FCC Part 15C&RSS-247 Test Report
FCC ID:2BBAJ-R2
IC:30615-R2

Applicant:	HERMAN INNOVATIONS TECHNOLOGY CO., LIMITED
Address:	UNIT 83, 3/F, YAU LEE CENTRE NO. 45 HOI YUEN ROAD KWUN TONG KOWLOON. HONG KONG China
Manufacturer:	HERMAN INNOVATIONS TECHNOLOGY CO., LIMITED
Address:	UNIT 83, 3/F, YAU LEE CENTRE NO. 45 HOI YUEN ROAD KWUN TONG KOWLOON. HONG KONG China
EUT:	DASH CAM
Trade Mark:	POFOTO
Model Number:	R2, S1, S2, S4, R1, R2Pro, R4L, R4, R4Pro, N1, N2, N2Pro, N4L, N4, N4Pro, M1, M2, M3, M4, G4
Date of Receipt:	May 08, 2023
Test Date:	May 08, 2023 - May 26, 2023
Date of Report:	May 29, 2023
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Applicable Standards:	FCC PART 15 C 15.247 RSS-247 Issue 2: February 2017, RSS-Gen Issue 5 April 2019 ANSI C63.4:2014
Test Result:	Pass
Report Number:	DL-20230519035E

Prepared (Test Engineer):	Pxing Huang
Reviewer (Supervisor):	Jack Bu
Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C RSS-247 Issue 2: February 2017 RSS-Gen Issue 5 April 2019			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen 8.8	Conducted Emission	N/A	
15.209(a) RSS-Gen §6.13	Radiated Spurious Emission	PASS	
FCC part 15.247(d) RSS-247 5.5	Band Edge Emission	PASS	
15.247(b)(1) RSS-247 5.4(d)	Peak Output Power	PASS	
15.247(a)(2) RSS-247 5.2(a)	6dB Bandwidth& 99% OCB	PASS	
FCC part 15.247 (e) RSS-247 5.2(b)	Power Spectral Density	PASS	
FCC part 15.247(d) RSS-Gen 8.9	Spurious RF Conducted Emission	PASS	
FCC part 15.203/15.247 (c) RSS-Gen 6.8	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen DL Testing Technology Co., Ltd.
Add. : 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

FCC Test Firm Registration Number: 854456
Designation Number: CN1307
ISED Registration number: 27485
IC Registered No.:CN0118

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2** ，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±2.56dB
2	RF power,conducted	±0.42dB
3	Spurious emissions,conducted	±2.76dB
4	All emissions,radiated(<1G)	±3.65dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	DASH CAM
Model No.:	R2
Sample ID:	DL-20230519035E-1#
HVIN:	R2
Serial No.:	S1, S2, S4, R1, R2Pro, R4L, R4, R4Pro, N1, N2, N2Pro, N4L, N4, N4Pro, M1, M2, M3, M4, G4
Model Difference	All PCB board, circuit, structure and internal of these model(s) are the same, Only model number is different for these model.
Operation Frequency:	2412~2462 MHz for 802.11b/g/nHT20 2422~2452 MHz for 802.11nHT40
Channel numbers:	11 Channels for 802.11b/g/n(HT20) 7 channels for 802.11nHT40
Channel separation:	5MHz
Modulation technology:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n(20): DSSS (CCK, DQPSK,DBPSK)+OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Rate of Transmitter	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 150Mbps
Antenna Type:	Internal Antenna
Antenna gain:	3.29dBi
Power supply:	DC 12V-24V From Battery

Note:
1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2.The EUT's all information provided by client.

2. Channel List(802.11b/g/nHT20)

Channel	Frequency (GHz)	Channel	Frequency (GHz)
01	2.412	08	2.447
02	2.417	09	2.452
03	2.422	10	2.457
04	2.427	11	2.462
05	2.432		
06	2.437		
07	2.442		

Channel List(802.11nHT40)

Channel	Frequency (GHz)	Channel	Frequency (GHz)
03	2.422	08	2.447
04	2.427	09	2.452
05	2.432		
06	2.437		
07	2.442		

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

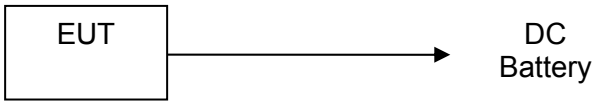
Pretest Mode	Description
Mode 1	802.11b CH1/ CH6/ CH11
Mode 2	802.11g CH1/ CH6/ CH11
Mode 3	802.11nHT20 CH1/ CH6/ CH11
Mode 4	802.11nHT40 CH3/ CH6/ CH09

For Conducted & Radiated Emission	
Final Test Mode	Description
Mode 1	802.11b CH1/ CH6/ CH11
Mode 2	802.11g CH1/ CH6/ CH11
Mode 3	802.11nHT20 CH1/ CH6/ CH11
Mode 4	802.11nHT40 CH3/ CH6/ CH09

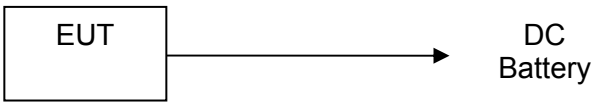
Note: 1. The measurements are performed at the highest, middle, lowest available channels.
2. During the test, the duty cycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note
E-1	DASH CAM	R2	N/A	EUT
AE	Notebook	B40-80	MP07F6JD	AE

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Max output power Setting				
Test software Version	Test program: SecuerCRT			
Mode	802.11b	802.11g	802.11n HT20	802.11n HT40
Data Rate	11Mbps	54Mbps	MSC0	MSC0
Power Setting of Softwave	40	40	40	40

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4408B	MY50140780	Nov. 05, 2022	Nov. 04, 2023
2	Test Receiver (9kHz-7GHz)	R&S	ESRP7	101393	Nov. 05, 2022	Nov. 04, 2023
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB9162	00306	Nov. 05, 2022	Nov. 04, 2023
4	Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA9120D	02139	Nov. 05, 2022	Nov. 04, 2023
5	Horn Antenna (18GHz-40GHz)	A.H. Systems	SAS-574	588	Nov. 05, 2022	Nov. 04, 2023
6	Amplifier (9KHz-6GHz)	Schwarzbeck	BBV9743B	00153	Nov. 05, 2022	Nov. 04, 2023
7	Amplifier (1GHz-18GHz)	EMEC	EM01G8GA	00270	Nov. 05, 2022	Nov. 04, 2023
8	Amplifier (18GHz-40GHz)	Quanjuda	DLE-161	97	Nov. 05, 2022	Nov. 04, 2023
9	Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Nov. 05, 2022	Nov. 04, 2023
10	RF cables1 (9kHz-1GHz)	ChengYu	966	004	Nov. 05, 2022	Nov. 04, 2023
11	RF cables2 (1GHz-40GHz)	ChengYu	966	003	Nov. 05, 2022	Nov. 04, 2023
12	Antenna connector	Florida RF Labs	N/A	RF 01#	Nov. 05, 2022	Nov. 04, 2023
13	Power probe	KEYSIGHT	U2021XA	MY55210018	Nov. 05, 2022	Nov. 04, 2023
14	Signal Analyzer 9kHz-26.5GHz	Agilent	N9020A	MY55370280	Nov. 05, 2022	Nov. 04, 2023
15	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	Nov. 05, 2022	Nov. 04, 2023
16	D.C. Power Supply	LongWei	PS-305D	010964729	Nov. 05, 2022	Nov. 04, 2023
17	Power Meter	Anritsu	ML2495A	N/A	Nov. 05, 2022	Nov. 04, 2023

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	843 Shielded Room	ChengYu	843 Room	843	Sep. 20, 2022	Sep. 19, 2025
2	EMI Receiver	R&S	ESR	101421	Nov. 05, 2022	Nov. 04, 2023
3	LISN	R&S	ENV216	102417	Nov. 05, 2022	Nov. 04, 2023
4	843 Cable 1#	ChengYu	CE Cable	001	Nov. 05, 2022	Nov. 04, 2023

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	IC
0.50 -5.0	56.00	46.00	IC
5.0 -30.0	60.00	50.00	IC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

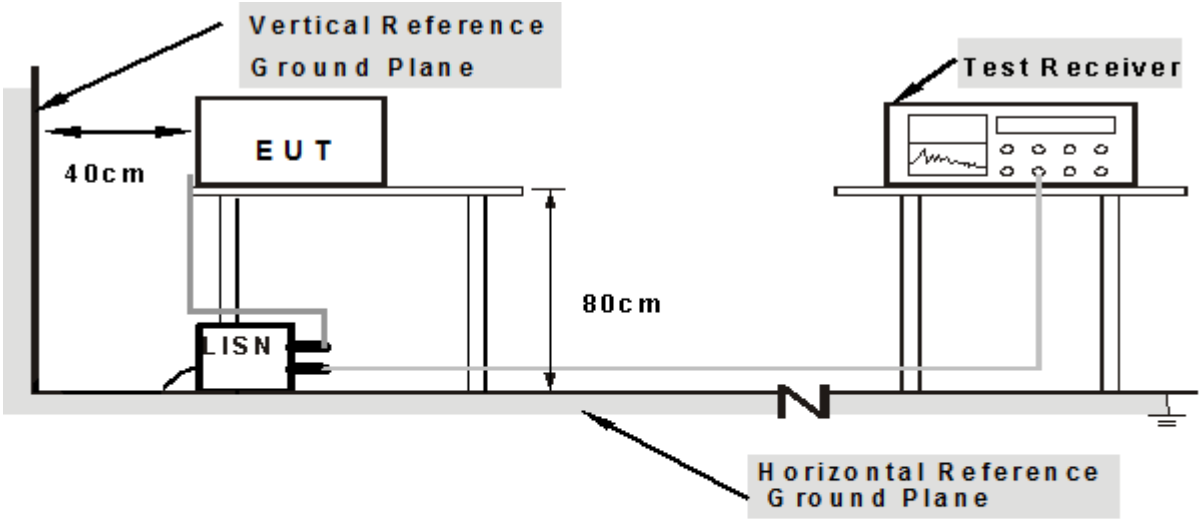
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

Not applicable.

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216-230	180	3
230~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel, the middle channel, the Highest channel

Note:

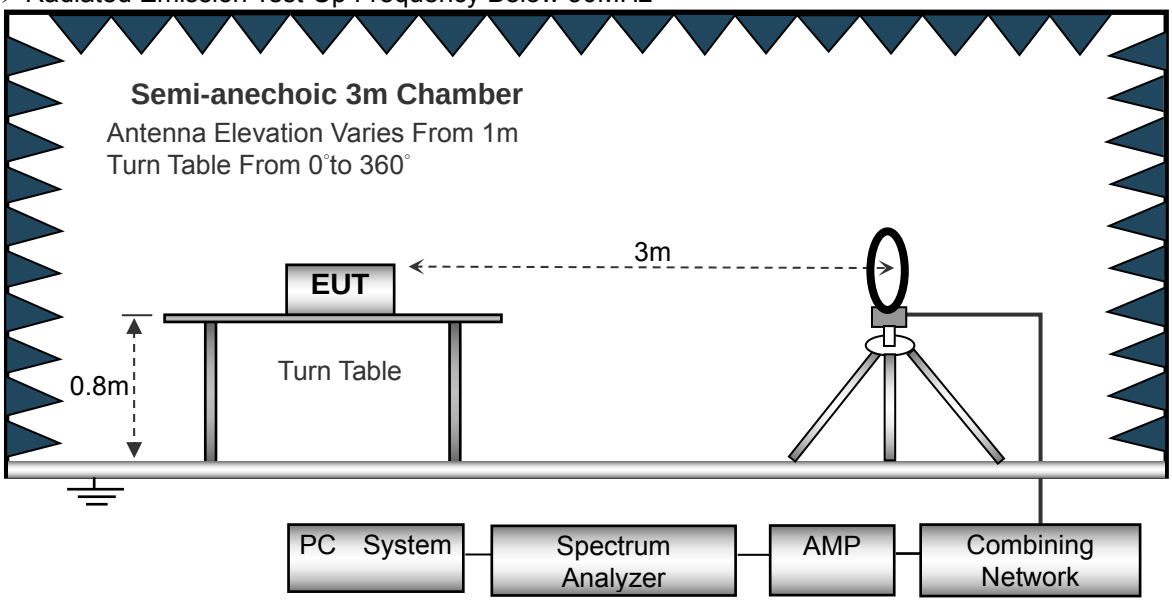
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

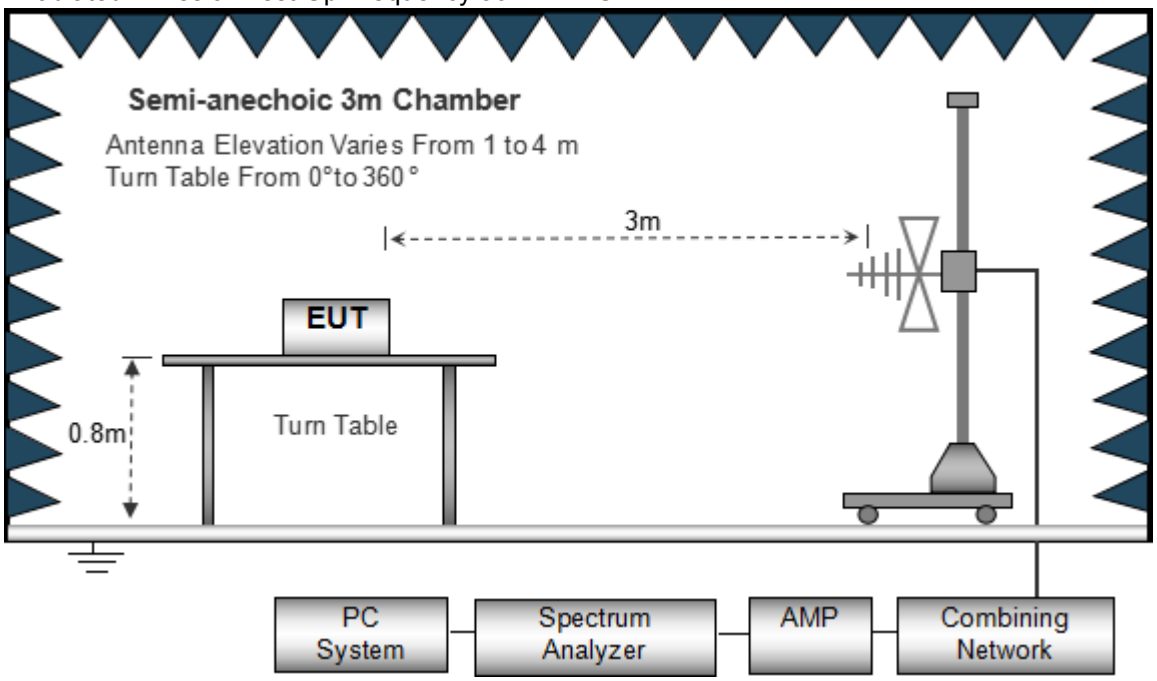
No deviation

3.2.4 TEST SETUP

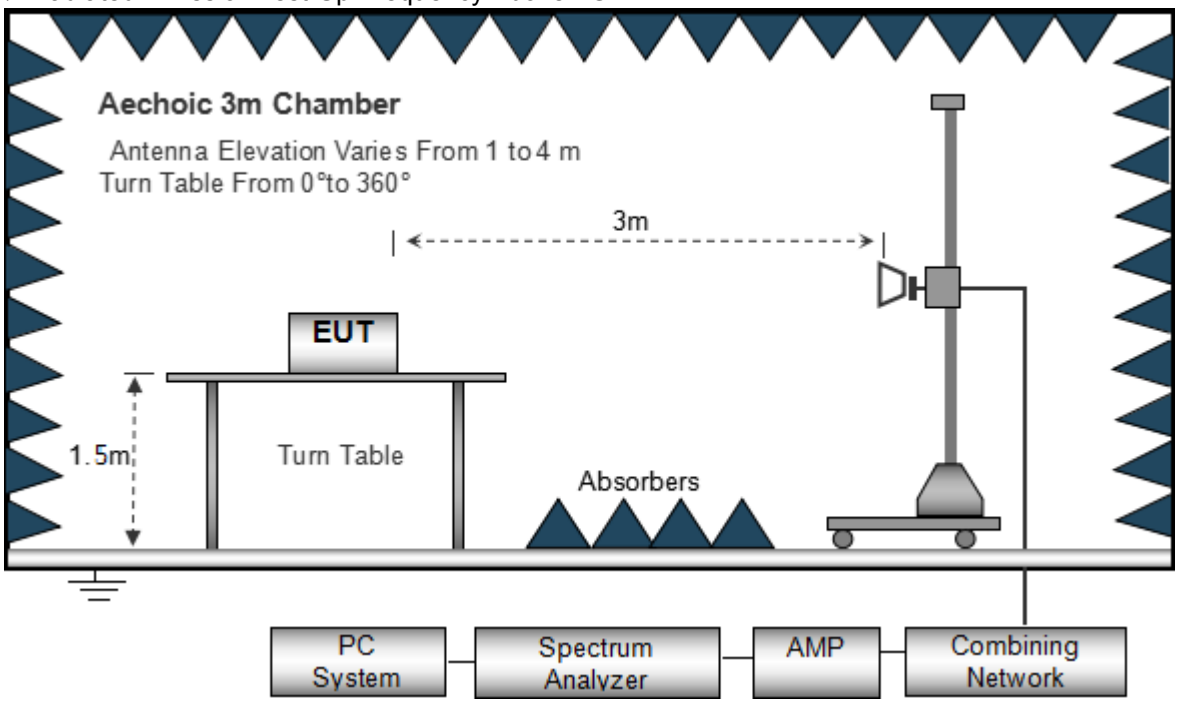
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	20℃	Relative Humidtity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 24V from battery
Test Mode :	Mode 5	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

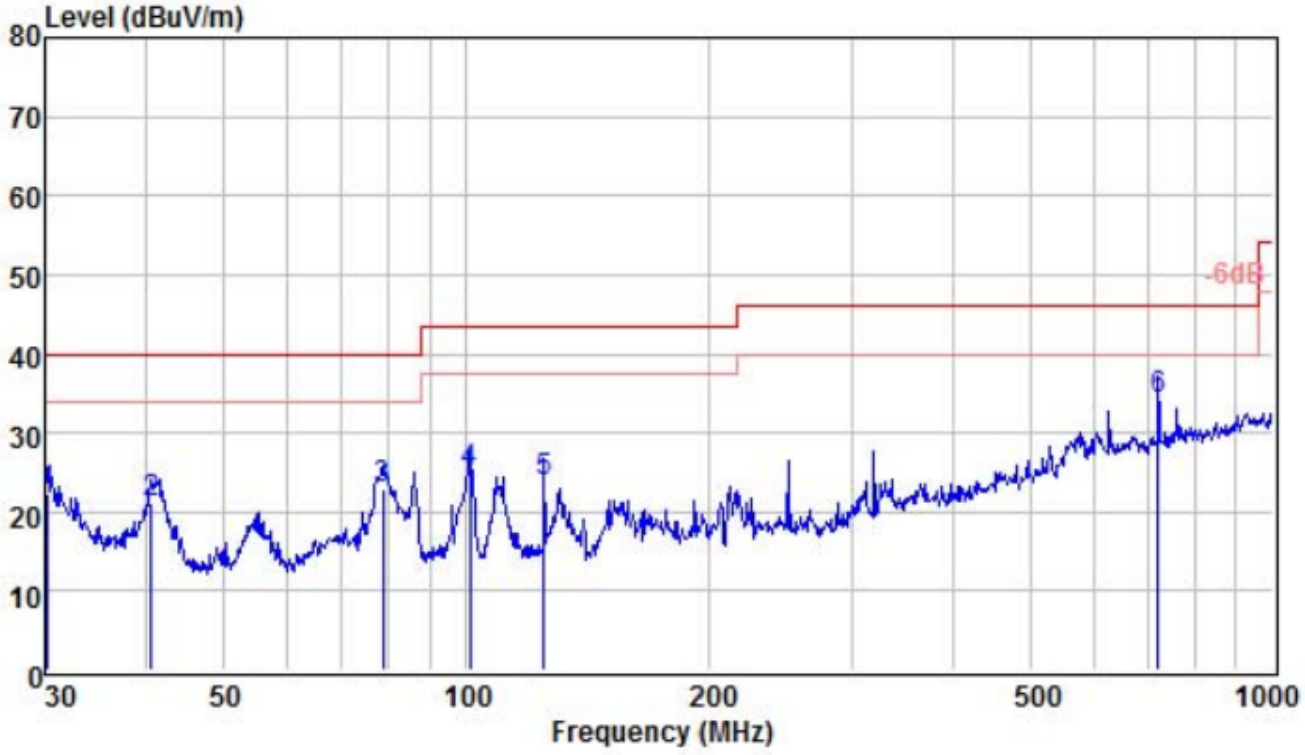
NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Remark:
1. All modes of 802.11b/g/n20/n40 were test at Low, Middle, and High channel, only the worst result of 802.11b Low Channel was reported for below 1GHz test.
2. Remark: We tested at 802.11b/802.11g/802.11n HT20/802.11n HT40 mode at the antenna single and recored the worst data 802.11b mode in report.

3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 24V from battery		
Test Mode :	Transmitting 802.11b mode		



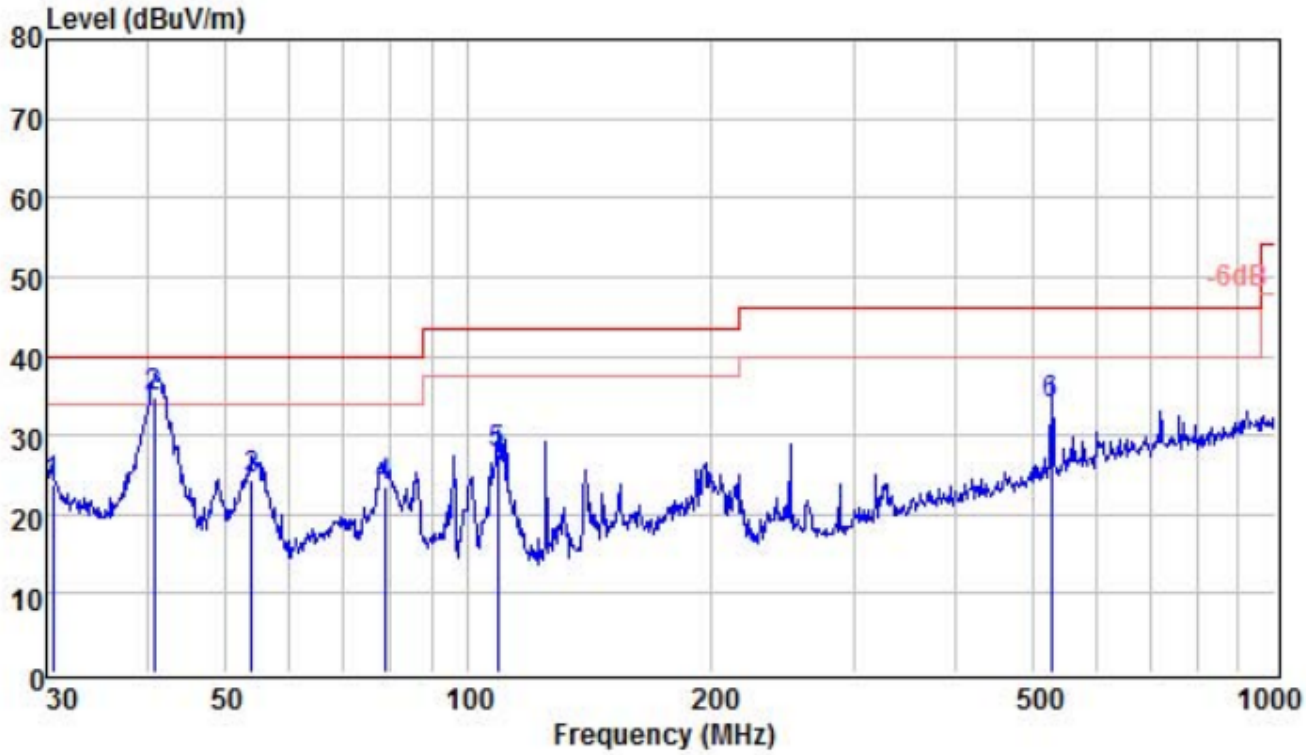
	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	30.21	3.02	18.80	0.45	22.27	40.00	-17.73	QP
2	40.70	7.92	12.90	0.26	21.08	40.00	-18.92	QP
3	78.69	14.28	8.00	0.57	22.85	40.00	-17.15	QP
4	100.93	14.74	9.45	0.76	24.95	43.50	-18.55	QP
5	125.01	14.64	8.30	0.80	23.74	43.50	-19.76	QP
6	721.73	10.02	22.42	1.75	34.19	46.00	-11.81	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 24V from battery		
Test Mode :	Transmitting 802.11b mode		



	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	30.53	4.82	18.49	0.44	23.75	40.00	-16.25	QP
2 !	40.84	21.85	12.55	0.26	34.66	40.00	-5.34	QP
3	53.88	15.77	8.22	0.28	24.27	40.00	-15.73	QP
4	78.69	14.95	7.93	0.57	23.45	40.00	-16.55	QP
5	108.65	17.47	9.34	0.77	27.58	43.50	-15.92	QP
6	528.25	13.04	19.24	1.55	33.83	46.00	-12.17	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

3.2.8 TEST RESULTS (1GHZ~25GHZ)

802.11b(Record the wors test data in report.)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	4824.00	66.37	50.65	6.88	31.29	53.89	74.00	-20.11	PK
V	4824.00	57.96	50.65	6.88	31.29	45.48	54.00	-8.52	AV
V	7236.00	64.37	49.98	7.16	36.63	58.18	74.00	-15.82	PK
V	7236.00	53.22	49.98	7.16	36.63	47.03	54.00	-6.97	AV
V	16087.00	51.24	51.53	11.34	41.52	52.57	74.00	-21.43	PK
H	4824.00	66.94	50.65	6.88	31.29	54.46	74.00	-19.54	PK
H	4824.00	57.41	50.65	6.88	31.29	44.93	54.00	-9.07	AV
H	7236.00	63.59	49.98	7.16	36.63	57.4	74.00	-16.6	PK
H	7236.00	53.89	49.98	7.16	36.63	47.7	54.00	-6.3	AV
H	16087.00	51.03	51.53	11.34	41.52	52.36	74.00	-21.64	PK
operation frequency:2437									
V	4874.00	65.37	50.67	6.89	31.38	52.97	74.00	-21.03	PK
V	4874.00	55.41	50.67	6.89	31.38	43.01	54.00	-10.99	AV
V	7311.00	63.91	50.02	7.24	36.63	57.76	74.00	-16.24	PK
V	7311.00	52.89	50.02	7.24	36.63	46.74	54.00	-7.26	AV
V	16087.00	50.27	51.53	11.34	41.52	51.6	74.00	-22.4	PK
H	4874.00	65.88	50.67	6.89	31.38	53.48	74.00	-20.52	PK
H	4874.00	56.23	50.67	6.89	31.38	43.83	54.00	-10.17	AV
H	7311.00	63.41	50.02	7.24	36.63	57.26	74.00	-16.74	PK
H	7311.00	53.27	50.02	7.24	36.63	47.12	54.00	-6.88	AV
H	16087.00	50.36	51.53	11.34	41.52	51.69	74.00	-22.31	PK
operation frequency:2462									
V	4924.00	65.37	50.79	6.83	31.36	52.77	74.00	-21.23	PK
V	4924.00	56.32	50.79	6.83	31.36	43.72	54.00	-10.28	AV
V	7386.00	63.49	50.11	7.25	36.58	57.21	74.00	-16.79	PK
V	7386.00	52.35	50.11	7.25	36.58	46.07	54.00	-7.93	AV
V	16087.00	50.27	51.53	11.34	41.52	51.6	74.00	-22.4	PK
H	4924.00	64.53	50.79	6.83	31.36	51.93	74.00	-22.07	PK
H	4924.00	55.37	50.79	6.83	31.36	42.77	54.00	-11.23	AV
H	7386.00	63.29	50.11	7.25	36.58	57.01	74.00	-16.99	PK
H	7386.00	53.27	50.11	7.25	36.58	46.99	54.00	-7.01	AV
H	16087.00	49.16	51.53	11.34	41.52	50.49	74.00	-23.51	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205, RSS-Gen Issue 5 Section RSS-247 §6.2.1

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to RSS-Gen Issue 5.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel,the Highest channel

Note:

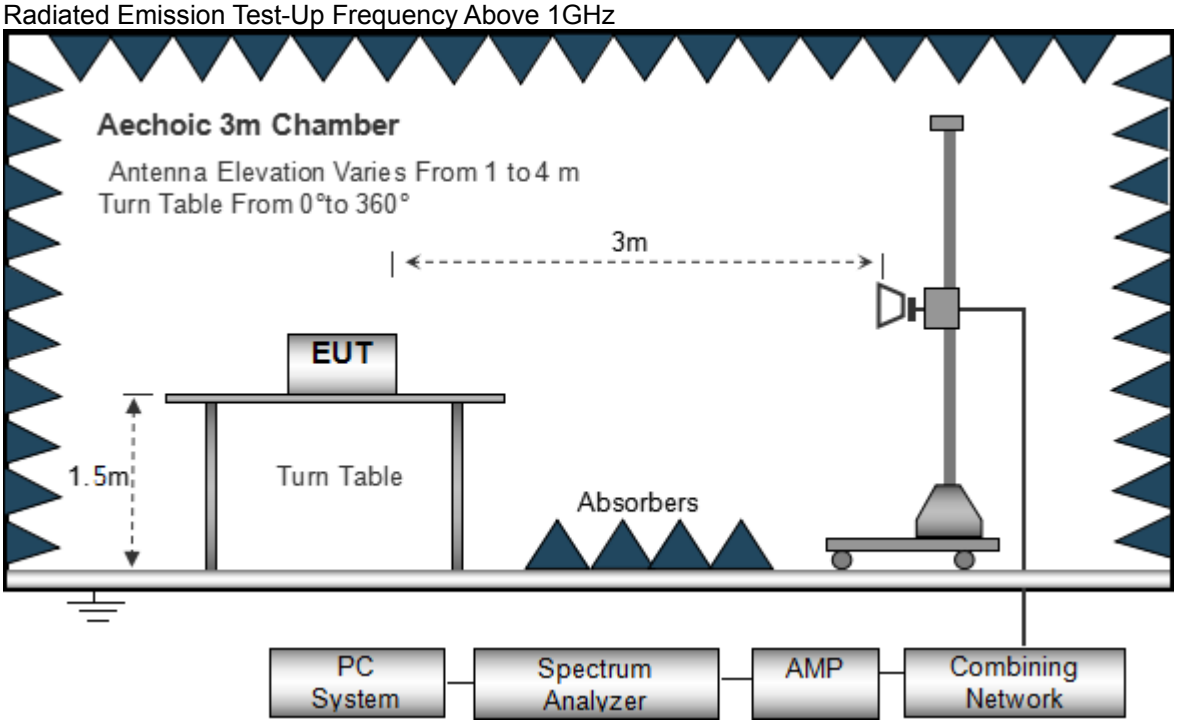
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

We tested at 802.11b/802.11g/802.11n HT20/802.11n HT40 mode at the antenna single and recored the worst data mode in report.

3.3.6 TEST RESULT

802.11b (Record the wors test data in report.)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	2390.00	76.35	52.12	2.73	27.38	54.34	74.00	-19.66	PK
V	2390.00	65.24	52.12	2.73	27.38	43.23	54.00	-10.77	AV
V	2400.00	75.21	52.16	2.78	27.41	53.24	74.00	-20.76	PK
V	2400.00	64.16	52.16	2.78	27.41	42.19	54.00	-11.81	AV
H	2390.00	75.82	52.12	2.73	27.38	53.81	74.00	-20.19	PK
H	2390.00	63.12	52.12	2.73	27.38	41.11	54.00	-12.89	AV
H	2400.00	76.51	52.16	2.78	27.41	54.54	74.00	-19.46	PK
H	2400.00	64.39	52.16	2.78	27.41	42.42	54.00	-11.58	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2462									
V	2483.50	75.39	52.23	2.86	27.44	53.46	74.00	-20.54	PK
V	2483.50	65.41	52.23	2.86	27.44	43.48	54.00	-10.52	AV
V	2500.00	75.41	52.26	2.88	27.49	53.52	74.00	-20.48	PK
V	2500.00	64.92	52.26	2.88	27.49	43.03	54.00	-10.97	AV
H	2483.50	75.32	52.23	2.86	27.44	53.39	74.00	-20.61	PK
H	2483.50	66.39	52.23	2.86	27.44	44.46	54.00	-9.54	AV
H	2500.00	75.61	52.26	2.88	27.49	53.72	74.00	-20.28	PK
H	2500.00	66.37	52.26	2.88	27.49	44.48	54.00	-9.52	AV

Remark:

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

4. PEAK OUTPUT POWER

4.1 APPLIED PROCEDURES / LIMIT

FCC PART15 (15.247), SUBPART C, RSS-247 ISSUE 2: FEBRUARY 2017				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(i) RSS-247 §6.2.1	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

4.2 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP

4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage :	DC 24V from battery

Mode	Test Channel	Peak Output Power (dBm)	LIMIT (dBm)	Result
802.11b	Low	13.33	30.00	PASS
	Moddle	12.99	30.00	PASS
	High	13.12	30.00	PASS
802.11g	Low	11.76	30.00	PASS
	Moddle	11.09	30.00	PASS
	High	10.66	30.00	PASS
802.11n HT20	Low	10.86	30.00	PASS
	Moddle	10.55	30.00	PASS
	High	10.30	30.00	PASS
802.11n HT40	Low	10.65	30.00	PASS
	Moddle	10.60	30.00	PASS
	High	10.38	30.00	PASS

Mode	Test Channel	Peak Output Power (dBm)	Antenna Gain	EIRP output power (dBm)	LIMIT (dBm)	Result
802.11b	Low	13.33	3.29	16.62	36.00	PASS
	Moddle	12.99	3.29	16.28	36.00	PASS
	High	13.12	3.29	16.41	36.00	PASS
802.11g	Low	11.76	3.29	15.05	36.00	PASS
	Moddle	11.09	3.29	14.38	36.00	PASS
	High	10.66	3.29	13.95	36.00	PASS
802.11n HT20	Low	10.86	3.29	14.15	36.00	PASS
	Moddle	10.55	3.29	13.84	36.00	PASS
	High	10.30	3.29	13.59	36.00	PASS
802.11n HT40	Low	10.65	3.29	13.94	36.00	PASS
	Moddle	10.60	3.29	13.89	36.00	PASS
	High	10.38	3.29	13.67	36.00	PASS

5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC PART15 C SECTION 15.247 (E), RSS-247 ISSUE 2: FEBRUARY 2017				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (e) RSS-247 §6.2.1	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 3kHz
VB	VBW ≥ 3RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

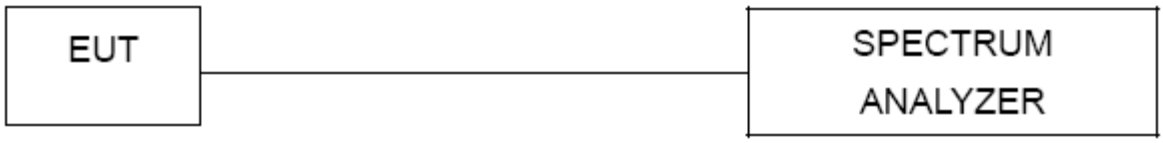
5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP

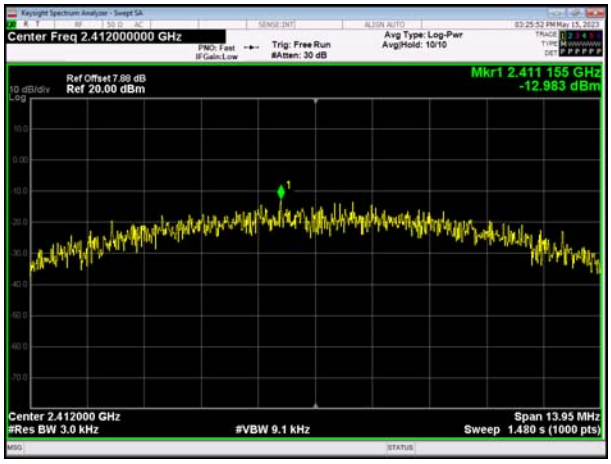
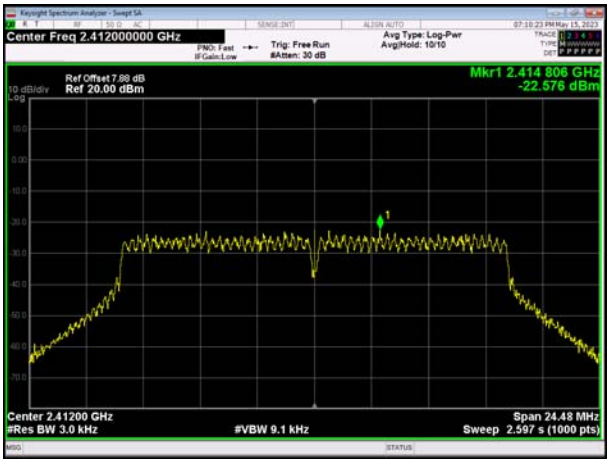
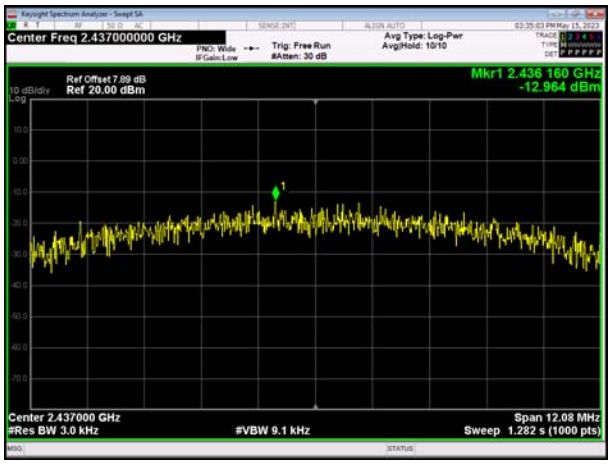
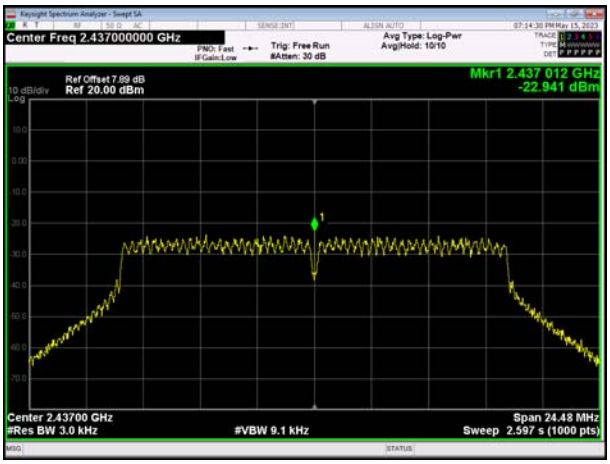
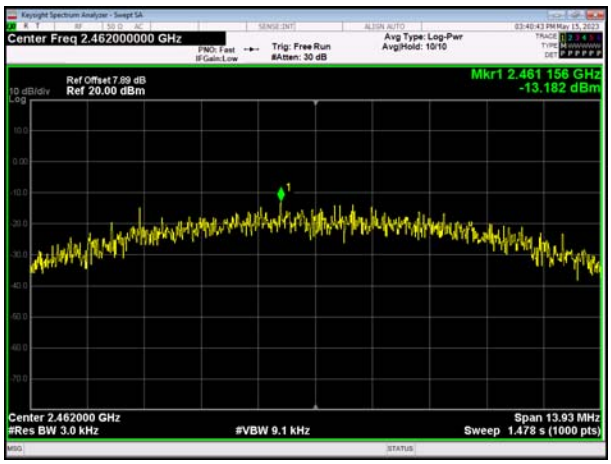
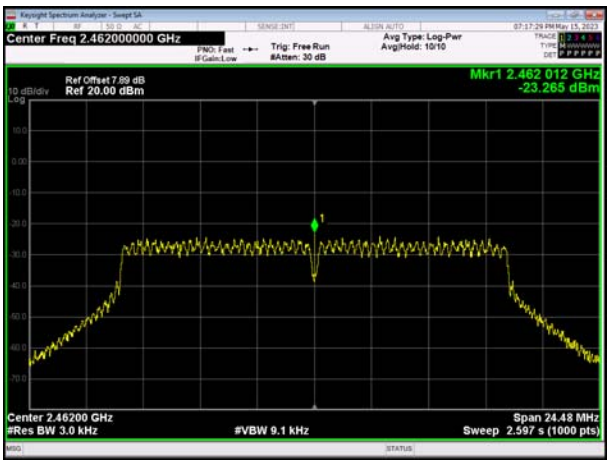


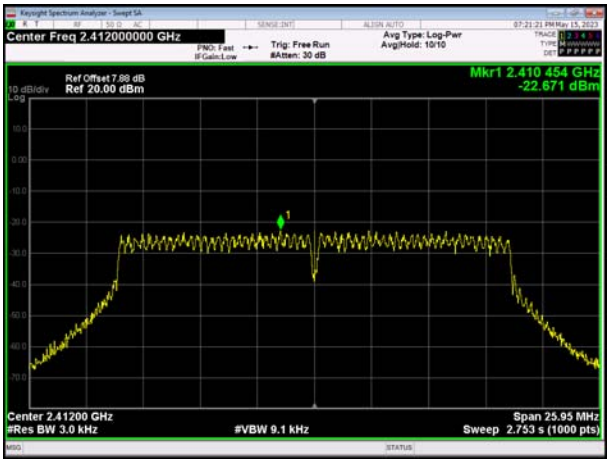
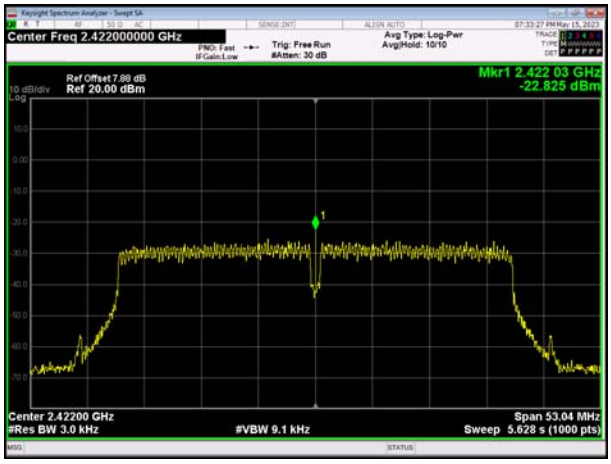
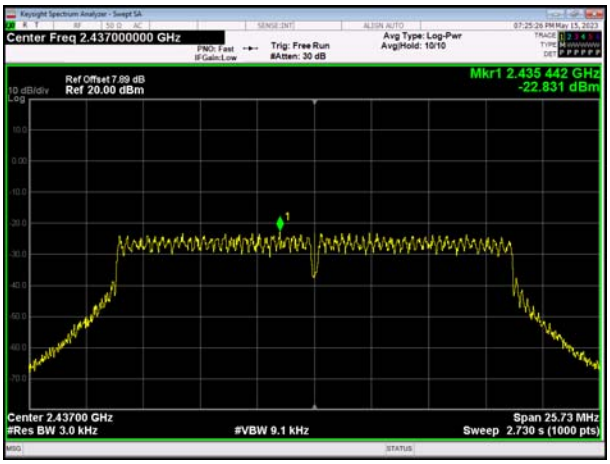
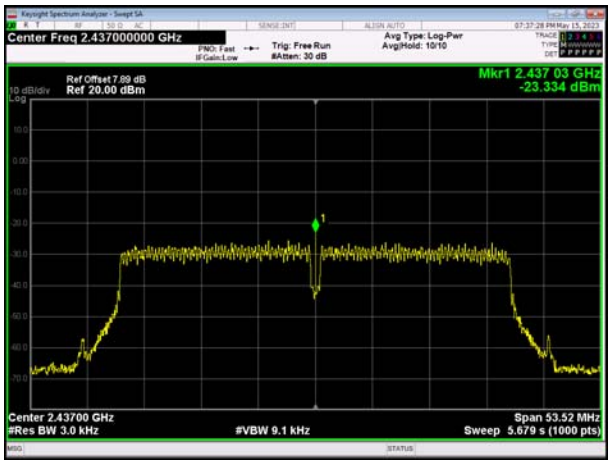
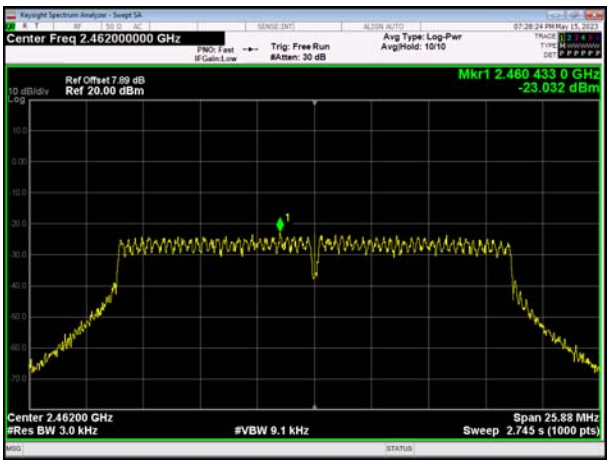
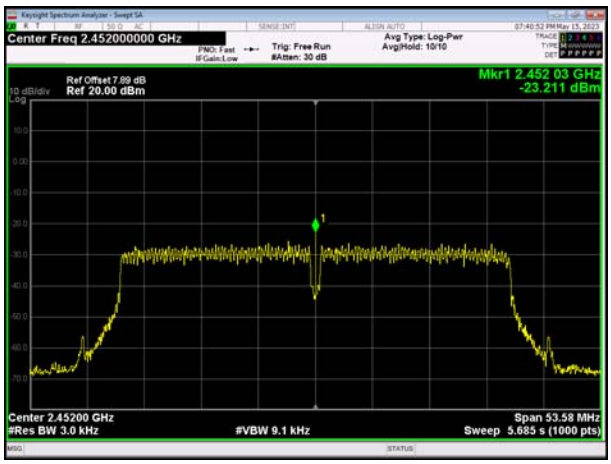
5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Mode	Test Channel	Reading Level (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11b	Low	-12.983	8	PASS
	Moddle	-12.964	8	PASS
	High	-13.182	8	PASS
802.11g	Low	-22.576	8	PASS
	Moddle	-22.941	8	PASS
	High	-23.265	8	PASS
802.11n20	Low	-22.671	8	PASS
	Moddle	-22.831	8	PASS
	High	-23.032	8	PASS
802.11n40	Low	-22.825	8	PASS
	Moddle	-23.334	8	PASS
	High	-23.211	8	PASS

802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

6. 6DB BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC PART15 (15.247) , SUBPART C, RSS-247 ISSUE 2: FEBRUARY 2017				
Section	Test Item	Limit	Frequency Range(MHz)	Result
15.247(a)(2) RSS-247 §5.2(1) &RSS-Gen§6.6	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

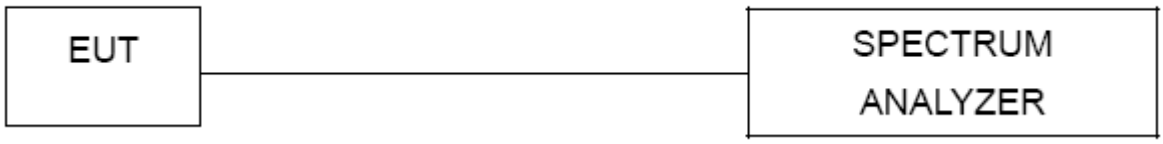
6.2 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 20 dB relative to the maximum level measured in the fundamental emission.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP

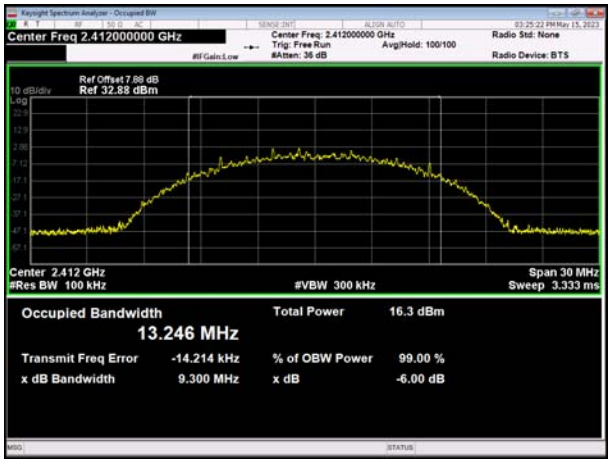
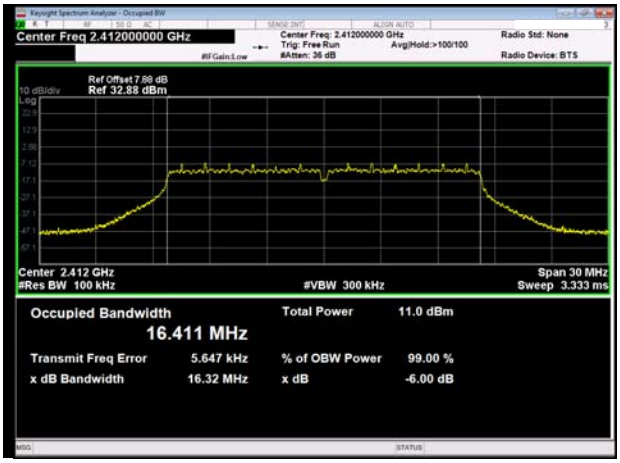
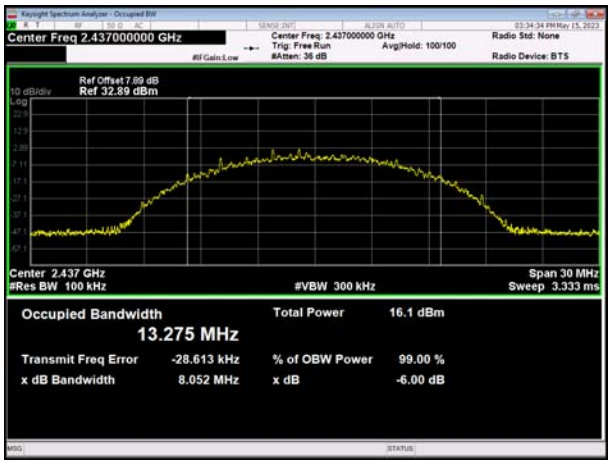
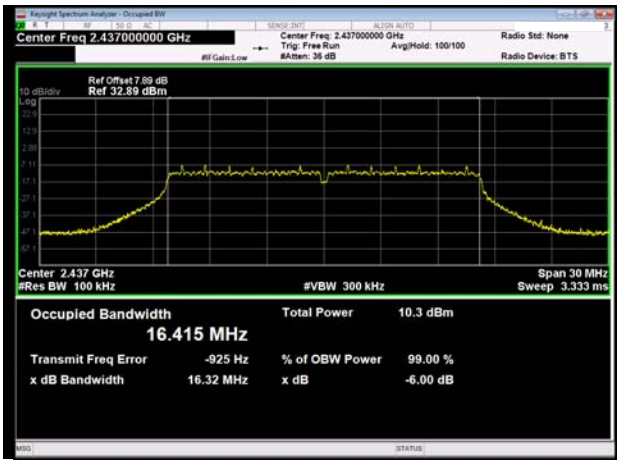
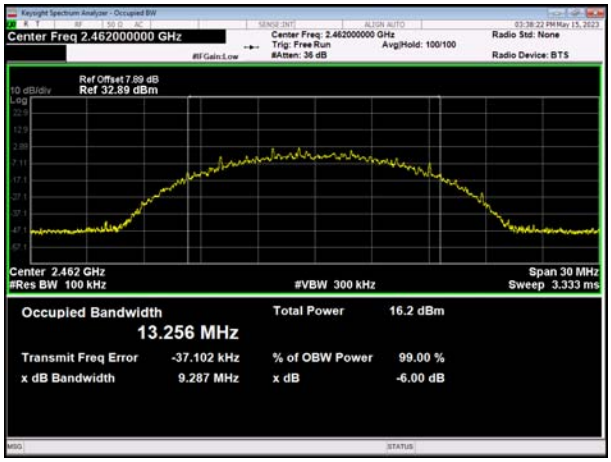
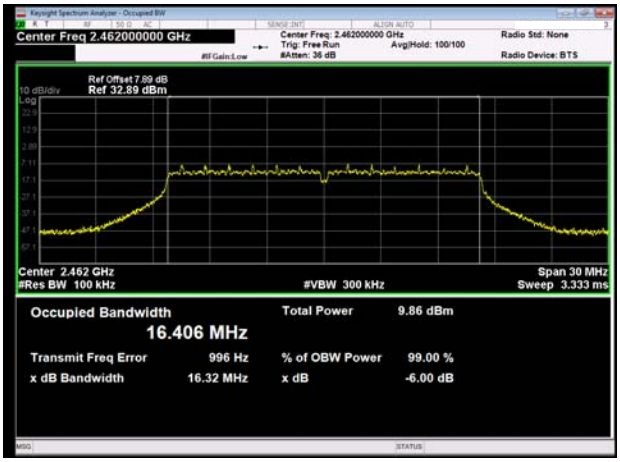


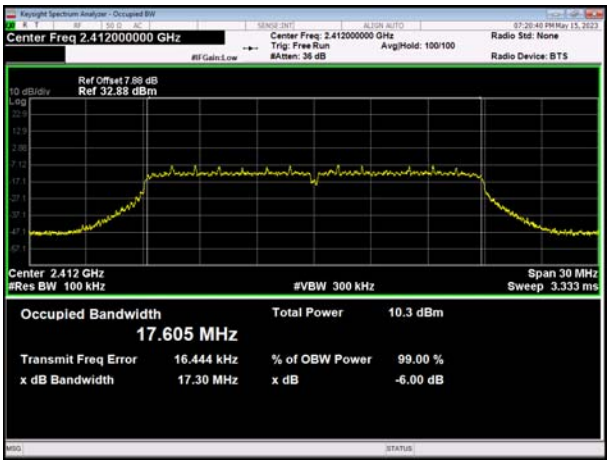
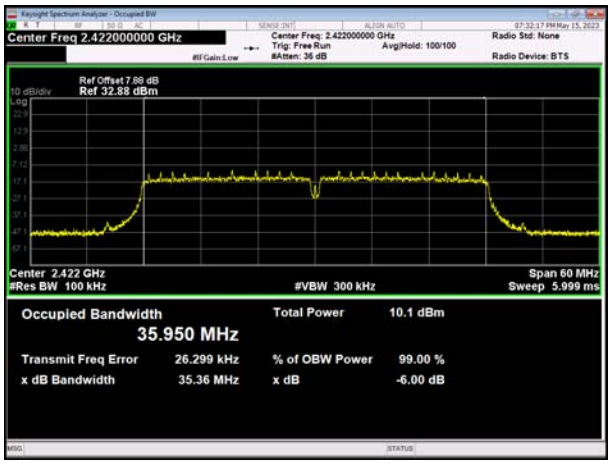
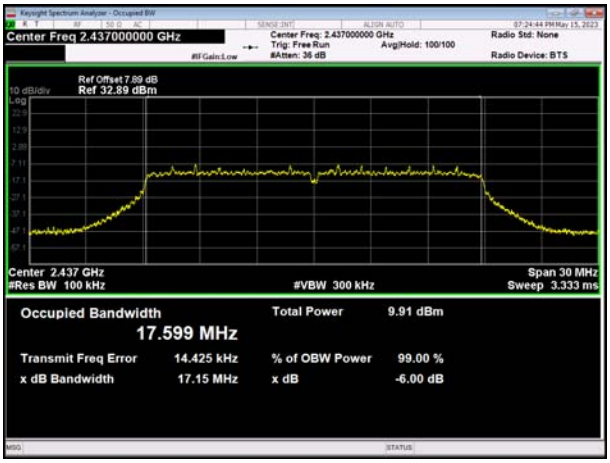
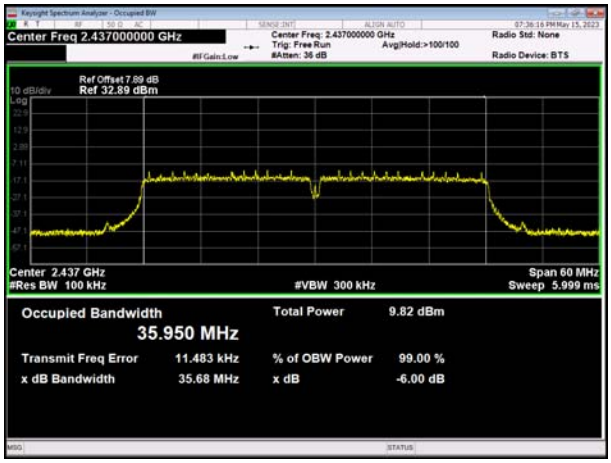
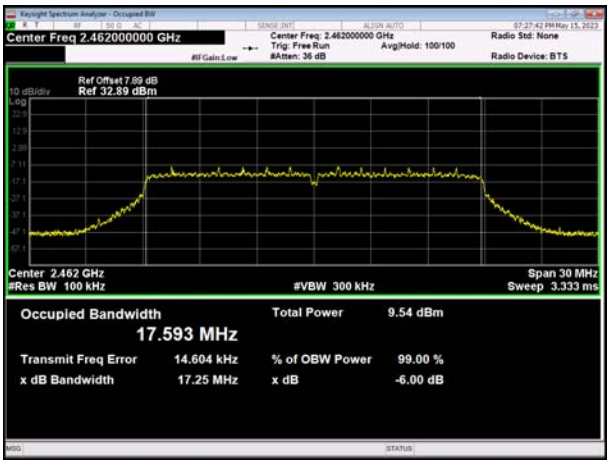
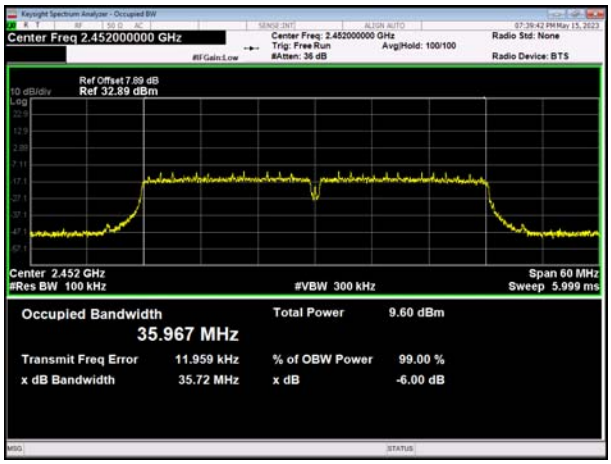
6.5 EUT OPERATION CONDITIONS

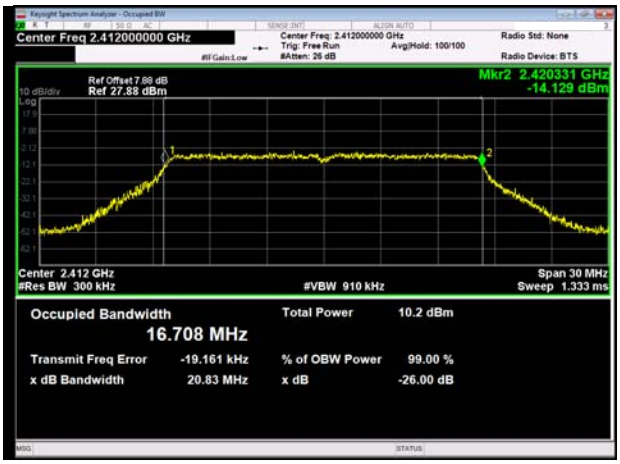
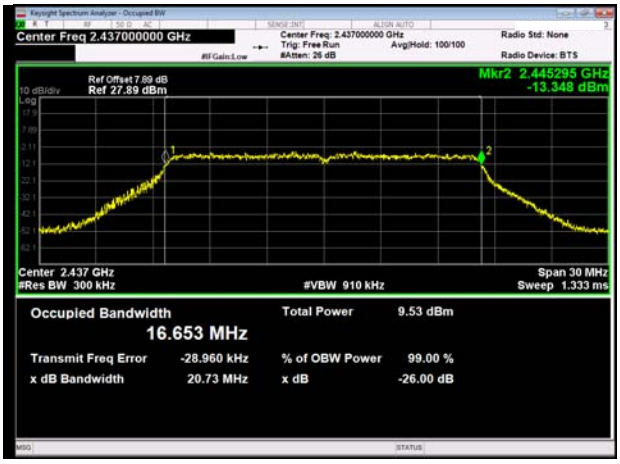
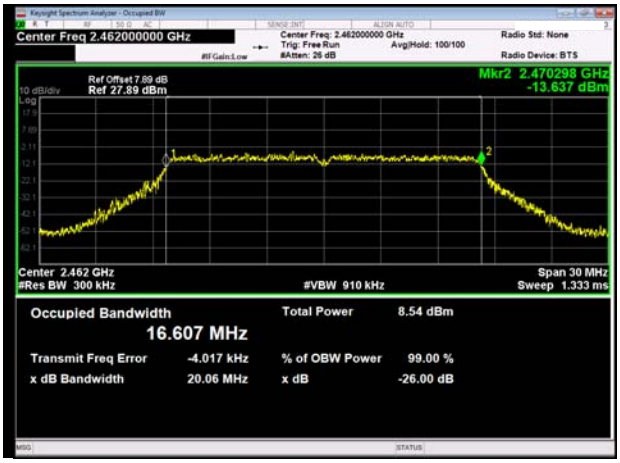
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

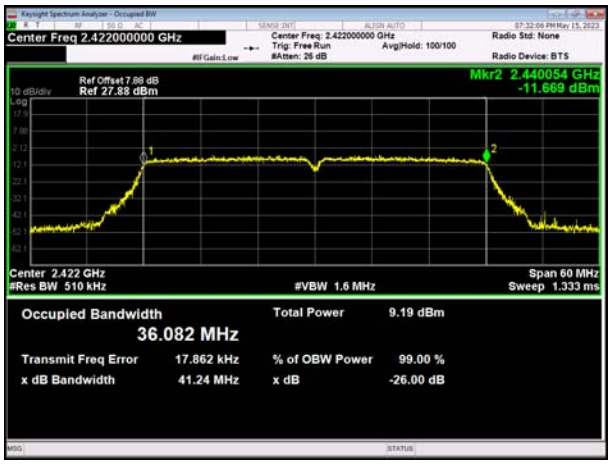
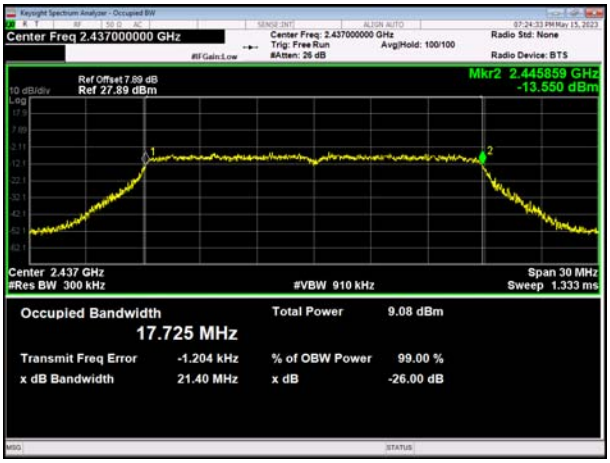
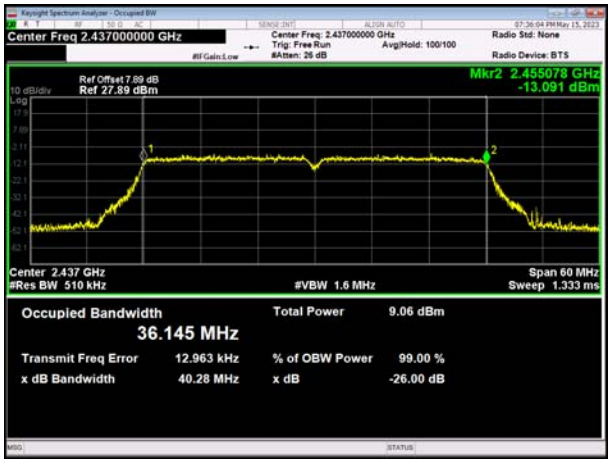
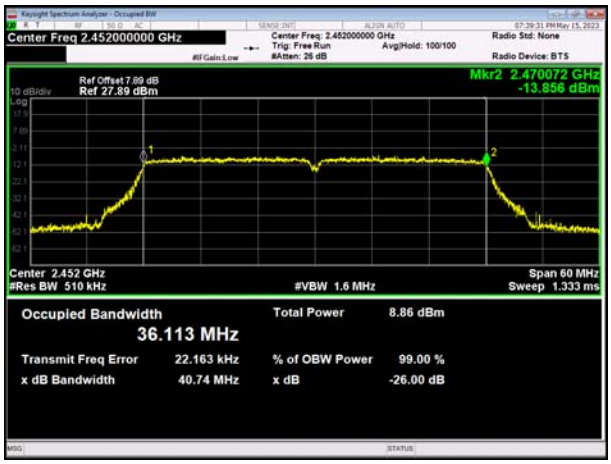
6.6 TEST RESULTS

	Test Channel	6dB Bandwidth (MHz)	99% Occupied bandwidth(MHz)	Limit (MHz)	Result
802.11b	Low	9.300	13.254	0.5	Pass
	Middle	8.052	13.256	0.5	Pass
	High	9.287	13.211	0.5	Pass
802.11g	Low	16.32	16.708	0.5	Pass
	Middle	16.32	16.653	0.5	Pass
	High	16.32	16.607	0.5	Pass
802.11n HT20	Low	17.30	17.789	0.5	Pass
	Middle	17.15	17.725	0.5	Pass
	High	17.25	17.696	0.5	Pass
802.11n HT40	Low	35.36	36.082	0.5	Pass
	Middle	35.68	36.145	0.5	Pass
	High	35.72	36.113	0.5	Pass

6dB Bandwidth	
802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

6dB Bandwidth	
802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

99% Bandwidth	
802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

99% Bandwidth	
802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

7. OUT OF BAND EMISSIONS TEST

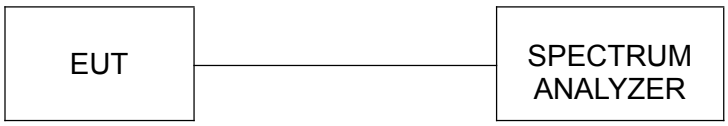
7.1 TEST LIMIT

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 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 20dB.

7.1.1 TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as TX operation and connect directly to the spectrum analyzer.
3. Based on RSS-247 Issue 2 Section 15.247: RBW=100KHz, VBW=300KHz.
4. Set detected by the spectrum analyzer with peak detector.

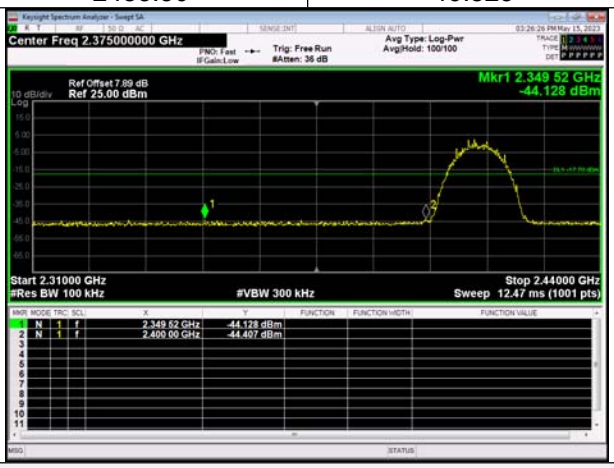
7.1.2 TEST SETUP



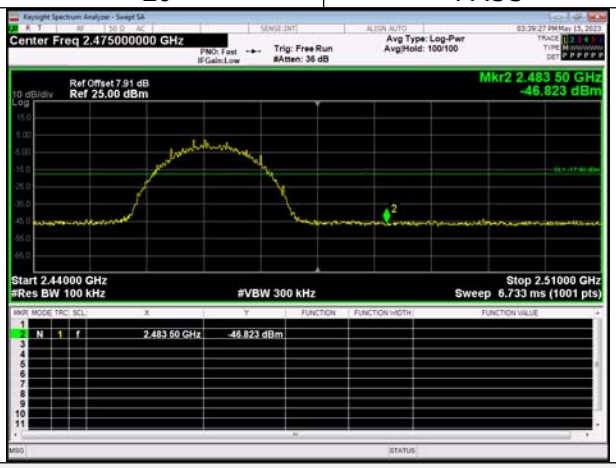
7.1.3 TEST RESULT

PASS

802.11b			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	44.407	20	PASS
2483.50	46.823	20	PASS

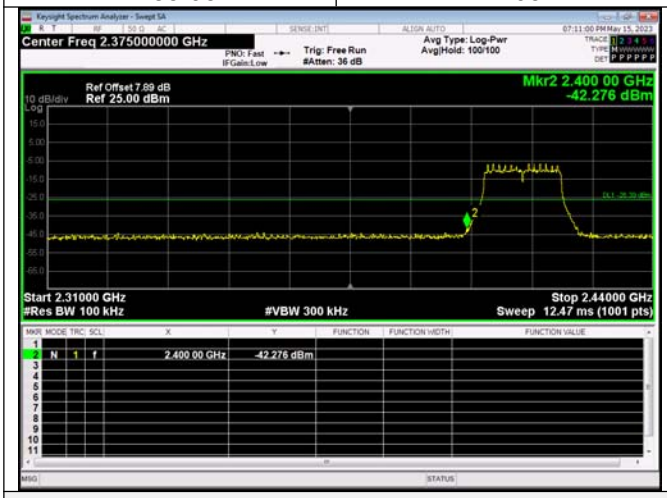


2412

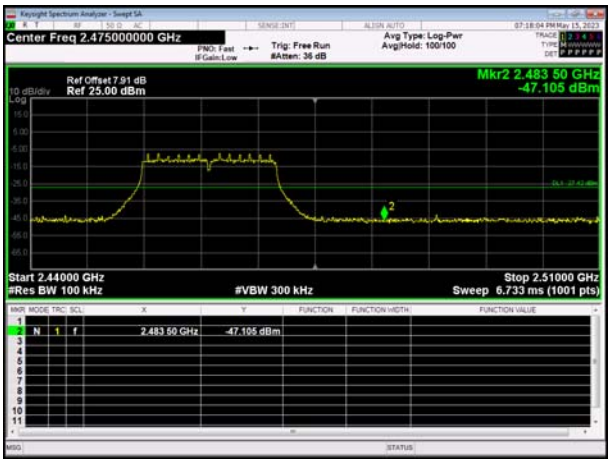


2462

802.11g			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	42.276	20	PASS
2483.05	47.105	20	PASS

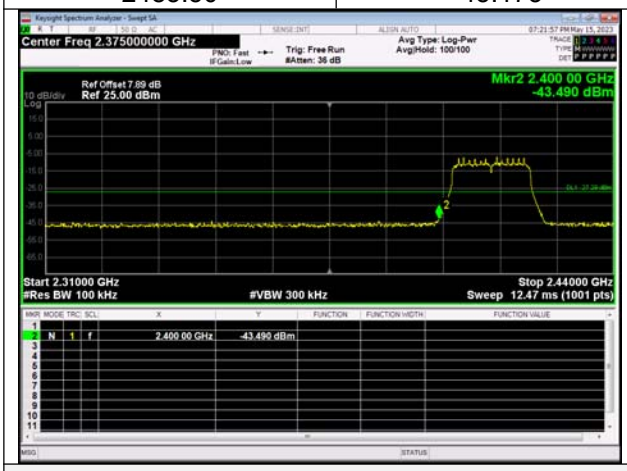


2412

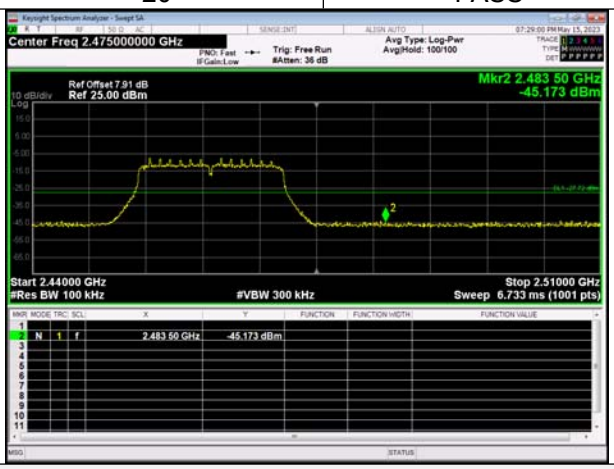


2462

802.11n HT20			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	43.490	20	PASS
2483.50	45.173	20	PASS

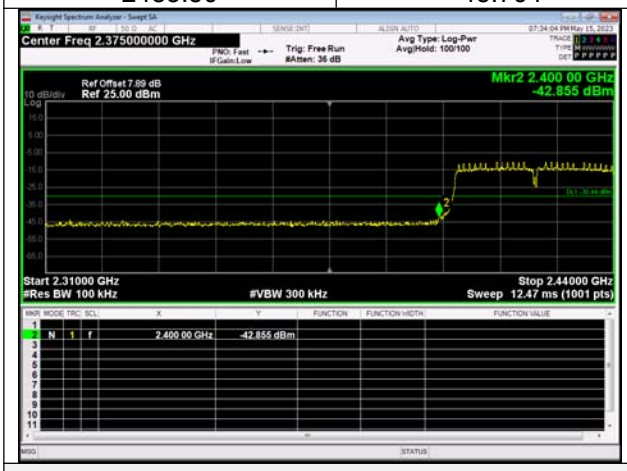


2412

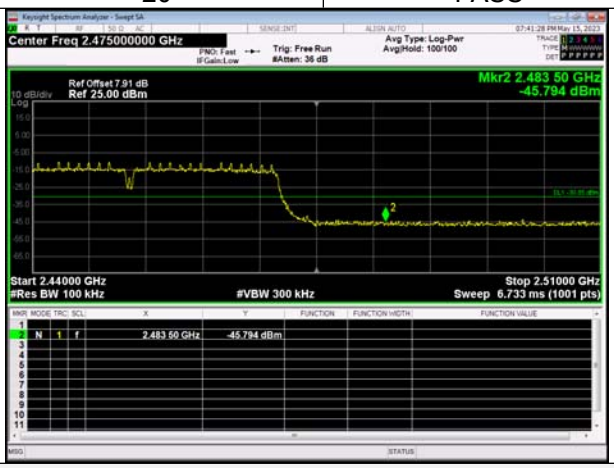


2462

802.11n HT40			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	42.855	20	PASS
2483.50	45.794	20	PASS



2422



2452

8. SPURIOUS RF CONDUCTED EMISSION

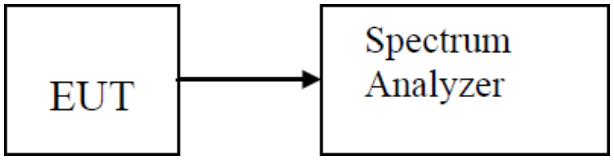
8.1 TEST LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.
3. For below 30MHz,For 9KHz-150kHz,150K-10MHz,We use the RBW 1KHz,10KHz, So the limit need to calculated by “10lg(BW1/BW2)“. for example For9KHz-150kHz,RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

8.1.1 TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz; For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz:For 10MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and mwasure frequeny range from 9KHz to 25GHz.

8.1.2 TEST SETUP

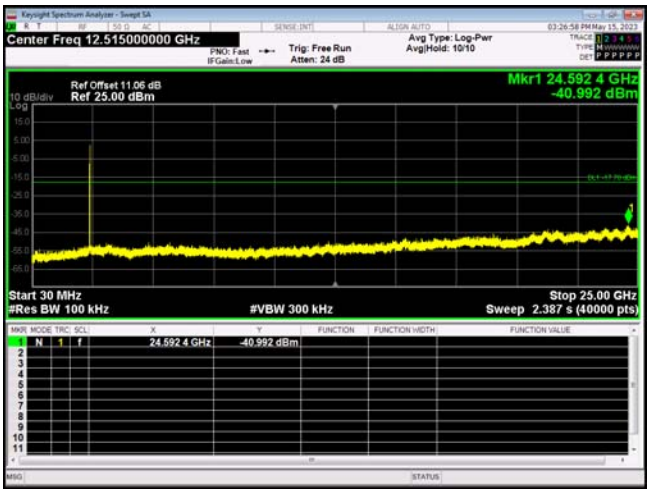


8.1.3 TEST RESULT

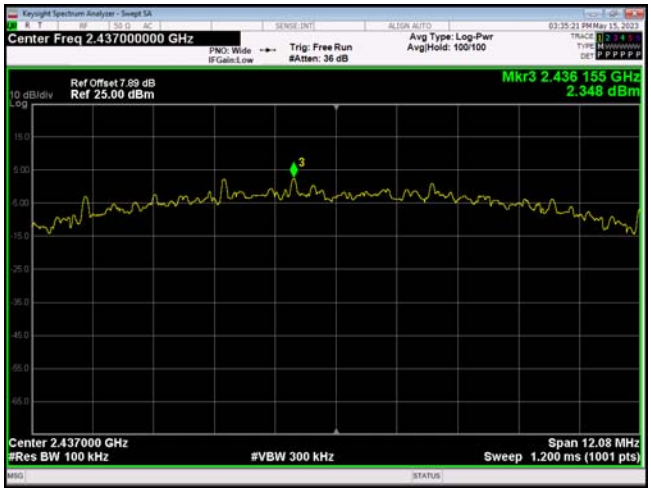
PASS

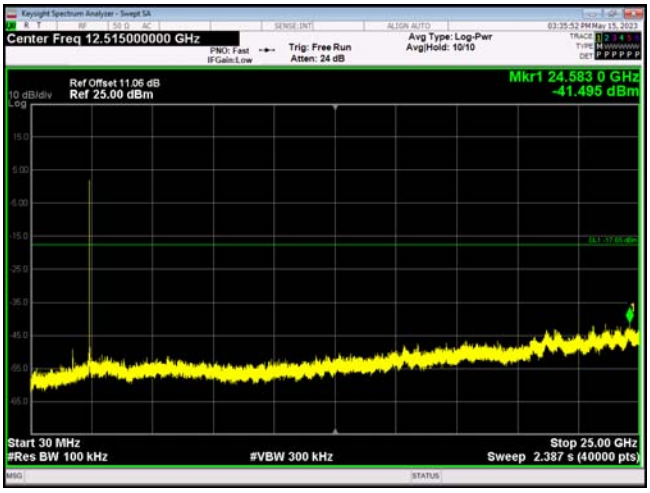
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.and record the worstest data for802.11b mode in report .

Test Mode:	802.11b	Test channel :	01

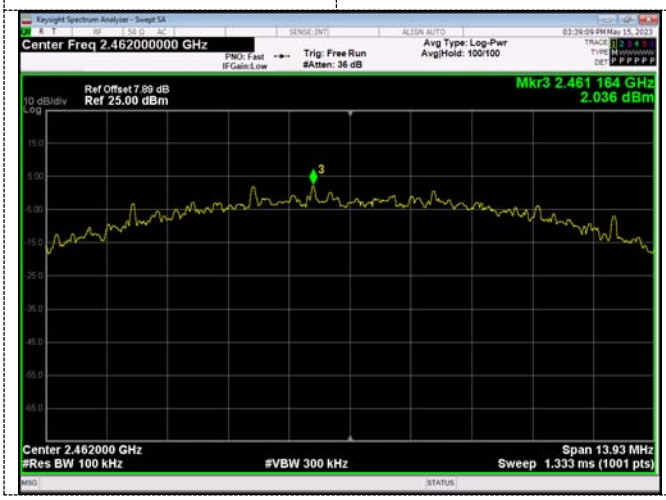


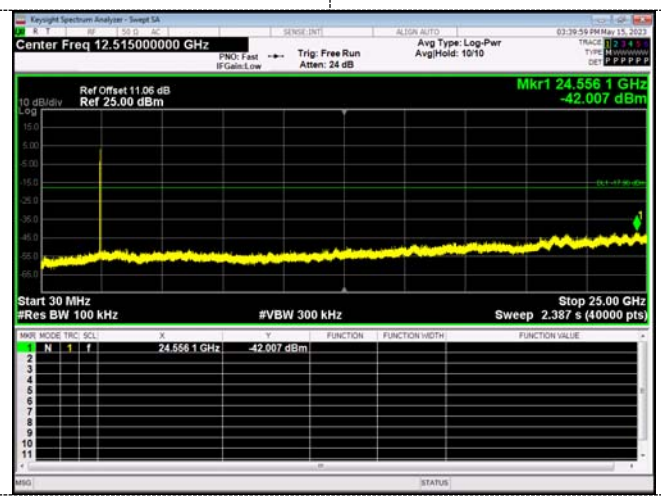
Test Mode:	802.11b	Test channel :	06



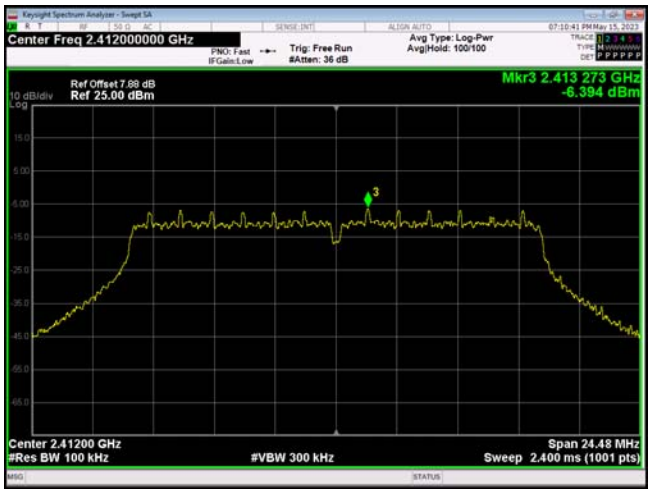


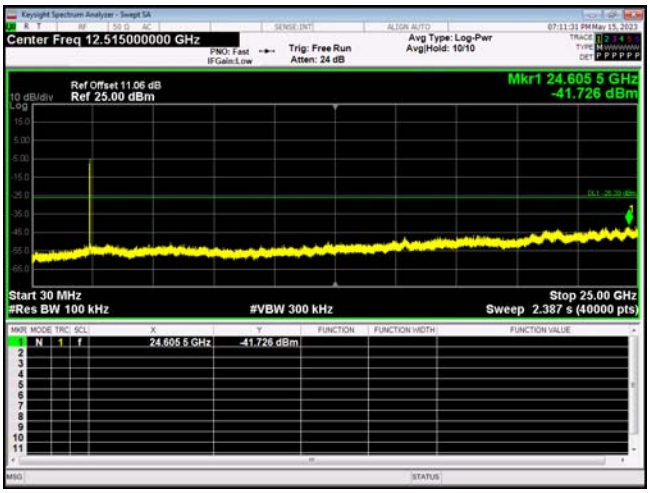
Test Mode:	802.11b	Test channel :	11



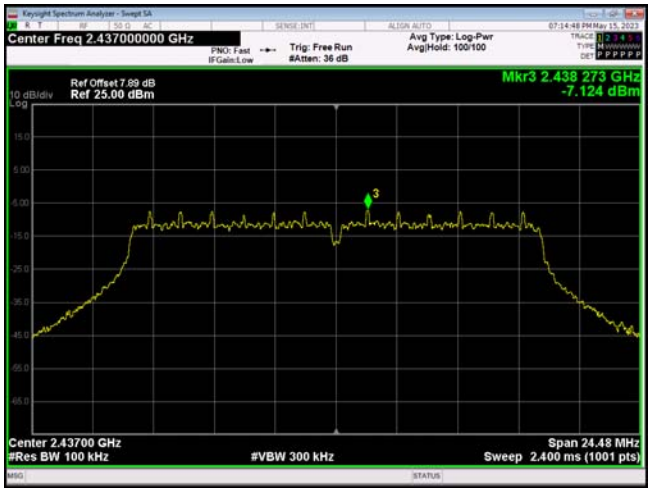


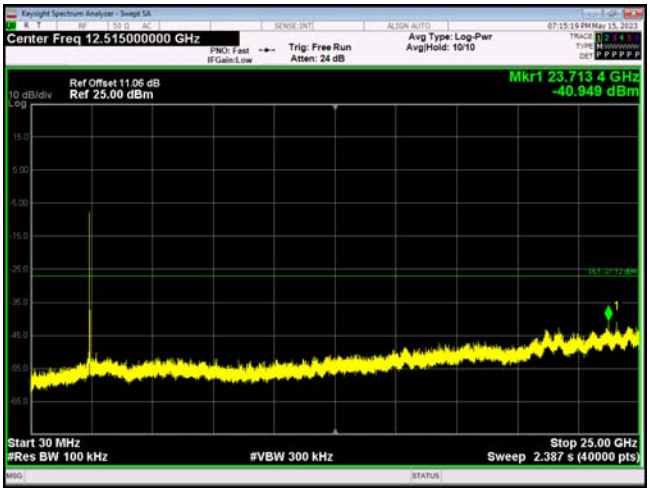
Test Mode:	802.11g	Test channel :	01



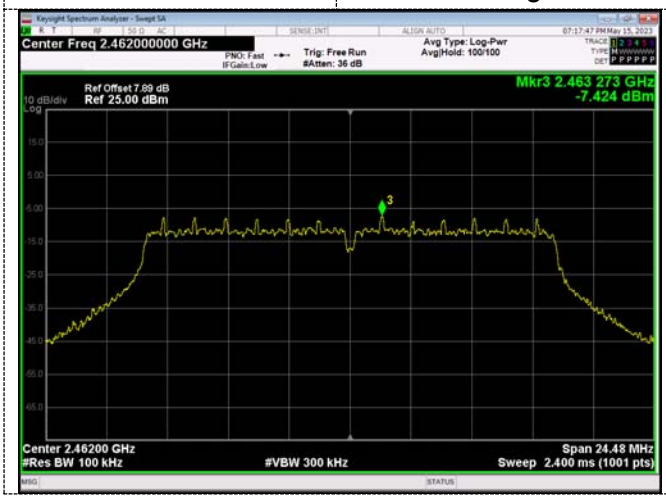


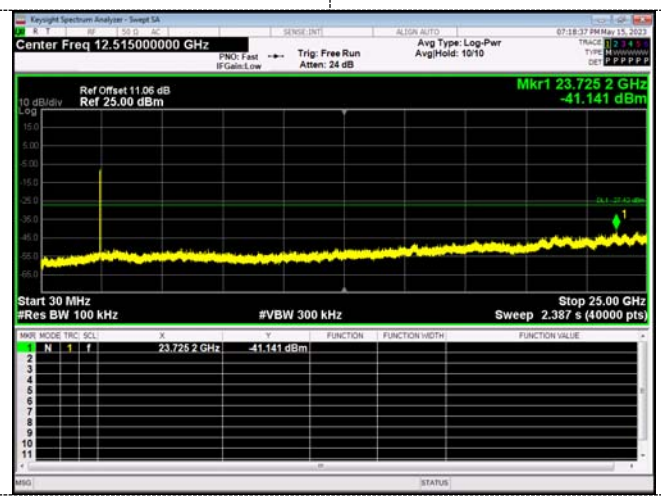
Test Mode:	802.11g	Test channel :	06



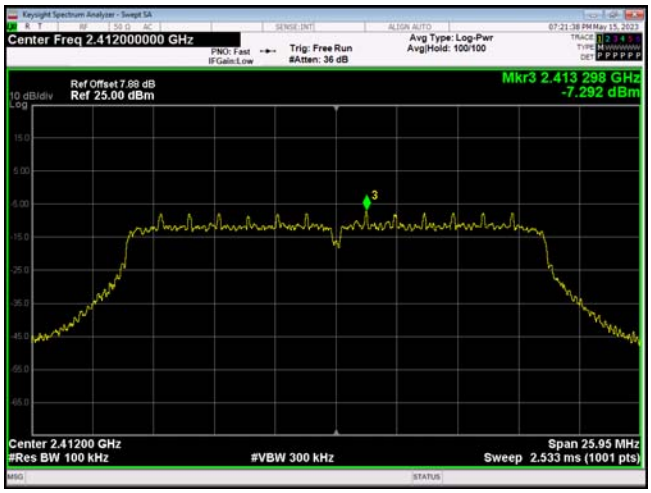


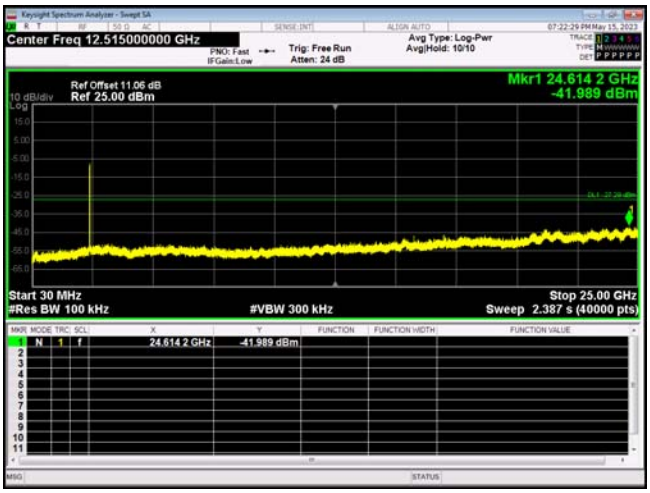
Test Mode:	802.11g	Test channel :	11



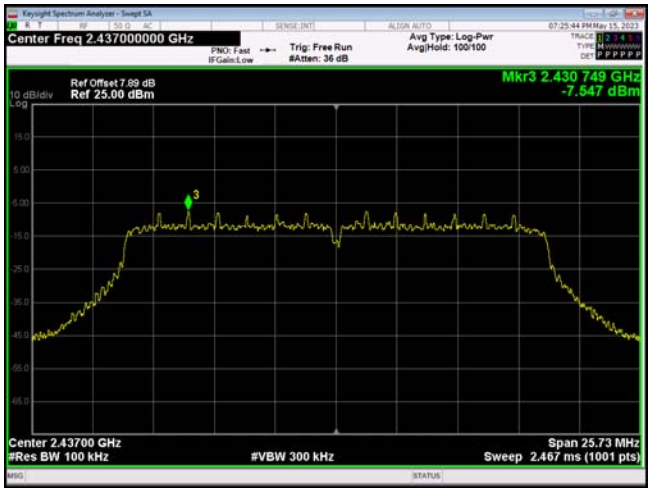


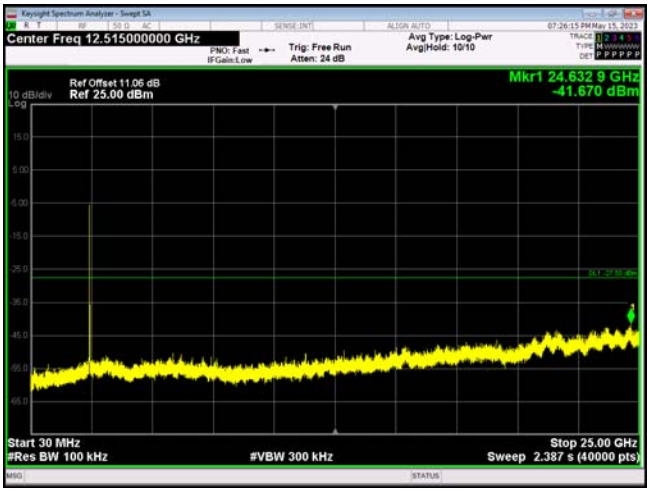
Test Mode:	802.11n HT20	Test channel :	01



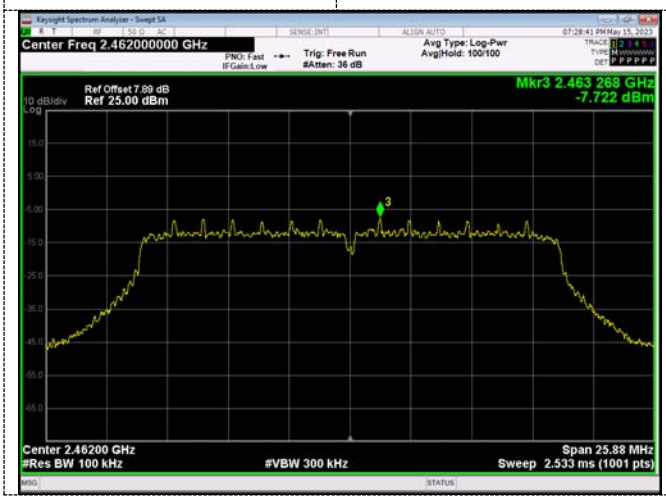


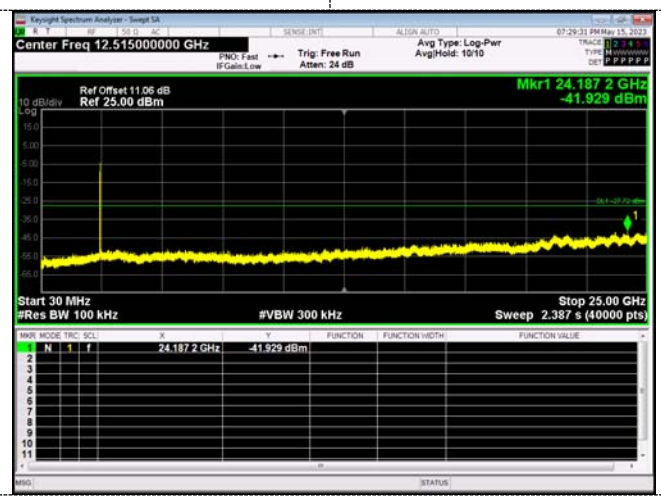
Test Mode:	802.11n HT20	Test channel :	06



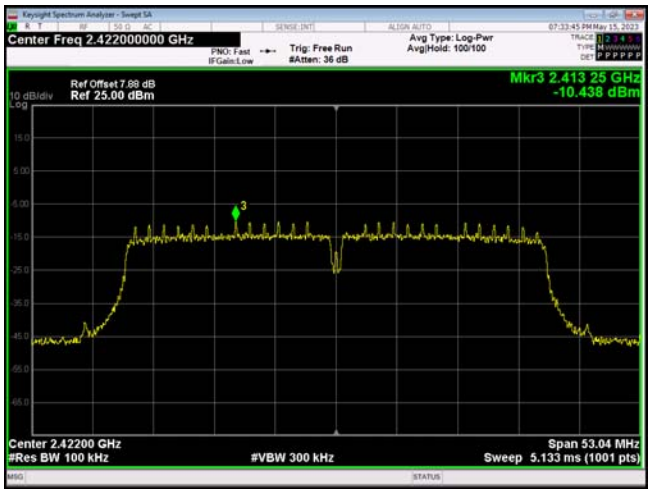


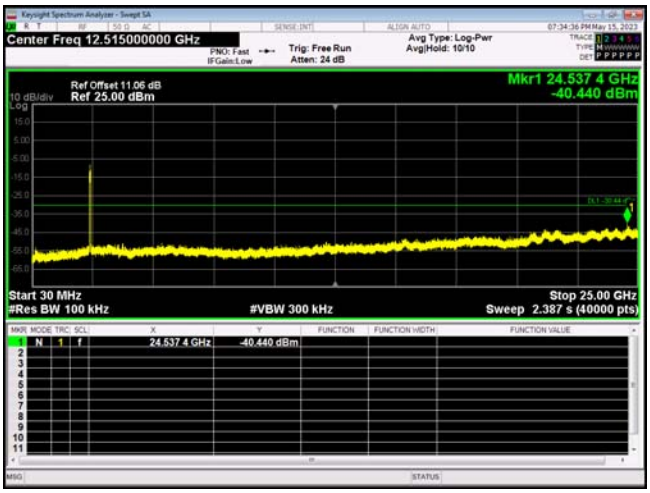
Test Mode:	802.11n HT20	Test channel :	11



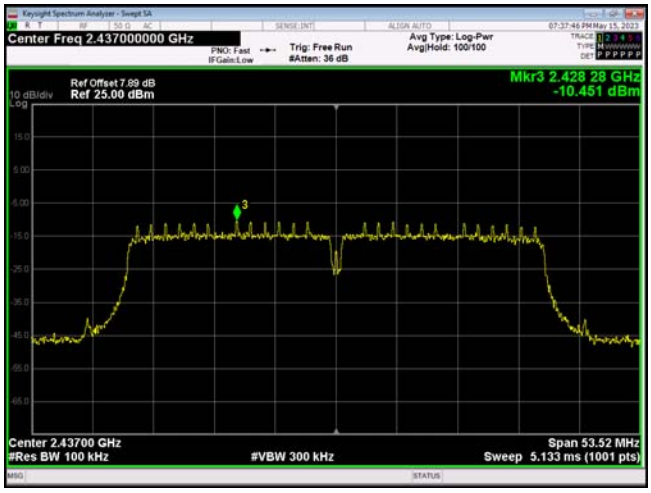


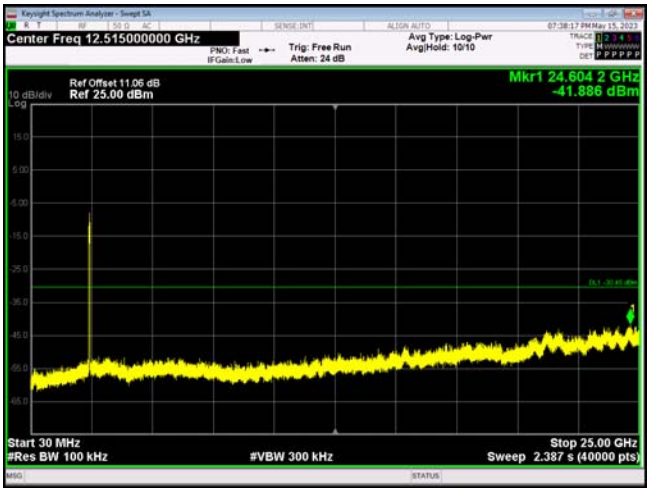
Test Mode:	802.11n HT40	Test channel :	03



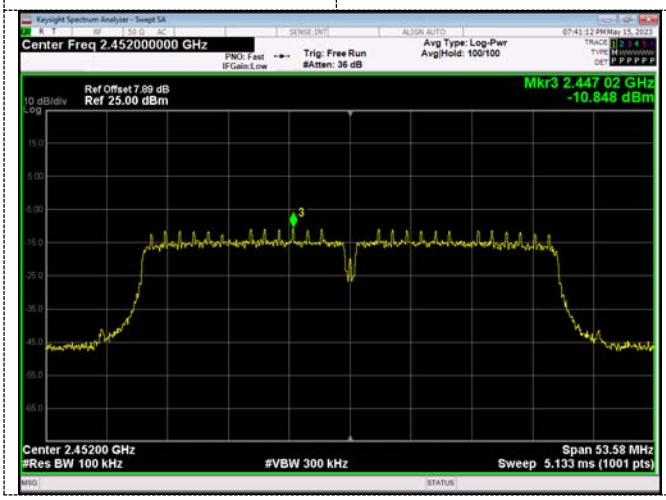


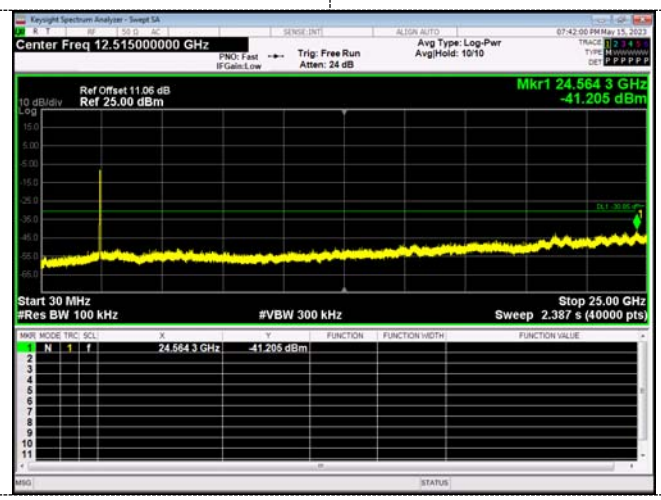
Test Mode:	802.11n HT40	Test channel :	06





Test Mode:	802.11n HT40	Test channel :	09





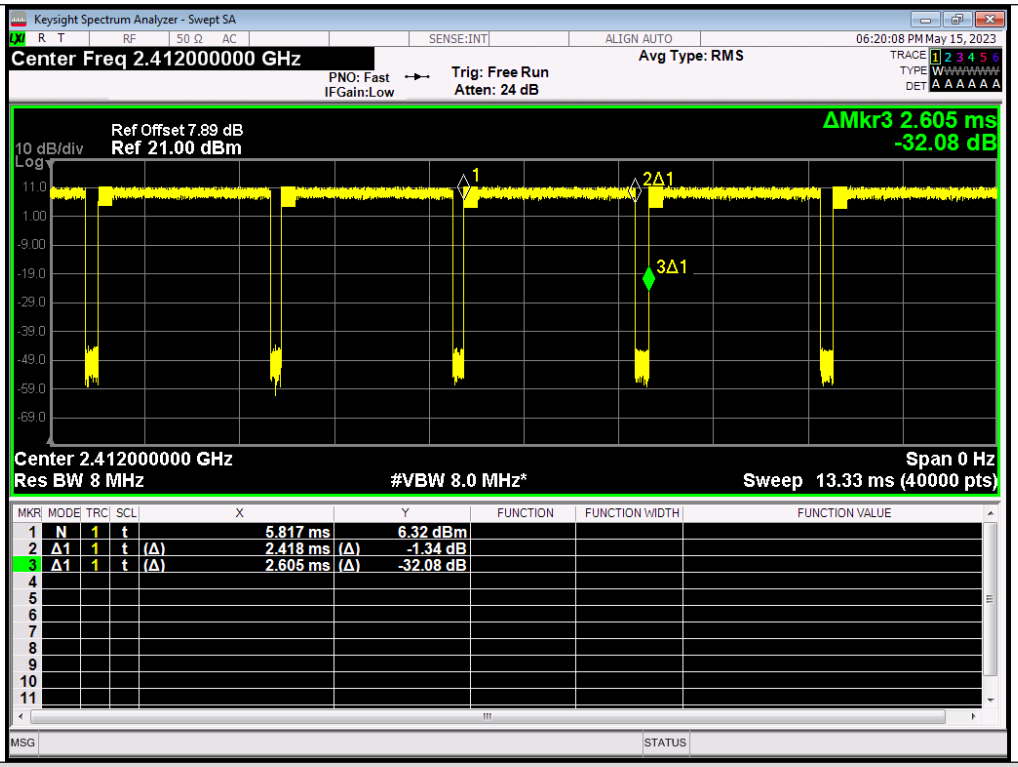
9. DUTY CYCLE

9.1 APPLICABLE STANDARD
According to KDB 558074 D01 15.247 Meas Guidance v05r02 Section 6.

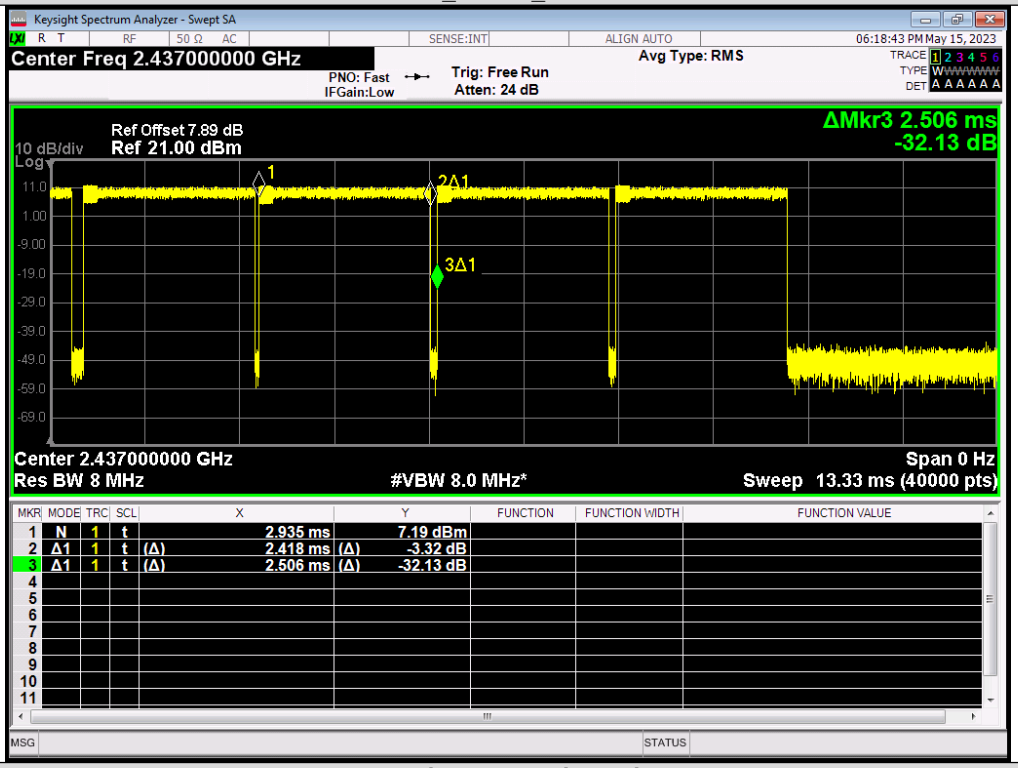
9.1 TEST PROCEDURE
a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
1) Set the center frequency of the instrument to the center frequency of the transmission.
2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
3) Set VBW ≥ RBW. Set detector = peak or average.
4) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if T ≤ 16.7 μs.)
Measure T_{total} and T_{on}
Calculate Duty Cycle = T_{on} / T_{total}

9.2 TEST RESULT

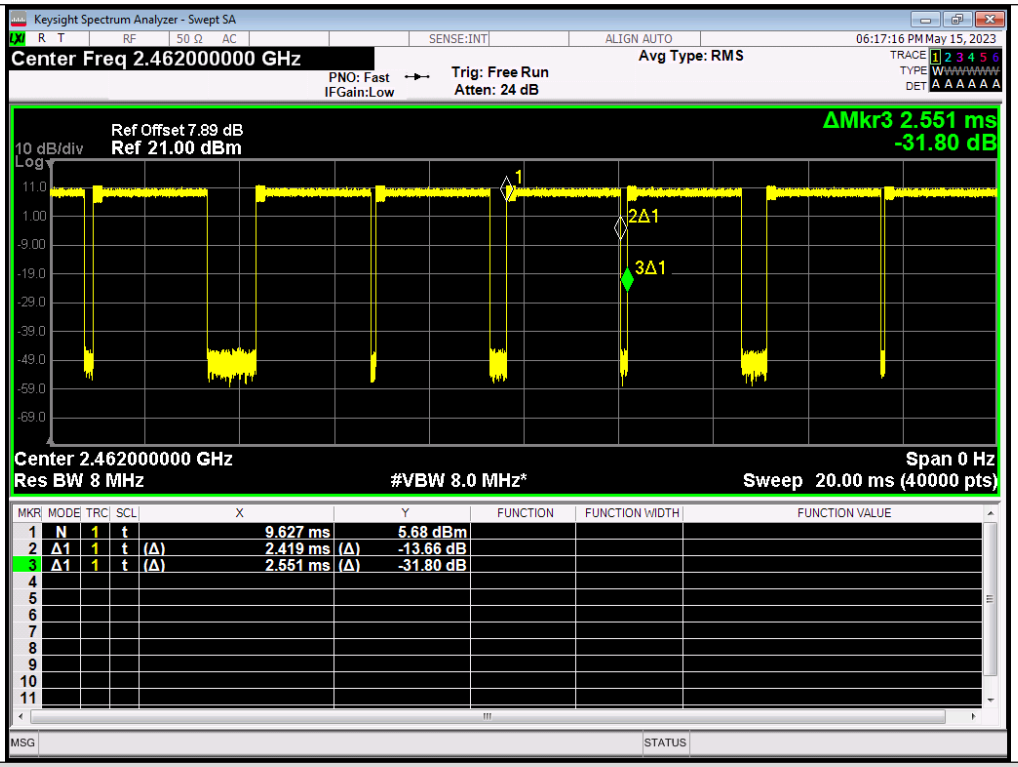
Mode	Data rates	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)
802.11b	11	1	2.418	2.605	92.85	0.9285	0.3222
		6	2.418	2.506	96.51	0.9651	0.1543
		11	2.419	2.551	94.82	0.9482	0.231
802.11g	54	1	2.066	2.215	93.24	0.9324	0.304
		6	2.065	2.197	94.00	0.9400	0.2687
		11	2.066	2.125	97.19	0.9719	0.1238
802.11n_20	MCS 0	1	1.921	1.990	96.52	0.9652	0.1538
		6	1.922	2.080	92.37	0.9237	0.3447
		11	1.921	2.026	94.81	0.9481	0.2315
802.11n_40		3	0.945	1.041	90.78	0.9078	0.4201
		6	0.945	3.836	24.64	0.2464	6.0836
		9	0.945	1.041	90.79	0.9079	0.4196



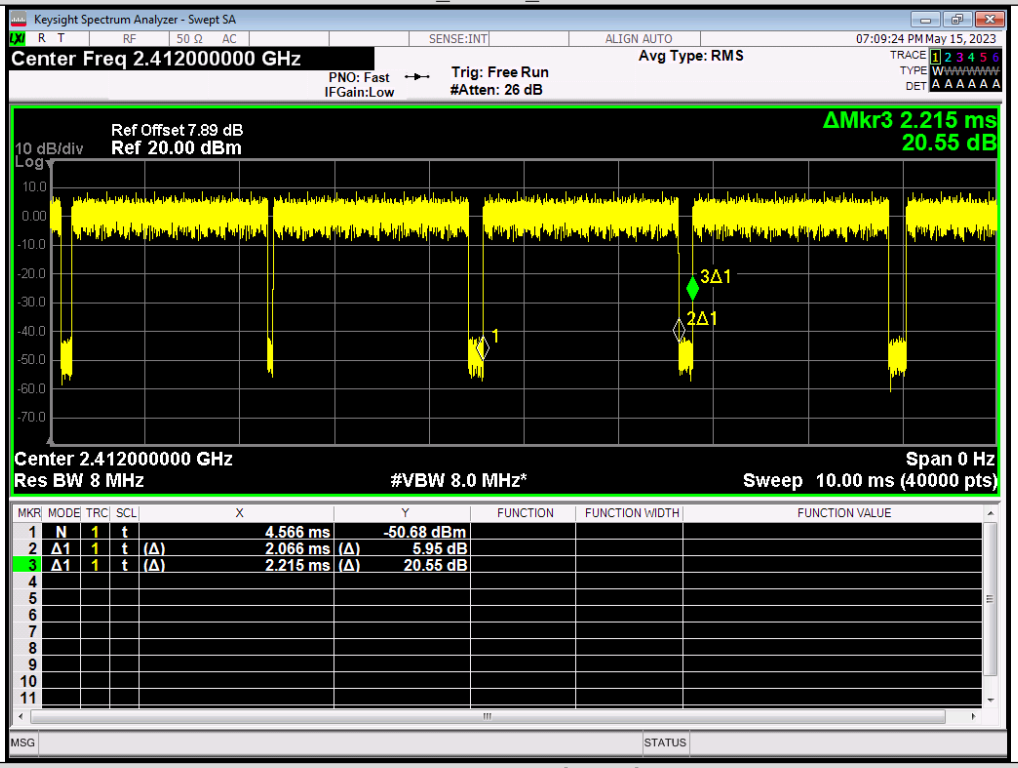
802.11b_20MHz_Channel 1



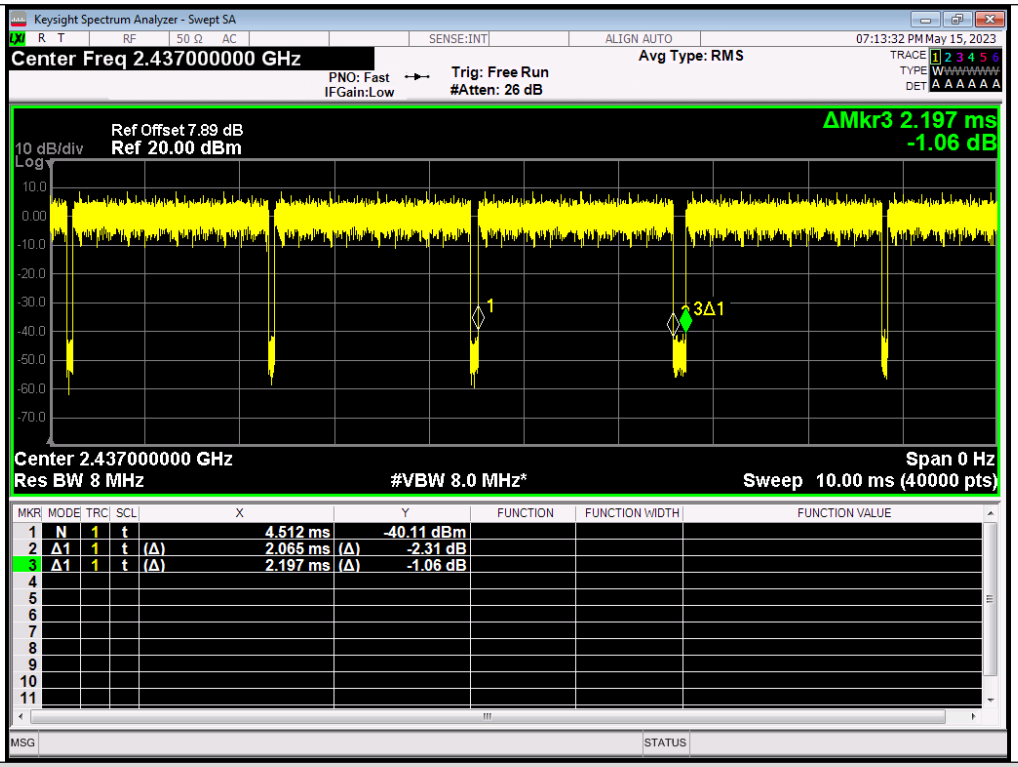
802.11b_20MHz_Channel 6



802.11b_20MHz_Channel 11



802.11g_20MHz_Channel 1



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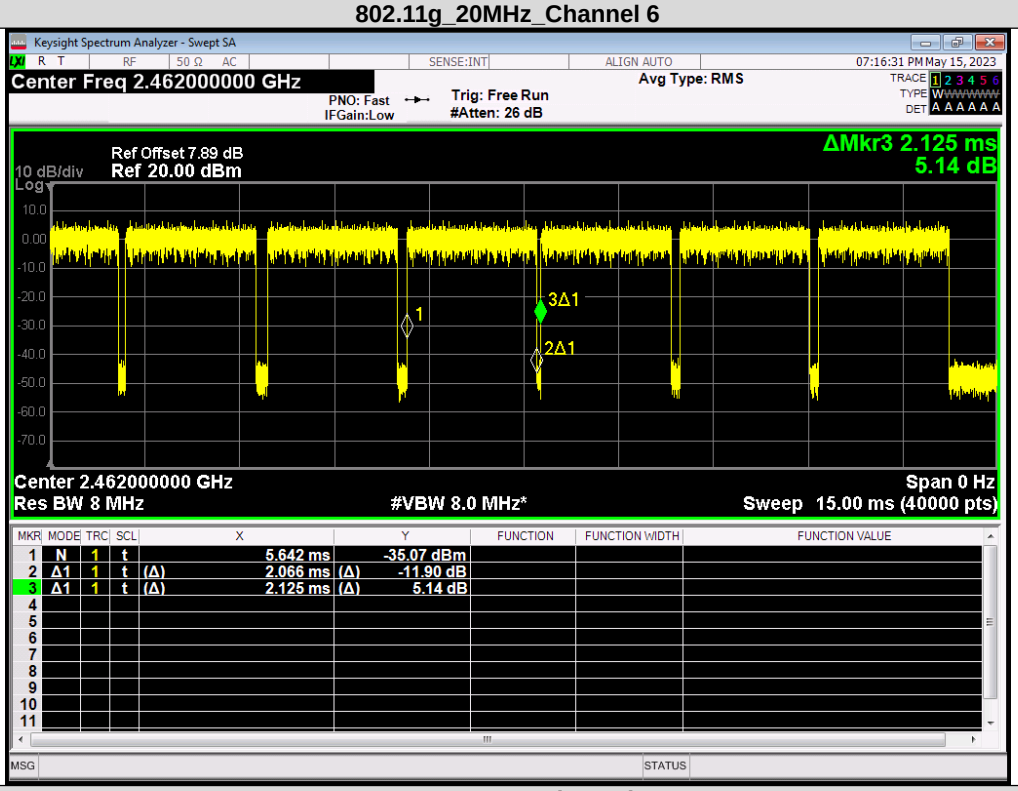

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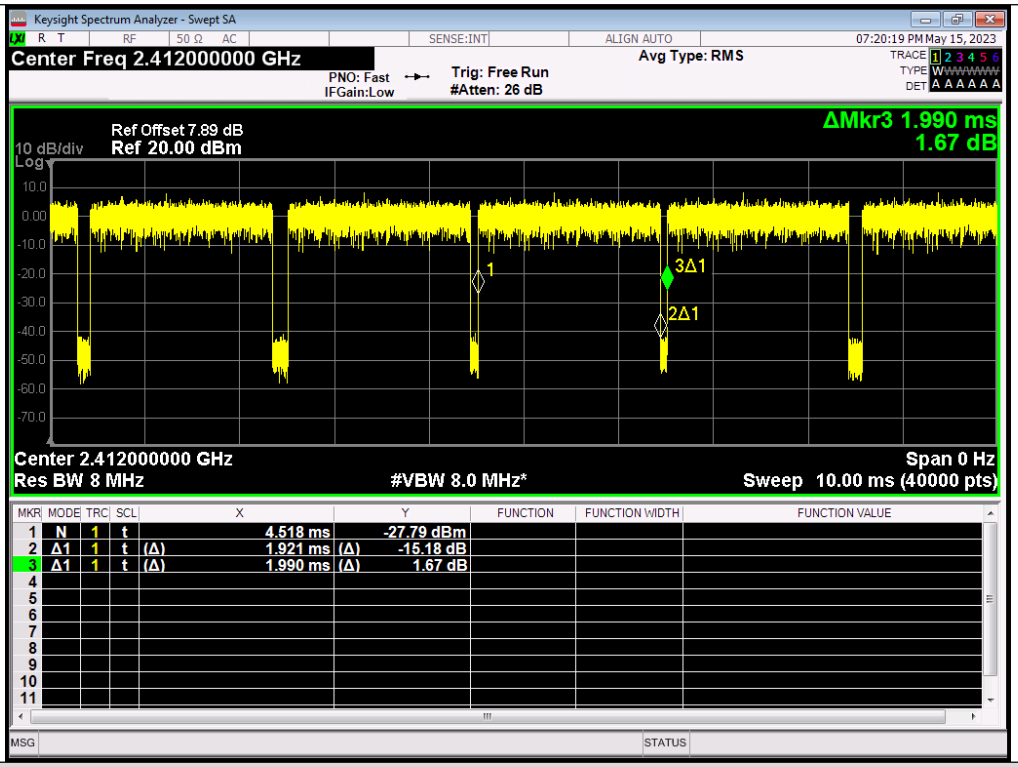
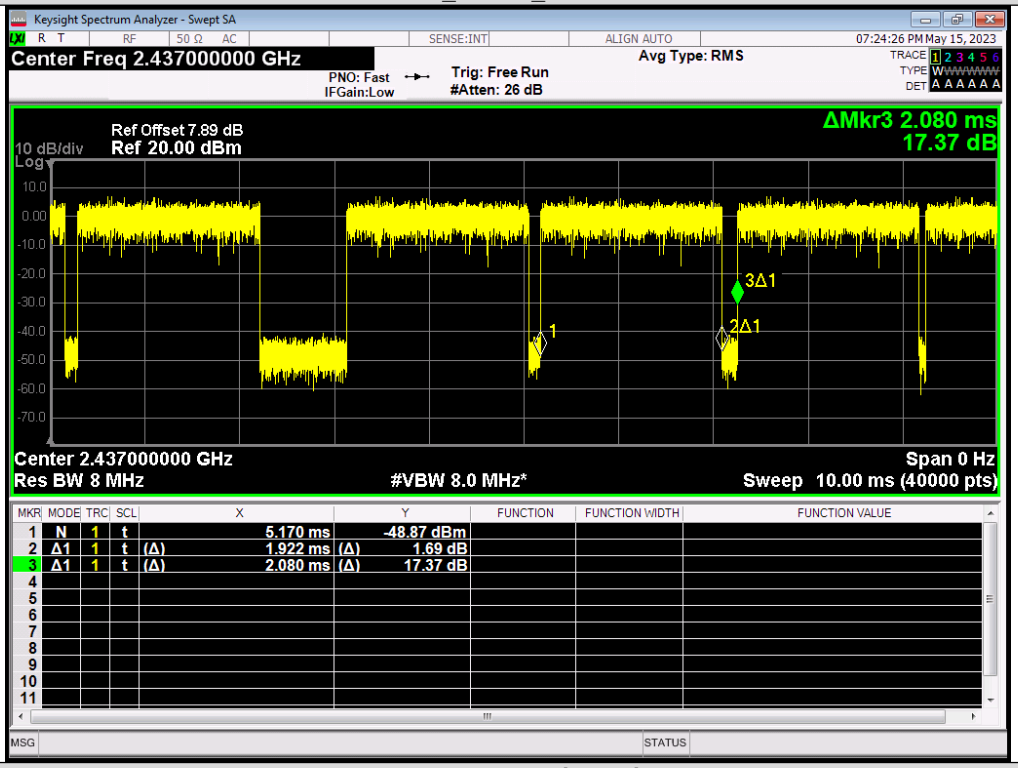
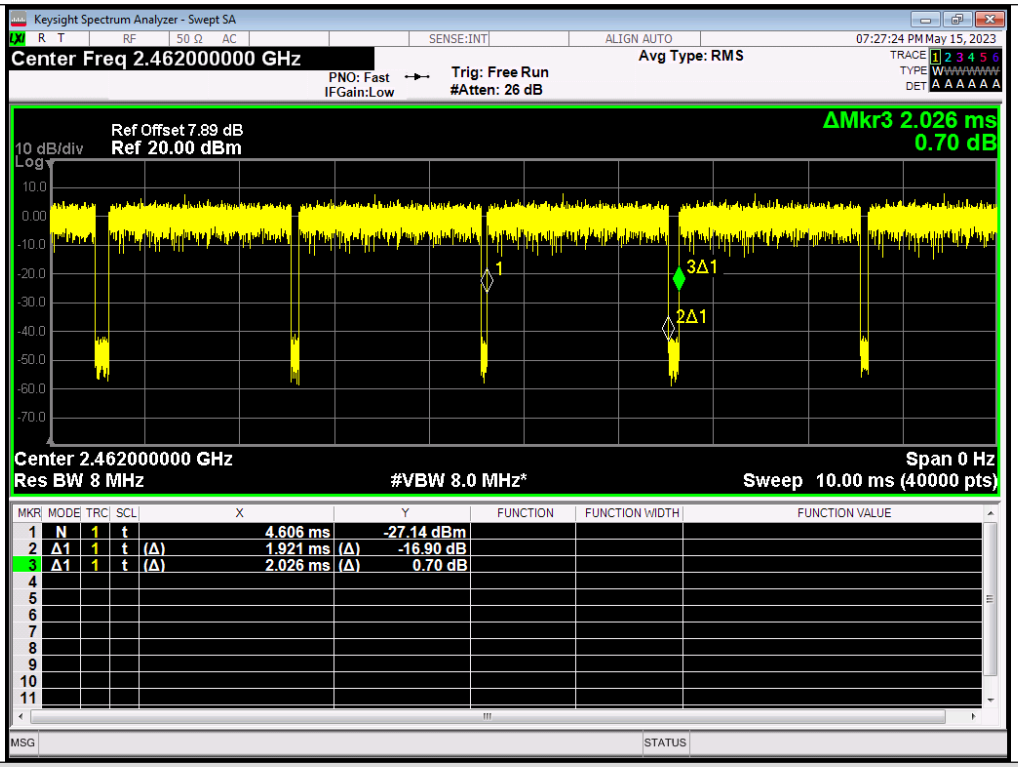


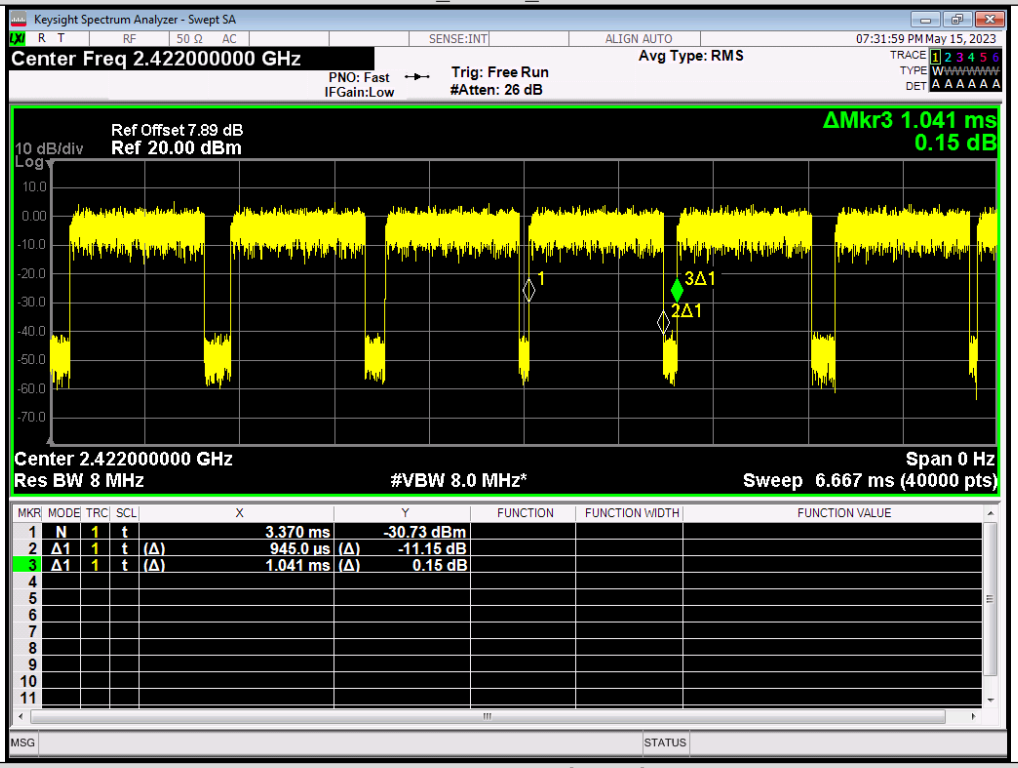
802.11n_20MHz_Channel 1



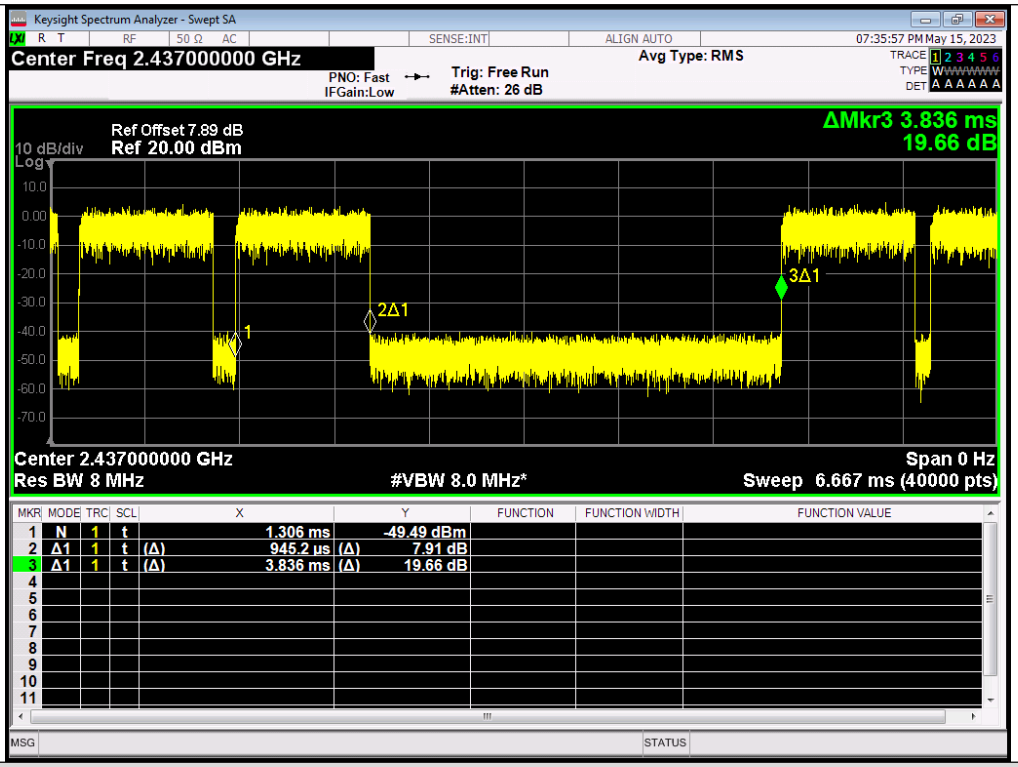
802.11n_20MHz_Channel 6



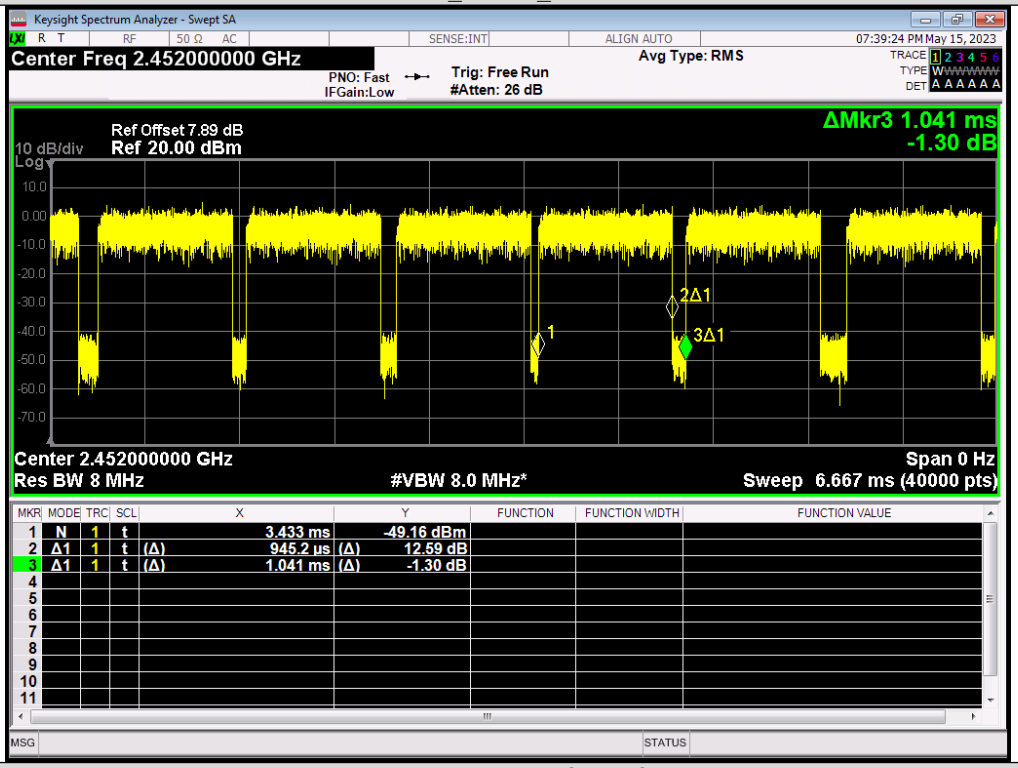
802.11n_20MHz_Channel 11



802.11n_40MHz_Channel 3



802.11n_40MHz_Channel 6



802.11n_40MHz_Channel 9

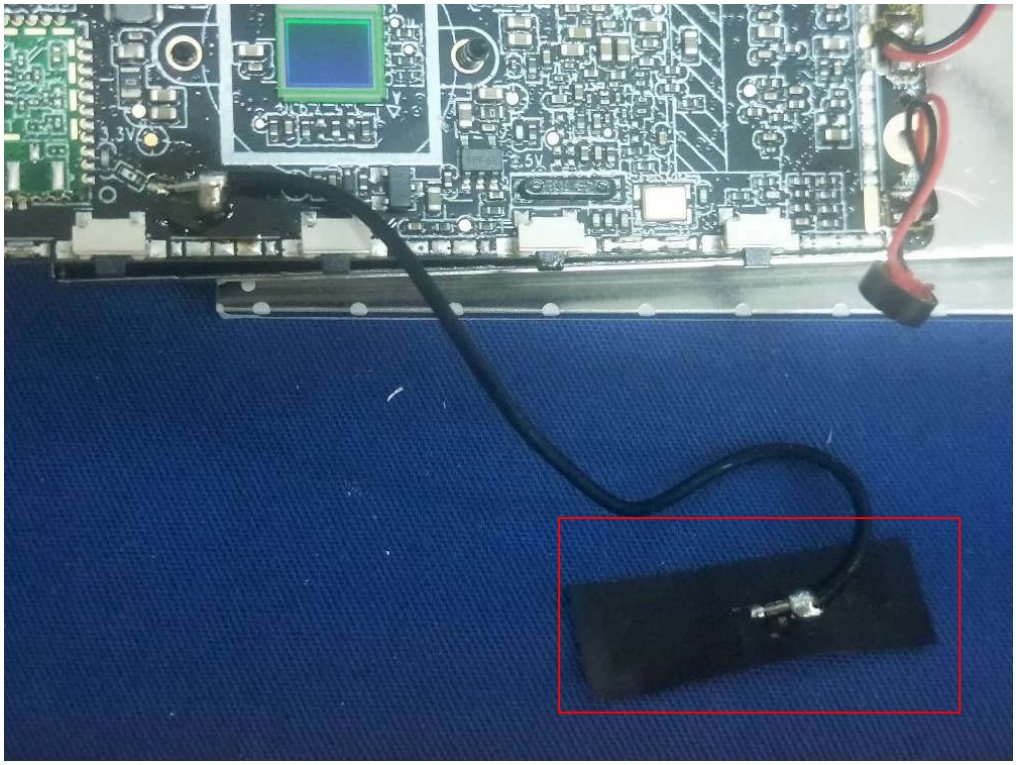
10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203&RSS-Gen§8.3: 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.

10.1.1 EUT ANTENNA

The EUT antenna is internal antenna,. It comply with the standard requirement.



11. TEST SEUUP PHOTO

Reference to the appendix I for details.

12. EUT PHOTO

Reference to the appendix II for details.

※※※※※ **END OF REPORT** ※※※※※