



CTK Co., Ltd.
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CTK Co., Ltd.

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TEST REPORT For FCC

Test Report No. : CTK-2015-00377
Date of Issue : 2015-03-25
FCC ID : P4Y365PLUS
Model/Type No. : 365plus
Kind of Product : Digital door lock
Applicant : Samsung SDS Co., Ltd.
Applicant Address : 125, Olympic-ro 35-gil, Songpa-gu, Seoul, Korea
Manufacturer : Meta Networks Co., Ltd.
Manufacturer Address : 55, Galmachi-ro 281beon-gil, Jungwon-gu, Seongnam-si, Gyeonggi-do, Korea
Contact Person : Yu Seungkwan / Advisory Engineer
Telephone : +82-2-6155-5105
Received Date : 2015-03-12
Test period : Start : 2015-03-17 End : 2015-03-25
Test Results : ☒ In Compliance ☐ Not in Compliance

The test results presented in this report relate only to the object tested.

Tested by

Won-Jae, Hwang
Test Engineer
Date: 2015-03-25

Reviewed by

Young-Joon, Park
Technical Manager
Date: 2015-03-25



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REPORT REVISION HISTORY

Date	Revision	Revision
2015-03-25	Issued (CTK-2015-00377)	

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1.0 General Product Description

1.0.1 Tested Equipment

- ☒ Unless otherwise indicated, all tests were conducted on Model 365plus
- ☐ Tests performed on Model _____ were considered to be representative of Model(s) _____.

1.0.2 Equipment Size, Mobility and Identification

Dimensions: Exterior Unit : 58(W) by 113(H) by 16.8(D) ☒ mm
Interior Unit : 70.4(W) by 163.8(H) by 38(D) ☒ mm

Mobility: ☐ Portable ☐ Table-top ☒ Built-in
☐ Floor-standing

Serial No.: Prototype

1.0.3 Electrical Ratings

Input : 6 Vdc (4 AA Alkaline 1.5 V Batteries (LR6))
Output : -

1.0.4 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage: 6 Vdc (Battery)
Frequency: -

1.0.5 Clock & Other Frequencies Utilized

16 MHz, 13.56 MHz

1.1 Model Differences

Not applicable

1.2 Device Modifications

Not applicable

1.3 EUT Configuration(s)

See Appendix A for individual test set-up configuration(s). The following peripheral devices and/or interface cables were connected during the measurement:

☒ Peripheral Devices

Device	Model No.	Serial No.	Manufacturer
-	-	-	-

1.4 Test Software

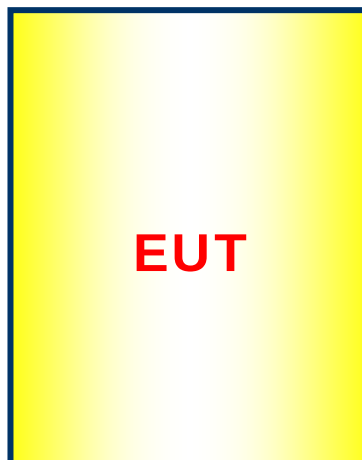
- ☐ EMC Test V 1.0
☐ Display Test Patterns – V1.5
☐ Ping.exe
☒ Not applicable

1.5 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

- ☐ Standby
☐ Display circles pattern
☒ Practice operation – EUT transmitting at 13.56 MHz continuously
☐ Scrolling 'H'
☐ Read / Write

1.6 Configuration





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1.7 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.8 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.9 Measurement Procedure

Preliminary AC power line conducted emissions tests were performed shielded room.

To find worst mode, several typical mode and typical cable position were tested.

Final AC power line conducted emissions test was performed shielded room. (location is same as Preliminary test)

Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

Preliminary radiated emissions test were performed anechoic chamber (Distance of antenna and EUT was 3 m). To find worst mode, several typical mode and typical cable position were tested and peak level and frequency were recorded.

Final radiated emissions test was performed Open Area Test Site. Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

* Measurement procedures was In accordance with ANSI C63.4-2003 7.2.3, 7.2.4, 8.3.1.1, 8.3.1.2



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1.10 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 m & 10 m SAC and Conducted Test Site to perform FCC Part 15/18 measurements	 805871
JAPAN	VCCI	3 m & 10 m SAC and Conducted Test Site	 R-948, C-986, T-1843
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	 No. 51, KR0025
International	KOLAS	EMC	



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2.0 Emissions Test Regulations

The emissions tests were performed according to following regulations:

☐ EN 61000-6-3:2007

☐ EN 61000-6-4:2007

☐ EN 55011:2007 +A2:2007

☐ Group 1

☐ Class A

☐ Group 2

☐ Class B

☐ EN 55013:2001 +A1:2003 +A2:2006

☐ EN 55014-1:2006

☐ EN 55015:2006

☐ EN 61204-3:2000

☐ Class A

☐ Class B

☐ EN 61131-2:2003

☐ EN 61326-1:2006

☐ Class A

☐ Class B

☐ EN 55022:2006

☐ Class A

☐ Class B

☐ EN 61000-3-2:2006

☐ EN 61000-3-3:1995 +A1:2001 +A2:2005

☐ VCCI V-3/2008.04

☐ Class A

☐ Class B

☐ AS/NZS CISPR22:2006

☐ Class A

☐ Class B

☒ FCC Part 15 Subpart C

☐ CISPR 22:2006

☐ Class A

☐ Class B

2.1 Radiated Electric Field Emissions - 15.225(a)

Reference Standard

FCC Part 15.225(a)

Test Date

2015-03-19

Test Location

☒ EMI-Anechoic chamber with a conductive ground plane:
Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2015-12-05
☒	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-06-13

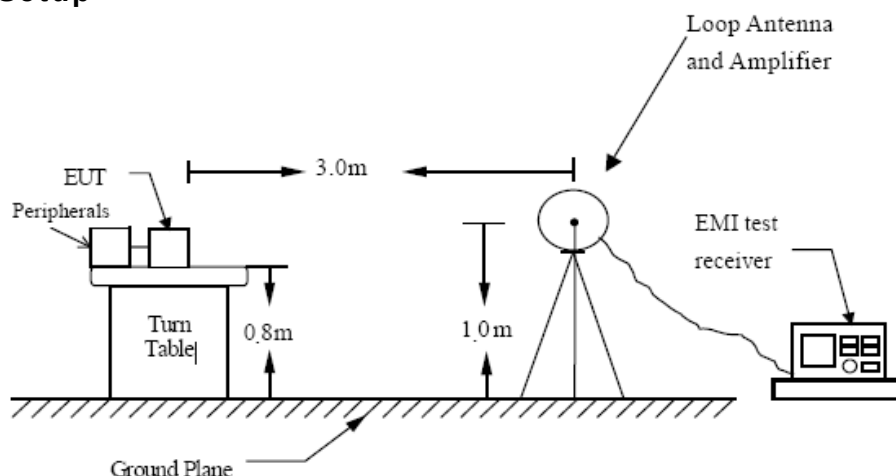
Frequency Range of Measurement

13.553 MHz to 13.567 MHz

Instrument Settings

IF Band Width: 10 kHz

Test Setup





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Measurement Procedure(blow 30 MHz)

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. Three orientation for the EUT were tried to find out which orientation produces the worst emissions.
3. The loop antenna was also moved around to find out worst position for the emissions.
4. Set the spectrum analyzer in the following setting as:
For Below 30 MHz :
RBW = 9 kHz / VBW = 300 kHz / Sweep = AUTO
5. Repeat above procedures until the measurements for all frequencies are complete.

Radiated emission limits

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

Test Results

Frequency (MHz)	Field Strength of Fundamental uV / m @ 30 m	Field Strength of Fundamental dBuV / m @ 30 m	Field Strength of Fundamental dBuV / m @ 3 m
13.553-13.567	0.73	-2.7	37.30

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data

1. The field strength of spurious emission was measured in the following position: EUT Antenna stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.



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2.2 Radiated Electric Field Emissions - 15.225(b)(c)

Reference Standard

FCC Part 15.225(b)(c)

Test Date

2015-03-19

Test Location

☒ EMI-Anechoic chamber with a conductive ground plane:
Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2015-12-05
☒	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-06-13

Frequency Range of Measurement

13.410 MHz to 13.553 MHz, 13.567 MHz to 13.710 MHz

13.110 MHz to 13.410 MHz, 13.710 MHz to 14.010 MHz

Instrument Settings

IF Band Width: 10 kHz

Radiated emission limits

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 uV/m 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 uV/m at 30 meters.

Test Results

Frequency (MHz)	Field Strength of Fundamental uV / m @ 30 m	Field Strength of Fundamental dBuV / m @ 30 m	Field Strength of Fundamental dBuV / m @ 3 m
13.410-13.553	0.02	-35.45	4.55
13.567-13.710	0.02	-35.80	4.20
13.110-13.410	0.15	-16.61	23.39
13.710-14.010	0.15	-16.67	23.33

The requirements are:

- ☒ MET
☐ NOT MET
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2.3 Radiated Electric Field Emissions - 15.225(d)

Reference Standard

FCC Part 15.225(d), 15.209

Test Date

2014-10-15

Test Location

☒ EMI-Anechoic chamber with a conductive ground plane:
Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2015-12-05
☒	Bilog Antenna	Schaffner	CBL6111C	2551	2016-05-08
☒	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-06-13

Frequency Range of Measurement

9 kHz to 1000 MHz

Instrument Settings

IF Band Width: 10 kHz (9 kHz to 30 MHz)

IF Band Width: 120 kHz (30 MHz to 1000 MHz)

Measurement Procedure(above 30 MHz)

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
For 30 MHz ~ 1000 MHz :
RBW = 120 kHz / VBW = 300 kHz / Sweep = AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.



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Radiated emission limits

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
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

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

Test Results

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data

2.4 Frequency Stability – 15.225(e)

Reference Standard

FCC Part 15.225(e)

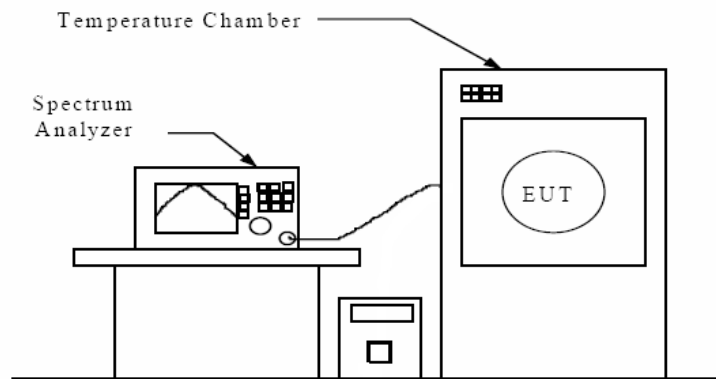
Test Date

2015-03-23

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2015-11-07
☒	Temp & Humi Chamber	Kunpoong Engineering	JT-TH-556-2	9 Q E 5 - 0 0 3	2016-01-16

Test Setup



Test Procedure

A. Frequency stability vs. temperature measurement

- The EUT was placed into the constant temperature chamber.
- The spectrum analyzer was used to read the EUT operating frequency.
- Set the constant temperature chamber temperature within the range of -20 °C to +50 °C

B. Frequency stability vs. input voltage measurement

- The EUT was placed into the constant temperature chamber and set the temperature to 20 °C.
- The spectrum analyzer was used to read the EUT operating frequency.
- The EUT is powered with the DC Power Supplied it with 85% and 115% voltage, and measured the EUT operating frequency.



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Frequency tolerance Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 °C to +50 °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 °C.

- Operating frequency : 13.56 MHz
- Limit : 13.56 MHz * (±) 0.0001 = (±) 1356 Hz
- Within the band : 13.558644 MHz – 13.561356 MHz.

Test Data

Timing	-20 °C	-10 °C	0 °C	10 °C	20 °C	30 °C	40 °C	50 °C
Start-up	13.560201	13.560205	13.560207	13.560210	13.560207	13.560215	13.560216	13.560219
10 min	13.560232	13.560239	13.560225	13.560230	13.560246	13.560249	13.560239	13.560244
30 min	13.560226	13.560229	13.560225	13.560227	13.560215	13.560216	13.560211	13.560209

Timing	Power 85 %	Power 115 %
Start-up	Not Applicable (Battery Power)	Not Applicable (Battery Power)
10 min	Not Applicable (Battery Power)	Not Applicable (Battery Power)
30 min	Not Applicable (Battery Power)	Not Applicable (Battery Power)

Test Results

The requirements are:

- ☒ MET
- ☐ NOT MET
- ☐ NOT APPLICABLE



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2.5 Conducted Voltage Emissions – 15.207

Reference Standard

FCC Part 15.207

Test Date

Not Applicable (Battery Power)

Test Location

Shielded Room

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☐	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2015-12-05
☐	LISN	Rohde & Schwarz	ENV216	101235	2015-07-30
☐	LISN	Rohde & Schwarz	ENV216	101236	2015-07-30

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Conducted Emission limits

Frequency of Emission (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

Test Results

The requirements are:

☐ MET

Frequency (MHz)	Measured Data (dBuV)	Margin (dB)	Remark
-	-	-	-

☐ NOT MET

☒ NOT APPLICABLE



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APPENDIX A – TEST DATA

[HOT]

Not Applicable

Not Applicable



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[NEUTRAL]

Not Applicable

Not Applicable

APPENDIX A – TEST DATA

Radiated Electric Field Emissions (Quasi-Peak reading)

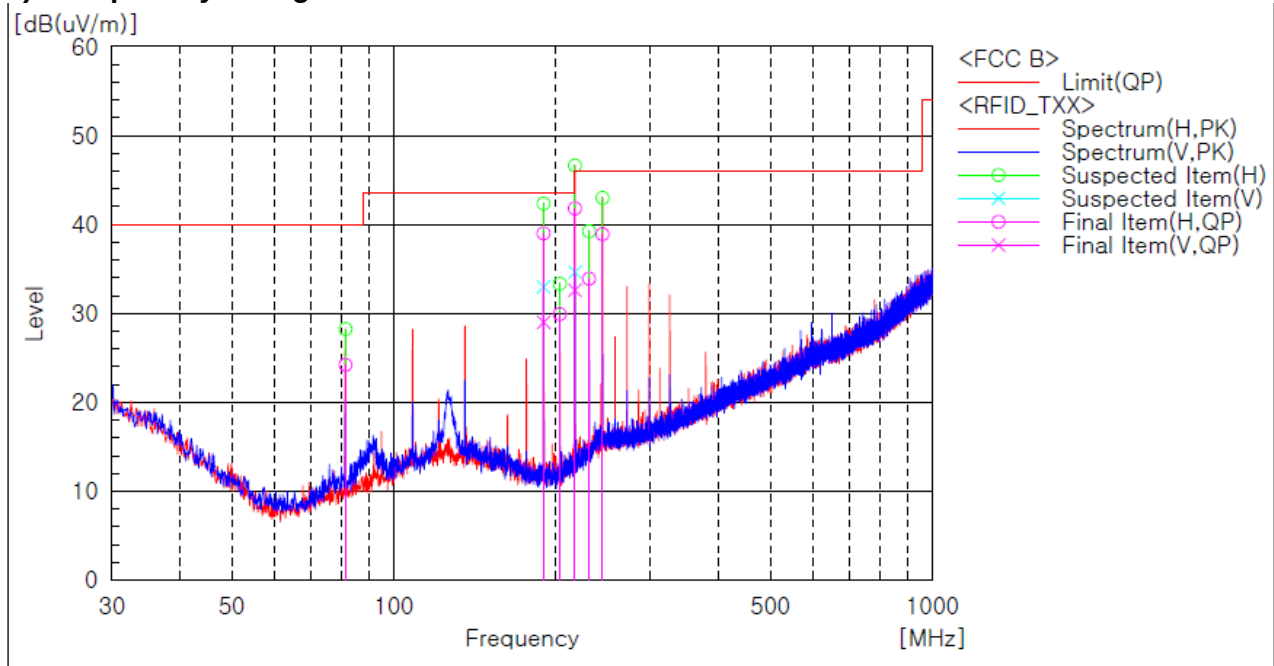
1) Fundamental Frequency Test Data

Frequency [MHz]	Reading [dBuV/m@3m]	Height [m]	Correction Factor		Limit [dBuV/m@3m]	Result [dBuV/m@3m]	Margin [dB]
			ANT[dB/m]	Cable[dB]			
13.56	21.35	1.00	20.20	6.20	93.5	37.30	56.2

2) Frequency Range from 9 kHz to 30 MHz Test Data

Frequency	Reading	Height	Correction Factor		Limit	Result	Margin
[MHz]	[dBuV/m@3m]	[m]	ANT[dB/m]	Cable[dB]	[dBuV/m@3m]	[dBuV/m@3m]	[dB]
No detected emissions.							

3) Frequency Range from 30 MHz to 1000 MHz Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	81.410	H	40.6	-16.4	24.2	40.0	15.8	195.0	313.0	
2	189.808	H	53.2	-14.2	39.0	43.5	4.5	195.0	276.0	
3	189.808	V	43.2	-14.2	29.0	43.5	14.5	208.0	158.0	
4	203.388	H	44.0	-14.1	29.9	43.5	13.6	100.0	46.0	
5	216.968	H	54.8	-13.0	41.8	46.0	4.2	100.0	9.0	
6	216.968	V	45.6	-13.0	32.6	46.0	13.4	208.0	158.0	
7	230.548	H	45.3	-11.4	33.9	46.0	12.1	100.0	271.0	
8	244.127	H	49.2	-10.3	38.9	46.0	7.1	100.0	46.0	



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Bandwidth of the Operating Frequency

