RF EXPOSURE REPORT

Test item : Wireless Mobile Interface
Model No. : D-WMI 2015 A
FCC ID : KR5DWMI2015A

Test specification: FCC Part 1.1310

Tests results are in compliance with the MPE requirements

The test results presented in this report are limited only to the sample under test.

Contents

1. Equipment information

1.1. Equipment description

Type of equipment	Wireless Charger
Equipment model name	D-WMI2015A
Frequency	108.7 kHz
Antenna type	3 Coil litz antenna A13 (according to Qi spec)*
Output power	Max. 5W
Power	12V lead acid vehicle battery

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

Note: Photos of the product available within the RF_Exposure_Photos_DWMI2015A annex document.

1.2. Support equipment

Equipment	Model No.	Serial No.	Manufacturer
Mobile phone	SM-G920F	R28G30DQNCH	Samsung Electronics Co., Ltd.

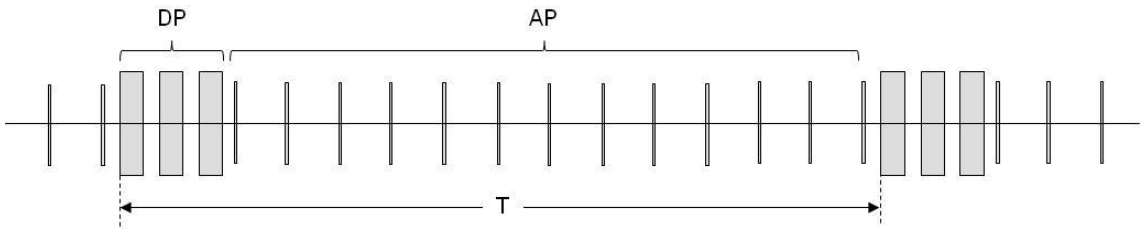
2. Information about test items

2.1. EUT

The EUT has two operational modes. The first one is called “Ping mode” which is the stand by behavior of the EUT (without smartphone on it surface). The second one is the “Charging mode” on which the smartphone’s battery charges.

2.1.1. Ping mode

In this mode, the EUT module transmits a short time carrier signal with a specific pattern in order to detect a mobile device Qi compliant onto its surface. When a smartphone is placed on the EUT, the identification and the configuration information is done without changing the operating point of the base station. Based on the configuration information received from the smartphone, the EUT creates a power transfer contract containing the maximum power that the mobile device intends to provide at its output. The pattern is composed of short carrier bursts during 10ms (Analog Ping AP) spaced of 200ms between them and followed by three carrier burst of 90ms (Digital Ping DP) spaced of 40ms.This pattern is repeated until that a mobile device is detected and identified with a period of 2840ms.



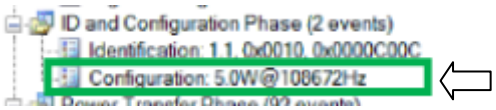
2.1.2. Charging mode

In this mode, the EUT sends the carrier at a given level defined in the power contract. The EUT controls the power transfer to the smartphone, in response to control data that it

receives from the latter. The power transfer is done until the smartphone decides to stop the charge.

2.2. Support equipment (smartphone)

In order to show the max power transfer, the test was performed with the smartphone placed off-centered on the EUT but into the limit boundary allowing continuously max charging. The max power requested by the smartphone is when the battery is fully discharged. The smartphone output power is monitored by using a Qi sniffer and an EUT interface which decode the control error packets sent by the smartphone during the power transfer phase (charging mode).



Qi sniffer interface: Logs of charging mode

Signal Strength Value	158	Received Power (mW)	5351
Packet 28 content	0000	Rectified Power	0
Qi spec version	11	Detection result	2
Ctrl Error	0	Last Qi msg header	03
Power Class	0	Last Qi msg byte0	00
MaxPower	10	Time from previous mgs (1/2 ms)	249
PowerCtrlHoldOffTime (ms)	0	Device ID	0000001000C00C5700000000000000

Receive Power*

EUT interface: Data transmitted from the smartphone. * Slightly overestimation of the Received Power (typically < 250mW)

3. E and H field strength

3.1. Test setup

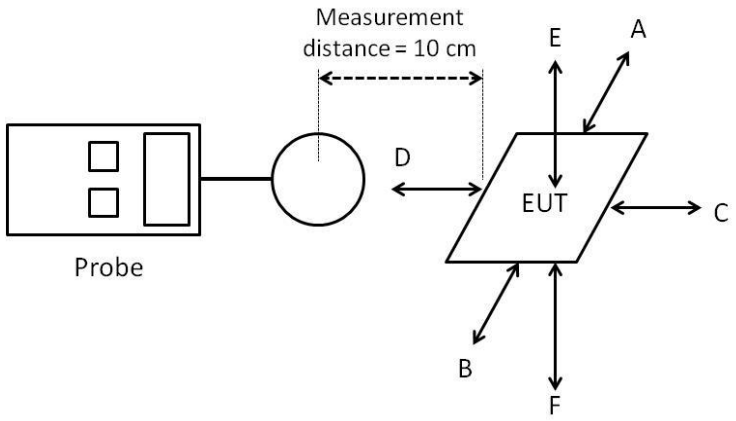
Test location

Anechoic chamber

Measurement distance information

Measurement distance = from 2 cm to 10 cm at 2cm step.

Distance is measured from the center of the probe to the EUT edge.



3.2. Radiofrequency radiation exposure limits

Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 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.

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)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
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/Uncontrolled Exposure				
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
300–1,500	.....	.....	f/1500	30
1,500–100,000	.....	.....	1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

3.3. Test results

3.3.1. Ping mode

H_{AVG} -field strength from the edges surrounding the EUT during a period.

$$H_{AVG} = \frac{1}{T}\left(1.\sum T_{DP} + \frac{I_{AP}}{I_{DP}}.\sum T_{AP}\right).H_{Max}$$

Where:

$T = \sum T_{DP} + \sum T_{AP} = 270ms + 130ms = 2840ms$

$\frac{I_{AP}}{I_{DP}} = 0.77$

$H_{Max} = Max.measured\ H\ field.$

	H_{AVG}-Field (A/m) Measured						Limit (A/m)
Distance (cm)	A	B	C	D	E	F	
10	0.090	0.112	0.090	0.094	**0.270**	0.083	**1.63**

E_{AVG} -field strength (calculated*) from the edges surrounding the EUT during a period.

	E_{AVG}-Field (V/m) Calculated						Limit (V/m)
Distance (cm)	A	B	C	D	E	F	
10	33.92	42.26	34.04	35.61	**101.73**	31.30	**614**

*E=377H

E = electric field strength (V/m), H = magnetic field strength (A/m)

3.3.2. Charging mode

H-field strength from the edges surrounding the EUT. The smartphone is placed at the center of the EUT.

	H-Field (A/m) Measured						Limit (A/m)
Distance (cm)	A	B	C	D	E	F	
3	0.294	1.751	2.021	0.955	2.148	0.724	
4	0.230	1.114	1.233	0.668	1.392	0.604	
6	0.175	0.589	0.525	0.326	0.795	0.356	**1.63**
8	0.159	0.358	0.326	0.207	0.501	0.238	
10	0.135	0.266	0.191	0.207	**0.334**	0.191	

E-field strength (calculated*) from the edges surrounding the EUT. The smartphone is placed at the center of the EUT.

	E-Field (V/m) Calculated						Limit (V/m)
Distance (cm)	A	B	C	D	E	F	
3	111.0	660.0	762.0	360.0	810.0	273.0	
4	87.0	420.0	465.0	252.0	525.0	228.0	
6	66.0	222.0	198.0	123.0	300.0	134.4	**614**
8	60.0	135.0	123.0	78.0	189.0	90.0	
10	51.0	100.2	72.0	78.0	**126.0**	72.0	

*E=377H
E = electric field strength (V/m). H = magnetic field strength (A/m)

H-field strength from the edges surrounding the EUT. The smartphone is placed at off-centered position on the EUT (worst-case).

	H-Field (A/m) Measured						Limit (A/m)
Distance (cm)	A	B	C	D	E	F	
10	0.175	0.358	0.382	0.183	**0.488**	0.222	**1.63**

E-field strength (calculated*) from the edges surrounding the EUT. The smartphone is placed at off-centered position on the EUT (worst-case).

	E-Field (V/m) Calculated						Limit (V/m)
Distance (cm)	A	B	C	D	E	F	
10	66	135	144	69	**184**	84	**614**

*E=377H
E = electric field strength (V/m). H = magnetic field strength (A/m)

4. Test equipment for Test

Equipment	Model No.	Serial No.	Manufacturer	Cal. Date (yy/mm/dd)	Next Cal. Date (yy/mm/dd)
Fieldmeter	ESM-100	972156	Maschek	13/01/2015	13/07/2016