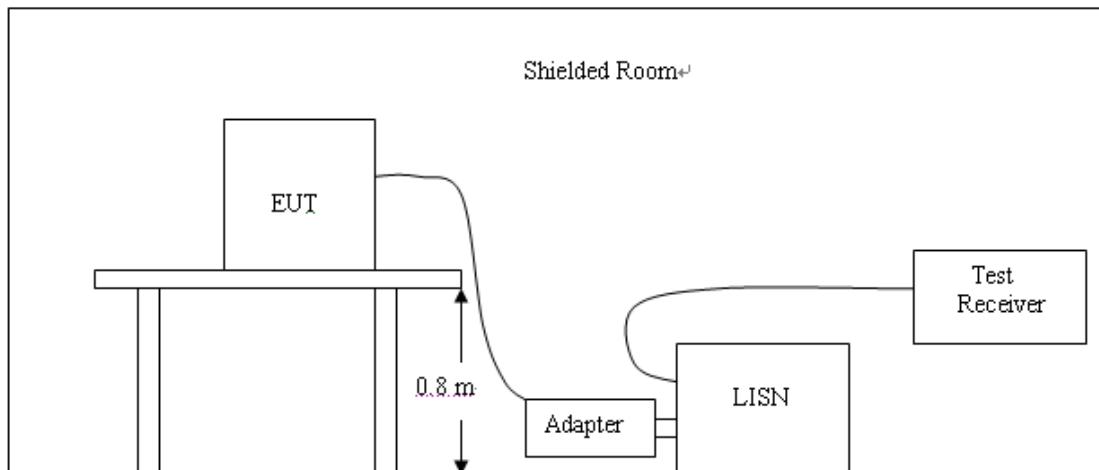
##### LIMIT

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

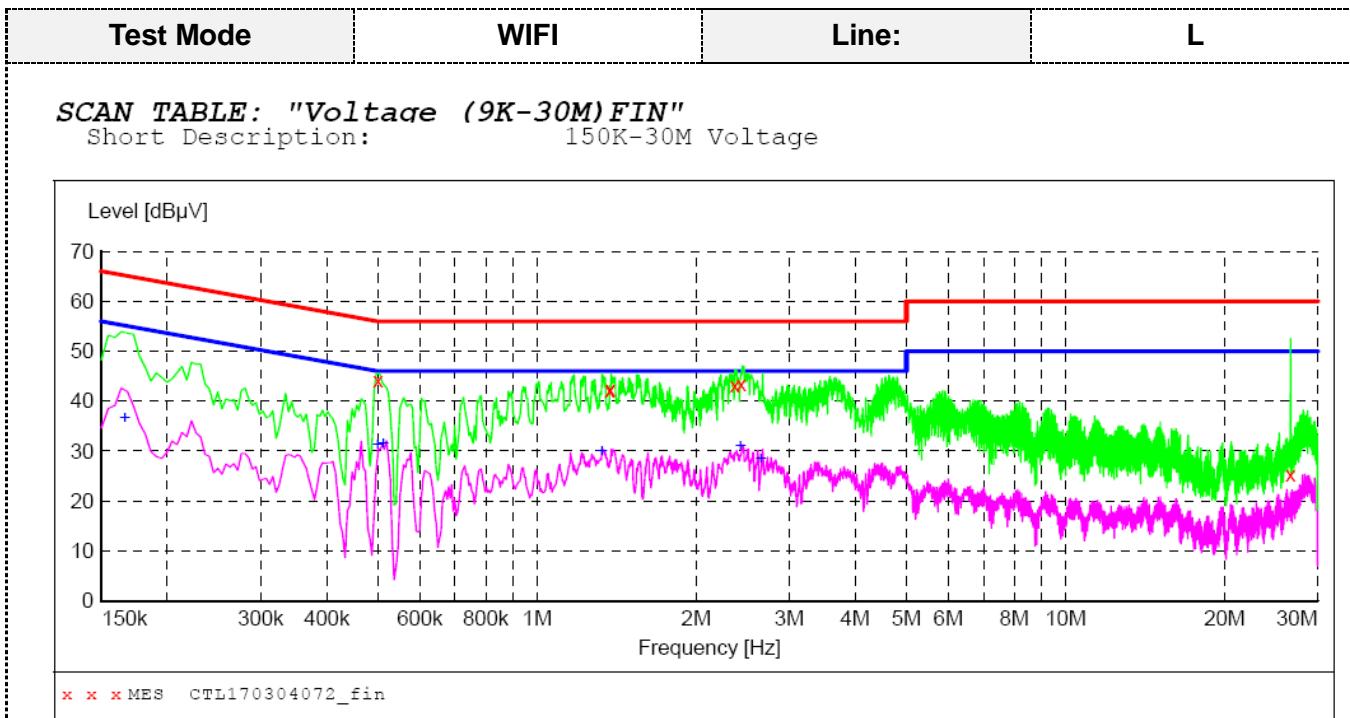


##### TEST PROCEDURE

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) and BLE mode all have been tested, only worse case of 802.11b High Channel and BLE High Channel are reported.



### **MEASUREMENT RESULT: "CTL170304072\_fin"**

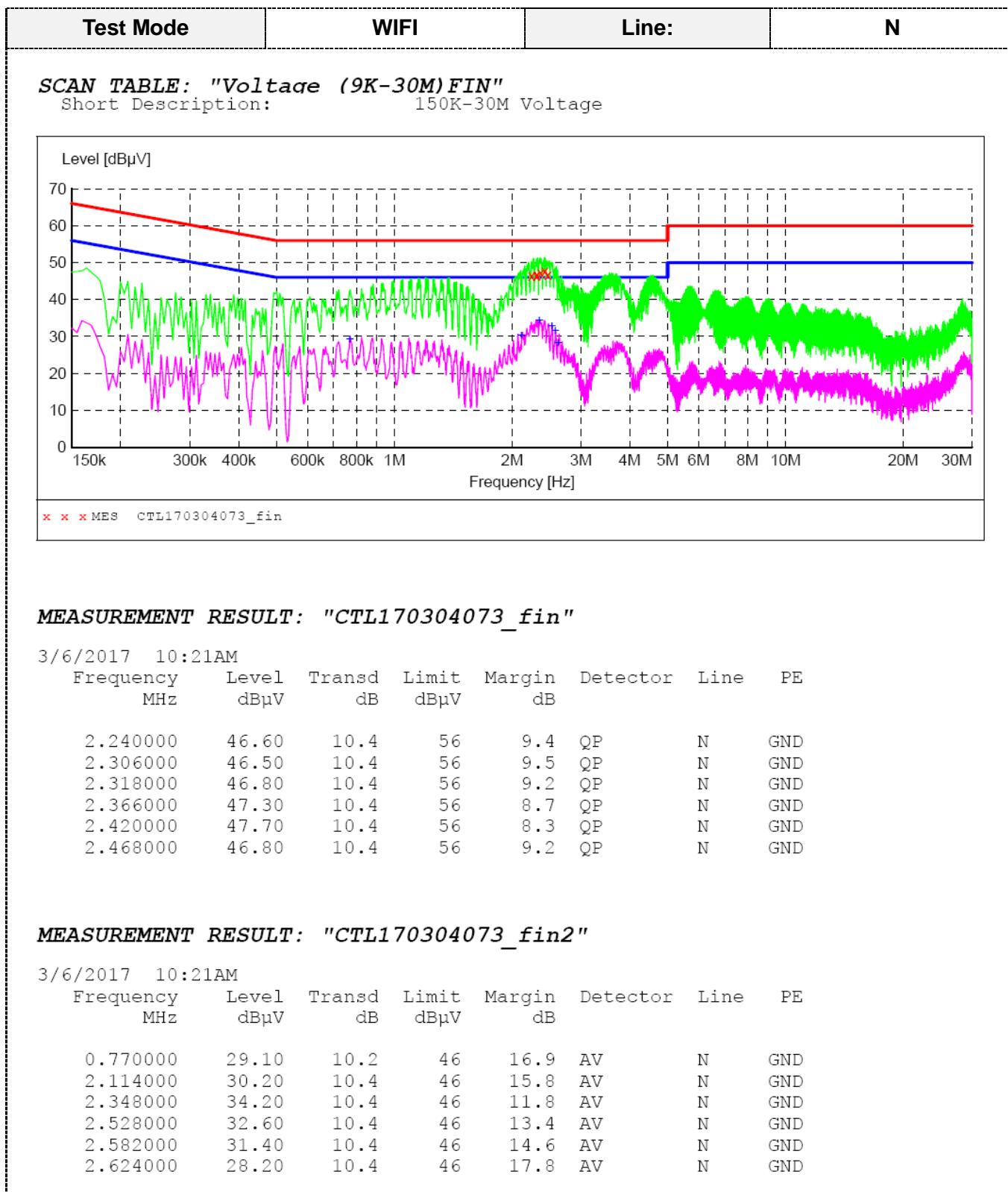
3/6/2017 10:18AM

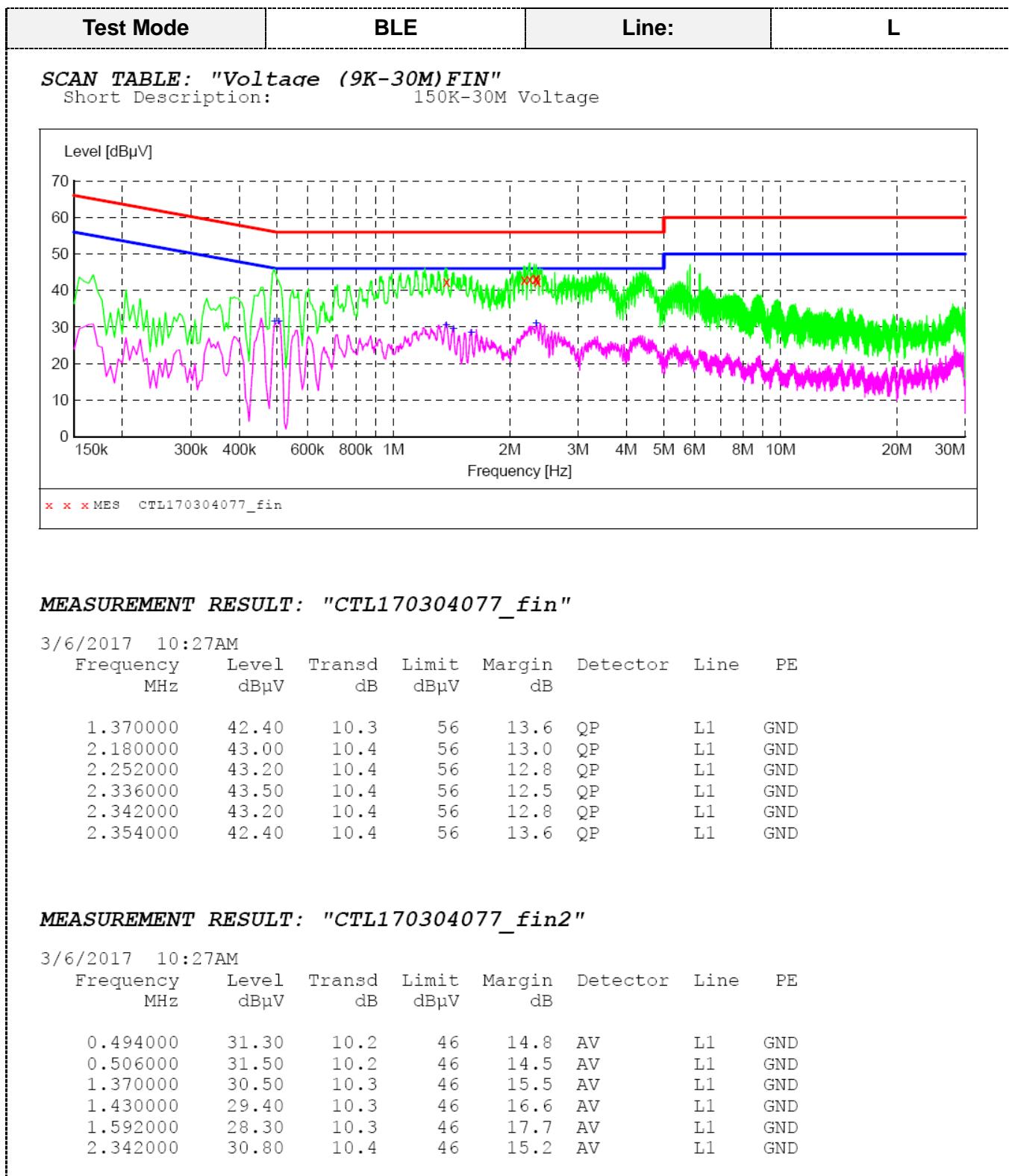
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.500000	44.10	10.2	56	11.9	QP	L1	GND
1.370000	42.20	10.3	56	13.8	QP	L1	GND
1.376000	42.40	10.3	56	13.6	QP	L1	GND
2.366000	43.20	10.4	56	12.8	QP	L1	GND
2.432000	43.40	10.4	56	12.6	QP	L1	GND
26.630000	25.40	11.2	60	34.6	QP	L1	GND

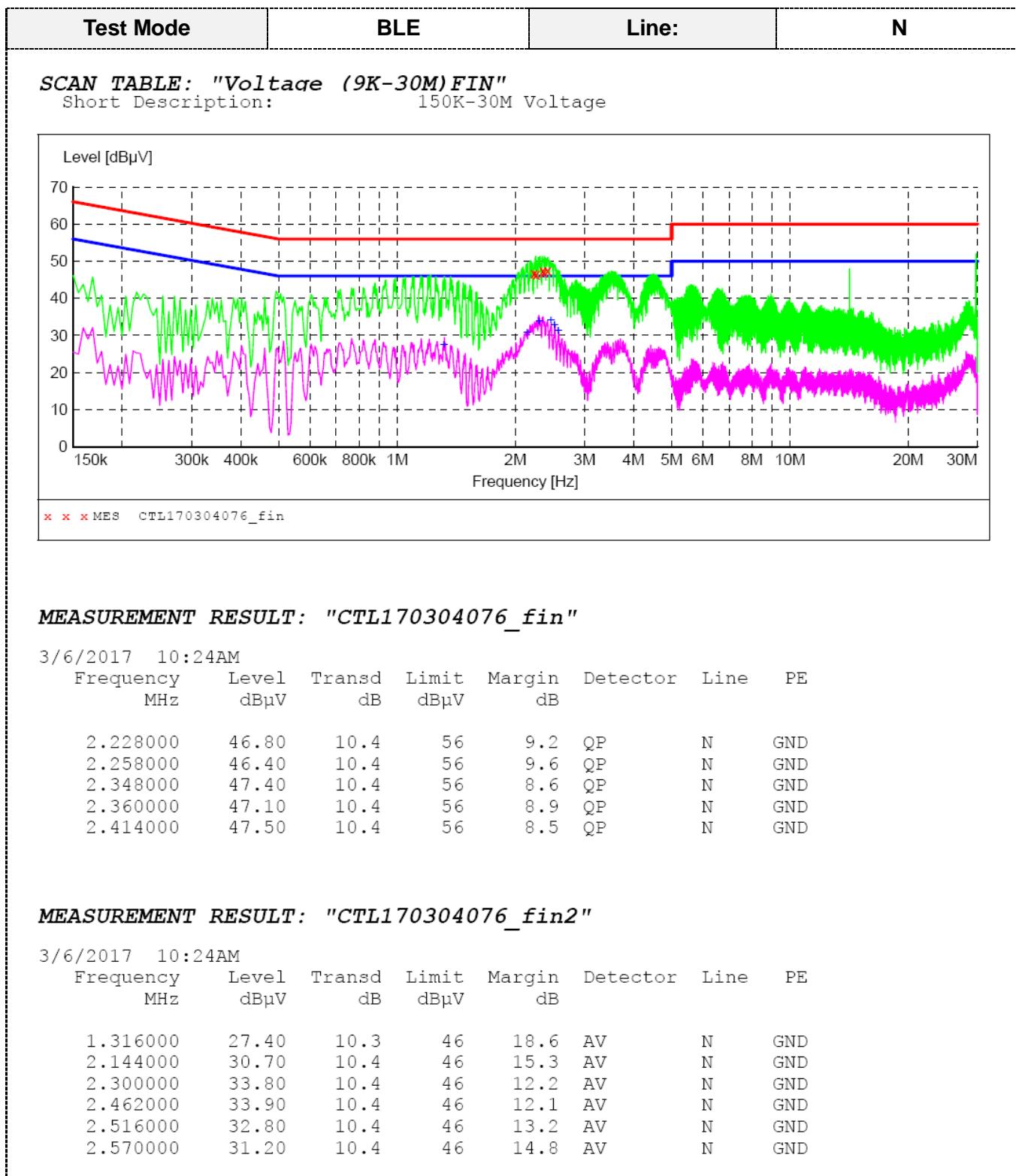
### **MEASUREMENT RESULT: "CTL170304072\_fin2"**

3/6/2017 10:18AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.166000	36.60	10.2	55	18.6	AV	L1	GND
0.500000	31.10	10.2	46	14.9	AV	L1	GND
0.512000	31.50	10.2	46	14.5	AV	L1	GND
1.328000	29.80	10.3	46	16.2	AV	L1	GND
2.426000	30.80	10.4	46	15.2	AV	L1	GND
2.654000	28.30	10.4	46	17.7	AV	L1	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.

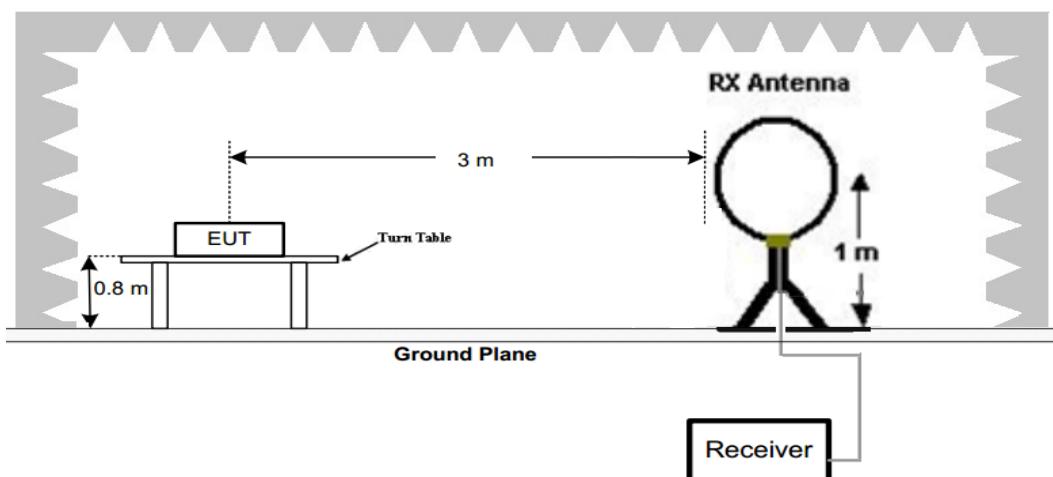
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

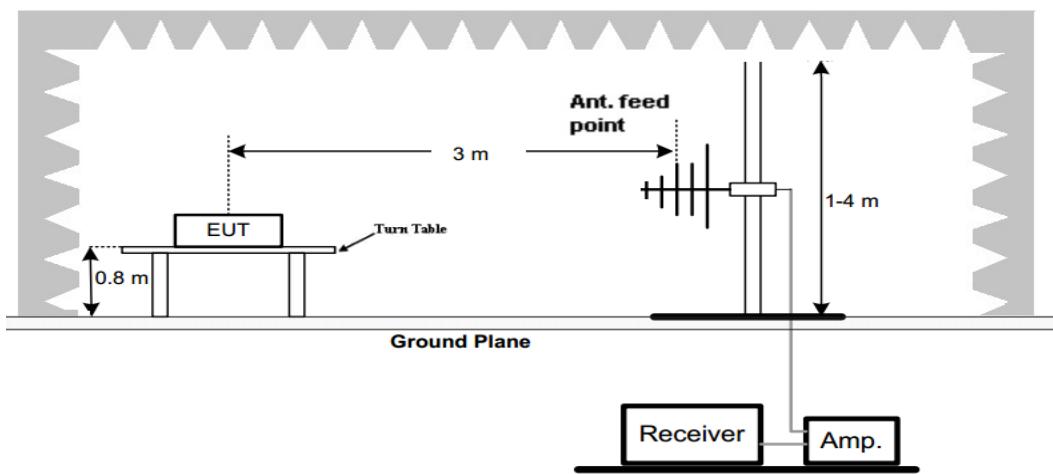
Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

#### TEST CONFIGURATION

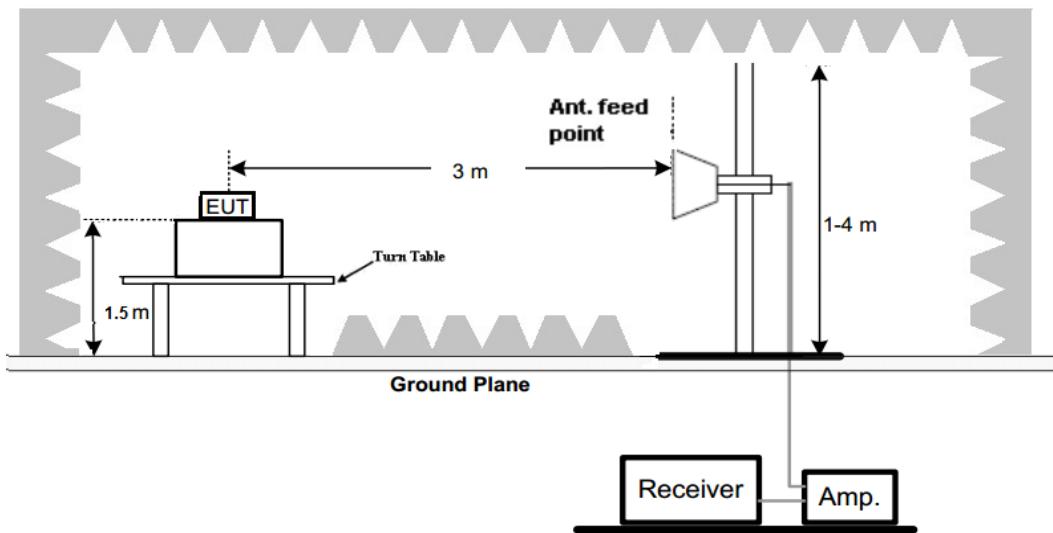
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



### Test Procedure

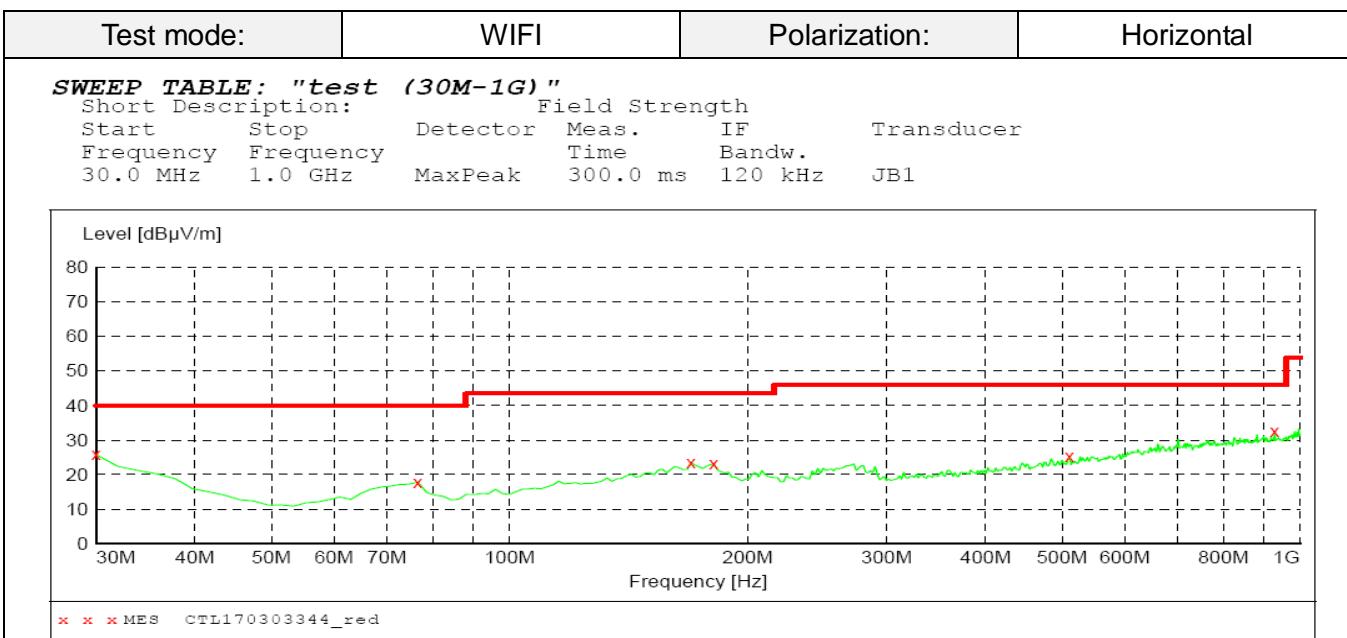
1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to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

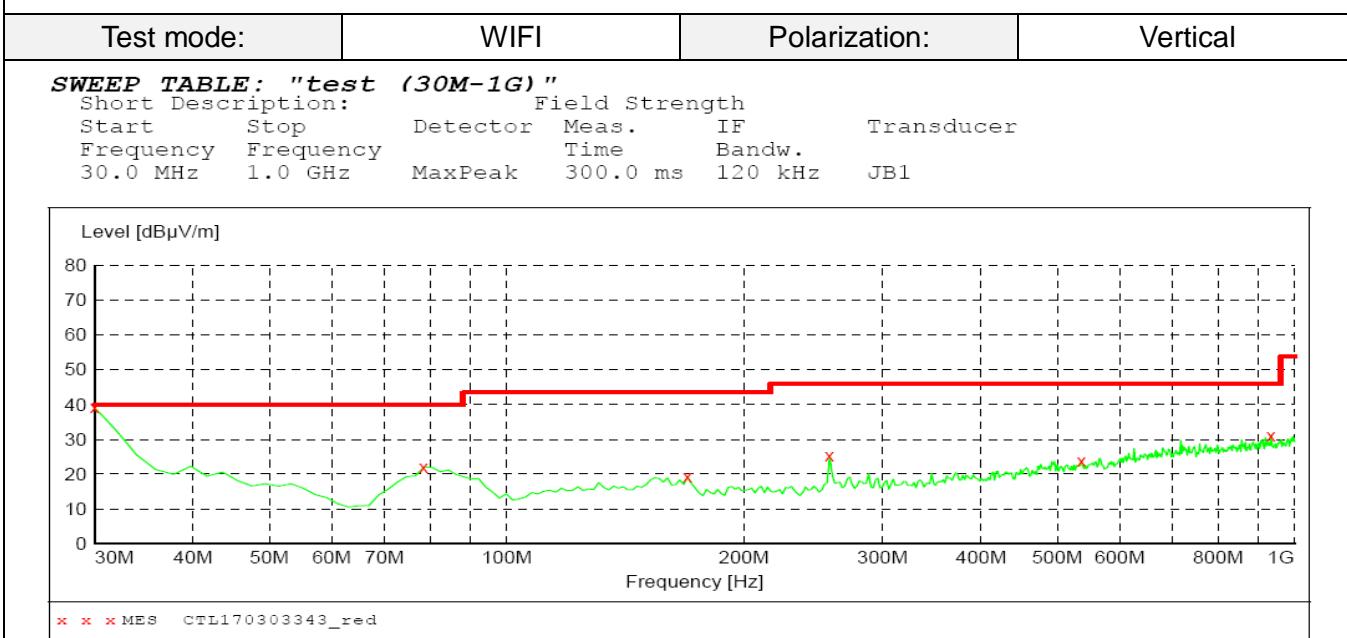
1. All three channels (lowest/middle/highest) of each mode were measured below 1GHz and recorded worst case at 802.11b low channel and BLE High Channel.
2. All three channels (lowest/middle/highest) of each mode were measured above 1GHz and recorded worst case at 802.11b mode.
3. Radiated emission test 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: "CTL170303344\_red"**

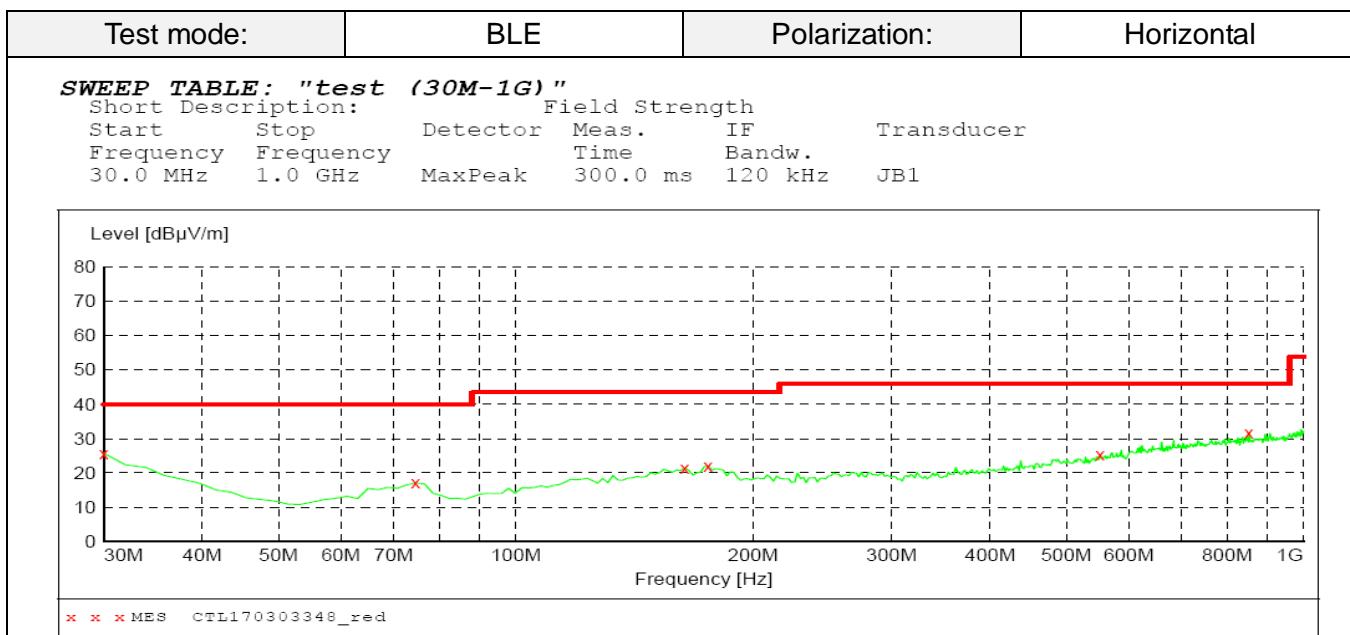
3/6/2017 9:40AM

Frequency MHz	Level dB $\mu$ V/m	Transd dB	Limit dB $\mu$ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	25.80	20.8	40.0	14.2	---	0.0	0.00	HORIZONTAL
76.560000	17.80	8.3	40.0	22.2	---	0.0	0.00	HORIZONTAL
169.680000	23.50	13.3	43.5	20.0	---	0.0	0.00	HORIZONTAL
181.320000	23.10	13.0	43.5	20.4	---	0.0	0.00	HORIZONTAL
511.120000	25.30	20.3	46.0	20.7	---	0.0	0.00	HORIZONTAL
928.220000	32.50	26.2	46.0	13.5	---	0.0	0.00	HORIZONTAL

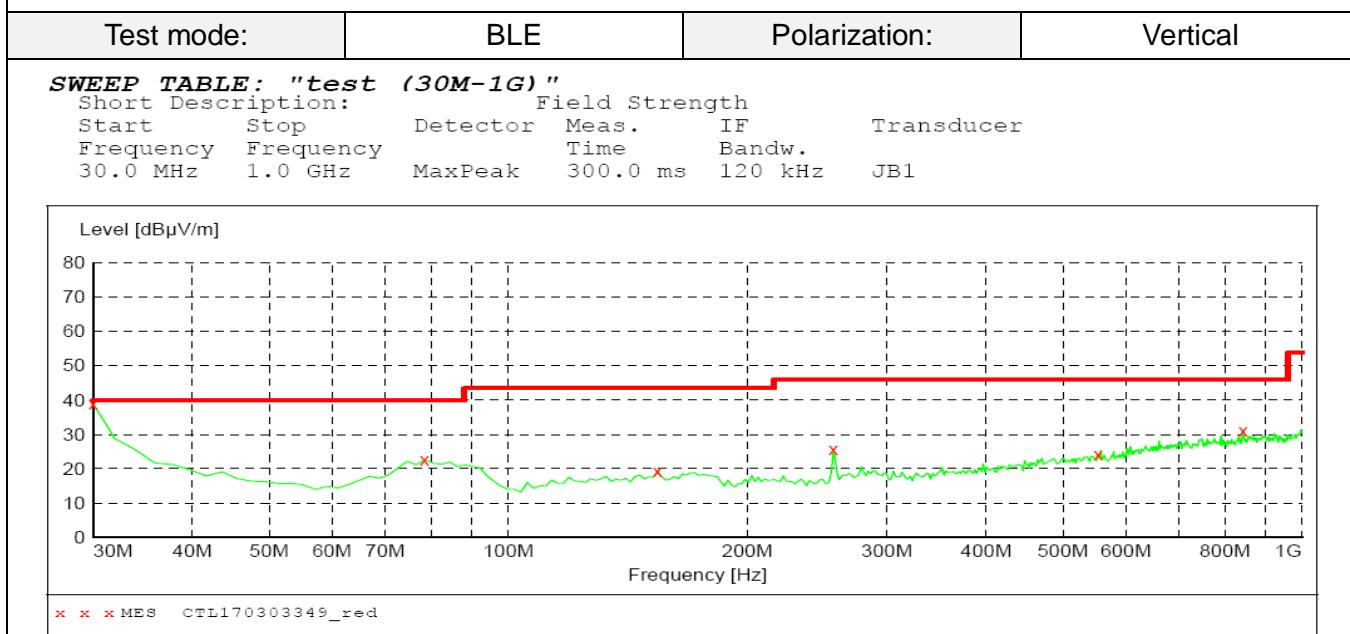
**MEASUREMENT RESULT: "CTL170303343\_red"**

3/6/2017 9:38AM

Frequency MHz	Level dB $\mu$ V/m	Transd dB	Limit dB $\mu$ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	39.10	20.8	40.0	0.9	---	0.0	0.00	VERTICAL
78.500000	22.10	8.4	40.0	17.9	---	0.0	0.00	VERTICAL
169.680000	19.20	13.3	43.5	24.3	---	0.0	0.00	VERTICAL
256.980000	25.20	14.4	46.0	20.8	---	0.0	0.00	VERTICAL
536.340000	23.80	20.6	46.0	22.2	---	0.0	0.00	VERTICAL
934.040000	31.10	26.3	46.0	14.9	---	0.0	0.00	VERTICAL

**MEASUREMENT RESULT: "CTL170303348\_red"**

3/6/2017 9:42AM	Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization
	MHz	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB		cm	deg	
	30.000000	25.70	20.8	40.0	14.3	---	0.0	0.00	HORIZONTAL
	74.620000	17.00	8.3	40.0	23.0	---	0.0	0.00	HORIZONTAL
	163.860000	21.50	13.6	43.5	22.0	---	0.0	0.00	HORIZONTAL
	175.500000	22.10	12.9	43.5	21.4	---	0.0	0.00	HORIZONTAL
	551.860000	25.20	21.0	46.0	20.8	---	0.0	0.00	HORIZONTAL
	852.560000	31.70	25.2	46.0	14.3	---	0.0	0.00	HORIZONTAL

**MEASUREMENT RESULT: "CTL170303349\_red"**

3/6/2017 9:43AM	Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization
	MHz	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB		cm	deg	
	30.000000	38.80	20.8	40.0	1.2	---	0.0	0.00	VERTICAL
	78.500000	22.60	8.4	40.0	17.4	---	0.0	0.00	VERTICAL
	154.160000	19.20	13.7	43.5	24.3	---	0.0	0.00	VERTICAL
	256.980000	25.70	14.4	46.0	20.3	---	0.0	0.00	VERTICAL
	553.800000	24.10	21.0	46.0	21.9	---	0.0	0.00	VERTICAL
	842.860000	31.00	25.1	46.0	15.0	---	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 Factor (dB/m)
4824.00	58.48	PK	74	15.52	53.93	33.52	6.92	35.89
4824.00	49.25	AV	54	4.75	44.70	33.52	6.92	35.89
5035.50	47.50	PK	74	26.50	40.59	34.10	7.05	34.24
5035.50	--	AV	54	--	--	--	--	--
7236.00	50.11	PK	74	23.89	38.84	37.10	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 Factor (dB/m)
4824.00	58.86	PK	74	15.14	54.31	33.52	6.92	35.89
4824.00	49.46	AV	54	4.54	44.91	33.52	6.92	35.89
5035.50	48.90	PK	74	25.10	41.99	34.10	7.05	34.24
5035.50	--	AV	54	--	--	--	--	--
7236.00	51.43	PK	74	22.57	40.16	37.10	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 Factor (dB/m)
4874.00	57.21	PK	74	16.79	52.57	33.59	6.95	35.90
4874.00	48.66	AV	54	5.34	44.02	33.59	6.95	35.90
5140.75	47.13	PK	74	26.87	39.88	34.42	7.11	34.28
5140.75	--	AV	54	--	--	--	--	--
7311.00	49.54	PK	74	24.46	37.88	37.44	9.22	35.00
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 Factor (dB/m)
4874.00	57.65	PK	74	16.35	53.01	33.59	6.95	35.90
4874.00	48.98	AV	54	5.02	44.34	33.59	6.95	35.90
5140.75	47.90	PK	74	26.10	40.65	34.42	7.11	34.28
5140.75	--	AV	54	--	--	--	--	--
7311.00	50.04	PK	74	23.96	38.38	37.44	9.22	35.00
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 Factor (dB/m)
4924.00	57.19	PK	74	16.81	52.41	33.71	6.98	35.91
4924.00	49.60	AV	54	4.40	44.82	33.71	6.98	35.91
5205.75	48.14	PK	74	25.86	40.75	34.55	7.14	34.30
5205.75	--	AV	54	--	--	--	--	--
7386.00	50.25	PK	74	23.75	38.37	37.61	9.25	34.98
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 Factor (dB/m)
4924.00	58.15	PK	74	15.85	53.37	33.71	6.98	35.91
4924.00	49.22	AV	54	4.78	44.44	33.71	6.98	35.91
5205.75	47.96	PK	74	26.04	40.57	34.55	7.14	34.30
5205.75	--	AV	54	--	--	--	--	--
7386.00	50.45	PK	74	23.55	38.57	37.61	9.25	34.98
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; RBW 1MHz VBW10Hz Peak detector is for AV value.

**BT4.0 GFSK Mode (above 1GHz)**

Frequency(MHz):		2402		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)
4804.00	49.55	PK	74	24.45	45.04	33.49	6.91	35.89
4804.00	--	AV	54	--	--	--	--	--
5275.25	43.41	PK	74	30.59	35.94	34.62	7.19	34.33
5275.25	--	AV	54	--	--	--	--	--
7206.00	45.11	PK	74	28.89	34.00	36.95	9.18	35.03
7206.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2402		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)
4804.00	50.21	PK	74	23.79	45.70	33.49	6.91	35.89
4804.00	--	AV	54	--	--	--	--	--
5275.25	44.55	PK	74	29.45	37.08	34.62	7.19	34.33
5275.25	--	AV	54	--	--	--	--	--
7206.00	45.65	PK	74	28.35	34.54	36.95	9.18	35.03
7206.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2440		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)
4880.00	48.14	PK	74	25.86	43.49	33.60	6.95	35.90
4880.00	--	AV	54	--	--	--	--	--
5305.25	43.20	PK	74	30.80	35.69	34.65	7.20	34.34
5305.25	--	AV	54	--	--	--	--	--
7320.00	44.85	PK	74	29.15	33.16	37.46	9.23	35.00
7320.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2440		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)
4880.00	49.11	PK	74	24.89	44.46	33.60	6.95	35.90
4880.00	--	AV	54	--	--	--	--	--
5305.25	44.22	PK	74	29.78	36.71	34.65	7.20	34.34
5305.25	--	AV	54	--	--	--	--	--
7320.00	45.35	PK	74	28.65	33.66	37.46	9.23	35.00
7320.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2480		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)
4960.00	49.22	PK	74	24.78	44.30	33.84	7.00	35.92
4960.00	--	AV	54	--	--	--	--	--
5405.50	44.17	PK	74	29.83	36.54	34.74	7.26	34.38
5405.50	--	AV	54	--	--	--	--	--
7440.00	45.20	PK	74	28.80	33.25	37.64	9.28	34.97
7440.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2480		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)
4960.00	50.22	PK	74	23.78	45.30	33.84	7.00	35.92
4960.00	--	AV	54	--	--	--	--	--
5405.50	44.45	PK	74	29.55	36.82	34.74	7.26	34.38
5405.50	--	AV	54	--	--	--	--	--
7440.00	45.74	PK	74	28.26	33.79	37.64	9.28	34.97
7440.00	--	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; RBW 1MHz VBW10Hz Peak detector is for AV value.

**Results of Band Edges Test (Radiated)****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 Factor (dB/m)	
2412.00	103.44	PK	--	--	70.02	28.80	4.62	0.00	33.42
2412.00	95.60	AV	--	--	62.18	28.80	4.62	0.00	33.42
2326.75	47.52	PK	74	26.48	14.66	28.33	4.53	0.00	32.86
2326.75	--	AV	54	--	--	--	--	--	--
2390.00	55.24	PK	74	18.76	21.92	28.72	4.60	0.00	33.32
2390.00	46.51	AV	54	7.49	13.19	28.72	4.60	0.00	33.32
2400.00	58.58	PK	74	15.42	25.19	28.78	4.61	0.00	33.39
2400.00	49.22	AV	54	4.78	15.83	28.78	4.61	0.00	33.39

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 Factor (dB/m)	
2412.00	103.25	PK	--	--	69.83	28.80	4.62	0.00	33.42
2412.00	95.79	AV	--	--	62.37	28.80	4.62	0.00	33.42
2326.75	48.01	PK	74	25.99	15.15	28.33	4.53	0.00	32.86
2326.75	--	AV	54	--	--	--	--	--	--
2390.00	55.69	PK	74	18.31	22.37	28.72	4.60	0.00	33.32
2390.00	46.41	AV	54	7.59	13.09	28.72	4.60	0.00	33.32
2400.00	58.74	PK	74	15.26	25.35	28.78	4.61	0.00	33.39
2400.00	49.39	AV	54	4.61	16.00	28.78	4.61	0.00	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	102.54	PK	--	--	68.97	28.89	4.68	0.00	33.57
2462.00	95.11	AV	--	--	61.54	28.89	4.68	0.00	33.57
2483.50	57.46	PK	74	16.54	23.83	28.93	4.70	0.00	33.63
2483.50	49.15	AV	54	4.85	15.52	28.93	4.70	0.00	33.63
2485.25	55.20	PK	74	18.8	21.56	28.93	4.70	0.00	33.64
2485.25	46.73	AV	54	7.27	13.09	28.93	4.70	0.00	33.64
2500.00	40.54	PK	74	33.46	6.86	28.96	4.72	0.00	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	102.86	PK	--	--	69.29	28.89	4.68	0.00
2462.00	95.24	AV	--	--	61.67	28.89	4.68	0.00
2483.50	58.50	PK	74	15.50	24.87	28.93	4.70	0.00
2483.50	50.22	AV	54	3.78	16.59	28.93	4.70	0.00
2485.25	55.14	PK	74	18.86	21.50	28.93	4.70	0.00
2485.25	48.20	AV	54	5.80	14.56	28.93	4.70	0.00
2500.00	42.04	PK	74	31.96	8.36	28.96	4.72	0.00
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; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.

**BT4.0 GFSK Mode**

Frequency(MHz):		2402		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)
2402.00	88.50	PK	--	--	55.10	28.78	4.61	0.00
2402.00	80.21	AV	--	--	46.81	28.78	4.61	0.00
2345.50	40.25	PK	74	33.75	7.26	28.44	4.55	0.00
2345.50	--	AV	54	--	--	--	--	--
2390.00	47.60	PK	74	26.40	14.28	28.72	4.60	0.00
2390.00	--	AV	54	--	--	--	--	--
2400.00	50.33	PK	74	23.67	16.94	28.78	4.61	0.00
2400.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2402		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)
2402.00	88.89	PK	--	--	55.49	28.78	4.61	0.00
2402.00	81.04	AV	--	--	47.64	28.78	4.61	0.00
2345.50	41.26	PK	74	32.74	8.27	28.44	4.55	0.00
2345.50	--	AV	54	--	--	--	--	32.99
2390.00	48.26	PK	74	25.74	14.94	28.72	4.60	0.00
2390.00	--	AV	54	--	--	--	--	--
2400.00	51.18	PK	74	22.82	17.79	28.78	4.61	0.00
2400.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2480		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)
2480.00	88.11	PK	--	--	54.49	28.92	4.70	0.00
2480.00	80.75	AV	--	--	47.13	28.92	4.70	0.00
2483.50	51.23	PK	74	22.77	17.60	28.93	4.70	0.00
2483.50	--	AV	54	--	--	--	--	--
2486.75	49.20	PK	74	24.80	15.56	28.94	4.71	0.00
2486.75	--	AV	54	--	--	--	--	--
2500.00	40.50	PK	74	33.50	6.82	28.96	4.72	0.00
2500.00	--	AV	54	--	--	--	--	--

Frequency(MHz):		2480		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)
2480.00	88.56	PK	--	--	54.94	28.92	4.70	0.00
2480.00	80.66	AV	--	--	47.04	28.92	4.70	0.00
2483.50	51.54	PK	74	22.46	17.91	28.93	4.70	0.00
2483.50	--	AV	54	--	--	--	--	--
2486.75	50.11	PK	74	23.89	16.47	28.94	4.71	0.00
2486.75	--	AV	54	--	--	--	--	--
2500.00	41.20	PK	74	32.80	7.52	28.96	4.72	0.00
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; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz 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	Peak Output power (dBm)	Limit (dBm)	Result
802.11b	01	22.37	30.00	Pass
	06	23.08		
	11	22.89		
802.11g	01	22.07	30.00	Pass
	06	22.49		
	11	22.18		
802.11n(HT20)	01	21.63	30.00	Pass
	06	21.40		
	11	21.36		
802.11n(HT40)	03	20.60	30.00	Pass
	06	20.63		
	09	20.52		

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

#### BT4.0

Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	00	-1.314	30.00	Pass
	19	-1.193		
	39	-1.732		

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  $\geq$  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



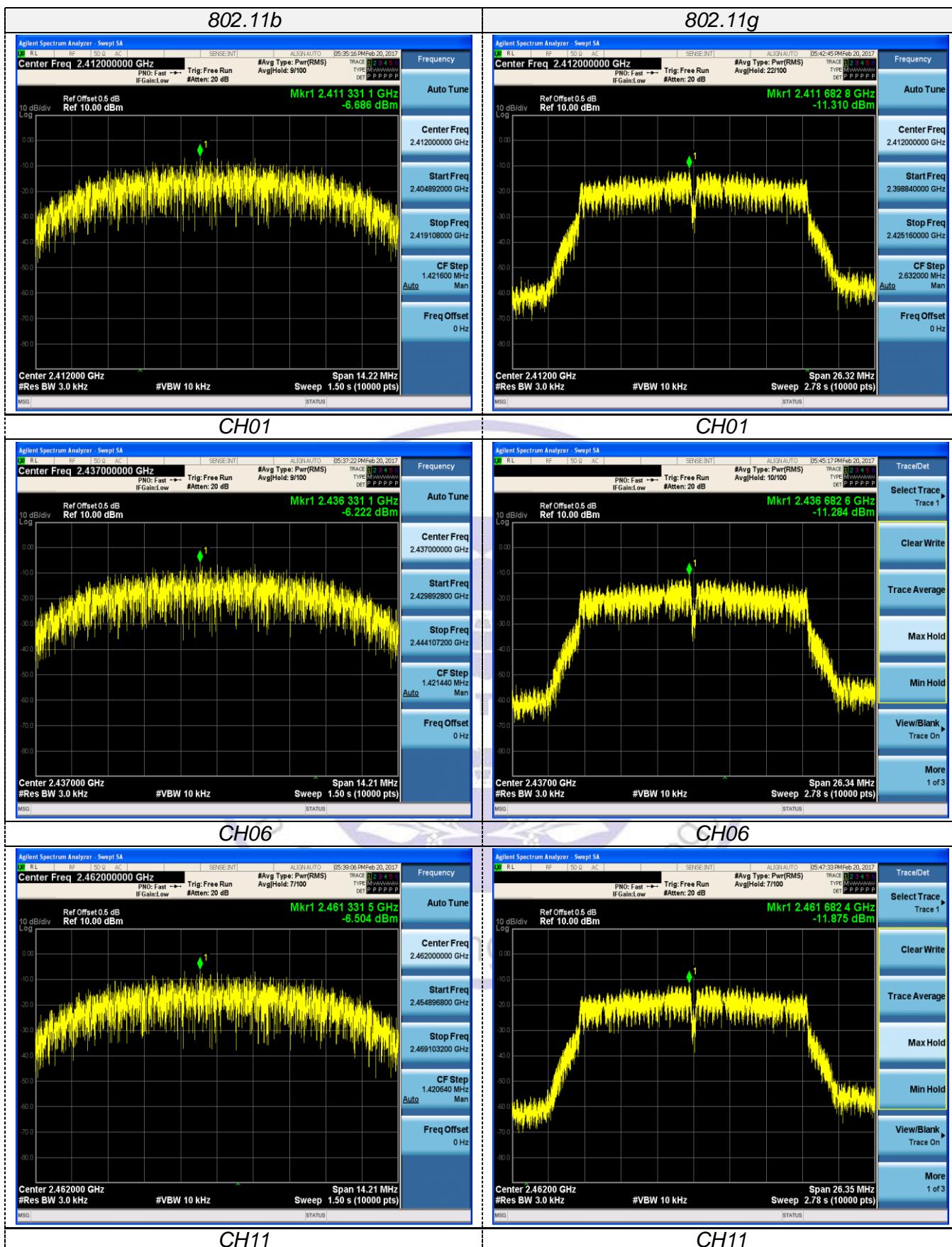
#### Test Results

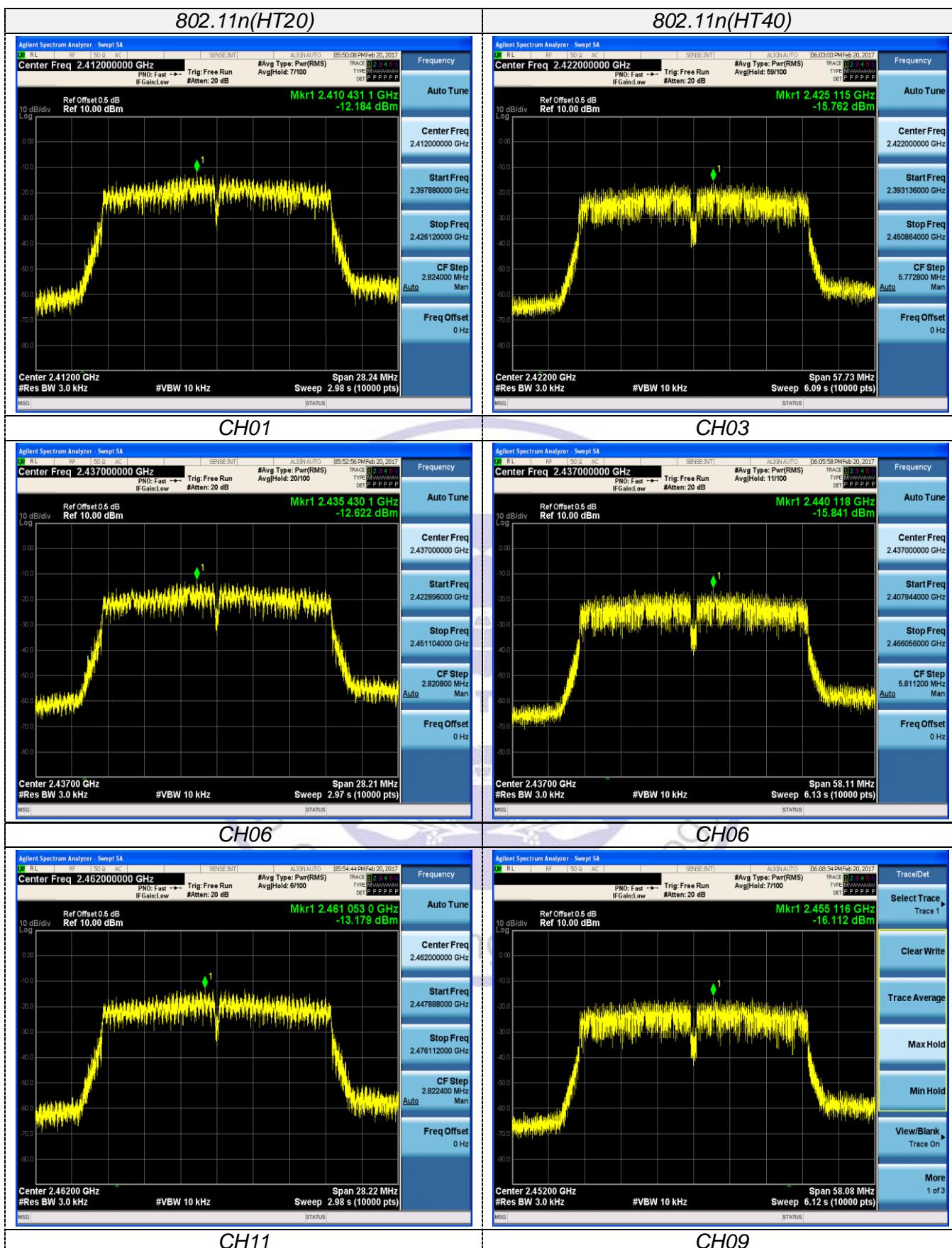
Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	01	-6.686	8.00	Pass
	06	-6.222		
	11	-6.504		
802.11g	01	-11.310	8.00	Pass
	06	-11.284		
	11	-11.875		
802.11n(HT20)	01	-12.184	8.00	Pass
	06	-12.622		
	11	-13.179		
802.11n(HT40)	03	-15.762	8.00	Pass
	06	-15.841		
	09	-16.112		

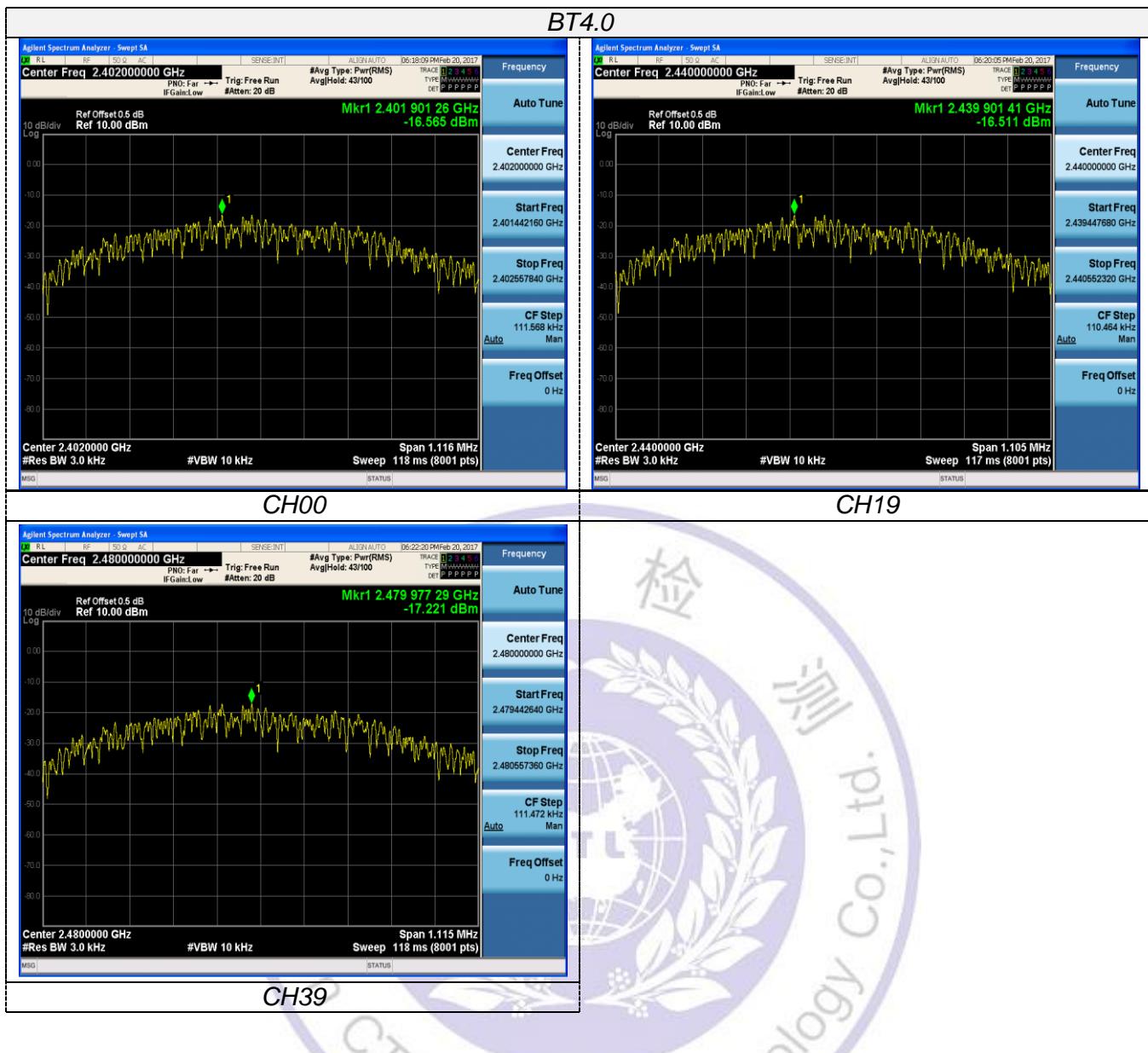
#### BT4.0

Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
GFSK	00	-16.565	8.00	Pass
	19	-16.511		
	39	-17.221		

Test plot as follows:







### 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



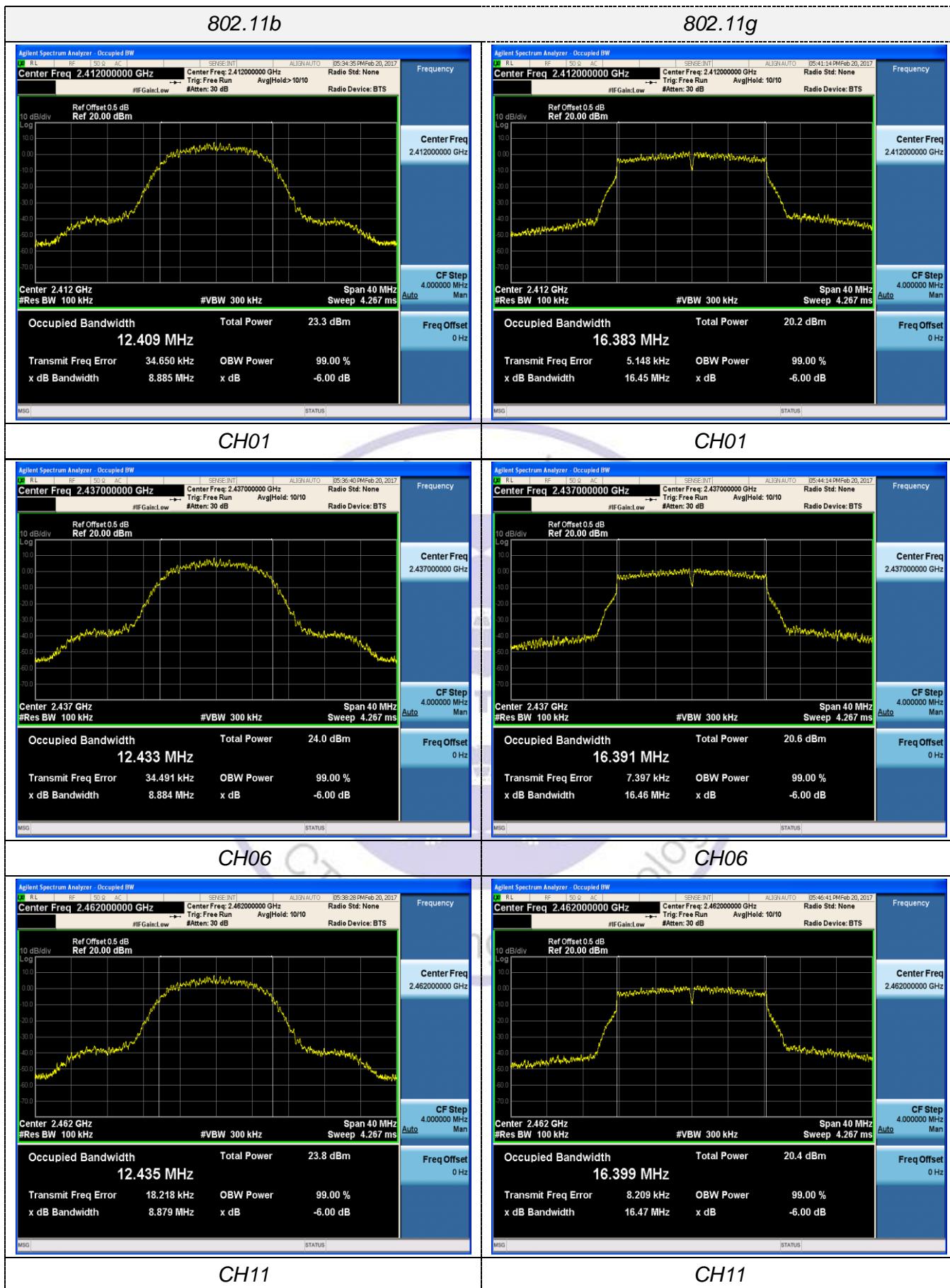
#### Test Results

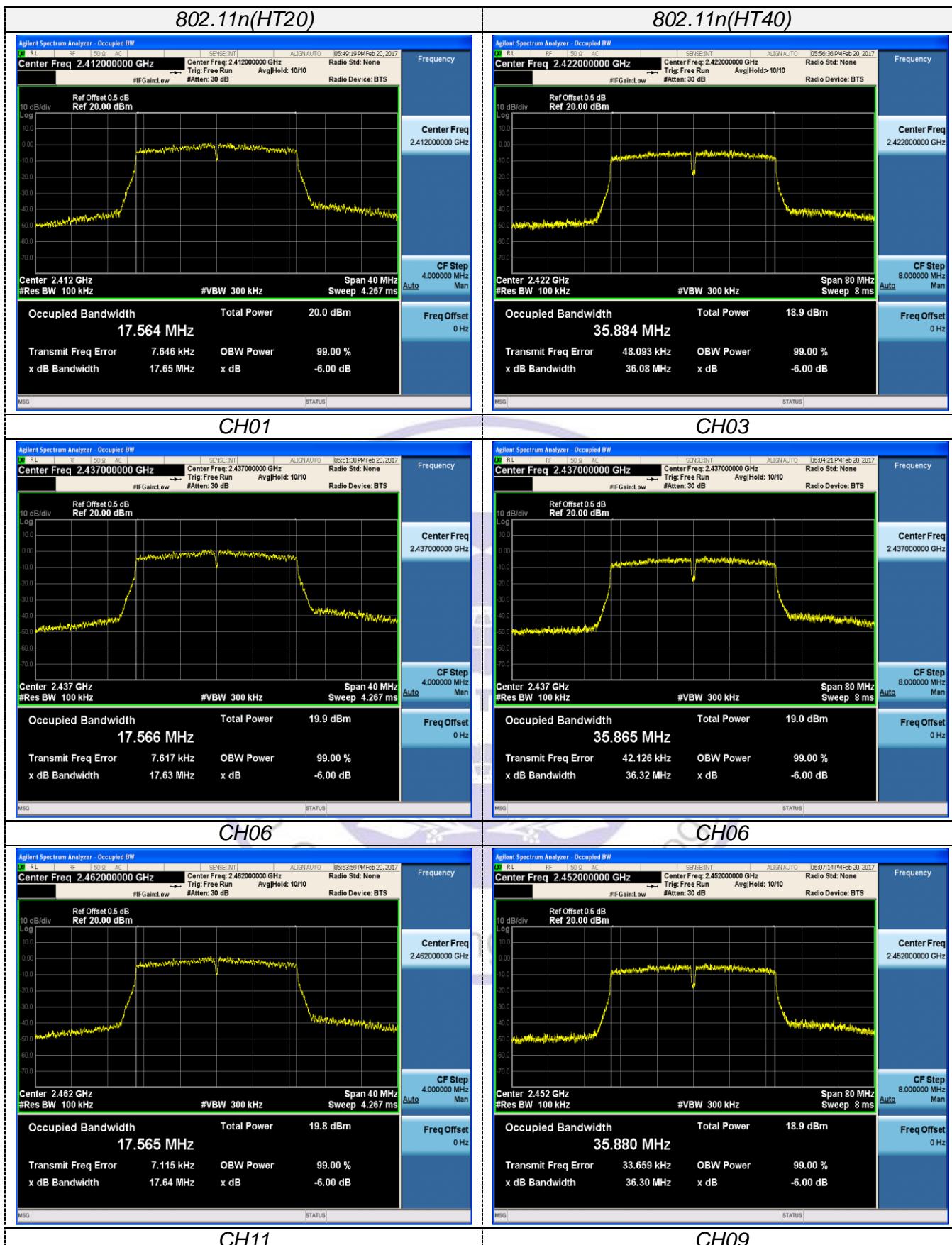
<b>WIFI</b>				
Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11b	01	8.885	≥500	Pass
	06	8.884		
	11	8.879		
802.11g	01	16.45	≥500	Pass
	06	16.46		
	11	16.47		
802.11n(HT20)	01	17.65	≥500	Pass
	06	17.63		
	11	17.64		
802.11n(HT40)	03	36.08	≥500	Pass
	06	36.32		
	09	36.30		

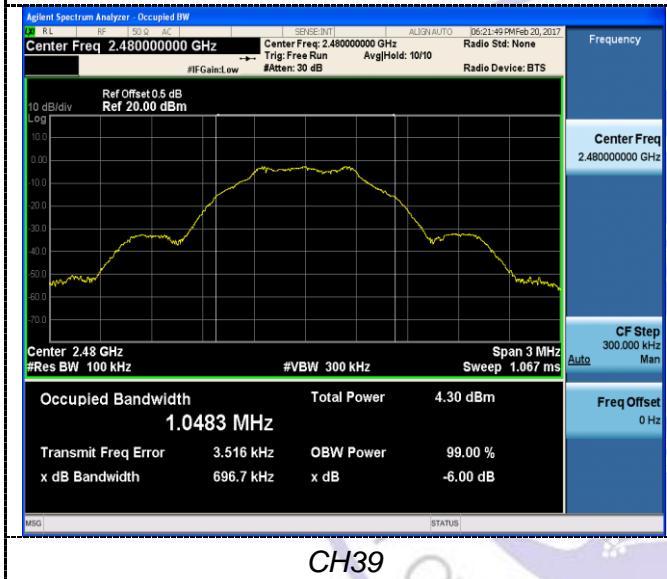
#### **BT4.0**

Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
GFSK	00	0.6973	≥500	Pass
	19	0.6904		
	39	0.6967		

Test plot as follows:





**BT4.0****CH00****CH39****CH19**