

RF TEST REPORT

Test item : Wireless Charger
Model No. : 4CH58AP000, 4CH58AP010
Order No. : DEMC1310-03224, DEMC1310-03236
Date of receipt : 2013-10-22, 2013-10-23
Test duration : 2013-11-08 ~ 2013-11-18
Date of issue : 2013-12-27
Use of report : FCC & IC Original Grant

Applicant : MCNEX CO., LTD.
Hanshin IT Tower 2, 60-18, Gasan-dong, Geumcheon-gu, Seoul, Korea

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

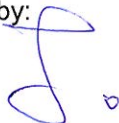
Test specification : FCC Part 15 Subpart C
RSS-Gen Issue 3

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:



Engineer
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Reviewed by:



General Manager
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Test Report Version

Test Report No.	Date	Description
DRTFCC1312-1220	Dec. 27, 2013	Initial issue

CONTENTS

1. Equipment information.....	4
1.1 Equipment description.....	4
1.2 Support equipments	4
2. Information about test items.....	5
2.1 Test mode.....	5
2.2 Tested environment	5
2.3 EMI Suppression Device(s)/Modifications	5
3. FACILITIES AND ACCREDITATIONS.....	6
3.1 FACILITIES	6
3.2 EQUIPMENT	6
4. Test Report.....	7
4.1 Summary of tests	7
4.2 Transmitter requirements.....	8
4.2.1 20dB Bandwidth.....	8
4.2.2 Radiated Emissions	9
4.2.3 AC Line Conducted Emissions	11
APPENDIX I	12

1. Equipment information

1.1 Equipment description

FCC Equipment Class	Part 15 Low Power Transmitter Below 1705 kHz (DCD)
Equipment type	Wireless Charger
Equipment model name	4CH58AP000
Equipment add model name	4CH58AP010
Equipment serial no.	Identical prototype
Frequency band	112 ~ 205kHz
Output power	Max : 5 W
Power	DC 12V
Antenna type	Coil Antenna X 3ea ^{Note}

Note: This device has 3 coil antennas but only one antenna is used for transmitting at a time after selection of the best coil antenna,.

1.2 Support equipments

Equipment	Model No.	Serial No.	Manufacturer	Note
Wireless Charging Cover	MWC-R525T	N/A	M.Cloud	-
Mobile Phone	GT-I9505	-I9505GSMH	SAMSUNG	FCC ID : A3LGTI9505

Note: The above equipments were supported by manufacturer.

2. Information about test items

2.1 Test mode

This device has been tested in all the configurations of charging mode with each coil antenna.

Mode	Charging Current	Support Equipment
1	300mA	Wireless Charging Cover (M/N: MWC-R525T)
2	600mA	
3	1000mA(Max)	
4	@ < 1% battery status	Mobile Phone(M/N: GT-I9505)
5	@ 50% battery status	

2.2 Tested environment

Temperature	:	23 ~ 24 °C
Relative humidity content	:	35 ~ 41 % R.H.
Details of power supply	:	DC 12 V

2.3 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. FACILITIES AND ACCREDITATIONS

3.1 FACILITIES

The semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 683-3, Yubang-Dong, Yongin-Si, Gyunggi-Do, 449-080, South Korea. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number : FCC(678747), IC(5470A-2)

3.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of antennas: loop, tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4. Test Report

4.1 Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
Test Items					
2.1049	N/A	20 dB Bandwidth	N/A	Radiated	C
15.209	RSS-Gen [7.2.5]	Radiated Emission	FCC 15.209 limits		C
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA ^{Note2}
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable					
Note 2: The supplying power of this device is DC 12V from a Car Battery.					

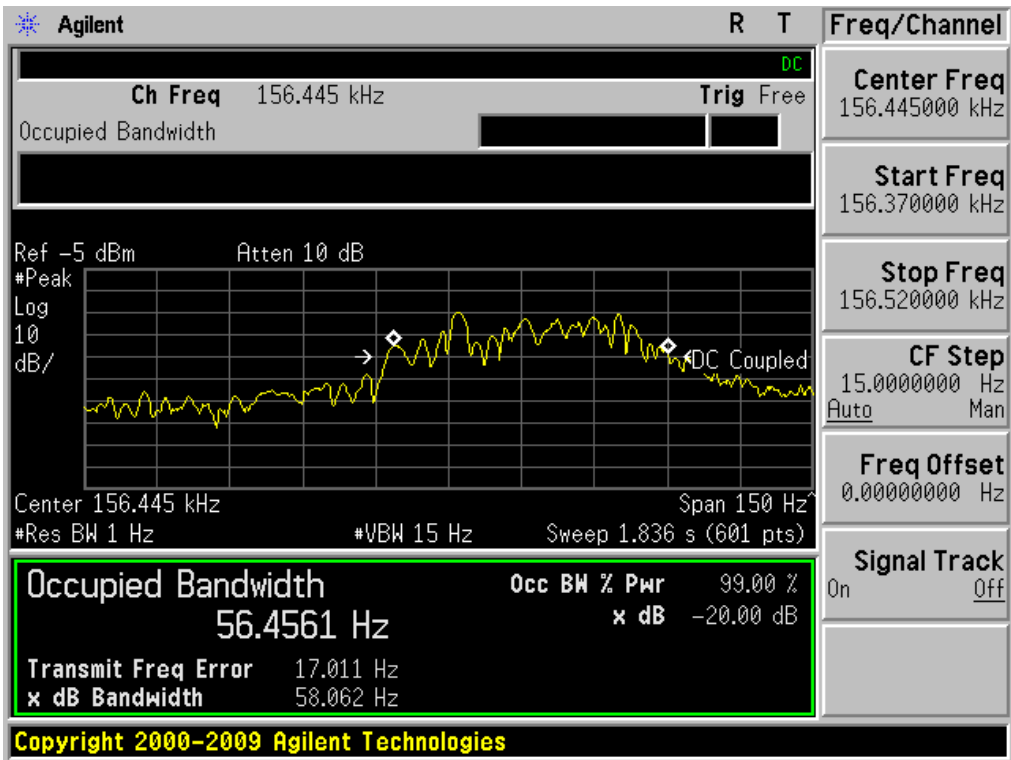
The sample was tested according to the following specification:
ANSI C-63.4 2009

4.2 Transmitter requirements

4.2.1 20dB Bandwidth

- **Procedure:**
The 20 dB bandwidth is measured with a spectrum analyzer connected via a receiving antenna placed near the EUT while the EUT is operating.

- **Measurement Data: Coil3 & Charging Current 1000 mA**



4.2.2 Radiated Emissions

- Limit: FCC Part 15.209(a) & RSS-GEN, section 7.2.5

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 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

- Procedure: ANSI C63.4 2009

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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

- Measurement Data: Wireless Charging Cover

Measurement Distance : **3 Meters**

ANT & Mode	Note.1	Freq. [MHz]	Det. Mode	ANT Pol.	Reading [dBuV]	T.F [dB/m]	D.C.F.	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
Coil 3 & 300mA	F	0.155	PK	N/A	72.50	17.90	80	10.40	23.80	13.40
	S	0.785	PK	N/A	34.80	18.10	40	12.90	29.71	16.81
	S	1.096	PK	N/A	30.00	18.20	40	8.20	26.81	18.61
	S	1.411	PK	N/A	26.20	18.20	40	4.40	24.61	20.21
	S	1.726	PK	N/A	23.70	18.20	40	1.90	29.54	27.64
	S	40.600	QP	V	37.30	-9.30	0	28.00	40.00	12.00
Coil 3 & 600mA	F	0.155	PK	N/A	72.50	17.90	80	10.40	23.80	13.40
	S	0.781	PK	N/A	34.80	18.10	40	12.90	29.75	16.85
	S	1.096	PK	N/A	29.50	18.20	40	7.70	26.81	19.11
	S	1.406	PK	N/A	26.20	18.20	40	4.40	24.64	20.24
	S	1.721	PK	N/A	23.20	18.20	40	1.40	29.54	28.14
	S	39.440	QP	V	35.40	-9.00	0	26.40	40.00	13.60
Coil 3 & 1000mA	F	0.155	PK	N/A	72.40	17.90	80	10.30	23.80	13.50
	S	0.776	PK	N/A	34.50	18.10	40	12.60	29.81	17.21
	S	1.086	PK	N/A	29.40	18.20	40	7.60	26.89	19.29
	S	1.396	PK	N/A	26.10	18.20	40	4.30	24.71	20.41
	S	1.707	PK	N/A	22.40	18.20	40	0.60	29.54	28.94
	S	39.300	QP	V	35.60	-9.00	0	26.60	40.00	13.40
Coil 1 & < 1% battery status	F	0.160	PK	N/A	64.50	17.90	80	2.40	23.52	21.12
	S	0.494	PK	N/A	37.20	18.10	40	15.30	33.73	18.43
	S	0.814	PK	N/A	29.60	18.10	40	7.70	29.39	21.69
	S	1.139	PK	N/A	23.40	18.20	40	1.60	26.47	24.87
	S	1.469	PK	N/A	19.90	18.20	40	-1.90	24.26	26.16
	S	39.620	QP	V	39.40	-9.10	0	30.30	40.00	9.70
Coil 1 & 50% battery status	F	0.160	PK	N/A	64.60	17.90	80	2.50	23.52	21.02
	S	0.494	PK	N/A	38.40	18.10	40	16.50	33.73	17.23
	S	0.819	PK	N/A	30.00	18.10	40	8.10	29.34	21.24
	S	1.149	PK	N/A	24.70	18.20	40	2.90	26.40	23.50
	S	1.479	PK	N/A	20.80	18.20	40	-1.00	24.20	25.20
	S	39.660	QP	N/A	40.30	-9.20	0	31.10	40.00	8.90

Note 1. The worst case data were reported.

And no other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 2. "F" = Fundamental / "S" = Spurious / "*" = Noise Floor

Note 3. All measurements were recorded using a spectrum analyzer employing a peak detector for below 30MHz and a Quasi-peak detector for above 30MHz.

Note 4. Distance Correction Factor(D.C.F.)

For 300m: $40 \cdot \log(300/3) = 80 \text{ dB}$ & For 30m: $40 \cdot \log(30/3) = 40 \text{ dB}$

Note 5. Sample calculation

$T.F = AF + CL - AG$ / Field Strength = Reading + T.F - D.C.F.

Margin = Limit - Field Strength

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

D.C.F = Distance Correction Factor

4.2.3 AC Line Conducted Emissions

- Minimum Standard: FCC Part 15.207 & RSS-GEN Issue 3, section 7.2.4

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

- Procedure: ANSI C63.4 2009

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

- Measurement Data: N/A

APPENDIX I

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4445A	13/10/21	14/10/21	MY42510129
Loop Antenna	Schwarzbeck	FMZB1513	12/09/24	14/09/24	1513-128
BILOG ANTENNA	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
Thermohygrometer	BODYCOM	BJ5478	13/06/01	14/06/01	120612-2
Vector Signal Generator	Rohde Schwarz	SMBV100A	13/01/08	14/01/08	255571
Amplifier (22dB)	HP	8447E	13/01/08	14/01/08	2945A02865
EMI TEST RECEIVER	R&S	ESU	13/01/08	14/01/08	100014