

TEST REPORT



DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1706-0102(1)
2. Customer
 - Name : SEOYON ELECTRONICS CO., LTD.
 - Address : 100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, South Korea
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : Wireless Charging System / SYECLWPC1707
FCC ID : NYOSYECLWPC1707
5. Test Method Used : ANSI 63.10 - 2013
Test Specification : FCC Part 15 Subpart C
6. Date of Test : 2017.05.12 ~ 2017.05.15
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by	Technical Manager
	Name : SunGeun Lee (Signature)	Name : GeunKi Son (Signature)

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 DT&C Co., Ltd.

2017 . 07 . 10 .

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If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1706-0102	Jun. 14, 2017	Initial issue
DRTFCC1706-0102(1)	Jul. 10, 2017	Change FCC Certification Number

Note: Test report DRTFCC1706-0102(1) issued on Jul. 10, 2017 supercedes previously issued test report DRTFCC1706-0102 on June. 14, 2017.

CONTENTS

1. General Information.....	4
1.1. Testing Laboratory.....	4
1.2. Testing Environment.....	4
1.3. Measurement Uncertainty	4
1.4. Details of Applicant.....	5
1.5. Description of EUT	5
2. Information about test items.....	6
2.1 Test mode.....	6
2.2 Support equipment.....	6
2.3 EMI Suppression Device(s)/Modifications	6
3. Antenna requirements.....	6
4. Test Report.....	7
4.1 Summary of tests	7
4.2 Transmitter requirements.....	8
4.2.1 20 dB Bandwidth.....	8
4.2.2 Radiated Emissions	9
4.2.3 AC Line Conducted Emissions	11
APPENDIX I	12

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 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
www.dtnet.net		
Telephone	:	+ 82-31-321-2664
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1.2. Testing Environment

Ambient Condition	
▪ Temperature	+23 °C ~ +25 °C
▪ Relative Humidity	40 % ~ 43 %

1.3. Measurement Uncertainty

Test items	Measurement uncertainty
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)

1.4. Details of Applicant

Applicant : SEOYON ELECTRONICS Co.,Ltd
 Address : 100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea
 16648
 Contact person : Ryu, Hee-Taek

1.5. Description of EUT

FCC Equipment Class	Part 15 Low Power Transmitter Below 1705 kHz (DCD)
Equipment type	Wireless Charging System
Equipment model name	SYECLWPC1707
Equipment add model name	NA
Equipment serial no.	Identical prototype
Hardware Version	1.0
Software Version	1.0
Frequency	110.9 kHz
Output power	Max : 5 W
Power	DC 12V
Antenna type	Coil Antenna x 3ea ^{Note}

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

2. Information about test items

2.1 Test mode

This device has been tested with the below test modes and charging current conditions:

Test Mode	Charging Current	Load condition	Support Equipment
TM1	Max	6.8 Ω	Client device(Passive Coil)
-		-	-

Note: The min load condition(ie, max charging current) was declared by manufacturer.

2.2 Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Passive Coil	EA02W122T	45-15F5-62	TDK	-

Note: The above equipment was supported by manufacturer.

2.3 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 permanently attached.

Please refer to the internal photo. Therefore this E.U.T Complies with the requirement of §15.203

4. Test Report

4.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
Test Items				
2.1049	20 dB Bandwidth	N/A	Radiated	C
15.209	Radiated Emission	FCC 15.209 limits		C
15.207	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA ^{Note2}
15.203	Antenna Requirements	FCC 15.203	-	C
Note 1: C =Comply NC =Not Comply NT =Not Tested NA =Not Applicable Note 2: This device is installed in a car. Therefore the power source is a battery of car.				

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

4.2 Transmitter requirements

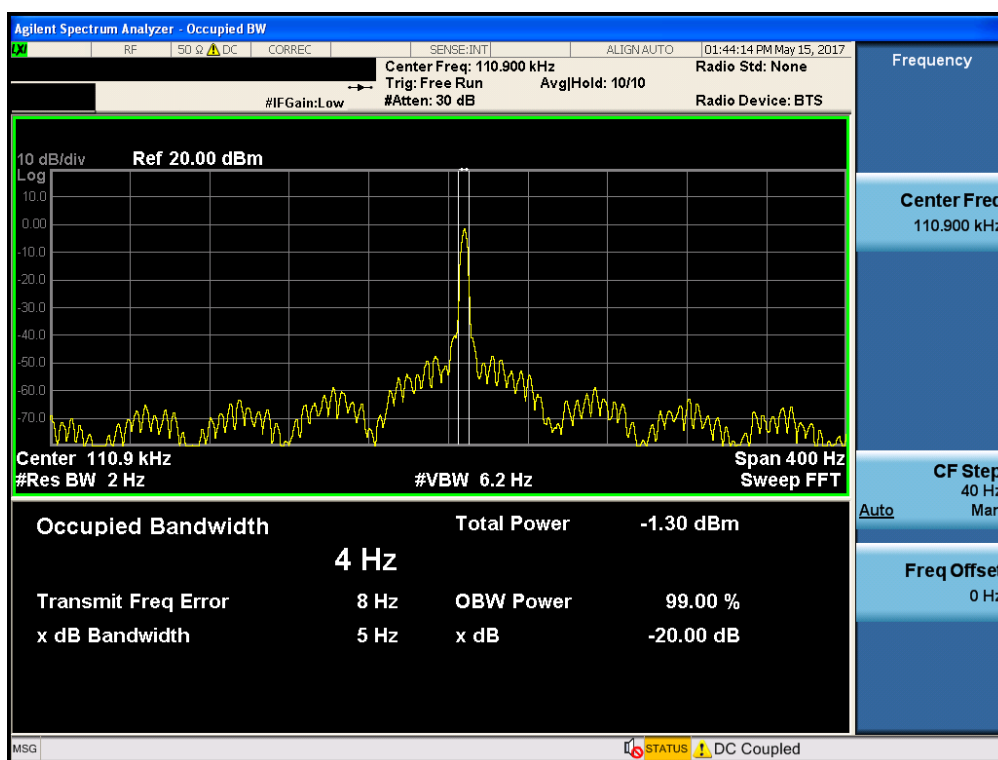
4.2.1 20 dB Bandwidth

- Procedure:

The 20 dB Bandwidth are measured with a spectrum analyzer connected via a receiving antenna placed near the EUT while the EUT is operating.

- Measurement Data:

Test mode	Tested Frequency(kHz)	20dB Bandwidth(kHz)
TM 1	110.900	0.005



4.2.2 Radiated Emissions

- Limit: FCC Part 15.209(a)

Frequency [MHz]	Field Strength [$\mu\text{V}/\text{m}$]	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 - 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.

- Procedure:

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.
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:

 Measurement Distance : **3 Meters**

Tested Mode	Emissions (Note 1)	Freq. [MHz]	Det. Mode	Worst case ANT pol (Note 2)	Reading [dBuV]	T.F [dB/m]	D.C.F.	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
TM 1	F	0.111	PK	F	59.20	19.50	80	-1.30	26.70	28.00
	S	1.848	PK	F	27.40	19.87	40	7.27	29.54	22.27
	S	36.138	QP	V	53.60	-18.45	NA	35.15	40.00	4.85
	S	40.216	QP	V	52.40	-18.02	NA	34.38	40.00	5.62
	S	114.966	QP	H	41.24	-18.57	NA	22.67	43.50	20.83
	S	181.005	QP	H	45.62	-17.61	NA	28.01	43.50	15.49
	S	206.755	QP	H	45.87	-19.14	NA	26.73	43.50	16.77
	S	209.847	QP	V	47.10	-19.06	NA	28.04	43.50	15.46

Note 1. "F" = Fundamental emission / "S" = Spurious emission / "*" = Noise Floor

Note 2. "F": = Facing the antenna / "T" = antenna shifted / turned 90s degrees [Loop antenna]
 "H": = Horizontal / "V" = Vertical [Bilog antenna]

Note 3. The worst case data were reported.
 And no other spurious emissions were reported greater than listed emissions above table.

Note 4. Distance Correction Factor(D.C.F.)
 For 300m: $40 \cdot \log(300/3) = 80$ dB & For 30m: $40 \cdot \log(30/3) = 40$ dB

Note 5. Sample calculation
 $T.F = AF + CL - AG$ / $\text{Field Strength} = \text{Reading} + T.F - D.C.F.$
 $\text{Margin} = \text{Limit} - \text{Field Strength}$
 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

- 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 μ 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:

NA

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:

NA

APPENDIX I

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent	N9020A	16/08/18	17/08/18	MY46471601
Dynamic Measurement DC Source	Agilent	66332A	17/01/11	18/01/11	US37473831
Multimeter	FLUKE	17B	17/04/12	18/04/12	26030065WS
Thermohygrometer	BODYCOM	BJ5478	17/04/11	18/04/11	120612-1
Signal Generator	Rohde Schwarz	SMBV100A	17/01/04	18/01/04	255571
EMI Test Receiver	Rohde Schwarz	ESR7	17/02/16	18/02/16	101061
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	16/11/11	18/11/13	3151
PreAmplifier	TSJ	MLA-010K01-B01-27	17/03/06	18/03/06	1844539