FCC REPORT

Applicant:	Dongguan Vatro Electronics Technology Co., LTD
Address of Applicant:	No 25,Dabandi Industrial Park, Daning Village, Humen Town, Dongguan City, China
Manufacturer:	Dongguan Vatro Electronics Technology Co., LTD
Address of Manufacturer:	No 25,Dabandi Industrial Park, Daning Village, Humen Town, Dongguan City, China

Equipment Under Test (EUT)

Product Name:	Wireless Charger
Model No.:	X5max, X2, X2max, X5, X6, X6max, X7, X7max, X8, X8max, X9, X9max
Trade Mark:	Vatro
FCC ID:	2AOP7-X5MAX
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C
Date of sample receipt:	May 28, 2018
Date of Test:	May 29, 2018-June 11, 2018
Date of report issued:	June 12, 2018
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

This 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.

2 Version

Version No.	Date	Description
00	*June 12, 2018*	*Original*

Prepared By:	Bill. Yuan	***Date:***	*June 12, 2018*
	Project Engineer		
Check By:	Andy. Wu	***Date:***	*June 12, 2018*
	Reviewer		

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Radiated Emission	15.209	Pass
20dB Bandwidth	15.215	Pass

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	Wireless Charger
Model No.:	X5max, X2, X2max, X5, X6, X6max, X7, X7max, X8, X8max, X9, X9max
Test Model No:	X5max
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.	
Serial No.:	X0001232345
Test sample(s) ID:	GTS201805000222-1
Sample(s) Status	Engineer sample
Hardware:	X5MAX
Software:	160A
Operation Frequency:	111.5kHz ~ 205KHz
Modulation type:	MSK
Antenna Type:	Inductive loop coil Antenna
Antenna gain:	ANT 1 & ANT 2: 0dBi (Max)
Power supply:	Input: DC 5V 2A, DC 9V 1.7A Output: DC5V 1A, DC 9V 1.1A, 10W (Max)

Operation Frequency each of channel

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	0.1115	06	0.140	11	0.165	16	0.190
02	0.120	07	0.145	12	0.170	17	0.195
03	0.125	08	0.150	13	0.175	18	0.200
04	0.130	09	0.155	14	0.180	19	0.205
05	0.135	10	0.160	15	0.185		

Test channel	Frequency (MHz)
CH12	0.170MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting.

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC Approval
SAMSUNG	Mobile Phone	S7EDGE	R28H835BJ2B	DOC
APPLE	USB Charger	A1399	N/A	N/A

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 381383, January 08, 2018.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June 26 2017	June 25 2018
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 26 2017	June 25 2018
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 26 2017	June 25 2018
6	Loop Antenna	Zhinan	ZN30900A	GTS215	June. 28 2017	June. 27 2018
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June 26 2017	June 25 2018
9	Coaxial Cable	GTS	N/A	GTS211	June 26 2017	June 25 2018
10	Coaxial cable	GTS	N/A	GTS210	June 26 2017	June 25 2018
11	Coaxial Cable	GTS	N/A	GTS212	June 26 2017	June 25 2018
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 26 2017	June 25 2018

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2014	May.15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2017	June. 25 2018
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 26 2017	June. 25 2018
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 26 2017	June. 25 2018
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 26 2017	June. 25 2018

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June 28 2017	June 27 2018
2	Thermo meter	KTJ	TA328	GTS233	June 28 2017	June 27 2018

7 Test results and Measurement Data

7.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203

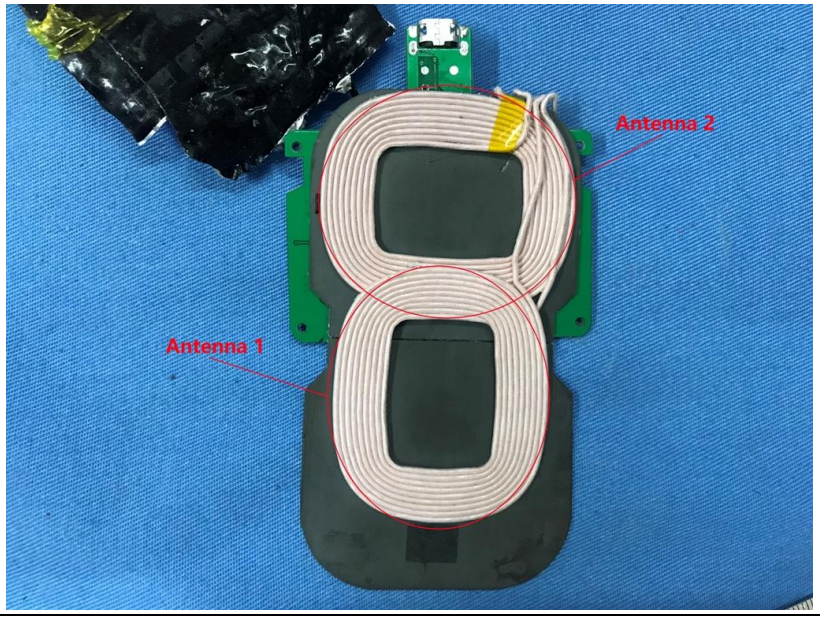
15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The Ant 1 and Ant 2 is Inductive loop coil antenna, the best case gain of the antenna is 0dBi.

Two antennas are simultaneously transmitting.



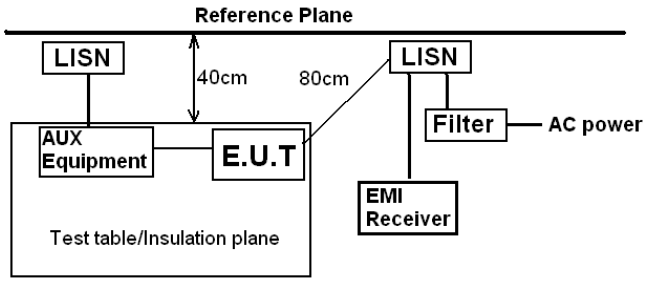
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test setup:



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

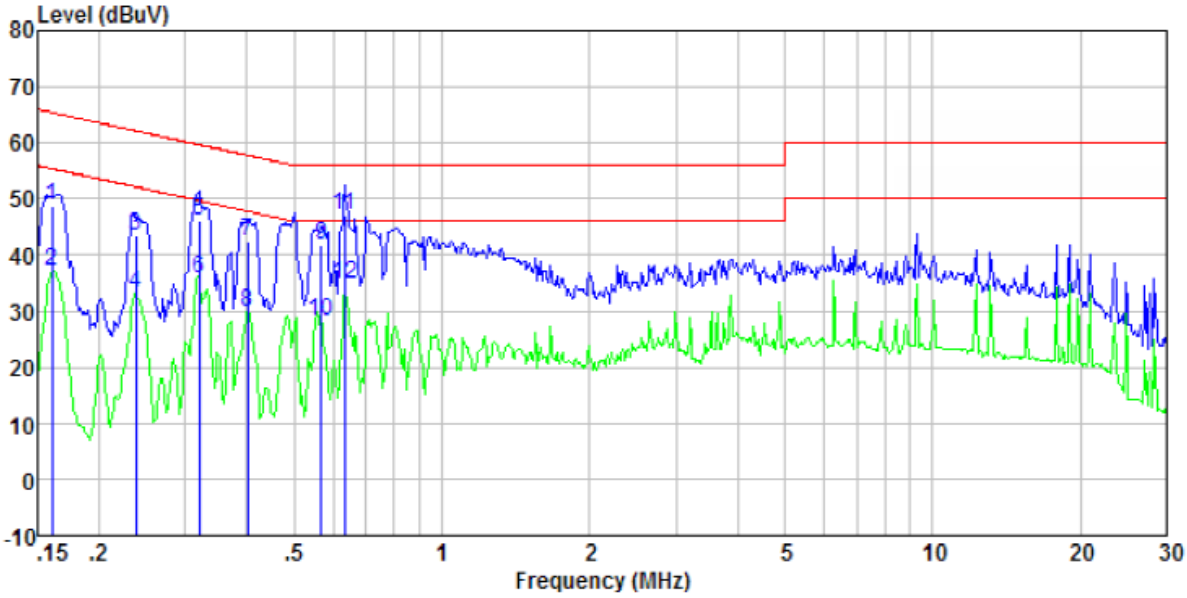
Test procedure:

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

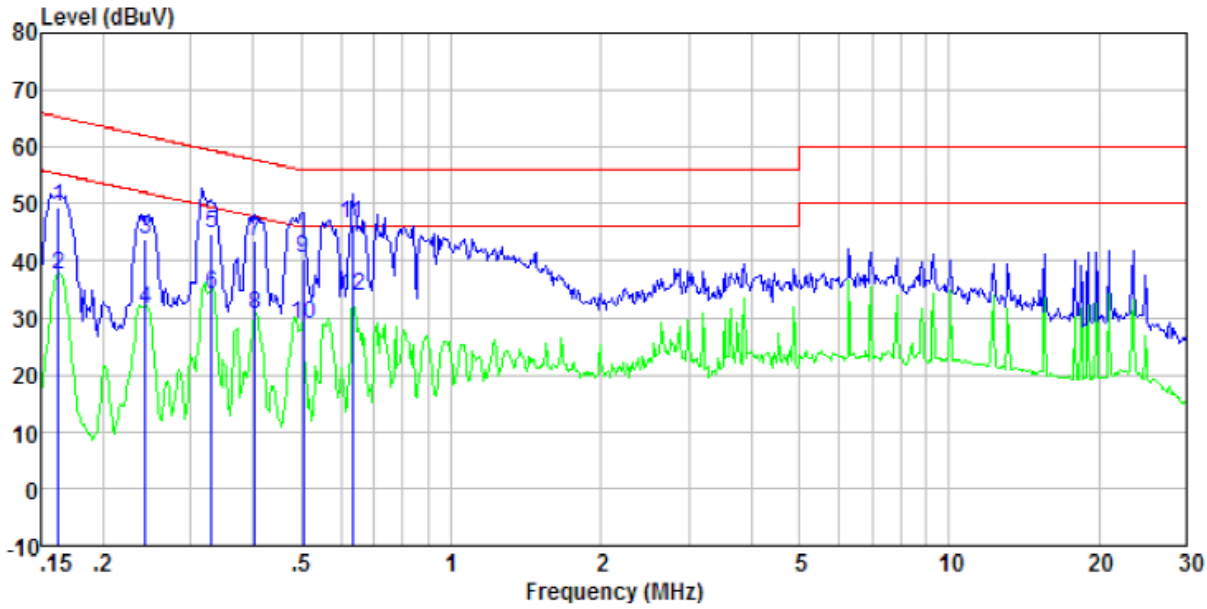
Measurement data:

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.16	48.19	0.40	0.08	48.67	65.43	-16.76	QP
0.16	36.52	0.40	0.08	37.00	55.43	-18.43	Average
0.24	42.86	0.40	0.11	43.37	62.17	-18.80	QP
0.24	32.71	0.40	0.11	33.22	52.17	-18.95	Average
0.32	45.62	0.39	0.10	46.11	59.71	-13.60	QP
0.32	35.36	0.39	0.10	35.85	49.71	-13.86	Average
0.40	42.17	0.35	0.11	42.63	57.81	-15.18	QP
0.40	29.34	0.35	0.11	29.80	47.81	-18.01	Average
0.57	41.56	0.29	0.12	41.97	56.00	-14.03	QP
0.57	27.92	0.29	0.12	28.33	46.00	-17.67	Average
0.63	46.62	0.28	0.12	47.02	56.00	-8.98	QP
0.63	34.38	0.28	0.12	34.78	46.00	-11.22	Average

Neutral:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.16	48.85	0.40	0.08	49.33	65.34	-16.01	QP
0.16	37.02	0.40	0.08	37.50	55.34	-17.84	Average
0.24	43.44	0.40	0.11	43.95	62.00	-18.05	QP
0.24	30.99	0.40	0.11	31.50	52.00	-20.50	Average
0.33	44.35	0.38	0.10	44.83	59.44	-14.61	QP
0.33	33.63	0.38	0.10	34.11	49.44	-15.33	Average
0.40	43.11	0.35	0.11	43.57	57.77	-14.20	QP
0.40	29.95	0.35	0.11	30.41	47.77	-17.36	Average
0.50	40.15	0.31	0.11	40.57	56.00	-15.43	QP
0.50	28.29	0.31	0.11	28.71	46.00	-17.29	Average
0.63	46.20	0.28	0.12	46.60	56.00	-9.40	QP
0.63	33.56	0.28	0.12	33.96	46.00	-12.04	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 1GHz
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Remark
9kHz - 30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak Value
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	AV	1MHz	10Hz	Average Value

Remark: For the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission test in these three bands are based on measurements employing an average detector.

Limit:
(Spurious Emissions)

Limits for frequency below 30MHz

Frequency	Limit (uV/m)	Measurement Distance(m)	Remark
0.009-0.490	2400/F(kHz)	300	Quasi-peak Value
0.490-1.705	24000/F(kHz)	30	Quasi-peak Value
1.705-30	30	30	Quasi-peak Value

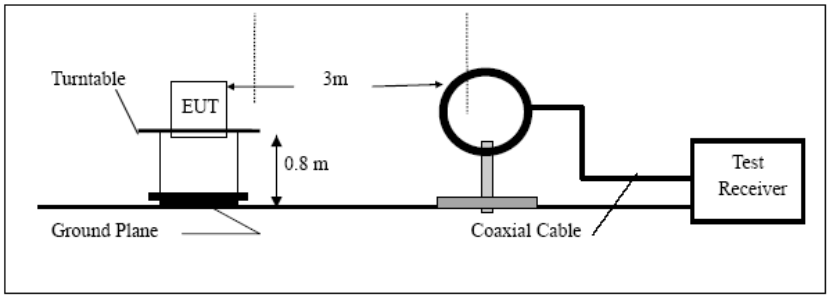
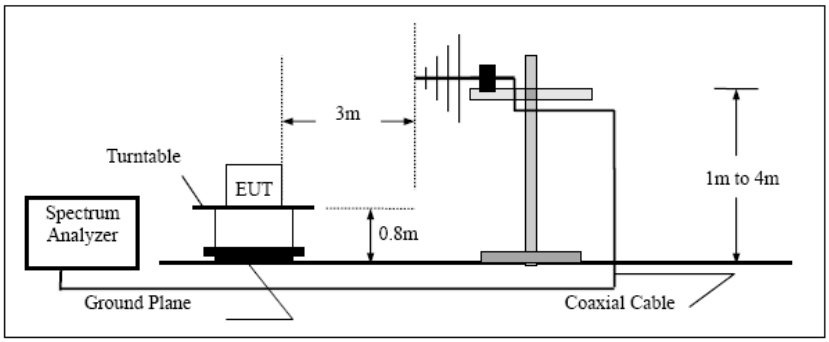
Limits for frequency Above 30MHz

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.00	Quasi-peak Value
88MHz-216MHz	43.50	Quasi-peak Value
216MHz-960MHz	46.00	Quasi-peak Value
960MHz-1GHz	54.00	Quasi-peak Value
Above 1GHz	54.00	Average Value
	74.00	Peak Value

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the

	limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test setup:	Below 30MHz  30MHz ~ 1000MHz 
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

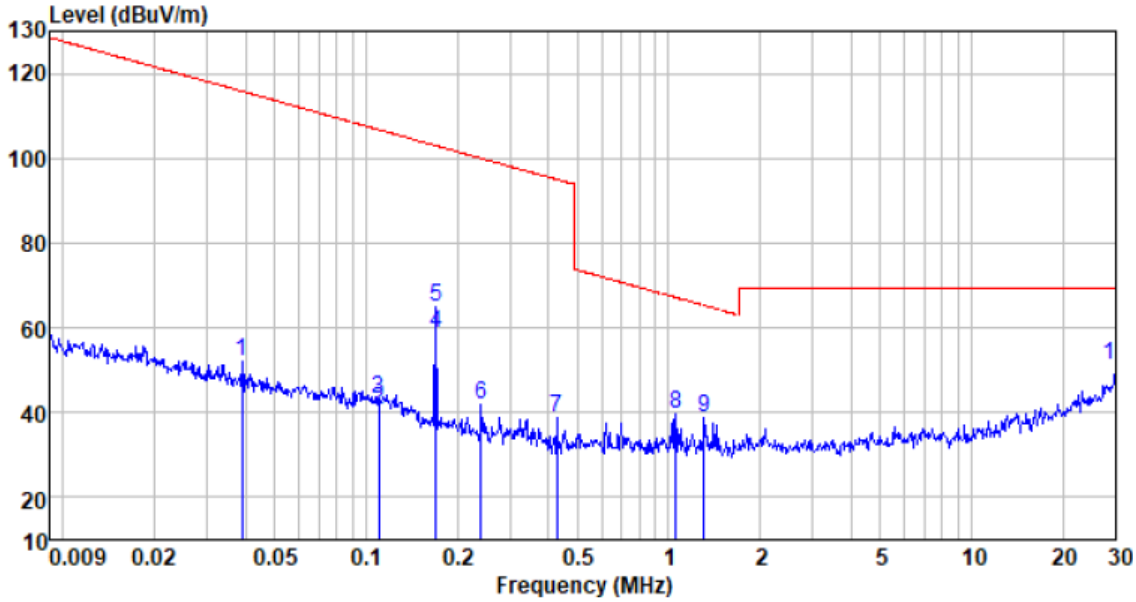
Measurement data:

Measurement data:

Note: Limit dBuV/m @3m = Limit dBuV/m @300m+ 80

Limit dBuV/m @3m = Limit dBuV/m @30m + 40

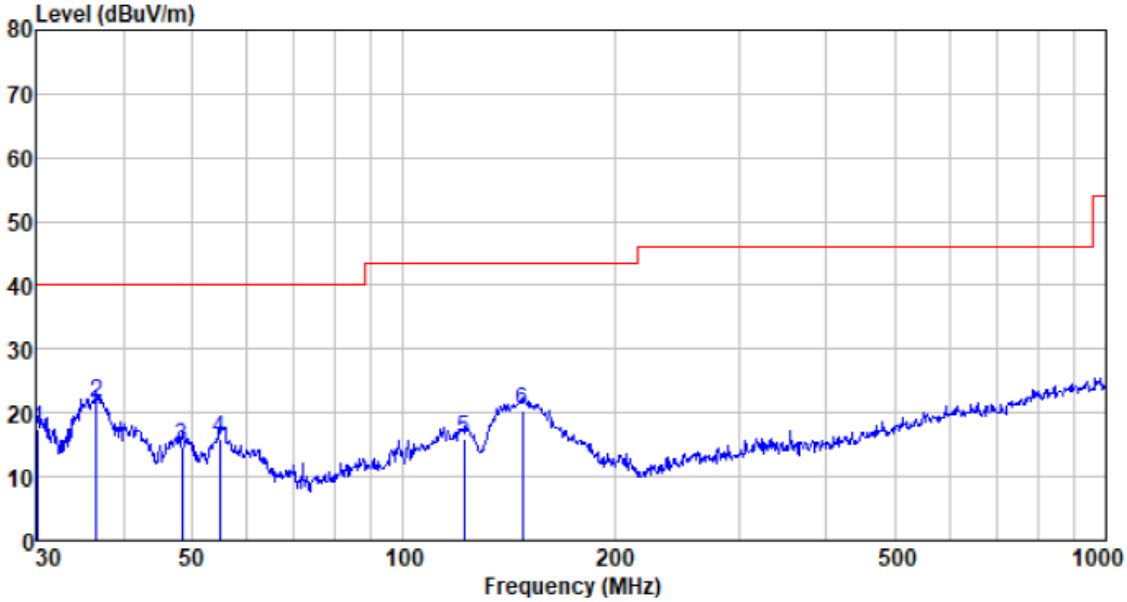
Below 30MHz



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
0.039	31.44	20.71	0.10	0.00	52.25	115.76	-63.51	Peak
0.110	16.39	24.12	0.17	0.00	40.68	106.78	-66.10	Average
0.110	18.71	24.12	0.17	0.00	43.00	106.78	-63.78	Peak
0.170	36.06	22.61	0.20	0.00	58.87	102.99	-44.12	Average
0.170	41.98	22.61	0.20	0.00	64.79	102.99	-38.20	Peak
0.240	19.93	21.80	0.23	0.00	41.96	99.99	-58.03	Peak
0.428	17.39	20.92	0.27	0.00	38.58	94.98	-56.40	Peak
1.052	18.29	20.98	0.33	0.00	39.60	67.16	-27.56	Peak
1.310	17.40	20.88	0.34	0.00	38.62	65.26	-26.64	Peak
30.000	22.06	28.60	0.56	0.00	51.22	69.54	-18.32	Peak

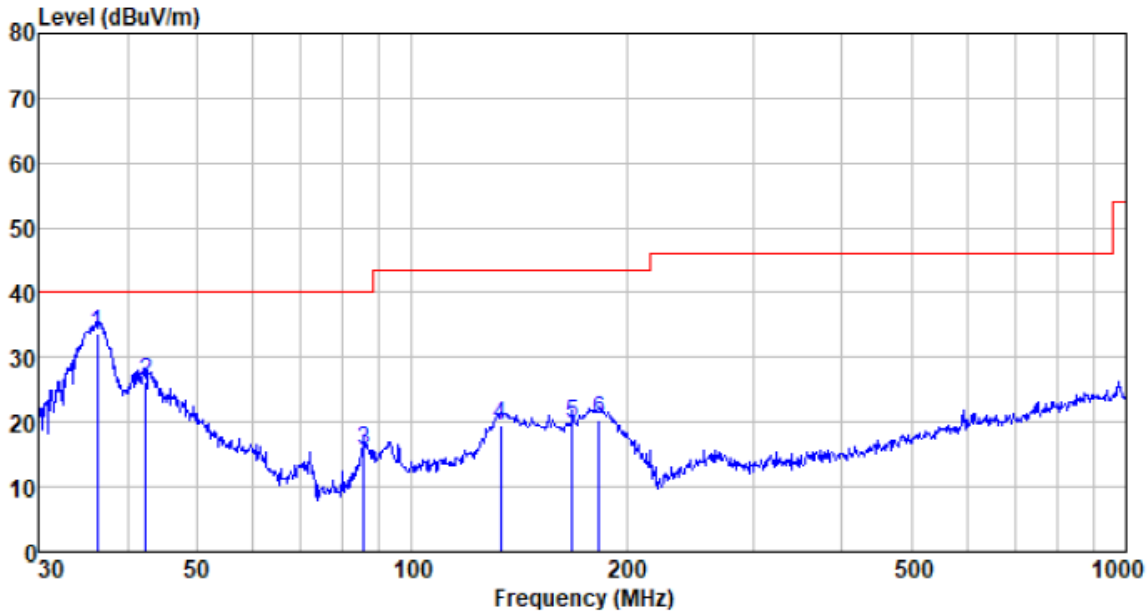
30MHz ~ 1GHz

Horizontal



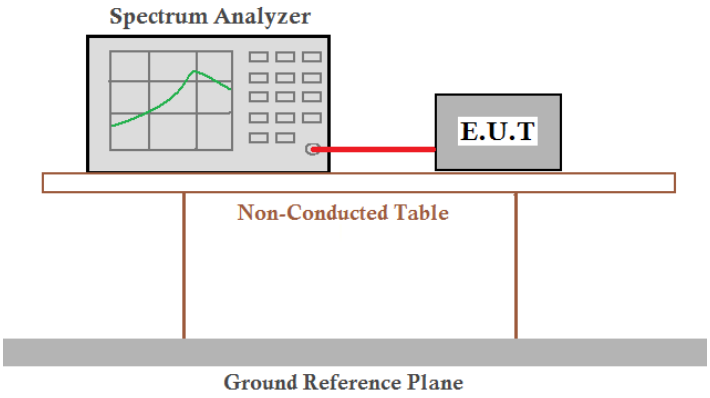
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
30.211	40.71	11.21	0.55	35.02	17.45	40.00	-22.55	QP
36.637	44.77	11.61	0.63	35.46	21.55	40.00	-18.45	QP
48.502	37.79	12.29	0.76	36.11	14.73	40.00	-25.27	QP
54.835	39.51	11.80	0.82	36.25	15.88	40.00	-24.12	QP
121.976	42.34	9.19	1.38	36.89	16.02	43.50	-27.48	QP
147.921	48.37	7.56	1.56	37.06	20.43	43.50	-23.07	QP

Vertical



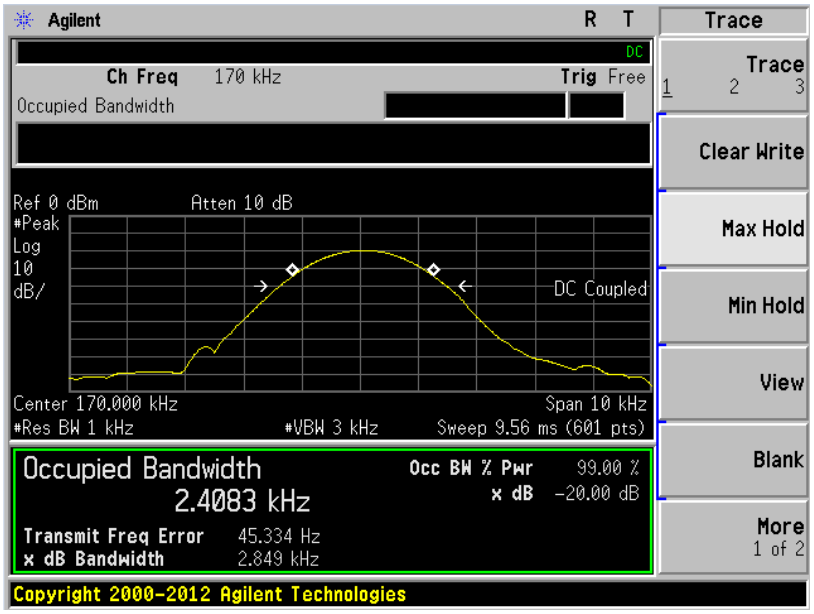
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
36.254	56.90	11.55	0.62	35.44	33.63	40.00	-6.37	QP
42.451	49.18	12.23	0.69	35.80	26.30	40.00	-13.70	QP
85.598	41.94	9.30	1.07	36.60	15.71	40.00	-24.29	QP
133.151	47.12	7.92	1.46	36.97	19.53	43.50	-23.97	QP
167.824	46.89	8.46	1.67	37.18	19.84	43.50	-23.66	QP
182.559	46.65	9.15	1.75	37.25	20.30	43.50	-23.20	QP

7.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10:2013
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

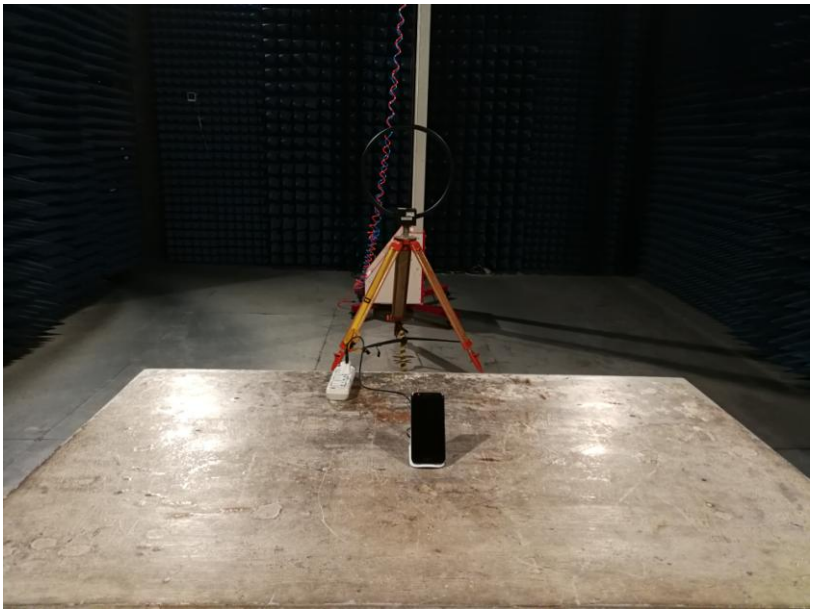
Measurement Data

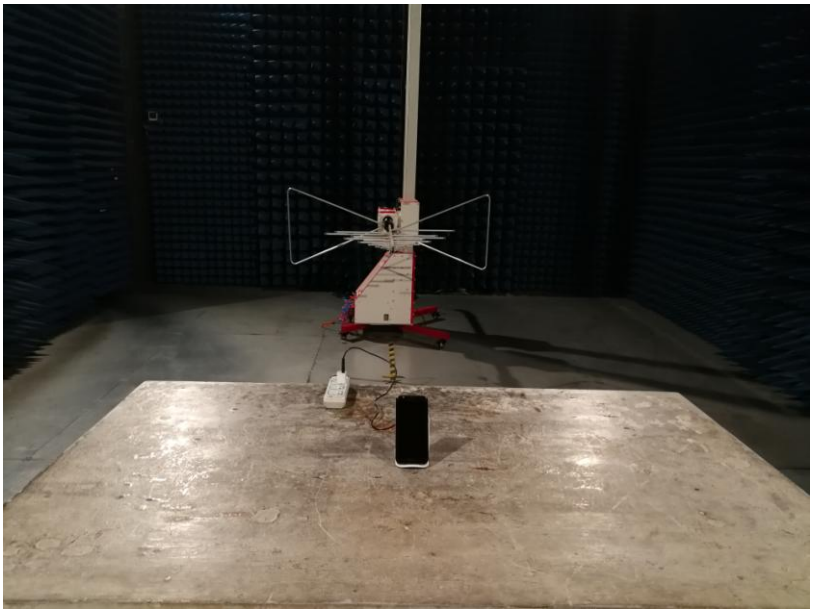
Test frequency (KHz)	20dB bandwidth (KHz)	Result
170.00	2.849	Pass



8 Test Setup Photo

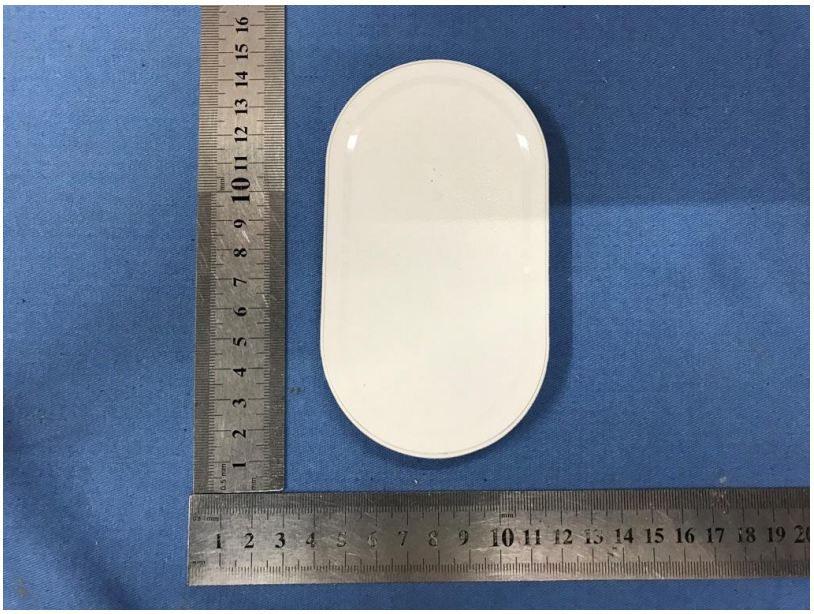
Radiated Emission



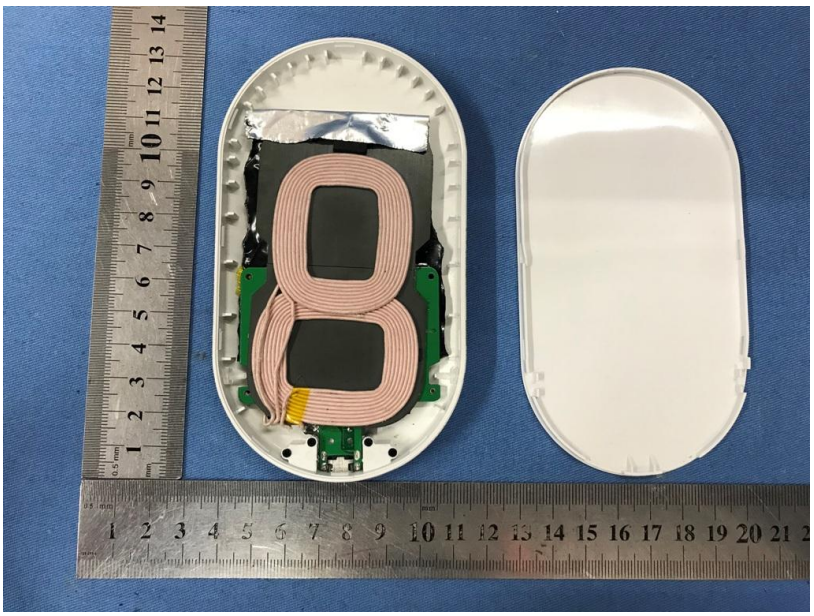


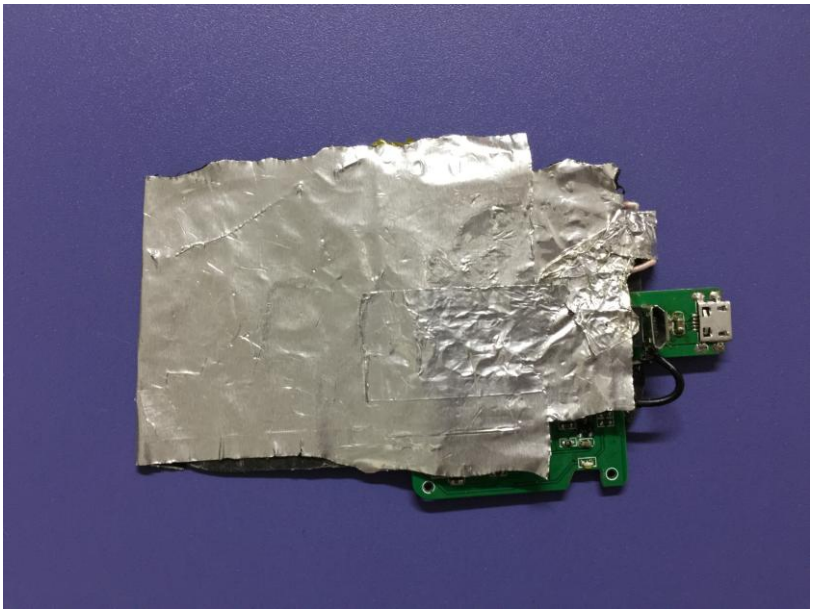
Conducted Emission

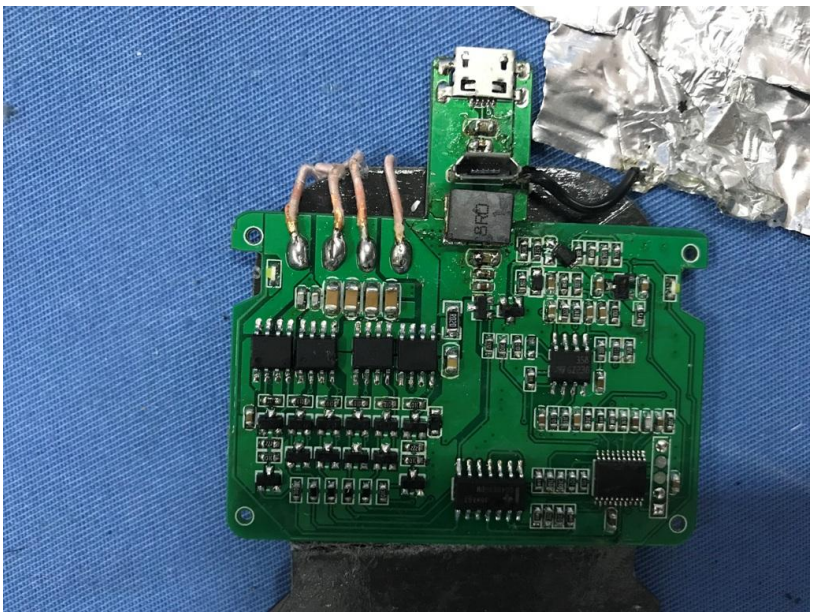
9 EUT Constructional Details

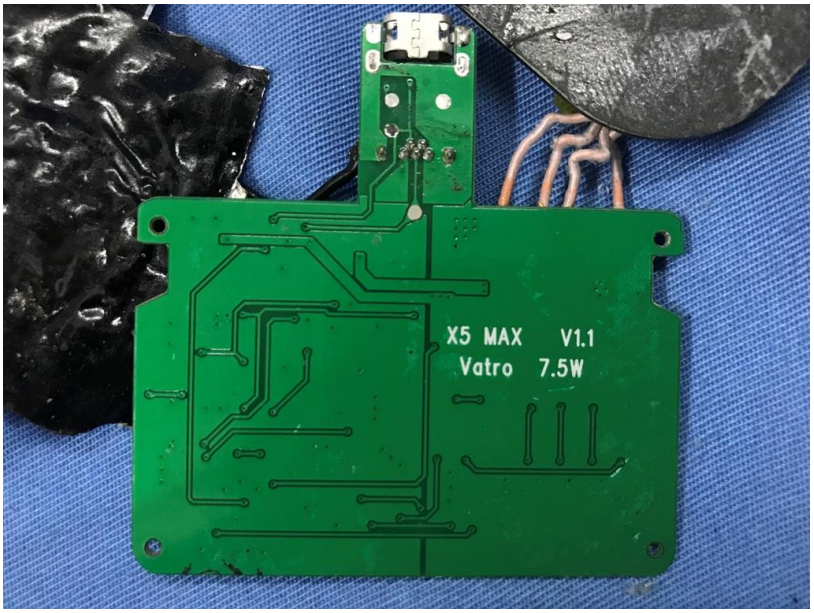


vatro
Wireless Charger









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