

# TEST REPORT

<b>DT&amp;C Co., Ltd.</b> 42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel : 031-321-2664, Fax : 031-321-1664	Report No : DRTFCC1512-0275 Pages:(1) / (16) page	
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1. Customer

- Name : POINTMOBILE CO., LTD.
- Address : Gasan-dong B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu, Seoul, Korea 153-709

2. Use of Report : FCC & IC Original Grant

3. Product Name (FCCID, IC) : Mobile Computer (V2X-PM80G, 10664A-PM80G)

4. Date of Test : 2015-10-14 ~ 2015-11-10

5. Test Method Used : FCC Part 15.225, RSS-210 issue 8

6. Testing Environment : See appended test report

7. Test Result :  Pass  Fail

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Name : Jaejin Lee (Signature)	Technical Manager Name : Bongjin Kim (Signature)
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2015 . 12 . 29 .

DT&C Co., Ltd.

## Test Report Version

Test Report No.	Date	Description
DRTFCC1512-0275	Dec, 29. 2015	Initial issue

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## 1. General Information

### 1.1 Testing Laboratory

DT&C Co., Ltd.			
	Standard	Site number	Address
FCC	<input checked="" type="checkbox"/>	165783	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	804488	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	596748	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	678747	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
IC	<input checked="" type="checkbox"/>	5740A-3	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	<input type="checkbox"/>	5740A-2	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
<a href="http://www.dtnc.net">www.dtnc.net</a>			
Telephone	:	+ 82-31-321-2664	
FAX	:	+ 82-31-321-1664	

### 1.2. Details of Applicant

Applicant : POINTMOBILE CO., LTD.  
 Address : Gasan-dong B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu,  
 Seoul, Korea 153-709  
 Contact person : W.S. Park

### 1.3. Description of EUT

FCC Equipment Class	Low Power Communications Device Transmitter(DXX)
EUT	Mobile Computer
Model Name	PM80
Add Model Name	CHD8, XT2, APT1
Hardware version	ReV 4
Software version	80.00
Serial Number	Identical prototype
Power Supply	Li-ion Battery: DC 3.8 V
Frequency Band	13.56 MHz
Modulation Type	ASK
Channel(s)	1
Antenna type	Loop Antenna

## 2. Information about test items

### 2.1 Test mode

Test mode1	Continuous transmitting mode
Test mode2	-

Note: For this test mode, a test program was supported by manufacturer.

### 2.2 Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

### 2.3 Tested frequency

Channel	TX Frequency (MHz)	RX Frequency (MHz)
Lowest	13.56	13.56
Middle	-	-
Highest	-	-

### 2.4 Tested environment

Temperature	:	21 ~ 24 °C
Relative humidity content	:	40 ~ 42 % R.H.
Details of power supply	:	DC 3.8 V

### 2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing

→ None

## 3. Antenna requirements

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

The antenna is attached to the battery cover, and antenna is coupled use the special tension.  
Therefore this E.U.T Complies with the requirement of §15.203

## 4. Test report

### 4.1 Summary of tests

FCC part section(s)	RSS section(s)	Parameter	Limit	Test condition	Status Note 1
2.1049	-	20 dB Bandwidth	-		C
-	RSS-Gen [ 6.6 ]	Occupied Bandwidth	-		C
15.225 (a)	RSS-210 [ A2.6 (a) ]	In-Band Emissions	15,848 $\mu$ V/m @ 30 m 13.553 – 13.567 MHz		
15.225 (b)	RSS-210 [ A2.6 (b) ]	In-Band Emissions	334 $\mu$ V/m @ 30 m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		C
15.225 (c)	RSS-210 [ A2.6 (c) ]	In-Band Emissions	106 $\mu$ V/m @ 30 m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		C
15.225 (d) 15.209	RSS-210 [ A2.6 (d) ]	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		C
15.225 (e)	RSS-210 [ A2.6 ]	Frequency Stability	$\pm$ 0.01 % of operating frequency	Temp & Humid Test Chamber	C
15.207	RSS-Gen [ 8.8 ]	AC Conducted Emissions	FCC Part 15.207	AC Line Conducted	C
15.203	-	Antenna Requirements	FCC Part 15.203	-	C

Note 1: **C**=Comply    **NC**=Not Comply    **NT**=Not Tested    **NA**=Not Applicable

The sample was tested according to the following specification:  
ANSI C-63.10-2013

## 4.2 Transmitter requirements

### 4.2.1 20dB bandwidth

#### - Procedure:

The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

#### - Measurement Data: Comply



#### - Minimum Standard: NA

## 4.2.2 Occupied bandwidth

### - Procedure:

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 x RBW.

### - Measurement Data: Comply



### - Minimum Standard: NA

#### 4.2.3 In-band emissions

##### - Procedure:

The EUT was placed on a 0.8 m high non-conductive table inside a 3 m semi anechoic chamber. An antenna was placed at 3 m distance from the EUT. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions. A loop antenna was used for this test item. And the loop antenna was rotated about vertical axis.

##### - Measurement Data: **Comply**

Tested Frequency : 13.56 MHz  
 Measurement Distance : 3 Meters

Test Frequency Band [MHz]	Freq. [MHz]	EUT Posi.	Reading Level [dBuV]	T.F	Field Strength @3 m [dBuV/m]	Field Strength @30 m [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.110 ~ 13.410	13.348	Z	21.80	20.20	42.00	2.00	40.51	38.51
13.410 ~ 13.553	13.553	Z	34.30	20.20	54.50	14.50	50.47	35.97
13.553 ~ 13.567	13.560	Z	39.10	20.20	59.30	19.30	84.00	64.70
13.567 ~ 13.710	13.568	Z	29.90	20.20	50.10	10.10	50.47	40.37
13.710 ~ 14.010	13.771	Z	20.50	20.20	40.70	0.70	40.51	39.81

**Note 1.** This test item was performed using a loop antenna.

**Note 2.** This test item was performed at 3 m and the data were extrapolated to the specified measurement distance of 30 m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)2.

▪ Extrapolation Factor =  $20 \log_{10}(30/3)^2 = 40$  dB

**Note 3.** All data were recorded using a spectrum analyzer employing a peak detector.

If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

**Note 4.** Sample Calculation.

Margin = Limit – Field Strength @ 30 m / Field Strength @ 30 m = Field Strength @ 3 m – 40 dB

Field Strength @ 3 m = Reading + T.F / T.F = AF + CL – AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

##### - Minimum Standard: Part 15.225(a), (b), (c)& RSS-210 [ A2.6(a), (b), (c) ]

Frequency Band [MHz]	Limit	
	[uV/m]	[dBuV/m]
13.553-13.567	15,848	84.00
13.410-13.553	334	50.47
13.567-13.710		
13.110-13.410	106	40.51
13.710-14.010		

#### 4.2.4 Out-of-band emissions

**- Procedure:**

The EUT was tested from 9 kHz up to the 1 GHz excluding the band 13.110-14.010 MHz. All measurements were recorded with spectrum analyzer employing a peak detector for emissions below 30 MHz. Above 30 MHz a Quasi-peak detector was used. All out-of-band emissions must not exceed the limits §15.209. A loop antenna was used for searching for emissions below 30 MHz.

**- Measurement Data: Comply**

Tested Frequency : 13.56 MHz  
 Measurement Distance : 3 Meters

Frequency [MHz]	EUT Posi.	ANT Pol	Reading [dBuV]	T.F [dB/m]	Distance factor	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
1.523	Z	N/A	28.2	19.30	40	7.5	24	16.5
3.284	Z	N/A	18.8	19.30	40	-1.9	29.5	31.4
5.374	Z	N/A	15.3	19.60	40	-5.1	29.5	34.6
26.120	Z	N/A	9.3	20.30	40	-10.4	29.5	39.9
40.670	Z	V	35.4	-16.60	0	18.8	40	21.2
49.643	Z	V	32.6	-16.10	0	16.5	40	23.5
67.709	Z	V	33.1	-17.80	0	15.3	40	24.7
176.224	Z	V	30.5	-15.50	0	15	43.5	28.5

**Note 1.** All measurements were recorded using a spectrum analyzer employing a peak detector for below 30 MHz and a Quasi-peak detector for above 30 MHz.

**Note 2.** Both Vertical and Horizontal polarities of the receiver antenna were evaluated with the worst case emissions being reported. For 30 MHz below the loop antenna was rotated about vertical axis.

**Note 3.** No other spurious and harmonic emissions were reported greater than listed emissions above table.

**Note 4.** Sample calculation

$$\text{Margin} = \text{Limit} - \text{Field Strength}$$

$$\text{Field Strength} = \text{Reading} + \text{T.F} - \text{Distance factor}$$

$$\text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

$$\text{Distance factor} = 20\log(\text{Measurement distance} / \text{The measured distance})^2$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

**- Minimum Standard: Part 15.209, 225(d) & RSS-210[ A2.6 (d) ]**

**- FCC Part 15.209(a):**

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	200	3

\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

**- FCC Part 15.209(b):**

In the emission table above, the tighter limit applies at the band edges.

#### 4.2.5 Frequency Stability

**- Procedure:**

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01 % of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

**- Measurement Data: Comply**

Operating Frequency : 13,560,000 Hz

VOLTAGE (%)	POWER (V <sub>DC</sub> )	TEMP (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.80	+20(ref)	13,559,340	-660	0.004867
100%		-30	13,559,373	-627	0.004624
100%		-20	13,559,354	-646	0.004764
100%		-10	13,559,362	-638	0.004705
100%		0	13,559,371	-629	0.004639
100%		+10	13,559,364	-636	0.004690
100%		+20	13,559,340	-660	0.004867
100%		+30	13,559,347	-653	0.004816
100%		+40	13,559,297	-703	0.005185
100%		+50	13,559,258	-742	0.005472
115%	4.37	+20	13,559,334	-666	0.004912
BATT.ENDPOINT	3.50	+20	13,559,337	-663	0.004890

**- Minimum Standard: Part 15. 225(e) & RSS-210 [ A2.6 ]**

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01$  % of the operating frequency.

#### 4.2.6 AC Line Conducted Emissions

##### - Test Requirements and limit

For an intentional radiator that is designed to be connected to the public utility (AC)power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

\* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

#### Test Configuration

See test photographs for the actual connections between EUT and support equipment.

#### TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

- Measurement Data: **Comply** (refer to the next page)

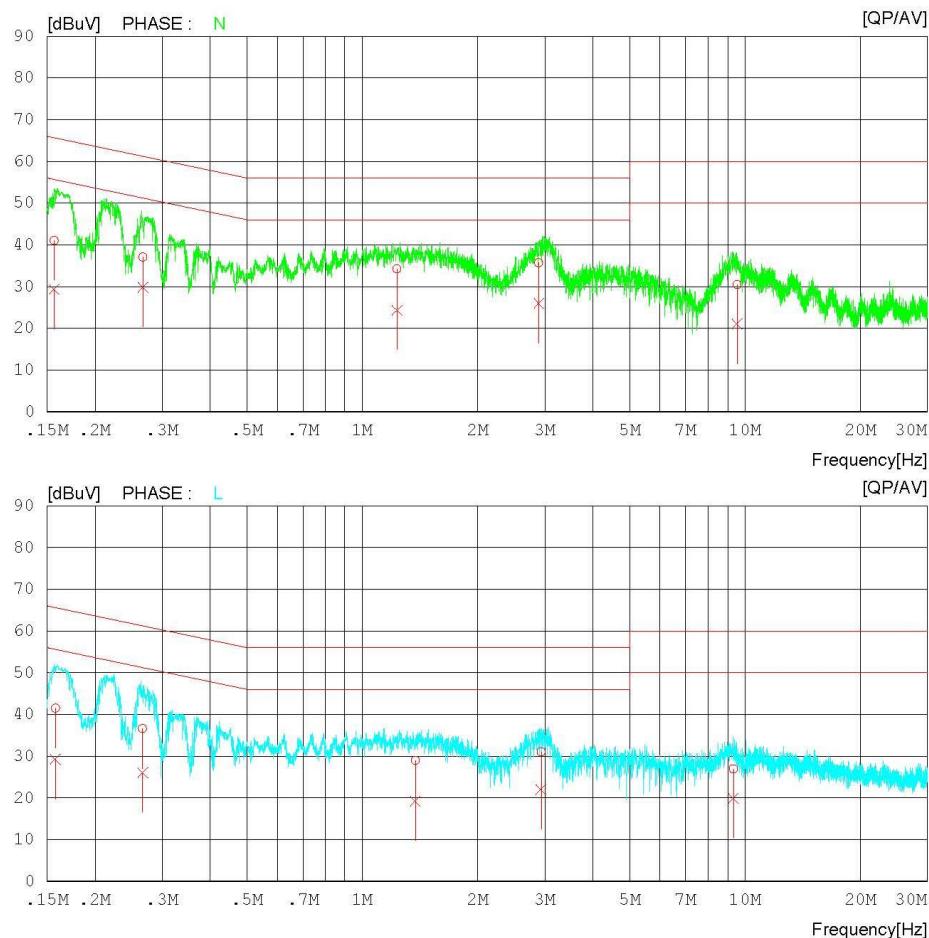
## Measurement Data (With Dummy Load)

### Results of Conducted Emission

DTNC

Date : 2015-10-27

Order No.	:	PM80	Reference No.	:
Model No.	:	Identical prototype	Power Supply	:
Serial No.	:		Temp/Humi.	:
Test Condition	:	NFC	Operator	:
Memo :				
LIMIT : CISPR22_B QP CISPR22_B AV				



## Measurement Data

### Results of Conducted Emission

DTNC

Date : 2015-10-27

Order No.	:		Reference No.	:	
Model No.	:	PM80	Power Supply	:	120V / 60Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	21 'C / 42 % R.H.
Test Condition	:	NFC	Operator	:	J.J.LEE

Memo :

LIMIT : CISPR22\_B QP  
CISPR22\_B AV

NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN [dBuV]	PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]		
1	0.15658	30.9	19.2	10.1	41.0	29.3	65.6	55.6	24.6	26.3 N
2	0.26680	27.0	19.7	10.1	37.1	29.8	61.2	51.2	24.1	21.4 N
3	1.23120	24.0	14.1	10.2	34.2	24.3	56.0	46.0	21.8	21.7 N
4	2.89240	25.5	15.7	10.2	35.7	25.9	56.0	46.0	20.3	20.1 N
5	9.53200	19.9	10.5	10.6	30.5	21.1	60.0	50.0	29.5	28.9 N
6	0.15768	31.3	19.1	10.1	41.4	29.2	65.6	55.6	24.2	26.4 L
7	0.26645	26.4	15.9	10.1	36.5	26.0	61.2	51.2	24.7	25.2 L
8	1.37660	18.8	9.0	10.2	29.0	19.2	56.0	46.0	27.0	26.8 L
9	2.93240	20.8	11.7	10.2	31.0	21.9	56.0	46.0	25.0	24.1 L
10	9.31620	16.3	9.3	10.6	26.9	19.9	60.0	50.0	33.1	30.1 L

# **APPENDIX**

## **TEST EQUIPMENT FOR TESTS**

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent Technologies	N9020A	15/08/19	16/08/18	MY50200867
Dynamic Measurement DC Source	Agilent	66332A	15/09/09	16/09/09	MY43000440
Vector Signal Generator	R&S	SMBV100A	15/01/06	16/01/06	25571
Multimeter	FLUKE	17B	15/04/27	16/04/27	26030065WS
Temp & Humi Test Chamber	SJ Science	SJ-TH-S50	15/10/19	16/10/19	SJ-TH-S50-130930
Thermohygrometer	BODYCOM	BJ5478	15/02/26	16/02/26	1209
Low Noise Pre Amplifier	TSJ	MLA-010K01-B01-27	15/04/09	16/04/09	1844538
Loop Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test-Antenna	Schwarzbeck	VULB 9160	14/04/30	16/04/30	3358
EMI TEST RECEIVER	R&S	ESR7	15/10/19	16/10/19	101109
EMI TEST RECEIVER	R&S	ESCI	15/02/25	16/02/25	100364
SINGLE-PHASE MASTER	NF	4420	15/09/09	16/09/09	3049354420023
ARTIFICIAL MAINS NETWORK	Narda S.T.S. / PMM	PMM L2-16B	15/06/26	16/06/26	000WX20305