

TEST REPORT

OF

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID : A3LEPPG950

Equipment Under Test : WIRELESS CHARGER
Model Name : EP-PG950
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Receipt : 2017.01.17
Date of Test(s) : 2017.01.23 ~ 2017.02.22
Date of Issue : 2017.03.03

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Patrick Kang

Date:

2017.03.03

Technical
Manager:

Logan Lee

Date:

2017.03.03

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RTT5041-20(2015.10.01)(3)

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A4(210 mm x 297 mm)

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

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1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Contact Person : Song, Keum-Su

Phone No. : +82 31 279 8141

1.3. Description of EUT

Kind of Product	WIRELESS CHARGER	
Model Name	EP-PG950	
Power Supply	DC 5.0 V, DC 9.0 V	
Frequency Range	DC 5.0 V Wireless Charger (ANT1 : 110 kHz ~ 148 kHz) (ANT2 : 110 kHz ~ 148 kHz) (ANT3 : 110 kHz ~ 148 kHz)	DC 9.0 V Wireless Charger (ANT1 : 130 kHz ~ 148 kHz) (ANT2 : 130 kHz ~ 148 kHz) (ANT3 : 135 kHz ~ 148 kHz)
Antenna Type	Inductive loop coil antenna	

1.4. Declarations by the manufacturer

- The EUT has 3 loop coil antennas and can't transmit simultaneously.

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	103102	Jun. 08, 2016	Annual	Jun. 08, 2017
E-Field Probe	D.A.R.E!! Instruments	RadiSense 4	13I00444SNO04	Aug. 02, 2016	Annual	Aug. 02, 2017
Magnetic Field Sensor	HIOKI	0850-B1	3471	Jul. 22, 2016	Annual	Jul. 22, 2017
Magnetic Field Hitester	HIOKI	FT3470-50	140430999	Jul. 22, 2016	Annual	Jul. 22, 2017
DC Power Supply	R&S	HMP2020	019922876	Apr. 26, 2016	Annual	Apr. 26, 2017
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.

► Support equipment

Description	Manufacturer	Model	FCC ID
Samsung Mobile Phone	Samsung Electronics Co., Ltd.	SM-G930F	A3LSMG930F

1.6. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL010861	2017.02.23	Initial
1	F690501/RF-RTL010861-1	2017.03.03	Modified test setup picture

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1.7. Worst case of test configurations

In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

EUT configuration	Mode	Description
Charging Mode with client device (Model : SM-G930F, FCC ID : A3LSMG930F)	Ant 1	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery
	Ant 2	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery
	Ant 3	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery

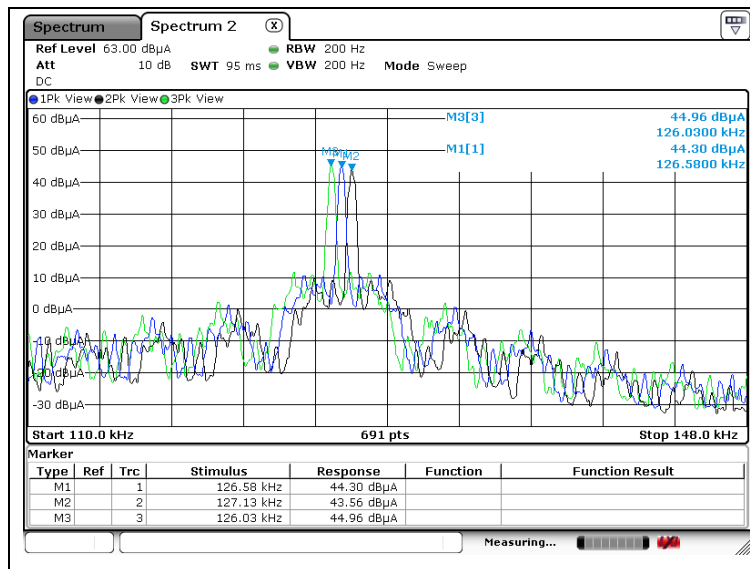
EUT setup configuration:

- The EUT can be capable of charging one client at a time.
- The measurement is performed with a typical WPT client device on the power transfer zone.

Operating configurations:

Client device (SM- G930F)

- While the client device was in airplane mode (Trace#2 "M2")
- While the client device was connected to an active data connection (Trace#3 "M3")
The device was tested under all modes and bands like 2G and 3G.
In the result, **PCS GSM / GPRS1900 / 1 TX** was found in **Middle channel**.
- While the wireless charger is charging with the client device turned off. (Trace#1 "M1")



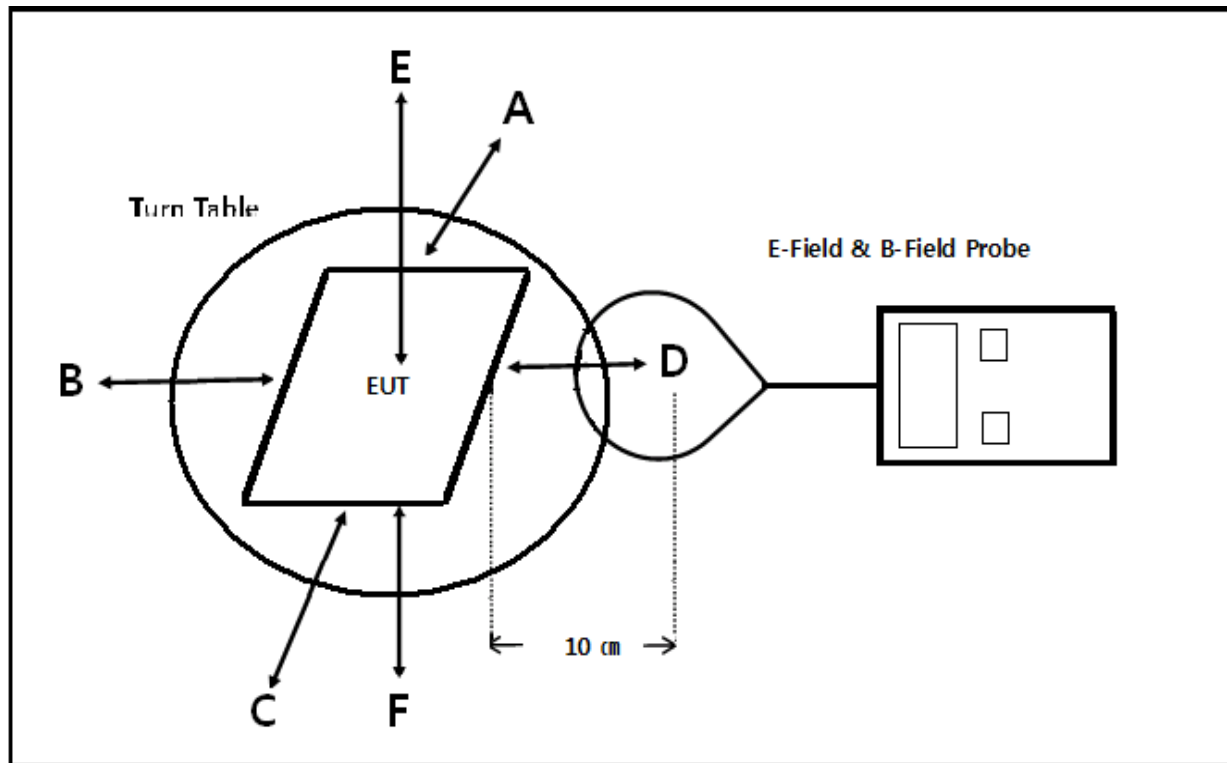
Plot – fundamental emission comparison

- The level of Trace#3 was more than Trace#1 and 2 so Trace#3 was selected.
- Trace#3 as **PCS GSM / GPRS1900 / 1 TX** which was found in **Middle channel** should be tested with the client device as a worst case.

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2. Test Result

2.1. Test Setup



2.2. Measurement procedure

- The RF exposure test was performed in anechoic chamber.
- The measurement probe was placed at test distance (10 cm) which is between the edge of the charger and the geometric center of probe.
- The highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D, E, F) were completed.
- The EUT was measured according to the dictates of KDB 680106 D01v02.

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2.3. Equipment Approval Considerations item 5.2 of KDB 680106 D01 v02.

- a) Power transfer frequency is less than 1 MHz.
- The device operates at a frequency of 110 kHz to 148 kHz.
- b) Output power from each primary coil is less than 10 watts in DC 5 V condition and 15 watts in DC 9 V condition.
- Output power from each primary coil : 15 watts.
- c) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils.
- The transfer system including a charging system with three primary coils is to detect and allow only between individual pairs of coils. (it can't transmit simultaneously)
- d) Client device is inserted in or placed directly in contact with the transmitter.
- Client device is placed directly in contact with the transmitter.
- e) The maximum coupling surface area of the transmit (charging) device is between 60 cm² and 400 cm².
- The EUT coupling surface area :
(Type : Circle)
 $\pi \times \text{Radius of width}^2 \text{ (cm}^2\text{)} = 3.14 \times 5.87^2 \text{ (cm}^2\text{)} = 108.19 \text{ cm}^2$, $60 \text{ cm}^2 < 108.19 \text{ cm}^2 < 400 \text{ cm}^2$
- f) Aggregate leakage fields at 10 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 30 % of the MPE limit.
- Refer to following test results.
The EUT E-Field Strength levels at 10 cm < 30 % of the MPE E-Field Strength limit 614 V/m
14.50 V/m (Max. at 10 cm) < 184.20 V/m

The EUT H-Field Strength levels at 10 cm < 30 % of the MPE H-Field Strength limit 1.63 A/m
0.409 A/m (Max. at 10 cm) < 0.489 A/m

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2.4. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

§1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of FCC part 2.1093 of this chapter

TABLE 1 - LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A) Limits for Occupational /Control Exposures				
0.3 – 3.0	614	1.63	*(100)	6
3.0 – 30	1842/f	4.89/f	*(900/f ²)	6
30 – 300	61.4	0.163	1.0	6
300 – 1 500			f/300	6
1 500 – 100 000			5	6
(B) Limits for General Population / Uncontrol Exposures				
<u>0.3 – 1.34</u>	<u>614</u>	<u>1.63</u>	*(100)	30
1.34 – 30	824/f	2.19/f	*(180/f ²)	30
30 – 300	27.5	0.073	0.2	30
300 – 1 500			f/1 500	30
1 500 – 100 000			1.0	30

f = frequency in MHz

* = Plane wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

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2.5. E and H field strength

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

2.5.1. E-Field Strength at 10 cm from the edges surrounding the EUT

Test Mode : Ant1 in DC 5 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	9.30	7.38	10.10	10.40	11.80	10.40	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	9.16	7.21	10.10	10.20	11.50	10.20	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	8.98	7.06	10.00	10.10	10.90	9.96	614.00

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Test Mode : Ant2 in DC 5 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	14.50	8.84	11.21	11.80	9.57	9.13	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	14.40	8.79	11.15	11.60	9.38	9.09	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	14.38	8.75	11.10	11.58	9.38	9.05	614.00

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Test Mode : Ant3 in DC 5 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	12.20	8.57	9.06	7.82	6.74	8.71	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	11.90	8.51	8.91	7.78	6.68	8.64	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
110 ~ 148	12.00	8.48	8.86	7.77	6.58	8.68	614.00

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Test Mode : Ant1 in DC 9 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
130 ~ 148	13.20	10.41	8.07	7.52	8.41	9.05	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
130 ~ 148	12.80	10.33	7.96	7.43	8.38	9.01	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
130 ~ 148	12.70	10.28	7.93	7.39	8.36	9.03	614.00

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Test Mode : Ant2 in DC 9 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
130 ~ 148	13.60	9.21	7.61	8.58	7.12	7.41	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
130 ~ 148	13.40	9.09	7.58	8.51	7.06	7.32	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
130 ~ 148	12.90	8.88	7.51	8.52	7.08	7.28	614.00

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Test Mode : Ant3 in DC 9 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
135 ~ 148	13.10	8.72	6.80	7.63	6.78	9.21	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
135 ~ 148	12.90	8.68	6.69	7.59	6.71	9.18	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
135 ~ 148	12.90	8.62	6.51	7.55	6.66	9.15	614.00

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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2.5.2. H-Field Strength at 10 cm from the edges surrounding the EUT

Test Mode : Ant1 in DC 5 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.119	0.094	0.106	0.097	0.102	0.094	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.116	0.092	0.102	0.093	0.098	0.090	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.115	0.093	0.101	0.093	0.096	0.091	1.630

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Test Mode : Ant2 in DC 5 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.221	0.154	0.108	0.106	0.119	0.123	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.212	0.148	0.103	0.101	0.109	0.118	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.211	0.151	0.101	0.103	0.112	0.116	1.630

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Test Mode : Ant3 in DC 5 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.409	0.286	0.178	0.107	0.256	0.224	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.389	0.259	0.166	0.102	0.248	0.212	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
110 ~ 148	0.381	0.266	0.171	0.096	0.238	0.209	1.630

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Test Mode : Ant1 in DC 9 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
130 ~ 148	0.118	0.103	0.124	0.154	0.158	0.397	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
130 ~ 148	0.111	0.099	0.118	0.148	0.150	0.368	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
130 ~ 148	0.109	0.093	0.116	0.150	0.151	0.372	1.630

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Test Mode : Ant2 in DC 9 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
130 ~ 148	0.326	0.094	0.100	0.109	0.100	0.137	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
130 ~ 148	0.296	0.086	0.096	0.105	0.092	0.126	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
130 ~ 148	0.301	0.088	0.094	0.102	0.096	0.130	1.630

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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A4(210 mm x 297 mm)

Test Mode : Ant3 in DC 9 V condition

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
135 ~ 148	0.374	0.218	0.244	0.208	0.262	0.250	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
135 ~ 148	0.351	0.202	0.221	0.196	0.251	0.232	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
135 ~ 148	0.348	0.200	0.216	0.196	0.256	0.238	1.630

Note.

- All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

- End of the Test Report -

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