RF EXPOSURE REPORT

Test item	:	Wireless Charger
Model No.	:	IWB-C1
Order No.	:	1012-01376
Date of receipt	:	2010-12-09
Test date		2011-08-01
Date of issue	:	2011-08-12
Use of report	:	FCC Original Grant

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FCC Rule Part	:	FCC Part 1.130 & 2.1091
Test environment	:	See appended test report

Tested by:	Witnessed by:	Reviewed by:
Engineer J.J. Lee	N/A	Manager W.J. Lee

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1. Equipment information

1.1 Equipment description

FCC Equipment Class	Part 15 Low Power Transmitter Below 1705 kHz (DCD)
FCCID	A3LIWB-C1
Equipment type	Wireless Charger
Equipment model name	IWB-C1
Equipment add model name	N/A
Equipment serial no.	Identical prototype
Device Category	Mobile device
Frequency range	118 ~ 124KHz 144 ~ 150KHz
Charging power range	Max. DC 4.1V, 61mA
Communication mode Note 2	Analog ping mode, Digital communication mode
Power	AC-DC Adaptor: AC 120 V 60 Hz
Antenna type	Internal Loop Antenna X 2ea

Note 1: Description of communication mode,

- Analog ping mode

In order to find the pen(RX), the charger(TX) applies a short pulse to its primary coil regularly. The charger(TX) can know the presence of the pen(RX) on the charger(TX) through monitoring its primary coil current.

- Digital communication mode

After finding the pen(RX), the charger(TX) initiates power signal and then receives data PACKETS from the pen(RX). If the pen(RX) is removed on the position of the charger(TX) then this communication is stopped at once and the transmitting power signal of the charger(TX) is immediately stopped.

Note 2: Operational description

The pens each have resonant circuits. Essentially primary circuit is tuned so that it resonates at the same frequency as the secondary circuit. The primary and secondary coils are thus magnetically coupled, creating a dual-tuned resonant air-core transformer. Resonance of the primary varies to improve efficiencies in power transfer to the secondaries. The pens use Adaptive Inductive Coupling. Adaptive Inductive Coupling uses principles of magnetic induction to transfer power. The implementation involves tuning the coil circuits and adaptively adjusting power intelligently to maximize total power transferred. This adaptive inductive coupling through system intelligent tuning increases system Q dramatically which, in turn, maximizes the system efficiency. The tuning of the circuitry occurs through the use of proprietary power controlling protocols.

And each pens can be charged in both frequency ranges allowed by the charger.

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Adapter	SAD1212	CN06BN4400133CDC07DB82687	SAMSUNG	-

2. Information about test items

2.1 Operating mode

Mode 1	**Charging and communication mode**

Note: Based on the part 15 test results, the emissions of the analog ping mode are very lower than the charging and communication mode.
So RF exposure test is performed only with the charging and communication mode.

2.2 Test Mode

This device has been tested to simulate the various load conditions of the client device.
For simulating the various load condition, electronic loads are used to control charging currents.
It means that the impedance electronic loads can be adjusted by operator.
So that it can control the charging current of the circuit.
The charging current was controlled from 35mA (Min) to 60mA (MAX) by 10 mA step using the electronic loads.

Charging current	Test Mode 1 (TM1)	Test Mode 2 (TM2)	Test Mode 3 (TM3)
35mA(Min.)	TM1-35	TM2-35	TM3-35
40mA	TM1-40	TM2-40	TM3-40
50mA	TM1-50	TM2-50	TM3-50
60mA(Max.)	TM1-60	TM2-60	TM3-60

Note 1: The test mode 3 was tested using 2 electronic loads for charging 2 pens at the same time.
Pen 1 was connected with electronic load 1 using red and black wire. And Pen 2 was connected with electronic load 2 using red and green wire.
(Refer to test setup photo for more details.)
Note 2: Additional Information for PEN
The USB dongle is a device for short distance communication with the Touch Pen.
And using touch pen, general user can send location data and input necessary data to USB Dongle using Zigbee. Then Dongle send received data from Touch Pen to PC via USB port.

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Pen(RX)	IWB-P1	N/A	SAMSUNG	FCCID: A3LIWB-P1 (Pending)

Note: This Pen(RX) is used to control the charging currents.

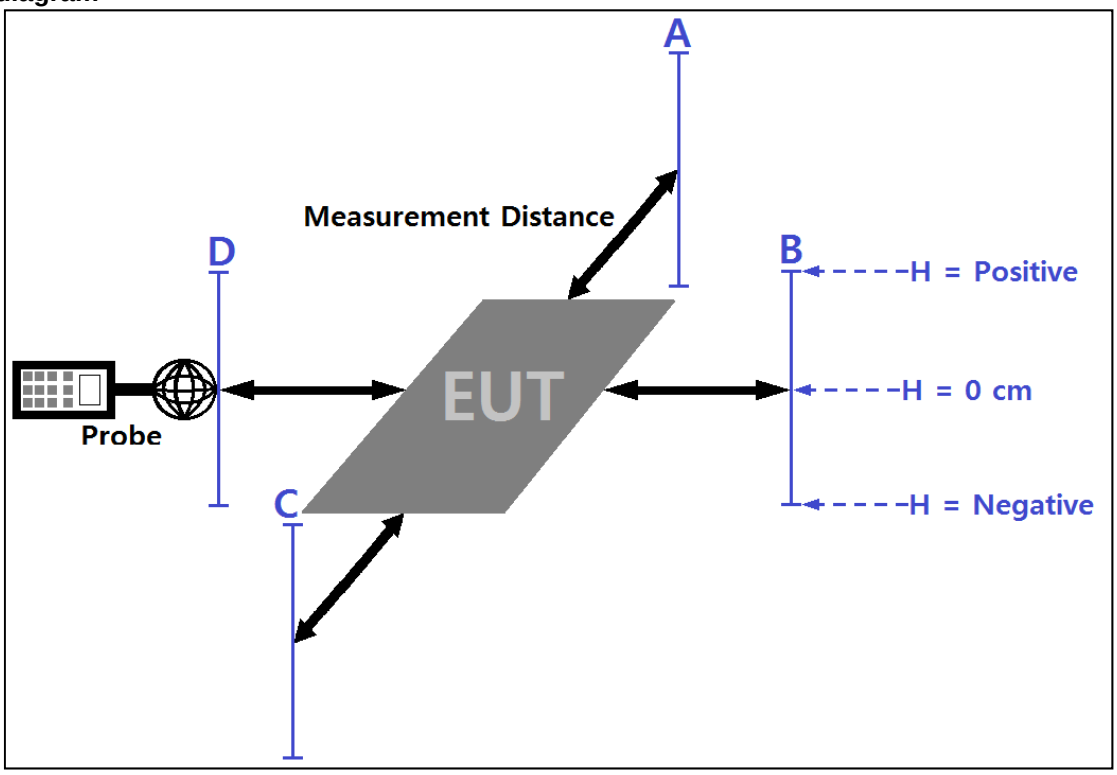
2.4 Tested environment

Temperature	:	23 °C
Relative humidity content	:	48 % R.H.
Details of power supply	:	AC 120V 60Hz

3. E and H field strength

For RF exposure purposes, the E and H field strengths are measured separately with E and H probes and meters at different locations surrounding the test setup.

- Test setup diagram



Note 1: Measurement distance between the edge of the EUT housing and the edge of the probe = 10 cm
Actual distance between the edge of the EUT housing and the geometric center of the probe = 12.5 cm
Note 2: Test were performed above A, B, C, D probe positions.
Note 3: The probe height(H) is varied to maximize the emission.

- Measurement data: refer to the next page

- Limit: There is no FCC RF exposure limit for this device's operating frequency range.

- Test equipment list

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	S/N
☒	Field Probe	Schaffner	EMC20	09/08/18	S-0033
☒	Electric Magnetic field Analyzer	NARDA	EHP-200	10/09/02	010WJ61113
☒	Electronic Load Note.1	KIKUSUI	PLZ334W	11/03/01	HK000921
☒	Electronic Load Note.1	Dae Gil	EL-500P	11/03/01	031250004

Note.1: This wireless charger can charge 2 pens at the same time. Therefore the 2 electronic loads were used to simulate the various load conditions of the each pens.
Please refer to page 2 of test setup photo for more details.

Measurement data

1. E field test results with TM1

Test Step	Test Mode	Probe Height (cm)	Probe Position **A** (V/m)	Probe Position **B** (V/m)	Probe Position **C** (V/m)	Probe Position **D** (V/m)
1	TM1-35	0	1.96	1.24	1.28	1.21
	TM1-40	0	2.01	1.27	1.24	1.57
	TM1-50	**0**	**2.03**	**1.33**	**1.29**	**1.75**
	TM1-60	0	2.00	1.32	1.28	1.74
2	TM1-50	+2	2.04	1.35	1.32	1.77
	TM1-50	-1	2.01	1.32	1.26	1.72

Note 1: The test step 2 were repeated at the worst case configuration of step 1 with varying the antenna height to maximize the emission.

2. H field test results with TM1

Test Step	Test configuration	Probe Height (cm)	Probe Position **A** (A/m)	Probe Position **B** (A/m)	Probe Position **C** (A/m)	Probe Position **D** (A/m)
1	TM1-35	0	0.14	0.21	0.17	0.13
	TM1-40	0	0.13	0.21	0.16	0.17
	TM1-50	**0**	**0.14**	**0.22**	**0.17**	**0.17**
	TM1-60	0	0.14	0.21	0.17	0.16
2	TM1-50	+2	0.16	0.25	0.18	0.19
	TM1-50	-1	0.13	0.20	0.15	0.15

Note 1: The test step 2 were repeated at the worst case configuration of step 1 with varying the antenna height to maximize the emission.

3. E field test results with TM2

Test Step	Test Mode	Probe Height (cm)	Probe Position **A** (V/m)	Probe Position **B** (V/m)	Probe Position **C** (V/m)	Probe Position **D** (V/m)
1	TM1-35	0	1.97	1.41	1.14	1.44
	TM1-40	0	1.96	1.44	1.17	1.42
	TM1-50	**0**	**2.05**	**1.48**	**1.19**	**1.45**
	TM1-60	0	2.04	1.45	1.17	1.43
2	TM1-50	+2	2.08	1.51	1.20	1.47
	TM1-50	-1	2.03	1.47	1.17	1.44

Note 1: The test step 2 were repeated at the worst case configuration of step 1 with varying the antenna height to maximize the emission.

4. H field test results with TM2

Test Step	Test configuration	Probe Height (cm)	Probe Position **A** (A/m)	Probe Position **B** (A/m)	Probe Position **C** (A/m)	Probe Position **D** (A/m)
1	TM1-35	0	0.21	0.22	0.15	0.27
	TM1-40	0	0.22	0.23	0.14	0.28
	TM1-50	**0**	**0.22**	**0.23**	**0.16**	**0.28**
	TM1-60	0	0.22	0.23	0.12	0.28
2	TM1-50	+2	0.24	0.24	0.19	0.29
	TM1-50	-1	0.21	0.21	0.15	0.26

Note 1: The test step 2 were repeated at the worst case configuration of step 1 with varying the antenna height to maximize the emission.

5. E field test results with TM3

Test Step	Test Mode	Probe Height (cm)	Probe Position **A** (V/m)	Probe Position **B** (V/m)	Probe Position **C** (V/m)	Probe Position **D** (V/m)
1	TM1-35	0	2.87	1.43	1.19	1.53
	TM1-40	0	2.88	1.67	1.43	1.96
	TM1-50	**0**	**2.90**	**1.68**	**1.46**	**2.02**
	TM1-60	0	2.83	1.62	1.45	1.93
2	TM1-50	+2	2.95	1.72	1.49	2.06
	TM1-50	-1	2.89	1.66	1.45	2.00

Note 1: The test step 2 were repeated at the worst case configuration of step 1 with varying the antenna height to maximize the emission.

6. H field test results with TM3

Test Step	Test configuration	Probe Height (cm)	Probe Position **A** (A/m)	Probe Position **B** (A/m)	Probe Position **C** (A/m)	Probe Position **D** (A/m)
1	TM1-35	0	0.22	0.28	0.18	0.31
	TM1-40	0	0.22	0.29	0.19	0.34
	TM1-50	**0**	**0.22**	**0.29**	**0.19**	**0.35**
	TM1-60	0	0.19	0.27	0.19	0.30
2	TM1-50	+2	0.24	0.31	0.20	0.37
	TM1-50	-1	0.21	0.28	0.18	0.34

Note 1: The test step 2 were repeated at the worst case configuration of step 1 with varying the antenna height to maximize the emission.