

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : W159R-D005

AGR No. : A158A-013

Applicant : BLUEBIRD INC.

Address : (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea

Manufacturer : BLUEBIRD INC.

Address : (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea

Type of Equipment : Mobile Payment Terminal

FCC ID : SS4MT280

Model Name : MT280

Serial number : N/A

Total page of Report : 22 pages (including this page)

Date of Incoming : August 03, 2015

Date of Issuing : September 07, 2015

SUMMARY

The equipment complies with the requirements of **FCC CFR 47 PART 15 SUBPART C, SECTION 15.225 and FCC Part 15 Subpart C Section 15.209 and 15.207.**

This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Reviewed by: 

 Jae-Ho, Lee / Chief Engineer
 ONETECH Corp.

Approved by: 

 Sung-Ik, Han/ Managing Director
 ONETECH Corp.

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Revision History

Issue Report No.	Issued Date	Revisions	Effect Section
W159R-D005	September 07, 2015	Initial Release	All

1. VERIFICATION OF COMPLIANCE

- APPLICANT : BLUEBIRD INC.
- ADDRESS : (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
- CONTACT PERSON : Jae ho, Lee / Assistant Manager
- TELEPHONE NO : +82-70-7730-8210
- FCC ID : SS4MT280
- MODEL NO/NAME : MT280
- SERIAL NUMBER : N/A
- DATE : September 07, 2015

EQUIPMENT CLASS	DXX-Part15 Low Power Communication Device Transmitter
EQUIPMENT DESCRIPTION	Mobile Payment Terminal
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.225, 15.209 and 15.207
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m Semi Anechoic Chamber

- The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The BLUEBIRD INC., Model MT280 (referred to as the EUT in this report) is a Mobile Payment Terminal, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Mobile Payment Terminal
MODULATION	ASK
TRANSMITTING FREQUENCY	13.56 MHz
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	24 MHz, 2.5 MHz, 1.25 MHz, 32.768 kHz
ANTENNA TYPE	PCB antenna
USED AC/DC ADAPTER	Input: AC 100-240 V~, 50~60 Hz, 0.8 A Output: DC 9 V, 3.0 A Model No.: PSAC30U-090 Manufacturer: Phihong(Dong guan) Electronics Co.,Ltd.
EXTERNAL CONNECTOR	DC Jack, Micro SD Slot, USIM Slot, SAM Slot_2 EA, Micro USB Port, Charging terminal

2.2 Model Differences:

-. None

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 15.225, 15.209 and 15.207

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842 IC (Industry Canada) – Registration No. Site# 3736-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation No. 85

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
KEY BOARD	N/A	PCB-MT280-KEY-REV0.2	N/A
MAIN BOARD	N/A	PCB-MT280-MAIN-REV0.2	N/A
TERMINAL BOARD	N/A	PCB-MT280-TERMINAL-REV0.2	N/A
LCD	N/A	N/A	N/A
LOWER BOARD	N/A	N/A	N/A
UPPER BOARD	N/A	N/A	N/A
Battery	N/A	N/A	N/A
Print	N/A	P2VS41504401136	N/A
BT Antenna	N/A	N/A	N/A
GSM Module	N/A	N/A	N/A
MSR	N/A	N/A	N/A
NFC Antenna	N/A	N/A	N/A
WCDMA Antenna	N/A	MT760_main antenna_GSM/WCDMA	N/A
WLAN Antenna	N/A	MT280_WLAN ant_FPCB_Rev.01	N/A

3.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
MT280	BLUEBIRD INC.	Mobile Payment Terminal (EUT)	Adapter
PSAC30U-090	Phihong(Dong guan) Electronics Co.,Ltd.	Adapter	EUT

3.3 Mode of operation during the test

The EUT was operated during the test as following operating mode.

- The EUT has 13.56 MHz RF boards for transmission signal and program was used for making continuous transmission mode during the test. (Portable mode / Charging mode)
- Portable mode: The EUT was operated with NFC signal continuous transmission state continuously during the test.
- Charging mode: The EUT was connected to the Adapter and then the EUT was operated with NFC signal continuous transmission state continuously during the test.

3.4 Equipment Modifications

- None

3.5 Configuration of Test System

Line Conducted Test : The EUT was connected to adaptor and the power of adaptor was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test : Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber.
For frequencies from 150 kHz to 30 MHz measurements were made of the magnetic H field. The measuring antenna is an electrically screened loop antenna.
The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

3.6 Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The transmitter antenna of the EUT is an INTENNA so there is no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode(Portable & Charging mode)	X

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode(Portable & Charging mode)	X

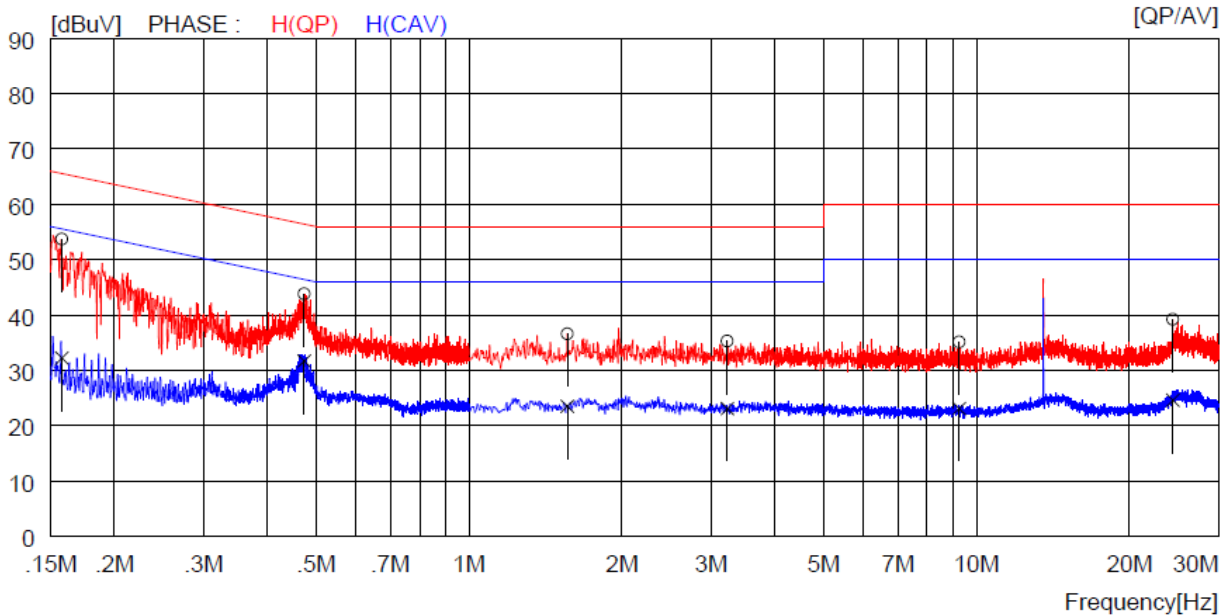
5. FINAL RESULT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

5.1 Conducted Emission Test

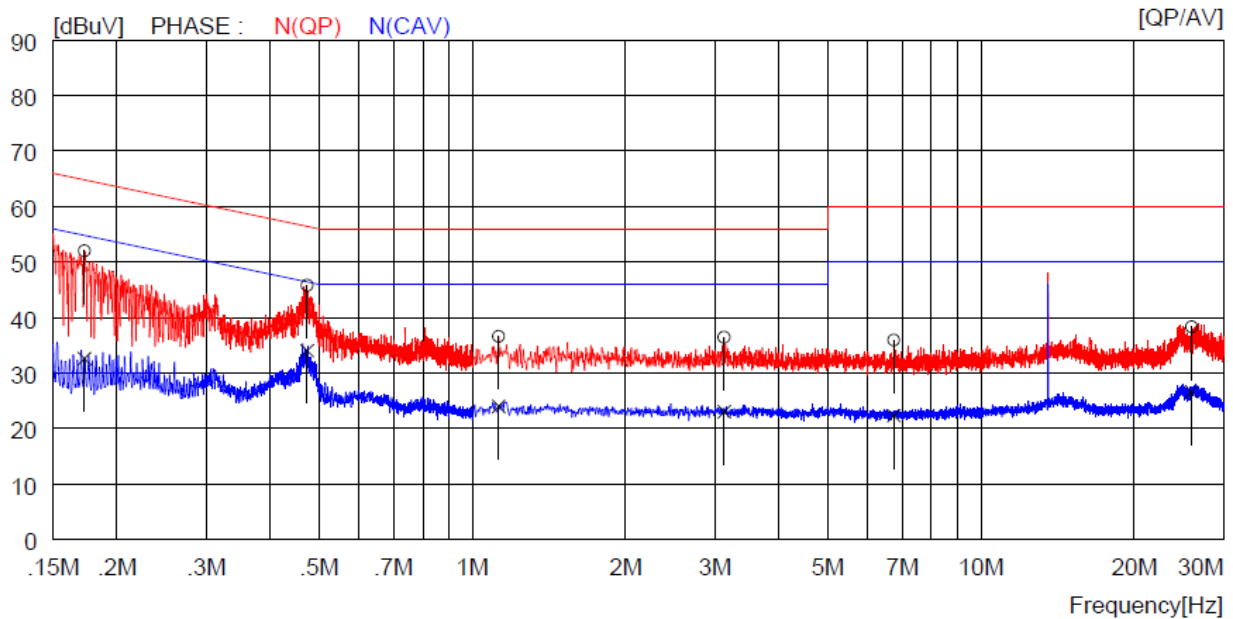
Humidity Level : (44 ~ 45) % R.H. Temperature: (20 ~ 21) °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.207(a)
 Result : PASSED

EUT : Mobile Payment Terminal Date: August 27, 2015
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)
 Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15800	33.5	----	20.2	53.7	----	65.6	----	11.9	----	H(QP)
2	0.47400	23.6	----	20.2	43.8	----	56.4	----	12.6	----	H(QP)
3	1.56400	16.4	----	20.2	36.6	----	56.0	----	19.4	----	H(QP)
4	3.23200	15.0	----	20.3	35.3	----	56.0	----	20.7	----	H(QP)
5	9.25000	14.8	----	20.3	35.1	----	60.0	----	24.9	----	H(QP)
6	24.38000	18.8	----	20.4	39.2	----	60.0	----	20.8	----	H(QP)
7	0.15800	----	12.0	20.2	----	32.2	----	55.6	----	23.4	H(CAV)
8	0.47400	----	11.5	20.2	----	31.7	----	46.4	----	14.7	H(CAV)
9	1.56400	----	3.3	20.2	----	23.5	----	46.0	----	22.5	H(CAV)
10	3.23200	----	2.8	20.3	----	23.1	----	46.0	----	22.9	H(CAV)
11	9.25000	----	2.8	20.3	----	23.1	----	50.0	----	26.9	H(CAV)
12	24.38000	----	4.2	20.4	----	24.6	----	50.0	----	25.4	H(CAV)

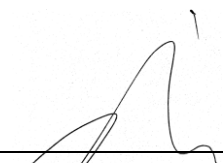
Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.17300	31.8	----	20.2	52.0	----	64.8	----	12.8	----	N (QP)
2	0.47400	25.6	----	20.2	45.8	----	56.4	----	10.6	----	N (QP)
3	1.12800	16.4	----	20.2	36.6	----	56.0	----	19.4	----	N (QP)
4	3.13200	16.1	----	20.3	36.4	----	56.0	----	19.6	----	N (QP)
5	6.74500	15.5	----	20.4	35.9	----	60.0	----	24.1	----	N (QP)
6	25.96000	17.9	----	20.4	38.3	----	60.0	----	21.7	----	N (QP)
7	0.17300	----	12.4	20.2	----	32.6	----	54.8	----	22.2	N (CAV)
8	0.47400	----	13.8	20.2	----	34.0	----	46.4	----	12.4	N (CAV)
9	1.12800	----	3.8	20.2	----	24.0	----	46.0	----	22.0	N (CAV)
10	3.13200	----	2.7	20.3	----	23.0	----	46.0	----	23.0	N (CAV)
11	6.74500	----	1.9	20.4	----	22.3	----	50.0	----	27.7	N (CAV)
12	25.96000	----	6.2	20.4	----	26.6	----	50.0	----	23.4	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.


Tested by: Jun-Hui, Lee / Senior Engineer

5.2 Radiated Emission Test

5.2.1 Operation frequency band: (13.553 ~ 13.567) MHz

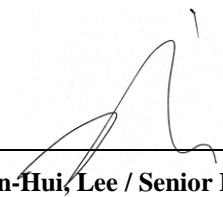
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 50 % R.H. Temperature: 22 °C
 Limits apply to : PART 15, SUBPART C, SECTION 15.225(a)
 Type of Test :
 Result : PASSED

EUT : Mobile Payment Terminal Date: August 25, 2015
 Operating Condition : Transmitting Mode
 Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)
 Distance : 3 m

Radiated Emission		Ant	Correction Factors		Total	RESULT	
Freq. (MHz)	Amplitude (dBµV)	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
13.56	47.41	H	18.4	0.3	66.11	124	57.89
13.56	44.16	V	18.4	0.3	62.86	124	61.14

Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.



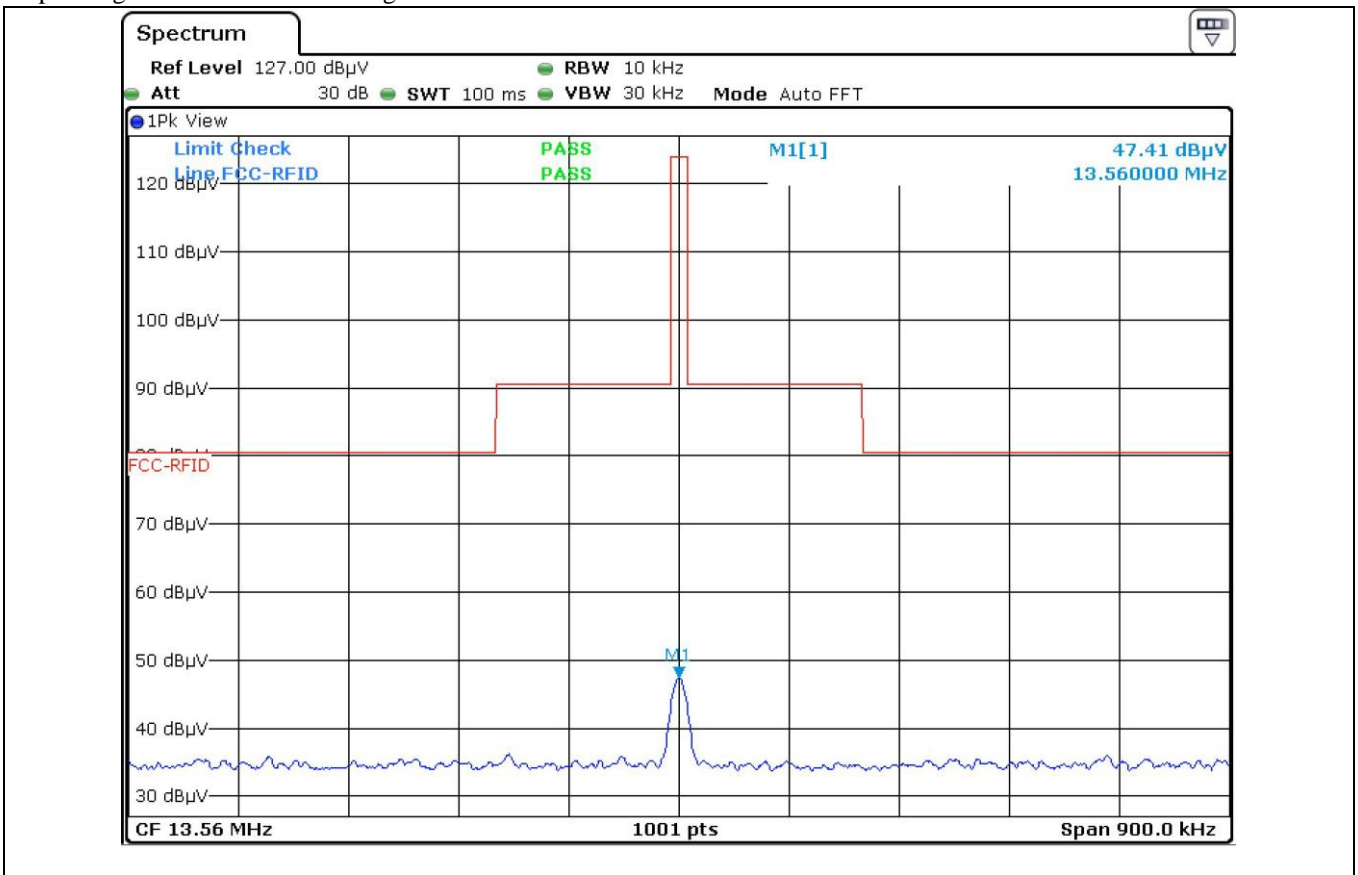
Tested by: Jun-Hui, Lee / Senior Engineer

5.2.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 50 % R.H. Temperature: 22 °C
 Limits apply to : PART 15, SUBPART C, SECTION 15.225(b) and (c)
 Type of Test :
 Result : PASSED

EUT : Mobile Payment Terminal Date: August 25, 2015
 Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.56MHz is 47.41 dBuV/m and the worst limit subject to 15.225 (b) and (c) is nothing emission signals. so the EUT meets the requirement.

[Signature]
Tested by: Jun-Hui, Lee / Senior Engineer

5.3 Spurious Emission Test

5.3.1 Test data for Adapter

5.3.1.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 50 % R.H. Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.225(d)

Type of Test :

Frequency Range : 9 kHz ~ 30 MHz

Result : PASSED

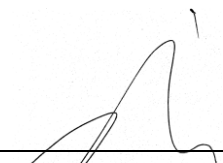
EUT : Mobile Payment Terminal

Date: August 25, 2015

Operating Condition : Transmitting Mode

Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Jun-Hui, Lee / Senior Engineer

5.3.1.2 Spurious Radiated Emission below 1 GHz

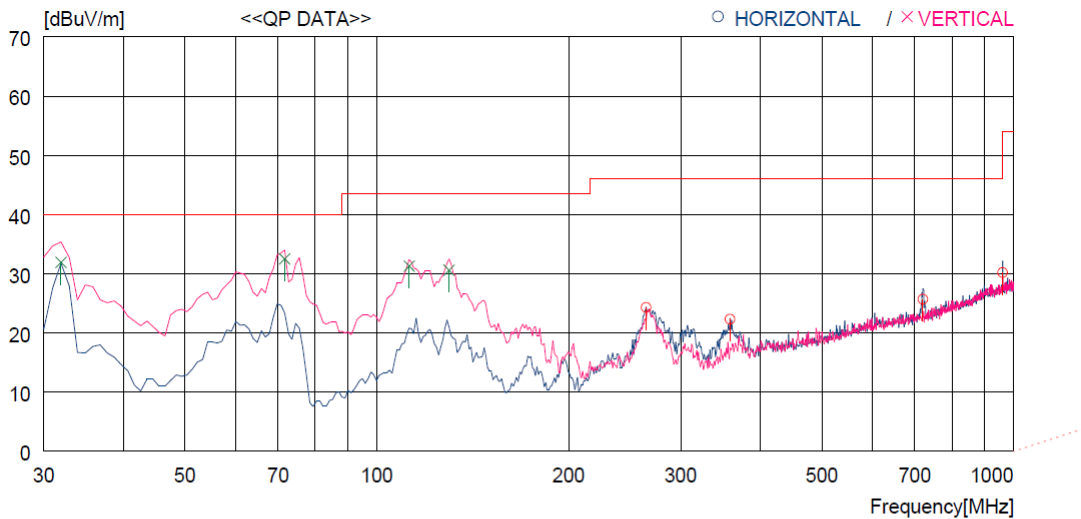
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 50 % R.H. Temperature: 23 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.225(d)
 Type of Test :
 Frequency range : 30 MHz ~ 1 000 MHz
 Result : PASSED

EUT : Mobile Payment Terminal Date: August 25, 2015

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	264.740	39.6	12.8	4.7	32.8	24.3	46.0	21.7	100	215
2	358.830	34.4	14.9	5.6	32.6	22.3	46.0	23.7	100	187
3	720.634	31.3	19.9	8.2	33.7	25.7	46.0	20.3	100	208
4	961.187	30.4	22.5	9.5	32.2	30.2	54.0	23.8	100	346
----- Vertical -----										
5	31.940	51.3	11.7	1.7	32.8	31.9	40.0	8.1	100	271
6	71.710	53.8	9.4	2.4	33.1	32.5	40.0	7.5	200	359
7	112.450	50.6	10.9	3.1	33.3	31.3	43.5	12.2	100	0
8	129.910	51.2	9.2	3.3	33.1	30.6	43.5	12.9	100	0

Tested by: Jun-Hui, Lee / Senior Engineer

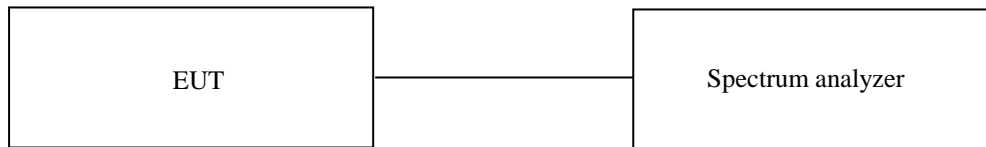
5.4 20 dB BANDWIDTH

5.4.1 Operating environment

Temperature : 22 °C
 Relative humidity : 50 % R.H.

5.4.2 Test set-up

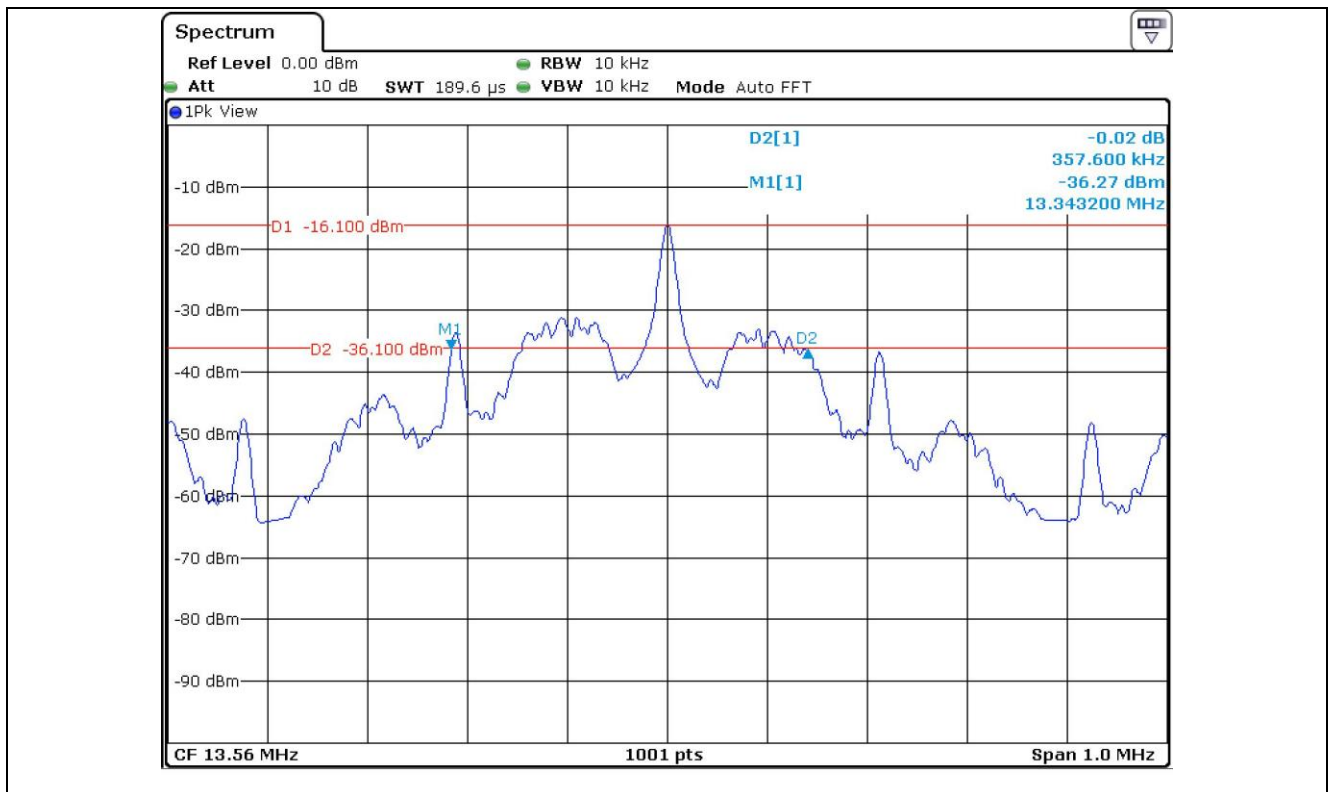
The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



5.4.3 Test data

- Test Date : August 25, 2015
- Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.215(c)

Operating Freq. (MHz)	Measured Value (kHz)	Assigned Operating Frequency Band (kHz)	Result
13.56	357.6	900	PASS



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5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.5.1 Operating environment

Temperature : 22 °C
 Relative humidity : 50 % R.H.


5.5.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50°C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

5.5.3 Test data

-. Test Date : August 25, 2015
 -. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 560 000	13 559 859	1 497	± 1 356
-10		13 559 873	1 483	
0		13 559 895	1 461	
10		13 559 911	1 445	
20		13 559 923	1 433	
30		13 559 935	1 421	
40		13 559 951	1 405	
50		13 559 988	1 368	



Tested by: Jun-Hui, Lee / Senior Engineer

5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.6.1 Operating environment

Temperature : 22 °C
 Relative humidity : 50 % R.H.

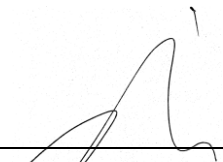
5.6.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

5.6.3 Test data

-. Test Date : August 25, 2015
 -. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
6.29(85 %)	13 560 000	13 559 921	1 435	± 1 355.99
7.40(100 %)		13 559 923	1 433	
8.51(115%)		13 559 926	1 430	



Tested by: Jun-Hui, Lee / Senior Engineer

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

+ Meter reading	(dB μ V)
- Amplifier Gain	(dB)
+ Cable Loss	(dB)
- Antenna Factor	(dB/m)
<hr/>	
= Corrected Result	(dB μ V/m)

Margin (dB)

Specification Limit	(dB μ V/m)
- Corrected Result	(dB μ V/m)
<hr/>	
= dB Relative to Spec	(\pm dB)

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101012	Nov. 03, 2014	One Year	■
2.		R/S	ESU	100261	Apr. 29, 2015	One Year	■
3.		R/S	ESPI	101278	Nov. 03, 2014	One Year	■
4.	Spectrum analyzer	R/S	FSV30	101372	April 29, 2015	One Year	■
5.	Amplifier	Sonoma Instrument	310N	312544	Apr. 29, 2015	One Year	■
6.	Amplifier	Sonoma Instrument	310N	312545	Apr. 29, 2015	One Year	■
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	May 02, 2014	Two Year	■
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-421	Jul. 10, 2014	Two Year	■
9.	Controller	Innco System	CO2000	619/27030611/L	N/A	N/A	■
10.	LISN	EMCO	3825/2	9109-1867	Apr. 29, 2015	One Year	■
				9109-1869	Apr. 29, 2015	One Year	-
		Schwarzbeck	NSLK8126	8126-404	Apr. 29, 2015	One Year	-
		Schwarzbeck	NSLK8128	8128-216	Apr. 06, 2015	One Year	■
11.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
12.	Antenna Master	Innco System	MA4000-EP	MA4000/332	N/A	N/A	■
13.	Antenna Master	Innco System	MA4000-EP	MA4000/335	N/A	N/A	■
14.	Loop Antenna	R/S	HFH2-Z2	879285/26	Dec. 09, 2014	Two Year	■
15.	Frequency Counter	HP	53152A	US39270295	Oct. 08, 2014	One Year	■
16.	Chamber	Sam Kun	SSE-43CI-A	060712	May 15, 2015	One Year	■
17.	DC Power Supply	Digital Electronics	DRP-305DN	4030195	Sep. 03, 2015	One Year	■