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

TEST REPORT

For

Roku, Inc.

1155 Coleman Avenue,
San Jose, CA 95110, USA

FCC ID: TC2-R1047
IC: 5959A-R1043

Report Type:	**Product Type:**
Original Report	WiFi Remote Control

Prepared By:	Deepak Mishra Test Technician
Report Number:	R2204071-247
Report Date:	2022-05-31
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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	R2204071-247	Original Report	2022-05-31

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 models: *RC-GZ1 and RC-GZ5, FCC ID: TC2-R1047 IC: 5959A-R1043*, or the "EUT" as referred to in this report. The EUT has 2.4 GHz/5 GHz Wi-Fi capabilities.

RC-GZ1 and RC-GZ5 have been declared by manufacturer to be electrically identical and RC-GZ1 was selected for testing. Please refer to the manufacturer declaration of similarity letter in Annex D of this report.

1.2 Objective

This report was prepared on behalf of *Roku, Inc.* in accordance with Part 2, Subpart J, and Part 15, Subpart C of the Federal Communication Commission's rules and ISEDC RSS-247 Issue 2, February 2017.

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

1.3 Related Submittal(s)/Grant(s)

Equipment Class: NII, FCC ID: TC2-R1047 IC: 5959A-R1043

1.4 Test Methodology

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

1.5 Measurement Uncertainty

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

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.86 dB
Power Spectral Density, conducted	±0.86 dB
Unwanted Emissions, conducted	±2.76 dB
All emissions, radiated	±4.94 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 ° C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.6 Test Facility Registrations

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

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

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

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

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2017 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2017 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2017 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide

range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

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

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

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

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

- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

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

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

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

5 Other
- For Water Coolers (ver. 3.0)

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

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

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v05r02.

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 to be as follows for each mode based upon investigation 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 PuTTy. The software is compliant with the standard requirements being tested against.

Please refer to the following power setting table.

Modulation	Frequency (MHz)	Power Setting
802.11b	2412	82
	2437	86
	2462	91
8002.11g	2412	92
	2437	127
	2462	79
802.11n20	2412	88
	2437	127
	2462	78

Data Rates Tested:
802.11b mode: 1Mbps
802.11g mode: 6Mbps
802.11n mode: MCS0

2.3 Duty Cycle Correction Factor

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

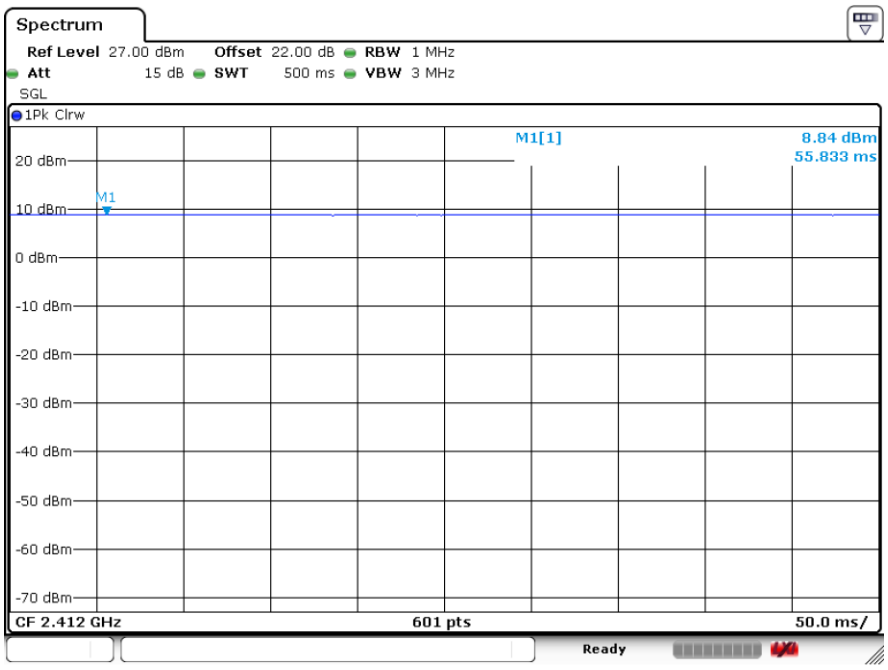
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	1	1	100	0
802.11g	1	1	100	0
802.11n20	1	1	100	0

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

Please refer to the following plots.

802.11b mode



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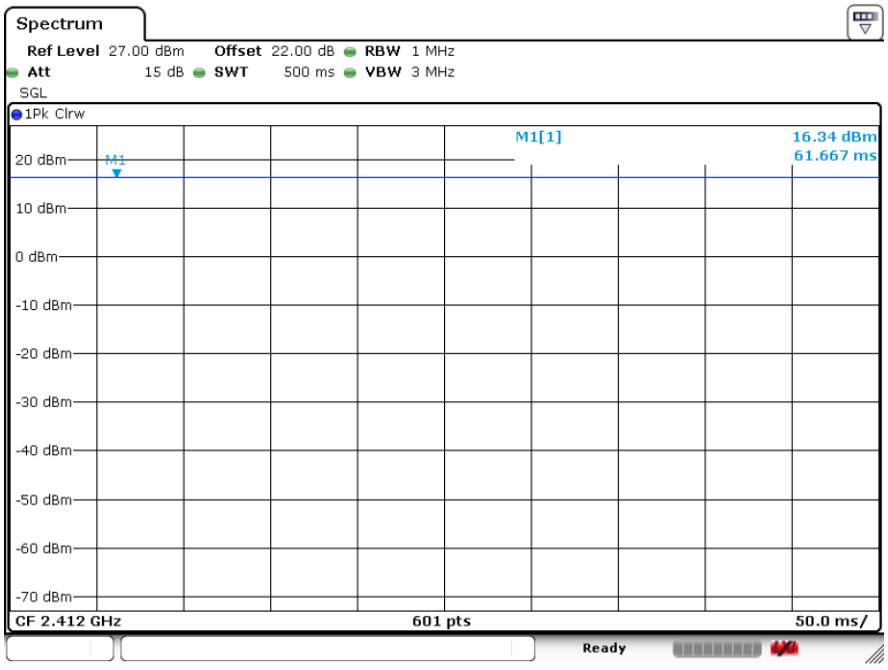
802.11g mode



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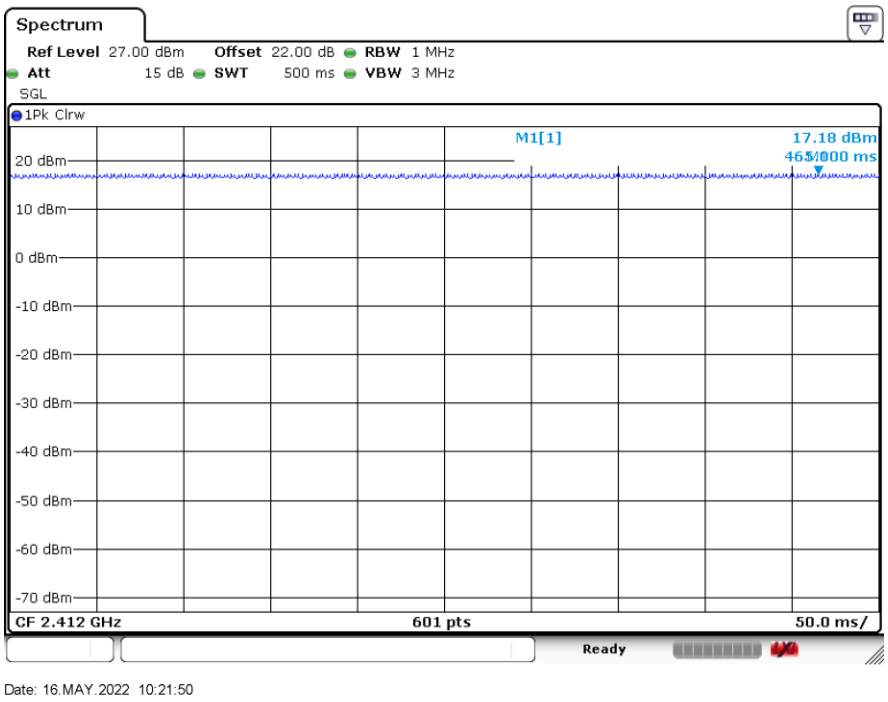
802.11n20 mode



2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

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
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

Results reported relate only to the product tested.

FCC/ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirements	Compliant
FCC §2.1093, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant[1]
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	N/A[2]
FCC §15.209, §15.247(d) ISEDC RSS-247 §5.5 RSS-Gen §8.9, §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISEDC RSS-247 §5.2 RSS-Gen §6.7	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) ISEDC RSS-247 §5.4	Maximum Output Power	Compliant
FCC §15.247(e) ISEDC RSS-247 §5.2(2)	Peak Power Spectral Density	Compliant
FCC §15.247(d) ISEDC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant

Note[1]: Please refer to Report Number *SAR.20220501* and issued by RF Exposure Lab, LLC for results.
Note[2]: Device is battery powered.

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

4.1 Applicable Standards

According to FCC §15.203:

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

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

According to ISEDC RSS-Gen §6.8: Transmitter Antenna

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

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

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

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

For license-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

4.2 Antenna Description

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)	Antenna Type
2.4GHz Wi-Fi	2412-2472	-1.5	PCB Trace

Note: The antenna used by the EUT is permanent attached antenna.
Note: Antenna info is information provided by customer.

5 FCC §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

5.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

As per ISEDC RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emission from licence-exempt transmitters shall company with the field strength limits shown in the table below. Additional, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

General Field Strength Limits for Licence-Exemption Transmitters at Frequencies above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 meters)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per ISEDC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

5.2 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 Subpart C 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.

5.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was 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 was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna 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 = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

5.4 Corrected Amplitude & Margin Calculation

For emissions below 1 GHz,

The Corrected Amplitude (CA) is calculated by adding the Correction Factor to the S.A. Reading. The basic equation is as follows:

CA = S.A. Reading + Correction Factor

For example, a corrected amplitude of 40.3 dBuV/m = S.A. Reading (32.5 dBuV) + Correction Factor (7.8 dB/m)

The Correction Factor is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) together. This calculation is done in the measurement software, and reported in the test result section. The basic equation is as follows:

Correction Factor = AF + CL + Atten – Ga

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

Margin = Corrected Amplitude – Limit

For emission above 1 GHz,

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

CA = Ai + AF + CL + Atten – Ga

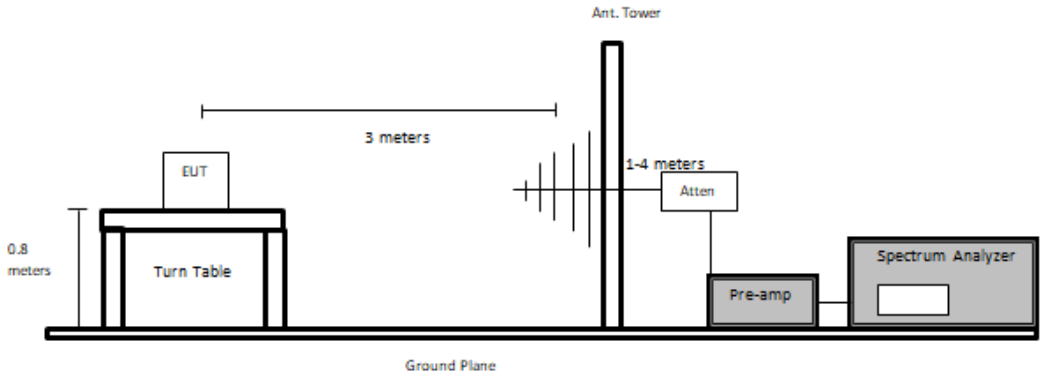
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

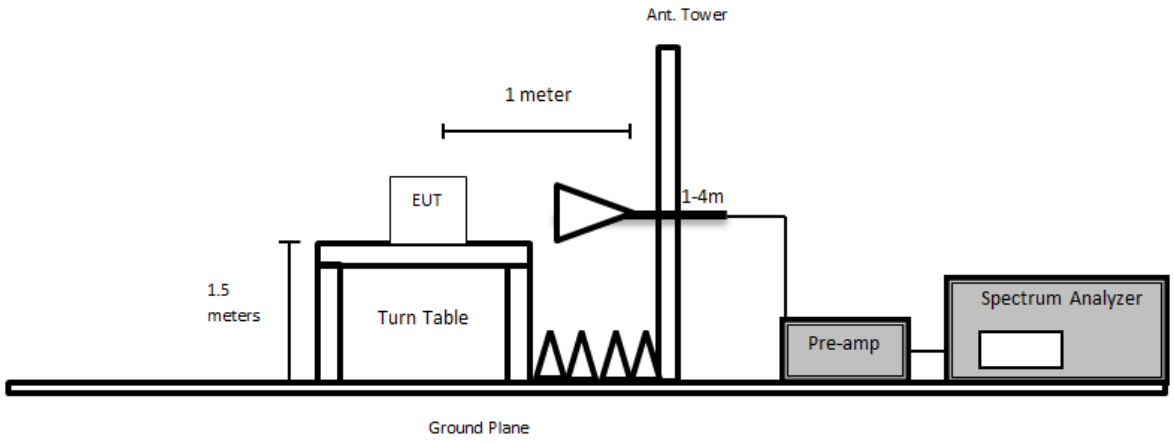
Margin = Corrected Amplitude – Limit

5.5 Test Setup Block Diagram

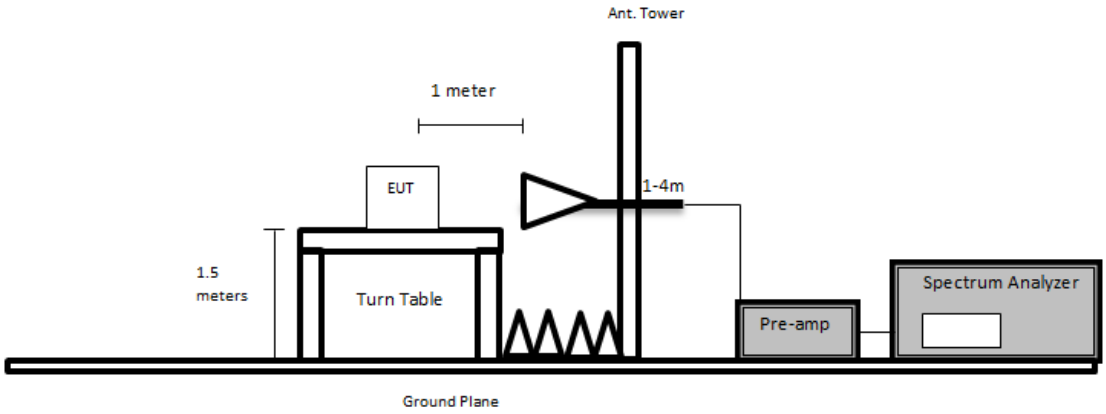
Below 1GHz:



1 GHz to 18 GHz (Asset #1192 Antenna used):



18 GHz to 26.5 GHz (#91 Antenna used):



5.6 Test Equipment List and Details

BACL No	Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2021-06-23	1 year
310	Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2021-11-18	1 year
-	Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/A
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2021-11-22	2 years
1101	IW Microwave	157 Series Cable Armored with 2.92mm Male Plugs on Both Sides	KPS-1571AN-2400	DC 1922	2021-07-06	1 year
91	Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2022-03-08	2 years
827	AH Systems	Preamplifier	PAM 1840 VH	170	2021-08-03	1 year
1077	Insulted Wire Corp	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1571AN-3960-KPS	DC 1917	2021-03-03	15 months
1228	Pasternack	Coaxial Cable, RG213	PE3496-800CM	2111301	2021-11-30	1 year
459	HP	Amplifier, Pre	8447D	2443A04374	2021-11-02	1 year
658	Agilent	Pre-Amplifier	8449B	3008A0113	2021-05-06	13 months
1192	ETS Lindgren	Antenna, Horn	3117	00218973	2021-09-14	2 years
-	-	Notch filter	-	-	Each time[1]	N/A
-	-	SMA cable	-	-	Each time[1]	N/A

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".*

5.7 Test Environmental Conditions

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

The testing was performed by Deepak Mishra from 2022-04-12 to 2022-05-12 in 5m chamber 3.

5.8 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC Part 15C and ISEDC RSS-247 standard's radiated emissions limits, and had the worst margin of:

2.4 GHz Wi-Fi

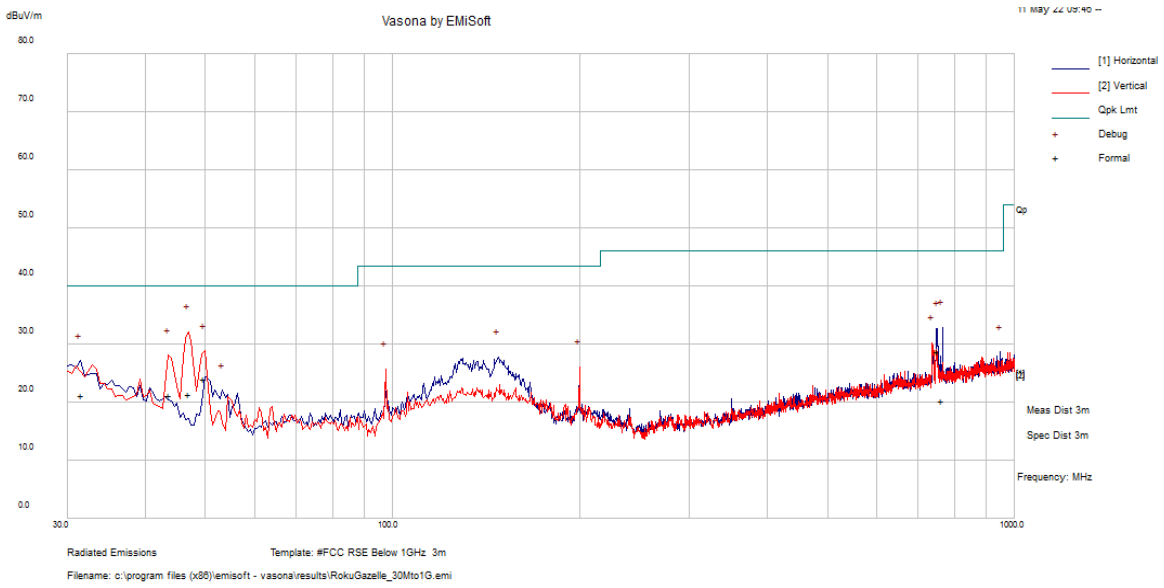
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Configuration**
-0.17	4874	Horizontal	b mode, 2437 MHz

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

5.9 Radiated Emissions Test Results

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

Worst Case: 2437 MHz, g mode



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
47.01275	31.52	-10.22	-10.25	253	V	112	40	-18.69	Pass
49.71475	35.18	-11.23	-11.26	291	V	46	40	-16.04	Pass
43.796	29.57	-8.37	-8.4	194	V	129	40	-18.8	Pass
31.61575	20.42	0.72	0.69	298	H	86	40	-18.86	Pass
765.682	17.25	3.06	1.78	273	H	311	46	-25.69	Pass
751.44075	26.04	2.75	1.49	149	H	32	46	-17.21	Pass

FCC/IC Limits for 1 GHz to 26.5 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

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)

2) 1–18 GHz Measured at 1 meter

802.11b 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 2412 MHz											
2390	64.62	305	138	H	32.228	5.813	39.242	63.42	84	-20.58	Peak
2390	53.84	228	150	V	32.228	5.813	39.242	52.64	84	-31.36	Peak
2390	38.77	305	138	H	32.228	5.813	39.242	37.57	64	-26.43	Ave
2390	38.15	228	150	V	32.228	5.813	39.242	36.95	64	-27.05	Ave
4824	61.55	193	150	H	34.709	10.394	38.302	68.35	84	-15.65	Peak
4824	57.95	351	189	V	34.709	10.394	38.302	64.75	84	-19.25	Peak
4824	55.66	176	147	H	34.709	10.394	38.302	62.46	64	-1.54	Ave
4824	54.99	351	189	V	34.709	10.394	38.302	61.79	64	-2.21	Ave
Middle Channel 2437 MHz											
4874	62.29	197	150	H	34.709	10.394	38.302	69.09	84	-14.91	Peak
4874	57.69	359	182	V	34.709	10.394	38.302	64.49	84	-19.51	Peak
4874	57.02	197	150	H	34.709	10.394	38.302	63.83	64	-0.17	Ave
4874	56.12	197	150	H	34.709	10.394	38.302	62.93	64	-1.08	Ave
High Channel 2462 MHz											
2483.5	67.020	196	147	H	32.665	5.813	39.242	66.26	84	-17.74	Peak
2483.5	55.290	41	228	V	32.665	5.813	39.242	54.53	84	-29.47	Peak
2483.5	55.349	196	147	H	32.665	5.813	39.242	54.59	64	-9.42	Ave
2483.5	43.584	41	228	V	32.665	5.813	39.242	42.82	64	-21.18	Ave
4924	62.04	191	150	H	34.709	10.394	38.25	68.89	84	-15.11	Peak
4924	57.89	345	150	V	34.709	10.394	38.25	64.74	84	-19.26	Peak
4924	55.67	195	110	H	34.709	10.394	38.25	62.53	64	-1.47	Ave
4924	55.35	345	150	V	34.709	10.394	38.25	62.20	64	-1.80	Ave

802.11g mode

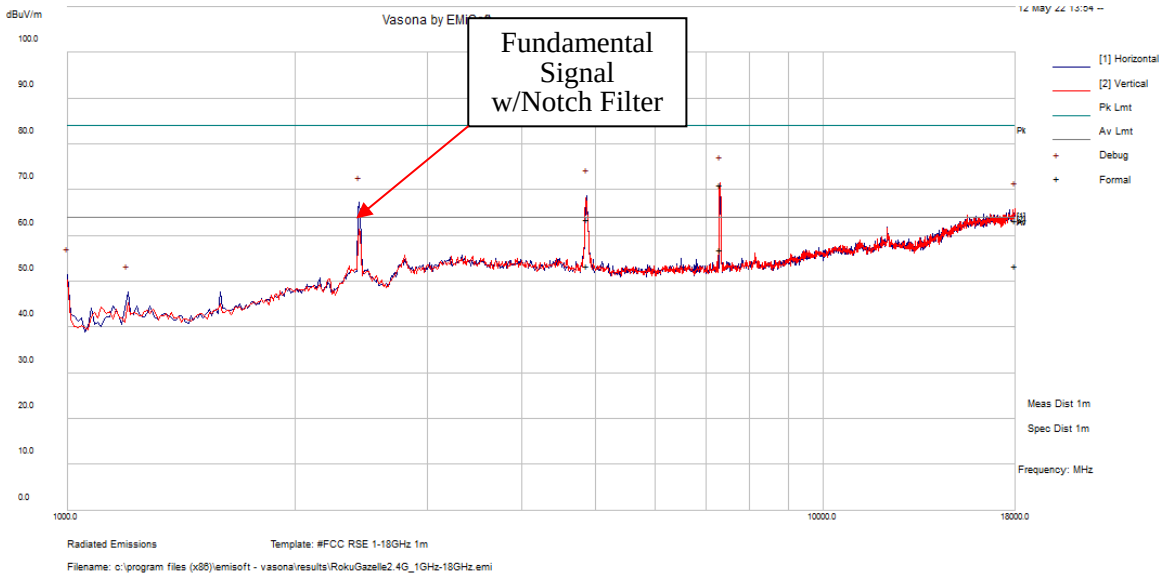
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	82.200	203	187	H	32.228	5.813	39.242	81.00	84	-3.00	Peak
2390	69.340	325	241	V	32.228	5.813	39.242	68.14	84	-15.86	Peak
2390	63.566	303	175	H	32.228	5.813	39.242	62.36	64	-1.64	Ave
2390	54.046	325	241	V	32.228	5.813	39.242	52.84	64	-11.16	Ave
4824	62.980	201	150	H	34.709	10.394	38.302	69.78	84	-14.22	Peak
4824	57.470	341	150	V	34.709	10.394	38.302	64.27	84	-19.73	Peak
4824	52.405	201	150	H	34.709	10.394	38.302	59.21	64	-4.79	Ave
4824	47.001	341	150	V	34.709	10.394	38.302	53.80	64	-10.20	Ave
Middle Channel 2437 MHz											
4874	68.910	193	150	H	34.709	10.394	38.302	75.71	84	-8.29	Peak
4874	62.370	355	172	V	34.709	10.394	38.302	69.17	84	-14.83	Peak
4874	53.853	168	124	H	34.709	10.394	38.302	60.65	64	-3.35	Ave
4874	52.551	355	172	V	34.709	10.394	38.302	59.35	64	-4.65	Ave
High Channel 2462 MHz											
2483.5	74.730	195	157	H	32.665	5.813	39.242	73.97	84	-10.03	Peak
2483.5	67.770	172	256	V	32.665	5.813	39.242	67.01	84	-16.99	Peak
2483.5	63.160	303	106	H	32.665	5.813	39.242	62.67	64	-1.33	Ave
2483.5	63.109	172	256	V	32.665	5.813	39.242	62.62	64	-1.38	Ave
4924	60.870	207	150	H	34.709	10.394	38.25	67.72	84	-16.28	Peak
4924	54.640	352	174	V	34.709	10.394	38.25	61.49	84	-22.51	Peak
4924	47.275	196	150	H	34.709	10.394	38.25	54.13	64	-9.87	Ave
4924	42.962	352	174	V	34.709	10.394	38.25	49.81	64	-14.19	Ave

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	78.3	296	125	H	32.228	5.813	39.242	77.1	84	-6.9	Peak
2390	69.47	263	193	V	32.228	5.813	39.242	68.27	84	-15.73	Peak
2390	63.962	296	125	H	32.228	5.813	39.242	62.76	64	-1.24	Ave
2390	55.95	263	193	V	32.228	5.813	39.242	54.75	64	-9.25	Ave
4824	65.84	290	150	H	34.709	10.394	38.302	72.64	84	-11.36	Peak
4824	59.51	103	150	V	34.709	10.394	38.302	66.31	84	-17.69	Peak
4824	49.18	290	150	H	34.709	10.394	38.302	55.98	64	-8.02	Ave
4824	47.292	103	150	V	34.709	10.394	38.302	54.09	64	-9.91	Ave
Middle Channel 2437 MHz											
4874	66.11	162	150	H	34.709	10.394	38.302	72.91	84	-11.09	Peak
4874	66.55	168	294	V	34.709	10.394	38.302	73.35	84	-10.65	Peak
4874	56.325	162	150	H	34.709	10.394	38.302	63.13	64	-0.87	Ave
4874	53.958	168	294	V	34.709	10.394	38.302	60.76	64	-3.24	Ave
High Channel 2462 MHz											
2483.5	81.82	307	110	H	32.665	5.813	39.242	81.06	84	-2.94	Peak
2483.5	71.43	246	257	V	32.665	5.813	39.242	70.67	84	-13.33	Peak
2483.5	63.467	307	110	H	32.665	5.813	39.242	62.7	64	-1.3	Ave
2483.5	54.529	246	257	V	32.665	5.813	39.242	53.76	64	-10.24	Ave
4924	61.29	286	150	H	34.709	10.394	38.25	68.14	84	-15.86	Peak
4924	60.28	102	150	V	34.709	10.394	38.25	67.13	84	-16.87	Peak
4924	47.515	286	150	H	34.709	10.394	38.25	54.37	64	-9.63	Ave
4924	46.192	102	150	V	34.709	10.394	38.25	53.04	64	-10.96	Ave

3) 1 GHz – 18 GHz Worst Case Scan at 1 Meter

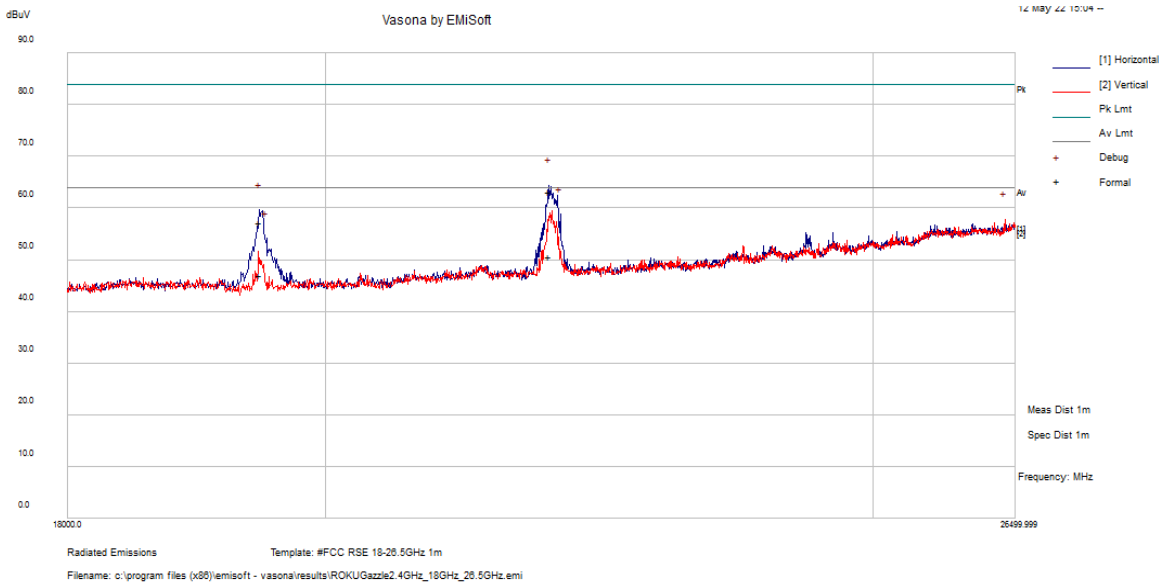
Worst Case: 2437 MHz, g mode



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
7320.625	62.96	8.21	71.17	147	V	341	84	-12.83	Peak
4877.09	56	7.6	63.6	141	H	233	84	-20.4	Peak
17979.53	44.39	18.92	63.31	200	V	26	84	-20.69	Peak
7320.625	48.72	8.21	56.93	147	V	341	64	-7.07	Average
4877.09	45.81	7.6	53.41	141	H	233	64	-10.59	Average
17979.53	34.44	18.92	53.36	200	V	26	64	-10.64	Average

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

Worst Case: 2437 MHz, g mode



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
21913.325	31.52	16.4	63.25	113	H	110	84	-20.75	Peak
19469.43	35.18	13.39	57.24	101	H	104	84	-26.76	Peak
21913.325	29.57	16.4	50.55	113	H	110	64	-13.45	Average
19469.43	20.42	13.39	47.07	101	H	104	64	-16.93	Average

6 FCC §15.247(a) (2) & ISEDC RSS-247 §5.2, RSS-Gen §6.7 - Emission Bandwidth

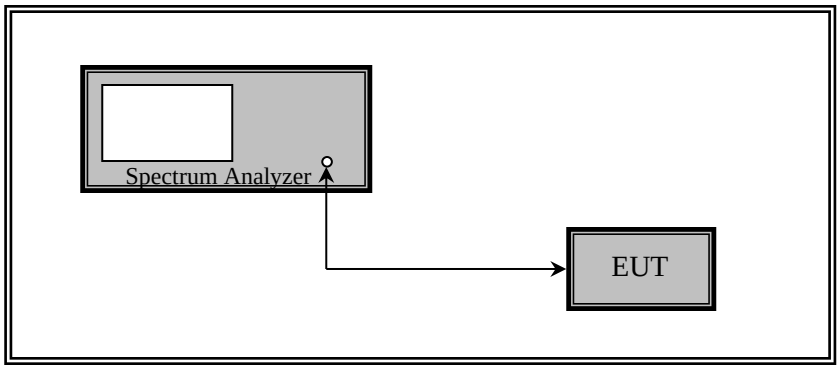
6.1 Applicable Standards

According to FCC §15.247(a) (2) and ISEDC RSS-247 §5.2: the minimum 6 dB bandwidth shall be 500 kHz.

6.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth.

6.3 Test Setup Block Diagram



6.4 Test Equipment List and Details

Bacl No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250 238	2021-06-23	1 year
-	-	RF cable	-	-	Each time[1]	N/A
-	-	10 dB attenuator	-	-	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".*

6.5 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

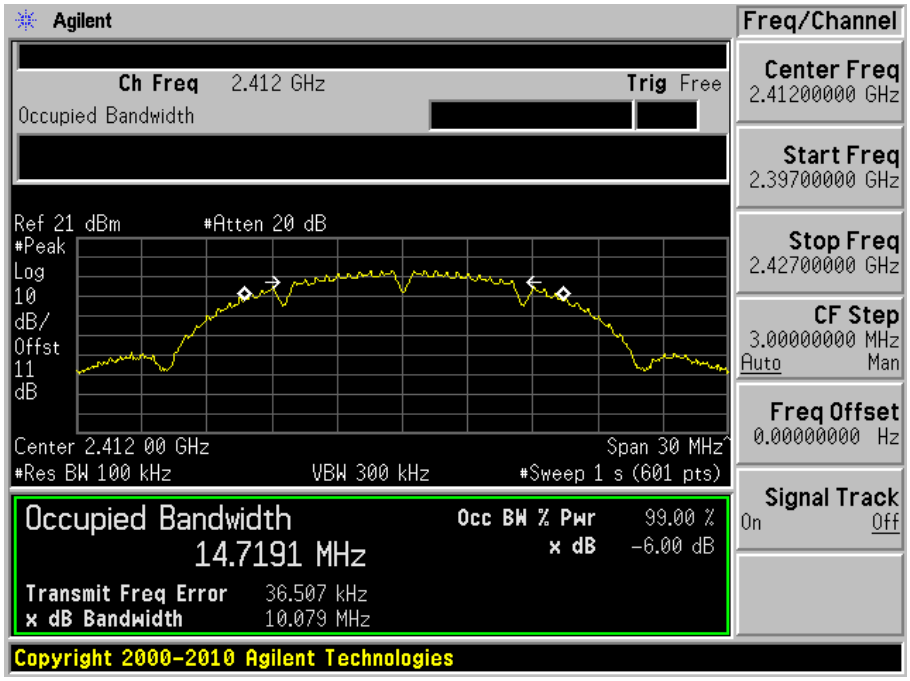
The testing was performed by Deepak Mishra on 2024-04-21 in RF site.

6.6 Test Results

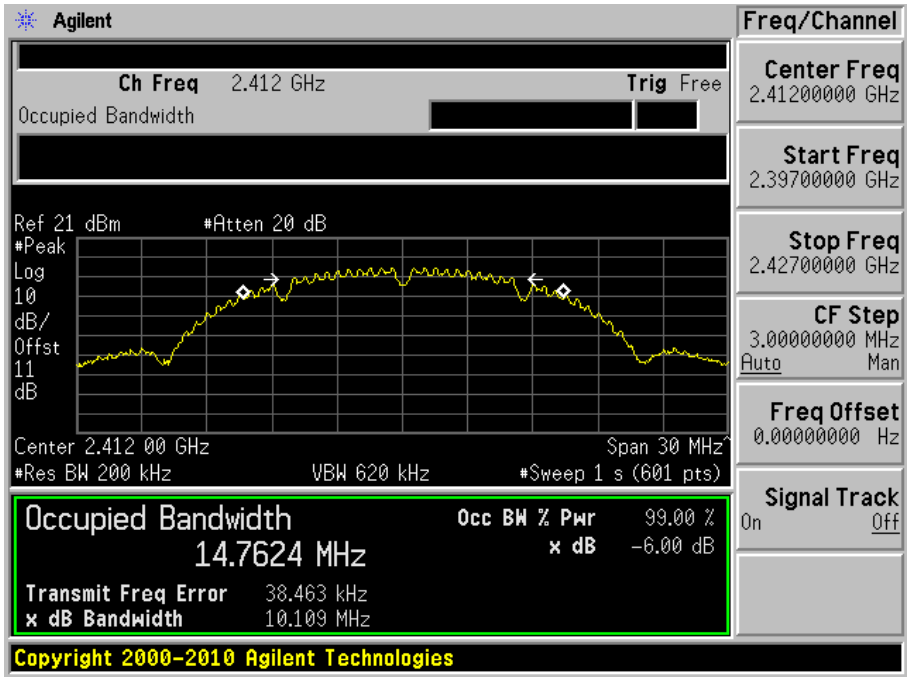
Channel	Frequency (MHz)	6 dB OBW (MHz)	99% OBW (MHz)	6 dB OBW Limit (kHz)	Result
802.11b					
Low	2412	10.079	14.7624	≥ 500	Pass
Middle	2437	10.075	14.7448	≥ 500	Pass
High	2462	10.077	14.7863	≥ 500	Pass
802.11g					
Low	2412	16.561	16.5594	≥ 500	Pass
Middle	2437	16.485	22.9568	≥ 500	Pass
High	2462	16.549	16.5606	≥ 500	Pass
802.11n20					
Low	2412	17.714	17.6716	≥ 500	Pass
Middle	2437	17.849	23.5867	≥ 500	Pass
High	2462	17.677	17.6738	≥ 500	Pass

Please refer to the following plots for detailed test results:

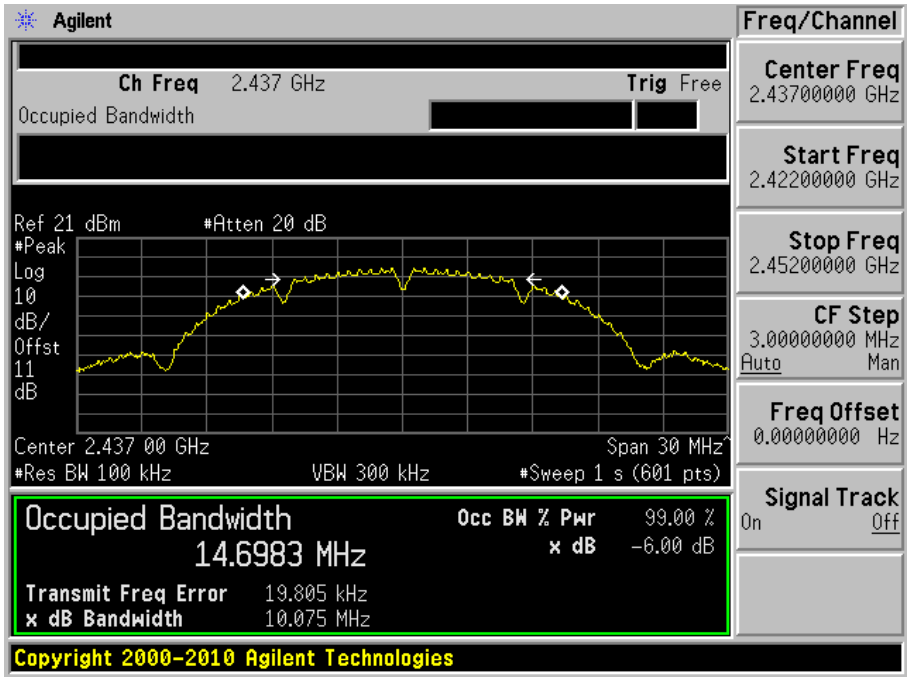
B Mode 2412 MHz Low Channel 6 dB BW



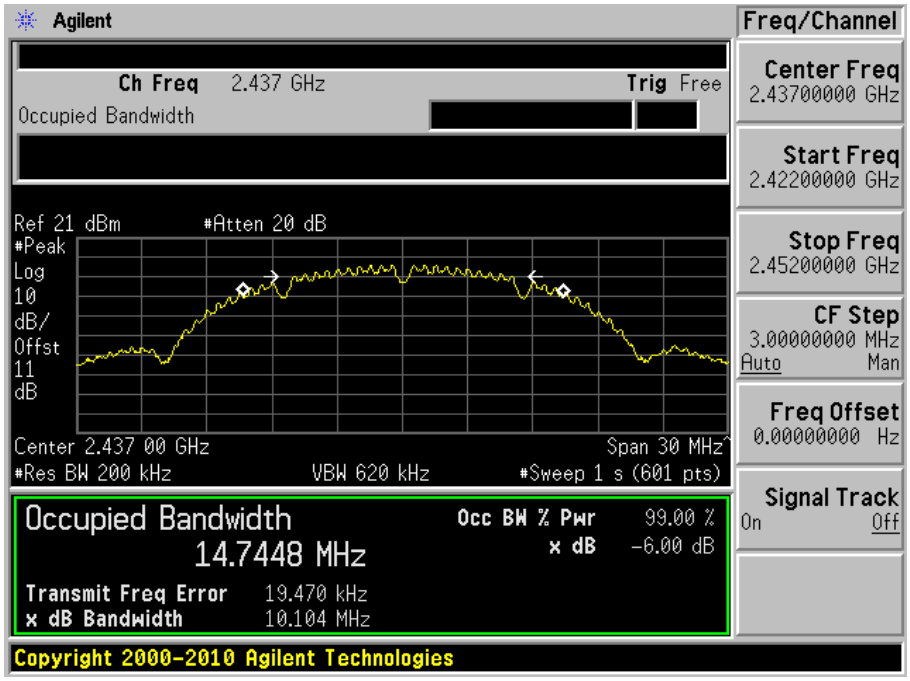
B Mode 2412 MHz Low Channel 99 BW



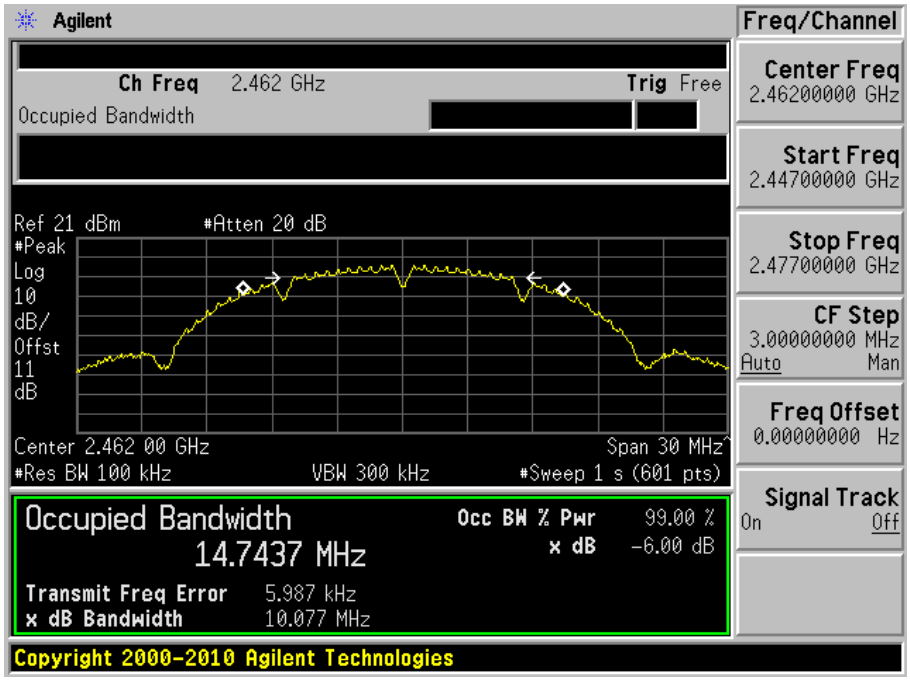
B Mode 2437 MHz Mid Channel 6 dB BW



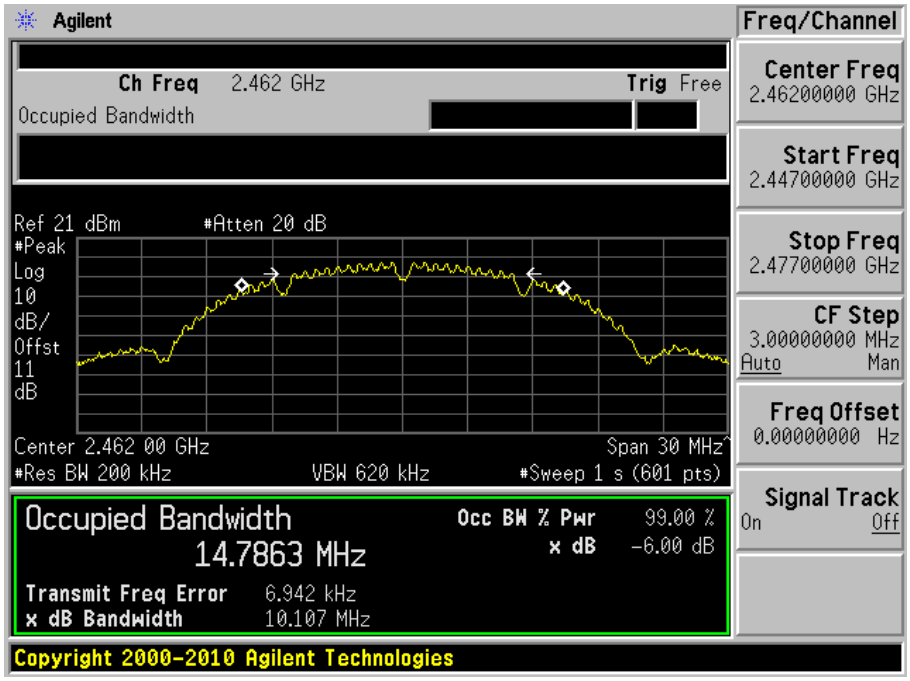
B Mode 2437 MHz Mid Channel 99 BW



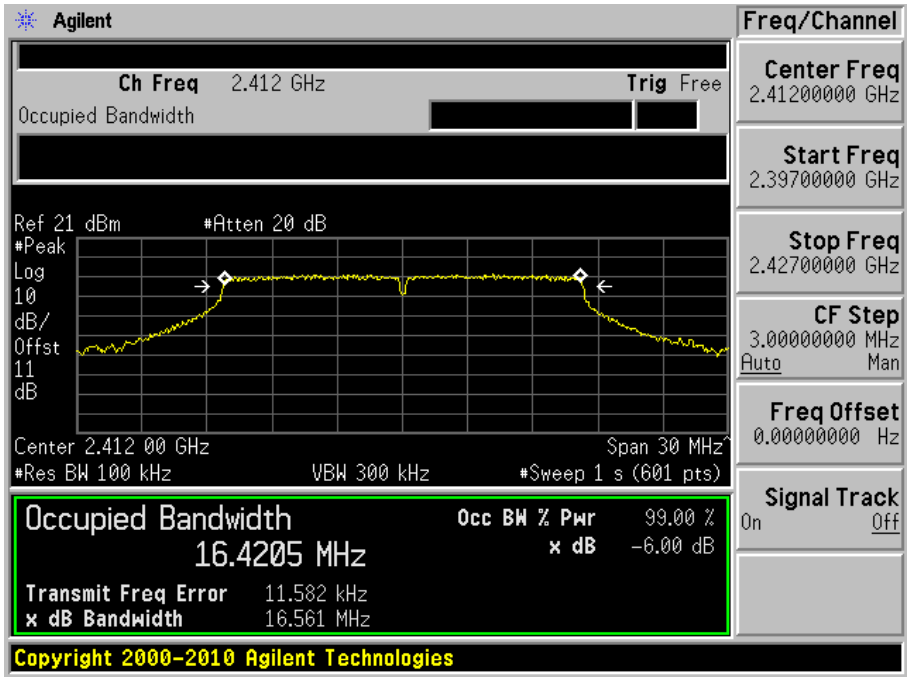
B Mode 2462 MHz High Channel 6 dB BW



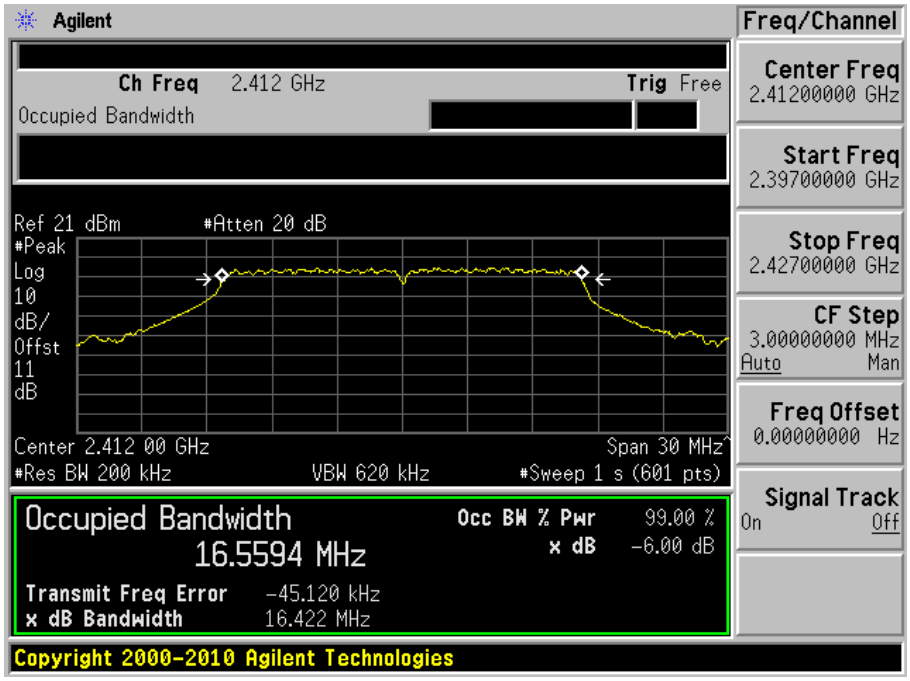
B Mode 2462 MHz High Channel 99 BW



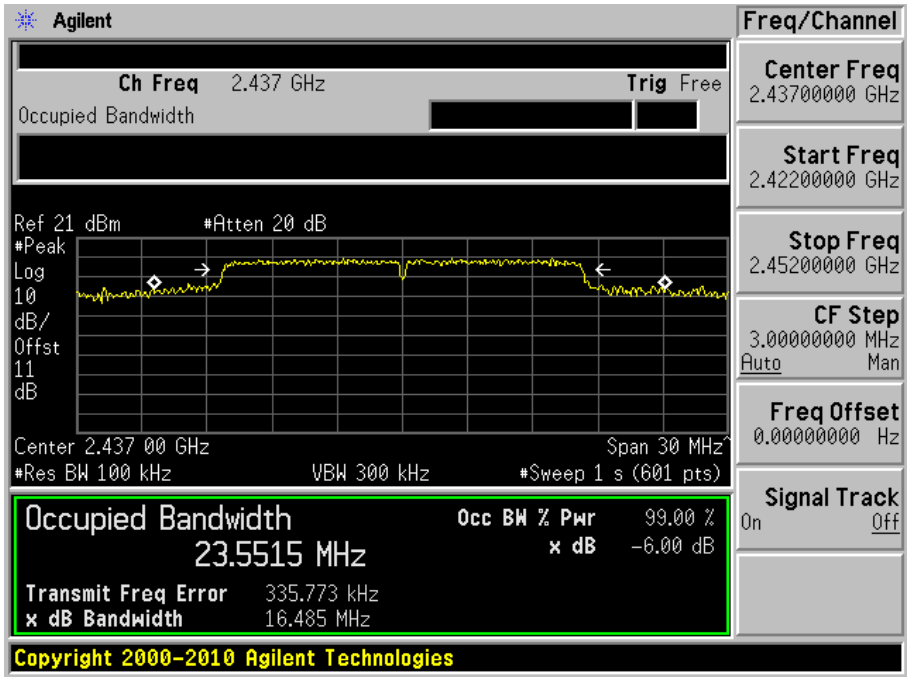
G Mode 2412 MHz Low Channel 6 dB BW



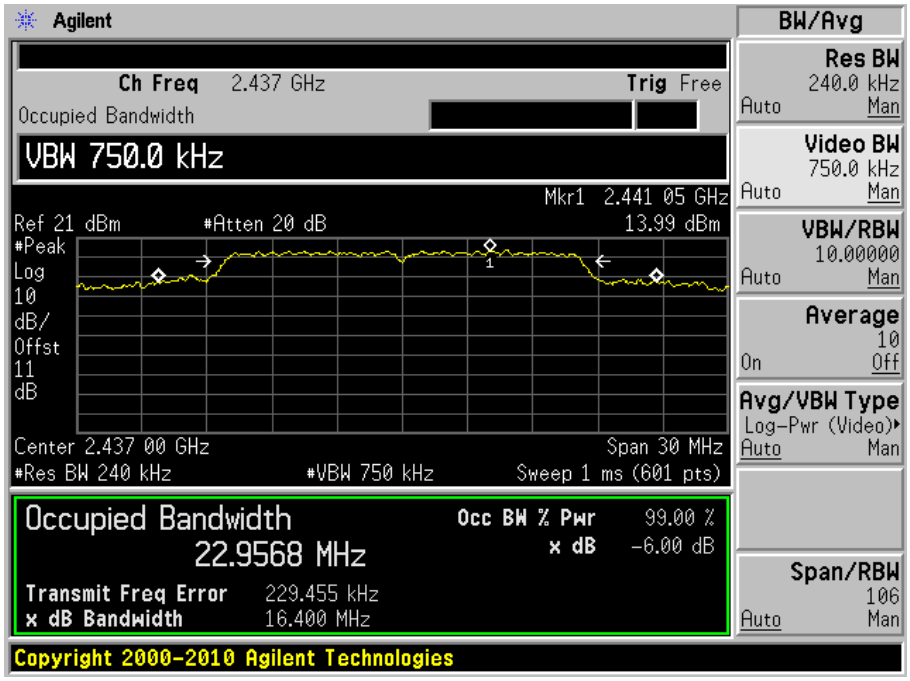
G Mode 2412 MHz Low Channel 99 BW



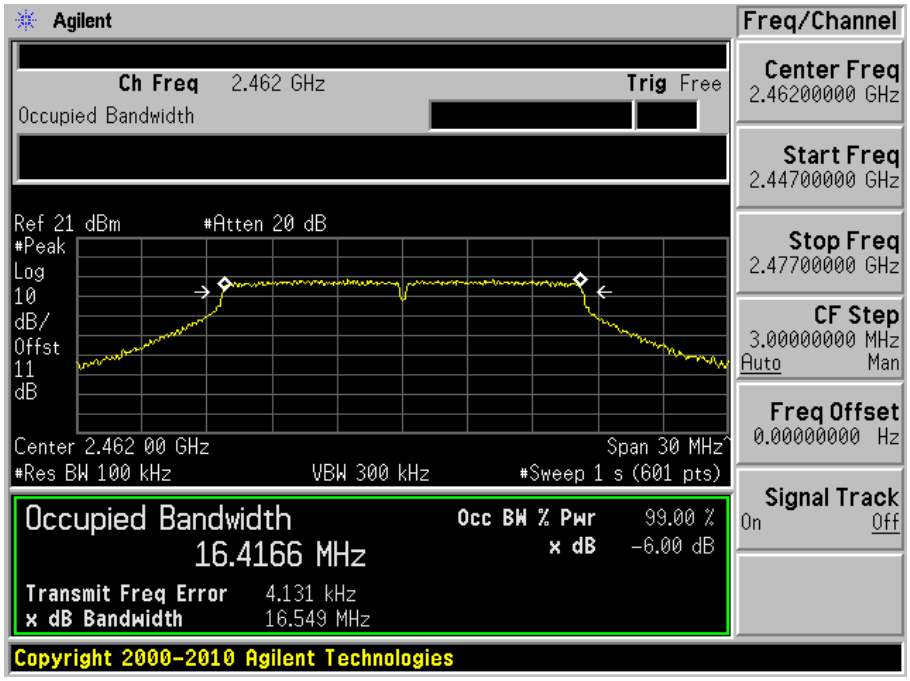
G Mode 2437 MHz Mid Channel 6 dB BW



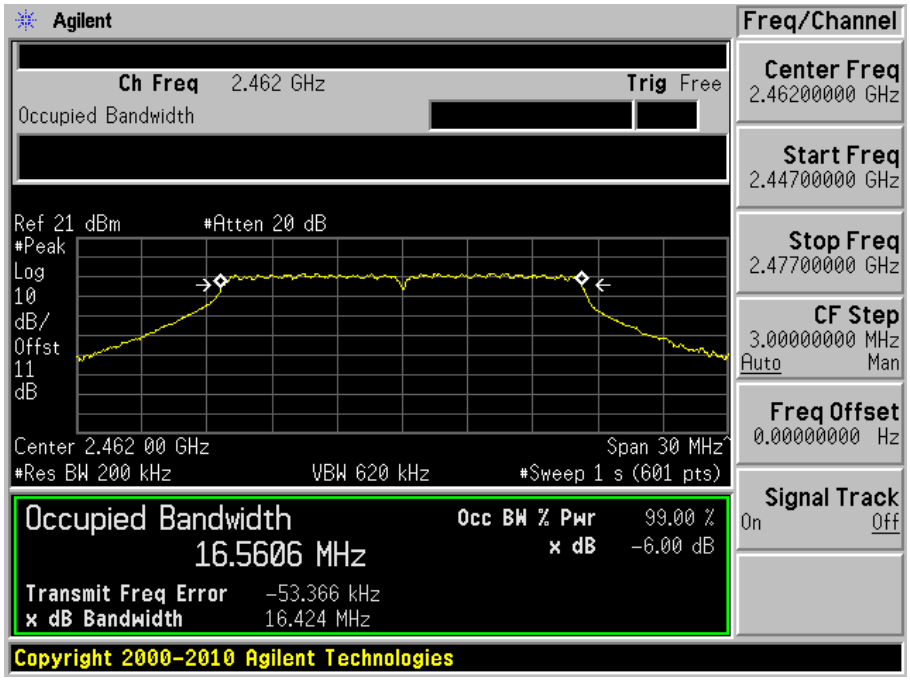
G Mode 2437 MHz Mid Channel 99 BW



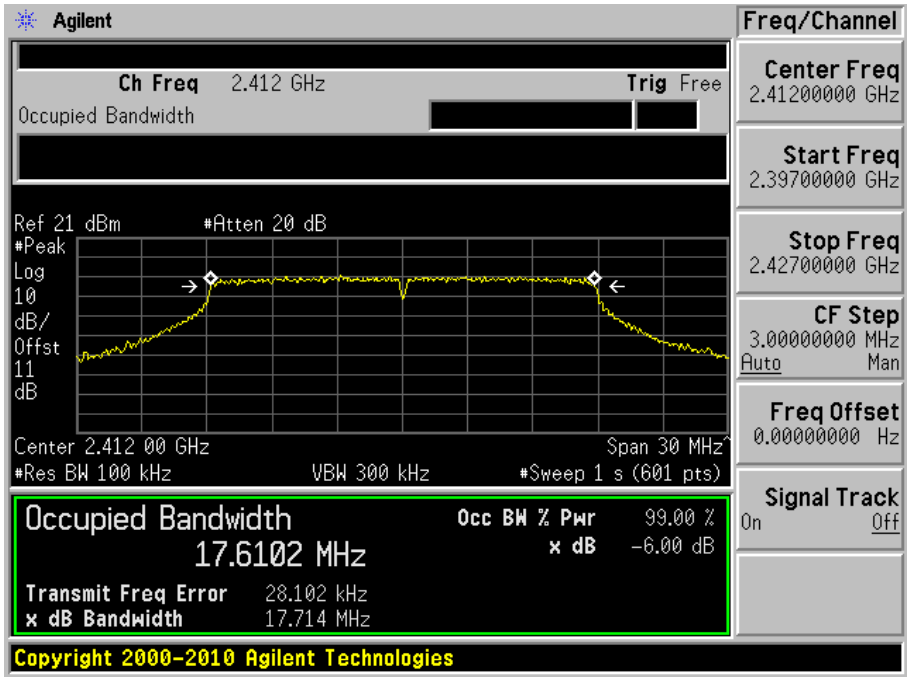
G Mode 2462 MHz High Channel 6 dB BW



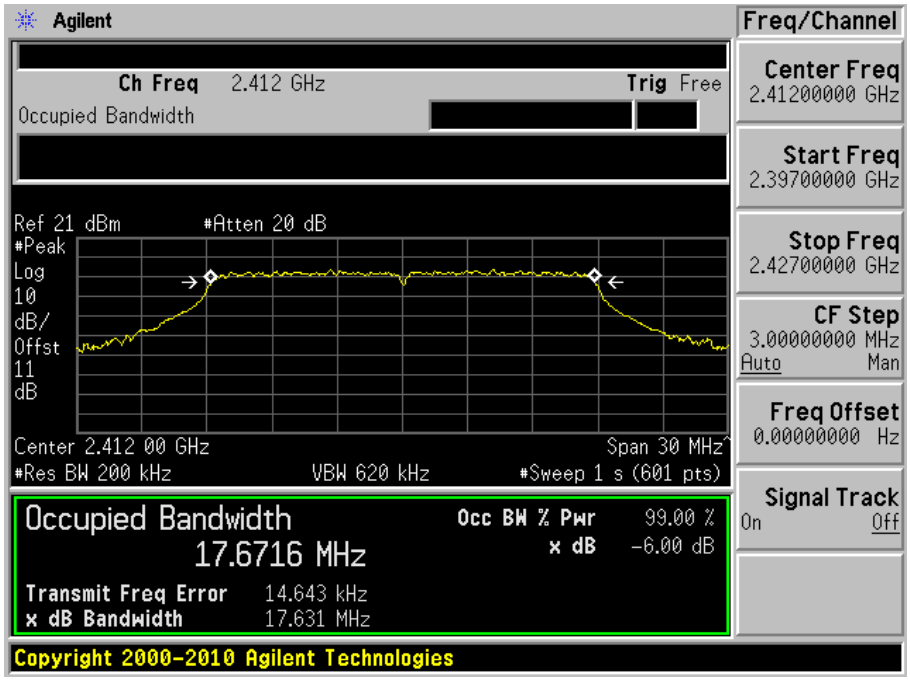
G Mode 2462 MHz High Channel 99 BW



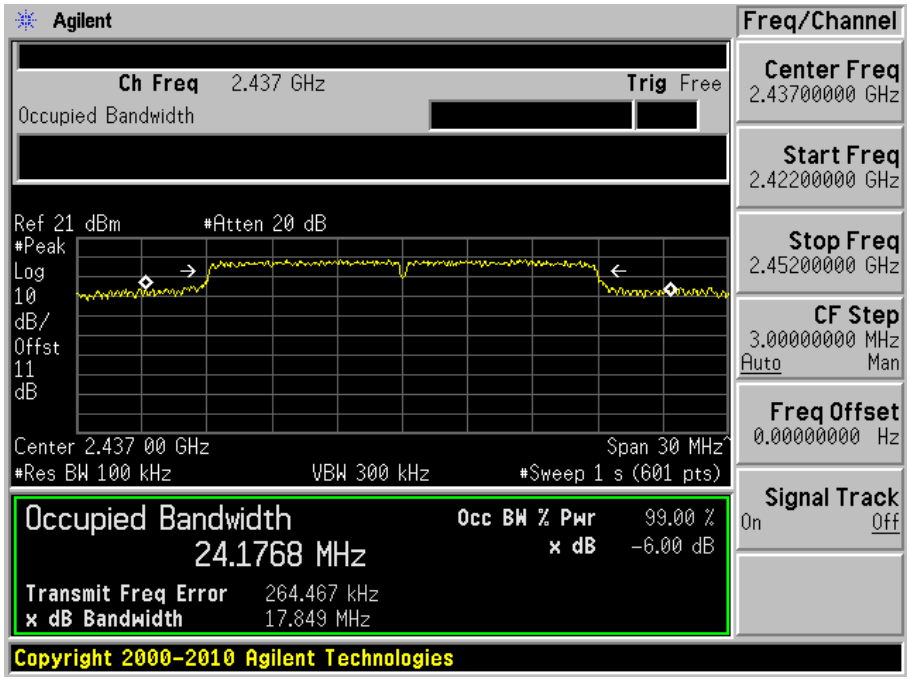
N20 Mode 2412 MHz Low Channel 6 dB BW



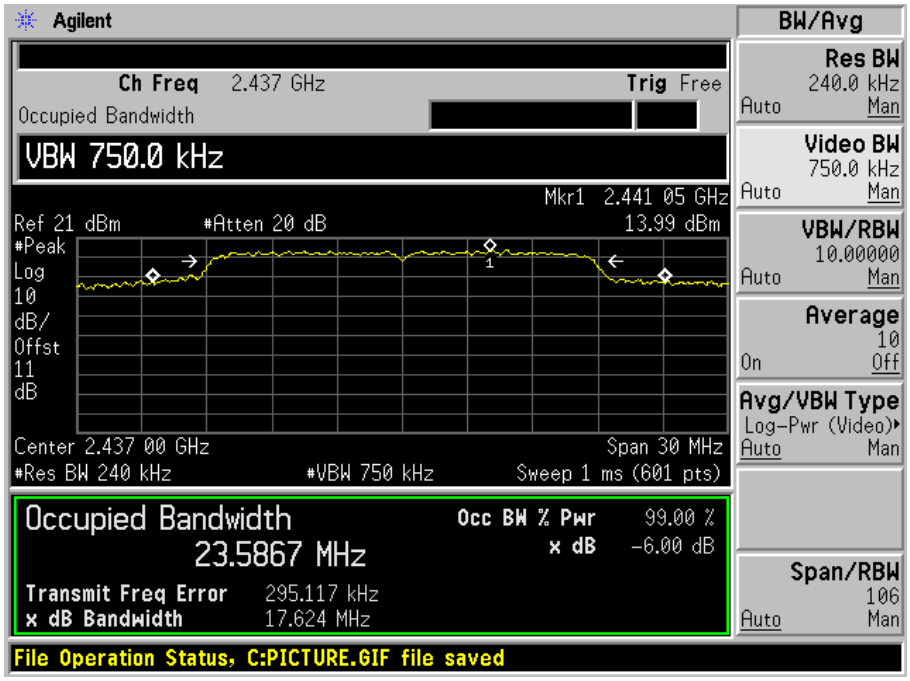
N20 Mode 2412 MHz Low Channel 99 BW



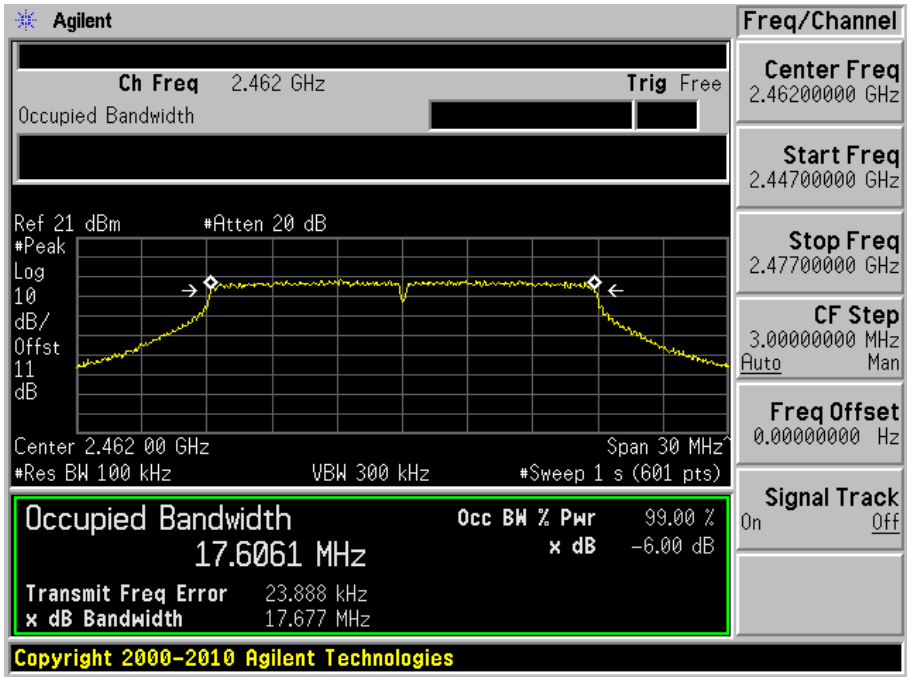
N20 Mode 2437 MHz Mid Channel 6 dB BW



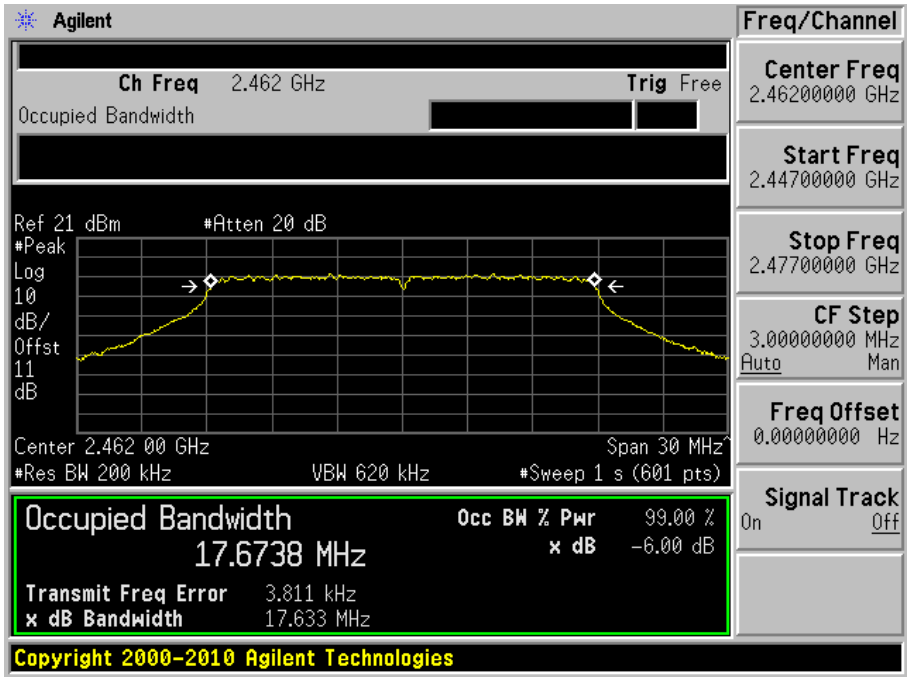
N20 Mode 2437 MHz Mid Channel 99 BW



N20 Mode 2462 MHz High Channel 6 dB BW



N20 Mode 2462 MHz High Channel 99 BW



7 FCC §15.247(b) (3) & ISEDC RSS-247 §5.4 - Maximum Output Power

7.1 Applicable Standards

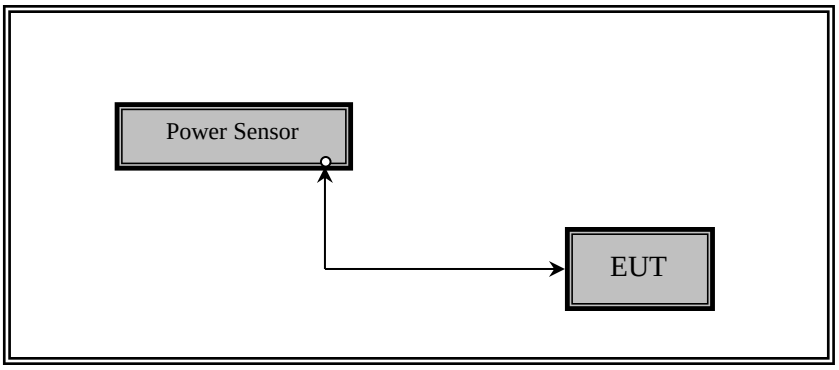
According to FCC §15.247(b) (3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247 §5.4: For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

7.2 Measurement Procedure

The measurements are based on ANSI C63.10-2013, Section 11.9.2.2.2.

7.3 Test Setup Block Diagram



7.4 Test Equipment List and Details

Bacl No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
697	ETS- Lingerin	Power Sensor	7002-006	160097	2021-02-21	2 years
-	-	RF cable	-	-	Each time[1]	N/A
-	-	10 dB attenuator	-	-	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".*

7.5 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Deepak Mishra on 2022-04-21 in RF site.

7.6 Test Results

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Output Power Limit (dBm)	Result
802.11b				
Low	2412	10.18	< 30	Pass
Middle	2437	11.25	< 30	Pass
High	2462	12.09	< 30	Pass
802.11g				
Low	2412	13.8	< 30	Pass
Middle	2437	21.4	< 30	Pass
High	2462	9.8	< 30	Pass
802.11 n20				
Low	2412	13.18	< 30	Pass
Middle	2437	21.3	< 30	Pass
High	2462	9.5	< 30	Pass

Note: Duty Cycle correction factor has already been added to the measurement.

8 FCC §15.247(d) & ISEDC RSS-247 §5.5 - 100 kHz Bandwidth of Band Edges

8.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

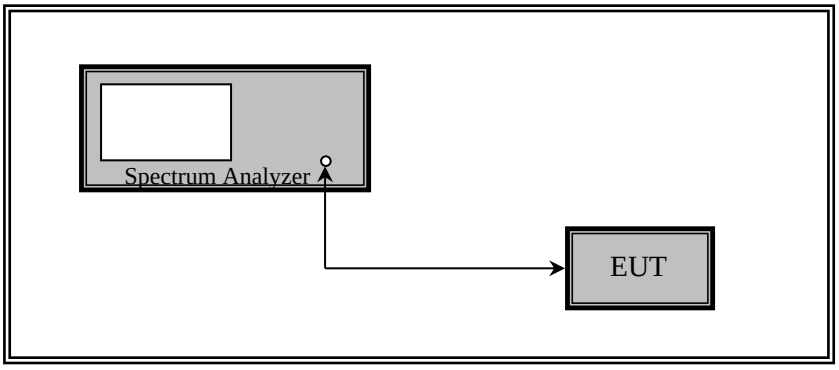
According to ISEDC RSS-247 §5.5.In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.2 Measurement Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation

RBW = 100 kHz
VBW = 300 kHz
Sweep = coupled
Detector function = peak
Trace = max hold

8.3 Test Setup Block Diagram



8.4 Test Equipment List and Details

Bacl No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250 238	2021-06-23	1 year
-	-	RF cable	-	-	Each time[1]	N/A
-	-	10 dB attenuator	-	-	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".*

8.5 Test Environmental Conditions

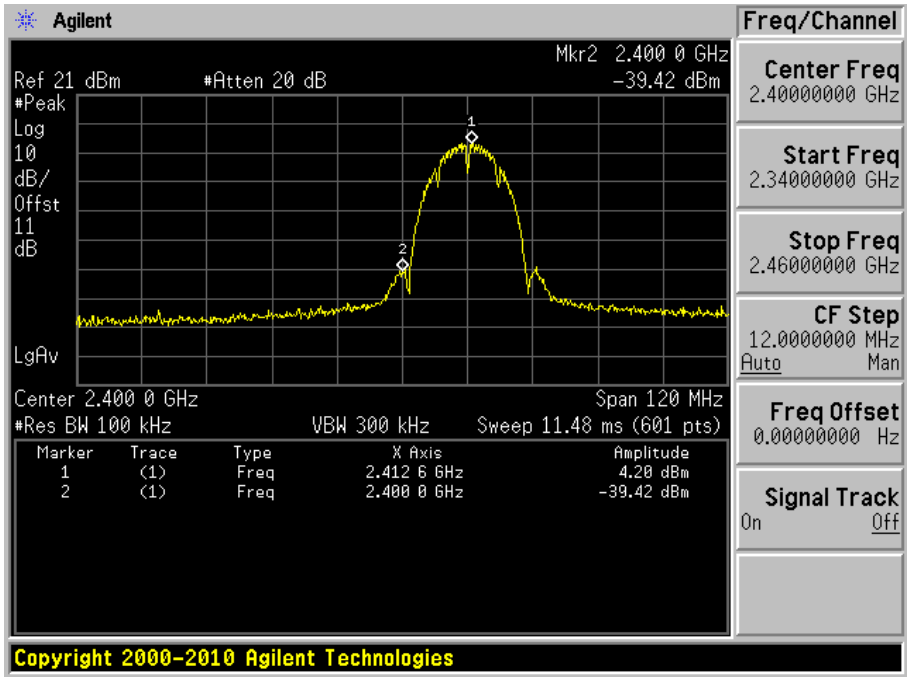
Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Deepak Mishra on 2022-05-02 in RF site.

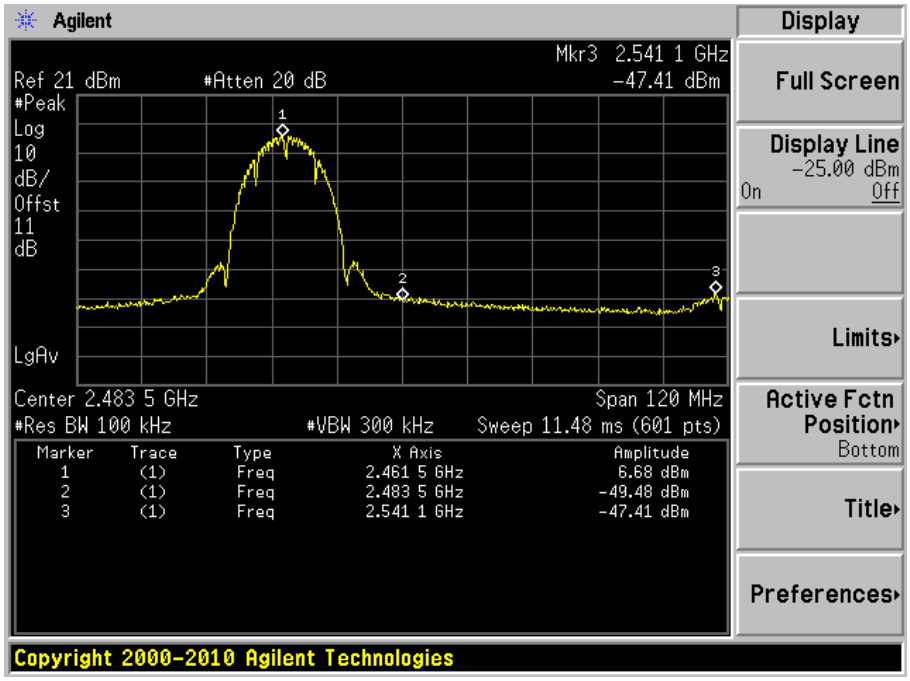
8.6 Test Results

Please refer to the following plots for detailed test results

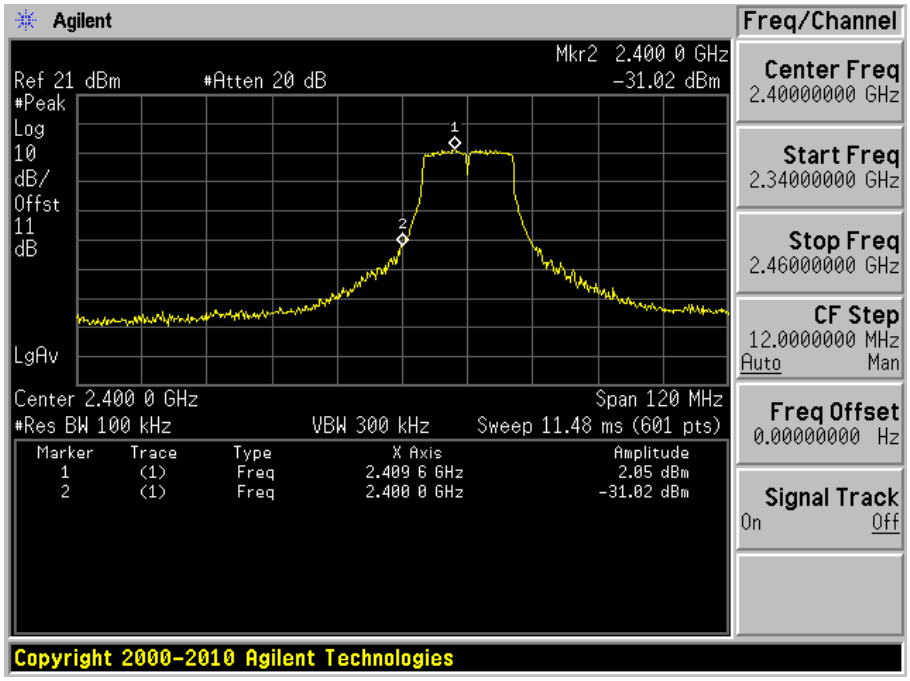
B Mode 2412 MHz Low Channel Band Edge



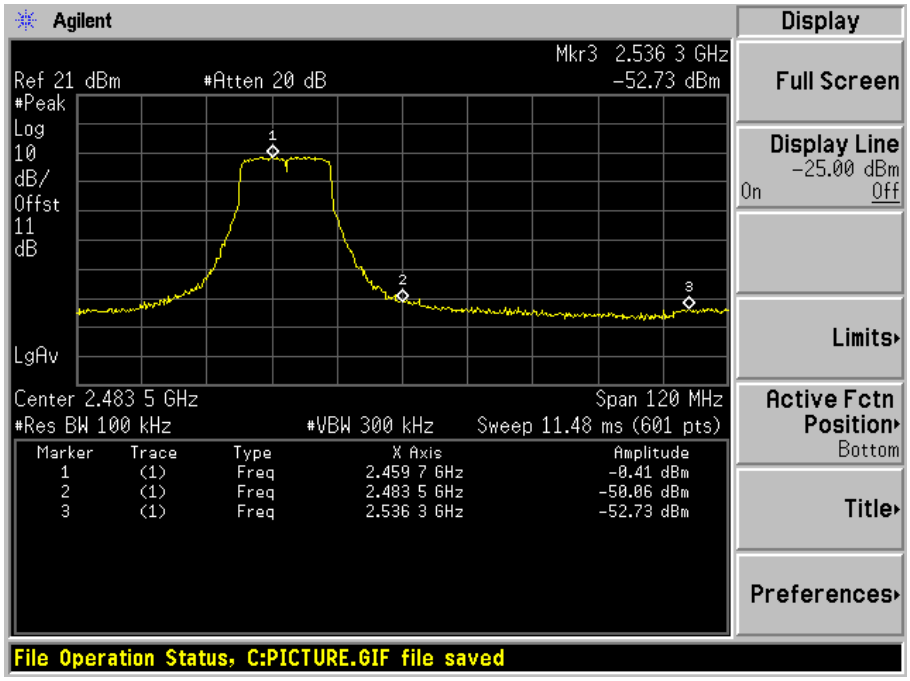
B Mode 2462 MHz High Channel Band Edge



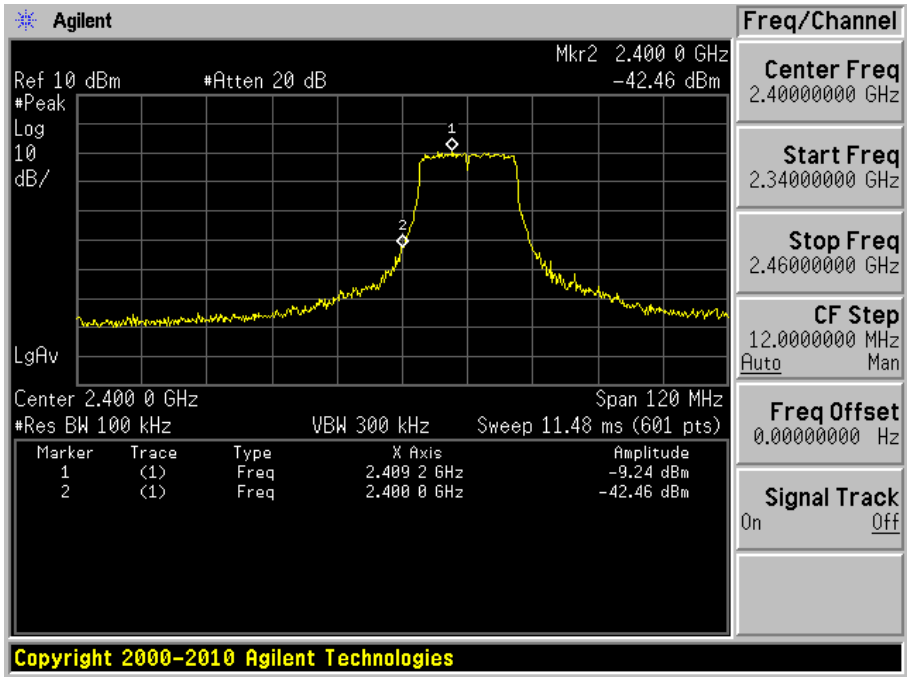
G Mode 2412 MHz Low Channel Band Edge



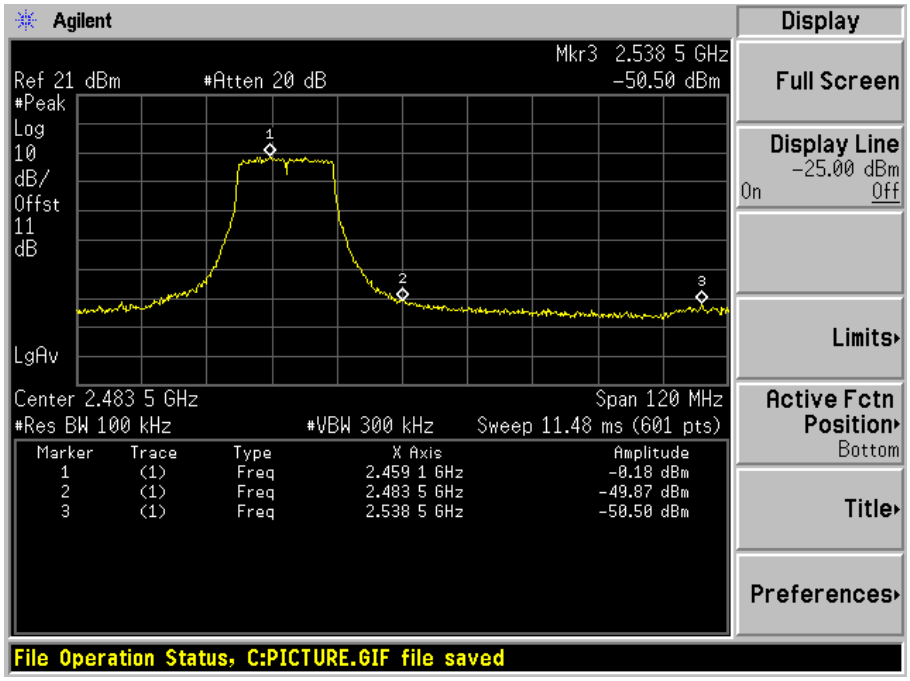
G Mode 2462 MHz High Channel Band Edge



N20 Mode 2412 MHz Low Channel Band Edge



N20 Mode 2462 MHz High Channel Band Edge



9 FCC §15.247(e) & ISEDC RSS-247 §5.2(2) – Peak Power Spectral Density

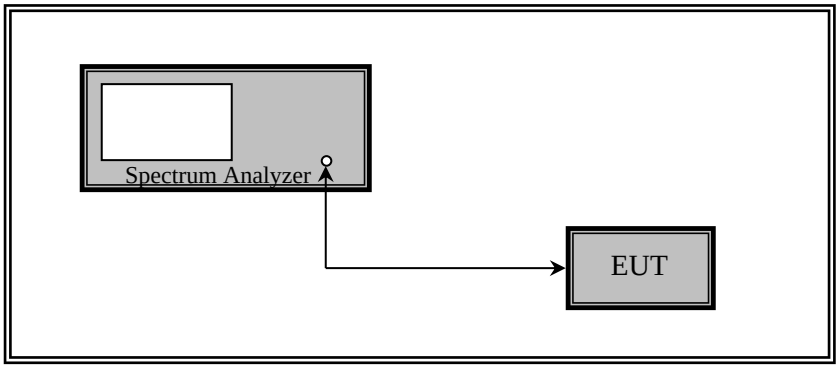
9.1 Applicable Standards

According to ECFR §15.247(e) and RSS-247 §5.2 (2) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission.

9.3 Test Setup Block Diagram



9.4 Test Equipment List and Details

Bacl No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250 238	2021-06-23	1 year
-	-	RF cable	-	-	Each time[1]	N/A
-	-	10 dB attenuator	-	-	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:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Deepak Mishra on 2022-04-21 in RF site.

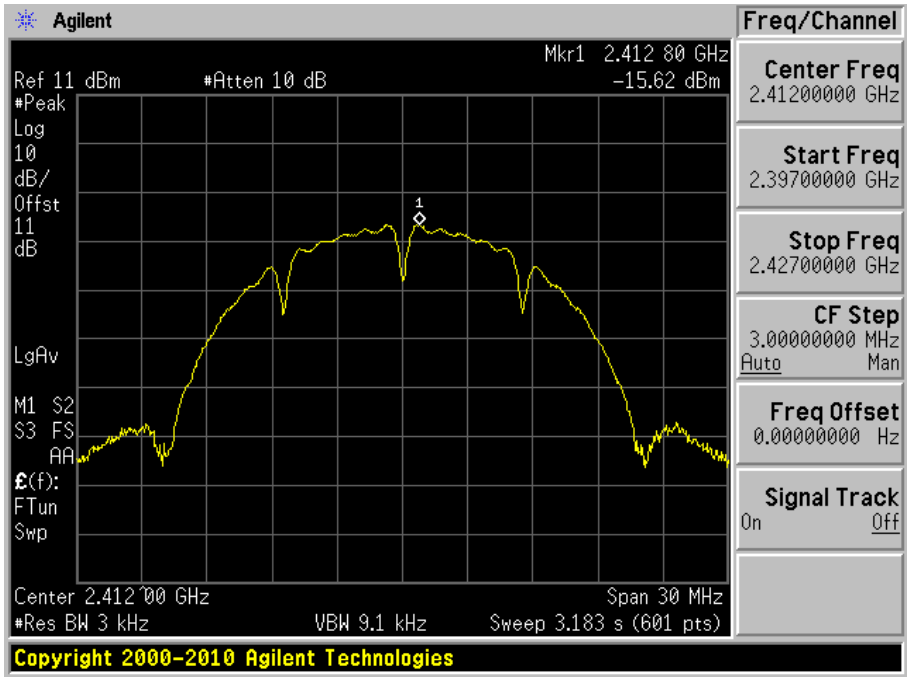
9.6 Test Results

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Corrected PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode				
Low	2412	-15.62	-15.62	< 8
Middle	2437	-14.32	-14.32	< 8
High	2462	-13.11	-13.11	< 8
802.11g mode				
Low	2412	-12.08	-12.08	< 8
Middle	2437	-4.37	-4.37	< 8
High	2462	-14.69	-14.69	< 8
802.11n20 mode				
Low	2412	-12.66	-12.66	< 8
Middle	2437	-4.58	-4.58	< 8
High	2462	-15.05	-15.05	< 8

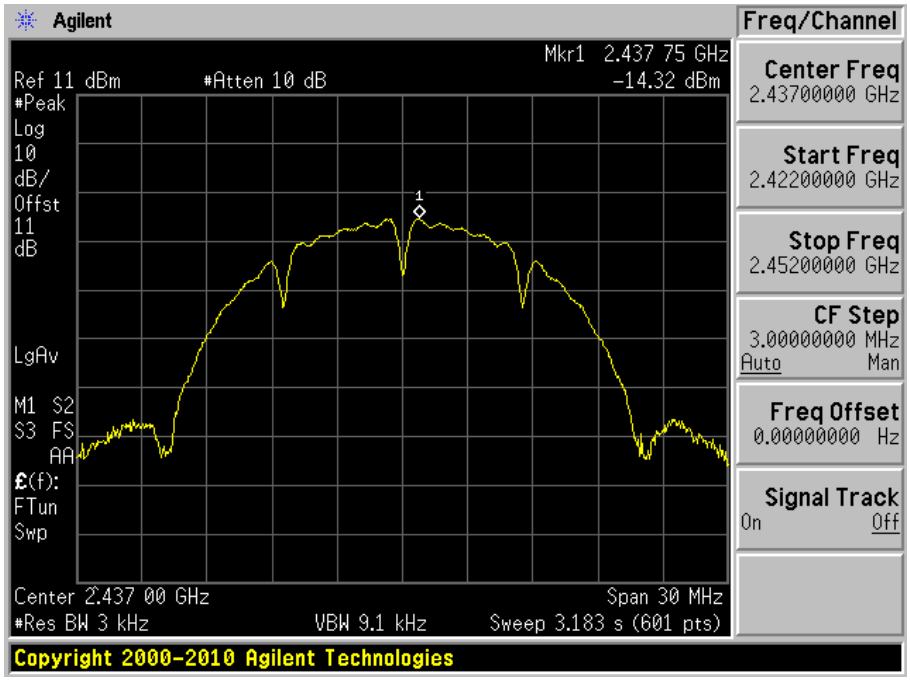
*Note: Corrected PSD (dBm/3kHz) = PSD(dBm/3kHz) +10*log(1/x), where x is duty cycle

Please refer to the following plots for detailed test results

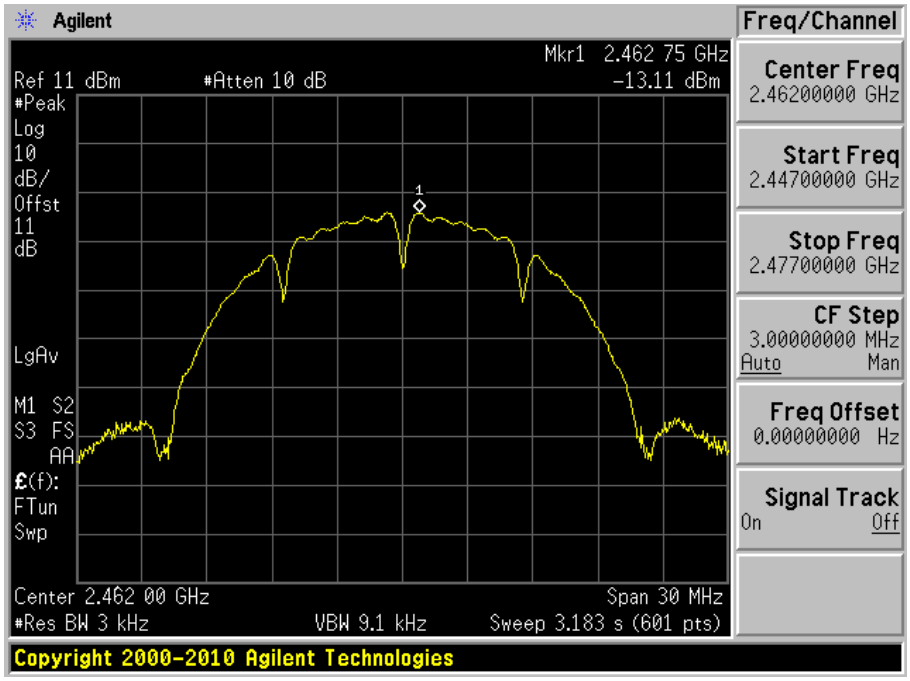
B Mode 2412 MHz Low Channel PSD



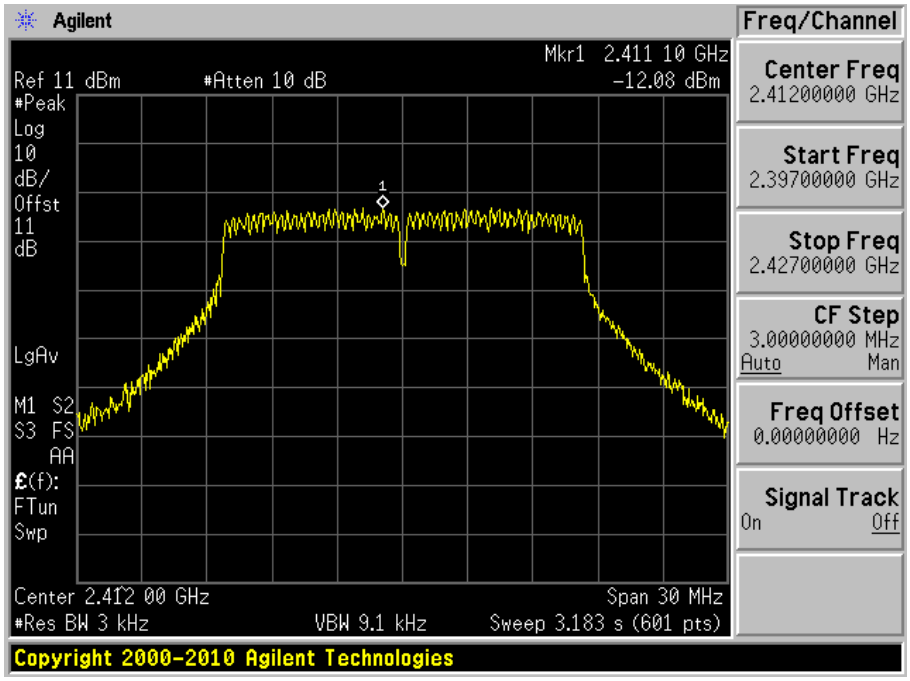
B Mode 2437 MHz Mid Channel PSD



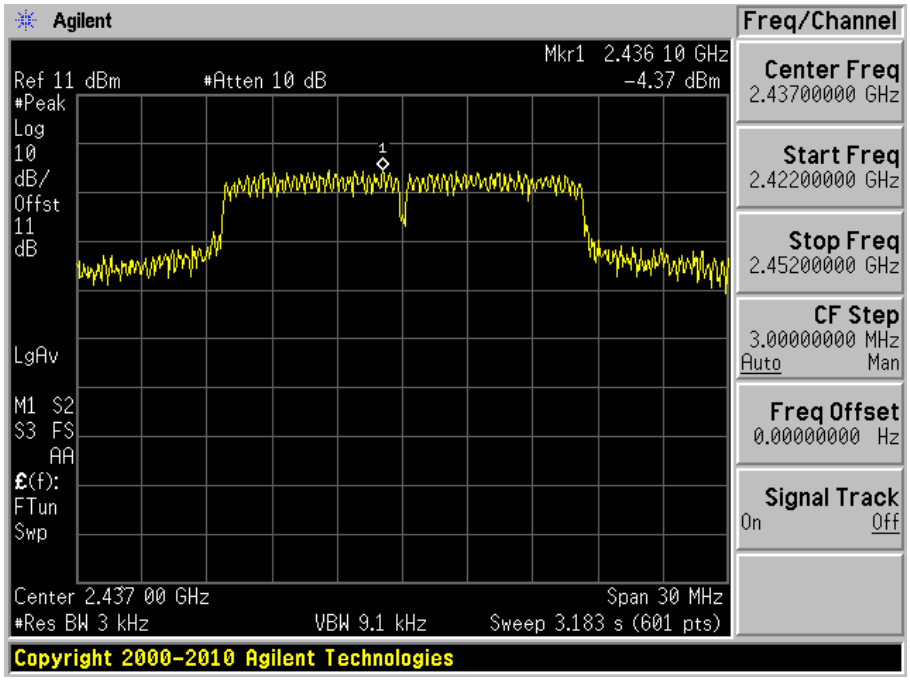
B Mode 2462 MHz High Channel PSD



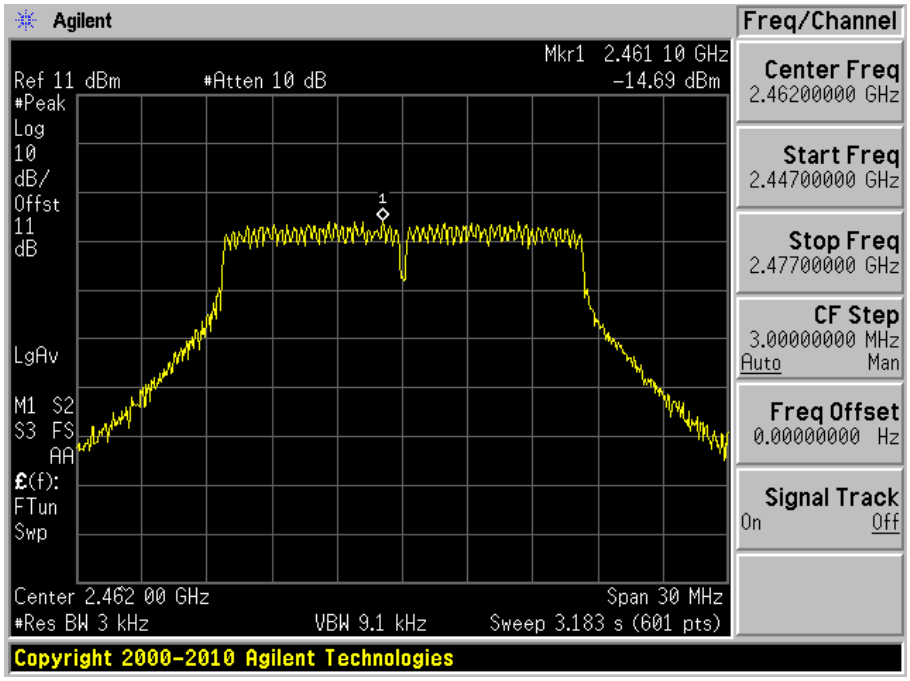
G Mode 2412 MHz Low Channel PSD



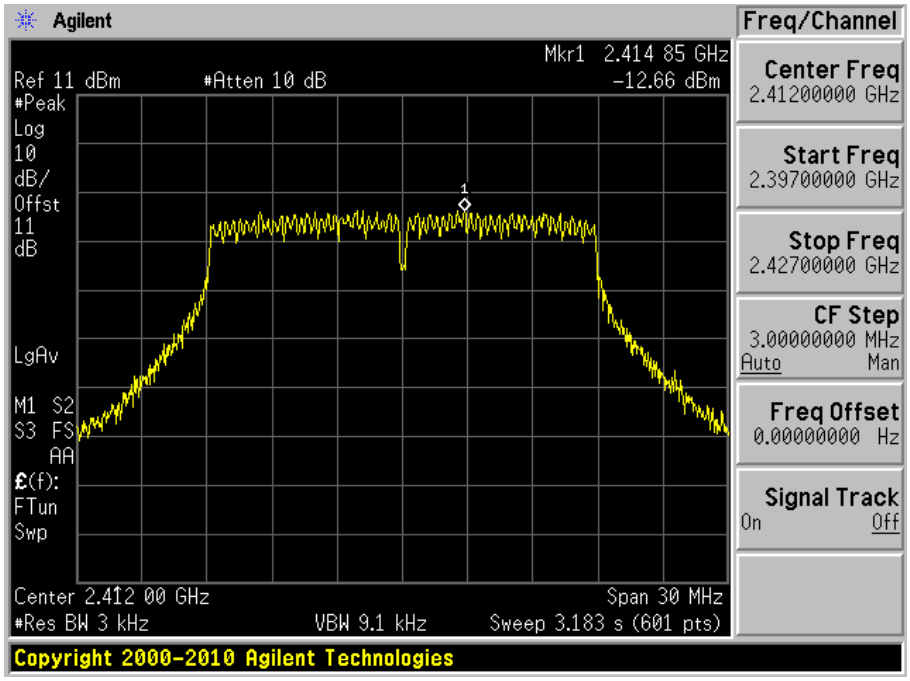
G Mode 2437 MHz Mid Channel PSD



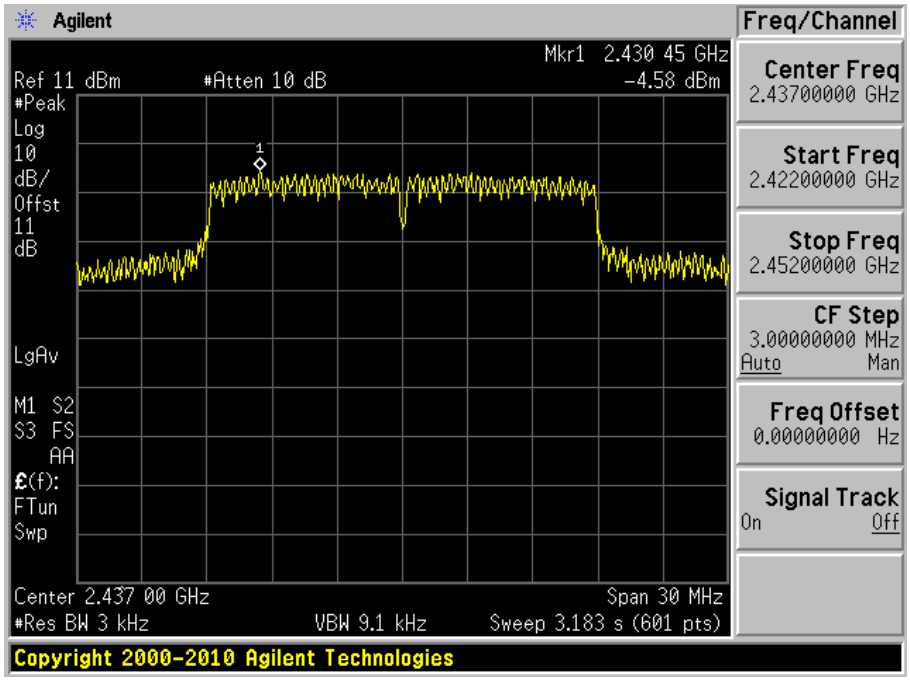
G Mode 2462 MHz High Channel PSD



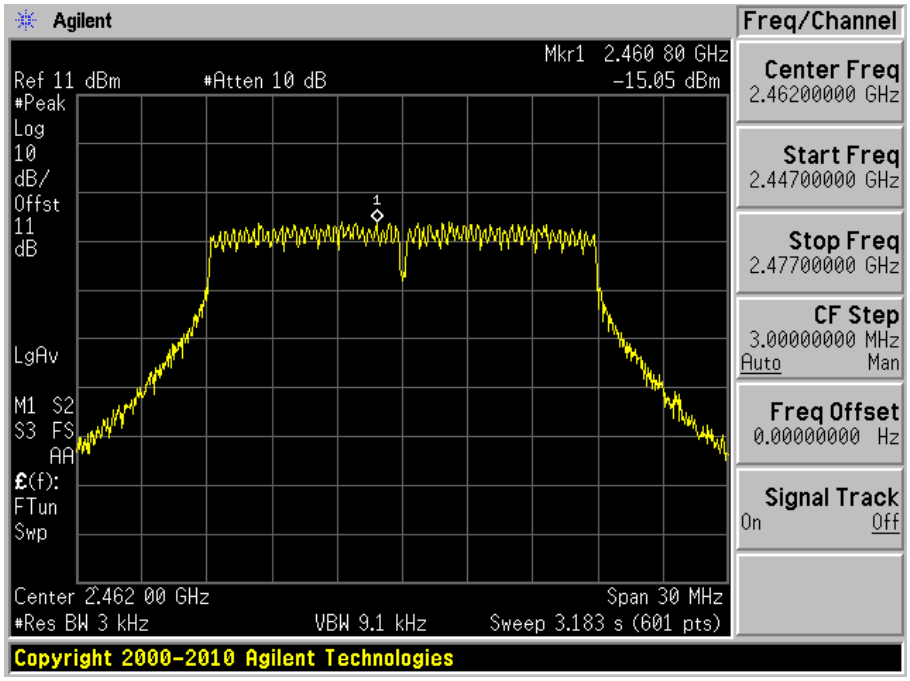
N20 Mode 2412 MHz Low Channel PSD



N20 Mode 2437 MHz Mid Channel PSD



N20 Mode 2462 MHz High Channel PSD



10 FCC §15.247(d) & ISEDC RSS-247 §5.5 - Spurious Emissions at Antenna Terminals

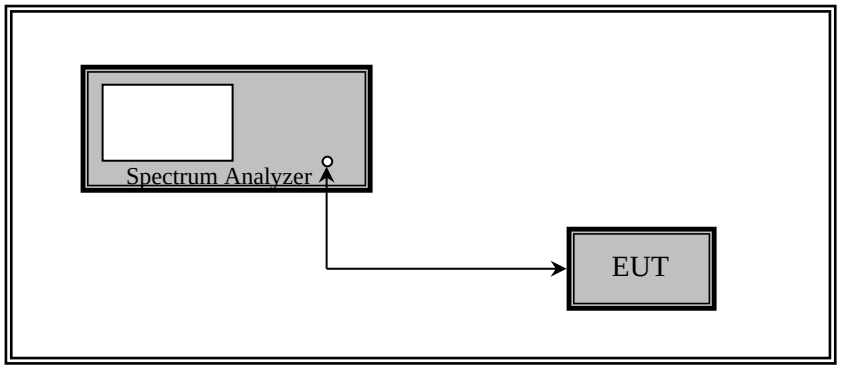
10.1 Applicable Standards

For FCC §15.247(d) and ISEDC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

10.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

10.3 Test Setup Block Diagram



10.4 Test Equipment List and Details

Bacl No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
624	Agilent	Spectrum Analyzer	E4446A	MY48250 238	2021-06-23	1 year
-	-	RF cable	-	-	Each time[1]	N/A
-	-	10 dB attenuator	-	-	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".*

10.5 Test Environmental Conditions

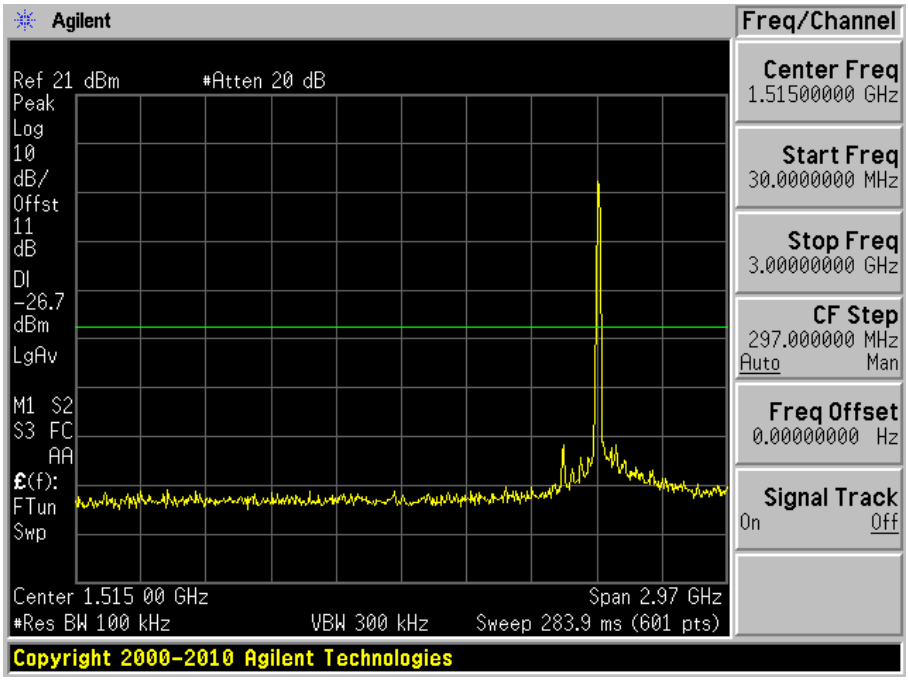
Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Deepak Mishra on 2022-04-21 in RF site.

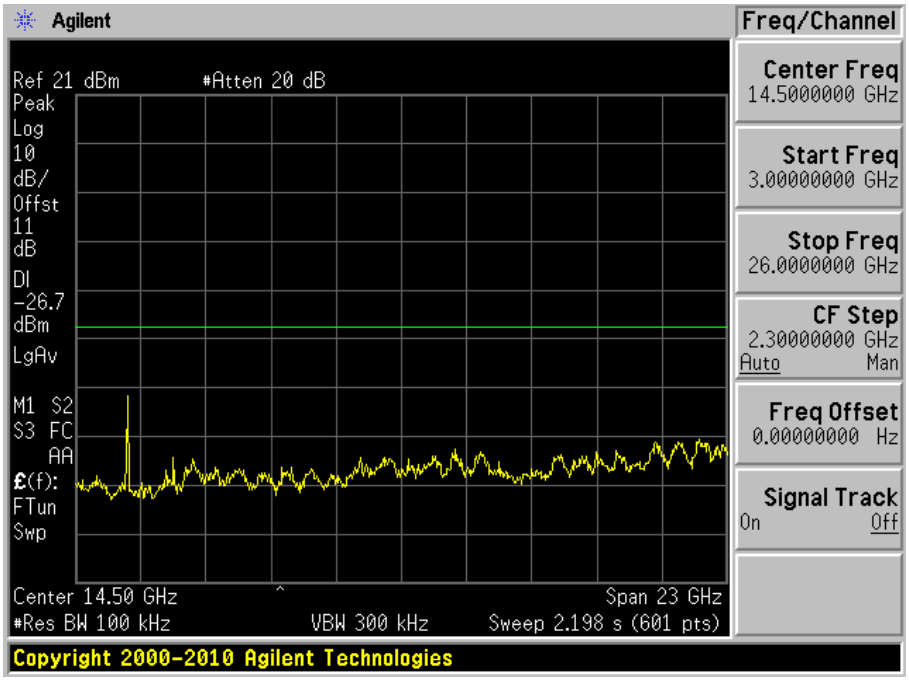
10.6 Test Results

Please refer to following plots.

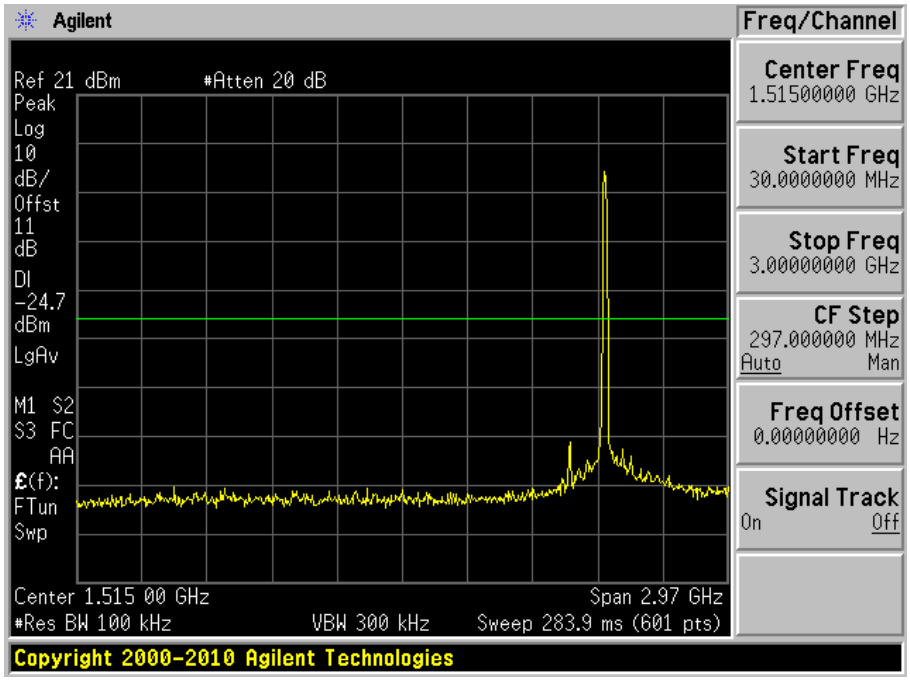
B Mode 2412 MHz Low Channel Spurious Emission_1



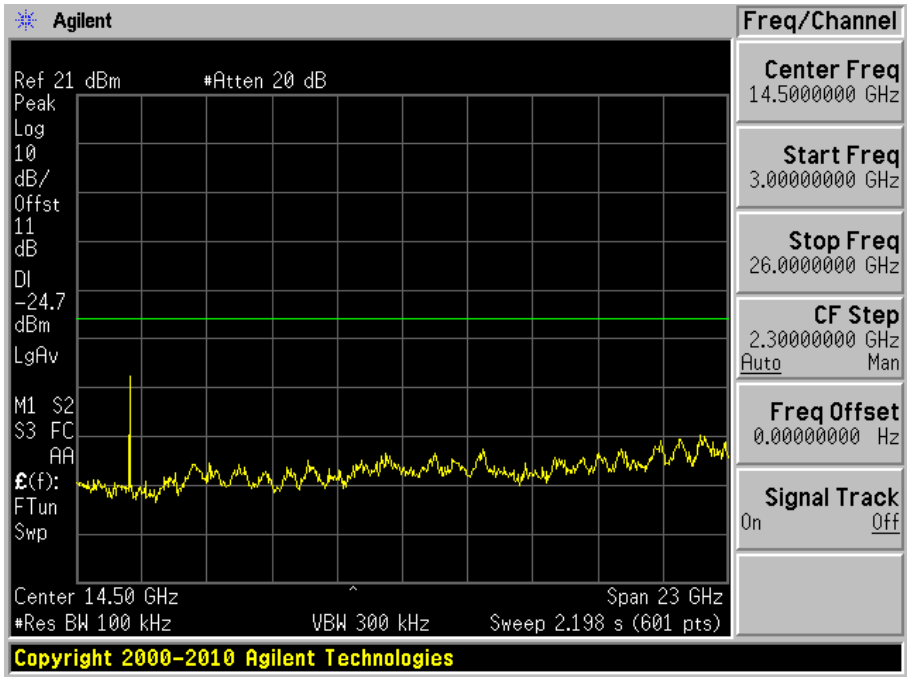
B Mode 2412 MHz Low Channel Spurious Emission_2



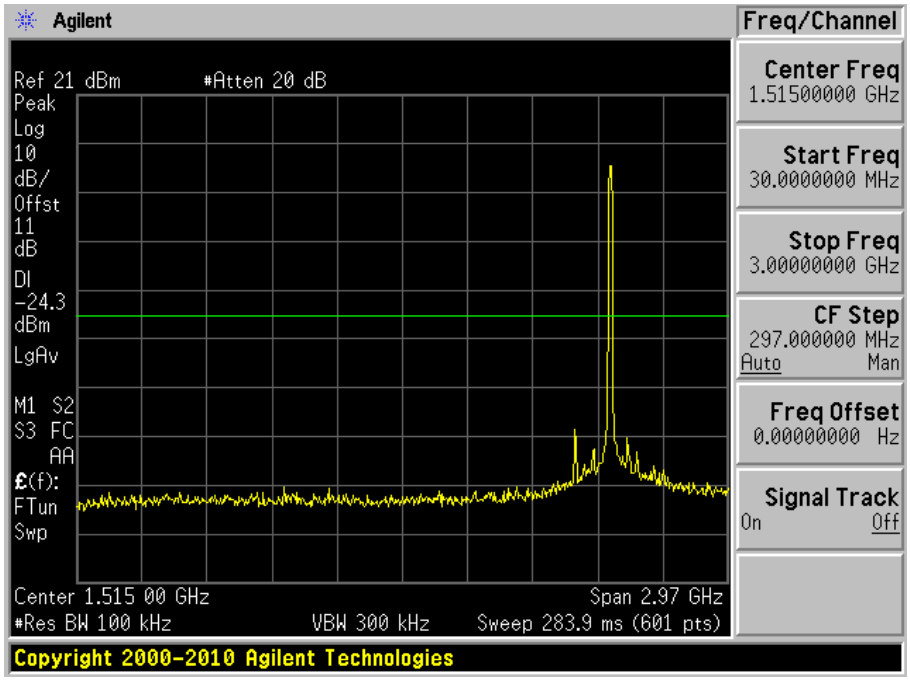
B Mode 2437 MHz Mid Channel Spurious Emission_1



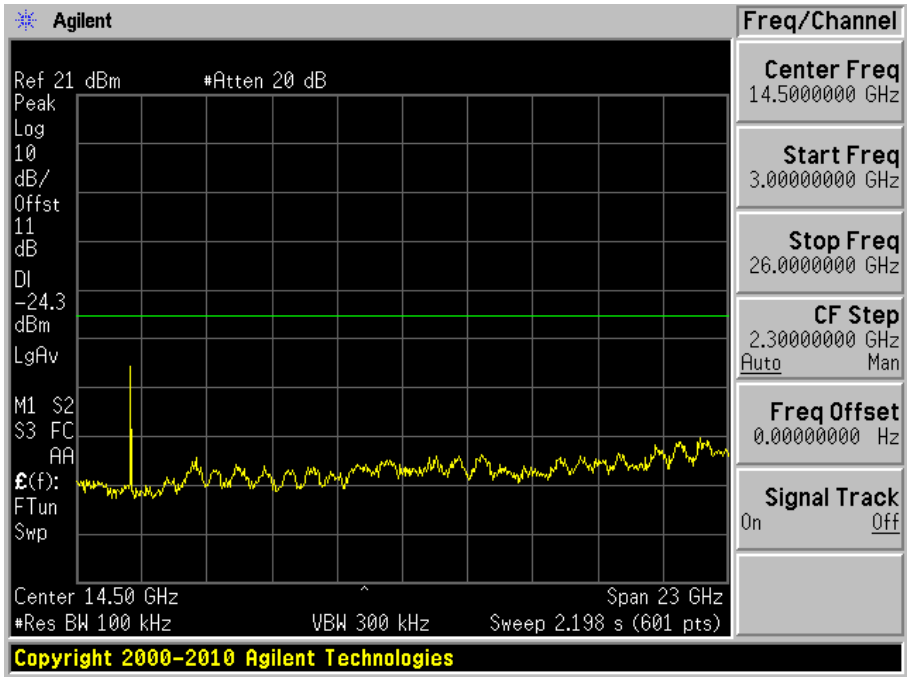
B Mode 2437 MHz Mid Channel Spurious Emission_2



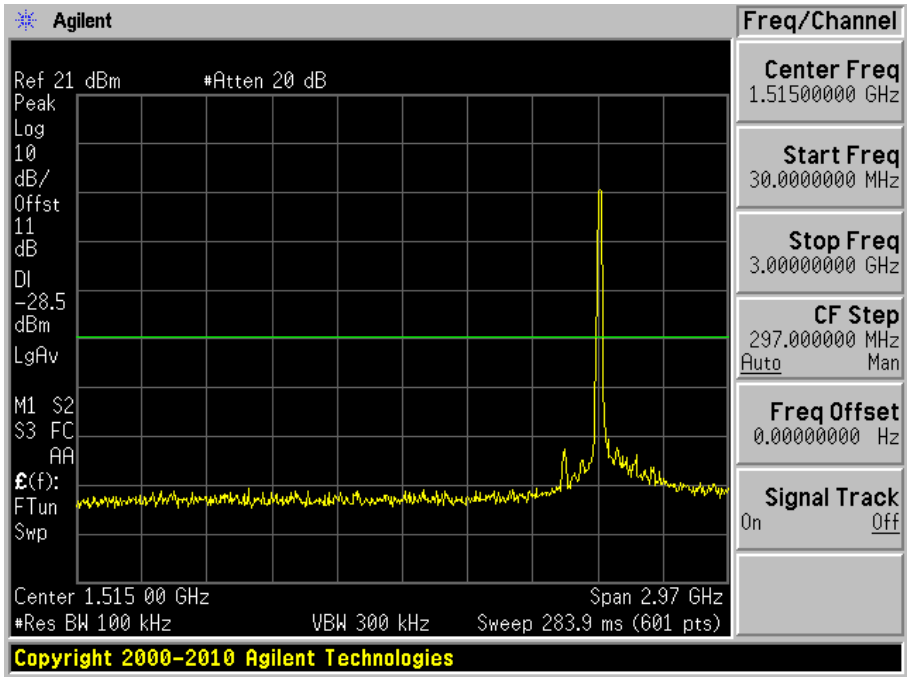
B Mode 2462 MHz High Channel Spurious Emission_1



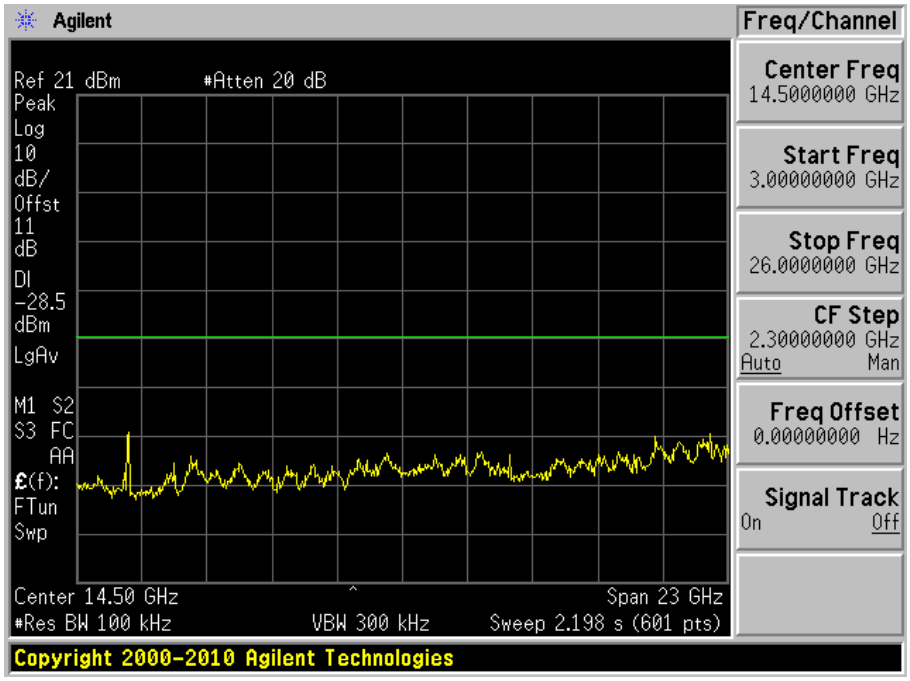
B Mode 2462 MHz High Channel Spurious Emission_2



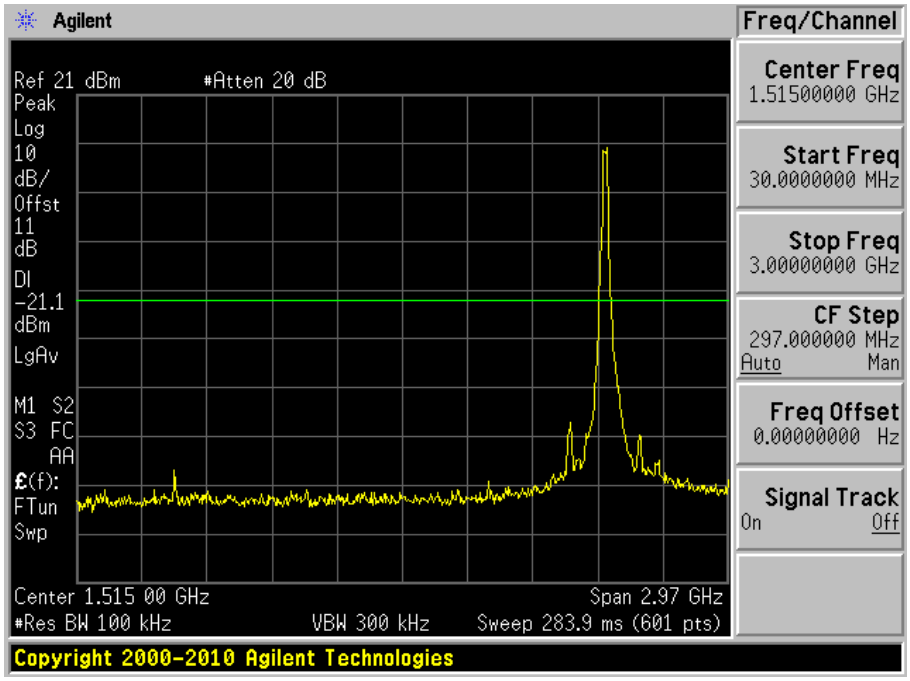
G Mode 2412 MHz Low Channel Spurious Emission_1



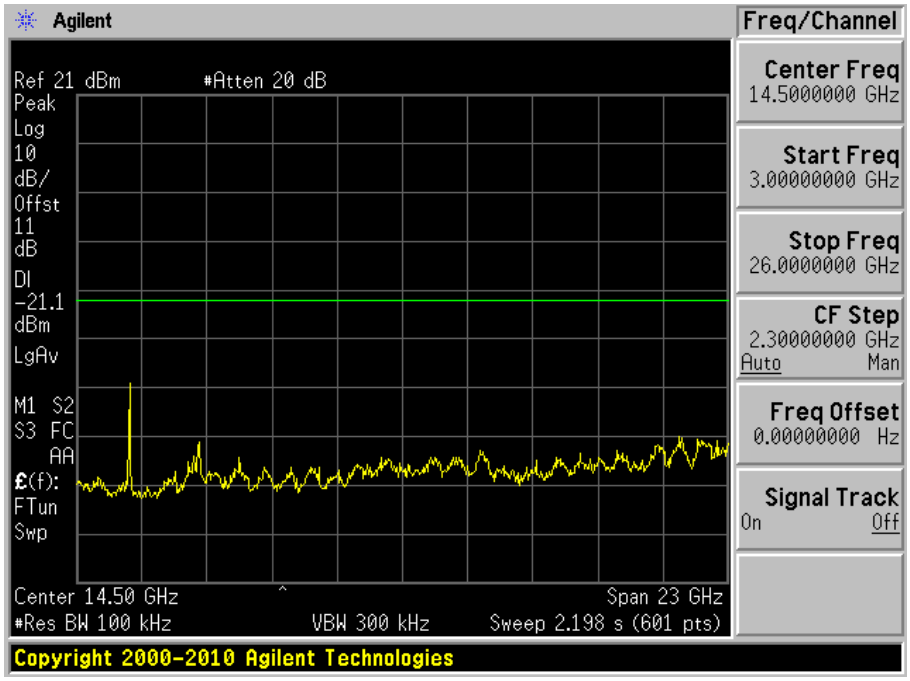
G Mode 2412 MHz Low Channel Spurious Emission_2



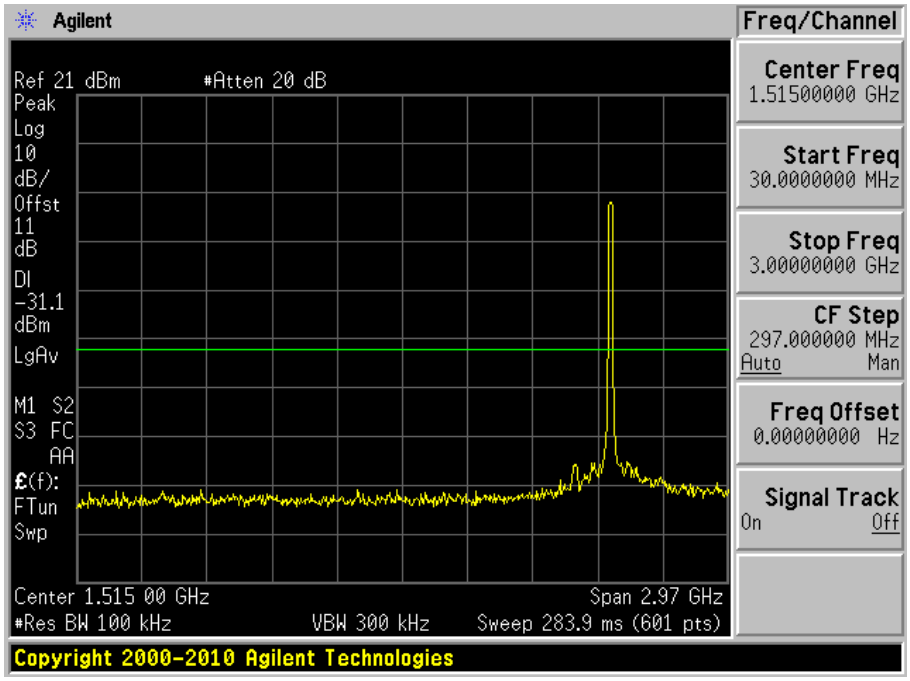
G Mode 2437 MHz Mid Channel Spurious Emission_1



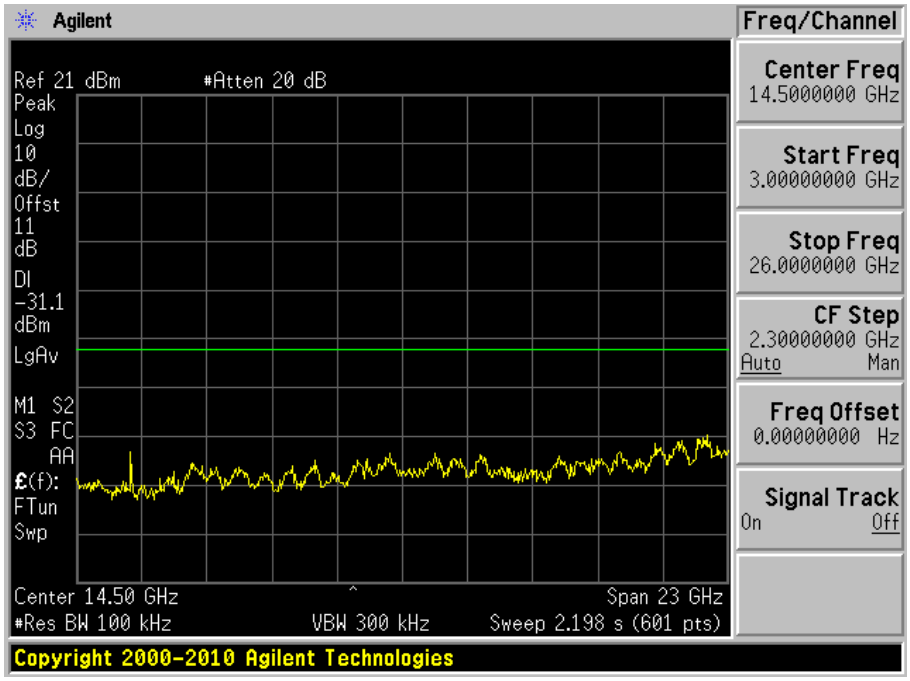
G Mode 2437 MHz Mid Channel Spurious Emission_2



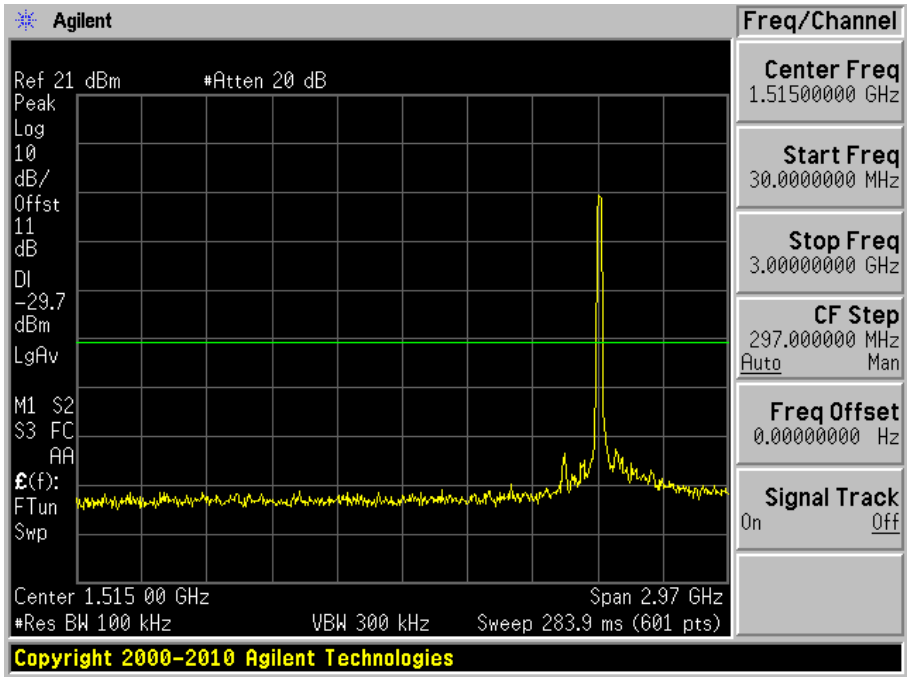
G Mode 2462 MHz High Channel Spurious Emission_1



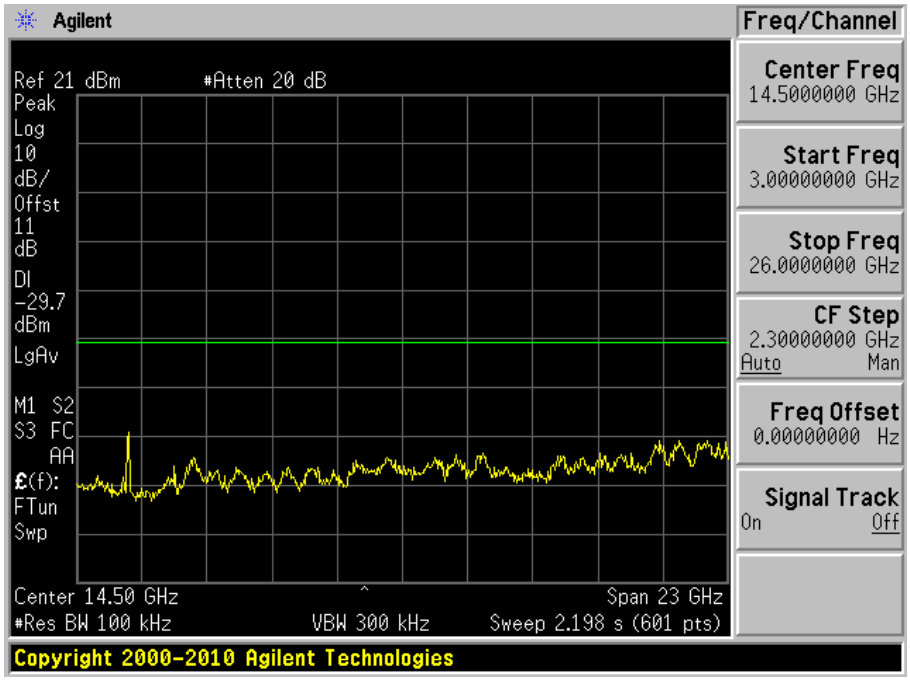
G Mode 2462 MHz High Channel Spurious Emission_2



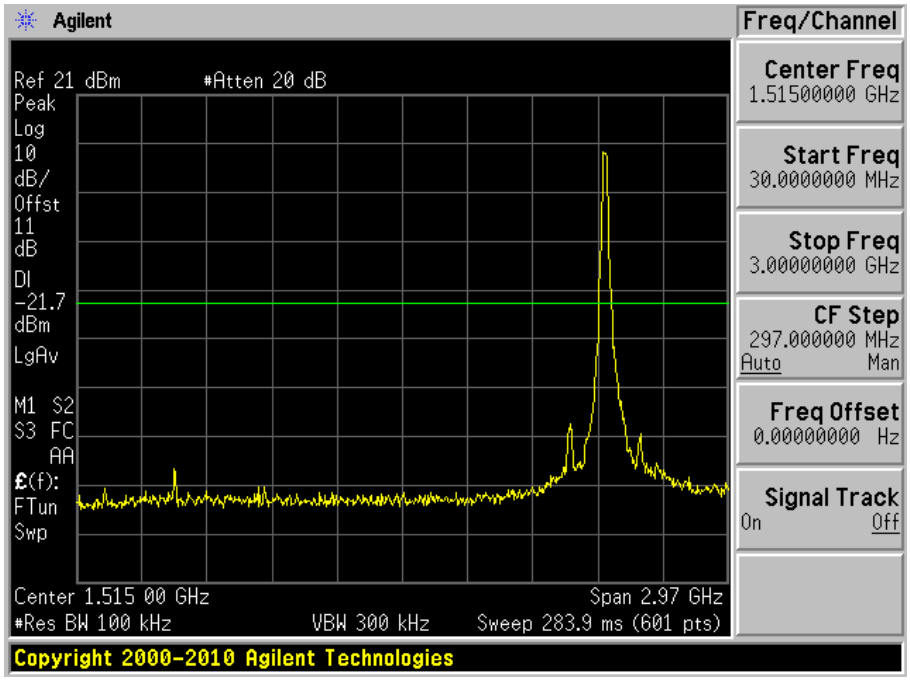
N20 Mode 2412 MHz Low Channel Spurious Emission_1



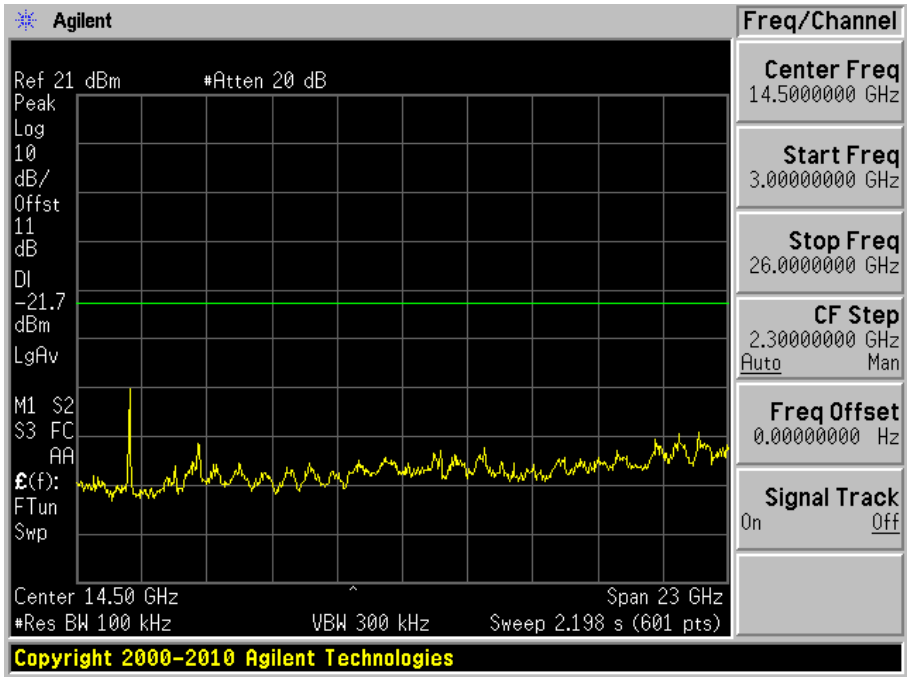
N20 Mode 2412 MHz Low Channel Spurious Emission_2



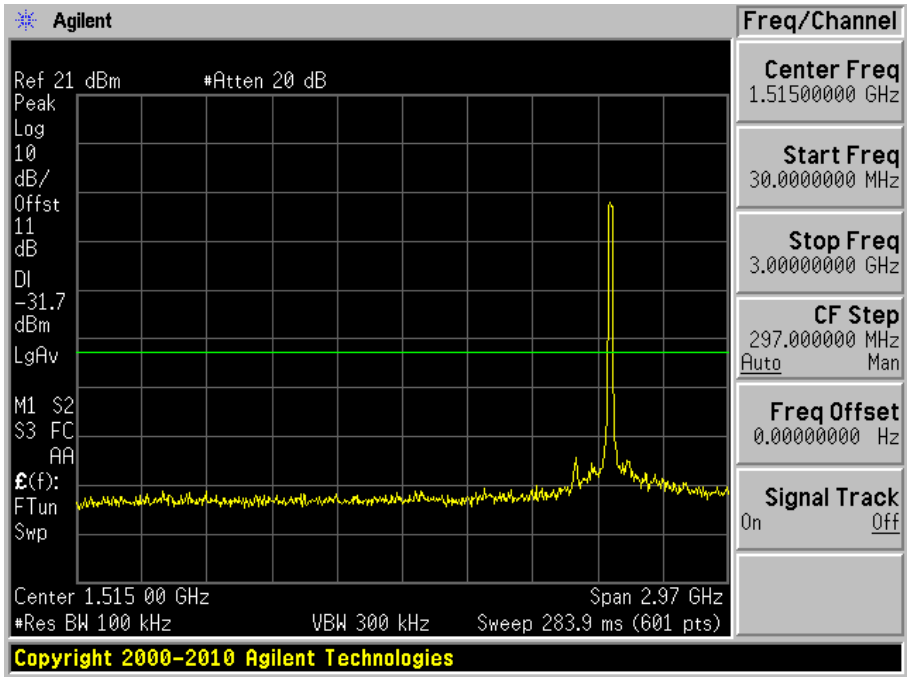
N20 Mode 2437 MHz Mid Channel Spurious Emission_1



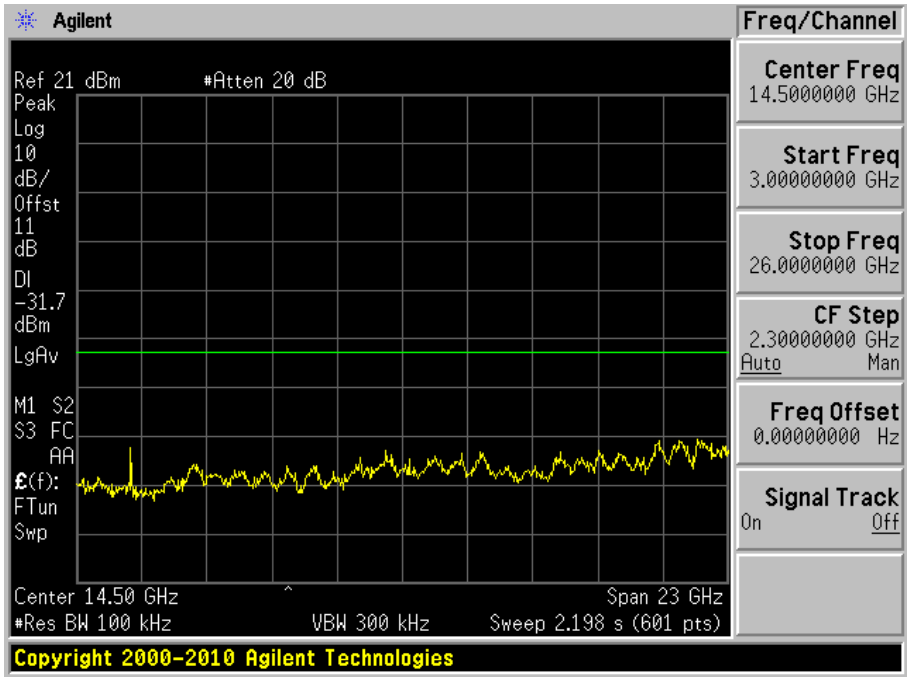
N20 Mode 2437 MHz Mid Channel Spurious Emission_2



N20 Mode 2462 MHz High Channel Spurious Emission_1



N20 Mode 2462 MHz High Channel Spurious Emission_2



11 Annex A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

12 Annex B (Normative) – EUT External Photographs

Please refer to the attachment.

13 Annex C (Normative) – EUT Internal Photographs

Please refer to the attachment.

14 Annex D (Informative) –Declaration of Similarity

Roku, Inc. 1155 Coleman Ave. San Jose, CA 95110 USA

DECLARATION OF SIMILARITY

April 25, 2022

To:

FEDERAL COMMUNICATIONS COMMISSIONS
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Innovation, Science and Economic Development Canada
Certification and Engineering Bureau
P.O. Box 11490, Station 'H' 3701 Carling Ave.,
Building 94 Ottawa, Ontario K2H 8S2 Canada

Dear Sir or Madam:

We, *Roku, Inc.*, hereby declare that product: Roku WiFi Remote Control, model: ***RC-GZ5*** is electrically identical to model: ***RC-GZ1*** *(FCC ID: TC2-R1047; IC ID: 5959A-R1043)* as tested by BACL, the results of which are featured in BACL project: *R2204071.*

The only difference between the models are minor external cosmetic appearances which does not affect any Electromagnetic Compatibility or RF characteristics of the device.

Please contact me should there be need for any additional clarification or information.

Best Regards,

Robert Curtis

Robert Curtis, Sr. Director SW, Engineering
Roku, Inc.
1155 Coleman Ave
San Jose, CA 95110

15 Annex E (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *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 10th day of March 2021.

Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2022

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

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

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

--- END OF REPORT ---