

FCC Test Report

Report No.: RF190423C25

FCC ID: K7SF8J237V2

Test Model: F8J237V2

Received Date: Apr. 23, 2019

Test Date: Apr. 24 ~ Apr. 27, 2019

Issued Date: May 06, 2019

Applicant: Belkin International, Inc.

Address: 12045 East Waterfront Drive, Playa Vista, CA 90094

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

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Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

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



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Release Control Record

Issue No.	Description	Date Issued
RF190423C25	Original release	May 06, 2019

1 Certificate of Conformity

Product: PowerHouse™ Charge Dock for Apple Watch + iPhone

Brand: belkin

Test Model: F8J237V2

Sample Status: Engineering sample

Applicant: Belkin International, Inc.

Test Date: Apr. 24 ~ Apr. 27, 2019

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.209)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** May 06, 2019
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** May 06, 2019
Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.209)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -13.79dB at 0.18122MHz.
15.209	Radiated Emission Test	Pass	Meet the requirement of limit. Minimum passing margin is -7.8dB at 134.890MHz.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	PowerHouse™ Charge Dock for Apple Watch + iPhone
Test Model	F8J237V2
Sample Status	Engineering sample
Power Supply Rating	12Vdc (Adapter)
Modulation Type	FSK
Operating Frequency	326.5 kHz
Antenna Type	Coil antenna
Field Strength	50.5dBuV/m
Dimension for Apple watch inductive coil	7.95cm ² (diameter = 31.82mm)
Accessory Device	Adapter
Data Cable Supplied	NA
Maximum Power Output for Apple watch inductive coil	Less than 5W

Note:

1. The EUT uses following adapter.

Brand	HOIOTO
Model	ADS-25SGP-12 12019E
Input Power	100-240Vac, 50/60Hz, 0.7A Max
Output Power	12Vdc, 1.6A
Power Line	1.5m non-shielded DC cable without core attached on adapter

2. The EUT has a wireless inductive charging coil for charging Apple watch and a USB board to charge iPhone.

3. After the evaluation of the metal and plastic band on Apple Watch, the metal band was found to be the worst case test mode and therefore was been presented in the test report.

3.2 Description of Test Modes

1 channel is provided to this EUT

Channel	Freq. (kHz)
1	326.5

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO		DESCRIPTION
	RE<1G	PLC	
A	√	√	Charging Mode
B	√	√	Standby Mode

Where **RE<1G**: Radiated Emission below 1GHz **PLC**: Power Line Conducted Emission

Note: The EUT is designed to be positioned on the **X-plane** only.

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel
A, B	1	1

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	Available Channel	Tested Channel
A, B	1	1

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE<1G	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
PLC	23 deg. C, 68% RH	120Vac, 60Hz	Adair Peng

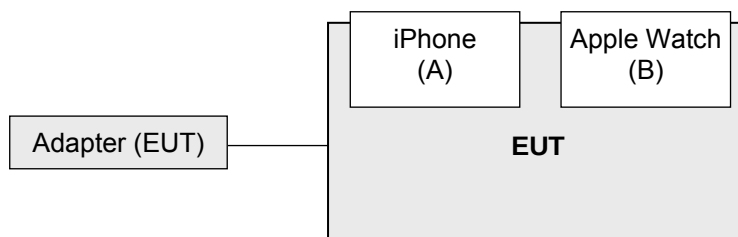
3.3 Description of Support Units

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

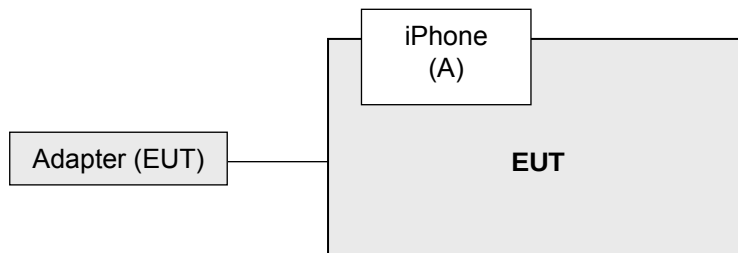
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	iPhone	APPLE	A1901	NA	NA	-
B.	Apple Watch	APPLE	A1554	NA	NA	-

3.3.1 Configuration of System under Test

Charging Mode



Standby Mode



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 (15.209)

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

FOR FREQUENCY BELOW 30MHz

Frequency (MHz)	Field Strength (dBuV/m)		Measurement Distance (meters)
	uV/m	dBuV/m	
0.009 – 0.490	2400 / F (kHz)	48.52-13.80	300
0.490 – 1.705	24000 / F (kHz)	33.80-22.97	30
1.705 – 30.0	30	29.54	30

FOR FREQUENCY BETWEEN 30-1000MHz

Frequency (MHz)	Class A (at 10m)		Class B (at 3m)	
	uV/m	dBuV/m	uV/m	dBuV/m
30-88	90	39.1	100	40.0
88-216	150	43.5	150	43.5
216-960	210	46.4	200	46.0
Above 960	300	49.5	500	54.0

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2018	Nov. 21, 2019
HORN Antenna SCHWARZBECK	9120D	209	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 27, 2019	Mar. 26, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 3.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

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

Note:

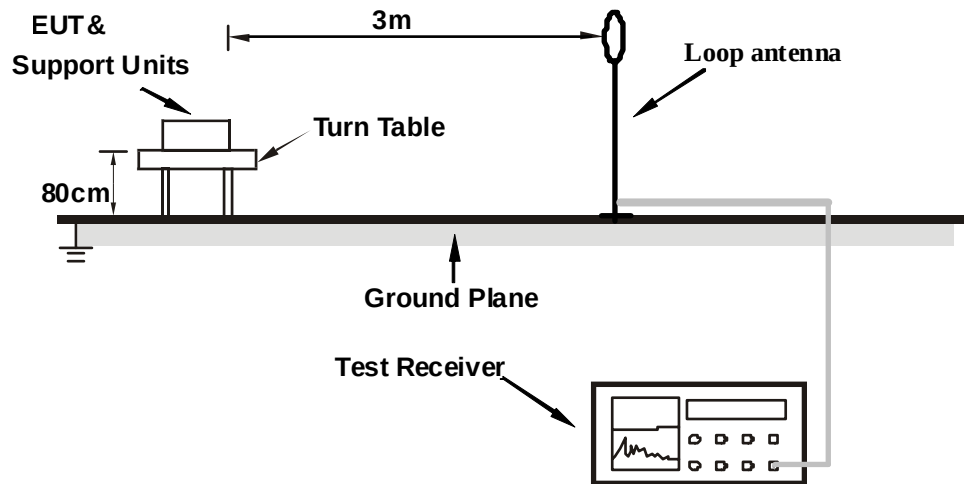
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

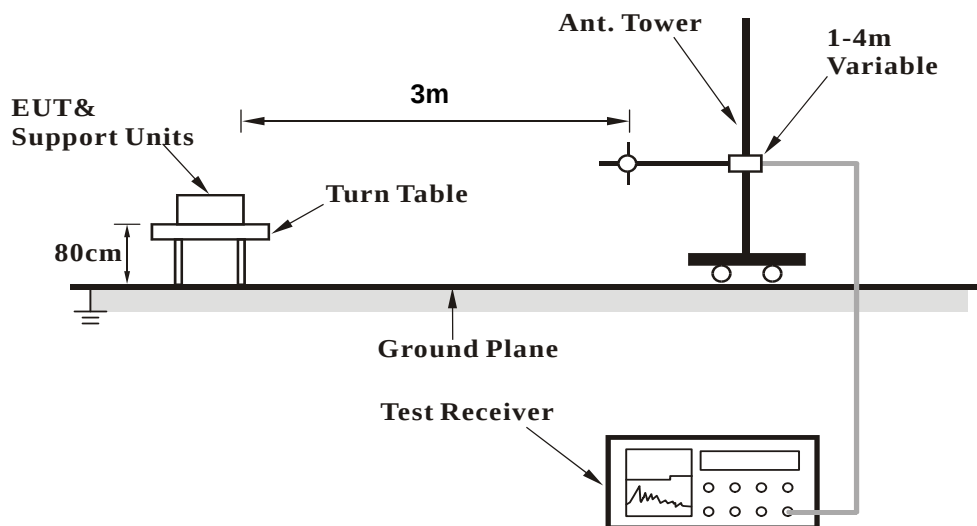
No deviation.

4.1.5 Test Set Up

For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



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

4.1.6 EUT Operating Conditions

Test Mode A

- The EUT powered by adapter.
- Put the iPhone & Apple watch on the EUT (wireless charging) during the test.

Test Mode B

- The EUT powered by adapter.

4.1.7 Test Results

Below 30MHz Data:

Charging Mode

Channel	TX Channel 1	Detector Function	Average (AV)
Frequency Range	9 kHz ~ 30 MHz		Quasi-Peak (QP)
Test Mode	A		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*0.3265	50.5 AV	97.3	-46.8	1.00	120	30.4	20.1
2	3.229	37.6 QP	69.5	-31.9	1.00	11	18.0	19.6
3	7.891	36.0 QP	69.5	-33.5	1.00	87	14.7	21.3
4	15.101	36.4 QP	69.5	-33.1	1.00	203	14.6	21.8
5	20.532	43.7 QP	69.5	-25.8	1.00	339	21.8	21.9
6	22.262	42.7 QP	69.5	-26.8	1.00	312	20.8	21.9
7	24.857	42.3 QP	69.5	-27.2	1.00	171	20.3	22.0
ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*0.3265	44.7 AV	97.3	-52.6	1.00	22	24.6	20.1
2	3.566	41.0 QP	69.5	-28.5	1.00	87	21.2	19.8
3	8.852	35.9 QP	69.5	-33.6	1.00	182	14.4	21.5
4	14.139	35.6 QP	69.5	-33.9	1.00	357	13.8	21.8
5	19.474	38.6 QP	69.5	-30.9	1.00	19	16.8	21.8
6	21.637	44.3 QP	69.5	-25.2	1.00	103	22.4	21.9
7	25.963	41.6 QP	69.5	-27.9	1.00	313	19.5	22.1
ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA GROUND-PARALLEL AT 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*0.3265	44.4 AV	97.3	-52.9	1.00	144	24.3	20.1
2	3.229	39.1 QP	69.5	-30.4	1.00	222	19.5	19.6
3	9.141	35.5 QP	69.5	-34.0	1.00	99	13.9	21.6
4	13.226	35.4 QP	69.5	-34.1	1.00	31	13.6	21.8
5	19.474	41.7 QP	69.5	-27.8	1.00	166	19.9	21.8
6	22.214	49.0 QP	69.5	-20.5	1.00	239	27.1	21.9
7	25.963	44.0 QP	69.5	-25.5	1.00	274	21.9	22.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * “: Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

Standby Mode

Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	9 kHz ~ 30 MHz		
Test Mode	B		

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*0.3265	34.4 AV	97.3	-62.9	1.00	325	14.3	20.1
2	0.653	34.0 QP	71.3	-37.3	1.00	333	13.8	20.2
3	3.229	39.3 QP	69.5	-30.2	1.00	86	19.7	19.6
4	9.477	35.5 QP	69.5	-34.0	1.00	219	13.8	21.7
5	12.169	36.7 QP	69.5	-32.8	1.00	312	14.9	21.8
6	17.792	40.9 QP	69.5	-28.6	1.00	3	19.1	21.8
7	24.857	42.7 QP	69.5	-26.8	1.00	94	20.7	22.0

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*0.3265	32.0 AV	97.3	-65.3	1.00	325	11.9	20.1
2	0.653	33.5 QP	71.3	-37.8	1.00	303	13.3	20.2
3	3.566	42.0 QP	69.5	-27.5	1.00	320	22.2	19.8
4	10.583	35.3 QP	69.5	-34.2	1.00	172	13.5	21.8
5	17.792	41.1 QP	69.5	-28.4	1.00	323	19.3	21.8
6	21.637	44.6 QP	69.5	-24.9	1.00	109	22.7	21.9
7	25.578	41.6 QP	69.5	-27.9	1.00	312	19.6	22.0

ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA GROUND-PARALLEL AT 3m

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*0.3265	31.6 AV	97.3	-65.7	1.00	325	11.5	20.1
2	0.653	32.7 QP	71.3	-38.6	1.00	153	12.5	20.2
3	3.229	41.1 QP	69.5	-28.4	1.00	178	21.5	19.6
4	6.978	35.9 QP	69.5	-33.6	1.00	197	14.9	21.0
5	16.206	40.0 QP	69.5	-29.5	1.00	108	18.2	21.8
6	20.532	48.3 QP	69.5	-21.2	1.00	260	26.4	21.9
7	24.473	43.9 QP	69.5	-25.6	1.00	256	21.9	22.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * “: Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

Below 1GHz Data:

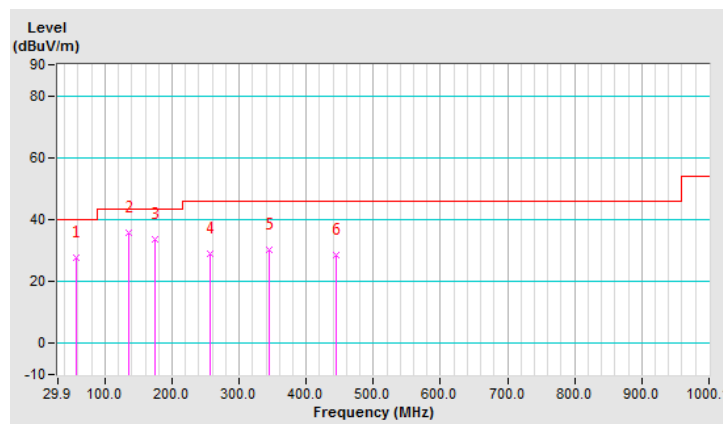
Charging Mode

Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		
Test Mode	A		

Antenna Polarity & Test Distance: Horizontal At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	57.120	27.7 QP	40.0	-12.3	1.99 H	341	37.8	-10.1
2	134.890	35.7 QP	43.5	-7.8	1.99 H	261	45.8	-10.1
3	173.780	33.5 QP	43.5	-10.0	1.49 H	82	43.2	-9.7
4	257.380	29.1 QP	46.0	-16.9	1.00 H	258	38.0	-8.9
5	344.870	30.3 QP	46.0	-15.7	1.00 H	65	37.1	-6.8
6	444.030	28.5 QP	46.0	-17.5	1.99 H	219	32.9	-4.4

Remarks:

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

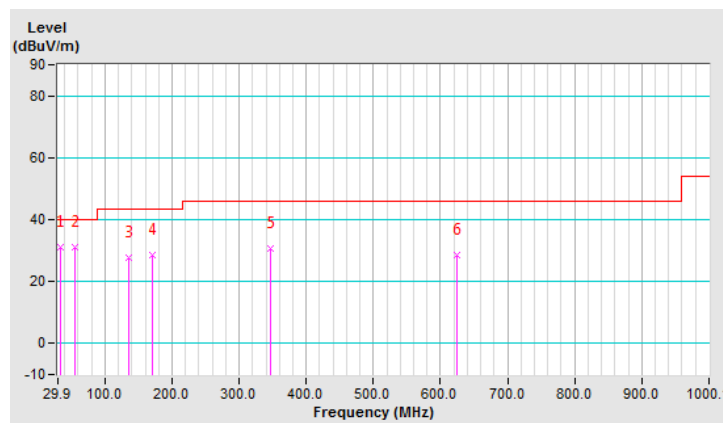


Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		
Test Mode	A		

Antenna Polarity & Test Distance: Vertical At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	33.790	30.9 QP	40.0	-9.1	1.00 V	121	42.1	-11.2
2	55.180	31.1 QP	40.0	-8.9	1.51 V	56	40.9	-9.8
3	134.890	27.9 QP	43.5	-15.6	1.99 V	194	38.0	-10.1
4	169.890	28.5 QP	43.5	-15.0	1.00 V	155	37.9	-9.4
5	346.820	30.8 QP	46.0	-15.2	1.00 V	172	37.6	-6.8
6	624.850	28.4 QP	46.0	-17.6	1.00 V	96	29.1	-0.7

Remarks:

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



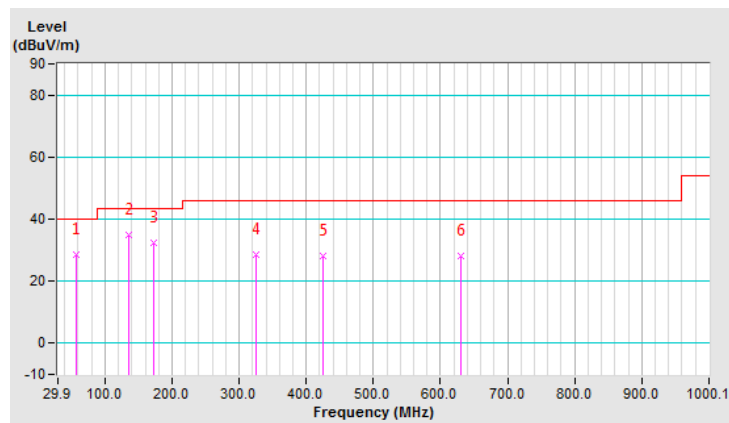
Standby Mode

Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		
Test Mode	B		

Antenna Polarity & Test Distance: Horizontal At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	57.120	28.5 QP	40.0	-11.5	2.00 H	85	38.6	-10.1
2	134.890	34.9 QP	43.5	-8.6	2.00 H	246	45.0	-10.1
3	171.830	32.5 QP	43.5	-11.0	1.51 H	102	42.0	-9.5
4	325.430	28.6 QP	46.0	-17.4	1.01 H	61	35.4	-6.8
5	424.590	28.2 QP	46.0	-17.8	2.00 H	199	33.0	-4.8
6	630.690	28.1 QP	46.0	-17.9	1.51 H	4	28.7	-0.6

Remarks:

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

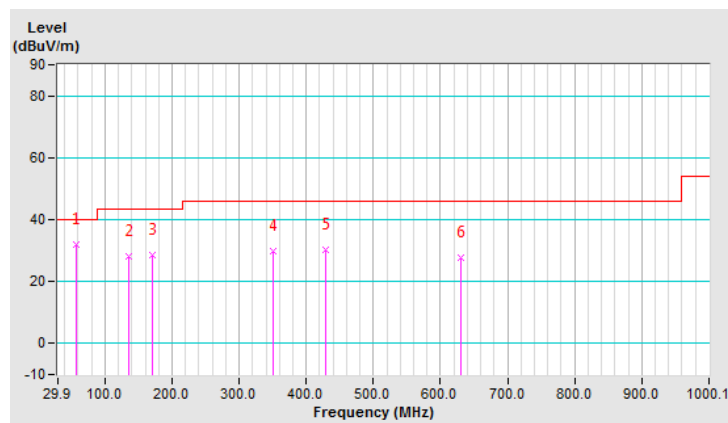


Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		
Test Mode	B		

Antenna Polarity & Test Distance: Vertical At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	57.120	31.9 QP	40.0	-8.1	1.50 V	6	42.0	-10.1
2	134.890	28.2 QP	43.5	-15.3	1.99 V	199	38.3	-10.1
3	169.890	28.6 QP	43.5	-14.9	1.00 V	137	38.0	-9.4
4	350.710	29.9 QP	46.0	-16.1	1.50 V	197	36.5	-6.6
5	428.480	30.1 QP	46.0	-15.9	1.00 V	200	34.8	-4.7
6	630.690	27.9 QP	46.0	-18.1	1.50 V	241	28.5	-0.6

Remarks:

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



4.2 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 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 10, 2018	Dec. 09, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	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-12040.

4.2.3 Test Procedures

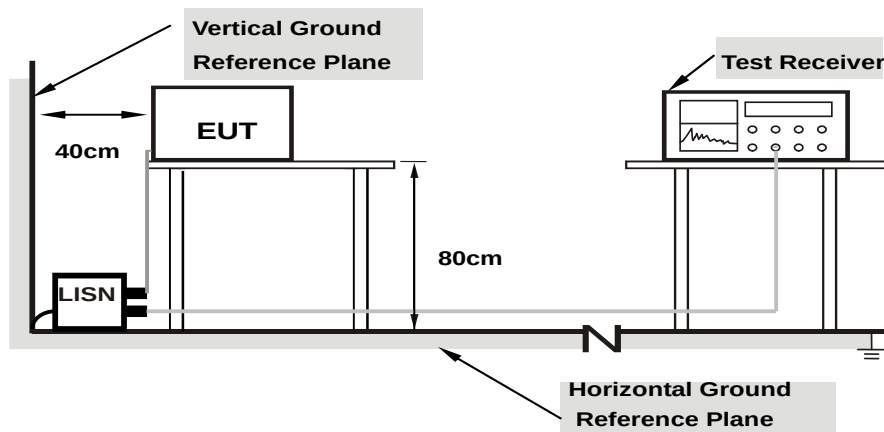
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

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

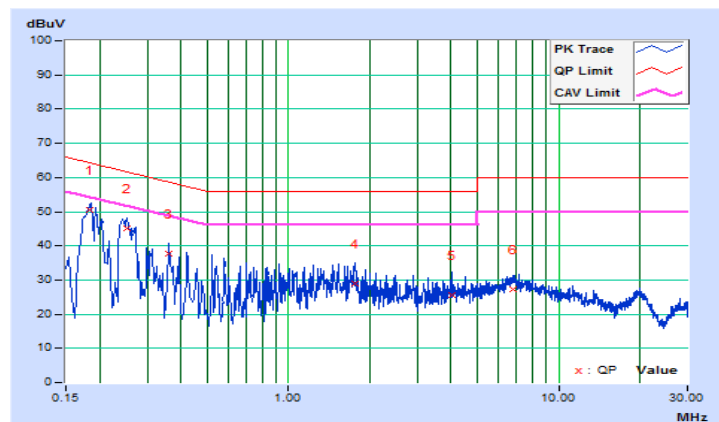
Charging Mode

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18363	9.68	40.67	24.61	50.35	34.29	64.32	54.32	-13.97	-20.03
2	0.25166	9.68	35.29	23.51	44.97	33.19	61.70	51.70	-16.73	-18.51
3	0.36114	9.68	27.94	12.06	37.62	21.74	58.70	48.70	-21.08	-26.96
4	1.76566	9.69	19.38	10.59	29.07	20.28	56.00	46.00	-26.93	-25.72
5	4.03263	9.75	15.72	8.81	25.47	18.56	56.00	46.00	-30.53	-27.44
6	6.78136	9.81	17.44	11.89	27.25	21.70	60.00	50.00	-32.75	-28.30

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.

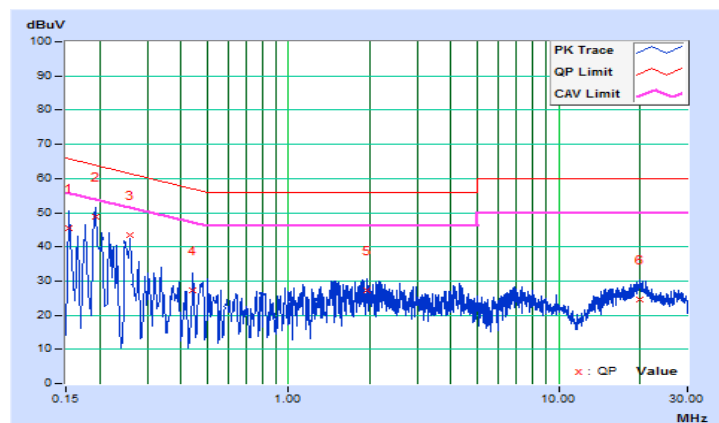


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.66	35.69	11.15	45.35	20.81	65.79	55.79	-20.44	-34.98
2	0.19305	9.66	39.29	25.11	48.95	34.77	63.90	53.90	-14.95	-19.13
3	0.25948	9.66	33.80	20.18	43.46	29.84	61.45	51.45	-17.99	-21.61
4	0.44325	9.65	17.53	3.13	27.18	12.78	57.00	47.00	-29.82	-34.22
5	1.94860	9.67	17.68	6.16	27.35	15.83	56.00	46.00	-28.65	-30.17
6	19.98152	10.00	14.48	9.13	24.48	19.13	60.00	50.00	-35.52	-30.87

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.



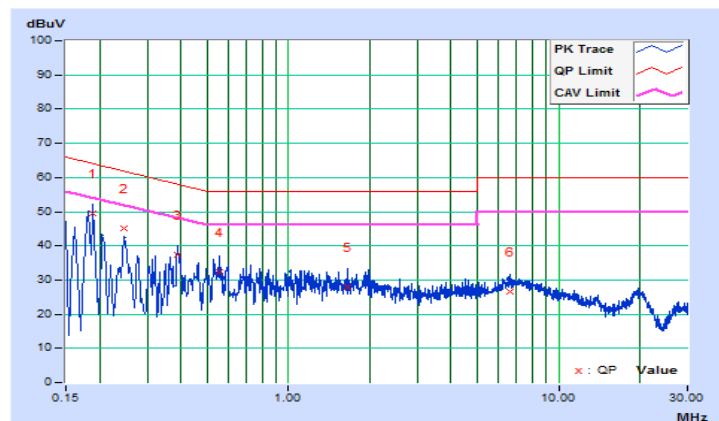
Standby Mode

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18903	9.68	39.87	26.51	49.55	36.19	64.08	54.08	-14.53	-17.89
2	0.24775	9.68	35.28	23.67	44.96	33.35	61.83	51.83	-16.87	-18.48
3	0.38851	9.68	27.81	16.26	37.49	25.94	58.10	48.10	-20.61	-22.16
4	0.55273	9.68	22.69	11.97	32.37	21.65	56.00	46.00	-23.63	-24.35
5	1.65926	9.69	18.10	10.85	27.79	20.54	56.00	46.00	-28.21	-25.46
6	6.65624	9.80	16.69	11.52	26.49	21.32	60.00	50.00	-33.51	-28.68

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.

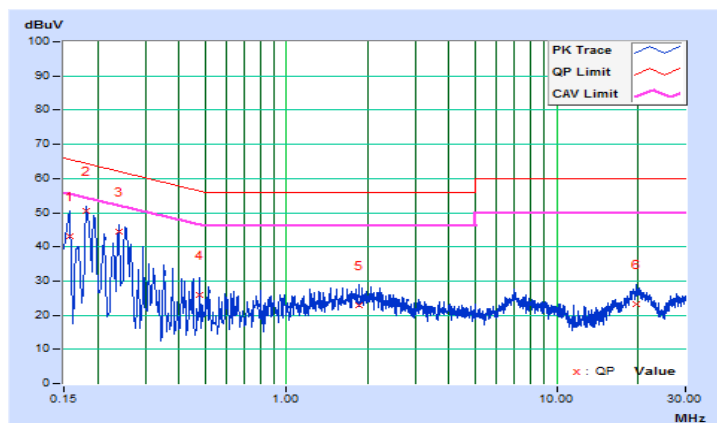


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15760	9.66	33.58	10.68	43.24	20.34	65.59	55.59	-22.35	-35.25
2	0.18122	9.66	40.98	25.28	50.64	34.94	64.43	54.43	-13.79	-19.49
3	0.23993	9.66	34.88	19.81	44.54	29.47	62.10	52.10	-17.56	-22.63
4	0.47844	9.65	16.38	3.34	26.03	12.99	56.37	46.37	-30.34	-33.38
5	1.85867	9.67	13.25	7.23	22.92	16.90	56.00	46.00	-33.08	-29.10
6	19.82903	10.00	13.24	8.18	23.24	18.18	60.00	50.00	-36.76	-31.82

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 of the Testing Laboratories

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

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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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