FCC TEST REPORT (WIFI)

for

Dayton Audio Division of Parts Express

AMPLIFIERT

Model Number: WF60PA

FCC ID: ZXZWF60PA

Prepared for	:	Dayton Audio Division of Parts Express
Address	:	725 Pleasant Valley Rd Springboro, Ohio 45066 USA

Prepared by	:	Keyway Testing Technology Co., Ltd.
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Report No.	:	17KWE025047F
Date of Test	:	Jan. 08~Feb. 15, 2017
Date of Report	:	Feb. 16, 2017

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Keyway Testing Technology Co., Ltd.

Applicant: **Address:**	Dayton Audio Division of Parts Express 725 Pleasant Valley Rd Springboro, Ohio 45066 USA		
Manufacturer: **Address:**	Dayton Audio Division of Parts Express 725 Pleasant Valley Rd Springboro, Ohio 45066 USA		
E.U.T:	AMPLIFIERT		
Model Number:	WF60PA		
Trade Name:	aptx	**Serial No.:**	------
Date of Receipt:	Jan. 08, 2017	**Date of Test:**	Jan. 08~Feb. 15, 2017
Test Specification:	FCC Part 15, Subpart 15.247: Oct. 1, 2016 ANSI C63.10:2013 KDB558074 D01 DTS Meas Guidance v03r05		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied. **Issue Date: Feb. 16, 2017**		

Tested by:	Reviewed by:	Approved by:
Keven Wu / Engineer	Mark Li / Supervisor	Andy Gao / Supervisor

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

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 Keyway Testing Technology Co., Ltd.

1.TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.205(a)/15.209/15.247(d)	PASS
6dB&99% Bandwidth	15.247(a)(2)	PASS
Power density	15.247(e)	PASS
Maximum Peak Output Power	15.247(b)	PASS
Duty Cycle	15.207	PASS
Emissions from out of band	15.247(d)	PASS
Antenna Requirement	15.203	PASS

2.GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	AMPLIFIERT
Model No.:	WF60PA
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20)); 2422MHz~2452MHz (802.11n(HT40))
Channel numbers:	11 for 802.11b/802.11g/802.11n(HT20); 9 for 802.11n(HT40)
Modulation technology:	Direct Sequence Spread Spectrum (DSSS) for (IEEE 802.11b) Orthogonal Frequency Division Multiplexing(OFDM) for (IEEE 802.11g/802.11n)
Data speed (IEEE 802.11b):	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Data speed (IEEE 802.11g):	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps
Data speed (IEEE 802.11n):	Up to 150Mbps
Antenna Type:	WIFI: External Antenna*2
Antenna gain:	WIFI:2.0dBi, MIMO the antenna gain is 5.01dBi
Power supply:	AC 120V/60Hz

2.3. Independent Operation Modes

The basic operation modes are:

2.3.1. EUT work WFI TX mode, and frequency as below:

		Frequency
Mode 1	802.11b	2412MHz
		2437MHz
		2462MHz
Mode 2	802.11g	2412MHz
		2437MHz
		2462MHz
Mode 3	802.11n(HT20)	2412MHz
		2437MHz
		2462MHz
Mode 4	802.11n(HT40)	2422MHz
		2437MHz
		2452MHz
Mode 5	LINK Mode	

Remark: 802.11b mode:1Mbps ,802.11g mode:6Mbps , 802.11n HT20 mode:MCS0,802.11n HT40 mode:MCS0.

2.4. Test Supporting System

None.

2.5. TEST SITES

2.5.1. Test Facilities

Lab Qualifications : Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

Certificated by FCC, USA
Registration No.: 370994
Date of registration: February 21, 2012

Certificated by CNAS China
Registration No.: CNAS L5783
Date of registration: August 8, 2012

2.6. List of Test and Measurement Instruments

2.6.1. For conducted emission at the mains terminals test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 09,16	Apr. 09,17
Artificial Mains Network	Rohde&Schwarz	ENV216	101315	Apr. 09,16	Apr. 09,17
RF Cable	FUJIKURA	3D-2W	944 Cable	Apr. 09,16	Apr. 09,17

2.6.2. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 09,16	Apr. 09,17
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 09,16	Apr. 09,17
Spectrum Analyzer	Agilent	E4411B	MY4511304	Apr. 09,16	Apr. 09,17
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 09,16	Apr. 09,17
Signal Amplifier	SONOMA	310	187016	Apr. 09,16	Apr. 09,17
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 09,16	Apr. 09,17
RF Cable	IMRO	IMRO-400	966 Cable 1#	N/A	N/A
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 09,16	Apr. 09,17
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 09,16	Apr. 09,17
High Pass filter	Micro	HPM50111	324216	Apr. 09,16	Apr. 09,17
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 09,16	Apr. 09,17
Attenuation	MCE	24-10-34	BN9258	Apr. 02,16	Apr. 02,17
Loop Antenna	ARA	PLA-1030/B	1029	Apr. 02,16	Apr. 02,17
Power Meter	Anritsu	ML2495A	1204003	Apr. 24,16	Apr. 24,17
Power Sensor	Anritsu	MA2411B	1126150	Apr. 24,16	Apr. 24,17

3. TEST SET-UP AND OPERATION MODES

3.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators

Conducted Emission:

Radiated Emission:

(EUT:AMPLIFIERT)

3.3. Test Operation Mode and Test Software

Final Test Mode	Description
Mode 1-b/g/n20	CH1
Mode 2-b/g/n20	CH7
Mode 3-b/g/n20	CH11
Mode 4	Link Mode
Mode 5-n40	CH3
Mode 6-n40	CH6
Mode 7-n40	CH9
Test Software	MP tool

3.4. Special Accessories and Auxiliary Equipment

Speaker	4Ω (Test LAB Provide, M/N:KWE098)

3.5. Countermeasures to Achieve EMC Compliance

None.

4. EMISSION TEST RESULTS

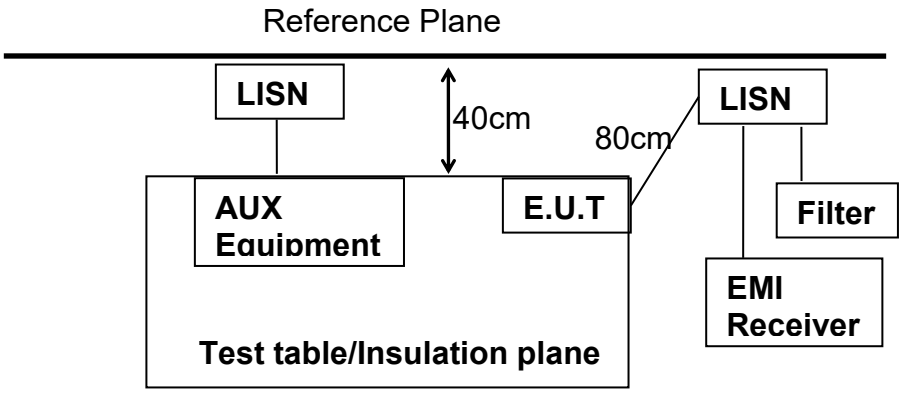
4.1. Conducted Emission at the Mains Terminals Test

4.1.1. Limit 15.209 limits

Frequency	Limit (dBuV)	
MHz	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50
NOTE: 1.The lower limit shall apply at the transition frequencies. 2.The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

4.1.2. Test Setup

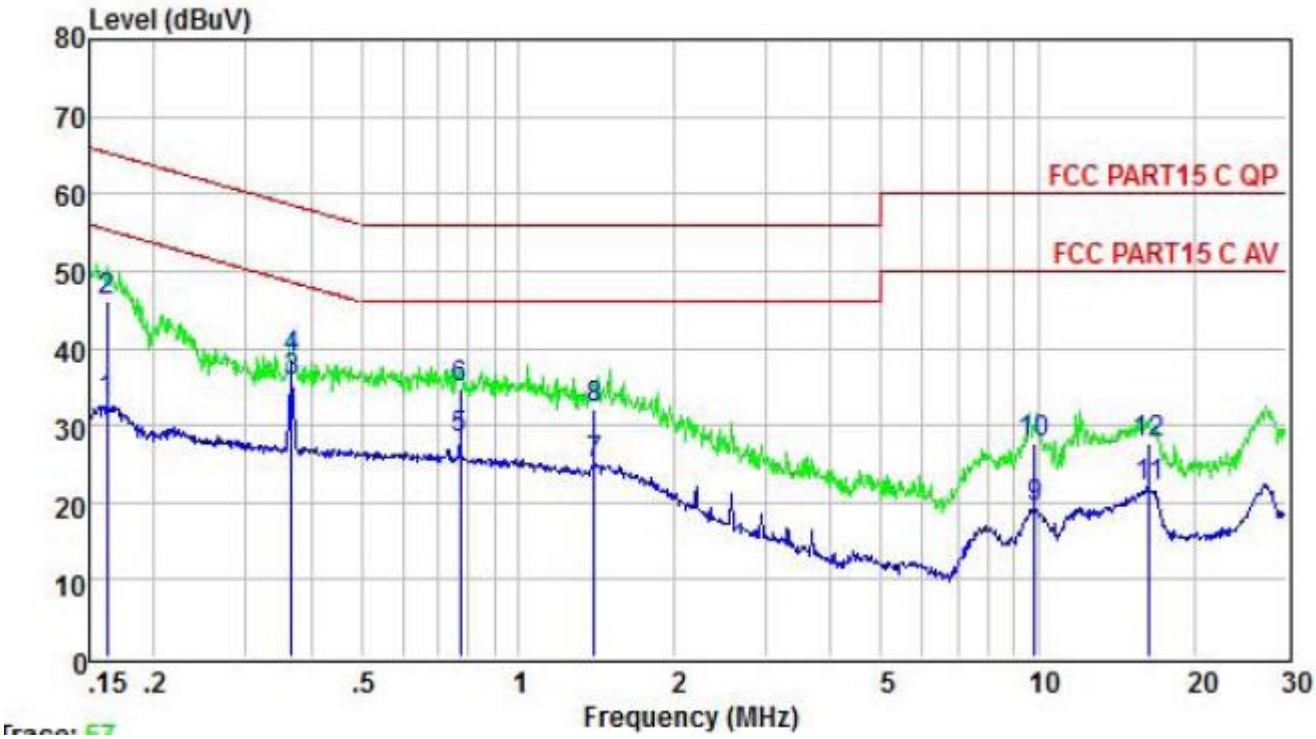
1.The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the center so as to form a bundle no longer than 0.4 m.
2.The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.
3.The frequency range from 150 kHz to 30 MHz was investigated.
4.The bandwidth of the test receiver was set at 9 kHz.
5.Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.



Remark: E.U.T. :Equipment Under Test
LISN: Line Impedance Stabilization Network
Test table height: 0.8m.

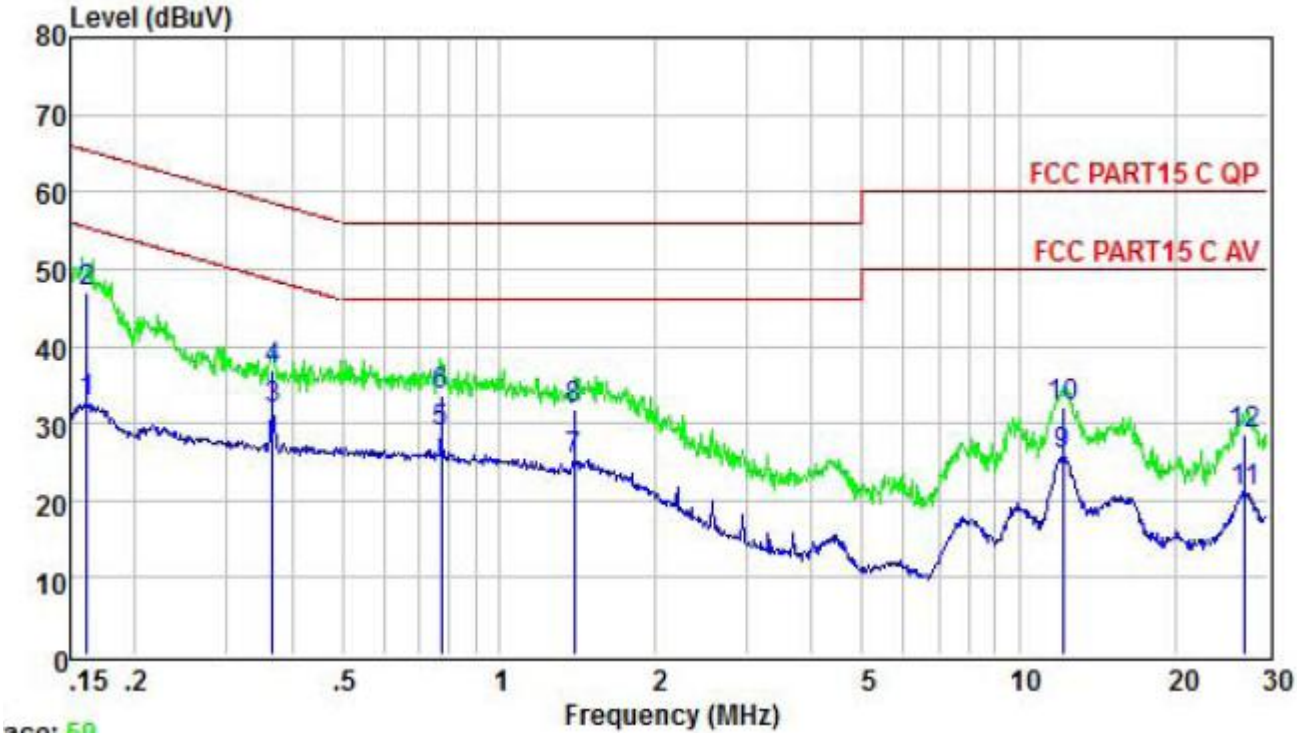
Test block

EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 5



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.162	32.90	55.34	-22.44	Average
2	0.162	45.96	65.34	-19.38	QP
3	0.367	35.70	48.56	-12.86	Average
4	0.367	38.56	58.56	-20.00	QP
5	0.775	28.30	46.00	-17.70	Average
6	0.775	34.69	56.00	-21.31	QP
7	1.403	25.06	46.00	-20.94	Average
8	1.403	32.10	56.00	-23.90	QP
9	9.861	19.33	50.00	-30.67	Average
10	9.861	27.58	60.00	-32.42	QP
11	16.398	22.06	50.00	-27.94	Average
12	16.398	27.59	60.00	-32.41	QP

EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 5



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.162	32.69	55.38	-22.69	Average
2	0.162	46.96	65.38	-18.42	QP
3	0.367	31.72	48.56	-16.84	Average
4	0.367	36.85	58.56	-21.71	QP
5	0.775	28.99	46.00	-17.01	Average
6	0.775	33.70	56.00	-22.30	QP
7	1.396	25.40	46.00	-20.60	Average
8	1.396	31.85	56.00	-24.15	QP
9	12.124	26.00	50.00	-24.00	Average
10	12.124	32.10	60.00	-27.90	QP
11	27.127	21.11	50.00	-28.89	Average
12	27.127	28.63	60.00	-31.37	QP

4.2. Radiated Emission Test

4.2.1. Limit 15.209 limits

Frequency MHZ	Distance Meters	Filed Strengths Limit	
		μV/m	dB(μV)/m
30~88	3	100	40.0
88~216	3	150	43.5
216~960	3	200	46.0
960~1000	3	500	54.0
Above 1000	3	74.0dB(μV)/m(Peak) 54.0dB(μV)/m(Average)	

4.2.2. Restricted bands of operation

MHz	MHz	MHz	GHz
0.009-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209,all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.			

4.2.3. Test setup

The EUT was placed on a turn table which was 0.8 m(above 1GHz, the high was 1.5m) above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz, Both PK and AV measure, PK detector is used.

The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Notes: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.

2. Measurement Uncertainty: ±3.2 dB at a level of confidence of 95%.

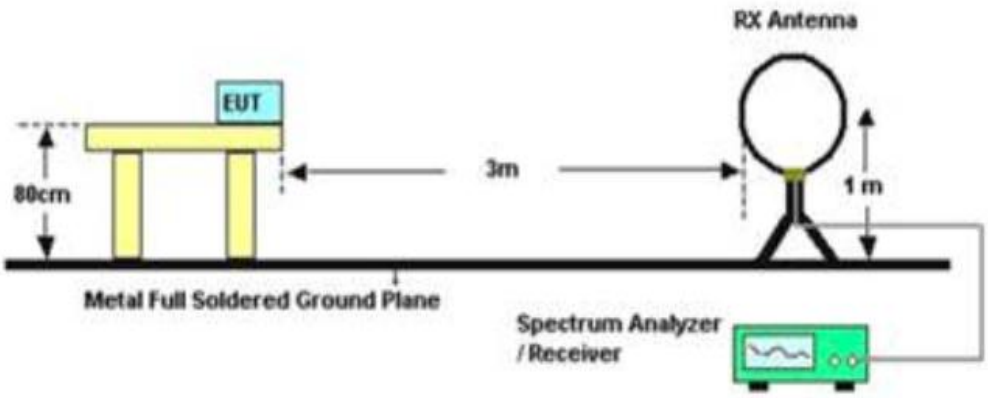
3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

4. For emissions below 1GHz, pretest for all mode, The test data of the worst case condition(s) was reported on the following pages.

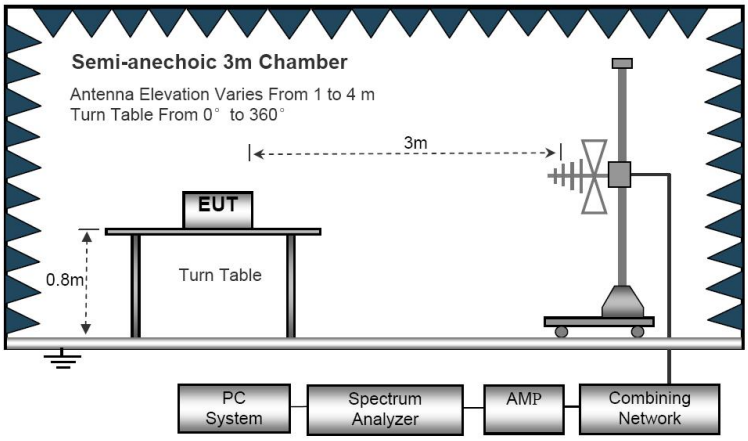
5. For Both PK and AV value above 1GHz, PK detector is used.

6.EUT Pre-scan X/Y/Z orientation, only worst case is presented in the report (Z orientation).

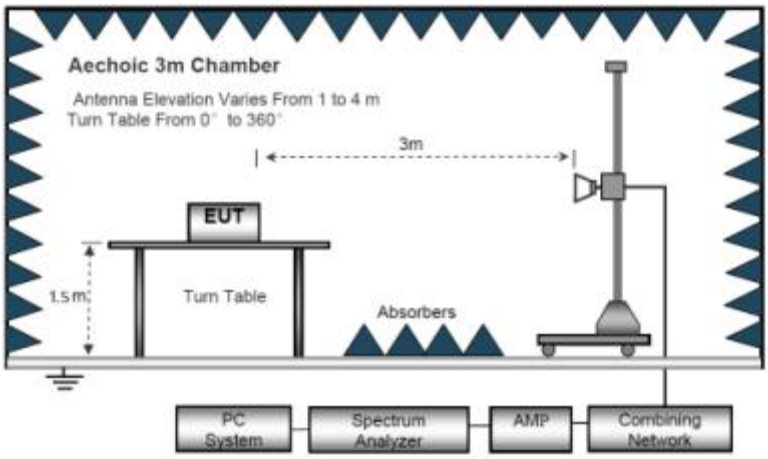
Radiated Emission Test-Up Frequency Below 30MHz



Radiated Emission Test-Up Frequency 30MHz- 1GHz



Above 1GHz



EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	TX
Test Voltage ：	AC 120V/60Hz		

Below 30MHz

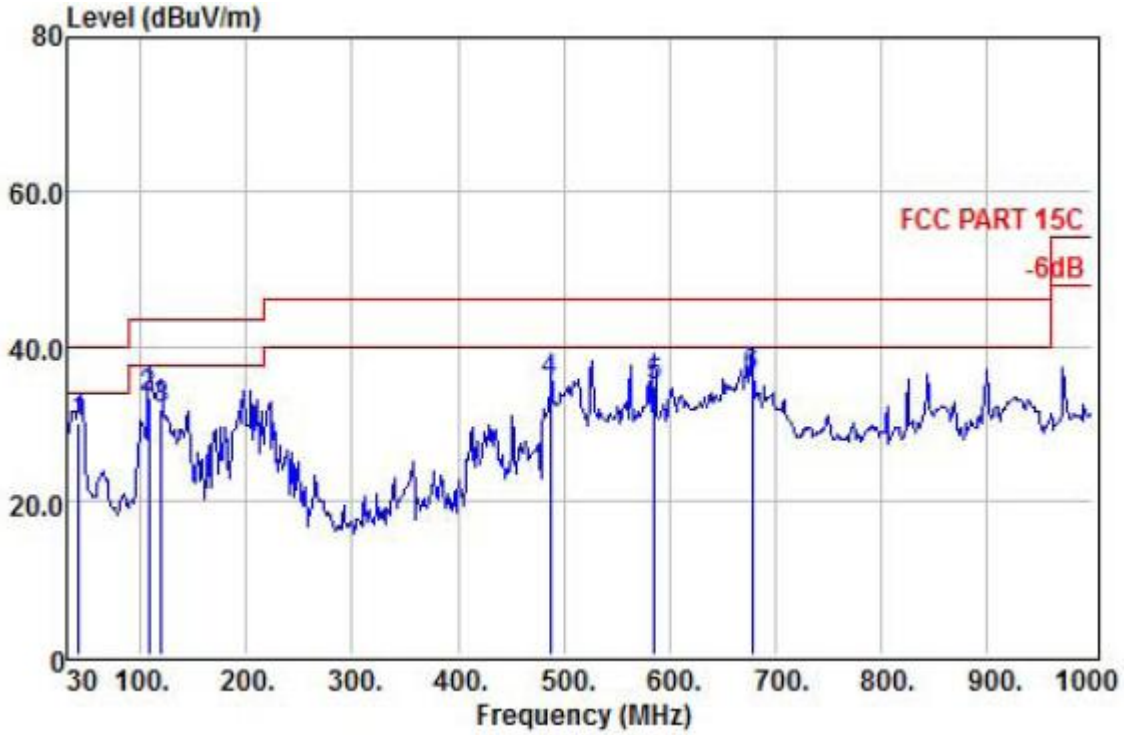
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

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.

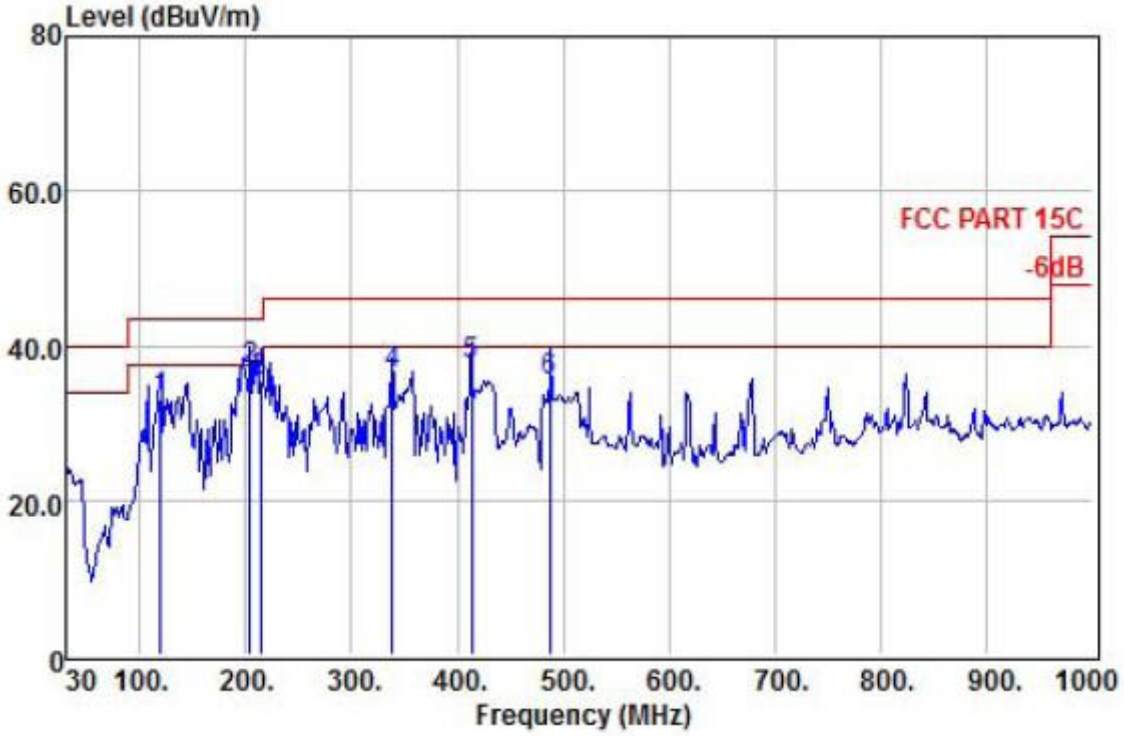
Below 1GHz			
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	Mode 5
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	41.64	31.38	48.64	0.56	12.23	30.05	40.00	-9.95	QP
2	107.60	31.32	54.33	1.03	9.37	33.41	43.50	-10.09	QP
3	119.24	31.24	53.34	1.12	8.56	31.78	43.50	-11.72	QP
4	487.84	30.59	44.68	2.77	18.51	35.37	46.00	-10.63	QP
5	585.81	30.72	42.28	3.20	20.15	34.91	46.00	-11.09	QP
6	677.96	30.75	40.82	3.80	21.99	35.86	46.00	-10.14	QP

Horizontal



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	119.24	31.24	54.50	1.12	8.56	32.94	43.50	-10.56	QP
2	204.60	31.09	55.30	1.46	11.22	36.89	43.50	-6.61	QP
3	214.30	31.04	53.34	1.53	11.69	35.52	43.50	-7.98	QP
4	338.46	30.72	49.89	2.10	15.04	36.31	46.00	-9.69	QP
5	413.15	30.63	48.95	2.48	16.72	37.52	46.00	-8.48	QP
6	487.84	30.59	44.73	2.77	18.51	35.42	46.00	-10.58	QP

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;
3.Mode 5 is the worst mode. Only worst case is presented in the report .

Above 1GHz			
EUT :	AMPLIFIERT	Model Name :	WF60PA
Temperature :	20 ℃	Relative Humidity :	48%
Pressure :	1010hPa	Test Voltage :	AC 120V/60Hz

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)	Remark
TX-Low channel									
V	4824	30.71	31.99	12.01	27.50	47.21	54	-6.79	Average
V	4824	43.29	31.99	12.01	27.50	59.79	74	-14.21	Peak
V	7236	38.56	25.31	16.61	27.95	52.53	74	-21.47	Peak
V	16884	37.87	22.33	20.84	30.91	50.13	74	-23.87	Peak
H	4824	31.34	31.99	12.01	27.50	47.84	54	-6.16	Average
H	4824	44.19	31.99	12.01	27.50	60.69	74	-13.31	Peak
H	7236	38.29	25.31	16.61	27.95	52.26	74	-21.74	Peak
H	16884	37.65	22.33	20.84	30.91	49.91	74	-24.09	Peak
TX-Mid channel									
V	4874	30.26	32.11	12.14	27.53	46.98	54	-7.02	Average
V	4874	43.29	32.11	12.14	27.53	60.01	74	-13.99	Peak
V	7311	36.43	24.32	16.62	27.96	49.41	74	-24.59	Peak
V	17059	38.93	21.78	20.95	31.12	50.54	74	-23.46	Peak
H	4874	31.76	32.11	12.14	27.53	48.48	54	-5.52	Average
H	4874	42.26	32.11	12.14	27.53	58.98	74	-15.02	Peak
H	7311	37.17	24.32	16.62	27.96	50.15	74	-23.85	Peak
H	17059	37.65	21.78	20.95	31.12	49.26	74	-24.74	Peak
TX-High channel									
V	4924	30.08	32.23	12.28	27.56	47.03	54	-6.97	Average
V	4924	43.48	32.23	12.28	27.56	60.43	74	-13.57	Peak
V	7386	36.54	24.36	16.62	27.98	49.54	74	-24.46	Peak
V	17234	36.12	21.62	21.17	31.35	47.56	74	-26.44	Peak
H	4924	29.73	32.23	12.28	27.56	46.68	54	-7.32	Average
H	4924	42.32	32.23	12.28	27.56	59.27	74	-14.73	Peak
H	7386	36.35	24.36	16.62	27.98	49.35	74	-24.65	Peak
H	17234	36.09	21.62	21.17	31.35	47.53	74	-26.47	Peak

Note: 1.”802.11b” mode is the worst mode.
2.When PK value is lower than the Average value limit, average didn't record.
3.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has not to be reported.

Spurious Emission in Restricted Band (1-25G) :

All the modulation modes have been tested and all other emissions more than 20dB below the limit, the worst result was report as below:

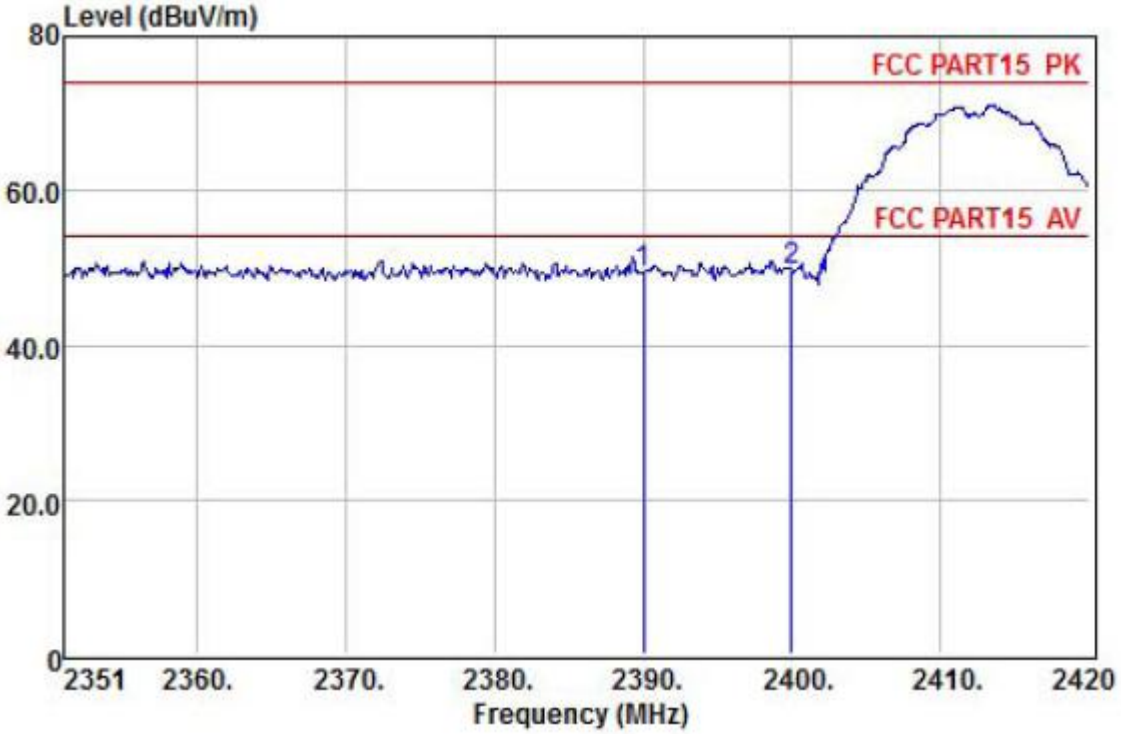
Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable loss (dB)	Preamp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
802.11b									
V	3264	32.59	30.26	9.96	26.63	46.18	74	-27.82	Pk
H	3264	33.31	30.26	9.96	26.63	46.9	74	-27.1	PK
V	3336	33.67	30.33	9.96	26.66	47.3	74	-26.7	Pk
H	3336	31.18	30.33	9.96	26.66	44.81	74	-29.19	PK
V	4100	33.54	31.64	10.61	27.06	48.73	74	-25.27	Pk
H	4100	32.35	31.64	10.61	27.06	47.54	74	-26.46	PK
V	11764	32.29	26.64	17.32	28.98	47.27	74	-26.73	Pk
H	11764	33.76	26.64	17.32	28.98	48.74	74	-25.26	PK
V	17732	31.34	26.27	22.01	30.39	49.23	74	-24.77	Pk
H	17732	32.25	26.27	22.01	30.39	50.14	74	-23.86	PK
802.11g									
V	3264	32.49	30.26	9.96	26.63	46.08	74	-27.92	Pk
H	3264	32.27	30.26	9.96	26.63	45.86	74	-28.14	PK
V	3336	31.53	30.33	9.96	26.66	45.16	74	-28.84	Pk
H	3336	31.48	30.33	9.96	26.66	45.11	74	-28.89	PK
V	4100	34.49	31.64	10.61	27.06	49.68	74	-24.32	Pk
H	4100	32.63	31.64	10.61	27.06	47.82	74	-26.18	PK
V	11764	31.32	26.64	17.32	28.98	46.3	74	-27.7	Pk
H	11764	32.16	26.64	17.32	28.98	47.14	74	-26.86	PK
V	17732	32.48	26.27	22.01	30.39	50.37	74	-23.63	Pk
H	17732	32.75	26.27	22.01	30.39	50.64	74	-23.36	PK
802.11n(20)									
V	3264	30.16	30.26	9.96	26.63	43.75	74	-30.25	Pk
H	3264	30.57	30.26	9.96	26.63	44.16	74	-29.84	PK
V	3336	31.63	30.33	9.96	26.66	45.26	74	-28.74	Pk
H	3336	32.49	30.33	9.96	26.66	46.12	74	-27.88	PK
V	4100	33.39	31.64	10.61	27.06	48.58	74	-25.42	Pk
H	4100	32.36	31.64	10.61	27.06	47.55	74	-26.45	PK
V	11764	32.37	26.64	17.32	28.98	47.35	74	-26.65	Pk
H	11764	32.42	26.64	17.32	28.98	47.4	74	-26.6	PK
V	17732	31.55	26.27	22.01	30.39	49.44	74	-24.56	Pk
H	17732	32.68	26.27	22.01	30.39	50.57	74	-23.43	PK
802.11n(40)									
V	3264	30.15	30.26	9.96	26.63	43.74	74	-30.26	Pk
H	3264	30.43	30.26	9.96	26.63	44.02	74	-29.98	PK
V	3336	31.32	30.33	9.96	26.66	44.95	74	-29.05	Pk
H	3336	31.58	30.33	9.96	26.66	45.21	74	-28.79	PK
V	4100	32.27	31.64	10.61	27.06	47.46	74	-26.54	Pk
H	4100	30.84	31.64	10.61	27.06	46.03	74	-27.97	PK
V	11764	31.36	26.64	17.32	28.98	46.34	74	-27.66	Pk
H	11764	31.69	26.64	17.32	28.98	46.67	74	-27.33	PK
V	17732	29.12	26.27	22.01	30.39	47.01	74	-26.99	Pk
H	17732	29.85	26.27	22.01	30.39	47.74	74	-26.26	PK

If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

Spurious Emission in Band Edge:

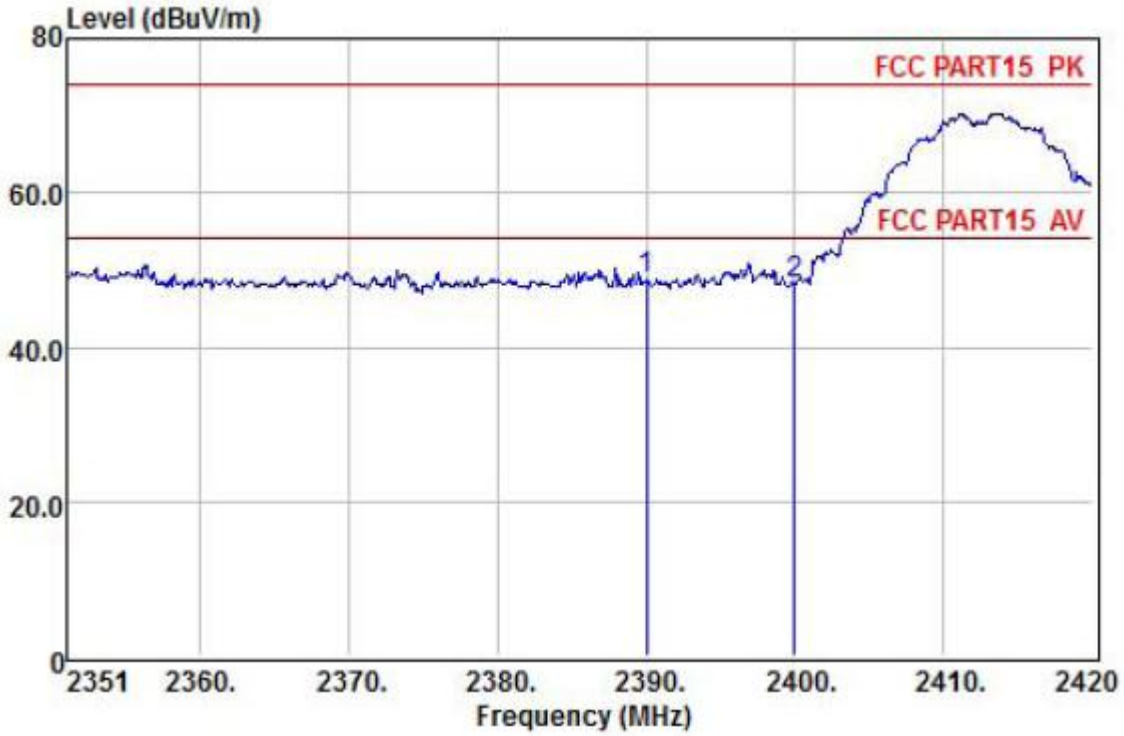
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11b-2412
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	39.10	7.79	28.72	49.29	74.00	-24.71	Peak
2	2400.00	26.32	39.47	7.79	28.72	49.66	74.00	-24.34	Peak

Horizontal

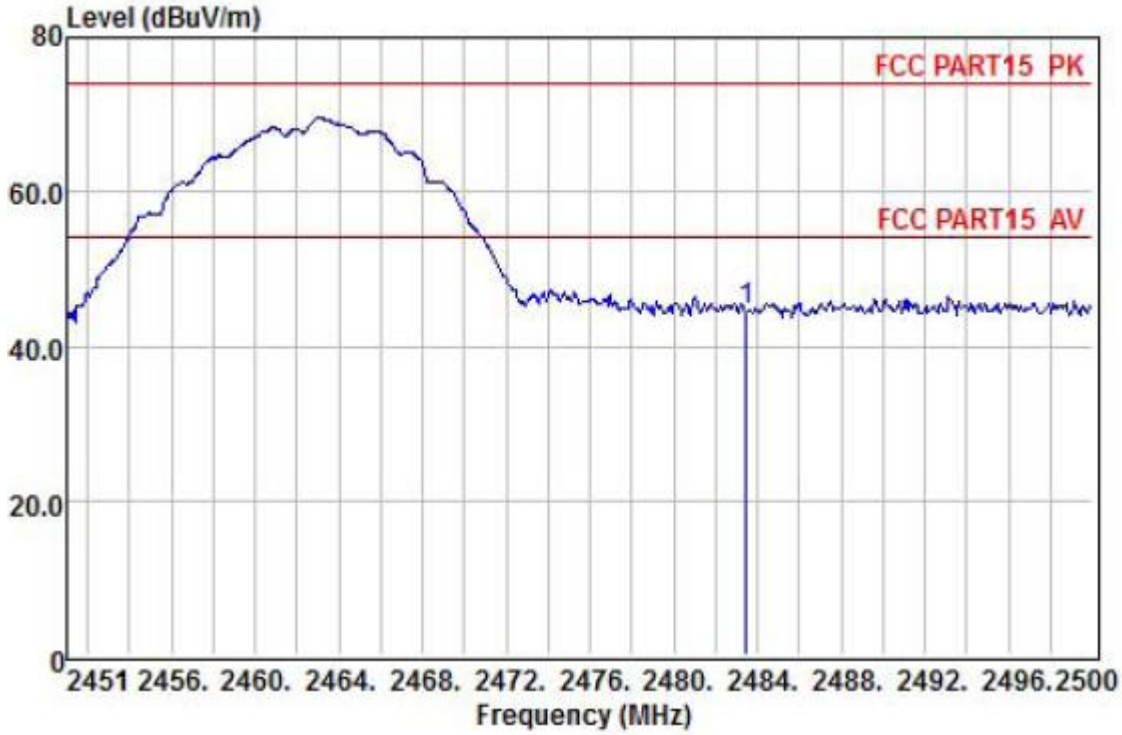


	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	39.21	7.23	28.72	48.84	74.00	-25.16	Peak
2	2400.00	26.32	38.52	7.25	28.72	48.17	74.00	-25.83	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

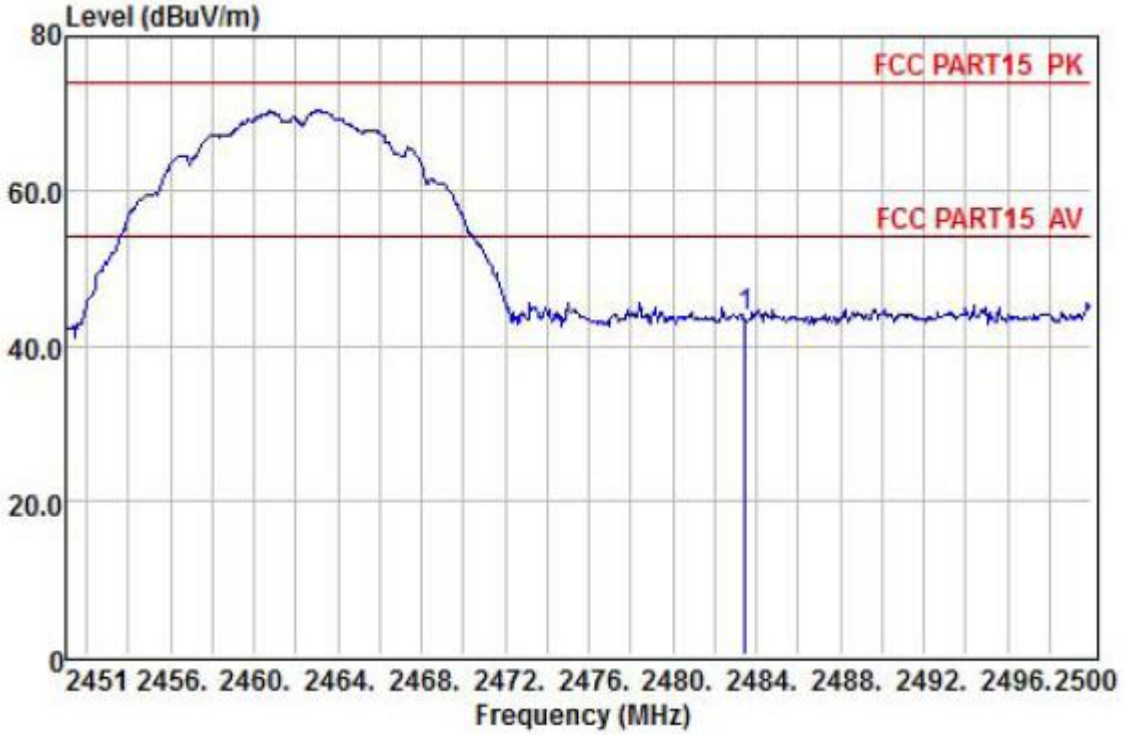
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11b-2462
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	34.63	7.44	28.79	44.52	74.00	-29.48	Peak

Horizontal

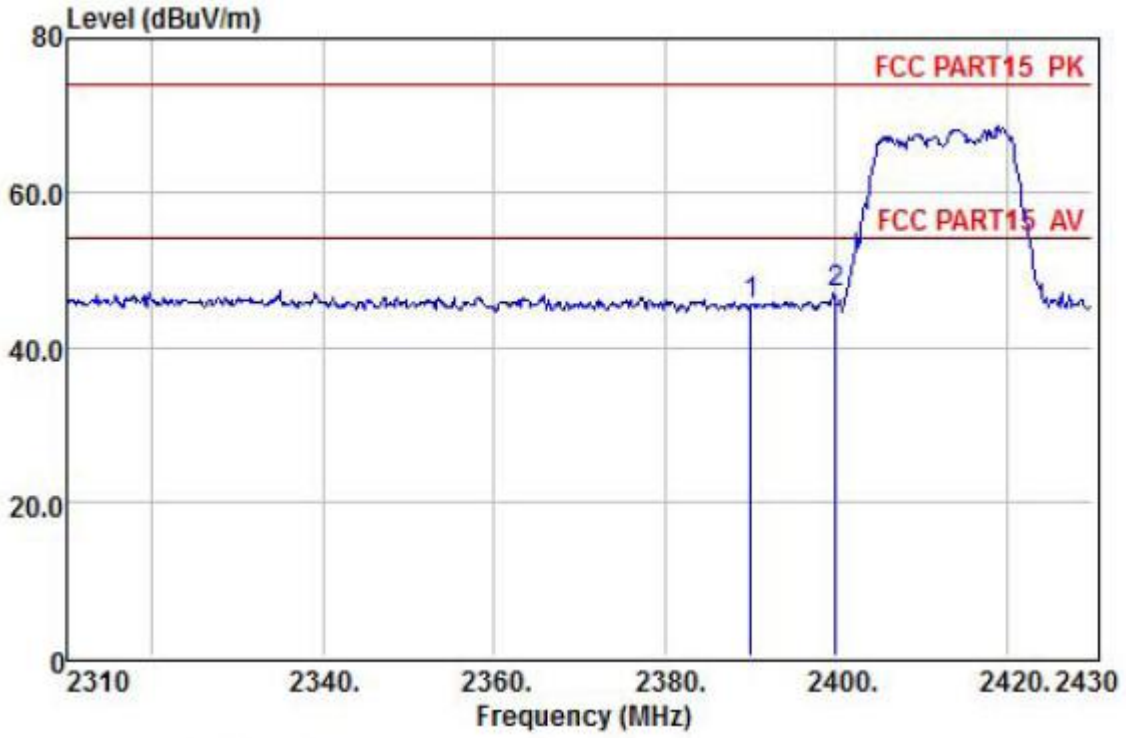


	Freq	Preamp Factor	Read Level	CableLoss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	33.85	7.44	28.79	43.74	74.00	-30.26	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

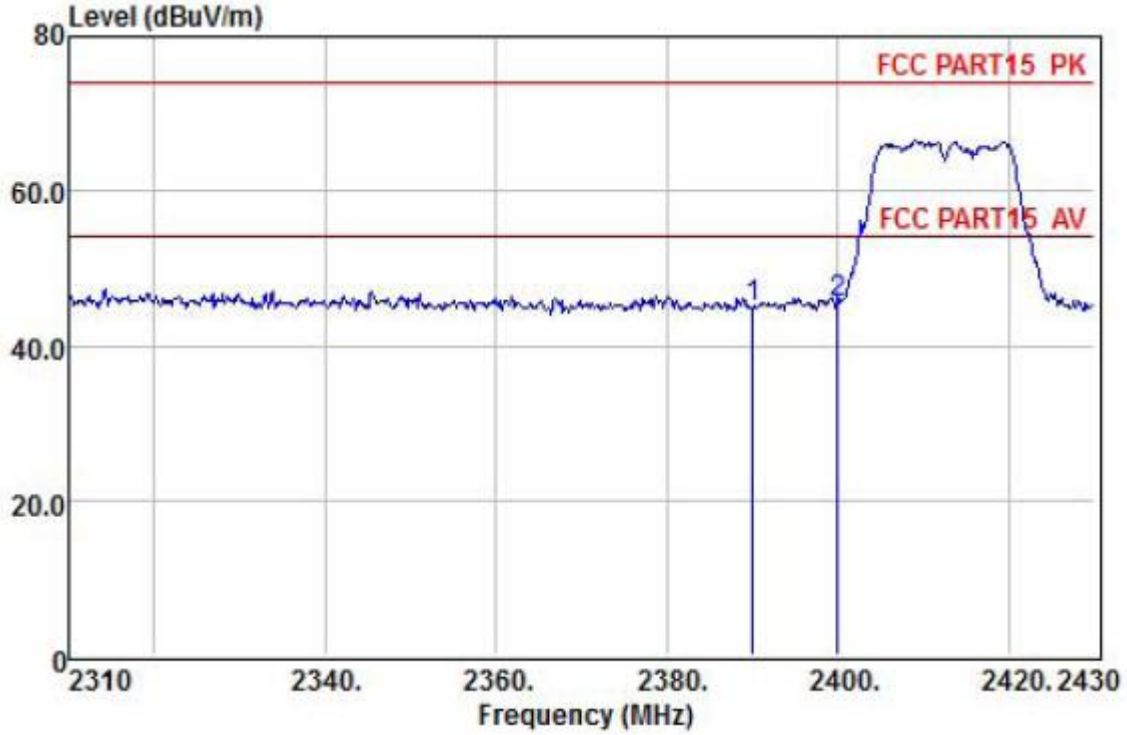
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11g-2412
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	36.02	7.23	28.72	45.65	74.00	-28.35	Peak
2	2400.00	26.32	37.41	7.25	28.72	47.06	74.00	-26.94	Peak

Horizontal

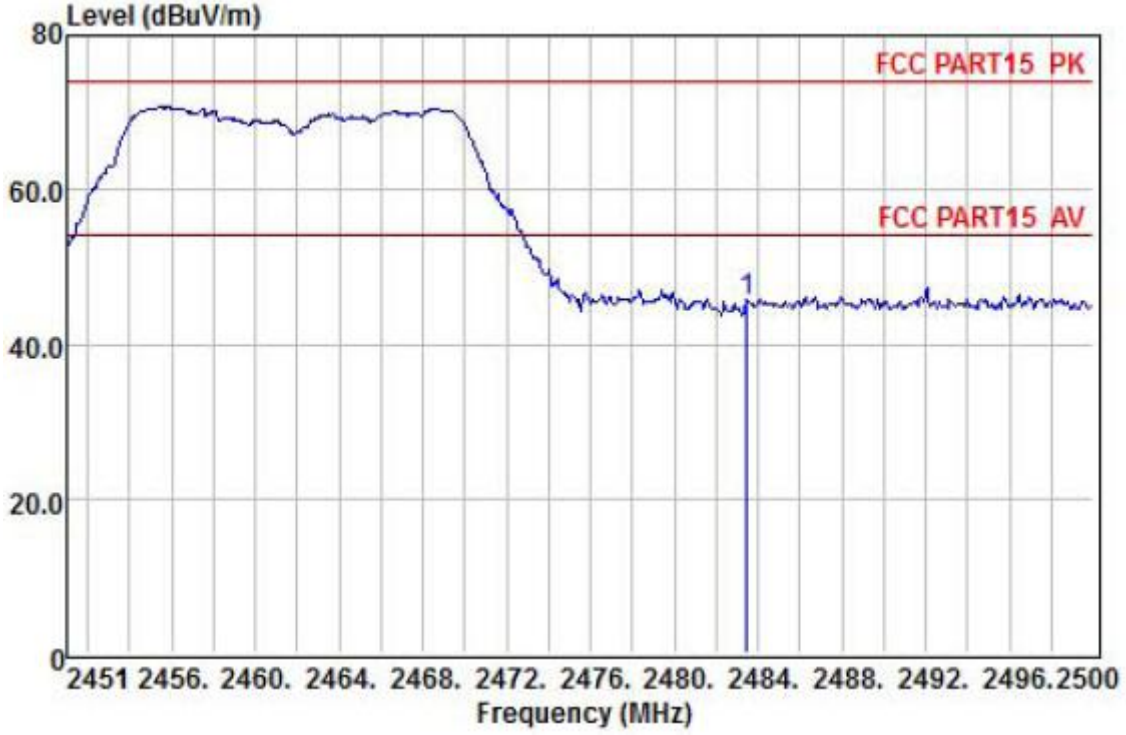


	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	35.21	7.23	28.72	44.84	74.00	-29.16	Peak
2	2400.00	26.32	35.88	7.25	28.72	45.53	74.00	-28.47	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

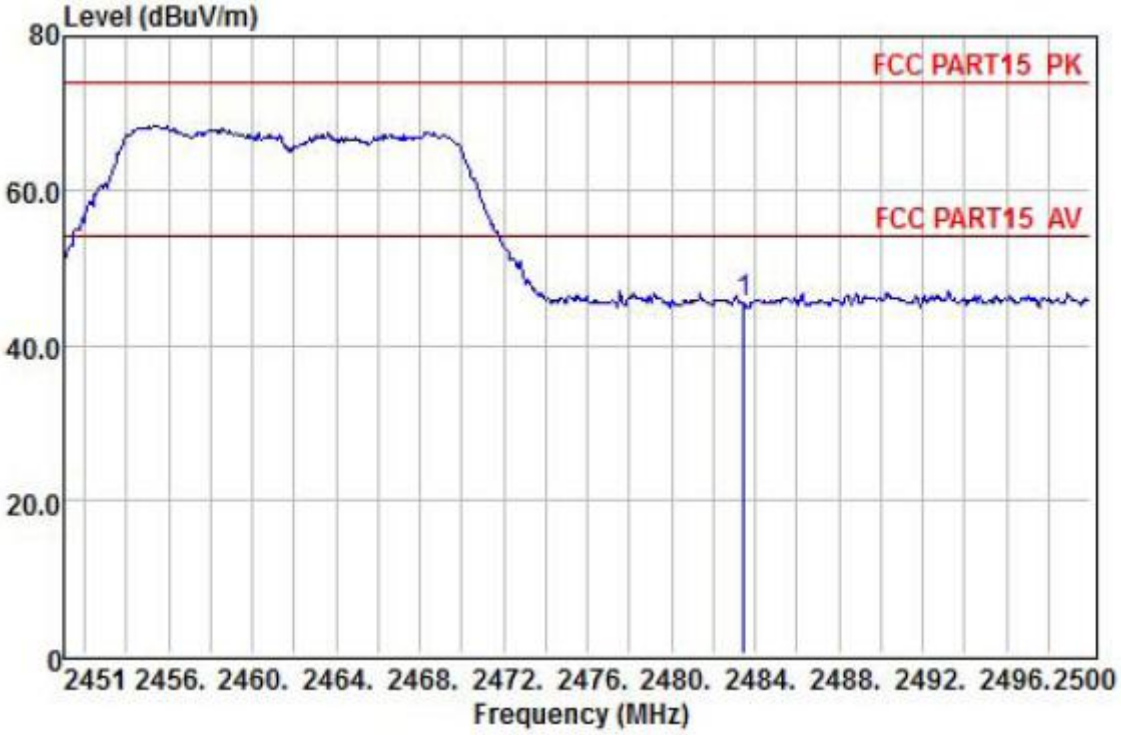
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11g-2462
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	35.67	7.44	28.79	45.56	74.00	-28.44	Peak

Horizontal

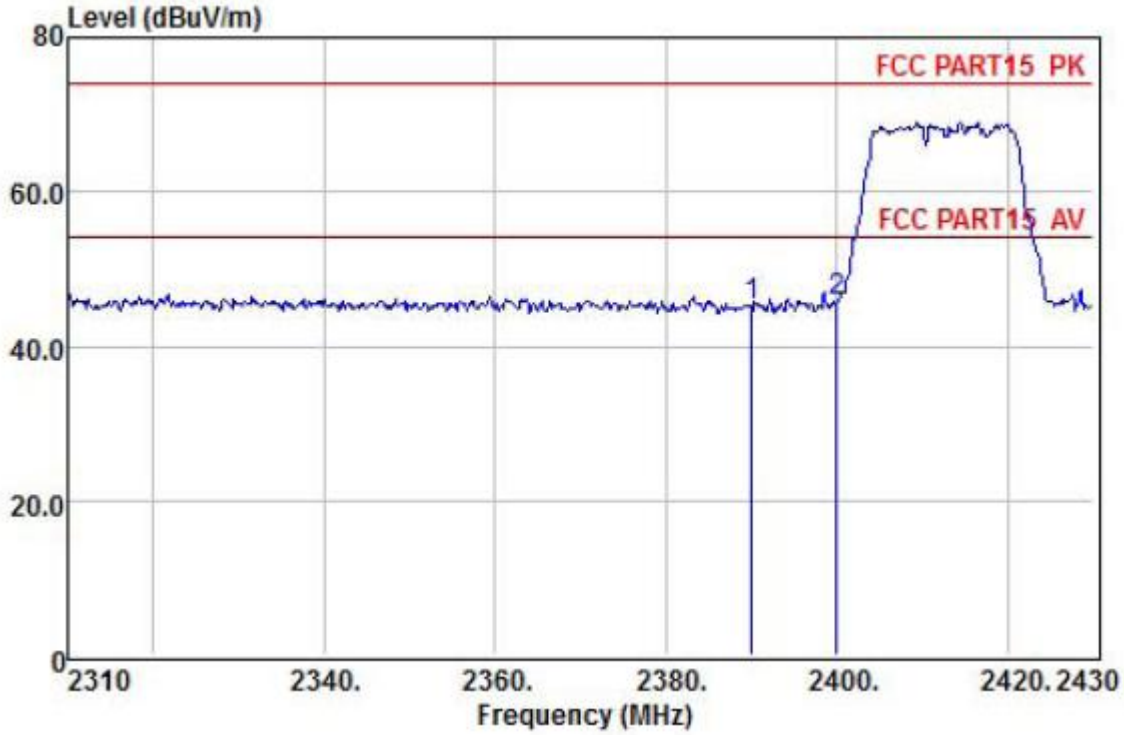


	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	35.69	7.44	28.79	45.58	74.00	-28.42	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

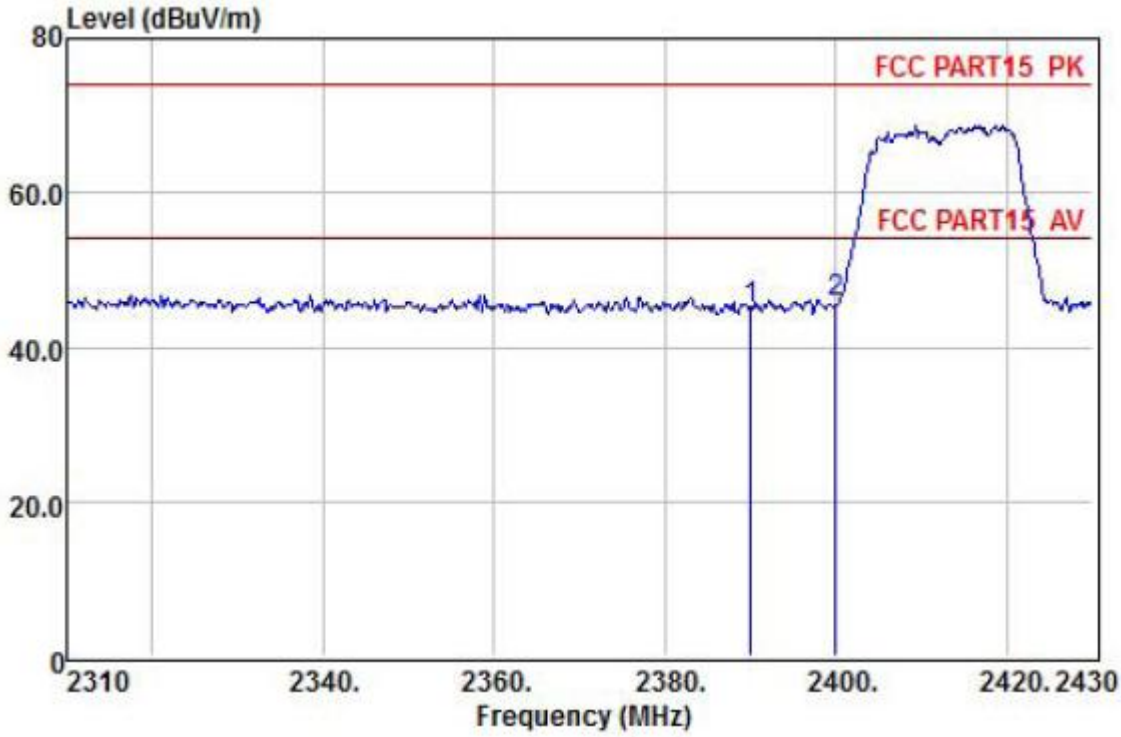
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11n20-2412
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	35.47	7.23	28.72	45.10	74.00	-28.90	Peak
2	2400.00	26.32	36.09	7.25	28.72	45.74	74.00	-28.26	Peak

Horizontal

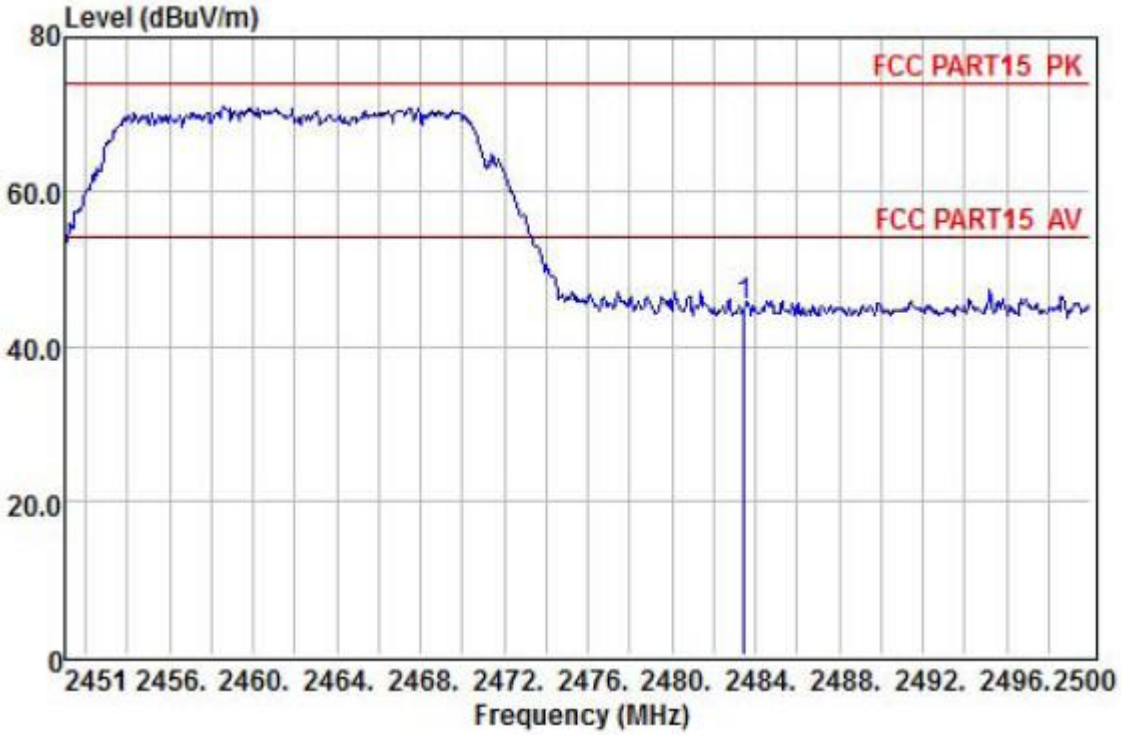


	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	35.32	7.23	28.72	44.95	74.00	-29.05	Peak
2	2400.00	26.32	36.11	7.25	28.72	45.76	74.00	-28.24	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

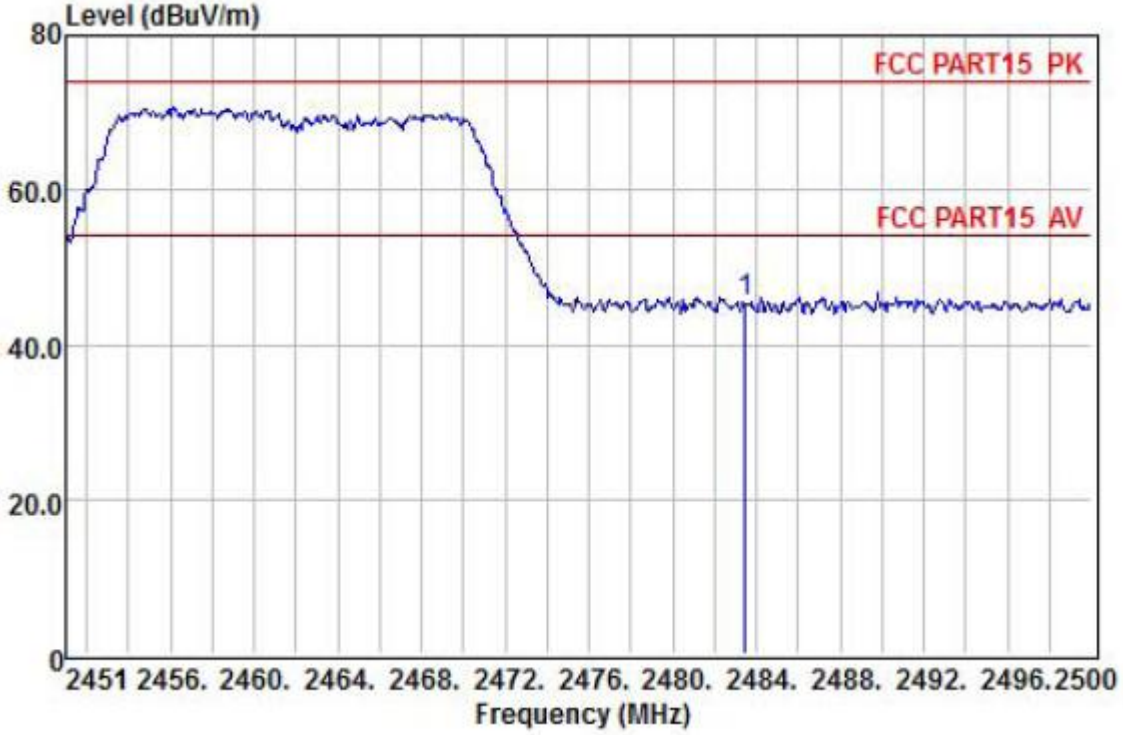
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11n20-2462
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	35.37	7.44	28.79	45.26	74.00	-28.74	Peak

Horizontal

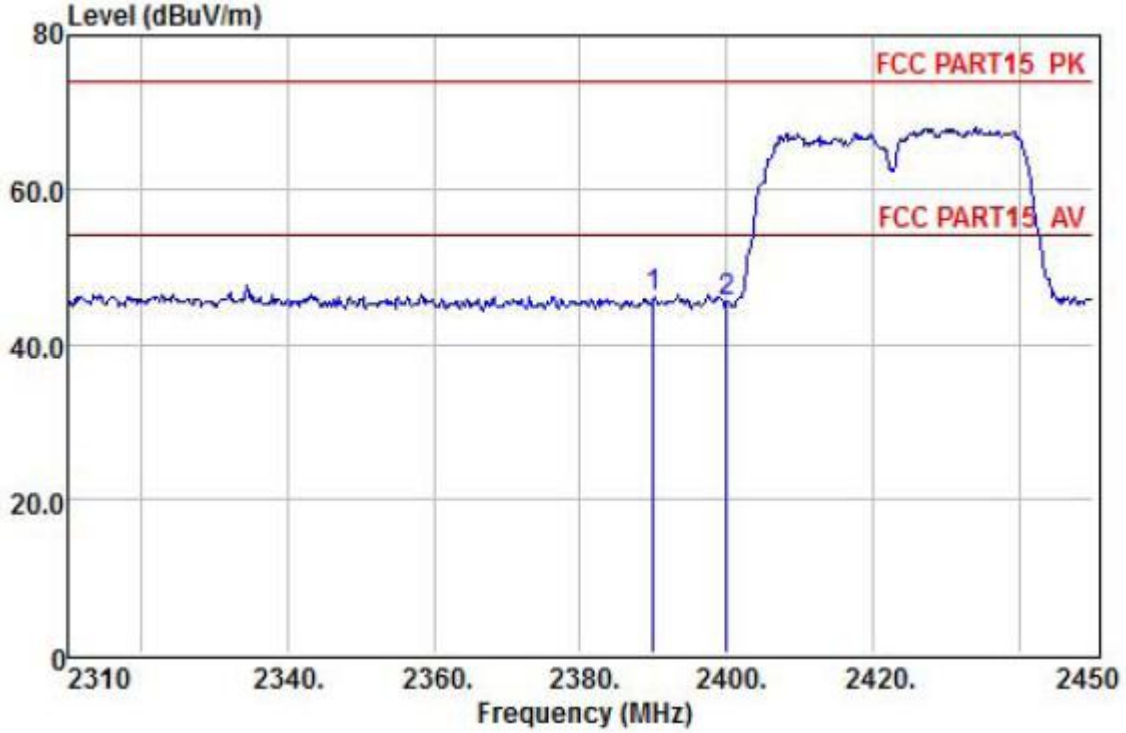


	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	35.57	7.44	28.79	45.46	74.00	-28.54	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

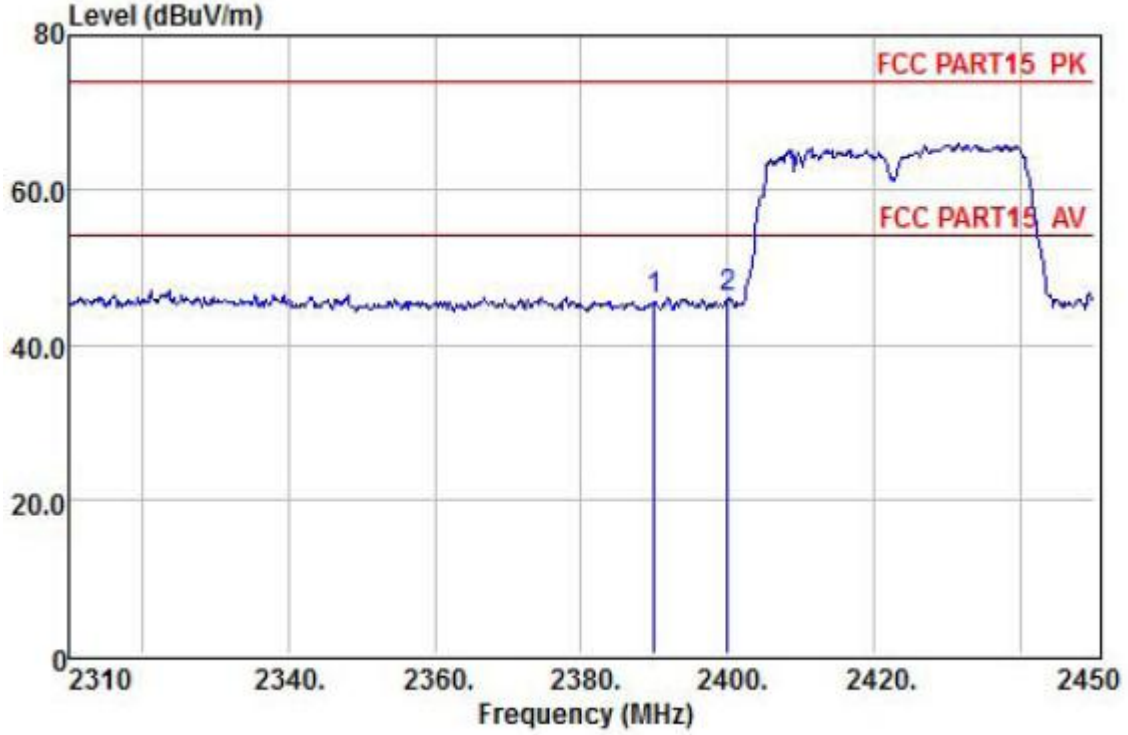
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11n40-2422
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	36.34	7.23	28.72	45.97	74.00	-28.03	Peak
2	2400.00	26.32	35.73	7.25	28.72	45.38	74.00	-28.62	Peak

Horizontal

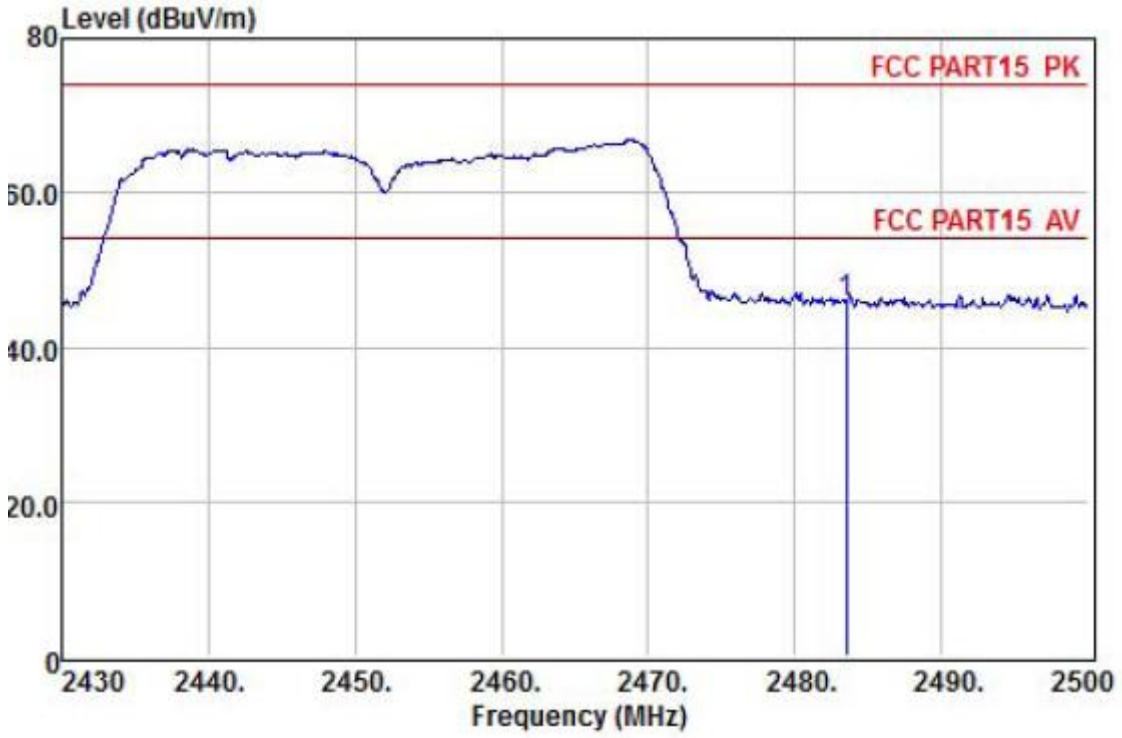


	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2390.00	26.32	36.22	7.23	28.72	45.85	74.00	-28.15	Peak
2	2400.00	26.32	36.41	7.25	28.72	46.06	74.00	-27.94	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

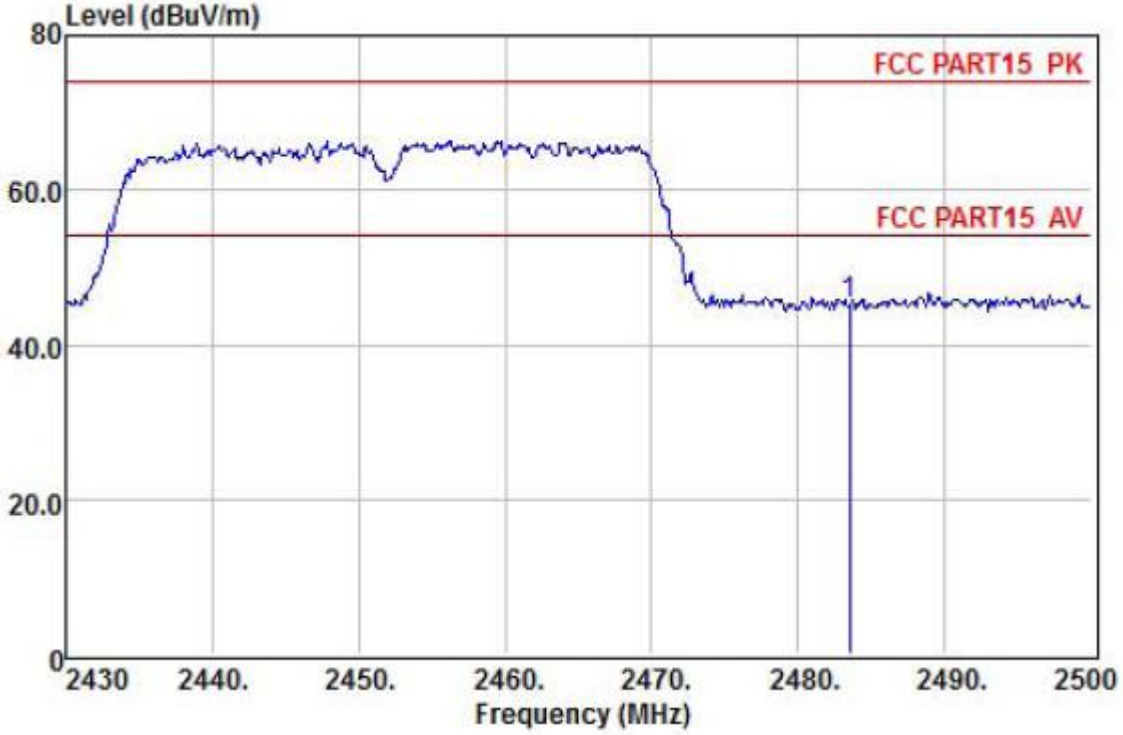
EUT：	AMPLIFIERT	Model Name ：	WF60PA
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11n40-2452
Test Voltage ：	AC 120V/60Hz		

Vertical



	Freq	Preamp Factor	Read Level	CableLoss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	35.79	7.44	28.79	45.68	74.00	-28.32	Peak

Horizontal



	Freq	Preamp Factor	Read Level	CableLoss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	2483.50	26.34	35.37	7.44	28.79	45.26	74.00	-28.74	Peak

Note: 1.Absolute Level= Reading Level+antenna Factor+cable loss - Preamp factor,
2.Over Limit= Absolute Level – Limit;

5. BAND EDGE COMPLIANCE TEST

5.1. Limits

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

5.2. Test setup

5.3. TEST Procedure

a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.

d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

e) Repeat above procedures until all measured frequencies were complete.

Conduction band-edge

Antenna 1

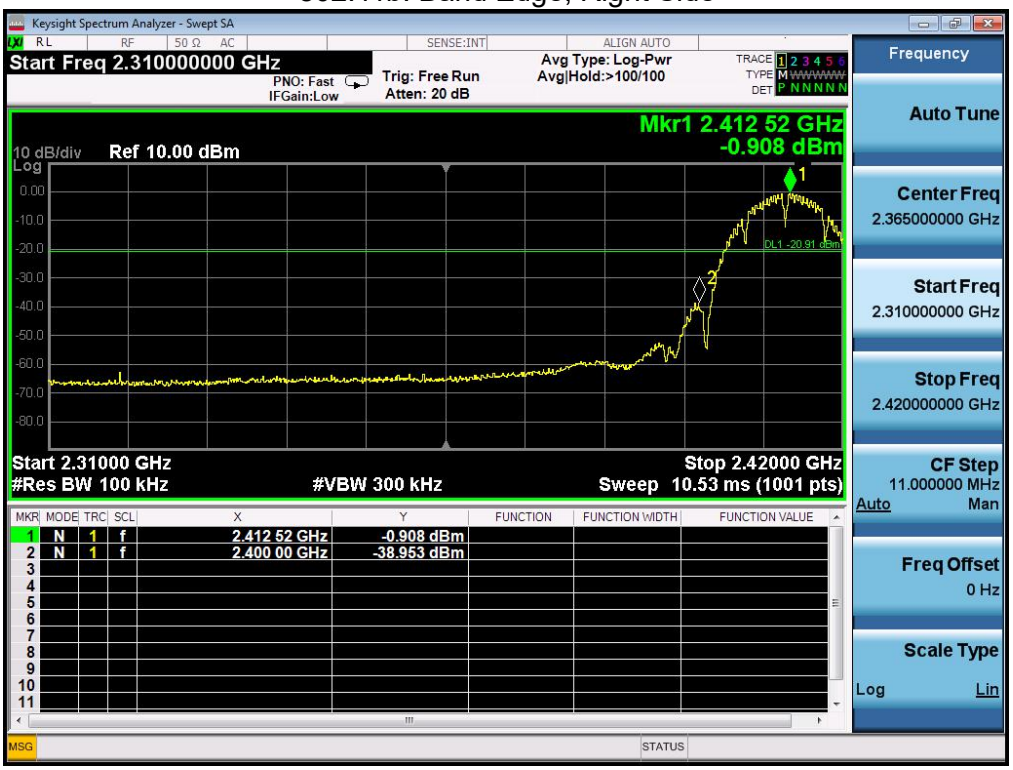
Frequency Band MHz	Delta Peak to band emission (dBc)	> Limit (dBc)	Result
802.11b mode			
2400	38.05	20	Pass
2483.5	59.71	20	Pass
802.11g mode			
2400	32.46	20	Pass
2483.5	43.46	20	Pass
802.11n-HT20 mode			
2400	32.37	20	Pass
2483.5	28.79	20	Pass
802.11n-HT40 mode			
2400	29.96	20	Pass
2483.5	35.54	20	Pass

Antenna 2

Frequency Band MHz	Delta Peak to band emission (dBc)	> Limit (dBc)	Result
802.11b mode			
2400	36.47	20	Pass
2483.5	54.08	20	Pass
802.11g mode			
2400	32.31	20	Pass
2483.5	44.88	20	Pass
802.11n-HT20 mode			
2400	32.66	20	Pass
2483.5	41.89	20	Pass
802.11n-HT40 mode			
2400	29.35	20	Pass
2483.5	38.13	20	Pass

Antenna 1

802.11b: Band Edge, Right Side



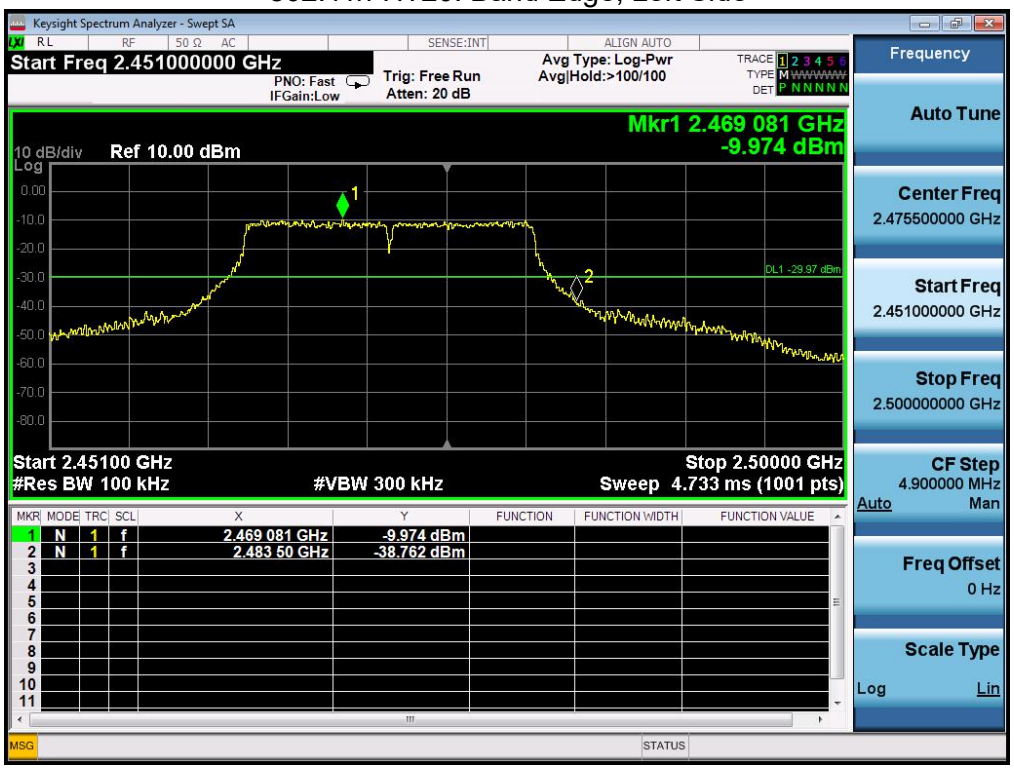
802.11b: Band Edge, Left Side

802.11g: Band Edge, Right Side

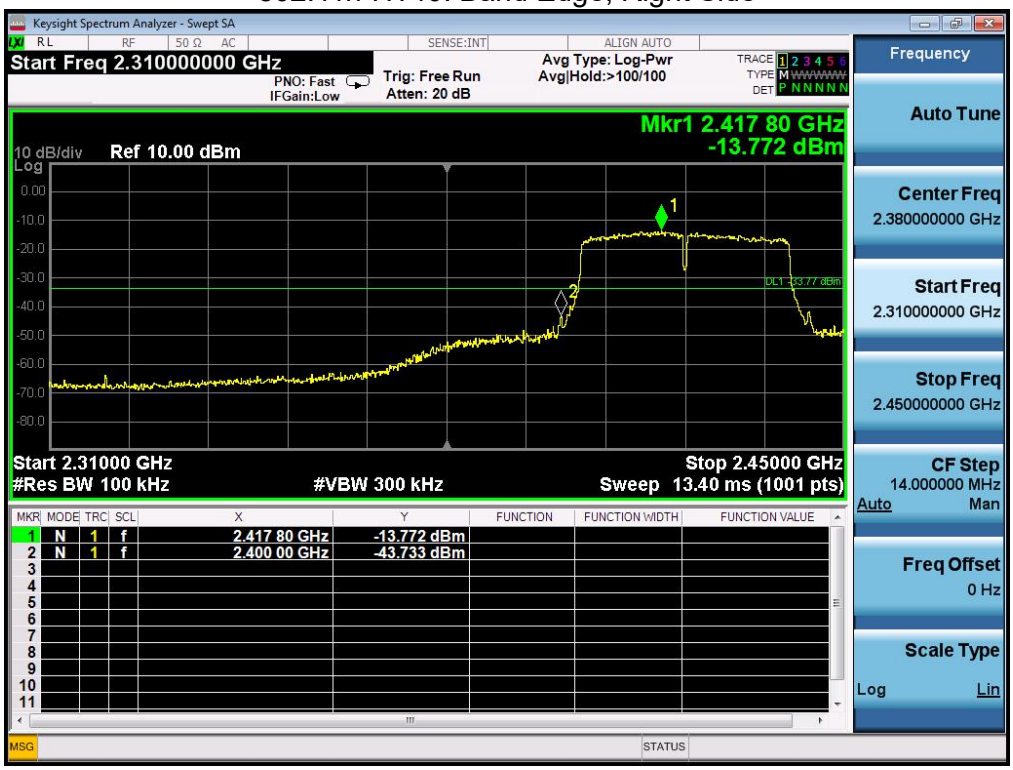
802.11g: Band Edge, Left Side

802.11n-HT20: Band Edge, Right Side

802.11n-HT20: Band Edge, Left Side



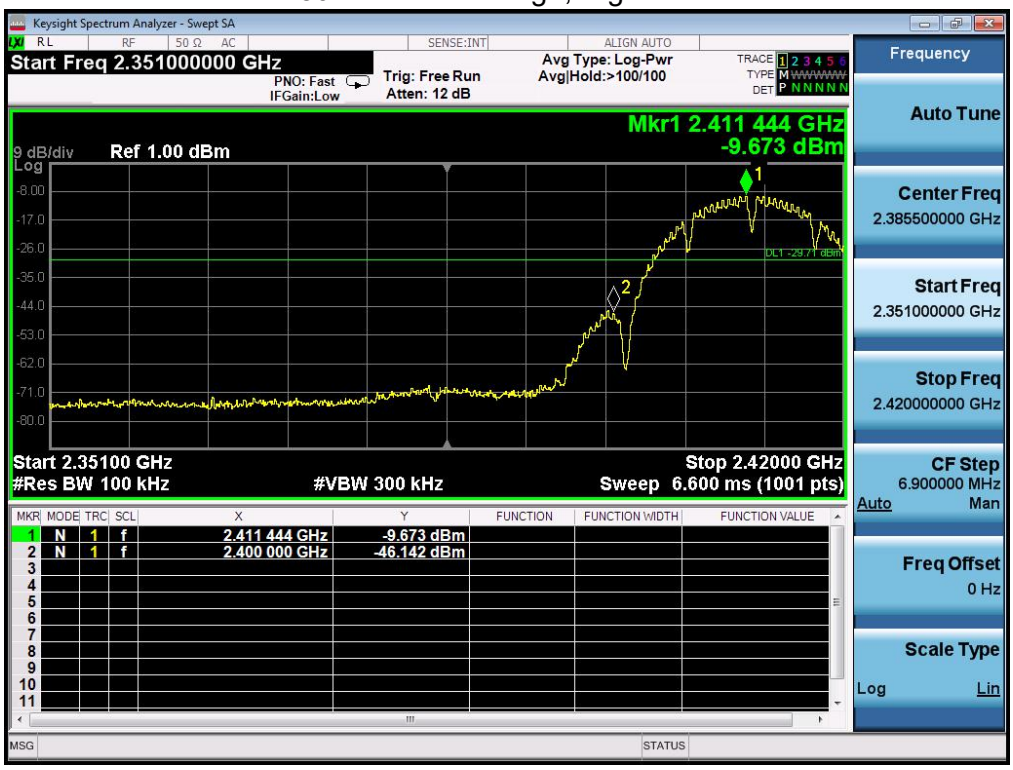
802.11n-HT40: Band Edge, Right Side



802.11n-HT40: Band Edge, Left Side

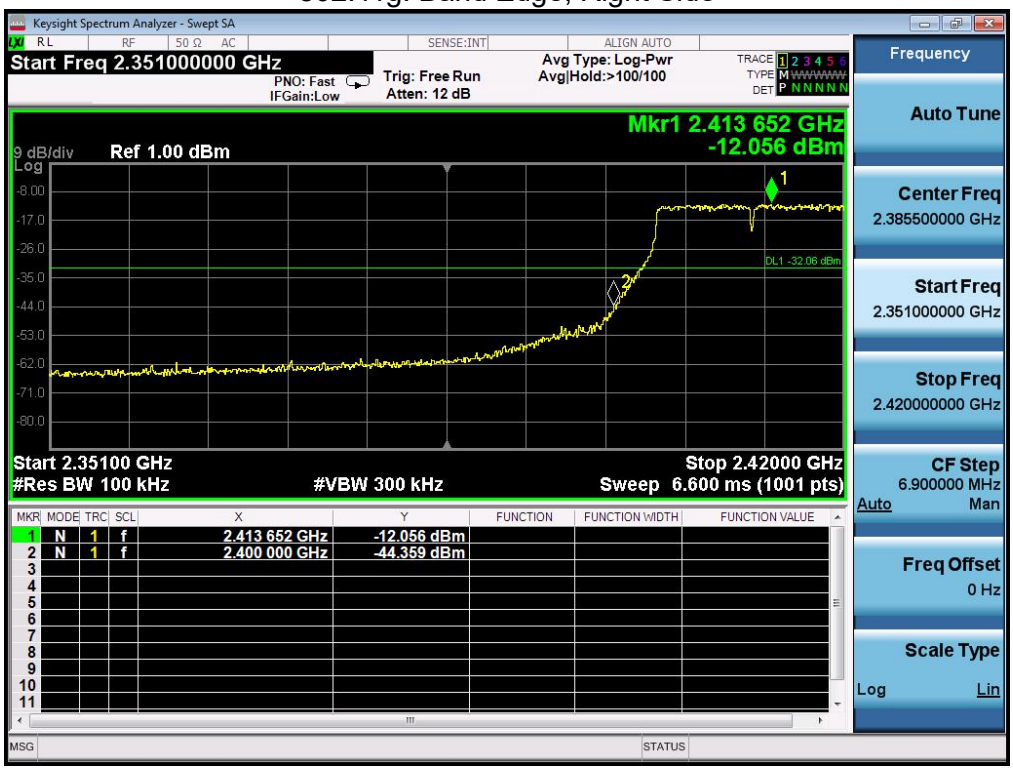
Antenna 2

802.11b: Band Edge, Right Side

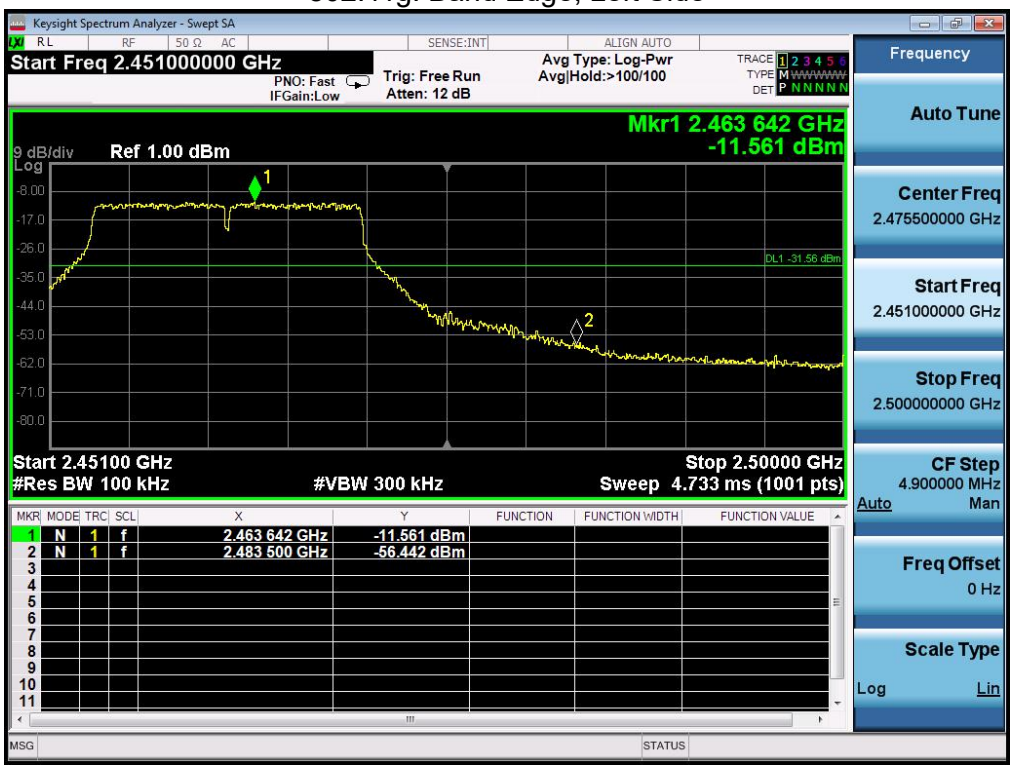


802.11b: Band Edge, Left Side

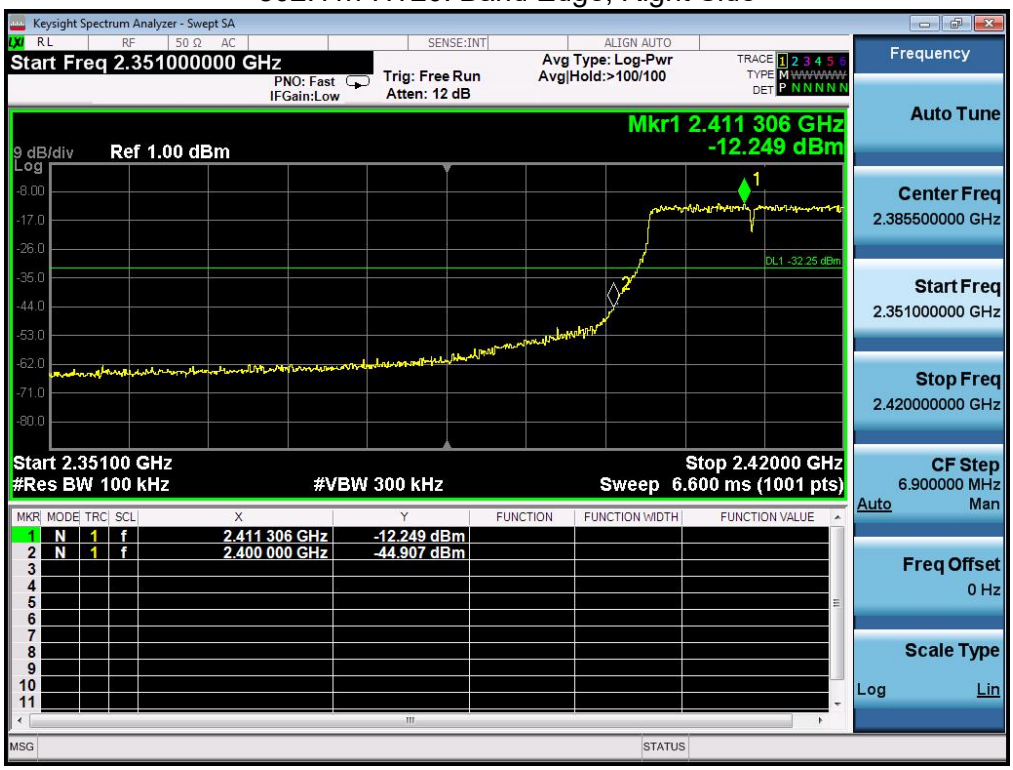
802.11g: Band Edge, Right Side



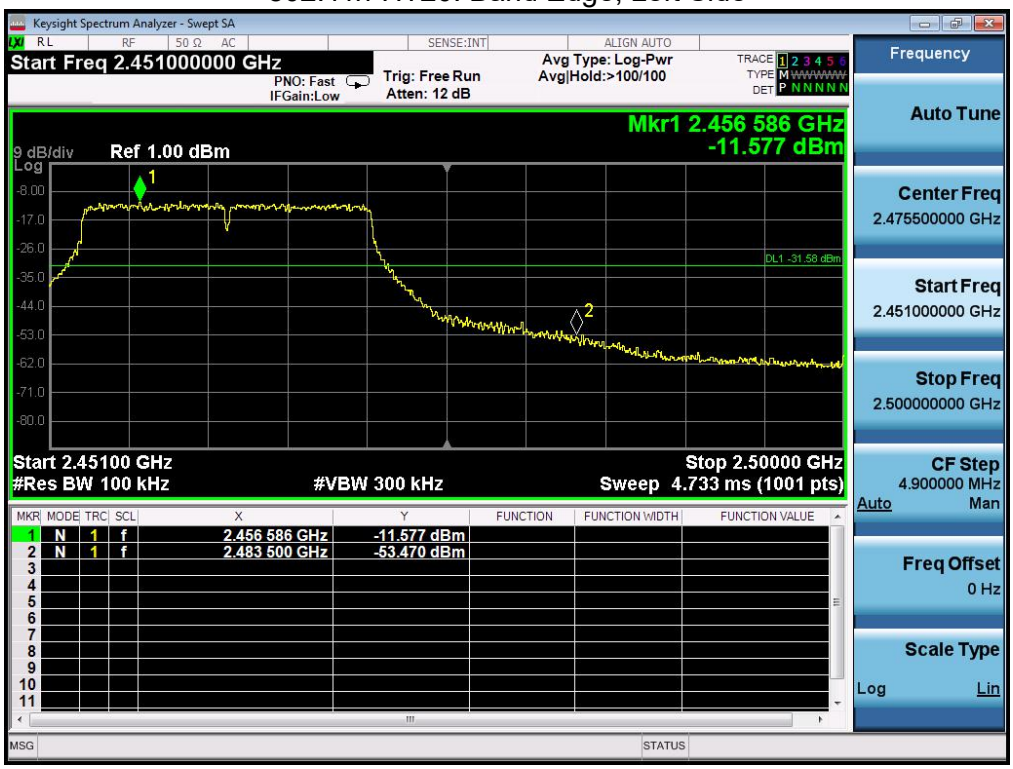
802.11g: Band Edge, Left Side



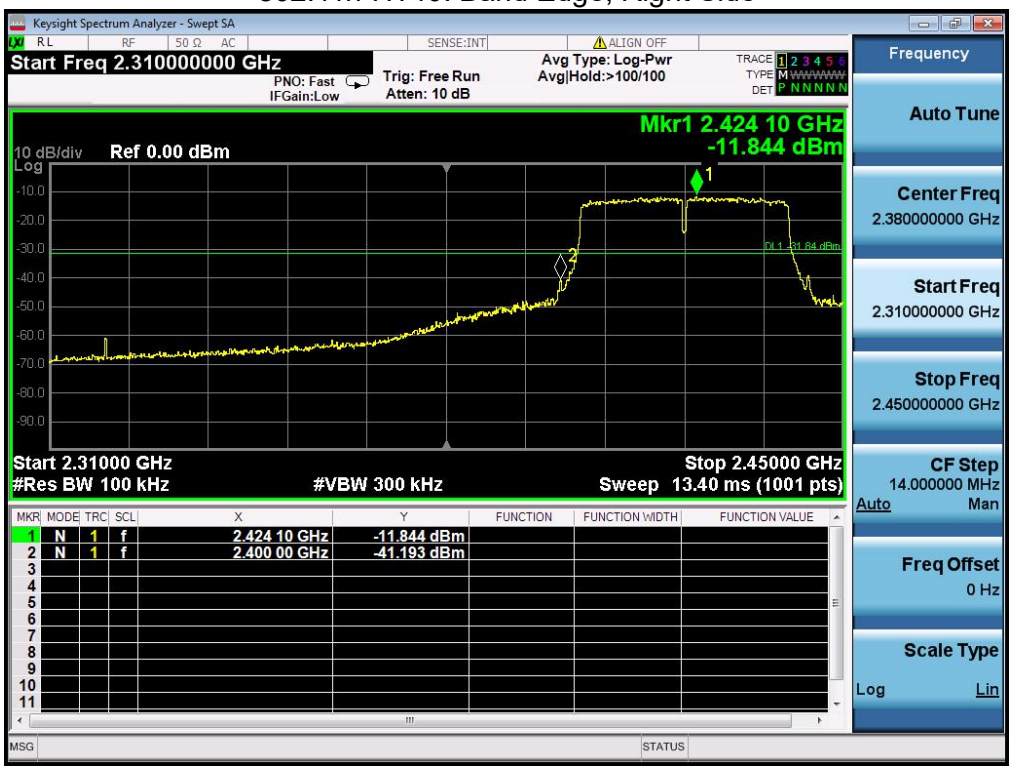
802.11n-HT20: Band Edge, Right Side



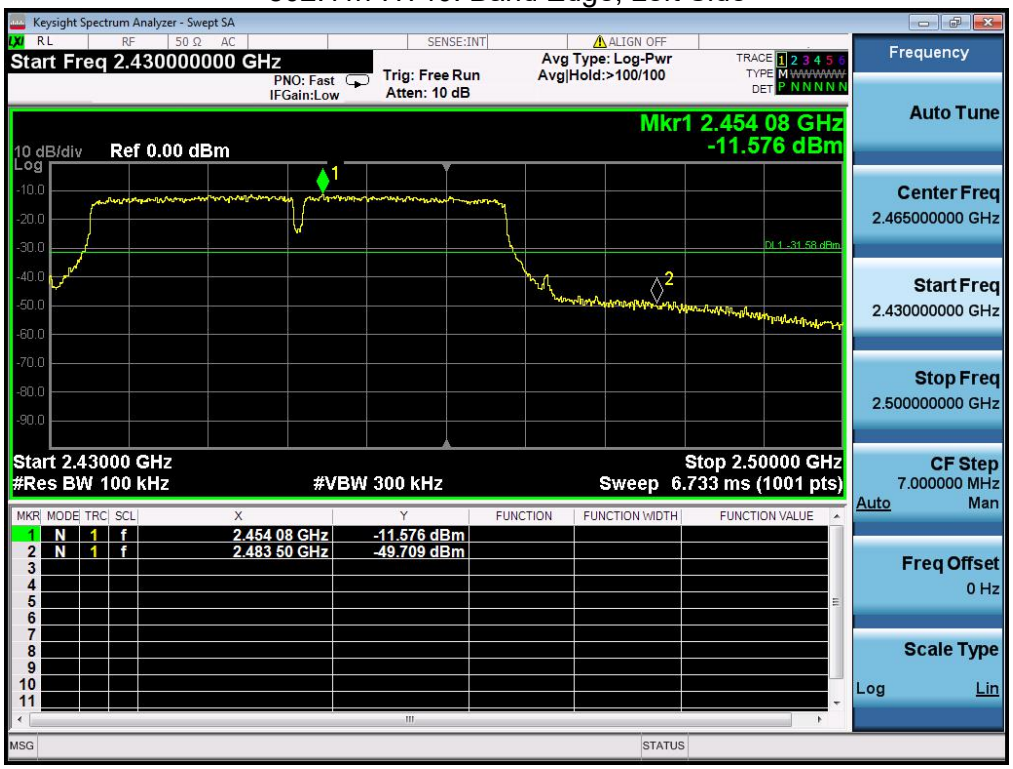
802.11n-HT20: Band Edge, Left Side



802.11n-HT40: Band Edge, Right Side



802.11n-HT40: Band Edge, Left Side



6. BANDWIDTH TEST

6.1. Limits

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

6.2. TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x 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) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test data:

	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	2412	9.86	>0.5	Pass
	2437	10.09	>0.5	Pass
	2462	10.05	>0.5	Pass
802.11g	2412	16.54	>0.5	Pass
	2437	16.57	>0.5	Pass
	2462	16.58	>0.5	Pass
802.11n (HT20)	2412	17.77	>0.5	Pass
	2437	17.81	>0.5	Pass
	2462	17.76	>0.5	Pass
802.11n (HT40)	2422	35.39	>0.5	Pass
	2437	35.53	>0.5	Pass
	2452	35.38	>0.5	Pass