

FCC Test Report

Report No.: RF180709D11

FCC ID: K7SF7U068

Test Model: F7U067

Series Model: F7U068

Received Date: Jul. 9, 2018

Test Date: Jul. 13 ~ 23, 2018

Issued Date: Jul. 30, 2018

Applicant: Belkin International., Inc

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

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Release Control Record

Issue No.	Description	Date Issued
RF180709D11	Original release	Jul. 30, 2018

1 Certificate of Conformity

Product: BOOST↑UP™ Wireless Charging Pad 5W

Brand: belkin

Test Model: F7U067

Series Model: F7U068

Sample Status: Engineering sample

Applicant: Belkin International., Inc

Test Date: Jul. 13 ~ 23, 2018

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 :

Annie Chang

Date: Jul. 30, 2018

Annie Chang / Senior Specialist

Approved by :

Rex Lai

Date: Jul. 30, 2018

Rex Lai / Associate Technical Manager

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 -11.51dB at 0.16173MHz.
15.215	Channel Bandwidth Measurement		
15.209	Radiated Emission Test	Pass	Meet the requirement of limit. Minimum passing margin is -9.23dB at 85.82MHz

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	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1000MHz	4.77 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	BOOST↑UP™ Wireless Charging Pad 5W
Brand	belkin
Test Model	F7U067
Series Model	F7U068
Model Difference	Refer to note as below
Sample Status	Engineering sample
Power Supply Rating	5Vdc (adapter / host)
Modulation Type	FSK
Operating Frequency	111-148kHz
Antenna Type	Coil antenna
Field Strength	77.97dBuV/m
Dimensions	70.136cm ² (diameter = 94.5mm)
Accessory Device	Adapter
Data Cable Supplied	1.3m shielded USB cable without core
Maximum Power Output from the Charging Coil	Max Power Should be 5W

Note:

1. The EUT is a wireless inductive charging coil for charging Phone.
2. All models are listed as below. The model: F7U067 was selected as a representative one and therefore only its test data was recorded in this report.

Brand	Model	Difference
belkin	F7U067	Wireless Charging Pad + Wall Charger + USB cable
	F7U068	Wireless Charging Pad + USB cable

3. The EUT uses following adapter.

Brand	belkin
Model	HNEM050200UU
Input power	100-240Vac 50/60Hz 0.35A MAX
Output power	5.0Vdc 2.0A

3.2 Description of Test Modes

The following test frequencies are provided to this EUT:

Operating Frequency (kHz)	Tested Frequency (kHz)	Mode
111-148	123	Charging Mode with Load
111-148	111	Charging Mode with iPhone
111-148	147	Standby Mode

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE<1G	PLC	CBW	
A	√	√	√	Charging Mode With Load
B	√	√	√	Charging Mode with iPhone
C	√	√	√	Standby Mode

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

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	Operating Frequency (kHz)	Tested Frequency (kHz)
A	111-148	123
B	111-148	111
C	111-148	147

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	Operating Frequency (kHz)	Tested Frequency (kHz)
A	111-148	123
B	111-148	111
C	111-148	147

Channel Bandwidth 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	Operating Frequency (kHz)	Tested Frequency (kHz)
A	111-148	123
B	111-148	111
C	111-148	147

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE<1G	25 deg. C, 68% RH	120Vac, 60Hz	James Wei
PLC	25 deg. C, 76% RH	120Vac, 60Hz	Dalen Dai
CBW	25 deg. C, 76% RH	120Vac, 60Hz	Saxon Lee

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.

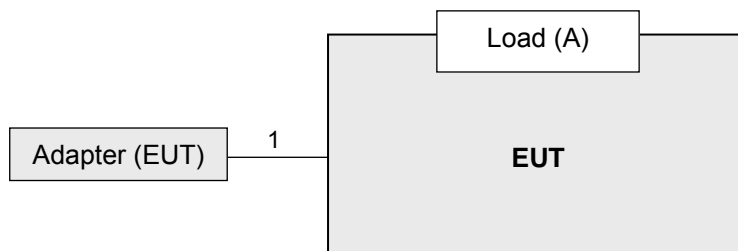
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load	NA	NA	NA	NA	Provided by manufacturer
B.	iPhone X	Apple	A1901	NA	BCG-E3175A	Provided by manufacturer

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	1.3	Y	0	Supplied by client

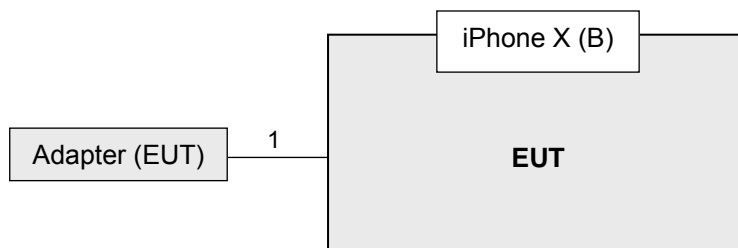
Note: The core(s) is(are) originally attached to the cable(s)

3.3.1 Configuration of System under Test

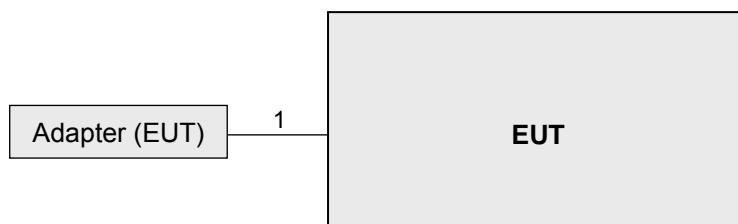
Test Mode A:



Test Mode B:



Test Mode C:



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.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 21, 2018	Feb. 20, 2019
HP Preamplifier	8449B	3008A01201	Feb. 22, 2018	Feb. 21, 2019
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 21, 2018	Feb. 20, 2019
Agilent TEST RECEIVER	N9038A	MY51210129	Feb. 6, 2018	Feb. 5, 2019
Schwarzbeck Antenna	VULB 9168	139	Nov. 29, 2017	Nov. 28, 2018
Schwarzbeck Antenna	VHBA 9123	480	May 19, 2017	May 18, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Dec. 1, 2017	Nov. 30, 2018
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Dec. 1, 2017	Nov. 30, 2018
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF104	CABLE-CH6	Aug. 14, 2017	Aug. 13, 2018
SUHNER RF cable With 3dB PAD	SF102	Cable-CH8-3.6m	Aug. 14, 2017	Aug. 13, 2018
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 26, 2017	Jul. 25, 2018
Loop Antenna EMCI	LPA600	270	Aug. 11, 2017	Aug. 10, 2019
EMCO Horn Antenna	3115	00028257	Nov. 30, 2017	Nov. 29, 2018
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 29, 2017	Sep. 28, 2018
Anritsu Power Sensor	MA2411B	0738404	Apr. 26, 2018	Apr. 25, 2019
Anritsu Power Meter	ML2495A	0842014	Apr. 26, 2018	Apr. 25, 2019

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
 2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 3. The test was performed in Chamber No. 6.
 4. The Industry Canada Reference No. IC 7450E-6.

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:

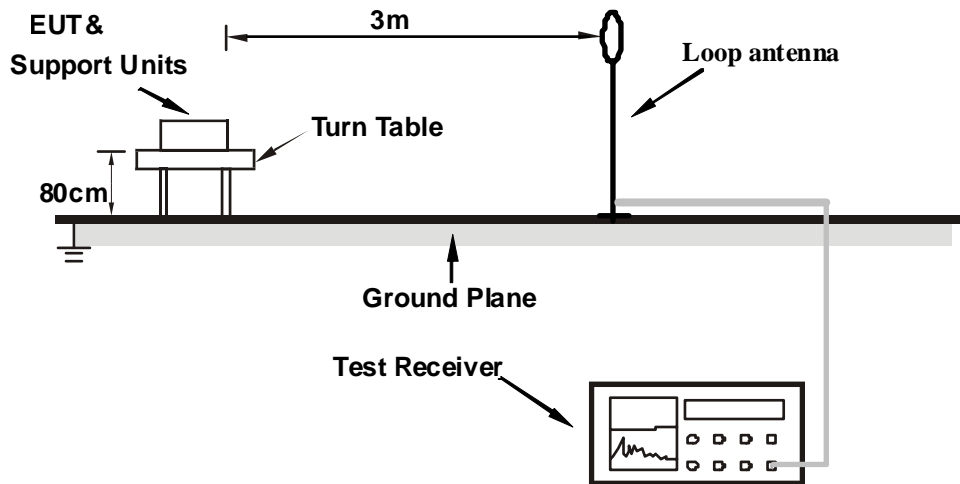
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

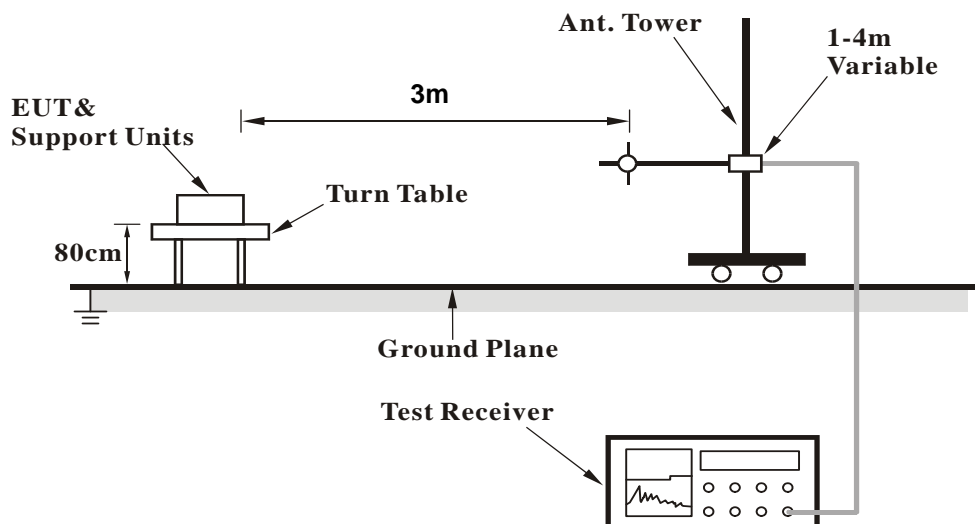
No deviation.

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 Load on the EUT (wireless charging) during the test.

Test Mode B:

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

Test Mode C:

- The EUT powered by adapter.

4.1.7 Test Results

Below 30MHz Data:

Charging Mode

Test Frequency	123kHz	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		
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	*0.123	75.36 QP	105.81	-30.45	1.00	123	60.23	15.13
2	0.246	49.14 QP	99.79	-50.65	1.00	195	39.94	9.20
3	0.369	48.56 QP	96.26	-47.70	1.00	294	42.52	6.04
4	0.492	39.76 QP	73.76	-34.00	1.00	236	35.56	4.20
5	3.795	24.14 QP	69.54	-45.40	1.00	55	27.50	-3.36
6	10.159	26.75 QP	69.54	-42.79	1.00	284	30.76	-4.01

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	*0.123	66.81 QP	105.81	-39.00	1.00	309	51.68	15.13
2	0.246	50.74 QP	99.79	-49.05	1.00	288	41.54	9.20
3	0.369	52.00 QP	96.26	-44.26	1.00	204	45.96	6.04
4	0.492	43.39 QP	73.76	-30.37	1.00	151	39.19	4.20
5	8.610	26.46 QP	69.54	-43.08	1.00	158	30.32	-3.86
6	19.515	25.77 QP	69.54	-43.77	1.00	144	30.97	-5.20

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	*0.123	74.44 QP	105.81	-31.37	1.00	326	59.31	15.13
2	0.246	49.40 QP	99.79	-50.39	1.00	296	40.20	9.20
3	0.369	45.08 QP	96.26	-51.18	1.00	208	39.04	6.04
4	0.492	39.77 QP	73.76	-33.99	1.00	113	35.57	4.20
5	4.266	24.35 QP	69.54	-45.19	1.00	174	27.83	-3.48
6	8.598	26.21 QP	69.54	-43.33	1.00	251	30.07	-3.86

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

Charging Mode

Test Frequency	111kHz	Detector Function	Quasi-Peak
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	*0.111	77.97 QP	106.70	-28.73	1.00	281	62.14	15.83
2	0.222	52.42 QP	100.68	-48.26	1.00	119	42.45	9.97
3	0.333	54.38 QP	97.16	-42.78	1.00	32	47.59	6.79
4	0.444	40.19 QP	94.66	-54.47	1.00	95	35.37	4.82
5	1.558	26.64 QP	63.75	-37.11	1.00	102	27.86	-1.22
6	10.566	25.27 QP	69.54	-44.27	1.00	116	29.31	-4.04

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	*0.111	74.35 QP	106.70	-32.35	1.00	305	58.52	15.83
2	0.222	51.93 QP	100.68	-48.75	1.00	250	41.96	9.97
3	0.333	52.35 QP	97.16	-44.81	1.00	61	45.56	6.79
4	0.444	43.07 QP	94.66	-51.59	1.00	21	38.25	4.82
5	1.455	32.31 QP	64.35	-32.04	1.00	22	33.29	-0.98
6	22.010	27.35 QP	69.54	-42.19	1.00	298	32.84	-5.49

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	*0.111	72.62 QP	106.70	-34.08	1.00	283	56.79	15.83
2	0.222	51.25 QP	100.68	-49.43	1.00	346	41.28	9.97
3	0.333	49.70 QP	97.16	-47.46	1.00	149	42.91	6.79
4	0.444	39.79 QP	94.66	-54.87	1.00	76	34.97	4.82
5	4.184	24.17 QP	69.54	-45.37	1.00	39	27.63	-3.46
6	11.696	25.38 QP	69.54	-44.16	1.00	254	29.43	-4.05

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

Test Frequency	147kHz	Detector Function	Quasi-Peak
Frequency Range	9 kHz ~ 30 MHz		
Test Mode	C		

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	*0.147	76.15 QP	104.26	-28.11	1.00	156	62.40	13.75
2	0.294	46.14 QP	98.24	-52.10	1.00	74	38.46	7.68
3	0.441	51.47 QP	94.72	-43.25	1.00	79	46.61	4.86
4	0.588	37.09 QP	72.22	-35.13	1.00	193	34.03	3.06
5	1.762	24.20 QP	69.54	-45.34	1.00	186	25.89	-1.69
6	8.729	25.55 QP	69.54	-43.99	1.00	197	29.44	-3.89

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	*0.147	63.15 QP	104.26	-41.11	1.00	12	49.40	13.75
2	0.294	46.48 QP	98.24	-51.76	1.00	57	38.80	7.68
3	0.441	48.15 QP	94.72	-46.57	1.00	185	43.29	4.86
4	0.588	37.53 QP	72.22	-34.69	1.00	275	34.47	3.06
5	6.411	26.85 QP	69.54	-42.69	1.00	103	30.47	-3.62
6	19.911	24.93 QP	69.54	-44.61	1.00	156	30.12	-5.19

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	*0.147	75.36 QP	104.26	-28.90	1.00	337	61.61	13.75
2	0.294	45.82 QP	98.24	-52.42	1.00	153	38.14	7.68
3	0.441	49.12 QP	94.72	-45.60	1.00	116	44.26	4.86
4	0.588	36.99 QP	72.22	-35.23	1.00	348	33.93	3.06
5	6.925	24.93 QP	69.54	-44.61	1.00	289	28.52	-3.59
6	14.082	24.62 QP	69.54	-44.92	1.00	117	28.52	-3.90

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

Test Frequency	123kHz	Detector Function	Quasi-Peak
Frequency Range	30 MHz ~ 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	86.70	28.40 QP	40.00	-11.60	2.02 H	60	41.02	-12.62
2	107.16	19.31 QP	43.50	-24.19	2.27 H	77	30.18	-10.87
3	534.64	27.81 QP	46.00	-18.19	2.01 H	253	28.27	-0.46
4	674.18	30.45 QP	46.00	-15.55	2.43 H	23	28.05	2.40
5	770.74	32.48 QP	46.00	-13.52	2.55 H	260	28.00	4.48
6	954.36	34.49 QP	46.00	-11.51	1.46 H	151	27.50	6.99
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	47.51	28.26 QP	40.00	-11.74	1.02 V	1	35.46	-7.20
2	85.82	30.77 QP	40.00	-9.23	1.97 V	218	43.34	-12.57
3	114.58	19.87 QP	43.50	-23.63	1.14 V	340	29.80	-9.93
4	574.95	27.88 QP	46.00	-18.12	1.46 V	22	27.34	0.54
5	720.49	31.29 QP	46.00	-14.71	2.23 V	122	28.20	3.09
6	806.92	32.06 QP	46.00	-13.94	1.58 V	203	27.49	4.57

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Test Frequency	111kHz	Detector Function	Quasi-Peak
Frequency Range	30 MHz ~ 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	87.62	27.81 QP	40.00	-12.19	2.28 H	86	40.46	-12.65
2	120.60	18.55 QP	43.50	-24.95	2.01 H	56	27.79	-9.24
3	545.80	29.77 QP	46.00	-16.23	1.47 H	258	29.91	-0.14
4	619.08	29.64 QP	46.00	-16.36	1.99 H	138	27.88	1.76
5	727.43	32.71 QP	46.00	-13.29	1.32 H	196	29.22	3.49
6	820.02	33.31 QP	46.00	-12.69	1.09 H	263	28.23	5.08

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	53.04	28.32 QP	40.00	-11.68	1.77 V	342	35.50	-7.18
2	84.71	26.76 QP	40.00	-13.24	1.05 V	246	39.17	-12.41
3	520.00	27.44 QP	46.00	-18.56	2.89 V	7	28.01	-0.57
4	623.49	29.09 QP	46.00	-16.91	2.49 V	185	27.24	1.85
5	716.37	32.12 QP	46.00	-13.88	1.16 V	293	29.07	3.05
6	897.47	33.87 QP	46.00	-12.13	2.85 V	60	27.87	6.00

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Standby Mode

Test Frequency	147kHz	Detector Function	Quasi-Peak
Frequency Range	30 MHz ~ 1GHz		
Test Mode	C		

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	47.31	20.24 QP	40.00	-19.76	2.27 H	264	27.47	-7.23
2	89.66	21.82 QP	43.50	-21.68	2.01 H	83	34.46	-12.64
3	544.20	27.80 QP	46.00	-18.20	1.48 H	133	27.98	-0.18
4	685.96	30.25 QP	46.00	-15.75	2.45 H	36	27.81	2.44
5	833.45	32.54 QP	46.00	-13.46	1.13 H	60	27.32	5.22
6	936.90	34.43 QP	46.00	-11.57	2.95 H	61	27.58	6.85

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	44.16	25.57 QP	40.00	-14.43	1.11 V	112	33.00	-7.43
2	53.13	24.34 QP	40.00	-15.66	1.58 V	310	31.53	-7.19
3	87.13	24.32 QP	40.00	-15.68	1.03 V	211	36.96	-12.64
4	532.65	28.12 QP	46.00	-17.88	1.75 V	233	28.58	-0.46
5	656.09	30.63 QP	46.00	-15.37	2.08 V	6	28.41	2.22
6	809.35	33.89 QP	46.00	-12.11	2.24 V	160	29.19	4.70

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)
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
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102414	Feb. 7, 2018	Feb. 6, 2019
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	May 23, 2018	May 22, 2019
LISN With Adapter (for EUT)	AD10	C10Ada-002	May 23, 2018	May 22, 2019
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 23, 2017	Nov. 22, 2018
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 3, 2018	May 2, 2019
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 14, 2018	Feb. 13, 2019
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 8, 2018	May 7, 2019
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 14, 2017	Nov. 13, 2018
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 14, 2017	Nov. 13, 2018

Notes: 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 Shielded Room No. 10.

4.2.3 Test Procedures

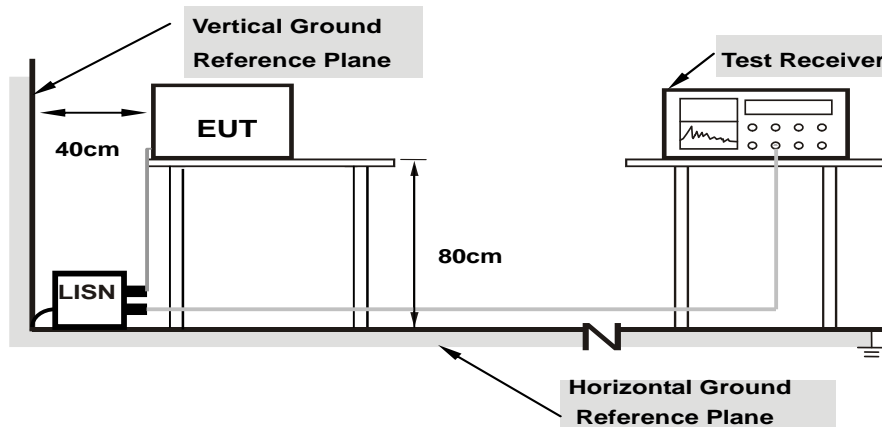
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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 item 4.1.6.

4.2.7 Test Results

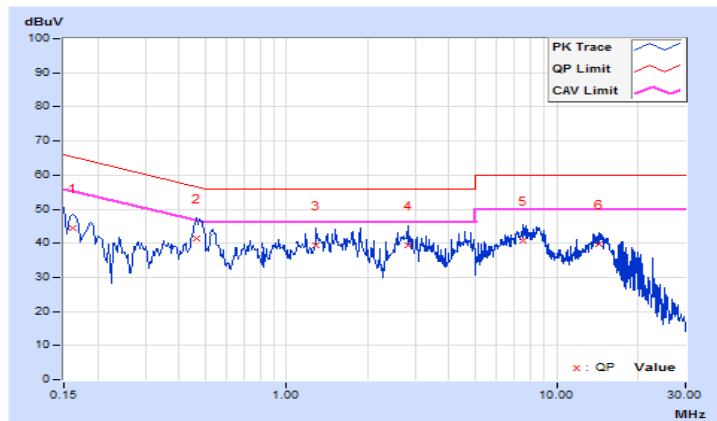
Charging Mode

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.16173	9.68	34.78	21.85	44.46	31.53	65.37
2	0.46671	9.77	31.71	19.56	41.48	29.33	56.57	46.57	-15.09	-17.24
3	1.28591	9.89	29.67	21.38	39.56	31.27	56.00	46.00	-16.44	-14.73
4	2.80690	10.01	29.49	22.24	39.50	32.25	56.00	46.00	-16.50	-13.75
5	7.48285	10.15	30.44	21.82	40.59	31.97	60.00	50.00	-19.41	-18.03
6	14.37618	10.29	29.60	21.07	39.89	31.36	60.00	50.00	-20.11	-18.64

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.

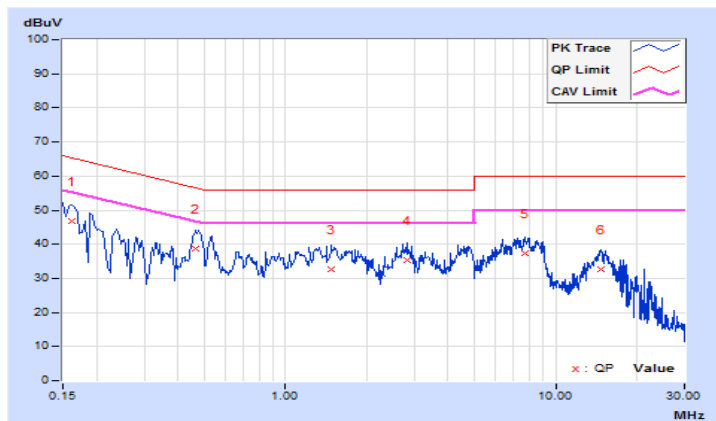


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

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	0.16216	9.70	37.11	23.28	46.81	32.98	65.35
2	0.46671	9.81	28.77	18.79	38.58	28.60	56.57	46.57	-17.99	-17.97
3	1.47359	9.94	22.88	14.25	32.82	24.19	56.00	46.00	-23.18	-21.81
4	2.80690	10.02	25.42	20.18	35.44	30.20	56.00	46.00	-20.56	-15.80
5	7.68226	10.15	27.15	16.15	37.30	26.30	60.00	50.00	-22.70	-23.70
6	14.74763	10.31	22.42	11.09	32.73	21.40	60.00	50.00	-27.27	-28.60

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.

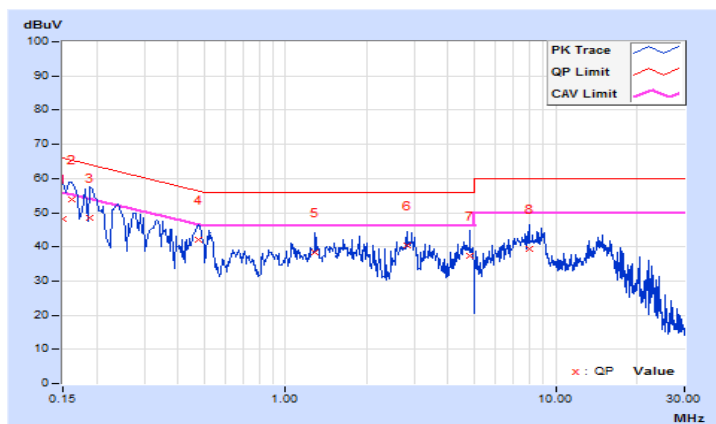


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

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	0.15000	9.68	38.54	14.60	48.22	24.28	66.00
2	0.16173	9.68	44.18	28.34	53.86	38.02	65.37	55.37	-11.51	-17.35
3	0.18910	9.70	38.64	13.74	48.34	23.44	64.08	54.08	-15.74	-30.64
4	0.47453	9.77	32.37	21.73	42.14	31.50	56.43	46.43	-14.29	-14.93
5	1.28591	9.89	28.64	19.51	38.53	29.40	56.00	46.00	-17.47	-16.60
6	2.81081	10.01	30.54	22.95	40.55	32.96	56.00	46.00	-15.45	-13.04
7	4.80491	10.08	27.44	19.79	37.52	29.87	56.00	46.00	-18.48	-16.13
8	7.97160	10.17	29.35	17.90	39.52	28.07	60.00	50.00	-20.48	-21.93

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.

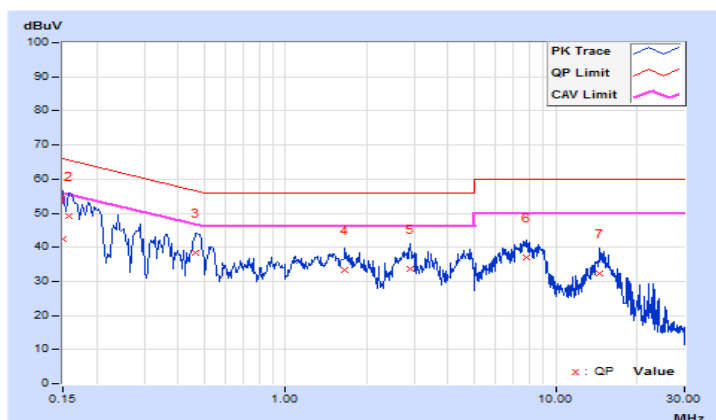


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

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	0.15000	9.69	32.70	10.91	42.39	20.60	66.00
2	0.15782	9.69	39.58	23.59	49.27	33.28	65.58	55.58	-16.31	-22.30
3	0.46671	9.81	28.51	18.39	38.32	28.20	56.57	46.57	-18.25	-18.37
4	1.66127	9.96	23.32	15.06	33.28	25.02	56.00	46.00	-22.72	-20.98
5	2.88901	10.03	23.63	16.92	33.66	26.95	56.00	46.00	-22.34	-19.05
6	7.81911	10.15	26.95	15.56	37.10	25.71	60.00	50.00	-22.90	-24.29
7	14.63033	10.31	22.01	10.37	32.32	20.68	60.00	50.00	-27.68	-29.32

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.



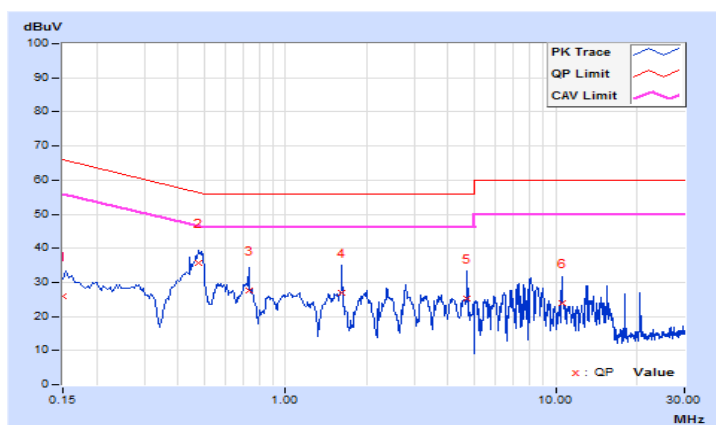
Standby Mode

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

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	0.15000	9.68	16.19	5.36	25.87	15.04	66.00
2	0.47453	9.77	25.97	13.23	35.74	23.00	56.43	46.43	-20.69	-23.43
3	0.73069	9.82	17.67	6.53	27.49	16.35	56.00	46.00	-28.51	-29.65
4	1.61435	9.93	17.08	5.13	27.01	15.06	56.00	46.00	-28.99	-30.94
5	4.70325	10.08	15.26	4.73	25.34	14.81	56.00	46.00	-30.66	-31.19
6	10.57957	10.23	13.75	2.71	23.98	12.94	60.00	50.00	-36.02	-37.06

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.

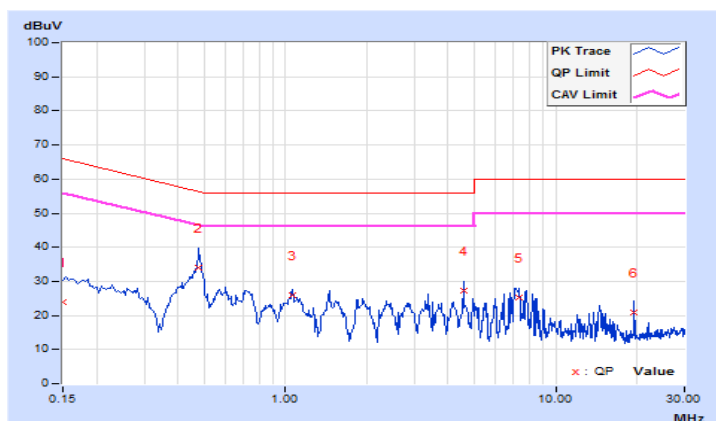


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

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	0.15000	9.69	14.34	7.88	24.03	17.57	66.00	56.00	-41.97	-38.43
2	0.47844	9.81	24.09	14.07	33.90	23.88	56.37	46.37	-22.47	-22.49
3	1.05913	9.90	16.11	8.48	26.01	18.38	56.00	46.00	-29.99	-27.62
4	4.55467	10.08	17.08	9.16	27.16	19.24	56.00	46.00	-28.84	-26.76
5	7.31081	10.14	15.08	6.92	25.22	17.06	60.00	50.00	-34.78	-32.94
6	19.54520	10.41	10.57	3.19	20.98	13.60	60.00	50.00	-39.02	-36.40

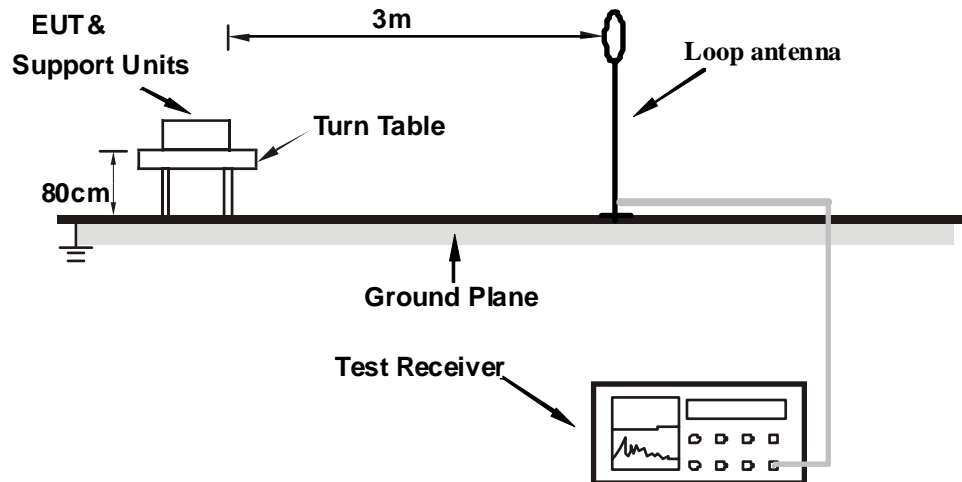
Remarks:

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 Channel Bandwidth

4.3.1 Test Setup



4.3.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.3 Test Procedure

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. Then the Loop antenna was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband loop antenna, which is fixed of a 1m height above the ground, and set away from 3m to the EUT to find the disturbance reading on each frequency.
- The test-receiver system was set to Quasi-peak detect function and specified bandwidth.

4.3.4 Deviation from Test Standard

No deviation.

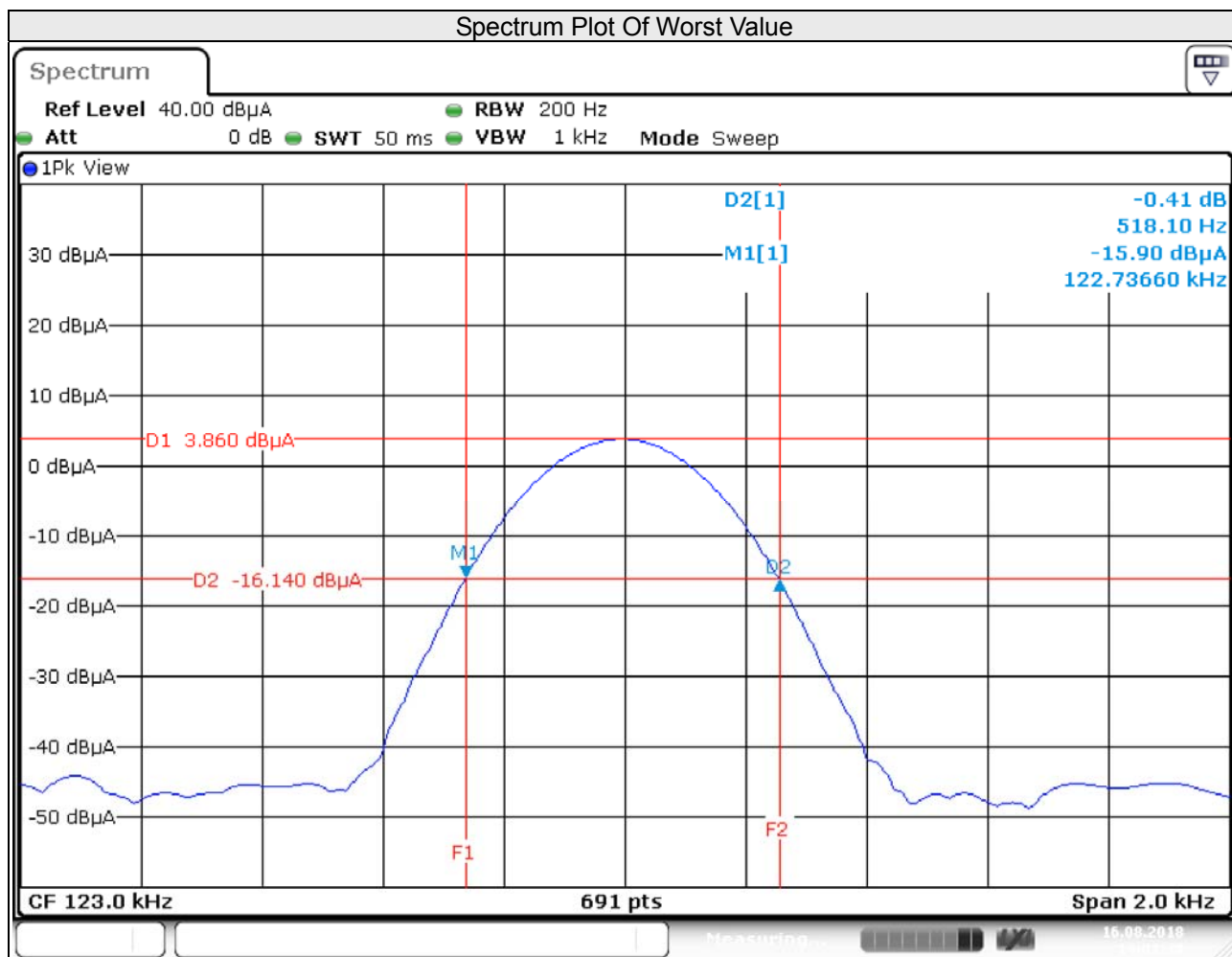
4.3.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously.

4.3.6 Test Results

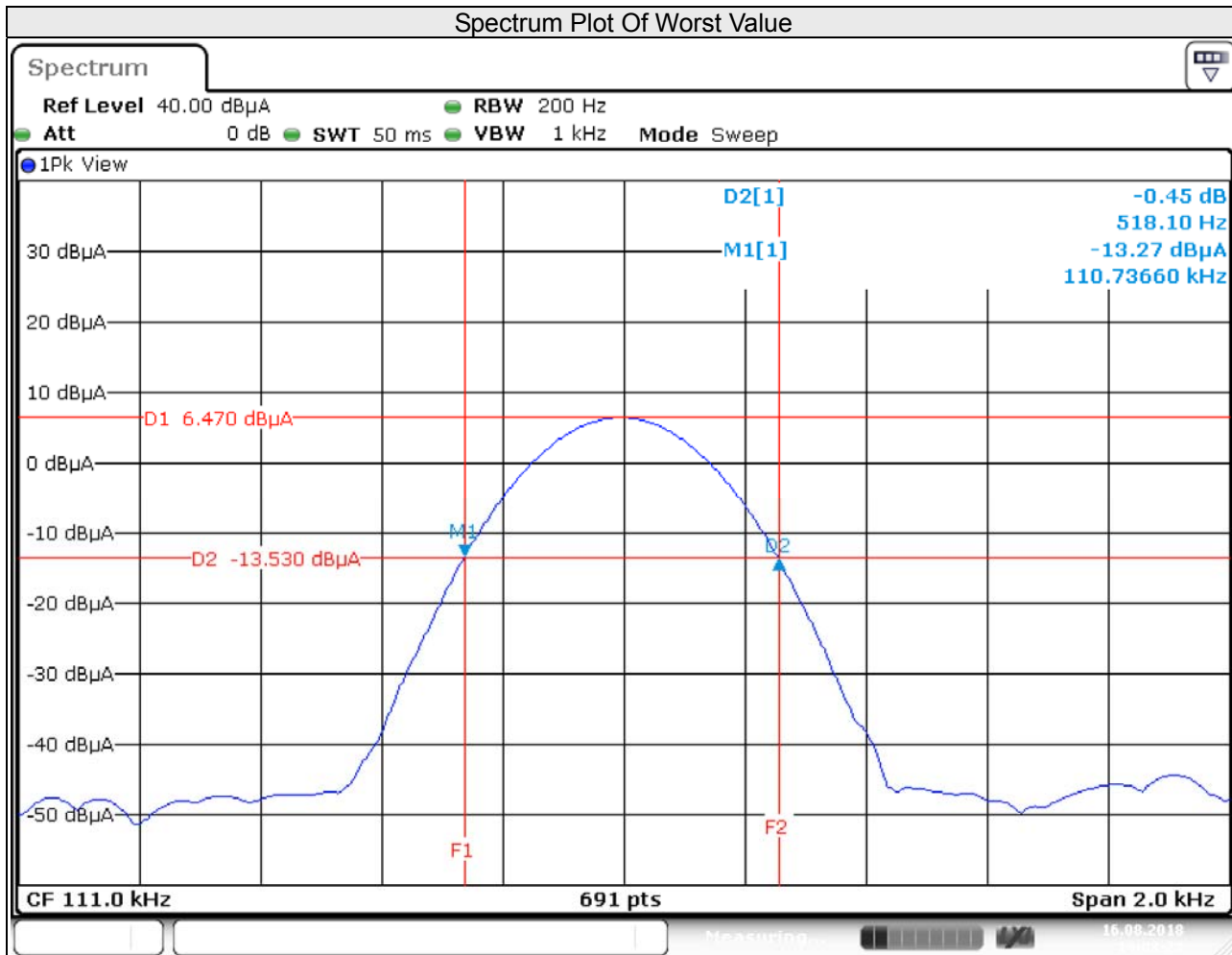
Mode A:

Frequency (kHz)	20dB Bandwidth (kHz)
123	0.518



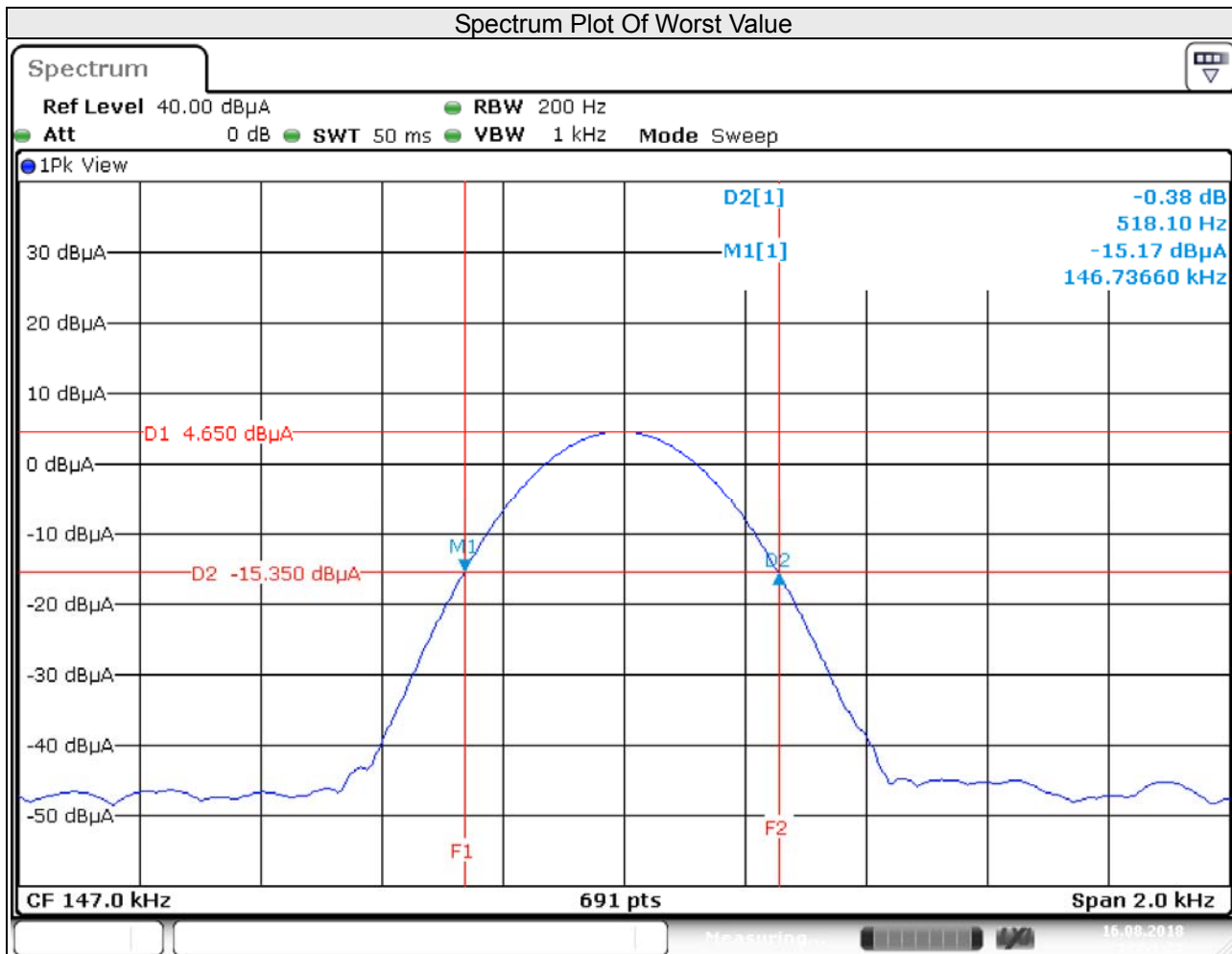
Mode B:

Frequency (kHz)	20dB Bandwidth (kHz)
111	0.518



Mode C:

Frequency (kHz)	20dB Bandwidth (kHz)
147	0.518



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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