FCC PART 15.407
ISEDC RSS-247, ISSUE 3, AUGUST 2023

TEST REPORT

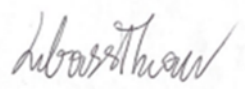
For

Roku, Inc.

1173 Coleman Ave
San Jose, CA 95110, USA

FCC ID: TC2-R1050
IC: 5959A-R1048

Report Type:	**Product Type:**
Original Report	Streaming Player

Prepared By:	Libass Thiaw RF Test Engineer	
Report Number:	R2311164-407	
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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

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2311164-407	Original Report	2024-04-16

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: 4850X, FCC ID: TC2-R1050, IC: 5959A-R1048 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.

NOTE: Device does not operate in the 5600-5650 MHz frequency band (TWDR) for ISED.

Model Number	4850X
FCC ID	TC2-R1050
IC	5959A-R1048
Radio Type	5 Wi-Fi
Operating Frequency	5150~5850 MHz
Modulation	802.11a/n20/n40/ac80/ax20/ax40/ax80

1.1 Mechanical Description of EUT

The UUT measures approximately 12.5cm (L) x 12.5cm (W) x 2.2cm (H) and weighs approximately 0.15 kg.

The data gathered was from a production sample provided by Roku, Inc. with with S/N: S0VT33CTFXAH

1.2 Objective

This report is prepared on behalf of *Roku, Inc.* in accordance with FCC CFR47 §15.407 and ISEDC RSS-247 Issue 3, August 2023.

The objective is to determine compliance with FCC Part 15.407 and ISEDC RSS-247 for Antenna Requirement, RF Exposure, AC Line Conducted Emissions, Radiated & Conducted Spurious Emissions, Band Edges, Emission Bandwidth, Output Power, Power Spectral Density, and 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.).

1.3 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment Class: DSS with FCC ID: TC2-R1050, IC: 5959A-R1048
FCC Part 15, Subpart C, Equipment Class: DTS with FCC ID: TC2-R1050, IC: 5959A-R1048

1.4 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz, and FCC KDB 789033 D02 General UNII Test Procedure New Rules v02r01.

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	±1.48 dB
Unwanted Emissions, conducted	±1.57dB
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%

1.6 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 17025:2017 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report.

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

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

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

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

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

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

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

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

5 Other
- For Water Coolers (ver. 3.0)

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

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

Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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.

UNII-1 IC

Modulation	Frequency (MHz)	Power Setting	
		Ant. A	Ant. B
802.11a	5180	15.0	15.0
	5200	15.0	15.0
	5240	15.0	15.0
802.11n20	5180	11.0	11.0
	5200	11.0	11.0
	5240	11.0	11.0
802.11n40	5190	13.0	13.0
	5230	13.0	13.0
802.11ac80	5210	13.0	13.0
802.11ax20	5180	11.0	11.0
	5200	10.5	10.5
	5240	10.5	10.5
802.11ax40	5190	13.0	13.0
	5230	13.0	13.0
802.11ax80	5210	13.0	13.0

Data rates used:
802.11b: 1Mbps
802.11g: 6 Mbps
802.11n: HTMCS0
802.11ac: VHT1MCS0
802.11ax: HE1MCS0

UNII-1 FCC

Modulation	Frequency (MHz)	Power Setting	
		Ant. A	Ant. B
802.11a	5180	18	18
	5200	20	20
	5240	20	20
802.11n20	5180	16	16
	5200	17	17
	5240	17	17
802.11n40	5190	13	13
	5230	20	20
802.11ac80	5210	13	13
802.11ax20	5180	16	16
	5200	17	17
	5240	17	17
802.11ax40	5190	13	13
	5230	20	20
802.11ax80	5210	13	13

UNII-2A

Modulation	Frequency (MHz)	Power Setting	
		Ant. A	Ant. B
802.11a	5260	20	20
	5300	20	20
	5320	16	16
802.11n20	5260	18	18
	5300	18	18
	5320	16	16
802.11n40	5270	20	20
	5310	12	12
802.11ac80	5290	13	13
802.11ax20	5260	17	17
	5300	17	17
	5320	15	15
802.11ax40	5270	17	17
	5310	12	12
802.11ax80	5290	13	13

UNII-2C

Modulation	Frequency (MHz)	Power Setting	
		Ant. A	Ant. B
802.11a	5500	17.0	17.0
	5600	20.0	20.0
	5720	20.0	20.0
802.11n20	5500	15.0	15.0
	5600	18.0	18.0
	5720	17.0	17.0
802.11n40	5510	12.0	12.0
	5590	20.0	20.0
	5710	20.0	20.0
802.11ac80	5530	13.0	13.0
	5610	19.0	19.0
	5690	19.0	19.0
802.11ax20	5500	17.0	17.0
	5600	18.0	18.0
	5720	18.0	18.0
802.11ax40	5510	14.0	14.0
	5590	20.0	20.0
	5710	20.0	20.0
802.11ax80	5530	14.5	14.5
	5610	16.0	16.0
	5690	18.0	18.0

UNII-3

Modulation	Frequency (MHz)	Power Setting	
		Ant. A	Ant. B
802.11a	5745	20	20
	5785	20	20
	5825	20	20
802.11n20	5745	20	20
	5785	20	20
	5825	18	18
802.11n40	5755	20	20
	5795	20	20
802.11ac80	5775	17	17
802.11ax20	5745	16	16
	5785	17	17
	5825	17	17
802.11ax40	5755	20	20
	5795	20	20
802.11ax80	5775	17	17

Note: The 802.11ax mode is investigated among different tones, full resource units (RU), partial resource units. The partial RU has no higher power than full RU's, thus the full RU is chosen as main test configuration.

2.3 Duty Cycle Correction Factor

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 section B:

All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

Modulation	Frequency	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	5785	1.344	1.368	98.0	0
802.11n20	5785	1.263	1.280	99.0	0
802.11n40	5755	0.5828	0.6392	91.0	0.4010
802.11ac80	5775	0.2391	0.2754	87.0	0.6140
802.11ax20	5785	0.9719	0.9990	97.0	0.1190
802.11ax40	5190	0.5143	0.5269	97.6	0.1050
802.11ax80	5210	0.2787	0.2875	96.9	0.1350

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

Please refer to the plots in [Annex G] for detailed test results.
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2.4 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E7440	-

2.5 Remote Support Equipment

Manufacturer	Description	Model	Serial Number
Roku, Inc.	Debug Board	-	-

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Roku, Inc.	AC Adaptor	WAN002	-

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, §15.407(f) ISEDC RSS-102	RF Exposure	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Power Line Conducted Emissions	Compliant
FCC §2.1053, §15.35(b), §15.205, §15.209, 15.407(b) ISEDC RSS-247 §6.2 ISEDC RSS-Gen §8.9, §8.10	Radiated Spurious Emissions	Compliant
FCC §15.407(e) ISEDC RSS-247 §6.2 RSS-Gen §6.7	Emission Bandwidth	Compliant
FCC §407(a) ISEDC RSS-247 §6.2	Output Power	Compliant
FCC §15.407(a) ISEDC RSS-247 §6.2	Power Spectral Density	Compliant
FCC §2.1051, §15.407(b) ISEDC RSS-247 §6.2	Spurious Emissions at Antenna Terminals	Compliant
FCC §2.1051, §15.407(b) ISEDC RSS-247 §6.2	Band Edges	Compliant
FCC §15.407(h) ISEDC RSS-247 §6.3	Dynamic Frequency Selection	Compliant
FCC §15.407(g)	Frequency Stability	Compliant[1]

Note 1: Customer confirmed an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

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

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

4.1 Applicable Standards

According to FCC §15.203:

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

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

According to ISEDC RSS-Gen §6.8: Transmitter Antenna

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

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

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

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

For 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)
Internal	5 GHz Wi-Fi Ant. A	Stamped metal	5150~5850	4
Internal	5 GHz Wi-Fi Ant. B		5150~5850	2

5 FCC §2.1091, FCC §15.407(f) & ISEDC RSS-102 – RF Exposure

5.1 Applicable Standards

According to FCC §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 5:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

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

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

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

5.2 MPE Prediction

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

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

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

Note: According to MIMOFCC KDB 662911 D02 MIMO with Cross Polarized Antenna v01, Where an FCC rule specifies limits in radiated terms such as EIRP or ERP, the limits apply to the maximum emission that would be observed by a linearly polarized measurement antenna. Therefore, the highest output power from single antenna power was selected to calculate in this section.

5.3 RF exposure evaluation for FCC

Worst Case: 802.11n40, 5270 MHz

Maximum output power at antenna input terminal (dBm):	22.85
Maximum output power at antenna input terminal (mW):	192.8
Prediction distance (cm):	20
Prediction frequency (MHz):	5270
Maximum Directional Antenna Gain, typical (dBi):	6.1
Maximum Antenna Gain (numeric):	4.07
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.16
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 0.16 mW/cm^2. Limit is 1.0 mW/cm^2.

Worst case colocation: BT ratio + 5Wifi ratio. 0.007/1 +0.16/1 = 0.167 < 1
Worst case colocation: BT ratio + 2.4Wifi ratio. 0.007/1 +0.14/1 = 0.147 < 1

5.4 RF exposure evaluation exemption for IC

Worst Case: 5180MHz frequency used for formula

Maximum EIRP power = 22.85dBm + 6.1 dBi = 28.95 dBm which is less than $1.31\times10^{-2}f^{0.6834}$ = 4.53 W = 36.56 dBm

Therefore the RF exposure Evaluation is not required.

Note: worst case overestimations made for antenna gain in order to show worst-case compliance.

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 Section 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 C63.10-2013 measurement procedure. The specification used were FCC §15.207 and ISEDC RSS-Gen §8.8 limits.

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

The 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 and Margin Calculation

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

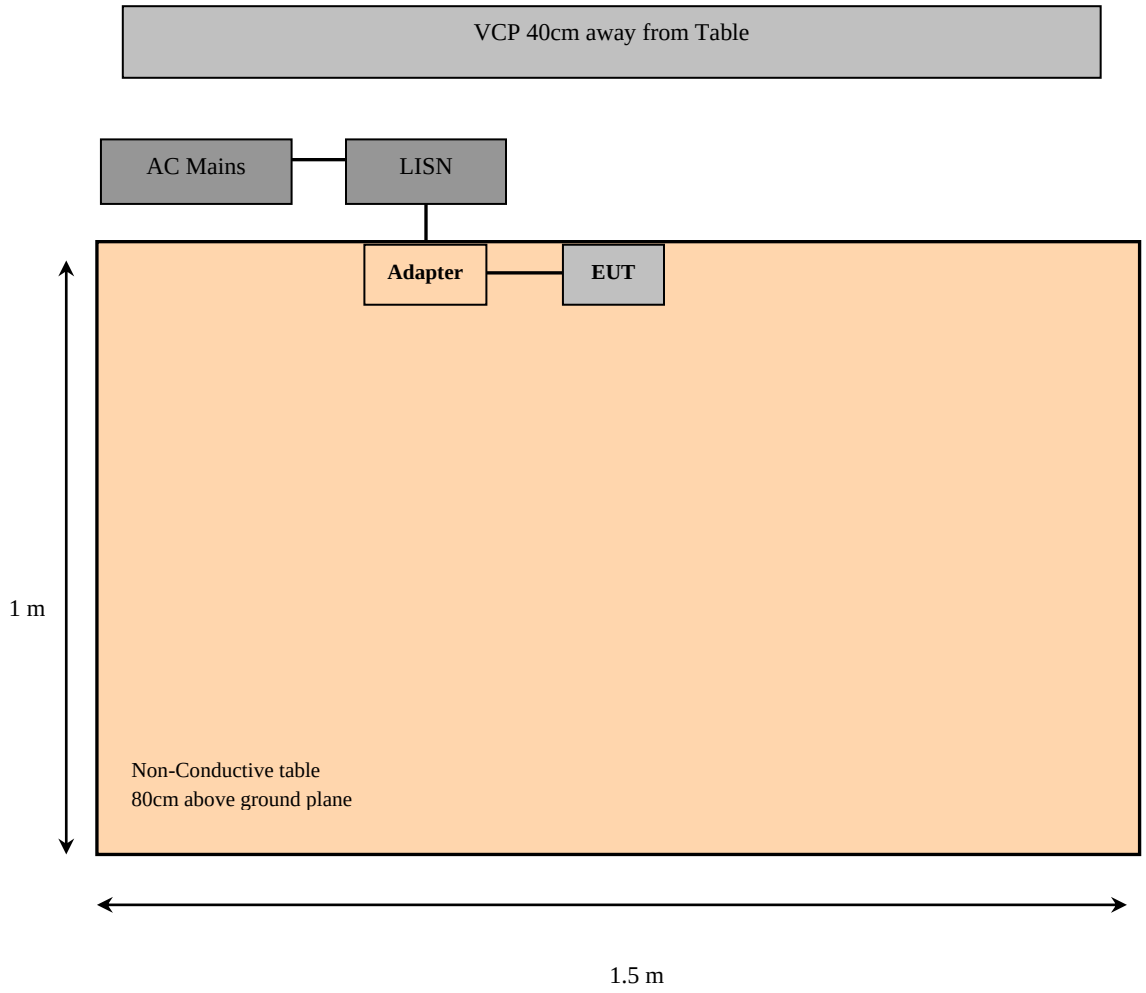
$$CA = Ai + CL + Atten$$

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

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

$$Margin = Corrected\ Amplitude - Limit$$

6.5 Test Setup Block Diagram



6.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
310	Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2023-05-11	1 year
680	Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101964	2024-03-22	1 year
724	Solar Electronics Company	High Pass Filter	Type 7930-100	7930150202	2024-03-22	1 year
732	FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2023-09-12	1 year
1425	Fairview Microwave	Micro-Coax Cable	FMC0101223-240	210241	2024-01-12	1 year
348	California Instruments	AC Power Source	5001ix-208	57079	Calibration not Required	Calibration not Required

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".*

6.7 Test Environmental Conditions

Temperature:	21.9 to 22.0ºC
Relative Humidity:	49.6 to 50.4%
ATM Pressure:	101.9 kPa

The testing was performed by Libass Thiaw from 04-01-2024 in 5m 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 Mode

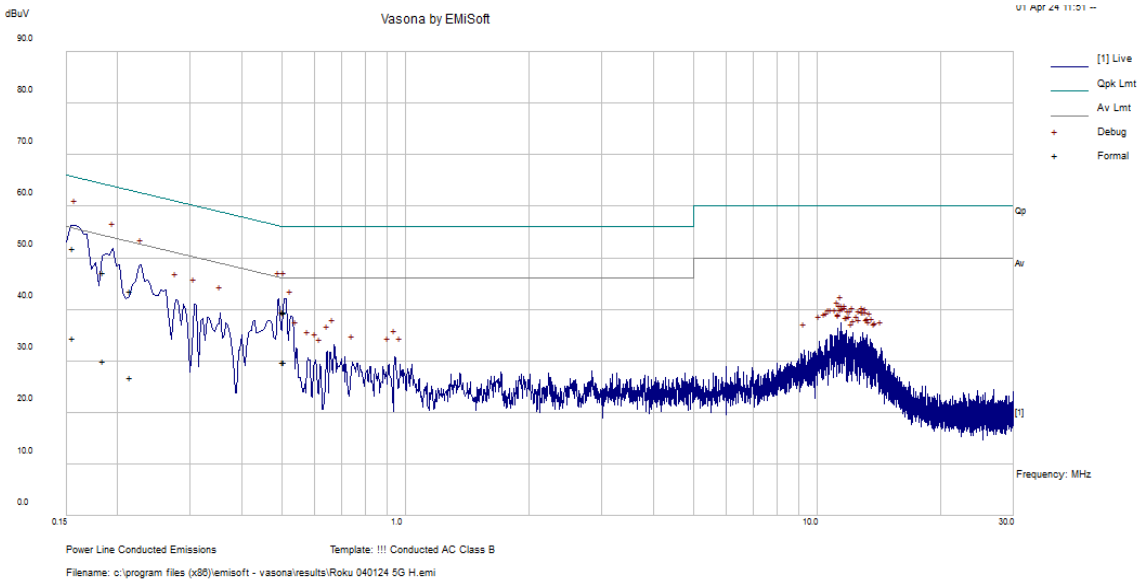
Worst Case – AC Line: 120 V, 60 Hz			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Hot/Neutral)**	**Range (MHz)**
-11.89	0.157343	Neutral	0.15 to 30

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

6.9 Conducted Emissions Test Plots and Data

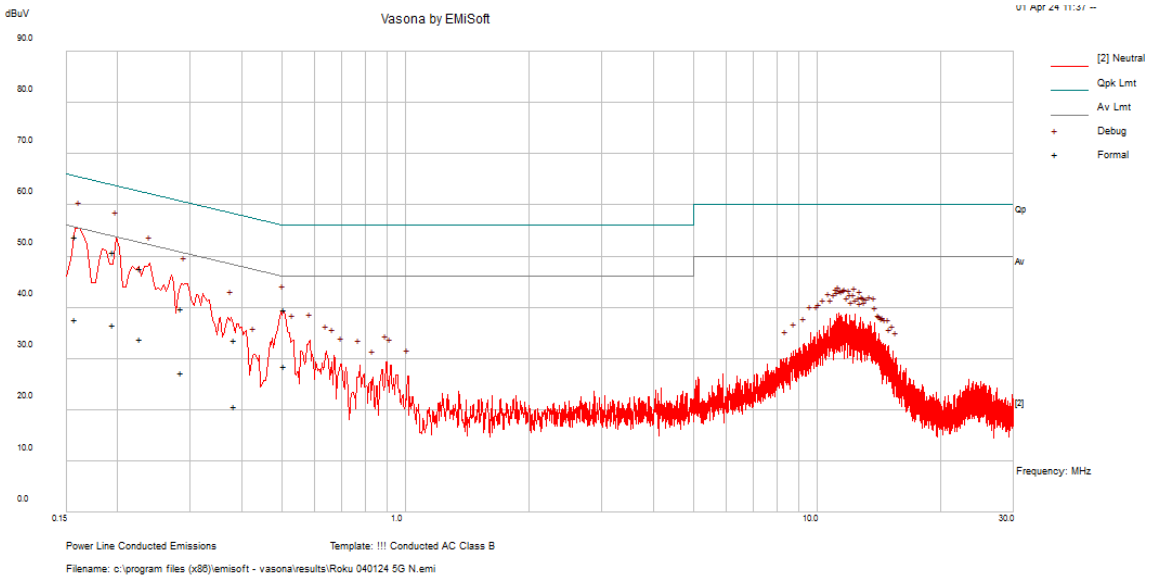
U-NII-3, 802.11A: 5825 MHz + BT colocation

AC Line: 120 V, 60 Hz – Hot Conductor



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.155663	40.31	11.57	51.88	65.69	-13.81	QP
0.185184	35.95	11.32	47.27	64.25	-16.98	QP
0.507684	28.83	10.69	39.52	56.00	-16.48	QP
0.21542	32.40	11.14	43.54	62.99	-19.45	QP
0.50471	28.94	10.69	39.63	56.00	-16.37	QP
0.50899	28.72	10.69	39.41	56.00	-16.59	QP
0.155663	22.83	11.57	34.40	55.69	-21.29	Ave
0.185184	18.63	11.32	29.95	54.25	-24.30	Ave
0.507684	19.09	10.69	29.78	46.00	-16.22	Ave
0.21542	15.60	11.14	26.74	52.99	-26.25	Ave
0.50471	19.03	10.69	29.72	46.00	-16.28	Ave
0.50899	19.10	10.69	29.79	46.00	-16.21	Ave

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



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.157343	42.15	11.56	53.71	65.6	-11.89	QP
0.195054	39.58	11.25	50.83	63.82	-12.99	QP
0.227154	36.58	11.07	47.65	62.55	-14.9	QP
0.285749	29.00	10.84	39.84	60.65	-20.81	QP
0.508885	28.97	10.69	39.66	56.00	-16.34	QP
0.385056	22.96	10.75	33.71	58.17	-24.46	QP
0.157343	26.11	11.56	37.67	55.6	-17.93	Ave
0.195054	25.24	11.25	36.49	53.82	-17.33	Ave
0.227154	22.69	11.07	33.76	52.55	-18.79	Ave
0.285749	16.48	10.84	27.32	50.65	-23.33	Ave
0.508885	17.73	10.69	28.42	46.00	-17.58	Ave
0.385056	9.900	10.75	20.65	48.17	-27.52	Ave

7 FCC §15.35(b), §15.205, §15.209, §15.407(b) & ISEDC RSS-247 §6.2, RSS-Gen §8.9, §8.10 –Radiated Spurious Emissions

7.1 Applicable Standard

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: 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

Note 1: 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 §15.407 (b),

1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
4) For transmitters operating solely in the 5.725–5.850 GHz band:
    i. All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
    ii. Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in § 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in § 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
8) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
9) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
10) The provisions of §15.205 apply to intentional radiators operating under this section.

According to ISEDC RSS-247 §6.2.1.2, for transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

According to ISEDC RSS-247 §6.2.2.2, devices shall comply with the following:

a. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or
b. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text "for indoor use only."

According to ISEDC RSS-247 §6.2.3.2, Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p.at 5850 MHz instead of 5725 MHz.

According to ISEDC RSS-247 §6.2.4.3, Devices operating in the band 5725-5850 MHz shall comply with the following e.i.r.p. spectral density limits:

a. 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 Bm/MHz at 5 MHz above or below the band edges;
b. 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
c. 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
d. -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

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 C63.10-2013. The specification used was the FCC §15.407 and ISEDC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

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

7.3 Test Procedure

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter or 1.5 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

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

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 3MHz / Sweep = 100ms
(2) Average: RBW = 1MHz / VBW = 10Hz or 1/T / Sweep = Auto

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

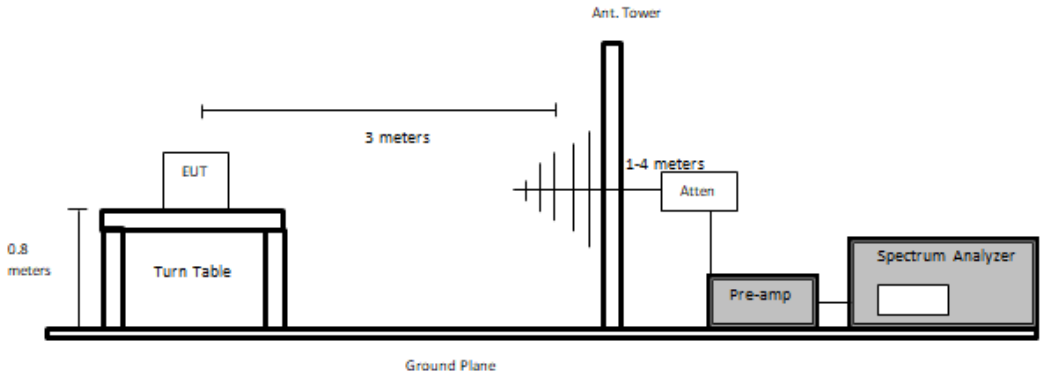
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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:

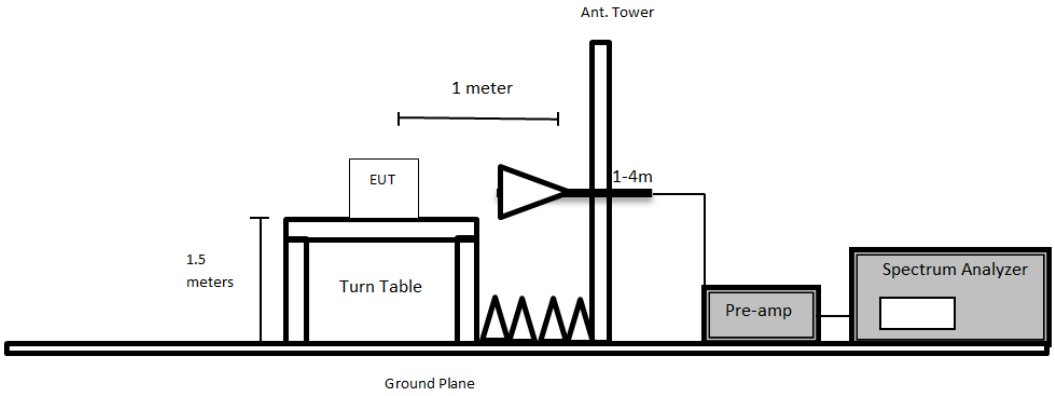
Margin = Corrected Amplitude – Limit

7.5 Test Setup Block Diagram

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
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
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	317	260406	2023-09-26	6 months
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2023-12-18	2 years
1186	Pasternack	Coaxial Cable, RG214	PE3062-1050CM	N/A	2023-10-03	6 months
1245	-	6dB Attenuator	PE7390-6	01182018A	2023-12-18	2 years
1246	Hewlet Packard	RF Limiter	11867A	01734	2023-04-13	1 year
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
658	HP/ Agilant	Pre Amplifier	8449B OPT HO2	3008A01103	2023-12-01	6 months
1192	ETS Lindgren	Horn Antenna	3117	00218973	2022-09-29	2 years
1247	Uti flex	Micro - Coax	N/A	N/A	2023-12-01	6 months
1353	RFMW	2.92mm 10ft RF Cable DC to 40 GHz	P1CA-29M29M-F150-120	N/A	2023-01-24	13 months
672	Micro-Tronics	2.4-2.6 GHz Notch Filter	BRM50701	160	2023-03-09	1 year
91	Wisewave	Horn Antenna	ARH-4223-02	10555-02	2022-03-08	2 years
92	Wisewave	Horn Antenna	ARH-2823-02	10555-01	2022-03-17	2 years
827	AH Systems	Preamplifier	PAM 1840 VH	170	2023-11-08	6 months
1329	Pasternack	2.92mm short coaxial cable	PE360-12	N/A	2023-11-28	6 months

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".*

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 from 2024-01-18 to 2024-01-22, 2024-02-20, 2024-02-27, and 2024-03-04 to 2024-03-06 in 5m chamber 3.

7.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.407 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**
-0.76	33.18875	Horizontal	802.11a: 5580 MHz

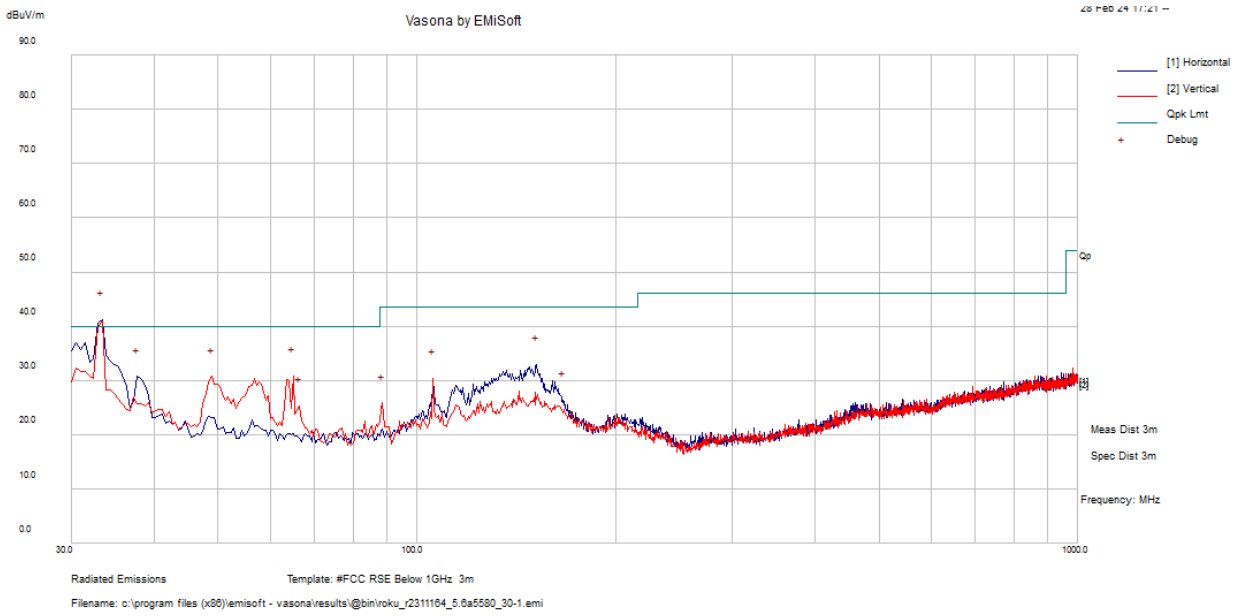
Please refer to the tables and plots in the next section for detailed test results.

7.9 Radiated Emissions Test Result Data

Note: *Pre-scans were performed on all shown configurations in order to determine worst-case results. Following this, a formal scan was performed on the worst-case detailed below*

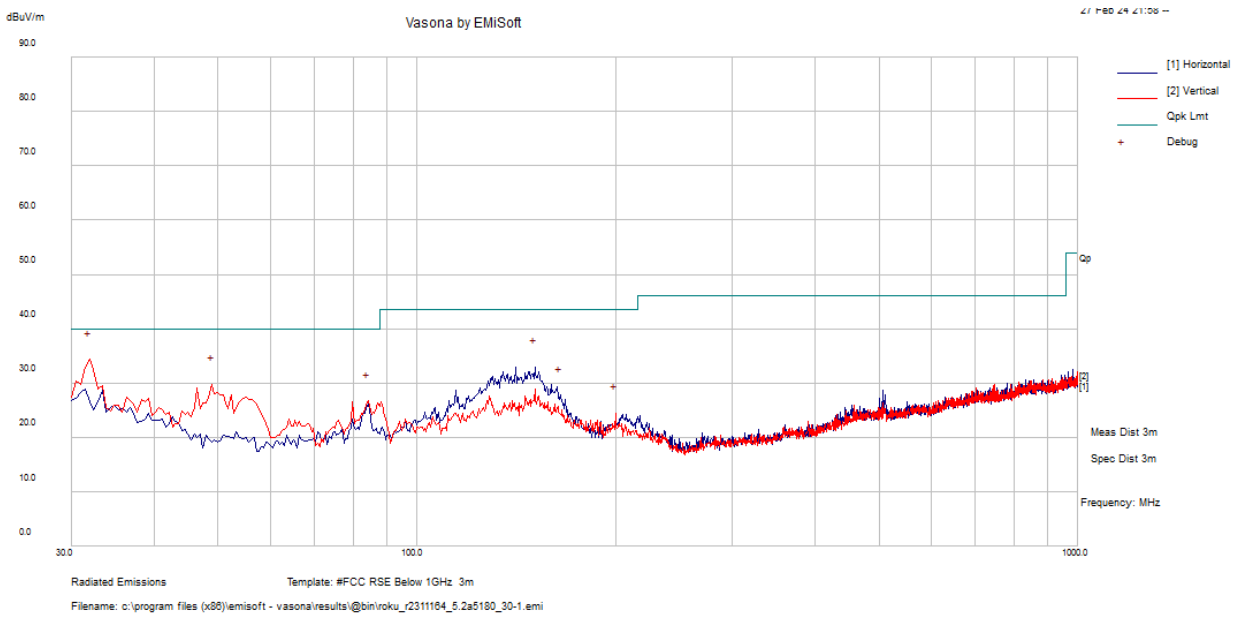
1) 30 MHz – 1 GHz, Measured at 3 meters

Worst Case: U-NII-2C, 802.11A: 5580 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
33.18875	51.22	-11.98	39.24	116	H	177	40	-0.76	QP
64.9505	42.33	-22.24	20.09	104	V	299	40	-19.91	QP
48.93275	45.89	-22.05	23.84	130	V	299	40	-16.16	QP
37.96675	32.75	-14.94	17.81	234	H	96	40	-22.19	QP
151.5445	42.37	-16.99	25.38	225	H	20	43.5	-18.12	QP
105.78575	42.69	-17.62	25.07	107	V	313	43.5	-18.43	QP

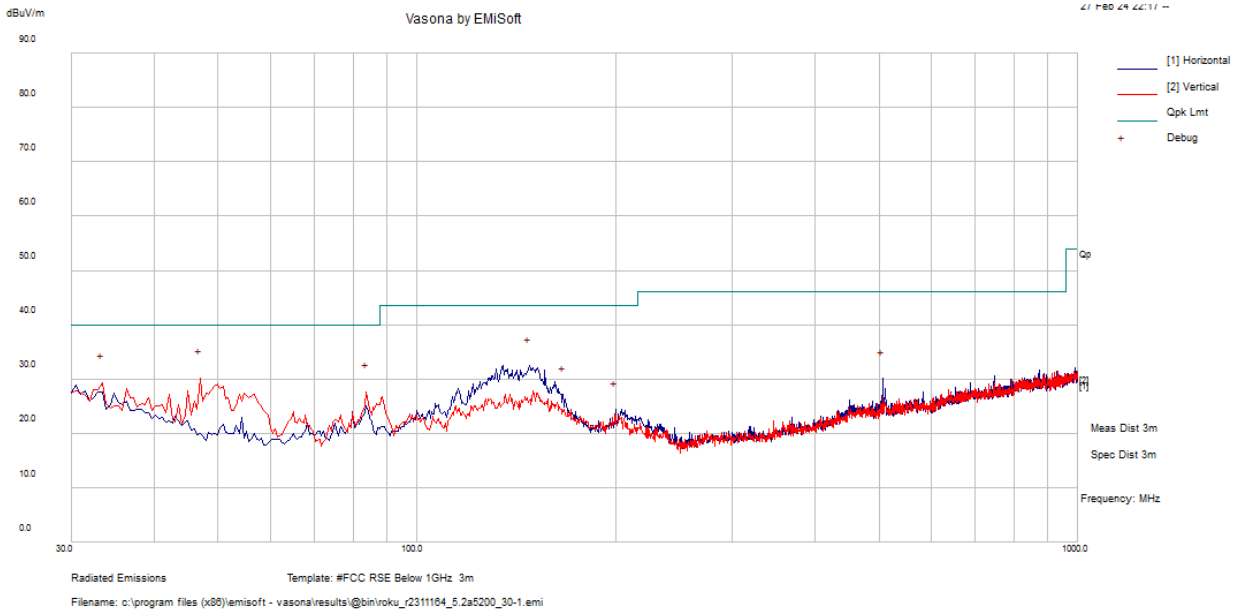
U-NII-1, 802.11A: 5180 MHz



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
31.94	45.46	-11.13	34.33	200.00	V	360.00	40.00	-5.67	Peak
48.92	51.77	-22.04	29.73	100.00	V	360.00	40.00	-10.27	Peak
150.77	49.95	-16.95	33.00	200.00	H	360.00	43.50	-10.50	Peak
84.32	49.52	-22.88	26.64	100.00	V	360.00	40.00	-13.36	Peak
164.83	45.05	-17.36	27.69	300.00	H	360.00	43.50	-15.81	Peak
199.75	41.27	-16.89	24.38	100.00	V	360.00	43.50	-19.12	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

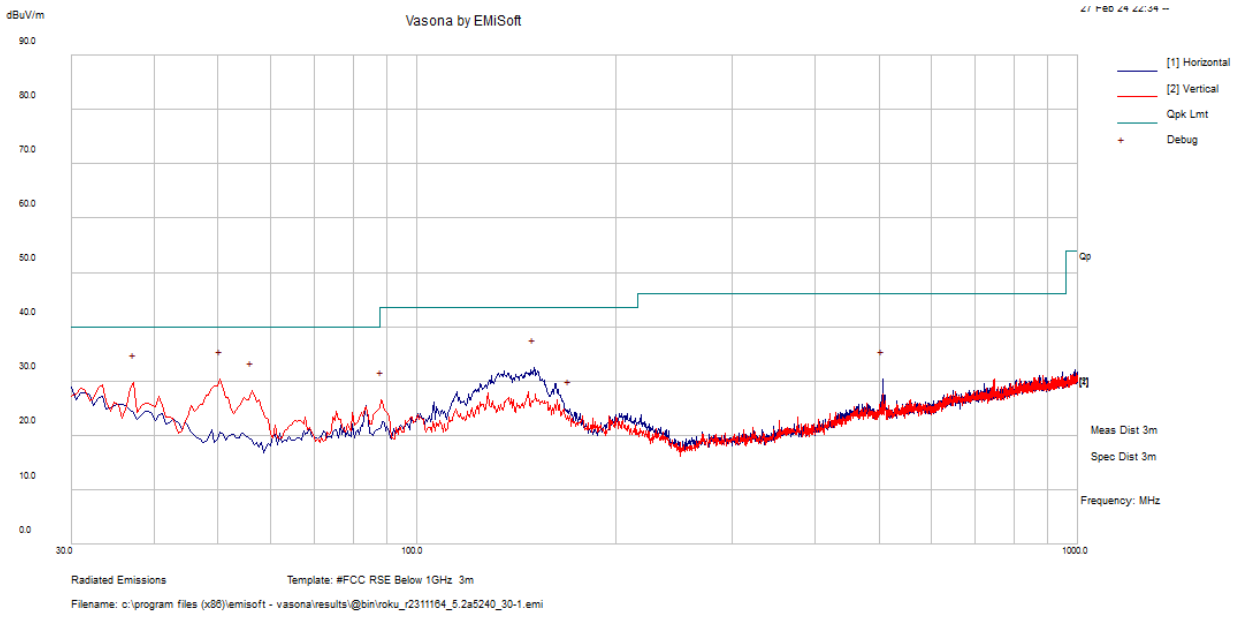
U-NII-1, 802.11A: 5200 MHz



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
46.98	51.21	-21.04	30.17	100.00	V	360.00	40.00	-9.83	Peak
33.40	41.40	-12.10	29.30	100.00	V	360.00	40.00	-10.70	Peak
147.86	49.26	-16.86	32.40	200.00	H	360.00	43.50	-11.10	Peak
83.84	50.56	-22.90	27.66	100.00	V	360.00	40.00	-12.34	Peak
506.27	40.14	-10.08	30.06	300.00	H	360.00	46.00	-15.94	Peak
166.29	44.53	-17.44	27.09	300.00	H	360.00	43.50	-16.41	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

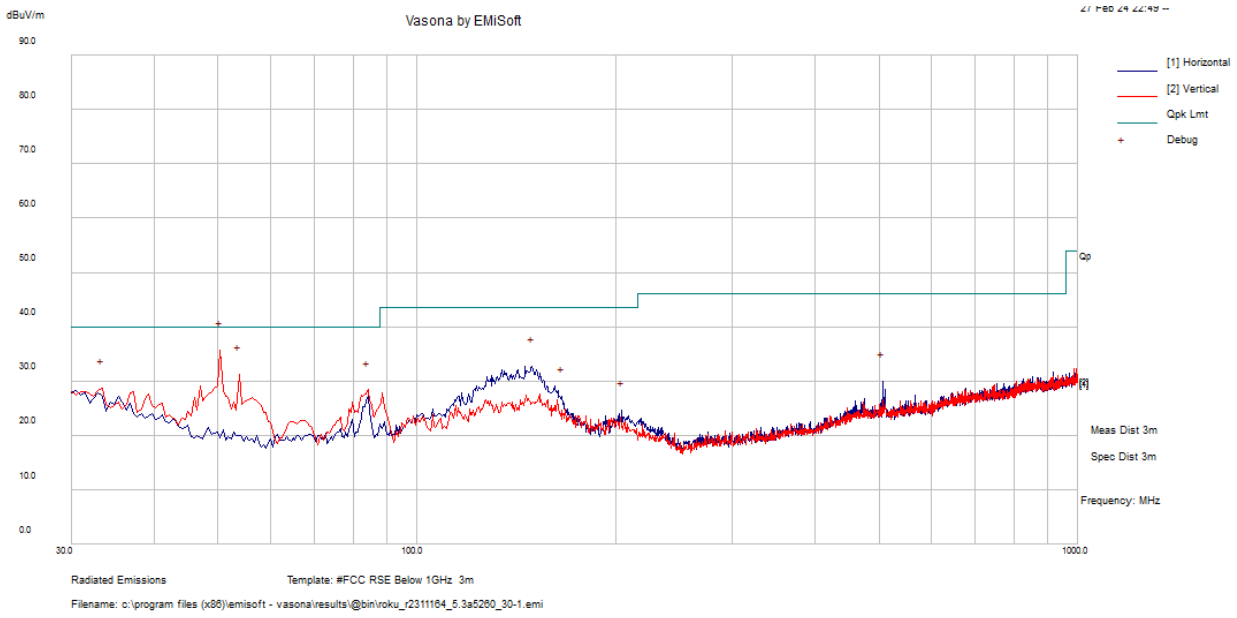
U-NII-1, 802.11A: 5240 MHz



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
50.37	52.93	-22.52	30.41	100.00	V	360.00	40.00	-9.59	Peak
37.28	44.21	-14.43	29.78	100.00	V	360.00	40.00	-10.22	Peak
150.28	49.42	-16.94	32.48	200.00	H	360.00	43.50	-11.02	Peak
56.19	51.25	-22.95	28.30	100.00	V	360.00	40.00	-11.70	Peak
506.27	40.47	-10.08	30.39	300.00	H	360.00	46.00	-15.61	Peak
88.20	48.88	-22.37	26.51	100.00	V	360.00	43.50	-16.99	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

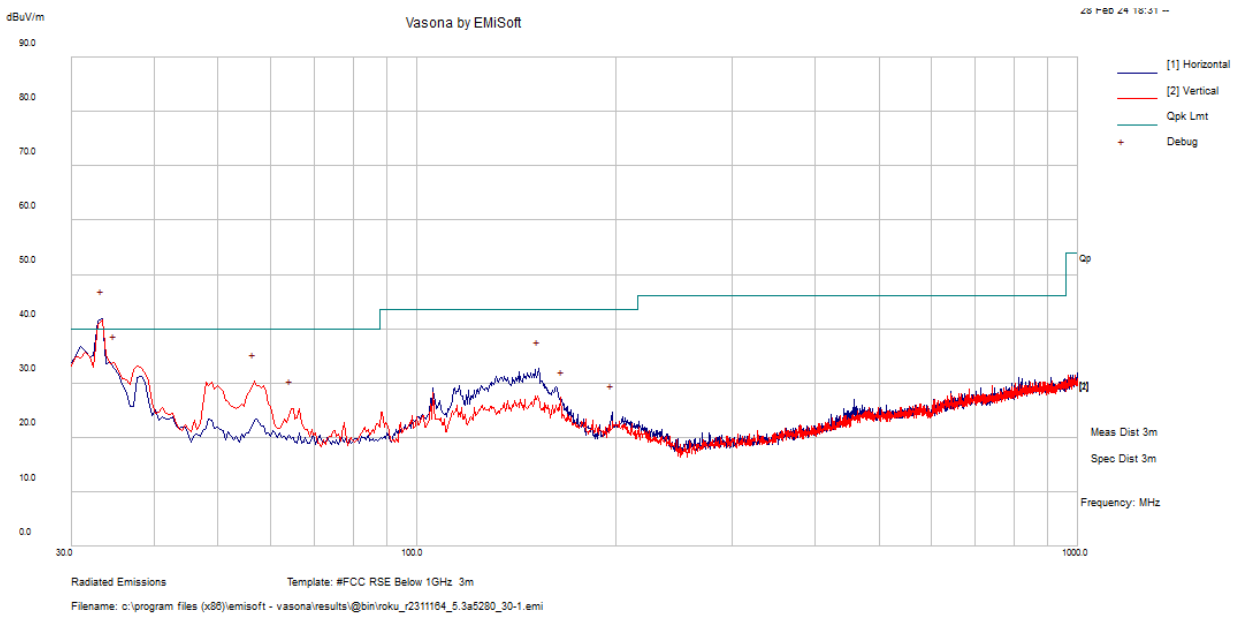
U-NII-2A, 802.11A: 5260 MHz



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
50.37	58.25	-22.52	35.73	100.00	V	360.00	40.00	-4.27	Peak
53.77	54.19	-22.97	31.22	100.00	V	360.00	40.00	-8.78	Peak
149.31	49.58	-16.90	32.68	200.00	H	360.00	43.50	-10.82	Peak
33.40	40.74	-12.10	28.64	100.00	V	360.00	40.00	-11.36	Peak
84.32	51.22	-22.88	28.34	100.00	V	360.00	40.00	-11.66	Peak
506.27	40.10	-10.08	30.02	300.00	H	360.00	46.00	-15.98	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

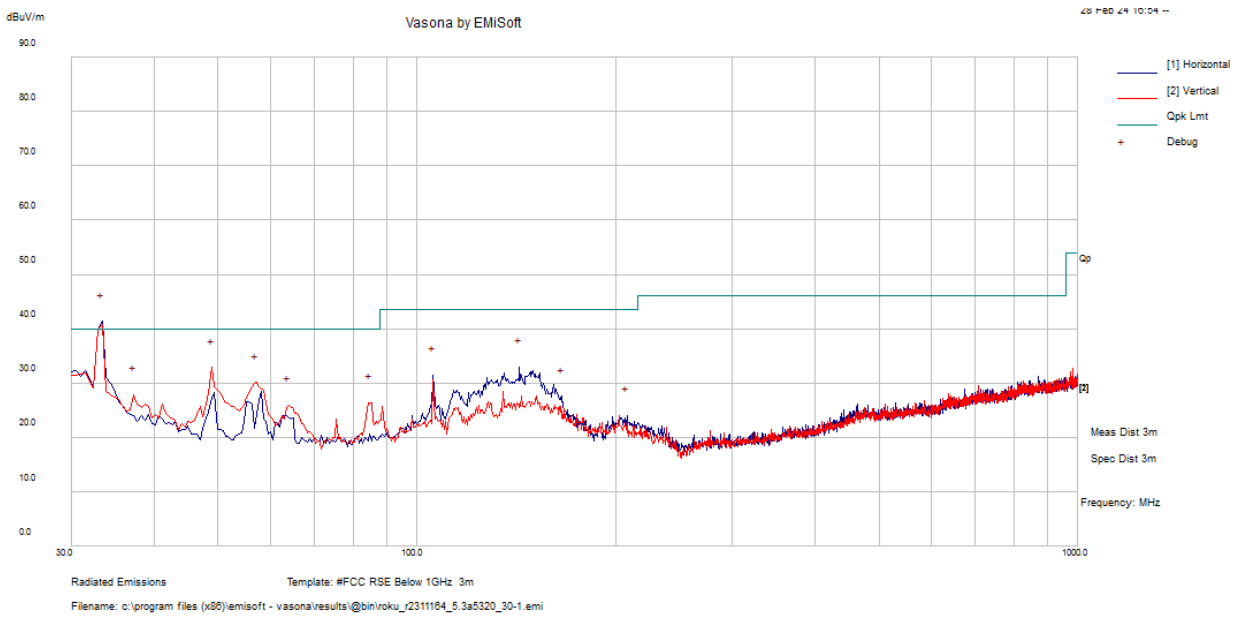
U-NII-2A, 802.11A: 5280 MHz



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
33.40	54.01	-12.10	41.91	100.00	H	360.00	68.30	-26.39	Peak
34.85	46.63	-12.92	33.71	100.00	V	360.00	40.00	-6.29	Peak
56.68	53.21	-22.91	30.30	100.00	V	360.00	40.00	-9.70	Peak
152.71	49.66	-17.05	32.61	200.00	H	360.00	43.50	-10.89	Peak
64.44	47.54	-22.27	25.27	100.00	V	360.00	40.00	-14.73	Peak
165.80	44.43	-17.41	27.02	300.00	H	360.00	43.50	-16.48	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

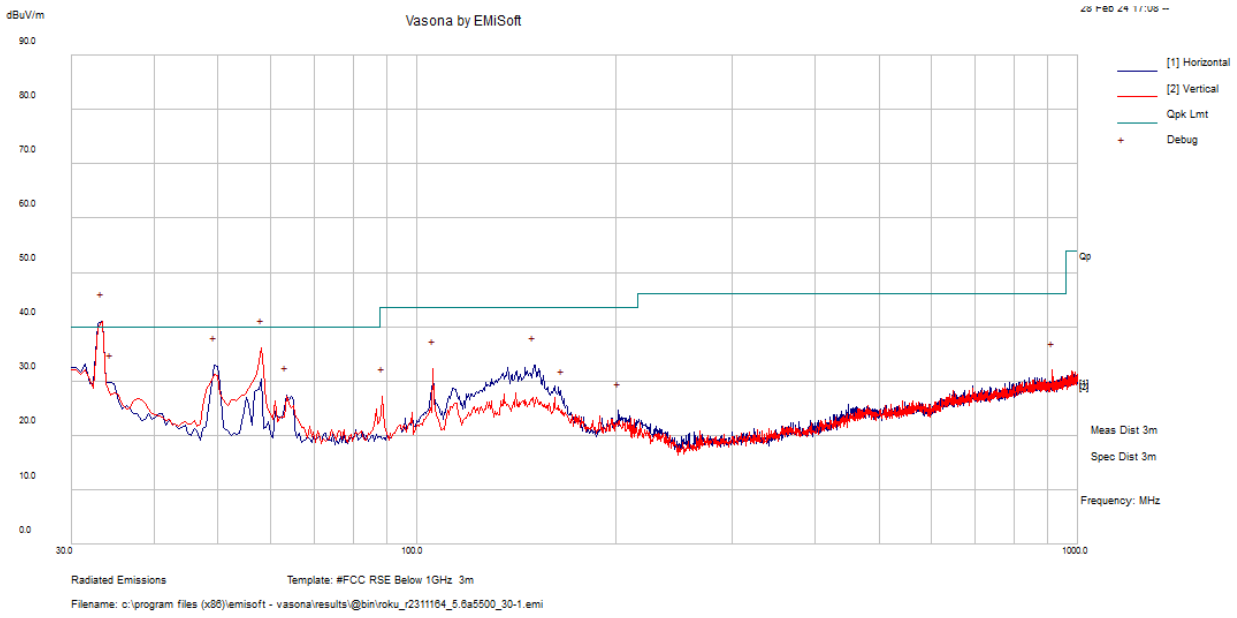
U-NII-2A, 802.11A: 5320 MHz



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
33.40	53.41	-12.10	41.31	100.00	H	360.00	68.30	-26.99	Peak
48.92	54.89	-22.04	32.85	100.00	V	360.00	40.00	-7.15	Peak
57.16	52.96	-22.88	30.08	100.00	V	360.00	40.00	-9.92	Peak
143.01	49.62	-16.64	32.98	200.00	H	360.00	43.50	-10.52	Peak
105.66	49.15	-17.65	31.50	100.00	H	360.00	43.50	-12.00	Peak
37.28	42.27	-14.43	27.84	100.00	V	360.00	40.00	-12.16	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

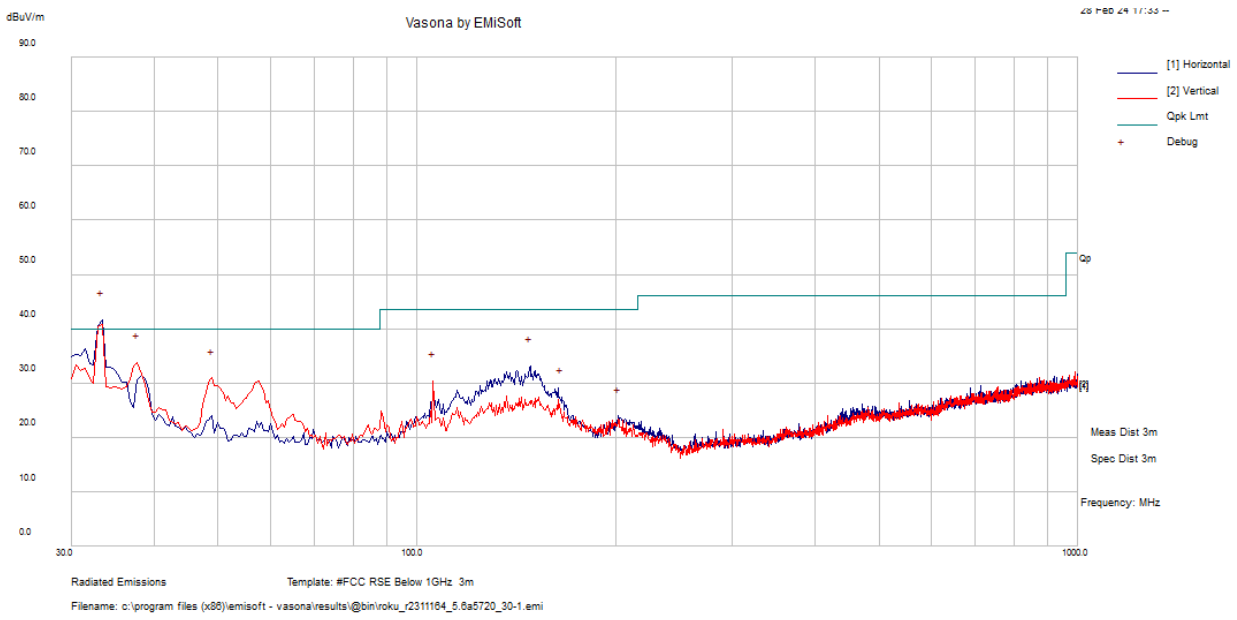
U-NII-2C, 802.11A: 5500 MHz



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
33.40	53.16	-12.10	41.06	100.00	H	360.00	68.30	-27.24	Peak
58.13	58.98	-22.80	36.18	100.00	V	360.00	40.00	-3.82	Peak
49.40	55.18	-22.24	32.94	100.00	H	360.00	40.00	-7.06	Peak
34.37	42.48	-12.66	29.82	100.00	H	360.00	40.00	-10.18	Peak
150.28	49.91	-16.94	32.97	200.00	H	360.00	43.50	-10.53	Peak
105.66	49.97	-17.65	32.32	100.00	V	360.00	43.50	-11.18	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

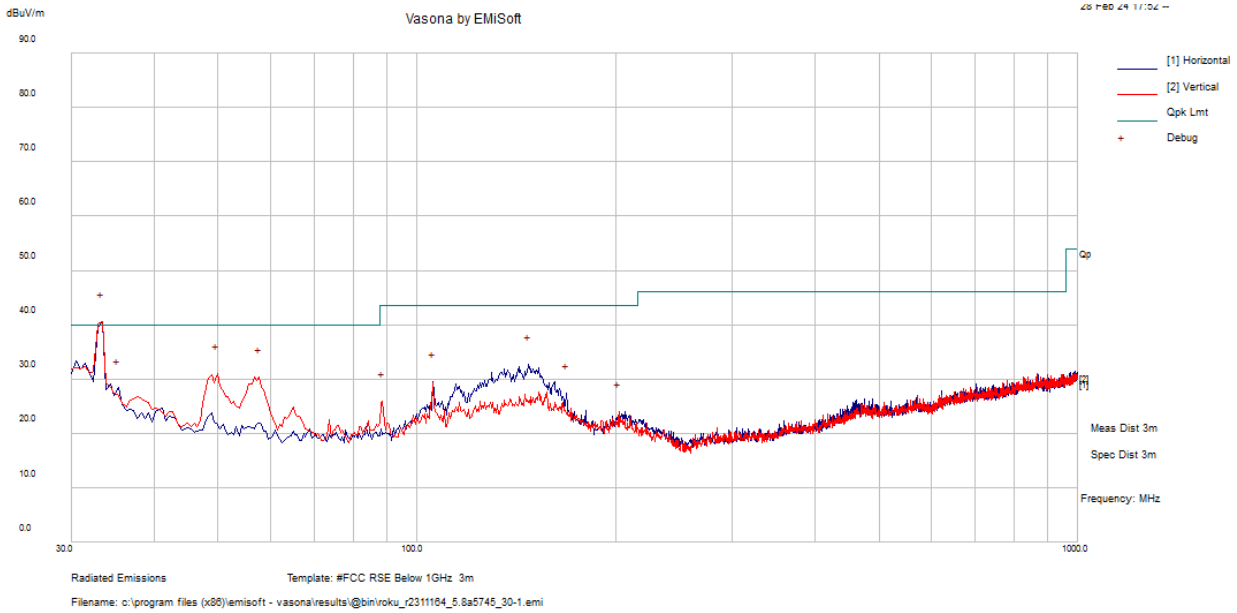
U-NII-2C, 802.11A: 5720 MHz



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
33.40	53.71	-12.10	41.61	100.00	H	360.00	68.30	-26.69	Peak
37.76	48.56	-14.78	33.78	300.00	V	360.00	40.00	-6.22	Peak
48.92	52.98	-22.04	30.94	100.00	V	360.00	40.00	-9.06	Peak
148.34	50.04	-16.87	33.17	200.00	H	360.00	43.50	-10.33	Peak
105.66	47.97	-17.65	30.32	100.00	V	360.00	43.50	-13.18	Peak
165.32	44.76	-17.39	27.37	300.00	H	360.00	43.50	-16.13	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

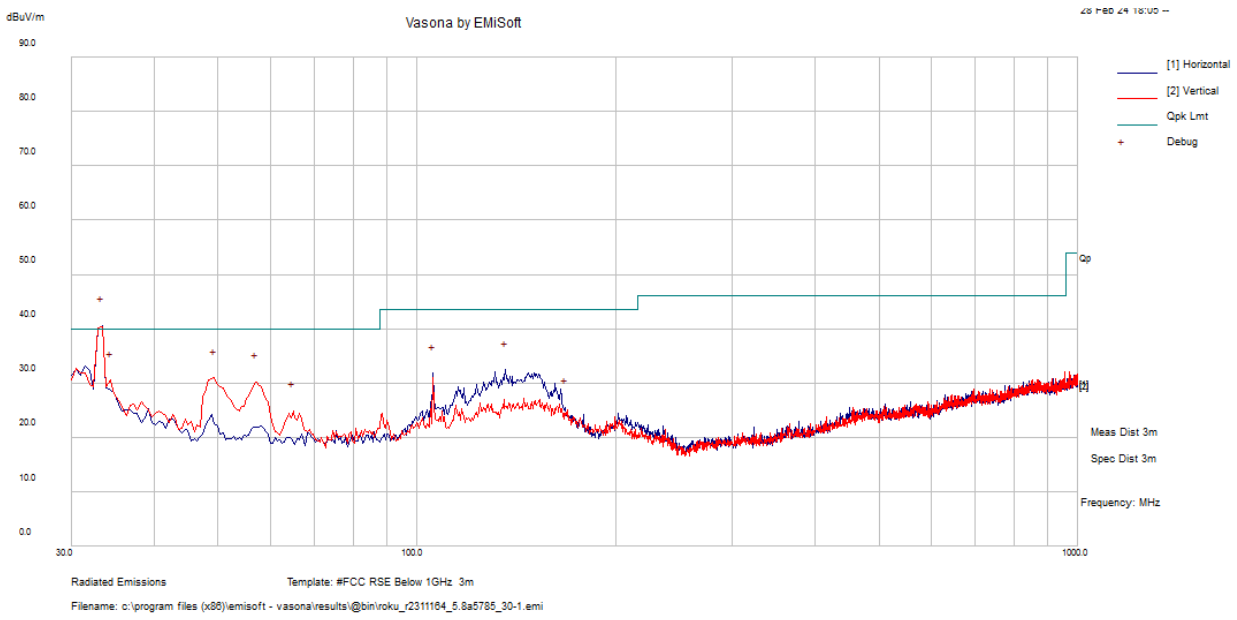
U-NII-3, 802.11A: 5745 MHz



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
33.40	52.76	-12.10	40.66	100.00	V	360.00	68.30	-27.64	Peak
49.89	53.48	-22.43	31.05	100.00	V	360.00	40.00	-8.95	Peak
57.65	53.25	-22.83	30.42	100.00	V	360.00	40.00	-9.58	Peak
147.37	49.52	-16.86	32.66	200.00	H	360.00	43.50	-10.84	Peak
35.34	41.55	-13.20	28.35	100.00	H	360.00	40.00	-11.65	Peak
105.66	47.17	-17.65	29.52	200.00	H	360.00	43.50	-13.98	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

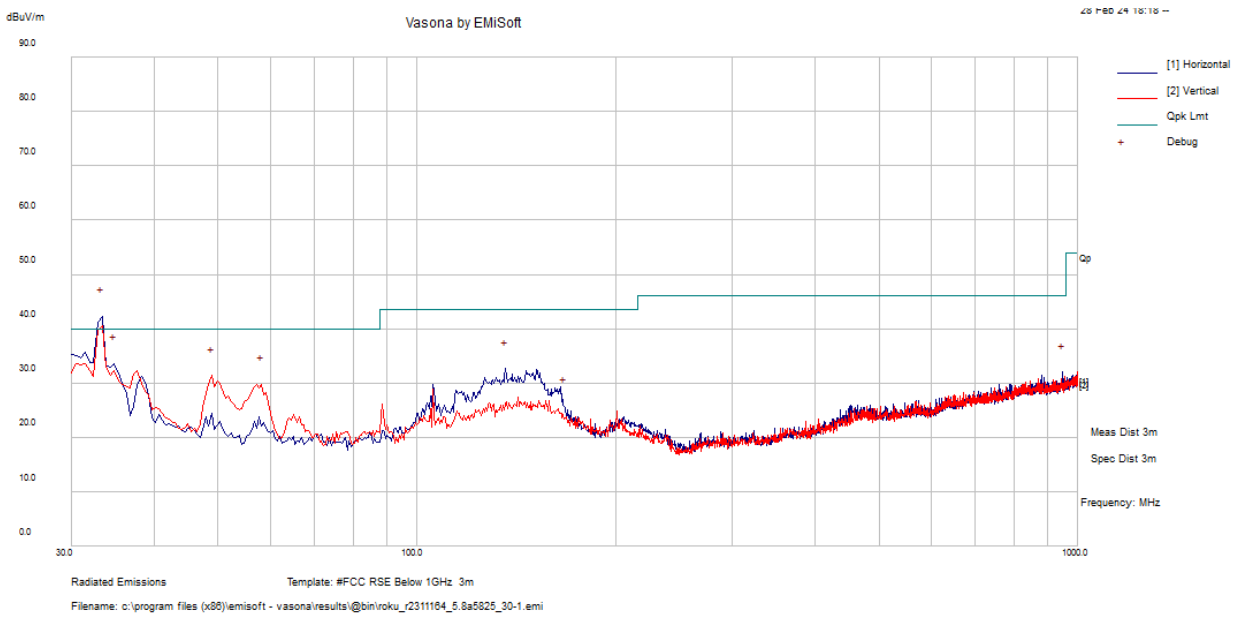
U-NII-3, 802.11A: 5785 MHz



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
33.40	52.65	-12.10	40.55	100.00	H	360.00	68.30	-27.75	Peak
49.40	53.14	-22.24	30.90	100.00	V	360.00	40.00	-9.10	Peak
34.37	43.13	-12.66	30.47	100.00	V	360.00	40.00	-9.53	Peak
57.16	53.05	-22.88	30.17	100.00	V	360.00	40.00	-9.83	Peak
136.22	48.47	-16.07	32.40	200.00	H	360.00	43.50	-11.10	Peak
105.66	49.42	-17.65	31.77	100.00	H	360.00	43.50	-11.73	Peak

Note: Peak measurement was compared to the quasi-peak limit to show compliance.

U-NII-3, 802.11A: 5825 MHz + BT colocation



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
33.40	54.43	-12.10	42.33	100.00	H	360.00	68.30	-25.97	Peak
34.85	46.44	-12.92	33.52	100.00	H	360.00	40.00	-6.48	Peak
48.92	53.37	-22.04	31.33	100.00	V	360.00	40.00	-8.67	Peak
58.13	52.61	-22.80	29.81	100.00	V	360.00	40.00	-10.19	Peak
136.22	48.67	-16.07	32.60	200.00	H	360.00	43.50	-10.90	Peak
948.11	35.98	-4.02	31.96	300.00	H	360.00	46.00	-14.04	Peak

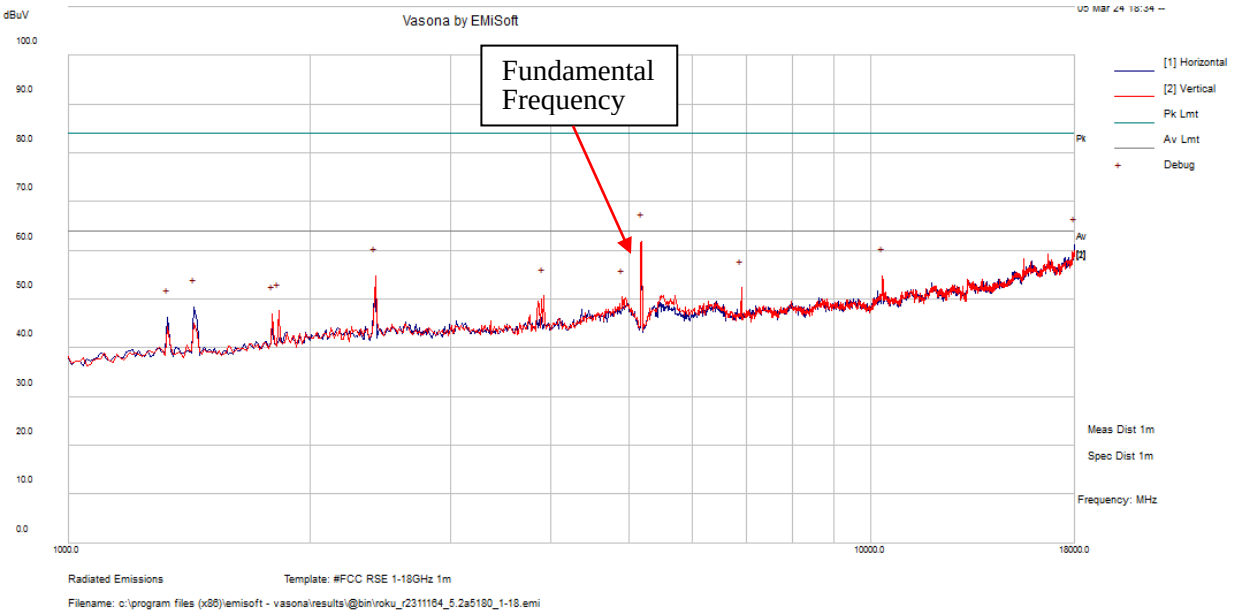
Note: Peak measurement was compared to the quasi-peak limit to show compliance.

FCC/IC Limits for 1 GHz to 40 GHz				
Applicability	**(dBm)**	**(uV/m at 3meters)**	**(dBuV/m at 3meters)**	**(dBuV/m at 1meter)[2]**
Restricted Band Average Limit	-	500	54	63.54
Restricted Band Peak Limit[1]	-	-	74	83.54
FCC §15.407(b)/ ISEDC RSS-247 §6.2 Defined Unwanted Emissions Limit	-27	-	68.2	77.74

Note 1: Restricted Band Peak Limit is defined to be 20dB higher than Average Limit.
Note 2: Limits at 1 meter are determined by applying a Distance correction factor accounts for extrapolation from 1 meter to 3 meters. Formula used is as follows: 20*log (3 meters / 1 meter) = 9.54 (According to ANSI C63.10-2013 Section 9.4).
Note 3: Where Restricted Band Peak Limit is replaced with the stricter 78 dBµV/m limit at 1 meter, compliance is being shown for unwanted emissions per FCC §15.407(b)/ISEDC RSS-247 §6.2.
Note 4: Ports terminated for radiated measurements.

2) 1 GHz – 18 GHz, Measured at 1 meter

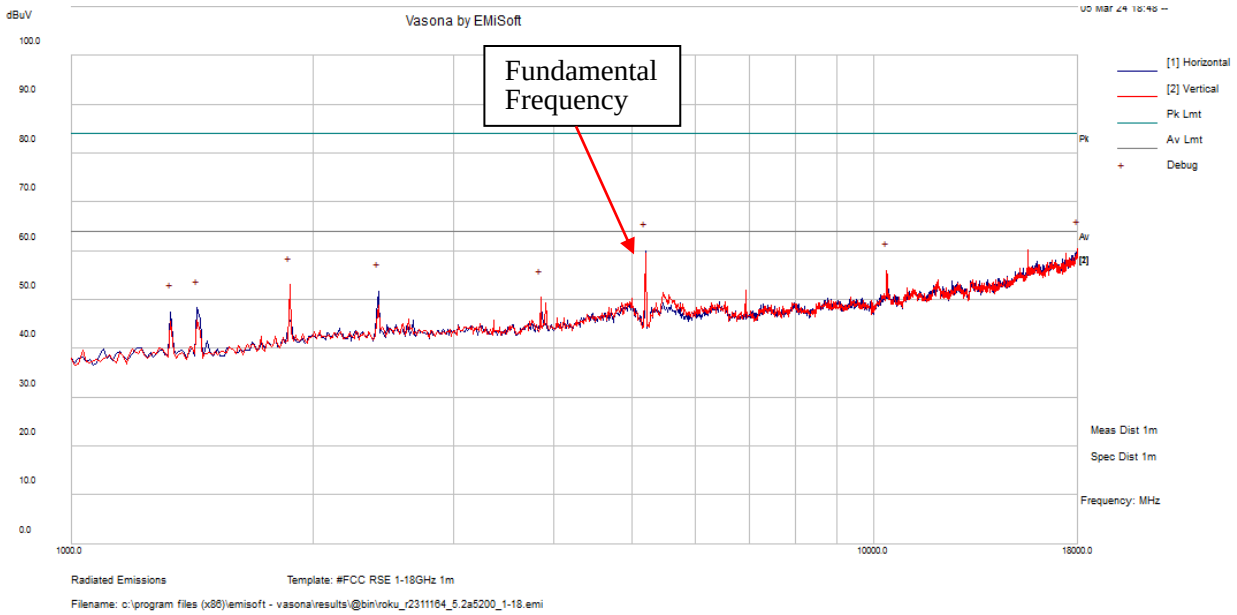
U-NII-1, 802.11A: 5180 MHz



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
17978.75	46.14	14.85	60.99	300	H	360	63.54	-2.55	Peak

Note: Peak measurement was compared to the average limit to show compliance.

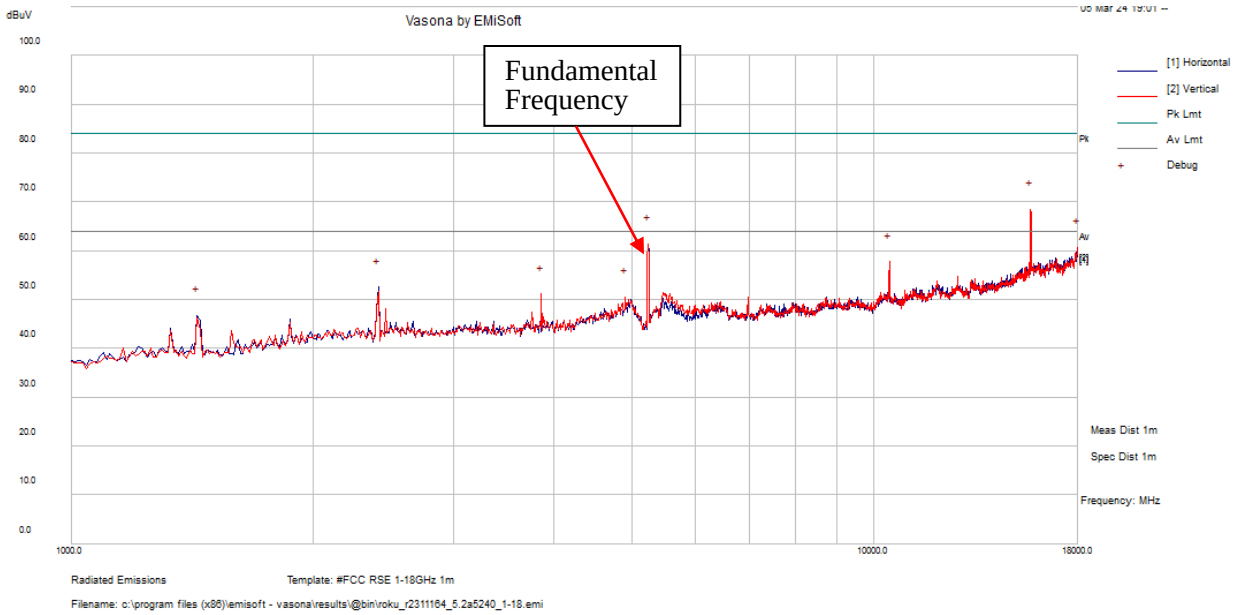
U-NII-1, 802.11A: 5200 MHz



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
17978.75	45.63	14.85	60.48	300	V	360	63.54	-3.06	Peak

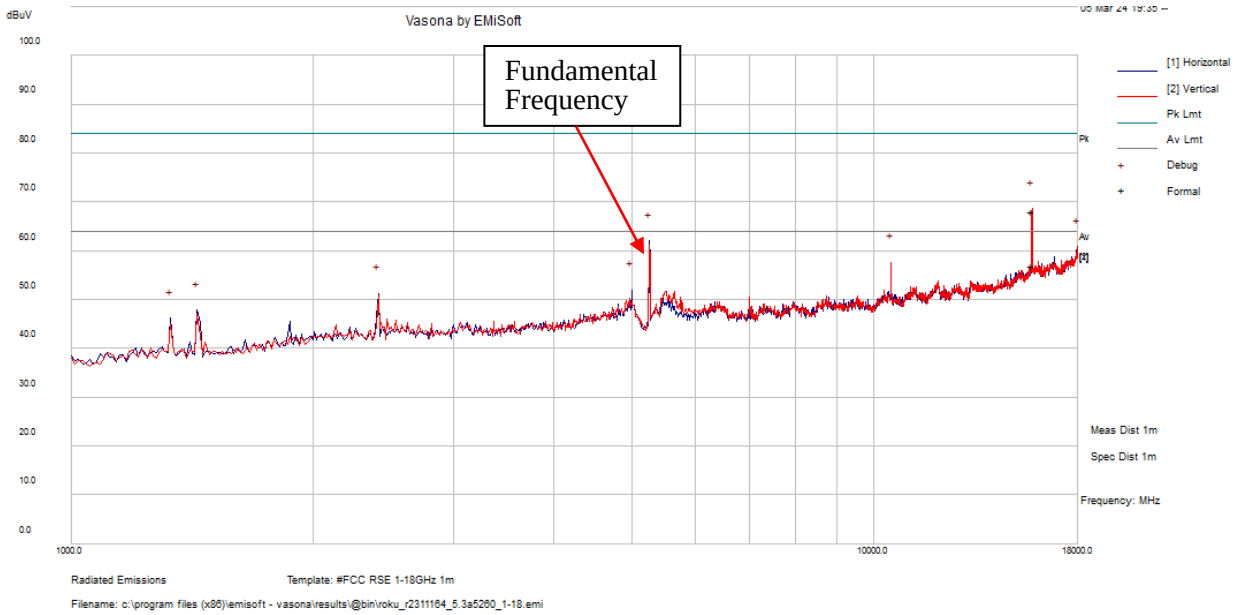
Note: Peak measurement was compared to the average limit to show compliance.

U-NII-1, 802.11A: 5240 MHz



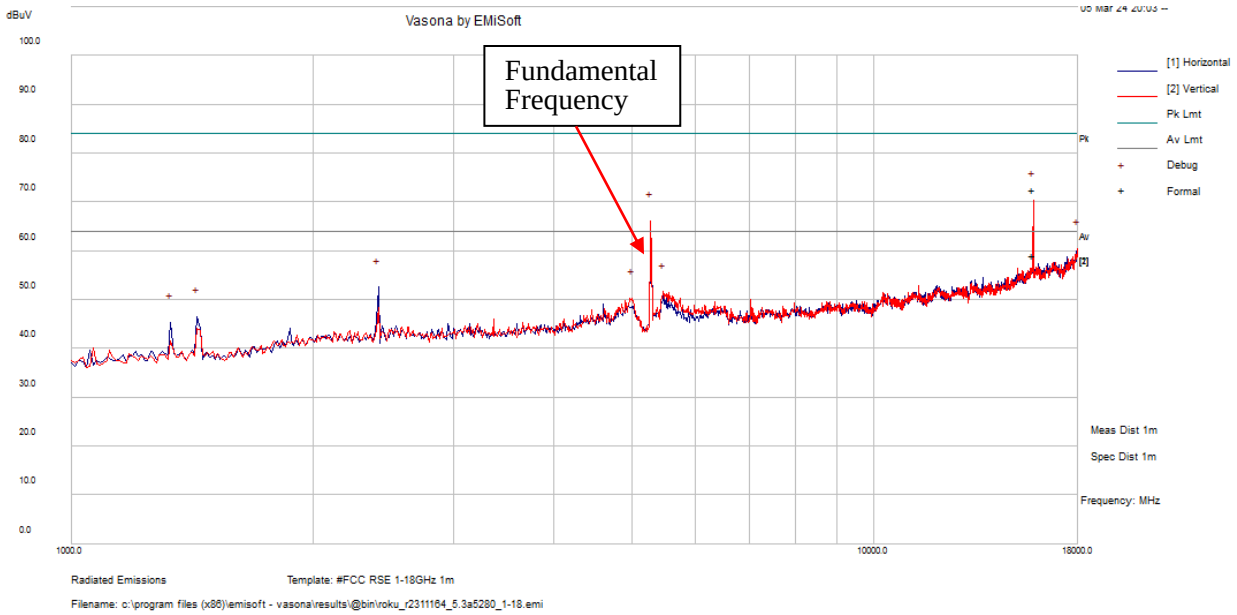
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
15717.98	59.78	10.05	69.83	217	V	337	83.54	-13.71	Peak
15717.98	48.34	10.05	58.39	217	V	337	63.54	-5.15	Avg

U-NII-2A, 802.11A: 5260 MHz



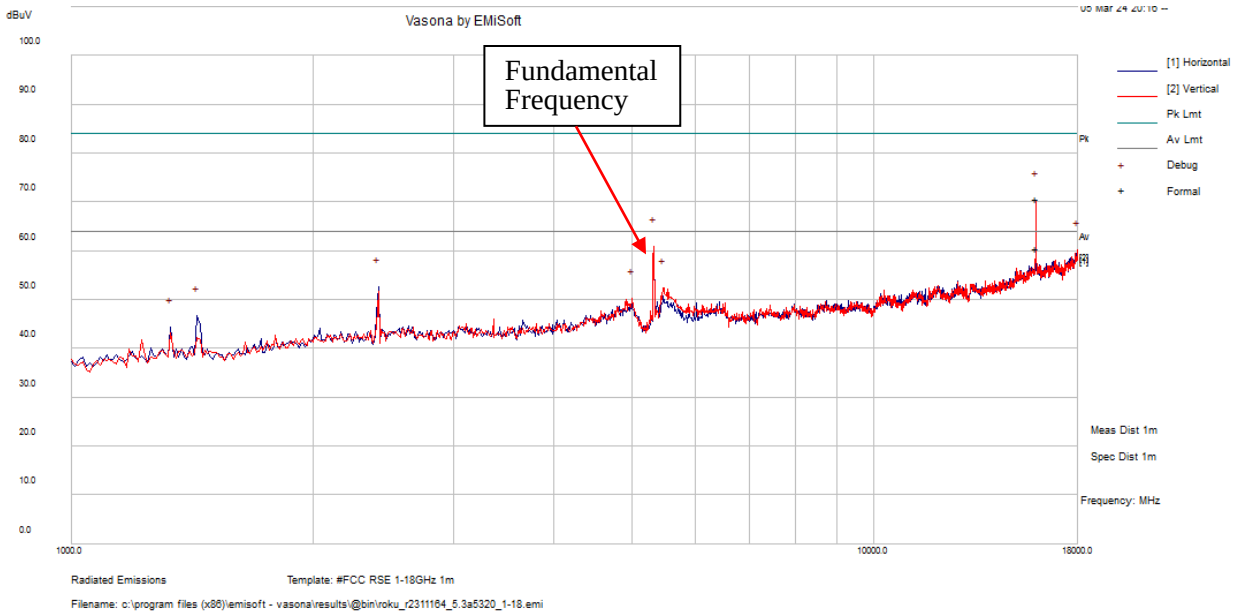
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
15777.915	58	10.09	68.09	255	V	210	83.54	-15.45	Peak
15777.915	46.9	10.09	56.99	255	V	210	63.54	-6.55	Avg

U-NII-2A, 802.11A: 5280 MHz



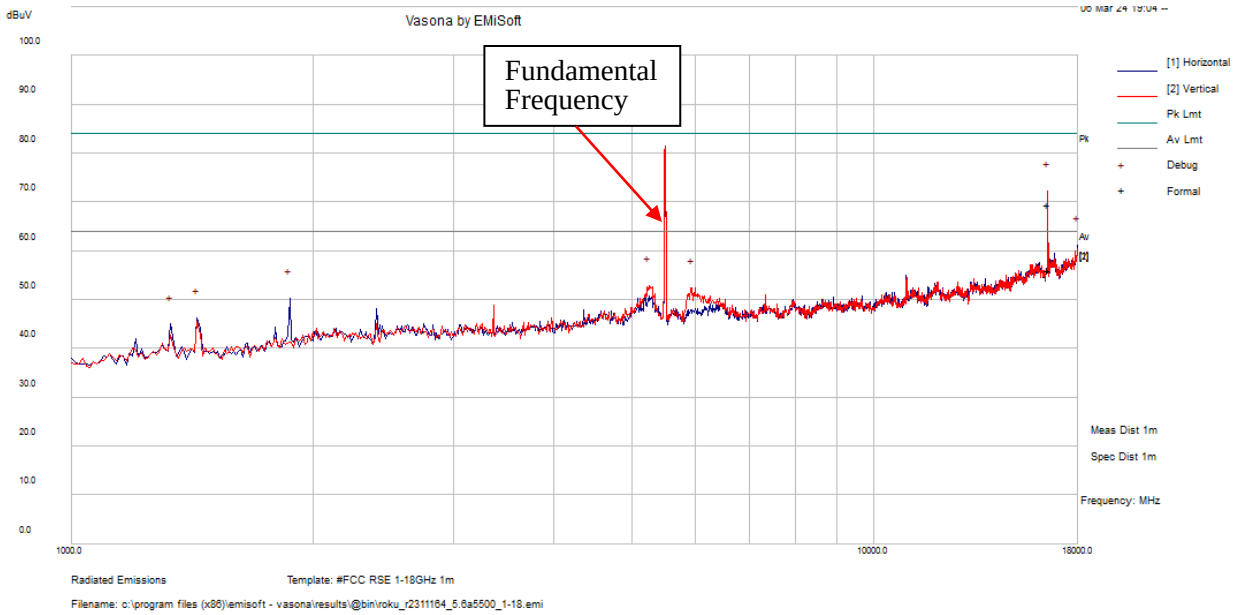
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
15844.185	62.28	10.22	72.5	201	V	206	83.54	-11.04	Peak
15844.185	48.9	10.22	59.12	201	V	206	63.54	-4.42	Avg

U-NII-2A, 802.11A: 5320 MHz



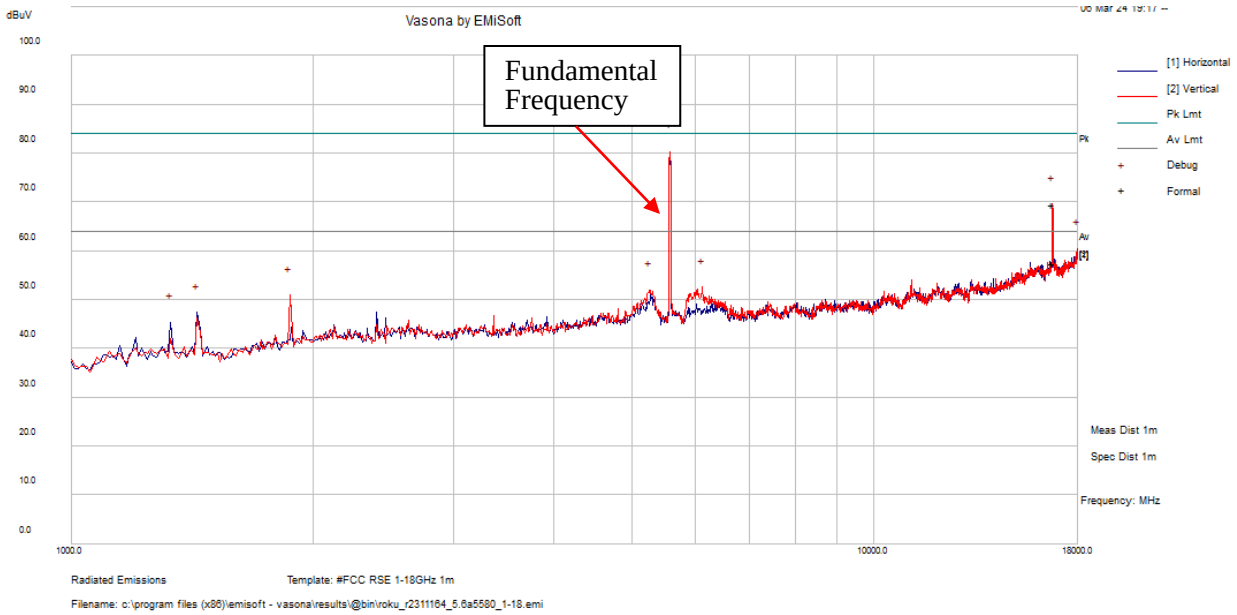
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
15959.19	60.2	10.39	70.59	223	V	201	83.54	-12.95	Peak
15959.19	50.2	10.39	60.59	223	V	201	63.54	-2.95	Avg

U-NII-2C, 802.11A: 5500 MHz



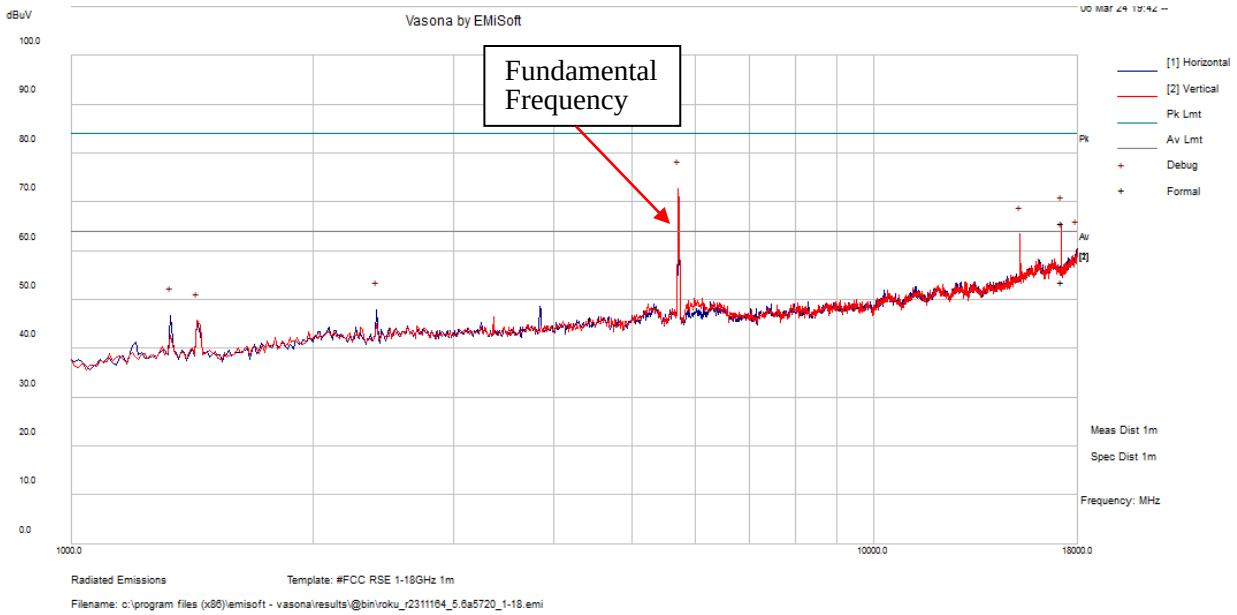
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
16503.823	58.24	11.22	69.46	264	V	173	83.54	-14.08	Peak
16503.823	44.86	11.22	56.08	264	V	173	63.54	-7.46	Avg

U-NII-2C, 802.11A: 5580 MHz



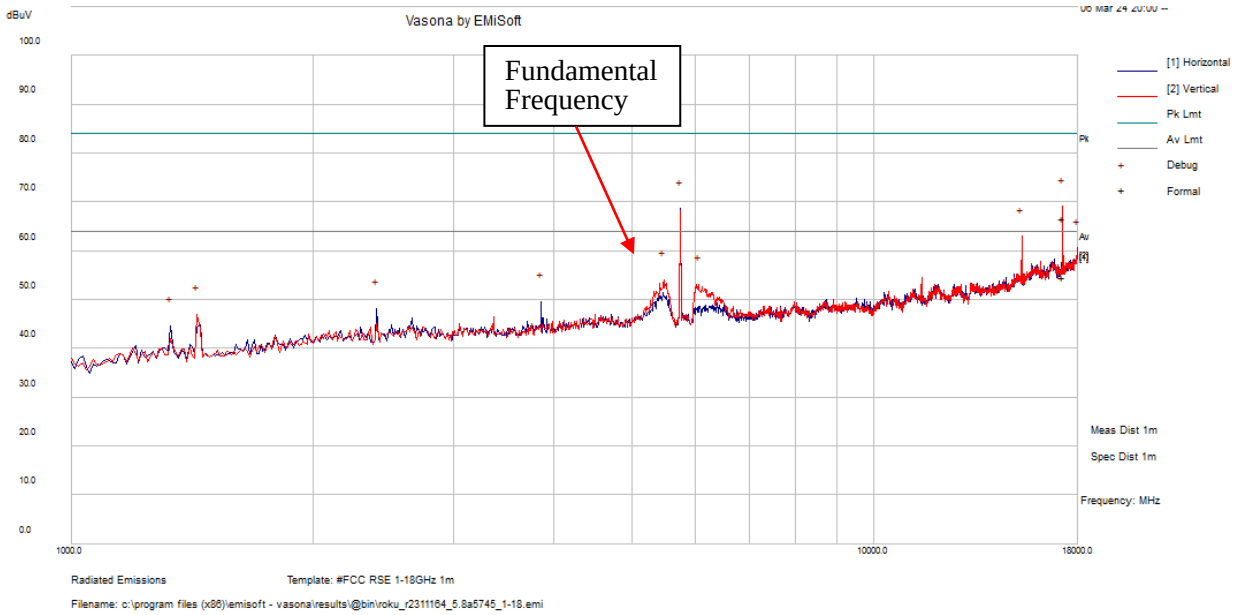
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
16736.865	57.75	11.77	69.52	234	V	206	83.54	-14.02	Peak
16736.865	45.6	11.77	57.37	234	V	206	63.54	-6.17	Avg

U-NII-2C, 802.11A: 5720 MHz



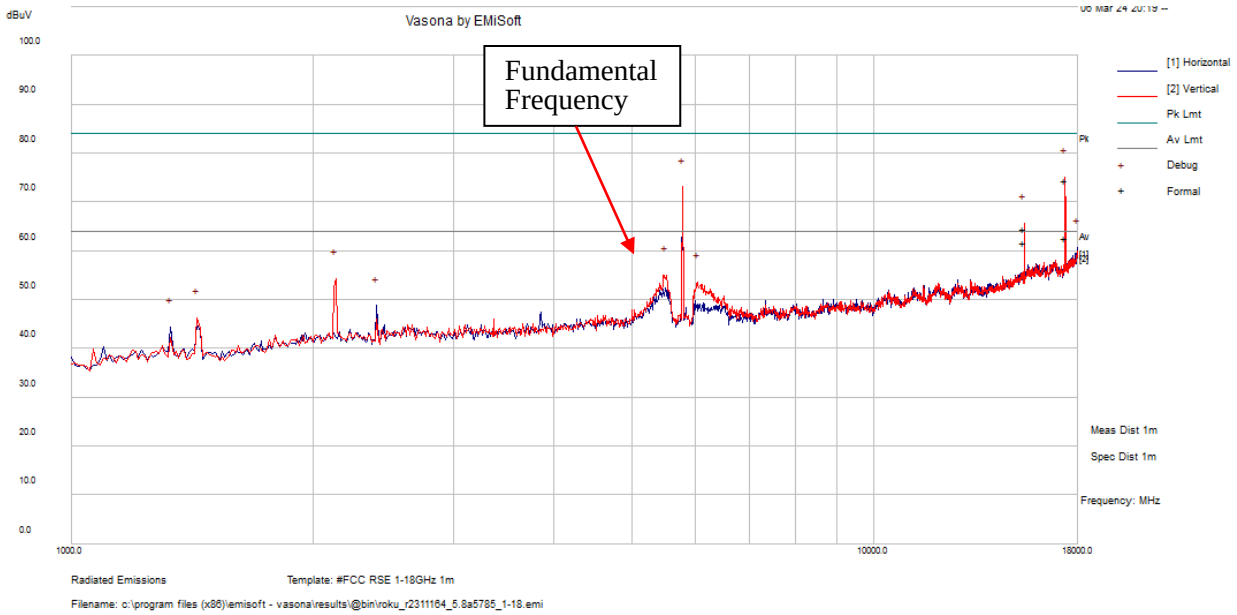
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
17159.505	53.86	11.85	65.71	245	V	196	83.54	-17.83	Peak
17159.505	41.91	11.85	53.76	245	V	196	63.54	-9.78	Avg

U-NII-3, 802.11A: 5745 MHz



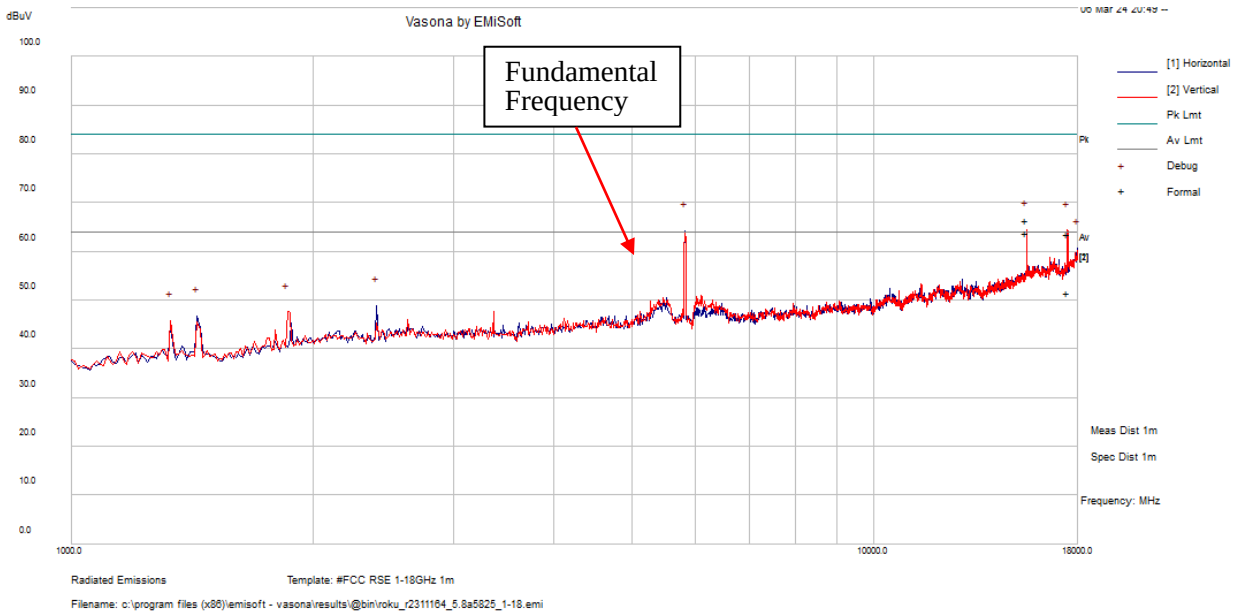
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
17233.195	55.18	11.54	66.72	243	V	208	83.54	-16.82	Peak
17233.195	42.93	11.54	54.47	243	V	208	63.54	-9.07	Avg

U-NII-3, 802.11A: 5785 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
17361.255	63.16	11.36	74.52	207	V	212	83.54	-9.02	Peak
17361.255	51.34	11.36	62.7	207	V	212	63.54	-0.84	Avg
15426.783	55.2	9.25	64.45	202	V	212	83.54	-19.09	Peak
15426.783	52.34	9.25	61.59	202	V	212	63.54	-1.95	Avg

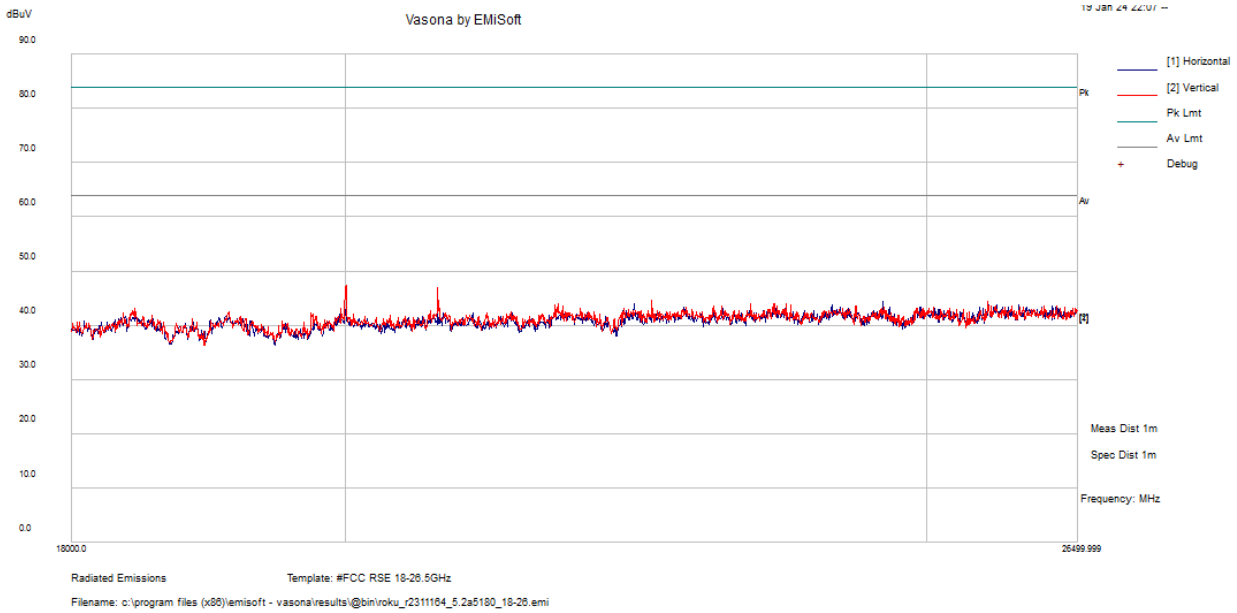
U-NII-3, 802.11A: 5825 MHz + BT colocation



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
15533.301	54.78	9.61	64.39	194	V	208	83.54	-19.15	Peak
15533.301	51.22	9.61	60.83	194	V	208	63.54	-2.71	Avg
17469.59	51.88	11.68	63.56	274	V	213	83.54	-19.98	Peak
17469.59	39.72	11.68	51.4	274	V	213	63.54	-12.14	Avg

3) 18 GHz – 26.5 GHz, Measured at 1 meter

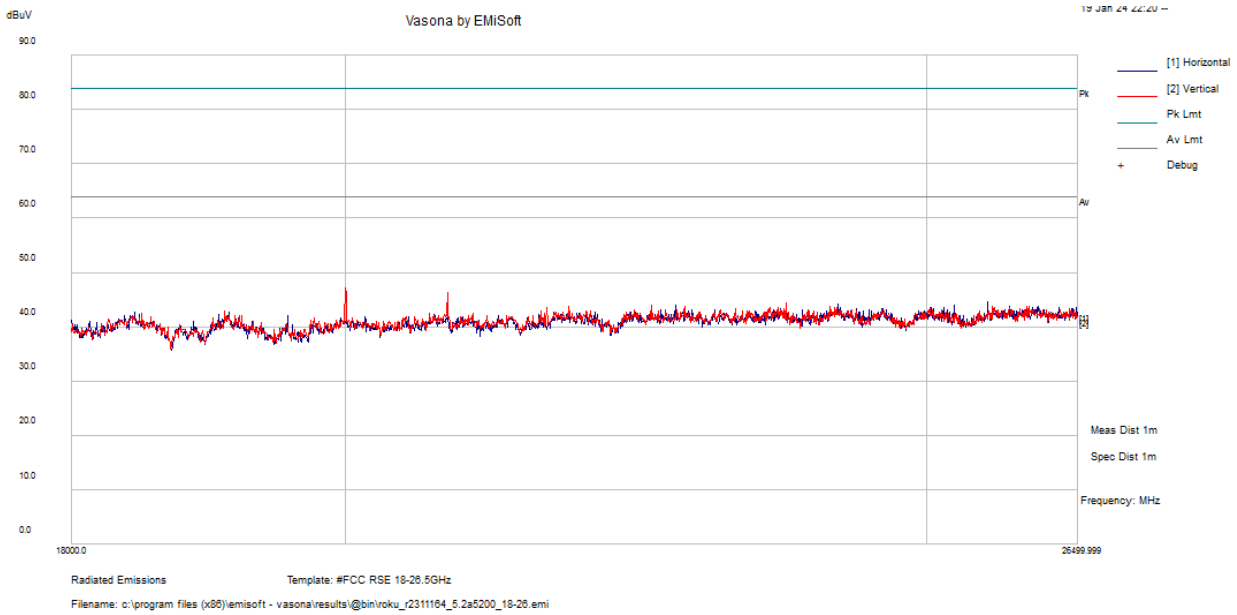
U-NII-1, 802.11A: 5180 MHz



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
20002.812	46.3285	1.0215	47.35	200	V	360	63.54	-16.19	Peak

Note: Peak measurement was compared to the average limit to show compliance.

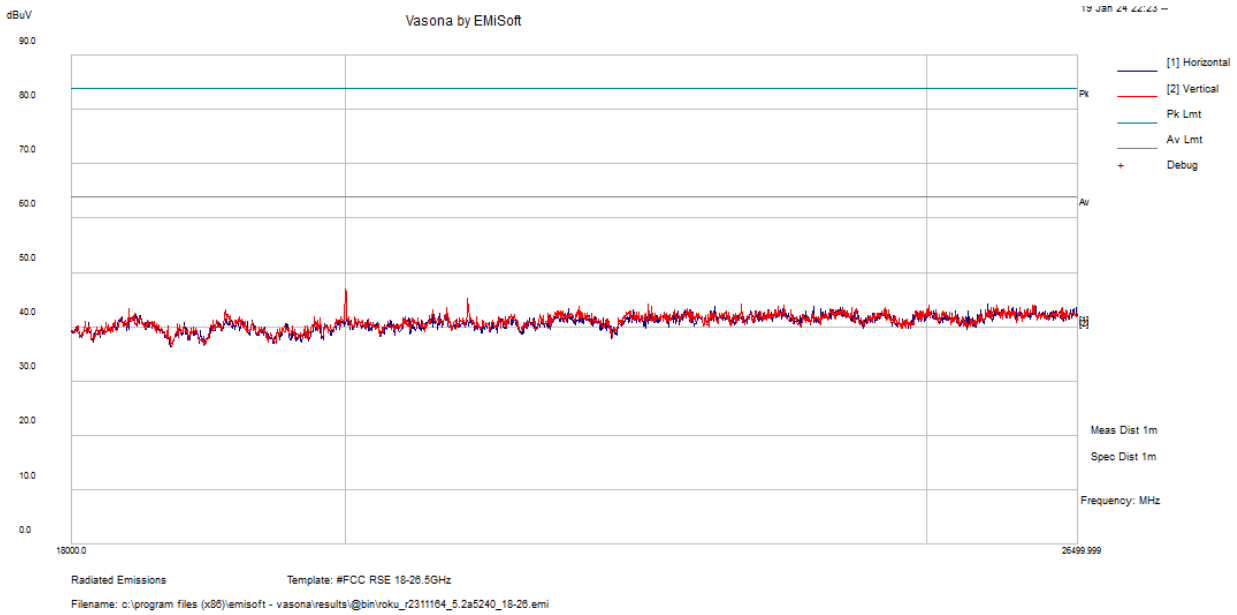
U-NII-1, 802.11A: 5200 MHz



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
19997.5	46.0615	1.0215	47.083	200	V	360	63.54	-16.457	Peak

Note: Peak measurement was compared to the average limit to show compliance.

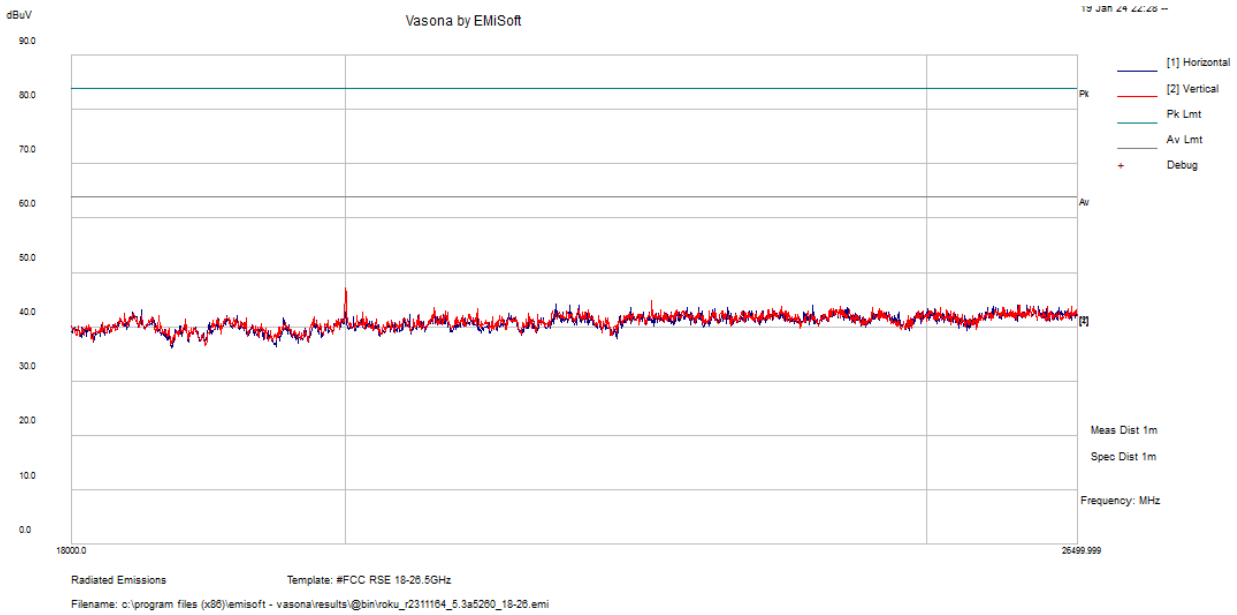
U-NII-1, 802.11A: 5240 MHz



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
19997.5	45.9735	1.0215	46.995	200	V	360	63.54	-16.545	Peak

Note: Peak measurement was compared to the average limit to show compliance.

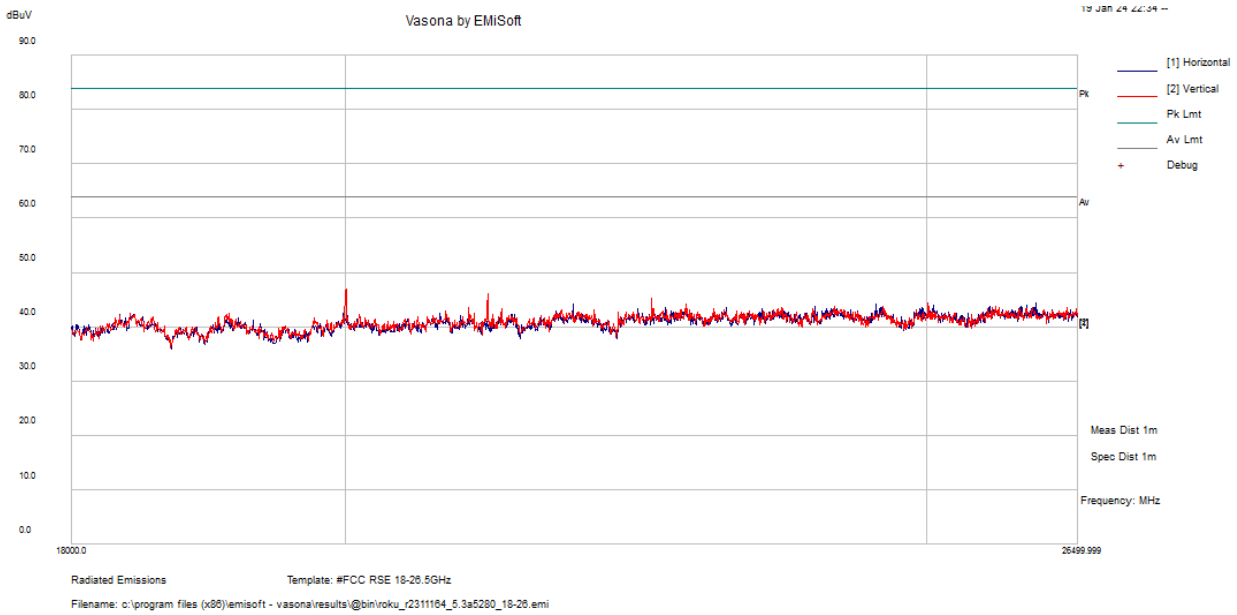
U-NII-2A, 802.11A: 5260 MHz



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
19997.5	46.1355	1.0215	47.157	200	V	360	63.54	-16.383	Peak

Note: Peak measurement was compared to the average limit to show compliance.

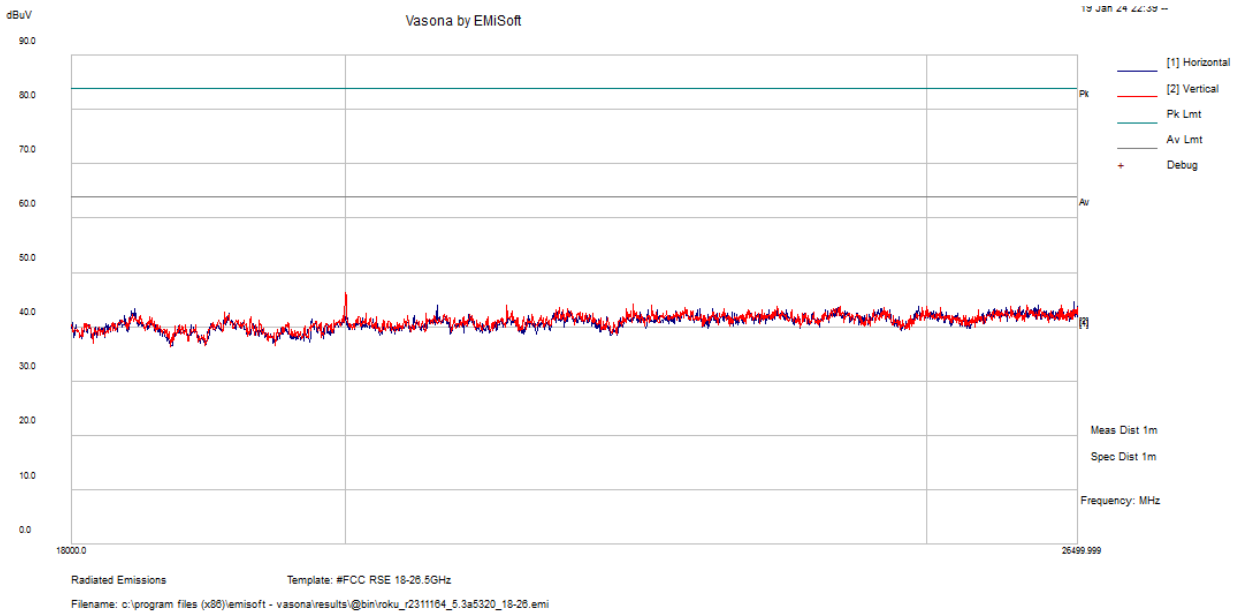
U-NII-2A, 802.11A: 5280 MHz



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
20002.812	45.9885	1.0215	47.01	200	V	360	63.54	-16.53	Peak

Note: Peak measurement was compared to the average limit to show compliance.

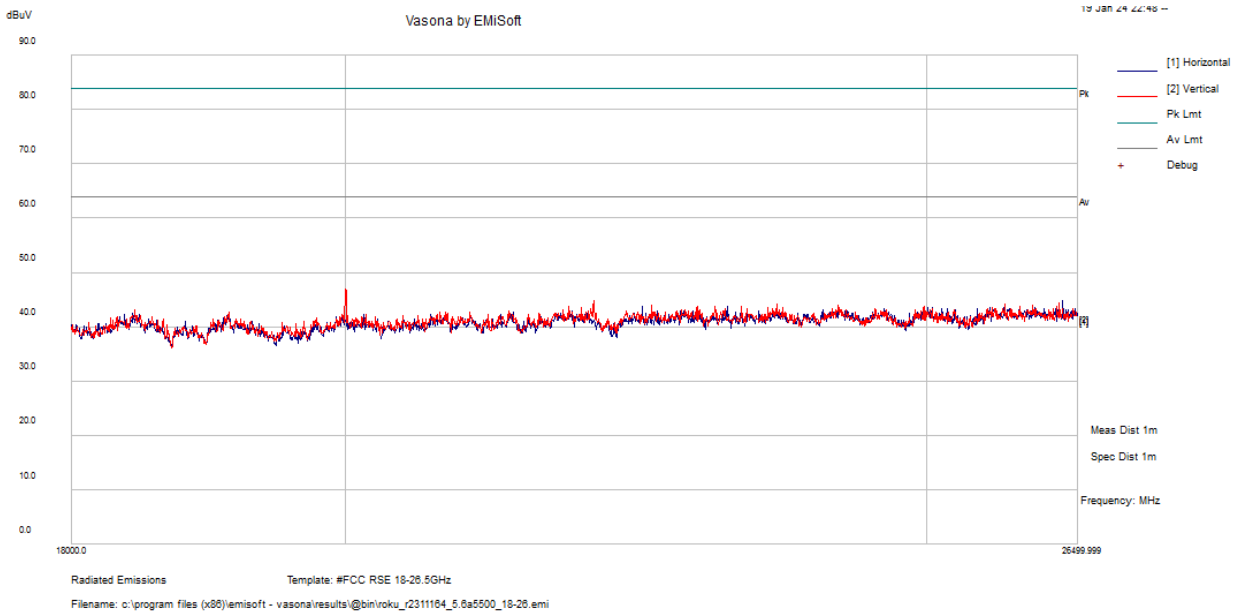
U-NII-2A, 802.11A: 5320 MHz



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
19997.5	45.2065	1.0215	46.228	200	V	360	63.54	-17.312	Peak

Note: Peak measurement was compared to the average limit to show compliance.

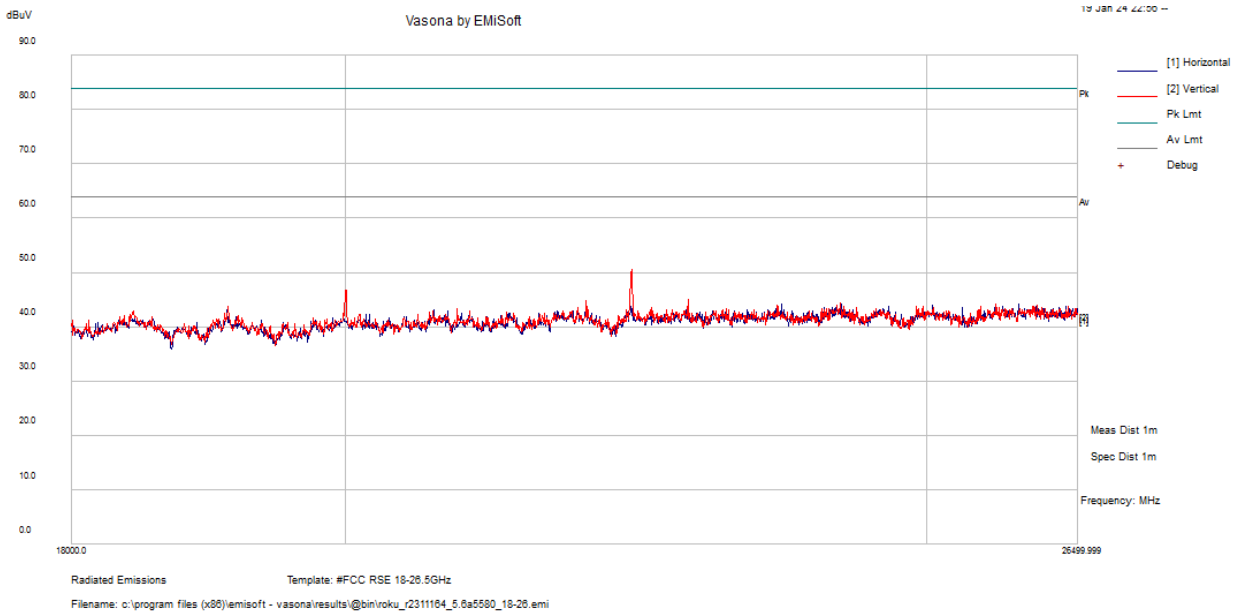
U-NII-2C, 802.11A: 5500 MHz



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
19997.5	45.8745	1.0215	46.896	200	V	360	63.54	-16.644	Peak

Note: Peak measurement was compared to the average limit to show compliance.

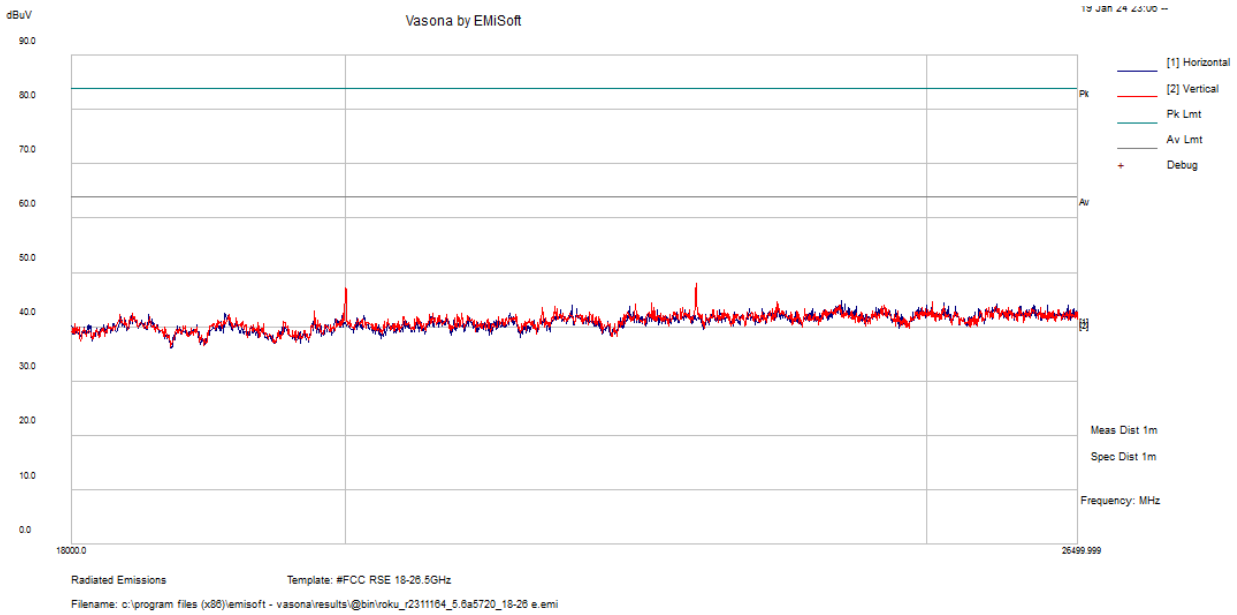
U-NII-2C, 802.11A: 5580 MHz



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
19997.5	45.7605	1.0215	46.782	200	V	360	63.54	-16.758	Peak

Note: Peak measurement was compared to the average limit to show compliance.

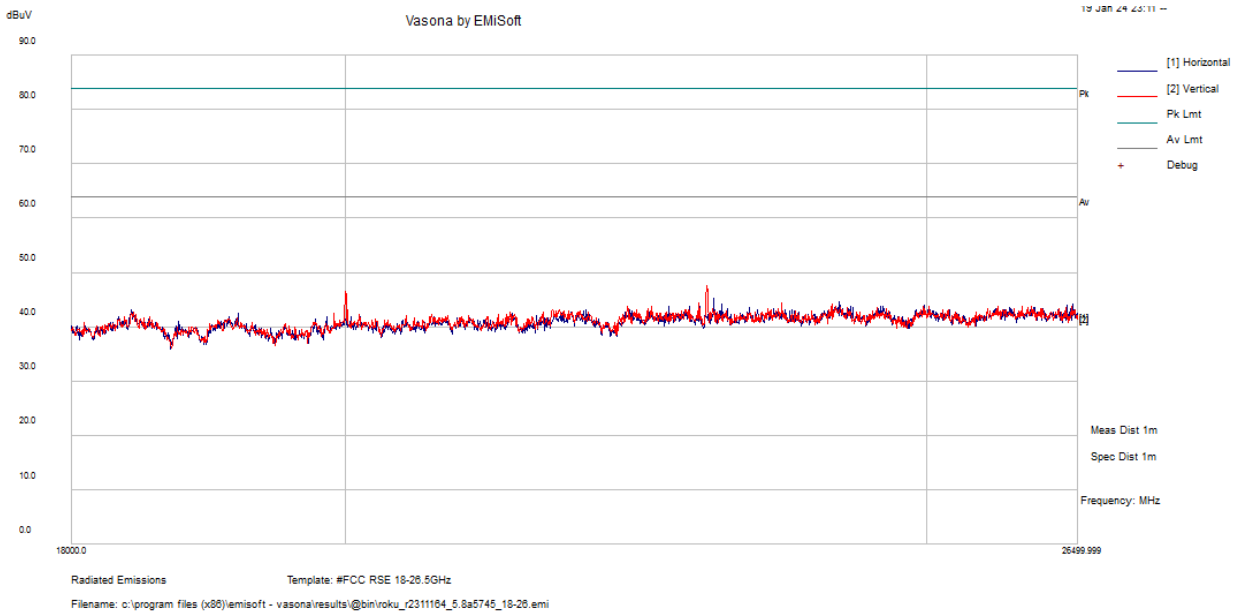
U-NII-2C, 802.11A: 5720 MHz



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
19997.5	46.0455	1.0215	47.067	200	V	360	63.54	-16.473	Peak

Note: Peak measurement was compared to the average limit to show compliance.

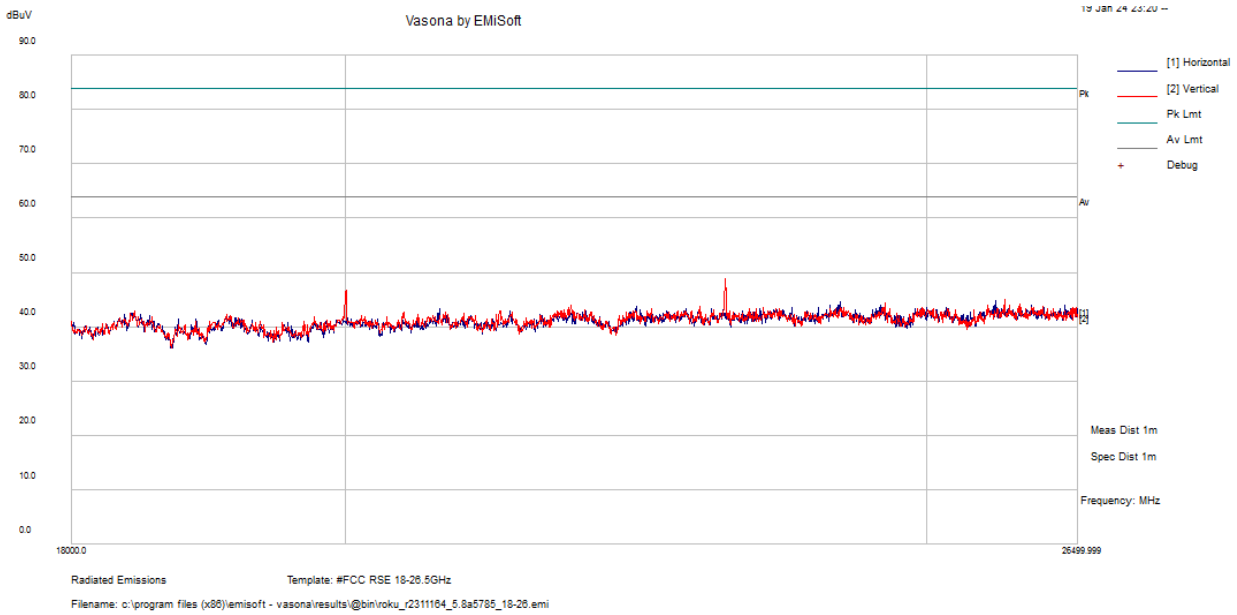
U-NII-3, 802.11A: 5745 MHz



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
19997.5	45.4425	1.0215	46.464	200	V	360	63.54	-17.076	Peak

Note: Peak measurement was compared to the average limit to show compliance.

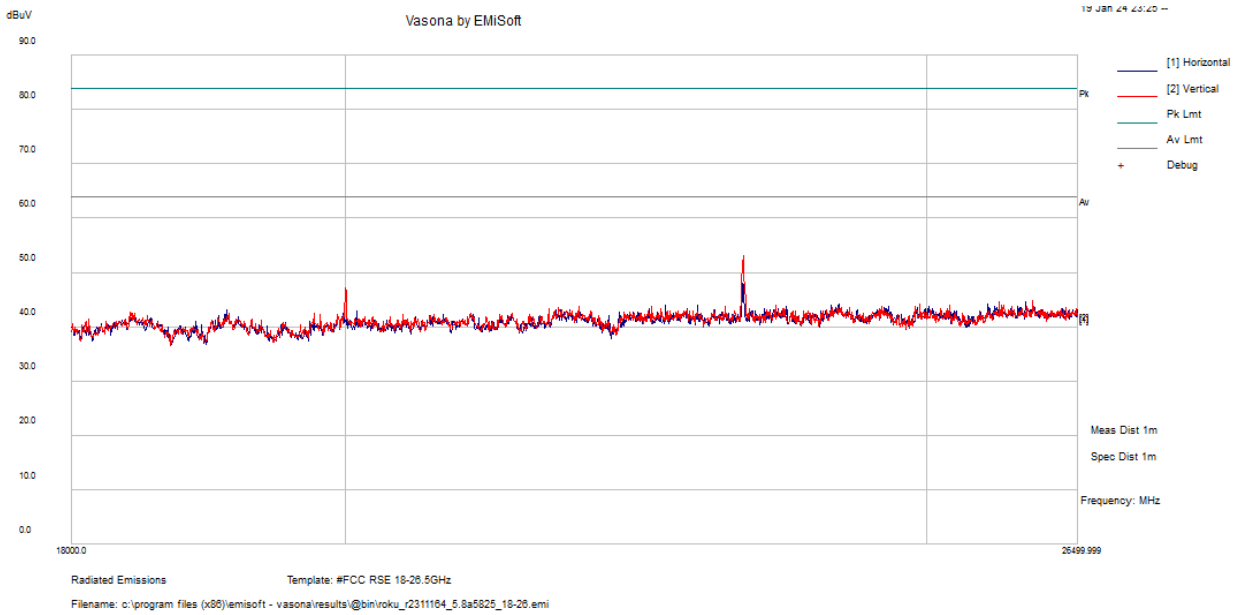
U-NII-3, 802.11A: 5785 MHz



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
20002.812	45.7665	1.0215	46.788	200	V	360	63.54	-16.752	Peak

Note: Peak measurement was compared to the average limit to show compliance.

U-NII-3, 802.11A: 5825 MHz + BT colocation

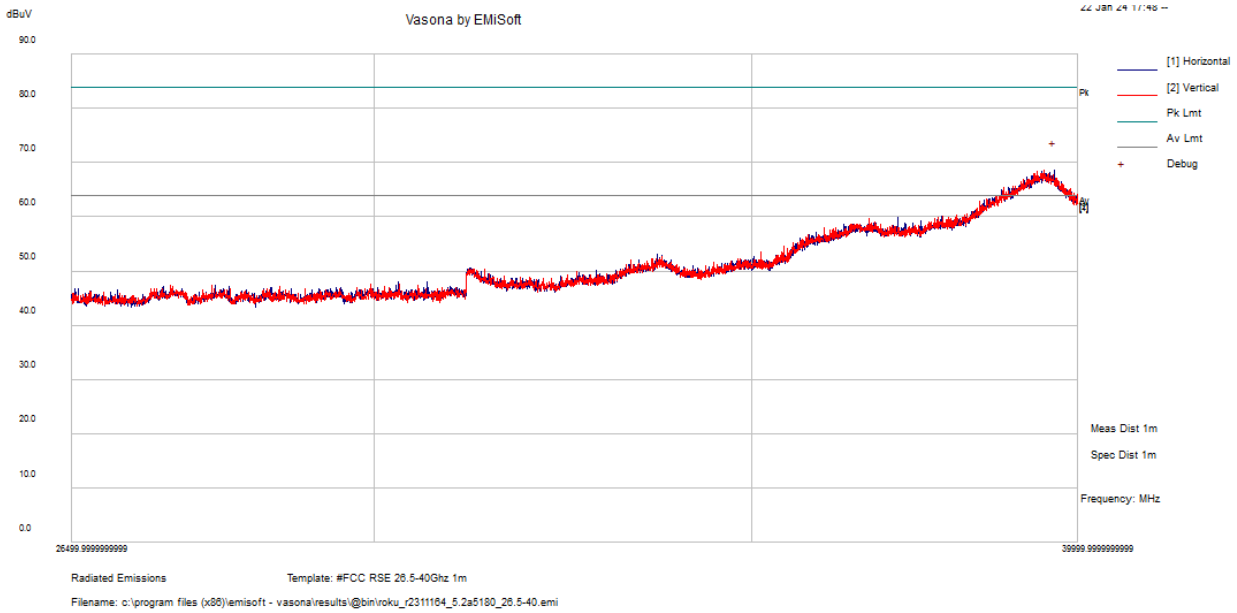


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
19997.5	46.2235	1.0215	47.245	200	V	360	63.54	-16.295	Peak

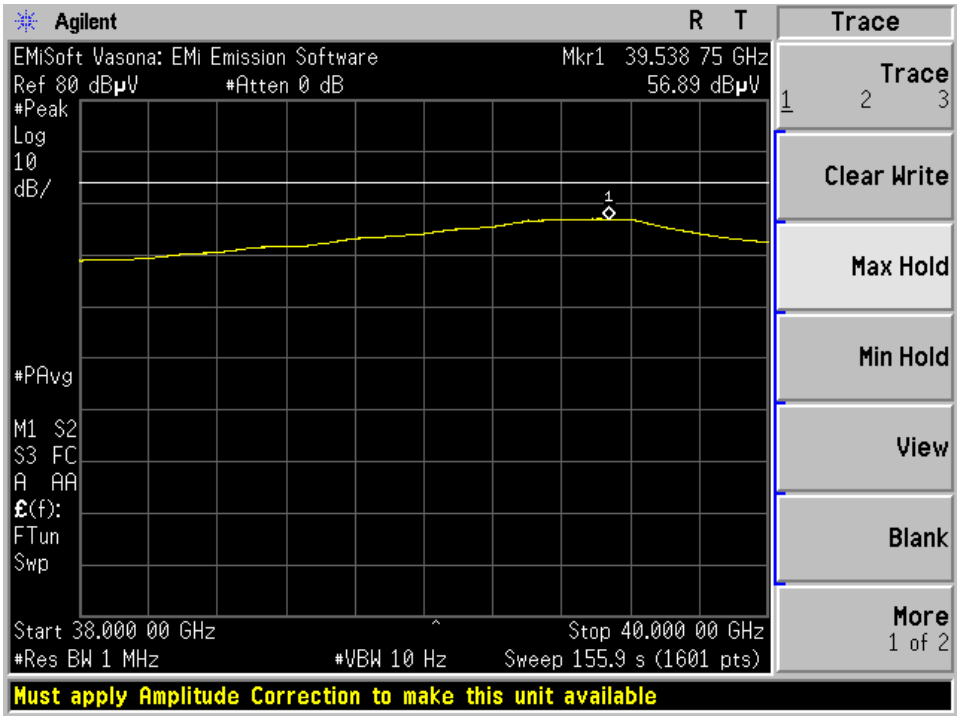
Note: Peak measurement was compared to the average limit to show compliance.

4) 26.5 GHz – 40 GHz, Measured at 1 meter

U-NII-1, 802.11A: 5180 MHz

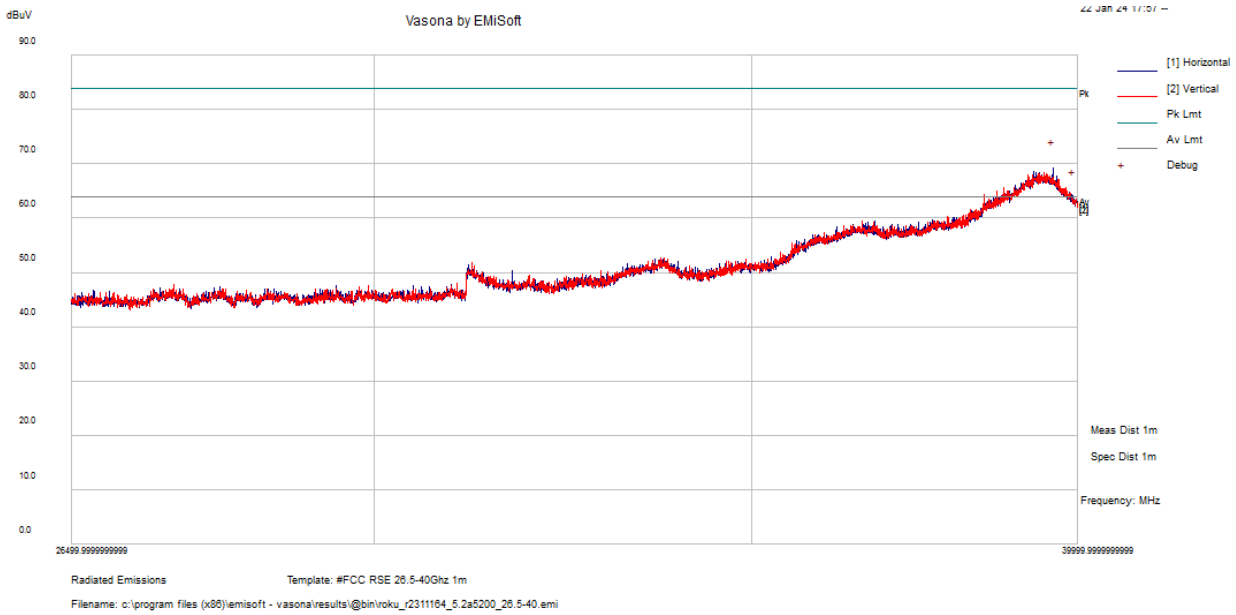


38 – 40 GHz Average Scan

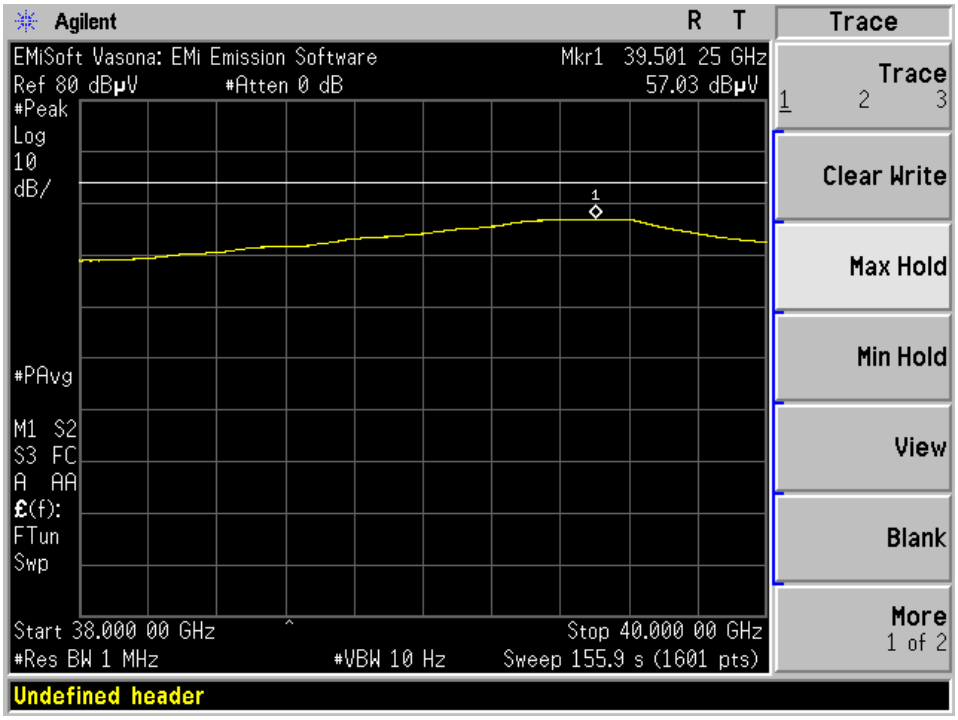


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39538.75	38.55	18.34	56.89	200	V	360	63.54	-6.65	Avg

U-NII-1, 802.11A: 5200 MHz

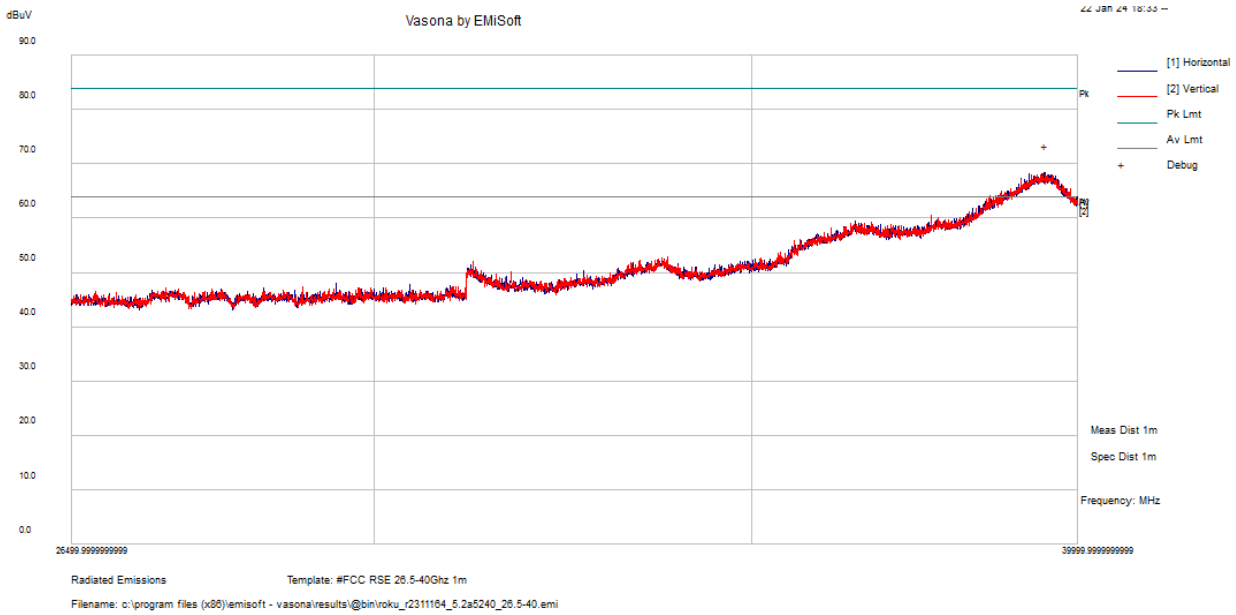


38 – 40 GHz Average Scan

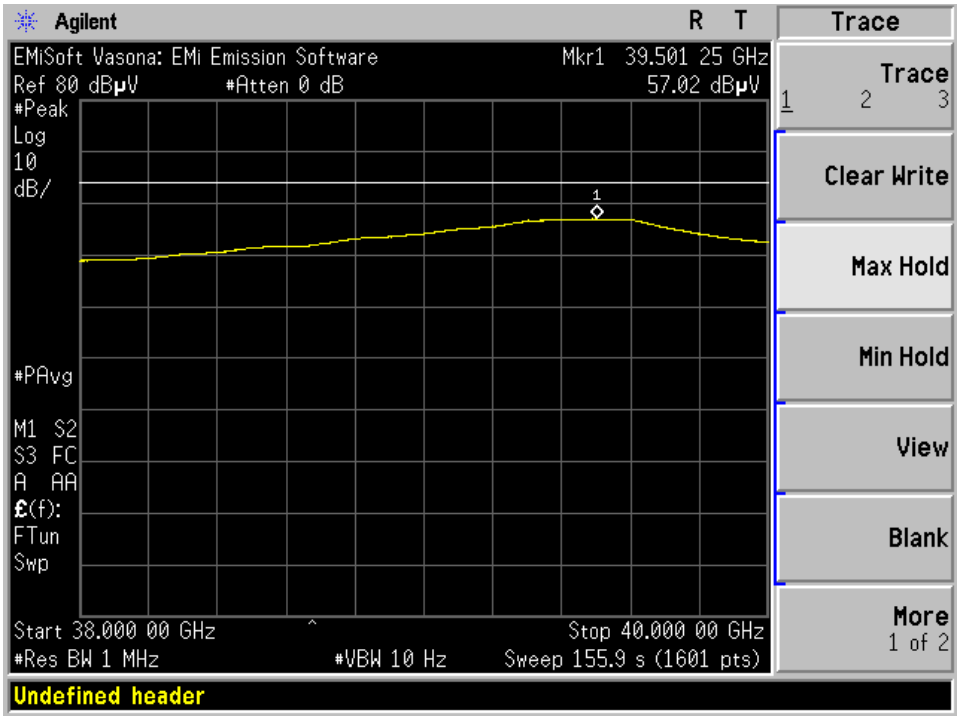


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.69	18.34	57.03	200	V	360	63.54	-6.51	Avg

U-NII-1, 802.11A: 5240 MHz

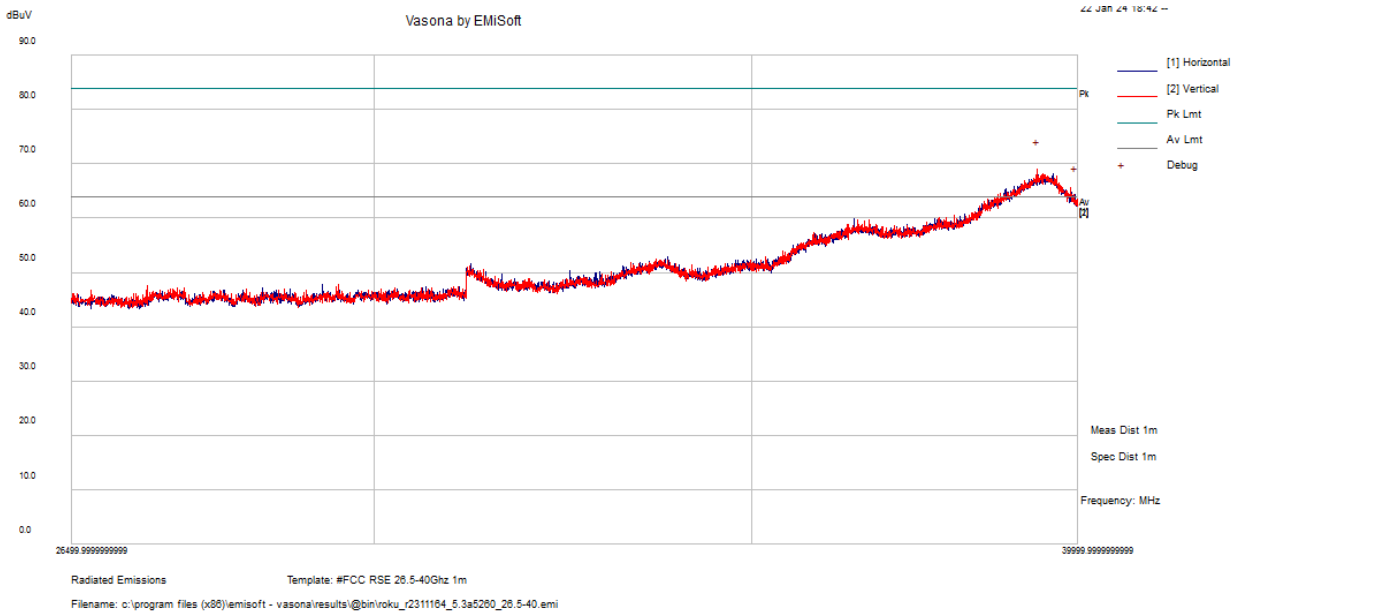


38 – 40 GHz Average Scan

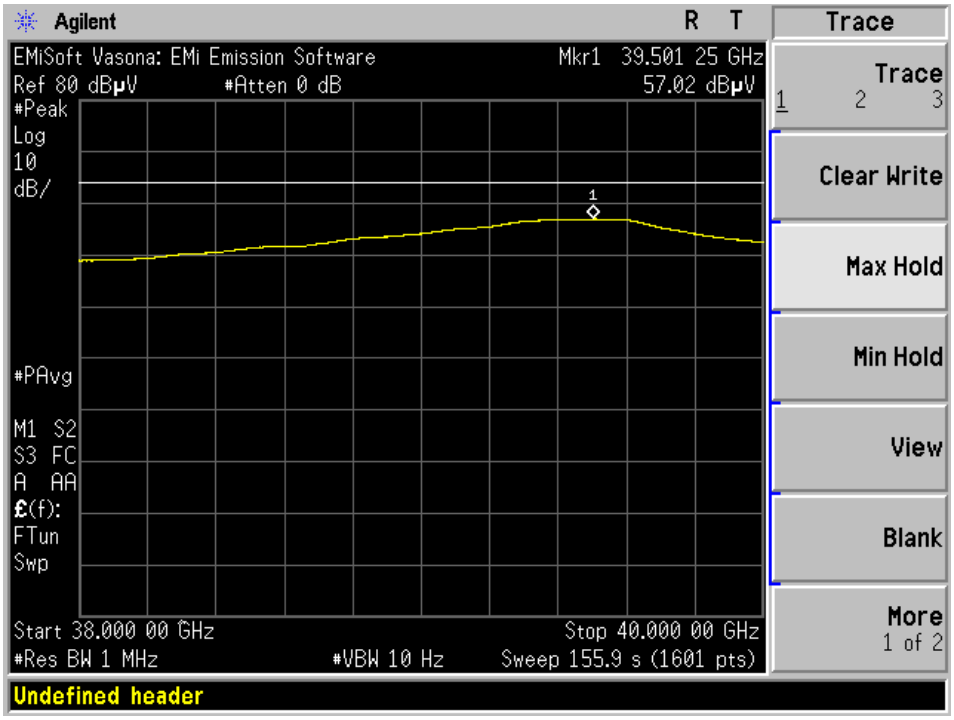


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.68	18.34	57.02	200	V	360	63.54	-6.52	Avg

U-NII-2A, 802.11A: 5260 MHz

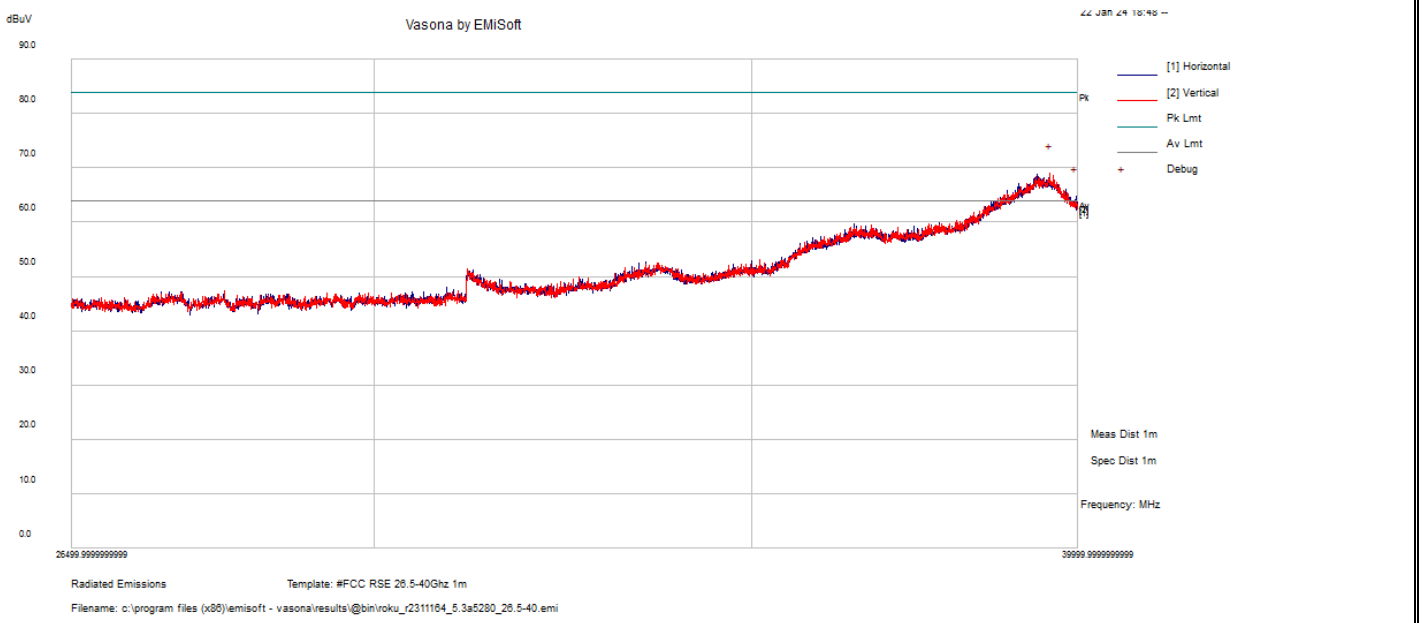


38 – 40 GHz Average Scan

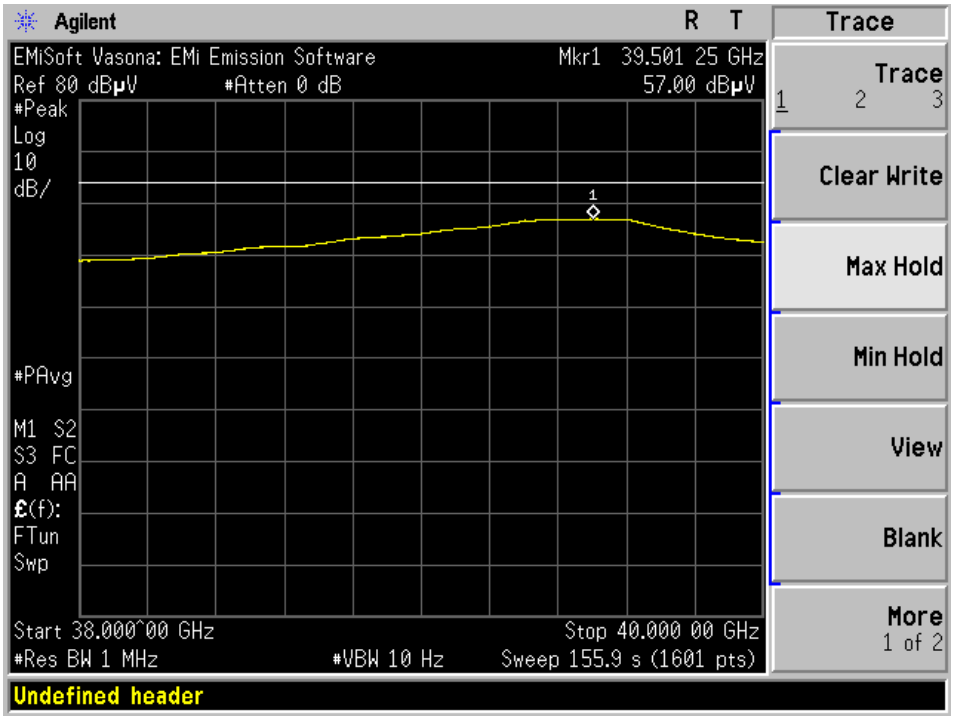


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.68	18.34	57.02	200	V	360	63.54	-6.52	Avg

U-NII-2A, 802.11A: 5280 MHz

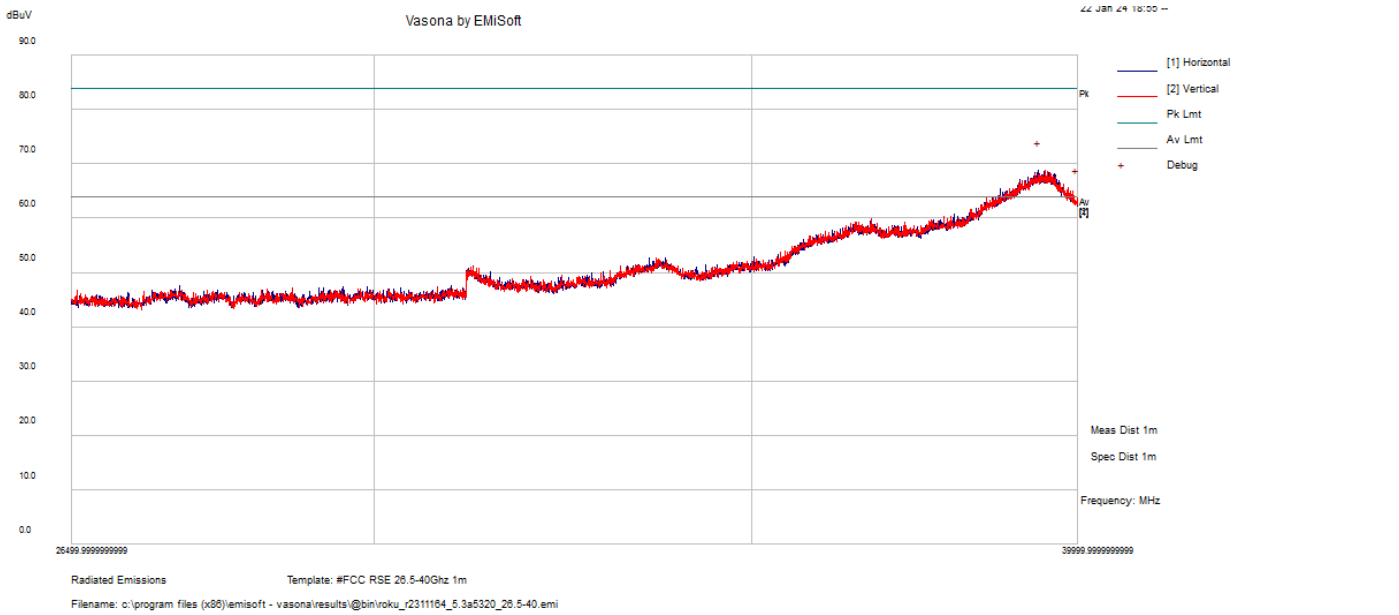


38 – 40 Average Scan

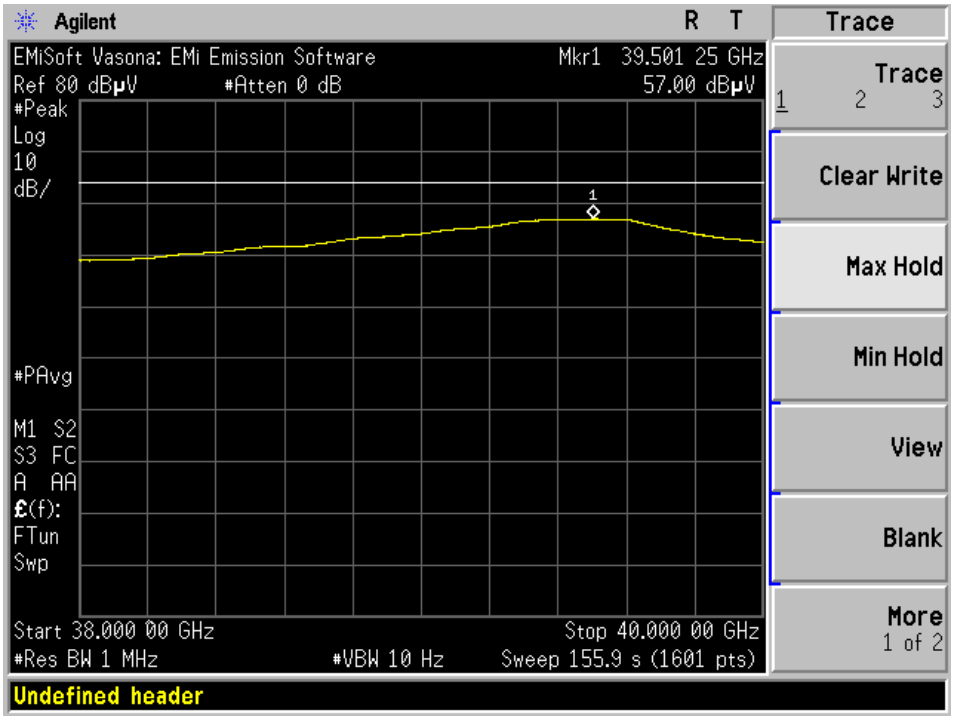


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.66	18.34	57.00	200	V	360	63.54	-6.54	Avg

U-NII-2A, 802.11A: 5320 MHz

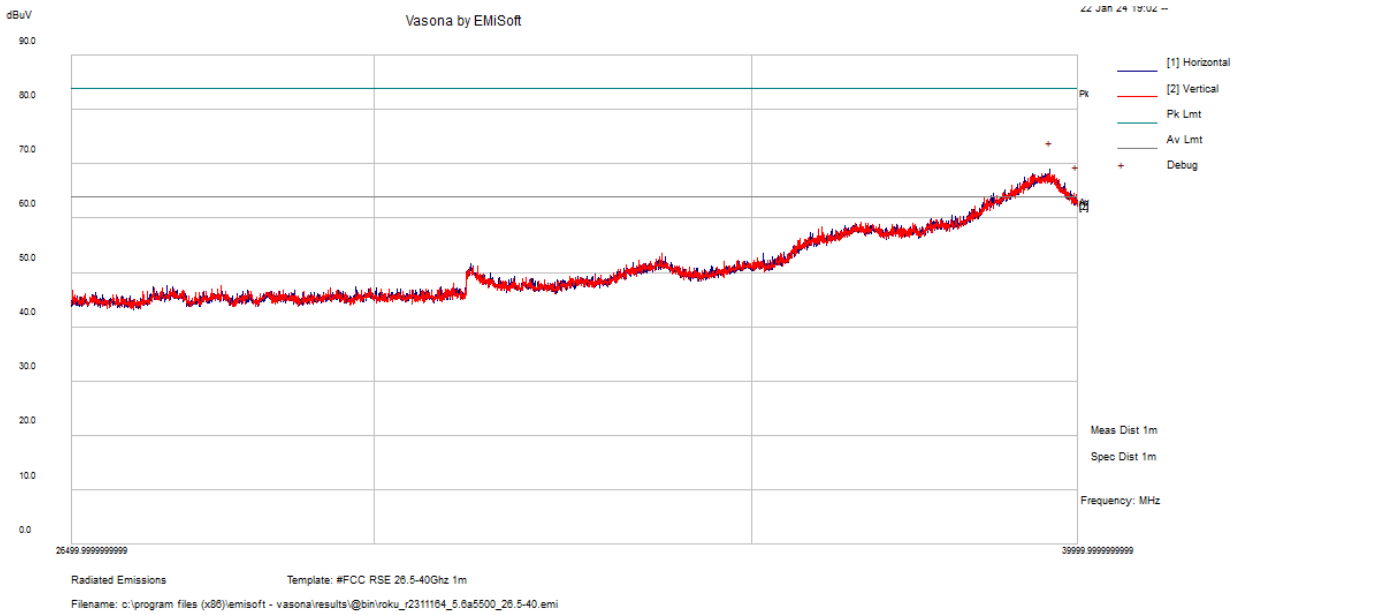


38 – 40 GHz Average Scan

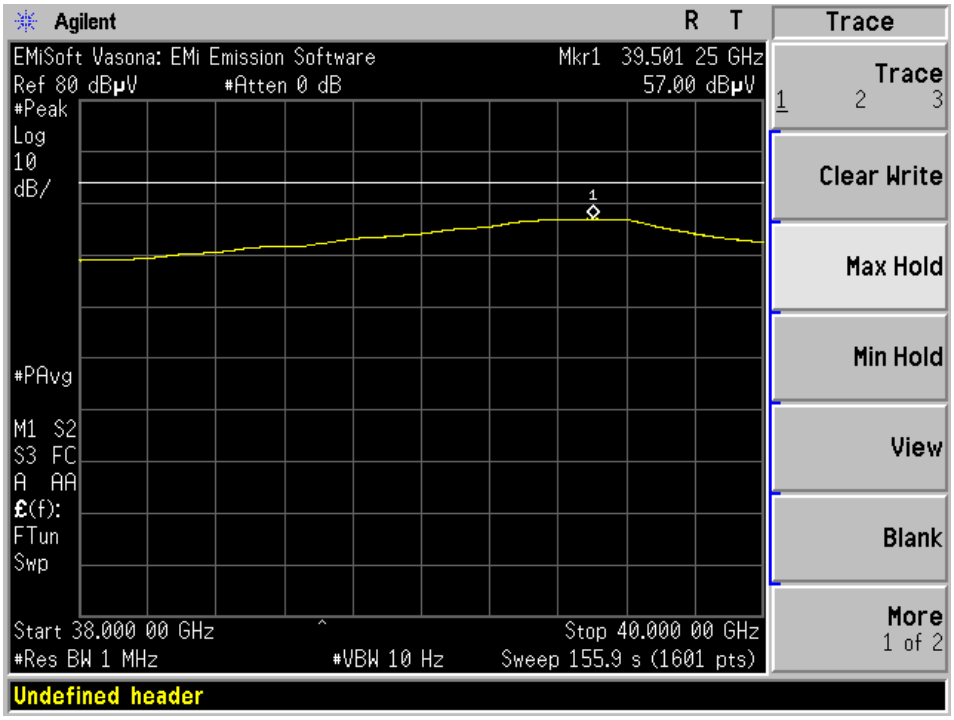


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.66	18.34	57.00	200	V	360	63.54	-6.54	Avg

U-NII-2C, 802.11A: 5500 MHz

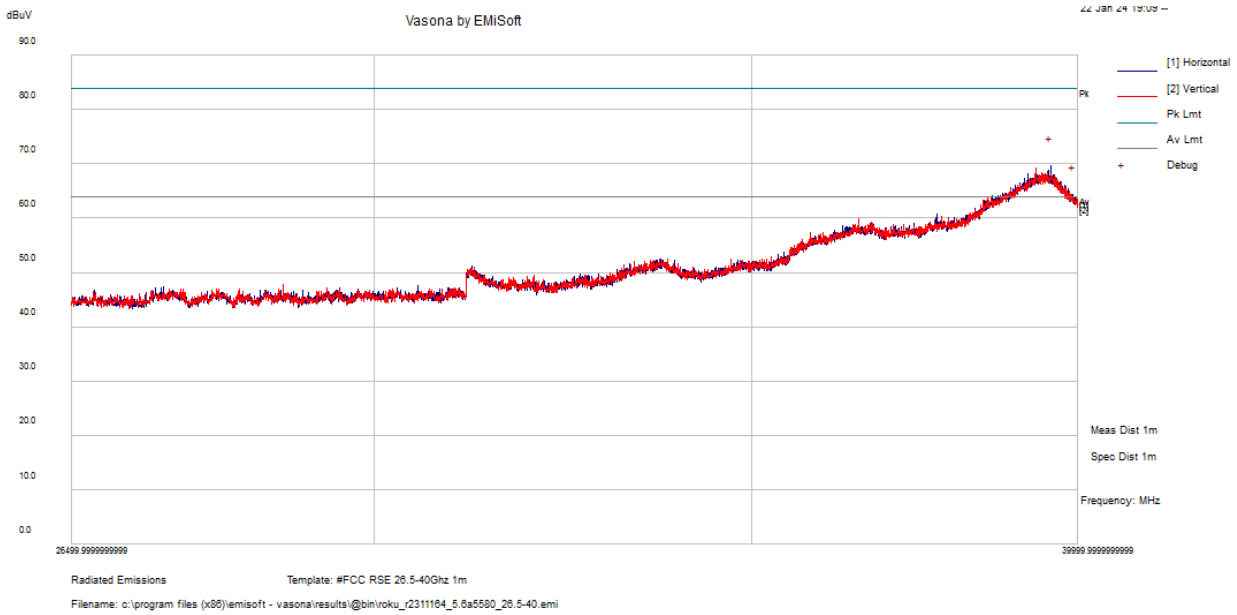


38 – 40 GHz Average Scan

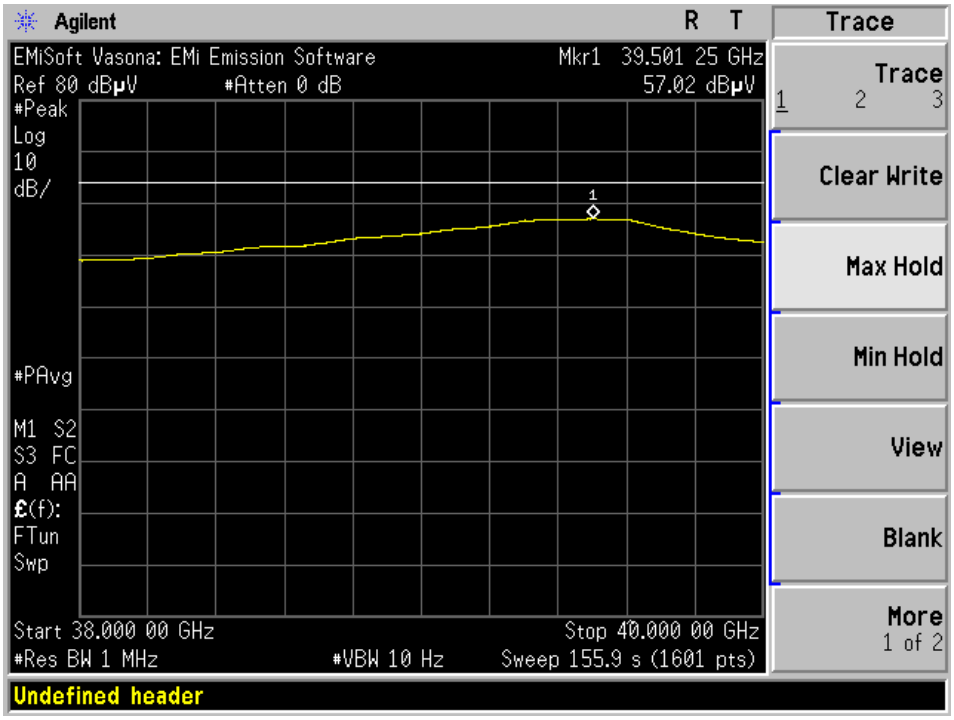


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.66	18.34	57.00	200	V	360	63.54	-6.54	Avg

U-NII-2C, 802.11A: 5580 MHz

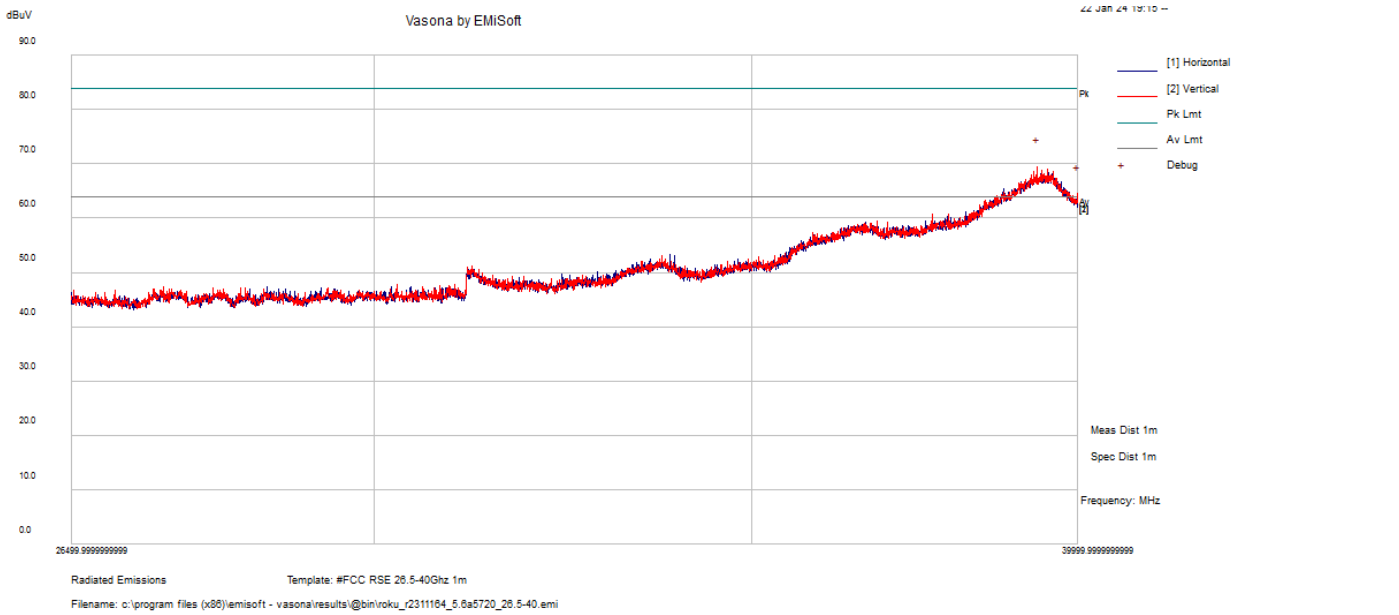


38 – 40 Average Scan

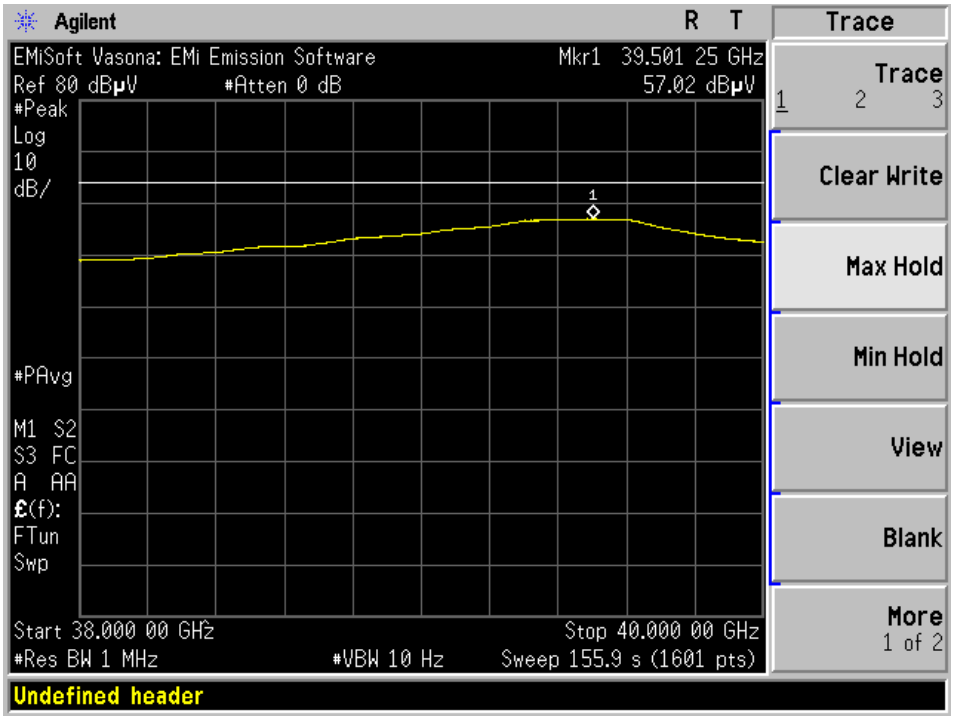


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.68	18.34	57.02	200	V	360	63.54	-6.52	Avg

U-NII-2C, 802.11A: 5720 MHz

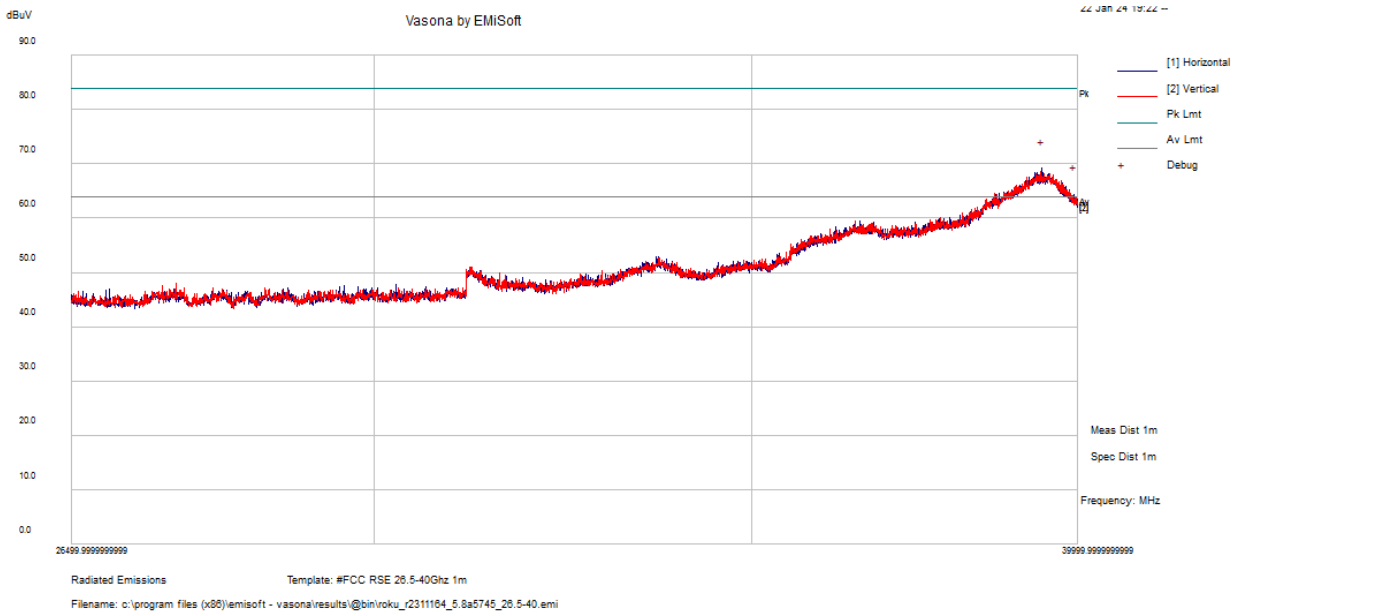


38 – 40 Average Scan

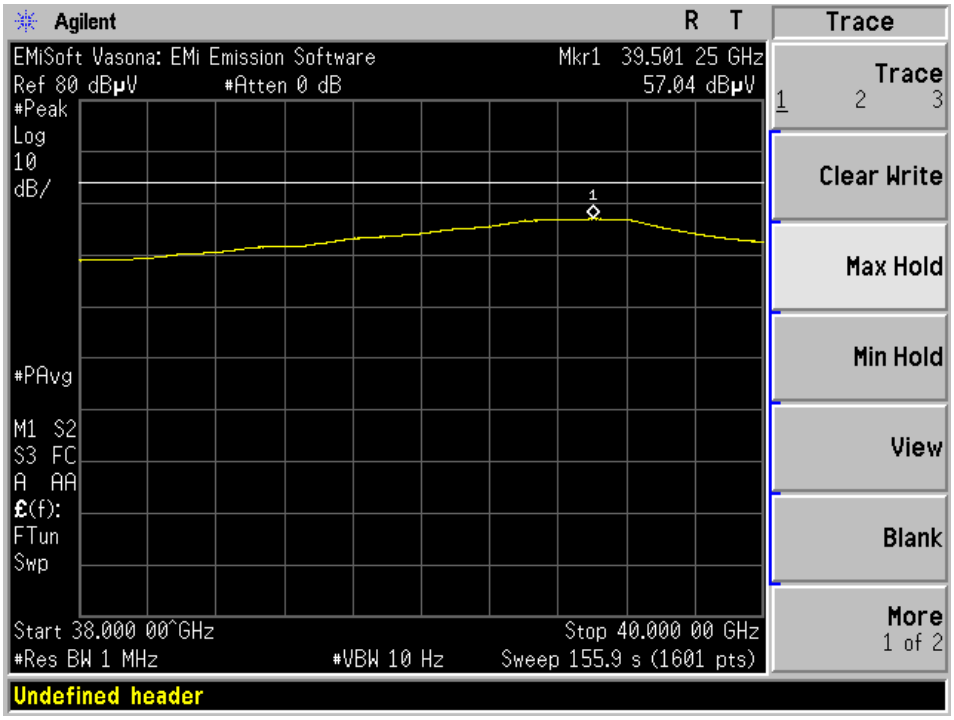


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.68	18.34	57.02	200	V	360	63.54	-6.52	Avg

U-NII-3, 802.11A: 5745 MHz

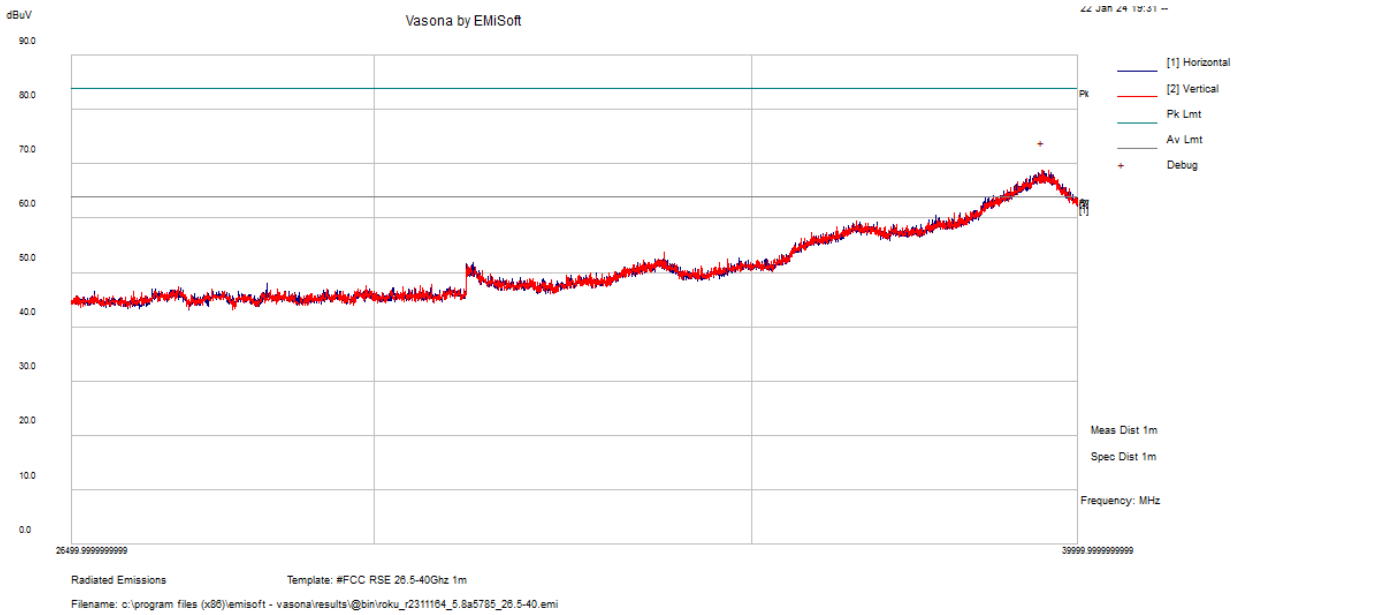


38 – 40 Average Scan

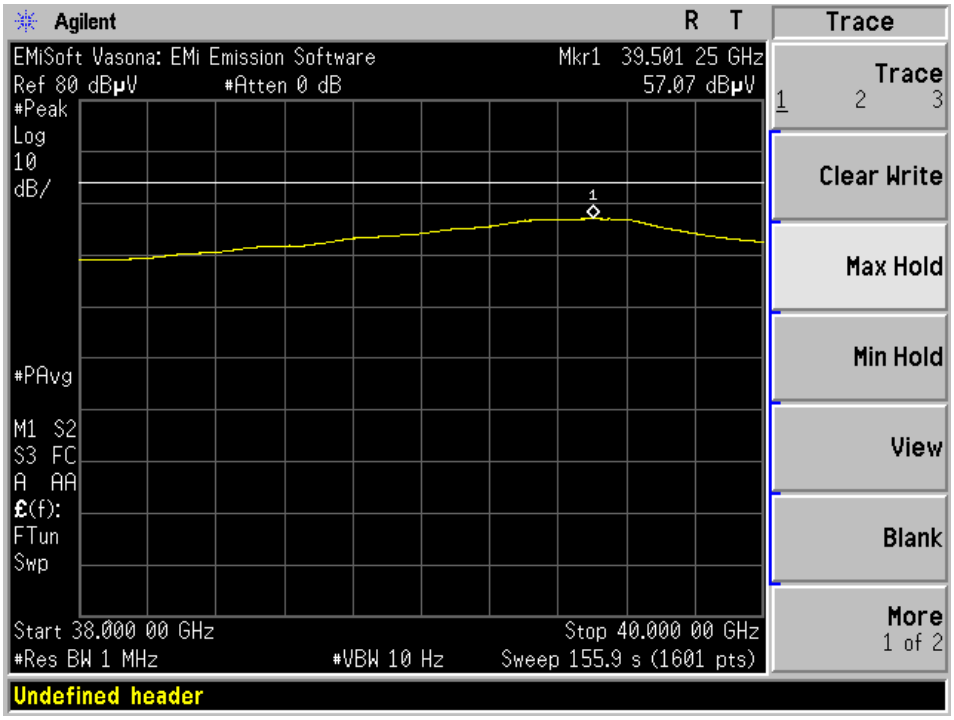


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.7	18.34	57.04	200	V	360	63.54	-6.5	Avg

U-NII-3, 802.11A: 5785 MHz

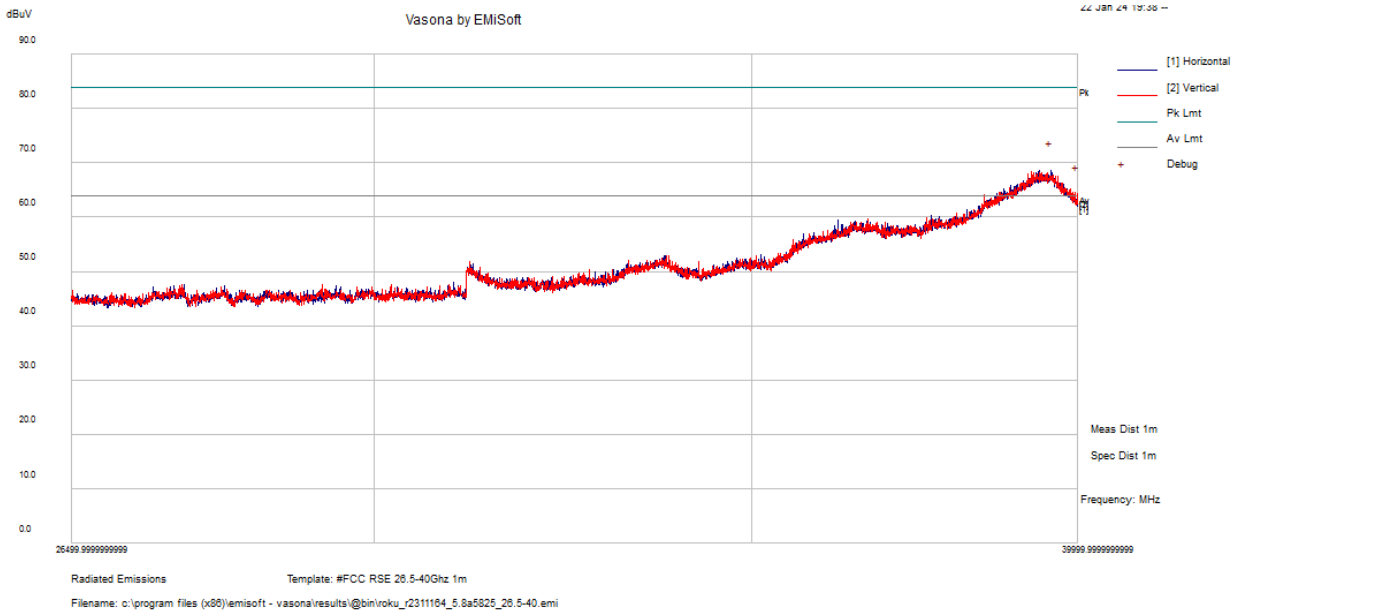


38 – 40 GHz

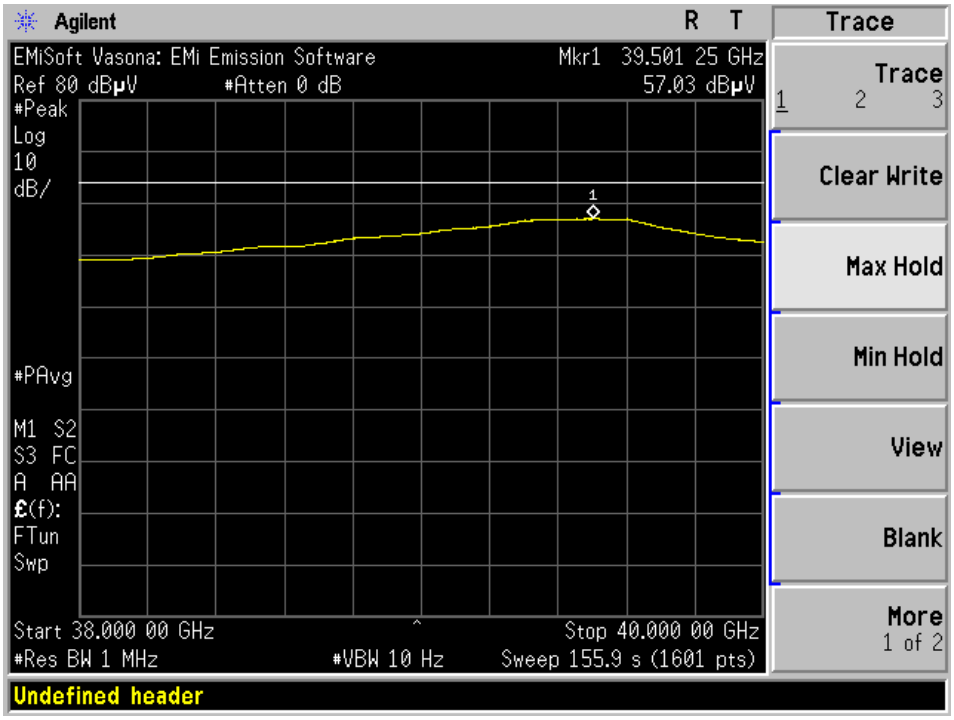


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
39501.25	38.73	18.34	57.07	200	V	360	63.54	-6.47	Avg

U-NII-3, 802.11A: 5825 MHz + BT colocation



38 – 40 GHz Average Scan



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
39501.25	38.69	18.34	57.03	200	V	360	63.54	-6.51	Avg

8 FCC §15.407(e) & ISEDC RSS-247 §6.2 – 6 dB, 26 dB, & 99% Occupied Bandwidth

8.1 Applicable Standards

As per FCC §15.407(e) and ISEDC RSS-247 6.2.4(1): for equipment operating in the band 5725 – 5850 MHz, the minimum 6 dB bandwidth of U-NII devices shall be 500 kHz.

8.2 Measurement Procedure

As per the ANSI 63.10 Clause 12.4.1: Emission Bandwidth

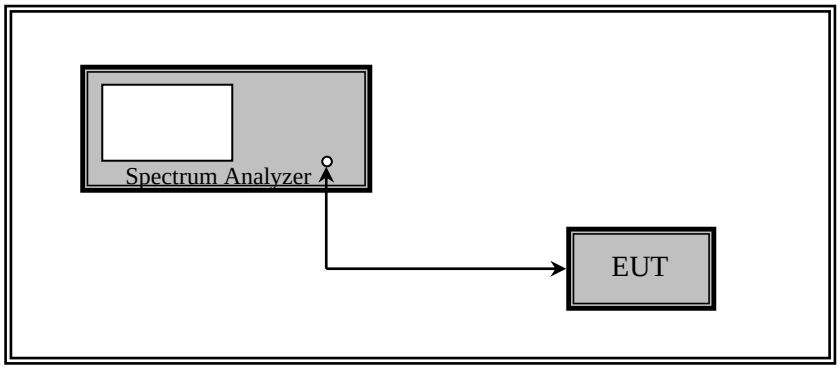
a. Set RBW = approximately 1% of the emission bandwidth
b. Set the VBW > RBW.
c. Detector = peak.
d. Trace mode = max hold.
e. Measure the maximum width of the emission that is 6 or 26 dB down from the peak of the emission. Compare this with the RBW setting of the instrument. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

As per the ANSI 63.10 Clause 6.9.3: Occupied Bandwidth – Power Bandwidth (99%)

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:

f. 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.
g. 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.
h. 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.
i. Step a) through step c) might require iteration to adjust within the specified range.
j. 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.
k. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
l. 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.
m. 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	05-12-2023	1 year

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:	21ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Libass Thiaw from 02/22/2024 to 02/28/2024 at RF test site.

8.6 Test Results

U-NII-1 IC

Channel	Frequency (MHz)	99% OBW (MHz)		26 dB OBW (MHz)	
		Antenna A	Antenna B	Antenna A	Antenna B
802.11a					
36	5180	16.249	16.281	18.660	18.713
40	5200	16.277	16.291	18.334	18.673
48	5240	16.254	16.350	18.330	21.107
802.11n20					
36	5180	17.434	17.395	19.607	19.905
40	5200	17.379	17.427	19.686	19.602
48	5240	17.338	17.298	19.667	19.579
802.11n40					
38	5190	35.646	35.706	39.280	39.687
46	5230	35.654	35.783	39.612	39.229
802.11ac80					
42	5210	76.176	75.267	87.510	86.254
802.11ax20					
36	5180	18.490	18.451	20.274	20.461
40	5200	18.516	18.491	20.497	20.207
48	5240	18.429	18.529	20.409	20.457
802.11ax40					
38	5190	37.0140	37.099	40.271	40.427
46	5230	37.0332	37.227	40.571	40.367
802.11ax80					
42	5210	76.956	76.965	82.767	83.102

U-NII-1 FCC

Channel	Frequency (MHz)	99% OBW (MHz)		26 dB OBW (MHz)	
		Antenna A	Antenna B	Antenna A	Antenna B
802.11a					
36	5180	16.337	16.670	18.307	26.709
40	5200	16.505	18.798	21.838	35.295
48	5240	19.394	17.754	19.003	34.865
802.11n20					
36	5180	17.361	17.446	19.717	19.705
40	5200	17.392	17.529	21.034	21.615
48	5240	17.477	17.467	21.034	25.047
802.11n40					
38	5190	35.566	35.795	39.399	39.660
46	5230	36.428	43.905	57.781	73.732
802.11ac80					
42	5210	76.086	75.523	86.292	85.346
802.11ax20					
36	5180	18.640	18.638	20.625	21.126
40	5200	18.574	18.745	20.594	26.766
48	5240	18.551	18.948	21.926	27.509
802.11ax40					
38	5190	37.014	37.099	40.271	40.427
46	5230	38.584	46.047	61.769	81.472
802.11ax80					
42	5210	76.956	76.965	82.767	83.102

U-NII-2A

Channel	Frequency (MHz)	99% OBW (MHz)		26 dB OBW (MHz)	
		Antenna A	Antenna B	Antenna A	Antenna B
802.11a					
52	5260	16.470	18.331	20.751	34.850
60	5300	16.551	19.109	22.363	34.723
64	5320	16.234	16.373	18.253	23.592
802.11n20					
52	5260	17.462	17.669	19.688	28.508
60	5300	17.465	17.825	19.670	29.169
64	5320	17.360	17.396	19.506	19.777
802.11n40					
54	5270	37.162	46.421	62.184	73.477
62	5310	35.515	35.651	39.444	39.487
802.11ac80					
58	5290	75.510	75.911	87.177	87.270
802.11ax20					
52	5260	18.614	18.769	20.658	27.238
60	5300	18.522	18.939	22.751	30.401
64	5320	18.442	18.576	20.201	23.267
802.11ax40					
54	5270	37.451	37.864	45.983	55.595
62	5310	36.965	37.099	40.456	40.316
802.11ax80					
58	5290	76.608	77.024	82.791	82.894

U-NII-2C

Channel	Frequency (MHz)	99% OBW (MHz)		26 dB OBW (MHz)	
		Antenna A	Antenna B	Antenna A	Antenna B
802.11a					
100	5500	16.367	16.487	21.246	25.932
120	5600	16.732	18.297	31.376	32.260
144	5720	17.714	19.325	34.220	34.185
802.11n20					
100	5500	17.444	17.538	21.878	22.609
120	5600	17.766	17.962	26.243	31.876
144	5720	17.579	17.673	24.176	29.162
802.11n40					
102	5510	35.767	35.695	43.958	43.885
118	5590	37.530	42.599	61.085	73.494
142	5710	42.349	41.372	71.767	64.965
802.11ac80					
106	5530	76.043	74.791	91.751	90.129
122	5610	86.547	86.661	153.669	152.760
138	5690	91.263	88.939	173.097	164.042
802.11ax20					
100	5500	18.914	18.748	35.395	23.076
120	5600	18.739	18.753	24.444	22.476
144	5720	18.639	18.818	22.349	25.176
802.11ax40					
102	5510	37.266	37.241	44.498	44.364
118	5590	41.317	42.470	59.322	75.218
142	5710	42.226	43.322	67.751	70.340
802.11ax80					
106	5530	77.442	77.403	89.714	89.806
122	5610	77.553	77.328	89.858	89.482
138	5690	77.851	77.499	90.118	92.783

U-NII-3

Channel	Frequency (MHz)	99% OBW (MHz)		6 dB OBW (MHz)		6 dB OBW Limit (kHz)	Result
		Antenna A	Antenna B	Antenna A	Antenna B		
802.11a							
149	5745	16.825	17.441	15.111	15.472	≥ 500	Pass
157	5785	16.707	16.417	15.114	13.835	≥ 500	Pass
165	5825	16.662	22.100	12.930	11.800	≥ 500	Pass
802.11n20							
149	5745	17.901	17.660	13.802	14.704	≥ 500	Pass
157	5785	17.650	18.678	11.411	13.858	≥ 500	Pass
165	5825	17.610	18.424	11.442	15.174	≥ 500	Pass
802.11n40							
151	5755	39.756	38.654	32.547	31.495	≥ 500	Pass
159	5795	37.856	39.144	27.773	31.475	≥ 500	Pass
802.11ac80							
155	5775	76.136	75.865	75.525	74.560	≥ 500	Pass
802.11ax20							
149	5745	18.958	19.127	15.548	13.535	≥ 500	Pass
157	5785	18.883	19.088	13.868	15.518	≥ 500	Pass
165	5825	18.626	19.468	14.123	14.985	≥ 500	Pass
802.11ax40							
151	5755	39.975	42.265	29.156	32.716	≥ 500	Pass
159	5795	38.537	41.056	31.528	31.418	≥ 500	Pass
802.11ax80							
155	5775	77.770	77.432	94.864	75.566	≥ 500	Pass

Please refer to the plots in Annex A for detailed test results.

9 FCC §407(a) & ISEDC RSS-247 §6.2 – Output Power

9.1 Applicable Standards

According to FCC §15.407(a):

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

According to ISEDC RSS-247 §6.2.1 for frequency band 5150-5250 MHz:

The maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10}B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

According to ISEDC RSS-247 §6.2.2 for frequency band 5250-5350 MHz:

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10}B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10}B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.3 for frequency band 5470-5600 MHz and 5650-5725 MHz:

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10}B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.4 for frequency band 5725-5850 MHz:

The maximum conducted output power shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

9.2 Measurement Procedure

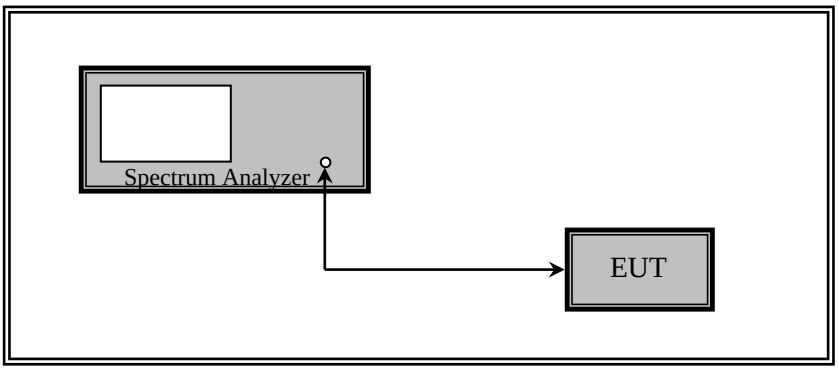
The measurements are based on ANSI C63.10-2013, Section 12.3.2.6

12.3.2.6Method SA-3

Method AVGSA-1 uses trace averaging with the EUT transmitting at full power throughout each sweep. The procedure for this method is as follows:

a. Set span to encompass the entire 26 dB EBW or 99% OBW of the signal.
b. Set sweep trigger to “free run.”
c. Set RBW = 1 MHz.
d. Set VBW ≥ 3 MHz
e. Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)
f. Sweep time ≤ [(number of points in sweep) × T], where T is defined in 12.2. If this gives a sweep time less than the auto sweep time of the instrument, then method SA-3A shall not be used. (The purpose of this step is so that averaging time in each bin is less than or equal to the minimum time of a transmission.)
g. Detector = RMS (power averaging).
h. Trace mode = max hold.
i. Allow max hold to run for at least 60 s or longer as needed to allow the trace to stabilize.
j. Compute power by integrating the spectrum across the 26 dB EBW or 99% OBW of the signal using the instrument’s band power measurement function with band limits set equal to the EBW or OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

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	05-12-2023	1 year

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:	21ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Libass Thiaw from 02/22/2024 to 02/28/2024 at RF test site.

9.6 Test Results

U-NII-1.IC

Channel	Frequency (MHz)	Conducted Power (dBm)			EIRP (dBm)			IC Limit (dBm)
		ANT A	ANT B	Total	ANT A	ANT B	Total	
802.11a mode								
36	5180	14.550	14.600	-	18.550	16.600	-	22.1
40	5200	14.320	14.350	-	18.320	16.350	-	22.1
48	5240	14.600	14.540	-	18.600	16.540	-	22.1
802.11n20 mode								
36	5180	10.170	10.050	13.120	-	-	19.220	22.4
40	5200	9.820	9.550	12.700	-	-	18.800	22.4
48	5240	10.190	10.020	13.120	-	-	19.220	22.4
802.11n40 mode								
38	5190	12.641	12.481	15.572	-	-	21.670	23
46	5230	12.981	12.681	15.844	-	-	21.940	23
802.11ac80 mode								
42	5210	12.704	12.784	15.754	-	-	21.850	23
802.11ax20								
36	5180	10.129	10.029	13.090			19.190	23
40	5200	9.479	9.229	12.366			18.470	23
48	5240	9.709	9.579	12.655			18.750	23
802.11ax40								
38	5190	12.465	12.355	15.421			21.521	23
46	5230	12.715	12.625	15.681			21.781	23
802.11ax80								
42	5210	12.575	12.575	15.585			21.685	23

*Note: Total Power [dBm] = 10*Log(Ant a(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: For MIMO Antenna gain, dBi=10log[(10^(Ant A gain [dBi]/20) + 10^(Ant B gain [dBi]/20)^2 / Number of Antennas]=6.1
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: 802.11n40 DCCF: 0.401, 802.11ac80 DCCF: 0.614, 802.11ax20 DCCF: 0.119

U-NII-1.FCC

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)[1,2]	FCC Limit (dBm)
		ANT A	ANT B		
802.11a					
36	5180	17.700	17.510	-	24
40	5200	19.140	18.850	-	24
48	5240	18.370	18.940	-	24
802.11n20					
36	5180	15.140	15.180	18.170	23.9
40	5200	16.110	16.070	19.100	23.9
48	5240	16.400	16.420	19.420	23.9
802.11n40					
38	5190	12.681	12.611	15.660	23.9
46	5230	19.311	19.601	22.470	23.9
802.11ac80					
42	5210	12.644	12.674	15.670	23.9
802.11ax20					
36	5180	15.439	15.449	18.450	23.9
40	5200	16.109	16.209	19.170	23.9
48	5240	16.499	16.149	19.340	23.9
802.11ax40					
38	5190	12.465	12.355	15.421	23.9
46	5230	19.635	19.055	22.365	23.9
802.11ax80					
42	5210	12.575	12.575	15.585	23.9

*Note: Total Power [dBm] = 10*Log(Ant a(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: 802.11n40 DCCF: 0.401, 802.11ac80 DCCF: 0.614, 802.11ax20 DCCF: 0.119
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

U-NII-2A

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)[1,2]	Limit (dBm)[3]
		ANT A	ANT B		
802.11a					
52	5260	19.310	19.120		24
60	5300	19.350	18.950		24
64	5320	15.770	15.970		24
802.11n20					
52	5260	17.680	17.330	20.520	23.9
60	5300	17.730	17.700	20.730	23.9
64	5320	15.540	15.930	18.750	23.9
802.11n40					
54	5270	20.011	19.651	22.850	23.9
62	5310	12.021	11.961	15.000	23.9
802.11ac80					
56	5290	13.354	13.244	16.310	23.9
802.11ax20					
52	5260	16.619	16.289	19.470	23.9
60	5300	16.449	16.819	19.650	23.9
64	5320	14.569	14.919	17.760	23.9
802.11ax40					
54	5270	17.185	17.025	20.116	23.9
62	5310	11.665	11.825	14.756	23.9
802.11ax80					
56	5290	12.785	12.825	15.815	23.9

*Note: Total Power [dBm] = 10*Log(Ant a(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: 802.11n40 DCCF: 0.401, 802.11ac80 DCCF: 0.614, 802.11ax20 DCCF: 0.119
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

U-NII-2C

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)[1,2]	Limit (dBm)[3]
		ANT A	ANT B		
802.11a					
100	5500	17.140	15.540		24
120	5600	19.660	19.290		24
144	5720	19.620	18.660		24
802.11n20					
100	5500	14.750	13.850	17.330	23.9
120	5600	18.160	17.410	20.810	23.9
144	5720	16.610	16.380	19.510	23.9
802.11n40					
102	5510	11.901	10.371	14.210	23.9
118	5590	19.551	19.691	22.630	23.9
142	5710	20.241	19.651	22.970	23.9
802.11ac80					
106	5530	13.204	11.784	15.560	23.9
122	5610	19.944	19.594	22.780	23.9
138	5690	19.934	19.234	22.610	23.9
802.11ax20					
100	5500	17.229	16.099	19.710	23.9
120	5600	16.999	16.009	19.540	23.9
144	5720	16.839	15.909	19.410	23.9
802.11ax40					
102	5510	13.955	12.815	16.433	23.9
118	5590	19.675	19.405	22.552	23.9
142	5710	20.055	19.555	22.822	23.9
802.11ax80					
106	5530	14.215	13.345	16.812	23.9
122	5610	16.035	15.615	18.840	23.9
138	5690	17.825	17.265	20.564	23.9

*Note: Total Power [dBm] = 10*Log(Ant a(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: 802.11n40 DCCF: 0.401, 802.11ac80 DCCF: 0.614, 802.11ax20 DCCF: 0.119
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

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Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total Power (dBm)[1,2]	Limit (dBm)[3]
		ANT A	ANT B		
802.11a					
149	5745	19.270	18.500		30
157	5785	19.460	17.440		30
165	5825	19.250	20.410		30
802.11n20					
149	5745	19.170	16.680	21.110	29.9
157	5785	18.720	18.560	21.650	29.9
165	5825	17.440	17.770	20.620	29.9
802.11n40					
151	5755	19.811	19.201	22.530	29.9
159	5795	19.761	19.551	22.670	29.9
802.11ac80					
155	5775	17.244	16.674	19.980	29.9
802.11ax20					
149	5745	18.689	18.289	21.530	29.9
157	5785	18.139	18.529	21.350	29.9
165	5825	14.019	17.459	19.080	29.9
802.11ax40					
151	5755	19.655	18.985	22.343	29.9
159	5795	19.575	19.525	22.560	29.9
802.11ax80					
155	5775	16.745	16.615	19.691	29.9

*Note: Total Power [dBm] = 10*Log(Ant a(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: 802.11n40 DCCF: 0.401, 802.11ac80 DCCF: 0.614, 802.11ax20 DCCF: 0.119
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

U-NII-1 to U-NII-2A Leakage

These measurements are to verify the following: ISED RSS-247 Section 6.2.1.2, any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB.

Channel	Frequency (MHz)	Conducted Output Power at Fundamental (dBm)		Total Power (dBm)[1,2]	Leakage Output Power		Total Leakage Power (dBm)	Attenuation
		ANT A	ANT B		ANT A	ANT B		
802.11a								
48	5240	18.370	18.940	-	-30.49	-20.32		48.86
802.11n20								
48	5240	16.400	16.420	19.420	-35.19	-33.61	-31.32	50.74
802.11n40								
46	5230	19.311	19.601	22.470	-29.4	-32.4	-27.64	50.10
802.11ac80								
42	5210	12.644	12.674	15.670	-28.16	-30.82	-26.28	41.95
802.11ax20								
48	5240	16.499	16.149	19.340	-27.15	-25.15	-23.03	42.36
802.11ax40								
46	5230	19.635	19.055	22.365	-29.05	-31.77	-27.19	49.56
802.11ax80								
42	5210	12.575	12.575	15.585	-27.98	-30.75	26.14	41.72

Please refer to the plots in Annex B and Annex I and Annex J for detailed test results.

10 FCC §15.407(a) & ISEDC RSS-247 §6.2 – Power Spectral Density

10.1 Applicable Standards

According to FCC §15.407(a):

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

According to ISEDC RSS-247 §6.2.1 for frequency band 5150-5250 MHz:

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

According to ISEDC RSS-247 §6.2.2 for frequency band 5250-5350 MHz:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

According to ISEDC RSS-247 §6.2.3 for frequency band 5470-5600 MHz and 5650-5725 MHz:

The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

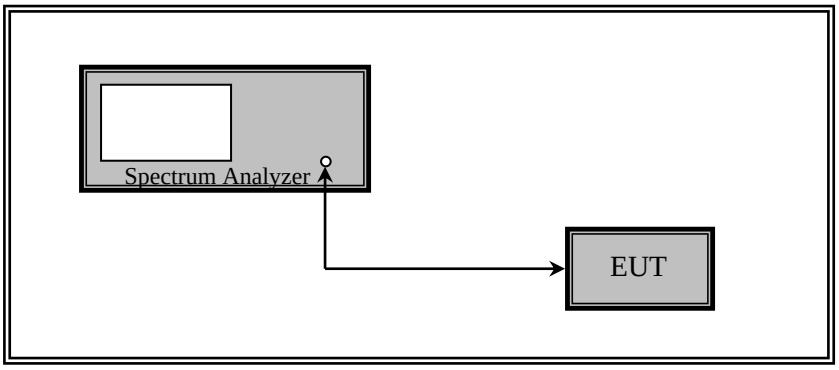
According to ISEDC RSS-247 §6.2.4 for frequency band 5725-5850 MHz:

The maximum conducted output power shall not exceed 1 W. The power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

10.2 Measurement Procedure

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 1 MHz.
3) Set VBW ≥ 3 MHz.
4) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5) Sweep time = auto.
6) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
7) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
8) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

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	05-12-2023	1 year

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:	21ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Libass Thiaw from 02/22/2024 to 02/28/2024 at RF test site.

10.6 Test Results

U-NII-1.IC

Channel	Frequency (MHz)	PSD (dBm/MHz)		DCCF (dB)	E.I.R.P Corrected PSD (dBm/MHz)		IC Limit (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
802.11a mode							
36	5180	4.723	4.517	-	8.723	6.517	10
40	5200	4.412	4.375	-	8.412	6.375	10
48	5240	4.79	4.637	-	8.79	6.637	10
802.11n20 mode							
36	5180	-0.094	0.030	-	9.079		10
40	5200	-0.186	-0.296	-	8.870		10
48	5240	0.290	0.315	-	9.410		10
802.11n40 mode							
38	5190	-0.289	-0.320	0.401	8.806		10
46	5230	0.131	-0.183	0.401	9.087		10
802.11ac80 mode							
42	5210	-4.720	-4.138	0.614	5.305		10
802.11ax20mode							
36	5180	0.369	-0.039	0.119	9.280		10
40	5200	-0.347	-0.649	0.119	8.615		10
48	5240	0.185	-0.286	0.119	9.066		10
802.11ax40mode							
38	5190	-0.056	-0.661	0.105	8.762		10
46	5230	-0.119	-0.330	0.105	8.887		10
802.11ax80mode							
42	5210	-4.018	-3.888	0.135	5.158		10

Note: EIRP PSD [dBm/MHz] = PSD [dBm/MHz] + Antenna Gain [dBi].
Note: EIRP Corrected for MIMO= Total PSD [dBm/MHz] + Antenna Gain [dBi]
*Note: Total PSD [dBm/MHz] = 10*Log (Ant A(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements

U-NII-1.FCC

Channel	Frequency (MHz)	PSD (dBm/MHz)		DCCF (dB)	Corrected PSD (dBm/MHz)		FCC Limit (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
802.11a mode							
36	5180	7.934	7.542	-	-	-	11
40	5200	9.378	9.027	-	-	-	11
48	5240	8.691	9.11	-	-	-	11
802.11n20 mode							
36	5180	5.295	5.212	-	8.264		10.9
40	5200	6.054	6.020	-	9.047		10.9
48	5240	6.412	6.542	-	9.488		10.9
802.11n40 mode							
38	5190	-0.235	-0.331	0.401	2.728		10.9
46	5230	6.391	6.802	0.401	9.612		10.9
802.11ac80 mode							
42	5210	-3.948	-3.548	0.614	-0.733		10.9
802.11ax20							
36	5180	5.483	5.417	0.119	8.460		10.9
40	5200	6.257	6.411	0.119	9.345		10.9
48	5240	6.457	6.697	0.119	9.589		10.9
802.11ax40							
38	5190	-0.056	-0.661	0.105	2.662		10.9
46	5230	6.686	6.077	0.105	9.402		10.9
802.11ax80							
42	5210	-4.018	-3.888	0.135	-0.942		10.9

*Note: Total PSD [dBm/MHz] = 10*Log (Ant A(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

U-NII-2A

Channel	Frequency (MHz)	PSD (dBm/MHz)		DCCF (dB)	Corrected PSD (dBm/MHz)		FCC Limit (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
802.11a mode							
52	5260	9.56	9.25	-	-	-	11
60	5300	9.595	9.152	-	-	-	11
64	5320	5.895	6.246	-	-	-	11
802.11n20 mode							
52	5260	7.677	7.555	-	10.630		10.9
60	5300	7.943	7.834	-	10.899		10.9
64	5320	5.591	5.897	-	8.760		10.9
802.11n40 mode							
54	5270	7.158	6.629	0.401	9.912		10.9
62	5310	-0.744	-0.835	0.401	2.221		10.9
802.11ac80 mode							
56	5290	-2.758	-2.957	0.614	0.154		10.9
802.11ax20							
52	5260	6.674	6.564	0.119	9.630		10.9
60	5300	6.558	6.905	0.119	9.745		10.9
64	5320	4.784	4.826	0.119	7.815		10.9
802.11ax40							
54	5270	4.240	4.120	0.105	7.191		10.9
62	5310	-1.196	-0.975	0.105	1.926		10.9
802.11ax80							
56	5290	-3.130	-3.569	0.135	-0.334		10.9

*Note: Total PSD [dBm/MHz] = 10*Log (Ant A(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

U-NII-2C

Channel	Frequency (MHz)	PSD (dBm/MHz)		DCCF (dB)	Corrected PSD (dBm/MHz)		FCC Limit (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
802.11a mode							
100	5500	7.139	5.757	-	-	-	11
120	5600	9.972	9.601	-	-	-	11
144	5720	9.535	8.761	-	-	-	11
802.11n20 mode							
100	5500	4.804	3.867	-	7.371		10.9
120	5600	8.071	7.600	-	10.852		10.9
144	5720	6.525	6.378	-	9.460		10.9
802.11n40 mode							
102	5510	-0.554	-2.264	0.401	1.685		10.9
118	5590	6.589	6.656	0.401	9.633		10.9
142	5710	7.410	6.568	0.401	10.020		10.9
802.11ac80 mode							
106	5530	-3.173	-4.225	0.614	-0.657		10.9
122	5610	3.313	3.112	0.614	6.224		10.9
138	5690	3.149	2.566	0.614	5.878		10.9
802.11ax20							
106	5530	7.370	6.315	0.119	9.885		10.9
122	5610	7.171	6.209	0.119	9.727		10.9
138	5690	6.953	7.354	0.119	10.168		10.9
802.11ax40							
102	5510	1.053	-0.01	0.105	3.564		10.9
118	5590	6.590	6.208	0.105	9.413		10.9
142	5710	6.858	6.509	0.105	9.697		10.9
802.11ax80							
106	5530	-2.214	-2.930	0.135	0.453		10.9
122	5610	-0.679	-0.770	0.135	2.286		10.9
138	5690	1.232	0.816	0.135	4.039		10.9

*Note: Total PSD [dBm/MHz] = 10*Log (Ant A(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

U-NII-3

Channel	Frequency (MHz)	PSD (dBm/500kHz)		DCCF (dB)	Corrected PSD (dBm/500kHz)		FCC Limit (dBm/500kHz)
		ANT A	ANT B		ANT A	ANT B	
802.11a mode							
149	5745	7.031	6.153	-	-	-	30
157	5785	7.443	5.234	-	-	-	30
165	5825	7.246	8.465	-	-	-	30
802.11n20 mode							
149	5745	6.582	4.388	-	8.632		29.9
157	5785	6.023	6.294	-	9.171		29.9
165	5825	5.390	5.299	-	8.355		29.9
802.11n40 mode							
151	5755	4.229	3.643	0.401	6.956		29.9
159	5795	4.248	3.813	0.401	7.046		29.9
802.11ac80 mode							
155	5775	-2.228	-2.432	0.614	0.681		29.9
802.11ax20							
149	5745	6.035	5.607	0.119	8.837		29.9
157	5785	6.587	5.874	0.119	9.255		29.9
165	5825	6.827	6.474	0.119	9.664		29.9
802.11ax40							
151	5755	3.797	3.352	0.105	6.590		29.9
159	5795	3.954	3.772	0.105	6.874		29.9
802.11ax80							
155	5775	-2.761	-2.896	0.135	0.182		29.9

*Note: Total PSD [dBm/MHz] = 10*Log (Ant A(mw)+Ant B(mw))*
Note: Antenna Gains [dBi] are 4, 2, and 6.1 for ANT A, ANT B and for MIMO, respectively
Note: DCCF was added to 802.11n40, 802.11ac80, and 802.11ax20 modes measurements
Note: maximum PSD [dBm/MHz) shall not exceed 30 dBm in any 500-kHz band
Note: Where applicable, limits are reduced (in dB) by amount that antenna gain exceeds 6dBi.

Fully Loaded Compared to RU 26 PSD for ax20 modes

RU Power Setting	Frequency (MHz)	Fully Loaded PSD (dBm/MHz)		Total Fully Loaded (dBm/MHz)	Partial PSD (dBm/MHz)		Total Partial (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
UNII-1 FCC							
9.5	5180	5.483	5.417	8.460	4.519	4.847	7.696
11	5200	6.257	6.411	9.345	5.96	5.707	8.846
11	5240	6.338	6.578	9.470	5.628	6.005	8.831
UNII-1 IC							
4	5180	0.369	-0.039	3.180	0.937	-3.29	2.329
5	5200	-0.347	-0.649	2.515	-3.876	0.163	1.607
6	5240	0.185	-0.286	2.966	-3.535	0.957	2.278
UNII-2A							
11	5260	6.555	6.445	9.511	6.026	4.598	8.381
11	5300	6.558	6.905	9.745	5.297	6.357	8.870
9	5320	4.784	4.826	7.815	4.235	4.226	7.241
UNII-2C							
11	5500	7.37	6.315	9.885	6.266	4.998	8.688
12	5600	7.171	6.209	9.727	6.523	6.092	9.323
12	5720	6.834	7.235	10.049	6.526	6.451	9.499
UNII-3							
10	5745	6.035	5.607	8.837	4.215	3.701	6.976
11	5785	6.587	5.874	9.255	5.058	5.583	8.339
10	5825	6.708	6.355	9.545	3.782	5.143	7.526

Fully Loaded Compared to RU 52 PSD for ax20 modes

RU Power Setting	Frequency (MHz)	Fully Loaded PSD (dBm/MHz)		Total Fully Loaded (dBm/MHz)	Partial PSD (dBm/MHz)		Total Partial (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
UNII-1 FCC							
9	5180	5.483	5.417	8.460	4.823	4.845	7.844
10	5200	6.257	6.411	9.345	5.933	5.398	8.684
11	5240	6.338	6.578	9.470	6.305	6.468	9.398
UNII-1 IC							
5	5180	0.369	-0.039	3.180	-1.972	0.618	2.524
4	5200	-0.347	-0.649	2.5149	-0.54	-1.346	2.086
5	5240	0.185	-0.286	2.966	-3.755	0.578	1.941
UNII-2A							
14	5260	6.555	6.445	9.511	6.532	6.384	9.469
14	5300	6.558	6.905	9.745	6.025	5.816	8.932
12	5320	4.784	4.826	7.815	3.986	3.96	6.983
UNII-2C							
14	5500	7.37	6.315	9.885	6.093	4.724	8.473
15	5600	7.171	6.209	9.727	6.771	6.443	9.620
15	5720	6.834	7.235	10.049	7.031	6.519	9.793
UNII-3							
13	5745	6.035	5.607	8.837	4.993	5.023	8.018
14	5785	6.587	5.874	9.255	5.192	5.258	8.235
13	5825	6.708	6.355	9.545	5.067	5.346	8.219

Fully Loaded Compared to RU 106 PSD for ax20 modes

RU Power Setting	Frequency (MHz)	Fully Loaded PSD (dBm/MHz)		Total Fully Loaded (dBm/MHz)	Partial PSD (dBm/MHz)		Total Partial (dBm/MHz)
		ANT A	ANT B		ANT A	ANT B	
UNII-1 FCC							
9	5180	5.483	5.417	8.460	4.487	5.244	7.892
11	5200	6.257	6.411	9.345	4.871	5.597	8.259
11	5240	6.338	6.578	9.470	6.227	6.494	9.373
UNII-1 IC							
5	5180	0.369	-0.039	3.180	-1.933	0.611	2.533
4	5200	-0.347	-0.649	2.515	-0.67	-1.805	1.810
5	5240	0.185	-0.286	2.966	-4.286	0.994	2.122
UNII-2A							
14	5260	6.555	6.445	9.512	6.458	6.171	9.327
14	5300	6.558	6.905	9.745	6.017	6.160	9.099
12	5320	4.784	4.826	7.815	4.165	4.146	7.166
UNII-2C							
14	5500	7.37	6.315	9.885	6.101	5.135	8.655
15	5600	7.171	6.209	9.727	6.442	6.134	9.301
15	5720	6.834	7.235	10.049	7.054	6.485	9.790
UNII-3							
13	5745	6.035	5.607	8.837	4.899	4.905	7.912
13	5785	6.587	5.874	9.255	5.302	4.746	8.043
13	5825	6.708	6.355	9.545	5.072	5.190	8.142

Note: confirmed that OOBE evaluated and partial loaded RU produced higher margins than fully loaded

Please refer to the plots in Annex C, Annex K, and Annex L for detailed test results.

11 FCC §15.407(b) & ISEDC RSS-247 §6.2 – Spurious Emissions at Antenna Terminals and Band Edges

11.1 Applicable Standards

According to FCC §15.407(b), undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
4) For transmitters operating solely in the 5.725–5.850 GHz band:
    i. All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
    ii. Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in § 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in § 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
8) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
9) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
10) The provisions of §15.205 apply to intentional radiators operating under this section.

According to ISEDC RSS-247 §6.2.1.2, for transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band.

According to ISEDC RSS-247 §6.2.2.2, devices shall comply with the following:

c. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.; or
d. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text "for indoor use only."

According to ISEDC RSS-247 §6.2.3.2, Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p.at 5850 MHz instead of 5725 MHz.

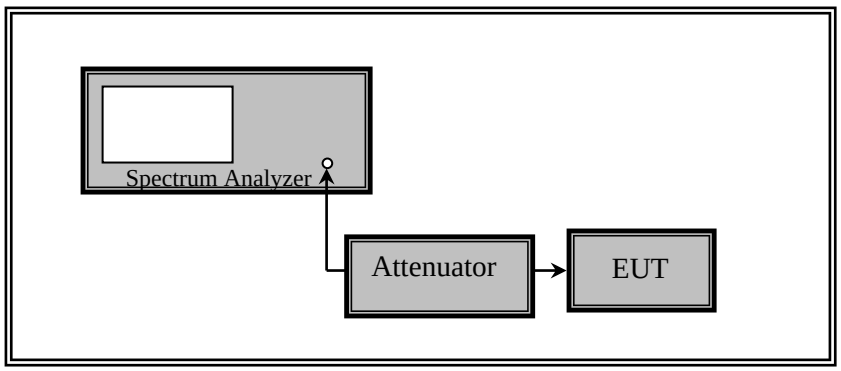
According to ISEDC RSS-247 §6.2.4.3, Devices operating in the band 5725-5850 MHz shall comply with the following e.i.r.p. spectral density limits:

e. 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 Bm/MHz at 5 MHz above or below the band edges;
f. 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
g. 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
h. -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

11.2 Measurement Procedure

1) 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
2) Set RBW = 1 MHz
3) Set VBW = 3 MHz
4) Sweep = coupled
5) Detector function = peak
6) 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	05-12-2023	1 year

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:	21ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

The testing was performed by Libass Thiaw from 02/22/2024 to 02/28/2024 at RF test site.

11.6 Test Results

Please refer to the plots from Annex E, Annex F, Annex G, and Annex H for detailed test results.

12 FCC §15.407(h) & ISEDC RSS-247 §6.3 – Dynamic Frequency Selection

12.1 Applicable Standards

FCC CFR47 §15.407 (h), RSS-247 Issue 3 and KDB: 905462 D02 UNII DFS Compliance Procedures New Rules v02.

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (Without radar detection)	Client (With radar detection)
Non-Occupancy Period	Yes	Not Required	Yes
DFS Detection Threshold	Yes	Not Required	Yes
Channel Availability Check Time	Yes	Not Required	Not Required
U-NII Detection Bandwidth	Yes	Not Required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not Required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not Required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

Table 3: Interference Threshold for Master and Client with Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2 and 3)
EIRP≥ 200 milliwatt	-64 dBm
EIRP< 200 milliwatt and power spectral density < 10dBm/MHz	-62 dBm
EIRP< 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. **Note3**: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds ***See Note 1***.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. ***See Notes 1 and 2***.
U-NII Detection Bandwidth	Minimum 100% of the UNII 99% transmission power bandwidth. ***See Note 3***.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

Table 5: Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

Table 6: Long Pulse Radar Test Signal

Radar Type	Bursts	Chirp Width (MHz)	PRI (usec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

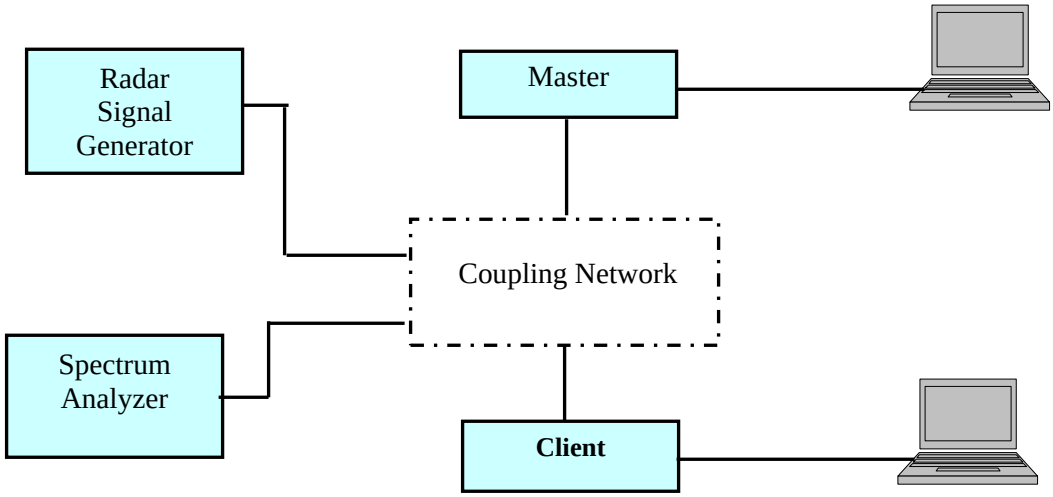
Table 7: Frequency Hopping Radar Test Signal

Radar Type	Pulse Width (usec)	PRI (usec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

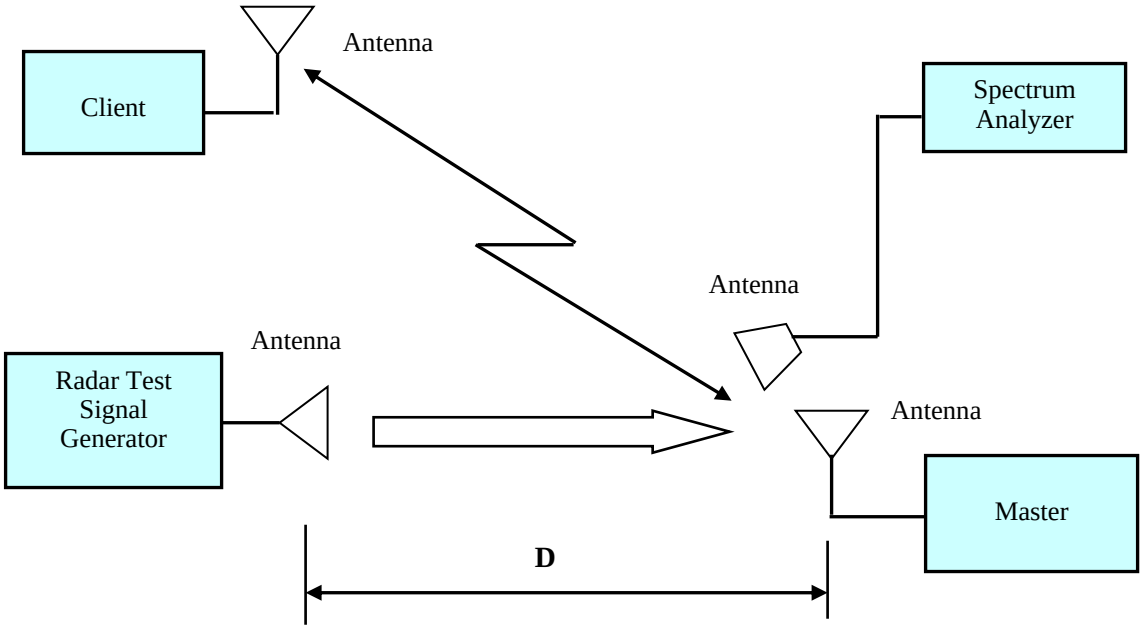
12.2 DFS Measurement System

BACL DFS measurement system consists of two subsystems: (1) The radar signal generating subsystem and (2) the traffic monitoring subsystem.

12.3 System Block Diagram



12.4 Radiated Method



12.5 Test Procedure

The EUT was connected to a certified master device (FCC ID: S9GH350, IC: 5912A-H350). A spectrum analyzer was used as a monitor that verifies the EUT's status, which includes the Channel Closing Transmission Time and the Channel Move Time.

BACL use type 0 radar signal to test the channel move time and channel closing transmission time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time = N * Dwell Time

N is the number of spectrum analyzer bins showing a device transmission
Dwell Time is the dwell time per bin (i.e. Dwell Time = S/B, S is the sweep time and B is the number of bin, i.e. 8192)

12.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
-	-	RF Coaxial Cable 5m	-	-	-[1]	-[1]
-	Mini-Circuits	Pre-Amp	ZVA-183-S+	SN670400946	-[1]	-[1]
1128	Agilent	EXA Signal Analyzer	N9010A	MY48030852	2023-04-25	1 year
624	Agilent	Analyzer, Spectrum	E4446A	MY48250238	2023-05-12	1 year
187	A.R.A.	Horn Antenna	DRG-118/A	1132	2024-03-18	2 years
473	EMCO	Horn Antenna	3115	9511-4627	2022-11-22	2 years
688	Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2023-10-09	1 year

Note[1]: cables, pre-amps, 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".*

12.7 Test Environmental Conditions

Temperature:	21ºC
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

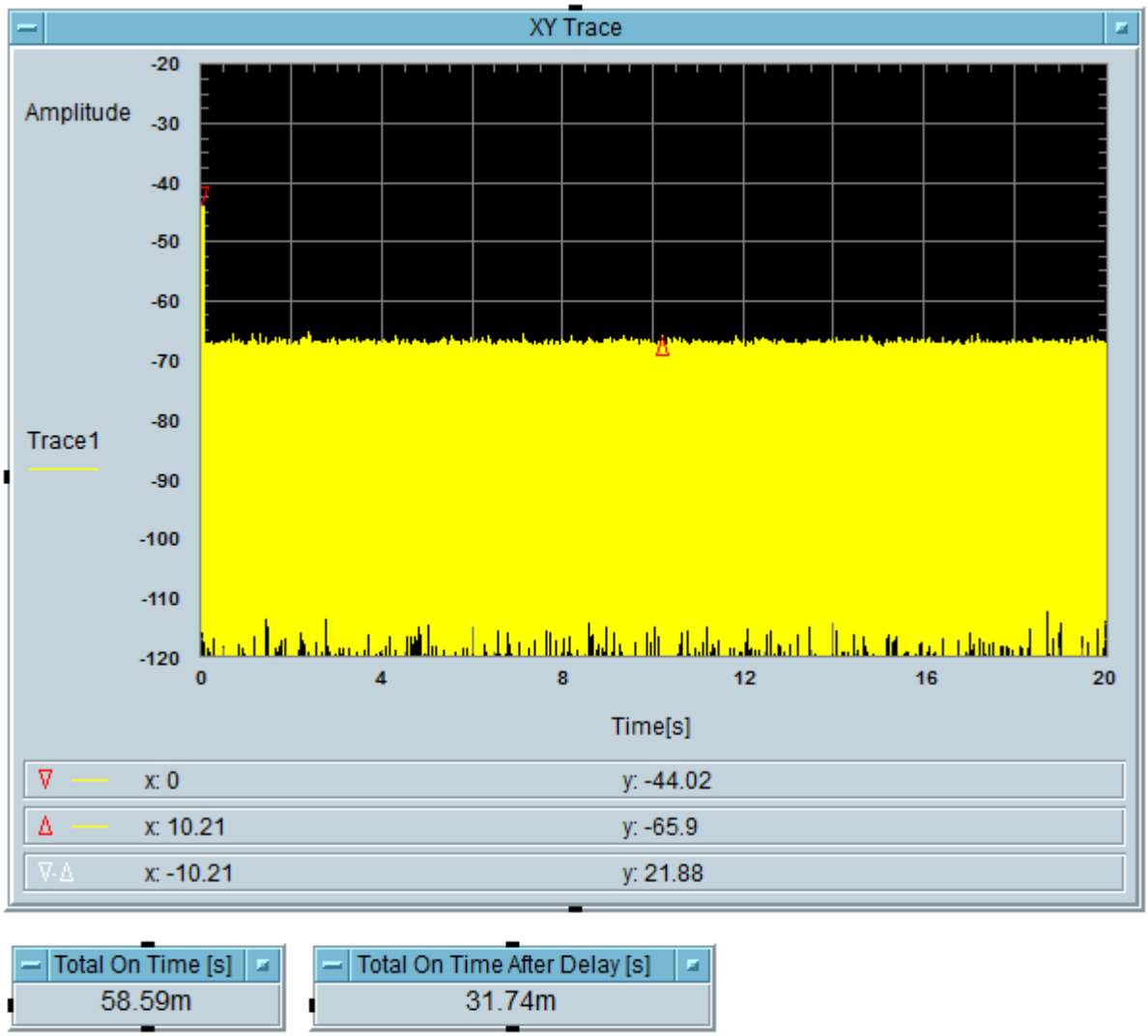
The testing was performed by Xavier Kelley from 03/20/2024 to 03/21/2024 at RF test site.

12.8 Test Results

Channel Move Time

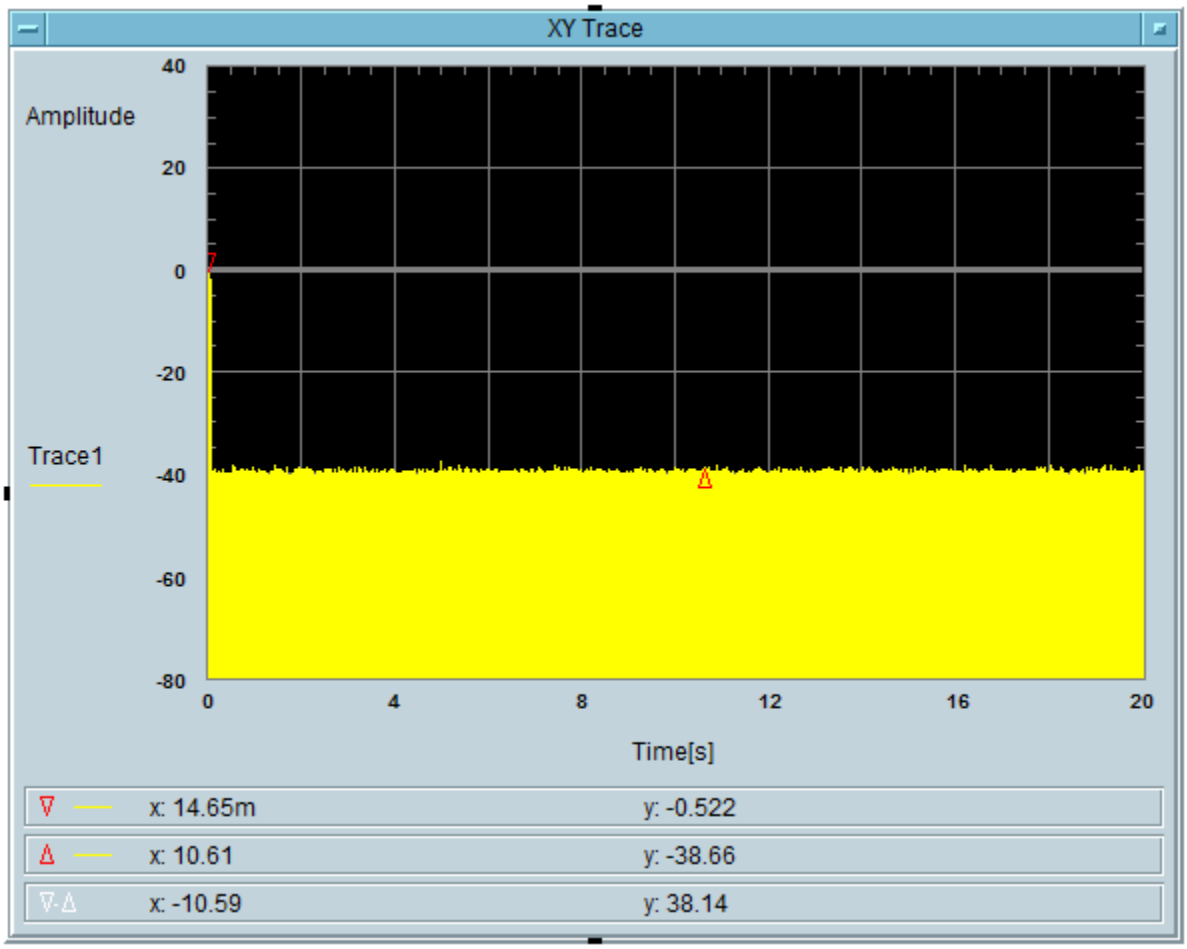
Type 0 radar channel move time less than 10s result

5290 MHz 80 MHz BW

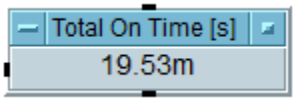


Channel closing transmitting time (ms)	Limit (ms)	Result
58.59+31.74	200	Pass

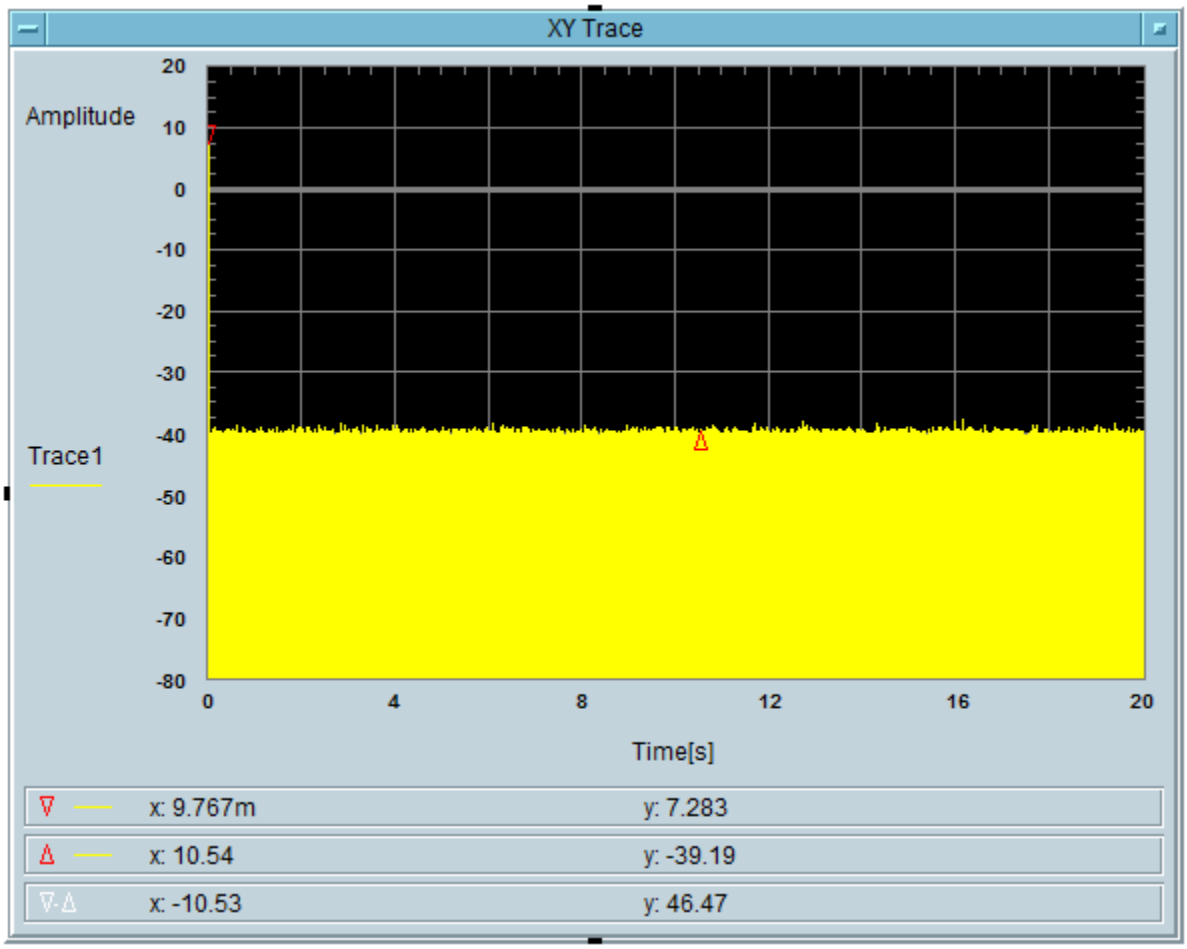
5530MHz 80MHz BW



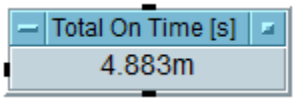
Channel closing transmitting time (ms)	Limit (ms)	Result
19.53	200	Pass



5610 MHz 80 MHz BW

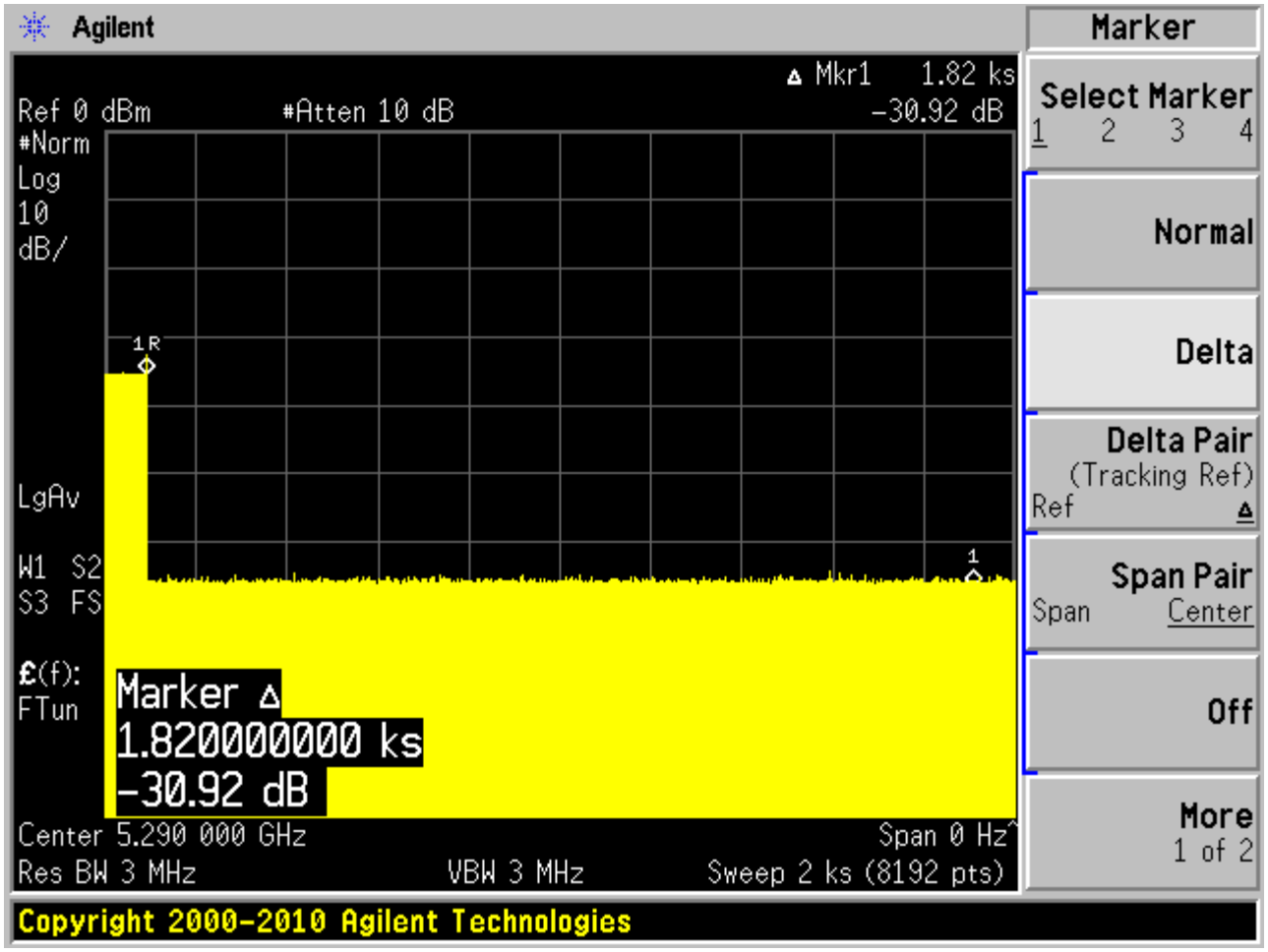


Channel closing transmitting time (ms)	Limit (ms)	Result
4.883	200	Pass

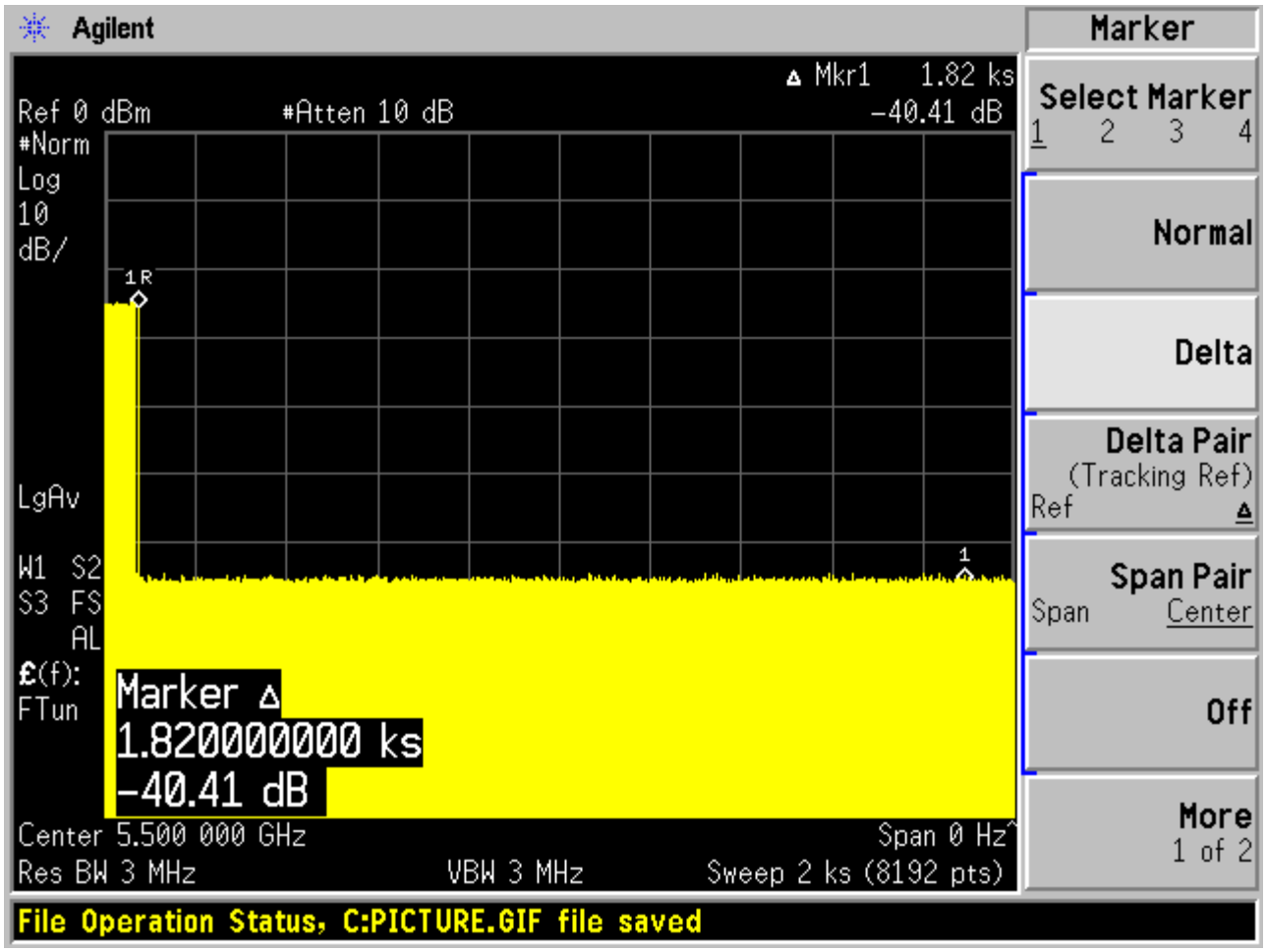


Non-Occupancy Period

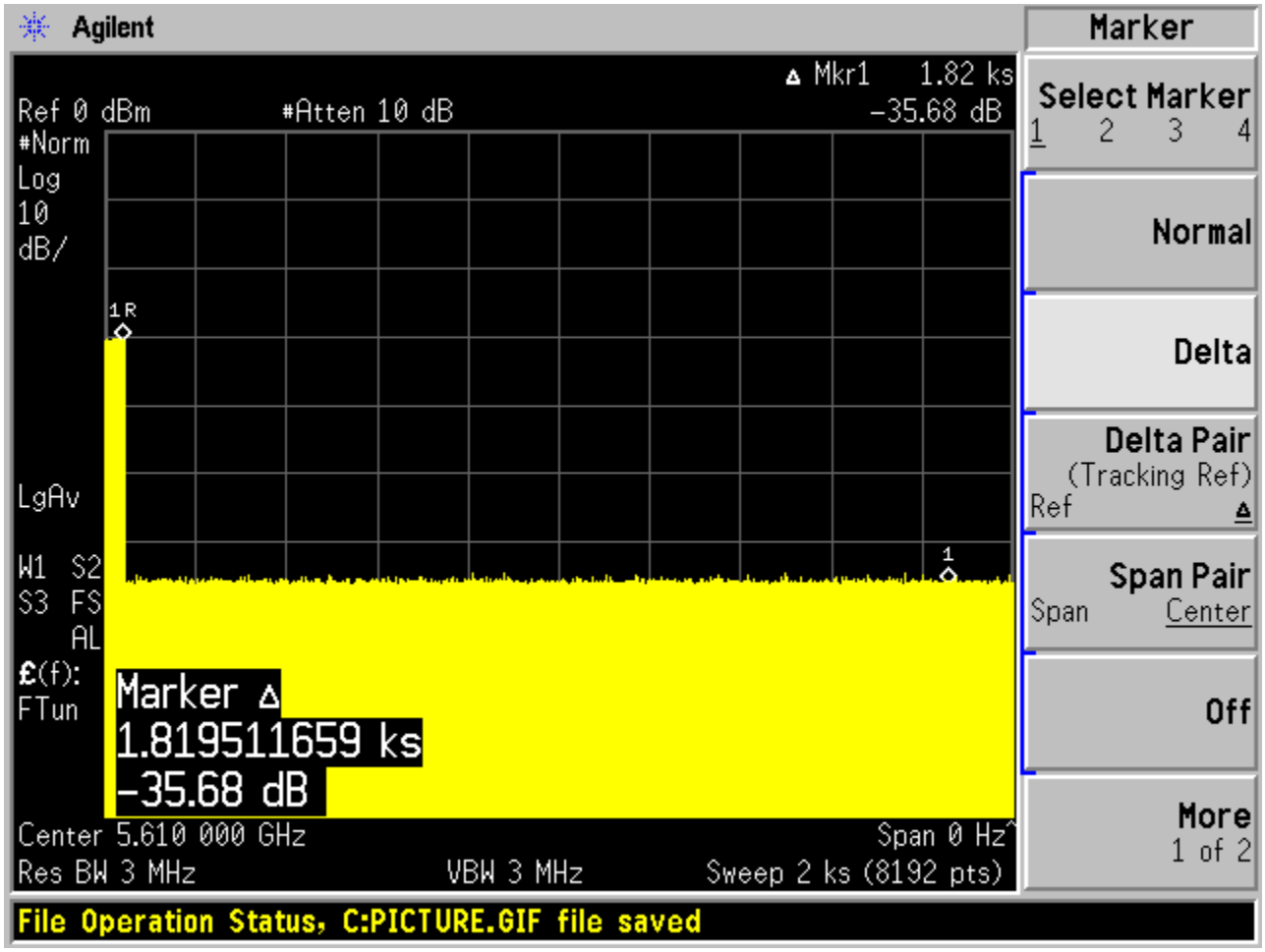
5290 MHz 80 MHz BW



5530 MHz 80 MHz BW



5610 MHz 80 MHz BW



13 Appendix A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

14 Appendix B (Normative) – EUT External Photographs

Please refer to the attachment.

15 Appendix C (Normative) – EUT Internal Photographs

Please refer to the attachment.

16 Appendix D (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 ---