

## FCC Test Report

**Report No.:** RF190111C05-2

**FCC ID:** HD5-CK65L0N

**Test Model:** CK65L0N

**Received Date:** Jan. 11, 2019

**Test Date:** Feb. 02, 2019 ~ Feb. 15, 2019

**Issued Date:** Mar. 08, 2019

**Applicant:** Honeywell International Inc.

**Address:** 9680 Old Bailes Road, Fort Mill, SC 29707 USA

**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 (1):** No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, Taiwan, R.O.C.

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RF190111C05-2	Original Release	Mar. 08, 2019

## 1 Certificate of Conformity

**Product:** Mobile computer

**Brand:** Honeywell

**Test Model:** CK65L0N


**Sample Status:** Engineering Sample


**Applicant:** Honeywell International Inc.

**Test Date:** Feb. 02, 2019 ~ Feb. 15, 2019

**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 RF characteristics under the conditions specified in this report.

**Prepared by :** , **Date:** Mar. 08, 2019  
Ivonne Wu / Supervisor

**Approved by :** , **Date:** Mar. 08, 2019  
Dylan Chiou / 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	NA	Without AC power port of the EUT.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -2.02 dB at 2483.72 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.
---	Occupied Bandwidth Measurement	Pass	Reference only
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	Antenna connector is POGO pin not a standard connector.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
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>	Mobile computer
<b>Brand</b>	Honeywell
<b>Test Model</b>	CK65L0N
<b>Status of EUT</b>	Engineering Sample
<b>Power Supply Rating</b>	3.7 Vdc (battery)
<b>Modulation Type</b>	CCK, DQPSK, DBPSK for DSSS 256QAM, 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 300 Mbps 802.11ac: up to 400 Mbps
<b>Operating Frequency</b>	2412 ~ 2462 MHz
<b>Number of Channel</b>	11 for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20) 7 for 802.11n (HT40), 802.11ac (VHT40)
<b>Output Power</b>	628.946 mW
<b>Antenna Type</b>	Refer to Note as below
<b>Antenna Connector</b>	Refer to Note as below
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	N/A

Note:

- There're 4 configurations for the EUT listed as below.

Sample	Scanner	Keypad	Antenna Type			
			Type	Connector	Gain (dBi)	
					Chain 0	Chain 1
A	N6703	Alpha/Num	FPC antenna	POGO pin	2.62	2.85
B	EX20	Alpha/Num	FPC antenna	POGO pin	2.64	2.88
C	N6703	Num	FPC antenna	POGO pin	2.62	2.85
D	EX20	Num	FPC antenna	POGO pin	2.64	2.88

- ✧ After pre-tested, only the worst configuration (Sample B) was chosen for the final test and recorded in this report.

- The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	Intermec Technologies Corporation	AB18	3.7 Vdc, 5.1 Ah, 18.9 mAh

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

Modulation Mode	Tx Function
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX
802.11ac (VHT20)	2TX
802.11ac (VHT40)	2TX

\* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for HT20 / HT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.



### 3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20) and 802.11ac (VHT20):

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) and 802.11ac (VHT40):

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	
-	√	√	-	√	-

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:**

1. No need to concern of Conducted Emission since the EUT is powered by battery.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

#### **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)
-	802.11n (HT20)	1 to 11	11	OFDM	BPSK	6.5

### **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)
-	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 9	OFDM	BPSK	13.5

### **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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

### **Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	3.7 Vdc	Jisyong Wang
RE<1G	25 deg. C, 65 % RH	3.7 Vdc	Jisyong Wang
APCM	25 deg. C, 65 % RH	3.7 Vdc	Vincent Huang

### 3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

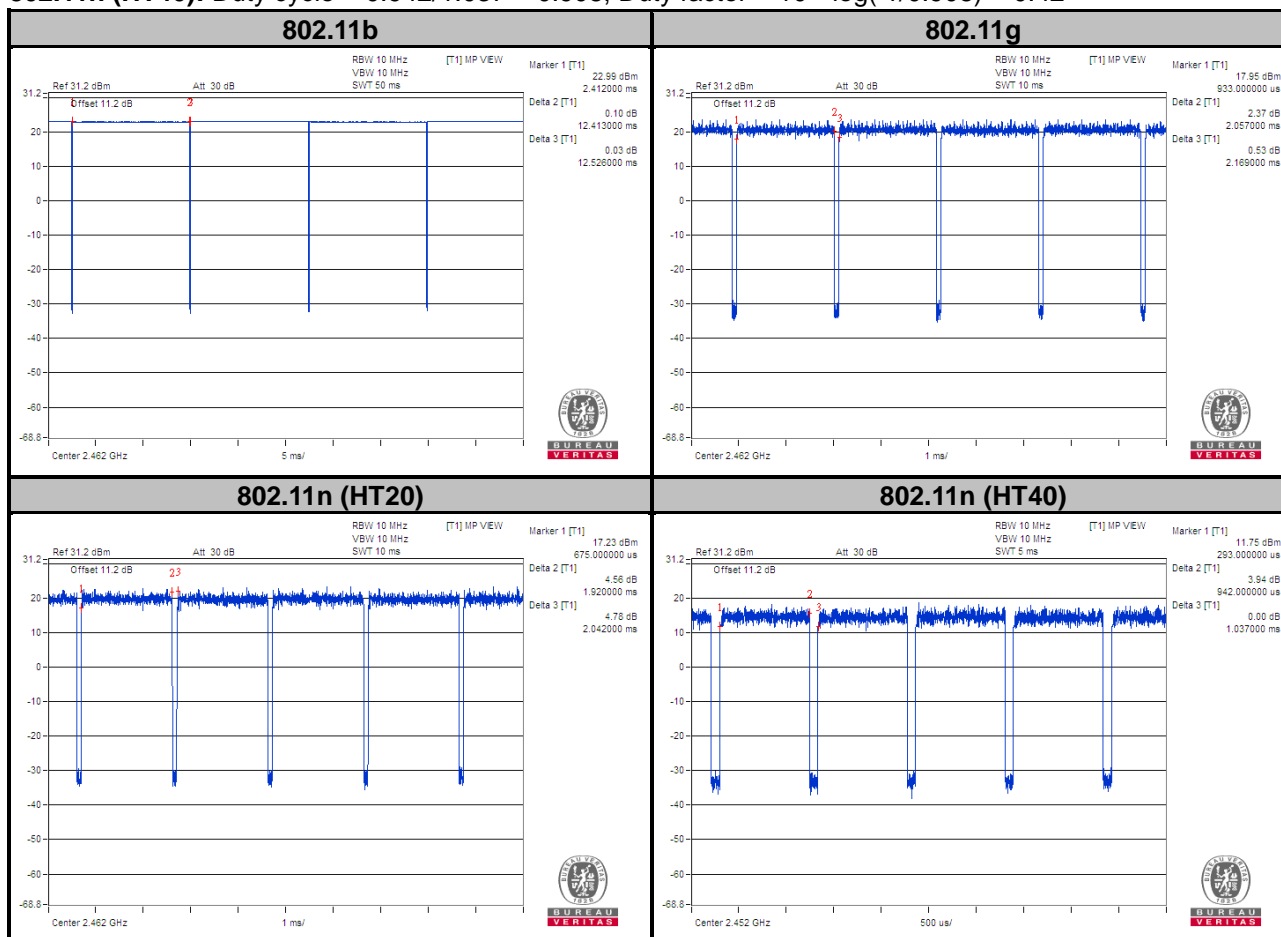
Duty cycle of test signal is ≥ 98 %, duty factor shall be not considered.

**802.11b:** Duty cycle = 12.413/12.526 = 0.991

**802.11g:** Duty cycle = 2.057/2.169 = 0.948, Duty factor = 10 \* log(1/0.948) = 0.23

**802.11n (HT20):** Duty cycle = 1.920/2.042 = 0.940, Duty factor = 10 \* log(1/0.940) = 0.27

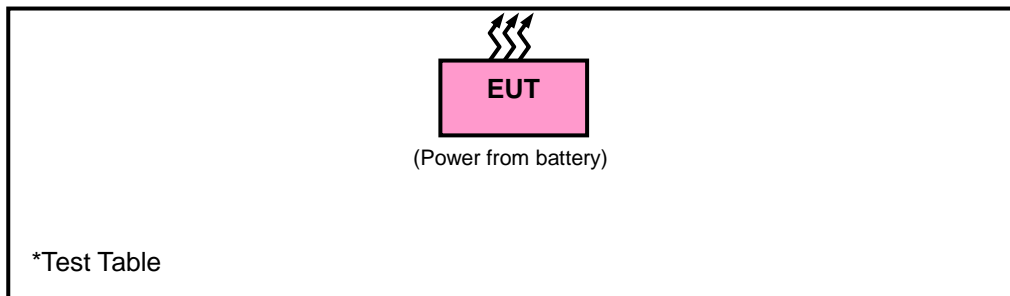
**802.11n (HT40):** Duty cycle = 0.942/1.037 = 0.908, Duty factor = 10 \* log( 1/0.908) = 0.42



### 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)**

**KDB 558074 D01 15.247 Meas Guidance v05r01**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

**ANSI C63.10-2013**

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

## 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	Mar. 16, 2018	Mar. 15, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 13, 2018	Dec. 12, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Jan. 21, 2019	Jan. 20, 2020
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
Loop Antenna	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
Preamplifier EMCI	EMC001340	980201	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 184045	980116	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 330H	980112	Oct. 12, 2018	Oct. 11, 2019
Power Meter Anritsu	ML2495A	1012010	Sep. 05, 2018	Sep. 04, 2019
Power Sensor Anritsu	MA2411B	1315050	Sep. 04, 2018	Sep. 03, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8 000&3000	140811+170717	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 12, 2018	Oct. 11, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
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 IC Site Registration No. is 7450F-10.

#### 4.1.3 Test Procedures

##### **For Radiated Emission below 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

##### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

##### **For Radiated Emission above 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 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 for Quasi-peak detection (QP) or Peak detection (PK) 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  $\geq 1/T$  (Duty cycle < 98 %) or 10 Hz (Duty cycle  $\geq 98$  %) for Average detection (AV) at frequency above 1 GHz.  
(11b: RBW = 1 MHz, VBW = 100 Hz ; 11g: RBW = 1 MHz, VBW = 1 kHz ;  
11n (HT20): RBW = 1 MHz, VBW = 1 kHz ; 11n (HT40): RBW = 1 MHz, VBW = 3 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

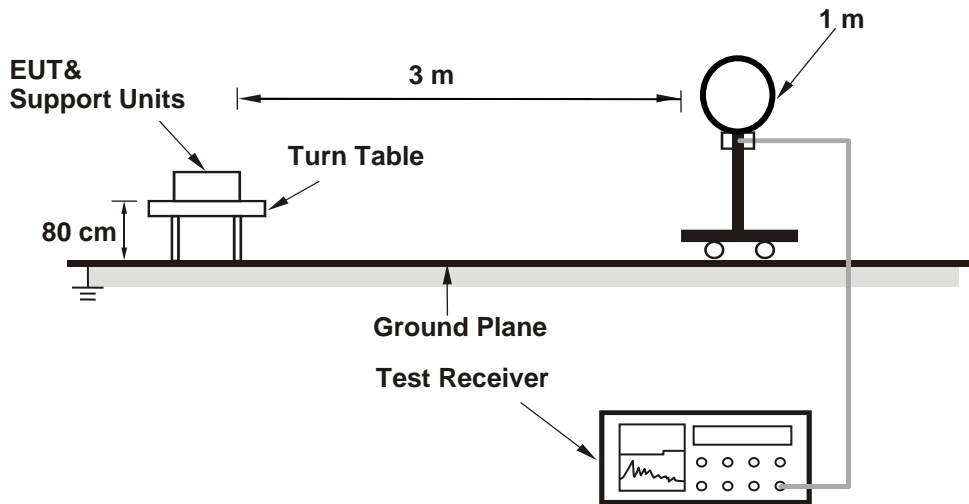


4.1.4 Deviation from Test Standard

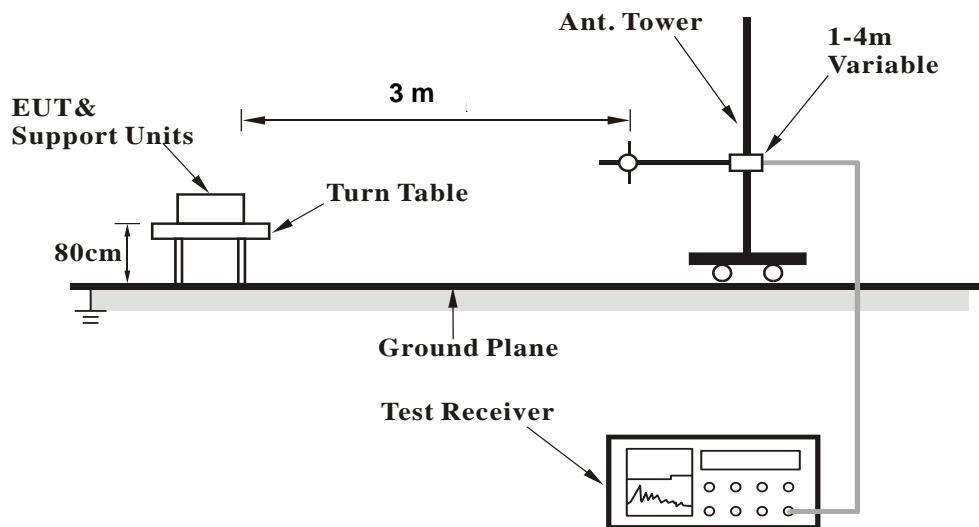
No deviation.

4.1.5 Test Set Up

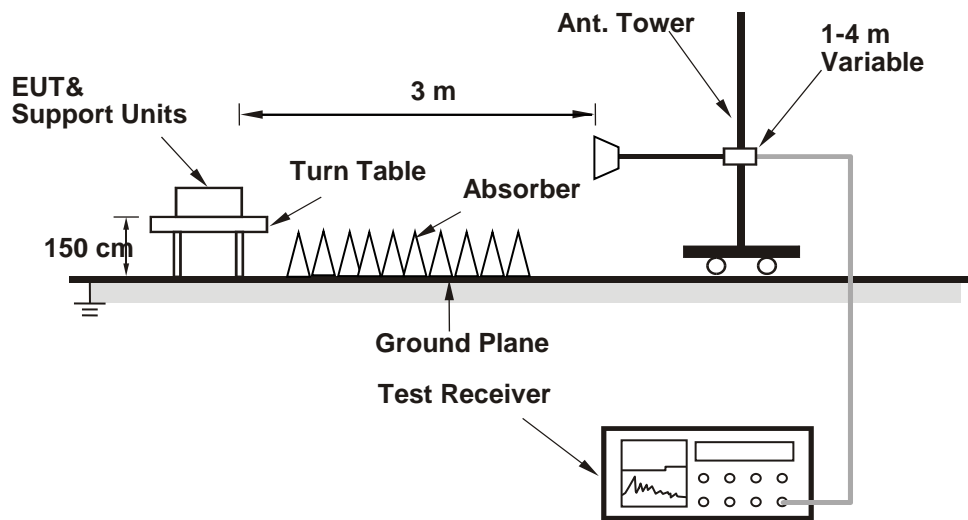
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



**<Radiated Emission above 1 GHz>**



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

**4.1.6 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.

4.1.7 Test Results

Above 1 GHz Data :  
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	Jisyong Wang

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
2386.16	40.98	46.97	54	-13.02	27.16	4.35	37.5	100	240	Average
2386.16	55.46	61.45	74	-18.54	27.16	4.35	37.5	100	240	Peak
2412	107.95	113.86			27.23	4.38	37.52	100	240	Average
2412	111.31	117.22			27.23	4.38	37.52	100	240	Peak
4824	37.89	52.8	54	-16.11	31.17	6.81	52.89	152	265	Average
4824	47.95	62.86	74	-26.05	31.17	6.81	52.89	152	265	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
2387.7	37.12	43.1	54	-16.88	27.16	4.36	37.5	100	247	Average
2387.7	52.04	58.02	74	-21.96	27.16	4.36	37.5	100	247	Peak
2412	103.1	109.01			27.23	4.38	37.52	100	247	Average
2412	106.89	112.8			27.23	4.38	37.52	100	247	Peak
4824	36.89	51.8	54	-17.11	31.17	6.81	52.89	162	231	Average
4824	46.91	61.82	74	-27.09	31.17	6.81	52.89	162	231	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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
2388.82	35.15	41.13	54	-18.85	27.16	4.36	37.5	112	238	Average
2388.82	47.48	53.46	74	-26.52	27.16	4.36	37.5	112	238	Peak
2437	102.18	107.86			27.38	4.4	37.46	112	238	Average
2437	106.23	111.91			27.38	4.4	37.46	112	238	Peak
2493.24	36.09	41.29	54	-17.91	27.61	4.44	37.25	112	238	Average
2493.24	48.99	54.19	74	-25.01	27.61	4.44	37.25	112	238	Peak
4874	34.61	49.36	54	-19.39	31.25	6.86	52.86	152	231	Average
4874	44.62	59.37	74	-29.38	31.25	6.86	52.86	152	231	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
2376.64	34.81	40.89	54	-19.19	27.08	4.34	37.5	131	243	Average
2376.64	47.41	53.49	74	-26.59	27.08	4.34	37.5	131	243	Peak
2437	97.7	103.38			27.38	4.4	37.46	131	243	Average
2437	100.99	106.67			27.38	4.4	37.46	131	243	Peak
2499.56	35.58	40.78	54	-18.42	27.61	4.44	37.25	131	243	Average
2499.56	48.14	53.34	74	-25.86	27.61	4.44	37.25	131	243	Peak
4874	35.57	50.32	54	-18.43	31.25	6.86	52.86	165	231	Average
4874	45.57	60.32	74	-28.43	31.25	6.86	52.86	165	231	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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	109.85	115.37			27.46	4.41	37.39	126	240	Average
2462	112.72	118.24			27.46	4.41	37.39	126	240	Peak
2486.44	44.8	50.16	54	-9.2	27.53	4.43	37.32	126	240	Average
2486.44	61.24	66.6	74	-12.76	27.53	4.43	37.32	126	240	Peak
4924	36.84	51.5	54	-17.16	31.34	6.89	52.89	185	295	Average
4924	46.89	61.55	74	-27.11	31.34	6.89	52.89	185	295	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	94.88	100.4			27.46	4.41	37.39	120	232	Average
2462	98.46	103.98			27.46	4.41	37.39	120	232	Peak
2487.16	38.88	44.24	54	-15.12	27.53	4.43	37.32	120	232	Average
2487.16	49.77	55.13	74	-24.23	27.53	4.43	37.32	120	232	Peak
4924	36.79	51.45	54	-17.21	31.34	6.89	52.89	132	265	Average
4924	46.8	61.46	74	-27.2	31.34	6.89	52.89	132	265	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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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	Jisyong Wang

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
2389.94	51.1	57.1	54	-2.9	27.16	4.36	37.52	109	120	Average
2389.94	69.56	75.56	74	-4.44	27.16	4.36	37.52	109	120	Peak
2412	102.11	108.02			27.23	4.38	37.52	104	131	Average
2412	111.35	117.26			27.23	4.38	37.52	104	131	Peak
4824	34.73	49.64	54	-19.27	31.17	6.81	52.89	158	251	Average
4824	44.74	59.65	74	-29.26	31.17	6.81	52.89	158	251	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
2389.1	49.11	55.09	54	-4.89	27.16	4.36	37.5	104	131	Average
2389.1	67.87	73.85	74	-6.13	27.16	4.36	37.5	104	131	Peak
2412	100.41	106.32			27.23	4.38	37.52	109	120	Average
2412	109.84	115.75			27.23	4.38	37.52	109	120	Peak
4824	33.97	48.88	54	-20.03	31.17	6.81	52.89	192	265	Average
4824	43.98	58.89	74	-30.02	31.17	6.81	52.89	192	265	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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
2389.38	41.01	46.99	54	-12.99	27.16	4.36	37.5	101	128	Average
2389.38	53.31	59.29	74	-20.69	27.16	4.36	37.5	101	128	Peak
2437	103.63	109.31			27.38	4.4	37.46	101	128	Average
2437	113.28	118.96			27.38	4.4	37.46	101	128	Peak
2484.84	43.99	49.35	54	-10.01	27.53	4.43	37.32	101	128	Average
2484.84	61.73	67.09	74	-12.27	27.53	4.43	37.32	101	128	Peak
4874	34.83	49.58	54	-19.17	31.25	6.86	52.86	152	256	Average
4874	44.84	59.59	74	-29.16	31.25	6.86	52.86	152	256	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
2389.8	38.86	44.86	54	-15.14	27.16	4.36	37.52	110	115	Average
2389.8	55.37	61.37	74	-18.63	27.16	4.36	37.52	110	115	Peak
2437	99.89	105.57			27.38	4.4	37.46	110	115	Average
2437	109.93	115.61			27.38	4.4	37.46	110	115	Peak
2483.6	40.9	46.26	54	-13.1	27.53	4.43	37.32	110	115	Average
2483.6	57.74	63.1	74	-16.26	27.53	4.43	37.32	110	115	Peak
4874	35.28	50.03	54	-18.72	31.25	6.86	52.86	192	174	Average
4874	45.28	60.03	74	-28.72	31.25	6.86	52.86	192	174	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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	99.47	104.99			27.46	4.41	37.39	101	130	Average
2462	109.55	115.07			27.46	4.41	37.39	101	130	Peak
2483.52	48.72	54.08	54	-5.28	27.53	4.43	37.32	101	130	Average
2483.52	69.13	74.49	74	-4.87	27.53	4.43	37.32	101	130	Peak
4924	34.8	49.46	54	-19.2	31.34	6.89	52.89	147	152	Average
4924	44.8	59.46	74	-29.2	31.34	6.89	52.89	147	152	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	97.92	103.44			27.46	4.41	37.39	122	121	Average
2462	107.94	113.46			27.46	4.41	37.39	122	121	Peak
2483.56	49.37	54.73	54	-4.63	27.53	4.43	37.32	122	121	Average
2483.56	70.5	75.86	74	-3.5	27.53	4.43	37.32	122	121	Peak
4924	34.78	49.44	54	-19.22	31.34	6.89	52.89	162	251	Average
4924	44.78	59.44	74	-29.22	31.34	6.89	52.89	162	251	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.



### 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	Jisyong Wang

#### 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
2389.94	51.91	57.91	54	-2.09	27.16	4.36	37.52	114	240	Average
2389.94	68.1	74.08	74	-5.9	27.16	4.36	37.5	114	240	Peak
2412	99.46	105.37			27.23	4.38	37.52	114	240	Average
2412	109.47	115.38			27.23	4.38	37.52	114	240	Peak
4824	34.39	49.3	54	-19.61	31.17	6.81	52.89	152	256	Average
4824	44.39	59.3	74	-29.61	31.17	6.81	52.89	152	256	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
2389.94	50.33	56.33	54	-3.67	27.16	4.36	37.52	160	300	Average
2389.94	66.55	72.55	74	-7.45	27.16	4.36	37.52	160	300	Peak
2412	95.69	101.6			27.23	4.38	37.52	160	300	Average
2412	105.62	111.53			27.23	4.38	37.52	160	300	Peak
4824	34.61	49.52	54	-19.39	31.17	6.81	52.89	165	295	Average
4824	44.62	59.53	74	-29.38	31.17	6.81	52.89	165	295	Peak

#### Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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
2389.8	41.65	47.65	54	-12.35	27.16	4.36	37.52	176	230	Average
2389.8	57.06	63.06	74	-16.94	27.16	4.36	37.52	176	230	Peak
2437	101.92	107.6			27.38	4.4	37.46	176	230	Average
2437	111.92	117.6			27.38	4.4	37.46	176	230	Peak
2483.52	44.09	49.45	54	-9.91	27.53	4.43	37.32	176	230	Average
2483.52	62.09	67.45	74	-11.91	27.53	4.43	37.32	176	230	Peak
4874	34.44	49.19	54	-19.56	31.25	6.86	52.86	152	231	Average
4874	44.44	59.19	74	-29.56	31.25	6.86	52.86	152	231	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
2389.66	37.17	43.15	54	-16.83	27.16	4.36	37.5	137	245	Average
2389.66	57.64	63.62	74	-16.36	27.16	4.36	37.5	137	245	Peak
2437	95.53	101.21			27.38	4.4	37.46	137	245	Average
2437	105.53	111.21			27.38	4.4	37.46	137	245	Peak
2483.56	38.38	43.74	54	-15.62	27.53	4.43	37.32	137	245	Average
2483.56	55.51	60.87	74	-18.49	27.53	4.43	37.32	137	245	Peak
4874	34.35	49.1	54	-19.65	31.25	6.86	52.86	185	245	Average
4874	44.36	59.11	74	-29.64	31.25	6.86	52.86	185	245	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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	98.03	103.55			27.46	4.41	37.39	139	232	Average
2462	108.04	113.56			27.46	4.41	37.39	139	232	Peak
2483.72	51.98	57.34	54	-2.02	27.53	4.43	37.32	139	232	Average
2483.72	71.7	77.06	74	-2.3	27.53	4.43	37.32	139	232	Peak
4924	36.94	51.6	54	-17.06	31.34	6.89	52.89	163	251	Average
4924	46.95	61.61	74	-27.05	31.34	6.89	52.89	163	251	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	93.67	99.19			27.46	4.41	37.39	100	245	Average
2462	103.7	109.22			27.46	4.41	37.39	100	245	Peak
2485.64	45.73	51.09	54	-8.27	27.53	4.43	37.32	100	245	Average
2485.64	63.89	69.25	74	-10.11	27.53	4.43	37.32	100	245	Peak
4924	38.1	52.76	54	-15.9	31.34	6.89	52.89	147	162	Average
4924	48.11	62.77	74	-25.89	31.34	6.89	52.89	147	162	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

### 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	Jisyong Wang

#### 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
2389.8	51.9	57.9	54	-2.1	27.16	4.36	37.52	113	240	Average
2389.8	67.08	73.08	74	-6.92	27.16	4.36	37.52	113	240	Peak
2422	95.09	100.85			27.31	4.39	37.46	113	240	Average
2422	105.13	110.89			27.31	4.39	37.46	113	240	Peak
2483.52	38.04	43.4	54	-15.96	27.53	4.43	37.32	113	240	Average
2483.52	52.45	57.81	74	-21.55	27.53	4.43	37.32	113	240	Peak
4844	34.68	49.53	54	-19.32	31.2	6.83	52.88	185	145	Average
4844	44.68	59.53	74	-29.32	31.2	6.83	52.88	185	145	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
2389.8	66.3	72.3	74	-7.7	27.16	4.36	37.52	140	297	Peak
2389.8	49.44	55.44	54	-4.56	27.16	4.36	37.52	140	297	Peak
2422	90.23	95.99			27.31	4.39	37.46	140	297	Average
2422	100.28	106.04			27.31	4.39	37.46	140	297	Peak
2483.52	36.57	41.93	54	-17.43	27.53	4.43	37.32	140	297	Average
2483.52	51.48	56.84	74	-22.52	27.53	4.43	37.32	140	297	Peak
4844	34.84	49.69	54	-19.16	31.2	6.83	52.88	195	265	Average
4844	44.84	59.69	74	-29.16	31.2	6.83	52.88	195	265	Peak

#### Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2422 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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	Jisyoung Wang

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
2389.94	48.8	54.8	54	-5.2	27.16	4.36	37.52	140	243	Average
2389.94	63.88	69.88	74	-10.12	27.16	4.36	37.52	140	243	Peak
2437	86.35	92.03			27.38	4.4	37.46	140	243	Average
2437	96.35	102.03			27.38	4.4	37.46	140	243	Peak
2483.52	51.61	56.97	54	-2.39	27.53	4.43	37.32	140	243	Average
2483.52	69	74.36	74	-5	27.53	4.43	37.32	140	243	Peak
4874	35.87	50.62	54	-18.13	31.25	6.86	52.86	152	231	Average
4874	45.88	60.63	74	-28.12	31.25	6.86	52.86	152	231	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
2389.8	46.11	52.11	54	-7.89	27.16	4.36	37.52	162	220	Average
2389.8	65.96	71.96	74	-8.04	27.16	4.36	37.52	162	220	Peak
2437	89.89	95.57			27.38	4.4	37.46	162	220	Average
2437	99.9	105.58			27.38	4.4	37.46	162	220	Peak
2483.56	43.13	48.49	54	-10.87	27.53	4.43	37.32	162	220	Average
2483.56	62.02	67.38	74	-11.98	27.53	4.43	37.32	162	220	Peak
4874	35.18	49.93	54	-18.82	31.25	6.86	52.86	152	231	Average
4874	45.18	59.93	74	-28.82	31.25	6.86	52.86	152	231	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

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	Jisyong Wang

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
2389.8	37.2	43.2	54	-16.8	27.16	4.36	37.52	126	234	Average
2389.8	56.3	62.3	74	-17.7	27.16	4.36	37.52	126	234	Peak
2452	93.93	99.53			27.38	4.41	37.39	126	234	Average
2452	103.93	109.53			27.38	4.41	37.39	126	234	Peak
2483.76	50.39	55.75	54	-3.61	27.53	4.43	37.32	126	234	Average
2483.76	67.4	72.76	74	-6.6	27.53	4.43	37.32	126	234	Peak
4904	34.95	49.61	54	-19.05	31.31	6.88	52.85	152	111	Average
4904	44.96	59.62	74	-29.04	31.31	6.88	52.85	152	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
2388.96	35.35	41.33	54	-18.65	27.16	4.36	37.5	133	233	Average
2388.96	53.71	59.69	74	-20.29	27.16	4.36	37.5	133	233	Peak
2452	87.77	93.37			27.38	4.41	37.39	133	233	Average
2452	97.78	103.38			27.38	4.41	37.39	133	233	Peak
2486.76	41.9	47.26	54	-12.1	27.53	4.43	37.32	133	233	Average
2486.76	58.49	63.85	74	-15.51	27.53	4.43	37.32	133	233	Peak
4904	34.69	49.35	54	-19.31	31.31	6.88	52.85	165	211	Average
4904	44.7	59.36	74	-29.3	31.31	6.88	52.85	165	211	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2452 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

**9 kHz ~ 30 MHz Data:**

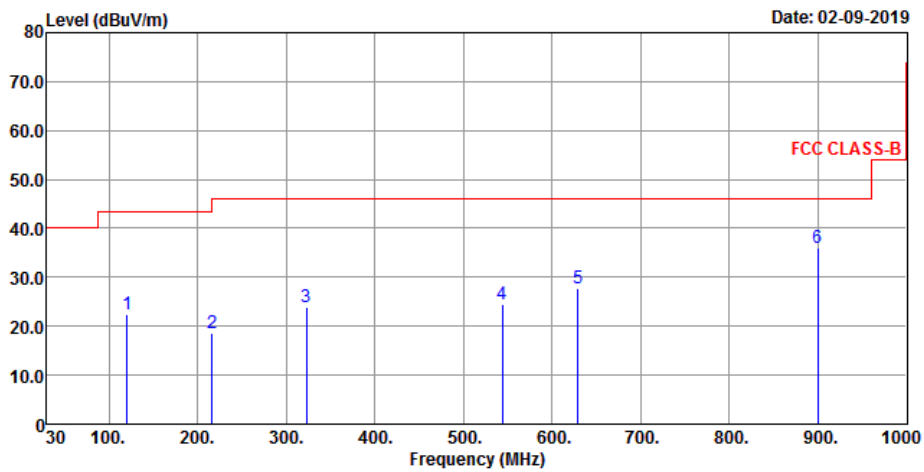
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**30 MHz ~ 1 GHz Worst-Case Data:**

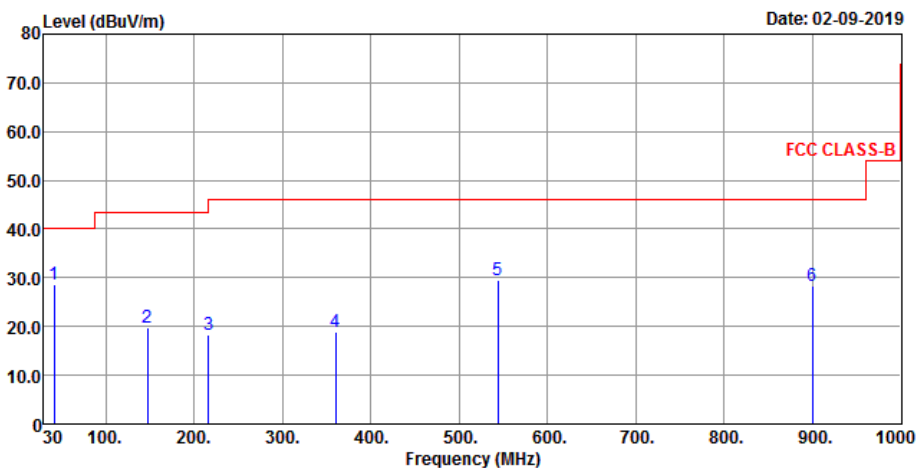
**802.11n (HT20)**

EUT Test Condition		Measurement Detail	
Channel	Channel 11	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	Jisyong Wang

**Horizontal**



**Vertical**



**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
120.21	22.43	42.47	43.5	-21.07	11.02	0.84	31.9	112	223	Peak
216.24	18.55	38.85	46	-27.45	10.05	1.31	31.66	130	30	Peak
322.94	23.95	40.56	46	-22.05	13.5	1.76	31.87	103	138	Peak
544.1	24.43	35.25	46	-21.57	18.33	2.67	31.82	129	135	Peak
629.46	27.68	36.84	46	-18.32	19.96	3.02	32.14	119	94	Peak
900.09	36.11	40.58	46	-9.89	23.51	4.03	32.01	150	50	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
41.64	28.5	45.49	40	-11.5	13.56	0.5	31.05	114	289	Peak
147.37	19.73	37.77	43.5	-23.77	12.61	0.97	31.62	126	349	Peak
216.24	18.35	38.65	46	-27.65	10.05	1.31	31.66	147	110	Peak
359.8	18.75	34.42	46	-27.25	14.38	1.92	31.97	103	69	Peak
544.1	29.55	40.37	46	-16.45	18.33	2.67	31.82	111	121	Peak
900.09	28.36	32.83	46	-17.64	23.51	4.03	32.01	139	49	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value.
- The emission levels of other frequencies were very low against the limit.

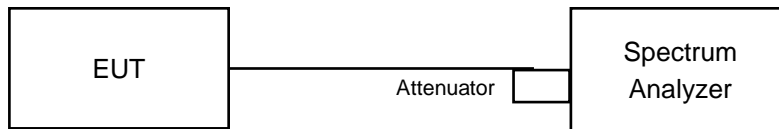


## 4.2 6 dB Bandwidth Measurement

### 4.2.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

### 4.2.2 Test Setup



### 4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.2.4 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

### 4.2.5 Deviation from Test Standard

No deviation.

### 4.2.6 EUT Operating Conditions

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

## 4.2.7 Test Results

## 802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.07	8.06	0.5	Pass
6	2437	8.07	7.57	0.5	Pass
11	2462	8.08	8.07	0.5	Pass

## 802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.09	16.37	0.5	Pass
6	2437	16.35	16.36	0.5	Pass
11	2462	16.34	16.41	0.5	Pass

## 802.11n (HT20)

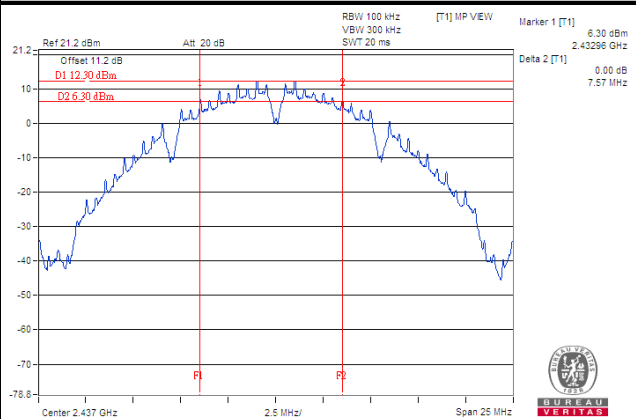
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.21	17.59	0.5	Pass
6	2437	17.61	17.59	0.5	Pass
11	2462	17.22	17.62	0.5	Pass

## 802.11n (HT40)

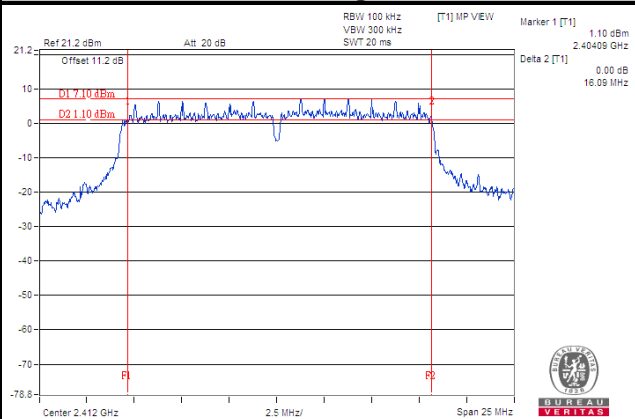
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.64	36.41	0.5	Pass
6	2437	36.10	36.35	0.5	Pass
9	2452	35.75	35.98	0.5	Pass

### Spectrum Plot of Worst Value

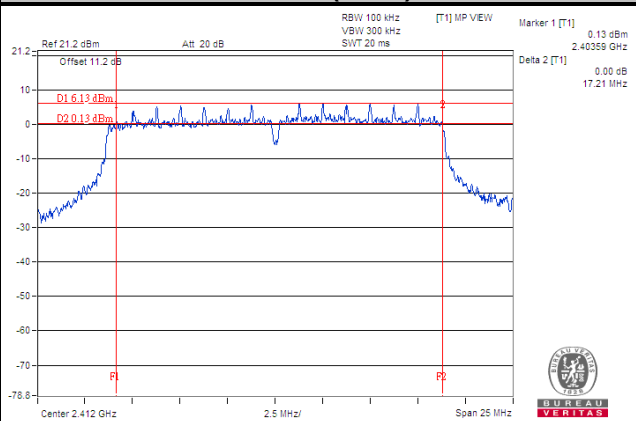
#### 802.11b



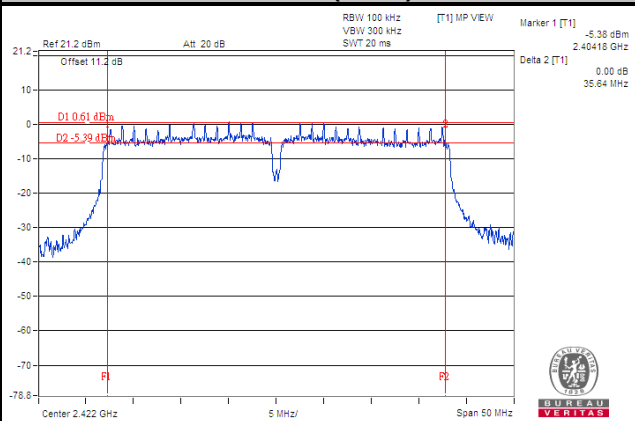
#### 802.11g



#### 802.11n (HT20)

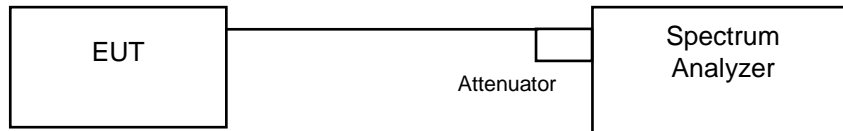


#### 802.11n (HT40)



### 4.3 Occupied Bandwidth Measurement

#### 4.3.1 Test Setup



#### 4.3.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

#### 4.3.4 Deviation from Test Standard

No deviation.

#### 4.3.5 EUT Operating Conditions

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

## 4.3.6 Test Results

## 802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	13.26	13.38	Pass
6	2437	13.14	13.08	Pass
11	2462	13.20	13.02	Pass

## 802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	17.04	16.98	Pass
6	2437	17.64	17.40	Pass
11	2462	16.92	16.98	Pass

## 802.11n (HT20)

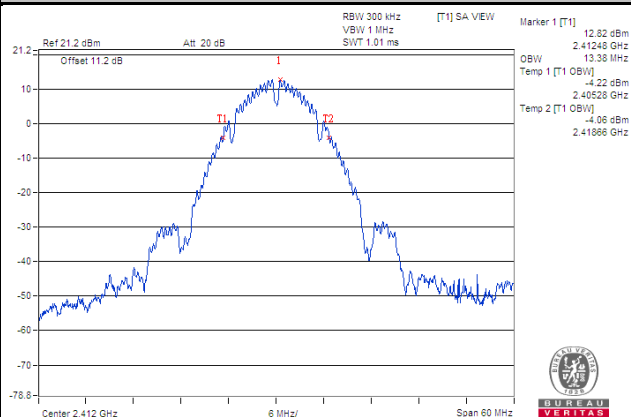
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	18.06	18.12	Pass
6	2437	18.96	19.08	Pass
11	2462	18.06	18.24	Pass

## 802.11n (HT40)

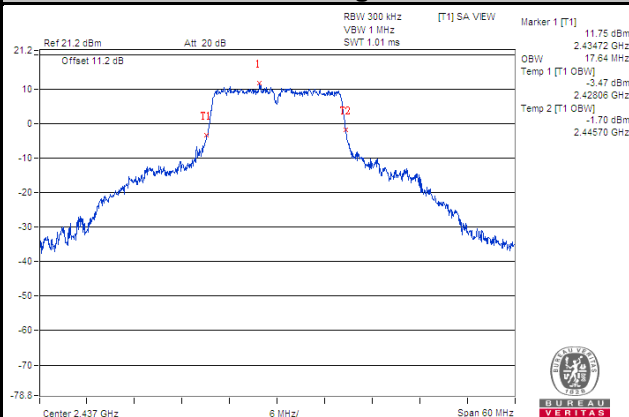
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	36.96	36.96	Pass
6	2437	37.26	37.02	Pass
9	2452	36.90	36.90	Pass

### Spectrum Plot of Worst Value

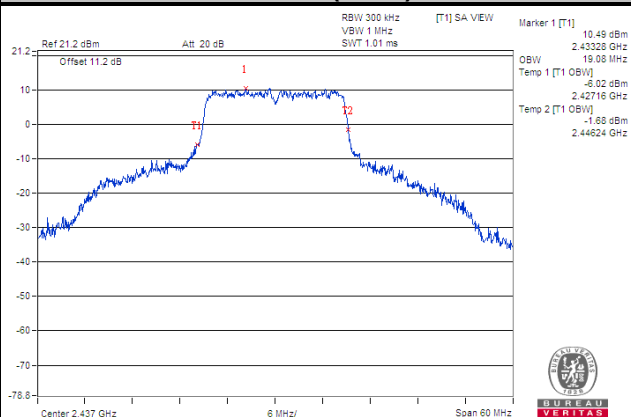
#### 802.11b



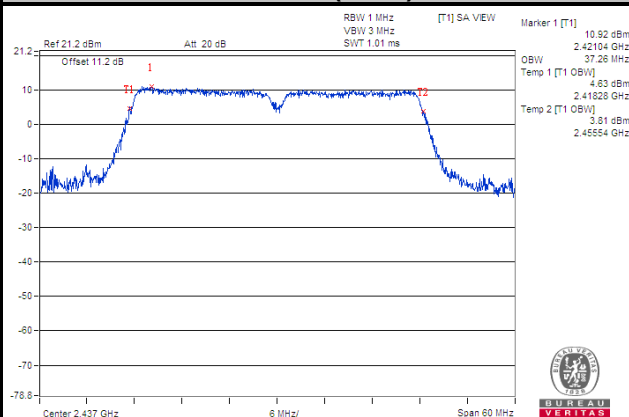
#### 802.11g



#### 802.11n (HT20)



#### 802.11n (HT40)



#### 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,

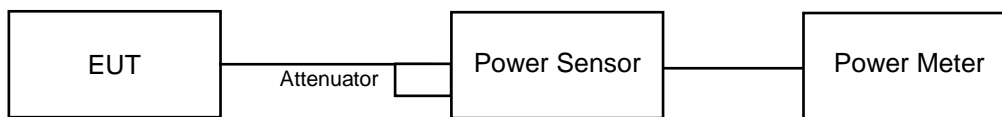
Array Gain = 0 dB (i.e., no array gain) for NANT  $\leq$  4;

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

Array Gain =  $5 \log(\text{NANT}/\text{NSS})$  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 =  $10 \log(\text{NANT}/\text{NSS})$  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

For peak power

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.

For average power

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

##### 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

##### For Peak Power

##### 802.11b

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.87	21.75	303.439	24.82	30	Pass
6	2437	21.93	21.86	309.417	24.91	30	Pass
11	2462	22.02	21.92	314.818	24.98	30	Pass

##### 802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	24.00	23.75	488.326	26.89	30	Pass
6	2437	25.06	24.89	628.946	27.99	30	Pass
11	2462	24.89	24.65	600.062	27.78	30	Pass

##### 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	22.90	23.19	403.433	26.06	30	Pass
6	2437	24.44	24.15	537.987	27.31	30	Pass
11	2462	22.72	22.70	373.277	25.72	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	21.72	21.23	281.333	24.49	30	Pass
6	2437	23.32	22.88	408.872	26.12	30	Pass
9	2452	22.05	21.85	313.434	24.96	30	Pass



For Average Power (reference only)

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	19.34	19.11	167.371	22.24
6	2437	19.23	19.20	166.929	22.23
11	2462	19.31	19.29	170.228	22.31

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	17.90	17.71	120.68	20.82
6	2437	19.42	19.25	171.638	22.35
11	2462	16.94	16.63	95.457	19.80

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	16.33	16.12	83.88	19.24
6	2437	18.91	18.87	154.894	21.90
11	2462	15.24	15.19	66.457	18.23

802.11n (HT40)

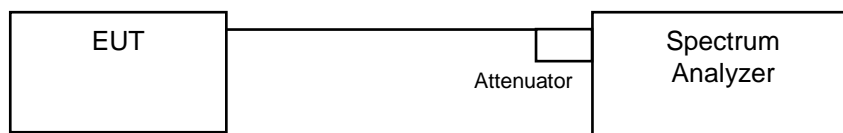
Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	13.63	13.58	45.87	16.62
6	2437	16.43	16.39	87.505	19.42
9	2452	13.61	13.58	45.764	16.61

## 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

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set the VBW  $\geq 3 \times \text{RBW}$ .
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. 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

##### 802.11b

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-0.20	3.01	2.81	8	Pass
	6	2437	-0.98	3.01	2.03	8	Pass
	11	2462	-0.32	3.01	2.69	8	Pass
1	1	2412	0.53	3.01	3.54	8	Pass
	6	2437	-0.16	3.01	2.85	8	Pass
	11	2462	0.24	3.01	3.25	8	Pass

**NOTE:**

1. Directional gain =  $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 5.77 \text{ dBi} < 6 \text{ dBi}$ , so the limit no need to be reduced.
2. Method 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

##### 802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-8.37	3.01	-5.36	8	Pass
	6	2437	-6.34	3.01	-3.33	8	Pass
	11	2462	-8.77	3.01	-5.76	8	Pass
1	1	2412	-8.14	3.01	-5.13	8	Pass
	6	2437	-6.09	3.01	-3.08	8	Pass
	11	2462	-8.86	3.01	-5.85	8	Pass

**NOTE:**

1. Directional gain =  $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 5.77 \text{ dBi} < 6 \text{ dBi}$ , so the limit no need to be reduced.
2. Method 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

### 802.11n (HT20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-8.31	3.01	-5.30	8	Pass
	6	2437	-5.13	3.01	-2.12	8	Pass
	11	2462	-9.27	3.01	-6.26	8	Pass
1	1	2412	-8.63	3.01	-5.62	8	Pass
	6	2437	-5.86	3.01	-2.85	8	Pass
	11	2462	-9.86	3.01	-6.85	8	Pass

**NOTE:**

1. Directional gain =  $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 5.77 \text{ dBi} < 6 \text{ dBi}$ , so the limit no need to be reduced.

2. Method 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

### 802.11n (HT40)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-13.41	3.01	-10.40	8	Pass
	6	2437	-10.44	3.01	-7.43	8	Pass
	9	2452	-13.52	3.01	-10.51	8	Pass
1	3	2422	-13.65	3.01	-10.64	8	Pass
	6	2437	-10.52	3.01	-7.51	8	Pass
	9	2452	-13.43	3.01	-10.42	8	Pass

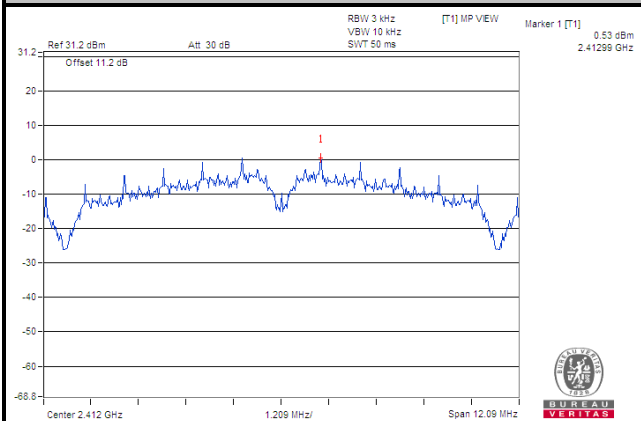
**NOTE:**

1. Directional gain =  $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 5.77 \text{ dBi} < 6 \text{ dBi}$ , so the limit no need to be reduced.

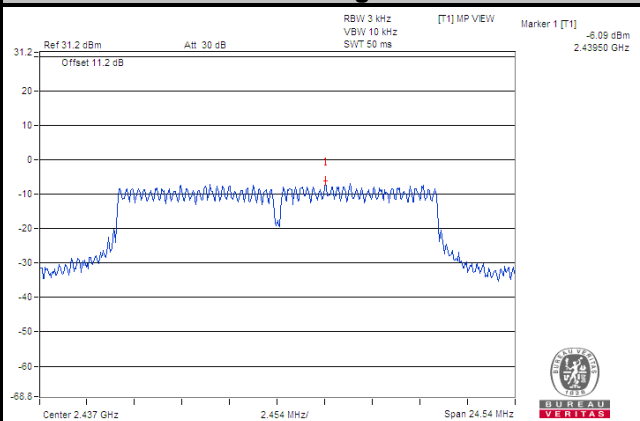
2. Method 2) a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

### Spectrum Plot of Worst Value

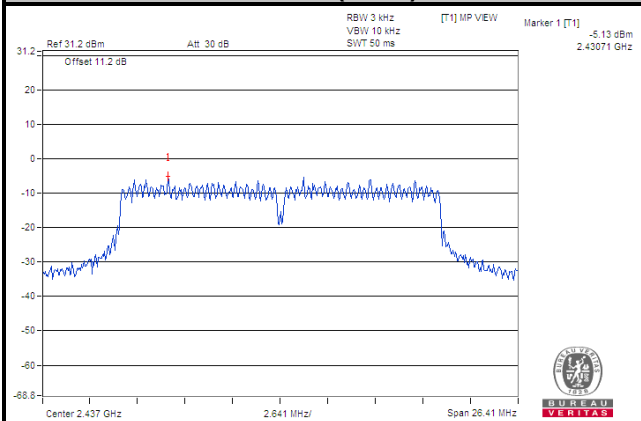
#### 802.11b



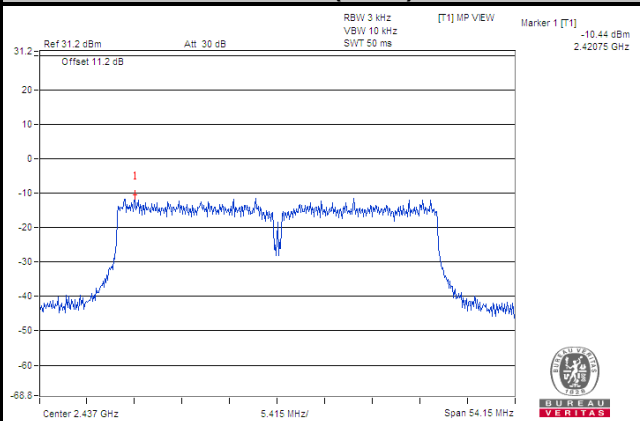
#### 802.11g



#### 802.11n (HT20)



#### 802.11n (HT40)

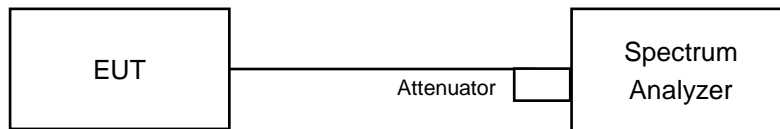


## 4.6 Conducted Out of Band Emission Measurement

### 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

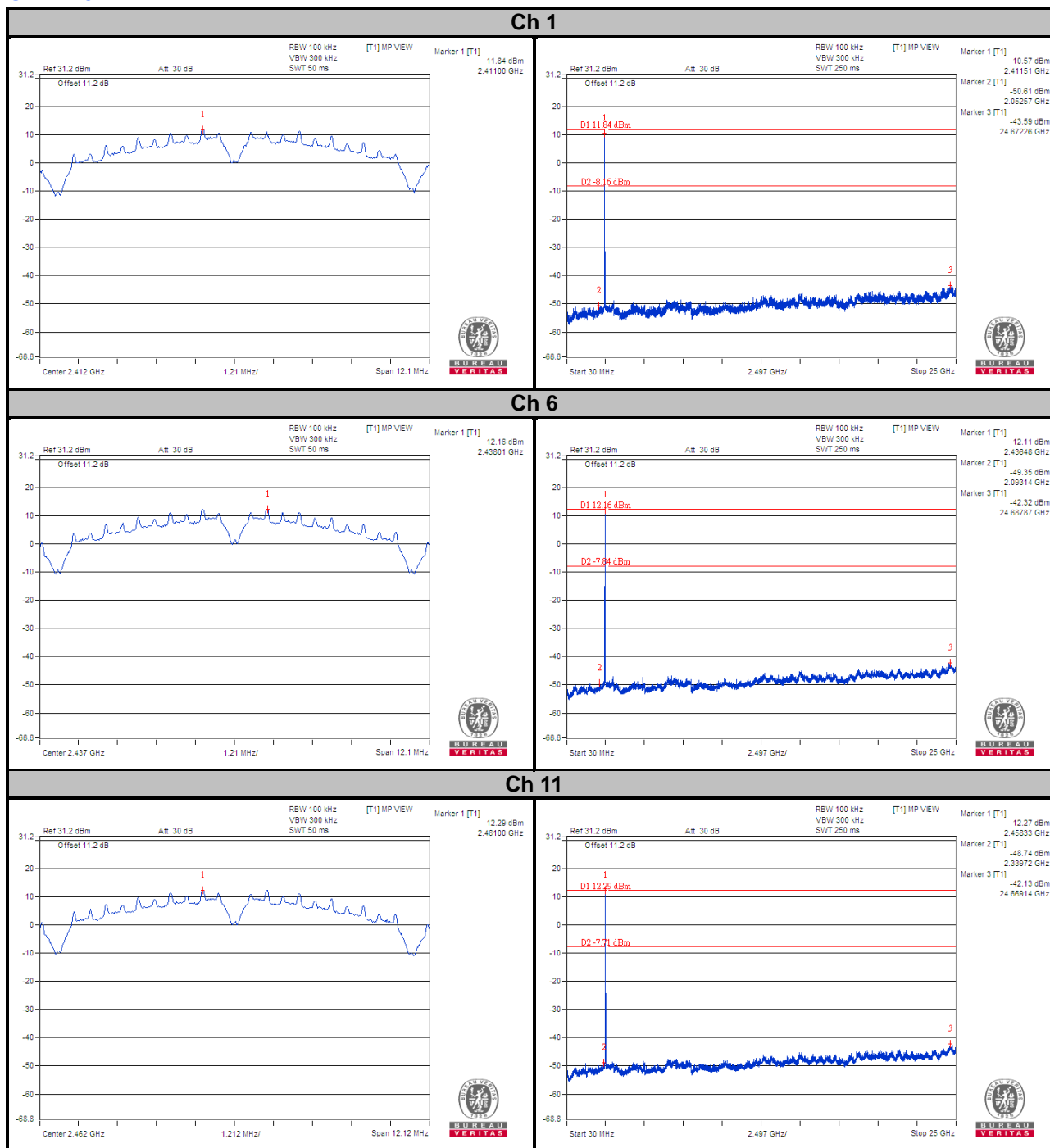
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.6.7 Test Results

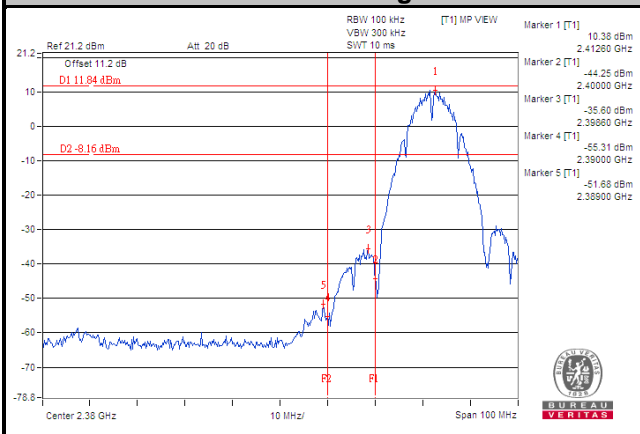
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

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.

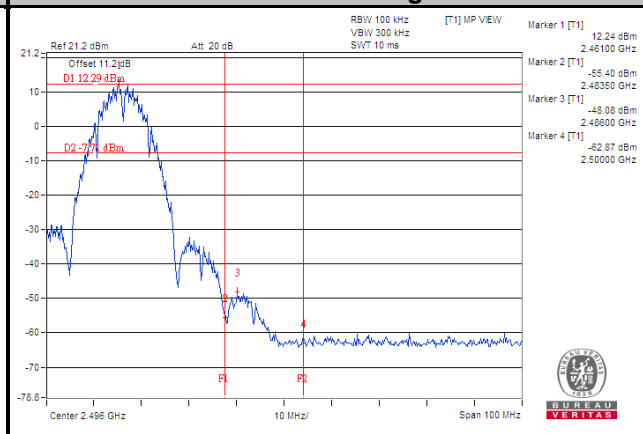
### 802.11b CHAIN 0



### Ch 1 Band Edge



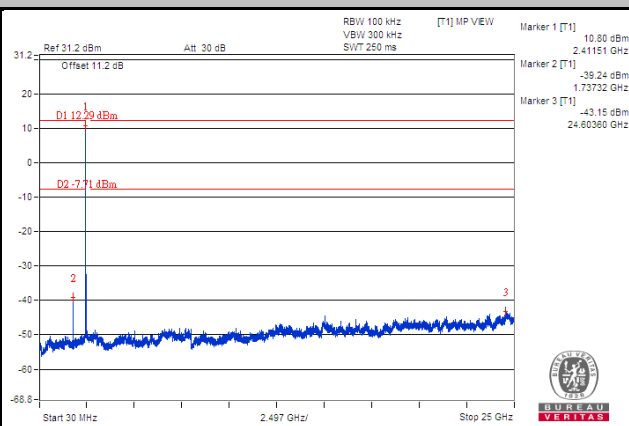
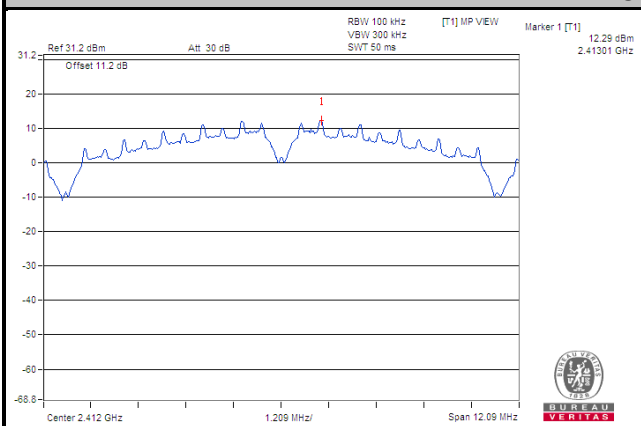
### Ch 11 Band Edge



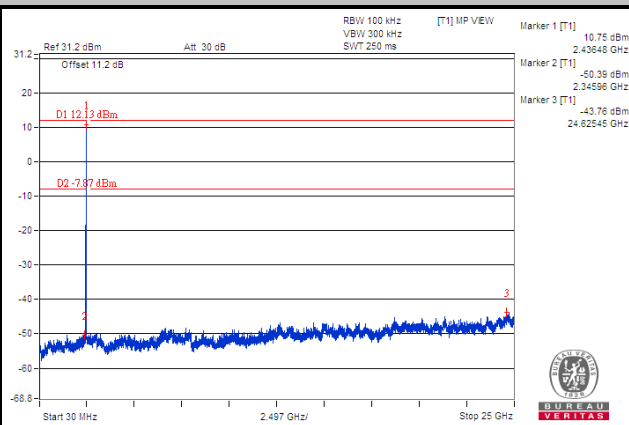
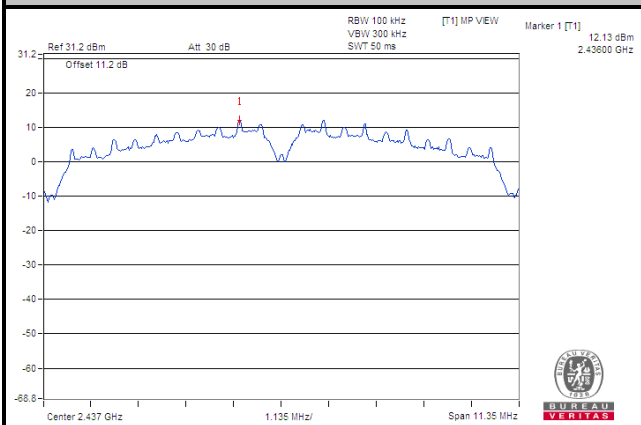


# CHAIN 1

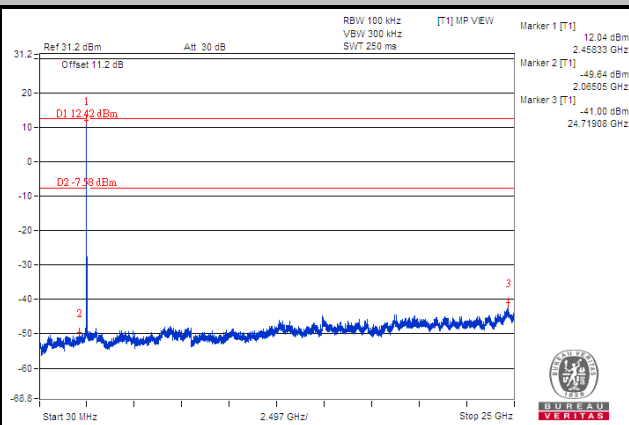
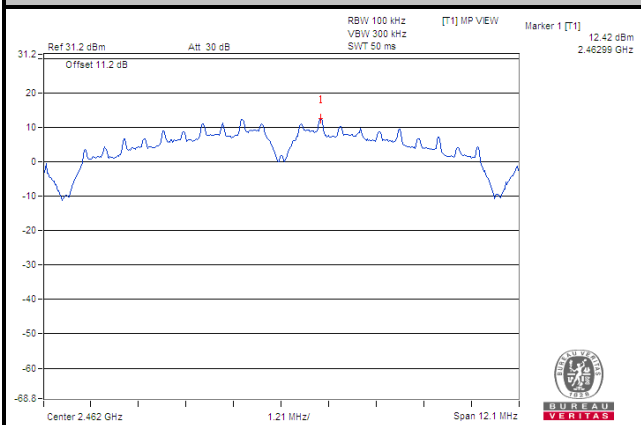
## Ch 1

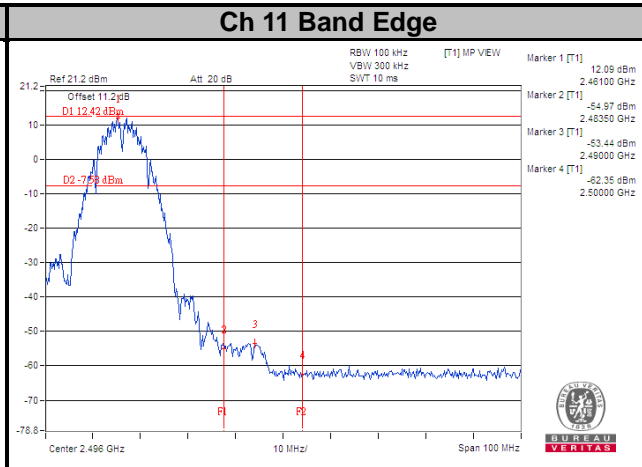
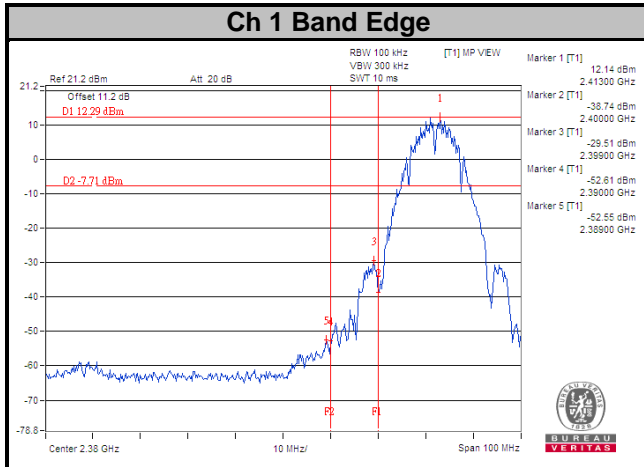


## Ch 6



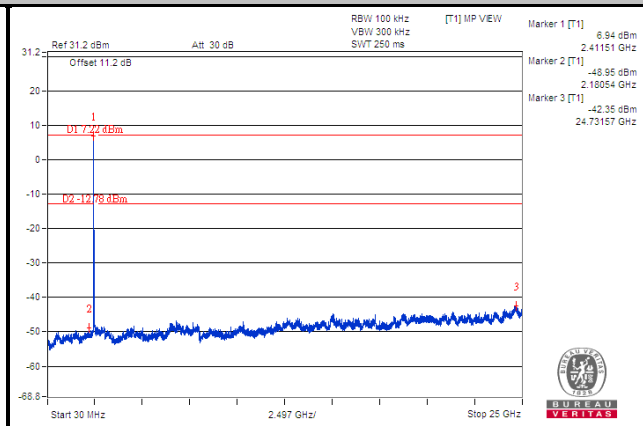
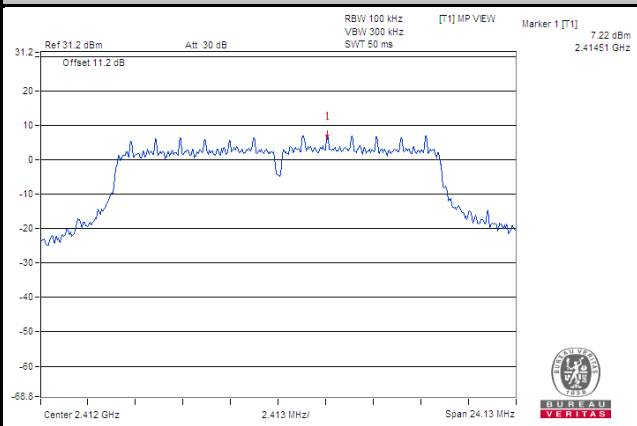
## Ch 11



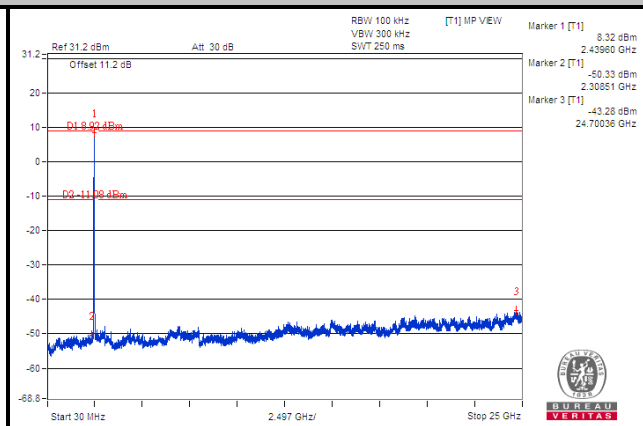
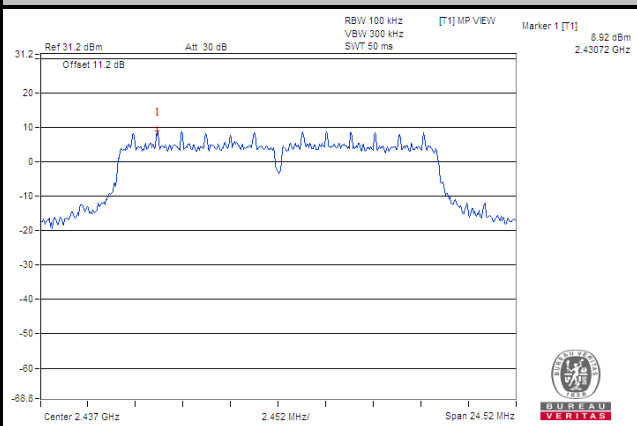


802.11g  
CHAIN 0

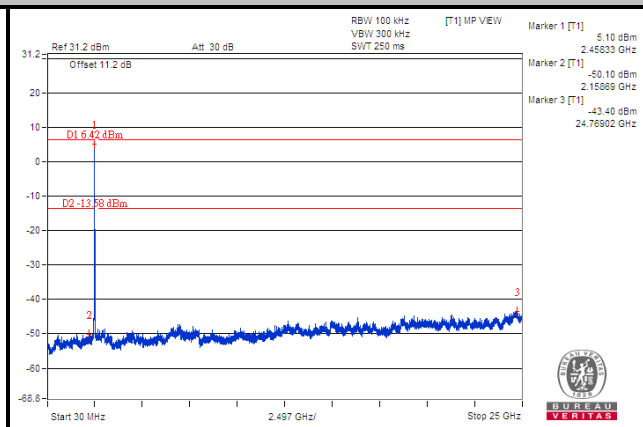
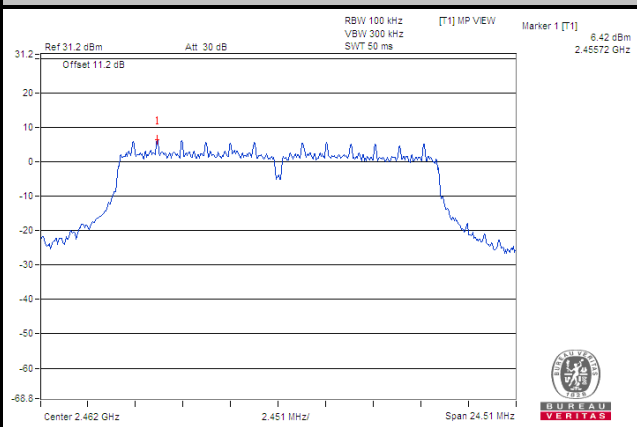
Ch 1



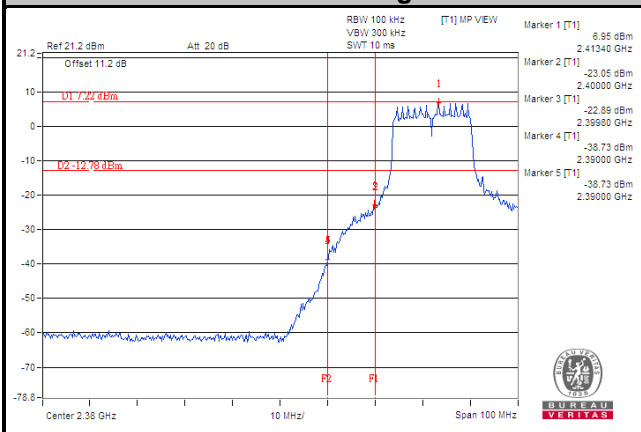
Ch 6



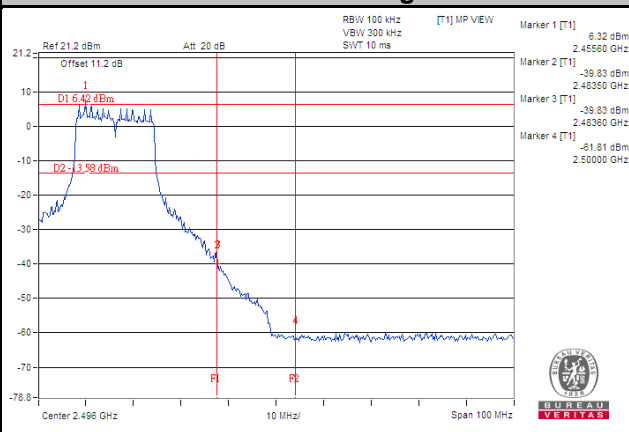
Ch 11



### Ch 1 Band Edge

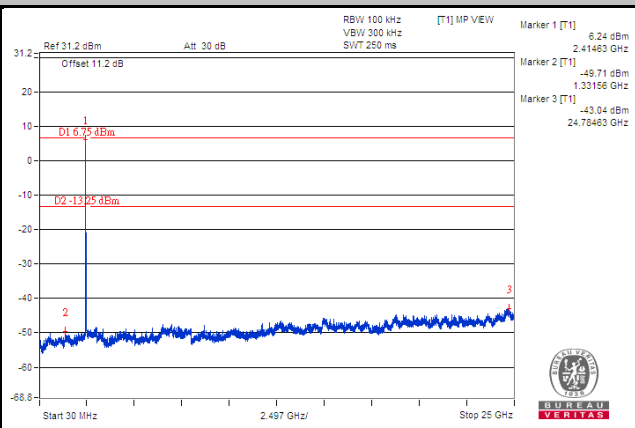
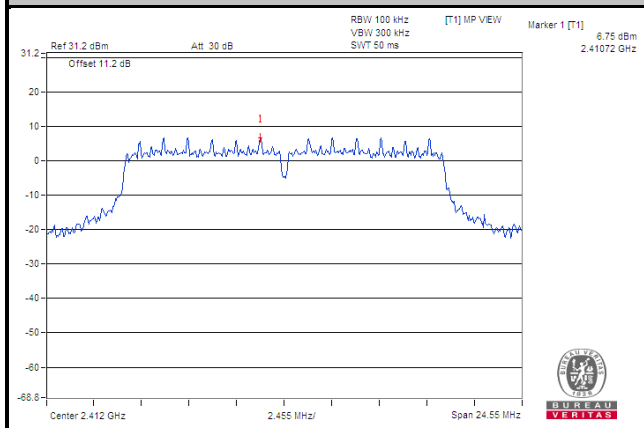


### Ch 11 Band Edge

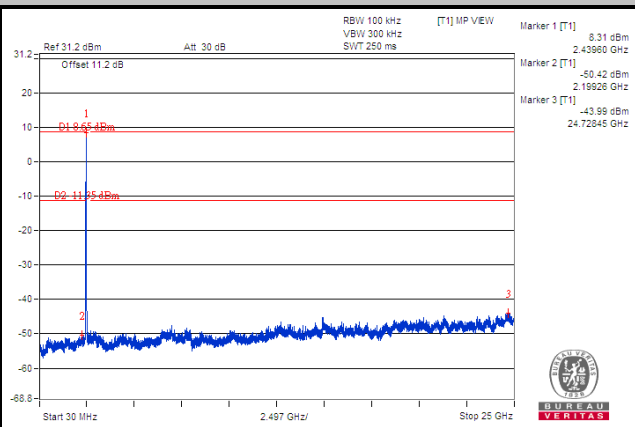
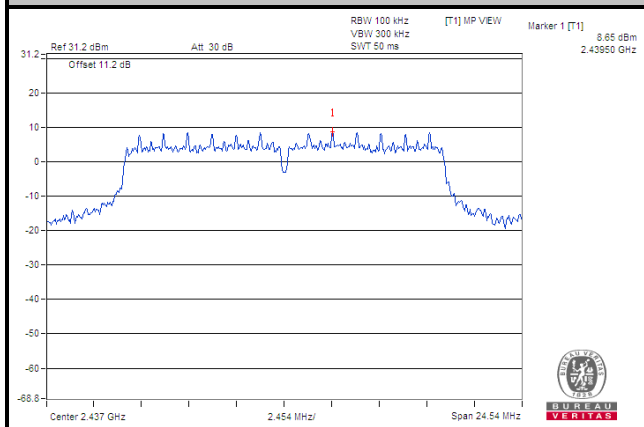


# CHAIN 1

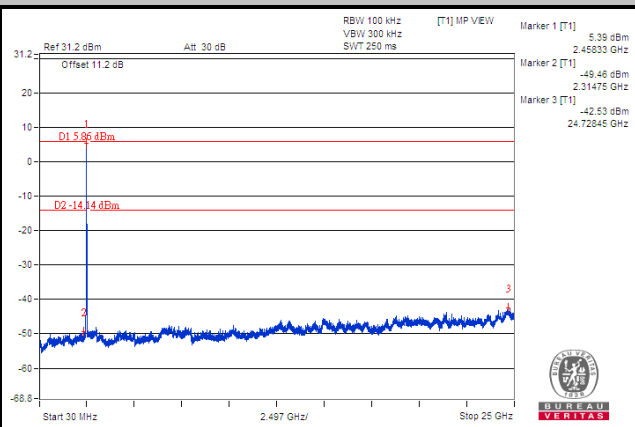
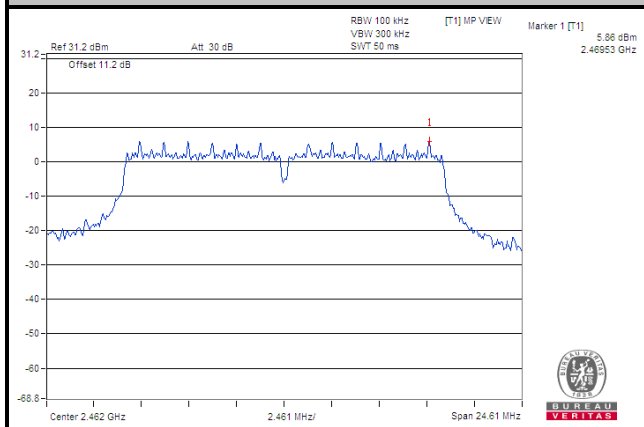
## Ch 1



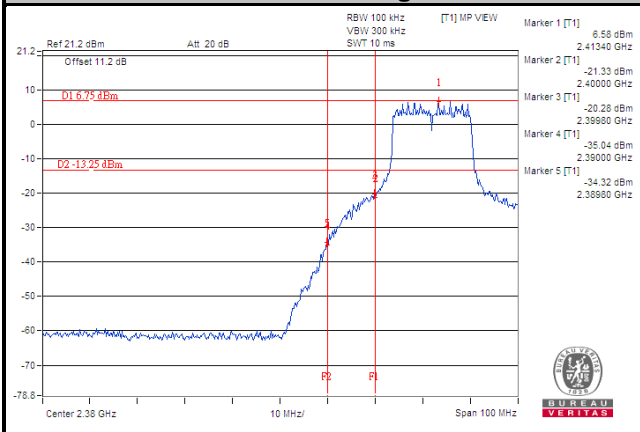
## Ch 6



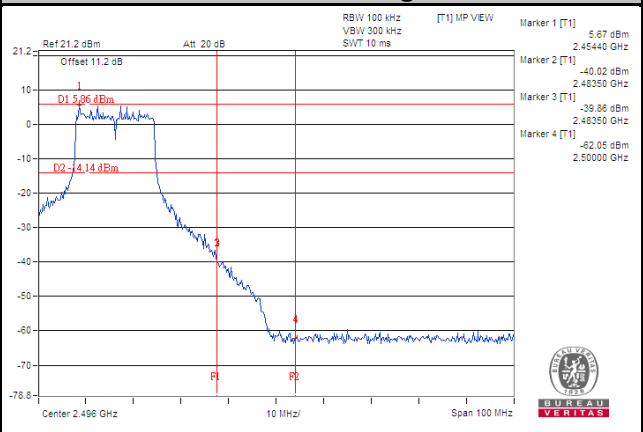
## Ch 11



### Ch 1 Band Edge

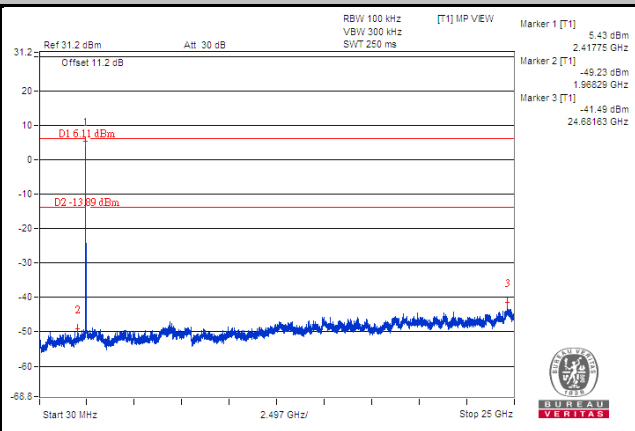
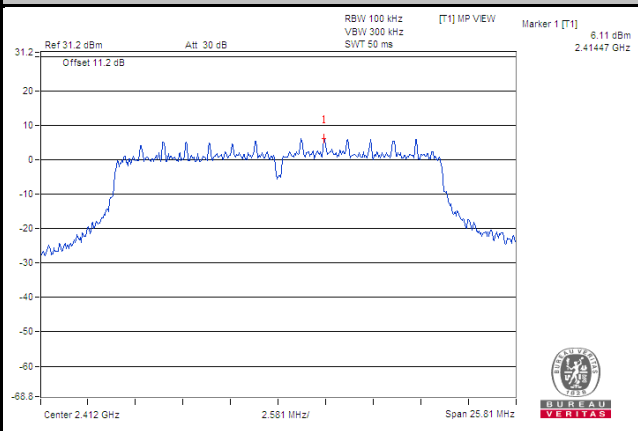


### Ch 11 Band Edge

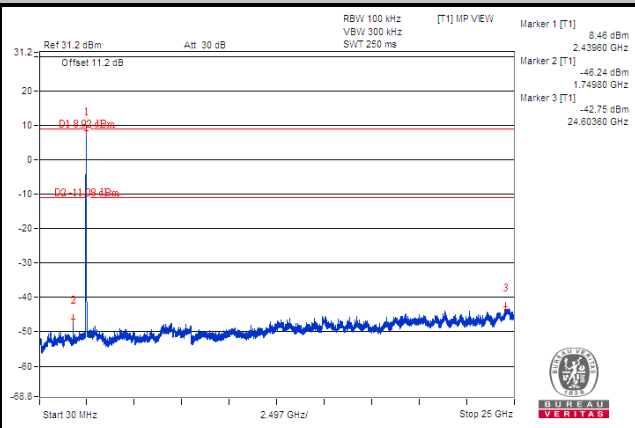
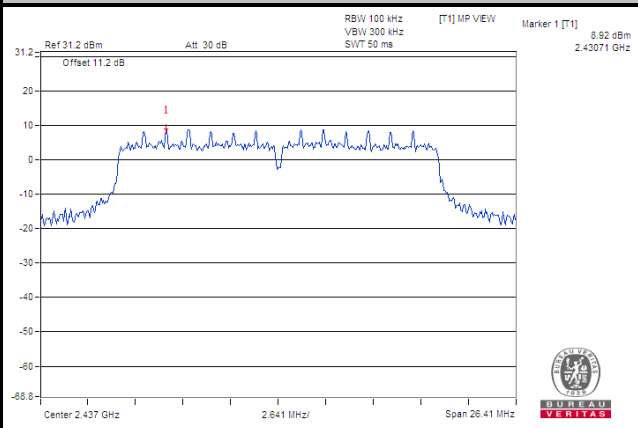


802.11n (HT20)  
CHAIN 0

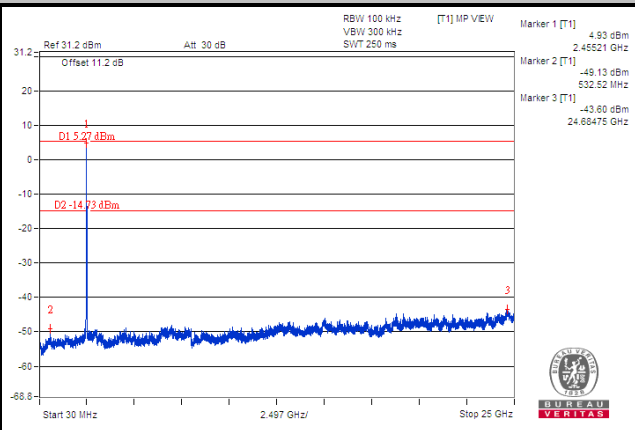
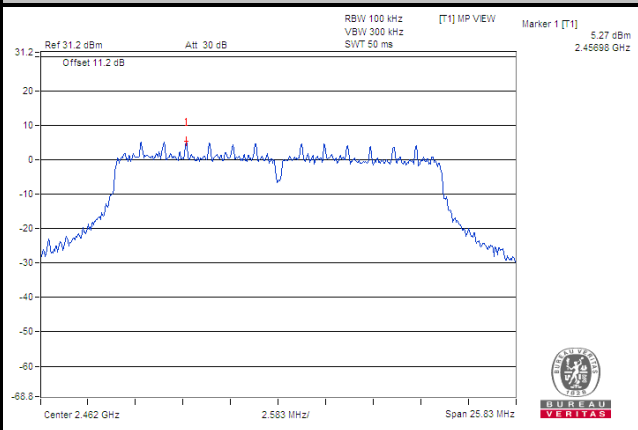
Ch 1



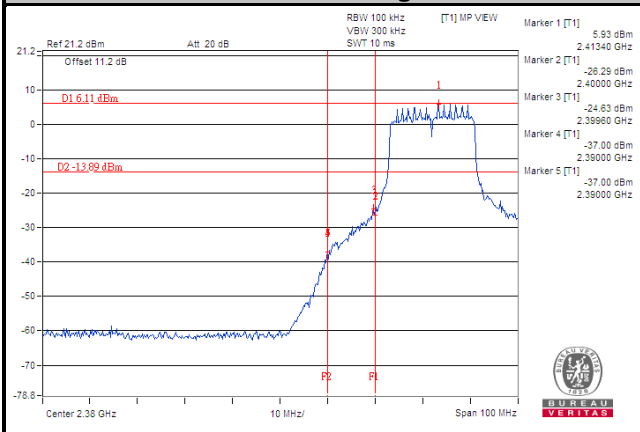
Ch 6



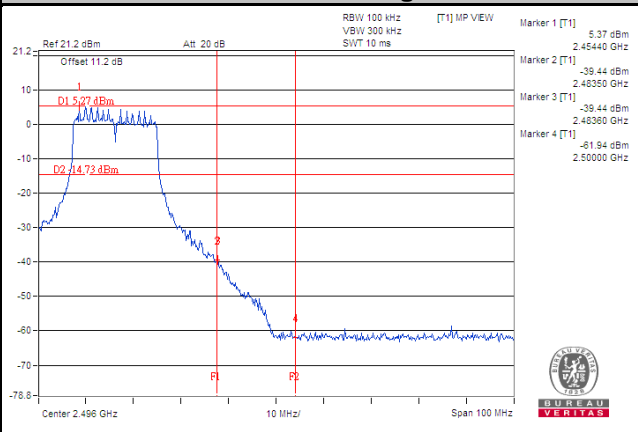
Ch 11



### Ch 1 Band Edge



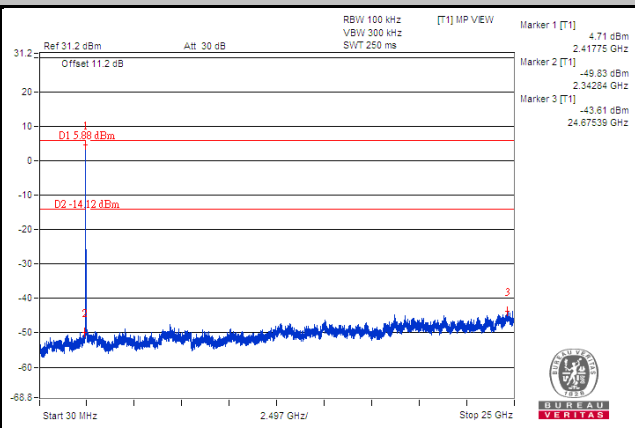
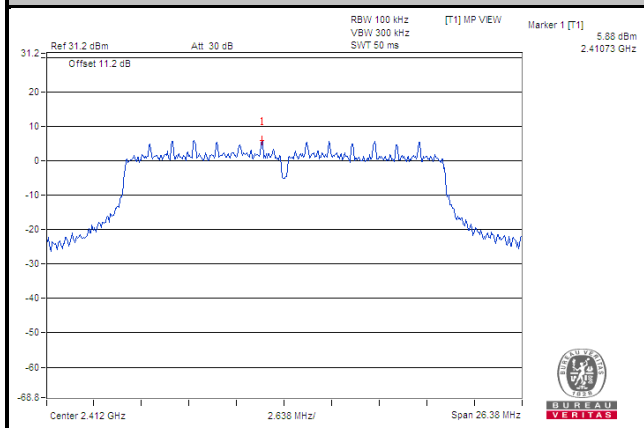
### Ch 11 Band Edge



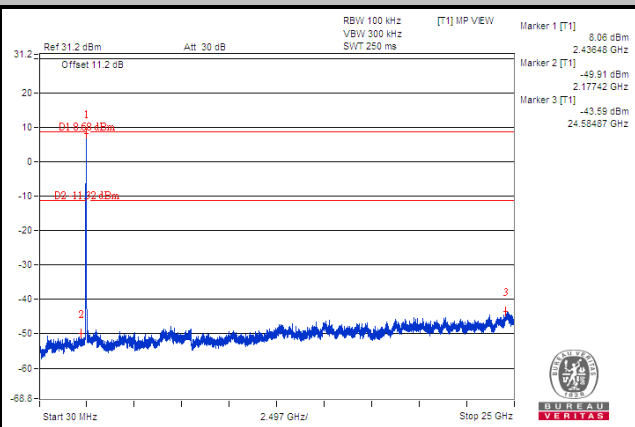
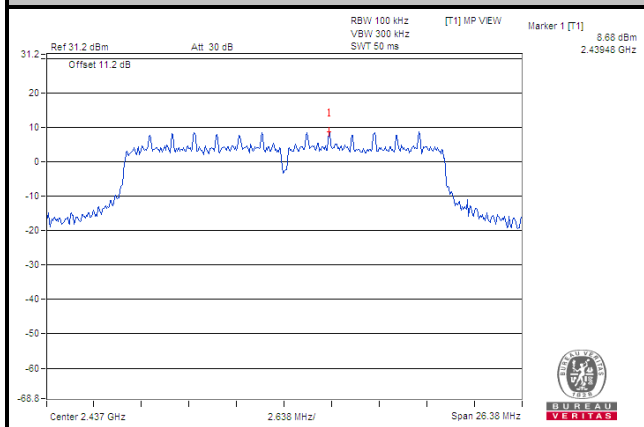


# CHAIN 1

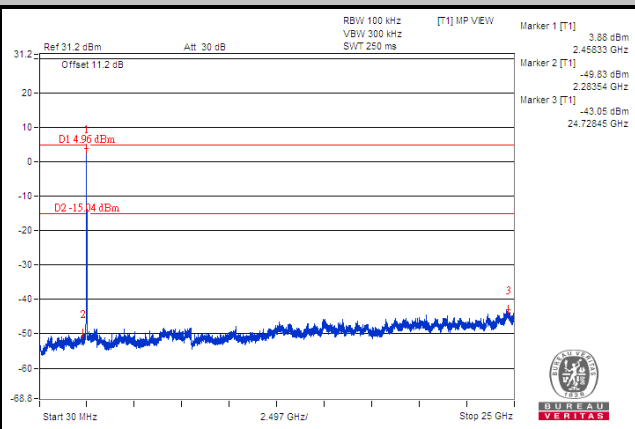
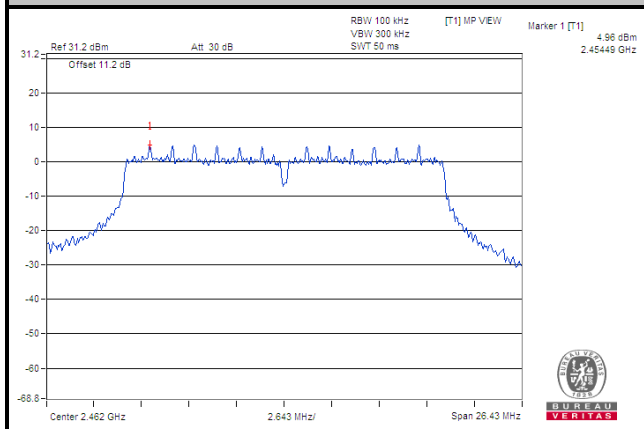
## Ch 1



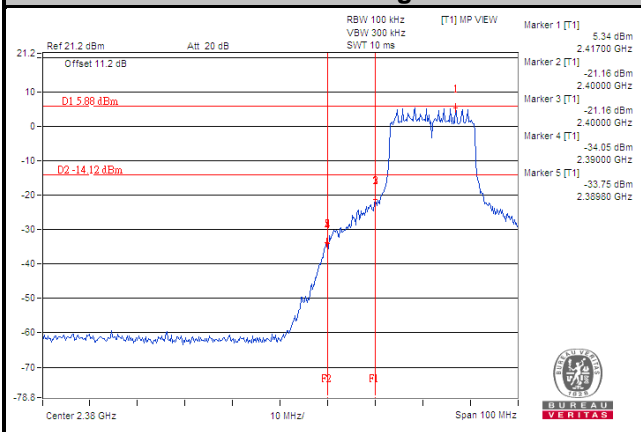
## Ch 6



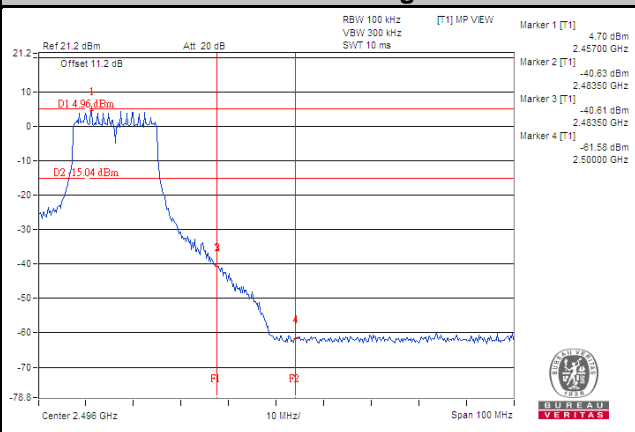
## Ch 11



### Ch 1 Band Edge

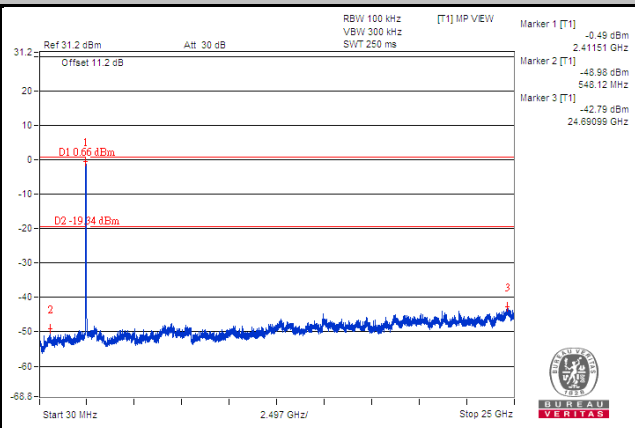
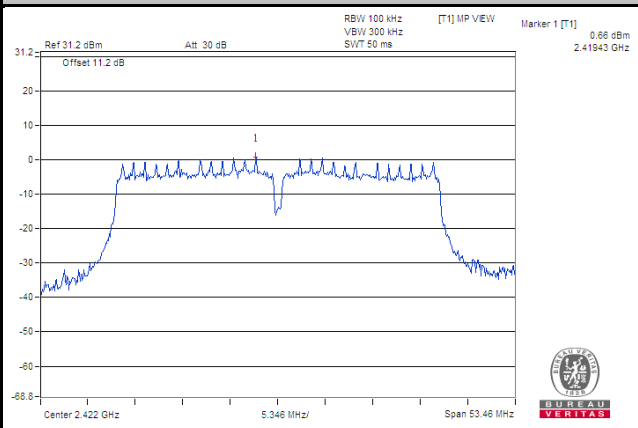


### Ch 11 Band Edge

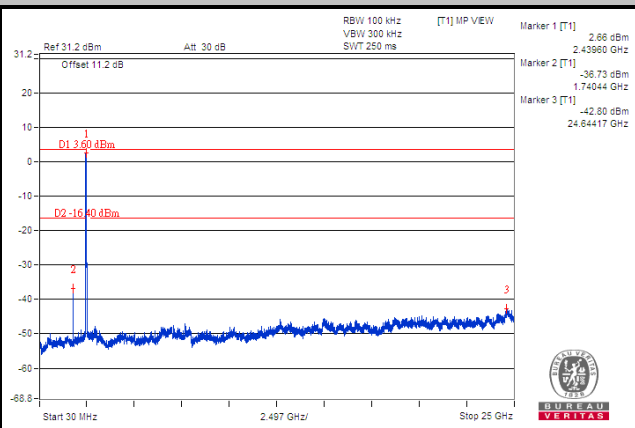
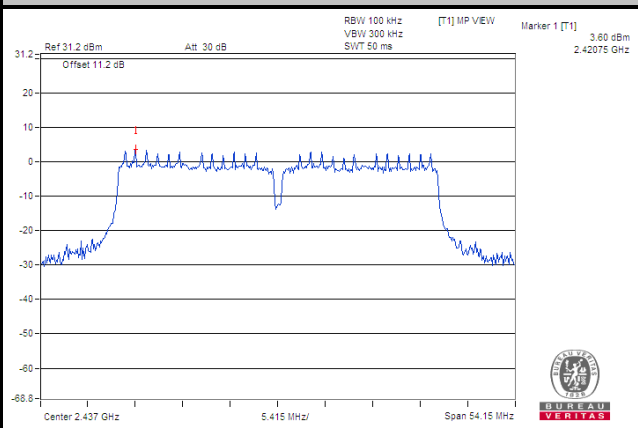


**802.11n (HT40)**  
**CHAIN 0**

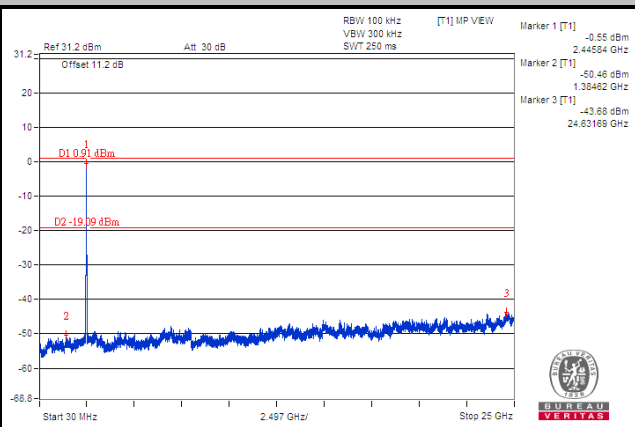
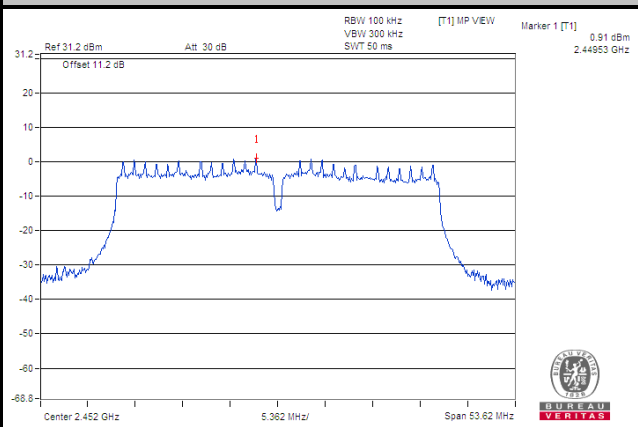
**Ch 3**



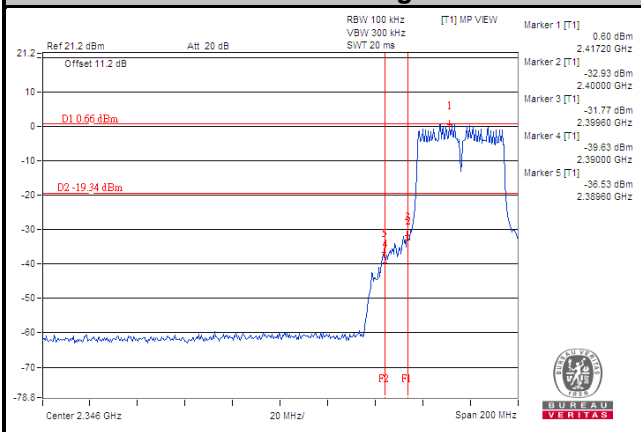
**Ch 6**



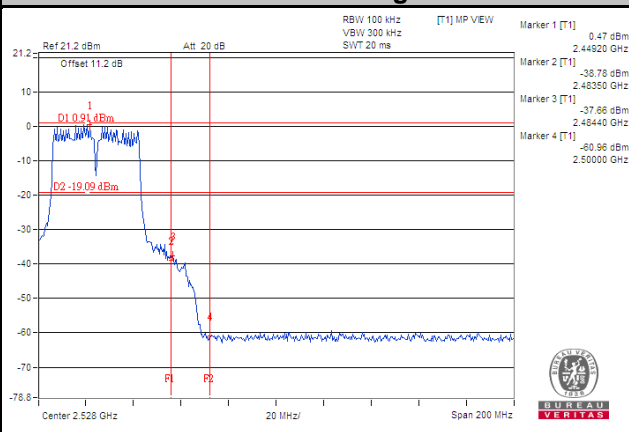
**Ch 9**



### Ch 3 Band Edge

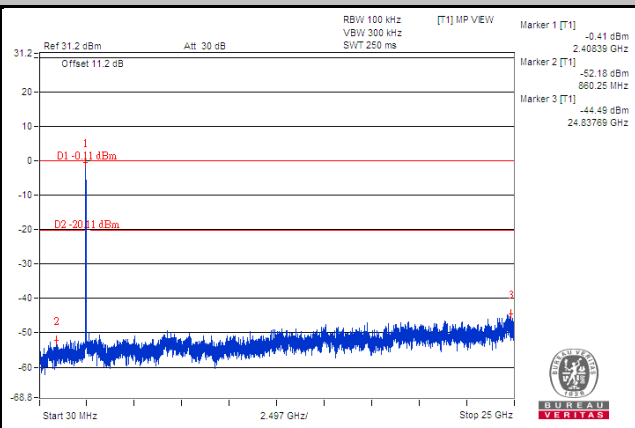
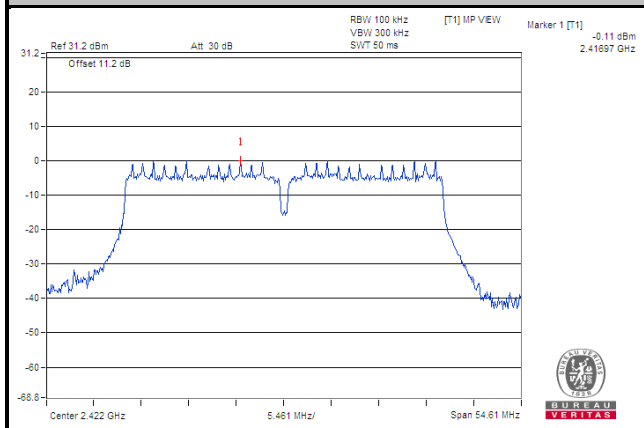


### Ch 9 Band Edge

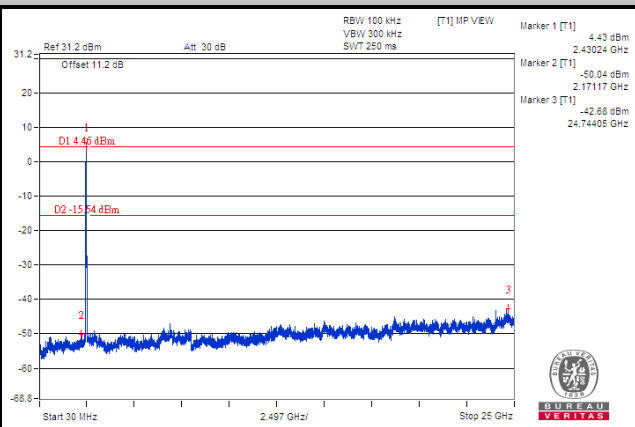
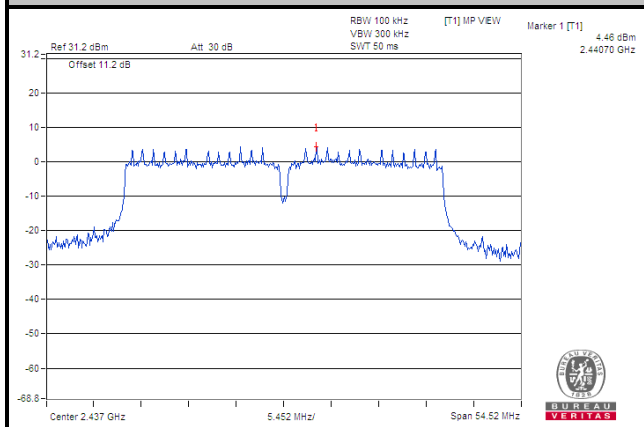


# CHAIN 1

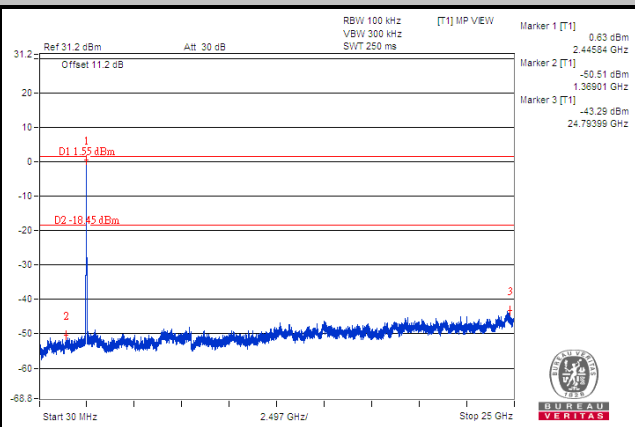
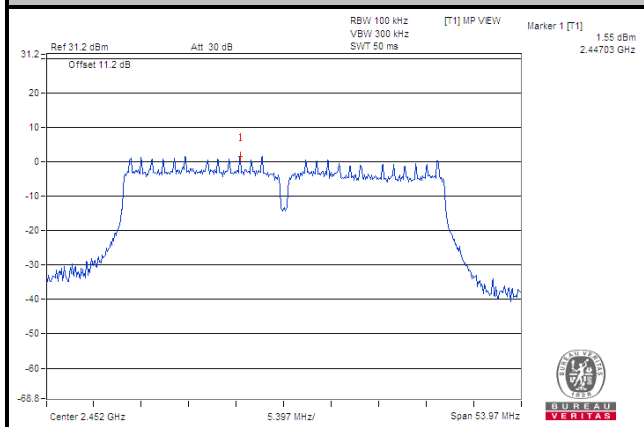
## Ch 3



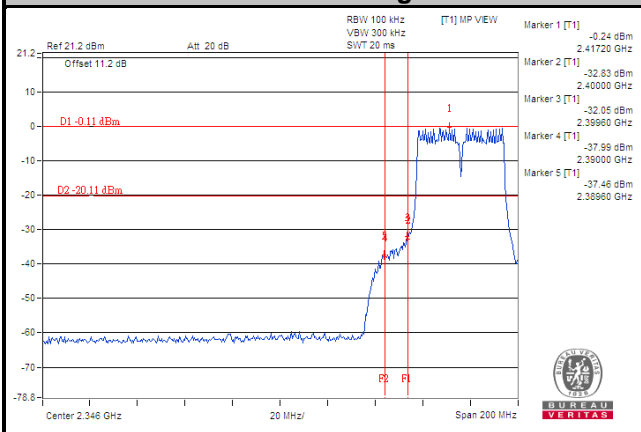
## Ch 6



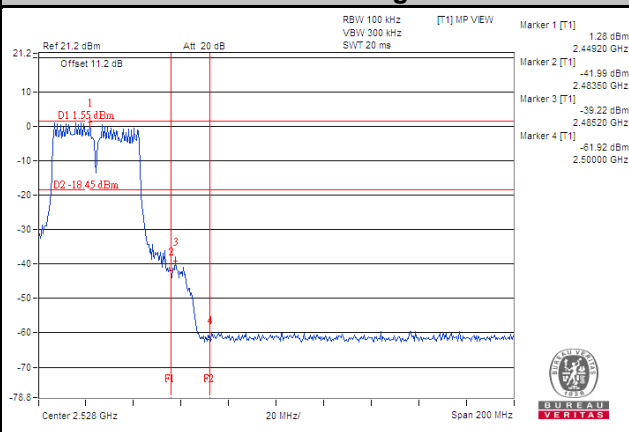
## Ch 9



### Ch 3 Band Edge



### Ch 9 Band Edge



## 5 Pictures of Test Arrangements

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

## Appendix – Information of 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 FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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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.

--- END ---