CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970 Fax: +82-31-624-9501
www.e-ctk.com

TEST REPORT

According to : FCC 47CFR part 15 subpart C

Test Report No.	:	CTK-2014-00184-1
Date of Issue	:	March 4, 2014
FCC ID	:	2ABS5-EWC-3000
Equipment Under Test	:	EWC-3000
Kind of Product	:	Wireless Car Charging Mount
Applicant	:	HSM CO., LTD.
Applicant Address	:	2F Yeong-jae Bldg., 40, Nonhyeon-ro 24gil, Gangnam-gu, Seoul, 135-855, Korea
Manufacturer	:	HSM CO., LTD.
Manufacturer Address	:	2F Yeong-jae Bldg., 40, Nonhyeon-ro 24gil, Gangnam-gu, Seoul, 135-855, Korea
Contact Person	:	Gyu Gwang, Choi / Project Manager
Telephone	:	+82-2-573-5466
Received Date	:	February 7, 2014
Test period	:	Start : February 7, 2014 End : February 18, 2014
Test Results	:	☒ In Compliance ☐ Not in Compliance

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

Tested by

Y. T. Lee

Young-taek Lee
Test Engineer
Date: March 4, 2014

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: March 4, 2014

REPORT REVISION HISTORY

Date	Revision	Page No
February 18, 2014	Issued (CTK-2014-00184)	All
March 4, 2014	Issued (CTK-2014-00184-1) Update Summary of tests	All

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1.0 General Product Description

Type of equipment	Wireless Car Charging Mount
Equipment model name	EWC-3000
Frequency Range	110 kHz – 205 kHz
Antenna type	Coil antenna
Power Source	CAR ADAPTER Input : DC 12 V - 24 V Output : DC 5 V, 2.0 A Test Voltage and Frequency : DC 5 V, -

1.1 Model Differences

Not applicable

1.2 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.	FCC ID or DoC
CAR ADAPTER	HAEM Co., Ltd.	ECA-P10XBK	DW1D521DS/B-E	-
Test Jig	S-MOBILE TECH CO., LTD.	-	-	-
Wireless Charging Cover	OPENTECH Inc.	OWC-300R	-	-
Wireless Charging Cover	RFTech Co., Ltd.	EBC-1G6WWE	RT0C802AS/4-E	-
Mobile Phone	Samsung Electronics Co., Ltd.	SCH-I535	-	A3LSCHI535

1.4 EUT Operating Modes

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

☒ Charging and communication mode

Modulation Type : CW (Continuous Wave)

Output Power : Max. 10.48 dBuV/m (Frequency 115.4 kHz, Test Distance 3 m)

TX Duty Cycle : 100 % by measurement

1.5 Test Modes

This device has been tested below conditions:

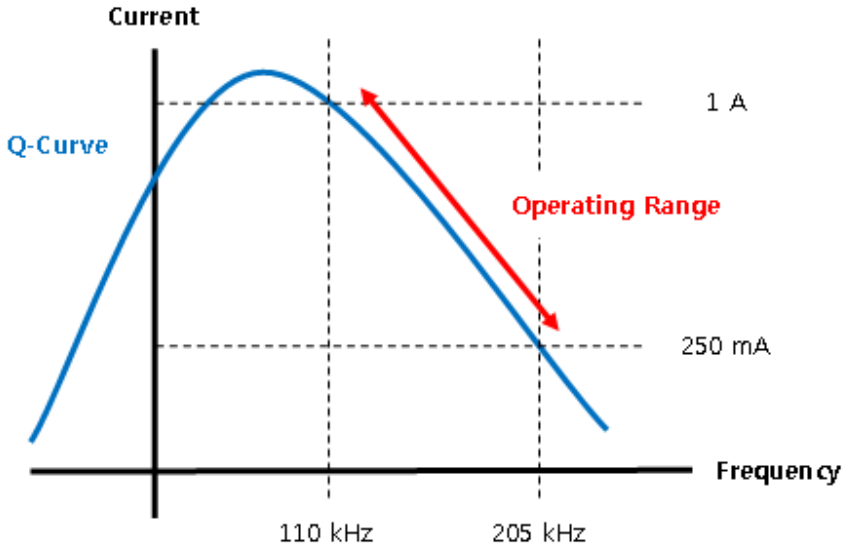
[Test Mode #1]

Frequency	Charging current	Note
110 kHz	1 A	Low Frequency, Max. Load
157.5 kHz	650 mA	Middle Frequency, Medium Load
205 kHz	250 mA	High Frequency, Min. Load

This device has been tested with the various resistors to simulate the various load conditions of the client device. The charging current was controlled from 250 mA (Min.) to 1 A (Max.) using the resistors and three types of Jig board with circular coil.

1) EUT has a range of the operating frequency from 110 kHz to 205 kHz and It has a range of the output current from 250 mA to 1 A when output voltage is DC 5 V.

2) If the operating frequency is 110 kHz, the maximum output current is 1 A and If the operating frequency is 205 kHz, the minimum output current is 250 mA.



3) To the simulation of the power transmission in from 110 kHz to 205 kHz. In the full range of the operating frequency, Normal operating condition, the test frequency is three which are the High, Middle and Low frequency of 110 kHz, 157.5 kHz and 205 kHz.

4) In order to operate EUT in three operating frequencies, three types of Test Jig were used.

5) The Wireless Charging Cover was used as Test Jig is actually used with the EUT.

6) The EUT to operate at a steady-state output current, the Wireless Charging Cover was not to combined with a smart phone. The DC output of the Wireless Charging Cover was connected to the resistor. As follows, the three types of Test Jig was prepared and tested.

7) Test Jig #1
Operating Frequency : 110 kHz, Output Voltage : DC 5 V, Output Current : 1 A
Calculation of resistor value : $I = \frac{V}{R}$, $1\ A = \frac{5\ V}{R}$, $R = \frac{5\ V}{1\ A}$, $R \approx 5\ \Omega$

8) Test Jig #2
Operating Frequency : 157.5 kHz, Output Voltage : DC 5 V, Output Current : 0.625 A
Calculation of resistor value : $I = \frac{V}{R}$, $0.65\ A = \frac{5\ V}{R}$, $R = \frac{5\ V}{0.65\ A}$, $R \approx 7.69\ \Omega$

9) Test Jig #3
Operating Frequency : 205 kHz, Output Voltage : DC 5 V, Output Current : 0.25 A
Calculation of resistor value : $I = \frac{V}{R}$, $0.25\ A = \frac{5\ V}{R}$, $R = \frac{5\ V}{0.25\ A}$, $R = 20\ \Omega$

[Test Mode #2]

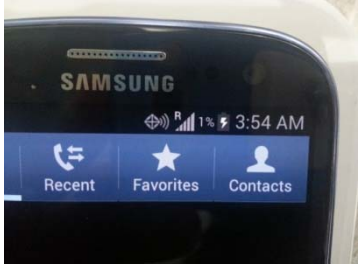
Support Equipment	Battery status	Note
Mobile Phone	< 1%	Max. Load
Mobile Phone	50 %	Medium Load

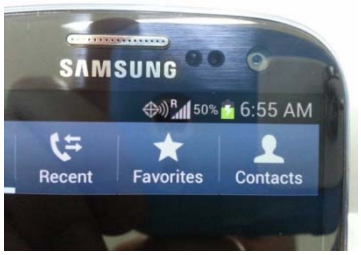
Note : The Charging is not operation when 100% fully charged status.

This device has been tested with the Mobile phone.

Mobile phone is on Airplane Mode.

Mobile phone's battery status was checked by display battery percentage function.





1.6 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.

1.7 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

2.0 Summary of tests

FCC Part Section(s)	Parameter	Status (note 1)
15.203	Antenna requirement	N/A
15.204	External radio frequency power amplifier and antenna modifications	N/A
15.207	Conducted emissions	N/A
15.209	Radiated emissions	Complies

Footnotes for N/A's:

§ 15.203 is not applicable because the transmitter is provided with an integral antenna.
§ 15.204 is not applicable because the transmitter is provided with an integral antenna.
§ 15.207 is not applicable because the transmitter is intended to be used in car.

2.1 Power line conducted emissions (Section 15.207)

Test Location
Not Applicable

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.
Amplitude measurements were performed with a quasi-peak detector and an average detector.

* Measurement procedures was In accordance with ANSI C63.4-2009 7.3.3, 7.3.4

Limit
-15.207(a)

Frequency (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.

EUT Operating Modes

The EUT is an intentional radiator is operated at 110 kHz to 205 kHz.
We have tested three frequencies, Low (110 kHz), Middle (157.5 kHz), High (205 kHz), for power line conducted emissions test.

* Middle (157.5 kHz) : Exactly half way between 110 kHz and 205 kHz.

Test Results
The requirements are:

☐ Complies

Test Data

2.2 Radiated emissions (Section 15.209)

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☐ 3 m SAC (test distance : 3 m)

1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Frequency Range = 9 kHz ~ 1 GHz
RBW = 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz
VBW ≥ RBW
Sweep = Auto

Limit

- **15.209(a)**

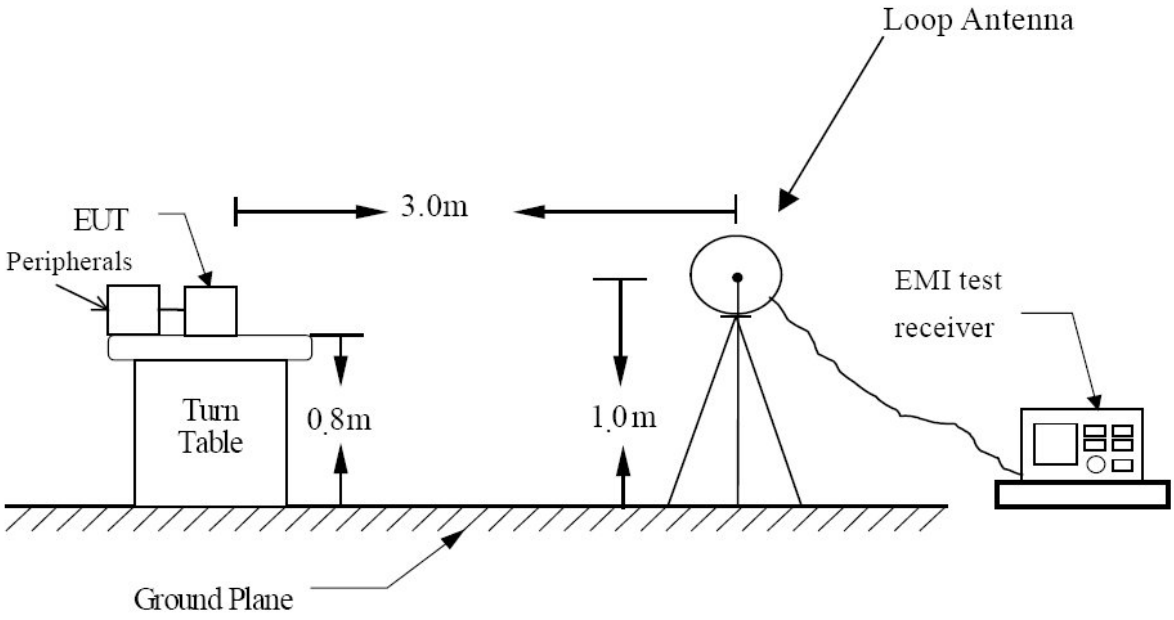
Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** 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.

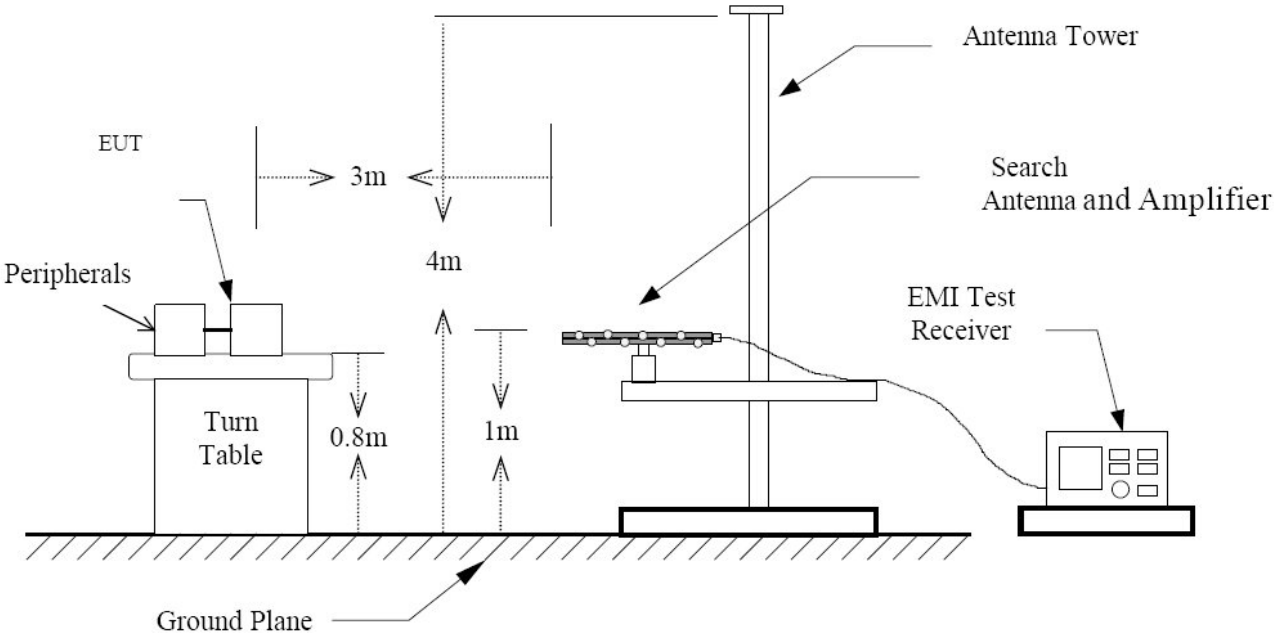
Note :
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Test Setup:

1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



Test Results

EUT	Wireless Car Charging Mount	Model	EWC-3000
Frequency Range	9 kHz ~ 1 GHz	Test mode	TX

The requirements are:

☒ Complies

Test Data

Fundamental Test Data

[Test Mode #1]

Operating Frequency : 110 kHz

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
115.4	64.4	20.18	5.9	-80	10.48	46.36	35.88	Peak
115.4	63.9	20.18	5.9	-80	9.98	26.36	16.38	Average

Operating Frequency : 157.5 kHz

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
156.2	55.3	20.18	5.9	-80	1.38	43.73	42.35	Peak
156.2	54.3	20.18	5.9	-80	0.38	23.73	23.35	Average

Operating Frequency : 205 kHz

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
203.4	51.4	20.18	5.9	-80	-2.52	41.44	43.96	Peak
204.4	50.9	20.18	5.9	-80	-3.02	21.44	24.46	Average

[Test Mode #2]

< 1 % Battery Status

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
121.6	53.5	20.18	5.9	-80	-0.42	45.91	46.33	Peak
121.6	53.1	20.18	5.9	-80	-0.82	25.91	26.73	Average

50 % Battery Status

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
159.3	44.6	20.18	5.9	-80	-9.32	43.56	52.88	Peak
159.3	43.5	20.18	5.9	-80	-10.42	23.56	33.98	Average

Spurious Test Data

[Test Mode #1]

Operating Frequency : 110 kHz

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
346.2	36.1	20.18	5.9	-80	-17.82	36.82	54.64	Peak
346.2	35.8	20.18	5.9	-80	-18.12	16.82	34.94	Average

Operating Frequency : 157.5 kHz

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
468.6	31.2	20.18	5.9	-80	-22.72	34.19	56.91	Peak
468.6	30.4	20.18	5.9	-80	-23.52	14.19	37.71	Average

Operating Frequency : 205 kHz

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
610.2	28.9	20.18	5.9	-80	-25.02	31.89	56.91	Peak
610.2	28.1	20.18	5.9	-80	-25.82	11.89	37.71	Average

[Test Mode #2]

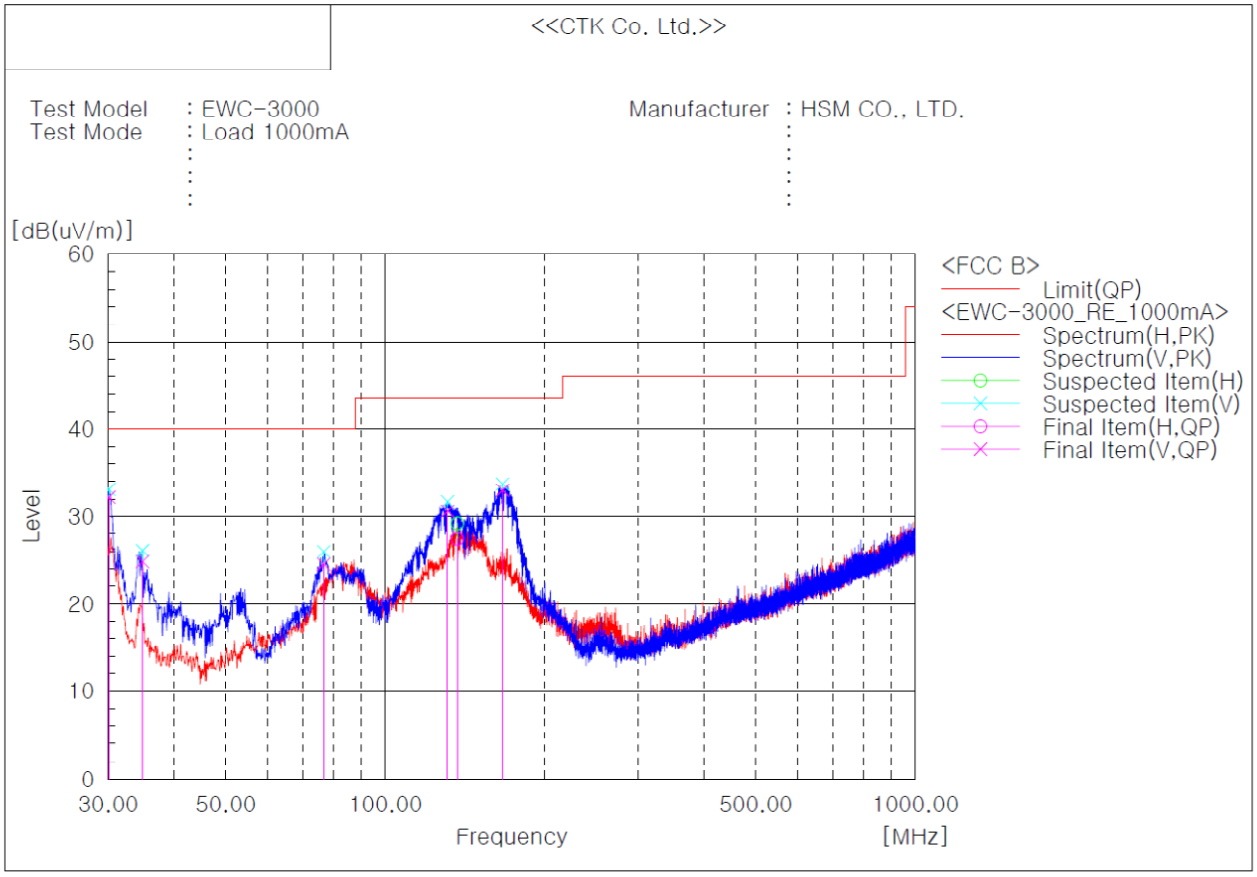
< 1 % Battery Status

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
364.8	30.4	20.18	5.9	-80	-23.52	36.36	59.88	Peak
364.8	30.2	20.18	5.9	-80	-23.72	16.36	40.08	Average

50 % Battery Status

Freq. (kHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Distance Correction	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detect Mode
477.9	23.1	20.18	5.9	-80	-30.82	34.02	64.84	Peak
477.9	22.9	20.18	5.9	-80	-31.02	14.02	45.04	Average

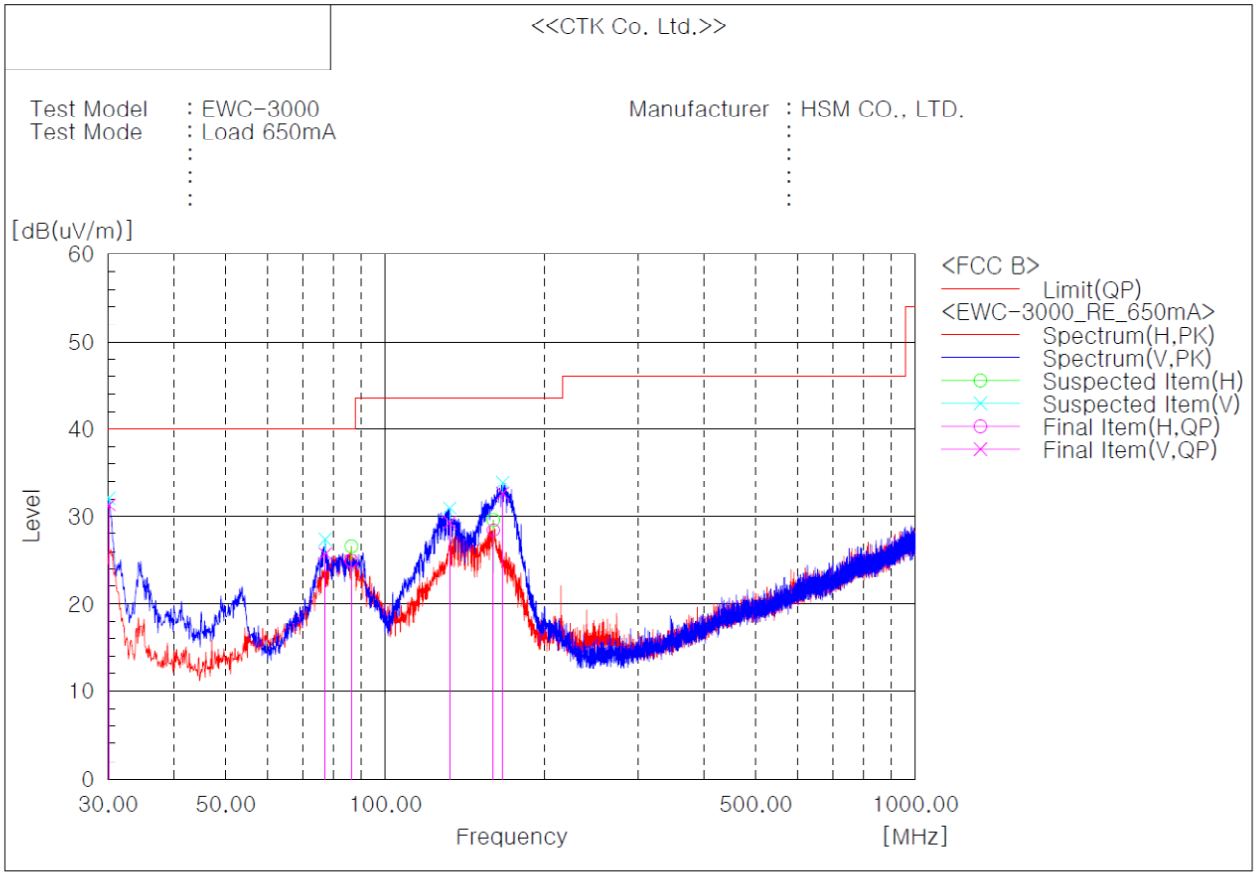
[Operating Frequency : 110 kHz]



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]
1	30.121	V	45.1	-12.9	32.2	40.0	7.8	100.0	253.0
2	34.850	V	37.4	-12.6	24.8	40.0	15.2	100.0	253.0
3	76.560	V	40.3	-15.8	24.5	40.0	15.5	100.0	64.0
4	131.123	V	40.8	-10.2	30.6	43.5	12.9	100.0	27.0
5	136.821	H	36.2	-8.8	27.4	43.5	16.1	205.0	250.0
6	166.528	V	39.5	-6.5	33.0	43.5	10.5	100.0	0.0

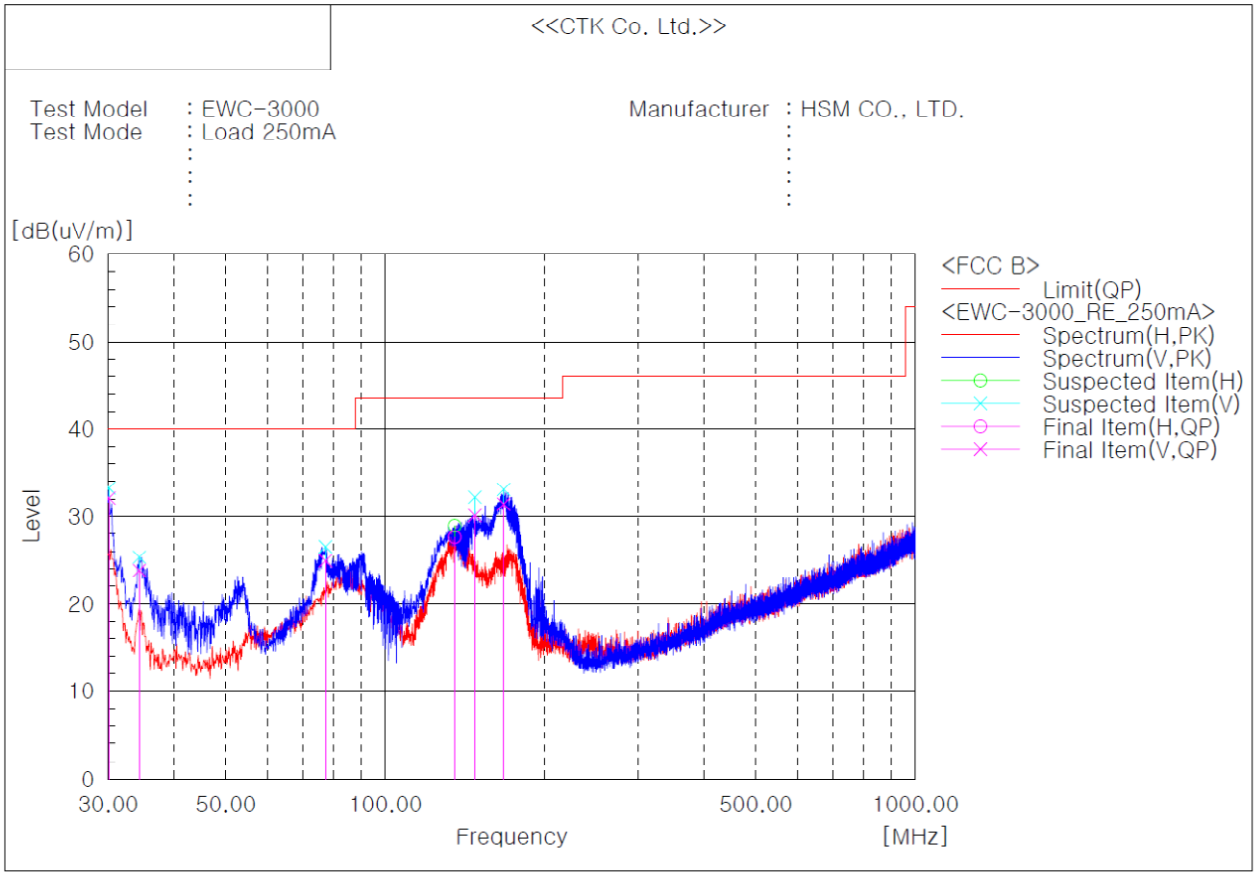
[Operating Frequency : 157.5 kHz]



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]
1	30.121	V	44.2	-12.9	31.3	40.0	8.7	100.0	290.0
2	77.045	V	41.5	-15.8	25.7	40.0	14.3	100.0	28.0
3	86.381	H	39.6	-14.7	24.9	40.0	15.1	307.0	70.0
4	132.335	V	39.2	-9.9	29.3	43.5	14.2	100.0	28.0
5	159.980	H	34.4	-6.0	28.4	43.5	15.1	100.0	98.0
6	166.649	V	39.1	-6.5	32.6	43.5	10.9	100.0	0.0

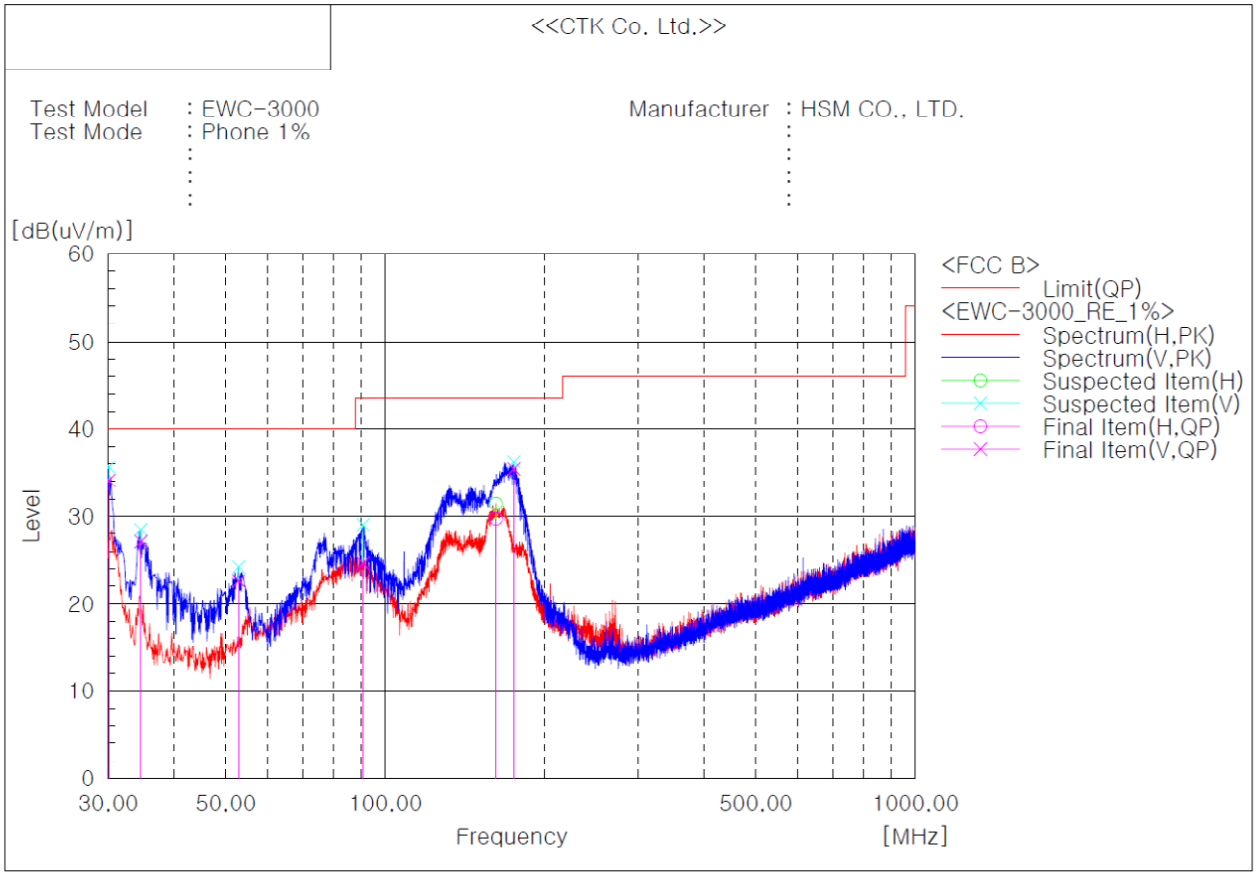
[Operating Frequency : 205 kHz]



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]
1	30.121	V	45.0	-12.9	32.1	40.0	7.9	100.0	253.0
2	34.365	V	36.4	-12.6	23.8	40.0	16.2	100.0	290.0
3	77.166	V	40.7	-15.8	24.9	40.0	15.1	100.0	66.0
4	135.245	H	36.8	-9.2	27.6	43.5	15.9	205.0	249.0
5	147.613	V	36.5	-6.4	30.1	43.5	13.4	100.0	29.0
6	167.255	V	38.0	-6.6	31.4	43.5	12.1	100.0	0.0

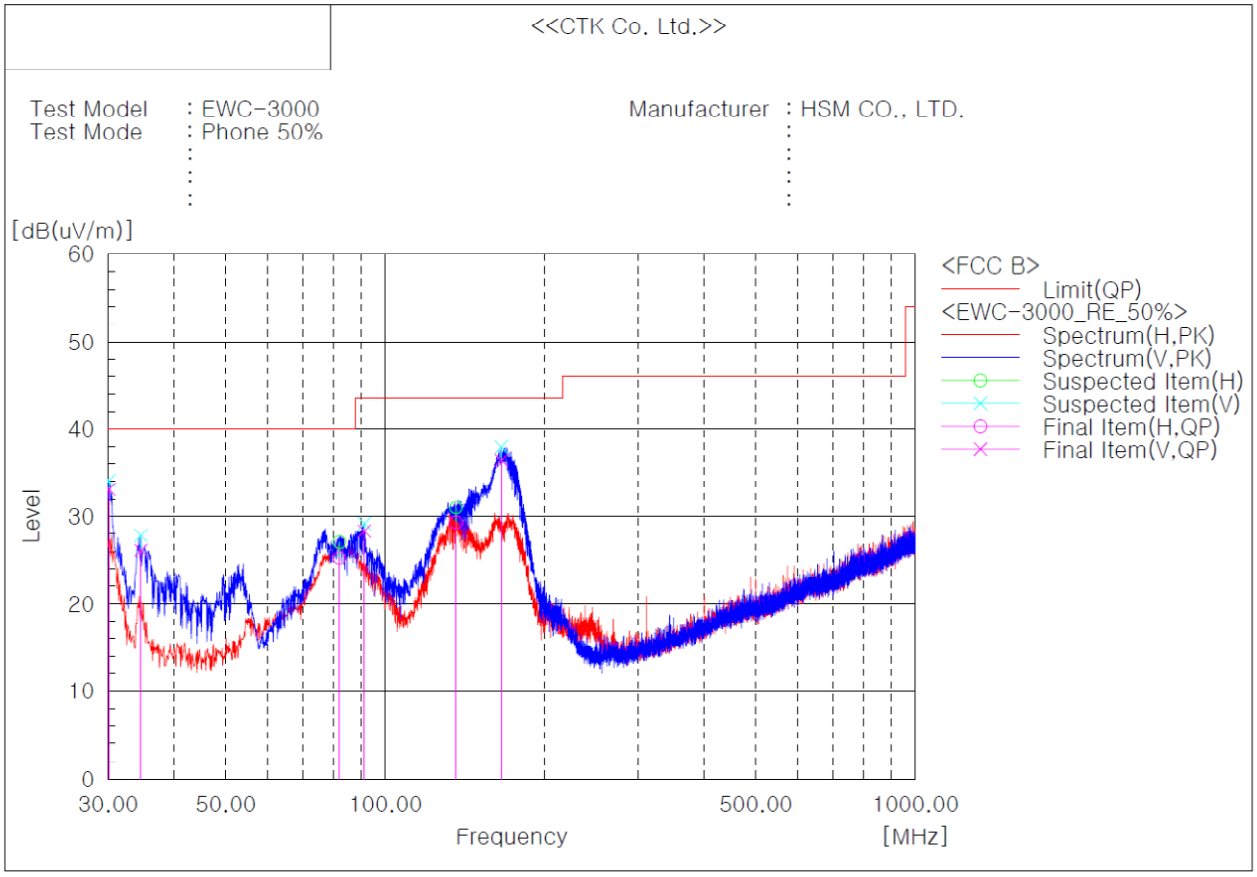
[< 1 % Battery Status]



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]
1	30.121	V	47.0	-12.9	34.1	40.0	5.9	100.0	253.0
2	34.608	V	39.7	-12.6	27.1	40.0	12.9	100.0	253.0
3	52.916	V	36.0	-13.4	22.6	40.0	17.4	100.0	0.0
4	90.868	V	38.5	-13.9	24.6	43.5	18.9	100.0	28.0
5	161.799	H	35.8	-6.1	29.7	43.5	13.8	100.0	98.0
6	174.894	V	43.5	-8.1	35.4	43.5	8.1	100.0	0.0

[50 % Battery Status]



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]
1	30.121	V	46.0	-12.9	33.1	40.0	6.9	100.0	290.0
2	34.608	V	38.7	-12.6	26.1	40.0	13.9	100.0	215.0
3	82.016	H	40.6	-15.4	25.2	40.0	14.8	206.0	25.0
4	91.353	V	42.1	-13.8	28.3	43.5	15.2	100.0	0.0
5	135.973	H	38.3	-9.0	29.3	43.5	14.2	206.0	249.0
6	165.558	V	42.8	-6.4	36.4	43.5	7.1	100.0	0.0

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
1	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2014-12-06
2	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2014-06-06
3	Trilog Broadband Antenna	Rohde & Schwarz	VULB 9161 SE	9161-4133	2014-06-11
4	6dB Attenuator	Rohde & Schwarz	DNF	272.4110.50	2014-11-12
5	AMPLIFIER	Sonoma Instrument Co.	310	291721	2015-02-06
6	Radio Communication Tester	Rohde & Schwarz	CMU200	106765	2015-02-06