Shenzhen Most Technology Service Co., Ltd.
No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China.

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**MTEB23060046-R**	
FCC ID..... :	**2BBL5-MA01**	
Compiled by (position+printed name+signature) .:	File administrators Alisa Luo	Alisa Luo
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Date of issue .....:	**Jun.06,2023**	
Representative Laboratory Name.:	**Shenzhen Most Technology Service Co., Ltd.**	
Address .....:	No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China.	
Applicant' s name.....:	**Matrix Electronic Technology Co., LTD**	
Address .....:	Room 801 Block B, #111 Fengcheng 5th Road Xi'an, Shaanxi, China	
Test specification.....:		
Standard.....:	**FCC Part 15.247**	
TRF Originator.....:	Shenzhen Most Technology Service Co., Ltd.	

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Test item description .....:	Music Streamer
Trade Mark .....:	Matrix Audio
Manufacturer .....:	**Matrix Electronic Technology Co., LTD**
Model/Type reference .....:	mini-i Pro 4
Listed Models .....:	element S, element S2, element X2 Pure, element X2, element X2S, element X3, element M2, element M2S, element M3, element i2, element i2S, element i3, mini-i 4
Modulation Type.....:	CCK/DSSS/ OFDM
Operation Frequency.....:	From 2412 - 2462MHz
Rating .....:	100V-240V~ 50/60Hz, 100W
Hardware version .....:	V1.5
Software version .....:	1.0.1 build008
Result .....:	PASS

TEST REPORT

Equipment under Test	:	Music Streamer
Model /Type	:	mini-i Pro 4
Listed Models	:	element S, element S2, element X2 Pure, element X2, element X2S, element X3, element M2, element M2S, element M3, element i2, element i2S, element i3, mini-i 4
Remark		Difference in model names
Applicant	:	Matrix Electronic Technology Co., LTD
Address	:	Room 801 Block B, #111 Fengcheng 5th Road Xi'an, Shaanxi, China
Manufacturer	:	Matrix Electronic Technology Co., LTD
Address	:	Room 801 Block B, #111 Fengcheng 5th Road Xi'an, Shaanxi, China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 Revision History

Revision	Issue Date	Revisions	Revised By
00	2023-06-06	Initial Issue	Alisa Luo

2 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB558074 D01 v05r02: Guidance for Compliance Measurements on Digital Transmission Systems (DTS) ,Frequency Hopping Spread Spectrum System(HFSS), and Hybrid System Devices Operating Under §15.247 of The FCC rules.

3 SUMMARY

3.1 General Remarks

Date of receipt of test sample	:	Jun.01,2023
Testing commenced on	:	Jun.02,2023
Testing concluded on	:	Jun.06,2023

3.2 Product Description

Product Name:	Music Streamer
Model/Type reference:	mini-i Pro 4
Power Supply：	100V-240V~ 50/60Hz, 100W
Testing sample ID：	MTYP01707
WIFI :	
Supported type:	802.11b/802.11g/802.11n(H20)/ 802.11n(HT40)
Modulation:	802.11b: DSSS 802.11g/802.11n(H20)/ 802.11n(HT40): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20)/ 802.11n(HT40): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz
Channel number:	802.11b/802.11g/802.11n(H20):11 802.11n(HT40): 7
Channel separation:	5MHz
Antenna type:	FPC antenna
Antenna gain:	3.14dBi

3.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	●	120V / 60Hz
		○	12 V DC	○	24 V DC
		○	Other (specified in blank below)		

3.4 Short description of the Equipment under Test (EUT)

This is a Music Streamer For more details, refer to the user's manual of the EUT.

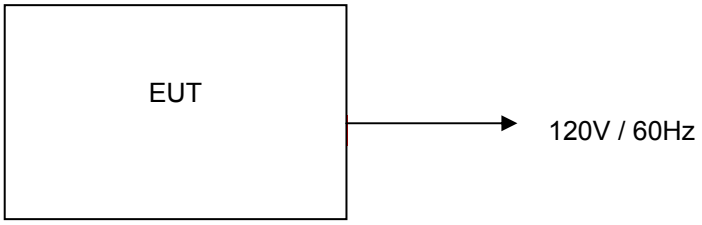
3.5 EUT operation mode

The application provider specific test software(AT command) to control sample in continuous TX and RX for testing meet KDB558074 test requirement

IEEE 802.11b/g/n: Thirteen channels are provided to the EUT.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432		
6	2437		
7	2442		

3.6 Block Diagram of Test Setup



3.7 Test Item (Equipment Under Test) Description*

Short designation	EUT Name	EUT Description	Serial number	Hardware status	Software status
EUT A	/	/	/	/	/
EUT B	/	/	/	/	/

*: declared by the applicant. According to customers information EUTs A and B are the same devices.

3.8 Auxiliary Equipment (AE) Description

AE short designation	EUT Name (if available)	EUT Description	Serial number (if available)	Software (if used)
AE 1	/	/	/	/
AE 2	/	/	/	/

3.9 Antenna Information*

Short designation	Antenna Name	Antenna Type	Frequency Range	Serial number	Antenna Peak Gain
Antenna 1	---	FPC antenna	2.4 – 2.5 GHz	---	3.14dBi
Antenna 2					

*: declared by the applicant.

3.10 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2BBL5-MA01 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

3.11 Modifications

No modifications were implemented to meet testing criteria.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Shenzhen Most Technology Service Co., Ltd.
No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China.
The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

4.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 0031192610

Shenzhen Most Technology Service Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

A2LA-Lab Cert. No.: 6343.01

Shenzhen Most Technology Service Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

4.3 Environmental conditions

Radiated Emission:

Temperature:	24 ° C
Humidity:	48 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

4.4 Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2)	6dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Conducted Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

Data Rate Used:
Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel
Maximum Peak Conducted Output Power Power Spectral Density 6dB Bandwidth Spurious RF conducted emission Radiated Emission 9KHz~1GHz& Radiated Emission 1GHz~10th Harmonic	11b/DSSS	1 Mbps	1/6/11
	11g/OFDM	6 Mbps	1/6/11
	11n(20MHz)/OFDM	6.5Mbps	1/6/11
	/	/	/
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	6.5Mbps	1/11
	11n(40MHz)/OFDM	6.5Mbps	1/11

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Most Technology Service Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Most Technology Service Co., Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.6 Equipments Used during the Test

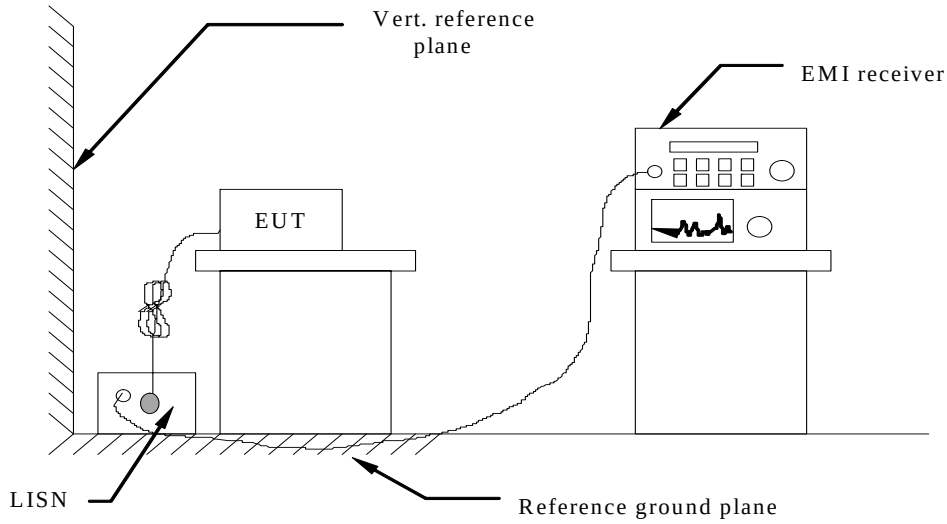
Item	Equipment	Manufacturer	Model No.	Serial No.	Firmware versions	Last Cal.	Cal. Interval
1.	L.I.S.N.	R&S	ENV216	100093	/	2023/03/17	1 Year
2	Three-phase artificial power network	Schwarzback Mess	NNLK8129	8129178	/	2023/03/17	1 Year
3.	Receiver	R&S	ESCI	100492	V3.0-10-2	2023/03/17	1 Year
4	Receiver	R&S	ESPI	101202	V3.0-10-2	2023/03/17	1 Year
5	Spectrum analyzer	Agilent	9020A	MT-E306	A14.16	2023/03/17	1 Year
6	Bilong Antenna	Sunol Sciences	JB3	A121206	/	2023/03/17	1 Year
7	Horn antenna	HF Antenna	HF Antenna	MT-E158	/	2023/03/17	1 Year
8	Loop antenna	Beijing Daze	ZN30900B	/	/	2023/03/17	1 Year
9	Horn antenna	R&S	OBH100400	26999002	/	2023/03/17	1 Year
10	Wireless Communication Test Set	R&S	CMW500	/	CMW-BASE-3.7.21	2023/03/17	1 Year
11	Spectrum analyzer	R&S	FSP	100019	V4.40 SP2	2023/03/17	1 Year
12	High gain antenna	Schwarzbeck	LB-180400KF	MT-E389	/	2023/03/17	1 Year
13	Preamplifier	Schwarzbeck	BBV 9743	MT-E390	/	2023/03/17	1 Year
14	Pre-amplifier	EMCI	EMC051845SE	MT-E391	/	2023/03/17	1 Year
15	Pre-amplifier	Agilent	83051A	MT-E392	/	2023/03/17	1 Year
16	High pass filter unit	Tonscend	JS0806-F	MT-E393	/	2023/03/17	1 Year
17	RF Cable(below1GHz)	Times	9kHz-1GHz	MT-E394	/	2023/03/17	1 Year
18	RF Cable(above 1GHz)	Times	1-40G	MT-E395	/	2023/03/17	1 Year
19	RF Cable (9KHz-40GHz)	Tonscend	170660	N/A	/	2023/03/17	1 Year

Note: The Cal.Interval was one year.

5 TEST CONDITIONS AND RESULTS

5.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

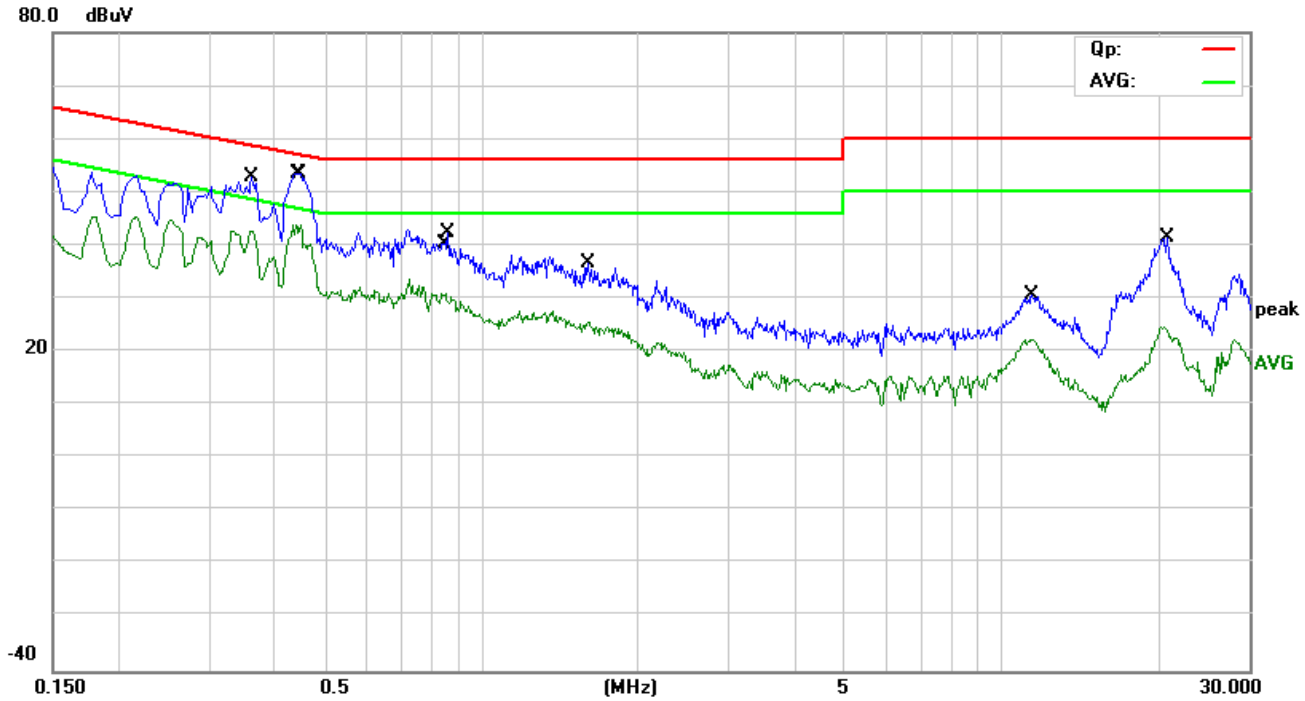
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

Remark:

1. WIFI modes were test at *802.11b/802.11g/802.11n (H20) /802.11n (H40)* (Low, Middle, and High channel); only the worst result of 802.11b Middle Channel was reported as below:

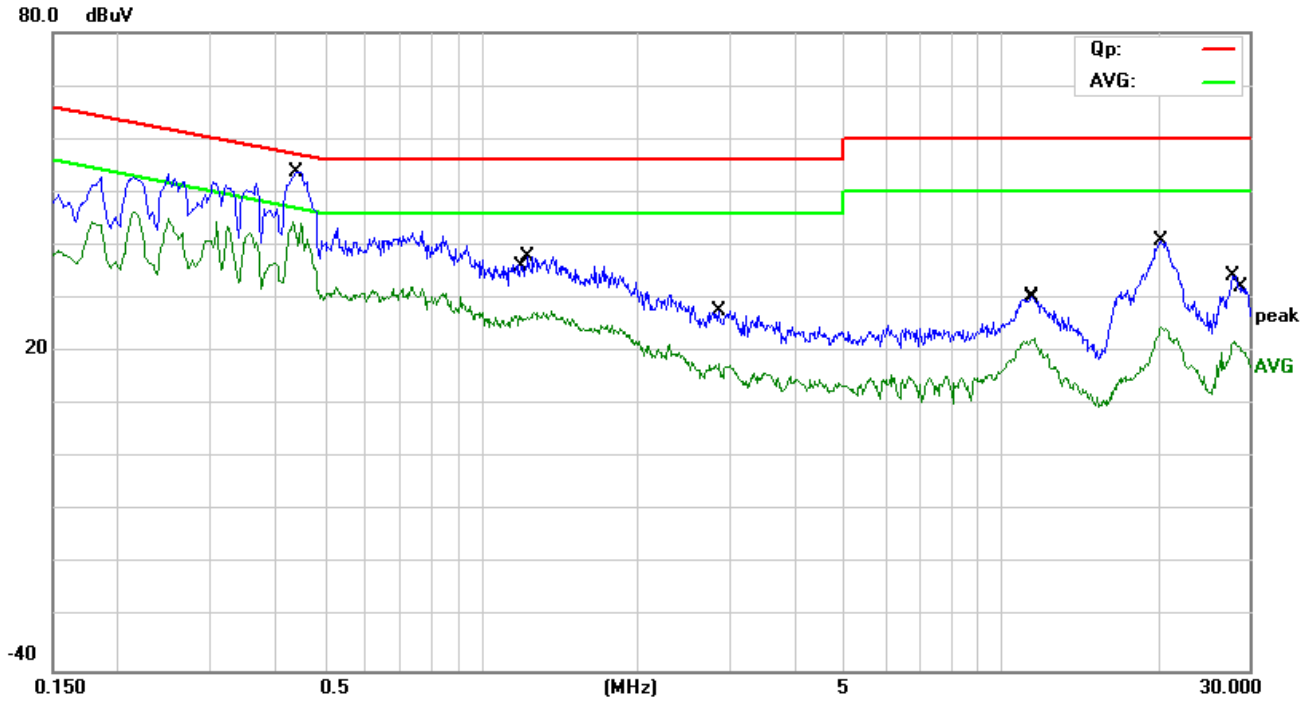
Power supply:	AC120V / 60Hz	Polarization	L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3620	43.17	9.59	52.76	58.68	-5.92	QP	
2		0.3620	33.17	9.59	42.76	48.68	-5.92	AVG	
3	*	0.4460	43.93	9.59	53.52	56.95	-3.43	QP	
4		0.4500	32.58	9.59	42.17	46.88	-4.71	AVG	
5		0.8420	21.33	9.60	30.93	46.00	-15.07	AVG	
6		0.8620	32.84	9.60	42.44	56.00	-13.56	QP	
7		1.6100	27.00	9.60	36.60	56.00	-19.40	QP	
8		1.6100	16.06	9.60	25.66	46.00	-20.34	AVG	
9		11.4220	12.55	9.69	22.24	50.00	-27.76	AVG	
10		11.4860	20.86	9.69	30.55	60.00	-29.45	QP	
11		20.6980	15.03	9.73	24.76	50.00	-25.24	AVG	
12		20.8380	31.65	9.73	41.38	60.00	-18.62	QP	

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

Power supply:	AC120V / 60Hz	Polarization	N



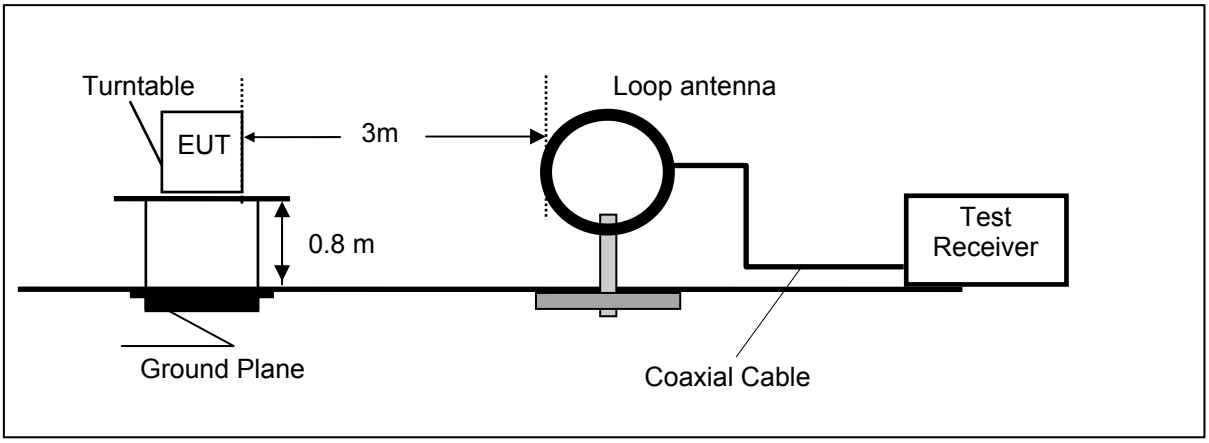
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4351	34.20	9.59	43.79	47.15	-3.36	AVG	
2	*	0.4420	44.14	9.59	53.73	57.02	-3.29	QP	
3		1.1860	17.26	9.60	26.86	46.00	-19.14	AVG	
4		1.2340	28.40	9.60	38.00	56.00	-18.00	QP	
5		2.8660	18.04	9.61	27.65	56.00	-28.35	QP	
6		2.8740	8.08	9.61	17.69	46.00	-28.31	AVG	
7		11.4580	20.56	9.69	30.25	60.00	-29.75	QP	
8		11.5860	13.00	9.69	22.69	50.00	-27.31	AVG	
9		20.2900	31.11	9.73	40.84	60.00	-19.16	QP	
10		20.2900	15.07	9.73	24.80	50.00	-25.20	AVG	
11		27.9340	24.52	9.76	34.28	60.00	-25.72	QP	
12		28.9940	10.50	9.77	20.27	50.00	-29.73	AVG	

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

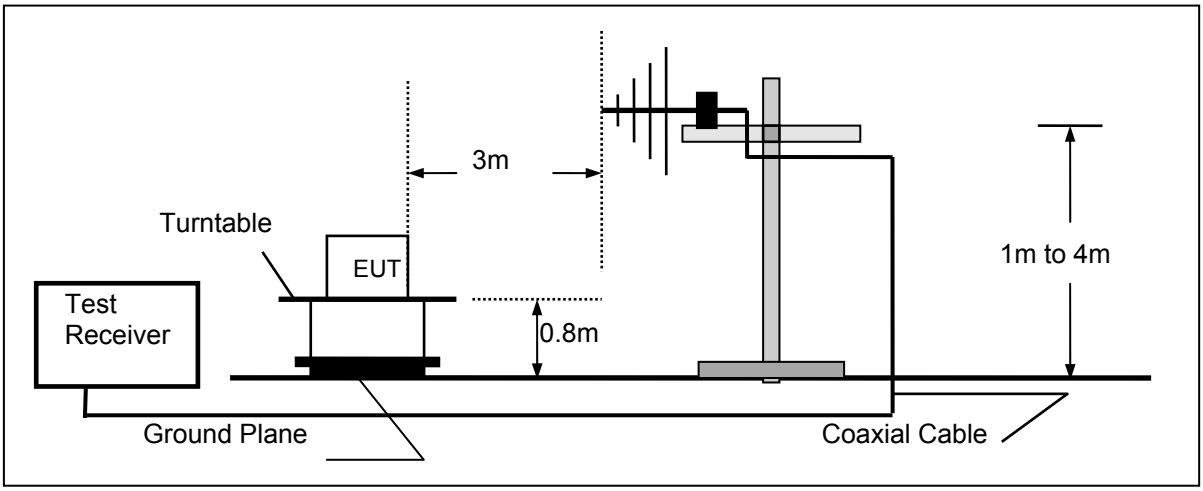
5.2 Radiated Emission

TEST CONFIGURATION

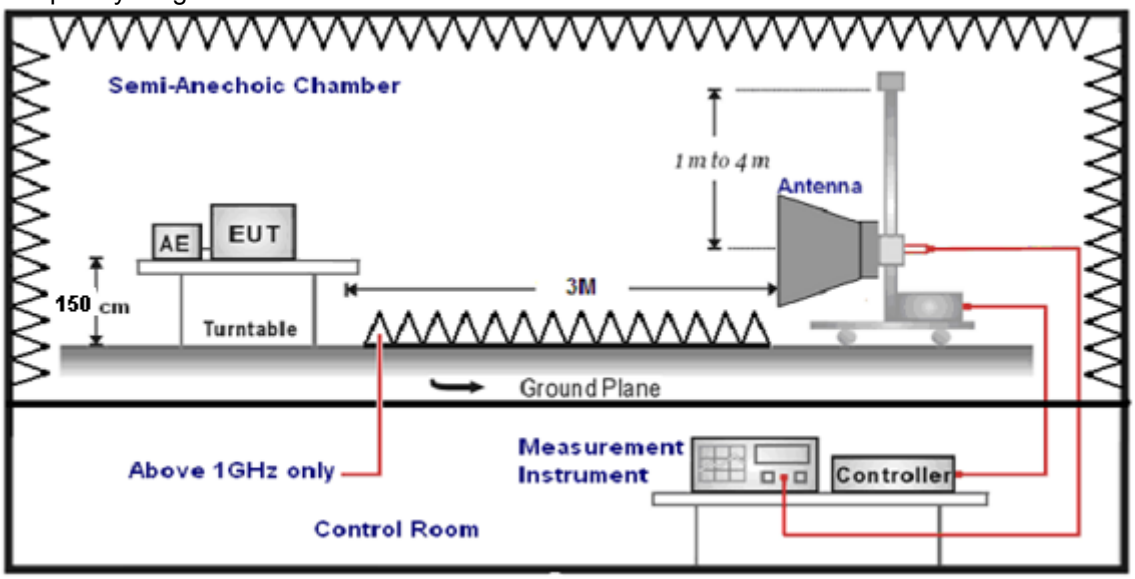
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

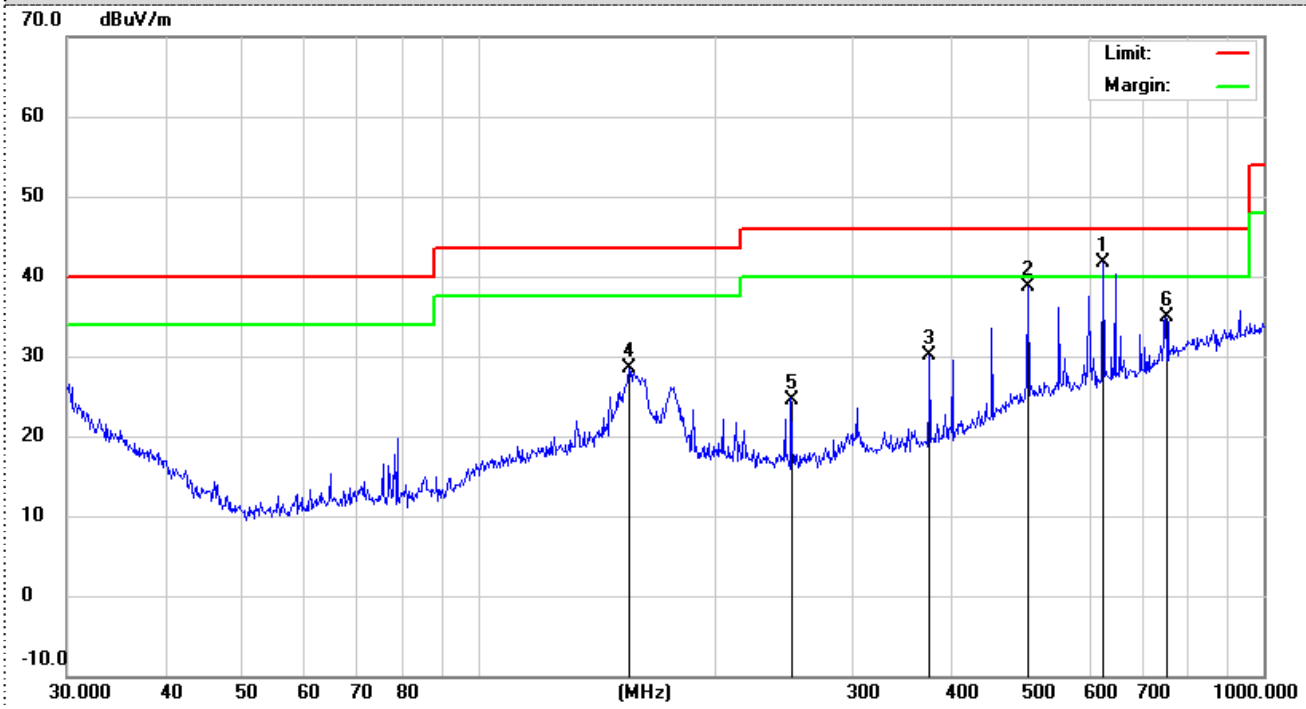
TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. All three channels (lowest/middle/highest) of each mode were measured below 1GHz and recorded worst case at 802.11b low channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.
4. Remark: Result=Reading value+Factor

For 30MHz-1GHz

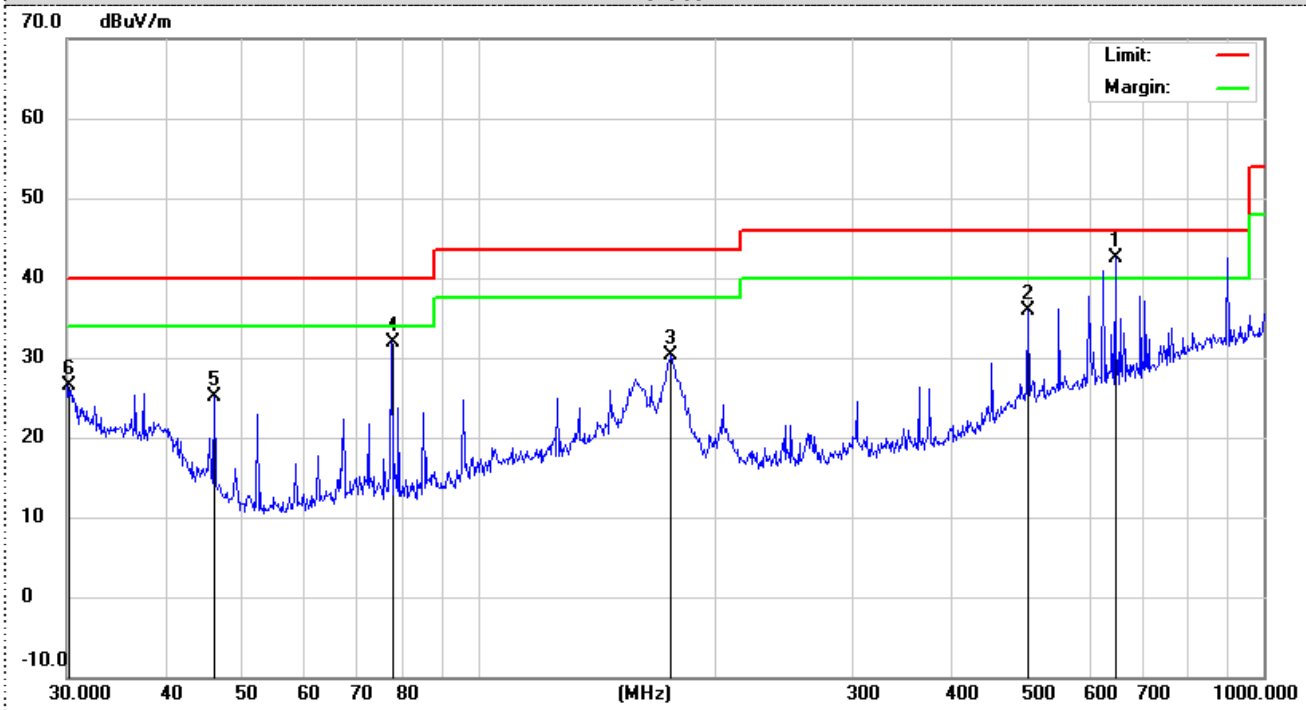
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	625.0780	17.53	24.13	41.66	46.00	-4.34	QP	200	125	
2		501.1790	15.90	22.71	38.61	46.00	-7.39	QP	200	147	
3		375.9385	13.25	16.94	30.19	46.00	-15.81	QP	200	118	
4		155.9101	11.03	17.46	28.49	43.50	-15.01	QP	200	261	
5		250.3012	10.79	13.81	24.60	46.00	-21.40	QP	200	58	
6		750.1083	8.47	26.50	34.97	46.00	-11.03	QP	200	88	

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

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	647.3856	18.15	24.42	42.57	46.00	-3.43	QP	100	215	
2		501.1790	13.24	22.71	35.95	46.00	-10.05	QP	100	158	
3		176.2686	14.03	16.24	30.27	43.50	-13.23	QP	100	177	
4		77.5928	22.05	9.91	31.96	40.00	-8.04	QP	100	251	
5		46.1779	15.20	9.93	25.13	40.00	-14.87	QP	100	268	
6		30.1054	5.76	20.83	26.59	40.00	-13.41	QP	100	245	

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

For 1GHz to 25GHz

Note: 802.11b/802.11g/802.11n (H20) /802.11n (H40) all have been tested, only worse case 802.11b mode is reported

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
802.11b-2412MHz									
V	4824	53.75	30.28	7.01	36.5	54.54	74	19.46	PK
V	4824	41.27	30.28	7.01	36.5	42.06	54	11.94	AV
H	4824	56.91	30.28	7.01	36.5	57.7	74	16.3	PK
H	4824	41.96	30.28	7.01	36.5	42.75	54	11.25	AV
V	7236	43.12	36.59	8.91	35.3	53.32	74	20.68	PK
V	7236	31.56	36.59	8.91	35.3	41.76	54	12.24	AV
H	7236	40.7	36.59	8.91	35.3	50.9	74	23.1	PK
H	7236	31.42	36.59	8.91	35.3	41.62	54	12.38	AV
802.11b -2437MHz									
V	4874	55.49	30.36	7.62	36.5	56.97	74	17.03	PK
V	4874	44.3	30.36	7.62	36.5	45.78	54	8.22	AV
H	4874	54.29	30.36	7.62	36.5	55.77	74	18.23	PK
H	4874	43.32	30.36	7.62	36.5	44.8	54	9.2	AV
V	7311	44.56	36.61	8.84	35.3	54.71	74	19.29	PK
V	7311	31.27	36.61	8.84	35.3	41.42	54	12.58	AV
H	7311	40.84	36.61	8.84	35.3	50.99	74	23.01	PK
H	7311	29.17	36.61	8.84	35.3	39.32	54	14.68	AV
802.11b -2462MHz									
V	4924	57.2	30.43	7.94	36.2	59.37	74	14.63	PK
V	4924	43.32	30.43	7.94	36.2	45.49	54	8.51	AV
H	4924	54.91	30.43	7.94	36.2	57.08	74	16.92	PK
H	4924	43.28	30.43	7.94	36.2	45.45	54	8.55	AV
V	7386	42.01	36.78	8.45	35.3	51.94	74	22.06	PK
V	7386	29.77	36.78	8.45	35.3	39.7	54	14.3	AV
H	7386	43.91	36.78	8.45	35.3	53.84	74	20.16	PK
H	7386	31.98	36.78	8.45	35.3	41.91	54	12.09	AV

Note：

1) Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor.
2) Margin value = Limits-Emission level.
3) -- Mean the PK detector measured value is below average limit.
4) The other emission levels were very low against the limit.
5) RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

Results of Band Edges Test (Radiated)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
802.11b -2412MHz									
V	2390	58.7	27.49	3.32	36.22	53.29	74	20.71	PK
V	2390	46.08	27.49	3.32	36.22	40.67	54	13.33	AV
H	2390	59.43	27.49	3.32	36.22	54.02	74	19.98	PK
H	2390	45.52	27.49	3.32	36.22	40.11	54	13.89	AV
V	2400	55.31	27.55	3.41	36.22	50.05	74	23.95	PK
V	2400	47.57	27.55	3.41	36.22	42.31	54	11.69	AV
H	2400	58.51	27.55	3.41	36.22	53.25	74	20.75	PK
H	2400	47.71	27.55	3.41	36.22	42.45	54	11.55	AV
802.11b -2462MHz									
V	2483.5	55.68	27.45	3.38	36.34	50.17	74	23.83	PK
V	2483.5	46.5	27.45	3.38	36.34	40.99	54	13.01	AV
H	2483.5	56.89	27.45	3.38	36.34	51.38	74	22.62	PK
H	2483.5	47.35	27.45	3.38	36.34	41.84	54	12.16	AV
V	2500	58.3	27.41	3.47	36.35	52.83	74	21.17	PK
V	2500	44.92	27.41	3.47	36.35	39.45	54	14.55	AV
H	2500	57.03	27.41	3.47	36.35	51.56	74	22.44	PK
H	2500	46.72	27.41	3.47	36.35	41.25	54	12.75	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
802.11g -2412MHz									
V	2390	55.12	27.49	3.32	36.22	49.71	74	24.29	PK
V	2390	46.56	27.49	3.32	36.22	41.15	54	12.85	AV
H	2390	59.42	27.49	3.32	36.22	54.01	74	19.99	PK
H	2390	45.04	27.49	3.32	36.22	39.63	54	14.37	AV
V	2400	56.78	27.55	3.41	36.22	51.52	74	22.48	PK
V	2400	47.17	27.55	3.41	36.22	41.91	54	12.09	AV
H	2400	58.37	27.55	3.41	36.22	53.11	74	20.89	PK
H	2400	43.37	27.55	3.41	36.22	38.11	54	15.89	AV
802.11g -2462MHz									
V	2483.5	58.96	27.45	3.38	36.34	53.45	74	20.55	PK
V	2483.5	45.78	27.45	3.38	36.34	40.27	54	13.73	AV
H	2483.5	56.01	27.45	3.38	36.34	50.5	74	23.5	PK
H	2483.5	47.27	27.45	3.38	36.34	41.76	54	12.24	AV
V	2500	59.03	27.41	3.47	36.35	53.56	74	20.44	PK
V	2500	44.93	27.41	3.47	36.35	39.46	54	14.54	AV
H	2500	56.2	27.41	3.47	36.35	50.73	74	23.27	PK
H	2500	45.91	27.41	3.47	36.35	40.44	54	13.56	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
802.11n(HT20) -2412MHz									
V	2390	59.24	27.49	3.32	36.22	53.83	74	20.17	PK
V	2390	46.13	27.49	3.32	36.22	40.72	54	13.28	AV
H	2390	56.98	27.49	3.32	36.22	51.57	74	22.43	PK
H	2390	44.09	27.49	3.32	36.22	38.68	54	15.32	AV
V	2400	58.99	27.55	3.41	36.22	53.73	74	20.27	PK
V	2400	43.66	27.55	3.41	36.22	38.4	54	15.6	AV
H	2400	56.21	27.55	3.41	36.22	50.95	74	23.05	PK
H	2400	46.59	27.55	3.41	36.22	41.33	54	12.67	AV
802.11n(HT20) -2462MHz									
V	2483.5	57.54	27.45	3.38	36.34	52.03	74	21.97	PK
V	2483.5	43.25	27.45	3.38	36.34	37.74	54	16.26	AV
H	2483.5	55.53	27.45	3.38	36.34	50.02	74	23.98	PK
H	2483.5	44.73	27.45	3.38	36.34	39.22	54	14.78	AV
V	2500	56.78	27.41	3.47	36.35	51.31	74	22.69	PK
V	2500	46.11	27.41	3.47	36.35	40.64	54	13.36	AV
H	2500	57.45	27.41	3.47	36.35	51.98	74	22.02	PK
H	2500	47.97	27.41	3.47	36.35	42.5	54	11.5	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
802.11n(HT40) -2422MHz									
V	2390	58.31	27.49	3.32	36.22	52.9	74	21.1	PK
V	2390	47.34	27.49	3.32	36.22	41.93	54	12.07	AV
H	2390	59.85	27.49	3.32	36.22	54.44	74	19.56	PK
H	2390	46.19	27.49	3.32	36.22	40.78	54	13.22	AV
V	2400	59.61	27.55	3.41	36.22	54.35	74	19.65	PK
V	2400	47.92	27.55	3.41	36.22	42.66	54	11.34	AV
H	2400	57.51	27.55	3.41	36.22	52.25	74	21.75	PK
H	2400	45.8	27.55	3.41	36.22	40.54	54	13.46	AV
802.11n(HT40) -2452MHz									
V	2483.5	58.65	27.45	3.38	36.34	53.14	74	20.86	PK
V	2483.5	43.64	27.45	3.38	36.34	38.13	54	15.87	AV
H	2483.5	59.47	27.45	3.38	36.34	53.96	74	20.04	PK
H	2483.5	45.83	27.45	3.38	36.34	40.32	54	13.68	AV
V	2500	56.12	27.41	3.47	36.35	50.65	74	23.35	PK
V	2500	47.4	27.41	3.47	36.35	41.93	54	12.07	AV
H	2500	59.32	27.41	3.47	36.35	53.85	74	20.15	PK
H	2500	44.4	27.41	3.47	36.35	38.93	54	15.07	AV

Note：

1) Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor.
2) Margin value = Limits-Emission level.
3) -- Mean the PK detector measured value is below average limit.
4) The other emission levels were very low against the limit.
5) RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

5.3 Maximum Conducted Output Power

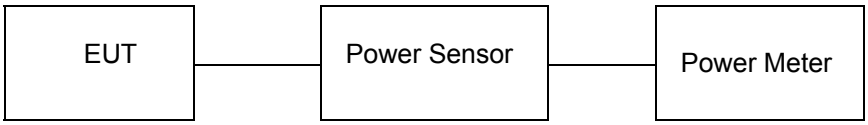
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

See Appendix I

5.4 Power Spectral Density

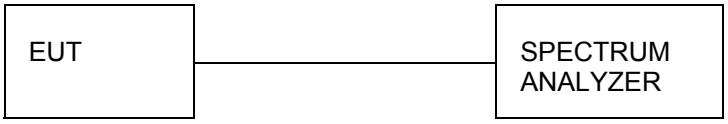
Limit

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.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW ≥ 3× RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
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 power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

Test Configuration



Test Results

See APPENDIX VI

5.5 6dB Bandwidth

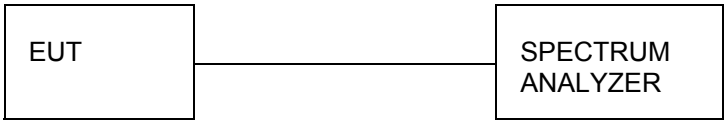
Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Test Configuration



Test Results

See APPENDIX III

5.6 Out-of-band Emissions

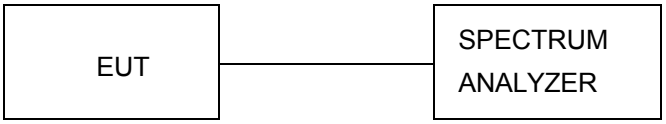
Limit

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, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies 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.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration



Test Results

See APPENDIX IV

5.7 Duty Cycle Information

See APPENDIX V

5.8 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

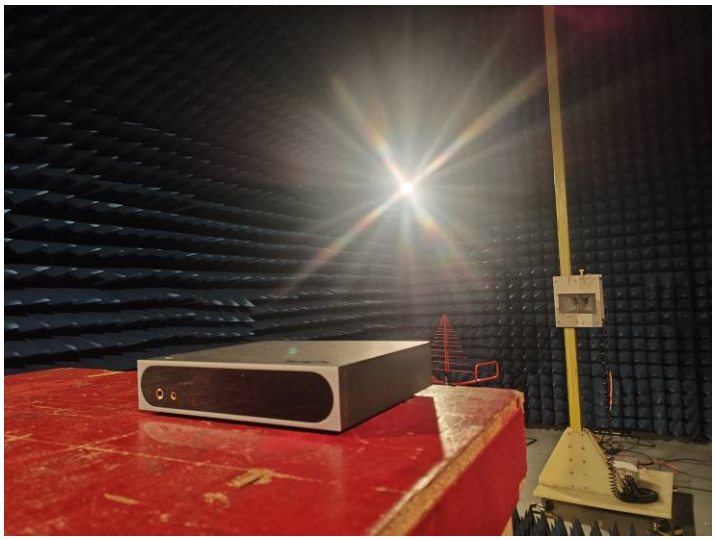
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

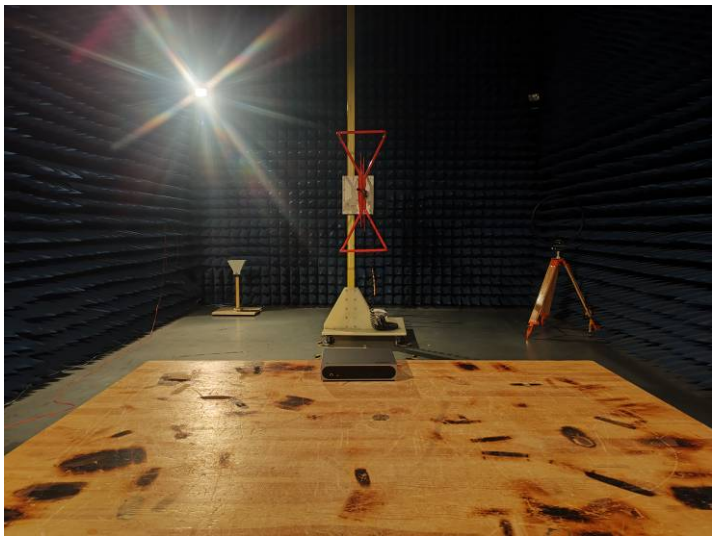
Test Result:

The directional gains of antenna used for transmitting is 3.14dBi, and the antenna is an FPC antenna and no consideration of replacement. Please see EUT photo for details.

Results: Compliance.

6 Test Setup Photos of the EUT





7 Photos of the EUT

See related photo report.

APPENDIX I.Conducted Peak Output Power

Test Result

Conducted peak output power

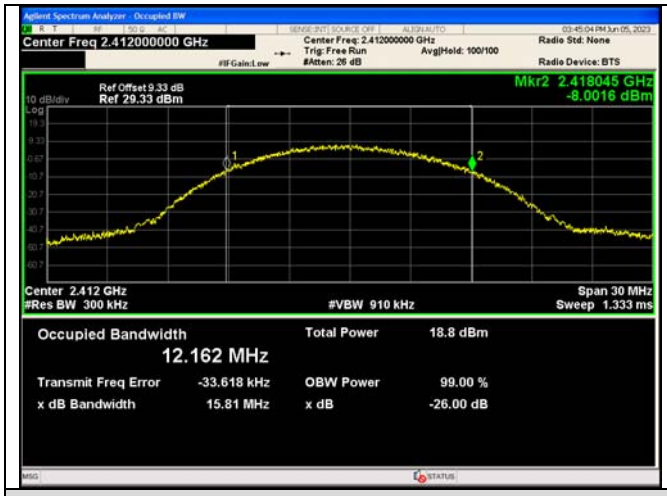
Mode	Channel	Ant. 0 (dBm)	Ant. 1 (dBm)	Ant. 2 (dBm)	Ant. 3 (dBm)	Total (dBm)	Limit (dBm)	Result
IEEE 802.11b	1	17.37				N/A	30	PASS
	6	18.42				N/A	30	PASS
	11	15.98				N/A	30	PASS
IEEE 802.11g	1	19.51				N/A	30	PASS
	6	17.59				N/A	30	PASS
	11	16.90				N/A	30	PASS
IEEE 802.11n_20	1	19.36				N/A	30	PASS
	6	19.89				N/A	30	PASS
	11	17.04				N/A	30	PASS
IEEE 802.11n_40	3	17.80				N/A	30	PASS
	6	19.53				N/A	30	PASS
	9	17.70				N/A	30	PASS

APPENDIX II.99% Bandwidth

Test Result

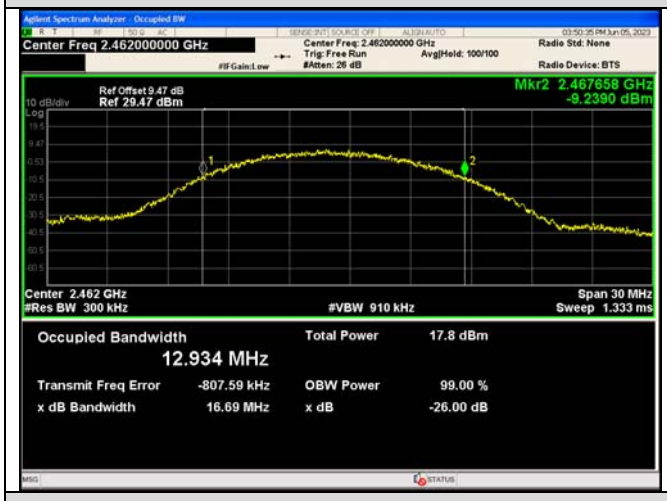
Mode	Channel	Ant.	99% BW (MHz)
IEEE 802.11b	1	3.14	12.162
	6		13.180
	11		12.934
IEEE 802.11g	1		16.382
	6		16.592
	11		17.261
IEEE 802.11n_20	1		17.501
	6		17.917
	11		17.841
IEEE 802.11n_40	3		36.058
	6		37.563
	9		35.114

Test Graphs

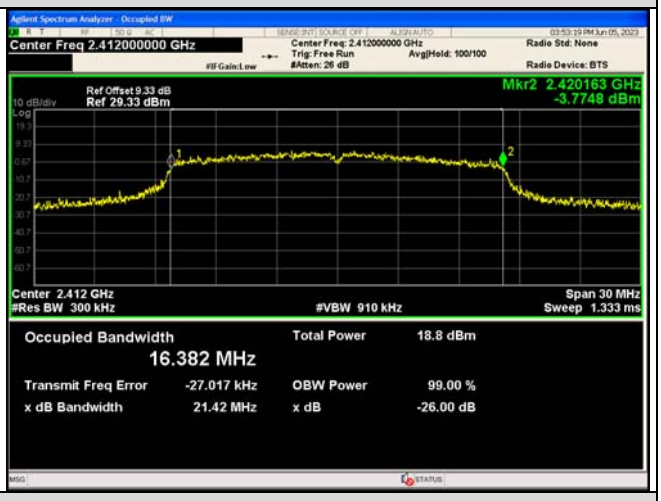


IEEE 802.11b_Channel 1_20MHz_Antenna 0

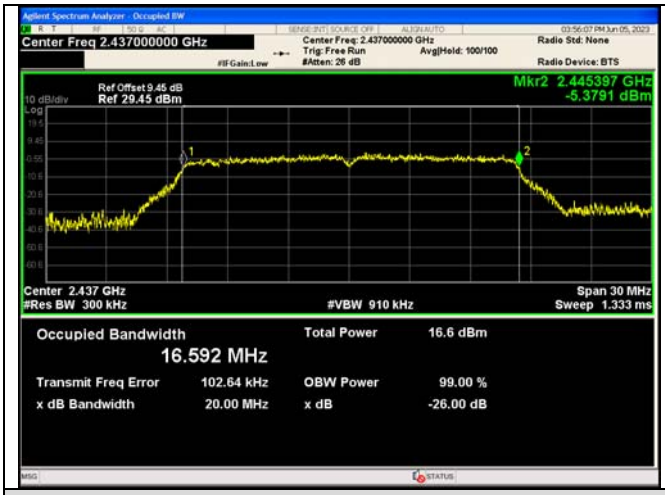
IEEE 802.11b_Channel 6_20MHz_Antenna 0



IEEE 802.11b_Channel 11_20MHz_Antenna 0

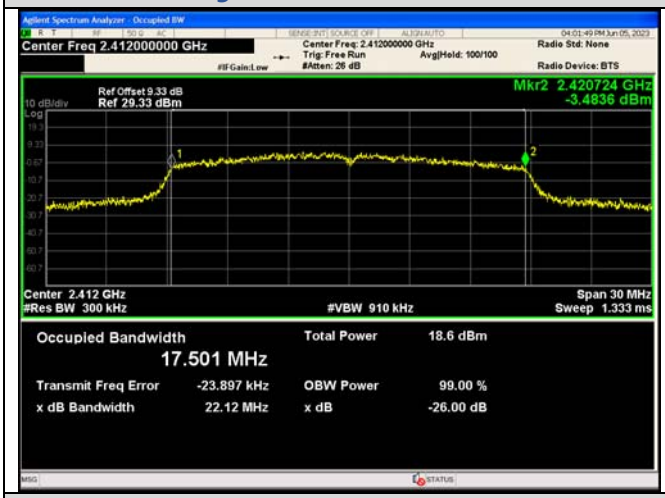


IEEE 802.11g_Channel 1_20MHz_Antenna 0

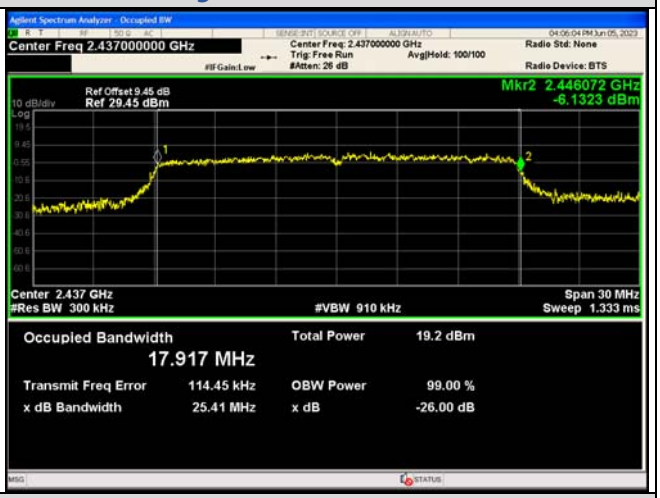


IEEE 802.11g_Channel 6_20MHz_Antenna 0

IEEE 802.11g_Channel 11_20MHz_Antenna 0



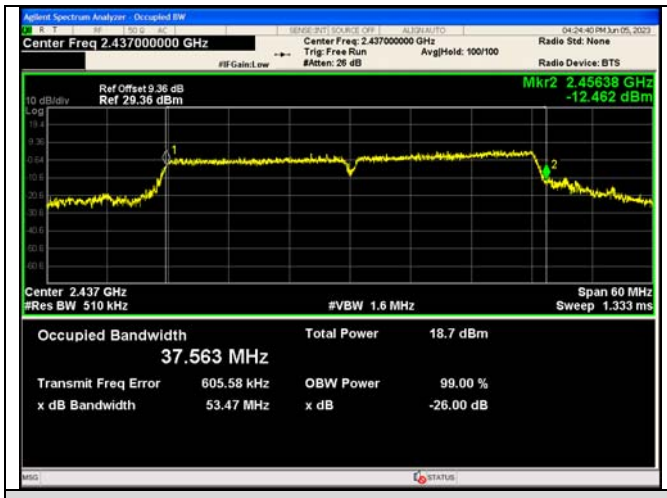
IEEE 802.11n_Channel 1_20MHz_Antenna 0



IEEE 802.11n_Channel 6_20MHz_Antenna 0

IEEE 802.11n_Channel 11_20MHz_Antenna 0

IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0

IEEE 802.11n_Channel 9_40MHz_Antenna 0

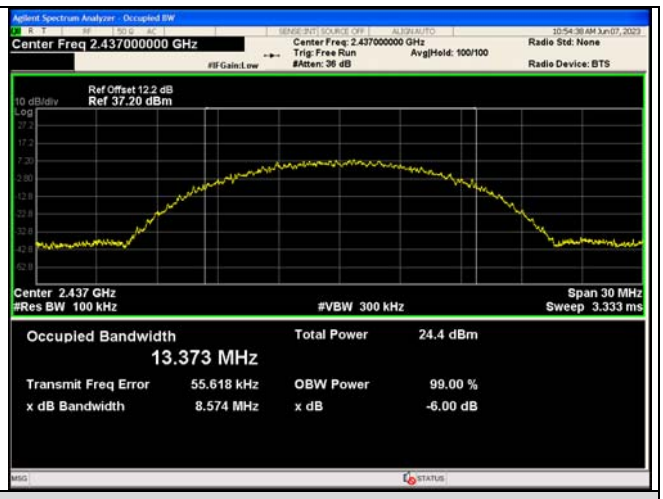
APPENDIX III.6dB Bandwidth

Test Result

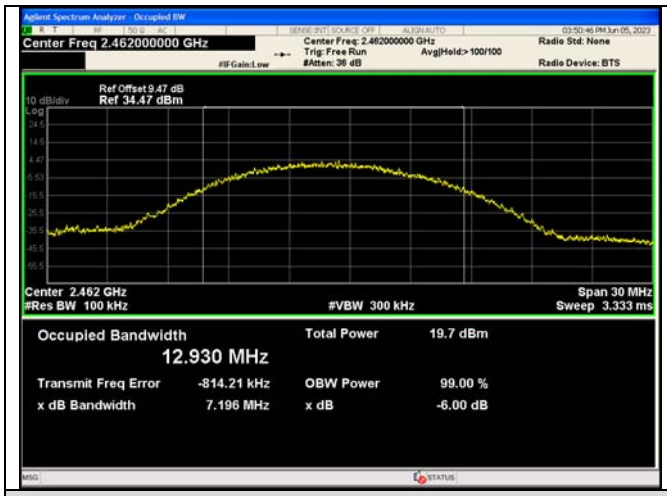
Mode	Channel	Ant.	Center Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11b	1	3.14	2412	7.281	0.5	PASS
	6		2437	8.574		PASS
	11		2462	7.196		PASS
IEEE 802.11g	1		2412	15.06		PASS
	6		2437	16.38		PASS
	11		2462	10.73		PASS
IEEE 802.11n_20	1		2412	15.06		PASS
	6		2437	16.95		PASS
	11		2462	11.93		PASS
IEEE 802.11n_40	3		2422	23.83		PASS
	6		2437	35.75		PASS
	9		2452	16.35		PASS

Test Graphs

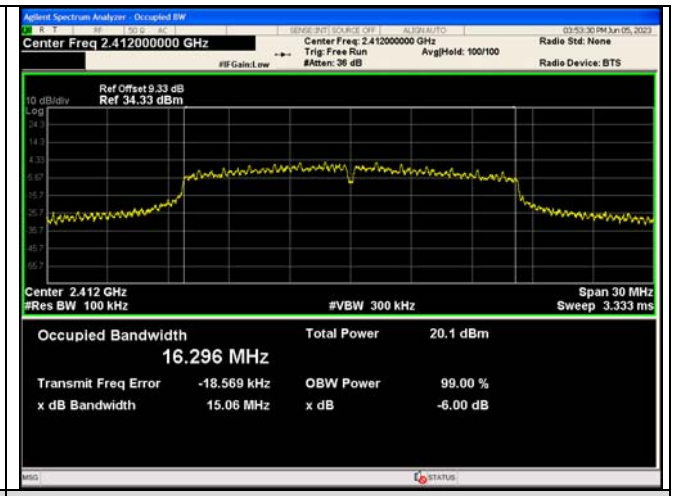
IEEE 802.11b_Channel 1_20MHz_Antenna 0



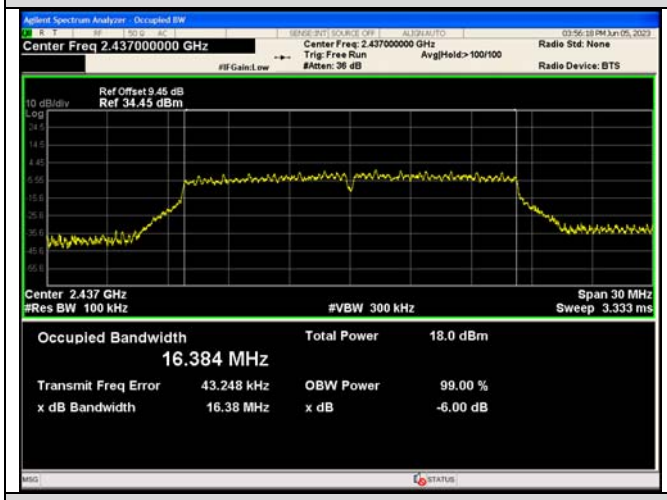
IEEE 802.11b_Channel 6_20MHz_Antenna 0



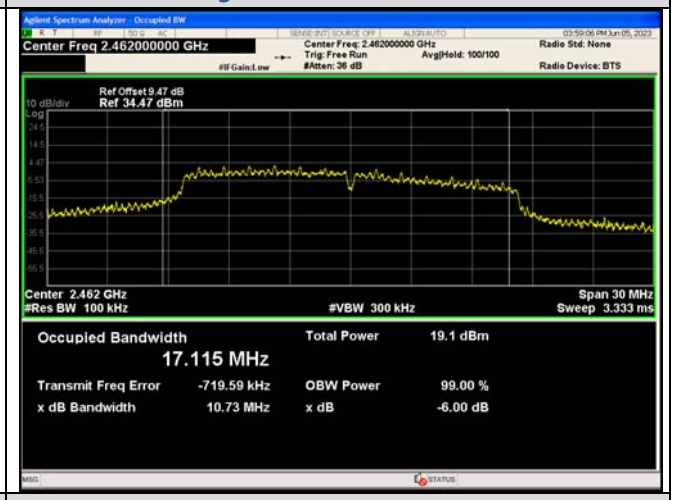
IEEE 802.11b_Channel 11_20MHz_Antenna 0



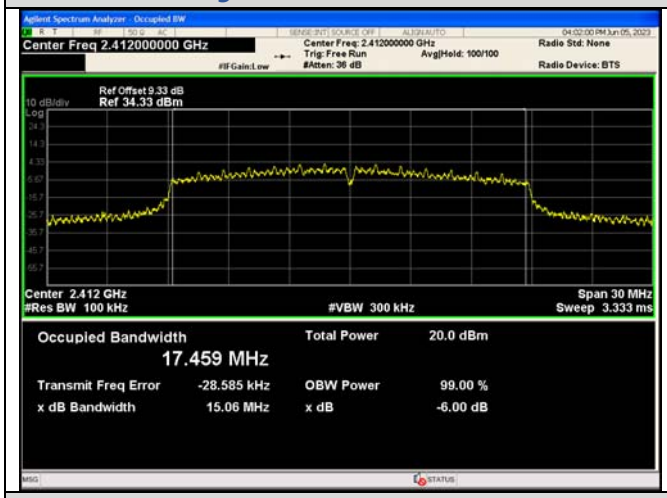
IEEE 802.11g_Channel 1_20MHz_Antenna 0



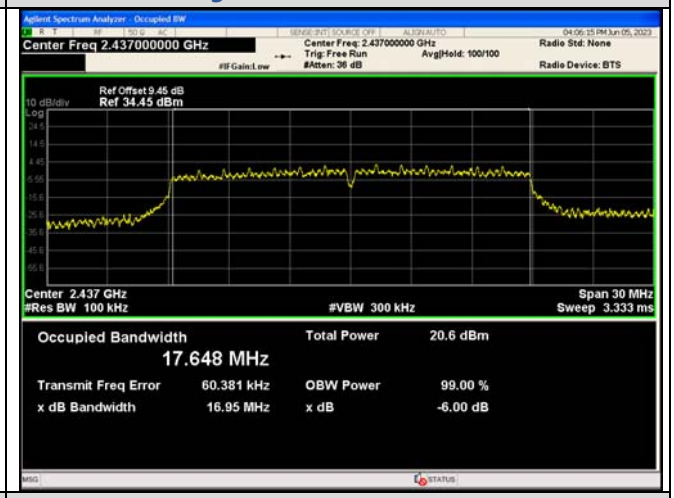
IEEE 802.11g_Channel 6_20MHz_Antenna 0



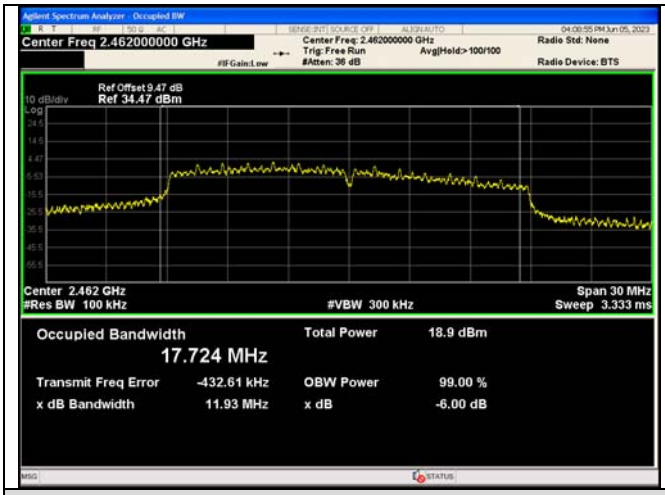
IEEE 802.11g_Channel 11_20MHz_Antenna 0



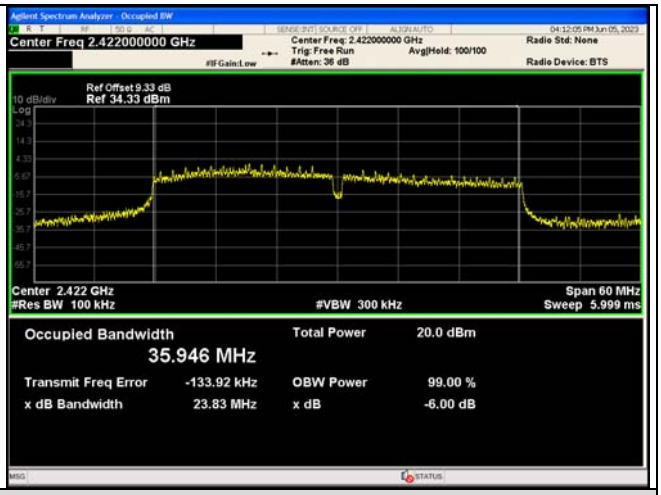
IEEE 802.11n_Channel 1_20MHz_Antenna 0



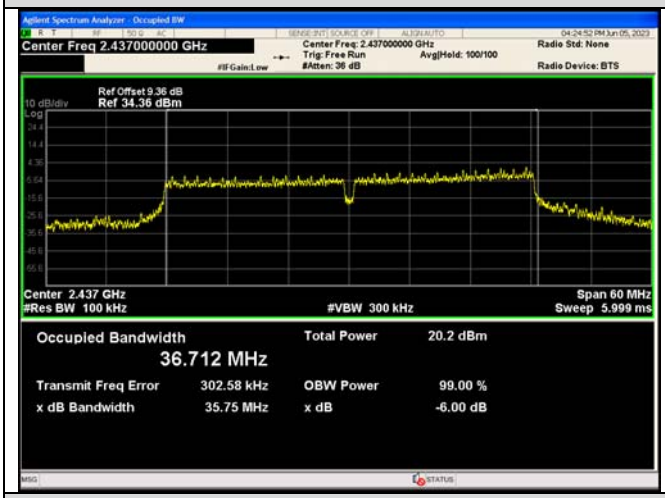
IEEE 802.11n_Channel 6_20MHz_Antenna 0



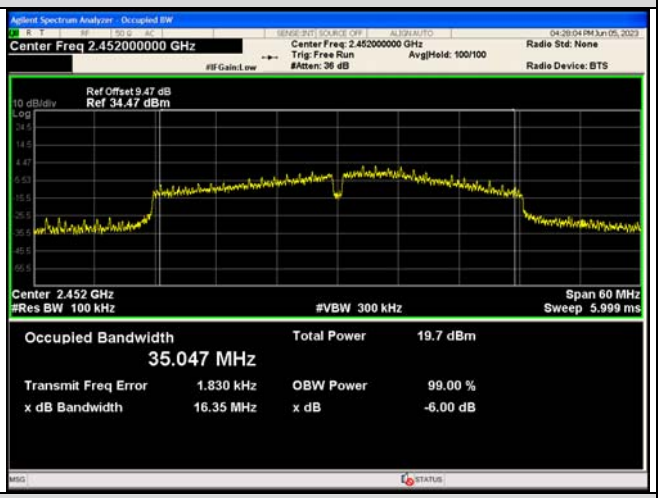
IEEE 802.11n_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 3_40MHz_Antenna 0



IEEE 802.11n_Channel 6_40MHz_Antenna 0



IEEE 802.11n_Channel 9_40MHz_Antenna 0

APPENDIX IV.Conducted Out Of Band Emission

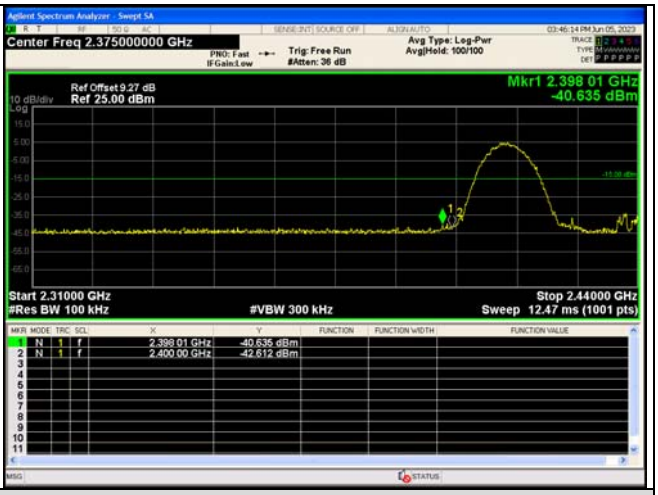
Test Result

Mode	Channel	Ant.	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
IEEE 802.11b	1	3.14	2400.00	-42.612	-15.08	-27.532	PASS
			2398.01	-40.635	-15.08	-25.555	PASS
			24952.6	-37.071	-15.08	-21.991	PASS
	6		24918.8	-36.375	-14.49	-21.885	PASS
	11		2483.50	-43.648	-16.07	-28	PASS
			24836.4	-37.008	-16.07	-20.938	PASS
IEEE 802.11g	1		2400.00	-26.300	-16.74	-9.560	PASS
			2398.92	-25.330	-16.74	-8.590	PASS
			24927.0	-37.699	-16.74	-20.959	PASS
	6		24966.3	-37.090	-19.53	-17.560	PASS
	11		2483.50	-36.311	-17.0	-19	PASS
			24882.6	-36.339	-17.0	-19.339	PASS
IEEE 802.11n_20	1		2400.00	-25.609	-16.54	-9.069	PASS
			2398.53	-25.282	-16.54	-8.742	PASS
			24982.5	-37.414	-16.54	-20.874	PASS
	6		24462.5	-37.460	-16.71	-20.750	PASS
	11		2483.50	-34.915	-17.17	-18	PASS
			24962.5	-37.352	-17.17	-20.181	PASS
IEEE 802.11n_40	3		2400.00	-25.776	-18.43	-7	PASS
			24914.5	-37.771	-18.43	-19.341	PASS
	6		24818.3	-37.077	-18.01	-19.067	PASS
	9		2483.50	-32.506	-17.18	-15	PASS
			24996.3	-37.397	-17.18	-20.217	PASS

Test Graphs

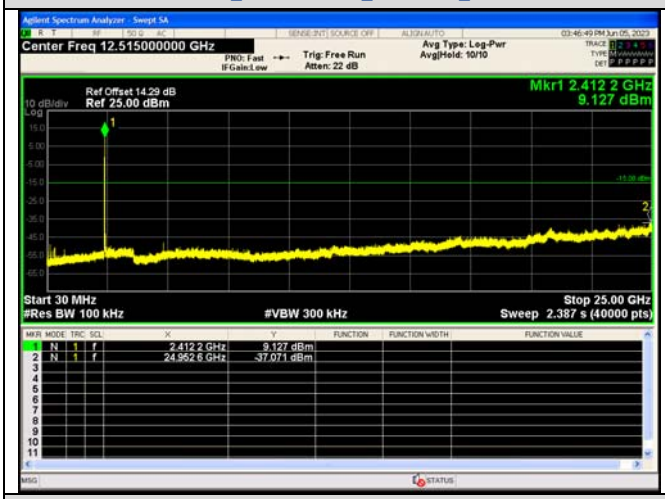
In-Band Reference Level

IEEE 802.11b_Channel 1_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11b_Channel 1_20MHz_Antenna 0

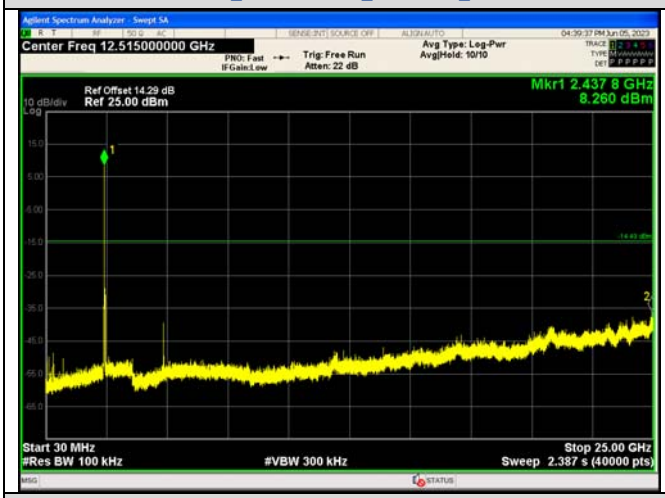


Spurious Emission

IEEE 802.11b_Channel 1_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11b_Channel 6_20MHz_Antenna 0

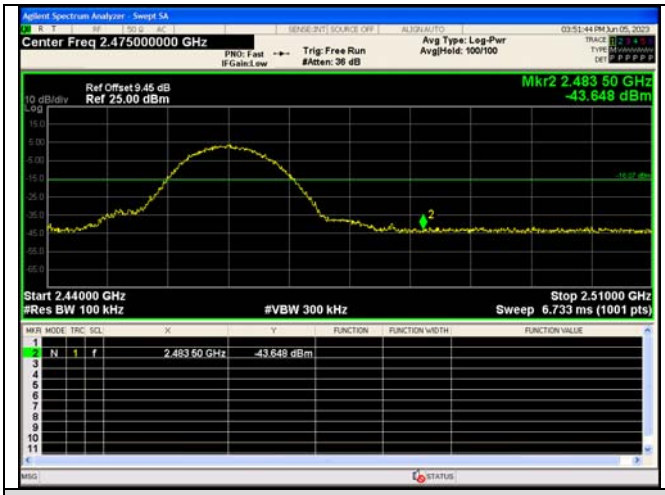


Spurious Emissions

IEEE 802.11b_Channel 6_20MHz_Antenna 0

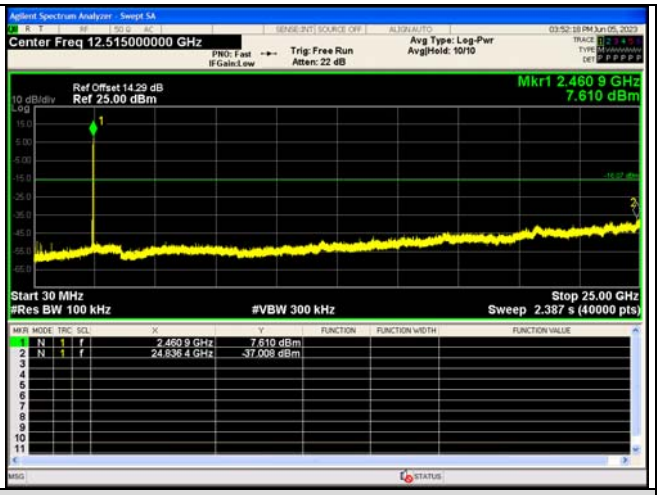
In-Band Reference Level

IEEE 802.11b_Channel 11_20MHz_Antenna 0



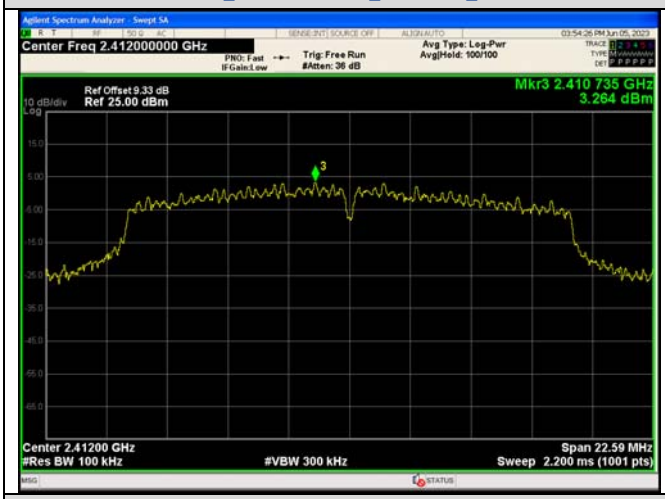
Out Of Band Emission

IEEE 802.11b_Channel 11_20MHz_Antenna 0



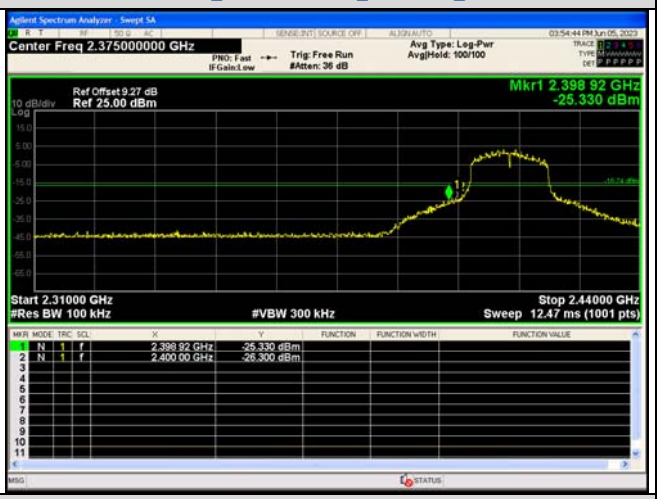
Spurious Emission

IEEE 802.11b_Channel 11_20MHz_Antenna 0



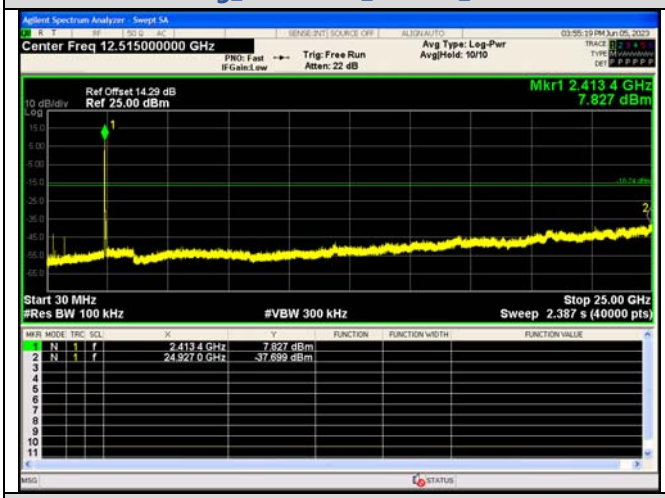
In-Band Reference Level

IEEE 802.11g_Channel 1_20MHz_Antenna 0



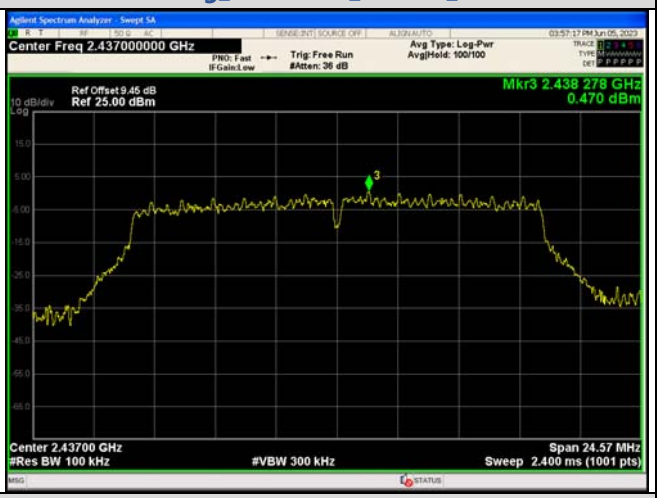
Out Of Band Emission

IEEE 802.11g_Channel 1_20MHz_Antenna 0



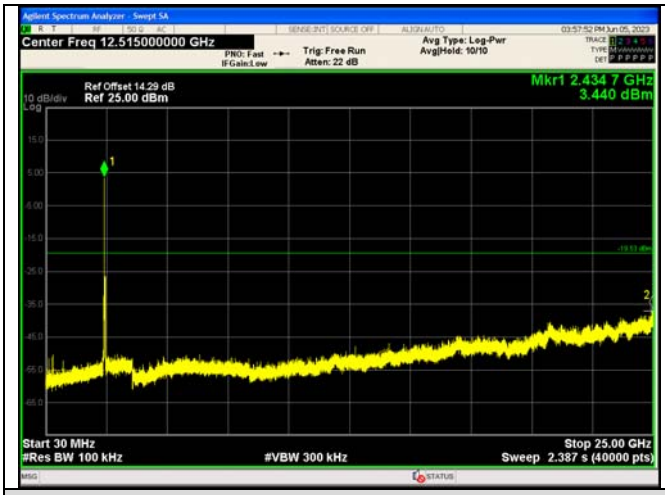
Spurious Emission

IEEE 802.11g_Channel 1_20MHz_Antenna 0



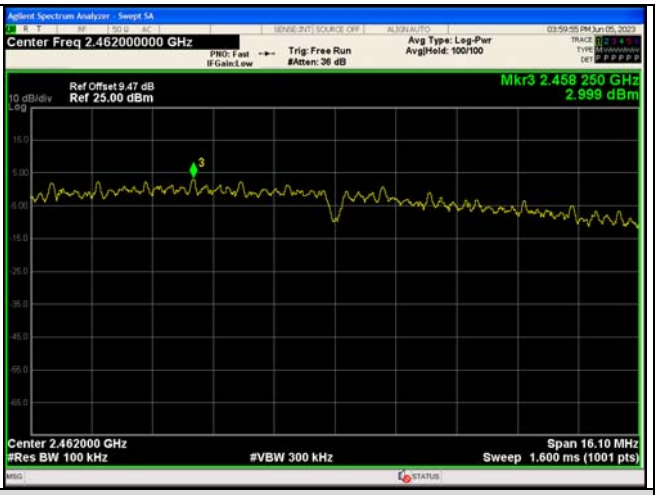
In-Band Reference Level

IEEE 802.11g_Channel 6_20MHz_Antenna 0



Spurious Emissions

IEEE 802.11g_Channel 6_20MHz_Antenna 0

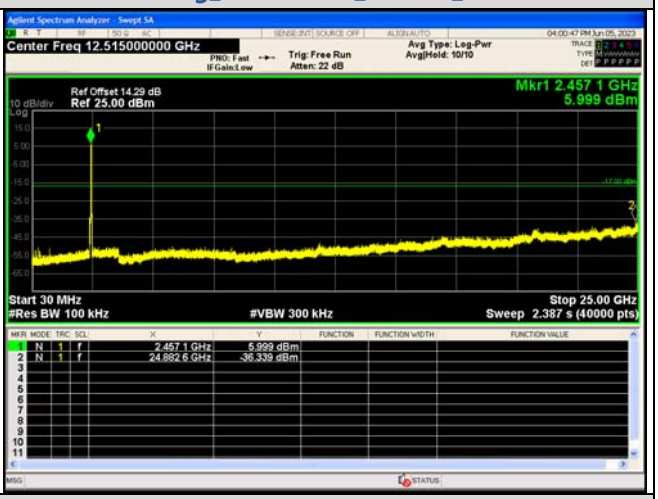


In-Band Reference Level

IEEE 802.11g_Channel 11_20MHz_Antenna 0

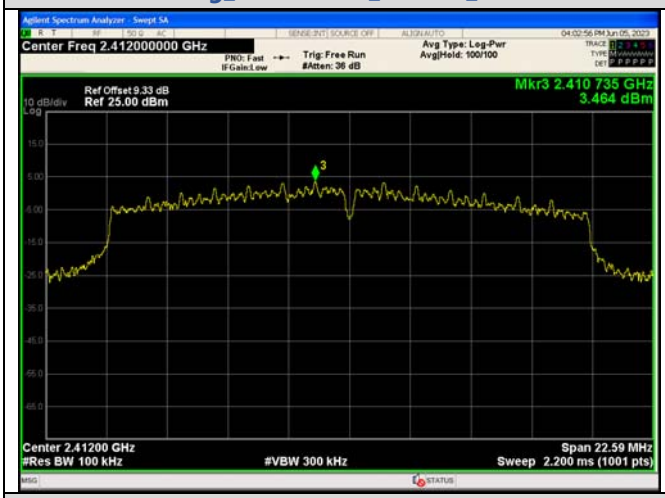
Out Of Band Emission

IEEE 802.11g_Channel 11_20MHz_Antenna 0



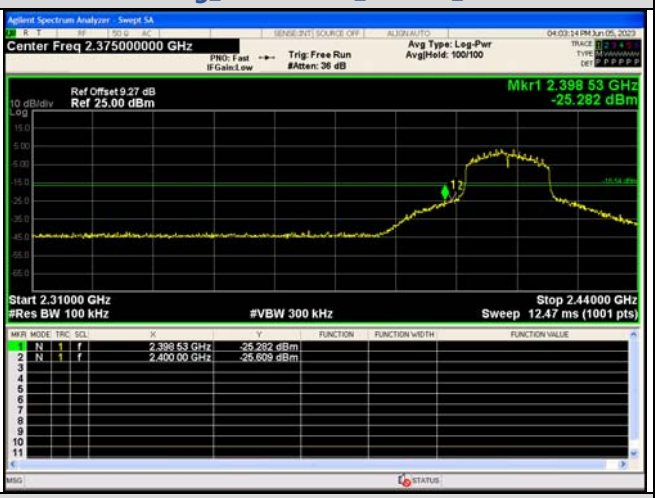
Spurious Emission

IEEE 802.11g_Channel 11_20MHz_Antenna 0



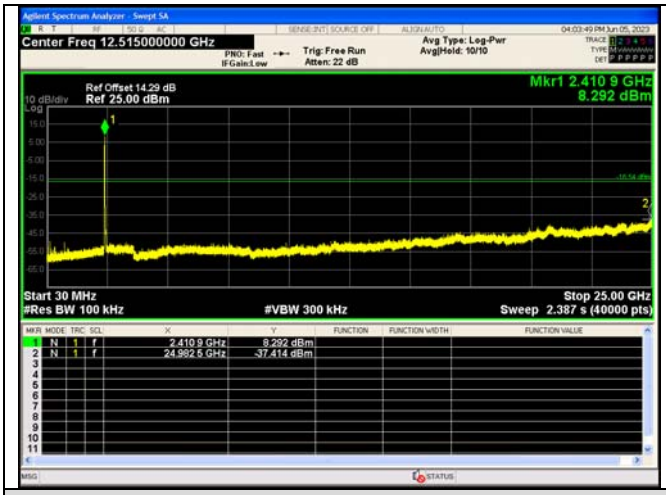
In-Band Reference Level

IEEE 802.11n_Channel 1_20MHz_Antenna 0



Out Of Band Emission

IEEE 802.11n_Channel 1_20MHz_Antenna 0

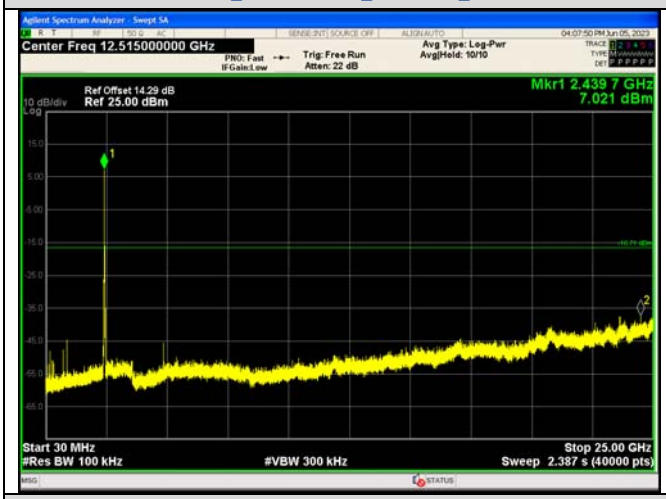


Spurious Emission

IEEE 802.11n_Channel 1_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11n_Channel 6_20MHz_Antenna 0



Spurious Emissions

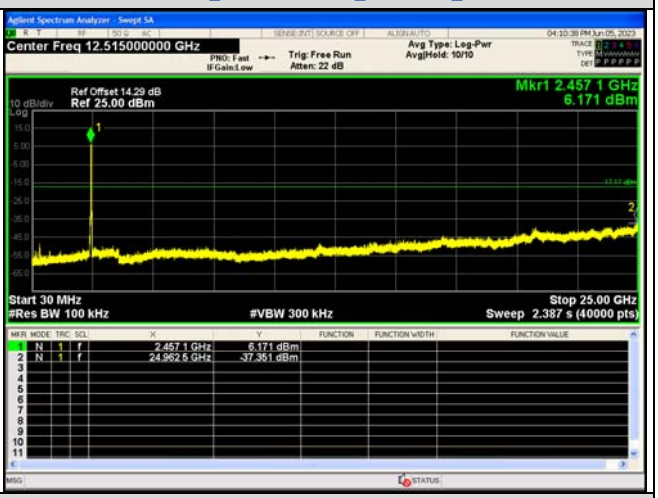
IEEE 802.11n_Channel 6_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11n_Channel 11_20MHz_Antenna 0

Out Of Band Emission

IEEE 802.11n_Channel 11_20MHz_Antenna 0



Spurious Emission

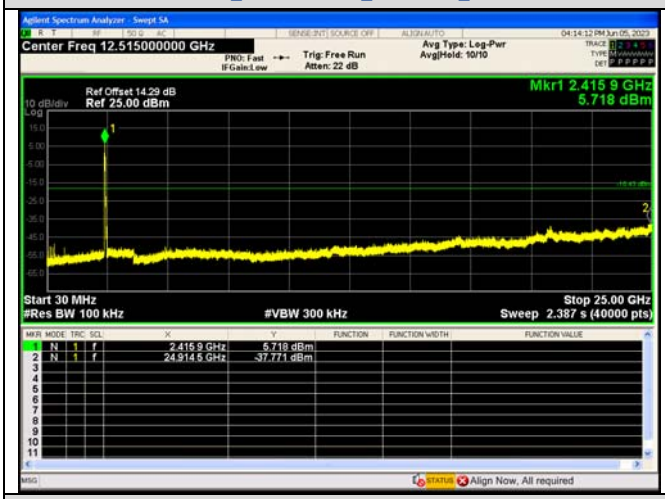
IEEE 802.11n_Channel 11_20MHz_Antenna 0

In-Band Reference Level

IEEE 802.11n_Channel 3_40MHz_Antenna 0

Out Of Band Emission

IEEE 802.11n_Channel 3_40MHz_Antenna 0

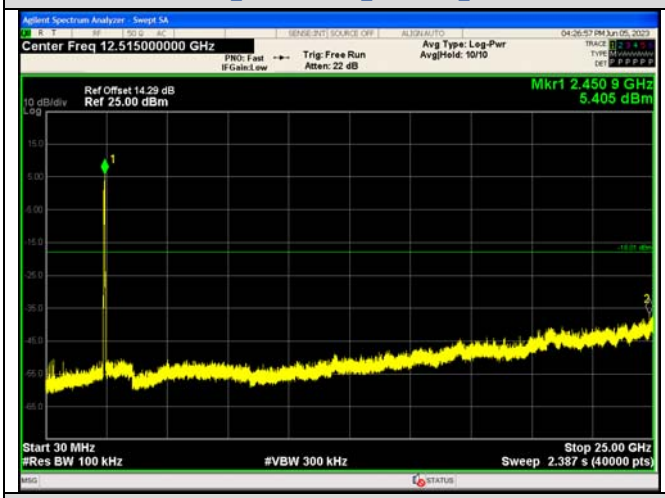


Spurious Emission

IEEE 802.11n_Channel 3_40MHz_Antenna 0

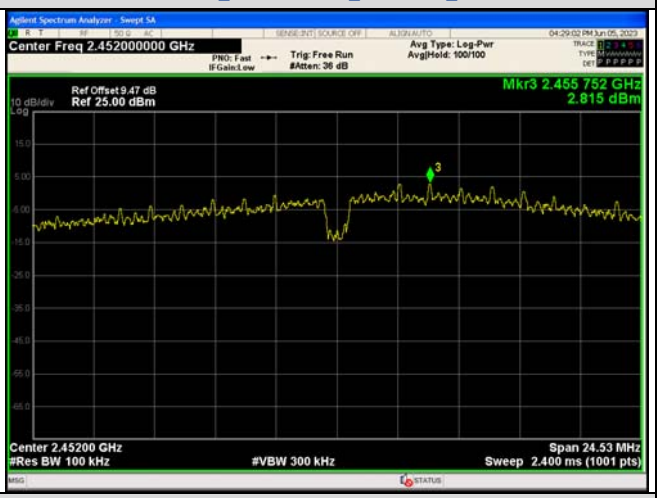
In-Band Reference Level

IEEE 802.11n_Channel 6_40MHz_Antenna 0



Spurious Emissions

IEEE 802.11n_Channel 6_40MHz_Antenna 0

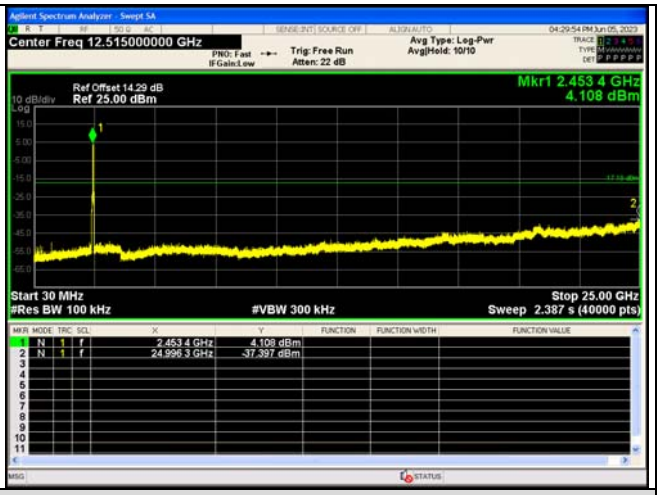


In-Band Reference Level

IEEE 802.11n_Channel 9_40MHz_Antenna 0

Out Of Band Emission

IEEE 802.11n_Channel 9_40MHz_Antenna 0



Spurious Emission

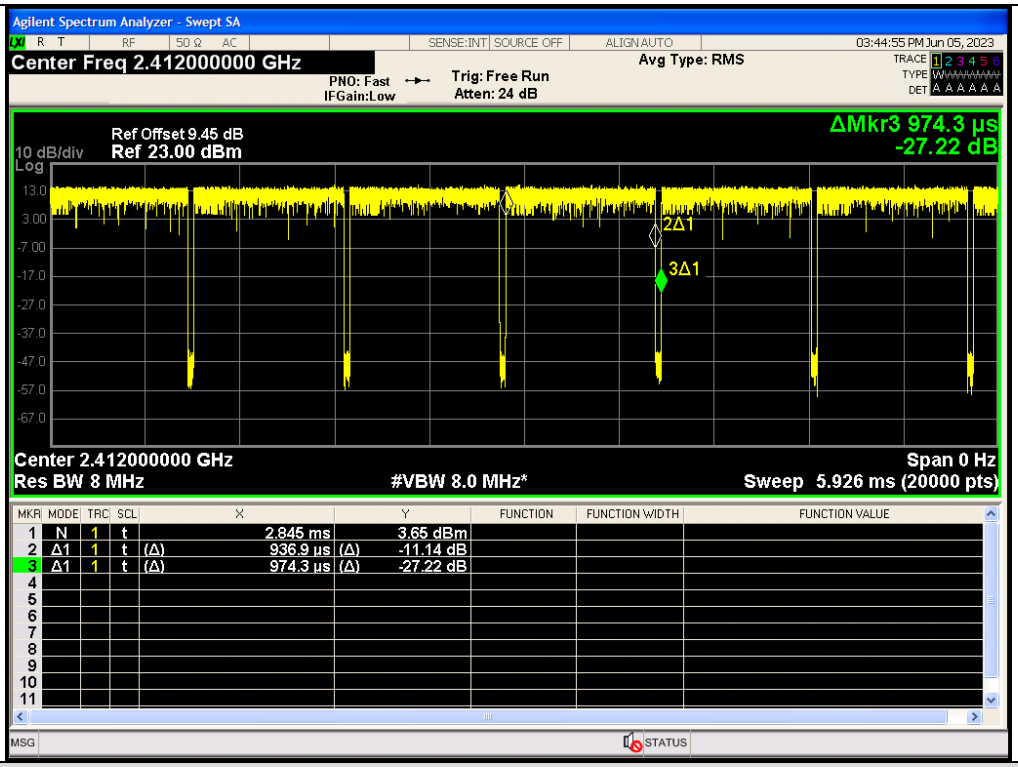
IEEE 802.11n_Channel 9_40MHz_Antenna 0

APPENDIX V.Duty Cycle

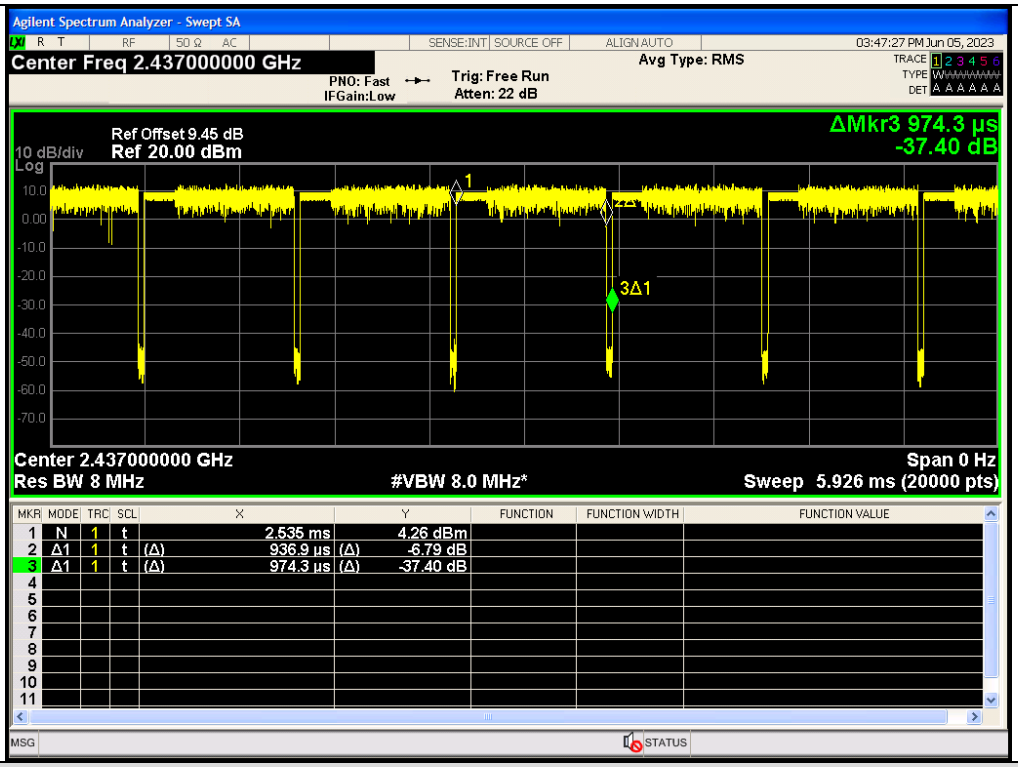
Test Result

Mode	Data rates	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)
IEEE 802.11b	11	1	0.937	0.974	96.17	0.9617	0.1696
		6	0.937	0.974	96.17	0.9617	0.1696
		11	0.937	0.974	96.17	0.9617	0.1696
IEEE 802.11g	54	1	0.177	0.221	80.01	0.8001	0.9686
		6	0.176	0.221	80.00	0.8000	0.9691
		11	0.177	0.221	80.04	0.8004	0.9669
IEEE 802.11n_20	MCS 7	1	0.164	0.209	78.82	0.7882	1.0336
		6	0.165	0.209	78.89	0.7889	1.0298
		11	0.165	0.299	55.10	0.5510	2.5885
IEEE 802.11n_40		3	0.101	0.144	69.81	0.6981	1.5608
		6	0.101	0.297	33.86	0.3386	4.7031
		9	0.101	0.297	33.90	0.3390	4.698

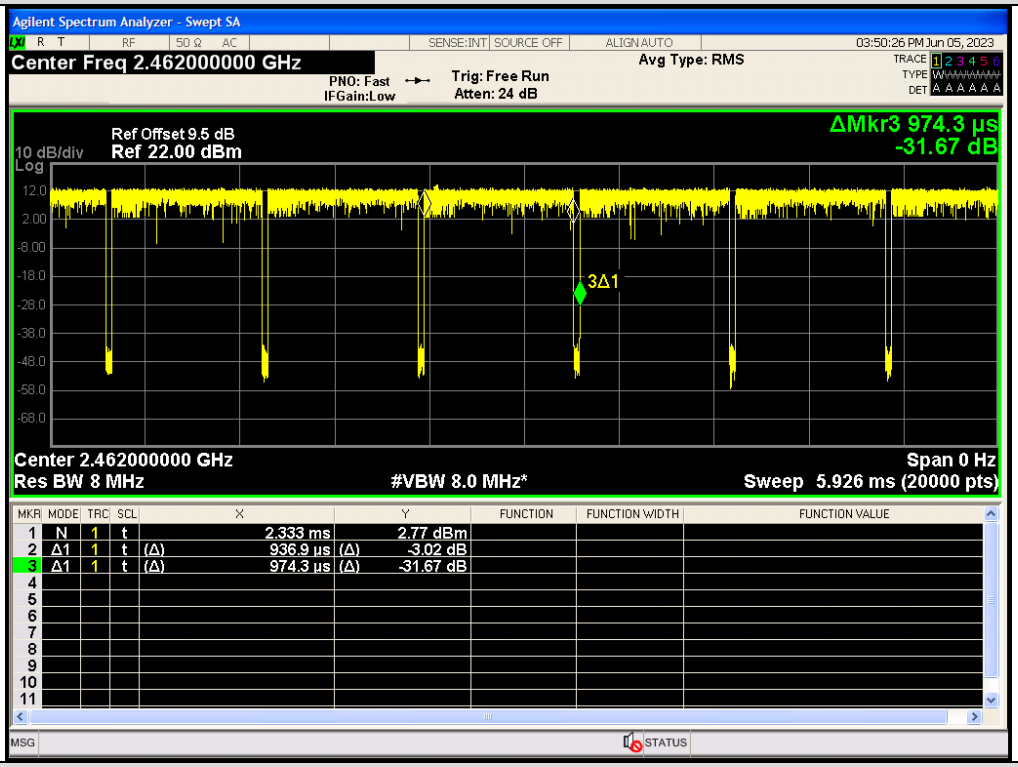
Test Graphs



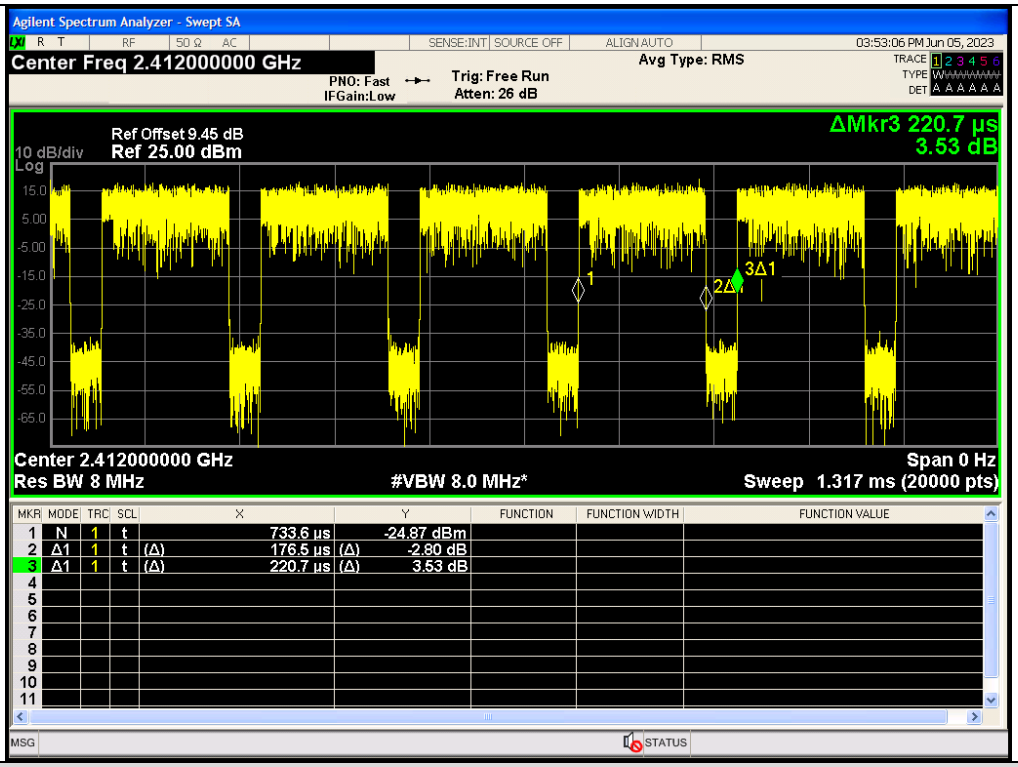
IEEE 802.11b_20MHz_Channel 1



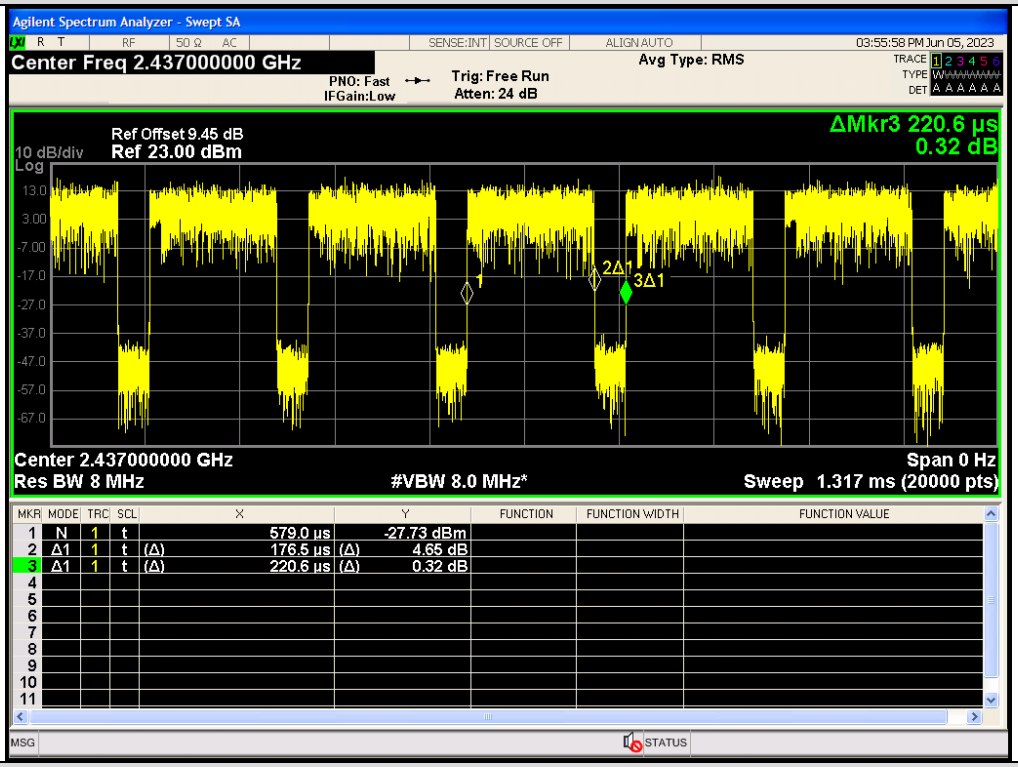
IEEE 802.11b_20MHz_Channel 6



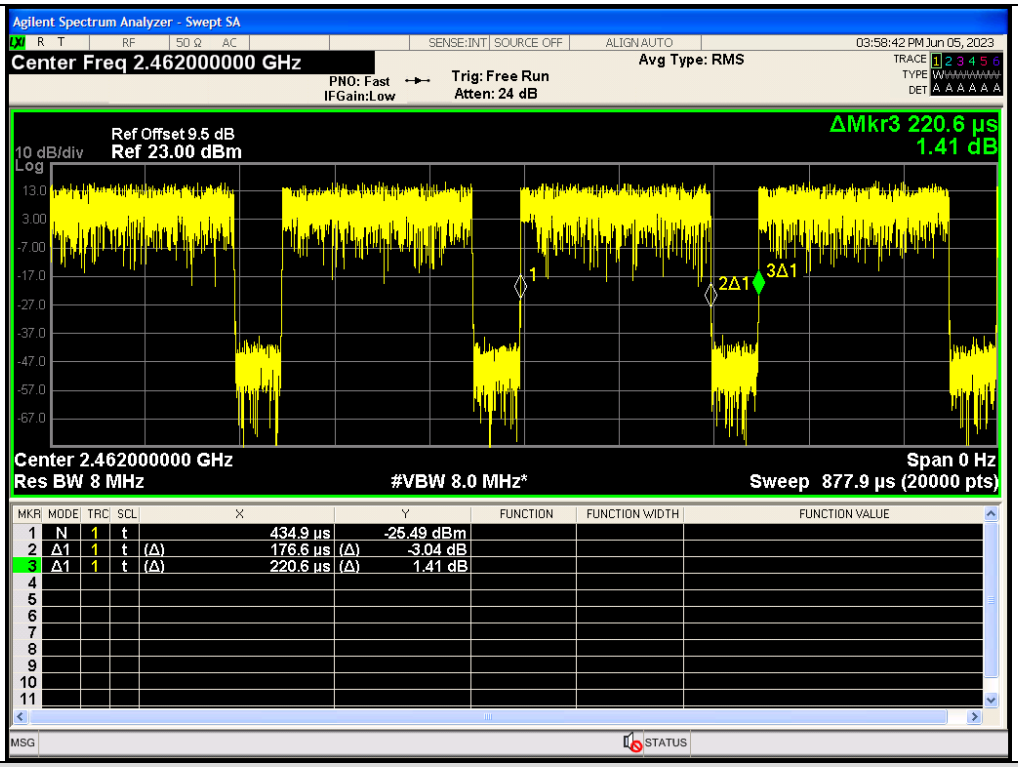
IEEE 802.11b_20MHz_Channel 11



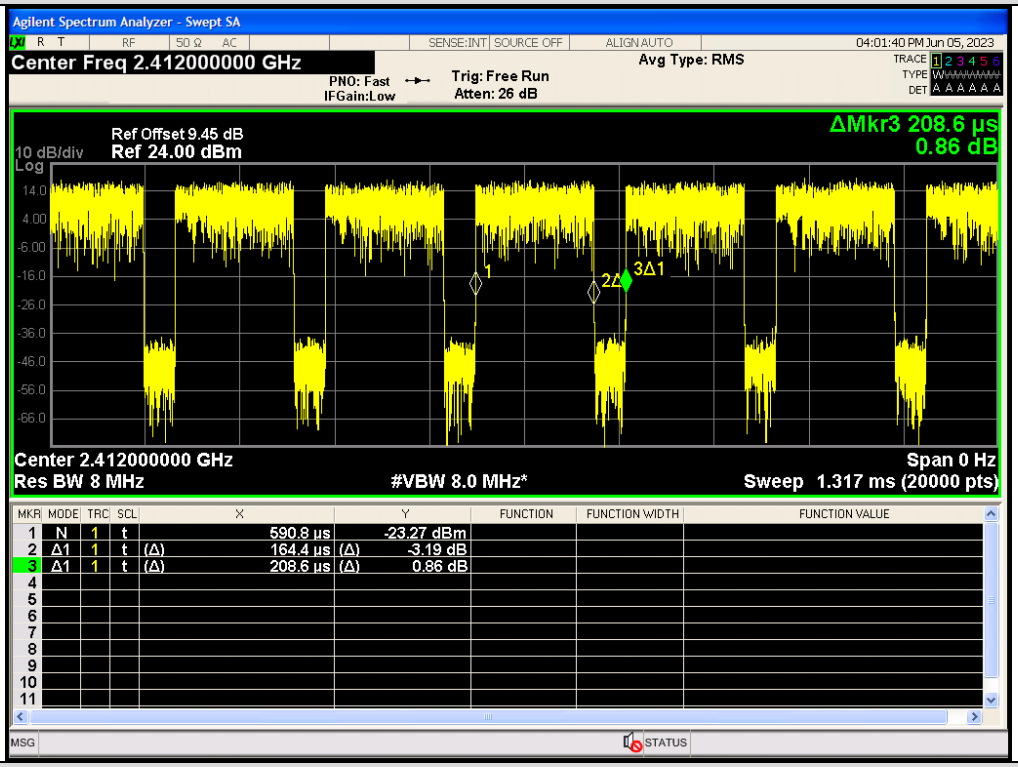
IEEE 802.11g_20MHz_Channel 1



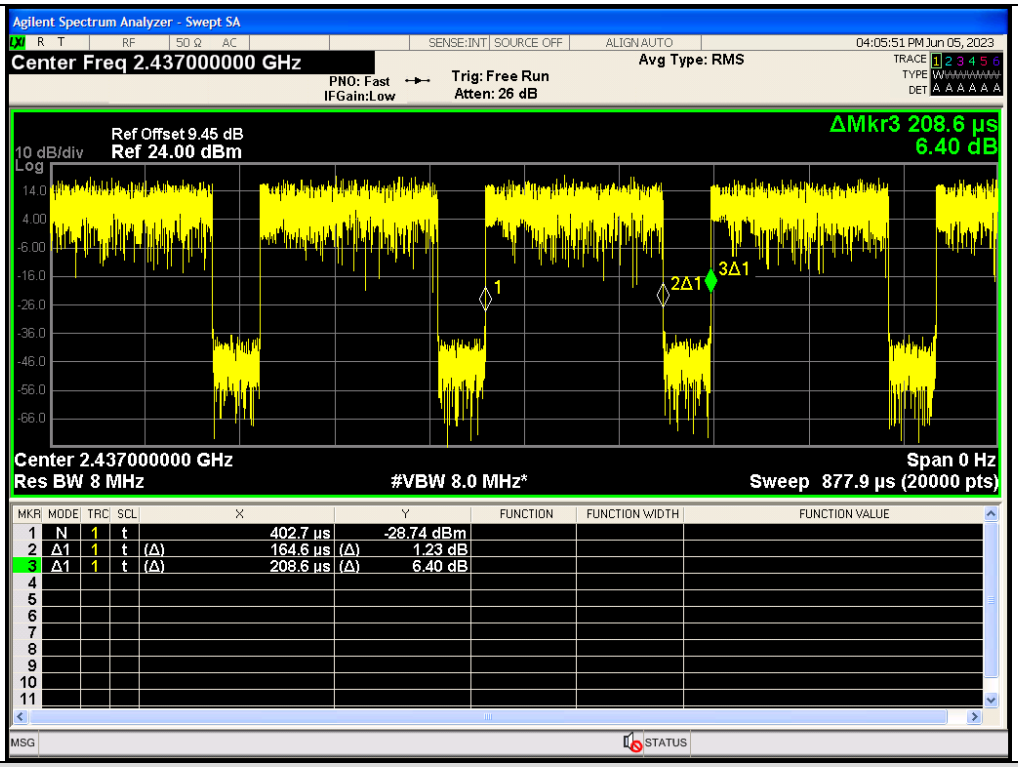
IEEE 802.11g_20MHz_Channel 6



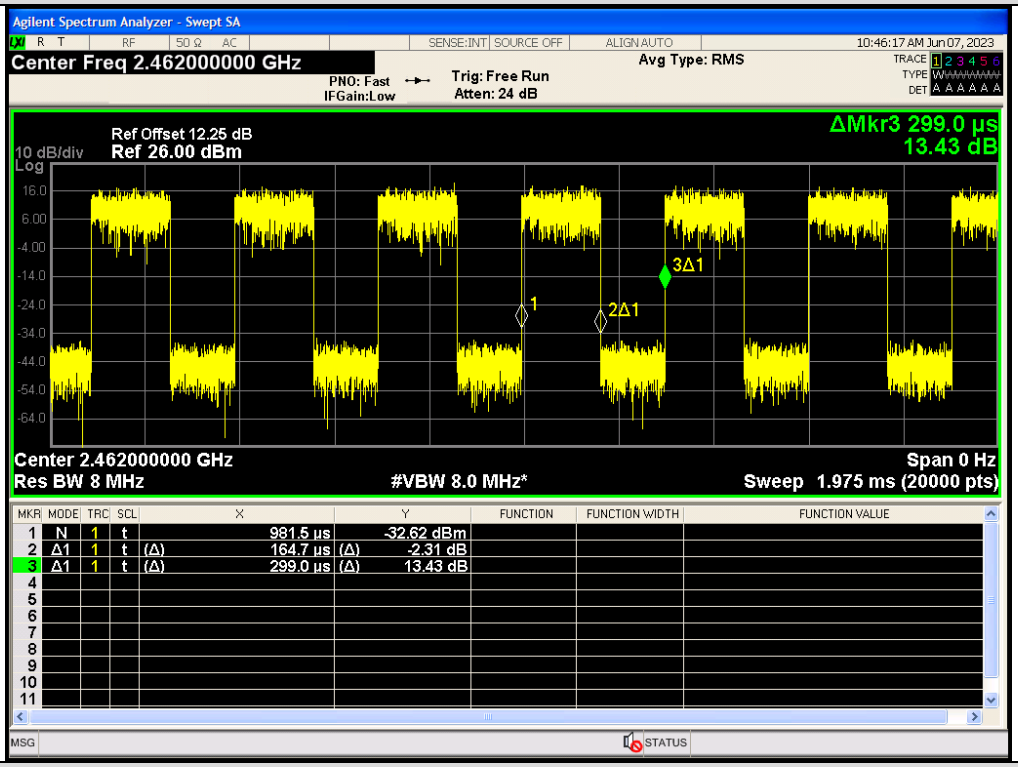
IEEE 802.11g_20MHz_Channel 11



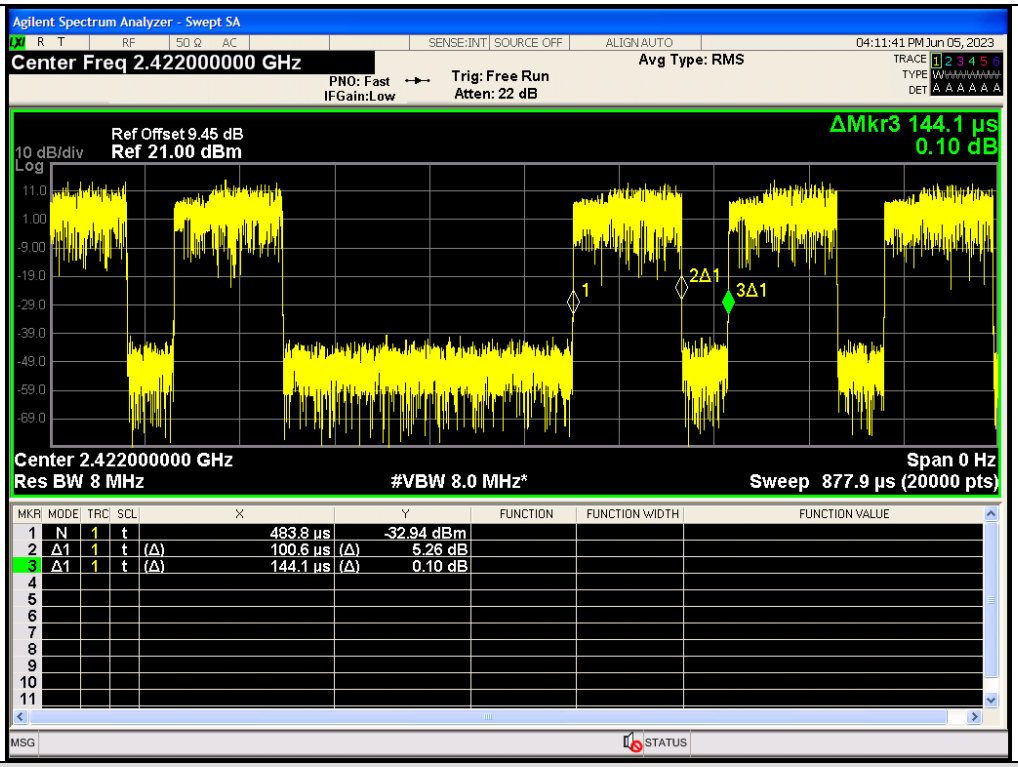
IEEE 802.11n_20MHz_Channel 1



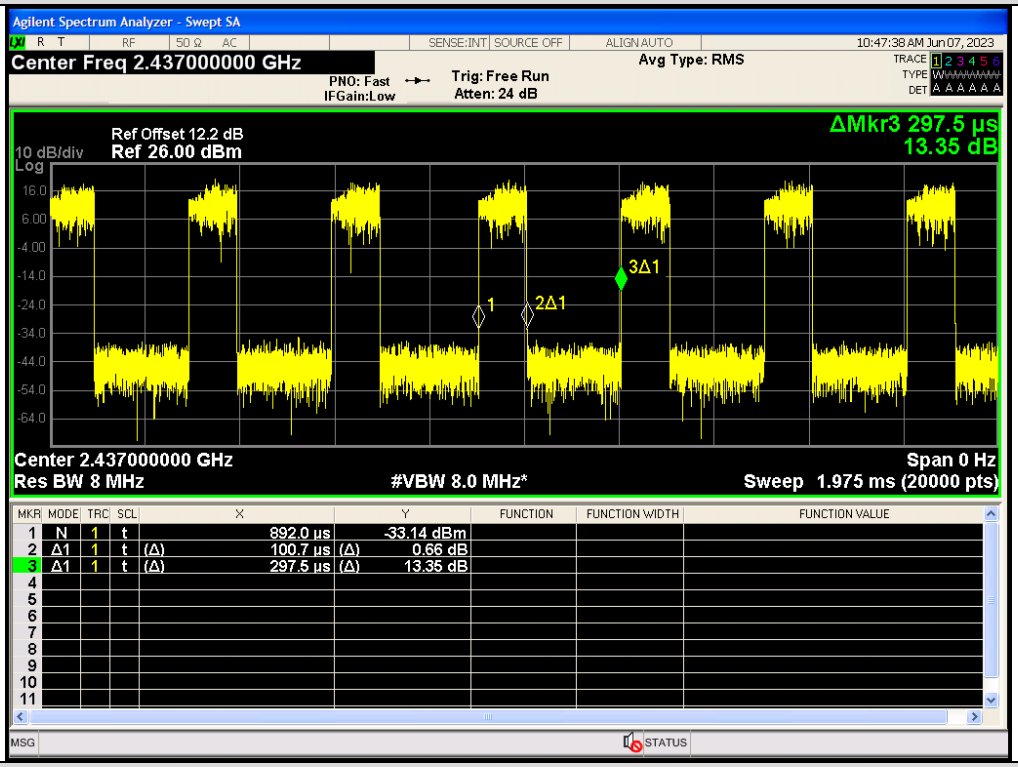
IEEE 802.11n_20MHz_Channel 6



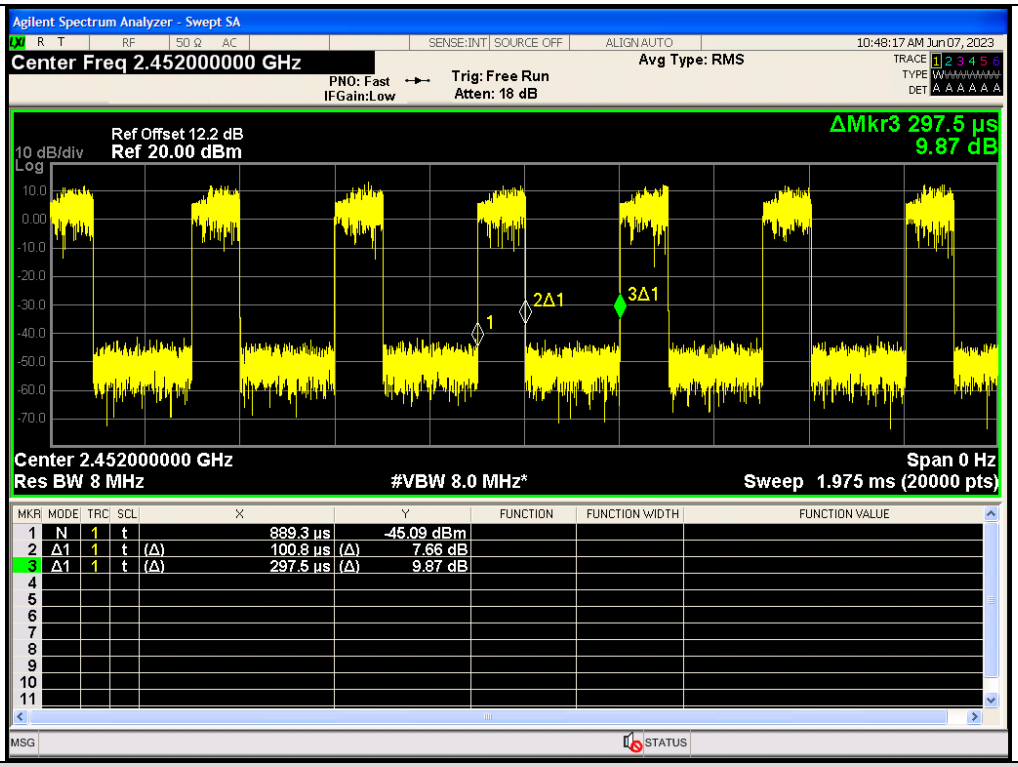
IEEE 802.11n_20MHz_Channel 11



IEEE 802.11n_40MHz_Channel 3



IEEE 802.11n_40MHz_Channel 6



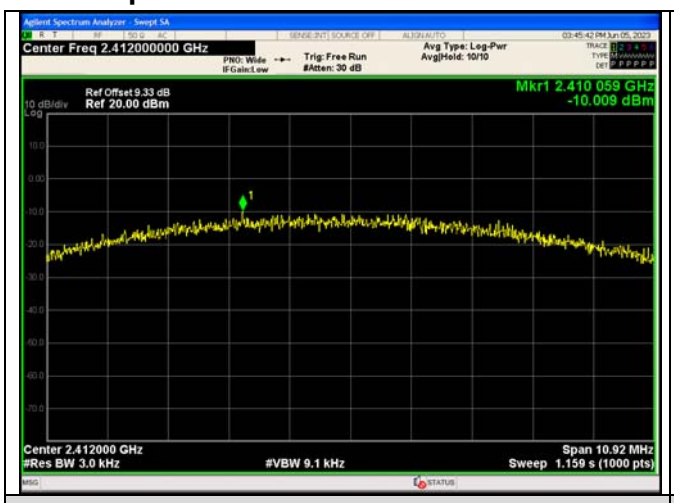
IEEE 802.11n_40MHz_Channel 9

APPENDIX VI.Power Spectral Density

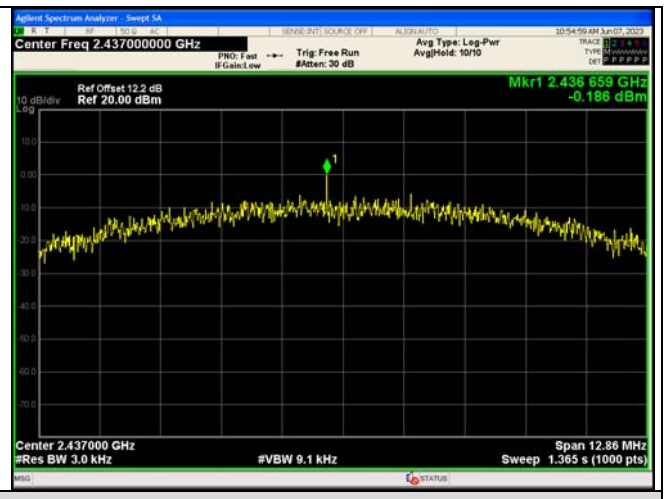
Test Result

Mode	Channel	PSD (dBm/3kHz) Ant. 0	Limit (dBm/3kHz)	Result
IEEE 802.11b	1	-10.009	8	PASS
	6	-0.186		PASS
	11	-11.002		PASS
IEEE 802.11g	1	-10.927		PASS
	6	-14.440		PASS
	11	-12.327		PASS
IEEE 802.11n_20	1	-9.414		PASS
	6	-11.362		PASS
	11	-12.414		PASS
IEEE 802.11n_40	3	-13.057		PASS
	6	-12.686		PASS
	9	-12.134		PASS

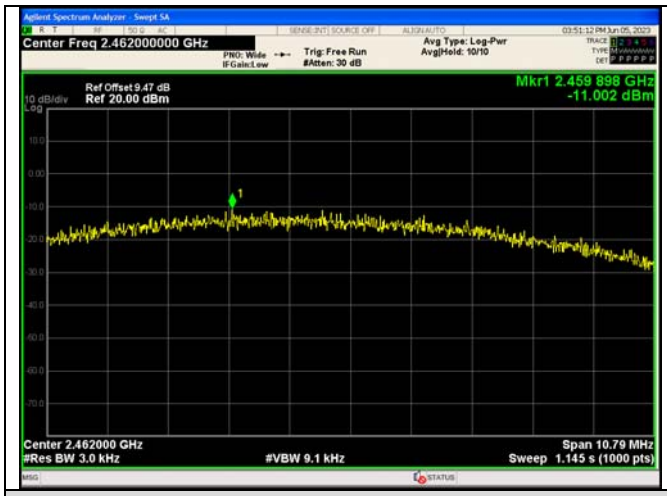
Test Graphs



IEEE 802.11b_Channel 1_20MHz_Antenna 0

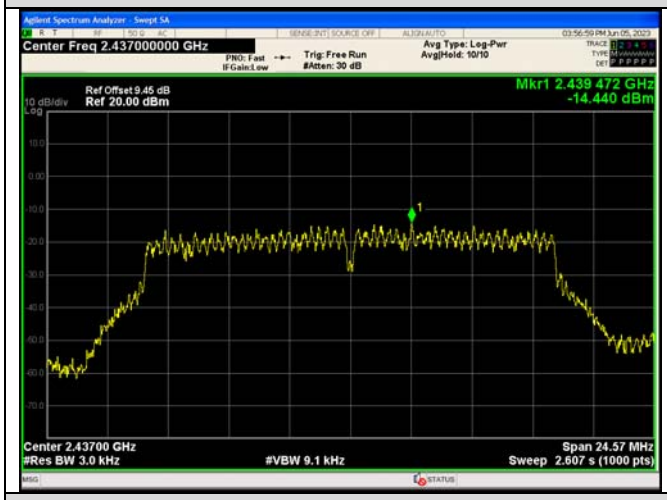


IEEE 802.11b_Channel 6_20MHz_Antenna 0

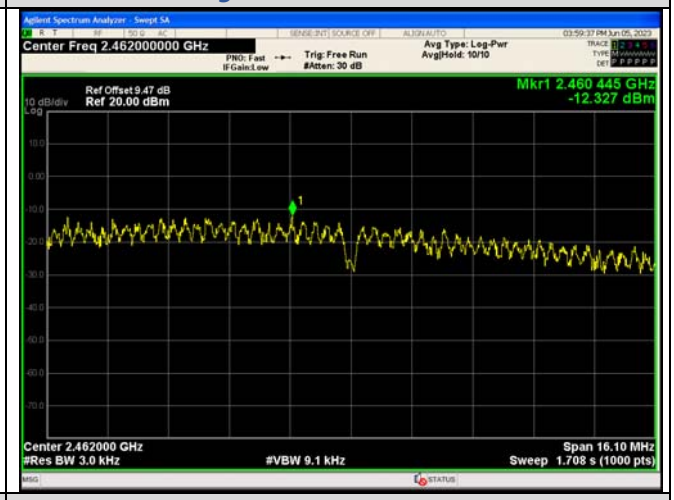


IEEE 802.11b_Channel 11_20MHz_Antenna 0

IEEE 802.11g_Channel 1_20MHz_Antenna 0

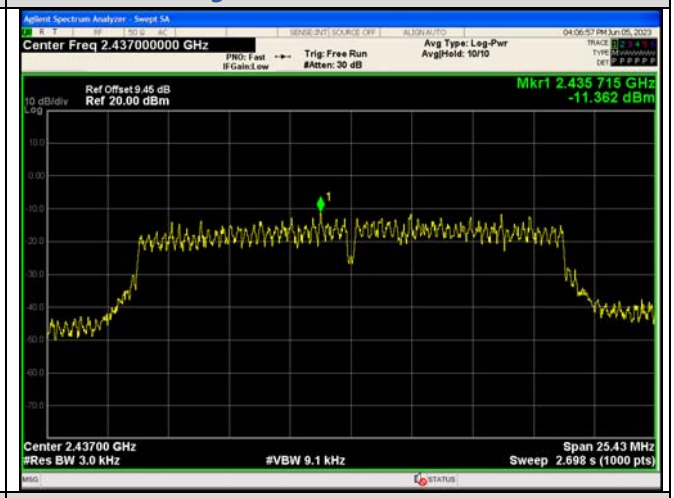


IEEE 802.11g_Channel 6_20MHz_Antenna 0

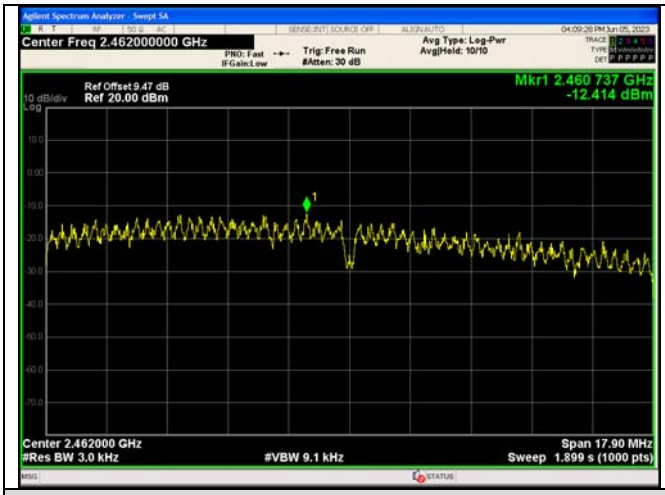


IEEE 802.11g_Channel 11_20MHz_Antenna 0

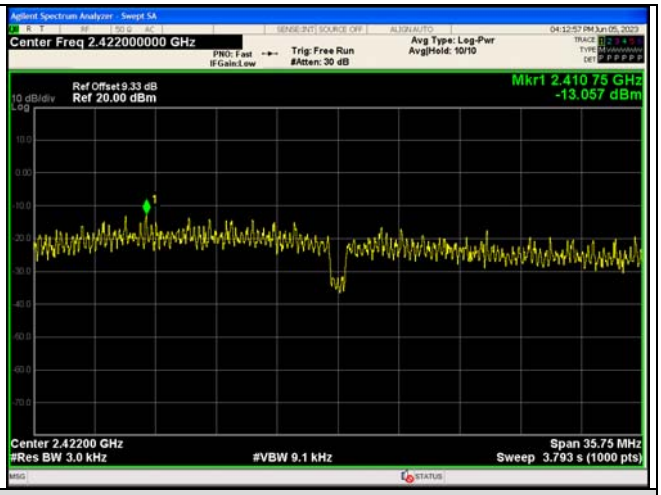
IEEE 802.11n_Channel 1_20MHz_Antenna 0



IEEE 802.11n_Channel 6_20MHz_Antenna 0

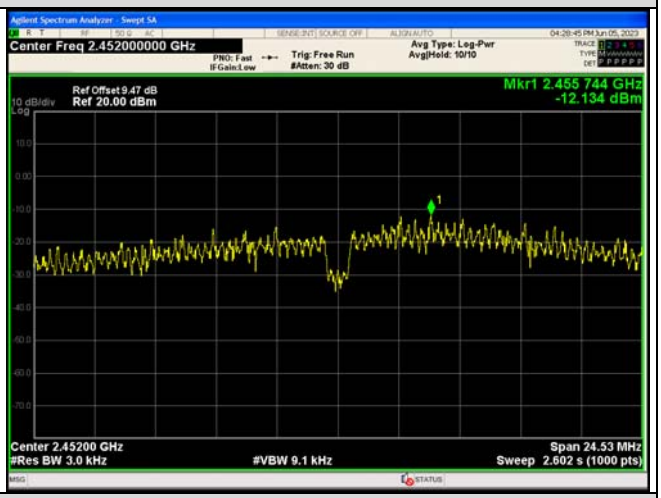


IEEE 802.11n_Channel 11_20MHz_Antenna 0



IEEE 802.11n_Channel 3_40MHz_Antenna 0

IEEE 802.11n_Channel 6_40MHz_Antenna 0



IEEE 802.11n_Channel 9_40MHz_Antenna 0

********** End of Report **********