FCC Test Report

Report No.:	RFBDGE-WTW-P23010073-1
FCC ID:	E2K-DWRFID2201-01
Test Model:	DWRFID2201-01
Received Date:	Oct. 31, 2022
Test Date:	Nov. 03 ~ Nov. 07, 2022
Issued Date:	Jan. 10, 2023
Applicant:	DELL INC.
Address:	One Dell Way Round Rock, Texas 78682 United States
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

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Release Control Record

Issue No.	Description	Date Issued
RFBDGE-WTW-P23010073-1	Original release	Jan. 10, 2023

1 Certificate of Conformity

Product:	RFID13.56MHz Wireless Module
Brand:	DELL
Test Model:	DWRFID2201-01
Sample Status:	Engineering sample
Applicant:	DELL INC.
Test Date:	Nov. 03 ~ Nov. 07, 2022
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 : Celine Chou , **Date:** Jan. 10, 2023

Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** Jan. 10, 2023

Jeremy Lin / 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 -9.46dB at 13.55800MHz
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 -63.8dB at 13.56MHz.
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 -2.2dB at 41.64MHz.
15.225 (e)	The frequency tolerance	Pass	Meet the requirement of limit.
15.215 (c)	20dB Bandwidth	Pass	Meet the requirement of limit.

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	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.44 dB
	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	RFID13.56MHz Wireless Module
Brand	DELL
Test Model	DWRFID2201-01
Sample Status	Engineering sample
Power Supply Rating	3.3 Vdc (host equipment)
Modulation Type	ASK
Data Rate	Type A: 106 kbit/s Type B: 106 kbit/s Type F: 212 kbit/s, 424 kbit/s Type V: 26.48 kbit/s
Operating Frequency	13.56MHz
Field Strength	20.2dBuV/m (30m)
Antenna Type	Refer to Note as below
Accessory Device	Refer to Note as below
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report (BV CPS report no.: RFBDGE-WTW-P23010073) is added new platform (P182G).
2. The EUT is authorized for use in specific End-product. Please refer to below for more details.

Product	Brand	Model
Portable Computer	DELL	P182G

3. The antenna information is listed as below.

End-product	Antenna Manufacturer	Antenna Model No.	Antenna Type	Antenna Gain (dBi)
P182G	WNC	025.90269.0001	Loop antenna	N/A
	Speed	025.90268.0001	Loop antenna	N/A

* Due to radiated measurements are made and the antenna gain is already accounted for this device, so provide an antenna datasheet and/or antenna measurement report is not required. The antenna dimensions and pictures (include antenna wire length if have) are stated in EUT photo exhibit.

4. The End-product contains following accessory devices.

End-product	Item	Brand	Model	Description
P182G	Adapter	DELL	HA60NM200	I/P: 100-240Vac, 50-60Hz, 1.7A O/P: 5.0Vdc, 3.0A, 15.0W; 9.0Vdc, 3.0A, 27.0W; 15.0Vdc, 3.0A, 45.0W; 20.0Vdc, 3.0A, 60.0W DC Power Cable: 1.79 meter AC Power cord: 0.82 meter
	Battery	DELL	DR02P	11.4Vdc; 54Wh; 4623mAh

3.2 Description of Test Modes

1 channel is provided to this EUT

Channel	Freq. (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Deta

EUT Configure Mode	Applicable to				Description
	RE	PLC	FS	EB	
-	√	√	√	√	EUT with Model: P182G end-product

Where RE: Radiated Emission PLC: Power Line Conducted Emission

FS: Frequency Stability EB: 20dB Bandwidth measurement

Note:

1. The EUT had been pre-tested on Type A, Type B, Type F and Type V. The worst case was found when data rate was Type B.
2. The end-product support tablet mode and NB mode, after pre-tested on NB mode and positioned for each 3 axis of tablet mode. The worst case was found when positioned on **tablet mode with Y-plane.**

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
-	1	1	ASK

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
-	1	1	ASK

Frequency Stability:

☒ 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
-	1	1	ASK

20dB Bandwidth:

☒ 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
-	1	1	ASK

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE	24 deg. C, 78% RH	120Vac, 60Hz	Vincent Chen
PLC	22 deg. C, 67% RH	120Vac, 60Hz	Vincent Chen
FS	23 deg. C, 67% RH	120Vac, 60Hz	Vincent Chen
BW	23 deg. C, 67% RH	120Vac, 60Hz	Vincent Chen

3.3 Description of Support Units

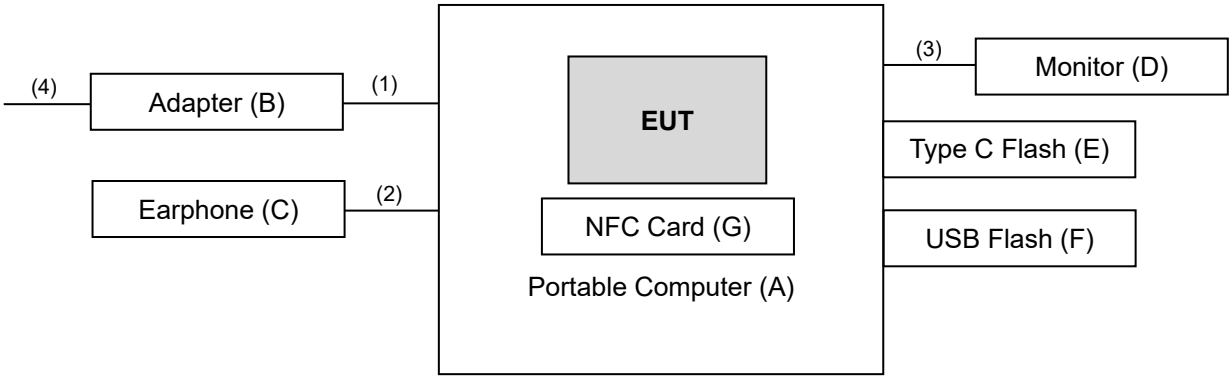
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Portable Computer	DELL	P182G	NA	NA	Provided by client
B.	Adapter	DELL	HA60NM200	NA	NA	Provided by client
C.	Earphone	APPLE	A1385	NA	NA	-
D.	Monitor	DELL	A14S2421HSXmTW	CN-01KWFW-WSL00-24C-711B	NA	-
E.	Type C Flash	SanDisk	SDDDC3-032G	NA	NA	-
F.	USB Flash	Transcend	USB3.0 32GB	NA	NA	-
G.	NFC Card	NA	NA	NA	NA	-

Note: 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.	DC Power cable	1	1.79	N	0	Provided by client Attached on adapter
2.	Audio cable	1	1.20	N	0	-
3.	HDMI cable	1	2.00	Y	0	-
4.	AC Power cable	1	0.82	N	0	Provided by client

3.3.1 Configuration of System under Test



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:

Test standard:
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.

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 27, 2022	Apr. 26, 2023
Signal Analyzer Agilent	N9010A	MY52220207	Jan. 06, 2022	Jan. 05, 2023
Loop Antenna TESEQ	HLA 6121	45745	Jul. 27, 2022	Jul. 26, 2023
Pre-amplifier EMCI	EMC001340	980201	Sep. 23, 2022	Sep. 22, 2023
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	Jan. 15, 2022	Jan. 14, 2023
Preamplifier EMCI	EMC 330H	980112	Oct. 01, 2022	Sep. 30, 2023
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Oct. 21, 2022	Oct. 20, 2023
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 01, 2022	Sep. 30, 2023
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-440H	AT93021705	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller Max-Full	MF-7802	NA	NA	NA
Boresight antenna tower fixture BV	BAF-02	7	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 HY - 966 chamber 5.

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

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200Hz at frequency band (9kHz-150kHz) and 9kHz at frequency below 30MHz (except 9kHz-150kHz).
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 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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.

Note:

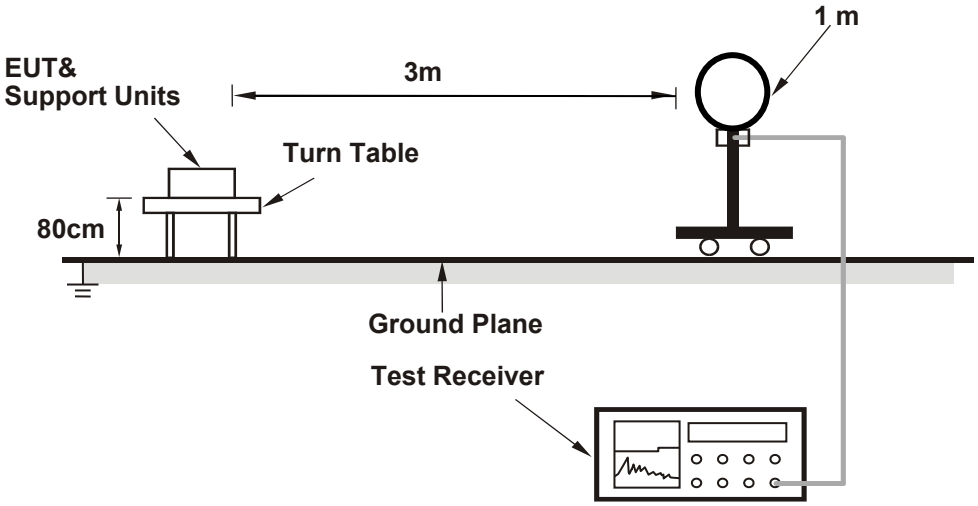
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

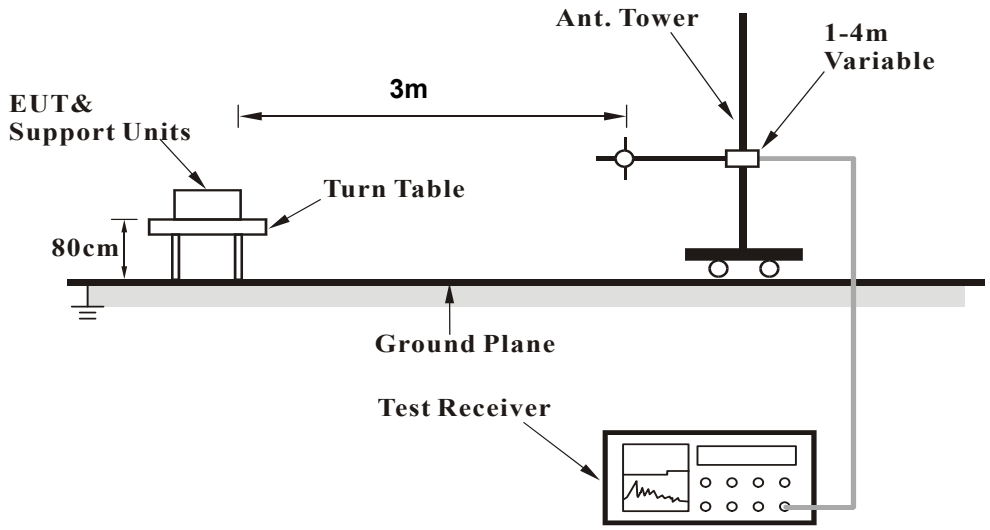
No deviation.

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).

KDB 414788 OFS and Chamber Correlation Justification
- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
- Parallel-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. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

WNC Antenna

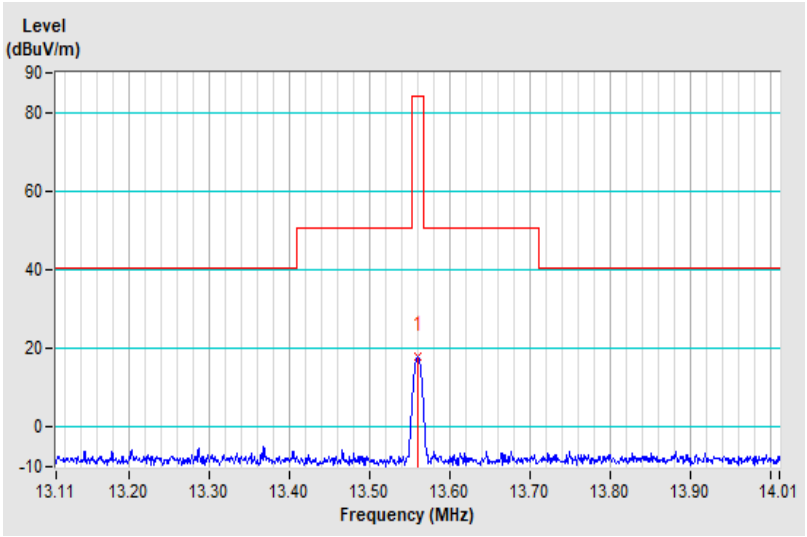
EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	*13.56	18.1 QP	84.0	-65.9	1.00	179	36.3	-18.2

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. " * " : Fundamental frequency.
6. Above limits have been translated by the formula

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 ~ 13.567MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	*13.56	14.9 QP	84.0	-69.1	1.00	105	33.1	-18.2

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. “ * “ : Fundamental frequency.
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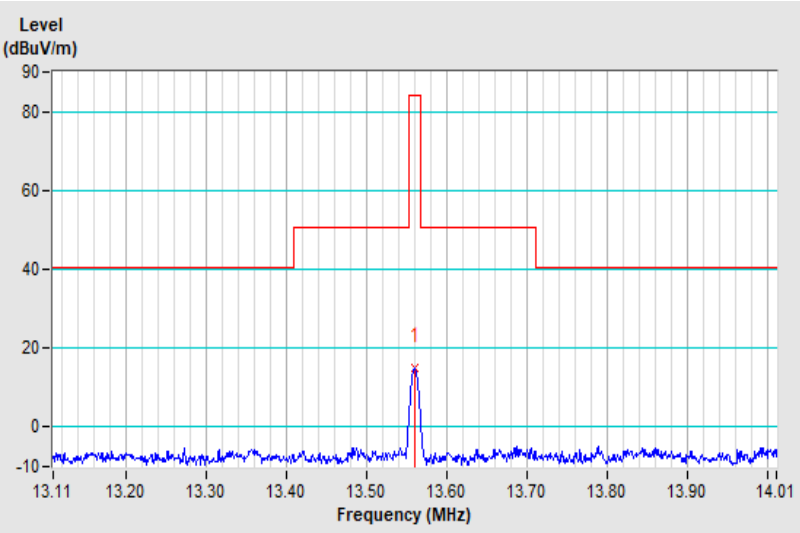
The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)



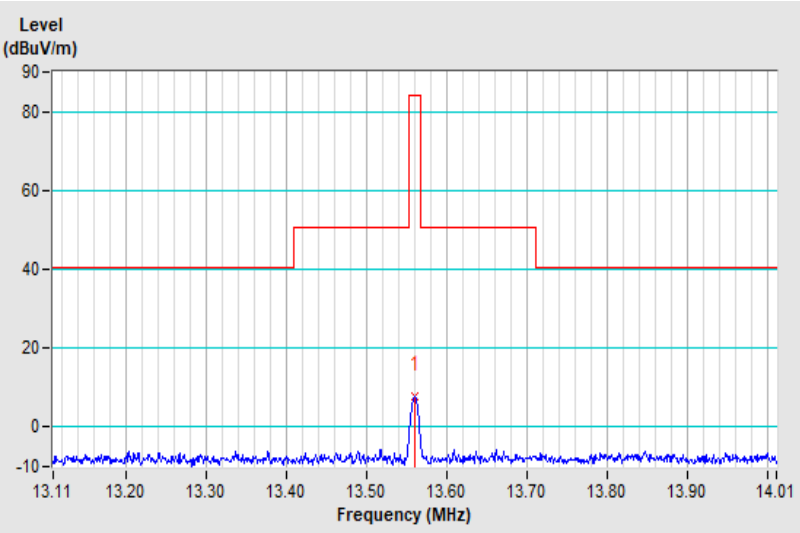
EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Ground-Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	*13.56	7.7 QP	84.0	-76.3	1.00	183	25.9	-18.2

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. “ * “ : Fundamental frequency.
6. Above limits have been translated by the formula

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)

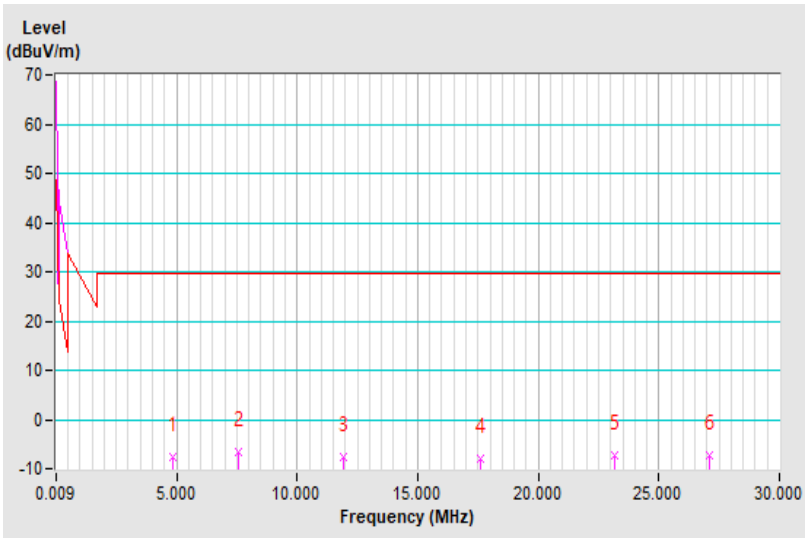


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	4.84	-7.5 QP	29.5	-37.0	1.00	18	12.6	-20.1
2	7.57	-6.6 QP	29.5	-36.1	1.00	308	12.5	-19.1
3	11.92	-7.7 QP	29.5	-37.2	1.00	18	10.5	-18.2
4	17.61	-7.9 QP	29.5	-37.4	1.00	8	10.2	-18.1
5	23.16	-7.4 QP	29.5	-36.9	1.00	25	10.7	-18.1
6	27.12	-7.3 QP	29.5	-36.8	1.00	62	10.8	-18.1

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. 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)

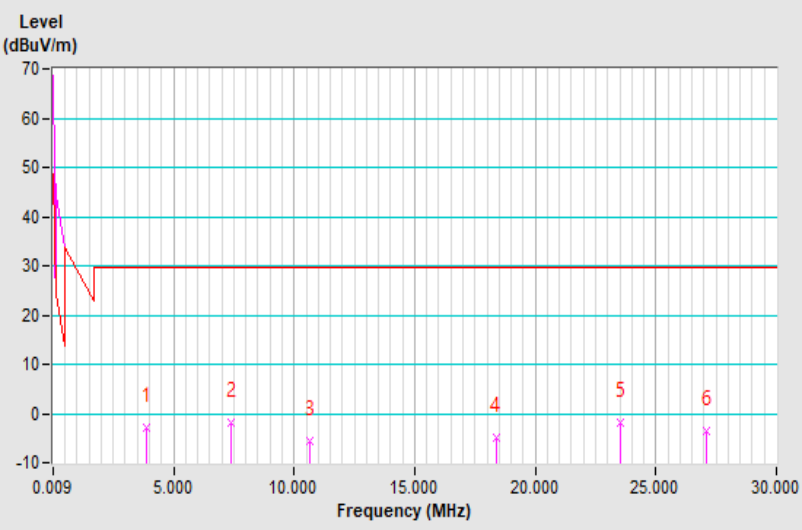


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	3.88	-2.9 QP	29.5	-32.4	1.00	254	17.0	-19.9
2	7.36	-1.9 QP	29.5	-31.4	1.00	317	17.3	-19.2
3	10.63	-5.7 QP	29.5	-35.2	1.00	237	12.5	-18.2
4	18.36	-4.9 QP	29.5	-34.4	1.00	304	13.2	-18.1
5	23.52	-2.0 QP	29.5	-31.5	1.00	12	16.1	-18.1
6	27.12	-3.7 QP	29.5	-33.2	1.00	39	14.4	-18.1

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. 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)

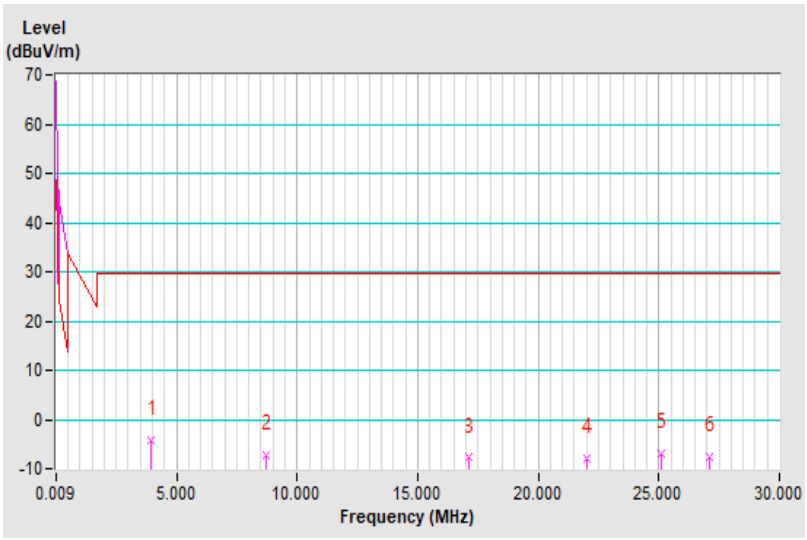


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Thomas Cheng

Antenna Polarity & Test Distance: Loop Antenna Ground-Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	3.97	-4.1 QP	29.5	-33.6	1.00	18	15.8	-19.9
2	8.74	-7.3 QP	29.5	-36.8	1.00	57	11.4	-18.7
3	17.10	-7.8 QP	29.5	-37.3	1.00	197	10.3	-18.1
4	22.02	-7.9 QP	29.5	-37.4	1.00	173	10.2	-18.1
5	25.08	-7.1 QP	29.5	-36.6	1.00	340	11.0	-18.1
6	27.12	-7.5 QP	29.5	-37.0	1.00	44	10.6	-18.1

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. 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)

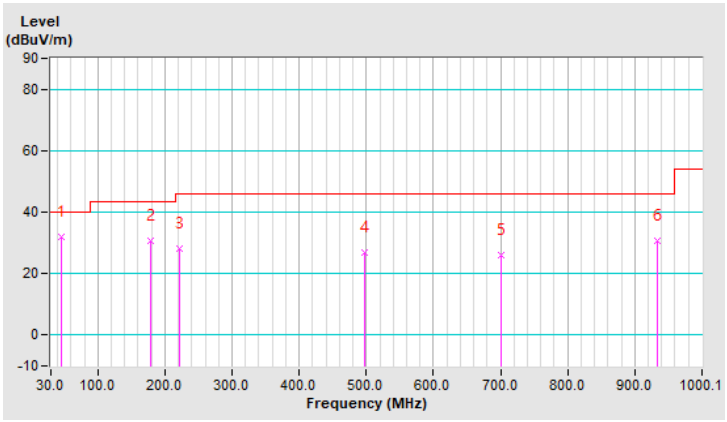


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	46.49	32.0 QP	40.0	-8.0	1.00 H	325	44.2	-12.2
2	178.43	30.6 QP	43.5	-12.9	1.50 H	8	44.4	-13.8
3	221.11	28.3 QP	46.0	-17.7	2.00 H	155	44.2	-15.9
4	497.59	26.9 QP	46.0	-19.1	1.50 H	152	33.9	-7.0
5	701.31	26.2 QP	46.0	-19.8	1.00 H	181	29.9	-3.7
6	934.13	30.6 QP	46.0	-15.4	1.50 H	237	31.3	-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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz.

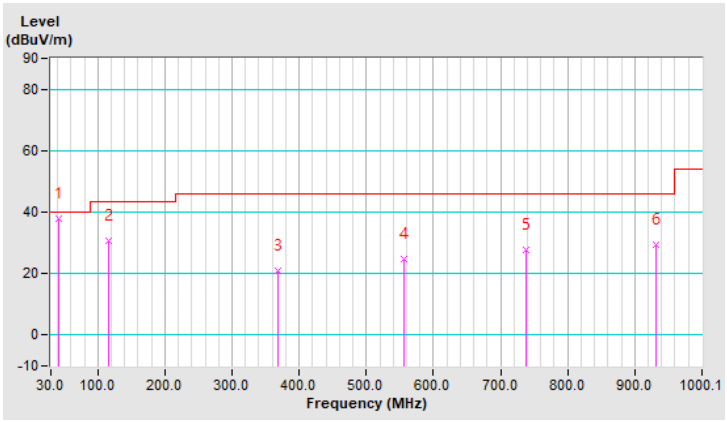


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**41.64**	**37.8 QP**	**40.0**	**-2.2**	**1.50 V**	**319**	**50.1**	**-12.3**
2	115.37	30.5 QP	43.5	-13.0	2.00 V	190	45.2	-14.7
3	368.56	20.9 QP	46.0	-25.1	1.50 V	3	31.0	-10.1
4	556.76	24.9 QP	46.0	-21.1	1.00 V	226	31.1	-6.2
5	737.20	27.7 QP	46.0	-18.3	2.00 V	16	30.3	-2.6
6	931.22	29.6 QP	46.0	-16.4	1.00 V	111	30.3	-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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz.



Speed Antenna

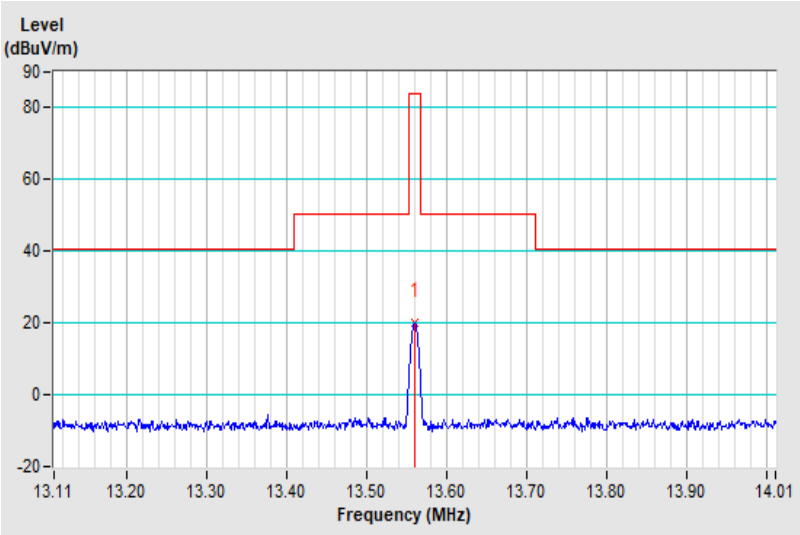
EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	***13.56**	**20.2 QP**	**84.0**	**-63.8**	**1.00**	**173**	**38.4**	**-18.2**

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. " * " : Fundamental frequency.
6. Above limits have been translated by the formula

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)



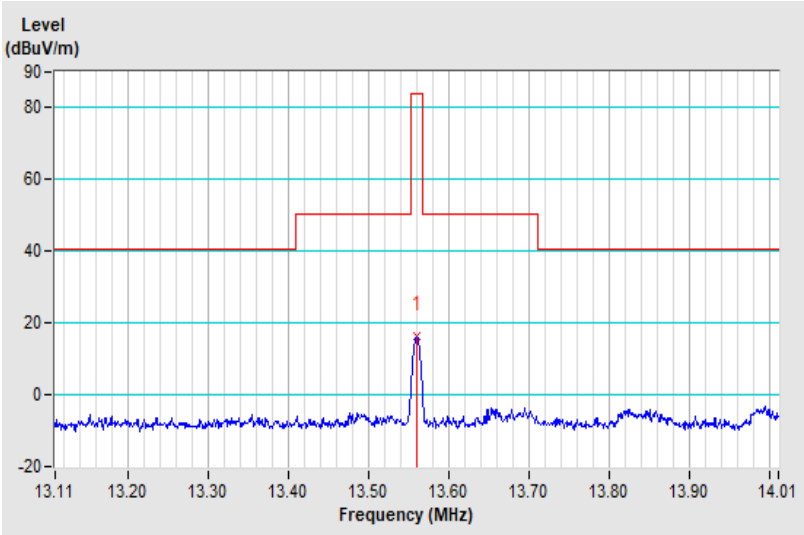
EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	*13.56	16.4 QP	84.0	-67.6	1.00	95	34.6	-18.2

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. “ * “ : Fundamental frequency.
6. Above limits have been translated by the formula

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)



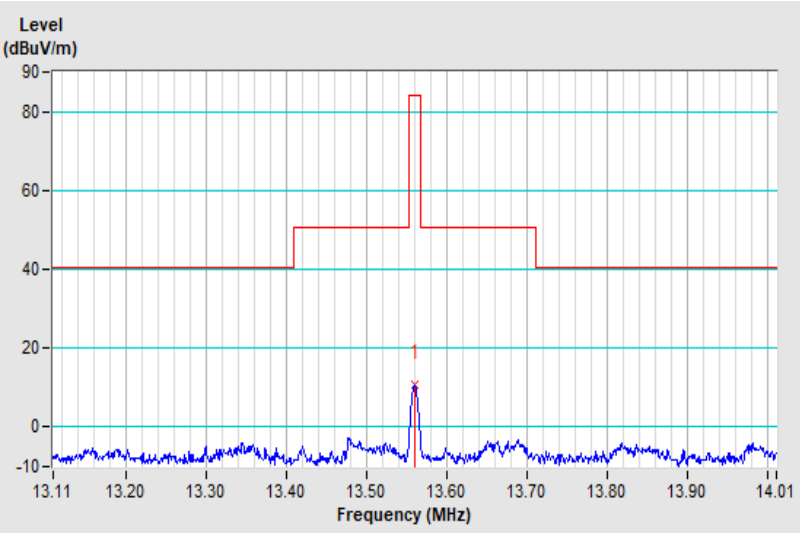
EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Ground-Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	*13.56	10.6 QP	84.0	-73.4	1.00	172	28.8	-18.2

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. “ * “ : Fundamental frequency.
6. Above limits have been translated by the formula

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)

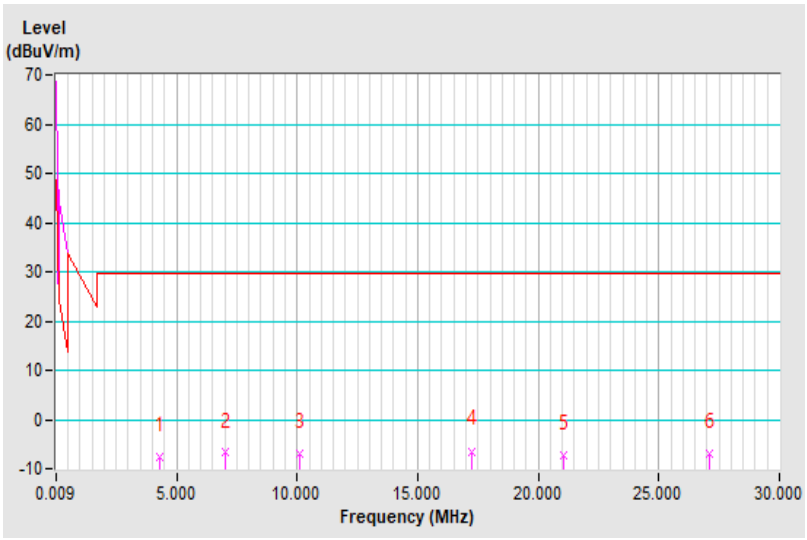


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	4.33	-7.7 QP	29.5	-37.2	1.00	292	12.3	-20.0
2	7.00	-6.8 QP	29.5	-36.3	1.00	312	12.5	-19.3
3	10.12	-6.8 QP	29.5	-36.3	1.00	204	11.4	-18.2
4	17.25	-6.4 QP	29.5	-35.9	1.00	241	11.7	-18.1
5	21.03	-7.3 QP	29.5	-36.8	1.00	114	10.8	-18.1
6	27.12	-7.0 QP	29.5	-36.5	1.00	0	11.1	-18.1

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. 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)

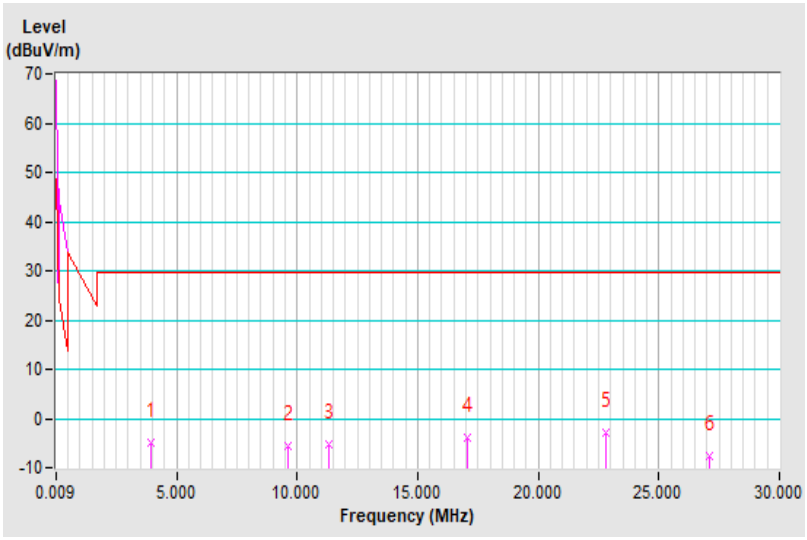


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	3.94	-5.0 QP	29.5	-34.5	1.00	250	14.9	-19.9
2	9.64	-5.5 QP	29.5	-35.0	1.00	131	12.8	-18.3
3	11.32	-5.1 QP	29.5	-34.6	1.00	152	13.1	-18.2
4	17.04	-4.0 QP	29.5	-33.5	1.00	280	14.1	-18.1
5	22.83	-2.9 QP	29.5	-32.4	1.00	160	15.2	-18.1
6	27.12	-7.5 QP	29.5	-37.0	1.00	226	10.6	-18.1

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. 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)

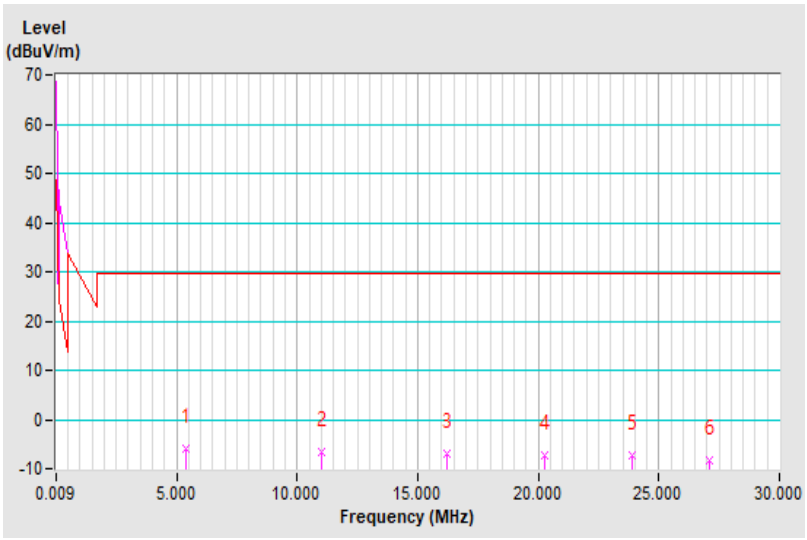


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Loop Antenna Ground-Parallel at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m) (30m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV) (3m)	Correction Factor (dB/m)
1	5.38	-6.0 QP	29.5	-35.5	1.00	15	14.0	-20.0
2	10.99	-6.5 QP	29.5	-36.0	1.00	308	11.7	-18.2
3	16.20	-7.1 QP	29.5	-36.6	1.00	160	11.0	-18.1
4	20.25	-7.4 QP	29.5	-36.9	1.00	53	10.7	-18.1
5	23.91	-7.2 QP	29.5	-36.7	1.00	29	10.9	-18.1
6	27.12	-8.3 QP	29.5	-37.8	1.00	297	9.8	-18.1

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) + Distance conversion factor.
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. 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)

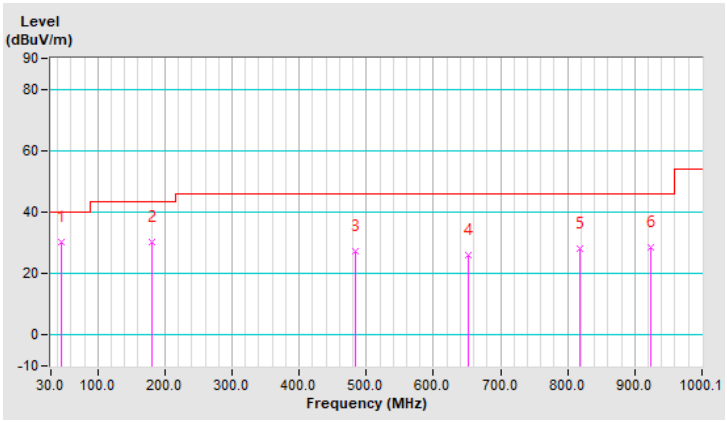


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	46.49	30.3 QP	40.0	-9.7	1.50 H	309	42.5	-12.2
2	181.34	30.2 QP	43.5	-13.3	1.00 H	227	44.4	-14.2
3	483.04	27.5 QP	46.0	-18.5	1.50 H	148	34.8	-7.3
4	652.80	25.9 QP	46.0	-20.1	1.00 H	276	30.3	-4.4
5	817.72	28.1 QP	46.0	-17.9	2.00 H	226	29.6	-1.5
6	923.46	28.6 QP	46.0	-17.4	1.00 H	241	29.3	-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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz.

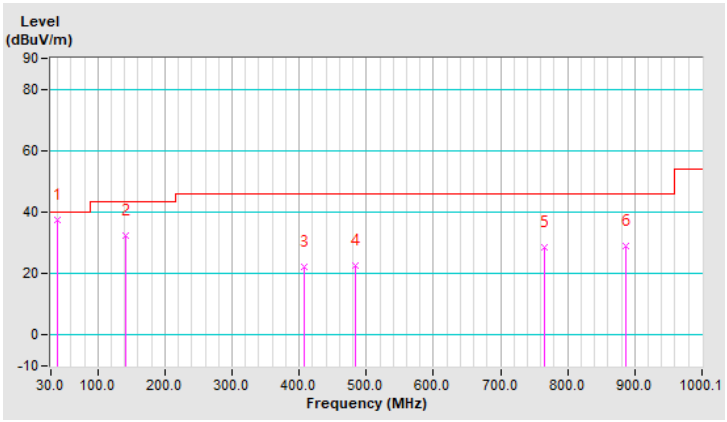


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	120Vac, 60Hz (System)	Detector Function	Quasi-Peak
Environmental Conditions	24 deg. C, 78% RH	Tested By	Vincent Chen

Antenna Polarity & Test Distance: Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39.70	37.3 QP	40.0	-2.7	1.50 V	43	49.9	-12.6
2	140.59	32.3 QP	43.5	-11.2	1.00 V	192	45.0	-12.7
3	408.34	22.4 QP	46.0	-23.6	2.00 V	299	31.7	-9.3
4	484.01	22.8 QP	46.0	-23.2	1.50 V	46	30.1	-7.3
5	766.31	28.6 QP	46.0	-17.4	1.00 V	266	30.4	-1.8
6	886.60	29.1 QP	46.0	-16.9	2.00 V	221	30.2	-1.1

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 of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz.



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. 03, 2021	Dec. 02, 2022
RF signal cable Woken	5D-FB	Cable-cond1-01	Jan. 15, 2022	Jan. 14, 2023
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Mar. 14, 2022	Mar. 13, 2023
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100220	Nov. 25, 2021	Nov. 24, 2022
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 HY - Conduction 1.
3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

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

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

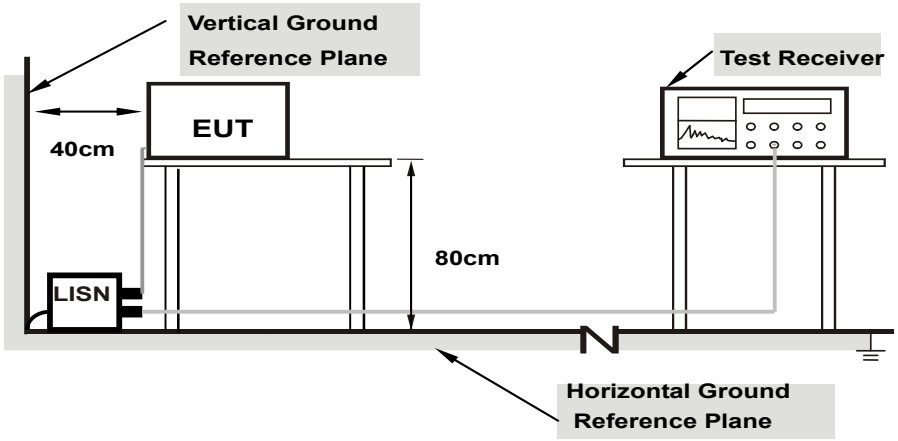
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

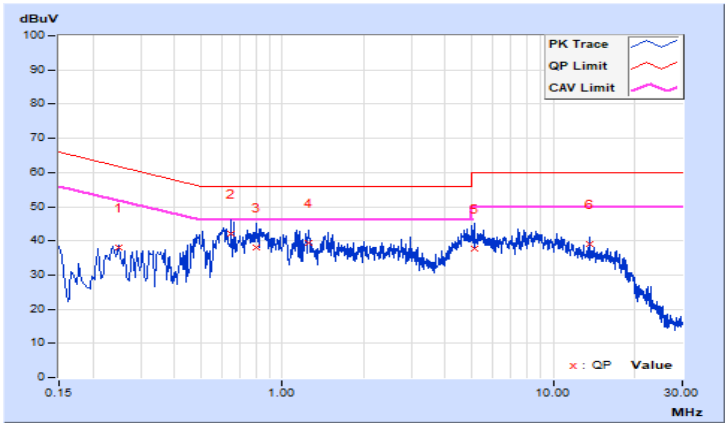
WNC Antenna

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.25000	9.65	28.40	17.87	38.05	27.52	61.76	51.76	-23.71	-24.24
2	0.65000	9.69	32.38	19.03	42.07	28.72	56.00	46.00	-13.93	-17.28
3	0.80200	9.70	28.34	18.80	38.04	28.50	56.00	46.00	-17.96	-17.50
4	1.25800	9.71	29.61	16.01	39.32	25.72	56.00	46.00	-16.68	-20.28
5	5.11400	9.76	27.92	22.20	37.68	31.96	60.00	50.00	-22.32	-18.04
6	13.56200	9.83	29.31	27.29	39.14	37.12	60.00	50.00	-20.86	-12.88

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.

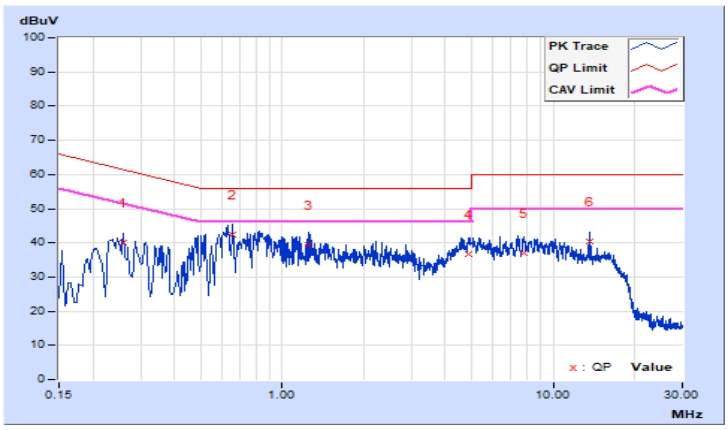


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.25800	9.65	30.45	17.27	40.10	26.92	61.50	51.50	-21.40	-24.58
2	0.65800	9.69	32.61	19.72	42.30	29.41	56.00	46.00	-13.70	-16.59
3	1.25800	9.71	29.61	15.08	39.32	24.79	56.00	46.00	-16.68	-21.21
4	4.89800	9.76	27.07	21.04	36.83	30.80	56.00	46.00	-19.17	-15.20
5	7.78600	9.79	27.15	21.07	36.94	30.86	60.00	50.00	-23.06	-19.14
6	13.56200	9.85	30.72	29.35	40.57	39.20	60.00	50.00	-19.43	-10.80

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.



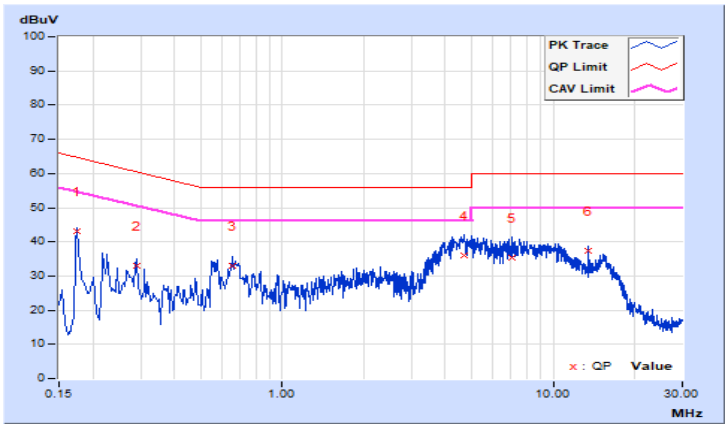
Speed Antenna

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17400	9.63	33.59	16.46	43.22	26.09	64.77	54.77	-21.55	-28.68
2	0.28982	9.66	23.21	18.01	32.87	27.67	60.53	50.53	-27.66	-22.86
3	0.65800	9.69	23.40	17.48	33.09	27.17	56.00	46.00	-22.91	-18.83
4	4.67400	9.76	26.35	16.84	36.11	26.60	56.00	46.00	-19.89	-19.40
5	7.09000	9.78	25.74	17.64	35.52	27.42	60.00	50.00	-24.48	-22.58
6	13.55800	9.83	27.71	26.16	37.54	35.99	60.00	50.00	-22.46	-14.01

Remarks:

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

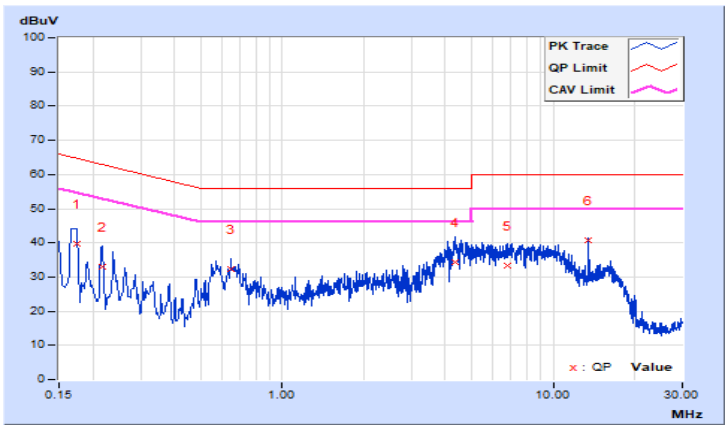


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17400	9.63	30.20	12.91	39.83	22.54	64.77	54.77	-24.94	-32.23
2	0.21690	9.64	23.30	8.57	32.94	18.21	62.94	52.94	-30.00	-34.73
3	0.64600	9.69	22.61	16.78	32.30	26.47	56.00	46.00	-23.70	-19.53
4	4.37000	9.75	24.57	17.79	34.32	27.54	56.00	46.00	-21.68	-18.46
5	6.80600	9.78	23.64	16.23	33.42	26.01	60.00	50.00	-26.58	-23.99
6	**13.55800**	**9.85**	**30.93**	**30.69**	**40.78**	**40.54**	**60.00**	**50.00**	**-19.22**	**-9.46**

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.

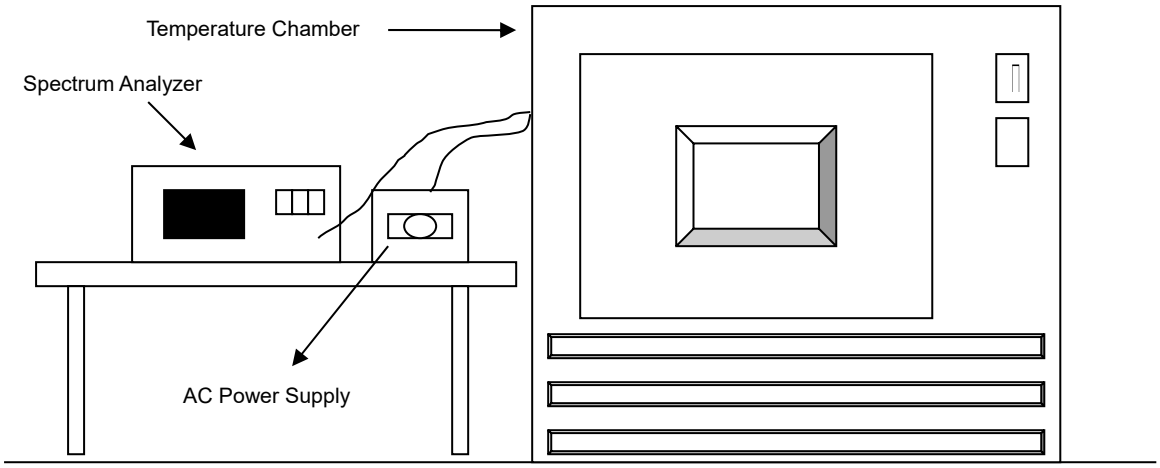


4.3 Frequency Stability

4.3.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within +/- 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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer R&S	FSV40	100979	Mar. 25, 2022	Mar. 24, 2023
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 2023
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2022	Jun. 22, 2023
AC Power Source ExTech	CFW-105	E000603	N/A	N/A

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

4.3.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.

b. Turned the EUT on and coupled its output to a spectrum analyzer.

c. Turned the EUT off and set the chamber to the highest temperature specified.

d. 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.

e. Repeat step d with every 10 degrees reduction until the lowest temperature achieved.

f. 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 fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.1.6.

4.3.7 Test Result

WNC Antenna

Frequency Stability Versus Temp.									
Temp. (℃)	Power Supply (Vac)	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	120	13.56002	0.00015	13.56001	0.00007	13.56001	0.00007	13.56001	0.00007
40	120	13.55998	-0.00015	13.55998	-0.00015	13.55999	-0.00007	13.55998	-0.00015
30	120	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022	13.55998	-0.00015
20	120	13.56003	0.00022	13.56004	0.00029	13.56004	0.00029	13.56002	0.00015
10	120	13.55995	-0.00037	13.55995	-0.00037	13.55994	-0.00044	13.55996	-0.00029
0	120	13.55994	-0.00044	13.55994	-0.00044	13.55994	-0.00044	13.55993	-0.00052
-10	120	13.56008	0.00059	13.56007	0.00052	13.56007	0.00052	13.56007	0.00052
-20	120	13.56002	0.00015	13.56003	0.00022	13.56002	0.00015	13.56001	0.00007

Frequency Stability Versus Voltage									
Temp. (℃)	Power Supply (Vac)	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	138	13.56003	0.00022	13.56004	0.00029	13.56004	0.00029	13.56002	0.00015
	120	13.56003	0.00022	13.56004	0.00029	13.56004	0.00029	13.56002	0.00015
	102	13.56003	0.00022	13.56004	0.00029	13.56004	0.00029	13.56002	0.00015

Speed Antenna

Frequency Stability Versus Temp.									
Temp. (℃)	Power Supply (Vac)	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	120	13.56004	0.00029	13.56004	0.00029	13.56004	0.00029	13.56004	0.00029
40	120	13.56004	0.00029	13.56004	0.00029	13.56004	0.00029	13.56004	0.00029
30	120	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029
20	120	13.56002	0.00015	13.56	0.00000	13.56001	0.00007	13.56002	0.00015
10	120	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56002	0.00015
0	120	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029	13.55997	-0.00022
-10	120	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044
-20	120	13.56003	0.00022	13.56003	0.00022	13.56002	0.00015	13.56002	0.00015

Frequency Stability Versus Voltage									
Temp. (℃)	Power Supply (Vac)	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	138	13.56002	0.00015	13.56	0.00000	13.56001	0.00007	13.56002	0.00015
	120	13.56002	0.00015	13.56	0.00000	13.56001	0.00007	13.56002	0.00015
	102	13.56002	0.00015	13.56	0.00000	13.56001	0.00007	13.56002	0.00015

4.4 20dB Bandwidth

4.4.1 Limits of 20dB Bandwidth Measurement

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

4.4.2 Test Setup

4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

4.4.5 Deviation from Test Standard

No deviation.

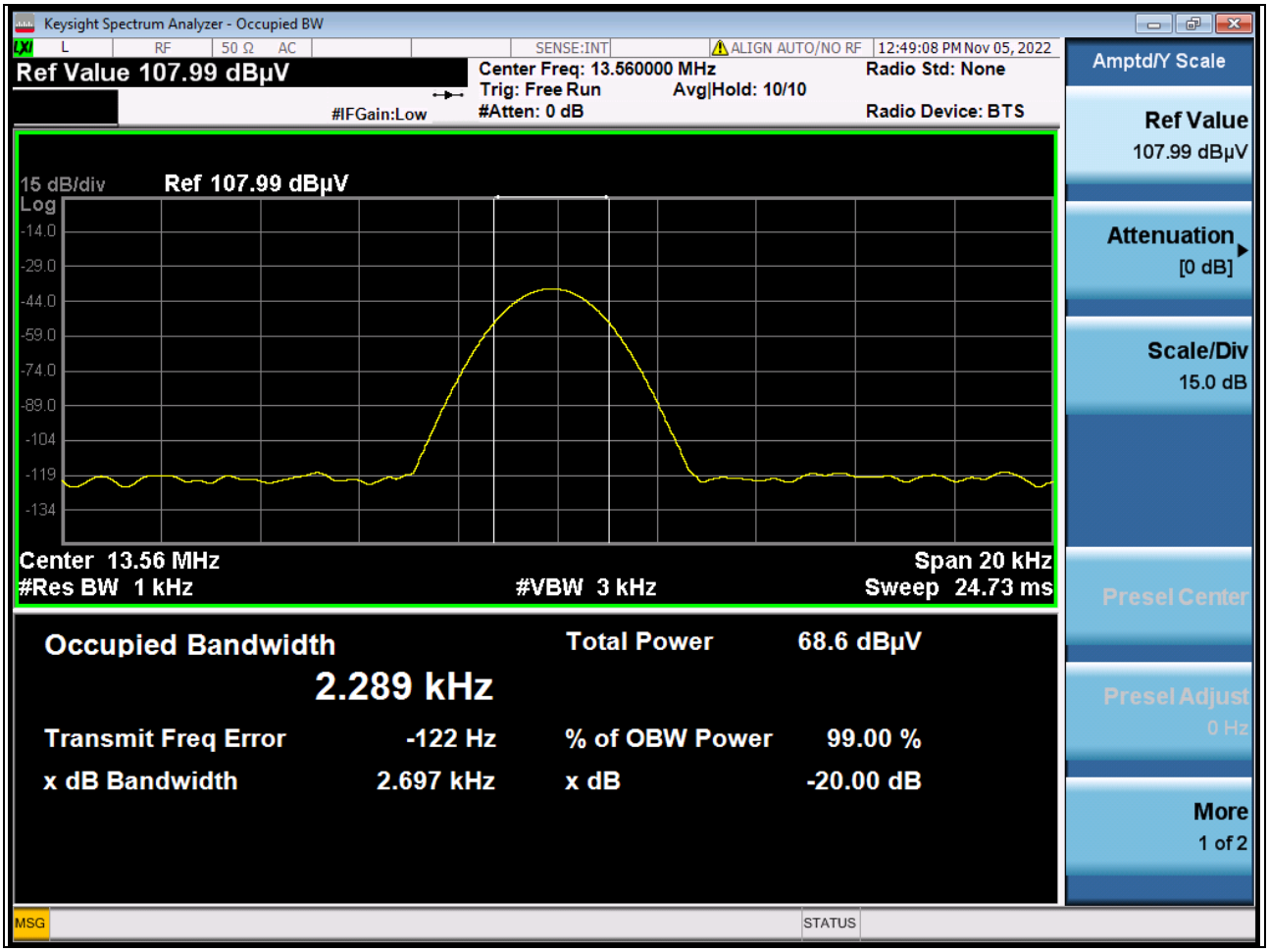
4.4.6 EUT Operating Conditions

Same as Item 4.1.6.

4.4.7 Test Results

WNC Antenna

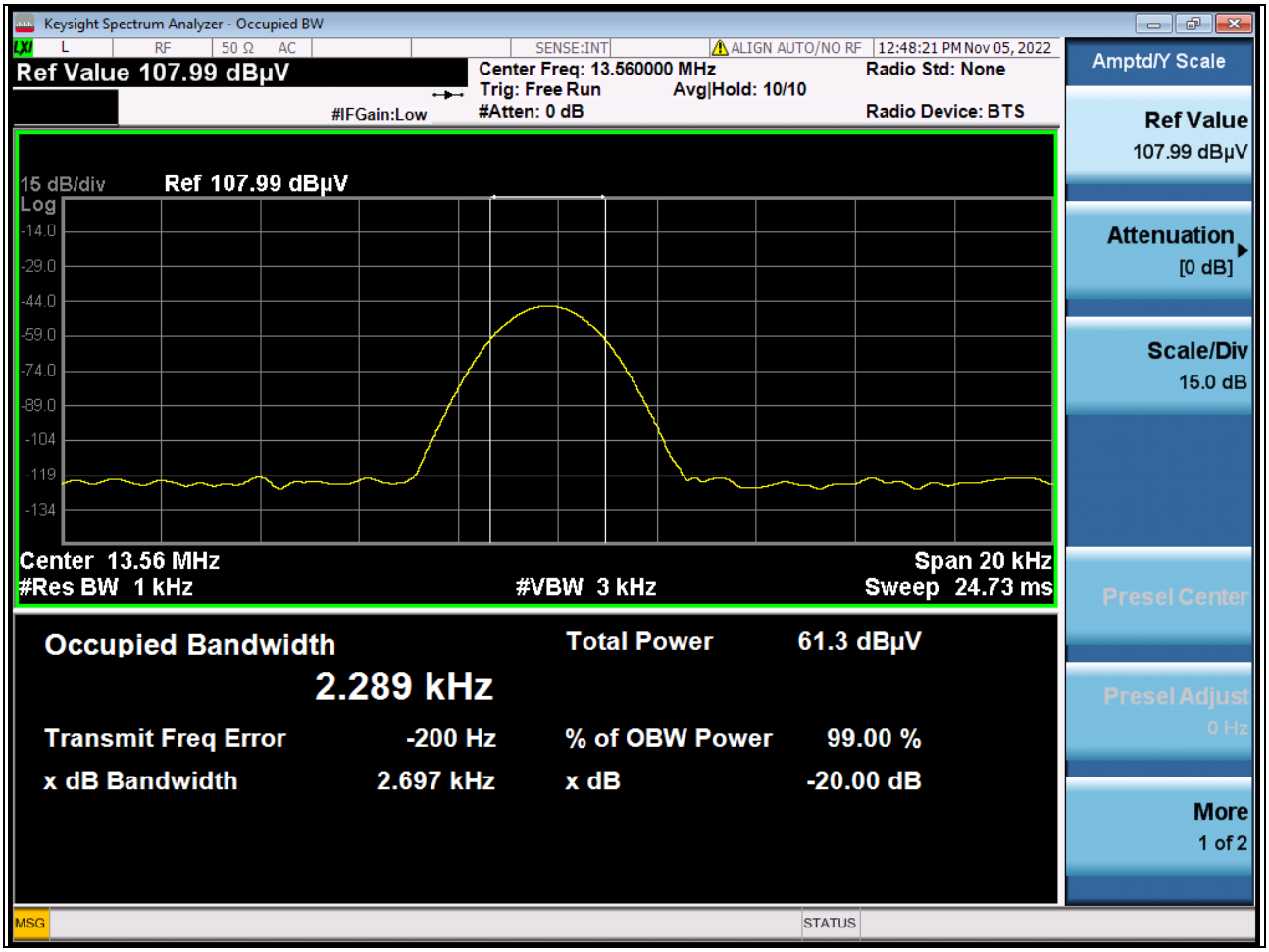
Operating frequency band (MHz)	20dB Bandwidth (kHz)	Pass/Fail
13.56	2.697	Pass



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

Speed Antenna

Operating frequency band (MHz)	20dB Bandwidth (kHz)	Pass/Fail
13.56	2.697	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 and approved 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.

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