

RF EXPOSURE

1. GENERAL INFORMATION

1.1 Applicant Information

- 1) Company Name : MAPTech Co., Ltd.
- 2) Product Name : Wireless Charger Base Station
- 3) Model Name : MWC-T510T
- 4) FCC ID : RUWMWC-T510T

1.2 EUT INFORMATION

Equipment Class	DCD – Part 15 Low Power Transmitter Below 1705 kHz
Product name	Wireless Charger Base Station
Power source	Input : DC 19.0 V, 1 A Adaptor : AC 100 - 240 V, 50/60 Hz, 0.6 A Max
Local Oscillator or X-Tal	-
Operating Frequency range	(112 ~ 205) kHz
Antenna Type	Integral loop antenna
Type of Modulation	CW(Continuous wave)
Device type of Wireless Power Consortium protocol ^{Note 1}	A1 Device
RF Output power	68.42 dBuV/m (PEAK) (measured @ 3 m)
External Ports	DC INPUT
Charging power range	0 ~5 W
Operating Temperature Range	(0 ~ 40) °C
Dimensions(W×L×T)	((72.1 ± 0.2) × (120.1 ± 0.2) × (15 ± 0.07)) mm
Weight	(105.0 ± 5) g

Note 1: This device can charge only one client device at a time with the specific location of the EUT. So this device is a A1 device of the Wireless Power Consortium protocol.

- Power Transmitter design A1 uses the Operating Frequency and duty cycle of the Power Signal in order to control the amount of power that is transferred. For this purpose, the Operating Frequency range of the half-bridge inverter is $f_{op}=110\sim 205$ kHz with a duty cycle of 50%; and its duty cycle range is 10...50% at an Operating Frequency of 205 kHz. A higher Operating Frequency or lower duty cycle result in the transfer of a lower amount of power. In order to achieve a sufficiently accurate adjustment of the amount of power that is transferred, a type A1 Power Transmitter shall control the Operating Frequency with a resolution of

- $0.01 \times f_{op} - 0.7$ kHz, for f_{op} in the 110...175 kHz range;
 - $0.015 \times f_{op} - 1.58$ kHz, for f_{op} in the 110...175 kHz range;
- or better. In addition, a type A1 Power Transmitter shall control the duty cycle of the Power Signal with a resolution of 0.1% or better.

1.3 TEST RESULT CERTIFICATION

1.3.1 Applicable standards

Standard	Clause	Test Item	Result	Remarks
FCC CFR 47 Part 1	1.1310	Radiofrequency radiation exposure limits.	Pass	-

2. TEST RESULT

2.1 Test Methodology

2.1.1 Description of support units

Equipment	Manufacturer	Model	S/N
Receiver unit	MAPTech Co., Ltd.	MWC-R524T	-
AC/DC adapter	SIMSUKIAN	SK02G-1900100U	-
Resistance Load jig	MAPTech Co., Ltd.	-	-
Mobile Phone	SAMSUNG ELECTRONICS CO., LTD.	SHV-E250S (FCC ID : A3LSHVE250S)	-

2.1.2 Test Mode

- This device has been tested below conditions:

Test Mode	Operating Mode	Charging	Note
Mode 1	112 kHz	1000 mA	Low Frequency, Max. Load
	158 kHz	800 mA	Middle Frequency, Medium Load
	205 kHz	500 mA	High Frequency, Min. Load
Mode 2	112 kHz	1000 mA	Low Frequency, Max. Load
	158 kHz	800 mA	Middle Frequency, Medium Load
	205 kHz	500 mA	High Frequency, Min. Load
Mode 3	GSM 1900	< 1 % Battery status	
		50 % Battery status	
	WCDMA	< 1 % Battery status	
		50 % Battery status	
Mode 4	GSM 1900	< 1 % Battery status	
		50 % Battery status	
	WCDMA	< 1 % Battery status	
		50 % Battery status	

Note

Mode 1

- Put the receiver on the EUT(transmitter), for maintain the state of charge at all times, we made a 'JIG Board' for 'Load' and tested it after mounted on top of the receiver.
- Frequency change : If changed the location as frequency (112 kHz ~ 205 kHz) will change. And also 'Current' value was changed followed it.
- 'JIG' for 'Load' : Made it using connect the resistor, for a maintain the state of charge at all times. (Resistance Specifications: Using 10W and 10Ω cement resistor)

Mode 2

- Tilt in the test mode and Test conducted in the same way as Mode 1.

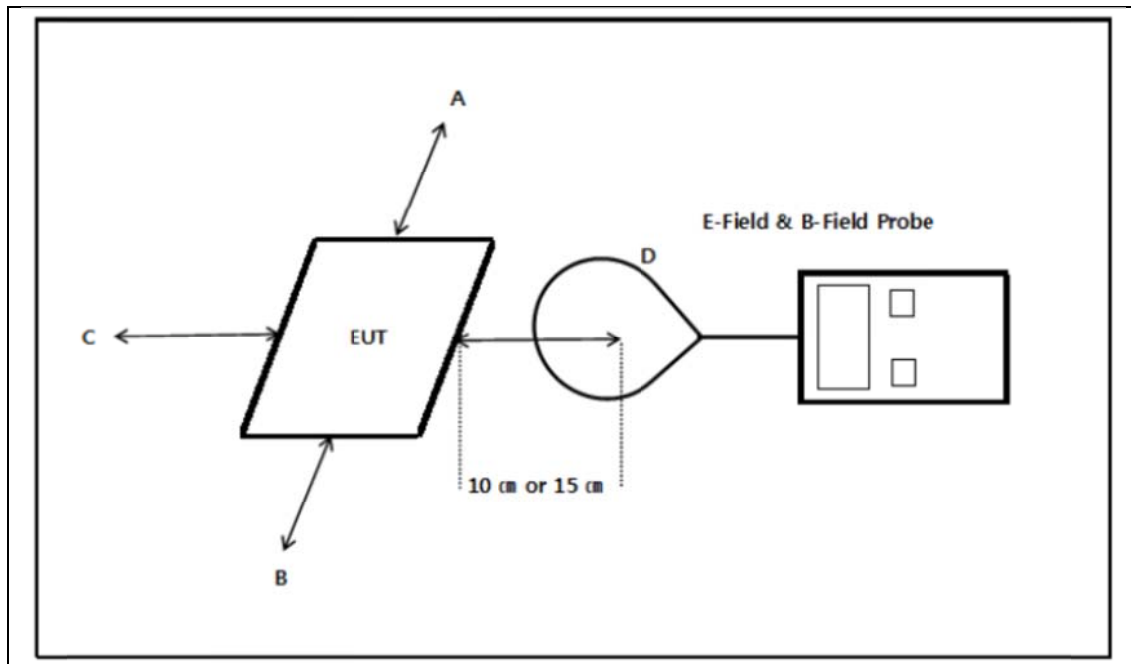
Mode 3

- Less than 1% and 50% when using the mobile phones in use in the field, in the state of charge was measured.
- We've got the above test results by activating call connecting with call test equipment.
- activating call connecting can cause higher battery consumption rate than airplane and stand by mode.
- Test was commenced with activating call connecting which place the most activating and the worst running condition.

Mode 4

- Tilt in the test mode and Test conducted in the same way as Mode 3.

2.2 Test Setup



Note

- The RF exposure test is performed in the shield room
- The test distance is between the edge of the charger and the geometric center of probe
- The MWC-R524T with specific receiver being charged by the transmitter during the field measurements.

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

According to FCC 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)

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
(B) Limits for General Population/Uncontrolled Exposure				
0.3 – 1.34	614	1.63	*(100)	30

* = Plane-wave equivalent power density

2.4 E and H field strength

2.4.1 E-Field Strength

Test Mode	Frequency Range (kHz)		Distance	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
baseline	Not Charging (Base Mode)		10 cm	1.31	1.47	1.63	1.43	614.00
	Not Charging (Tilt Mode)		10 cm	1.33	1.42	1.58	1.45	614.00
Mode 1	128.76		10 cm	1.63	2.54	2.30	2.69	614.00
	167.01		10 cm	1.81	2.23	2.55	2.86	614.00
	183.22		10 cm	1.74	2.24	2.75	2.68	614.00
Mode 2	130.41		10 cm	1.73	2.33	2.90	2.96	614.00
	158.14		10 cm	1.84	2.62	3.02	3.60	614.00
	188.06		10 cm	1.80	2.57	2.76	2.99	614.00
Mode 3	GSM 1900	< 1 % Battery status	10 cm	2.05	2.03	3.16	4.01	614.00
		50 % Battery status	10 cm	1.89	1.88	2.94	3.75	614.00
	WCDMA	< 1 % Battery status	10 cm	2.03	2.02	3.11	4.05	614.00
		50 % Battery status	10 cm	1.90	1.91	2.97	3.76	614.00
Mode 4	GSM 1900	< 1 % Battery status	10 cm	2.03	3.11	4.01	4.23	614.00
		50 % Battery status	10 cm	1.90	2.98	3.77	4.07	614.00
	WCDMA	< 1 % Battery status	10 cm	3.08	3.10	3.99	4.19	614.00
		50 % Battery status	10 cm	2.84	2.98	3.78	4.05	614.00

2.4.2 H-Field Strength

Test Mode	Frequency Range (kHz)		Distance	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Limits (A/m)
baseline	Not Charging (Base Mode)		10 cm	0.1931	0.1933	0.1930	0.1931	1.630
	Not Charging (Tilt Mode)		10 cm	0.1929	0.1931	0.1931	0.1928	1.630
Mode 1	126.33		10 cm	0.1978	0.1978	0.2200	0.2272	1.630
	170.28		10 cm	0.1962	0.1962	0.2065	0.2041	1.630
	174.69		10 cm	0.1986	0.2026	0.2097	0.2073	1.630
Mode 2	134.42		10 cm	0.2041	0.2439	0.2407	0.2169	1.630
	169.29		10 cm	0.2010	0.2161	0.2010	0.2026	1.630
	188.47		10 cm	0.2049	0.2478	0.2081	0.2327	1.630
Mode 3	GSM 1900	< 1 % Battery status	10 cm	0.1930	0.1938	0.1938	0.1930	1.630
		50 % Battery status	10 cm	0.1930	0.1938	0.1930	0.1930	1.630
	WCDMA	< 1 % Battery status	10 cm	0.1930	0.1938	0.1938	0.1930	1.630
		50 % Battery status	10 cm	0.1938	0.1930	0.1938	0.1938	1.630
Mode 4	GSM 1900	< 1 % Battery status	10 cm	0.1938	0.1938	0.1938	0.1946	1.630
		50 % Battery status	10 cm	0.1946	0.1938	0.1938	0.1930	1.630
	WCDMA	< 1 % Battery status	10 cm	0.1938	0.1938	0.1938	0.1938	1.630
		50 % Battery status	10 cm	0.1938	0.1930	0.1938	0.1938	1.630

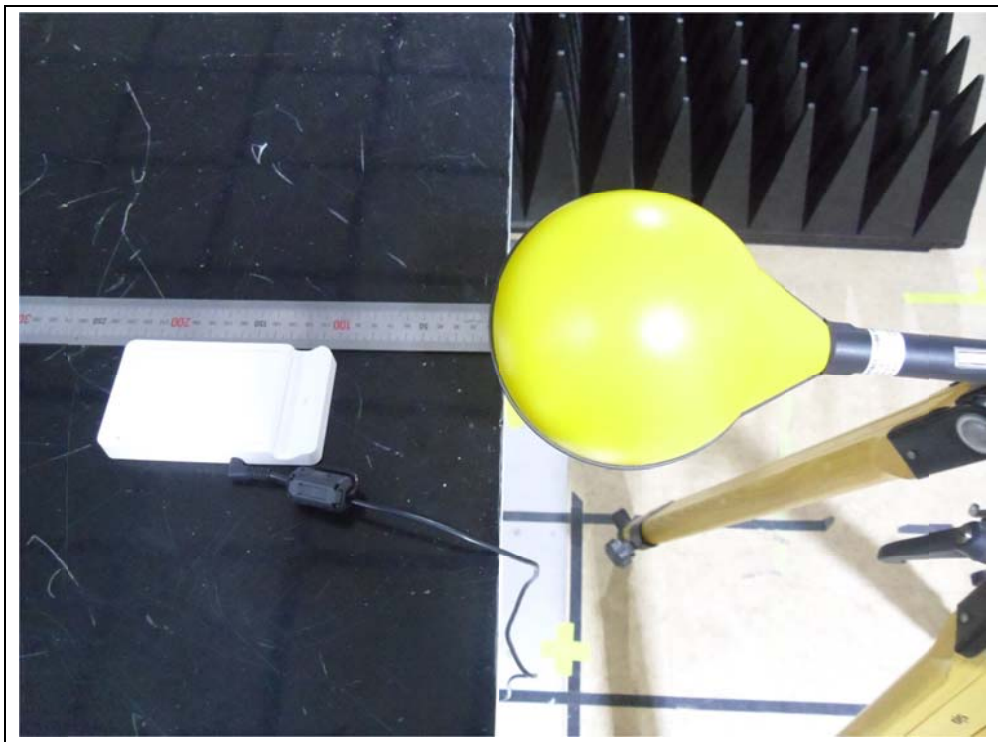
3. TEST EQUIPMENT USED FOR TEST

Used equipment	Description	Manufacturer	Model Name	Serial Number	Specifications	Next Cal. Data
■	Isotropic Electric Field Probe	Amplifer research	FP7003	311520	100 kHz ~ 3 GHz	2013-12-07
■	B-Field Probe	Narde	2300/90.10	M-0269	1 Hz ~ 400 kHz	2013-11-02
■	Exposure Level Meter	Narde	ELP-400	M-0260	1 Hz ~ 400 kHz	2013-11-02
■	Wireless Communications Test Set	Agilent	E5515C	GB4223D736	INPUT MAX. 5 W	2013-11-12

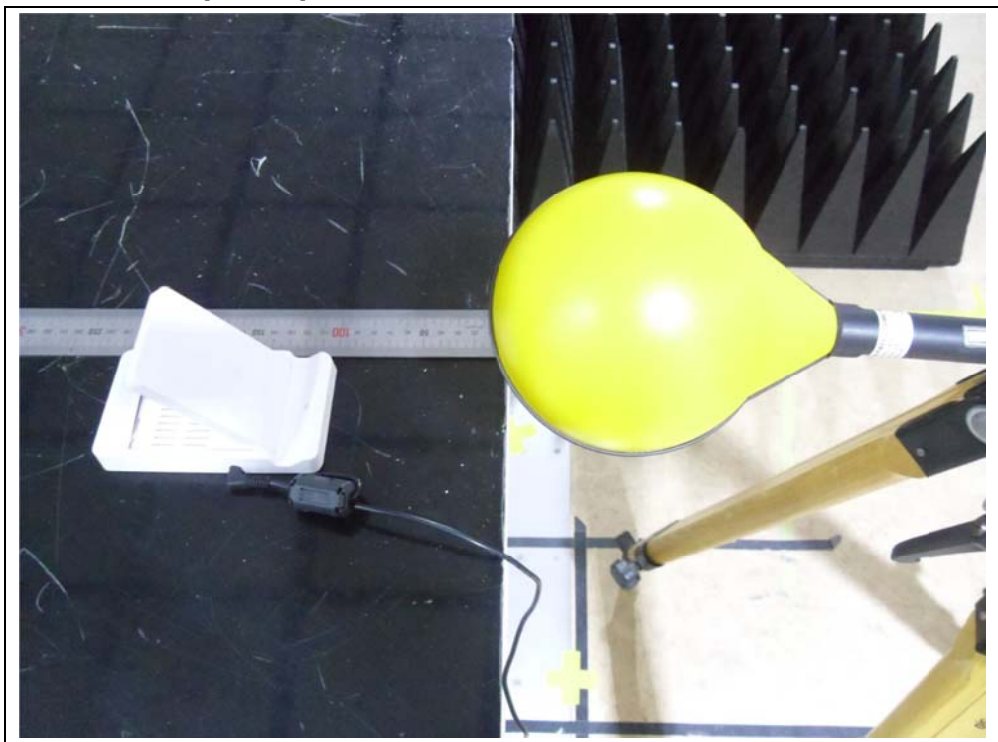
4. SETUP PHOTOS

4.1. E-Field Strength

4.1.1. Baseline 1 (10 cm)



4.1.2. Baseline 2 (10 cm)



4.1.3. Mode 1 (10 cm)



4.1.4. Mode 2 (10 cm)



4.1.5. Mode 3 (10 cm)

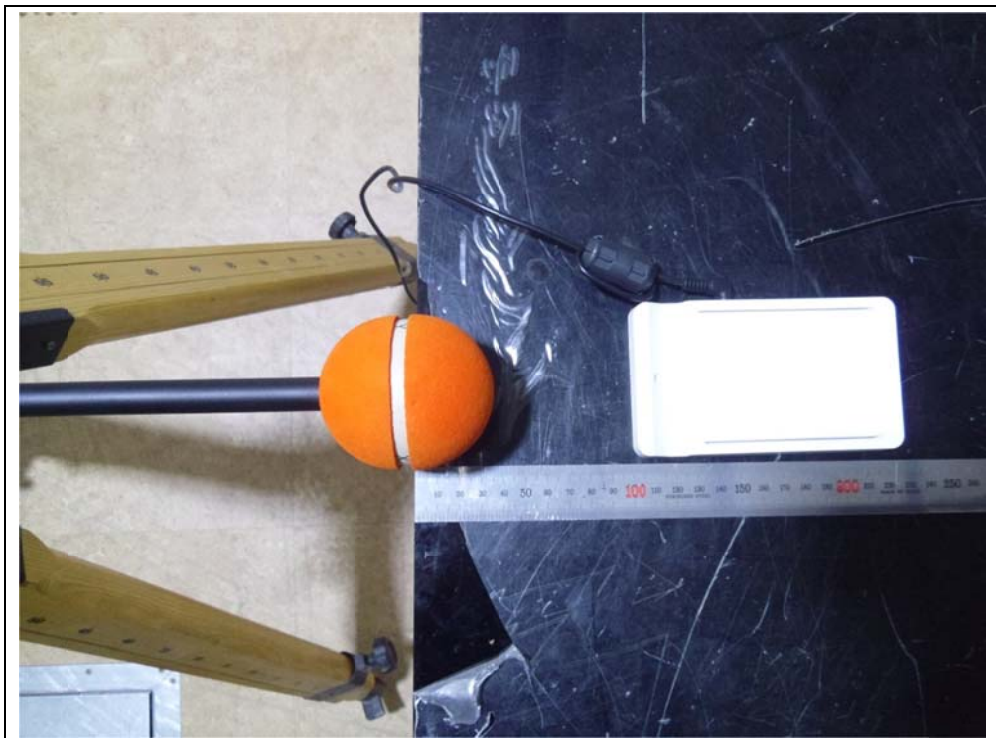


4.1.6. Mode 4 (10 cm)

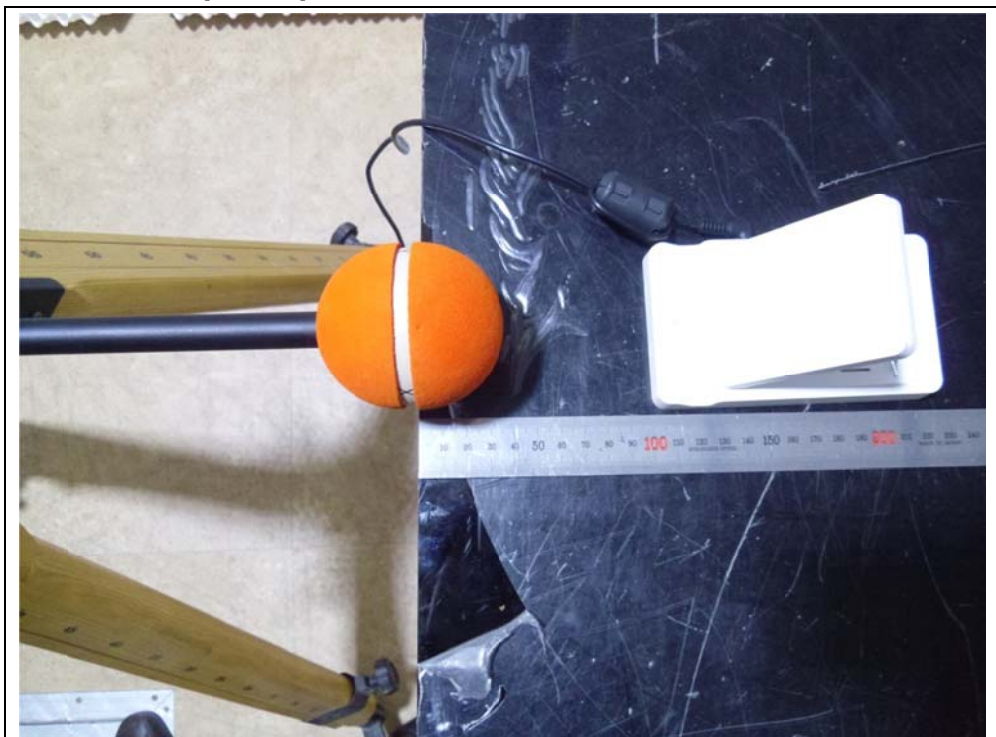


4.2. H-Field Strength

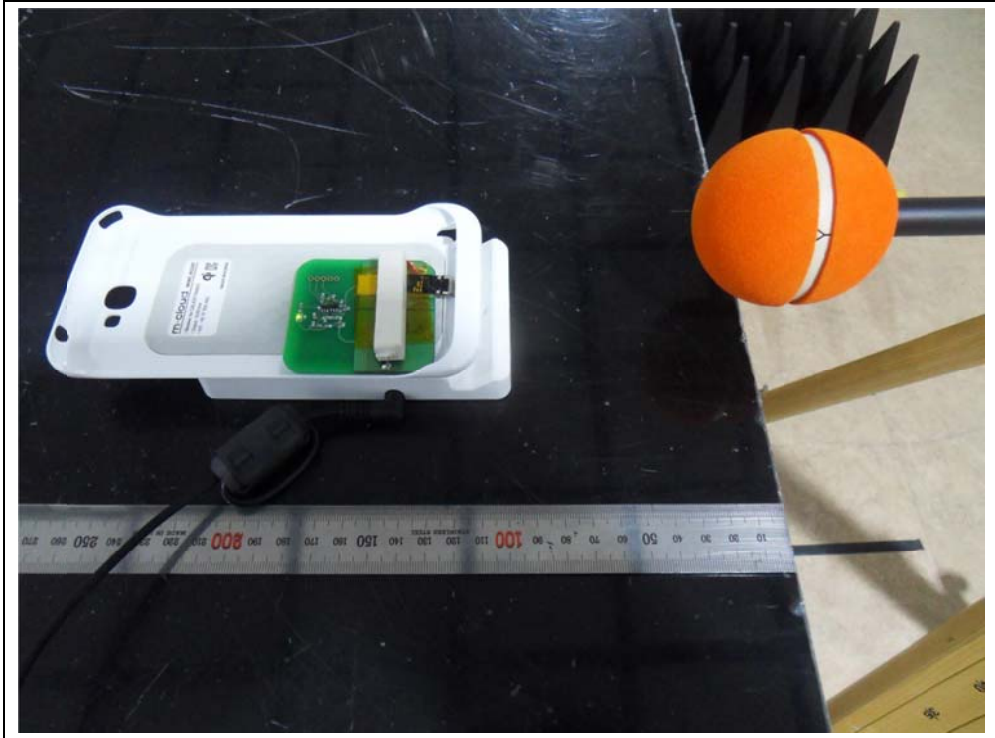
4.2.1. Baseline 1 (10 cm)



4.2.2. Baseline 2 (10 cm)



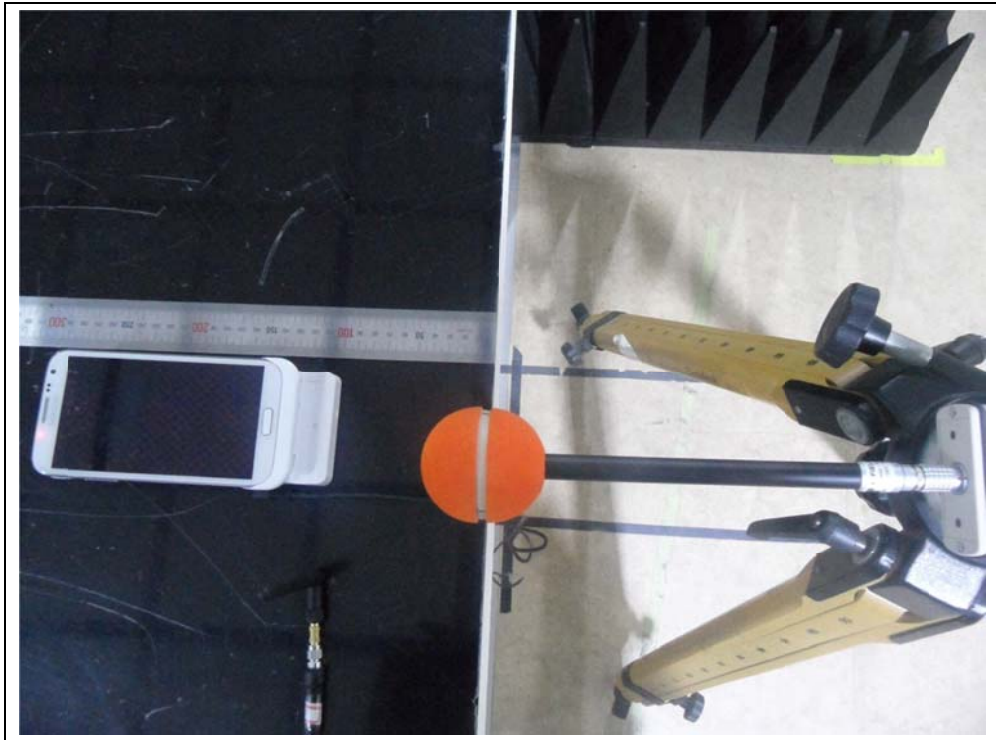
4.2.3. Mode 1 (10 cm)



4.2.4. Mode 2 (10 cm)



4.2.5. Mode 3 (10 cm)



4.2.6. Mode 4 (10 cm)

