

## FCC Test Report

**Report No.:** RF170220C11E-2

**FCC ID:** NM8HTV33

**Test Model:** HTV33

**Received Date:** Feb. 20, 2017

**Test Date:** Mar. 13, 2017 ~ Mar. 23, 2017

**Issued Date:** May 08, 2017

**Applicant:** HTC Corporation

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan ( R.O.C )

**Test Location:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.



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### Release Control Record

Issue No.	Description	Date Issued
RF170220C11E-2	Original Release	May 08, 2017

## 1 Certificate of Conformity

**Product:** Smartphone

**Brand:** HTC

**Test Model:** HTV33

**Sample Status:** Production Unit

**Applicant:** HTC Corporation

**Test Date:** Mar. 13, 2017 ~ Mar. 23, 2017

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**

*Gina Liu*

**Date:**

May 08, 2017

Gina Liu / Specialist

**Approved by :**

*David Huang*

**Date:**

May 08, 2017

David Huang / Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -3.52 dB at 0.84208 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.69 dB at 2483.52 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Smartphone
<b>Brand</b>	HTC
<b>Test Model</b>	HTV33
<b>Status of EUT</b>	Production Unit
<b>Power Supply Rating</b>	3.85 Vdc (Battery) 5 or 9 or 12 Vdc (Adapter or host equipment) 5 Vdc (Host equipment)
<b>Modulation Type</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
<b>Modulation Technology</b>	DSSS, OFDM
<b>Transfer Rate</b>	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to MCS7
<b>Operating Frequency</b>	2412 ~ 2462 MHz
<b>Number of Channel</b>	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
<b>Output Power</b>	179.208 mW
<b>Antenna Type</b>	PIFA antenna with -2.50 dBi gain
<b>Antenna Connector</b>	N/A
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

2. The EUT's accessories list refers to Ext. Pho.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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

7 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437		



### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
A	√	-	√	√	1TX
B	√	√	-	√	2TX

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz      **RE<1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission      **APCM**: Antenna Port Conducted Measurement

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.  
**NOTE:** "-" means no effect.

#### **Radiated Emission Test (Above 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
B	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0
B	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0

#### **Radiated Emission Test (Below 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
B	802.11n (HT40)	3 to 9	9	OFDM	BPSK	MCS0

#### **Power Line Conducted Emission Test:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
B	802.11n (HT40)	3 to 9	9	OFDM	BPSK	MCS0

### **Bandedge Measurement:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
B	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	MCS0
B	802.11n (HT40)	3 to 9	3, 9	OFDM	BPSK	MCS0

### **Antenna Port Conducted Measurement:**

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
B	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0
B	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0

### **Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
APCM	25 deg. C, 65 % RH	3.85 Vdc	Wayne Lin

### 3.3 Duty Cycle of Test Signal

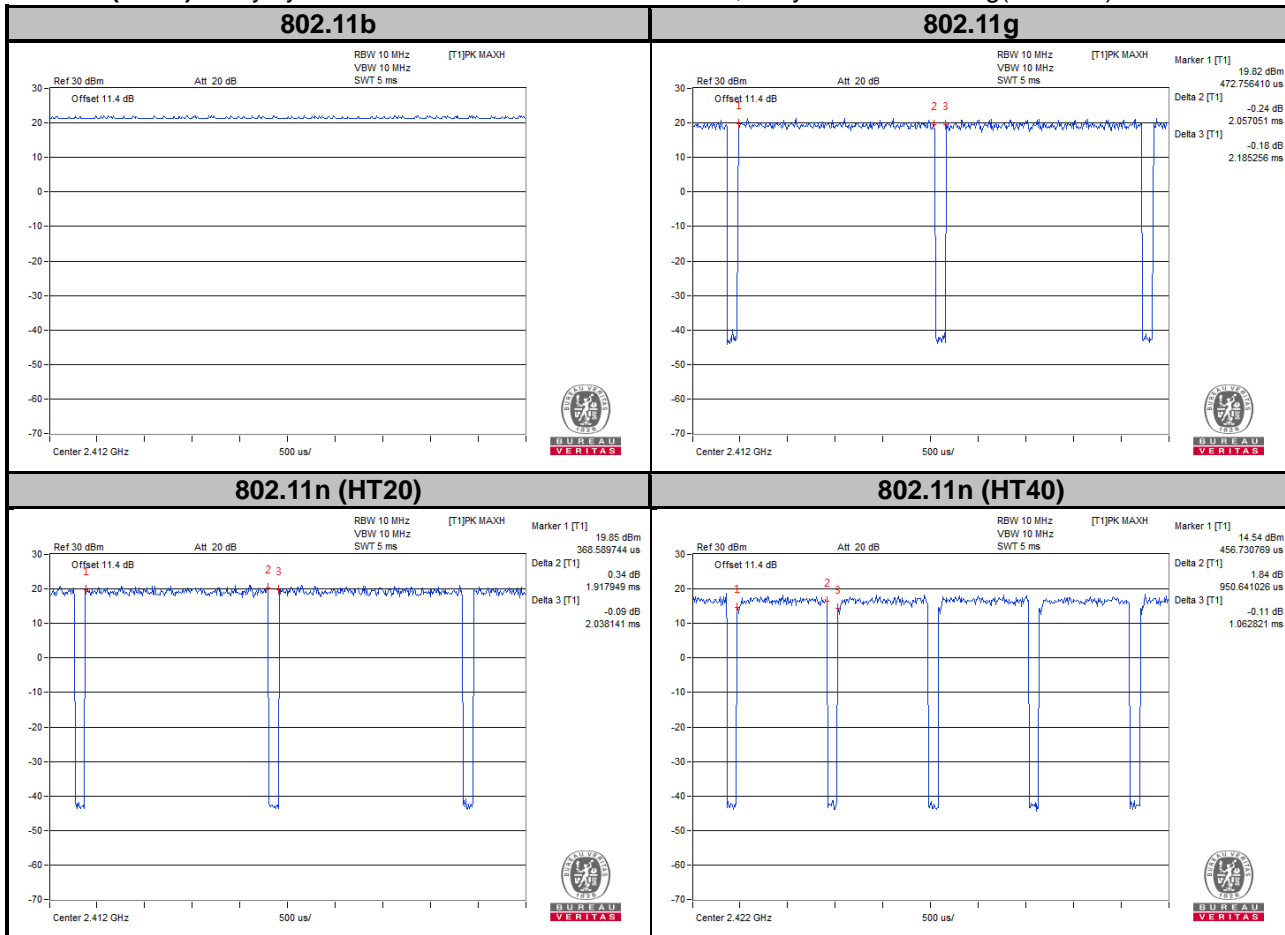
#### Mode A

**802.11b:** Duty cycle of test signal is 100 %

**802.11g:** Duty cycle =  $2.057051/2.185256 = 0.941$ , Duty factor =  $10 * \log(1/0.941) = 0.26$

**802.11n (HT20):** Duty cycle =  $1.917949/2.038141 = 0.941$ , Duty factor =  $10 * \log(1/0.941) = 0.26$

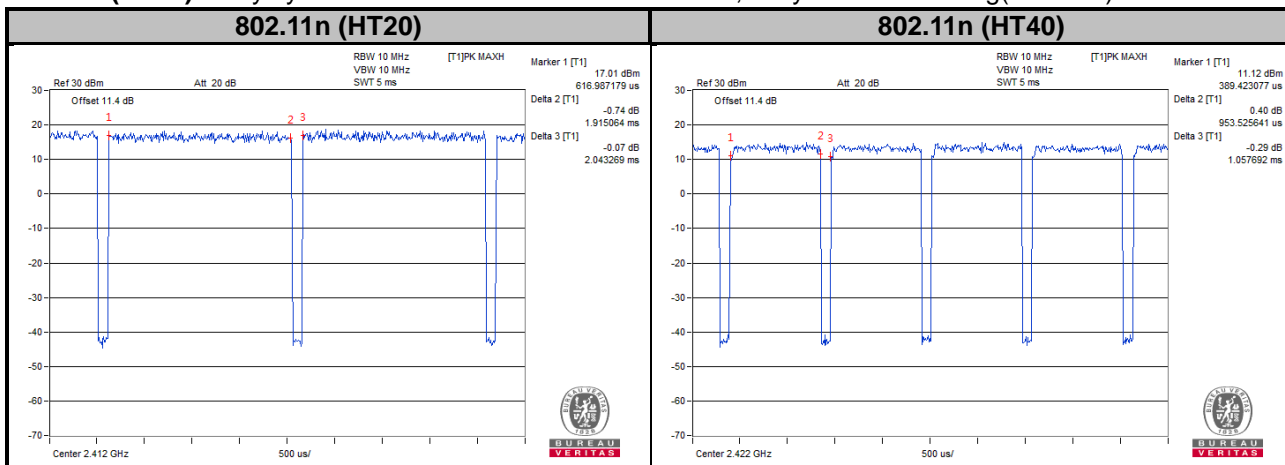
**802.11n (HT40):** Duty cycle =  $0.950641026/1.062821 = 0.894$ , Duty factor =  $10 * \log(1/0.894) = 0.48$



#### Mode B

**802.11n (HT20):** Duty cycle =  $1.915064/2.043269 = 0.937$ , Duty factor =  $10 * \log(1/0.937) = 0.28$

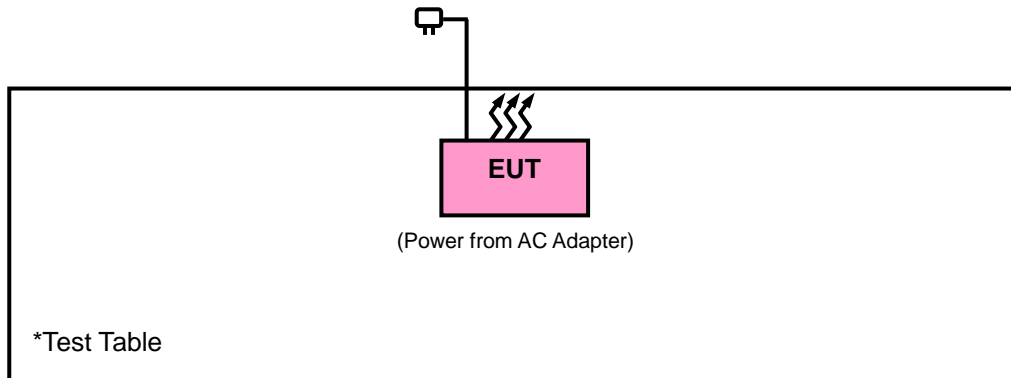
**802.11n (HT40):** Duty cycle =  $0.953525641/1.057692 = 0.902$ , Duty factor =  $10 * \log(1/0.902) = 0.45$



### 3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

#### 3.4.1 Configuration of System under Test



### 3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

#### **FCC Part 15, Subpart C (15.247)**

**558074 D01 DTS Meas Guidance v03r05**

**662911 D01 Multiple Transmitter Output v02r01**

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).  
The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

## 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Feb. 17, 2017	Feb. 16, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 16, 2016	Dec. 15, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 26, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Dec. 12, 2016	Dec. 13, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Preamplifier EMCI	EMC 012645	980115	Oct. 21, 2016	Oct. 20, 2017
Preamplifier EMCI	EMC 184045	980116	Oct. 21, 2016	Oct. 20, 2017
Preamplifier EMCI	EMC 330H	980112	Oct. 21, 2016	Oct. 20, 2017
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2016	Sep. 07, 2017
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2016	Sep. 07, 2017
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 21, 2016	Oct. 20, 2017
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 21, 2016	Oct. 20, 2017
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 21, 2016	Oct. 20, 2017
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Site Registration No. is 690701.
5. The IC Site Registration No. is IC7450F-10.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna 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.
- d. 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.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

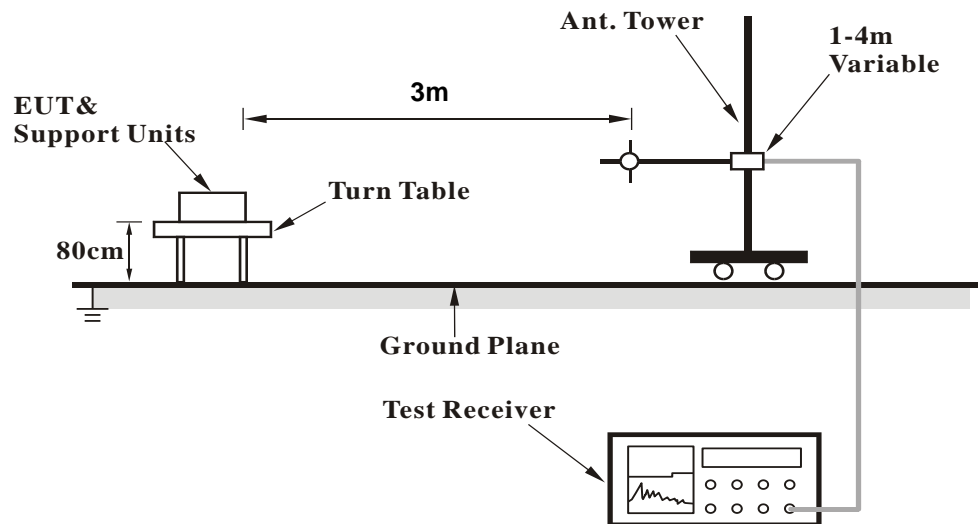
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 KHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for RMS Average (Duty cycle < 98 %) for Peak detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle  $\geq$  98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

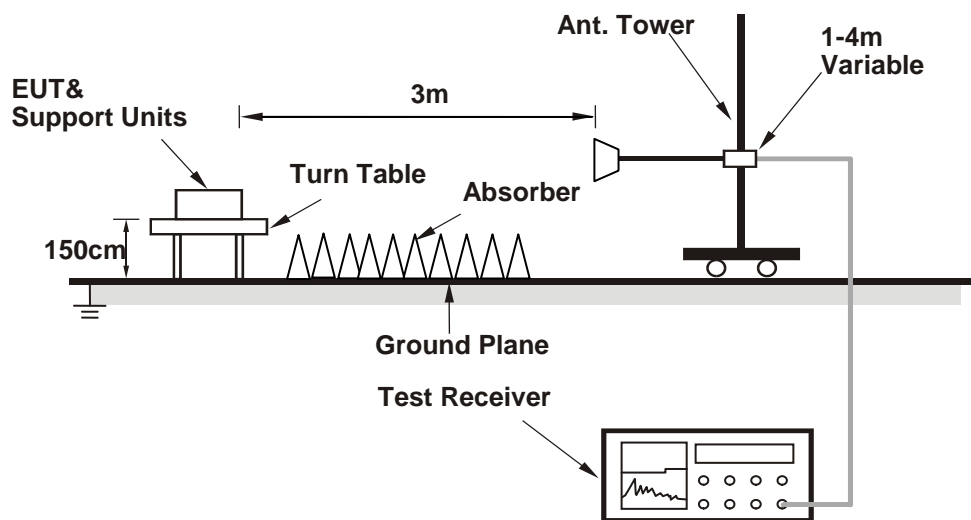
No deviation.

#### 4.1.5 Test Set Up

##### <Frequency Range below 1 GHz>



##### <Frequency Range above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.



4.1.7 Test Results

Above 1 GHz Data :

Mode A

802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2370.93	47.82	54.39	74	-26.18	26.86	4.07	37.5	285	52	Peak
2389.92	37.18	43.71	54	-16.82	26.91	4.08	37.52	285	52	Average
2412	103.37	109.84			26.96	4.09	37.52	285	52	Average
2412	106.45	112.92			26.96	4.09	37.52	285	52	Peak
4824	34.61	49.91	54	-19.39	30.99	6.79	53.08	100	111	Average
4824	43.99	59.29	74	-30.01	30.99	6.79	53.08	100	111	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2347.35	47.06	53.73	74	-26.94	26.77	4.05	37.49	297	358	Peak
2389.47	36.75	43.26	54	-17.25	26.91	4.08	37.5	297	358	Average
2412	99.24	105.71			26.96	4.09	37.52	297	358	Average
2412	102.39	108.86			26.96	4.09	37.52	297	358	Peak
4824	34.72	50.02	54	-19.28	30.99	6.79	53.08	100	128	Average
4824	44.97	60.27	74	-29.03	30.99	6.79	53.08	100	128	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.84	47.53	54.04	74	-26.47	26.91	4.08	37.5	280	52	Peak
2389.74	36.21	42.72	54	-17.79	26.91	4.08	37.5	280	52	Average
2437	103.63	109.91			27.06	4.12	37.46	280	52	Average
2437	106.88	113.16			27.06	4.12	37.46	280	52	Peak
2483.76	36.82	42.84	54	-17.18	27.15	4.15	37.32	280	52	Average
2499.2	47.72	53.61	74	-26.28	27.2	4.16	37.25	280	52	Peak
4874	34.26	49.4	54	-19.74	31.06	6.85	53.05	100	174	Average
4874	43.84	58.98	74	-30.16	31.06	6.85	53.05	100	174	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2370.75	36.6	43.17	54	-17.4	26.86	4.07	37.5	289	359	Average
2384.43	47.27	53.83	74	-26.73	26.86	4.08	37.5	289	359	Peak
2437	99.31	105.59			27.06	4.12	37.46	289	359	Average
2437	102.69	108.97			27.06	4.12	37.46	289	359	Peak
2490.44	47.8	53.76	74	-26.2	27.2	4.16	37.32	289	359	Peak
2493.44	36.65	42.54	54	-17.35	27.2	4.16	37.25	289	359	Average
4874	34.71	49.85	54	-19.29	31.06	6.85	53.05	100	163	Average
4874	44.17	59.31	74	-29.83	31.06	6.85	53.05	100	163	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	102.53	110.05			27.1	4.13	38.75	279	53	Average
2462	106.09	113.61			27.1	4.13	38.75	279	53	Peak
2485.44	37.1	43.12	54	-16.9	27.15	4.15	37.32	279	53	Average
2486.4	47.93	53.95	74	-26.07	27.15	4.15	37.32	279	53	Peak
4924	34.07	49.1	54	-19.93	31.12	6.88	53.03	100	166	Average
4924	44.3	59.33	74	-29.7	31.12	6.88	53.03	100	166	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	99.42	105.58			27.1	4.13	37.39	310	359	Average
2462	102.71	108.87			27.1	4.13	37.39	310	359	Peak
2485.64	36.85	42.87	54	-17.15	27.15	4.15	37.32	310	359	Average
2487.16	47.59	53.61	74	-26.41	27.15	4.15	37.32	310	359	Peak
4924	34.62	49.65	54	-19.38	31.12	6.88	53.03	100	158	Average
4924	44.62	59.65	74	-29.38	31.12	6.88	53.03	100	158	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.

802.11g

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.74	60.02	66.53	74	-13.98	26.91	4.08	37.5	258	57	Peak
2389.92	49.13	55.66	54	-4.87	26.91	4.08	37.52	258	57	Average
2412	97.53	104			26.96	4.09	37.52	258	57	Average
2412	104.89	111.36			26.96	4.09	37.52	258	57	Peak
4824	34.44	49.74	54	-19.56	30.99	6.79	53.08	100	207	Average
4824	44.18	59.48	74	-29.82	30.99	6.79	53.08	100	207	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	43.18	49.71	54	-10.82	26.91	4.08	37.52	296	355	Average
2389.92	53.11	59.64	74	-20.89	26.91	4.08	37.52	296	355	Peak
2412	92.28	98.75			26.96	4.09	37.52	296	355	Average
2412	100.24	106.71			26.96	4.09	37.52	296	355	Peak
4824	34.73	50.03	54	-19.27	30.99	6.79	53.08	100	251	Average
4824	44.42	59.72	74	-29.58	30.99	6.79	53.08	100	251	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.85	47.6	54.11	74	-26.4	26.91	4.08	37.5	251	56	Peak
2389.56	38.4	44.91	54	-15.6	26.91	4.08	37.5	251	56	Average
2437	96.73	103.01			27.06	4.12	37.46	251	56	Average
2437	104.57	110.85			27.06	4.12	37.46	251	56	Peak
2483.52	40.3	46.32	54	-13.7	27.15	4.15	37.32	251	56	Average
2484.04	50.45	56.47	74	-23.55	27.15	4.15	37.32	251	56	Peak
4874	34.4	49.54	54	-19.6	31.06	6.85	53.05	100	132	Average
4874	43.64	58.78	74	-30.36	31.06	6.85	53.05	100	132	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2370.48	37.87	44.44	54	-16.13	26.86	4.07	37.5	290	359	Average
2388.93	50.36	56.87	74	-23.64	26.91	4.08	37.5	290	359	Peak
2437	93.22	99.5			27.06	4.12	37.46	290	359	Average
2437	101.22	107.5			27.06	4.12	37.46	290	359	Peak
2484.04	38.81	44.83	54	-15.19	27.15	4.15	37.32	290	359	Average
2488.84	48.87	54.83	74	-25.13	27.2	4.16	37.32	290	359	Peak
4874	34.84	49.98	54	-19.16	31.06	6.85	53.05	100	115	Average
4874	44.24	59.38	74	-29.76	31.06	6.85	53.05	100	115	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	96.84	103			27.1	4.13	37.39	249	56	Average
2462	104.45	110.61			27.1	4.13	37.39	249	56	Peak
2483.56	48.15	54.17	54	-5.85	27.15	4.15	37.32	249	56	Average
2484.56	60.21	66.23	74	-13.79	27.15	4.15	37.32	249	56	Peak
4924	34.84	49.87	54	-19.16	31.12	6.88	53.03	100	111	Average
4924	43.55	58.58	74	-30.45	31.12	6.88	53.03	100	111	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	93.53	99.69			27.1	4.13	37.39	286	359	Average
2462	100.92	107.08			27.1	4.13	37.39	286	359	Peak
2483.52	45.99	52.01	54	-8.01	27.15	4.15	37.32	286	359	Average
2484.56	57.94	63.96	74	-16.06	27.15	4.15	37.32	286	359	Peak
4924	35.11	50.14	54	-18.89	31.12	6.88	53.03	100	218	Average
4924	44.45	59.48	74	-29.55	31.12	6.88	53.03	100	218	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.

**Mode B**

**802.11n (HT20)**

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.2	51.49	58	74	-22.51	26.91	4.08	37.5	208	107	Peak
2389.92	41.65	48.18	54	-12.35	26.91	4.08	37.52	208	107	Average
2412	94.63	101.1			26.96	4.09	37.52	208	107	Average
2412	102.13	108.6			26.96	4.09	37.52	208	107	Peak
4824	34.28	49.58	54	-19.72	30.99	6.79	53.08	100	111	Average
4824	44.12	59.42	74	-29.88	30.99	6.79	53.08	100	111	Peak

Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.29	50.36	56.87	74	-23.64	26.91	4.08	37.5	236	26	Peak
2389.74	40.06	46.57	54	-13.94	26.91	4.08	37.5	236	26	Average
2412	90.33	96.8			26.96	4.09	37.52	236	26	Average
2412	98.84	105.31			26.96	4.09	37.52	236	26	Peak
4824	34.02	49.32	54	-19.98	30.99	6.79	53.08	100	128	Average
4824	44.05	59.35	74	-29.95	30.99	6.79	53.08	100	128	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2359.14	47.62	54.25	74	-26.38	26.81	4.05	37.49	205	98	Peak
2389.92	37.67	44.2	54	-16.33	26.91	4.08	37.52	205	98	Average
2437	94.77	101.05			27.06	4.12	37.46	205	98	Average
2437	102.6	108.88			27.06	4.12	37.46	205	98	Peak
2484.56	38.21	44.23	54	-15.79	27.15	4.15	37.32	205	98	Average
2484.8	48.9	54.92	74	-25.1	27.15	4.15	37.32	205	98	Peak
4874	34.41	49.55	54	-19.59	31.06	6.85	53.05	102	114	Average
4874	44.9	60.04	74	-29.1	31.06	6.85	53.05	102	114	Peak

Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2333.85	37.15	43.86	54	-16.85	26.72	4.04	37.47	237	24	Average
2385.15	48.24	54.8	74	-25.76	26.86	4.08	37.5	237	24	Peak
2437	90.93	97.21			27.06	4.12	37.46	237	24	Average
2437	99.58	105.86			27.06	4.12	37.46	237	24	Peak
2483.8	38.21	44.23	54	-15.79	27.15	4.15	37.32	237	24	Average
2490.6	47.94	53.9	74	-26.06	27.2	4.16	37.32	237	24	Peak
4874	34.01	49.15	54	-19.99	31.06	6.85	53.05	101	129	Average
4874	44.52	59.66	74	-29.48	31.06	6.85	53.05	101	129	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.



EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	94.17	100.33			27.1	4.13	37.39	202	110	Average
2462	101.96	108.12			27.1	4.13	37.39	202	110	Peak
2483.56	46.41	52.43	54	-7.59	27.15	4.15	37.32	202	110	Average
2483.8	57.82	63.84	74	-16.18	27.15	4.15	37.32	202	110	Peak
4924	34.68	49.71	54	-19.32	31.12	6.88	53.03	100	102	Average
4924	44.3	59.33	74	-29.7	31.12	6.88	53.03	100	102	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	90.33	96.49			27.1	4.13	37.39	234	25	Average
2462	98.84	105			27.1	4.13	37.39	234	25	Peak
2483.52	44.39	50.41	54	-9.61	27.15	4.15	37.32	234	25	Average
2483.8	54.66	60.68	74	-19.34	27.15	4.15	37.32	234	25	Peak
4924	34.18	49.21	54	-19.82	31.12	6.88	53.03	105	123	Average
4924	44.36	59.39	74	-29.64	31.12	6.88	53.03	105	123	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.

### 802.11n (HT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 3	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

#### Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.83	47.12	53.65	54	-6.88	26.91	4.08	37.52	203	100	Average
2389.83	57.18	63.71	74	-16.82	26.91	4.08	37.52	203	100	Peak
2422	93.41	99.75			27.01	4.11	37.46	203	100	Average
2422	100.93	107.27			27.01	4.11	37.46	203	100	Peak
2483.8	38.4	44.42	54	-15.6	27.15	4.15	37.32	203	100	Average
2485.36	48.16	54.18	74	-25.84	27.15	4.15	37.32	203	100	Peak
4844	34.29	49.52	54	-19.71	31.01	6.82	53.06	104	116	Average
4844	44.4	59.63	74	-29.6	31.01	6.82	53.06	104	116	Peak

#### Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.11	54.44	60.95	74	-19.56	26.91	4.08	37.5	236	23	Peak
2389.92	46.04	52.57	54	-7.96	26.91	4.08	37.52	236	23	Average
2422	89.03	95.37			27.01	4.11	37.46	236	23	Average
2422	97.72	104.06			27.01	4.11	37.46	236	23	Peak
2483.64	38.04	44.06	54	-15.96	27.15	4.15	37.32	236	23	Average
2499.24	48.59	54.48	74	-25.41	27.2	4.16	37.25	236	23	Peak
4844	34.11	49.34	54	-19.89	31.01	6.82	53.06	102	119	Average
4844	44.48	59.71	74	-29.52	31.01	6.82	53.06	102	119	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2422 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.56	53.1	59.61	74	-20.9	26.91	4.08	37.5	202	97	Peak
2389.92	42.06	48.59	54	-11.94	26.91	4.08	37.52	202	97	Average
2437	93.15	99.43			27.06	4.12	37.46	202	97	Average
2437	100.9	107.18			27.06	4.12	37.46	202	97	Peak
2483.52	45.46	51.48	54	-8.54	27.15	4.15	37.32	202	97	Average
2483.64	56.38	62.4	74	-17.62	27.15	4.15	37.32	202	97	Peak
4874	34.34	49.48	54	-19.66	31.06	6.85	53.05	101	108	Average
4874	44.07	59.21	74	-29.93	31.06	6.85	53.05	101	108	Peak

Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.11	51.51	58.02	74	-22.49	26.91	4.08	37.5	242	22	Peak
2389.92	41.42	47.95	54	-12.58	26.91	4.08	37.52	242	22	Average
2437	89.9	96.18			27.06	4.12	37.46	242	22	Average
2437	96.52	102.8			27.06	4.12	37.46	242	22	Peak
2483.52	41.94	47.96	54	-12.06	27.15	4.15	37.32	242	22	Average
2483.64	53.56	59.58	74	-20.44	27.15	4.15	37.32	242	22	Peak
4874	34.19	49.33	54	-19.81	31.06	6.85	53.05	100	131	Average
4874	45.21	60.35	74	-28.79	31.06	6.85	53.05	100	131	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 9	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2352.39	47.05	53.68	74	-26.95	26.81	4.05	37.49	204	94	Peak
2389.83	37.88	44.41	54	-16.12	26.91	4.08	37.52	204	94	Average
2452	93.71	99.91			27.06	4.13	37.39	204	94	Average
2452	101.07	107.27			27.06	4.13	37.39	204	94	Peak
2483.52	50.31	56.33	54	-3.69	27.15	4.15	37.32	204	94	Average
2483.72	58.77	64.79	74	-15.23	27.15	4.15	37.32	204	94	Peak
4904	34.55	49.6	54	-19.45	31.1	6.88	53.03	106	109	Average
4904	44.43	59.48	74	-29.57	31.1	6.88	53.03	106	109	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2356.62	47.26	53.89	74	-26.74	26.81	4.05	37.49	234	28	Peak
2389.65	37.8	44.31	54	-16.2	26.91	4.08	37.5	234	28	Average
2452	89.28	95.48			27.06	4.13	37.39	234	28	Average
2452	97.68	103.88			27.06	4.13	37.39	234	28	Peak
2483.56	47.06	53.08	54	-6.94	27.15	4.15	37.32	234	28	Average
2484	57.43	63.45	74	-16.57	27.15	4.15	37.32	234	28	Peak
4904	34.29	49.34	54	-19.71	31.1	6.88	53.03	103	135	Average
4904	44.01	59.06	74	-29.99	31.1	6.88	53.03	103	135	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2452 MHz: Fundamental frequency.

**9 kHz ~ 30 MHz DATA:**

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**30 MHz ~ 1 GHz WORST-CASE DATA:**

**Mode B**

**802.11n (HT40)**

EUT Test Condition		Measurement Detail	
Channel	Channel 9	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
42.61	22.05	38.89	40	-17.95	13.58	0.66	31.08	122	292	Peak
88.2	19.25	41.9	43.5	-24.25	8.27	0.95	31.87	103	134	Peak
176.47	18.66	38.19	43.5	-24.84	11.1	1.17	31.8	125	240	Peak
463.59	19.96	33.29	46	-26.04	16.6	2.02	31.95	117	91	Peak
568.35	22.52	33.52	46	-23.48	18.88	2.2	32.08	113	235	Peak
853.53	26.57	32.85	46	-19.43	22.91	2.69	31.88	101	221	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
62.01	25.68	44.59	40	-14.32	11.71	0.83	31.45	114	271	Peak
138.64	19.07	37.31	43.5	-24.43	12.27	1.15	31.66	127	143	Peak
237.58	14.02	33.43	46	-31.98	10.95	1.44	31.8	106	44	Peak
578.05	22.76	33.55	46	-23.24	19.1	2.22	32.11	115	163	Peak
802.12	26.75	33.32	46	-19.25	22.25	2.61	31.43	107	71	Peak
944.71	27.59	32.89	46	-18.41	23.76	2.82	31.88	114	258	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 28, 2016	Jul. 27, 2017
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 Test Procedures

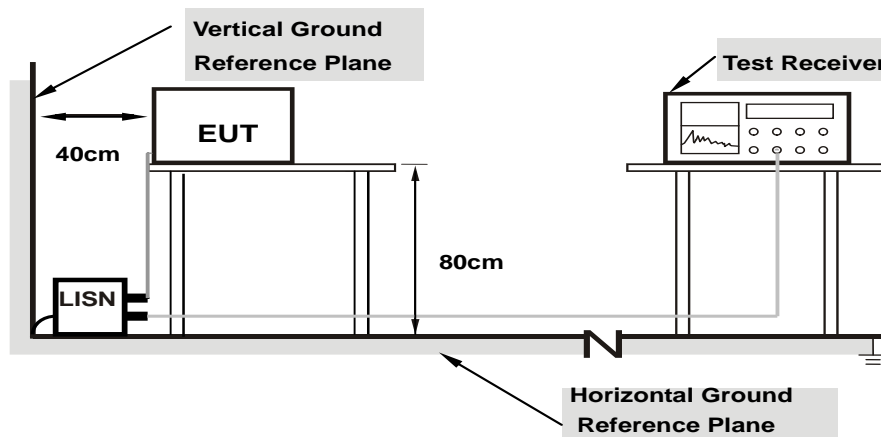
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT Operating Conditions

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

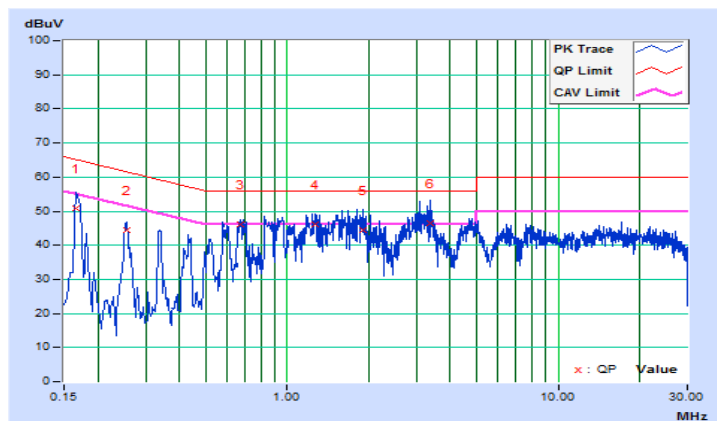
#### 4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/3/21

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16569	10.35	40.45	26.61	50.80	36.96	65.17	55.17	-14.37	-18.21
2	0.25458	10.38	34.16	24.60	44.54	34.98	61.61	51.61	-17.07	-16.63
3	0.67394	10.40	35.70	23.25	46.10	33.65	56.00	46.00	-9.90	-12.35
4	1.26435	10.42	35.87	22.67	46.29	33.09	56.00	46.00	-9.71	-12.91
5	1.89386	10.45	33.88	21.43	44.33	31.88	56.00	46.00	-11.67	-14.12
6	3.36011	10.53	35.79	21.74	46.32	32.27	56.00	46.00	-9.68	-13.73

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



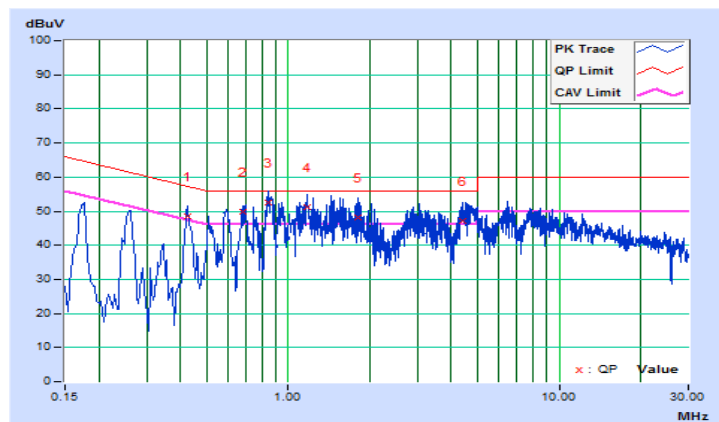


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/3/21

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.42670	10.16	38.49	29.51	48.65	39.67	57.32	47.32	-8.67	-7.65
2	0.67785	10.16	39.56	29.52	49.72	39.68	56.00	46.00	-6.28	-6.32
3	0.84208	10.17	42.31	30.88	52.48	41.05	56.00	46.00	-3.52	-4.95
4	1.17985	10.18	41.11	29.52	51.29	39.70	56.00	46.00	-4.71	-6.30
5	1.81175	10.22	37.90	26.77	48.12	36.99	56.00	46.00	-7.88	-9.01
6	4.43145	10.36	36.69	28.46	47.05	38.82	56.00	46.00	-8.95	-7.18

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

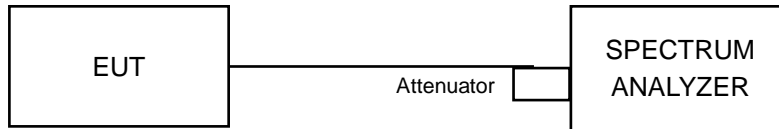


### 4.3 6 dB Bandwidth Measurement

#### 4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.3.7 Test Result

##### Mode A

##### 802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	6.62	0.5	Pass
6	2437	8.07	0.5	Pass
11	2462	7.56	0.5	Pass

##### 802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.17	0.5	Pass
6	2437	15.50	0.5	Pass
11	2462	15.56	0.5	Pass

##### Mode B

##### 802.11n (HT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.18	16.33	0.5	Pass
6	2437	16.02	16.40	0.5	Pass
11	2462	15.98	15.18	0.5	Pass

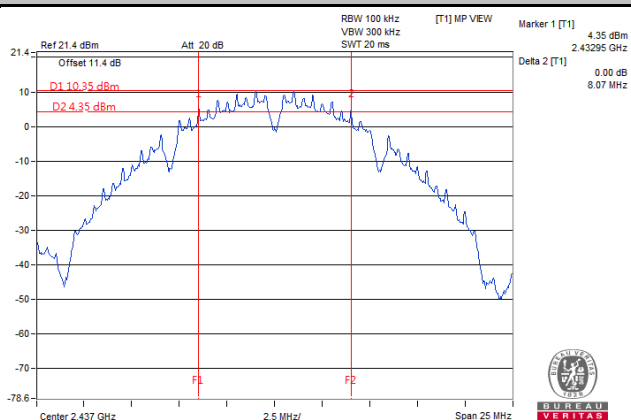
##### 802.11n (HT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.16	35.15	0.5	Pass
6	2437	35.45	35.81	0.5	Pass
9	2452	35.16	35.18	0.5	Pass

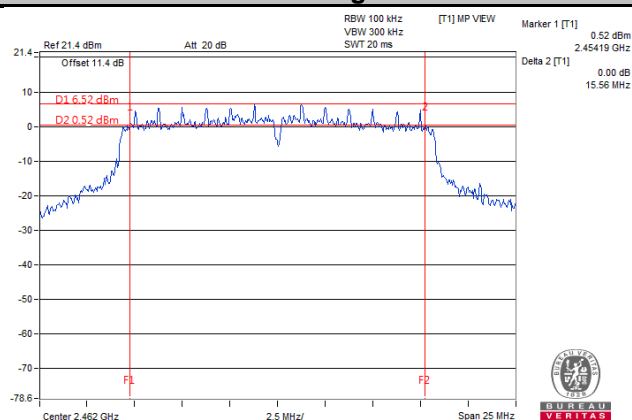
### Spectrum Plot of Worst Value

#### Mode A

##### 802.11b

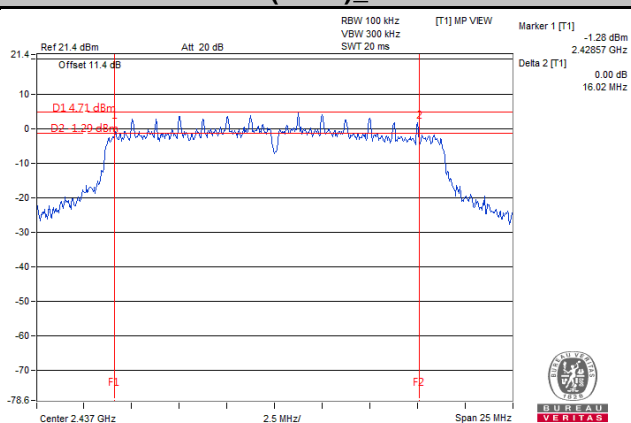


##### 802.11g

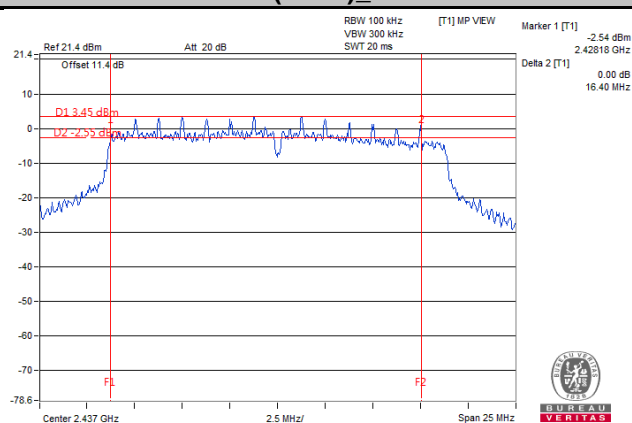


#### Mode B

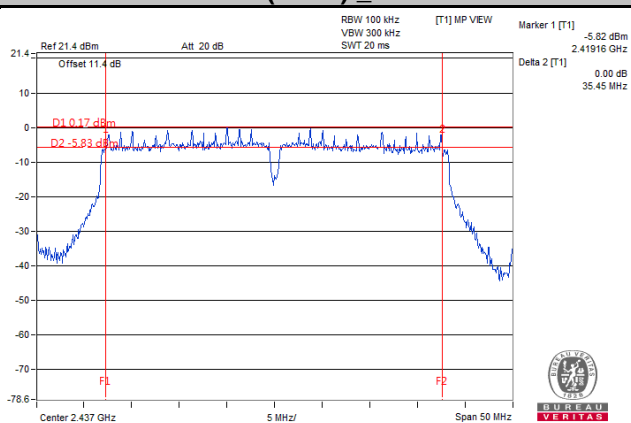
##### 802.11n (HT20)\_Chain 0



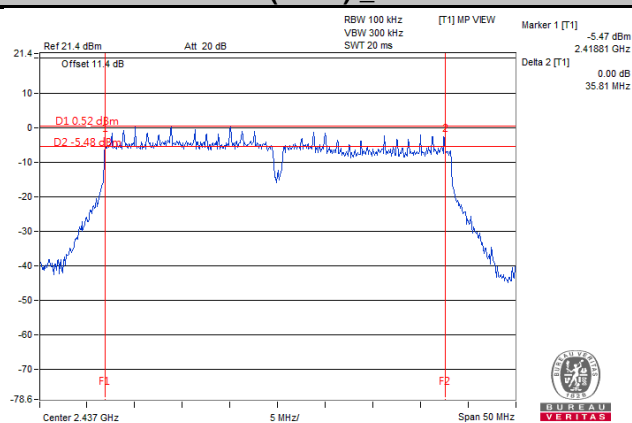
##### 802.11n (HT20)\_Chain 1



##### 802.11n (HT40)\_Chain 0



##### 802.11n (HT40)\_Chain 0



## 4.4 Conducted Output Power Measurement

### 4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

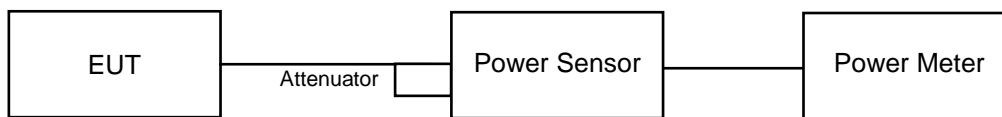
Array Gain = 0 dB (i.e., no array gain) for  $NANT \leq 4$ ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  MHz for any NANT;

Array Gain =  $5 \log(NANT/NSS)$  dB or 3 dB, whichever is less for 20 MHz channel widths with  $NANT \geq 5$ .

For power measurements on all other devices: Array Gain =  $10 \log(NANT/NSS)$  dB.

### 4.4.2 Test Setup



### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.4.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

### 4.4.5 Deviation from Test Standard

No deviation.

### 4.4.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.4.7 Test Results

##### Mode A

##### 802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	125.314	20.98	30	Pass
6	2437	127.057	21.04	30	Pass
11	2462	123.595	20.92	30	Pass

##### 802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	121.06	20.83	30	Pass
6	2437	124.165	20.94	30	Pass
11	2462	118.304	20.73	30	Pass

##### Mode B

##### 802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.49	17.62	128.442	21.09	30	Pass
6	2437	18.78	17.96	138.026	21.40	30	Pass
11	2462	18.18	17.81	126.161	21.01	30	Pass

##### 802.11n (HT40)

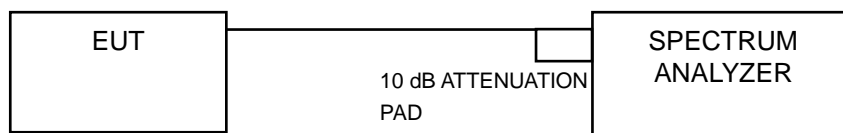
Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.87	18.99	176.301	22.46	30	Pass
6	2437	19.95	19.05	179.208	22.53	30	Pass
9	2452	19.91	18.87	175.039	22.43	30	Pass

## 4.5 Power Spectral Density Measurement

### 4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm.

### 4.5.2 Test Setup



### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- Set the VBW  $\geq 3 \times \text{RBW}$ .
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

### 4.5.5 Deviation from Test Standard

No deviation.

### 4.5.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.5.7 Test Results

##### Mode A

##### 802.11b

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-8.62	8	Pass
6	2437	-7.98	8	Pass
11	2462	-8.90	8	Pass

##### 802.11g

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-11.53	8	Pass
6	2437	-11.40	8	Pass
11	2462	-11.55	8	Pass

##### Mode B

##### 802.11n (HT20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass / Fail
0	1	2412	-14.14	3.01	-11.13	6	Pass
	6	2437	-13.65	3.01	-10.64	6	Pass
	11	2462	-14.44	3.01	-11.43	6	Pass
1	1	2412	-14.55	3.01	-11.54	6	Pass
	6	2437	-13.69	3.01	-10.68	6	Pass
	11	2462	-14.16	3.01	-11.15	6	Pass

**NOTE:** Directional gain =  $-2.5 \text{ dBi} + 10\log(2) = 0.51 \text{ dBi} < 6 \text{ dBi}$ , so the limit no need to reduced.

##### 802.11n (HT40)

TX Chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass / Fail
0	3	2422	-16.25	3.01	-13.24	6	Pass
	6	2437	-15.96	3.01	-12.95	6	Pass
	9	2452	-16.03	3.01	-13.02	6	Pass
1	3	2422	-16.42	3.01	-13.41	6	Pass
	6	2437	-16.32	3.01	-13.31	6	Pass
	9	2452	-16.56	3.01	-13.55	6	Pass

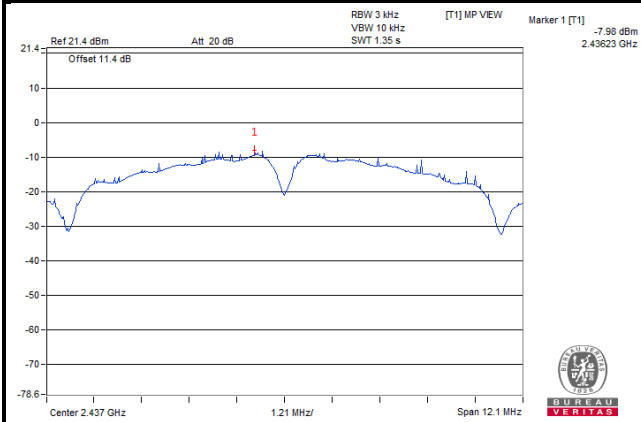
**NOTE:** Directional gain =  $-2.5 \text{ dBi} + 10\log(2) = 0.51 \text{ dBi} < 6 \text{ dBi}$ , so the limit no need to reduced.



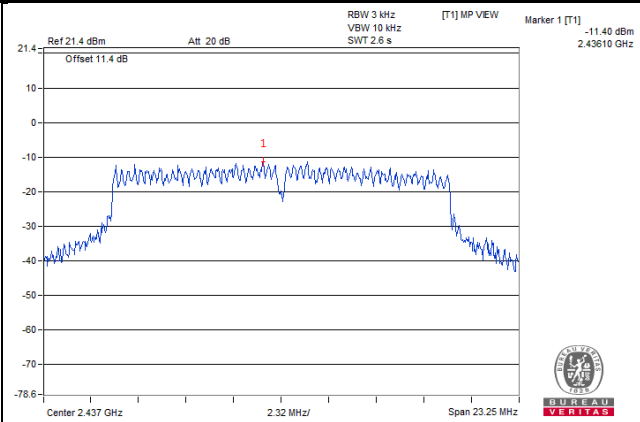
### Spectrum Plot of Worst Value

#### Mode A

##### 802.11b

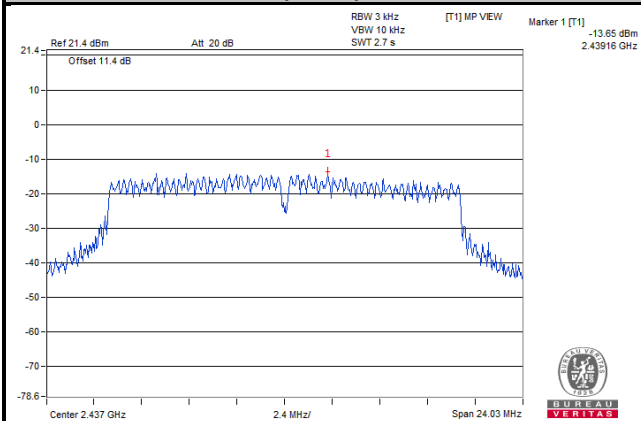


##### 802.11g

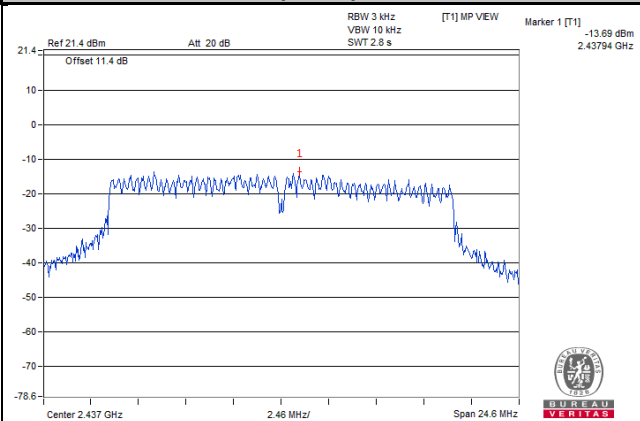


#### Mode B

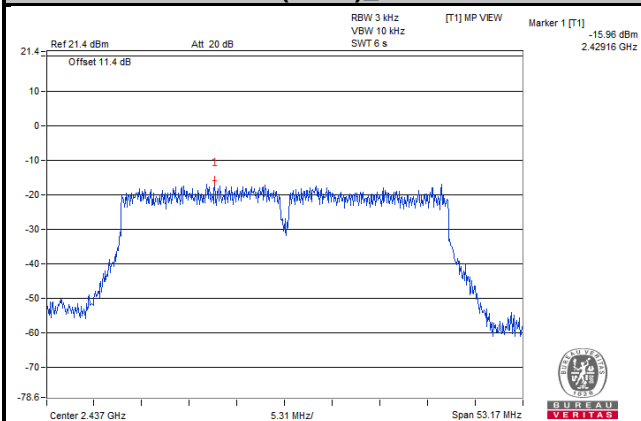
##### 802.11n (HT20)\_Chain 0



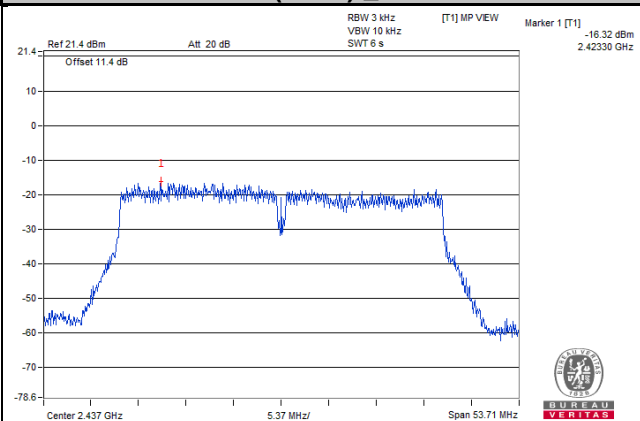
##### 802.11n (HT20)\_Chain 1



##### 802.11n (HT40)\_Chain 0



##### 802.11n (HT40)\_Chain 1

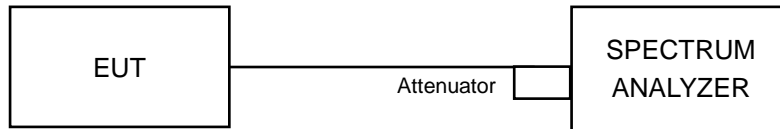


## 4.6 Conducted Out of Band Emission Measurement

### 4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

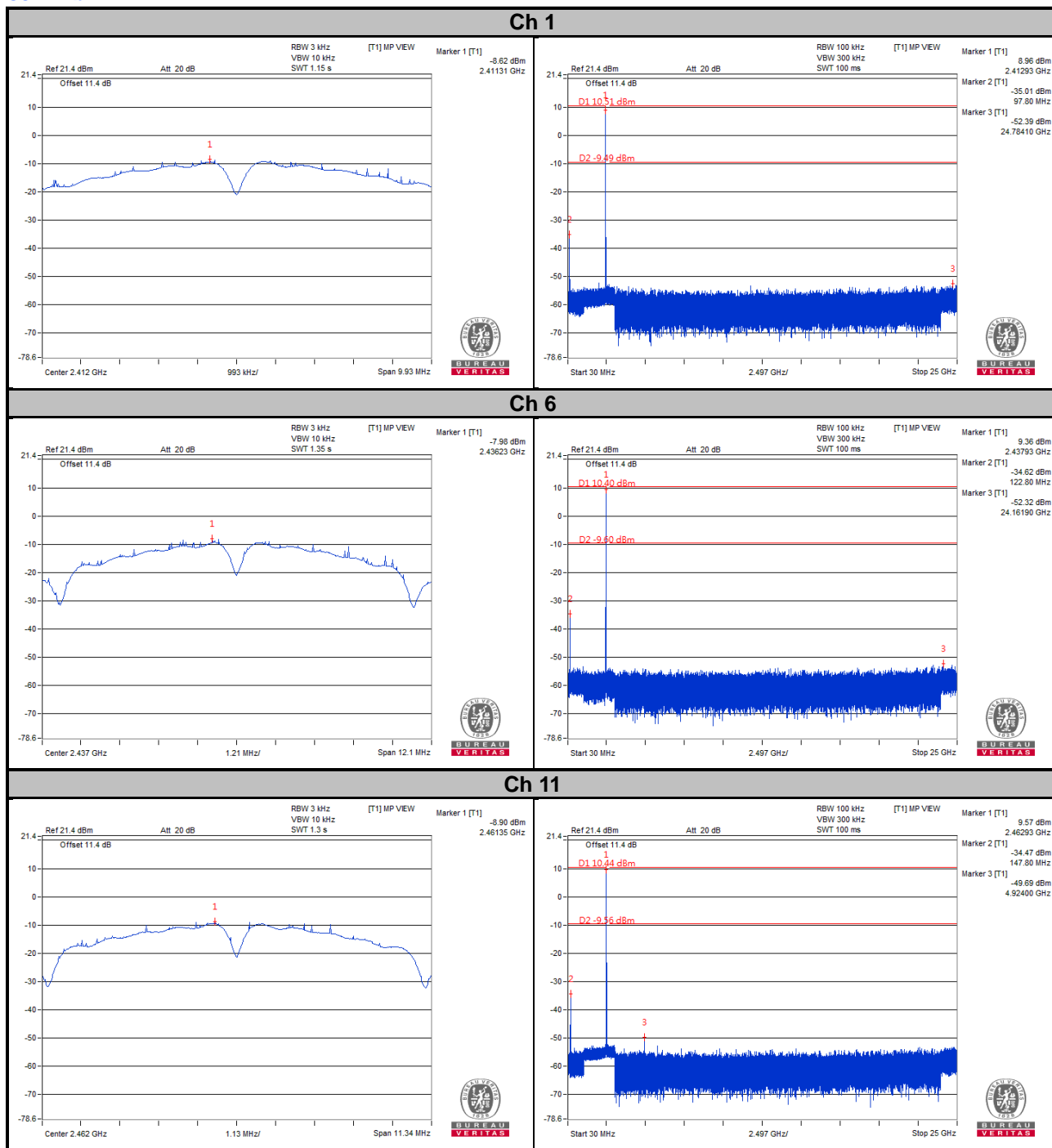
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.6.7 Test Results

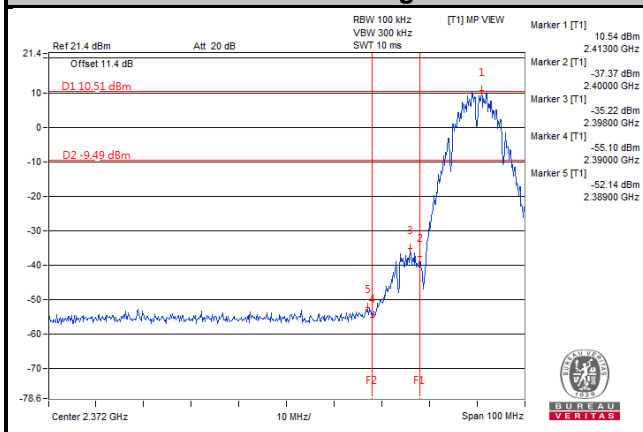
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement.

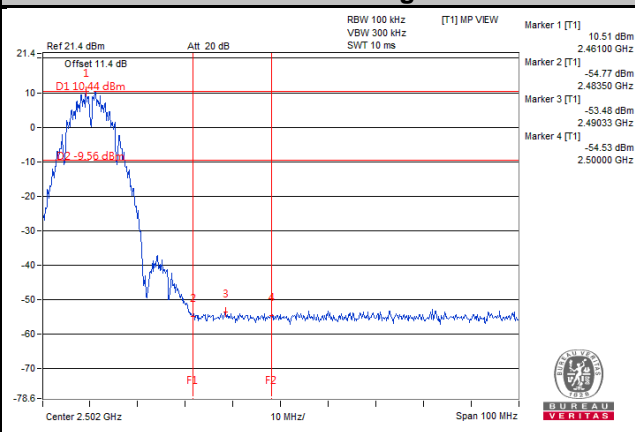
#### Mode A 802.11b



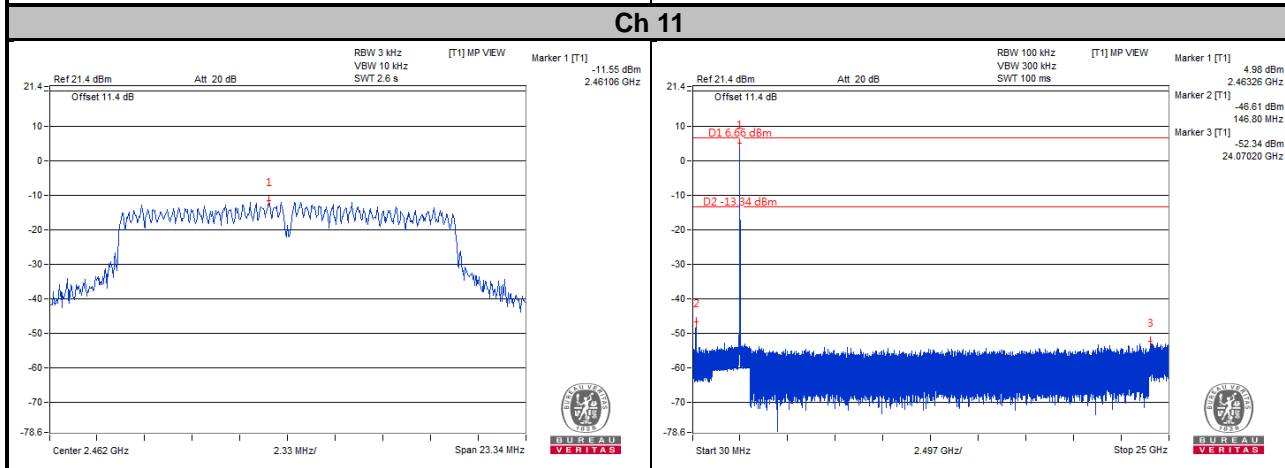
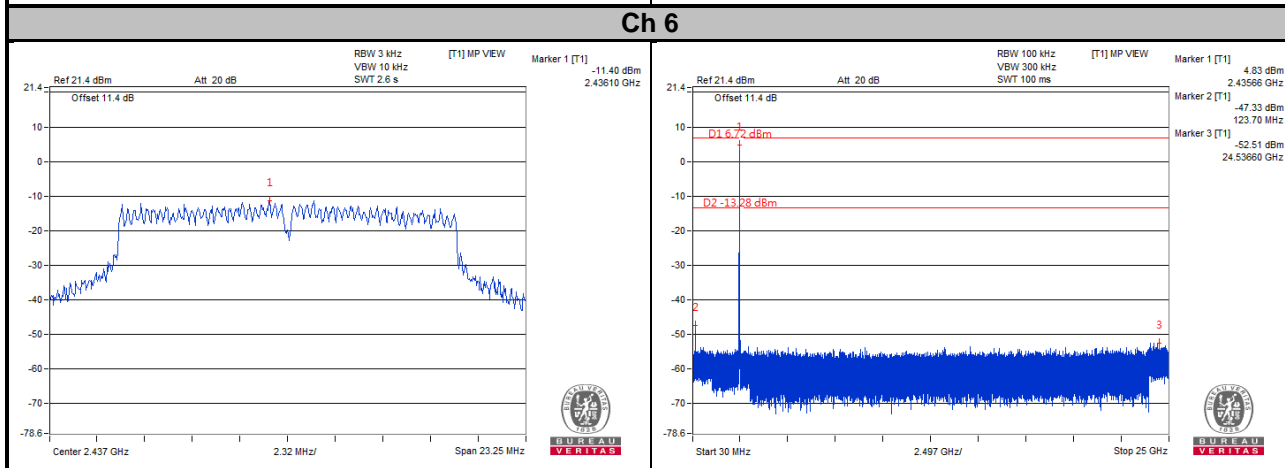
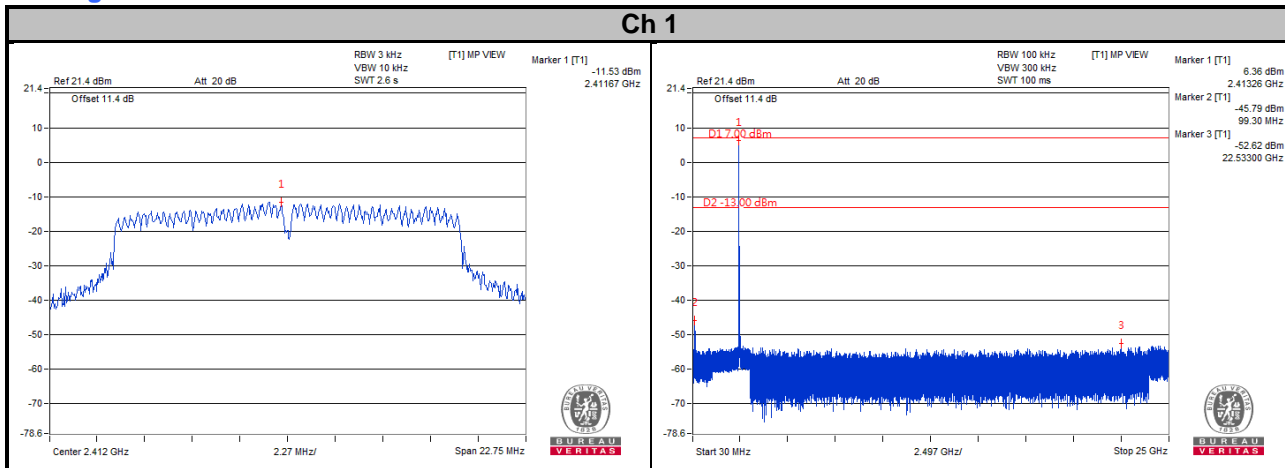
### Ch 1 Band Edge



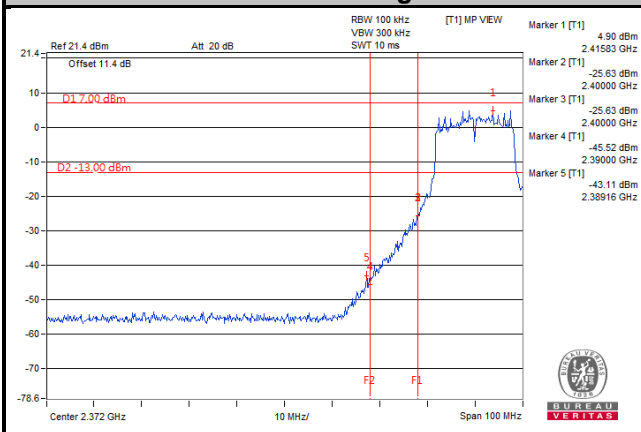
### Ch 11 Band Edge



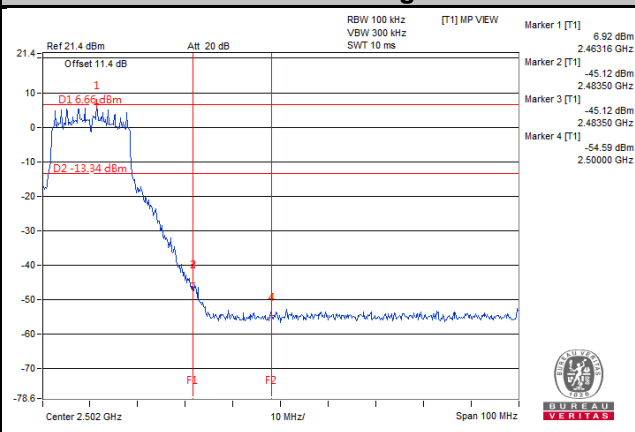
802.11g



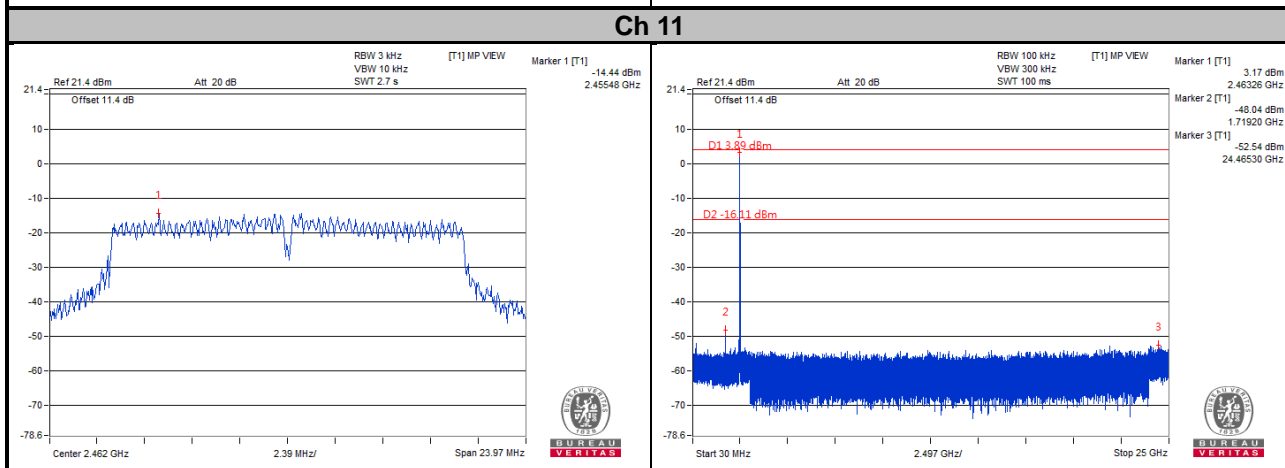
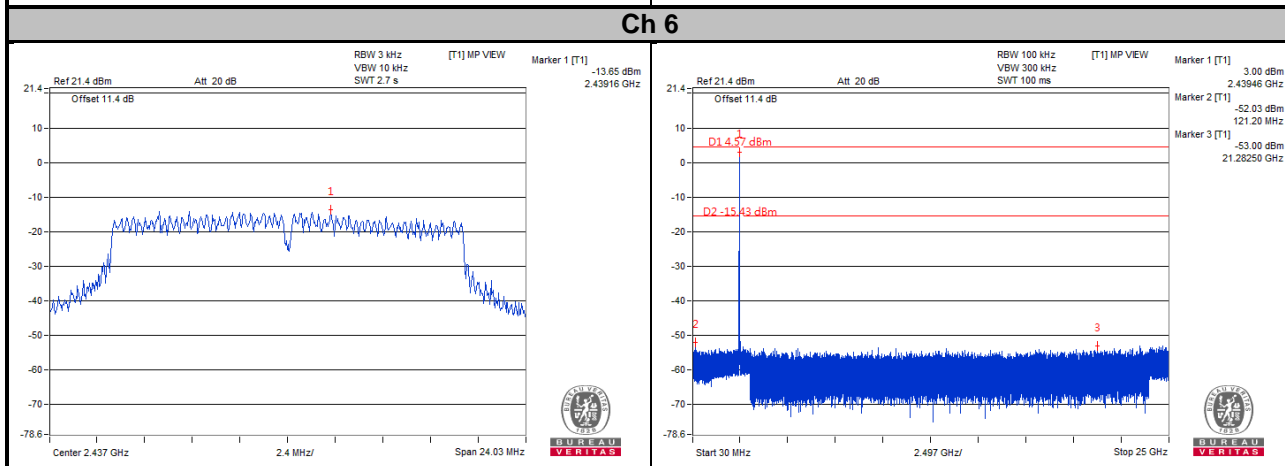
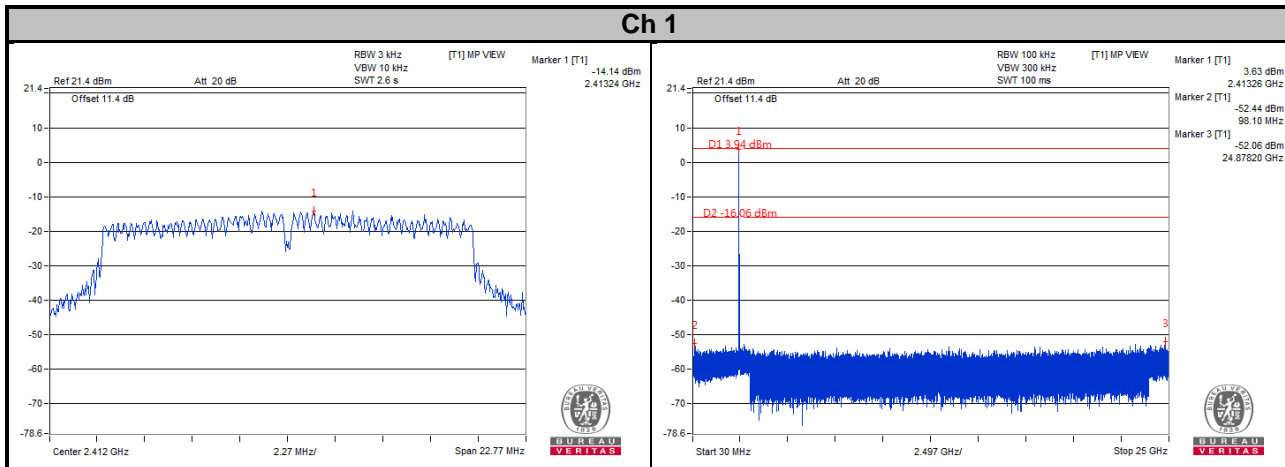
### Ch 1 Band Edge



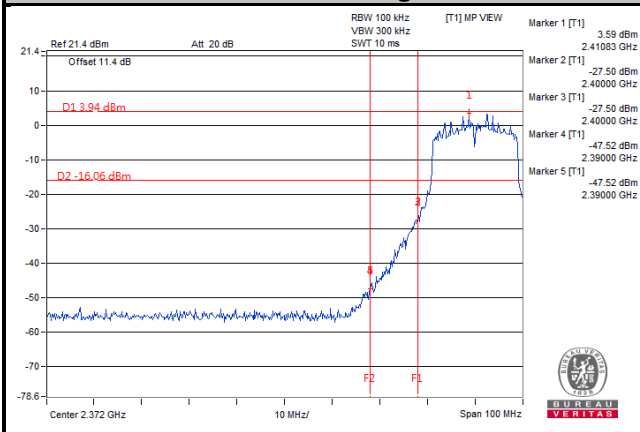
### Ch 11 Band Edge



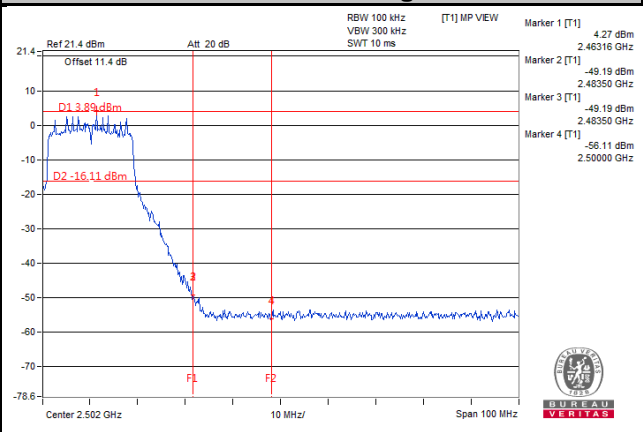
**Mode B**  
**802.11n (HT20)**  
**CHAIN 0**



### Ch 1 Band Edge



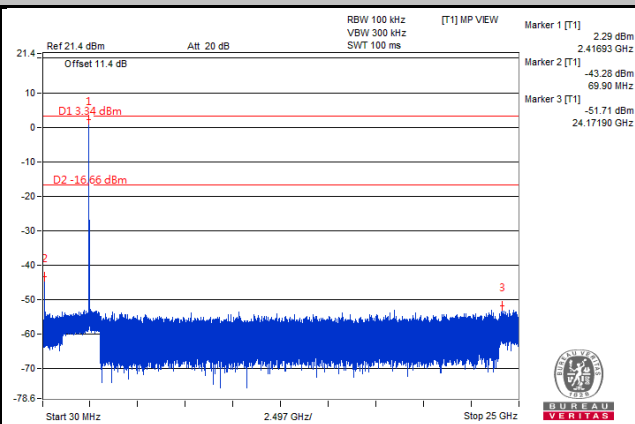
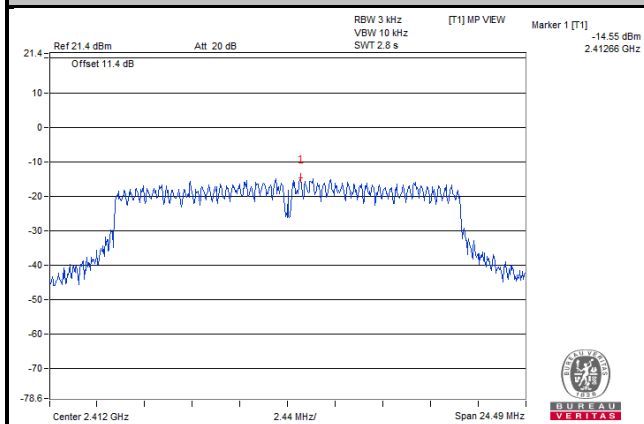
### Ch 11 Band Edge



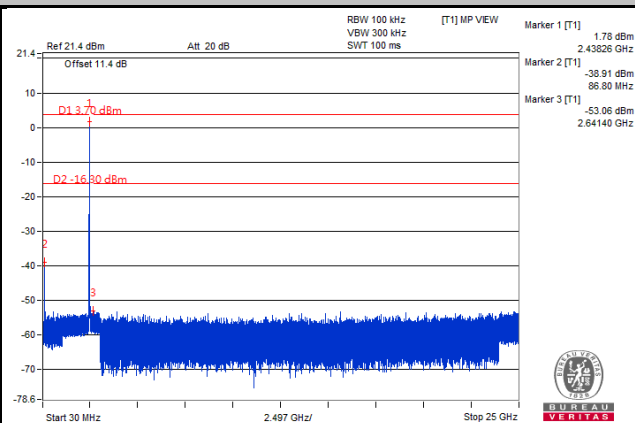
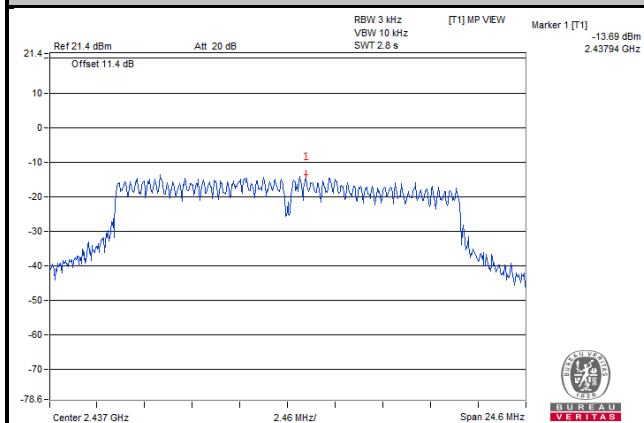


# CHAIN 1

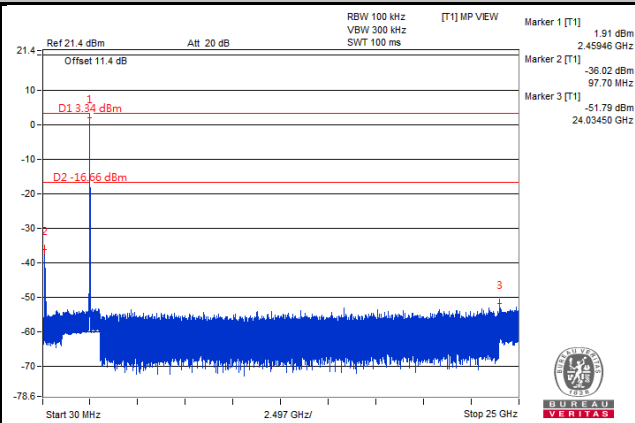
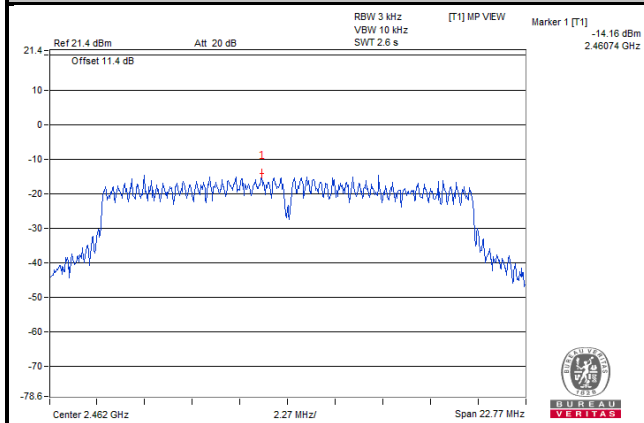
## Ch 1



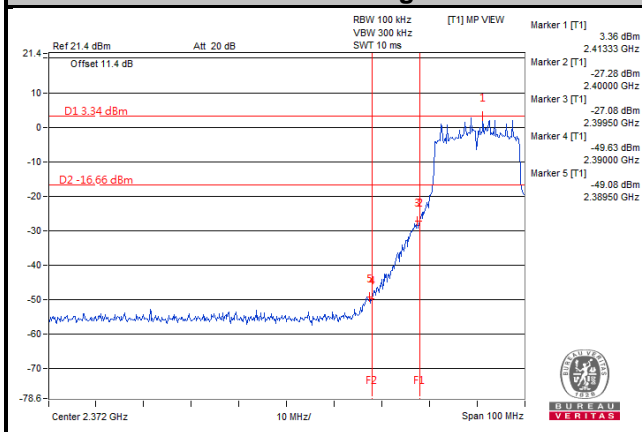
## Ch 6



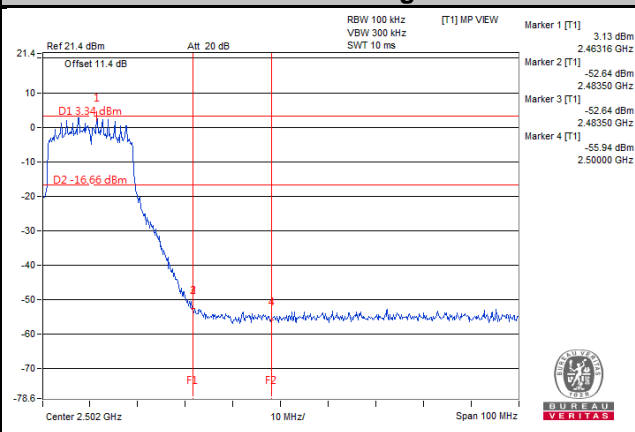
## Ch 11



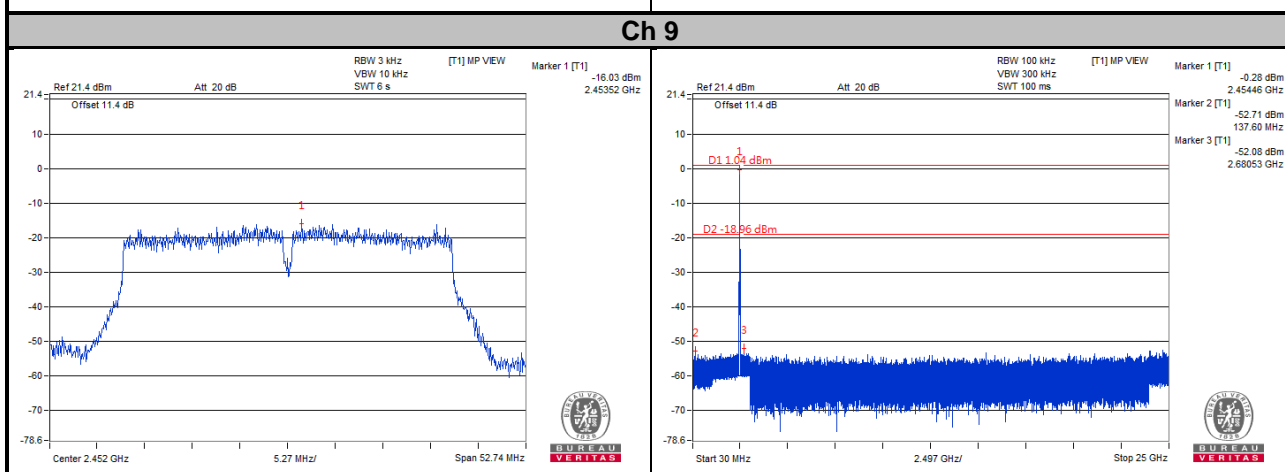
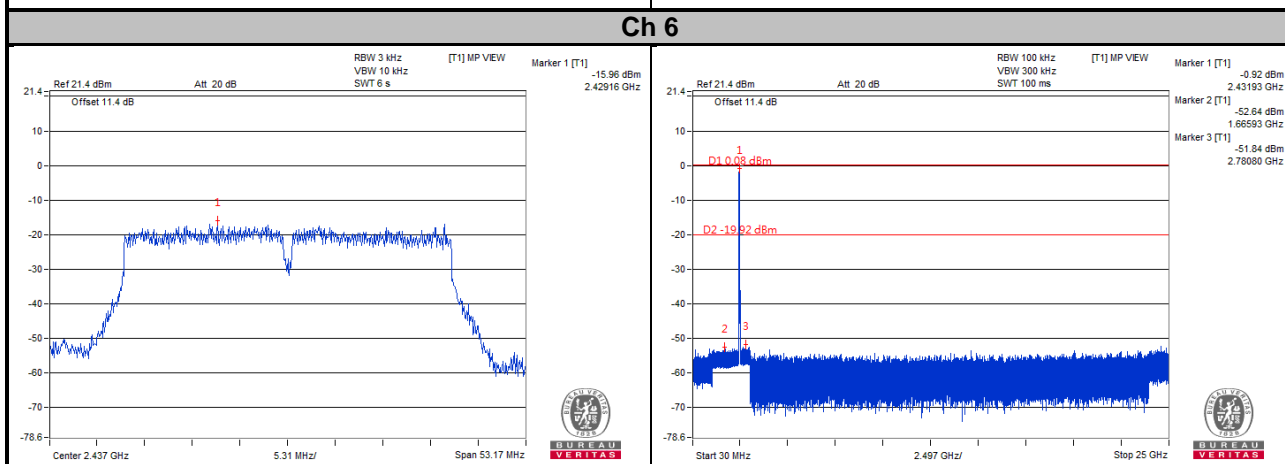
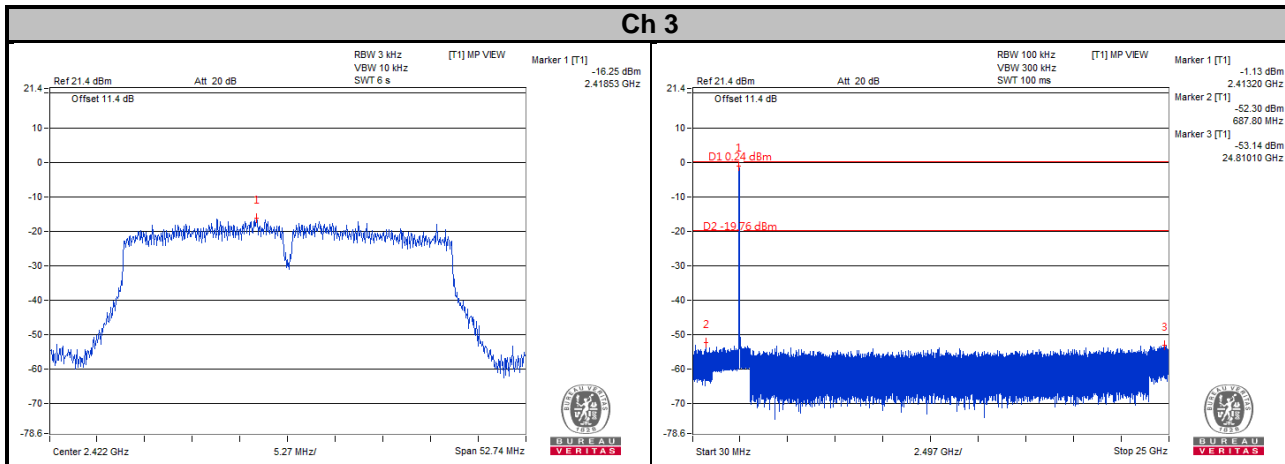
### Ch 1 Band Edge

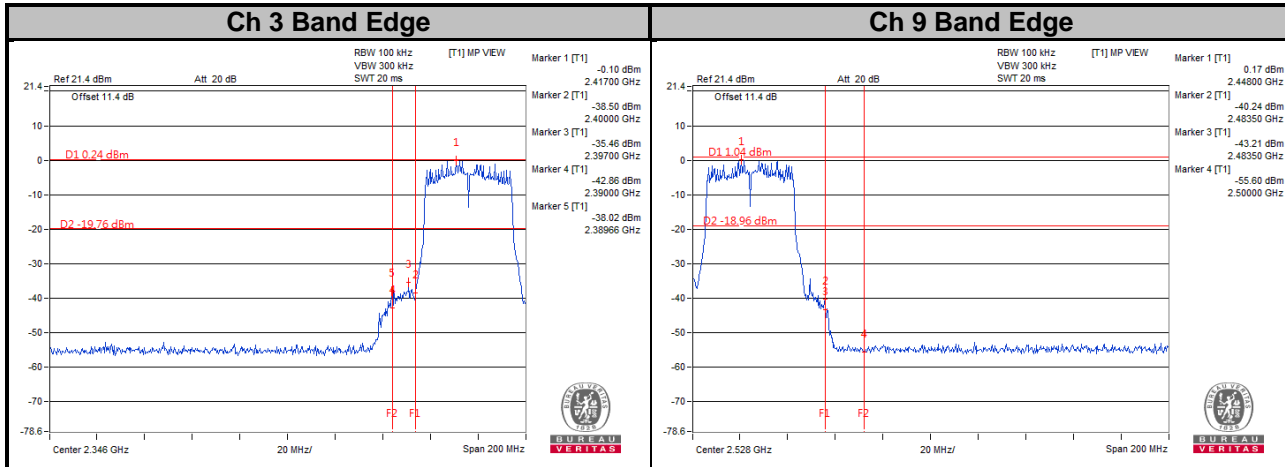


### Ch 11 Band Edge



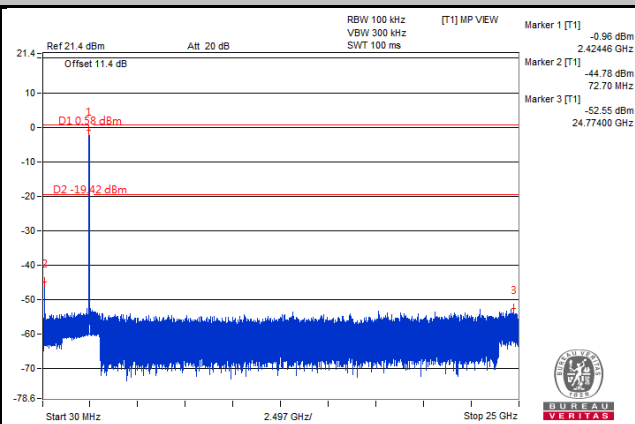
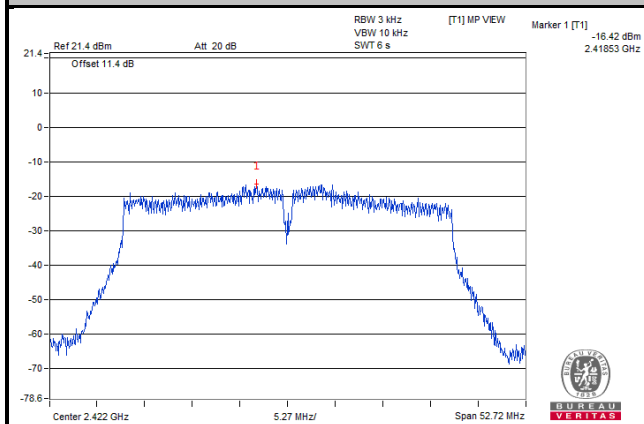
802.11n (HT40)  
CHAIN 0



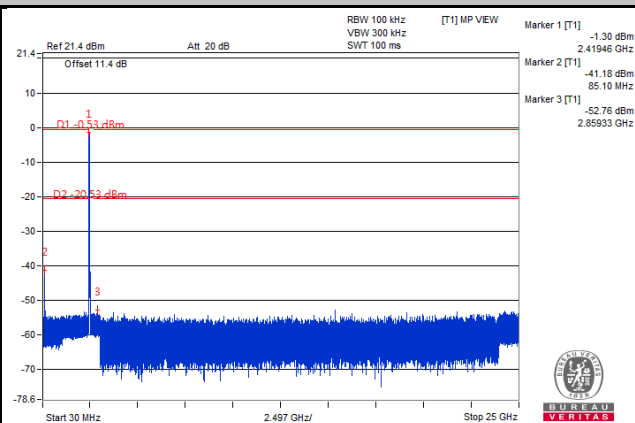
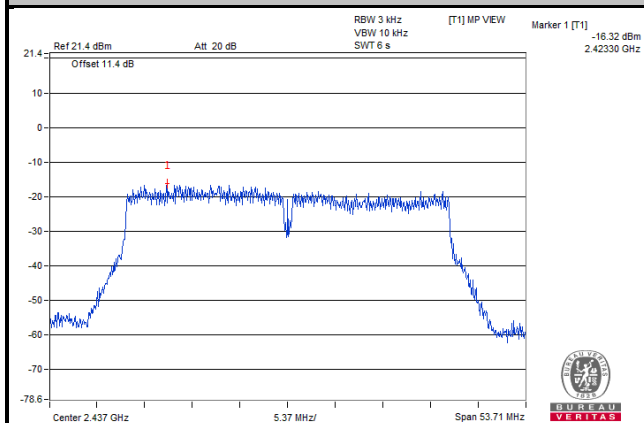


# CHAIN 1

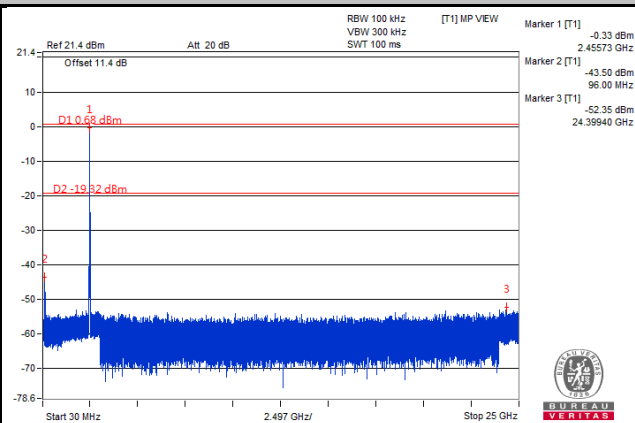
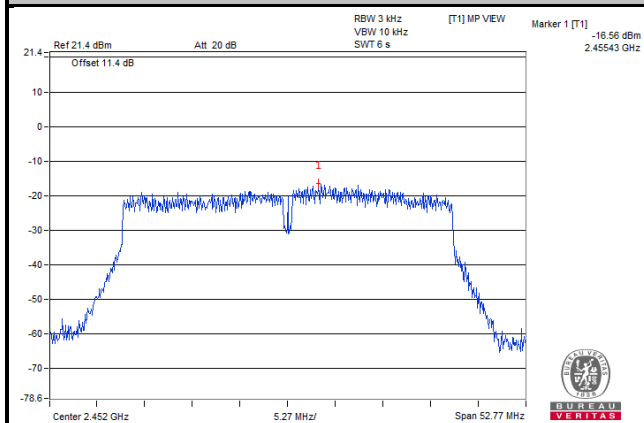
## Ch 3

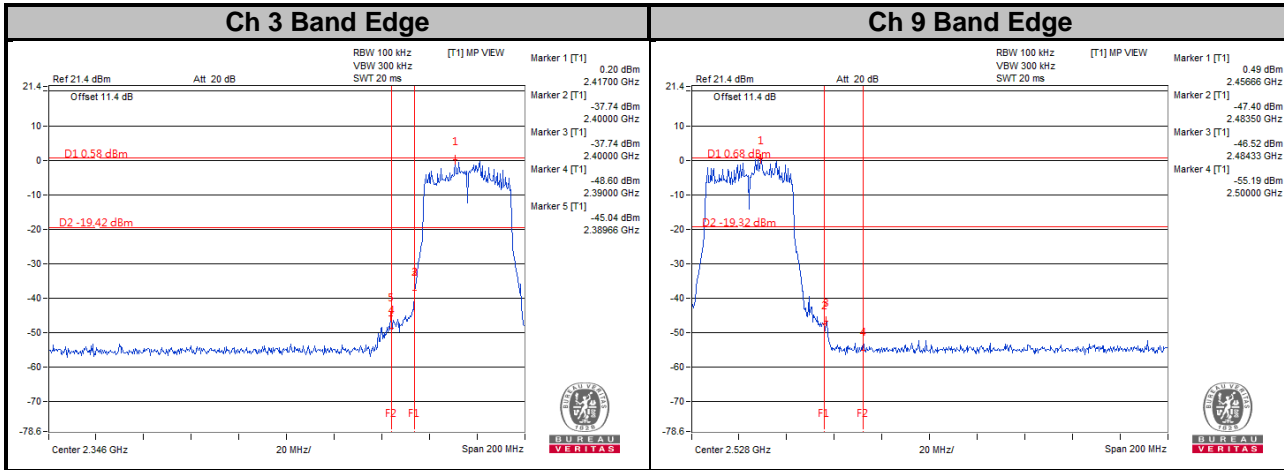


## Ch 6



## Ch 9





## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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