FCC PART 15, SUBPART C
ISEDC RSS-247, ISSUE 3, AUGUST 2023

TEST REPORT

For

Roku, Inc.

1173 Coleman Ave

San Jose, CA 95110, USA

FCC ID: TC2-R1056
IC: 5959A-R1054

Report Type: Original Report	**Product Type:** Streaming Stick	
Prepared By:	Libass Thiaw RF Test Engineer	
Report Number:	R2411112-DTS	
Report Date:	2025-03-06	
Reviewed By:	Christian McCaig RF Lead Engineer	
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164		

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2411112-DTS	Original Report	2025-03-06

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report is prepared on behalf of *Roku, Inc.*, and their product model: 3840X, FCC ID: TC2-R1056 IC: 5959A-R1054, the “EUT” as referred to in this report. The EUT has 2.4 GHz/ 5 GHz Wi-Fi and 2.4 GHz BLE/BTC capabilities.

Model Number	3840X
FCC ID	TC2-R1056
IC	5959A-R1054
Radio Type	2.4Wi-Fi, BLE
Operating Frequency	2400~2480 MHz
Modes	Wi-Fi (802.11b/g/n20), BLE (1M,2M)

1.2 Mechanical Description of EUT

The UUT measures approximately 9.6 cm (L) x 2.0 cm (W) x 1.0 cm (H) and weighs approximately < 0.05 kg.

The data gathered was from a production sample provided by Roku, Inc. with S/N: SIGK34A15CAX

1.3 Objective

This report is prepared on behalf of *Roku, Inc.* in accordance with Part 2, Subpart J, and Part 15, Subpart C of the Federal Communication Commission’s rules and ISEDC RSS-247 Issue 3, August 2023.

The objective is to determine compliance with FCC Part 15.247 and ISEDC RSS-247 for Antenna Requirement, RF Exposure, Radiated & Conducted Spurious Emissions, Emission Bandwidth, Maximum Output Power, Power Spectral Density, and 100 kHz Band Edges.

In order to determine compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the immunity should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing and/or I/O cable changes, etc.).

1.4 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment Class: DSS with FCC ID: TC2-R1056 IC: 5959A-R1054
FCC Part 15, Subpart E, Equipment Class: NII with FCC ID: TC2-R1056 IC: 5959A-R1054

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2020 , American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v05r02: 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	±1.48 dB
Unwanted Emissions, conducted	±1.57 dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2ºC
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.

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-428.

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 - ISED) 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 C63.10-2020 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.

2.2 EUT Exercise Software

The exercising software used during testing was “Tera Term”, the software is compliant with the standard requirements being tested against.

Radio	Frequency (MHz)	Configuration	Power Setting
2.4 GHz Wi-Fi	2412	802.11b	109
	2437		127
	2462		109
	2412	802.11g	93
	2437		127
	2462		93
	2412	802.11n20	93
	2437		127
	2462		93
2.4 GHz BLE	2402	1 Mbps	Default
	2442		Default
	2480		Default
	2402	2 Mbps	Default
	2442		Default
	2480		Default

Data rates used:

802.11b: 1Mbps
802.11g: 6 Mbps
802.11n: MCS0

2.3 Duty Cycle Correction Factor

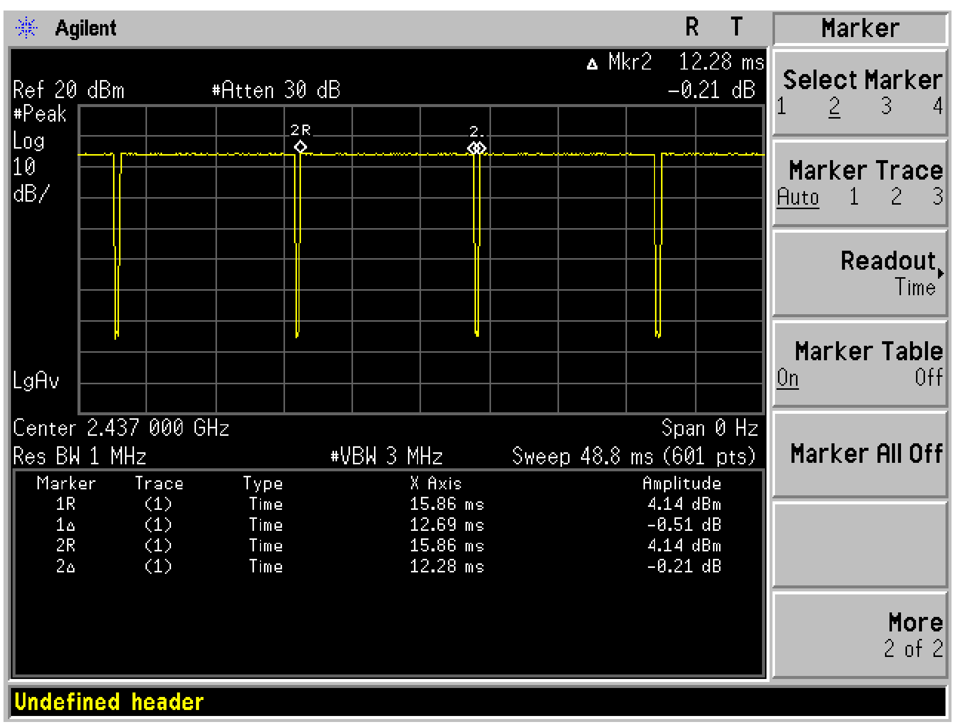
According to KDB 558074 D01 DTS Meas Guidance v05r02 section 6.0:

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).

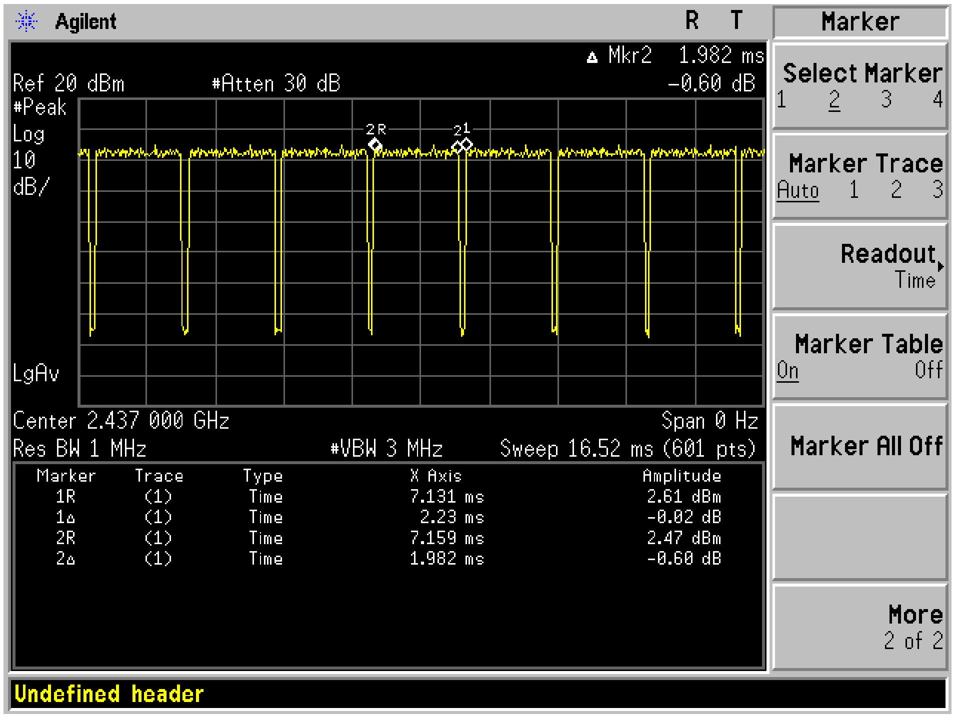
Radio	Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
2.4 GHz Wi-Fi	802.11b	12.28	12.69	96.77	0.143
	802.11g	1.982	2.23	88.88	0.512
	802.11n20	1.845	2.175	84.83	0.715
2.4 GHZ BLE	1Mbps	0.393	0.6219	63.210	1.992
	2Mbps	0.200	0.616	32.386	4.896

*Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)*

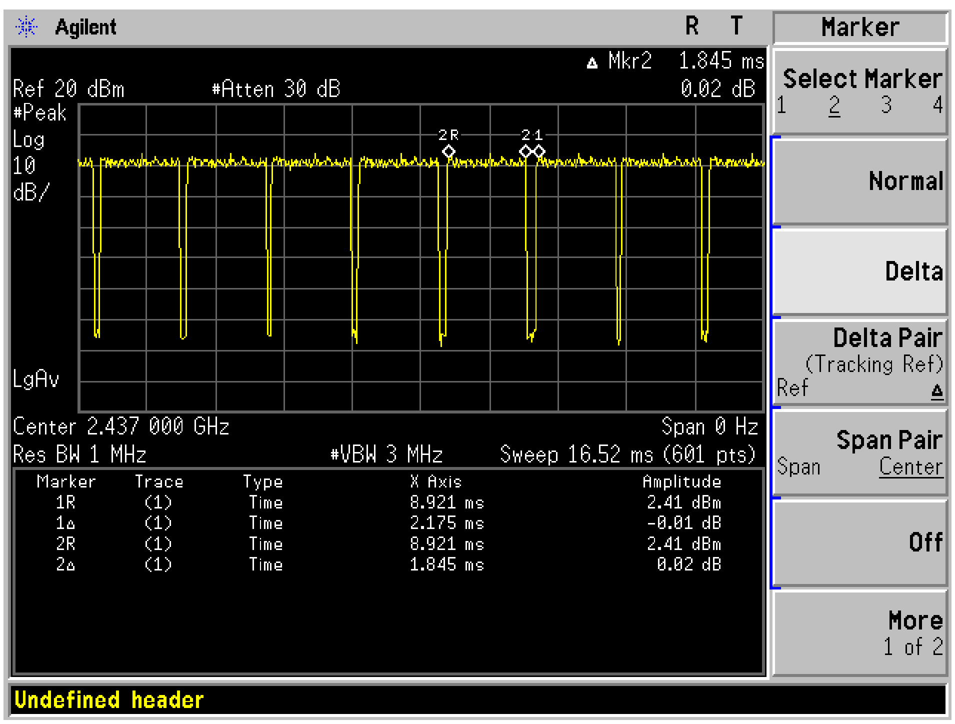
bmode Duty Cycle



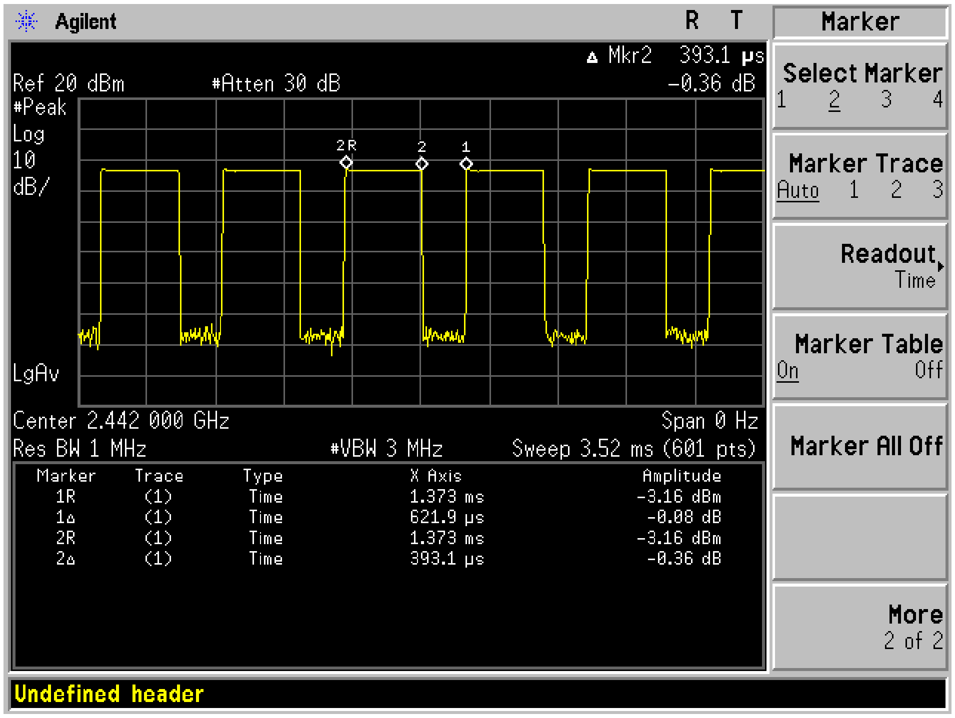
gmode Duty Cycle



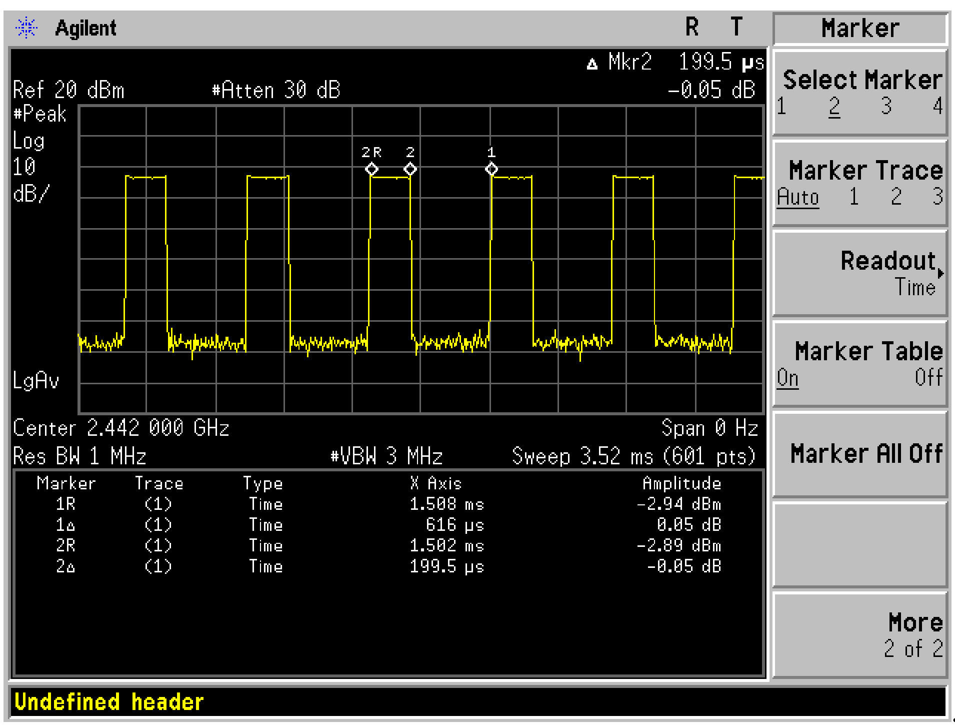
n20mode Duty Cycle



1Mbps Duty Cycle



2Mbps Duty Cycle



2.4 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E7440	-

2.5 Remote Support Equipment

N/A

2.6 Power Supply and Line Filters

N/A

2.7 Interface Ports and Cabling

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

3 Summary of Test Results

FCC & ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirements	Compliant
FCC §2.1091, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §2.1053, §15.35(b), §15.205, §15.209, §15.247(d) ISEDC RSS-247 §5.5 ISEDC 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)	Power Spectral Density	Compliant
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
	100 kHz Bandwidth of Frequency Band Edges	Compliant

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 isotopically 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	Antenna Usage	Antenna Type	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Integral	2.4 GHz Wi-Fi	Chip	2412-2462	-2.9
Integral	2.4 GHz BLE		2402-2480	-0.1

Note: The antenna gain were provided by the customer.

5 FCC §2.1091, FCC §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.

According to KDB 447 498 Section (7.2), "simultaneous transmission of MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum *test separation distance* required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency.

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

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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field.

According to ISED RSS-102 Issue 6:

6.6 Field reference level exposure exemption limits

Field reference level (FRL) 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 (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP 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 EIRP of the device is equal to or less than $4.49/f^{0.5}W$ (adjusted for tune-up tolerance), where ƒ is in MHz
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum EIRP 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 EIRP of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834} W$ (adjusted for tune-up tolerance), where ƒ is in MHz
- at or above 6 GHz and the source-based, time-averaged maximum EIRP 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 EIRP 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 RF exposure evaluation for FCC

Worst Case: 802.11b, 2437 MHz

Maximum output power at antenna input terminal (dBm):	22.49
Maximum output power at antenna input terminal (mW):	177.419
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Directional Antenna Gain, typical (dBi):	-2.9
Maximum Antenna Gain (numeric):	0.513
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0181
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement FCC MPE limit for uncontrolled exposure. The maximum power density at the distance of 20cm is 0.017mW/cm^2. Limit is 1.0 mW/cm^2.

Worst Case: BLE, 2M, 2442 MHz

Maximum output power at antenna input terminal (dBm):	8.62
Maximum output power at antenna input terminal (mW):	7.278
Prediction distance (cm):	20
Prediction frequency (MHz):	2442
Maximum Directional Antenna Gain, typical (dBi):	-0.1
Maximum Antenna Gain (numeric):	0.977
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00142
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement FCC MPE limit for uncontrolled exposure. The maximum power density at the distance of 20cm is 0.002mW/cm^2. Limit is 1.0 mW/cm^2.

Worst case colocation: BLE ratio + 5Wifi ratio. 0.00142/1 +0.056/1 = 0.05742 < 1
Worst case colocation: BLE ratio + 2.4Wifi ratio. . 0.00142/1 +0.0181/1 = 0.01952< 1

5.4 RF exposure evaluation exemption for IC

Worst Case for WIFI: 2437MHz frequency used for formula

Maximum EIRP power = 22.49 dBm -2.9 dBi = 19.59 dBm which is less than $1.31\times10^{-2}f^{\,0.6834}$ = 2.68 W = 34.3 dBm

Therefore the RF exposure Evaluation is not required.

Worst Case WIFI: 2442MHz frequency used for formula

Maximum EIRP power = 8.18 dBm + -0.1 dBi = 8.52 dBm which is less than $1.31\times10^{-2}f^{\,0.6834}$ = 2.68 W = 34.3 dBm

Therefore the RF exposure Evaluation 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 Note1	56 to 46 Note2
0.5-5	56	46
5-30	60	50

Note1: Decreases with the logarithm of the frequency.
Note2: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2020 measurement procedure. The specification used were FCC §15.207 and ISED RSS-Gen §8.8 limits.

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

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cords of support equipment were connected to LISN-2.

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

All data were recorded in the peak, 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 & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Correction Factor (CF) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CF

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Correction Factor (13.7 dB)

The Correction Factor is calculated by adding Cable loss (CL) and attenuation of the impulse limiter and the high pass filter. The basic equation is as follows:

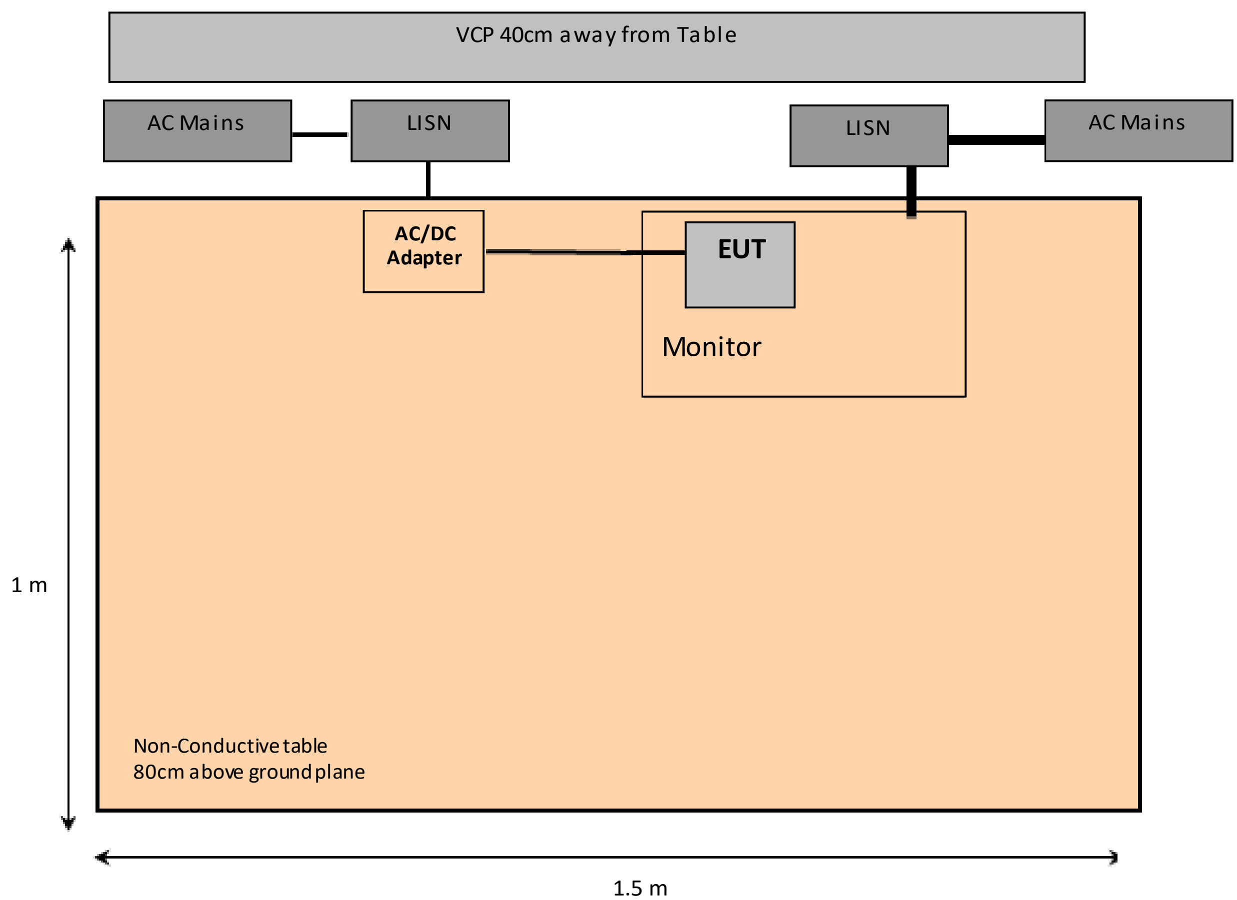
CF= CL + Attenuator

For example, a corrected amplitude of 13.7 dB = Cable Loss (3.7 dB) + Attenuation (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

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
124	Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2024-06-19	1 year
681	Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101962	2024-09-17	6 months
732	FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2024-09-13	1 year
732	FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2024-03-05	1 year
1425	Pasternack	Ground Plane RG58 Coaxial Cable	PE3441-500CM	NA	2025-01-07	6 months

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:	21 to 23 ºC
Relative Humidity:	59 to 60.34 %
ATM Pressure:	101.6 kPa

The testing was performed by Shankar Pangeni on 2025-02-24 to 2025-02-27 in the 5 meter chamber 3.

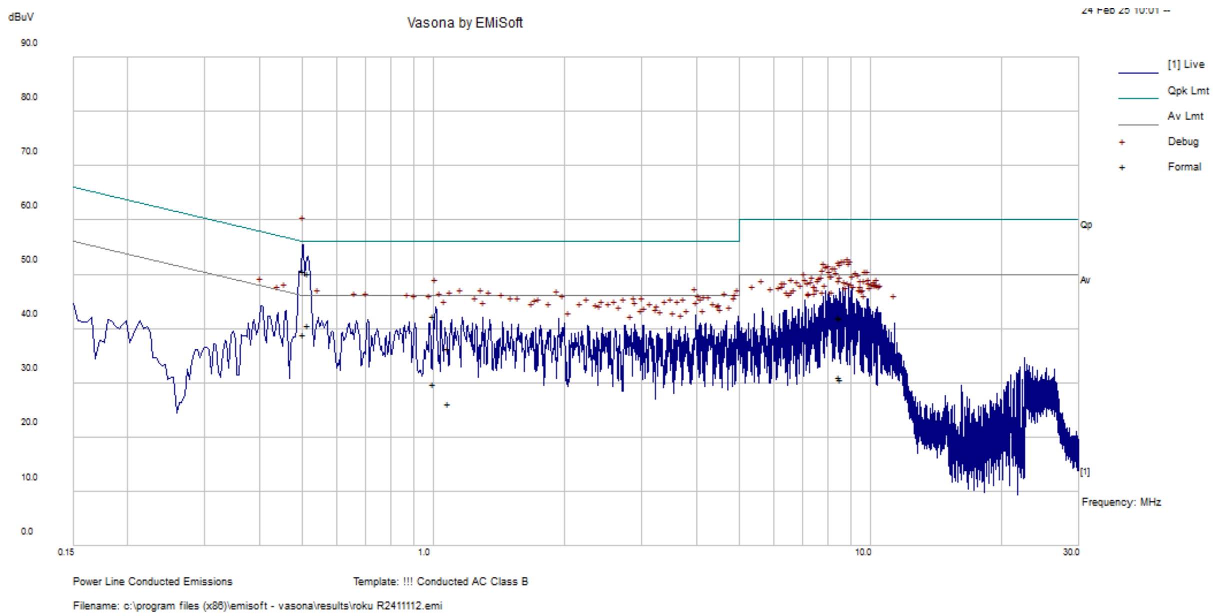
6.8 Summary of Test Results

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:

Worst Case – AC Line (via AC/DC Adapter): 120V, 60Hz			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-3.02	0.505303	Live	0.15 to 30

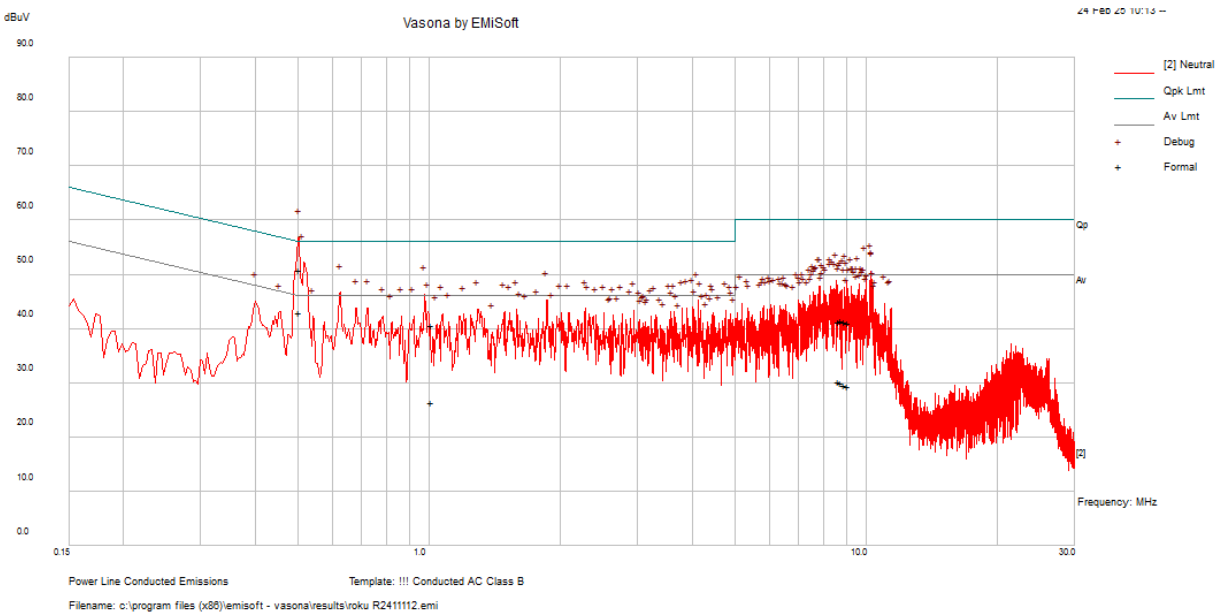
6.9 Conducted Emissions Test Plots and Data

AC Line (via AC/DC Adapter): 120V, 60Hz – Live Conductor



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.505303	40.38	10.53	50.91	56	-5.09	QP
1.016729	30.4	10.27	40.68	56	-15.32	QP
8.935268	30.94	10.24	41.18	60	-18.82	QP
8.640349	31.12	10.24	41.36	60	-18.64	QP
9.066437	30.78	10.24	41.02	60	-18.98	QP
8.765303	31.31	10.24	41.55	60	-18.45	QP
0.505303	32.44	10.53	42.98	46	**-3.02**	Ave
1.016729	16.11	10.27	26.38	46	-19.62	Ave
8.935268	19.36	10.24	29.6	50	-20.4	Ave
8.640349	20.06	10.24	30.29	50	-19.71	Ave
9.066437	19.07	10.24	29.31	50	-20.69	Ave
8.765303	19.71	10.24	29.94	50	-20.06	Ave

AC Line (via AC/DC Adapter): 120V, 60Hz – Neutral Conductor



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBμV)	Limit (dBμV)	Margin (dB)	Detector
0.502585	41.53	10.53	52.07	56	-3.93	QP
0.503123	41.2	10.53	51.74	56	-4.26	QP
0.622322	28.63	10.43	39.06	56	-16.94	QP
10.22158	30.04	10.25	40.3	60	-19.7	QP
0.979707	32.48	10.29	42.77	56	-13.23	QP
9.972915	30.22	10.25	40.47	60	-19.53	QP
0.502585	31.78	10.53	42.31	46	-3.69	Ave
0.503123	31.72	10.53	42.26	46	-3.74	Ave
0.622322	19.16	10.43	29.59	46	-16.41	Ave
10.22158	17.7	10.25	27.96	50	-22.04	Ave
0.979707	24.09	10.29	34.38	46	-11.62	Ave
9.972915	17.99	10.25	28.25	50	-21.75	Ave

7 FCC §15.35(b), §15.205, §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(b): 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) 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-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.

As per ISEDC RSS-Gen §8.9,

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter’s fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field Strength (μV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Field Strength (micro volts/meter)	Measurement Distance (meters)
9 – 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 – 1705 kHz	63.7/F (F in kHz)	30
1.705 – 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

As per ISEDC RSS-Gen §8.10(c),

Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7 – Restricted frequency bands[Note 1]

MHz	MHz	GHz
0.090 – 0.110	149.9 – 150.05	9.0 – 9.2
0.495 – 0.505	156.52475 – 156.52525	9.3 – 9.5
2.1735 – 2.1905	156.7 – 156.9	10.6 – 12.7
3.020 – 3.026	162.0125 –167.17	13.25 – 13.4
4.125 – 4.128	167.72 – 173.2	14.47 – 14.5
4.17725 – 4.17775	240 – 285	15.35 – 16.2
4.20725 – 4.20775	322 – 335.4	17.7 – 21.4
5.677 – 5.683	399.9 – 410	22.01 – 23.12
6.215 – 6.218	608 – 614	23.6 – 24.0
6.26775 – 6.26825	960 – 1427	31.2 – 31.8
6.31175 – 6.31225	1435 – 1626.5	36.43 – 36.5
8.291 – 8.294	1645.5 – 1646.5	Above 38.6
8.362 – 8.366	1660 – 1710	
8.37625 – 8.38675	1718.8 – 1722.2	
8.41425 – 8.41475	2200 – 2300	
12.29 – 12.293	2310 – 2390	
12.51975 – 12.52025	2483.5 – 2500	
12.57675 – 12.57725	2655 – 2900	
13.36 – 13.41	3260 – 3267	
16.42 – 16.423	3332 – 3339	
16.69475 – 16.69525	3345.8 – 3358	
16.80425 – 16.80475	3500 – 4400	
25.5 – 25.67	4500 – 5150	
37.5 – 38.25	5350 – 5460	
73 – 74.6	7250 – 7750	
74.8 – 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter chamber, using the setup in accordance with ANSI C63.10-2020 . The specification used was the FCC §15.247 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 bundled when necessary.

7.3 Test Procedure

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 meters, and the EUT was placed on a turntable, which was 0.8 meters and 1.5 meters 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 = 3MHz / Sweep = Auto / Trace averaging for 100 traces

7.4 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

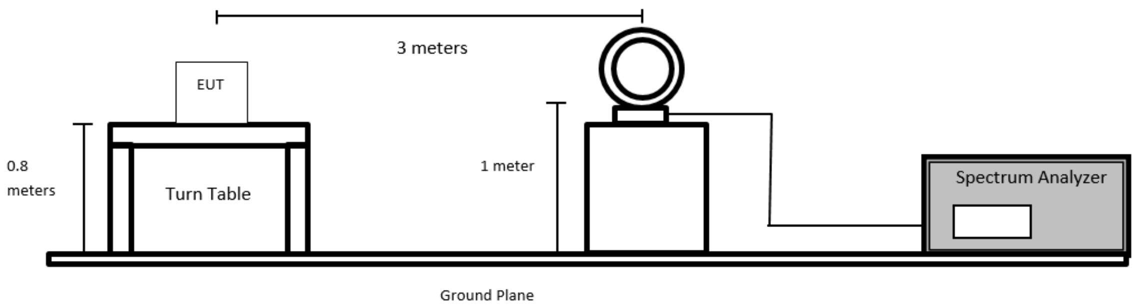
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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:

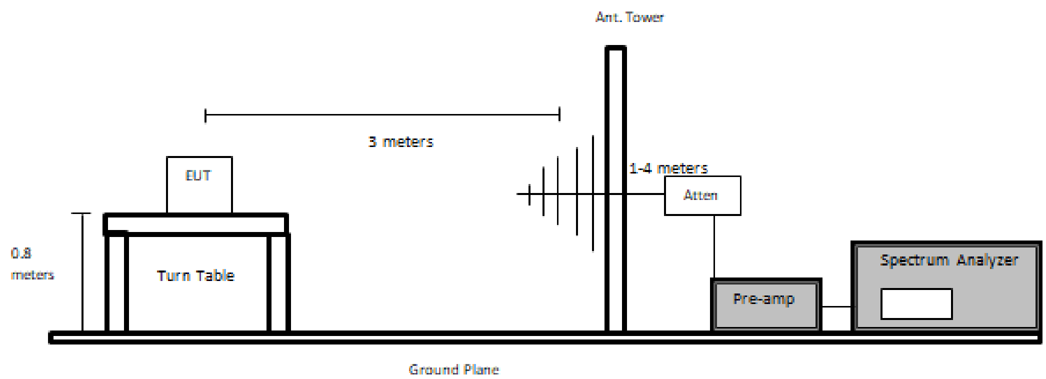
Margin = Corrected Amplitude – Limit

7.5 Test Setup Block Diagram

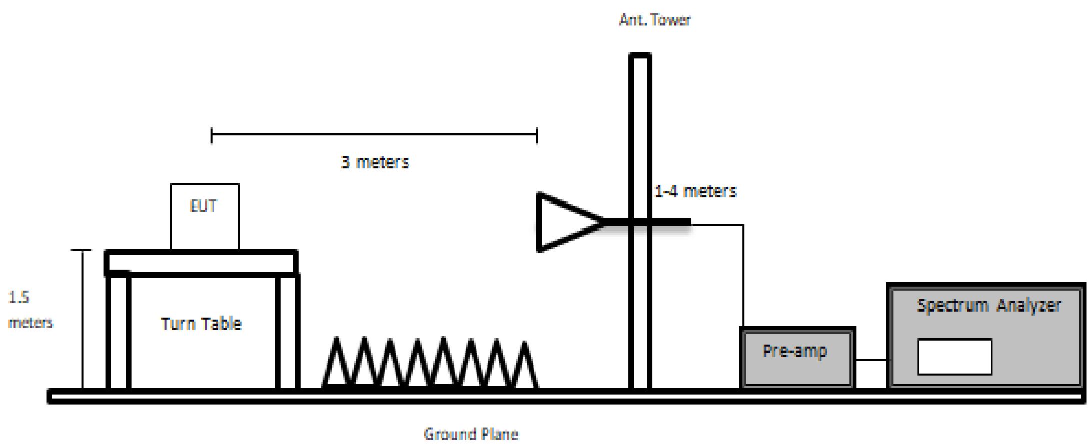
9 kHz to 30 MHz



30 MHz to 1 GHz



Above 1 GHz



7.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
327	Sunol Sciences	System Controller	SC110V	122303-1	N/R	N/R
1075	Sunol Sciences	Boresight Tower	TLT3	050119-7	N/R	N/R
1388	Sunol Sciences	Flush Mount Turntable	FM	112005-2	N/R	N/R
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
1432	Keysight Technologies	MXE EMI Receiver, Multi-touch	N9038B	MY60180008	2025-01-03	1 year
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2024-08-30	6 months
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2023-12-18	2 years
1245	-	6dB Attenuator	PE7390-6	01182018A	2023-12-18	2 years
1246	Hewlet Packard	RF Limiter	11867A	1734	2024-04-09	1 year
1248	Pasternack	RG214 COAX Cable	PE3062	-	2024-10-01	6 months
1249	Time microwave	LMR-400 Cable Dc-3 GHz	AE13684	2k80612-5 6fts	2024-04-09	1 year
1533	Pasternack	Coaxial Cable	NA	NA	2024-12-31	6 months
1192	ETS Lindgren	Horn Antenna	3117	218973	2024-10-23	2 years
1397	Mini Circuit	CBL ASSY 2.92MM PLUG TO PLUG 12"	FL086-12KM+	QN2318110-2318	2024-08-16	6 months
1449	BACL	Preamplifier	BACL1313-A100M18G	4052472	2024-08-19	6 months
90	Wisewave	Horn Antenna	ARH-4223-02	10555-01	2023-05-02	2 years
393	Com-Power	Loop Antenna, Active	AL-130	17043	2023-05-26	2 years
1394	Mini Circuit	CBL ASSY 2.92MM PLUG TO PLUG 12"	FL086-12KM+	QN2318110-2318	2024-08-16	6 months
1451	BACL	Preamplifier	BACL-1313-A1840	4052432	2024-08-16	6 months
1334	Micro-Tronics	Notch Filter	BRM50702	G361	2024-12-31	1 year

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".*

7.7 Test Environmental Conditions

Temperature:	20 – 22.5°C
Relative Humidity:	55%
ATM Pressure:	101.85 kPa

The testing was performed by Arturo Reyes and Michael Papa from 2025-01-22 to 2025-01-27 in 5m chamber 3.

7.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.209, 15.247 and ISEDC RSS-247 standards' radiated emissions limits, and had the worst margin of:

Worst Case – Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Configuration**
-0.77	1871.25	Horizontal	GFSK(LE), 2402 MHz

Please refer to the tables and plots in the next section for detailed test results.

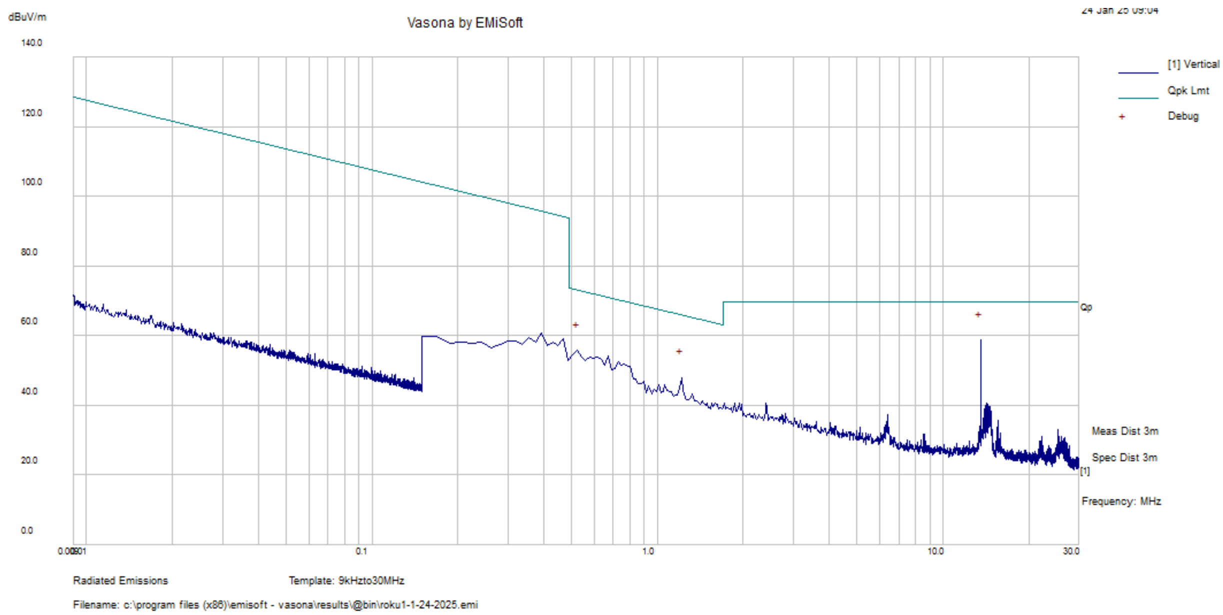
7.9 Radiated Emissions Test Results

Note: *Below test data are the radiated measurements. For conducted band edge measurements at the antenna port please refer to* ANNEX *E.*
Note: *Pre-scan was performed in order to determine worst-case orientation of device with respect to measurement antenna in the X/Y/Z axis. Plots/data shown represent measurements made in worst-case orientation.*
Note: *Worst-case performed on worst configs per modulation family.*

1) 9KHz – 30 MHz, Measured at 3 meters

Note: BT Classic +2.4GHz

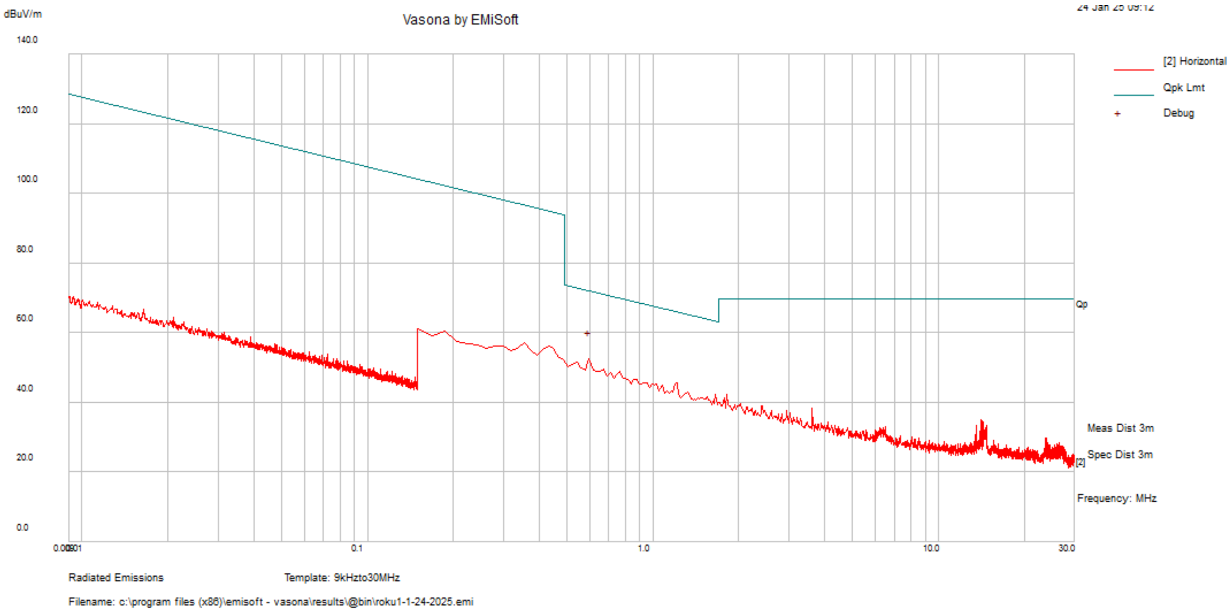
Parallel



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
13.56384	48.19	10.46	58.65	V	69.54	-10.89	Peak
0.523125	45.54	10.13	55.67	V	73.23	-17.57	Peak
1.213406	37.77	10.08	47.85	V	65.92	-18.08	Peak

Note: Peak emissions are compared to QP limits to show worst-case compliance.

Perpendicular

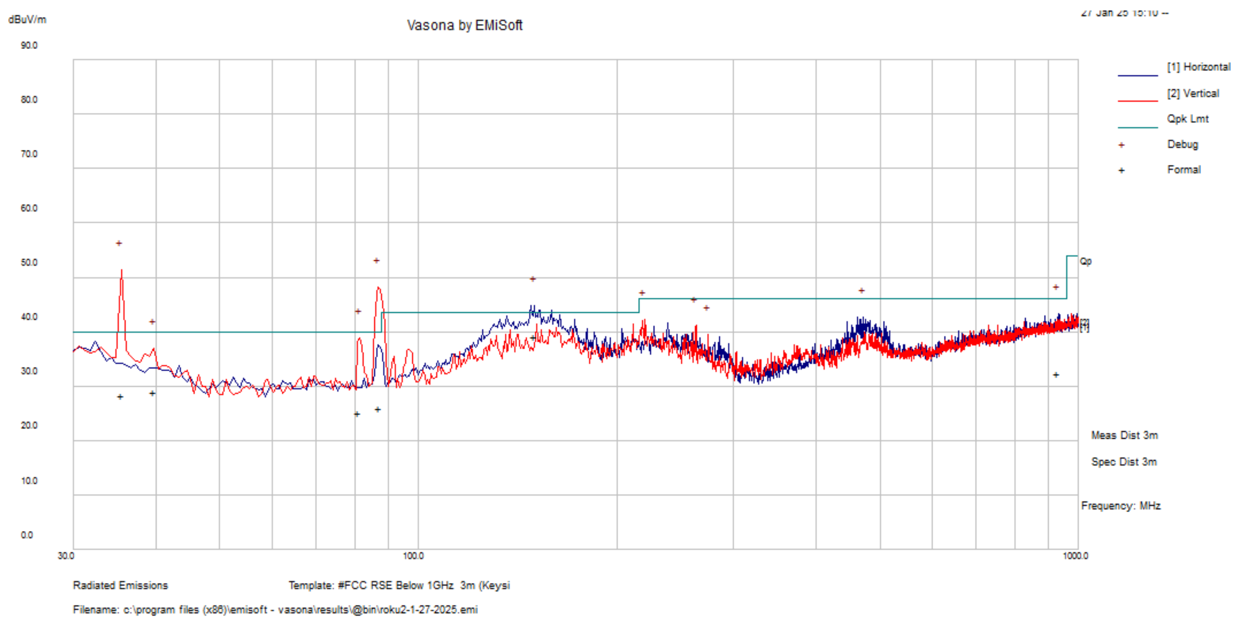


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBμV/m)	Antenna Polarity (H/V)	Limit (dBμV/m)	Margin (dB)	Detector
0.59775	42.24	10.11	52.35	H	72.08	-19.72	Peak

Note: Peak emissions are compared to QP limits to show worst-case compliance.

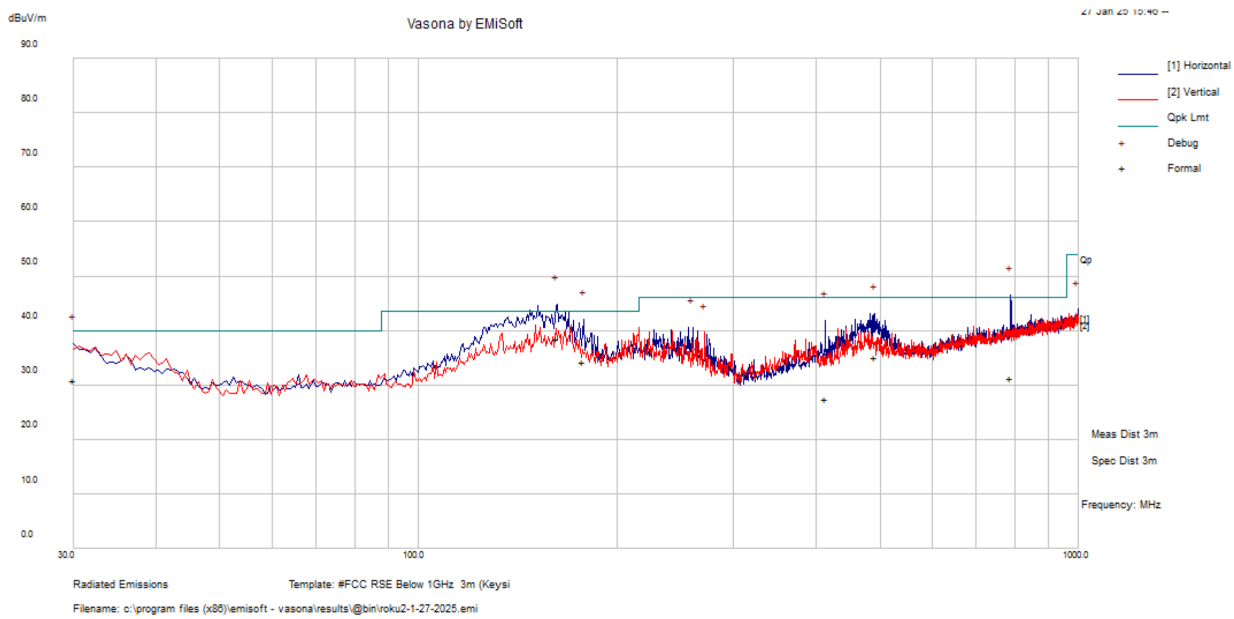
2) 30 MHz – 1 GHz, Measured at 3 meters

Worst Case: BLE 1M, 2442 MHz



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)	Detector
35.51031	32.69	-4.38	28.31	285	V	143	40	-11.7	QP
87.23375	39.37	-13.45	25.92	194	V	141	40	-14.08	QP
149.8569	47.01	-7.96	39.05	198	H	171	43.5	-4.45	QP
81.34313	38.86	-13.73	25.13	249	V	139	40	-14.87	QP
931.5925	28.11	4.25	32.36	299	H	45	46	-13.64	QP
39.82094	36.35	-7.41	28.94	188	V	132	40	-11.06	QP

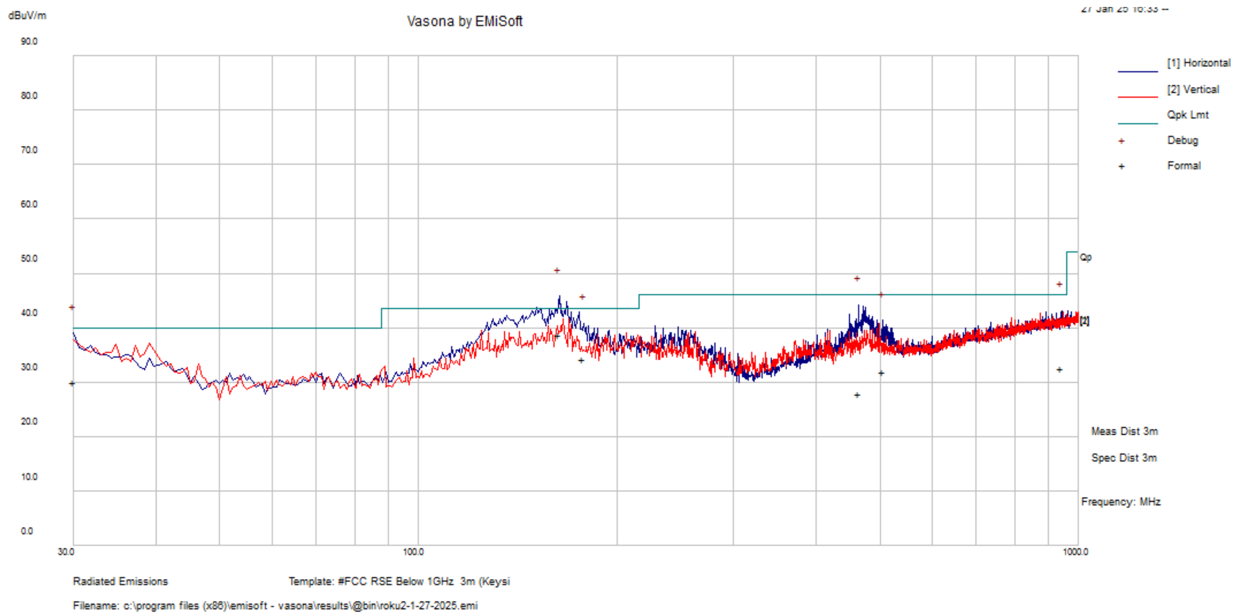
BLE 1M, 2402 MHz



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)	Detector
162.2022	46.69	-8.26	38.43	252	H	197	43.5	-5.07	QP
789.0138	28.6	2.65	31.25	123	H	217	46	-14.75	QP
177.8703	43.39	-9.18	34.21	284	H	160	43.5	-9.29	QP
30	31.38	-0.58	30.80	232	H	168	40	-9.2	QP
491.3794	36.62	-1.50	35.12	101	H	140	46	-10.88	QP
413.0306	31.2	-3.65	27.55	168	H	298	46	-18.45	QP

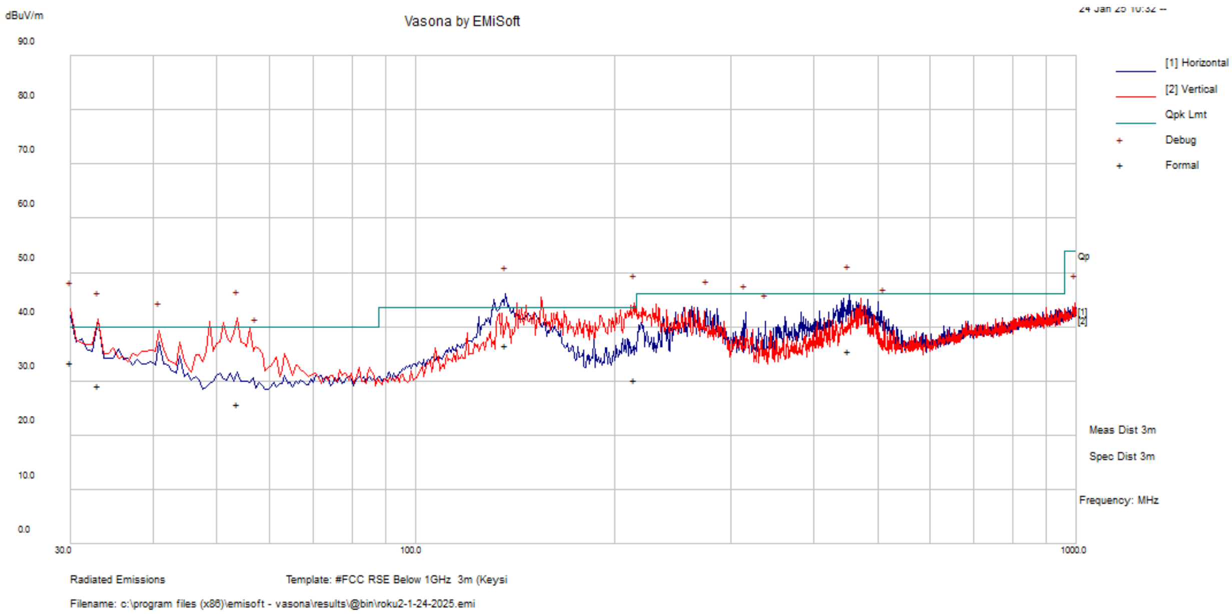
Note: Peak measurement is used to compare to quasi-peak limit to show compliance.

BLE 1M, 2480 MHz



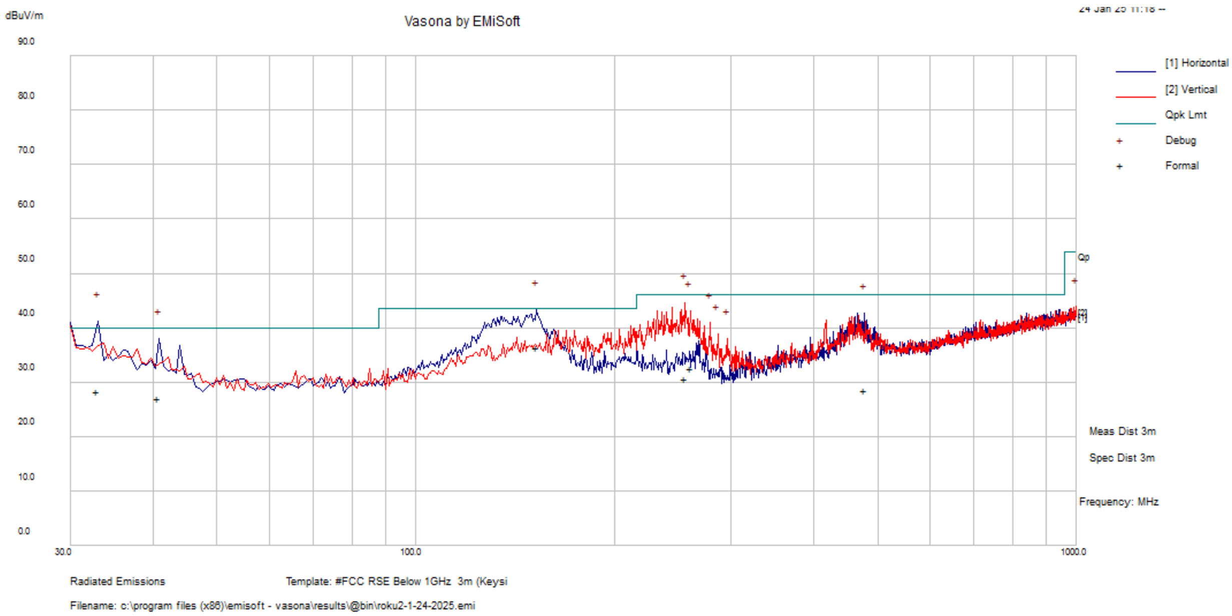
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
163.3322	46.93	-8.32	38.61	293	H	170	43.5	-4.89	QP
30	30.65	-0.59	30.06	174	H	182	40	-9.94	QP
464.2425	29.86	-1.89	27.97	143	H	162	46	-18.03	QP
177.8122	43.34	-9.18	34.16	151	H	202	43.5	-9.35	QP
942.2738	28.08	4.4	32.48	251	H	261	46	-13.52	QP
505.0841	33.33	-1.38	31.95	103	H	203	46	-14.06	QP

Worst Case: 802.11b, 2462 MHz



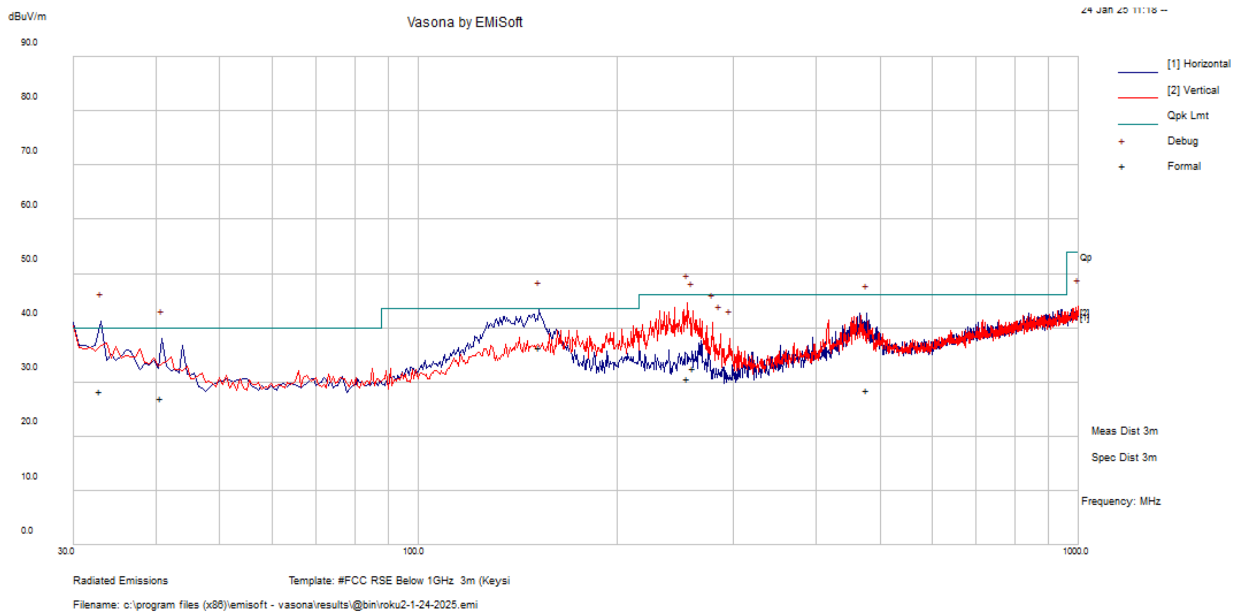
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
30	34.18	-0.72	33.46	116	V	188	40	-6.54	QP
136.6522	43.8	-7.11	36.69	209	H	344	43.5	-6.81	QP
53.74469	39.66	-13.98	25.68	170	V	210	40	-14.32	QP
33.08125	32.16	-3.01	29.15	247	V	157	40	-10.85	QP
214.0978	39.87	-9.75	30.12	203	V	334	43.5	-13.38	QP
452.595	37.69	-2.13	35.56	166	H	151	46	-10.44	QP

802.11b, 2412 MHz



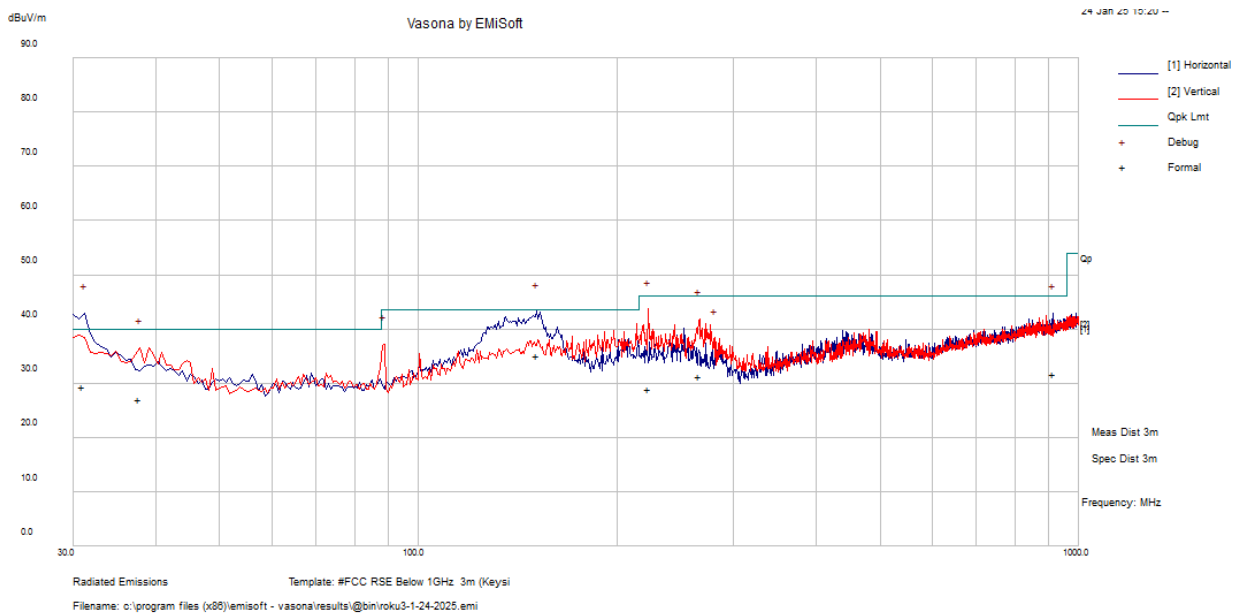
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
32.94	31.12	-2.92	28.2	217	H	360	40	-11.8	QP
152.3447	44.48	-8.05	36.43	182	H	24	43.5	-7.07	QP
255.6575	38.93	-8.21	30.72	140	V	227	46	-15.29	QP
40.815	35.25	-8.19	27.06	261	H	195	40	-12.94	QP
260.3997	40.33	-7.76	32.57	106	V	151	46	-13.43	QP
477.1975	29.58	-1.05	28.53	157	H	32	46	-17.47	QP

802.11b, 2437 MHz (+BT Classic)



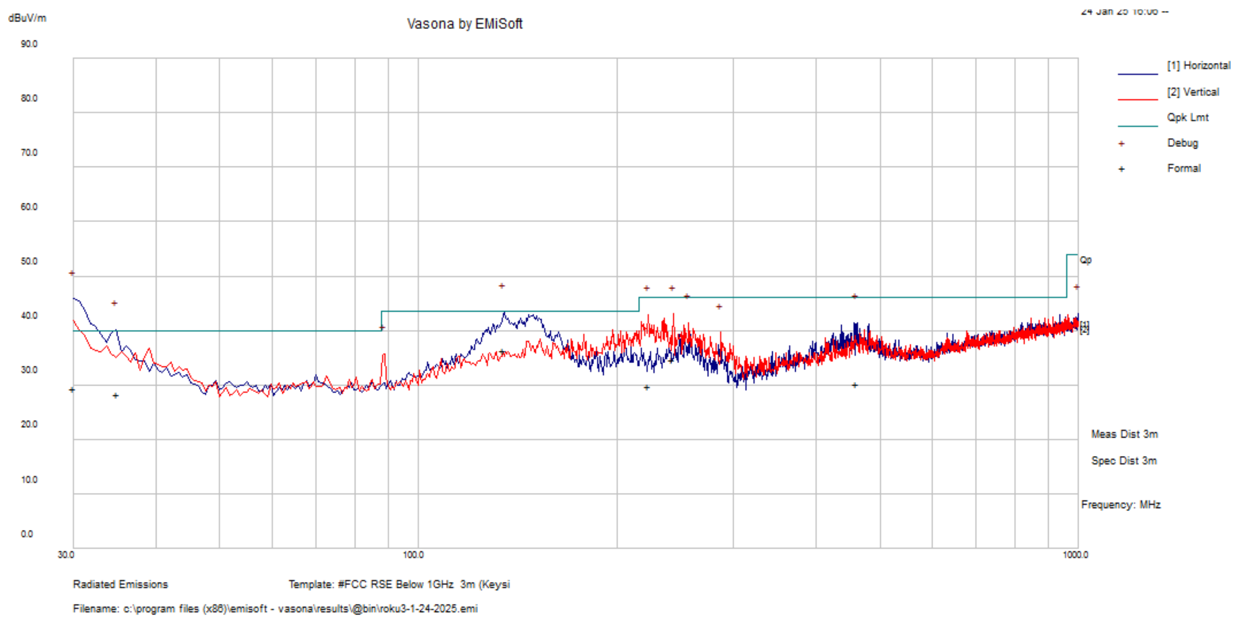
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
32.94	31.12	-2.92	28.2	217	H	360	40	-11.8	QP
152.3447	44.48	-8.05	36.43	182	H	24	43.5	-7.07	QP
255.6575	38.93	-8.21	30.72	140	V	227	46	-15.29	QP
40.815	35.25	-8.19	27.06	261	H	195	40	-12.94	QP
260.3997	40.33	-7.76	32.57	106	V	151	46	-13.43	QP
477.1975	29.58	-1.05	28.53	157	H	32	46	-17.47	QP

802.11g, 2412 MHz



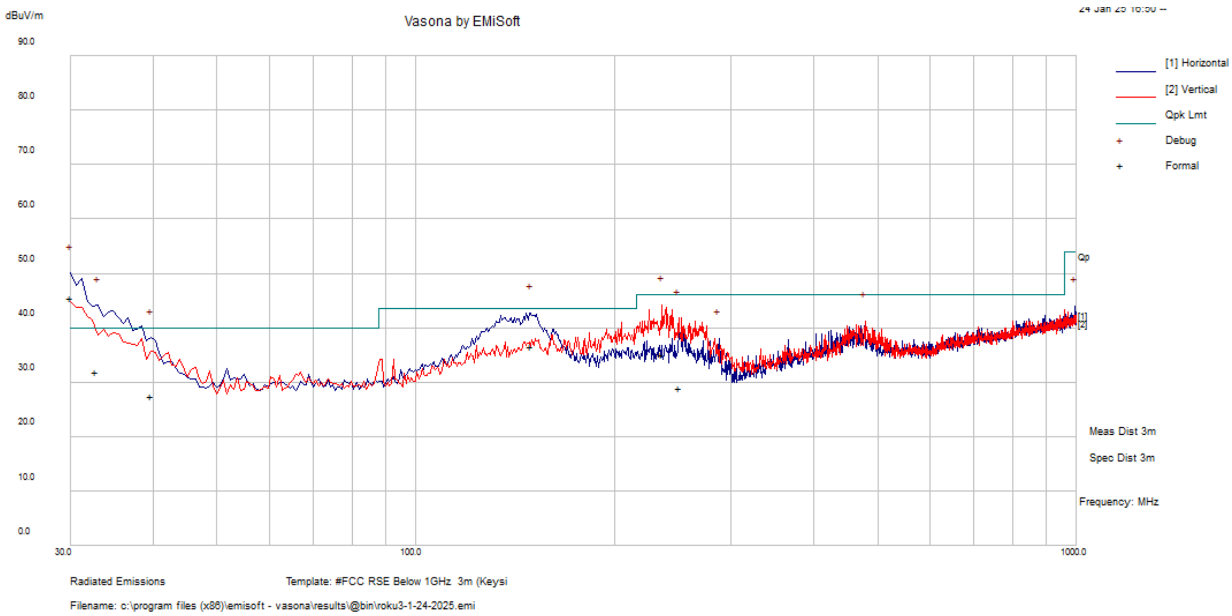
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
31.00406	30.97	-1.6	29.37	154	H	133	40	-10.63	QP
151.2813	43.46	-8.27	35.19	218	H	151	43.5	-8.31	QP
222.9066	38.68	-9.84	28.84	152	V	268	46	-17.16	QP
914.5066	28.1	3.54	31.64	231	H	145	46	-14.37	QP
37.79125	33.21	-6.15	27.06	280	V	184	40	-12.94	QP
266.6244	38.79	-7.59	31.2	204	V	22	46	-14.8	QP

802.11g, 2437 MHz



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)	Detector
30	30.24	-0.81	29.43	108	H	360	40	-10.57	QP
35.05438	32.6	-4.3	28.3	290	H	114	40	-11.7	QP
134.8722	43.56	-7.22	36.34	202	H	244	43.5	-7.16	QP
243.1853	43.64	-8.89	34.75	121	V	164	46	-11.25	QP
222.7738	39.66	-9.84	29.82	130	V	77	46	-16.18	QP
461.4859	32.61	-2.32	30.29	173	H	199	46	-15.71	QP

802.11g, 2462 MHz



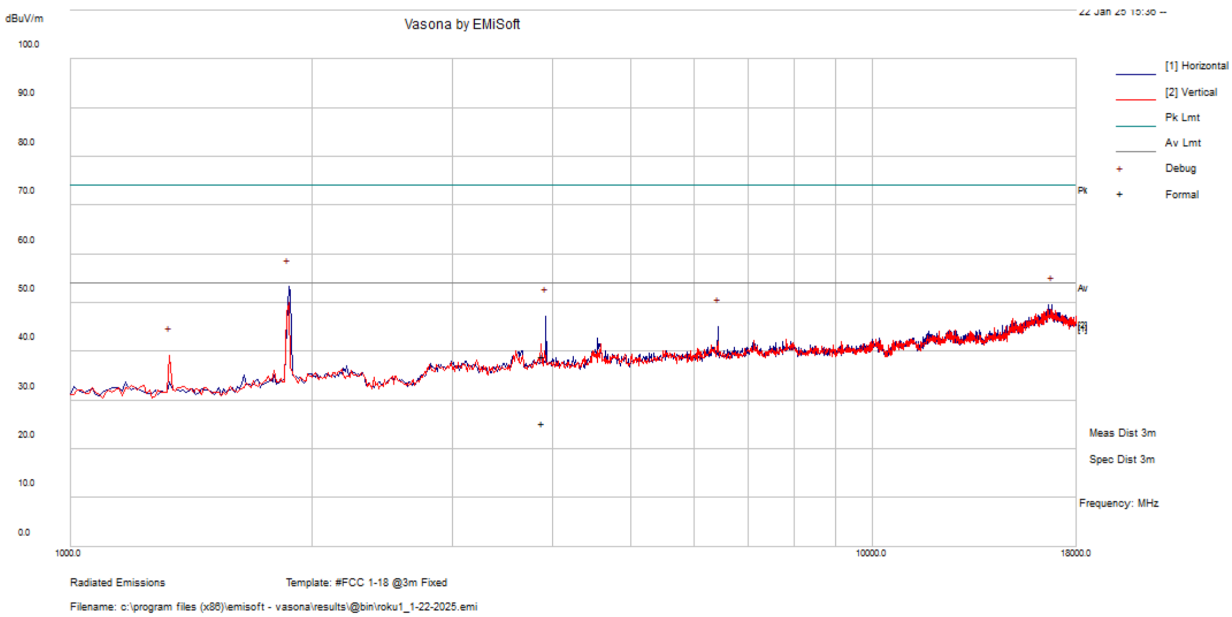
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
30	38.4	-0.81	37.59	100	H	145	40	-2.41	QP
32.83125	34.95	-2.96	31.99	100	H	161	40	-8.01	QP
149.25	44.72	-8.18	36.54	184	H	144	43.5	-6.97	QP
236.2663	44.24	-9.13	35.11	142	V	153	46	-10.89	QP
39.7275	35.05	-7.56	27.49	299	H	306	40	-12.52	QP
250.1759	37.68	-8.84	28.84	117	V	7	46	-17.16	QP

FCC/IC Limits for 1 GHz to 26.5 GHz			
Applicability	**(dBm)**	**(uV/m at 3meters)**	**(dBuV/m at 3meters)**
Restricted Band Average Limit	-	500	54
Restricted Band Peak Limit[1]	-	-	74

Note[1]: Restricted Band Peak Limit is defined to be 20dB higher than Average Limit.

3) 1 GHz – 18 GHz, Measured at 3 meters

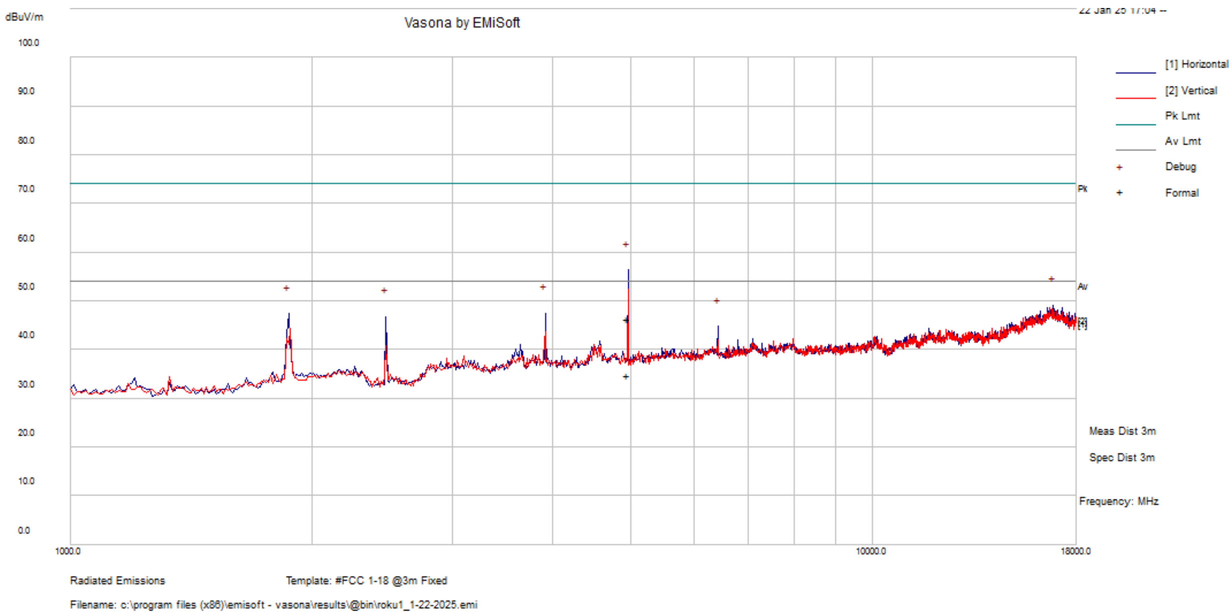
BLE 1M, 2402 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
1871.25	**59.4**	**-6.17**	**53.23**	**H**	**54**	**-0.77**	**Peak**
16778.13	34.06	15.58	49.64	H	54	-4.36	Peak
3921.875	49.14	-1.9	47.24	H	54	-6.76	Peak
6429.375	43.75	1.41	45.16	H	54	-8.84	Peak
1329.375	48.62	-9.5	39.12	V	54	-14.88	Peak

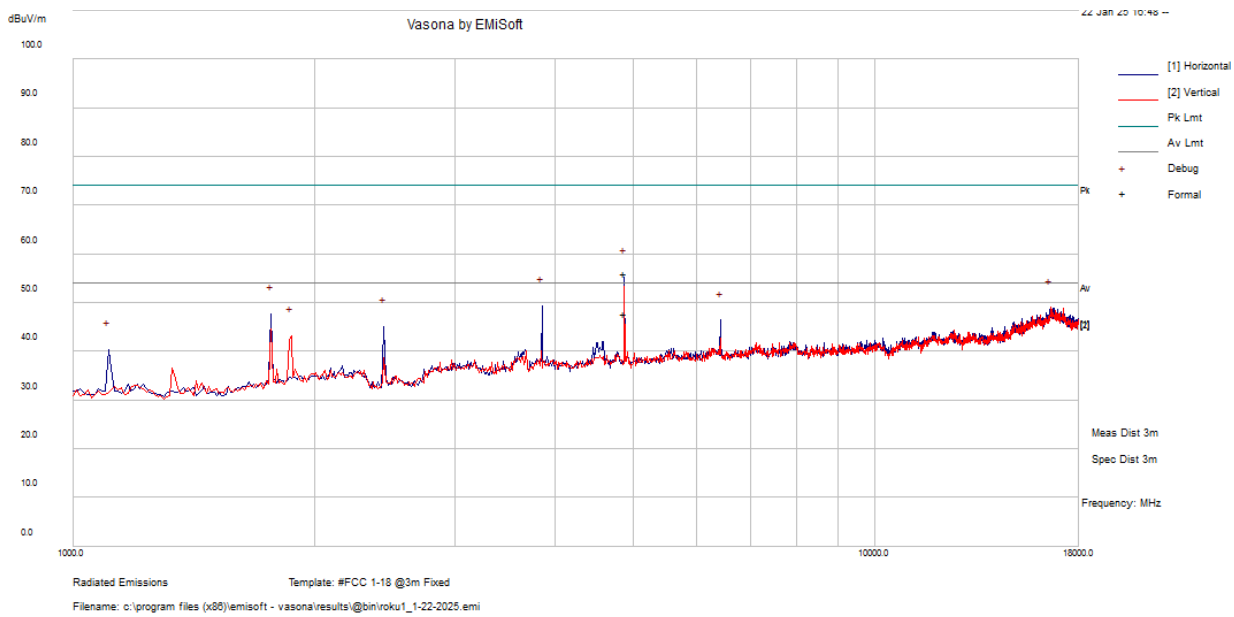
Note: Peak measurement is used to compare to the average limit.

BLE 1M, 2442 MHz



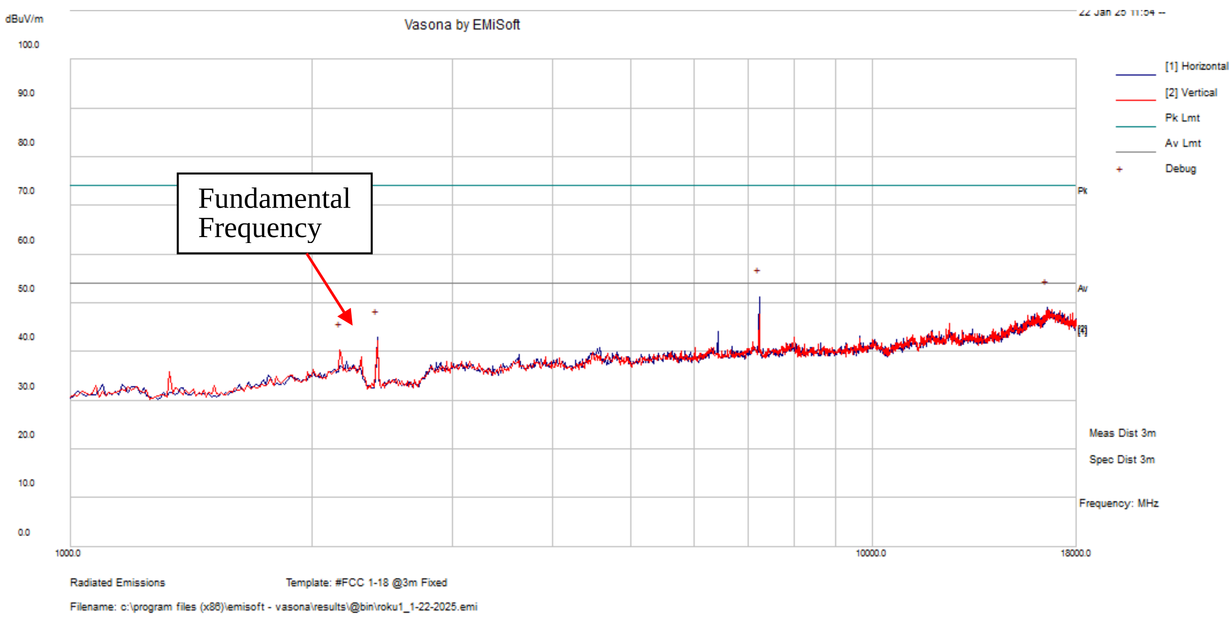
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)	Detector
4961.148	47.27	-1.07	46.20	229	H	136	74	-27.8	Peak
4961.148	35.93	-1.08	34.85	229	H	136	54	-19.15	Average

BLE 1M 2480 MHz



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)	Detector
4880.038	57.1	-1.08	56.02	141	H	98	74	-17.98	Peak
4880.038	48.69	-1.07	47.62	141	H	98	54	-6.38	Average

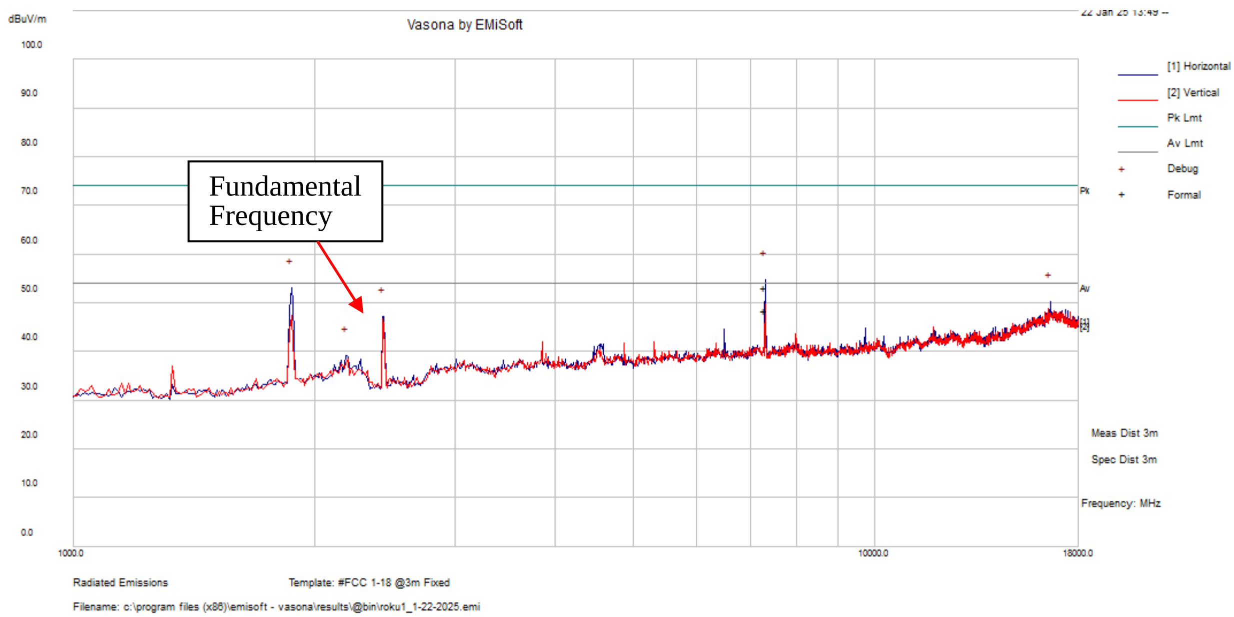
802.11b, 2412 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
7236.875	48.58	2.6	51.18	H	54	-2.83	Peak
16533.75	33.73	15.24	48.97	H	54	-5.03	Peak
2413.125	47.38	-4.5	42.88	H	54	-11.12	Peak
2168.75	45.71	-5.47	40.24	V	54	-13.76	Peak

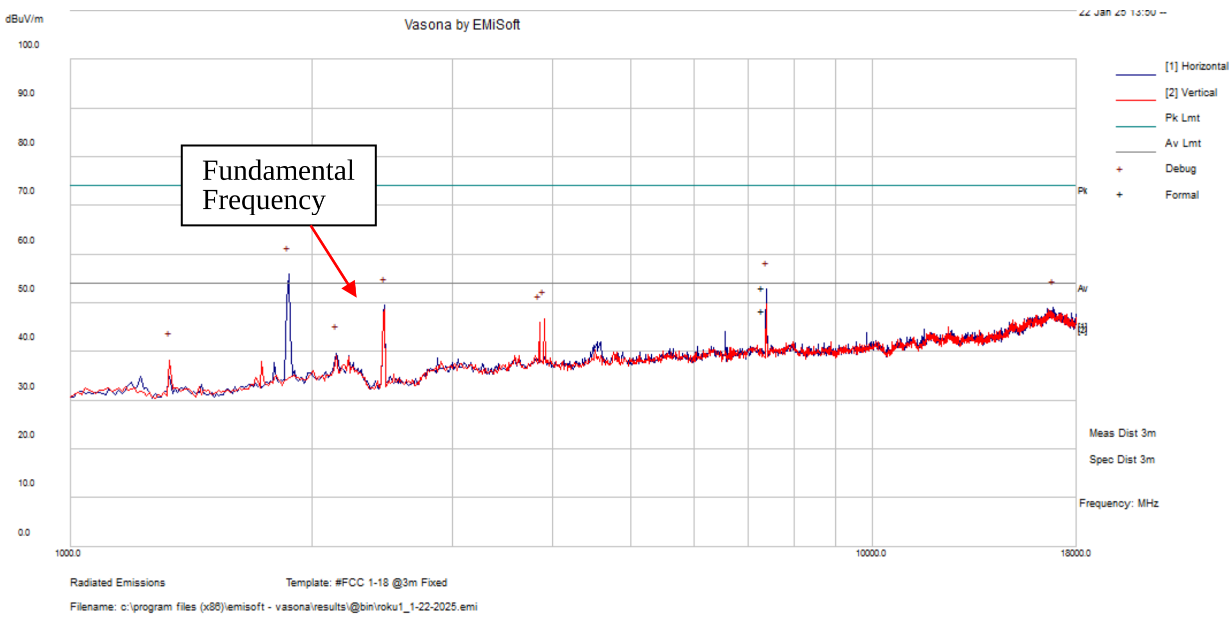
Note: Peak measurement is used to compare to the average limit.

802.11b, 2437 MHz (+BT Classic)



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)	Detector
7310.155	50.5	2.59	53.09	101	H	341	74	-20.91	Peak
7310.155	45.97	2.58	48.55	101	H	341	54	-5.45	Average

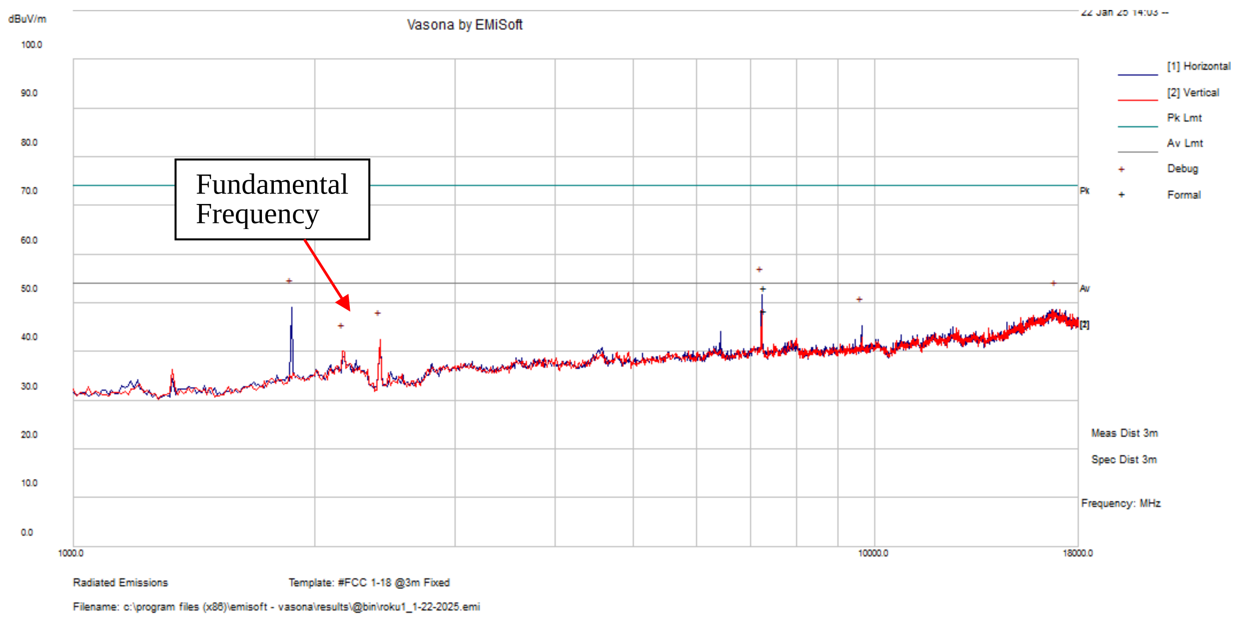
802.11b, 2462 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBμV/m)	Antenna Polarity (H/V)	Limit (dBμV/m)	Margin (dB)	Detector
1871.25	62.04	-6.17	55.87	H	74	-11.96	Peak
1871.25	30.23	-6.17	24.06	H	54	-29.94	Avg
7385.625	50.48	2.31	52.79	H	54	-1.22	Peak
2466.25	53.8	-4.32	49.48	H	54	-4.52	Peak
16852.5	33.46	15.55	49.01	H	54	-4.99	Peak
3900.625	48.59	-1.83	46.76	V	54	-7.24	Peak
3847.5	47.73	-1.84	45.89	V	54	-8.11	Peak

Note: Peak measurement is used to compare to the average limit.

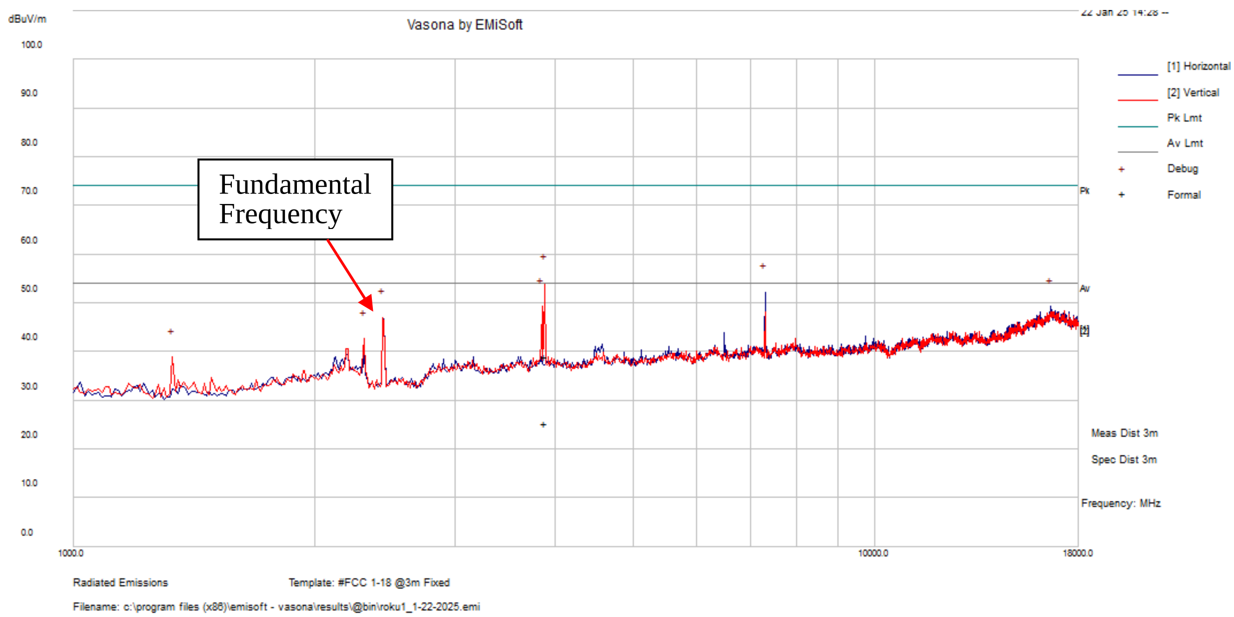
802.11g, 2412 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
7236.875	49.03	2.59	51.62	H	54	-2.38	Peak
1871.25	55.32	-6.17	49.15	H	54	-4.85	Peak
16863.13	33.17	15.54	48.71	H	54	-5.29	Peak
9648.75	40.18	5.14	45.32	H	54	-8.68	Peak
2413.125	47.07	-4.5	42.57	V	54	-11.43	Peak
2168.75	45.45	-5.46	39.99	V	54	-14.02	Peak

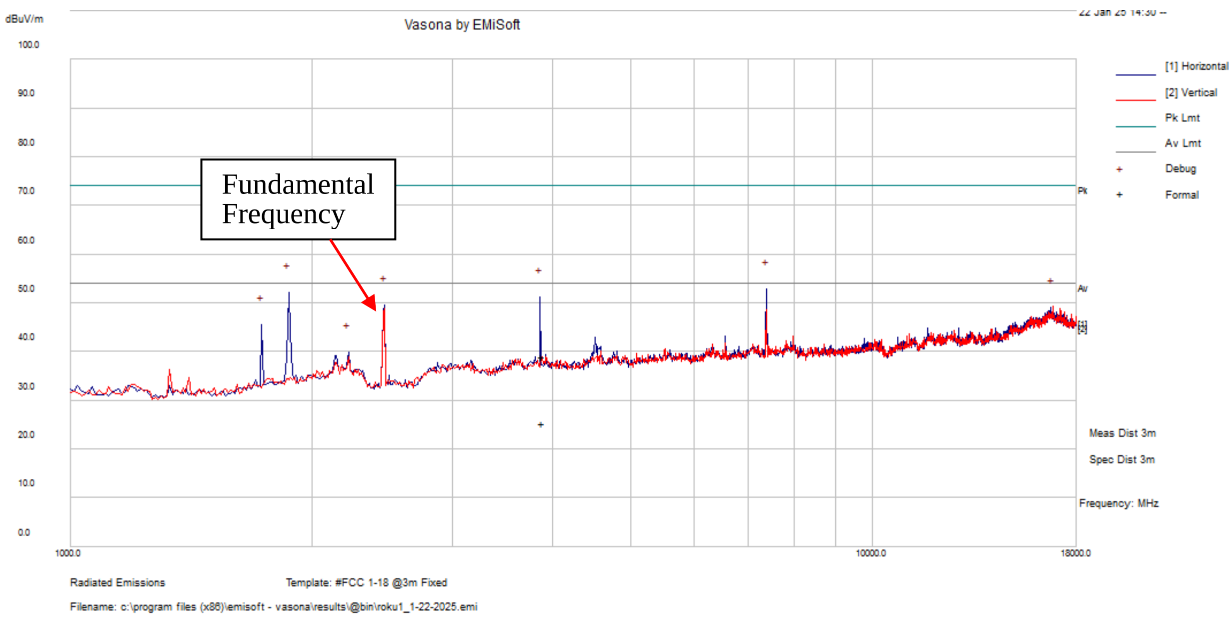
Note: Peak measurement is used to compare to the average limit.

802.11g, 2437 MHz



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)	Detector
3877.918	40.92	-1.82	39.1	162	V	266	74	-34.9	Peak
3877.918	27.13	-1.82	25.31	162	V	266	54	-28.7	Average

802.11g, 2462 MHz

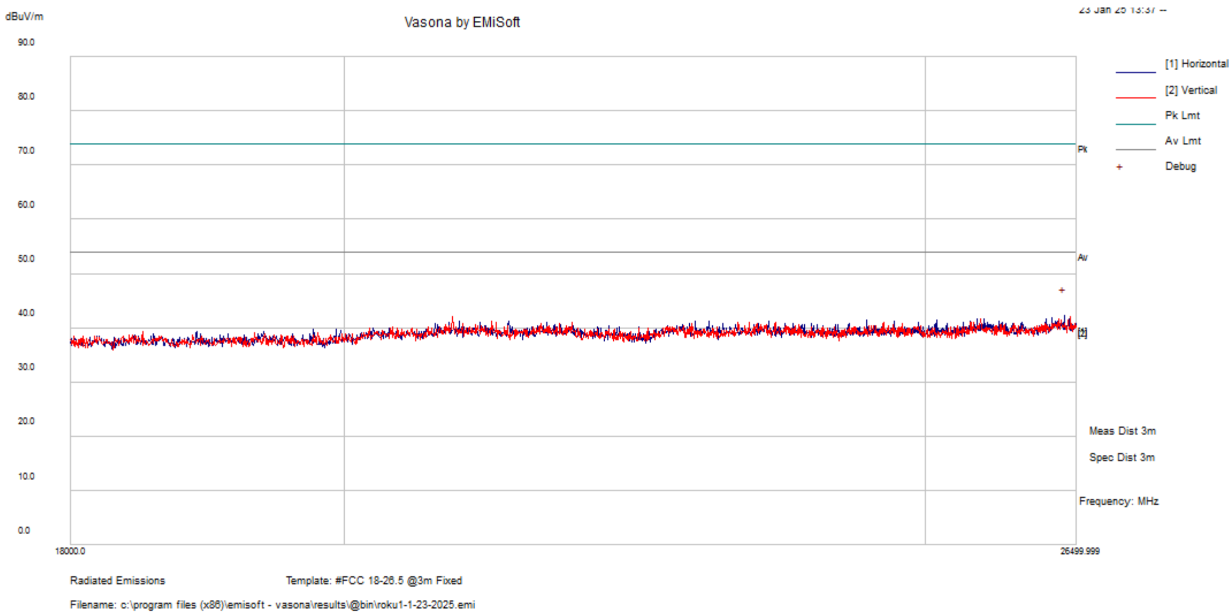


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
7385.625	50.66	2.3	52.96	H	54	-1.04	Peak
1871.25	58.34	-6.17	52.17	H	54	-1.84	Peak
3858.125	53.06	-1.84	51.22	H	54	-2.78	Peak
16799.38	33.66	15.6	49.26	V	54	-4.75	Peak
1733.125	53.3	-7.71	45.59	H	54	-8.41	Peak
2221.875	45.23	-5.3	39.93	H	54	-14.07	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

4) 18 GHz – 26.5 GHz, Measured at 3 meters

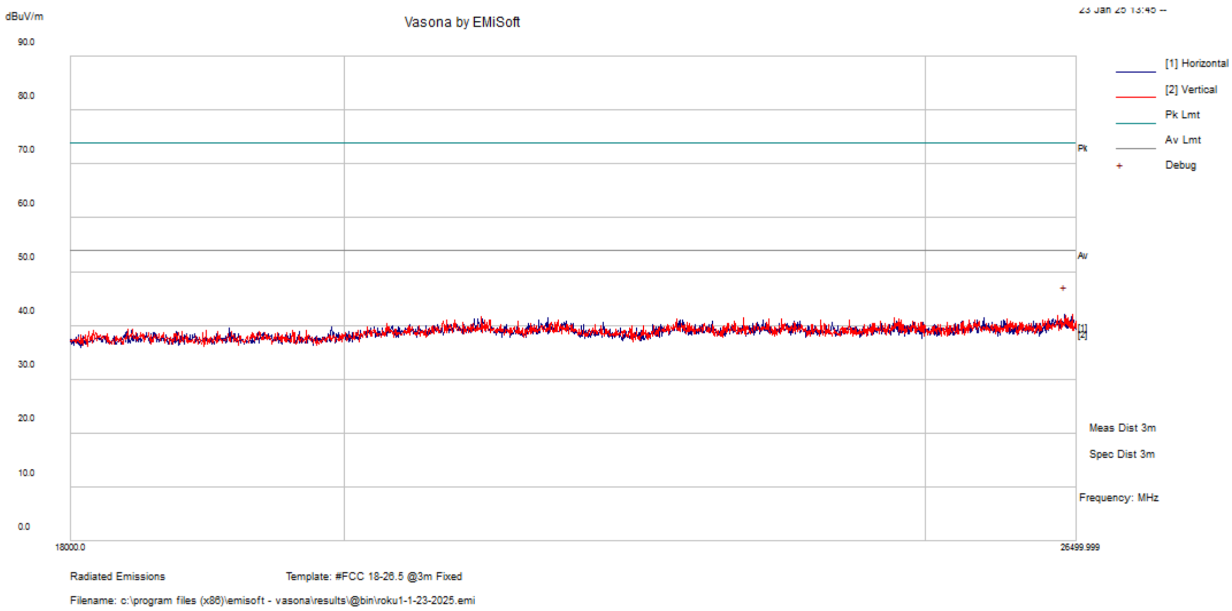
BLE 1M, 2402 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
26372.5	39.00	3.20	42.20	H	54	-11.81	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

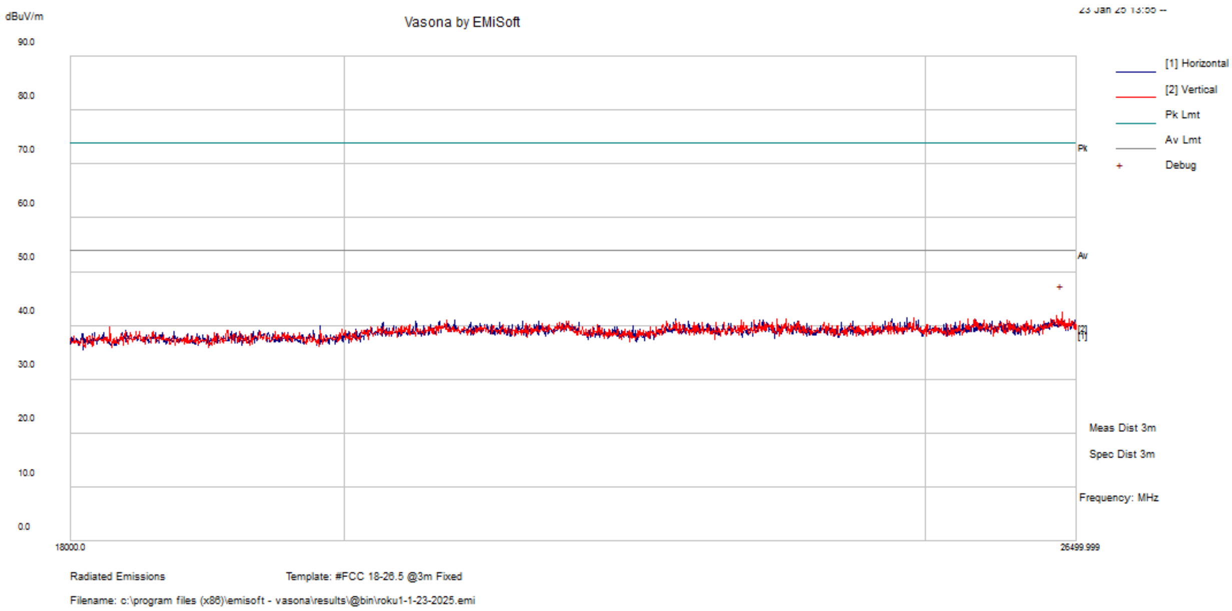
BLE 1M, 2442 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBμV/m)	Antenna Polarity (H/V)	Limit (dBμV/m)	Margin (dB)	Detector
26383.12	38.87	3.21	42.08	H	54	-11.92	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

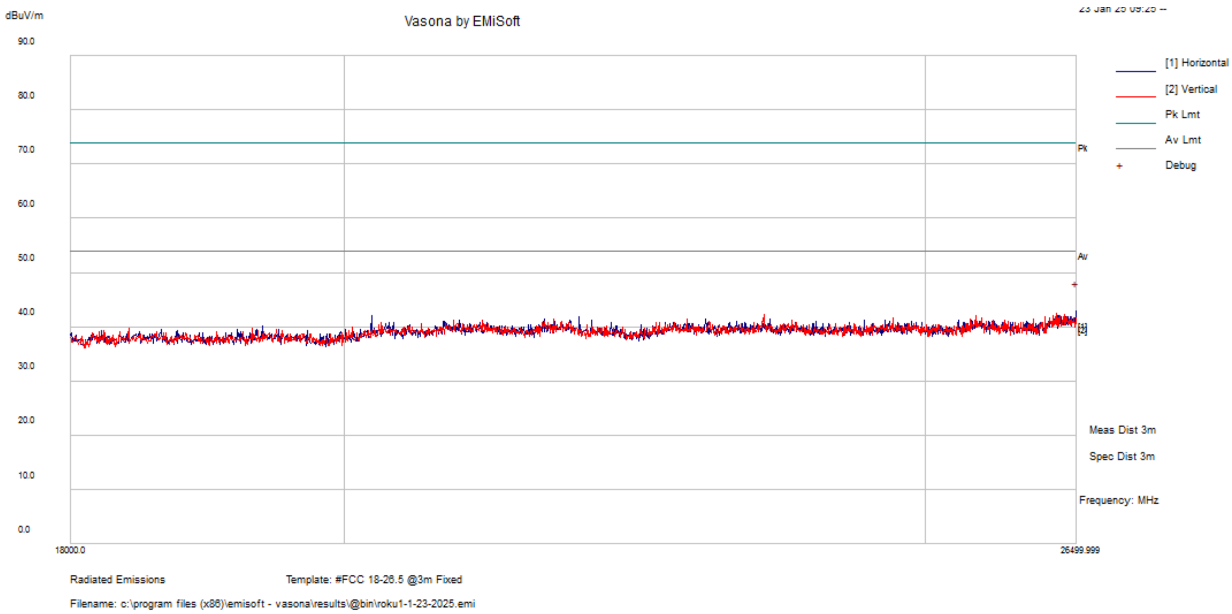
BLE 1M, 2480 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
26351.25	39.26	3.16	42.42	V	54	-11.58	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

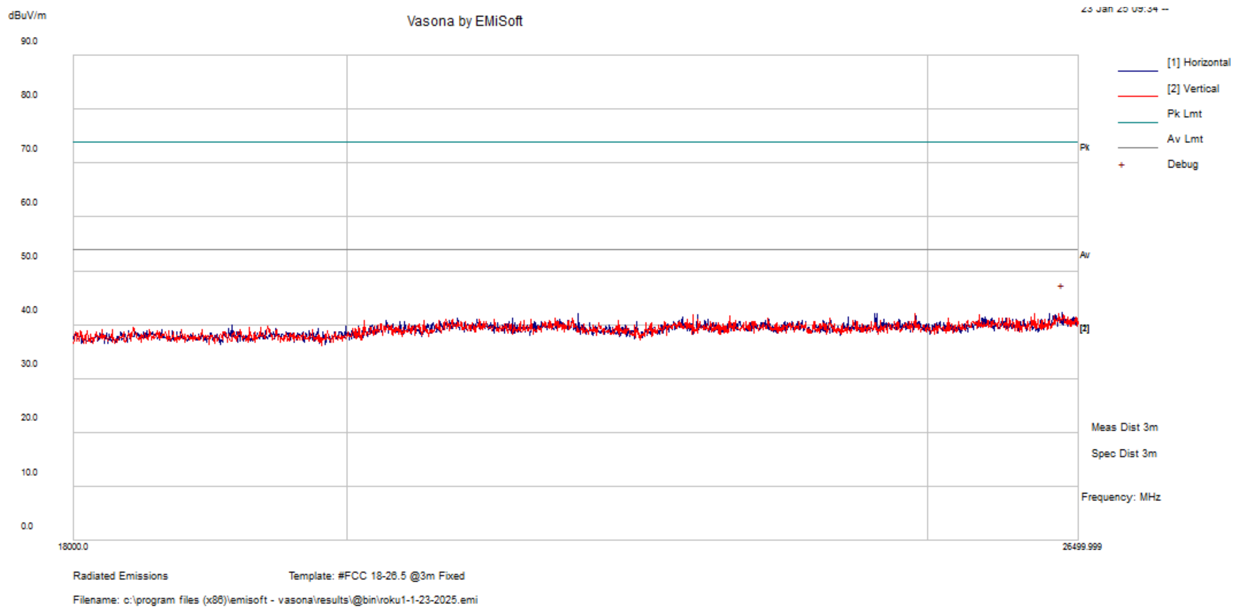
802.11b, 2412 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
26494.69	39.73	3.18	42.91	H	54	-11.09	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

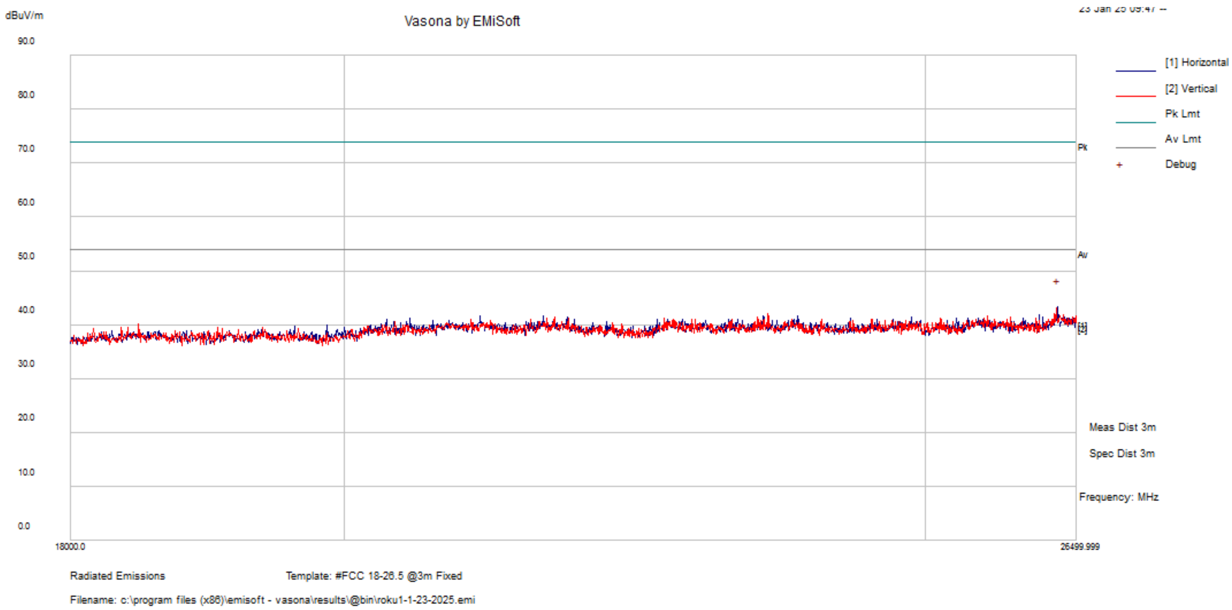
802.11b, 2437 MHz (+BT Classic)



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBμV/m)	Antenna Polarity (H/V)	Limit (dBμV/m)	Margin (dB)	Detector
26335.31	39.2	3.14	42.34	H	54	-11.66	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

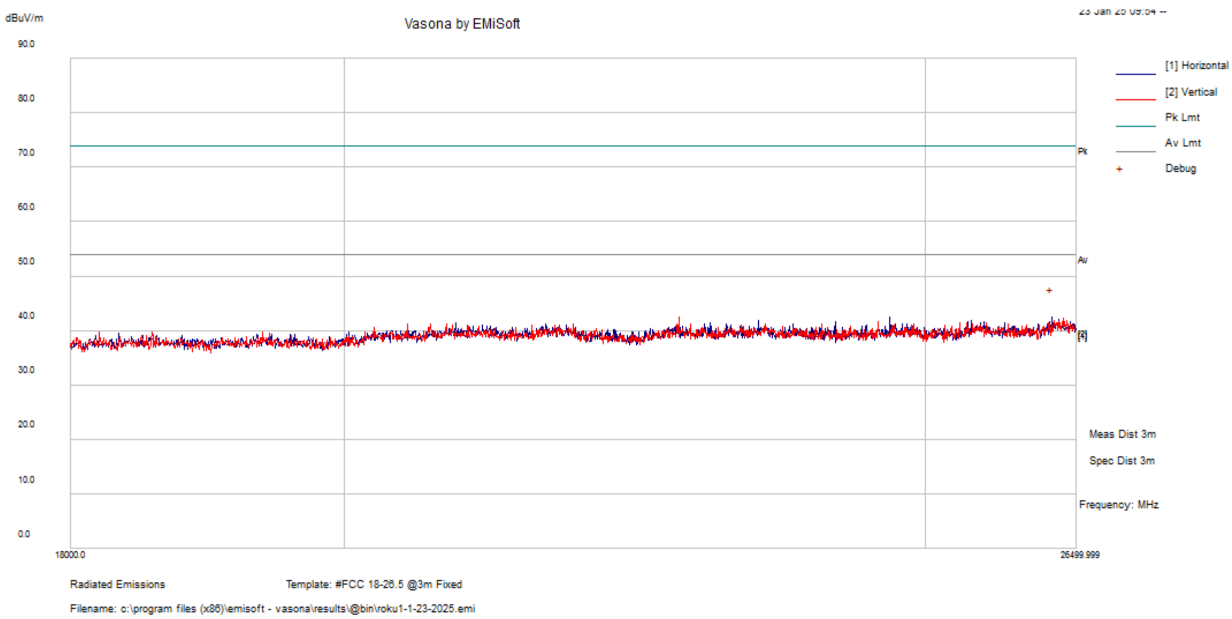
802.11b, 2462 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
26314.06	40.12	3.11	42.23	H	54	-10.77	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

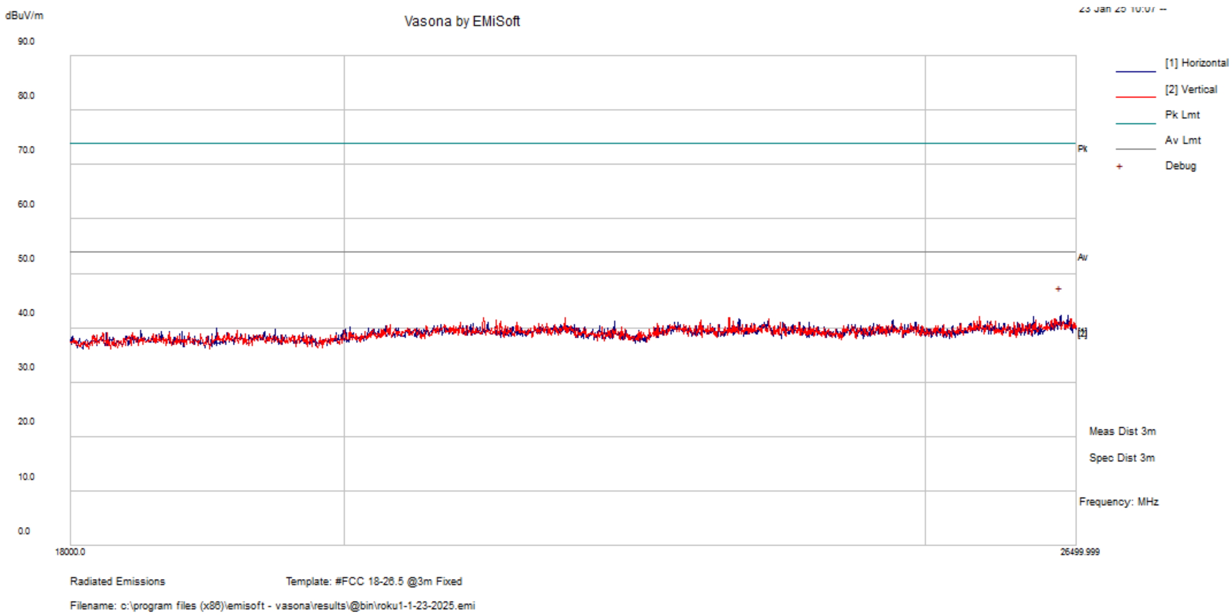
802.11g, 2412 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
26245	39.68	2.87	42.55	H	54	-11.45	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

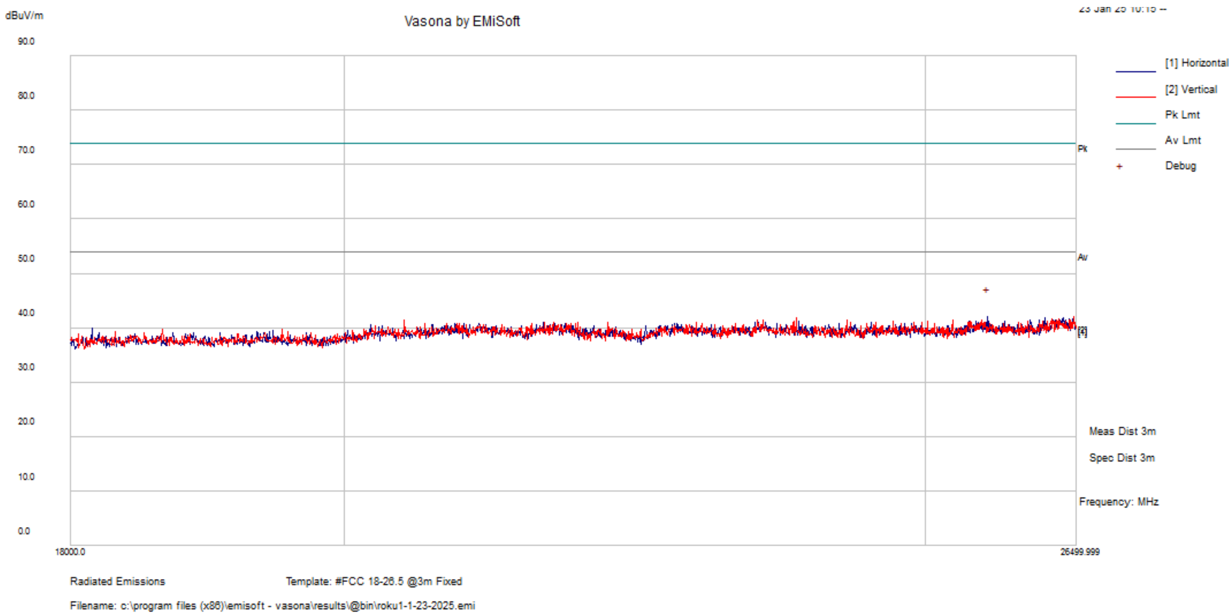
802.11g, 2437 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Polarity (H/V)	Limit (dBµV/m)	Margin (dB)	Detector
26340.62	39.12	3.15	42.27	H	54	-11.73	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

802.11g, 2462 MHz



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBμV/m)	Antenna Polarity (H/V)	Limit (dBμV/m)	Margin (dB)	Detector
25612.81	39.85	2.23	42.08	H	54	-11.93	Peak

Note: Peak measurement is used to compare to the average limit to show compliance.

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.

As per ANSI C63.10 Clause 11.8: DTS bandwidth

One of the following procedures may be used to determine the modulated DTS bandwidth.

Option 1:

a. Set RBW = 100 kHz.
b. Set the VBW ≥ [3 × RBW].
c. Detector = peak.
d. Trace mode = max hold.
e. Sweep = auto couple.
f. Allow the trace to stabilize.
g. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by00206 dB relative to the maximum level measured in the fundamental emission.

Option 2:
The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function.
When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.

As per the ANSI 63.10 Clause 6.9.3: Occupied Bandwidth

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

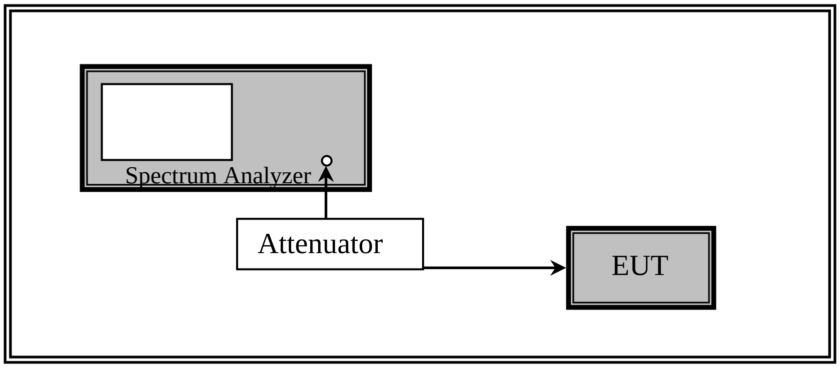
a. The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
c. Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d. Step a) through step c) might require iteration to adjust within the specified range.
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g. If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h. The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

8.3 Test Setup Block Diagram



8.4 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	10dB Attenuator	-	-	-	-

Note[1]: cables, attenuators and notch filters included in the test set-up were 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".*

8.5 Test Environmental Conditions

Temperature:	22ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Shankar Pangeni and Libass Thiaw from 2024-12-16 to 2025-01-10 at RF test site.

8.6 Test Results

2.4 GHz Wi-Fi

Channel	Frequency (MHz)	6 dB OBW (MHz)	99% OBW (MHz)	6 dB OBW Limit (kHz)	Result
802.11b					
Low	2412	10.089	13.812	≥ 500	Pass
Middle	2437	10.166	13.982	≥ 500	Pass
High	2462	10.097	13.846	≥ 500	Pass
802.11g					
Low	2412	16.460	17.036	≥ 500	Pass
Middle	2437	16.482	17.109	≥ 500	Pass
High	2462	16.525	17.128	≥ 500	Pass
802.11n20					
Low	2412	17.678	18.045	≥ 500	Pass
Middle	2437	17.708	18.063	≥ 500	Pass
High	2462	17.720	18.219	≥ 500	Pass

2.4 GHz BLE

Channel	Frequency (MHz)	6 dB OBW (MHz)		99% OBW (MHz)		6 dB OBW Limit (kHz)	Result
		1 Mbps	2 Mbps	1 Mbps	2 Mbps		
Low	2402	0.538	0.609	1.027	2.048	≥ 500	Pass
Middle	2442	0.589	0.591	1.031	2.048	≥ 500	Pass
High	2480	0.588	0.730	1.012	2.014	≥ 500	Pass

Please refer to Annex A for detailed test results.

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 DTS 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 C63.10-2020, Section 11.9.2.2.2, and 11.9.1.1

11.9.1.1 Maximum peak conducted output power RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

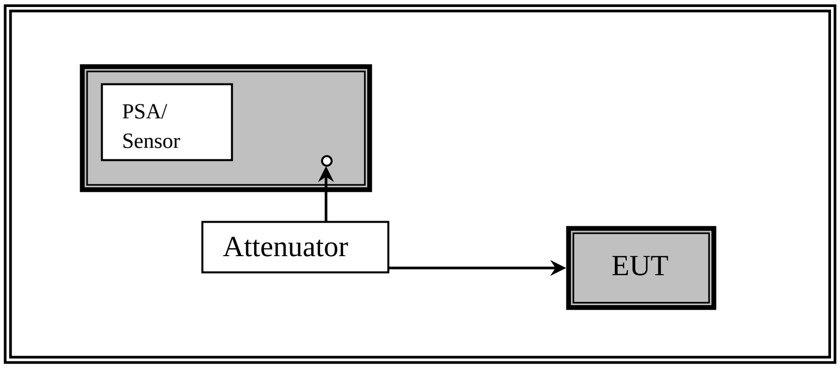
a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) d)Sweep time = No faster than coupled (auto) time.
e) Detector = peak.
f) Trace mode = max-hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

11.9.2.3 Measurement using a power meter (PM)
11.9.2.3.1 Method AVGPM Method
AVGPM is a measurement using an RF average power meter, as follows:
a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent (see Figure 24) if all of the conditions listed below are satisfied:

1. The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
2. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle, D, of the transmitter output signal as described in 11.6.
c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
d) Correct the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle.

9.3 Test Setup Block Diagram



9.4 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
697	ETS-Lindgren	USB RF Power Sensor	7002-006	00160097	2024-06-03	1 Year
-	-	10dB Attenuator	-	-	-	-

Note[1]: cables, attenuators and notch filters included in the test set-up were 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".*

9.5 Test Environmental Conditions

Temperature:	22ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Shankar Pangeni and Libass Thiaw from 2024-12-16 to 2025-01-10 at RF test site.

9.6 Test Results

2.4 GHz Wi-Fi

Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC/IC Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b					
Low	2412	18.93	<30	16.03	<36
Middle	2437	22.49	<30	19.59	<36
High	2462	18.52	<30	15.62	<36
802.11g					
Low	2412	14.46	<30	11.56	<36
Middle	2437	22.17	<30	19.27	<36
High	2462	14.04	<30	11.14	<36
802.11n20					
Low	2412	15.33	<30	12.43	<36
Middle	2437	20.39	<30	17.49	<36
High	2462	14.12	<30	11.22	<36

Note: The measurement were performed using power meter.
Note: Antenna gain is -2.9dBi
Note: EIRP [dBm] = Conducted Output Power [dBm]+Antenna Gain [dBi]
Note: For EIRP limit, dBm=10log(Power[mW]/1mW)=10log(4000mW/1mW)=36dBm
Note: Duty Cycle correction factor is included with Conducted Output Power measurement.

2.4 GHz BLE

Channel	Frequency (MHz)	Antenna Gain (dBi)	Conducted Output Power (dBm)		Output Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
			1 Mbps	2 Mbps				
Low	2402	-0.1	7.86	8.01	30	7.91	<36	Pass
Middle	2442	-0.1	8.80	8.62	30	8.70	<36	Pass
High	2480	-0.1	8.19	8.46	30	8.36	<36	Pass

Note: The EIRP evaluated in the BLE table above uses the higher conducted output power between the 1Mbps and 2 Mbps data rate.
Note: The measurements were performed using Spectrum Analyzer
Note: EIRP [dBm] = Conducted Output Power [dBm]+Antenna Gain [dBi]
Note: For eirp limit, dBm=10log(Power[mW]/1mW)=10log(4000mW/1mW)=36dBm

Please refer to Annex B for detailed test results.

10 FCC §15.247(e) & ISEDC RSS-247 §5.2(2) –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 8.4: Maximum power spectral density level in the fundamental emission.

As per ANSI C63.10 Clause 11.10: Maximum power spectral density level in the fundamental emission

Some regulatory requirements specify a conducted PSD limit within the DTS bandwidth during any time interval of continuous transmission.88 Such specifications require that the same method as used to determine the conducted output power shall be used to determine the power spectral density. If maximum peak conducted output power was measured, then the peak PSD procedure 11.10.2 (method PKPSD) shall be used. If maximum conducted output power was measured, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option):

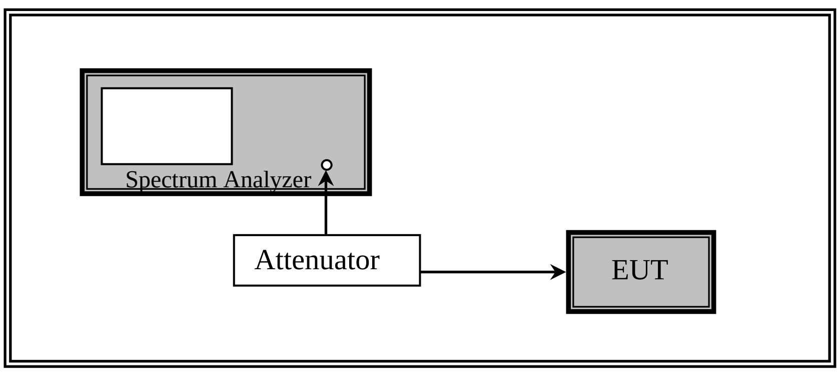
Method PKPSD (peak PSD): The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ [3 × RBW].
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.
j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

Method AVGPSD-2 (average PSD): The following procedure is applicable when the EUT cannot be configured to transmit continuously (i.e.,
$D < 98\%$), when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than ±2%):

a) Measure the duty cycle (*D*) of the transmitter output signal as described in 11.6.
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to > 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥ [3 × RBW].
f) Detector = power averaging (rms) or sample detector (when rms not available).
g) Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
h) Sweep time = auto couple.
i) Do not use sweep triggering; allow sweep to "free run."
j) Employ trace averaging (rms) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add [10 log (1 / *D*)], where *D* is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time.
m) If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this might require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

10.3 Test Setup Block Diagram



10.4 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	10dB Attenuator	-	-	-	-

Note[1]: cables, attenuators and notch filters included in the test set-up were 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".*

10.5 Test Environmental Conditions

Temperature:	22ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Shankar Pangeni and Libass Thiaw from 2024-12-16 to 2025-01-10 at RF test site.

10.6 Test Results

2.4 GHz Wi-Fi

Channel	Frequency (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)
802.11b			
Low	2412	1.69	8
Middle	2437	3.84	8
High	2462	0.33	8
802.11g			
Low	2412	-5.48	8
Middle	2437	1.71	8
High	2462	-6.58	8
802.11n20			
Low	2412	-4.68	8
Middle	2437	1.59	8
High	2462	-7.65	8

Note: The EUT passed with stringent RBW of 10 kHz, thus complied with FCC and IC RBW requirement of 3 kHz.

2.4 GHz BLE

Channel	Frequency (MHz)	PSD (dBm/10kHz)		Limit (dBm/3kHz)
		1 Mbps	2 Mbps	
Low	2402	-2.50	-2.36	<8
Middle	2442	-2.17	-2.93	<8
High	2480	-1.69	-2.20	<8

Note: The EUT passed with stringent RBW of 10 kHz, thus complied with FCC and IC RBW requirement of 3 kHz.

Please refer to Annex D for detailed test results.

11 FCC §15.247(d) & ISEDC RSS-247 §5.5 – Spurious Emissions at Antenna Terminal and 100 kHz 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).

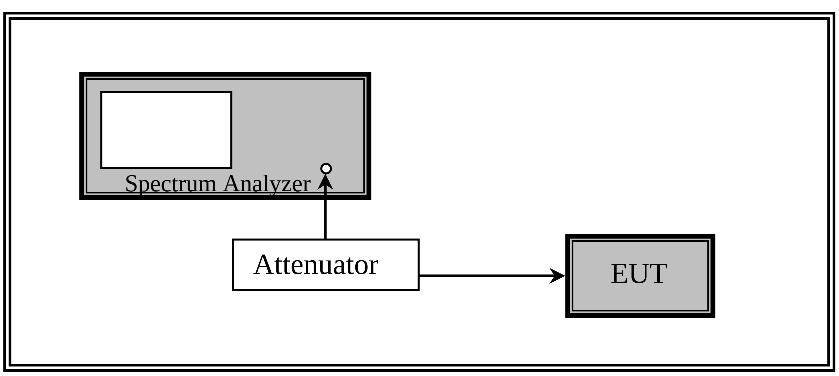
According to ISEDC RSS-247 §5.5.In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the 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 Setup Block Diagram



11.4 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2024-06-14	1 year
-	-	10dB Attenuator	-	-	-	-

Note[1]: cables, attenuators and notch filters included in the test set-up were 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".*

11.5 Test Environmental Conditions

Temperature:	22ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Shankar Pangeni and Libass Thiaw from 2024-12-16 to 2025-01-10 at RF test site

11.6 Test Results

Please refer to Annex C

Test Results: Pass

12 Appendix A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

13 Appendix B (Normative) – EUT External Photographs

Please refer to the attachment.

14 Appendix C (Normative) – EUT Internal Photographs

Please refer to the attachment.

15 Appendix D (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 13th day of September 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2026

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

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