Engineering Test Report No. 1904050-03	
Report Date	October 29-30, 2019
Manufacturer Name	Oncore Manufacturing LLC
Manufacturer Address	1751 West Diehl Rd Naperville, IL 60563
Product Name Brand/Model No.	PBase
Date Received	October 29, 2019
Test Dates	October 29-30, 2019
Specifications	FCC Part 15, Subpart C and ISED RSS-210
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515
Signature	
Tested by	Javier Cardenas
Signature	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894

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1. Report Revision History

Revision	Date	Description
–	11/05/2019	Initial Release of Engineering Test Report No. 1904050-03

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on a Base Station (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was identified as follows:

Description	Part #	S/N
Base Station Transceiver	PBase	n/a

The EUT listed above was used throughout the test series.

The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
24VAC Transformer	ELK-TRG2440	n/a

3. Test Specification(s)

The tests were performed to selected portions of, and in accordance with the FCC Part15, Subpart C and ISED RSS-210 test specification(s).

Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C
ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
Industry Canada Radio Standards Specification, RSS-Gen, “General Requirements and Information for the Certification of Radiocommunication Equipment
Industry Canada Radio Standards Specification, RSS-210, “Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4. Laboratory Conditions

The temperature at the time of the test was 20.5°C and the relative humidity was 18%.

5. Summary

The following EMC tests were performed and the results are shown below:

Test Description	Results
RF Conducted Emissions Test (AC Mains)	Conforms
RF Radiated Emissions Test	Conforms
Duty Cycle Factor Measurements	Conforms
Radiated Spurious Emissions Test	Conforms
Band-Edge Compliance	Conforms
Occupied Bandwidth	Conforms

6. Test Plan

No test plan was provided. Instructions were provided by personnel from Oncore Manufacturing LLC and used in conjunction with the FCC Part 15, Subpart C and ISED RSS-210 specifications.

7. Grounding

The EUT was not grounded.

8. Firmware/Software

For all tests, the EUT had Firmware Version FW-TPBase-905-057B.hex loaded onto the device to provide the

correct load characteristics.

9. Modifications Made to EUT

No modifications were made to the EUT during the testing.

10. Deviations from Specification(s)

No deviations from the specification(s) were made during the testing.

11. Modes of Operation

The EMC tests were performed with the EUT operating in one or more of the test modes described below. See the specific test section for the applicable test modes.

11.1. Standby

The EUT was “listening” for a signal

11.2. Transmitting

The EUT was programmed to continuously transmit at 913MHz.

12. Test Method

The tests were performed using the referenced methods described in the FCC Part 15, Subpart C and ISED RSS-210 test specification(s). The specific test sections and specification references are called out in the individual test sections.

13. Sample Calculations

For Powerline Conducted Emissions:

The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB).

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

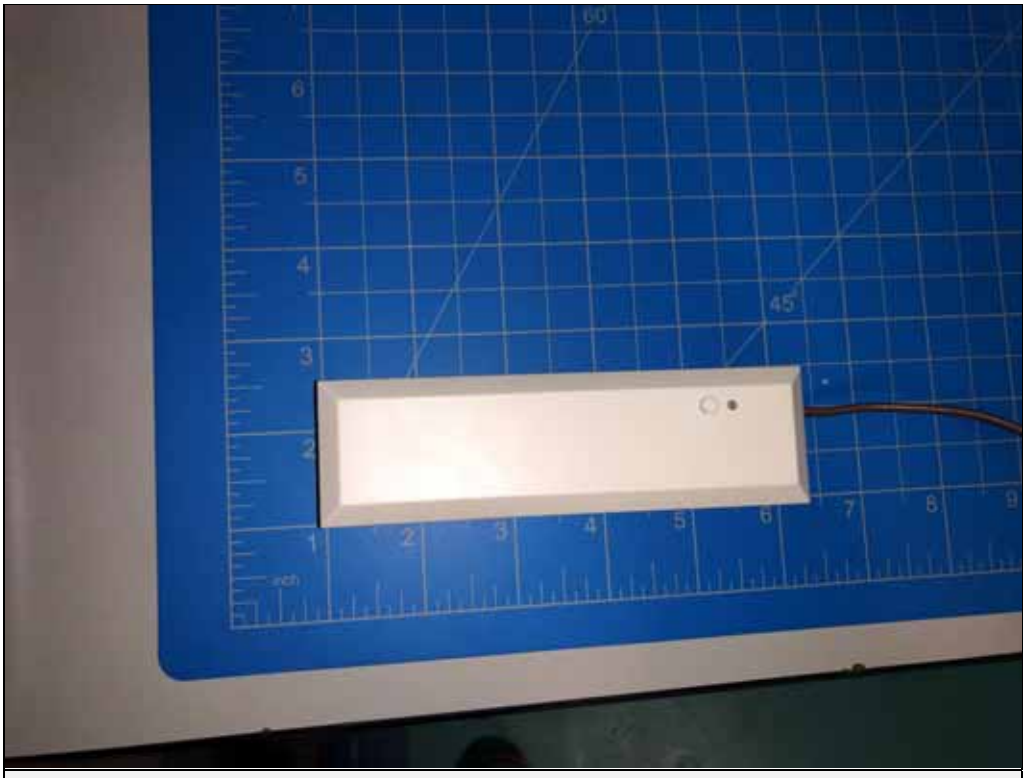
14. Statement of Conformity

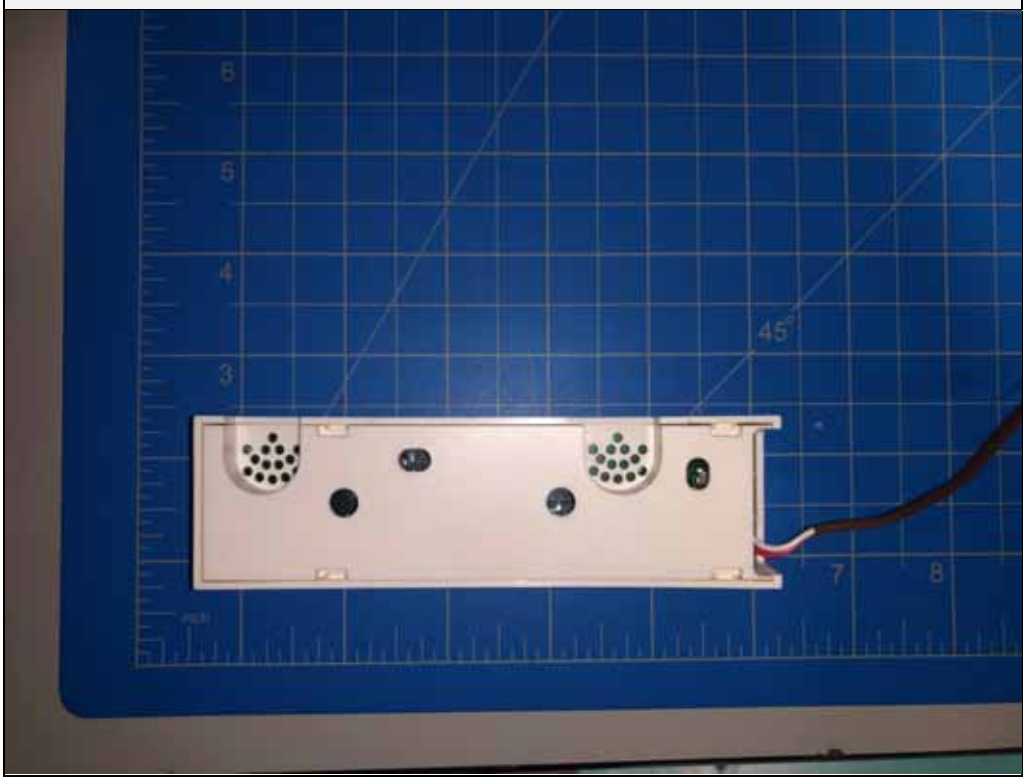
The Oncore Manufacturing LLC Base Station, Model No. PBase did fully conform to the selected requirements of FCC Part 15, Subpart C and ISED RSS-210.

15. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC Part 15, Subpart C and ISED RSS-210 test specification(s). The data presented in this test report pertains to the EUT on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

16. Photographs of EUT





17. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/8/2019	4/8/2020
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
GURB	ATTENUATOR FOR PEFT.1	HAEFELY	50R	54.3DB	1HZ-1MHZ	10/3/2019	10/3/2020
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	9/23/2019	9/23/2020
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/10/2018	4/10/2020
PLF3	CISPR16 50UH LISN	ELITE	CISPER16/70A	003	.15-30MHz	4/24/2019	4/24/2020
PLF5	CISPR16 50UH LISN	ELITE	CISPR16/15A	006	.15-30MHz	4/23/2019	4/23/2020
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	2/21/2019	2/21/2020
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
VBR8	CISPR EN FCC CE VOLTAGE.exe					N/A	
VBV2	CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	---	---	N/A	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
XLTM	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	5/25/2018	5/25/2020
XPQ2	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	3	1.8-10GHZ	9/6/2019	9/6/2021

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required
NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

18. RF Conducted Emissions Test (AC Mains)

Manufacturer	Oncore Manufacturing LLC
Product	Base Station
Model	PBase
Serial No	N/A
Modes	Standby Transmitting

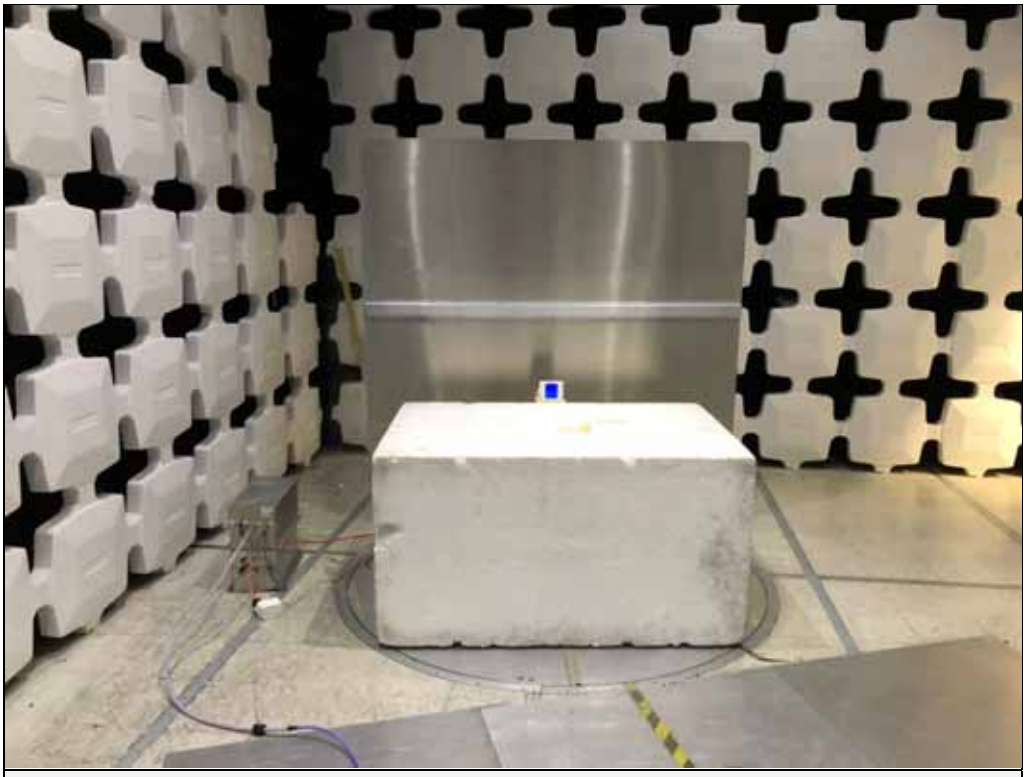
Information	
Size of EUT	12cm x 3.5cm x 3.5cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Note	

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7

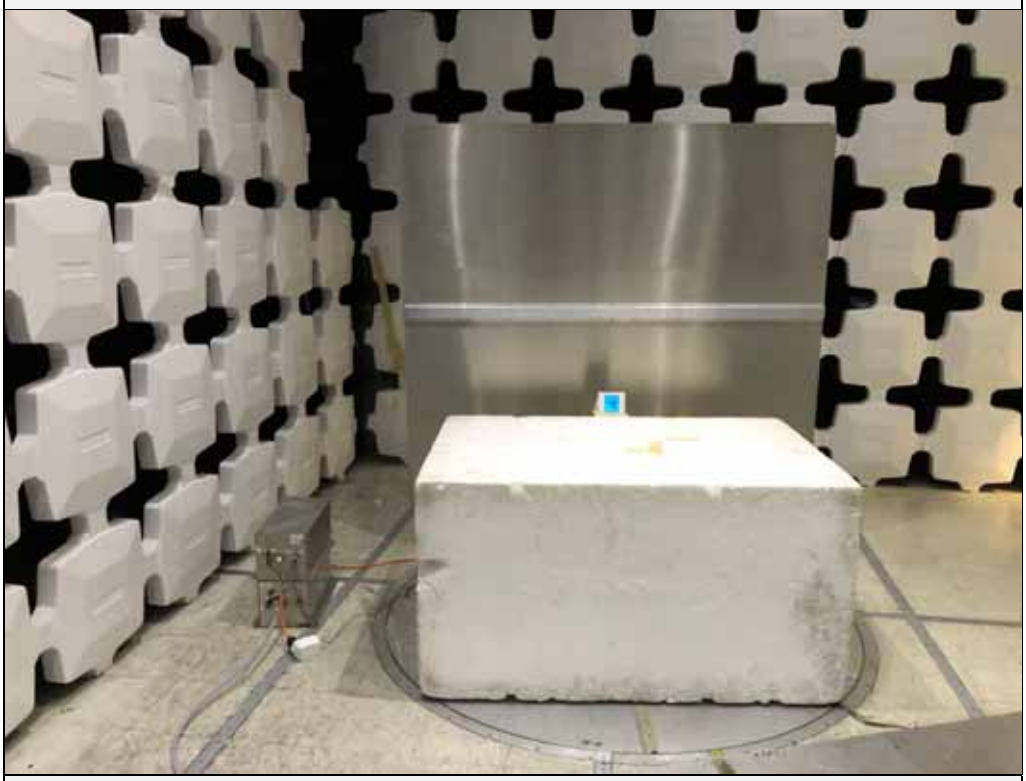
Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

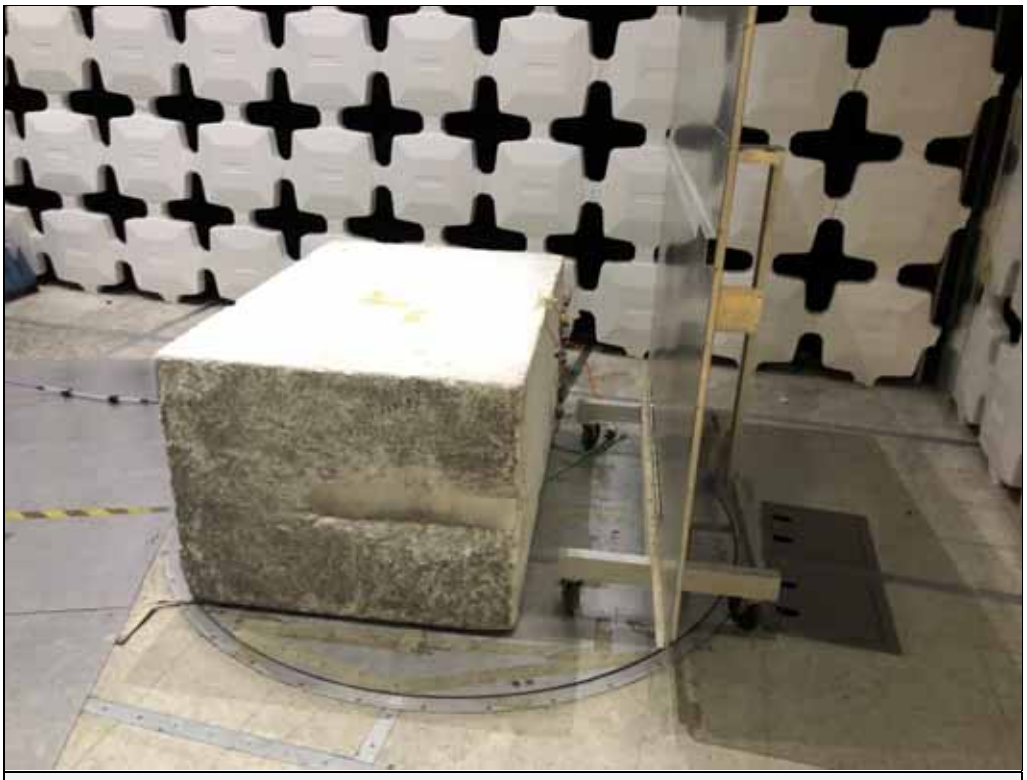
a) The EUT was operated in the Standby mode.
b) Measurements were first made on the Voltage high line.
c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
e) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
f) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits.
g) Steps (c) through (f) were repeated on the Voltage return line.
h) Steps (b) through (g) were repeated with the EUT operated in the Transmitting mode.



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)

Test Setup for RF Conducted Emissions (AC Mains)

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Line Tested	:	High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:32:26 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

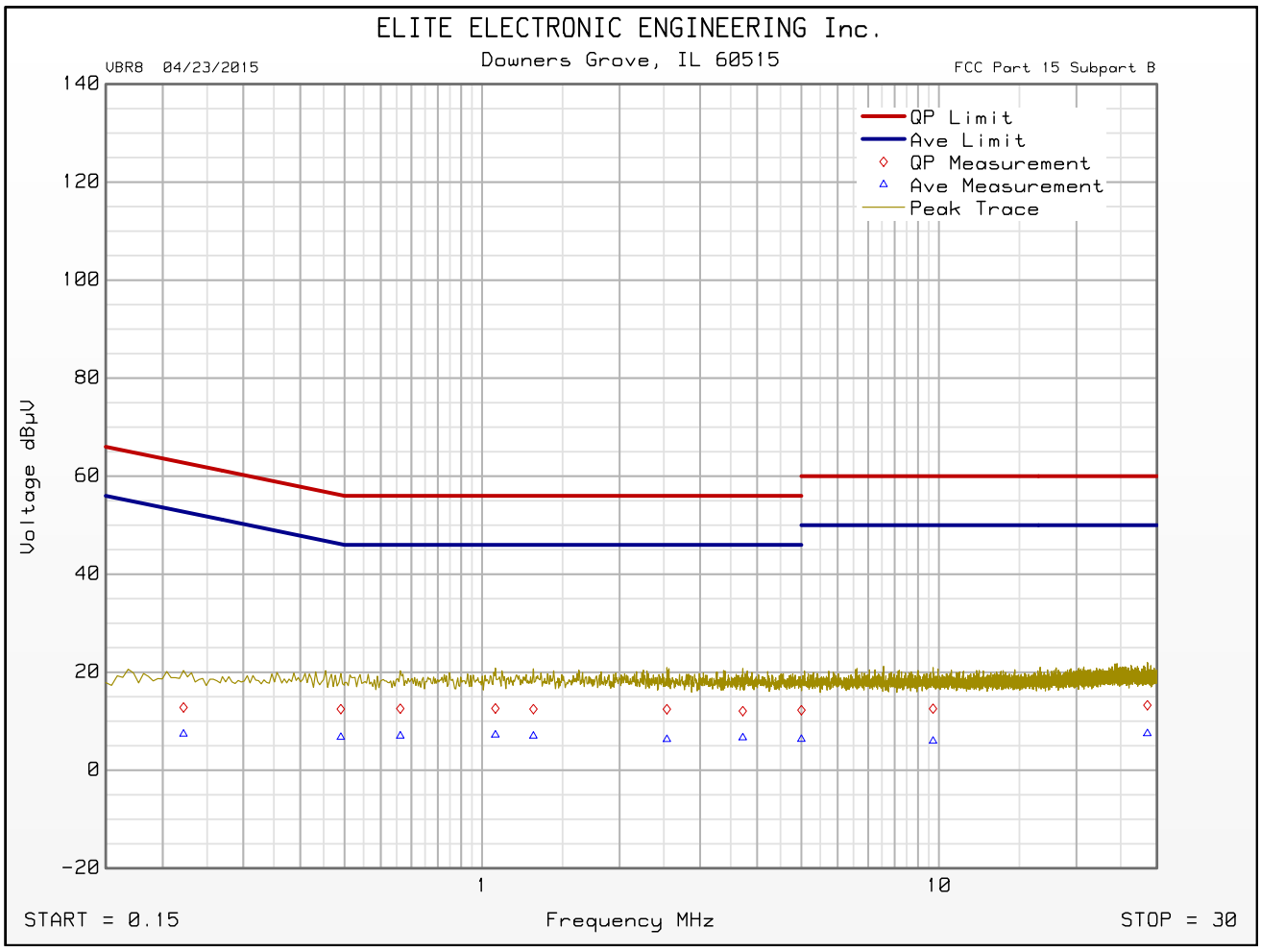
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.222	12.8	62.7		7.4	52.7	
0.491	12.5	56.2		6.8	46.2	
0.662	12.6	56.0		7.0	46.0	
1.069	12.6	56.0		7.2	46.0	
1.295	12.5	56.0		7.0	46.0	
2.538	12.5	56.0		6.3	46.0	
5.000	12.3	56.0		6.4	46.0	
9.707	12.6	60.0		6.0	50.0	
28.594	13.3	60.0		7.5	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Line Tested	:	High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:32:26 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Line Tested	:	Neutral
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:37:55 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

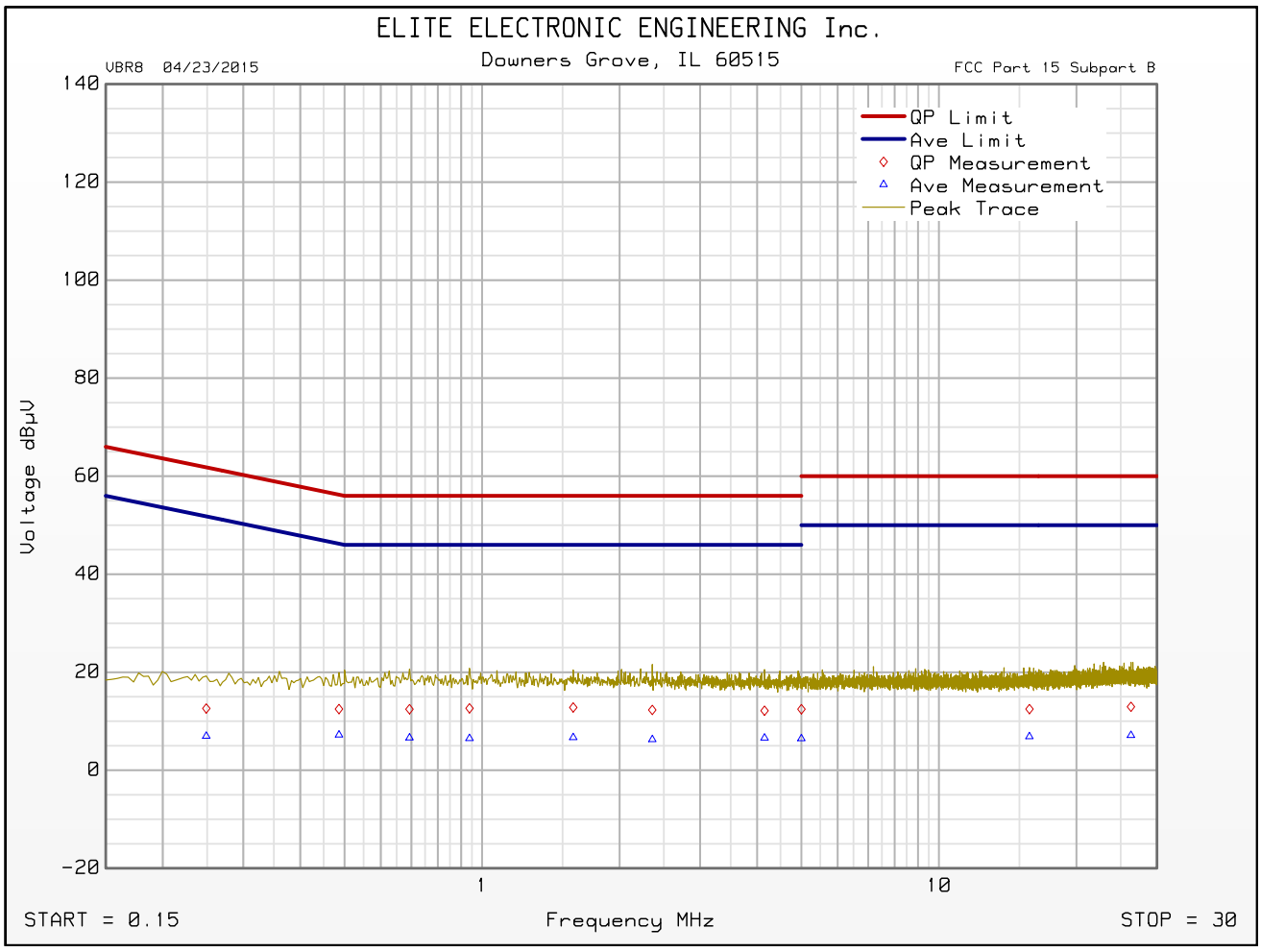
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.249	12.6	61.8		7.0	51.8	
0.486	12.5	56.2		7.2	46.2	
0.694	12.5	56.0		6.6	46.0	
0.939	12.6	56.0		6.5	46.0	
1.583	12.8	56.0		6.7	46.0	
2.358	12.3	56.0		6.3	46.0	
5.000	12.5	56.0		6.5	46.0	
15.782	12.5	60.0		6.9	50.0	
26.321	13.0	60.0		7.1	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Line Tested	:	Neutral
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:37:55 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Transmitting
Line Tested	:	High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:24:21 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

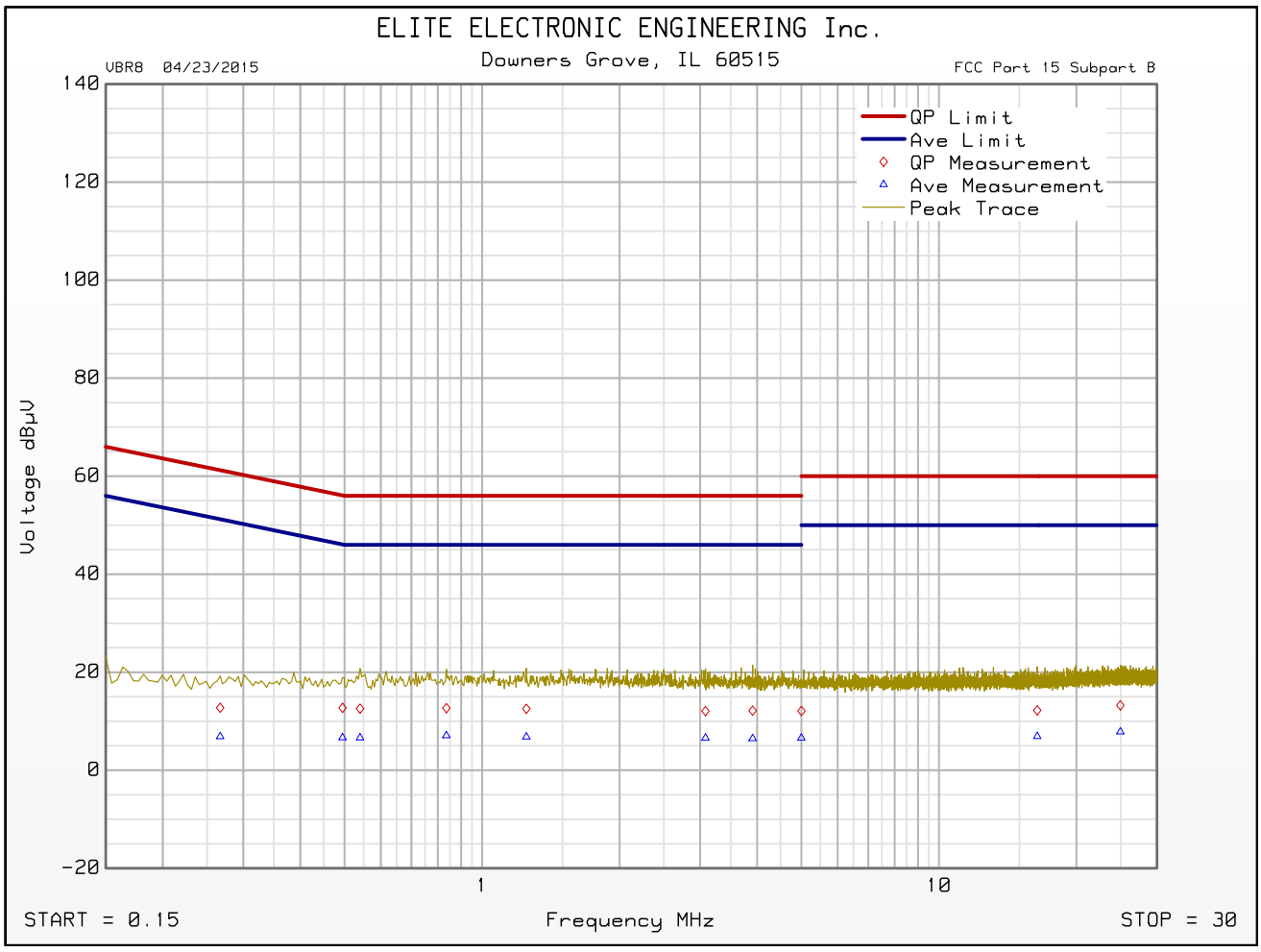
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.267	12.8	61.2		6.9	51.2	
0.495	12.7	56.1		6.6	46.1	
0.541	12.6	56.0		6.6	46.0	
0.835	12.7	56.0		7.1	46.0	
1.250	12.5	56.0		6.8	46.0	
3.083	12.1	56.0		6.6	46.0	
3.910	12.2	56.0		6.5	46.0	
5.000	12.1	56.0		6.6	46.0	
16.412	12.2	60.0		6.9	50.0	
24.958	13.2	60.0		7.8	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	Transmitting
DUT Mode	:	Tx 913 MHz
Line Tested	:	High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:24:21 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Transmitting
Line Tested	:	Neutral
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:44:33 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

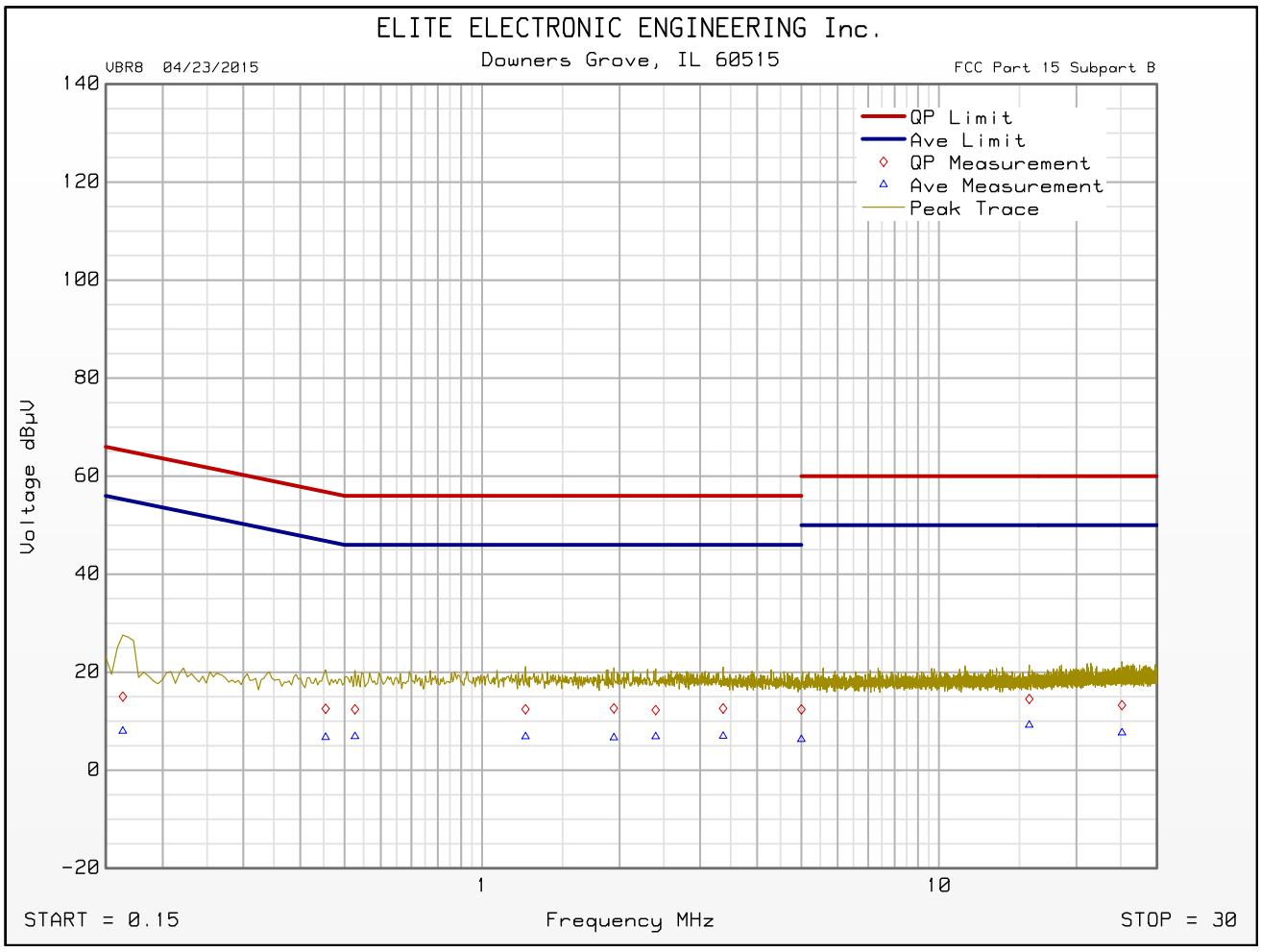
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.164	15.0	65.3		8.0	55.3	
0.455	12.6	56.8		6.7	46.8	
0.527	12.4	56.0		6.9	46.0	
1.245	12.4	56.0		6.9	46.0	
1.943	12.6	56.0		6.6	46.0	
2.399	12.3	56.0		6.9	46.0	
3.370	12.6	56.0		7.0	46.0	
5.000	12.4	56.0		6.3	46.0	
15.768	14.5	60.0		9.2	50.0	
25.160	13.3	60.0		7.7	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Transmitting
Line Tested	:	Neutral
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	J. Cardenas
Limit	:	Class B
Test Date	:	Oct 30, 2019 02:44:33 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

19. RF Radiated Emissions Test

Manufacturer	Oncore Manufacturing LLC
Product	Base Station
Model	PBase
Serial No	N/A
Mode	Standby

Information	
Size of EUT	12cm x 3.5cm x 3.5cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Highest Internal Frequency of the EUT:	913 MHz
Highest Measurement Frequency:	10 GHz
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

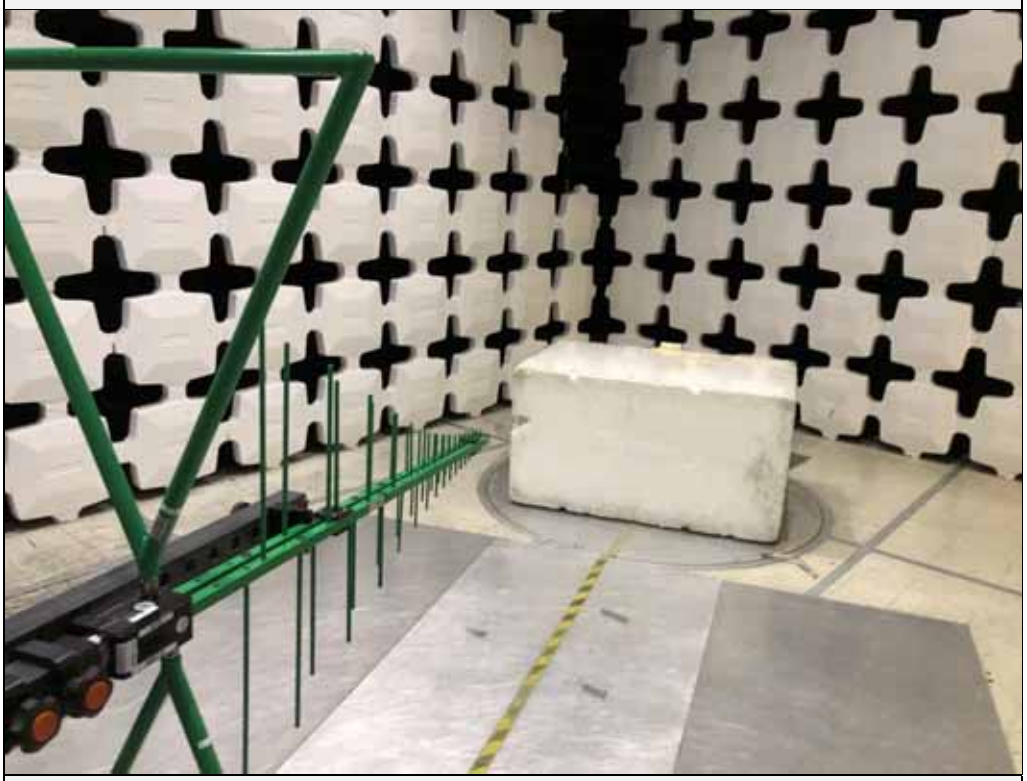
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedures
Since a quasi-peak detector and an average detector requires a long integration times, it is not practical to automatically sweep through the quasi-peak and average levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector or average detector. The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The frequency range from 1GHz to 10 GHz was investigated using a peak detector function with the double ridged waveguide antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the exploratory sweeps using the following methods:

1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna.
2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:
   a) The EUT was rotated so that all sides were exposed to the receiving antenna.
   b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
   c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
   d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

Test Setup for Radiated Emissions: 30MHz to 1GHz, Horizontal Polarization



Test Setup for Radiated Emissions: 30MHz to 1GHz, Vertical Polarization

Test Setup for Radiated Emissions: Above 1GHz, Horizontal Polarization

Test Setup for Radiated Emissions: Above 1GHz, Vertical Polarization

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

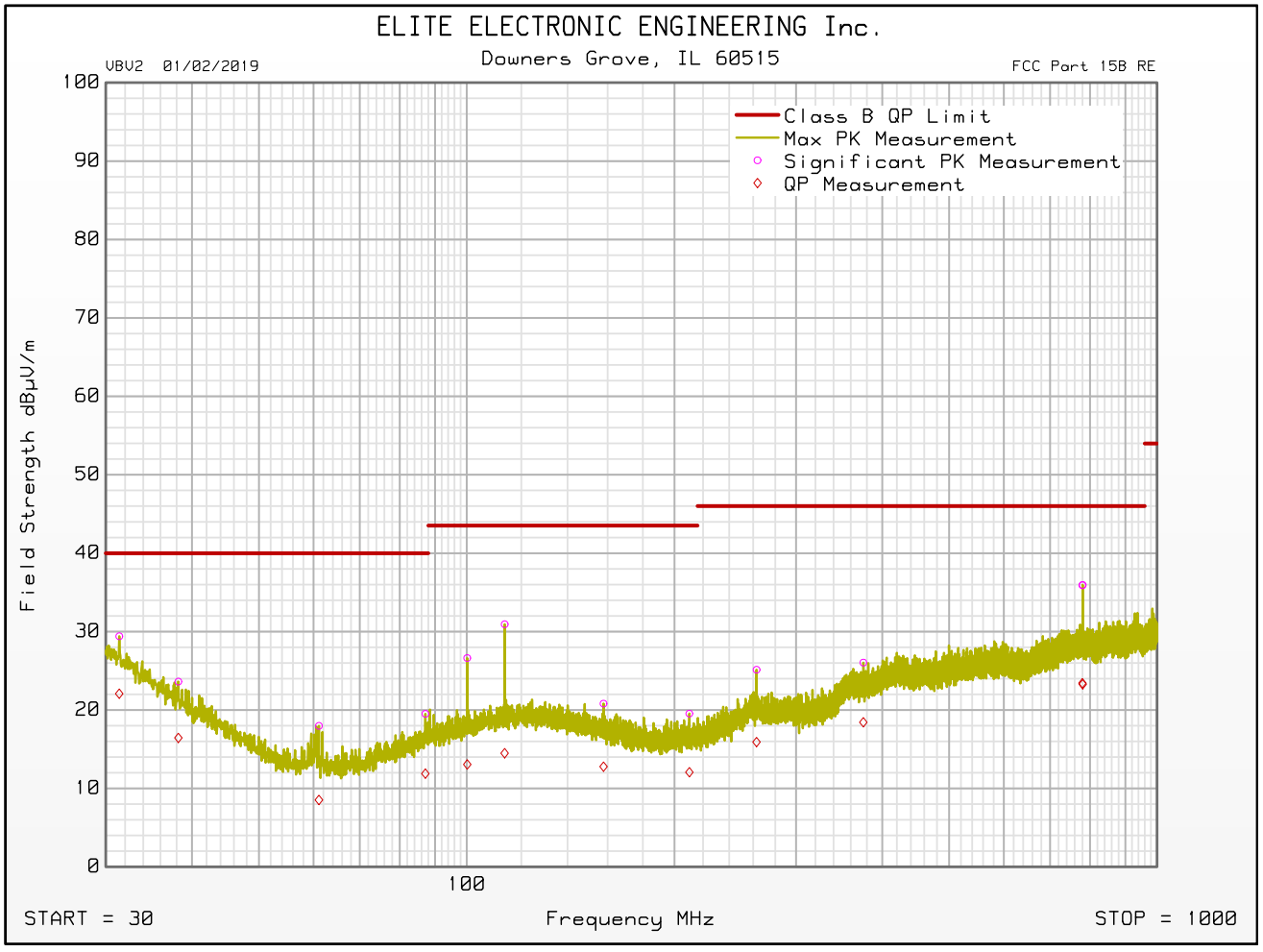
Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	Base
Test Engineer	:	J. Cardenas
Test Date	:	Oct 29, 2019 10:39:48 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °
31.380	4.4	-2.9	24.7	0.0	0.4	0.0	29.4	22.1	40.0	-17.9	V	120	225
38.220	2.7	-4.4	20.5	0.0	0.4	0.0	23.6	16.4	40.0	-23.6	V	200	180
48.360	3.6	-4.5	15.4	0.0	0.4	0.0	19.3	11.3	40.0	-28.7	H	340	270
61.080	5.3	-4.2	12.4	0.0	0.4	0.0	18.0	8.5	40.0	-31.5	V	120	225
87.120	2.9	-4.8	16.3	0.0	0.4	0.0	19.5	11.9	40.0	-28.1	V	120	270
100.180	8.3	-5.3	17.9	0.0	0.4	0.0	26.6	13.1	43.5	-30.5	V	120	0
113.500	11.4	-5.0	19.1	0.0	0.4	0.0	30.9	14.5	43.5	-29.0	V	200	225
135.100	2.9	-5.1	18.8	0.0	0.5	0.0	22.3	14.2	43.5	-29.3	H	120	315
157.840	2.9	-5.1	17.3	0.0	0.6	0.0	20.8	12.8	43.5	-30.7	V	120	90
210.160	2.5	-5.0	16.3	0.0	0.8	0.0	19.5	12.1	43.5	-31.5	V	340	90
262.980	4.5	-4.7	19.8	0.0	0.8	0.0	25.1	15.9	46.0	-30.1	V	120	90
375.480	3.0	-4.6	22.0	0.0	1.1	0.0	26.0	18.4	46.0	-27.6	V	200	270
466.740	6.1	-5.2	23.6	0.0	1.1	0.0	30.9	19.5	46.0	-26.5	H	200	180
582.120	7.2	-4.9	24.8	0.0	1.1	0.0	33.2	21.1	46.0	-24.9	H	120	270
779.700	7.6	-4.9	26.8	0.0	1.5	0.0	35.9	23.4	46.0	-22.6	V	120	0
780.600	7.7	-5.0	26.8	0.0	1.5	0.0	35.9	23.3	46.0	-22.7	V	120	0
920.700	3.6	-4.4	27.4	0.0	1.5	0.0	32.5	24.5	46.0	-21.5	H	120	45

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

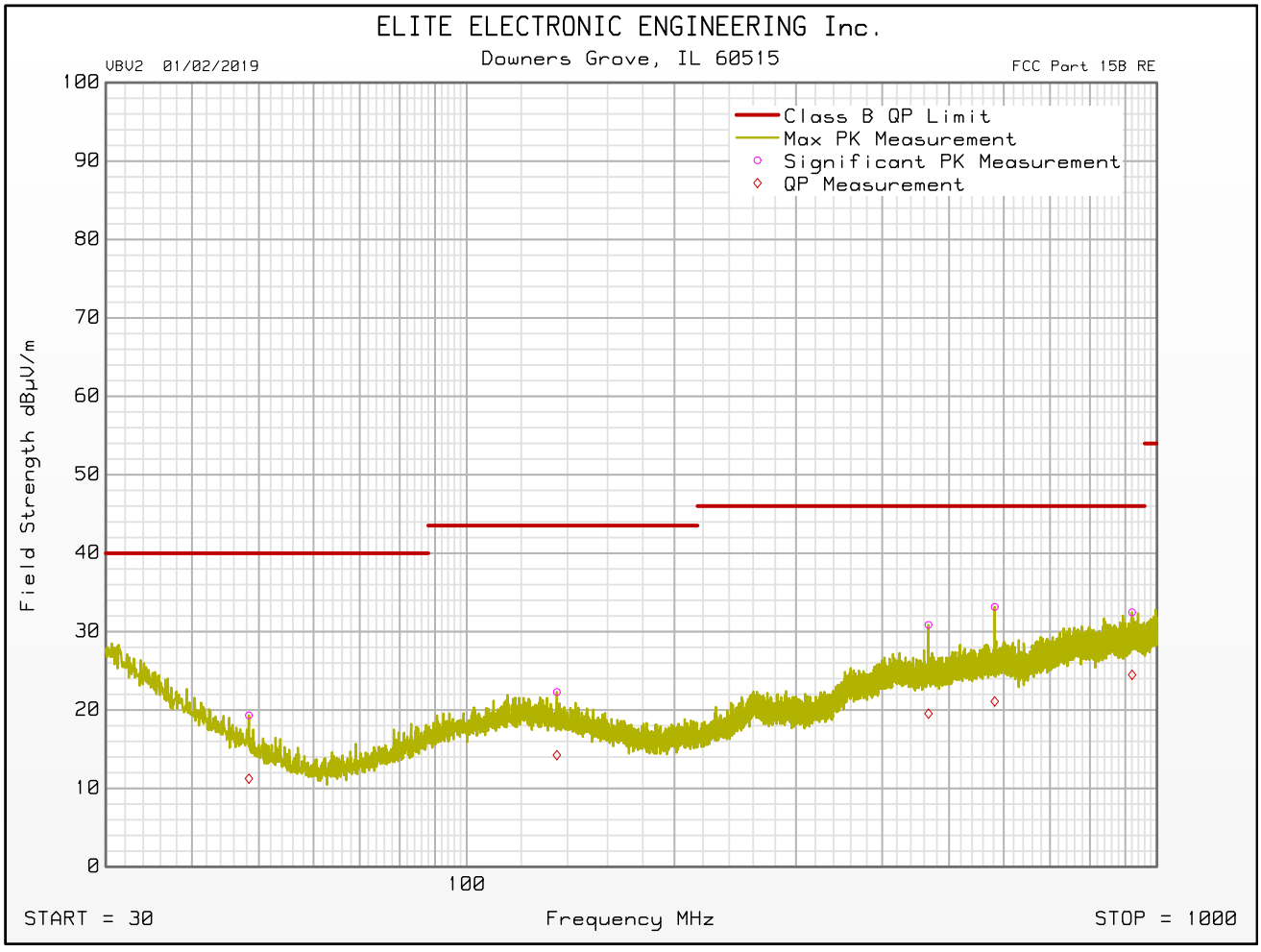
Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Ant. Polarization(s)	:	V
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	Base
Test Engineer	:	J. Cardenas
Test Date	:	Oct 29, 2019 10:39:48 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Ant. Polarization(s)	:	H
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	Base
Test Engineer	:	J. Cardenas
Test Date	:	Oct 29, 2019 10:39:48 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

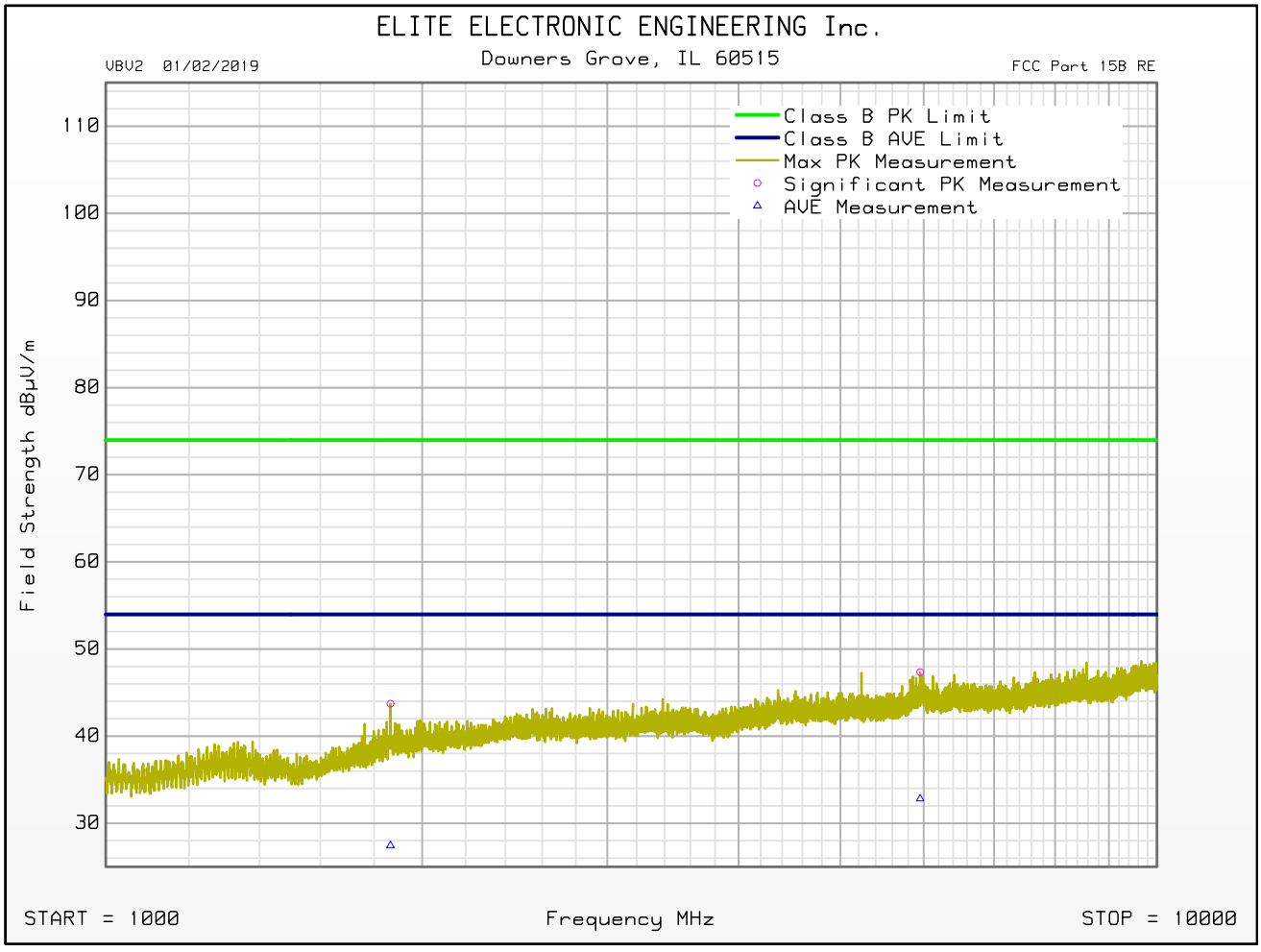
Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	J. Cardenas
Test Date	:	Oct 30, 2019 10:08:50 AM

Freq MHz	Peak Mtr Rdg dBuV	Average Mtr Rdg dBuV	Ant Fac dB	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °
1237.000	49.9	36.9	29.0	-40.8	1.8	0.0	39.8	74.0	-34.1	26.8	54.0	-27.1	H	200	90
1866.000	51.7	35.4	30.9	-41.0	2.2	0.0	43.7	74.0	-30.2	27.5	54.0	-26.5	V	120	45
2581.000	48.9	35.6	32.6	-40.5	2.7	0.0	43.7	74.0	-30.3	30.4	54.0	-23.6	H	120	0
4471.000	48.4	34.7	34.0	-40.4	3.6	0.0	45.7	74.0	-28.3	31.9	54.0	-22.1	H	120	0
5953.500	48.6	34.1	35.0	-40.5	4.2	0.0	47.4	74.0	-26.6	32.8	54.0	-21.2	V	340	0
9518.500	47.5	34.3	36.4	-40.3	5.1	0.0	48.8	74.0	-25.2	35.5	54.0	-18.4	H	200	180

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

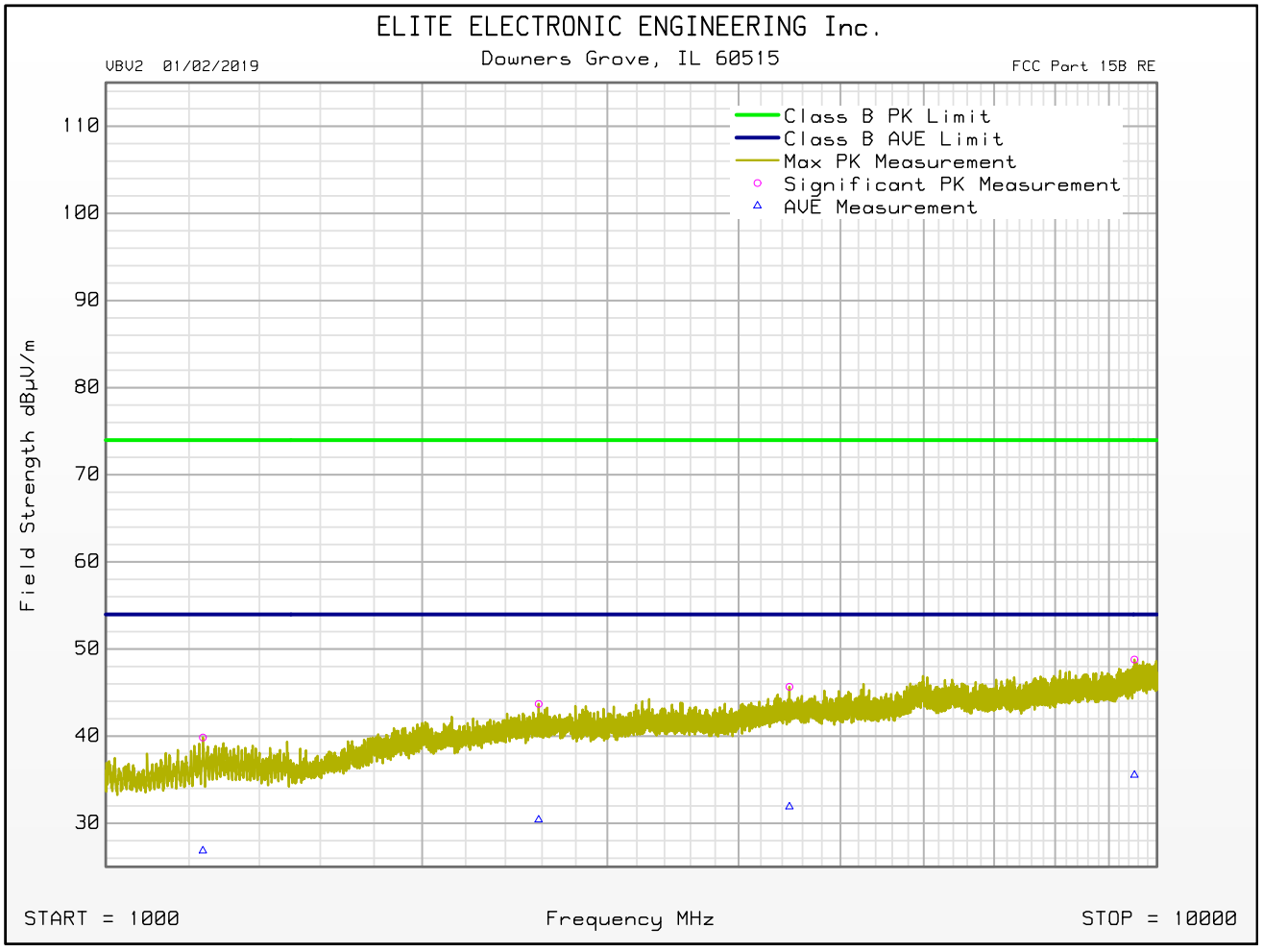
Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Ant. Polarization(s)	:	V
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	J. Cardenas
Test Date	:	Oct 30, 2019 10:08:50 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

Manufacturer	:	Oncore Manufacturing LLC
Model	:	PBase
Serial Number	:	n/a
DUT Mode	:	Standby
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Ant. Polarization(s)	:	H
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	J. Cardenas
Test Date	:	Oct 30, 2019 10:08:50 AM



20. Duty Cycle Factor Measurements

Manufacturer	Oncore Manufacturing LLC
Product	Base Station
Model	PBase
Serial No	N/A
Mode	Transmitting

Information	
Size of EUT	12cm x 3.5cm x 3.5cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedures

The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal.

a) With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer.

b) The pulse width is measured and a plot of this measurement is recorded.

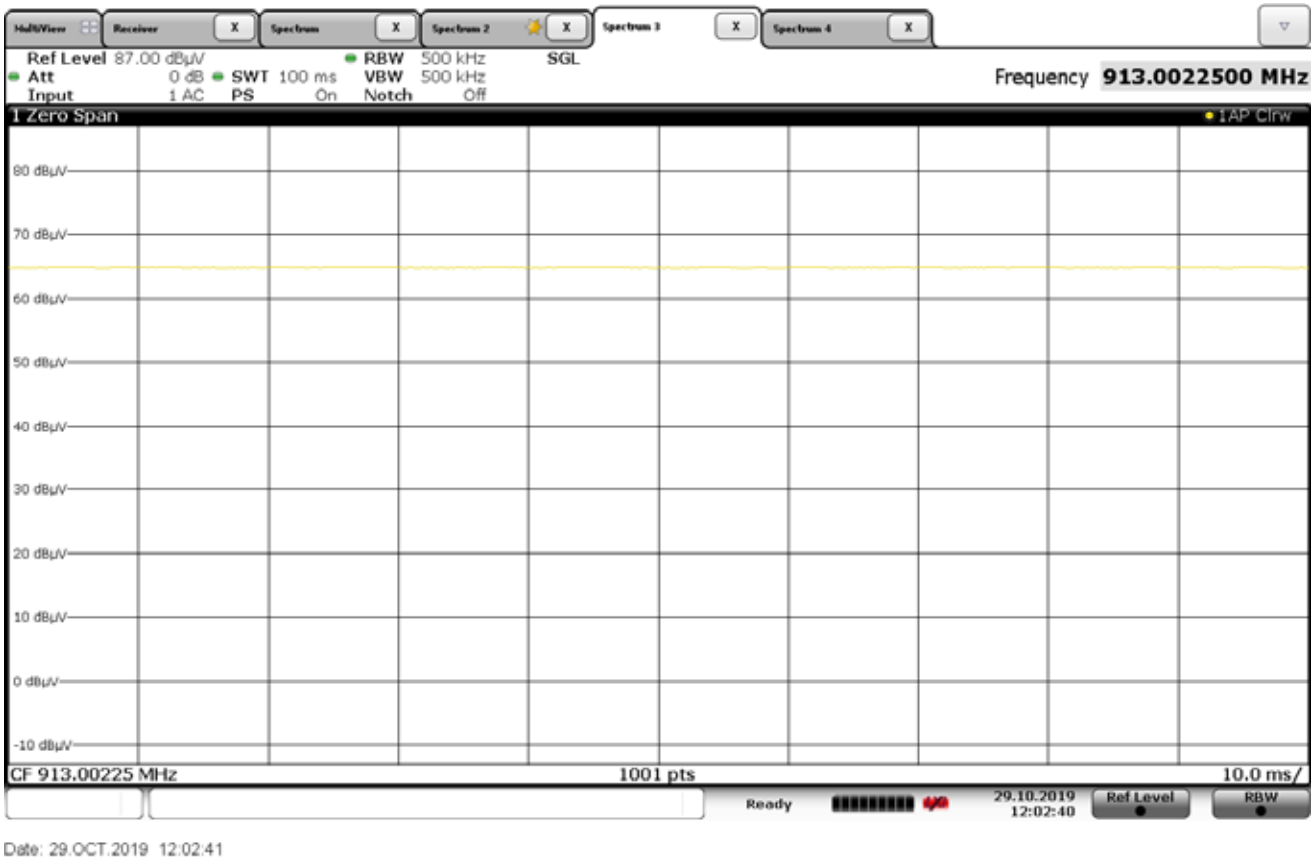
c) Next, the number of pulses in the word period is measured and a plot is recorded.

d) Finally, the length of the word period is measured and a third plot is recorded. If the word period exceeds 100 msec, the word period is limited to 100 msec.

e) The pulse width and number of pulses for the word period are used to compute the on-time. The duty cycle is then computed as the (on-time/ word period).

f) The duty cycle factor is computed from the duty cycle.

DATA PAGE	
MANUFACTURER	Oncore Manufacturing LLC
EUT	Base Station
MODEL NO.	PBase
TEST	Duty Cycle = 100%
MODE	Transmitting at 913 MHz
DATE TESTED	October 29, 2019
TEST PERFORMED BY	Javier Cardenas
NOTES	



$$Duty\ Cycle\ Factor = 20\log(100ms/100ms) = 0$$

21. Radiated Spurious Emissions Test

Manufacturer	Oncore Manufacturing LLC
Product	Base Station
Model	PBase
Serial No	N/A
Mode	Transmitting

Information	
Size of EUT	12cm x 3.5cm x 3.5cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedures

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to 10.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 1GHz.

1) The field strength of the fundamental was measured using a bilog antenna. The bilog antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 80cm high non-conductive stand. A quasi-peak detector with a resolution bandwidth of 120 kHz was used on the spectrum analyzer. The field strength must not exceed the levels outlined in §15.249(a)

2) The field strengths of all of the harmonics were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector and an average detector with resolution bandwidths of 1 MHz were used on the spectrum analyzer.

3) To ensure that maximum or worst case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:

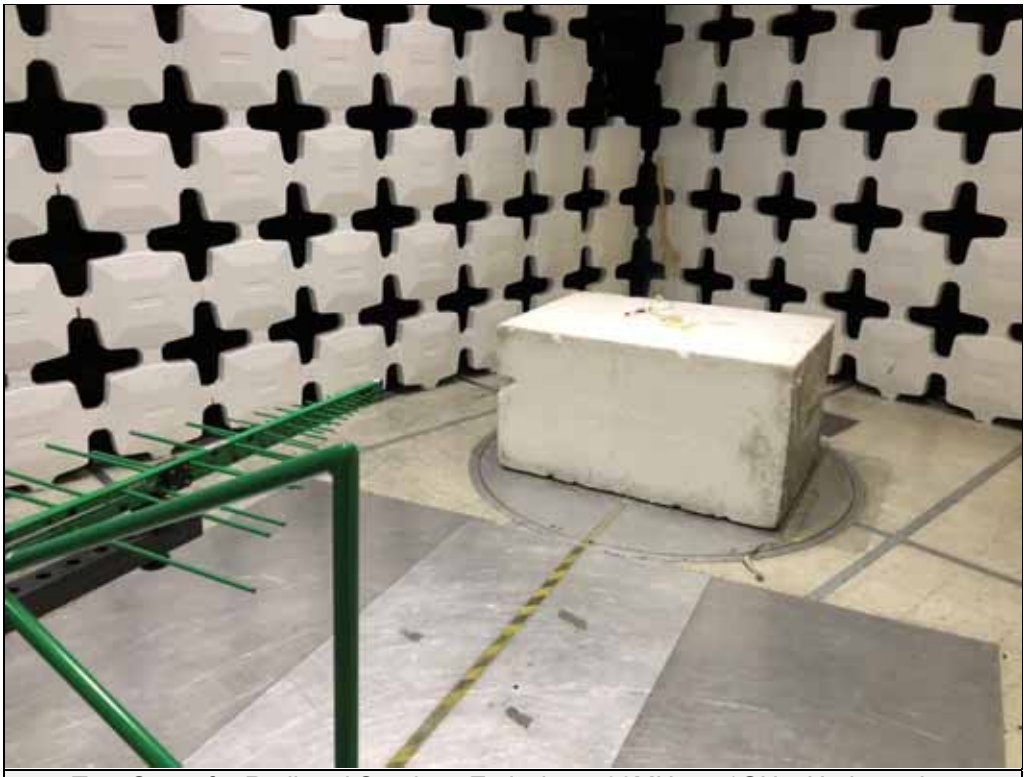
   i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

   ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

   iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

   iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axes to ensure the maximum readings were recorded for the EUT.

4) All harmonics must be attenuated below the limits specified in §15.249(a).



Test Setup for Radiated Spurious Emissions: 30MHz to 1GHz, Horizontal Polarization

Test Setup for Radiated Spurious Emissions: 30MHz to 1GHz, Vertical Polarization

Test Setup for Radiated Spurious Emissions: Above 1GHz, Horizontal Polarization

Test Setup for Radiated Spurious Emissions: Above 1GHz, Vertical Polarization

DATA PAGE	
MANUFACTURER	Oncore Manufacturing LLC
EUT	Base Station
MODEL NO.	PBase
TEST	Spurious Emissions – QP/Peak
MODE	Transmitting at 913 MHz
DATE TESTED	October 30, 2019
TEST PERFORMED BY	Javier Cardenas
NOTES	QP <1GHz, Peak >1GHz

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	QP/Peak Total dBuV/m at 3m	QP/Peak Total uV/m at 3 m	QP/Peak Limit uV/m at 3 m	Margin (dB)
913.000	H	64.0		1.6	26.7	0.0	92.2	40801.0	50000.0	-1.8
913.000	V	59.5		1.6	26.7	0.0	87.8	24443.9	50000.0	-6.2
1826.000	H	51.2		2.2	30.6	-40.0	44.1	159.8	5000.0	-29.9
1826.000	V	51.3		2.2	30.6	-40.0	44.2	161.5	5000.0	-29.8
2739.000	H	52.8		2.8	32.5	-39.7	48.4	264.3	5000.0	-25.5
2739.000	V	51.4		2.8	32.5	-39.7	47.0	223.6	5000.0	-27.0
3652.000	H	55.5		3.3	33.0	-39.2	52.5	420.5	5000.0	-21.5
3652.000	V	52.9		3.3	33.0	-39.2	50.0	315.0	5000.0	-24.0
4565.000	H	50.9	*	3.6	34.2	-39.2	49.4	296.7	5000.0	-24.5
4565.000	V	50.3	*	3.6	34.2	-39.2	48.8	275.6	5000.0	-25.2
5478.000	H	49.6	*	3.9	34.6	-39.4	48.7	273.0	5000.0	-25.3
5478.000	V	49.1	*	3.9	34.6	-39.4	48.2	258.3	5000.0	-25.7
6391.000	H	50.0	*	4.3	35.5	-39.4	50.4	330.7	5000.0	-23.6
6391.000	V	50.0	*	4.3	35.5	-39.4	50.4	330.3	5000.0	-23.6
7304.000	H	51.9		4.7	35.6	-39.4	52.8	435.4	5000.0	-21.2
7304.000	V	51.1		4.7	35.6	-39.4	52.0	398.0	5000.0	-22.0
8217.000	H	49.5	*	4.9	35.7	-39.4	50.7	344.0	5000.0	-23.2
8217.000	V	49.5	*	4.9	35.7	-39.4	50.8	345.2	5000.0	-23.2
9130.000	H	50.0	*	5.0	36.0	-39.3	51.7	386.3	5000.0	-22.2
9130.000	V	49.5	*	5.0	36.0	-39.3	51.2	364.3	5000.0	-22.8

DATA PAGE	
MANUFACTURER	Oncore Manufacturing LLC
EUT	Base Station
MODEL NO.	PBase
TEST	Spurious Emissions – Average
MODE	Transmitting at 913 MHz
DATE TESTED	October 30, 2019
TEST PERFORMED BY	Javier Cardenas
NOTES	

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
1826.00	H	51.2		2.2	30.6	-40.0	0.0	44.1	159.8	500.0	-9.9
1826.00	V	51.29		2.2	30.6	-40.0	0.0	44.2	161.5	500.0	-9.8
2739.00	H	52.83		2.8	32.5	-39.7	0.0	48.4	264.3	500.0	-5.5
2739.00	V	51.38		2.8	32.5	-39.7	0.0	47.0	223.6	500.0	-7.0
3652.00	H	55.45		3.3	33.0	-39.2	0.0	52.5	420.5	500.0	-1.5
3652.00	V	52.94		3.3	33.0	-39.2	0.0	50.0	315.0	500.0	-4.0
4565.00	H	50.91	*	3.6	34.2	-39.2	0.0	49.4	296.7	500.0	-4.5
4565.00	V	50.27	*	3.6	34.2	-39.2	0.0	48.8	275.6	500.0	-5.2
5478.00	H	49.57	*	3.9	34.6	-39.4	0.0	48.7	273.0	500.0	-5.3
5478.00	V	49.09	*	3.9	34.6	-39.4	0.0	48.2	258.3	500.0	-5.7
6391.00	H	50.01	*	4.3	35.5	-39.4	0.0	50.4	330.7	500.0	-3.6
6391.00	V	50	*	4.3	35.5	-39.4	0.0	50.4	330.3	500.0	-3.6
7304.00	H	51.88		4.7	35.6	-39.4	0.0	52.8	435.4	500.0	-1.2
7304.00	V	51.1		4.7	35.6	-39.4	0.0	52.0	398.0	500.0	-2.0
8217.00	H	49.51	*	4.9	35.7	-39.4	0.0	50.7	344.0	500.0	-3.2
8217.00	V	49.54	*	4.9	35.7	-39.4	0.0	50.8	345.2	500.0	-3.2
9130.00	H	50.02	*	5.0	36.0	-39.3	0.0	51.7	386.3	500.0	-2.2
9130.00	V	49.51	*	5.0	36.0	-39.3	0.0	51.2	364.3	500.0	-2.8

22. Band-Edge Compliance

Manufacturer	Oncore Manufacturing LLC
Product	Base Station
Model	PBase
Serial No	N/A
Mode	Standby

Information	
Size of EUT	12cm x 3.5cm x 3.5cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedures

Low Band Edge

1) The EUT was set up inside the test chamber on a non-conductive stand.
2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
3) The EUT was set to transmit continuously at 913 MHz.
4) The EUT was maximized for worst case emissions at the measuring antenna. The maximum meter reading was recorded.
5) To determine the band edge compliance, the following spectrum analyzer settings were used:
   a. Center frequency = low band edge frequency.
   b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
   c. Resolution bandwidth (RBW) ≥ 1% of the span.
   d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
   e. The marker was set on the peak of the in-band emissions. A display line was placed 46dB down

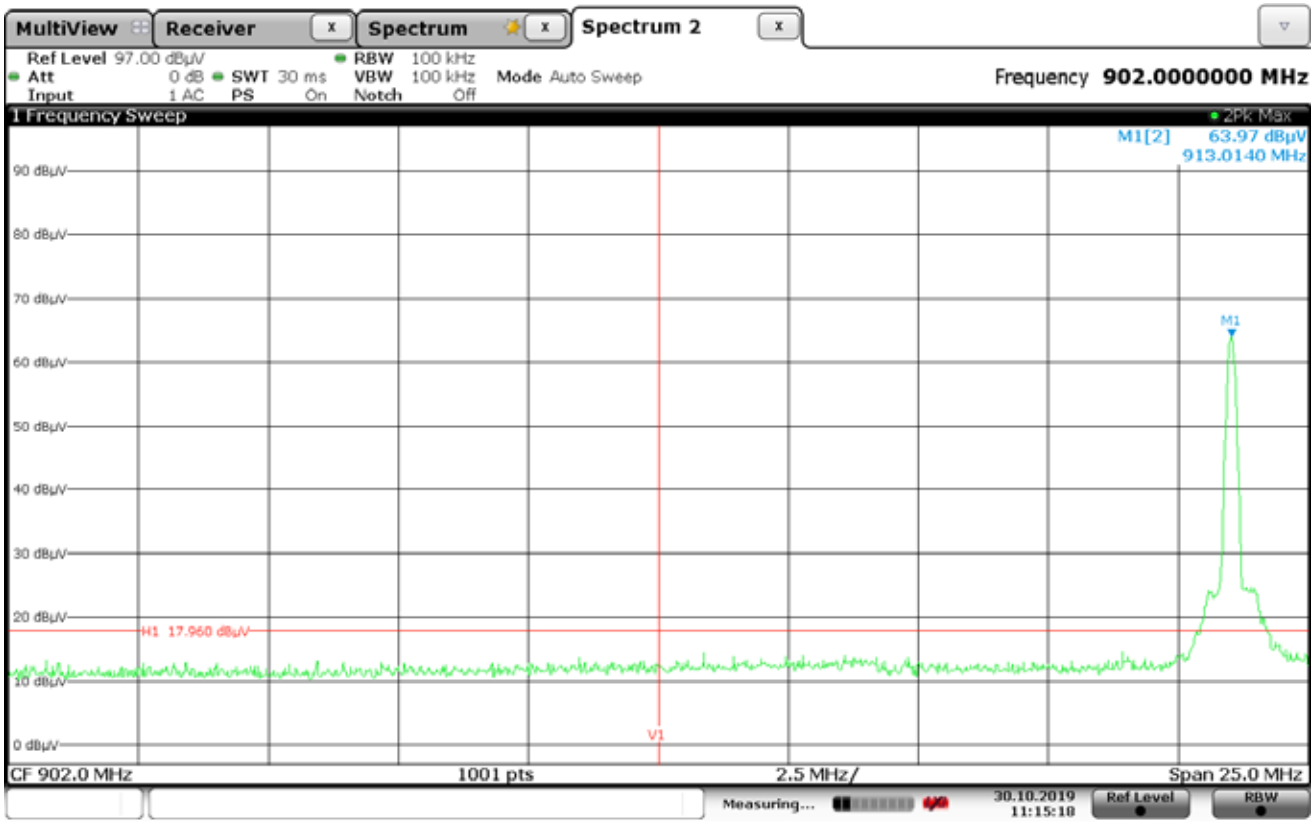
from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 46dB down display line. (All emissions to the left of the center frequency (band edge) must be below the display line.)

f. The analyzer's display was plotted using a 'screen dump' utility.

High Band Edge

1) The EUT was set up inside the test chamber on a non-conductive stand.
2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
3) The EUT was set to transmit continuously at 913 MHz.
4) The EUT was maximized for worst case emissions at the measuring antenna.
5) To determine the band edge compliance, the following spectrum analyzer settings were used:
   a. Center frequency = high band edge frequency.
   b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
   c. Resolution bandwidth (RBW) ≥ 1% of the span.
   d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
   e. The marker was set on the peak of the in-band emissions. A display line was placed 46dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 46dB down display line. (All emissions to the right of the center frequency (band edge) must be below the display line.)
   f. The analyzer's display was plotted using a 'screen dump' utility.

DATA PAGE	
MANUFACTURER	Oncore Manufacturing LLC
EUT	Base Station
MODEL NO.	PBase
TEST	Low Band-Edge
MODE	Transmitting at 913 MHz
DATE TESTED	October 30, 2019
TEST PERFORMED BY	Javier Cardenas
NOTES	



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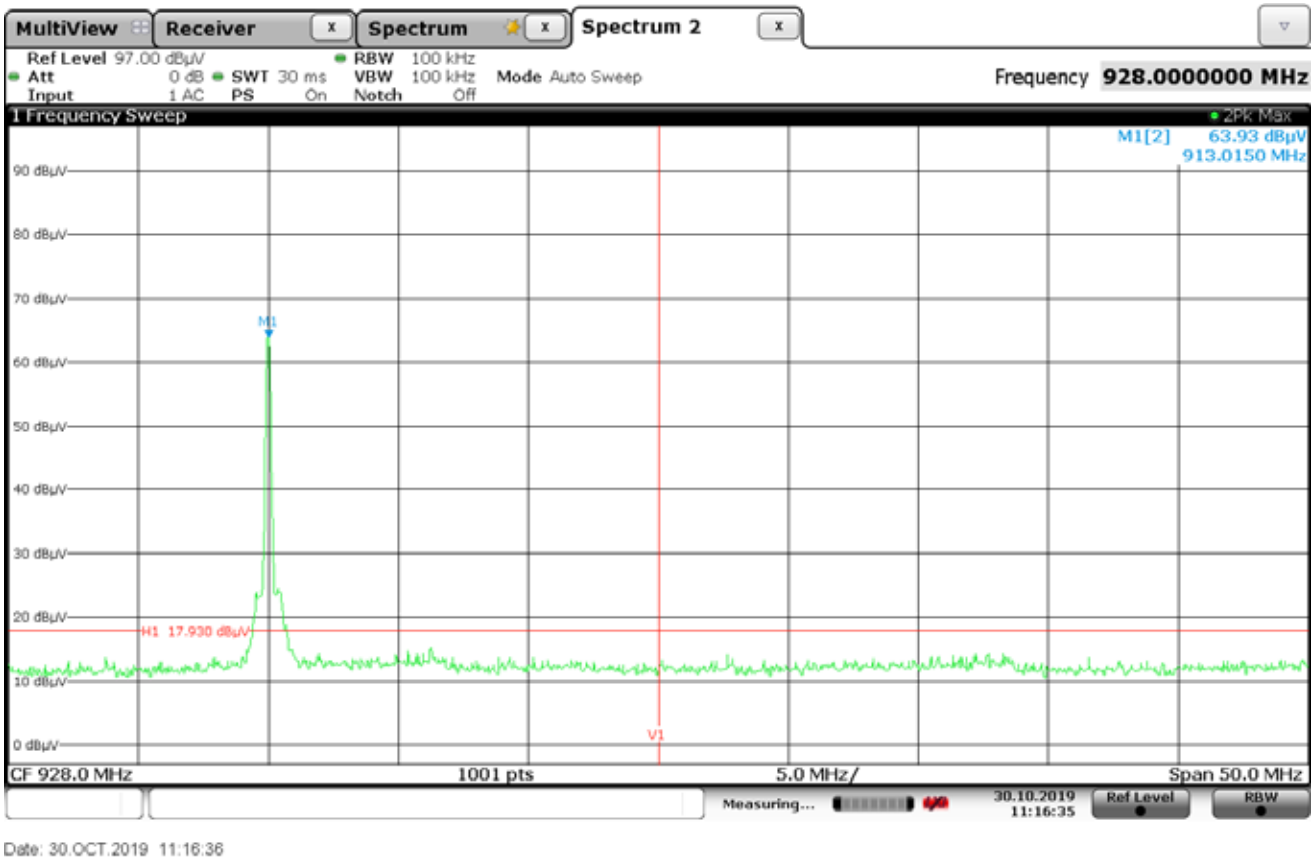
DATA PAGE	
MANUFACTURER	Oncore Manufacturing LLC
EUT	Base Station
MODEL NO.	PBase
TEST	High Band-Edge
MODE	Transmitting at 913 MHz
DATE TESTED	October 30, 2019
TEST PERFORMED BY	Javier Cardenas
NOTES	



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23. Occupied Bandwidth Calculations

Manufacturer	Oncore Manufacturing LLC
Product	Base Station
Model	PBase
Serial No	N/A
Mode	Standby

Information	
Size of EUT	12cm x 3.5cm x 3.5cm (L x W x H)
Setup Format	(Tabletop or Floor Standing)
Height of Support	(For Floor Standing only)
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedures
The EUT utilizes a 2-GFSK modulation scheme. The OBW was calculated using the published data rate and frequency deviation.

DATA PAGE	
MANUFACTURER	Oncore Manufacturing LLC
EUT	Base Station
MODEL NO.	PBase
TEST	Occupied Bandwidth = 9.8 kHz
MODE	Transmitting at 913 MHz
DATE TESTED	October 30, 2019
TEST PERFORMED BY	Javier Cardenas
NOTES	

$$OBW = data\ rate + (2 \times frequency\ deviation)$$
$$OBW = 4.8\ + (2 \times 2.5)$$
$$OBW = 9.8\ \text{kHz}$$

24. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ELITE ELECTRONIC ENGINEERING, INC.
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ELECTRICAL

Valid to: June 30, 2021 Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:	Test Method(s)[1]:
Transient Immunity	ISO 7637-2 (including emissions); ISO 7637-3; ISO 16750-2:2012, Sections 4.6.3 and 4.6.4; CS-11979, Section 6.4; CS.00054, Section 5.9; EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222); GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12
Electrostatic Discharge (ESD)	ISO 10605 (2001, 2008); CS-11979 Section 7.0; CS.00054, Section 5.10; EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13; GMW 3097 Section 3.6
Conducted Emissions	CISPR 25 (2002, 2008), Sections 6.2 and 6.3; CISPR 25 (2016), Sections 6.3 and 6.4; CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2; GMW 3097, Section 3.3.2; EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)
Radiated Emissions Anechoic	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CS-11979, Section 5.3; CS.00054, Section 5.6.3; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310)
Vehicle Radiated Emissions	CISPR 12; ICES-002

Test Technology:	Test Method(s) [1]:
Bulk Current Injection (BCI)	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112)
Bulk Current Injections (BCI) *(Closed Loop Method)*	ISO 11452-4; SAE J1113-4
Radiated Immunity Anechoic *(Including Radar Pulse)*	ISO 11452-2; ISO 11452-5; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21
Radiated Immunity Magnetic Field	ISO 11452-8
Radiated Immunity Reverb	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
Vehicle Radiated Immunity (ALSE)	ISO 11451-2
Electrical Loads	ISO 16750-2, Sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, and 4.12
Dielectric Withstand Voltage	MIL-STD-202, Method 301; EIA-364-20D
Insulation Resistance	MIL-STD-202, Method 302; SAE/USCAR-2, Revision 6, Section 5.5.1; EIA-364-21D
Contact Resistance	MIL-STD-202, Method 307; SAE/USCAR-2, Revision 6, Section 5.3.1; EIA/ECA-364-23C; USCAR21-3 Section 4.5.3
DC Resistance	MIL-STD-202, Method 303
Contact Chatter	MIL-STD-202, Method 310; SAE/USCAR-2, Revision 6, Section 5.1.9
Voltage Drop	SAE/USCAR-2, Revision 6, Section 5.3.2; USCAR21-3 Section 4.5.6

Test Technology:	Test Method(s) [1]:
Emissions	
Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KN 11; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KN 32
Current Harmonics	IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2
Flicker and Fluctuations	IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3
Immunity	
Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; IEEE C37.90.2 2004
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011); IEC 61000-4-4 (1995) + A1(2000) + A2(2001); KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008); IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4
Surge	IEC 61000-4-5 (1995) + A1(2000); IEC 61000-4-5, Ed 1.1 (2005-11); EN 61000-4-5 (1995) + A1(2001); KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5; IEEE C37.90.1 2012

Test Technology:	Test Method(s) [1]:
Immunity (cont'd)	
Conducted Immunity	IEC 61000-4-6 (1996) + A1(2000); IEC 61000-4-6, Ed 2.0 (2006-05); IEC 61000-4-6 Ed. 3.0 (2008); KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6; EN 61000-4-6; KN 61000-4-6
Power Frequency Magnetic Field Immunity	IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009); EN 61000-4-8 (1994) + A1(2000); KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8
Voltage Dips, Short Interrupts, and Line Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11
Ring Wave	IEC 61000-4-12, Ed. 2 (2006-09); EN 61000-4-12:2006; IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; EN 50130-4; IEC 61326-1; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC 60601-1-2; JIS T0601-1-2
TxRx EMC Requirements	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19; EN 301 489-52;
European Radio Test Standards	ETSI EN 300 086-1; ETSI EN 300 086-2; ETSI EN 300 113-1; ETSI EN 300 113-2; ETSI EN 300 220-1; ETSI EN 300 220-2; ETSI EN 300 330-1; ETSI EN 300 330-2; ETSI EN 300 440-1; ETSI EN 300 440-2; ETSI EN 300 422-1; ETSI EN 300 422-2; ETSI EN 300 328; ETSI EN 301 893; ETSI EN 301 511; ETSI EN 301 908-1; ETSI EN 908-2; ETSI EN 908-13; ETSI EN 301 413; ETSI EN 302 502

Test Technology:	Test Method(s)[1]:
Canadian Radio Tests	RSS-102 (RF Exposure Evaluation only); RSS-111; RSS-112; RSS-117; RSS-119; RSS-123; RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-191; RSS-192; RSS-194; RSS-195; RSS-196; RSS-197; RSS-199; RSS-210; RSS-211; RSS-213; RSS-215; RSS-216; RSS-220; RSS-222; RSS-236; RSS-238; RSS-243; RSS-244; RSS-246; RSS-247; RSS-251; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN
Mexico Radio Tests	IFT-008; NOM-208-SCFI
Japan Radio Tests	Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18
Taiwan Radio Tests	LP-0002
Australia/New Zealand Radio Tests	AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)
Hong Kong Radio Tests	HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073
Korean Radio Test Standards	KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52
Unlicensed Radio Frequency Devices *(3 Meter Semi-Anechoic Room)*	47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H (using ANSI C63.10:2013, ANSI C63.17:2013 and FCC KDB 905462 D02 (v02))
Licensed Radio Service Equipment	47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101; ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015;
Electrical Measurements and Simulation	
AC Voltage / Current	FAA AC 150/5345-10H
(1mV to 5kV) 60 Hz	FAA AC 150/5345-43J
(0.1V to 250V) up to 500 MHz	FAA AC 150/5345-44K
(1µA to 150A) 60 Hz	FAA AC 150/5345-46E
DC Voltage / Current	FAA AC 150/5345-47C
(1mV to 15kV) / (1µA to 10A)	FAA EB 67D
Power Factor / Efficiency / Crest Factor	
(Power to 30kW)	
Resistance	
(1mΩ to 4000MΩ)	
Surge	
(Up to 10 kV / 5 kA) (Combination Wave and Ring Wave)	

On the following products and materials:
Telecommunications Terminal Equipment (TTE), Radio Equipment, Network Equipment, Information Technology Equipment (ITE), Automotive Electronic Equipment, Automotive Hybrid Electronic Devices, Maritime Navigation and Radio Communication Equipment and Systems, Vehicles, Boats and Internal Combustion Engine Driven Devices, Automotive, Aviation, and General Lighting Products, Medical Electrical Equipment, Motors, Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment, Household Appliances, Electric Tools, Low-voltage Switchgear and Control gear, Programmable Controllers, Electrical Equipment for Measurement, Control and Laboratory Use, Base Materials, Power and Data Transmission Cables and Connectors

[1] When the date, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is expected to be using the current version within one year of the date of publication, per part C., Section 1 of A2LA *R101 - General Requirements - Accreditation of ISO-IEC 17025 Laboratories*.

Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	40000
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
U-NIII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NIII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	40000
BPL Intentional Radiators Part 15G	ANSI C63.10:2013	40000
White Space Device Intentional Radiators Part 15H	ANSI C63.10:2013	40000

Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Commercial Mobile Services (FCC Licensed Radio Service Equipment)		
Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
General Mobile Radio Services (FCC Licensed Radio Service Equipment)		
Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97, and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment)		
Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Maritime and Aviation Radio Services		
Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
Microwave and Millimeter Bands Radio Services		
Parts 25, 30, 74, 90 (above 3 GHz), 97 (above 3 GHz), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Broadcast Radio Services		
Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Signal Boosters		
Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

[2]Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

Accredited Laboratory

A2LA has accredited

ELITE ELECTRONIC ENGINEERING INC.

Downers Grove, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 8th day of August 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.