

FCC Test Report (WLAN)

Report No.: RF171130C28

FCC ID: HD5-CN80L0N

Test Model: CN80L0N

Received Date: Dec. 04, 2017

Test Date: Jan. 24 to 25, 2018

Issued Date: Feb. 23, 2018

Applicant: Honeywell International Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan
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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF171130C28	Original release.	Feb. 23, 2018

1 Certificate of Conformity

Product: Dolphin CN80

Brand: Honeywell

Test Model: CN80L0N

Sample Status: ENGINEERING SAMPLE

Applicant: Honeywell International Inc.

Test Date: Jan. 24 to 25, 2018

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 : Mary Ko, **Date:** Feb. 23, 2018
Mary Ko / Specialist

Approved by : May Chen, **Date:** Feb. 23, 2018
May Chen / Manager

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 -3.5dB at 4824.00MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB 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	Antenna connector is POGO pin not a standard connector.

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	30MHz ~ 1GHz	5.53 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	6GHz ~ 18GHz	4.98 dB
	18GHz ~ 40GHz	5.19 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	Dolphin CN80
Brand	Honeywell
Test Model	CN80L0N
Status of EUT	ENGINEERING SAMPLE
HW Version	Rev 1.1
HW P/N	DVT1
SW Version	351D
SW P/N	351D
Power Supply Rating	3.85Vdc from battery
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.50 ~ 5.72GHz, 5.745 ~ 5.825GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 25 802.11n (HT40), 802.11ac (VHT40): 12 802.11ac (VHT80): 6
Output Power	2.4GHz: 403.711mW 5GHz: 5.18 ~ 5.24GHz: 52.558mW 5.26 ~ 5.32GHz: 52.889mW 5.50 ~ 5.72GHz: 85.088mW 5.745 ~ 5.825GHz: 84.701mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x 1 Touch pen x 1
Data Cable Supplied	NA

Note:

- All Scanners are listed as below.

Item	Model	Difference
Scanner	EX20	20.53 mm (L) x 7.8 mm (W) x 3.97 mm (H) (8.08 in x 3.07 in x 1.56 in) Weight: 500 grams (17.6 oz) with battery pack
	N6603ER	20.4 mm (L) x 7.8 mm (W) x 3.32 mm (H) (8.03 in x 3.07 in x 1.31 in) Weight: 550 grams (19.4 oz) with battery pack

* All scanners are appearance and size different.

2. There are WLAN, Bluetooth, Zigbee and NFC technology used for the EUT. The EUT has three radios as following table:

Radio 1	Radio 2	Radio 3
WLAN+BT 1	Zigbee+BT 2	NFC

Note: For Bluetooth technology the Radio 1 support BT 5.0 dual mode, the Radio 2 support BT-LE (4.2) single mode only

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

Sample A: Short K/B-number + Scanner (EX20)

Sample B: Short K/B-Qwety + Scanner (EX20)

Sample C: Short K/B-number + Scanner (N6603ER)

Sample D: Short K/B-Qwenty + Scanner (N6603ER)

From the above samples, the worst cases were found in **Sample C**. Therefore only the test data of the mode was recorded in this report.

4. Simultaneously transmission condition.

Condition	Technology		
1	WLAN 2.4GHz	NFC	Zigbee
2	WLAN 5GHz	NFC	Zigbee
3	Bluetooth	NFC	Zigbee

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

5. The EUT needs to be supplied from battery, the information is as below table:

Brand	Model No.	Spec.
Inventus Power, Inc. / Honeywell	CW-BAT	3.85Vdc, 5800mAh, 22.3Wh

6. The antennas provided to the EUT, please refer to the following table:

Radio 1					
WLAN Antenna Spec. / Bluetooth Antenna No. 1 Spec.					
Chain No.	Antenna Gain include trace loss and cable loss (dBi)	Frequency range (GHz)	Antenna type	Connector type	Trace loss and cable loss (dB)
Chain 0	-0.38	2.4~2.4835	PIFA	POGO pin	1.6
	-0.39	5.15~5.25			3
	-0.39	5.25~5.35			
	-0.39	5.47~5.725			
	-0.39	5.725~5.85			
Chain 1	3.36	2.4~2.4835	PIFA	POGO pin	0.6
	3.46	5.15~5.25			1.2
	3.46	5.25~5.35			
	3.46	5.47~5.725			
	3.46	5.725~5.85			
Radio 2					
Bluetooth Antenna No. 2 Spec. / Zigbee Antenna Spec.					
Antenna Gain include trace loss (dBi)	Frequency range (GHz)	Antenna type	Connector type	Trace loss (dB)	
-0.03	2.4~2.4835	PIFA	POGO pin	0.8	
Radio 3					
NFC Antenna Spec.					
Frequency range (MHz)		Antenna type		Connector type	
13~14		Loop		NA	

7. The EUT incorporates a MIMO function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 Nss=1	2TX	2RX
	MCS0~8 Nss=2	2TX	2RX
802.11ac (VHT40)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
802.11ac (VHT80)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX

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

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 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
APCM: Antenna Port Conducted Measurement

NOTE: 1. No need to concern of Conducted Emission due to 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 **Z-plane (below 1GHz) & X-plane (above 1GHz)**.

Radiated Emission Test (Above 1GHz):

- ☒ 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Radiated Emission Test (Below 1GHz):

- ☒ 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	11	OFDM	BPSK	6.5

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	26deg. C, 70%RH	DC 3.85V	Weiwei Lo
RE<1G	24deg. C, 68%RH	DC 3.85V	Weiwei Lo
APCM	25deg. C, 60%RH	DC 3.85V	Jyunchun Lin

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11b: Duty cycle = $12.262/12.381 = 0.99$

802.11g: Duty cycle = $2.026/2.135 = 0.949$, Duty factor = $10 \cdot \log(1/0.949) = 0.23$

802.11n (HT20): Duty cycle = $1.889/1.996 = 0.946$, Duty factor = $10 \cdot \log(1/0.946) = 0.24$

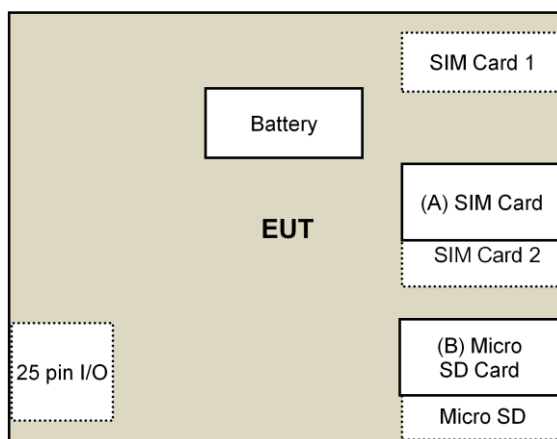


3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	SIM Card	NA	NA	NA	NA	Supplied by client
B.	SD Card	NA	NA	NA	NA	Supplied by client

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 DTS Meas Guidance v04
KDB 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 20dB 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 1000MHz, 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 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Loop Antenna ^(*) TESEQ	HLA 6121	45745	May 19, 2017	May 18, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980385	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Pre-Amplifier EMCI	EMC184045SE	980387	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 11, 2018	Jan. 10, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Spectrum Analyzer R&S	FSV40	100964	July 1, 2017	June 30, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018

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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. Loop antenna was used for all emissions below 30 MHz.
5. The CANADA Site Registration No. is 20331-1
6. Tested Date: Jan. 24 to 25, 2018

4.1.3 Test Procedures

For Radiated emission below 30MHz

- 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. Both X and Y axes 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 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 detect 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:

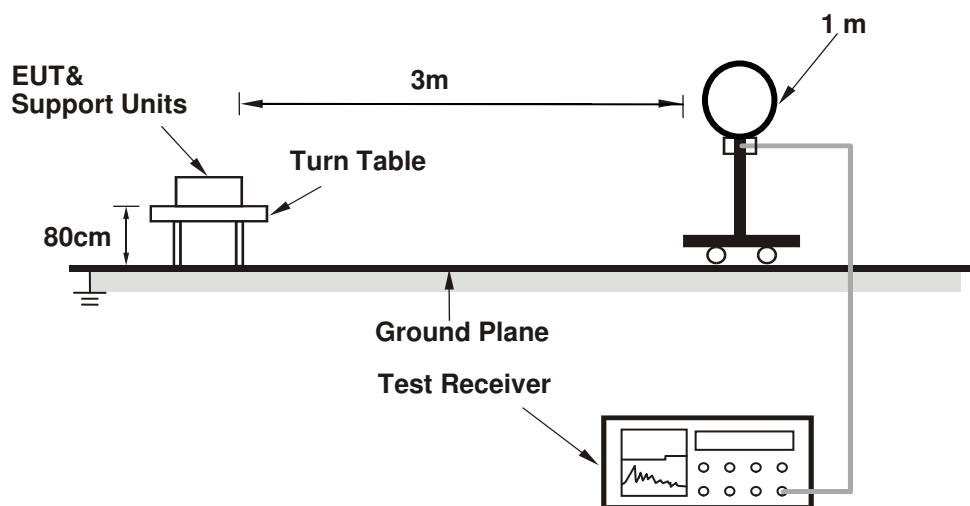
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

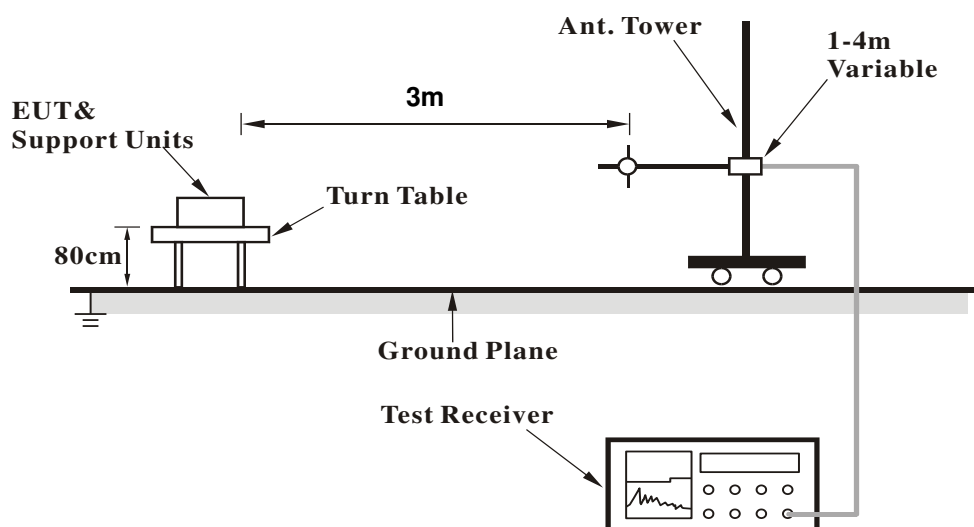
No deviation.

4.1.5 Test Setup

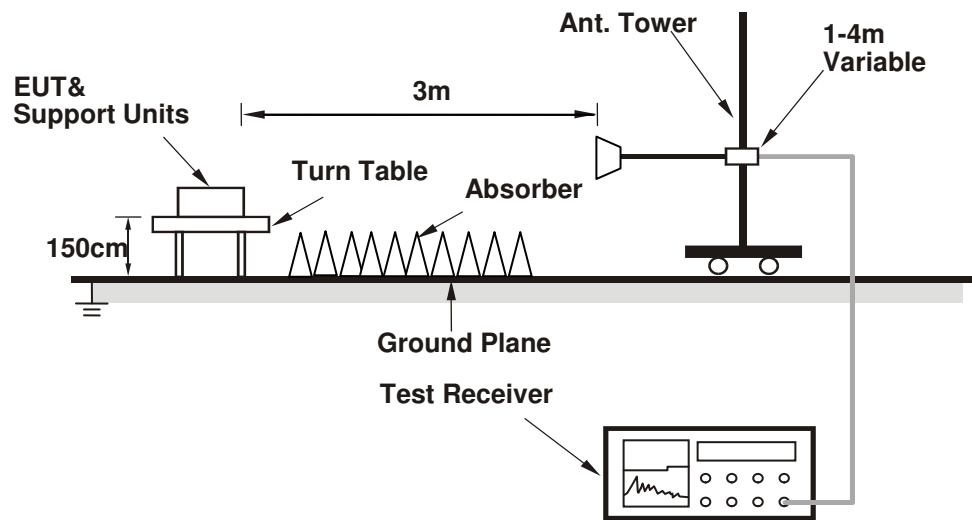
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Controlling software (QRCT.exe V3.0.268.0) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data:

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.7 PK	74.0	-16.3	1.25 H	343	58.9	-1.2
2	2390.00	42.6 AV	54.0	-11.4	1.25 H	343	43.8	-1.2
3	*2412.00	108.8 PK			1.25 H	343	110.1	-1.3
4	*2412.00	106.3 AV			1.25 H	343	107.6	-1.3
5	4824.00	49.8 PK	74.0	-24.2	1.79 H	213	46.7	3.1
6	4824.00	48.2 AV	54.0	-5.8	1.79 H	213	45.1	3.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.8 PK	74.0	-17.2	1.47 V	279	58.0	-1.2
2	2390.00	36.2 AV	54.0	-17.8	1.47 V	279	37.4	-1.2
3	*2412.00	107.6 PK			1.47 V	279	108.9	-1.3
4	*2412.00	104.3 AV			1.47 V	279	105.6	-1.3
5	4824.00	52.6 PK	74.0	-21.4	1.40 V	77	49.5	3.1
6	4824.00	50.5 AV	54.0	-3.5	1.40 V	77	47.4	3.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.2 PK	74.0	-18.8	1.31 H	360	56.4	-1.2
2	2390.00	34.2 AV	54.0	-19.8	1.31 H	360	35.4	-1.2
3	*2437.00	108.6 PK			1.31 H	360	110.2	-1.6
4	*2437.00	106.1 AV			1.31 H	360	107.7	-1.6
5	2483.50	58.4 PK	74.0	-15.6	1.31 H	360	59.9	-1.5
6	2483.50	33.9 AV	54.0	-20.1	1.31 H	360	35.4	-1.5
7	4874.00	49.5 PK	74.0	-24.5	1.76 H	205	46.3	3.2
8	4874.00	47.9 AV	54.0	-6.1	1.76 H	205	44.7	3.2
9	7311.00	43.0 PK	74.0	-31.0	2.24 H	219	34.1	8.9
10	7311.00	33.8 AV	54.0	-20.2	2.24 H	219	24.9	8.9

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	44.9 PK	74.0	-29.1	1.41 V	342	46.1	-1.2
2	2390.00	33.7 AV	54.0	-20.3	1.41 V	342	34.9	-1.2
3	*2437.00	107.4 PK			1.41 V	342	109.0	-1.6
4	*2437.00	103.9 AV			1.41 V	342	105.5	-1.6
5	2483.50	45.2 PK	74.0	-28.8	1.41 V	342	46.7	-1.5
6	2483.50	33.2 AV	54.0	-20.8	1.41 V	342	34.7	-1.5
7	4874.00	52.4 PK	74.0	-21.6	1.38 V	83	49.2	3.2
8	4874.00	50.5 AV	54.0	-3.5	1.38 V	83	47.3	3.2
9	7311.00	42.4 PK	74.0	-31.6	1.62 V	319	33.5	8.9
10	7311.00	30.2 AV	54.0	-23.8	1.62 V	319	21.3	8.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	108.7 PK			1.31 H	346	110.3	-1.6
2	*2462.00	106.4 AV			1.31 H	346	108.0	-1.6
3	2483.50	58.4 PK	74.0	-15.6	1.31 H	346	59.9	-1.5
4	2483.50	43.1 AV	54.0	-10.9	1.31 H	346	44.6	-1.5
5	4924.00	49.8 PK	74.0	-24.2	1.74 H	208	46.5	3.3
6	4924.00	48.3 AV	54.0	-5.7	1.74 H	208	45.0	3.3
7	7386.00	42.9 PK	74.0	-31.1	2.25 H	219	33.7	9.2
8	7386.00	33.8 AV	54.0	-20.2	2.25 H	219	24.6	9.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	108.0 PK			1.22 V	313	109.6	-1.6
2	*2462.00	104.7 AV			1.22 V	313	106.3	-1.6
3	2483.50	56.9 PK	74.0	-17.1	1.22 V	313	58.4	-1.5
4	2483.50	39.5 AV	54.0	-14.5	1.22 V	313	41.0	-1.5
5	4924.00	52.4 PK	74.0	-21.6	1.36 V	93	49.1	3.3
6	4924.00	50.4 AV	54.0	-3.6	1.36 V	93	47.1	3.3
7	7386.00	42.3 PK	74.0	-31.7	1.65 V	320	33.1	9.2
8	7386.00	30.3 AV	54.0	-23.7	1.65 V	320	21.1	9.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.1 PK	74.0	-4.9	1.26 H	58	70.3	-1.2
2	2390.00	49.5 AV	54.0	-4.5	1.26 H	58	50.7	-1.2
3	*2412.00	109.9 PK			1.26 H	58	111.2	-1.3
4	*2412.00	100.0 AV			1.26 H	58	101.3	-1.3
5	4824.00	43.3 PK	74.0	-30.7	1.16 H	36	40.2	3.1
6	4824.00	30.8 AV	54.0	-23.2	1.16 H	36	27.7	3.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.6 PK	74.0	-7.4	1.89 V	284	67.8	-1.2
2	2390.00	45.6 AV	54.0	-8.4	1.89 V	284	46.8	-1.2
3	*2412.00	103.2 PK			1.89 V	284	104.5	-1.3
4	*2412.00	94.4 AV			1.89 V	284	95.7	-1.3
5	4824.00	45.9 PK	74.0	-28.1	2.03 V	302	42.8	3.1
6	4824.00	34.9 AV	54.0	-19.1	2.03 V	302	31.8	3.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.8 PK	74.0	-19.2	1.27 H	72	56.0	-1.2
2	2390.00	34.1 AV	54.0	-19.9	1.27 H	72	35.3	-1.2
3	*2437.00	109.6 PK			1.27 H	72	111.2	-1.6
4	*2437.00	99.9 AV			1.27 H	72	101.5	-1.6
5	2483.50	58.6 PK	74.0	-15.4	1.27 H	72	60.1	-1.5
6	2483.50	34.3 AV	54.0	-19.7	1.27 H	72	35.8	-1.5
7	4874.00	43.6 PK	74.0	-30.4	1.16 H	25	40.4	3.2
8	4874.00	31.1 AV	54.0	-22.9	1.16 H	25	27.9	3.2
9	7311.00	40.9 PK	74.0	-33.1	1.60 H	201	32.0	8.9
10	7311.00	30.0 AV	54.0	-24.0	1.60 H	201	21.1	8.9

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	48.8 PK	74.0	-25.2	1.88 V	296	50.0	-1.2
2	2390.00	35.5 AV	54.0	-18.5	1.88 V	296	36.7	-1.2
3	*2437.00	103.9 PK			1.88 V	296	105.5	-1.6
4	*2437.00	95.0 AV			1.88 V	296	96.6	-1.6
5	2483.50	53.2 PK	74.0	-20.8	1.88 V	296	54.7	-1.5
6	2483.50	34.3 AV	54.0	-19.7	1.88 V	296	35.8	-1.5
7	4874.00	45.5 PK	74.0	-28.5	2.03 V	302	42.3	3.2
8	4874.00	34.7 AV	54.0	-19.3	2.03 V	302	31.5	3.2
9	7311.00	40.9 PK	74.0	-33.1	1.69 V	134	32.0	8.9
10	7311.00	29.6 AV	54.0	-24.4	1.69 V	134	20.7	8.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	109.6 PK			1.29 H	67	111.2	-1.6
2	*2462.00	99.7 AV			1.29 H	67	101.3	-1.6
3	2483.50	67.5 PK	74.0	-6.5	1.29 H	67	69.0	-1.5
4	2483.50	47.9 AV	54.0	-6.1	1.29 H	67	49.4	-1.5
5	4924.00	43.6 PK	74.0	-30.4	1.17 H	36	40.3	3.3
6	4924.00	30.9 AV	54.0	-23.1	1.17 H	36	27.6	3.3
7	7386.00	41.5 PK	74.0	-32.5	1.56 H	212	32.3	9.2
8	7386.00	30.3 AV	54.0	-23.7	1.56 H	212	21.1	9.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	103.6 PK			1.43 V	320	105.2	-1.6
2	*2462.00	94.7 AV			1.43 V	320	96.3	-1.6
3	2483.50	66.6 PK	74.0	-7.4	1.43 V	320	68.1	-1.5
4	2483.50	45.7 AV	54.0	-8.3	1.43 V	320	47.2	-1.5
5	4924.00	45.6 PK	74.0	-28.4	2.02 V	308	42.3	3.3
6	4924.00	34.6 AV	54.0	-19.4	2.02 V	308	31.3	3.3
7	7386.00	41.6 PK	74.0	-32.4	1.66 V	122	32.4	9.2
8	7386.00	30.1 AV	54.0	-23.9	1.66 V	122	20.9	9.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11n (HT20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.5 PK	74.0	-6.5	1.53 H	234	68.7	-1.2
2	2390.00	43.9 AV	54.0	-10.1	1.53 H	234	45.1	-1.2
3	*2412.00	109.6 PK			1.53 H	234	110.9	-1.3
4	*2412.00	99.0 AV			1.53 H	234	100.3	-1.3
5	4824.00	44.2 PK	74.0	-29.8	1.13 H	33	41.1	3.1
6	4824.00	31.3 AV	54.0	-22.7	1.13 H	33	28.2	3.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.0 PK	74.0	-5.0	1.65 V	269	70.2	-1.2
2	2390.00	49.9 AV	54.0	-4.1	1.65 V	269	51.1	-1.2
3	*2412.00	107.5 PK			1.65 V	269	108.8	-1.3
4	*2412.00	96.4 AV			1.65 V	269	97.7	-1.3
5	4824.00	45.1 PK	74.0	-28.9	2.08 V	299	42.0	3.1
6	4824.00	34.3 AV	54.0	-19.7	2.08 V	299	31.2	3.1

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.2 PK	74.0	-18.8	1.48 H	61	56.4	-1.2
2	2390.00	34.4 AV	54.0	-19.6	1.48 H	61	35.6	-1.2
3	*2437.00	109.4 PK			1.48 H	61	111.0	-1.6
4	*2437.00	98.8 AV			1.48 H	61	100.4	-1.6
5	2483.50	58.9 PK	74.0	-15.1	1.48 H	61	60.4	-1.5
6	2483.50	34.6 AV	54.0	-19.4	1.48 H	61	36.1	-1.5
7	4874.00	43.3 PK	74.0	-30.7	1.17 H	33	40.1	3.2
8	4874.00	30.4 AV	54.0	-23.6	1.17 H	33	27.2	3.2
9	7311.00	41.6 PK	74.0	-32.4	1.54 H	211	32.7	8.9
10	7311.00	30.3 AV	54.0	-23.7	1.54 H	211	21.4	8.9

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.0 PK	74.0	-19.0	1.56 V	287	56.2	-1.2
2	2390.00	34.3 AV	54.0	-19.7	1.56 V	287	35.5	-1.2
3	*2437.00	107.5 PK			1.56 V	287	109.1	-1.6
4	*2437.00	96.2 AV			1.56 V	287	97.8	-1.6
5	2483.50	59.3 PK	74.0	-14.7	1.56 V	287	60.8	-1.5
6	2483.50	34.8 AV	54.0	-19.2	1.56 V	287	36.3	-1.5
7	4874.00	46.3 PK	74.0	-27.7	1.97 V	307	43.1	3.2
8	4874.00	35.1 AV	54.0	-18.9	1.97 V	307	31.9	3.2
9	7311.00	41.7 PK	74.0	-32.3	1.66 V	136	32.8	8.9
10	7311.00	30.3 AV	54.0	-23.7	1.66 V	136	21.4	8.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	109.6 PK			1.48 H	60	111.2	-1.6
2	*2462.00	99.1 AV			1.48 H	60	100.7	-1.6
3	2483.50	69.1 PK	74.0	-4.9	1.48 H	60	70.6	-1.5
4	2483.50	50.2 AV	54.0	-3.8	1.48 H	60	51.7	-1.5
5	4924.00	43.7 PK	74.0	-30.3	1.11 H	30	40.4	3.3
6	4924.00	30.9 AV	54.0	-23.1	1.11 H	30	27.6	3.3
7	7386.00	41.6 PK	74.0	-32.4	1.55 H	227	32.4	9.2
8	7386.00	30.3 AV	54.0	-23.7	1.55 H	227	21.1	9.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	107.5 PK			1.60 V	270	109.1	-1.6
2	*2462.00	96.4 AV			1.60 V	270	98.0	-1.6
3	2483.50	67.5 PK	74.0	-6.5	1.60 V	270	69.0	-1.5
4	2483.50	43.9 AV	54.0	-10.1	1.60 V	270	45.4	-1.5
5	4924.00	45.2 PK	74.0	-28.8	1.97 V	298	41.9	3.3
6	4924.00	34.3 AV	54.0	-19.7	1.97 V	298	31.0	3.3
7	7386.00	41.4 PK	74.0	-32.6	1.67 V	131	32.2	9.2
8	7386.00	29.7 AV	54.0	-24.3	1.67 V	131	20.5	9.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

Below 1GHz Data:

802.11n (HT20)

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	137.28	24.3 QP	43.5	-19.2	1.50 H	85	32.9	-8.6
2	347.75	25.7 QP	46.0	-20.3	1.00 H	235	31.9	-6.2
3	520.60	28.5 QP	46.0	-17.5	3.00 H	305	30.8	-2.3
4	676.29	30.5 QP	46.0	-15.5	2.00 H	338	30.1	0.4
5	833.91	34.1 QP	46.0	-11.9	2.00 H	322	31.2	2.9
6	945.24	35.4 QP	46.0	-10.6	2.00 H	360	31.3	4.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	151.44	24.1 QP	43.5	-19.4	1.00 V	1	31.9	-7.8
2	229.17	23.2 QP	46.0	-22.8	3.00 V	220	34.0	-10.8
3	381.79	25.4 QP	46.0	-20.6	1.50 V	67	30.8	-5.4
4	468.90	27.6 QP	46.0	-18.4	2.00 V	45	30.9	-3.3
5	644.42	31.5 QP	46.0	-14.5	1.50 V	360	31.3	0.2
6	801.15	33.1 QP	46.0	-12.9	3.00 V	268	30.6	2.5

REMARKS:

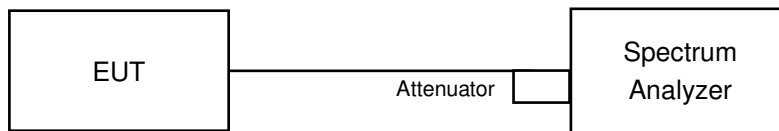
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 6dB Bandwidth Measurement

4.2.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB 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) = 100kHz
- 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 Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.05	8.07	0.5	Pass
6	2437	7.56	7.59	0.5	Pass
11	2462	8.06	7.61	0.5	Pass

802.11g

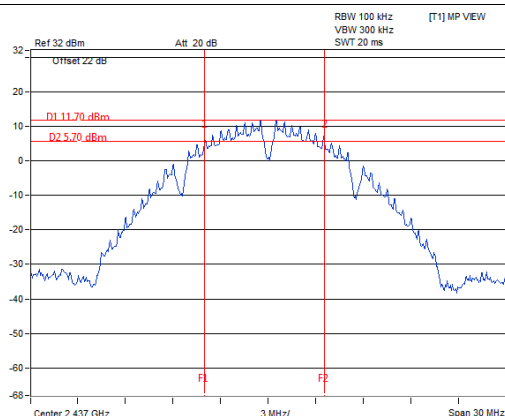
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.44	16.44	0.5	Pass
6	2437	16.41	16.43	0.5	Pass
11	2462	16.40	16.43	0.5	Pass

802.11n (HT20)

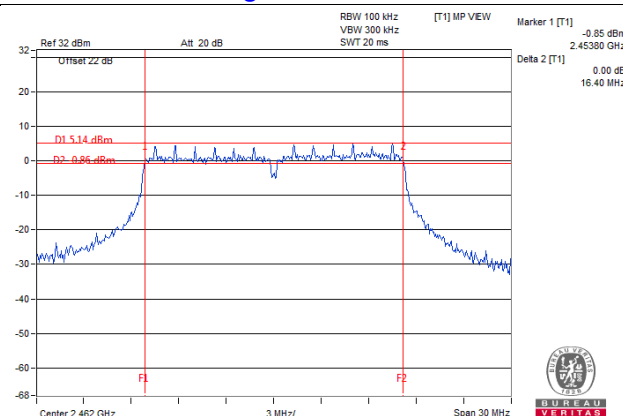
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.67	17.64	0.5	Pass
6	2437	17.63	17.64	0.5	Pass
11	2462	17.69	17.69	0.5	Pass

Spectrum Plot of Worst Value

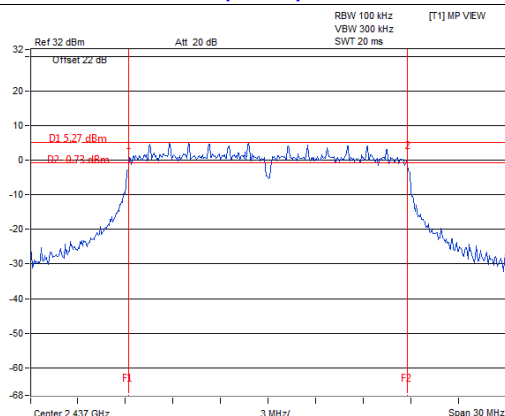
802.11b / Chain 0 : CH6



802.11g / Chain 0 : CH11



802.11n (HT20) / Chain 0 : CH6



4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

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

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

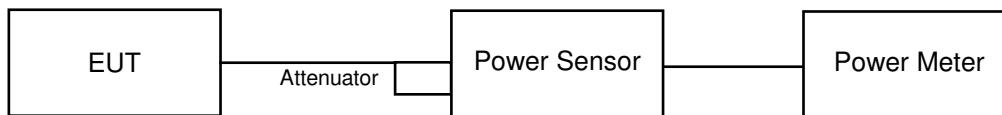
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

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 Procedures

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.2.6.

4.3.7 Test Results

FOR PEAK POWER

802.11b

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.55	21.71	291.141	24.64	30.00	Pass
6	2437	21.56	21.65	289.437	24.62	30.00	Pass
11	2462	21.66	21.42	285.231	24.55	30.00	Pass

802.11g

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.98	22.93	394.945	25.97	30.00	Pass
6	2437	23.01	22.95	397.228	25.99	30.00	Pass
11	2462	23.04	22.88	395.461	25.97	30.00	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.99	22.91	394.501	25.96	30.00	Pass
6	2437	23.10	22.98	402.783	26.05	30.00	Pass
11	2462	23.11	22.99	403.711	26.06	30.00	Pass

FOR AVERAGE POWER - reference only

802.11b

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	18.97	19.12	160.544	22.06
6	2437	19.02	19.04	159.967	22.04
11	2462	19.15	18.84	158.784	22.01

802.11g

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	16.13	16.03	81.107	19.09
6	2437	16.12	16.08	81.477	19.11
11	2462	16.16	15.86	79.853	19.02

802.11n (HT20)

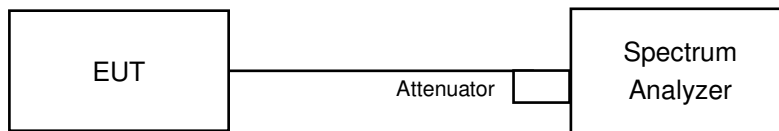
Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	16.12	15.98	80.554	19.06
6	2437	16.23	16.02	81.97	19.14
11	2462	16.22	15.96	81.325	19.10

4.4 Power Spectral Density Measurement

4.4.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

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 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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

Same as Item 4.2.6

4.4.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-2.40	3.01	0.61	8.00	Pass
	6	2437	-3.13	3.01	-0.12	8.00	Pass
	11	2462	-3.57	3.01	-0.56	8.00	Pass
1	1	2412	-2.90	3.01	0.11	8.00	Pass
	6	2437	-3.08	3.01	-0.07	8.00	Pass
	11	2462	-2.85	3.01	0.16	8.00	Pass

Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 4.7\text{dBi} < 6\text{dBi}$, so the power density limit shall not be reduced.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-8.56	3.01	-5.55	8.00	Pass
	6	2437	-10.02	3.01	-7.01	8.00	Pass
	11	2462	-9.22	3.01	-6.21	8.00	Pass
1	1	2412	-7.76	3.01	-4.75	8.00	Pass
	6	2437	-9.47	3.01	-6.46	8.00	Pass
	11	2462	-8.44	3.01	-5.43	8.00	Pass

Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 4.7\text{dBi} < 6\text{dBi}$, so the power density limit shall not be reduced.

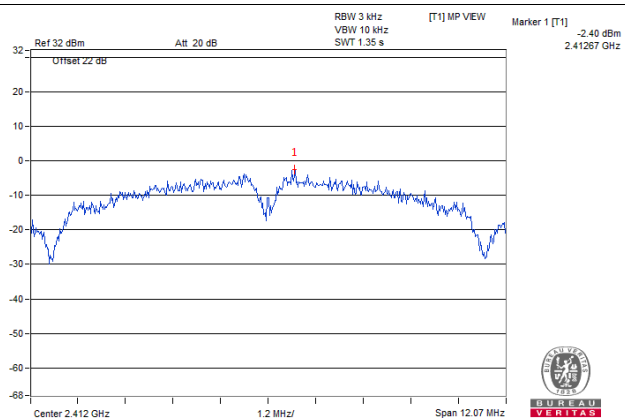
802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-10.07	3.01	-7.06	8.00	Pass
	6	2437	-9.85	3.01	-6.84	8.00	Pass
	11	2462	-9.74	3.01	-6.73	8.00	Pass
1	1	2412	-8.75	3.01	-5.74	8.00	Pass
	6	2437	-9.30	3.01	-6.29	8.00	Pass
	11	2462	-10.06	3.01	-7.05	8.00	Pass

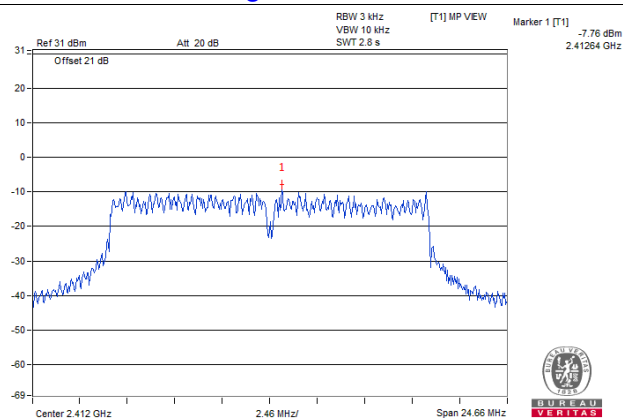
Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 4.7\text{dBi} < 6\text{dBi}$, so the power density limit shall not be reduced.

Spectrum Plot of Worst Value

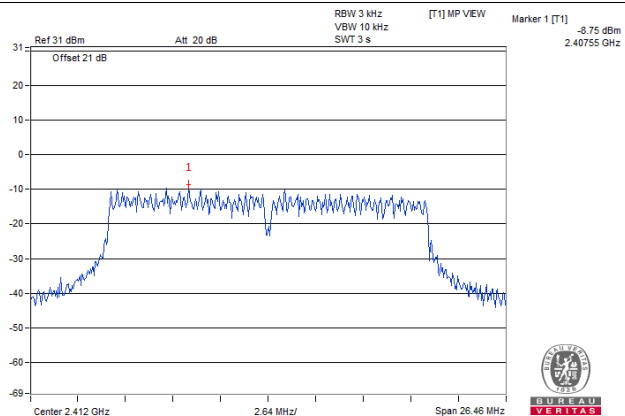
802.11b / Chain 0 : CH1



802.11g / Chain 1 : CH1



802.11n (HT20) / Chain 1 : CH1

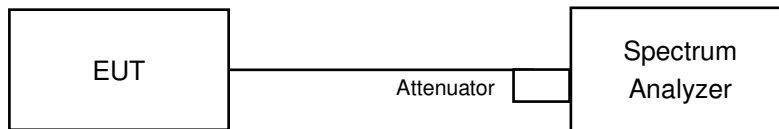


4.5 Conducted Out of Band Emission Measurement

4.5.1 Limits of Conducted Out of Band Emission Measurement

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

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

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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

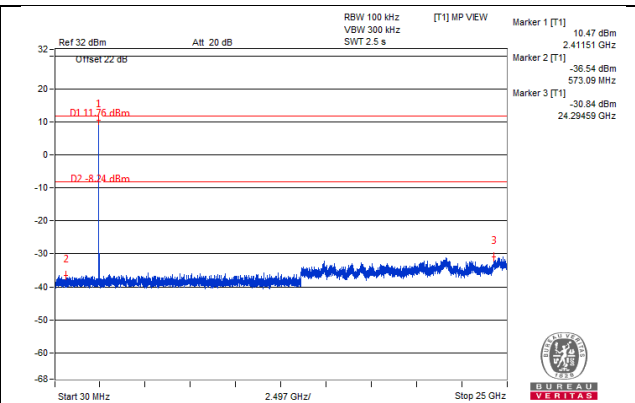
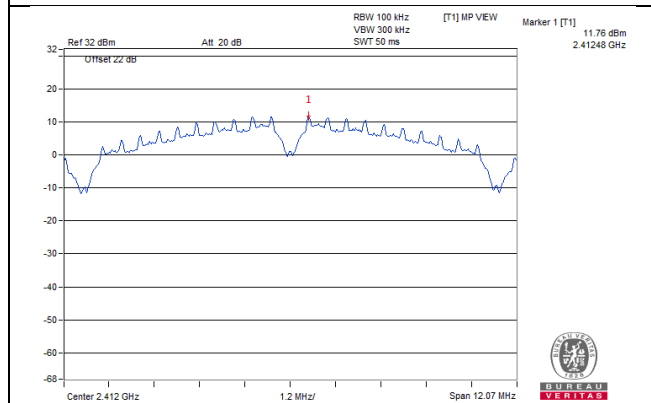
Same as Item 4.2.6

4.5.7 Test Results

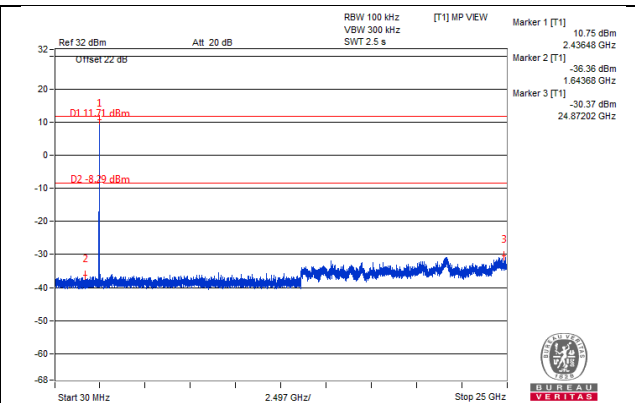
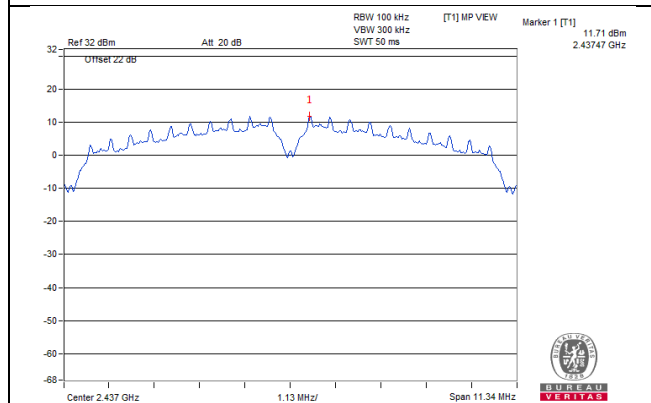
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b Chain 0

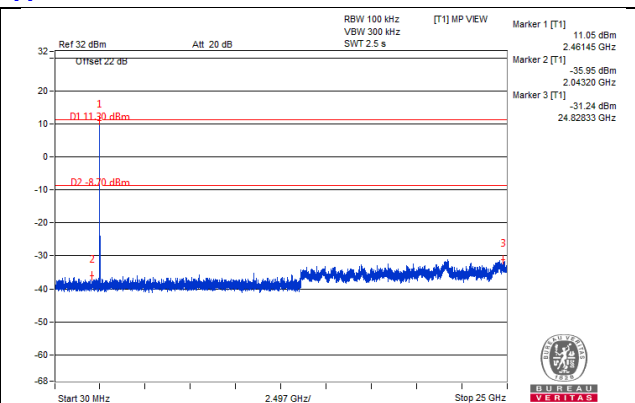
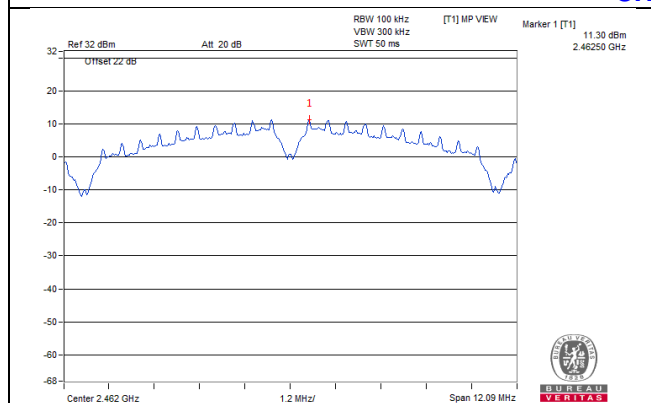
CH 1



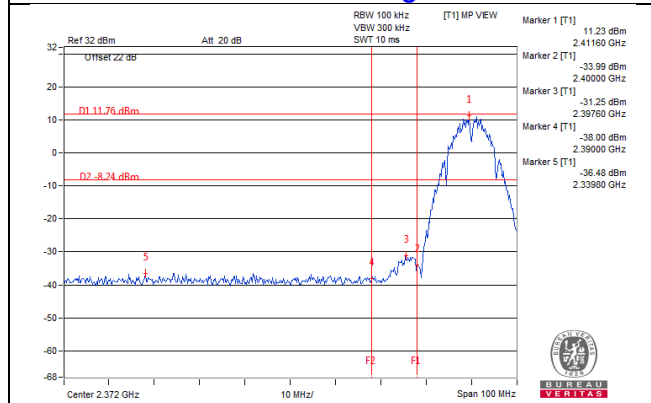
CH 6



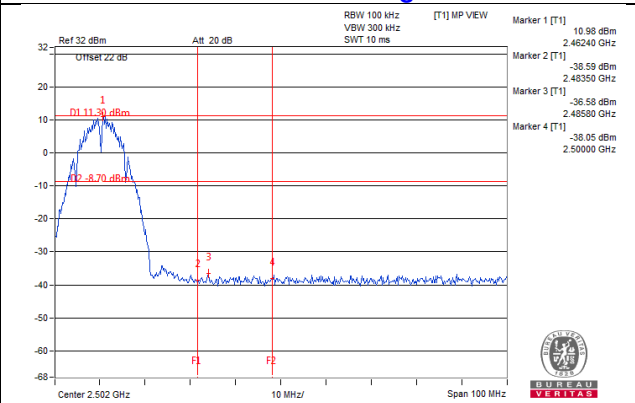
CH 11



CH 1 Band edge

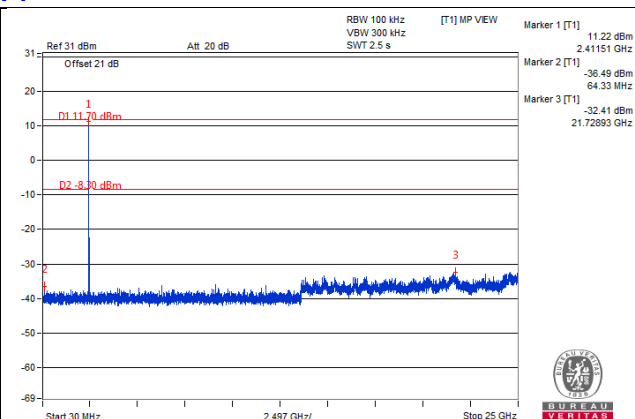
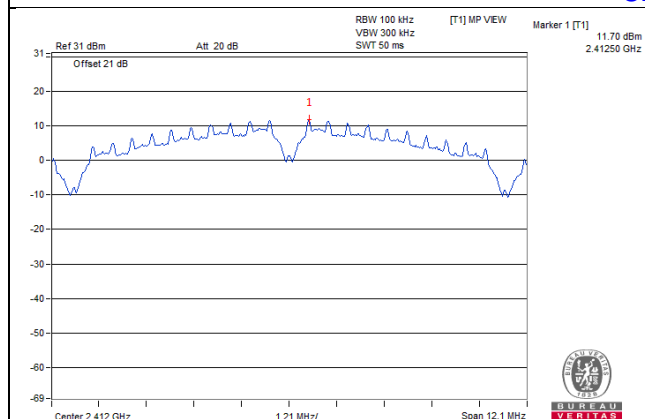


CH 11 Band edge

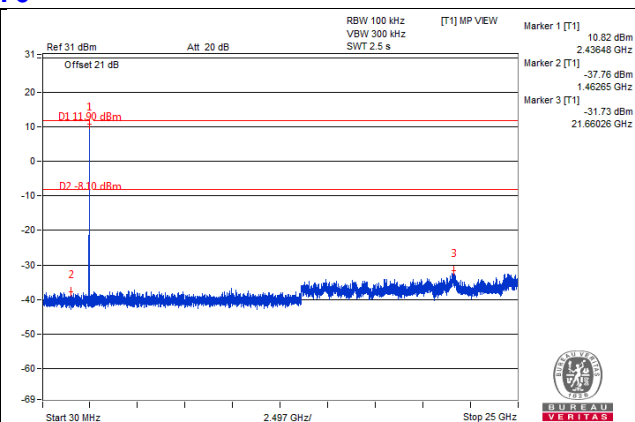
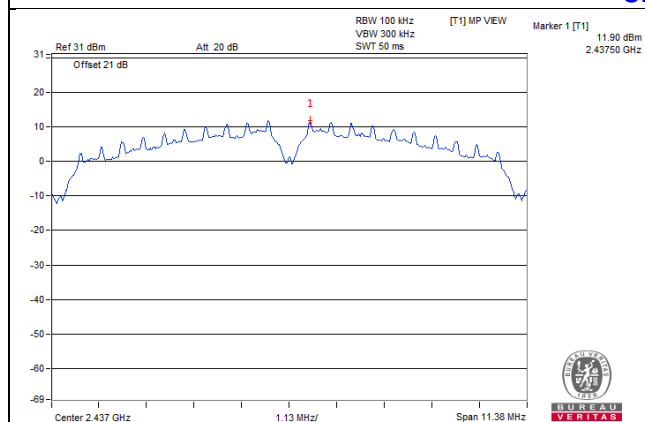


Chain 1

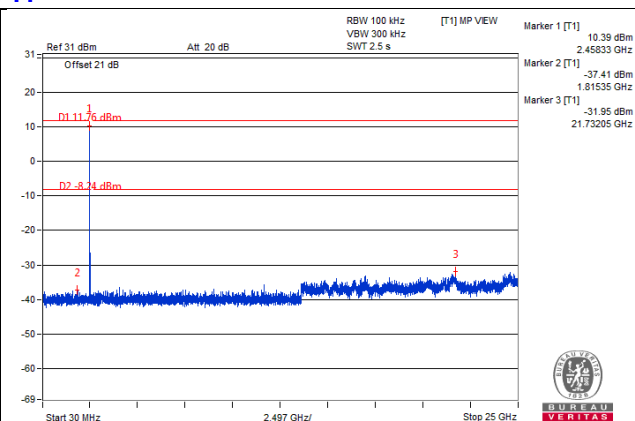
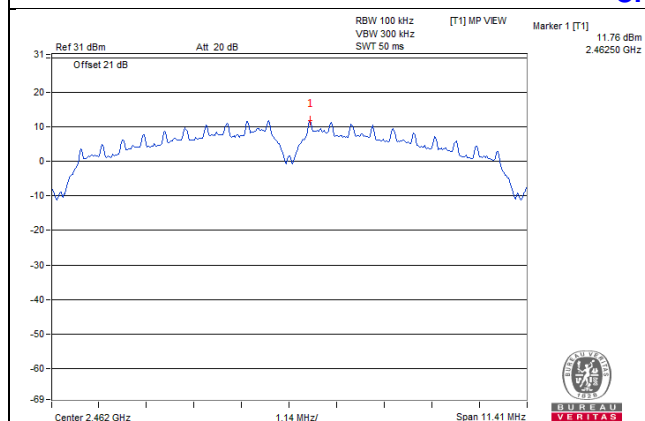
CH 1



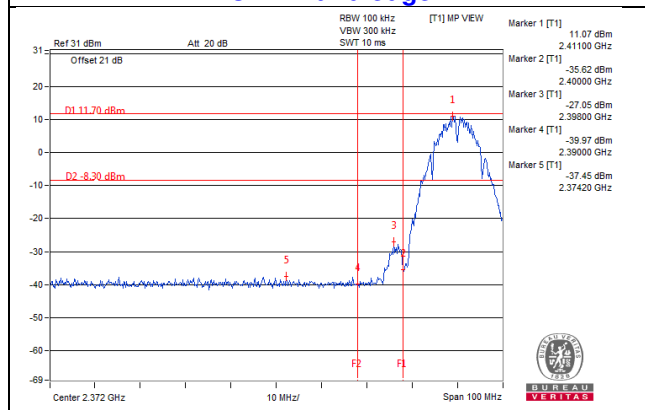
CH 6



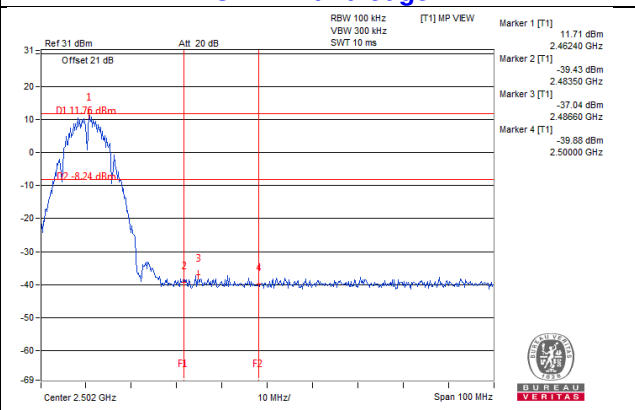
CH 11



CH 1 Band edge

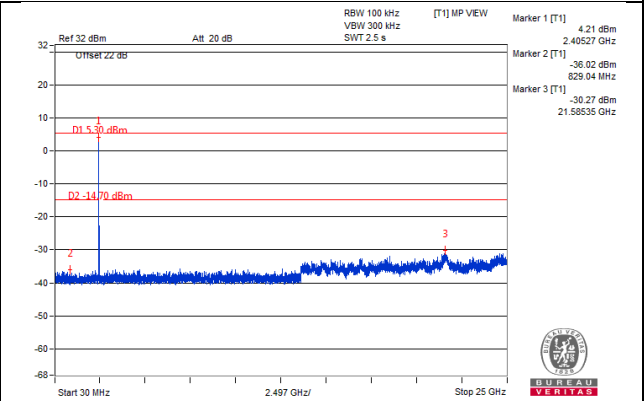
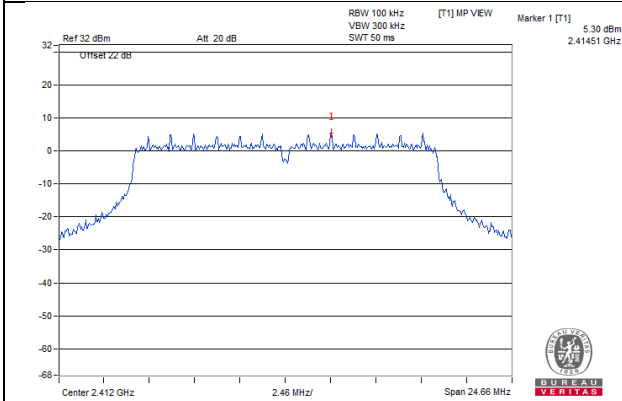


CH 11 Band edge

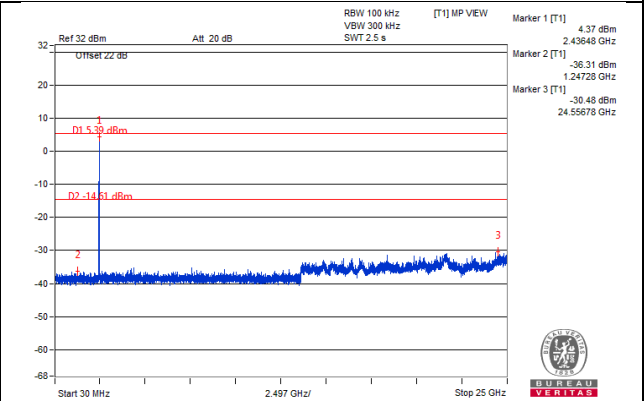
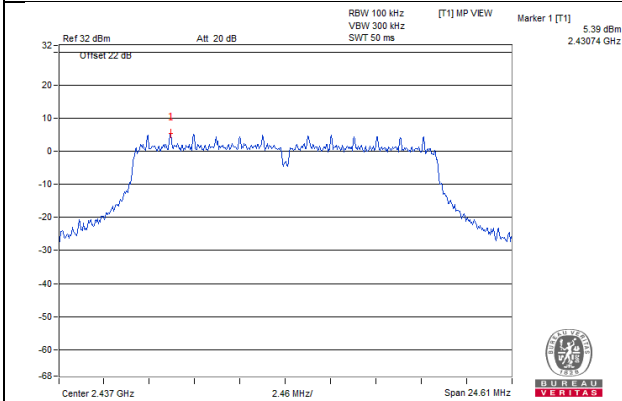


802.11g Chain 0

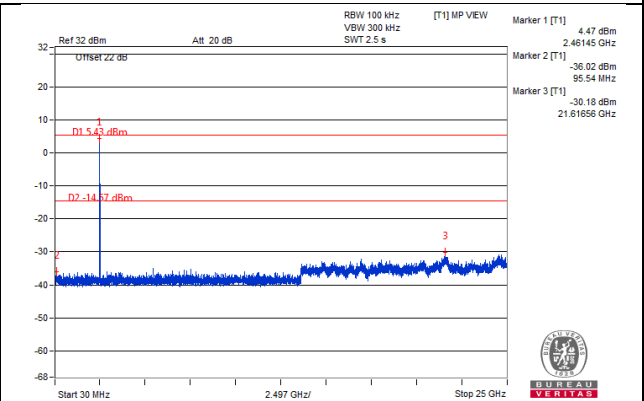
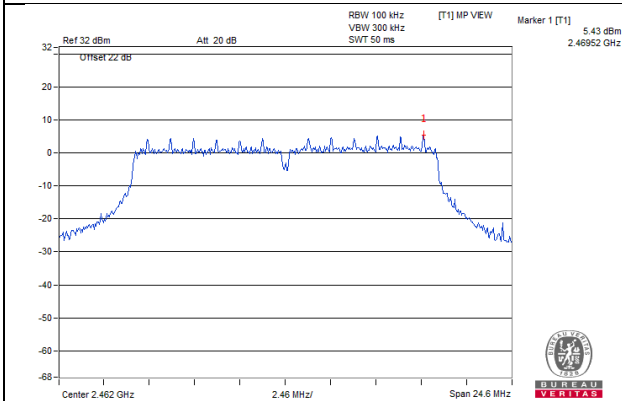
CH 1



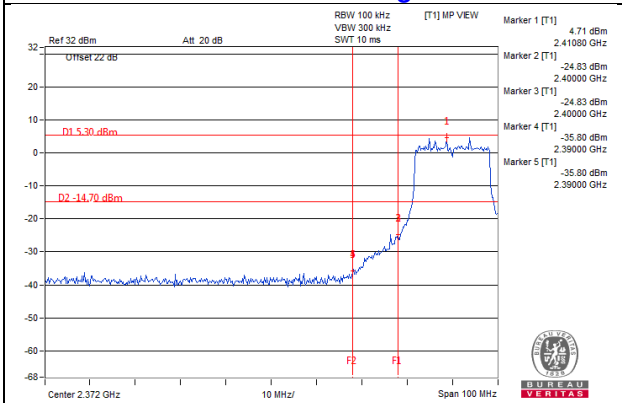
CH 6



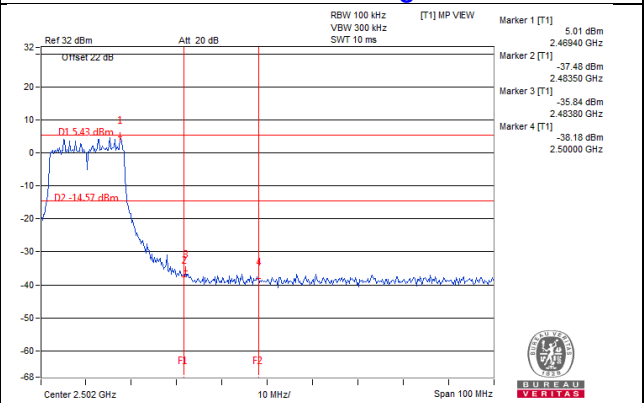
CH 11



CH 1 Band edge

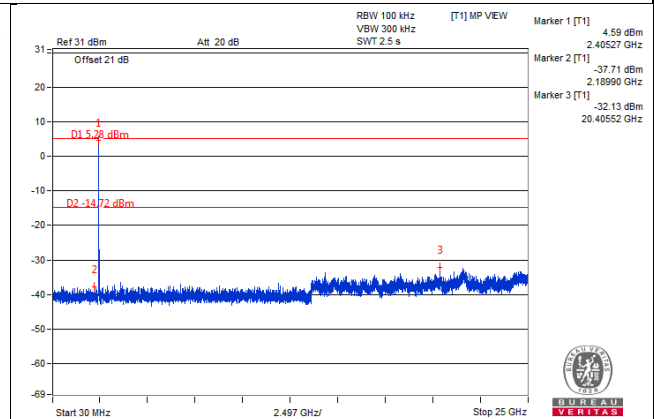
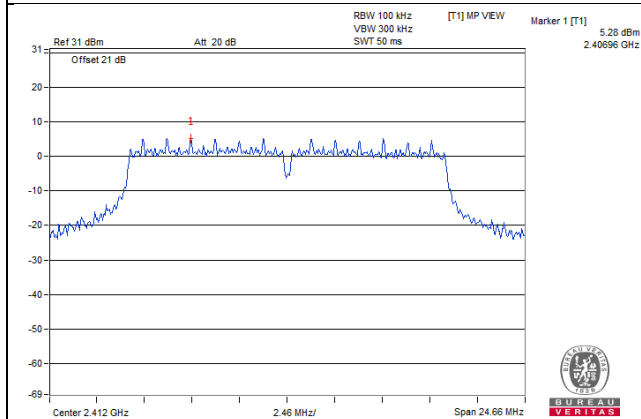


CH 11 Band edge

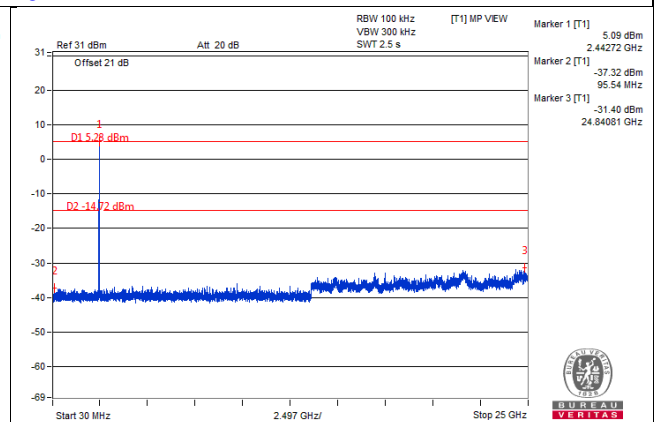
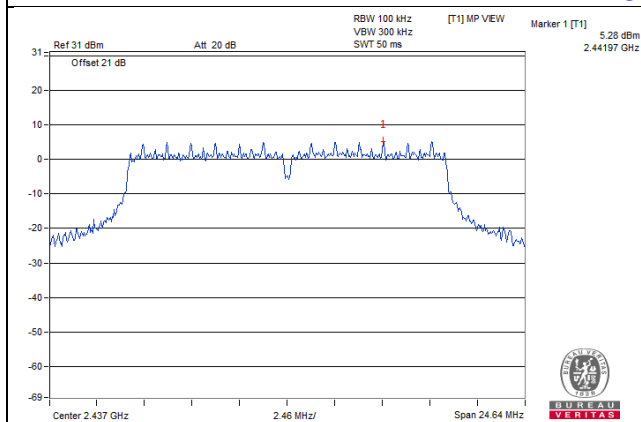


Chain 1

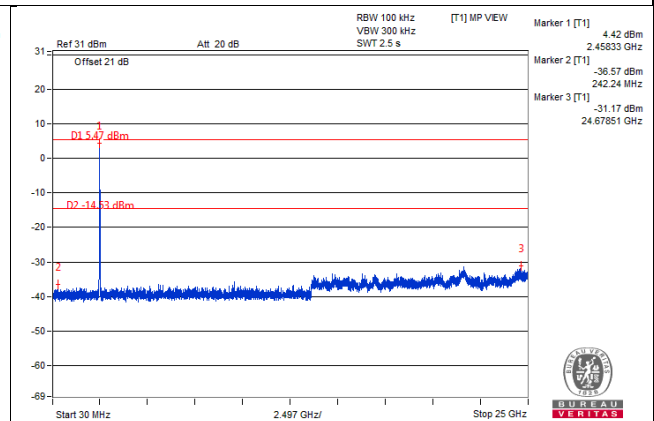
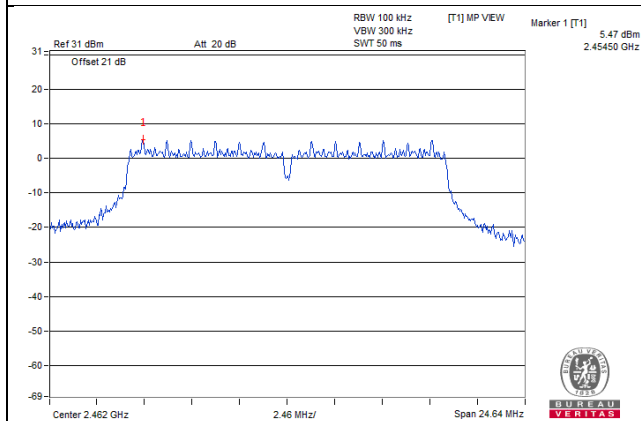
CH 1



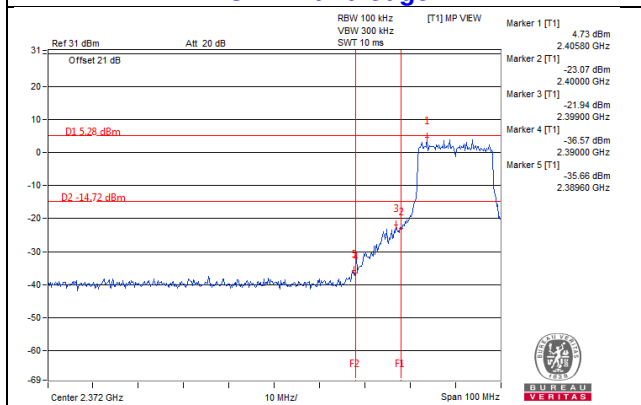
CH 6



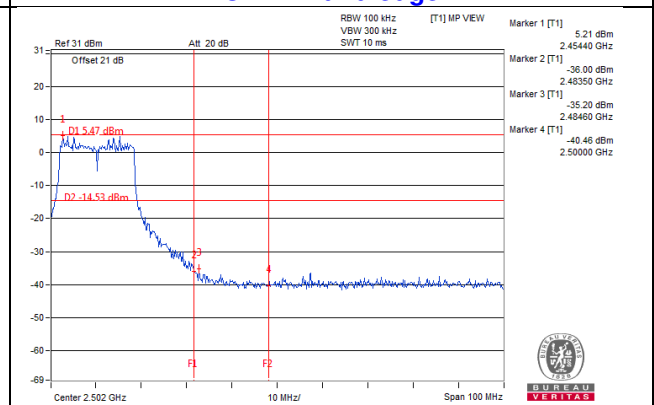
CH 11



CH 1 Band edge

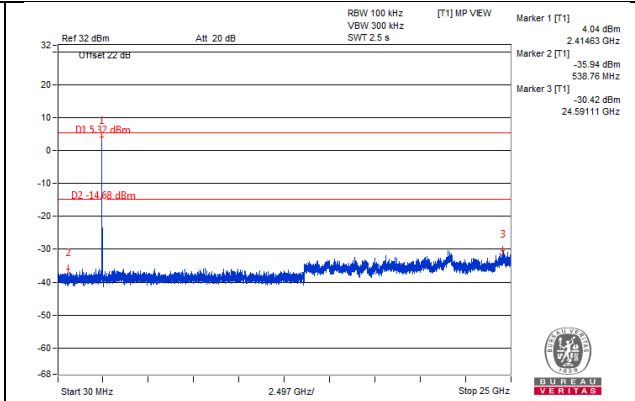
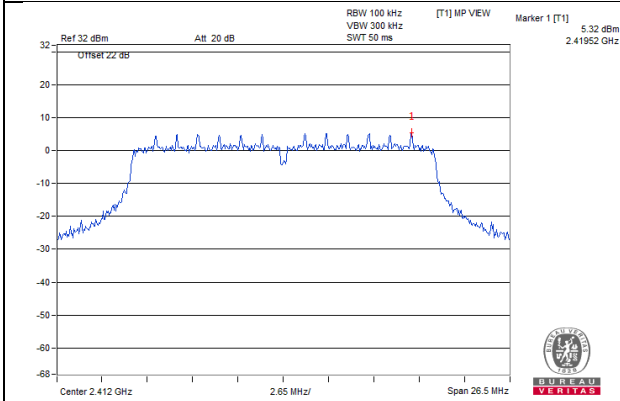


CH 11 Band edge

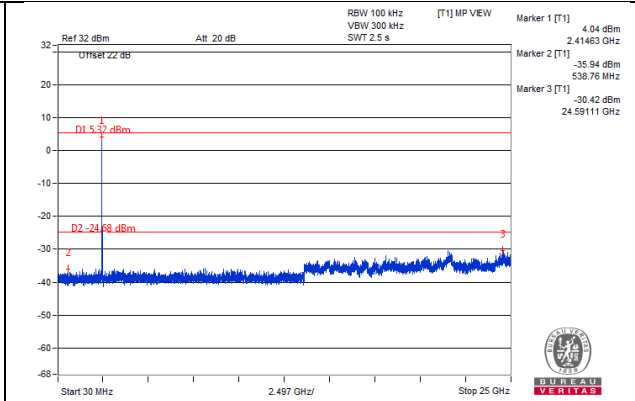
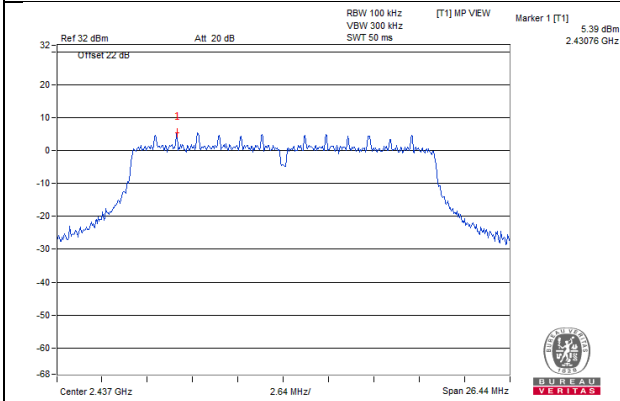


802.11n (HT20) Chain 0

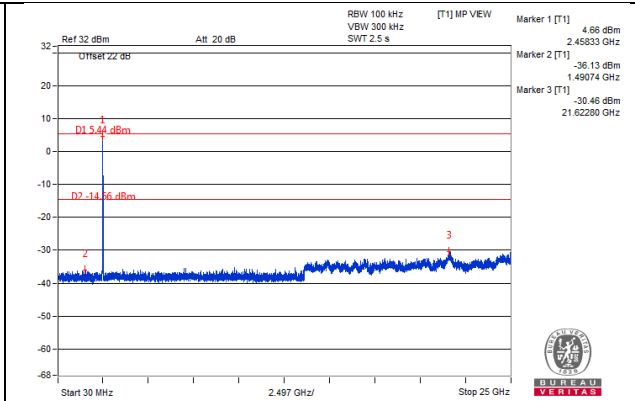
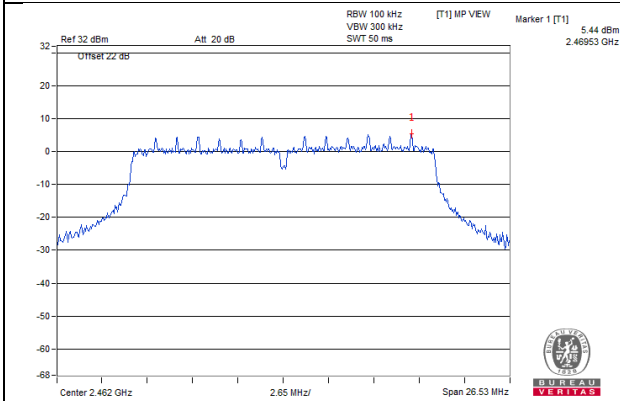
CH 1



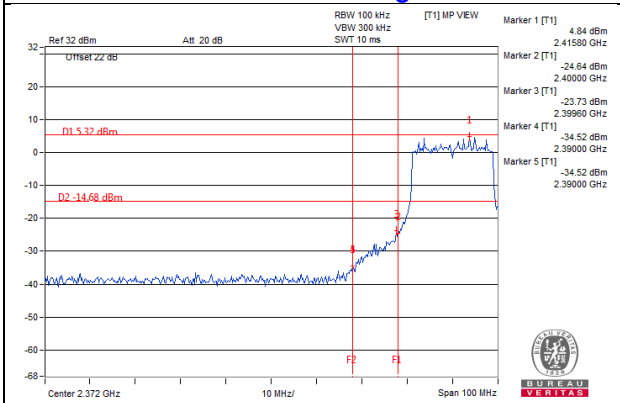
CH 6



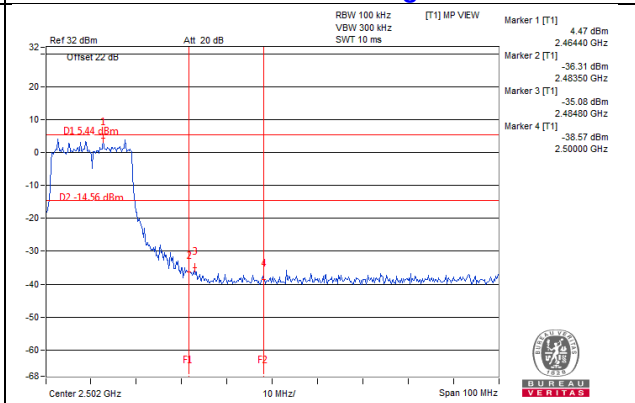
CH 11



CH 1 Band edge

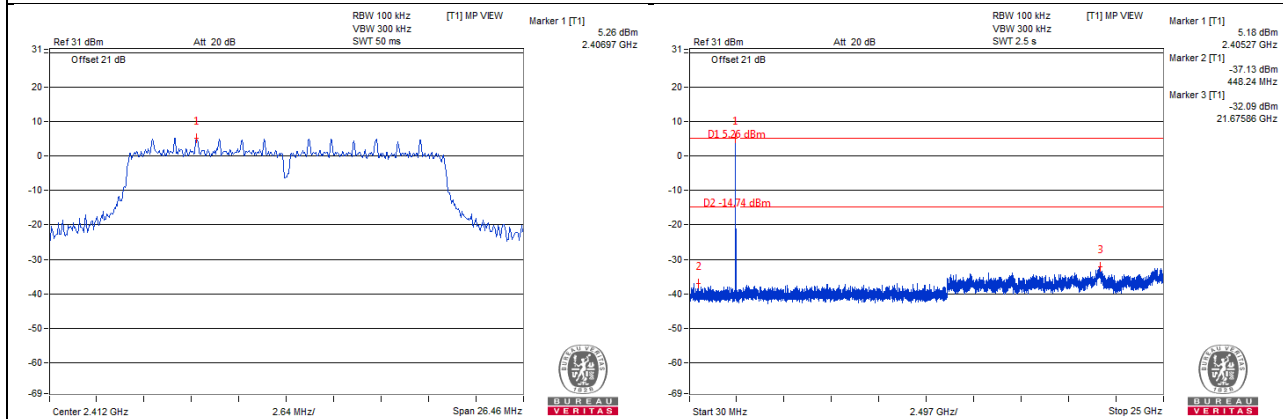


CH 11 Band edge

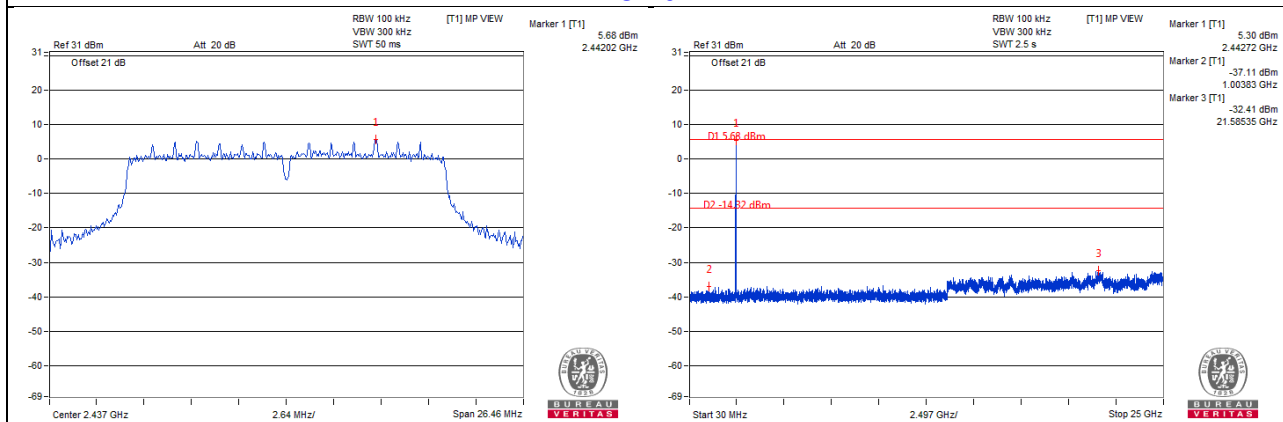


Chain 1

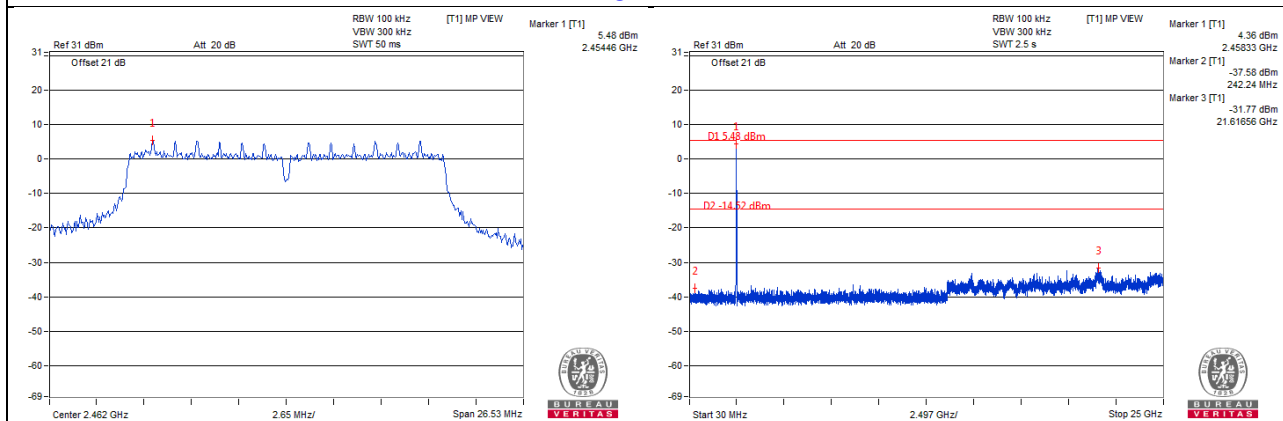
CH 1



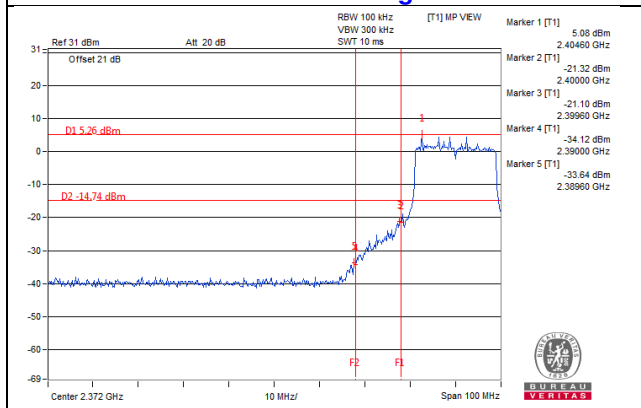
CH 6



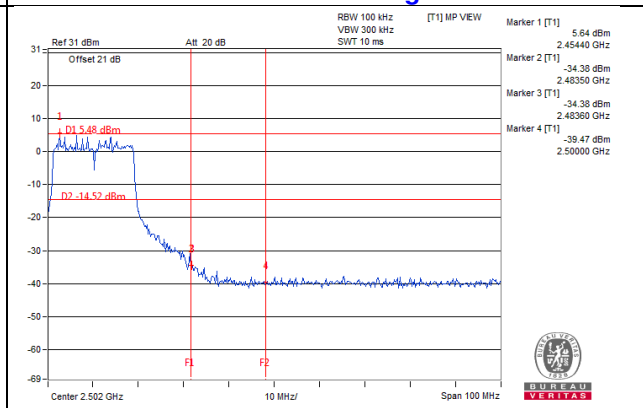
CH 11



CH 1 Band edge



CH 11 Band edge



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 FCC recognized accredited test firms and accredited 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

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

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