FCC Part 15C
Measurement and Test Report

For

JDiag Electronics Technology Co.,Ltd

FCC ID:2BCYU-M200

FCC Rule(s):	FCC Part 15C
Product Description:	Motorcycle Tester
Tested Model:	M200
Report No.:	BSL230906020001RF
Tested Date:	Sep.16~Oct.15, 2023
Issued Date:	Oct.16, 2023
Tested By:	Steven Wen/ Engineer
Reviewed By:	Lisa. Ji / EMC Manager
Approved & Authorized By:	Mike mo / PSQ Manager

steven wen

Lisa. Ji

Prepared By:

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	JDiag Electronics Technology Co.,Ltd
Address of applicant:	Floor3,building B2,zone B.Jindida Science Park,Langkou Community,Dalang Street,Longhua District,Shenzhen,China
Manufacturer:	JDiag Electronics Technology Co.,Ltd
Address of manufacturer:	Floor3,building B2,zone B.Jindida Science Park,Langkou Community,Dalang Street,Longhua District,Shenzhen,China

General Description of EUT	
Product Name:	Motorcycle Tester
Trade Name:	JDiag
Model No.:	M200,M200PRO,M300,M300PRO,M400,M400PRO, M500,M500PRO,M600,M600PRO
Rated Voltage:	DC 5V by USB
Adapter information:	N/A

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20)
RF Output Power:	9.61dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 72.2Mbps
Quantity of Channels:	11 for 802.11b/g/n(HT20)
Channel Separation:	5MHz
Type of Antenna:	PCB Antenna
Antenna Gain:	-1dBi

1.2 Test Standards

The following report is prepared on behalf of the MAD Gaze (Shen Zhen) Limited in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v05 for digital transmission systems shall be performed also.

1.4 Test Facility

BSL Testing Co.,LTD.
1/F, Building B, Xinshidai GR Park, Shiyan Street, Bao'an District, Shenzhen, ShiyanStreet, Bao'an District, Shenzhen,Guangdong,518052,People’s Republic of China

FCC Test Firm Registration Number: 562200
Designation Number: CN1338

Tel: 400-882-9628
Fax: 86-755-26508703

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2437MHz, 2462MHz
TM2	802.11g	2412MHz, 2437MHz, 2462MHz
TM3	802.11n-HT20	2412MHz, 2437MHz, 2462MHz
Note: All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report.		

Accessories Equipment List and Details			
Description	**Manufacturer**	**Model No.**	**Serial Number**
Accessories Cable List and Details			
Cable Description	**Length (m)**	**Shielded/Unshielded**	**With Core/Without Core**
USB Line	1m	Unshielded	Without Ferrite
EUT Cable List and Details			
Cable Description	**Length (m)**	**Shielded/Unshielded**	**With Core/Without Core**

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Adapter	XYX	P2003	N/A

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	±2.88dB
Transmitter Spurious Emissions	Radiated	±5.1dB

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
Communication Tester	Rohde & Schwarz	CMW500	100358	2022-11-08	2023-11-07
Spectrum Analyzer	R&S	FSP40	100550	2022-11-08	2023-11-07
Test Receiver	R&S	ESCI7	US47140102	2022-11-08	2023-11-07
Signal Generator	HP	83630B	3844A01028	2022-11-08	2023-11-07
Test Receiver	R&S	ESPI-3	100180	2022-11-08	2023-11-07
Amplifier	Agilent	8449B	4035A00116	2022-11-08	2023-11-07
Amplifier	HP	8447E	2945A02770	2022-11-08	2023-11-07
Signal Generator	IFR	2023A	202307/242	2022-11-08	2023-11-07
Broadband Antenna	SCHAFFNER	2774	2774	2022-11-08	2023-11-07
Biconical and log periodic antennas	ELECTRO-METRICS	EM-6917B-1	171	2022-11-08	2023-11-07
Horn Antenna	R&S	HF906	100253	2022-11-08	2023-11-07
Horn Antenna	EM	EM-6961	6462	2022-11-08	2023-11-07
LISN	R&S	ESH3-Z5	100196	2022-11-08	2023-11-07
LISN	COM-POWER	LI-115	02027	2022-11-08	2023-11-07
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	2022-11-08	2023-11-07
Horn Antenna	A-INFOMW	LB-180400KF	BSL088	2022-11-08	2023-11-07
20dB Attenuator	ICPROBING	IATS1	BSL1003	2022-11-08	2023-11-07
POWER DIVIDER	Mini-circuits	PD-2SF-0010	N/A	2022-11-08	2023-11-07
POWER DIVIDER	Mini-circuits	PD-2SF-0010	N/A	2022-11-08	2023-11-07
Loop Antenna	Schwarz beck	FMZB 1516	9773	2022-11-08	2023-11-07
MWRF Power Meter Test system	MW	MW100-RPCB	N/A	2022-11-08	2023-11-07
Power Meter	Schwarz beck	FMZB 1516	9773	2022-11-08	2023-11-07

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	PASS
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	PASS
§15.205	Restricted Band of Operation	PASS
§ 15.207(a)	Conducted Emission	PASS
§ 15.247(e)	Power Spectral Density	PASS
§ 15.247(a)(2)	6 dB Bandwidth	PASS
§ 15.247(b)(3)	RF Output Power	PASS
§ 15.209(a)	Radiated Emission	PASS
§ 15.247(d)	Band Edge (Out of Band Emissions)	PASS

Note: PASS: applicable, N/A: not applicable.

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.2 Evaluation Information

This product has a PCB antenna(-1dBi), fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

According to 15.247(a)(1)(iii), 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.

5.2 Test Procedure

According to the KDB 558074 D01 v05, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz. .
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.3 Environmental Conditions

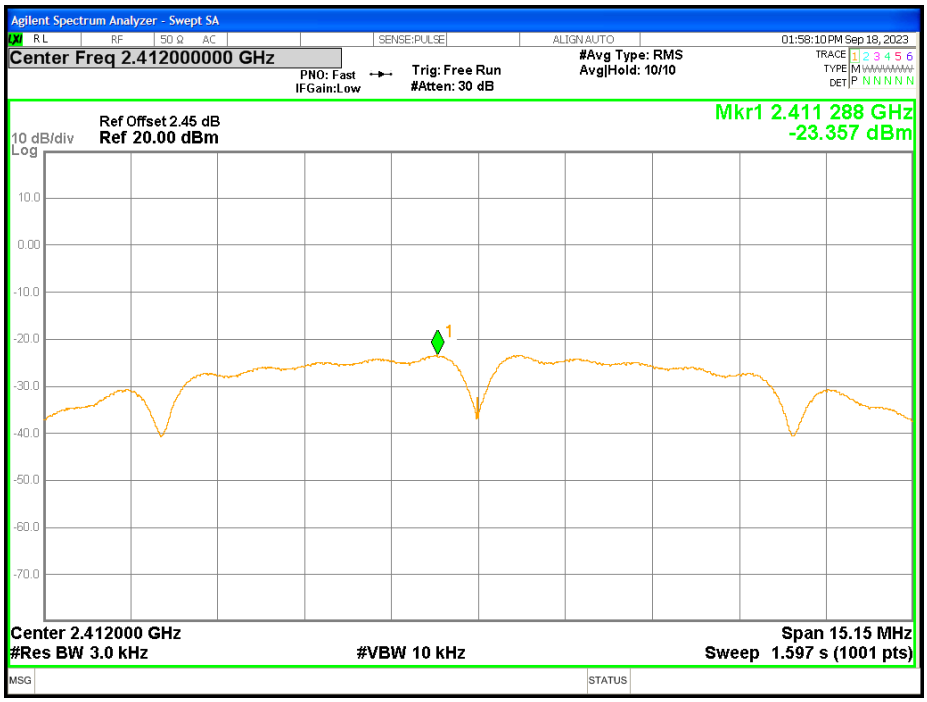
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

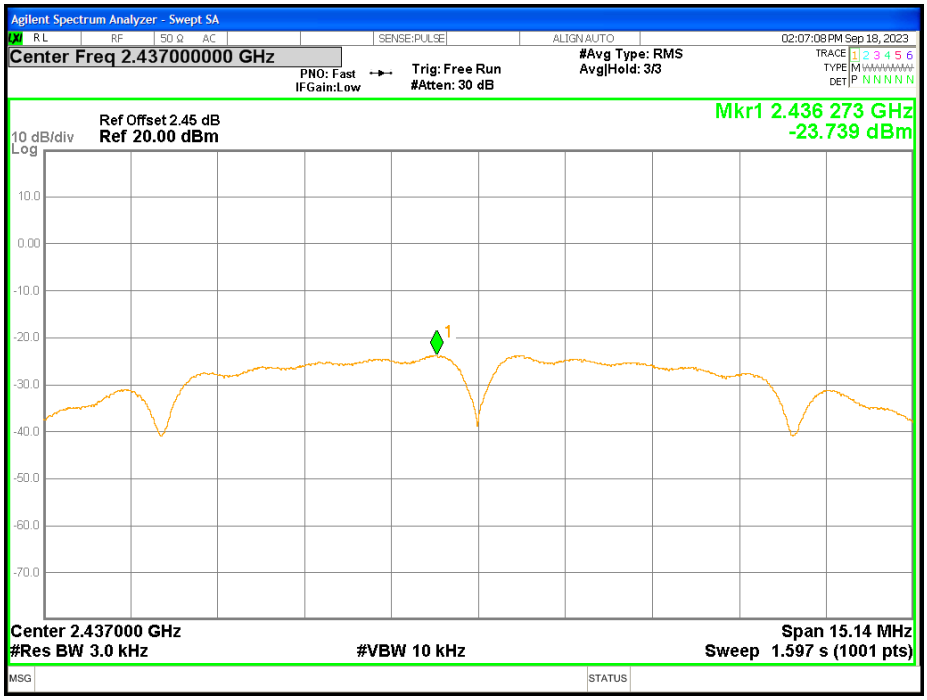
Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3kHz)	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	b	2412	Ant1	-23.36	0	-23.36	8	Pass
NVNT	b	2437	Ant1	-23.74	0	-23.74	8	Pass
NVNT	b	2462	Ant1	-23.37	0	-23.37	8	Pass
NVNT	g	2412	Ant1	-21.75	0	-21.75	8	Pass
NVNT	g	2437	Ant1	-21.75	0	-21.75	8	Pass
NVNT	g	2462	Ant1	-22.46	0	-22.46	8	Pass
NVNT	n20	2412	Ant1	-20.59	0	-20.59	8	Pass
NVNT	n20	2437	Ant1	-20.53	0	-20.53	8	Pass
NVNT	n20	2462	Ant1	-20.19	0	-20.19	8	Pass

Please refer to the following test plots:

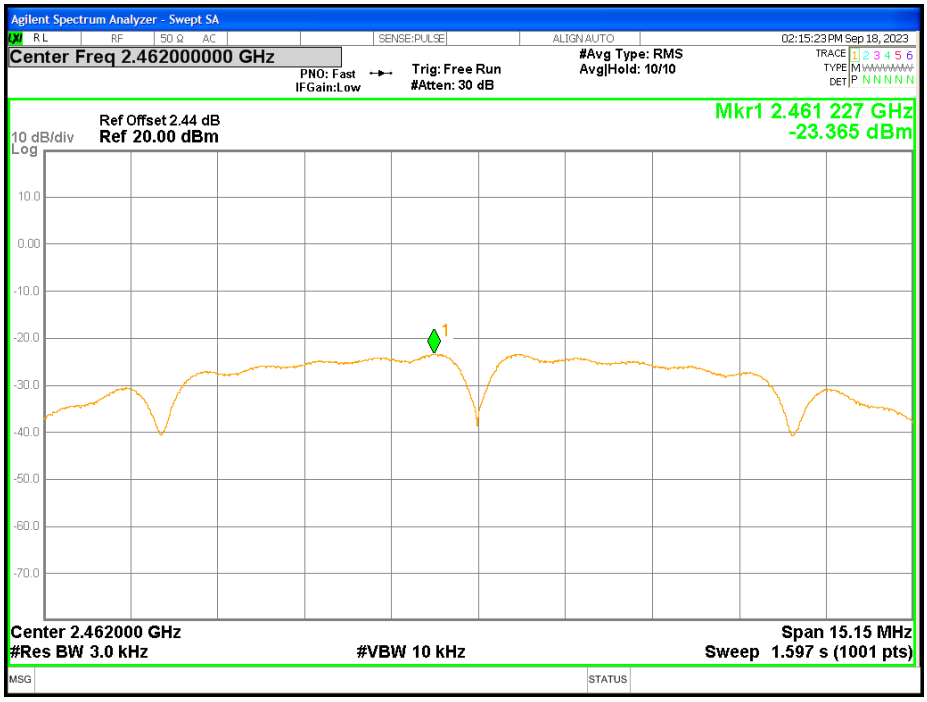
802.11b-Low Channel



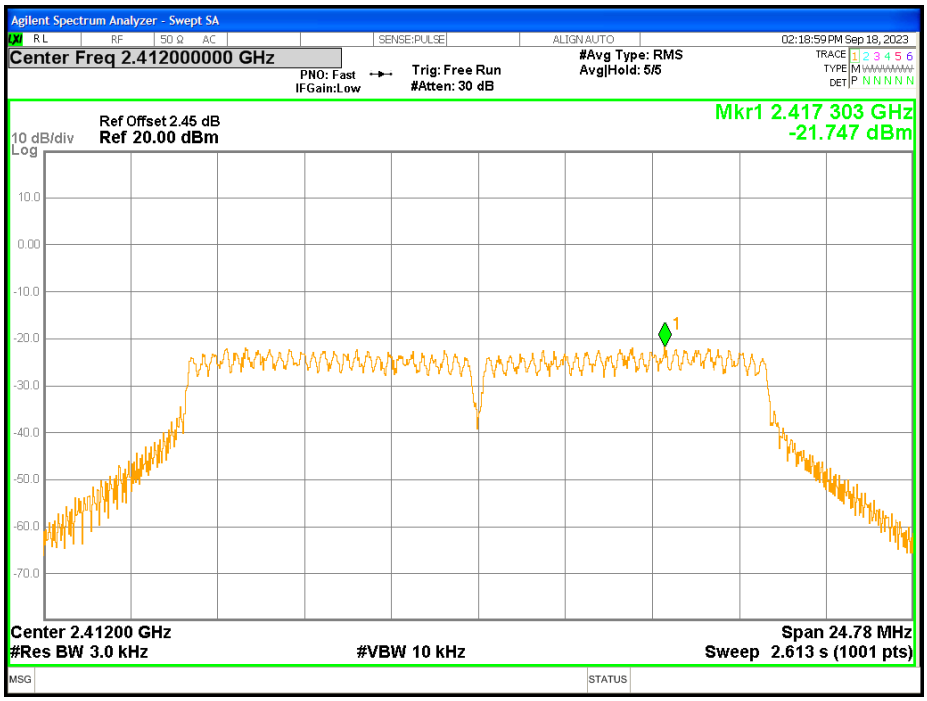
802.11b-Middle Channel



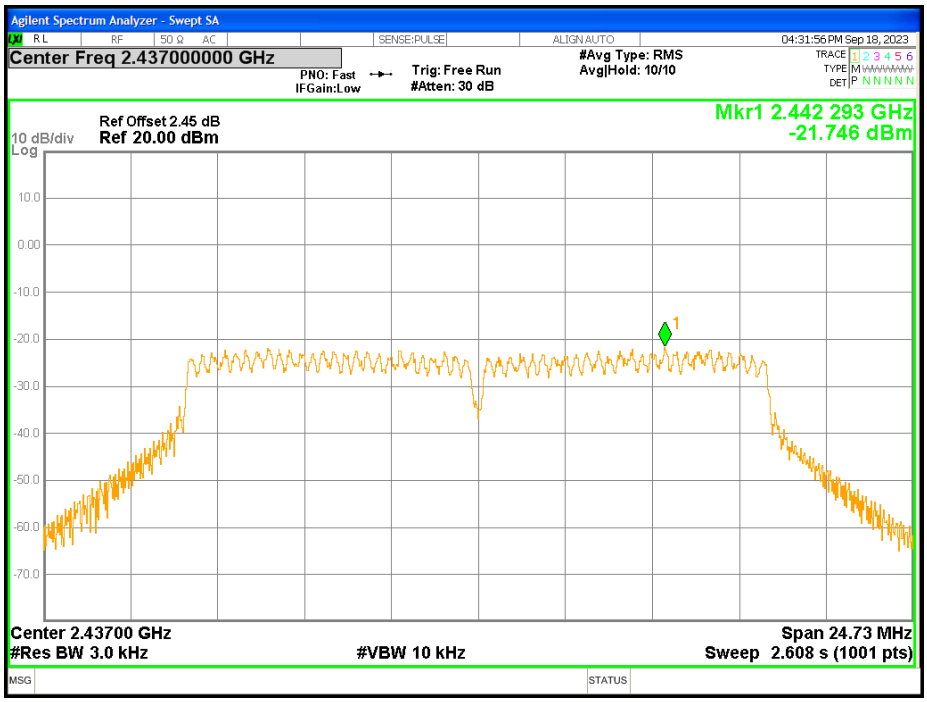
802.11b-High Channel



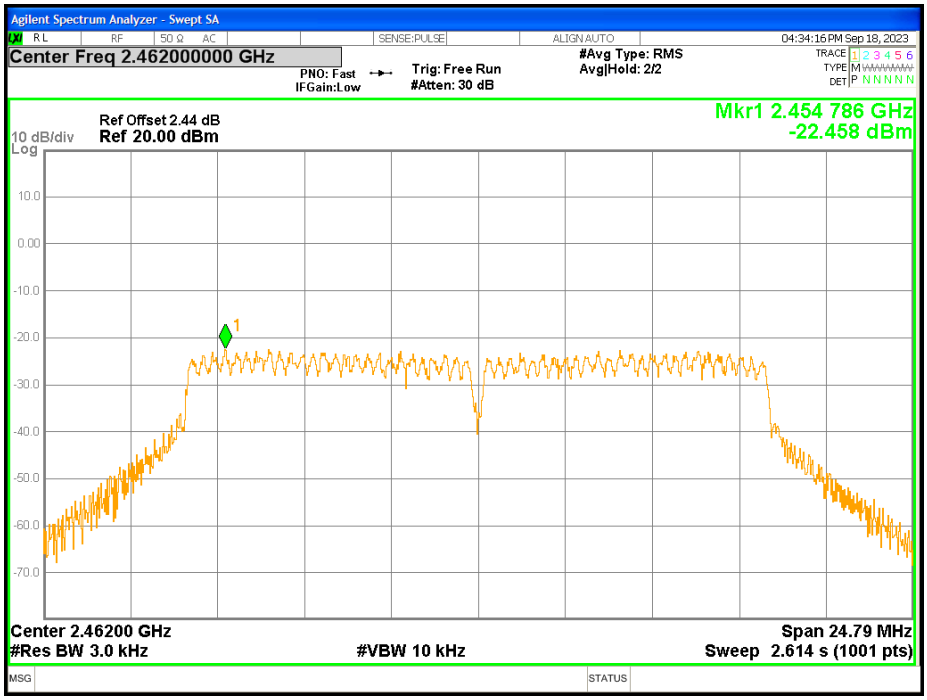
802.11g-Low Channel



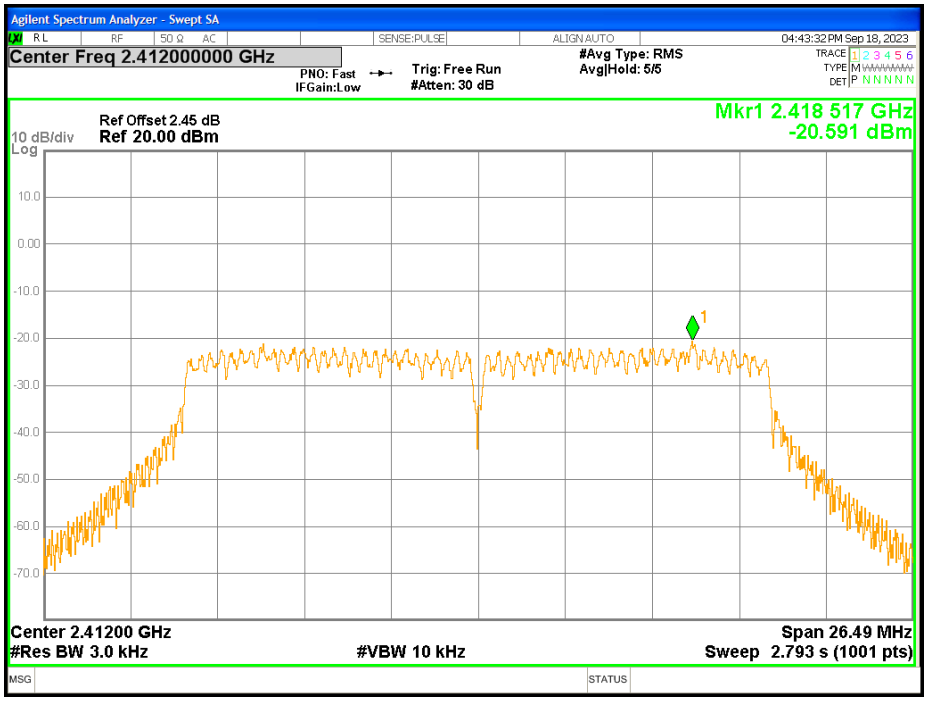
802.11g-Middle Channel



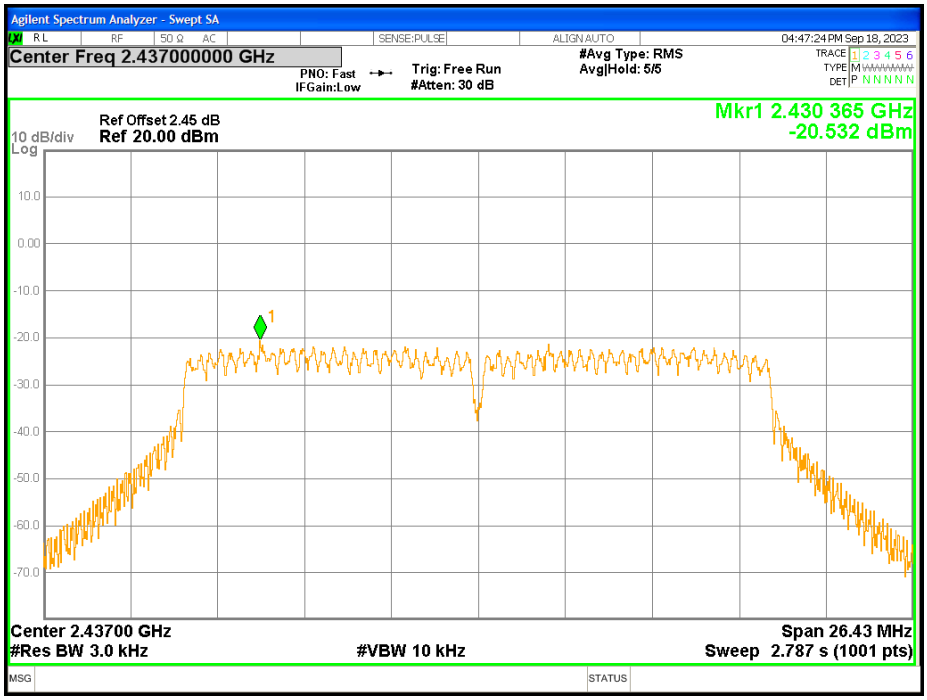
802.11g-High Channel



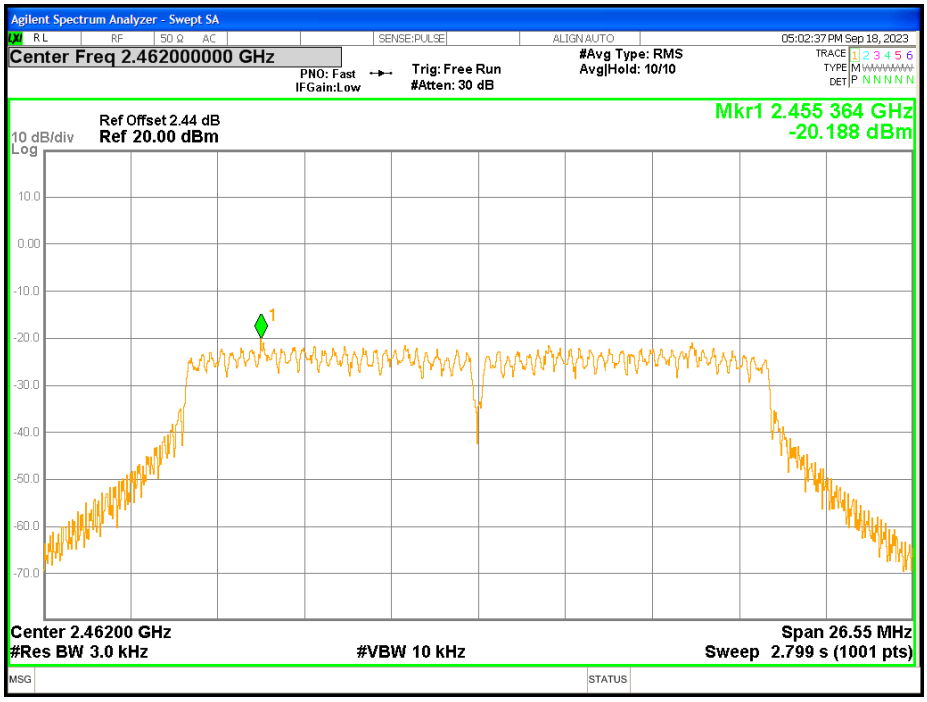
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



6. 6dB Bandwidth

6.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.2 Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Environmental Conditions

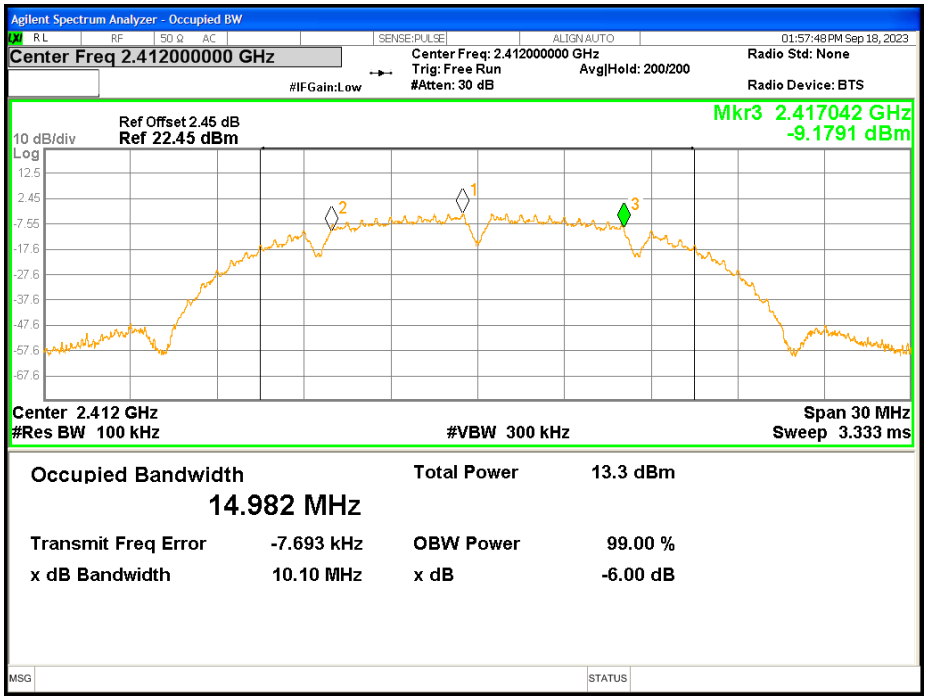
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

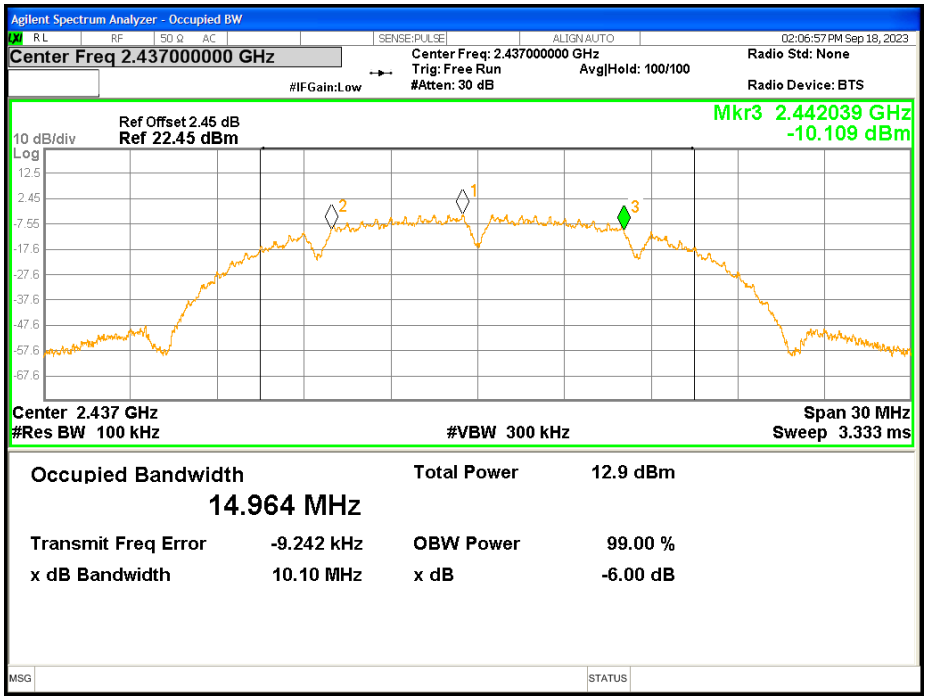
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant1	10.099	0.5	Pass
NVNT	b	2437	Ant1	10.096	0.5	Pass
NVNT	b	2462	Ant1	10.1	0.5	Pass
NVNT	g	2412	Ant1	16.521	0.5	Pass
NVNT	g	2437	Ant1	16.489	0.5	Pass
NVNT	g	2462	Ant1	16.526	0.5	Pass
NVNT	n20	2412	Ant1	17.661	0.5	Pass
NVNT	n20	2437	Ant1	17.623	0.5	Pass
NVNT	n20	2462	Ant1	17.697	0.5	Pass

Please refer to the following test plots:

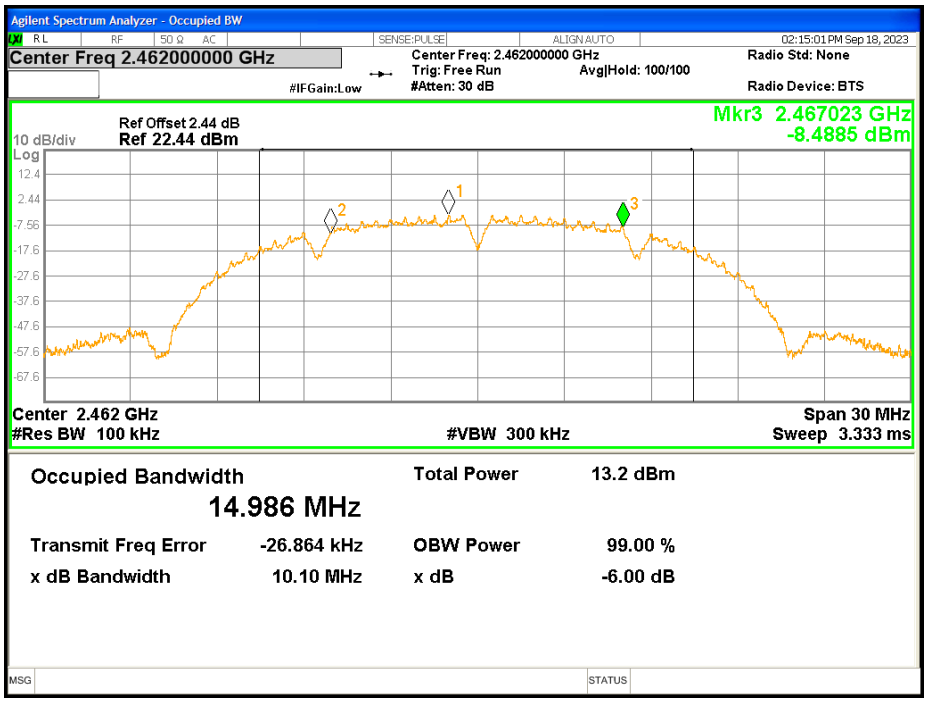
802.11b-Low Channel



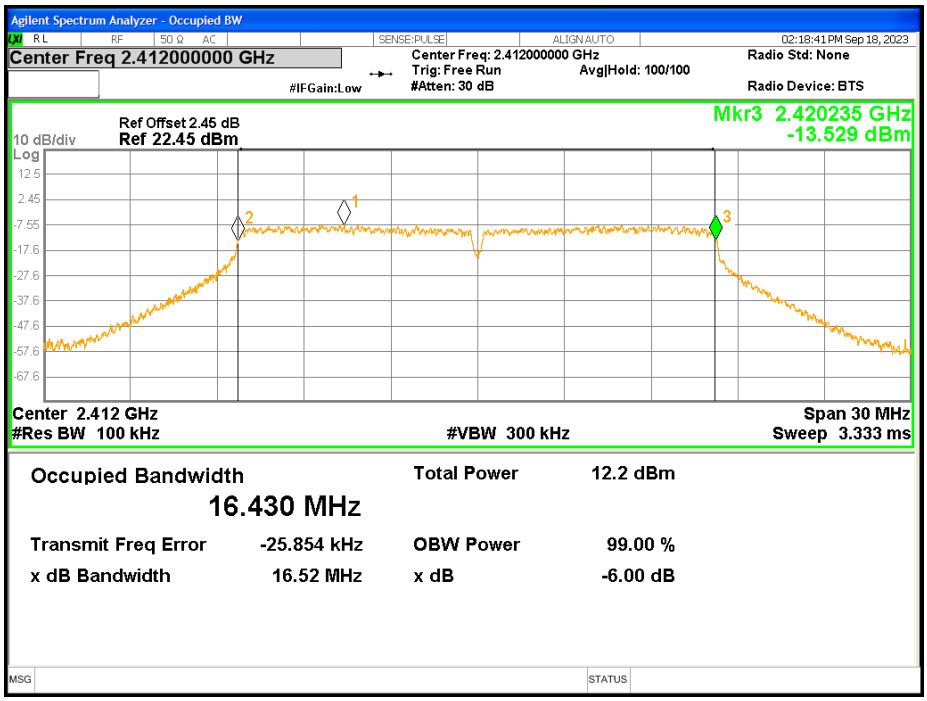
802.11b-Middle Channel



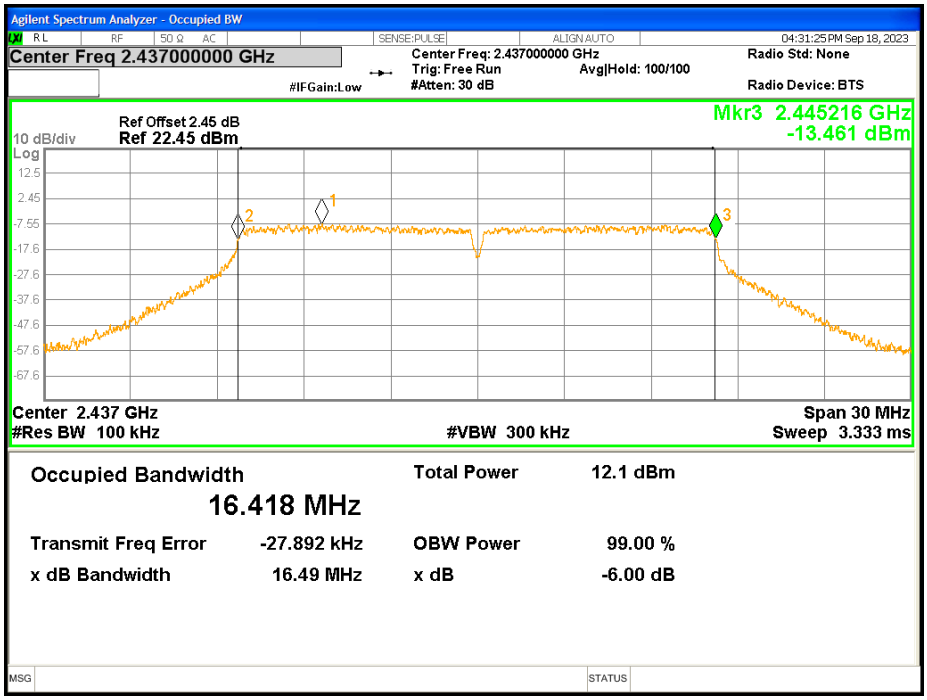
802.11b-High Channel



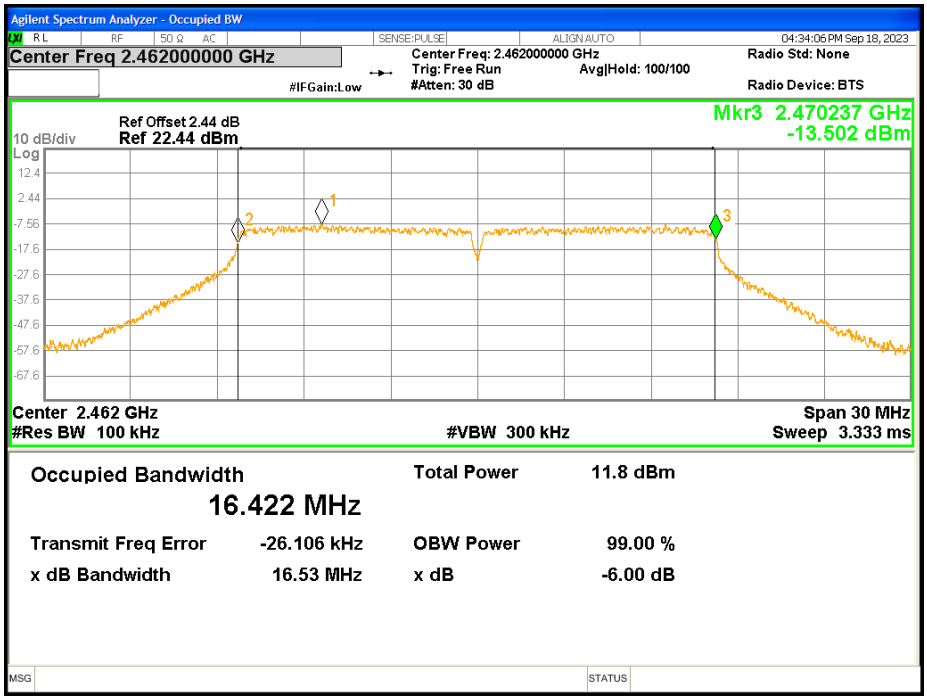
802.11g-Low Channel



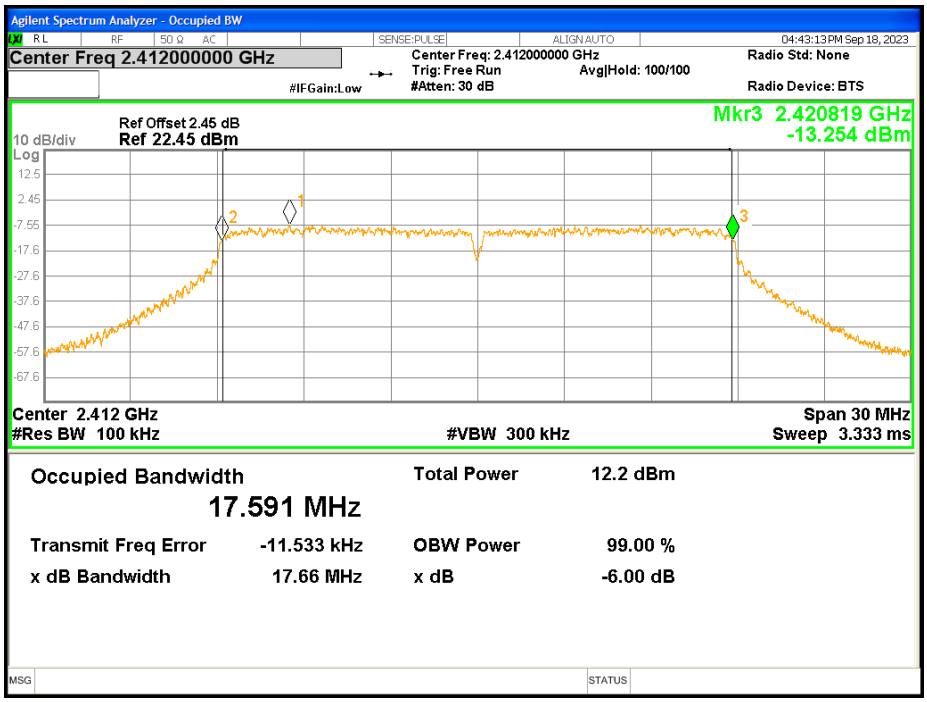
802.11g-Middle Channel



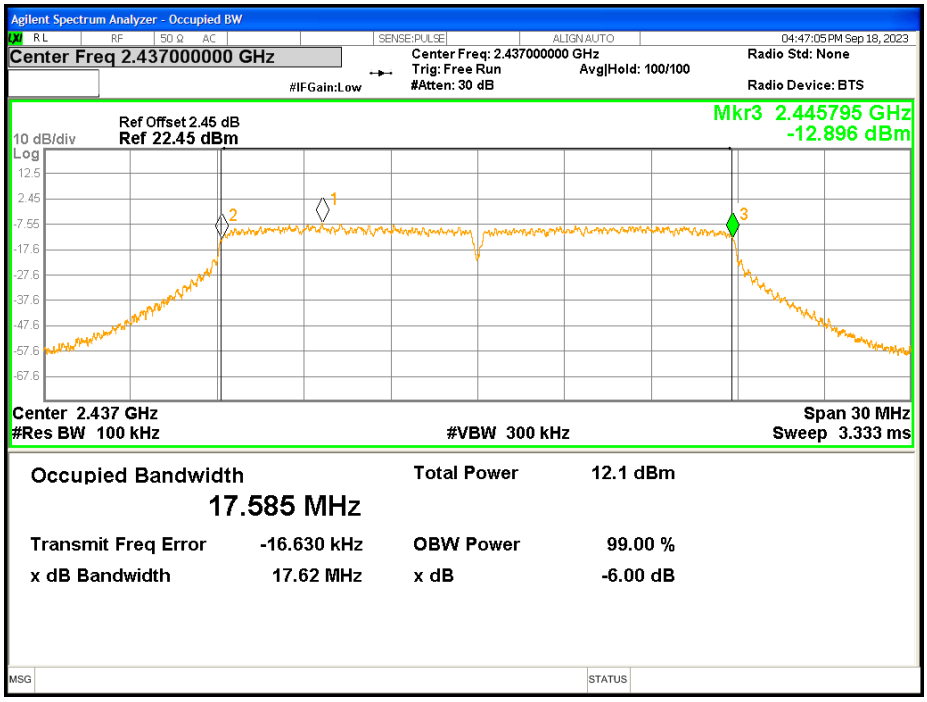
802.11g-High Channel



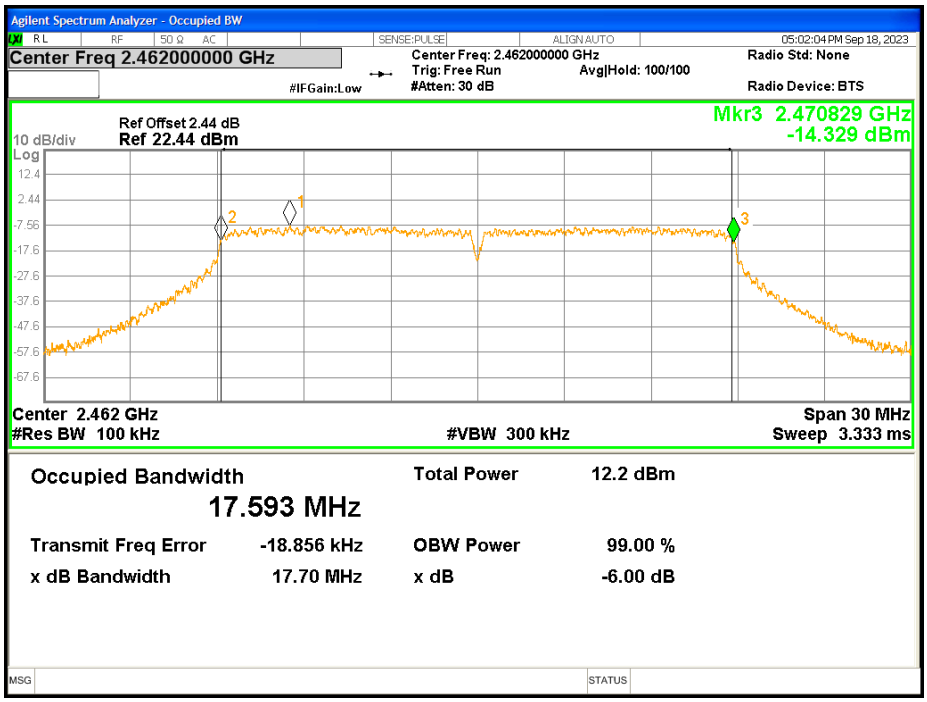
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



7. RF Output Power

7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

7.2 Test Procedure

According to the KDB-558074 D01 v05, 9.2.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

a) Set span to at least 1.5 times the OBW.
b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ 3 x RBW.
d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto.
f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
g) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

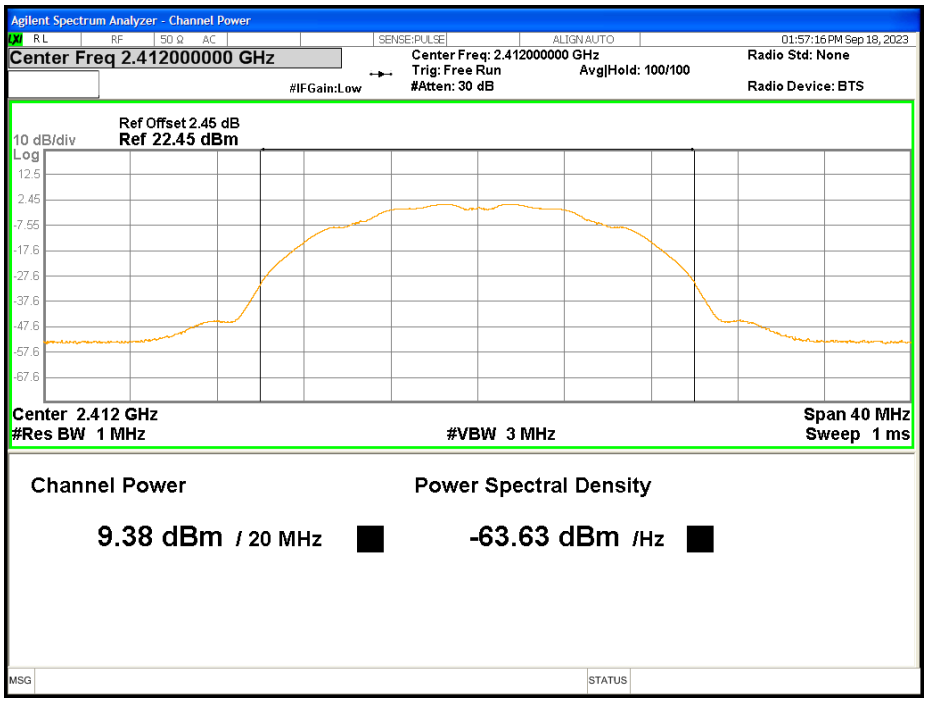
7.3 Environmental Conditions

Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

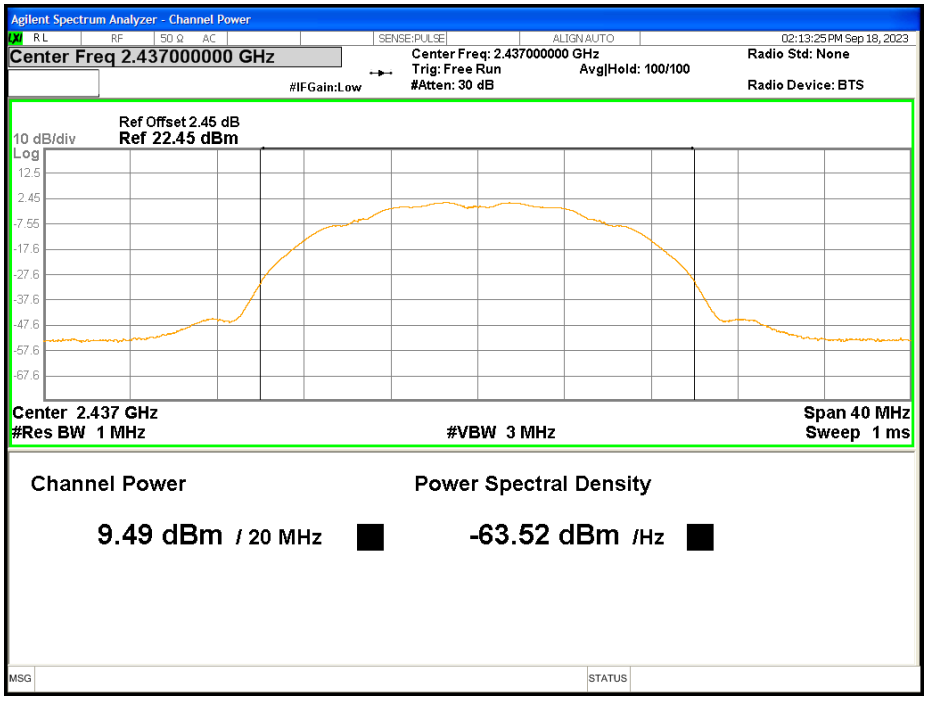
7.4 Summary of Test Results/Plots

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	9.38	0	9.38	30	Pass
NVNT	b	2437	Ant1	9.49	0	9.49	30	Pass
NVNT	b	2462	Ant1	9.59	0	9.59	30	Pass
NVNT	g	2412	Ant1	9.41	0	9.41	30	Pass
NVNT	g	2437	Ant1	9.61	0	9.61	30	Pass
NVNT	g	2462	Ant1	9.11	0	9.11	30	Pass
NVNT	n20	2412	Ant1	9.56	0	9.56	30	Pass
NVNT	n20	2437	Ant1	9.4	0	9.4	30	Pass
NVNT	n20	2462	Ant1	9.51	0	9.51	30	Pass

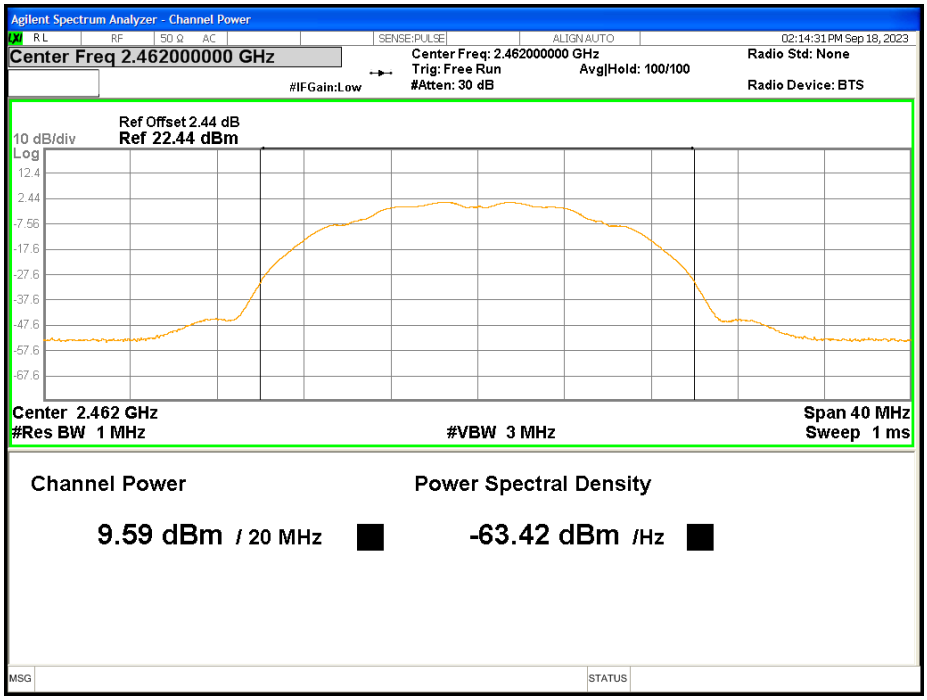
802.11b -Low Channel



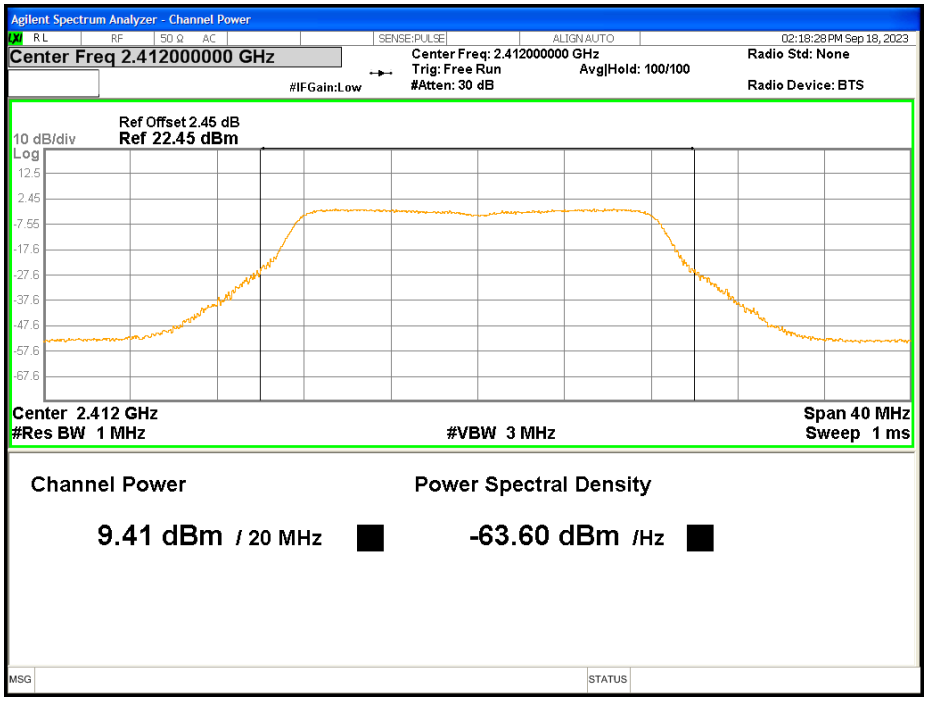
802.11b -Middle Channel



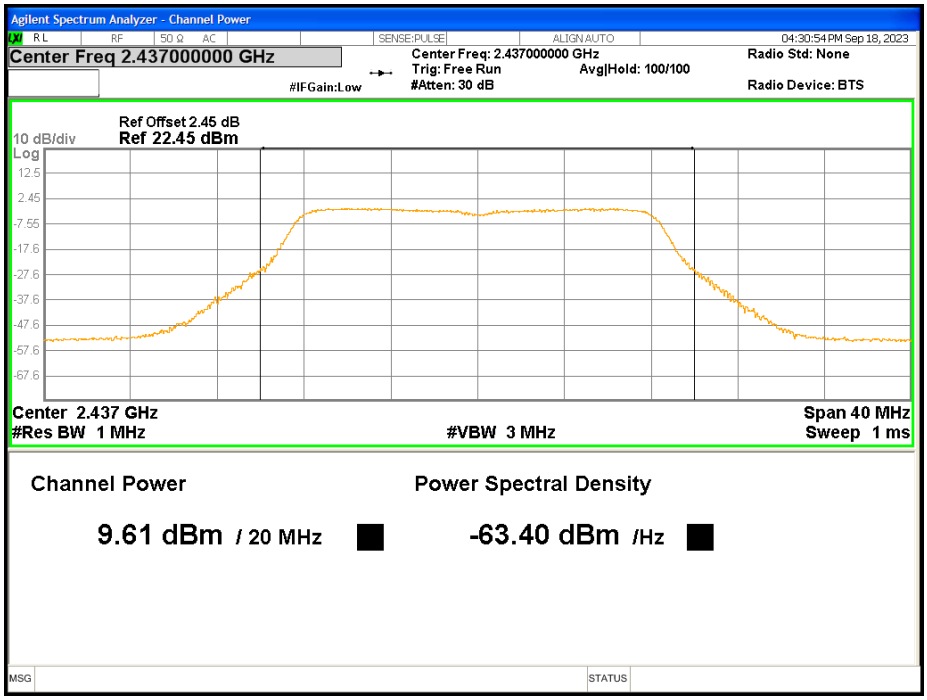
802.11b -Hight Channel



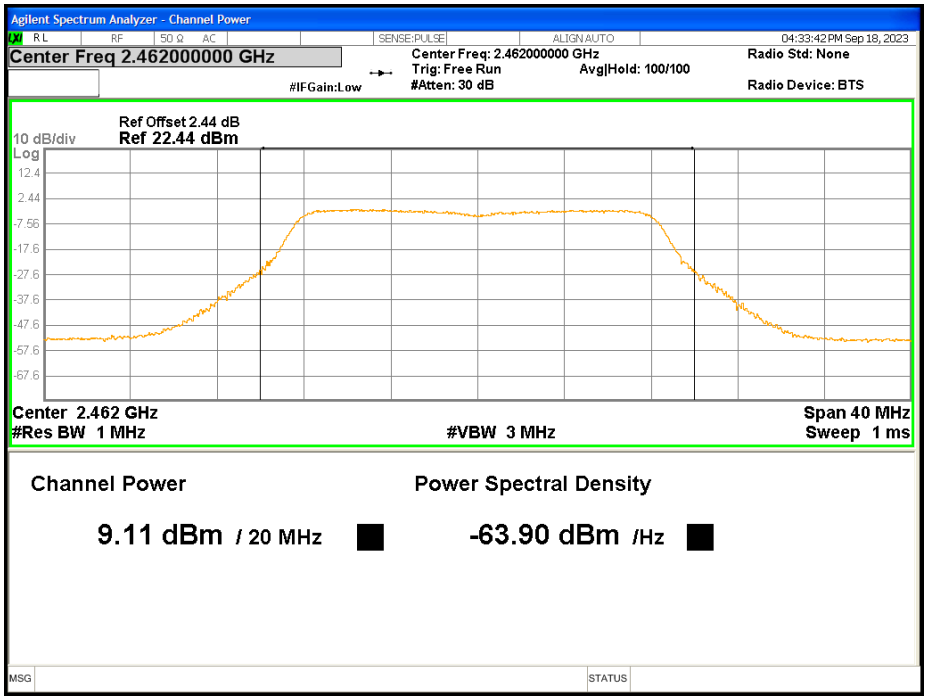
802.11g -Low Channel



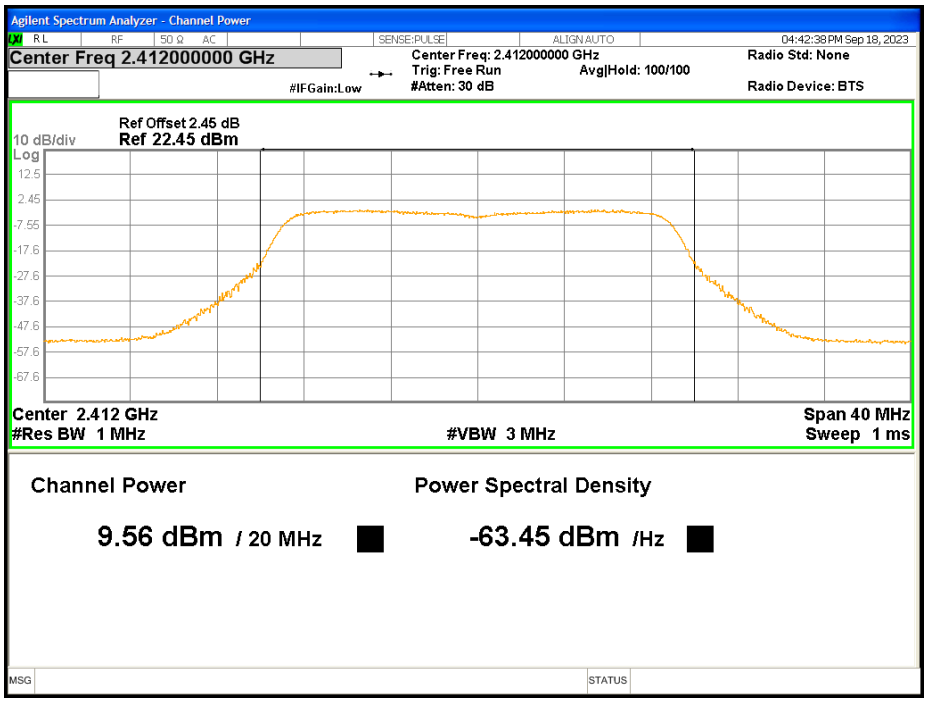
802.11g -Middle Channel



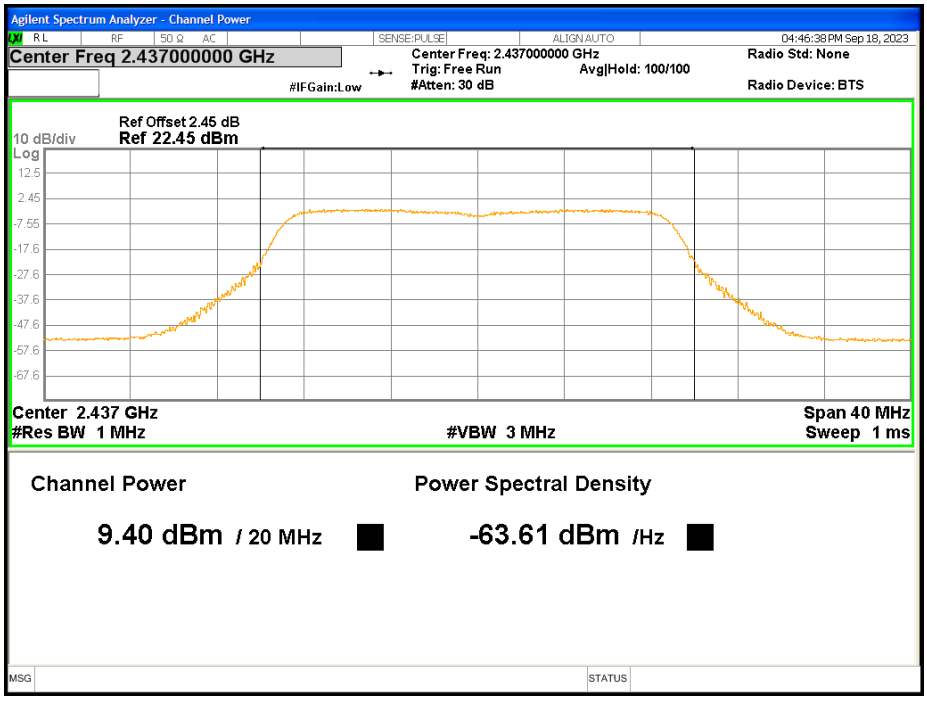
802.11g -Hight Channel



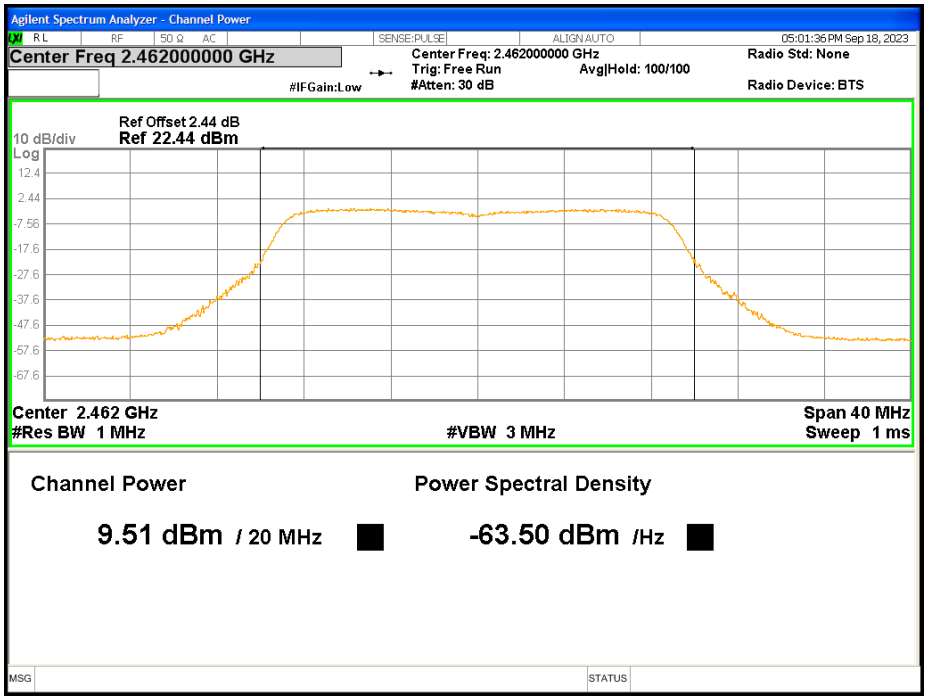
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-Higt Channel



8. Field Strength of Spurious Emissions

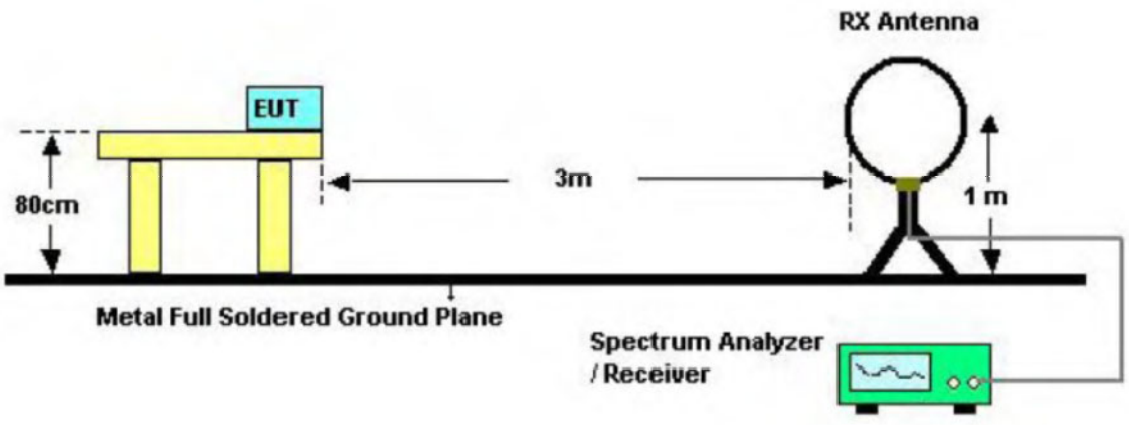
8.1 Standard Applicable

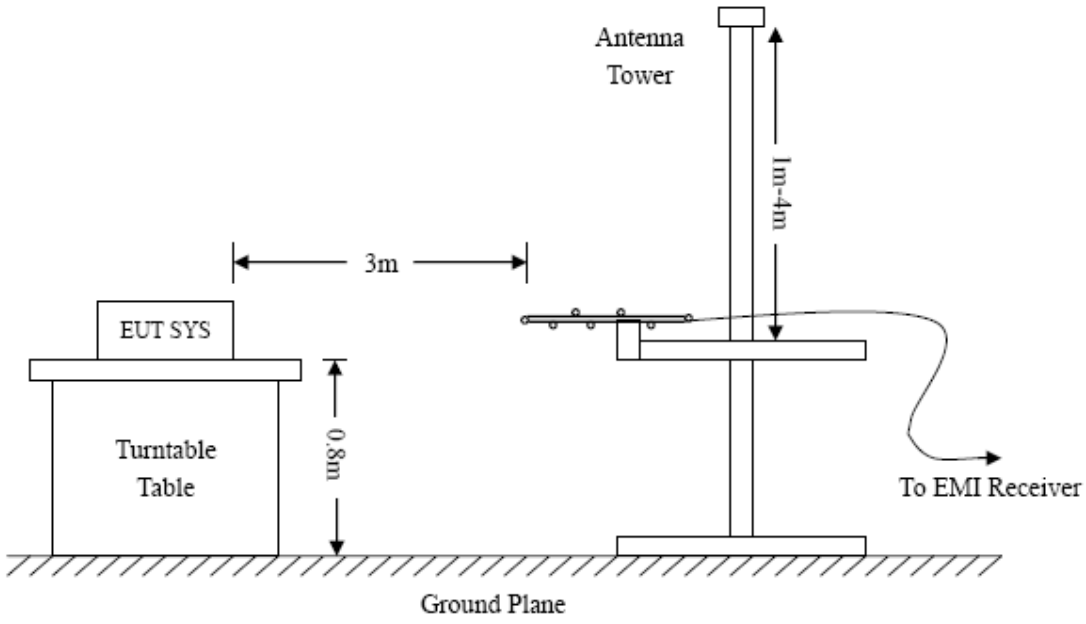
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

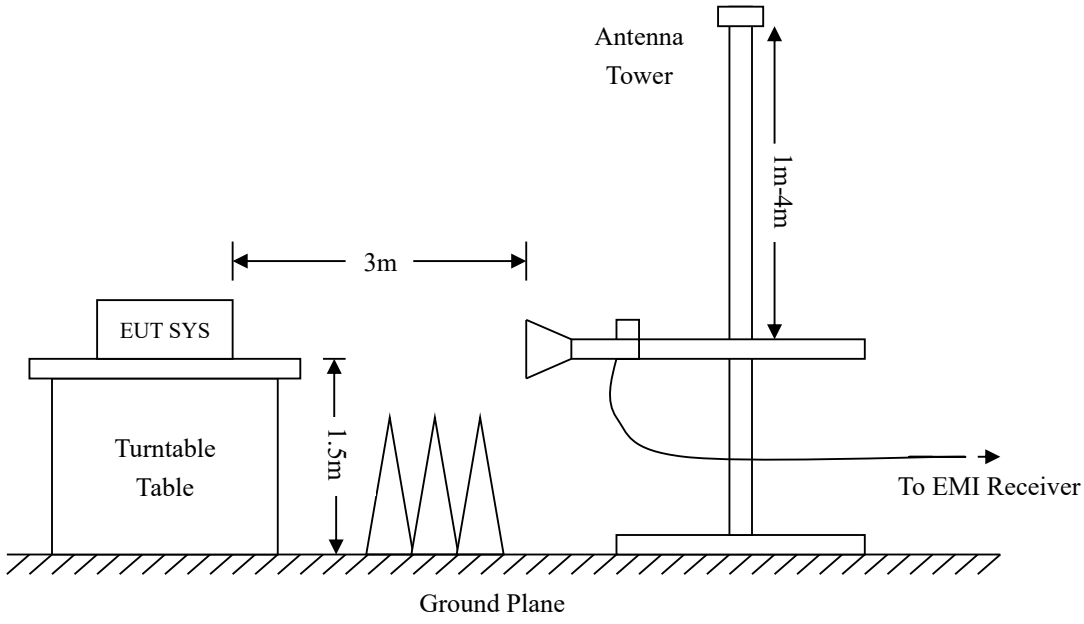
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.







Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

8.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

8.5 Summary of Test Results/Plots

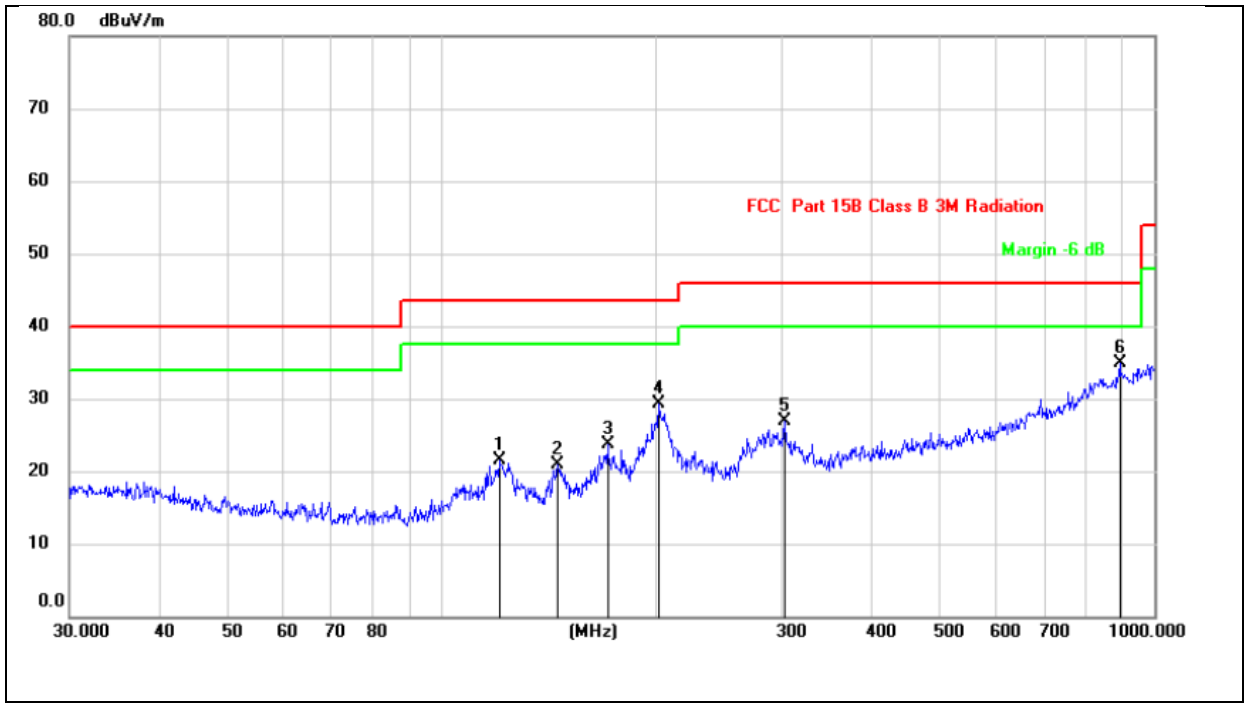
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note:
1. Worst-case radiated emission below 1GHz is 802.11b (CH Low) mode.
2. Worst-case radiated emission above 1GHz is 802.11g (CH Low, Middle, High) mode.
3. The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.
4. In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

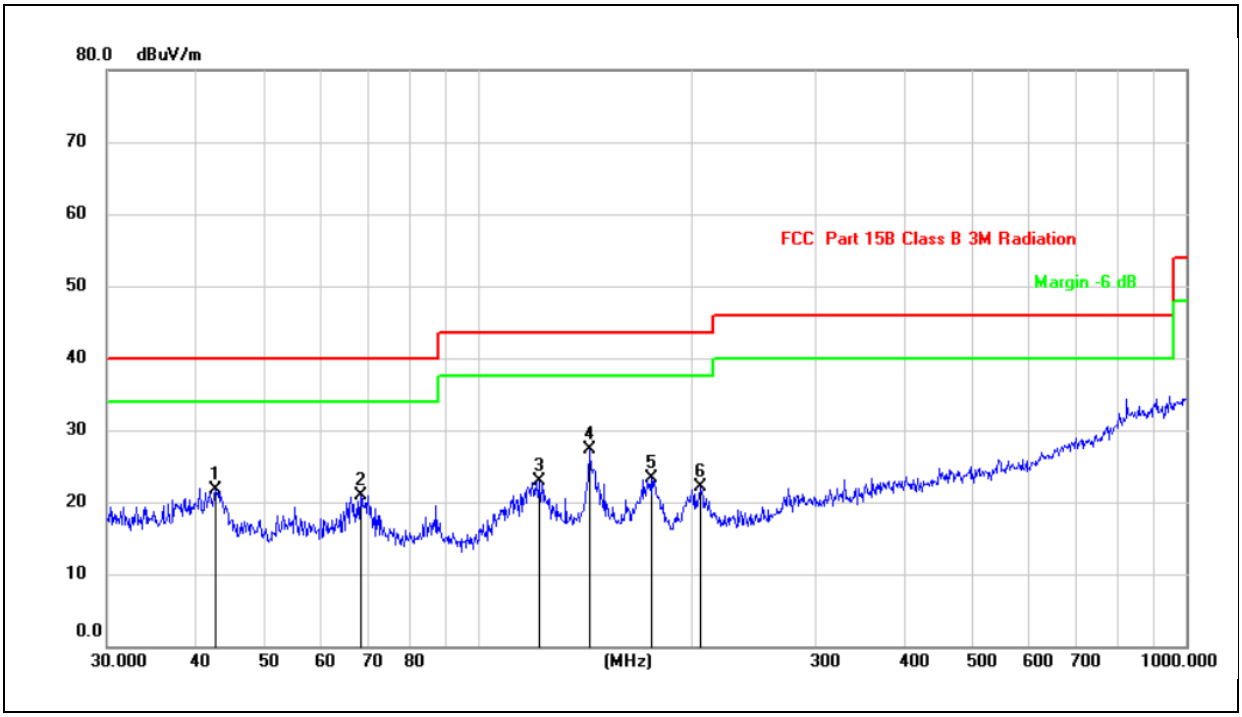
Operating Condition: *802.11b Transmitting Low Channel-2412MHz*

Test Specification: *Horizontal*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		120.2766	17.43	4.13	21.56	43.50	-21.94	QP			
2		145.3505	17.87	3.07	20.94	43.50	-22.56	QP			
3		170.7925	21.25	2.41	23.66	43.50	-19.84	QP			
4		201.3930	25.75	3.55	29.30	43.50	-14.20	QP			
5		302.4812	19.74	7.15	26.89	46.00	-19.11	QP			
6	*	893.8567	16.29	18.69	34.98	46.00	-11.02	QP			

Test Specification: *Vertical*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		42.6000	17.83	3.78	21.61	40.00	-18.39	QP			
2		68.3907	19.84	1.10	20.94	40.00	-19.06	QP			
3		121.9754	18.81	4.03	22.84	43.50	-20.66	QP			
4	*	143.8294	24.21	3.14	27.35	43.50	-16.15	QP			
5		175.6516	20.82	2.54	23.36	43.50	-20.14	QP			
6		206.3976	18.51	3.59	22.10	43.50	-21.40	QP			

Spurious Emissions Above 1GHz

Test Mode: 802.11g

Frequency	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low channel-2412MHz					
4824	56.23	74	-17.77	H	PK
4824	45.69	54	-8.31	H	AV
7236	54.51	74	-19.49	H	PK
7236	45.34	54	-8.66	H	AV
4824	54.57	74	-19.43	V	PK
4824	44.68	54	-9.32	V	AV
7236	56.31	74	-17.69	V	PK
7236	40.57	54	-13.43	V	AV
Middle channel-2437MHz					
4874	55.92	74	-18.08	H	PK
4874	43.58	54	-10.42	H	AV
7311	51.38	74	-22.62	H	PK
7311	39.68	54	-14.32	H	AV
4874	55.63	74	-18.37	V	PK
4874	43.21	54	-10.79	V	AV
7311	51.36	74	-22.64	V	PK
7311	40.67	54	-13.33	V	AV
High channel-2462MHz					
4924	55.69	74	-18.31	H	PK
4924	42.38	54	-11.62	H	AV
7386	52.69	74	-21.31	H	PK
7386	40.37	54	-13.63	H	AV
4924	53.64	74	-20.36	V	PK
4924	40.28	54	-13.72	V	AV
7386	52.37	74	-21.63	V	PK
7386	41.38	54	-12.62	V	AV

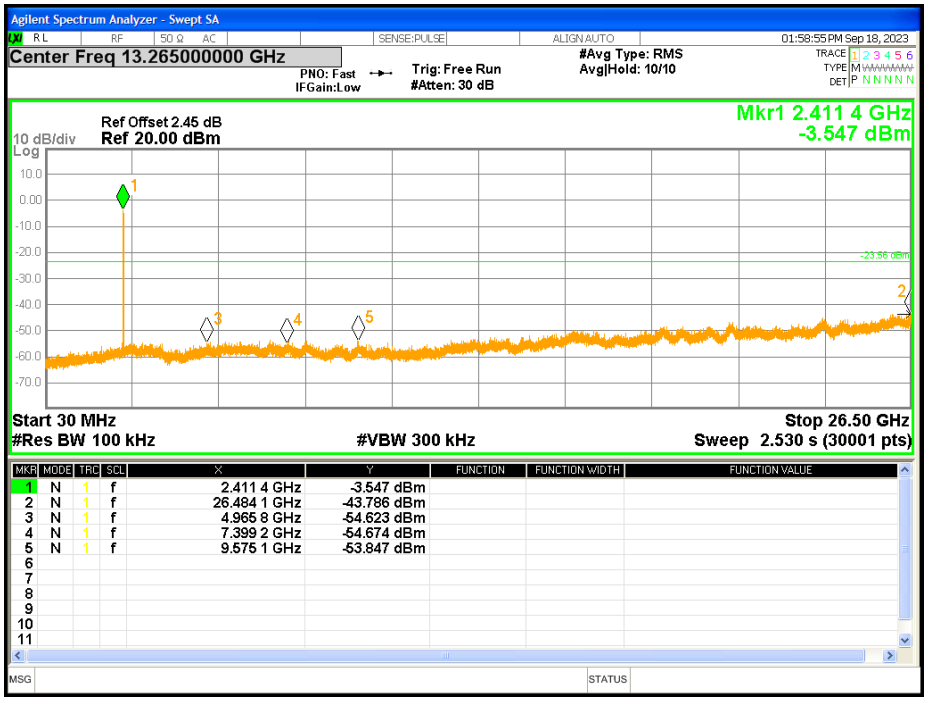
Note:

1. Calculation of result is: Result (dBm) = Reading (dBm) + Correction Factor (dB).
2. Correction Factor (dB)=Ant. Factor + Cable Loss – Ampl. Gain.
3. Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

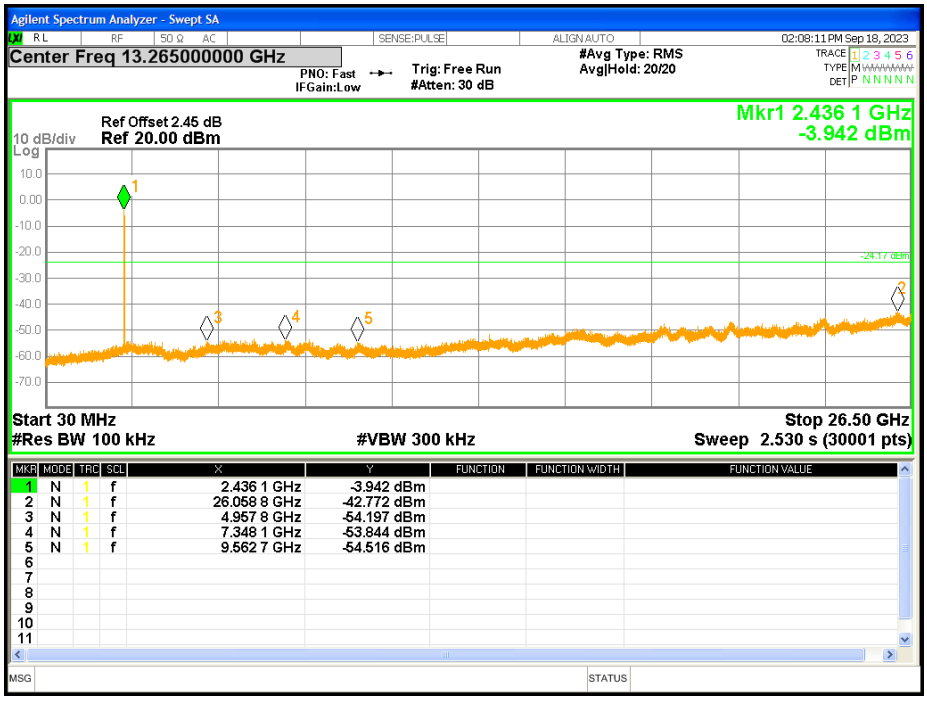
Spurious (Conducted)

802.11b-Lowest

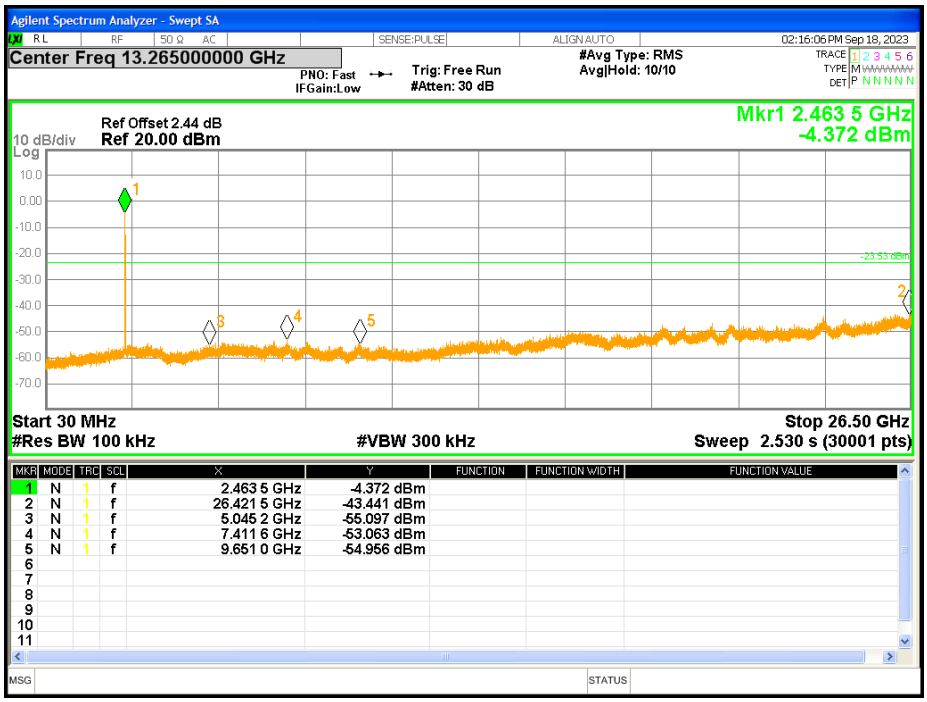
Lowest



Middle



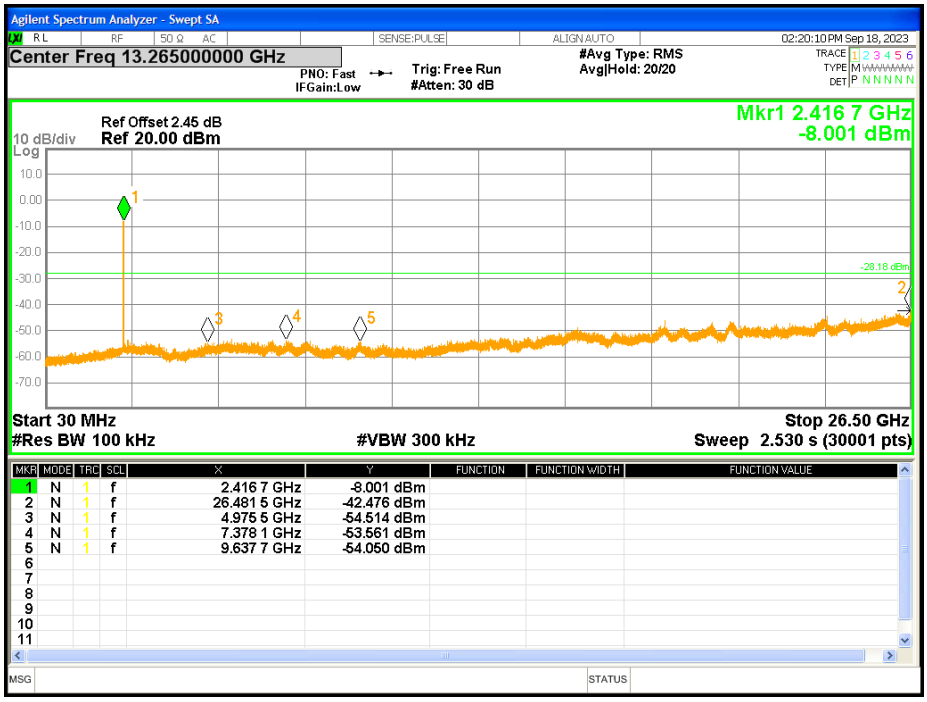
Highest



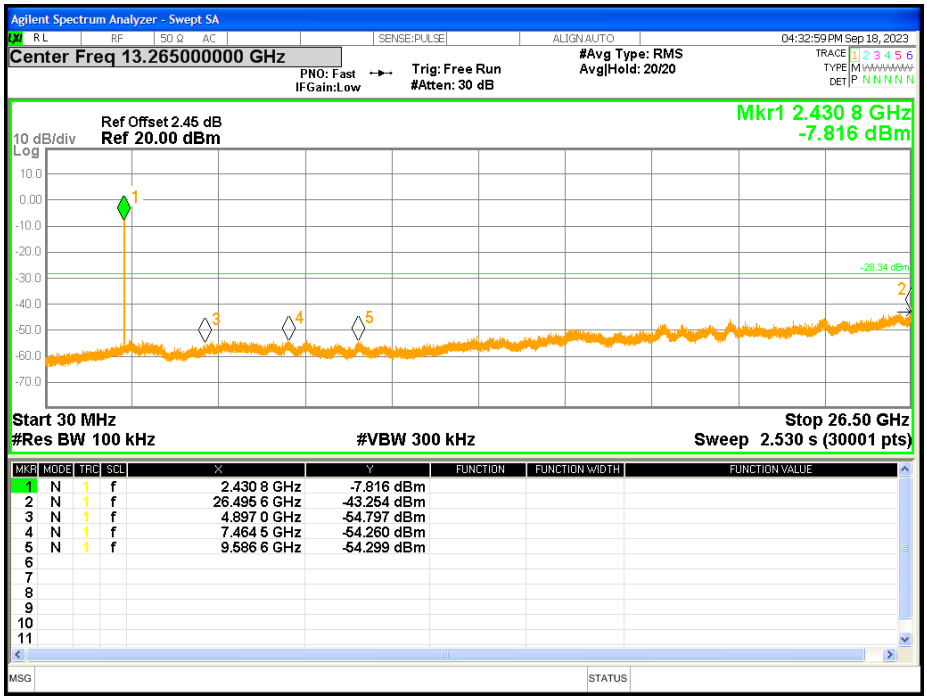
Spurious (Conducted)

802.11g-Lowest

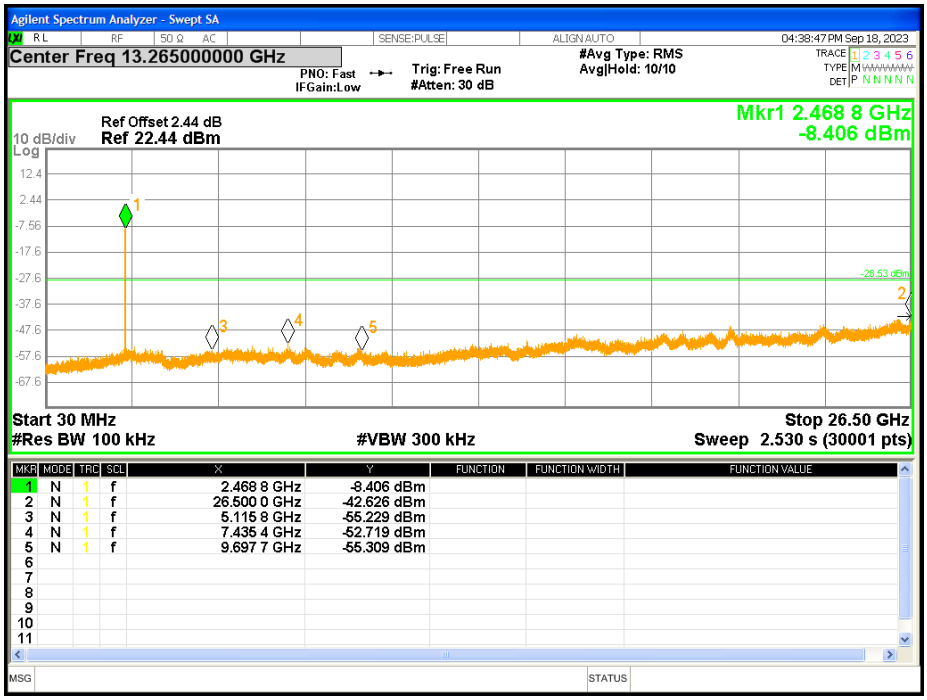
Lowest



Middle



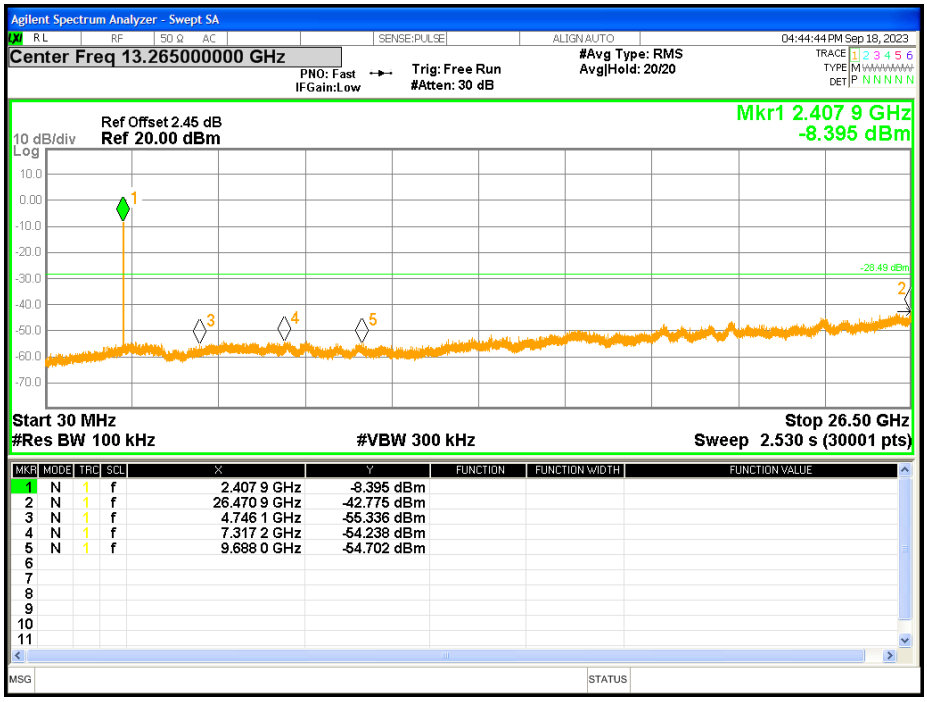
Highest



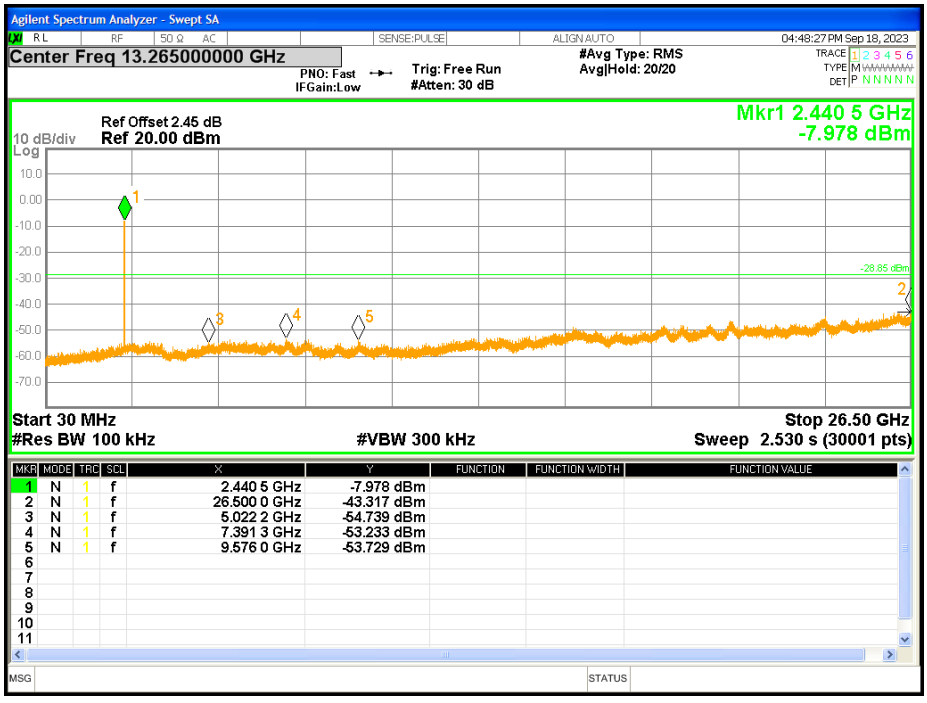
Spurious (Conducted)

802.11n-HT20-Lowest

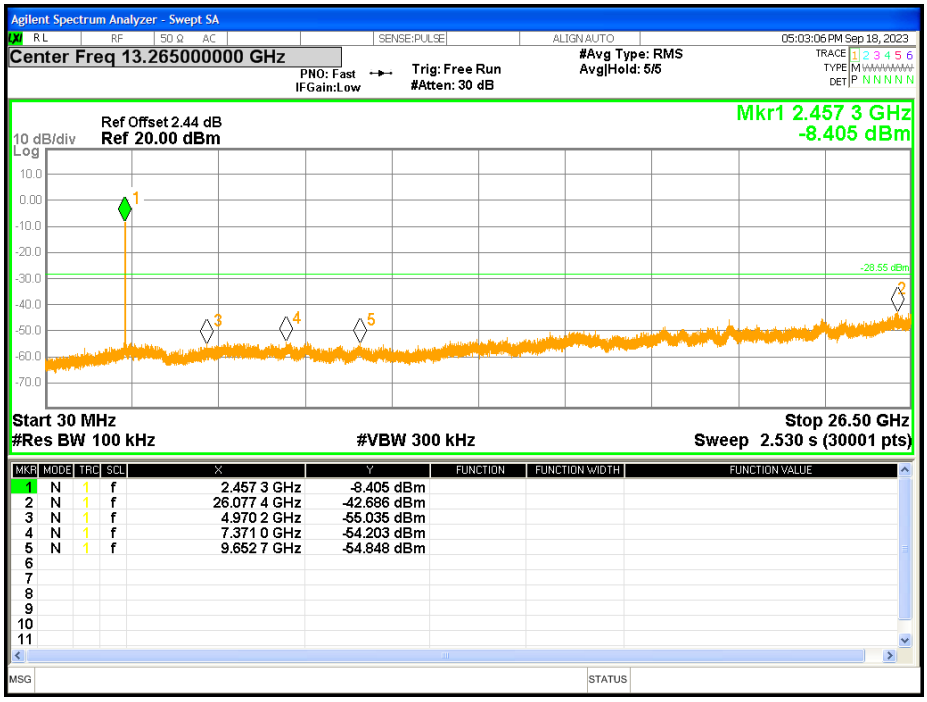
Lowest



Middle



Highest


Agilent Spectrum Analyzer - Swept SA
Center Freq 13.265000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 5/5
05:03:06 PM Sep 18, 2023
Ref Offset 2.44 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.457 3 GHz
-8.405 dBm
-28.55 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.530 s (30001 pts)
1 N 1 f 2.457 3 GHz -8.405 dBm
2 N 1 f 26.077 4 GHz -42.686 dBm
3 N 1 f 4.970 2 GHz -55.035 dBm
4 N 1 f 7.371 0 GHz -54.203 dBm
5 N 1 f 9.652 7 GHz -54.848 dBm

9. Out of Band Emissions

9.1 Standard Applicable

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

9.2 Test Procedure

According to the KDB 558074D01 v05r02, the band-edge radiated test method as follows:
for Antenna-port conducted measurement.
Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.
1). Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2). Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3). Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for AV detector.
4). Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5). Repeat above procedures until all measured frequencies were complete.
6). Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7). Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8). Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9). For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10). Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E = EIRP – 20log D + 104.77=EIRP+95.23
Where:
E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.
11). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12). Compare the resultant electric field strength level to the applicable regulatory limit.
13). Perform radiated spurious emission test duress until all measured frequencies were complete.

9.3 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.4 Summary of Test Results/Plots

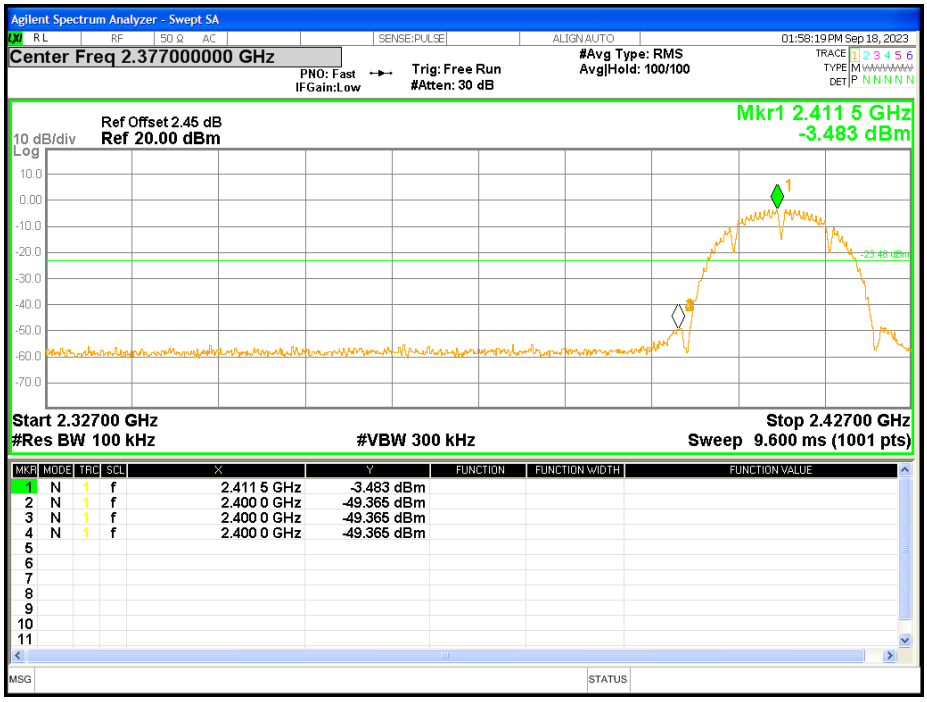
Mode	Channel	Freq.(MHz)	Power(dBm)	Gain(dBi)	E(dBuV/m)	Limit(dBuV/m)	Margin(dB)	Detector
802.11b	LOW (2412MHz)	2400.00	-49.37	-1	44.87	74	-29.135	Peak
	HIGH (2462MHz)	2483.50	-59.30	-1	34.93	74	-39.07	Peak
		2500.00	-59.92	-1	34.31	74	-39.68	Peak
802.11g	LOW (2412MHz)	2400.00	-48.90	-1	45.33	74	-28.67	Peak
	HIGH (2462MHz)	2483.50	-59.75	-1	34.48	74	-39.52	Peak
		2492.40	-55.50	-1	38.73	74	-35.27	Peak
		2500.00	-57.19	-1	37.04	74	-36.96	Peak
802.11n （HT20）	LOW (2412MHz)	2400.00	-44.48	-1	49.75	74	-24.25	Peak
	HIGH (2462MHz)	2483.50	-61.50	-1	32.73	74	-41.27	Peak
		2483.90	-55.59	-1	38.64	74	-35.36	Peak
		2500.00	-58.02	-1	36.21	74	-37.79	Peak

Remark: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

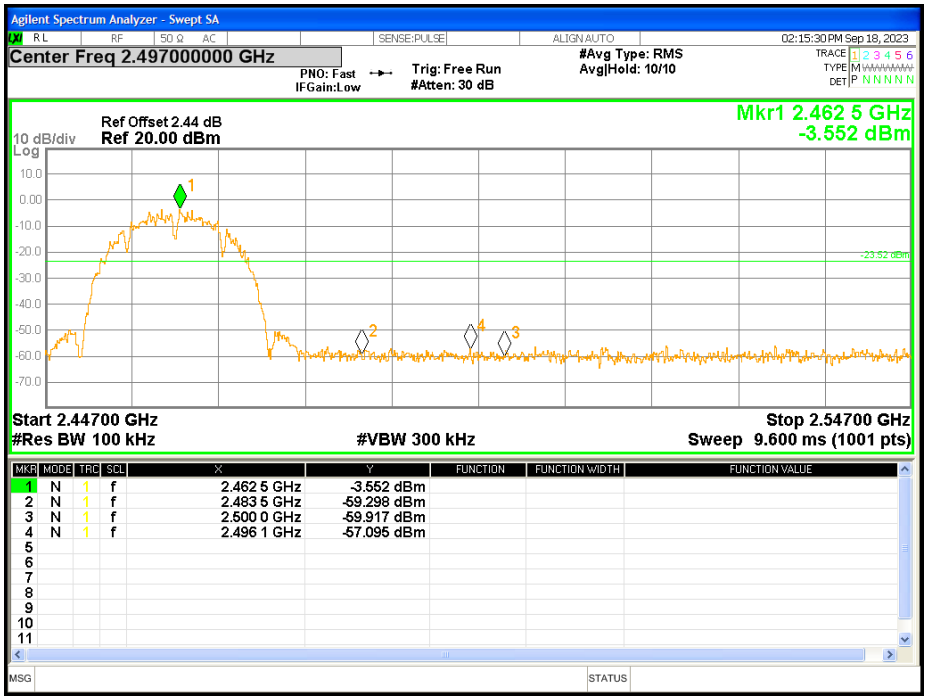
Bandedge (Conducted)

802.11b-Lowest

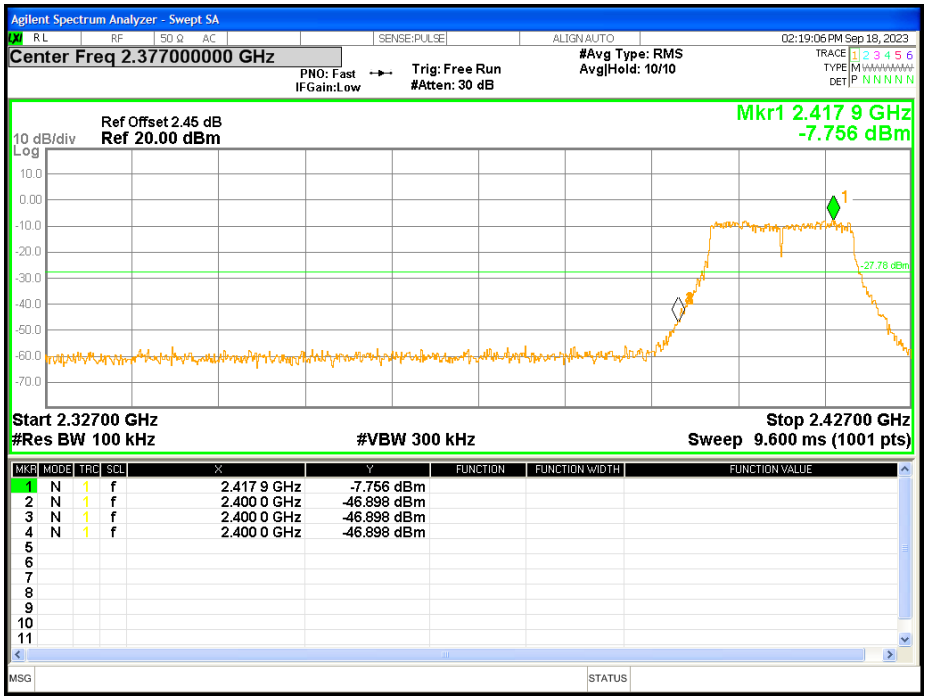
Lowest



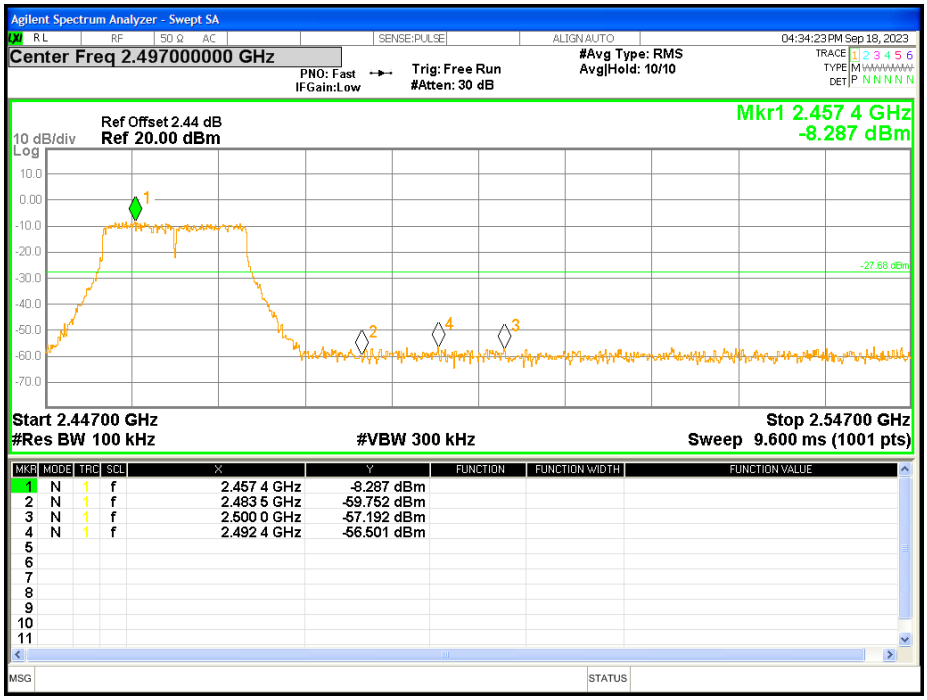
Highest



802.11g-Lowest

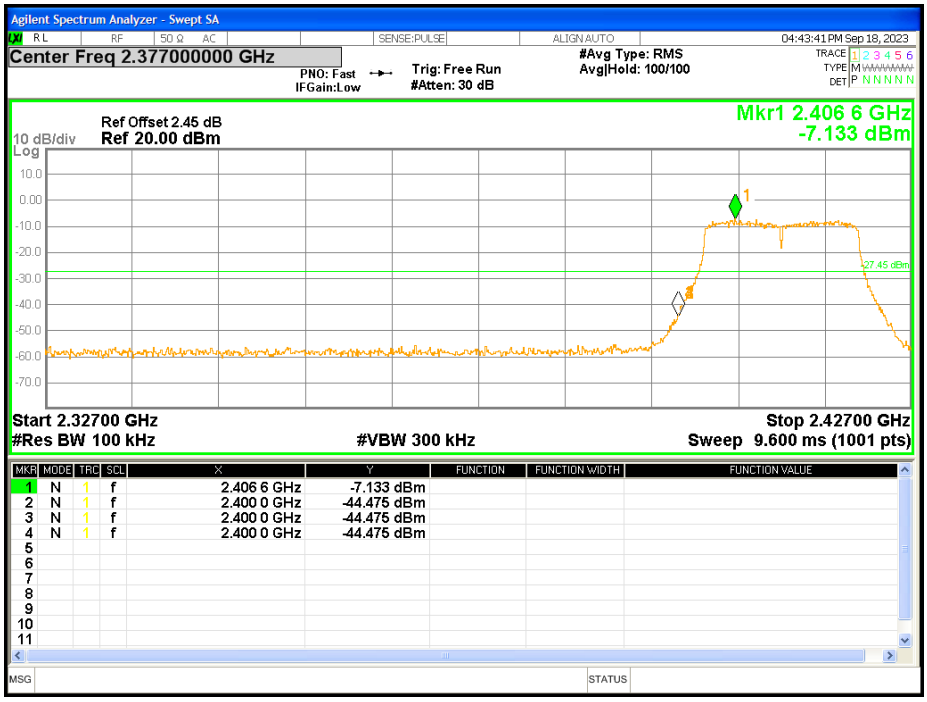


Highest

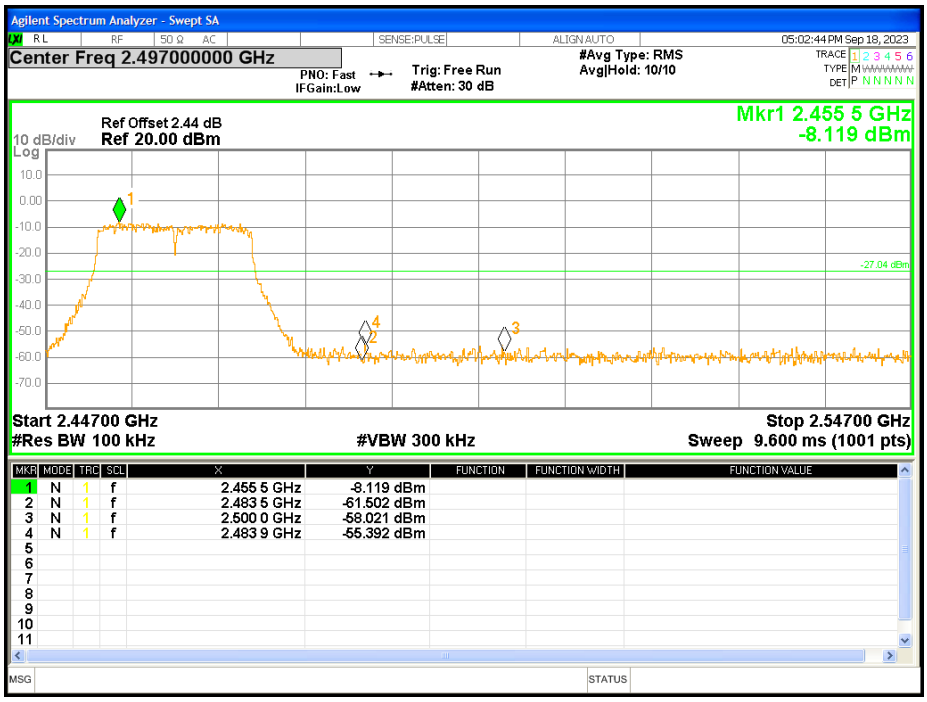


802.11n-HT20-Lowest

Lowest



Highest

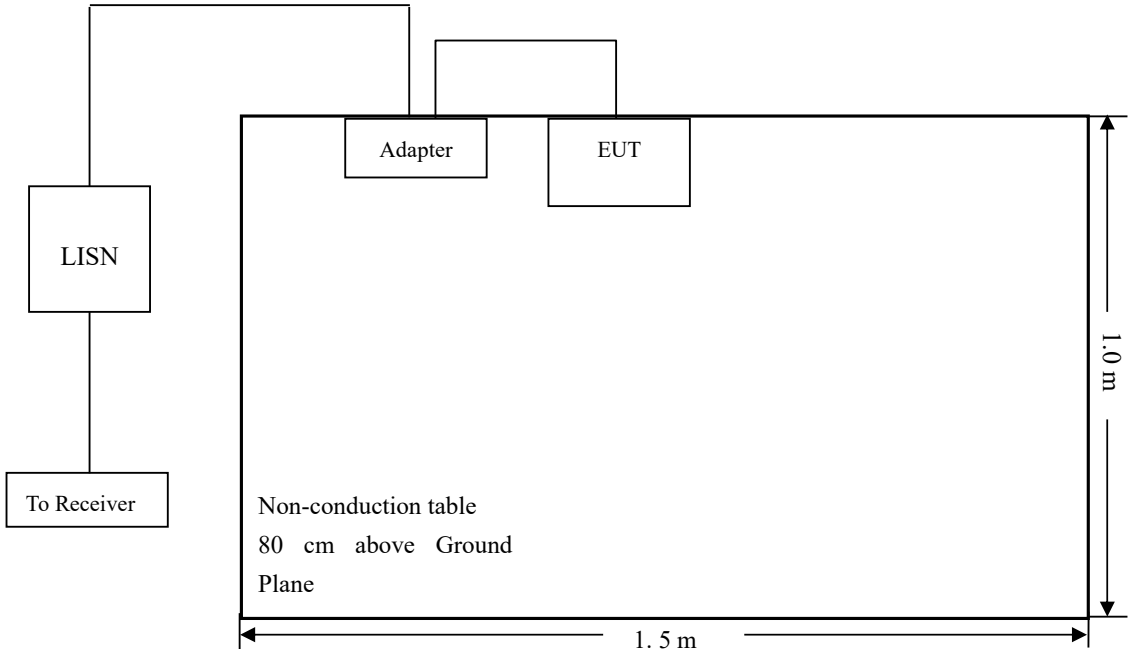


10. Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.

10.2 Basic Test Setup Block Diagram



10.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

10.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency ..... 150 kHz
Stop Frequency ..... 30 MHz
Sweep Speed ..... Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth ..... 9 kHz
Quasi-Peak Adapter Mode ..... Normal

10.5 Summary of Test Results/Plots

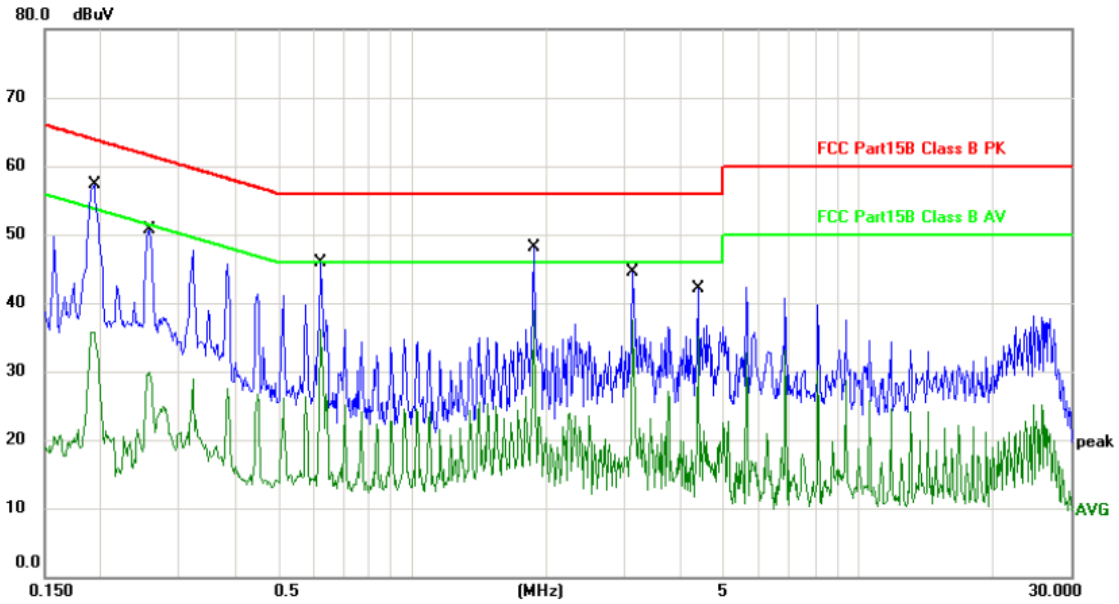
According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device.

10.6 Conducted Emissions Test Data

Note: we are pre-scan all modes, the worst data is 802.11n HT20(Low) mode.

Plot of Conducted Emissions Test Data: 802.11n HT20(Low)

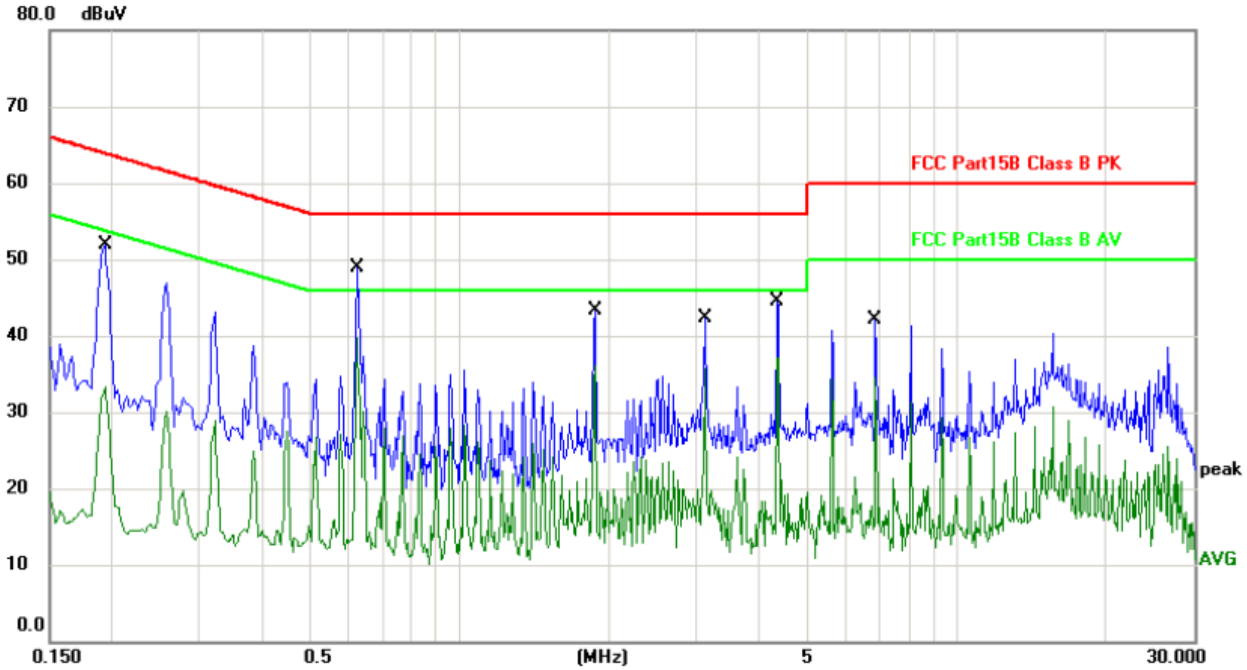
Test Specification: *Neutral*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1922	56.99	0.00	56.99	63.94	-6.95	QP	
2		0.1922	35.73	0.00	35.73	53.94	-18.21	AVG	
3		0.2580	50.65	0.00	50.65	61.49	-10.84	QP	
4		0.2580	30.25	0.00	30.25	51.49	-21.24	AVG	
5		0.6260	45.96	0.00	45.96	56.00	-10.04	QP	
6		0.6260	35.64	0.00	35.64	46.00	-10.36	AVG	
7		1.8740	48.02	0.00	48.02	56.00	-7.98	QP	
8		1.8740	35.72	0.00	35.72	46.00	-10.28	AVG	
9		3.1218	44.48	0.00	44.48	56.00	-11.52	QP	
10		3.1218	34.36	0.00	34.36	46.00	-11.64	AVG	
11		4.3699	42.10	0.00	42.10	56.00	-13.90	QP	
12		4.3699	36.12	0.00	36.12	46.00	-9.88	AVG	

*:Maximum data x:Over limit !:over margin

Test Specification: *Live*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1940	51.96	0.00	51.96	63.86	-11.90	QP	
2		0.1940	34.31	0.00	34.31	53.86	-19.55	AVG	
3		0.6260	48.89	0.00	48.89	56.00	-7.11	QP	
4	*	0.6260	39.12	0.00	39.12	46.00	-6.88	AVG	
5		1.8779	41.80	0.00	41.80	56.00	-14.20	QP	
6		1.8779	38.45	0.00	38.45	46.00	-7.55	AVG	
7		3.1299	39.73	0.00	39.73	56.00	-16.27	QP	
8		3.1299	37.68	0.00	37.68	46.00	-8.32	AVG	
9		4.3578	44.48	0.00	44.48	56.00	-11.52	QP	
10		4.3578	37.33	0.00	37.33	46.00	-8.67	AVG	
11		6.8498	42.00	0.00	42.00	60.00	-18.00	QP	
12		6.8498	36.68	0.00	36.68	50.00	-13.32	AVG	

*:Maximum data x:Over limit !:over margin