

RF Test Report

Applicant : Edimax Technology Co., Ltd.
Product Type : AC1200 Wireless Dual Band Concurrent Easy Repeater
Trade Name : EDIMAX
Model Number : RE-7438UC
Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013
Receive Date : Jul. 19, 2018
Test Period : Sep. 01 ~ Sep. 19, 2018
Issue Date : Oct. 03, 2018

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C)
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Foundation accreditation number: 1330
Test Firm MRA designation number: TW0010

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Revision History

Rev.	Issue Date	Revisions	Revised By
00	Oct. 03, 2018	Initial Issue	Janet Chao

Verification of Compliance

Issued Date: Oct. 03, 2018

Applicant : Edimax Technology Co., Ltd.

Product Type : AC1200 Wireless Dual Band Concurrent Easy Repeater

Trade Name : EDIMAX

Model Number : RE-7438UC

FCC ID : NDD9574381804

EUT Rated Voltage : DC 5 V, 1 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.

No. 140-1, Changan Street, Bade District,
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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



(Manager)

Reviewed By



(Testing Engineer)

(Eric Ou Yang)

TABLE OF CONTENTS

1	General Information	5
2	EUT Description	7
3	Test Methodology	8
3.1.	Mode of Operation.....	8
3.2.	EUT Test Step.....	16
3.3.	Configuration of Test System Details	16
3.4.	Test Instruments	18
3.5.	Test Site Environment	19
4	Measurement Procedure	20
4.1.	AC Power Line Conducted Emission Measurement	20
4.2.	Radiated Emission Measurement	22
4.3.	Maximum Conducted Output Power Measurement	26
4.4.	6 dB RF Bandwidth Measurement	27
4.5.	Maximum Power Density Measurement	28
4.6.	Out of Band Conducted Emissions Measurement	30
4.7.	Antenna Measurement	31
5	Test Results	32
	Annex A. Conducted Emission.....	32
	Annex B. Conducted Test Results.....	34
	Annex C. Radiated Emission Measurement	101



1 General Information

1.1 Summary of Test Result

Standard	Item	Result	Remark
FCC			
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	-----

The test results of this report relate only to the tested sample(s) identified in this report.

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 v04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under Section 15.247
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 (dB)
Conducted Emission	9 kHz ~ 150 kHz	2.7
	150 kHz ~ 30 MHz	2.7
Radiated Emission	9 kHz ~ 30 MHz	1.7
	30 MHz ~ 1000 MHz	5.7
	1000 MHz ~ 18000 MHz	5.5
	18000 MHz ~ 26500 MHz	4.8
	26500 MHz ~ 40000 MHz	4.8
Conducted Output Power	+0.27 dB / -0.28 dB	
RF Bandwidth	4.96 %	
Power Spectral Density	+0.71 dB / -0.77 dB	

2 EUT Description

Applicant	Edimax Technology Co., Ltd. No.278, Xinhua 1st Rd., Neihu Dist., Taipei City, Taiwan			
Manufacturer	Edimax Technology Co., Ltd. No.278, Xinhua 1st Rd., Neihu Dist., Taipei City, Taiwan			
Product Type	AC1200 Wireless Dual Band Concurrent Easy Repeater			
Trade Name	EDIMAX			
Model Number	RE-7438UC			
FCC ID	NDD9574381804			
Operate Freq. Band	Frequency Range (MHz)	Modulation	Channel Bandwidth	Data Rate 400 / 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	20 MHz	Up to 144.4 Mbps
IEEE 802.11n 2.4 GHz 40 MHz	2422 ~ 2452	OFDM	40 MHz	Up to 300 Mbps
Antenna information	Antenna	Model Number	Type	Max. Gain (dBi)
	ANT-0	ALX18M-222AA2	PIFA Antenna	5.22
	ANT-1	ALX18M-222AA2	PIFA Antenna	5.29
	G _{ANT}			5.26
Antenna Delivery	See section 3.1			
Operate Temp. Range	0 ~ +40 °C			

Frequency Band	Max. RF Output Power (W)
IEEE 802.11b	0.213
IEEE 802.11g	0.210
IEEE 802.11n 2.4 GHz 20 MHz	0.211
IEEE 802.11n 2.4 GHz 40 MHz	0.147

Beamforming on

Frequency Band	Max. RF Output Power (W)
IEEE 802.11n 2.4GHz 20MHz	0.085
IEEE 802.11n 2.4GHz 40MHz	0.072

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

Test Mode	Antenna Delivery	Data Rate	Test Channel
Mode 2	2TX(CDD)	1M	1, 6, 11
Mode 3	2TX(CDD)	6M	1, 6, 11
Mode 4	2TX(CDD/MIMO/Beamforming On)	13M	1, 6, 11
Mode 5	2TX(CDD/MIMO/Beamforming On)	27M	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	8.950	8.950	1.000	0.000	0.010
Mode 3	2412	5.520	5.520	1.000	0.000	0.010
Mode 4	2412	4.460	4.460	1.000	0.000	0.010
Mode 5	2422	6.740	6.740	1.000	0.000	0.010

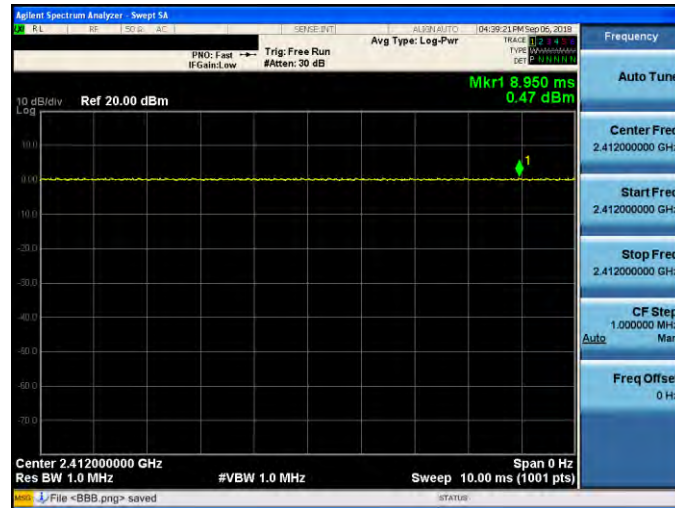
Beamforming on

Test Mode	Frequency (MHz)	on time (ms)	on+off time (ms)	Duty cycle	Duty Factor (dB)	1/T Minimum VBW (kHz)
Mode 4	2412	9.400	9.400	1.000	0.000	0.010
Mode 5	2422	7.770	7.770	1.000	0.000	0.010

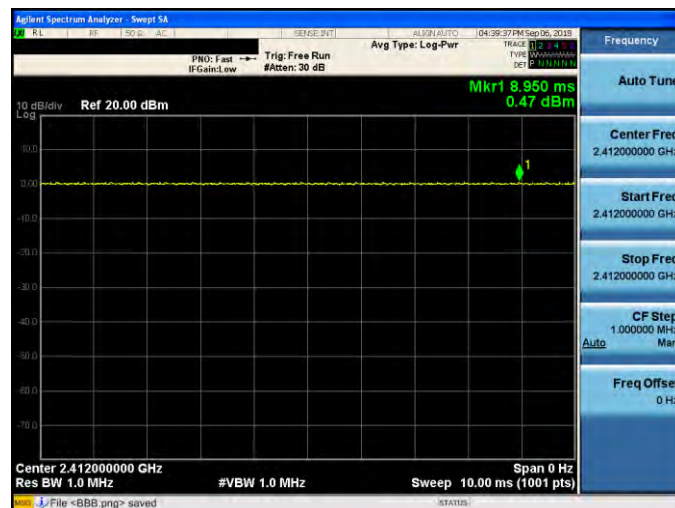
Duty Cycle Graphs

Mode 2: IEEE 802.11b Continuous TX mode

On time



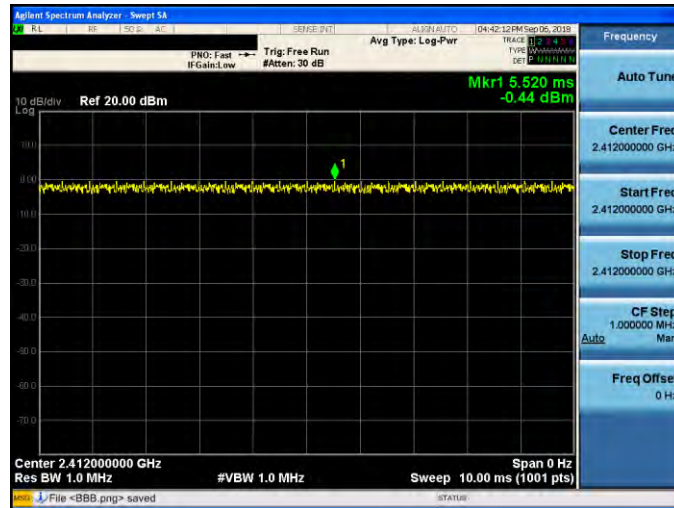
On+off time



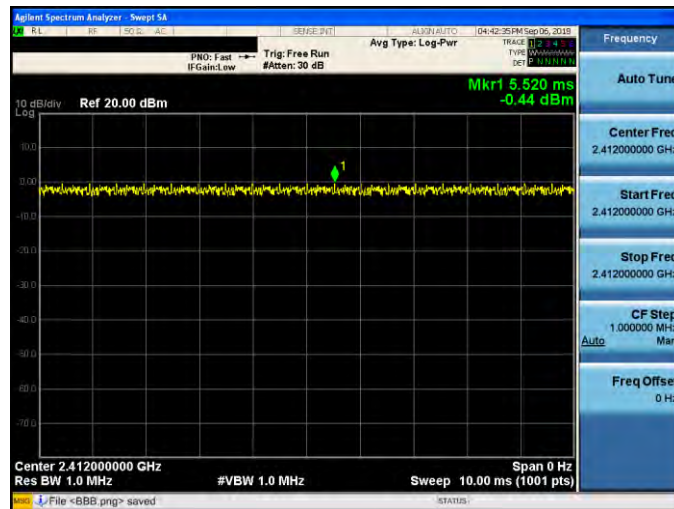


Mode 3: IEEE 802.11g Continuous TX mode

On time

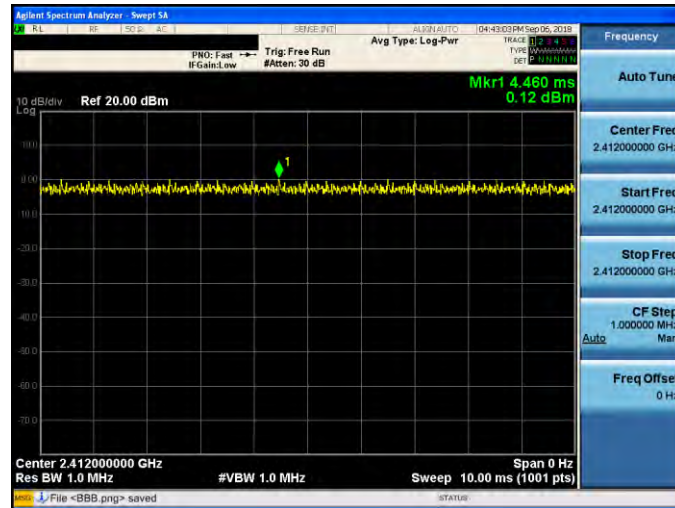


On+off time

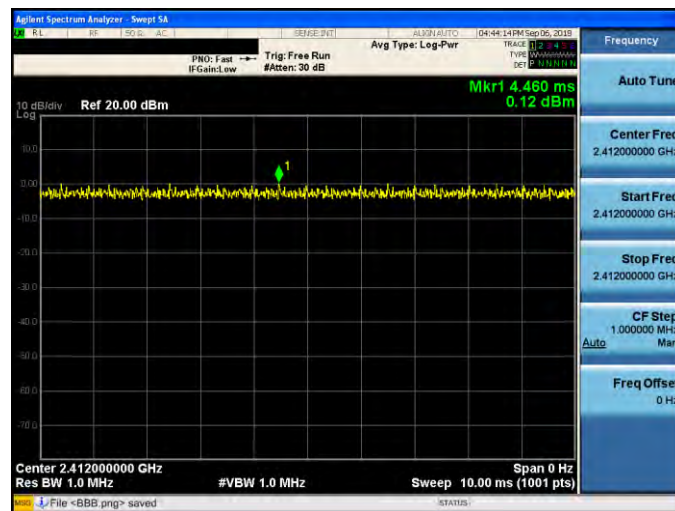


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode

On time

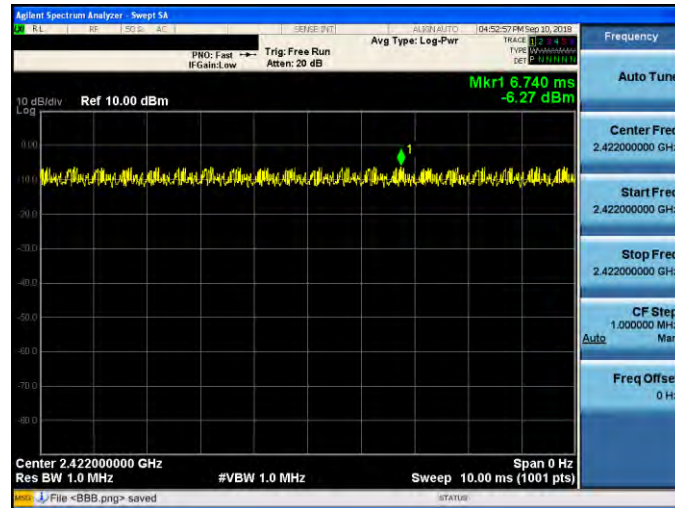


On+off time

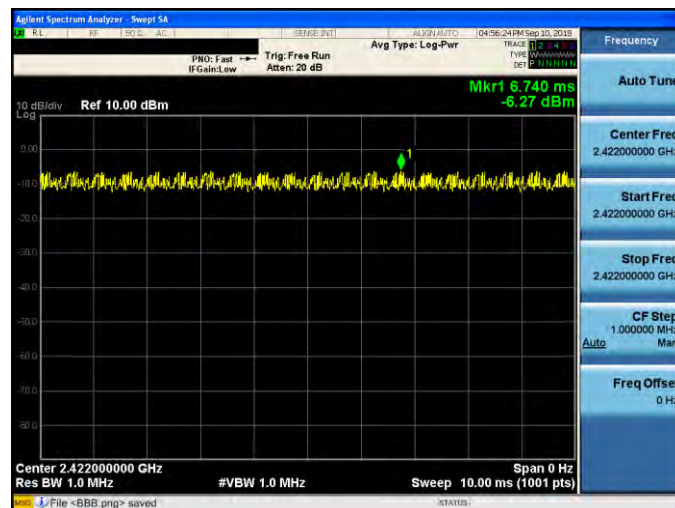


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode

On time



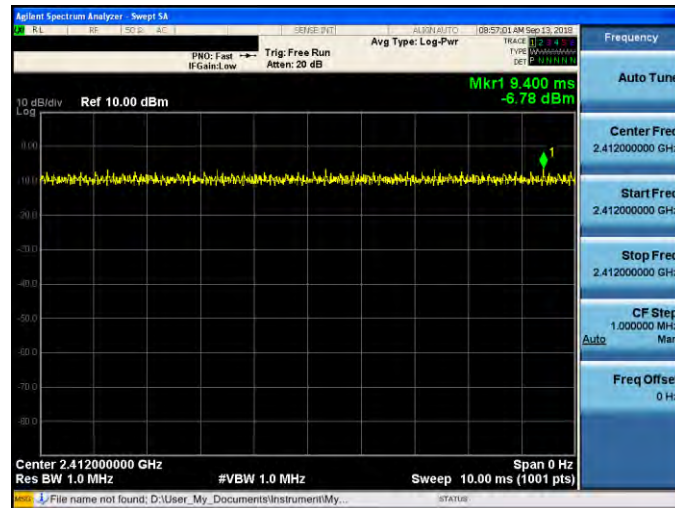
On+off time



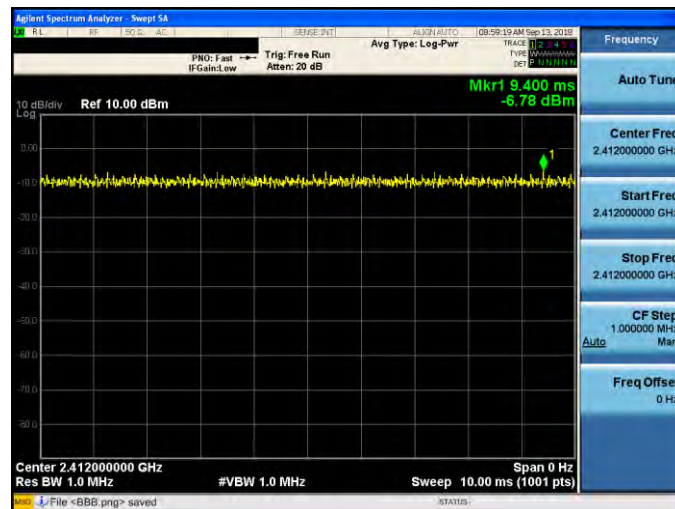
Beamforming on

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

On time

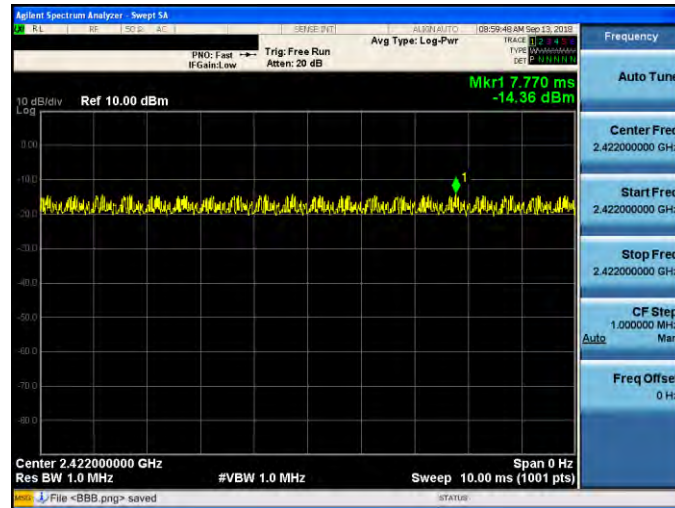


On+off time

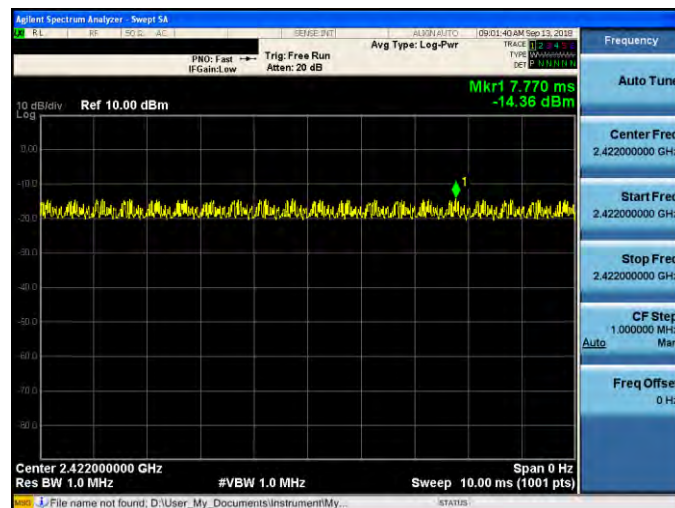


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode

On time



On+off time



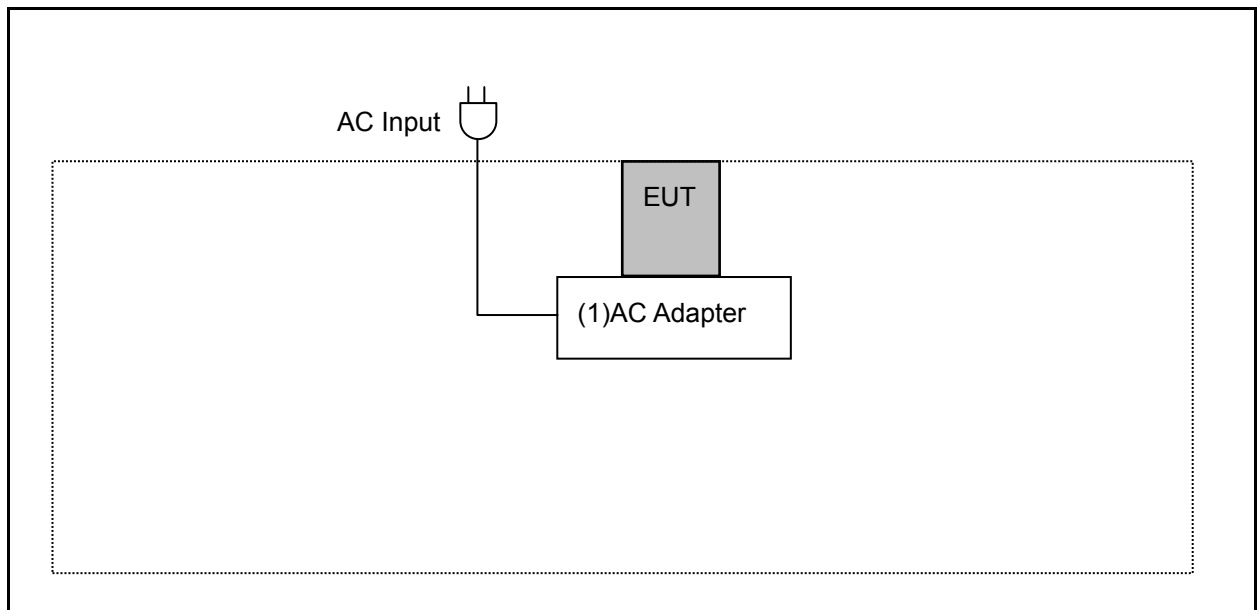
3.2. EUT Test Step

1.	Setup the EUT shown on "Configuration of Test System Details."
2.	Turn on the power of all equipment.
3.	Turn Wi-Fi function link to Notebook
4.	EUT run test program.

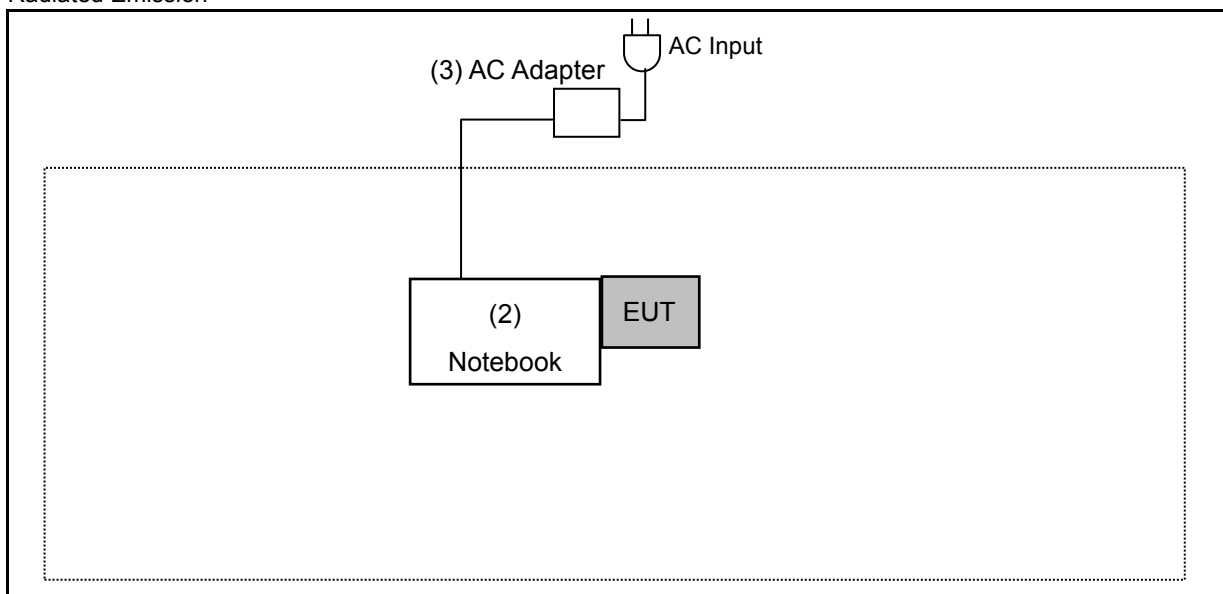
Measurement Software	
1	EZ-EMC Ver. ATL-03A1-1
2	EZ-EMC Ver ATL-ITC-3A1-1

3.3. Configuration of Test System Details

Conducted Emissions



Radiated Emission



Devices Description					
Product	Manufacturer	Model Number	Serial Number	Power Cord	Remark
(1) AC Adapter	LG	MCS-04WD	DA430040890	---	---
(2) Notebook	HP	PROBOOK 4421s	CNF1182X1G	---	---
(3) AC Adapter	HP	Series PPP012H-S	---	---	---



3.4. Test Instruments

For Conducted Emission

Test Period: Sep. 19, 2018

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Test Receiver	R&S	ESCI	100367	05/21/2018	1 year
LISN	R&S	ENV216	101040	04/11/2018	1 year
LISN	R&S	ENV216	101041	03/23/2018	1 year

For Radiated Emissions

Test Period: Sep. 01 ~ Sep. 07, 2018

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer (10 Hz~44 GHz)	Keysight	N9010A	MY52221312	01/15/2018	1 year
Pre Amplifier (1~26.5 GHz)	Agilent	8449B	3008A02237	10/16/2017	1 year
Pre Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A11119	01/10/2018	1 year
Pre Amplifier (26.5~40 GHz)	EMCI	EMC2654045	980028	08/23/2018	1 year
Pre Amplifier (1~26.5 GHz)	EMCI	EMC012645SE	980289	01/17/2018	1 year
Broadband Antenna	Schwarzbeck	VULB9168	416	10/26/2017	1 year
Horn Antenna (1~18 GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	08/23/2018	1 year
Horn Antenna (18~40 GHz)	ETS	3116	86467	09/19/2017	1 year
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	03/13/2018	1 year
RF Cable	EMCI	EMC104-N-N-6000	TE01-1	02/20/2018	1 year
Microwave Cable	EMCI	EMC104-SM-SM-1 3000	170814	10/31/2017	1 year
Microwave Cable	EMCI	EMC102-KM-KM-1 4000	151001	02/20/2018	1 year

Note: N.C.R. = No Calibration Request.



For Conducted

Test Period: Sep. 06 ~ Sep. 10, 2018

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Power Sensor	Anritsu	MA2411B	1126022	08/29/2018	1 year
Power Meter	Anritsu	ML2495A	1135009	08/29/2018	1 year
Spectrum Analyzer (20Hz~26.5GHz)	Agilent	N9020A	US47520902	09/21/2017	1 year
Microwave Cable	EMCI	EMC102-SM-SM15 00	001	11/22/2017	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

3.5. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	990

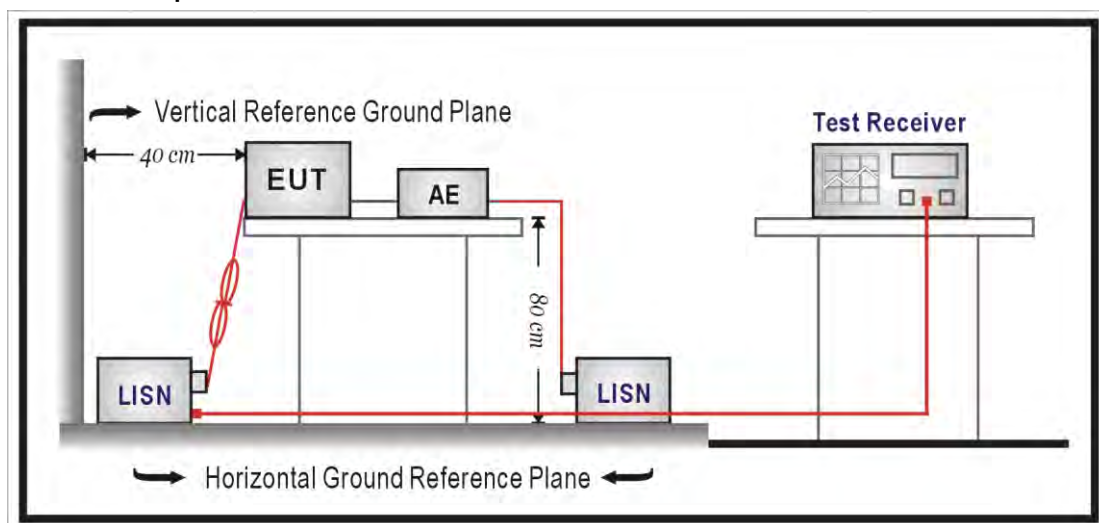
4 Measurement Procedure

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

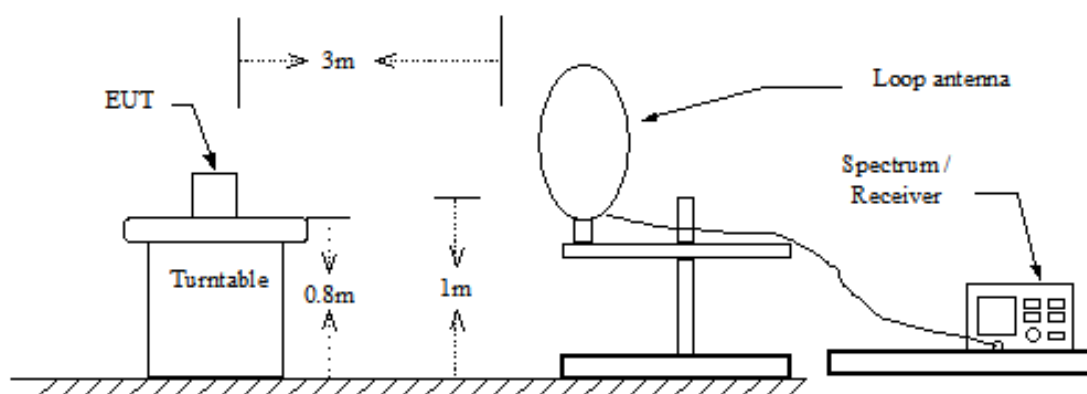
According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

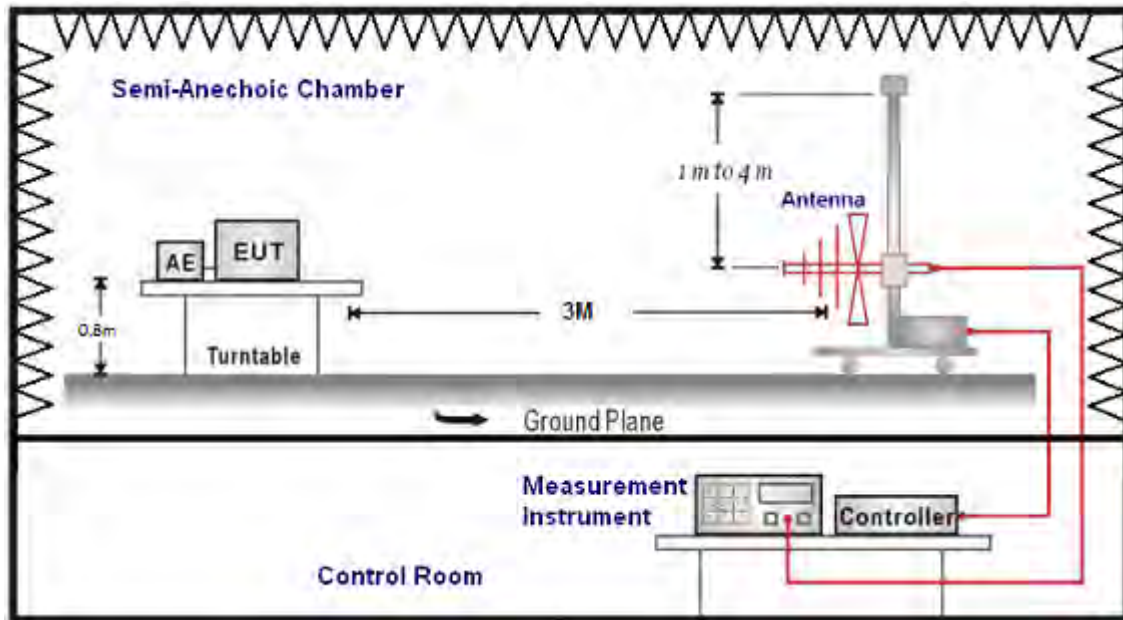
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

■ Setup

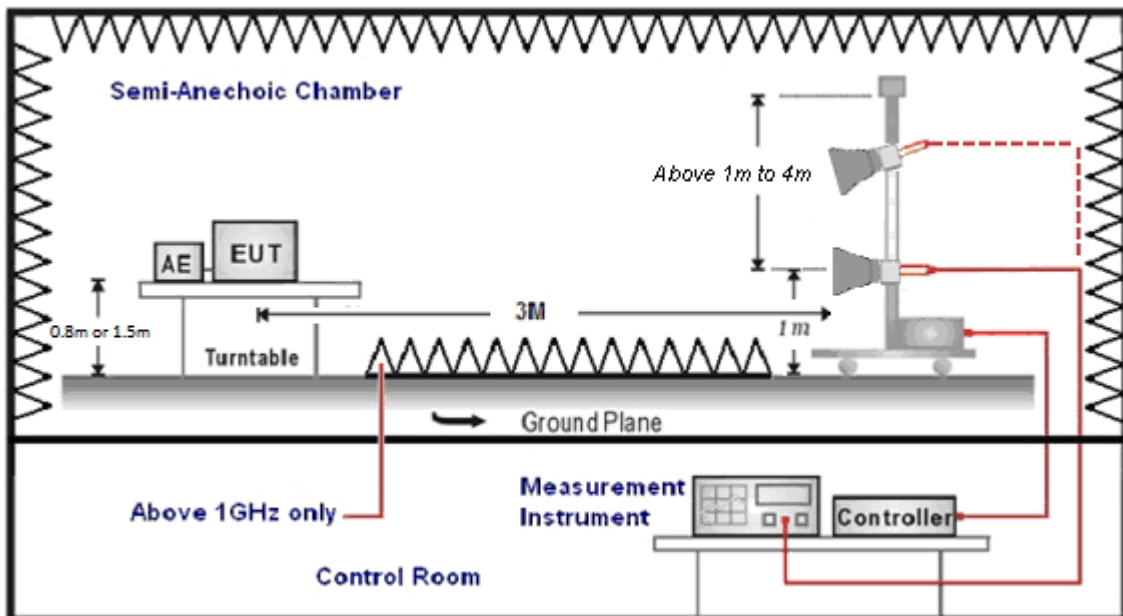
9 kHz ~ 30 MHz



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 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.

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

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

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

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.

IEEE 802.11b / IEEE 802.11g / IEEE 802.11n 2.4 GHz 20 MHz / 40 MHz

CDD mode:

Directional Gain = $10 \cdot \log\{[10^{(G1/10)} + 10^{(G2/10)} + \dots + 10^{(Gn/10)}] / NANT\}$ = 5.26 dBi < 6dBi

* power limit = 30 dBm

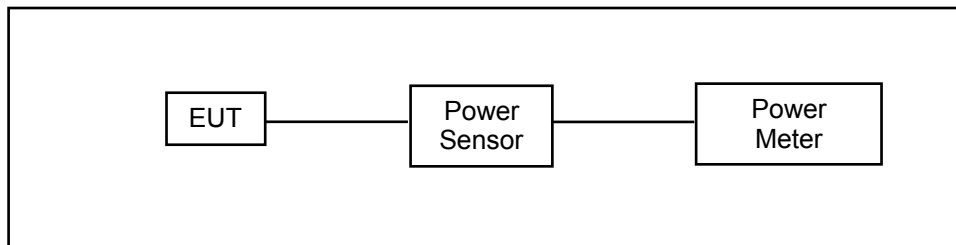
IEEE 802.11n 2.4 GHz 20 MHz / 40 MHz

MIMO/Beamforming On mode :

Directional Gain = $10 \cdot \log\{[10^{(G1/20)} + 10^{(G2/20)} + \dots + 10^{(Gn/20)}]^2 / NANT\}$ = 8.27 dBi > 6dBi

* Power limit shall be reduced = $30 - 2.27 = 27.73$ dBm

■ Test Setup



■ Test Procedure

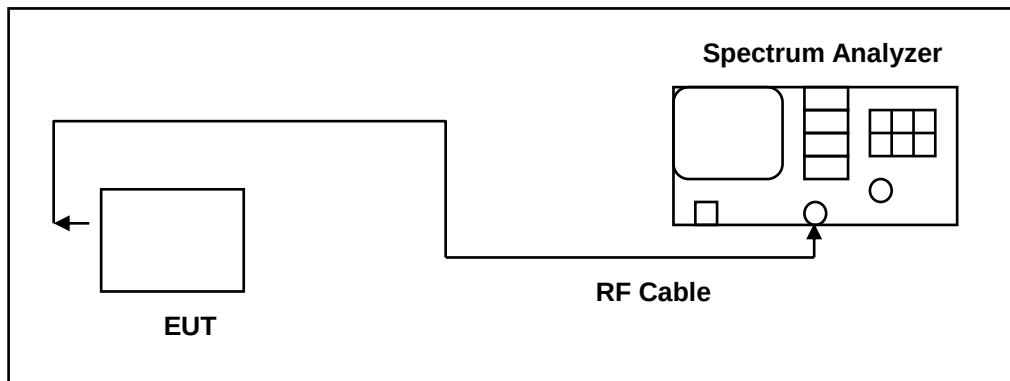
The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor.

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 KDB 558074 D01 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 Density Measurement

■ Limit

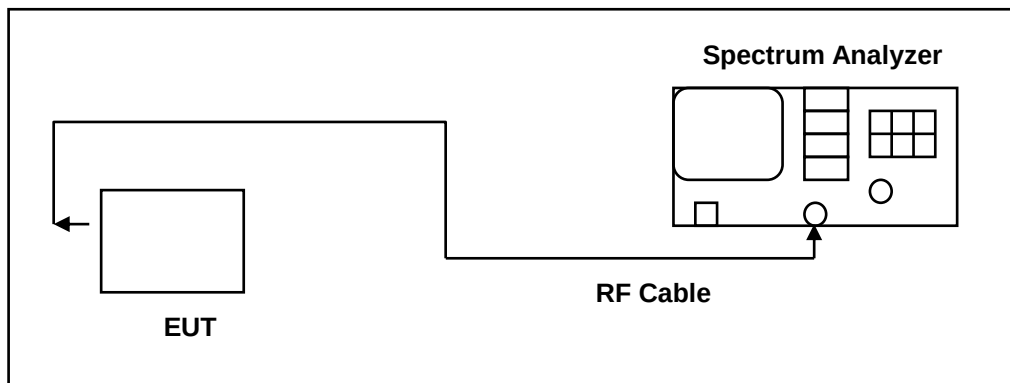
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

IEEE 802.11b / IEEE 802.11g / IEEE 802.11n 2.4 GHz 20 MHz / 40 MHz

CDD/MIMO/Beamforming On :

- * Directional Gain = $10 \cdot \log\{[10^{G1/20} + 10^{G2/20} + \dots + 10^{Gn/20}]^2 / N\} = 8.27 \text{ dBi} > 6 \text{ dBi}$
- * Power Spectral Density limit shall be reduced = $8 - 2.27 = 5.73 \text{ dBm} / 3 \text{ kHz}$

■ Test Setup





■ **Test Procedure**

The EUT tested to DTS test procedure of KDB 558074 D01 for compliance to FCC 47CFR 15.247 requirements.

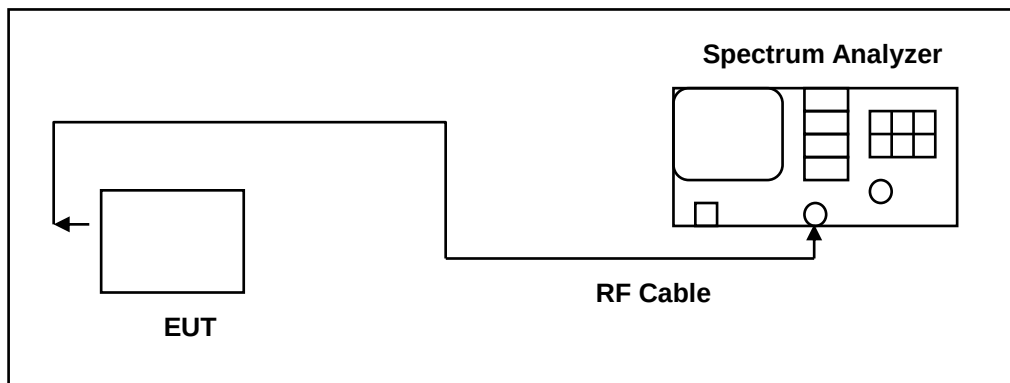
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
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 30 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 30 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 Conducted Output Power

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11b	5.26
IEEE 802.11g	5.26
IEEE 802.11n 2.4 GHz 20 MHz	5.26
IEEE 802.11n 2.4 GHz 40 MHz	5.26
Beamforming on	
IEEE 802.11n 2.4 GHz 20 MHz	8.27
IEEE 802.11n 2.4 GHz 40 MHz	8.27

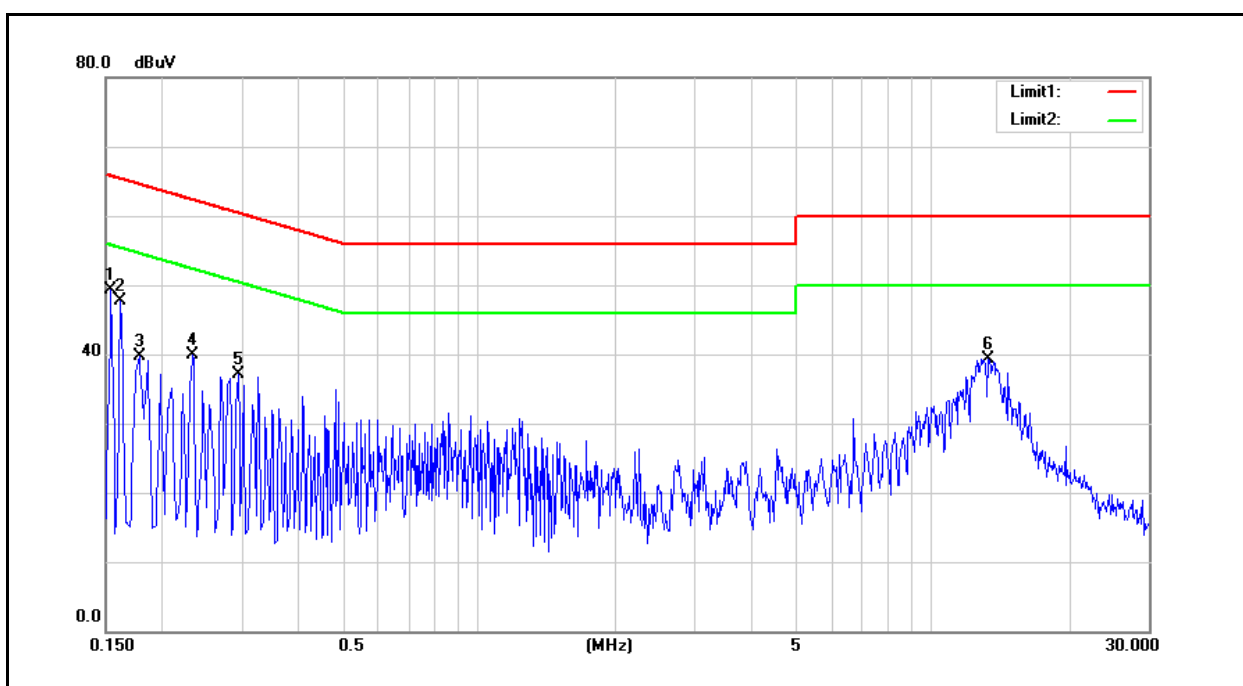
For Peak Power Spectral Density

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11b	8.27
IEEE 802.11g	8.27
IEEE 802.11n 2.4 GHz 20 MHz	8.27
IEEE 802.11n 2.4 GHz 40 MHz	8.27
Beamforming on	
IEEE 802.11n 2.4 GHz 20 MHz	8.27
IEEE 802.11n 2.4 GHz 40 MHz	8.27

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	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
Description:			

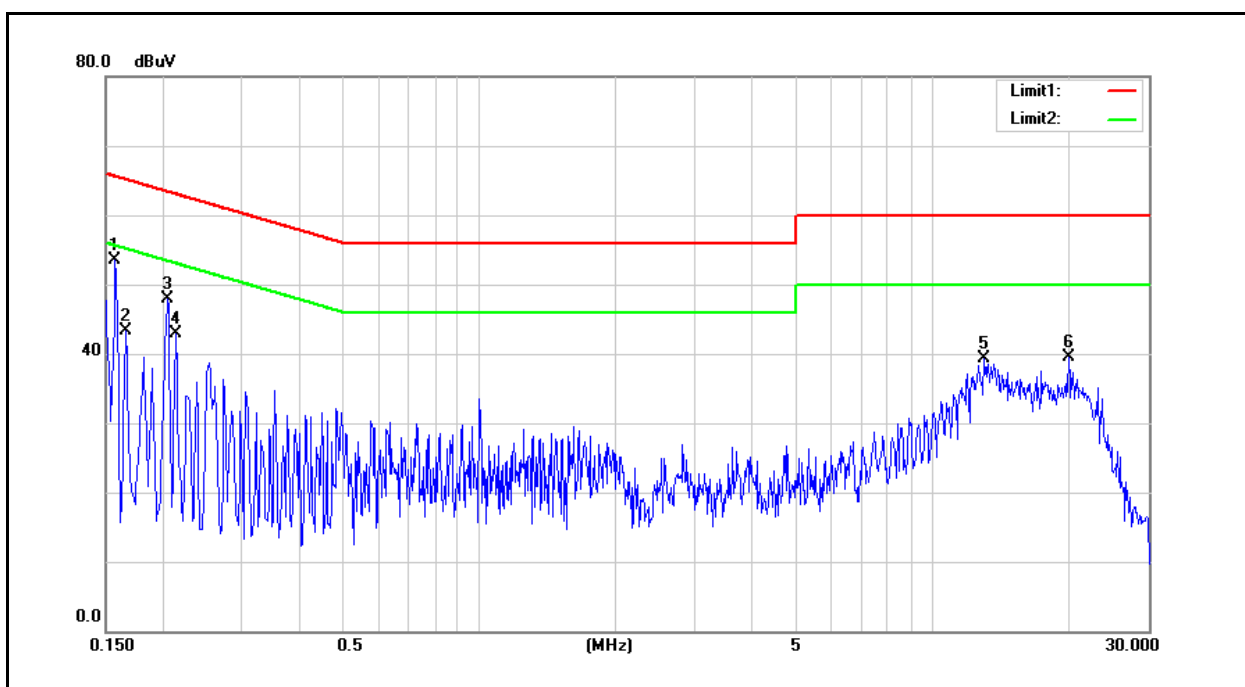


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1540	35.97	11.56	9.60	45.57	21.16	65.78	55.78	-20.21	-34.62	Pass
2	0.1620	35.98	11.63	9.60	45.58	21.23	65.36	55.36	-19.78	-34.13	Pass
3	0.1780	26.66	5.80	9.60	36.26	15.40	64.58	54.58	-28.32	-39.18	Pass
4	0.2340	24.55	8.22	9.60	34.15	17.82	62.31	52.31	-28.16	-34.49	Pass
5	0.2940	22.33	7.29	9.60	31.93	16.89	60.41	50.41	-28.48	-33.52	Pass
6	13.3140	24.86	15.68	9.90	34.76	25.58	60.00	50.00	-25.24	-24.42	Pass

Note: 1. Result (dBuV/m) = Correct Factor (dB/m) + 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	Temp.(°C)/Hum.(%RH):	26(°C)/60 %RH
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	0.1580	35.48	12.01	9.71	45.19	21.72	65.57	55.57	-20.38	-33.85	Pass
2	0.1660	34.70	14.33	9.71	44.41	24.04	65.16	55.16	-20.75	-31.12	Pass
3	0.2060	29.20	9.97	9.70	38.90	19.67	63.37	53.37	-24.47	-33.70	Pass
4	0.2140	27.64	12.84	9.70	37.34	22.54	63.05	53.05	-25.71	-30.51	Pass
5	13.0460	22.30	15.31	10.05	32.35	25.36	60.00	50.00	-27.65	-24.64	Pass
6	20.0500	20.03	2.84	10.20	30.23	13.04	60.00	50.00	-29.77	-36.96	Pass

Note: 1. Result (dBuV/m) = Correct Factor (dB/m) + 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		
			Measurement Results		Limit
			dBm	W	dBm
Mode 2	2412	1 M	20.22	0.105	≤ 30
	2437		20.29	0.107	≤ 30
	2462		20.20	0.105	≤ 30
	2437	2 M	20.04	0.101	≤ 30
	2437	5.5 M	20.14	0.103	≤ 30
	2437	11 M	20.14	0.103	≤ 30
Mode 3	2412	6 M	19.24	0.084	≤ 30
	2437		20.20	0.105	≤ 30
	2462		20.13	0.103	≤ 30
	2437	9 M	20.05	0.101	≤ 30
	2437	12 M	20.06	0.101	≤ 30
	2437	18 M	20.14	0.103	≤ 30
	2437	24 M	20.00	0.100	≤ 30
	2437	36 M	20.05	0.101	≤ 30
	2437	48 M	20.11	0.103	≤ 30
	2437	54 M	20.13	0.103	≤ 30

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

ANT-0					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 4	2412	13M	18.89	0.077	≤ 30
	2437		20.23	0.105	≤ 30
	2462		19.11	0.081	≤ 30
	2437	28.8M	20.11	0.103	≤ 30
	2437	43.4M	20.07	0.102	≤ 30
	2437	57.8M	19.97	0.099	≤ 30
	2437	86.6M	19.93	0.098	≤ 30
	2437	115.6M	20.15	0.104	≤ 30
	2437	130M	20.13	0.103	≤ 30
	2437	144.4M	20.08	0.102	≤ 30
Mode 5	2422	27M	18.19	0.066	≤ 30
	2437		19.06	0.081	≤ 30
	2452		17.27	0.053	≤ 30
	2437	60M	18.90	0.078	≤ 30
	2437	90M	18.92	0.078	≤ 30
	2437	120M	18.85	0.077	≤ 30
	2437	180M	19.00	0.079	≤ 30
	2437	240M	18.93	0.078	≤ 30
	2437	270M	18.82	0.076	≤ 30
	2437	300M	18.85	0.077	≤ 30

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

ANT-1					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 2	2412	1 M	20.32	0.108	≤ 30
	2437		20.23	0.105	≤ 30
	2462		20.12	0.103	≤ 30
	2437	2 M	20.06	0.101	≤ 30
	2437	5.5 M	20.09	0.102	≤ 30
	2437	11 M	20.15	0.104	≤ 30
Mode 3	2412	6 M	18.92	0.078	≤ 30
	2437		20.24	0.106	≤ 30
	2462		20.21	0.105	≤ 30
	2437	9 M	20.13	0.103	≤ 30
	2437	12 M	20.11	0.103	≤ 30
	2437	18 M	20.08	0.102	≤ 30
	2437	24 M	20.13	0.103	≤ 30
	2437	36 M	20.06	0.101	≤ 30
	2437	48 M	20.08	0.102	≤ 30
	2437	54 M	20.18	0.104	≤ 30

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

ANT-1					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 4	2412	13M	17.95	0.062	≤ 30
	2437		20.22	0.105	≤ 30
	2462		18.75	0.075	≤ 30
	2437	28.8M	20.18	0.104	≤ 30
	2437	43.4M	20.11	0.103	≤ 30
	2437	57.8M	20.08	0.102	≤ 30
	2437	86.6M	19.99	0.100	≤ 30
	2437	115.6M	20.06	0.101	≤ 30
	2437	130M	20.11	0.103	≤ 30
	2437	144.4M	20.07	0.102	≤ 30
Mode 5	2422	27M	17.11	0.051	≤ 30
	2437		18.24	0.067	≤ 30
	2452		16.66	0.046	≤ 30
	2437	60M	18.19	0.066	≤ 30
	2437	90M	18.08	0.064	≤ 30
	2437	120M	17.99	0.063	≤ 30
	2437	180M	18.02	0.063	≤ 30
	2437	240M	18.15	0.065	≤ 30
	2437	270M	18.19	0.066	≤ 30
	2437	300M	18.06	0.064	≤ 30

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

ANT-0+1					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 2	2412	1 M	23.28	0.213	≤ 30
	2437		23.27	0.212	≤ 30
	2462		23.17	0.208	≤ 30
	2437	2 M	23.06	0.202	≤ 30
	2437	5.5 M	23.13	0.205	≤ 30
	2437	11 M	23.16	0.207	≤ 30
Mode 3	2412	6 M	22.09	0.162	≤ 30
	2437		23.23	0.210	≤ 30
	2462		23.18	0.208	≤ 30
	2437	9 M	23.10	0.204	≤ 30
	2437	12 M	23.10	0.204	≤ 30
	2437	18 M	23.12	0.205	≤ 30
	2437	24 M	23.08	0.203	≤ 30
	2437	36 M	23.07	0.203	≤ 30
	2437	48 M	23.11	0.204	≤ 30
	2437	54 M	23.17	0.207	≤ 30

ANT-0+1					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 4	2412	13M	21.46	0.140	≤ 30
	2437		23.24	0.211	≤ 30
	2462		21.94	0.156	≤ 30
	2437	28.8M	23.16	0.207	≤ 30
	2437	43.4M	23.10	0.204	≤ 30
	2437	57.8M	23.04	0.201	≤ 30
	2437	86.6M	22.97	0.198	≤ 30
	2437	115.6M	23.12	0.205	≤ 30
	2437	130M	23.13	0.206	≤ 30
	2437	144.4M	23.09	0.203	≤ 30
Mode 5	2422	27M	20.69	0.117	≤ 30
	2437		21.68	0.147	≤ 30
	2452		19.99	0.100	≤ 30
	2437	60M	21.57	0.144	≤ 30
	2437	90M	21.53	0.142	≤ 30
	2437	120M	21.45	0.140	≤ 30
	2437	180M	21.55	0.143	≤ 30
	2437	240M	21.57	0.143	≤ 30
	2437	270M	21.53	0.142	≤ 30
	2437	300M	21.48	0.141	≤ 30

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

Beamforming on

ANT-0					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 4	2412	13M	15.67	0.037	≤ 27.73
	2437		16.12	0.041	≤ 27.73
	2462		15.99	0.040	≤ 27.73
	2437	28.8M	16.08	0.041	≤ 27.73
	2437	43.4M	15.94	0.039	≤ 27.73
	2437	57.8M	15.96	0.039	≤ 27.73
	2437	86.6M	16.03	0.040	≤ 27.73
	2437	115.6M	15.93	0.039	≤ 27.73
	2437	130M	16.05	0.040	≤ 27.73
	2437	144.4M	15.97	0.040	≤ 27.73
Mode 5	2422	27M	14.74	0.030	≤ 27.73
	2437		15.84	0.038	≤ 27.73
	2452		14.42	0.028	≤ 27.73
	2437	60M	15.75	0.038	≤ 27.73
	2437	90M	15.72	0.037	≤ 27.73
	2437	120M	15.69	0.037	≤ 27.73
	2437	180M	15.73	0.037	≤ 27.73
	2437	240M	15.67	0.037	≤ 27.73
	2437	270M	15.71	0.037	≤ 27.73
	2437	300M	15.59	0.036	≤ 27.73

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

ANT-1					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 4	2412	13M	15.51	0.036	≤ 27.73
	2437		16.48	0.044	≤ 27.73
	2462		15.93	0.039	≤ 27.73
	2437	28.8M	16.22	0.042	≤ 27.73
	2437	43.4M	16.08	0.041	≤ 27.73
	2437	57.8M	16.16	0.041	≤ 27.73
	2437	86.6M	16.05	0.040	≤ 27.73
	2437	115.6M	16.17	0.041	≤ 27.73
	2437	130M	16.03	0.040	≤ 27.73
	2437	144.4M	16.16	0.041	≤ 27.73
Mode 5	2422	27M	14.77	0.030	≤ 27.73
	2437		15.31	0.034	≤ 27.73
	2452		13.23	0.021	≤ 27.73
	2437	60M	15.25	0.033	≤ 27.73
	2437	90M	15.18	0.033	≤ 27.73
	2437	120M	15.23	0.033	≤ 27.73
	2437	180M	15.08	0.032	≤ 27.73
	2437	240M	15.04	0.032	≤ 27.73
	2437	270M	15.18	0.033	≤ 27.73
	2437	300M	15.21	0.033	≤ 27.73

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

ANT-0+1					
Test Mode	Frequency (MHz)	Data Rate	Average Output Power		
			Measurement Results		Limit
			dBm	W	dBm
Mode 4	2412	13M	18.60	0.072	≤ 27.73
	2437		19.31	0.085	≤ 27.73
	2462		18.97	0.079	≤ 27.73
	2437	28.8M	19.16	0.082	≤ 27.73
	2437	43.4M	19.02	0.080	≤ 27.73
	2437	57.8M	19.07	0.081	≤ 27.73
	2437	86.6M	19.05	0.080	≤ 27.73
	2437	115.6M	19.06	0.081	≤ 27.73
	2437	130M	19.05	0.080	≤ 27.73
	2437	144.4M	19.08	0.081	≤ 27.73
Mode 5	2422	27M	17.77	0.060	≤ 27.73
	2437		18.59	0.072	≤ 27.73
	2452		16.88	0.049	≤ 27.73
	2437	60M	18.52	0.071	≤ 27.73
	2437	90M	18.47	0.070	≤ 27.73
	2437	120M	18.48	0.070	≤ 27.73
	2437	180M	18.43	0.070	≤ 27.73
	2437	240M	18.38	0.069	≤ 27.73
	2437	270M	18.46	0.070	≤ 27.73
	2437	300M	18.41	0.069	≤ 27.73

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	
Mode 2	2412	10090	10100	≥ 500
	2437	10100	10100	≥ 500
	2462	10100	10100	≥ 500
Mode 3	2412	16520	16510	≥ 500
	2437	16520	16490	≥ 500
	2462	16500	16480	≥ 500
Mode 4	2412	17620	17610	≥ 500
	2437	17630	17610	≥ 500
	2462	17640	17620	≥ 500
Mode 5	2422	36450	36460	≥ 500
	2437	36460	36450	≥ 500
	2452	36470	36460	≥ 500

Beamforming on

Test Mode	Frequency (MHz)	Measurement (kHz)		Limit (kHz)
		ANT-0	ANT-1	
Mode 4	2412	17.497	17.496	≥ 500
	2437	17.497	17.501	≥ 500
	2462	17.496	17.499	≥ 500
Mode 5	2422	36.049	36.067	≥ 500
	2437	36.040	36.057	≥ 500
	2452	36.046	36.067	≥ 500



■ Test Graphs

Mode 2: IEEE 802.11b Continuous TX mode_ANT-0

2412 MHz



2437 MHz

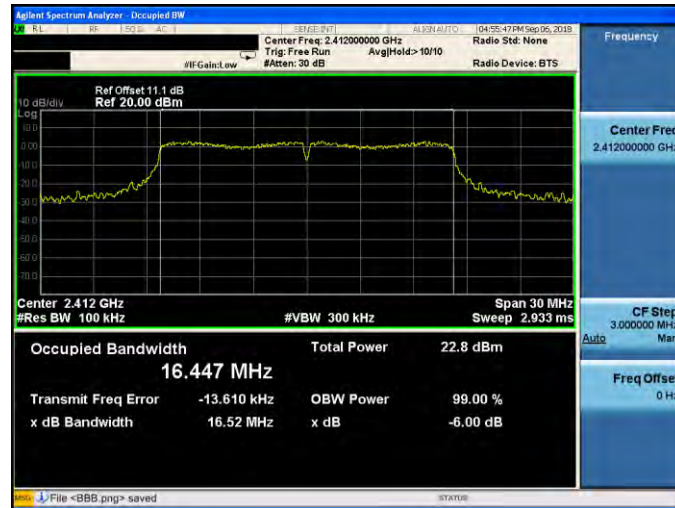


2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-0

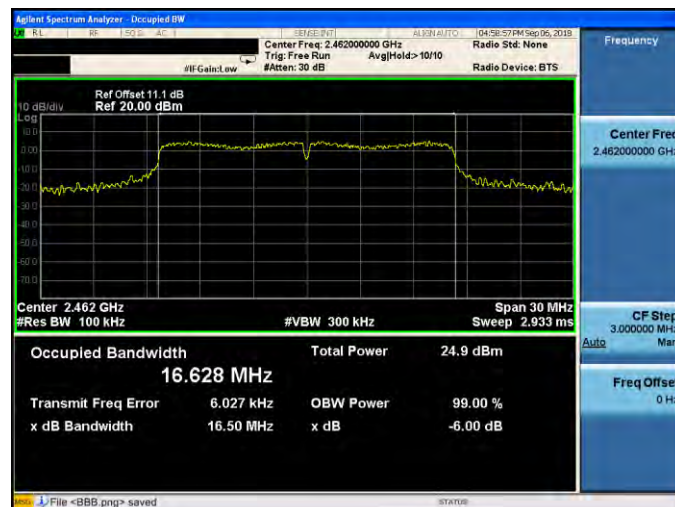
2412 MHz



2437 MHz

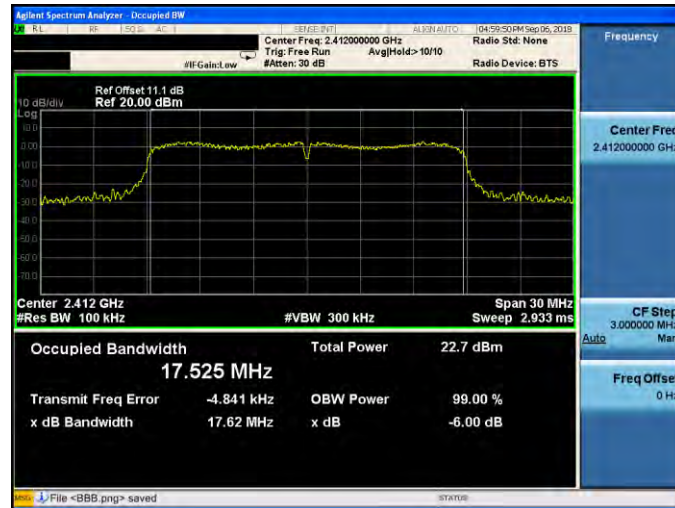


2462 MHz



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

2412 MHz



2437 MHz



2462 MHz

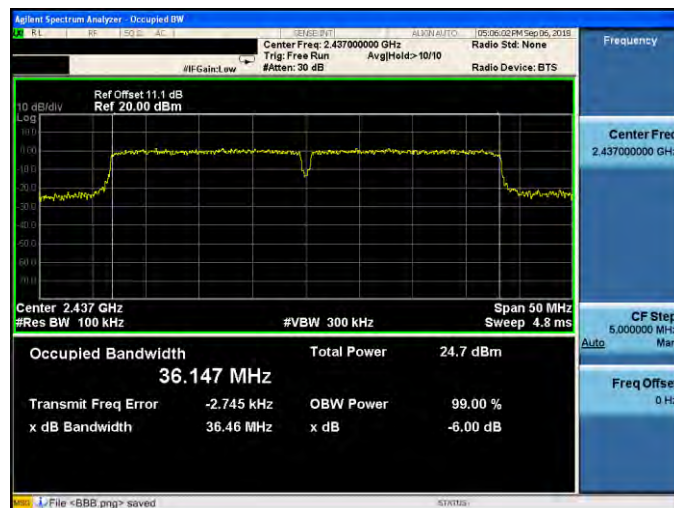


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

2422 MHz



2437 MHz



2452 MHz





Mode 2: IEEE 802.11b Continuous TX mode_ANT-1

2412 MHz



2437 MHz

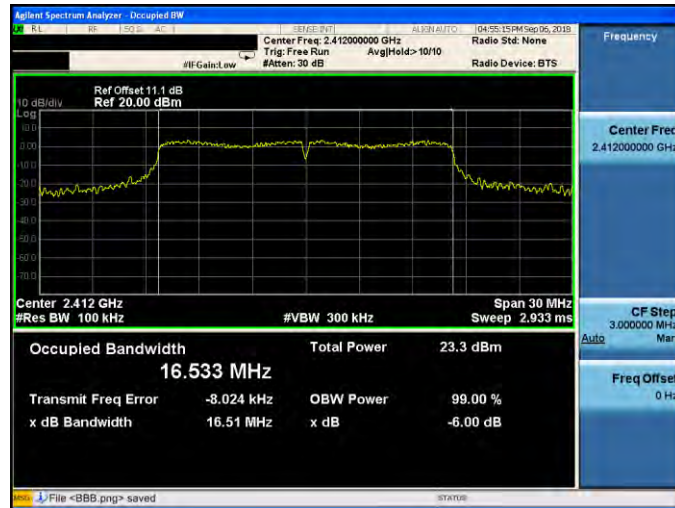


2462 MHz



Mode 3: IEEE 802.11g Continuous TX mode_ANT-1

2412 MHz



2437 MHz

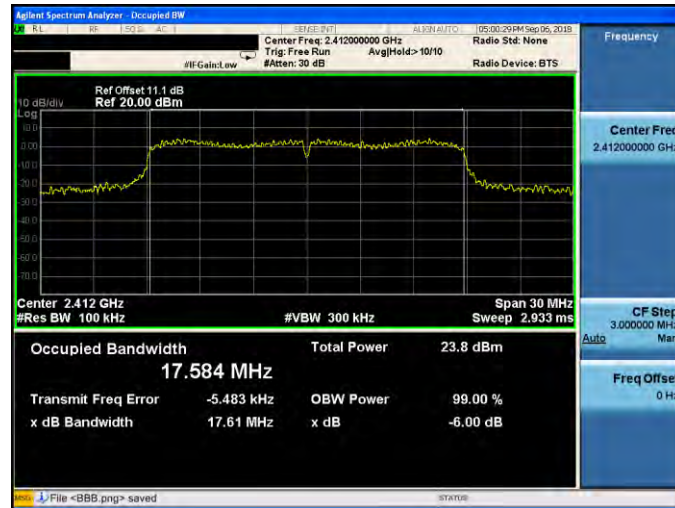


2462 MHz



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

2412 MHz



2437 MHz

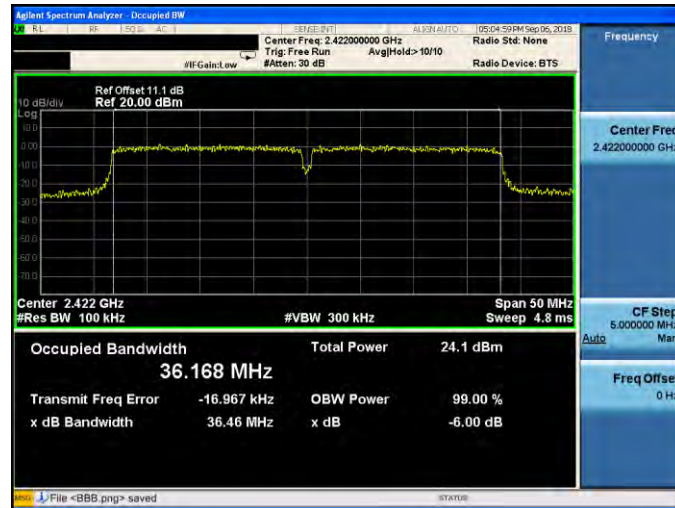


2462 MHz

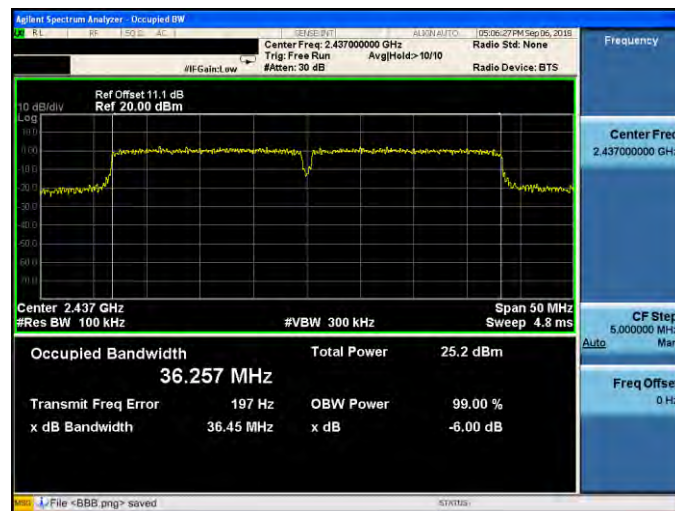


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-1

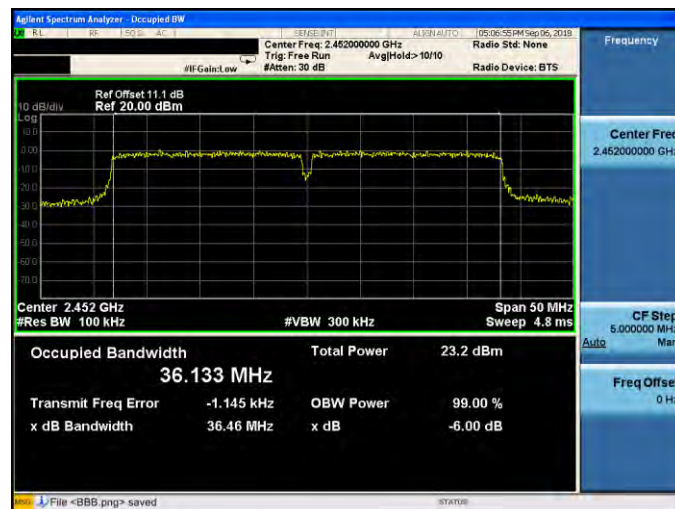
2422 MHz



2437 MHz



2452 MHz



Beamforming on

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

2412 MHz



2437 MHz

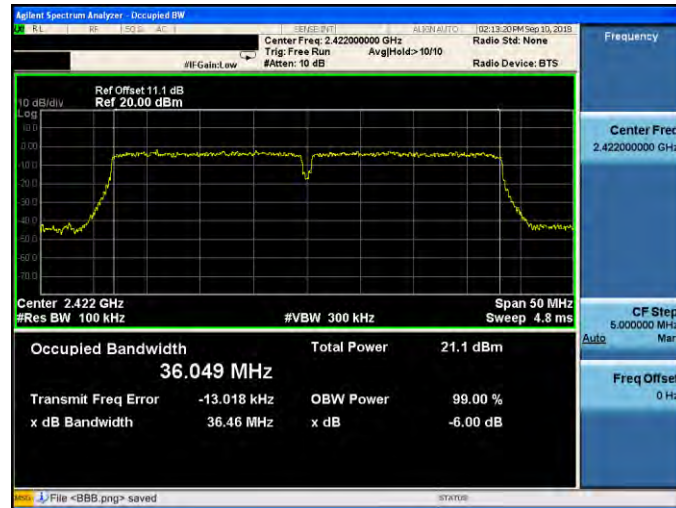


2462 MHz



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

2422 MHz



2437 MHz



2452 MHz



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

2412 MHz



2437 MHz

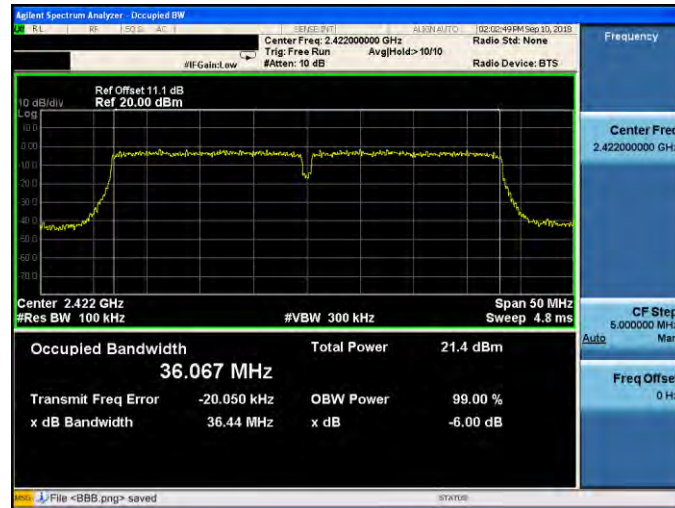


2462 MHz



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

2422 MHz



2437 MHz



2452 MHz



Maximum Power Density Measurement

Test Mode	Frequency (MHz)	Measurement (dBm/3 kHz)			Limit (dBm/3 kHz)
		ANT-0	ANT-1	ANT-0+1	
Mode 2	2412	-10.018	-9.463	-6.721	≤ 5.73
	2437	-8.870	-9.158	-6.001	≤ 5.73
	2462	-8.983	-9.178	-6.069	≤ 5.73
Mode 3	2412	-9.654	-10.767	-7.165	≤ 5.73
	2437	-8.167	-7.378	-4.744	≤ 5.73
	2462	-6.895	-7.237	-4.052	≤ 5.73
Mode 4	2412	-8.150	-8.939	-5.516	≤ 5.73
	2437	-6.887	-6.792	-3.829	≤ 5.73
	2462	-6.564	-6.893	-3.715	≤ 5.73
Mode 5	2422	-10.911	-13.120	-8.866	≤ 5.73
	2437	-9.333	-12.026	-7.464	≤ 5.73
	2452	-11.010	-13.861	-9.195	≤ 5.73

Beamforming on

Test Mode	Frequency (MHz)	Measurement (dBm/3 kHz)			Limit (dBm/3 kHz)
		ANT-0	ANT-1	ANT-0+1	
Mode 4	2412	-10.524	-10.666	-7.584	≤ 5.73
	2437	-9.921	-9.748	-6.823	≤ 5.73
	2462	-10.557	-10.784	-7.659	≤ 5.73
Mode 5	2422	-14.944	-16.670	-12.712	≤ 5.73
	2437	-14.668	-16.413	-12.443	≤ 5.73
	2452	-15.828	-18.600	-13.986	≤ 5.73

Test Graphs

Mode 2: IEEE 802.11b Continuous TX mode_ANT-0

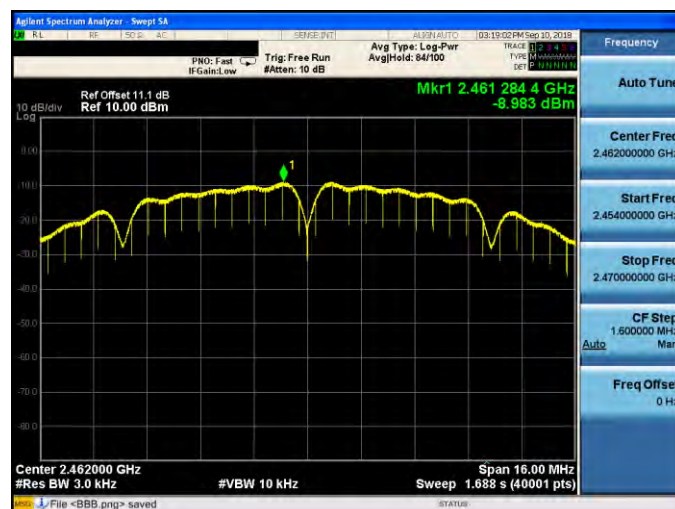
2412 MHz



2437 MHz



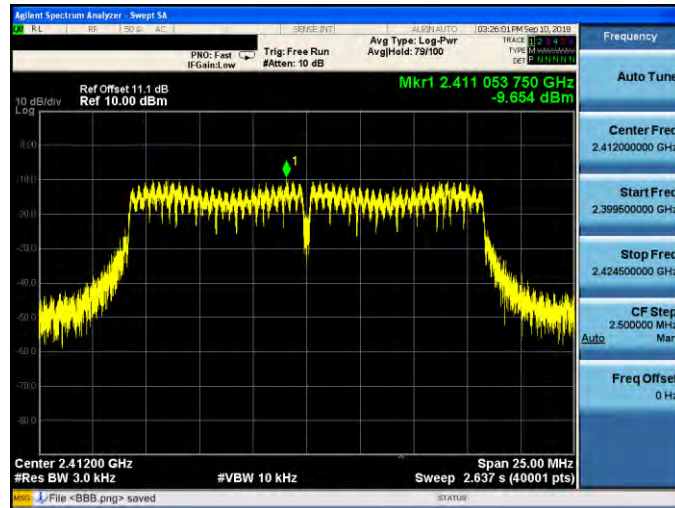
2462 MHz



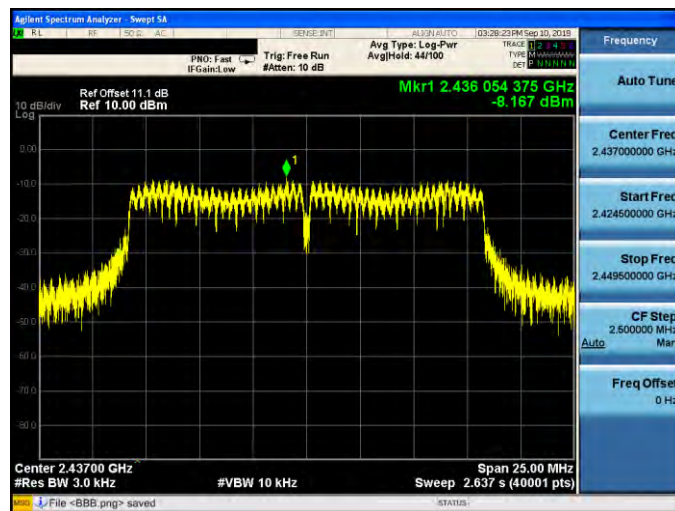


Mode 3: IEEE 802.11g Continuous TX mode_ANT-0

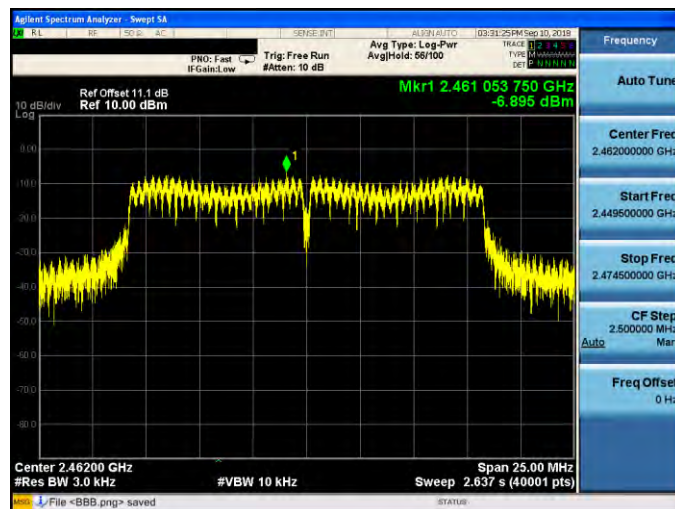
2412 MHz



2437 MHz



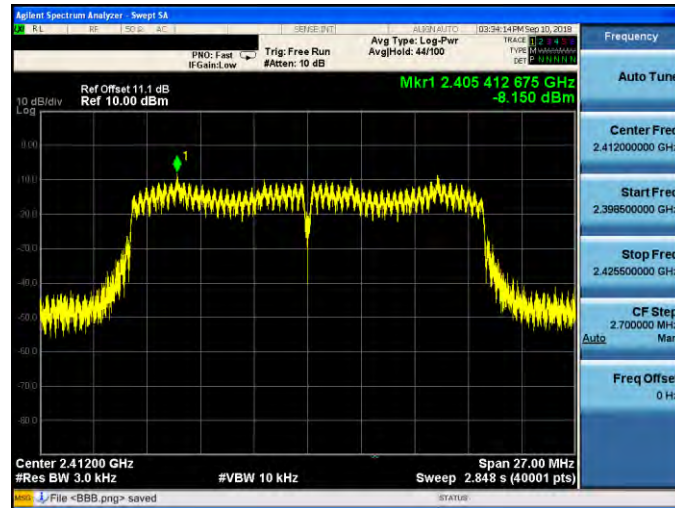
2462 MHz



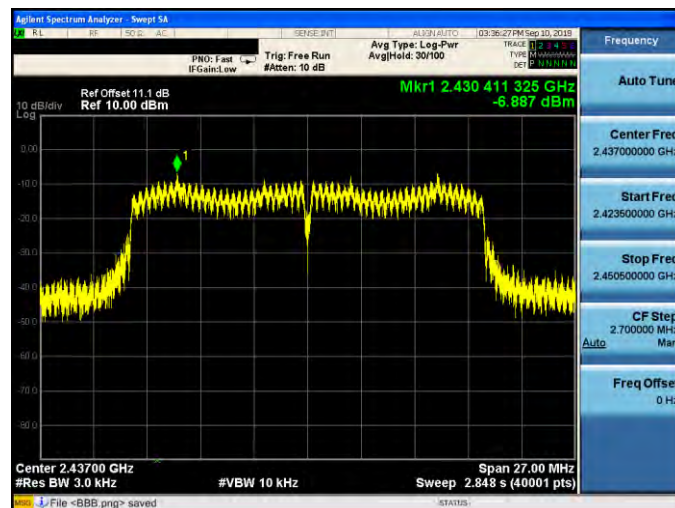


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-0

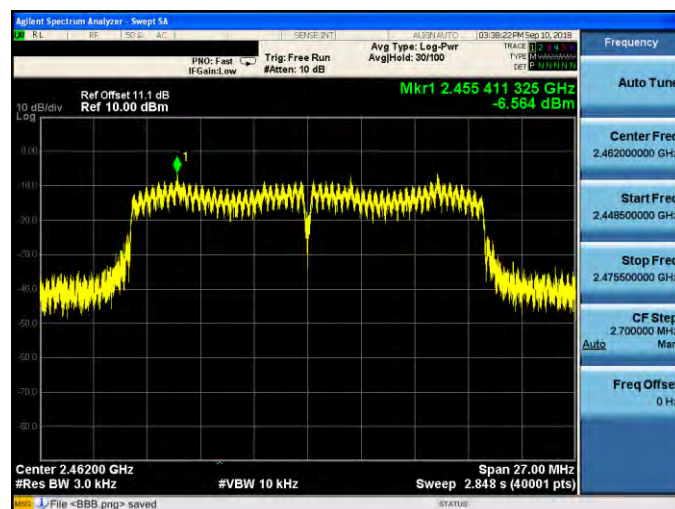
2412 MHz



2437 MHz

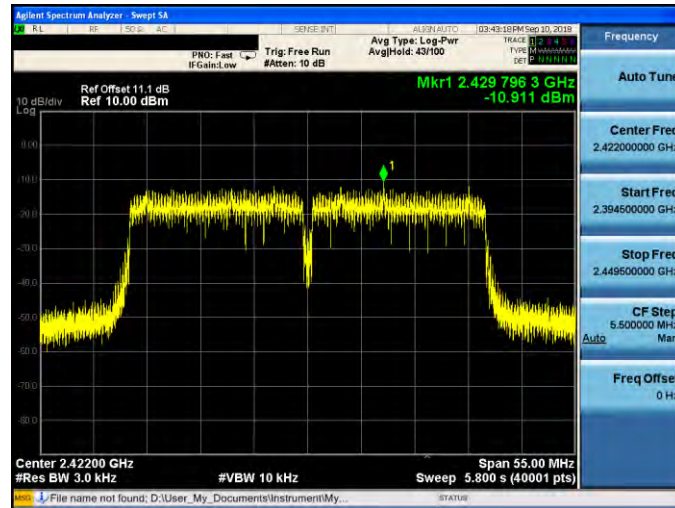


2462 MHz

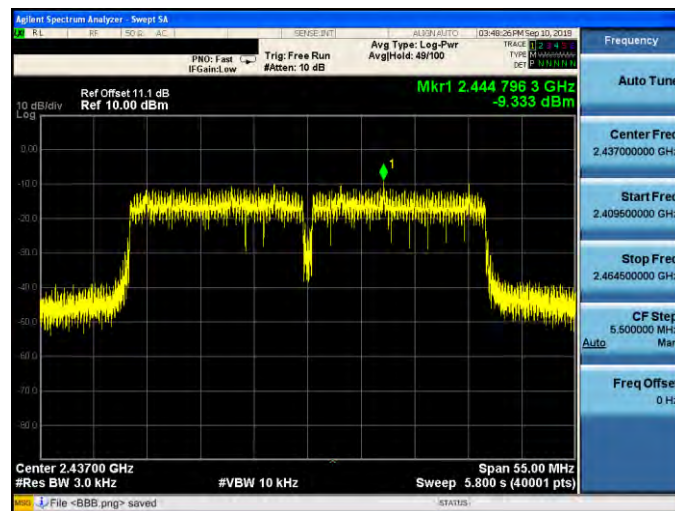


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

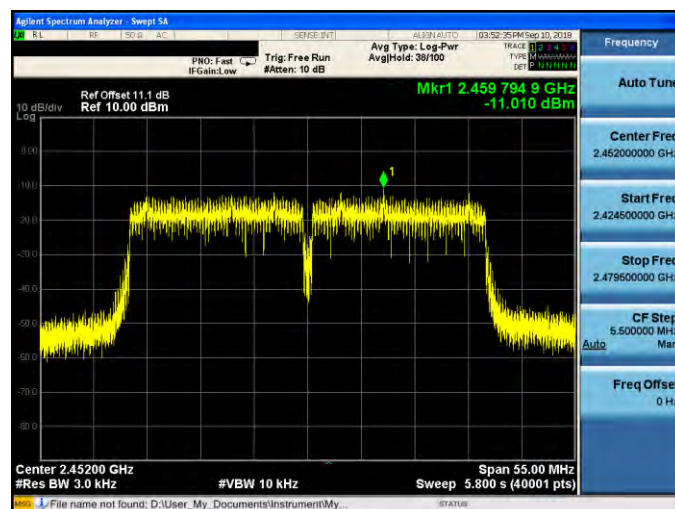
2422 MHz



2437 MHz



2452 MHz





Mode 2: IEEE 802.11b Continuous TX mode_ANT-1

2412 MHz



2437 MHz

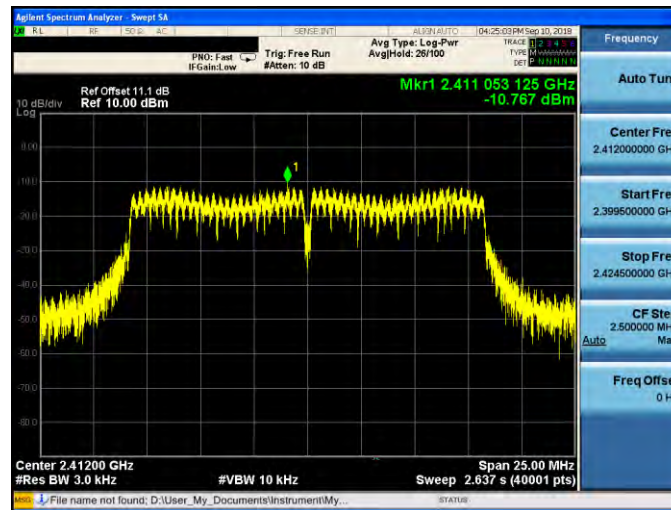


2462 MHz

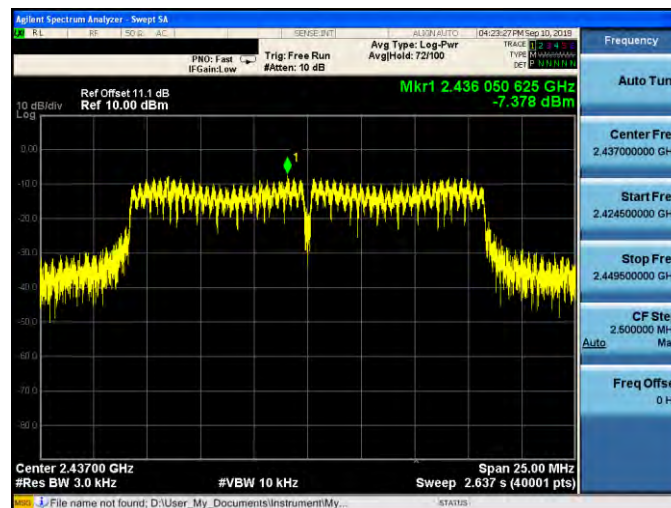


Mode 3: IEEE 802.11g Continuous TX mode_ANT-1

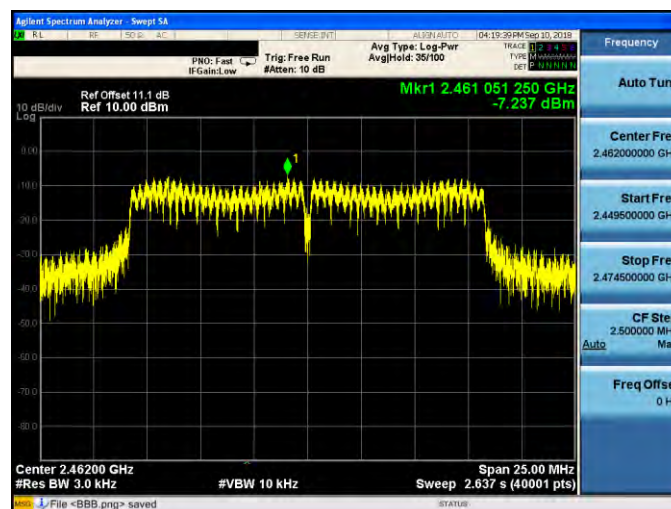
2412 MHz



2437 MHz

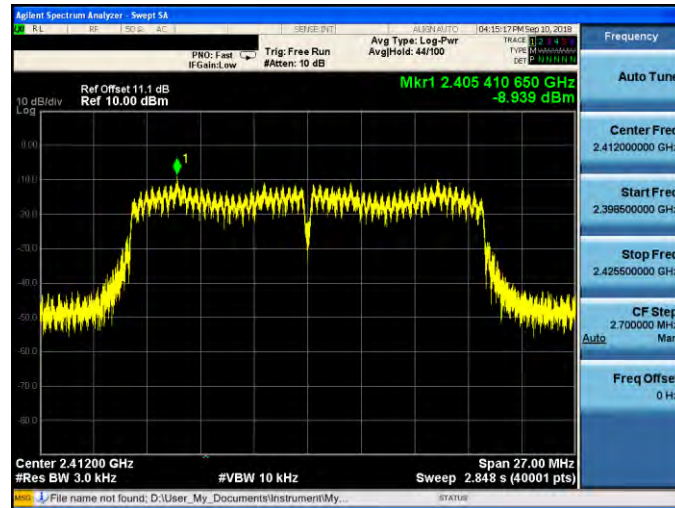


2462 MHz

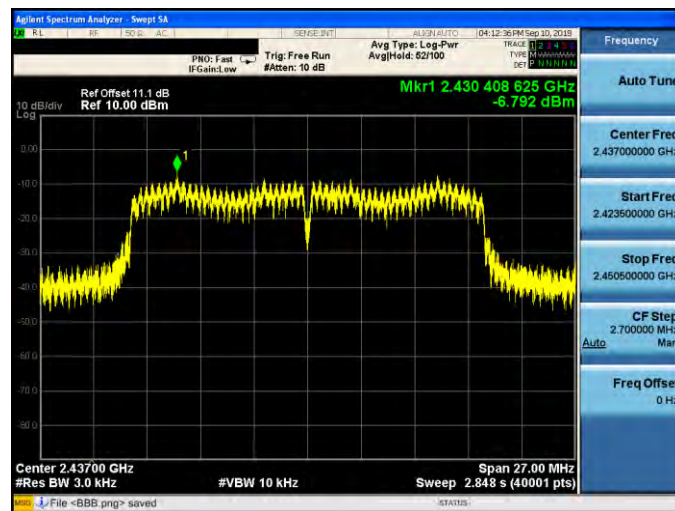


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-1

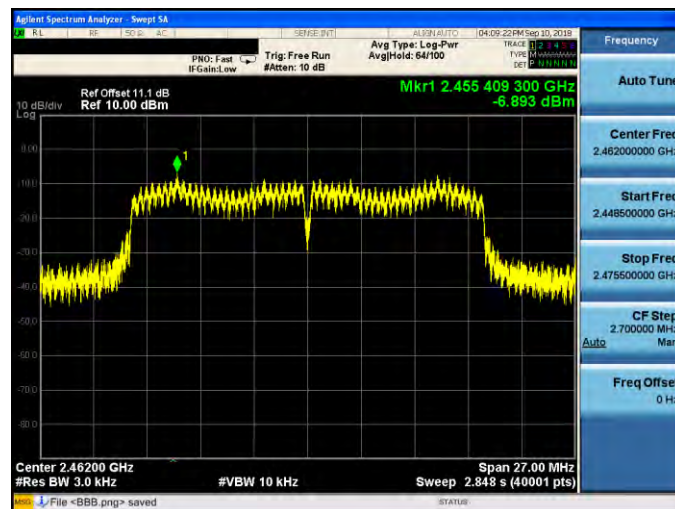
2412 MHz



2437 MHz



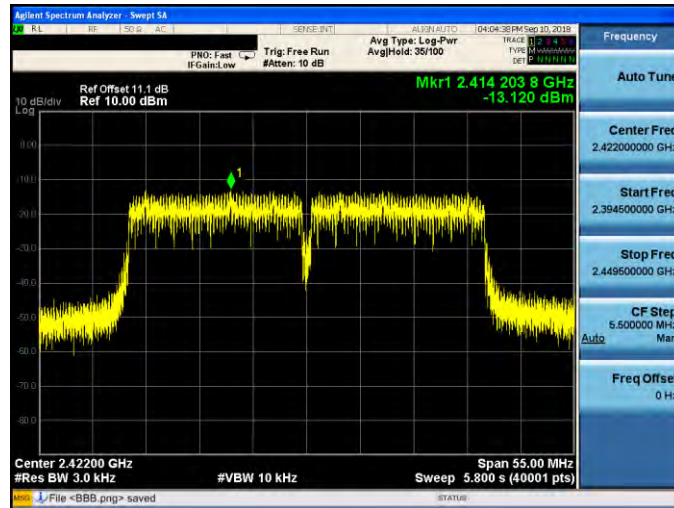
2462 MHz



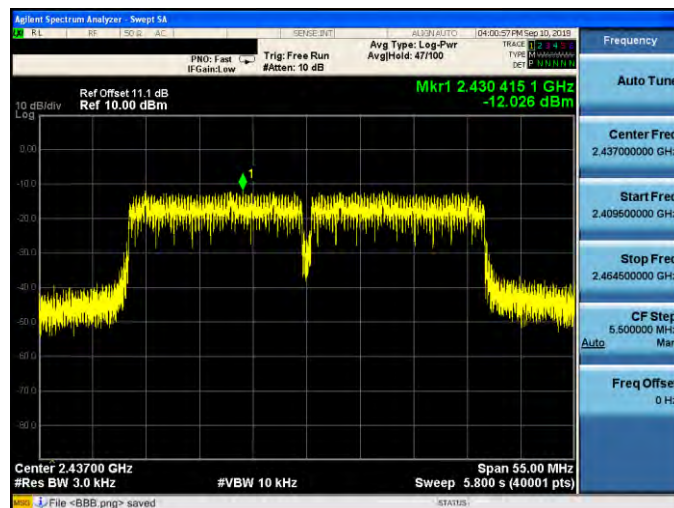


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-1

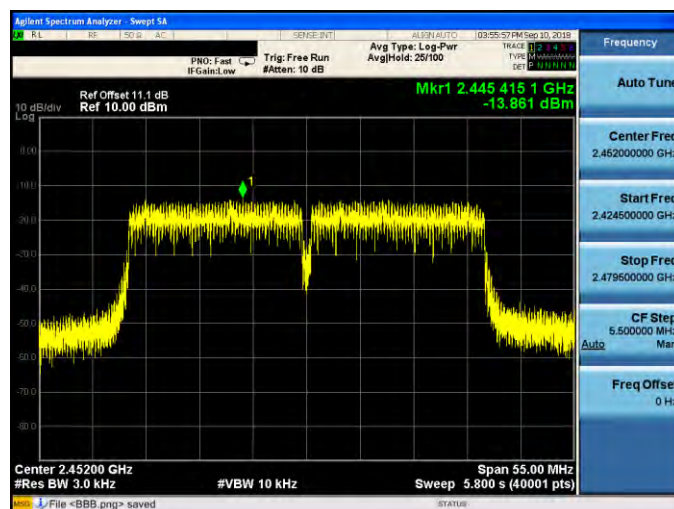
2422 MHz



2437 MHz



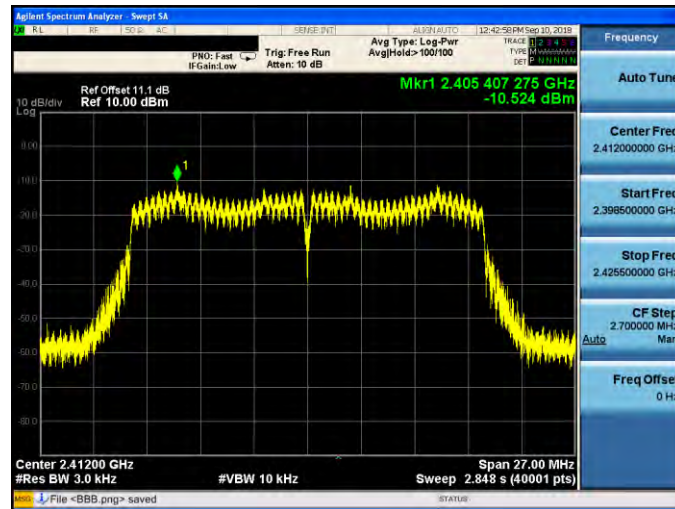
2452 MHz



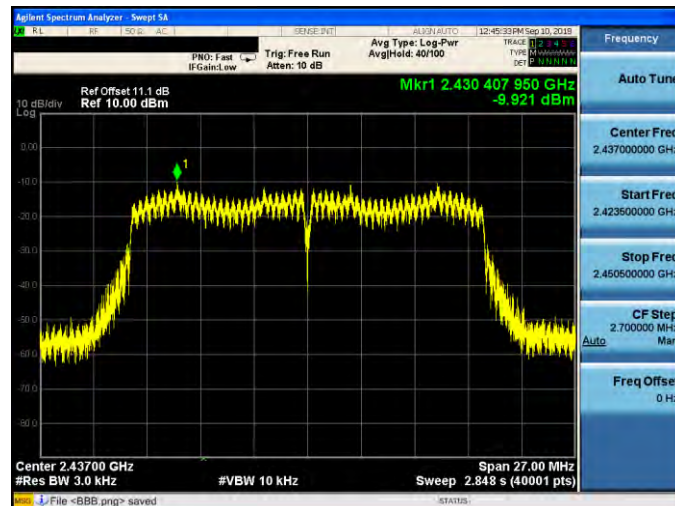
Beamforming on

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

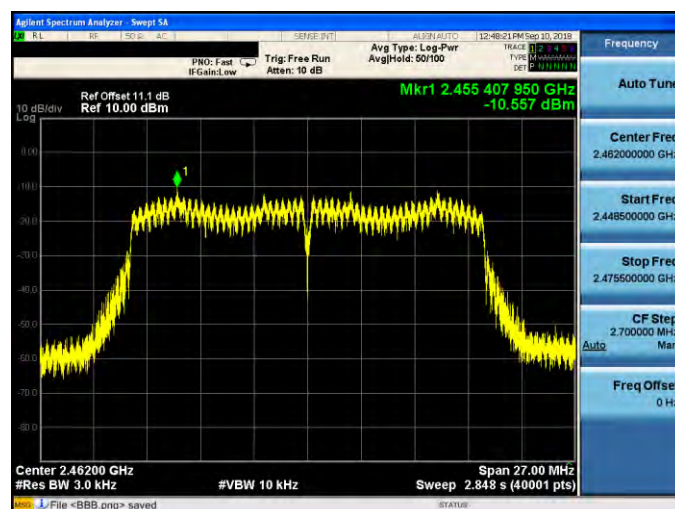
2412 MHz



2437 MHz



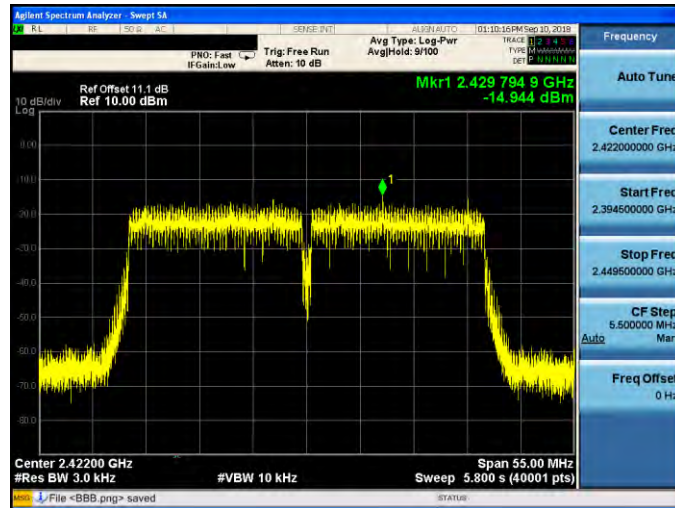
2462 MHz



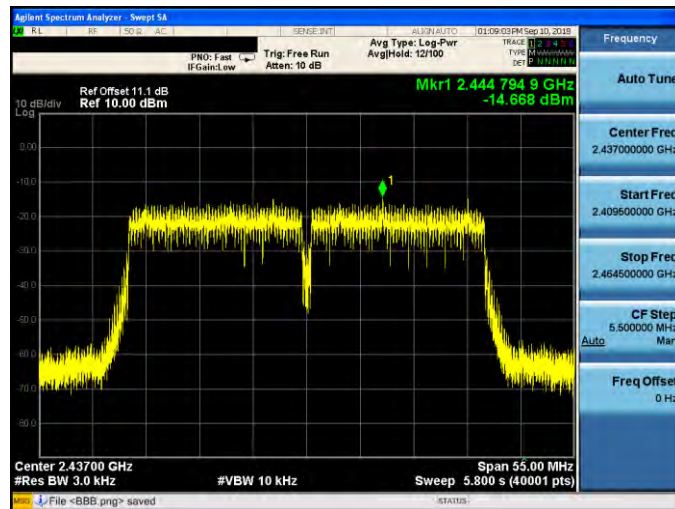


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

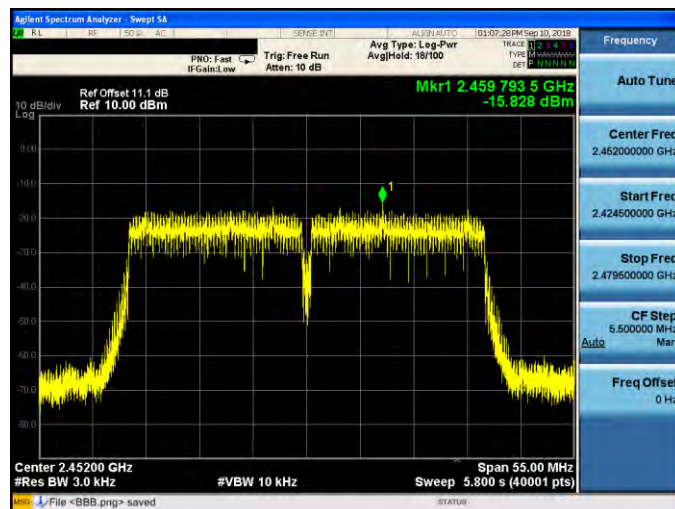
2422 MHz



2437 MHz

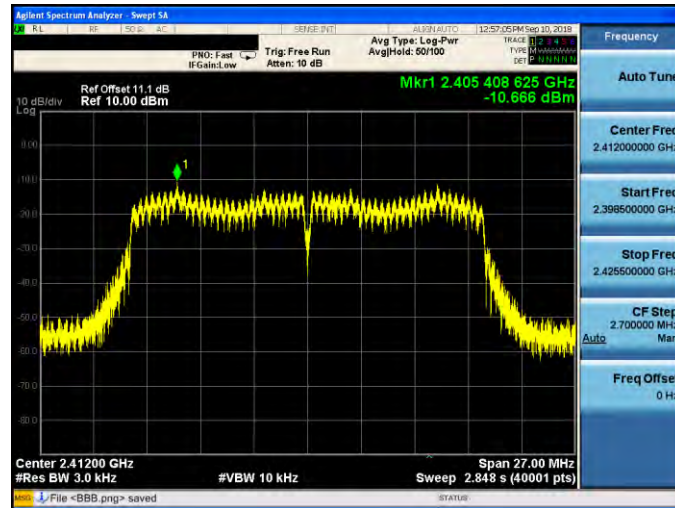


2452 MHz

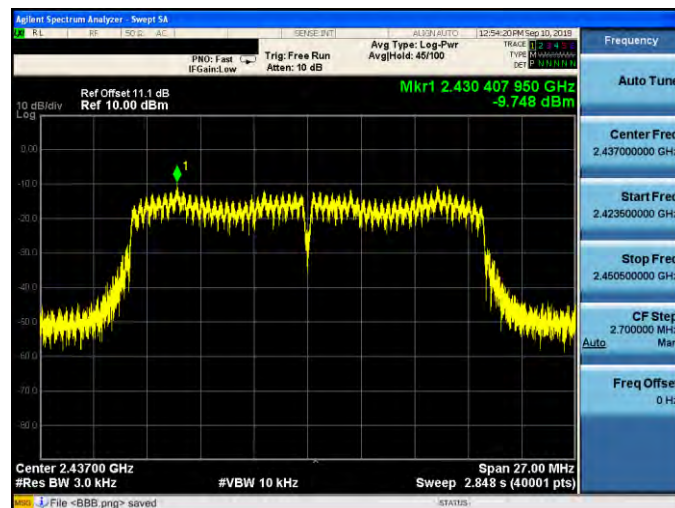


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-1

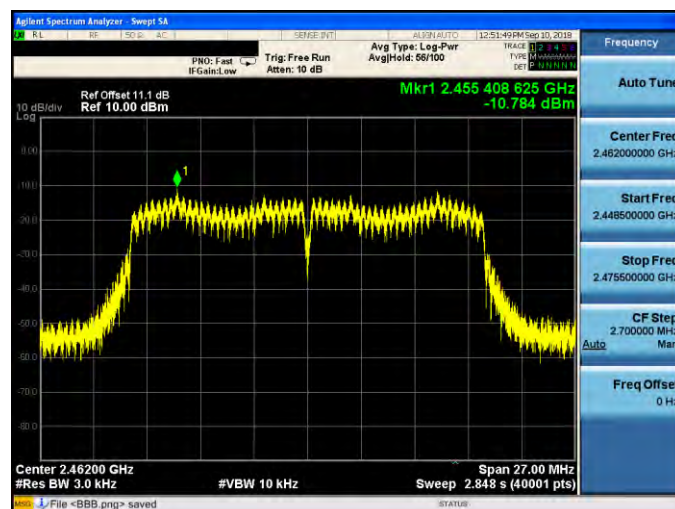
2412 MHz



2437 MHz

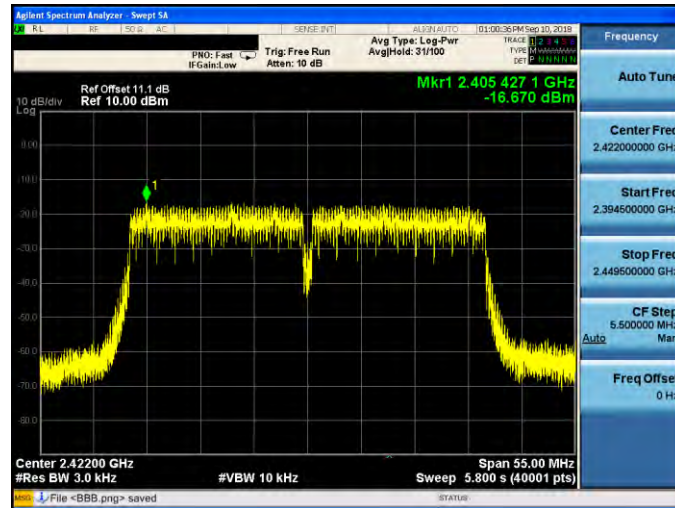


2462 MHz

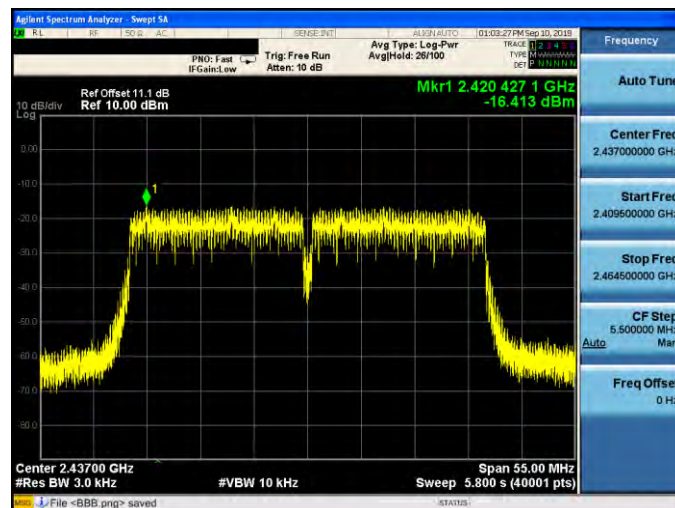


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-1

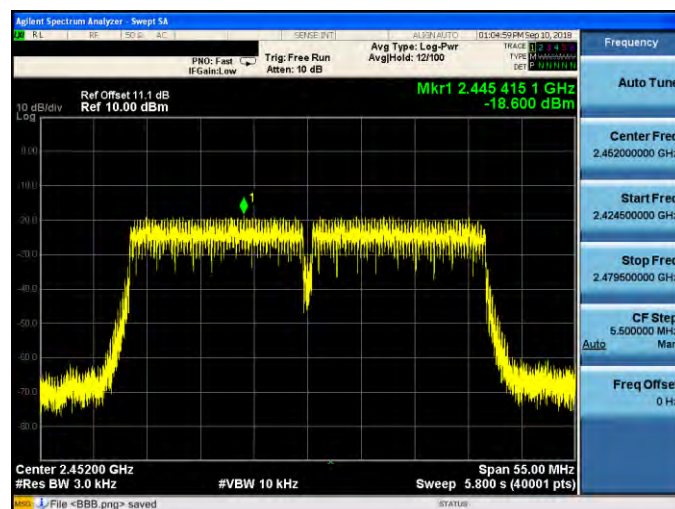
2422 MHz



2437 MHz



2452 MHz



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

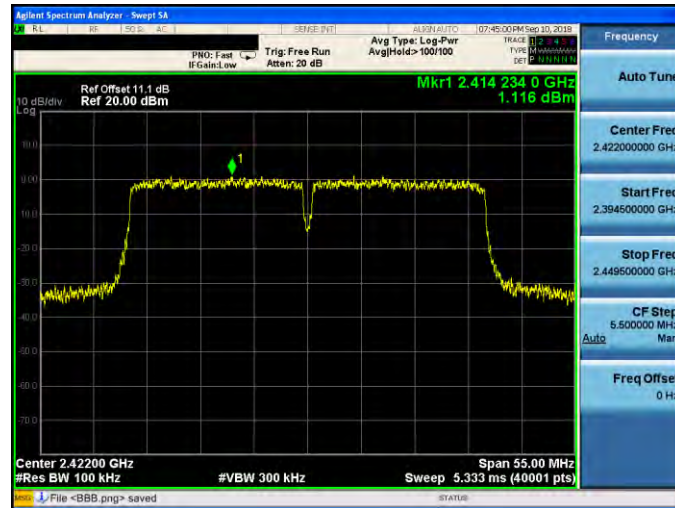


2462 MHz

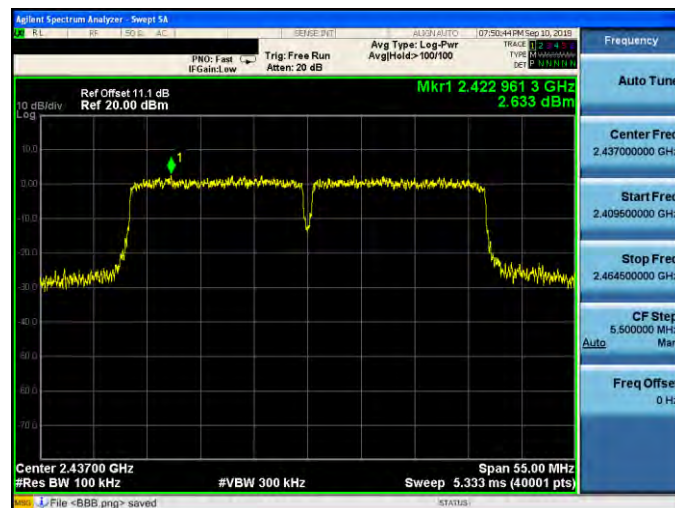


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

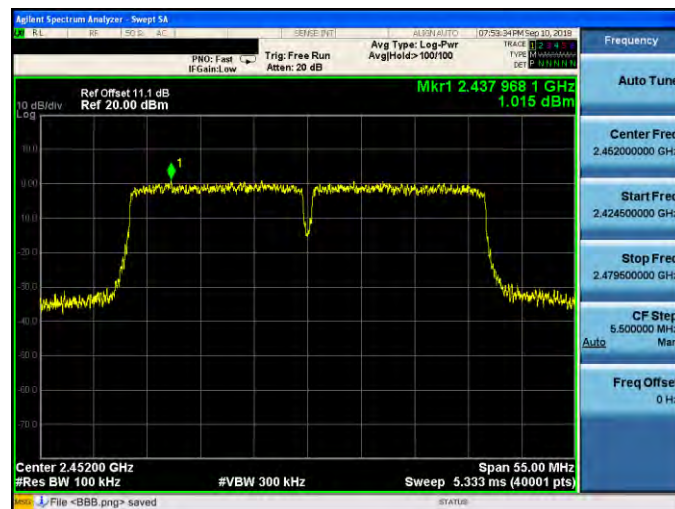
2422 MHz



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



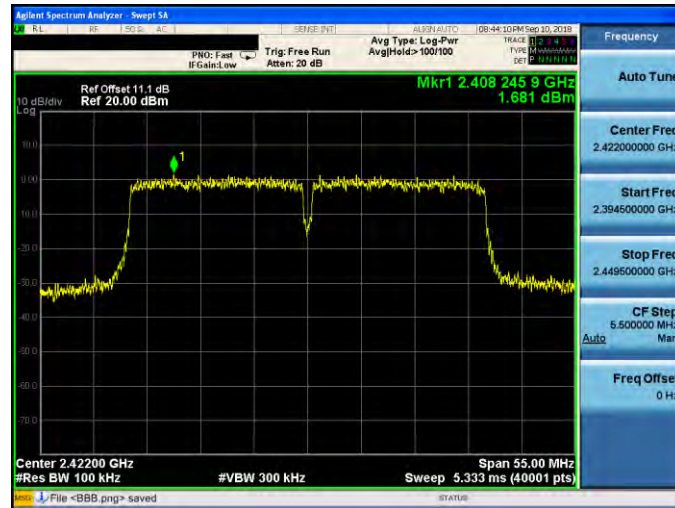
2462 MHz





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

2422 MHz



2437 MHz



2452 MHz

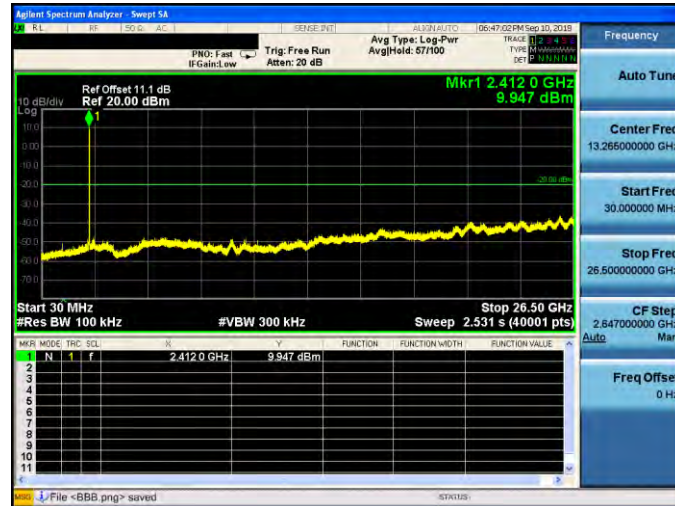




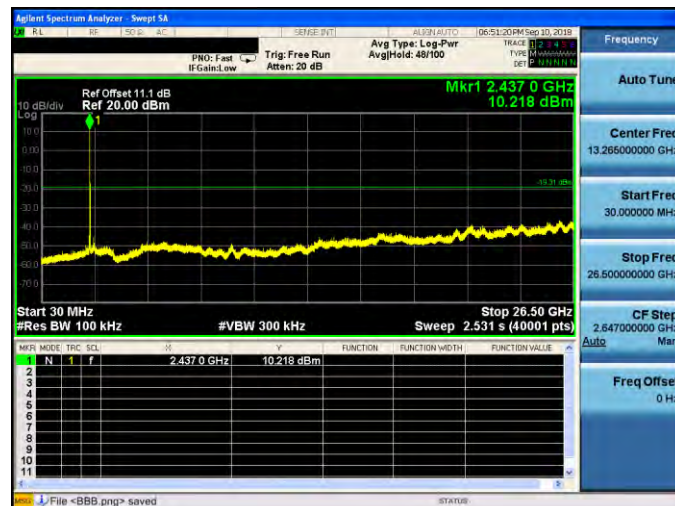
Out of Band Conducted Emissions

Mode 2: IEEE 802.11b Continuous TX mode_ANT-0

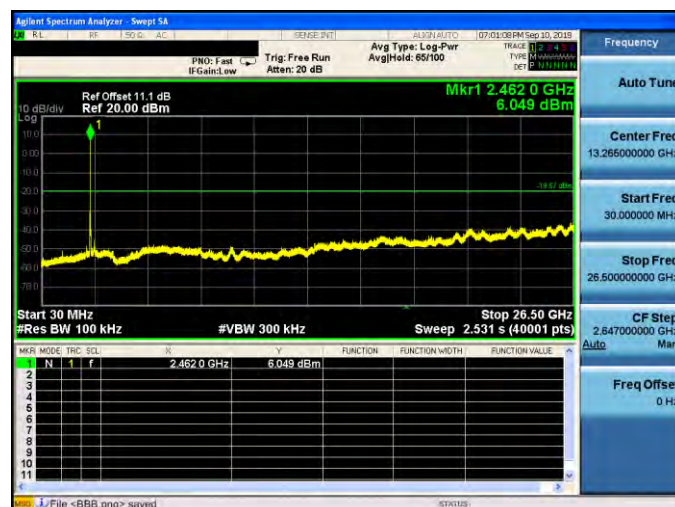
2412 MHz



2437 MHz



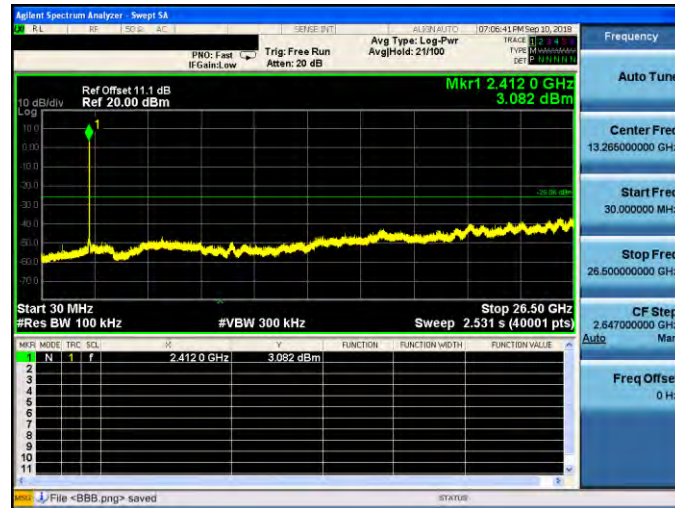
2462 MHz



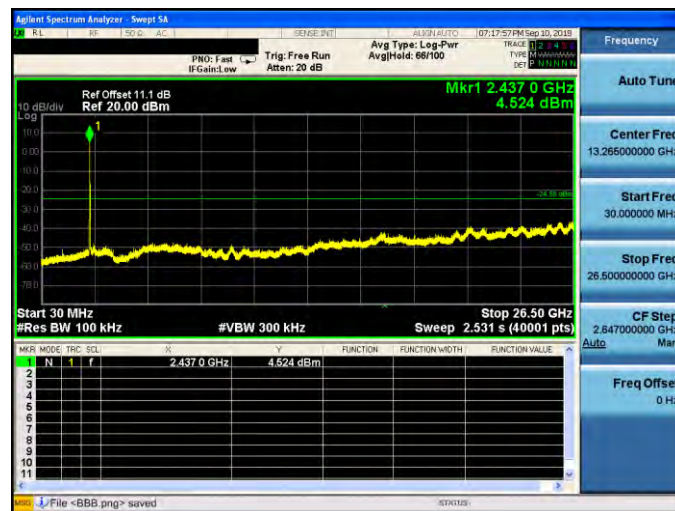


Mode 3: IEEE 802.11g Continuous TX mode_ANT-0

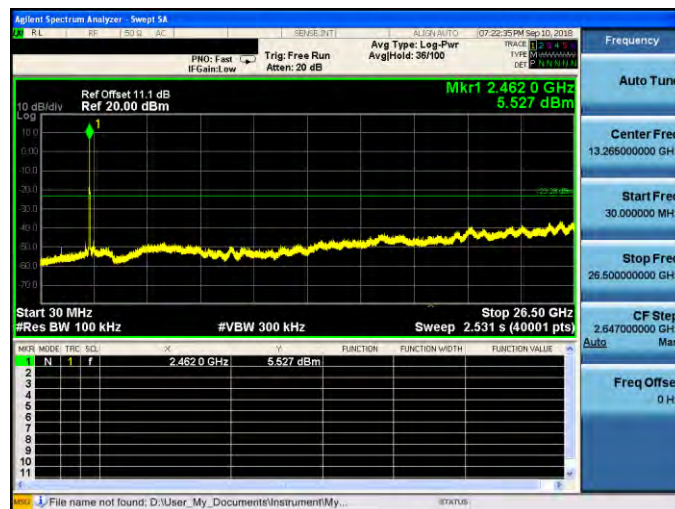
2412 MHz



2437 MHz



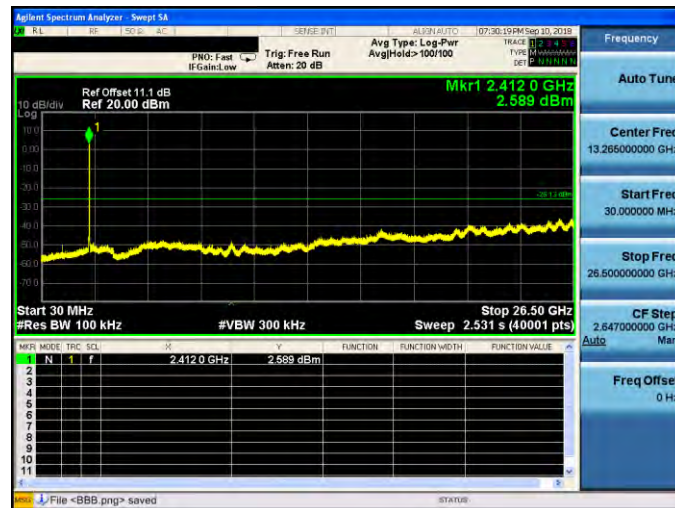
2462 MHz



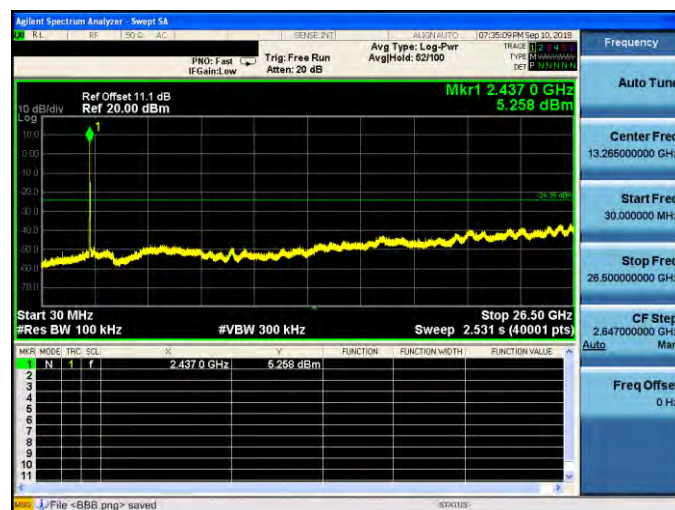


Mode 4: IEEE 802.11n 2.4 GHz 20 MHz Continuous TX mode _ANT-0

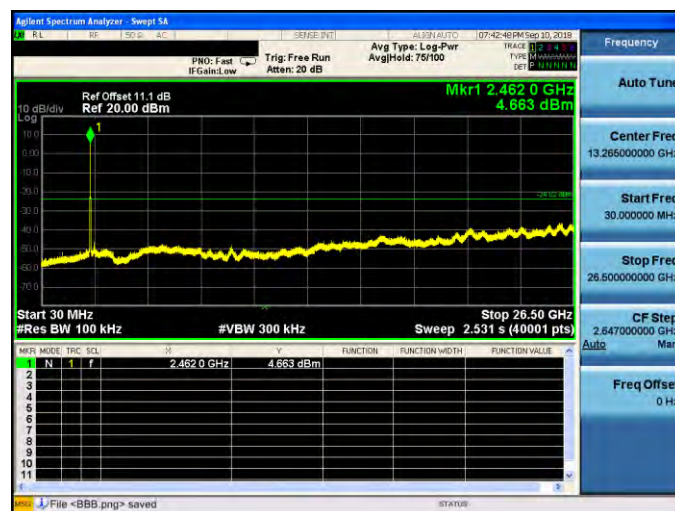
2412 MHz



2437 MHz



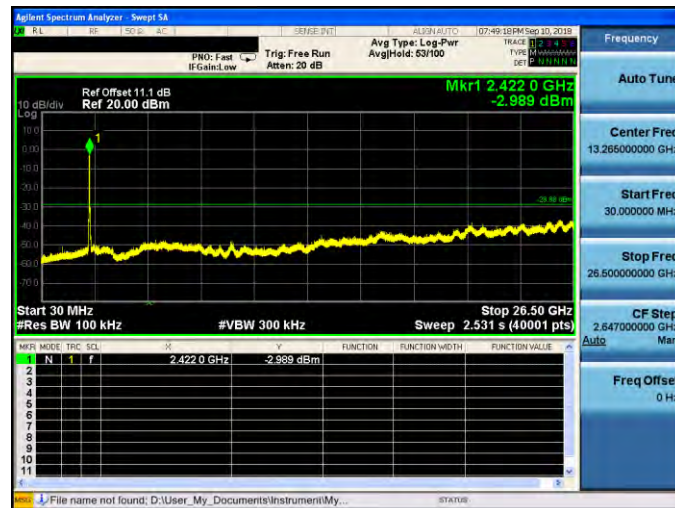
2462 MHz



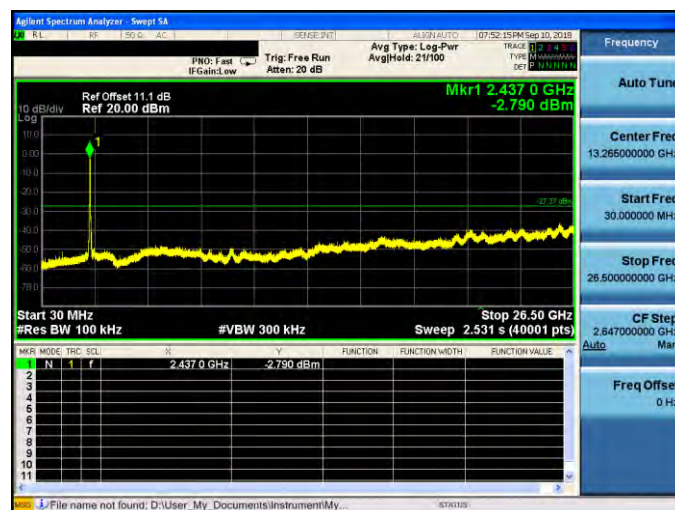


Mode 5: IEEE 802.11n 2.4 GHz 40 MHz Continuous TX mode _ANT-0

2422 MHz



2437 MHz



2452 MHz

