

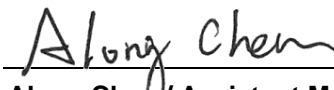
FCC C2PC Test Report

FCC ID : RF41539B
Equipment : Handheld Terminal
Model No. : DX-A600
Brand Name : KEYENCE
Applicant : KEYENCE CORPORATION
Address : 1-3-14 HIGASHI-NAKAJIMA,
HIGASHI-YODOGAWA-KU, OSAKA, JAPAN
Standard : 47 CFR FCC Part 15.225
Received Date : Sep. 26, 2023
Tested Date : Oct. 02 ~ Oct. 04, 2023

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Approved by:



Along Chen / Assistant Manager



Gary Chang / Manager

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Release Record

Report No.	Version	Description	Issued Date
FR162104-02NF	Rev. 01	Initial issue	Nov. 02, 2023

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.579MHz 27.70 (Margin -18.30dB) - AV	Pass
15.225(a)~(c)	Field strength of fundamental emissions and spectrum mask	Meet the requirement of limit	Pass
15.225(d)	Field strength of any emissions appearing outside of the 13.110-14.010 MHz band	Meet the requirement of limit	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

This is a Class II Permissive Change report (C2PC).

This report is issued as a supplementary report to original ICC report no. FR162104-01NF. The modification is concerned with following items:

- ✧ Added components and change specification of resistor for HAC, T-coil function
- ✧ PCB re-layout for above change.

Therefore, conducted emission and radiated emission tests were performed.

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information			
Frequency Range (MHz)	Modulation	Ch. Frequency (MHz)	Channel Number
13.553 – 13.567	ASK	13.56	1

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Coil	---	---	---

1.1.3 EUT Operational Condition

Supply Voltage	3.8Vdc		
Operational Voltage	<input checked="" type="checkbox"/> Vnom (3.8 V)	<input checked="" type="checkbox"/> Vmax (3.99 V)	<input checked="" type="checkbox"/> Vmin (3.61 V)
Operational Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (50°C)	<input checked="" type="checkbox"/> Tmin (-20°C)

1.1.4 Accessories

No.	Equipment	Description
1	Battery	Brand: KEYENCE Model: DX-BQ6 Rating: 3.8Vdc (23.02Wh) 6060mAh

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Oct. 04, 2023				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 17, 2023	Feb. 16, 2024
LISN	R&S	ENV216	101579	May. 09, 2023	May. 08, 2024
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127667	Jan. 03, 2023	Jan. 02, 2024
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 17, 2022	Oct. 16, 2023
50 ohm terminal (Support Unit)	NA	50	01	Jun. 14, 2023	Jun. 13, 2024
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Oct. 02, 2023				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 03, 2023	Mar. 02, 2024
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 01, 2022	Oct. 31, 2023
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 31, 2023	Jul. 30, 2024
Preamplifier	EMC	EMC02325	980225	Jun. 28, 2023	Jun. 27, 2024
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 04, 2022	Oct. 03, 2023
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 04, 2022	Oct. 03, 2023
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 04, 2022	Oct. 03, 2023
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 04, 2022	Oct. 03, 2023
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.225

ANSI C63.10-2013

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$)).

Measurement Uncertainty	
Parameters	Uncertainty
Radiated emission \leq 30MHz	± 2.3 dB
Radiated emission \leq 1GHz	± 3.41 dB
AC conducted emission	± 2.92 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Test Configuration
AC Power Line Conducted Emissions	RFID	13.56	---
Field strength of fundamental emissions	RFID	13.56	---
Unwanted Emissions into Restricted Frequency Bands < 30MHz	RFID	13.56	---
Unwanted Emissions into Restricted Frequency Bands > 30MHz	RFID	13.56	---

NOTE:

- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Field Strength of Fundamental Emissions

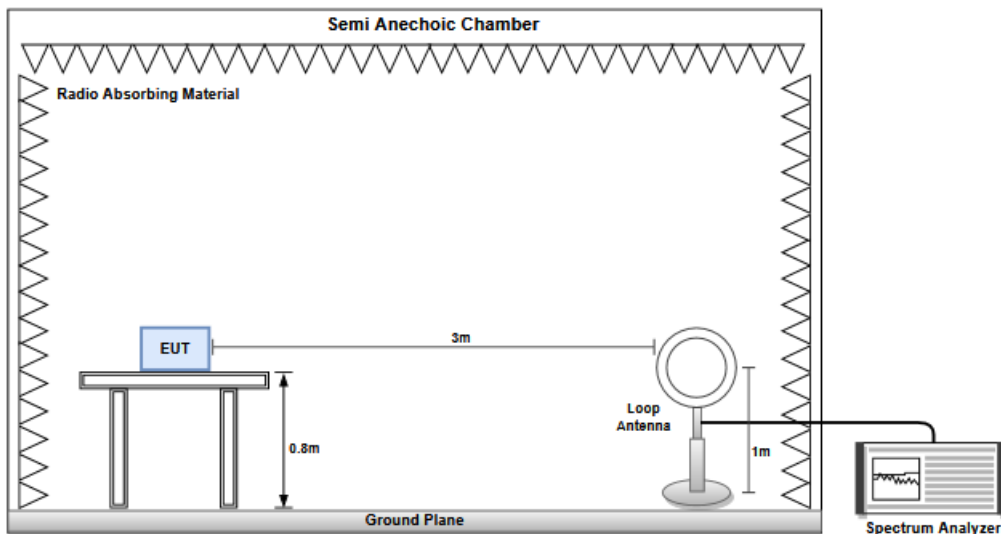
3.1.1 Field Strength of Fundamental Emissions

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

3.1.2 Test Procedures

1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the open and close planes of polarization. . Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, and the antenna rotated to repeat the measurements for both the open and close antenna polarizations.

3.1.3 Test Setup



3.1.4 Test Result

Ambient Condition	25°C / 63%	Tested By	Paul Lin
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Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark
Open	13.56	49.89	105.39	-55.5	25.47	24.42	QP

Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark
Close	13.56	46.57	105.39	-58.82	22.15	24.42	QP

Note: Emission level = SA reading + Factor

3.2 Unwanted Emissions into Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Restricted Frequency Bands

- 1) 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.
- 2) 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.
- 3) 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 below table

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.2.2 Test Procedures

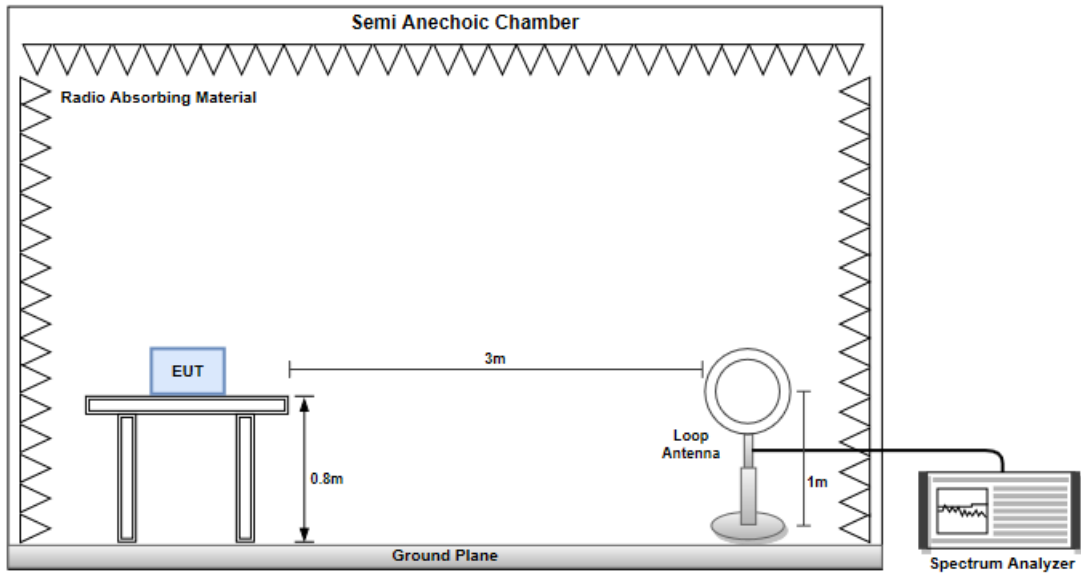
4. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
5. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
6. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

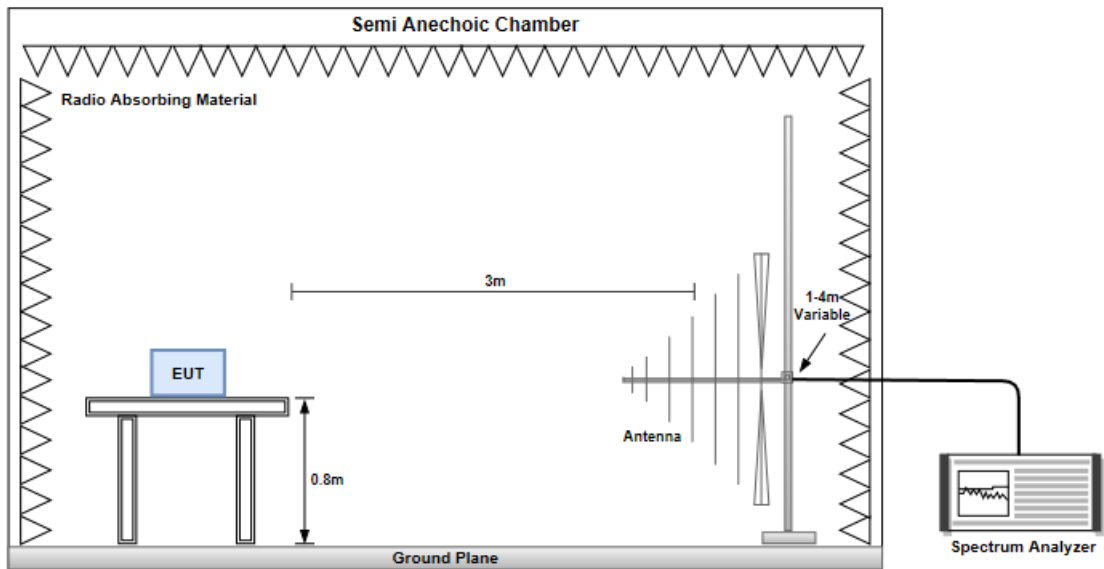
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.

3.2.3 Test Setup

Radiated Emissions below 30MHz



Radiated Emissions below 1 GHz



3.2.4 Transmitter Radiated Unwanted Emissions (Below 30MHz)

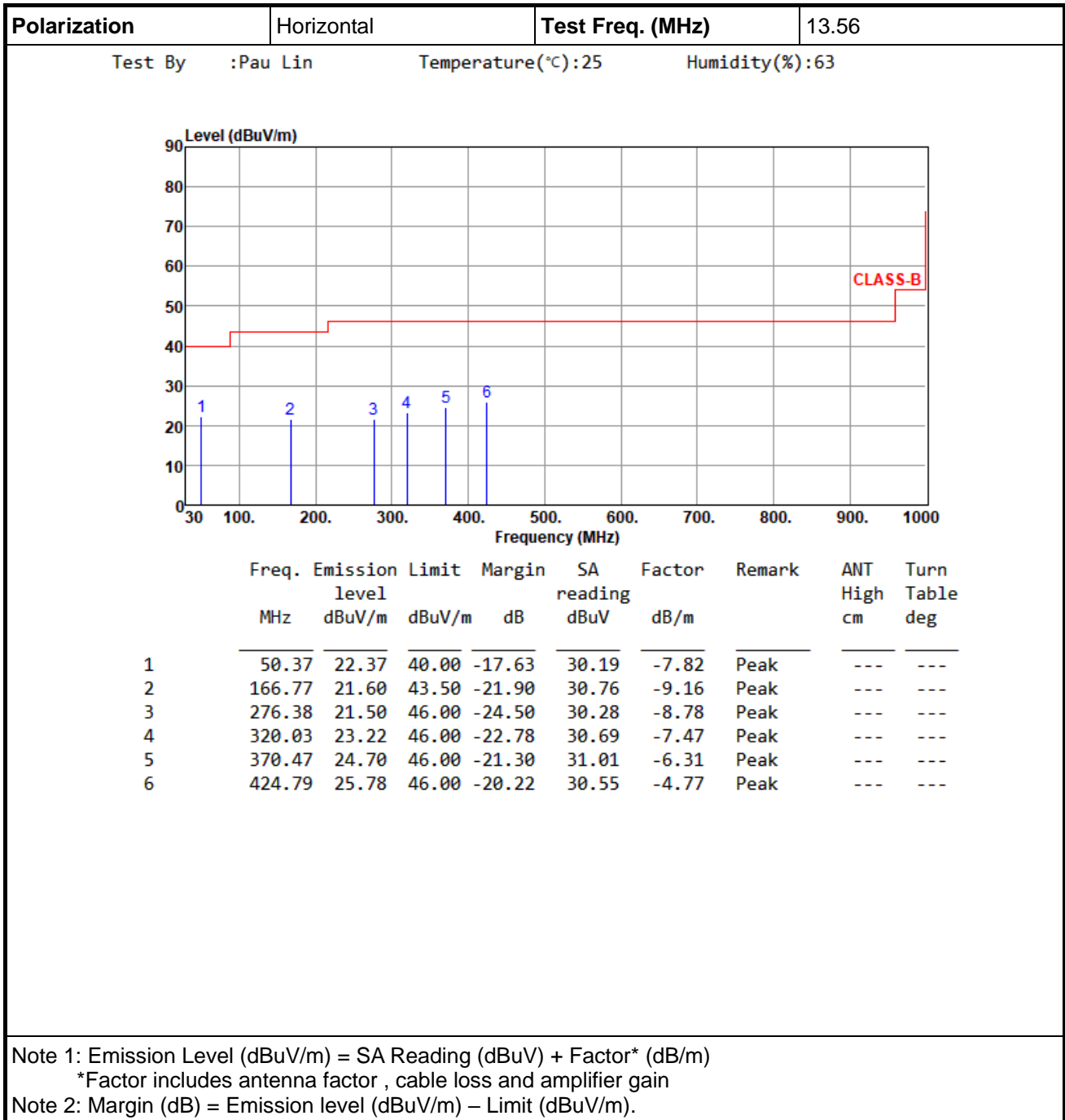
Ambient Condition	25°C / 63%	Tested By	Paul Lin
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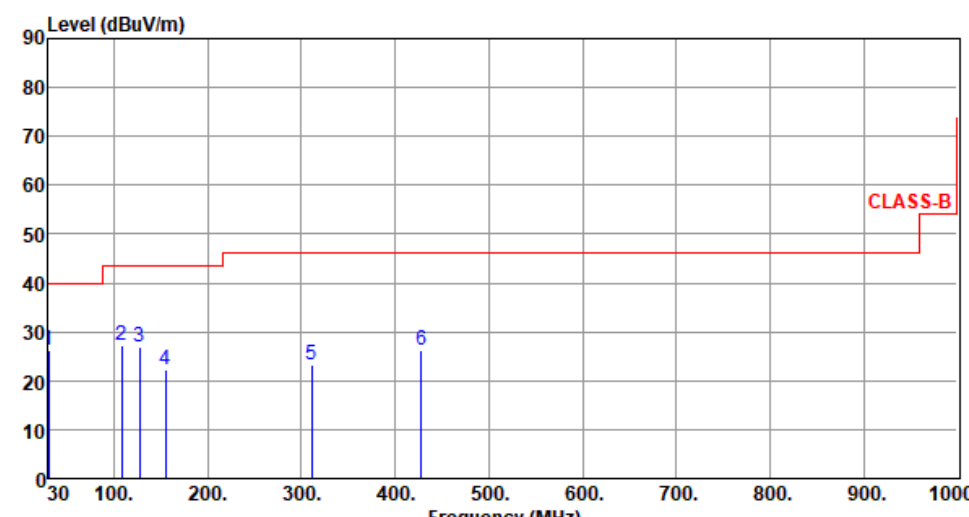
Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark
Open	13.41	38.75	62	-23.25	14.38	24.37	QP
Open	13.553	40.64	71.87	-31.23	16.23	24.41	QP
Open	13.567	39.26	71.86	-32.6	14.84	24.42	QP
Open	13.71	36.74	61.81	-25.07	12.28	24.46	QP
Open	27.12	29.03	49.54	-20.51	9.34	19.69	QP

Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark
Close	13.41	35.42	62	-26.58	11.05	24.37	QP
Close	13.553	37.99	71.87	-33.88	13.58	24.41	QP
Close	13.567	36.57	71.86	-35.29	12.15	24.42	QP
Close	13.71	34.58	61.81	-27.23	10.12	24.46	QP
Close	27.12	29.14	49.54	-20.4	9.45	19.69	QP

Note: Emission level = SA reading + Factor

3.2.5 Transmitter Radiated Unwanted Emissions (Above 30MHz)



Polarization	Vertical	Test Freq. (MHz)	13.56						
Test By	:Pau Lin	Temperature(°C):25	Humidity(%) :63						
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg
1	30.00	26.27	40.00	-13.73	36.08	-9.81	Peak	---	---
2	108.57	27.16	43.50	-16.34	39.19	-12.03	Peak	---	---
3	127.00	26.80	43.50	-16.70	37.19	-10.39	Peak	---	---
4	155.13	22.41	43.50	-21.09	31.04	-8.63	Peak	---	---
5	311.30	23.14	46.00	-22.86	30.89	-7.75	Peak	---	---
6	427.70	26.38	46.00	-19.62	31.09	-4.71	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.3 AC Power Line Conducted Emissions

3.3.1 Limit of AC Power Line Conducted Emissions

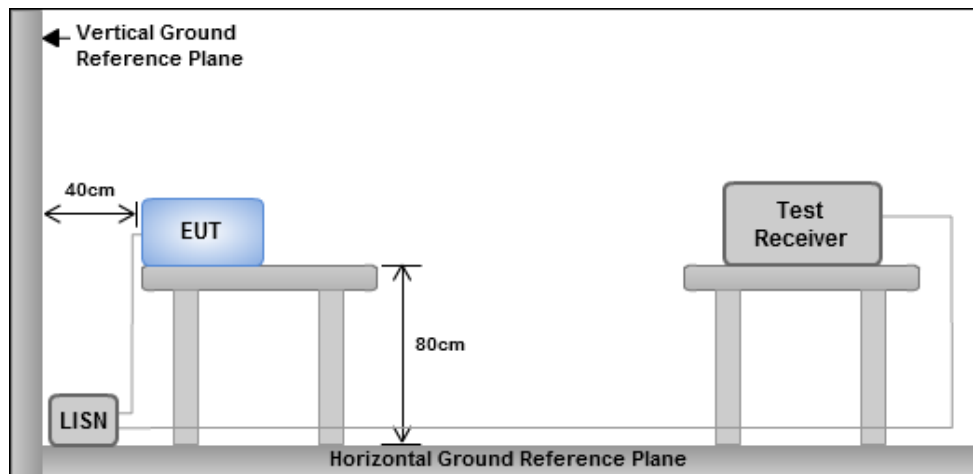
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.3.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

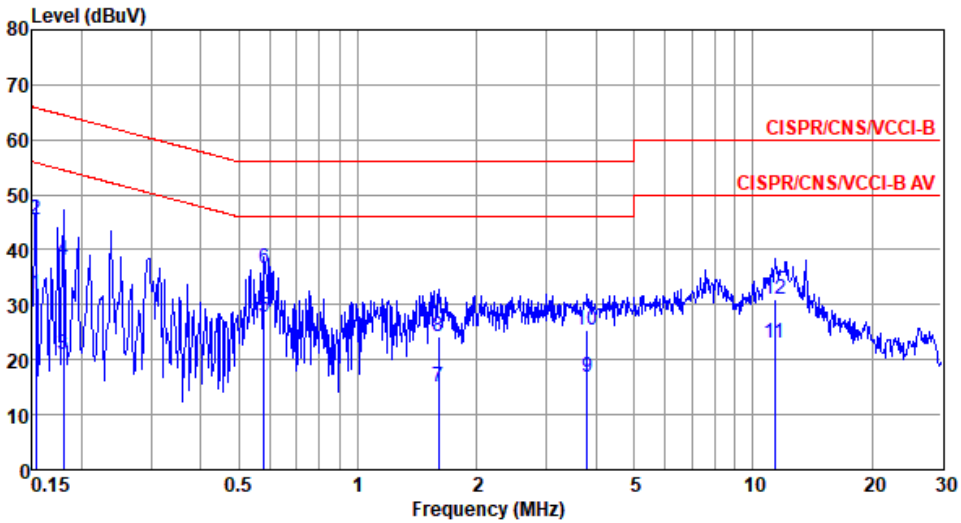
3.3.3 Test Setup

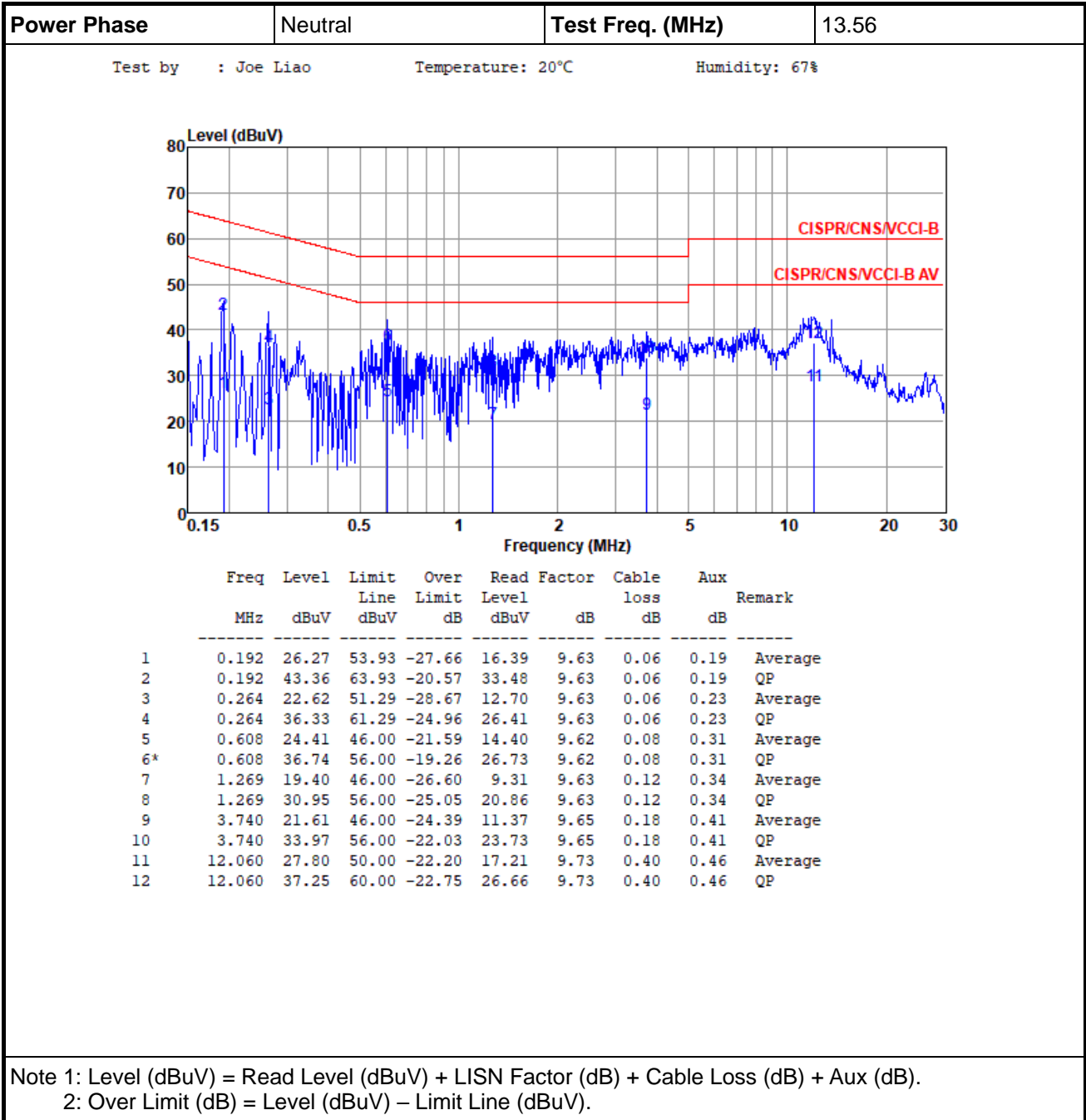


Note: 1. Support units were connected to second LISN.

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

3.3.4 Test Result of Conducted Emissions

Power Phase	Line	Test Freq. (MHz)	13.56																																																																																																																																		
Test by : Joe Liao Temperature: 20°C Humidity: 67%																																																																																																																																					
																																																																																																																																					
<table border="1"> <thead> <tr> <th></th> <th>Freq MHz</th> <th>Level dBuV</th> <th>Limit Line dBuV</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Cable loss dB</th> <th>Aux dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.153</td><td>31.94</td><td>55.82</td><td>-23.88</td><td>22.07</td><td>9.63</td><td>0.06</td><td>0.18</td><td>Average</td></tr> <tr><td>2</td><td>0.153</td><td>45.45</td><td>65.82</td><td>-20.37</td><td>35.58</td><td>9.63</td><td>0.06</td><td>0.18</td><td>QP</td></tr> <tr><td>3</td><td>0.180</td><td>21.02</td><td>54.50</td><td>-33.48</td><td>11.15</td><td>9.62</td><td>0.06</td><td>0.19</td><td>Average</td></tr> <tr><td>4</td><td>0.180</td><td>38.23</td><td>64.50</td><td>-26.27</td><td>28.36</td><td>9.62</td><td>0.06</td><td>0.19</td><td>QP</td></tr> <tr><td>5*</td><td>0.579</td><td>27.70</td><td>46.00</td><td>-18.30</td><td>17.69</td><td>9.62</td><td>0.08</td><td>0.31</td><td>Average</td></tr> <tr><td>6</td><td>0.579</td><td>36.51</td><td>56.00</td><td>-19.49</td><td>26.50</td><td>9.62</td><td>0.08</td><td>0.31</td><td>QP</td></tr> <tr><td>7</td><td>1.602</td><td>14.96</td><td>46.00</td><td>-31.04</td><td>4.86</td><td>9.63</td><td>0.12</td><td>0.35</td><td>Average</td></tr> <tr><td>8</td><td>1.602</td><td>24.09</td><td>56.00</td><td>-31.91</td><td>13.99</td><td>9.63</td><td>0.12</td><td>0.35</td><td>QP</td></tr> <tr><td>9</td><td>3.799</td><td>16.76</td><td>46.00</td><td>-29.24</td><td>6.51</td><td>9.65</td><td>0.18</td><td>0.42</td><td>Average</td></tr> <tr><td>10</td><td>3.799</td><td>25.50</td><td>56.00</td><td>-30.50</td><td>15.25</td><td>9.65</td><td>0.18</td><td>0.42</td><td>QP</td></tr> <tr><td>11</td><td>11.377</td><td>23.14</td><td>50.00</td><td>-26.86</td><td>12.60</td><td>9.69</td><td>0.39</td><td>0.46</td><td>Average</td></tr> <tr><td>12</td><td>11.377</td><td>31.08</td><td>60.00</td><td>-28.92</td><td>20.54</td><td>9.69</td><td>0.39</td><td>0.46</td><td>QP</td></tr> </tbody> </table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark	1	0.153	31.94	55.82	-23.88	22.07	9.63	0.06	0.18	Average	2	0.153	45.45	65.82	-20.37	35.58	9.63	0.06	0.18	QP	3	0.180	21.02	54.50	-33.48	11.15	9.62	0.06	0.19	Average	4	0.180	38.23	64.50	-26.27	28.36	9.62	0.06	0.19	QP	5*	0.579	27.70	46.00	-18.30	17.69	9.62	0.08	0.31	Average	6	0.579	36.51	56.00	-19.49	26.50	9.62	0.08	0.31	QP	7	1.602	14.96	46.00	-31.04	4.86	9.63	0.12	0.35	Average	8	1.602	24.09	56.00	-31.91	13.99	9.63	0.12	0.35	QP	9	3.799	16.76	46.00	-29.24	6.51	9.65	0.18	0.42	Average	10	3.799	25.50	56.00	-30.50	15.25	9.65	0.18	0.42	QP	11	11.377	23.14	50.00	-26.86	12.60	9.69	0.39	0.46	Average	12	11.377	31.08	60.00	-28.92	20.54	9.69	0.39	0.46	QP
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark																																																																																																																												
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<p>Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).</p>																																																																																																																																					



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No.30-2, Ding Fwu Tsuen, Lin Kou
District, New Taipei City, Taiwan
(R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

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