

FCC Test Report

Report No.: RFBHJP-WTW-P21010398-3

FCC ID: UK7-DW13

Test Model: DW13F1, DW13F2, DW13M1 (refer to section 3.1 for more details)

Received Date: Jan. 15, 2021

Test Date: Feb. 11, 2021 ~ Feb. 22, 2021

Issued Date: Apr. 28, 2021

Applicant: Fossil Group, Inc.

Address: 901 S. Central Expressway, Richardson, Tx 75080, USA

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

FCC Registration /
Designation Number: 788550 / TW0003



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results.....	5
2.1 Measurement Uncertainty.....	5
2.2 Modification Record	5
3 General Information	6
3.1 General Description of EUT	6
3.2 Description of Test Modes.....	7
3.2.1 Test Mode Applicability and Tested Channel Detail.....	7
3.3 Description of Support Units	9
3.3.1 Configuration of System under Test	9
3.4 General Description of Applied Standards and references.....	10
4 Test Types and Results	11
4.1 Radiated Emission Measurement.....	11
4.1.1 Limits of Radiated Emission Measurement	11
4.1.2 Test Instruments	12
4.1.3 Test Procedures.....	13
4.1.4 Deviation from Test Standard	13
4.1.5 Test Set Up	14
4.1.6 EUT Operating Conditions.....	14
4.1.7 Test Results	15
4.2 Conducted Emission Measurement.....	23
4.2.1 Limits of Conducted Emission Measurement	23
4.2.2 Test Instruments	23
4.2.3 Test Procedures.....	24
4.2.4 Deviation from Test Standard	24
4.2.5 Test Setup.....	24
4.2.6 EUT Operating Conditions.....	24
4.2.7 Test Results	25
4.3 Frequency Stability	29
4.3.1 Limits of Frequency Stability Measurement	29
4.3.2 Test Setup.....	29
4.3.3 Test Instruments	29
4.3.4 Test Procedure	29
4.3.5 Deviation from Test Standard	29
4.3.6 EUT Operating Conditions.....	29
4.3.7 Test Results	30
4.4 20 dB Bandwidth.....	31
4.4.1 Limits of 20 dB Bandwidth Measurement.....	31
4.4.2 Test Setup.....	31
4.4.3 Test Instruments	31
4.4.4 Test Procedures.....	31
4.4.5 Deviation from Test Standard	31
4.4.6 EUT Operating Conditions.....	31
4.4.7 Test Results	32
5 Pictures of Test Arrangements.....	33
Appendix – Information of the Testing Laboratories	34

Release Control Record

Issue No.	Description	Date Issued
RFBHJP-WTW-P21010398-3	Original Release	Apr. 28, 2021

1 Certificate of Conformity

Product: Smart Watch

Test Model: DW13F1, DW13F2, DW13M1 (refer to section 3.1 for more details)

Sample Status: Identical Prototype

Applicant: Fossil Group, Inc.

Test Date: Feb. 11, 2021 ~ Feb. 22, 2021

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.225)
47 CFR FCC Part 15, Subpart C (Section 15.215)
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 : Vera Huang , Date: Apr. 28, 2021
Vera Huang / Specialist

Approved by : Dylan Chiou , Date: Apr. 28, 2021
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.225, 15.215)			
FCC Clause	Test Item	Result	Remarks
15.207	Conducted emission test	Pass	Meet the requirement of limit. Minimum passing margin is -8.78 dB at 13.56000 MHz.
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	Pass	Meet the requirement of limit. Minimum passing margin is -79.27 dB at 13.56 MHz.
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	Pass	Meet the requirement of limit.
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	Pass	Meet the requirement of limit.
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	Pass	Meet the requirement of limit. Minimum passing margin is -5.56 dB at 342.34 MHz.
15.225 (e)	The frequency tolerance	Pass	Meet the requirement of limit.
15.215 (c)	20 dB Bandwidth	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Smart Watch
Test Model	DW13F1, DW13F2, DW13M1
Status of EUT	Identical Prototype
Power Supply Rating	5.0 Vdc (adapter or host equipment) 3.88 Vdc (Li-ion battery)
Modulation Type	ASK
Data Rate	Type A: 106 kbit/s
Operating Frequency	13.56 MHz
Field Strength (Maximum)	4.73 dBuV/m (30m)
Antenna Type	Loop Antenna
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. All models are listed as below. Only model: DW13F1 as a representative for final test.

Model	Difference
DW13F1	All models are electrically identical, different antenna gain due to enclosure, and different model names are for marketing purpose.
DW13F2	
DW13M1	

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Charging Dock	Simula	CB407D-6040-202	Voltage Rating: 5V
Battery	Lishen	DAGP382427SA	3.88 Vdc, 300 mAh

3. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

One channel was provided to this EUT:

Channel	Frequency (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE	PLC	FS	EB	
A	√	√	√	√	EUT + Adapter
B	-	√	-	-	EUT + Notebook

Where **RE:** Radiated Emission
FS: Frequency Stability

PLC: Power Line Conducted Emission
EB: 20 dB Bandwidth measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

NOTE: "-" means no effect.

Radiated 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	Modulation Type	Axis
A	1	1	ASK	Y

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	Modulation Type	Axis
A, B	1	1	ASK	Y

Frequency Stability:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Axis
A	1	1	ASK	Y

20 dB Bandwidth:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Axis
A	1	1	ASK	Y

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen
FS	22 deg. C, 67 % RH	3.88 Vdc	Tim Chen
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen
EB	25 deg. C, 68 % RH	3.88 Vdc	Tim Chen

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	Adapter	ASUS	AD827M	NA	NA	--
B	Notebook	DELL	Inspiron 14R	8LRKKW1	NA	--

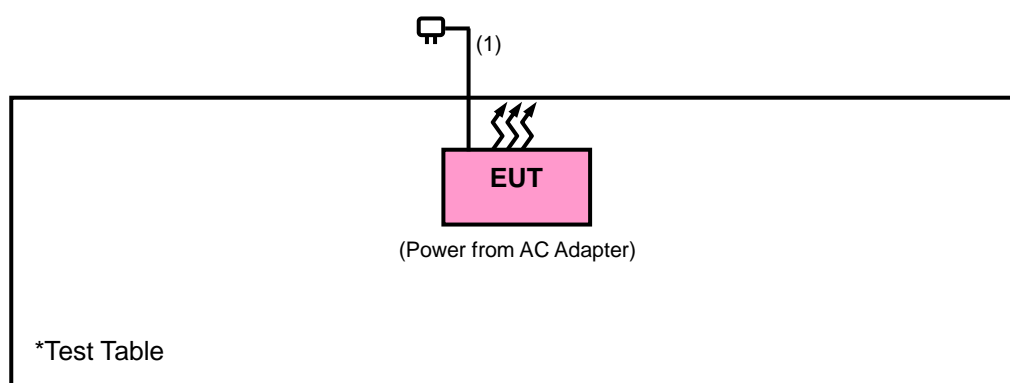
Note:

1. All power cords of the above support units are non-shielded (1.8m).

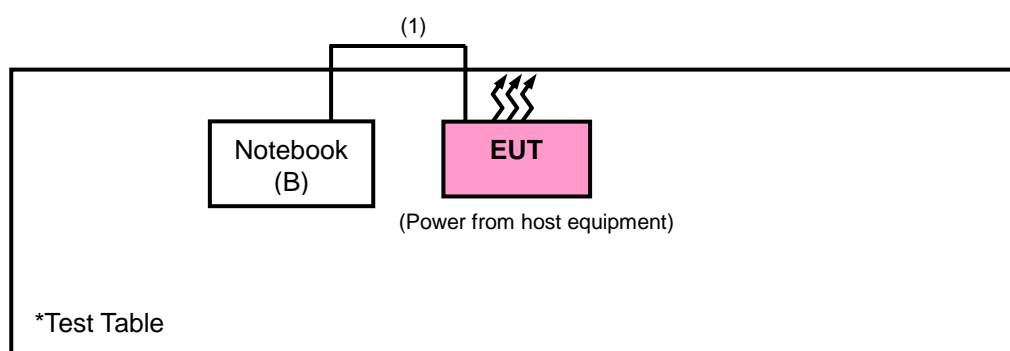
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Charging Cable	1	0.85	N	0	Provided by client

3.3.1 Configuration of System under Test

Mode A



Mode B



3.4 General Description of Applied Standards and references

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

FCC Part 15, Subpart C (15.225)

FCC Part 15, Subpart C (15.215)

ANSI C63.10-2013

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

References Test Guidance :

KDB 414788 D01 Radiated Test Site v01r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

- The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below table:

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:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 07, 2020	Dec. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100980	Apr. 20, 2020	Apr. 19, 2021
Signal Analyzer Keysight	N9010A	MY56070348	Sep. 16, 2020	Sep. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 06, 2020	Nov. 05, 2021
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier EMCI	EMC001340	980201	Oct. 21, 2020	Oct. 20, 2021
Preamplifier EMCI	EMC 012645	980115	Oct. 07, 2020	Oct. 06, 2021
Preamplifier EMCI	EMC 330H	980112	Oct. 07, 2020	Oct. 06, 2021
Power Meter Anritsu	ML2495A	1012010	Sep. 01, 2020	Aug. 31, 2021
Power Sensor Anritsu	MA2411B	1315050	Sep. 01, 2020	Aug. 31, 2021
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	171005	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 07, 2020	Oct. 06, 2021
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
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
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 24, 2020	Dec. 23, 2021
DC power supply Keysight	U8002A	MY56330015	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2020	Jun. 22, 2021

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 test was performed in HwaYa Chamber 10.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- 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, except for the frequency band (9kHz-90kHz, 110Hz-490kHz) set to average detect function.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters 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.

Note:

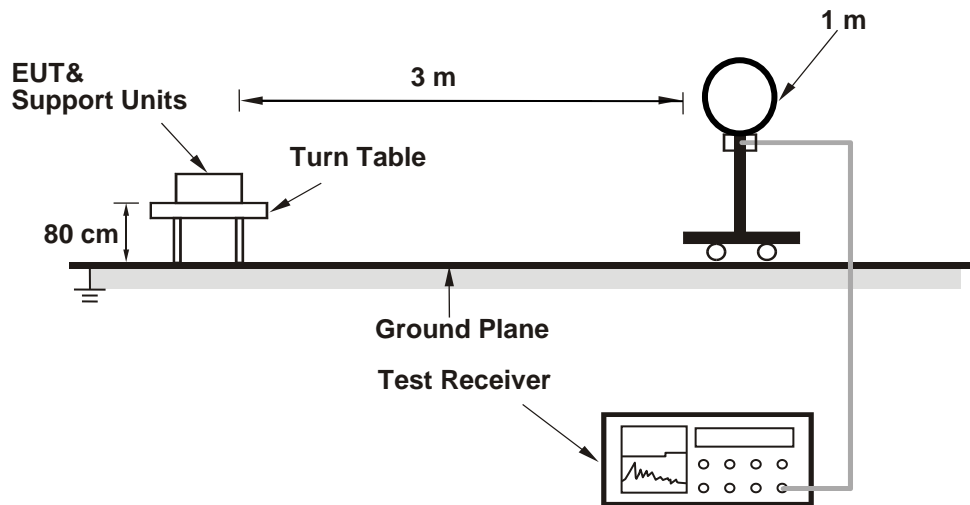
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

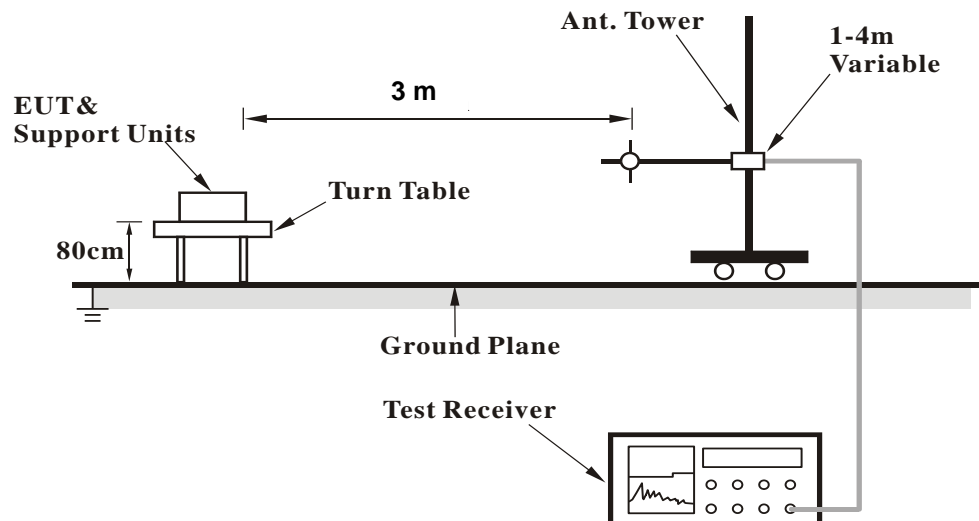
No deviation.

4.1.5 Test Set Up

<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



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

KDB 414788 OFS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

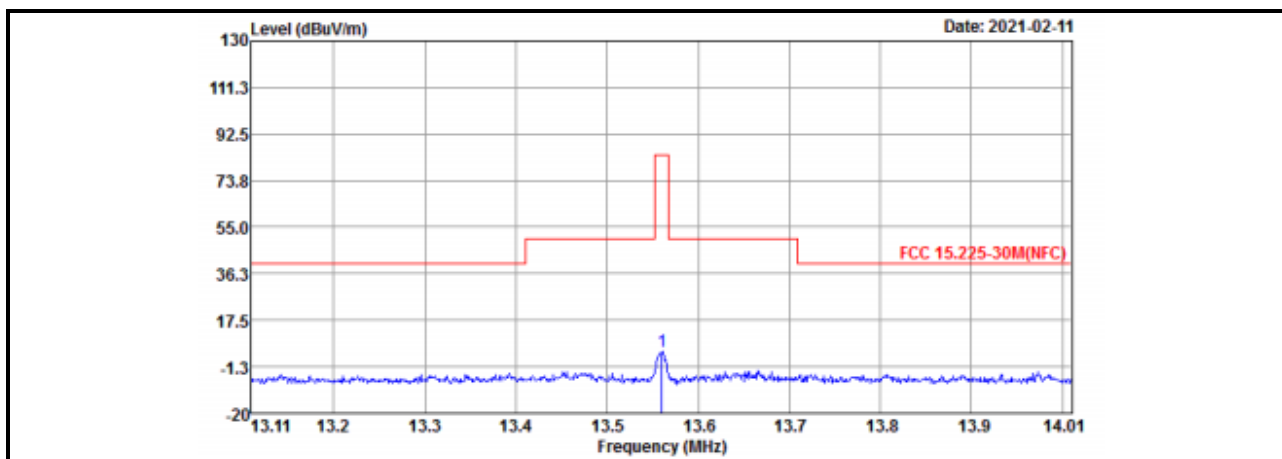
4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Type A

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen



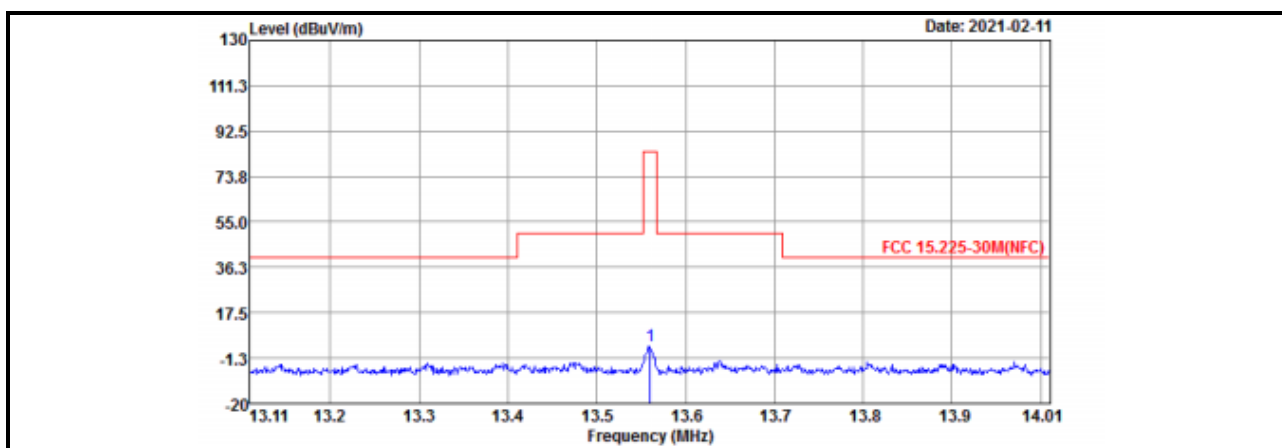
Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
13.56	4.73	23.36	-18.63	84	-79.27	100	360	QP

Remarks:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
2. The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. Above limits have been translated by the formula
5. The factor value already contains the test distance interpolation coefficient.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen



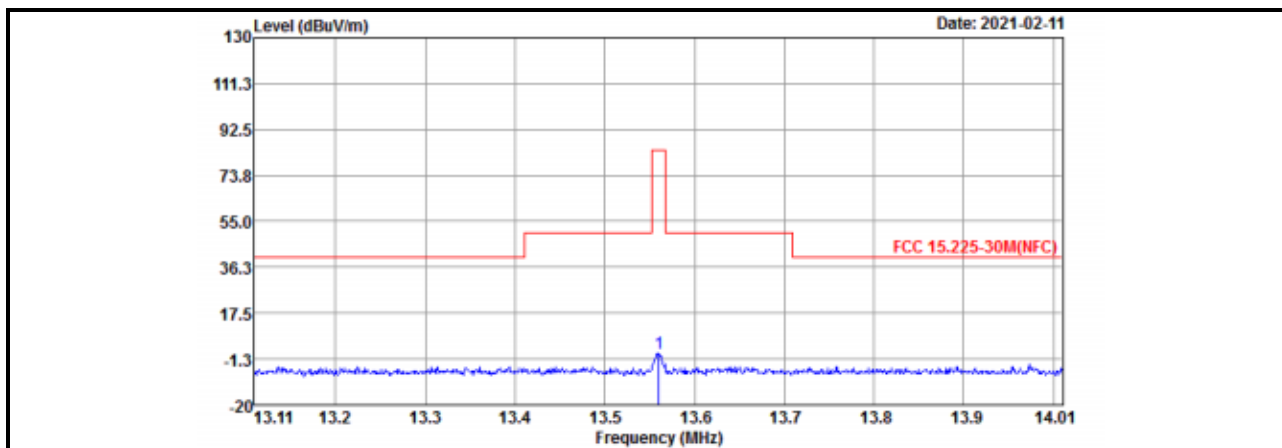
Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
13.56	3.57	22.2	-18.63	84	-80.43	100	360	QP

Remarks:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
2. The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. Above limits have been translated by the formula
5. The factor value already contains the test distance interpolation coefficient.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen



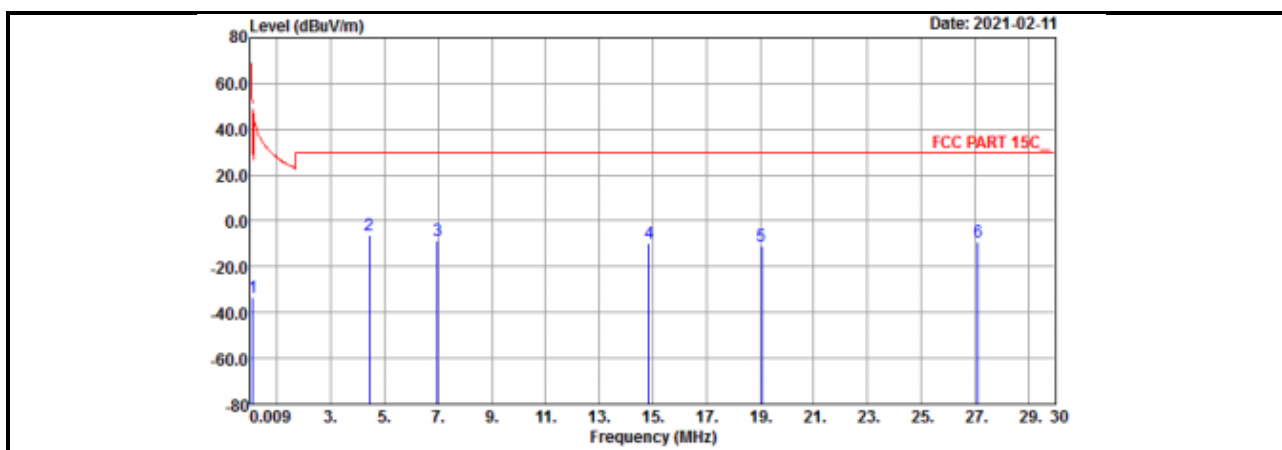
Antenna Polarity & Test Distance: Loop Antenna Ground-parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
13.56	1.12	19.75	-18.63	84	-82.88	100	0	QP

Remarks:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
2. The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. Above limits have been translated by the formula
5. The factor value already contains the test distance interpolation coefficient.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen



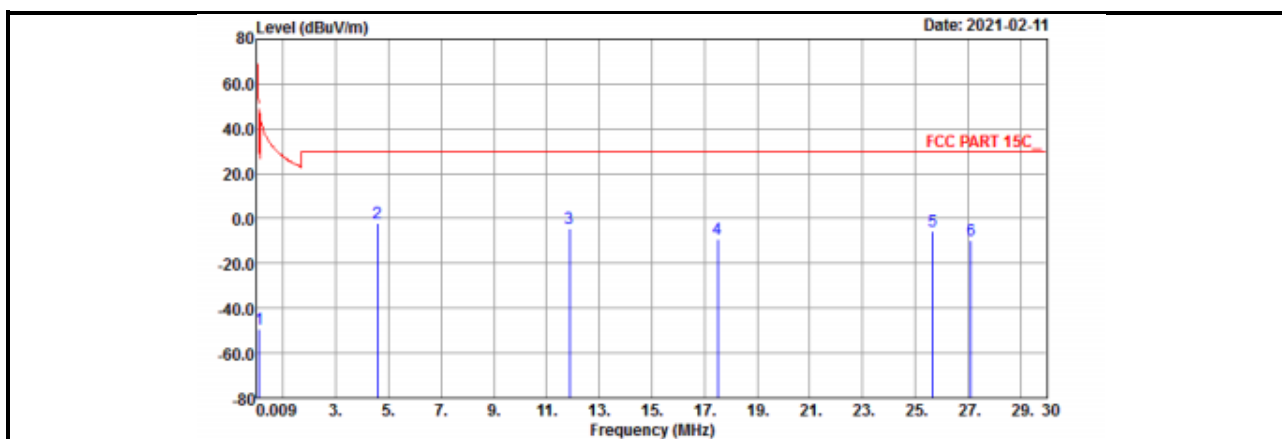
Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.0943	-33.31	27.31	-60.62	28.1	-61.41	100	104	QP
4.448	-6.29	13.79	-20.08	29.54	-35.83	100	114	QP
6.986	-8.36	11.02	-19.38	29.54	-37.9	100	78	QP
14.866	-9.97	8.6	-18.57	29.54	-39.51	100	199	QP
19.075	-10.82	7.61	-18.43	29.54	-40.36	100	253	QP
27.12	-9.42	8.83	-18.25	29.54	-38.96	100	214	QP

Remarks:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
2. The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. The factor value already contains the test distance interpolation coefficient.

The measured field strength above 490kHz was extrapolated to distance 30 meters and below 490kHz was extrapolated to distance 300 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen



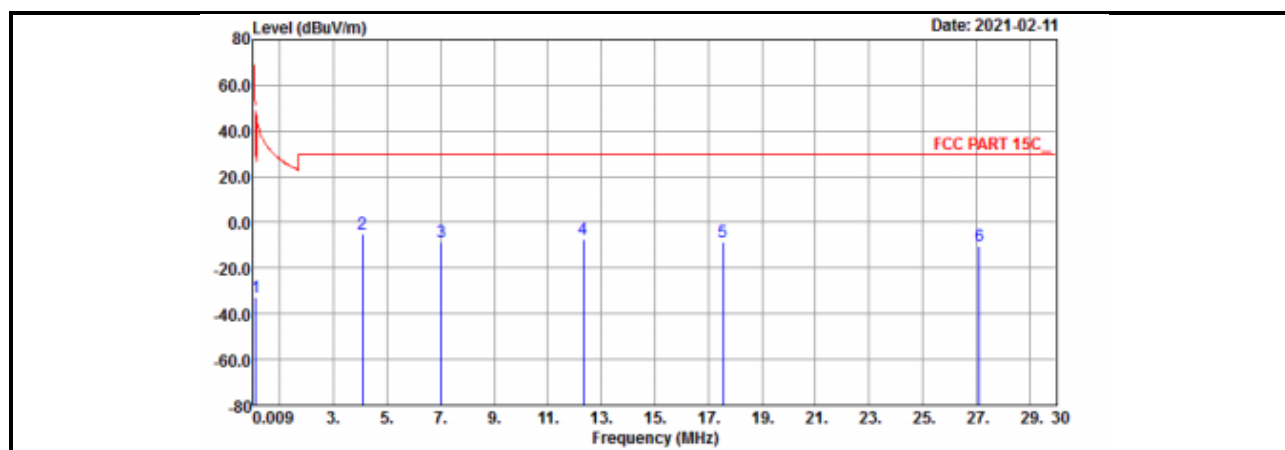
Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.09628	-49.31	11.33	-60.64	27.93	-77.24	100	105	QP
4.598	-1.78	18.25	-20.03	29.54	-31.32	100	322	QP
11.881	-4.24	14.46	-18.7	29.54	-33.78	100	203	QP
17.493	-9.15	9.33	-18.48	29.54	-38.69	100	219	QP
25.672	-5.58	12.7	-18.28	29.54	-35.12	100	337	QP
27.12	-9.52	8.73	-18.25	29.54	-39.06	100	47	QP

Remarks:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
- 2 The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. The factor value already contains the test distance interpolation coefficient.

The measured field strength above 490kHz was extrapolated to distance 30 meters and below 490kHz was extrapolated to distance 300 meters , using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen



Antenna Polarity & Test Distance: Loop Antenna Ground-parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.09402	-32.63	27.98	-60.61	28.13	-60.76	100	167	QP
4.09	-4.75	15.47	-20.22	29.54	-34.29	100	122	QP
7.016	-8.68	10.68	-19.36	29.54	-38.22	100	307	QP
12.329	-7.4	11.28	-18.68	29.54	-36.94	100	96	QP
17.553	-8.43	10.05	-18.48	29.54	-37.97	100	118	QP
27.12	-10.4	7.85	-18.25	29.54	-39.94	100	174	QP

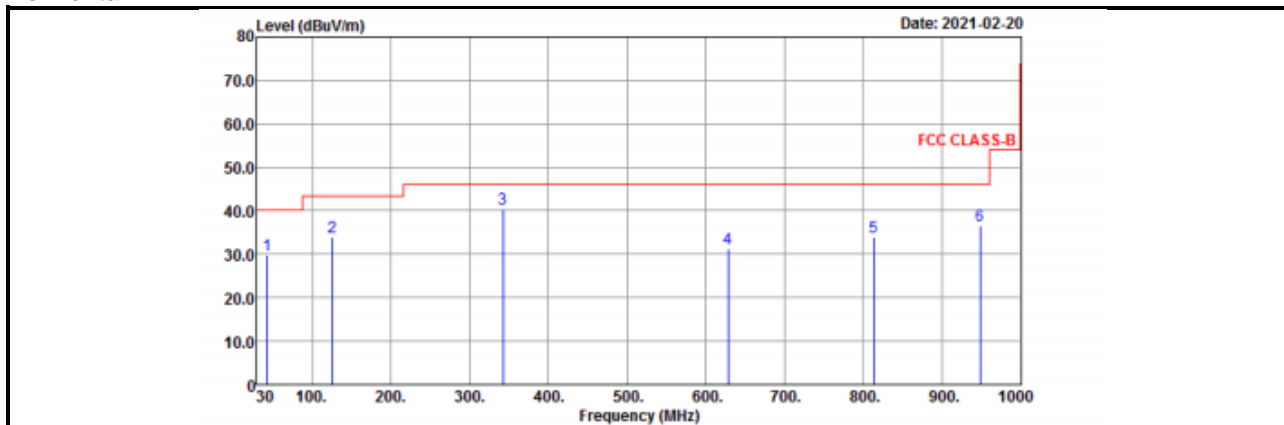
Remarks:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Factor (dB/m)
2. The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. The factor value already contains the test distance interpolation coefficient.

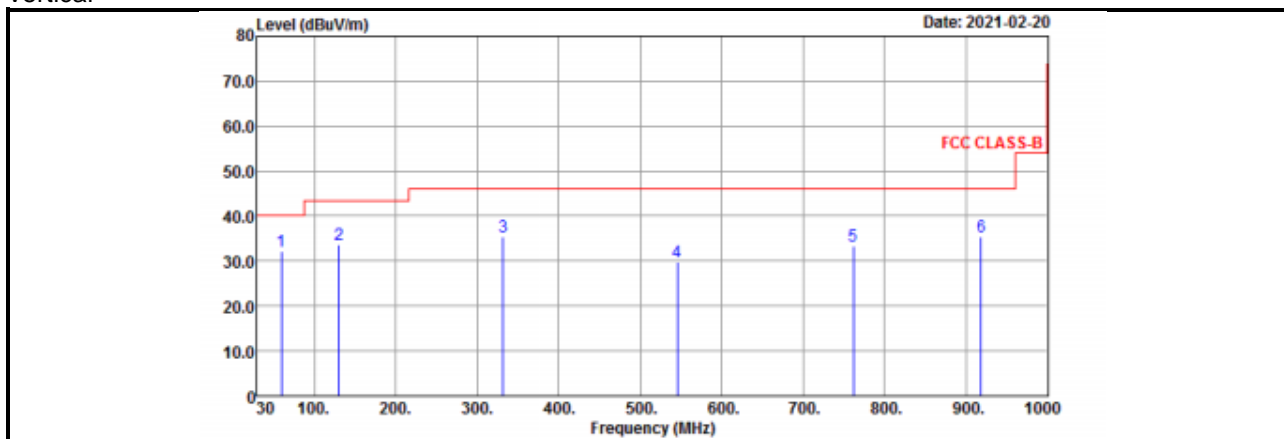
The measured field strength above 490kHz was extrapolated to distance 30 meters and below 490kHz was extrapolated to distance 300 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000 MHz
Input Power	120 Vac, 60 Hz	Detector Function	Quasi-Peak or Peak
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
42.61	29.79	42.48	-12.69	40	-10.21	157	106	QP
125.06	33.81	47.3	-13.49	43.5	-9.69	138	27	QP
342.34	40.44	50.69	-10.25	46	-5.56	152	193	QP
628.49	31.23	33.3	-2.07	46	-14.77	191	218	QP
813.76	34	33.04	0.96	46	-12	119	207	QP
948.59	36.53	33.25	3.28	46	-9.47	101	309	QP

Antenna Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
59.41	32.25	45.39	-13.14	40	-7.75	143	156	QP
129.91	33.64	46.71	-13.07	43.5	-9.86	103	13	QP
331.67	35.41	45.82	-10.41	46	-10.59	138	172	QP
545.07	29.92	34.35	-4.43	46	-16.08	171	59	QP
761.38	33.45	33.19	0.26	46	-12.55	126	288	QP
918.52	35.54	32.78	2.76	46	-10.46	181	93	QP

Remarks:

1. Emission Level = Read Level + Factor
2. Margin value = Emission level – Limit value.
3. The other emission levels were very low against the limit.
4. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
– Pre-Amplifier Factor (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.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 04, 2020	Dec. 03, 2021
RF signal cable Woken	5D-FB	Cable-cond1-01	Jan. 16, 2021	Jan. 15, 2022
V-LISN/AMN SCHWARZBECK (EUT)	NNLK 8121	8121-731	Apr. 20, 2020	Apr. 19, 2021
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
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

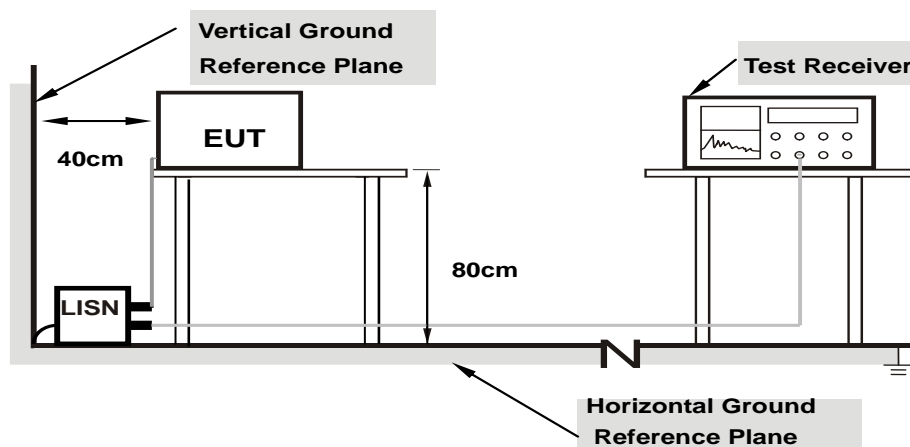
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance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

Note: 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.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

4.2.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.

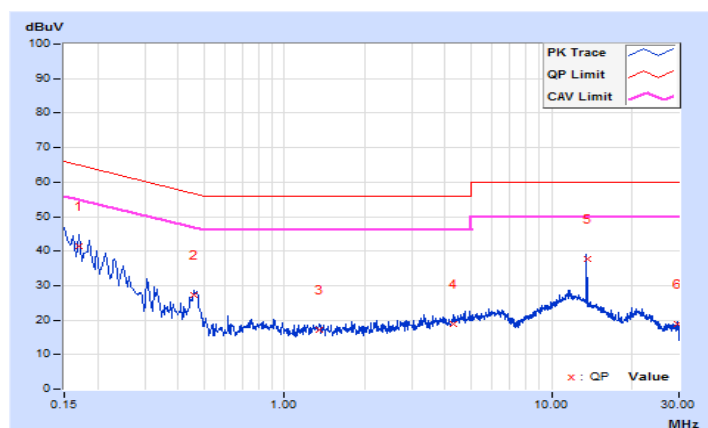
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 67%RH
Tested by	Tim Chen	Test Date	2021/2/20
Test Mode	Mode A		

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	0.17000	10.10	31.36	7.92	41.46	18.02	64.96	54.96	-23.50	-36.94
2	0.45800	10.20	16.98	6.28	27.18	16.48	56.73	46.73	-29.55	-30.25
3	1.34600	10.32	6.81	1.03	17.13	11.35	56.00	46.00	-38.87	-34.65
4	4.29000	10.50	8.47	2.45	18.97	12.95	56.00	46.00	-37.03	-33.05
5	13.56000	10.99	26.71	6.62	37.70	17.61	60.00	50.00	-22.30	-32.39
6	29.75000	11.45	7.52	2.14	18.97	13.59	60.00	50.00	-41.03	-36.41

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

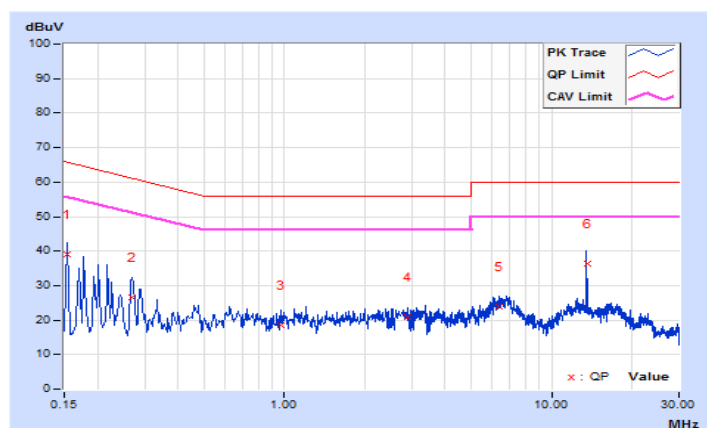


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 67%RH
Tested by	Tim Chen	Test Date	2021/2/20
Test Mode	Mode A		

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	0.15400	10.08	28.88	5.75	38.96	15.83	65.78	55.78	-26.82	-39.95
2	0.26992	10.13	16.46	2.75	26.59	12.88	61.12	51.12	-34.53	-38.24
3	0.97376	10.29	8.28	0.54	18.57	10.83	56.00	46.00	-37.43	-35.17
4	2.88200	10.39	10.52	1.11	20.91	11.50	56.00	46.00	-35.09	-34.50
5	6.37000	10.55	13.51	8.17	24.06	18.72	60.00	50.00	-35.94	-31.28
6	13.56000	10.83	25.45	20.69	36.28	31.52	60.00	50.00	-23.72	-18.48

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

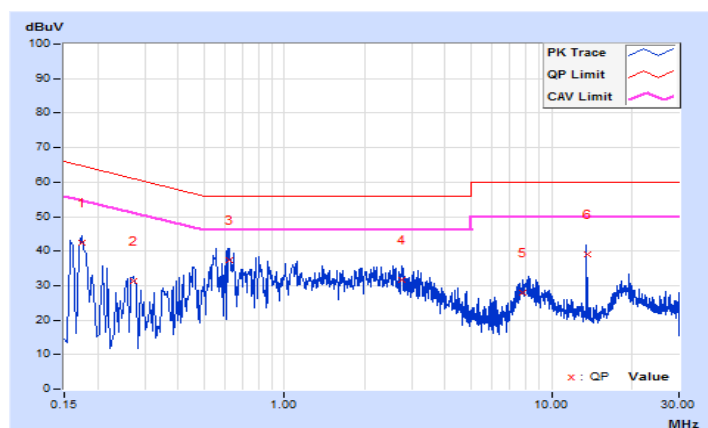


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 67%RH
Tested by	Tim Chen	Test Date	2021/2/20
Test Mode	Mode B		

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	0.17400	10.05	32.28	16.18	42.33	26.23	64.77	54.77	-22.44	-28.54
2	0.27278	10.06	21.39	7.51	31.45	17.57	61.03	51.03	-29.58	-33.46
3	0.62550	10.11	27.19	12.16	37.30	22.27	56.00	46.00	-18.70	-23.73
4	2.76600	10.23	21.38	10.14	31.61	20.37	56.00	46.00	-24.39	-25.63
5	7.82200	10.51	17.58	7.59	28.09	18.10	60.00	50.00	-31.91	-31.90
6	13.56000	10.78	28.15	26.38	38.93	37.16	60.00	50.00	-21.07	-12.84

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

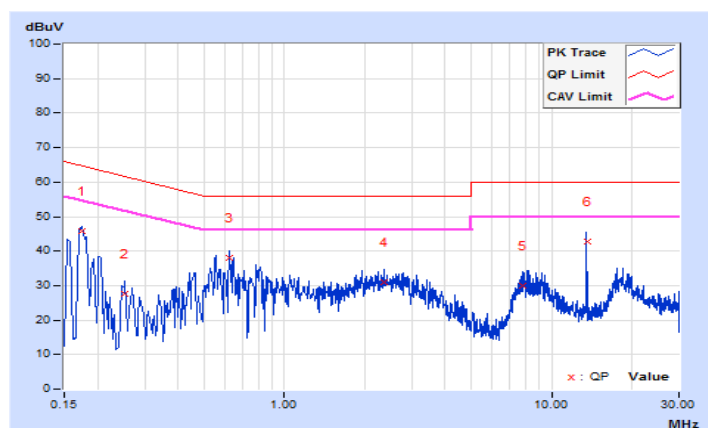


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23°C, 67%RH
Tested by	Tim Chen	Test Date	2021/2/20
Test Mode	Mode B		

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	0.17400	10.04	35.87	18.38	45.91	28.42	64.77	54.77	-18.86	-26.35
2	0.25400	10.05	17.64	4.74	27.69	14.79	61.63	51.63	-33.94	-36.84
3	0.62200	10.11	27.79	13.74	37.90	23.85	56.00	46.00	-18.10	-22.15
4	2.36600	10.20	20.63	9.05	30.83	19.25	56.00	46.00	-25.17	-26.75
5	7.78600	10.41	19.51	8.79	29.92	19.20	60.00	50.00	-30.08	-30.80
6	13.56000	10.60	32.32	30.62	42.92	41.22	60.00	50.00	-17.08	-8.78

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

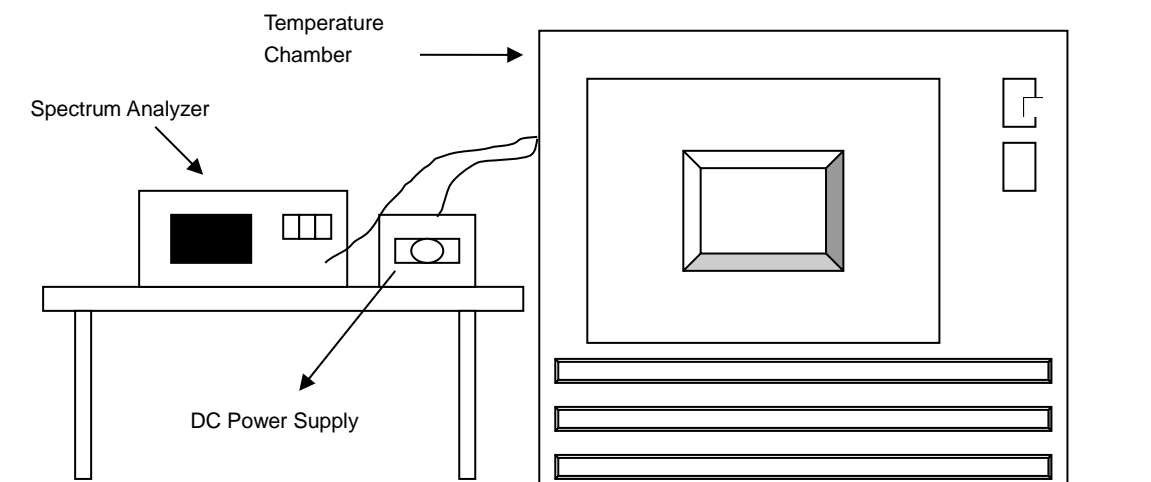


4.3 Frequency Stability

4.3.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- Turned the EUT on and coupled its output to a spectrum analyzer.
- Turned the EUT off and set the chamber to the highest temperature specified.
- Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
- Repeated step c and d with the every 10 degrees reduction until the lowest temperature achieved.
- The test chamber was allowed to stabilize at $+20$ degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.

4.3.7 Test Results

Type A

Frequency Stability Versus Temperature									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
50	3.88	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044
40	3.88	13.55994	-0.00044	13.55994	-0.00044	13.55993	-0.00052	13.55994	-0.00044
30	3.88	13.56003	0.00022	13.56002	0.00015	13.56003	0.00022	13.56003	0.00022
20	3.88	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55998	-0.00015
10	3.88	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029
0	3.88	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022
-10	3.88	13.56006	0.00044	13.56007	0.00052	13.56006	0.00044	13.56006	0.00044
-20	3.88	13.56001	0.00007	13.56001	0.00007	13.56001	0.00007	13.56001	0.00007

Frequency Stability Versus Voltage									
Temp. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	4.462	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55996	-0.00029
	3.88	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55996	-0.00029
	3.298	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55996	-0.00029

4.4 20 dB Bandwidth

4.4.1 Limits of 20 dB Bandwidth Measurement

The 20 dB bandwidth shall be specified in operating frequency band.

4.4.2 Test Setup

Refer to section 4.1.5.

4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1 kHz RBW and 3 kHz VBW. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

4.4.5 Deviation from Test Standard

No deviation.

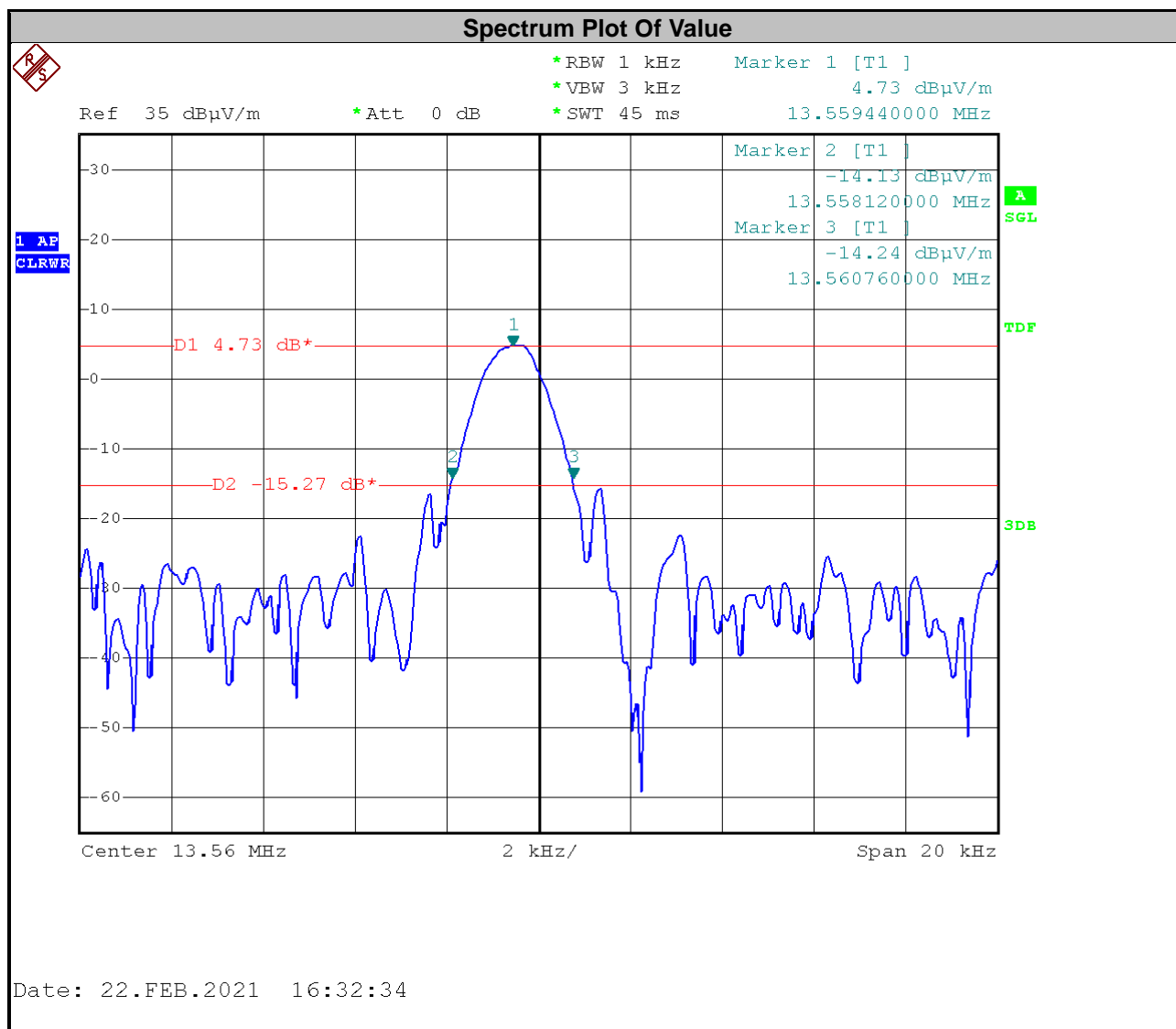
4.4.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Set the EUT under transmission condition continuously at specific channel frequency.

4.4.7 Test Results

Type A

20 dBc Point (Low)	20 dBc Point (High)	Operating Frequency Band (MHz)	20 dBc Bandwidth (kHz)	Pass / Fail
13.55812	13.56076	13.553~13.567	2.64	Pass



Note: The signal look like CW signal, so RBW can't be match 1~5 % OBW.

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 according to ISO/IEC 17025.

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

Lin Kou 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.

--- END ---