

TEST REPORT

Reference No. : WTS20S04020509W
FCC ID : 2ACWB-BASE10P
Applicant..... : mophie LLC
Address..... : 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.
Manufacturer : mophie LLC
Address..... : 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.
Trade Mark..... :  mophie.
Product..... : mophie wireless charging base 10W
Model(s) : WRLS-CHGBASE-10W-P
Standards..... : FCC Part 15 subpart C:2019
Date of Receipt sample : 2020-04-20
Date of Test..... : 2020-04-20 to 2020-04-24
Date of Issue..... : 2020-04-24
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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2 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS20S04020509W	2020-04-20	2020-04-20 to 2020-04-24	2020-04-24	original	-	Valid

3 General Information

3.1 General Description of E.U.T

Product:	mophie wireless charging base 10W
Model(s):	WRLS-CHGBASE-10W-P
Type of Modulation:	ASK
Frequency Range:	0.112-0.205MHz
Antenna installation:	Coil Antenna;

3.2 Details of E.U.T.

Ratings:	Input: 12V $\overline{\text{---}}$ 1.5A
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4 Equipment Used during Test

4.1 Equipments List

Conducted Emissions Test Site						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMI Test Receiver	R&S	ESCI	101155	2019-09-17	2020-09-16
2	LISN	SCHWARZBECK	NSLK 8128	8128-259	2019-09-17	2020-09-16
3	Limiter	CYBERTEK	EM5010	261115-001-0024	2019-09-17	2020-09-16
4	Cable	Laplace	RF300	-	2019-09-17	2020-09-16
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2020-04-20	2021-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-05-24	2020-05-23
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2019-04-28	2020-04-27
4	Amplifier	ANRITSU	MH648A	M43381	2020-04-19	2021-04-18
5	Cable	HUBER+SUHNER	CBL2	525178	2020-04-20	2021-04-19
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2019-09-17	2020-09-16
2.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2020-04-19	2021-04-18
3.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	2019-09-15	2020-09-14
RF EXPOSURE						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Protection Network	SCHWARZBECK	VDHH9502	9502-103	2019-04-26	2020-04-25
2	EMI Test Receiver	R&S	ESCI	101296	2020-04-20	2021-04-19

4.2 Description of Support Units

Equipment	Manufacturer	Model No.	Specification
Wireless charging receiver	Waltek Services (Shenzhen) Co., Ltd	/	10W
power adapter	mophie	A138A-120150UUS2	Input:100-240V~, 50/60Hz, 0.5A
mophie juice pack™ for Samsung Galaxy Note 9	mophie LLC	JP-SGN9	/

4.3 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conducted Emissions	150kHz~30MHz	$\pm 3.64\text{dB}$	(1)
Radiated Spurious Emissions	26KHz~30MHz	$\pm 3.03\text{dB}$	(1)
Radiated Spurious Emissions	30MHz~1000MHz	$\pm 5.03\text{dB}$	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

4.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

4.5 Test Facility

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.
ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A

4.6 Test Mode

All the test model(s) and condition(s) mentioned were considered and evaluated respectively by performing full test, the worst data were recorded and reported.

Test Item	Test mode	Test channel
Conducted Emission	Transmitting with Full load	128.60kHz
	Transmitting with Half load*	
	Transmitting with No load	
Radiated Spurious Emissions	Transmitting with Full load	128.60kHz
	Transmitting with Half load*	
	Transmitting with No load	
RF Exposure	Transmitting with Full load	128.60kHz
	Transmitting with Half load*	
	Transmitting with No load	
All test mode were tested and passed, “*” show the worst case mode which were recorded in this report.		

5 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Spurious Emissions	15.209	PASS
Occupied Bandwidth	15.215	PASS
Antenna Requirement	15.203	PASS

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.10:2013
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan(9kHz Resolution Bandwidth)

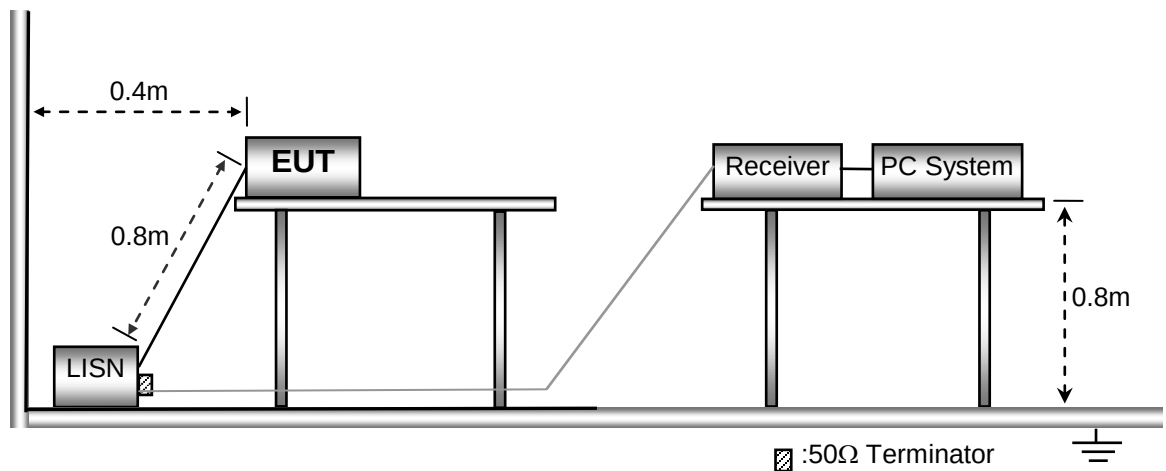
6.1 E.U.T. Operation

Operating Environment:	
Power Supply:	AC 120V, 60Hz
Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	101.2kPa
EUT Operation:	Refer to section 4.6.

The test was performed in transmitting mode, the worst case were shown in the report.

6.2 EUT Setup

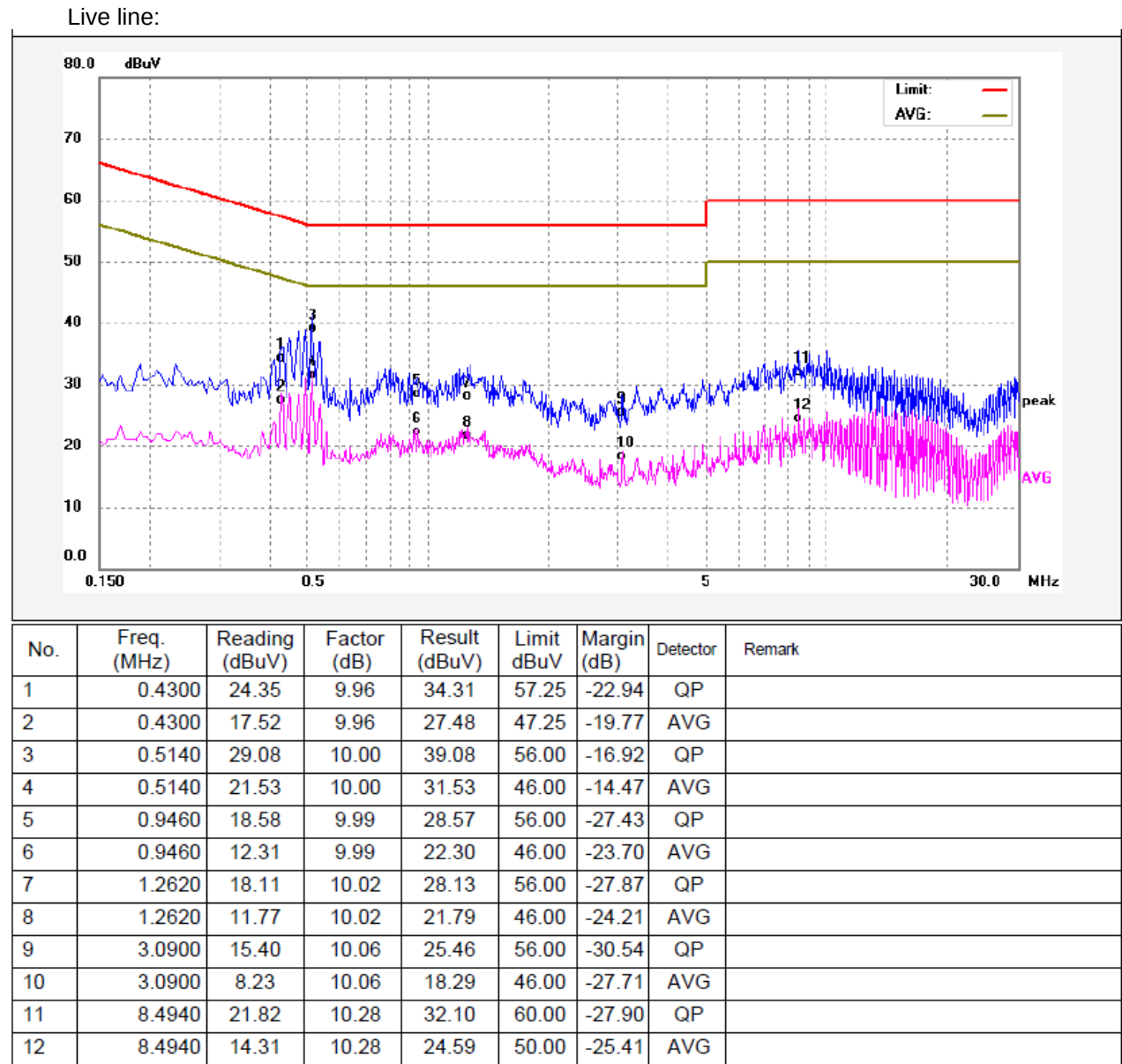
The EUT was placed on the test table in shielding room.



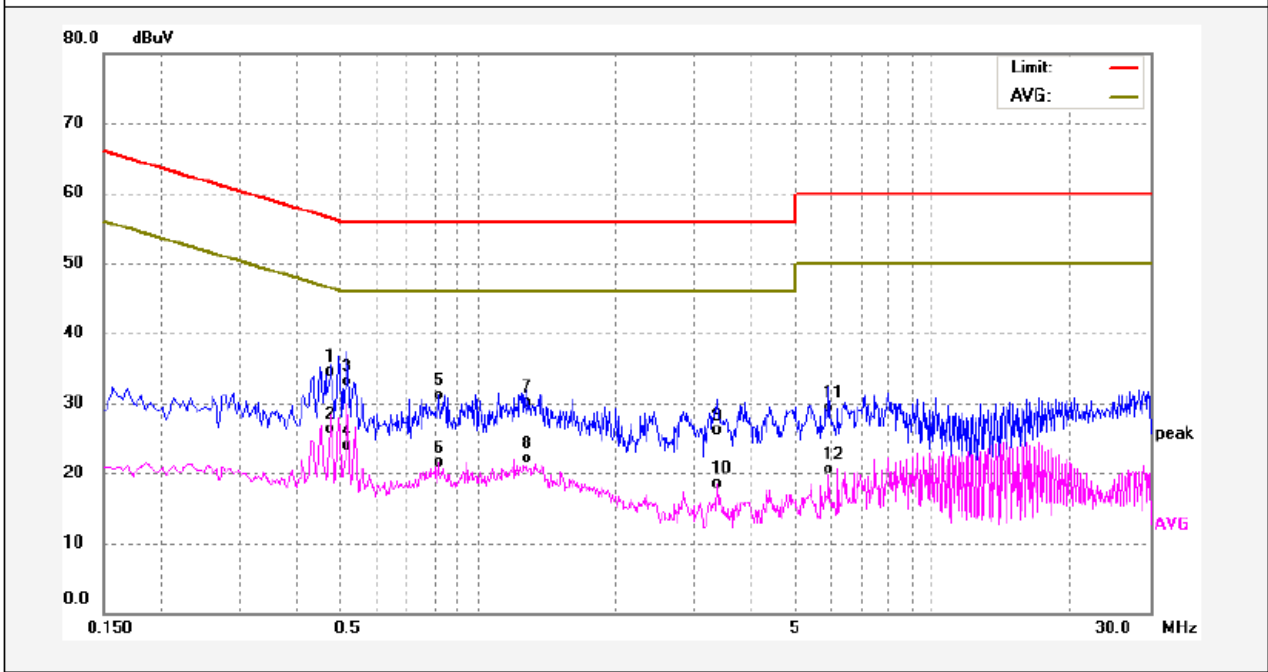
6.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.4 Conducted Emission Test Result



Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.4739	24.42	9.99	34.41	56.45	-22.04	QP	
2	0.4739	16.27	9.99	26.26	46.45	-20.19	AVG	
3	0.5140	23.06	10.00	33.06	56.00	-22.94	QP	
4	0.5140	13.87	10.00	23.87	46.00	-22.13	AVG	
5	0.8180	21.21	9.96	31.17	56.00	-24.83	QP	
6	0.8180	11.47	9.96	21.43	46.00	-24.57	AVG	
7	1.2860	20.05	10.02	30.07	56.00	-25.93	QP	
8	1.2860	12.05	10.02	22.07	46.00	-23.93	AVG	
9	3.3460	16.14	10.05	26.19	56.00	-29.81	QP	
10	3.3460	8.36	10.05	18.41	46.00	-27.59	AVG	
11	5.9220	19.01	10.21	29.22	60.00	-30.78	QP	
12	5.9220	10.32	10.21	20.53	50.00	-29.47	AVG	

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

FCC Part15 Paragraph 15.209

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment:

Power Supply: AC 120V, 60Hz

Temperature: 23.5 °C

Humidity: 51.1% RH

Atmospheric Pressure: 101.2kPa

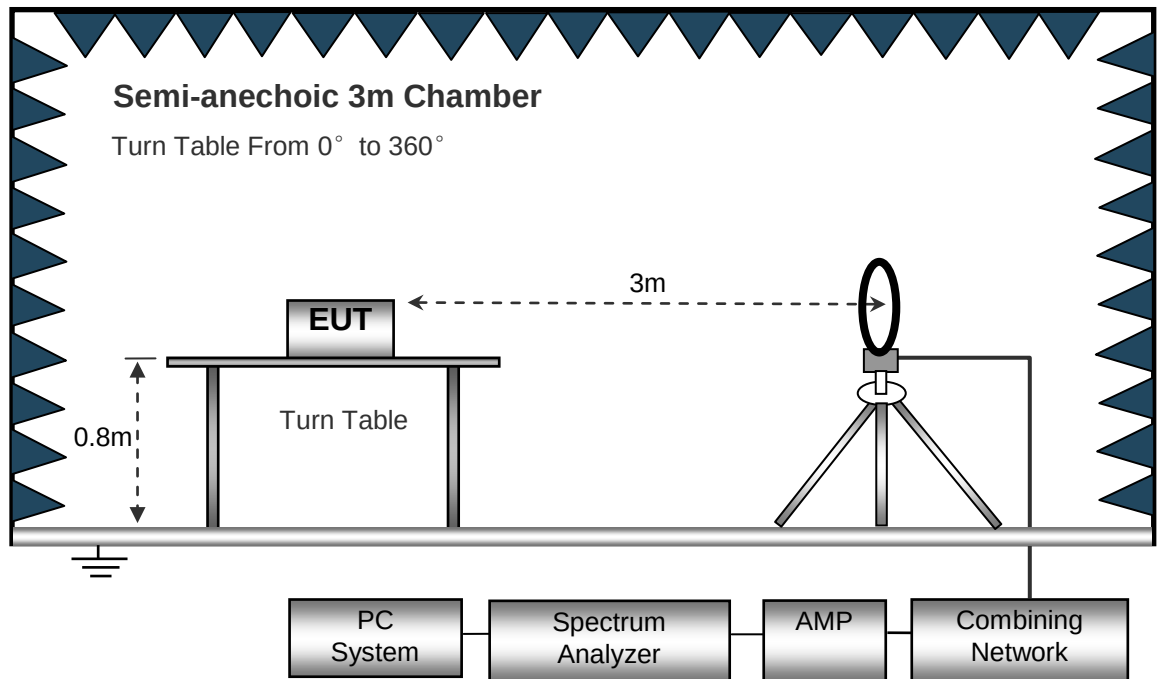
EUT Operation: Refer to section 4.6.

The test was performed in transmitting mode, the worst case were recorded in the report.

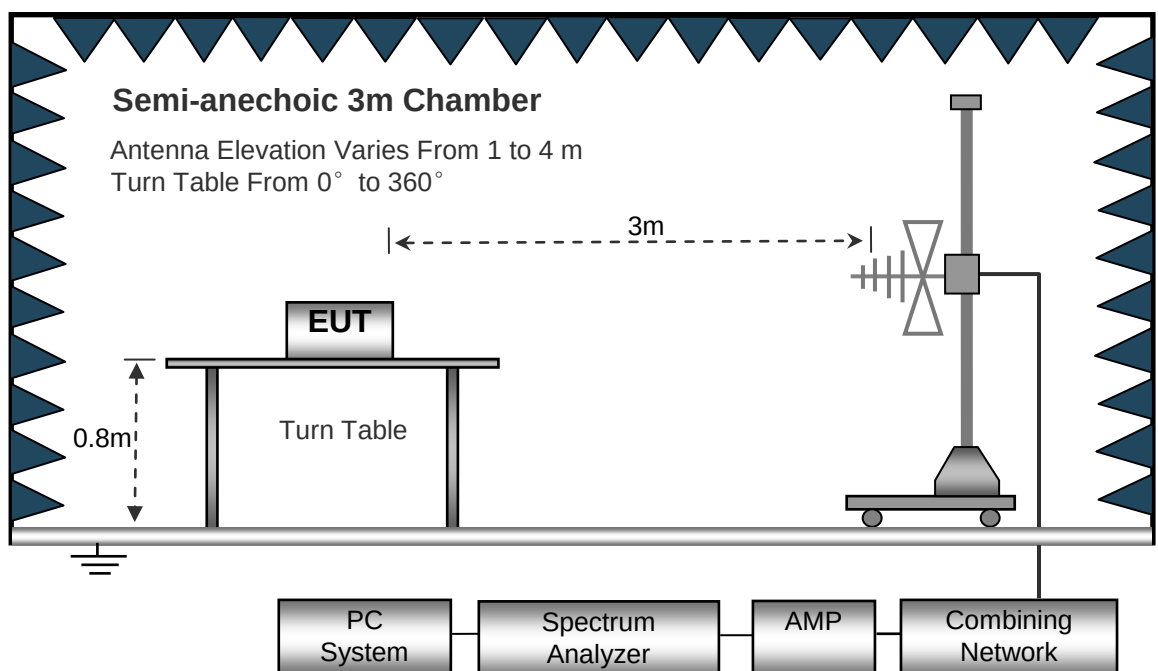
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz
Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed Auto
Detector PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 9KHz ~ 30MHz

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15. 209	
			Height	Polar			Limit	Margin
(kHz)	(dBμV)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
128.60	54.64	357	1.4	H	18.72	73.36	105.42	-32.06
128.60	60.27	117	1.5	V	18.72	78.99	105.42	-26.43

Note: Correct factor = Cable loss + Antenna factor)

Test Frequency: 30MHz ~ 1GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.209	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP /Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
50.76	32.50	QP	166	1.3	H	-16.42	16.08	40.00	-23.92
50.76	43.24	QP	45	1.3	V	-16.42	26.82	40.00	-13.18
112.92	39.56	QP	179	1.5	H	-18.29	21.27	43.50	-22.23
112.92	44.16	QP	349	1.9	V	-18.29	25.87	43.50	-17.63
206.40	43.61	QP	38	1.7	H	-17.79	25.82	43.50	-17.68
206.40	50.19	QP	301	1.5	V	-17.79	32.40	43.50	-11.10

Note: Correct factor = Cable loss + Antenna factor)

8 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.215

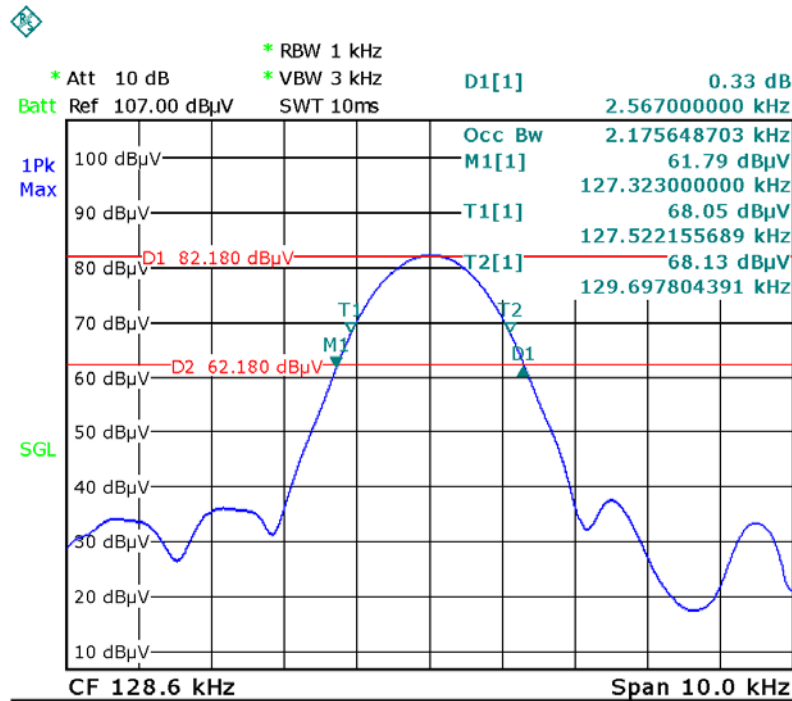
8.1 Test Procedure

1. The transmitter shall be operated at its maximum carrier power measured under normal test conditions;
2. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
3. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

8.2 Test Result

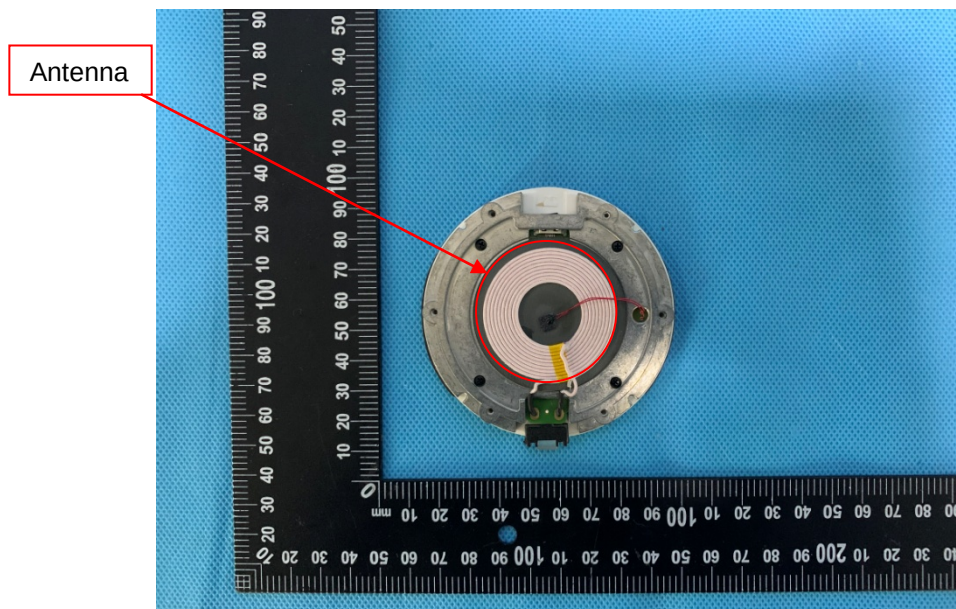
Test Channel(kHz)	99% Bandwidth(kHz)	20dB Bandwidth Emission(KHz)
128.60	2.176	2.567

Test result plot as follows:



9 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a Coil antenna, fulfill the requirement of this section.

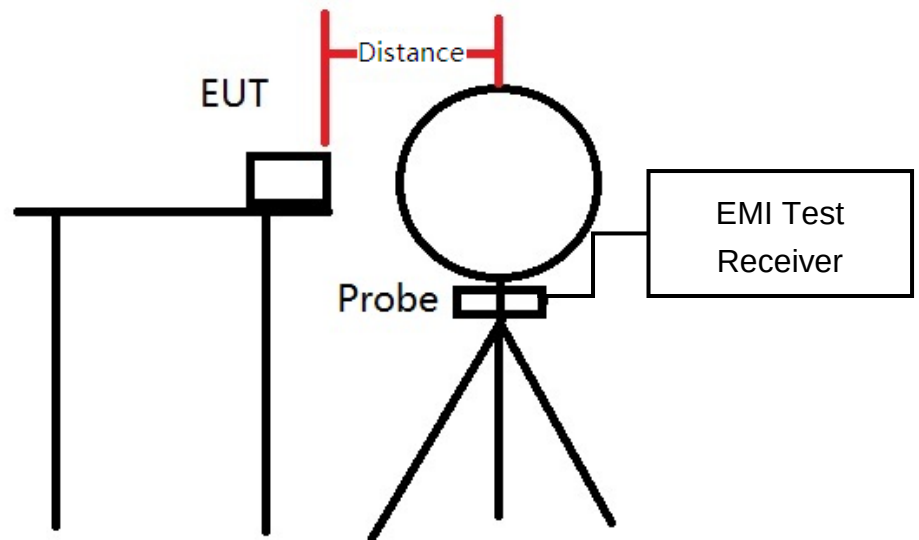


10 2ACWB-BASE10P RF Exposure

Test Requirement:

Environmental evaluation and exposure limit according to FCC CFR 47 Part 1.1307 (c) and (d), 1.1310. According KDB680106 D01 RF Exposure Wireless Charging Apps v03

10.1 Test Setup



These testing were performed at test configuration as above diagram.

EUT was placed on a table, and the measure probe was placed at a measurement distance of 20cm from the top of EUT to the center of the probe and 15cm from other directions of EUT to the center of the probe..

The EUT was put in different directions (Left, Right, Front, Rear, Top and Bottom) to obtain the maximum reading.

10.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

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

10.3 Test Data

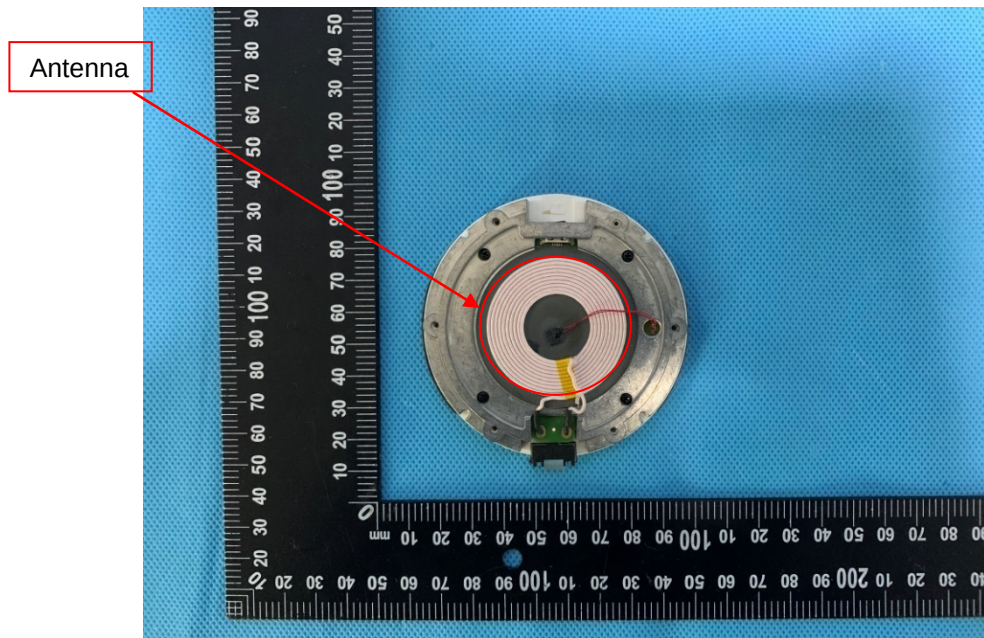
Test Side	Separation Distance(cm)	H-Field Measured(A/m)	MPE Limit(A/m)	Result
Left	15	0.25	1.63	Compliance
Right	15	0.26	1.63	Compliance
Front	15	0.32	1.63	Compliance
Rear	15	0.30	1.63	Compliance
Top	20	0.44	1.63	Compliance
Bottom	15	0.31	1.63	Compliance
% of Margin Limit	26.99%	Limit	50%	Compliance

Remark: The device meets the RF exposure limit at a distance as specified in §1.1310 of the FCC Rules and meeting all of the following requirements as follows.

- (1) Power transfer frequency is less than 1 MHz.
- (2) Output power from each primary coil is less than or equal to 15 watts.
- (3) 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.
- (4) Client device is placed directly in contact with the transmitter.
- (5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).
- (6) The aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.

10.4 EUT coupling surface area

The inductive area is below (Coupling area: $\varnothing$ 42 mm, The located at top of the equipment):



11 Photographs-Test Setup

Note: Please refer to file: WRLS-CHGBASE-10W-P_Tsup Pho.

12 Photograph-RF Exposure Test Setup

Note: Please refer to file: WRLS-CHGBASE-10W-P_Tsup Pho.

13 Photographs-Constructional Details

13.1 External Photos

Note: Please refer to file: WRLS-CHGBASE-10W-P_ExtPho.

13.2 Internal Photos

Note: Please refer to file: WRLS-CHGBASE-10W-P_IntPho.

===== End of Report =====