Engineering Test Report No. 2001248-01	
Report Date	March 18, 2020
Manufacturer Name	Uptime Solutions
Manufacturer Address	3724 Jefferson St Austin, TX 78731
Product Name Brand/Model No.	Model 1000 Model 1000
Date Received	March 6, 2020
Test Dates	March 9, 2020 through March 11, 2020
Specifications	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Digital Modulation Intentional Radiators Operating within the band 2400-2483.5MHz FCC “Code of Federal Regulations” Title 47, Part15, Subpart 15B, Section 15.107 and 15.109 for Receivers Innovation, Science, and Economic Development Canada RSS-247 Innovation, Science, and Economic Development Canada RSS-GEN
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515
Signature	MARK E. LONGINOTTI
Tested by	Mark E. Longinotti
Signature	Raymond J Klouda
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894

Table of Contents

1. Report Revision History

Revision	Date	Description
–	18 March 2020	Initial Release of Engineering Test Report No. 20012480-01
		-

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on two (2) MistLX Model 1000 (hereinafter referred to as the Equipment Under Test (EUTs)). The EUTs were identified as follows:

Description	Part #	S/N
MistLX	Model 1000 MistLX	Sample #1*
MistLX	Model 1000 MistLX	Sample #2*

*- No serial numbers were assigned to the EUTs. Sample #1 was assigned to the unmodified EUT used for all radiated emissions tests. Sample #2 was assigned to the EUT used for all antenna port conducted tests. Sample #2 was modified by placing a coaxial connector at the antenna port so that antenna port conducted tests could be performed.

EUT Identification	
Description	Model 1000
Model/Part No.	Model 1000, MistLX
S/N	None Assigned
Size of EUT	2” in diameter by 1.5” tall
Number of Interconnection Wires	None
Type of Interconnection Wires	N/A
Highest Internal Frequency of the EUT:	2480MHz

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

Description	Model #
Laptop computer	Dell Inspirion 15 3000

3. Test Specification(s)

This document presents the technical information of the EUT as tested to a series of electromagnetic compatibility (EMC) tests. This information is listed as follows:

Applicant FCC FRN Company number (If known)	0024136616
Applicant IC company number (If known)	N/A
FCC ID Number (If known)	2ADT3BA2000
IC UPN number (If Known)	N/A
FCC test site(s) Reg. number	269750
IC test site(s) Reg. number	2987A
FCC Test Speciation	FCC 15.247
RSS number and Issue number	RSS-247 Issue 2, Feb 2017
Frequency band	2402–2480 MHz
Frequency Min (MHz)	2402 BLE
Frequency Mid (MHz)	2426 BLE
Frequency Max (MHz)	2480 BLE
RF power Max (W), Conducted	1.1mW (0.4 dBm)
Field strength, Units @ distance	N/A
Measured BW (kHz)	1070
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	GFSK, π/4-DQPSK BLE
Transmitter spurious, dBµV/m @ 3 m	54.1 dBµV/m @ 3Meters
Emission classification	F1D BLE
Power requirements	3.6 VDC

4. Test Specification(s)

The tests were performed to selected portions of, and in accordance with the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 2400-2483.5 MHz band:

-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"

-ANSI C63.10-2013 “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”

-“Federal Communications Commission Office of Engineering and Technology Laboratory Division, Guidance For Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules” April 2, 2019, KDB 558074 D01 DTS Meas Guidance v05

-RSS-Gen Issue 5, March 2019, Amendment 1, Innovation, Science, and Economic Development Canada, “Spectrum Management and Telecommunications, Radio Standards Specification, General Requirements for Compliance of Radio Apparatus”

-RSS-247 Issue 2, February 2017, Innovation, Science, and Economic Development Canada, “Spectrum Management and Telecommunications, Radio Standards Specification, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”

5. Laboratory Conditions

The temperature at the time of the test was 24°C, and the relative humidity was 19%.

6. Summary

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

Test Description	Results
Transmitter 6dB Bandwidth Test	Conforms
Transmitter 99% Bandwidth Test	Conforms
Transmitter Peak Conducted Output Power Test	Conforms
Transmitter Peak Power Spectral Density Test	Conforms
Transmitter Low Band Edge Test	Conforms
Transmitter EIRP Test	Conforms
Transmitter Duty Cycle Correction Factor Test	N/A
Transmitter Spurious Radiated Emissions Test	Conforms
Transmitter High Band Edge Test	Conforms

7. Test Plan

No test plan was provided. Instructions were provided by personnel from Uptime Solutions and used in conjunction with the FCC 15.247, ISED RSS-247, and ANSI C63.4-10 specifications.

8. Grounding

The EUT was ungrounded during the tests.

9. Firmware/Software

For all tests, the EUT had Production Firmware Version 38 loaded onto the device to provide correct load characteristics.

10. Modifications Made to EUT

No modifications were made to the EUT during the testing.

11. Deviations from Specification(s)

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

12. Modes of Operation

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

12.1. Transmit/Standby

The EUT was energized. The EUT was programmed to continuously transmit separately at each of the following channels:

- Transmit at 2402MHz; 4dBm
- Transmit at 2426MHz; 4dBm
- Transmit at 2480MHz; 4dBm

13. Test Method

The tests were performed using the referenced methods described in the FCC 15.247, ISED RSS-247, and ANSI C63.4-10 test specifications. The specific test sections and specification references are called out in the individual test sections.

14. 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 pre-amplifier 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]

15. Statement of Conformity

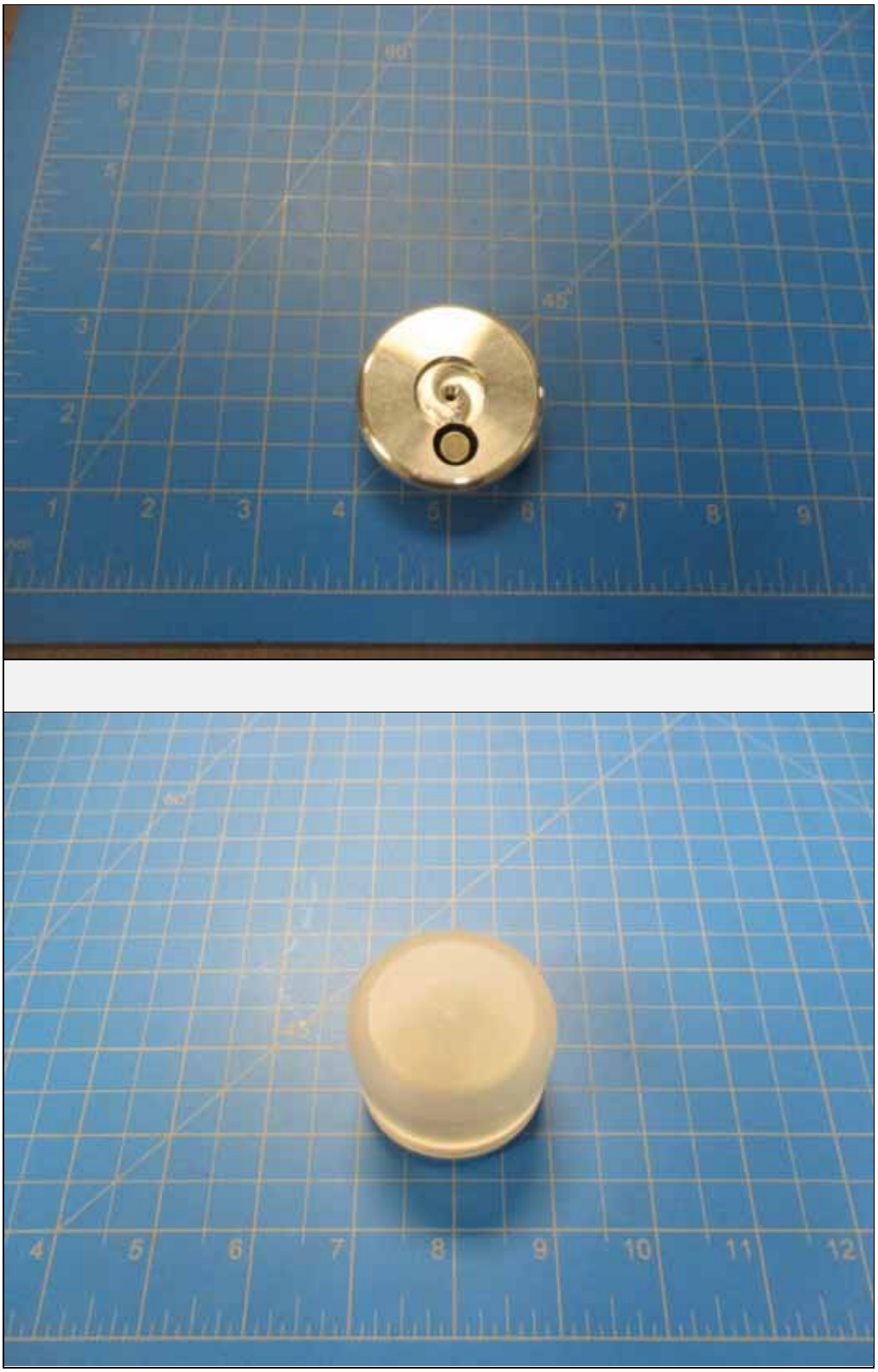
The Uptime Solutions, MistLX, Model No. MistLX Model 1000, did fully conform to the selected requirements of FCC 15.247, ISED RSS-247 and ANSI C63.4-10.

16. 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 15.247, ISED RSS-247, and ANSI C63.4-

10 test specifications. 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.

17. Photographs of EUT

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18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	10/2/2019	10/2/2020
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	4/8/2019	4/8/2020
CDY0	WORKSTATION	ELITE	WORKSTATION		WINDOWS 7	N/A	
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/10/2019	10/10/2020
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	3/22/2018	3/22/2020
RBG0	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101533	10HZ-44GHZ	2/19/2020	2/19/2021
SHC2	Power Supplies	HENGFU	HF60W-SL-24	A11372702	24V	NOTE 1	
XOB2	ADAPTER	HEWLETT PACKARD	K281C,012	09407	18-26.5GHZ	NOTE 1	
XPQ4	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000-O/O	1	4.8-20GHZ	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.

19. Antenna Port Conducted Emissions Tests

Manufacturer	Uptime Solutions
Product	MistLX
Model	MistLX Model 1000
Serial No	Sample #2
Mode	Transmit at 2402MHz, 4dBm Transmit at 2426MHz, 4dBm Transmit at 2480MHz, 4dBm

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	+/- 224kHz
Power Spectral Density	+/- 0.372Hz
RF Output Power, Conducted	+/- 0.349 dB
Unwanted Emissions, Conducted	+/- 1.39 dB
All Emissions Radiated Below 1GHz	+/- 2.629 dB
All Emissions Radiated Above 1GHz	+/- 2.710 dB
Temperature	+/- 0.165 ˚C
Humidity	+/- 1.7% RH
DC and Low Frequency Voltages	+/- 0.115 Volts
Time	+/- 0.05%

Procedures

6dB Bandwidth (DTS Bandwidth)

C63.10-2013 section 11.8 Option 1:

a) The following settings were employed on the EMI Test Receiver:

1. Center Frequency = Transmit Frequency of the EUT
2. Frequency Span = 2 x Occupied Channel Bandwidth
3. RBW = 100kHz
4. VBW = 3 x RBW
5. Detector Mode = Max Peak
6. Trace Mode = Max Hold

b) Allow the trace to stabilize.

c) Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

d) Determine the 6dB down amplitude.

e) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope trace, such that each marker is at or slightly below the 6dB down amplitude determined in step d). If a marker is below this 6dB down amplitude value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers.

Peak Conducted Output Power

C63.10-2013 section 11.9.1.1:

a) The following settings were employed on the EMI Test Receiver:

1. Center Frequency = Transmit Frequency of the EUT
2. RBW ≥ DTS Bandwidth
3. VBW ≥ 3 x RBW
4. Span ≥ 3 x RBW
5. Sweep Time = Auto couple
6. Detector Mode = Max Peak
7. Trace Mode = Max Hold

b) Allow the trace to stabilize.

c) Use the peak marker function to determine the peak amplitude level.

Peak Power Spectral Density

C63.10-20013 section 11.10.2:

a) The following settings were employed on the EMI Test Receiver:

1. Center Frequency = Transmit Frequency of the EUT
2. Frequency Span = At least 1.5 times the OBW
3. RBW = 3kHz ≤ RBW ≤ 100kHz
4. VBW ≥ 3 x RBW
5. Detector Mode = Max Peak
6. Sweep Time = Auto Couple
7. Trace Mode = Max Hold

b) Allow the trace to stabilize.

c) Use the peak marker function to determine the maximum amplitude level within the RBW.

d) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

99% Bandwidth (OBW)

C63.10-2013 section 6.9.3:

a) The following settings were employed on the EMI Test Receiver:

1. Center Frequency = Transmit Frequency of the EUT
2. Frequency Span = Between 1.5 and 5 times the OBW
3. RBW = Between 1% to 5% of the OBW
4. VBW = Approximately 3 x RBW
5. Steps 1) through 4) might require iterations to adjust within the specified range
6. Detector Mode = Max Peak
7. Trace Mode = Max Hold

b) Allow the trace to stabilize.

c) Use the 99% power bandwidth function of the EMI receiver.

Low Band Edge

C63.10-2013 section 11.11:

a) Reference Level Measurement

1. Start Frequency = 2400MHz
2. Stop Frequency = 2483.5MHz
3. RBW = 100kHz
4. VBW ≥ 3 x RBW
5. Detector Mode = Max Peak
6. Trace Mode = Max Hold
7. Sweep Time = Auto

b) Allow the trace to stabilize

c) Use the peak marker function to determine the maximum level

d) Emission Level Measurement

1. Start Frequency = 2310MHz
2. Stop Frequency = 2483.5MHz
3. RBW = 100kHz
4. VBW ≥ 3 x RBW
5. Detector Mode = Max Peak
6. Trace Mode = Max Hold
7. Sweep Time = Auto

e) Allow the trace to stabilize

f) Use the peak marker function to determine the maximum level

g) The two sweeps were combined and plotted.

h) Ensure that the amplitude of all unwanted emissions is attenuated by at least the minimum requirements.

FCC Part 47 §15.247 2400-2483.5 MHz

DUT Information

DUT Name: MISTLX
Manufacturer: UPTIME SOLUTIONS
Serial Number:
Hardware Rev:
Software Rev:
Comment:

Frequencies
2402 MHz (2402 MHz) 2426 MHz (2426 MHz) 2480 MHz (2480 MHz)

Bandwidths
2 MHz (2 MHz)

Power
4.000 dBm (4 dBm)

Beamforming Gain
4.000 dBm (4 dBm) ---

DUT Settings

No. of transmission chains	1
Equipment Type	Other
Digital Modulation	Yes
Frequency Hopping	No

Hardware Setup: WMS Measurements\TS8997

Spectrum Analyzer:	SA ESW 44 (SA ESW 44) @ VISA (ADR TCPIP::192.168.48.148::inst0::instr), SN 1328.4100K44/101533, FW 1.50 SP1
Vector Generator:	VG SMBV100A (VG SMBV100A) @ VISA (ADR TCPIP::192.168.48.149::inst0::instr), SN 260452, FW 3.1.18.2-3.01.130.48.1
Generator:	SMB100A (SMB100A) @ VISA (ADR TCPIP::192.168.48.150::inst0::instr)
OSP:	OSP-B157W (OSP-B157W) @ VISA (ADR TCPIP::192.168.48.157::inst0::instr), SN 1527.1144, FW 1.24.0.10

Minimum Emission Bandwidth 6 dB (2402 MHz; 4.000 dBm; 2 MHz)

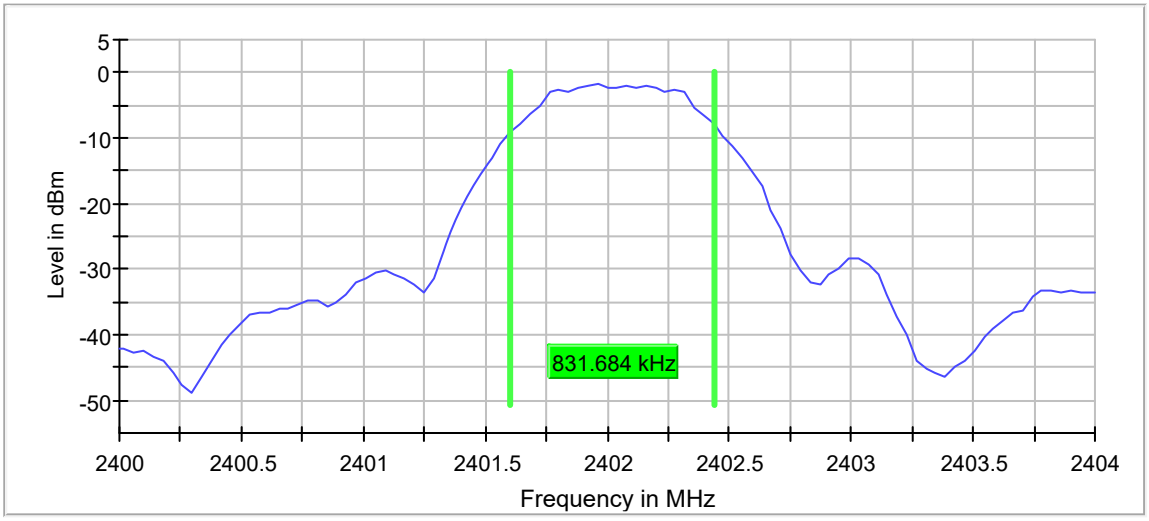
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	0.831684	0.500000	---	2401.603960	2402.435644

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2402.000000	-1.8	PASS

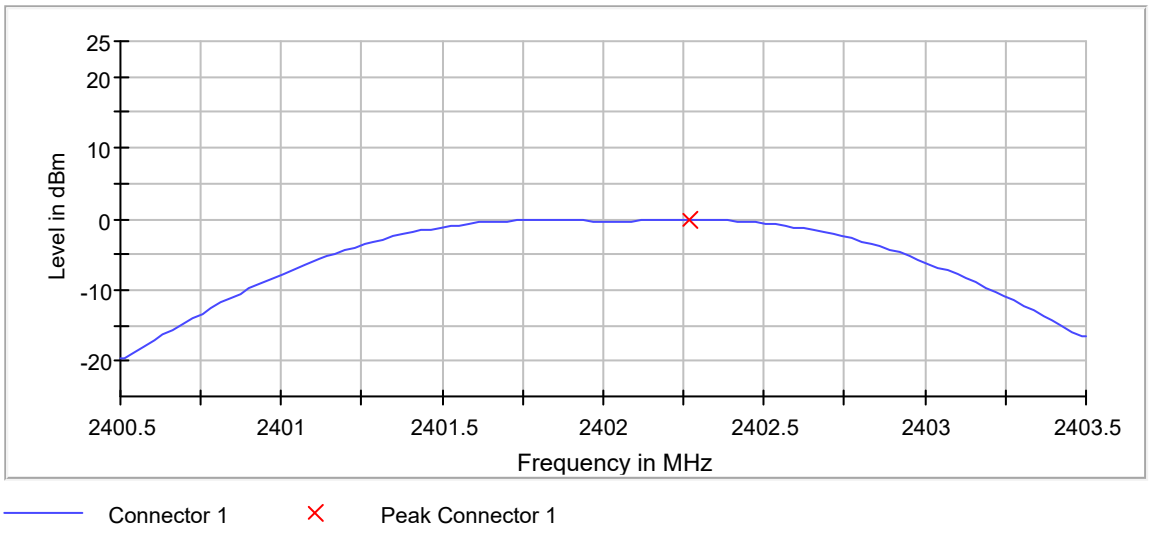


Peak output power (Sweep) (2402 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.9.1.1

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402.000000	-0.2	30.0	PASS

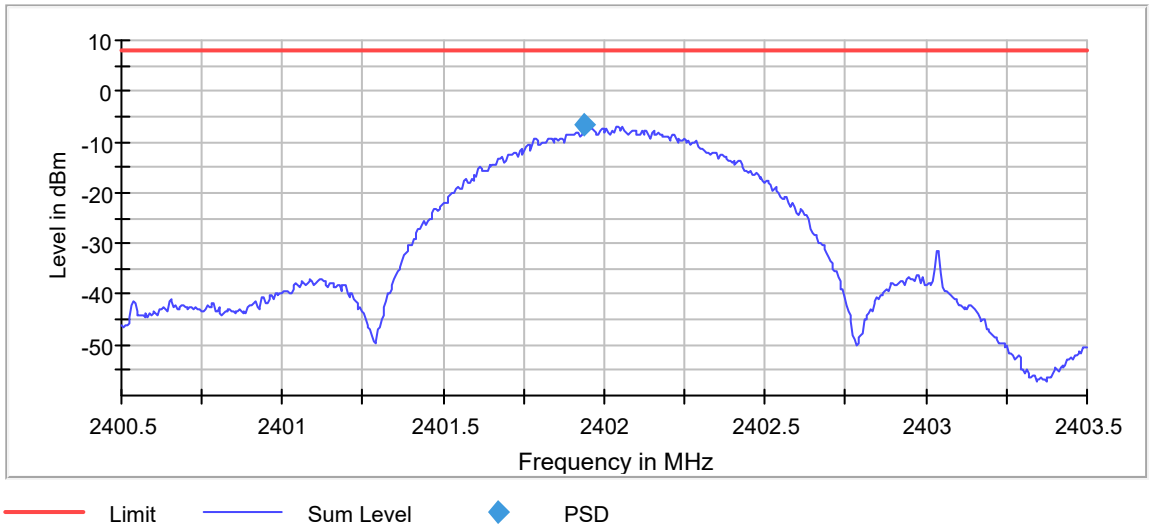


Peak Power Spectral Density (2402 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(a),(e), KDB 558074 D01 DTS Meas Guidance v05 F and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	2401.937500	-6.479	8.0	PASS



Occupied Channel Bandwidth 99% (2402 MHz; 4.000 dBm; 2 MHz)

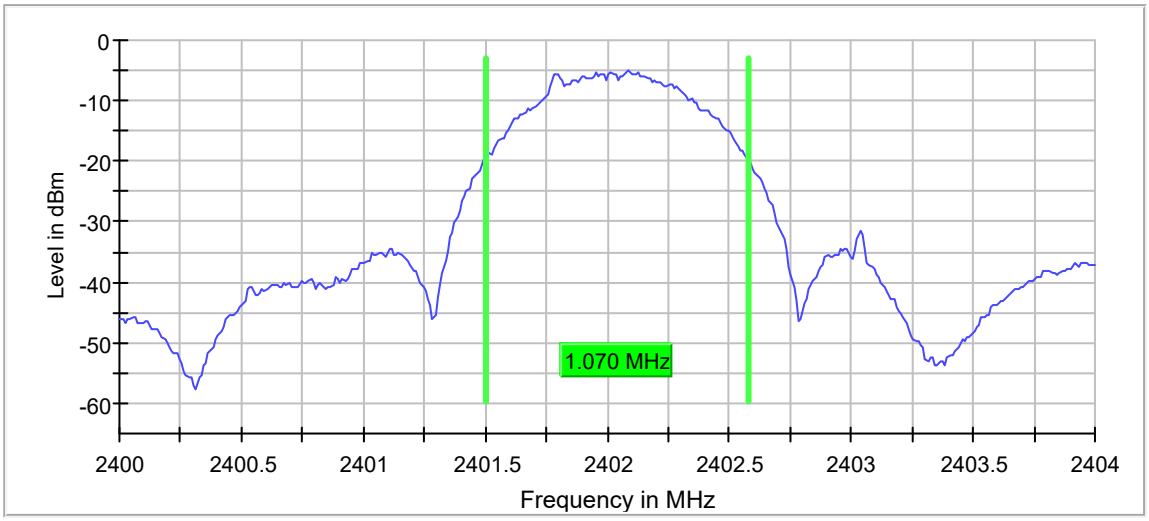
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	1.070000	---	---	2401.505000	2402.575000

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2402.000000	PASS



Band Edge low (2402 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 8.7 and ANSI C63.10-2013

Result

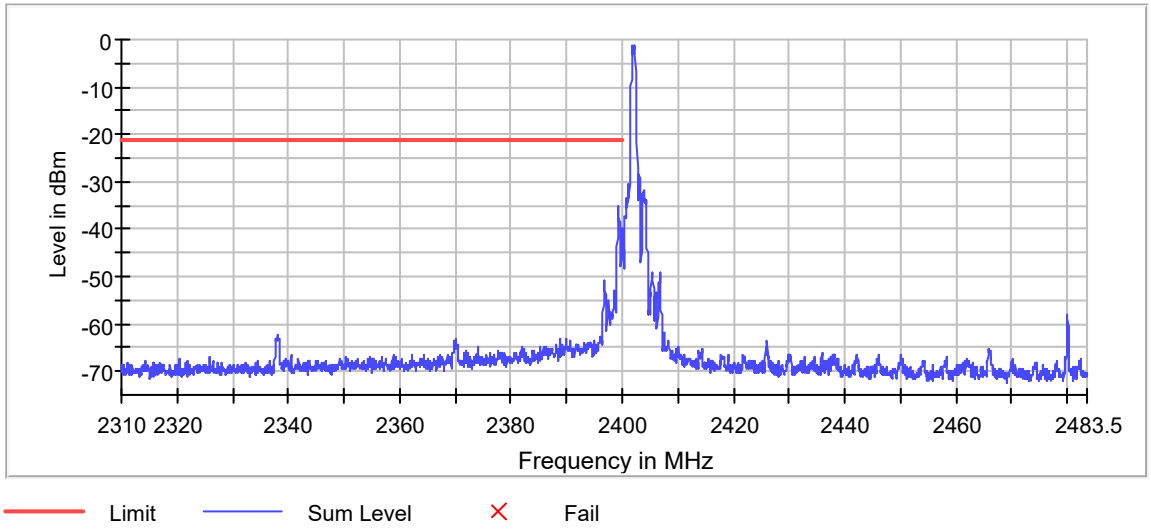
DUT Frequency (MHz)	Result
2402.000000	PASS

Inband Peak

Frequency (MHz)	Level (dBm)
2402.275000	-1.2

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.275000	-35.1	13.8	-21.2	PASS
2399.325000	-35.3	14.1	-21.2	PASS
2399.225000	-36.4	15.2	-21.2	PASS
2399.425000	-37.9	16.7	-21.2	PASS
2399.375000	-37.9	16.7	-21.2	PASS
2399.475000	-38.6	17.3	-21.2	PASS
2399.525000	-39.7	18.5	-21.2	PASS
2399.975000	-40.0	18.8	-21.2	PASS
2399.175000	-40.4	19.2	-21.2	PASS
2399.575000	-41.2	19.9	-21.2	PASS
2399.925000	-41.9	20.6	-21.2	PASS
2399.125000	-42.0	20.8	-21.2	PASS
2399.625000	-42.2	21.0	-21.2	PASS
2399.875000	-43.0	21.8	-21.2	PASS
2399.075000	-43.6	22.4	-21.2	PASS



Minimum Emission Bandwidth 6 dB (2426 MHz; 4.000 dBm; 2 MHz)

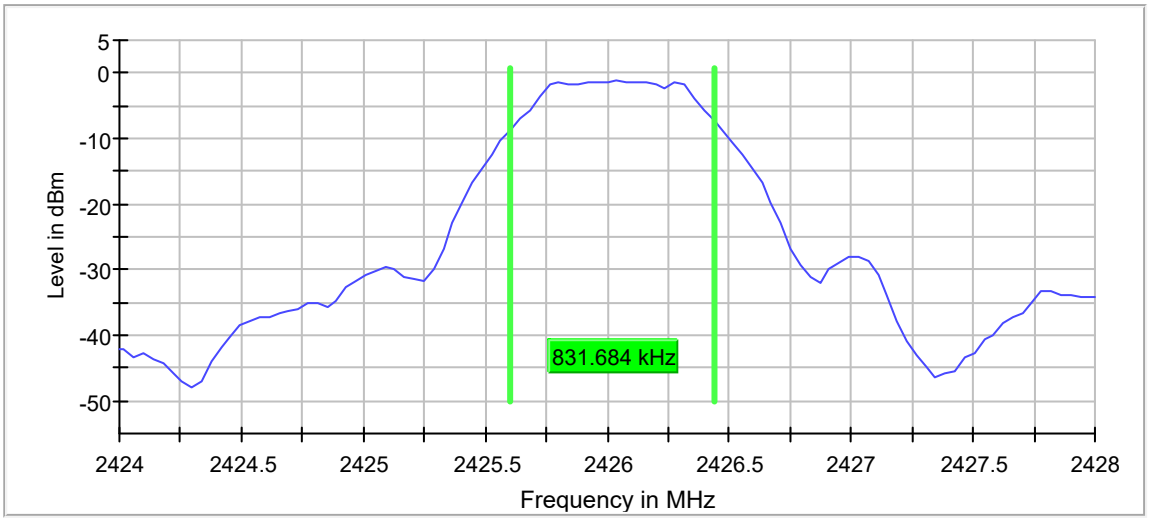
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2426.000000	0.831684	0.500000	---	2425.603960	2426.435644

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2426.000000	-1.2	PASS

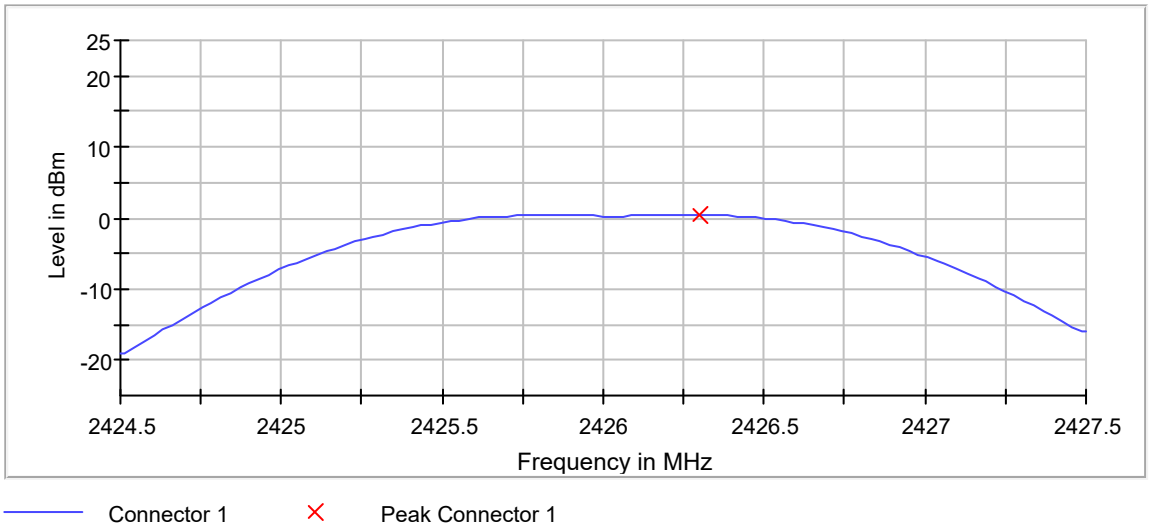


Peak output power (Sweep) (2426 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.9.1.1

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2426.000000	0.4	30.0	PASS

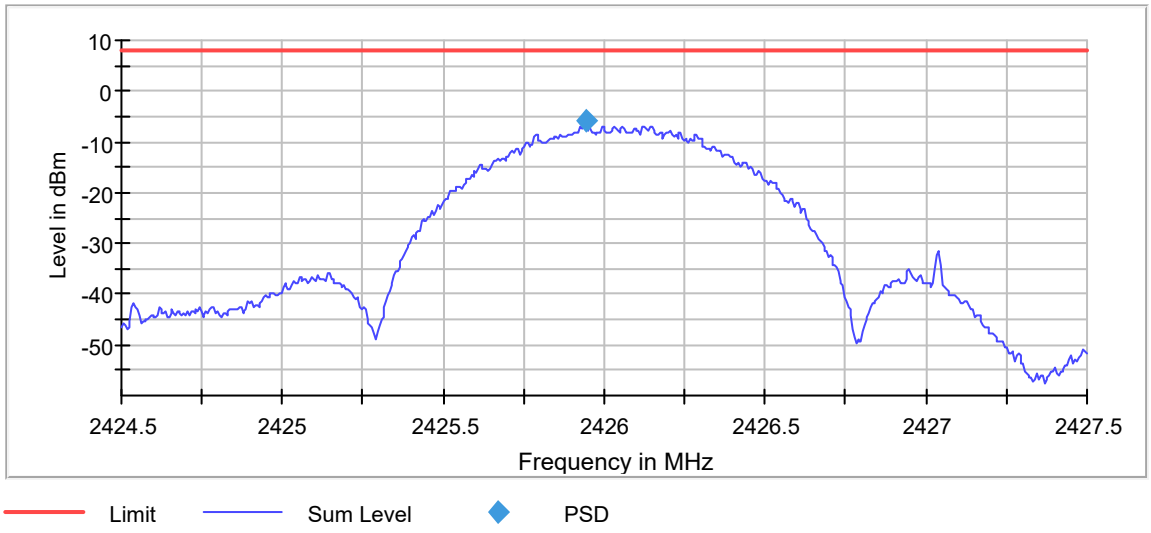


Peak Power Spectral Density (2426 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(a),(e), KDB 558074 D01 DTS Meas Guidance v05 F and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2426.000000	2425.942500	-5.852	8.0	PASS



Occupied Channel Bandwidth 99% (2426 MHz; 4.000 dBm; 2 MHz)

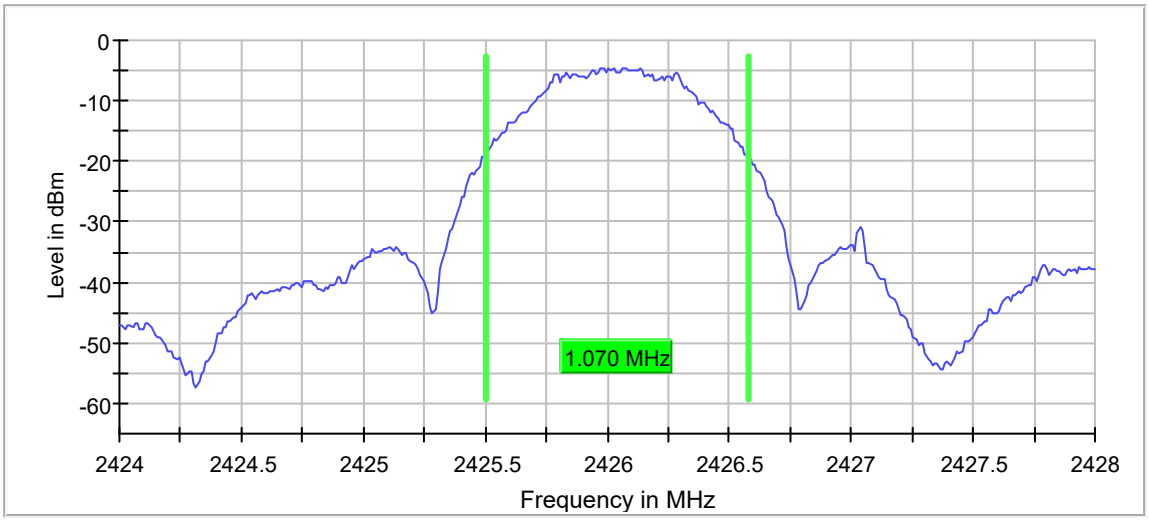
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2426.000000	1.070000	---	---	2425.505000	2426.575000

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2426.000000	PASS



Minimum Emission Bandwidth 6 dB (2480 MHz; 4.000 dBm; 2 MHz)

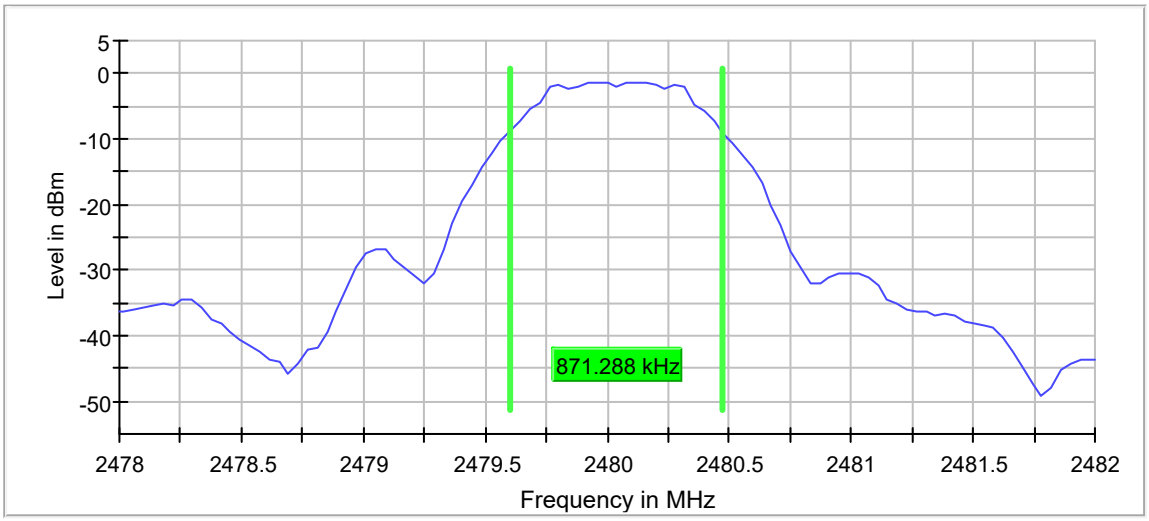
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	0.871288	0.500000	---	2479.603960	2480.475248

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2480.000000	-1.3	PASS

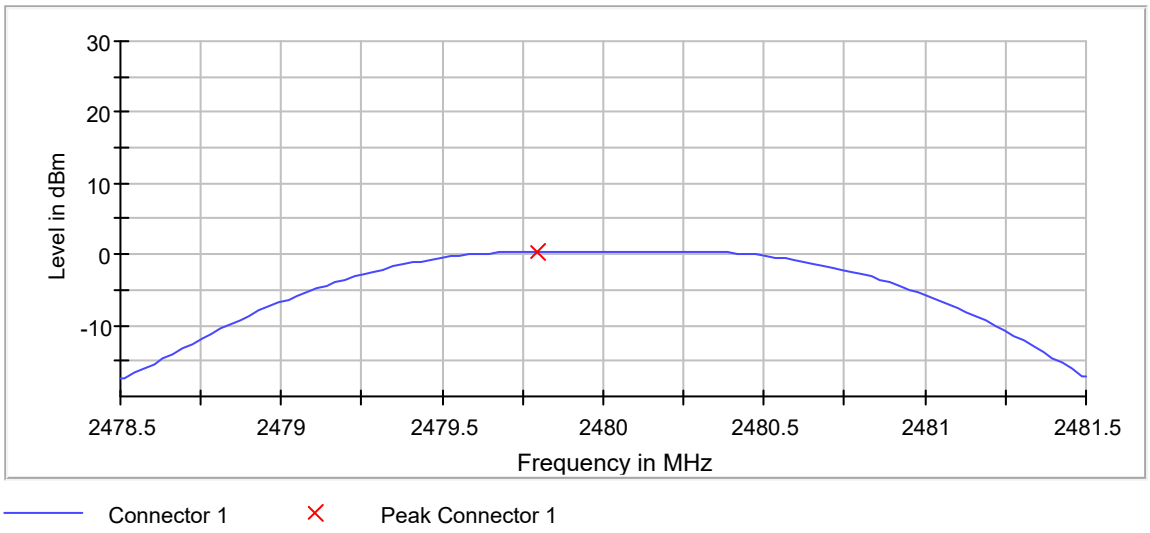


Peak output power (Sweep) (2480 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.9.1.1

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2480.000000	0.4	30.0	PASS

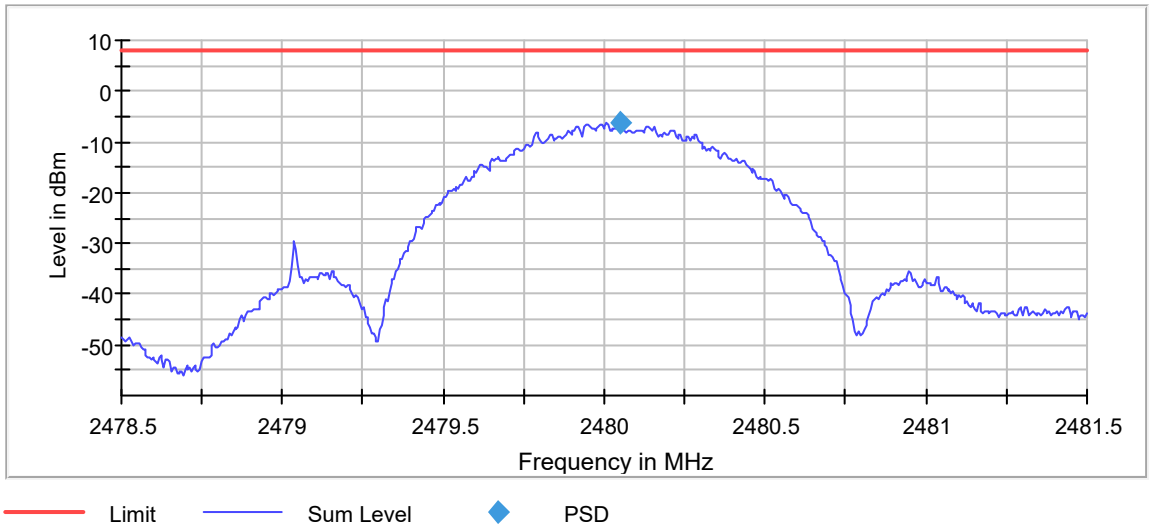


Peak Power Spectral Density (2480 MHz; 4.000 dBm; 2 MHz)

Test according to FCC title 47 part 15 §15.247(a),(e), KDB 558074 D01 DTS Meas Guidance v05 F and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	2480.052500	-6.204	8.0	PASS



Occupied Channel Bandwidth 99% (2480 MHz; 4.000 dBm; 2 MHz)

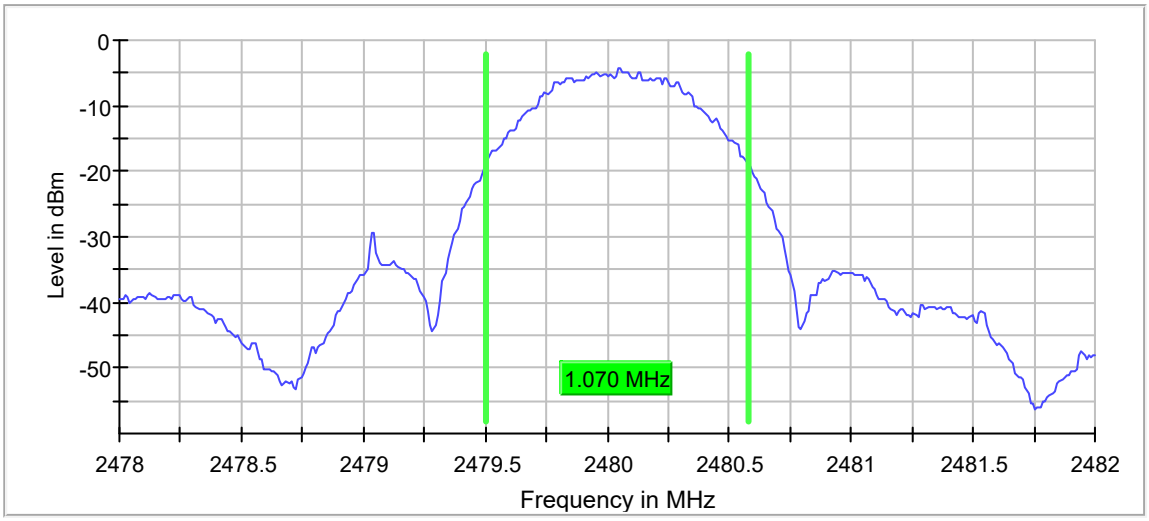
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	1.070000	---	---	2479.505000	2480.575000

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2480.000000	PASS



20. Radiated Emissions Tests

Manufacturer	Uptime Solutions
Product	MistLX
Model	MistLX Model 1000
Serial No	Sample #1
Mode	Transmit at 2402MHz, 4dBm Transmit at 2426MHz, 4dBm Transmit at 2480MHz, 4dBm

Information	
Setup Format	Tabletop
Height of Support (radiated spurious emissions)	80cm below 1GHz; 1.5M above 1GHz
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Highest Internal Frequency of the EUT:	2480 MHz BLE transmitter
Highest Measurement Frequency:	25GHz
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

EIRP

C63.10-2013 Annex G:

The EUT was placed on a 1.5 meter high non-conductive stand and set to transmit. A double ridged waveguide antenna was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 6dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The equivalent power was determined using equation G.1 in C63.10 to convert field intensity levels measured at 3 meters into EIRP readings.

Radiated Emissions in Non-Restricted Bands

C63.10-2013 Section 11.11

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 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

a) The field strength of the fundamental was 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 with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.

b) The field strengths of all of the harmonics not in the restricted band 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 with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.

c) 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 axis to ensure the maximum readings were recorded for the EUT.

d) All harmonics not in the restricted bands must be at least 20 dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.

Radiated Emissions in Restricted Bands

C63.10-2013 Section 11.12

a) The field strengths of all emissions below 1 GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.

b) The field strengths of all emissions above 1 GHz were 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 with a resolution bandwidth of 1 MHz was used on the spectrum analyzer.

c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:

   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 axis to ensure the maximum readings were recorded for the EUT.

d) For all radiated emissions measurements below 1 GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1 GHz, the peak readings must comply with the 15.35(b) limits. 15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).

f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken.

High Band Edge

C63.10-2013 section 11.12:

1) The EUT was set to transmit continuously at the channel closest to the high band-edge
2) A double ridged waveguide was placed 3 meters away from the EUT. The antenna was connected to the input of a spectrum analyzer.
3) The center frequency of the analyzer was set to the high band edge (2483.5MHz)
4) The resolution bandwidth was set to 1MHz.
5) To ensure that the maximum or worst case emission level was measured, the following steps were taken:

   a. The EUT was rotated so that all of its 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.

6) The highest measured peak reading was recorded.
7) The highest measured average reading was recorded.

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : See Below
Test Specification : FCC-15.247, RSS-247 Peak EIRP
Date : March 10, 2020
Test Distance : 3 meters
Notes : Peak Detector with 1MHz Resolution Bandwidth

Transmit at 2402MHz

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	EIRP (dBm)	Limit (dBm)	Margin (dBm)
2402.00	H	45.7	3.4	32.2	0.0	81.3	-13.7	36.0	-49.7
2402.00	V	47.2	3.4	32.2	0.0	82.8	-12.2	36.0	-48.2

Transmit at 2426MHz

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	EIRP (dBm)	Limit (dBm)	Margin (dBm)
2426.00	H	45.5	3.5	32.2	0.0	81.1	-13.9	36.0	-49.9
2426.00	V	48.1	3.5	32.2	0.0	83.8	-11.2	36.0	-47.2

Transmit at 2480MHz

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	EIRP (dBm)	Limit (dBm)	Margin (dBm)
2480.00	H	45.0	3.5	32.3	0.0	80.8	-14.2	36.0	-50.2
2480.00	V	45.5	3.5	32.3	0.0	81.3	-13.7	36.0	-49.7

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2402MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4804.00	H	51.9		4.8	34.2	-40.2	50.7	342.5	5000.0	-23.3
4804.00	V	52.7		4.8	34.2	-40.2	51.5	375.5	5000.0	-22.5
12010.00	H	48.9	Ambient	8.0	38.7	-39.7	55.9	621.9	5000.0	-18.1
12010.00	V	49.2	Ambient	8.0	38.7	-39.7	56.2	643.8	5000.0	-17.8
19216.00	H	32.8	Ambient	2.2	40.4	-28.8	46.6	213.9	5000.0	-27.4
19216.00	V	34.5	Ambient	2.2	40.4	-28.8	48.3	260.1	5000.0	-25.7

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2402MHz
Test Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Average Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4804.00	H	43.0		4.8	34.2	-40.2	41.8	122.9	500.0	-12.2
4804.00	V	45.2		4.8	34.2	-40.2	44.0	158.4	500.0	-10.0
12010.00	H	34.3	Ambient	8.0	38.7	-39.7	41.3	115.8	500.0	-12.7
12010.00	V	33.7	Ambient	8.0	38.7	-39.7	40.7	108.1	500.0	-13.3
19216.00	H	18.6	Ambient	2.2	40.4	-28.8	32.4	41.7	500.0	-21.6
19216.00	V	19.6	Ambient	2.2	40.4	-28.8	33.4	46.8	500.0	-20.6

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2402MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions not in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 100kHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2402.00	H	45.7		3.4	32.2	0.0	81.3	11639.8		
2402.00	V	47.2		3.4	32.2	0.0	82.8	13833.9		
7206.00	H	41.0		6.1	35.9	-40.1	43.0	140.6	5000.0	-31.0
7206.00	V	44.8		6.1	35.9	-40.1	46.8	217.7	5000.0	-27.2
9608.00	H	38.3	Ambient	6.8	36.8	-39.6	42.4	131.2	5000.0	-31.6
9608.00	V	38.1	Ambient	6.8	36.8	-39.6	42.2	128.2	5000.0	-31.8
14412.00	H	38.9	Ambient	8.7	39.6	-40.0	47.2	229.0	5000.0	-26.8
14412.00	V	38.6	Ambient	8.7	39.6	-40.0	46.9	221.2	5000.0	-27.1
16814.00	H	37.8	Ambient	9.4	42.0	-38.9	50.3	327.1	5000.0	-23.7
16814.00	V	38.7	Ambient	9.4	42.0	-38.9	51.2	362.8	5000.0	-22.8
21618.00	H	22.6	Ambient	2.2	40.6	-28.9	36.5	67.0	5000.0	-37.5
21618.00	V	23.3	Ambient	2.2	40.6	-28.9	37.2	72.6	5000.0	-36.8
24020.00	H	24.3	Ambient	2.2	40.6	-30.2	36.9	70.4	5000.0	-37.0
24020.00	V	23.9	Ambient	2.2	40.6	-30.2	36.5	67.2	5000.0	-37.4

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2426MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4852.00	H	51.8		4.9	34.1	-40.2	50.6	337.1	5000.0	-23.4
4852.00	V	52.5		4.9	34.1	-40.2	51.3	365.4	5000.0	-22.7
7278.00	H	49..94		6.1	35.9	-40.1	2.0	1.3	5000.0	-72.0
7278.00	V	51.2		6.1	35.9	-40.1	53.2	458.6	5000.0	-20.8
12130.00	H	50.6	Ambient	8.0	38.7	-39.6	57.6	760.7	5000.0	-16.4
12130.00	V	50.2	Ambient	8.0	38.7	-39.6	57.2	724.8	5000.0	-16.8
19408.00	H	33.4	Ambient	2.2	40.4	-28.7	47.3	231.4	5000.0	-26.7
19408.00	V	34.3	Ambient	2.2	40.4	-28.7	48.2	256.7	5000.0	-25.8

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2426MHz
Test Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Average Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4852.00	H	43.8		4.9	34.1	-40.2	42.6	134.2	500.0	-11.4
4852.00	V	44.4		4.9	34.1	-40.2	43.2	143.8	500.0	-10.8
7278.00	H	34.54		6.1	35.9	-40.1	36.5	67.1	500.0	-17.4
7278.00	V	36.4		6.1	35.9	-40.1	38.4	83.1	500.0	-15.6
12130.00	H	34.8	Ambient	8.0	38.7	-39.6	41.8	122.9	500.0	-12.2
12130.00	V	34.8	Ambient	8.0	38.7	-39.6	41.8	122.9	500.0	-12.2
19408.00	H	18.6	Ambient	2.2	40.4	-28.7	32.5	42.1	500.0	-21.5
19408.00	V	18.9	Ambient	2.2	40.4	-28.7	32.8	43.6	500.0	-21.2

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2426MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions not in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 100kHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2426.00	H	45.5		3.5	32.2	0.0	81.1	11397.5		
2426.00	V	48.1		3.5	32.2	0.0	83.8	15410.2		
9704.00	H	39.3	Ambient	6.9	36.9	-39.6	43.6	151.0	5000.0	-30.4
9704.00	V	38.9	Ambient	6.9	36.9	-39.6	43.1	143.4	5000.0	-30.9
14556.00	H	39.4	Ambient	8.8	39.7	-40.1	47.7	243.4	5000.0	-26.3
14556.00	V	39.2	Ambient	8.8	39.7	-40.1	47.5	237.6	5000.0	-26.5
16982.00	H	39.8	Ambient	9.5	42.0	-38.7	52.5	421.6	5000.0	-21.5
16982.00	V	39.9	Ambient	9.5	42.0	-38.7	52.6	427.5	5000.0	-21.4
21834.00	H	22.7	Ambient	2.2	40.6	-29.2	36.3	65.0	5000.0	-37.7
21834.00	V	23.4	Ambient	2.2	40.6	-29.2	37.0	70.5	5000.0	-37.0
24260.00	H	23.6	Ambient	2.2	40.6	-30.5	36.0	62.9	5000.0	-38.0
24260.00	V	23.1	Ambient	2.2	40.6	-30.5	35.5	59.4	5000.0	-38.5

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4960.00	H	52.5		4.9	34.1	-40.3	51.3	366.9	5000.0	-22.7
4960.00	V	54.4		4.9	34.1	-40.3	53.1	451.9	5000.0	-20.9
7440.00	H	52.1		6.2	35.8	-40.0	54.1	508.1	5000.0	-19.9
7440.00	V	51.1		6.2	35.8	-40.0	53.1	450.7	5000.0	-20.9
12400.00	H	48.6	Ambient	8.0	38.6	-39.5	55.7	609.8	5000.0	-18.3
12400.00	V	49.2	Ambient	8.0	38.6	-39.5	56.3	651.9	5000.0	-17.7
19840.00	H	33.3	Ambient	2.2	40.4	-28.4	47.5	238.3	5000.0	-26.4
19840.00	V	34.2	Ambient	2.2	40.4	-28.4	48.4	264.3	5000.0	-25.5
22320.00	H	33.2	Ambient	2.2	40.6	-29.3	46.7	216.7	5000.0	-27.3
22320.00	V	35.0	Ambient	2.2	40.6	-29.3	48.5	266.6	5000.0	-25.5

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Average Radiated Emissions in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Average Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4960.00	H	41.8		4.9	34.1	-40.3	40.6	106.8	500.0	-13.4
4960.00	V	47.0		4.9	34.1	-40.3	45.8	194.1	500.0	-8.2
7440.00	H	40.93		6.2	35.8	-40.0	42.9	139.8	500.0	-11.1
7440.00	V	42.1		6.2	35.8	-40.0	44.0	159.4	500.0	-9.9
12400.00	H	32.7	Ambient	8.0	38.6	-39.5	39.8	97.2	500.0	-14.2
12400.00	V	33.5	Ambient	8.0	38.6	-39.5	40.6	107.0	500.0	-13.4
19840.00	H	18.7	Ambient	2.2	40.4	-28.4	32.9	44.4	500.0	-21.0
19840.00	V	19.6	Ambient	2.2	40.4	-28.4	33.8	49.2	500.0	-20.1
22320.00	H	18.8	Ambient	2.2	40.6	-29.3	32.3	41.3	500.0	-21.7
22320.00	V	20.5	Ambient	2.2	40.6	-29.3	34.0	50.2	500.0	-20.0

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions not in Restricted Bands
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 100kHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2480.00	H	45.0		3.5	32.3	0.0	80.8	10984.7		
2480.00	V	45.5		3.5	32.3	0.0	81.3	11662.4		
9920.00	H	40.1	Ambient	7.0	37.1	-39.5	44.7	171.6	5000.0	-29.3
9920.00	V	41.4	Ambient	7.0	37.1	-39.5	45.9	197.9	5000.0	-28.0
14880.00	H	38.7	Ambient	8.9	39.8	-40.4	47.0	224.2	5000.0	-27.0
14880.00	V	38.7	Ambient	8.9	39.8	-40.4	47.0	224.2	5000.0	-27.0
17360.00	H	38.7	Ambient	9.7	41.7	-39.1	51.0	353.3	5000.0	-23.0
17360.00	V	38.6	Ambient	9.7	41.7	-39.1	50.9	349.3	5000.0	-23.1
24800.00	H	21.6	Ambient	2.2	40.6	-31.2	33.3	46.1	5000.0	-40.7
24800.00	V	21.8	Ambient	2.2	40.6	-31.2	33.5	47.2	5000.0	-40.5

Total (dBuV/m) = Meter Reading + CBL FAC + Ant Fac + Pre Amp

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Peak Radiated Emissions at High Band Edge
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Peak Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	16.7		3.5	32.3	0.0	52.5	423.4	5000.0	-21.4
2483.50	V	16.4		3.5	32.3	0.0	52.2	409.0	5000.0	-21.7

Manufacturer : Uptime Solutions
Test Item : MistLX
Model No. : MistLX Model 1000
Mode : Transmit at 2480MHz
Test Specification : FCC-15.247, RSS-247 Average Radiated Emissions at High Band Edge
Date : March 10, 2020 and March 11, 2020
Test Distance : 3 meters
Notes : Average Detector with 1MHz Resolution Bandwidth

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	3.0		3.5	32.3	0.0	38.8	87.4	500.0	-15.1
2483.50	V	3.2		3.5	32.3	0.0	39.0	89.5	500.0	-14.9

21. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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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

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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 15-kV) / (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.