

TEST REPORT

Reference No. : WTS19S07052488W001
FCC ID : 2ACWB-DUALR
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 dual wireless charging pad
Model(s) : DUAL-WRLS-BASE
Standards..... : FCC Part 15 subpart C:2019
Date of Receipt sample : 2019-07-31
Date of Test..... : 2019-07-31 to 2019-08-16
Date of Issue..... : 2019-08-16
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.

Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

Test site/Test Location:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

Tel :+86-755-83551033

Fax:+86-755-83552400

Compiled by:

Frank Yin

Frank Yin / Test Engineer

Waltek Services (Shenzhen) Co.,Ltd.

<http://www.waltek.com.cn>

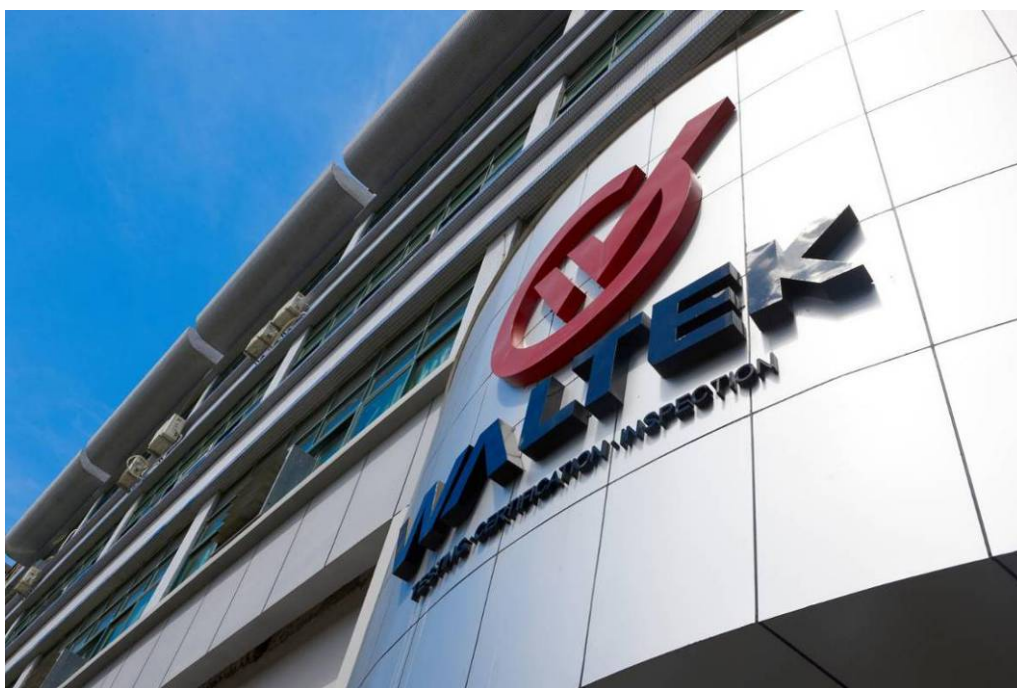
Approved by:



Philo Zhong / Manager

1 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), ISED Canada (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

1.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Scope Covered By	Scope	Note
USA	ISO/IEC 17025	FCC ID \ SDoC(VOC/DOC)	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand		NTC	-
Singapore		IDA	-
Note:			
1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.			
2. ISED CAB identifier : CN0013. Test Firm Registration No.: 7760A.			

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd.	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

2 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

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4 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS19S07052488W001	2019-07-31	2019-07-31 to 2019-08-16	2019-08-16	original	-	Valid

5 General Information

5.1 General Description of E.U.T

Product:	mophie dual wireless charging pad
Model(s):	DUAL-WRLS-BASE
Type of Modulation:	ASK
Frequency Range:	0.112-0.205MHz
Antenna installation:	Ant1: Coil Antenna; Ant2: Coil Antenna

5.2 Details of accessories

Ratings:	Input: DC 19V, 1.58A; Output(Qi): 10W*2; Output(USB-A): DC 5V, 1A
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6 Equipment Used during Test

6.1 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	2018-09-15	2019-09-14
2	LISN	SCHWARZBECK	NSLK 8128	8128-259	2018-09-15	2019-09-14
3	Limiter	CYBERTEK	EM5010	261115-001-0024	2018-09-15	2019-09-14
4	Cable	Laplace	RF300	-	2019-07-18	2020-07-17
3m Semi-anechoic Chamber for Radiation Emissions Test site						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2019-04-20	2020-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-04-19	2020-04-18
3	Amplifier	ANRITSU	MH648A	M43381	2019-04-20	2020-04-19
4	Cable	HUBER+SUHNER	CBL2	525178	2019-04-20	2020-04-19
5	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2019-04-17	2020-04-16
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2018-09-15	2019-09-14
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2018-11-18	2019-11-17
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2019-04-19	2020-04-18
4.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	2018-09-15	2019-09-14

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Specification
Wireless charging receiver 1	Waltek Services (Shenzhen) Co., Ltd	/	10W
Wireless charging receiver 2	Waltek Services (Shenzhen) Co., Ltd	/	10W
Resistive Load	Waltek Services (Shenzhen) Co., Ltd	/	5Ω
AC adapter	SHENZHEN HONOR ELECTRONIC CO., LTD.	ADS-40FSI-19 19030EPCU	Input: 100-240V~, 50/60Hz, Max.1.0A Output: DC 19V, 1.58A

6.3 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conducted Emissions	150kHz~30MHz	$\pm 3.64\text{dB}$	(1)
Radiated Spurious Emissions	9kHz~26kHz	$\pm 4.03\text{dB}$	(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 $k=2$.

6.4 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.

6.5 Test Mode

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

Description	Test channel	Test mode
Full Load	127.7728kHz	Transmitting with Ant1
Half Load	127.7728kHz	Transmitting with Ant1
No Load	127.7728kHz	Transmitting with Ant1
Full Load	127.7728kHz	Transmitting with Ant2
Half Load	127.7728kHz	Transmitting with Ant2
No Load	127.7728kHz	Transmitting with Ant2
Full Load	127.7728kHz	Transmitting with Ant1+Ant2
Half Load	127.7728kHz	Transmitting with Ant1+Ant2
No Load	127.7728kHz	Transmitting with Ant1+Ant2
All the modes were tested and passed, the worst case were recorded in this report.		

7 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)

7.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

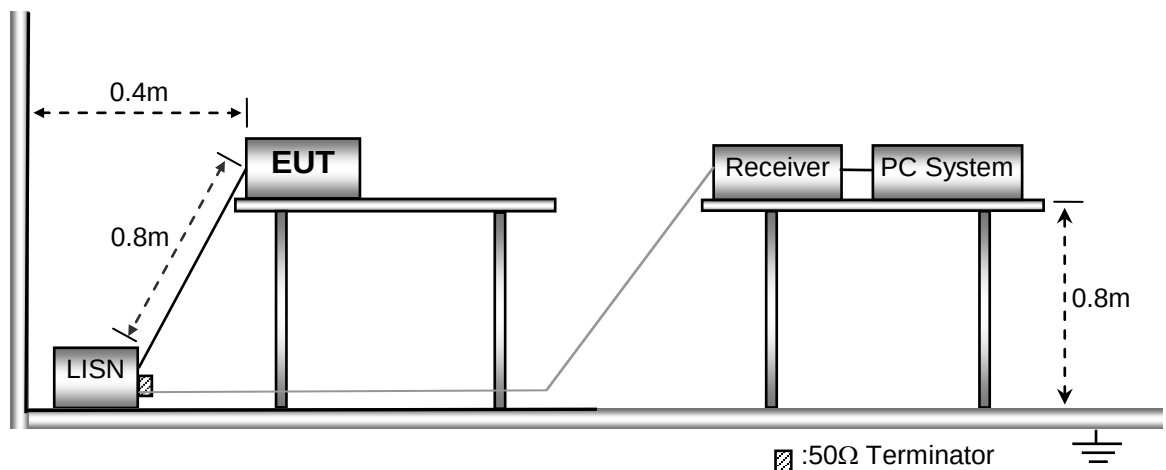
Atmospheric Pressure: 101.2kPa

EUT Operation: Refer to section 6.5

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

7.2 EUT Setup

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

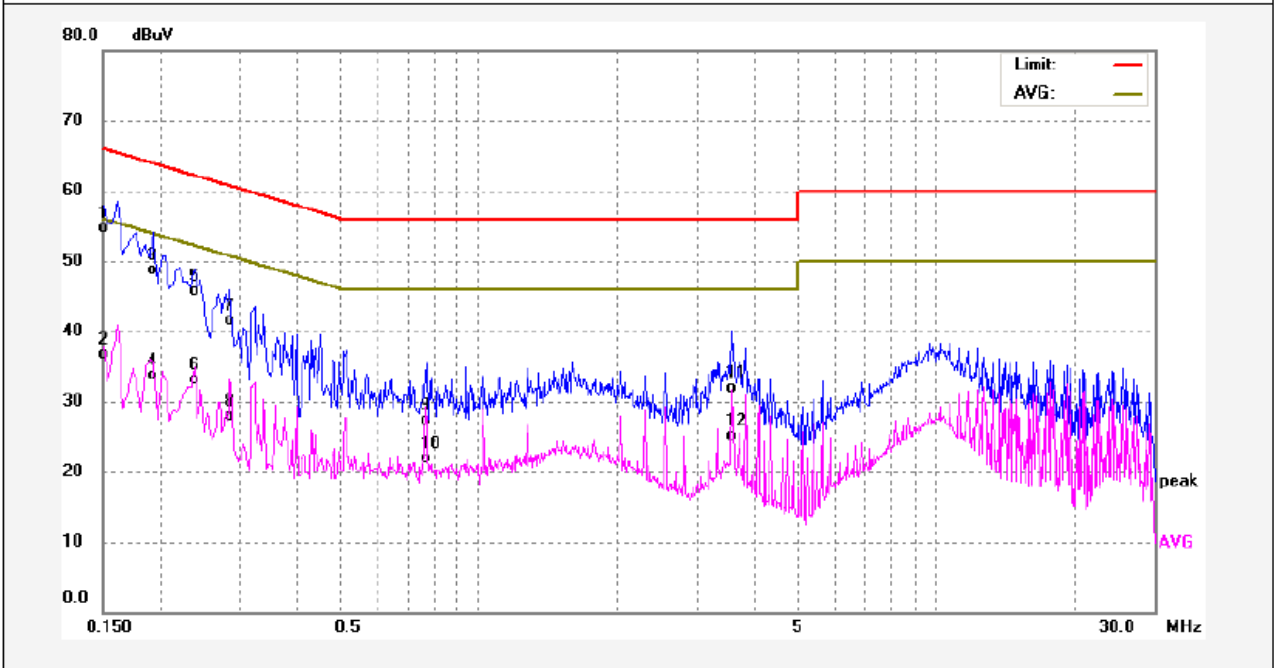


7.3 Measurement Description

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.

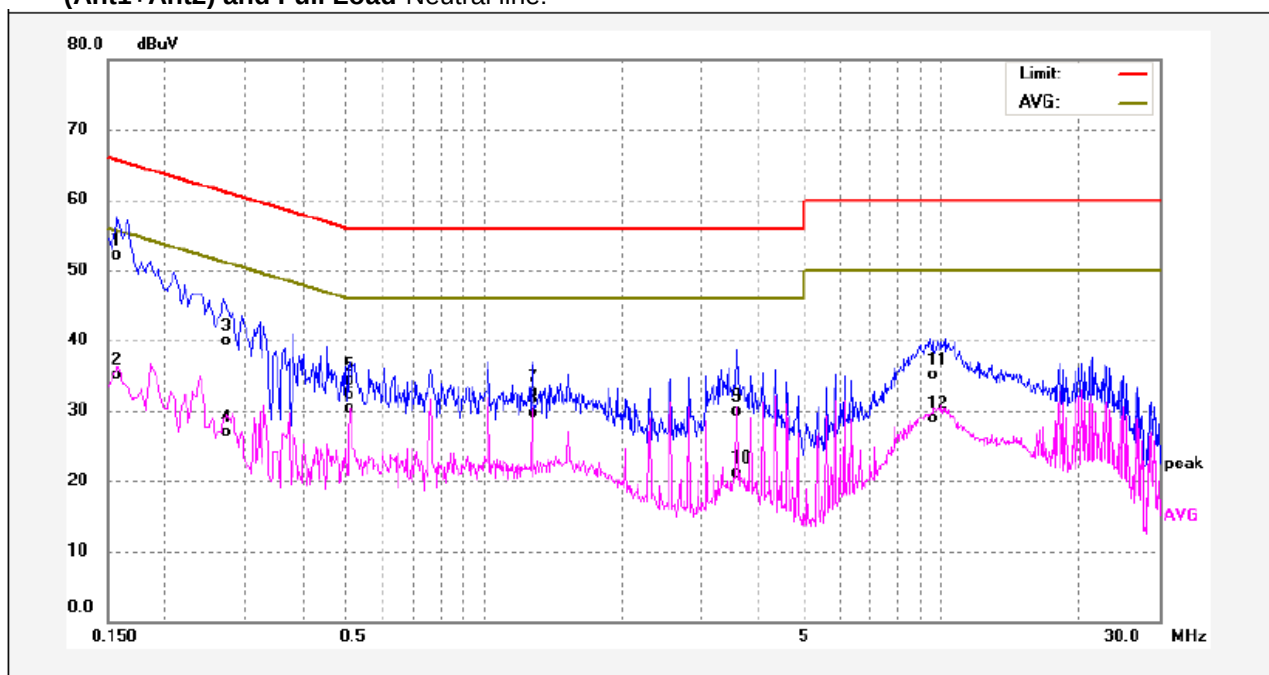
7.4 Conducted Emission TestResult

(Ant1+Ant2) and Full Load -Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	44.35	10.26	54.61	65.99	-11.38	QP	
2	0.1500	26.41	10.26	36.67	55.99	-19.32	AVG	
3	0.1940	38.41	10.32	48.73	63.86	-15.13	QP	
4	0.1940	23.29	10.32	33.61	53.86	-20.25	AVG	
5	0.2380	35.43	10.37	45.80	62.16	-16.36	QP	
6	0.2380	22.80	10.37	33.17	52.16	-18.99	AVG	
7	0.2860	31.08	10.40	41.48	60.64	-19.16	QP	
8	0.2860	17.58	10.40	27.98	50.64	-22.66	AVG	
9	0.7740	16.96	10.44	27.40	56.00	-28.60	QP	
10	0.7740	11.50	10.44	21.94	46.00	-24.06	AVG	
11	3.5820	21.22	10.74	31.96	56.00	-24.04	QP	
12	3.5820	14.33	10.74	25.07	46.00	-20.93	AVG	

(Ant1+Ant2) and Full Load-Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	41.81	10.27	52.08	65.56	-13.48	QP	
2	0.1580	24.82	10.27	35.09	55.56	-20.47	AVG	
3	0.2700	29.44	10.40	39.84	61.12	-21.28	QP	
4	0.2700	16.47	10.40	26.87	51.12	-24.25	AVG	
5	0.5100	23.91	10.43	34.34	56.00	-21.66	QP	
6	0.5100	19.97	10.43	30.40	46.00	-15.60	AVG	
7	1.2780	22.31	10.45	32.76	56.00	-23.24	QP	
8	1.2780	19.27	10.45	29.72	46.00	-16.28	AVG	
9	3.5740	19.13	10.74	29.87	56.00	-26.13	QP	
10	3.5740	10.28	10.74	21.02	46.00	-24.98	AVG	
11	9.4780	23.90	11.19	35.09	60.00	-24.91	QP	
12	9.4780	17.74	11.19	28.93	50.00	-21.07	AVG	

8 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	$20\log^{(500)}$

8.1 EUT Operation

Operating Environment:

Temperature: 23.5 °C

Humidity: 51.1% RH

Atmospheric Pressure: 101.2kPa

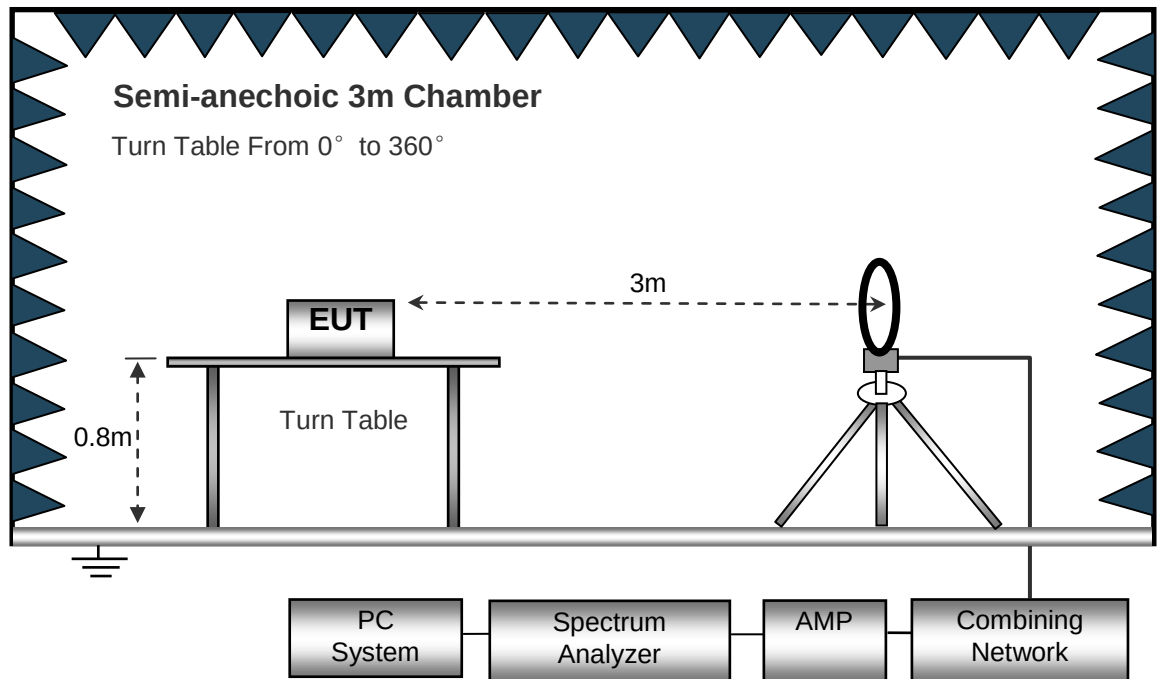
EUT Operation: Refer to section 6.5

Only the worst case were recorded in the report.

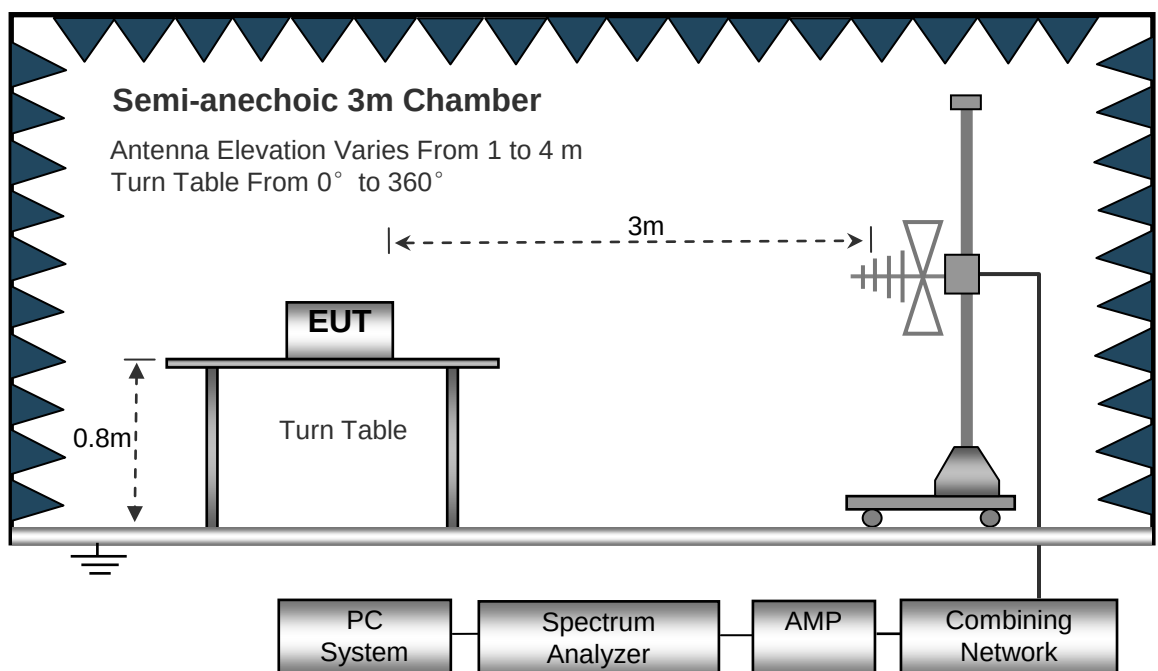
8.2 Test Setup

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.



8.3 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

8.4 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.

8.5 Summary of Test Results

Ant1 and Full Load (Test Frequency:9KHz ~ 30MHz, Note: Correct factor = Cable loss + Antenna factor)

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)
127.7728	60.84	14	1.4	H	18.72	79.56	105.48	-25.92
127.7728	66.42	119	1.0	V	18.72	85.14	105.48	-20.34

Ant1 and Full Load (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)
37.29	35.87	QP	230	1.9	H	-17.14	18.73	40.00	-21.27
37.29	51.92	QP	300	1.1	V	-17.14	34.78	40.00	-5.22
73.36	41.72	QP	289	1.2	H	-20.08	21.64	40.00	-18.36
73.36	54.98	QP	92	1.9	V	-20.08	34.90	40.00	-5.10
180.02	46.43	QP	48	1.7	H	-17.16	29.27	43.50	-14.23
180.02	53.32	QP	269	1.5	V	-17.16	36.16	43.50	-7.34

Ant2 and Full Load (Test Frequency:9KHz ~ 30MHz, Note: Correct factor = Cable loss + Antenna factor)

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)
127.7728	64.33	340	1.6	H	18.72	83.05	105.48	-22.43
127.7728	66.59	121	1.1	V	18.72	85.31	105.48	-19.17

Ant2 and Full Load (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)
37.29	35.66	QP	341	2.0	H	-17.14	18.52	40	-21.48
37.29	50.75	QP	243	2.0	V	-17.14	33.61	40	-6.39
73.36	42.75	QP	263	1.5	H	-20.08	22.67	40	-17.33
73.36	55.40	QP	250	1.4	V	-20.08	35.32	40	-4.68
180.02	47.42	QP	91	1.2	H	-17.16	30.26	43.5	-13.24
180.02	55.14	QP	15	1.7	V	-17.16	37.98	43.5	-5.52

(Ant1+Ant2) and Full Load

(Test Frequency:9KHz ~ 30MHz, Note: Correct factor = Cable loss + Antenna factor)

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)
127.7728	64.36	204	1.9	H	18.72	83.08	105.48	-22.40
127.7728	68.04	313	1.9	V	18.72	86.76	105.48	-18.72

(Ant1+Ant2) and Full Load

(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)
37.29	34.42	QP	85	1.3	H	-17.14	17.28	40	-22.72
37.29	48.35	QP	200	1.8	V	-17.14	31.21	40	-8.79
73.36	43.54	QP	44	1.2	H	-20.08	23.46	40	-16.54
73.36	52.83	QP	53	1.3	V	-20.08	32.75	40	-7.25
180.02	47.36	QP	300	1.3	H	-17.16	30.20	43.5	-13.30
180.02	53.07	QP	119	1.7	V	-17.16	35.91	43.5	-7.59

9 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.215

9.1 Test Procedure

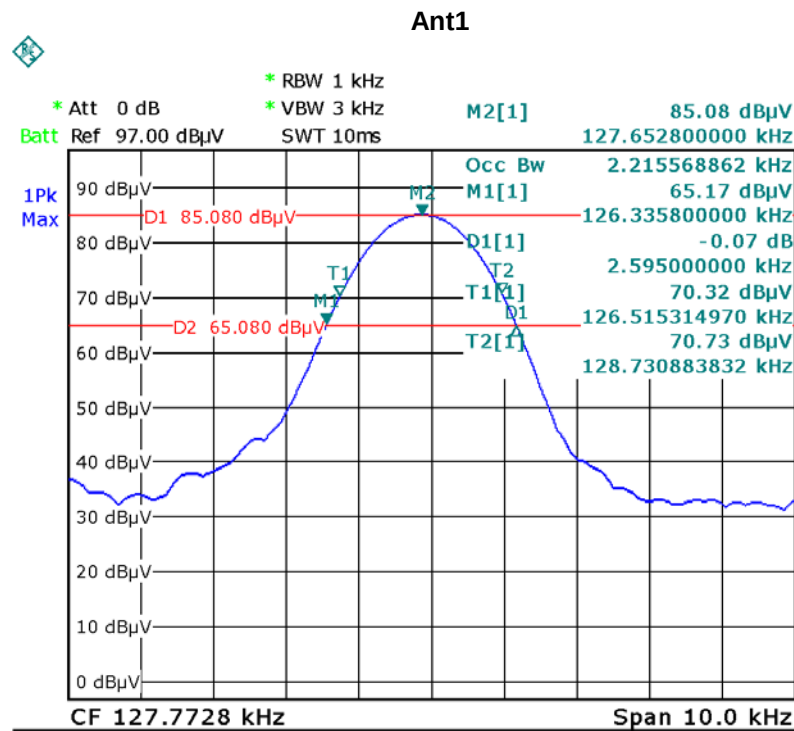
1. The transmitter shall be operated at its maximum carrier power measured under normal test conditions;
2. The span of the analyzer shall be set to capture all products of the modulation process,including the emission skirts.
3. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the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

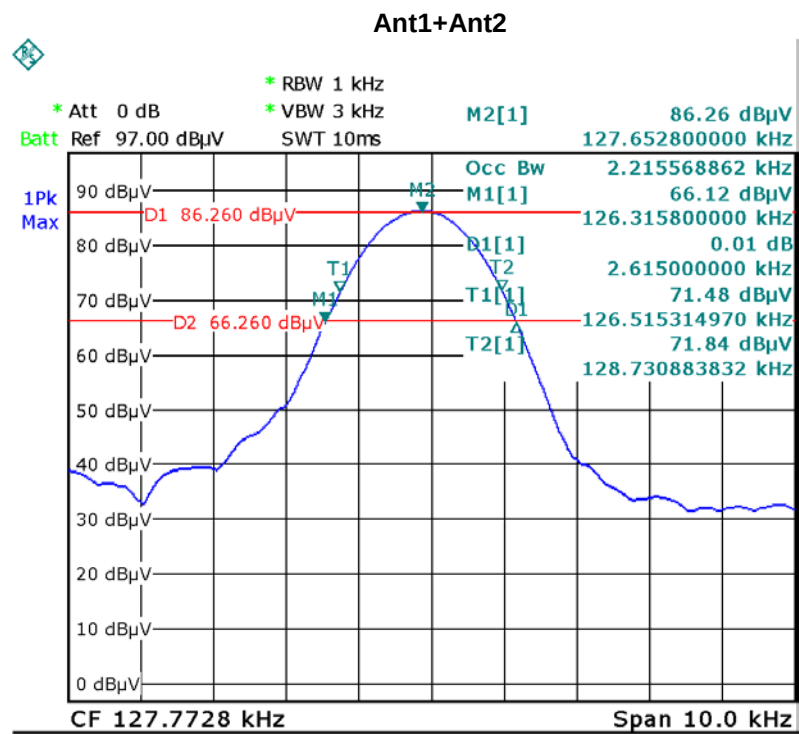
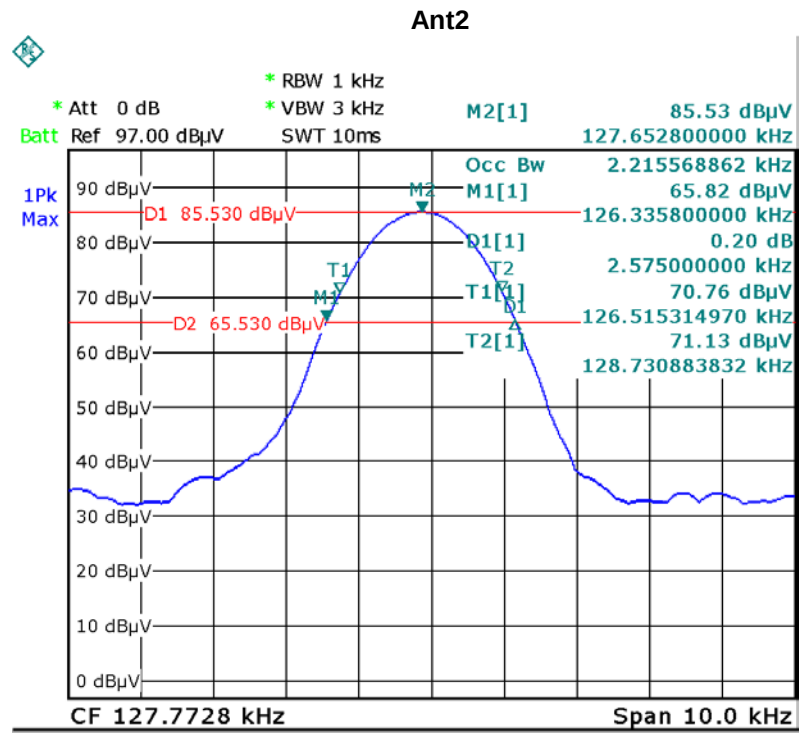
9.2 Test ResultPlot:

Test Mode	Test Channel(kHz)	99% Bandwidth(kHz)	20dB Bandwidth Emission(kHz)
Ant1	127.7728	2.216	2.595
Ant2	127.7728	2.216	2.575
(Ant1+Ant2)	127.7728	2.216	2.615

Note: The test was performed in transmitting mode, the worst case (Half Load) were shown in the report.

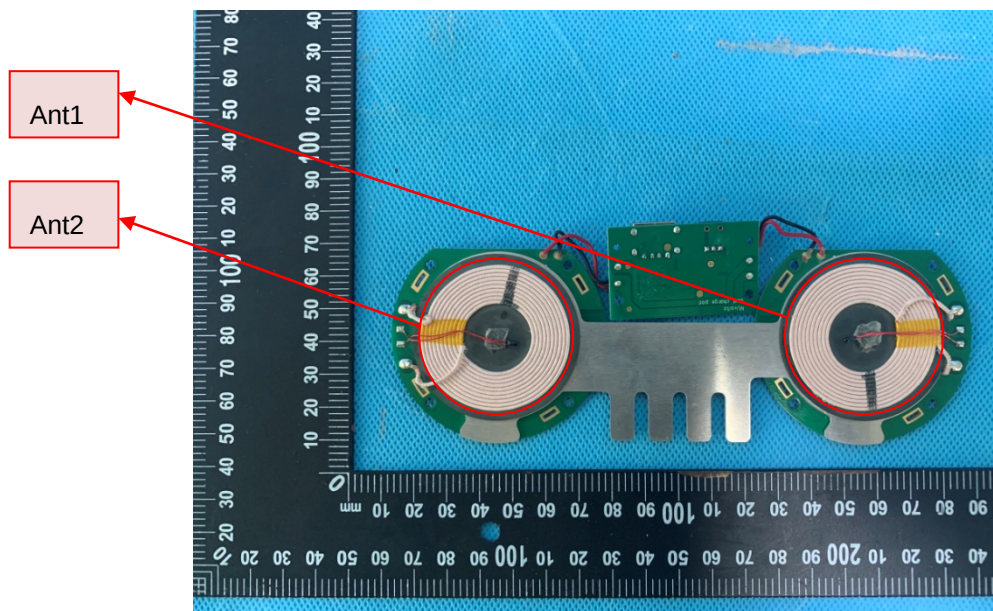
Test result plot as follows:





10 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.



11 Photographs-Test Setup

Note: Refer to the file DUAL-WRLS-BASE _Tsup Pho.

12 Photographs - Constructional Details

12.1 External View

Note: Refer to the file DUAL-WRLS-BASE _ExtPho.

12.2 Internal View

Note: Refer to the file DUAL-WRLS-BASE _IntPho.

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