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Report No.: GTI20150556F-1

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# TEST REPORT

**Product Name** .....: IEEE 802.11b/g/n WLAN BT Combo USB Module

**Trademark** .....: LB-LINK

**Model/Type reference** .....: BL-R8723BT1

**Listed Model(s)** .....: /

**FCC ID**.....: S8J-R8723BT1

**Test Standards** .....: **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**

**Applicant** .....: Shenzhen Bilian Electronic Co., Ltd.

**Address of applicant** .....: Building B1, Zhongxing Industrial Zone, Juling,  
Jutang Community, Guanlan street, Bao'an, Shenzhen,  
China

**Date of Receipt** .....: Oct. 12, 2015

**Date of Test Date**.....: Oct. 12, 2015 - Nov. 03, 2015

**Data of issue.** .....: Nov. 03, 2015

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

GENERAL DESCRIPTION OF EUT	
Equipment:	IEEE 802.11b/g/n WLAN BT Combo USB Module
Model Name:	BL-R8723BT1
Manufacturer:	Shenzhen Bilian Electronic Co., Ltd.
Manufacturer Address:	Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan street, Bao'an, Shenzhen, China
Power Rating:	DC 5.0V form PC

Compiled By: Thomas Morgan  
(Thomas Morgan)

Reviewed By: Tony Wang  
(Tony Wang)

Approved By: Walter Chen  
(Walter Chen)

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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 40 GHz

**KDB558074 D01 V03r03:** Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

## 1.2. Test Description

FCC PART 15 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 Peak Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 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 General Testing & Inspection Technology Co., Ltd.

Add: 1F, 2 Block, Jiaquan Building, Guanlan High-tech Park Baoan District, Shenzhen, Guangdong, China

### 1.3.2 Laboratory accreditation

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

#### IC Registration No.: 9783A

The 3m alternate test site of Shenzhen GTI Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Aug, 2011.

#### FCC-Registration No.: 214666

Shenzhen GTI 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 214666, Sep 19, 2011

## 1.4. 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 General Testing & Inspection 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 General Testing & Inspection laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## 2. GENERAL INFORMATION

### 2.1. Environmental conditions

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

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

### 2.2. General Description of EUT

Product Name:	IEEE 802.11b/g/n WLAN BT Combo USB Module
Model/Type reference:	BL-R8723BT1
Power supply:	DC 5V from PC
Hardware version:	V1.0
Software version:	05/06/2014,1014.0.1128.2011
<b>WIFI :</b>	
Supported type:	802.11b/802.11g/802.11n(H20)/802.11n(H40)
Modulation technology:	802.11b: DSSS 802.11g/802.11n(H20)/802.11n(H40): OFDM
Modulation type:	802.11b: BPSK/QPSK/CCK 802.11g/802.11n(H20)/802.11n(H40): BPSK/QPSK/16QAM/64QAM
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:	External Antenna
Antenna gain:	5.0dBi
<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:	External Antenna
Antenna gain:	5.0dBi

Note: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

### 2.3. Description of Test Modes

**Peripherals Devices:**

OUTSIDE SUPPORT EQUIPMENT						
No.	Equipment	Model	Serial No.	Manufacture	Trade name	Remark
1.	PC Note	1717-A31	L3-M1102	Lenovo	IBM	FCC DOC
2.	AC adapter	PA-1650-161	Qzp1158	Lenovo	Lenovo	Input: AC 100-240V,50-60Hz Output: DC 20V, 3.25A

**Note:** All the above equipment /cable were placed in worse case position to maximize emission signals during emission test.

**Operation Frequency**

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

**BT 4.0**

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>

**WIFI Operation Frequency :**

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

**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
AC Power Conducted Emission Maximum Peak 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



## 2.1. Measurement Instruments List

Maximum Peak Output Power					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSU26	100105	Jan 07,2016

Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSU26	100105	Jan 07,2016

Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrate until
1	LISN	R&S	ENV216	101112	Jan. 07, 2016
2	LISN	R&S	ENV216	101113	Jan. 07, 2016
3	EMI Test Receiver	R&S	ESCI	100920	Jan. 07, 2016
4	Cable	Schwarzbeck	AK9515E	33156	Jan. 07, 2016

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100658	Jan 07,2016
2	High pass filter	micro-tranics	HPM50111	34202	Jan 07,2016
3	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Jan 07,2016
4	Ultra-Broadband Antenna	ShwarzBeck	BBHA9170	25841	Jan. 10,2016
5	Loop Antenna	LAPLAC	RF300	9138	Jan. 10,2016
6	Spectrum Analyzer	Rohde & Schwarz	FSU	100105	Jan 07,2016
7	Horn Antenna	Schwarzbeck	BBHA 9120D	647	Jan 14,2016
8	Pre-Amplifier	HP	8447D	1937A03050	Jan. 07,2016
9	Pre-Amplifier	EMCI	EMC05183 5	980075	Jan. 07,2016
10	Antenna Mast	UC	UC3000	N/A	N/A
11	Turn Table	UC	UC3000	N/A	N/A
12	Cable Below 1GHz	Schwarzbeck	AK9515E	33155	Jan. 07,2016
13	Cable Above 1GHz	Hubersuhner	SUCOFLEX1 02	DA1580	Jan. 07,2016

Note: 1. The Cal.Interval was one year.

2. The cable loss has calculated in test result which connection between each test instruments.

### 3. TEST CONDITIONS AND RESULTS

#### 3.1. Conducted Emission (AC Main)

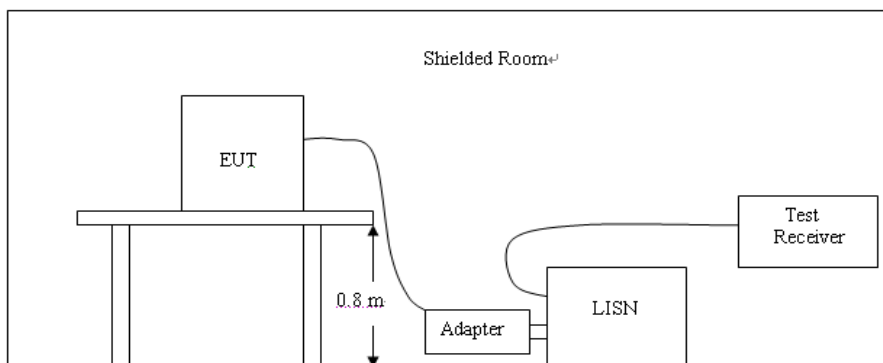
##### LIMIT

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 EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

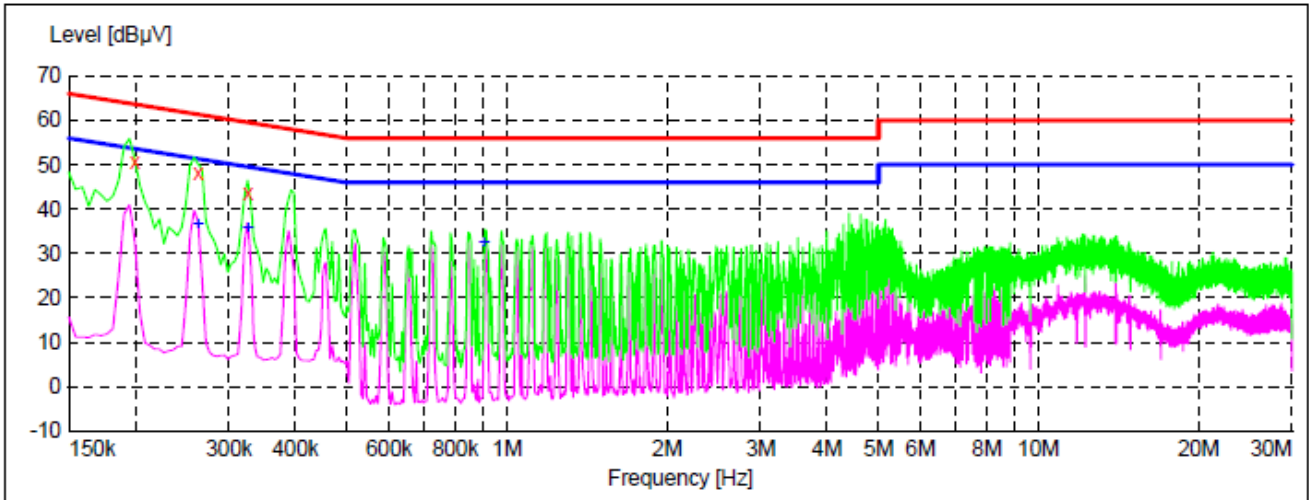
8. During the above scans, the emissions were maximized by cable manipulation.

**TEST RESULTS**

**Note:** We tested all modes, recorded the worst case at wifi 802.11b mode and BT 4.0

<b>Test mode:</b>	802.11b Mid Channel	<b>Polarization:</b>	L
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**SCAN TABLE: "Vol (9K-30M) FIN-N"**  
 Short Description: 150K-30M Voltage



x x x MES GTI151016145\_fin

**MEASUREMENT RESULT: "GTI151016145\_fin"**

10/17/2015 11:48AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.199500	50.70	9.7	64	12.9	QP	L1	GND
0.262500	48.30	9.7	61	13.1	QP	L1	GND
0.325500	43.70	9.8	60	15.9	QP	L1	GND

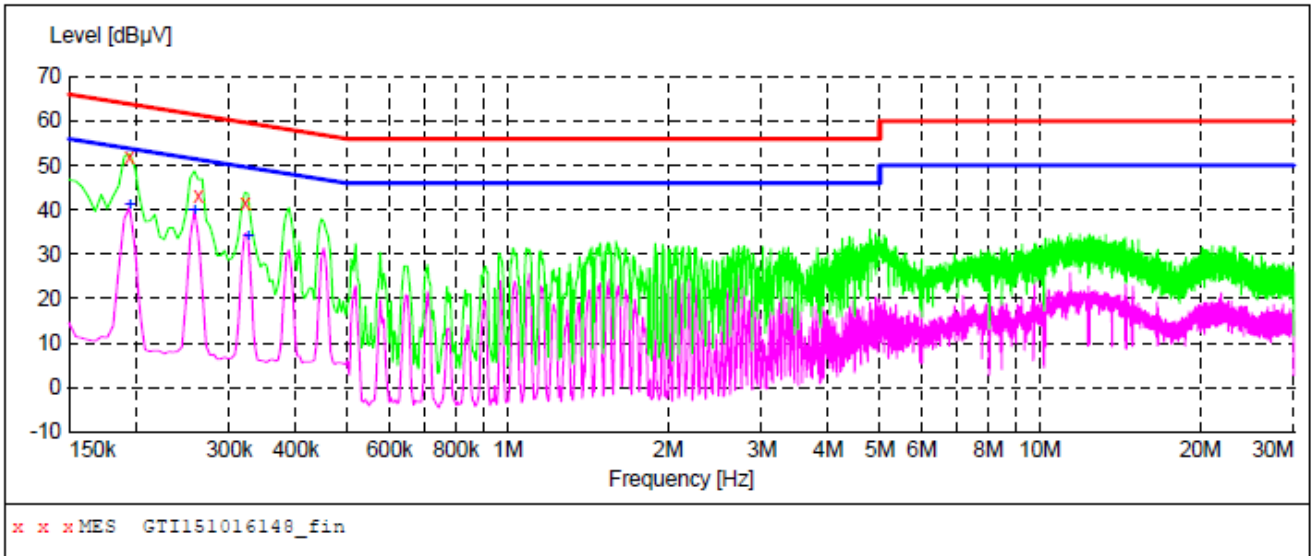
**MEASUREMENT RESULT: "GTI151016145\_fin2"**

10/17/2015 11:48AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.262500	36.60	9.7	51	14.8	AV	L1	GND
0.325500	35.90	9.8	50	13.7	AV	L1	GND
0.905000	32.50	10.0	46	13.5	AV	L1	GND

<b>Test mode:</b>	802.11b Mid Channel	<b>Polarization:</b>	N
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**SCAN TABLE: "Vol (9K-30M) FIN-N"**  
 Short Description: 150K-30M Voltage



**MEASUREMENT RESULT: "GTI151016148\_fin"**

10/17/2015 11:51AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	51.90	9.5	64	11.9	QP	N	GND
0.262500	43.20	9.5	61	18.2	QP	N	GND
0.321000	41.60	9.5	60	18.1	QP	N	GND

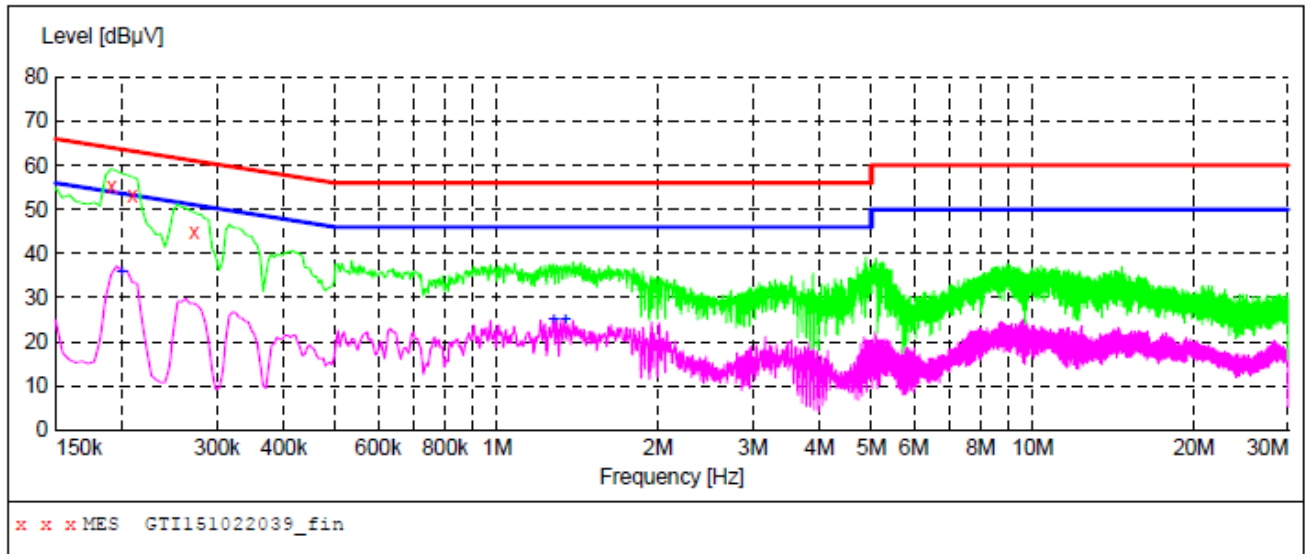
**MEASUREMENT RESULT: "GTI151016148\_fin2"**

10/17/2015 11:51AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	41.00	9.5	54	12.8	AV	N	GND
0.258000	39.70	9.5	52	11.8	AV	N	GND
0.325500	34.20	9.5	50	15.4	AV	N	GND

<b>Test mode:</b>	BT 4.0 Mid Channel	<b>Polarization:</b>	L
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**SCAN TABLE: "Vol (9K-30M) FIN-N"**  
 Short Description: 150K-30M Voltage



**MEASUREMENT RESULT: "GTI151022039\_fin"**

10/22/2015 9:57AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190500	55.30	9.5	64	8.7	QP	L1	GND
0.208500	53.30	9.5	63	10.0	QP	L1	GND
0.271500	45.00	9.5	61	16.1	QP	L1	GND

**MEASUREMENT RESULT: "GTI151022039\_fin2"**

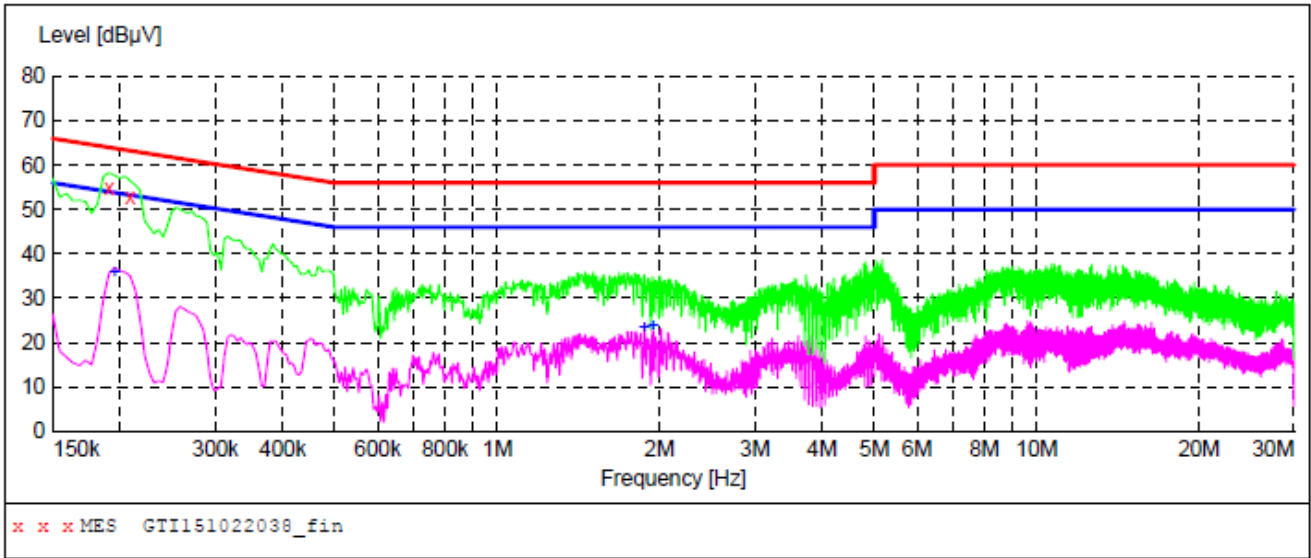
10/22/2015 9:57AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.199500	35.90	9.5	54	17.7	AV	L1	GND
1.274000	25.10	9.8	46	20.9	AV	L1	GND
1.341500	24.80	9.8	46	21.2	AV	L1	GND

Test mode:	BT 4.0 Mid Channel	Polarization:	N
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**SCAN TABLE: "Vol (9K-30M) FIN-N"**

Short Description: 150K-30M Voltage



**MEASUREMENT RESULT: "GTI151022038\_fin"**

10/22/2015 9:54AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190500	54.80	9.5	64	9.2	QP	N	GND
0.208500	52.70	9.5	63	10.6	QP	N	GND

**MEASUREMENT RESULT: "GTI151022038\_fin2"**

10/22/2015 9:54AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	35.80	9.5	54	18.0	AV	N	GND
1.872500	23.40	10.0	46	22.6	AV	N	GND
1.940000	23.90	10.0	46	22.1	AV	N	GND



### 3.2. Radiated Emission

#### Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. RBW=1MHz, VBW=3MHz for peak values, RBW=1MHz, VBW=10Hz for Average values, used peak detector. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBuV/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 Procedure

1. The EUT was placed on a turn table which is 0.8m 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.

#### Field Strength Calculation

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

$$FS = RA + AF + CL - AG$$

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

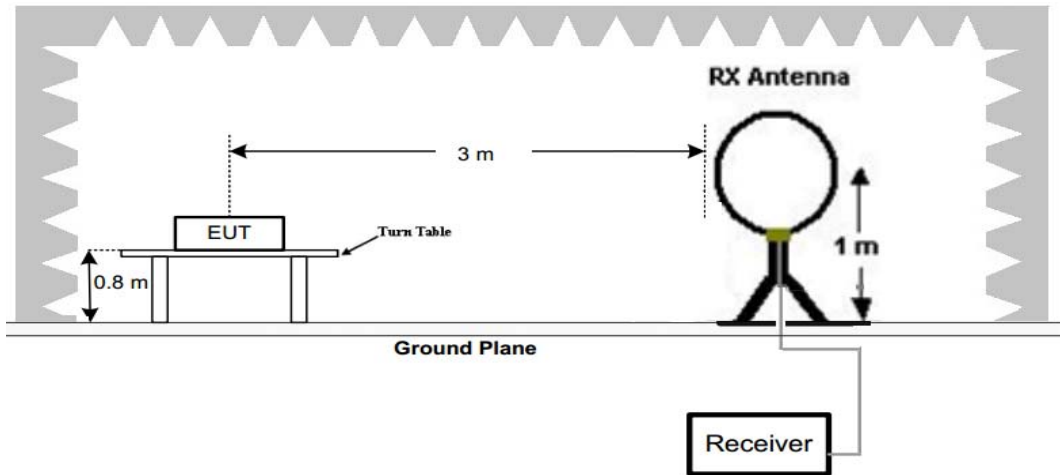
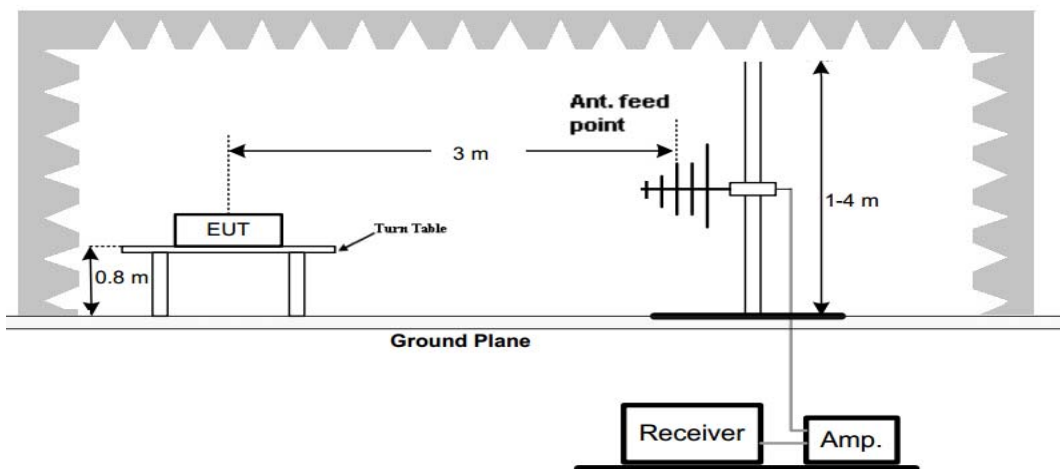
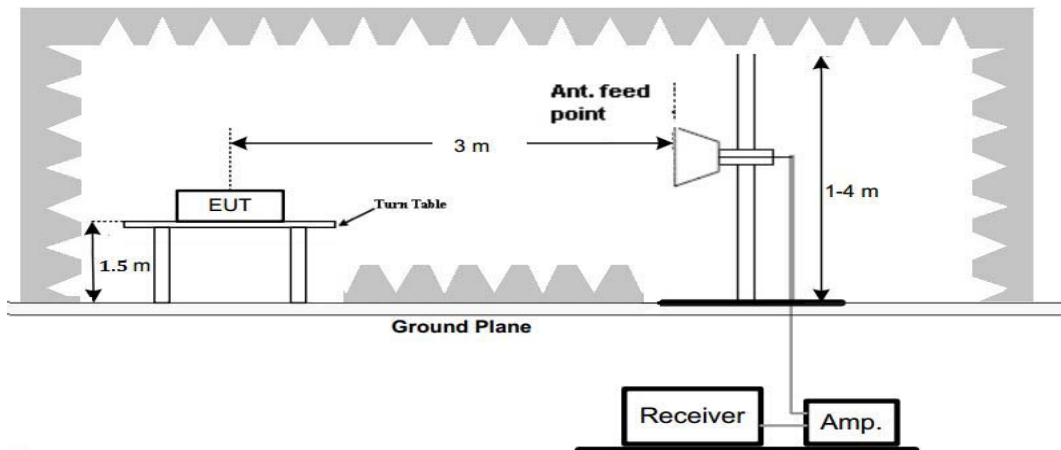
For example

Frequency (MHz)	FS (dBµV/m)	RA (dBµV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
150.00	40	58.1	12.2	1.6	31.90	-18.1

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

#### Test Configuration

For the actual test configuration, please refer to the related Item –EUT Test Photos.

**Frequency range 9 KHz – 30MHz****Frequency range 30MHz – 1000MHz****Frequency range above 1GHz-25GHz****Test Results**

Remark:

1. We tested three channels for each mode and recorded worst case at mid channel of 802.11b and BT 4.0 mode from 30MHz to 1GHz.
2. We tested three channels for each mode and recorded worst case at mid channel of 802.11b mode for below 30MHz;



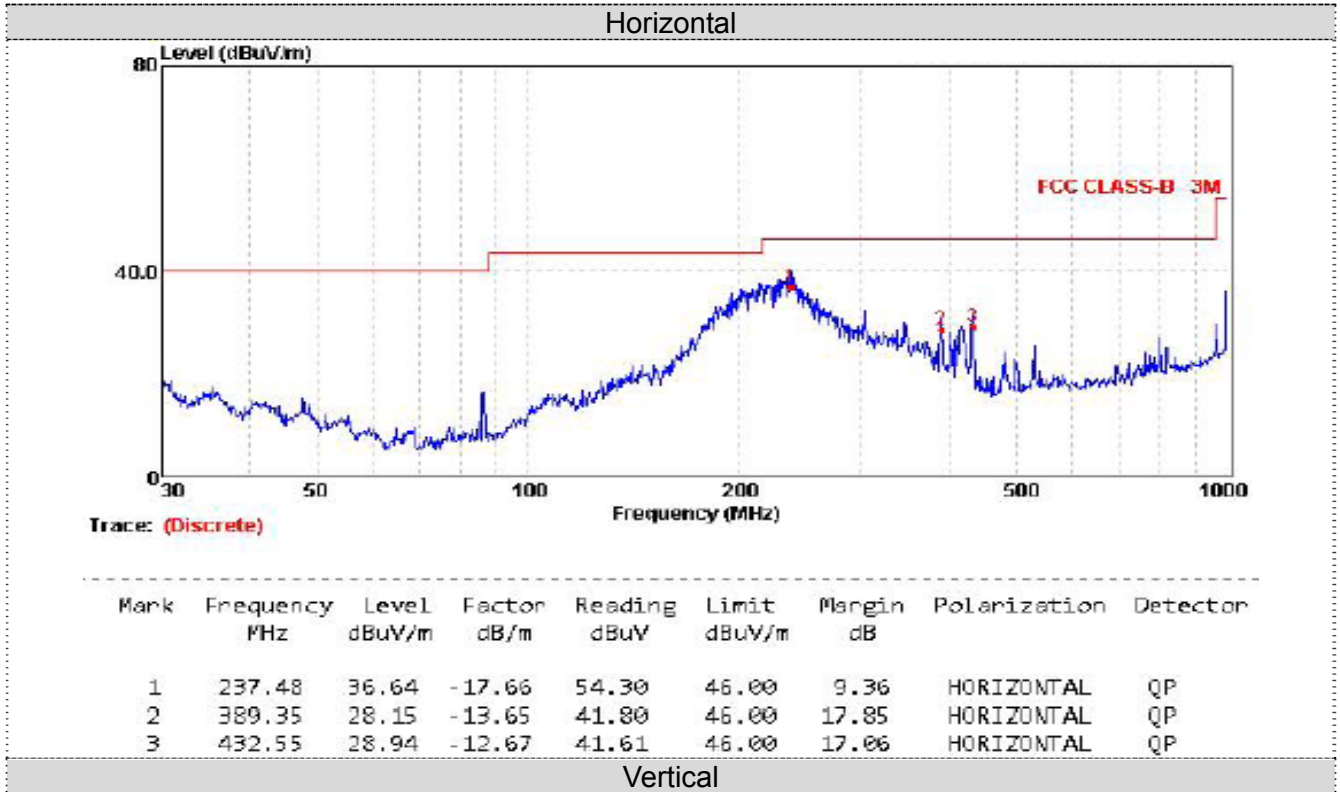
**For 9 KHz-30MHz**

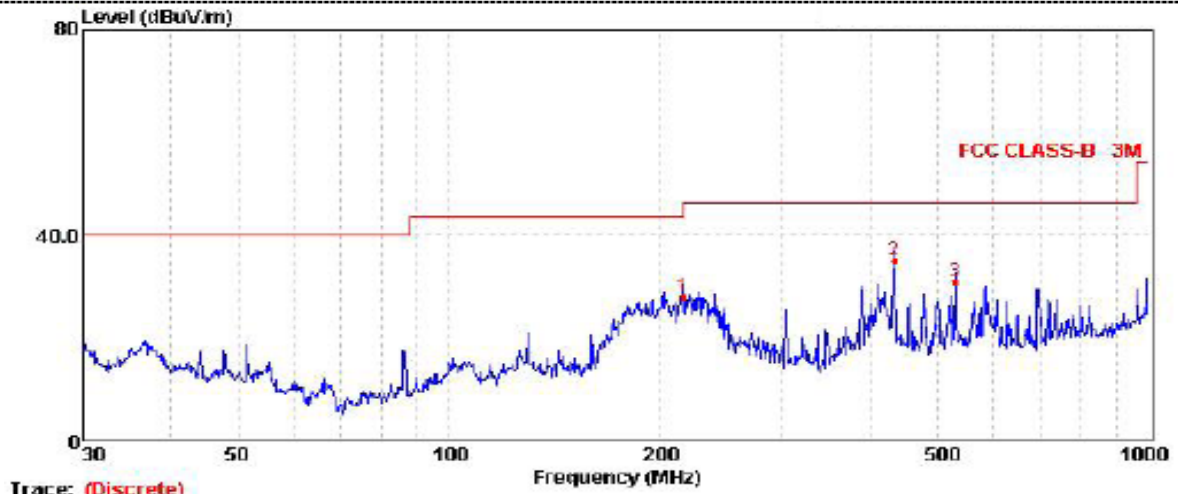
For 802.11b Mid Channel

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Result
0.23	61.39	100.37	38.98	Peak	PASS
1.24	46.74	65.74	19.00	QP	PASS
13.58	32.65	69.54	36.89	QP	PASS
22.36	38.52	69.54	31.02	QP	PASS

**For 30MHz-1GHz**

For 802.11b Mid Channel



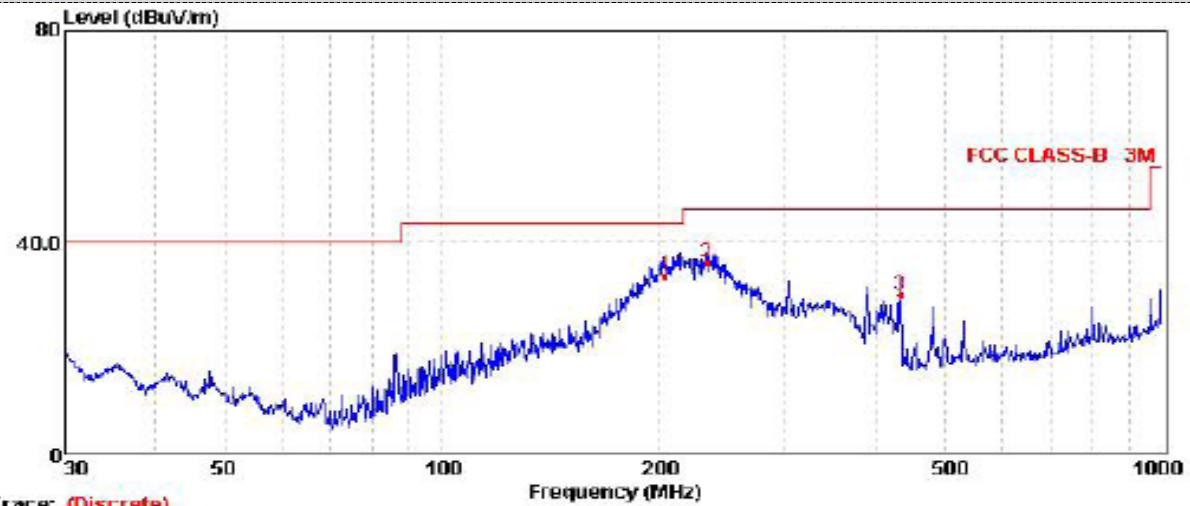


Trace: (Discrete)

Mark	Frequency MHz	Level dBuV/m	Factor dB/m	Reading dBuV	Limit dBuV/m	Margin dB	Polarization	Detector
1	216.02	27.73	-17.77	45.50	46.00	18.27	VERTICAL	QP
2	432.55	34.74	-12.67	47.41	46.00	11.26	VERTICAL	QP
3	528.25	30.77	-11.14	41.91	46.00	15.23	VERTICAL	QP

For BT 4.0 Mid Channel

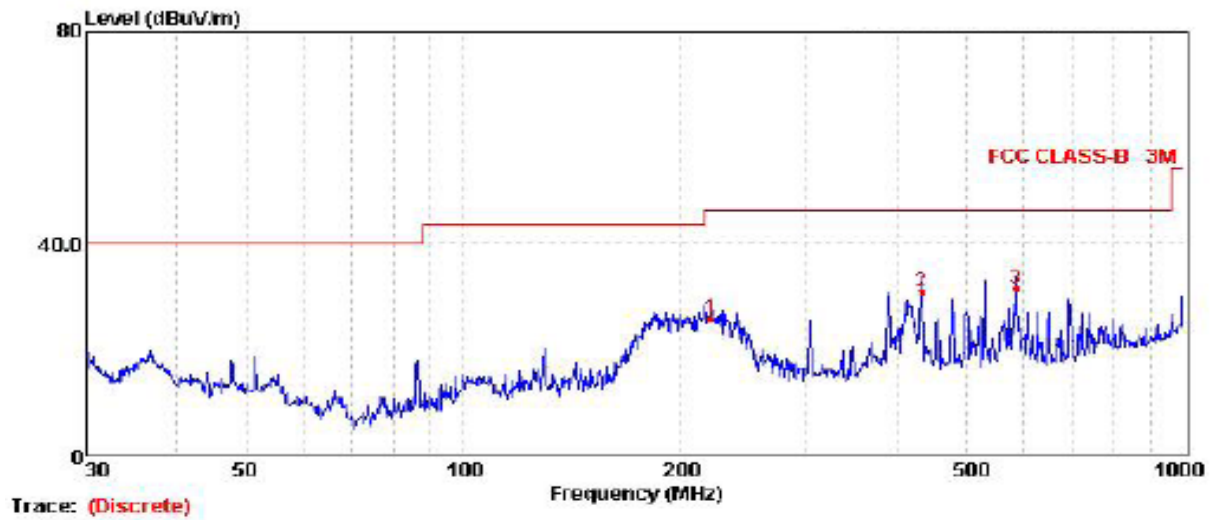
Horizontal



Trace: (Discrete)

Mark	Frequency MHz	Level dBuV/m	Factor dB/m	Reading dBuV	Limit dBuV/m	Margin dB	Polarization	Detector
1	284.24	33.27	-17.84	51.11	43.50	10.23	HORIZONTAL	QP
2	233.35	36.02	-17.68	53.70	46.00	9.98	HORIZONTAL	QP
3	432.55	29.64	-12.67	42.31	46.00	16.36	HORIZONTAL	QP

Vertical



Trace: (Discrete)

Mark	Frequency MHz	Level dBuV/m	Factor dB/m	Reading dBuV	Limit dBuV/m	Margin dB	Polarization	Detector
1	220.62	25.46	-17.74	43.20	46.00	20.54	VERTICAL	QP
2	432.55	30.64	-12.67	43.31	46.00	15.36	VERTICAL	QP
3	584.79	31.27	-10.32	41.59	46.00	14.73	VERTICAL	QP

For 1GHz to 25GHz

802.11b Mode (above 1GHz)

Frequency(MHz):				2412			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBUV/m)		Limit (dBUV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBUV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824	47.92	PK	74.00	26.08	1.00	62	45.82	31.60	7.00	36.50	2.10
1	4824	41.51	AV	54.00	12.49	1.00	62	39.41	31.60	7.00	36.50	2.10
2	7236	41.24	PK	74.00	32.76	1.00	62	30.31	37.33	8.90	35.30	10.93
2	7236	33.92	AV	54.00	20.08	1.00	62	22.99	37.33	8.90	35.30	10.93

Frequency(MHz):				2412			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBUV/m)		Limit (dBUV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBUV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824	47.81	PK	74.00	26.19	1.00	166	45.71	31.60	7.00	36.50	2.10
1	4824	41.86	AV	54.00	12.14	1.00	166	39.76	31.60	7.00	36.50	2.10
2	7236	39.11	PK	74.00	34.89	1.00	166	28.18	37.33	8.90	35.30	10.93
2	7236	32.74	AV	54.00	21.26	1.00	166	21.81	37.33	8.90	35.30	10.93

Frequency(MHz):				2437			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBUV/m)		Limit (dBUV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBUV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	47.67	PK	74.00	26.33	1.00	56	45.55	31.02	7.60	36.50	2.12
1	4874	42.44	AV	54.00	11.56	1.00	56	40.32	31.02	7.60	36.50	2.12
2	7311	40.29	PK	74.00	33.71	1.00	56	29.21	37.28	8.60	34.80	11.08
2	7311	35.10	AV	54.00	18.90	1.00	56	24.02	37.28	8.60	34.80	11.08

Frequency(MHz):				2437			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBUV/m)		Limit (dBUV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBUV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	48.40	PK	74.00	25.60	1.00	176	46.28	31.02	7.60	36.50	2.12
1	4874	42.18	AV	54.00	11.82	1.00	176	40.06	31.02	7.60	36.50	2.12
2	7311	41.71	PK	74.00	32.29	1.00	176	30.63	37.28	8.60	34.80	11.08
2	7311	33.23	AV	54.00	20.77	1.00	176	22.15	37.28	8.60	34.80	11.08

Frequency(MHz):				2462			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBUV/m)		Limit (dBUV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBUV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924	49.00	PK	74.00	25.00	1.00	74	45.80	31.58	7.82	36.20	3.20
1	4924	42.48	AV	54.00	11.52	1.00	74	39.28	31.58	7.82	36.20	3.20
2	7386	41.82	PK	74.00	32.18	1.00	74	29.88	38.51	8.73	35.30	11.94
2	7386	34.87	AV	54.00	19.13	1.00	74	22.93	38.51	8.73	35.30	11.94

Frequency(MHz):				2462			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBUV/m)		Limit (dBUV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBUV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924	48.41	PK	74.00	25.59	1.00	162	45.21	31.58	7.82	36.20	3.20
1	4924	42.71	AV	54.00	11.29	1.00	162	39.51	31.58	7.82	36.20	3.20
2	7386	41.34	PK	74.00	32.66	1.00	162	29.40	38.51	8.73	35.30	11.94
2	7386	33.73	AV	54.00	20.27	1.00	162	21.79	38.51	8.73	35.30	11.94

**802.11g Mode (above 1GHz)**

Frequency(MHz):			2412			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824	47.93 PK	74.00	26.07	1.00	62	45.83	31.6	7.00	36.50	2.10
1	4824	39.27 AV	54.00	14.73	1.00	62	37.17	31.6	7.00	36.50	2.10
2	7236	40.44 PK	74.00	33.56	1.00	62	29.51	37.33	8.90	35.30	10.93
2	7236	31.12 AV	54.00	22.88	1.00	62	20.19	37.33	8.90	35.30	10.93

Frequency(MHz):			2412			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824	49.37 PK	74.00	24.63	1.00	166	47.27	31.60	7.00	36.50	2.10
1	4824	37.16 AV	54.00	16.84	1.00	166	35.06	31.60	7.00	36.50	2.10
2	7236	40.87 PK	74.00	33.13	1.00	166	29.94	37.33	8.90	35.30	10.93
2	7236	34.03 AV	54.00	19.97	1.00	166	23.10	37.33	8.90	35.30	10.93

Frequency(MHz):			2437			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	48.59 PK	74.00	25.41	1.00	56	46.47	31.02	7.60	36.50	2.12
1	4874	38.55 AV	54.00	15.45	1.00	56	36.43	31.02	7.60	36.50	2.12
2	7311	41.33 PK	74.00	32.67	1.00	56	30.25	37.28	8.60	34.80	11.08
2	7311	31.92 AV	54.00	22.08	1.00	56	20.84	37.28	8.60	34.80	11.08

Frequency(MHz):			2437			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	49.05 PK	74.00	24.95	1.00	176	46.93	31.02	7.60	36.50	2.12
1	4874	38.93 AV	54.00	15.07	1.00	176	36.81	31.02	7.60	36.50	2.12
2	7311	39.65 PK	74.00	34.35	1.00	176	28.57	37.28	8.60	34.80	11.08
2	7311	31.04 AV	54.00	22.96	1.00	176	19.96	37.28	8.60	34.80	11.08

Frequency(MHz):			2462			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924	47.57 PK	74.00	26.43	1.00	176	44.37	31.58	7.82	36.20	3.20
1	4924	36.60 AV	54.00	17.40	1.00	176	33.40	31.58	7.82	36.20	3.20
2	7386	39.61 PK	74.00	34.39	1.00	176	27.67	38.51	8.73	35.30	11.94
2	7386	30.97 AV	54.00	23.03	1.00	176	19.03	38.51	8.73	35.30	11.94

Frequency(MHz):			2462			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924	48.35 PK	74.00	25.65	1.00	162	45.15	31.58	7.82	36.20	3.20
1	4924	36.61 AV	54.00	17.39	1.00	162	33.41	31.58	7.82	36.20	3.20
2	7386	42.51 PK	74.00	31.49	1.00	162	30.57	38.51	8.73	35.30	11.94
2	7386	31.52 AV	54.00	22.48	1.00	162	19.58	38.51	8.73	35.30	11.94



**802.11n20 Mode (above 1GHz)**

Frequency(MHz):			2412			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824	45.61 PK	74.00	28.39	1.00	50	43.51	31.6	7.00	36.50	2.10
1	4824	39.69 AV	54.00	14.31	1.00	50	37.59	31.6	7.00	36.50	2.10
2	7236	41.29 PK	74.00	32.71	1.00	50	30.36	37.33	8.90	35.30	10.93
2	7236	30.92 AV	54.00	23.08	1.00	50	19.99	37.33	8.90	35.30	10.93

Frequency(MHz):			2412			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824	45.92 PK	74.00	28.08	1.00	151	43.82	31.60	7.00	36.50	2.10
1	4824	37.53 AV	54.00	16.47	1.00	151	35.43	31.60	7.00	36.50	2.10
2	7236	39.11 PK	74.00	34.89	1.00	151	28.18	37.33	8.90	35.30	10.93
2	7236	32.96 AV	54.00	21.04	1.00	151	22.03	37.33	8.90	35.30	10.93

Frequency(MHz):			2437			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	45.28 PK	74.00	28.72	1.00	50	43.16	31.02	7.60	36.50	2.12
1	4874	38.69 AV	54.00	15.31	1.00	50	36.57	31.02	7.60	36.50	2.12
2	7311	39.84 PK	74.00	34.16	1.00	50	28.76	37.28	8.60	34.80	11.08
2	7311	32.89 AV	54.00	21.11	1.00	50	21.81	37.28	8.60	34.80	11.08

Frequency(MHz):			2437			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	46.23 PK	74.00	27.77	1.00	181	44.11	31.02	7.60	36.5	2.12
1	4874	35.98 AV	54.00	18.02	1.00	181	33.86	31.02	7.60	36.5	2.12
2	7311	39.48 PK	74.00	34.52	1.00	181	28.40	37.28	8.60	34.8	11.08
2	7311	30.00 AV	54.00	24.00	1.00	181	18.92	37.28	8.60	34.8	11.08

Frequency(MHz):			2462			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924	46.85 PK	74.00	27.15	1.00	186	43.65	31.58	7.82	36.20	3.20
1	4924	38.48 AV	54.00	15.52	1.00	186	35.28	31.58	7.82	36.20	3.20
2	7386	39.58 PK	74.00	34.42	1.00	186	27.64	38.51	8.73	35.30	11.94
2	7386	32.91 AV	54.00	21.09	1.00	186	20.97	38.51	8.73	35.30	11.94

Frequency(MHz):			2462			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924	47.49 PK	74.00	26.51	1.00	156	44.29	31.58	7.82	36.20	3.20
1	4924	36.99 AV	54.00	17.01	1.00	156	33.79	31.58	7.82	36.20	3.20
2	7386	41.73 PK	74.00	32.27	1.00	156	29.79	38.51	8.73	35.30	11.94
2	7386	31.89 AV	54.00	22.11	1.00	156	19.95	38.51	8.73	35.30	11.94

**802.11n40 Mode (above 1GHz)**

Frequency(MHz):				2422			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4844	46.13	PK	74.00	27.87	1.00	72	44.03	31.60	7.00	36.50	2.10
1	4844	35.46	AV	54.00	18.54	1.00	72	33.36	31.60	7.00	36.50	2.10
2	7266	40.46	PK	74.00	33.54	1.00	72	29.53	37.33	8.90	35.30	10.93
2	7266	35.74	AV	54.00	13.26	1.00	72	24.81	37.33	8.90	35.30	10.93

Frequency(MHz):				2422			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4844	45.66	PK	74.00	28.34	1.00	171	43.56	31.60	7.00	36.50	2.10
1	4844	35.52	AV	54.00	18.48	1.00	171	33.42	31.60	7.00	36.50	2.10
2	7266	37.63	PK	74.00	36.37	1.00	171	26.70	37.33	8.90	35.30	10.93
2	7266	32.18	AV	54.00	21.82	1.00	171	21.25	37.33	8.90	35.30	10.93

Frequency(MHz):				2437			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	44.46	PK	74.00	29.54	1.00	52	42.34	31.02	7.60	36.50	2.12
1	4874	37.46	AV	54.00	16.54	1.00	52	35.34	31.02	7.60	36.50	2.12
2	7311	39.20	PK	74.00	34.80	1.00	52	28.12	37.28	8.60	34.80	11.08
2	7311	31.32	AV	54.00	22.68	1.00	52	20.24	37.28	8.60	34.80	11.08

Frequency(MHz):				2437			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874	44.24	PK	74.00	29.76	1.00	191	42.12	31.02	7.60	36.50	2.12
1	4874	37.35	AV	54.00	16.65	1.00	191	35.23	31.02	7.60	36.50	2.12
2	7311	39.68	PK	74.00	34.32	1.00	191	28.60	37.28	8.60	34.80	11.08
2	7311	30.48	AV	54.00	23.52	1.00	191	19.40	37.28	8.60	34.80	11.08

Frequency(MHz):				2452			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4904	46.88	PK	74.00	27.12	1.00	176	43.68	31.58	7.82	36.20	3.20
1	4904	35.36	AV	54.00	18.64	1.00	176	32.16	31.58	7.82	36.20	3.20
2	7356	38.58	PK	74.00	35.42	1.00	176	26.64	38.51	8.73	35.30	11.94
2	7356	29.83	AV	54.00	24.17	1.00	176	17.89	38.51	8.73	35.30	11.94

Frequency(MHz):				2452			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4904	47.43	PK	74.00	26.57	1.00	162	44.23	31.58	7.82	36.20	3.20
1	4904	36.41	AV	54.00	17.59	1.00	162	33.21	31.58	7.82	36.20	3.20
2	7356	39.97	PK	74.00	34.03	1.00	162	28.03	38.51	8.73	35.30	11.94
2	7356	29.47	AV	54.00	24.53	1.00	162	17.53	38.51	8.73	35.30	11.94

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

Frequency(MHz):				2402			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4804.00	43.47	PK	74.00	30.53	1.00	120	41.57	31.42	6.98	36.50	1.90
1	4804.00	32.77	AV	54.00	21.23	1.00	120	30.87	31.42	6.98	36.50	1.90
2	7206.00	37.39	PK	74.00	36.61	1.00	120	26.79	37.03	8.87	35.30	10.60
2	7206.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2402			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4804.00	45.27	PK	74.00	28.73	1.00	165	43.37	31.42	6.98	36.50	1.90
1	4804.00	34.45	AV	54.00	19.55	1.00	165	32.55	31.42	6.98	36.50	1.90
2	7206.00	37.09	PK	74.00	36.91	1.00	165	26.49	37.03	8.87	35.30	10.60
2	7206.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2440			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4880.00	43.51	PK	74.00	30.49	1.00	120	41.45	30.98	7.58	36.50	2.06
1	4880.00	32.86	AV	54.00	21.14	1.00	120	30.8	30.98	7.58	36.50	2.06
2	7320.00	35.77	PK	74.00	38.23	1.00	120	24.85	37.66	8.56	35.30	10.92
2	7320.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2440			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4880.00	44.58	PK	74.00	29.42	1.00	165	42.52	30.98	7.58	36.50	2.06
1	4880.00	34.54	AV	54.00	19.46	1.00	165	32.48	30.98	7.58	36.50	2.06
2	7320.00	37.96	PK	74.00	36.04	1.00	165	27.04	37.66	8.56	35.30	10.92
2	7320.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2480			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4960.00	42.64	PK	74.00	31.36	1.00	120	39.57	31.47	7.80	36.20	3.07
1	4960.00	32.60	AV	54.00	21.40	1.00	120	29.53	31.47	7.80	36.20	3.07
2	7340.00	37.22	PK	74.00	36.78	1.00	120	25.48	38.32	8.72	35.30	11.74
2	7340.00	--	AV	--	--	--	--	--	--	--	--	--

Frequency(MHz):				2480			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4960.00	44.04	PK	74.00	29.96	1.00	165	40.97	31.47	7.80	-36.20	3.07
1	4960.00	34.84	AV	54.00	19.16	1.00	165	31.77	31.47	7.80	-36.20	3.07
2	7340.00	36.56	PK	74.00	37.44	1.00	165	24.82	38.32	8.72	-35.30	11.74
2	7340.00	--	AV	--	--	--	--	--	--	--	--	--



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.

### 3.3. Maximum Conducted Output Power

#### Limit

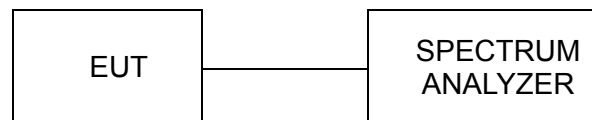
30dBm for digital modulation systems.

#### Test Procedure

- For Maximum conducted (average) output power
  1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the SPECTRUM.
  2. Ensure EUT transmitting with a duty cycle  $\geq 98\%$ .
  3. Set SA as follow:
    - a) Center frequency: frequency to be tested.
    - b) Span: at least 1.5 times the OBW.
    - c) RBW:= 1-5% of the OBW, not to exceed 1 MHz
    - d) VBW:  $\geq 3 \times$  RBW.
    - e) Sweep points:  $\geq 2 \times$  span / RBW.
    - f) Sweep time: auto.
    - g) Detector: RMS
    - h) Trace: Average(100 traces)
  4. Allow trace to fully stabilize
  5. Use instrument's band power measurement function to integrate power in this band across a bandwidth OBW.

#### Test Configuration

- For Maximum conducted (average) output power



**Test Results**

**WIFI**

Type	Channel	Output power AV(dBm)	Limit (dBm)	Result
802.11b	01	12.2	30.00	Pass
	06	12.13		
	11	11.42		
802.11g	01	11.78	30.00	Pass
	06	11.73		
	11	10.88		
802.11n(H20)	01	12.32	30.00	Pass
	06	11.92		
	11	11.39		
802.11n(H40)	03	11.99	30.00	Pass
	06	11.4		
	09	11.92		

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

**BT4.0**

Type	Channel	Output power PK(dBm)	Limit (dBm)	Result
GFSK	00	1.250	30.00	Pass
	19	1.120		
	39	-0.790		

Note: The test results including the cable loss.

### 3.4. Power Spectral Density

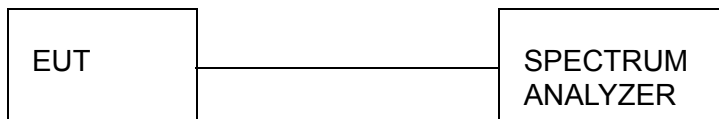
#### Limit

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/ the maximum (average) conducted output power in the fundamental emission was used to demonstrate compliance.
  - a) RBW:  $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
  - b) VBW:  $\geq 3 \times \text{RBW}$ .  
Span: 1.5 times the DTS channel bandwidth/OBW.
  - c) Detector: RMS.
  - d) Sweep time: Auto couple.
  - e) Swoop points:  $\geq 2 \times \text{span} / \text{RBW}$ .
  - f) Trace mode = Average (100 traces)
  - g) Use the peak marker function to determine the maximum power level.
  - h) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
2. The resulting peak PSD level must be 8dBm.

#### Test Configuration



#### Test Results

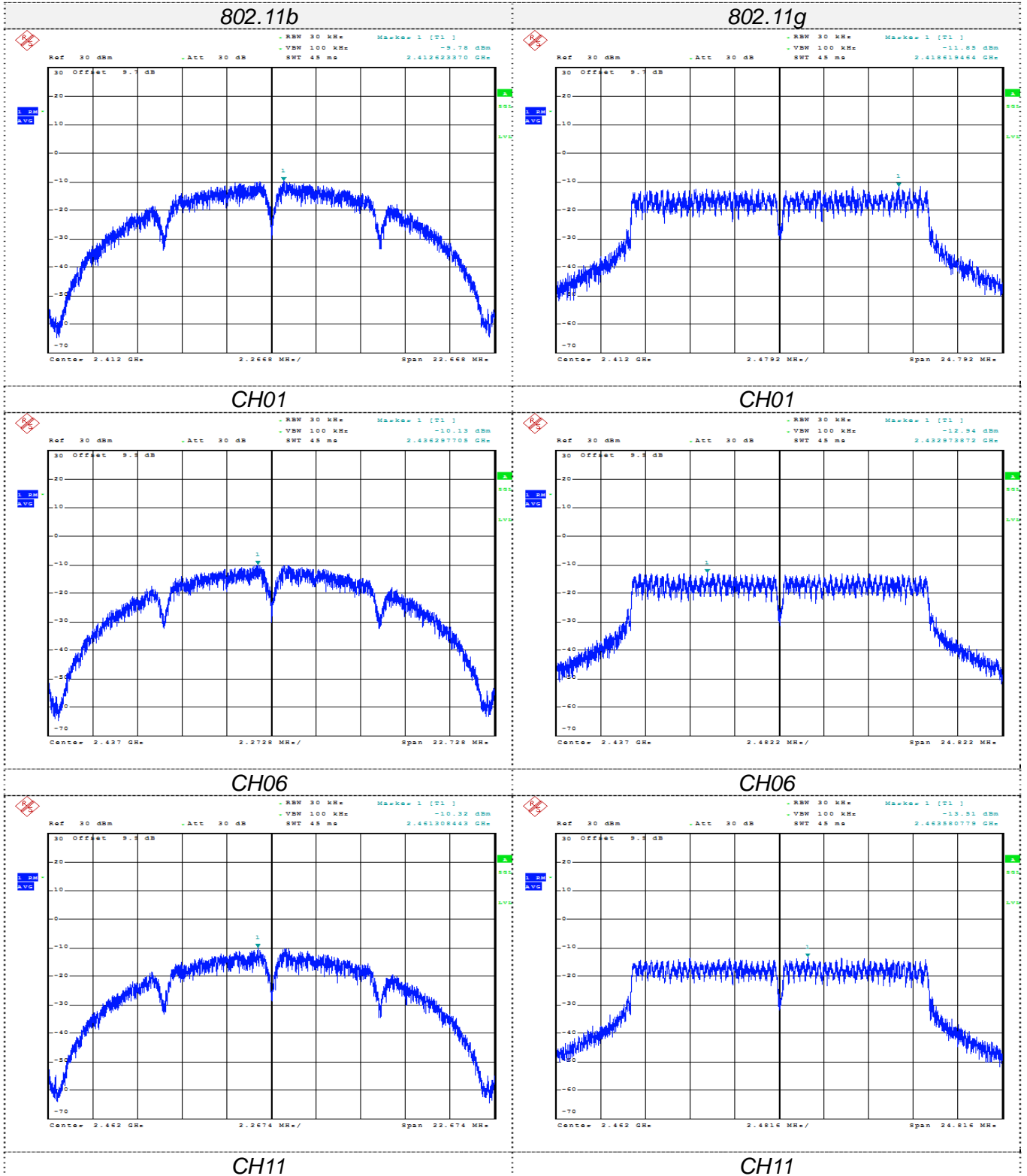
##### WIFI

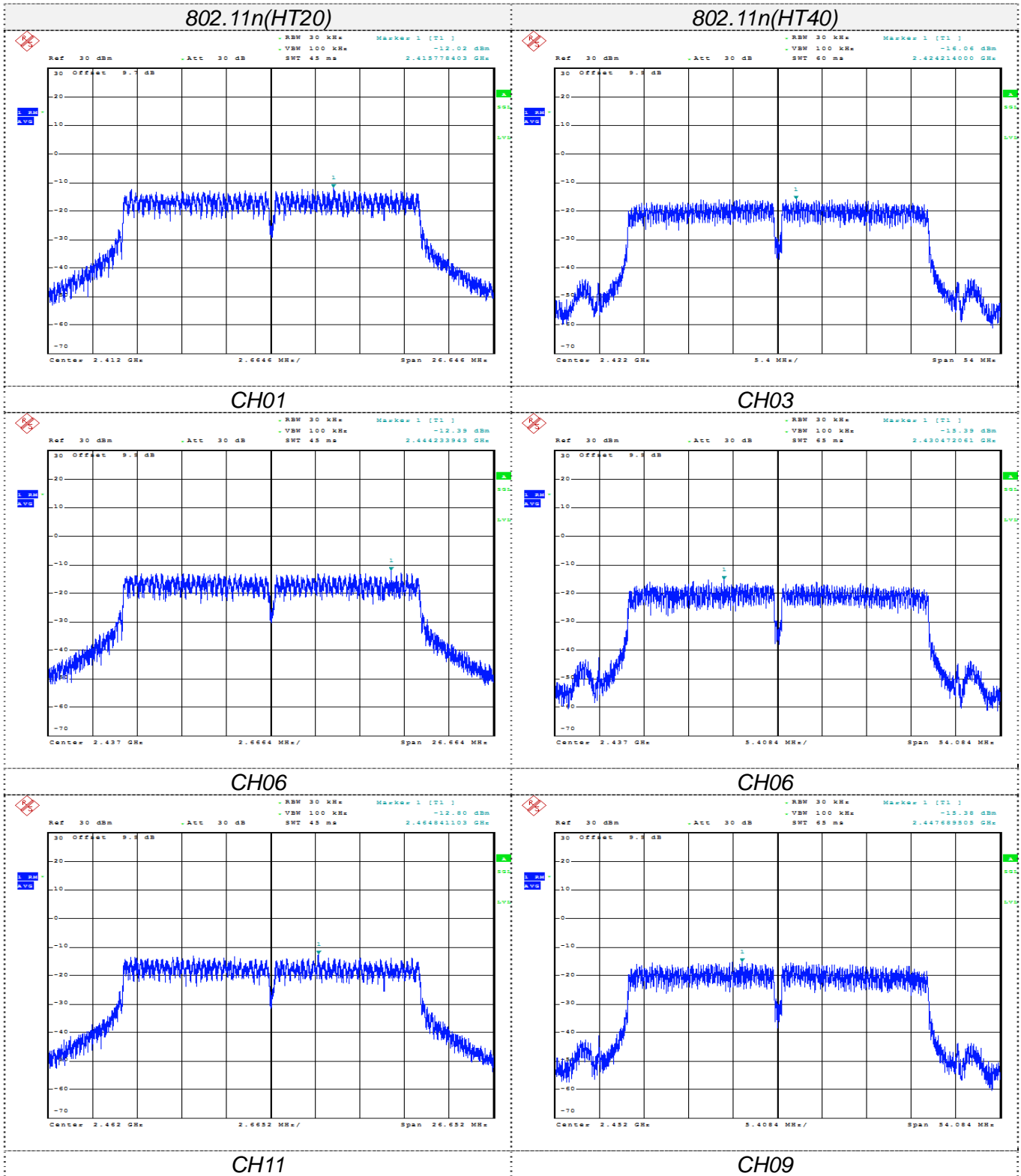
Type	Channel	Power Spectral Density (dBm/30KHz)	Limit (dBm/3KHz)	Result
802.11b	01	-9.780	8.00	Pass
	06	-10.130		
	11	-10.320		
802.11g	01	-11.850	8.00	Pass
	06	-12.940		
	11	-13.510		
802.11n(HT20)	01	-12.020	8.00	Pass
	06	-12.390		
	11	-12.800		
802.11n(HT40)	03	-16.060	8.00	Pass
	06	-15.390		
	09	-15.380		

##### BT4.0

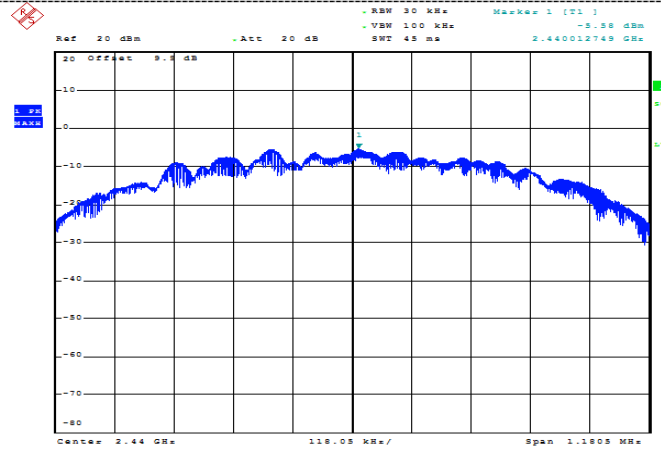
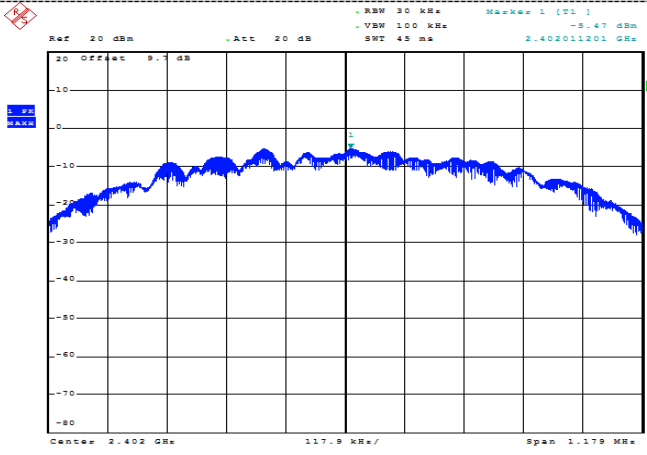
Type	Channel	Power Spectral Density (dBm/30KHz)	Limit (dBm/3KHz)	Result
BT4.0	00	-5.470	8.00	Pass
	19	-5.580		
	39	-7.490		

Test plot as follows:



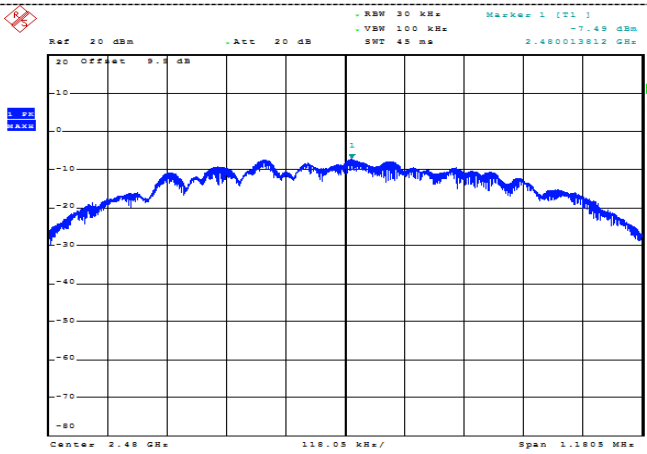


BT4.0



CH00

CH19



CH39

### 3.5. 6dB Bandwidth

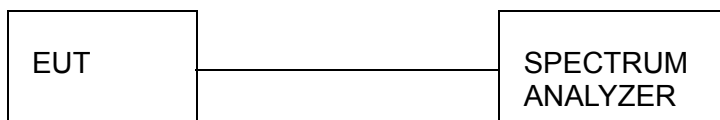
#### Limit

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

#### Test Procedure

1. The transmitter output was connected to the spectrum analyzer.
2. Set SA as follow:
  - a) RBW: 100 kHz.
  - b) VBW:  $\geq 3 \times$  RBW.
  - c) Detector: Peak.
  - d) Trace mode: max hold.
  - e) Sweep: auto couple.
3. Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### Test Configuration



#### Test Results

##### WIFI

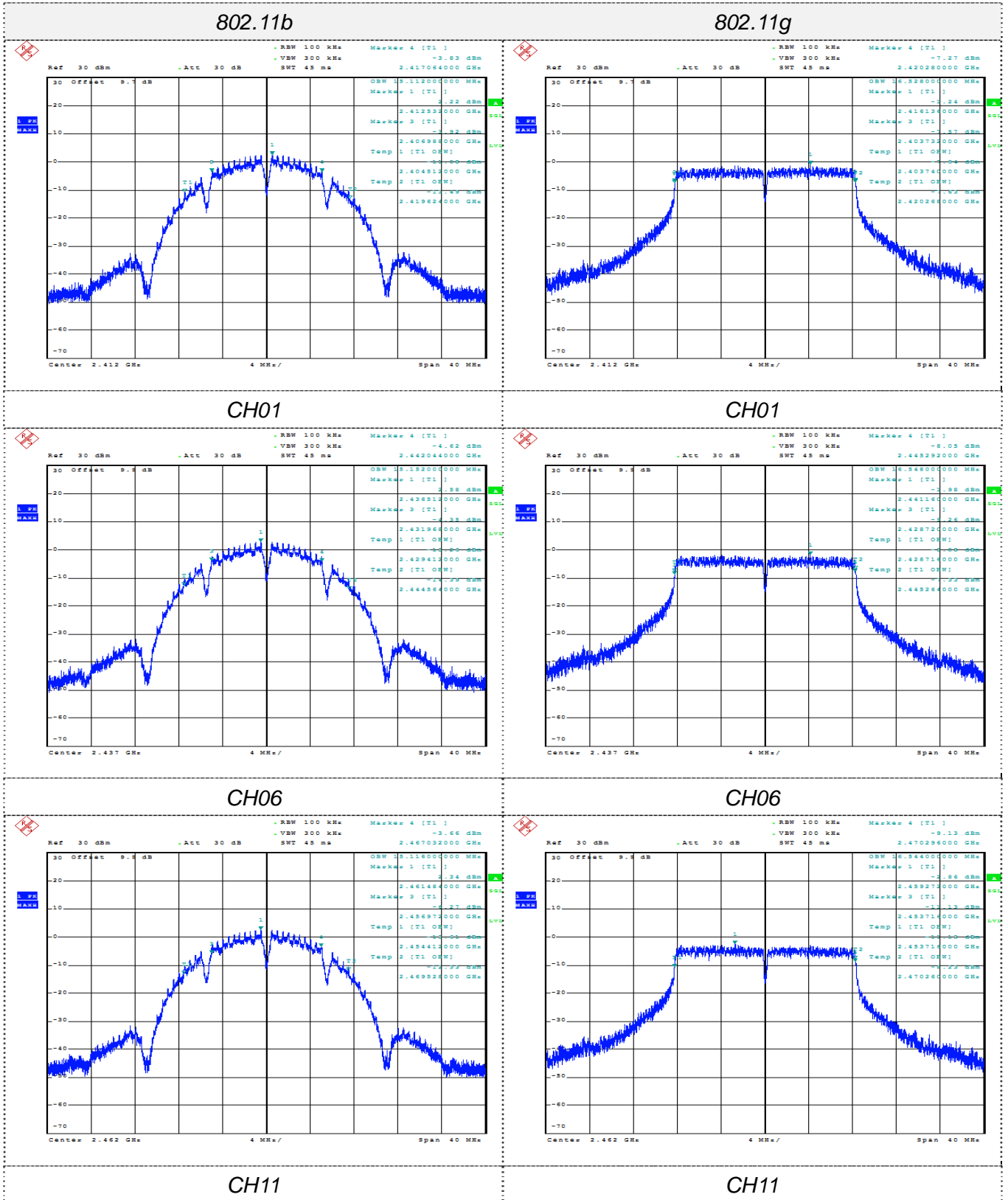
Type	Channel	6dB Bandwidth (MHz)	99% OBW (MHz)	Limit (KHz)	Result
802.11b	01	10.076	15.112	$\geq 500$	Pass
	06	10.076	15.152		
	11	10.060	15.116		
802.11g	01	16.548	16.528	$\geq 500$	Pass
	06	16.572	16.548		
	11	16.580	16.544		
802.11n(HT20)	01	17.808	17.764	$\geq 500$	Pass
	06	17.824	17.776		
	11	17.812	17.768		
802.11n(HT40)	03	36.344	36.000	$\geq 500$	Pass
	06	36.384	36.056		
	09	36.368	36.056		

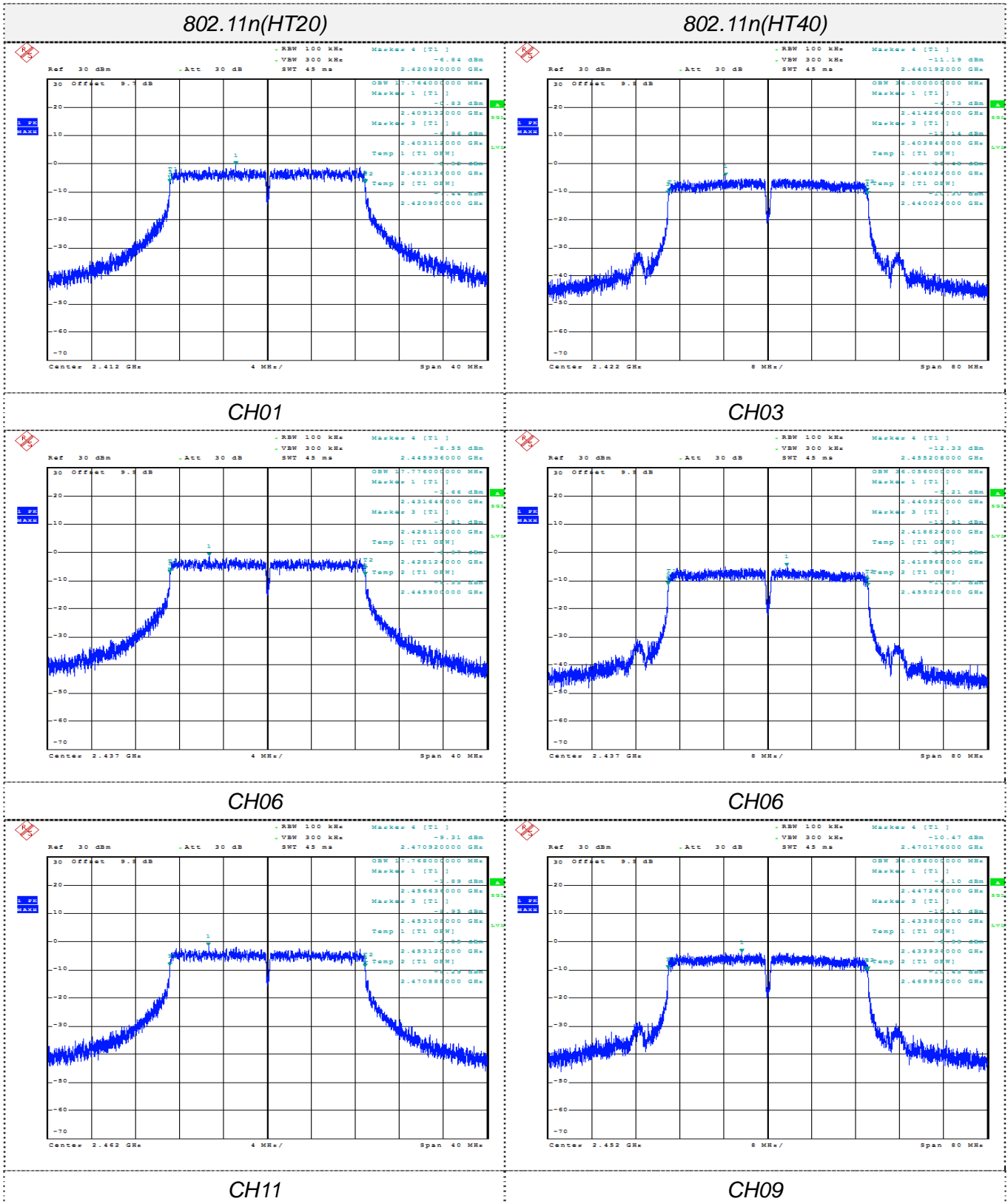
##### BT4.0

Type	Channel	6dB Bandwidth (MHz)	99% OBW (MHz)	Limit (KHz)	Result
GFSK	00	0.786	1.062	$\geq 500$	Pass
	19	0.787	1.066		
	39	0.787	1.063		

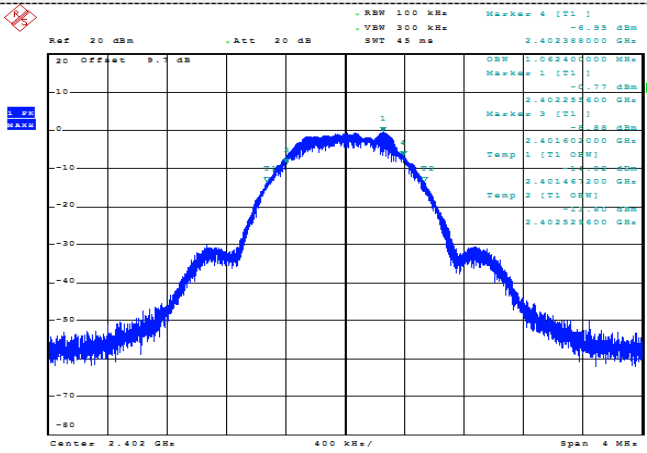
Test plot as follows:



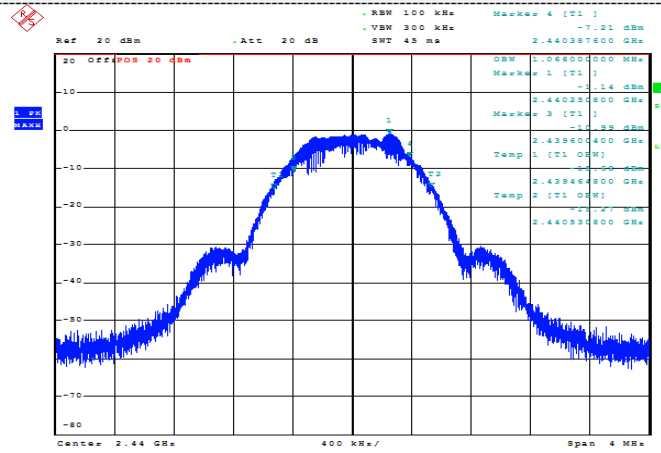




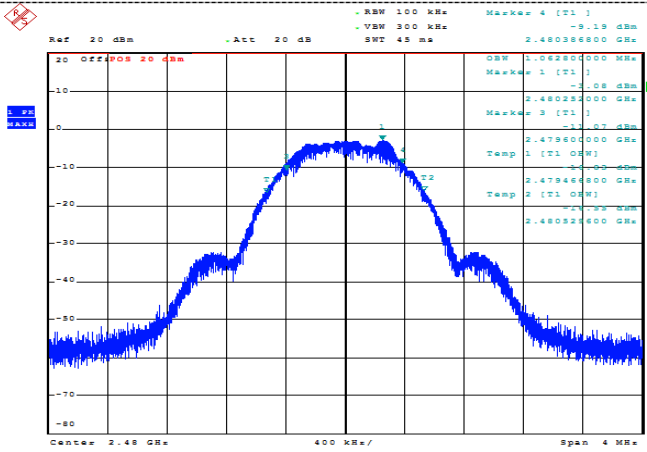
BT4.0



CH00



CH19



CH39

### 3.6. Band Edge Compliance of RF Emission

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

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

#### Test Procedure

##### **Test Procedure for conducted method**

1. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a spectrum analyzer
2. Turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set spectrum analyzer RBW =100 kHz, VBW=300 kHz, Detector=Peak, Sweep point= $\geq 2 \times \text{span} / \text{RBW}$ , Sweep time=Auto, trace= Max Hold( 100 traces)
4. Marker the highest point which fall into restricted frequency bands
5. Repeat above procedures until all measured frequencies were complete.

##### **Test Procedure for radiated method**

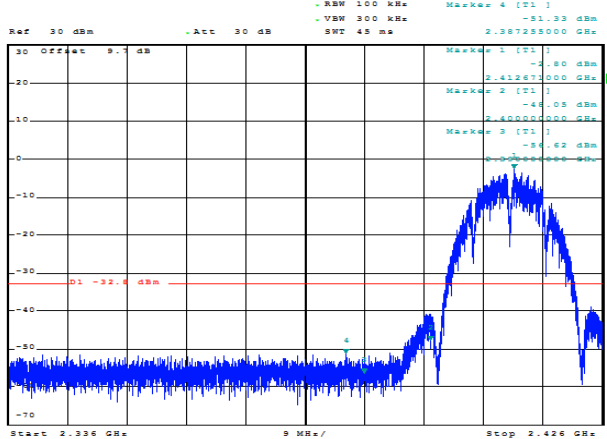
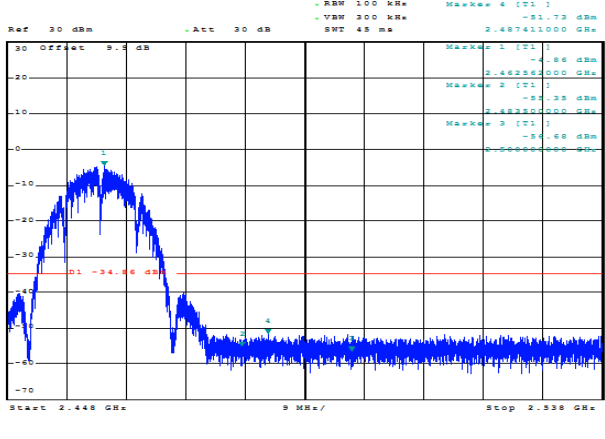
1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel
7. Test the EUT in the lowest channel, the highest channel
8. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
9. Repeat above procedures until all frequencies measured was complete.

**Test Results**

**A. Conducted measurements**

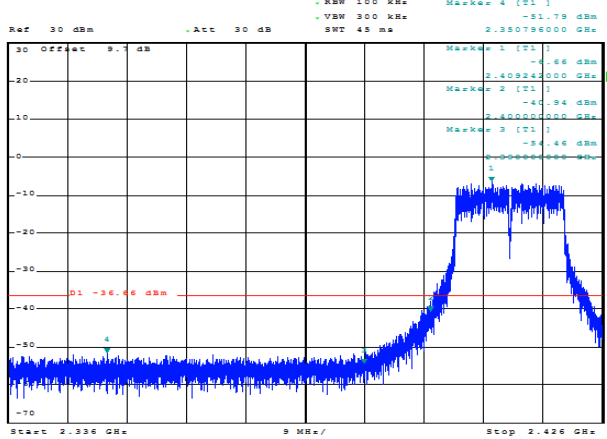
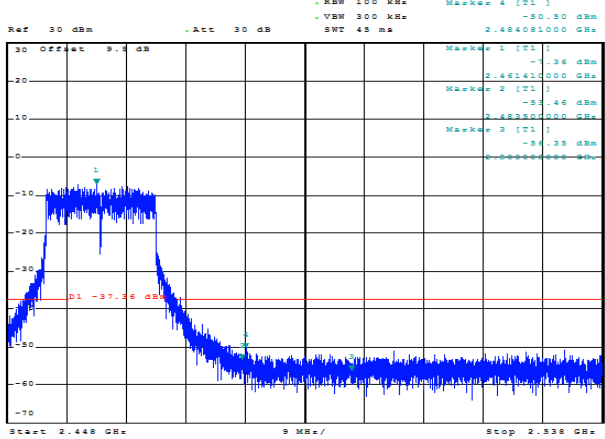
802.11b			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2387.255	48.532	30	PASS
2487.411	46.869	30	PASS

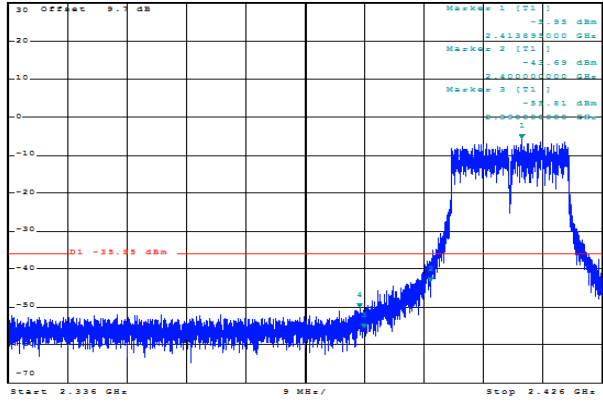
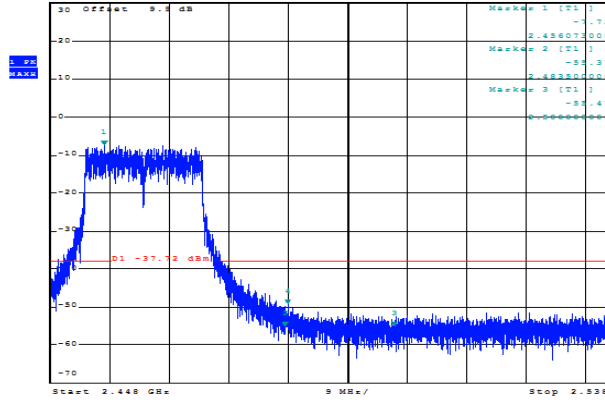
  

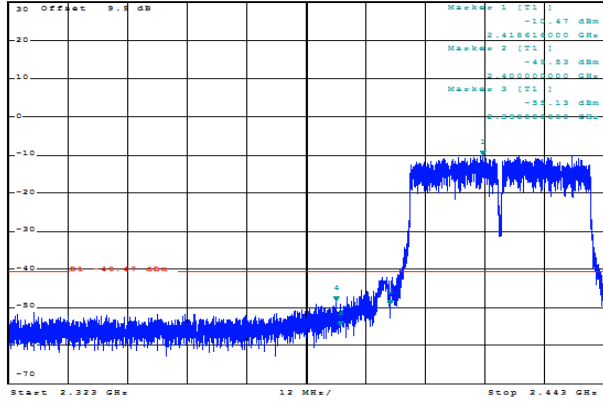
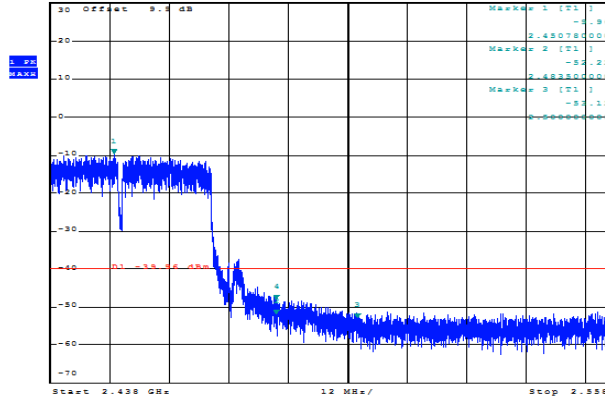
	
2412	2462

802.11g			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2350.796	45.134	30	PASS
2484.081	43.143	30	PASS

	
2412	2462

802.11n20			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2389.181	44.587	30	PASS
2483.973	41.893	30	PASS
		2412	
		2462	

802.11n40			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2388.892	38.109	30	PASS
2483.540	38.194	30	PASS
		2422	
		2452	

BT4.0			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2377.846	52.996	20	PASS
2492.954	50.613	20	PASS
		2402	
		2480	

**B. Radiated measurements**

**802.11b**

Frequency(MHz):			2412			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	55.32	PK	74.00	18.68	1.00	114	60.63	27.49	3.32	36.12	-5.31
2390	47.12	AV	54.00	6.88	1.00	114	52.43	27.49	3.32	36.12	-5.31
Frequency(MHz):			2412			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	53.91	PK	74.00	20.09	1.00	225	59.22	27.49	3.32	36.12	-5.31
2390	44.21	AV	54.00	9.79	1.00	225	49.52	27.49	3.32	36.12	-5.31
Frequency(MHz):			2462			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	55.91	PK	74.00	18.09	1.00	119	61.63	27.45	3.38	36.55	-5.72
2483.5	44.3	AV	54.00	9.70	1.00	119	50.02	27.45	3.38	36.55	-5.72
Frequency(MHz):			2462			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	53.52	PK	74.00	20.48	1.00	215	59.24	27.45	3.38	36.55	-5.72
2483.5	45.2	AV	54.00	8.80	1.00	215	50.92	27.45	3.38	36.55	-5.72

**802.11g**

Frequency(MHz):			2412			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	54.41	PK	74.00	19.59	1.00	109	59.72	27.49	3.32	36.12	-5.31
2390	43.89	AV	54.00	10.11	1.00	109	49.20	27.49	3.32	36.12	-5.31
Frequency(MHz):			2412			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	53.32	PK	74.00	20.68	1.00	220	58.63	27.49	3.32	36.12	-5.31
2390	44.58	AV	54.00	9.42	1.00	220	49.89	27.49	3.32	36.12	-5.31
Frequency(MHz):			2462			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	55.18	PK	74.00	18.82	1.00	119	60.90	27.45	3.38	36.55	-5.72
2483.5	45.09	AV	54.00	8.91	1.00	119	50.81	27.45	3.38	36.55	-5.72
Frequency(MHz):			2462			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	53.70	PK	74.00	20.30	1.00	235	59.42	27.45	3.38	36.55	-5.72
2483.5	43.28	AV	54.00	10.72	1.00	235	49.00	27.45	3.38	36.55	-5.72



**802.11n20**

Frequency(MHz):			2412			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	54.27	PK	74.00	19.73	1.00	134	59.58	27.49	3.32	36.12	-5.31
2390	43.53	AV	54.00	10.47	1.00	134	48.84	27.49	3.32	36.12	-5.31
Frequency(MHz):			2412			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	53.34	PK	74.00	20.66	1.00	237	58.65	27.49	3.32	36.12	-5.31
2390	45.17	AV	54.00	8.83	1.00	237	50.48	27.49	3.32	36.12	-5.31
Frequency(MHz):			2462			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	53.18	PK	74.00	20.82	1.00	129	58.90	27.45	3.38	36.55	-5.72
2483.5	45.45	AV	54.00	8.55	1.00	129	51.17	27.45	3.38	36.55	-5.72
Frequency(MHz):			2462			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	54.23	PK	74.00	19.77	1.00	245	59.95	27.45	3.38	36.55	-5.72
2483.5	43.37	AV	54.00	10.63	1.00	245	49.09	27.45	3.38	36.55	-5.72

**802.11n40**

Frequency(MHz):			2422			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	52.51	PK	74.00	21.49	1.00	134	57.82	27.49	3.32	36.12	-5.31
2390	41.26	AV	54.00	12.74	1.00	134	46.57	27.49	3.32	36.12	-5.31
Frequency(MHz):			2422			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	53.05	PK	74.00	20.95	1.00	237	58.36	27.49	3.32	36.12	-5.31
2390	41.52	AV	54.00	12.48	1.00	237	46.83	27.49	3.32	36.12	-5.31
Frequency(MHz):			2452			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	51.20	PK	74.00	22.80	1.00	129	56.92	27.45	3.38	36.55	-5.72
2483.5	41.35	AV	54.00	12.65	1.00	129	47.07	27.45	3.38	36.55	-5.72
Frequency(MHz):			2452			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	51.18	PK	74.00	22.82	1.00	245	56.90	27.45	3.38	36.55	-5.72
2483.5	41.28	AV	54.00	12.72	1.00	245	47.00	27.45	3.38	36.55	-5.72

bt 4.0 GFSK

Frequency(MHz):			2402			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	51.22	PK	74.00	22.78	1.00	129	56.53	27.49	3.32	36.12	-5.31
2390	42.21	AV	54.00	11.79	1.00	129	47.52	27.49	3.32	36.12	-5.31
Frequency(MHz):			2402			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390	52.53	PK	74.00	21.47	1.00	210	57.84	27.49	3.32	36.12	-5.31
2390	42.50	AV	54.00	11.50	1.00	210	47.81	27.49	3.32	36.12	-5.31
Frequency(MHz):			2480			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	50.25	PK	74.00	23.75	1.00	119	55.97	27.45	3.38	36.55	-5.72
2483.5	39.33	AV	54.00	14.67	1.00	119	45.05	27.45	3.38	36.55	-5.72
Frequency(MHz):			2480			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.5	51.32	PK	74.00	22.68	1.00	241	57.04	27.45	3.38	36.55	-5.72
2483.5	40.74	AV	54.00	13.26	1.00	241	46.46	27.45	3.38	36.55	-5.72

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.

### 3.7. Spurious RF Conducted Emission

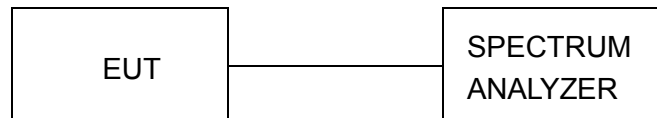
#### Limit

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

#### Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10:2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100 kHz and VBM= 300 KHz to measure the peak field strength, and measured frequency range from 30MHz to 26.5GHz.

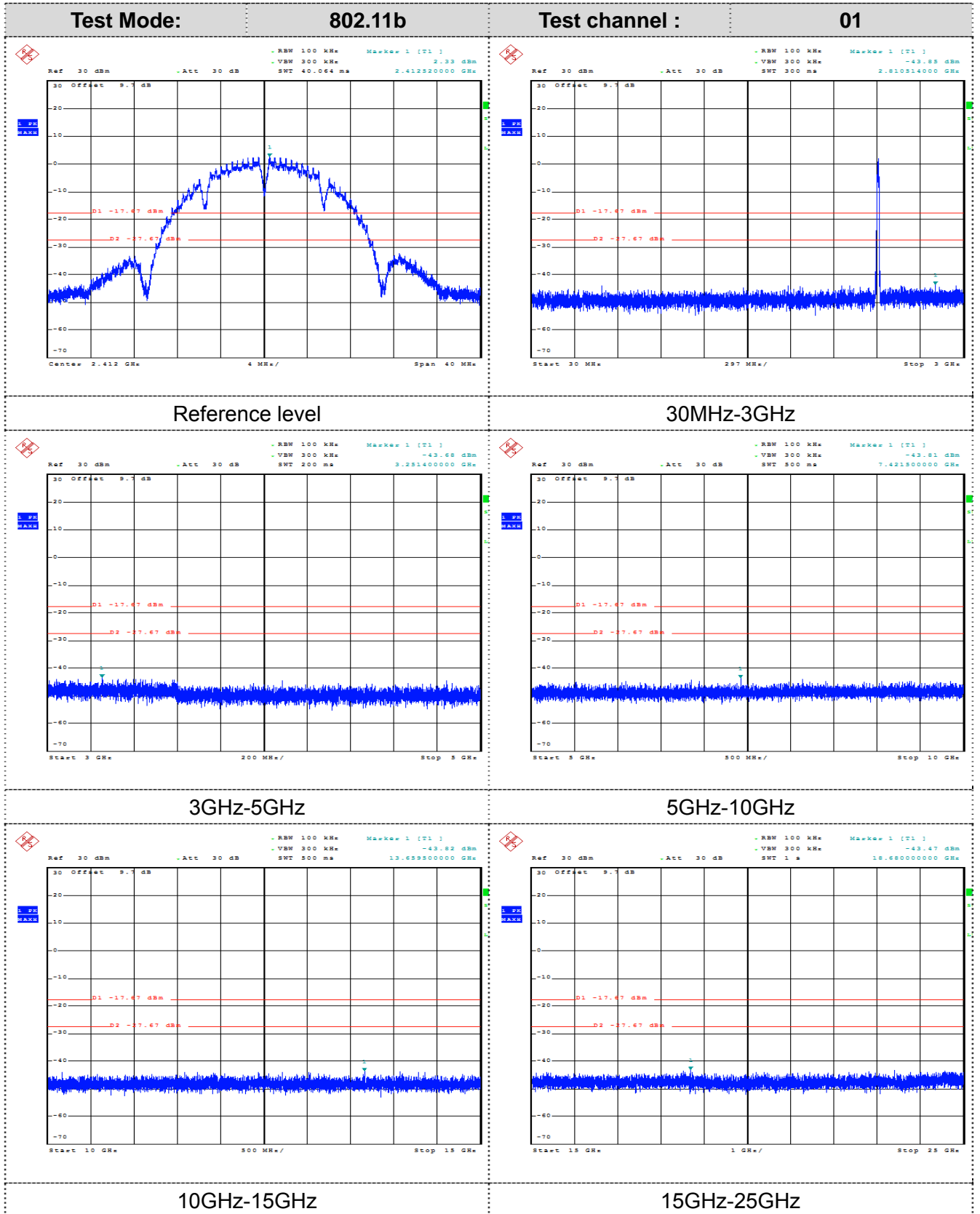
#### Test Configuration

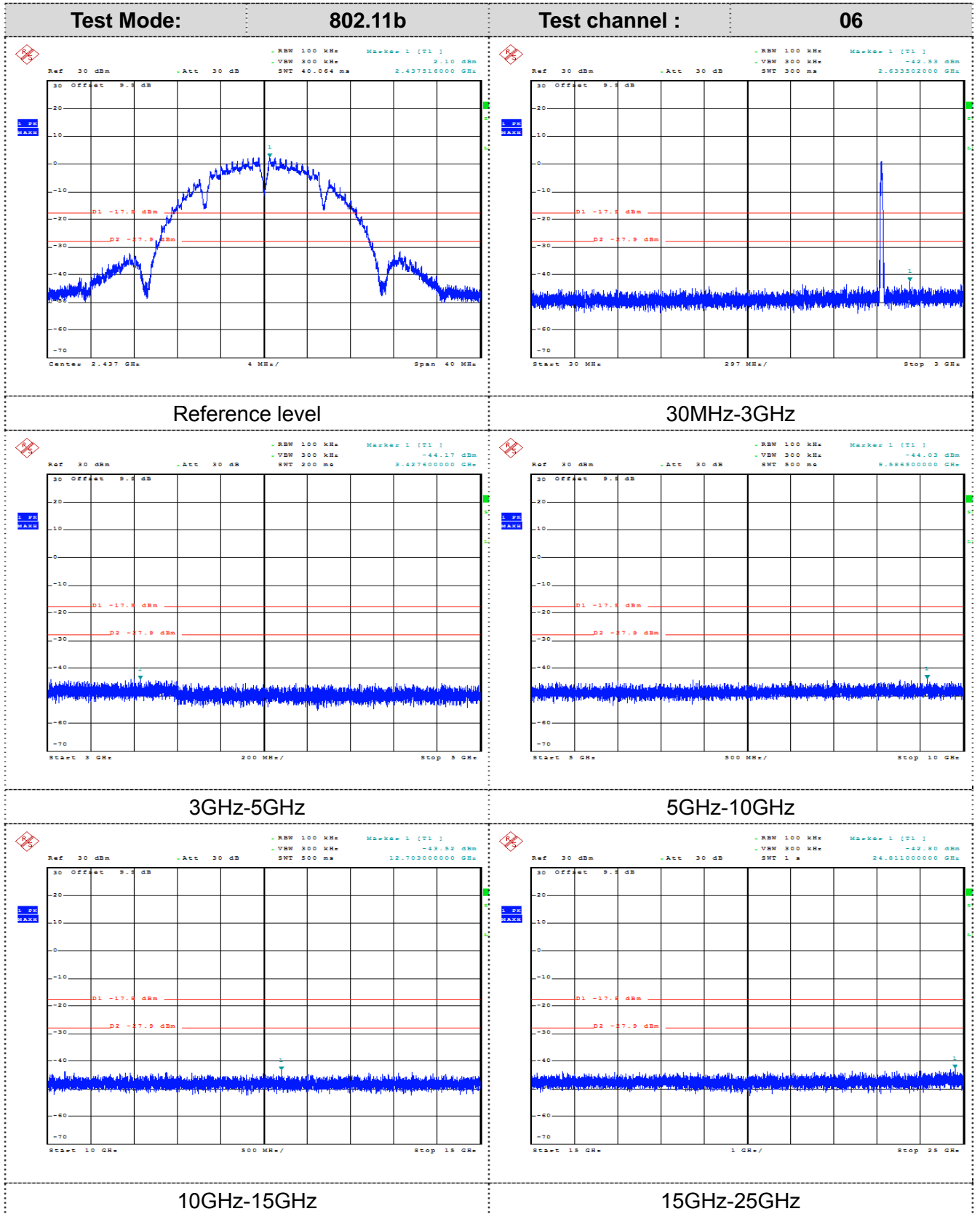


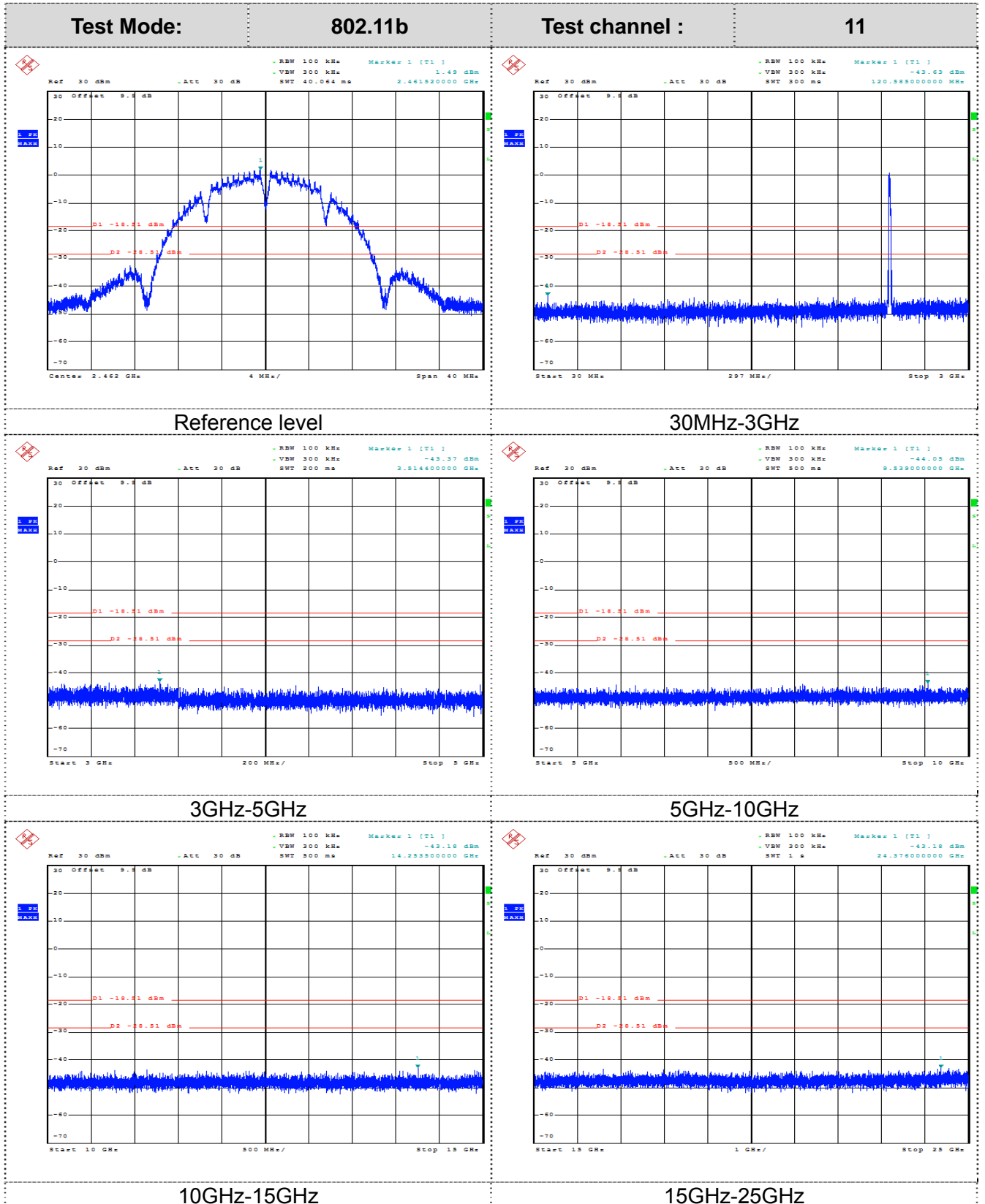
#### Test Results

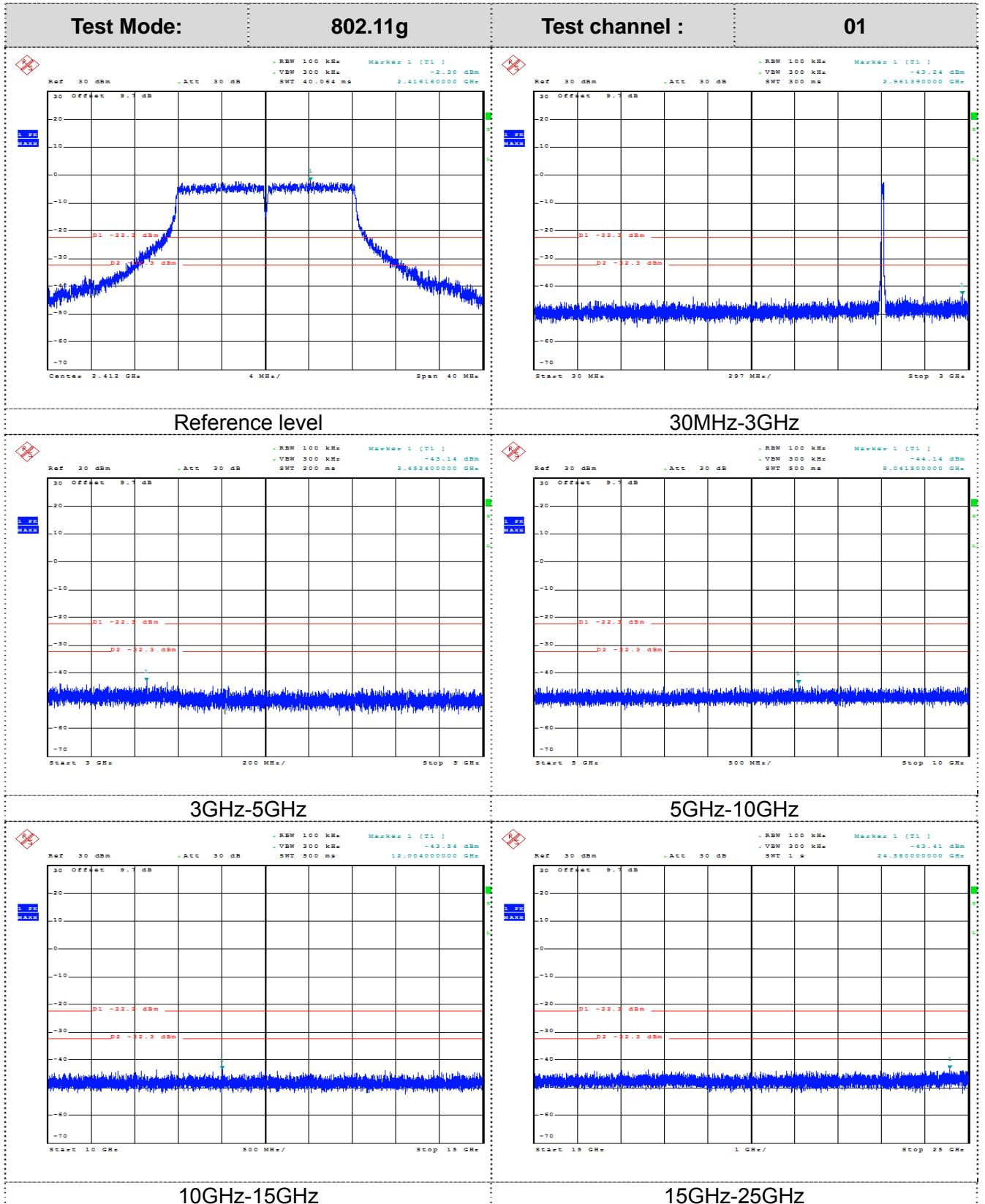
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

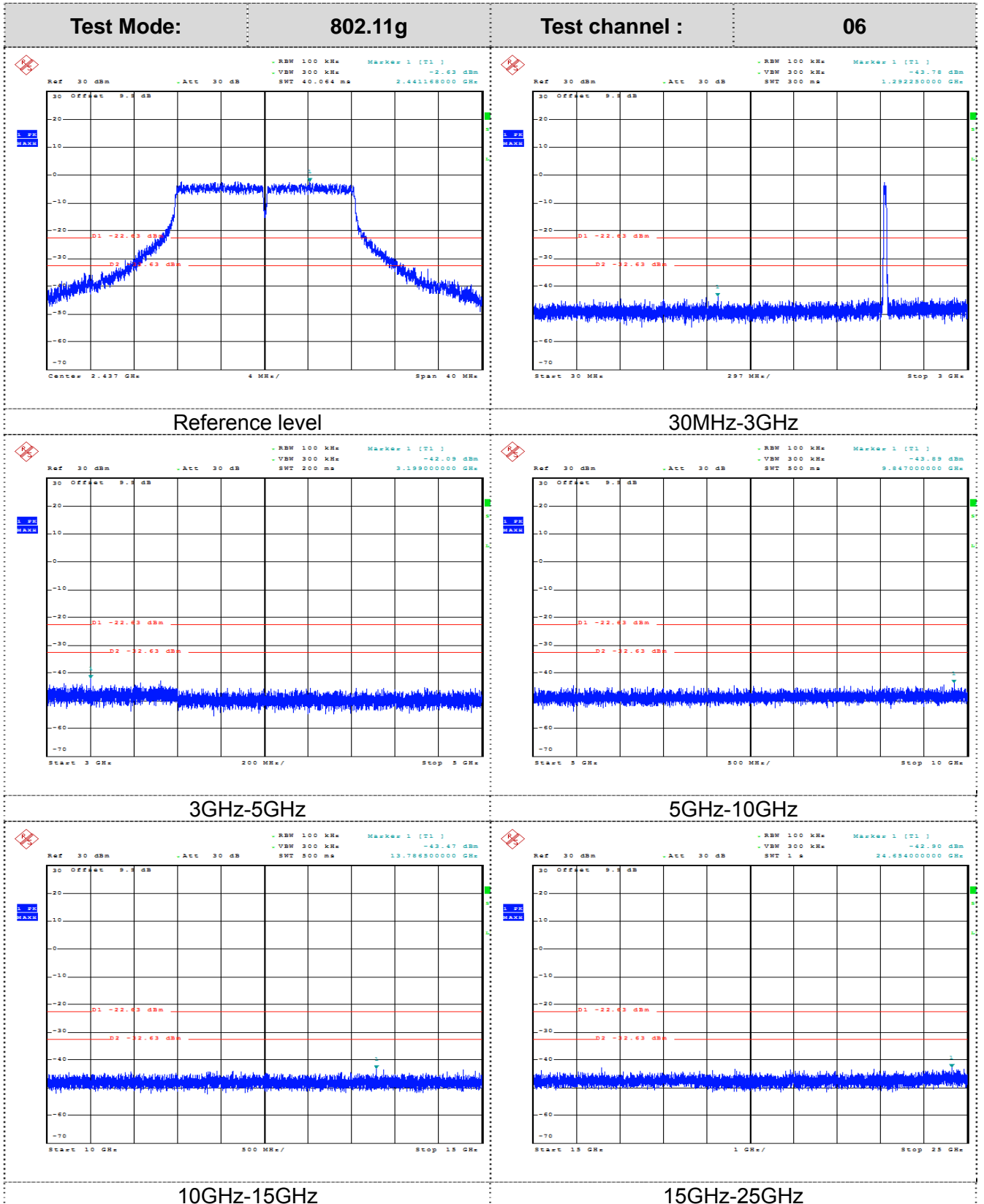
Test plot as follows:



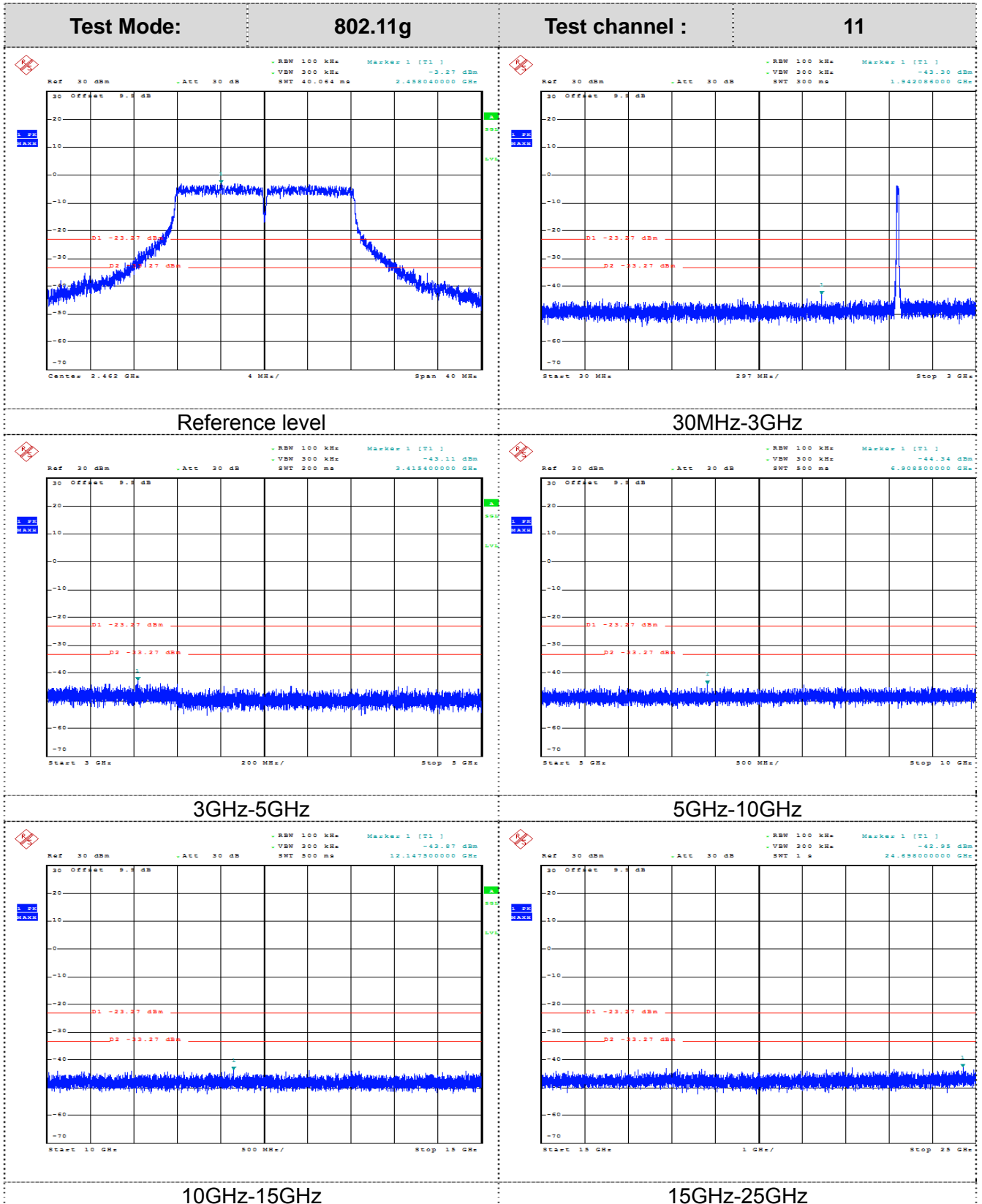


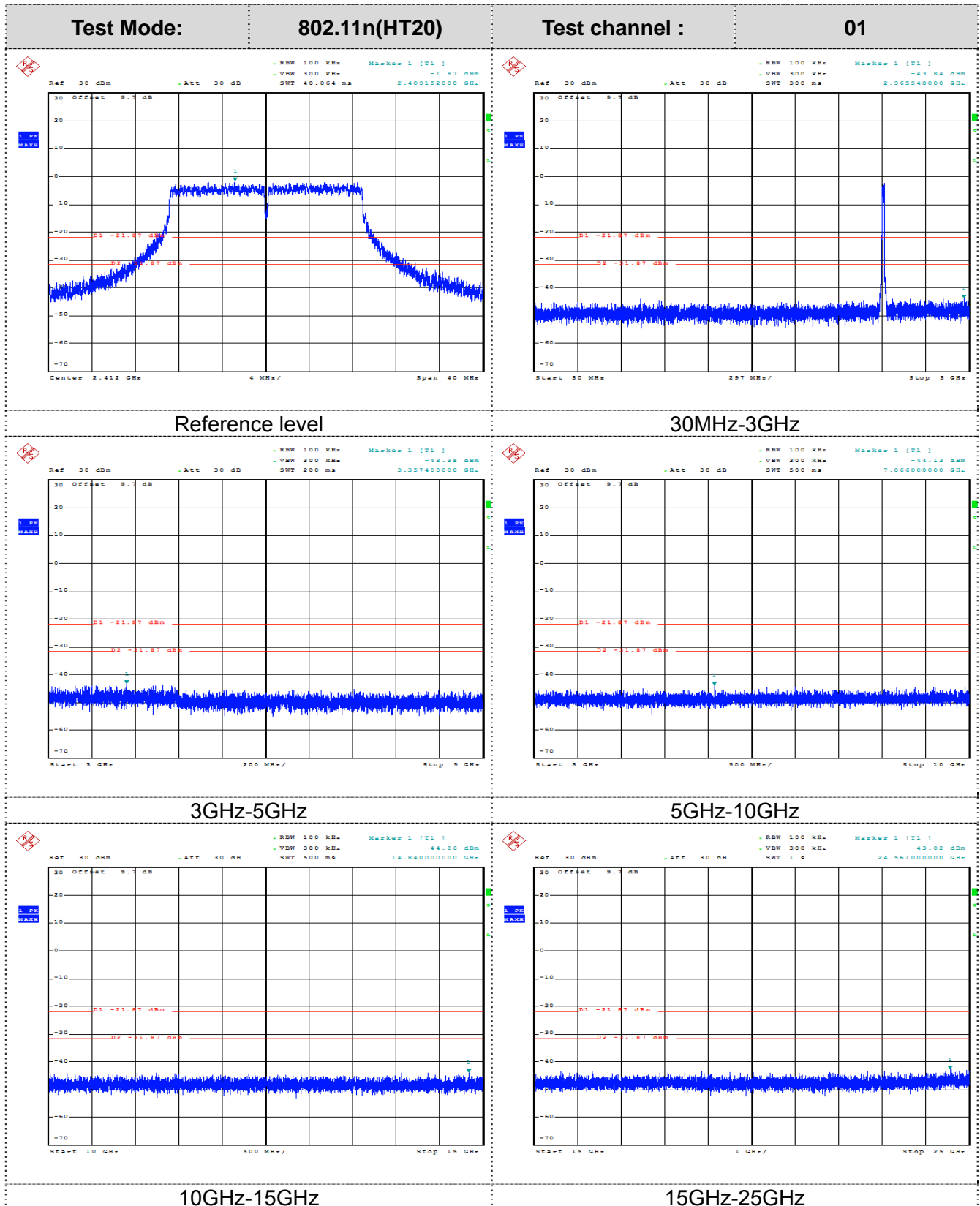


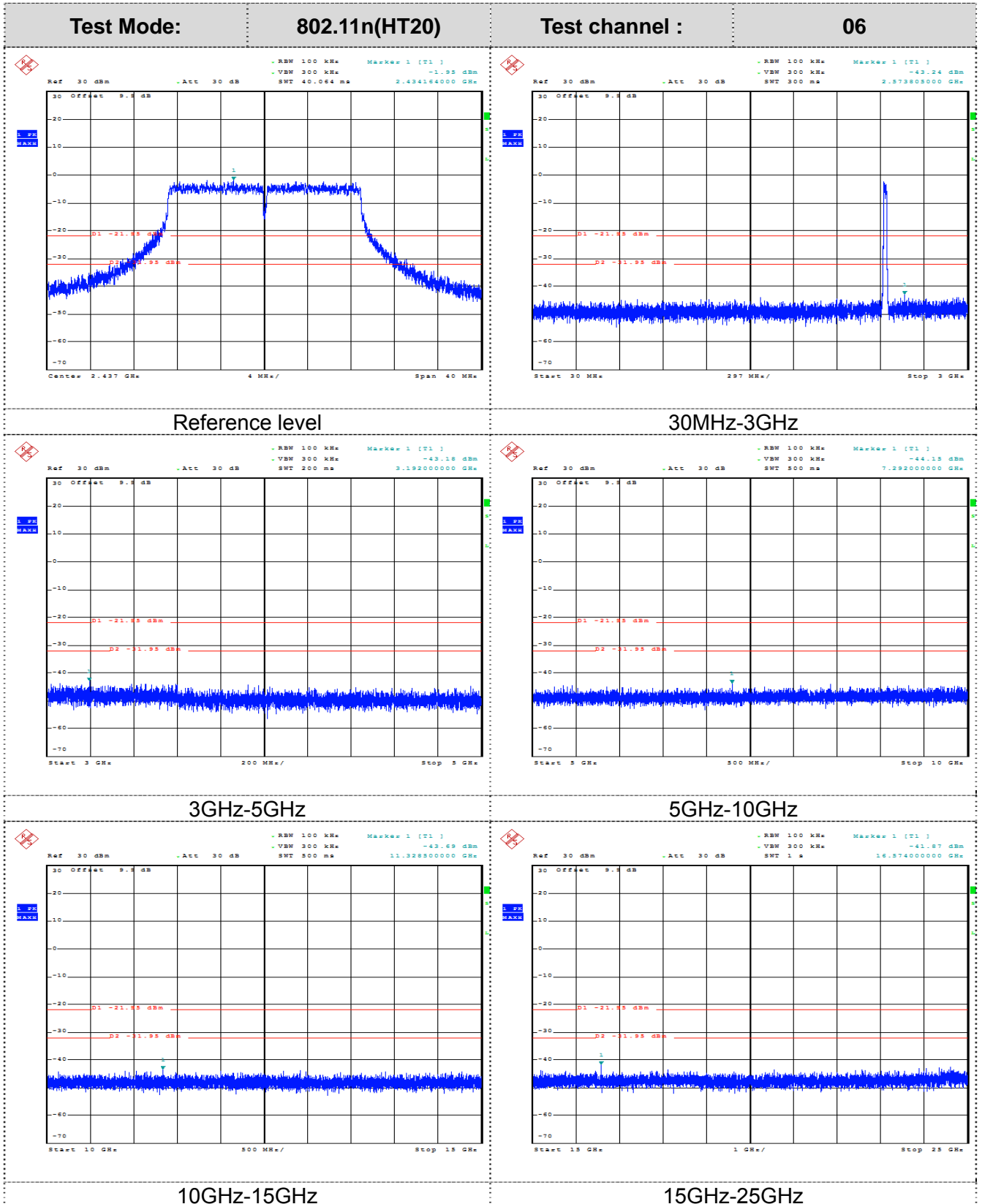


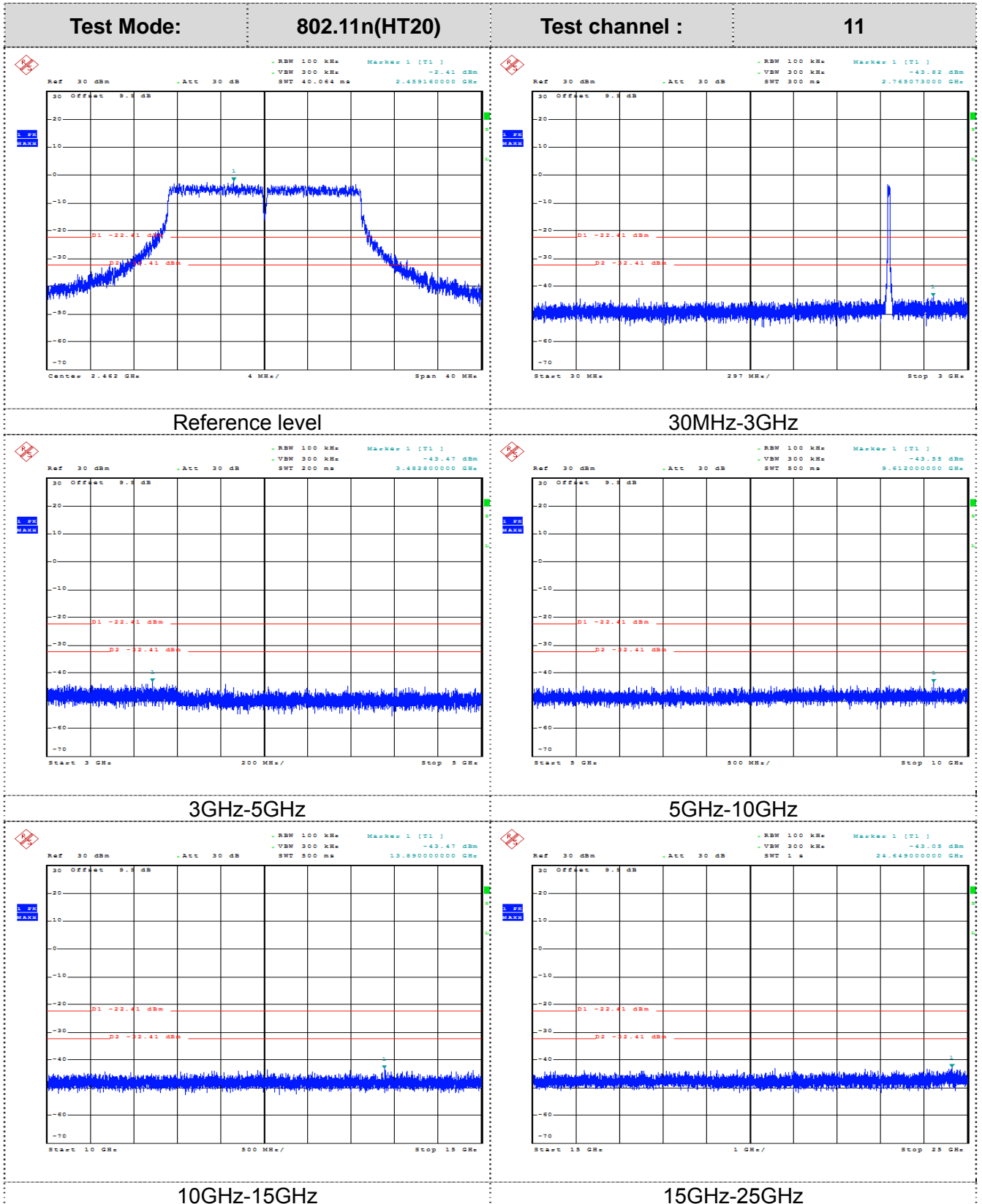


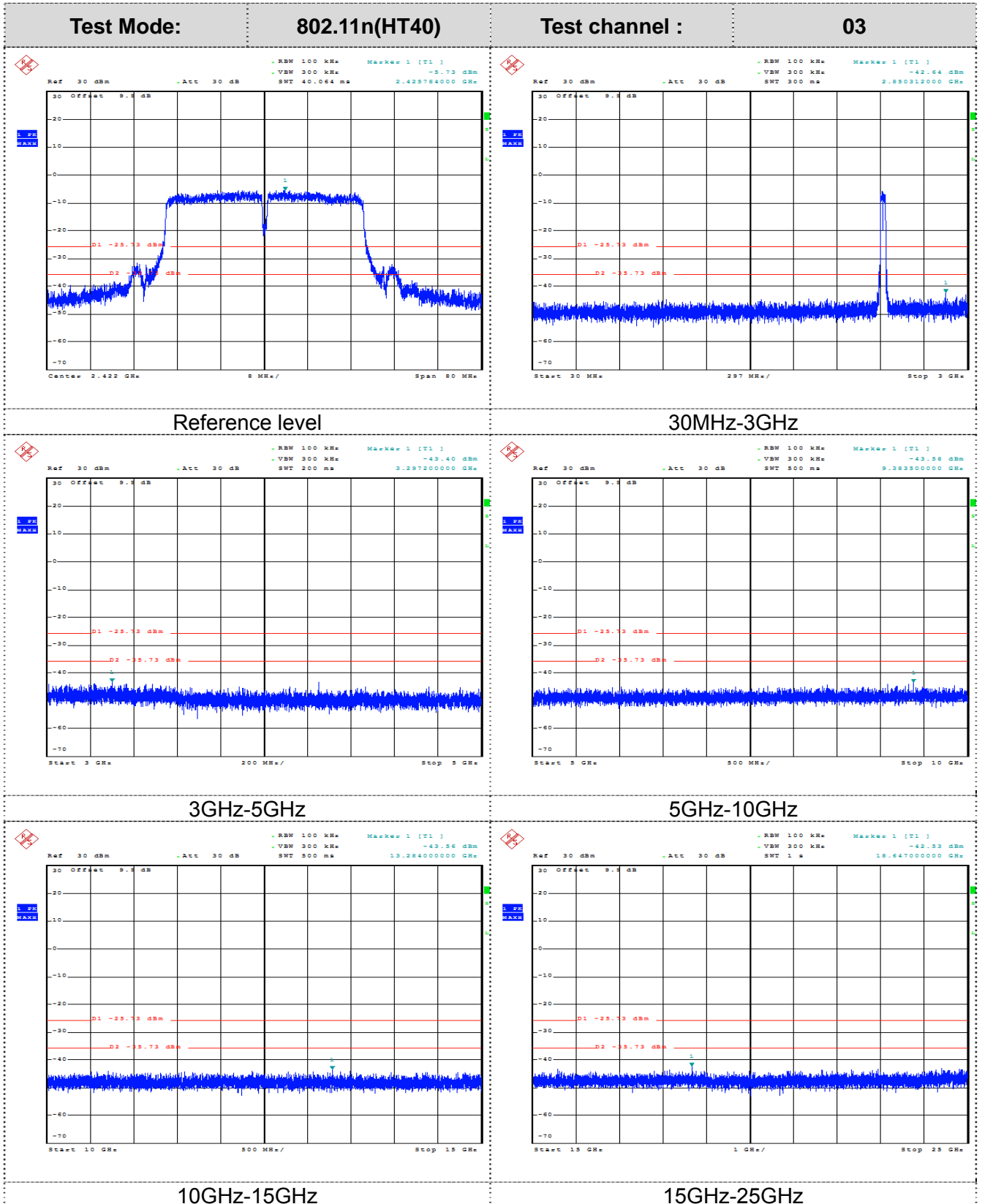


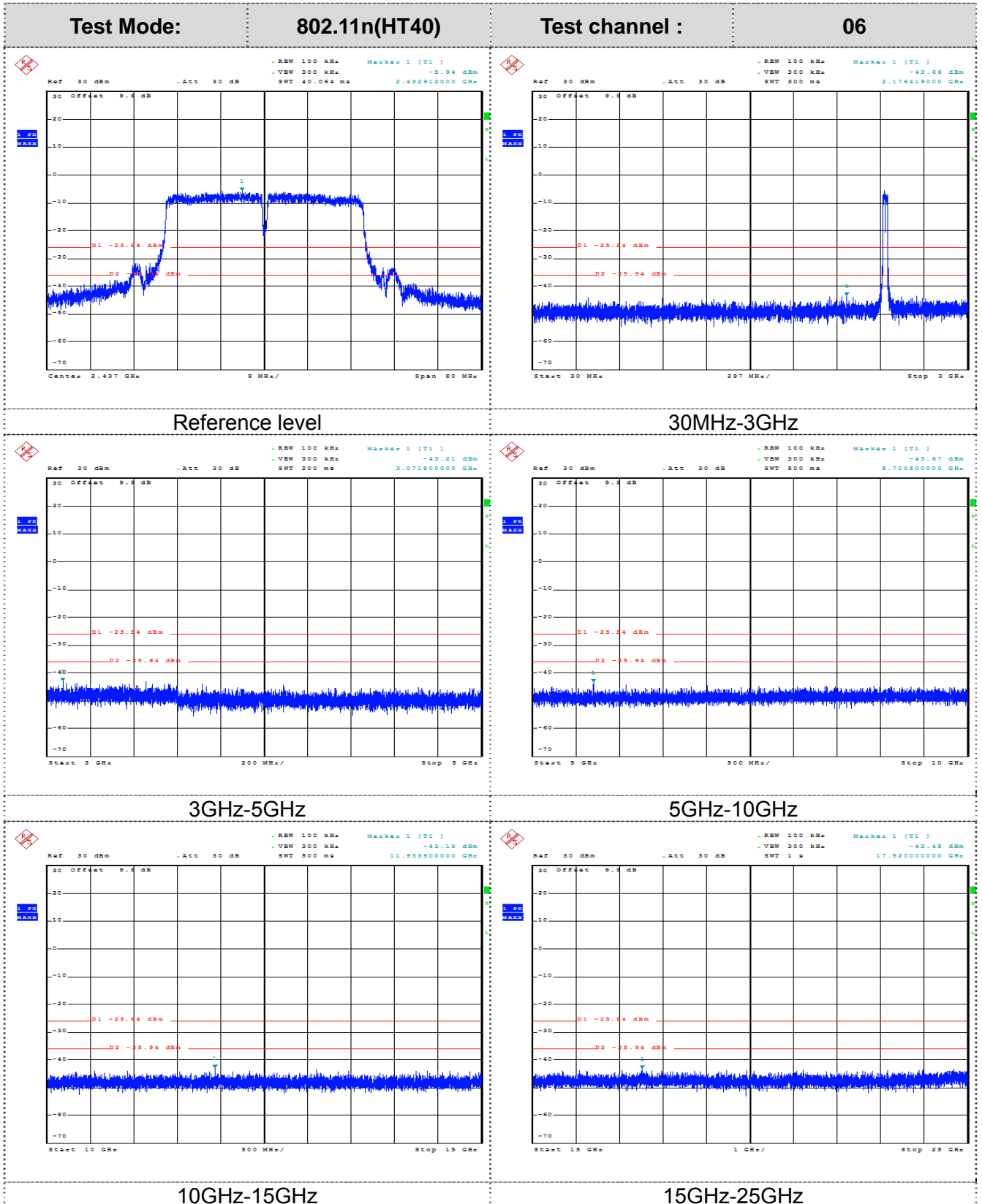


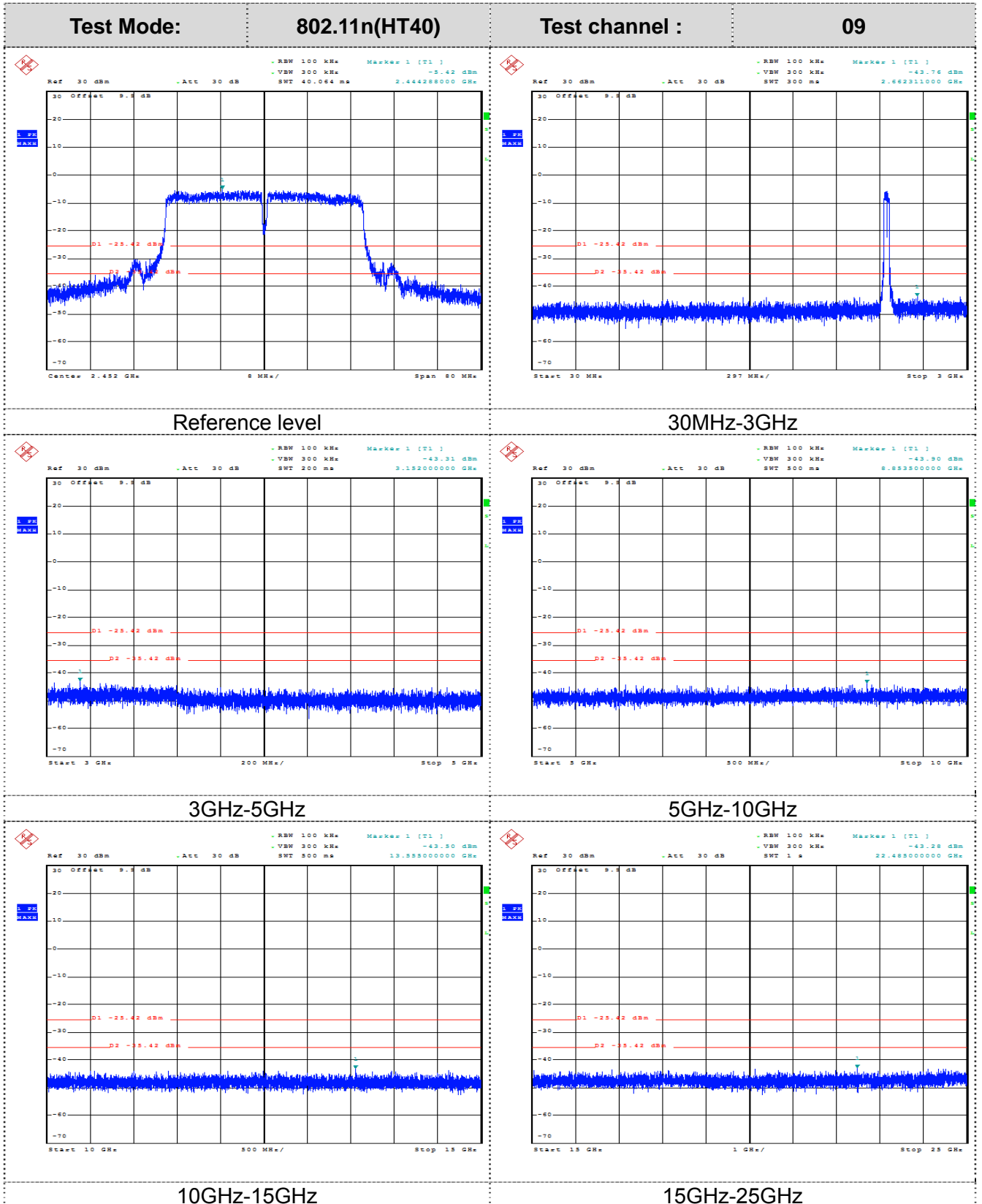


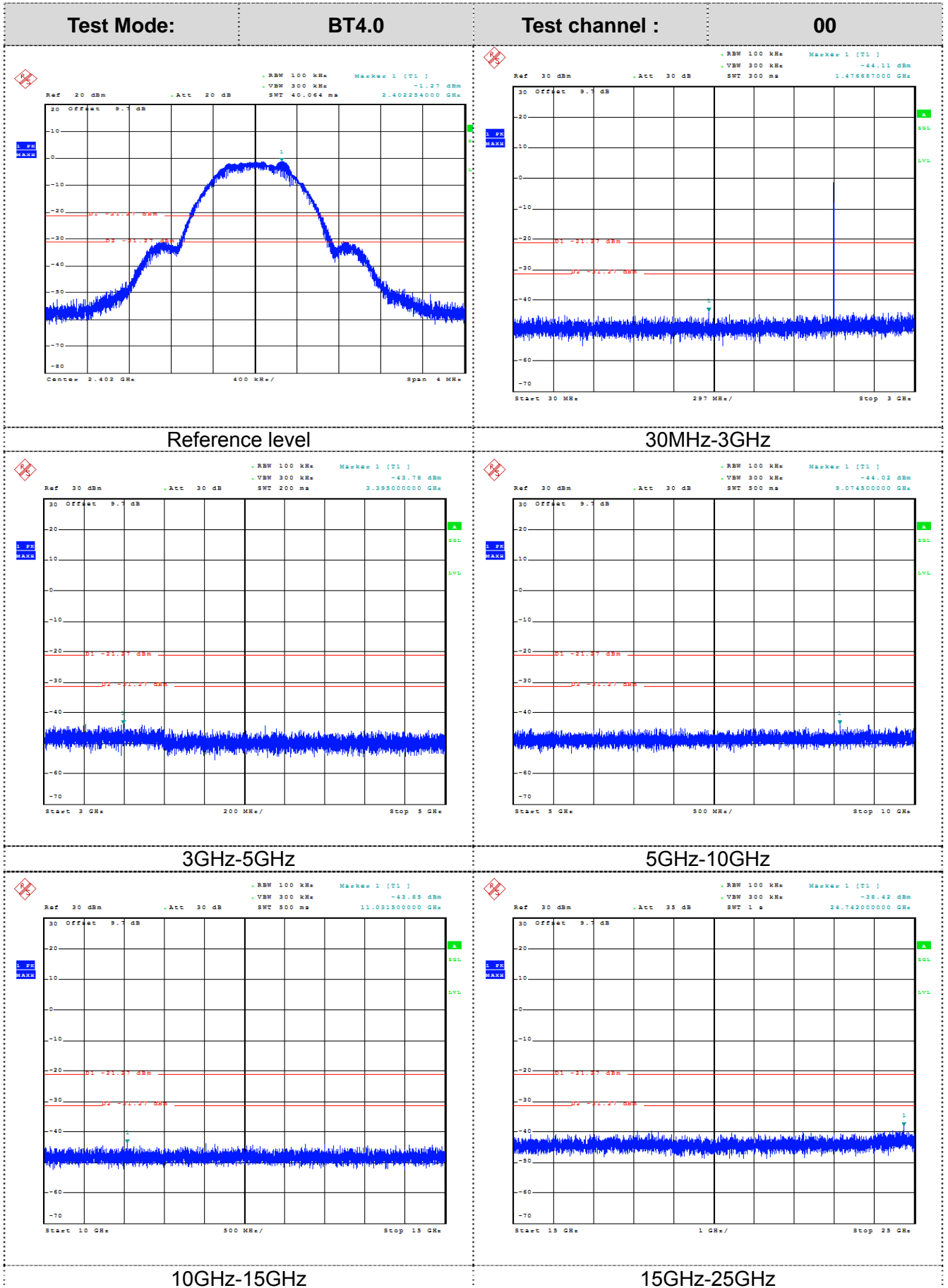




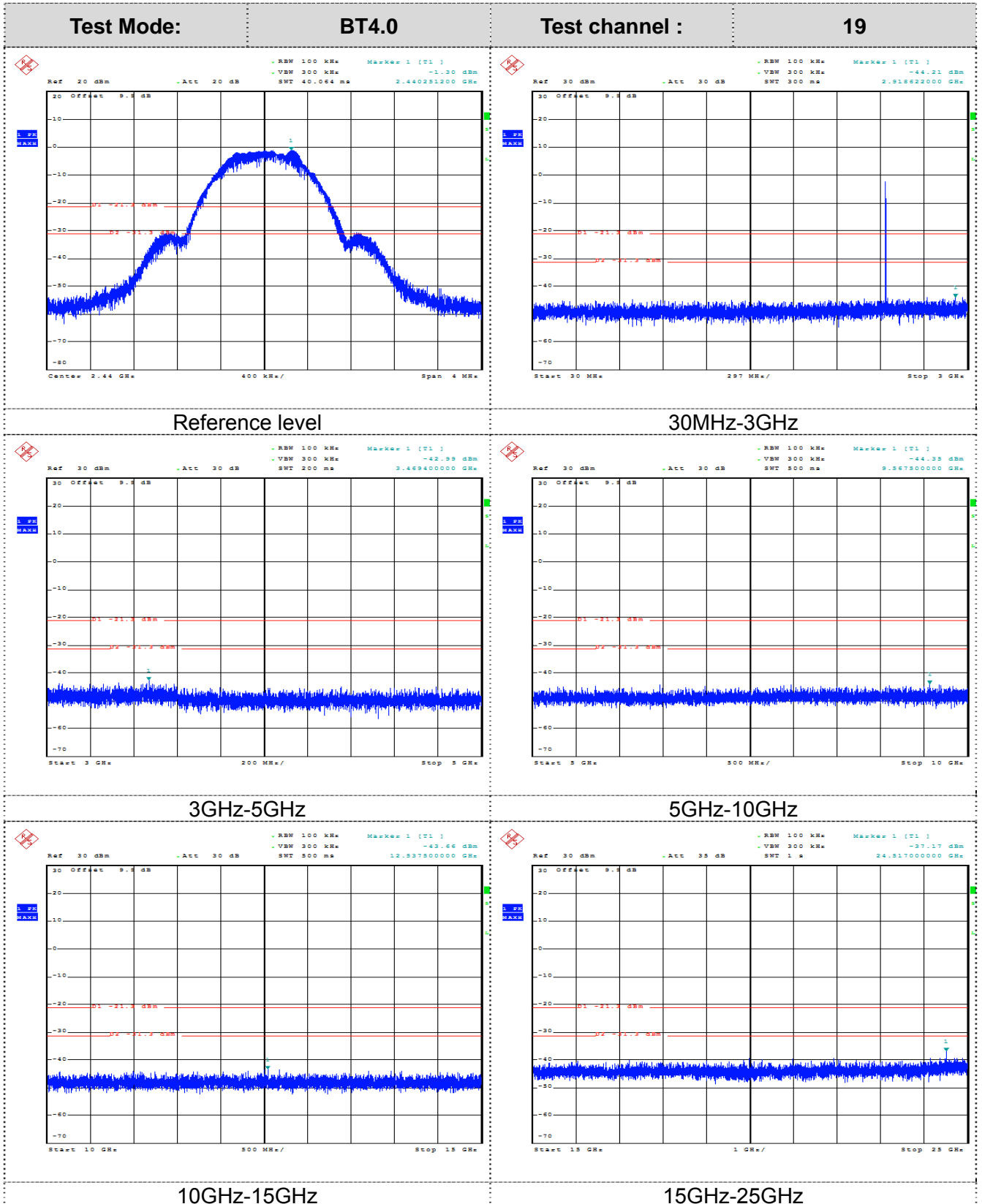


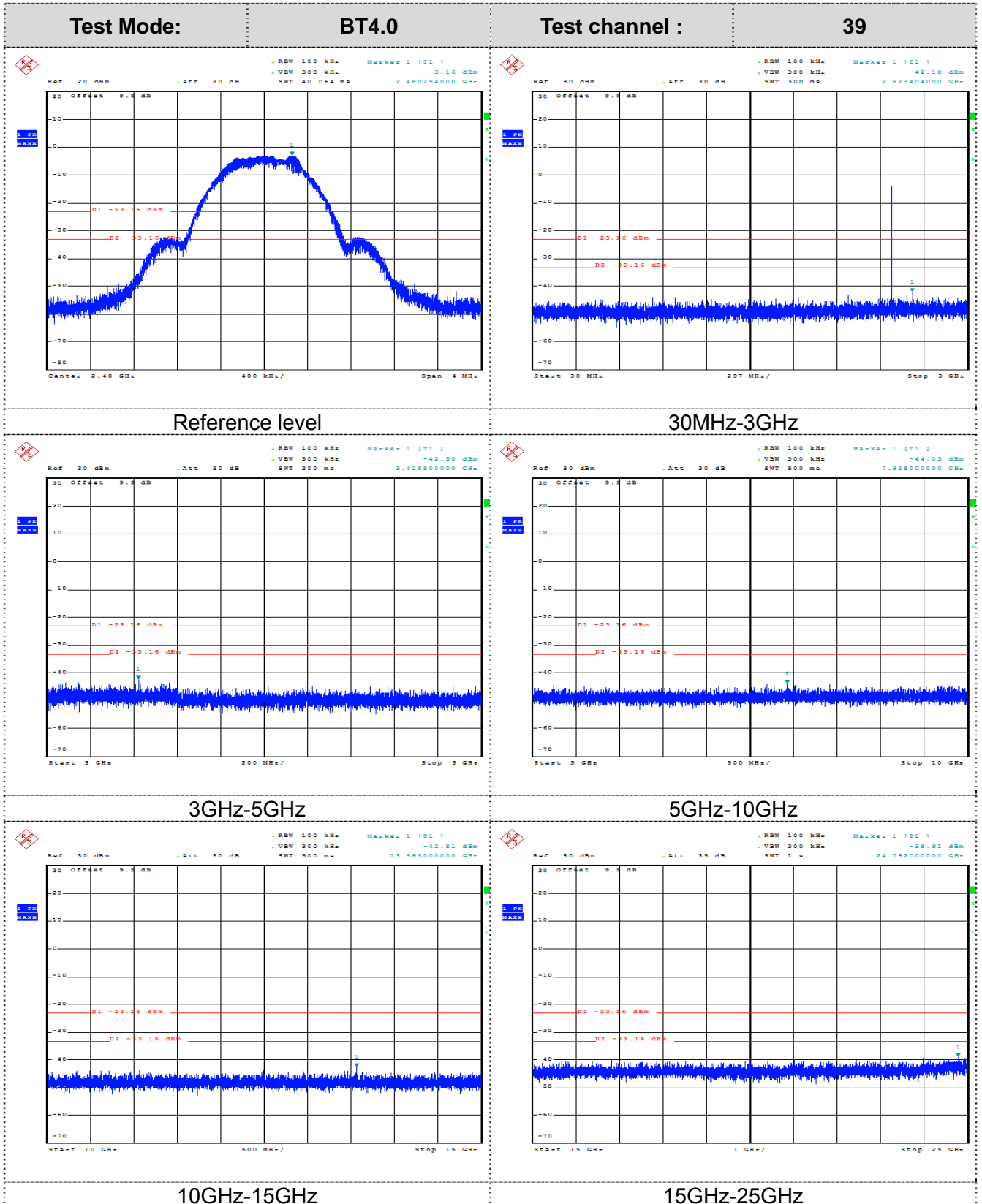












### 3.8. Antenna Requirement

#### 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:

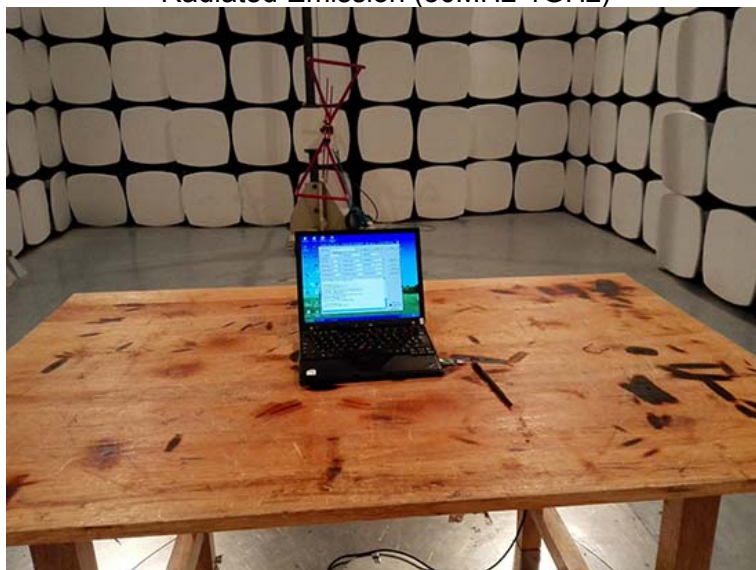
The maximum gain of WIFI/BT antenna was 5.00dBi.

WIFI/BT  
Antenna

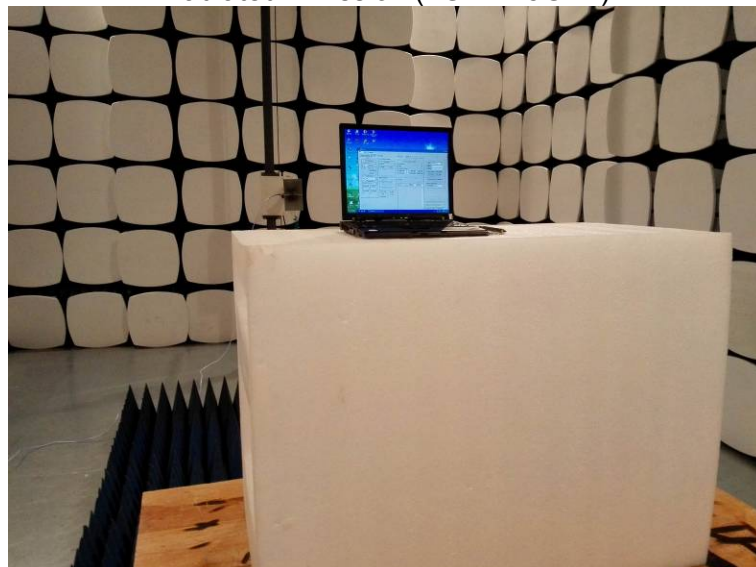


## 4. EUT TEST PHOTO

Radiated Emission (30MHz-1GHz)



Radiated Emission (1GHz-25GHz)



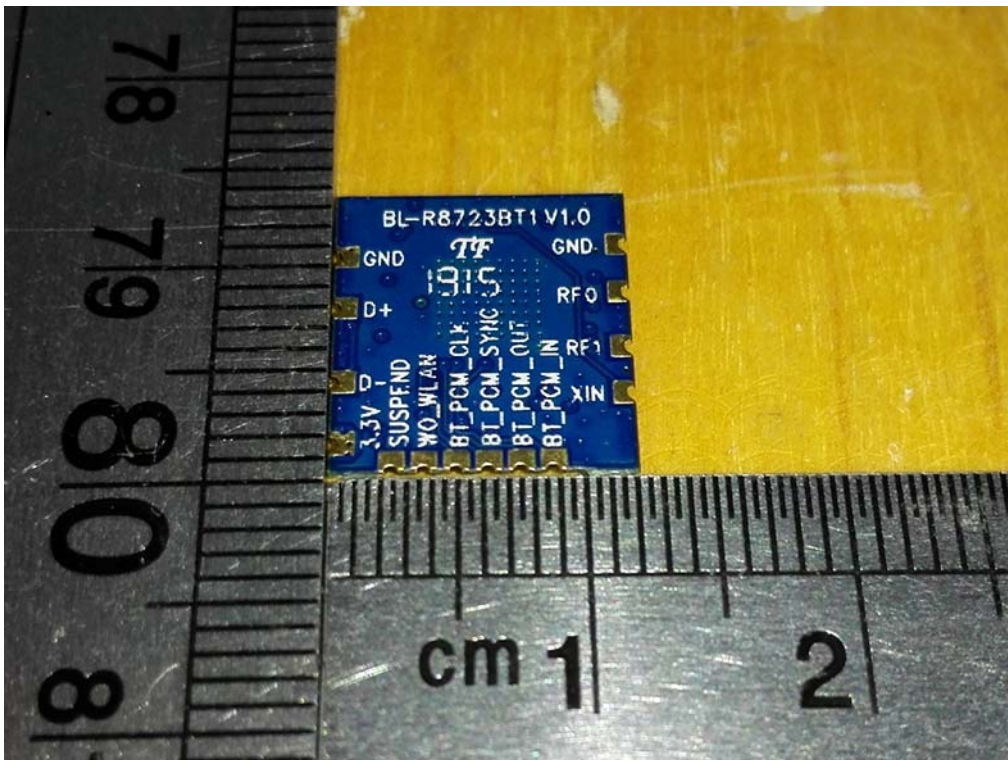
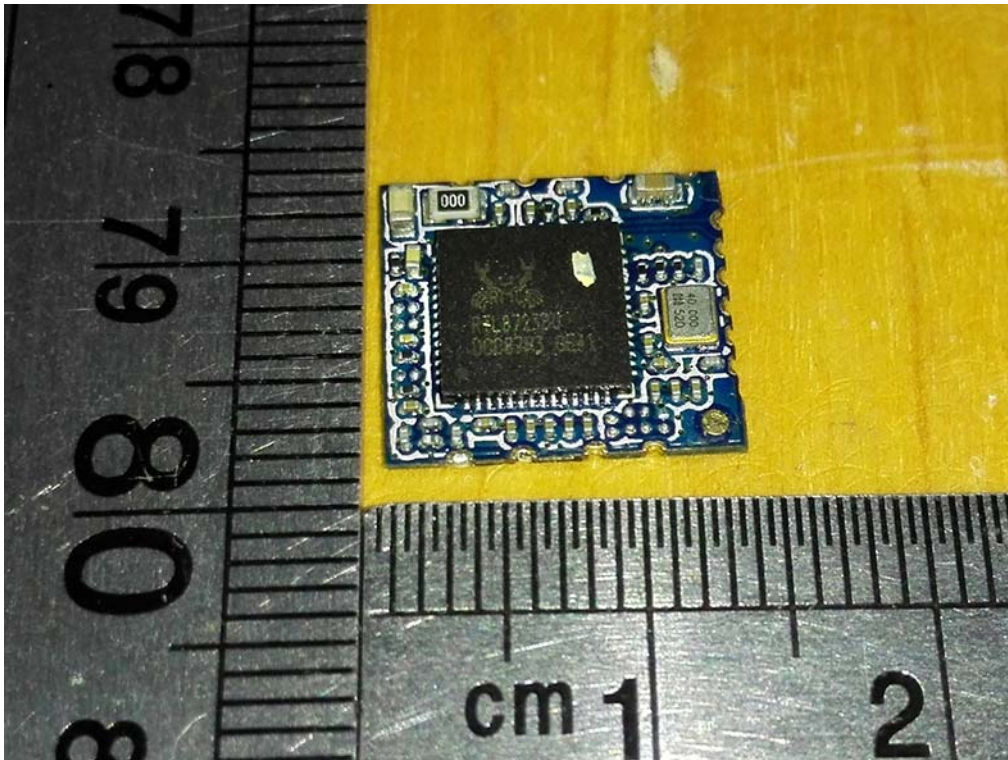
Conducted Emission





## 5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL





\*\*\*\*\*THE END\*\*\*\*\*