

FCC Test Report

Report No.: RF150814C22

FCC ID: 2AD9M-001A

Test Model: LEM-TYPER

Received Date: Aug. 14, 2015

Test Date: Nov. 28, 2016 ~ Dec. 11, 2016

Issued Date: Jan. 26, 2017

Applicant: LEOMO, Inc

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

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(R.O.C)

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Release Control Record

Issue No.	Description	Date Issued
RF150814C22	Original Release	Jan. 26, 2017

1 Certificate of Conformity

Product: Lemonade Type R Wearable Device

Brand: LEOMO, Inc

Test Model: LEM-TYPER

Sample Status: Identical Prototype

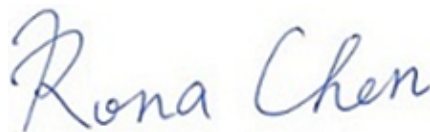
Applicant: LEOMO, Inc

Test Date: Nov. 28, 2016 ~ Dec. 11, 2016

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 :



Date:

Jan. 26, 2017

Rona Chen / Specialist

Approved by :



Date:

Jan. 26, 2017

David Huang / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -6.86 dB at 0.62195 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -11.59 dB at 4874 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

2.1 Measurement Uncertainty

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

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

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

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Lemonade Type R Wearable Device
Brand	LEOMO, Inc
Test Model	LEM-TYPER
Status of EUT	Identical Prototype
Power Supply Rating	5.0 Vdc (adapter or host equipment) 3.7 Vdc (Li-ion battery)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 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 MCS7
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	108.643 mW
Antenna Type	Monopole antenna with 1.36 dBi gain
Antenna Connector	N/A
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. The EUT EUT provides 1 completed transmitter and 1 receiver.

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

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
AC Adapter	LEOMO, Inc	LEM-A2021U	I/P: 100-240 Vac, 50-60Hz, 0.7 A O/P: 5 Vdc, 4.8 A
Smart Watch Embedded Battery	LEOMO, Inc	300824P	3.7 Vdc, 30 mAh
L Battery	LEOMO, Inc	LEM-FOXH855	3.7 Vdc, 635 mAh
S Battery	LEOMO, Inc	LEM-FOX5755	3.7 Vdc, 385 mAh
Dock Charger	LEOMO, Inc	LEM-DR2000	3.7 Vdc, 2090 mAh
USB Cable	LEOMO, Inc	LEM-USB1	1 m non-shielded cable w/o core
LCD Panel	LEOMO, Inc	LEM-DL1	3"
Bike Mount	LEOMO, Inc	LEM-BM1	--
Wrist Band	LEOMO, Inc	LEM-WB1	--
Dock	LEOMO, Inc	LEM-DC1	I/P: 5 Vdc , 1.5 A O/P: 5 Vdc, 600 mA 4.2 Vdc, 600 mA
Adjustment Spacer	LEOMO, Inc	LEM-AS1	--
Motion Sensor	LEOMO, Inc	LEM-MS1	--
Motion Sensor Embedded Battery	LEOMO, Inc	AHB521630PS-02	3.7 Vdc, 240 mAh
Sensor Charger	LEOMO, Inc	LEM-SCH1	I/P: 5 Vdc , 1.5 A O/P: 5 Vdc, 210 mA

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

3.2 Description of Test Modes

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT + LCD Panel + L Battery + Bike Mount + Dock + Dock Charger
B	√	√	-	-	EUT + LCD Panel + L Battery + Wrist Band

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 **Z-plane**.

Radiated Emission Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

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

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)
A, B	802.11b	1 to 11	6	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	6	DSSS	DBPSK	1.0

Bandedge Measurement:

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

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

Antenna Port Conducted Measurement:

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

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

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Toby Tian
APCM	25 deg. C, 65 % RH	3.7 Vdc	Taylor Liu

3.3 Duty Cycle of Test Signal

802.11b: Duty cycle of test signal is 100 %, duty factor is not required.

802.11g: Duty cycle = $1.358/1.558 = 0.872$, Duty factor = $10 * \log(1/0.872) = 0.60$

802.11n (HT20): Duty cycle = $1.275/1.475 = 0.864$, Duty factor = $10 * \log(1/0.864) = 0.63$

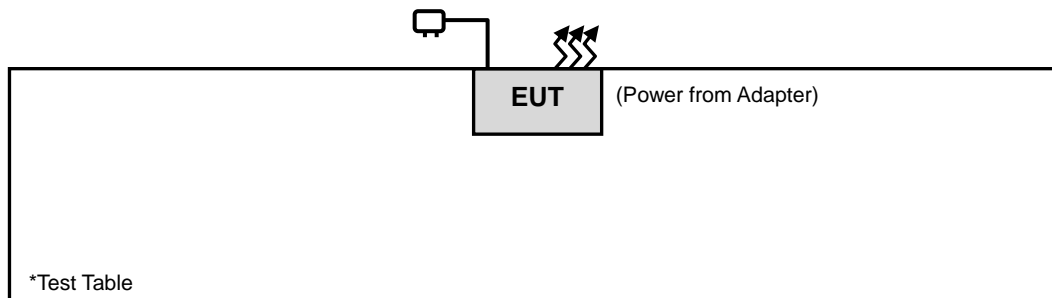


3.4 Description of Support Units

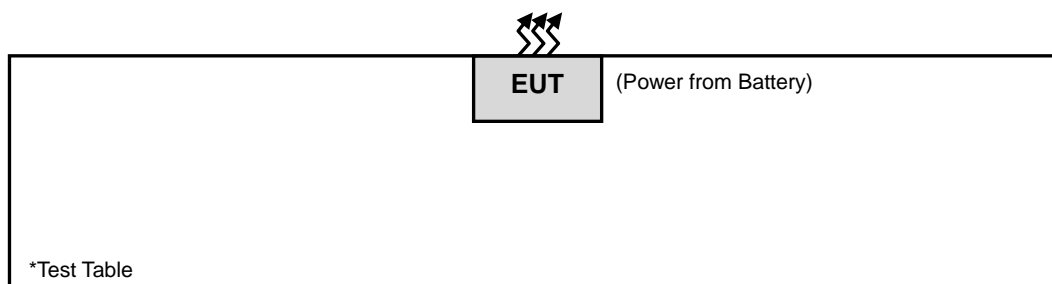
The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4.1 Configuration of System under Test

Mode A



Mode B



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

558074 D01 DTS Meas Guidance v03r05

ANSI C63.10-2013

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Jan. 21, 2016	Jan. 20, 2017
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 16, 2016	Dec. 15, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Jan. 04, 2016	Jan. 03, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Jan. 08, 2016	Jan. 07, 2017
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Test Receiver Agilent	N9038A	MY51210203	Jan. 21, 2016	Jan. 20, 2017
Preamplifier EMCI	EMC 012645	980115	Oct. 21, 2016	Oct. 20, 2017
Preamplifier EMCI	EMC 184045	980116	Oct. 21, 2016	Oct. 20, 2017
Preamplifier EMCI	EMC 330H	980112	Oct. 21, 2016	Oct. 20, 2017
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2016	Sep. 07, 2017
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2016	Sep. 07, 2017
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 21, 2016	Oct. 20, 2017
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 21, 2016	Oct. 20, 2017
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 21, 2016	Oct. 20, 2017
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

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

4.1.3 Test Procedures

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

Note:

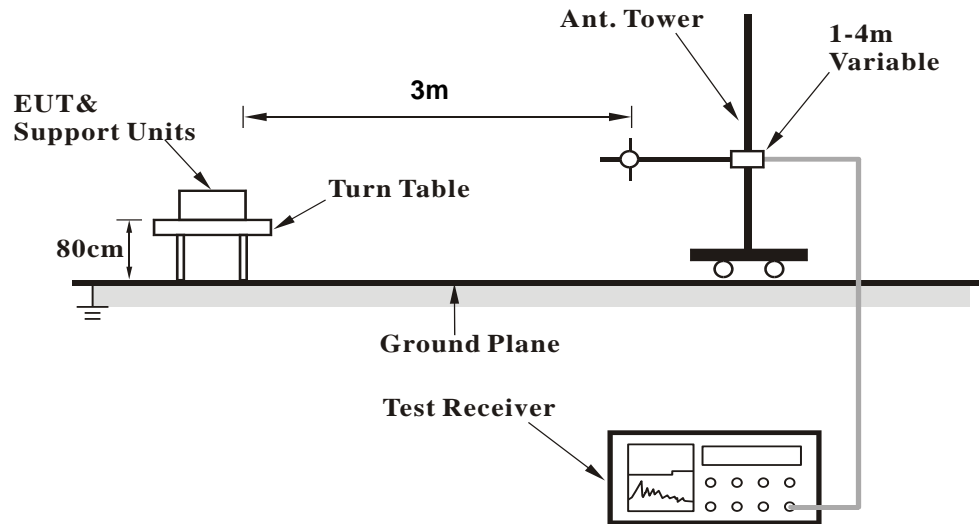
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 KHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency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

4.1.4 Deviation from Test Standard

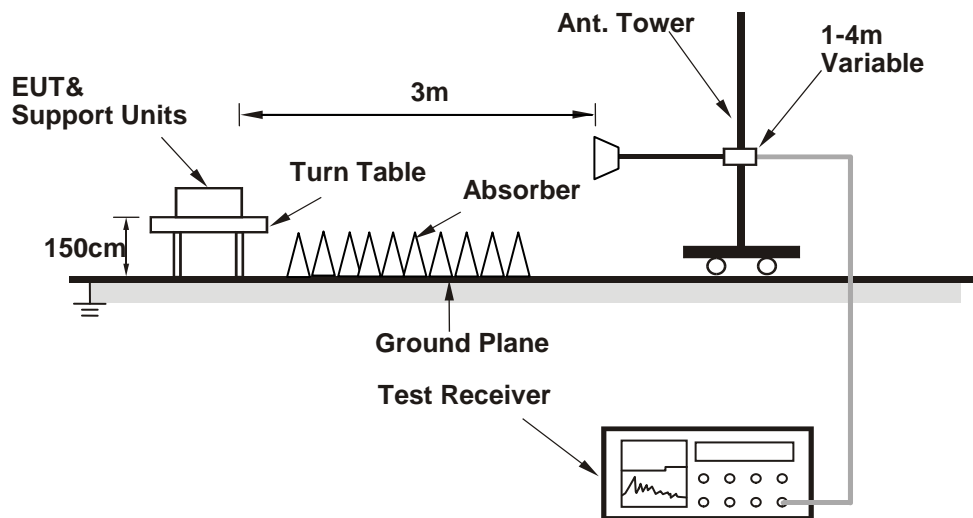
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1 GHz>



<Frequency Range above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1 GHz Data :

Mode A

802.11b

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

Antenna 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
2386.32	59.92	66.43	74	-14.08	26.91	4.08	37.5	192	337	Peak
2389.92	37.81	44.34	54	-16.19	26.91	4.08	37.52	192	337	Average
2412	103.19	109.66			26.96	4.09	37.52	192	337	Average
2412	106.48	112.95			26.96	4.09	37.52	192	337	Peak
4824	40.15	55.45	54	-13.85	30.99	6.79	53.08	179	278	Average
4824	44.5	59.8	74	-29.5	30.99	6.79	53.08	179	278	Peak
Antenna 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
2361.03	57.84	64.47	74	-16.16	26.81	4.05	37.49	100	64	Peak
2389.83	36	42.53	54	-18	26.91	4.08	37.52	100	64	Average
2412	94.25	100.72			26.96	4.09	37.52	100	64	Average
2412	97.63	104.1			26.96	4.09	37.52	100	64	Peak
4824	41.58	56.88	54	-12.42	30.99	6.79	53.08	212	356	Average
4824	45.33	60.63	74	-28.67	30.99	6.79	53.08	212	356	Peak

Remarks:

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

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

Antenna 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
2378.4	57.22	63.79	74	-16.78	26.86	4.07	37.5	189	334	Peak
2389.92	36.56	43.09	54	-17.44	26.91	4.08	37.52	189	334	Average
2437	103.2	109.48			27.06	4.12	37.46	189	334	Average
2437	106.57	112.85			27.06	4.12	37.46	189	334	Peak
2487.72	58.31	64.27	74	-15.69	27.2	4.16	37.32	189	334	Peak
2490.08	37.22	43.18	54	-16.78	27.2	4.16	37.32	189	334	Average
4874	41.36	56.5	54	-12.64	31.06	6.85	53.05	188	278	Average
4874	45.52	60.66	74	-28.48	31.06	6.85	53.05	188	278	Peak
Antenna 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
2374.98	56.97	63.54	74	-17.03	26.86	4.07	37.5	134	2	Peak
2389.02	35.86	42.37	54	-18.14	26.91	4.08	37.5	134	2	Average
2437	94.28	100.56			27.06	4.12	37.46	134	2	Average
2437	97.71	103.99			27.06	4.12	37.46	134	2	Peak
2488.68	36.38	42.34	54	-17.62	27.2	4.16	37.32	134	2	Average
2493.96	57.66	63.55	74	-16.34	27.2	4.16	37.25	134	2	Peak
4874	42.41	57.55	54	-11.59	31.06	6.85	53.05	124	20	Average
4874	46.47	61.61	74	-27.53	31.06	6.85	53.05	124	20	Peak

Remarks:

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

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

Antenna 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	103.06	109.22			27.1	4.13	37.39	169	336	Average
2462	106.32	112.48			27.1	4.13	37.39	169	336	Peak
2488.48	41.55	47.51	54	-12.45	27.2	4.16	37.32	169	336	Average
2493.44	57.58	63.47	74	-16.42	27.2	4.16	37.25	169	336	Peak
4924	41.2	56.23	54	-12.8	31.12	6.88	53.03	100	286	Average
4924	45.94	60.97	74	-28.06	31.12	6.88	53.03	100	286	Peak
Antenna 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	94.09	100.25			27.1	4.13	37.39	136	329	Average
2462	97.47	103.63			27.1	4.13	37.39	136	329	Peak
2483.6	36.43	42.45	54	-17.57	27.15	4.15	37.32	136	329	Average
2490.92	57.87	63.83	74	-16.13	27.2	4.16	37.32	136	329	Peak
4924	41.94	56.97	54	-12.06	31.12	6.88	53.03	100	62	Average
4924	46.95	61.98	74	-27.05	31.12	6.88	53.03	100	62	Peak

Remarks:

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

802.11g

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

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.83	42.08	48.61	54	-11.92	26.91	4.08	37.52	154	335	Average
2389.83	55.42	61.95	74	-18.58	26.91	4.08	37.52	154	335	Peak
2412	96.81	103.28			26.96	4.09	37.52	154	335	Average
2412	104.3	110.77			26.96	4.09	37.52	154	335	Peak
4824	38.85	54.15	54	-15.15	30.99	6.79	53.08	100	169	Average
4824	43.18	58.48	74	-30.82	30.99	6.79	53.08	100	169	Peak
Antenna 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
2360.94	47.09	53.72	74	-26.91	26.81	4.05	37.49	100	63	Peak
2389.92	37.3	43.83	54	-16.7	26.91	4.08	37.52	100	63	Average
2412	86.21	92.68			26.96	4.09	37.52	100	63	Average
2412	94.97	101.44			26.96	4.09	37.52	100	63	Peak
4824	39.14	54.44	54	-14.86	30.99	6.79	53.08	100	117	Average
4824	44.84	60.14	74	-29.16	30.99	6.79	53.08	100	117	Peak

Remarks:

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

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

Antenna 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
2368.95	47.53	54.1	74	-26.47	26.86	4.07	37.5	106	349	Peak
2388.75	36.89	43.4	54	-17.11	26.91	4.08	37.5	106	349	Average
2437	96.54	102.82			27.06	4.12	37.46	106	349	Average
2437	104.14	110.42			27.06	4.12	37.46	106	349	Peak
2489.04	50.45	56.41	74	-23.55	27.2	4.16	37.32	106	349	Peak
2489.68	41.64	47.6	54	-12.36	27.2	4.16	37.32	106	349	Average
4874	37.77	52.91	54	-16.23	31.06	6.85	53.05	100	158	Average
4874	43.79	58.93	74	-30.21	31.06	6.85	53.05	100	158	Peak
Antenna 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
2368.41	36.58	43.2	54	-17.42	26.81	4.07	37.5	100	14	Average
2379.39	46.66	53.23	74	-27.34	26.86	4.07	37.5	100	14	Peak
2437	88.11	94.39			27.06	4.12	37.46	100	14	Average
2437	95.87	102.15			27.06	4.12	37.46	100	14	Peak
2489.52	37.93	43.89	54	-16.07	27.2	4.16	37.32	100	14	Average
2491.12	48.19	54.15	74	-25.81	27.2	4.16	37.32	100	14	Peak
4874	38.88	54.02	54	-15.12	31.06	6.85	53.05	100	65	Average
4874	44.59	59.73	74	-29.41	31.06	6.85	53.05	100	65	Peak

Remarks:

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

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

Antenna 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	97.18	103.34			27.1	4.13	37.39	104	353	Average
2462	104.57	110.73			27.1	4.13	37.39	104	353	Peak
2483.56	42.25	48.27	54	-11.75	27.15	4.15	37.32	104	353	Average
2483.56	56.09	62.11	74	-17.91	27.15	4.15	37.32	104	353	Peak
4924	37.46	52.49	54	-16.54	31.12	6.88	53.03	186	294	Average
4924	42.27	57.3	74	-31.73	31.12	6.88	53.03	186	294	Peak
Antenna 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	88.17	94.33			27.1	4.13	37.39	100	12	Average
2462	95.66	101.82			27.1	4.13	37.39	100	12	Peak
2483.56	37.9	43.92	54	-16.1	27.15	4.15	37.32	100	12	Average
2491.8	49.02	54.91	74	-24.98	27.2	4.16	37.25	100	12	Peak
4924	38.54	53.57	54	-15.46	31.12	6.88	53.03	176	22	Average
4924	43.38	58.41	74	-30.62	31.12	6.88	53.03	176	22	Peak

Remarks:

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

802.11n (HT20)

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

Antenna 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
2389.65	52.56	59.07	74	-21.44	26.91	4.08	37.5	190	336	Peak
2389.83	41.09	47.62	54	-12.91	26.91	4.08	37.52	190	336	Average
2412	95.08	101.55			26.96	4.09	37.52	190	336	Average
2412	102.11	108.58			26.96	4.09	37.52	190	336	Peak
4824	33.55	48.85	54	-20.45	30.99	6.79	53.08	103	112	Average
4824	44.11	59.41	74	-29.89	30.99	6.79	53.08	103	112	Peak
Antenna 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
2389.38	46.97	53.48	74	-27.03	26.91	4.08	37.5	100	67	Peak
2389.92	37.1	43.63	54	-16.9	26.91	4.08	37.52	100	67	Average
2412	83.78	90.25			26.96	4.09	37.52	100	67	Average
2412	92.61	99.08			26.96	4.09	37.52	100	67	Peak
4824	34.69	49.99	54	-19.31	30.99	6.79	53.08	105	196	Average
4824	44.58	59.88	74	-29.42	30.99	6.79	53.08	105	196	Peak

Remarks:

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

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

Antenna 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
2388.21	47.48	53.99	74	-26.52	26.91	4.08	37.5	154	336	Peak
2389.83	36.96	43.49	54	-17.04	26.91	4.08	37.52	154	336	Average
2437	95.03	101.31			27.06	4.12	37.46	154	336	Average
2437	102.28	108.56			27.06	4.12	37.46	154	336	Peak
2488.64	50.1	56.06	74	-23.9	27.2	4.16	37.32	154	336	Peak
2488.84	41.16	47.12	54	-12.84	27.2	4.16	37.32	154	336	Average
4874	33.51	48.65	54	-20.49	31.06	6.85	53.05	103	111	Average
4874	43.1	58.24	74	-30.9	31.06	6.85	53.05	103	111	Peak
Antenna 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
2372.55	46.97	53.54	74	-27.03	26.86	4.07	37.5	100	1	Peak
2379.21	36.61	43.18	54	-17.39	26.86	4.07	37.5	100	1	Average
2437	86.36	92.64			27.06	4.12	37.46	100	1	Average
2437	93.62	99.9			27.06	4.12	37.46	100	1	Peak
2489.24	37.54	43.5	54	-16.46	27.2	4.16	37.32	100	1	Average
2489.32	47.68	53.64	74	-26.32	27.2	4.16	37.32	100	1	Peak
4874	34.53	49.67	54	-19.47	31.06	6.85	53.05	100	152	Average
4874	43.47	58.61	74	-30.53	31.06	6.85	53.05	100	152	Peak

Remarks:

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

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

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	94.78	100.94			27.1	4.13	37.39	170	335	Average
2462	102.15	108.31			27.1	4.13	37.39	170	335	Peak
2483.52	40.9	46.92	54	-13.1	27.15	4.15	37.32	170	335	Average
2486.72	55.2	61.22	74	-18.8	27.15	4.15	37.32	170	335	Peak
4924	33.74	48.77	54	-20.26	31.12	6.88	53.03	107	142	Average
4924	43.78	58.81	74	-30.22	31.12	6.88	53.03	107	142	Peak
Antenna 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	86.27	92.43			27.1	4.13	37.39	102	0	Average
2462	93.91	100.07			27.1	4.13	37.39	102	0	Peak
2483.64	37.43	43.45	54	-16.57	27.15	4.15	37.32	102	0	Average
2488.56	47.8	53.76	74	-26.2	27.2	4.16	37.32	102	0	Peak
4924	34.34	49.37	54	-19.66	31.12	6.88	53.03	106	118	Average
4924	44.5	59.53	74	-29.5	31.12	6.88	53.03	106	118	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

Mode B

802.11b

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

Antenna 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
2371.65	57.61	64.18	74	-16.39	26.86	4.07	37.5	190	23	Peak
2389.92	35.83	42.36	54	-18.17	26.91	4.08	37.52	190	23	Average
2437	98.7	104.98			27.06	4.12	37.46	190	23	Average
2437	102.1	108.38			27.06	4.12	37.46	190	23	Peak
2490.16	36.48	42.44	54	-17.52	27.2	4.16	37.32	190	23	Average
2491.88	57.56	63.45	74	-16.44	27.2	4.16	37.25	190	23	Peak
4874	41.96	57.1	54	-12.04	31.06	6.85	53.05	103	177	Average
4874	47.68	62.82	74	-26.32	31.06	6.85	53.05	103	177	Peak
Antenna 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
2348.16	57.13	63.8	74	-16.87	26.77	4.05	37.49	100	113	Peak
2388.21	35.52	42.03	54	-18.48	26.91	4.08	37.5	100	113	Average
2437	87.15	93.43			27.06	4.12	37.46	100	113	Average
2437	90.6	96.88			27.06	4.12	37.46	100	113	Peak
2490.2	36.09	42.05	54	-17.91	27.2	4.16	37.32	100	113	Average
2491.4	57.2	63.16	74	-16.8	27.2	4.16	37.32	100	113	Peak
4874	41.63	56.77	54	-12.37	31.06	6.85	53.05	100	169	Average
4874	47.1	62.24	74	-26.9	31.06	6.85	53.05	100	169	Peak

Remarks:

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

9 kHz ~ 30 MHz DATA:

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

30 MHz ~ 1 GHz WORST-CASE DATA:

Mode A

802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antenna 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
89.17	33.91	56.58	43.5	-9.59	8.28	0.96	31.91	105	5	Peak
149.31	30.54	48.34	43.5	-12.96	12.68	1.13	31.61	108	73	Peak
293.84	23.93	41.28	46	-22.07	12.77	1.62	31.74	124	121	Peak
441.28	21.38	35.25	46	-24.62	16.16	1.97	32	114	303	Peak
565.44	22.54	33.6	46	-23.46	18.81	2.2	32.07	134	206	Peak
671.17	24.14	33.08	46	-21.86	20.47	2.4	31.81	123	88	Peak
Antenna 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
30.97	35.78	54.17	40	-4.22	12.14	0.59	31.12	120	179	Peak
83.35	33.37	55.92	40	-6.63	8.18	0.92	31.65	105	70	Peak
148.34	28.52	46.36	43.5	-14.98	12.64	1.14	31.62	114	339	Peak
293.84	19.37	36.72	46	-26.63	12.77	1.62	31.74	139	70	Peak
445.16	21.7	35.48	46	-24.3	16.23	1.98	31.99	129	145	Peak
552.83	23.44	34.71	46	-22.56	18.53	2.18	31.98	133	230	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

Mode B

802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Antenna 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
52.31	17.37	35.21	40	-22.63	12.76	0.72	31.32	121	48	Peak
152.22	15.86	33.69	43.5	-27.64	12.71	1.12	31.66	115	165	Peak
336.52	17.2	33.47	46	-28.8	13.82	1.73	31.82	102	22	Peak
444.19	20.74	34.54	46	-25.26	16.21	1.98	31.99	139	276	Peak
576.11	23.26	34.08	46	-22.74	19.06	2.22	32.1	102	147	Peak
695.42	25.46	34.06	46	-20.54	20.76	2.45	31.81	115	179	Peak
Antenna 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
43.58	17.22	34.07	40	-22.78	13.59	0.67	31.11	134	108	Peak
149.31	15.54	33.34	43.5	-27.96	12.68	1.13	31.61	106	96	Peak
304.51	15.79	32.97	46	-30.21	13.06	1.65	31.89	104	210	Peak
406.36	19.57	34.23	46	-26.43	15.46	1.92	32.04	103	157	Peak
554.77	23.72	34.98	46	-22.28	18.57	2.18	32.01	138	100	Peak
696.39	25.09	33.68	46	-20.91	20.77	2.45	31.81	119	75	Peak

Remarks:

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

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2016	Feb. 25, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 28, 2016	Jul. 27, 2017
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

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

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

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

4.2.3 Test Procedures

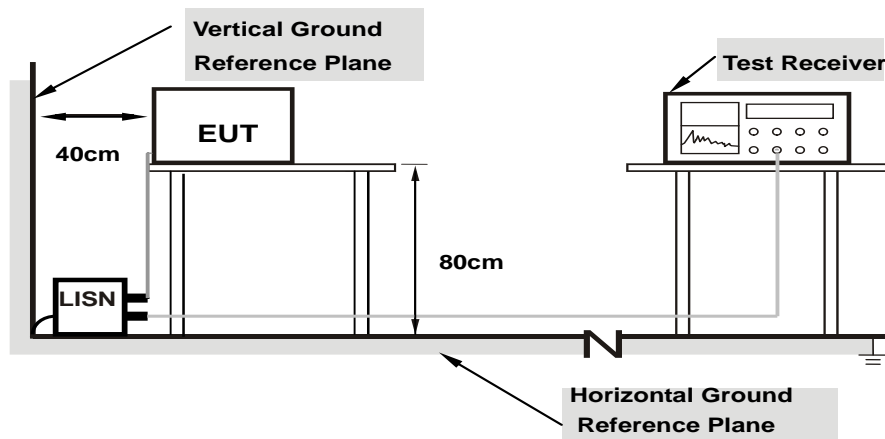
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

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

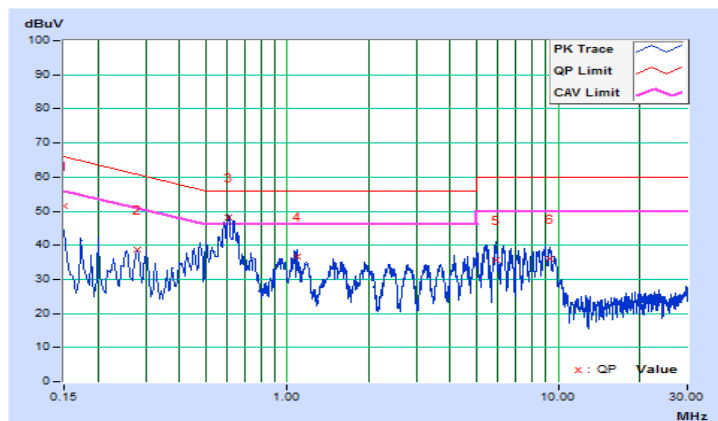
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2016/12/11

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.01	41.63	18.89	51.64	28.90	66.00	56.00	-14.36	-27.10
2	0.27918	10.07	28.67	16.74	38.74	26.81	60.84	50.84	-22.10	-24.03
3	0.60737	10.15	37.92	24.84	48.07	34.99	56.00	46.00	-7.93	-11.01
4	1.08444	10.21	26.44	13.97	36.65	24.18	56.00	46.00	-19.35	-21.82
5	5.87033	10.51	25.08	10.54	35.59	21.05	60.00	50.00	-24.41	-28.95
6	9.30331	10.69	25.29	12.30	35.98	22.99	60.00	50.00	-24.02	-27.01

Remarks:

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

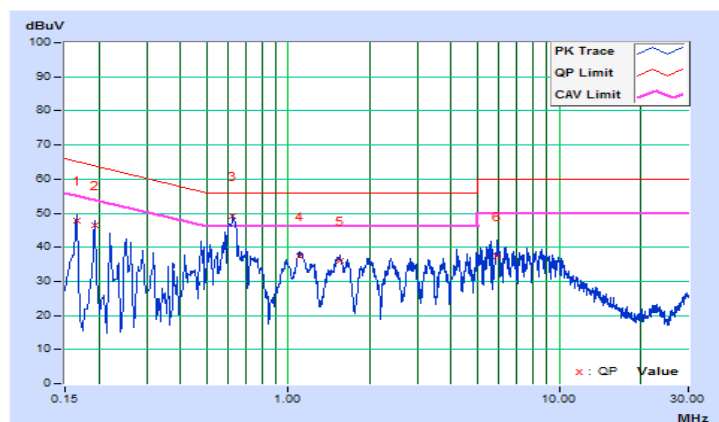


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2016/12/11

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16564	10.03	37.71	20.01	47.74	30.04	65.18	55.18	-17.44	-25.14
2	0.19305	10.04	36.43	23.96	46.47	34.00	63.90	53.90	-17.43	-19.90
3	0.62195	10.16	38.88	28.98	49.04	39.14	56.00	46.00	-6.96	-6.86
4	1.10013	10.22	27.24	19.11	37.46	29.33	56.00	46.00	-18.54	-16.67
5	1.54587	10.25	25.80	18.37	36.05	28.62	56.00	46.00	-19.95	-17.38
6	5.91334	10.55	26.91	19.80	37.46	30.35	60.00	50.00	-22.54	-19.65

Remarks:

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

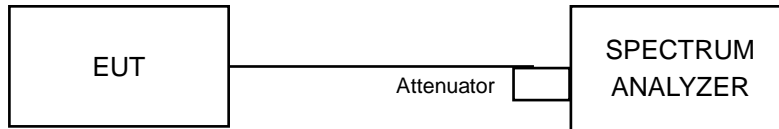


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	7.58	0.5	Pass
6	2437	7.13	0.5	Pass
11	2462	7.58	0.5	Pass

802.11g

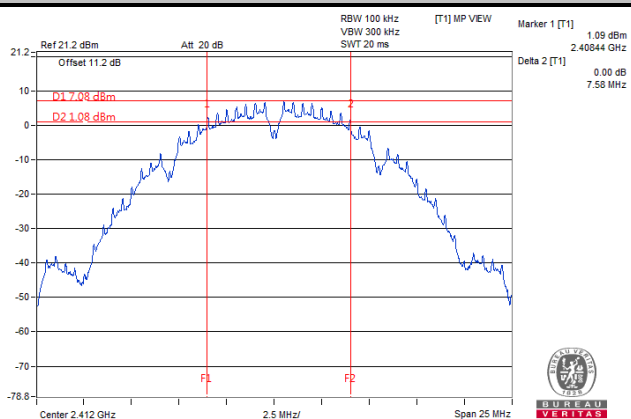
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.11	0.5	Pass
6	2437	16.44	0.5	Pass
11	2462	15.79	0.5	Pass

802.11n (HT20)

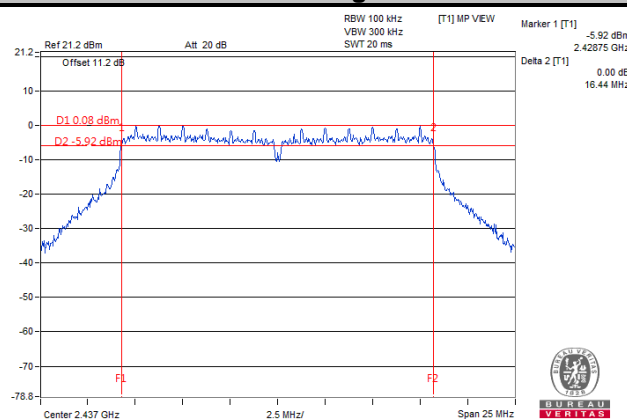
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.31	0.5	Pass
6	2437	17.65	0.5	Pass
11	2462	16.39	0.5	Pass

Spectrum Plot of Worst Value

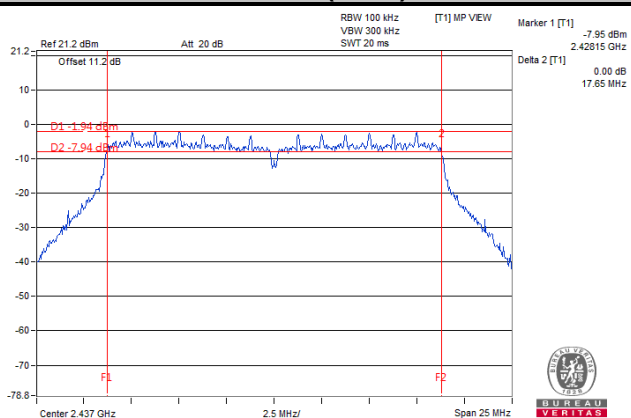
802.11b



802.11g



802.11n (HT20)

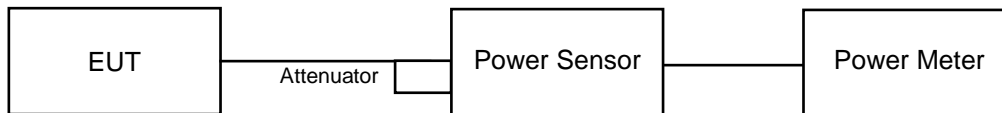


4.4 Conducted Output Power Measurement

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)

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

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

4.4.7 Test Results

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	55.081	17.41	30	Pass
6	2437	47.753	16.79	30	Pass
11	2462	56.754	17.54	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	108.643	20.36	30	Pass
6	2437	97.051	19.87	30	Pass
11	2462	102.565	20.11	30	Pass

802.11n (HT20)

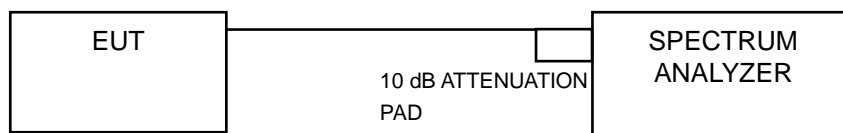
Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	72.778	18.62	30	Pass
6	2437	67.453	18.29	30	Pass
11	2462	68.077	18.33	30	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

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

4.5.7 Test Results

802.11b

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-7.82	8	Pass
6	2437	-8.39	8	Pass
11	2462	-7.76	8	Pass

802.11g

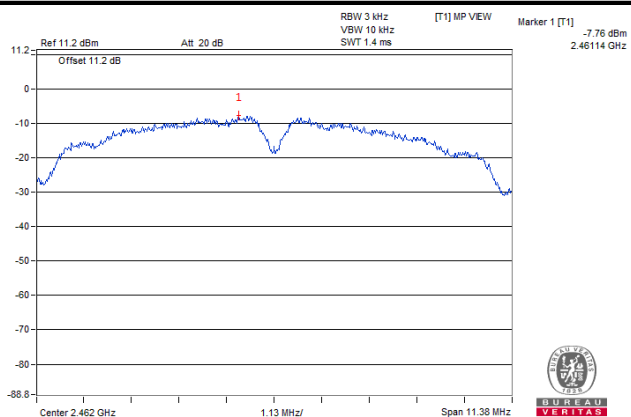
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-12.87	8	Pass
6	2437	-13.63	8	Pass
11	2462	-13.64	8	Pass

802.11n (HT20)

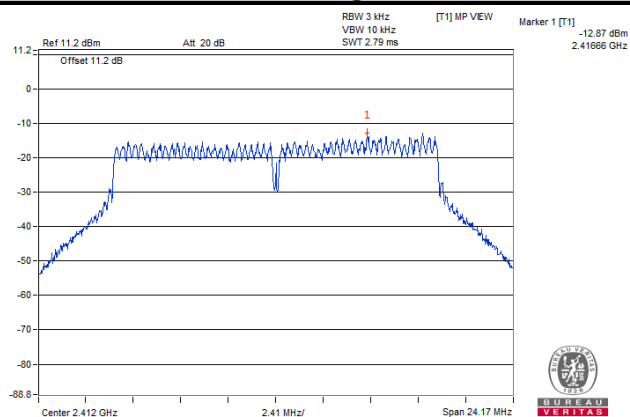
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-16.51	8	Pass
6	2437	-16.86	8	Pass
11	2462	-16.37	8	Pass

Spectrum Plot of Worst Value

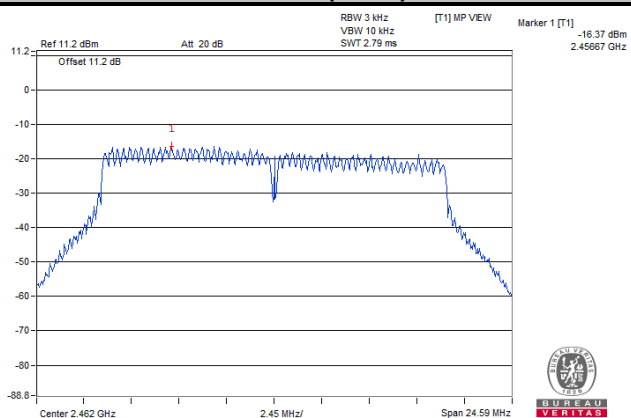
802.11b



802.11g



802.11n (HT20)

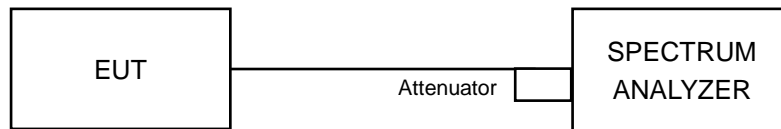


4.6 Conducted Out of Band Emission Measurement

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.

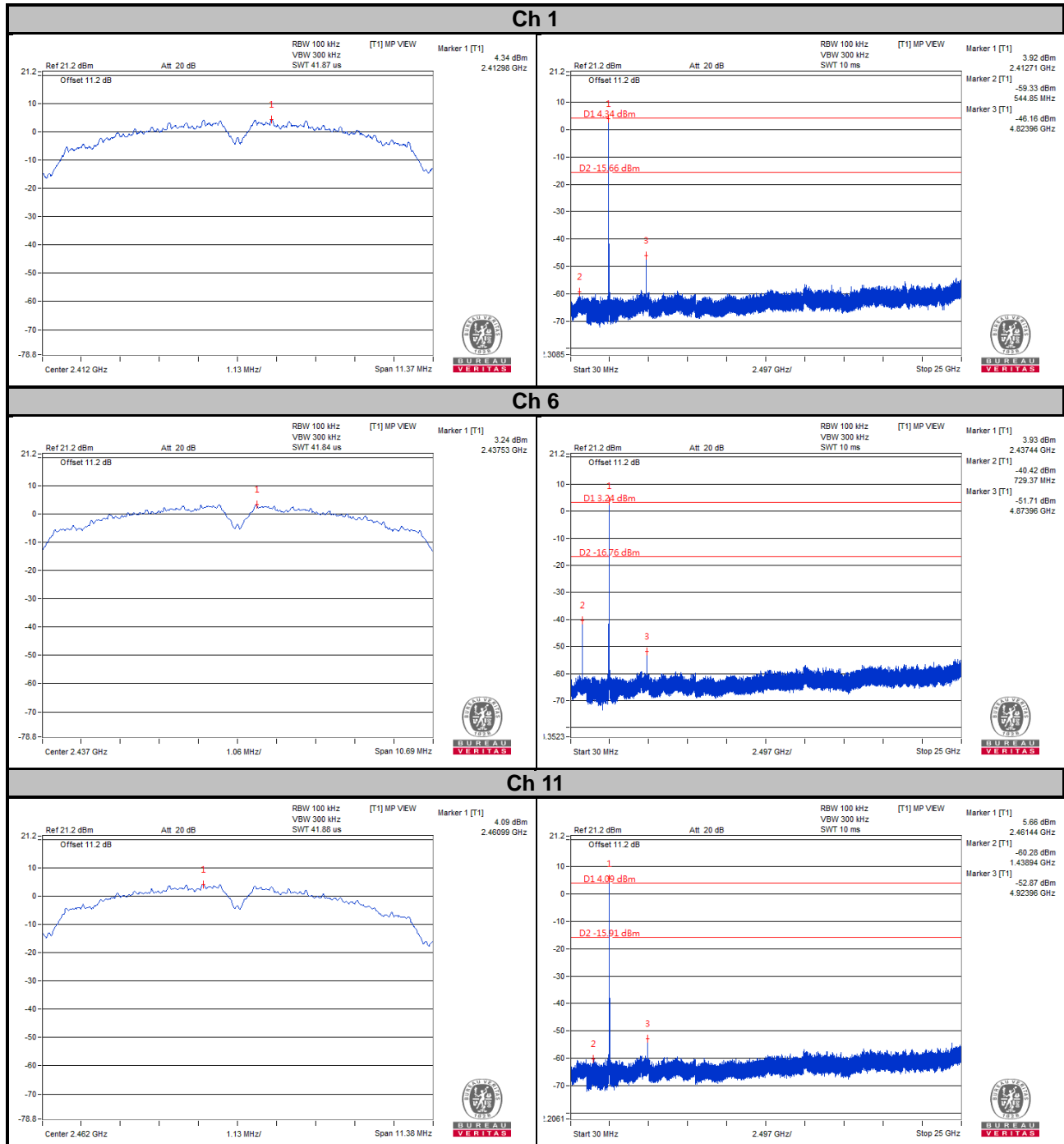
4.6.6 EUT Operating Condition

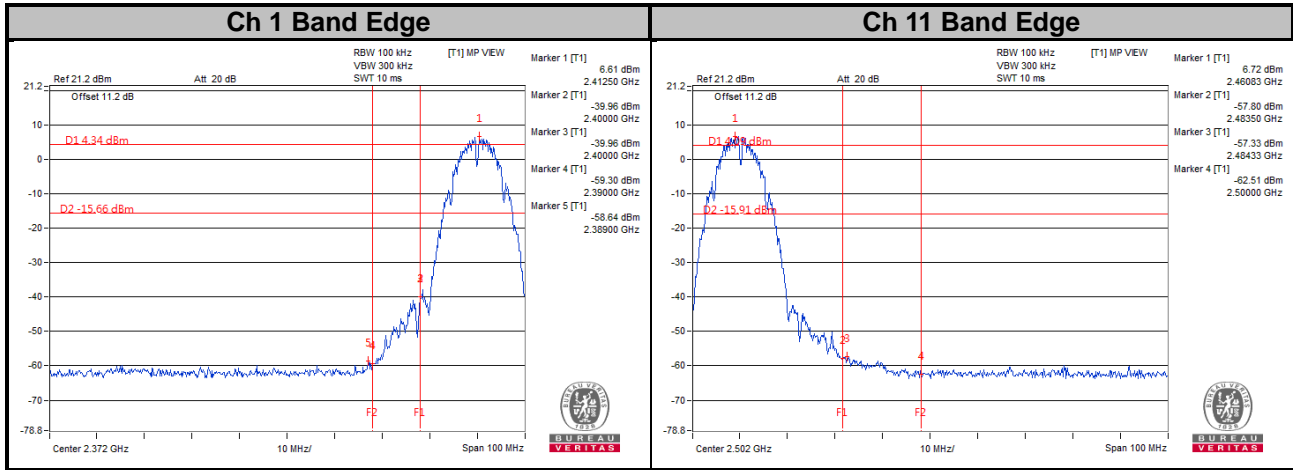
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 Test Results

The 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.

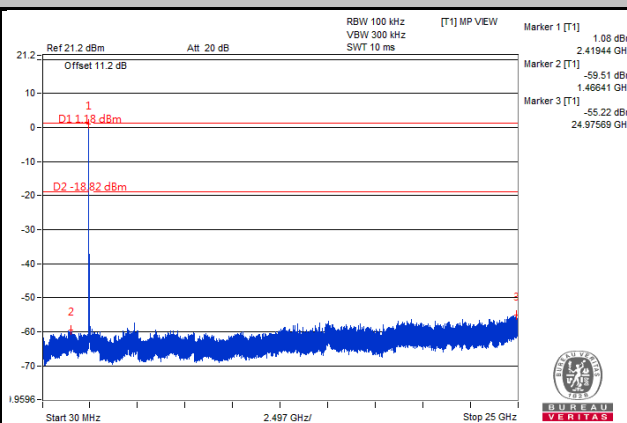
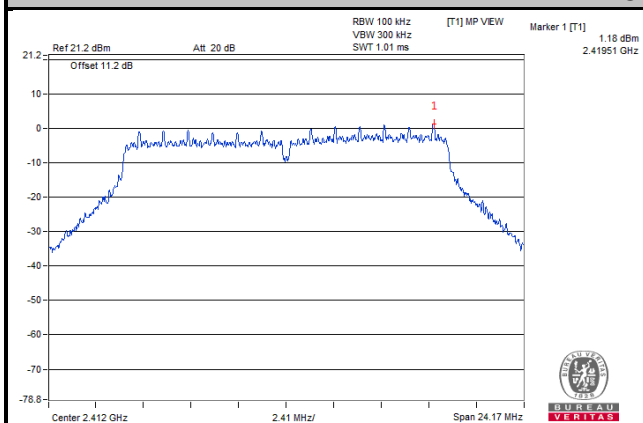
802.11b



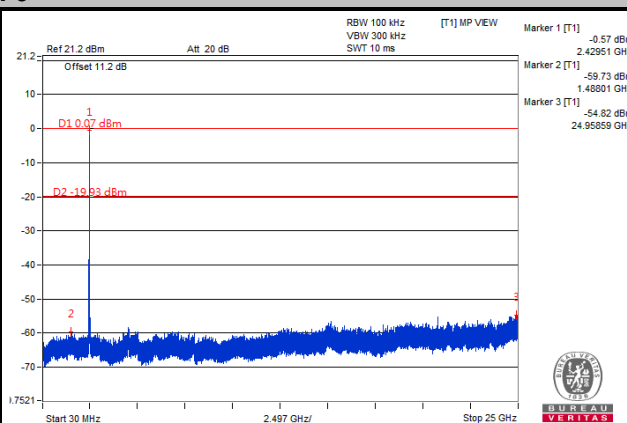
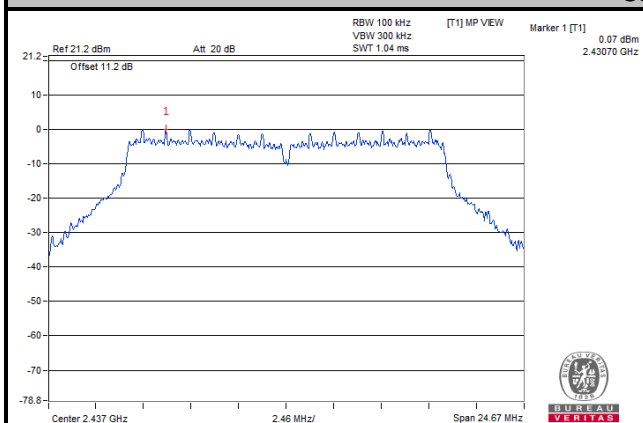


802.11g

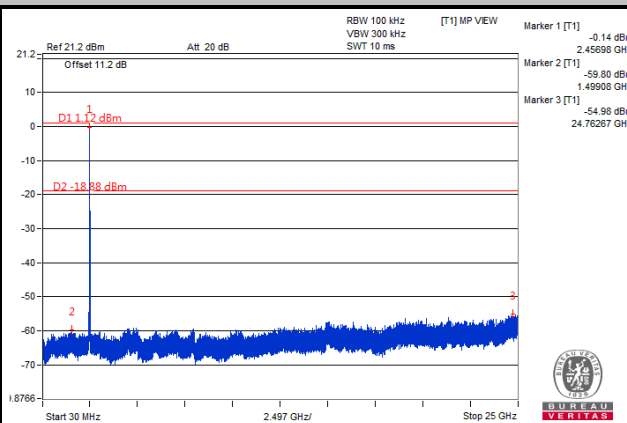
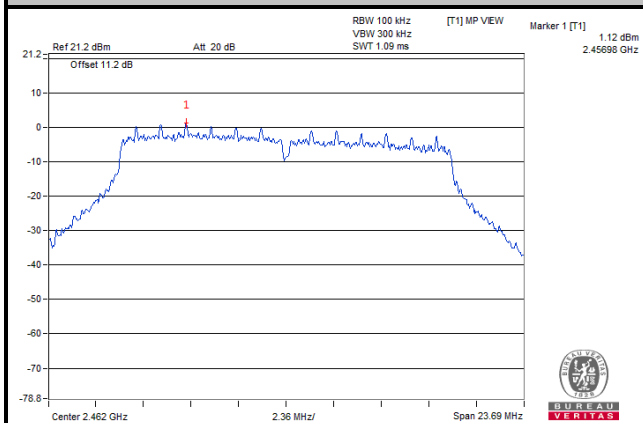
Ch 1

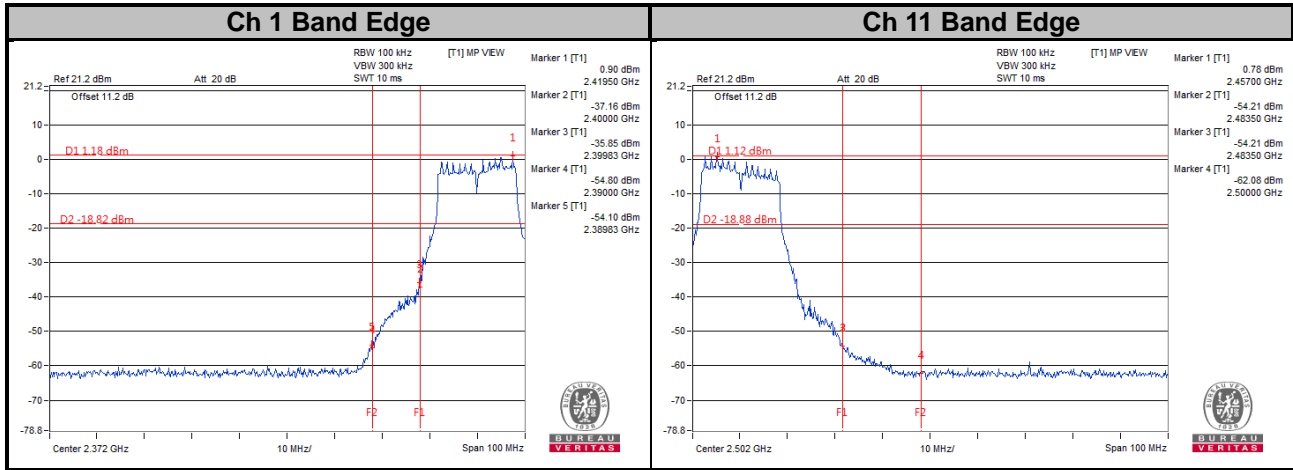


Ch 6



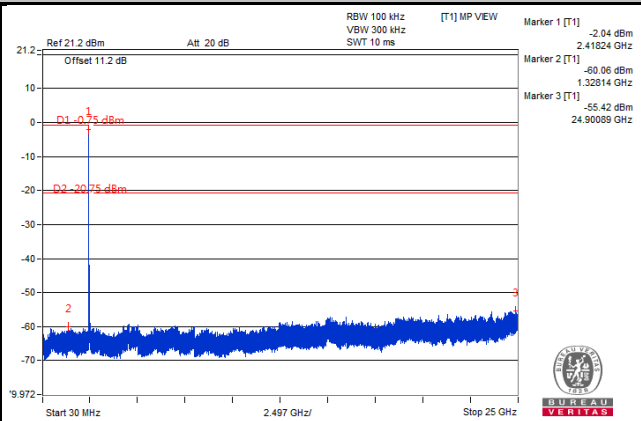
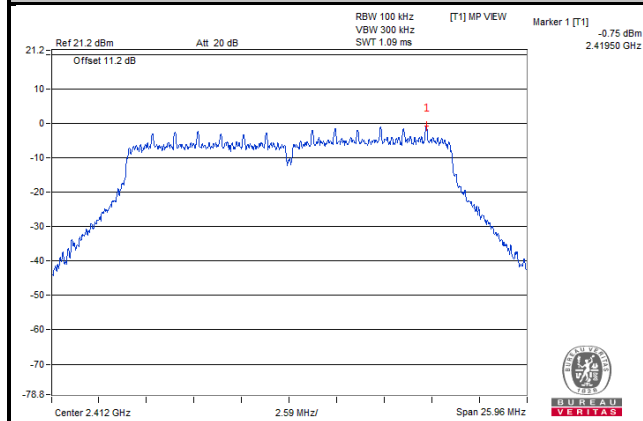
Ch 11



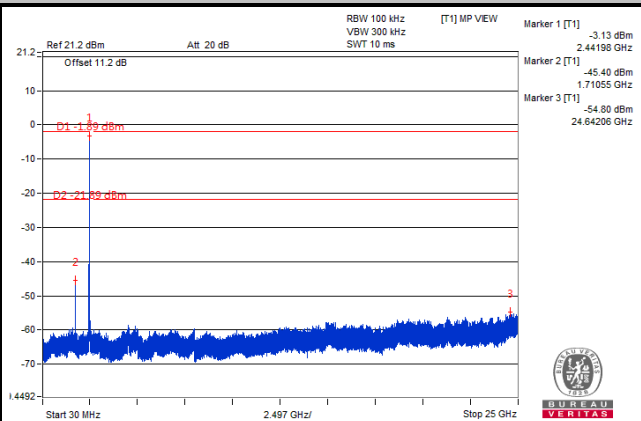
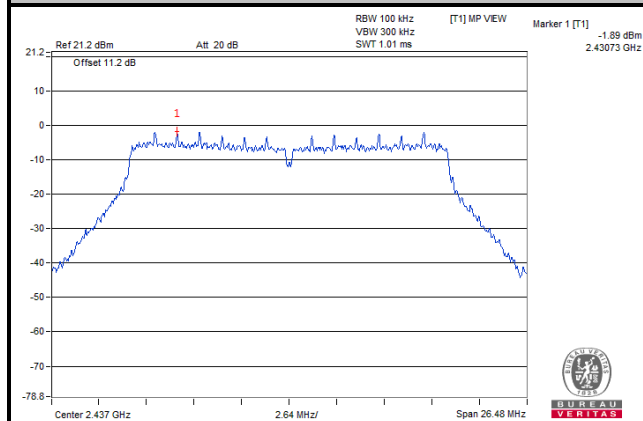


802.11n (HT20)

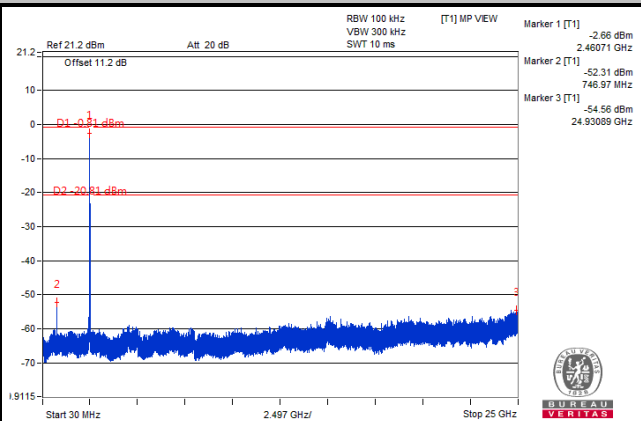
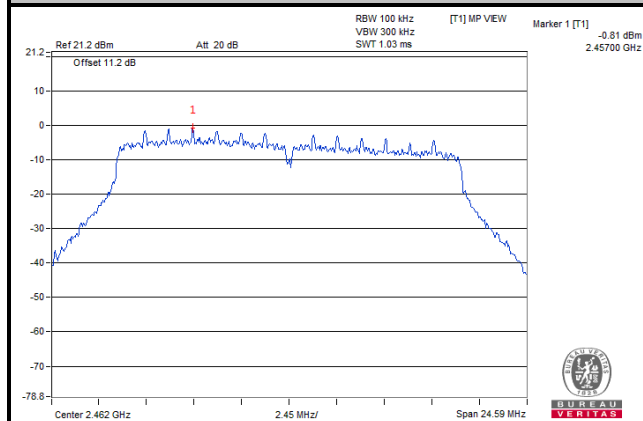
Ch 1

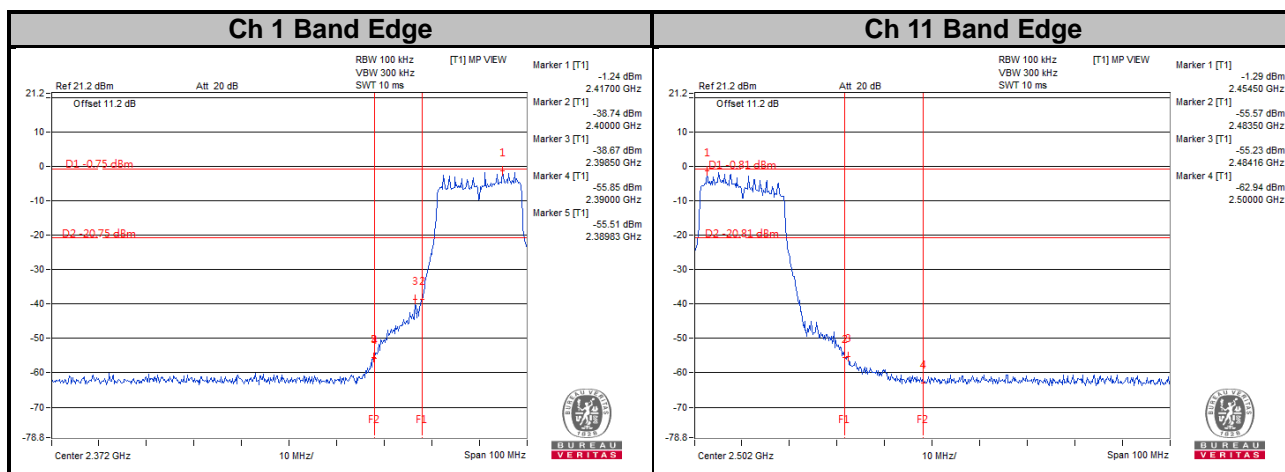


Ch 6



Ch 11





5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

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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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