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

TEST REPORT

For

Roku, Inc.

1155 Coleman Avenue, San Jose, CA 95110, USA

FCC ID:TC2-R1040
IC: 5959A-R1037

Report Type:	**Model:**
Class II Permissive Change	3940X

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ACCREDITED
CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2302151-407	Class II Permisive Change	2023-03-29

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report was prepared on behalf of *Roku, Inc.*, and their product model: 3940X, FCC ID: TC2-R1040, IC: 5959A-R1037 or the "EUT" as referred to in this report. It is a Set-Top-Box with 5GHz Wi-Fi capability.

1.2 Mechanical Description of EUT

The EUT measures approximately: 20 (H), *40 (W), *80 (D) mm weighs approximately <1 kg

1.3 Objective

This report was prepared on behalf of *Roku, Inc* in accordance with FCC CFR47 §15.407 and ISEDC RSS-247 Issue 2, February2017.

The objective was to determine compliance with FCC Part 15.407 and ISEDC RSS-247 rules for Output Power, Antenna Requirements, AC Line Conducted Emissions, Emission Bandwidth, Power spectral density, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 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.

1.6 Measurement Uncertainty

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

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

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2017 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 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 software used was TeraTerm. The software is compliant with the standard requirements being tested against.

Please refer to the following power setting table.

5250MHz-5350MHz

Modulation	Frequency (MHz)	Power Setting	
		Ant A	Ant B
802.11a	5260	45	
	5300	46	
	5320	45	
802.11n/ac20	5260	45	
	5280	46	
	5320	45	
802.11n/ac40	5270	46	
	5310	45	
802.11ac80	5290	40	

5470MHz-5725MHz

Modulation	Frequency (MHz)	Power Setting	
		Ant A	Ant B
802.11a	5500	50	
	5580	57	
	5700	45	
	5720	64	
802.11n/ac20	5500	50	
	5580	59	
	5700	45	
	5720	62	
802.11n/ac40	5510	45	
	5590	59	
	5670	50	
	5710	62	
802.11ac80	5530	47	
	5610	62	

*Data rates tested:
802.11a mode: 6 Mbps
802.11n/ac20 HT20/VHT20: MCS0
802.11n/ac40 HT40/VHT40: MCS0
802.11ac80: VHT80: MCS0

Note: 5600-5650MHz range cannot and will not be used in Canada.

2.3 Duty Cycle Correction Factor

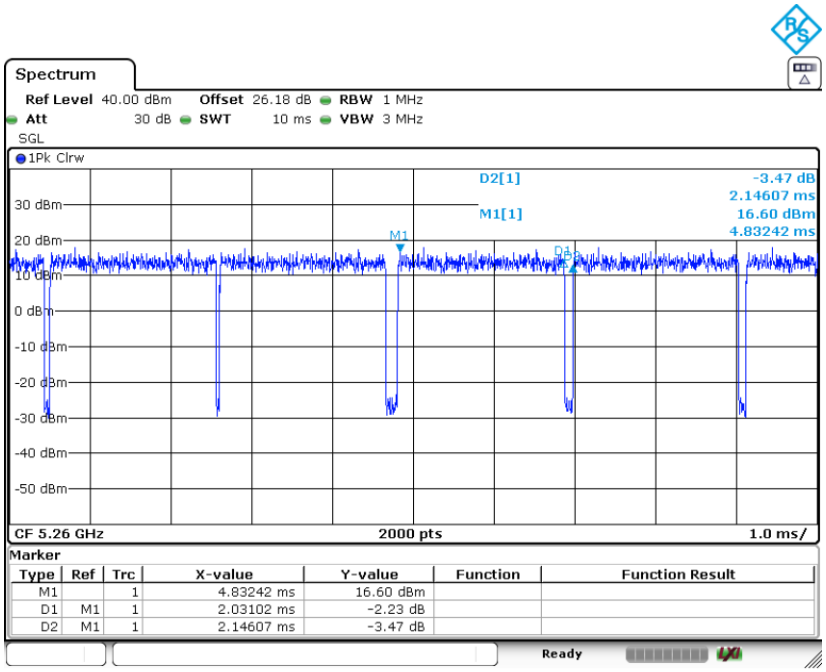
According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 section B:

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.

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11a	2.03102	2.14607	94.6%	0.22
802.11n/ac20	1.90095	2.02601	93.8%	0.27
802.11n/ac40	0.88794	1.05053	84.5%	0.7
802.11ac80	0.42271	0.54577	77.4%	1.1

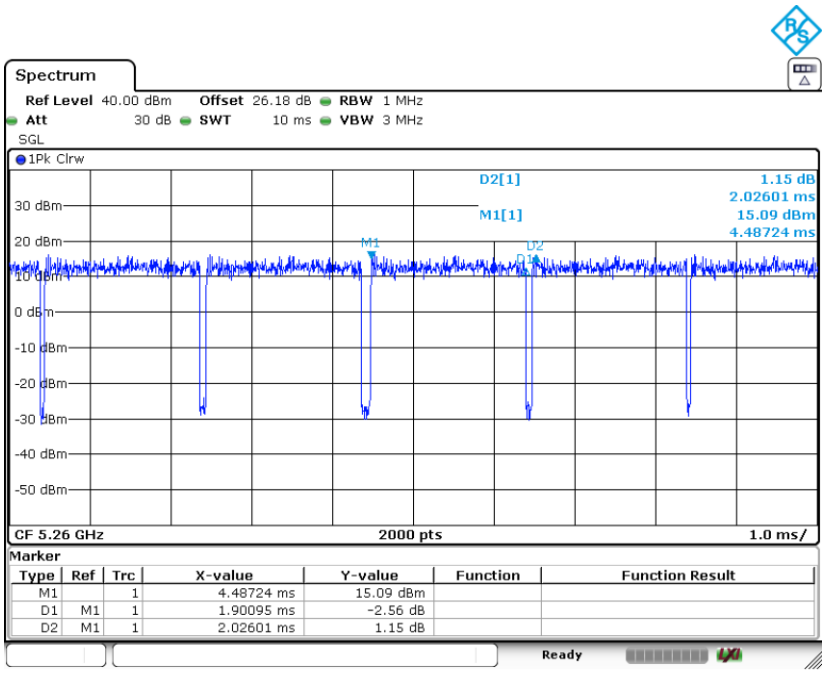
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)
Please refer to the following plots.

802.11a mode



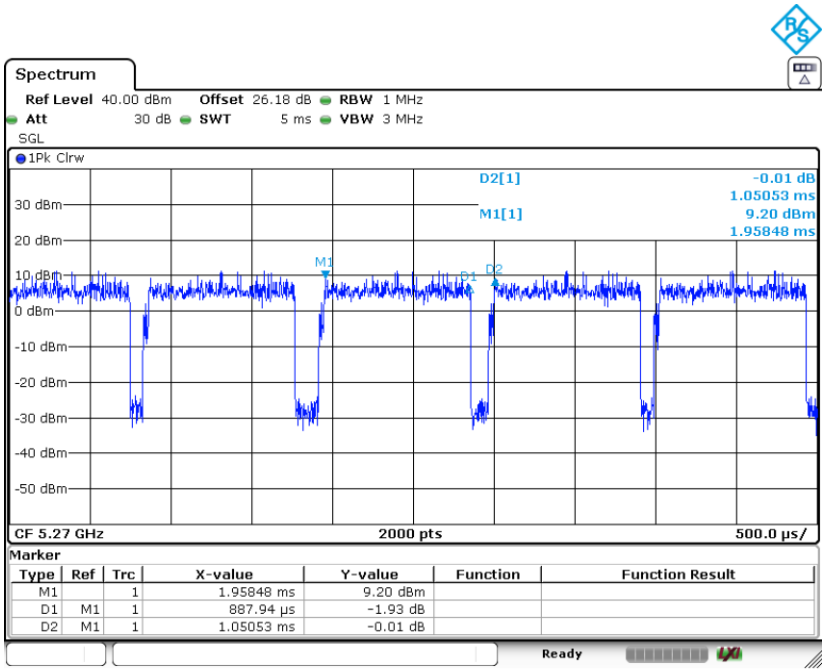
Date: 23.FEB.2023 12:45:57

802.11n20/ac20 mode



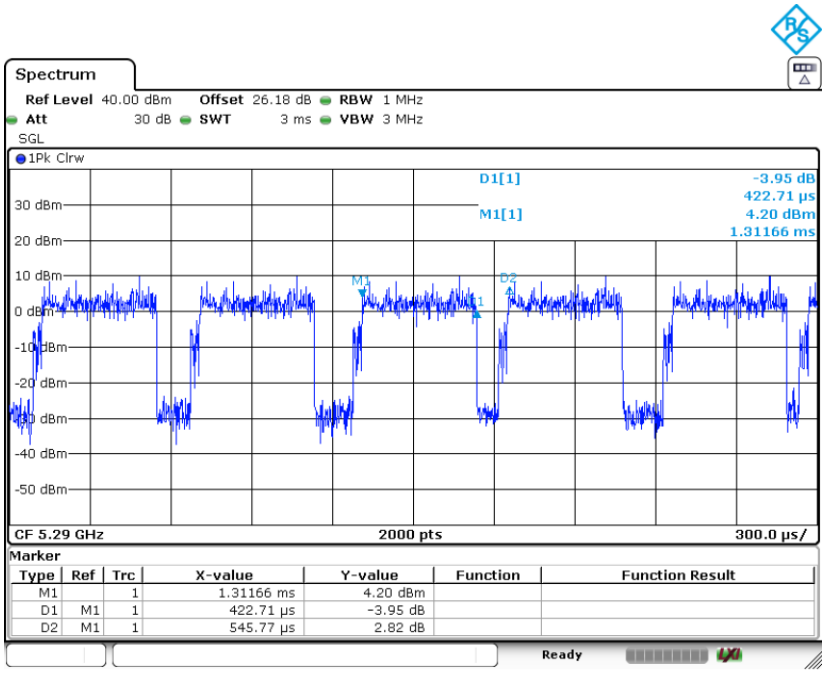
Date: 23.FEB.2023 12:51:39

802.11n20/ac40 mode



Date: 23.FEB.2023 13:00:28

802.11ac80



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2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410
Dell	TV Monitor	S3221QS

2.6 Support Equipment

Manufacturer	Description	Model
Roku, Inc.	Debug Board	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	< 1 m	Laptop	EUT
HDMI Cable	0.5	EUT	Monitor
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

FCC/ISEDC Rules	Description of Test	Result
FCC §2.1091, §15.407(f), ISEDC RSS-102	RF Exposure	Compliant
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirement	Compliant
FCC §15.407(h) ISEDC RSS-247 §6.3	Dynamic Frequency Selection	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Power Line Conducted Emissions	Compliant
FCC §2.1053, §15.205, §15.209, 15.407(b) ISEDC RSS-247 §6.2	Spurious Radiated Emissions	Compliant
FCC §15.407(e) ISEDC RSS-Gen §6.2	Emission Bandwidth	Compliant
FCC §407(a) ISEDC RSS-247 §6.2	Output Power	Compliant
FCC §2.1051, §15.407(b) ISEDC RSS-247 §6.2	Band Edges	Compliant
FCC §15.407(a) ISEDC RSS-247 §6.2	Power Spectral Density	Compliant

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

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

4.1 Applicable Standards

According to FCC KDB 447498 D04 Interim General RF Exposure Guidance v01, Section 2.1 RF Exposure Test Exemptions for Single Source,

2.1.1 General RF Exposure Test Exemption Considerations

RF exposure test exemptions provide means to obtain certification without the need of showing data (measurements, or analytical/numerical modeling) to demonstrate compliance. Hereafter, in this context, an RF source is referred to as "*exempt RF device*" in the sense that it is not required to show data demonstrating compliance to RF exposure limits.

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.[8] However, it is always possible, especially when the potential for exposure cannot be easily determined, that an RF exposure evaluation may become required according §§ 1.1307(c) and (d).

As detailed in Section 2.1.2, the 1 mW and SAR-based test exemption conditions are in terms of source-based available maximum time-averaged (matched conducted) output power for all operating configurations, adjusted for tune-up tolerance, and at the minimum *test separation distance* required for the particular RF exposure scenario under consideration. This minimum *test separation distance* is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander. To qualify for SAR test exemption, the *test separation distances* applied must be fully explained and justified (typically in the SAR measurement, or SAR analysis report, according to KDB Pub. 865664) by showing the actual operating configurations and exposure conditions of the transmitter, and applicable host platform requirements (e.g., KDB Pubs. 648474, 616217, 941225)

When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for SAR test exemption.

If RF exposure testing requirements for a specific device are covered in a KDB Publication, those requirements must be satisfied before applying any SAR test exemption provisions. For example, this is the case for handheld PTT two-way radios, handsets, laptops, and tablets, etc.[9]

Finally, when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

2.1.2 1-mW Test Exemption

Per §1.1307(b)(3)(i)(A), a single RF source is *exempt RF device* (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

2.1.3 SAR-Based Exemption

A more comprehensive exemption, considering a variable power threshold that depends on both the *separation distance* and power, is provided in §1.1307(b)(3)(ii)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with *test separation distances* between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Accordingly, a RF source is considered an *RF exempt device* if its available maximum time-averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold. This exemption threshold was derived based on general population 1-g SAR requirements and is detailed in Appendix C.

2.1.4 MPE-Based Exemption

An alternative to the SAR-based exemption is provided in §1.1307(b)(3)(ii)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the

[8] Specific test exemption thresholds for operations under occupational/controlled limits are not established.
[9] When SAR evaluation is required by the hotspot mode or UMPC mini-tablet procedures, that is, where an antenna is ≤ 2.5 cm from a surface or edge, the *test separation distance* from the phantom to the antenna or device enclosure, as appropriate, should be applied to determine SAR test exemption for such configurations, according to the criteria in this document. For that case, the *test separation distance* cannot be determined from the distance of the antenna to the device surface or edge.

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

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

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

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

4.2 FCC RF Exposure Exemption Evaluation Procedures

According to FCC KDB 447498 D04 Interim General RF Exposure Guidance v01, Annex B Exemptions for Single Source,

B.1 General

This appendix provides the exemption criteria and summarizes relevant parameters and usage considerations based on descriptions in FCC 19-126.

B.2 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance. The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A). The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

B.3 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1 – THRESHOLD FOR SINGLE RF SOURCE SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L/2\pi$		$\lambda_H/2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	1,920 R^2
1.34	-	30	35.6 m	-	1.6 m	3,450 R^2/f^2
30	-	300	1.6 m	-	159 mm	3.83 R^2
300	-	1,500	159 mm	-	31.8 mm	0.0128 $R^2 f$
1,500	-	100,000	31.8 mm	-	0.5 mm	19.2 R^2
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP20cm in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{\text{th}}\,(\text{mW}) = ERP_{20\text{ cm}}\,(\text{mW}) = 2040f \quad 0.3\text{ GHz} \le f < 1.5\text{ GHz}$$
$$P_{\text{th}}\,(\text{mW}) = ERP_{20\text{ cm}}\,(\text{mW}) = 3060 \quad 1.5\text{ GHz} \le f \le 6\text{ GHz} \qquad \text{(B.1)}$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

B.4 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than λ/4 where the gain is not well defined, but always less than that of a half-wave dipole (length λ/2), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th}\ (\text{mW}) = ERP_{20\ \text{cm}}\,(d/20\ \text{cm})^{x} \quad d \le 20\ \text{cm}$$
$$P_{th}\ (\text{mW}) = ERP_{20\ \text{cm}} \quad 20\ \text{cm} < d \le 40\ \text{cm} \qquad \text{(B.2)}$$

Where

$$x = -\log_{10}\,(60/(ERP_{20\ \text{cm}}\sqrt{f}))$$

and f is in GHz, d is the separation distance (cm), and EPR20cm is per Formula (B.1).

The example values shown in Table B.2 are for illustration only.

Table B.2 – Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
		5	10	15	20	25	30	35	40	45	50
	300	39	65	88	110	129	148	166	184	201	217
	450	22	44	67	89	112	135	158	180	203	226
	835	9	25	44	66	90	116	145	175	207	240
	1900	3	12	26	44	66	92	122	157	195	236
	2450	3	10	22	38	59	83	111	143	179	219
	3600	2	8	18	32	49	71	96	125	158	195
	5800	1	6	14	25	40	58	80	106	136	169

4.3 RF exposure evaluation exemption for FCC

Prediction frequency (GHz)	5.590
Maximum output power (dBm)	21.27
Maximum ERP (dBm)	22.12
Maximum ERP (mW)	163
Prediction distance (cm)	20
Maximum antenna gain (dBi)	3
1500 MHz ≤ f < 10000 MHz	Option C (MPE based) Exemption Threshold
	P_{th} (W)
	$19.2R^2 = 0.768$

As shown in the table above, the EUT's Max ERP is lower than the MPE-based Exemption Threshold. SAR testing for this device is exempted.

4.4 RF exposure evaluation exemption for IC

Maximum EIRP = 21.27 dBm + 3dBi = 24.27 dBm (0.267 W), which is less $1.31\times10^{-2}f^{0.6834}$ = 4.77 W = 36.78 dBm. Therefore, ISED SAR testing is not required.

5 FCC §15.203 & ISEDC RSS-Gen §6.8 - 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 §15.247 (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 licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] 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.

5.2 Antenna List

Radio	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
5.3/5.6 GHz Wi-Fi (Ant A)	5250-5725	3
5.3/5.6 GHz Wi-Fi (Ant B)	5250-5725	1.28

Note: The antennas used by the EUT are permanent attached antennas.
Note: Antenna used is a Chip Antenna.
Note: Antenna info is information provided by customer.
Note: Antennas work in Diversity mode and don't transmit simultaneously.

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

6.1 Applicable Standards

As per FCC §15.207 and ISEDC RSS GEN §8.8

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 was FCC §15.207 limits and and ISEDC RSS GEN §8.8.

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.

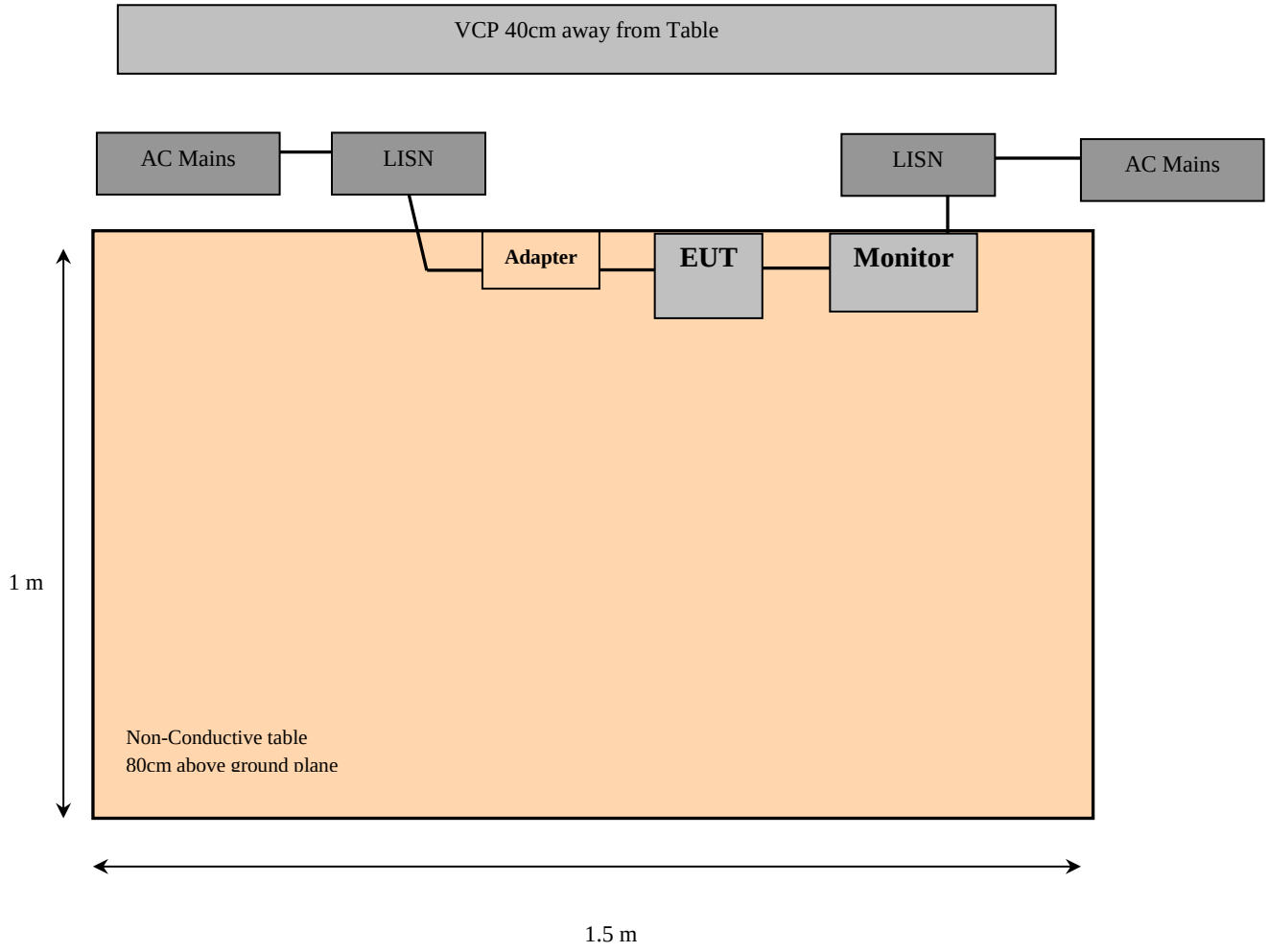
6.3 Test Procedure

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 was 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 Test Setup Block Diagram



6.5 Corrected Amplitude and Margin Calculation

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

CA = Ai + CF

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

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

CF= CL + LISN calibration factor + Attenuation

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.5 dB) + LISN calibration factor (0.2 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

6.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
124	Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100044	2021-05-14	2 years
681	Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101962	2022-09-12	1 year
725	Solar Electronics Company	High Pass Filter	Type 7930-100	7930150203	2022-09-16	1 year
732	FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2022-09-01	1 year
1226	Fairview Microwave	Coaxial Cable	PE3C2220-1250CM	2109241	2022-09-12	1 year
-	Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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

6.7 Test Environmental Conditions

Temperature:	20º C
Relative Humidity:	55 %
ATM Pressure:	102.1 kPa

The testing was performed by Kevin Nguyen on 2023-03-15 in the Ground Plane test site.

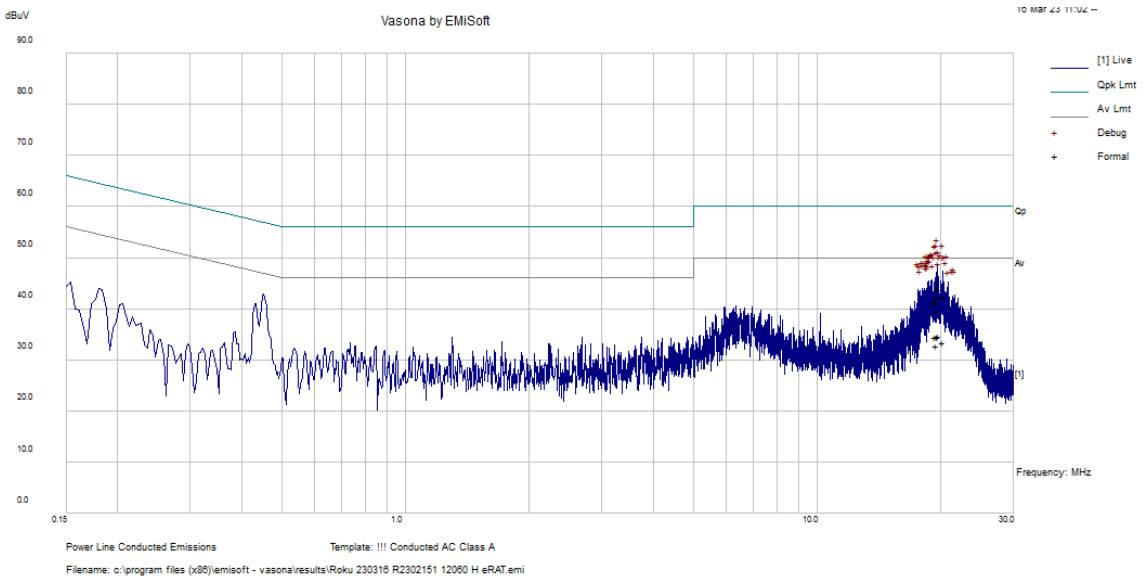
6.8 Summary of Test Results

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

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-13.88	19.185399	Neutral	0.15-30

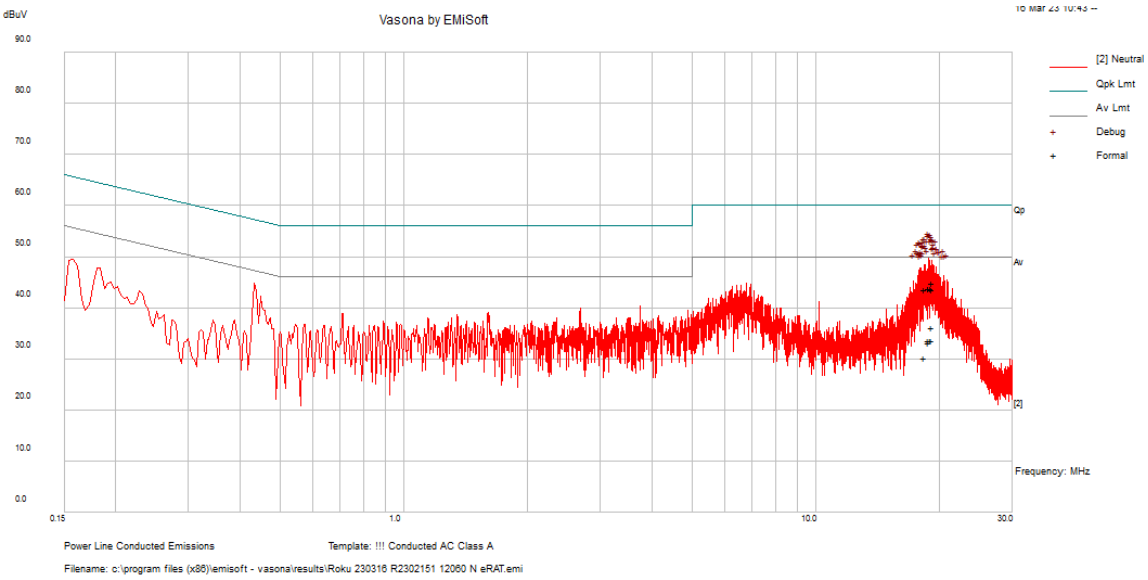
6.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
19.623069	26.8	12.83	39.63	60	-20.37	QP
20.236156	29.39	12.89	42.28	60	-17.72	QP
19.570212	29.3	12.83	42.13	60	-17.87	QP
19.390406	28.22	12.81	41.03	60	-18.97	QP
19.695323	30.88	12.84	43.72	60	-16.28	QP
19.461491	28.66	12.82	41.48	60	-18.52	QP
19.623069	21.73	12.83	34.56	50	-15.44	Ave
20.236156	20.41	12.89	33.3	50	-16.7	Ave
19.570212	21.61	12.82	34.43	50	-15.57	Ave
19.390406	21.65	12.81	34.46	50	-15.54	Ave
19.695323	21.82	12.84	34.66	50	-15.34	Ave
19.461491	19.98	12.82	32.8	50	-17.2	Ave

120 V, 60 Hz – Neutral



Frequency (MHz)	Ai. Reading (dBuV)	Correction Factor (dB)	Corrected Amplitude (dBµV)	Limit (dBµV)	Margin (dB)	Detector
18.838094	31.09	12.76	43.85	60	-16.15	QP
19.096088	30.97	12.78	43.75	60	-16.25	QP
18.838187	31.16	12.75	43.91	60	-16.09	QP
19.116957	32.16	12.78	44.94	60	-15.06	QP
18.361895	30.99	12.71	43.7	60	-16.3	QP
19.185399	30.82	12.79	43.61	60	-16.39	QP
18.838094	20.33	12.75	33.08	50	-16.92	Ave
19.096088	20.82	12.78	33.6	50	-16.4	Ave
18.838187	20.76	12.76	33.52	50	-16.48	Ave
19.116957	20.88	12.78	33.66	50	-16.34	Ave
18.361895	17.46	12.71	30.17	50	-19.83	Ave
19.185399	23.33	12.79	36.12	50	-13.88	Ave

7 FCC §15.209, §15.407(b) & ISEDC RSS-247 §6.2 - 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 5.47-5725 GHz band shall not exceed an ei.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall noet exceed an e.i.r.p. of -27 dBm/MHz.

(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.

As per ISEDC RSS-247 §6.2

For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250- 5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250-5350 MHz

For devices with both operating frequencies and channel bandwidths contained within the band 5250-5350 MHz, the device shall comply with the following:

1. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. if the equipment is intended for outdoor use; or
2. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of Section 6.2.1. The device shall be labelled “for indoor use only.”

For devices with operating frequencies in the band 5250-5350 MHz but having a channel bandwidth that overlaps the band 5150-5250 MHz, the devices’ unwanted emission shall not exceed -27 dBm/MHz e.i.r.p. outside the band 5150-5350 MHz and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device shall be labelled “for indoor use only.”

For transmitters operating in the band 5470-5725 MHz, emissions outside the band shall not exceed -27 dBm/MHz e.i.r.p.

For the band 5725-5850 MHz, emissions at frequencies from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p. For emissions at frequencies more than 10 MHz above or below the band edges, the emissions power shall not exceed -27 dBm/MHz.

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

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 = 100ms
(2) Average: RBW = 1MHz / VBW = 10Hz / 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

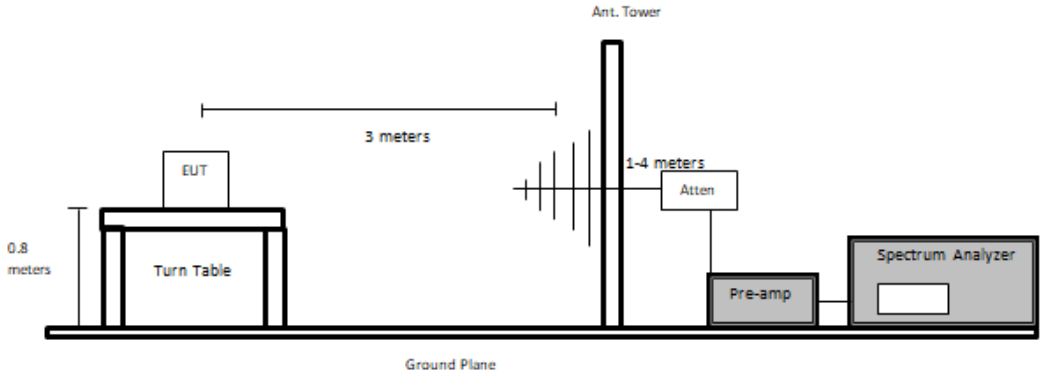
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

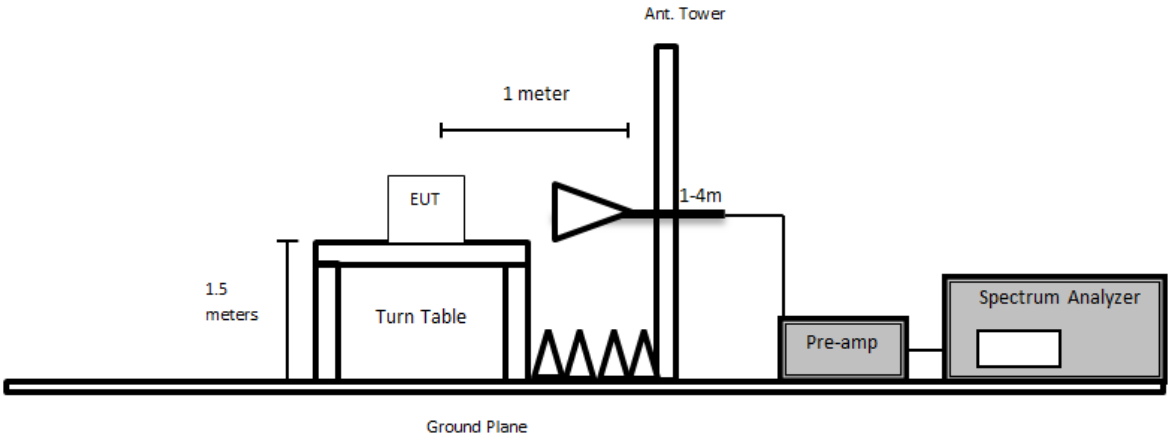
7.5 Test Setup Block Diagram

Below 1GHz:

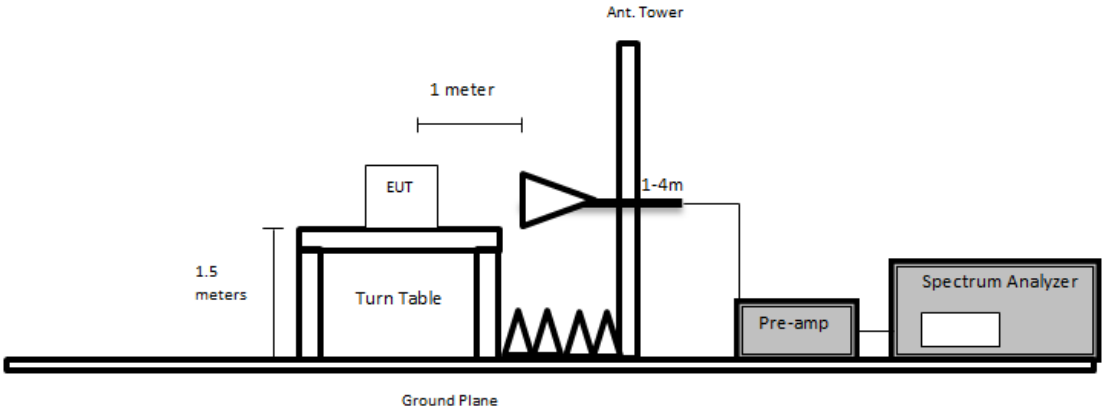


Above 1GHz:

Using Asset #1192



Using Asset #91,#230



7.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
124	Rhode & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2021-05-14	2 years
287	HP/Agilent	PSA spectrum analyzer 3HZ to 44 GHZ	E4446A	US44300386	2022-05-05	1 year
424	Agilent	Spectrum Analyzer	E4440A	US45303156	2022-12-19	1 year
655	Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2022-02-07	2 years
327	Sunol Science Corp	System Controller	SC110V	122303-1	N/R	N/A
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2022-05-12	1 year
658	HP/Agilent	Pre-Amplifier	8449B OPT HO2	3008A01103	2022-07-22	1 year
827	AH Systems	Preamplifier	PAM 1840 VH	170	2022-06-21	1 year
91	Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2022-03-08	2 years
230	Wisewave	Antenna, Horn	ARH-2823-02	10555-02	2022-03-08	2 years
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2021-11-22	2 years
1192	ETS Lindgren	Horn Antenna	3117	00218973	2022-09-29	2 years
1186	Pasternack	Coaxial Cable, RG214	PE3062-1050CM	1	2022-09-26	1 year
1247	Uti flex	Micro - Coax	-	-	2022-07-22	1 year
1248	Pasternack	RG214 COAX Cable	PE3062	-	2022-04-12	1 year
1249	Time Microwave	LMR-400 Cable Dc-3 Ghz	AE13684	2k80612-56fts	2022-04-12	1 year
1328	Centric RF	2.92mm short coaxial cable	C547-107-12B	CW10S34123	2022-12-14	6 months
1346	RFMW	2.92mm 10ft RF cable	KMSE-160SAW-240.0-KSME	-	2023-02-03	6 months
387	Micro-Tronics	5150-5350 MHz Notch Filter	BRC50703	006	2022-03-31	1 year
389	Micro-Tronics	5.6 GHz Notch Filter	BRC 50704	003	2022-06-13	1 year
1245	-	6dB Atennuator	PE7390-6	01182018A	2022-11-22	1 year
1246	HP	RF Limiter	11867A	01734	2022-04-12	1 year
	Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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

7.7 Test Environmental Conditions

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

The testing was performed by Deepak Mishra and Arturo Reyes from 2023-02-24 to 2023-03-22 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 RSS-247 standards' radiated emissions limits, and had the worst margin of:

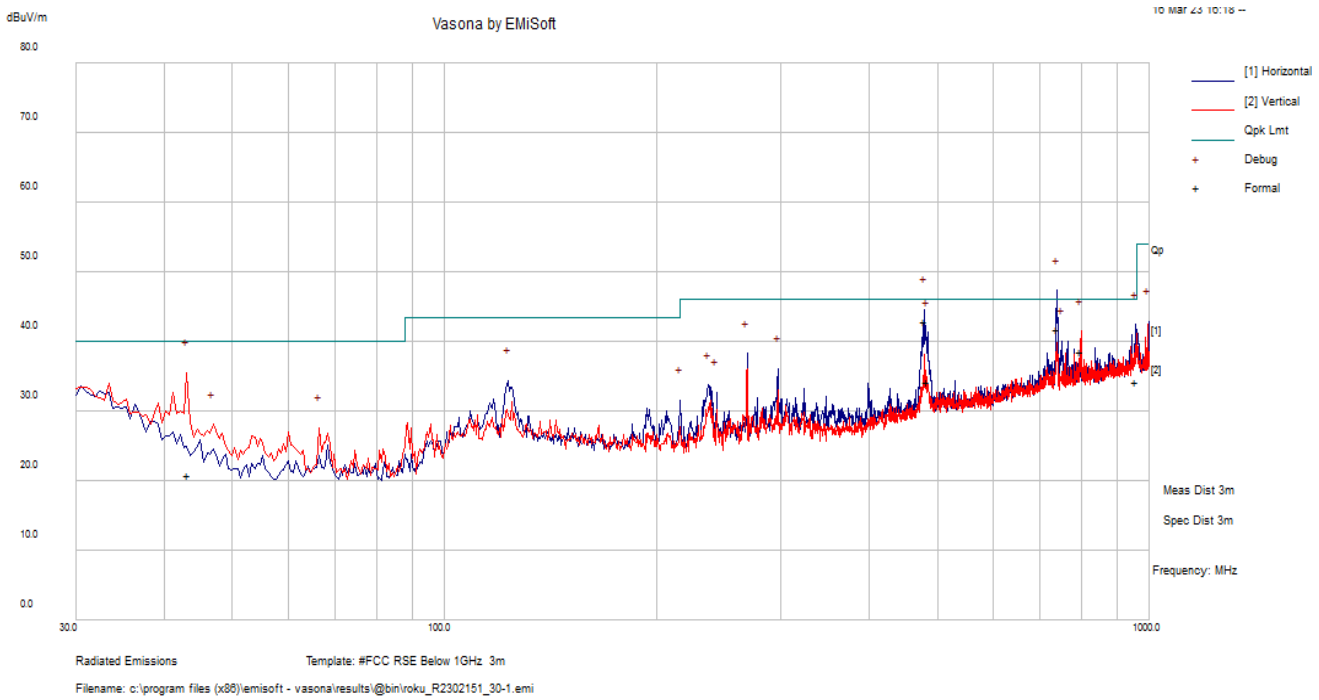
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.112	5350	Horizontal	802.11ac80 mode, 5290 MHz

Please see following plots and data tables.

7.9 Radiated Emissions Test Result Data

1) 30 MHz – 1 GHz at 3 meters

Worst Case:



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
739.278	40.09	1.73	41.82	124	H	255	46	-4.18	QP
479.969	45.17	-2.18	42.99	122	H	272	46	-3.01	QP
956.96725	30.3	3.91	34.21	260	H	267	46	-11.78	QP
43.27325	30.53	-9.74	20.79	231	V	175	40	-19.21	QP
799.45075	36.19	2.43	38.62	117	V	188	46	-7.38	QP
484.26225	36.34	-2.09	34.25	105	H	115	46	-11.76	QP

FCC/IC Limits for 1 GHz to 40 GHz				
Applicablity	**(dBm)**	**(uV/m at 3meters)**	**(dBuV/m at 3meters)**	**(dBuV/m at 1meter)[2]**
Restricted Band Average Limit	-	500	54	64
Restricted Band Peak Limit[1]	-	-	74	84
FCC §15.407(b) & ISEDC RSS-247 §6.2 Defined Unwanted Emissions Limit	-27	-	68	78

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 meters to 3 meters. Formula used is as follows: 20*log(3meters/1meter) = 9.54 (According to ANSI C63.10-2013 Section 9.4)
Note[3]: Where Restricted Band Peak Limit is replaced with stricter 78 dBµV/m at 1 meter, compliance is being shown for unwmated emissions per FCC §15.407(b) & ISEDC RSS-247 §6.2

2) 1 – 18 GHz, Band Edges, Harmonics & Emission Masks measured at 1 meter

Antenna A

5250 - 5350 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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5260											
10520	48.170	28	239	H	38.297	11.157	36.314	61.310	78	-16.690	Peak
10520	36.348	28	239	H	38.297	11.157	36.314	49.488	64	-14.512	Ave
15780	50.550	353	146	H	41.922	15.941	36.742	71.671	84	-12.329	Peak
15780	37.768	353	146	H	41.922	15.941	36.742	58.889	64	-5.111	Ave
Middle Channel: 5280 MHz											
10560	48.970	275	143	H	38.373	11.113	36.225	62.231	78	-15.769	Peak
10560	36.348	275	143	H	38.373	11.113	36.225	49.609	64	-14.391	Ave
15840	48.910	11	228	H	41.675	15.414	36.756	69.243	84	-14.757	Peak
15840	37.558	11	228	H	41.675	15.414	36.756	57.891	64	-6.109	Ave
High Channel: 5320 MHz											
5350	58.120	32	139	H	36.088	7.580	36.650	65.138	78	-12.862	Peak
5350	39.678	32	139	H	36.088	7.580	36.650	46.696	64	-17.304	Ave
10640	48.070	358	235	H	38.473	11.067	36.205	61.405	84	-22.595	Peak
10640	35.868	358	235	H	38.473	11.067	36.205	49.203	64	-14.797	Ave
15960	48.830	112	181	H	41.758	14.913	36.531	68.970	84	-15.030	Peak
15960	37.078	112	181	H	41.758	14.913	36.531	57.218	64	-6.782	Ave

Antenna A

5250 - 5350 MHz

802.11ac20/n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5260 MHz											
10520	48.990	263	186	H	38.297	11.157	36.314	62.130	78	-15.870	Peak
10520	35.811	263	186	H	38.297	11.157	36.314	48.951	64	-15.049	Ave
15780	50.250	301	204	H	41.922	15.941	36.742	71.371	84	-12.629	Peak
15780	37.391	301	204	H	41.922	15.941	36.742	58.512	64	-5.488	Ave
Middle Channel: 5280 MHz											
10560	47.700	275	143	H	38.373	11.113	36.225	60.961	78	-17.039	Peak
10560	36.271	275	143	H	38.373	11.113	36.225	49.532	64	-14.468	Ave
15840	61.920	170	150	H	41.675	15.414	36.756	82.253	84	-1.747	Peak
15840	37.511	170	150	H	41.675	15.414	36.756	57.844	64	-6.156	Ave
High Channel: 5320 MHz											
5350	61.730	78	173	H	36.088	7.580	36.650	68.748	78	-9.252	Peak
5350	42.431	78	173	H	36.088	7.580	36.650	49.449	64	-14.551	Ave
10640	48.350	288	146	H	38.473	11.067	36.205	61.685	84	-22.315	Peak
10640	35.931	288	146	H	38.473	11.067	36.205	49.266	64	-14.734	Ave
15960	49.210	142	243	H	41.758	14.913	36.531	69.350	84	-14.650	Peak
15960	37.001	142	243	H	41.758	14.913	36.531	57.141	64	-6.859	Ave

Antenna A

5250 - 5350 MHz

802.11ac40/n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5270 MHz											
10540	48.400	217	285	H	38.297	11.157	36.314	61.540	78	-16.460	Peak
10540	36.374	217	285	H	38.297	11.157	36.314	49.514	64	-14.486	Ave
15810	49.770	181	196	H	41.922	15.941	36.742	70.891	84	-13.109	Peak
15810	37.634	181	196	H	41.922	15.941	36.742	58.755	64	-5.245	Ave
High Channel: 5310 MHz											
5350	69.300	54	151	H	36.088	7.580	36.650	76.318	78	-1.682	Peak
5350	51.634	54	151	H	36.088	7.580	36.650	58.652	64	-5.348	Ave
10620	48.220	74	191	H	38.473	11.067	36.205	61.555	84	-22.445	Peak
10620	35.964	74	191	H	38.473	11.067	36.205	49.299	64	-14.701	Ave
15930	49.240	130	266	H	41.758	14.913	36.531	69.380	84	-14.620	Peak
15930	36.894	130	266	H	41.758	14.913	36.531	57.034	64	-6.966	Ave

Antenna A

5250 - 5350 MHz

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel: 5290 MHz											
5350	70.870	51	154	H	36.088	7.580	36.650	77.888	78	-0.112	Peak
5350	48.446	51	154	H	36.088	7.580	36.650	55.464	64	-8.536	Ave
10580	47.880	349	164	H	38.373	11.113	36.225	61.141	78	-16.859	Peak
10580	36.306	349	164	H	38.373	11.113	36.225	49.567	64	-14.433	Ave
15870	49.610	125	199	H	41.675	15.414	36.756	69.943	84	-14.057	Peak
15870	37.536	125	199	H	41.675	15.414	36.756	57.869	64	-6.131	Ave

Antenna A

5470 - 5725 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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5500 MHz											
5470	64.930	64	136	H	36.219	7.66	36.626	72.183	78	-5.817	Peak
5470	43.618	64	136	H	36.219	7.66	36.626	50.871	64	-13.129	Ave
11000	48.080	340	178	H	38.474	11.28	35.981	61.853	84	-22.147	Peak
11000	35.818	340	178	H	38.474	11.28	35.981	49.591	64	-14.409	Ave
16500	49.320	44	265	H	42.340	13.97	35.866	69.764	78	-8.236	Peak
16500	36.768	44	265	H	42.340	13.97	35.866	57.212	64	-6.788	Ave
Middle Channel: 5580 MHz											
11160	47.860	200	271	H	38.378	11.394	35.867	61.765	84	-22.235	Peak
11160	36.008	200	271	H	38.378	11.394	35.867	49.913	64	-14.087	Ave
16740	48.780	59	295	H	42.510	14.648	35.607	70.331	78	-7.669	Peak
16740	36.628	59	295	H	42.510	14.648	35.607	58.179	64	-5.821	Ave
High Channel: 5700 MHz											
5725	70.950	56	134	H	35.612	7.840	36.690	77.712	78	-0.288	Peak
5725	43.548	56	134	H	35.612	7.840	36.690	50.310	64	-13.690	Ave
11400	48.280	108	122	H	38.574	11.430	35.891	62.393	84	-21.607	Peak
11400	35.648	108	122	H	38.574	11.430	35.891	49.761	64	-14.239	Ave
17100	49.580	331	254	H	42.145	15.915	35.982	71.658	78	-6.342	Peak
17100	36.958	331	254	H	42.145	15.915	35.982	59.036	64	-4.964	Ave
5720 MHz											
11440	48.951	108	122	H	38.574	11.430	35.891	63.064	84	-20.936	Peak
11440	35.716	108	122	H	38.574	11.430	35.891	49.829	64	-14.171	Ave
17160	49.874	331	254	H	42.145	15.915	35.982	71.952	78	-6.048	Peak
17160	37.149	331	254	H	42.145	15.915	35.982	59.227	64	-4.773	Ave

Antenna A

5470 - 5725 MHz

802.11ac20/n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5500 MHz											
5470	69.060	64	136	H	36.219	7.660	36.626	76.313	78	-1.687	Peak
5470	49.491	64	136	H	36.219	7.660	36.626	56.744	64	-7.256	Ave
11000	47.820	272	256	H	38.474	11.280	35.981	61.593	84	-22.407	Peak
11000	35.441	272	256	H	38.474	11.280	35.981	49.214	64	-14.786	Ave
16500	48.560	173	168	H	42.340	13.970	35.866	69.004	78	-8.996	Peak
16500	36.301	173	168	H	42.340	13.970	35.866	56.745	64	-7.255	Ave
Middle Channel: 5580 MHz											
11160	46.920	200	271	H	38.378	11.394	35.867	60.825	84	-23.175	Peak
11160	35.781	200	271	H	38.378	11.394	35.867	49.686	64	-14.314	Ave
16740	48.920	84	125	H	42.510	14.648	35.607	70.471	78	-7.529	Peak
16740	36.451	84	125	H	42.510	14.648	35.607	58.002	64	-5.998	Ave
High Channel: 5700 MHz											
5725	70.590	56	134	H	35.612	7.840	36.690	77.352	78	-0.648	Peak
5725	43.991	56	134	H	35.612	7.840	36.690	50.753	64	-13.247	Ave
11400	47.590	301	216	H	38.574	11.430	35.891	61.703	84	-22.297	Peak
11400	35.481	301	216	H	38.574	11.430	35.891	49.594	64	-14.406	Ave
17100	49.820	57	207	H	42.145	15.915	35.982	71.898	78	-6.102	Peak
17100	36.701	57	207	H	42.145	15.915	35.982	58.779	64	-5.221	Ave
5720 MHz											
11440	48.856	108	122	H	38.574	11.430	35.891	62.969	84	-21.031	Peak
11440	35.975	108	122	H	38.574	11.430	35.891	50.088	64	-13.912	Ave
17160	49.913	331	254	H	42.145	15.915	35.982	71.991	78	-6.009	Peak
17160	37.172	331	254	H	42.145	15.915	35.982	59.250	64	-4.750	Ave

Antenna A

5470 - 5725 MHz

802.11ac40/n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5510 MHz											
5470	68.640	71	127	H	36.219	7.660	36.626	75.893	78	-2.107	Peak
5470	47.614	71	127	H	36.219	7.660	36.626	54.867	64	-9.133	Ave
11020	46.660	74	134	H	38.474	11.280	35.981	60.433	84	-23.567	Peak
11020	35.564	74	134	H	38.474	11.280	35.981	49.337	64	-14.663	Ave
16530	48.850	265	219	H	42.340	13.970	35.866	69.294	78	-8.706	Peak
16530	36.714	265	219	H	42.340	13.970	35.866	57.158	64	-6.842	Ave
Middle Channel: 5590 MHz											
11180	48.100	250	148	H	38.378	11.394	35.867	62.005	84	-21.995	Peak
11180	38.238	250	148	H	38.378	11.394	35.867	52.143	64	-11.857	Ave
16770	48.760	10	274	H	42.510	14.648	35.607	70.311	78	-7.689	Peak
16770	38.786	10	274	H	42.510	14.648	35.607	60.337	64	-3.663	Ave
High Channel: 5670 MHz											
5725	71.060	56	133	H	35.612	7.840	36.690	77.822	78	-0.178	Peak
5725	55.488	56	133	H	35.612	7.840	36.690	62.250	64	-1.750	Ave
11340	49.210	338	220	H	38.574	11.430	35.891	63.323	84	-20.677	Peak
11340	39.221	338	220	H	38.574	11.430	35.891	53.334	64	-10.666	Ave
17010	50.500	1	185	H	42.145	15.915	35.982	72.578	78	-5.422	Peak
17010	38.982	1	185	H	42.145	15.915	35.982	61.060	64	-2.940	Ave
5710 MHz											
11420	49.358	338	220	H	38.574	11.430	35.891	63.471	84	-20.529	Peak
11420	39.346	338	220	H	38.574	11.430	35.891	53.459	64	-10.541	Ave
17130	50.348	1	185	H	42.145	15.915	35.982	72.426	78	-5.574	Peak
17130	39.028	1	185	H	42.145	15.915	35.982	61.106	64	-2.894	Ave

Antenna A

5470 - 5725 MHz

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5530 MHz											
5470	70.430	67	137	H	36.219	7.660	36.626	77.683	78	-0.317	Peak
5470	55.741	67	137	H	36.219	7.660	36.626	62.994	64	-1.006	Ave
11060	48.480	13	191	H	38.474	11.280	35.981	62.253	84	-21.747	Peak
11060	38.086	13	191	H	38.474	11.280	35.981	51.859	64	-12.141	Ave
16590	49.070	293	137	H	42.340	13.970	35.866	69.514	78	-8.486	Peak
16590	39.348	293	137	H	42.340	13.970	35.866	59.792	64	-4.208	Ave
High Channel: 5610 MHz											
11220	46.290	76	116	H	38.378	11.394	35.867	60.195	84	-23.805	Peak
11220	36.731	76	116	H	38.378	11.394	35.867	50.636	64	-13.364	Ave
16830	48.840	250	235	H	42.510	14.648	35.607	70.391	78	-7.609	Peak
16830	38.986	250	235	H	42.510	14.648	35.607	60.537	64	-3.463	Ave
5690 MHz											
11380	49.247	338	220	H	38.574	11.430	35.891	63.360	84	-20.640	Peak
11380	39.466	338	220	H	38.574	11.430	35.891	53.579	64	-10.421	Ave
17070	50.344	1	185	H	42.145	15.915	35.982	72.422	78	-5.578	Peak
17070	39.154	1	185	H	42.145	15.915	35.982	61.232	64	-2.768	Ave

Antenna B

5250 - 5350 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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5260											
10520	48.190	351	166	H	38.29	11.15	36.314	61.330	78	-16.670	Peak
10520	37.938	351	166	H	38.29	11.15	36.314	51.078	64	-12.922	Ave
15780	49.290	153	193	H	41.92	15.94	36.742	70.411	84	-13.589	Peak
15780	39.871	153	193	H	41.92	15.94	36.742	60.992	64	-3.008	Ave
Middle Channel: 5280 MHz											
10560	48.550	89	283	H	38.37	11.11	36.225	61.811	78	-16.189	Peak
10560	38.298	89	283	H	38.37	11.11	36.225	51.559	64	-12.441	Ave
15840	50.850	18	255	H	41.67	15.41	36.756	71.183	84	-12.817	Peak
15840	39.308	18	255	H	41.67	15.41	36.756	59.641	64	-4.359	Ave
High Channel: 5320 MHz											
5350	56.420	310	116	H	36.08	7.580	36.650	63.438	78	-14.562	Peak
5350	45.314	310	116	H	36.08	7.580	36.650	52.332	64	-11.668	Ave
10640	47.440	280	267	H	38.47	11.06	36.205	60.775	84	-23.225	Peak
10640	37.476	280	267	H	38.47	11.06	36.205	50.811	64	-13.189	Ave
15960	48.780	209	165	H	41.75	14.91	36.531	68.920	84	-15.080	Peak
15960	38.530	209	165	H	41.75	14.91	36.531	58.670	64	-5.330	Ave

Antenna B

5250 - 5350 MHz

802.11ac20/n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5260											
10520	47.550	149	205	H	38.29	11.15	36.314	60.690	78	-17.310	Peak
10520	37.361	149	205	H	38.29	11.15	36.314	50.501	64	-13.499	Ave
15780	49.430	126	245	H	41.92	15.94	36.742	70.551	84	-13.449	Peak
15780	39.061	126	245	H	41.92	15.94	36.742	60.182	64	-3.818	Ave
Middle Channel: 5280 MHz											
10560	47.490	183	295	H	38.37	11.11	36.225	60.751	78	-17.249	Peak
10560	37.624	183	295	H	38.37	11.11	36.225	50.885	64	-13.115	Ave
15840	49.910	13	252	H	41.67	15.41	36.756	70.243	84	-13.757	Peak
15840	39.639	13	252	H	41.67	15.41	36.756	59.972	64	-4.028	39.639
High Channel: 5320 MHz											
5350	59.370	318	136	H	36.08	7.580	36.650	66.388	78	-11.612	Peak
5350	45.151	318	136	H	36.08	7.580	36.650	52.169	64	-11.831	Ave
10640	48.338	126	294	H	38.47	11.06	36.205	61.673	84	-22.327	Peak
10640	37.419	126	294	H	38.47	11.06	36.205	50.754	64	-13.246	Ave
15960	49.700	285	278	H	41.75	14.91	36.531	69.840	84	-14.160	Peak
15960	39.015	285	278	H	41.75	14.91	36.531	59.155	64	-4.845	Ave

Antenna B

5250 - 5350 MHz

802.11ac40/n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5270 MHz											
10540	47.250	131	230	H	38.297	11.157	36.314	60.390	78	-17.610	Peak
10540	37.644	131	230	H	38.297	11.157	36.314	50.784	64	-13.216	Ave
15810	50.080	172	240	H	41.922	15.941	36.742	71.201	84	-12.799	Peak
15810	39.064	172	240	H	41.922	15.941	36.742	60.185	64	-3.815	Ave
High Channel: 5310 MHz											
5350	70.710	283	142	H	36.088	7.580	36.650	77.728	78	-0.272	Peak
5350	56.850	283	142	H	36.088	7.580	36.650	63.868	64	-0.132	Ave
10620	47.330	200	178	H	38.473	11.067	36.205	60.665	84	-23.335	Peak
10620	37.421	200	178	H	38.473	11.067	36.205	50.756	64	-13.244	Ave
15930	48.960	164	106	H	41.758	14.913	36.531	69.100	84	-14.900	Peak
15930	39.583	164	106	H	41.758	14.913	36.531	59.723	64	-4.277	Ave

Antenna B

5250 - 5350 MHz

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel: 5290 MHz											
5350	70.780	296	114	H	36.088	7.580	36.65	77.798	78	-0.202	Peak
5350	54.318	296	114	H	36.088	7.580	36.65	61.336	64	-2.664	Ave
10580	47.500	220	225	H	38.373	11.113	36.22	60.761	78	-17.239	Peak
10580	37.141	220	225	H	38.373	11.113	36.22	50.402	64	-13.598	Ave
15870	49.690	312	149	H	41.675	15.414	36.75	70.023	84	-13.977	Peak
15870	39.446	312	149	H	41.675	15.414	36.75	59.779	64	-4.221	Ave

Antenna B

5470 - 5725 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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5500 MHz											
5470	61.140	297	143	H	36.219	7.66	36.626	68.393	78	-9.607	Peak
5470	47.918	297	143	H	36.219	7.66	36.626	55.171	64	-8.829	Peak
11000	48.190	138	143	H	38.474	11.28	35.981	61.963	84	-22.037	Peak
11000	37.598	138	143	H	38.474	11.28	35.981	51.371	64	-12.629	Peak
16500	49.010	149	234	H	42.340	13.97	35.866	69.454	78	-8.546	Peak
16500	39.108	149	234	H	42.340	13.97	35.866	59.552	64	-4.448	Peak
Middle Channel: 5580 MHz											
11160	48.460	181	146	H	38.378	11.394	35.867	62.365	84	-21.635	Peak
11160	37.408	181	146	H	38.378	11.394	35.867	51.313	64	-12.687	Ave
16740	48.690	140	244	H	42.510	14.648	35.607	70.241	78	-7.759	Peak
16740	38.222	140	244	H	42.510	14.648	35.607	59.773	64	-4.227	Ave
High Channel: 5700 MHz											
5725	69.520	305	130	H	35.612	7.840	36.690	76.282	78	-1.718	Peak
5725	48.745	305	130	H	35.612	7.840	36.690	55.507	64	-8.493	Ave
11400	48.120	100	281	H	38.574	11.430	35.891	62.233	84	-21.767	Peak
11400	37.852	100	281	H	38.574	11.430	35.891	51.965	64	-12.035	Ave
17100	48.910	359	247	H	42.145	15.915	35.982	70.988	78	-7.012	Peak
17100	39.075	359	247	H	42.145	15.915	35.982	61.153	64	-2.847	Ave
5720 MHz											
11440	47.698	100	281	H	38.574	11.430	35.891	61.811	84	-22.189	Peak
11440	37.642	100	281	H	38.574	11.430	35.891	51.755	64	-12.245	Ave
17160	48.617	359	247	H	42.145	15.915	35.982	70.695	78	-7.305	Peak
17160	38.704	359	247	H	42.145	15.915	35.982	60.782	64	-3.218	Ave

Antenna B

5470 - 5725 MHz

802.11ac20/n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5500 MHz											
5470	66.140	304	145	H	36.219	7.660	36.626	73.393	78	-4.607	Peak
5470	48.756	304	145	H	36.219	7.660	36.626	56.009	64	-7.991	Ave
11000	48.150	357	186	H	38.474	11.280	35.981	61.923	84	-22.077	Peak
11000	37.782	357	186	H	38.474	11.280	35.981	51.555	64	-12.445	Ave
16500	49.370	254	152	H	42.340	13.970	35.866	69.814	78	-8.186	Peak
16500	38.941	254	152	H	42.340	13.970	35.866	59.385	64	-4.615	Ave
Middle Channel: 5580 MHz											
11160	48.700	81	123	H	38.378	11.394	35.867	62.605	84	-21.395	Peak
11160	37.839	81	123	H	38.378	11.394	35.867	51.744	64	-12.256	Ave
16740	49.230	294	169	H	42.510	14.648	35.607	70.781	78	-7.219	Peak
16740	38.348	294	169	H	42.510	14.648	35.607	59.899	64	-4.101	Ave
High Channel: 5700 MHz											
5725	61.940	292	136	H	35.612	7.840	36.690	68.702	78	-9.298	Peak
5725	48.457	292	136	H	35.612	7.840	36.690	55.219	64	-8.781	Ave
11400	46.440	42	122	H	38.574	11.430	35.891	60.553	84	-23.447	Peak
11400	36.565	42	122	H	38.574	11.430	35.891	50.678	64	-13.322	Ave
17100	48.750	157	183	H	42.145	15.915	35.982	70.828	78	-7.172	Peak
17100	38.771	157	183	H	42.145	15.915	35.982	60.849	64	-3.151	Ave
5720 MHz											
11440	46.285	42	122	H	38.574	11.430	35.891	60.398	84	-23.602	Peak
11440	36.472	42	122	H	38.574	11.430	35.891	50.585	64	-13.415	Ave
17160	48.344	157	183	H	42.145	15.915	35.982	70.422	78	-7.578	Peak
17160	38.259	157	183	H	42.145	15.915	35.982	60.337	64	-3.663	Ave

Antenna B

5470 - 5725 MHz

802.11ac40/n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5510 MHz											
5470	66.39	301	136	H	36.219	7.660	36.62	73.643	78	-4.357	Peak
5470	54.52	301	136	H	36.219	7.660	36.62	61.781	64	-2.219	Ave
11020	47.95	117	239	H	38.474	11.28	35.98	61.723	84	-22.27	Peak
11020	37.69	117	239	H	38.474	11.28	35.98	51.464	64	-12.53	Ave
16530	48.68	6	105	H	42.340	13.97	35.86	69.124	78	-8.87	Peak
16530	38.81	6	105	H	42.340	13.97	35.86	59.262	64	-4.73	Ave
Middle Channel: 5590 MHz											
11180	48.060	38	291	H	38.378	11.39	35.86	61.965	84	-22.03	Peak
11180	37.403	38	291	H	38.378	11.39	35.86	51.308	64	-12.69	Ave
16770	48.240	342	213	H	42.510	14.64	35.60	69.791	78	-8.20	Peak
16770	38.479	342	213	H	42.510	14.64	35.60	60.030	64	-3.97	Ave
High Channel: 5670 MHz											
5725	64.900	299	127	H	35.612	7.840	36.69	71.662	78	-6.33	Peak
5725	49.456	299	127	H	35.612	7.840	36.69	56.218	64	-7.78	Ave
11340	48.110	344	266	H	38.574	11.43	35.89	62.223	84	-21.77	Peak
11340	37.633	344	266	H	38.574	11.43	35.89	51.746	64	-12.25	Ave
17010	48.710	87	236	H	42.145	15.91	35.98	70.788	78	-7.21	Peak
17010	38.454	87	236	H	42.145	15.91	35.98	60.532	64	-3.46	Ave
5710 MHz											
11420	47.554	344	266	H	38.574	11.430	35.891	61.667	84	-22.333	Peak
11420	37.342	344	266	H	38.574	11.430	35.891	51.455	64	-12.545	Ave
17130	48.654	87	236	H	42.145	15.915	35.982	70.732	78	-7.268	Peak
17130	38.333	87	236	H	42.145	15.915	35.982	60.411	64	-3.589	Ave

Antenna B

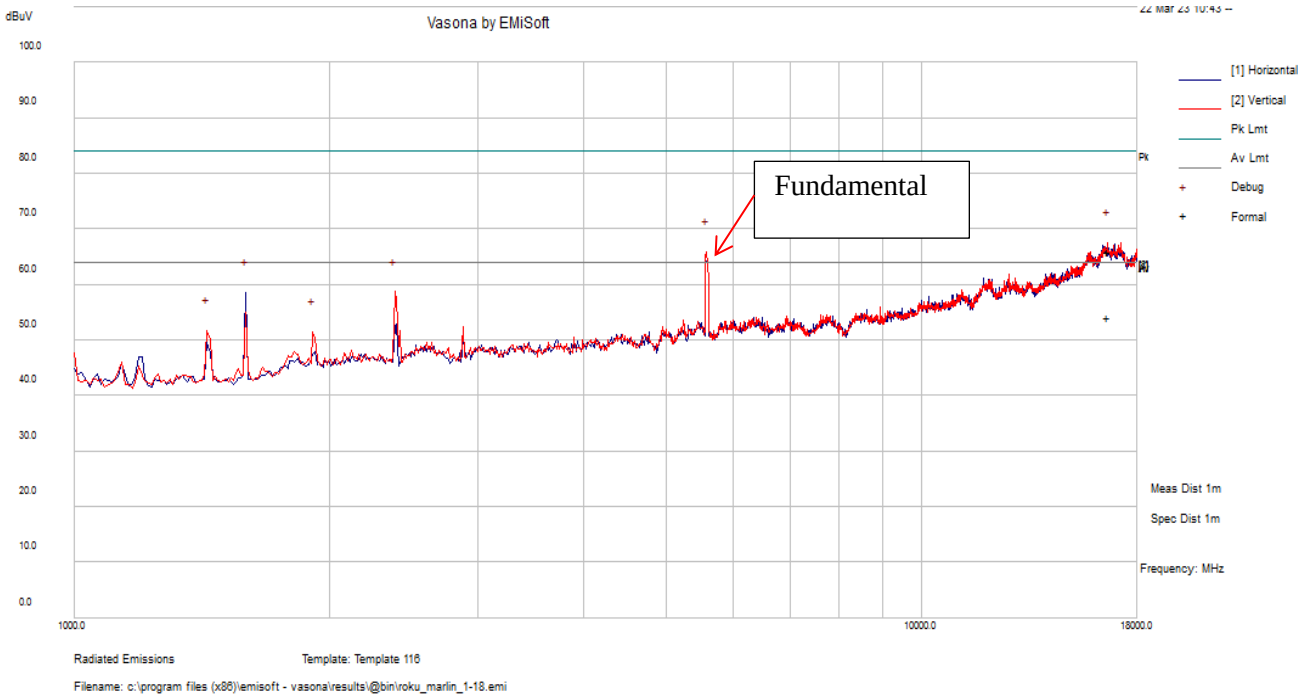
5470 - 5725 MHz

802.11ac80 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel: 5530 MHz											
5470	70.590	328	134	H	36.21	7.660	36.626	77.843	78	-0.157	Peak
5470	56.547	328	134	H	36.21	7.660	36.626	63.800	64	-0.200	Ave
11060	48.160	256	101	H	38.47	11.280	35.981	61.933	84	-22.06	Peak
11060	38.200	256	101	H	38.47	11.280	35.981	51.973	64	-12.02	Ave
16590	49.660	239	101	H	42.34	13.970	35.866	70.104	78	-7.89	Peak
16590	38.812	239	101	H	42.340	13.970	35.866	59.256	64	-4.744	Ave
High Channel: 5610 MHz											
11220	49.111	6	219	H	38.378	11.394	35.867	63.016	84	-20.984	Peak
11220	39.457	6	219	H	38.378	11.394	35.867	53.362	64	-10.638	Ave
16830	49.357	177	159	H	42.510	14.648	35.607	70.908	78	-7.092	Peak
16830	38.645	177	159	H	42.510	14.648	35.607	60.196	64	-3.804	Ave
5690 MHz											
11380	46.330	344	266	H	38.574	11.430	35.891	60.443	84	-23.557	Peak
11380	36.628	344	266	H	38.574	11.430	35.891	50.741	64	-13.259	Ave
17070	49.365	87	236	H	42.145	15.915	35.982	71.443	78	-6.557	Peak
17070	38.772	87	236	H	42.145	15.915	35.982	60.850	64	-3.150	Ave

3) 1 to 18 GHz Vasona scan at 1 meter

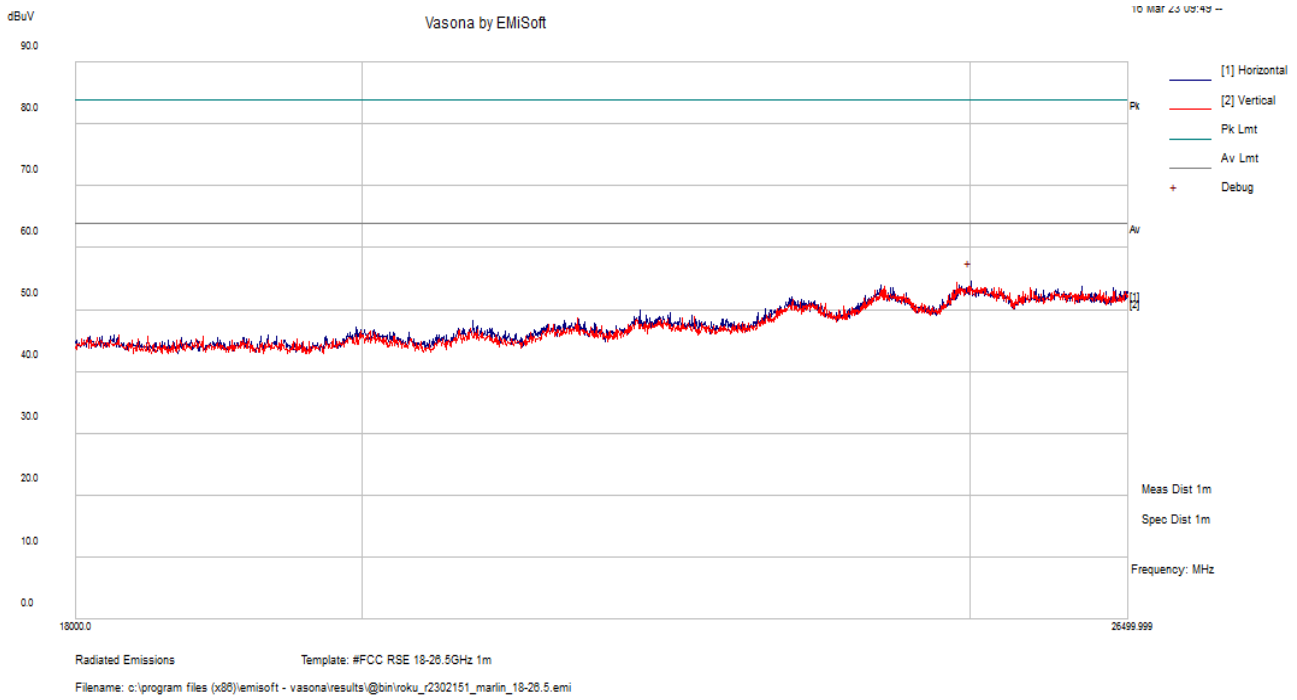
Worst Case:



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
16609.475	48.51	17.44	65.95	101	V	110	84	-18.05	Peak
16609.475	36.78	17.44	54.22	101	V	110	64	-9.78	Avg

4) 18 – 26.5 GHz Worst Case Scan at 1 Meter

Worst Case:

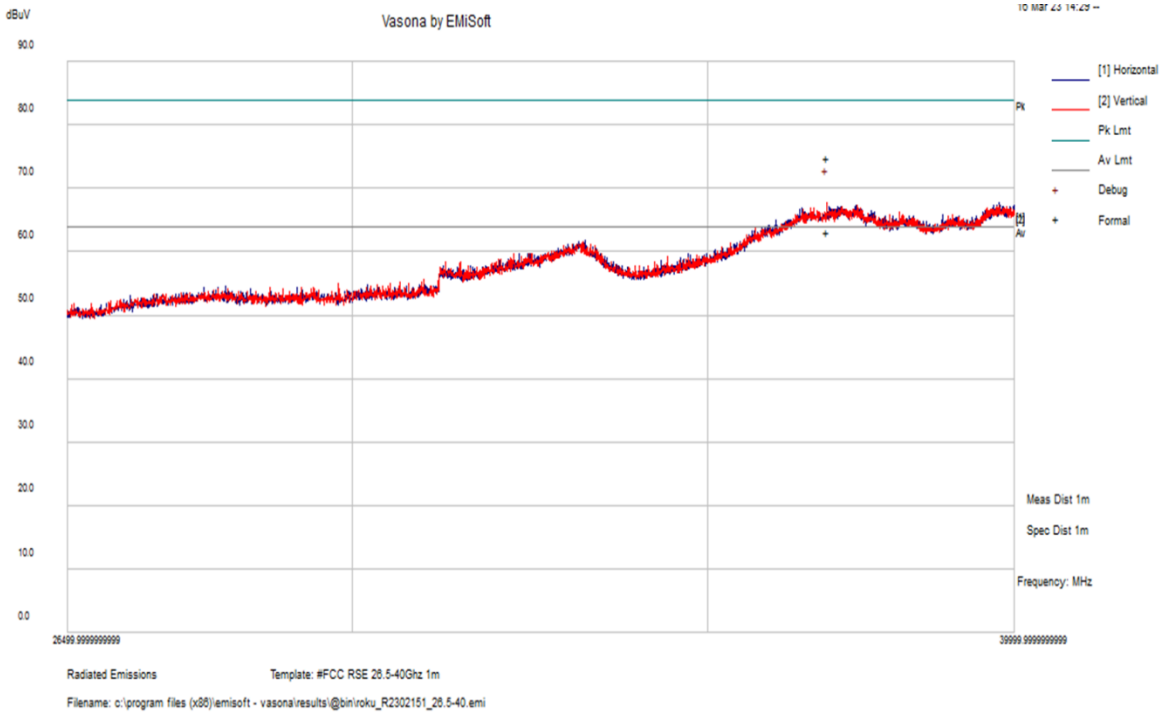


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
24924.249	38.7	14.8	53.5	101	V	7	64	-10.5	Peak

Note: Worst case peak emission was compared to average limit to show compliance.

5) 26.5 – 40 GHz Worst Case Scan at 1 Meter

Worst Case:



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
36862.188	56.03	18.81	74.84	277	V	343	84	-9.16	Peak
36862.188	44.31	18.81	63.12	277	V	343	64	-0.88	Avg

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

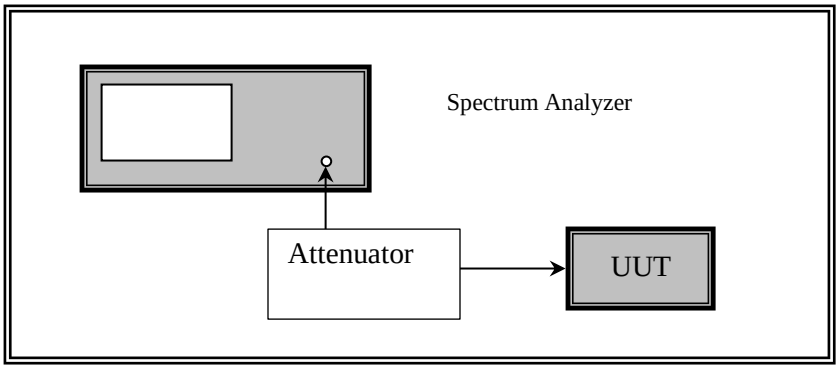
8.1 Applicable Standards

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

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 or 26 dB from the reference level. Record the frequency difference as the minimum emission or emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

8.3 Test Setup Block Diagram



8.4 Test Equipment List and Details

BACL Number	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
912	Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008k39-101203-UW	2022-05-05	1 year
-	-	20dB attenuator	-	-	Each time[1]	N/A
-	-	RF cable	-	-	Each time[1]	N/A

Note[1]: 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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability"*

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8.5 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

Testing was performed by Christian Schwartz from 2023-02-23 to 2023-03-28 at the RF site.

8.6 Test Results

Please refer to the following tables and plots.

5250 - 5350 MHz

Ant A

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
52	5260	18.84	21.85
56	5280	19.2	21.45
64	5320	18.04	21.6
802.11n/ac20 mode			
52	5260	19.4	21.8
56	5280	19.6	21.8
64	5320	19.2	21.45
802.11n/ac40 mode			
54	5270	44.56	43.1
62	5310	45.52	42.4
802.11ac80 mode			
58	5290	132.96	82

Ant B

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
52	5260	18.16	21.25
56	5280	18.28	21.6
64	5320	18.52	21.65
802.11n/ac20 mode			
52	5260	19.04	22.5
56	5280	18.88	21.95
64	5320	19.12	22.1
802.11n/ac40 mode			
54	5270	38.8	42.2
62	5310	39.6	42.8
802.11ac80 mode			
58	5290	113.44	82.8

Note: See Annex A for 99% Bandwidth results
Note: See Annex B for 26dB Bandwidth results

5470MHz - 5725 MHz

Ant A

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
100	5500	22.84	33.65
116	5580	28.72	44.35
140	5700	21.36	23.45
144	5720	30.52	44.8
802.11n/ac20 mode			
100	5500	21.92	34.75
116	5580	30.00	46.85
140	5700	21.76	23.2
144	5720	29.56	48.5
802.11n/ac40 mode			
102	5510	54.24	54.9
118	5590	56.56	93.4
134	5670	49.28	68.4
142	5710	69.9	95
802.11ac80 mode			
106	5530	144.54	134.55
122	5610	127.68	208.57
138	5690	139.68	206.77

Note: See Annex A for 99% Bandwidth results
Note: See Annex B for 26dB Bandwidth results

5470MHz - 5725 MHz

Ant B

Channel	Frequency (MHz)	99% OBW (MHz)	26 dB OBW (MHz)
802.11a mode			
100	5500	25.36	40.1
116	5580	27.36	43.35
140	5700	18.84	22.00
144	5720	29.36	44.2
802.11n/ac20 mode			
100	5500	25.36	40.1
116	5580	28.72	46.15
140	5700	19.24	22.55
144	5720	28.64	45.9
802.11n/ac40 mode			
102	5510	45.84	69.9
118	5590	56.32	97.65
134	5670	42.16	72.15
142	5710	54.56	93.75
802.11ac80 mode			
106	5530	101.6	135
122	5610	118.08	208.25
122	5610	118.08	201.5

Note: See Annex A for 99% Bandwidth results
Note: See Annex B for 26dB Bandwidth 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.

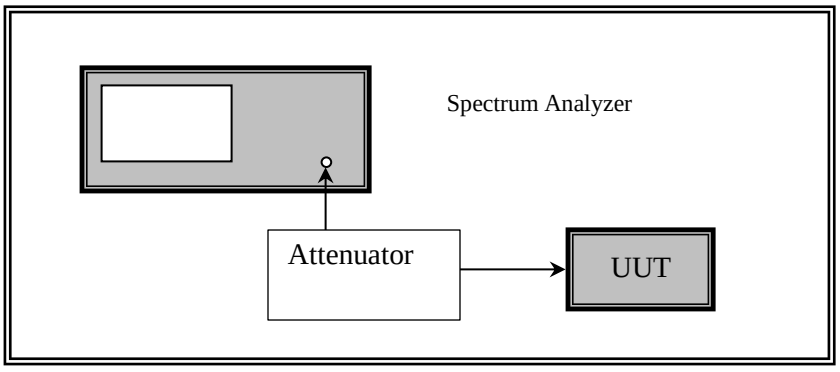
According to ISEDC RSS-247 §6.2.4 for frequency band 5725-5850 MHz:

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

(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(ii) Set RBW = 1 MHz.
(iii) Set VBW $\geqslant$ 3 MHz.
(iv) Number of points in sweep $\geqslant 2 \times$ span / RBW. (This ensures that bin-to-bin spacing is $\leqslant$ RBW/2, so that narrowband signals are not lost between frequency bins.)
(v) Sweep time = auto.
(vi) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.
(vii) If transmit duty cycle < 98%, 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 $\geqslant$ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
(viii) Trace average at least 100 traces in power averaging (rms) mode.
(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

9.3 Test Setup Block Diagram



9.4 Test Equipment List and Details

BACL Number	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
912	Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008k39-101203-UW	2022-05-05	1 year
-	-	20dB attenuator	-	-	Each time[1]	N/A
-	-	RF cable	-	-	Each time[1]	N/A

Note[1]: 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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

9.5 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	55 %
ATM Pressure:	102.2 KPa

Testing was performed by Christian Schwartz from 2023-02-23 to 2023-03-29 at the RF site.

9.6 Test Results

5250 - 5350 MHz
Ant A

Channel	Frequency (MHz)	Conducted Output Power (dBm)	CorrectedOutput Power (dBm)	FCC/IC Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11a mode						
52	5260	15.93	16.15	<23.55	19.15	<29.55
56	5280	15.43	15.65	<23.55	18.65	<29.55
64	5320	16.03	16.25	<23.55	19.25	<29.55
802.11n/ac20 mode						
52	5260	15.58	15.85	<23.79	18.85	<29.79
56	5280	15.22	15.49	<23.79	18.49	<29.79
64	5320	15.79	16.06	<23.79	19.06	<29.79
802.11n/ac40 mode						
54	5270	15.5	16.2	<24	19.2	<30
62	5310	15.47	16.17	<24	19.17	<30
802.11ac80 mode						
58	5290	12.6	13.7	<24	16.7	<30

Note: See Annex C for Conducted Output Power results
Note: Corrected Output Power(dBm)= Conducted Output Power(dBm) + Duty Cycle Correction Factor(dBm)
Note: EIRP(dBm) = Corrected Output Power (dBm) + Antenna Gain(dBi)
Note: For 5250MHz-5350MHz for FCC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 26dB bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.
Note: For 5250MHz-5350MHz for IC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 99% emission bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.

5250 - 5350 MHz
Ant B

Channel	Frequency (MHz)	Conducted Output Power (dBm)	CorrectedOutput Power (dBm)	FCC/IC Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11a mode						
52	5260	11.72	11.94	<23.55	13.22	<29.55
56	5280	12.06	12.28	<23.55	13.56	<29.55
64	5320	11.67	11.89	<23.55	13.17	<29.55
802.11n/ac20 mode						
52	5260	11.63	11.9	<23.55	13.18	<29.55
56	5280	12.10	12.37	<23.55	13.65	<29.55
64	5320	11.76	12.03	<23.55	13.31	<29.55
802.11n/ac40 mode						
54	5270	12.12	12.82	<24	14.1	<30
62	5310	11.76	12.46	<24	13.74	<30
802.11ac80 mode						
58	5290	10.21	11.31	<24	12.59	<30

Note: See Annex C for Conducted Output Power results
Note: Corrected Output Power(dBm)= Conducted Output Power(dBm) + Duty Cycle Correction Factor(dBm)
Note: EIRP(dBm) = Corrected Output Power (dBm) + Antenna Gain(dBi)
Note: For 5250MHz-5350MHz for FCC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 26dB bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.
Note: For 5250MHz-5350MHz for IC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 99% emission bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.

5470MHz - 5725 MHz
Ant A

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Corrected Output Power (dBm)	FCC/IC Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11a mode						
100	5500	16.69	16.91	<24	19.91	<30
116	5580	20.16	20.38	<24	23.38	<30
140	5700	15.02	15.24	<24	18.24	<30
144	5710-5725	17.02	17.24	<24	20.24	<30
144	5725-5730	9.57	9.79	<30	12.79	<30
802.11n/ac20 mode						
100	5500	16.63	16.9	<24	19.9	<30
116	5580	20.67	20.94	<24	23.94	<30
140	5700	14.98	15.25	<24	18.25	<30
144	5710-5725	16.61	16.88	<24	19.88	<30
144	5725-5730	9.61	9.88	<30	12.88	<30
802.11n/ac40 mode						
102	5510	14.06	14.76	<24	17.76	<30
118	5590	20.57	21.27	<24	24.27	<30
134	5670	16.69	17.37	<24	20.37	<30
142	5690-5725	17.23	17.93	<24	20.93	<30
142	5725-5730	5.13	5.83	<30	8.83	<30
802.11ac80 mode						
106	5530	14.49	15.59	<24	18.59	<30
122	5610	17.54	20.82	<24	23.82	<30
138	5650-5725	16.92	18.02	<24	21.02	<30
138	5725-5730	1.29	2.39	<30	5.39	<30

Note: See Annex C for Conducted Output Power results
Note: Corrected Output Power(dBm)= Conducted Output Power(dBm) + Duty Cycle Correction Factor(dBm)
Note: EIRP(dBm) = Corrected Output Power (dBm) + Antenna Gain(dBi)
Note: For 5470MHz-5725MHz for FCC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 26dB bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.
Note: For 5470MHz-5725MHz for IC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 99% emission bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.

5470MHz - 5725 MHz
Ant B

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Corrected Output Power (dBm)	FCC/IC Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11a mode						
100	5500	15.02	15.24	<23.55	16.52	<29.55
116	5580	17.57	17.79	<23.55	19.07	<29.55
140	5700	13.18	13.4	<23.55	14.68	<29.55
144	5710-5725	17.30	17.52	<23.55	18.8	<29.55
144	5725-5730	9.69	9.91	<30	11.19	<30
802.11n/ac20 mode						
100	5500	14.59	14.86	<23.79	16.14	<29.79
116	5580	17.97	18.24	<23.79	19.52	<29.79
140	5700	13.01	13.28	<23.79	14.56	<29.79
144	5710-5725	16.12	16.39	<23.79	17.67	<29.79
144	5725-5730	9.67	9.94	<30	11.22	<30
802.11n/ac40 mode						
102	5510	12.49	13.19	<24	14.47	<30
118	5590	17.68	18.38	<24	19.66	<30
134	5670	14.76	15.46	<24	16.74	<30
142	5690-5725	16.56	17.26	<24	18.54	<30
142	5725-5730	5.14	5.84	<30	7.12	<30
802.11ac80 mode						
106	5530	13	14.1	<24	15.38	<30
122	5610	18.04	19.14	<24	20.42	<30
138	5650-5725	16.38	17.48	<24	18.76	<30
138	5725-5730	1.20	2.3	<30	3.58	<30

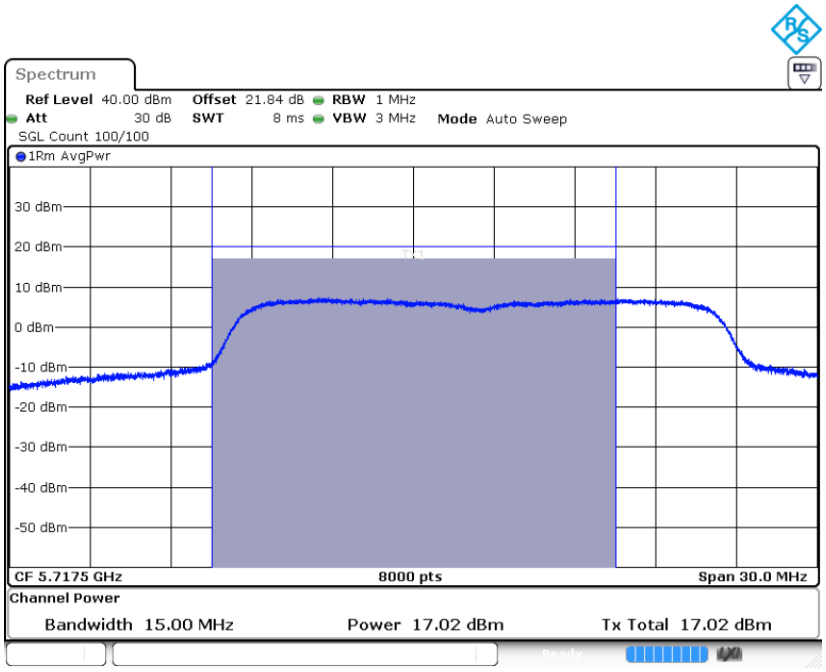
Note: See Annex C for Conducted Output Power results
Note: Corrected Output Power(dBm)= Conducted Output Power(dBm) + Duty Cycle Correction Factor(dBm)
Note: EIRP(dBm) = Corrected Output Power (dBm) + Antenna Gain(dBi)
Note: For 5470MHz-5725MHz for FCC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 26dB bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.
Note: For 5470MHz-5725MHz for IC: the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. Here B is the 99% emission bandwidth in megahertz. In this instance B was chosen to be the lowest measured BW rounded down to represent the worst case limit.

Note: For straddle channels (i.e. Ch. 144), see below screenshots for test results.

Ant A

A mode

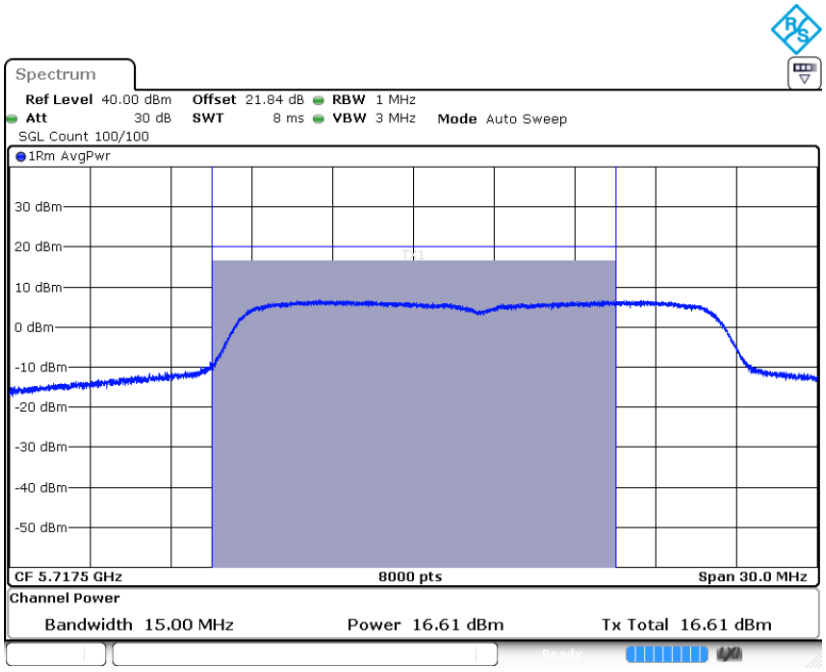
5710-5725MHz



Date: 24.MAR.2023 08:27:21

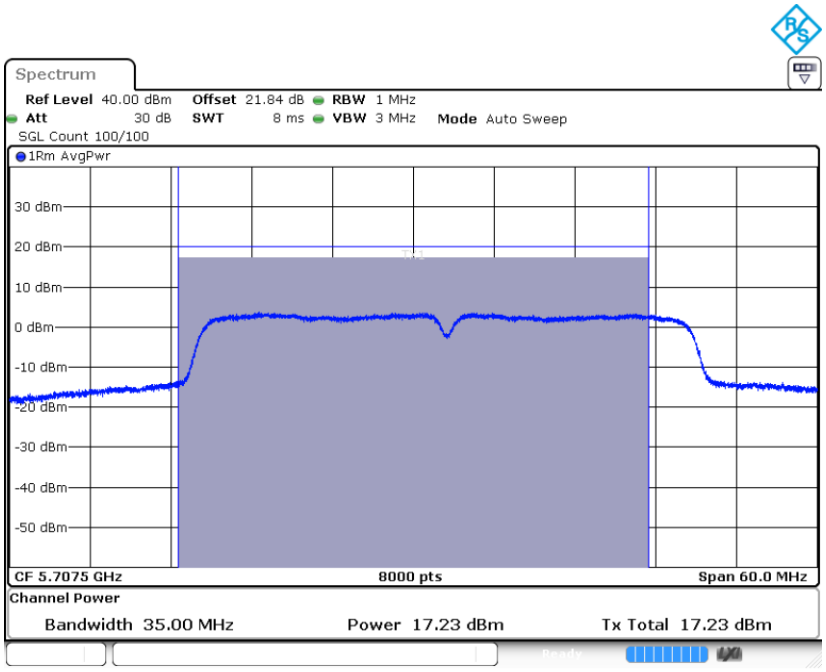
Ac/N20 mode

5710-5725MHz



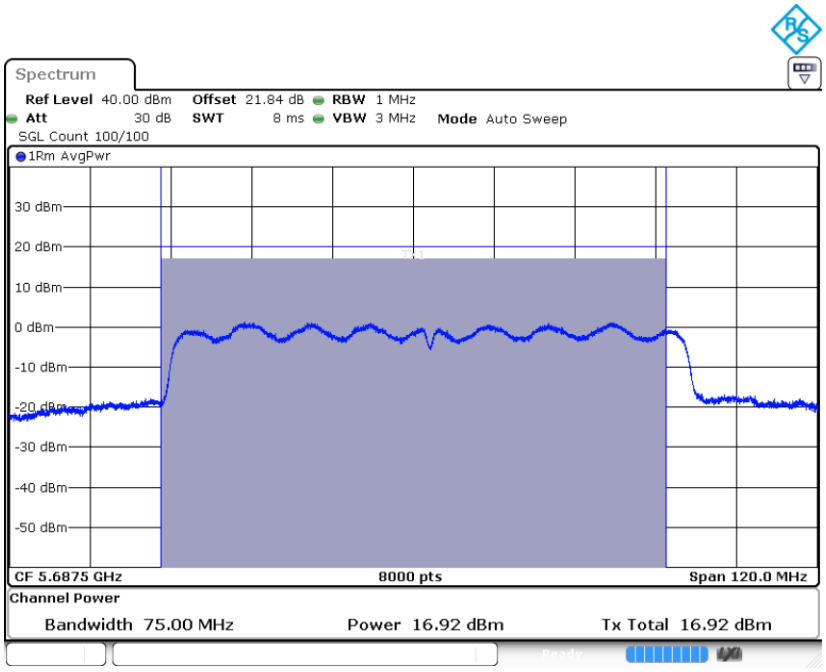
Date: 24.MAR.2023 08:28:54

Ac/N40 mode
5690-5725MHz



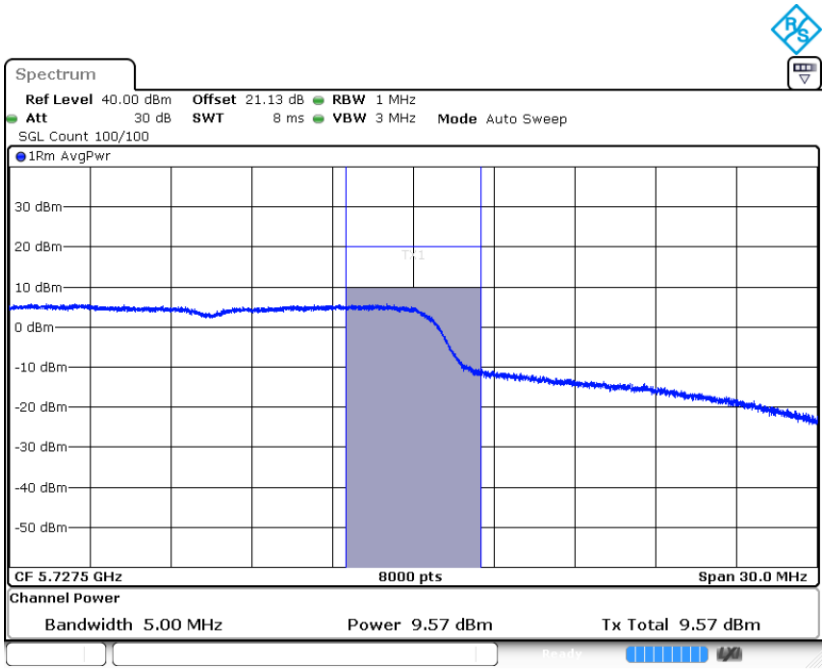
Date: 24.MAR.2023 08:30:26

Ac80 mode
5650-5725MHz



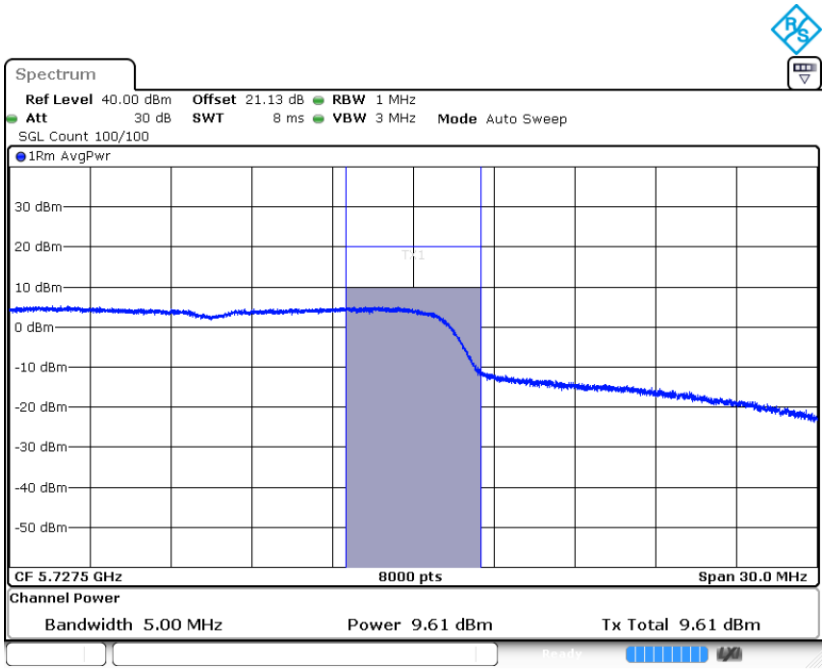
Date: 24.MAR.2023 08:31:58

A mode
5725-5730 MHz



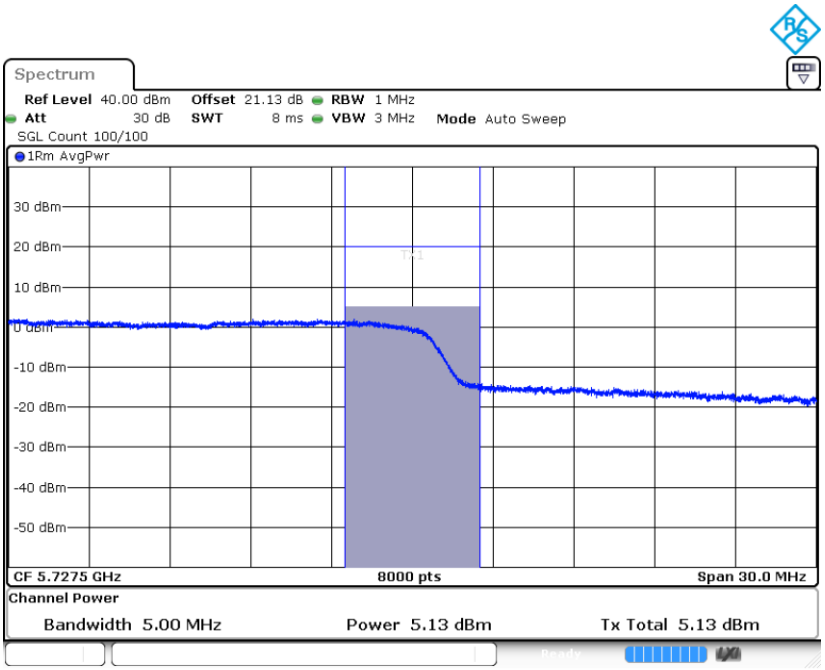
Date: 29.MAR.2023 11:00:48

Ac/N20 mode
5725-5730 MHz



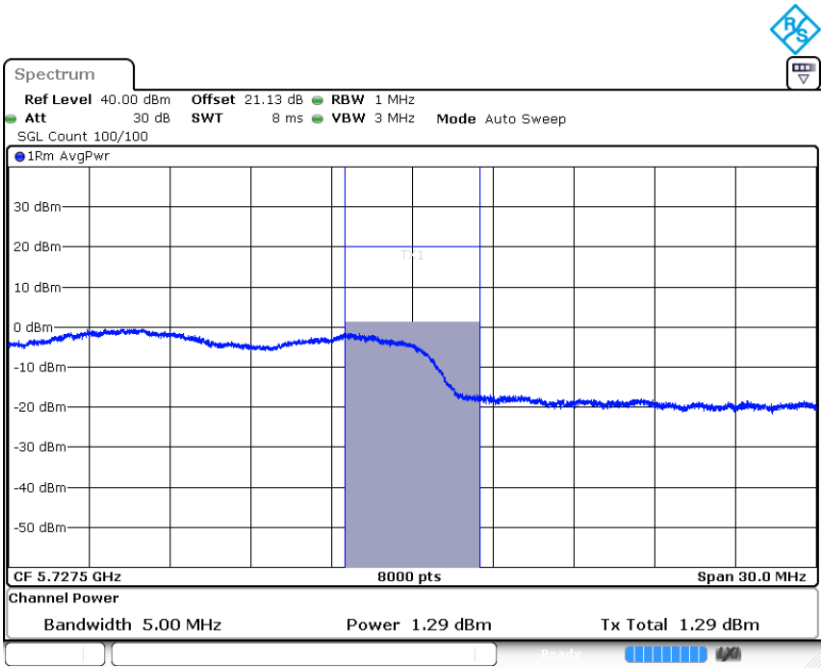
Date: 29.MAR.2023 11:01:11

Ac/N40 mode
5725-5730 MHz



Date: 29.MAR.2023 11:03:58

Ac80 mode
5725-5730 MHz

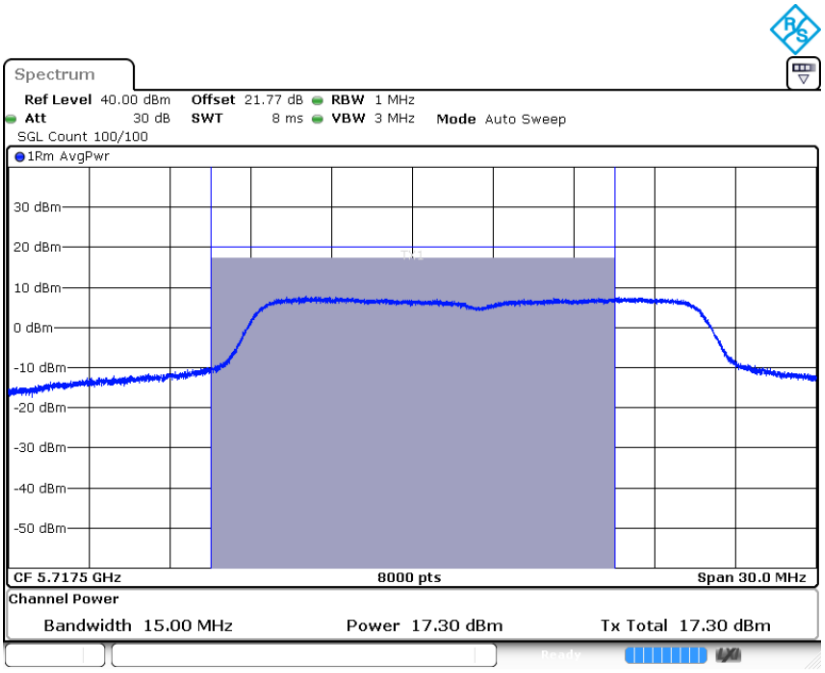


Date: 29.MAR.2023 11:04:21

Ant B

A mode

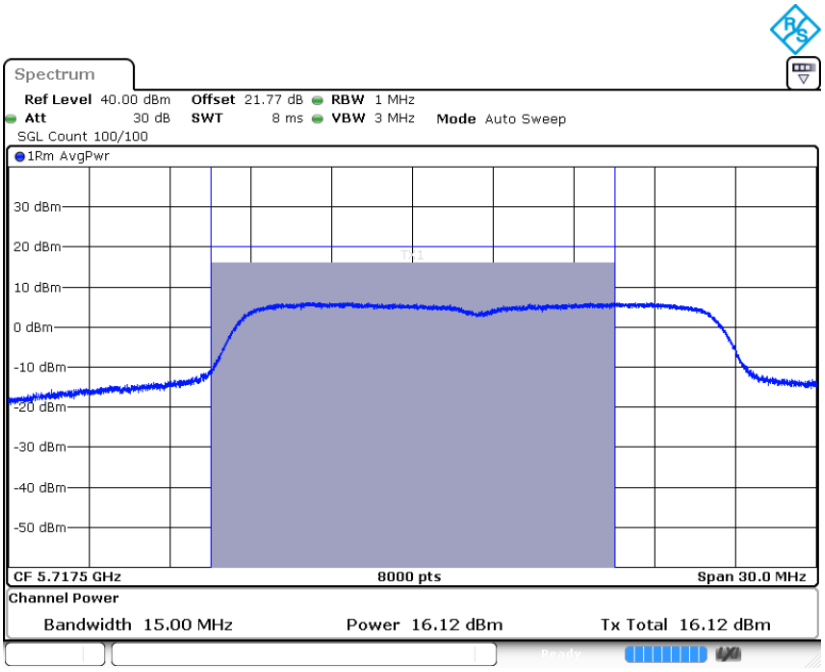
5710-5725MHz



Date: 28.MAR.2023 08:28:17

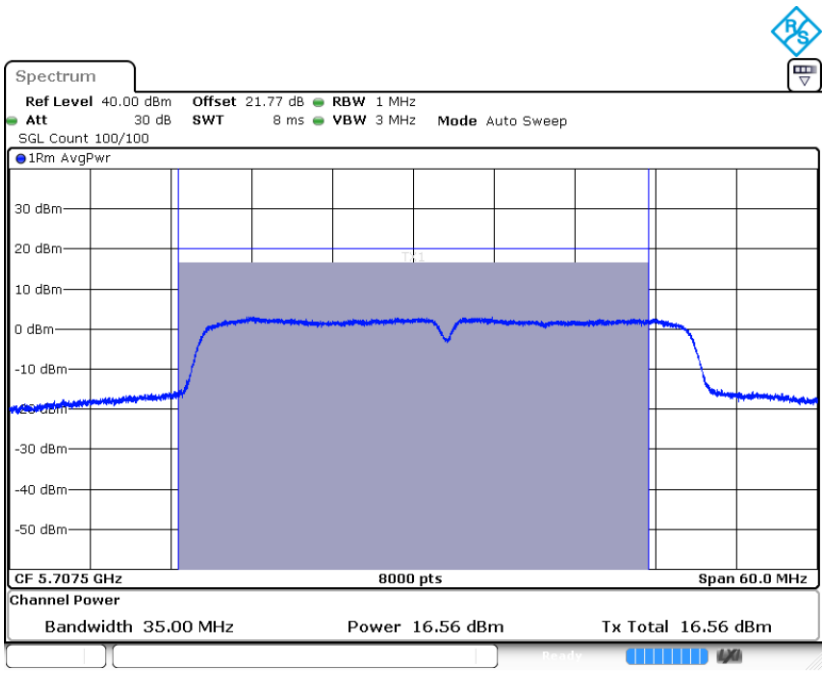
Ac/N20 mode

5710-5725MHz



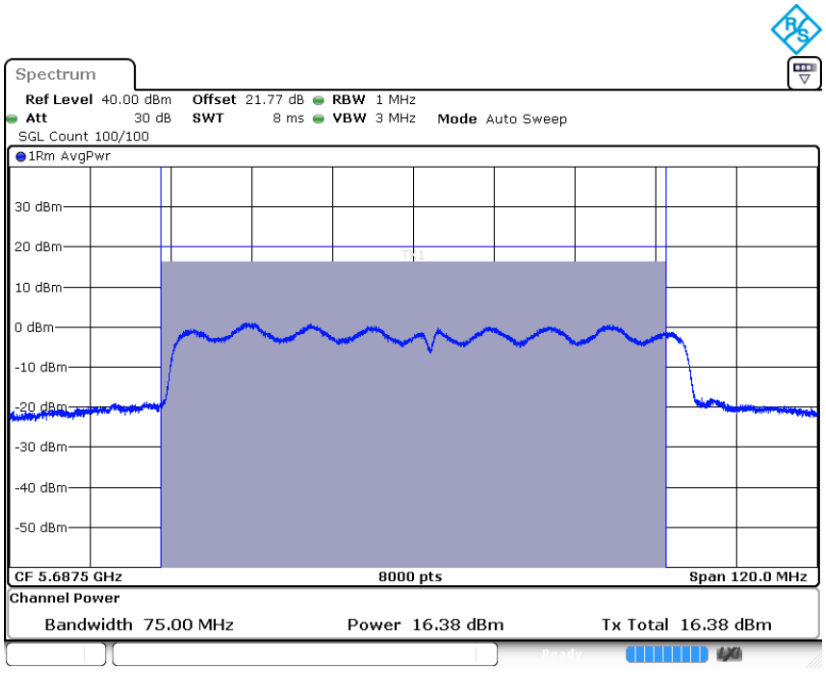
Date: 28.MAR.2023 08:31:39

Ac/N40 mode
5690-5725MHz



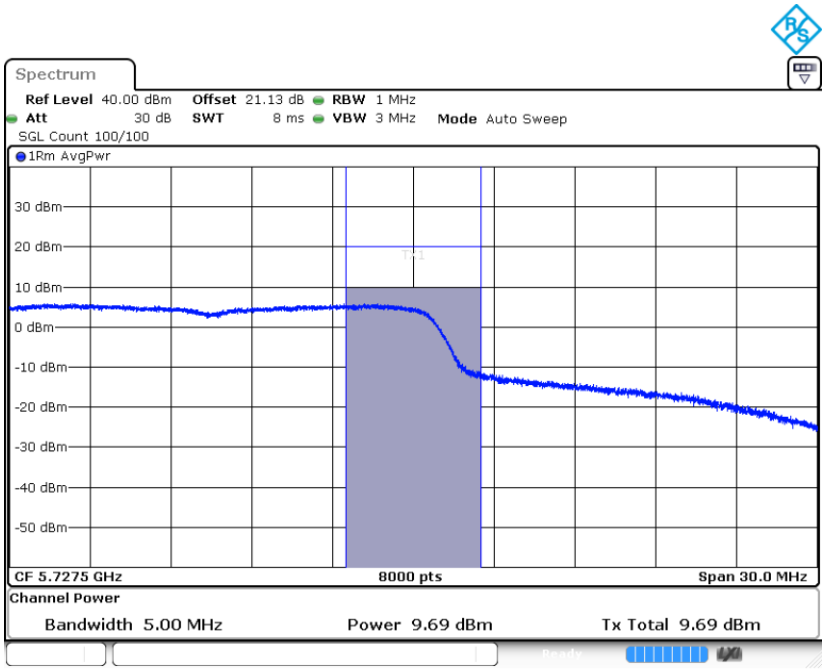
Date: 28.MAR.2023 08:34:55

Ac80 mode
5650-5725MHz



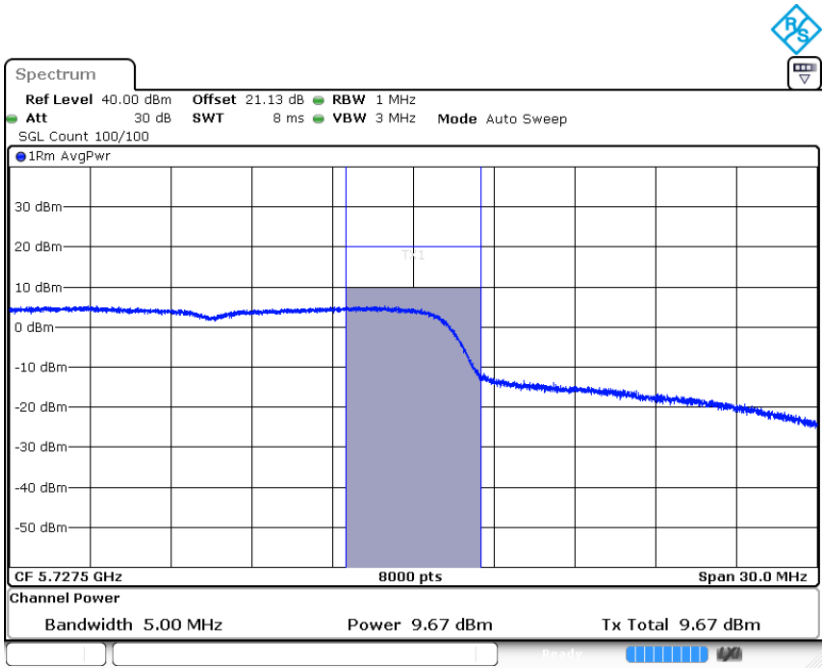
Date: 28.MAR.2023 08:38:11

A mode
5725-5730 MHz



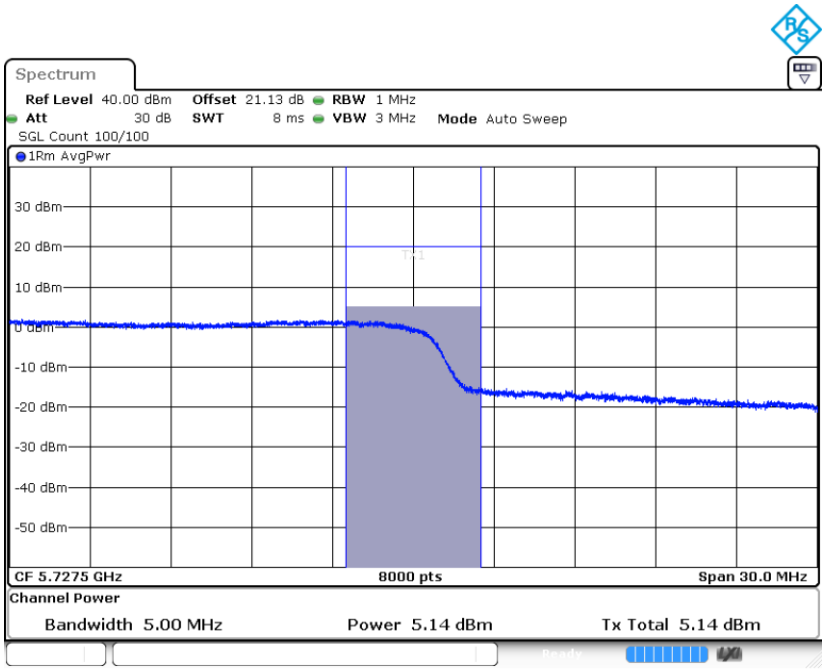
Date: 29.MAR.2023 11:07:27

Ac/N20 mode
5725-5730 MHz



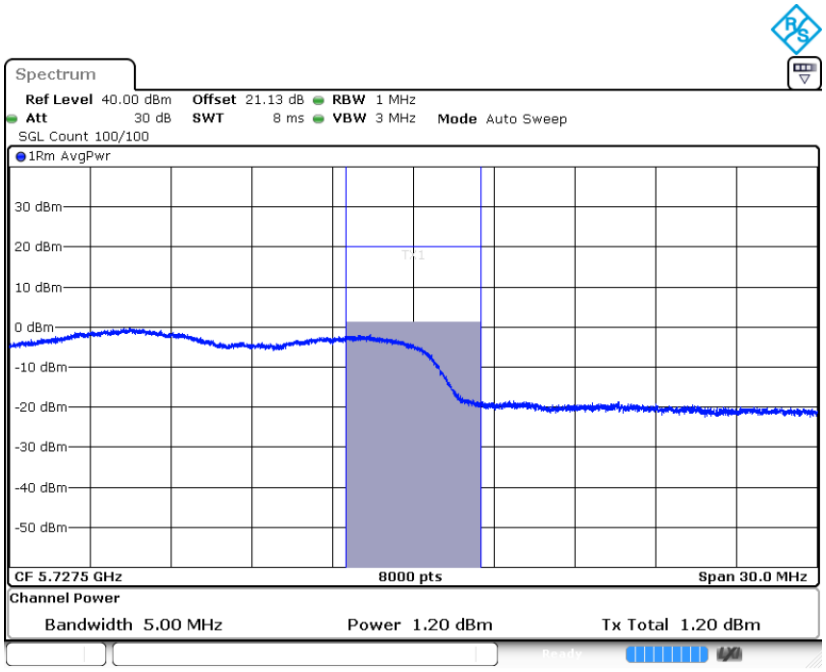
Date: 29.MAR.2023 11:07:50

Ac/N40 mode
5725-5730 MHz



Date: 29.MAR.2023 11:08:13

Ac80 mode
5725-5730 MHz



Date: 29.MAR.2023 11:08:35

10 FCC §15.407(a) & ISEDC RSS-247 §6.2 - 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.

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.

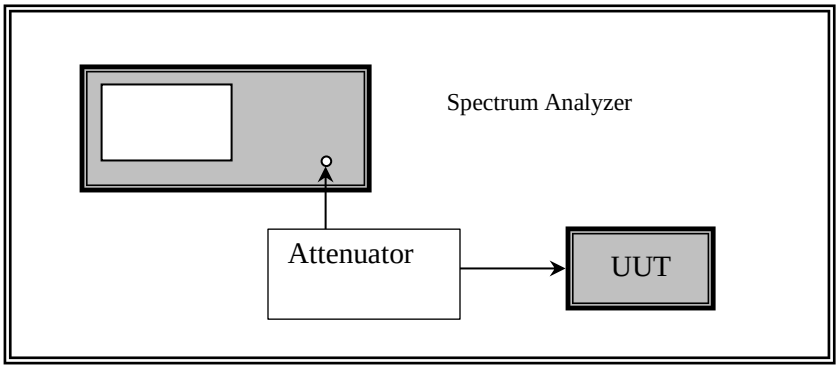
According to ISEDC RSS-247 §6.2.4 for frequency band 5725-5850 MHz:

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.

1.2 Measurement Procedure

(i) Set span to encompass the entire emission bandwidth (EBW) of the signal.
(ii) Set RBW = 1 MHz.
(iii) Set VBW ≥ 3 MHz.
(iv) 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.)
(v) Sweep time = auto.
(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
(vii) 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".
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
(ix) Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

10.2 Test Setup Block Diagram



10.3 Test Equipment List and Details

BACL Number	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
912	Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008k39-101203-UW	2022-05-05	1 year
-	-	20dB attenuator	-	-	Each time[1]	N/A
-	-	RF cable	-	-	Each time[1]	N/A

Note[1]: 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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

10.4 Test Environmental Conditions

Temperature:	22-24 ºC
Relative Humidity:	50-55 %
ATM Pressure:	102.1-102.7 kPa

Testing was performed by Christian Schwartz from 2023-02-23 to 2023-03-28 at the RF site.

10.5 Test Results

5250 - 5350 MHz

Ant A

Channel	Frequency (MHz)	PSD (dBm/MHz)	Corrected PSD(dBm/MHz)	FCC/IC Limit (dBm/ MHz)
802.11a mode				
52	5260	0.28	0.5	<11
56	5280	0.59	0.81	<11
64	5320	-0.32	-0.1	<11
802.11n/ac20 mode				
52	5260	-0.47	0.2	<11
56	5280	-0.01	0.26	<11
64	5320	-0.80	-1.07	<11
802.11n/ac40 mode				
54	5270	-3.22	-2.52	<11
62	5310	-3.95	-3.25	<11
802.11ac80 mode				
58	5290	-7.98	-6.88	<11

Note: See Annex D for test results
Note: Corrected PSD (dBm/MHz) = Conducted PSD(dBm/MHz) + Duty Cycle Correction Factor(dB)

5250 - 5350 MHz

Ant B

Channel	Frequency (MHz)	PSD (dBm/MHz)	Corrected PSD(dBm/MHz)	FCC/IC Limit (dBm/ MHz)
802.11a mode				
52	5260	0.47	0.69	<11
56	5280	0.85	1.12	<11
64	5320	0.42	0.64	<11
802.11n/ac20 mode				
52	5260	0.12	0.39	<11
56	5280	0.59	0.86	<11
64	5320	0.20	0.47	<11
802.11n/ac40 mode				
54	5270	-2.46	-1.76	<11
62	5310	-2.80	-2.1	<11
802.11ac80 mode				
58	5290	-6.41	-5.31	<11

Note: See Annex D for test results
Note: Corrected PSD (dBm/MHz) = Conducted PSD(dBm/MHz) + Duty Cycle Correction Factor(dB)

5470MHz - 5725 MHz

Ant A

Channel	Frequency (MHz)	PSD (dBm/MHz)	Corrected PSD(dBm/MHz)	FCC/IC Limit (dBm/ MHz)
802.11a mode				
100	5500	2.56	2.78	<11
116	5580	5.22	5.44	<11
140	5700	1.68	1.90	<11
144	5710-5725	6.51	6.73	<11
144*	5725-5730	3.35 dBm/500kHz	3.57 dBm/500kHz	<30 dBm/500kHz
802.11n/ac20 mode				
100	5500	2.01	2.28	<11
116	5580	5.31	5.58	<11
140	5700	1.26	1.53	<11
144	5710-5725	6.19	6.46	<11
144*	5725-5730	3.15 dBm/500kHz	3.42 dBm/500kHz	<30 dBm/500kHz
802.11n/ac40 mode				
102	5510	-3.24	-2.54	<11
118	5590	2.15	2.85	<11
134	5670	-0.22	0.48	<11
134	5690-5725	3.14	3.84	<11
134*	5725-5730	-0.18 dBm/500kHz	0.52 dBm/500kHz	<30 dBm/500kHz
802.11ac80 mode				
106	5530	-4.02	-2.92	<11
122	5610	0.66	1.76	<11
138	5650-5725	0.82	1.92	<11
138*	5725-5730	-3.47 dBm/500kHz	-2.37 dBm/500kHz	<30 dBm/500kHz

Note: See Annex D for test results
Note: Corrected PSD (dBm/MHz) = Conducted PSD(dBm/MHz) + Duty Cycle Correction Factor(dB)
Note*: Due to channel being in U-NII-3 band, PSD and Limit is dBm/500kHz.

Note: For straddle channels (i.e. Ch. 144), see below screenshots for test results.

5470MHz - 5725 MHz

Ant B

Channel	Frequency (MHz)	PSD (dBm/MHz)	Corrected PSD(dBm/MHz)	FCC/IC Limit (dBm/ MHz)
802.11a mode				
100	5500	3.74	3.96	<11
116	5580	6.26	6.48	<11
140	5700	1.92	2.14	<11
144	5710-5725	6.45	6.67	<11
144*	5725-5730	3.37 dBm/500kHz	3.59 dBm/500kHz	<30 dBm/500kHz
802.11n/ac20 mode				
100	5500	3.22	3.49	<11
116	5580	6.4	6.67	<11
140	5700	1.61	1.88	<11
144	5710-5725	5.57	5.84	<11
144*	5725-5730	2.44 dBm/500kHz	2.71 dBm/500kHz	<30 dBm/500kHz
802.11n/ac40 mode				
102	5510	-1.88	-1.18	<11
118	5590	3.16	3.86	<11
134	5670	0.29	0.99	<11
134	5690-5725	2.42	3.12	<11
134*	5725-5730	-0.99 dBm/500kHz	-0.29 dBm/500kHz	<30 dBm/500kHz
802.11ac80 mode				
106	5530	-2.77	-1.67	<11
122	5610	1.85	2.95	<11
138	5650-5725	0.61	1.71	<11
138*	5725-5730	-4.16 dBm/500kHz	-3.06 dBm/500kHz	<30 dBm/500kHz

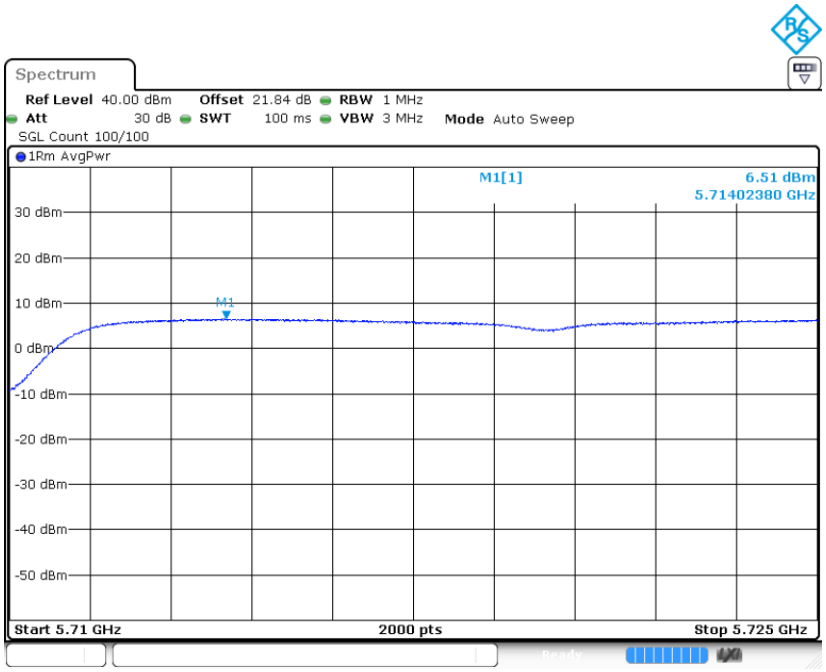
Note: See Annex D for test results
Note: Corrected PSD (dBm/MHz) = Conducted PSD(dBm/MHz) + Duty Cycle Correction Factor(dB)
Note*: Due to channel being in U-NII-3 band, PSD and Limit is dBm/500kHz.

Note: For straddle channels (i.e. Ch. 144), see below screenshots for test results.

Ant A

A mode

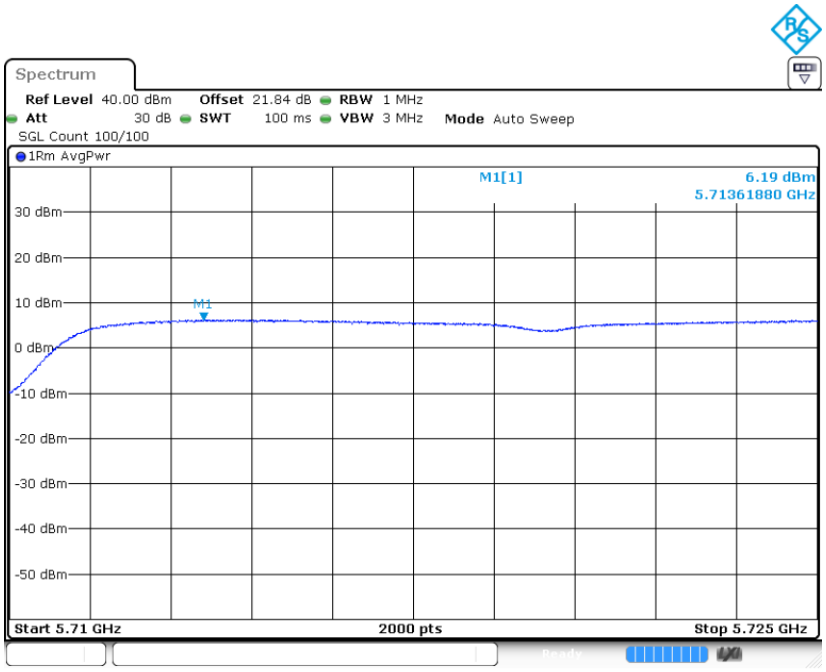
5710-5725MHz



Date: 24.MAR.2023 08:28:13

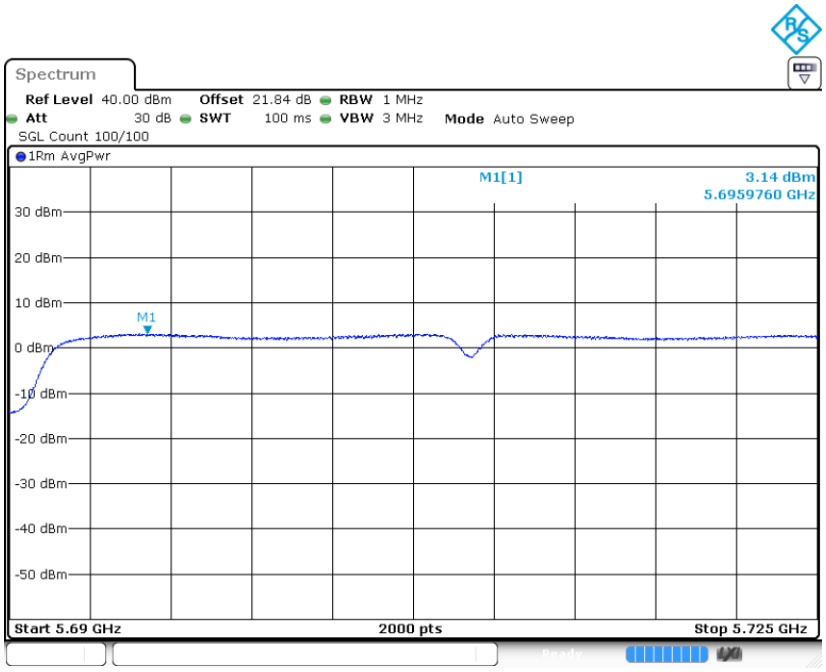
Ac/N20 mode

5710-5725MHz



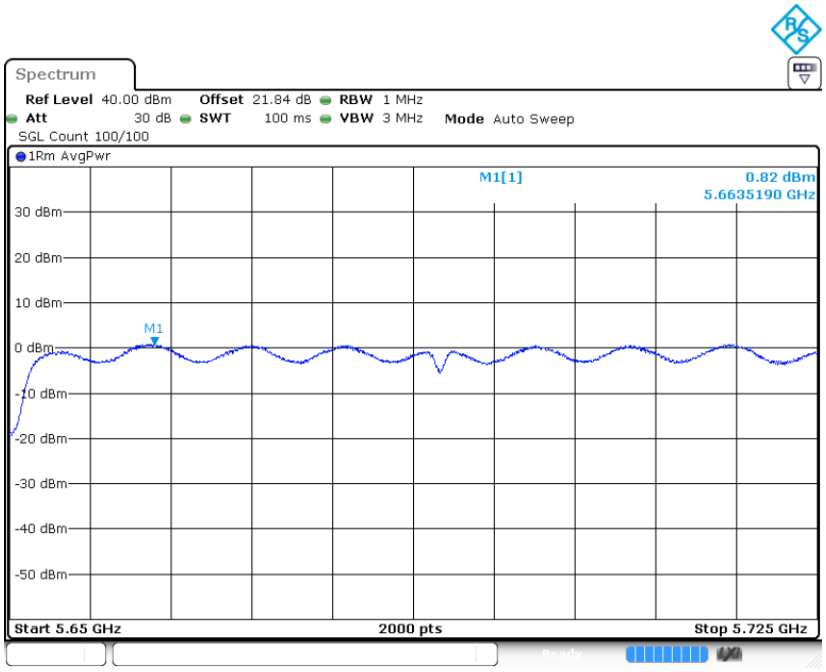
Date: 24.MAR.2023 08:29:44

Ac/N40 mode
5690-5725MHz



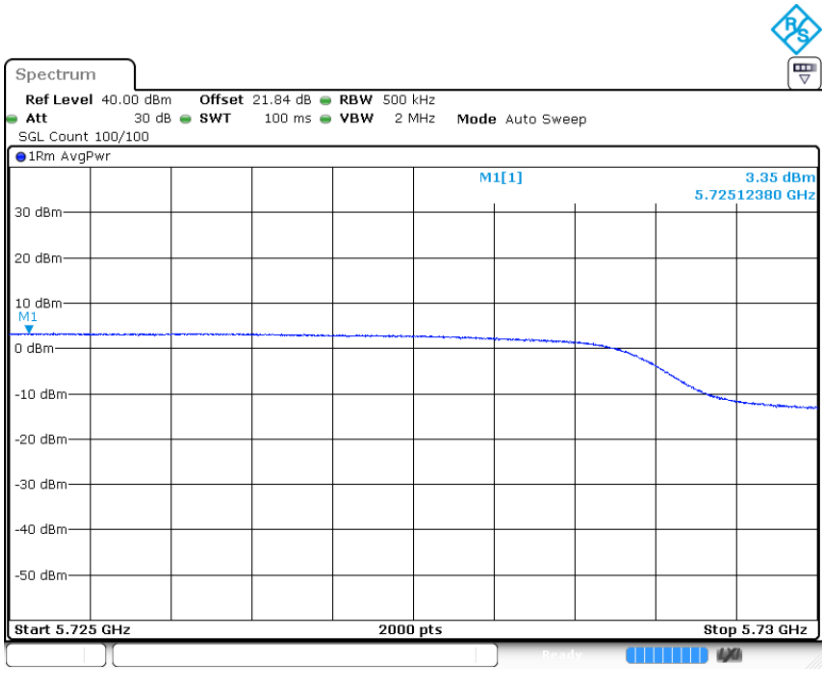
Date: 24.MAR.2023 08:31:17

Ac80 mode
5650-5725MHz



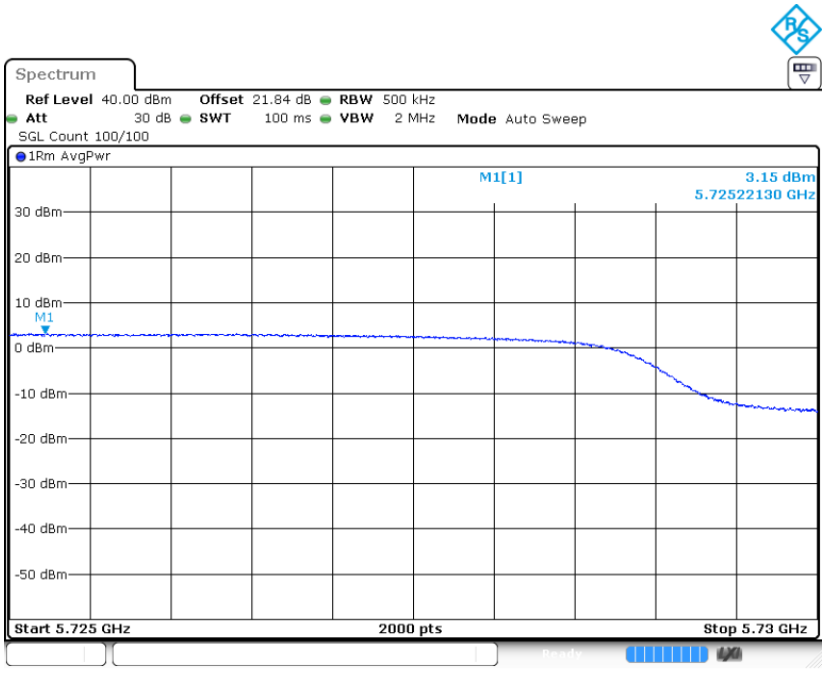
Date: 24.MAR.2023 08:32:49

A mode
5725-5730 MHz



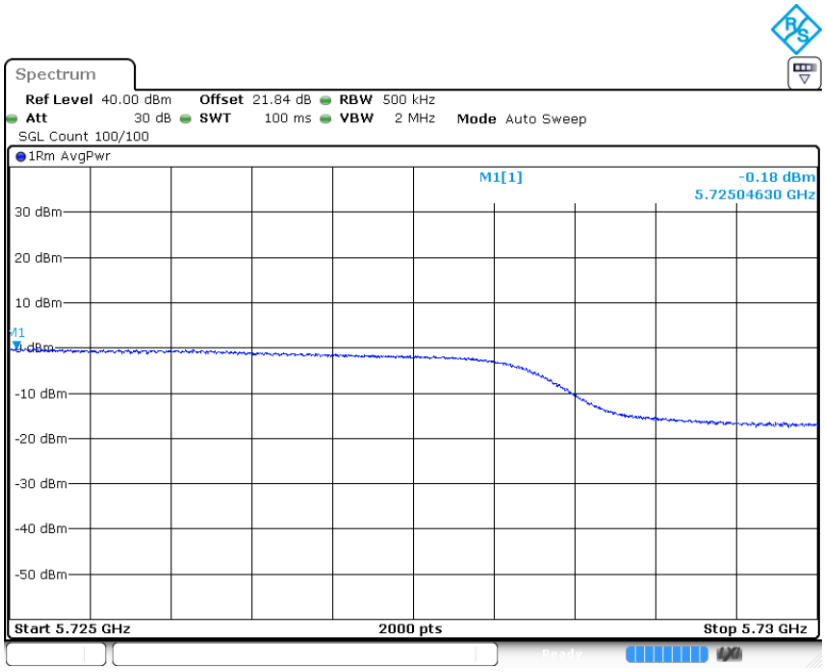
Date: 24.MAR.2023 08:28:37

Ac/N20 mode
5725-5730 MHz



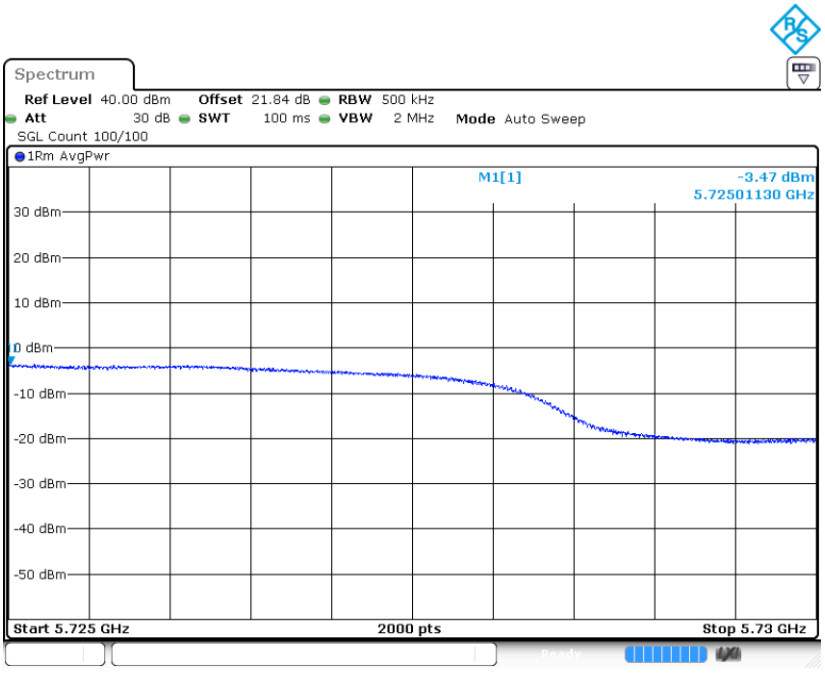
Date: 24.MAR.2023 08:30:09

Ac/N40 mode
5725-5730 MHz



Date: 24.MAR.2023 08:31:41

Ac80 mode
5725-5730 MHz

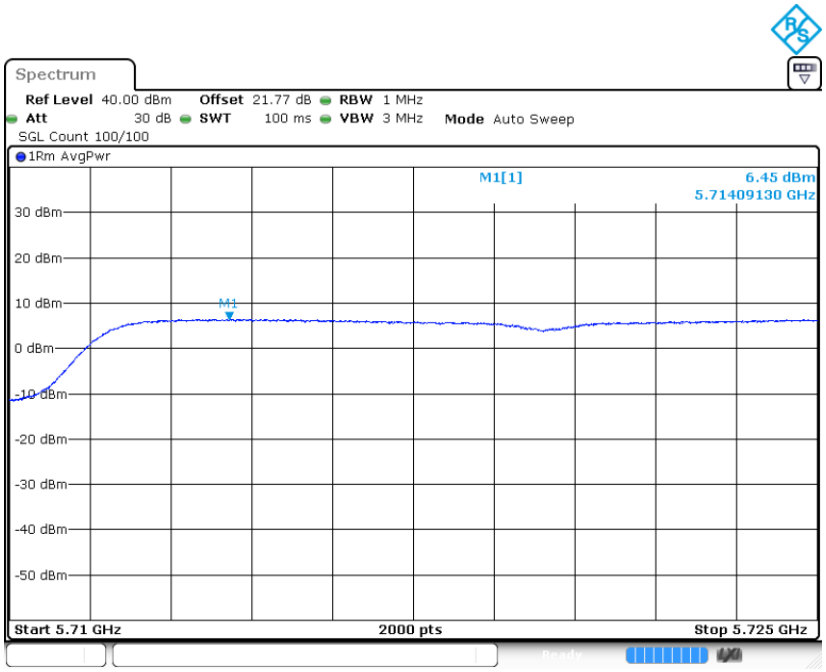


Date: 24.MAR.2023 08:33:13

Ant B

A mode

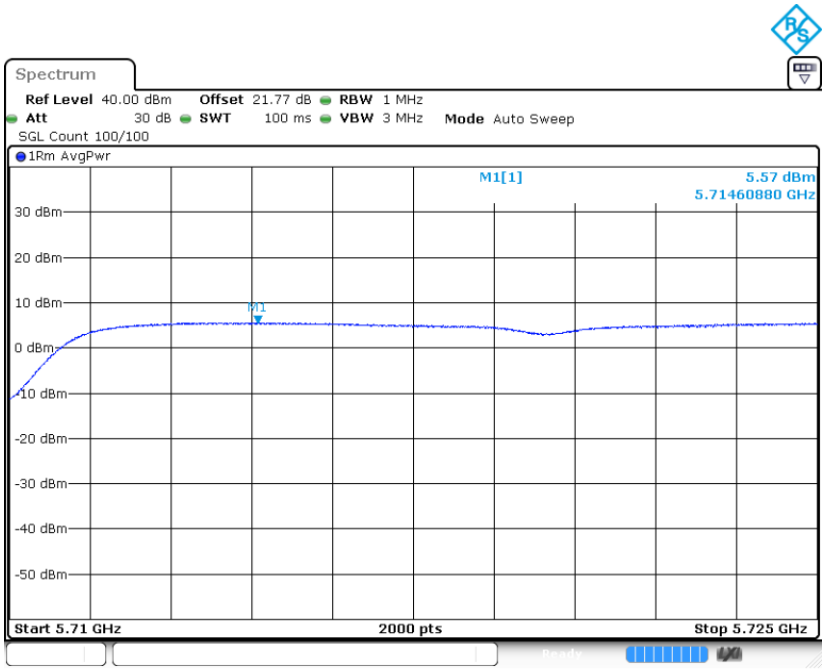
5710-5725MHz



Date: 28.MAR.2023 08:29:28

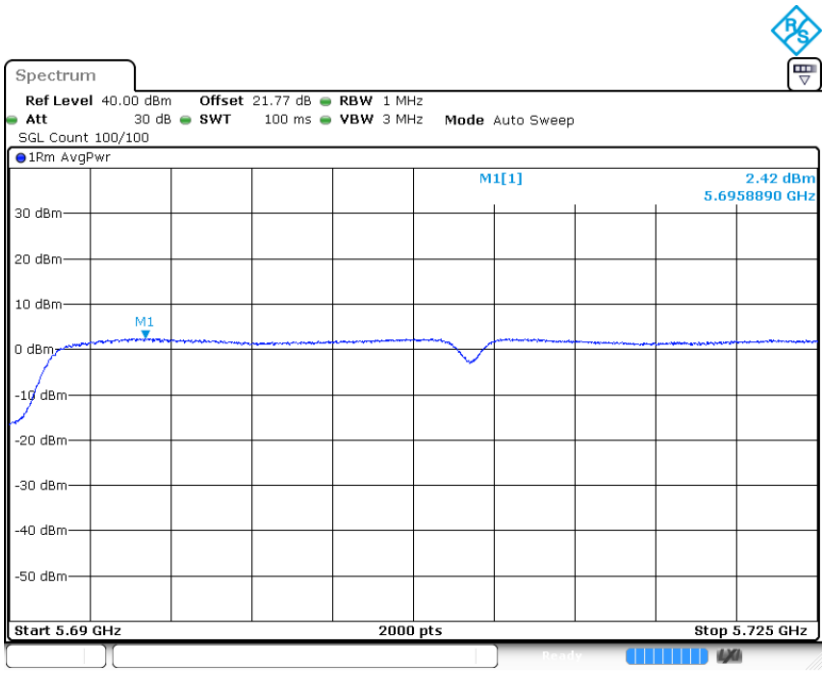
Ac/N20 mode

5710-5725MHz



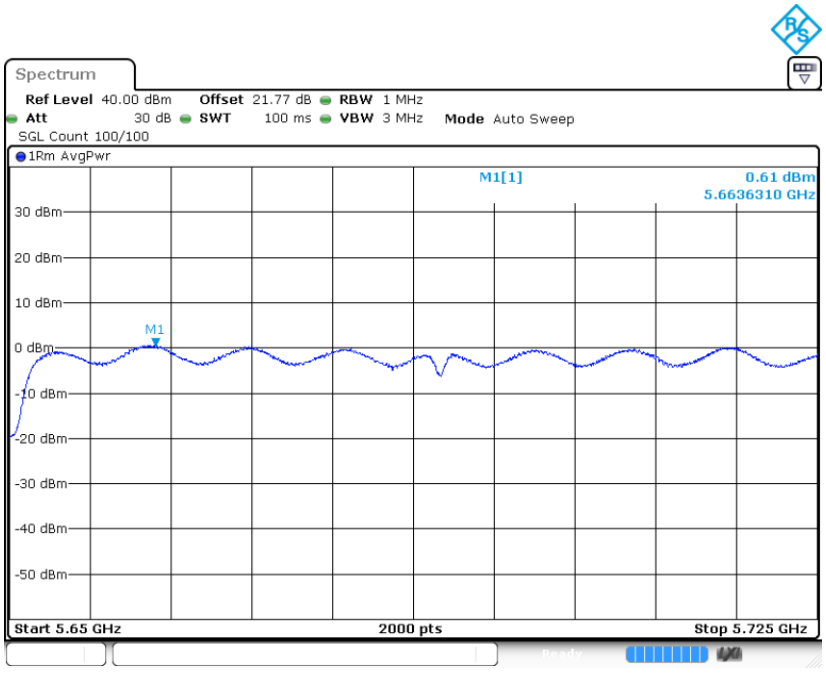
Date: 28.MAR.2023 08:32:44

Ac/N40 mode
5690-5725MHz



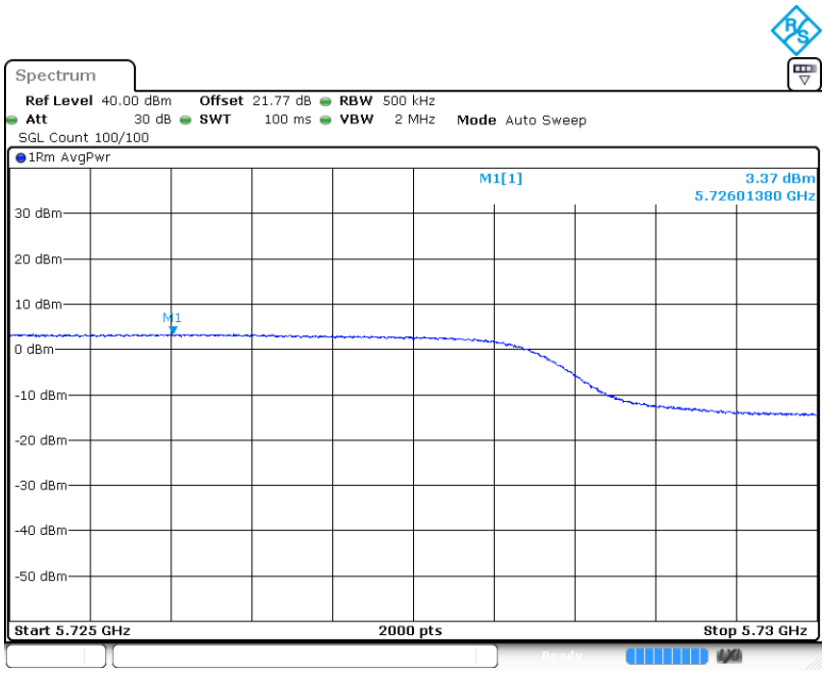
Date: 28.MAR.2023 08:36:00

Ac80 mode
5650-5725MHz



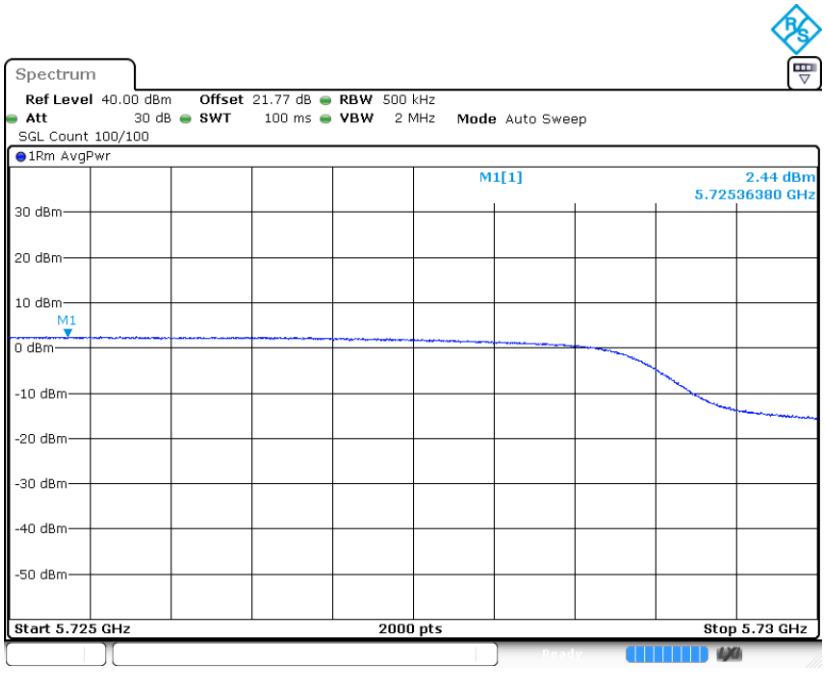
Date: 28.MAR.2023 08:39:16

A mode
5725-5730 MHz



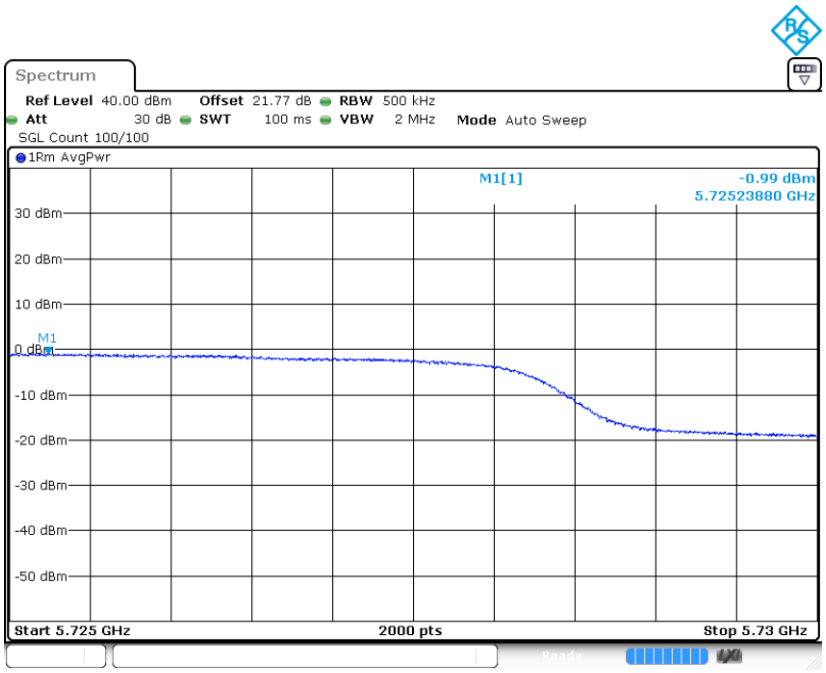
Date: 28.MAR.2023 08:29:54

Ac/N20 mode
5725-5730 MHz



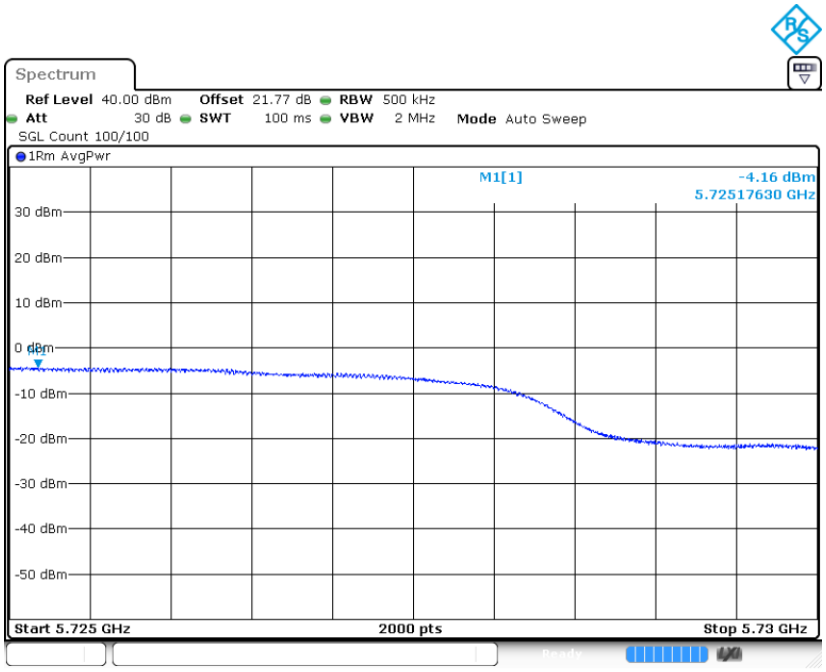
Date: 28.MAR.2023 08:33:10

Ac/N40 mode
5725-5730 MHz



Date: 28.MAR.2023 08:36:26

Ac80 mode
5725-5730 MHz



Date: 28.MAR.2023 08:39:41

11 FCC §15.407(b) & ISEDC RSS-247 §6.2 - 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.

According to ISEDC RSS-247 §6.2.1 for devices operatinging in the frequency band 5150-5250 MHz:

For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250-5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250-5350 MHz.

According to ISEDC RSS-247 §6.2.2 for devices operatinging in the frequency band 5250-5350 MHz:

For devices with both operating frequencies and channel bandwidths contained within the band 5250-5350 MHz, the device shall comply with the following:

1. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. if the equipment is intended for outdoor use; or
2. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of Section 6.2.1. The device shall be labelled “for indoor use only.”

For devices with operating frequencies in the band 5250-5350 MHz but having a channel bandwidth that overlaps the band 5150-5250 MHz, the devices’ unwanted emission shall not exceed -27 dBm/MHz e.i.r.p. outside the band 5150-5350 MHz and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device shall be labelled “for indoor use only.”
According to ISEDC RSS-247 §6.2.3 for devices operatinging in the frequency band 5470-5600 MHz and 5650-5725 MHz. Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

According to ISEDC RSS-247 §6.2.4 for devices operatinging in the frequency band 5725-5850 MHz:
For the band 5725-5850 MHz, emissions at frequencies from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p.
For emissions at frequencies more than 10 MHz above or below the band edges, the emissions power shall not exceed -27 dBm/MHz.

11.2 Measurement Procedure

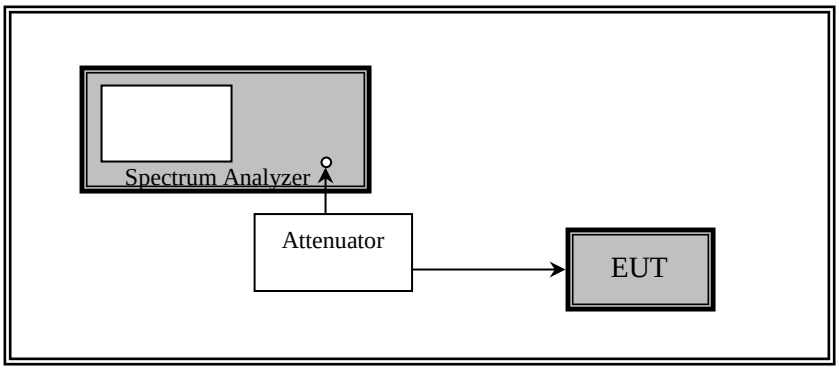
Add a correction factor (antenna gain+ Attenuator loss+cable loss) to the offset of the spectrum analyzer.

Unwanted Emission Measurement:

Maximum emission levels are measured by setting the analyzer as follows:

i. RBW = 1 MHz
ii. VBW ≥ 3 MHz
iii. Detector = Peak
iv. Sweep time = auto
v. Trace mode = max hold

11.3 Test Setup Block Diagram



11.4 Test Equipment List and Details

BACL Number	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
912	Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008k39-101203-UW	2022-05-05	1 year
-	-	20dB attenuator	-	-	Each time[1]	N/A
-	-	10dB attenuator	-	-	Each time[1]	N/A
-	-	RF cable	-	-	Each time[1]	N/A

Note[1]: 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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

11.5 Test Environmental Conditions

Temperature:	22-24º C
Relative Humidity:	40-41 %
ATM Pressure:	103.1-104.1 kPa

Testing was performed by Christian Schwartz from 2023-02-23 to 2023-03-28 at the RF site.

11.6 Test Results

Note: See Annex E for test results
Note: Antenna Gain is considered into offset.

12 FCC §15.407(h)– Dynamic Frequency Selection

12.1 Applicable Standards

FCC CFR47 §15.407 (h) 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

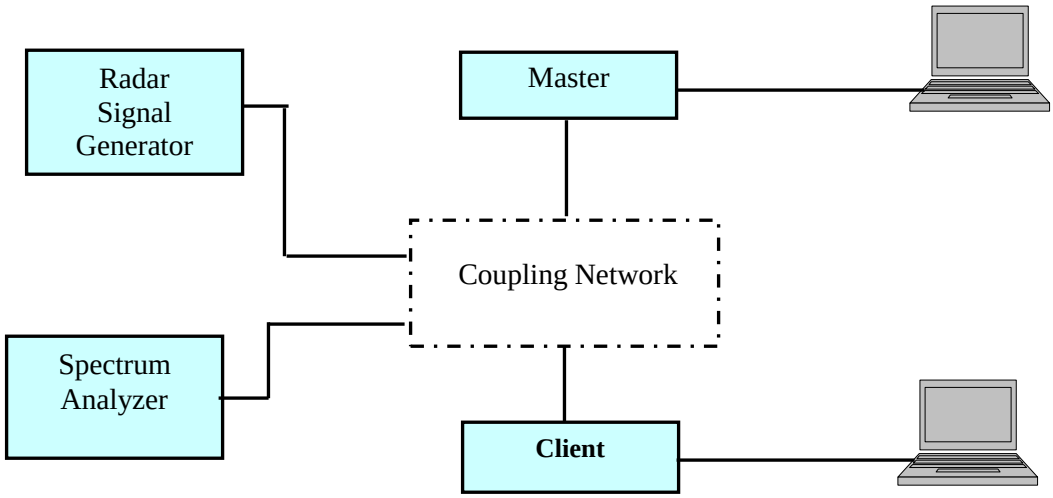
Table 7: Frequency Hopping Radar Test Signal

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

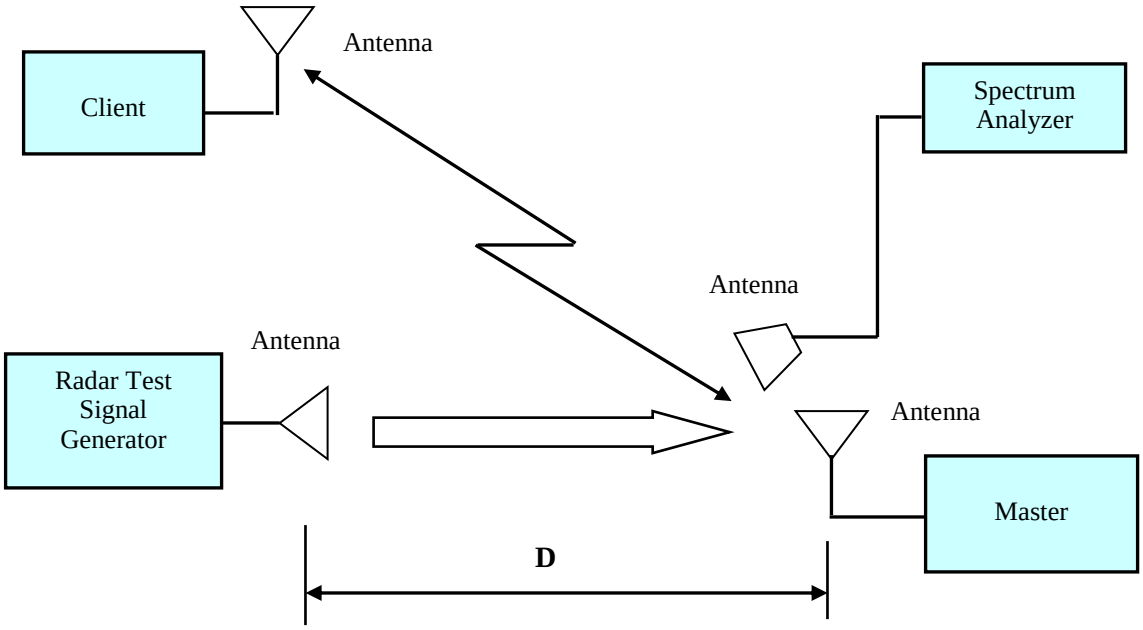
12.2 DFS Measurement System

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	Equipment Description	Model	S/N	Calibration Date	Calibration Interval
547	National Instruments	NI PXI-1042 8-Slot chassis	PXI-1042	V08X01EE1	N/A	N/A
-	National Instruments	Arbitrary Waveform Generator	PXI-5421	N/A	N/A	N/A
-	National Instruments	RF Upconverter	PXI-5610	N/A	N/A	N/A
-	ASCOR	Upconverter	AS-7206	N/A	N/A	N/A
424	Agilent	Analyzer, Spectrum	E4440A	US45303156	2022-12-19	1 year
188	Sunol Sciences	Antenna, Horn	DRH-118	A052704	2021-10-07	2 years
110	A. H. Systems	Antenna, Horn	SAS-200/571	261	Each Time	Each Time
-	-	RF Cable	-	-	Each Time	Each Time

Note[1]: 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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

12.7 Test Environmental Conditions

Temperature:	20° C
Relative Humidity:	30 %
ATM Pressure:	102.9 kPa

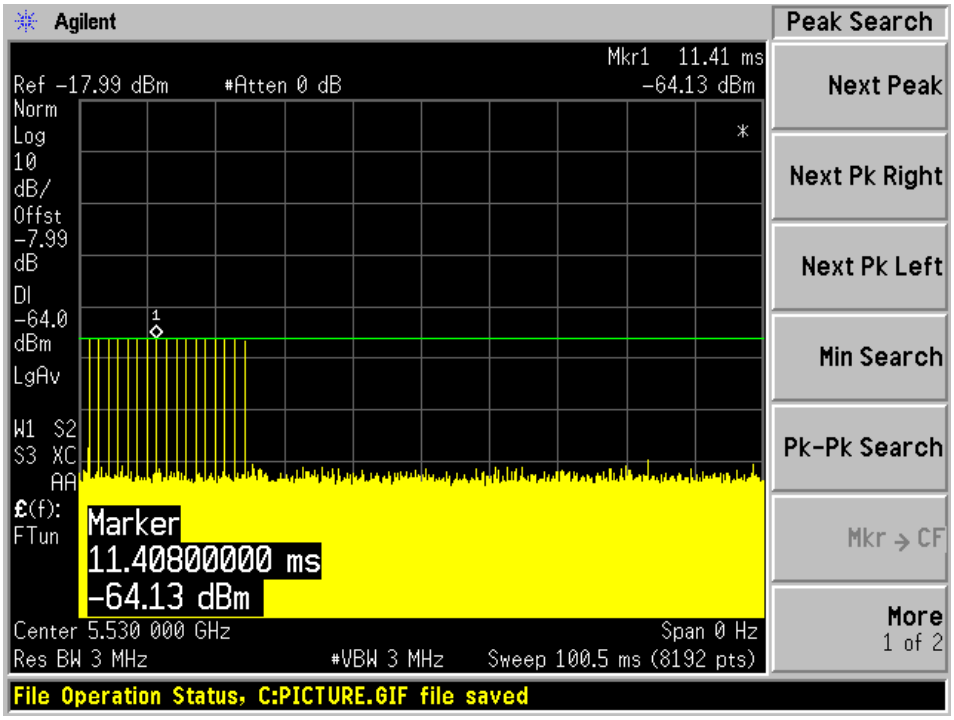
Testing was performed by Tao Jin on 2023-03-13 at the DFS testing site.

12.8 Test Results

Plots of Radar Waveforms

Radar Type 0

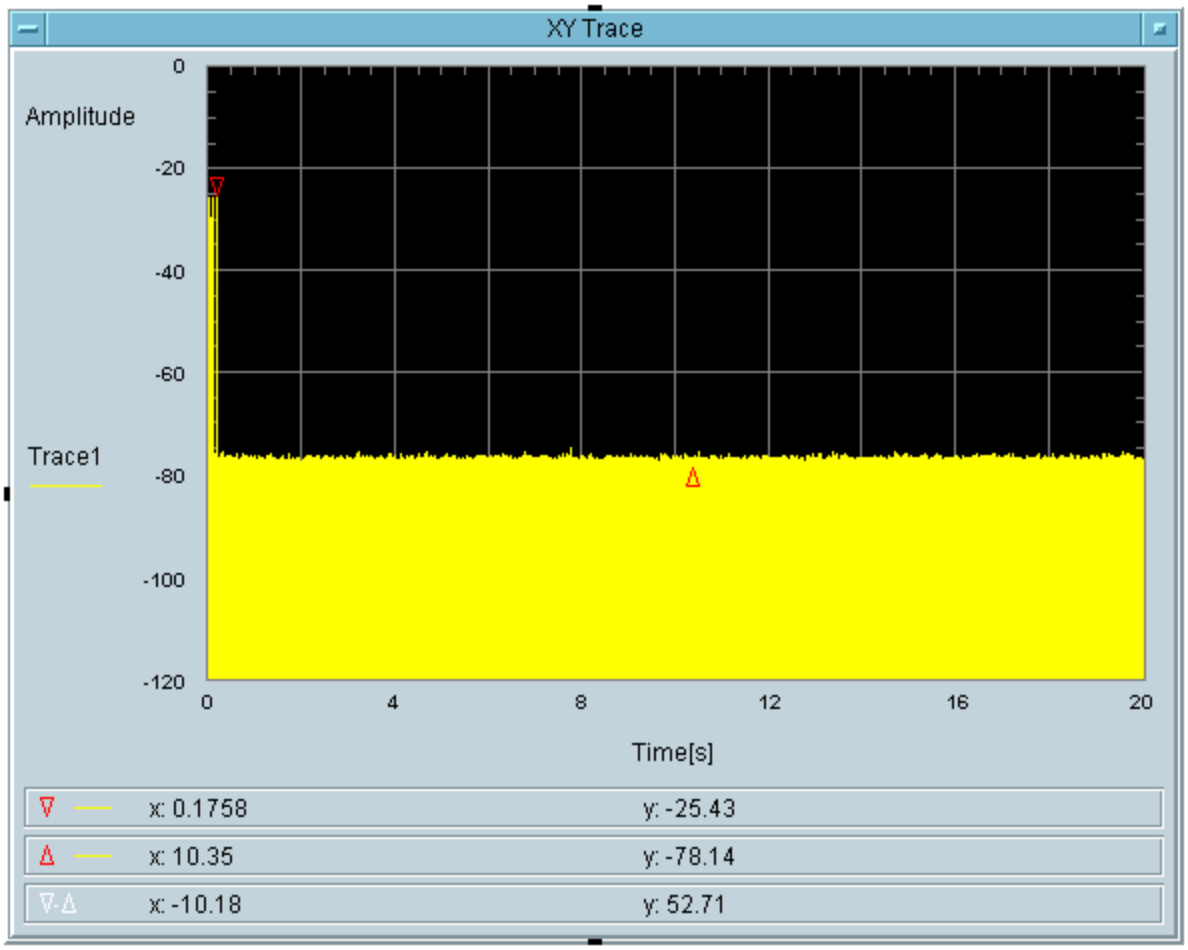
5530 MHz



Frequency (MHz)	Bandwidth (MHz)	Radar Type	Results
5530	80	Type 0	Compliant

5530 MHz 80 MHz Bandwidth

Type 0 radar channel move time less than 10s result:

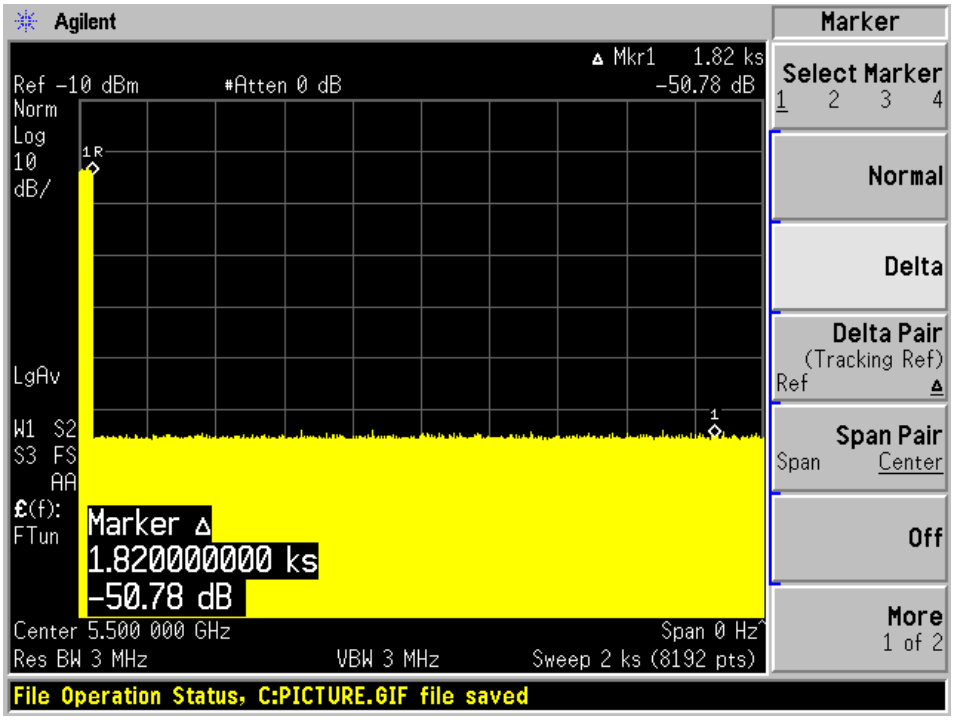


Type 0 radar channel closing transmission time result:

Channel closing transmitting time (ms)	Limit (ms)	Result
24.41+0	200	Pass

Non-occupancy Time

5530 MHz for 80 MHz channel bandwidth



Note: the communication between EUT and router was set to 5530 MHz and 80 MHz channel bandwidth. However, 5500 MHz is the primary channel that contains the control signal. Therefore, it was monitored for the non-occupancy period.

13 Annex A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

14 Annex B (Normative) – EUT External Photographs

Please refer to the attachment.

15 Annex C (Normative) – EUT Internal Photographs

Please refer to the attachment.

16 Annex D (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

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

Presented this 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

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