FCC PART 15.407

TEST REPORT

For

Roku Inc.

150 Winchester Circle,

Los Gatos, CA 95032, USA

FCC ID: TC2-R1026

Report Type:	Model:
Original Report	100002421

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Report Number:	R1905296-407
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CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1905296-407	Original Report	2019-08-21

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Roku Inc., Model: 100002421,* FCC ID: TC2-R1026.

1.2 Objective

This report is prepared on behalf of *Roku Inc.* in accordance with FCC CFR47 §15.407.

The objective is to determine compliance with FCC Part 15.407 rules for Output Power, Antenna Requirements, AC Line Conducted Emissions, Emission Bandwidth, Power spectral density, and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

FCC 15.247 Report: R1905296-247 DTS; FCC ID: TC2-R1026
FCC 15.247 Report: R1905296-247 DSS; FCC ID: TC2-R1026

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	±1.48dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 º C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.6 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 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03)*** 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 3279.01)*** 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 EUT 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.

The worst-case data rates are determined by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

2.2 EUT Exercise Software

The test firmware used was Putty, the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting RADIO 2 Ant A &B	Power Setting RADIO 1 Ant A
802.11a	5180	51	58
	5220	51	58
	5240	51	58
	5745	53	63
	5785	52	63
	5825	52	63
802.11n20	5180	52	59
	5220	52	59
	5240	52	59
	5745	54	63
	5785	50	63
	5825	50	63
802.11ac20	5180	54	58
	5220	54	58
	5240	54	58
	5745	54	63
	5785	51	63
	5825	52	63

Data Rates Tested:

802.11a mode: 6Mbps
802.11n HT20 mode: MCS0
802.11ac VHT20 mode: MCS0

Note: Radio 2 is Roku Wifi 1 and Radio 1 is Roku Wifi 2 in the block diagram.

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.

Duty Cycle:

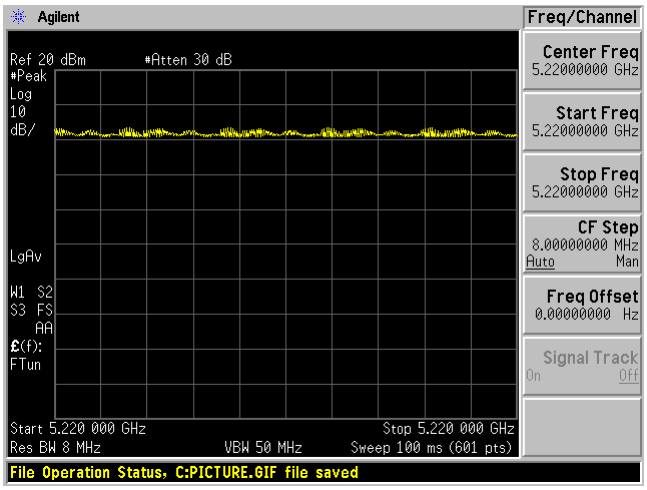
Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	100	100	100	0.00
802.11n20	100	100	100	0.00
802.11ac20	100	100	100	0.00

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

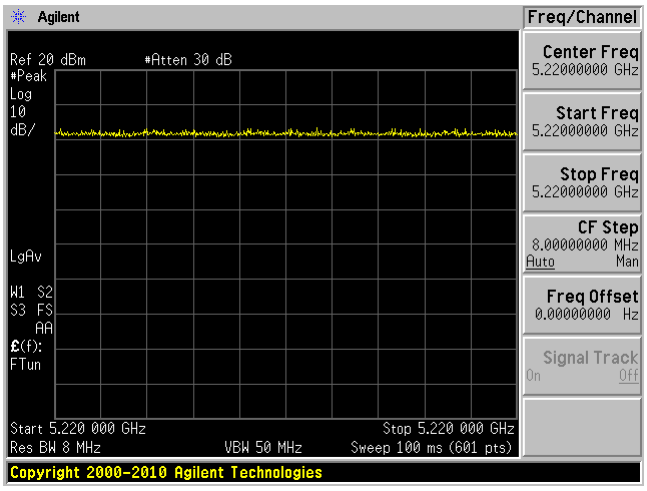
Please refer to the following plots.

Duty Cycle

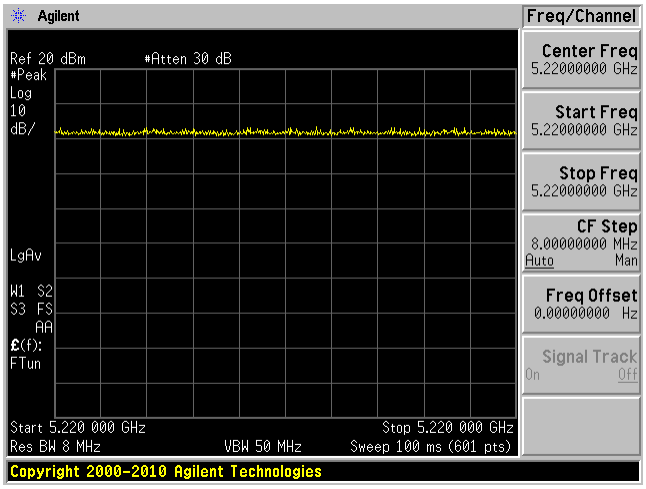
802.11 a mode



802.11 n20 mode



802.11 ac20 mode



2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E6410	3CKRAQ1

2.6 Support Equipment

Manufacturer	Description	Model
Roku	Debug Board	Unknown

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB 2.0 A-Male to B-Male	2 m	Laptop	EUT
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

FCC Rules	Description of Test	Result
§2.1091, §15.407(f),	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207	AC Power Line Conducted Emissions	Compliant
§2.1053, §15.205, §15.209, 15.407(b)	Spurious Radiated Emissions	Compliant
§15.407(e)	Emission Bandwidth	Compliant
§407(a)	Output Power	Compliant
§2.1051, §15.407(b)	Band Edges	Compliant
§15.407(a)	Power Spectral Density	Compliant
§2.1051, §15.407(b)	Spurious Emissions at Antenna Terminals	Compliant

4 FCC §2.1091 & §15.407(f) - RF Exposure

4.1 Applicable Standards

According to FCC §15.407(f) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

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

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

4.2 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

4.3 MPE Results

Radio 1

5 GHz Wi-Fi

Maximum output power at antenna input terminal (dBm):	21.91
Tuned up maximum output power at antenna input terminal (dBm):	22.91
Tuned up maximum output power at antenna input terminal (mW):	195.4339
Prediction distance (cm):	20
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	2.6
Maximum Antenna Gain (numeric):	1.82
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0708
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0708 mW/cm^2. Limit is 1.0 mW/cm^2.

2.4 GHz Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	22.47
Tuned up maximum output power at antenna input terminal (dBm):	23.47
Tuned up maximum output power at antenna input terminal (mW):	222.331
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	1.8
Maximum Antenna Gain (numeric):	1.51
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0670
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0670 mW/cm^2. Limit is 1.0 mW/cm^2.

Radio 2

5 GHz Wi-Fi

Maximum output power at antenna input terminal (dBm):	19.18
Tuned up maximum output power at antenna input terminal (dBm):	20.18
Tuned up maximum output power at antenna input terminal (mW):	104.232
Prediction distance (cm):	20
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	2.6
Maximum Antenna Gain (numeric):	1.82
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0378
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0378 mW/cm^2. Limit is 1.0 mW/cm^2.

2.4 GHz Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	22.02
Tuned up maximum output power at antenna input terminal (dBm):	23.02
Tuned up maximum output power at antenna input terminal (mW):	200.45
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	1.8
Maximum Antenna Gain (numeric):	1.51
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0604
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0604 mW/cm^2. Limit is 1.0 mW/cm^2.

2.4 GHz Classic Bluetooth

Maximum peak output power at antenna input terminal (dBm):	12.81
Tuned up maximum output power at antenna input terminal (dBm):	13.81
Tuned up maximum output power at antenna input terminal (mW):	24.04
Prediction distance (cm):	20
Prediction frequency (MHz):	2402
Maximum Antenna Gain, typical (dBi):	1.8
Maximum Antenna Gain (numeric):	1.51
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.00724
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00724mW/cm^2. Limit is 1.0 mW/cm^2.

Worst case colocation Radio 1 5 GHz Wi-Fi, Radio 2 2.4 GHz Wi-Fi and 2.4 GHz Classic Bluetooth:

Frequency Band	Tuned up Max Conducted Power(dBm)	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
Worst Case							
Radio 1 5 GHz WiFi	22.91	20	0.0708	1.0	7.08%	13.844%	100%
Radio 2 2.4 GHz WiFi	23.02	20	0.0604	1.0	6.04%		
2.4 GHz Classic BT	13.81	20	0.00724	1.0	0.724%		

5 FCC §15.203 - Antenna Requirements

5.1 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 §15.407 (a) (ii), 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.

5.2 Antenna List

The antennas used by the EUT are permanent attached antennas.

	Antenna usage	Band of Operation (GHz)	Maximum Antenna Gain (dBi)
Radio 1	Wi-Fi	2400-2483.5	1.8
	Wi-Fi	5000-6000	2.6
Radio 2	Wi-Fi	2400-2483.5	1.8
	Wi-Fi	5000-6000	2.6

Antenna usage	Band of Operation (GHz)	Maximum Antenna Gain (dBi)
Bluetooth	2400-2483.5	1.8

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 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 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.

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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2017-09-18	2 years
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101964	2018-07-28	1 year
Keysight Technologies	RF Limiter	11867A	MY42242931	2018-09-04	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150202	2019-02-25	1 year
Fairview Microwave	Micro-Coaxial Cable	FMC0101223-360	102515	2019-07-18	1 year
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160130	2019-04-11	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

6.6 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.31 kPa

The testing was performed by Corey Phan on 2019-07-23 in the outside emission test site.

6.7 Summary of Test Results

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

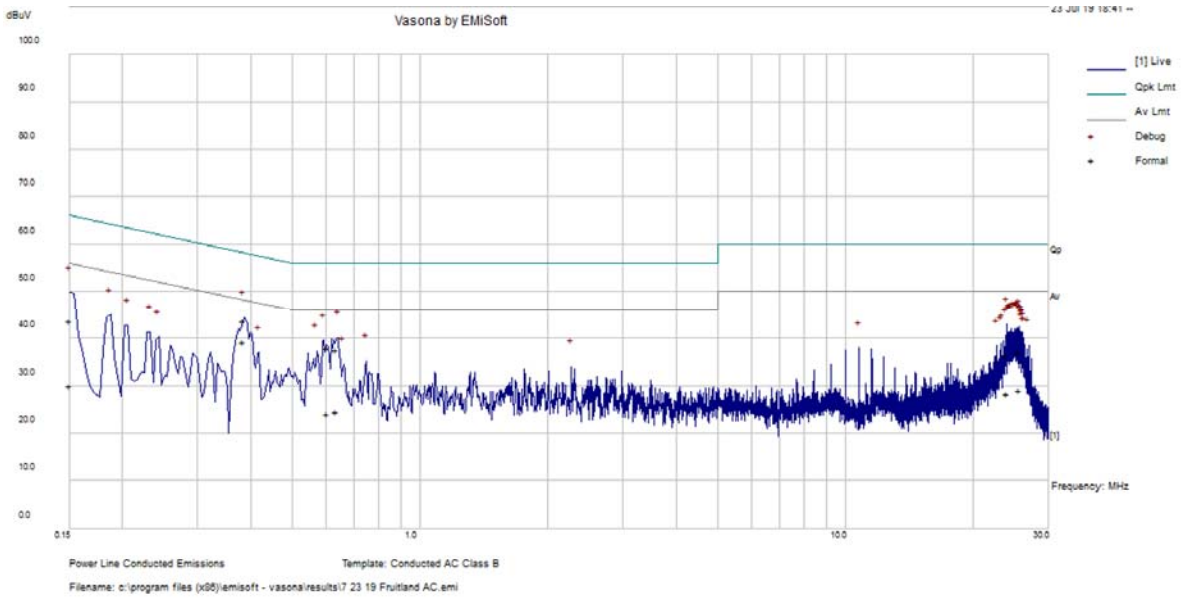
Colocation 5 GHz Wi-Fi and 2.4 GHz Classic Bluetooth

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-8.93	0.384653	Line	0.15-30

6.8 Conducted Emissions Test Plots and Data

Worst Case Colocation, Radio 1-5 GHz Wi-Fi a mode (5745 MHz), Radio 2-5 GHz Wi-Fi ac20 mode (5240 MHz) and 2.4 GHz Classic Bluetooth π/4-DQPSK (2402 MHz)

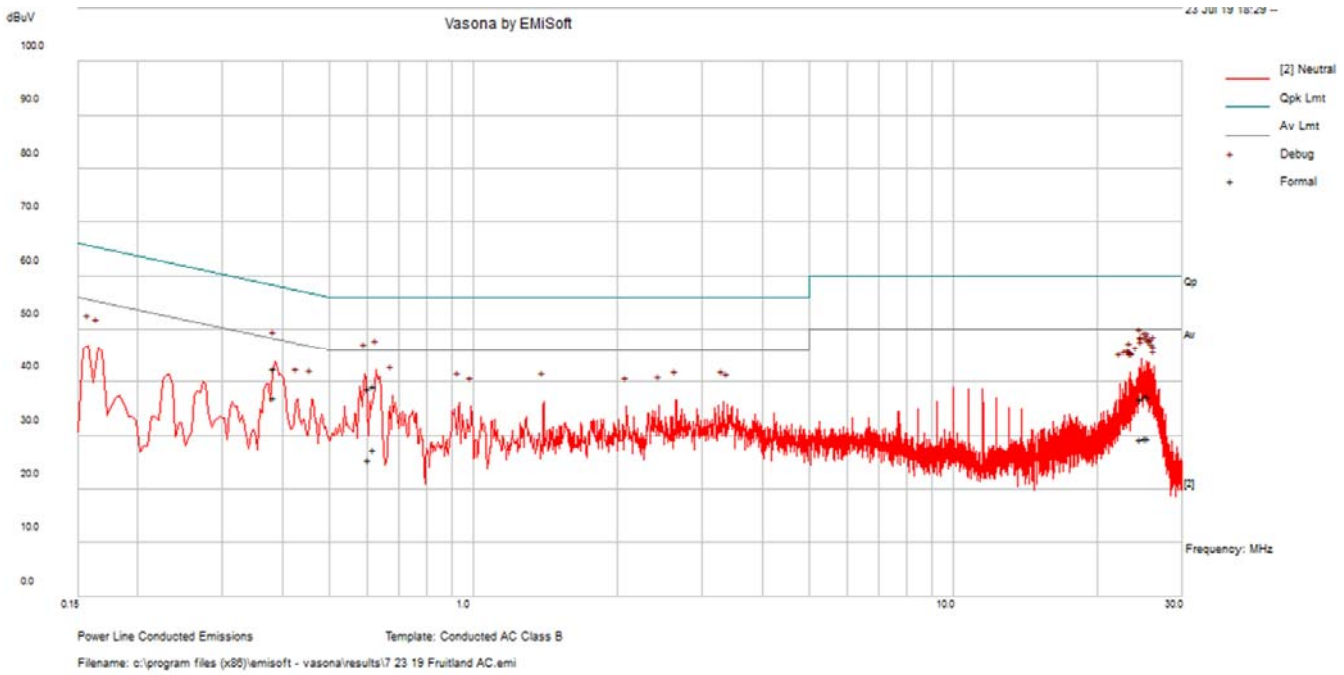
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.384653	43.79	Line	58.18	-14.39	QP
0.634908	37.55	Line	56	-18.45	QP
0.150068	43.66	**Line**	66	-22.34	**QP**
0.607405	37.95	Line	56	-18.05	QP
23.965379	36.35	Line	60	-23.65	QP
25.6339	37.03	Line	60	-22.97	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.384653	**39.25**	**Line**	**48.18**	**-8.93**	**Ave.**
0.634908	24.51	Line	46	-21.49	Ave.
0.150068	30.01	Line	56	-25.99	Ave.
0.607405	24.06	Line	46	-21.94	Ave.
23.965379	28.45	Line	50	-21.55	Ave.
25.6339	29.16	Line	50	-20.84	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.619424	39.18	Neutral	56	-16.82	QP
0.385571	42.53	Neutral	58.16	-15.63	QP
0.604975	38.81	Neutral	56	-17.19	QP
24.568679	36.85	Neutral	60	-23.15	QP
25.191209	37.4	Neutral	60	-22.6	QP
25.495024	37.45	Neutral	60	-22.55	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.619424	27.32	Neutral	46	-18.68	Ave.
0.385571	37.04	Neutral	48.16	-11.12	Ave.
0.604975	25.56	Neutral	46	-20.44	Ave.
24.568679	29.37	Neutral	50	-20.63	Ave.
25.191209	29.66	Neutral	50	-20.34	Ave.
25.495024	29.46	Neutral	50	-20.54	Ave.

7 FCC §15.209 & §15.407(b) - Spurious Radiated Emissions

7.1 Applicable Standard

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 Note 1	3
88 - 216	150 Note 1	3
216 - 960	200 Note 1	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 Part 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 in the 5.725-5.85 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.

(5) 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.

(6) 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.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

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 limits.

The spacing between the peripherals was 10 centimeters.

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

7.3 Test Procedure

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

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

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

7.4 Corrected Amplitude and Margin Calculation

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

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + 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 for Class A. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	2018-10-26	2 years
Agilent	Analyzer, Spectrum	E4440A	US45303156	2019-03-19	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2018-02-26	2 years
EMCO	Antenna, Horn	3115	9511-4627	2018-03-28	2 years
Agilent	Amplifier, Pre	8447D	2443A04374	2018-08-13	1 year
AH Systems	Pre-Amplifier 18-40GHz	PAM-1840VH	170	2018-09-10	1 year
Insulated Wire INC	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1501AN-3960-KPS	DC 1807	2018-03-13	2 years
-	SMA cable	-	C0002	Each time[1]	N/A
HP/Agilent	Pre-Amplifier	8449B	3008A01978	2018-08-17	1 year
Wisewave	Antenna, Horn 18-26.5GHz	ARH-4223-02	10555-02	2017-12-15	2 years
Wisewave	Antenna, Horn 26.5-40GHz	ARH-2823-02	10555-01	2017-09-18	2 years
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2019-04-02	2 years
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note[1]: cables included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

7.6 Test Environmental Conditions

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

The testing was performed by Christian McCaig from 2019-07-03 to 2019-07-22 in 5m chamber 3.

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.407 standards' radiated emissions limits, and had the worst margin of:

Radio 1:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.53	5150	Vertical	a mode, 5180 MHz

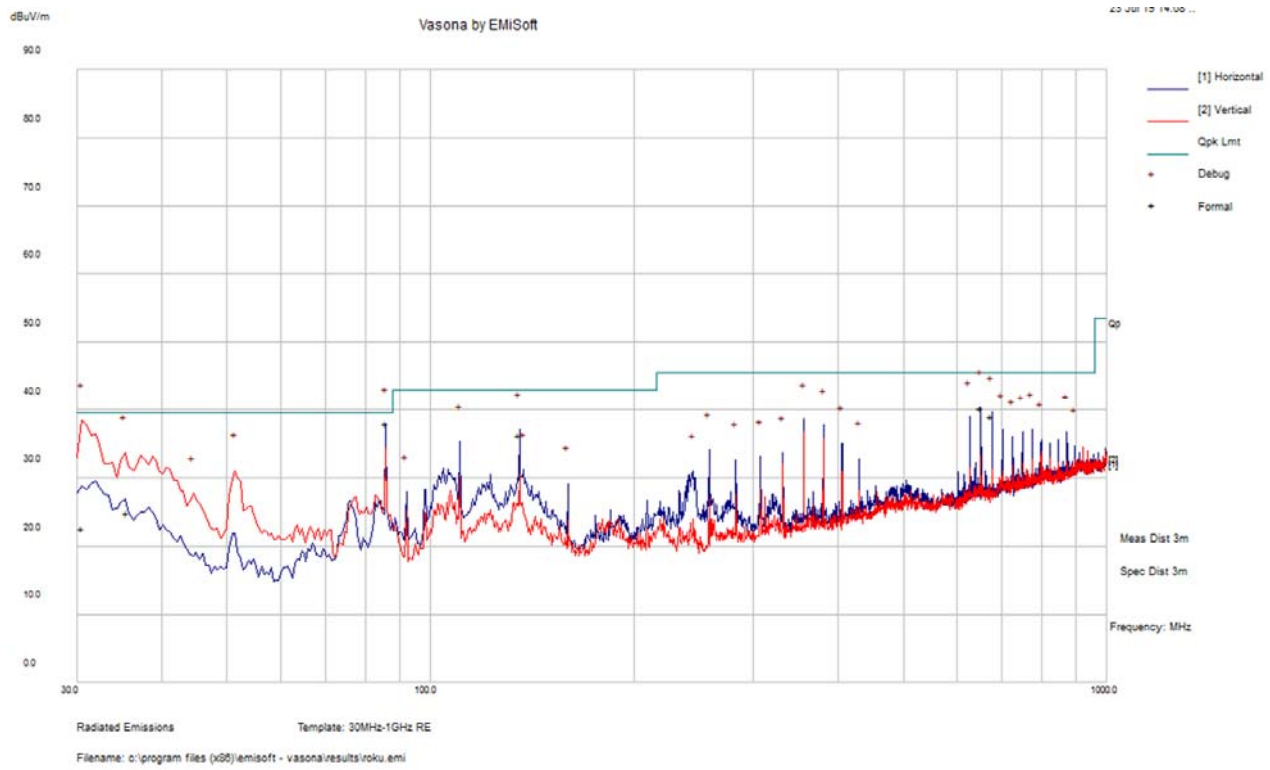
Radio 2:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.34	5180	Vertical	n20 mode, 5180 MHz

7.8 Radiated Emissions Test Result Data

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

Worst Case Colocation, Radio 1-5 GHz Wi-Fi a mode (5745 MHz), Radio 2-5 GHz Wi-Fi ac20 mode (5240 MHz) and 2.4 GHz Classic Bluetooth π/4-DQPSK (2402 MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
30.493	22.55	145	V	145	39.5	-16.95	QP
86.01175	38.09	226	H	226	39.5	-1.41	QP
651.2515	40.24	109	H	109	45.5	-5.26	QP
35.54325	24.93	182	V	182	39.5	-14.57	QP
675.81925	39.07	104	H	104	45.5	-6.43	QP
135.15775	36.22	212	H	212	43	-6.78	QP

2) 1–40 GHz at 3 meter

Radio 1
5150 - 5250 MHz

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5150	61.47	236	160	H	33.59	8.958	35.515	68.50	74	-5.50	PK
5150	46.01	236	160	H	33.59	8.958	35.515	53.04	54	-0.96	AV
5150	61.17	227	197	V	33.542	8.958	35.515	68.15	74	-5.85	PK
5150	46.49	227	197	V	33.542	8.958	35.515	53.47	54	-0.53	AV
10360	43.83	0	100	H	38.17	13.71	35.42	60.29	68	-7.71	PK
10360	44.06	0	100	V	38.13	13.71	35.42	60.48	68	-7.52	PK
Middle Channel 5220 MHz											
10440	43.82	0	100	H	38.23	13.71	34.63	61.13	68	-6.87	PK
10440	43.54	0	100	V	38.15	13.71	34.63	60.78	68	-7.22	PK
High Channel 5240 MHz											
10480	43.60	0	100	H	38.17	13.71	35.42	60.06	68	-7.94	PK
10480	43.22	0	100	V	38.13	13.71	35.42	59.64	68	-8.36	PK

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5150	62.65	234	178	H	33.59	8.958	35.515	69.68	74	-4.32	PK
5150	46.42	234	178	H	33.59	8.958	35.515	53.45	54	-0.55	AV
5150	61.56	226	180	V	33.542	8.958	35.515	68.54	74	-5.46	PK
5150	45.36	226	180	V	33.542	8.958	35.515	52.34	54	-1.66	AV
10360	43.92	0	100	H	38.17	13.71	35.42	60.38	68	-7.62	PK
10360	44.01	0	100	V	38.13	13.71	35.42	60.43	68	-7.57	PK
Middle Channel 5220 MHz											
10440	43.95	0	100	H	38.23	13.71	34.63	61.26	68	-6.74	PK
10440	43.49	0	100	V	38.15	13.71	34.63	60.73	68	-7.27	PK
High Channel 5240 MHz											
10480	43.55	0	100	H	38.17	13.71	35.42	60.01	68	-7.99	PK
10480	43.11	0	100	V	38.13	13.71	35.42	59.53	68	-8.47	PK

802.11ac20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5150	62.34	235	180	H	33.59	8.958	35.515	69.37	74	-4.63	PK
5150	46.18	235	180	H	33.59	8.958	35.515	53.21	54	-0.79	AV
5150	63.03	227	180	V	33.542	8.958	35.515	70.01	74	-3.99	PK
5150	46.24	227	180	V	33.542	8.958	35.515	53.22	54	-0.78	AV
10360	44.15	0	100	H	38.17	13.71	35.42	60.61	68	-7.39	PK
10360	44.95	0	100	V	38.13	13.71	35.42	61.37	68	-6.63	PK
Middle Channel 5220 MHz											
10440	43.73	0	100	H	38.23	13.71	34.63	61.04	68	-6.96	PK
10440	44.31	0	100	V	38.15	13.71	34.63	61.55	68	-6.45	PK
High Channel 5240 MHz											
10480	44.22	0	100	H	38.17	13.71	35.42	60.68	68	-7.32	PK
10480	43.96	0	100	V	38.13	13.71	35.42	60.38	68	-7.62	PK

5725 - 5850 MHz Harmonics

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
11490	41.79	0	100	H	38.44	15.393	33.832	61.79	74.00	-12.21	PK
11490	27.36	0	100	H	38.44	15.393	33.832	47.36	54.00	-6.64	AV
11490	41.89	0	100	V	38.43	15.393	33.832	61.88	74.00	-12.12	PK
11490	27.34	0	100	V	38.43	15.393	33.832	47.33	54.00	-6.67	AV
Middle Channel 5785 MHz											
11570	42.94	0	100	H	38.44	15.393	33.832	62.94	74.00	-11.06	PK
11570	27.77	0	100	H	38.44	15.393	33.832	47.77	54.00	-6.23	AV
11570	42.59	0	100	V	38.43	15.393	33.832	62.58	74.00	-11.42	PK
11570	27.90	0	100	V	38.43	15.393	33.832	47.89	54.00	-6.11	AV
High Channel 5825 MHz											
11650	42.94	0	100	H	38.44	15.393	33.832	62.94	74.00	-11.06	PK
11650	28.65	0	100	H	38.44	15.393	33.832	48.65	54.00	-5.35	AV
11650	43.29	0	100	V	38.43	15.393	33.832	63.28	74.00	-10.72	PK
11650	28.18	0	100	V	38.43	15.393	33.832	48.17	54.00	-5.83	AV

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
11490	42.17	0	100	H	38.44	15.393	33.832	62.17	74.00	-11.83	PK
11490	27.36	0	100	H	38.44	15.393	33.832	47.36	54.00	-6.64	AV
11490	41.94	0	100	V	38.43	15.393	33.832	61.93	74.00	-12.07	PK
11490	27.38	0	100	V	38.43	15.393	33.832	47.37	54.00	-6.63	AV
Middle Channel 5785 MHz											
11570	42.12	0	100	H	38.44	15.393	33.832	62.12	74.00	-11.88	PK
11570	27.86	0	100	H	38.44	15.393	33.832	47.86	54.00	-6.14	AV
11570	42.08	0	100	V	38.43	15.393	33.832	62.07	74.00	-11.93	PK
11570	27.83	0	100	V	38.43	15.393	33.832	47.82	54.00	-6.18	AV
High Channel 5825 MHz											
11650	43.53	0	100	H	38.44	15.393	33.832	63.53	74.00	-10.47	PK
11650	28.43	0	100	H	38.44	15.393	33.832	48.43	54.00	-5.57	AV
11650	42.76	0	100	V	38.43	15.393	33.832	62.75	74.00	-11.25	PK
11650	28.45	0	100	V	38.43	15.393	33.832	48.44	54.00	-5.56	AV

802.11ac20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
11490	41.73	0	100	H	38.44	15.393	33.832	61.73	74.00	-12.27	PK
11490	27.06	0	100	H	38.44	15.393	33.832	47.06	54.00	-6.94	AV
11490	42.13	0	100	V	38.43	15.393	33.832	62.12	74.00	-11.88	PK
11490	27.11	0	100	V	38.43	15.393	33.832	47.10	54.00	-6.90	AV
Middle Channel 5785 MHz											
11570	41.85	0	100	H	38.44	15.393	33.832	61.85	74.00	-12.15	PK
11570	27.19	0	100	H	38.44	15.393	33.832	47.19	54.00	-6.81	AV
11570	41.10	0	100	V	38.43	15.393	33.832	61.09	74.00	-12.91	PK
11570	27.13	0	100	V	38.43	15.393	33.832	47.12	54.00	-6.88	AV
High Channel 5825 MHz											
11650	41.71	0	100	H	38.44	15.393	33.832	61.71	74.00	-12.29	PK
11650	27.27	0	100	H	38.44	15.393	33.832	47.27	54.00	-6.73	AV
11650	42.04	0	100	V	38.43	15.393	33.832	62.03	74.00	-11.97	PK
11650	27.24	0	100	V	38.43	15.393	33.832	47.23	54.00	-6.77	AV

5725 - 5850 MHz Band Edges

Please refer to Annex D for plots.

Radio 2
5150 - 5250 MHz

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5150	62.96	114	164	H	33.59	8.958	35.515	69.99	74	-4.01	PK
5150	44.90	114	164	H	33.59	8.958	35.515	51.93	54	-2.07	AV
5150	63.05	193	190	V	33.542	8.958	35.515	70.03	74	-3.97	PK
5150	46.04	193	190	V	33.542	8.958	35.515	53.02	54	-0.98	AV
10360	50.73	30	191	H	38.17	13.71	35.42	67.19	68	-0.81	PK
10360	50.63	177	190	V	38.13	13.71	35.42	67.05	68	-0.95	PK
Middle Channel 5220 MHz											
10440	50.29	123	195	H	38.23	13.71	34.63	67.60	68	-0.4	PK
10440	49.34	31	190	V	38.15	13.71	34.63	66.58	68	-1.42	PK
High Channel 5240 MHz											
10480	48.88	30	198	H	38.17	13.71	35.42	65.34	68	-2.66	PK
10480	50.73	125	187	V	38.13	13.71	35.42	67.15	68	-0.85	PK

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5150	64.18	115	159	H	33.59	8.958	35.515	71.21	74	-2.79	PK
5150	46.23	115	159	H	33.59	8.958	35.515	53.26	54	-0.74	AV
5150	59.53	202	158	V	33.542	8.958	35.515	66.51	74	-7.49	PK
5150	41.06	202	158	V	33.542	8.958	35.515	48.04	54	-5.96	AV
10360	49.69	28	198	H	38.17	13.71	35.42	66.15	68	-1.85	PK
10360	51.24	127	192	V	38.13	13.71	35.42	67.66	68	-0.34	PK
Middle Channel 5220 MHz											
10440	48.55	138	191	H	38.23	13.71	34.63	65.86	68	-2.14	PK
10440	49.13	185	186	V	38.15	13.71	34.63	66.37	68	-1.63	PK
High Channel 5240 MHz											
10480	48.63	29	170	H	38.17	13.71	35.42	65.09	68	-2.91	PK
10480	48.67	136	185	V	38.13	13.71	35.42	65.09	68	-2.91	PK

802.11ac20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5180 MHz											
5150	64.18	154	133	H	33.59	8.958	35.515	71.21	74	-2.79	PK
5150	46.51	133	154	H	33.59	8.958	35.515	53.54	54	-0.46	AV
5150	64.31	190	231	V	33.542	8.958	35.515	71.29	74	-2.71	PK
5150	46.13	190	231	V	33.542	8.958	35.515	53.11	54	-0.89	AV
10360	50.92	34	108	H	38.17	13.71	35.42	67.38	68	-0.62	PK
10360	51.15	181	109	V	38.13	13.71	35.42	67.57	68	-0.43	PK
Middle Channel 5220 MHz											
10440	49.87	41	124	H	38.17	11.06	35.42	63.68	68	-4.32	PK
10440	49.43	200	131	V	38.13	11.06	35.42	63.20	68	-4.8	PK
High Channel 5240 MHz											
10480	48.31	41	134	H	38.17	11.06	35.42	62.12	68	-5.88	PK
10480	48.78	192	161	V	38.13	11.06	35.42	62.55	68	-5.45	PK

5725 - 5850 MHz Harmonics

802.11a mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
11490	47.35	74	170	H	38.44	15.393	33.832	67.35	74.00	-6.65	PK
11490	32.82	74	170	H	38.44	15.393	33.832	52.82	54.00	-1.18	AV
11490	47.59	85	188	V	38.43	15.393	33.832	67.58	74.00	-6.42	PK
11490	33.35	85	188	V	38.43	15.393	33.832	53.34	54.00	-0.66	AV
Middle Channel 5785 MHz											
11570	45.00	74	168	H	38.44	15.393	33.832	65.00	74.00	-9.00	PK
11570	32.78	74	168	H	38.44	15.393	33.832	52.78	54.00	-1.22	AV
11570	48.27	86	197	V	38.43	15.393	33.832	68.26	74.00	-5.74	PK
11570	33.49	86	197	V	38.43	15.393	33.832	53.48	54.00	-0.52	AV
High Channel 5825 MHz											
11650	47.83	75	157	H	38.44	15.393	33.832	67.83	74.00	-6.17	PK
11650	33.08	75	157	H	38.44	15.393	33.832	53.08	54.00	-0.92	AV
11650	47.57	86	206	V	38.43	15.393	33.832	67.56	74.00	-6.44	PK
11650	33.06	86	206	V	38.43	15.393	33.832	53.05	54.00	-0.95	AV

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
11490	47.65	80	196	H	38.44	15.393	33.832	67.65	74.00	-6.35	PK
11490	32.04	80	196	H	38.44	15.393	33.832	52.04	54.00	-1.96	AV
11490	48.68	85	188	V	38.43	15.393	33.832	68.67	74.00	-5.33	PK
11490	33.35	85	188	V	38.43	15.393	33.832	53.34	54.00	-0.66	AV
Middle Channel 5785 MHz											
11570	45.48	80	125	H	38.44	15.393	33.832	65.48	74.00	-8.52	PK
11570	30.42	80	125	H	38.44	15.393	33.832	50.42	54.00	-3.58	AV
11570	49.00	175	218	V	38.43	15.393	33.832	68.99	74.00	-5.01	PK
11570	33.04	175	218	V	38.43	15.393	33.832	53.03	54.00	-0.97	AV
High Channel 5825 MHz											
11650	47.05	75	157	H	38.44	15.393	33.832	67.05	74.00	-6.95	PK
11650	31.54	75	157	H	38.44	15.393	33.832	51.54	54.00	-2.46	AV
11650	48.21	175	206	V	38.43	15.393	33.832	68.20	74.00	-5.80	PK
11650	33.14	175	206	V	38.43	15.393	33.832	53.13	54.00	-0.87	AV

802.11ac20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments (PK/Ave.)
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 5745 MHz											
11490	46.59	76	206	H	38.44	15.393	33.832	66.59	74.00	-7.41	PK
11490	31.15	76	206	H	38.44	15.393	33.832	51.15	54.00	-2.85	AV
11490	48.22	176	205	V	38.43	15.393	33.832	68.21	74.00	-5.79	PK
11490	33.00	176	205	V	38.43	15.393	33.832	52.99	54.00	-1.01	AV
Middle Channel 5785 MHz											
11570	48.01	78	182	H	38.44	15.393	33.832	68.01	74.00	-5.99	PK
11570	32.39	78	182	H	38.44	15.393	33.832	52.39	54.00	-1.61	AV
11570	48.79	175	196	V	38.43	15.393	33.832	68.78	74.00	-5.22	PK
11570	33.35	175	196	V	38.43	15.393	33.832	53.34	54.00	-0.66	AV
High Channel 5825 MHz											
11650	47.03	73	165	H	38.44	15.393	33.832	67.03	74.00	-6.97	PK
11650	31.76	73	165	H	38.44	15.393	33.832	51.76	54.00	-2.24	AV
11650	48.06	175	206	V	38.43	15.393	33.832	68.05	74.00	-5.95	PK
11650	32.95	175	206	V	38.43	15.393	33.832	52.94	54.00	-1.06	AV

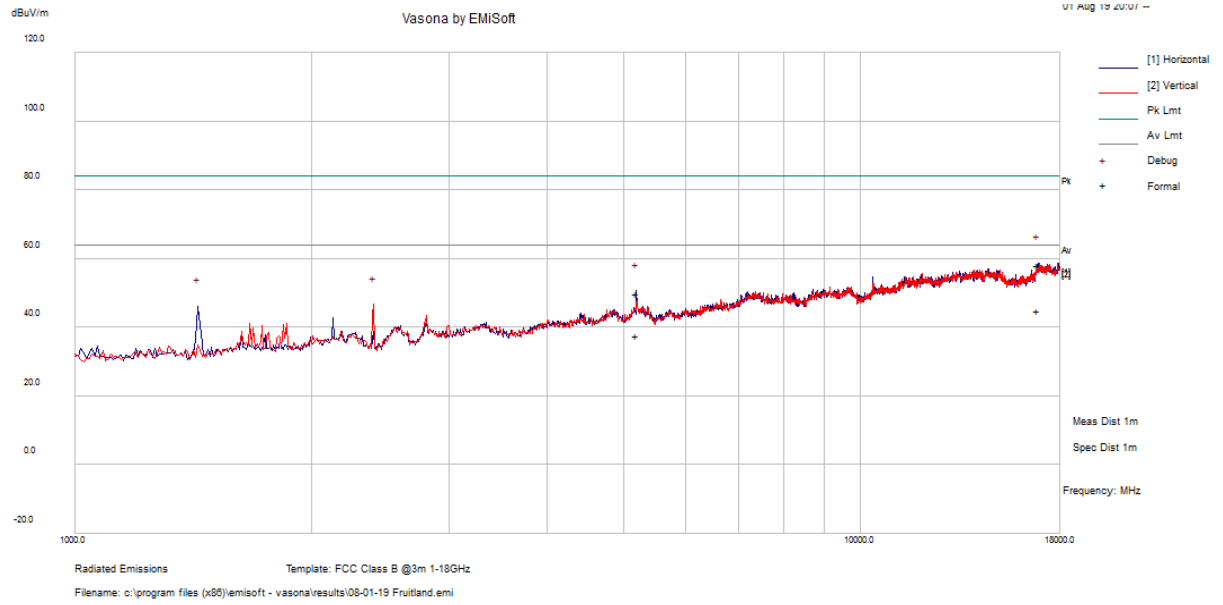
5725 - 5850 MHz Band Edges

Please refer to Annex D for plots.

Note 1: Any emissions above 12 GHz are emissions from the noise floor.
Note 2: The worst-case modulations were used to show compliance.

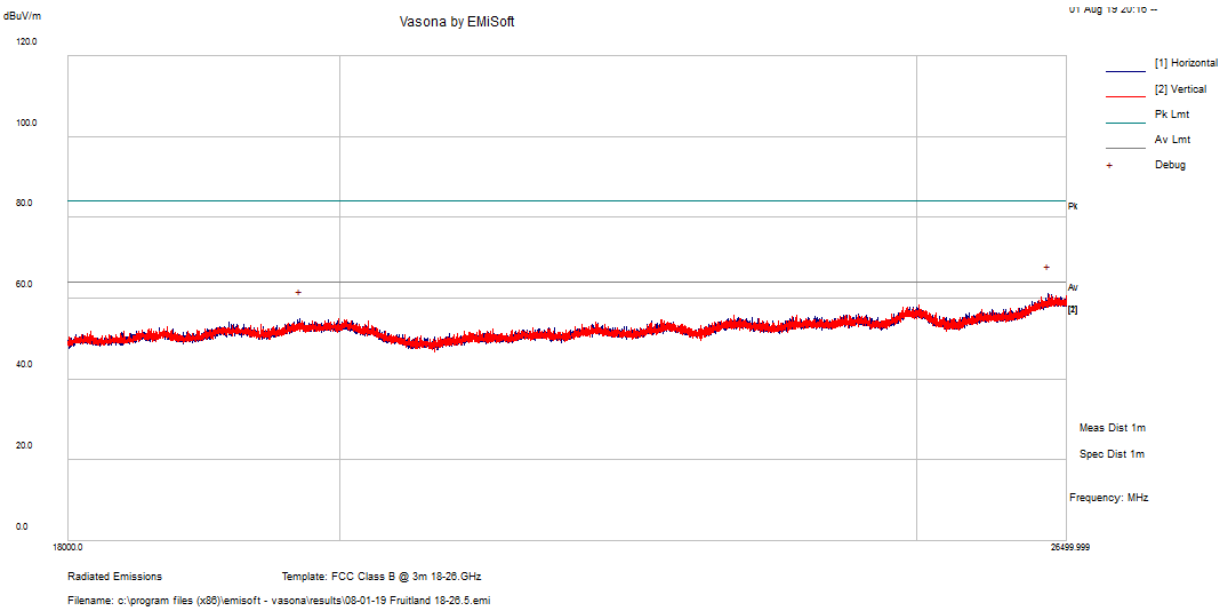
1 GHz – 18 GHz Worst Case Scan at 1 meter

Worst Case Colocation, Radio 1-5 GHz Wi-Fi, Radio 2-5 GHz Wi-Fi and 2.4 GHz Classic Bluetooth



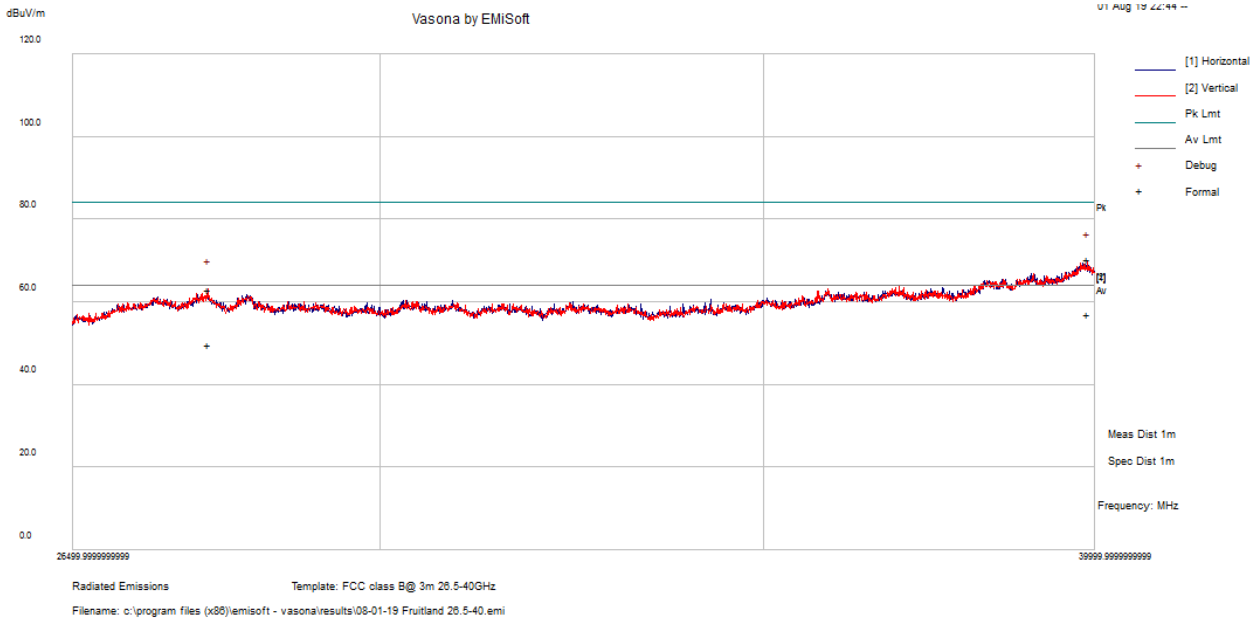
18 GHz – 26.5 GHz Worst Case Scan at 1 meter

Worst Case Colocation, Radio 1-5 GHz Wi-Fi, Radio 2-5 GHz Wi-Fi and 2.4 GHz Classic Bluetooth



26.5 GHz – 40 GHz Worst Case Scan at 1 meter

Worst Case Colocation, Radio 1-5 GHz Wi-Fi, Radio 2-5 GHz Wi-Fi and 2.4 GHz Classic Bluetooth



8 FCC §15.407(e) - 6 dB, 26 dB & 99% Occupied Bandwidth

8.1 Applicable Standards

As per FCC §15.407(e): 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

The measurements are based on FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01: C. Bandwidth Measurement.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US45303156	2019-03-06	1 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

8.4 Test Environmental Conditions

Temperature:	24 ºC
Relative Humidity:	44 %
ATM Pressure:	102.5kPa

The testing was performed by Zhao Zhao on 2019-07-09 in RF site.

8.5 Test Results

Please refer to the following table

5150 - 5250 MHz

RADIO 2 Ant A

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
36	5180	16.9706	30
44	5220	16.6915	27.723
48	5240	16.6514	26.487
802.11n20 mode			
36	5180	17.9440	30
44	5220	17.8145	29.486
48	5240	17.7594	27.247
802.11ac20 mode			
36	5180	18.6797	30
44	5220	18.0355	30
48	5240	17.8986	30

RADIO 2 Ant B

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
36	5180	16.5336	20.853
44	5220	16.5304	20.765
48	5240	16.5271	20.778
802.11n20 mode			
36	5180	17.6373	21.477
44	5220	17.6396	21.437
48	5240	17.6402	21.464
802.11ac20 mode			
36	5180	17.6631	21.566
44	5220	17.6691	21.656
48	5240	17.6662	21.627

RADIO 1 Ant A

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
36	5180	19.8957	30
44	5220	20.4561	30
48	5240	20.5840	30
802.11n20 mode			
36	5180	20.3306	30
44	5220	21.0414	30
48	5240	21.5254	30
802.11ac20 mode			
36	5180	20.6212	30
44	5220	21.1964	30
48	5240	21.4187	30

5725 - 5850 MHz

RADIO 2 Ant A

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	6 dB OBW limit (kHz)
802.11a mode				
149	5745	17.0142	16.509	≥500
157	5785	16.7590	16.509	≥500
165	5825	16.6905	16.541	≥500
802.11n20 mode				
149	5745	18.2729	17.689	≥500
157	5785	17.8279	17.674	≥500
165	5825	17.7597	17.656	≥500
802.11ac20 mode				
149	5745	18.3000	17.717	≥500
157	5785	17.8622	17.663	≥500
165	5825	17.8046	17.653	≥500

RADIO 2 Ant B

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	6 dB OBW limit (kHz)
802.11a mode				
149	5745	16.5302	16.525	≥500
157	5785	16.5141	16.505	≥500
165	5825	16.5266	16.532	≥500
802.11n20 mode				
149	5745	17.6352	17.663	≥500
157	5785	17.6181	17.666	≥500
165	5825	17.6264	17.658	≥500
802.11ac20 mode				
149	5745	17.6494	17.671	≥500
157	5785	17.6370	17.668	≥500
165	5825	17.6395	17.663	≥500

RADIO 1 Ant A

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	6 dB OBW limit (kHz)
802.11a mode				
149	5745	21.4969	16.495	≥500
157	5785	21.3076	16.494	≥500
165	5825	21.1206	16.508	≥500
802.11n20 mode				
149	5745	22.3259	17.761	≥500
157	5785	21.6614	17.763	≥500
165	5825	21.7002	17.749	≥500
802.11ac20 mode				
149	5745	22.4698	17.756	≥500
157	5785	22.0599	17.768	≥500
165	5825	21.8278	17.769	≥500

Please refer to Annex D for plots.

9 FCC §15.407(a) - 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 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.

9.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01: E. Maximum Conducted Output Power.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
ETS-LINDGREN	Power Sensor	7002-006	160097	2018-12-31	2 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

Temperature:	24º C
Relative Humidity:	44 %
ATM Pressure:	102.5 KPa

The testing was performed by Zhao Zhao on 2019-07-09 in RF site.

9.5 Test Results

5150 - 5250 MHz

RADIO 2

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
		ANT A	ANT B		
802.11a mode					
Low	5180	15.62	13.58	17.73	24.00
Middle	5220	15.59	13.67	17.75	24.00
High	5240	15.37	13.56	17.57	24.00
802.11n20 mode					
Low	5180	15.79	14.29	18.11	24.00
Middle	5220	15.55	14.31	17.98	24.00
High	5240	15.46	14.19	17.88	24.00
802.11ac20 mode					
Low	5180	16.41	14.81	18.69	24.00
Middle	5220	16.78	14.85	18.93	24.00
High	5240	16.69	14.97	18.92	24.00

RADIO 1

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
802.11a mode			
Low	5180	18.63	24.00
Middle	5220	18.83	24.00
High	5240	19.09	24.00
802.11n20 mode			
Low	5180	19.17	24.00
Middle	5220	19.23	24.00
High	5240	19.18	24.00
802.11ac20 mode			
Low	5180	18.84	24.00
Middle	5220	18.95	24.00
High	5240	18.89	24.00

5745 - 5825 MHz

RADIO 2

Channel	Frequency (MHz)	Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
		ANT A	ANT B		
802.11a mode					
Low	5745	16.58	13.97	18.48	30
Middle	5785	15.84	13.27	17.75	30
High	5825	15.27	13.29	17.40	30
802.11n20 mode					
Low	5745	17.13	14.93	19.18	30
Middle	5785	15.29	13.05	17.32	30
High	5825	14.99	12.97	17.11	30
802.11ac20 mode					
Low	5745	16.95	14.38	18.86	30
Middle	5785	15.33	13.35	17.46	30
High	5825	15.16	13.46	17.40	30

RADIO 1

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
802.11a mode			
Low	5745	21.91	30.00
Middle	5785	20.56	30.00
High	5825	20.19	30.00
802.11n20 mode			
Low	5745	20.84	30.00
Middle	5785	20.55	30.00
High	5825	20.24	30.00
802.11ac20 mode			
Low	5745	20.86	30.00
Middle	5785	20.53	30.00
High	5825	20.07	30.00

10 FCC §15.407(a) - Power Spectral Density

10.1 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.

10.2 Measurement Procedure

The measurements are based on FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01: F. Maximum Power Spectral Density (PSD).

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US45303156	2019-03-06	1 year
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

10.4 Test Environmental Conditions

Temperature:	24 ºC
Relative Humidity:	44 %
ATM Pressure:	102.5 kPa

The testing was performed by Zhao Zhao on 2019-07-09 in RF site.

10.5 Test Results

RADIO 2
5150 - 5250 MHz

Channel	Frequency (MHz)	PSD (dBm/MHz)		Total (dBm/MHz)	Limit (dBm/MHz)
		ANT A	ANT B		
802.11a mode					
Low	5180	5.463	2.720	7.31	11.00
Middle	5220	4.872	2.903	7.01	11.00
High	5240	4.473	2.381	6.56	11.00
802.11n20 mode					
Low	5180	4.787	3.311	7.12	11.00
Middle	5220	4.431	3.019	6.79	11.00
High	5240	4.073	2.830	6.51	11.00
802.11ac20 mode					
Low	5180	6.072	3.512	7.99	11.00
Middle	5220	5.700	3.609	7.79	11.00
High	5240	5.215	3.174	7.32	11.00

RADIO 1

Channel	Frequency (MHz)	PSD (dBm/MHz)	Limit (dBm/MHz)
802.11a mode			
Low	5180	9.396	11.00
Middle	5220	9.580	11.00
High	5240	9.492	11.00
802.11n20 mode			
Low	5180	8.963	11.00
Middle	5220	9.467	11.00
High	5240	9.321	11.00
802.11ac20 mode			
Low	5180	9.052	11.00
Middle	5220	9.313	11.00
High	5240	9.160	11.00

RADIO 2
5745 - 5825 MHz

Channel	Frequency (MHz)	PSD (dBm/100 kHz)		Total PSD (dBm/100 kHz)	Corrected PSD Total (dBm/500 kHz)	Limit (dBm/500 kHz)
		ANT A	ANT B			
802.11a mode						
Low	5745	-3.982	-6.247	-1.96	5.03	30
Middle	5785	-4.131	-6.354	-2.09	4.90	30
High	5825	-4.204	-6.622	-2.24	4.75	30
802.11n20 mode						
Low	5745	-3.937	-6.647	-2.07	4.92	30
Middle	5785	-4.810	-7.890	-3.07	3.92	30
High	5825	-4.777	-7.617	-2.96	4.03	30
802.11ac20 mode						
Low	5745	-3.965	-6.620	-2.08	4.91	30
Middle	5785	-4.701	-7.299	-2.80	4.19	30
High	5825	-5.197	-7.176	-3.06	3.93	30

RADIO 1

Channel	Frequency (MHz)	PSD (dBm/MHz)	Corrected PSD Total (dBm/500 kHz	Limit (dBm/500 kHz)
802.11a mode				
Low	5745	0.502	7.49	30
Middle	5785	0.687	7.68	30
High	5825	0.726	7.72	30
802.11n20 mode				
Low	5745	0.478	7.47	30
Middle	5785	-0.009	6.98	30
High	5825	0.145	7.13	30
802.11ac20 mode				
Low	5745	0.207	7.20	30
Middle	5785	0.063	7.05	30
High	5825	0.003	6.99	30

Note: For the 5725-5850 MHz band, the Corrected PSD (dBm/500 kHz) is equal to:
Correct PSD (dBm/500 kHz) = PSD (dBm/100 kHz) + Duty Cycle Correction (dB) + 10*log(500 kHz/100 kHz)

Please refer to Annex D for plots.

11 FCC §15.407(b) - Out of Band Emissions

11.1 Applicable Standards

According to FCC §15.407(b):

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.

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.

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.

For transmitters operating in the 5.725-5.85 GHz band: 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.

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.

The provisions of §15.205 apply to intentional radiators operating under this section.

11.2 Measurement Procedure

Add a correction factor (antenna gain+ Attenuator loss+cable loss) to the offset of the spectrum analyzer.
Integration Method

1. For peak emissions measurements, follow the procedures described in section H)5), “Procedures for Peak Unwanted Emissions Measurements above 1000 MHz”, except for the following changes:

- Set RBW = 100 kHz
- Set VBW = 3RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured. CAUTION: You must ensure that the spectrum analyzer or EMI receiver is set for peak-detection and max-hold for this measurement.

2. For average emissions measurements, follow the procedures described in section H)6), “Procedures for Average Unwanted Emissions Measurements above 1000 MHz”, except for the following changes:

- Set RBW = 100 kHz
- Set VBW = 3RBW
- Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	US45303156	2019-03-06	1 year
Rohde & Schwarz	Analyzer, Spectrum	FSQ26	200749	2019-03-14	2 years
-	RF cable	-	-	Each time[1]	N/A
-	20dB attenuator	-	-	Each time[1]	N/A

Note1: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

11.4 Test Environmental Conditions

Temperature:	24 ºC
Relative Humidity:	44 %
ATM Pressure:	102.5 kPa

The testing was performed by Zhao Zhao on 2019-07-09 in RF site.

11.5 Test Results

Compliant

Please refer to Annex D for plots.

12 Annex A (Normative) – EUT Test Setup Photographs

Please refer to the attachment

13 Annex B (Normative) – EUT External Photographs

Please refer to the attachment

14 Annex C (Normative) – EUT Internal Photographs

Please refer to the attachment

15 Annex D (Normative) - Plots

Please refer to attachments:

Appendix B – Occupied Bandwidth
Appendix C – Spurious Emissions at Antenna Port
Appendix D – Power Spectral Density
Appendix E – Band Edge

16 Annex E (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets A2LA *R222 - Specific Requirements EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 2nd day of October 2018.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2020
Revised June 5, 2019

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

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

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

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