

TEST REPORT

Applicant: Wings Mobile Telecom SL

Address of Applicant: c/Beethoven 15, piso 4, Barcelona, Spain

Manufacturer/Factory: Wings Mobile Telecom SL

Address of Manufacturer/Factory: c/Beethoven 15, piso 4, Barcelona, Spain

Equipment Under Test (EUT)

Product Name: Wings Light

Brand Name: Wings Mobile

Model No.: LW20

FCC ID: 2ATQILW20

Applicable standards: FCC CFR Title 47 Part 15 Subpart C

Date of sample receipt: Sep. 06, 2020

Date of Test: Sep. 06, 2020 - Sep. 16, 2020

Date of report issued: Sep. 16, 2020

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	Sep. 16, 2020	Original

Prepared By:



Date:

Sep. 16, 2020

Project Engineer

Check By:



Date:

Sep. 16, 2020

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
Spurious Emission	15.209(a)(f)	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	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(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:	Wings Light
Model No.:	LW20
Serial No.:	N/A
Hardware version:	V 1.0
Software version:	V 1.0
Test sample(s) ID:	GTS202009000118F01
Sample(s) Status	Engineer sample
Operation Frequency:	110kHz ~ 205KHz
Number of Frequency:	20 Channels
Modulation type:	MSK
Antenna Type:	Inductive loop coil Antenna
Antenna gain:	0dBi
Power supply:	DC 5V2A

Operation Frequency each of channel

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	0.110	07	0.140	13	0.170	19	0.200
02	0.115	08	0.145	14	0.175	20	0.205
03	0.120	09	0.150	15	0.180		
04	0.125	10	0.155	16	0.185		
05	0.130	11	0.160	17	0.190		
06	0.135	12	0.165	18	0.195		

Test channel	Frequency (MHz)
CH01	0.110MHz
CH20	0.205MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<p><i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i></p>	

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
ASUS	Notebook	ATS1000	N/A

5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● 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. ● IC —Registration No.: 9079A 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 ● NVLAP (LAB CODE:600179-0) Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.5 Test Location

All tests were performed at:
<p>Global United Technology Services Co., Ltd. No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960</p>

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. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

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.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 25 2020	June. 24 2021
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. 25 2020	June. 24 2021
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 25 2020	June. 24 2021

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

7 Test results and Measurement Data

7.1 Antenna requirement:

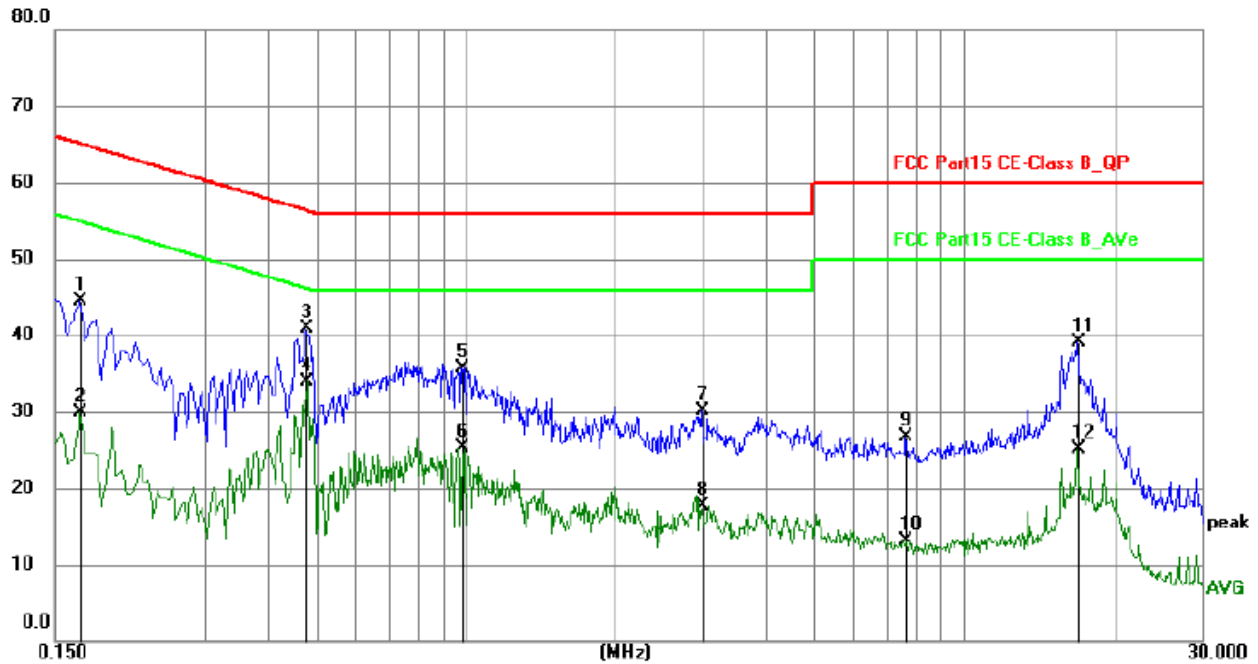
Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling 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 antenna is Inductive loop coil Antenna, the best case gain of the antenna is 0dBi, reference to the appendix II for details.	

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:	<p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>					
Test procedure:	<ol style="list-style-type: none"> 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 environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

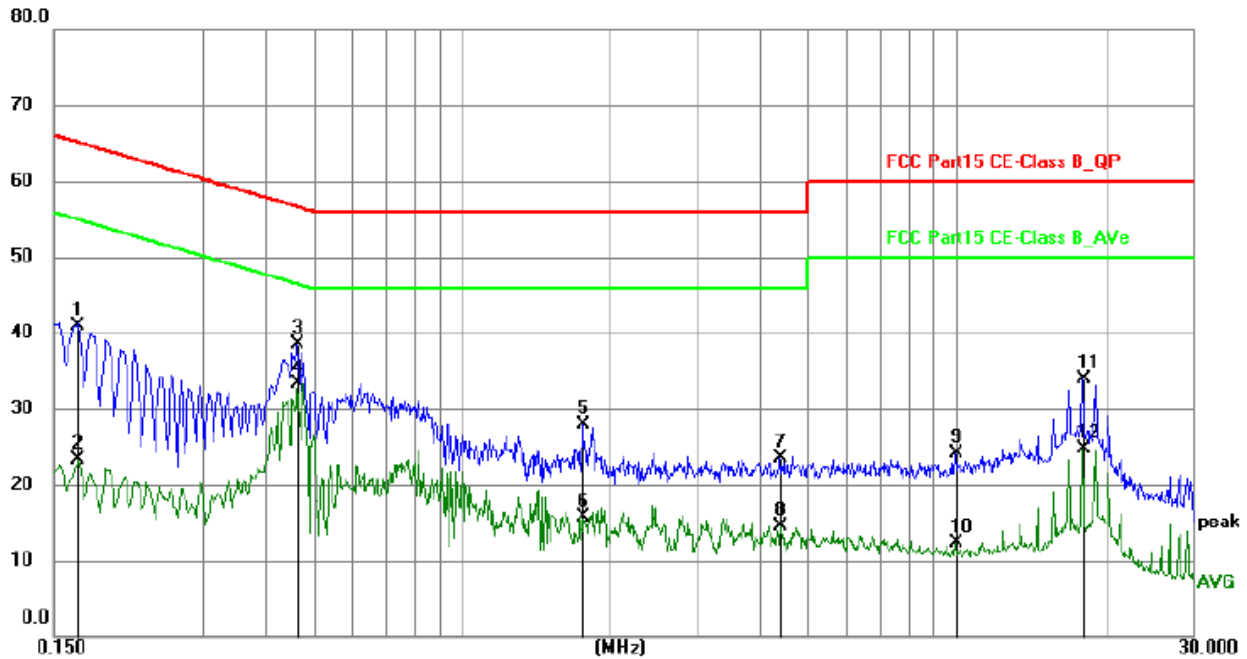
Measurement data:

Line:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1680	33.99	10.51	44.50	65.06	-20.56	QP
2	0.1680	19.32	10.51	29.83	55.06	-25.23	AVG
3	0.4785	30.33	10.52	40.85	56.37	-15.52	QP
4	0.4785	23.42	10.52	33.94	46.37	-12.43	AVG
5	0.9825	25.46	10.24	35.70	56.00	-20.30	QP
6	0.9825	15.14	10.24	25.38	46.00	-20.62	AVG
7	2.9670	19.92	10.28	30.20	56.00	-25.80	QP
8	2.9670	7.38	10.28	17.66	46.00	-28.34	AVG
9	7.6290	16.20	10.51	26.71	60.00	-33.29	QP
10	7.6290	2.57	10.51	13.08	50.00	-36.92	AVG
11	16.8810	28.39	10.77	39.16	60.00	-20.84	QP
12	16.8810	14.26	10.77	25.03	50.00	-24.97	AVG

Neutral:



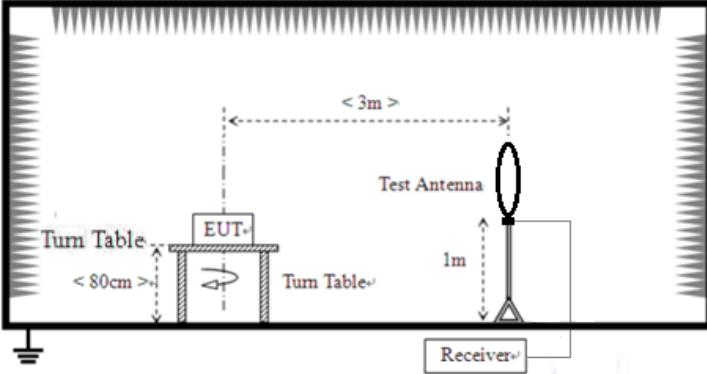
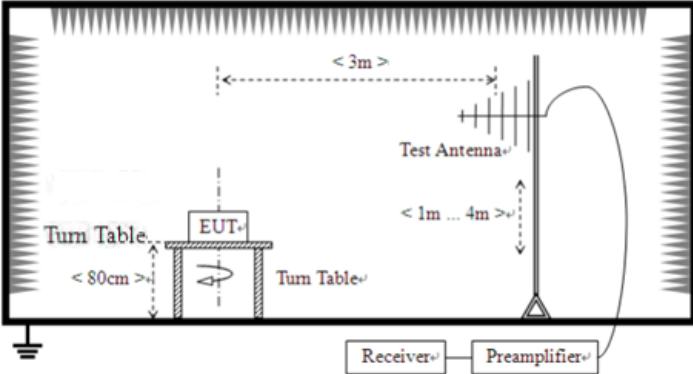
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1659	30.46	10.51	40.97	65.16	-24.19	QP
2	0.1659	12.86	10.51	23.37	55.16	-31.79	AVG
3	0.4650	28.06	10.52	38.58	56.60	-18.02	QP
4	0.4650	22.88	10.52	33.40	46.60	-13.20	AVG
5	1.7565	17.74	10.25	27.99	56.00	-28.01	QP
6	1.7565	5.37	10.25	15.62	46.00	-30.38	AVG
7	4.3845	13.26	10.32	23.58	56.00	-32.42	QP
8	4.3845	4.24	10.32	14.56	46.00	-31.44	AVG
9	9.9645	13.43	10.67	24.10	60.00	-35.90	QP
10	9.9645	1.70	10.67	12.37	50.00	-37.63	AVG
11	18.0285	23.11	10.78	33.89	60.00	-26.11	QP
12	18.0285	13.97	10.78	24.75	50.00	-25.25	AVG

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

7.3 Spurious Emission

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:	<ol style="list-style-type: none"> 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. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 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. 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. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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 				

	<p>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.</p> <p>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.</p>						
<p>Test setup:</p>	<p>Below 30MHz</p>  <p>30MHz ~ 1000MHz</p> 						
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>						
<p>Test mode:</p>	<p>Refer to section 5.2 for details</p>						
<p>Test environment:</p>	<table border="1"> <tr> <td>Temp.:</td> <td>25 °C</td> <td>Humid.:</td> <td>52%</td> <td>Press.:</td> <td>1012mbar</td> </tr> </table>	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar		
<p>Test voltage:</p>	<p>AC 120V, 60Hz</p>						
<p>Test results:</p>	<p>Pass</p>						

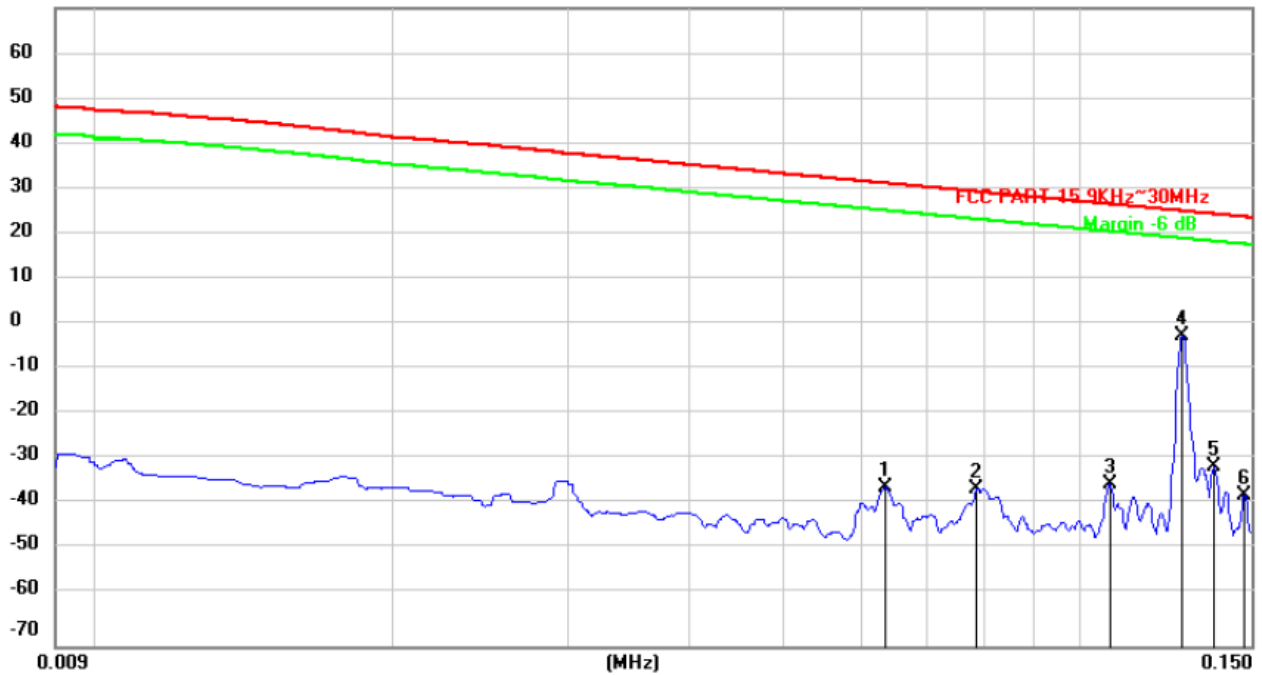
Measurement data:

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

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

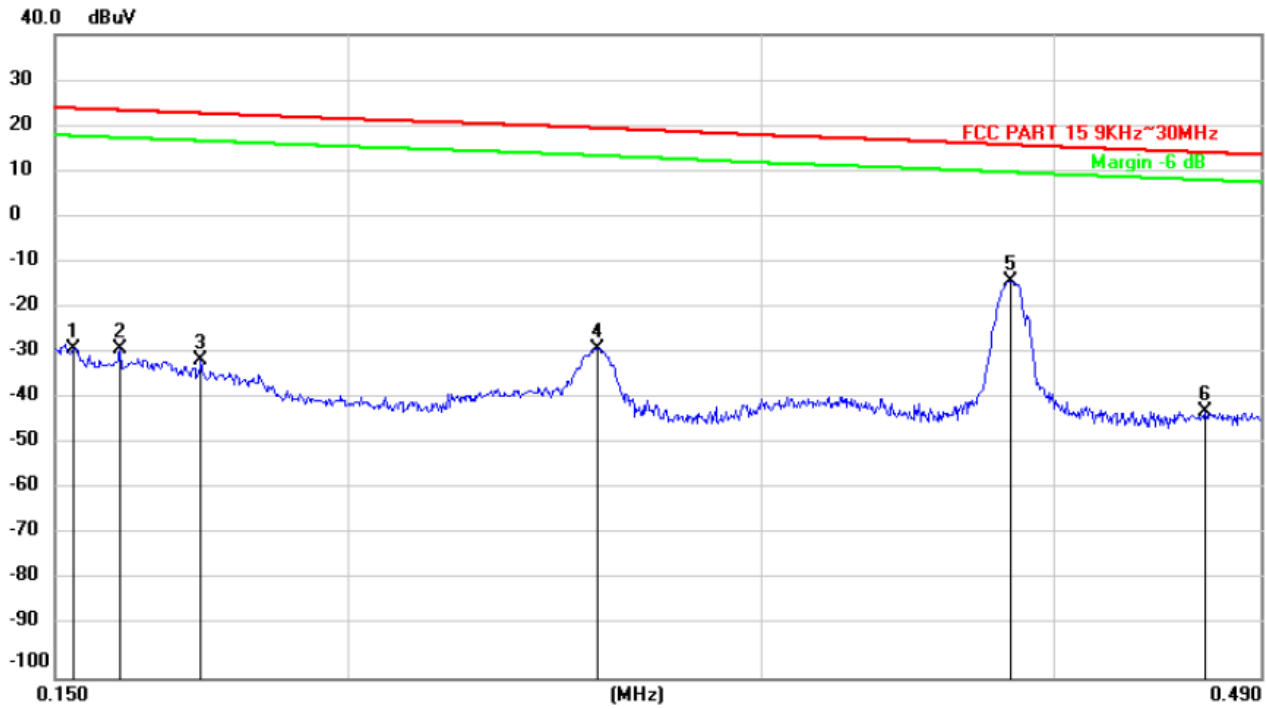
9kHz~150kHz

70.0 dBuV



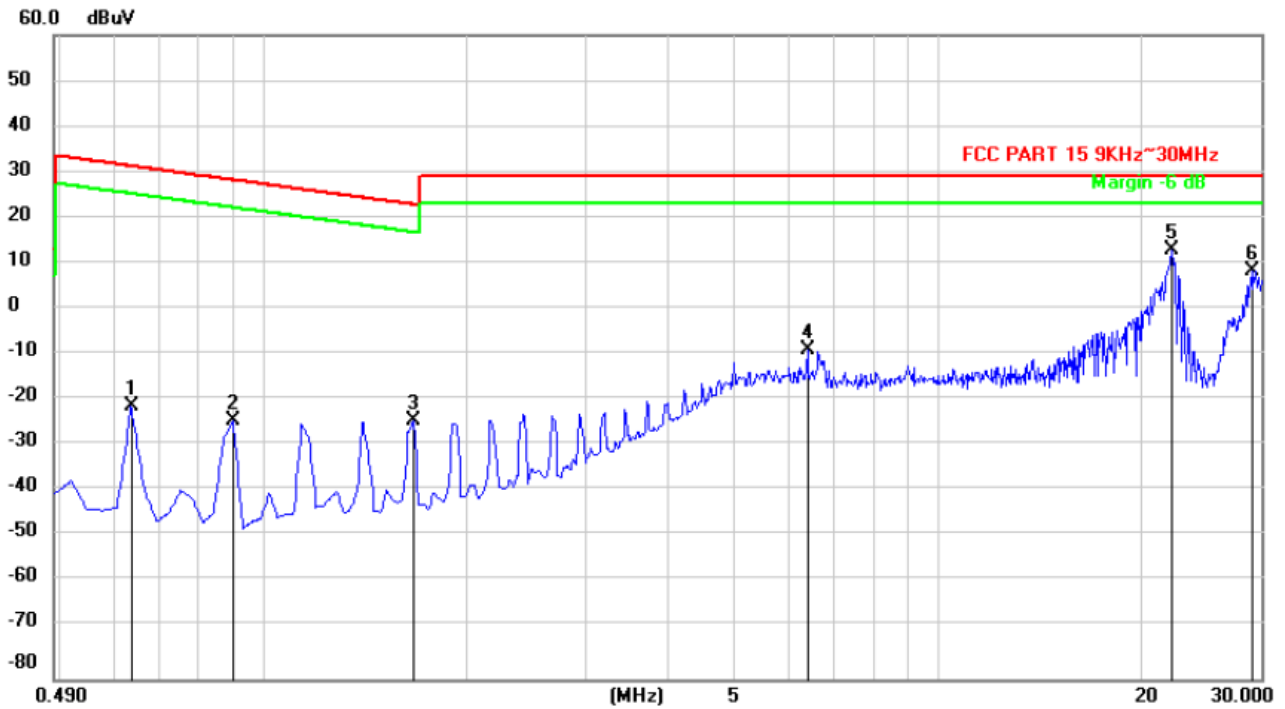
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.0633	65.00	-100.31	-35.31	31.60	-66.91	peak
2	0.0786	64.78	-100.37	-35.59	29.70	-65.29	peak
3	0.1076	65.93	-100.48	-34.55	26.98	-61.53	peak
4	0.1275	98.52	-100.44	-1.92	25.50	-27.42	peak
5	0.1375	69.65	-100.42	-30.77	24.84	-55.61	peak
6	0.1476	63.56	-100.40	-36.84	24.22	-61.06	peak

150kHz~490kHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1527	72.01	-100.40	-28.39	23.93	-52.32	peak
2	0.1599	71.95	-100.43	-28.48	23.53	-52.01	peak
3	0.1731	69.51	-100.47	-30.96	22.84	-53.80	peak
4	0.2556	72.35	-100.72	-28.37	19.62	-47.99	peak
5	0.3832	87.48	-101.04	-13.56	15.98	-29.54	peak
6	0.4642	59.26	-101.25	-41.99	14.30	-56.29	peak

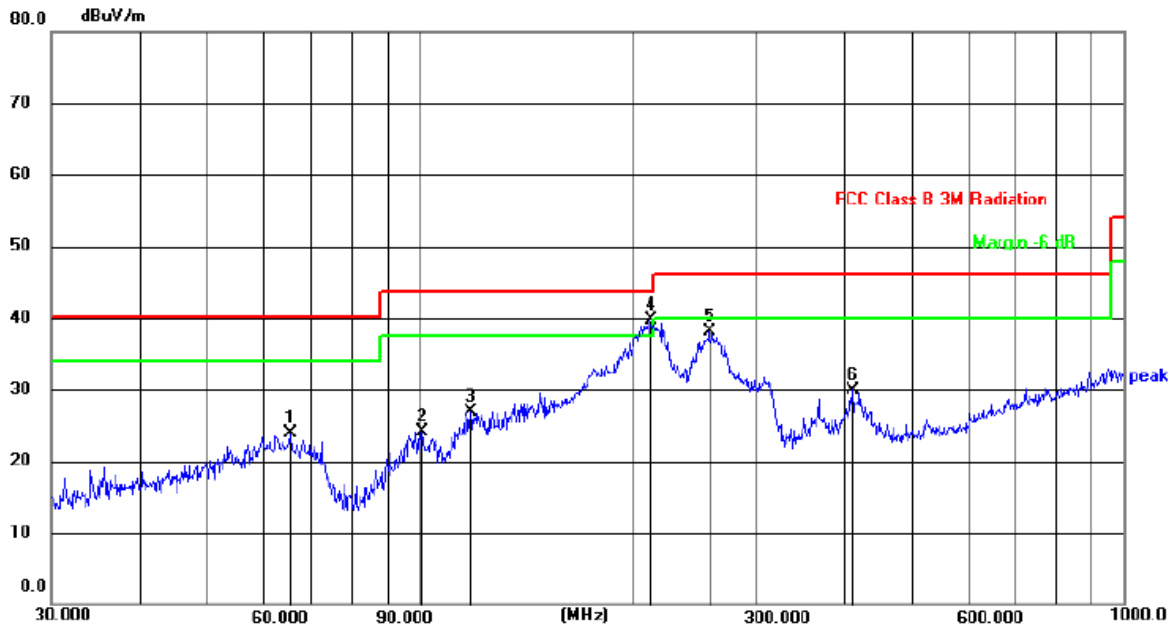
490kHz~30MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.6375	79.45	-100.26	-20.81	31.54	-52.35	peak
2	0.9031	74.62	-98.40	-23.78	28.49	-52.27	peak
3	1.6704	67.69	-91.56	-23.87	23.15	-47.02	peak
4	6.3920	53.48	-61.83	-8.35	29.54	-37.89	peak
5	22.2094	74.69	-61.51	13.18	29.54	-16.36	peak
6	29.2327	69.55	-60.85	8.70	29.54	-20.84	peak

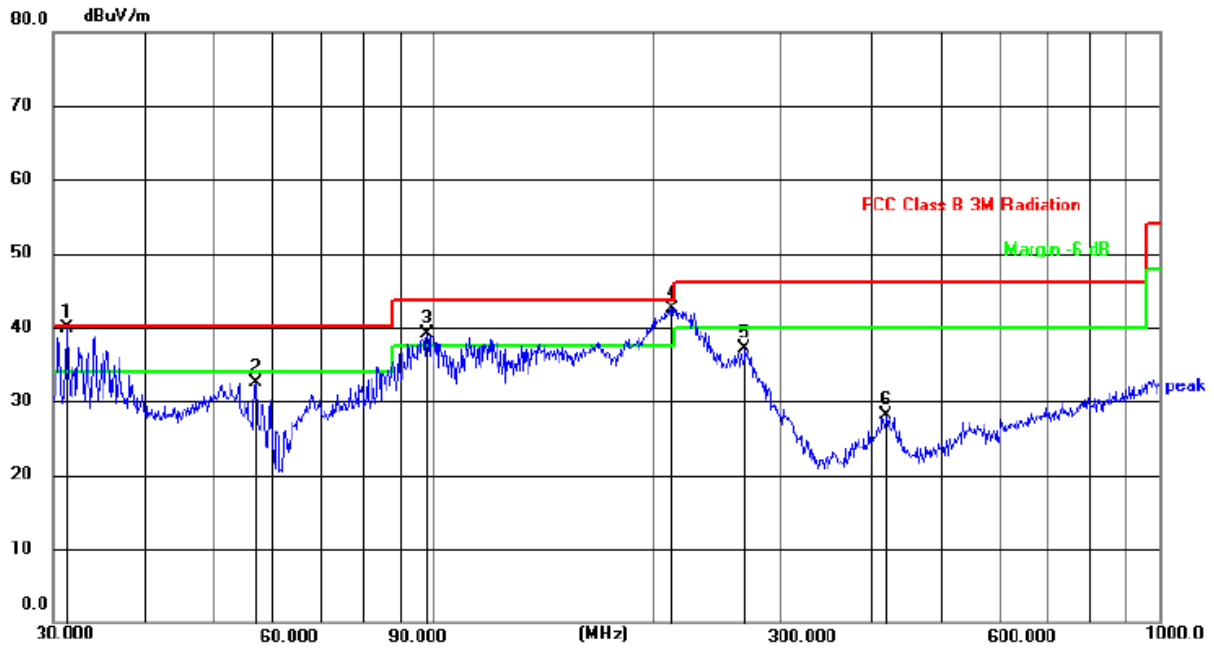
30MHz~1GHz

Horizontal



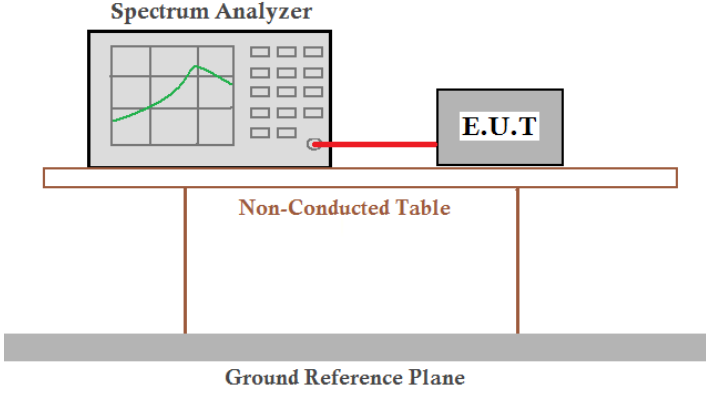
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Margin dB	Detector	Comment
1		65.5727	40.38	-16.51	23.87	40.00	-16.13	QP	
2		100.9339	40.02	-15.85	24.17	43.50	-19.33	QP	
3		118.1862	44.52	-17.61	26.91	43.50	-16.59	QP	
4	*	212.2695	54.89	-15.26	39.63	43.50	-3.87	QP	
5		257.4222	51.87	-13.85	38.02	46.00	-7.98	QP	
6		411.8240	40.20	-10.36	29.84	46.00	-16.16	QP	

Vertical



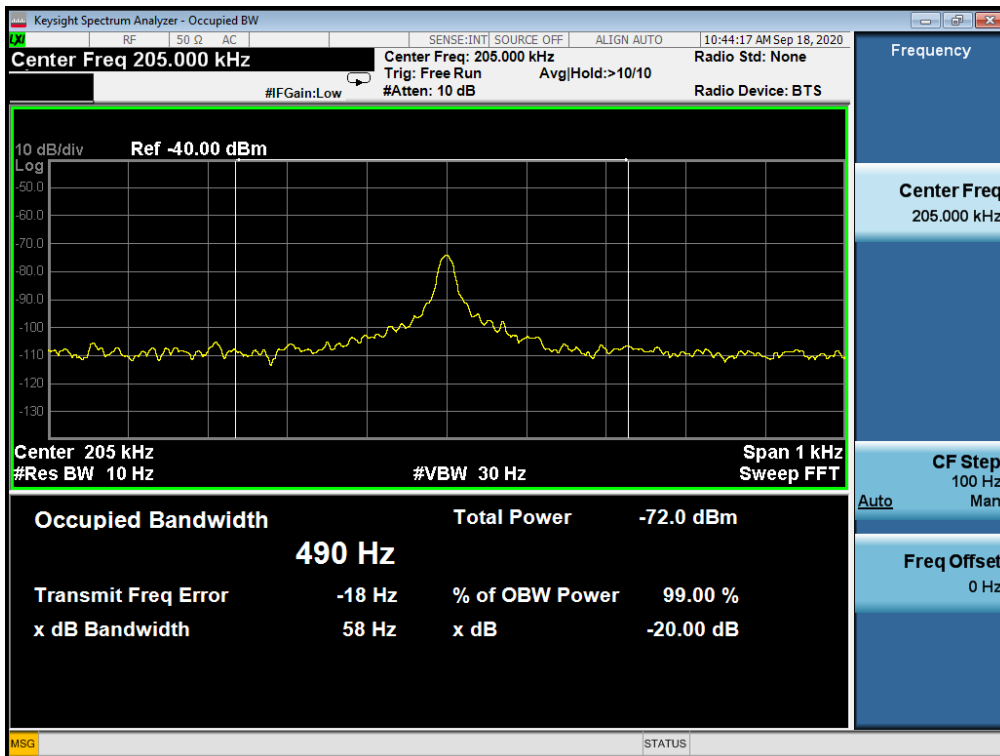
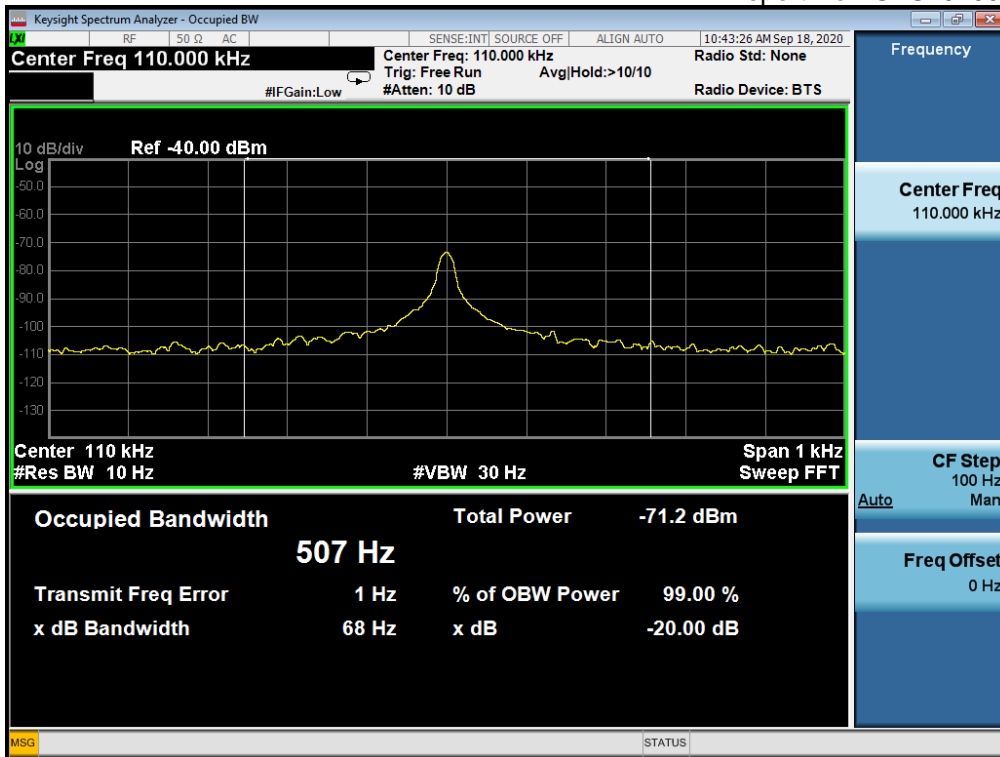
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Margin dB	Detector	Comment
1	*	31.3992	56.11	-16.28	36.83	40.00	-3.17	QP	
2		56.9912	46.83	-14.38	32.45	40.00	-7.55	QP	
3	!	98.1418	55.10	-16.09	39.01	43.50	-4.49	QP	
4	!	213.0151	57.78	-15.22	39.56	43.50	-3.94	QP	
5		268.4852	50.75	-13.62	37.13	46.00	-8.87	QP	
6		420.5803	38.33	-10.21	28.12	46.00	-17.88	QP	

7.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10:2013
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

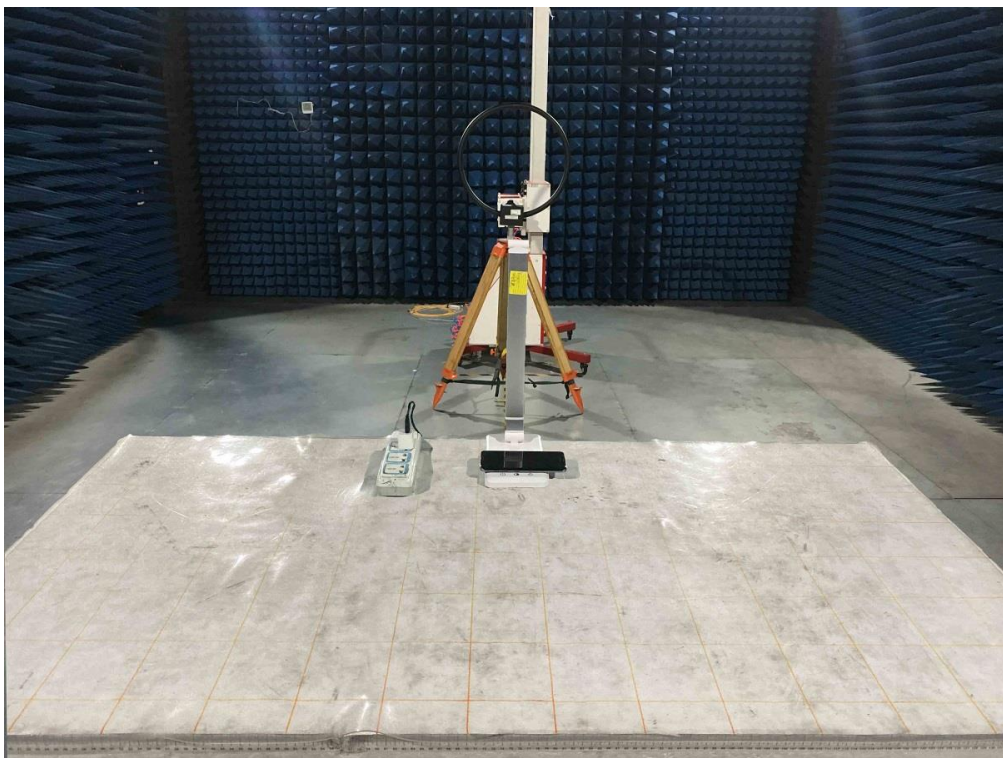
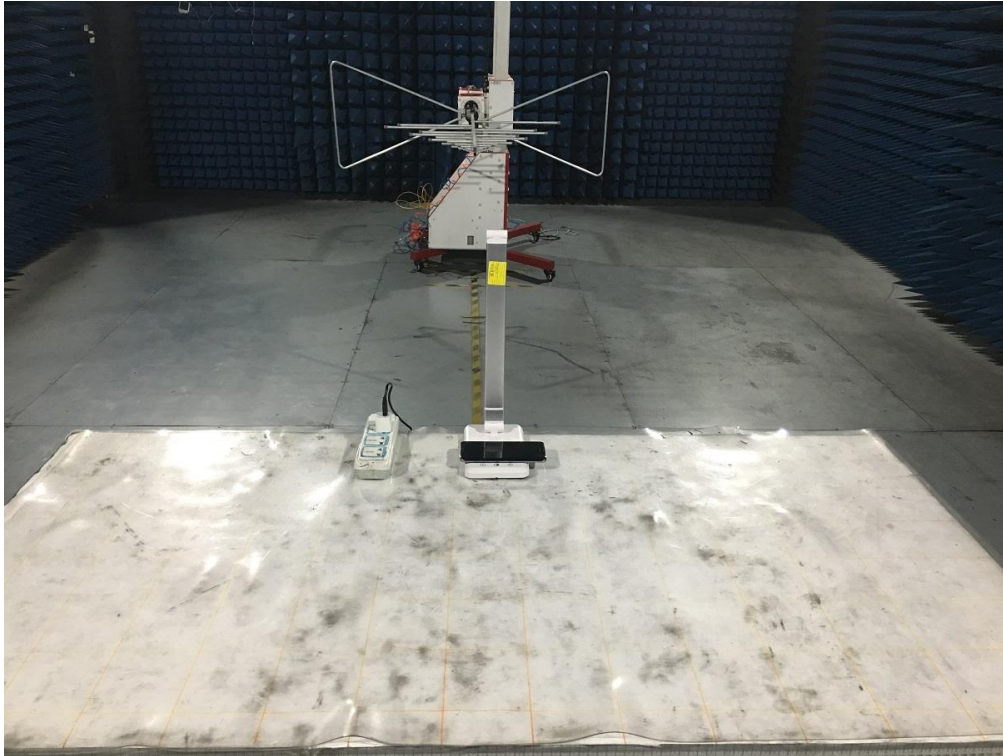
Measurement Data

	110kHz: 20dB BW=68Hz
	205kHz: 20dB BW=58Hz



8 Test Setup Photo

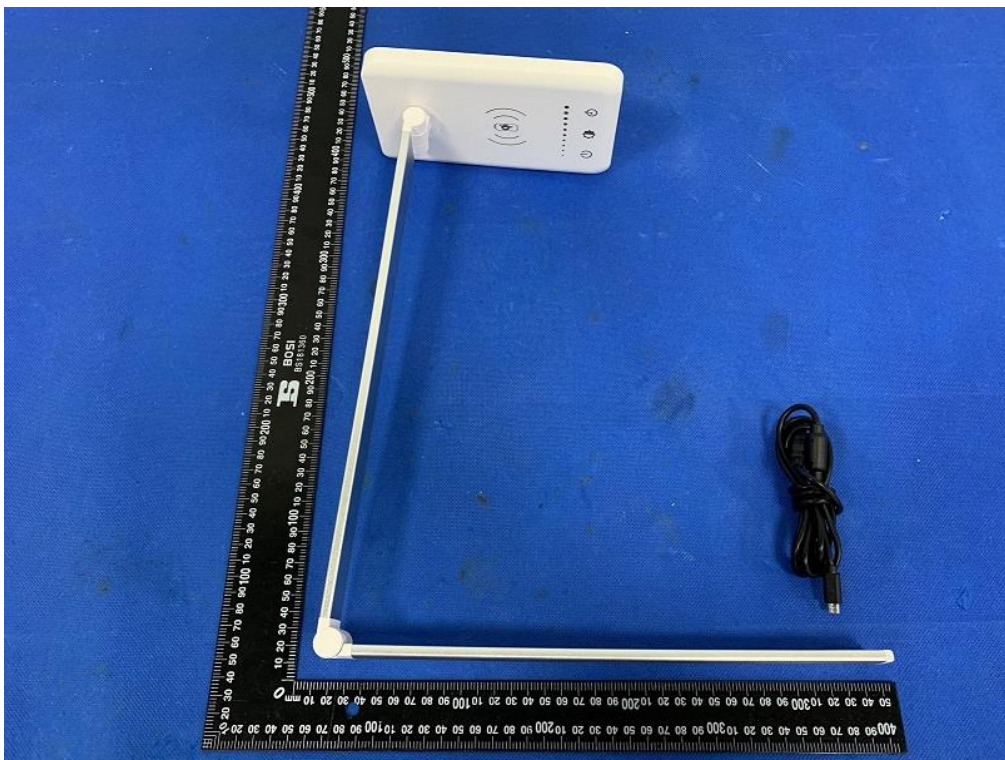
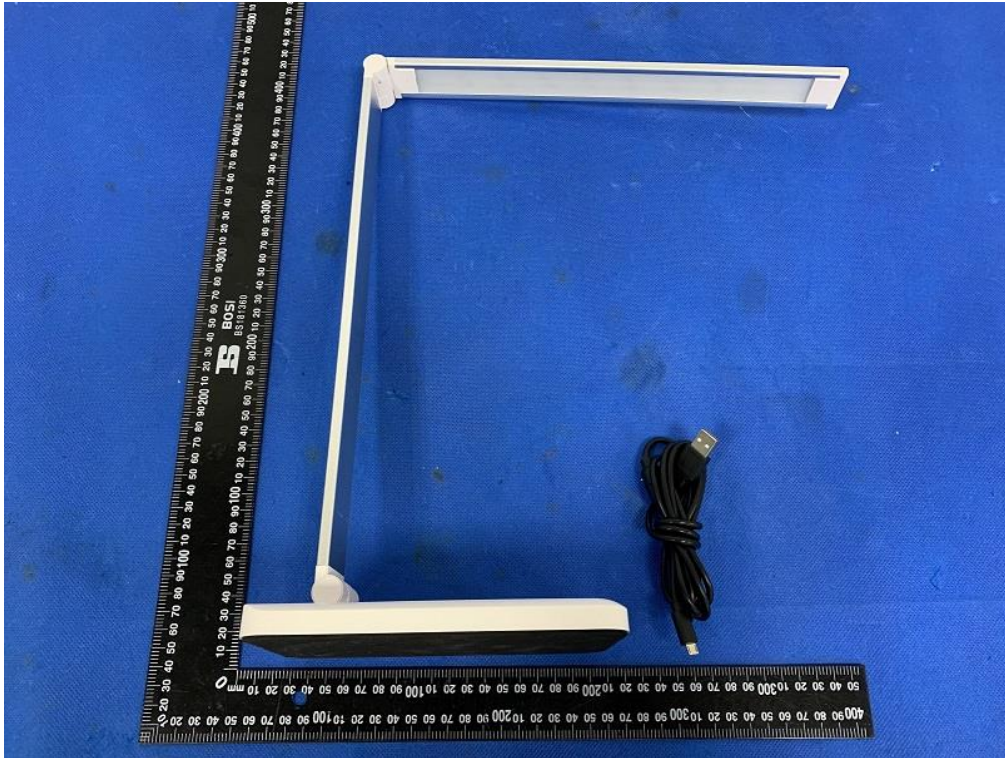
Radiated Emission

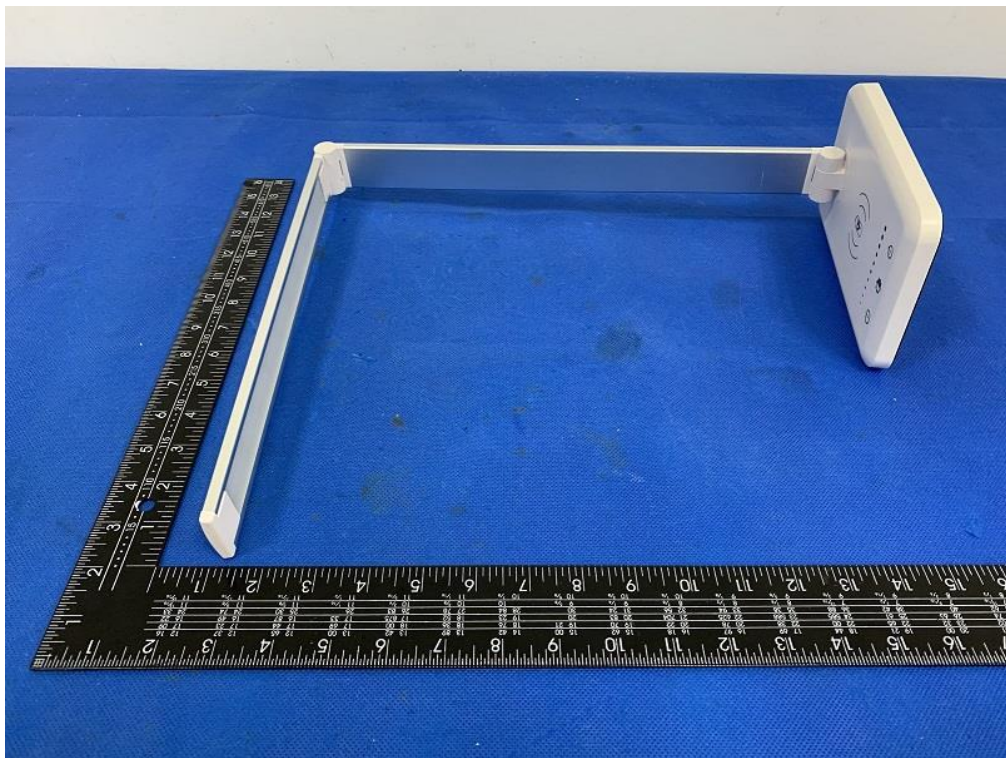
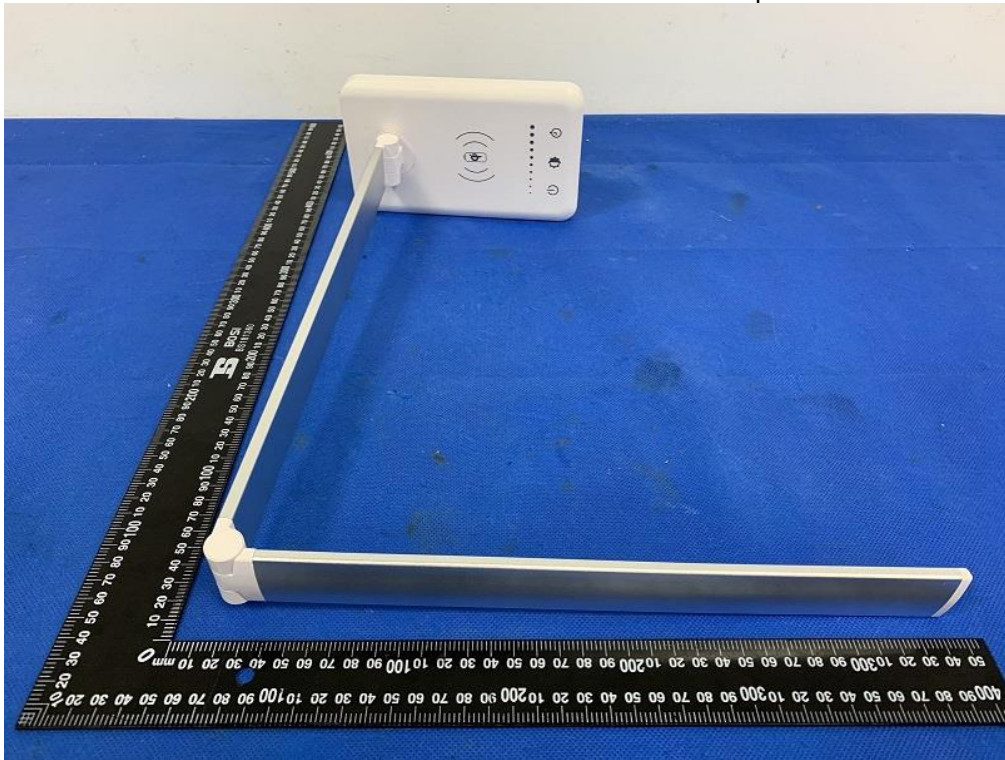


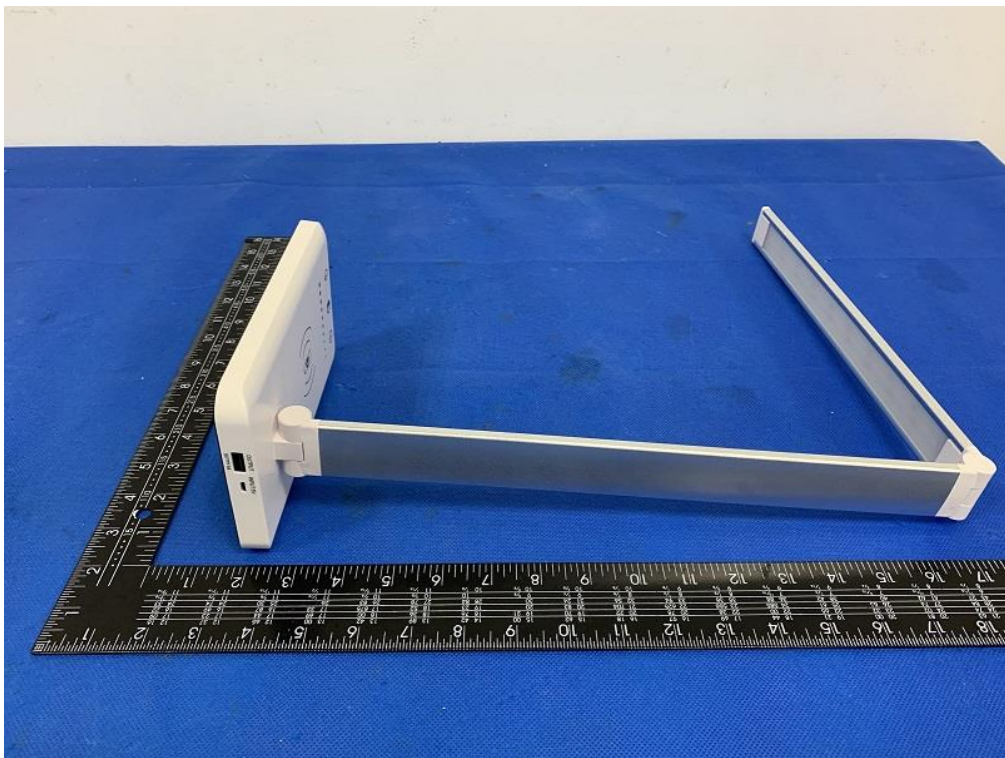
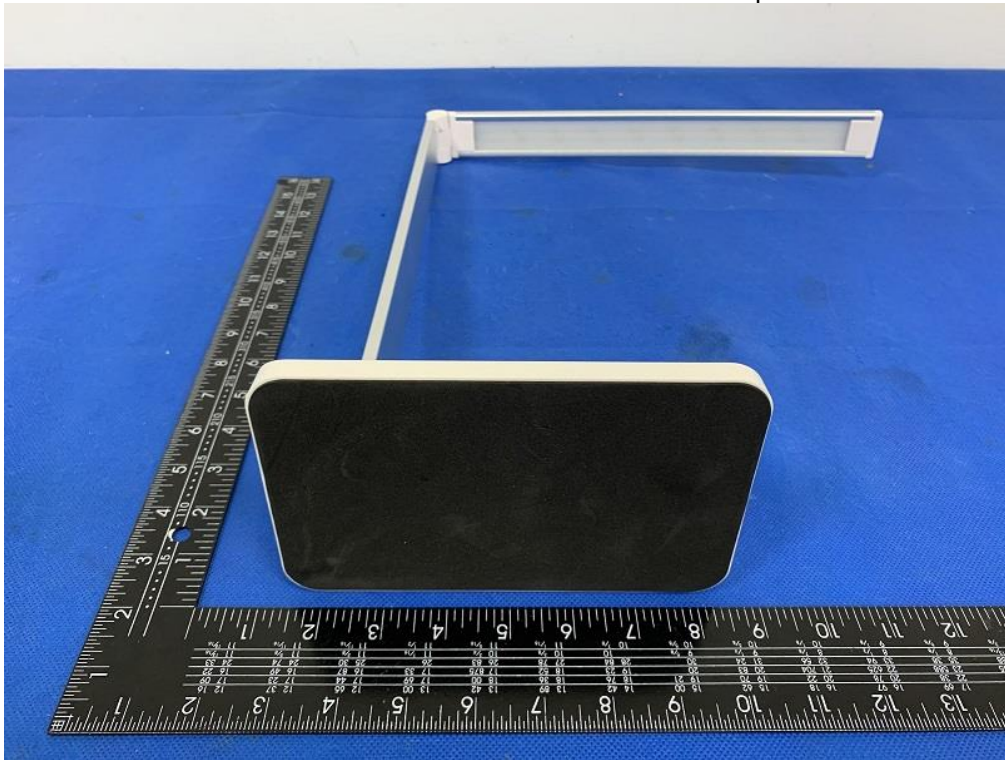
Conducted Emissions

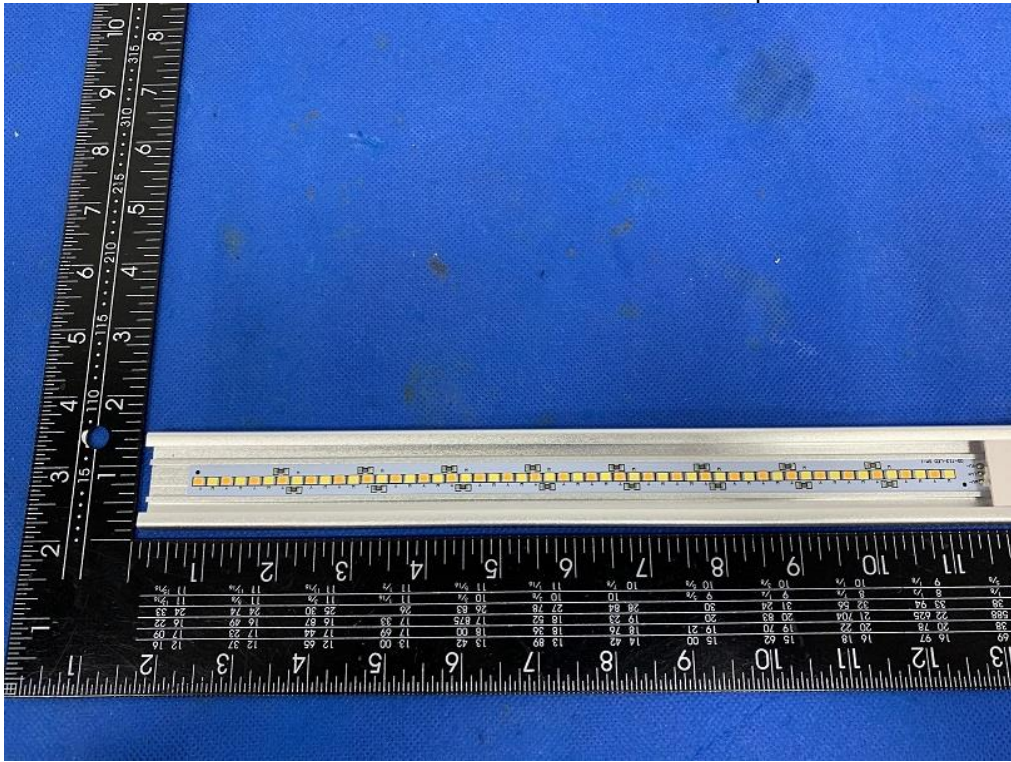


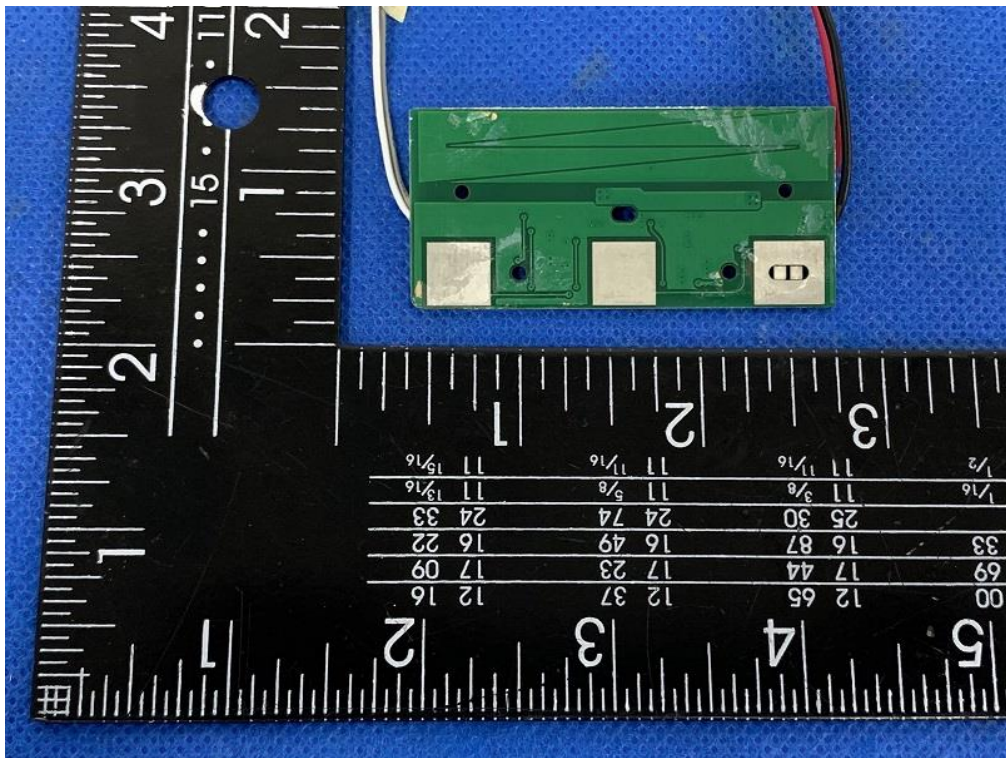
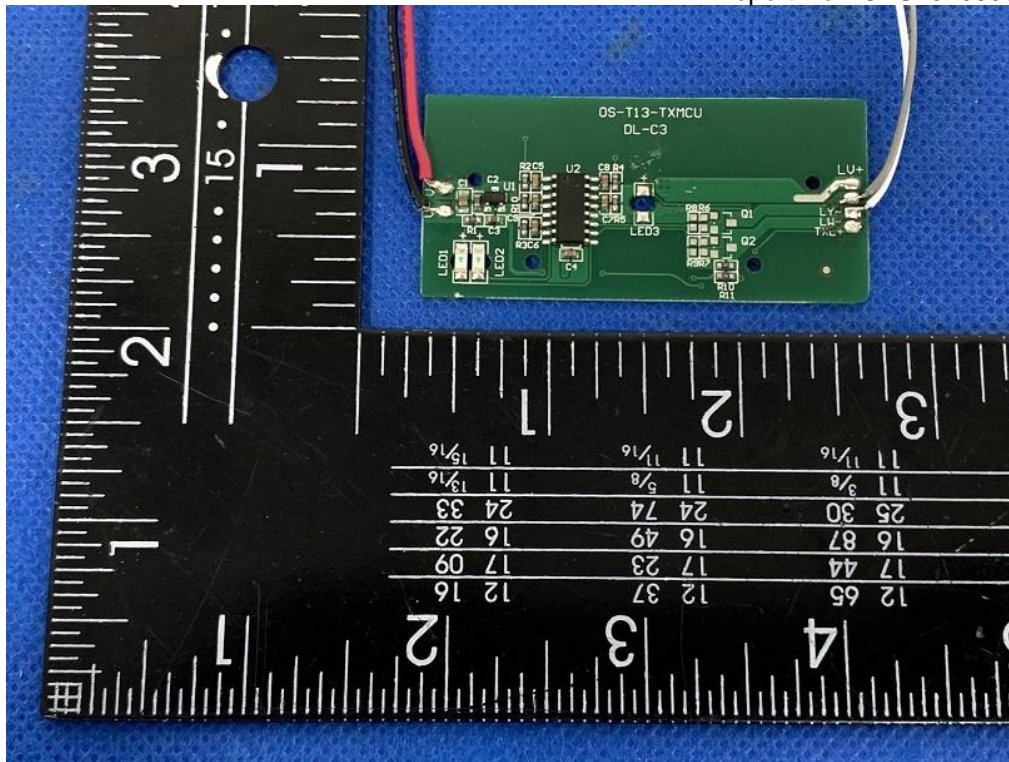
9 EUT Constructional Details

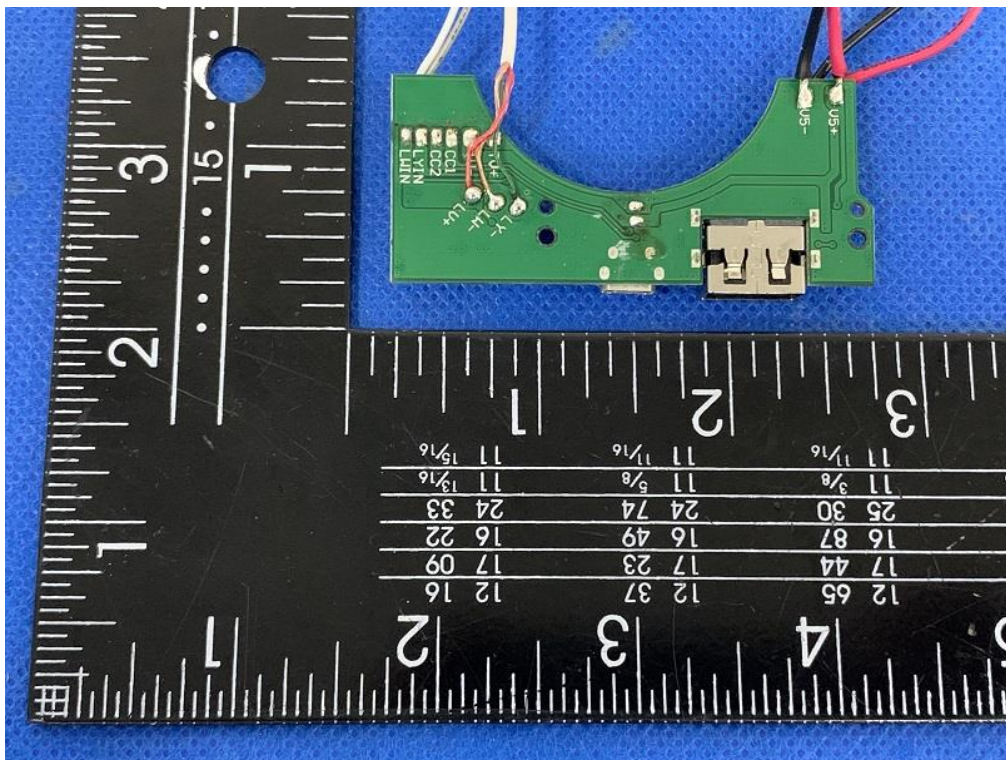
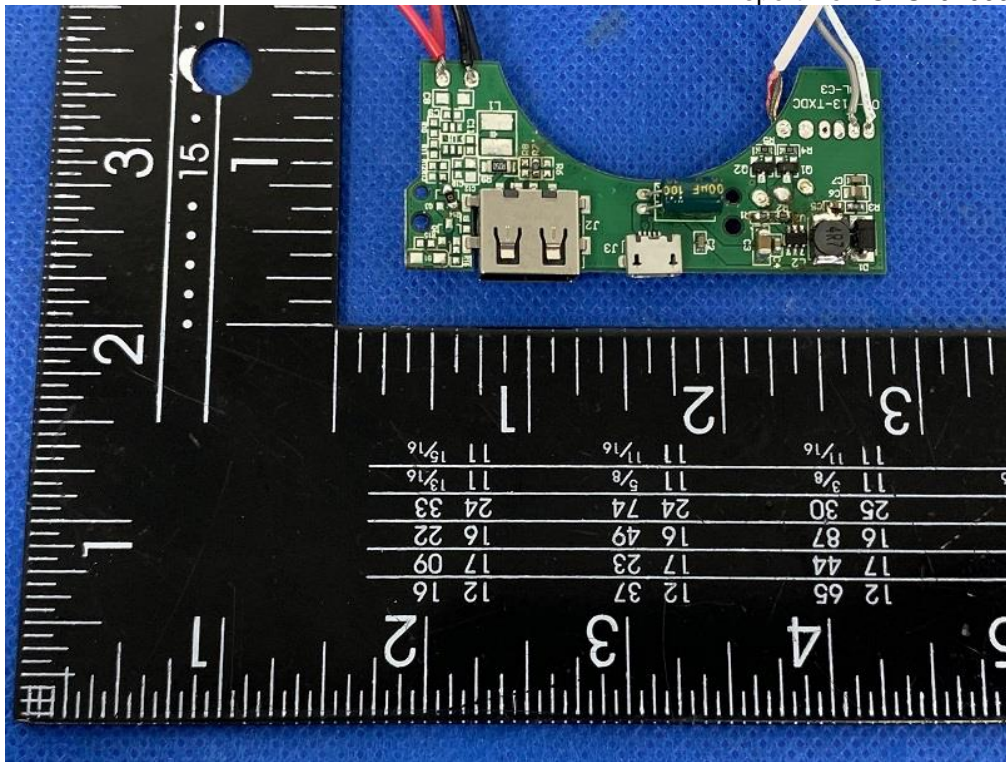


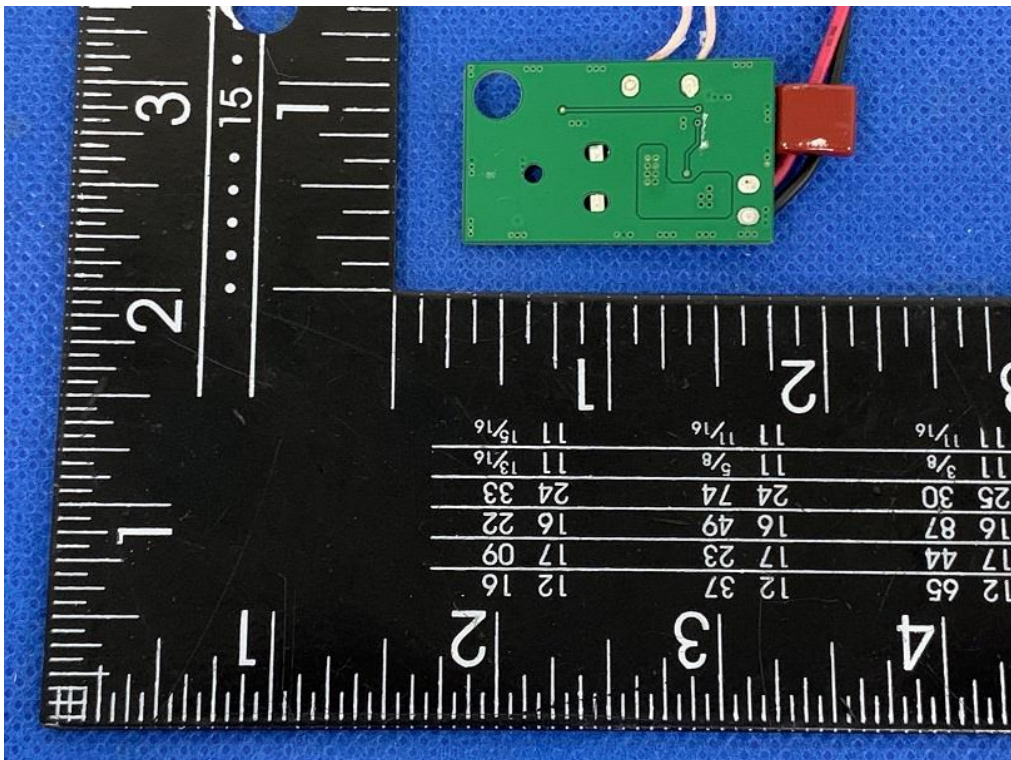
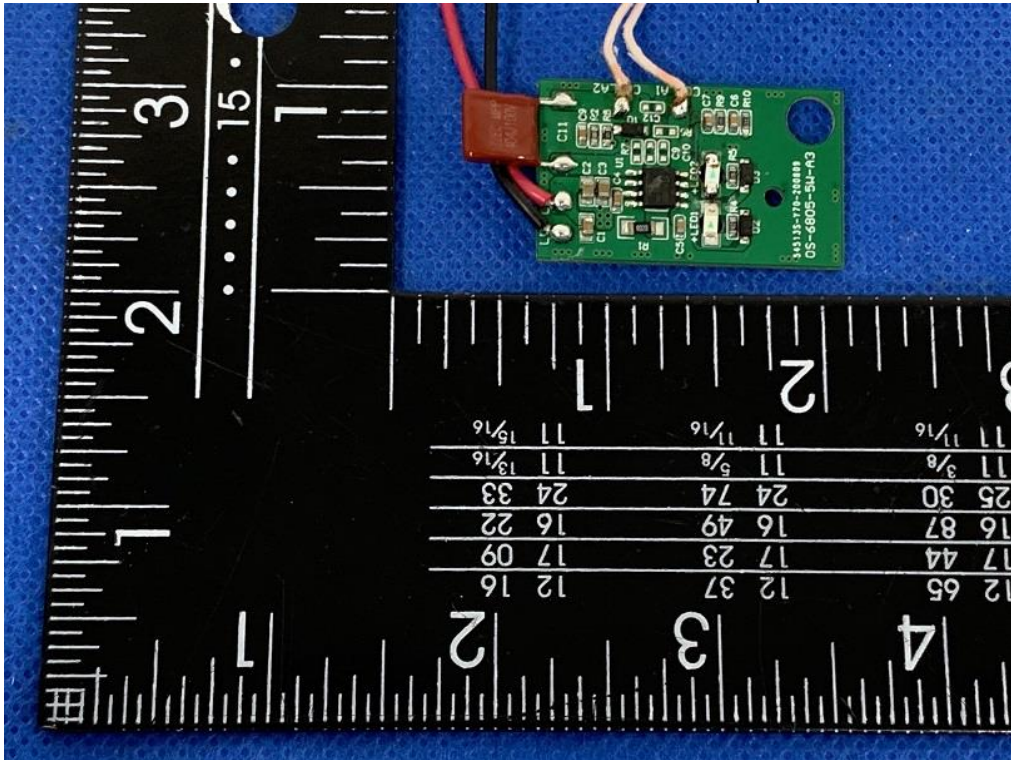


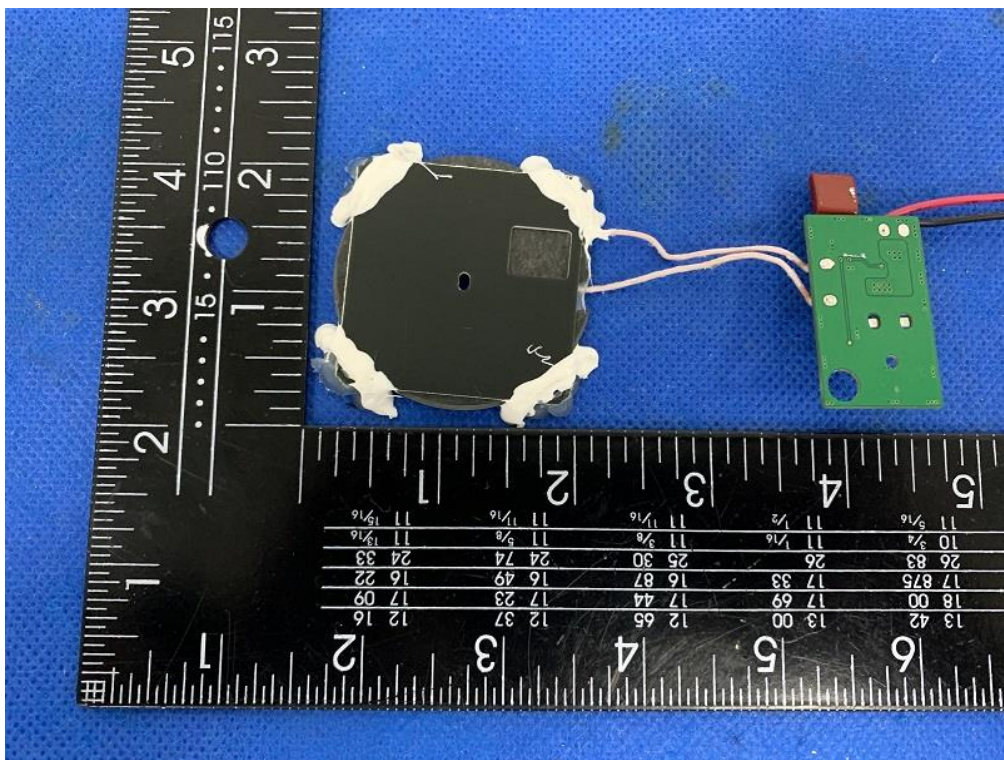
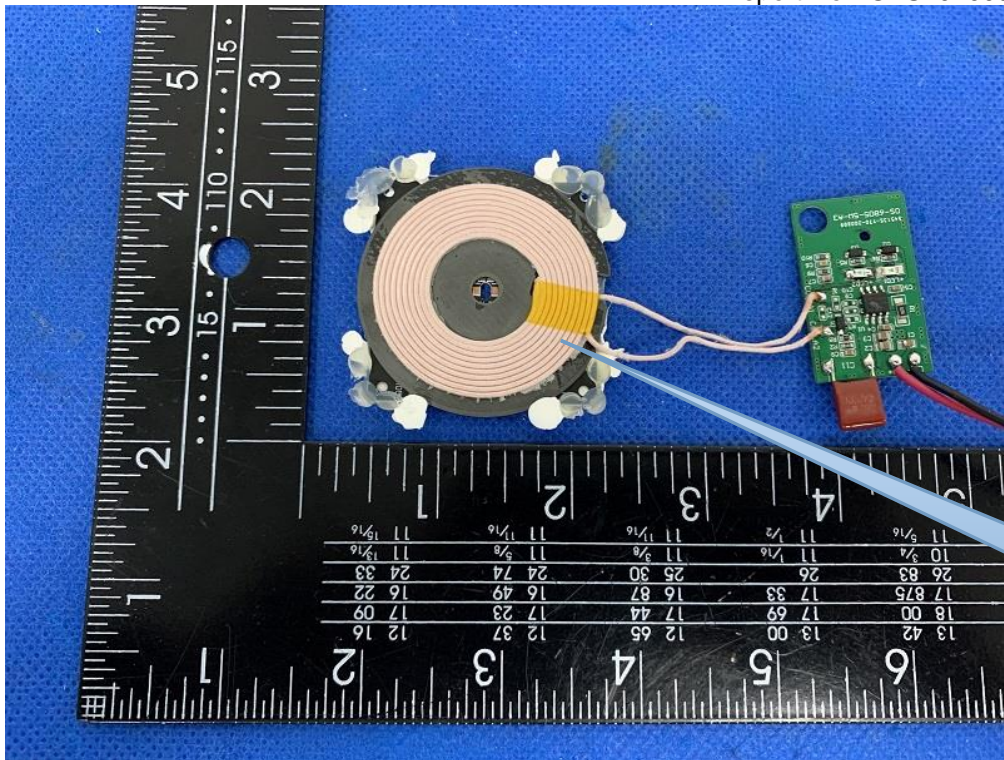












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