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

TEST AND MEASUREMENT REPORT

For

Zebra Technologies Corporation

3 Overlook Point, Lincolnshire, IL 60069, USA

FCC ID: I28-EYSNSNZWWZ1
IC: 3798B-EYSNSNZWWZ1

Report Type:	**Product Type:**
Original Report	Bluetooth Radio

Prepared By:	Allen Huang Test Technician
Report Number:	R20091414-247
Report Issue Date:	2021-02-19
Reviewed By:	Christian McCaig RF Engineer

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue,
Sunnyvale, CA 94089, USA
Tel: +1 (408) 732-9162, Fax: +1 (408) 732-9164

A2LA ACCREDITED CERTIFICATE #3297.02

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by A2LA*, NIST, or any agency of the Federal Government.
* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" (Rev.2)

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R20091414-247	Original Report	2021-02-19

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Zebra Technologies Corporation* and their product model: *EYSNSNZWWZ1*, FCC ID: *I28-EYSNSNZWWZ1*; IC: *3798B-EYSNSNZWWZ1* or the "EUT" as referred to in this report. It is a Bluetooth radio that operates within the 2400-2483.5 MHz frequency range.

1.2 Mechanical Description of EUT

The EUT measures approximately 2.54 cm (Length), 2.54 cm (Width).

The data gathered are from a production sample provided by Zebra Technologies Corporation with BACL assigned serial number: R20091414.

1.3 Objective

This report was prepared on behalf of *Zebra Technologies Corporation* in accordance with Part 2, Subpart J, and Part 15, Subpart 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 for Antenna Requirement, RF Exposure, AC Line Conducted Emissions, Emission Bandwidth, Radiated & Conducted Spurious Emissions, 100 kHz Band Edges, Maximum Output Power, and Peak Power Spectrum Density

1.4 Related Submittal(s)/Grant(s)

None

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.

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 º 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 17025:2005 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 17025:2005 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 17025:2005 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 in accordance to ANSI C63.10.

2.2 EUT Exercise Software

The software "Zebra Toolbox v1.81" was used to transmit signal for all the modules. The software was provided by *Zebra Technologies Corporation* and verified by Allen Huang to comply with the standard requirements being tested against.

Bit Rate (Mbps)	Frequency (MHz)	Command Line
1	2402	"2001"
	2442	"2221"
	2480	"2391"
2	2402	"20012"
	2442	"22212"
	2480	"23912"

2.3 Duty Cycle Correction Factor

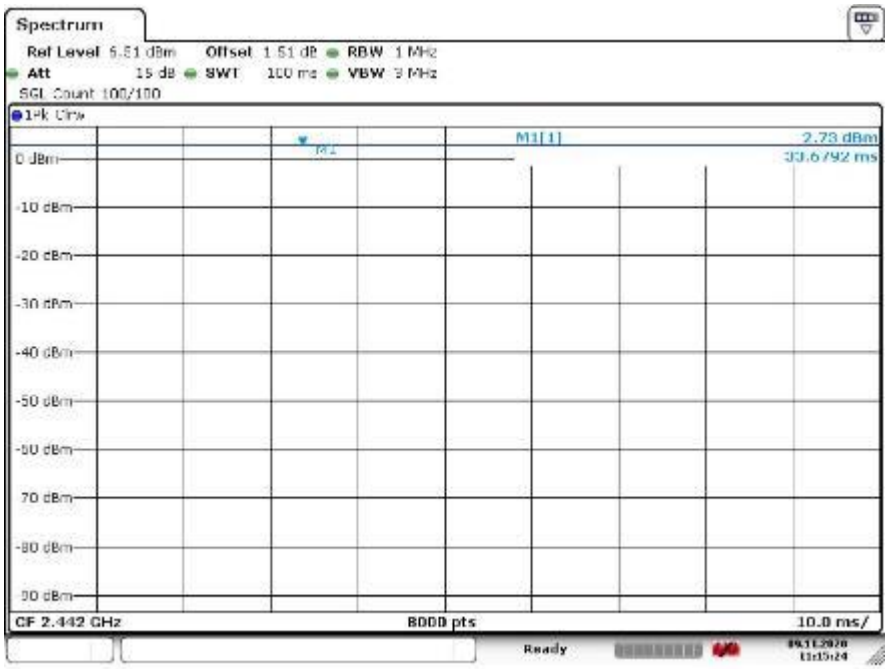
According to KDB 558074 D01 DTS Meas Guidance v05r02 section 6.0:

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 frequency (MHz)	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
2442	-	-	100	0

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

Please refer to the following plots.



Date: 9.NOV.2020 11:15:24

2.4 Equipment Modifications

None

2.5 Local Support Equipment

None

2.6 Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410
Zebra	Printer	ZD621

2.7 Interface Ports and Cabling

Cable Descriptions	Length (m)	From	To
USB to USB-B	1.5	Laptop	Printer
Flat Flex Ribbon Jumper	< 1	Printer	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirements	Compliant
FCC §2.1091, §2.1093, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.209, §15.247(d) ISEDC RSS-247 §5.5 RSS-Gen §8.9, §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISEDC RSS-247 §5.2 RSS-Gen §6.7	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) ISEDC RSS-247 §5.4	Maximum Output Power	Compliant
FCC §15.247(e) ISEDC RSS-247 §5.2(2)	Peak Power Spectral Density	Compliant
FCC §15.247(d) ISEDC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant

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

This radio transmitter 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

External/Internal/ Integral	Frequency Range (MHz)	Antenna Type	Maximum Antenna Gain (dBi)
External	2400-2483.5 MHz	PCB Antenna	-4.00

Note: the antenna gain is information provided by the applicant.

5 FCC §2.1091, §2.1093, §15.247(i) & ISEDC RSS-102 - RF Exposure

5.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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 (minutes)
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

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

According to FCC KDB 447498 D01 General RF Exposure Guidance v06 Section 4.3.1, Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

   [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

   • f(GHz) is the RF channel transmit frequency in GHz
   • Power and distance are rounded to the nearest mW and mm before calculation
   • The result is rounded to one decimal place for comparison
   • 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

   The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:

a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

3) At frequencies below 100 MHz, the following may be considered for SAR test exclusion, and as illustrated in Appendix C:

a) The power threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by [1 + log(100/f(MHz))] for test separation distances > 50 mm and < 200 mm
b) The power threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by ½ for test separation distances ≤ 50 mm

c) SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable.

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.

According to ISED RSS-102 Issue 5 Section 2.5.1 Exemption Limits for Routine Evaluation-SAR Evaluation:

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in table below,

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71	101	132	162	193
450	52	70	88	106	123
835	17	30	42	55	67
1900	7	10	18	34	60
2450	4	7	15	30	52
3500	2	6	16	32	55
5800	1	6	15	27	41

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223	254	284	315	345
450	141	159	177	195	213
835	80	92	105	117	130
1900	99	153	225	316	431
2450	83	123	173	235	309
3500	86	124	170	225	290
5800	56	71	85	97	106

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 MPE Results for FCC

Maximum peak output power at antenna input terminal (dBm):	2.10
Maximum peak output power at antenna input terminal (mW):	1.6218
Prediction distance (cm):	20
Prediction frequency (MHz):	2442
Maximum Antenna Gain, typical (dBi):	-4.00
Maximum Antenna Gain (numeric):	0.398
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00013
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00013mW/cm^2. Limit is 1 mW/cm^2.

5.4 RF exposure evaluation exemption for ISED

Maximum EIRP power = 2.10dBm + -4.00 dBi = **-1.90 dBm** which is less than $1.31\times10^{-2}f^{0.6834}$ = 2.707 W = **34.325 dBm**.

Therefore, the RF exposure evaluation is exempt.

5.5 Portable device RF Exposure (SAR) exemption

The maximum conducted output power measured from the EUT is 2.10 dBm (1.62 mW).

According to FCC KDB 447498 D01, [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] [√f(GHz)] = (1.62 mW/5mm)* √2.442 = 0.506, which is less than 3.0. Therefore, FCC SAR testing is excluded.

Maximum conducted power = 2.10 dBm = 1.62 mW, which is less than 4 mW. Therefore, IC SAR testing is not required.

6 FCC §15.207 & ISEDC RSS-Gen §8.8 - AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and ISEDC RSS-Gen §8.8 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.
Note 2: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used was FCC §15.207 and ISEDC RSS-Gen §8.8 limits.

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

The EUT was connect to a printer which had an AC/DC power adapter that was connected with LISN which provided 120 V / 60 Hz AC power.

6.3 Test Procedure

During the conducted emissions test, the EUT was connection to the printer support device and the power cord of the printer support device was connected to the mains outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data were recorded in the peak detection mode, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Corrected Amplitude and Margin Calculation

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

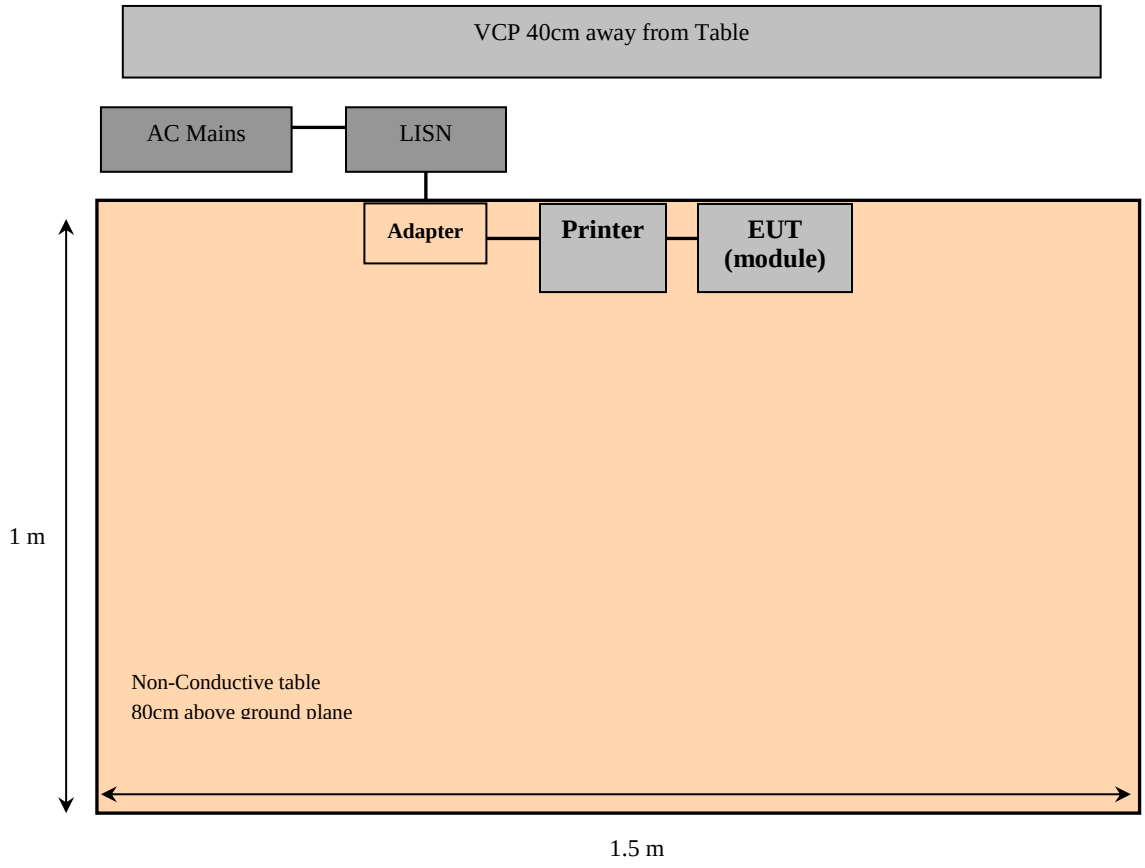
CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 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 Diagram



6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2020-03-17	1 year
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101964	2020-07-01	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2020-02-27	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160130	2020-10-13	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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".*

6.7 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	43 %
ATM Pressure:	101.8 kPa

The testing was performed by Allen Huang on 2020-10-28 in the 5 meter chamber 3 test site.

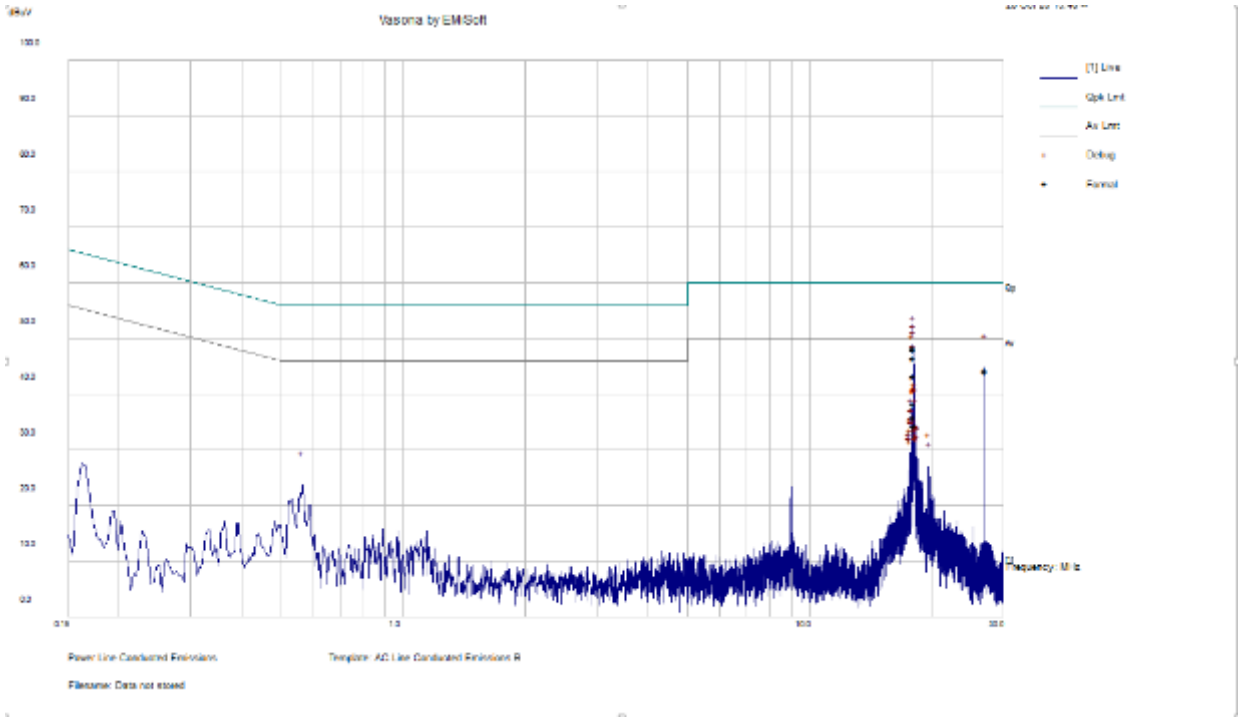
6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C and ISEDC RSS-Gen standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-5.46	26.99934	Live	0.15-30

6.9 Conducted Emissions Test Plots and Data

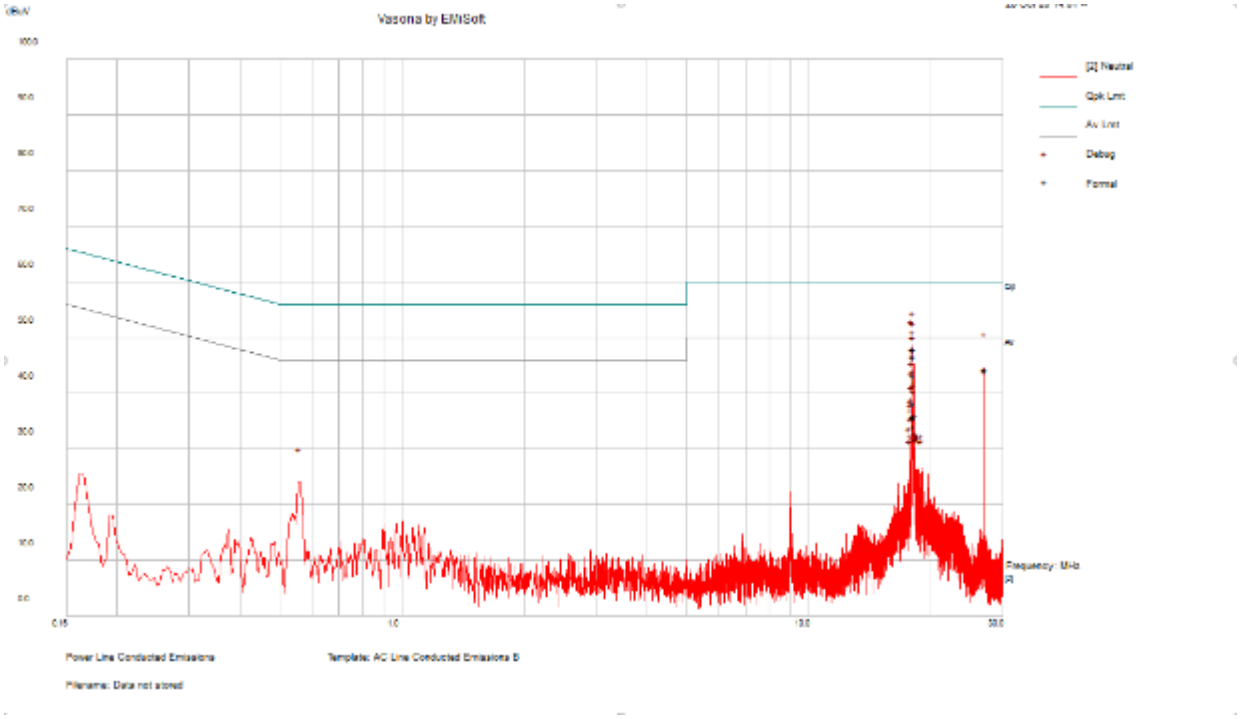
Middle Channel: 2442 MHz, 1 Mbps – Live



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.981677	48.3	Live	60	-11.7	QP
18.001154	46.66	Live	60	-13.34	QP
18.053403	43.3	Live	60	-16.7	QP
26.99934	44.18	Live	60	-15.82	QP
17.981181	48.24	Live	60	-11.76	QP
17.982496	48.01	Live	60	-11.99	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.981677	36.16	Live	50	-13.84	Ave.
18.001154	38.4	Live	50	-11.6	Ave.
18.053403	34.4	Live	50	-15.6	Ave.
26.99934	44.54	Live	50	-5.46	Ave.
17.981181	36.12	Live	50	-13.88	Ave.
17.982496	35.88	Live	50	-14.12	Ave.

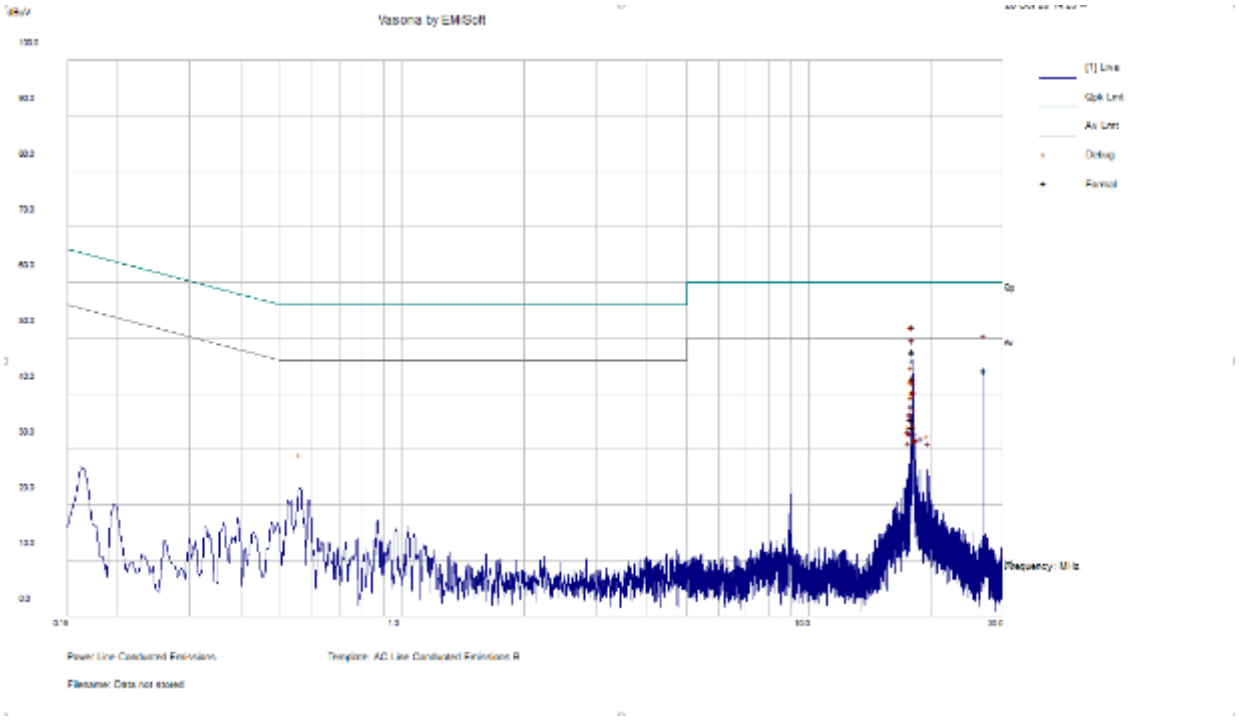
Middle Channel: 2442 MHz, 1 Mbps – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.982496	47.77	Neutral	60	-12.23	QP
17.981181	48	Neutral	60	-12	QP
18.001154	46.38	Neutral	60	-13.62	QP
18.053871	43.13	Neutral	60	-16.87	QP
26.999646	44.07	Neutral	60	-15.93	QP
17.981587	48.05	Neutral	60	-11.95	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.982496	35.63	Neutral	50	-14.37	Ave.
17.981181	35.88	Neutral	50	-14.12	Ave.
18.001154	38.11	Neutral	50	-11.89	Ave.
18.053871	34.25	Neutral	50	-15.75	Ave.
26.999646	44.43	Neutral	50	-5.57	Ave.
17.981587	35.93	Neutral	50	-14.07	Ave.

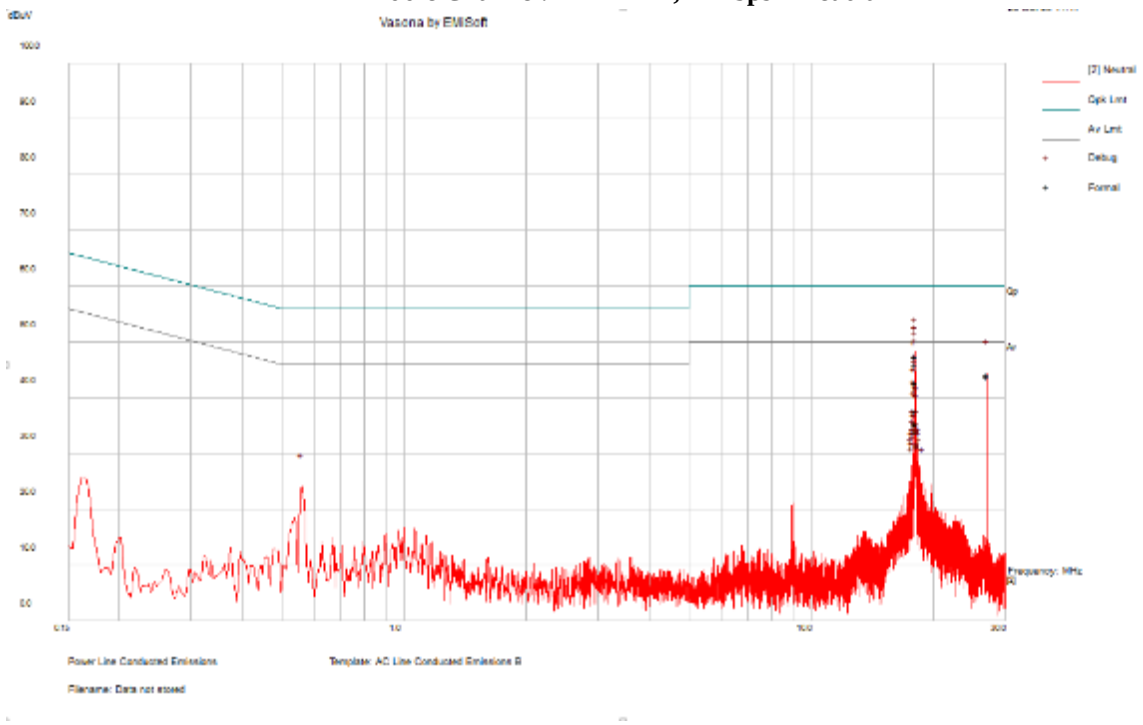
Middle Channel: 2442 MHz, 2 Mbps – Live



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
18.001154	46.06	Live	60	-13.94	QP
17.982496	47.48	Live	60	-12.52	QP
17.981181	47.72	Live	60	-12.28	QP
26.999286	44	Live	60	-16	QP
17.981173	47.73	Live	60	-12.27	QP
18.053643	42.85	Live	60	-17.15	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
18.001154	37.79	Live	50	-12.21	Ave.
17.982496	35.32	Live	50	-14.68	Ave.
17.981181	35.58	Live	50	-14.42	Ave.
26.999286	44.37	Live	50	-5.63	Ave.
17.981173	35.58	Live	50	-14.42	Ave.
18.053643	33.98	Live	50	-16.02	Ave.

Middle Channel: 2442 MHz, 2 Mbps – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.982496	47.41	Neutral	60	-12.59	QP
17.981461	47.67	Neutral	60	-12.33	QP
18.001154	45.99	Neutral	60	-14.01	QP
18.053871	42.78	Neutral	60	-17.22	QP
26.99979	43.86	Neutral	60	-16.14	QP
17.981181	47.69	Neutral	60	-12.31	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/ Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.982496	35.25	Neutral	50	-14.75	Ave.
17.981461	35.52	Neutral	50	-14.48	Ave.
18.001154	37.72	Neutral	50	-12.28	Ave.
18.053871	33.9	Neutral	50	-16.1	Ave.
26.99979	44.21	Neutral	50	-5.79	Ave.
17.981181	35.55	Neutral	50	-14.45	Ave.

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

7.1 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	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

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, emission from licence-exempt transmitters shall company with the field strength limits shown in the table below. Additional, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

General Field Strength Limits for Licence-Exemption Transmitters at Frequencies above 30 MHz

Frequency (MHz)	**Field Strength (µv/m at 3 meters)**
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 licence-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.

7.2 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.

7.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was 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 should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is 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 / Sweep = Auto

7.4 Corrected Amplitude & Margin Calculation

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/m) + 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:

$$Margin = Corrected\ Amplitude – Limit$$

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2020-03-17	1 year
Agilent	Spectrum Analyzer	E4446A	MY48250238	2019-06-26	18 months
Sunol Science Corp	System Controller	SC110V	122303-1	N/R	N/A
Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2019-11-20	2 years
HP	Pre-Amplifier	8447D	2944A07030	2020-08-17	1 year
HP	Pre-Amplifier	8449B	3147A00400	2020-02-27	1 year
AH Systems	Pre-Amplifier	PAM 1840 VH	170	2019-11-09	1 year
Keysight Technologies	RF Limiter	11867A	MY42243052	2020-10-27	1 year
BACL	5m3 Sensitivity Box	1	2	2020-10-27	1 year
ETS Lindgren	Horn Antenna	3117	00218973	2019-02-13	2 years
Wisewave	Horn Antenna	ARH-4223-02	10555-02	2020-02-05	2 years
MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35'	LMR400UF	BACL1904161	2020-05-20	1 year
IW Microwave	157 Series Cable Armored with 2.92mm Male Plugs on Both Sides	KPS-1571AN-2400	DC 1922	2020-06-06	1 year
-	RF cable	-	-	Each time[1]	N/A
-	Notch Filter	-	-	Each time[1]	N/A
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note[1]: cable and notch filter 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".*

7.6 Test Environmental Conditions

Temperature:	19 ºC
Relative Humidity:	34 %
ATM Pressure:	102.2 kPa

The testing was performed by Allen Huang from 2020-10-27 to 2020-11-02 at 5 meter chamber 3.

7.7 Summary of Test Results

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

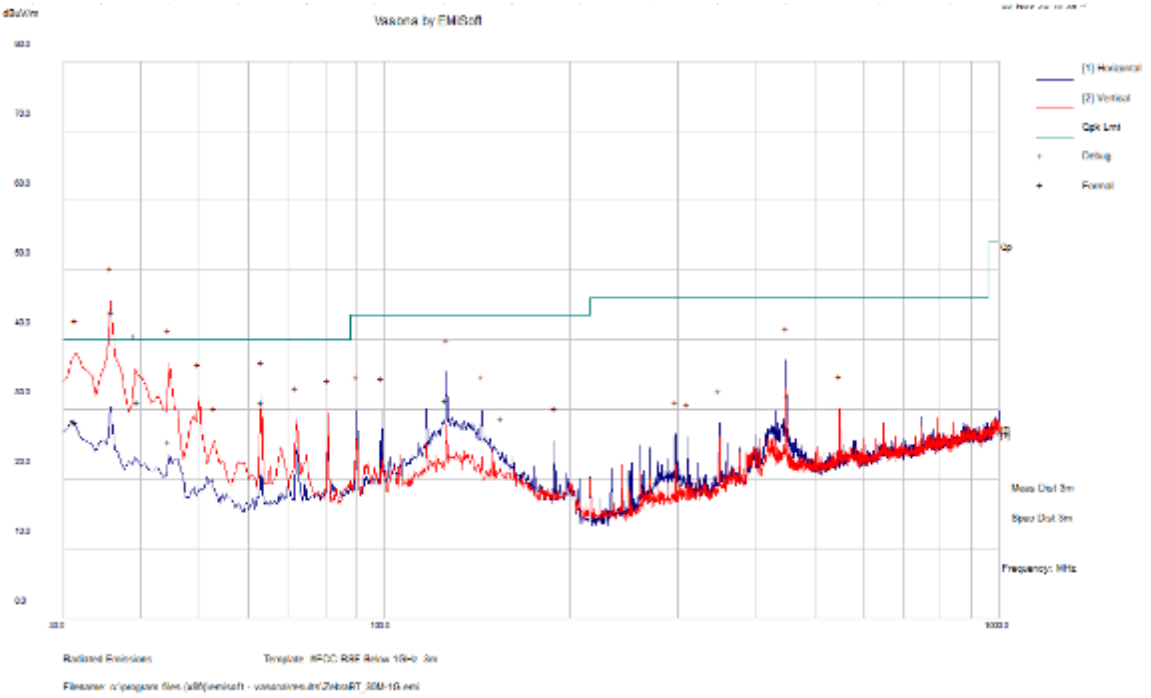
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Transmitting Channel**
-0.828	**4804**	**Horizontal**	**2402 MHz**

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

7.8 Radiated Emissions Test Results

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

Worst Case: 2442 MHz, 1 Mbps



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
35.98475	44.03	123	V	123	66.986[1]	-22.956	QP
31.459	28.29	183	V	19	40	-11.71	QP
44.45375	25.45	102	V	54	40	-14.55	QP
39.63775	31.21	118	V	240	40	-8.79	QP
63.018	31	149	V	231	40	-9	QP
125.94175	31.33	195	H	165	43.5	-12.17	QP

Note[1]: Due to frequencies being outside of the restricted bands, the limit was determined to be 30dB below the fundamental emission.

2) 1–10 GHz, Measured at 3 Meters

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: 2402 MHz, 1 Mbps											
2402	98.68	50	225	H	32.4	4.836	36.42	99.496	-	-	Peak
2402	97.46	35	285	V	32.4	4.836	36.42	98.276	-	-	Peak
2390	47.34	215	125	H	32.4	4.836	36.42	48.156	74	-25.844	Peak
2390	47.39	165	150	V	32.4	4.836	36.42	48.206	74	-25.794	Peak
2390	42.70	215	125	H	32.4	4.836	36.42	43.52	54	-10.48	Ave
2390	42.83	165	150	V	32.4	4.836	36.42	43.65	54	-10.35	Ave
4804	51.02	200	110	H	35	7.866	35.43	58.456	74	-15.544	Peak
4804	48.93	180	205	V	35	7.866	35.43	56.366	74	-17.634	Peak
4804	45.74	200	110	H	35	7.866	35.43	53.172	54	-0.828	Ave
4804	42.61	180	205	V	35	7.866	35.43	50.048	54	-3.952	Ave
7206	49.45	105	110	H	36.1	10.245	35.82	59.975	69.496	-9.521	Peak
7206	48.24	20	125	V	36.1	10.245	35.82	58.765	68.276	-9.511	Peak

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: 2402 MHz, 2 Mbps											
2402	98.62	40	150	H	32.4	4.836	36.42	99.436	-	-	Peak
2402	97.44	35	285	V	32.4	4.836	36.42	98.256	-	-	Peak
2390	47.80	340	150	H	32.4	4.836	36.42	48.616	74	-25.384	Peak
2390	47.87	35	145	V	32.4	4.836	36.42	48.686	74	-25.314	Peak
2390	43.63	340	150	H	32.4	4.836	36.42	44.442	54	-9.558	Ave
2390	43.24	35	145	V	32.4	4.836	36.42	44.054	54	-9.946	Ave
4804	51.98	255	115	H	35	7.866	35.43	59.416	74	-14.584	Peak
4804	49.38	360	150	V	35	7.866	35.43	56.816	74	-17.184	Peak
4804	45.46	255	115	H	35	7.866	35.43	52.897	54	-1.103	Ave
4804	40.65	360	150	V	35	7.866	35.43	48.087	54	-5.913	Ave
7206	49.58	105	150	H	36.1	10.245	35.82	60.105	69.436	-9.331	Peak
7206	49.54	30	150	V	36.1	10.245	35.82	60.065	68.256	-8.191	Peak

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)	
Middle Channel: 2442 MHz, 1 Mbps											
2442	99.22	55	195	H	32.8	4.956	36.34	100.636	-	-	Peak
2442	95.27	33	270	V	32.8	4.956	36.34	96.986	-	-	Peak
4884	48.85	70	260	H	35.2	7.866	35.43	56.486	74	-17.514	Peak
4884	47.22	40	145	V	35.2	7.866	35.43	54.856	74	-19.144	Peak
4884	42.66	70	260	H	35.2	7.866	35.43	50.291	54	-3.709	Ave
4884	36.94	40	145	V	35.2	7.866	35.43	44.574	54	-9.426	Ave
7326	46.98	30	150	H	36.1	10.655	35.82	57.915	74	-16.085	Peak
7326	46.83	15	115	V	36.1	10.655	35.82	57.765	74	-16.235	Peak
7326	38.49	30	150	H	36.1	10.655	35.82	49.423	54	-4.577	Ave
7326	38.55	15	115	V	36.1	10.655	35.82	49.488	54	-4.512	Ave

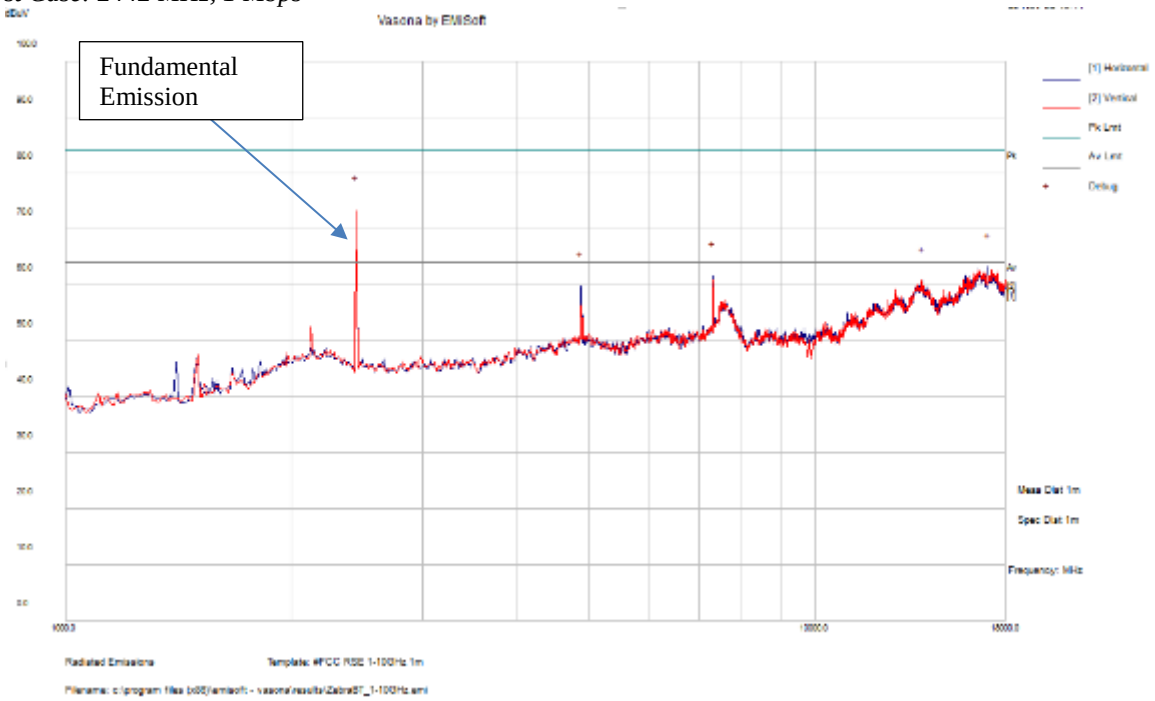
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/ISEDC		Note
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel: 2442 MHz, 2 Mbps											
4884	48.18	250	150	H	35.2	7.866	35.43	55.816	74	-18.184	Peak
4884	45.74	60	150	V	35.2	7.866	35.43	53.376	74	-20.624	Peak
4884	39.80	250	150	H	35.2	7.866	35.43	47.435	54	-6.565	Ave
4884	35.22	60	150	V	35.2	7.866	35.43	42.856	54	-11.144	Ave
7326	48.35	40	155	H	36.1	10.655	35.82	59.285	74	-14.715	Peak
7326	47.39	20	150	V	36.1	10.655	35.82	58.235	74	-15.675	Peak
7326	38.76	40	155	H	36.1	10.655	35.82	49.694	54	-4.306	Ave
7326	38.34	20	150	V	36.1	10.655	35.82	49.273	54	-4.727	Ave

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)	
High Channel: 2480 MHz, 1 Mbps											
2483.5	48.80	50	105	H	32.8	4.836	36.34	50.096	74	-23.094	Peak
2483.5	47.43	165	250	V	32.8	4.836	36.34	48.726	74	-25.274	Peak
2483.5	43.77	50	105	H	32.8	4.836	36.34	45.07	54	-8.93	Ave
2483.5	43.90	165	250	V	32.8	4.836	36.34	45.198	54	-8.802	Ave
4960	47.66	70	170	H	35.4	7.866	35.43	55.496	74	-18.504	Peak
4960	44.30	90	150	V	35.4	7.866	35.43	52.136	74	-21.864	Peak
4960	39.66	70	170	H	35.4	7.866	35.43	47.498	54	-6.502	Ave
4960	33.45	90	150	V	35.4	7.866	35.43	41.288	54	-12.712	Ave
7440	48.80	55	170	H	36.1	10.655	35.9	59.655	74	-14.345	Peak
7440	46.78	130	150	V	36.1	10.655	35.9	57.635	74	-16.365	Peak
7440	41.59	55	170	H	36.1	10.655	35.9	52.444	54	-1.556	Ave
7440	37.94	130	150	V	36.1	10.655	35.9	48.793	54	-5.207	Ave

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)	
High Channel: 2480 MHz, 2 Mbps											
2483.5	54.37	35	150	H	32.8	4.836	36.34	55.666	74	-18.334	Peak
2483.5	52.35	355	205	V	32.8	4.836	36.34	53.646	74	-20.354	Peak
2483.5	49.31	35	150	H	32.8	4.836	36.34	50.609	54	-3.391	Ave
2483.5	47.90	355	205	V	32.8	4.836	36.34	49.191	54	-4.809	Ave
4960	46.10	105	150	H	35.4	7.866	35.43	53.936	74	-20.064	Peak
4960	45.30	250	150	V	35.4	7.866	35.43	53.136	74	-20.864	Peak
4960	35.43	105	150	H	35.4	7.866	35.43	43.263	54	-10.737	Ave
4960	33.72	250	150	V	35.4	7.866	35.43	41.553	54	-12.447	Ave
7440	47.91	65	150	H	36.1	10.655	35.9	58.765	74	-15.235	Peak
7440	47.84	345	150	V	36.1	10.655	35.9	58.695	74	-15.305	Peak
7440	37.55	65	150	H	36.1	10.655	35.9	48.409	54	-5.591	Ave
7440	35.06	345	150	V	36.1	10.655	35.9	45.917	54	-8.083	Ave

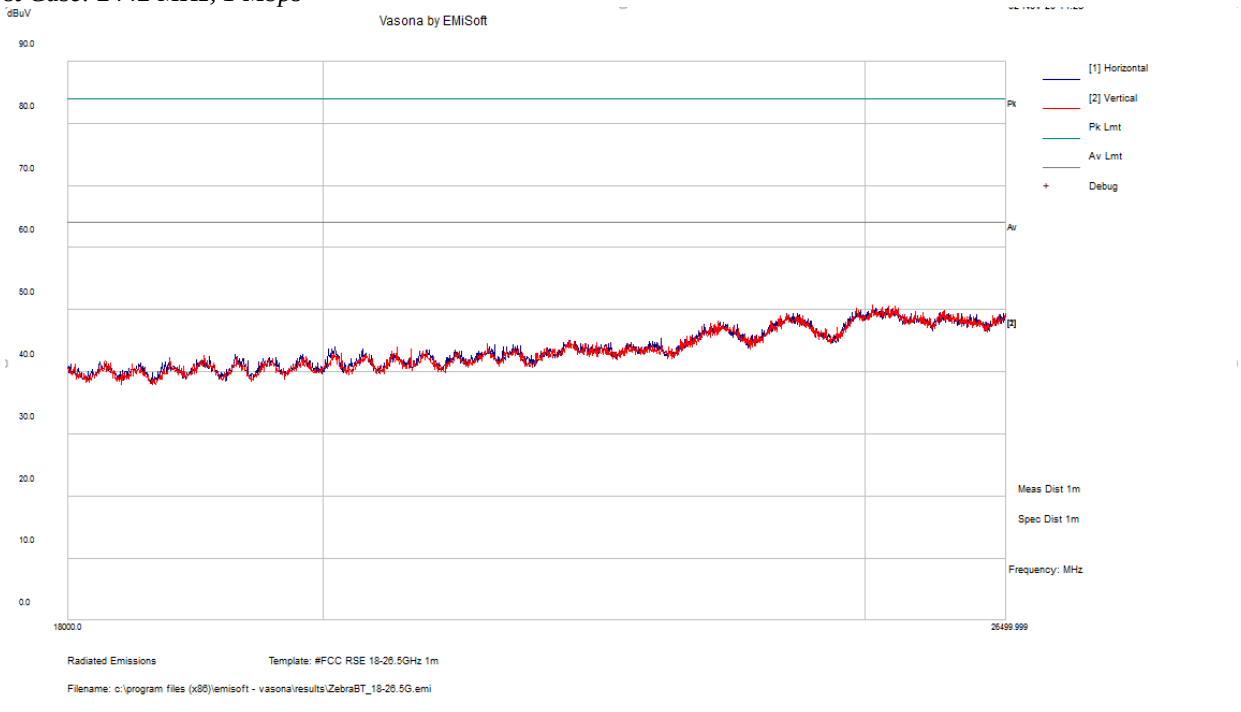
1 – 18 GHz Worst Case Pre-Scan, Measured at 1 meter

Worst Case: 2442 MHz, 1 Mbps



18 – 26.5 GHz Worst Case Pre-Scan, Measured at 1 meter

Worst Case: 2442 MHz, 1 Mbps



8 FCC §15.247(a) (2) & ISEDC RSS-247 §5.2, RSS-Gen §6.7 - Emission Bandwidth

8.1 Applicable Standards

According to FCC §15.247(a) (2) and ISEDC RSS-247 §5.2: the minimum 6 dB bandwidth shall be 500 kHz.

8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2020-02-06	1 year
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable 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".*

8.4 Test Environmental Conditions

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

The testing was performed by Allen Huang on 2020-11-05 at RF test site.

8.5 Test Results

1 Mbps

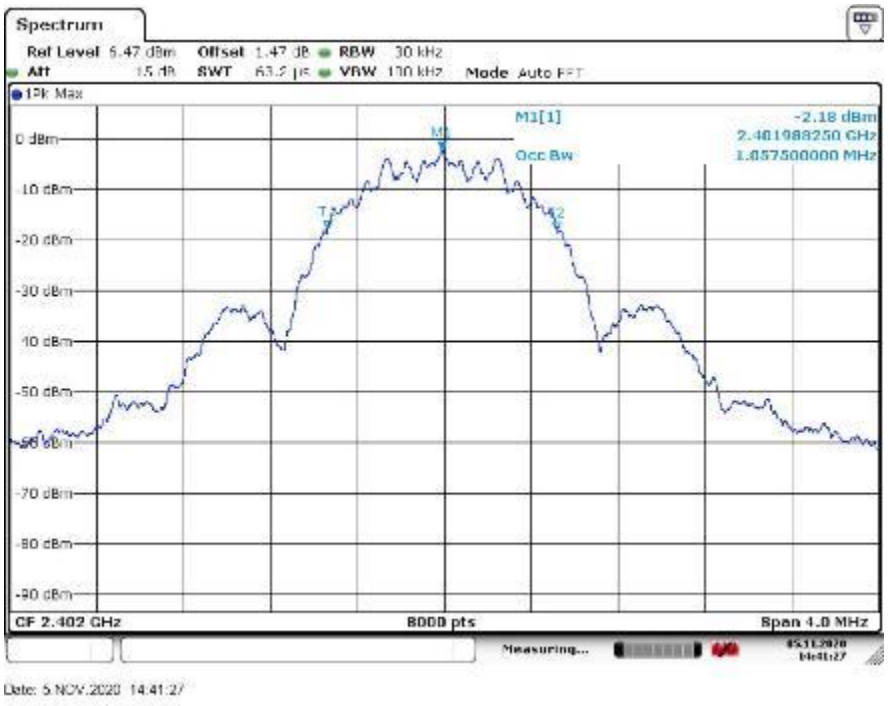
Channel	Frequency (MHz)	99% OBW (kHz)	-6 dB OBW (kHz)	-6 dB OBW Limit (kHz)
Low	2402	1057.5	741.5	>500
Middle	2442	1061	746	>500
High	2480	1063.5	746.5	>500

2 Mbps

Channel	Frequency (MHz)	99% OBW (kHz)	-6 dB OBW (kHz)	-6 dB OBW Limit (kHz)
Low	2402	2076	1170	>500
Middle	2442	2084.25	1170.75	>500
High	2480	2089.5	1172.25	>500

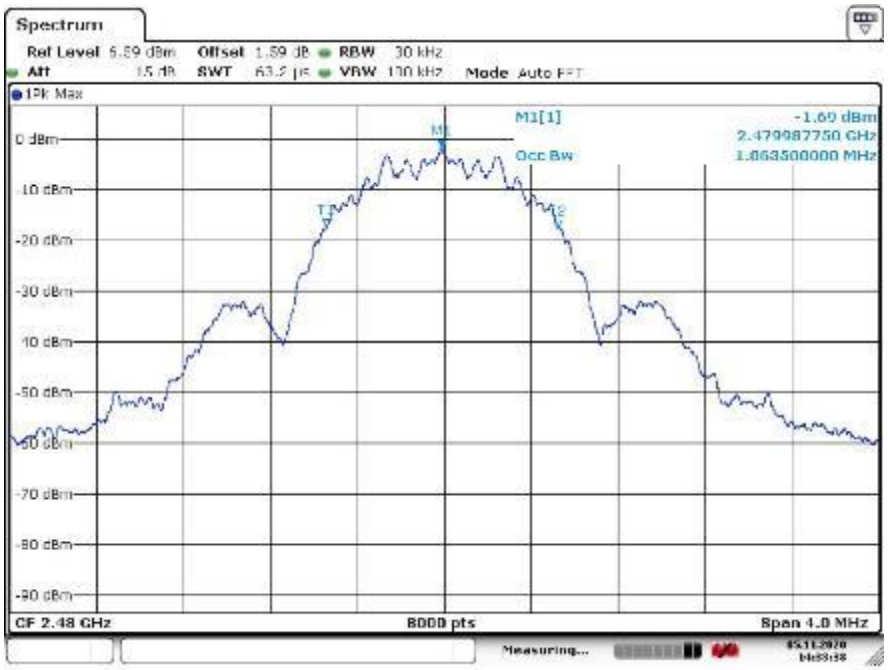
Please refer to the following plots for detailed test results.

99% OBW, Low Channel: 2402 MHz, 1 Mbps

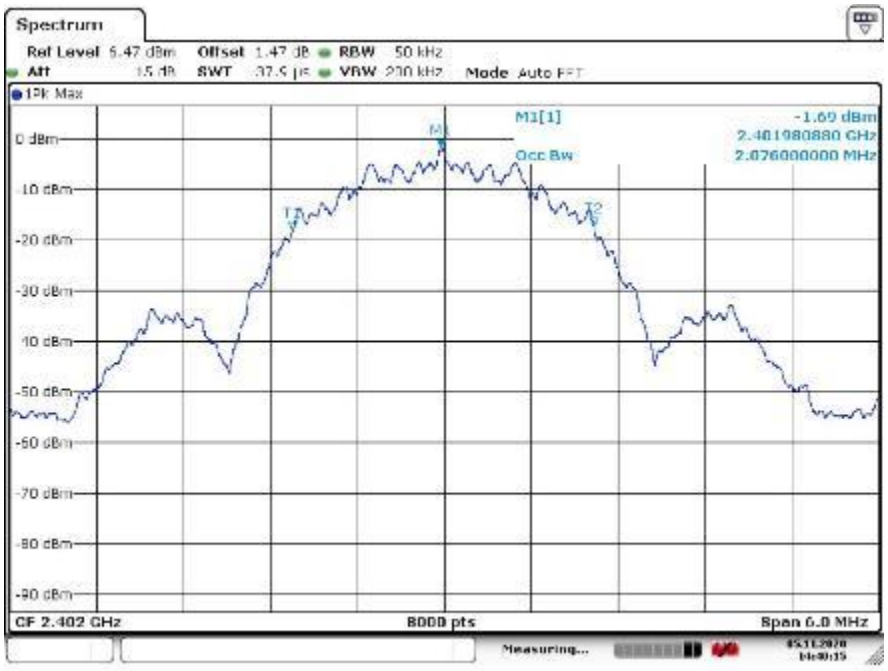


99% OBW, Middle Channel: 2442 MHz, 1 Mbps

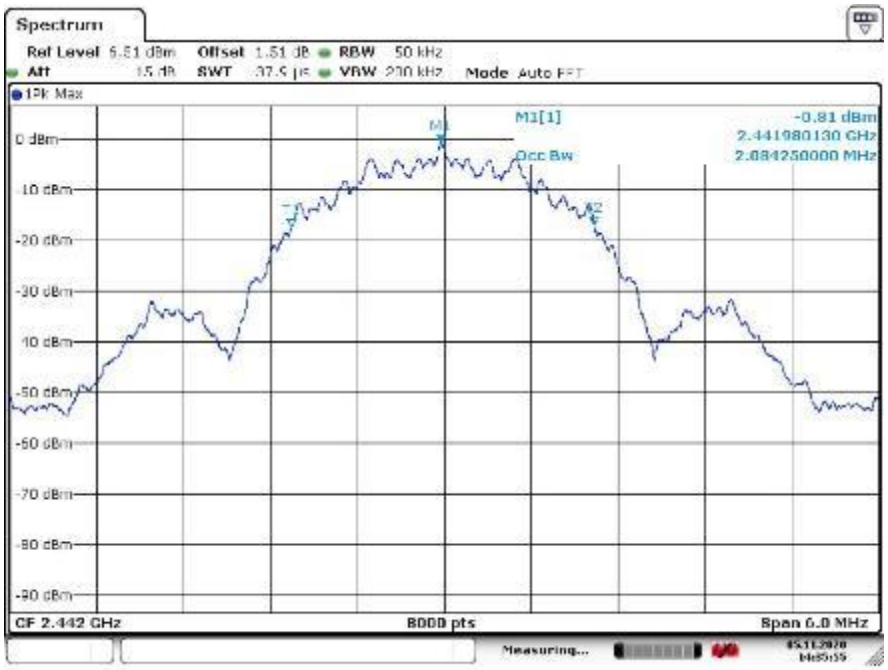
99% OBW, High Channel: 2480 MHz, 1 Mbps



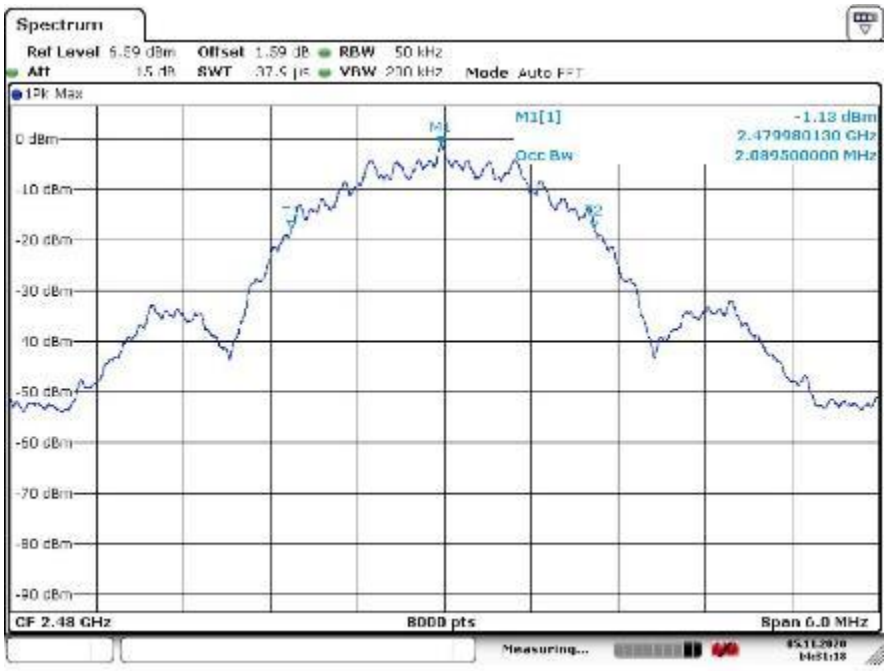
99% OBW, Low Channel: 2402 MHz, 2 Mbps



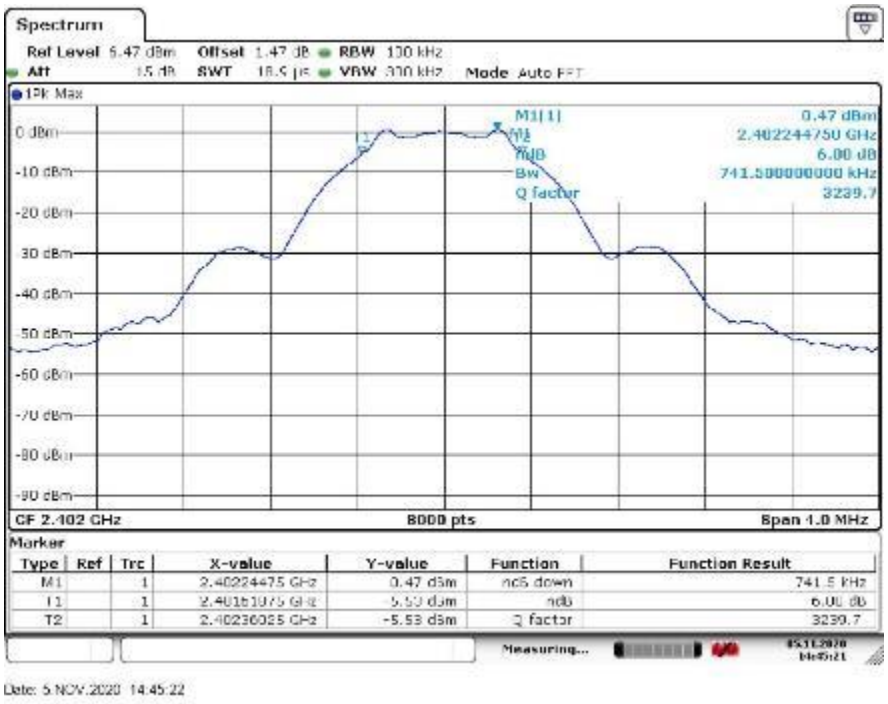
99% OBW, Middle Channel: 2442 MHz, 2 Mbps



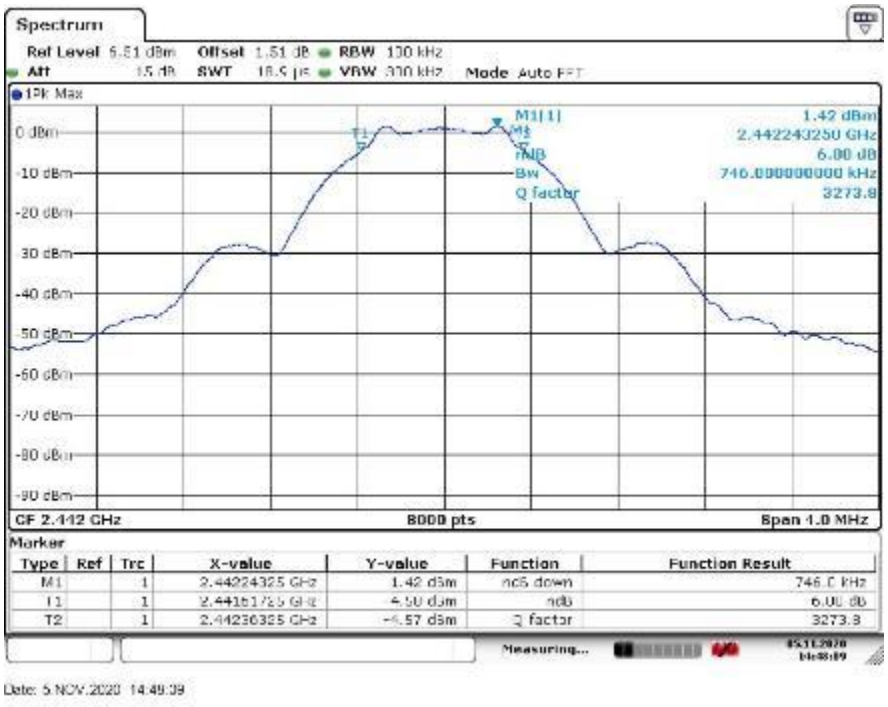
99% OBW, High Channel: 2480 MHz, 2 Mbps



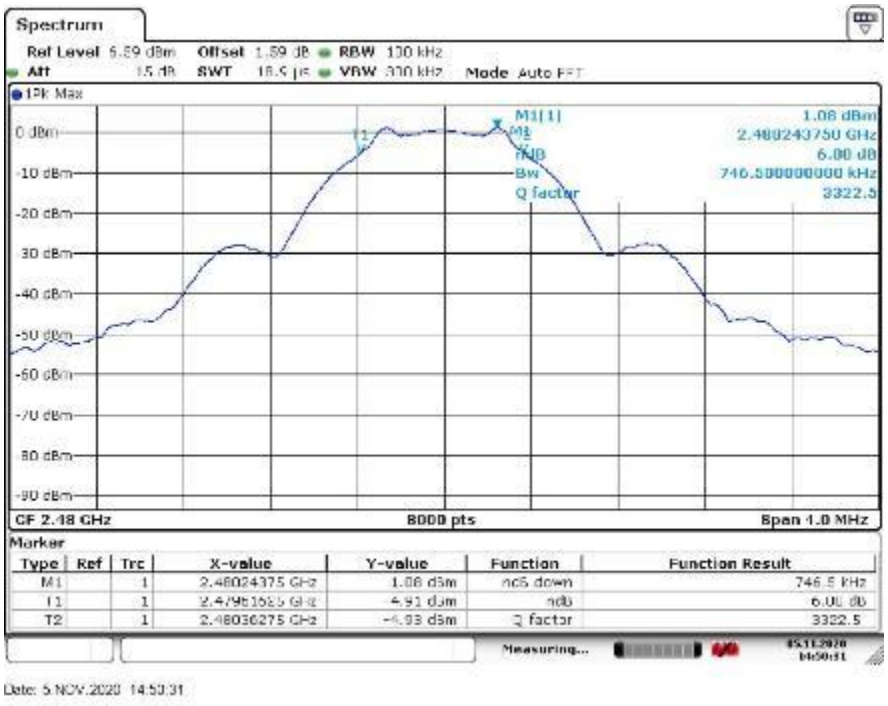
-6 dB OBW, Low Channel: 2402 MHz, 1 Mbps



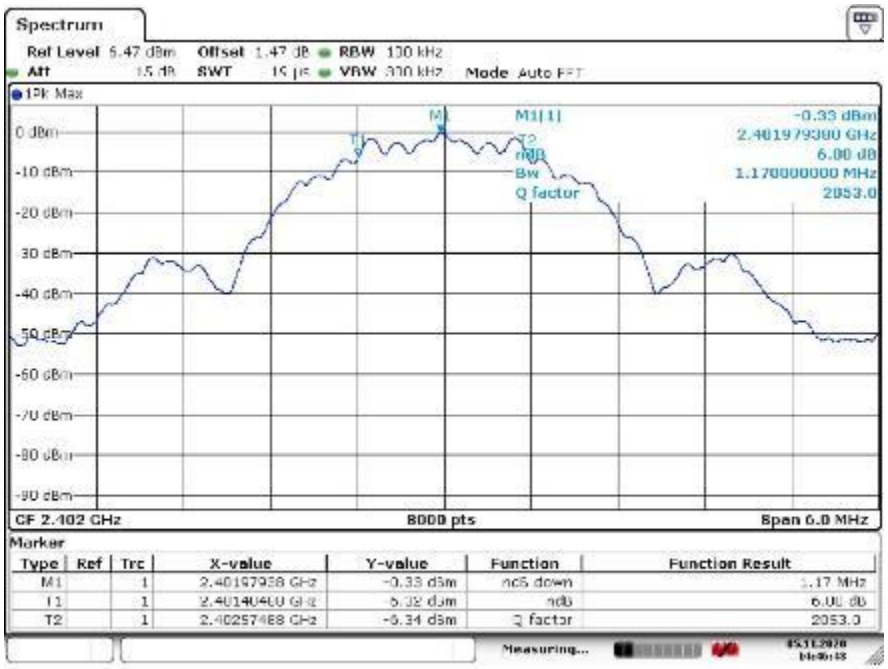
-6 dB OBW, Middle Channel: 2442 MHz, 1 Mbps



-6 dB OBW, High Channel: 2480 MHz, 1 Mbps

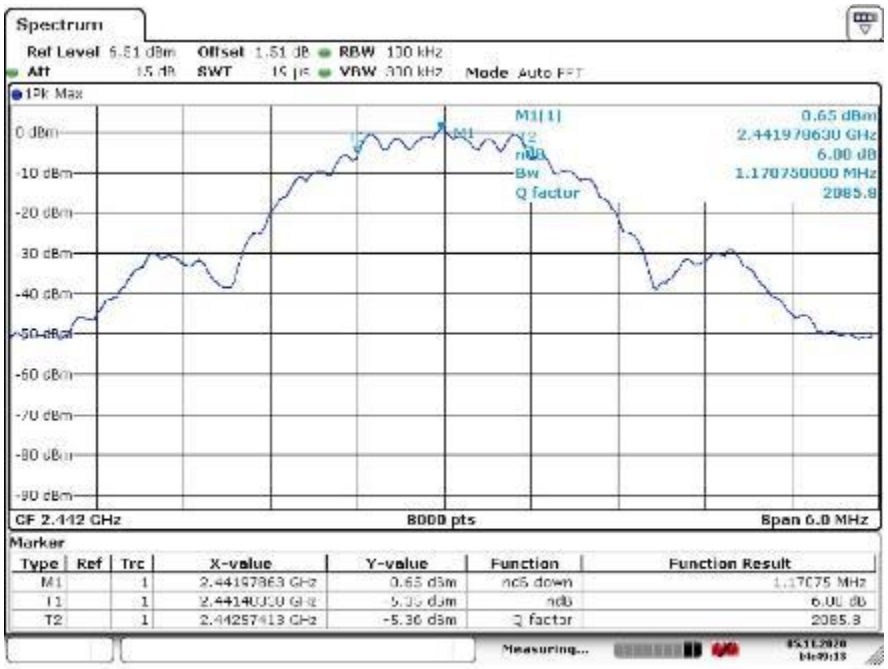


-6 dB OBW, Low Channel: 2402 MHz, 2 Mbps



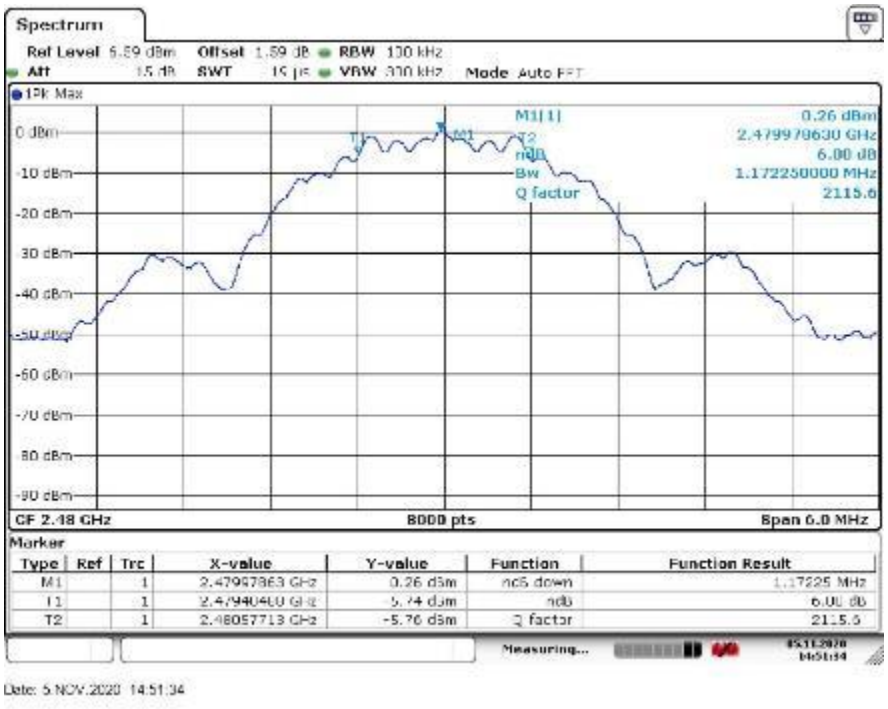
Date: 5.NOV.2020 14:48:44

-6 dB OBW, Middle Channel: 2442 MHz, 2 Mbps



Date: 5.NOV.2020 14:49:13

-6 dB OBW, High Channel: 2480 MHz, 2 Mbps



Date: 5.NOV.2020 14:51:34

9 FCC §15.247(b) (3) & ISEDC RSS-247 §5.4 – Maximum Output Power

9.1 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).

9.2 Measurement Procedure

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

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2020-02-06	1 year
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable 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".*

9.4 Test Environmental Conditions

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

The testing was performed by Allen Huang on 2020-11-05 at RF test site.

9.5 Test Results

1 Mbps

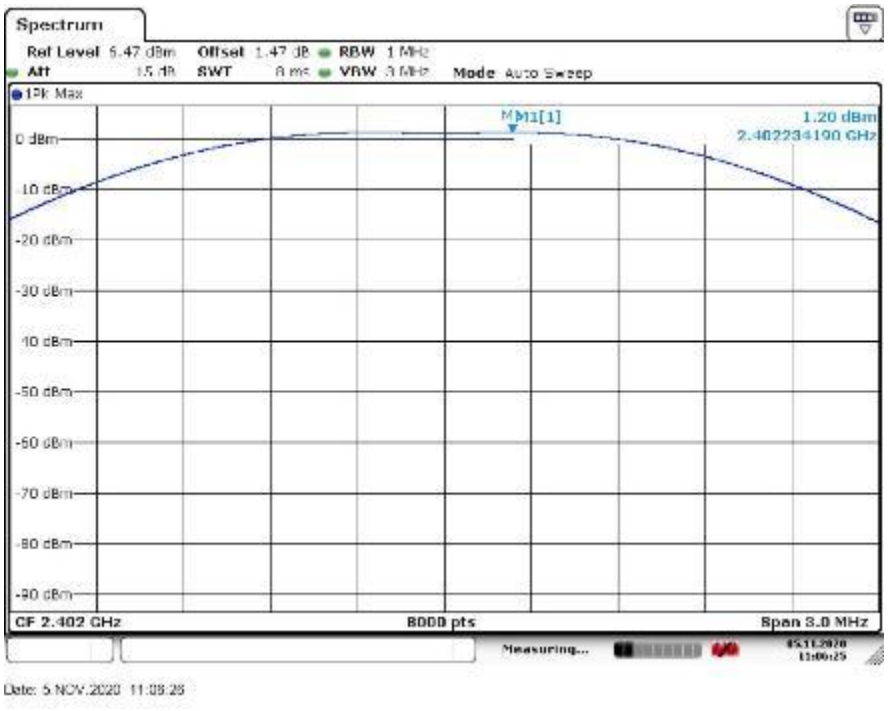
Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC/ISEDC Limit (dBm)
Low	2402	1.20	< 30
Middle	2442	2.10	< 30
High	2480	1.74	< 30

2 Mbps

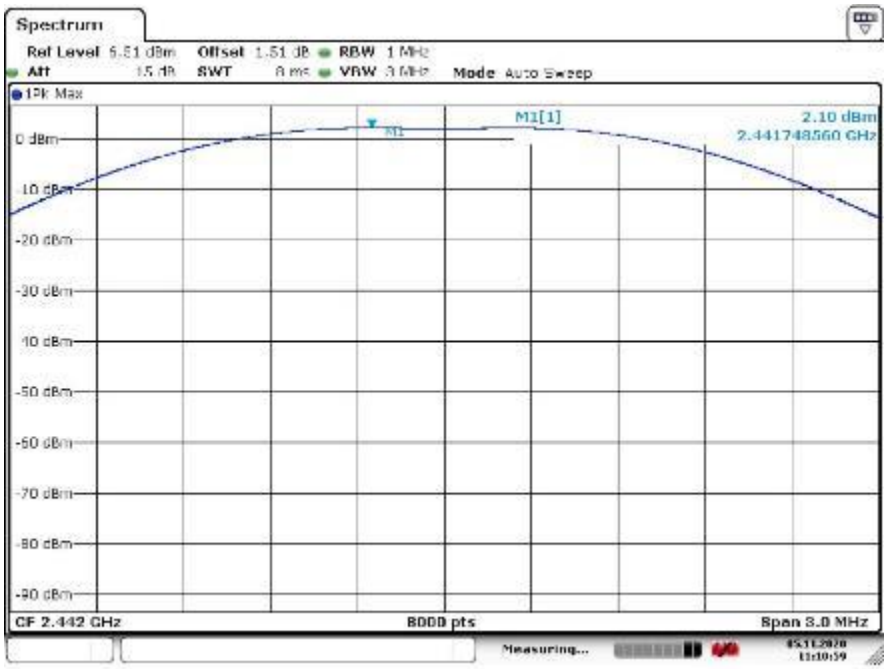
Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC/ISEDC Limit (dBm)
Low	2402	1.17	< 30
Middle	2442	2.09	< 30
High	2480	1.73	< 30

Please refer to the following plots for detailed test results.

Low Channel: 2402 MHz, 1 Mbps

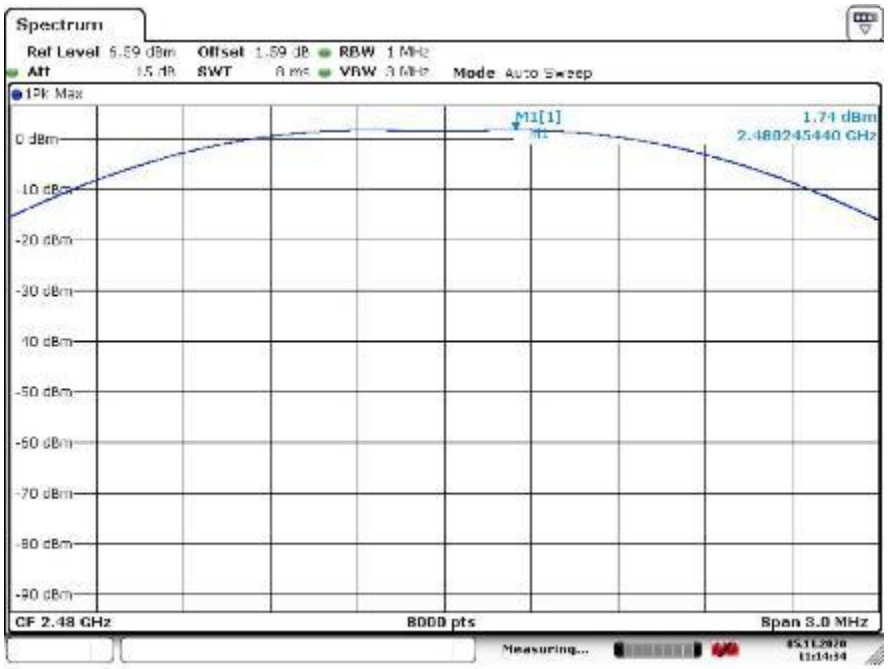


Middle Channel: 2442 MHz, 1 Mbps



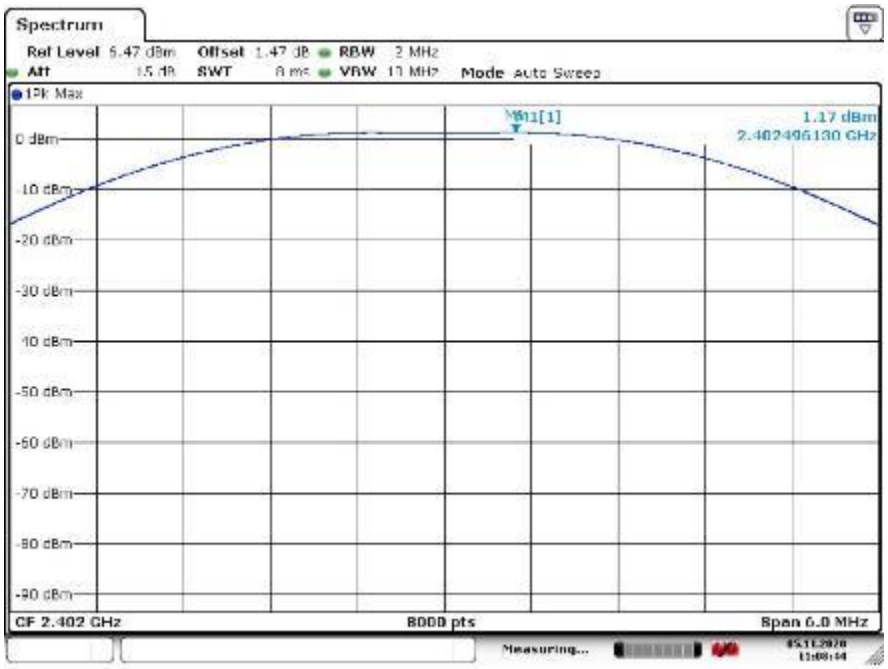
Date: 5.NOV.2020 11:11:30

High Channel: 2480 MHz, 1 Mbps

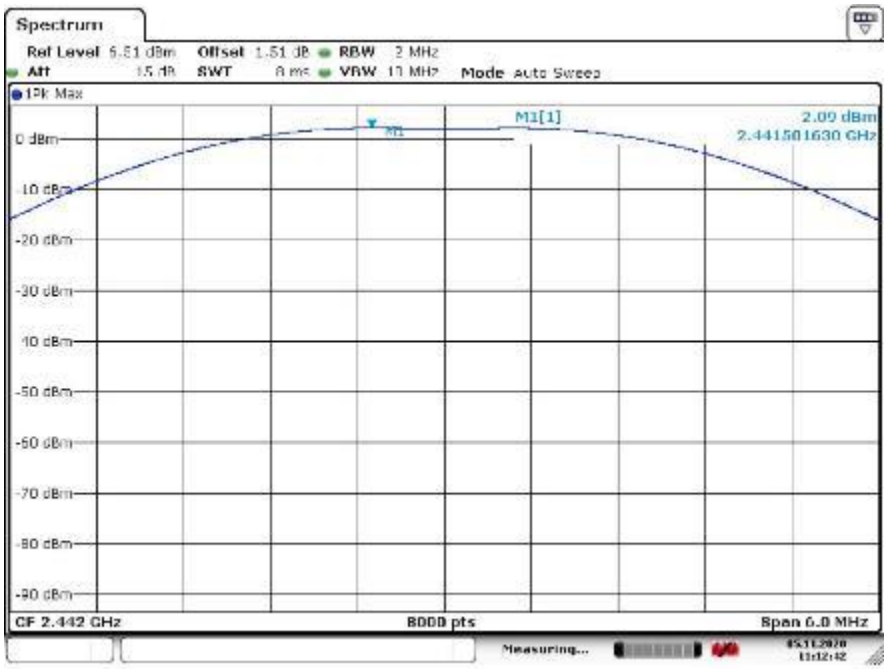


Date: 5.NOV.2020 11:14:34

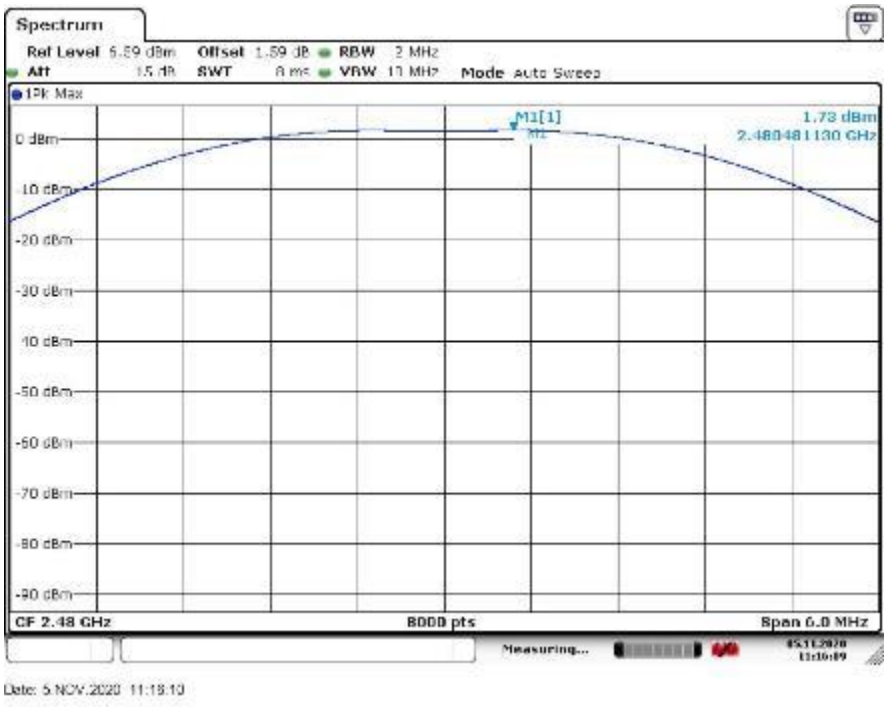
Low Channel: 2402 MHz, 2 Mbps



Middle Channel: 2442 MHz, 2 Mbps



High Channel: 2480 MHz, 2 Mbps



10 FCC §15.247(e) & ISEDC RSS-247 §5.2(2) – Peak Power Spectral Density

10.1 Applicable Standards

According to ECFR §15.247(e) and RSS-247 §5.2 (2) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission.

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2020-02-06	1 year
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable 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".*

10.4 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Allen Huang on 2020-11-05 at RF test site.

10.5 Test Results

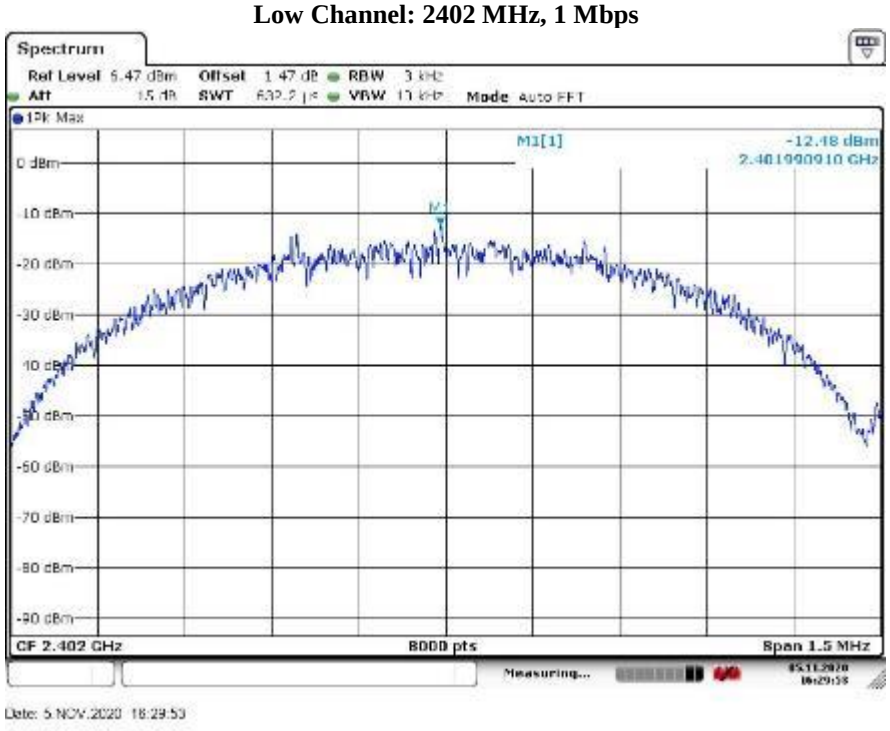
1 Mbps

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	FCC/ISEDC Limit (dBm/3 kHz)
Low	2402	-12.48	8
Middle	2442	-11.63	8
High	2480	-12.04	8

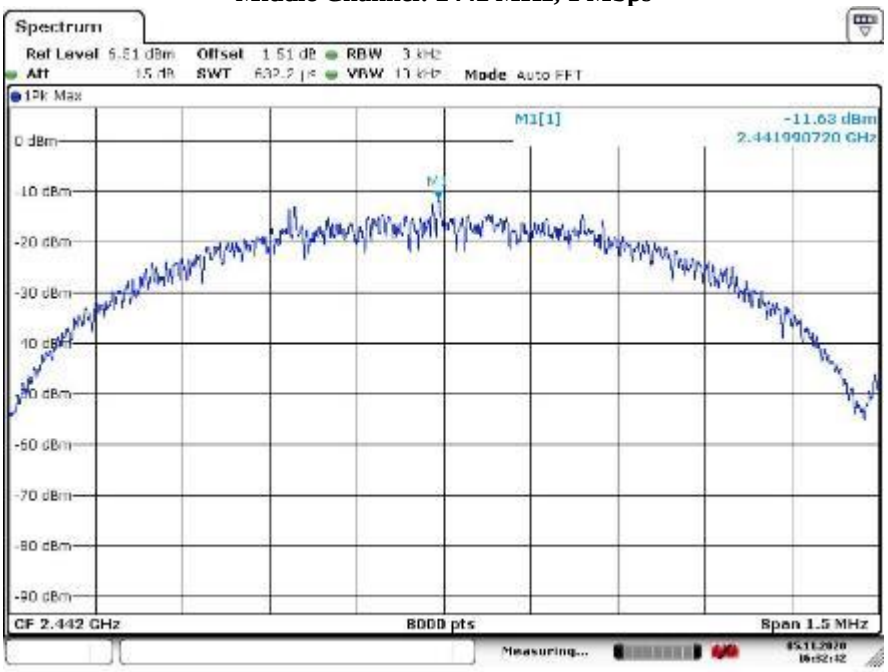
2 Mbps

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	FCC/ISEDC Limit (dBm/3 kHz)
Low	2402	-15.20	8
Middle	2442	-14.30	8
High	2480	-14.71	8

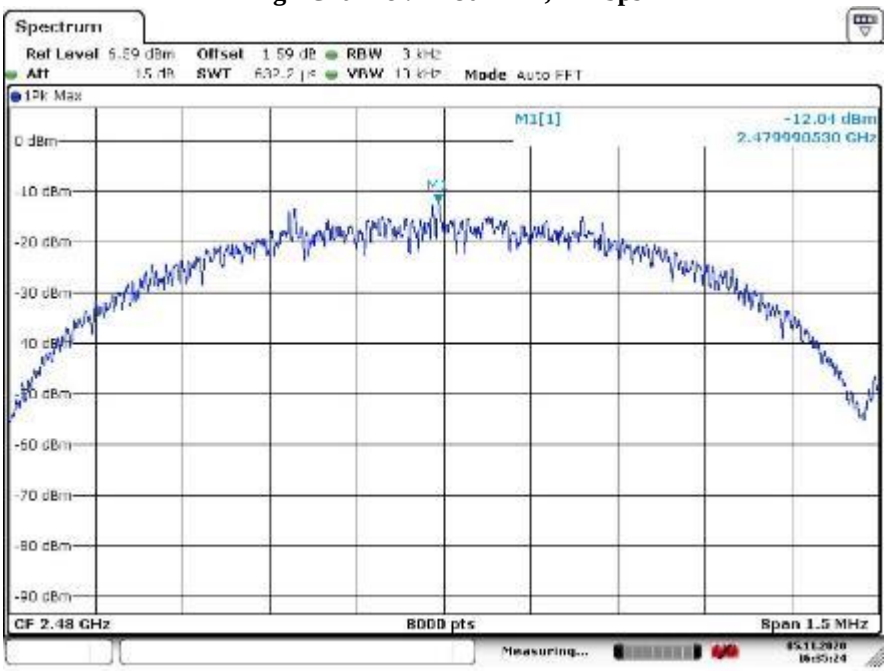
Low Channel: 2402 MHz, 1 Mbps



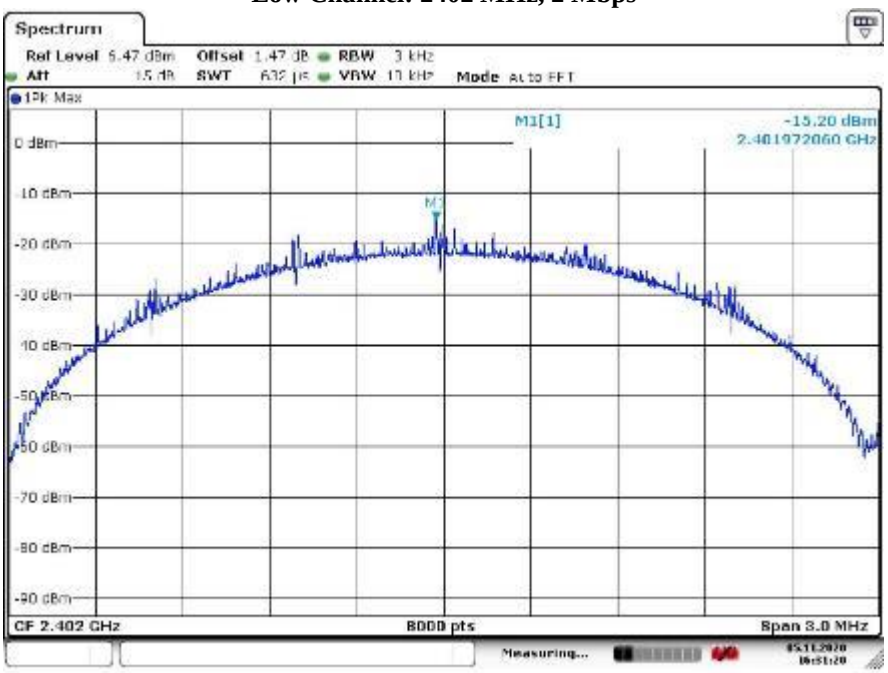
Middle Channel: 2442 MHz, 1 Mbps



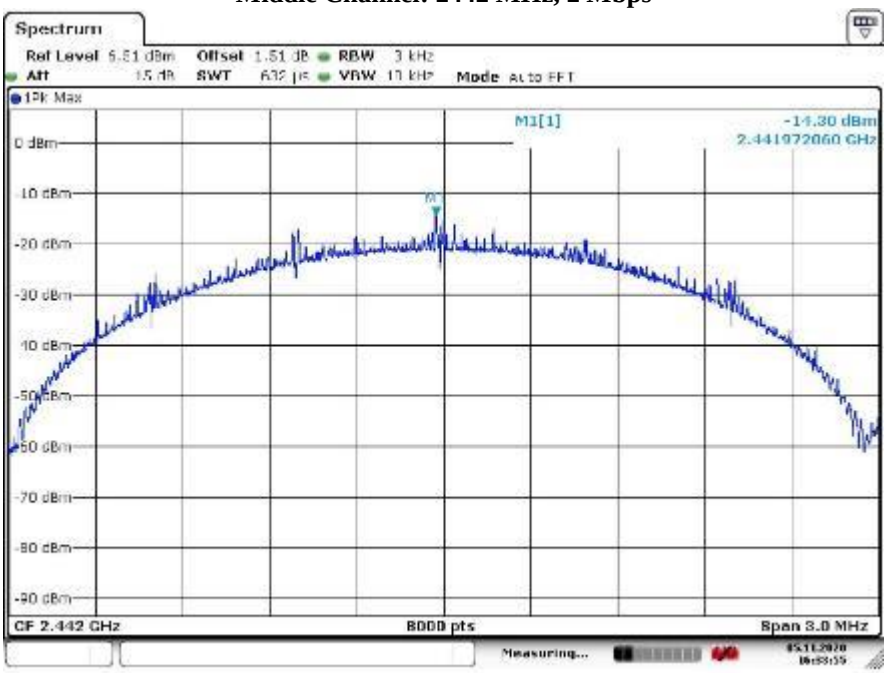
High Channel: 2480 MHz, 1 Mbps



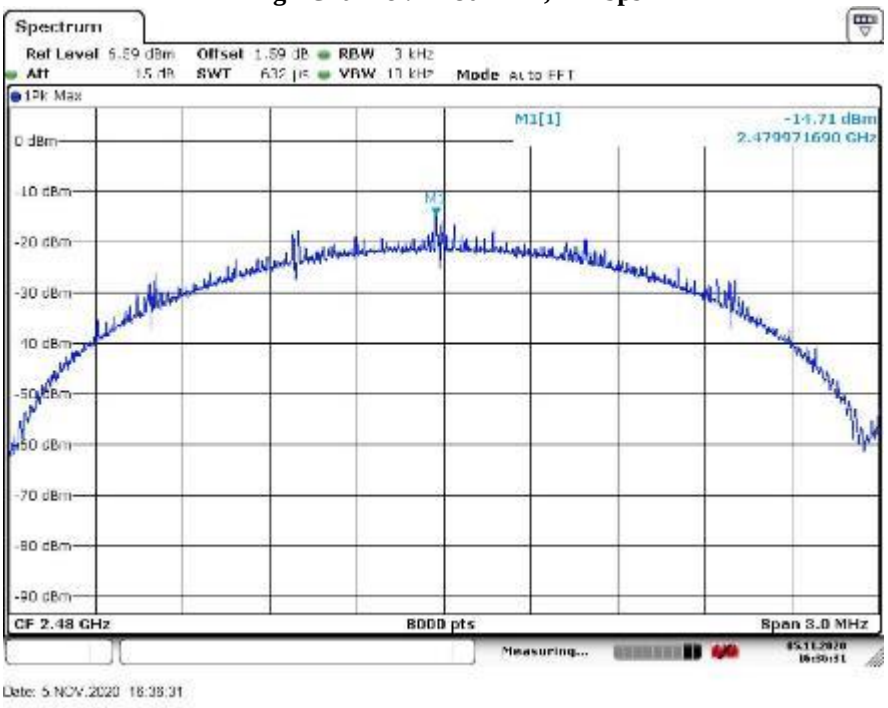
Low Channel: 2402 MHz, 2 Mbps



Middle Channel: 2442 MHz, 2 Mbps



High Channel: 2480 MHz, 2 Mbps



11 FCC §15.247(d) & ISEDC RSS-247 §5.5 - 100 kHz Bandwidth of Band Edges

11.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to 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.

11.2 Measurement Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation

RBW = 100 kHz
VBW = 300 kHz
Sweep = coupled
Detector function = peak
Trace = max hold

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2020-02-06	1 year
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable 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".*

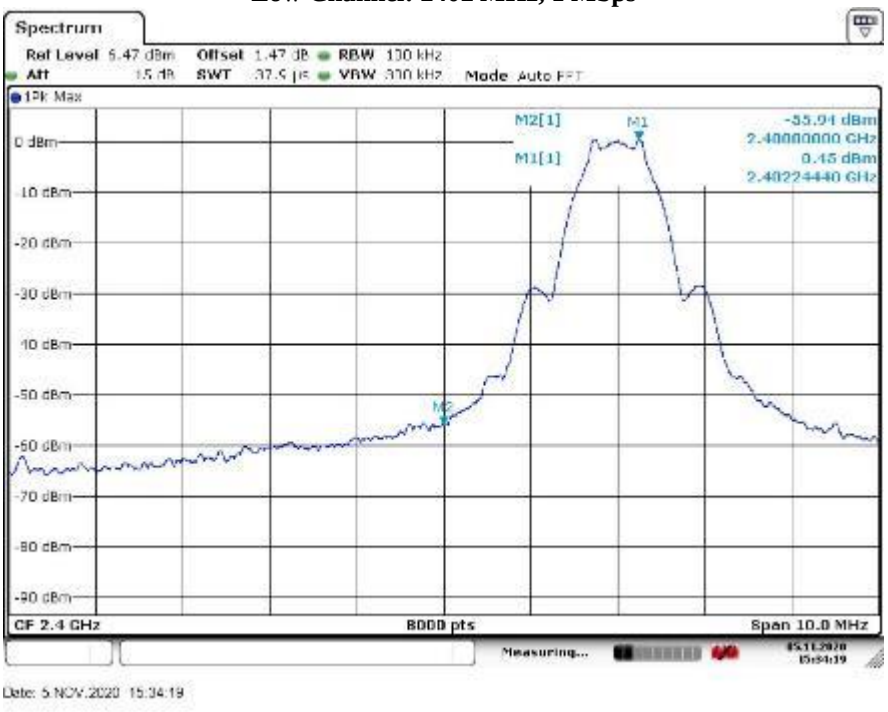
11.4 Test Environmental Conditions

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

The testing was performed by Allen Huang on 2020-11-05 at RF test site.

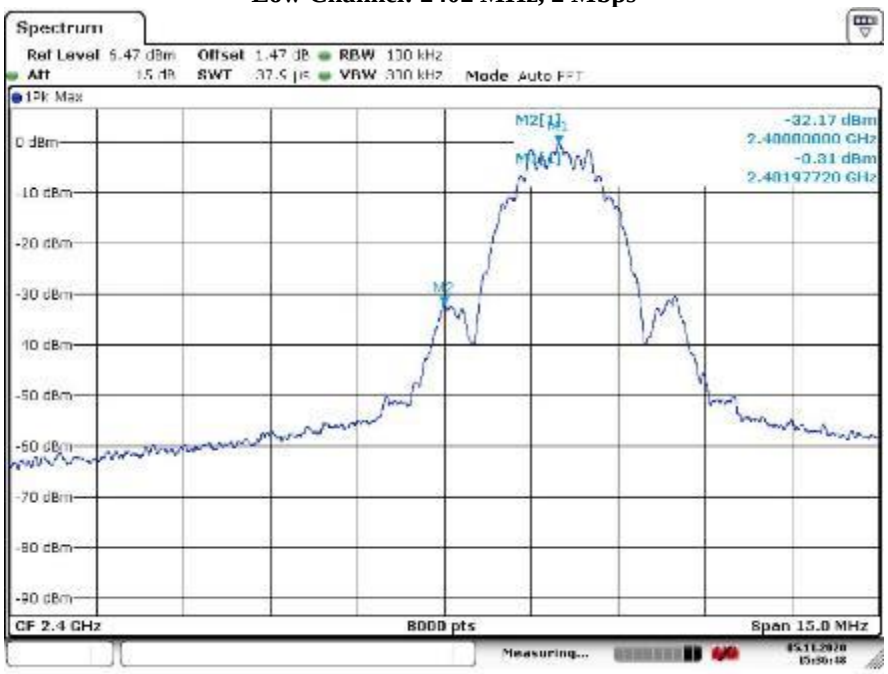
11.5 Test Results

Low Channel: 2402 MHz, 1 Mbps

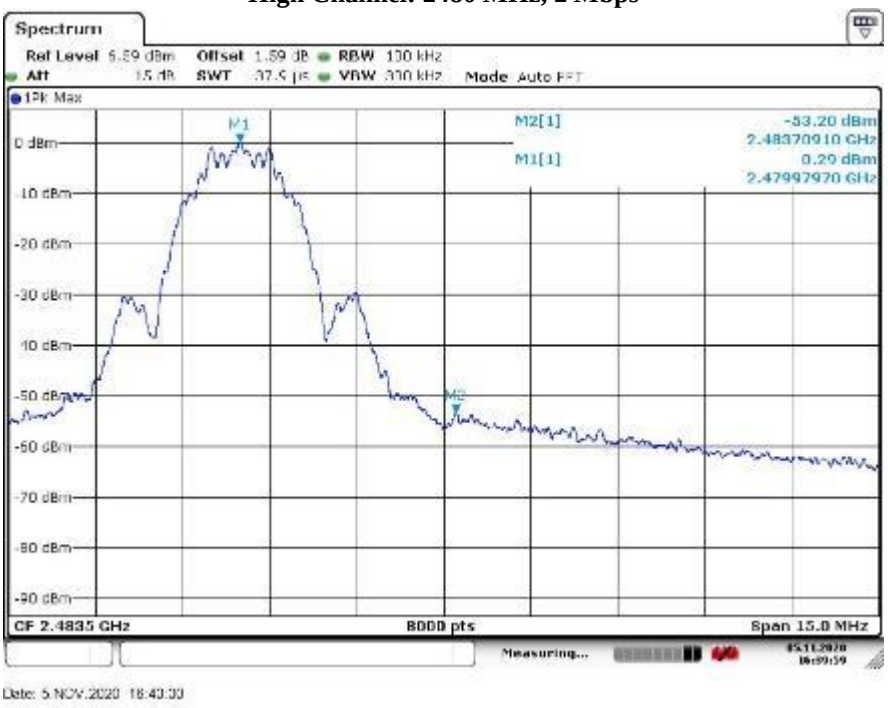


High Channel: 2480 MHz, 1 Mbps

Low Channel: 2402 MHz, 2 Mbps



High Channel: 2480 MHz, 2 Mbps



12 FCC §15.247(d) & ISEDC RSS-247 §5.5 - Spurious Emissions at Antenna Terminals

12.1 Applicable Standards

For FCC §15.247(d) and ISEDC RSS-247 §5.5, 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)).

12.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2020-02-06	1 year
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable 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".*

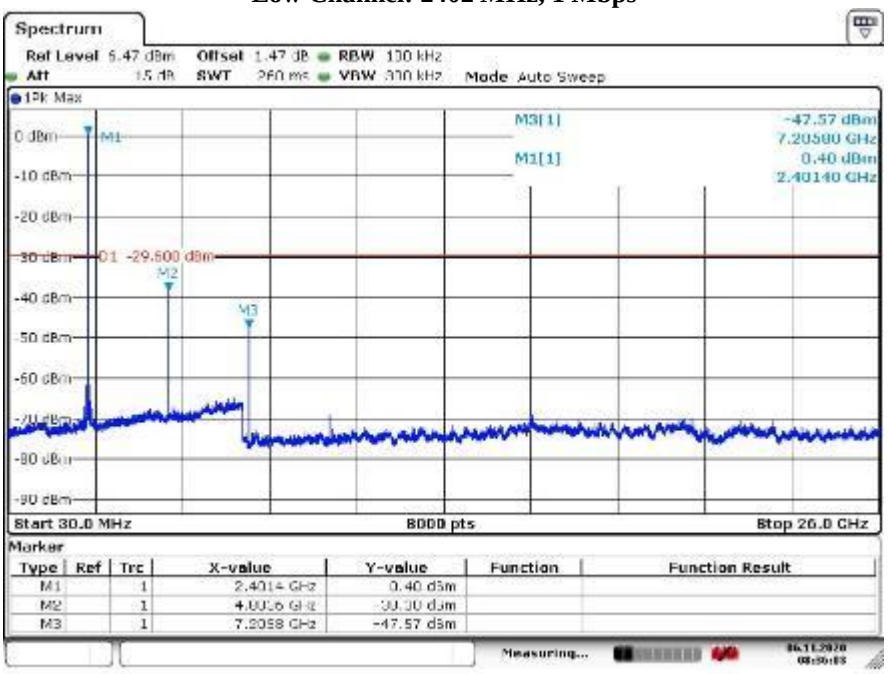
12.4 Test Environmental Conditions

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

The testing was performed by Allen Huang on 2020-11-06 at RF test site.

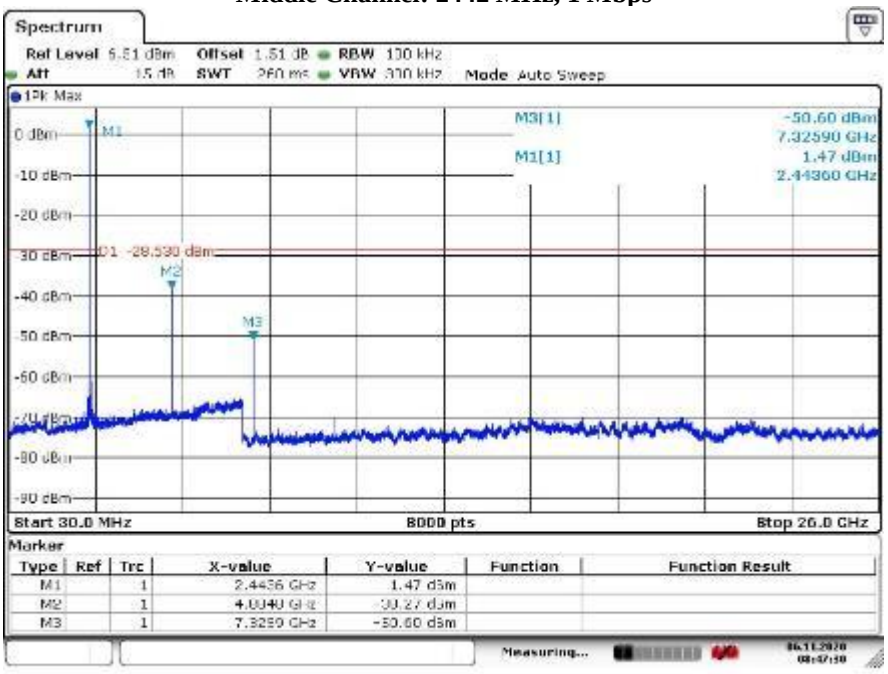
12.5 Test Results

Low Channel: 2402 MHz, 1 Mbps



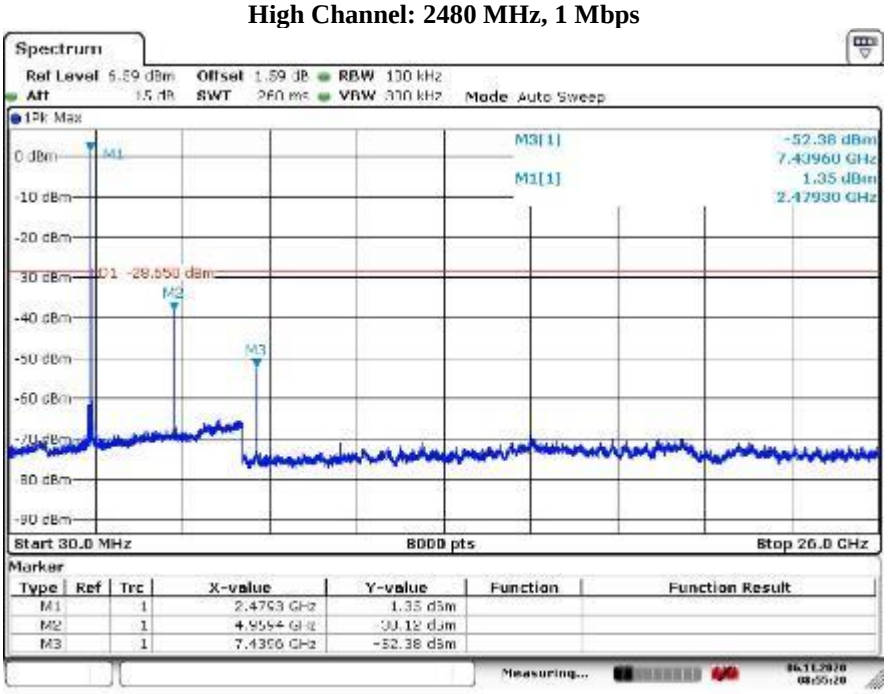
Date: 6.NOV.2020 08:38:33

Middle Channel: 2442 MHz, 1 Mbps



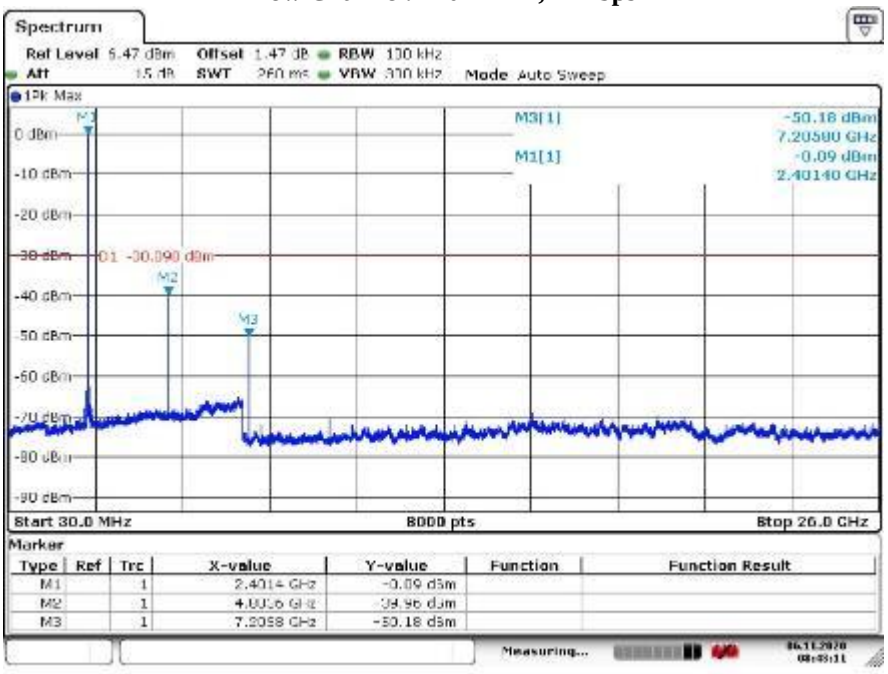
Date: 6.NOV.2020 08:47:30

High Channel: 2480 MHz, 1 Mbps



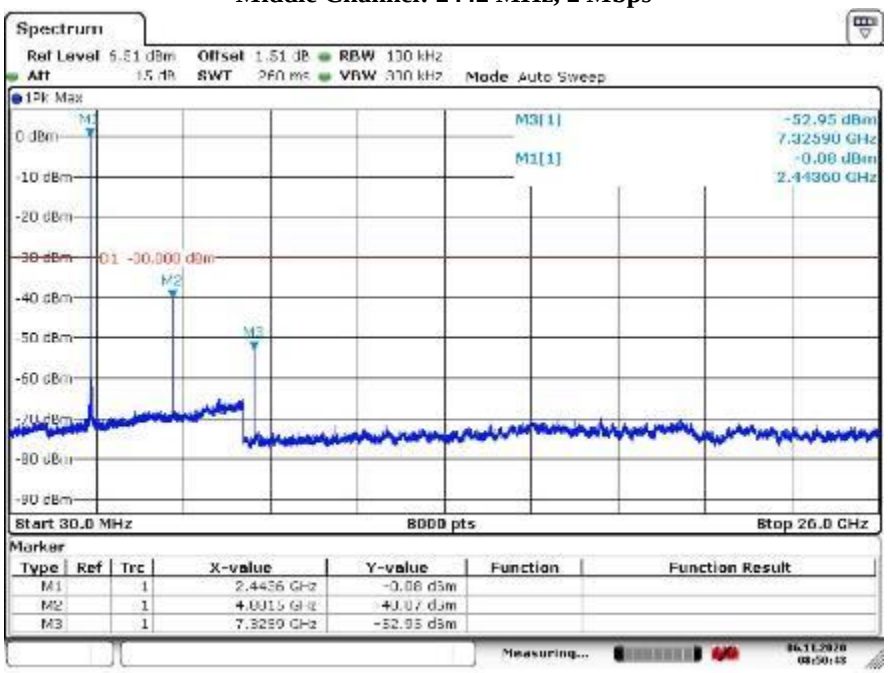
Date: 6.NOV.2020 08:55:20

Low Channel: 2402 MHz, 2 Mbps



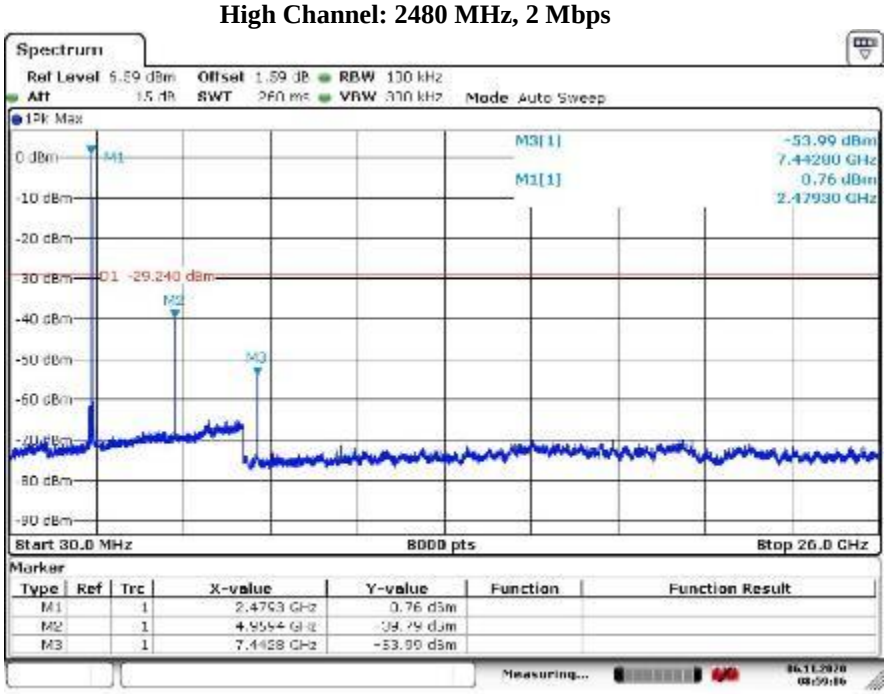
Date: 6.NOV.2020 08:43:11

Middle Channel: 2442 MHz, 2 Mbps



Date: 6.NOV.2020 08:50:43

High Channel: 2480 MHz, 2 Mbps



Date: 6.NOV.2020 08:59:06

13 Annex A (Normative) - Test Setup Photographs

Please refer to the attachment

14 Annex B (Normative) - EUT Photographs

Please refer to the attachment

15 Annex C (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 2nd day of October 2018.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to February 28, 2021
Revised December 04, 2020

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 ---