

Variant FCC Test Report

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Test Model: G011A

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Applicant: HTC Corporation

Address: 1F, 6-3 Baoqiang Road, Xindian District, New Taipei City, Taiwan 231

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 Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Test Location (2): No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C



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Release Control Record

Issue No.	Description	Date Issued
RF170502C07A	Original Release	Sep. 08, 2017

1 Certificate of Conformity

Product: Smartphone
Test Model: G011A
Sample Status: Production Unit
Applicant: HTC Corporation
Test Date: Aug. 23, 2017
Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

This report is issued as a supplementary report to BV CPS report no.: RF170502C07-2. This report shall be used combining with its original report.

Prepared by : Ivonne Wu , **Date:** Sep. 08, 2017
Ivonne Wu / Supervisor

Approved by : David Huang , **Date:** Sep. 08, 2017
David Huang / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	N/A	Refer to Note
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1 dB at 2483.52 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: In addition to conducted emission test, all the other test items had been performed for the addendum. Refer to original report for other test data.

2.1 Measurement Uncertainty

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

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Smartphone
Test Model	G011A
Status of EUT	Production Unit
Power Supply Rating	5.0 Vdc or 9.0 Vdc (adapter) 3.85 Vdc (Li-ion battery)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	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 MCS15 802.11ac: up to MCS8
Operating Frequency	2412 ~ 2472 MHz
Number of Channel	13 for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (HT20)
Output Power	129.718 mW (ch 12&13)
Antenna Type	PIFA antenna with -1.22 dBi gain (Main) PIFA antenna with -3.34 dBi gain (Aux.)
Antenna Connector	N/A
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

- This report is issued as a supplementary report to BV CPS report no.: RF170502C07-2. The difference compared with original report is adding channel 12 and 13. Therefore, in addition to conducted emission test, all the other test items for channel 12 and 13 had been performed and recorded in this report.
- There're 2 configuraitons for the EUT listed as below.
Main Sample: EUT + Battery 1
2nd Sample: EUT + Battery 2
✧ Only the worst test data was presented in the report.
- The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

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

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

** In test mode assessment for 1TX, both antennas (Ant 0 and Ant1) must be considered for testing, the worst case is determined by the max antenna gain.

- The EUT's accessories list refers to EMI report.
- 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

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

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: 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.

NOTE: Radiated emission below 1 GHz and conducted emission tests refer to original report.

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 13	12, 13	DSSS	DBPSK	1.0
	802.11g	1 to 13	12, 13	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 13	12, 13	OFDM	BPSK	MCS0

Bandedge Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 13	12, 13	DSSS	DBPSK	1.0
	802.11g	1 to 13	12, 13	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 13	12, 13	OFDM	BPSK	MCS0

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 13	12, 13	DSSS	DBPSK	1.0
	802.11g	1 to 13	12, 13	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 13	12, 13	OFDM	BPSK	MCS0

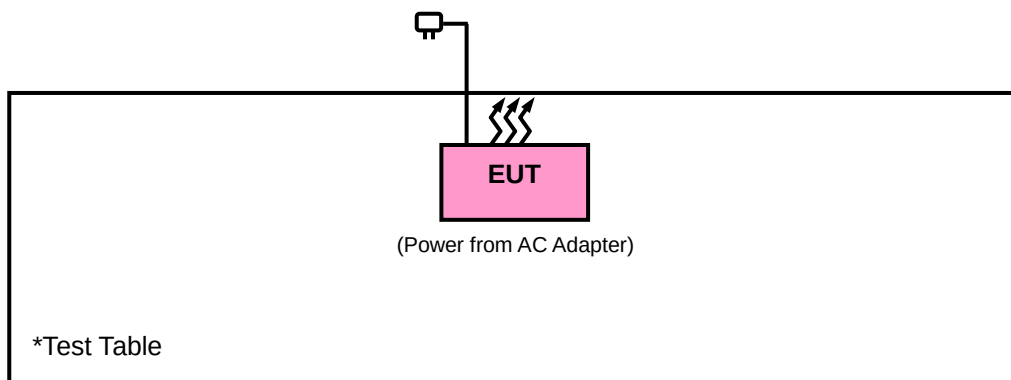
Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
APCM	25 deg. C, 65 % RH	3.85 Vdc	Carlos Chen

3.3 Description of Support Units

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

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

558074 D01 DTS Meas Guidance v04

662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 16, 2016	Dec. 15, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Dec. 29, 2016	Dec. 28, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2017	Apr. 16, 2018
Bluetooth Tester	CBT	100980	Jun. 28, 2017	Jun. 27, 2019
Loop Antenna	HLA 6121	45745	May 19, 2017	May 18, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2016	Sep. 07, 2017
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2016	Sep. 07, 2017
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(R FC-SMS-100-SM S-120+RFC-SMS -100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(R FC-SMS-100-SM S-24)	Jun. 23, 2017	Jun. 22, 2018
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Temperature & Humidity Chamber	GTH-120-40-CP-A R	MAA1306-019	Sep. 02, 2016	Sep. 01, 2017
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	73680266	Nov. 10, 2016	Nov. 09, 2017

- 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 HsinTien Chamber 1.
 3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
 4. The FCC Site Registration No. is 149147.
 5. The IC Site Registration No. is IC7450I-1.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

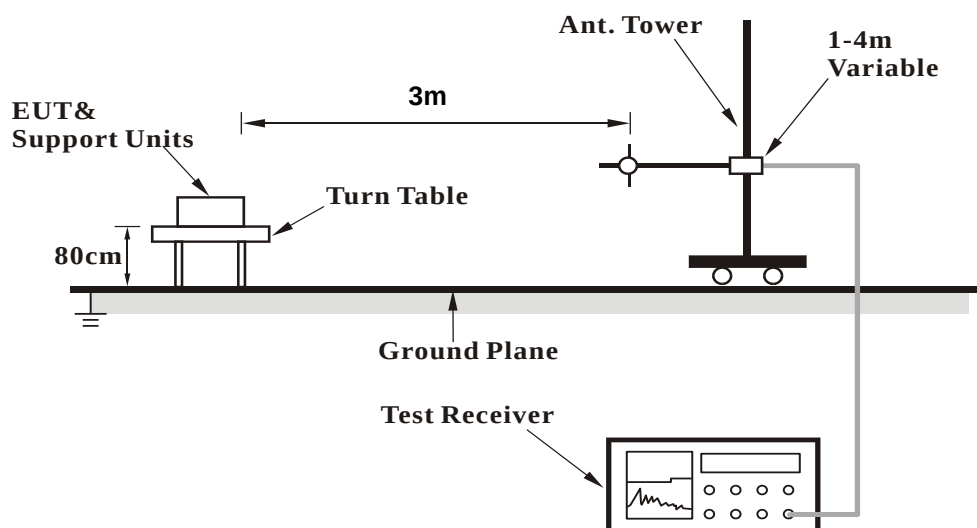
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 KHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency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

4.1.4 Deviation from Test Standard

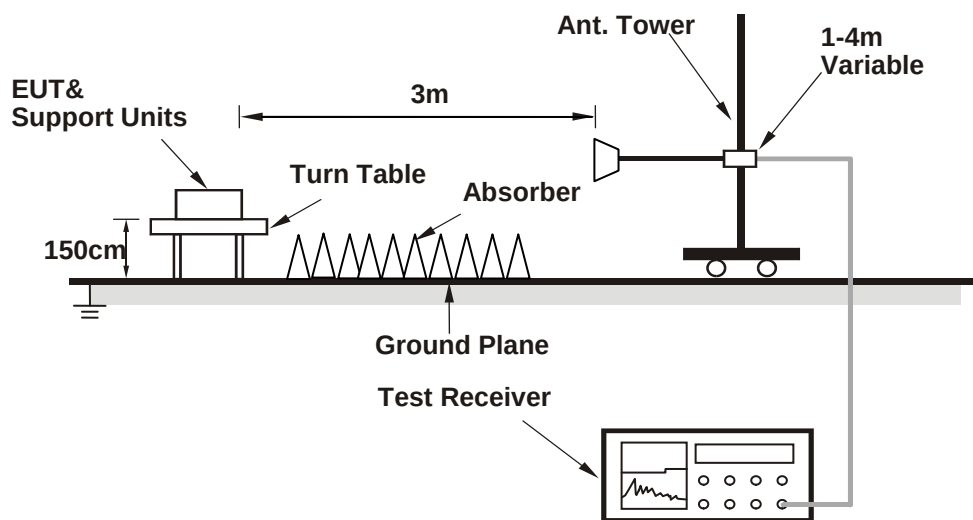
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1 GHz>



<Frequency Range above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1 GHz Data :

Mode A

<1TX>

802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 12	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	Charles Hsiao

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
2467	103.36	101.41			31.87	5.5	35.42	111	214	Average
2467	106.18	104.23			31.87	5.5	35.42	111	214	Peak
2483.76	52.69	50.73	54	-1.31	31.88	5.5	35.42	111	214	Average
2483.76	57.58	55.62	74	-16.42	31.88	5.5	35.42	111	214	Peak
4934	40.39	32.13	54	-13.61	33.99	8.29	34.02	102	165	Average
4934	48.8	40.54	74	-25.2	33.99	8.29	34.02	102	165	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
2467	101.24	99.29			31.87	5.5	35.42	152	272	Average
2467	104.18	102.23			31.87	5.5	35.42	152	272	Peak
2484.2	49.61	47.62	54	-4.39	31.88	5.53	35.42	152	272	Average
2484.2	56.56	54.57	74	-17.44	31.88	5.53	35.42	152	272	Peak
4934	39.84	31.58	54	-14.16	33.99	8.29	34.02	116	195	Average
4934	48.83	40.57	74	-25.17	33.99	8.29	34.02	116	195	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2467 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 13	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	Charles Hsiao

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
2472	101.28	99.32			31.88	5.5	35.42	111	214	Average
2472	104.37	102.41			31.88	5.5	35.42	111	214	Peak
2485.04	52.71	50.72	54	-1.29	31.88	5.53	35.42	111	214	Average
2485.04	57.73	55.74	74	-16.27	31.88	5.53	35.42	111	214	Peak
4944	39.52	31.25	54	-14.48	33.99	8.29	34.01	136	159	Average
4944	47.84	39.57	74	-26.16	33.99	8.29	34.01	136	159	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
2472	99.52	97.56			31.88	5.5	35.42	152	272	Average
2472	102.09	100.13			31.88	5.5	35.42	152	272	Peak
2485.52	49.77	47.78	54	-4.23	31.88	5.53	35.42	152	272	Average
2485.52	56.01	54.02	74	-17.99	31.88	5.53	35.42	152	272	Peak
4944	39.86	31.59	54	-14.14	33.99	8.29	34.01	166	147	Average
4944	48.11	39.84	74	-25.89	33.99	8.29	34.01	166	147	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2472 MHz: Fundamental frequency.

802.11g

EUT Test Condition		Measurement Detail	
Channel	Channel 12	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	Charles Hsiao

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
2467	93.36	91.41			31.87	5.5	35.42	111	214	Average
2467	101.18	99.23			31.87	5.5	35.42	111	214	Peak
2483.52	53	51.04	54	-1	31.88	5.5	35.42	111	214	Average
2483.52	65.55	63.59	74	-8.45	31.88	5.5	35.42	111	214	Peak
4934	39.78	31.52	54	-14.22	33.99	8.29	34.02	166	174	Average
4934	48.05	39.79	74	-25.95	33.99	8.29	34.02	166	174	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2467	91.43	89.48			31.87	5.5	35.42	152	272	Average
2467	99.27	97.32			31.87	5.5	35.42	152	272	Peak
2483.52	52.69	50.73	54	-1.31	31.88	5.5	35.42	152	272	Average
2483.52	64.46	62.5	74	-9.54	31.88	5.5	35.42	152	272	Peak
4934	39.78	31.52	54	-14.22	33.99	8.29	34.02	159	162	Average
4934	48.04	39.78	74	-25.96	33.99	8.29	34.02	159	162	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2467 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 13	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	Charles Hsiao

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
2472	84.41	82.45			31.88	5.5	35.42	111	214	Average
2472	92.31	90.35			31.88	5.5	35.42	111	214	Peak
2484	52.48	50.52	54	-1.52	31.88	5.5	35.42	111	214	Average
2484	64.2	62.24	74	-9.8	31.88	5.5	35.42	111	214	Peak
4944	39.8	31.53	54	-14.2	33.99	8.29	34.01	112	165	Average
4944	47.84	39.57	74	-26.16	33.99	8.29	34.01	112	165	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
2472	82.05	80.09			31.88	5.5	35.42	152	272	Average
2472	90.41	88.45			31.88	5.5	35.42	152	272	Peak
2483.64	51.68	49.72	54	-2.32	31.88	5.5	35.42	152	272	Average
2483.64	62.8	60.84	74	-11.2	31.88	5.5	35.42	152	272	Peak
4944	39.87	31.6	54	-14.13	33.99	8.29	34.01	166	169	Average
4944	48.11	39.84	74	-25.89	33.99	8.29	34.01	166	169	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2472 MHz: Fundamental frequency.

<2TX>

802.11n (HT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 12	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	Charles Hsiao

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
2467	94.46	92.51			31.87	5.5	35.42	111	214	Average
2467	102.65	100.7			31.87	5.5	35.42	111	214	Peak
2483.52	52.45	50.49	54	-1.55	31.88	5.5	35.42	108	214	Average
2483.52	65.25	63.29	74	-8.75	31.88	5.5	35.42	108	214	Peak
4934	39.5	31.24	54	-14.5	33.99	8.29	34.02	166	195	Average
4934	48.05	39.79	74	-25.95	33.99	8.29	34.02	166	195	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
2467	93.47	91.52			31.87	5.5	35.42	100	272	Average
2467	101.79	99.84			31.87	5.5	35.42	100	272	Peak
2483.52	51.66	49.7	54	-2.34	31.88	5.5	35.42	101	272	Average
2483.52	64.99	63.03	74	-9.01	31.88	5.5	35.42	101	272	Peak
4934	39.51	31.25	54	-14.49	33.99	8.29	34.02	169	147	Average
4934	48.04	39.78	74	-25.96	33.99	8.29	34.02	169	147	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2467 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 13	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	Charles Hsiao

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
2472	83.35	81.39			31.88	5.5	35.42	111	214	Average
2472	91.65	89.69			31.88	5.5	35.42	111	214	Peak
2483.52	52.98	51.02	54	-1.02	31.88	5.5	35.42	110	214	Average
2483.52	65.92	63.96	74	-8.08	31.88	5.5	35.42	110	214	Peak
4944	39.8	31.53	54	-14.2	33.99	8.29	34.01	169	142	Average
4944	48.05	39.78	74	-25.95	33.99	8.29	34.01	169	142	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
2472	82.36	80.4			31.88	5.5	35.42	100	272	Average
2472	90.4	88.44			31.88	5.5	35.42	100	272	Peak
2483.52	50.03	48.07	54	-3.97	31.88	5.5	35.42	100	272	Average
2483.52	62.8	60.84	74	-11.2	31.88	5.5	35.42	100	272	Peak
4944	39.8	31.53	54	-14.2	33.99	8.29	34.01	199	165	Average
4944	48.04	39.77	74	-25.96	33.99	8.29	34.01	199	165	Peak

Remarks:

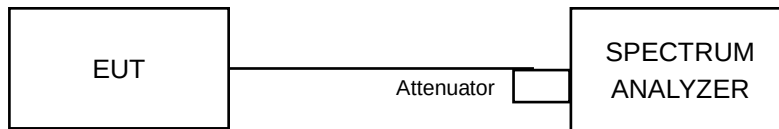
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2472 MHz: Fundamental frequency.

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 Result

<1TX>

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
12	2467	6.65	0.5	Pass
13	2472	7.58	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
12	2467	15.70	0.5	Pass
13	2472	15.46	0.5	Pass

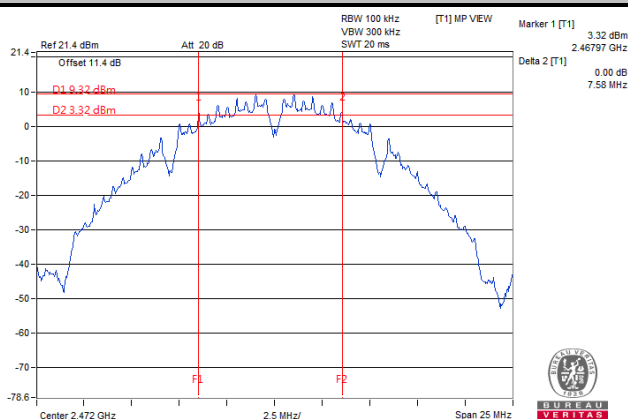
<2TX>

802.11n (HT20)

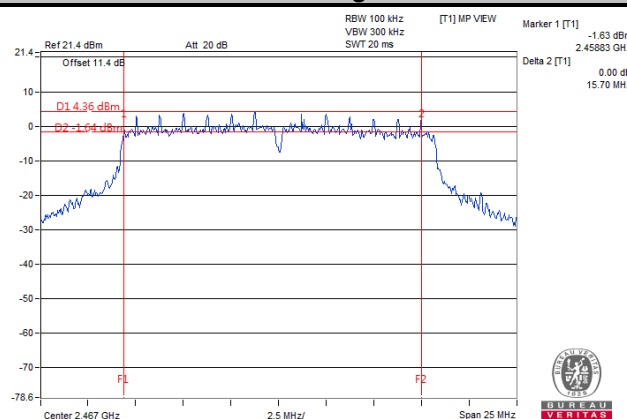
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
12	2467	16.56	15.48	0.5	Pass
13	2472	16.00	15.98	0.5	Pass

Spectrum Plot of Worst Value

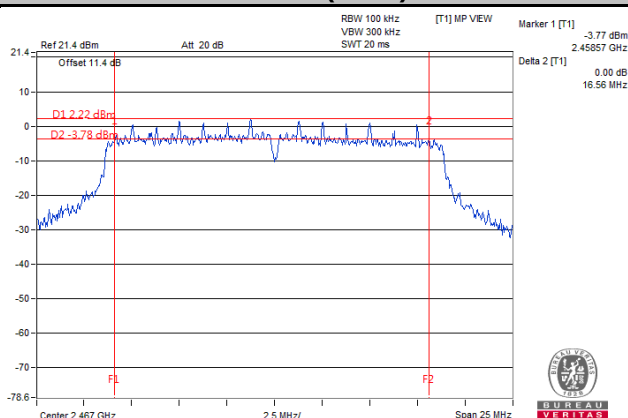
802.11b



802.11g



802.11n (HT20)



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 (30 dBm)

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

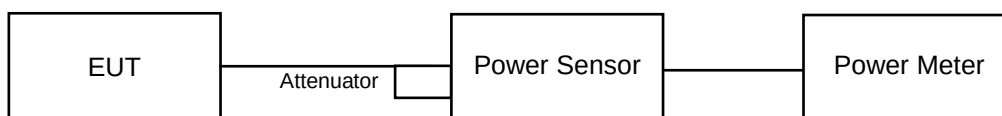
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

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

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

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

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

<1TX>

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
12	2467	129.718	21.13	30	Pass
13	2472	84.918	19.29	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
12	2467	67.608	18.30	30	Pass
13	2472	7.295	8.63	30	Pass

<2TX>

802.11n (HT20)

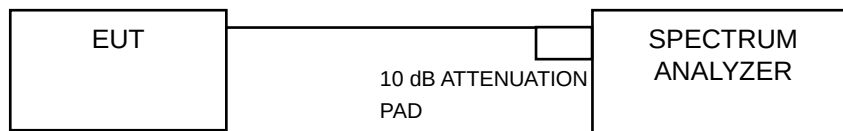
Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
12	2467	15.85	16.19	80.05	19.03	30	Pass
13	2472	5.83	5.81	7.639	8.83	30	Pass

4.4 Power Spectral Density Measurement

4.4.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm.

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

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Condition

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

4.4.7 Test Results

<1TX>

802.11b

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
12	2467	-5.62	8	Pass
13	2472	-7.80	8	Pass

802.11g

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
12	2467	-13.16	8	Pass
13	2472	-24.07	8	Pass

<2TX>

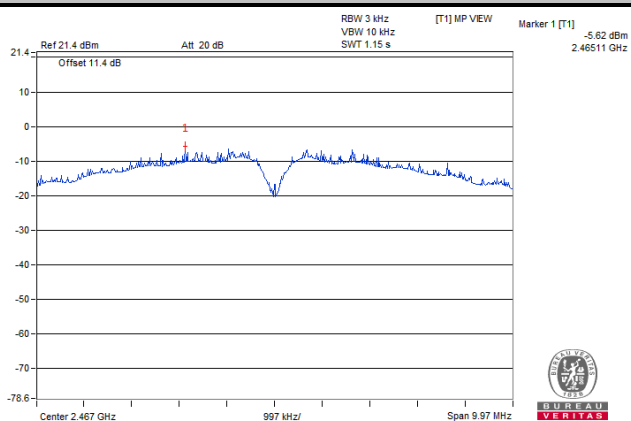
802.11n (HT20)

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	12	2467	-15.82	3.01	-12.81	8	Pass
	13	2472	-30.41	3.01	-27.40	8	Pass
1	12	2467	-15.93	3.01	-12.92	8	Pass
	13	2472	-28.34	3.01	-25.33	8	Pass

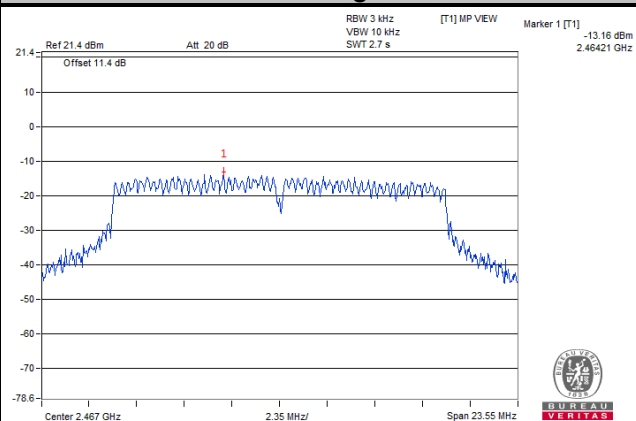
NOTE: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}] = 0.79 \text{ dBi} < 6 \text{ dBi}$, i, so the limit doesn't need to be reduced.

Spectrum Plot of Worst Value

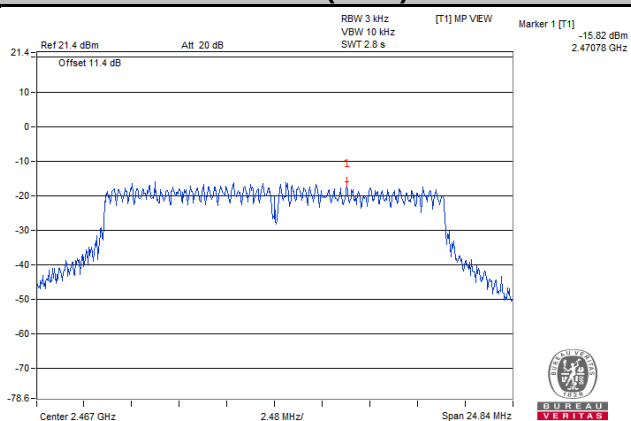
802.11b



802.11g



802.11n (HT20)

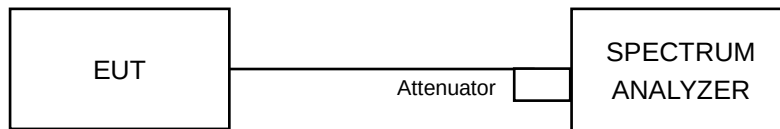


4.5 Conducted Out of Band Emission Measurement

4.5.1 Limits of Conducted Out of Band Emission Measurement

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

4.5.2 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

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

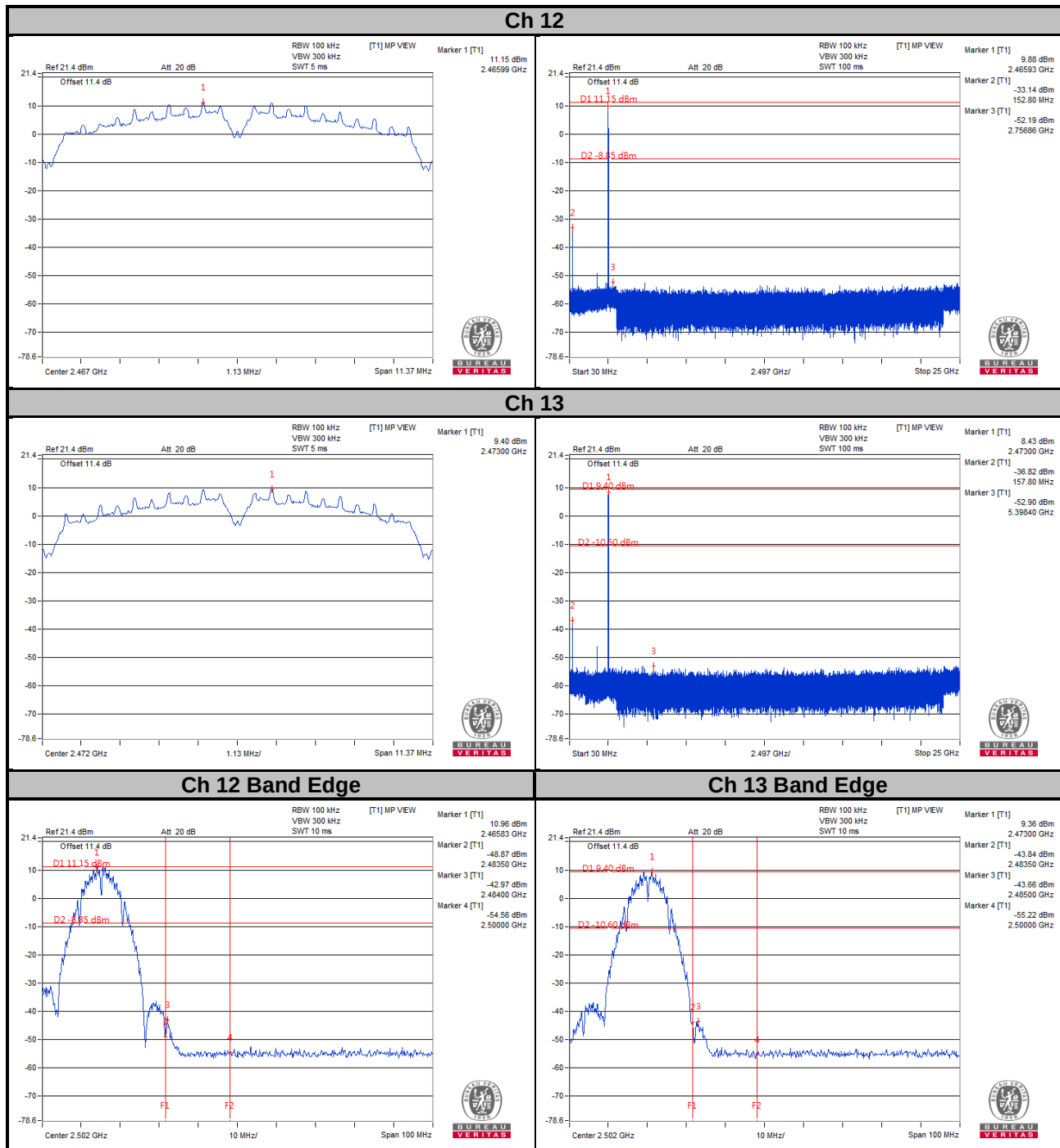
4.5.7 Test Results

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.

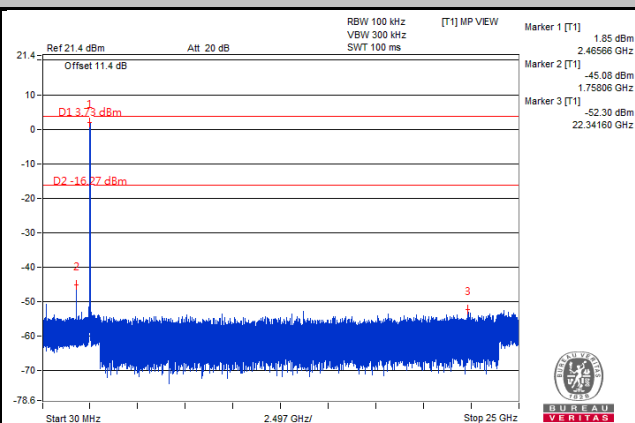
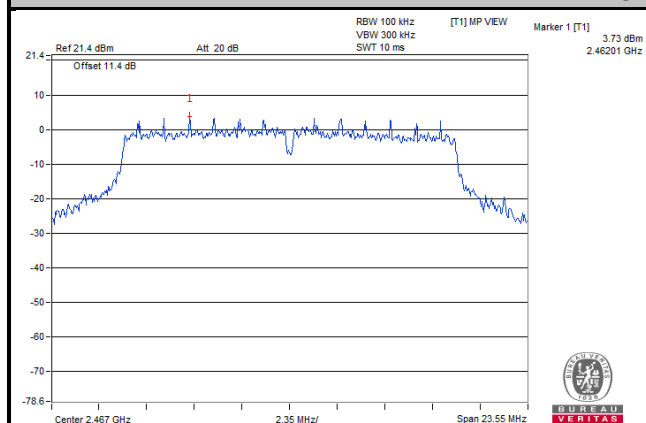
<1TX>

802.11b

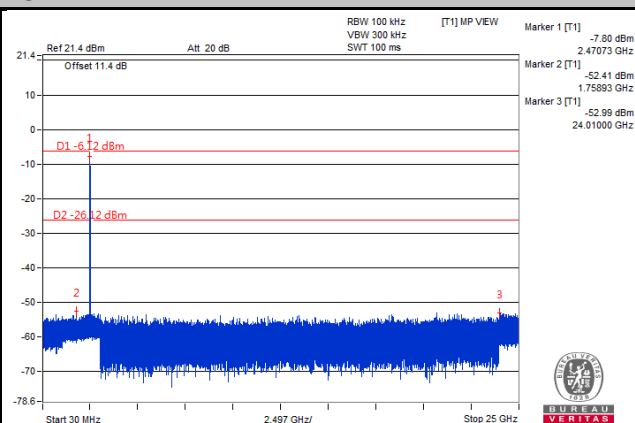
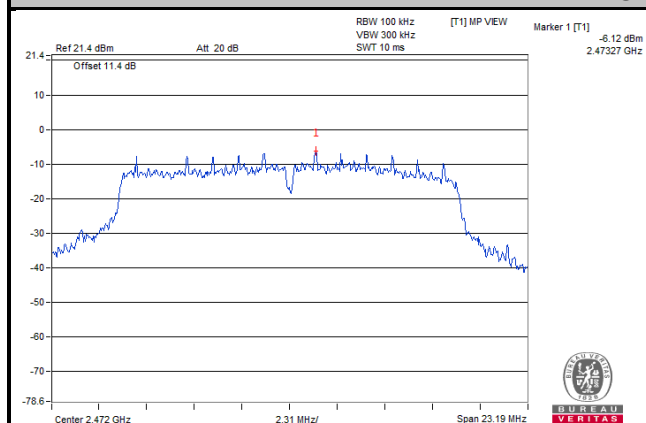


802.11g

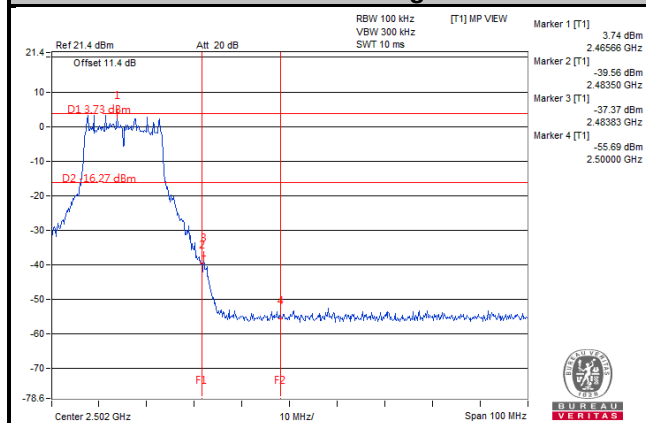
Ch 12



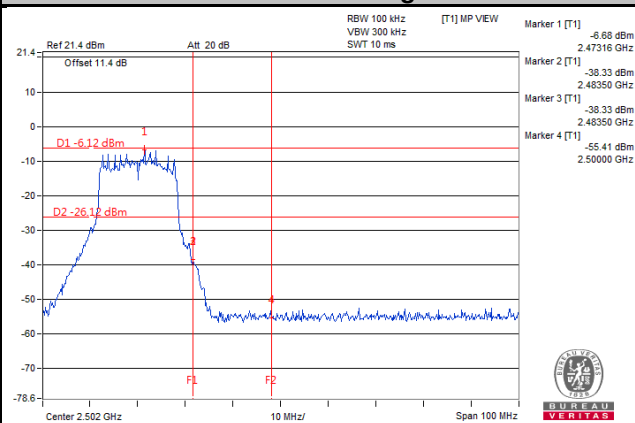
Ch 13



Ch 12 Band Edge



Ch 13 Band Edge

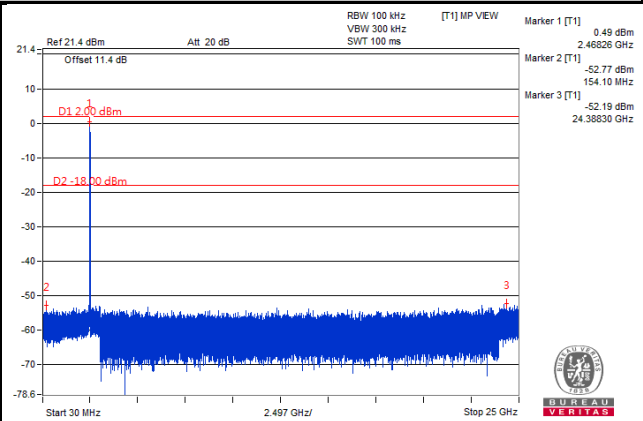
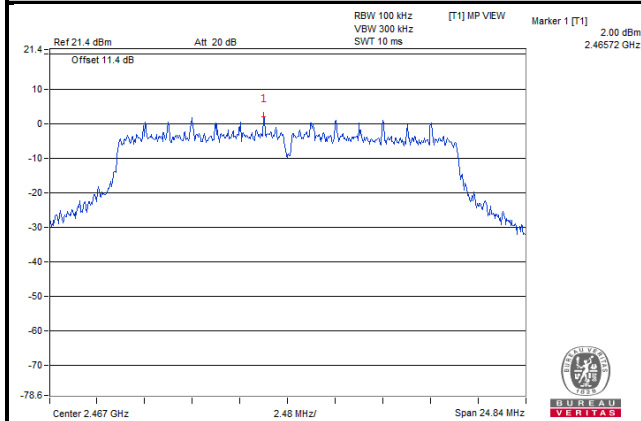


<2TX>

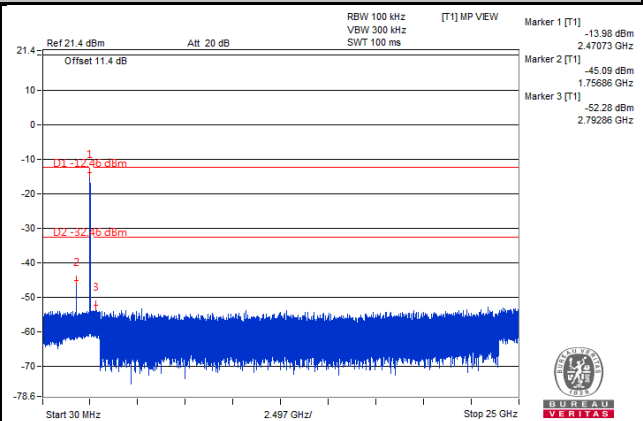
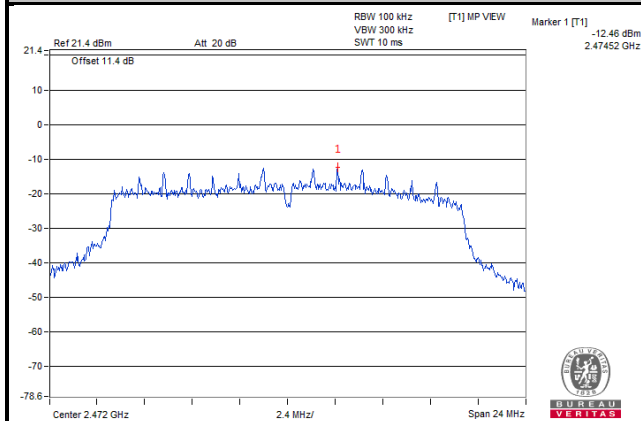
802.11n (HT20)

CHAIN 0

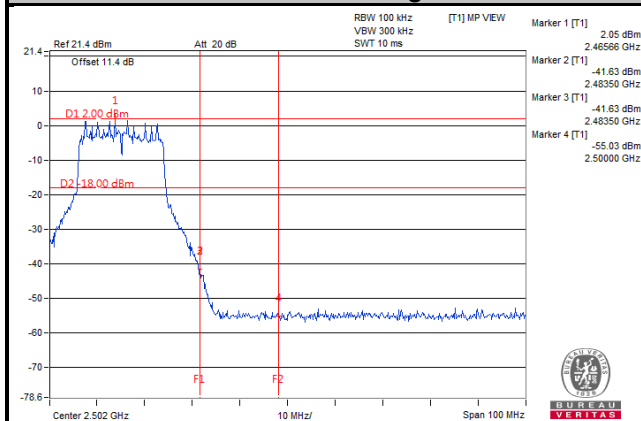
Ch 11



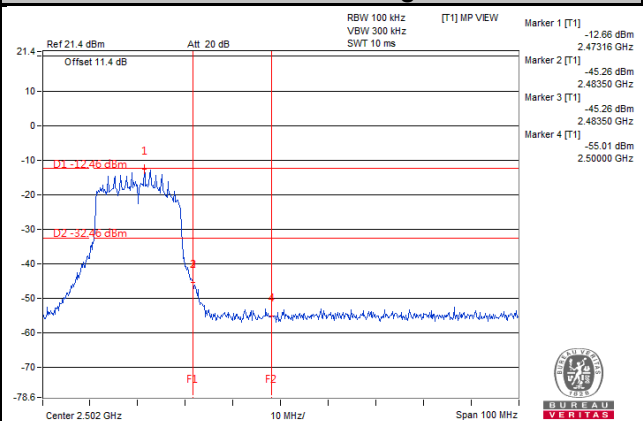
Ch 13



Ch 12 Band Edge

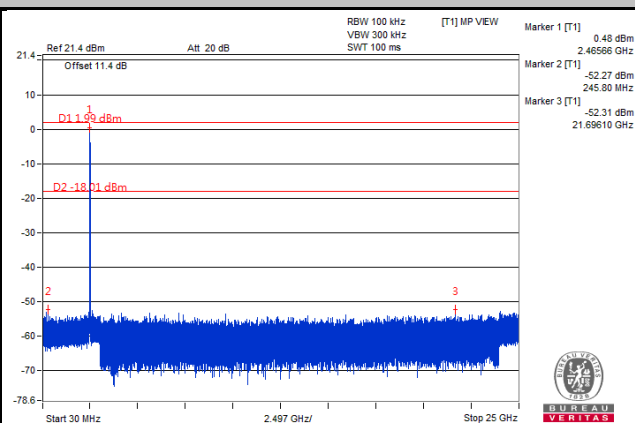
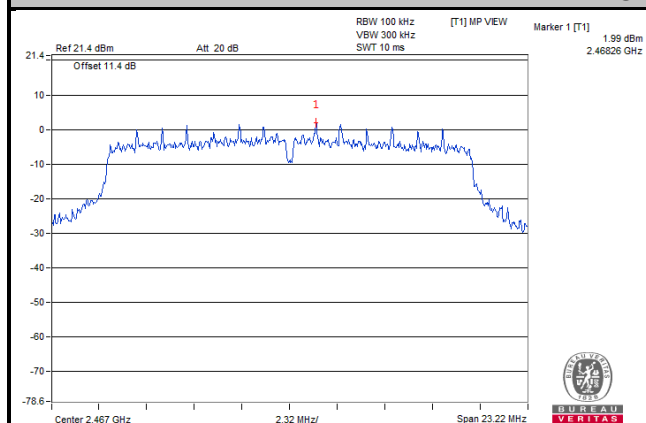


Ch 13 Band Edge

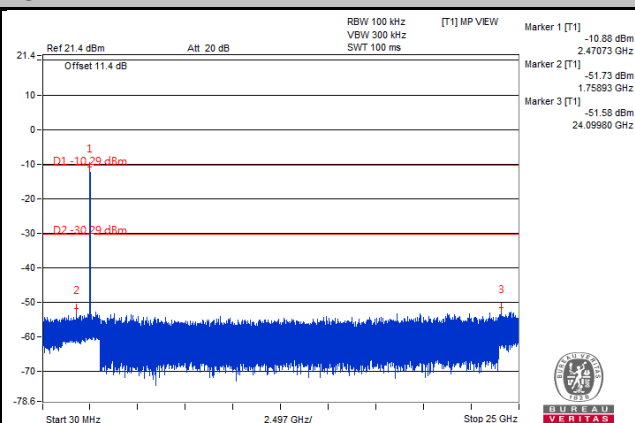
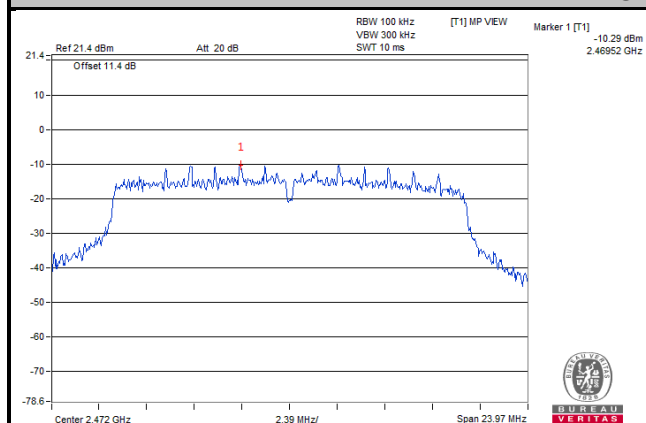


CHAIN 1

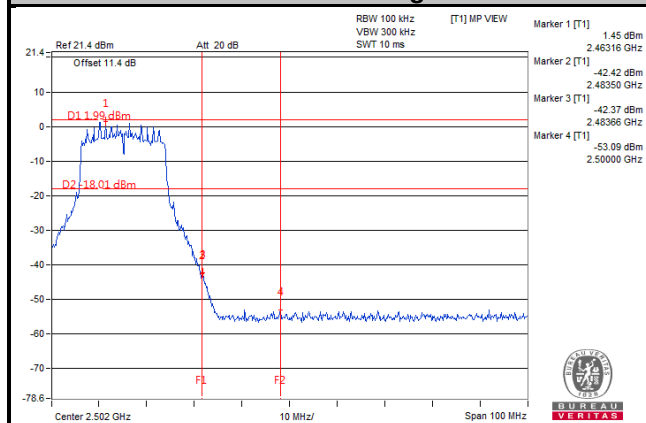
Ch 12



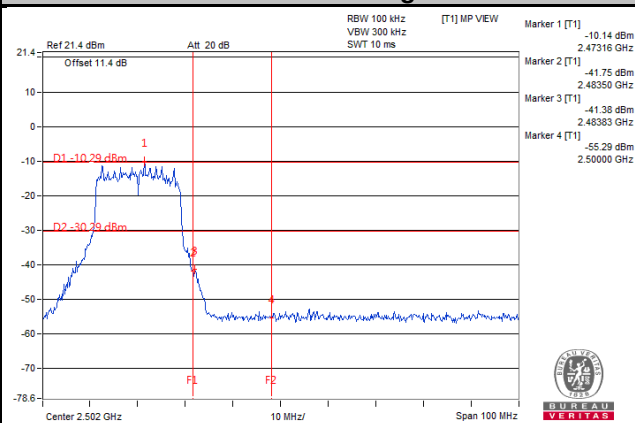
Ch 13



Ch 12 Band Edge



Ch 13 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 accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

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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