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RF EXPOSURE EVALUATION (MAXIMUM PERMISSIBLE EXPOSURE)

Applicant Name:

Samsung Electronics Co., Ltd.
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Republic of Korea

Date of Testing:

2/28-3/28/2012

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Test Report Serial No.:

0Y1302270364.A3L-R1

FCC ID: A3LEPP100IJWU

IC CERTIFICATION NO.: 649E-EPP100IJWU

APPLICANT: Samsung Electronics Co., Ltd.

EUT Type: Wireless Charging Pad

FCC Rule Part(s): FCC Part 1 (§1.1310) and Part 2 (§2.1091)

IC Specification(s): RSS-102 Issue 4

FCC Classification: Part 15 Low Power Transmitter Below 1705 kHz (DCD)

Test Procedure: OET Bulletin 65

The device bearing the FCC Identifier specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in FCC OET Bulletin 65 (See Test Report). These measurements were performed with no deviation from the standards. Test results reported herein relate only to the item(s) tested.

I authorize and attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

**This revised Test Report (S/N: 0Y1302270364.A3L-R1) supersedes and replaces the previously issued test report on the same subject EUT for the same type of testing as indicated. Please discard and destroy the previously issued test report (S/N: 0Y1302270364.A3L) and dispose of it accordingly.*


Randy Ortanez
President



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1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Introduction

This document is prepared on behalf of Samsung Electronics Co., Ltd. to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations and RSS-102 of Industry Canada.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

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 (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

Table 1-1. Limits for Maximum Permissible Exposure (MPE)

1.2 EUT Description

The Samsung Model: EP-P100IJWU is a wireless charging pad containing a wireless charging circuit using a frequency of 112 – 205kHz. For this MPE evaluation the device is set to transmit and the RF exposure is evaluated.

EUT:

Model: EP-P100IJWU
 Grantee: Samsung Electronics Co., Ltd.
 FCC ID: A3LEPP100IJWU

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1.3 MPE Requirements Overview

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- o **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.
- o **Mobile Devices:** a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.
- o **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/ Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- o **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.
- o **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

The Samsung Wireless Charging Pad FCC ID: A3LEPP100IJWU is evaluated to the Fixed Installation requirements and is considered a device to be used by the General Population/Uncontrolled Exposure.

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1.4 Test Equipment

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model or P/N	Description	Cal Date	Cal Interval	Cal Due	S/N
Narda	EF 0391	E-Field Probe (100kHz - 3GHz)	12/10/2012	Biennial	12/10/2014	A-1238
Narda	HF 3061	H-Field Probe (300kHz - 30MHz)	5/23/2011	Biennial	5/23/2013	A-0333
Narda	NBM-550	Broadband Field Meter	7/18/2012	Biennial	7/18/2014	E-0477

1.5 Test Configuration

112 – 205 kHz Charging Operation:

The field strength of both E-field and H-field was measured at 10cm using the equipment list above for determining compliance with the MPE requirements of FCC Part 1.1310. During measurements, the wireless charging pad (WCP) FCC ID: A3LEPP100IJWU was wirelessly charging a battery housed inside a Samsung portable handset. The Samsung portable handset was equipped with the Samsung wireless charging cover (WCC) FCC ID: A3LEBC1G6WWE. During testing, the Samsung WCP FCC ID: A3LEPP100IJWU was powered by an AC Travel Adapter Model: ETA-U90JWS.

The WCP uses the industry standard WPC charging protocol and this is the configuration used during the testing. No special test mode conditions were set on the EUT. The Power Transfer Step follows the same routine as describe in the technical operation: 1) Analog Ping, 2) Digital Ping, and 3) Power Transfer Step. These modes are all included in the emissions and exposure evaluation. The Analog Ping period is 400ms. The digital Ping occurs at 175kHz with a duty cycle of 50%. Following the Digital Ping the WCP goes to the Power Transfer stage. The frequency of the Power Transfer stage is not fixed but will between 112KHz – 205kHz.

The WCP was tested with the Samsung handset model SCH-I535. The RF power density was measured with the battery at 4 different charge conditions: battery at 0% (depleted), battery at 50% charger, battery near 100% charge, max resistive load (WCC with resistor attached). The WCC with the max resistive load was created through the use of a WCC with a 17.5Ω resistor attached, drawing the maximum 300mA from the WCP. The MPE data in the table below are from these test configurations.

During testing, the WCP was placed on a non-conductive (composite plastic) table top, and the handset with the WCC was placed on the WCP for charging. Maximum E-field and H-field measurements were made 10cm from each side of the EUT. Along the side of the EUT and still 10cm away from the edge of the EUT, the field probes were positioned at the location where there is maximum field strength. The maximum E-field and H-field is reported below.

The Samsung Wireless Charging System uses a wireless charging circuit for power transfer operating at the frequency of 112 – 205kHz. Thus, the 300kHz limits were used: E-field Limit = 614 (V/m); H-field limit = 1.63 (A/m).

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112 – 205 kHz Charging Operation with an Active Licensed Band Data Connection:

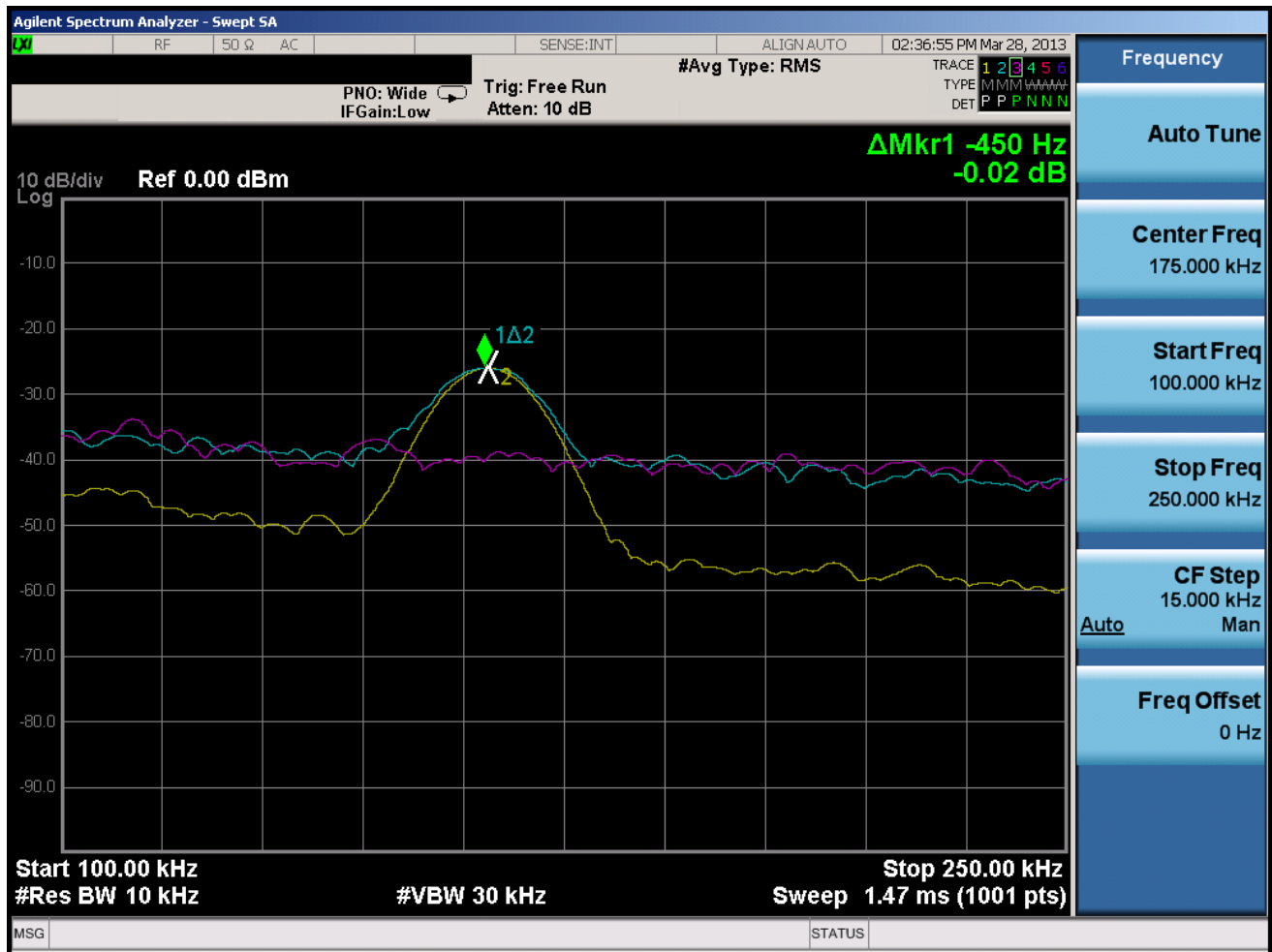


Figure 1-1. WCP Fundamental Emission Comparison

The fundamental emission of the wireless charging pad was measured and compared in two operating configurations: (1) while the portable handset was in airplane mode, as represented by the yellow trace on Figure 1-1; and (2) while the portable handset was connected to an active data connection as represented by the blue trace on Figure 1-1. The purple trace was that of the portable handset while connected to an active data connection without being charged by the wireless charging pad, which shows that the rise in noise level in the second configuration was not due to the wireless charging pad; but was rather due to the data connection of the portable handset. For the second configuration, the device was tested under all bands, R.C.s and S.O.s and the worst case was found to be in mid channel cellular CDMA, RC3/SO55, with "All Up" power control bits. Figure 1-1 shows that the test condition with the active call during the charging state does not change the fundamental power level of the wireless charging signal.

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1.6 Wireless Charging Pad MPE Data

	E-Field Measurement (10cm)				
EUT Sides	Left (V/m)	Right (V/m)	Top (V/m)	Bottom (V/m)	Z-Axis (above) (V/m)
Battery at 0% (depleted)	1.26	1.09	1.1	0.852	0.91
Battery at 50% charge	1.01	1.02	1.11	0.78	0.73
Battery near 100% charge	1.02	0.94	1.08	0.72	0.81
WCC (max resistive load)	0.63	0.62	0.5	0.54	0.92

Table 1-2. E-field MPE Data

	H-Field Measurement (10cm)				
EUT Sides	Left (A/m)	Right (A/m)	Top (A/m)	Bottom (A/m)	Z-Axis (above) (A/m)
Battery at 0% (depleted)	0.020	0.018	0.035	0.018	0.051
Battery at 50% charge	0.018	0.021	0.031	0.017	0.041
Battery near 100% charge	0.044	0.039	0.039	0.033	0.066
WCC (max resistive load)	0.071	0.068	0.048	0.036	0.318

Table 1-3. H-field MPE Data

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2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 10cm separation distance as specified in §2.1091 of the FCC Rules and Regulations and Health Canada Safety Code 6. An appropriate RF exposure compliance statement will be placed in the user's manual.

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3.0 WCC – MAX RESISTIVE LOAD PHOTO



WCC – Max Resistive Load Photo

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