FCC Test Report

Report No.:	RF150814C22-3
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
Address:	1-10-8 Nishiazabu Minato-ku, Tokyo Japan 106-0031
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan, R.O.C.

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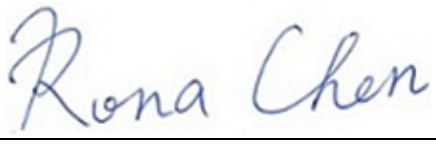
Release Control Record

Issue No.	Description	Date Issued
RF150814C22-3	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 15.249) 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 15.249)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -2.95dB at 30.97 MHz.
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -7.64dB at 0.62702 MHz.

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**	**Expended 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	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	GFSK
Operating Frequency	2403 ~ 2480 MHz
Number of Channel	78
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 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-FOXS755	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

2. 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

78 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		
20	2422	40	2442	60	2462		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥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≥1G:** Radiated Emission above 1 GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1 GHz

PLC: Power Line Conducted Emission

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	Available Channel	Tested Channel	Modulation Type
A	1 to 78	1, 39, 78	GFSK
B	1 to 78	39	GFSK

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	Tested Channel	Modulation Technology	Modulation Type
A, B	1 to 78	39	GFSK

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	Tested Channel	Modulation Technology	Modulation Type
A	1 to 78	39	GFSK

Test Condition:

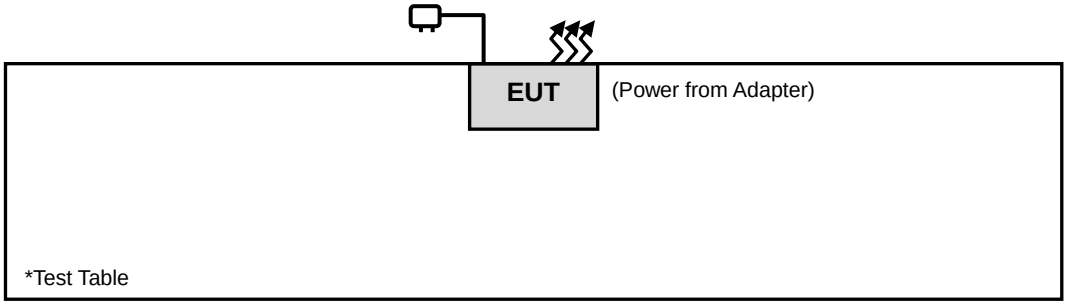
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
PLC	25 deg. C, 68 % RH	120 Vac, 60 Hz	Toby Tian

3.3 Description of Support Units

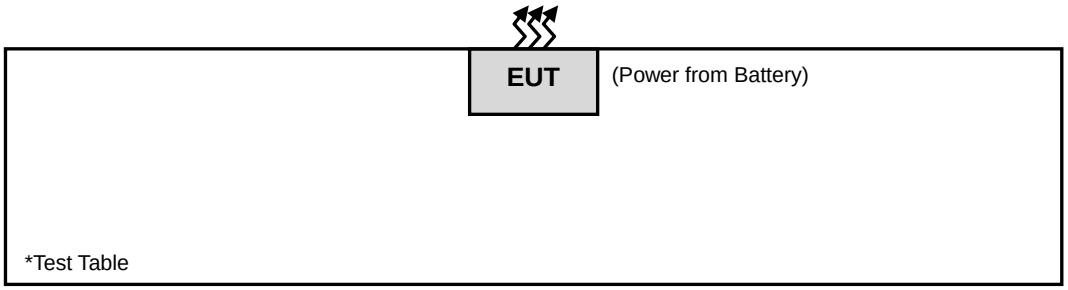
The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3.1 Configuration of System under Test

Mode A



Mode B



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 (15.249)
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

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

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 20dB 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
Test Receiver Agilent	N9038A	MY51210203	Jan. 21, 2016	Jan. 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 1GHz 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 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:

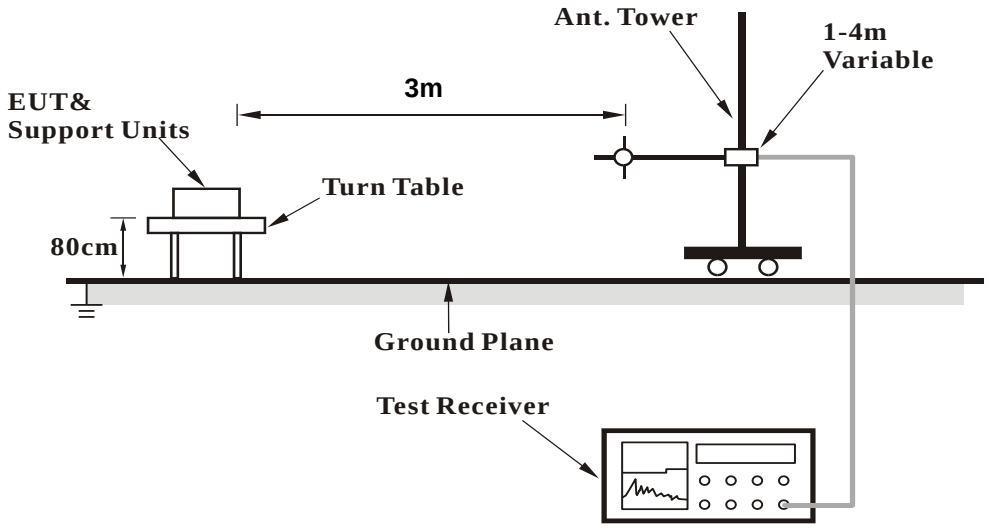
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz 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

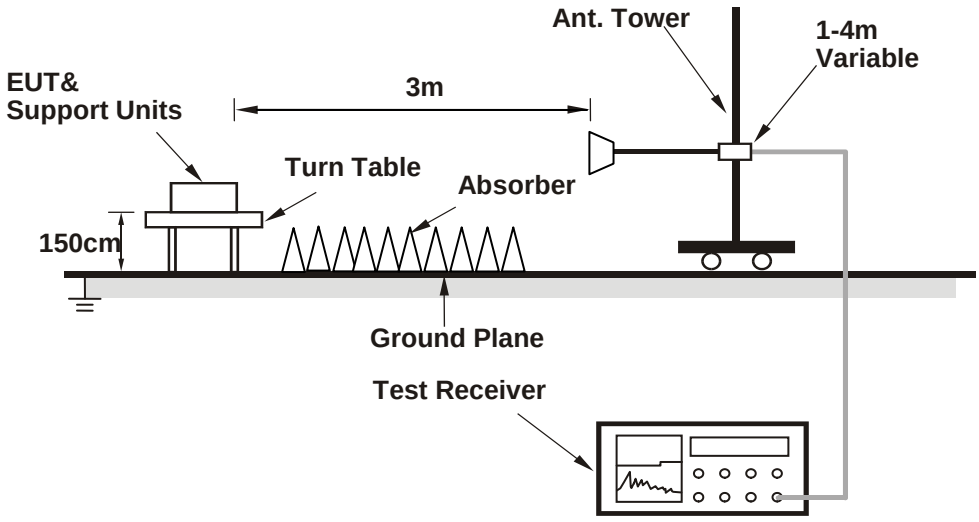
No deviation.

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

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz WORST-CASE DATA:

Mode A

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**
2332	35.3	42.01	54	-18.7	26.72	4.04	37.47	190	180	Average
2332	55.88	62.59	74	-18.12	26.72	4.04	37.47	190	180	Peak
2403	74.38	80.85	94	-19.62	26.96	4.09	37.52	190	180	Average
2403	94.96	101.43	114	-19.04	26.96	4.09	37.52	190	180	Peak
2498	36.26	42.15	54	-17.74	27.2	4.16	37.25	190	180	Average
2498	56.84	62.73	74	-17.16	27.2	4.16	37.25	190	180	Peak
4806	24.98	40.32	54	-29.02	30.97	6.79	53.1	100	155	Average
4806	45.56	60.9	74	-28.44	30.97	6.79	53.1	100	155	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**
2362	36.54	43.17	54	-17.46	26.81	4.05	37.49	168	249	Average
2362	57.12	63.75	74	-16.88	26.81	4.05	37.49	168	249	Peak
2403	65.18	71.65	94	-28.82	26.96	4.09	37.52	168	249	Average
2403	85.76	92.23	114	-28.24	26.96	4.09	37.52	168	249	Peak
2490	35.94	41.9	54	-18.06	27.2	4.16	37.32	168	249	Average
2490	56.52	62.48	74	-17.48	27.2	4.16	37.32	168	249	Peak
4806	23.64	38.98	54	-30.36	30.97	6.79	53.1	100	136	Average
4806	44.22	59.56	74	-29.78	30.97	6.79	53.1	100	136	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.187 ms / 0.08 ms) = -16.5 dB
   Please refer to the plotted duty

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**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**
2344	35.29	41.97	54	-18.71	26.77	4.04	37.49	185	181	Average
2344	55.87	62.55	74	-18.13	26.77	4.04	37.49	185	181	Peak
2441	73.75	79.96	94	-20.25	27.06	4.12	37.39	185	181	Average
2441	94.33	100.54	114	-19.67	27.06	4.12	37.39	185	181	Peak
2488	36.69	42.65	54	-17.31	27.2	4.16	37.32	185	181	Average
2488	57.27	63.23	74	-16.73	27.2	4.16	37.32	185	181	Peak
4882	23.48	38.62	54	-30.52	31.06	6.85	53.05	100	188	Average
4882	44.06	59.2	74	-29.94	31.06	6.85	53.05	100	188	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**
2370	35.66	42.23	54	-18.34	26.86	4.07	37.5	166	246	Average
2370	56.24	62.81	74	-17.76	26.86	4.07	37.5	166	246	Peak
2441	65.28	71.49	94	-28.72	27.06	4.12	37.39	166	246	Average
2441	85.86	92.07	114	-28.14	27.06	4.12	37.39	166	246	Peak
2490	35.58	41.54	54	-18.42	27.2	4.16	37.32	166	246	Average
2490	56.16	62.12	74	-17.84	27.2	4.16	37.32	166	246	Peak
4882	23.45	38.59	54	-30.55	31.06	6.85	53.05	100	33	Average
4882	44.03	59.17	74	-29.97	31.06	6.85	53.05	100	33	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.187 ms / 0.08 ms) = -16.5 dB
   Please refer to the plotted duty

EUT Test Condition		Measurement Detail	
Channel	Channel 78	**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**
2340	36.04	42.72	54	-17.96	26.77	4.04	37.49	181	180	Average
2340	56.62	63.3	74	-17.38	26.77	4.04	37.49	181	180	Peak
2480	74.24	80.26	94	-19.76	27.15	4.15	37.32	181	180	Average
2480	94.82	100.84	114	-19.18	27.15	4.15	37.32	181	180	Peak
2490	35.91	41.87	54	-18.09	27.2	4.16	37.32	181	180	Average
2490	56.49	62.45	74	-17.51	27.2	4.16	37.32	181	180	Peak
4960	23.54	38.51	54	-30.47	31.16	6.91	53.04	100	152	Average
4960	44.12	59.09	74	-29.88	31.16	6.91	53.04	100	152	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**
2318	36.4	43.12	54	-17.6	26.72	4.03	37.47	160	248	Average
2318	56.98	63.7	74	-17.02	26.72	4.03	37.47	160	248	Peak
2480	65.54	71.56	94	-28.46	27.15	4.15	37.32	160	248	Average
2480	86.12	92.14	114	-27.88	27.15	4.15	37.32	160	248	Peak
2500	35.95	41.84	54	-18.05	27.2	4.16	37.25	160	248	Average
2500	56.53	62.42	74	-17.47	27.2	4.16	37.25	160	248	Peak
4960	23.72	38.69	54	-30.28	31.16	6.91	53.04	100	136	Average
4960	44.3	59.27	74	-29.7	31.16	6.91	53.04	100	136	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.187 ms / 0.08 ms) = -16.5 dB
   Please refer to the plotted duty

Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**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**
2376	35.58	42.15	54	-18.42	26.86	4.07	37.5	153	3	Average
2376	56.16	62.73	74	-17.84	26.86	4.07	37.5	153	3	Peak
2441	70.95	77.16	94	-23.05	27.06	4.12	37.39	153	3	Average
2441	91.53	97.74	114	-22.47	27.06	4.12	37.39	153	3	Peak
2490	36.17	42.13	54	-17.83	27.2	4.16	37.32	153	3	Average
2490	56.75	62.71	74	-17.25	27.2	4.16	37.32	153	3	Peak
4882	23.72	38.86	54	-30.28	31.06	6.85	53.05	100	128	Average
4882	44.3	59.44	74	-29.7	31.06	6.85	53.05	100	128	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**
2344	36.01	42.69	54	-17.99	26.77	4.04	37.49	143	344	Average
2344	56.59	63.27	74	-17.41	26.77	4.04	37.49	143	344	Peak
2441	59.48	65.69	94	-34.52	27.06	4.12	37.39	143	344	Average
2441	80.06	86.27	114	-33.94	27.06	4.12	37.39	143	344	Peak
2494	35.68	41.57	54	-18.32	27.2	4.16	37.25	143	344	Average
2494	56.26	62.15	74	-17.74	27.2	4.16	37.25	143	344	Peak
4882	23.61	38.75	54	-30.39	31.06	6.85	53.05	100	163	Average
4882	44.19	59.33	74	-29.81	31.06	6.85	53.05	100	163	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.187 ms / 0.08 ms) = -16.5 dB
   Please refer to the plotted duty

Below 1 GHz WORST-CASE DATA:

Mode A

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**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	33.72	56.39	43.5	-9.78	8.28	0.96	31.91	107	162	Peak
149.31	29.59	47.39	43.5	-13.91	12.68	1.13	31.61	119	57	Peak
190.05	25.84	46.2	43.5	-17.66	10.05	1.26	31.67	116	145	Peak
293.84	23.13	40.48	46	-22.87	12.77	1.62	31.74	135	54	Peak
441.28	22.3	36.17	46	-23.7	16.16	1.97	32	128	214	Peak
669.23	24.3	33.28	46	-21.7	20.44	2.4	31.82	121	109	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	**37.05**	**55.44**	**40**	**-2.95**	**12.14**	**0.59**	**31.12**	**122**	**299**	**Peak**
83.35	32.37	54.92	40	-7.63	8.18	0.92	31.65	120	149	Peak
149.31	28.14	45.94	43.5	-15.36	12.68	1.13	31.61	101	144	Peak
292.87	18.73	36.09	46	-27.27	12.74	1.62	31.72	126	257	Peak
480.08	22.92	35.79	46	-23.08	16.93	2.05	31.85	122	130	Peak
600.36	24.71	35.09	46	-21.29	19.61	2.26	32.25	101	137	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.187 ms / 0.08 ms) = -16.5 dB
   Please refer to the plotted duty

Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**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

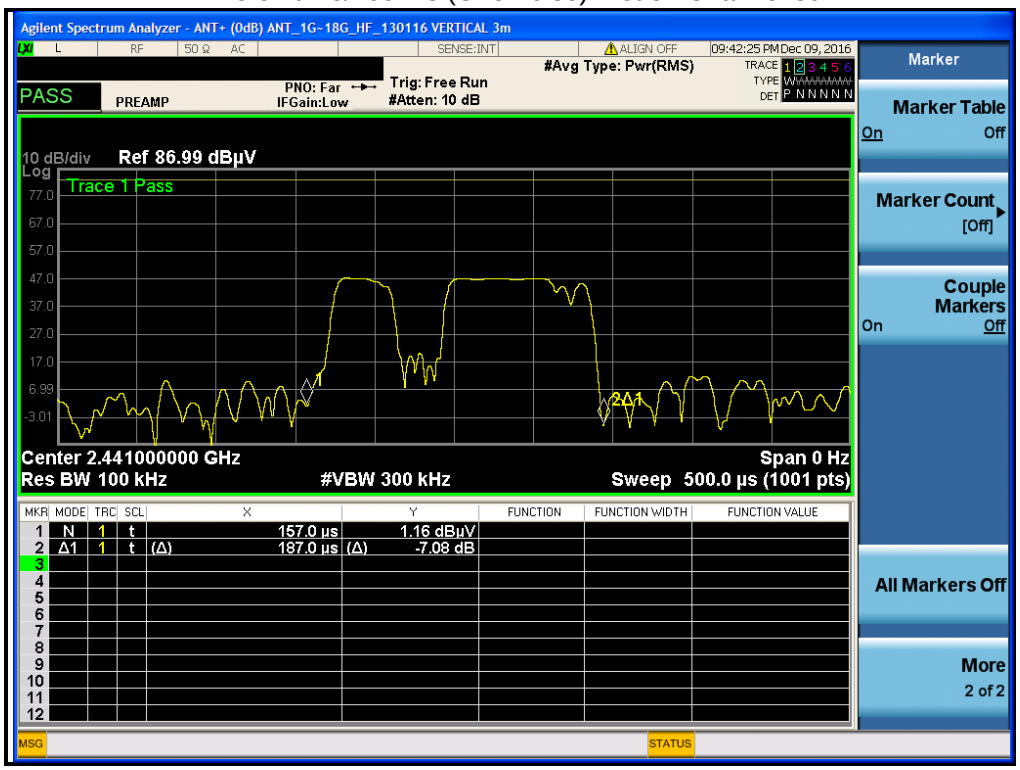
Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Factor (dB/m)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
54.25	16.87	34.9	40	-23.13	12.56	0.74	31.33	114	253	Peak
136.7	16.05	34.48	43.5	-27.45	12.14	1.14	31.71	103	286	Peak
300.63	16.43	33.69	46	-29.57	12.96	1.63	31.85	133	293	Peak
450.98	20.22	33.86	46	-25.78	16.35	1.99	31.98	106	169	Peak
588.72	22.94	33.5	46	-23.06	19.34	2.24	32.14	126	129	Peak
666.32	24.8	33.86	46	-21.2	20.41	2.39	31.86	113	241	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**
44.55	17.27	34.14	40	-22.73	13.6	0.67	31.14	123	344	Peak
152.22	15.36	33.19	43.5	-28.14	12.71	1.12	31.66	109	287	Peak
230.79	15.75	35.52	46	-30.25	10.66	1.42	31.85	106	258	Peak
408.3	19.51	34.1	46	-26.49	15.5	1.93	32.02	117	60	Peak
506.27	21.02	33.05	46	-24.98	17.46	2.11	31.6	140	308	Peak
598.42	23.25	33.66	46	-22.75	19.57	2.25	32.23	138	331	Peak

Remarks:

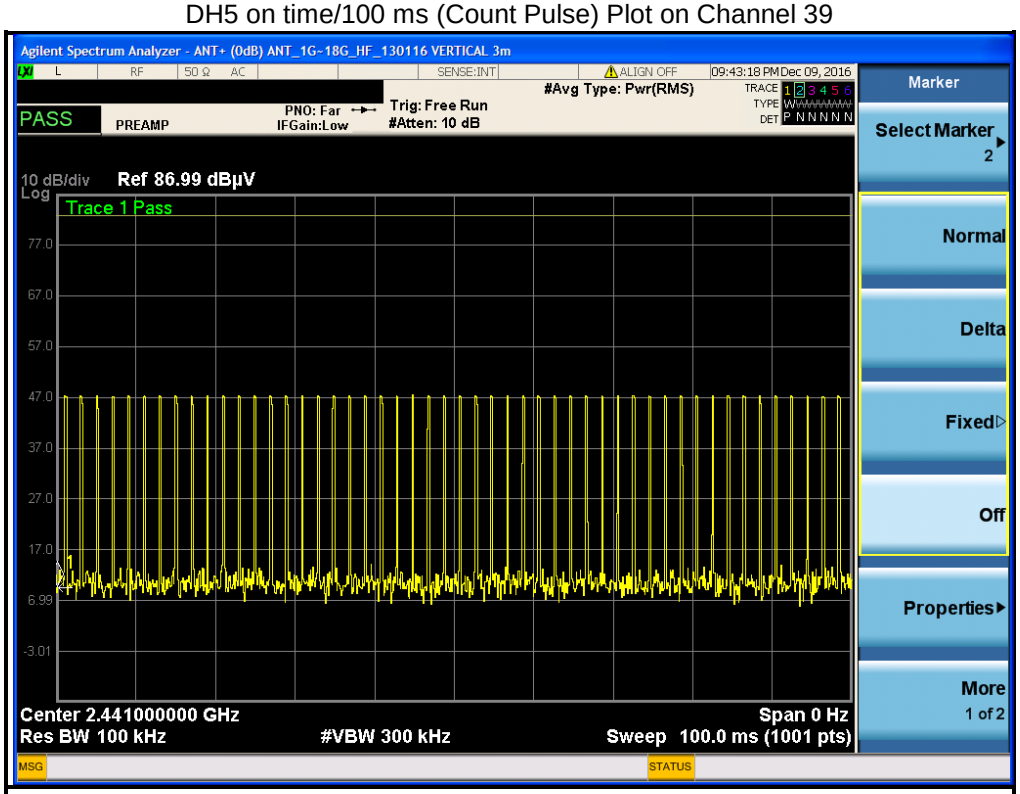
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.187 ms / 0.08 ms) = -16.5 dB
   Please refer to the plotted duty

<Duty Cycle Correction Factor>

DH5 on time/100 ms (One Pulse) Plot on Channel 39



DH5 on time/100 ms (Count Pulse) Plot on Channel 39



20 log (Duty cycle) = 20 log (0.187 ms * 80 / 100 ms) = -16.5 dB

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

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

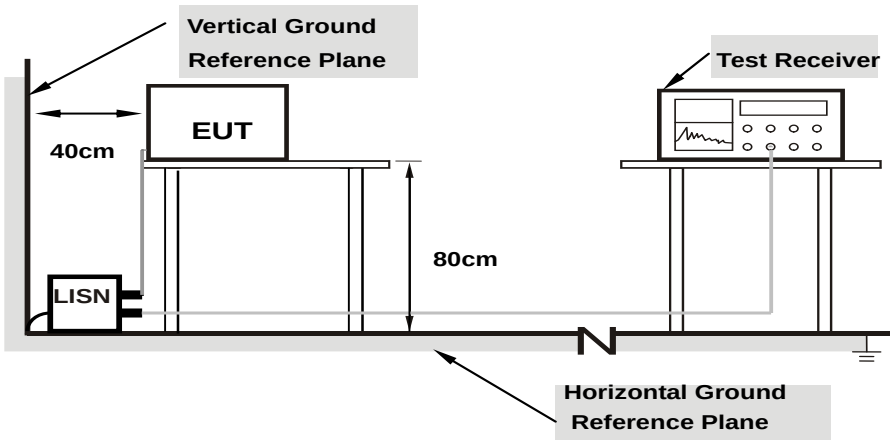
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz - 30 MHz.

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

Same as 4.1.6.

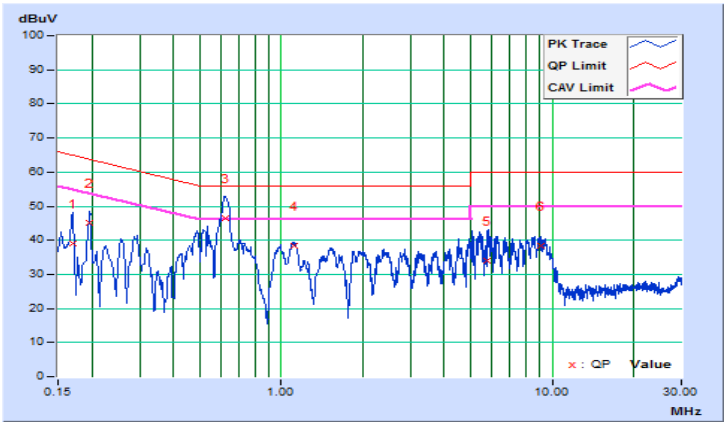
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 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	0.16955	10.02	29.10	8.61	39.12	18.63	64.98	54.98	-25.86	-36.35
2	0.19692	10.03	35.10	19.99	45.13	30.02	63.74	53.74	-18.61	-23.72
3	0.62311	10.15	36.47	24.38	46.62	34.53	56.00	46.00	-9.38	-11.47
4	1.12359	10.21	28.06	19.65	38.27	29.86	56.00	46.00	-17.73	-16.14
5	5.78431	10.51	23.64	14.66	34.15	25.17	60.00	50.00	-25.85	-24.83
6	9.06871	10.68	27.81	22.79	38.49	33.47	60.00	50.00	-21.51	-16.53

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

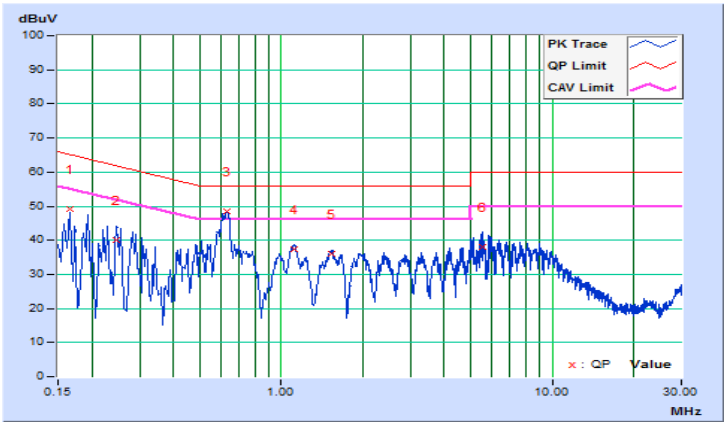


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH
Tested by	Toby Tian	Test Date	2016/12/11

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	39.04	22.41	49.07	32.44	65.18	55.18	-16.11	-22.74
2	0.24775	10.06	30.07	14.46	40.13	24.52	61.83	51.83	-21.70	-27.31
3	**0.62702**	**10.16**	**38.20**	**28.12**	**48.36**	**38.28**	**56.00**	**46.00**	**-7.64**	**-7.72**
4	1.11928	10.22	27.25	19.12	37.47	29.34	56.00	46.00	-18.53	-16.66
5	1.52632	10.25	25.70	17.79	35.95	28.04	56.00	46.00	-20.05	-17.96
6	5.51843	10.52	27.63	20.20	38.15	30.72	60.00	50.00	-21.85	-19.28

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



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

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