Ossia, Inc.

REVISED EMC TEST REPORT TO 102778-11

Cota Forever Tracker Client
Model: Tracker Rx

Tested to The Following Standards:

FCC Part 15 Subpart B Section 15.107 & 15.109

Report No.: 102778-11A

Date of issue: August 30, 2019

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Test Certificate # 803.01

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Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Ossia, Inc.
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Bellevue WA 98004

Representative: Bob McDonald
Customer Reference Number: 13076

REPORT PREPARED BY:

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CKC Laboratories, Inc.
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Project Number: 102778

DATE OF EQUIPMENT RECEIPT: June 28, 2019
DATE(S) OF TESTING: June 28, 2019

Revision History

Original: Testing of the Cota Forever Tracker Client, Model: Tracker Rx to FCC Part 15 Subpart B Section 15.107 & 15.109.
Revision A: Added Configuration 1 and Conditions During Testing description with block diagrams and corrected typo on test method.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Canyon Park, Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart B

Test Procedure	Description	Modifications	Results
15.107 Class B	Conducted Emissions	NA	Pass
15.109 Class B	Radiated Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

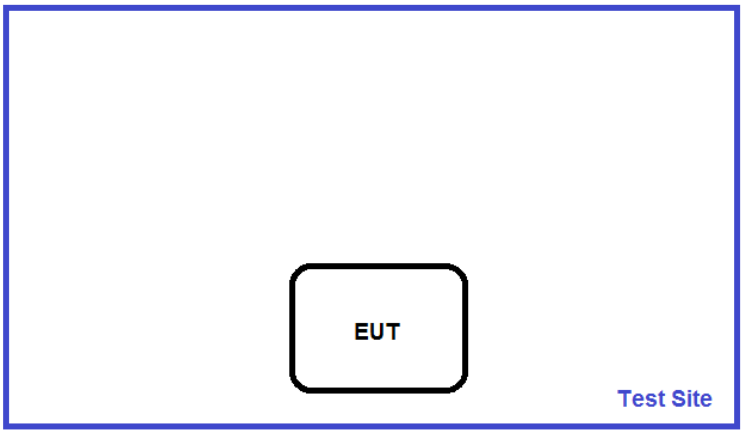
Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
Configuration 1 and Configuration 2: The manufacturer declares the EUT is a battery client that is capable of being charged wirelessly with a Part 18 device, or via USB charging. The EUT also consists of an IEE802.15.4 radio and a beacon radio. The EUT was operating in a mode considered for unintentional emissions: the radios were in receive mode, and the EUT was not wireless charging. Radio emissions and wireless power are considered in separate reports under the relevant standards. The EUT was investigated in two configurations. Configuration 1 was investigated without any connection to a USB charger. Configuration 2 was investigated the client connected to a USB charger via a USB cable. It was found that Configuration 2 was representative of worst case for radiated emissions, so data presented in the report is measured while in Configuration 2. For AC Conducted emissions only Configuration 2 applies (no connection to AC mains for Configuration 1).

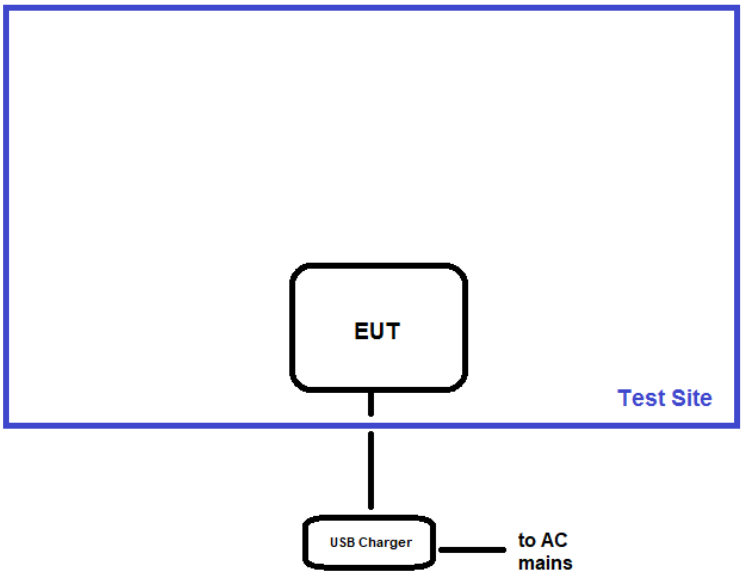
Configuration 1

Test Setup Block Diagram



Configuration 2

Test Setup Block Diagram



EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Cota Forever Tracker Client	Ossia, Inc.	Tracker Rx	728B

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Cota Forever Tracker Client	Ossia, Inc.	Tracker Rx	728B

Support Equipment:

Device	Manufacturer	Model #	S/N
USB Charger	Belkin	F8J017	N/A

FCC PART 15 SUBPART B

15.107 AC Conducted Emissions

Test Notes: Conducted Disturbances at Mains Terminals, LISN method.

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Ossia, Inc.**		
Specification:	**15.107 AC Mains Class B - Average**		
Work Order #:	**102778**	Date:	6/28/2019
Test Type:	**Conducted Emissions**	Time:	11:02:15
Tested By:	Matthew Harrison	Sequence#:	17
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 21-23°C
Humidity: 35-40%
Pressure: 101.5-103kPa

Test Method: ANSI C63.4 (2014)

Frequency: 150k-30MHz

All radios in RX mode.

Ossia, Inc. WO#: 102778 Sequence#: 17 Date: 6/28/2019
15.107 AC Mains Class B - Average Test Lead: 120V 60Hz Line
dBµV
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Peak Readings
Average Readings
Software Version: 5.03.12
2 - 15.107 AC Mains Class B - Quasi-peak
Readings
QP Readings
Ambient
1 - 15.107 AC Mains Class B - Average

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T4	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	510.693k	10.1	+9.1	+0.0	+0.0	+0.4	+0.0	19.8	46.0	-26.2	Line
Ave			+0.2								
^	510.693k	26.9	+9.1	+0.0	+0.0	+0.4	+0.0	36.6	46.0	-9.4	Line
			+0.2								
3	1.141M	3.0	+9.1	+0.0	+0.0	+0.3	+0.0	12.6	46.0	-33.4	Line
Ave			+0.2								
^	1.141M	16.5	+9.1	+0.0	+0.0	+0.3	+0.0	26.1	46.0	-19.9	Line
			+0.2								
5	441.609k	3.5	+9.1	+0.1	+0.0	+0.5	+0.0	13.4	47.0	-33.6	Line
Ave			+0.2								
^	441.608k	17.7	+9.1	+0.1	+0.0	+0.5	+0.0	27.6	47.0	-19.4	Line
			+0.2								
7	432.882k	3.6	+9.1	+0.1	+0.0	+0.5	+0.0	13.5	47.2	-33.7	Line
Ave			+0.2								
^	432.882k	17.6	+9.1	+0.1	+0.0	+0.5	+0.0	27.5	47.2	-19.7	Line
			+0.2								
9	3.812M	2.5	+9.1	+0.1	+0.0	+0.3	+0.0	12.1	46.0	-33.9	Line
Ave			+0.1								
^	3.812M	16.2	+9.1	+0.1	+0.0	+0.3	+0.0	25.8	46.0	-20.2	Line
			+0.1								
11	410.339k	3.6	+9.1	+0.0	+0.0	+0.5	+0.0	13.3	47.6	-34.3	Line
Ave			+0.1								
^	410.338k	19.0	+9.1	+0.0	+0.0	+0.5	+0.0	28.7	47.6	-18.9	Line
			+0.1								
13	387.068k	3.8	+9.1	+0.0	+0.0	+0.5	+0.0	13.5	48.1	-34.6	Line
Ave			+0.1								
^	387.068k	18.9	+9.1	+0.0	+0.0	+0.5	+0.0	28.6	48.1	-19.5	Line
			+0.1								

15	370.342k	4.1	+9.1	+0.0	+0.0	+0.6	+0.0	13.9	48.5	-34.6	Line
Ave			+0.1								
^	370.342k	20.7	+9.1	+0.0	+0.0	+0.6	+0.0	30.5	48.5	-18.0	Line
			+0.1								
17	355.071k	4.1	+9.1	+0.0	+0.0	+0.6	+0.0	13.9	48.8	-34.9	Line
Ave			+0.1								
^	355.071k	19.8	+9.1	+0.0	+0.0	+0.6	+0.0	29.6	48.8	-19.2	Line
			+0.1								
19	330.346k	4.2	+9.1	+0.0	+0.0	+0.6	+0.0	14.0	49.4	-35.4	Line
Ave			+0.1								
^	330.346k	20.6	+9.1	+0.0	+0.0	+0.6	+0.0	30.4	49.4	-19.0	Line
			+0.1								
21	262.716k	4.4	+9.1	+0.0	+0.0	+0.8	+0.0	14.5	51.3	-36.8	Line
Ave			+0.2								
^	262.715k	22.4	+9.1	+0.0	+0.0	+0.8	+0.0	32.5	51.3	-18.8	Line
			+0.2								
23	253.989k	4.5	+9.1	+0.0	+0.0	+0.9	+0.0	14.7	51.6	-36.9	Line
Ave			+0.2								
^	253.989k	23.0	+9.1	+0.0	+0.0	+0.9	+0.0	33.2	51.6	-18.4	Line
			+0.2								
25	240.173k	4.5	+9.1	+0.0	+0.0	+0.9	+0.0	14.7	52.1	-37.4	Line
Ave			+0.2								
^	240.172k	24.6	+9.1	+0.0	+0.0	+0.9	+0.0	34.8	52.1	-17.3	Line
			+0.2								
27	220.538k	4.6	+9.1	+0.0	+0.0	+1.1	+0.0	15.0	52.8	-37.8	Line
Ave			+0.2								
^	220.537k	25.1	+9.1	+0.0	+0.0	+1.1	+0.0	35.5	52.8	-17.3	Line
			+0.2								
29	166.725k	4.9	+9.1	+0.0	+0.0	+1.6	+0.0	16.1	55.1	-39.0	Line
Ave			+0.5								
^	166.724k	27.2	+9.1	+0.0	+0.0	+1.6	+0.0	38.4	55.1	-16.7	Line
			+0.5								

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Ossia, Inc.**		
Specification:	**15.107 AC Mains Class B - Average**		
Work Order #:	**102778**	Date:	6/28/2019
Test Type:	**Conducted Emissions**	Time:	11:11:26
Tested By:	Matthew Harrison	Sequence#:	18
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Temperature: 21-23°C
Humidity: 35-40%
Pressure: 101.5-103kPa

Test Method: ANSI C63.4 (2014)

Frequency: 150k-30MHz

All radios in RX mode.

Ossia, Inc. WO#: 102778 Sequence#: 18 Date: 6/28/2019
15.107 AC Mains Class B - Average Test Lead: 120V 60Hz Neutral
dBµV
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Peak Readings
Average Readings
Software Version: 5.03.12
2 - 15.107 AC Mains Class B - Quasi-peak
Readings
QP Readings
Ambient
1 - 15.107 AC Mains Class B - Average

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
T4	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1 Ave	508.512k	12.4	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	22.1	46.0	-23.9	Neutr
^	508.511k	25.5	+9.1 +0.2	+0.0	+0.0	+0.4	+0.0	35.2	46.0	-10.8	Neutr
3 Ave	440.881k	3.6	+9.1 +0.2	+0.1	+0.0	+0.5	+0.0	13.5	47.0	-33.5	Neutr
^	440.881k	18.2	+9.1 +0.2	+0.1	+0.0	+0.5	+0.0	28.1	47.0	-18.9	Neutr
5 Ave	432.882k	3.5	+9.1 +0.2	+0.1	+0.0	+0.5	+0.0	13.4	47.2	-33.8	Neutr
^	432.882k	18.0	+9.1 +0.2	+0.1	+0.0	+0.5	+0.0	27.9	47.2	-19.3	Neutr
7 Ave	400.885k	3.8	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	13.5	47.8	-34.3	Neutr
^	400.885k	18.6	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	28.3	47.8	-19.5	Neutr
9 Ave	384.887k	4.1	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	13.8	48.2	-34.4	Neutr
^	384.886k	19.2	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	28.9	48.2	-19.3	Neutr
11 Ave	369.615k	4.4	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	14.1	48.5	-34.4	Neutr
12 Ave	373.978k	4.3	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	14.0	48.4	-34.4	Neutr
^	373.978k	20.6	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	30.3	48.4	-18.1	Neutr
^	369.615k	19.8	+9.1 +0.1	+0.0	+0.0	+0.5	+0.0	29.5	48.5	-19.0	Neutr
15 Ave	331.073k	5.1	+9.1 +0.1	+0.0	+0.0	+0.6	+0.0	14.9	49.4	-34.5	Neutr
16 Ave	341.981k	4.9	+9.1 +0.1	+0.0	+0.0	+0.6	+0.0	14.7	49.2	-34.5	Neutr
^	341.981k	21.4	+9.1 +0.1	+0.0	+0.0	+0.6	+0.0	31.2	49.2	-18.0	Neutr

18	379.796k	4.1	+9.1	+0.0	+0.0	+0.5	+0.0	13.8	48.3	-34.5	Neutr
Ave			+0.1								
^	379.796k	19.2	+9.1	+0.0	+0.0	+0.5	+0.0	28.9	48.3	-19.4	Neutr
			+0.1								
20	328.892k	5.1	+9.1	+0.0	+0.0	+0.6	+0.0	14.9	49.5	-34.6	Neutr
Ave			+0.1								
^	328.891k	20.7	+9.1	+0.0	+0.0	+0.6	+0.0	30.5	49.5	-19.0	Neutr
			+0.1								
^	331.073k	20.1	+9.1	+0.0	+0.0	+0.6	+0.0	29.9	49.4	-19.5	Neutr
			+0.1								
23	318.711k	5.2	+9.1	+0.0	+0.0	+0.6	+0.0	15.0	49.7	-34.7	Neutr
Ave			+0.1								
^	318.710k	21.8	+9.1	+0.0	+0.0	+0.6	+0.0	31.6	49.7	-18.1	Neutr
			+0.1								
25	291.077k	5.5	+9.1	+0.0	+0.0	+0.7	+0.0	15.4	50.5	-35.1	Neutr
Ave			+0.1								
^	291.076k	23.1	+9.1	+0.0	+0.0	+0.7	+0.0	33.0	50.5	-17.5	Neutr
			+0.1								
27	261.262k	5.7	+9.1	+0.0	+0.0	+0.8	+0.0	15.8	51.4	-35.6	Neutr
Ave			+0.2								
^	261.261k	24.0	+9.1	+0.0	+0.0	+0.8	+0.0	34.1	51.4	-17.3	Neutr
			+0.2								
29	174.724k	5.6	+9.1	+0.0	+0.0	+1.4	+0.0	16.5	54.7	-38.2	Neutr
Ave			+0.4								
^	174.724k	27.7	+9.1	+0.0	+0.0	+1.4	+0.0	38.6	54.7	-16.1	Neutr
			+0.4								

Test Setup Photo(s)

15.109 Radiated Emissions

Test Notes: Radiated disturbances emanating from enclosure.

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Ossia, Inc.**		
Specification:	**15.109 Radiated Emissions Class B**		
Work Order #:	**102778**	Date:	6/28/2019
Test Type:	**Maximized Emissions**	Time:	09:09:14
Tested By:	Michael Atkinson	Sequence#:	12
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

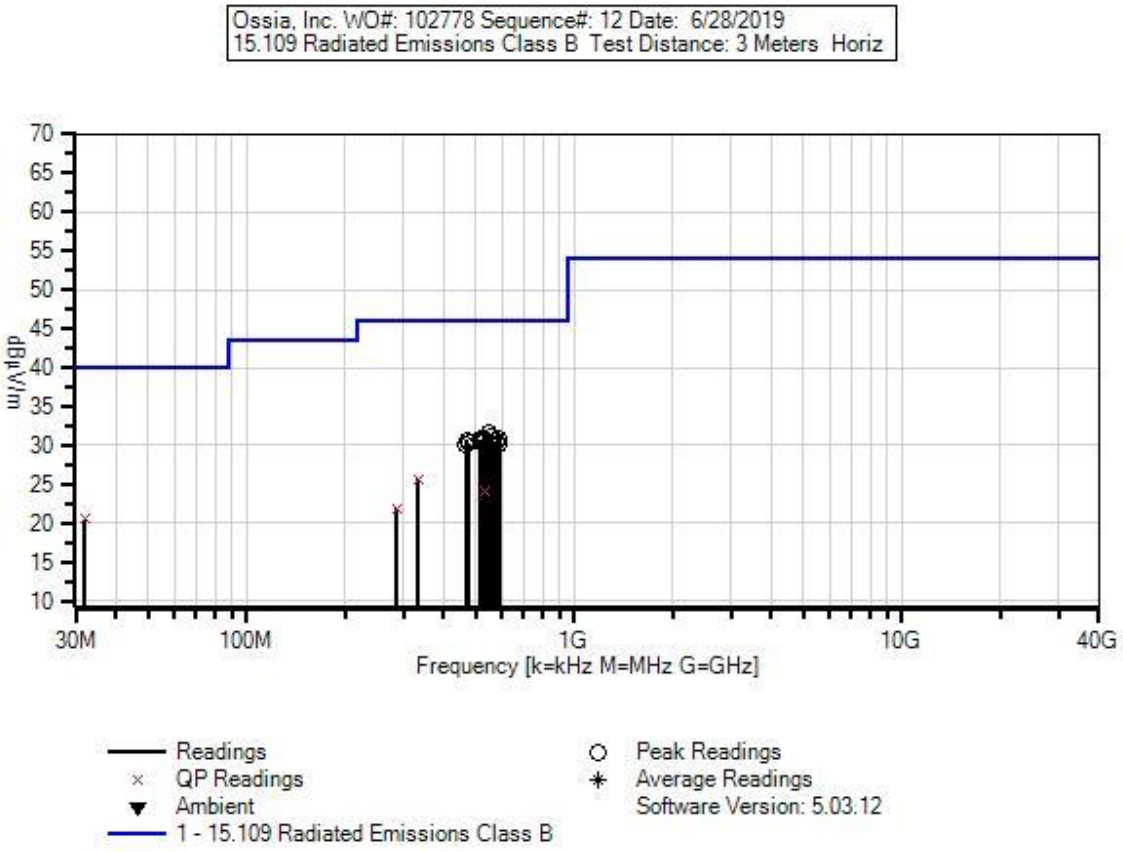
Test Conditions / Notes:

Temperature: 21-23°C
Humidity: 35-40%
Pressure: 101.5-103kPa

Test Method: ANSI C63.4 (2014)

Frequency: 30-1000MHz

All radios are in RX mode.
Investigated battery charging, as well as not charging with cable detached.
Worst case reported (charging while cable attached).
EUT is investigated in X, Y, & Z Axis with worst case reported.


Ossia, Inc. WO#: 102778 Sequence#: 12 Date: 6/28/2019
15.109 Radiated Emissions Class B Test Distance: 3 Meters Horiz
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV/m
30M
100M
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.109 Radiated Emissions Class B
Peak Readings
Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T1	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T2	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T3	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN00851	Biconilog Antenna	CBL6111C	5/1/2018	5/1/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	546.639M	32.0	+0.3 +5.8	+1.2 +19.1	-28.2	+1.4	+0.0	31.6	46.0	-14.4	Horiz
2	554.807M	31.2	+0.3 +5.8	+1.2 +19.3	-28.2	+1.4	+0.0	31.0	46.0	-15.0	Horiz
3	587.960M	30.2	+0.3 +5.8	+1.3 +20.0	-28.2	+1.5	+0.0	30.9	46.0	-15.1	Horiz
4	518.410M	31.9	+0.3 +5.8	+1.2 +18.4	-28.2	+1.4	+0.0	30.8	46.0	-15.2	Horiz
5	523.576M	31.8	+0.3 +5.8	+1.2 +18.5	-28.2	+1.4	+0.0	30.8	46.0	-15.2	Horiz
6	469.401M	32.6	+0.3 +5.8	+1.1 +17.5	-28.0	+1.3	+0.0	30.6	46.0	-15.4	Horiz
7	530.302M	31.4	+0.3 +5.8	+1.2 +18.7	-28.2	+1.4	+0.0	30.6	46.0	-15.4	Horiz
8	580.272M	30.2	+0.3 +5.8	+1.2 +19.8	-28.2	+1.5	+0.0	30.6	46.0	-15.4	Horiz
9	552.404M	30.7	+0.3 +5.8	+1.2 +19.2	-28.2	+1.4	+0.0	30.4	46.0	-15.6	Horiz
10	476.248M	32.2	+0.3 +5.8	+1.1 +17.6	-28.0	+1.3	+0.0	30.3	46.0	-15.7	Horiz
11	524.777M	31.2	+0.3 +5.8	+1.2 +18.6	-28.2	+1.4	+0.0	30.3	46.0	-15.7	Horiz
12	565.738M	30.2	+0.3 +5.8	+1.2 +19.5	-28.2	+1.4	+0.0	30.2	46.0	-15.8	Horiz
13	467.600M	32.2	+0.3 +5.8	+1.1 +17.4	-28.0	+1.3	+0.0	30.1	46.0	-15.9	Horiz
14	590.362M	29.4	+0.3 +5.8	+1.3 +20.0	-28.2	+1.5	+0.0	30.1	46.0	-15.9	Horiz

15	31.930M	23.7	+0.1	+0.3	-28.0	+0.3	+0.0	20.5	40.0	-19.5	Horiz
QP			+5.8	+18.3							
^	31.930M	29.5	+0.1	+0.3	-28.0	+0.3	+0.0	26.3	40.0	-13.7	Horiz
			+5.8	+18.3							
17	332.831M	30.3	+0.2	+0.9	-27.1	+1.1	+0.0	25.6	46.0	-20.4	Horiz
QP			+5.8	+14.4							
^	332.825M	35.6	+0.2	+0.9	-27.1	+1.1	+0.0	30.9	46.0	-15.1	Horiz
			+5.8	+14.4							
19	531.263M	24.8	+0.3	+1.2	-28.2	+1.4	+0.0	24.0	46.0	-22.0	Horiz
QP			+5.8	+18.7							
^	531.263M	32.5	+0.3	+1.2	-28.2	+1.4	+0.0	31.7	46.0	-14.3	Horiz
			+5.8	+18.7							
21	286.098M	27.9	+0.2	+0.8	-27.0	+1.0	+0.0	21.9	46.0	-24.1	Horiz
QP			+5.8	+13.2							
^	286.098M	36.6	+0.2	+0.8	-27.0	+1.0	+0.0	30.6	46.0	-15.4	Horiz
			+5.8	+13.2							

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Ossia, Inc.**		
Specification:	**15.109 Radiated Emissions Class B**		
Work Order #:	**102778**	Date:	6/28/2019
Test Type:	**Maximized Emissions**	Time:	08:45:40
Tested By:	Michael Atkinson	Sequence#:	11
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

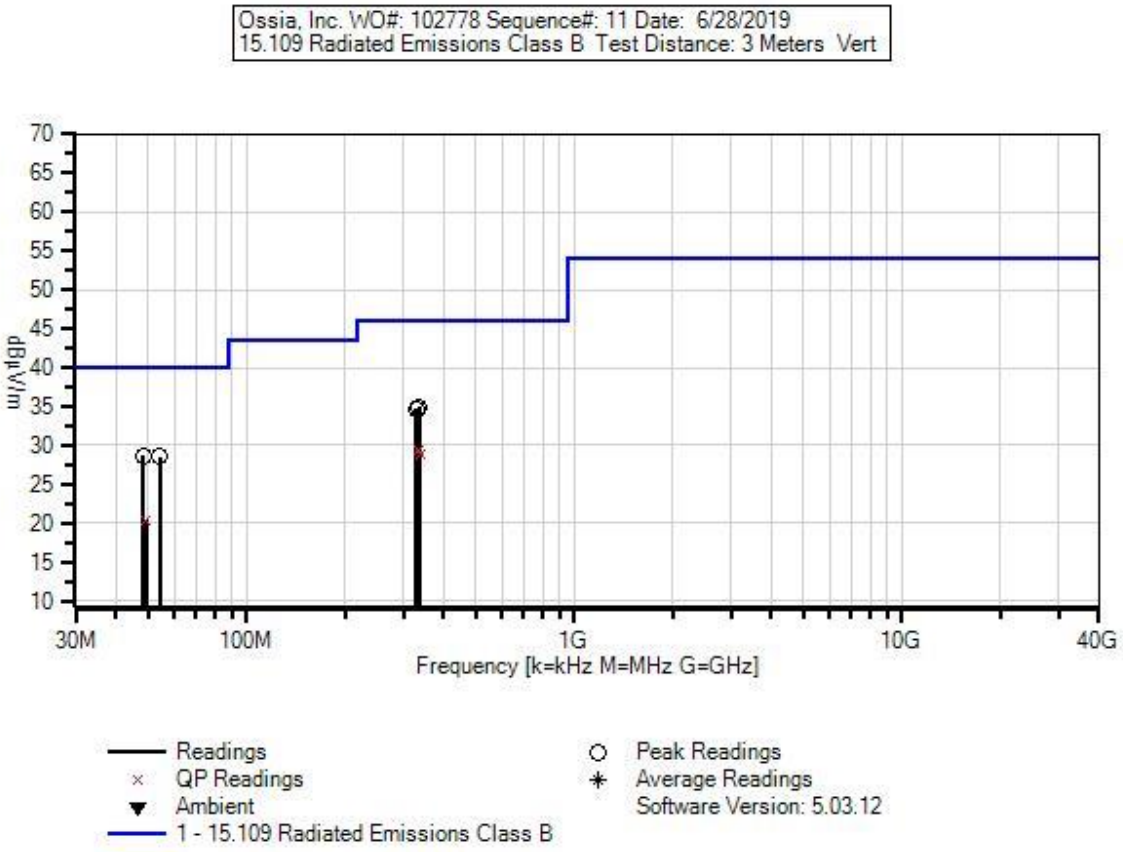
Test Conditions / Notes:

Temperature: 21-23°C
Humidity: 35-40%
Pressure: 101.5-103kPa

Test Method: ANSI C63.4 (2014)

Frequency: 30-1000MHz

All radios are in RX mode.
Investigated battery charging, as well as not charging with cable detached.
Worst case reported (charging while cable attached).
EUT is investigated in X, Y, & Z Axis with worst case reported.


Ossia, Inc. WO#: 102778 Sequence#: 11 Date: 6/28/2019
15.109 Radiated Emissions Class B Test Distance: 3 Meters Vert
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV/m
30M
100M
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.109 Radiated Emissions Class B
Peak Readings
Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T1	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T2	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T3	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN00851	Biconilog Antenna	CBL6111C	5/1/2018	5/1/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	336.068M	39.6	+0.2 +5.8	+0.9 +14.5	-27.2	+1.1	+0.0	34.9	46.0	-11.1	Vert
2	333.546M	39.5	+0.2 +5.8	+0.9 +14.4	-27.1	+1.1	+0.0	34.8	46.0	-11.2	Vert
3	329.582M	39.5	+0.2 +5.8	+0.9 +14.3	-27.1	+1.1	+0.0	34.7	46.0	-11.3	Vert
4	48.368M	40.5	+0.1 +5.8	+0.4 +9.4	-27.9	+0.4	+0.0	28.7	40.0	-11.3	Vert
5	54.290M	42.3	+0.1 +5.8	+0.4 +7.4	-27.9	+0.4	+0.0	28.5	40.0	-11.5	Vert
6	334.985M QP	34.1	+0.2 +5.8	+0.9 +14.5	-27.2	+1.1	+0.0	29.4	46.0	-16.6	Vert
7	337.482M QP	33.5	+0.2 +5.8	+0.9 +14.5	-27.2	+1.1	+0.0	28.8	46.0	-17.2	Vert
^	337.510M	39.8	+0.2 +5.8	+0.9 +14.5	-27.2	+1.1	+0.0	35.1	46.0	-10.9	Vert
9	49.299M QP	32.5	+0.1 +5.8	+0.4 +9.0	-27.9	+0.4	+0.0	20.3	40.0	-19.7	Vert
^	49.299M	41.6	+0.1 +5.8	+0.4 +9.0	-27.9	+0.4	+0.0	29.4	40.0	-10.6	Vert

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Ossia, Inc.**		
Specification:	**15.109 Radiated Emissions Class B**		
Work Order #:	**102778**	Date:	6/28/2019
Test Type:	**Maximized Emissions**	Time:	15:46:10
Tested By:	Matthew Harrison	Sequence#:	20
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

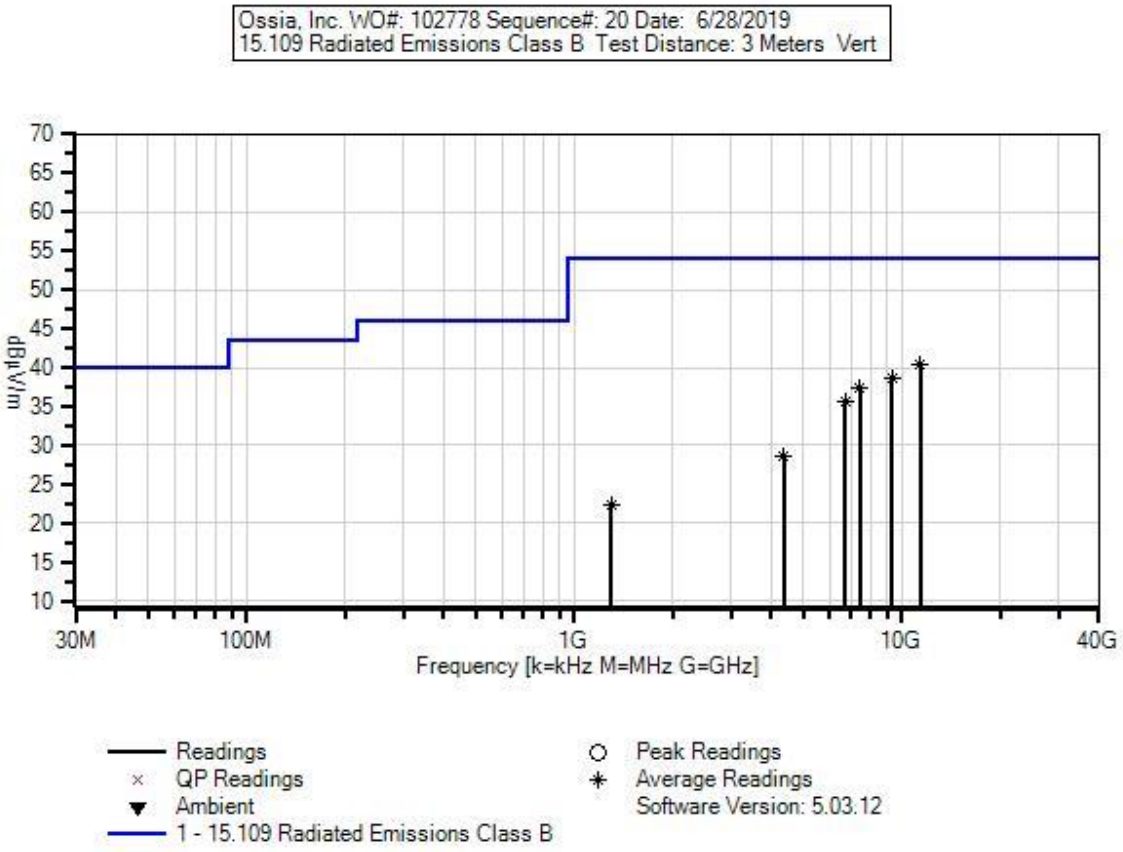
Test Conditions / Notes:

Temperature: 21-23°C
Humidity: 35-40%
Pressure: 101.5-103kPa

Test Method: ANSI C63.4 (2014)

Frequency: 1-13GHz

All radios are in RX mode.
Investigated battery charging, as well as not charging with cable detached.
Worst case reported (charging while cable attached).
EUT is investigated in X, Y, & Z Axis with worst case reported.


Ossia, Inc. WO#: 102778 Sequence#: 20 Date: 6/28/2019
15.109 Radiated Emissions Class B Test Distance: 3 Meters Vert
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV/m
30M
100M
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.109 Radiated Emissions Class B
Peak Readings
Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T4	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T6	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	11344.000 M Ave	26.1	+0.0 +38.6	+6.5 +2.9	+0.9	-34.5	+0.0	40.5	54.0	-13.5	Vert
^	11344.000 M	38.4	+0.0 +38.6	+6.5 +2.9	+0.9	-34.5	+0.0	52.8	54.0	-1.2	Vert
3	9316.000M Ave	25.7	+0.0 +37.3	+6.2 +2.5	+0.9	-34.1	+0.0	38.5	54.0	-15.5	Horiz
^	9316.000M	39.3	+0.0 +37.3	+6.2 +2.5	+0.9	-34.1	+0.0	52.1	54.0	-1.9	Horiz
5	7456.000M Ave	26.3	+0.0 +36.9	+5.5 +2.2	+1.1	-34.7	+0.0	37.3	54.0	-16.7	Horiz
^	7456.000M	39.6	+0.0 +36.9	+5.5 +2.2	+1.1	-34.7	+0.0	50.6	54.0	-3.4	Horiz
7	6700.000M Ave	26.3	+0.0 +35.5	+5.4 +2.0	+0.6	-34.2	+0.0	35.6	54.0	-18.4	Vert
^	6700.000M	39.7	+0.0 +35.5	+5.4 +2.0	+0.6	-34.2	+0.0	49.0	54.0	-5.0	Vert
9	4372.000M Ave	24.9	+0.0 +31.7	+3.8 +1.5	+0.5	-33.7	+0.0	28.7	54.0	-25.3	Vert
^	4372.000M	36.7	+0.0 +31.7	+3.8 +1.5	+0.5	-33.7	+0.0	40.5	54.0	-13.5	Vert
11	1300.000M Ave	30.3	+0.0 +25.0	+1.9 +0.6	+0.4	-35.9	+0.0	22.3	54.0	-31.7	Horiz
^	1300.000M	42.4	+0.0 +25.0	+1.9 +0.6	+0.4	-35.9	+0.0	34.4	54.0	-19.6	Horiz

Test Setup Photo(s)

Below 1GHz, Not Charging

Above 1GHz, Not Charging

Below 1GHz, Charging

Above 1GHz, Charging

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.