

RF Test Report

Applicant : Lightspeed International Co

Product Type : 5G gateway 500G

Trade Name : LIGHTSPEED

Model Number : 5G-500G

Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013

Received Date : Jun. 11, 2021

Test Period : Jul. 21. ~ Jul. 28, 2021

Issued Date : Nov. 19, 2021

Issued by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
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Taiwan Accreditation Foundation accreditation number: 1330
Frequency Range : 9 kHz to 40 GHz
Test Firm MRA designation number: TW0010

Note:

- 1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
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- 3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Rev.	Issued Date	Revisions	Revised By
00	Nov. 15, 2021	Initial Issue	Snow Wang
01	Nov. 19, 2021	Update chapter 4.7 (P.27)	Snow Wang

Verification of Compliance

Applicant : Lightspeed International Co

Product Type : 5G gateway 500G

Trade Name : LIGHTSPEED

Model Number : 5G-500G

FCC ID : NGJ-5G-500G

EUT Rated Voltage : DC 12 V, 5.0 A

Test Voltage : 120 Vac / 60 Hz

Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013

Test Result : Complied

Performing Lab. : A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330
<http://www.atl-lab.com.tw/e-index.htm>

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

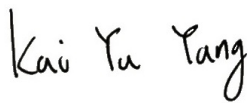
Approved By : 
(Kai Yu Yang)

TABLE OF CONTENTS

1	General Information	5
1.1.	Summary of Test Result	5
1.2.	Measurement Uncertainty	6
2	EUT Description	7
3	Test Methodology	8
3.1.	Mode of Operation	8
3.2.	EUT Test Step	12
3.3.	Configuration of Test System Details	13
3.4.	Test Instruments	15
3.5.	Test Site Environment	16
4	Measurement Procedure	17
4.1.	AC Power Line Conducted Emission Measurement	17
4.2.	Radiated Emission Measurement	19
4.3.	Maximum Conducted Output Power Measurement	23
4.4.	6 dB RF Bandwidth Measurement	24
4.5.	Maximum Power Spectral Density Measurement.....	25
4.6.	Out of Band Conducted Emissions Measurement	26
4.7.	Antenna Measurement.....	27
5	Test Results.....	28
	Annex A. Conducted Emission.....	28
	Annex B. Conducted Test Results.....	30
	Annex C. Radiated Emission Measurement	115

1 General Information

1.1. Summary of Test Result

Standard	Item	Result	Remark
15.207	AC Power Conducted Emission	PASS	-----
15.247(d)	Transmitter Radiated Emissions	PASS	-----
15.247(b)(3)	Max. Output Power	PASS	-----
15.247(a)(2)	6 dB RF Bandwidth	PASS	-----
15.247(e)	Maximum Power Spectral Density	PASS	-----
15.247(d)	Out of Band Conducted Spurious Emission	PASS	-----
15.203	Antenna Requirement	PASS	-----

Decision Rule

- ☒ Uncertainty is not included.
- ☐ Uncertainty is included.

Standard	Description
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63. 10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 15.247 Meas Guidance v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
KDB 662911 D01 v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conducted Emission	150 kHz ~ 30 MHz	2.7 dB
Radiated Emission	9 kHz ~ 30 MHz	2.2 dB
	30 MHz ~ 1000 MHz	5.1 dB
	1000 MHz ~ 18000 MHz	5.1 dB
	18000 MHz ~ 26500 MHz	4.4 dB
	26500 MHz ~ 40000 MHz	4.6 dB
Conducted Output Power	1.1 dB	
RF Bandwidth	4.7 %	
Power Spectral Density	1.1 dB	

2 EUT Description

Applicant	Lightspeed International Co No.20, Lane 526 Niupu East Road HsinChu, Taiwan, ROC 30091			
Manufacturer	Lightspeed International Co No.20, Lane 526 Niupu East Road HsinChu, Taiwan, ROC 30091			
Product Type	5G gateway 500G			
Trade Name	LIGHTSPEED			
Model Number	5G-500G			
FCC ID	NGJ-5G-500G			
Operate Freq. Band	Frequency Range (MHz)	Modulation	Channel Bandwidth	Data Rate 800 GI (ns)
IEEE 802.11b	2412 ~ 2462	DSSS	20 MHz	Up to 11 Mbps
IEEE 802.11g	2412 ~ 2462	OFDM	20 MHz	Up to 54 Mbps
IEEE 802.11n 2.4 GHz 20 MHz	2412 ~ 2462	OFDM (64QAM)	20 MHz	Up to 288.8 Mbps
IEEE 802.11n 2.4 GHz 40 MHz	2422 ~ 2452	OFDM (64QAM)	40 MHz	Up to 600 Mbps
Antenna information	ANT	Model Number	Type	Max. Gain (dBi)
	ANT-0	AN2450D-67A51BX	Linear Antenna	4.92
	ANT-1/ANT-2/ANT-3	AN2450D-67A52BGX	Linear Antenna	4.92
Antenna Delivery	See section 3.1			
Operate Temp. Range	0 ~ +40 °C			

Frequency Band	Max. RF Output Power (W)
IEEE 802.11b	0.193
IEEE 802.11g	0.548
IEEE 802.11n 2.4 GHz 20 MHz	0.557
IEEE 802.11n 2.4 GHz 40 MHz	0.397

3 Test Methodology

3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit mode
Mode 2: IEEE 802.11b Continuous TX mode
Mode 3: IEEE 802.11g Continuous TX mode
Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode
Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

Test Mode	ANT-0	ANT-1	ANT-2	ANT-3	ANT-0+1+2+3
Mode 2	V	V	V	V	V
Mode 3	V	V	V	V	V
Mode 4	V	V	V	V	V
Mode 5	V	V	V	V	V

Test Mode	Antenna Delivery	Data Rate (Mbps)	Test Channel
Mode 2	2TX (CDD)	1	1, 6, 11
Mode 3	2TX (CDD)	6	1, 6, 11
Mode 4	2TX (CDD)	26	1, 6, 11
Mode 5	2TX (CDD)	54	3, 6, 9

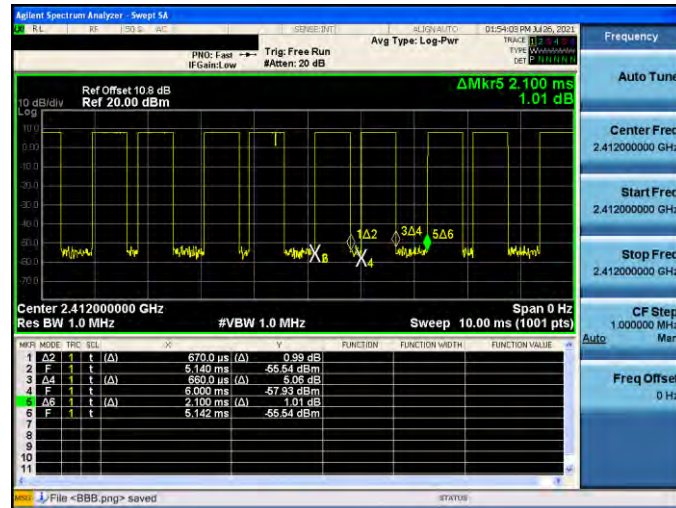
Duty cycle

Test Mode	Frequency (MHz)	on time (ms)	on+off time (ms)	Duty cycle	Duty Factor (dB)	1/T Minimum VBW (kHz)
Mode 2	2412	1.330	2.100	0.633	1.984	0.752
Mode 3	2412	1.568	1.656	0.947	0.237	0.638
Mode 4	2412	5.235	5.430	0.964	0.159	0.191
Mode 5	2422	5.235	5.580	0.938	0.277	0.191

Duty Cycle Graphs

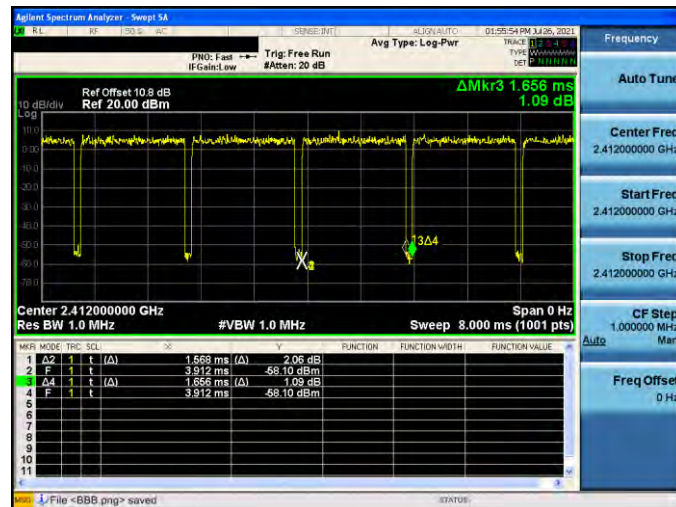
Mode 2: IEEE 802.11b Continuous TX mode

On+off time



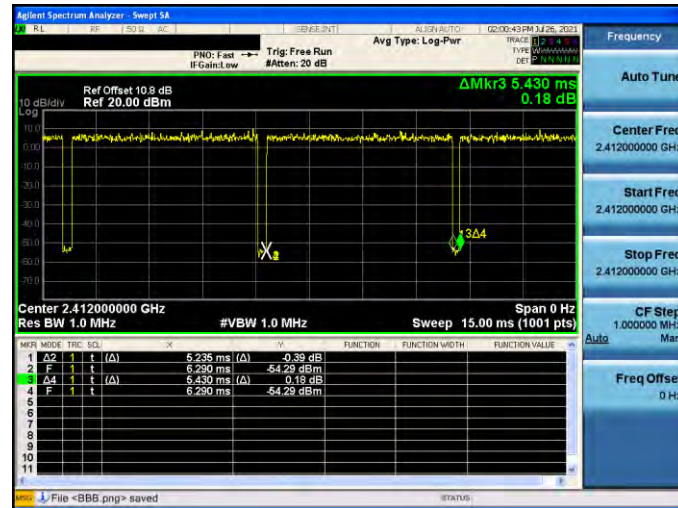
Mode 3: IEEE 802.11g Continuous TX mode

On+off time



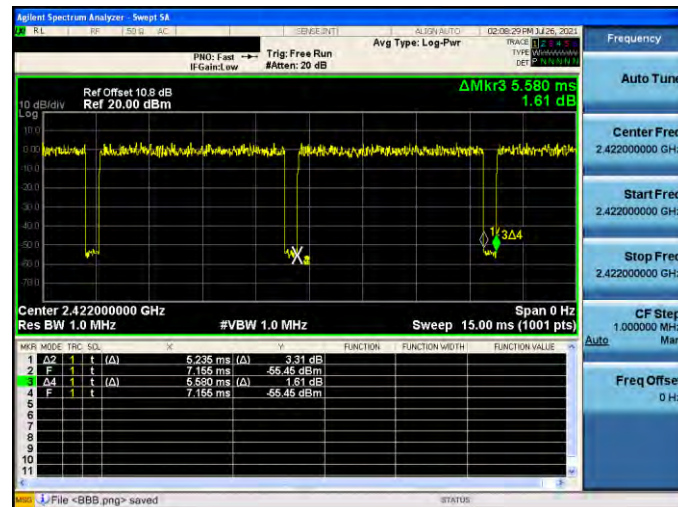
Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode

On+off time



Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode

On+off time



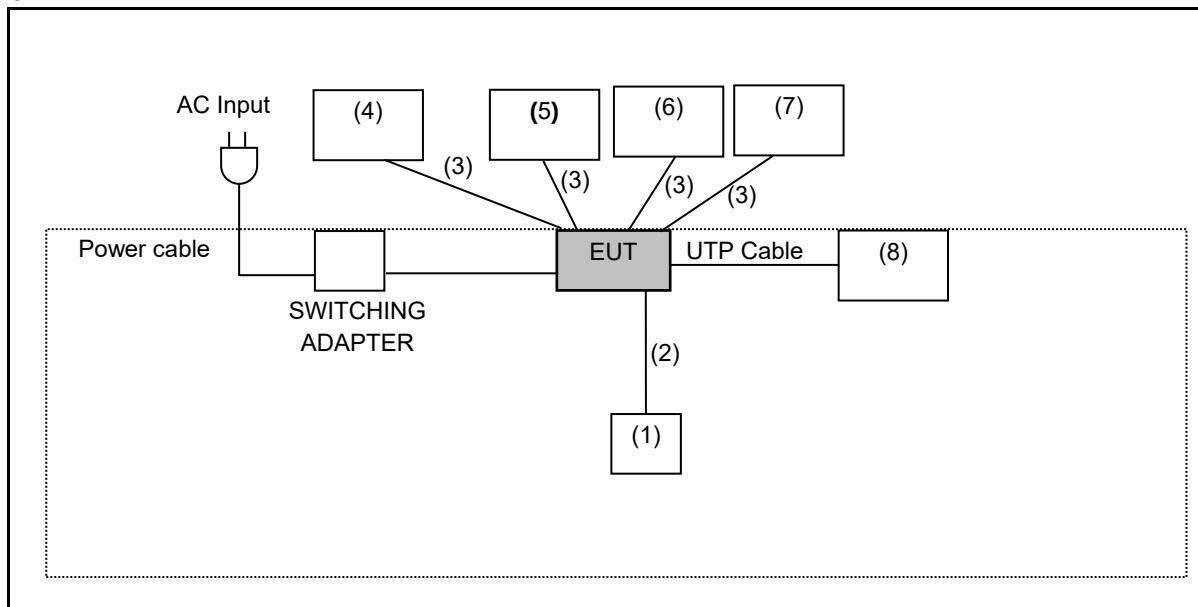
3.2. EUT Test Step

1.	Setup the EUT shown on "Configuration of Test System Details".
2.	Turn on the power of all equipment.
3.	Turn on TX function.
4.	EUT run test program.

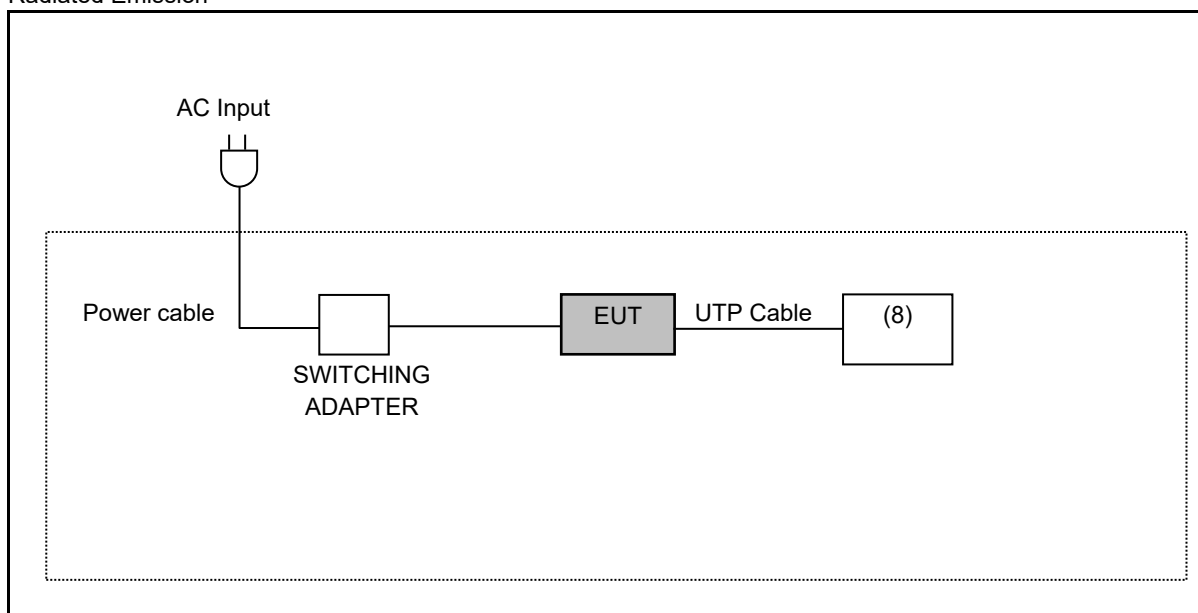
Measurement Software			
No.	Description	Software	Version
1	Conducted Emission	EZ EMC	1.1.4.3
2	Radiated Emission	EZ EMC	1.1.4.4

3.3. Configuration of Test System Details

Conducted Emissions



Radiated Emission



Devices Description					
	Product	Manufacturer	Model Number	Serial Number	Power Cord
(1)	HDD	Transend	TS1TSJ25A3K	E47225-0095	---
(2)	USB cable	Transend	TS1TSJ25A3K	---	---
(3)	Network Cable	LI FA SHON	CAT6 STP	---	---
(4)	Notebook	ASUS	BU400A	D1NXAS148534020	---
(5)	Notebook	DELL	LATITUDE E5440	BRTQXY1	---
(6)	Notebook	ASUS	P2430U	GANXCV04H86940A	---
(7)	Notebook	ASUS	P1448U	K7NXCV10P847329A	---
(8)	Notebook	ACER	N19C1	NXEG8TA008109033E 23400	---

3.4. Test Instruments

For Conducted Emission

Test Period: Jul. 28, 2021

Testing Engineer: JS Liao

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Test Receiver	R&S	ESCI	100367	05/21/2021	1 year
RF Cable	Woken	00100D1380194M	TE-02-03	05/28/2021	1 year
LISN	R&S	ENV216	101040	03/29/2021	1 year
LISN	R&S	ENV216	101041	04/08/2021	1 year

For Radiated Emissions

Test Period: Jul. 22, 2021

Testing Engineer: Marc Yeh, Pink Li, Ida Chuang

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer (2 Hz~50 GHz)	Keysight	N9030B	MY57143537	04/19/2021	1 year
Pre Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A11119	01/15/2021	1 year
Pre Amplifier (1~26.5 GHz)	Agilent	8449B	3008A02237	10/21/2020	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	416	11/11/2020	1 year
Horn Antenna (1~18 GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	02207	07/09/2021	1 year
Horn Antenna (18~40 GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	08/18/2020	1 year
Coaxial Cable	Titan	T0710AT327A10A 100	J11005	08/13/2020	1 year
Coaxial Cable	Titan	T0710AT327A10A 900	J11004	08/13/2020	1 year

For Conducted

Test Period: Jul. 21 ~ Jul. 27, 2021

Testing Engineer: Peter Shui, Andy Lu, Willie Luo

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Power Sensor	Anritsu	MA2411B	1126022	09/01/2020	1 year
Power Meter	Anritsu	ML2495A	1135009	09/01/2020	1 year
Spectrum Analyzer (20 Hz~26.5 GHz)	Agilent	N9020A	US47520902	09/24/2020	1 year

3.5. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	20-30
Humidity (%RH)	25-75	45-75

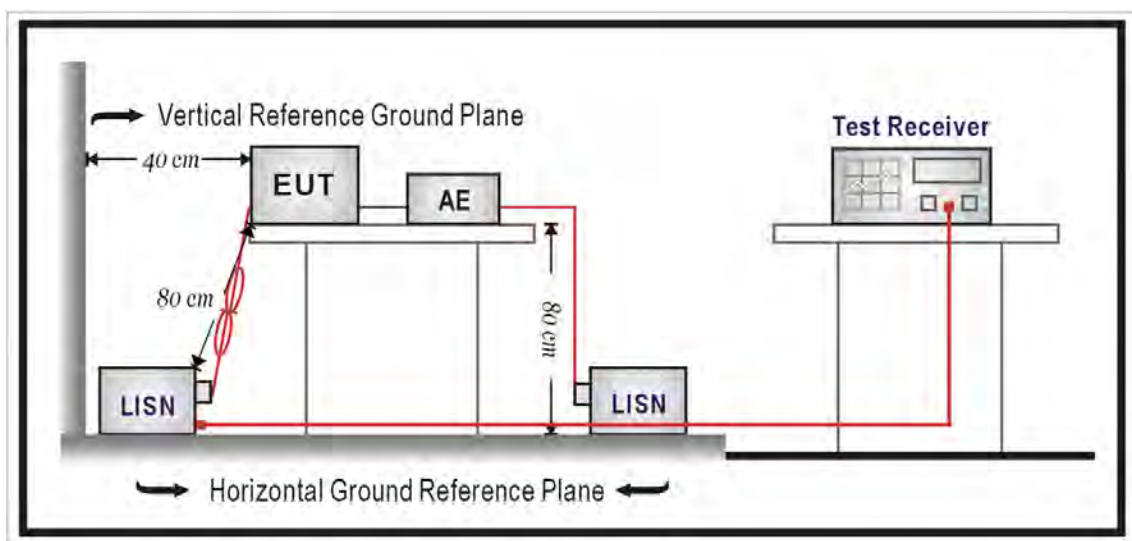
4 Measurement Procedure

4.1. AC Power Line Conducted Emission Measurement

■ Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

■ Test Setup



■ Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a $50\ \Omega // 50\ \mu\text{H}$ coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a $50\ \Omega // 50\ \mu\text{H}$ coupling impedance with 50 ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40 cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80 cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12 mm insulating material.

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150 kHz to 30 MHz then quasi-peak and average measurement was unnecessary.

The AMN shall be placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the AMN. If the mains power cable is longer than 1 m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4 m. All of interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1 m. All $50\ \Omega$ ports of the LISN shall be resistively terminated into $50\ \Omega$ loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

4.2. Radiated Emission Measurement

■ Limit

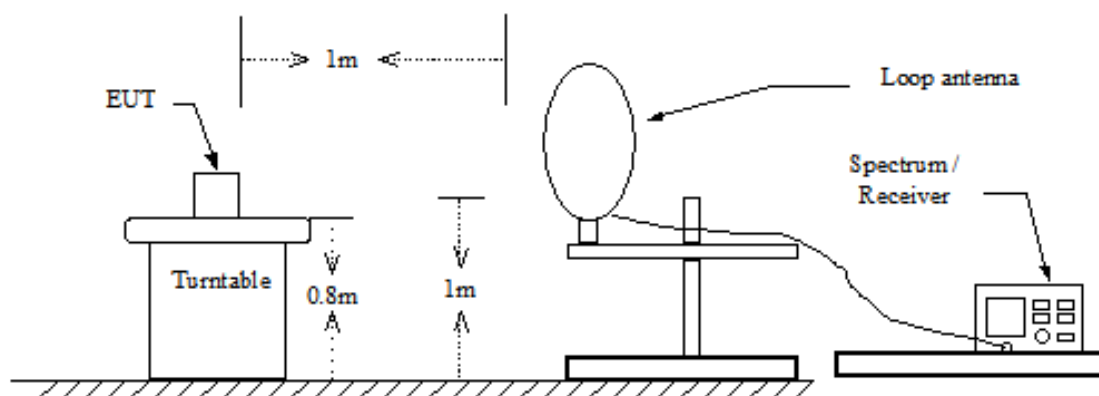
According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 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

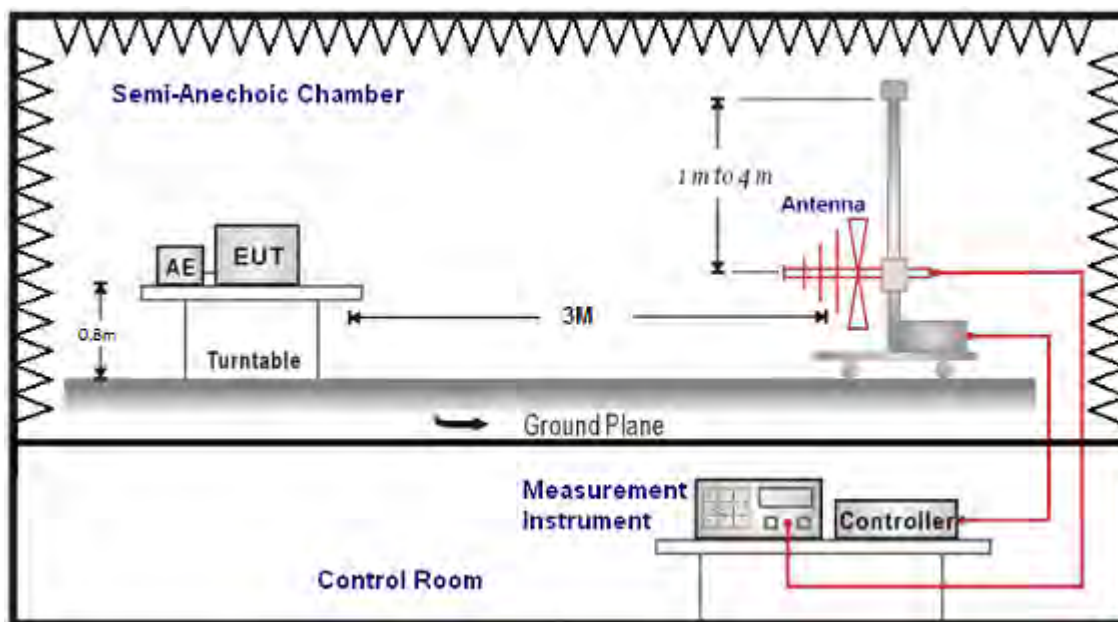
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

■ Setup

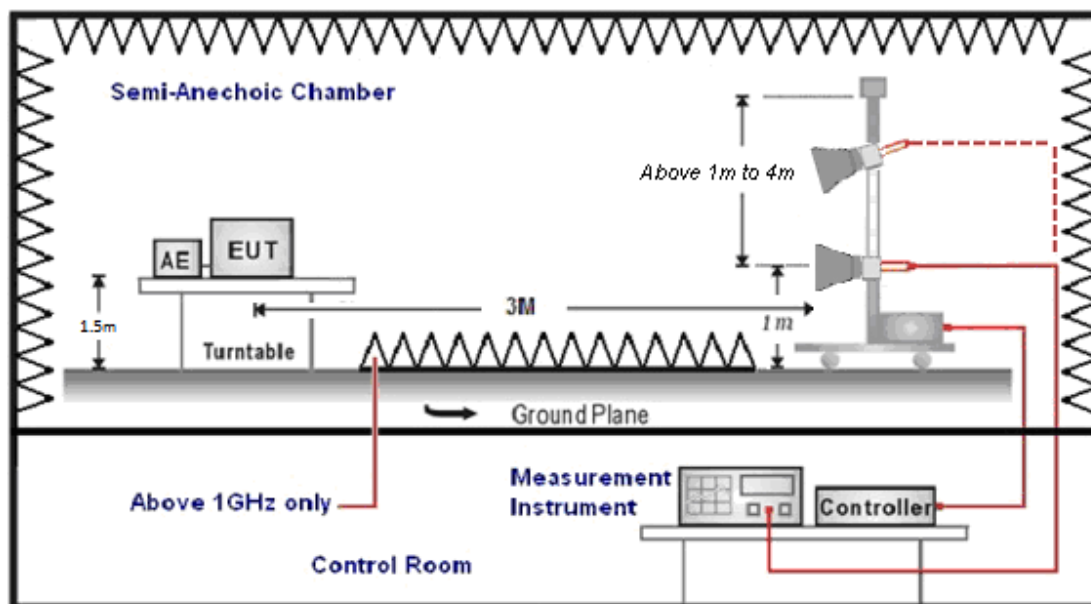
9 kHz ~ 30 MHz



Below 1 GHz



Above 1 GHz



■ Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 10 Hz for average measurements when Duty cycle >0.98 / $1/T$ for average measurements when Duty cycle <0.98 . A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 –26.5 GHz at a distance of 3 meter. The antenna at an angle toward the source of the emission. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20 dB/decade).

For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) $\text{Amplitude (dBuV/m)} = \text{FI (dBuV)} + \text{AF (dBuV)} + \text{CL (dBuV)} - \text{Gain (dB)}$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) $\text{Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30 dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

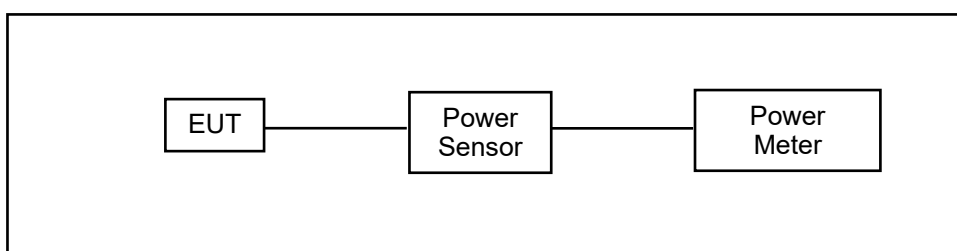
4.3. Maximum Conducted Output Power Measurement

■ Limit

For systems using digital modulation in the 2400-2483.5 MHz, the limit for maximum output power is 30 dBm.

And According to 15.247 (b), 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.

■ Test Setup



■ Test Procedure

The testing follows the Measurement Procedure of ANSI C63.10:2013 section 11.9.2.3.2 Method AVGPM.

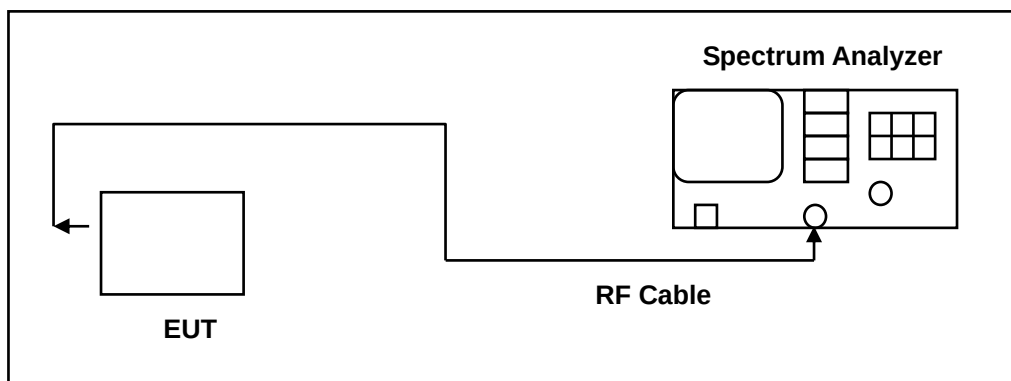
The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor.

4.4. 6 dB RF Bandwidth Measurement

■ Limit

6 dB RF Bandwidth: Systems using digital modulation techniques may operate in the 2400–2483.5 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

■ Test Setup



■ Test Procedure

The EUT tested to DTS test procedure of ANSI C63.10:2013 section 11.8.2 option2 for compliance to FCC 47CFR 15.247 requirements.

6 dB RF Bandwidth: The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

The test was performed at 3 channels (Channel low, middle, high)

4.5. Maximum Power Spectral Density Measurement

■ Limit

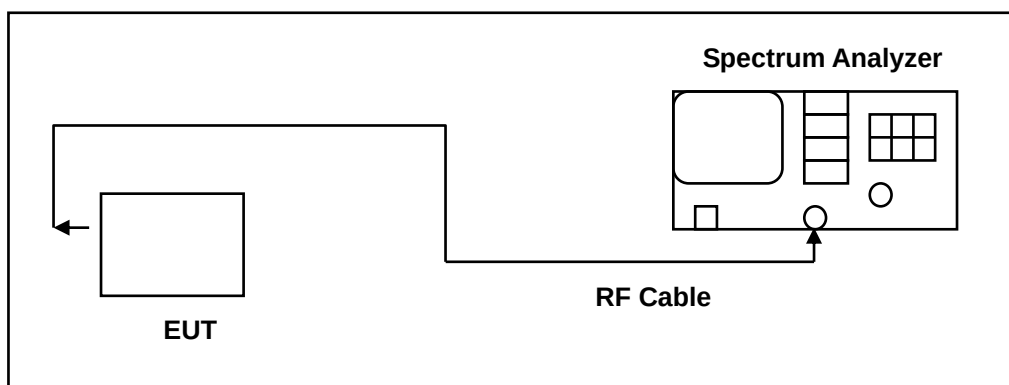
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

CDD mode :

Directional Gain = $10 \cdot \log\{[10^{(G1/20)} + 10^{(G2/20)} + \dots + 10^{(Gn/20)}]^2 / N_{ANT}\} = 10.94 \text{ dBi} > 6 \text{ dBi}$

Power Spectral Density Limit = $8 - 4.94 = 3.06 \text{ dBm/3 kHz}$

■ Test Setup



■ Test Procedure

The EUT tested to DTS test procedure of ANSI C63.10:2013 section 11.10.2 Method PKPSD for compliance to FCC 47CFR 15.247 requirements.

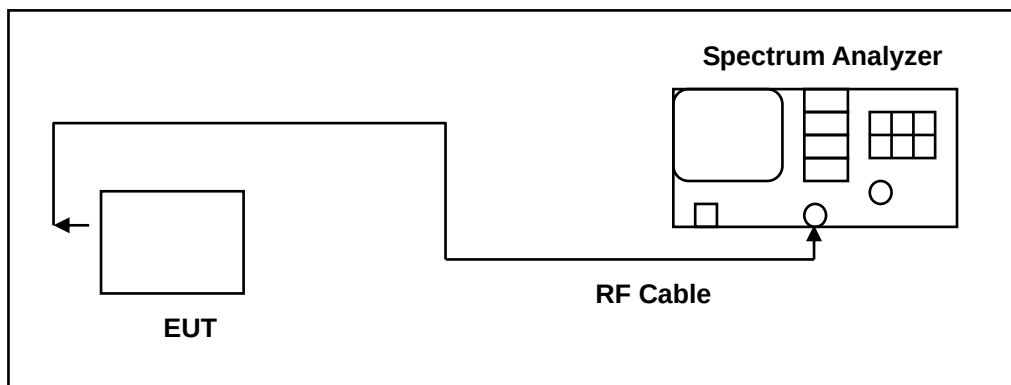
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.6. Out of Band Conducted Emissions Measurement

■ Limit

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

■ Test Setup



■ Test Procedure

In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function. All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels.

4.7. Antenna Measurement

■ Limit

For intentional device, according to 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.

And According to 15.247 (b), 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.

■ Antenna Description

See section 2 – antenna information.

■ Directional Gain Calculated

For Maximum Power Density

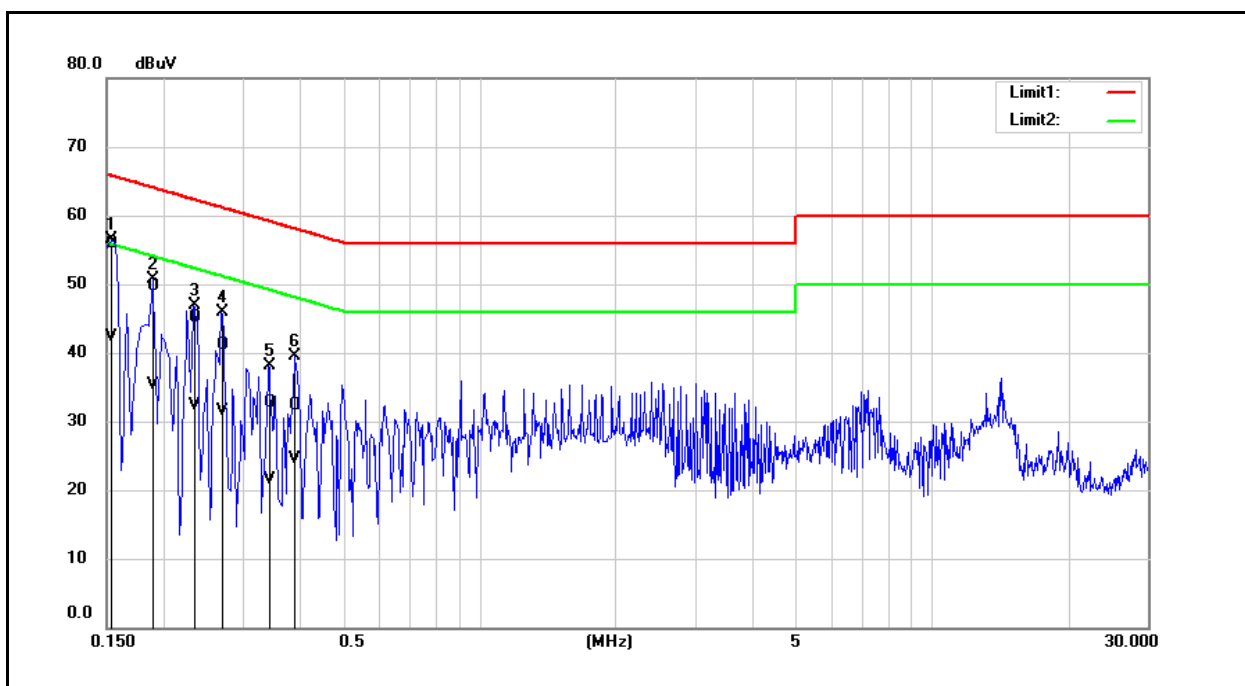
$$\text{Directional Gain} = 10 \cdot \log\{[10^{(G1/20)} + 10^{(G2/20)} + \dots + 10^{(Gn/20)}]^2 / NANT\}$$

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11b	10.94
IEEE 802.11g	10.94
IEEE 802.11n 2.4 GHz 20 MHz	10.94
IEEE 802.11n 2.4 GHz 40 MHz	10.94

5 Test Results

Annex A. Conducted Emission

Standard:	FCC Part 15.247	Line:	L1
Test item:	Conducted Emission	Power:	AC 120 V/60 Hz
Mode:	Mode 1		
Description:			

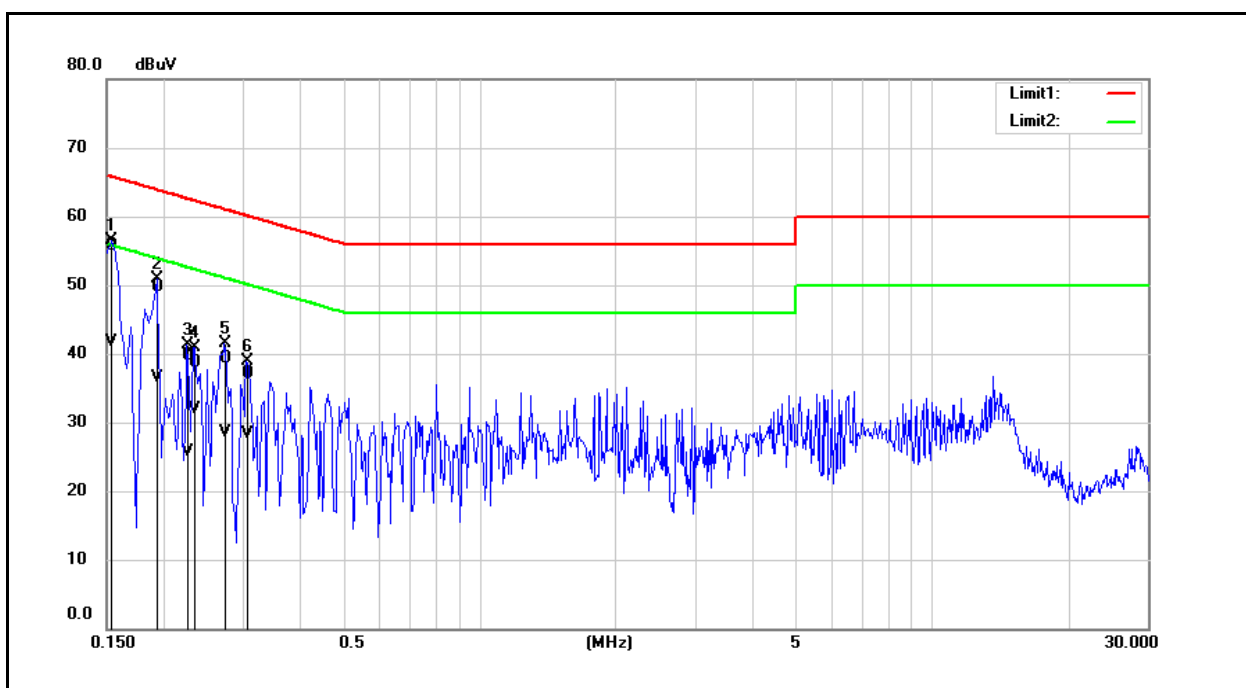


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1540	46.21	32.52	9.74	55.95	42.26	65.78	55.78	-9.83	-13.52	Pass
2	0.1900	39.93	25.62	9.74	49.67	35.36	64.04	54.04	-14.37	-18.68	Pass
3	0.2340	35.29	22.66	9.74	45.03	32.40	62.31	52.31	-17.28	-19.91	Pass
4	0.2700	31.41	21.80	9.74	41.15	31.54	61.12	51.12	-19.97	-19.58	Pass
5	0.3420	22.95	11.80	9.73	32.68	21.53	59.15	49.15	-26.47	-27.62	Pass
6	0.3900	22.48	14.86	9.74	32.22	24.60	58.06	48.06	-25.84	-23.46	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	FCC Part 15.247	Line:	N
Test item:	Conducted Emission	Power:	AC 120 V/60 Hz
Mode:	Mode 1		
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1540	45.98	32.05	9.74	55.72	41.79	65.78	55.78	-10.06	-13.99	Pass
2	0.1940	39.96	26.69	9.73	49.69	36.42	63.86	53.86	-14.17	-17.44	Pass
3	0.2260	29.92	16.02	9.73	39.65	25.75	62.60	52.60	-22.95	-26.85	Pass
4	0.2340	29.02	22.24	9.73	38.75	31.97	62.31	52.31	-23.56	-20.34	Pass
5	0.2740	29.62	18.80	9.73	39.35	28.53	61.00	51.00	-21.65	-22.47	Pass
6	0.3060	27.45	18.65	9.72	37.17	28.37	60.08	50.08	-22.91	-21.71	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Annex B. Conducted Test Results

Maximum Conducted Output Power Measurement

ANT-0							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 2	2412	1 M	14.15	0.026	16.69	0.047	≤ 30
	2437		14.08	0.026	16.61	0.046	≤ 30
	2462		14.16	0.026	16.67	0.046	≤ 30
Mode 3	2412	6 M	14.28	0.027	21.18	0.131	≤ 30
	2437		14.11	0.026	21.10	0.129	≤ 30
	2462		14.63	0.029	21.56	0.143	≤ 30
Mode 4	2412	26 M	13.44	0.022	20.31	0.107	≤ 30
	2437		14.35	0.027	21.14	0.130	≤ 30
	2462		12.35	0.017	19.12	0.082	≤ 30
Mode 5	2422	54 M	12.30	0.017	18.71	0.074	≤ 30
	2437		14.07	0.026	20.02	0.100	≤ 30
	2452		11.32	0.014	17.79	0.060	≤ 30

ANT-1							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 2	2412	1 M	14.31	0.027	16.88	0.049	≤ 30
	2437		14.51	0.028	17.03	0.050	≤ 30
	2462		14.45	0.028	17.00	0.050	≤ 30
Mode 3	2412	6 M	14.31	0.027	21.29	0.135	≤ 30
	2437		14.63	0.029	21.65	0.146	≤ 30
	2462		14.52	0.028	21.43	0.139	≤ 30
Mode 4	2412	26 M	13.42	0.022	20.24	0.106	≤ 30
	2437		14.97	0.031	22.16	0.164	≤ 30
	2462		12.82	0.019	19.64	0.092	≤ 30
Mode 5	2422	54 M	12.47	0.018	19.08	0.081	≤ 30
	2437		14.02	0.025	20.22	0.105	≤ 30
	2452		11.47	0.014	18.01	0.063	≤ 30

Note: The relevant measured result has the offset with cable loss already.

ANT-2							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 2	2412	1 M	14.00	0.025	16.51	0.045	≤ 30
	2437		14.05	0.025	16.48	0.044	≤ 30
	2462		14.33	0.027	16.82	0.048	≤ 30
Mode 3	2412	6 M	14.15	0.026	21.11	0.129	≤ 30
	2437		14.05	0.025	21.02	0.126	≤ 30
	2462		14.45	0.028	21.32	0.136	≤ 30
Mode 4	2412	26 M	13.04	0.020	19.96	0.099	≤ 30
	2437		14.44	0.028	21.33	0.136	≤ 30
	2462		12.65	0.018	19.49	0.089	≤ 30
Mode 5	2422	54 M	12.02	0.016	18.69	0.074	≤ 30
	2437		14.09	0.026	19.90	0.098	≤ 30
	2452		11.22	0.013	17.62	0.058	≤ 30

ANT-3							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 2	2412	1 M	14.03	0.025	16.32	0.043	≤ 30
	2437		14.16	0.026	16.63	0.046	≤ 30
	2462		14.39	0.027	16.83	0.048	≤ 30
Mode 3	2412	6 M	14.09	0.026	20.83	0.121	≤ 30
	2437		14.07	0.026	20.94	0.124	≤ 30
	2462		14.20	0.026	21.17	0.131	≤ 30
Mode 4	2412	26 M	12.81	0.019	19.68	0.093	≤ 30
	2437		14.16	0.026	21.02	0.126	≤ 30
	2462		12.37	0.017	19.02	0.080	≤ 30
Mode 5	2422	54 M	11.85	0.015	18.22	0.066	≤ 30
	2437		14.05	0.025	19.74	0.094	≤ 30
	2452		11.08	0.013	17.52	0.056	≤ 30

Note: The relevant measured result has the offset with cable loss already.

ANT-0+1+2+3							
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		Peak Output Power		
			Measurement Results		Measurement Results		Limit
			dBm	W	dBm	W	dBm
Mode 2	2412	1 M	20.14	0.103	22.63	0.183	≤ 30
	2437		20.22	0.105	22.71	0.187	≤ 30
	2462		20.35	0.108	22.85	0.193	≤ 30
Mode 3	2412	6 M	20.23	0.105	27.13	0.516	≤ 30
	2437		20.24	0.106	27.21	0.526	≤ 30
	2462		20.47	0.111	27.39	0.548	≤ 30
Mode 4	2412	26 M	19.21	0.083	26.08	0.406	≤ 30
	2437		20.51	0.112	27.46	0.557	≤ 30
	2462		18.57	0.072	25.35	0.343	≤ 30
Mode 5	2422	54 M	18.19	0.066	24.71	0.296	≤ 30
	2437		20.08	0.102	25.99	0.397	≤ 30
	2452		17.30	0.054	23.76	0.238	≤ 30

Note: The relevant measured result has the offset with cable loss already.

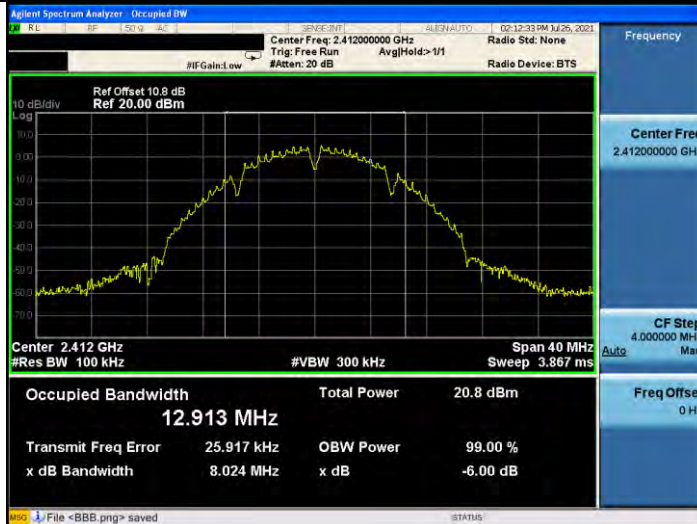
6 dB RF Bandwidth Measurement

Test Mode	Frequency (MHz)	Measurement (kHz)				Limit (kHz)
		ANT-0	ANT-1	ANT-2	ANT-3	
Mode 2	2412	8024	8067	8063	8089	≥ 500
	2437	7597	8052	8051	8099	≥ 500
	2462	8038	7584	8096	7125	≥ 500
Mode 3	2412	16300	16340	16370	16360	≥ 500
	2437	15700	15900	16370	16360	≥ 500
	2462	15850	16390	16380	16380	≥ 500
Mode 4	2412	17570	17630	17590	17200	≥ 500
	2437	17550	16940	17570	17250	≥ 500
	2462	16930	17600	17580	17580	≥ 500
Mode 5	2422	35430	36110	35680	35200	≥ 500
	2437	36100	35710	35760	36130	≥ 500
	2452	35260	35180	35630	35790	≥ 500

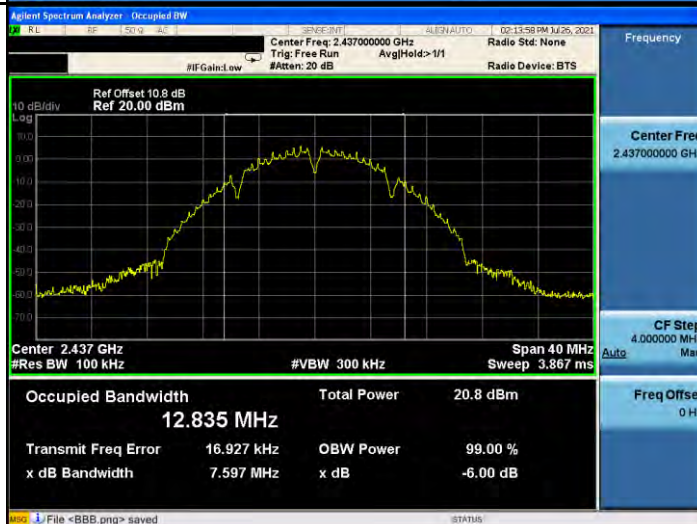
Test Graphs

Mode 2: IEEE 802.11b Continuous TX mode_ANT-0

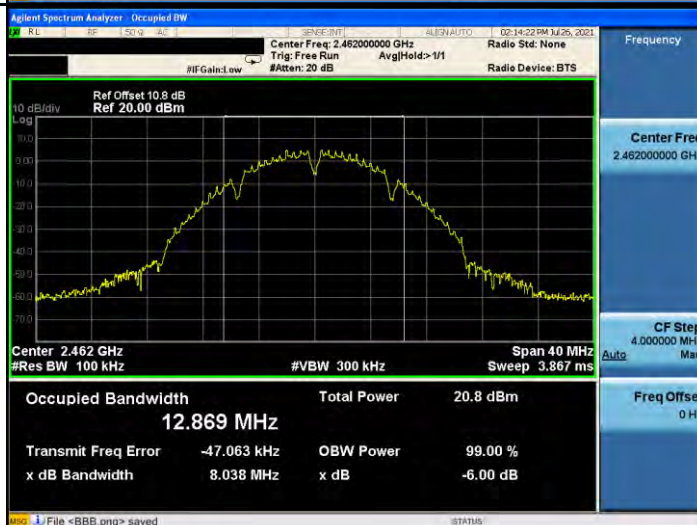
2412 MHz



2437 MHz

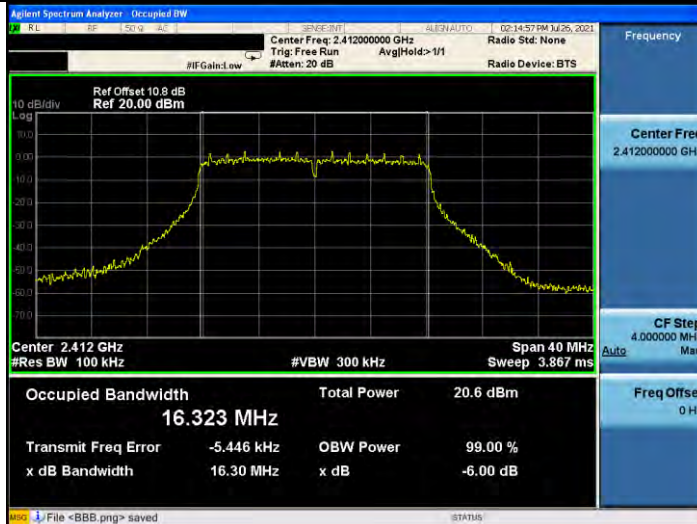


2462 MHz

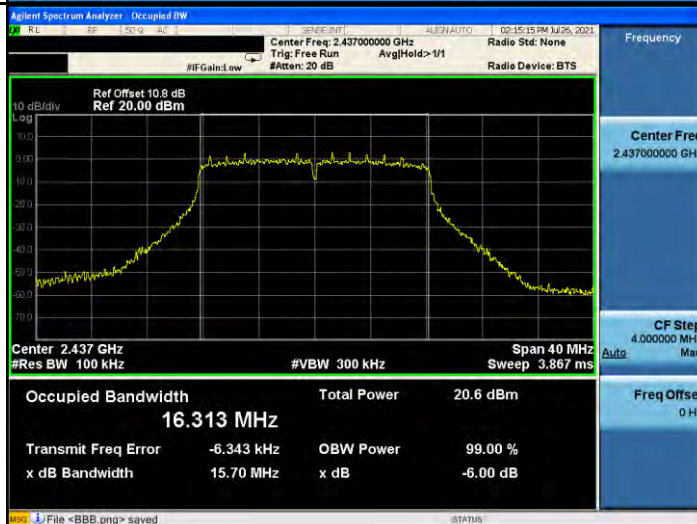


Mode 3: IEEE 802.11g Continuous TX mode_ANT-0

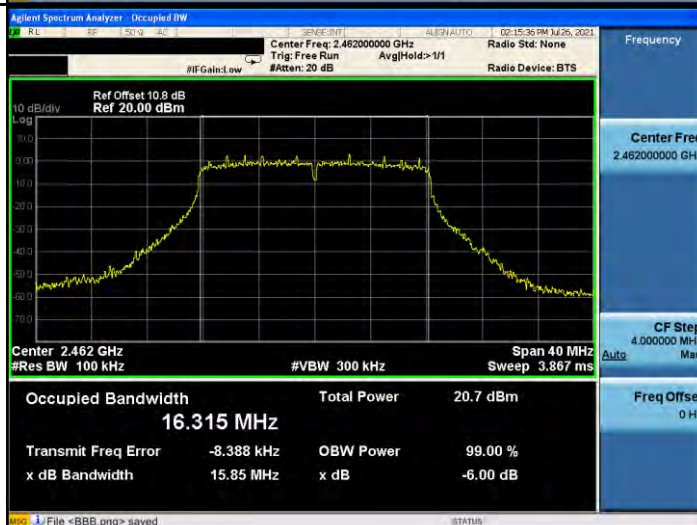
2412 MHz



2437 MHz

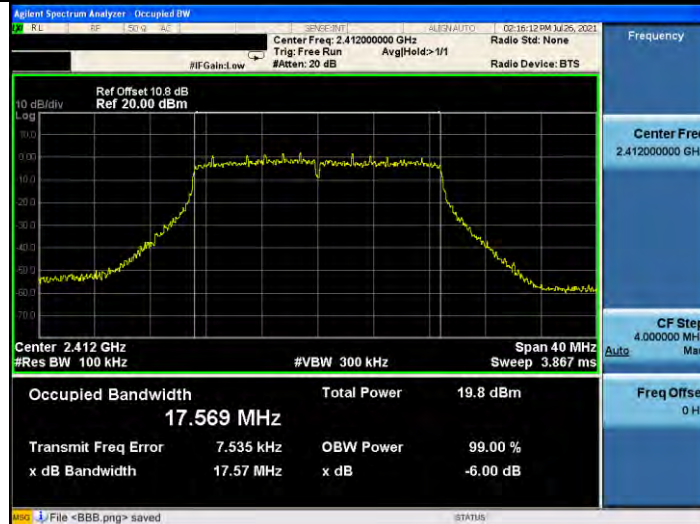


2462 MHz

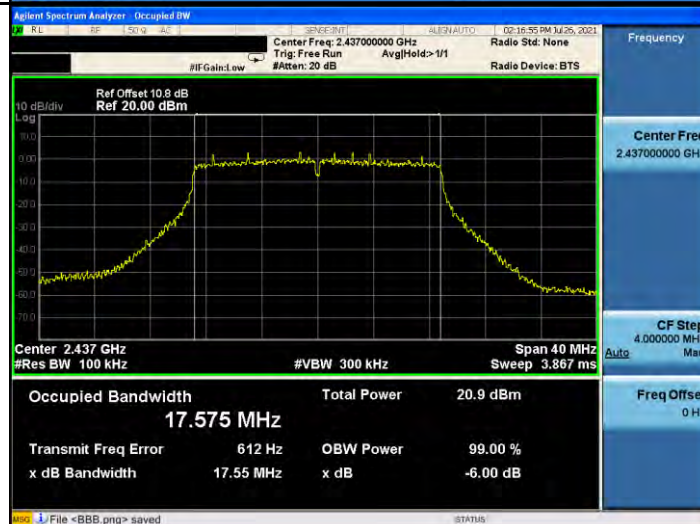


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-0

2412 MHz



2437 MHz

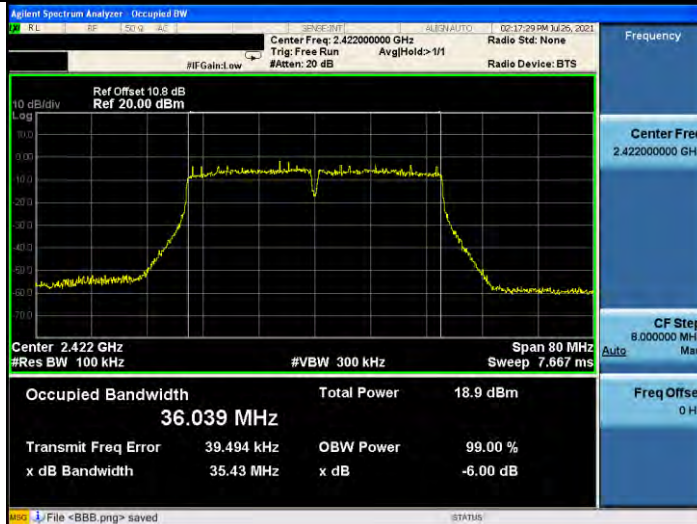


2462 MHz

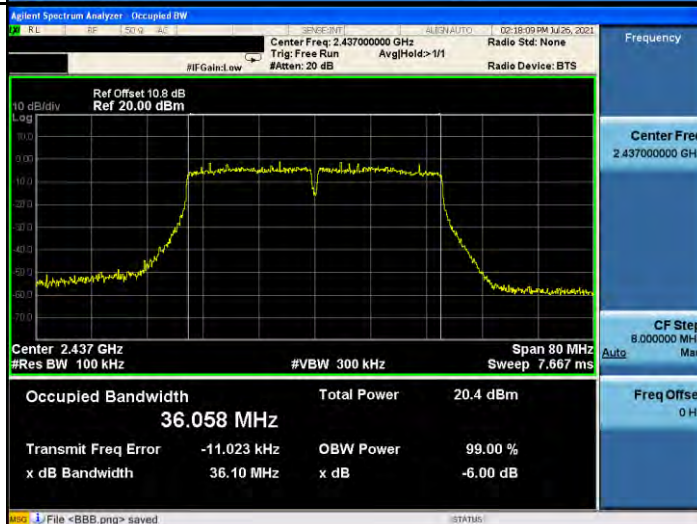


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

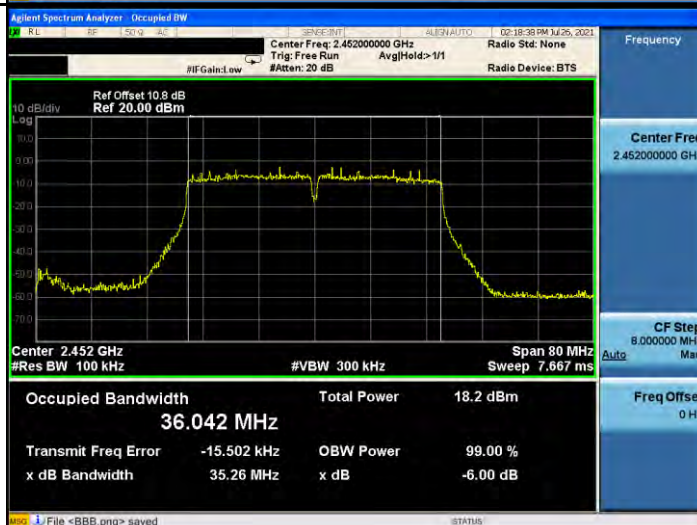
2422 MHz



2437 MHz

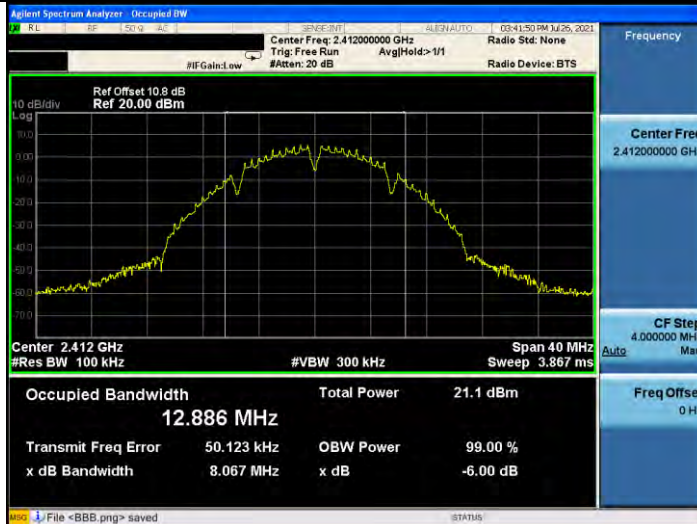


2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-1

2412 MHz



2437 MHz

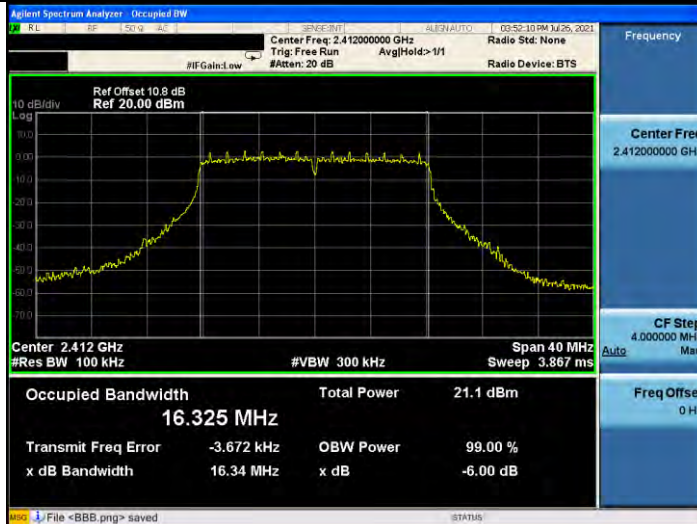


2462 MHz

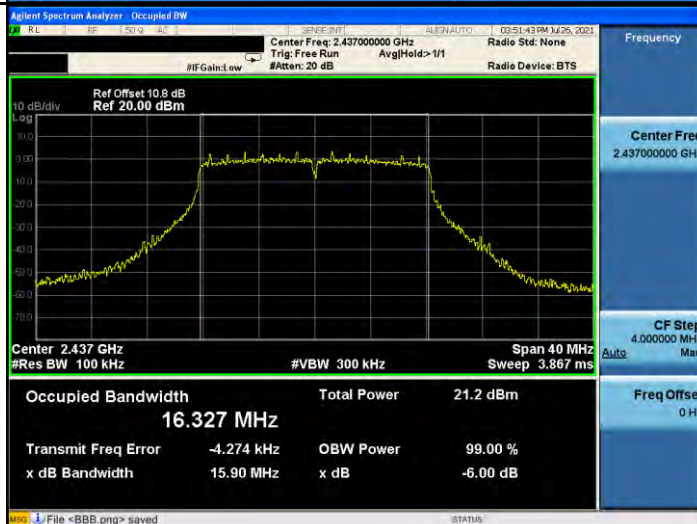


Mode 3: IEEE 802.11g Continuous TX mode_ANT-1

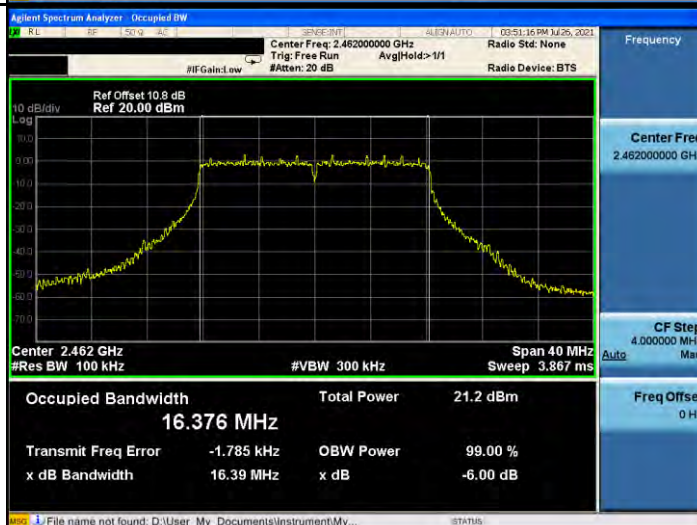
2412 MHz



2437 MHz

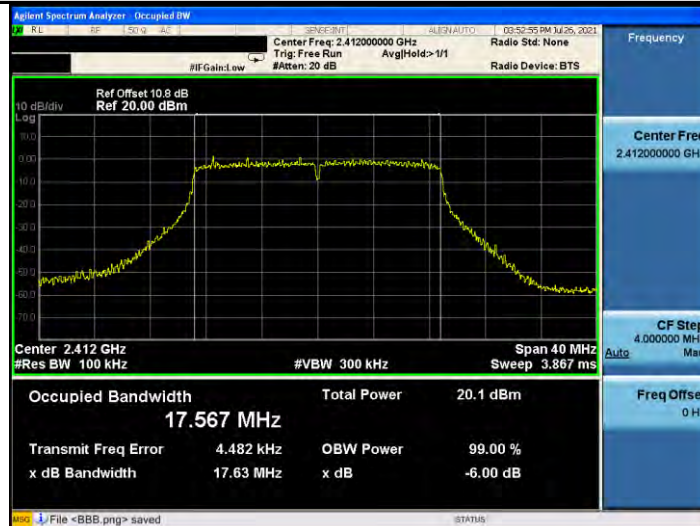


2462 MHz

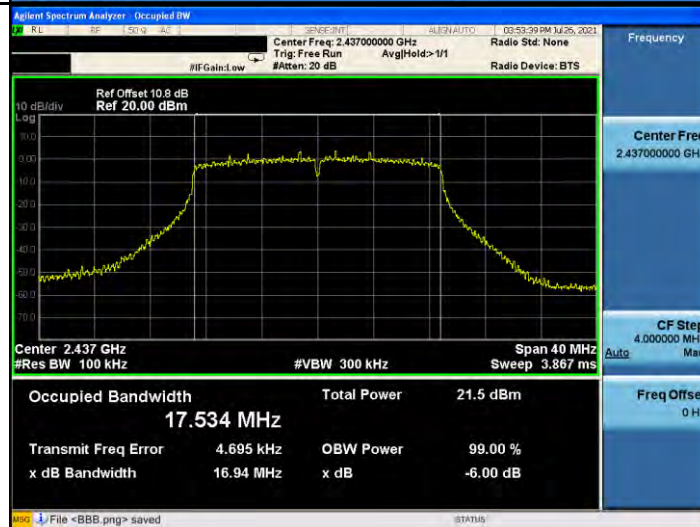


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-1

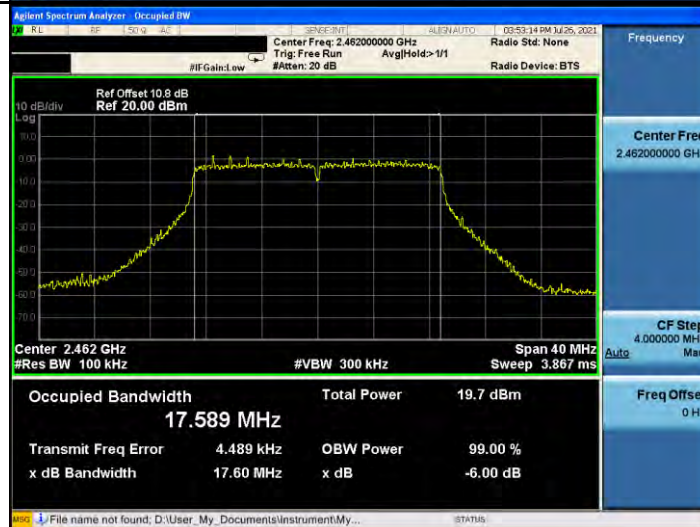
2412 MHz



2437 MHz

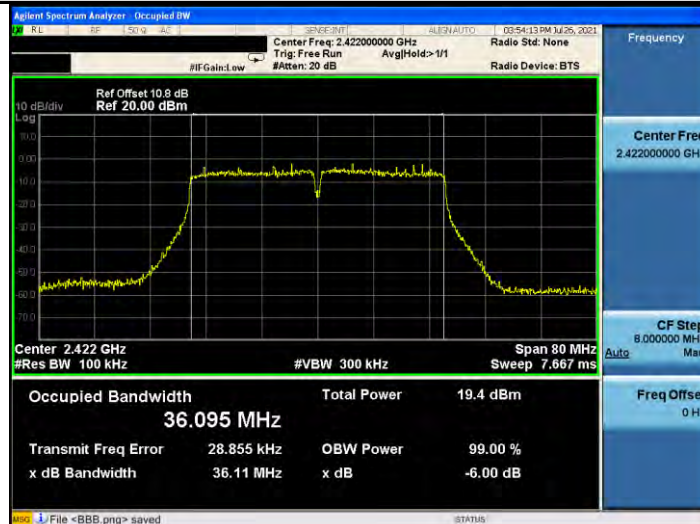


2462 MHz



Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-1

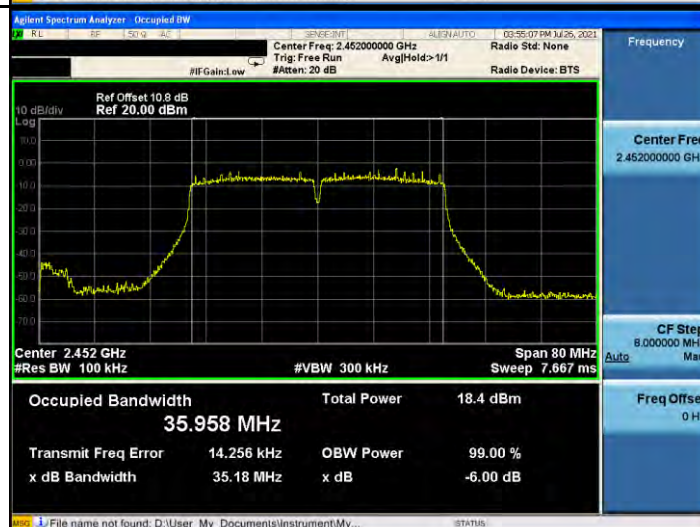
2422 MHz



2437 MHz

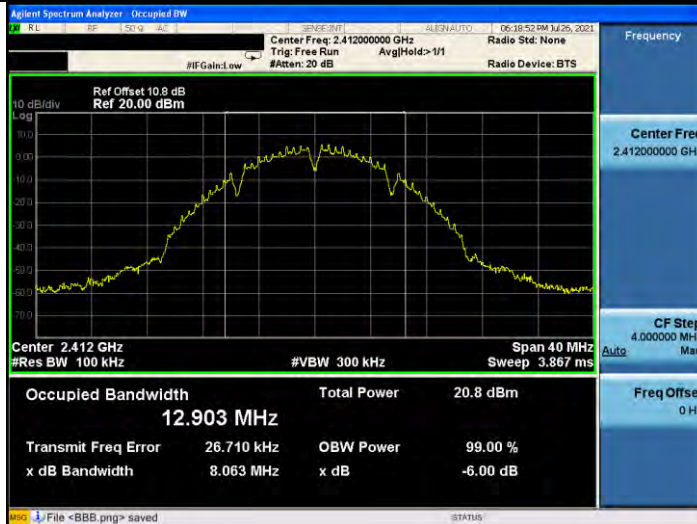


2452 MHz

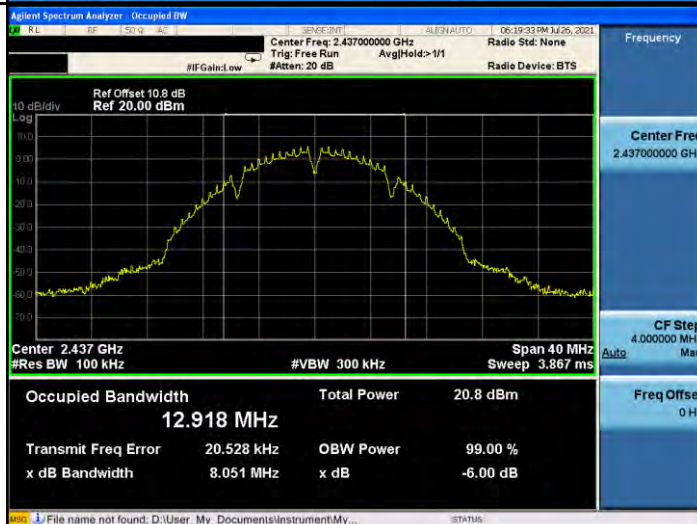


Mode 2: IEEE 802.11b Continuous TX mode_ANT-2

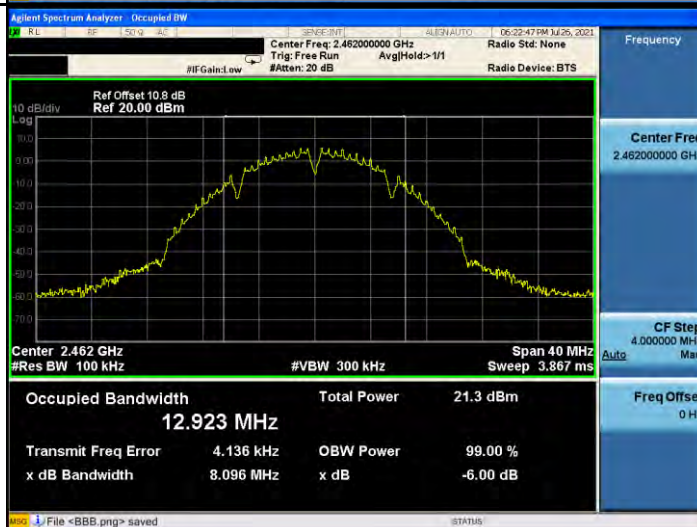
2412 MHz



2437 MHz

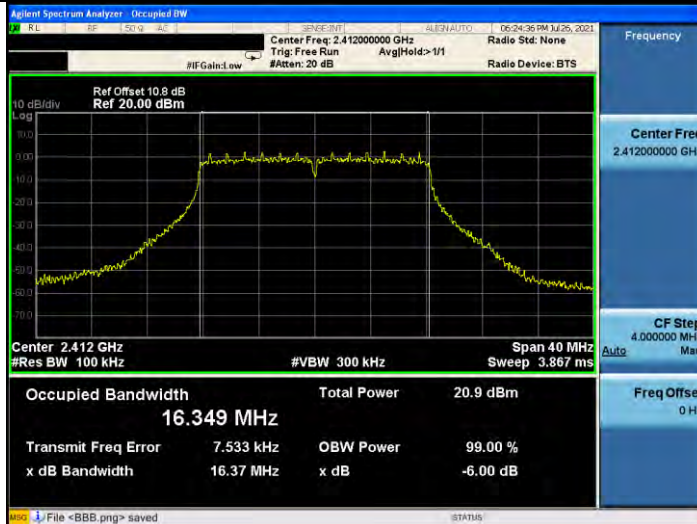


2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-2

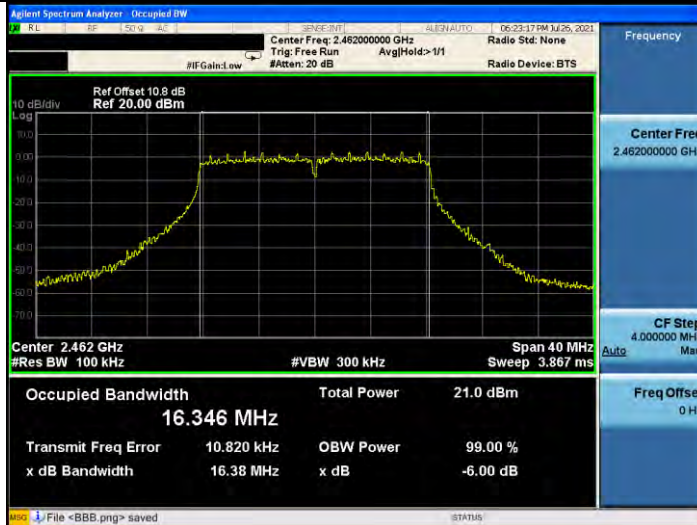
2412 MHz



2437 MHz

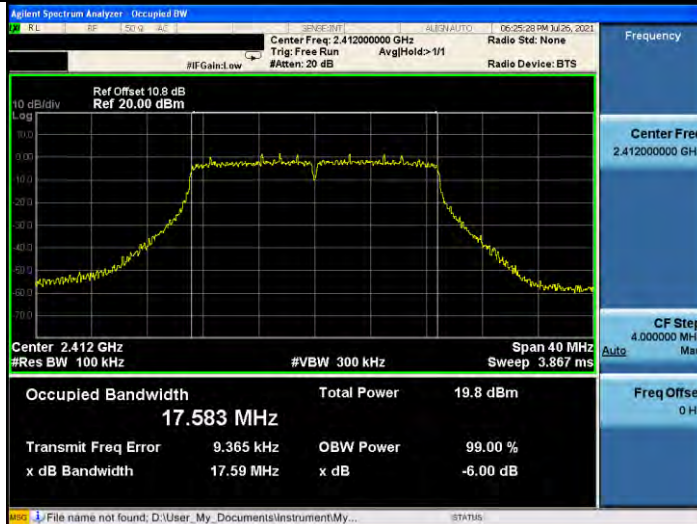


2462 MHz

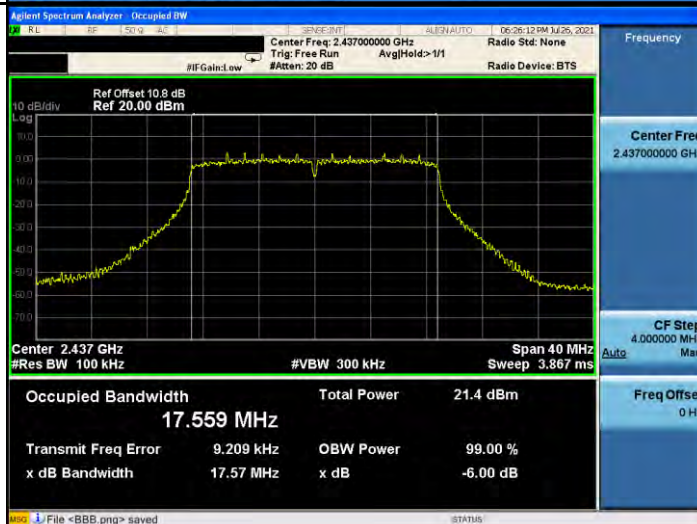


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-2

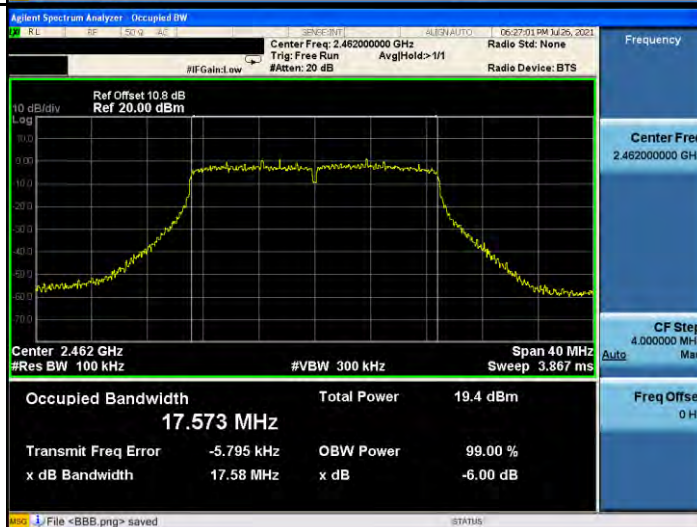
2412 MHz



2437 MHz

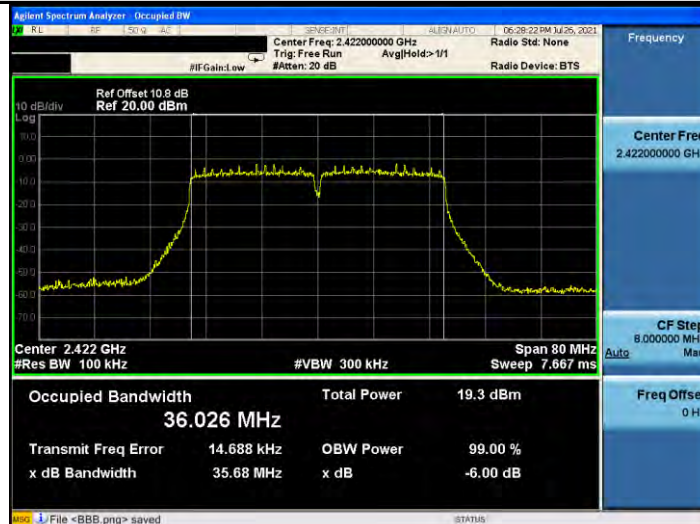


2462 MHz

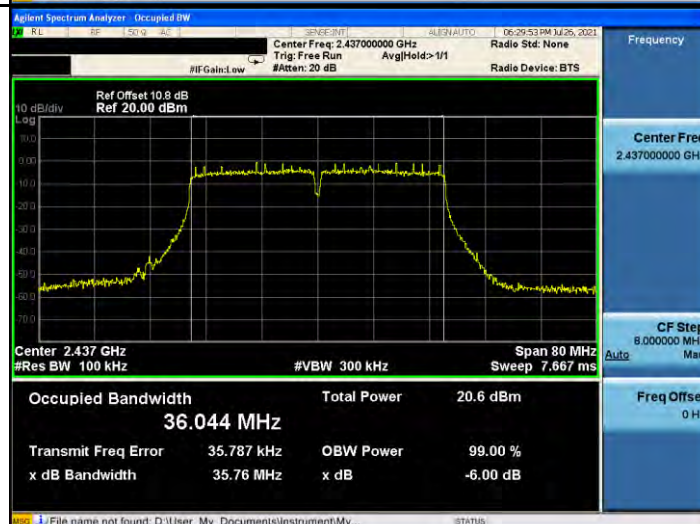


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-2

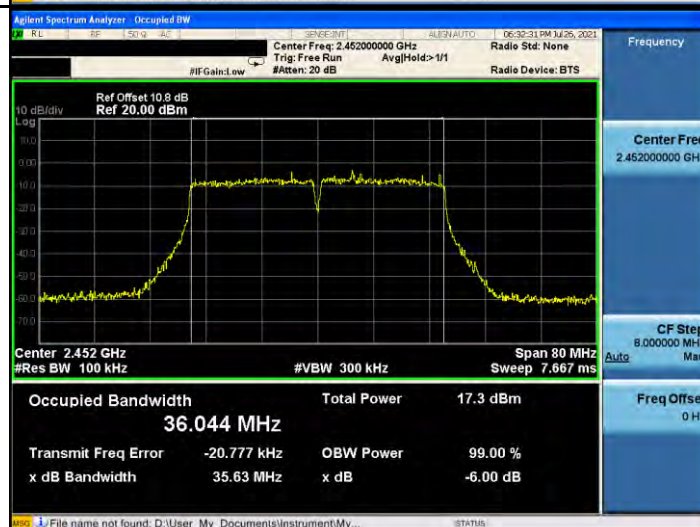
2422 MHz



2437 MHz

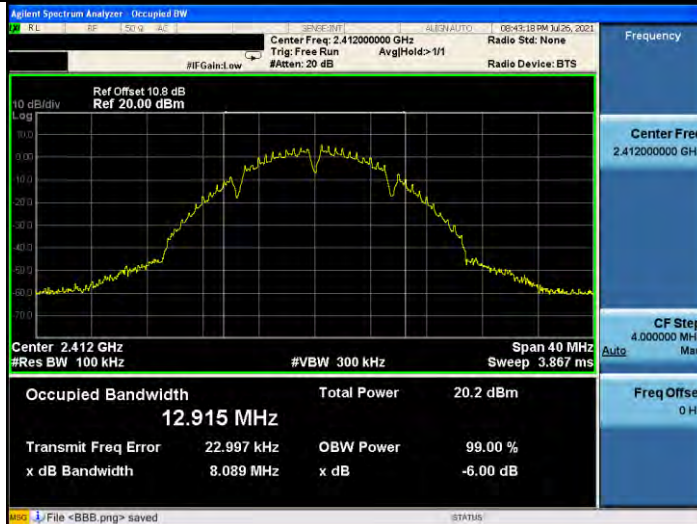


2452 MHz

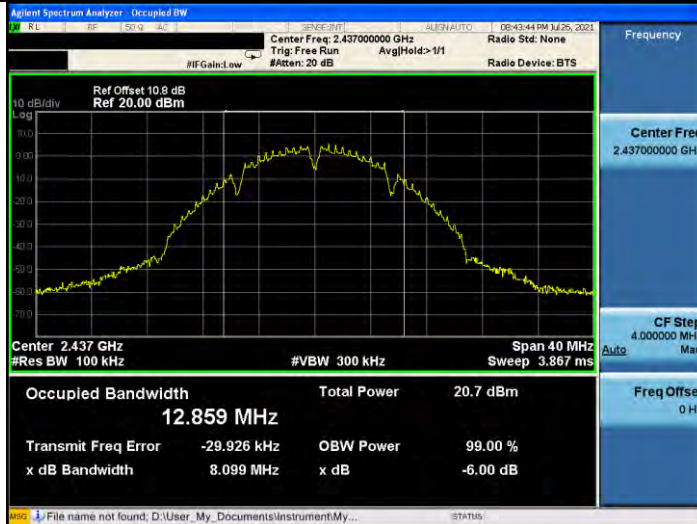


Mode 2: IEEE 802.11b Continuous TX mode_ANT-3

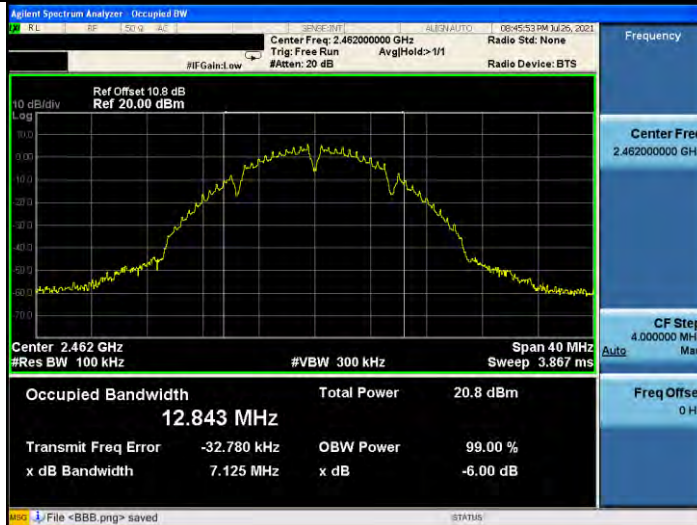
2412 MHz



2437 MHz

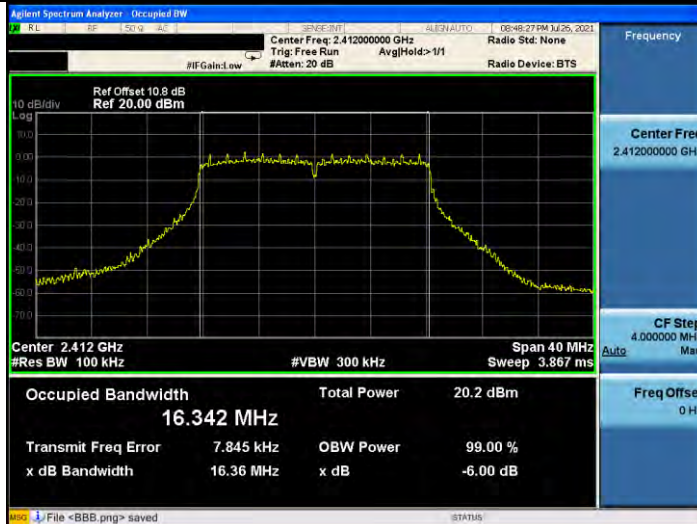


2462 MHz

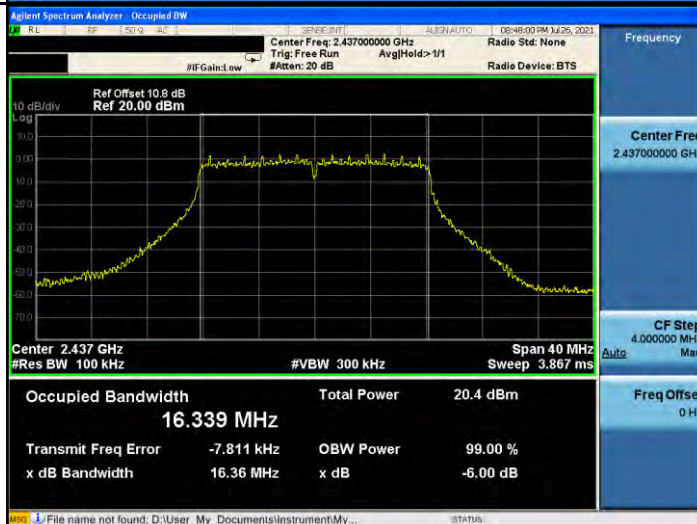


Mode 3: IEEE 802.11g Continuous TX mode_ANT-3

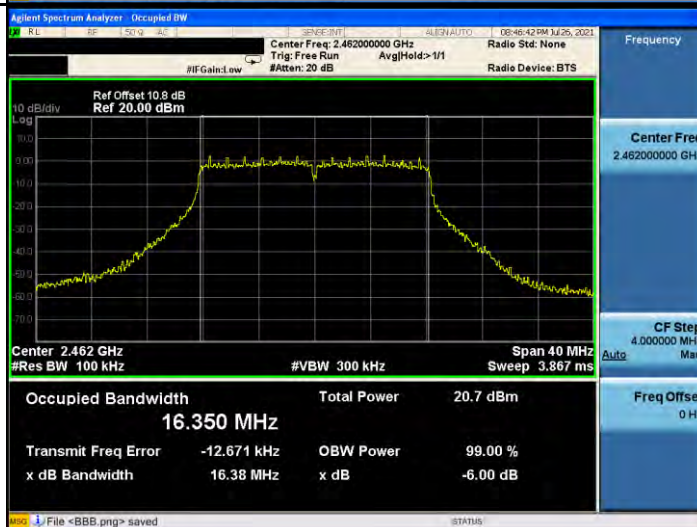
2412 MHz



2437 MHz

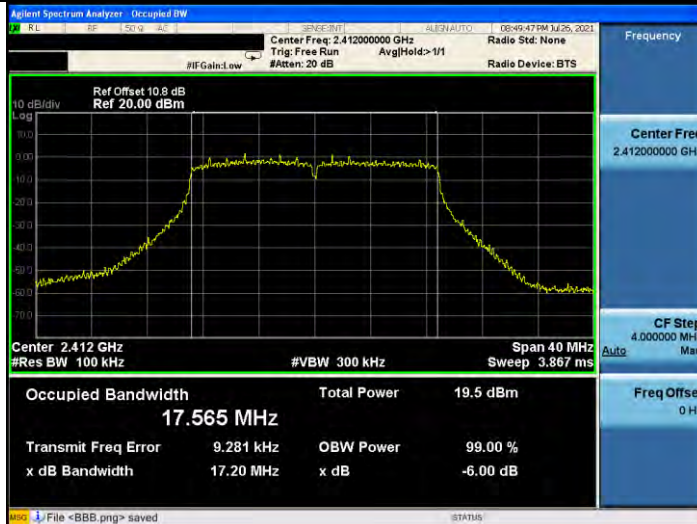


2462 MHz

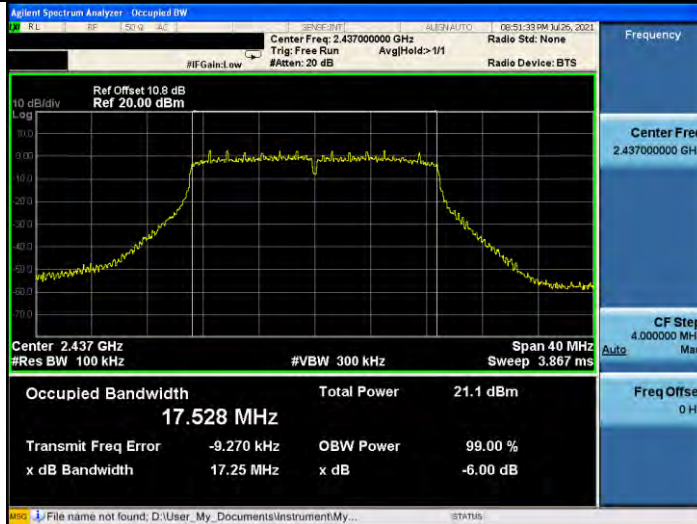


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-3

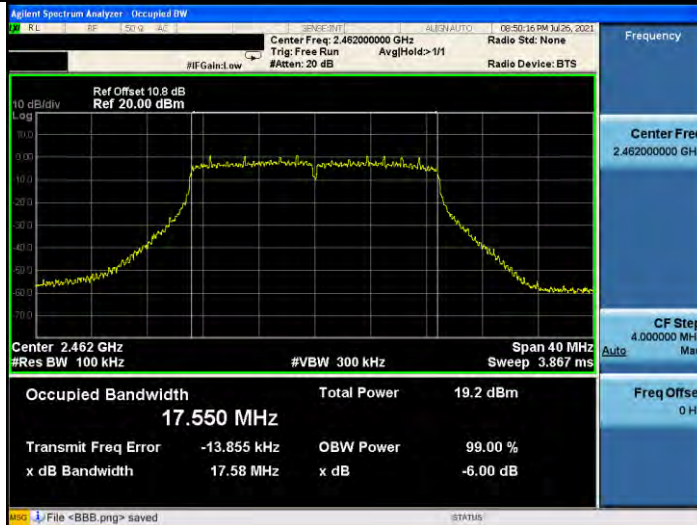
2412 MHz



2437 MHz

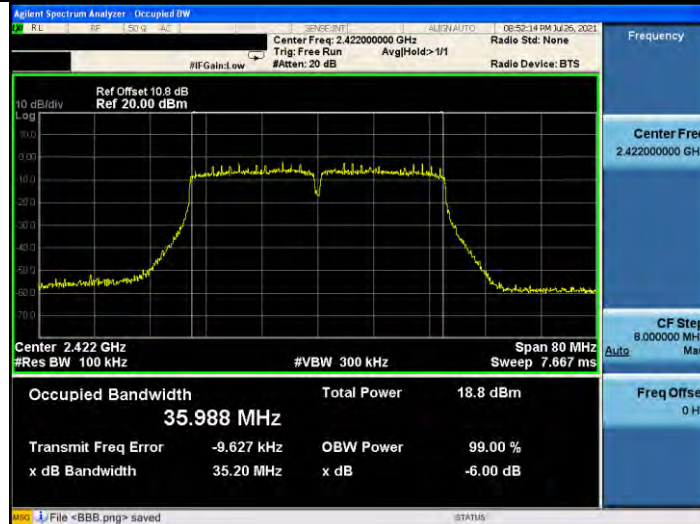


2462 MHz

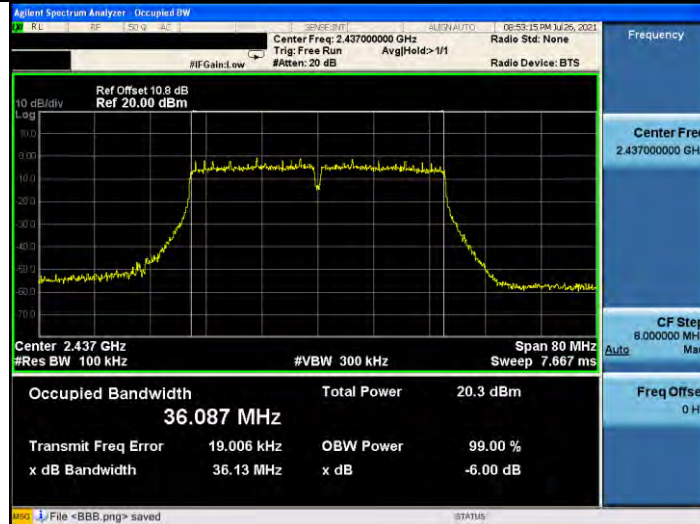


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-3

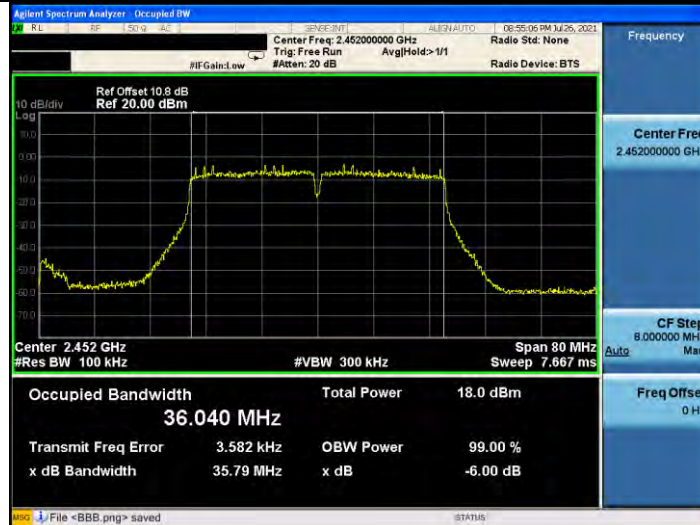
2422 MHz



2437 MHz



2452 MHz



Maximum Power Spectral Density Measurement

Test Mode	Frequency (MHz)	Measurement (dBm/3 kHz)				Limit (dBm/3 kHz)
		ANT-0	ANT-1	ANT-2	ANT-3	
Mode 2	2412	-8.911	-8.985	-7.424	-8.002	≤ 3.06
	2437	-7.863	-7.735	-8.155	-7.787	≤ 3.06
	2462	-7.355	-6.398	-7.338	-7.689	≤ 3.06
Mode 3	2412	-12.889	-11.798	-12.411	-12.588	≤ 3.06
	2437	-11.840	-11.394	-12.055	-10.543	≤ 3.06
	2462	-11.682	-11.627	-10.600	-10.951	≤ 3.06
Mode 4	2412	-12.082	-11.950	-12.236	-12.809	≤ 3.06
	2437	-11.616	-11.369	-11.547	-10.656	≤ 3.06
	2462	-13.171	-12.794	-12.303	-12.812	≤ 3.06
Mode 5	2422	-16.227	-15.734	-16.797	-15.555	≤ 3.06
	2437	-15.013	-14.493	-15.371	-15.053	≤ 3.06
	2452	-16.596	-16.607	-16.709	-16.678	≤ 3.06

Test Mode	Frequency (MHz)	Measurement (dBm/3 kHz)	Limit (dBm/3 kHz)
		ANT-0+1+2+3	
Mode 2	2412	-2.261	≤ 3.06
	2437	-1.861	≤ 3.06
	2462	-1.147	≤ 3.06
Mode 3	2412	-6.382	≤ 3.06
	2437	-5.398	≤ 3.06
	2462	-5.170	≤ 3.06
Mode 4	2412	-6.237	≤ 3.06
	2437	-5.259	≤ 3.06
	2462	-6.738	≤ 3.06
Mode 5	2422	-10.031	≤ 3.06
	2437	-8.950	≤ 3.06
	2452	-10.627	≤ 3.06

Mode 2: IEEE 802.11b Continuous TX mode_ANT-0

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-0

2412 MHz



2437 MHz



2462 MHz

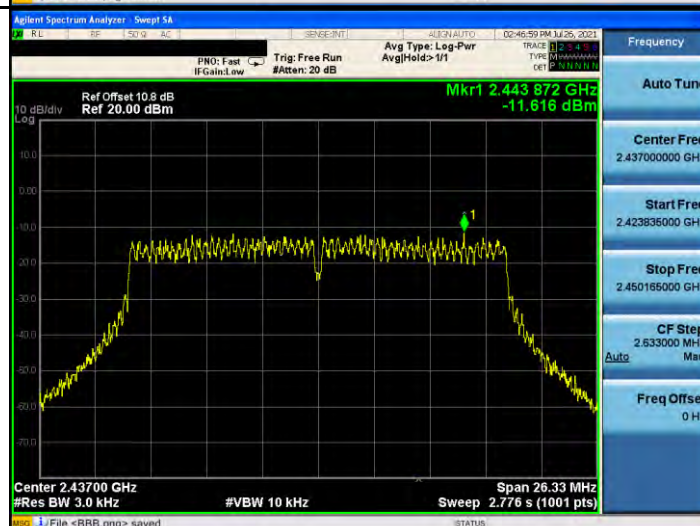


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-0

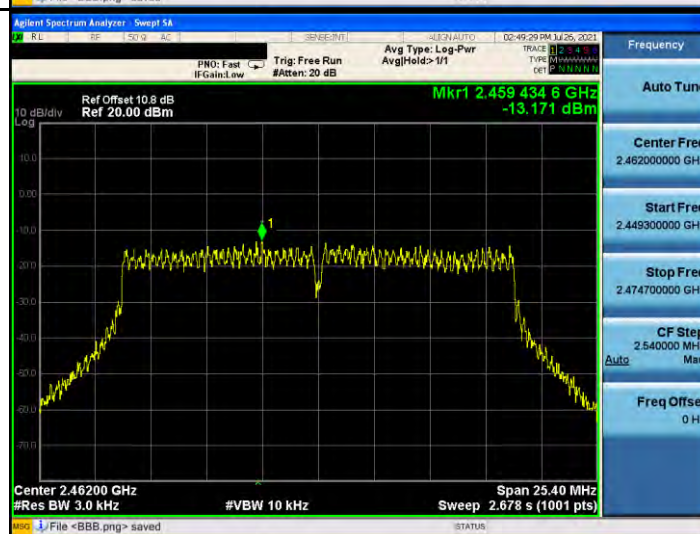
2412 MHz



2437 MHz

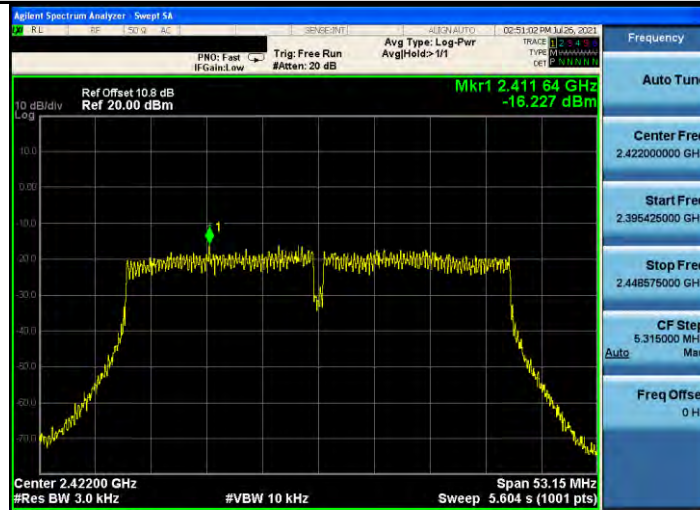


2462 MHz

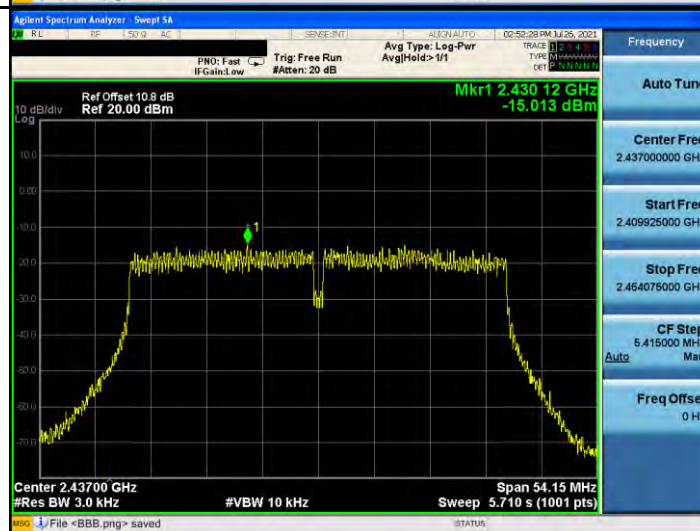


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

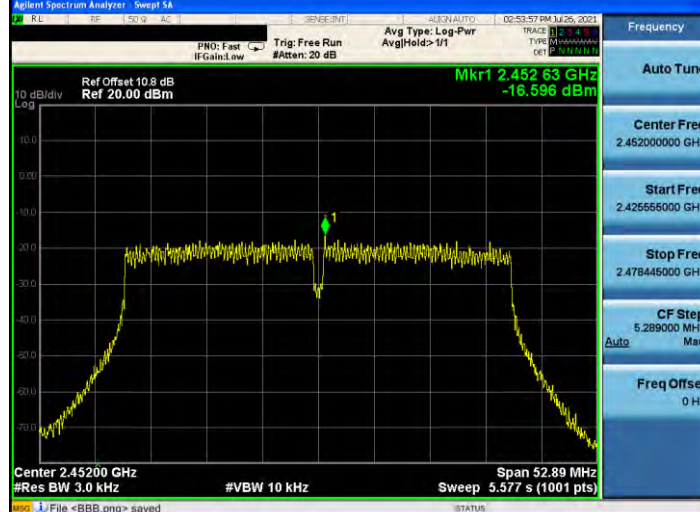
2422 MHz



2437 MHz



2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-1

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-1

2412 MHz



2437 MHz

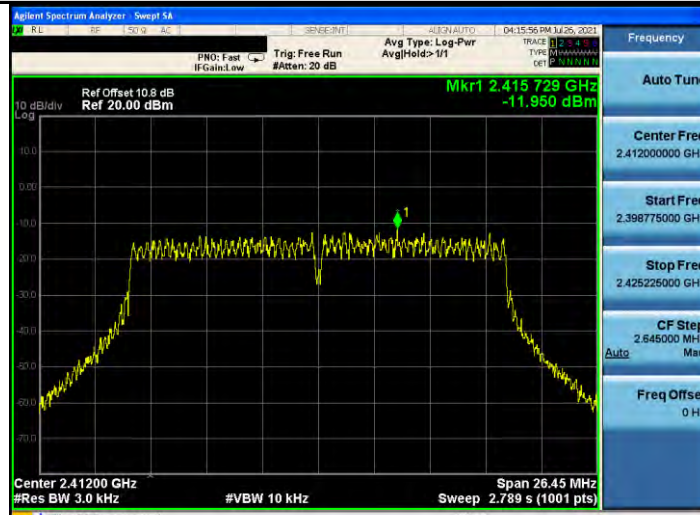


2462 MHz



Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-1

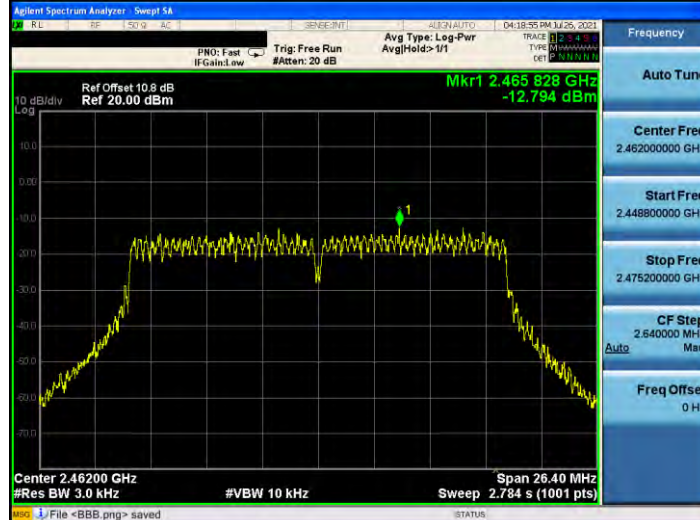
2412 MHz



2437 MHz

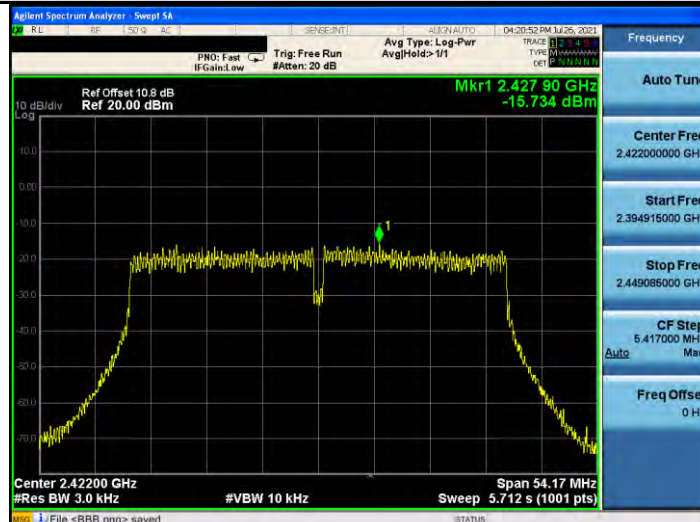


2462 MHz

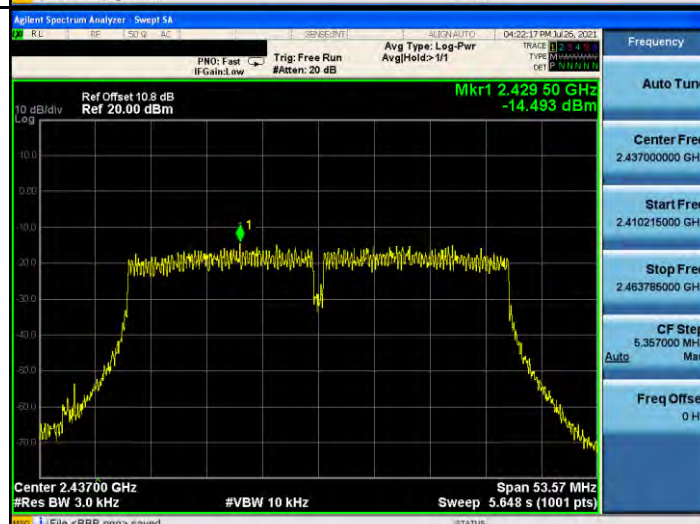


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-1

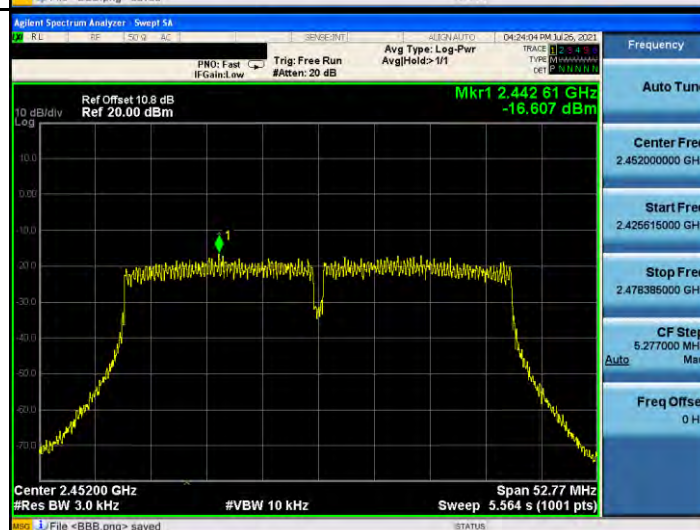
2422 MHz



2437 MHz



2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-2

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-2

2412 MHz



2437 MHz

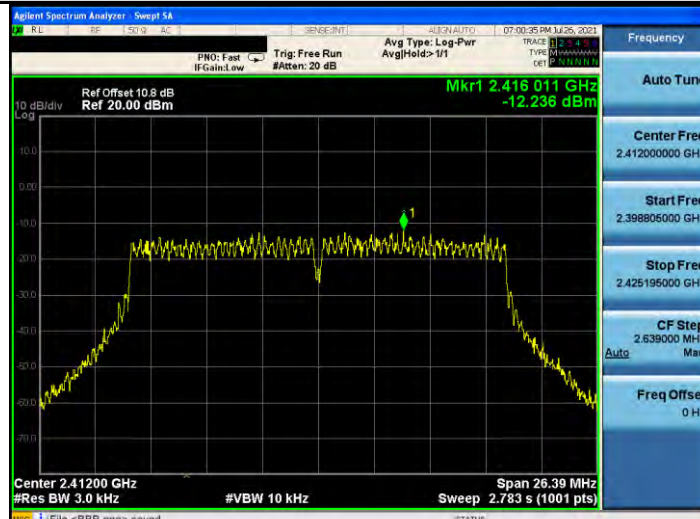


2462 MHz

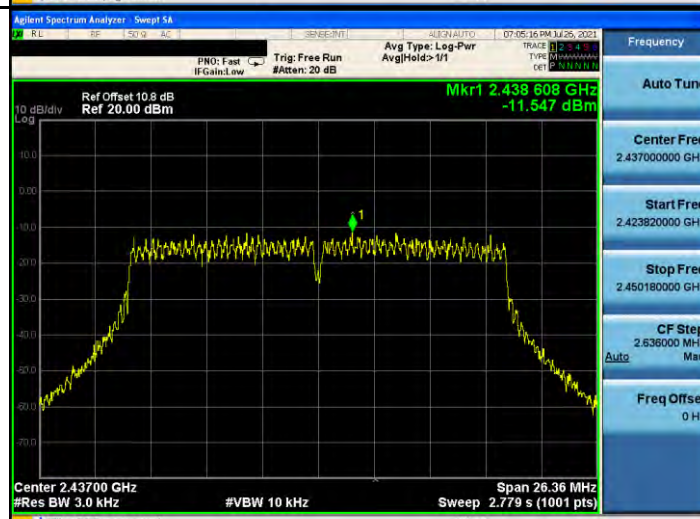


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-2

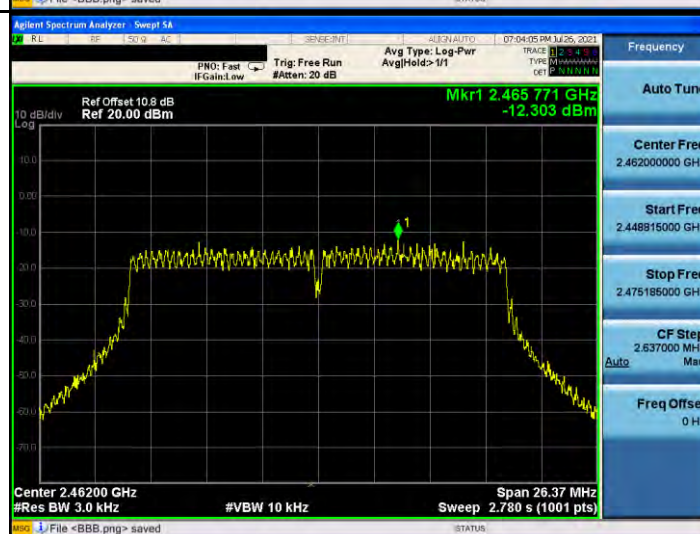
2412 MHz



2437 MHz

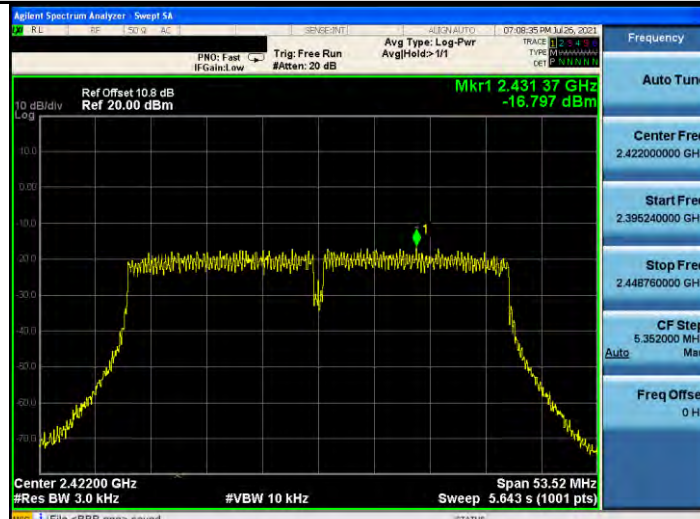


2462 MHz

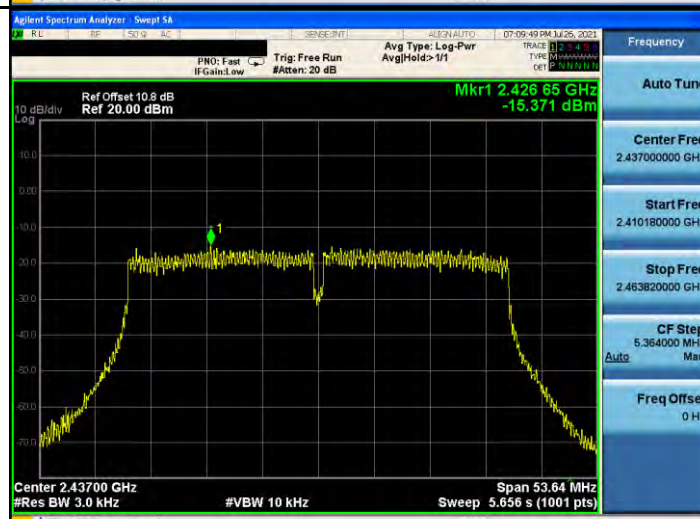


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-2

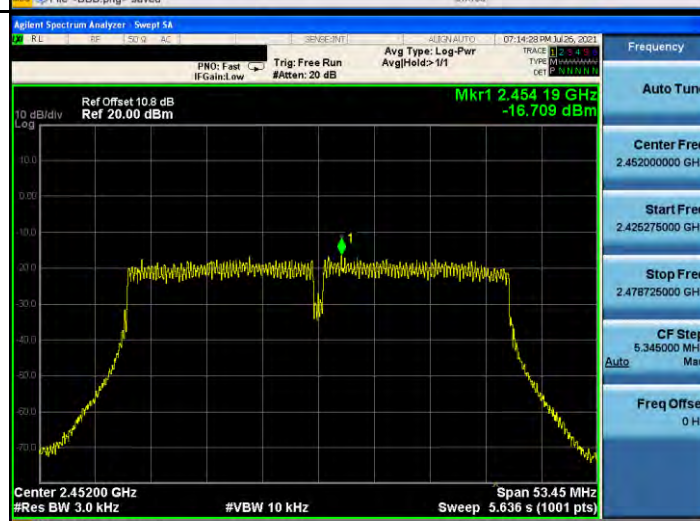
2422 MHz



2437 MHz



2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-3

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-3

2412 MHz



2437 MHz

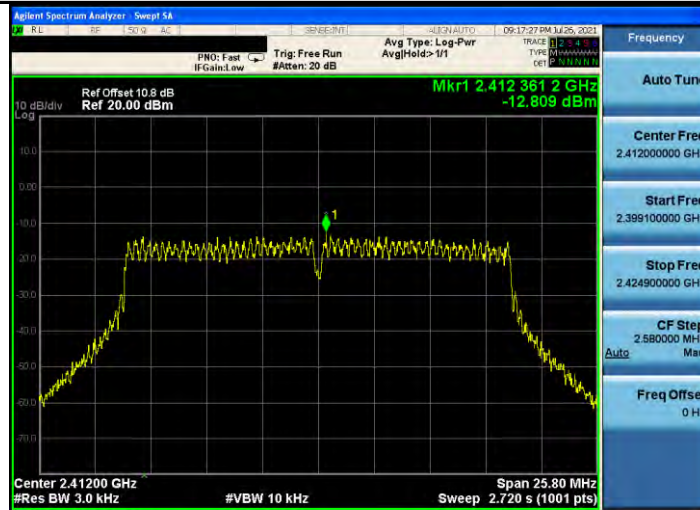


2462 MHz

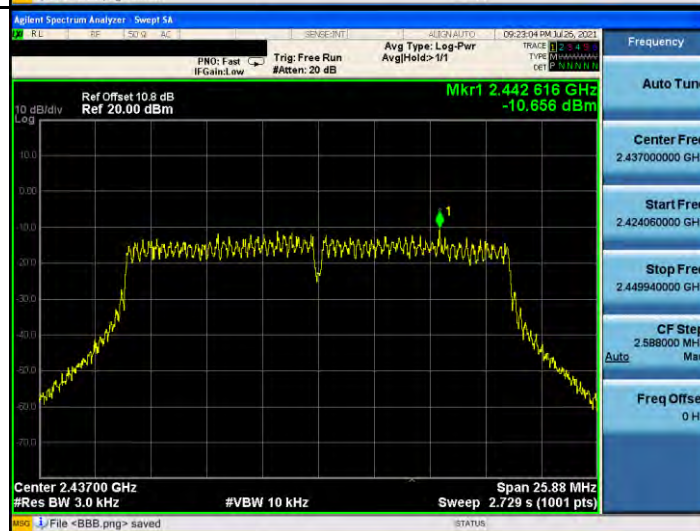


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-3

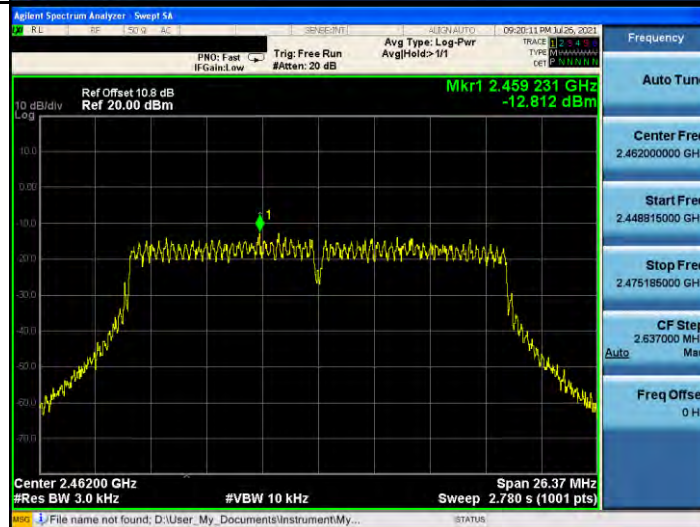
2412 MHz



2437 MHz

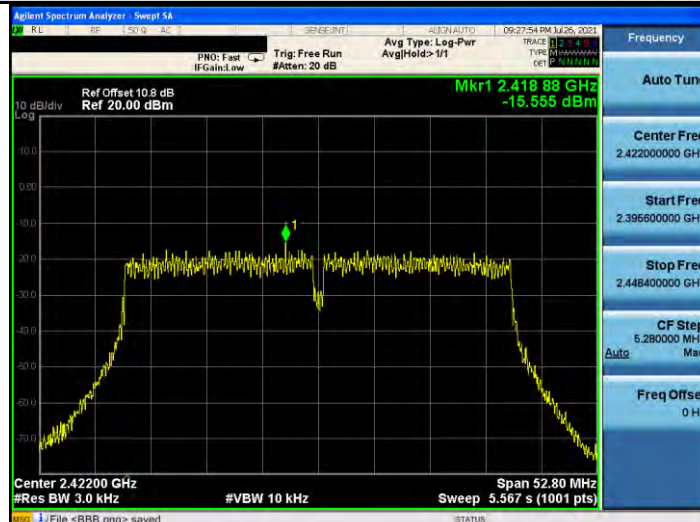


2462 MHz

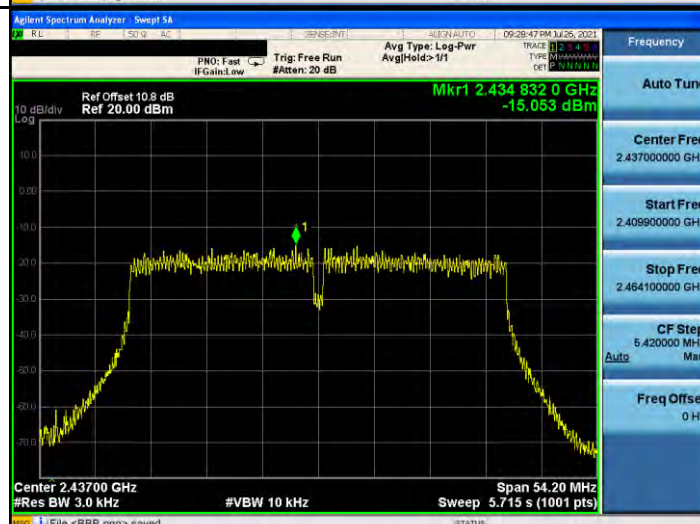


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-3

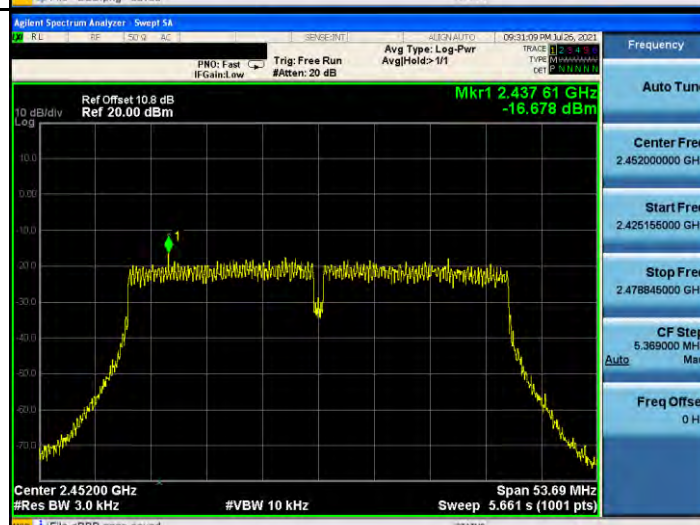
2422 MHz



2437 MHz



2452 MHz



Out of Band Conducted Emissions Measurement

■ Test Graphs

Reference level

Mode 2: IEEE 802.11b Continuous TX mode_ANT-0

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-0

2412 MHz



2437 MHz



2462 MHz



Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-0

2412 MHz



2437 MHz

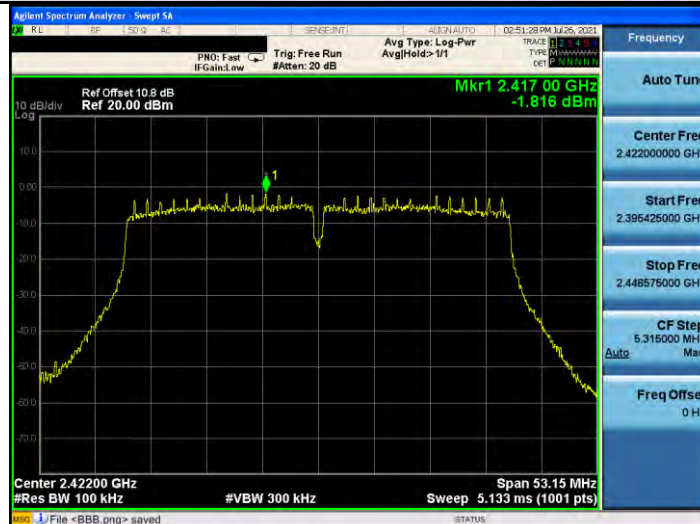


2462 MHz



Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

2422 MHz



2437 MHz



2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-1

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-1

2412 MHz



2437 MHz



2462 MHz



Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-1

2412 MHz



2437 MHz



2462 MHz



Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-1

2422 MHz



2437 MHz



2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-2

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-2

2412 MHz



2437 MHz



2462 MHz



Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-2

2412 MHz



2437 MHz



2462 MHz

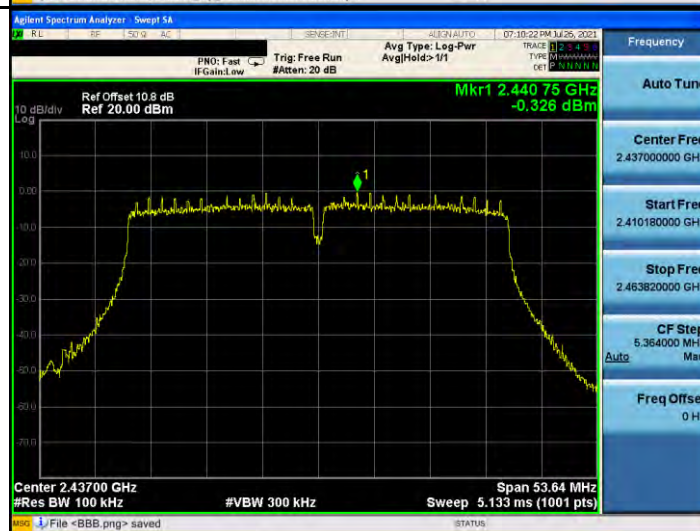


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-2

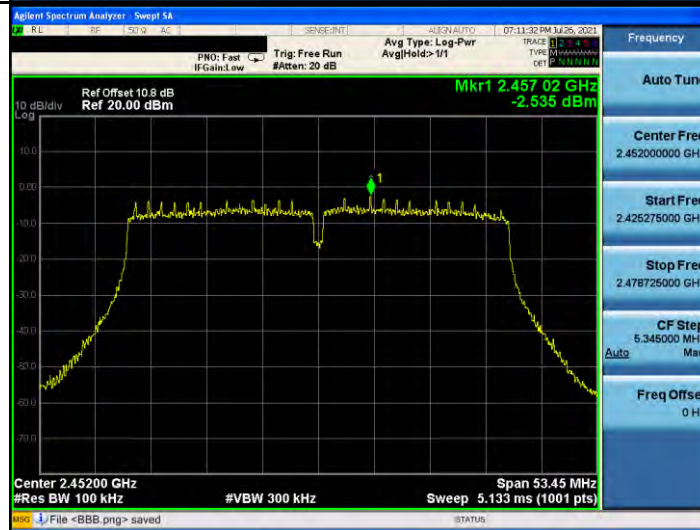
2422 MHz



2437 MHz



2452 MHz



Mode 2: IEEE 802.11b Continuous TX mode_ANT-3

2412 MHz



2437 MHz



2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-3

2412 MHz



2437 MHz



2462 MHz



Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-3

2412 MHz



2437 MHz



2462 MHz



Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-3

2422 MHz



2437 MHz



2452 MHz

