FCC PART 15, SUBPART C,
FCC PART 22,
FCC PART 24E,
FCC PART 27
TEST REPORT

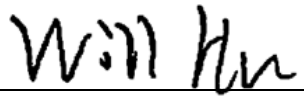
For

DPTechnics

Westkapellestraat 396/44
8300 Knokke-Heist, Belgium

FCC ID: 2BDGUWALTER

Report Type:	**Product Type:**
Original	IoT Module

Prepared By:	Will Hu RF Test Engineer	
Report Number:	R2310312-FCC	
Report Date:	2024-05-20	
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

ACCREDITED
CERTIFICATE #3297.02

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2310312-FCC	Original Report	2024-05-20

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test was prepared on behalf of *DPTechnics* and their product model: Walter, FCC ID: 2BDGUWALTER, the "EUT" as referred to in this report. The EUT is an IoT Module that is meant to be installed on a carrier board. It provides a CPU to run user code on and various connectivity options with a WIFI/BLE module ESP32-S3-WROOM-1 (*FCC ID: 2AC7Z-ESPS3WROOM1*), and a LTE-M/NB-Iot Sequans module (*FCC ID: 2AAGMGM02SA*). It also contains a GNSS receiver. Original results are used in cases of leveraging original module certification. After spot checking to ensure the power is consistent with original certifications, it was determined that original test reports accurately represent test results under the new conditions.

1.2 Objective

This report is prepared on behalf of *DPTechnics* in accordance with FCC Part 15C, Part 22, Part 24E, and Part 27 of the Federal Communication Commission's rules.

The objective was to determine compliance with FCC Part 15C, Part 22, Part 24E, and Part 27 for Radiated Spurious Emissions and RF Exposure.

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.).

1.3 Related Submittal(s)/Grant(s)

N/A

1.4 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.5 Measurement Uncertainty

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

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

1.6 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.

1.7 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 17025:2005 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-License-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 C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v05r02.

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

2.2 EUT Exercise Software

The test utility used was the Terminal Test Code provided by *DPTechnics*, the software is compliant with the standard requirements being tested against.

Radio	Frequency	Modulation	Power Setting
Wifi	2412-2462 MHz	802.11b	10
Bluetooth	2402-2480 MHz	GFSK	5
LTE	Band 2: Uplink:1850-1910 MHz Downlink: 1930-1990 MHz	N/A	N/A

2.3 Equipment Modification

None.

2.4 Local Support Equipment

None.

2.5 Remote Support Equipment

Manufacturer	Description	Model
Lenovo	Laptop computer to power the EUT and perform serial monitoring	L520(7896BG)

2.6 Interface Ports and Cabling

Cable Descriptions	Length (m)	From	To
USB Cable	1	UUT	Laptop

3 Summary of Test Results

FCC Rules	Description of Test	Results
FCC §2.1091, §1.1310(d)	RF Exposure	Compliant
FCC §2.1053, §15.35(b), §15.205, §15.20, §22.917, §2.1051, §24.238, §27.1509	Radiated Spurious Emissions	Compliant[1]

Note[1]: Prior to testing, conducted power was verified to be consistent with original certification's conducted power.

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 §2.1091, §1.1310(d) (3) & RSS-102 - RF Exposure

4.1 Applicable Standards

As per FCC §1.1310(d) (3), At operating frequencies above 6 GHz, the MPE limits listed in Table 1 in paragraph (e)(1) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b) of this part.

TABLE 1 TO §1.1310(E)(1)—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*($900/f^2$)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) 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
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

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

4.2 MPE Prediction

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

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

Where: S = power density
EIRP = Effective Isotropic Radiated Power
R = distance to the center of radiation of the antenna

4.3 MPE Results for the FCC

Standalone

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Ratio (%)
2.4GHz Wifi	2412	3.26	20.50	23.76	237.68	0.047	1.0	4.70
Bluetooth	2402	3.26	10.00	13.26	21.18	0.004	1.0	0.40
LTE Band 2	1850-1910	4.83	25	29.83	961.61	0.19	1.0	19.13
LTE Band 4	1710-1755	4.83	25	29.83	961.61	0.19	1.0	19.13
LTE Band 5	824-849	3.78	25	28.78	755.09	0.15	0.5	30.04
LTE Band 12	699-716	0.36	25	25.36	343.56	0.07	0.5	13.67
LTE Band 13	777-787	0.36	25	25.36	343.56	0.07	0.5	13.67
LTE Band 17	704-716	0.36	25	25.36	343.56	0.07	0.5	13.67
LTE Band 25	1850-1915	4.83	25	29.83	961.61	0.19	1.0	19.13
LTE Band 66	1710-1780	4.83	25	29.83	961.61	0.19	1.0	19.13

Note: Wifi and BT cannot transmit simultaneously
Note: Refer to antenna datasheet SPE-14-8-054-G provided by TAOGLAS for antenna gain that is to be used by this device.

Sum of Ratios:

Wifi + LTE: 0.047/1.0+0.15/0.5= 0.347 < 1
BT + LTE: 0.004/1.0+0.15/0.5= 0.304 < 1

NOTE: LTE ratio shown above is based on band with worst ratio based on above table.

5 FCC §15.205, §15.209 & RSS-Gen §8.9, §8.10- Spurious Radiated Emissions

5.1 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	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 §2.1051 and §22.917:
The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts. In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100

kHz or greater. In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz. At Po transmitting power, the specified minimum attenuation becomes 43+10 log (Po), and the level in dBm relative to Po becomes:

$$Po\ (dBm) – [43 + 10 \log (Po\ in\ mW) - 30] = -13\ dBm$$

As per FCC §27.1509:
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. At Po transmitting power, the specified minimum attenuation becomes 43+10 log (Po), and the level in dBm relative to Po becomes:

$$Po\ (dBm) – [43 + 10 \log (Po\ in\ mW) - 30] = -13\ dBm$$

As per FCC §27.1509:
The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) in watts by at least the following amounts:

(a.) For 900 MHz broadband operations in 897.5–900.5 MHz band by at least 43 + 10 log (P) dB.
(b.) For 900 MHz broadband operations in the 936.5–939.5 MHz band, by at least 50 + 10 log (P) dB
(c.) Compliance with the provisions of paragraphs (a) and (b) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the licensee's band, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(d.) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.
(e.) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

5.2 Test Setup

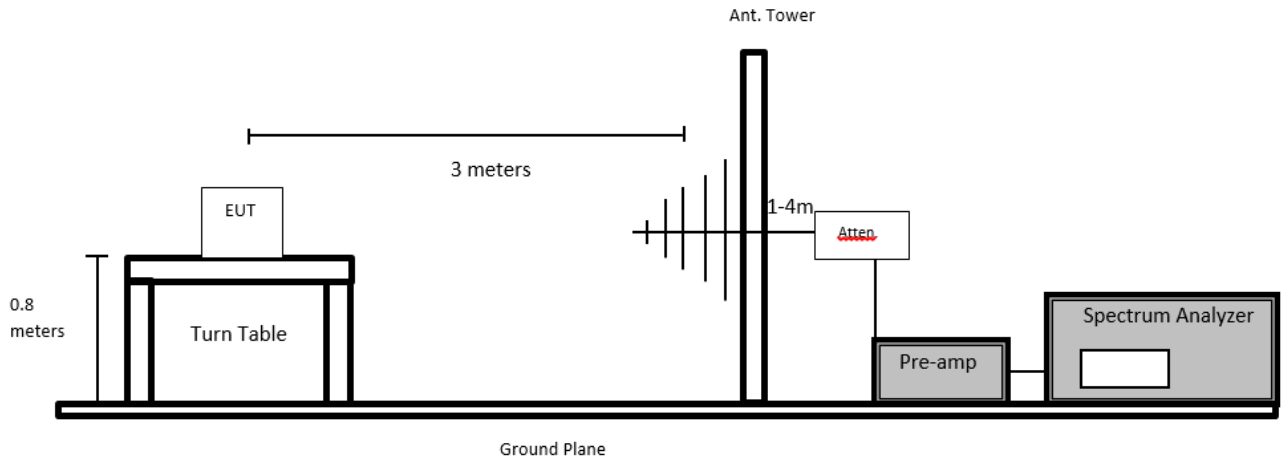
The radiated emissions tests were performed in the 5-meter chamber and 10-meter chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C, FCC 22. FCC 24 Subpart E, FCC 27.

The spacing between the peripherals was 10 centimeters.

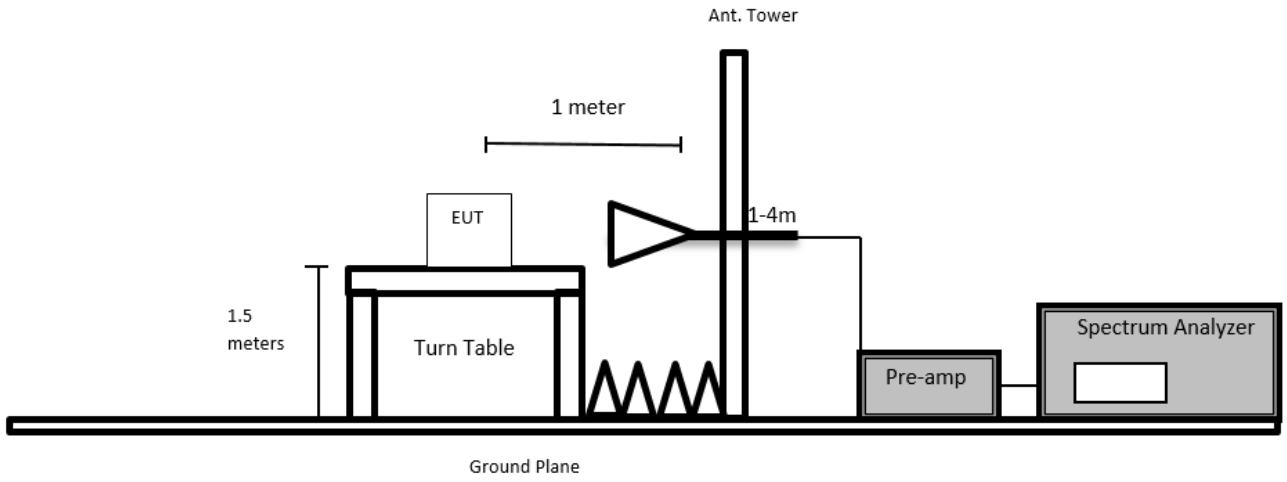
External I/O cables were draped along the edge of the test table and bundled when necessary.

5.3 Test Setup diagrams

Below 1 GHz



Above 1 GHz



5.4 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 = 10Hz or 1/T / Sweep = Auto

5.5 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

5.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
310	Rohde & Schwarz	EMI test receiver 9 kHz to 3 GHZ	ESCI 1166.5950.03	100338	2023-05-11	1 year
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2023-05-12	1 year
124	Rhode & Schwarz	EMI Test Receiver	ESCI	100044	2023-06-16	1 year
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
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2023-09-26	6 months
658	HP/ Agilant	Pre Amplifier	8449B OPT HO2	3008A01103	2023-12-01	6 months
1247	Uti flex	Micro - Coax	N/A	N/A	2023-12-01	6 months
827	AH Systems	Preamplifier	PAM 1840 VH	170	2023-11-08	6 months
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2023-12-18	2 years[1]
1246	HEWLET PACKARD	RF Limiter	11867A	01734	2023-04-13	1 year
1245	-	6dB Attenuator	PE7390-6	01182018A	2021-11-22	2 years
1192	ETS Lindgren	Horn Antenna	3117	00218973	2022-09-29	2 years
90	Wisewave	Antenna, Horn	ARH-4223-02	10555-01	2023-05-02	2 years
1186	Pasternack	Coaxial Cable, RG214	PE3062-1050CM	N/A	2023-10-03	6 months
1248	Pasternack	RG214 COAX Cable	PE3062	N/A	2023-10-04	6 months
1249	Time Microwave	LMR-400 Cable Dc-3 GHz	AE13684	2k80612-5 6fts	2023-10-09	6 months
1346	R1FMW	2.92mm 10ft RF cable	KMSE-160SAW-240.0-KSME	N/A	2023-11-03	6 months
1354	RFMW	2.92mm 10ft RF Cable DC to 40 GHz	P1CA-29M29M-F150-120	N/A	2023-02-24	6 months
1295	Carlisle	10m Ultra Low Loss Coaxial Cable	UFB142A-1-3937-200200	64639890912-001	2023-10-31	6 months

Note[1]: Equipment was only used for testing performed on 2023-12-19

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".*

5.7 Test Environmental Conditions

Temperature:	23.2 ºC
Relative Humidity:	38%
Barometric Pressure:	101.7 kPa

The testing was performed by Will Hu from 2023-12-12 to 2023-12-13 and 2023-12-20 to 2023-12-21 in 5m chamber 3.

5.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15C, Part 22, Part 24E, and Part 27 standards' radiated emissions limits, and had the worst margin of:

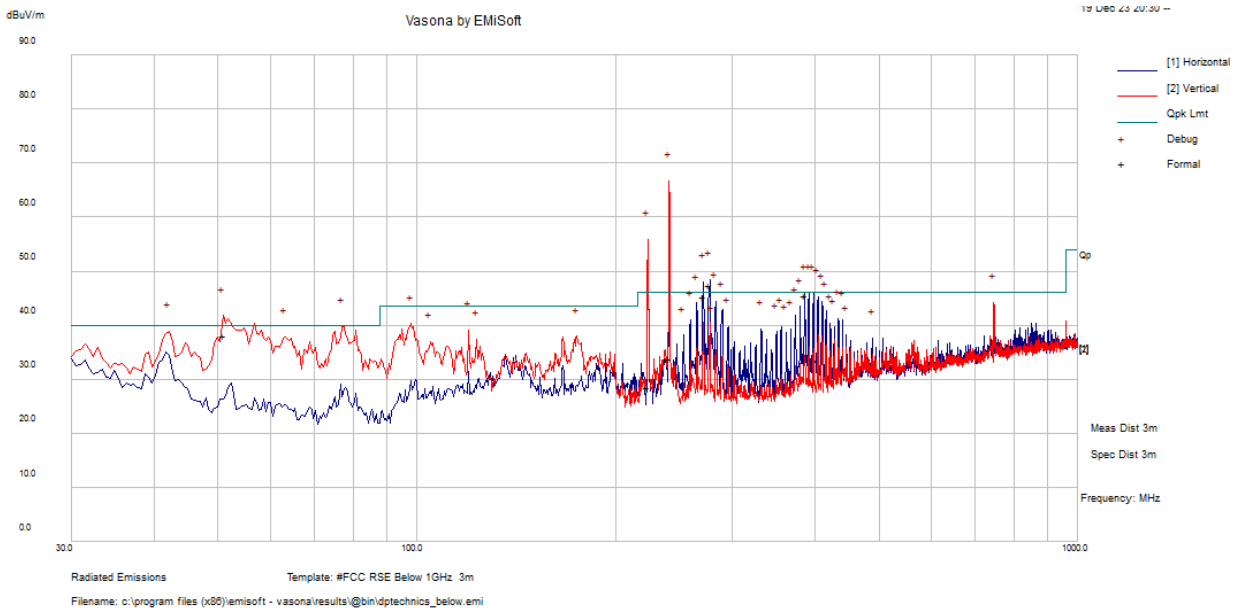
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Configuration**
-0.46	386.3083	Horizontal	BLE GFSK Middle Channel +LTE

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

5.9 Radiated Emissions Test Results

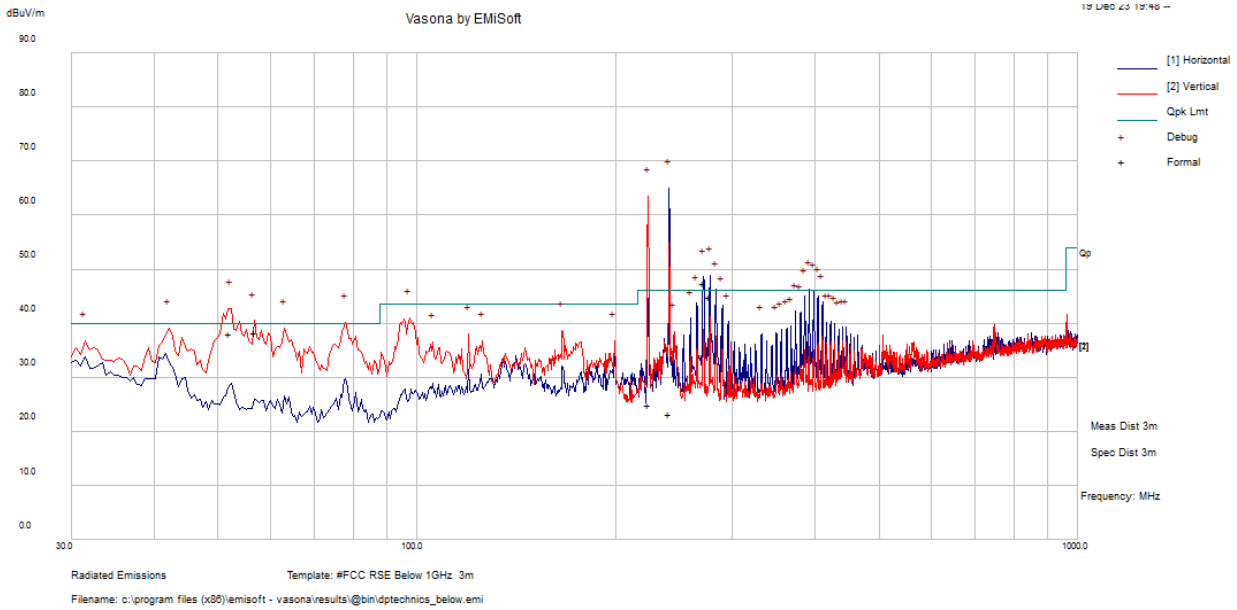
1) 30 MHz – 1 GHz, Measured at 3 meters

Colocation 2.4G BLE Middle Channel + LTE



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV /m)	Margin (dB)	Comment
240.5168	43.41	-9.6	33.81	100	V	191	46	-12.19	QP
223.516	38.67	-10.15	28.52	113	V	81	46	-17.48	QP
277.549	52.19	-7.55	44.64	108	H	40	46	-1.36	QP
271.6153	53.08	-7.69	45.39	129	H	247	46	-0.61	QP
50.908	51	-13.02	37.98	108	V	314	40	-2.02	QP
386.3083	51.03	-5.49	45.54	100	H	331	46	-0.46	QP

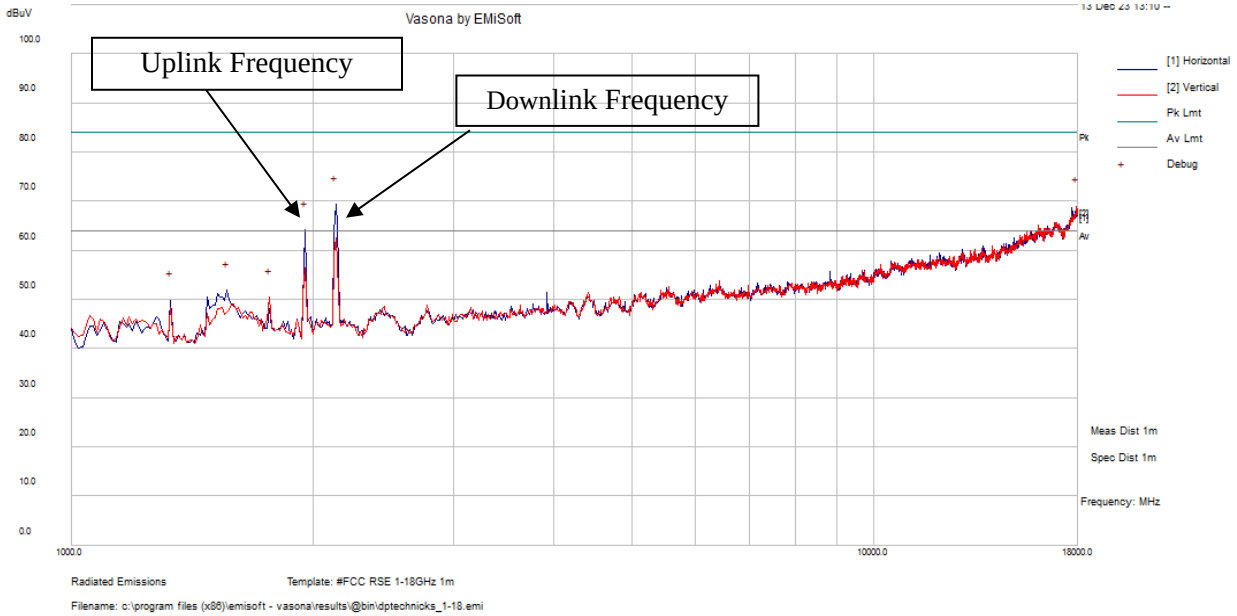
Colocation 2.4G Wifi Middle Channel + LTE



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
240.6768	32.71	-9.6	23.11	162	H	213	46	-22.89	QP
224.237	34.97	-10.14	24.83	101	V	279	46	-21.17	QP
277.6213	52.48	-7.55	44.94	120	H	194	46	-1.06	QP
52.1445	51.3	-13.3	38	113	V	330	40	-2	QP
271.612	52.01	-7.69	44.32	129	H	33	46	-1.68	QP
56.8655	51.95	-13.77	38.18	104	V	20	40	-1.82	QP

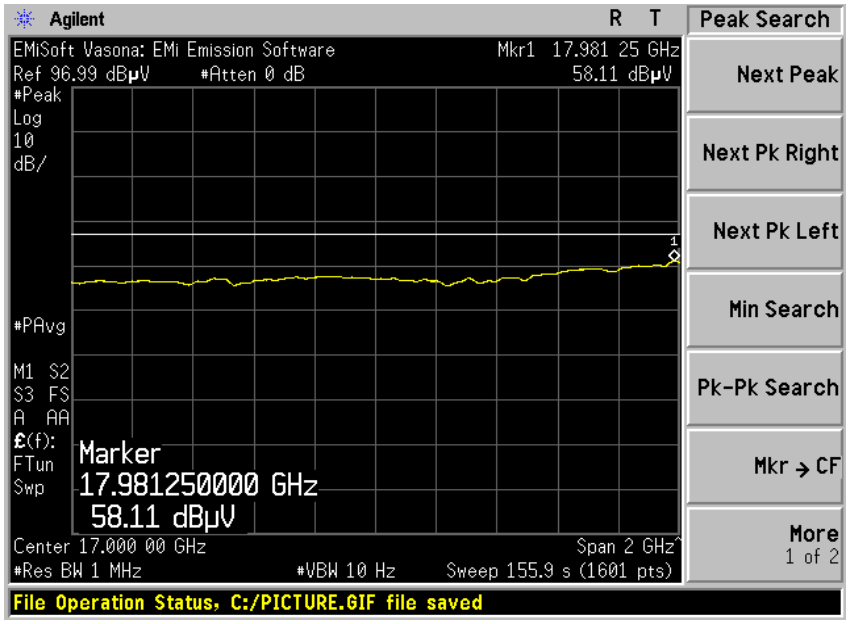
2) 1 – 18 GHz, Measured at 1 meter

Colocation 2.4G BLE Middle Channel + LTE



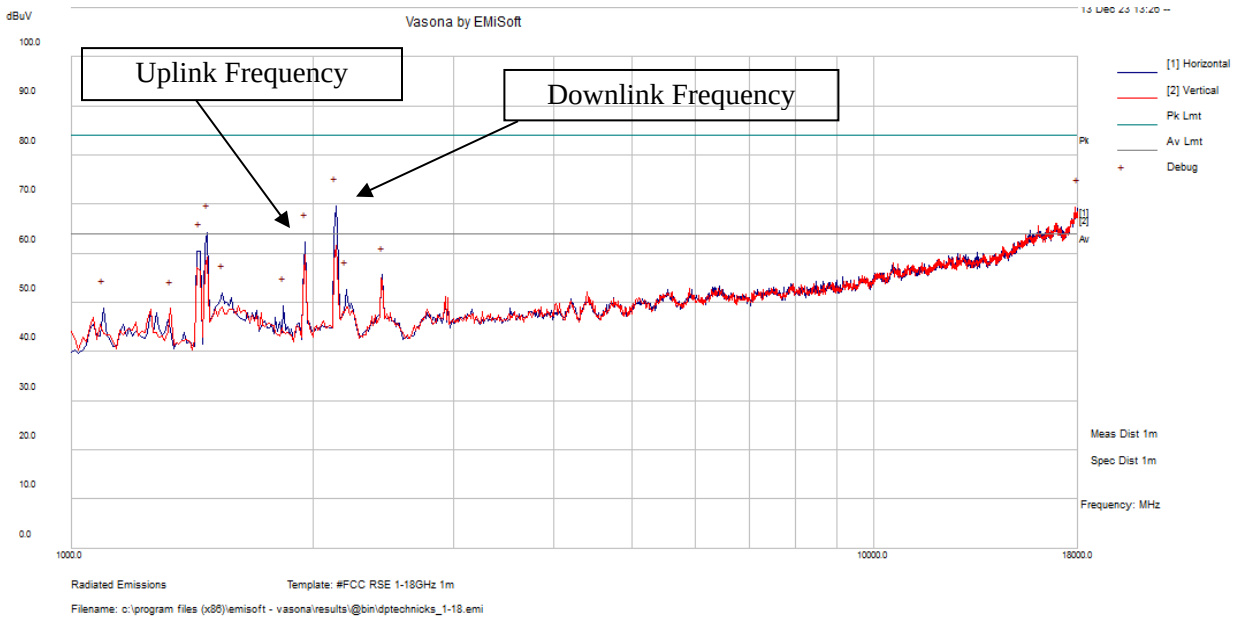
Note: above plot shows all peak emissions below 16GHz pass under average limits

Average plot for 16 – 18 GHz



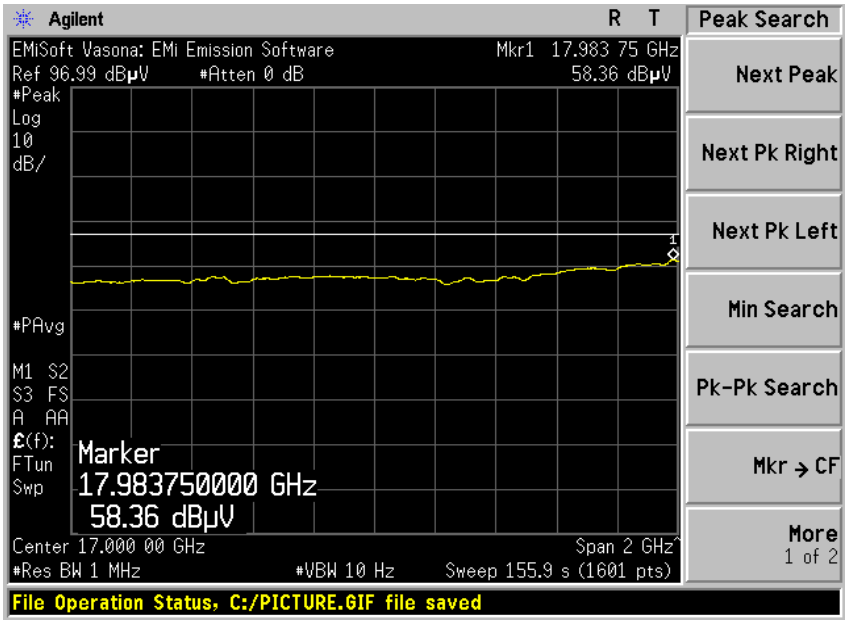
Note: above plot shows reduced VBW to make average measurements comparing to average limits and thus show compliance in range of 16-18GHz

Colocation 2.4G Wifi Middle Channel + LTE



Note: above plot shows all peak emissions below 16GHz pass under average limits

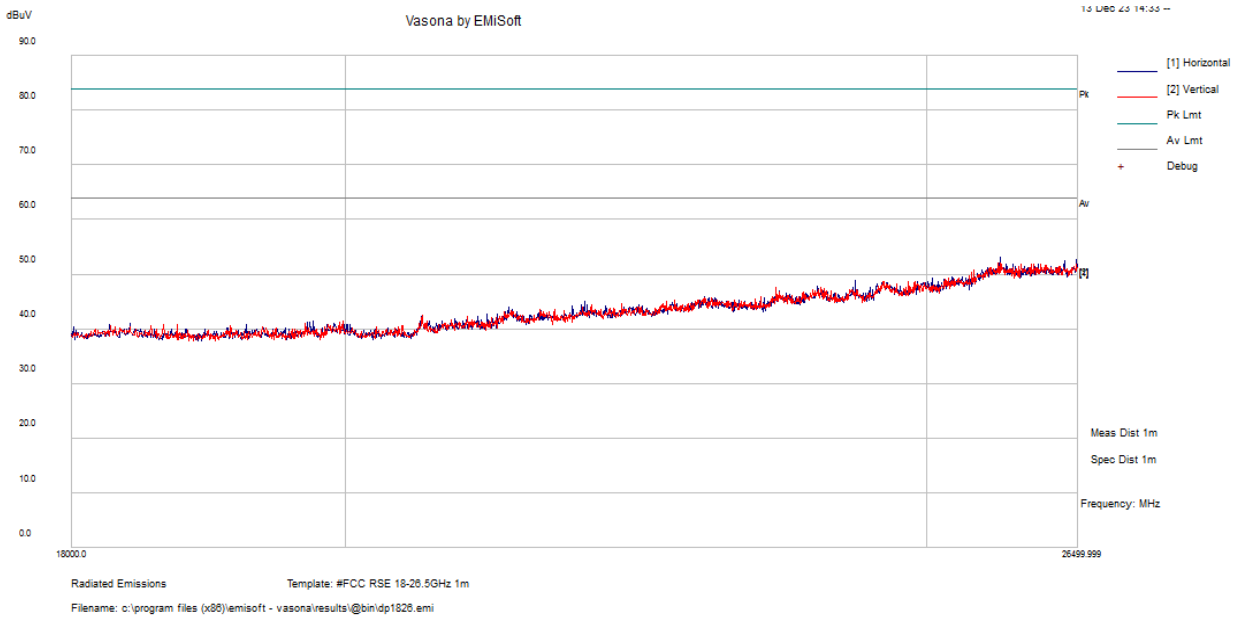
Average plot for 16 – 18 GHz



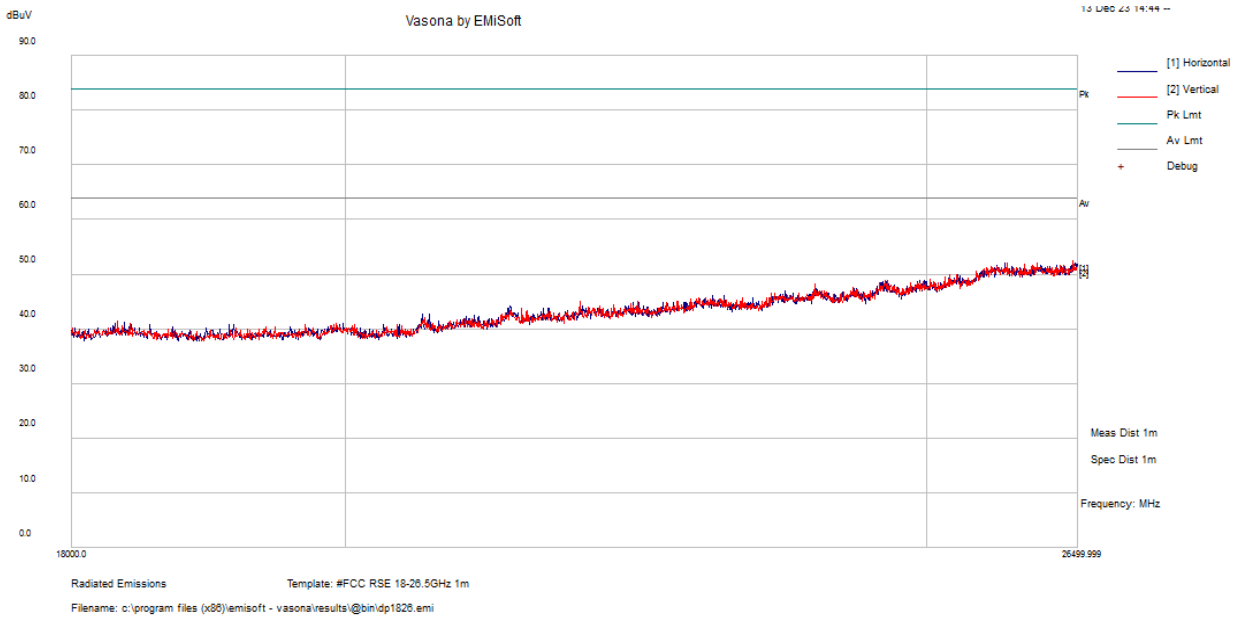
Note: above plot shows reduced VBW to make average measurements comparing to average limits and thus show compliance in range of 16-18GHz

3) 18-26.5 GHz, Measured at 1 meter

Colocation 2.4G BLE Middle Channel + LTE



Colocation 2.4G Wifi Middle Channel + LTE



6 Appendix A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

7 Appendix B (Normative) –EUT Photographs

Please refer to the attachment

8 Appendix C (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIACE 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 21st day of December 2022.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2024

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 ---