EMI TEST REPORT FOR FCC VERIFICATION
For
Wincor Nixdorf Pte. Ltd.
POS Terminal
Model No.: BEETLE /iPOS plus Advanced
Brand: WINCOR NIXDORF

Prepared for

Wincor Nixdorf Pte. Ltd.
151 Lorong Chuan, New Tech Park #05-01A/B
Singapore 556741

Prepared by

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Report Number	:	ACWE-F1401001C
Date of Test	:	May 13~22, 2017
Date of Report	:	Jul.12, 2017

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TEST REPORT VERIFICATION

Applicant	:	Wincor Nixdorf Pte. Ltd.
Manufacturer	:	Wincor Nixdorf Pte. Ltd.
EUT Description	:	POS Terminal
(A) Model No.	:	BEETLE /iPOS plus Advanced
(B) Brand	:	WINCOR NIXDORF
(C) Power Supply	:	DC 24V, 5A
(D) Test Voltage	:	AC 120V, 60Hz

Applicable Standards:

FCC 47 CFR Part 15 Subpart B/Oct. 2015
ANSI C63.4: 2014
ICES-003 Issue 6: 2016

(Note: These results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations.)

The device described above was tested by Audix Technology (Wujiang) Co., Ltd. EMC Dept. to determine the maximum emission levels emanating from the device. The maximum emission levels were compared with the requirements in section §15.107(b) and §15.109(b) of FCC Part 15 regulation.

The measurement results are contained in this test report and Audix Technology (Wujiang) Co., Ltd. EMC Dept. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC limits.

This report applies to above tested sample only and which shall not be reproduced in part without written approval of Audix Technology (Wujiang) Co., Ltd. EMC Dept.

Date of Test: May 13~22, 2017 Date of Report: Jul.12, 2017

Prepared by : Emma Hu

(Emma Hu/Assistant Administer)

Approved & Authorized Signer : Ken Lu

(Ken Lu/ Assistant General Manager)

1 DESCRIPTION OF VERSION

Edition No.	Date of Rev.	Summary	Report No.
0	Jan.14, 2014	Original Report	ACWE-F1401001
Rev. A	Jul.07, 2015	1. Changing I/O Hub controller IC. 2. Add 10 points touch, alternate panel and changes at touch controller.	ACWE-F1401001A
Rev. B	Jul.17, 2016	1.Updated I/O shield(no vent holes), aluminium housing(no vent holes at VESA area) 2. Add a new LCD panel. 3. Add new touch sensor & touch controller. 4. Alternate copper based CPU cooler. 5. Add in NFC Board. 6. Add two new CPUS: (1)I3-4350T 3.10GHz (2)I5-4590T 2.0/3.0GHz 7. Add new HDD and Memories.	ACWE-F1401001B
Rev. C	Jul.12, 2017	1. Add a new alternate motherboard(due new generation of processors&RAM). 2. Add a new alternate enclosure construction(remove the hump). 3. Add five new CPUs: (1)i5-6500TE (2)i3-6100TE (3)G3900TE (4)i3-7101TE (5)i5-7500T 4. Add a new 24V power USB port&Type-C port. 5. Add a wireless module(Intel Wireless-ac 8265)-WIFI(2.4GHz, 5GHz), Bluetooth 4.0, NFC(13.56MHz).	ACWE-F1401001C

2 SUMMARY OF STANDARDS AND RESULTS

The EUT has been tested according to the applicable standards and test results are referred as below.

EMISSION				
Description of Test Item	**Standard**	**Limits**	**Results**	**Remark**
Conducted Emission	FCC 47 CFR Part 15 Subpart B/ Oct. 2015	§15.107 (b) Class A	PASS	Minimum passing margin is 10.49 dB at 0.15 MHz
Radiated Emission	FCC 47 CFR Part 15 Subpart B/ Oct. 2015	§15.109 (b) Class A	PASS	Minimum passing margin is 18.45 dB at 522.57 MHz

3 GENERAL INFORMATION

3.1 Description of Device (EUT)

Product	:	POS Terminal
Model Number	:	BEETLE /iPOS plus Advanced
Brand	:	WINCOR NIXDORF
Applicant	:	Wincor Nixdorf Pte. Ltd. 151 Lorong Chuan, New Tech Park #05-01A/B Singapore 556741
Manufacturer	:	Wincor Nixdorf Pte. Ltd. 151 Lorong Chuan, New Tech Park #05-01A/B Singapore 556741
Adapter	:	I/P: AC100-240V, 50-60Hz, 2.0A, O/P: DC24.0V, 5.0A DC Cable: Shielded, Undetachable, 1.5m AC Cable: Unshielded, Detachable, 1.8m
Date of Receipt of Sample	:	Apr.11, 2017
Date of Test	:	May 13~22, 2017

3.2 Configuration of components under test

Component	Brand	Model Number/Part Number	Note
Motherboard	WINCOR NIXDORF	D611	Chipset: H81
		D611	Chipset: Q87
Motherboard(Added)	**WINCOR NIXDORF**	**D873**	**Chipset: H110**
		D873	**Chipset: Q170**
LCD Panel #1	Sharp	LQ150X1LG98	15 inch TFT-LCD
LCD Panel #2	AUO	G150XTN03.0	15 inch TFT-LCD
LCD Panel #3	Sharp	LQ150X1LX99	15 inch TFT-LCD
CPU	Intel	i5-4570TE	2.70G / 1150pin
		i3-4330TE	2.40G / 1150pin
		Pentium, G3320TE	2.30G / 1150pin
		Celeron, G1820TE	2.20 G / 1150pin
		I3-4350T	3.10GHz
		I5-4590T	2.0/3.0GHz
CPU(Added)	**Intel**	**i5-6500TE**	**2.3/3.3GHz, 4 Cores**
		i3-6100TE	**2.70 GHz, 2 Cores**
		Celeron, G3900TE	**2.3GHz, 2 Cores**
		i3-7101TE	**3.40 GHz, 2 Cores**
		i5-7500T	**2.7/3.3GHz, 4 Cores**
CPU Fan	Dynaeon Industrial Co., Ltd	DB127515BH-A	12 Vdc, 0.9 A max.
CPU Cooler	Dynatron	T385R1	12 Vdc, 0.7 A max.
HDD	Seagate	ST980811AS	80GB
	Seagate	ST250LT012	250GB
	Seagate	ST500LT012	SATA/500GB/5400rpm
Memory	Apacer	SOD PC3-10600 CL9	2GB
	Apacer	PC3-10600 CL9 4GB	4GB
	ADATA	PC3-10600 CL9 4GB	8GB
Memory(Added)	**Apacer**	**SOD DDR4 2133 CL15**	**4GB**
WLAN Module (Added)	**Intel**	**8265NGW**	**---**
PC- Touch (Projective Capacitive Touch)	---	---	---
R –Touch (Resistive Touch)	---	---	---
Adapter	M/N: ADC029 Brand: AcBel I/P: AC 100-240V~, 50-60Hz, 2.0A, O/P: DC 24.0V, 5.0A DC Cord: Shielded, Undetectable, 1.5m, bonded 1 ferrite core.		

3.3 Configurations' list of components as following:

Components / Mode	LCD Panel	Touch panel	CPU	HDD	Memory	Motherboard
Configuration 1	Sharp, LQ150X1LX99	R-Touch	Intel, i5-6500TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:Q170
Configuration 2	Sharp, LQ150X1LX99	PC-Touch	Intel, i3-6100TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:Q170
Configuration 3	Sharp, LQ150X1LX99	R-Touch or PC-Touch	Intel, i3-7101TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:Q170
Configuration 4	Sharp, LQ150X1LX99	PC-Touch	Intel, Celeron, G3900TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:Q170
Configuration 5	Sharp, LQ150X1LX99	R-Touch or PC-Touch	Intel, i5-7500T	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:Q170
Configuration 6	Sharp, LQ150X1LX99	R-Touch	Intel, i5-6500TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:H110
Configuration 7	Sharp, LQ150X1LX99	PC-Touch	Intel, i3-6100TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:H110
Configuration 8	Sharp, LQ150X1LX99	R-Touch or PC-Touch	Intel, i3-7101TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:H110
Configuration 9	Sharp, LQ150X1LX99	PC-Touch	Intel, Celeron, G3900TE	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:H110
Configuration 10	Sharp, LQ150X1LX99	R-Touch or PC-Touch	Intel, i5-7500T	Seagate, ST500LT012	Apacer, SOD DDR4 2133 CL15	D873, Chipset:H110

Remark:
EUT with above 1~10 configurations were pre-scanned at the test voltage AC110V/60Hz for Conducted & Radiated Disturbance Measurements with following modes. Please refer all test data to appendix II & III.

Conducted Disturbance Measurements:

Mode	Test Condition
For AC Main Port	
1	**Full System (Configuration 1)**
2	Full System (Configuration 2)
3	Full System (Configuration 3)
4	Full System (Configuration 4)
5	Full System (Configuration 5)
6	Full System (Configuration 6)
7	Full System (Configuration 7)
8	Full System (Configuration 8)
9	Full System (Configuration 9)
10	Full System (Configuration 10)

Radiated Disturbance Measurements:

Mode	Test Condition
For 30MHz~1GHz	
11	**Full System (Configuration 1)**
12	Full System (Configuration 2)
13	Full System (Configuration 3)
14	Full System (Configuration 4)
15	Full System (Configuration 5)
16	Full System (Configuration 6)
17	Full System (Configuration 7)
18	Full System (Configuration 8)
19	Full System (Configuration 9)
20	Full System (Configuration 10)
For 1GHz~6GHz	
21	**Full System (Configuration 1)**
22	Full System (Configuration 2)
23	Full System (Configuration 3)
24	Full System (Configuration 4)
25	Full System (Configuration 5)
26	Full System (Configuration 6)
27	Full System (Configuration 7)
28	Full System (Configuration 8)
29	Full System (Configuration 9)
30	Full System (Configuration 10)

Finally, the worse test modes (**Mode 1&11&21**) was demonstrated at AC120V/60Hz for Conducted & Radiated Disturbance Measurement and recorded in the report.

3.4 List of Interface Ports of EUT

Interface Ports :

Plink 2 port →Link to Second Display
USB port*1→Link to Expend I/O board
USB port*1→ Link to Second Display
USB port*3→Link to HDD*3
Power USB port*1→Link to HDD
Type C Port*1→Link to HDD
USB port*1→ Link to keyboard
USB port*1→ Link to Mouse
LAN 1 port→Link to Host PC
DC 24V Input (POS Terminal)→ Link to stand
RS232 port→ Link to Modem
RS232 port→ Link to Customer display
Audio Out port→ Link to Earphone
RJ12 port→Cash Drawer Controller
RS232 port→ Link to Handheld scanner
RS232 port→ Link to POS Printer
DC 24V Input (stand)→ Link to AC Adapter
eSATA port →Link to the HDD in stand.

Remark: This update report is to add a new alternate motherboard(due new generation of processors&RAM); add a new alternate enclosure construction(remove the hump); add a new 24V power USB port&Type-C port; add five new CPUs: (1)i5-6500TE (2)i3-6100TE (3)G3900TE (4)i3-7101TE (5)i5-7500T; add a wireless module(Intel Wireless-ac8265)-WIFI(2.4GHz, 5GHz), Bluetooth 4.0, NFC(13.56MHz), so we chose the worst configuration in original report to pre-scan with five new CPUs, and the worst test data are record in this report ACWE-F1401001C.

3.5 Operating Condition of EUT

3.5.1 Set up the EUT as showed in respective block diagram of test setup.

3.5.2 Turn on the power of all equipment. The printer, keyboard and mouse are all in standing by.

3.5.3 Driving software “BurnIn Test” to make the EUT operating normally.

3.5.4 The RJ-45 port of EUT operates normally by ping test of another PC.

3.5.5 The other peripheral devices are driven and operated in turn during all testing.

3.5.6 What is said above will be put into practice as the TKC-402 test plan after the work of EUT in the stable state.

3.6 Tested Supporting System Details (AE)

3.6.1 USB Keyboard

Manufacturer	:	DELL
Model Number	:	L100
Serial Number	:	CN-ORH656-65890-97D-052P
Data Cable	:	Shielded, Undetachable, 2.0m, 1 ferrite core

3.6.2 USB Mouse

Manufacturer	:	HP
Model Number	:	M-UAE96
Serial Number	:	FATSK0L5B0LE1R
Data Cable	:	Shielded, Undetachable, 1.8m

3.6.3 USB HDD #1

Manufacturer	:	SEAGATE
Model Number	:	SRD00F1
Serial Number	:	NA4233KW
Data Cable	:	Shielded, Detachable, 1.0 m

3.6.4 USB HDD #2

Manufacturer	:	SEAGATE
Model Number	:	SRD00F1
Serial Number	:	NA45HL0Z
Data Cable	:	Shielded, Detachable, 1.0 m

3.6.5 USB HDD #3

Manufacturer	:	SEAGATE
Model Number	:	SRD00F1
Serial Number	:	NA4233SF
Data Cable	:	Shielded, Detachable, 1.0 m

3.6.6 USB HDD #4

Manufacturer	:	SEAGATE
Model Number	:	SRD00F1
Serial Number	:	NA4233P0
Data Cable	:	Shielded, Detachable, 1.0 m

3.6.7 USB HDD #5

Manufacturer	:	SEAGATE
Model Number	:	SRD00F1
Serial Number	:	NA41RT5Z
Data Cable	:	Shielded, Detachable, 1.0 m

3.6.8 Earphone

Manufacturer	:	SOMIC
Model Number	:	SM-301
Audio Cable	:	Unshielded, Undetachable, 2.2 m

3.6.9 Modem

Manufacturer	:	ACEEX
Model Number	:	MODEM1414
Serial Number	:	980034391
Data Cable	:	Shielded, Detachable, 1.5m
Adapter	:	HUACHENG/HC-1609 DC Cord: Shielded, Undetachable, 1.5m

3.6.10 POS Printer

Manufacturer	:	WINCOR NIXDORF
Model Number	:	TH200
Serial Number	:	BYG0016613
RS-232→Parallel Cable	:	Shielded, Detachable, 2.0m
AC Adapter	:	Brand: TIGER POWER, M/N: TG-0652-24V I/P: AC100-240V, 50-60Hz, 1.6A Max. O/P: DC 24V, 2.6A DC Cord: Unshielded, Undetachable, 1.5m

3.6.11 Cash Drawer Controller

Manufacturer	:	WINCOR NIXDORF
Serial Number	:	1750060917
RJ-12 Cable	:	Shielded, Undetachable, 1.5m

3.6.12 Scanner

Manufacturer	:	Eclipse
Model Number	:	MS5145
Serial Number	:	5207023188
RS232 Cable	:	Unshielded, Undetachable, 1.6m

3.6.13 Host PC

Manufacturer	:	Lenovo
Model Number	:	SL500
Serial Number	:	N/A
BSMI ID	:	R33160
Power Cord	:	Unshielded, Detachable, 1.0m
AC Adapter	:	M/N: 92P1211 Input: AC 100-240V, 50-60Hz, 2.0A-1.2A Output: DC 20V,3.25A DC Cord: Shielded, Undetachable, 1.8m, 1 ferrite core.

3.6.14 Second Display

Manufacturer	:	WINCOR NIXDORF
Model Number	:	BA93
RS232 Cable	:	Unshielded, Undetachable, 2.6m

3.6.15 Customer Display

Manufacturer	:	WINCOR NIXDORF
Model Number	:	BA63-1
RS232 Cable	:	Unshielded, Undetachable, 2.6m

3.6.16 AC Power Cord : Unshielded, Detachable, 1.8m

3.7 Description of Test Facility

Name of Firm	:	**Audix Technology (Wujiang) Co.,Ltd EMC Dept.**
Site Location	:	No. 1289 Jiangxing East Road, the Eastern Part of Wujiang Economic Development Zone Jiangsu China 215200
Test Facilities	:	**No. 1 10m Semi-anechoic Chamber** FCC Filing Date of Validity: May 23, 2015 Registration No. : 252588 **No. 1 Conducted Shielding Enclosure**
NVLAP Lab Code	:	200786-0 Valid until on Sep. 30, 2017 (NVLAP is a signatory member of ILAC MRA) Remark: This report shall not be imply endorsement, certification or approval by NVLAP, NIST, or any agency of the U.S. Federal Government.

3.8 Measurement Uncertainty

Test Item	Range Frequency	Uncertainty
No.1 Conducted Shielding Enclosure		
Conducted Disturbance Measurement at mains port	0.15MHz ~ 30MHz	± 2.65dB
At 10m Semi-Anechoic Chamber		
Radiated Disturbance Measurement (Distance 10m)	30MHz~1GHz	± 3.65dB (Horizontal)
		± 3.74dB (Vertical)
Radiated Disturbance Measurement (Distance 3m)	1GHz ~ 6GHz	± 4.73dB

Remark: Uncertainty = $ku_c(y)$

4 CONDUCTED EMISSION MEASUREMENT

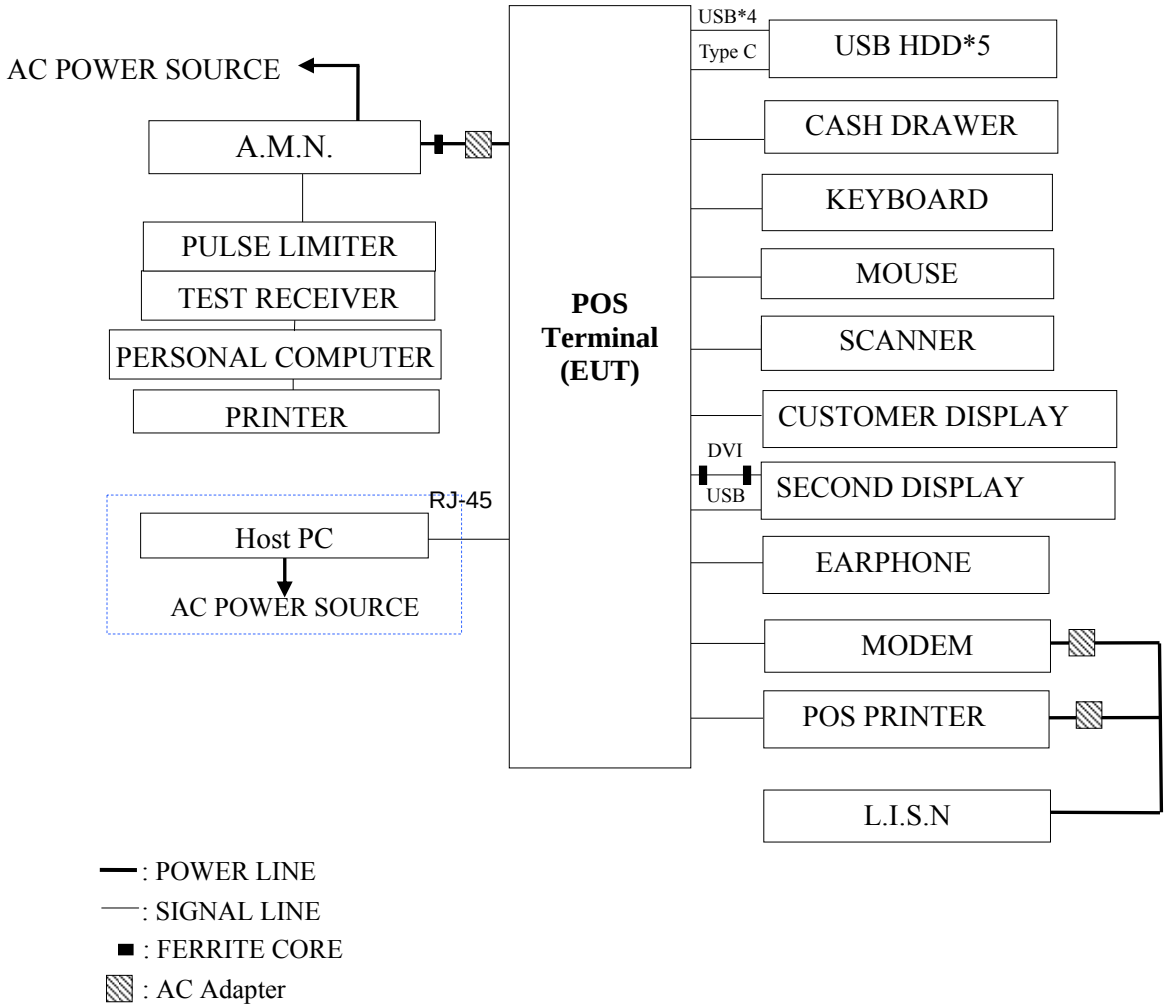
4.1 Test Equipment

The following test equipments were used during the conducted emission measurement：

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R & S	ESCI	100351	2016-07-03	2017-07-02
2.	A.M.N	R & S	ESH2-Z5	100153	2017-04-21	2018-04-20
3.	L.I.S.N.	Kyoritsu	KNW-407	8-1793-3	2016-07-03	2017-07-02
4.	Pulse Limiter	R&S	ESH3-Z2	100605	2016-07-03	2017-07-02
5.	RF Cable	Shenxuan	RG400	Cable 59/1+Switch)	2017-01-04	2018-01-03
6.	Software	Audix/e3(6.7.0313)				

4.2 Block Diagram of Test Setup

4.2.1 Block Diagram of Test Setup for AC Mains Port



4.3 Power line Conducted Emission Limit

(§15.107(b), Class A)

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level	Average Level
150kHz ~ 5MHz	79dBμV	66dBμV
5MHz ~ 30MHz	73BμV	60BμV

Remark 1. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.

2. The tight limit applies at the band edges.

4.4 Test Procedure

The measuring process is according to ANSI C63.4 clause 12 and laboratory internal procedure TKC-301-010.

In the conducted emission measurement, the EUT and all peripheral devices were set up on a non-metallic table which was 0.8 meter height above the ground plane, and 0.4 meter far away from the vertical plane. The mains cable of the EUT connected to one Artificial Main Network(AMN). All other unit of the EUT and AE connected to a second Line Impedance Stabilization Network(L.I.S.N.). The telecommunication cable connected to the AE through a Impedance Stabilization Network(ISN) which terminated a 50Ω resistor. For the measurement, the A.M.N measuring port was terminated by a 50Ω measuring equipment and the second L.I.S.N measuring port was terminated by a 50Ω terminator. All measurements were done between the phase lead and the reference ground, and between the neutral lead and the reference ground. All cables or wires placement were verified to find out the maximum emission.

The bandwidth of measuring receiver was set at 9 kHz.

The required frequency band (0.15 MHz ~ 30 MHz) was pre-scanned with peak detector; the final measurement was measured with quasi-peak detector and average detector. (If the average limit is met when using a quasi-peak detector, the average detector is unnecessary).

The emission level is calculated automatically by the test system which uses the following equation:

Emission level (dBμV) = Reading (dBμV) + A.M.N factor (dB) + Cable loss (dB).
(Cable loss includes pulse limiter loss)

4.5 Conducted Emission Measurement Results

PASSED

The details of test modes and reference test data are as follows：

Test Date: May 13, 2017 Temperature: 18.7℃ Humidity: 46%

Item	Test Condition	Reference Test Data No.	
		Neutral	Line
1	**Full System (Configuration 1)**	**# 32**	**※# 31**

NOTE 1 – '※'means the worst test mode.

NOTE 2 – The worst emission is detected at 0.15 MHz with emission level of 55.29 dB (μV) and with QP detector (limit is 65.78 dB (μV), when the Line of the EUT is connected to A.M.N.

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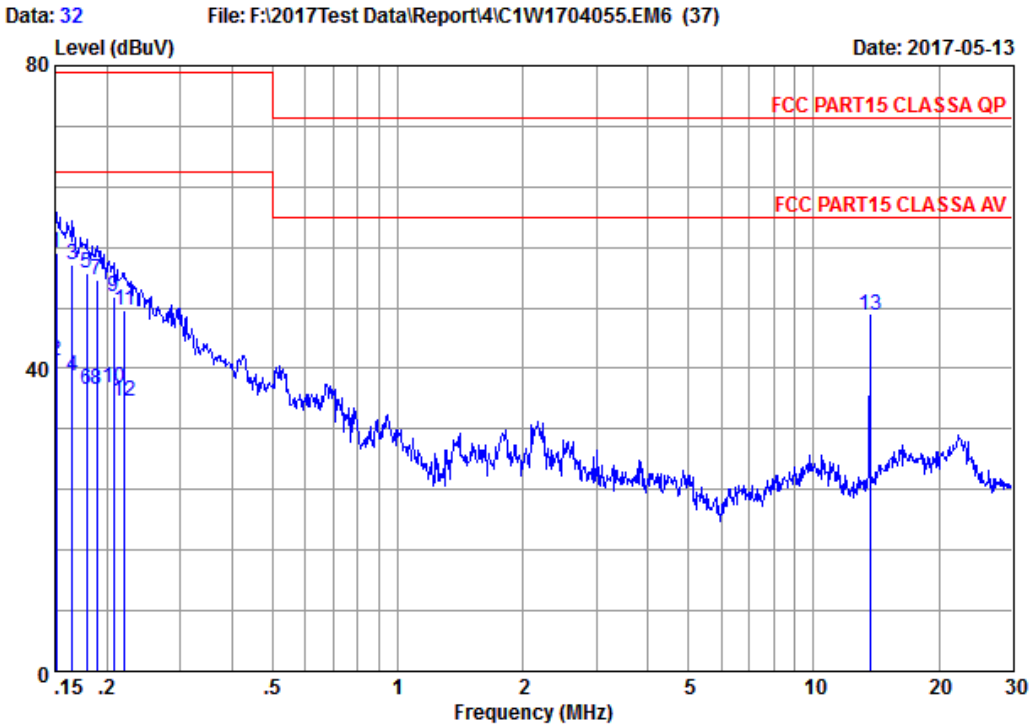

Site no.	: No.1 Conducted shielding Enclosure	Data no.	: 32
AMN/LISN	: ESH2-Z5-1605	Phase	: NEUTRAL
Limit	: FCC PART15 CLASSA QP		
Env. / Ins.	: 18.7*C&46%/ESCI	Engineer	: KM.Tong
EUT	: POS Terminal		
M/N	: BEETLE/iPOS plus Advanced		
Power Rating	: 120Vac/60Hz		
Test mode	: Full System		
Memo	: Configuration 1		

	Freq. (MHz)	AMN+PS Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.15	0.15	0.02	45.10	55.18	79.00	23.82	QP
2	0.15	0.15	0.02	30.90	40.98	66.00	25.02	Average
3	0.17	0.15	0.02	43.60	53.68	79.00	25.32	QP
4	0.17	0.15	0.02	28.90	38.98	66.00	27.02	Average
5	0.18	0.15	0.02	42.60	52.68	79.00	26.32	QP
6	0.18	0.15	0.02	27.10	37.18	66.00	28.82	Average
7	0.19	0.15	0.02	41.70	51.78	79.00	27.22	QP
8	0.19	0.15	0.02	27.20	37.28	66.00	28.72	Average
9	0.21	0.15	0.02	39.30	49.38	79.00	29.62	QP
10	0.21	0.15	0.02	27.30	37.38	66.00	28.62	Average
11	0.22	0.15	0.02	37.70	47.78	79.00	31.22	QP
12	0.22	0.15	0.02	25.61	35.69	66.00	30.31	Average
13	13.62	0.49	0.15	36.45	46.98	73.00	26.02	Peak

Remarks:
1.Emission Level= AMN(Include Pulse Att) factor + Cable loss + Reading .

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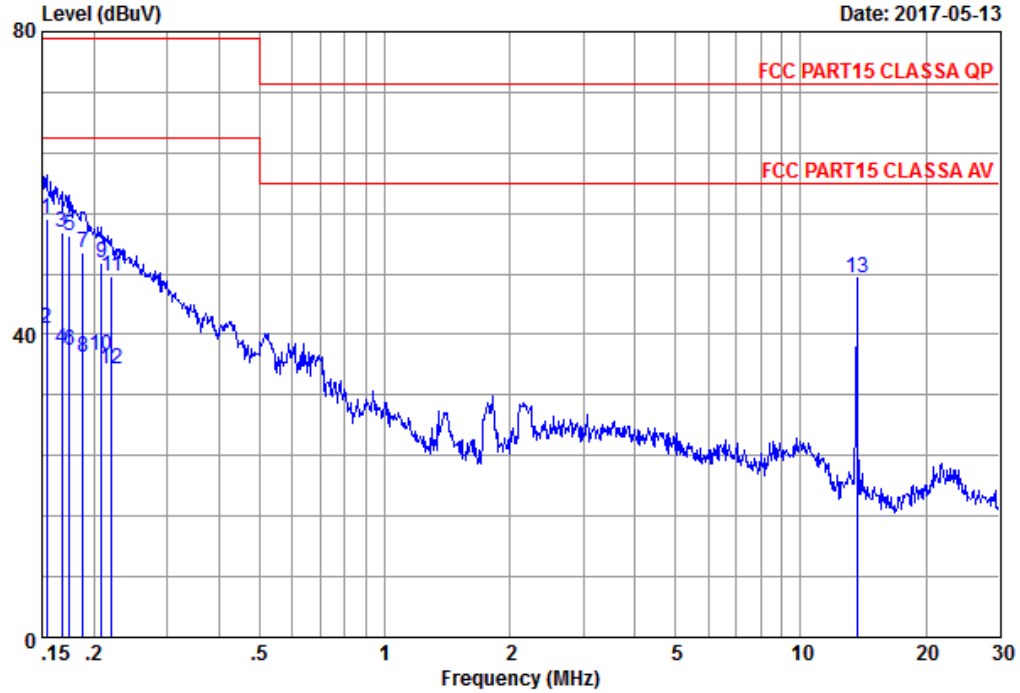


Site no.	: No.1 Conducted shielding Enclosure	Data no.	: 31
AMN/LISN	: ESH2-Z5-1605	Phase	: LINE
Limit	: FCC PART15 CLASSA QP		
Env. / Ins.	: 18.7*C&46%/ESCI	Engineer	: KM.Tong
EUT	: POS Terminal		
M/N	: BEETLE/iPOS plus Advanced		
Power Rating	: 120Vac/60Hz		
Test mode	: Full System		
Memo	: Configuration 1		

	Freq. (MHz)	AMN+PS Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV)	Margin (dB)	Remark
1	0.15	0.16	0.02	45.20	55.29	79.00	23.71	QP
2	0.15	0.16	0.02	30.70	40.79	66.00	25.21	Average
3	0.17	0.16	0.02	43.40	53.49	79.00	25.51	QP
4	0.17	0.16	0.02	28.01	38.10	66.00	27.90	Average
5	0.17	0.16	0.02	43.00	53.09	79.00	25.91	QP
6	0.17	0.16	0.02	27.70	37.79	66.00	28.21	Average
7	0.19	0.16	0.02	40.80	50.89	79.00	28.11	QP
8	0.19	0.16	0.02	26.90	36.99	66.00	29.01	Average
9	0.21	0.16	0.02	39.40	49.49	79.00	29.51	QP
10	0.21	0.16	0.02	27.10	37.19	66.00	28.81	Average
11	0.22	0.16	0.02	37.70	47.79	79.00	31.21	QP
12	0.22	0.16	0.02	25.40	35.49	66.00	30.51	Average
13	13.62	0.44	0.15	36.89	47.37	73.00	25.63	Peak

Remarks:
1.Emission Level= AMN(Include Pulse Att) factor + Cable loss + Reading .

5 RADIATED DISTURBANCE MEASUREMENT

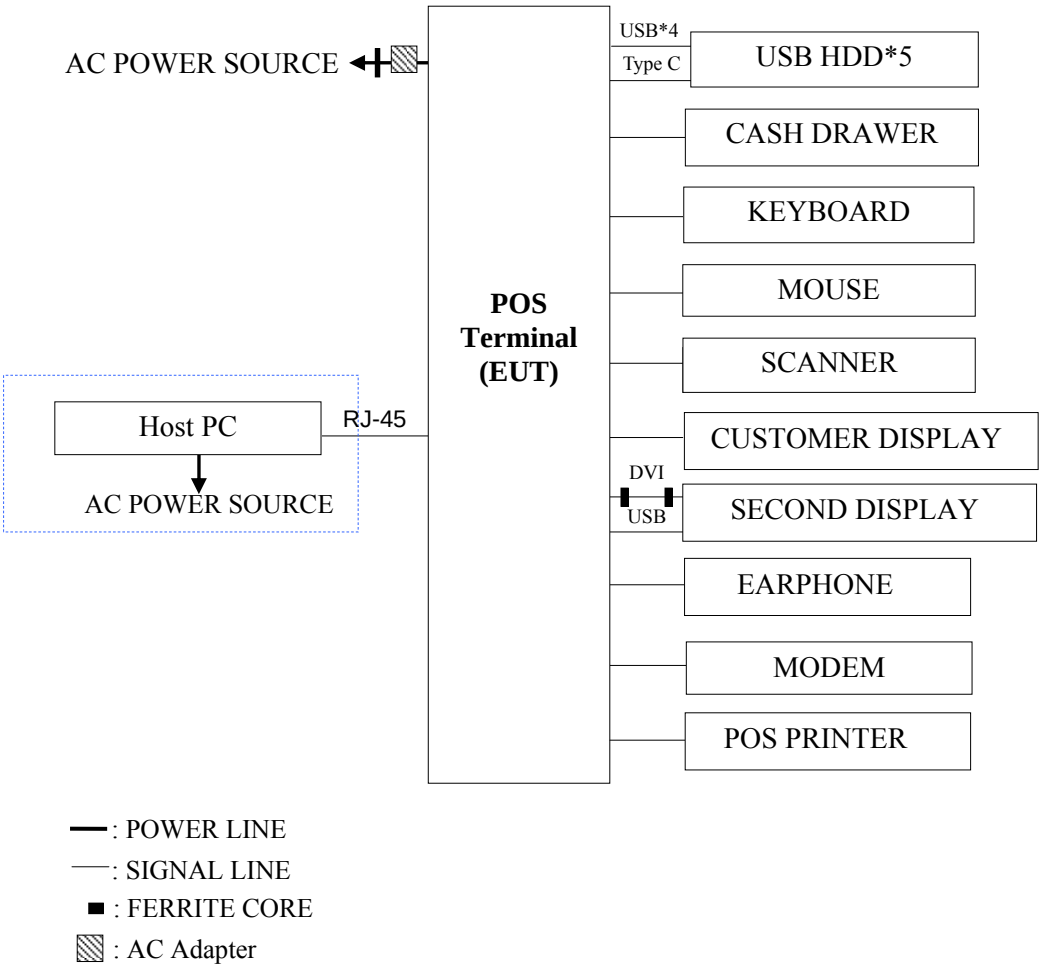
5.1 Test Equipment

The following test equipment was used during the radiated emission measurement：
(At 10m Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E7405A	MY45107028	2017-01-05	2018-01-04
2.	PXA signal analyzer	Agilent	N9030A	MY53120367	2017-06-23	2018-06-22
3.	Pre-Amplifier	Chengyi dianzi	EMC9135	980374	2017-01-04	2018-01-03
4.	Pre-Amplifier	Chengyi dianzi	EMC9135	980373	2017-01-04	2018-01-03
5.	Bi-log Antenna (Horizontal)	Seibersdorf	VULB 9168	704	2016-07-20	2017-07-19
6.	Bi-log Antenna (Vertical)	Seibersdorf	VULB 9168	703	2016-07-20	2017-07-19
7.	Horn Antenna	EMCO	3115	62960	2016-07-07	2017-07-06
8.	Test Receiver	R&S	ESCI	100352	2017-01-04	2018-01-03
9.	RF SWITCH	AUDIX	R2S	20121102111250	2017-01-05	2018-01-04
10.	Microwave amplifier	Agilent	8449B	3008A02234	2017-01-05	2018-01-04
11.	RF Cable	Shengxuan	CSRH	50/2	2017-01-04	2018-01-03
12.	RF Cable	Shengxuan	CSRH	59/2	2017-01-04	2018-01-03
13.	RF Cable	Shengxuan	CSRH	50/1	2017-01-04	2018-01-03
14.	RF Cable	Shengxuan	CSRH	59/4	2017-01-04	2018-01-03
15.	RF Cable	Huber+Suhner	SUCOFLEX 104	504085/4	2017-01-05	2018-01-04
16.	RF Cable	Huber+Suhner	SUCOFLEX 104	504087/4	2017-01-05	2018-01-04
17.	Software	Audix/e3(6.7.0313)				

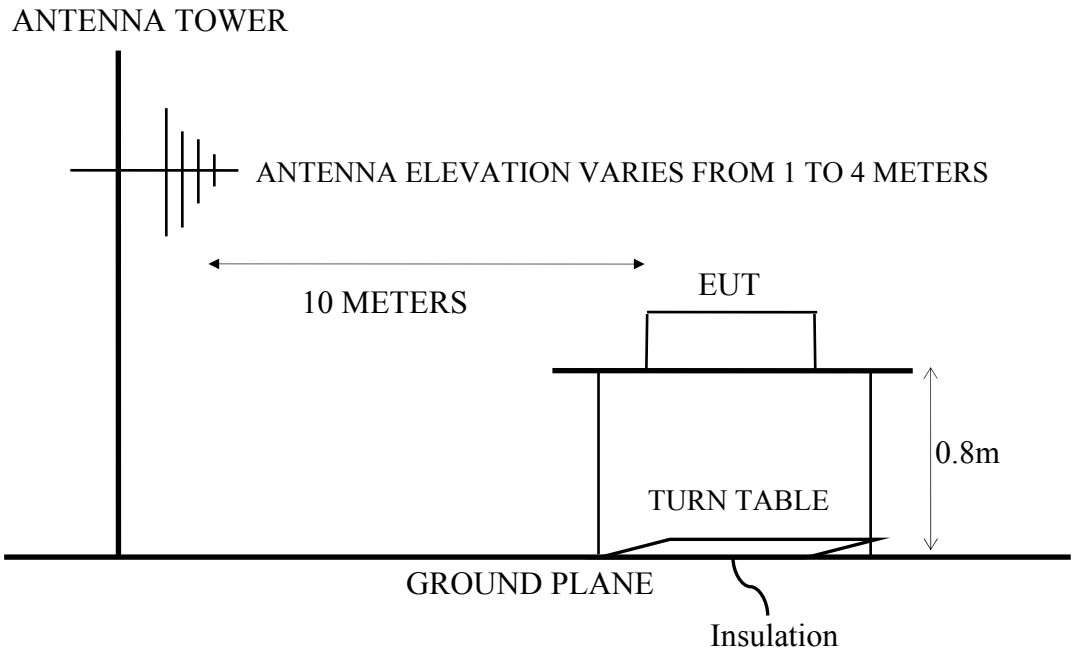
5.2 Block Diagram of Test Setup

5.2.1 Block Diagram of connection between EUT and simulators



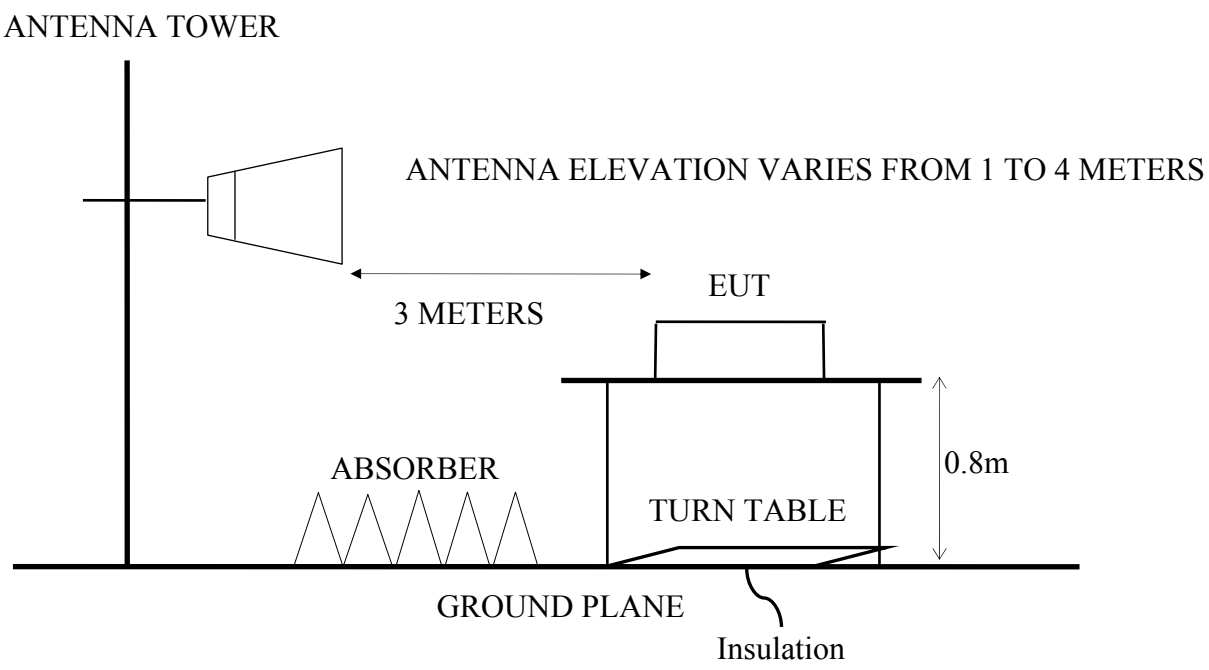
5.2.2 Test Setup at No. 1 10m Semi-Anechoic Chamber Setup Diagram (Test distance: 10m)

For 30MHz~1000MHz



5.2.3 No. 1 10m Semi-Anechoic Chamber Setup Diagram (Test distance: 3m)

For Above 1GHz



5.3 Radiation Emission Limit

5.3.1 Limits for Radiated Disturbance (below 1GHz, §15.109(b), Class A)

All emanations from receiver shall not exceed the level of field strengths specified below:

FREQUENCY	DISTANCE	FIELD STRENGTHS LIMITS	
(MHz)	(Meters)	(μV/m)	(dBμV/m)
30 ~ 88	10	90	39
88~216	10	150	43.5
216~960	10	210	46.4

Notes: (1) Emission level(dBμV/m)=20 log Emission level(μV/m).
(2) The tight limit applies at the edge between two frequency bands.
(3) The 3m limit applies relation: L2 = L1 (d1/d2)

5.3.2 Limits for Radiated Disturbance (1GHz~15GHz, §15.109(b), Class A)

FREQUENCY	DISTANCE	FIELD STRENGTHS LIMITS	
(MHz)	(Meters)	(μV/m)	(dBμV/m)
Above 960	3	300	50

Notes: (1) Emission level(dBμV/m)=20 log Emission level(μV/m).
(2) The tight limit applies at the edge between two frequency bands.
(3) The 3m limit applies relation: L2 = L1 (d1/d2)

5.4 Test Procedure

The measuring process is according to ANSI C63.4 clause 12 and laboratory internal procedure TKC-301-011.

In the radiated disturbance measurement, the EUT and all simulators were set up on a non-metallic turn table which was 0.8 meter above the ground plane. Measurement distance between EUT and receiving antennas was set at 10 meters at 30MHz~1GHz and 3 meters at 1GHz~6GHz. The measurement distance is the shortest horizontal distance between an imaginary circular periphery which consists of EUT periphery and cables and the reference point of the antenna. During the radiated measurement, the EUT was rotated 360° and receiving antennas were moved from 1 ~ 4 meters for finding maximum emission. Two receiving antennas were used for both horizontal and vertical polarization detection for 30MHz~1GHz, One receiving antennas was used for both horizontal and vertical polarization detection for 1GHz~6GHz (the absorbing material was added when testing of 1GHz~6GHz was done). All cables or wires placement were verified to find out the maximum emission.

The bandwidth of measuring receiver (or spectrum analyzer) was set to:

RBW (120 kHz), VBW (300kHz) for QP detector below 1GHz
RBW (1 MHz), VBW (1MHz) for Peak detector above 1GHz
RBW (1 MHz), VBW (10Hz) for Average detector above 1GHz

which is defined against CISPR16-1-1 section.

The required frequency band (30MHz ~ 6GHz) was pre-scanned with peak detector; all final measurements were measured with quasi-peak detector below 1GHz, measured with average detector and peak detector above 1GHz.

The emission level is calculated automatically by the test system which uses the following equation:

1. For 30MHz-1GHz measurement:
   Emission Level (dBμV/m) = Reading (dBμV)+Antenna Factor (dB/m)+Cable Loss (dB)
2. For 1GHz-6GHz measurement:
   Emission Level (dBμV/m) = Reading (dBμV)+Antenna Factor (dB/m)+Cable Loss(dB)-Pre-amplifier factor (dBμV)

In chapter 7.6.6.1 the standard EN 55016-2-3 requires to include the values of w in the test report:"w: The dimension of the line tangent to the EUT formed by Θ_{3dB} at the measurement distance *d*. Equation (10) shall be used to calculate w for each actual antenna and measurement distance used. The values of w shall be included in the test report. This calculation may be based on the manufacturer-provided receive-antenna beamwidth specifications:
$w=2 \times d \times \tan(0{,}5 \times \Theta_{3dB})$

Frequency	3115 Horn	
GHz	Θ_{3dB}	d=3m
	(°)	w (m)
1.00	66	3.90
2.00	54	3.06
4.00	50	2.80
6.00	34	1.83

The values of w. are greater than chapter 7.6.6.1 of Table 2, the minimum dimension of w. (Wmin) requirements.

5.5 Radiated Emission Measurement Results

PASSED.

5.5.1 For 30~1000MHz Frequency Range

The details of test modes and reference test data are as follows:

Test Date:May 18, 2017 Temperature: 18.7℃ Humidity: 57%

Item	Test Condition	Reference Test Data No.	
		Horizontal	Vertical
※1	**Full System (Configuration 1)**	**# 31**	**# 32**

NOTE 1 - '※' means the worst test mode.

NOTE 2 - 0° was the table front facing the antenna. Degree is calculated from 0° clockwise facing the antenna.

NOTE 3 - The worst emission at horizontal polarization was detected at 336.54 MHz with emission level of 27.36 dBμV/m (limit is 46.40 dBμV/m), when the antenna was 4.0 m height and the turntable was at 152°. The worst emission at vertical polarization was detected at 522.57 MHz with emission level of 27.95 dBμV/m (limit is 46.40 dBμV/m), when the antenna was 1.0 m height and the turntable was at 149°.

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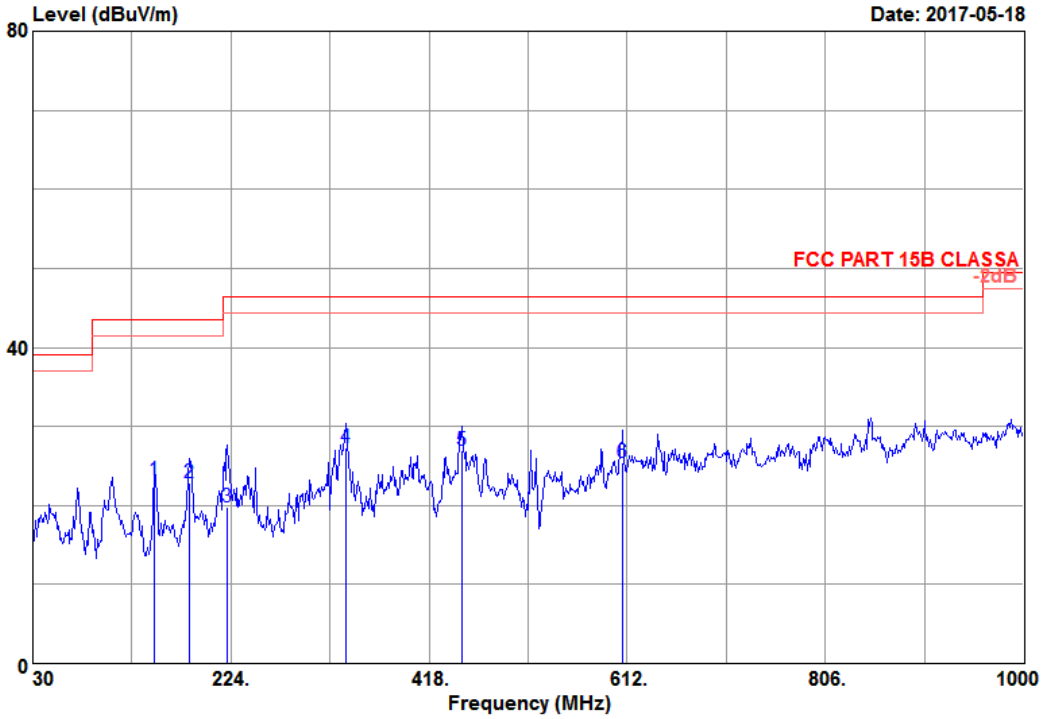
Tel:0512-63403993 Fax:0512-63403339

Data: 31 File: G:\TEST DATA\2017\Report\4\C1W1704055.EM6 (68)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(704)-160720-H
Limit : FCC PART 15B CLASSA
Env. / Ins. : 18.7*C 57%/ESCI
EUT : POS Terminal
M/N : BEETLE /iPOS plus Advanced
Power Rating : 120V/60Hz
Test Mode : Full System
Memo : Configuration 1

Ant. pol. : HORIZONTAL
Engineer : King

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	149.34	19.16	1.41	2.66	23.23	43.50	20.27	QP
2	183.27	17.09	1.56	4.29	22.94	43.50	20.56	QP
3	220.71	15.85	1.72	2.16	19.73	46.40	26.67	QP
4	336.54	20.11	2.16	5.09	27.36	46.40	19.04	QP
5	450.03	22.87	2.53	1.58	26.98	46.40	19.42	QP
6	607.98	25.83	3.06	-3.45	25.44	46.40	20.96	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

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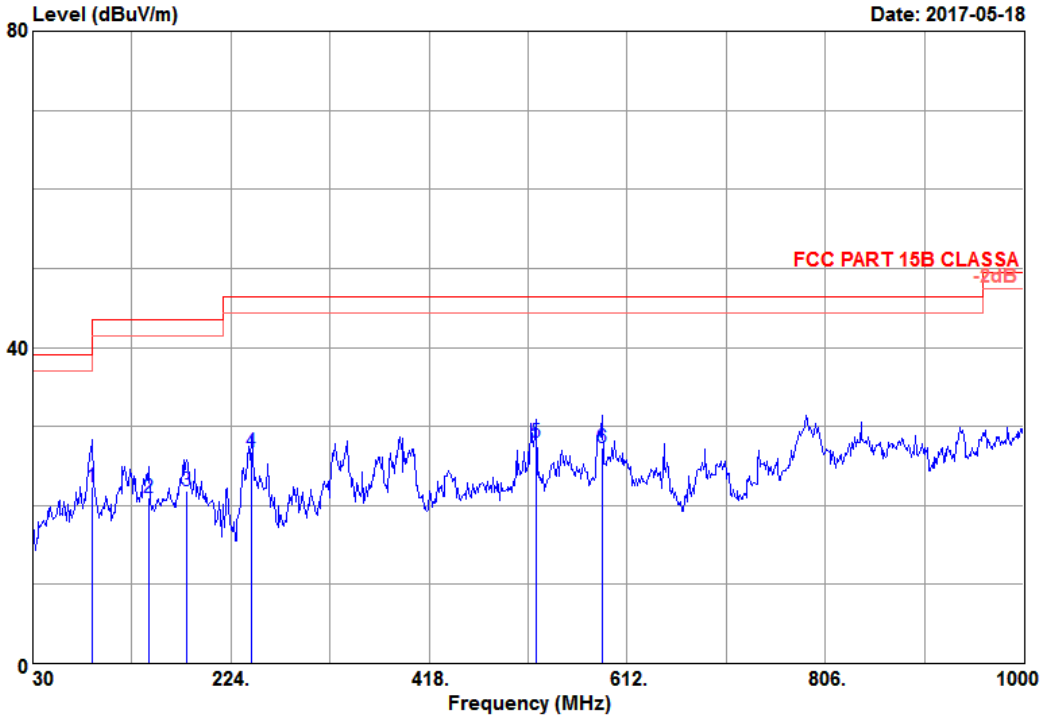
Data: 32 File: G:\TEST DATA\2017\Report\4\C1W1704055.EM6 (68)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 10m 9168(703)-160720-V
Limit : FCC PART 15B CLASSA
Env. / Ins. : 18.7*C 57%/ESCI
EUT : POS Terminal
M/N : BEETLE /iPOS plus Advanced
Power Rating : 120V/60Hz
Test Mode : Full System
Memo : Configuration 1

Ant. pol. : VERTICAL
Engineer : King

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	88.50	13.49	0.87	7.96	22.32	43.50	21.18	QP
2	143.49	18.82	1.11	1.04	20.97	43.50	22.53	QP
3	180.93	17.52	1.26	3.01	21.79	43.50	21.71	QP
4	244.11	17.33	1.47	7.91	26.71	46.40	19.69	QP
5	522.57	23.92	2.19	1.84	27.95	46.40	18.45	QP
6	588.09	25.09	2.35	-0.10	27.34	46.40	19.06	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

5.5.2 For Above 1GHz Frequency Range

The details of test modes and reference test data are as follows:

Test Date: May 22, 2017 Temperature: 18.7℃ Humidity: 57%

Item	Test Condition	Reference Test Data No.	
		Horizontal	Vertical
1	Full System (Configuration 1)	# 66	# 65

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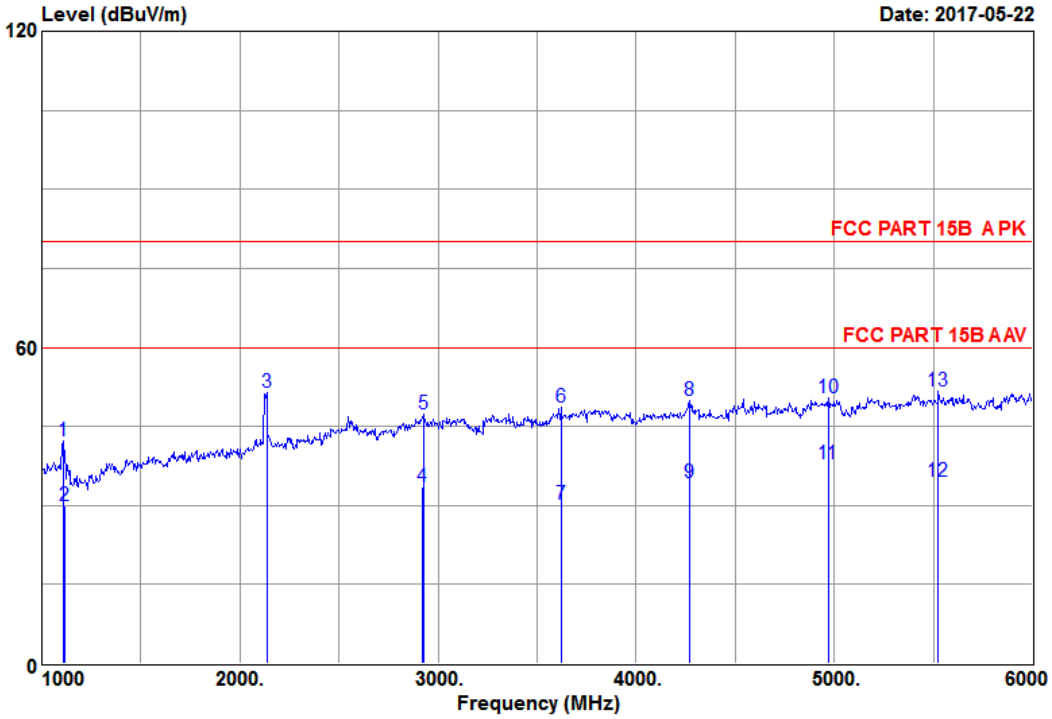
Data: 66 File: G:\TEST DATA\2017\Report\4\C1W1704055.EM6 (68)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 3m 3115-62960-160707
Limit : FCC PART 15B A PK
Env. / Ins. : 18.7*C 57%/N9030A
EUT : POS Terminal
M/N : BEETLE /iPOS plus Advanced
Power Rating : 120V/60Hz
Test Mode : Full System
Memo : Configuration 1

Ant. pol. : HORIZONTAL
Engineer : King

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Preamp Factor (dB)	Emission Levle (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1110.00	23.75	3.55	49.74	34.86	42.18	80.00	37.82	Peak
2	1112.53	23.81	3.55	37.42	34.83	29.95	60.00	30.05	Average
3	2135.00	27.89	5.07	52.00	33.55	51.41	80.00	28.59	Peak
4	2923.66	29.82	6.01	30.91	33.23	33.51	60.00	26.49	Average
5	2925.00	29.82	6.01	44.71	33.23	47.31	80.00	32.69	Peak
6	3620.00	31.67	6.71	43.26	32.95	48.69	80.00	31.31	Peak
7	3622.55	31.67	6.71	24.65	32.95	30.08	60.00	29.92	Average
8	4270.00	32.39	7.29	42.93	32.70	49.91	80.00	30.09	Peak
9	4271.54	32.39	7.29	27.26	32.70	34.24	60.00	25.76	Average
10	4970.00	33.46	7.89	41.49	32.46	50.38	80.00	29.62	Peak
11	4971.09	33.46	7.89	28.92	32.46	37.81	60.00	22.19	Average
12	5523.88	34.21	8.35	24.20	32.27	34.49	60.00	25.51	Average
13	5525.00	34.21	8.35	41.42	32.27	51.71	80.00	28.29	Peak

Remarks:
1.Emission Level= Antenna factor + Cable loss + Reading-Preamp Factor
2.The emission level that are 20dB below the offical limit are not reported

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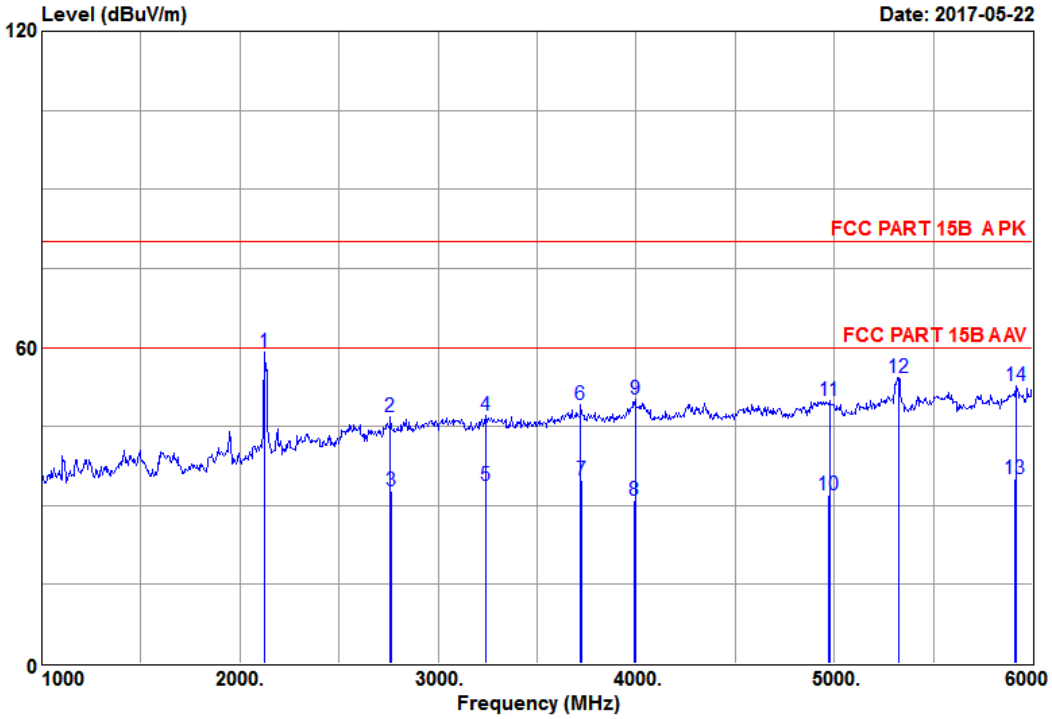
Data: 65 File: G:\TEST DATA\2017\Report\4\C1W1704055.EM6 (68)



Site NO. : NO.1 10m Chamber
Dis. / Ant. : 3m 3115-62960-160707
Limit : FCC PART 15B A PK
Env. / Ins. : 18.7*C 57%/N9030A
EUT : POS Terminal
M/N : BEETLE /iPOS plus Advanced
Power Rating : 120V/60Hz
Test Mode : Full System
Memo : Configuration 1

Ant. pol. : VERTICAL
Engineer : King

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Preamp Factor (dB)	Emission Levle (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2125.00	27.84	5.04	59.72	33.55	59.05	80.00	20.95	Peak
2	2760.00	29.49	5.82	44.76	33.30	46.77	80.00	33.23	Peak
3	2762.55	29.49	5.82	30.68	33.29	32.70	60.00	27.30	Average
4	3240.00	30.68	6.34	43.19	33.10	47.11	80.00	32.89	Peak
5	3242.55	30.68	6.34	29.86	33.10	33.78	60.00	26.22	Average
6	3720.00	31.89	6.81	43.29	32.91	49.08	80.00	30.92	Peak
7	3723.12	31.89	6.81	28.92	32.91	34.71	60.00	25.29	Average
8	3992.51	32.50	7.06	24.28	32.80	31.04	60.00	28.96	Average
9	3995.00	32.50	7.06	43.32	32.80	50.08	80.00	29.92	Peak
10	4973.56	33.46	7.89	23.13	32.46	32.02	60.00	27.98	Average
11	4975.00	33.46	7.89	40.91	32.46	49.80	80.00	30.20	Peak
12	5325.00	33.94	8.19	44.51	32.34	54.30	80.00	25.70	Peak
13	5913.26	34.37	8.69	24.21	32.13	35.14	60.00	24.86	Average
14	5915.00	34.37	8.69	41.72	32.13	52.65	80.00	27.35	Peak

Remarks:
1.Emission Level= Antenna factor + Cable loss + Reading-Preamp Factor
2.The emission level that are 20dB below the offical limit are not reported

6 DEVIATION TO TEST SPECIFICATIONS

【NONE】