FCC PART 15, SUBPART C
ISEDC RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Minetec Pty Ltd

Unit 2, 29 Wellard Street
Bibra Lake, WA 6163, Australia

FCC ID: 2AVQP-M1010512
IC: 25823-M1010512

Report Type: Original Report	**Product Type:** Wireless Ranging and Data Transceiver Device
Prepared By:	Deepak Mishra Test Engineer
Report Number:	R2012073-247
Report Date:	2022-10-26
Reviewed By:	Christian McCaig RF Project Engineer
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162, Fax: (408) 732-9164	

ACCREDITED
CERTIFICATE #3297.02

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2012073-247	Original Report	2022-10-26

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report was prepared on behalf of *Minetec Pty Ltd.*, and their product model: M1010512-001, Caterpillar Part number: 5918506, FCC ID: 2AVQP-M1010512, IC: 25823-M1010512, or the "EUT" as referred to in this report. The EUT is a Mobile node which uses CSIRO's Wireless Ad-hoc System for Positioning (WASP) including Time of Arrival (ToA) techniques using 5.8GHz (for WASP) and 2.4GHz (data communications) designed for harsh mining environment. The 2.4 GHz radio module has been pre-certified with FCC ID: 2AVQP-G2M5477, IC: 25823-G2M5477. The 5.8 GHz radio module has been pre-certified with FCC ID: 2AVQP-M1010802; IC: 25823-M1010802.

1.2 Mechanical Description of EUT

The UUT measures approximately 110 mm (L) x 75 mm (W) x 60 mm (H) and weighs approximately 655 g.

1.3 Objective

This report was prepared on behalf of *Minetec Pty Ltd.*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and ISEDC RSS-247 Issue 2, February 2017.

The objective was to determine compliance with FCC Part 15.247 and ISEDC RSS-247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v05r2: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Power Spectral Density, conducted	±1.48dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 ° C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2017 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2017 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2017 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical

Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03)*** to certify

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)

- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISEDC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
  - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v05r02.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test software used was QCMBR provided by *Minetec Pty Ltd.*, the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting
QPSK	5734.375	35
	5780.077	35
	5841.013	35
802.11b	2412	Default
	2437	Default
	2462	Default
802.11g	2412	Default
	2437	Default
	2462	Default

2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v05r02 section 6.0:

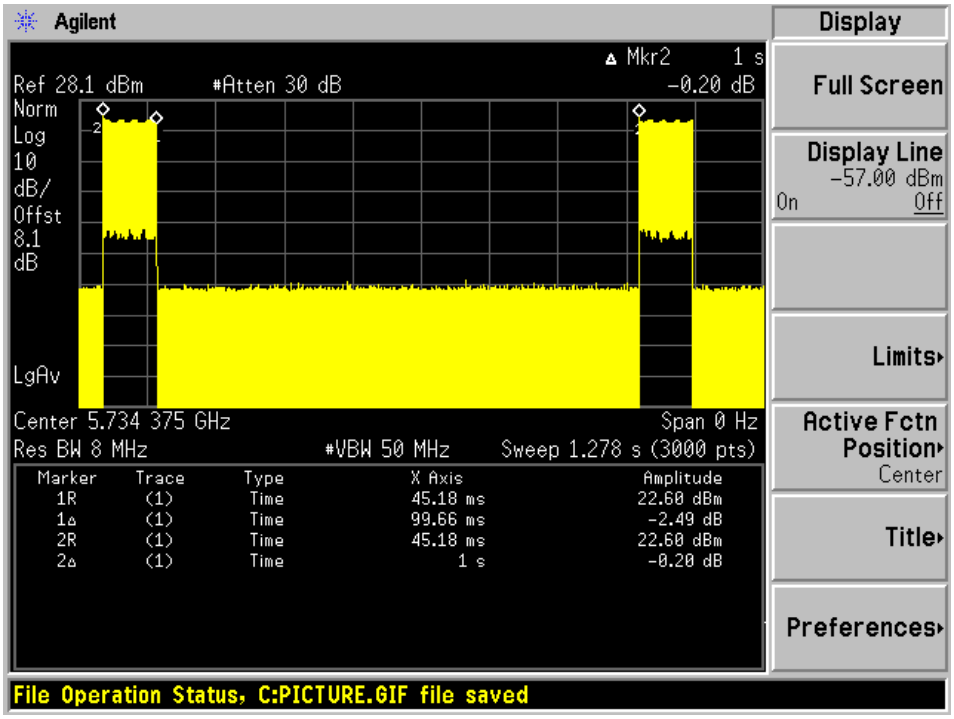
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

Radio Mode	Total On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
QPSK	99.66	1000	9.966	10
802.11b	4.183	4.255	98.3	0.074
802.11g	0.673	0.769	87.5	0.579

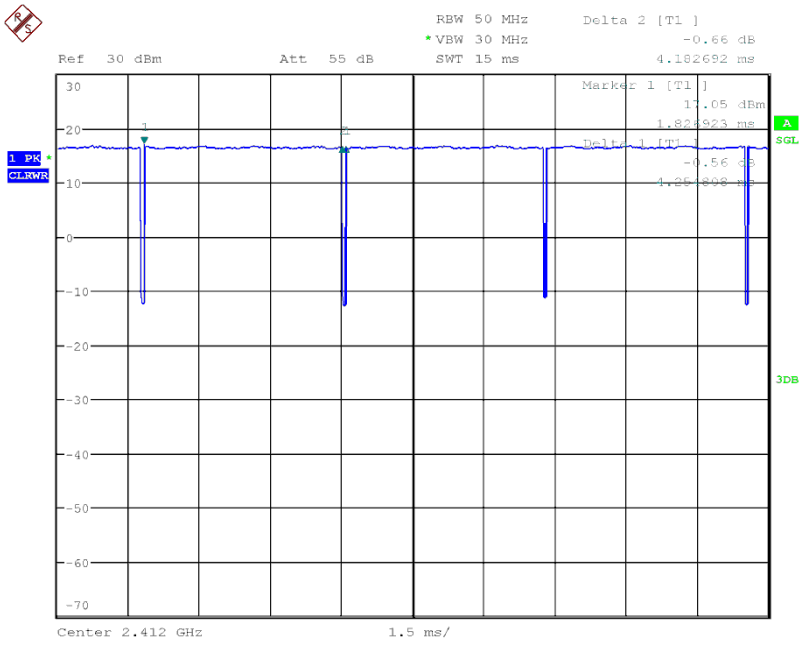
Duty Cycle = On Time (ms)/ Period (ms)
Duty Cycle Correction Factor (dB) = 10*log(1/Duty Cycle)

Please refer to the following plots.

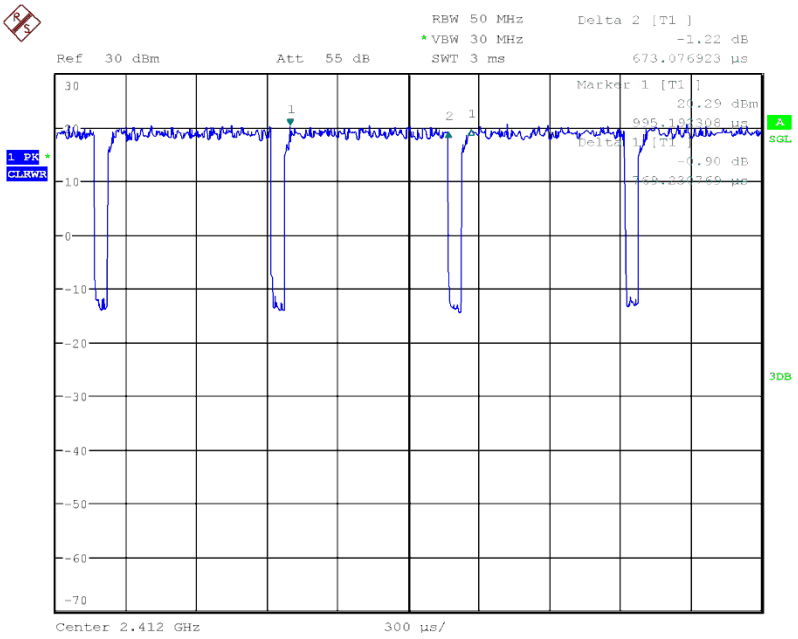
QPSK



802.11b mode



802.11g mode



2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model	S/N
Dell	Laptop	Latitude E7450	-
Volteq	DC Power Supply	HY5003D	160402343

2.6 Remote Support Equipment

Manufacturer	Description	Model	S/N
Minetec	Vehicle PC	M1011057	1806-2592

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

Results reported relate only to the product tested.

FCC and ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirement	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	N/A[1]
FCC §2.1091, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §2.1053, §15.205, §15.209, §15.247 (d) ISEDC RSS-247 §5.5 ISEDC RSS-Gen §8.9 and §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISEDC RSS-247 §5.2 (1)	6 dB and 99% Emission Bandwidth	Compliant[2,3]
FCC §15.247(b)(3) ISEDC RSS-247 §5.4 (4)	Maximum Peak Output Power	Compliant[2,3]
FCC §15.247(d) ISEDC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant[2,3]
FCC §15.247(e) ISEDC RSS-247 §5.2 (2)	Power Spectral Density	Compliant[2,3]

Note[1]: the device is powered by DC Source.
Note[2]: the Mobile Node (EUT) shares the same daughter board (contains the 5.8 GHz radio) as Personal Node (FCC ID: 2AVQP-M1010802; IC: 25823-M1010802). The 5.8 GHz DTS radio test results from the antenna port are recorded in Report: R2005264-247 for FCC ID: 2AVQP-M1010802; IC: 25823-M1010802.
Note[3]: Based on KDB 484596 D01, 2.4GHz data leveraged from pre-certified radio module (FCC ID: 2AVQP-G2M5477, IC: 25823-G2M5477) test report.

BACL is responsible for all the information provided in this report, except when information is provided by the customer as identified in this report. Information provided by the customer, e.g., antenna gain, can affect the validity of results.

4 FCC §15.203 & ISEDC RSS-Gen §6.8 - Antenna Requirements

4.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to ISEDC RSS-Gen §6.8: Transmitter Antenna

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

4.2 Antenna Description

All antennas used are internal, and not accessible to the end users.

Manufacturer	Model Number	Frequency Range (MHz)	Antenna Type	Maximum Antenna Gain (dBi)
Minetec	-	5725-5825	Patch	7.1
Molex	47902011	2400-2483.5	Flexible PCB	3.4

5 FCC §2.1091, §15.247(i) & ISEDC RSS-102 – RF Exposure

5.1 Applicable Standard

According to FCC §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz
* = Plane-wave equivalent power density

According to ISED RSS-102 Issue 5:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

5.3 Test Results for the FCC

Standalone:

Maximum output power at antenna input terminal (total) (dBm):	11.52
Maximum output power at antenna input terminal (mW):	14.19
Prediction distance (cm):	20
Predication frequency (MHz):	5734.375
Maximum Antenna Gain, typical (dBi):	7.1
Maximum Antenna Gain (numeric):	5.129
Power density of prediction frequency at prediction distance (mW/cm^2):	0.01448
FCC limit (mW/cm^2):	1.00

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.01448 mW/cm^2. Limit is 1.00 mW/cm^2

Radio Co-location:

Worst Case Co-location MPE Calculation

Radio	Max Conducted Power (dBm)	Antenna Gain (dBi)	Evaluated Distance (cm)	Worst-Case Exposure Level (mW/cm^2)	Limit (mW/cm^2)	Worst-Case Ratios	Sum of Ratios	Limit
Worst Case								
5.8GHz WASP	11.52	7.1	20	0.01448	1.0	1.45%	11.79%	100%
2.4GHz Wi-Fi	23.76	3.4	20	0.10345	1.0	10.34%		

Note: 2.4 GHz Wi-Fi data is taken from test data reported in Report Number: GMIS15-A2 Rev A issued by MiCOM Labs, Inc. on 02/10/2009.

5.4 RF exposure evaluation exemption for IC

5.8 GHz WASP: Low Channel 5734.375 MHz

Maximum EIRP power = 11.52 dBm + 7.1 dBi = 18.62 dBm, which is less than $1.31\times10^{-2}f^{0.6834}$ = 4.85 W = 36.86 dBm

Therefore, the RF exposure Evaluation is not required.

6 FCC §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

6.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

As per ISEDC RSS-Gen 8.9,

> Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 or Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for license-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per ISEDC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

6.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C and ISEDC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

6.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz or 1/T / Sweep = Auto

6.4 Corrected Amplitude and Margin Calculation

For emissions below 1 GHz,

The Corrected Amplitude (CA) is calculated by adding the Correction Factor to the S.A. Reading. The basic equation is as follows:

CA = S.A. Reading + Correction Factor

For example, a corrected amplitude of 40.3 dBuV/m = S.A. Reading (32.5 dBuV) + Correction Factor (7.8 dB/m)

The Correction Factor is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) together. This calculation is done in the measurement software, and reported in the test result section. The basic equation is as follows:

Correction Factor = AF + CL + Atten – Ga

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

For emission above 1 GHz,

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

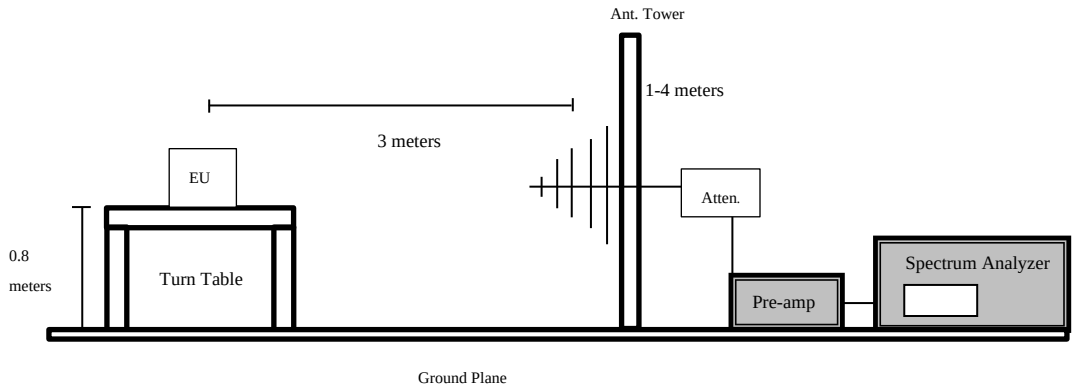
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

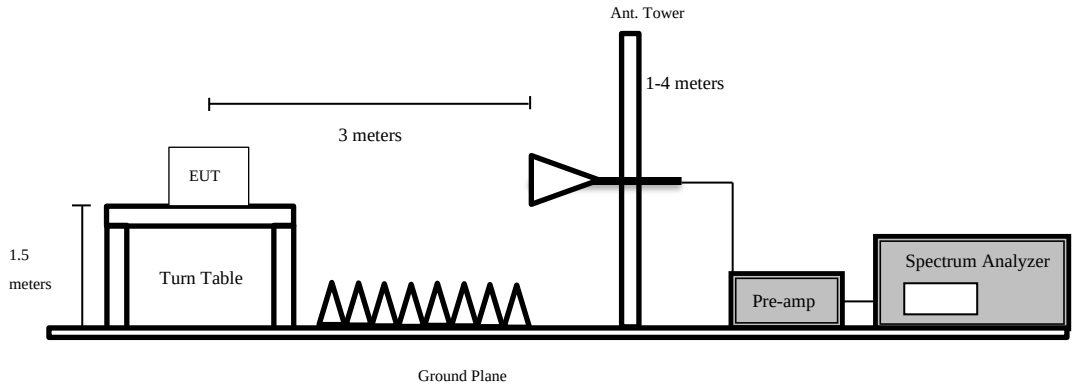
$$Margin = Corrected\ Amplitude - Limit$$

6.5 Test Setup Block Diagrams

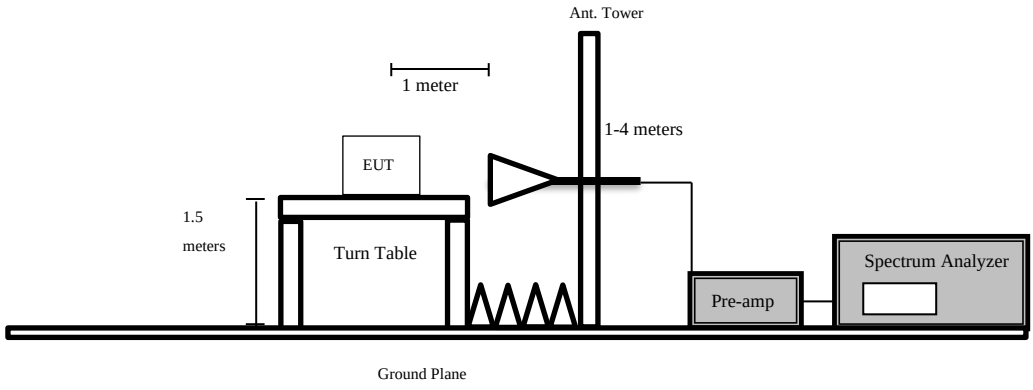
Test Setup for Below 1 GHz at 3 meters



Test Setup for Above 1 GHz at 3 meters



Test Setup for Above 1 GHz at 1 meter



6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
HP	Spectrum Analyzer	E4446A	US44300386	2019-08-24	18 months
Insulted Wire Corp.	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1571AN-3960-KPS	DC 1917	2020-02-28	1 year
ETS Lindgren	Horn Antenna	3117	00218973	2019-02-13	2 years
IW Microwave	157 Series Cable Armored with 2.92mm Male Plugs	KPS-1571AN-2400	DC 1922	2020-06-06	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950.03	100338	2020-03-17	18 months
MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35\'	LMR400UF	BACL1904161	2020-05-20	1 year
Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2019-11-20	2 years
HP	Pre Amplifier	8447D	2944A07030	2020-08-17	1 year
Agilent	Preamplifier	8449B	3147A00400	2020-02-27	1 year
BACL	5m3 Sensitivity Box	1	2	2020-10-27	1 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2020-02-05	2 years
Wisewave	Antenna, Horn	ARH-2823-02	10555-02	2020-02-05	2 years
-	RF cable	-	-	Each time[1]	N/A
-	Notch Filter	-	-	Each time[1]	N/A
AH Systems	Preamplifier	PAM 1840 VH	170	2020-11-09	1 year
Volteq	DC Power Supply	HY5003D	180100312	-	-

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

The equipment above was used for testing performed by Allen Huang from 2020-12-29 to 2020-12-30 in 5 meter chamber 3.

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
323	Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/A
321	Sunol Sciences Corp	Biconilog Antenna	JB3	A020106-2	2021-11-22	2 years
287	HP	PSA spectrum analyzer 3HZ to 44 GHZ	E4446A	US44300386	2022-05-05	1 year
-	-	10dB Attenuator	-	-	Each Time	-
32	HP	Pre-Amplifier	8449B	3008A01978	2022-05-09	6 months
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2022-05-12	1 year
188	Sunol Sciences	Antenna, Horn	DRH-118	A052704	2021-10-07	2 years
187	A.R.A.	Antenna, Horn	DRG-118/A	1132	2022-03-17	2 years
688	Keysight	Vector Signal Generator	N5182B	MY51350070	2022-07-28	1 year
568	COM-POWER	Antenna, Dipole	AD-100 DB-4	721033DB1,721033DB2,721033DB3,521921	2021-04-30	2 years
-	-	RF Cable	-	-	Each Time	-
	Volteq	DC Power Supply	HY5003D	180100312	-	-

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

The equipment above was used for testing performed by Deepak Mishra from 2022-09-21 to 2022-09-23 in 5 meter chamber 3.

6.7 Test Environmental Conditions

Temperature:	20-22 ºC
Relative Humidity:	42-50 %
ATM Pressure:	102.7 kPa

The testing was performed by Allen Huang, 2020-12-29 and 2020-12-30 in 5m chamber 3.

Temperature:	21-24 ºC
Relative Humidity:	39-45 %
ATM Pressure:	100.7 kPa

The testing was performed by Deepak Mishra, 2022-09-21 to 2022-09-23 in 5m chamber 3.

6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C and ISEDC RSS-247 standard's radiated emissions limits, and had the worst margin of:

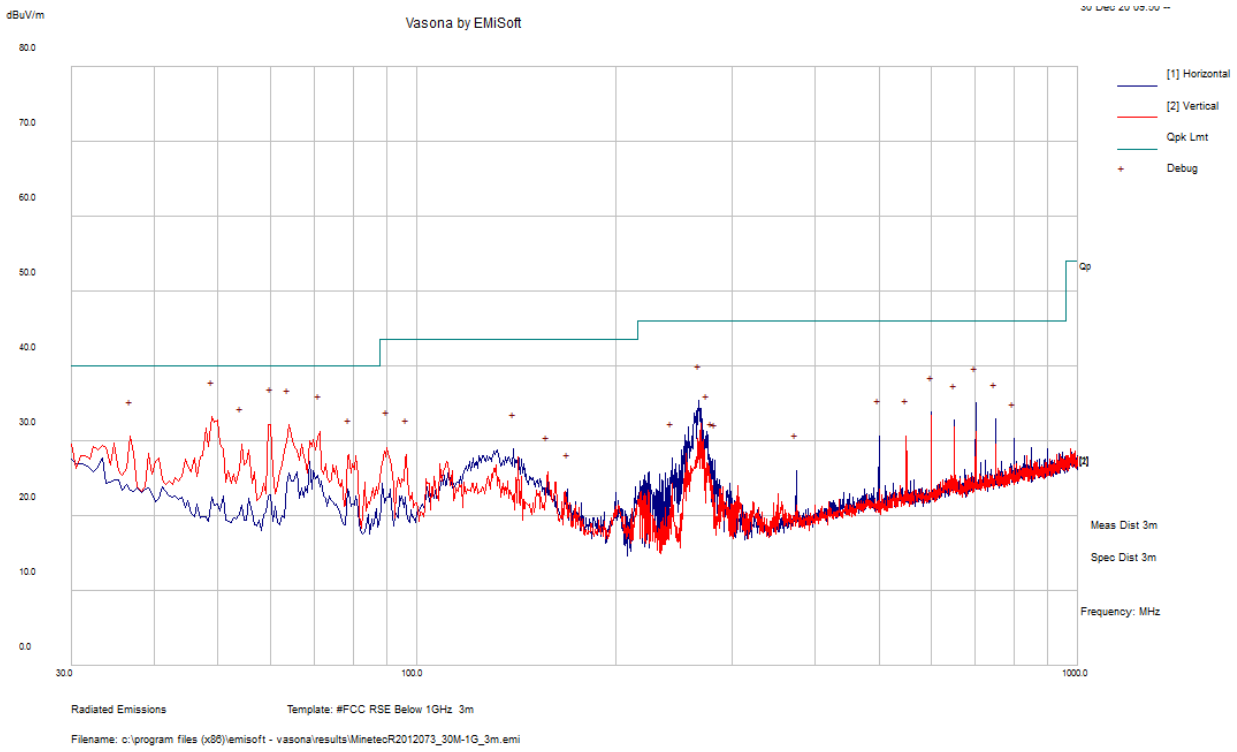
Mode: Transmitting(5.8GHz Radio)			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, channel**
-2.58	37422.82	Vertical	Middle channel 5780.077 MHz

Mode: Transmitting(2.4GHz Wifi Radio)			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, channel**
-0.49	2412	Vertical	802.11g, 2412 MHz

Please refer to the following table and plots for specific test result details

6.9 Radiated Emissions Test Results

1) 30 MHz – 1 GHz Worst Case Colocation, Measured at 3 meters



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
49.00525	45.58	-15.21	30.37	136	V	132	40	-9.63	QP
59.99775	48.46	-16.01	32.45	105	V	168	40	-7.55	QP
64.053	40.63	-15.68	24.94	160	V	75	40	-15.06	QP
71.03225	39.26	-15.42	23.83	121	V	43	40	-16.17	QP
36.8855	31.68	-7.48	24.21	128	V	115	40	-15.79	QP
54.20225	36.16	-16.21	19.95	163	V	147	40	-20.05	QP

2) 1-18GHz Measurements at 1 Meter

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Note
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel (5734.375 MHz)											
5734.375	72.700	45	115	H	35.4	8.473	-	116.573	-	-	Peak
5734.375	75.080	0	150	V	35.4	8.473	-	118.953	-	-	Peak
4587.5	54.230	330	180	H	34.6	7.302	35.63	60.50	84	-23.50	Peak
4587.5	55.160	5	150	V	34.6	7.302	35.63	61.43	84	-22.57	Peak
4587.5	52.019	330	180	H	34.6	7.302	35.63	58.29	64	-5.71	Ave
4587.5	52.859	5	150	V	34.6	7.302	35.63	59.13	64	-4.87	Ave
9175	48.640	35	175	H	37	11.59	36.03	61.20	84	-22.80	Peak
9175	46.230	55	145	V	37	11.59	36.03	58.79	84	-25.21	Peak
9175	43.694	35	175	H	37	11.59	36.03	56.25	64	-7.75	Ave
9175	39.675	55	145	V	37	11.59	36.03	52.24	64	-11.77	Ave
Middle Channel (5780.077 MHz)											
5780.077	73.31	20	105	H	35.4	8.473	-	117.183	-	-	Peak
5780.077	75.7	0	150	V	35.4	8.473	-	119.573	-	-	Peak
4624.1	53.47	355	150	H	34.6	7.302	35.57	59.802	84	-24.198	Peak
4624.1	54.93	0	135	V	34.6	7.302	35.57	61.262	84	-22.738	Peak
4624.1	50.765	355	150	H	34.6	7.302	35.57	57.097	64	-6.903	Ave
4624.1	52.667	0	135	V	34.6	7.302	35.57	58.999	64	-5.001	Ave
9248.2	48.22	40	150	H	37	11.59	36.03	60.78	84	-23.22	Peak
9248.2	45.36	60	170	V	37	11.59	36.03	57.92	84	-26.08	Peak
9248.2	42.145	40	150	H	37	11.59	36.03	54.705	64	-9.295	Ave
9248.2	38.586	60	170	V	37	11.59	36.03	51.146	64	-12.854	Ave
High Channel (5841.013 MHz)											
5841.013	73.710	15	115	H	35.4	8.473		117.583	-	-	Peak
5841.013	73.920	0	150	V	35.4	8.473		117.793	-	-	Peak
4672.8	54.230	0	150	H	34.6	7.302	35.57	60.562	84	-23.438	Peak
4672.8	55.060	5	165	V	34.6	7.302	35.57	61.392	84	-22.608	Peak
4672.8	51.837	0	150	H	34.6	7.302	35.57	58.17	64	-5.83	Ave
4672.8	53.265	5	165	V	34.6	7.302	35.57	59.60	64	-4.40	Ave
9345.6	47.520	30	150	H	37	11.59	36.03	60.08	84	-23.92	Peak
9345.6	45.300	50	150	V	37	11.59	36.03	57.86	84	-26.14	Peak
9345.6	41.920	30	150	H	37	11.59	36.03	54.48	64	-9.52	Ave
9345.6	38.516	50	150	V	37	11.59	36.03	51.08	64	-12.92	Ave

3) 1-18GHz Measurements at 3 Meters

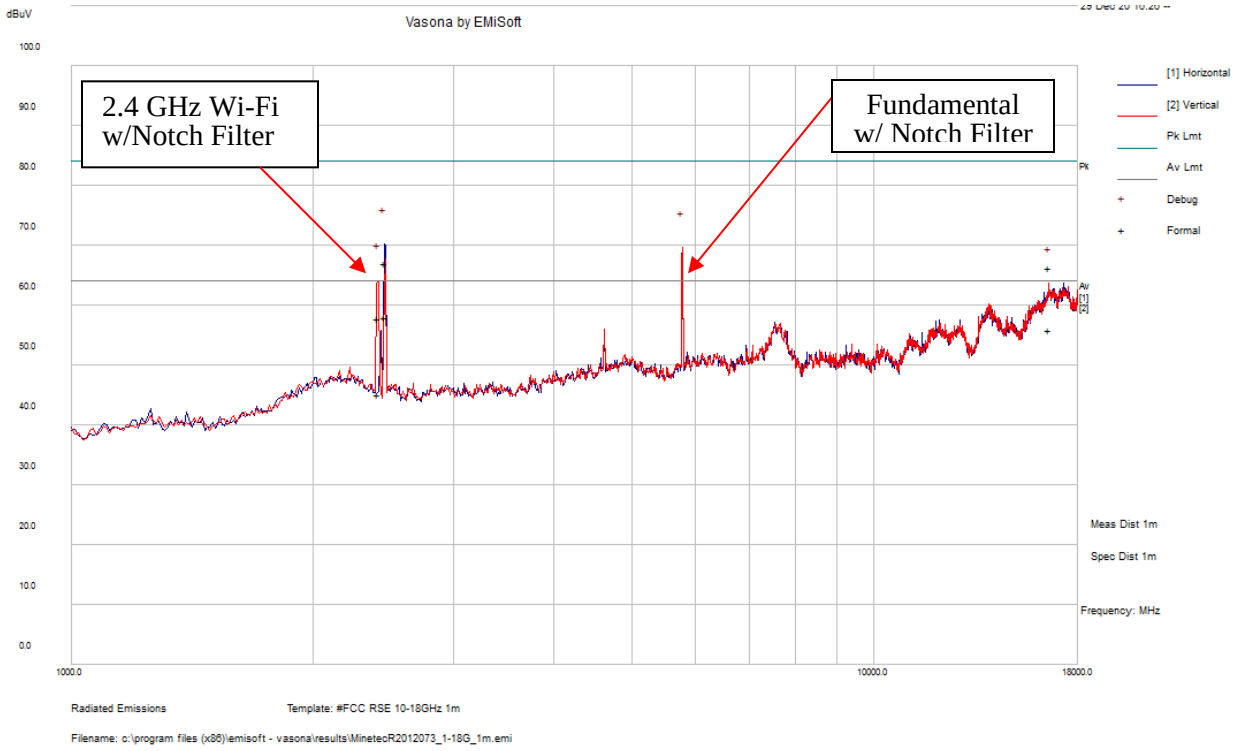
802.11b mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Note
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 1: 2412											
2390.00	53.130	173	190	H	32.228	4.430	38.154	51.634	74	-22.366	Peak
2390.00	58.570	220	141	V	32.228	4.430	38.154	57.074	74	-16.926	Peak
2390.00	44.348	173	190	H	32.228	4.430	38.154	42.852	54	-11.148	Ave
2390.00	49.607	220	141	V	32.228	4.430	38.154	48.111	54	-5.889	Ave
4824.00	46.080	165	207	H	34.709	7.000	37.125	50.664	74	-23.336	Peak
4824.00	47.130	100	150	V	34.709	7.000	37.125	51.714	74	-22.286	Peak
4824.00	37.860	165	207	H	34.709	7.000	37.125	42.444	54	-11.556	Ave
4824.00	38.018	100	150	V	34.709	7.000	37.125	42.602	54	-11.398	Ave
High channel 11: 2462											
2483.50	53.500	201	169	H	32.665	4.420	38.075	52.510	74	-21.490	Peak
2483.50	59.210	300	128	V	32.665	4.420	38.075	58.220	74	-15.780	Peak
2483.50	39.632	201	169	H	32.665	4.420	38.075	38.642	54	-15.358	Ave
2483.50	46.679	300	128	V	32.665	4.420	38.075	45.689	54	-8.311	Ave
4924.00	45.170	220	218	H	34.709	7.000	37.027	49.852	74	-24.148	Peak
4924.00	44.770	237	125	V	34.709	7.000	37.027	49.452	74	-24.548	Peak
4924.00	34.385	220	218	H	34.709	7.000	37.027	39.067	54	-14.933	Ave
4924.00	34.341	237	125	V	34.709	7.000	37.027	39.023	54	-14.977	Ave
Mid channel 6: 2437											
4874.00	46.830	162	218	H	34.709	7.000	37.027	51.512	74	-22.488	Peak
4874.00	58.830	184	262	V	34.709	7.000	37.027	63.512	74	-10.488	Peak
4874.00	37.363	162	218	H	34.709	7.000	37.027	42.045	54	-11.955	Ave
4874.00	47.892	184	262	V	34.709	7.000	37.027	52.574	54	-1.426	Ave

802.11g mode

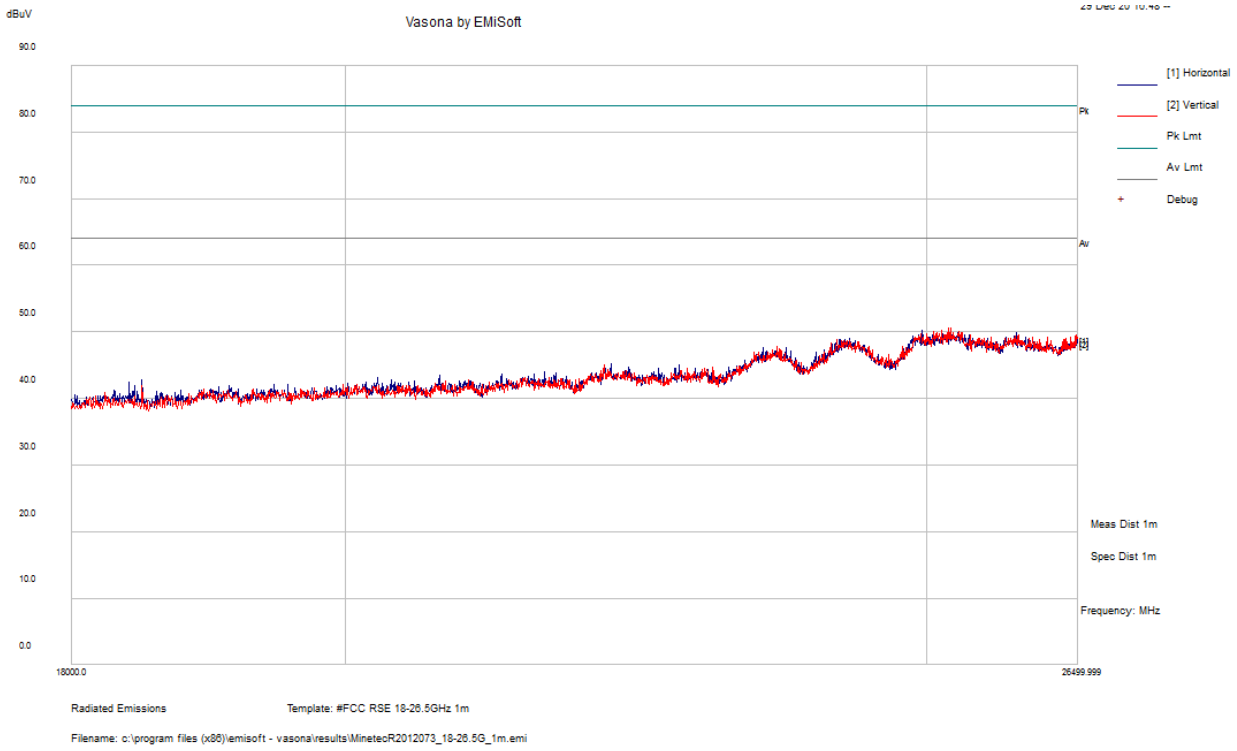
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Note
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 1: 2412											
2390.00	63.370	360	284	H	32.228	4.430	38.154	61.874	74	-12.126	Peak
2390.00	69.120	183	117	V	32.228	4.430	38.154	67.624	74	-6.376	Peak
2390.00	51.098	360	284	H	32.228	4.430	38.154	49.602	54	-4.398	Ave
2390.00	55.006	183	117	V	32.228	4.430	38.154	53.510	54	-0.490	Ave
4824.00	46.230	62	137	H	34.709	7.000	37.125	50.814	74	-23.186	Peak
4824.00	45.910	268	210	V	34.709	7.000	37.125	50.494	74	-23.506	Peak
4824.00	35.357	62	137	H	34.709	7.000	37.125	39.941	54	-14.059	Ave
4824.00	35.209	268	210	V	34.709	7.000	37.125	39.793	54	-14.207	Ave
High channel 11: 2462											
2483.50	61.770	163	113	H	32.665	4.420	38.075	60.780	74	-13.220	Peak
2483.50	72.960	217	161	V	32.665	4.420	38.075	71.970	74	-2.030	Peak
2483.50	47.757	163	113	H	32.665	4.420	38.075	46.767	54	-7.233	Ave
2483.50	52.871	217	161	V	32.665	4.420	38.075	51.881	54	-2.119	Ave
4924.00	45.630	111	286	H	34.709	7.000	37.027	50.312	74	-23.688	Peak
4924.00	45.580	79	176	V	34.709	7.000	37.027	50.262	74	-23.738	Peak
4924.00	34.264	111	286	H	34.709	7.000	37.027	38.946	54	-15.054	Ave
4924.00	34.293	79	176	V	34.709	7.000	37.027	38.975	54	-15.025	Ave
Mid channel 6: 2437											
4874.00	45.270	356	165	H	34.709	7.000	37.027	49.952	74	-24.048	Peak
4874.00	45.150	182	277	V	34.709	7.000	37.027	49.832	74	-24.168	Peak
4874.00	33.935	356	165	H	34.709	7.000	37.027	38.617	54	-15.383	Ave
4874.00	34.001	182	277	V	34.709	7.000	37.027	38.683	54	-15.317	Ave

1 GHz – 18 GHz Worst Case Colocation Scan at 1 Meter

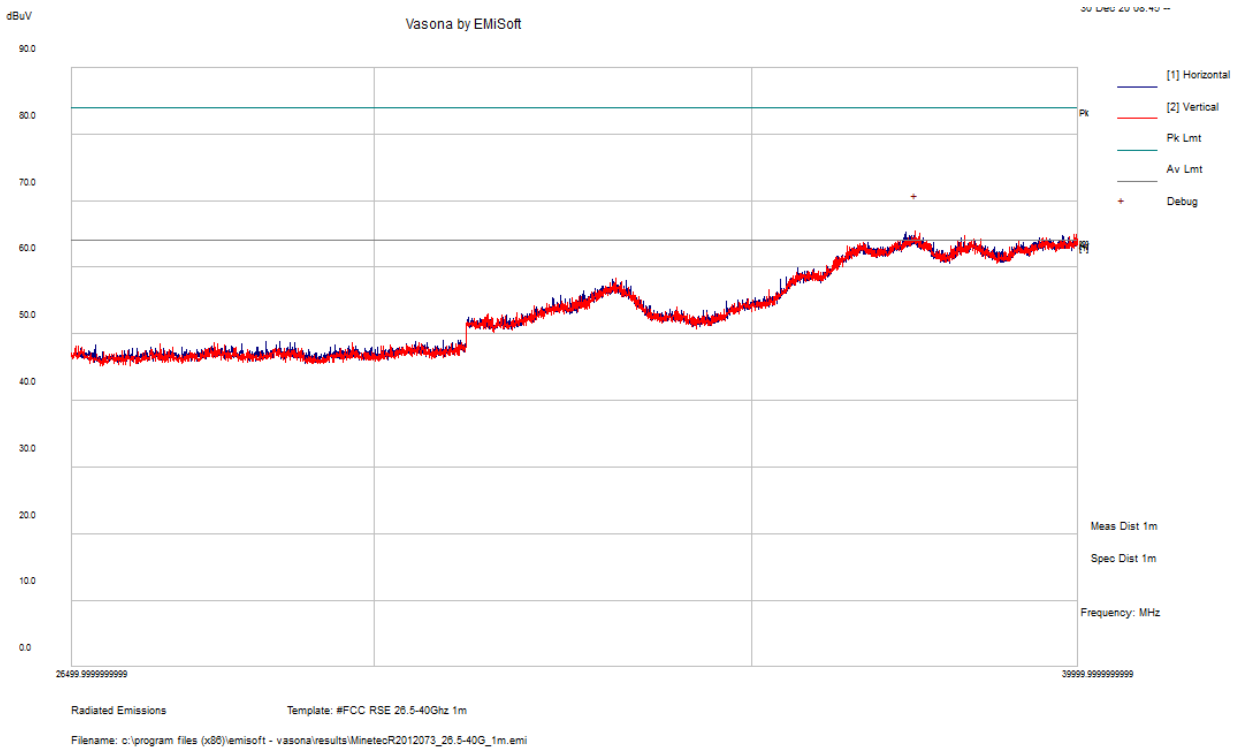


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
16576.52	41.22	25.08	66.3	219	V	238	84	-17.7	Peak
16576.52	30.84	25.08	55.92	204	H	28	64	-8.08	Average

18 GHz – 26.5 GHz Worst Case Colocation Scan at 1 Meter



26.5 GHz – 40 GHz Worst Case Scan at 1 Meter



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
37422.82	55.26	17.26	72.52	100	H	188	84	-11.48	Peak
37422.82	44.16	17.26	61.42	179	V	28	64	-2.58	Average

7 FCC §15.247(b) (3) & ISEDC RSS-247 §5.4 (4) - Output Power Measurement

7.1 Applicable Standards

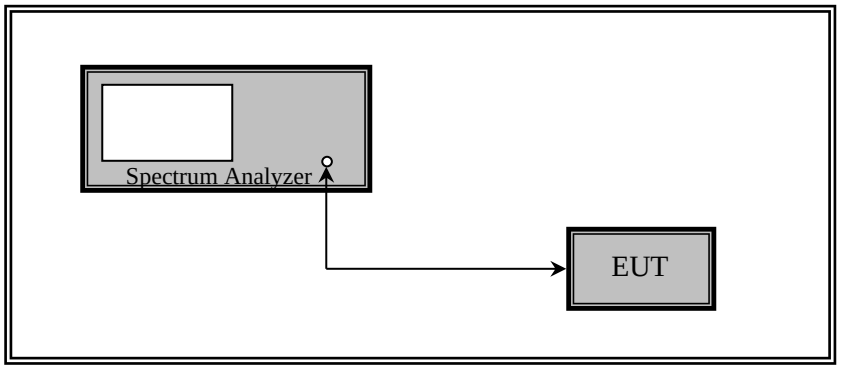
According to FCC §15.247(b) (3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247 §5.4: For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

7.2 Measurement Procedure

The measurements are based on ANSI C63.10-2013, Section 11.9.2.2.2.

7.3 Test Setup Block Diagram



7.4 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
912	Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008k39-101203-UW	2022-05-05	1 year
-	-	RF cable	-	-	Each time[1]	N/A

Note[1]: equipment included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

7.5 Test Environmental Conditions

Temperature:	21° C
Relative Humidity:	39 %
ATM Pressure:	102.0 KPa

The testing was performed by Arturo Reyes on 2022-09-20 at RF test site.

7.6 Test Results

2.4GHz Wifi Power Spot Check

Channel	Frequency (MHz)	Measured Conducted Output Power (dBm)	Original Report Comparison (dBm)[1]	FCC/ISEDC Limit (dBm)
802.11b				
Low	2412	18.79	19.12	30
Middle	2437	18.64	19.38	30
High	2462	18.73	19.44	30
802.11g				
Low	2412	22.50	22.52	30
Middle	2437	22.92	22.73	30
High	2462	22.10	22.26	30

Note[1]: Per Report Number: GMIS15-A2 Rev A issued by MiCOM Labs, Inc. on 02/10/2009

2.4GHz Wifi EIRP Evaluation with updated antenna gain

Channel	Frequency (MHz)	Conducted Output Power (dBm) [1]	EIRP (dBm)	ISEDC Limit (dBm)
802.11b				
Low	2412	19.12	22.52	36
Middle	2437	19.38	22.78	36
High	2462	19.44	22.84	36
802.11g				
Low	2412	22.52	25.92	36
Middle	2437	22.73	26.13	36
High	2462	22.26	25.66	36

Note: Antenna Gain is 3.4dBi as provided by customer
Note[1]: Per Report Number: GMIS15-A2 Rev A issued by MiCOM Labs, Inc. on 02/10/2009

Please refer to test results below:

8 Annex A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

9 Annex B (Normative) – EUT External Photographs

Please refer to the attachment.

10 Annex C (Normative) – EUT Internal Photographs

Please refer to the attachment.

11 Annex D (Informative) – Declaration of Similarity

MINETEC™
STOP WORKING IN THE DARK

Minetec Pty Ltd
ABN 11 094 579 567
2/29 Wellard Street
Bibra Lake WA 6163

DECLARATION OF SIMILARITY

June 29, 2021

To:

FEDERAL COMMUNICATIONS COMMISSIONS
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Innovation, Science and Economic Development Canada
Certification and Engineering Bureau
P.O. Box 11490, Station 'H'
3701 Carling Ave., Building 94
Ottawa, Ontario K2H 8S2, Canada

Dear Sir or Madam:

We *Minetec Pty Ltd.* hereby declare that product: *Minetec Mobile Node (R),* model: *M1010512-003 (FCC ID: 2AVQP-M1010512, IC: 25823-M1010512)* is electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics as model: *M1010512-001* tested by BACL, the results of which are featured in BACL project: *R2012073*

A description of the differences between the tested model and those that are declared similar are as follows:

1. *The connection of a wiring loom (no change in wiring loom)*
2. *The data flow is different but RF performance and RF operation is unchanged*
3. *Firmware is changed but does not impact to the RF performance or RF operation.*

Please contact me should there be need for any additional clarification or information.

Best Regards,

Grant Wilmot
General Manager, Minetec Technology

12 Annex E (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

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 laboratory also meets A2LA *R222 - Specific Requirements EPA ENERGY STAR Accreditation Program*. 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 10th day of March 2021.

Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to November 30, 2022
Revised September 16, 2022

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

Please follow the web link below for a full ISO 17025 scope

https://www.a2la.org/scopepdf/3297-02.pdf

--- END OF REPORT ---