

TEST REPORT

Report Number: 103494026MPK-001

Project Number: G103494026

May 15, 2018

**Testing performed on the
Remote Controller of the
Pulsante SPG Microstimulator System**

Model Number: RC-300

FCC ID: 2APE8-RC300

to

FCC Part 15 Subpart C (15.209)

Industry Canada RSS-210 Issue 9

FCC Part 15, Subpart B

Industry Canada ICES-003

For

Autonomic Technologies, Inc.

Test Performed by:

Intertek

1365 Adams Court

Menlo Park, CA 94025 USA

Test Authorized by:

Autonomic Technologies, Inc.

355 Ravendale Drive

Mountain View, CA 94043 USA

Prepared by:


Anderson Soungpanya

Date: May 15, 2018

Reviewed by:


Krishna Vemuri

Date: May 15, 2018

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program. This report must not be used to claim product endorsement by A2LA, NIST nor any other agency of the U.S. Government.

Report No. 103494026MPK-001

Equipment Under Test:	Remote Controller of Pulsante SPG Microstimulator System
Trade Name:	Autonomic Technologies, Inc.
Model Number:	RC-300
Serial Number:	EMC001
Applicant:	Autonomic Technologies, Inc.
Contact:	Vimal Ganesan
Address:	355 Ravendale Drive Mountain View, CA 94043
Country	USA
Tel. Number:	(650) 216-6107
Email	vganesan@ati-spg.com
Applicable Regulation:	FCC Part 15 Subpart C (15.209) Industry Canada RSS-210 Issue 9 FCC Part 15, Subpart B Industry Canada ICES-003 Issue 6
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	May 09, 2018

We attest to the accuracy of this report:



Anderson Soungpanya
Project Engineer



Krishna K Vemuri
Engineering Team Lead

TABLE OF CONTENTS

1.0	Summary of Tests	4
2.0	General Description	5
2.1	Product Description.....	5
2.2	Related Submittal(s) Grants	7
2.3	Test Methodology	7
2.4	Test Facility.....	7
2.5	Measurement Uncertainty	7
3.0	System Test Configuration	8
3.1	Equipment and Description	8
3.2	Block Diagram of Test Setup	9
3.3	Justification	10
3.4	Software Exercise Program	10
3.5	Mode of Operation during test	10
3.6	Modifications required for Compliance	10
3.7	Additions, deviations and exclusions from standards.....	10
4.0	Measurement Results	11
4.1	Radiated Spurious Emissions	11
4.1.1	Requirements	11
4.1.2	Procedure	11
4.1.3	Test Result	13
4.1.4	Test Configuration Photographs.....	19
4.2	Occupied Bandwidth.....	24
4.2.1	Requirements	24
4.2.2	Procedure	24
4.2.3	Test Results	25
4.3	AC Line Conducted Emission	27
4.3.1	Requirement.....	27
4.3.2	Procedure	27
4.3.3	Test Result	28
4.3.4	Test Configuration Photographs.....	36
4.4	Radiated Emissions on Digital Parts	38
4.4.1	Test Limit.....	38
4.4.2	Procedures.....	38
4.4.3	Test Results	39
5.0	List of test equipment	44
6.0	Document History	45

1.0 Summary of Tests

TEST	REFERENCE FCC 15C	REFERENCE RSS-210	RESULTS
Radiated Emissions	15.209	RSS 210 (4.3)	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Occupied Bandwidth	15.215(c)	RSS-GEN	Complies
Radiated Emissions from Digital Parts	15.109	ICES-003	Complies
Conducted Emissions from Digital Parts	15.107	ICES-003	Complies
Antenna requirement	15.203	RSS-GEN	Complies ¹

¹ The EUT utilizes an internal Antenna.

2.0 General Description

2.1 Product Description

Autonomic Technologies, Inc. supplied the following description of the EUT:

Patient use – Home healthcare environment and Clinician Use- Hospital healthcare environment

Neurostimulator: Implantable device used to treat cluster headache attacks by generating biphasic rectangle stimulation pulses. This device does not have battery and powered externally through resonant inductive coupling technology. Graphical image of neurostimulator is shown in figure 1.

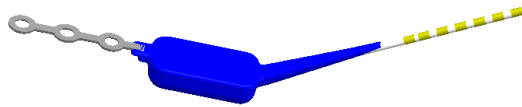


Figure 1.

Remote Controller: Battery operated handheld external device shown in figure 2 used to power and communicate wirelessly with the neurostimulator to generate stimulation pulses.



Figure 2.

Clinician Programmer: A off the shelf medical grade tablet shown in figure 3 (non-ME equipment) used as a support device to program the neurostimulator through the remote controller via USB link.



Figure 3.

Overview of the EUT

Applicant name & address	Autonomic Technologies, Inc. 355 Ravendale Drive Mountain View, CA 94043 USA
Manufacturer & address	Autonomic Technologies, Inc. 355 Ravendale Drive Mountain View, CA 94043 USA
Contact info / Email	Vimal Ganesan / vganesan@ati-spg.com
Model	RC-300
FCC Identifier	2APE8-RC300
Operating Frequency	126kHz \pm 3kHz
Number of Channels	1
Type of Modulation	BFSK Modulation
Antenna Type	Internal Antenna

EUT receive date: May 09, 2018
EUT receive condition: The EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: May 09, 2018
Test completion date: May 09, 2018

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4: 2014. Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47 7, ANSI C63.10: 2013, ANSI C63.4-2014& RSS-GEN Issue 4.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz	30 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-

3.0 System Test Configuration

3.1 Equipment and Description

EUT Equipment Description:

Reference	Part Number	Description	Omnify Revision	ME Equipment	Model Number	Device Name	Implantable
1	4085002	Remote Controller	1.0	Yes	RC-300	Casper	No
4	2525	Remote Controller Charger (Part of 4085002)	A	Yes	RA-200	RC Charger	No
2	2603	Neurostimulator	D	Yes	NS-100	Niffler	Yes

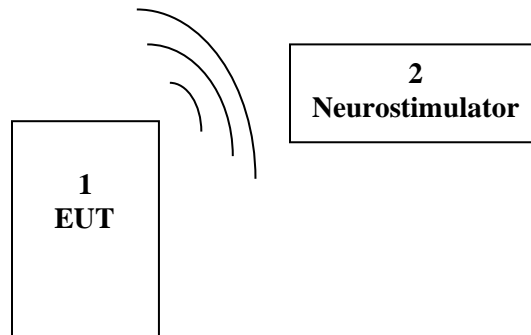
Support Equipment Description:

Reference	Part Number	Description	Omnify Revision	ME Equipment	Model Number	Device Name	Implantable
3	4085001	Clinician Programmer	1.0	No	CP-100	Lumos	No
5	2727002	1 Micro B USB cable for Clinician Programmer	USB cable	No	N/A	USB Cable	No
6	N/A	Clinician Programmer Charger (FSP Group Inc.)	N/A	No	FSP065-DBBM1	CP Charger	No

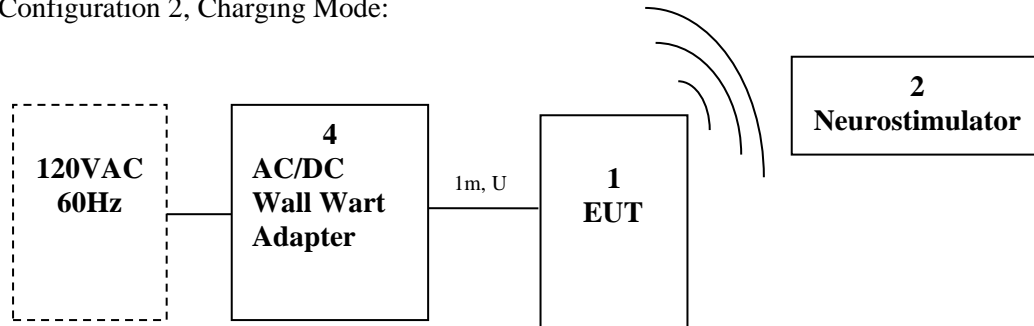
3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.

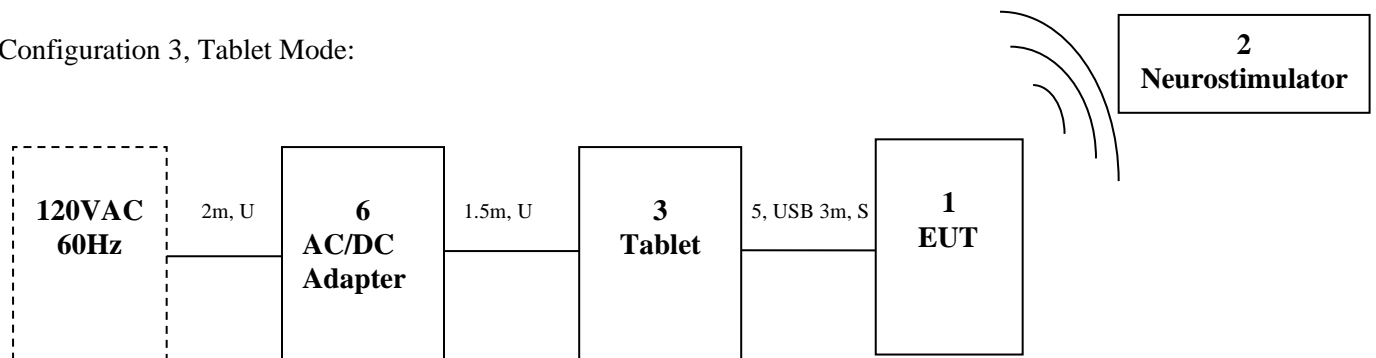
Configuration 1, Battery Mode:



Configuration 2, Charging Mode:



Configuration 3, Tablet Mode:



S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit. The highest clock frequency used in the EUT is 66.66MHz; Radiated Emissions was tested up to 1GHz.

3.4 Software Exercise Program

None

3.5 Mode of Operation during test

Stimulation Mode (RF on) and Standby Mode (RF off). Both modes were tested in the following configuration below

Configuration 1: RC300 is in Battery Mode

Configuration 2: RC300 is in Charging Mode

Configuration 3: RC300 is in Tablet Mode. In Tablet Mode, the RC300 is controlled remotely using the tablet.

3.6 Modifications required for Compliance

No modifications were made by the manufacturer to bring the EUT into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Radiated Spurious Emissions

4.1.1 Requirements

FCC Rule 15.209

§15.209 Radiated emission limits; general requirements.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were made at 10 meters. Data results below are corrected for distance.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

4.1.2 Procedure (continued)

Radiated emission measurements were performed from 9kHz to 1 GHz.

Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz

9 kHz or greater for 150kHz to 30 MHz

120 kHz or greater for 30MHz to 1000 MHz

For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels).

A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:

$$FS = RA + AF + CF - AG - DCF$$

Where FS = Field Strength in dB (μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB (μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB (1/m)

AG = Amplifier Gain in dB

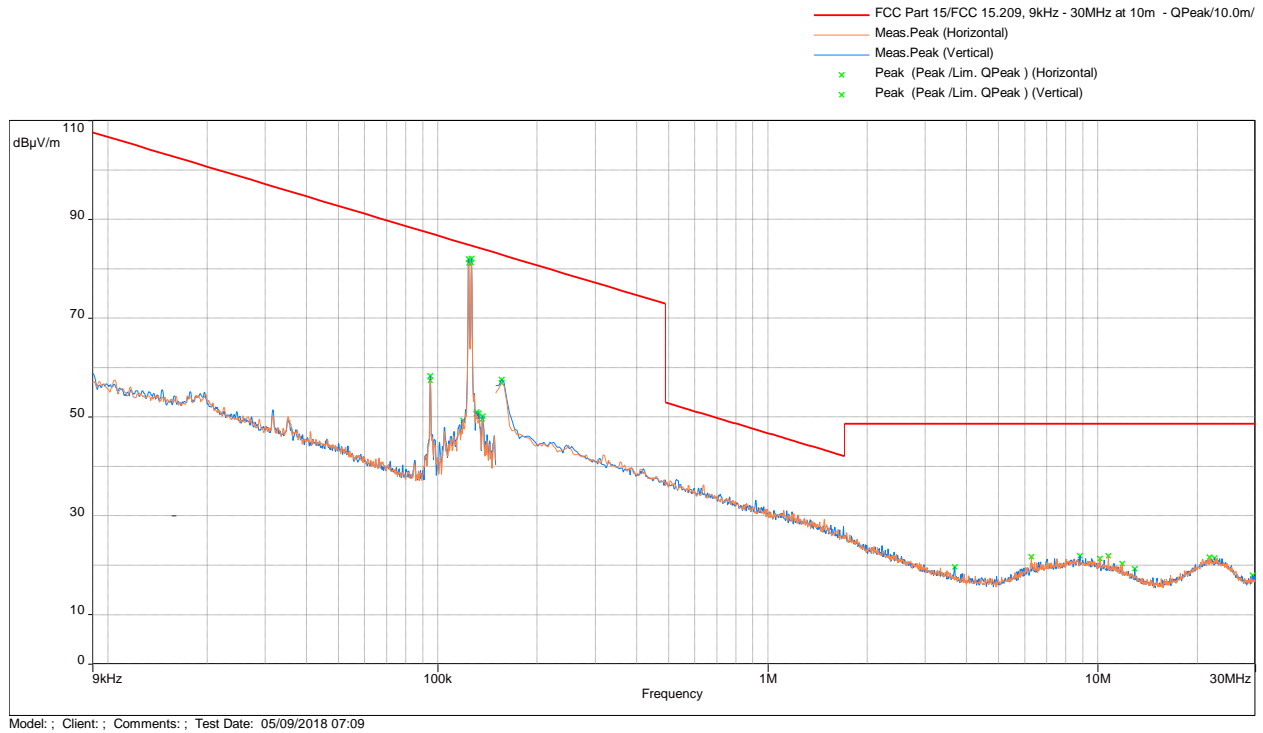
DCF = Distance Correction Factor

Radiated Spurious Measurements were made with EUT in X, Y and Z Axis for all configurations. The worst case axis for each configurations are presented in data below.

Note: FS was measured with loop antenna below 30MHz, and Bi-Log antenna for 30-1000MHz

4.1.3 Test Result

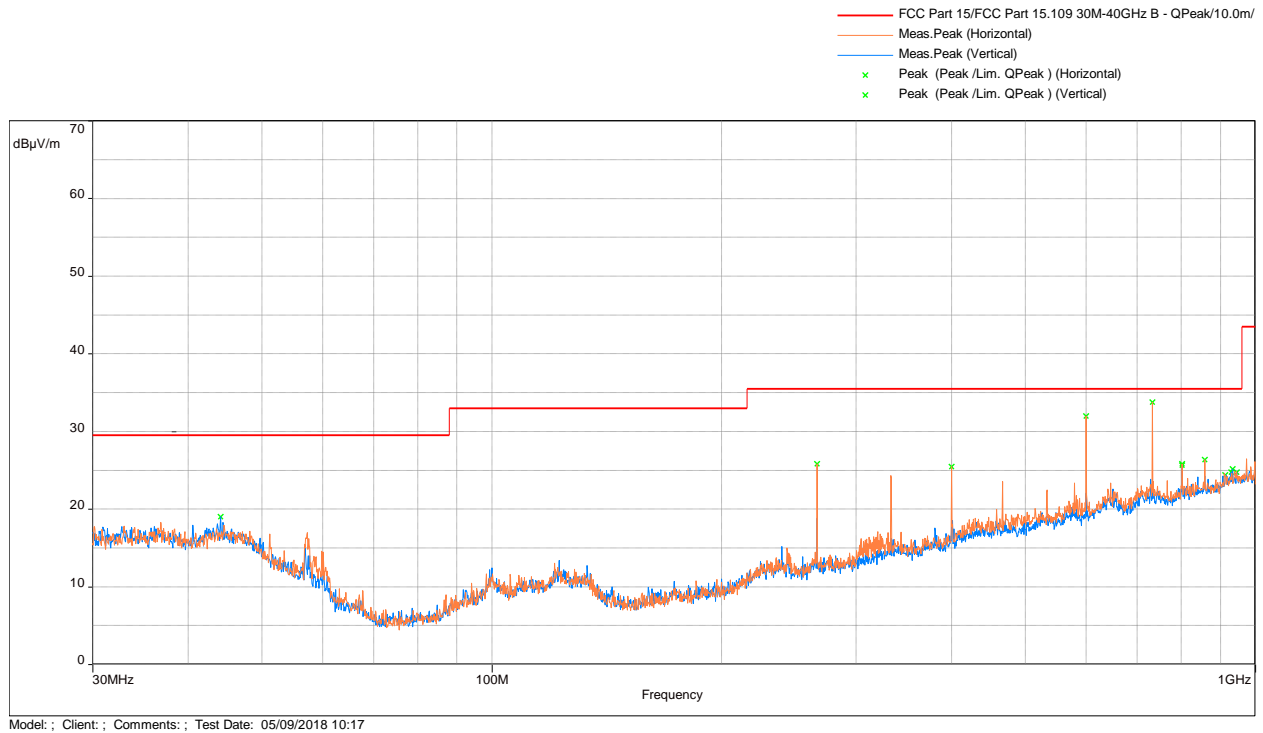
Radiated Spurious Emissions, 9 kHz to 30MHz; Battery Mode



Frequency (MHz)	Peak FS@ 10m dB(uV/m)	Limit@ 10m dB(uV/m)	Margin dB	Antenna Orientation
0.126	81.16	84.67	-3.51	
0.126	82.04	84.67	-2.63	Perpendicular

4.1.3 Test Result (Continued)

Radiated Spurious Emissions, 30 MHz to 1000 MHz; Battery Mode

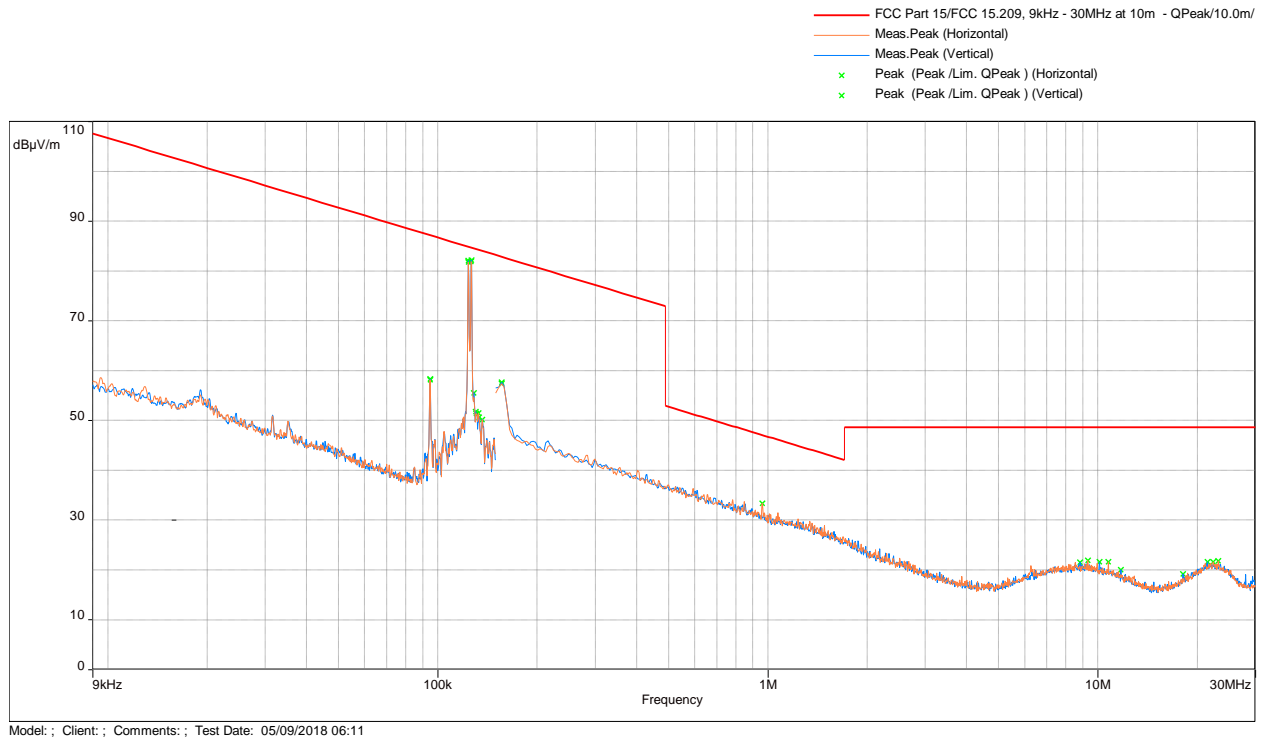


Frequency (MHz)	QP @ 10m (dBµ V/m)	QP Limit @ 10m (dBµ V/m)	Margin (dB)	Comment	Correction (dB)
266.647	25.82	35.5	-9.68	Horizontal	-12.89
399.990	25.44	35.5	-10.06	Horizontal	-10.01
600.004	31.94	35.5	-3.56	Horizontal	-6.57
733.347	33.75	35.5	-1.75	Horizontal	-4.04
801.829	25.81	35.5	-9.69	Horizontal	-3.49
859.091	26.33	35.5	-9.17	Horizontal	-2.58
44.1297	18.98	29.5	-10.52	Vertical	-9.51

Results **Complies by 1.75 dB for Battery Mode**

4.1.3 Test Result (Continued)

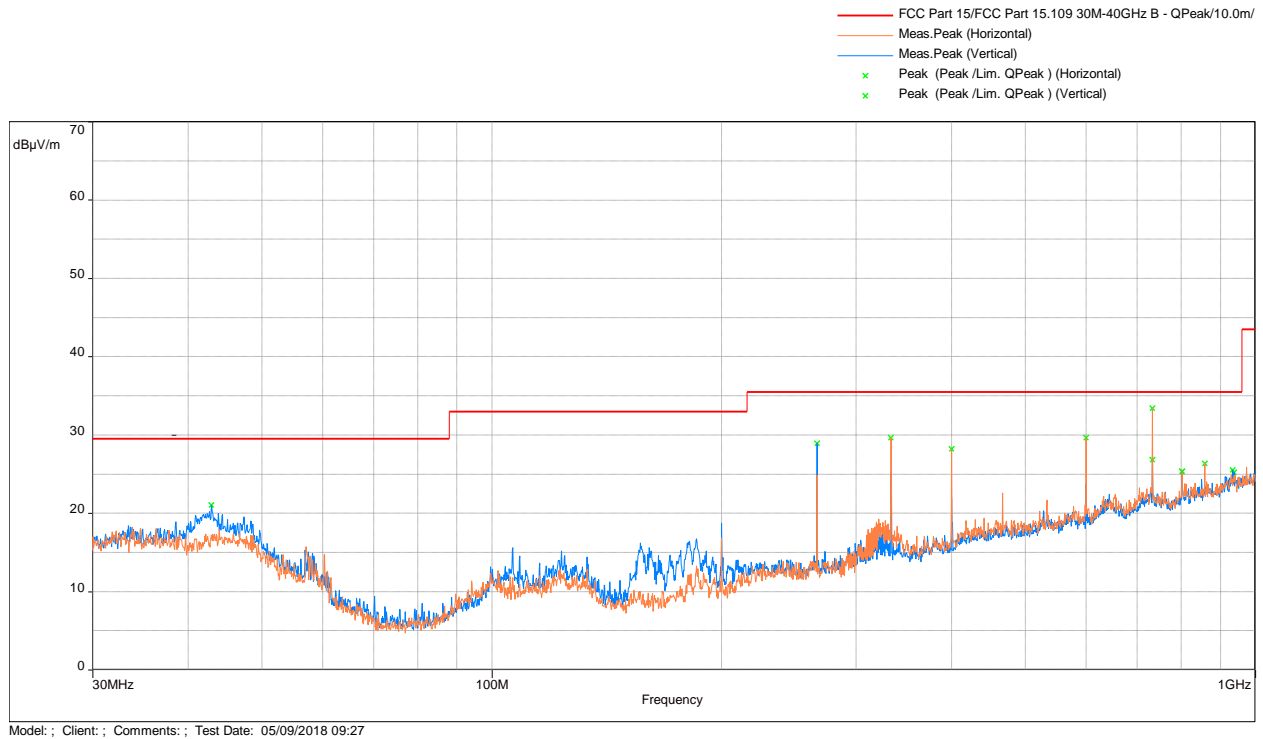
Radiated Spurious Emissions, 9 kHz to 30MHz; Charging Mode



Frequency (MHz)	Peak FS@10m dB(uV/m)	Limit@10m dB(uV/m)	Margin dB	Antenna Orientation
0.126	81.82	84.67	-2.85	Parallel
0.126	82.10	84.67	-2.57	Perpendicular

4.1.3 Test Result (Continued)

Radiated Spurious Emissions, 30 MHz to 1000 MHz; Charging Mode

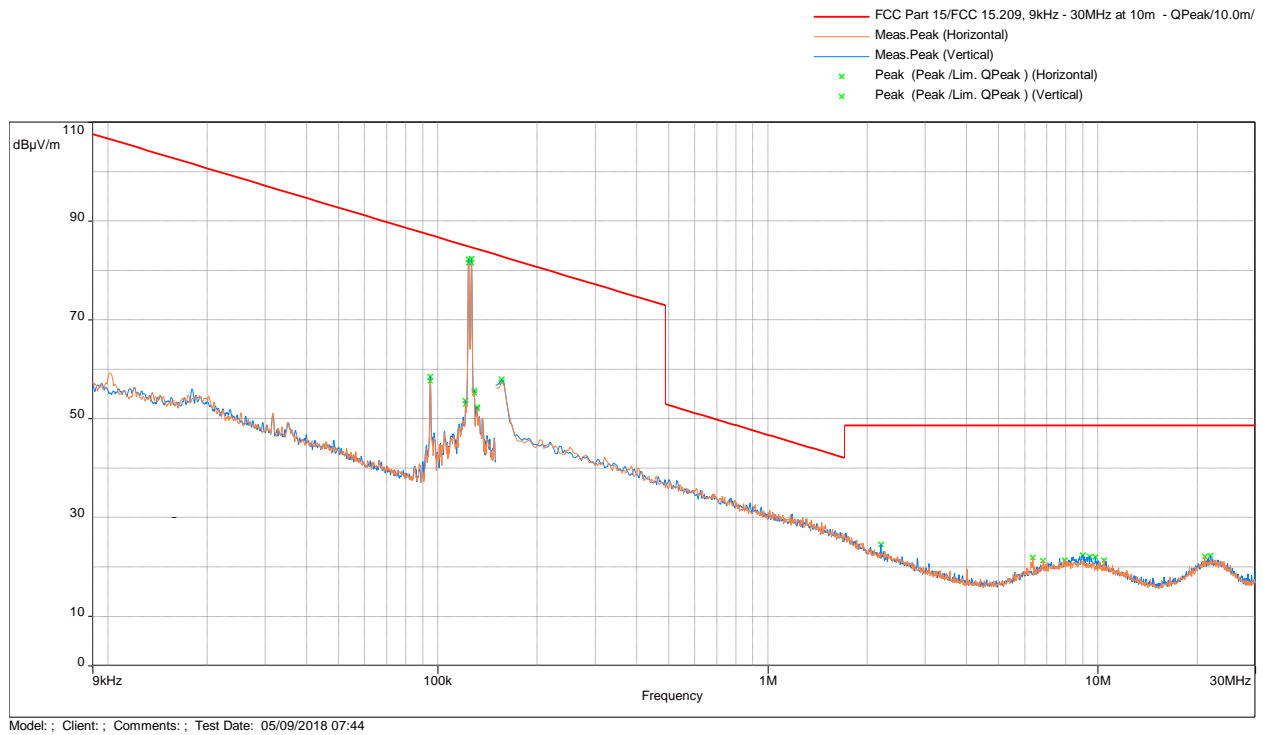


Frequency (MHz)	QP @ 10m (dBµV/m)	QP Limit @ 10m (dBµV/m)	Margin (dB)	Comment	Correction (dB)
333.319	29.63	35.5	-5.87	Horizontal	-11.3
399.990	28.19	35.5	-7.31	Horizontal	-10.01
600.004	29.61	35.5	-5.89	Horizontal	-6.57
733.347	33.41	35.5	-2.09	Horizontal	-4.04
42.933	21.02	29.5	-8.48	Vertical	-9.15
266.647	28.94	35.5	-6.56	Vertical	-12.89
733.347	26.84	35.5	-8.66	Vertical	-4.04

Results **Complies by 2.09 dB for Charging Mode**

4.1.3 Test Result (Continued)

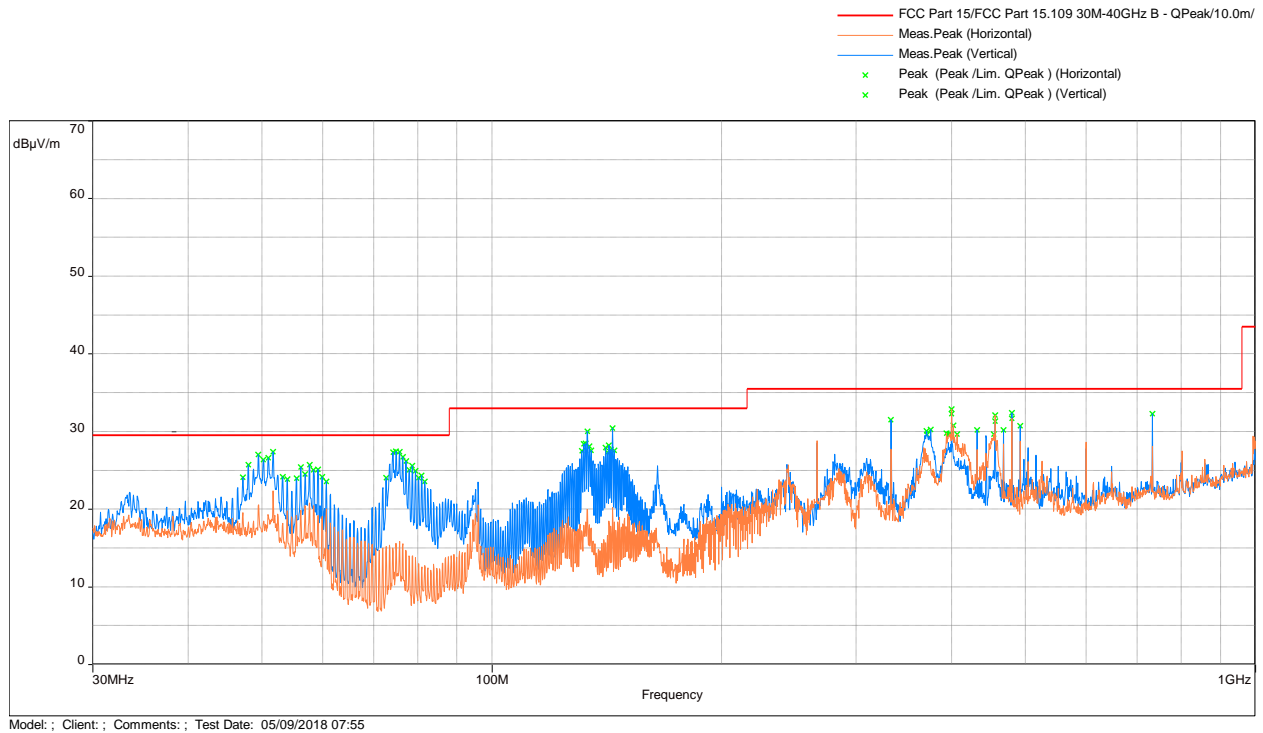
Radiated Spurious Emissions, 9 kHz to 30MHz; Tablet Mode



Frequency (MHz)	Peak FS@ 10m dB(uV/m)	Limit@ 10m dB(uV/m)	Margin dB	Antenna Orientation
0.126	81.50	84.67	-3.17	Parallel
0.126	82.29	84.67	-2.38	Perpendicular

4.1.3 Test Result (Continued)

Radiated Spurious Emissions, 30 MHz to 1000 MHz; Tablet Mode



Frequency (MHz)	QP @ 10m (dBµV/m)	QP Limit @ 10m (dBµV/m)	Margin (dB)	Comment	Correction (dB)
51.695	27.33	29.5	-2.17	Vertical	-12.34
74.943	27.42	29.5	-2.08	Vertical	-20.4
133.369	29.99	33.0	-3.01	Vertical	-15.47
143.975	30.39	33.0	-2.61	Vertical	-17.89
333.319	31.49	35.5	-4.01	Vertical	-11.3
371.698	29.57	35.5	-5.93	Vertical	-10.48
399.990	32.86	35.5	-2.64	Vertical	-10.01
455.991	32.05	35.5	-3.45	Vertical	-8.37
480.015	32.36	35.5	-3.14	Vertical	-8.44
733.347	32.28	35.5	-3.22	Vertical	-4.04
394.105	29.74	35.5	-5.76	Horizontal	-10.34
454.375	29.61	35.5	-5.89	Horizontal	-8.48

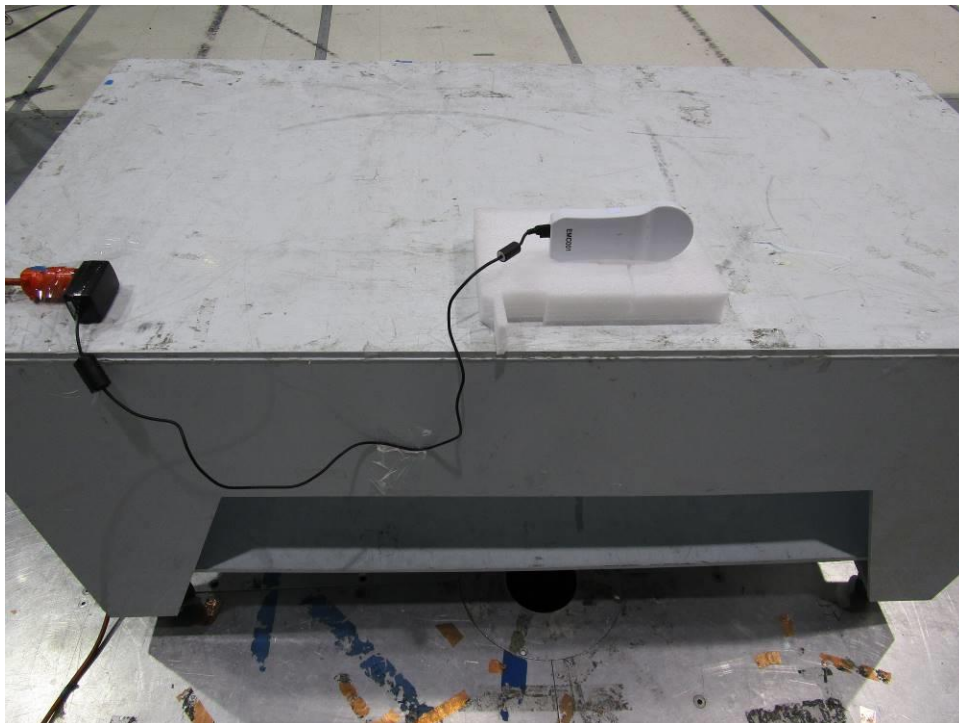
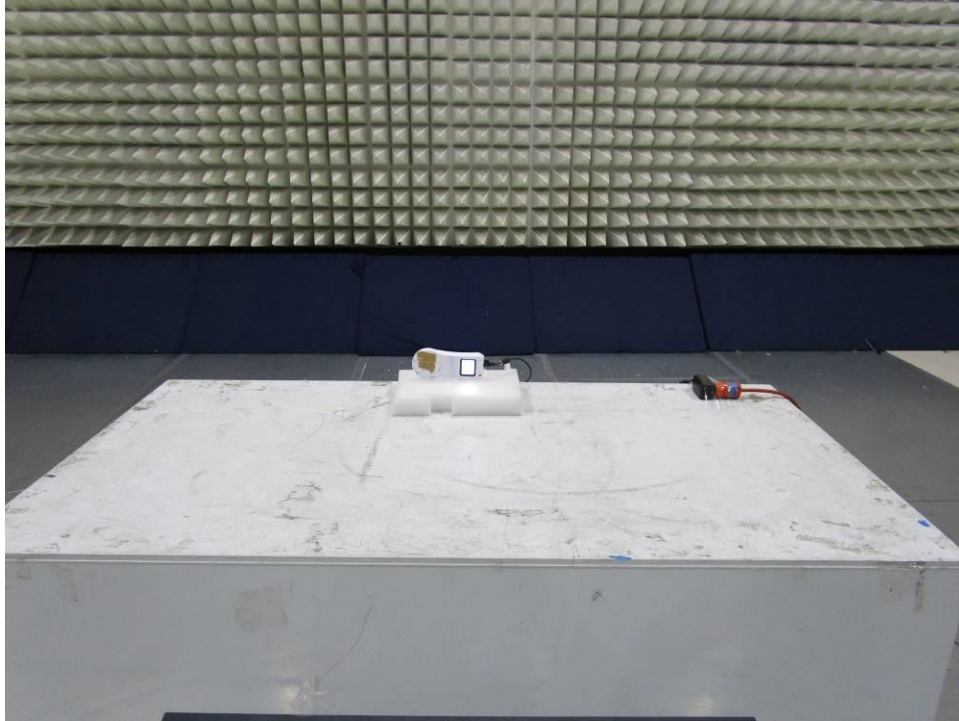
Results **Complies by 2.08 dB for Tablet Mode**

4.1.4 Test Configuration Photographs



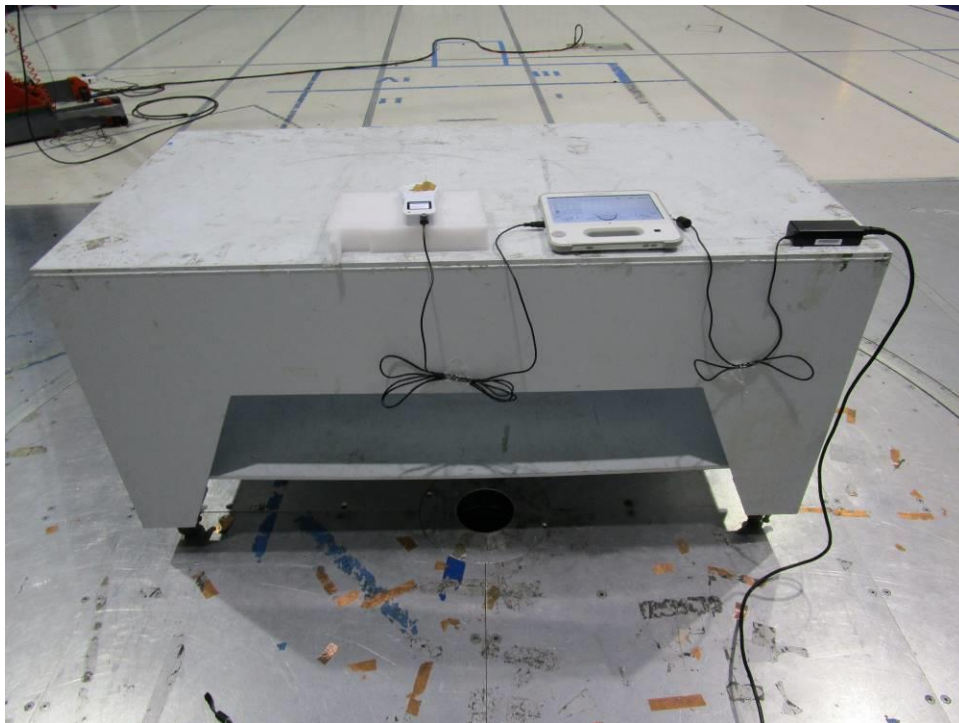
X Axis in Battery Mode

4.1.4 Test Configuration Photographs (Continued)



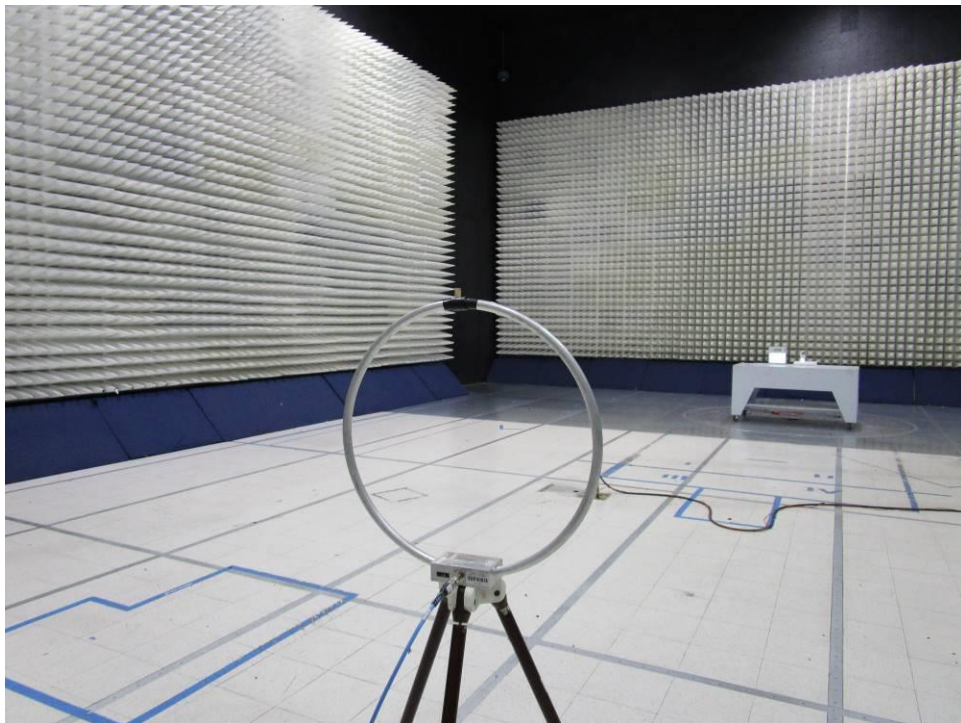
Y Axis in Charging Mode

4.1.4 Test Configuration Photographs (Continued)



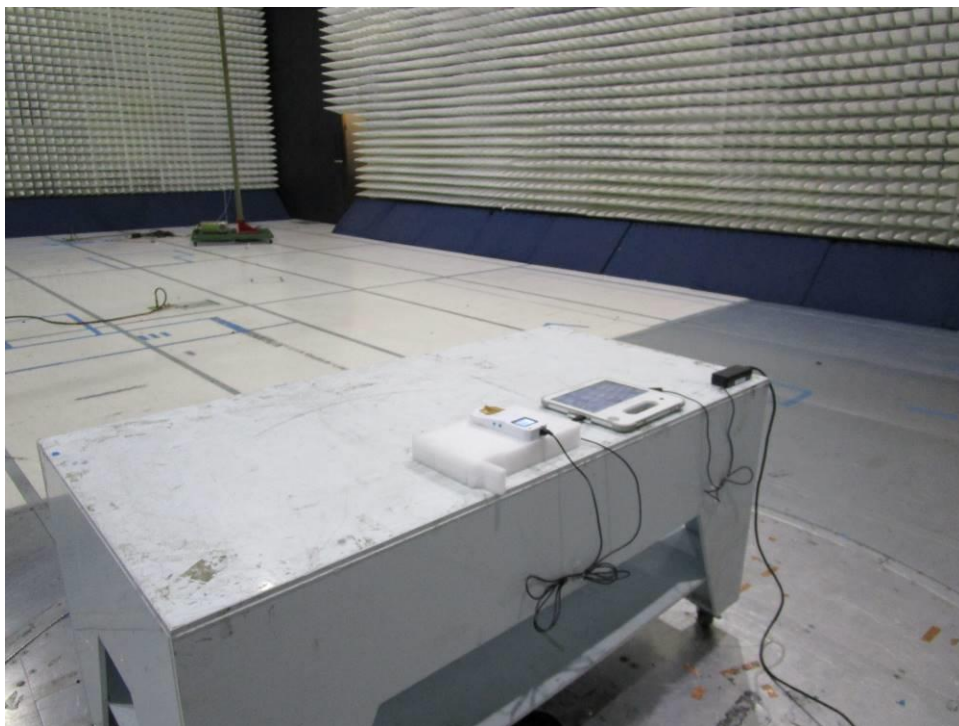
Z Axis in Tablet Mode

4.1.4 Test Configuration Photographs (Continued)



Radiated Emissions, 9kHz to 30MHz, Loop Antenna

4.1.4 Test Configuration Photographs (Continued)



Radiated Emissions, 30 MHz to 1000MHz, Bi-Log Antenna

4.2 Occupied Bandwidth FCC 15.215

4.2.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

4.2.2 Procedure

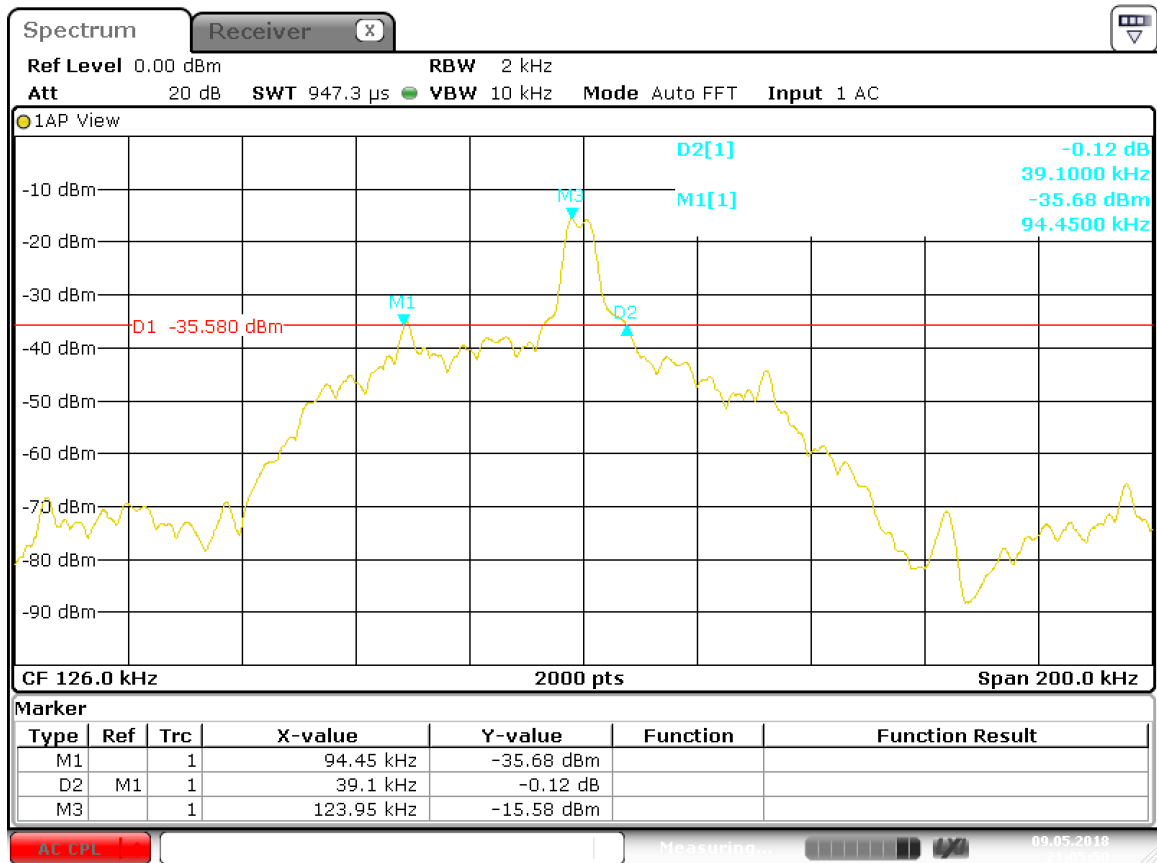
The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10: 2013, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

4.2.3 Test Results

Frequency (MHz)	-20 dB Channel Bandwidth (kHz)	99% Channel Bandwidth (Hz)
0.126	39.1	44.0

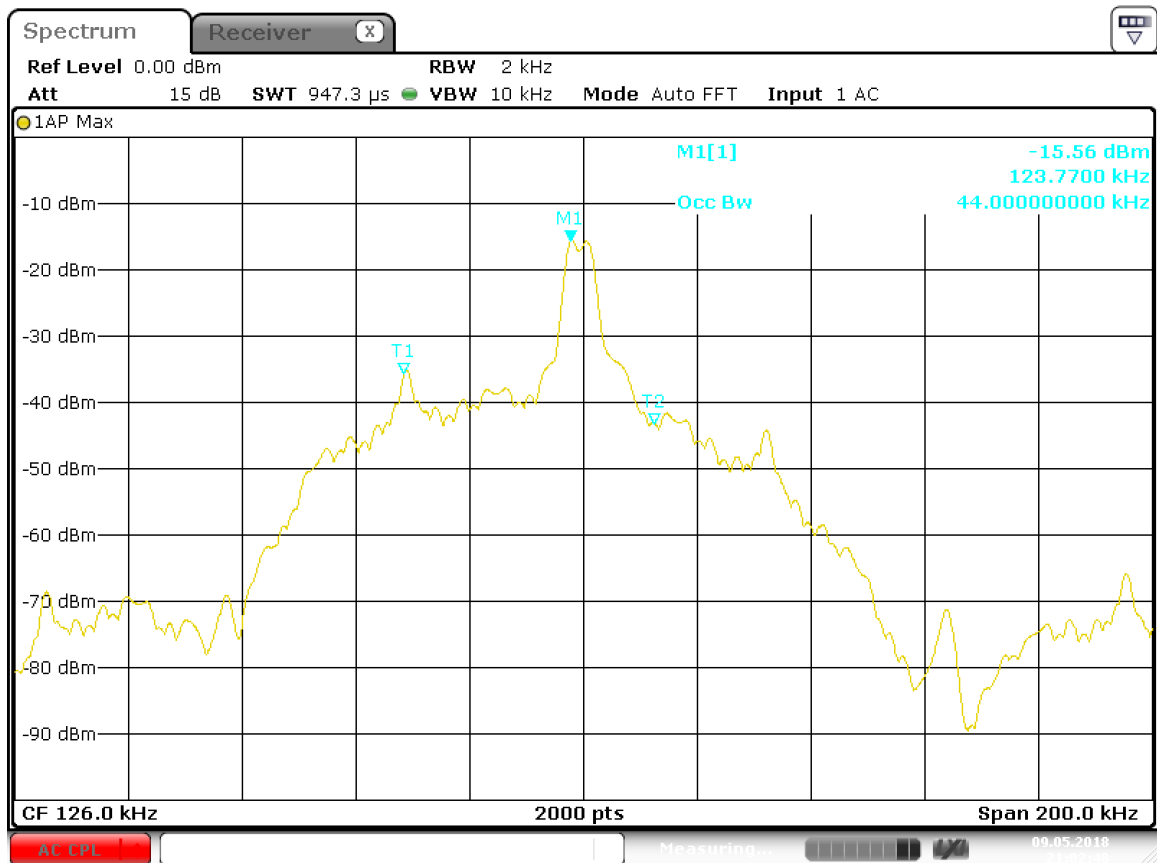
-20dB Channel Bandwidth Plot



Date: 9.MAY.2018 21:05:50

4.3.3 Test Results (Continued)

99% Channel Bandwidth Plot



Date: 9.MAY.2018 21:02:48

4.3 AC Line Conducted Emission FCC Rule 15.207, FCC 15.107

4.3.1 Requirement

Frequency Band MHz	Class B Limit dB(μ V)		Class A Limit dB(μ V)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.

4.3.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 to ensure the device complies with 15.207. After, the EUT RF was powered off and was measured to show compliance with the 15.107 limits.

4.3.3 Test Result

15.207. Transmitter ON with EUT in Charging Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 1

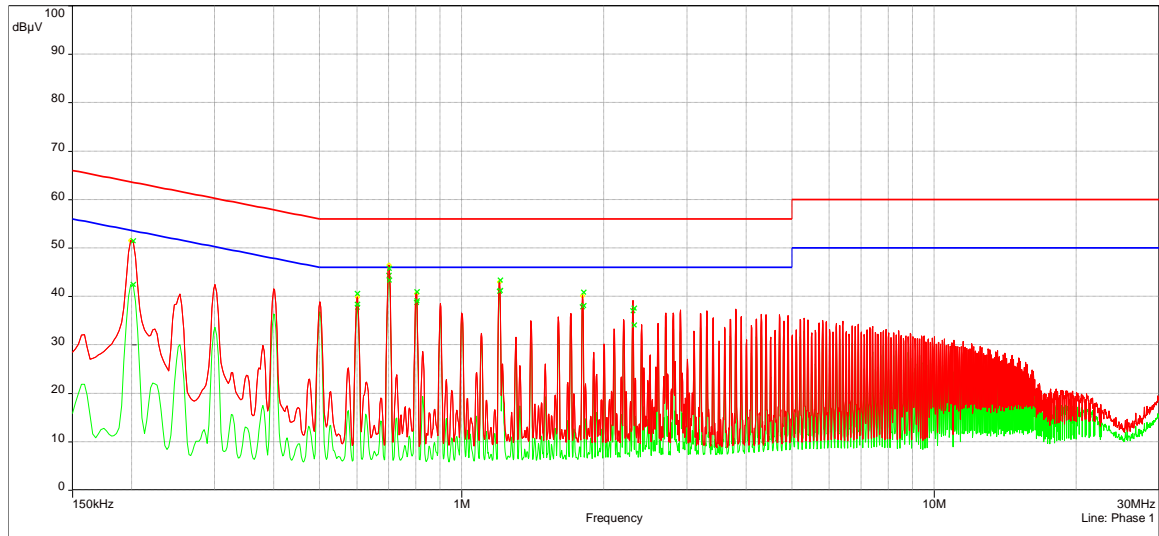
Sub-range 1

Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)

Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On

Line: Phase 1

— FCC Part 15/FCC Part 15.107 B - Average/
 — FCC Part 15/FCC Part 15.107 B - QPeak/
 — Meas.QPeak (Phase 1)
 — Mes. CISPR AVG (Phase 1)
 — QPeak (QPeak /Lim. QPeak) (Phase 1)
 — CISPR AVG (CISPR AVG /Lim. Average) (Phase 1)
 — Ave Level (dBuV) (Final QP and Ave) (Phase 1)
 — QP Level (dBuV) (Final QP and Ave) (Phase 1)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 11:10

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.199	51.56	63.63	-12.07	Phase 1	11.54
0.602	39.83	56	-16.17	Phase 1	11.59
0.701	46.47	56	-9.53	Phase 1	11.60
0.802	40.55	56	-15.45	Phase 1	11.62
1.203	43.01	56	-12.99	Phase 1	11.63
1.803	40.14	56	-15.86	Phase 1	11.67

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.602	37.74	46	-8.26	Phase 1	11.59
0.701	44.28	46	-1.72	Phase 1	11.60
0.802	38.71	46	-7.29	Phase 1	11.62
1.203	41.01	46	-4.99	Phase 1	11.63
1.803	37.83	46	-8.17	Phase 1	11.67
2.305	36.98	46	-9.02	Phase 1	11.69

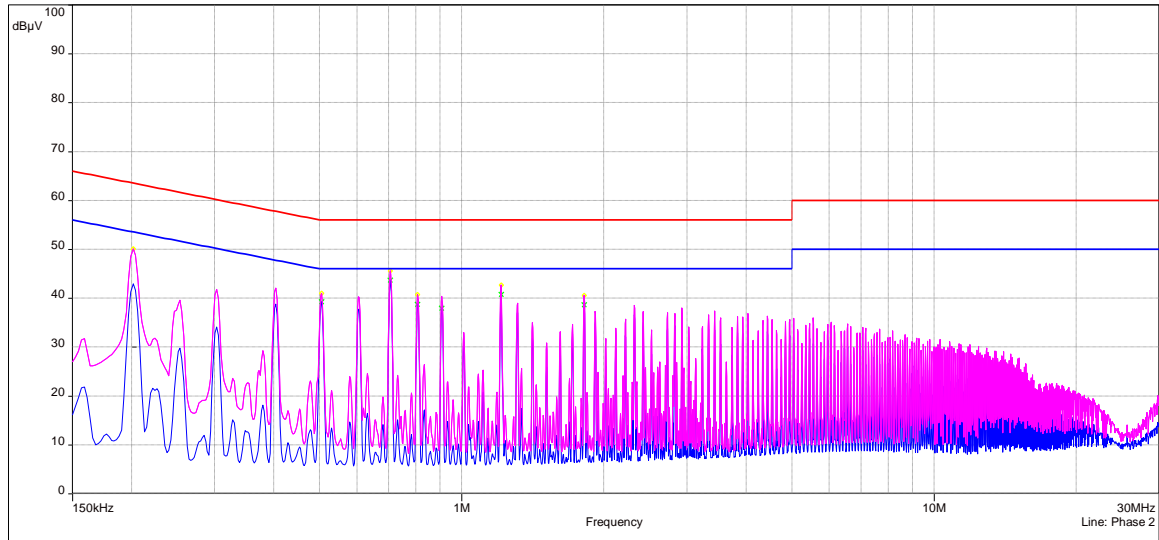
4.3.3 Test Result (Continued)

15.207, Transmitter ON with EUT in Charging Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Presselector: On
Line: Phase 2

— FCC Part 15/FCC Part 15.107 B - Average/
— FCC Part 15/FCC Part 15.107 B - QPeak/
— Meas.QPeak (Phase 2)
— Mes. CISPR AVG (Phase 2)
● QPeak (QPeak /Lim. QPeak) (Phase 2)
x CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 11:10

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.201	50.12	63.54	-13.42	Phase 2	11.55
0.505	40.98	56	-15.02	Phase 2	11.59
0.705	45.6	56	-10.4	Phase 2	11.6
0.807	40.71	56	-15.29	Phase 2	11.62
1.212	42.66	56	-13.34	Phase 2	11.62
1.817	40.55	56	-15.45	Phase 2	11.67

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.505	39.2	46	-6.8	Phase 2	11.59
0.705	43.67	46	-2.33	Phase 2	11.6
0.807	38.69	46	-7.31	Phase 2	11.62
0.908	37.91	46	-8.09	Phase 2	11.63
1.212	40.75	46	-5.25	Phase 2	11.62
1.817	38.61	46	-7.39	Phase 2	11.67

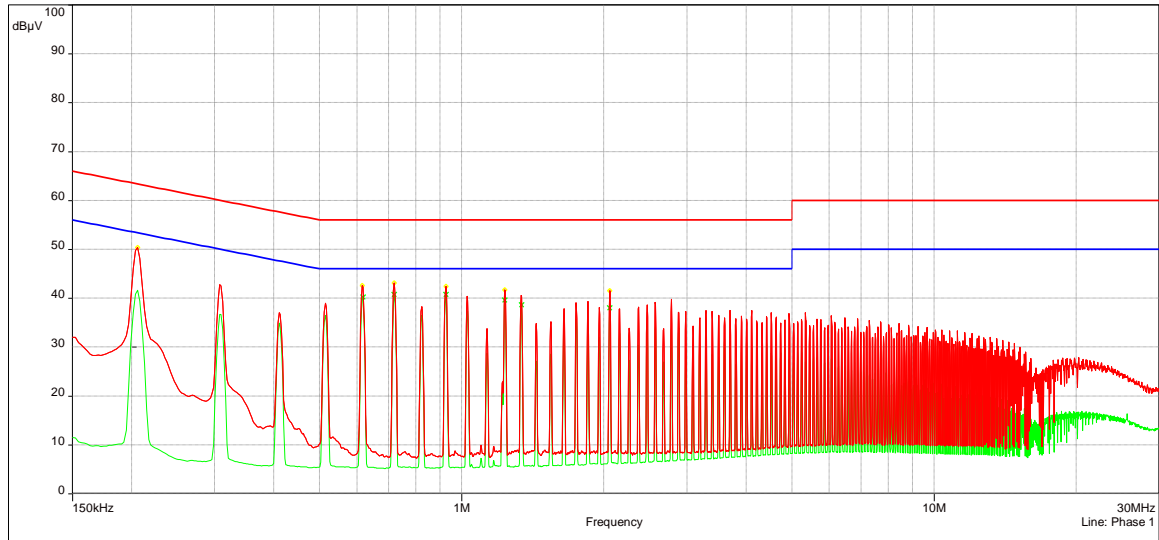
4.3.3 Test Result (Continued)

15.107, Transmitter OFF with EUT in Charging Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 1

Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Presselector: On
Line: Phase 1

— FCC Part 15/FCC Part 15.107 B - Average/
— FCC Part 15/FCC Part 15.107 B - QPeak/
— Meas.QPeak (Phase 1)
— Mes. CISPR AVG (Phase 1)
o QPeak (QPeak/Lim. QPeak) (Phase 1)
x CISPR AVG (CISPR AVG/Lim. Average) (Phase 1)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 11:18

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.206	50.35	63.35	-13.00	Phase 1	11.55
0.615	42.59	56	-13.41	Phase 1	11.59
0.719	43.13	56	-12.87	Phase 1	11.61
0.926	42.43	56	-13.57	Phase 1	11.63
1.2345	41.66	56	-14.34	Phase 1	11.62
2.058	41.48	56	-14.52	Phase 1	11.67

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.618	40.23	46	-5.77	Phase 1	11.59
0.719	40.69	46	-5.31	Phase 1	11.61
0.926	40.72	46	-5.28	Phase 1	11.63
1.234	39.59	46	-6.41	Phase 1	11.62
1.338	38.63	46	-7.37	Phase 1	11.63
2.058	38.02	46	-7.98	Phase 1	11.67

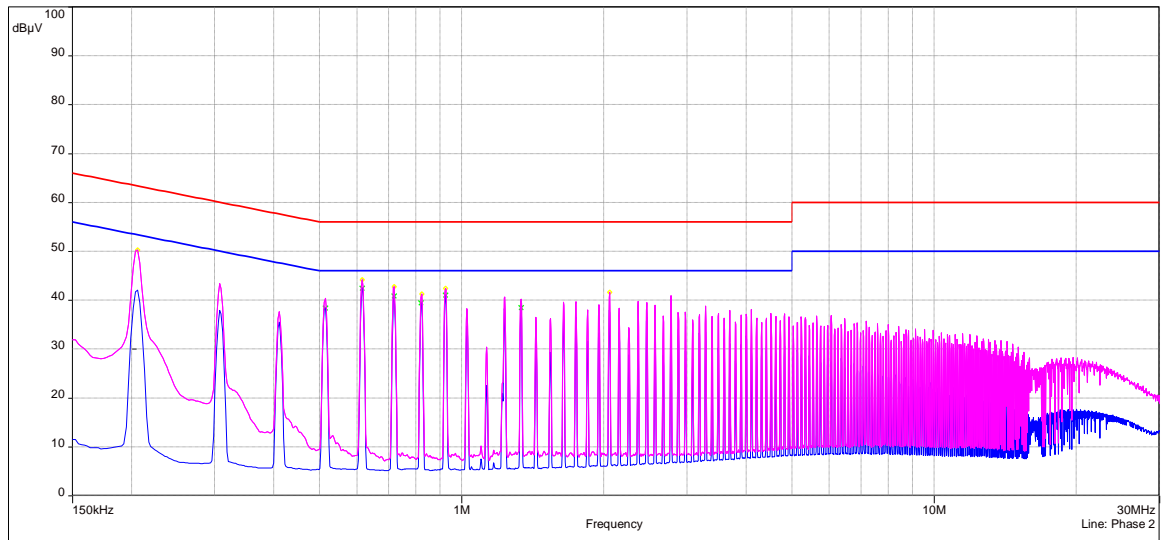
4.3.3 Test Result (Continued)

15.107, Transmitter OFF with EUT in Charging Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Pres-selector: On
Line: Phase 2

— FCC Part 15/FCC Part 15.107 B - Average/
— FCC Part 15/FCC Part 15.107 B - QPeak/
— Meas. QPeak (Phase 2)
— Mes. CISPR AVG (Phase 2)
o QPeak (QPeak /Lim. QPeak) (Phase 2)
x CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 11:18

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.206	50.26	63.35	-13.09	Phase 2	11.55
0.615	44.18	56	-11.82	Phase 2	11.59
0.719	42.76	56	-13.24	Phase 2	11.61
0.822	41.31	56	-14.69	Phase 2	11.62
0.924	42.44	56	-13.56	Phase 2	11.63
2.055	41.58	56	-14.42	Phase 2	11.67

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.514	38.37	46	-7.63	Phase 2	11.59
0.6157	42.39	46	-3.61	Phase 2	11.59
0.7192	40.83	46	-5.17	Phase 2	11.61
0.820	39.44	46	-6.56	Phase 2	11.62
0.924	40.98	46	-5.02	Phase 2	11.63
1.335	38.42	46	-7.58	Phase 2	11.62

4.3.3 Test Result (Continued)

15.207. Transmitter ON with EUT in Tablet Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 1

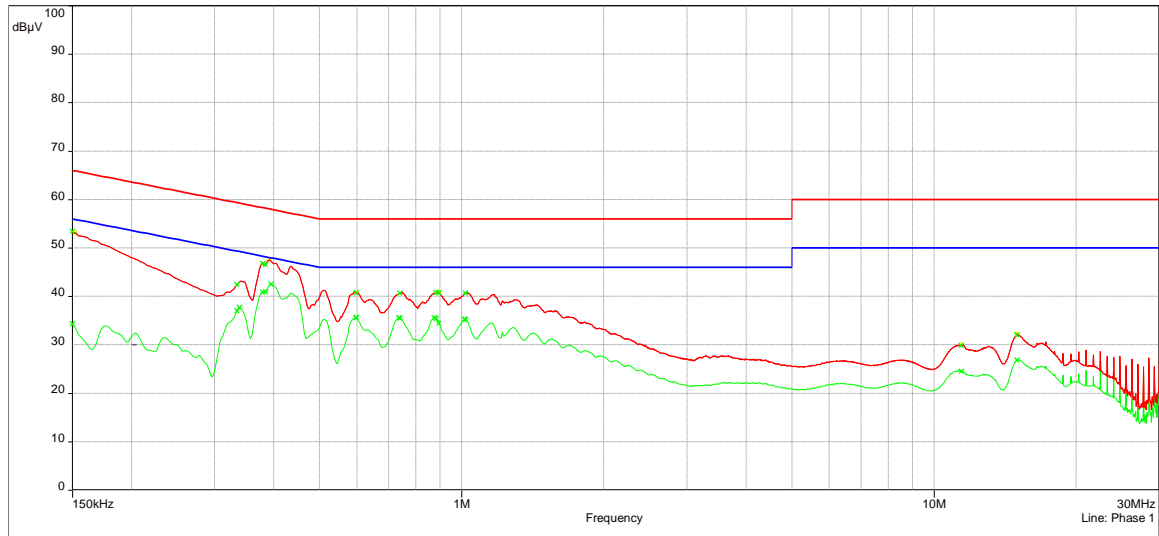
Sub-range 1

Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)

Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On

Line: Phase 1

— FCC Part 15/FCC Part 15.107 B - Average/
— FCC Part 15/FCC Part 15.107 B - QPeak/
— Meas.QPeak (Phase 1)
— Mes. CISPR AVG (Phase 1)
○ QPeak (QPeak /Lim. QPeak) (Phase 1)
× CISPR AVG (CISPR AVG /Lim. Average) (Phase 1)
× Ave Level (dBuV) (Final QP and Ave) (Phase 1)
× QP Level (dBuV) (Final QP and Ave) (Phase 1)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 10:56

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.152	53.16	65.88	-12.71	Phase 1	11.51
0.390	47.48	58.05	-10.57	Phase 1	11.58
0.595	40.86	56	-15.14	Phase 1	11.59
0.894	40.88	56	-15.12	Phase 1	11.63
11.413	30.05	60	-29.95	Phase 1	11.89
14.993	32.23	60	-27.77	Phase 1	11.95

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.339	37.73	49.23	-11.5	Phase 1	11.59
0.395	42.56	47.95	-5.39	Phase 1	11.58
0.598	35.64	46	-10.36	Phase 1	11.59
0.737	35.53	46	-10.47	Phase 1	11.61
0.875	35.61	46	-10.39	Phase 1	11.63
1.014	35.3	46	-10.7	Phase 1	11.63

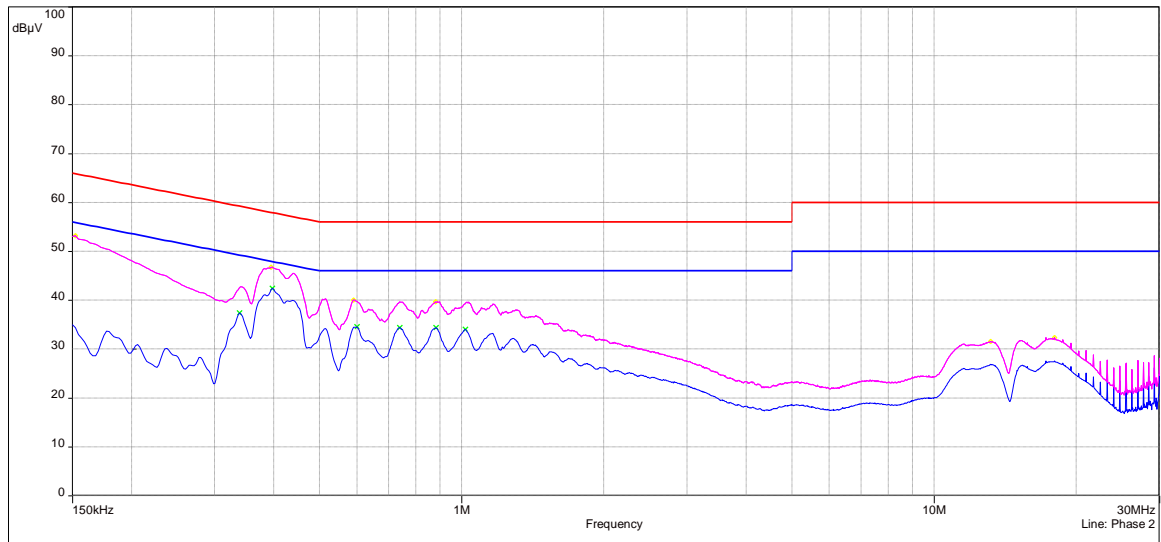
4.3.3 Test Result (Continued)

15.207, Transmitter ON with EUT in Tablet Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 2

Sub-range 2
 Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
 Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
 Line: Phase 2

FCC Part 15/FCC Part 15.107 B - Average/
 FCC Part 15/FCC Part 15.107 B - QPeak/
 Meas.QPeak (Phase 2)
 Mes. CISPR AVG (Phase 2)
 QPeak (QPeak /Lim. QPeak) (Phase 2)
 CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 10:56

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.152	53.23	65.88	-12.65	Phase 2	11.51
0.395	46.77	57.95	-11.18	Phase 2	11.58
0.591	40.04	56	-15.96	Phase 2	11.59
0.881	39.67	56	-16.33	Phase 2	11.63
13.178	31.57	60	-28.43	Phase 2	11.93
17.990	32.34	60	-27.66	Phase 2	11.93

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.339	37.38	49.23	-11.85	Phase 2	11.59
0.398	42.4	47.91	-5.51	Phase 2	11.58
0.600	34.51	46	-11.49	Phase 2	11.59
0.740	34.41	46	-11.59	Phase 2	11.61
0.884	34.33	46	-11.67	Phase 2	11.63
1.019	34.02	46	-11.98	Phase 2	11.63

4.3.3 Test Result (Continued)

15.107. Transmitter OFF with EUT in Tablet Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 1

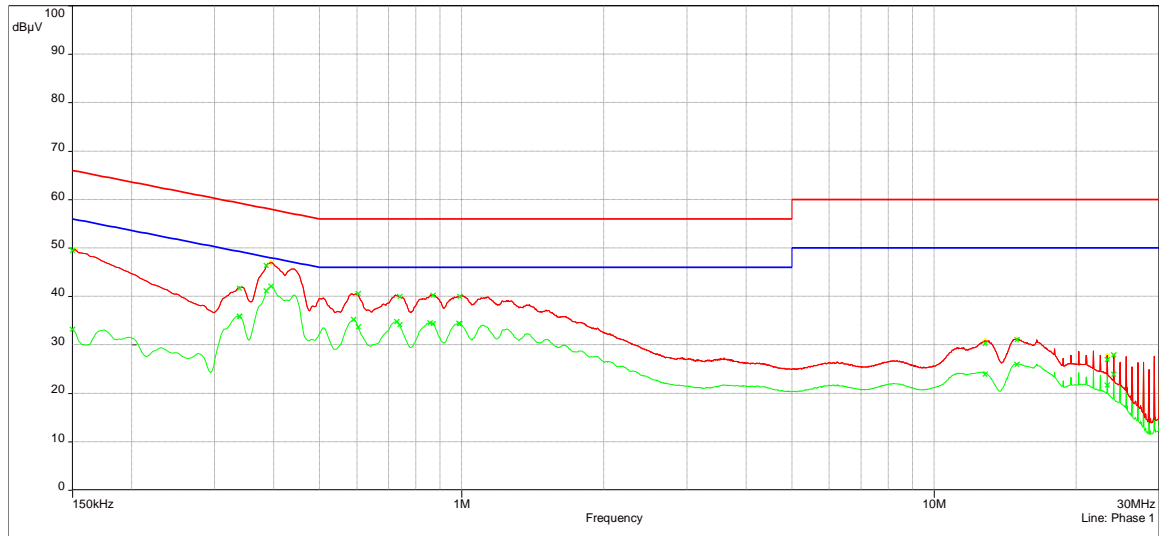
Sub-range 1

Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)

Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On

Line: Phase 1

— FCC Part 15/FCC Part 15.107 B - Average/
 — FCC Part 15/FCC Part 15.107 B - QPeak/
 — Meas.QPeak (Phase 1)
 — Mes. CISPR AVG (Phase 1)
 ○ QPeak (QPeak /Lim. QPeak) (Phase 1)
 × CISPR AVG (CISPR AVG /Lim. Average) (Phase 1)
 × Ave Level (dBuV) (Final QP and Ave) (Phase 1)
 × QP Level (dBuV) (Final QP and Ave) (Phase 1)



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 10:43

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.152	49.65	65.88	-16.23	Phase 1	11.51
0.395	46.95	57.95	-11.01	Phase 1	11.58
12.827	30.86	60	-29.14	Phase 1	11.92
14.998	31.23	60	-28.77	Phase 1	11.95
23.249	27.82	60	-32.18	Phase 1	11.98
23.998	27.7	60	-32.3	Phase 1	11.98

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.339	35.83	49.23	-13.4	Phase 1	11.59
0.395	42.07	47.95	-5.88	Phase 1	11.58
0.591	35.18	46	-10.82	Phase 1	11.59
0.728	34.79	46	-11.21	Phase 1	11.61
0.857	34.53	46	-11.47	Phase 1	11.63
0.987	34.43	46	-11.57	Phase 1	11.63

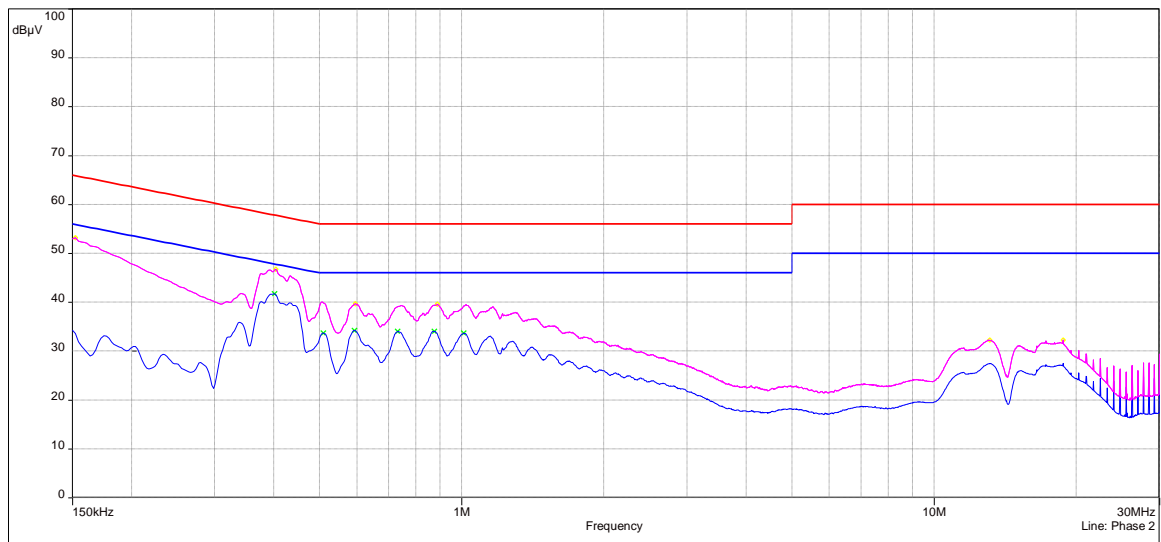
4.3.3 Test Result (Continued)

15.107, Transmitter OFF with EUT in Tablet Mode

AC Line Conducted Emission, 120VAC 60Hz Phase 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 2

— FCC Part 15/FCC Part 15.107 B - Average/
— FCC Part 15/FCC Part 15.107 B - QPeak/
— Meas. QPeak (Phase 2)
— Mes. CISPR AVG (Phase 2)
♦ QPeak (QPeak /Lim. QPeak) (Phase 2)
x CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



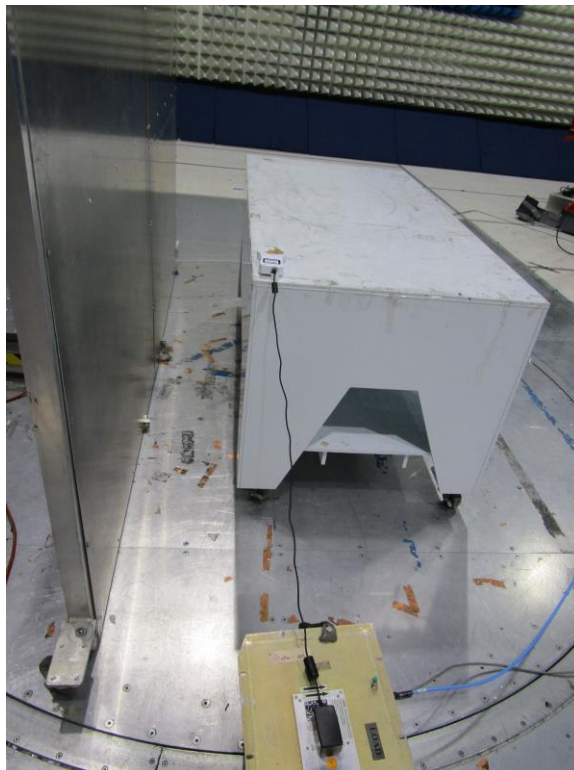
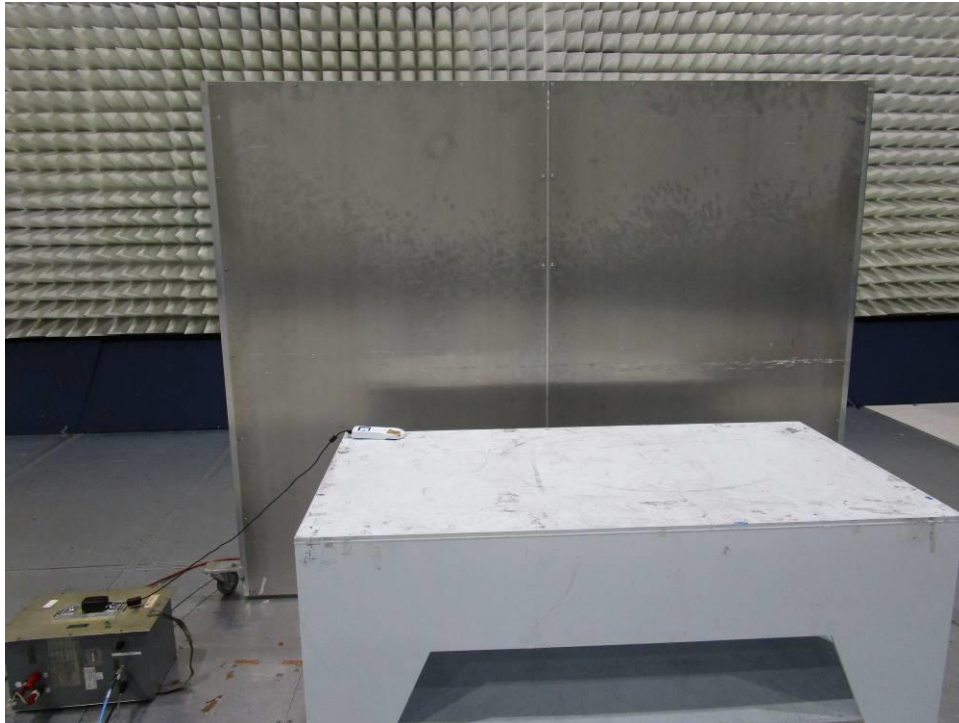
Model: ; Client: ; Comments: ; Test Date: 05/09/2018 10:43

Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.152	53.18	65.88	-12.69	Phase 2	11.51
0.404	46.75	57.77	-11.02	Phase 2	11.58
0.596	39.66	56	-16.34	Phase 2	11.59
0.888	39.62	56	-16.38	Phase 2	11.63
13.119	32.25	60	-27.75	Phase 2	11.93
18.749	32.29	60	-27.71	Phase 2	11.94

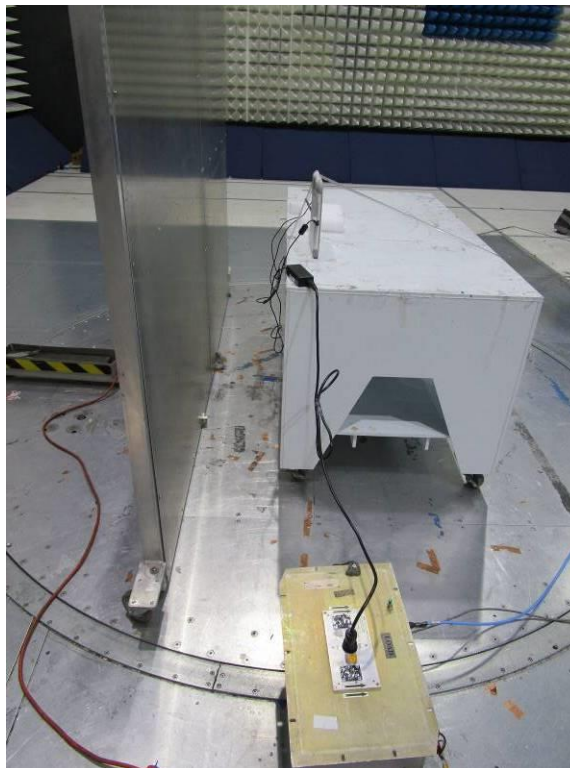
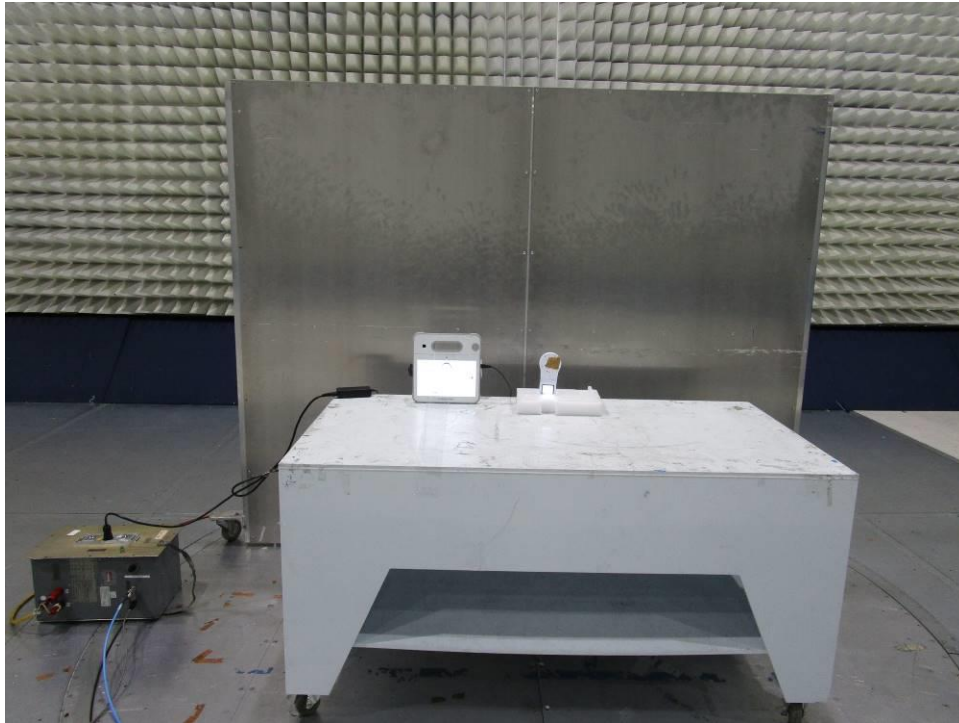
Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.402	41.7	47.81	-6.11	Phase 2	11.58
0.510	33.69	46	-12.31	Phase 2	11.59
0.593	34.22	46	-11.78	Phase 2	11.59
0.733	34.01	46	-11.99	Phase 2	11.61
0.875	34.05	46	-11.95	Phase 2	11.63
1.010	33.63	46	-12.37	Phase 2	11.63

Results
Complies by 3.61 dB for 15.107
Complies by 1.72 dB for 15.207

4.3.4 Test Configuration Photographs



4.3.4 Test Configuration Photographs (Continued)



4.4 Radiated Emissions on Digital Parts

FCC Ref: 15.109, ICES 003, RSS Gen

4.4.1 Test Limit

Limits for Electromagnetic Radiated Emissions FCC Section 15.109(b), ICES 003*, RSS GEN

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 3m dB(μV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

4.4.2 Procedures

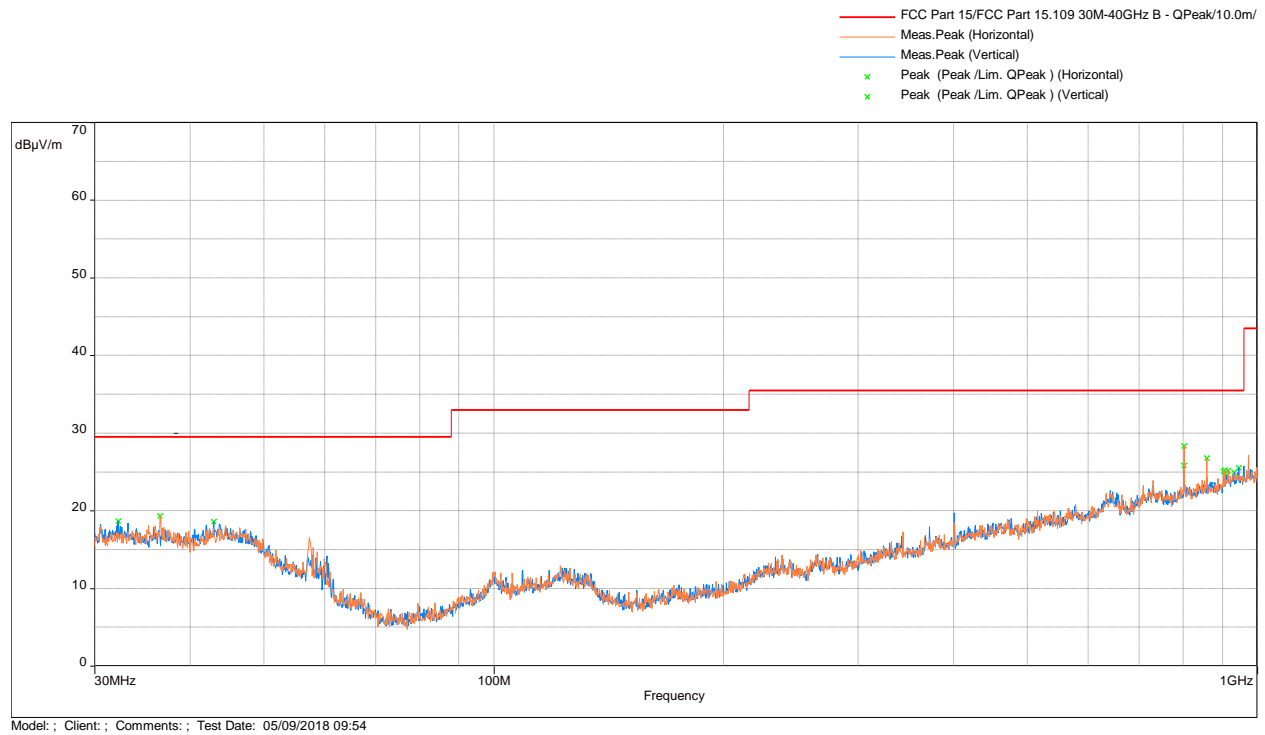
Radiated measurements were taken. 120 kHz resolution bandwidth was used from 30 MHz - 1 GHz. 1 MHz resolution bandwidth was used for measurements done above 1 GHz. All plots are corrected for cable loss, antenna factor, and preamp.

Radiated emission measurements were performed from 30 MHz to 18000 MHz. The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Measurements recorded in this section were made with the Transmitter in standby mode (RF Off).

4.4.3 Test Results

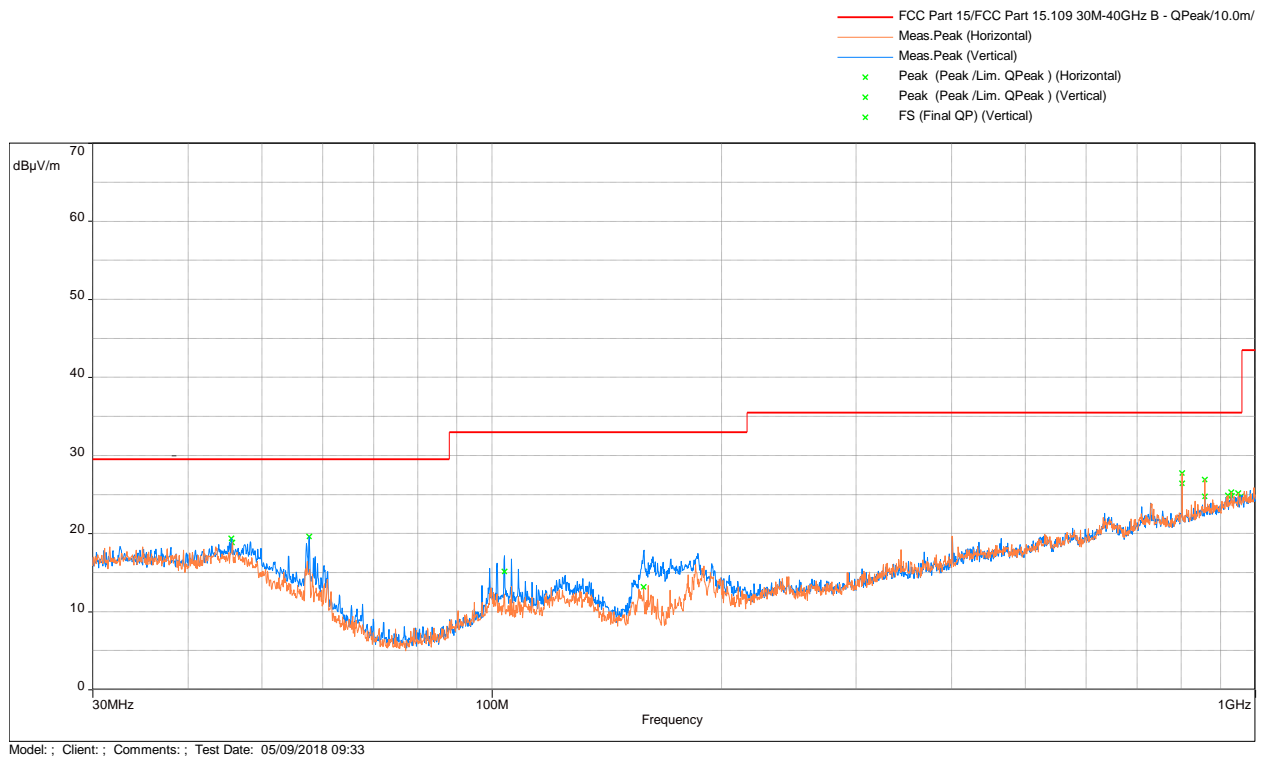
FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz; Battery Mode



Freq (MHz)	FS @10m (dB(uV/m))	Limit @10m (dB(uV/m))	Margin (dB)	Azimuth (deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
36.563	19.30	29.5	-10.2	244	1.02	Horizontal	28.86	-9.56
801.829	28.34	35.5	-7.16	94	1.02	Horizontal	31.83	-3.49
859.091	26.77	35.5	-8.73	51	1.02	Horizontal	29.35	-2.58
32.198	18.66	29.5	-10.84	22	1.00	Vertical	28.09	-9.43
42.965	18.59	29.5	-10.91	85	2.00	Vertical	27.74	-9.15
801.829	25.79	35.5	-9.71	122	2.00	Vertical	29.28	-3.49

4.4.3 Test Results (Continued)

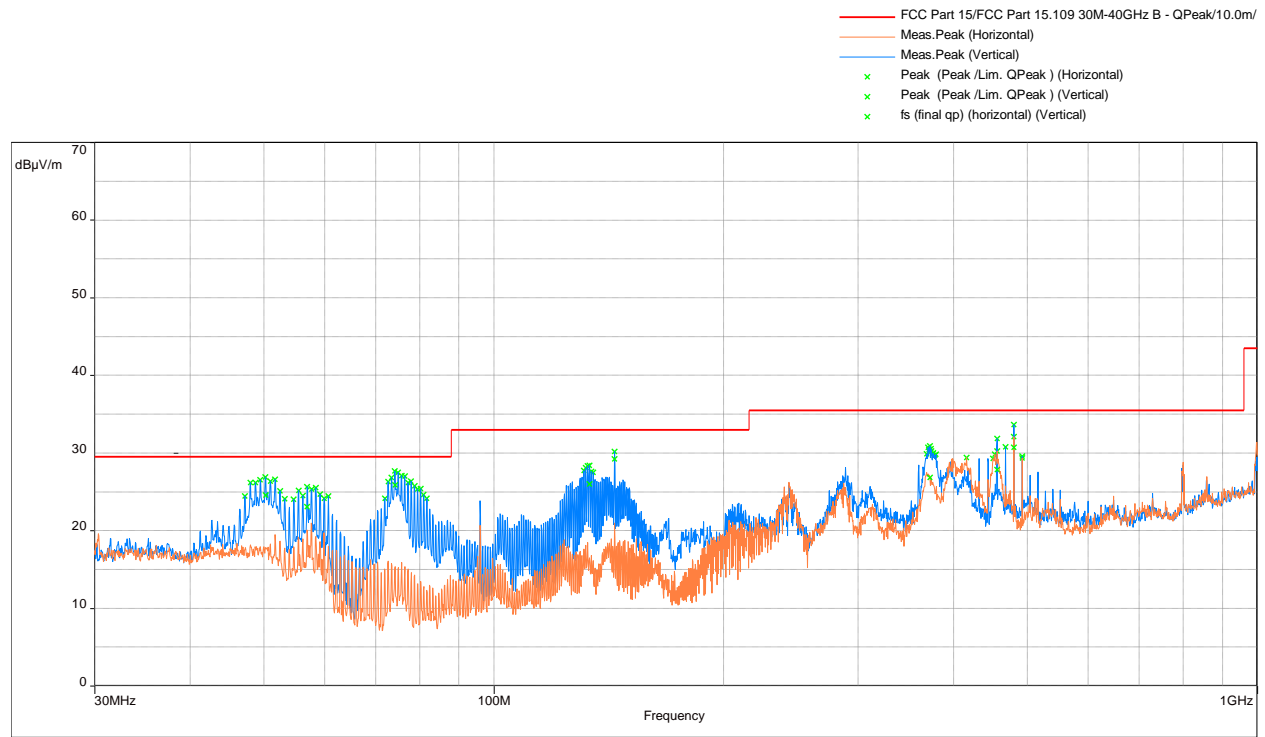
FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz; Charging Mode



Freq (MHz)	FS @10m (dB(uV/m))	Limit @10m (dB(uV/m))	Margin (dB)	Azimuth (deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
45.585	19.35	29.5	-10.15	64	1.00	Vertical	29.25	-9.9
57.645	19.57	29.5	-9.93	300	1.00	Vertical	35.08	-15.51
103.803	15.12	33.0	-17.88	142	1.72	Vertical	31.53	-16.41
158.093	13.12	33.0	-19.88	100	1.00	Vertical	31.17	-18.05
45.714	18.80	29.5	-10.70	145	1.00	Horizontal	28.71	-9.91
801.829	27.71	35.5	-7.79	259	1.00	Horizontal	31.2	-3.49

4.4.3 Test Results (Continued)

FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz; Tablet Mode



Model: ; Client: ; Comments: ; Test Date: 05/09/2018 08:24

Freq (MHz)	FS @10m (dB(uV/m))	Limit @10m (dB(uV/m))	Margin (dB)	Azimuth (deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
50.234	24.58	29.5	-4.92	287	3.64	Vertical	35.91	-11.35
56.954	23.07	29.5	-6.43	62.5	2.80	Vertical	38.31	-15.23
74.243	25.84	29.5	-3.66	204	1.79	Vertical	46.12	-20.28
133.354	26.00	33.0	-7.00	355	1.53	Vertical	41.50	-15.47
144.001	29.18	33.0	-3.82	73	1.20	Vertical	47.07	-17.90
372.663	26.81	35.5	-8.69	224	3.65	Vertical	37.22	-10.40
455.984	27.85	35.5	-7.65	213	3.45	Vertical	36.22	-8.37
480.003	30.70	35.5	-4.80	205	3.17	Vertical	39.14	-8.44

Results ☒ **Complies** by 3.66 dB for FCC Part 15 Subpart B and ICES-003

4.4.4 Test Configuration Photographs



Electromagnetic Radiated Disturbance Setup Photograph

4.4.4 Test Configuration Photographs (Continued)



5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset No.	Calibration Interval	Cal Due
EMI Receiver	Rohde and Schwarz	ESR7	ITS 01607	12	10/09/18
BI-Log Antenna	Schaffner	LPB-2513/A	ITS 00355	12	02/21/19
Pre-Amplifier	Sonoma Instrument	310N	ITS 01493	12	10/20/18
Loop Sensor	Solar Electronics	7334-1	ITS 01608	12	09/26/18
Ant-Passive Loop	EMCO	6512	ITS 01598	12	10/10/18
AC LISN	FCC	FCC-LISN-50-50-M-H	ITS 00552	12	11/14/18
Transient Limiter	COM-Power	LIT-930A	ITS 01274	12	06/26/18

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.17.0.10	ATI 15.209.bpp

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G103494026	AS	KV	May 15, 2018	Original document

END OF REPORT