

FCC Part 15C

Measurement and Test Report

For

mophie LLC

6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.

FCC ID: 2ACWB-CHRGPAD

FCC Rule(s):	<u>FCC Part 15C</u>
Product Description:	<u>mophie wireless charging base</u>
Tested Model:	<u>WRL-CHGPAD</u>
Report No.:	<u>STR17018092I</u>
Tested Date:	<u>2017-01-11 to 2017-02-14</u>
Issued Date:	<u>2017-02-14</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: mophie LLC
Address of applicant: 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.

Manufacturer: mophie LLC
Address of manufacturer: 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.

General Description of EUT

Product Name:	mophie wireless charging base
Trade Name:	mophie
Model No.:	WRL-CHGPAD
Adding Model(s):	/

Note: The test data is gathered from a production sample, provided by the manufacturer.

Technical Characteristics of EUT

Frequency Range:	112~205KHz
Modulation Type:	ASK
Antenna Type:	Coil Antenna
Rated Voltage:	DC 5V (Wireless output)
Rated Current:	<1A (Wireless output)
Rated Power:	<5W (Wireless output)

1.2 Test Standards

The following report is prepared on behalf of the mophie LLC in accordance with Part 15.207, 15.209, RSS-Gen Issue 4 and RSS-216 Issue 2 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.207, 15.209 and RSS-Gen Issue 4 and RSS-216 Issue 2 rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

FCC-Registration No.: 971995

CENTRE OF TESTING SERVICE CO., LTD, EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration No.791995, July 13,2012.

IC-Registration No.: 8374A

The 3m Alternate Test Site of CENTRE OF TESTING SERVICE CO., LTD has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 8374A on June 6, 2011.

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	Charging	Wireless Output

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
USB Cable	0.8	Shielded	Without Ferrite

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
Mobile Phone	SAMSUNG	SM-G9250	/
Adapter	DELL	PSAI10R-050Q	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2016-06-04	2017-06-03
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2016-06-04	2017-06-03
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2016-06-04	2017-06-03
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2016-06-04	2017-06-03
Loop Antenna	ETS-LINDGREN	6502	00071730	2016-06-04	2017-06-03
Receiver	R&S	ESCI	100435	2016-06-04	2017-06-03
Spectrum Analyzer	R&S	FSP40	100416	2016-06-04	2017-06-03

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§ 15.207(a) Conducted Emission	Compliant
§ 15.209(a) Radiated Emission	Compliant

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 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 or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.2 Evaluation Information

This product has a Coil antenna, fulfill the requirement of this section.

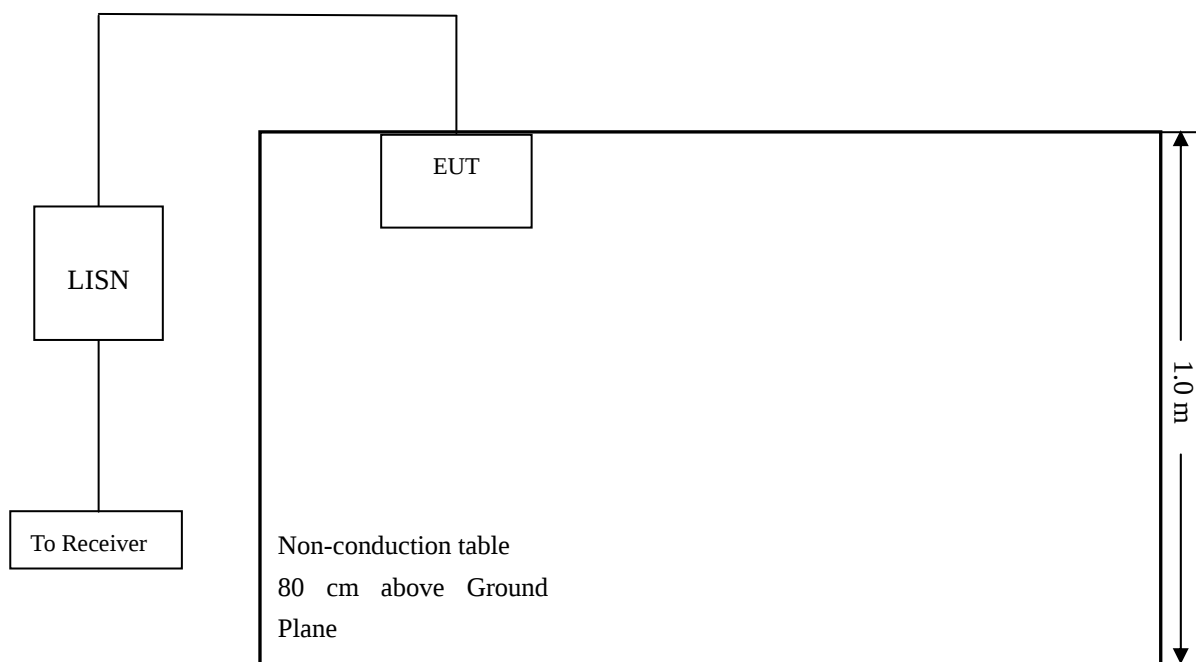
5. Conducted Emissions

5.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

5.2 Basic Test Setup Block Diagram



5.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

5.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

5.5 Summary of Test Results/Plots

According to the data in section 5.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

-8.79 dB at 0.4140 MHz in the Neutral, AVG detector, 0.15-30MHz

Plot of Conducted Emissions Test Data

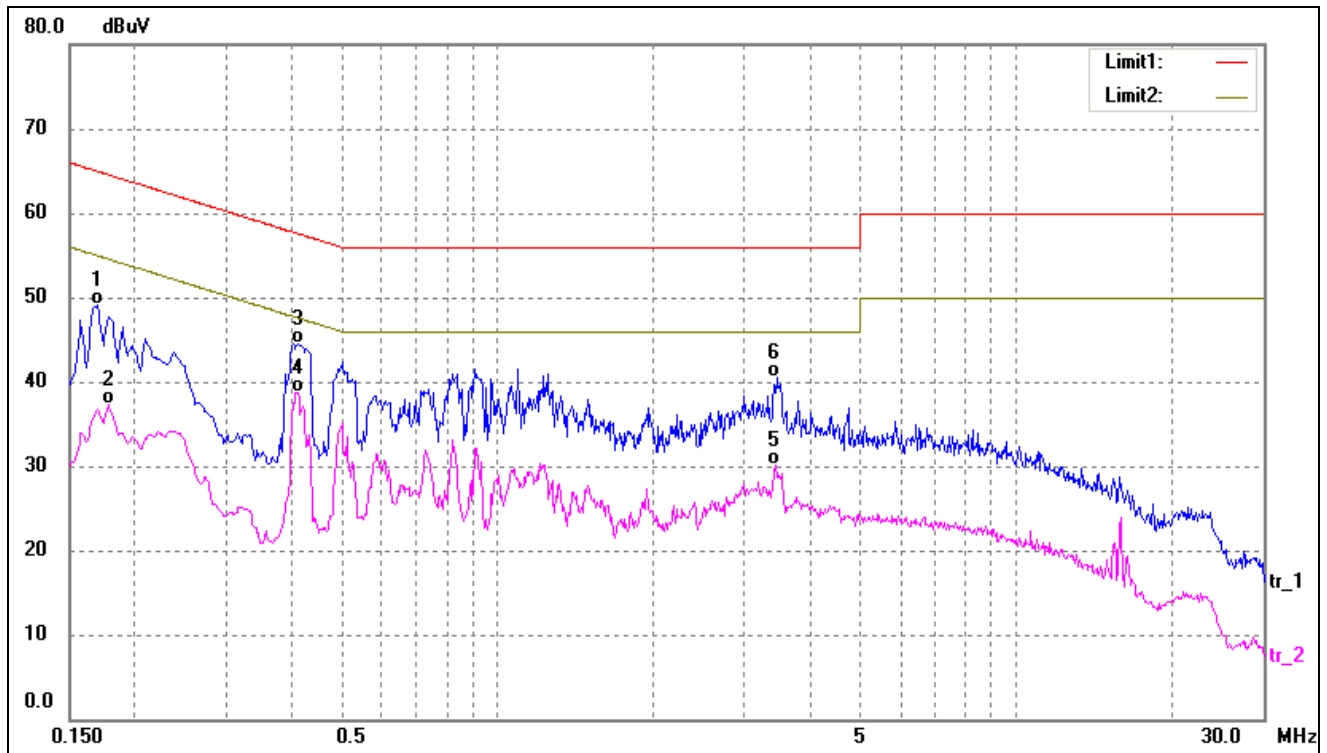
EUT: *mophie wireless charging base*

Tested Model: *WRL-CHGPAD*

Operating Condition: *TM1*

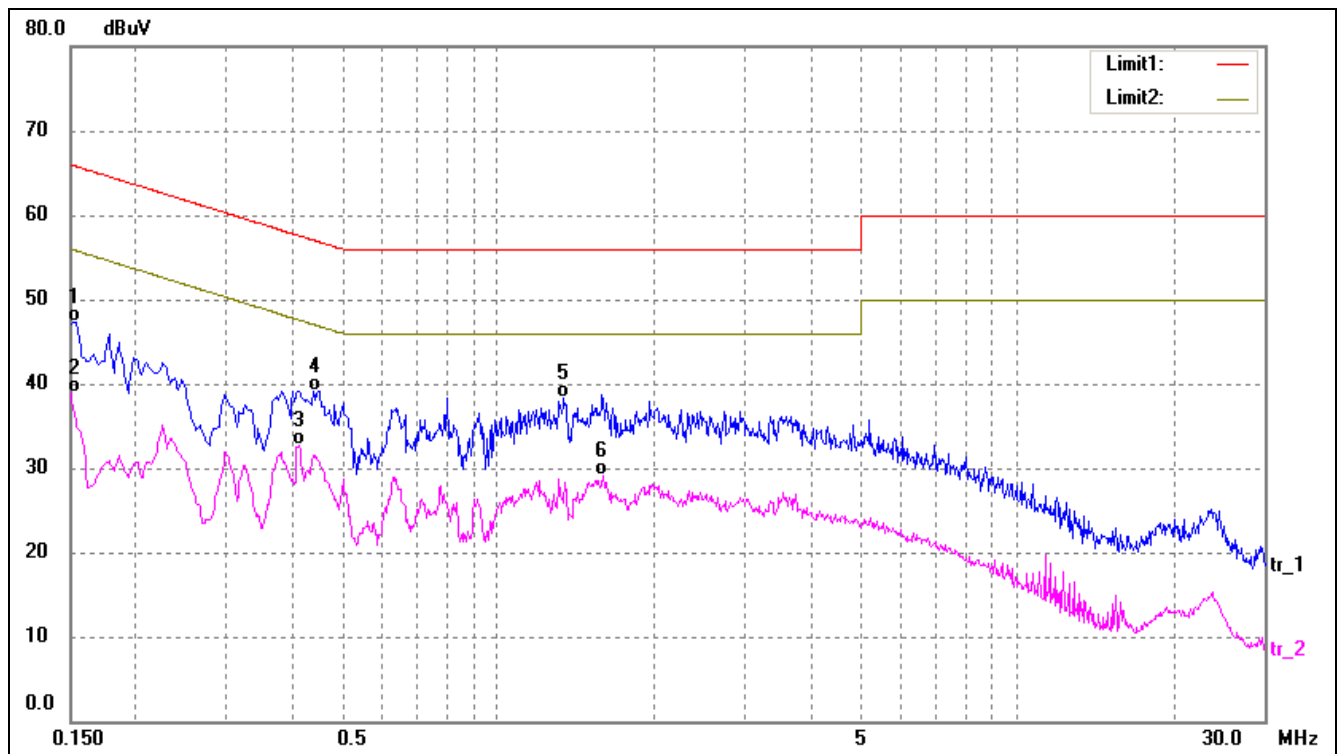
Comment: *Adapter DC5V*

Test Specification: *Neutral*



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1700	39.23	9.83	49.06	64.96	-15.90	QP
2	0.1780	27.48	9.82	37.30	54.58	-17.28	AVG
3	0.4140	34.74	9.80	44.54	57.57	-13.03	QP
4	0.4140	28.98	9.80	38.78	47.57	-8.79	AVG
5	3.4380	20.35	9.70	30.05	46.00	-15.95	AVG
6	3.4620	30.72	9.70	40.42	56.00	-15.58	QP

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1540	37.52	9.85	47.37	65.78	-18.41	QP
2	0.1540	29.13	9.85	38.98	55.78	-16.80	AVG
3	0.4140	22.88	9.80	32.68	47.57	-14.89	AVG
4	0.4500	29.39	9.80	39.19	56.88	-17.69	QP
5	1.3420	28.59	9.75	38.34	56.00	-17.66	QP
6	1.5980	19.27	9.75	29.02	46.00	-16.98	AVG

6. Field Strength of Spurious Emissions

6.1 Standard Applicable

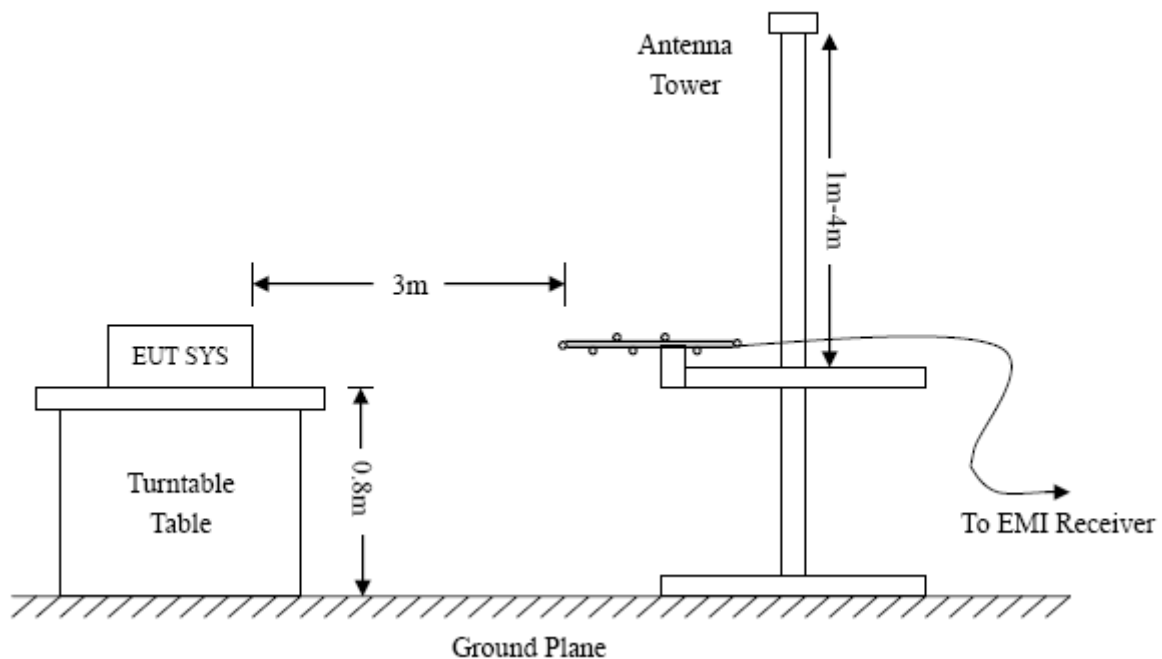
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

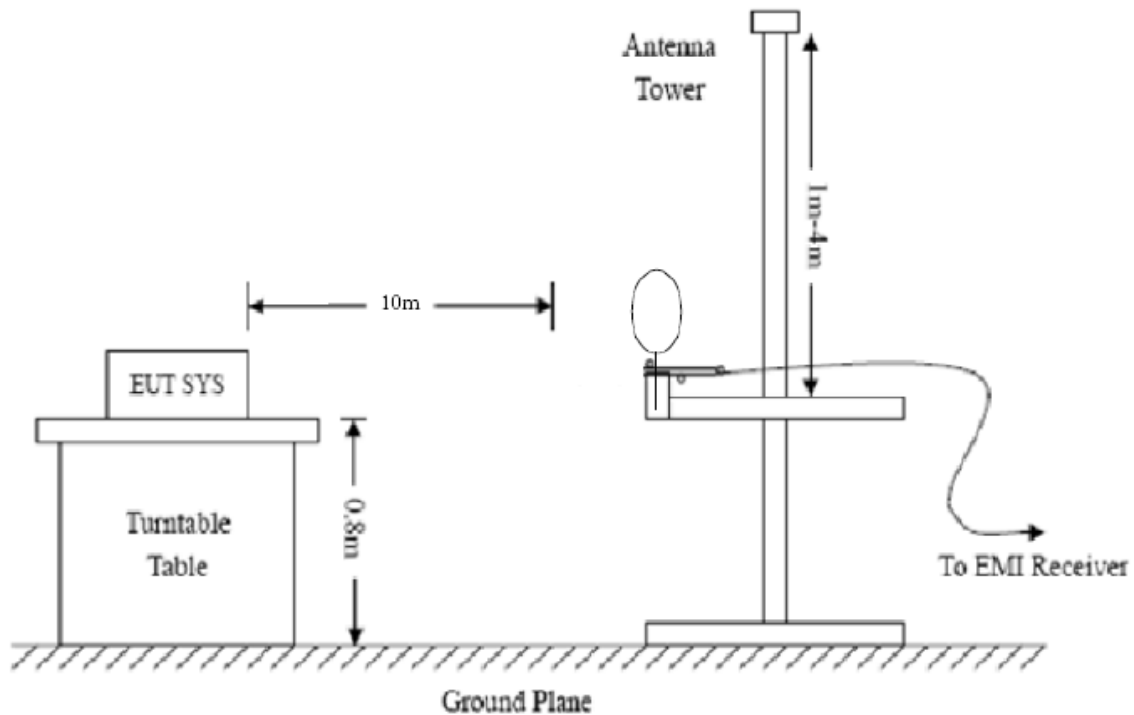
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

6.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

6.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

6.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

6. Reference Measurement at open field site

The measurement was performed with set-up consisting of a single turn loop antenna with a diameter of 0.15 m, feeded by a signal generator. The loop dimension was chosen to simulate the EUT as far as possible. The signal generator was set to a fixed output level with an unmodulated 10 kHz and 14 kHz sinusoidal signal.

The radiated H fieldstrength at 10 kHz and 14 kHz generated by this set-up was measured with the same test setup as used in the SAC in 3 m distance first, and then repeated at the open field site in 3 m and 10 m distance

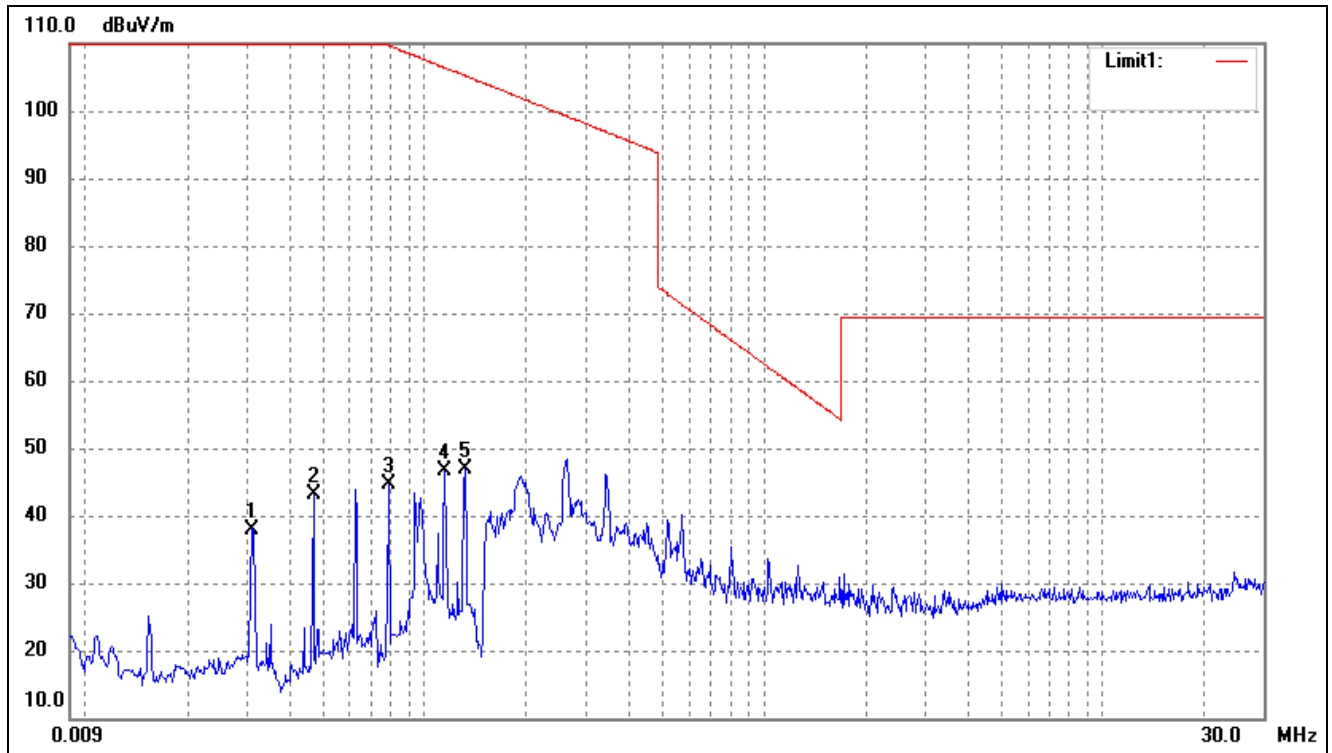
6.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.209(a) standards, and had the worst cases:

-12.26 dB at 183.8440 MHz in the Vertical polarization QP detector, 9kHz to 1 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Radiated Emissions 9kHz to 30MHz:

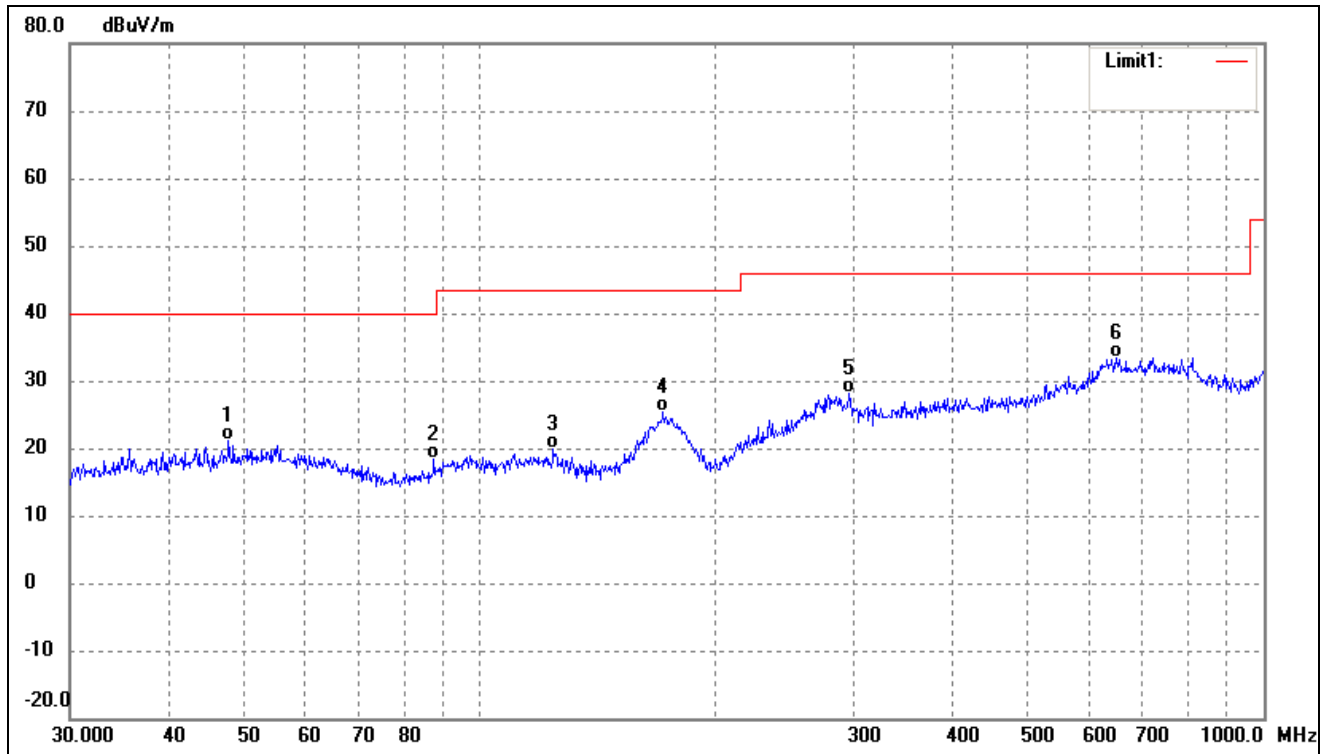


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	0.0309	38.00	0.00	38.00	117.79	-79.79	165	100	peak
2	0.0468	23.26	19.83	43.09	114.19	-71.10	20	100	peak
3	0.0781	24.86	19.76	44.62	109.74	-65.12	147	100	peak
4	0.1145	26.95	19.70	46.65	106.42	-59.77	91	100	peak
5	0.1313	27.22	19.67	46.89	105.23	-58.34	236	100	peak

Plot of Radiated Emissions Test Data

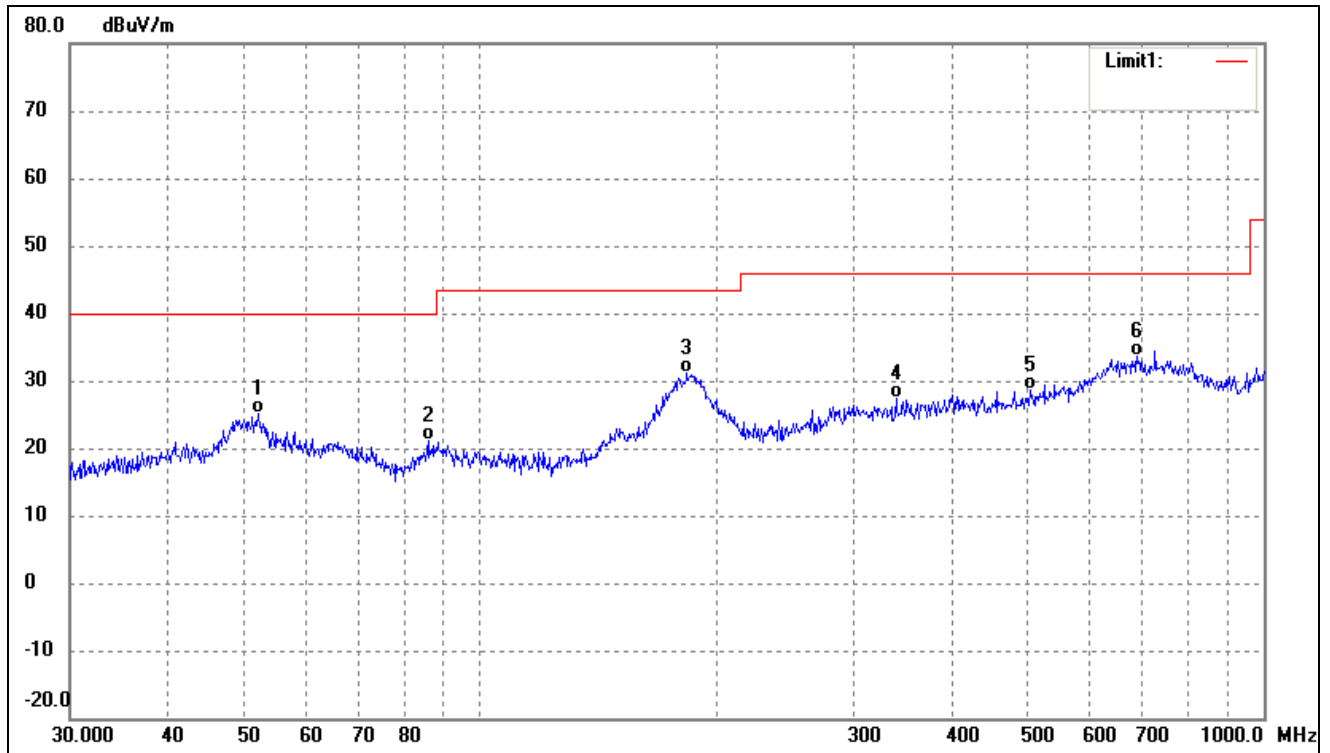
EUT: *mophie wireless charging base*
Tested Model: *WRL-CHGPAD*
Operating Condition: *TM1*
Comment: *Adapter DC5V*

Test Specification: *Horizontal*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	47.8260	16.27	4.96	21.23	40.00	-18.77	165	100	QP
2	87.4177	15.33	2.96	18.29	40.00	-21.71	20	100	QP
3	124.1330	15.51	4.48	19.99	43.50	-23.51	114	100	QP
4	171.3926	22.92	2.46	25.38	43.50	-18.12	88	100	QP
5	296.1836	16.22	11.81	28.03	46.00	-17.97	215	100	QP
6	647.3856	15.52	17.90	33.42	46.00	-12.58	65	100	QP

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	52.2079	20.04	5.04	25.08	40.00	-14.92	165	100	QP
2	85.8984	18.32	2.70	21.02	40.00	-18.98	201	100	QP
3	183.8440	28.63	2.61	31.24	43.50	-12.26	47	100	QP
4	339.5888	15.94	11.38	27.32	46.00	-18.68	81	100	QP
5	502.9395	15.26	13.41	28.67	46.00	-17.33	311	100	QP
6	689.5644	15.57	17.96	33.53	46.00	-12.47	45	100	QP

7. Occupied Bandwidth

7.1 Standard Applicable

According to 15.205, 99% emission bandwidth.

7.2 Test Procedure

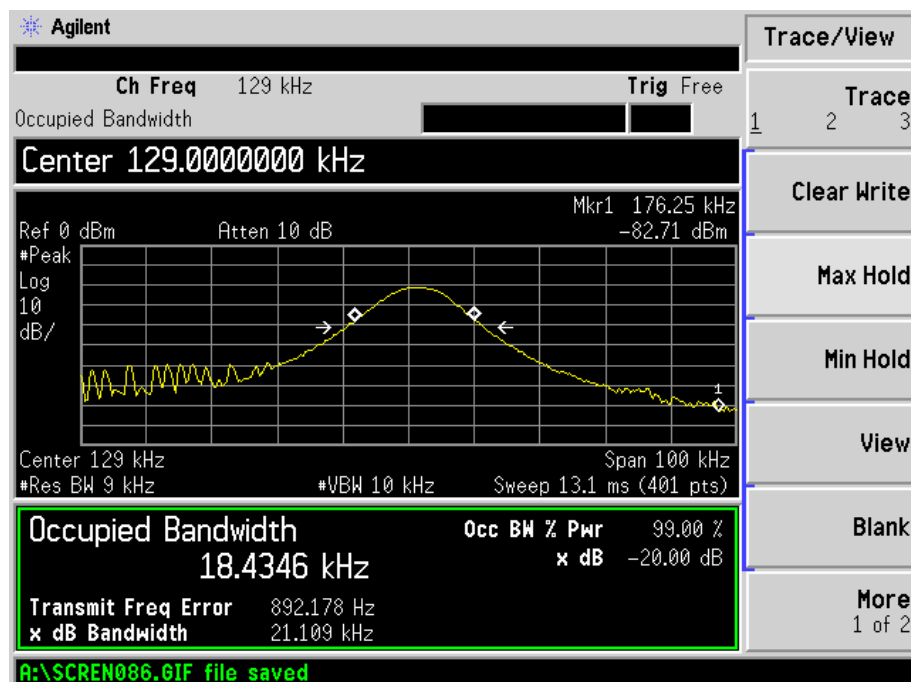
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied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

7.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

7.4 Summary of Test Results/Plots

Test Channel(kHz)	99% Bandwidth(kHz)
129	18.4346



***** END OF REPORT *****