FCC RADIO TEST REPORT

FCC ID: APIHKOMNI10

Product： Streaming wireless speaker

Trade Name： harman/kardon

Model Name： HK OMNI 10

Serial Model： N/A

Report No.： NTEK-2014DC0512019F1

Prepared for

Harman International Industries, Incorporated.

8500 Balboa Blvd, Northridge, CA 91329, United States

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name ..... Harman International Industries, Incorporated.

Address ..... 8500 Balboa Blvd, Northridge, CA 91329, United States

Manufacture's Name... Harman International Industries, Incorporated.

Address ..... 8500 Balboa Blvd, Northridge, CA 91329, United States

Product description

Product name ..... Streaming wireless speaker

Model and/or type reference ..... HK OMNI 10

Serial Model ..... N/A

Standards ..... FCC Part15.247 : Oct. 1, 2013

Test procedure ..... ANSI C63.4-2003

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test .....

Date (s) of performance of tests ..... 12 May 2014 ~18 Jun. 2014

Date of Issue..... 18 Jun. 2014

Test Result..... **Pass**

Testing Engineer : Kyle Xu

(Kyle Xu)

Technical Manager : Brown Lu

(Brown Lu)

Authorized Signatory : Bill

(Bill Yao)

Table of Contents

	Page
1 . SUMMARY OF TEST RESULTS	5
1.1 TEST FACILITY	6
1.2 MEASUREMENT UNCERTAINTY	6
2 . GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF EUT	7
2.2 DESCRIPTION OF TEST MODES	9
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	10
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	11
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	12
3 . EMC EMISSION TEST	13
3.1 CONDUCTED EMISSION MEASUREMENT	13
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS	13
3.1.2 TEST PROCEDURE	14
3.1.3 DEVIATION FROM TEST STANDARD	14
3.1.4 TEST SETUP	14
3.1.5 EUT OPERATING CONDITIONS	14
3.1.6 TEST RESULTS	15
3.2 RADIATED EMISSION MEASUREMENT	19
3.2.1 RADIATED EMISSION LIMITS	19
3.2.2 TEST PROCEDURE	20
3.2.3 DEVIATION FROM TEST STANDARD	20
3.2.4 TEST SETUP	21
3.2.5 EUT OPERATING CONDITIONS	22
3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)	23
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)	24
3.2.8 TEST RESULTS (ABOVE 1000 MHZ)	26
4 . POWER SPECTRAL DENSITY TEST	46
4.1 APPLIED PROCEDURES / LIMIT	46
4.1.1 TEST PROCEDURE	46
4.1.2 DEVIATION FROM STANDARD	46
4.1.3 TEST SETUP	46
4.1.4 EUT OPERATION CONDITIONS	46
4.1.5 TEST RESULTS	47
5 . BANDWIDTH TEST	59
5.1 APPLIED PROCEDURES / LIMIT	59
5.1.1 TEST PROCEDURE	59

Table of Contents

	Page
5.1.2 EUT OPERATION CONDITIONS	59
5.1.3 TEST RESULTS	60
6 . PEAK OUTPUT POWER TEST	72
6.1 APPLIED PROCEDURES / LIMIT	72
6.1.1 TEST PROCEDURE	72
6.1.2 DEVIATION FROM STANDARD	72
6.1.3 TEST SETUP	72
6.1.4 EUT OPERATION CONDITIONS	72
6.1.5 TEST RESULTS	73
7 . 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE	75
7.1 DEVIATION FROM STANDARD	75
7.2 TEST SETUP	75
7.3 EUT OPERATION CONDITIONS	75
7.4 TEST RESULTS	76
8 . ANTENNA REQUIREMENT	86
8.1 STANDARD REQUIREMENT	86
8.2 EUT ANTENNA	86
APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS	

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247 (a)(2)	6dB Bandwidth	PASS	
15.247 (b)	Peak Output Power	PASS	
15.247 (c)	Radiated Spurious Emission	PASS	
15.247 (d)	Power Spectral Density	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

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

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd
Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.
FCC Registration No.:238937; IC Registration No.:9270A-1
CNAS Registration No.:L5516

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	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>Streaming wireless speaker</td></tr>
<tr><td>Trade Name</td><td>harman/kardon</td></tr>
<tr><td>Model Name</td><td>HK OMNI 10</td></tr>
<tr><td>Serial Model</td><td>N/A</td></tr>
<tr><td>Model Difference</td><td>N/A</td></tr>
<tr><td>Product Description</td><td>The EUT is a Streaming wireless speaker
<table>
<tr><td>Operation Frequency:</td><td>802.11b/g/n(20MHz): 2412~2462MHz</td></tr>
<tr><td>Modulation Type:</td><td>CCK/OFDM/DBPSK</td></tr>
<tr><td>Bit Rate of Transmitter</td><td>802.11b:11/5.5/2/1 Mbps
802.11g:54/48/36/24/18/12/9/6Mbps
802.11n(20MHz):150/144.44/130/117/115.56/104/86.67/78/52/6.5Mbps</td></tr>
<tr><td>Number Of Channel</td><td>802.11b/g/n20MHz:11CH</td></tr>
<tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr>
<tr><td>Output Power(Conducted):</td><td>Ant A:
802.11b: 13.68 dBm (Max.)
802.11g: 12.65 dBm (Max.)
802.11n(20M): 11.99 dBm (Max.)
Ant B:
802.11b: 13.34 dBm (Max.)
802.11g: 12.61 dBm (Max.)
802.11n(20M): 12.28 dBm (Max.)</td></tr>
<tr><td>Antenna Gain (dBi)</td><td>Ant A:2.47 dbi
Ant B:2.86 dbi</td></tr>
</table>
Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Ratings</td><td>DC 19V</td></tr>
<tr><td>Adapter</td><td>Model:DT19V-3C-DC
Input: 100-240V~,50/60Hz
Output: 19V⎓, 3A</td></tr>
<tr><td>Battery</td><td>N/A</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2.

Channel List for 802.11b/g/n(20 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
A	N/A	N/A	FPCB Antenna	N/A	2.47	Wifi Antenna
B	N/A	N/A	FPCB Antenna	N/A	2.86	Wifi Antenna

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	802.11n/20MHz CH1/ CH6/ CH11
Mode 4	Link Mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Link Mode

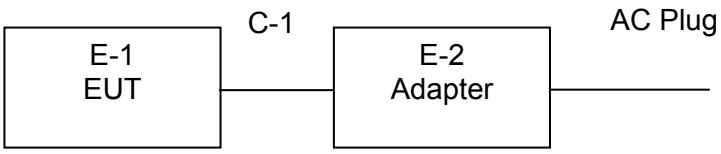
For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11b CH1/ CH6/ CH11
Mode 2	802.11g CH1/ CH6/ CH11
Mode 3	802.11n/20MHz CH1/ CH6/ CH11

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



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	Brand	Model/Type No.	Series No.	Note
E-1	Streaming wireless speaker	harman/kardon	HK OMNI 10	N/A	EUT
E-2	Adapter	N/A	DT19V-3C-DC	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.8m	

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2013.07.06	2014.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2014.06.07	2015.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2013.07.06	2014.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2014.06.07	2015.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2014.06.07	2015.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2013.07.06	2014.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2013.07.06	2014.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2013.12.22	2014.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2014.06.08	2015.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2013.07.06	2014.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2013.07.06	2014.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2014.06.06	2015.06.05	1 year
2	LISN	R&S	ENV216	101313	2013.08.24	2014.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2013.08.24	2014.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2014.06.07	2015.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2014.06.07	2015.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2014.06.08	2015.06.07	1 year

1	Attenuation	MCE	24-10-34	BN9258	2014.06.08	2015.06.07	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

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

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

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

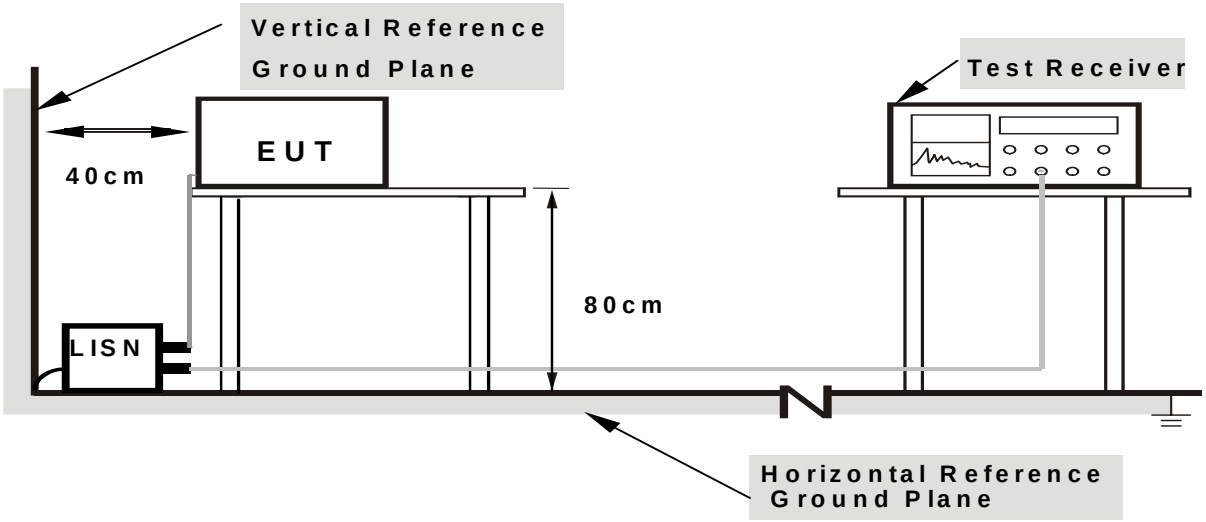
3.1.2 TEST PROCEDURE

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

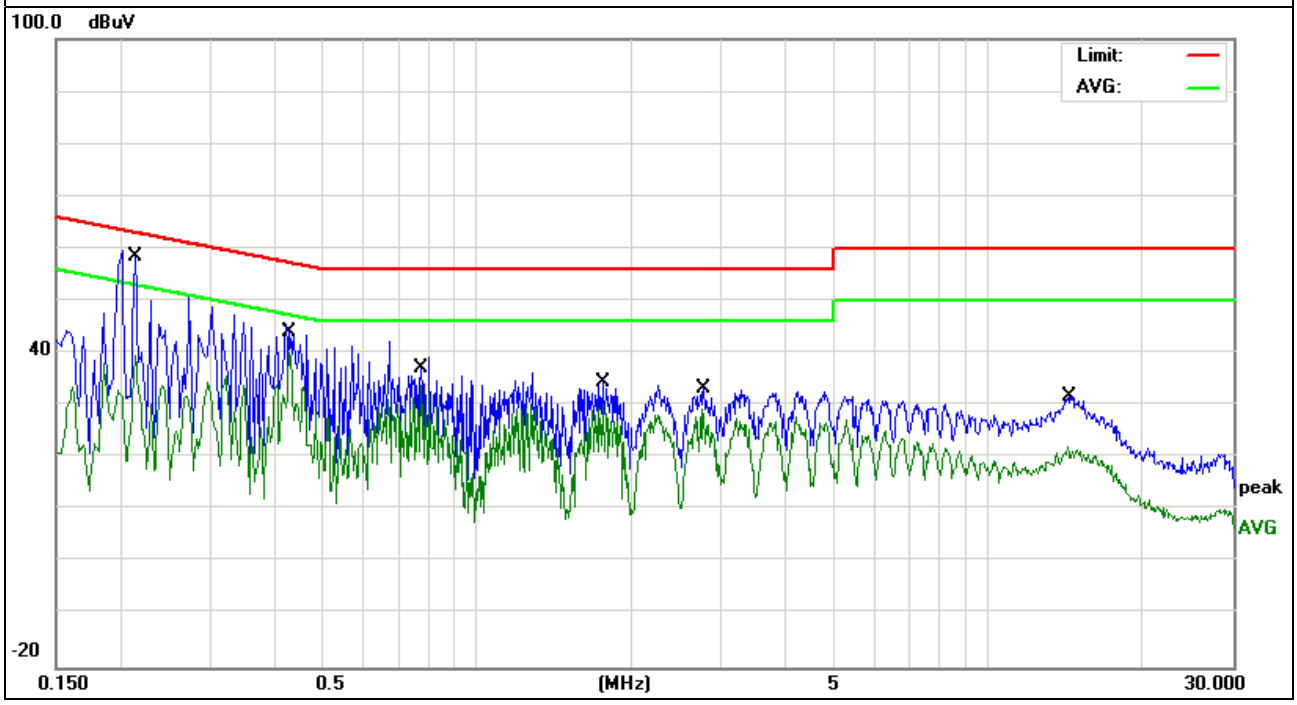
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

EUT：	Streaming wireless speaker	Model Name. ：	HK OMNI 10
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 19V form Adapter AC 120V/60Hz	Test Mode：	Mode 4-Ant A

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.2140	58.55	0.00	58.55	63.04	-4.49	QP
0.2140	39.60	0.00	39.60	53.04	-13.44	AVG
0.4300	44.13	0.00	44.13	57.25	-13.12	QP
0.4300	40.08	0.00	40.08	47.25	-7.17	AVG
0.7780	37.30	0.00	37.30	56.00	-18.70	QP
0.7780	33.79	0.00	33.79	46.00	-12.21	AVG
1.7580	34.41	0.00	34.41	56.00	-21.59	QP
1.7580	30.24	0.00	30.24	46.00	-15.76	AVG
2.7500	32.53	0.00	32.53	56.00	-23.47	QP
2.7500	29.30	0.00	29.30	46.00	-16.70	AVG
14.2779	31.07	0.00	31.07	60.00	-28.93	QP
14.2779	22.00	0.00	22.00	50.00	-28.00	AVG

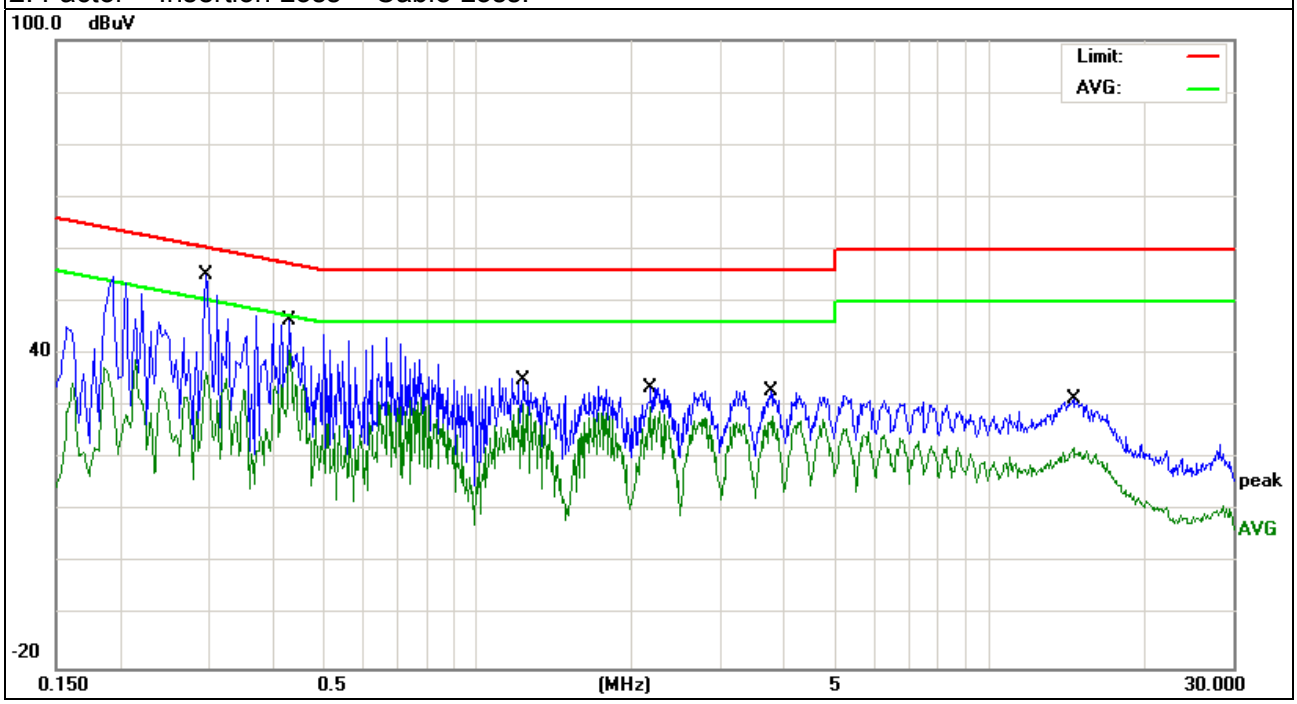
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Streaming wireless speaker	Model Name. ：	HK OMNI 10
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 19V form Adapter AC 120V/60Hz	Test Mode：	Mode 4-Ant A

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.2940	55.21	0.00	55.21	60.41	-5.20	QP
0.2940	36.60	0.00	36.60	50.41	-13.81	AVG
0.4300	46.50	0.00	46.50	57.25	-10.75	QP
0.4300	40.67	0.00	40.67	47.25	-6.58	AVG
1.2340	35.14	0.00	35.14	56.00	-20.86	QP
1.2340	30.66	0.00	30.66	46.00	-15.34	AVG
2.1860	33.52	0.00	33.52	56.00	-22.48	QP
2.1860	30.04	0.00	30.04	46.00	-15.96	AVG
3.7820	32.42	0.00	32.42	56.00	-23.58	QP
3.7820	28.07	0.00	28.07	46.00	-17.93	AVG
14.6420	30.00	0.00	30.00	60.00	-30.00	QP
14.6420	22.17	0.00	22.17	50.00	-27.83	AVG

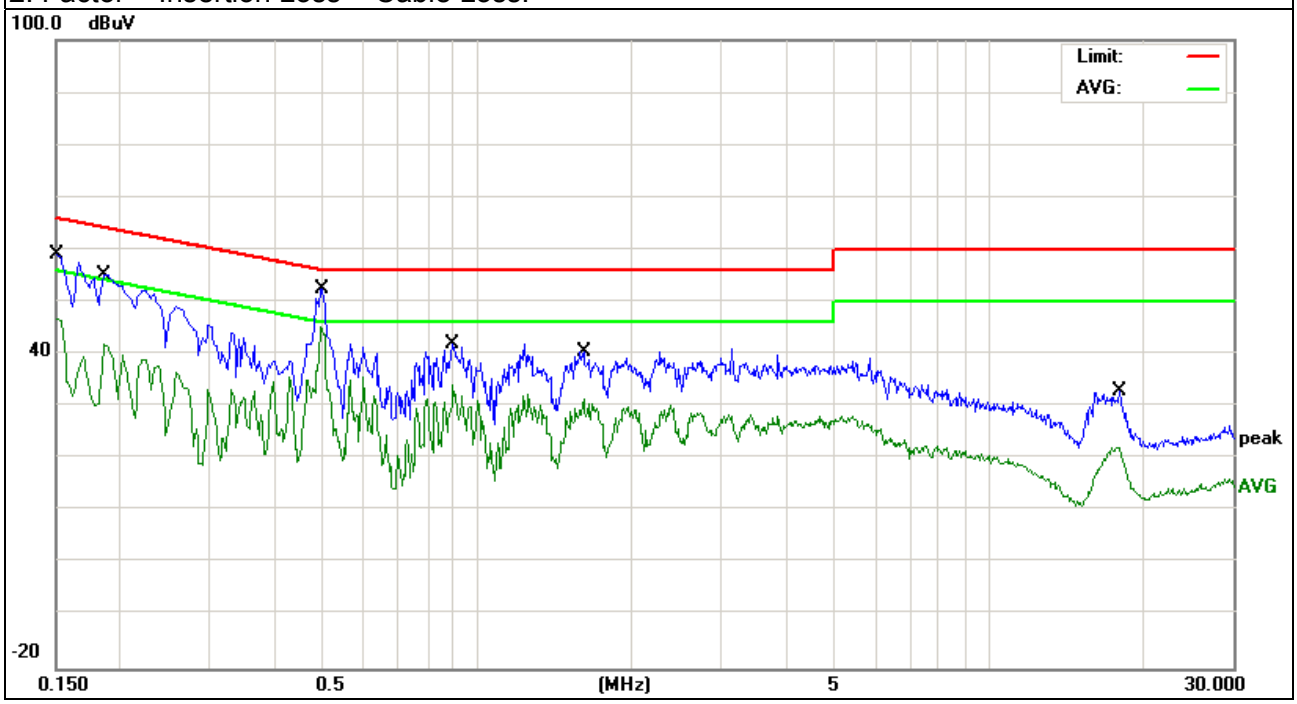
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Streaming wireless speaker	Model Name. ：	HK OMNI 10
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 19V form Adapter AC 120V/60Hz	Test Mode：	Mode 4-Ant B

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1499	49.46	9.63	59.09	66.00	-6.91	QP
0.1499	37.08	9.63	46.71	56.00	-9.29	AVG
0.1860	45.72	9.53	55.25	64.21	-8.96	QP
0.1860	32.36	9.53	41.89	54.21	-12.32	AVG
0.4940	42.88	9.51	52.39	56.10	-3.71	QP
0.4940	35.87	9.51	45.38	46.10	-0.72	AVG
0.8980	32.46	9.53	41.99	56.00	-14.01	QP
0.8980	24.52	9.53	34.05	46.00	-11.95	AVG
1.6140	30.91	9.54	40.45	56.00	-15.55	QP
1.6140	21.85	9.54	31.39	46.00	-14.61	AVG
18.0019	22.71	10.11	32.82	60.00	-27.18	QP
18.0019	12.02	10.11	22.13	50.00	-27.87	AVG

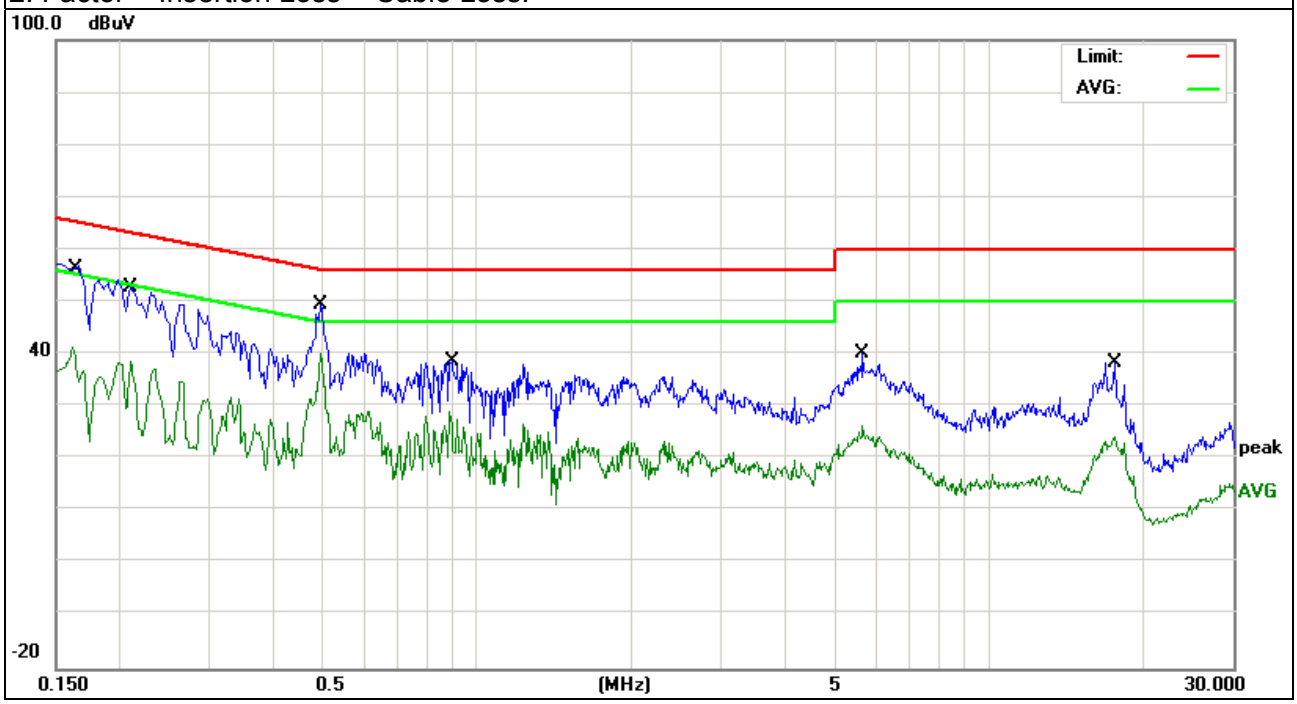
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Streaming wireless speaker	Model Name. ：	HK OMNI 10
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 19V form Adapter AC 120V/60Hz	Test Mode：	Mode 4-Ant B

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1620	46.52	9.60	56.12	65.36	-9.24	QP
0.1620	31.66	9.60	41.26	55.36	-14.10	AVG
0.2100	43.31	9.49	52.80	63.20	-10.40	QP
0.2100	29.13	9.49	38.62	53.20	-14.58	AVG
0.4940	39.80	9.51	49.31	56.10	-6.79	QP
0.4940	30.61	9.51	40.12	46.10	-5.98	AVG
0.8820	28.98	9.53	38.51	56.00	-17.49	QP
0.8820	19.56	9.53	29.09	46.00	-16.91	AVG
5.6579	30.47	9.63	40.10	60.00	-19.90	QP
5.6579	16.57	9.63	26.20	50.00	-23.80	AVG
17.6259	28.26	10.08	38.34	60.00	-21.66	QP
17.6259	14.14	10.08	24.22	50.00	-25.78	AVG

Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

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

20dBc in any 100 kHz bandwidth outside the operating frequency band. 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
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (dBuV/m) (at 3M)		Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80	60	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	10th carrier harmonic
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

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

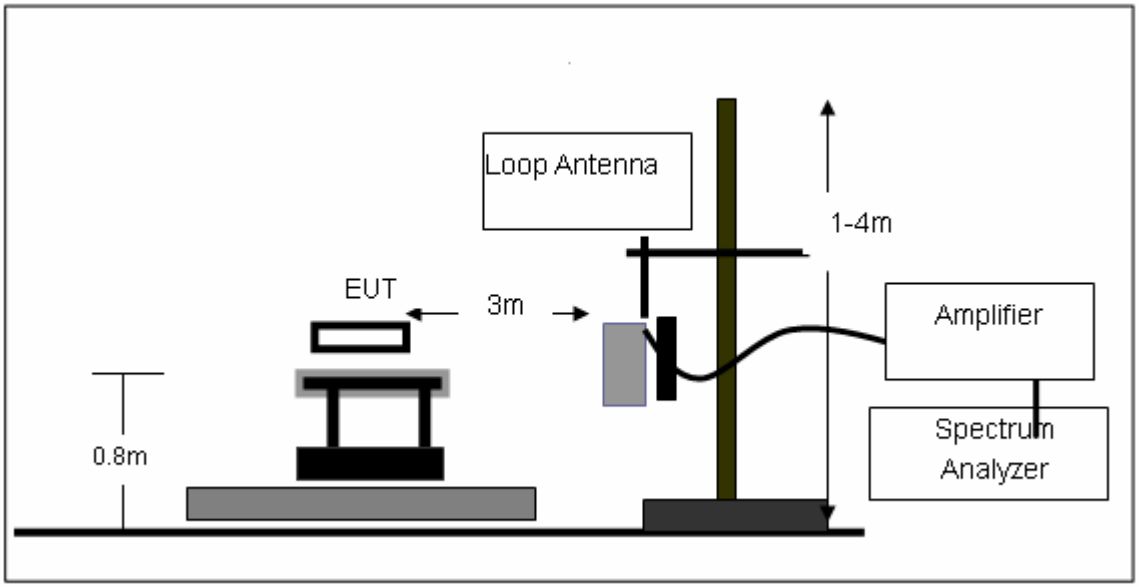
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

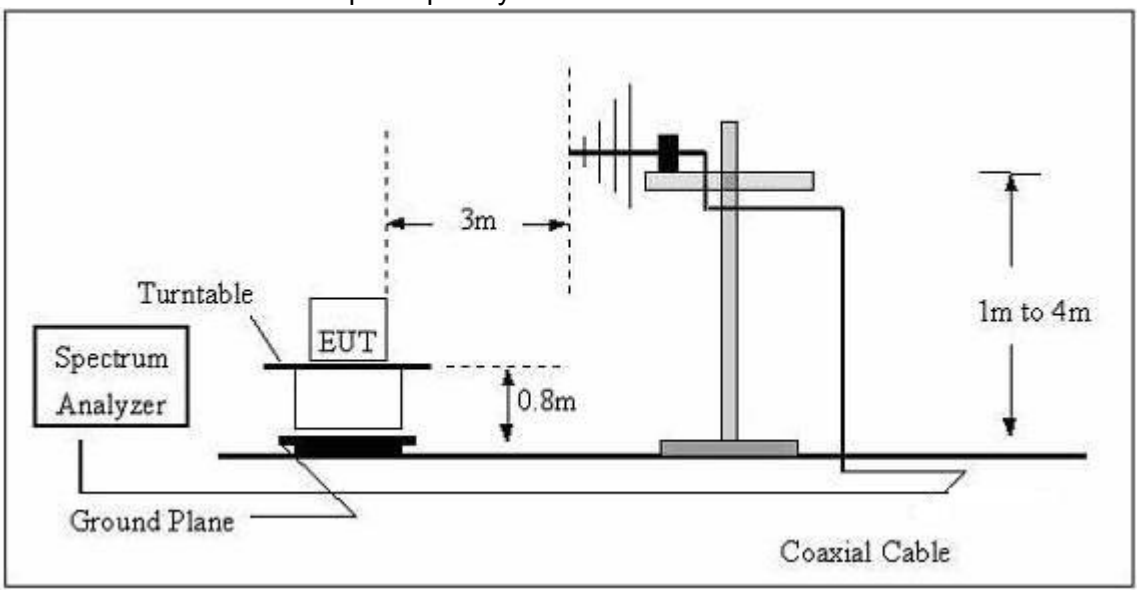
No deviation

3.2.4 TEST SETUP

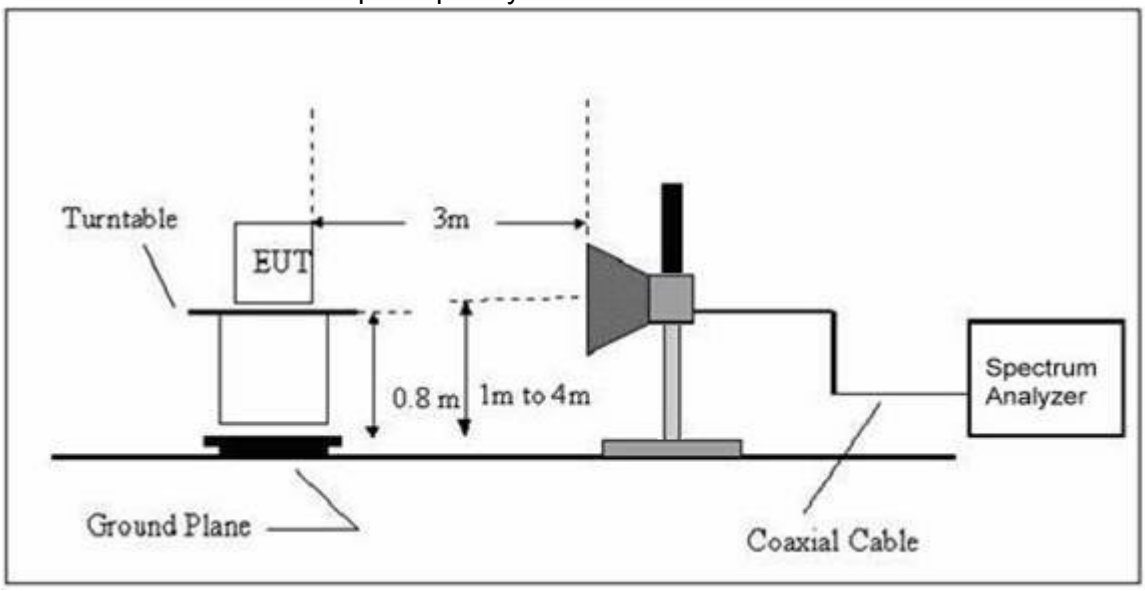
（A）Radiated Emission Test-Up Frequency Below 30MHz



（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 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

EUT：	Streaming wireless speaker	Model Name. ：	HK OMNI 10
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	N/A
Test Mode ：	TX	Polarization :	--

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

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.

3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX-Ant A		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	133.2342	15.73	12.25	27.98	43.50	-15.52	QP
V	235.4655	16.84	11.65	28.49	46.00	-17.51	QP
V	267.0332	17.33	14.62	31.95	46.00	-14.05	QP
V	315.4806	16.98	15.26	32.24	46.00	-13.76	QP
V	528.2458	16.12	21.12	37.24	46.00	-8.76	QP
V	815.9678	11.43	26.46	37.89	46.00	-8.11	QP
H	125.0066	16.66	12.21	28.87	43.50	-14.63	QP
H	263.8190	16.81	14.62	31.43	46.00	-14.57	QP
H	432.5457	17.64	18.82	36.46	46.00	-9.54	QP
H	528.2097	17.68	21.12	38.80	46.00	-7.20	QP
H	721.7259	10.54	25.59	36.13	46.00	-9.87	QP
H	815.2377	11.15	26.46	37.61	46.00	-8.39	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX-Ant B		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	115.0234	17.81	12.03	29.84	43.50	-13.66	QP
V	233.7409	16.22	11.65	27.87	46.00	-18.13	QP
V	401.0240	17.19	18.53	35.72	46.00	-10.28	QP
V	493.4544	15.56	20.56	36.12	46.00	-9.88	QP
V	524.2269	15.68	21.12	36.80	46.00	-9.20	QP
V	802.9012	10.08	26.43	36.51	46.00	-9.49	QP
H	115.0355	15.32	12.21	27.53	43.50	-15.97	QP
H	164.9071	15.73	10.81	26.54	43.50	-16.96	QP
H	287.9904	16.74	14.30	31.04	46.00	-14.96	QP
H	524.2632	16.11	21.12	37.23	46.00	-8.77	QP
H	701.7765	9.68	25.59	35.27	46.00	-10.73	QP
H	802.0336	10.46	26.43	36.89	46.00	-9.11	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX-Ant A		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector (PK/QP/AV)	Polar (H/V)
Low Channel (2412 MHz)-Above 1G							
4824.012	47.87	10.44	58.31	74.00	-15.69	Pk	Vertical
4824.012	38.11	10.44	48.55	54.00	-5.45	AV	Vertical
7236.000	39.12	12.39	51.51	74.00	-22.49	pk	Vertical
4824.012	45.74	10.44	56.18	74.00	-17.82	pk	Horizontal
4824.012	37.54	10.44	47.98	54.00	-6.02	AV	Horizontal
7236.000	30.54	12.39	42.93	74.00	-31.07	pk	Horizontal
Mid Channel (2437 MHz)-Above 1G							
4874.043	47.19	10.40	57.59	74.00	-16.41	pk	Vertical
4874.043	37.76	10.40	48.16	54.00	-5.84	AV	Vertical
7311.147	36.87	12.75	49.62	74.00	-24.38	Pk	Vertical
4874.043	47.31	10.40	57.71	74.00	-16.29	Pk	Horizontal
4874.043	38.11	10.40	48.51	54.00	-5.49	AV	Horizontal
7311.147	30.23	12.75	42.98	74.00	-31.02	Pk	Horizontal
High Channel (2462 MHz)- Above 1G							
4924.124	49.12	10.39	59.51	74.00	-14.49	pk	Vertical
4924.124	37.99	10.39	48.38	54.00	-5.62	AV	Vertical
7386.076	39.13	12.68	51.81	74.00	-22.19	pk	Vertical
4924.124	47.15	10.39	57.54	74.00	-16.46	pk	Horizontal
4924.124	35.42	10.39	45.81	54.00	-8.19	AV	Horizontal
7386.033	31.56	12.68	44.24	74.00	-29.76	pk	Horizontal

Note: Scan with 802.11b, 802.11g,802.11n(20M), the worst case is 802.11b.
When PK value is lower than the Average value limit, average didn't record.

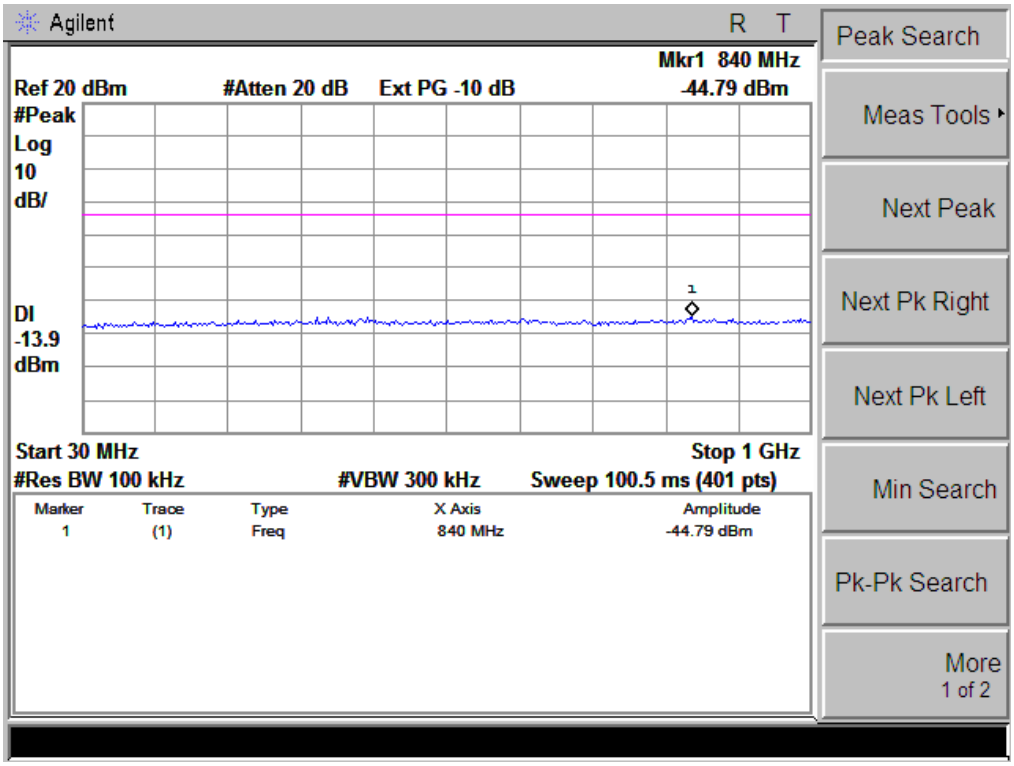
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX-Ant B		

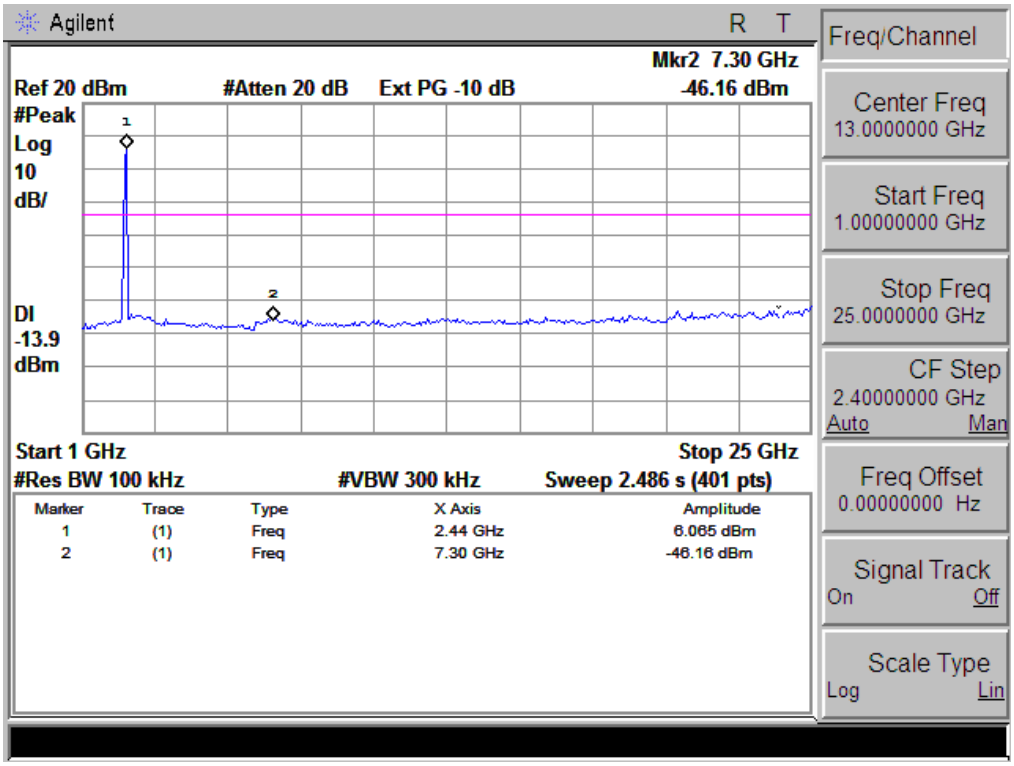
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector (PK/QP/AV)	Polar (H/V)
Low Channel (2412 MHz)-Above 1G							
4824.012	47.15	10.44	57.59	74.00	-16.41	Pk	Vertical
4824.012	30.01	10.44	40.45	54.00	-13.55	AV	Vertical
7236.000	36.88	12.39	49.27	74.00	-24.73	pk	Vertical
4824.012	44.58	10.44	55.02	74.00	-18.98	pk	Horizontal
4824.012	28.17	10.44	38.61	54.00	-15.39	AV	Horizontal
7236.000	30.06	12.39	42.45	74.00	-31.55	pk	Horizontal
Mid Channel (2437 MHz)-Above 1G							
4874.043	48.36	10.40	58.76	74.00	-15.24	pk	Vertical
4874.043	32.34	10.40	42.74	54.00	-11.26	AV	Vertical
7311.147	38.26	12.75	51.01	74.00	-22.99	Pk	Vertical
4874.043	47.13	10.40	57.53	74.00	-16.47	Pk	Horizontal
4874.043	30.47	10.40	40.87	54.00	-13.13	AV	Horizontal
7311.147	31.76	12.75	44.51	74.00	-29.49	Pk	Horizontal
High Channel (2462 MHz)- Above 1G							
4924.124	47.88	10.39	58.27	74.00	-15.73	pk	Vertical
4924.124	31.05	10.39	41.44	54.00	-12.56	AV	Vertical
7386.076	34.55	12.68	47.23	74.00	-26.77	pk	Vertical
4924.124	45.69	10.39	56.08	74.00	-17.92	pk	Horizontal
4924.124	30.43	10.39	40.82	54.00	-13.18	AV	Horizontal
7386.033	32.08	12.68	44.76	74.00	-29.24	pk	Horizontal

Note: Scan with 802.11b, 802.11g,802.11n(20M), the worst case is 802.11b.
When PK value is lower than the Average value limit, average didn't record.

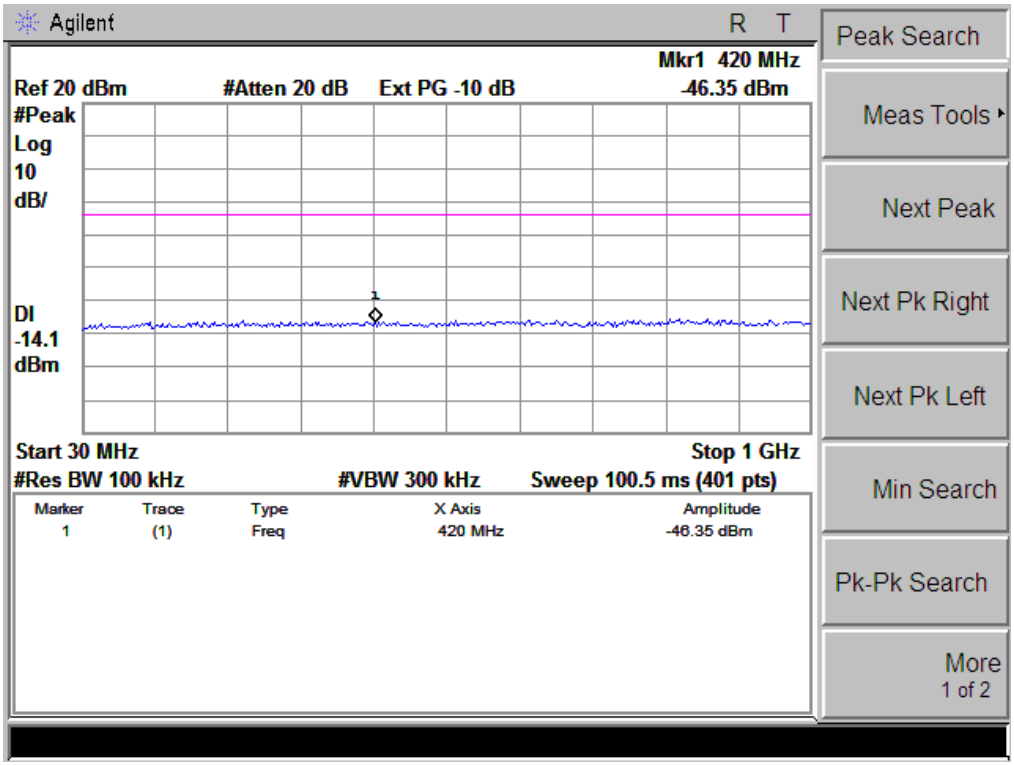
Conducted Spurious Emissions at Antenna Port: Ant A

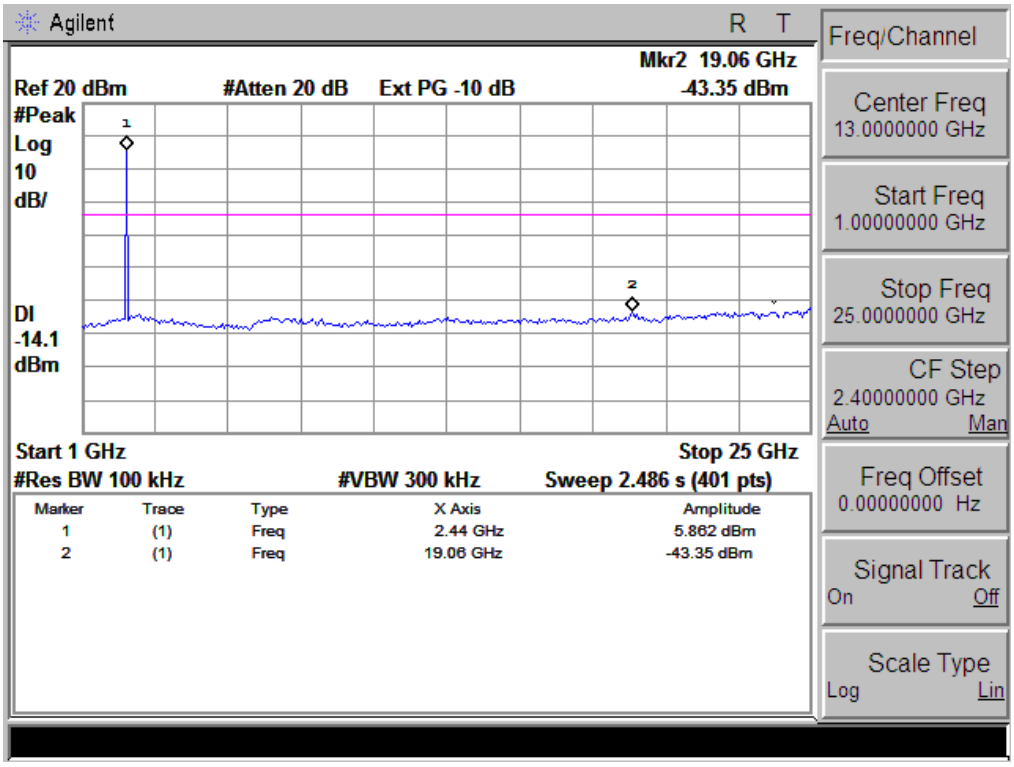
802.11b Low Channel



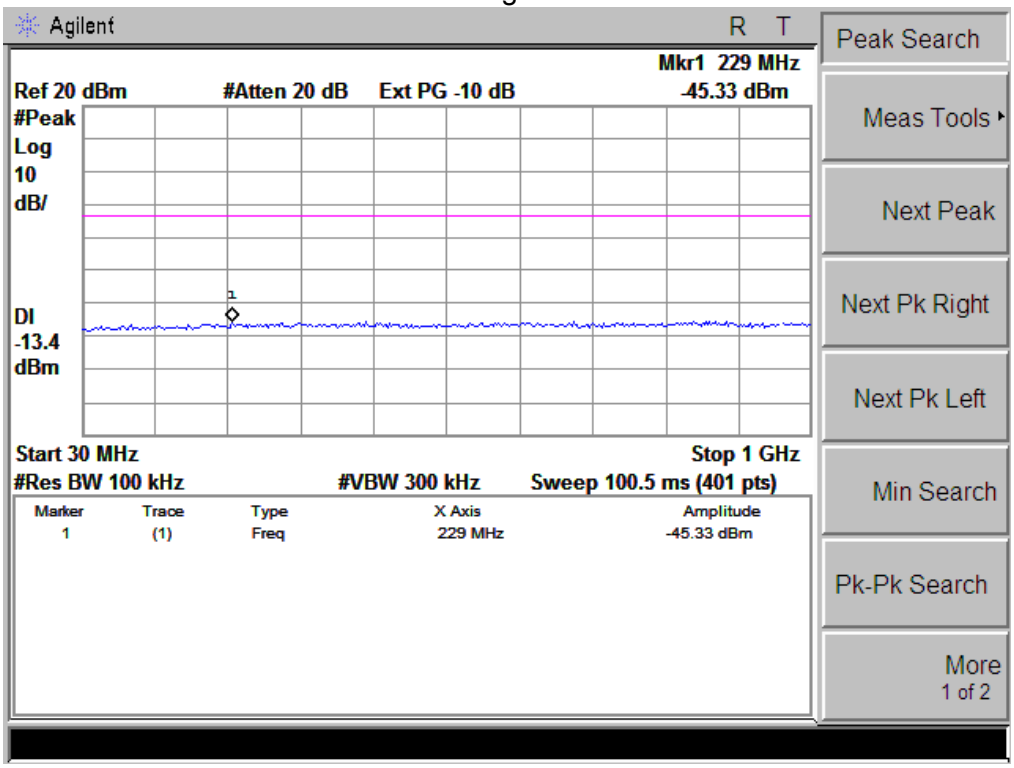


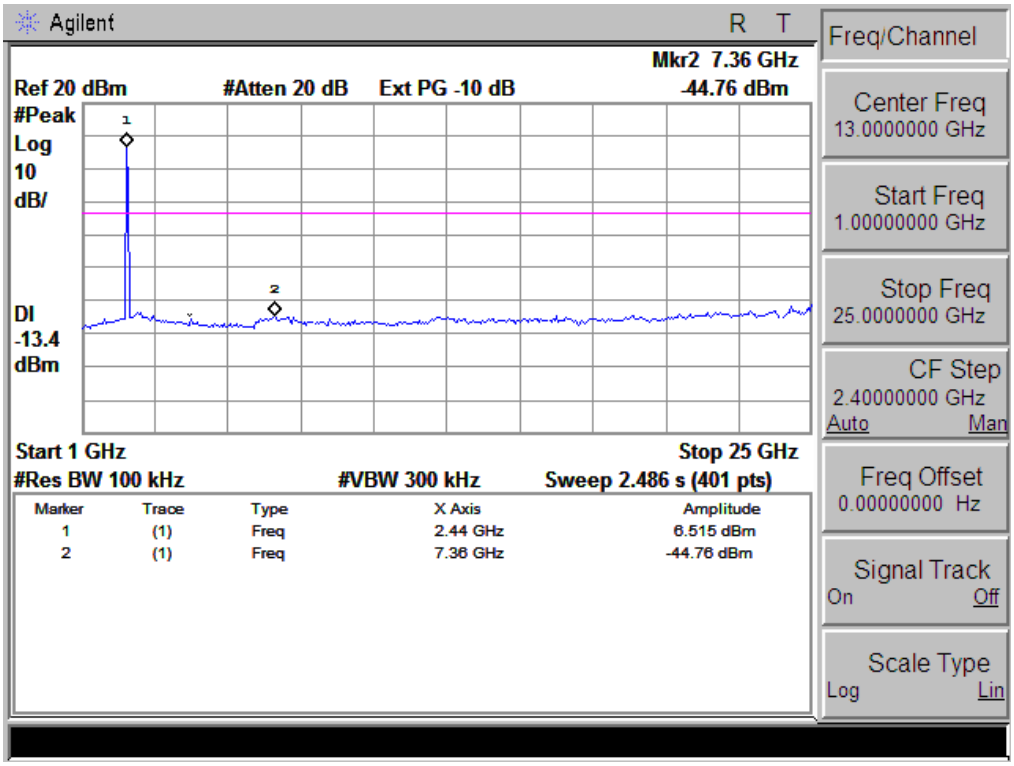
802.11b Middle Channel



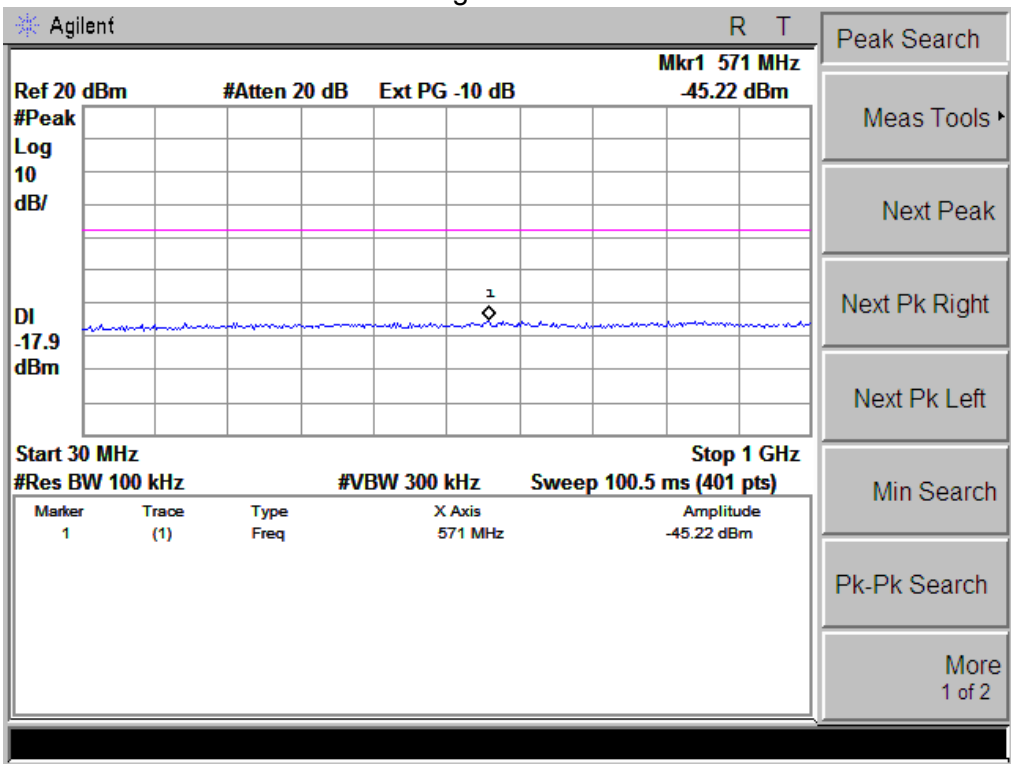


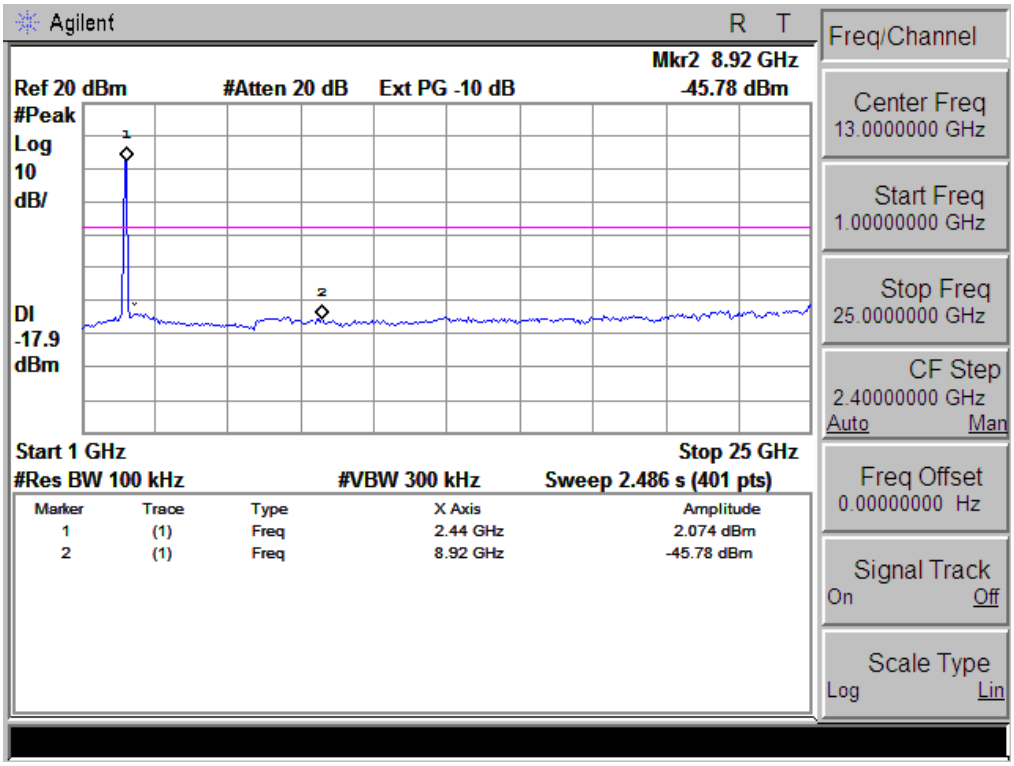
802.11b High Channel



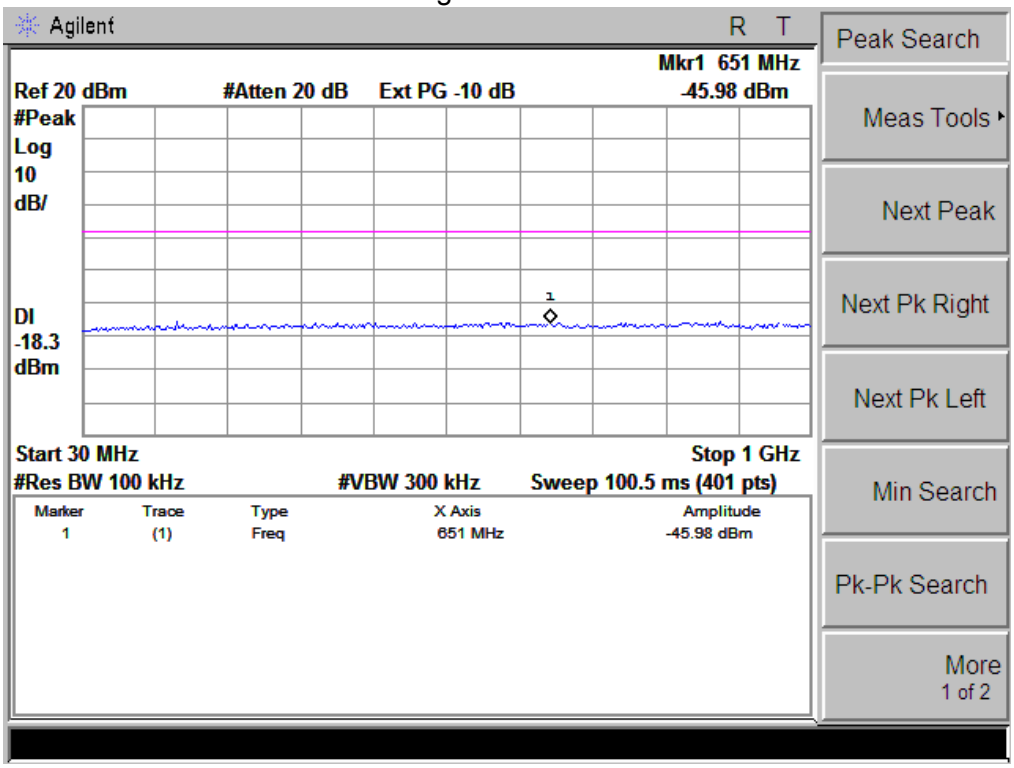


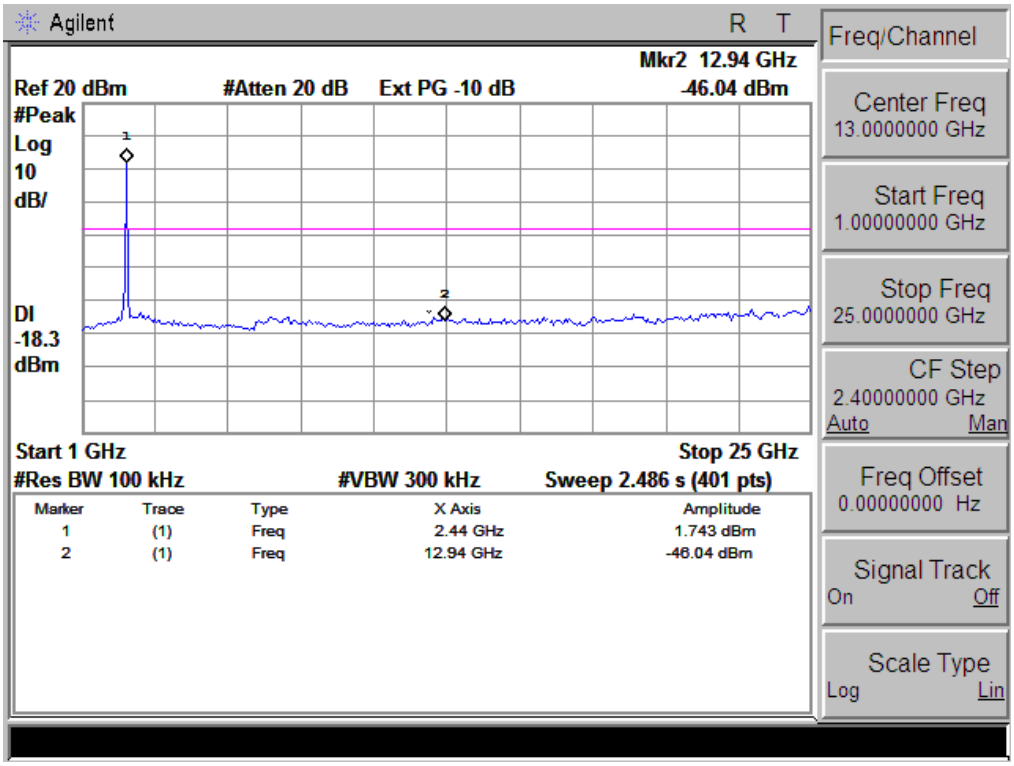
802.11g Low Channel



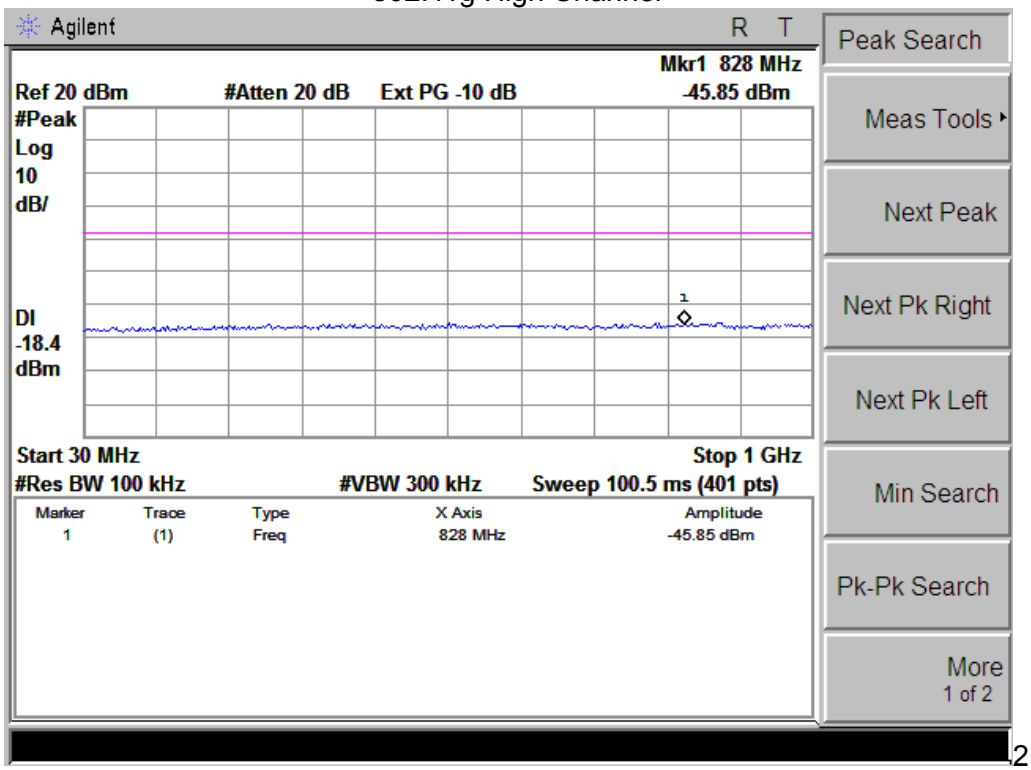


802.11g Middle Channel





802.11g High Channel



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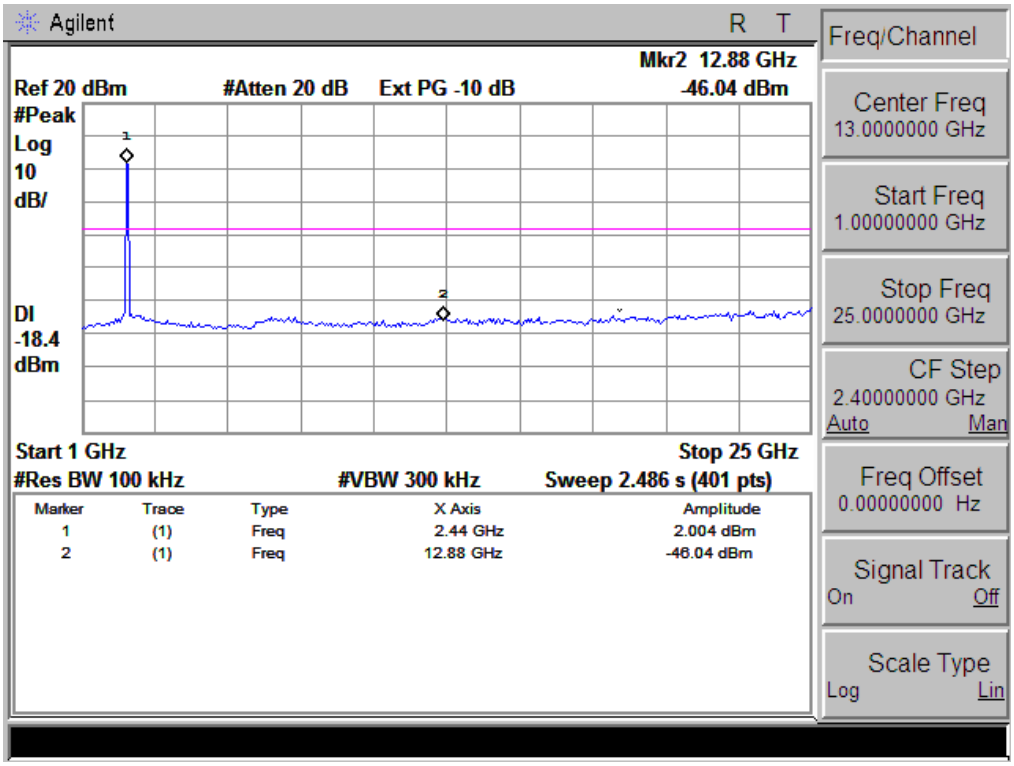
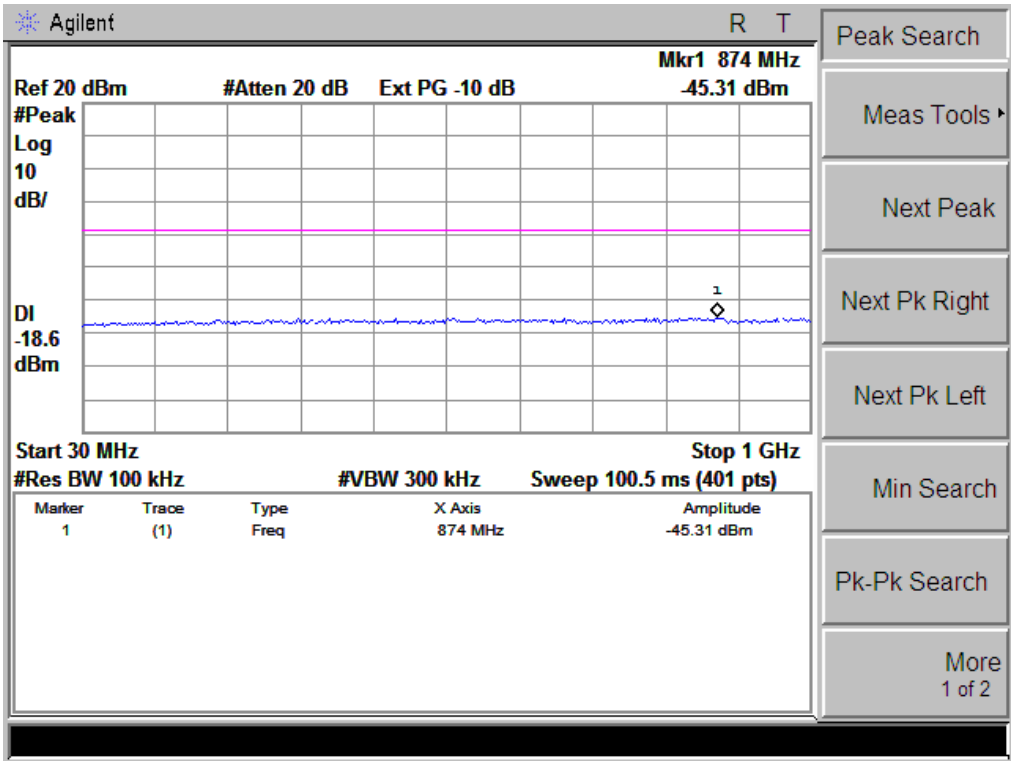
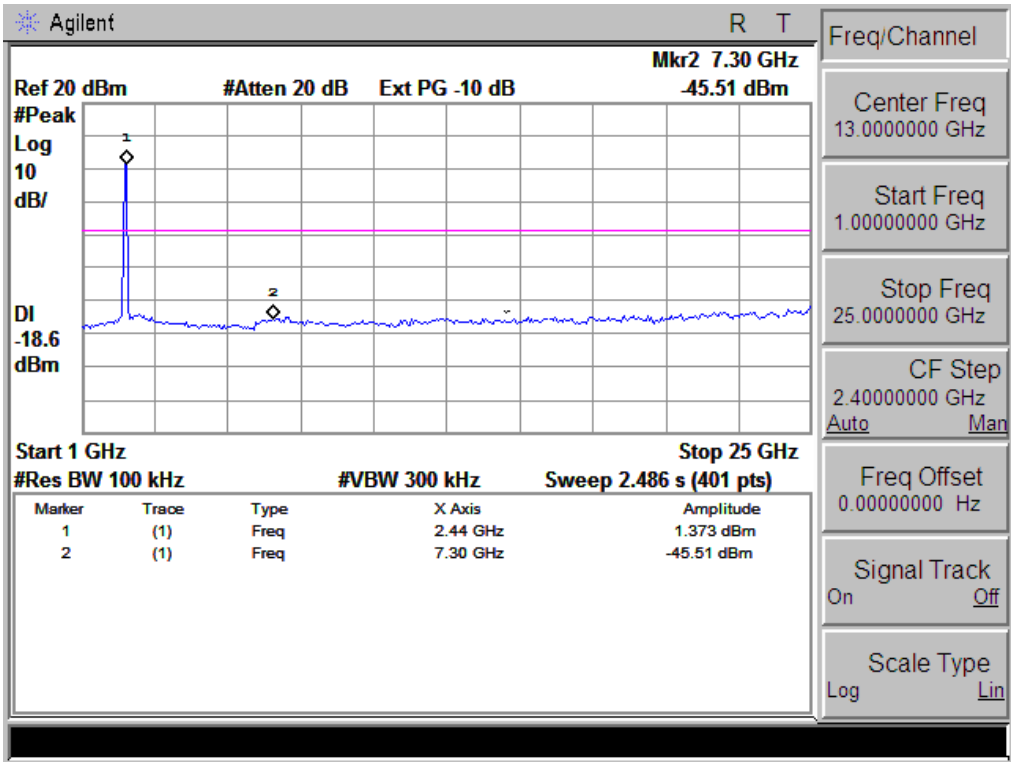
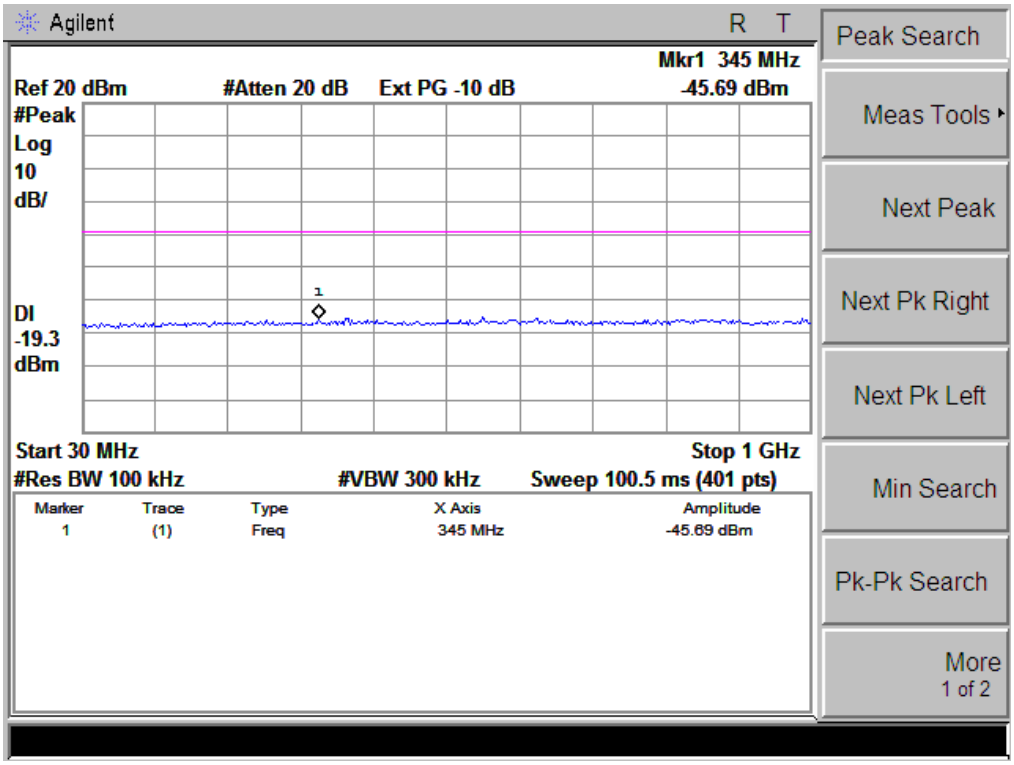


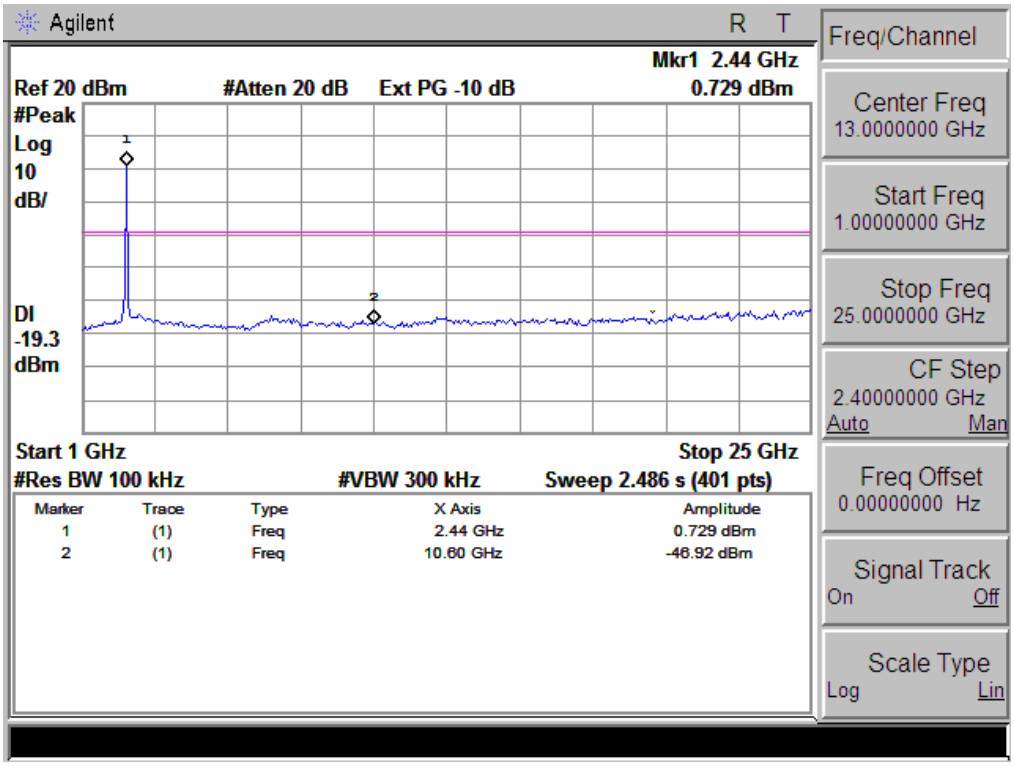
802.11n-HT20 Low Channel



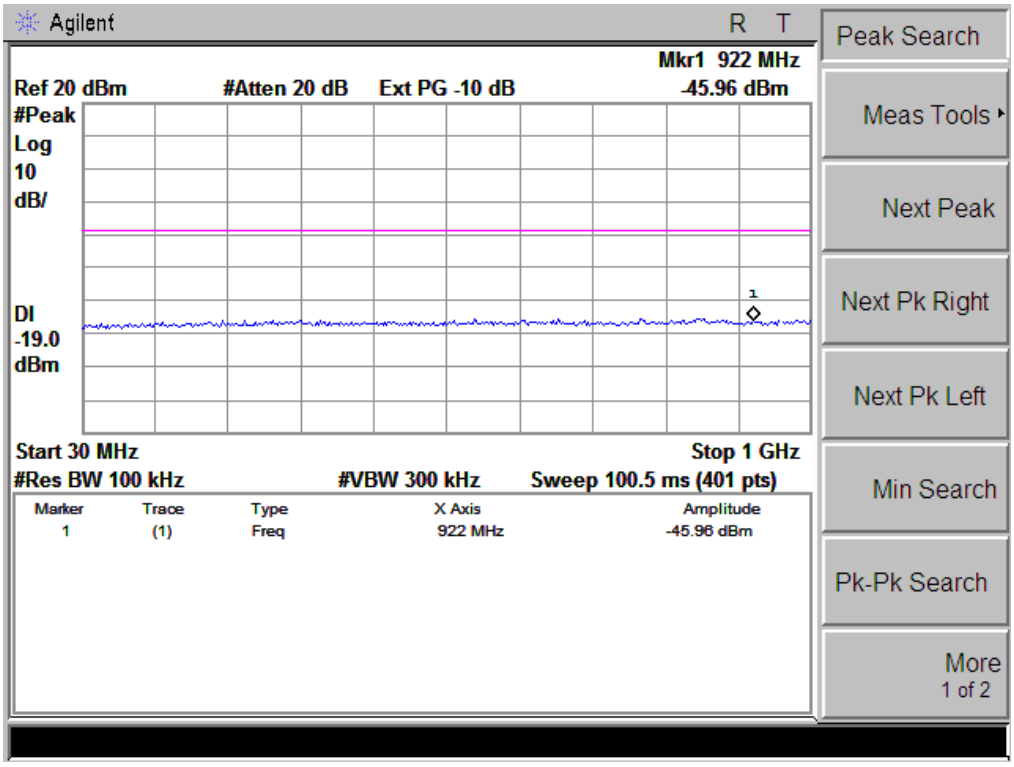


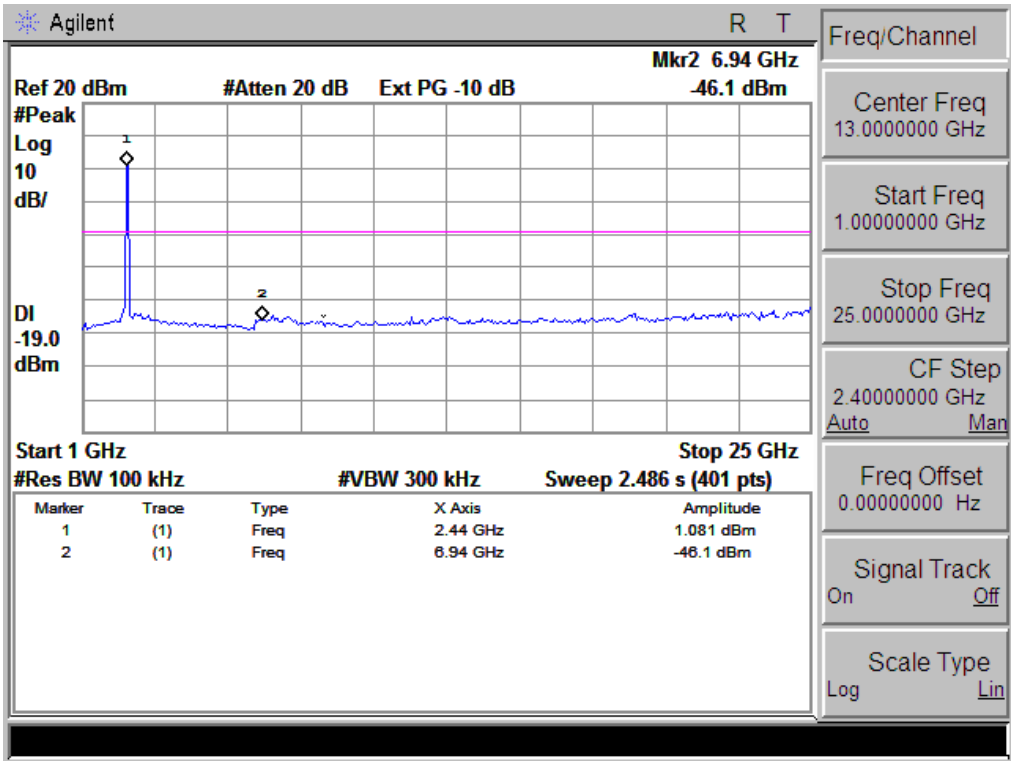
802.11n-HT20 Middle Channel





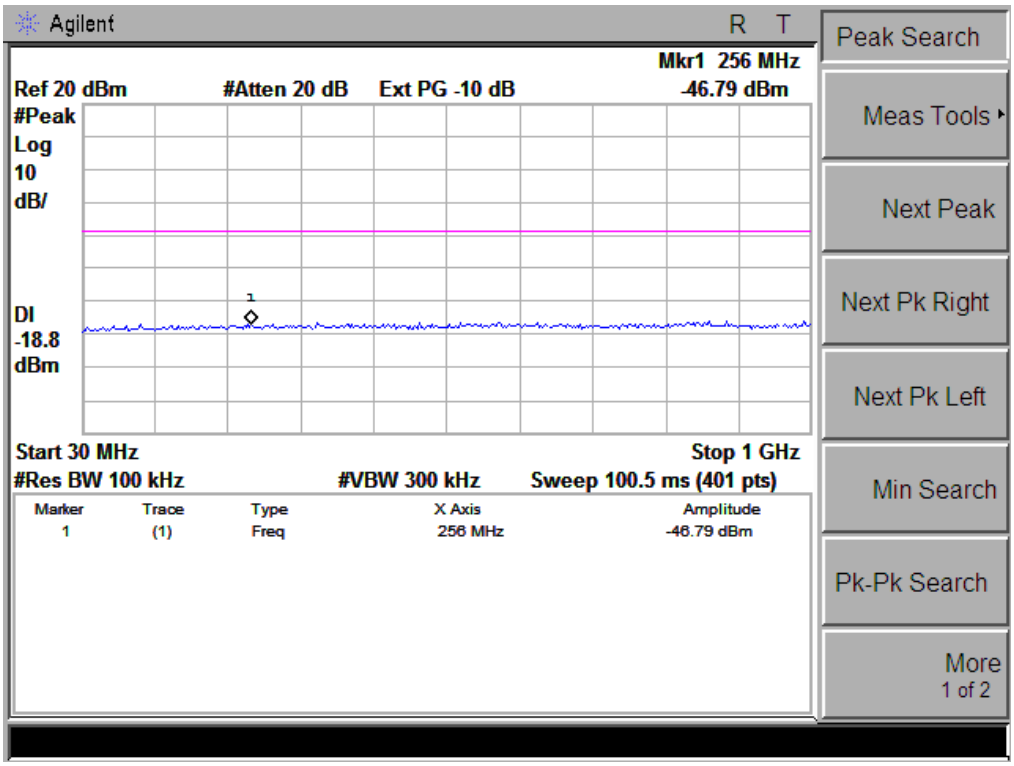
802.11n-HT20 High Channel

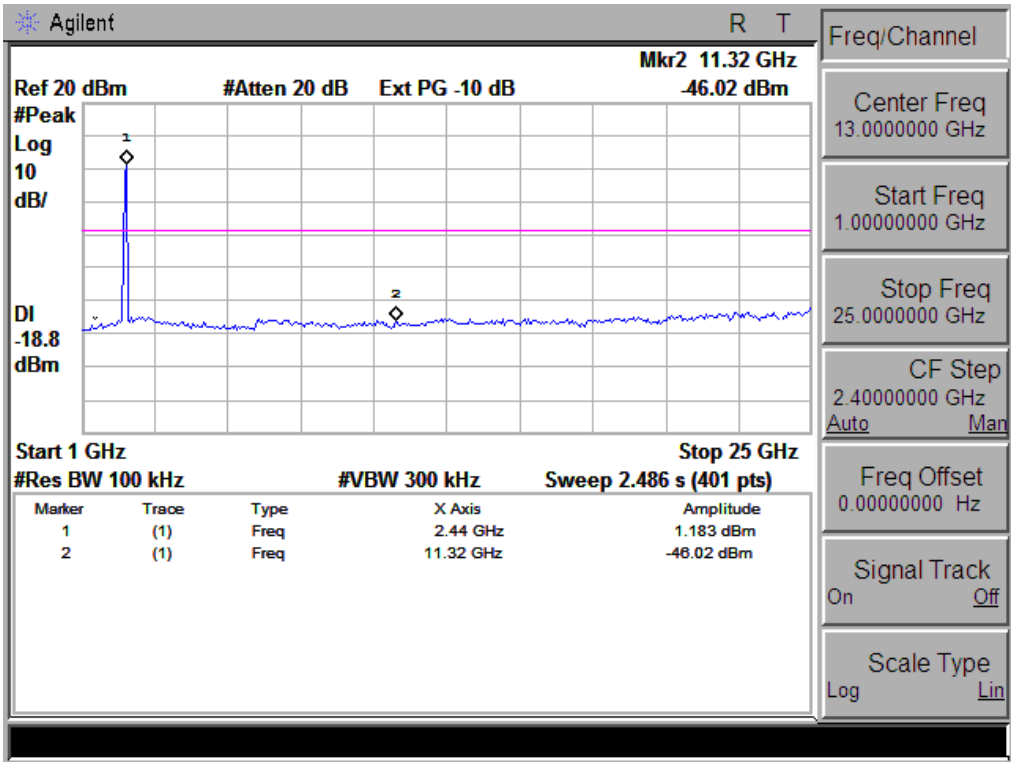




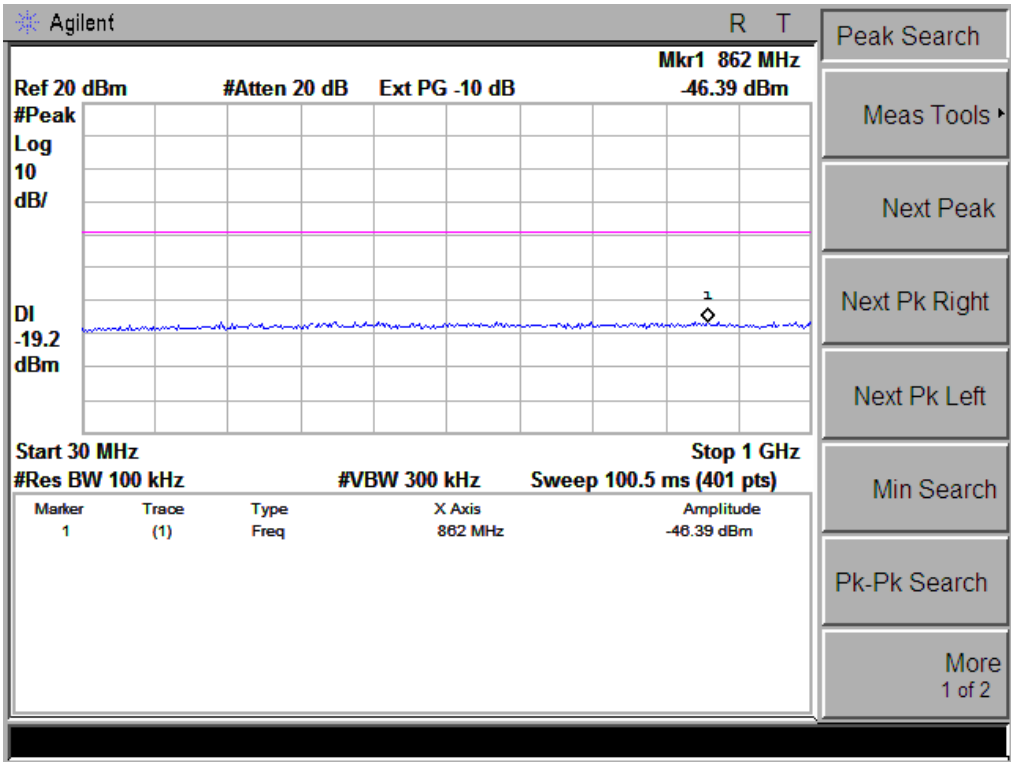
Conducted Spurious Emissions at Antenna Port: Ant B

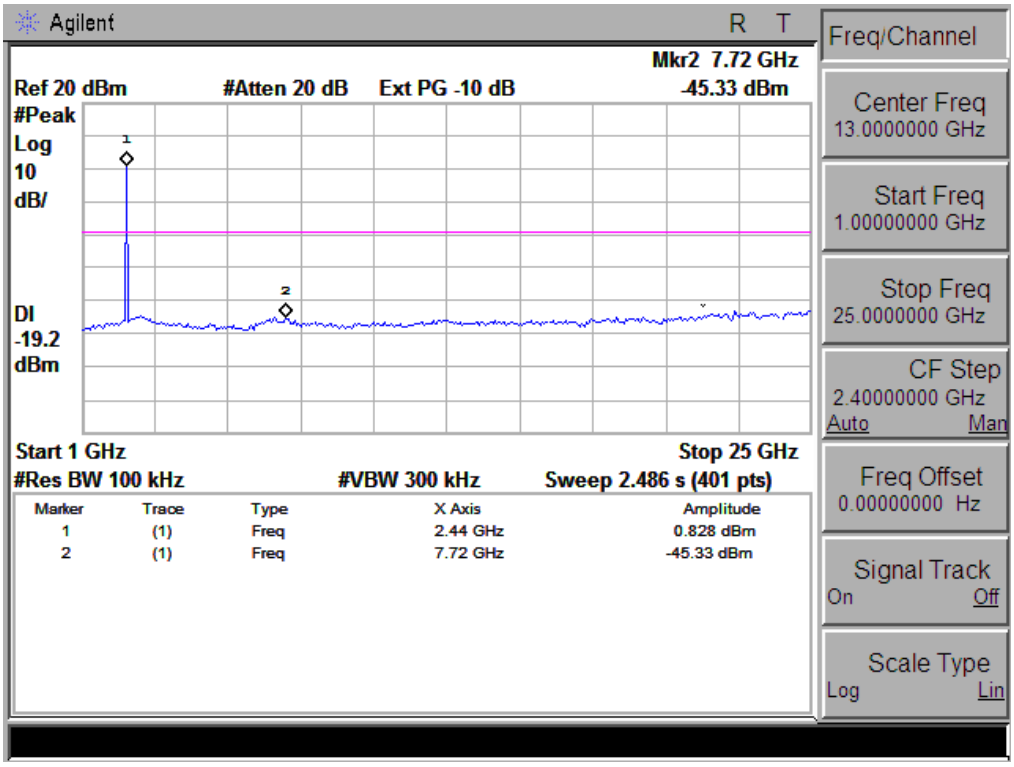
802.11b Low Channel



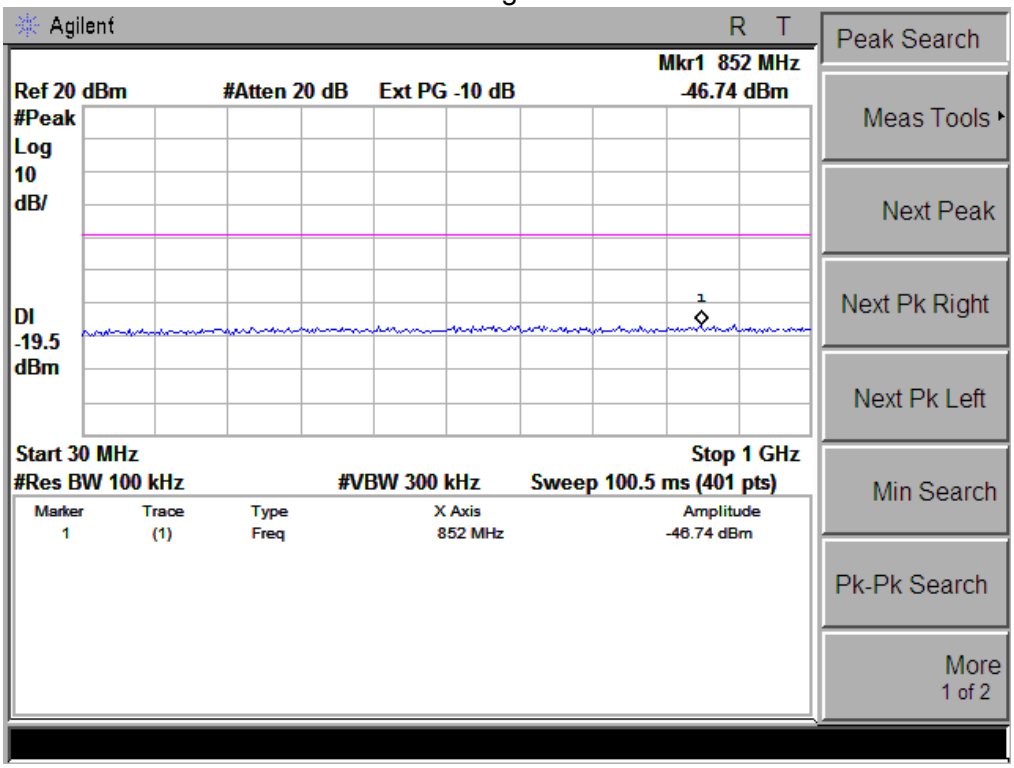


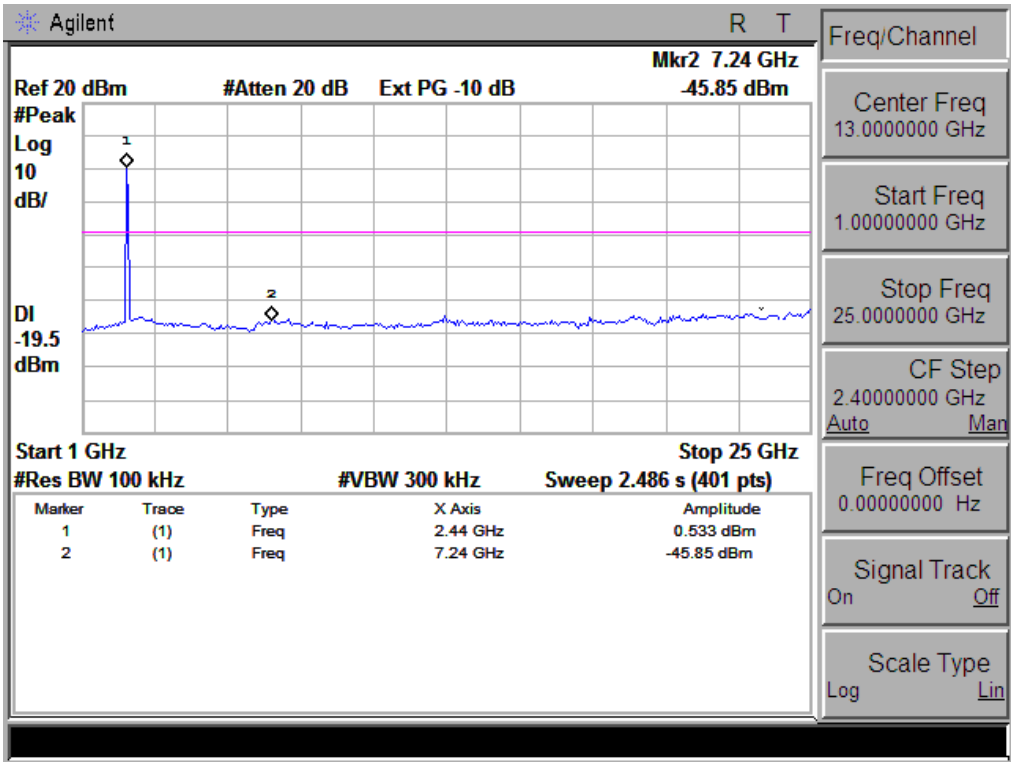
802.11b Middle Channel



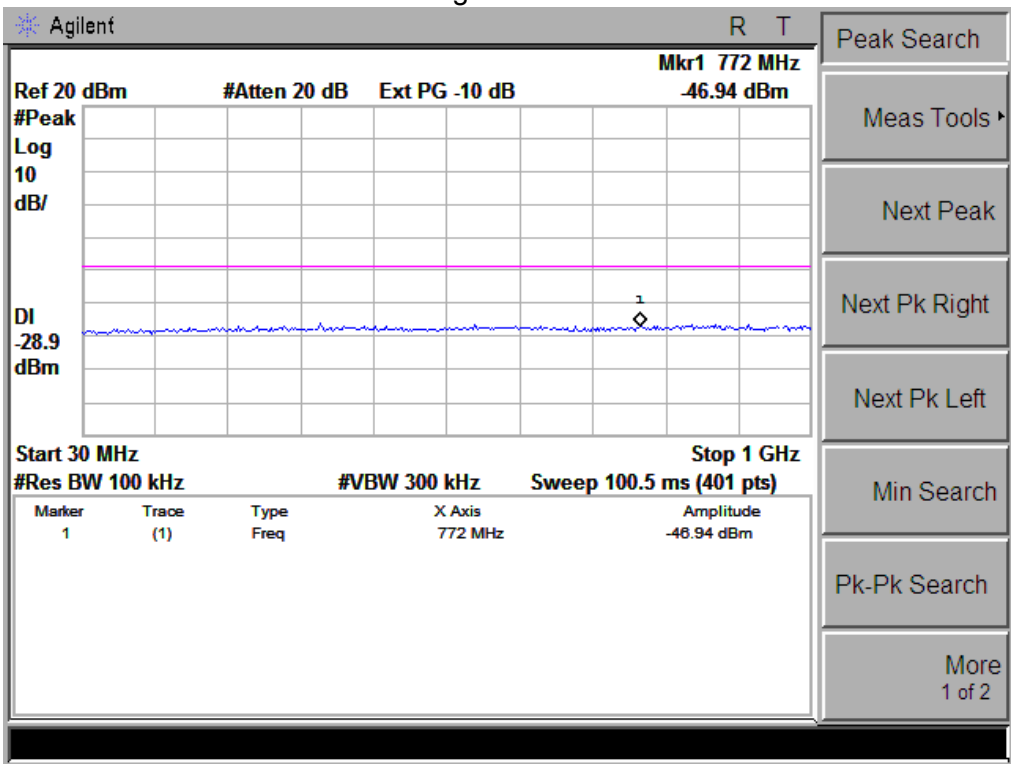


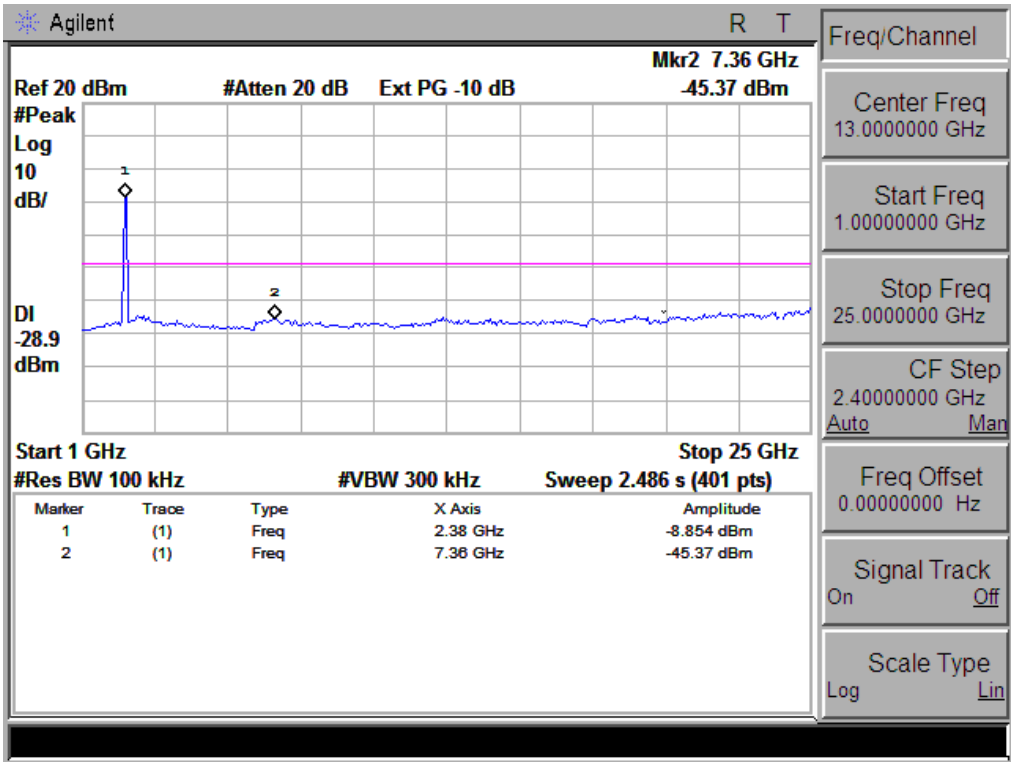
802.11b High Channel



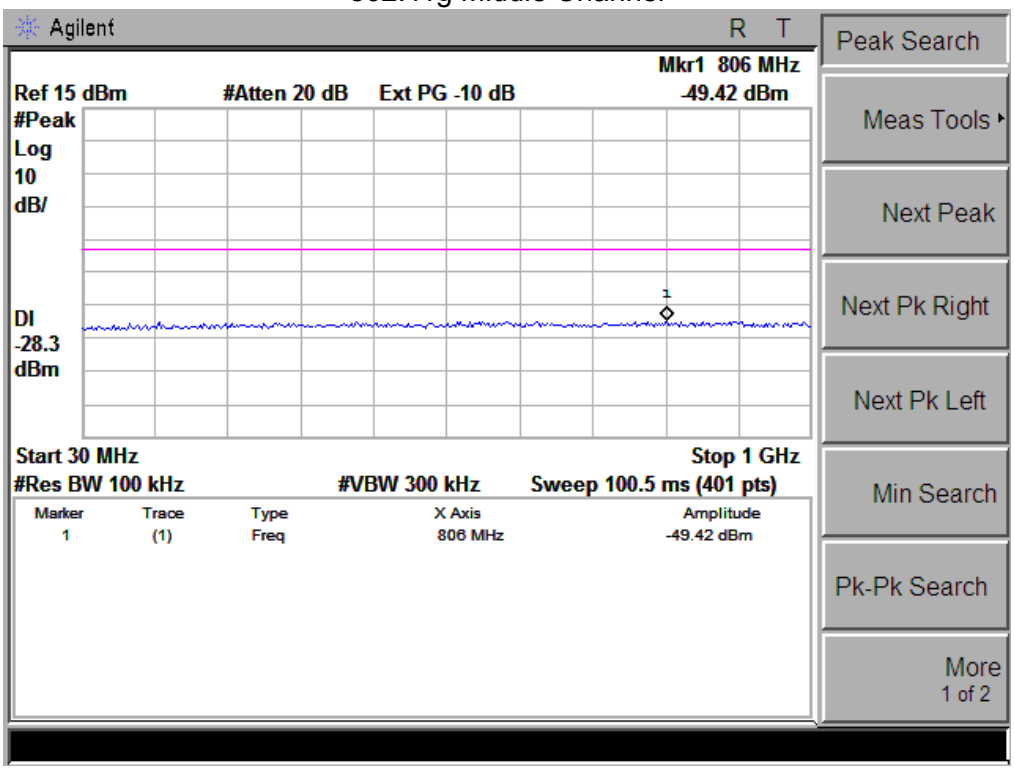


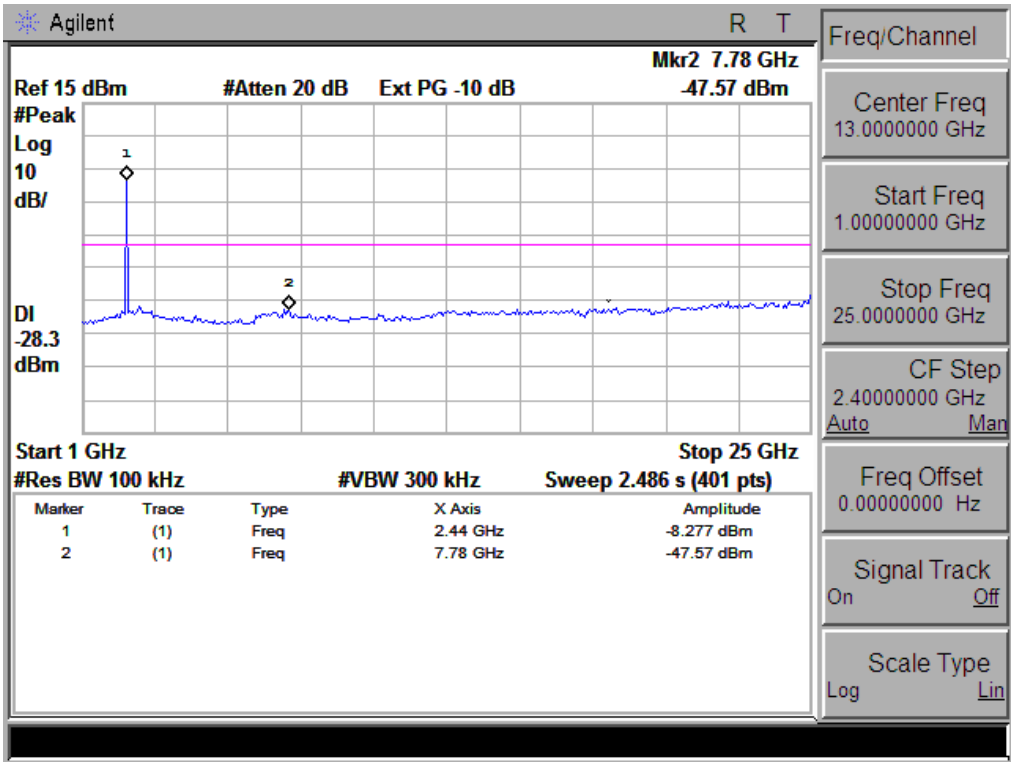
802.11g Low Channel



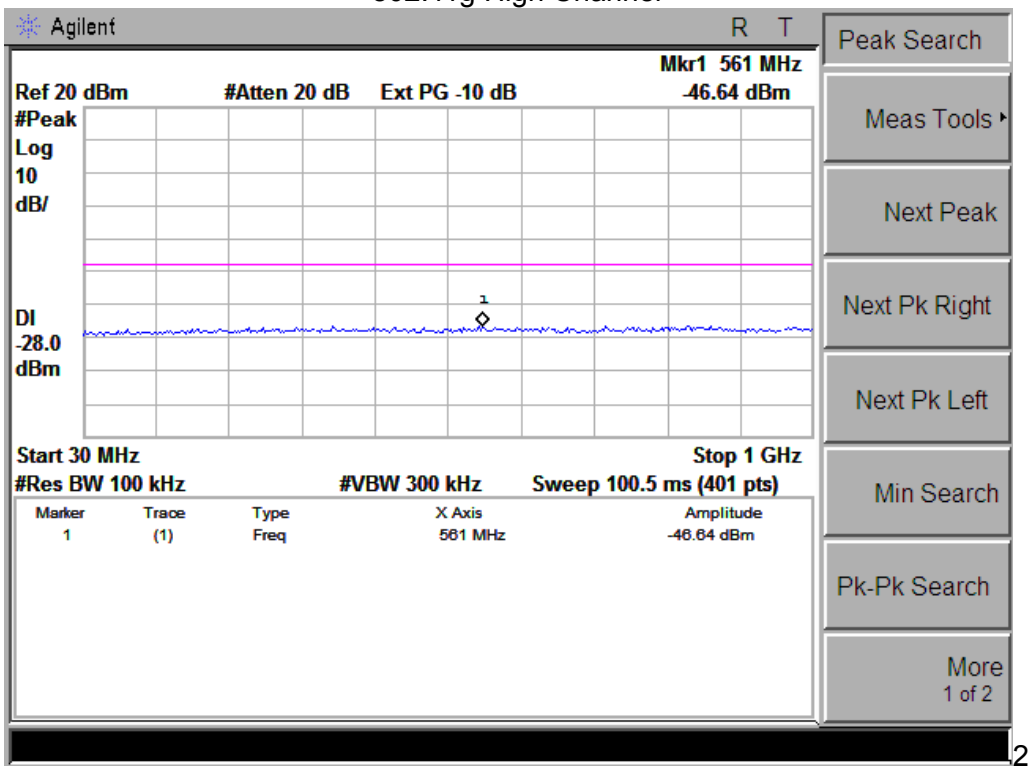


802.11g Middle Channel

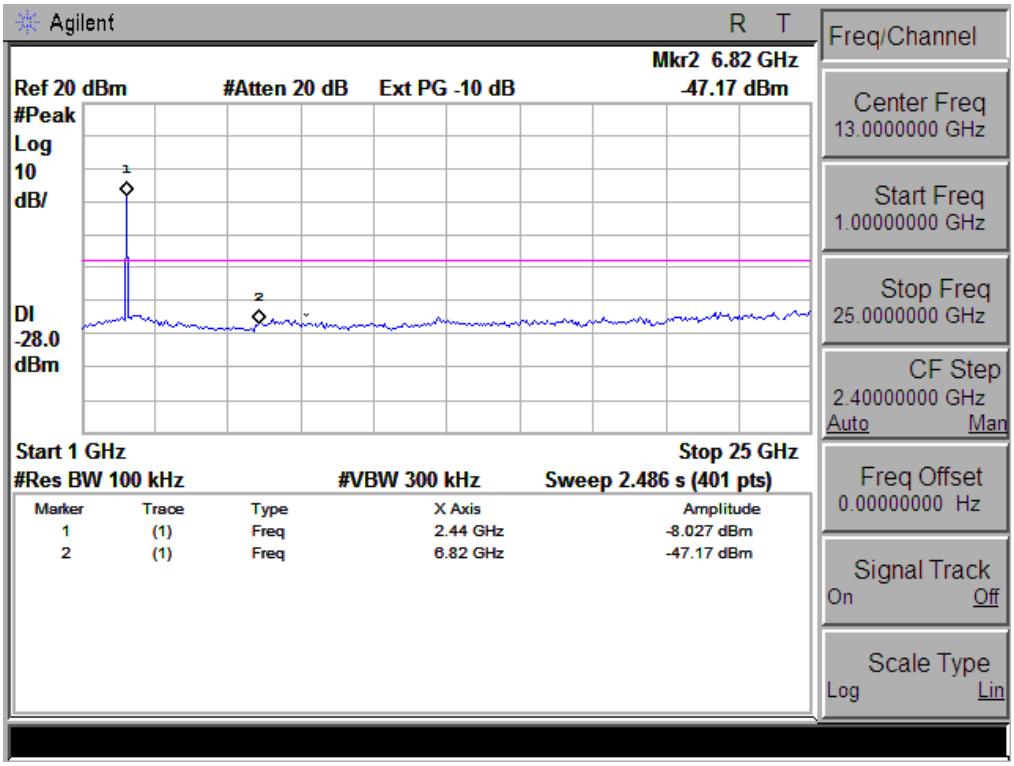




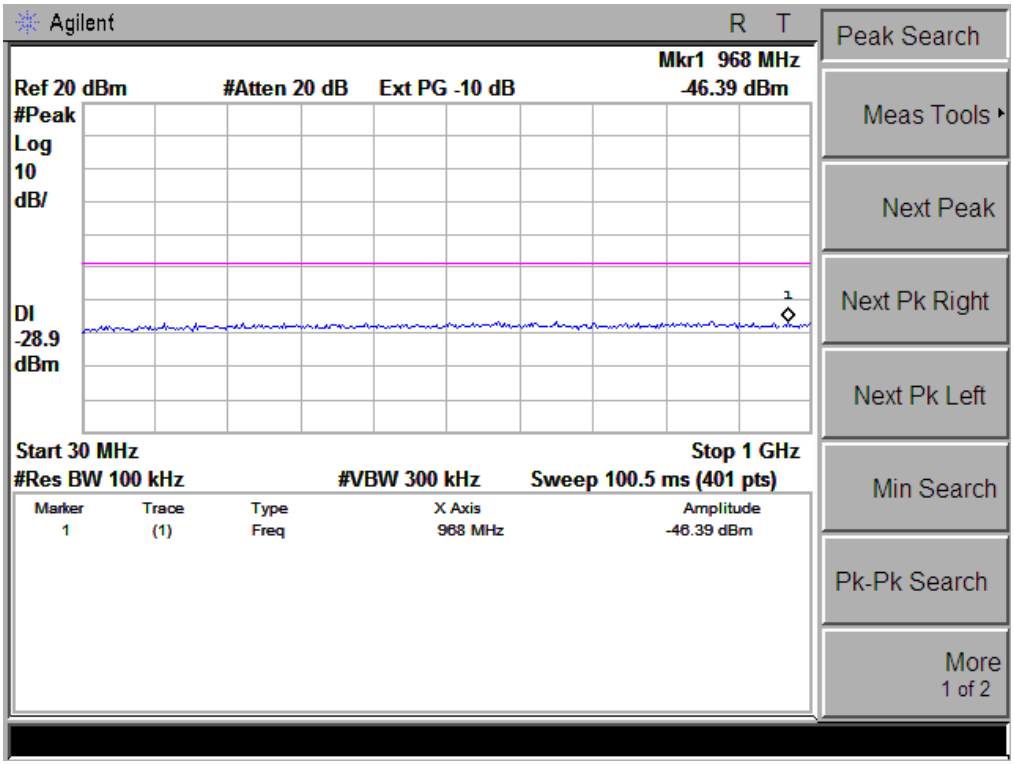
802.11g High Channel

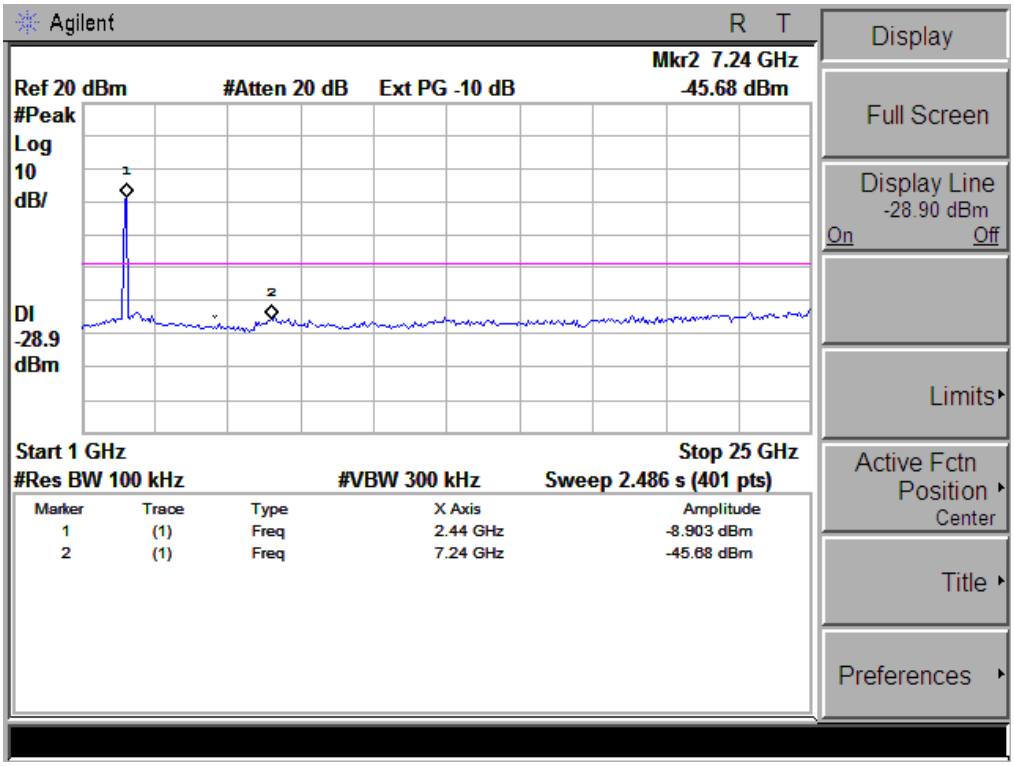


2

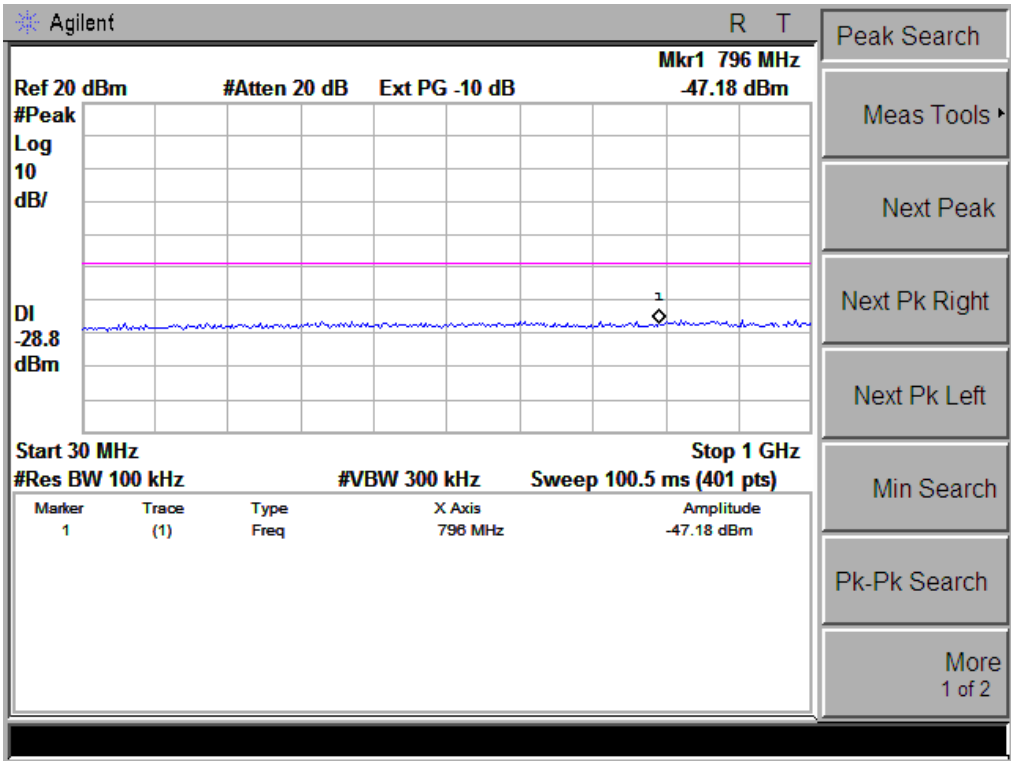


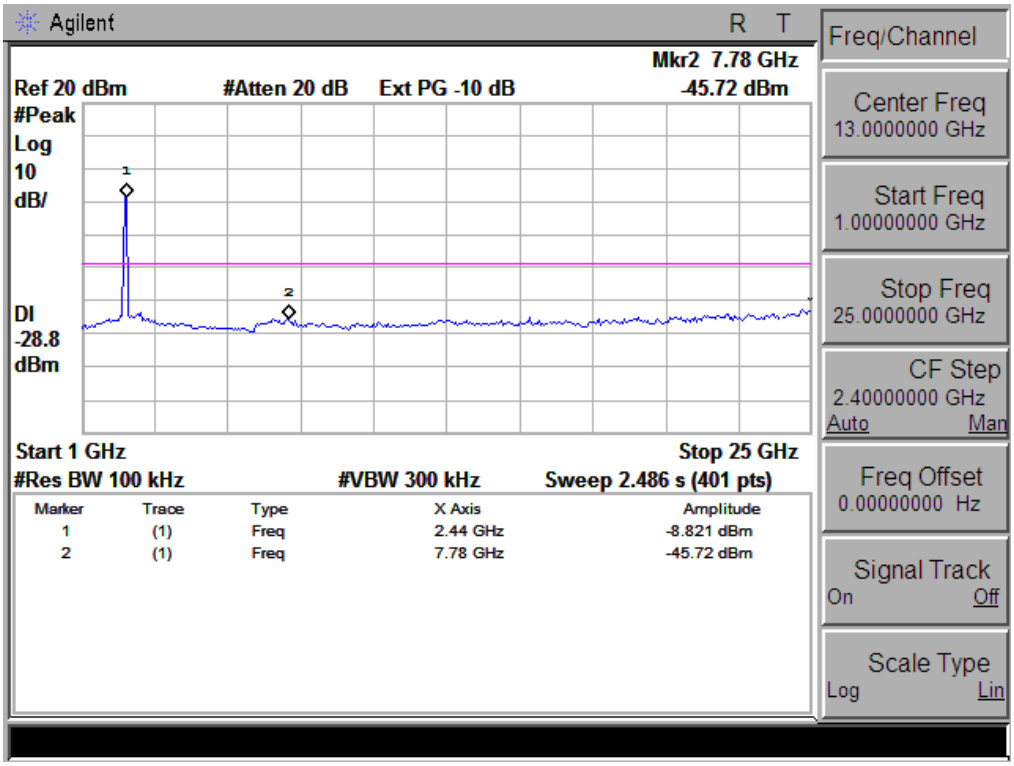
802.11n-HT20 Low Channel



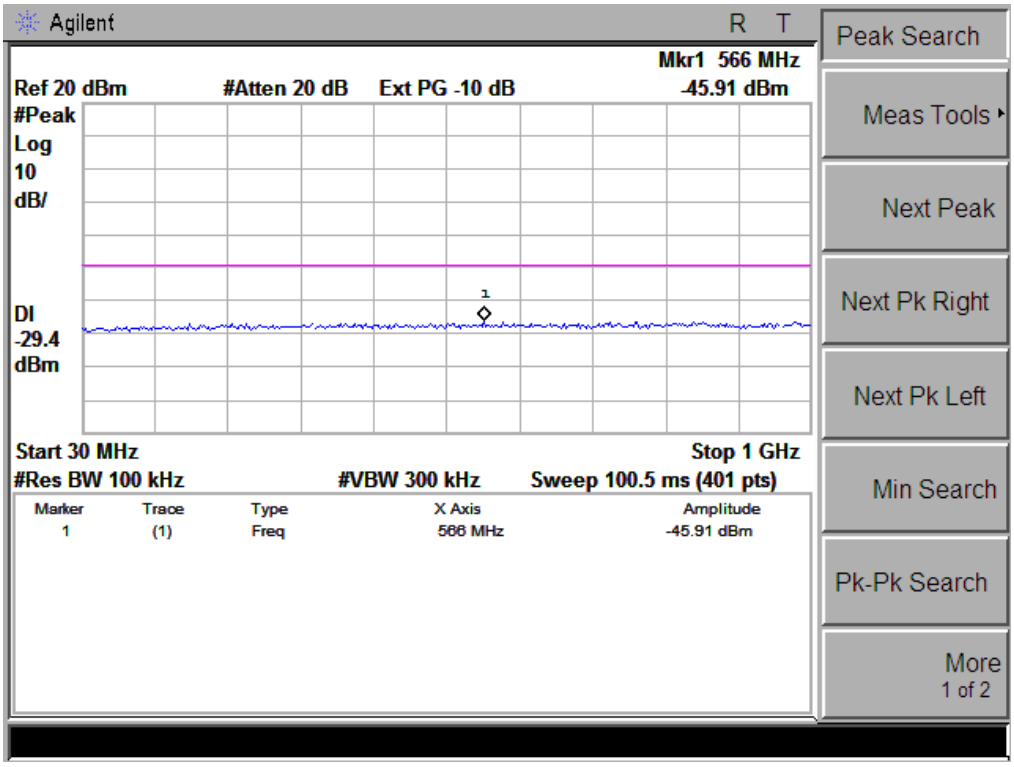


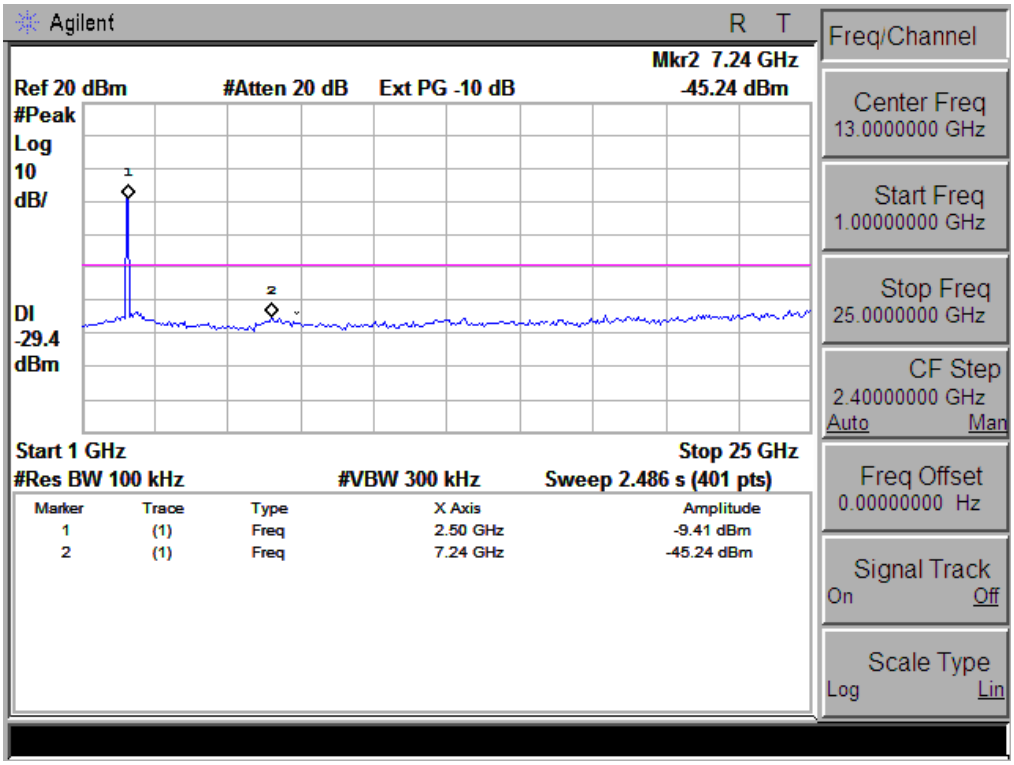
802.11n-HT20 Middle Channel





802.11n-HT20 High Channel





4. POWER SPECTRAL DENSITY TEST

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

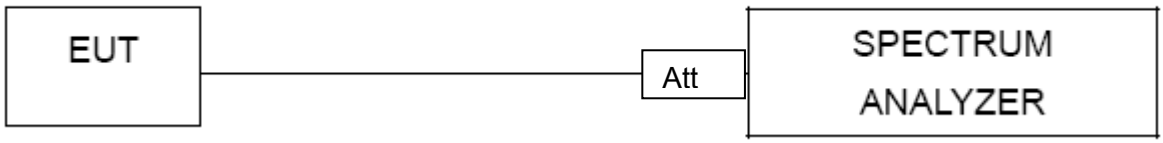
4.1.1 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. 3 kHz ≤Set the RBW≤100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION CONDITIONS

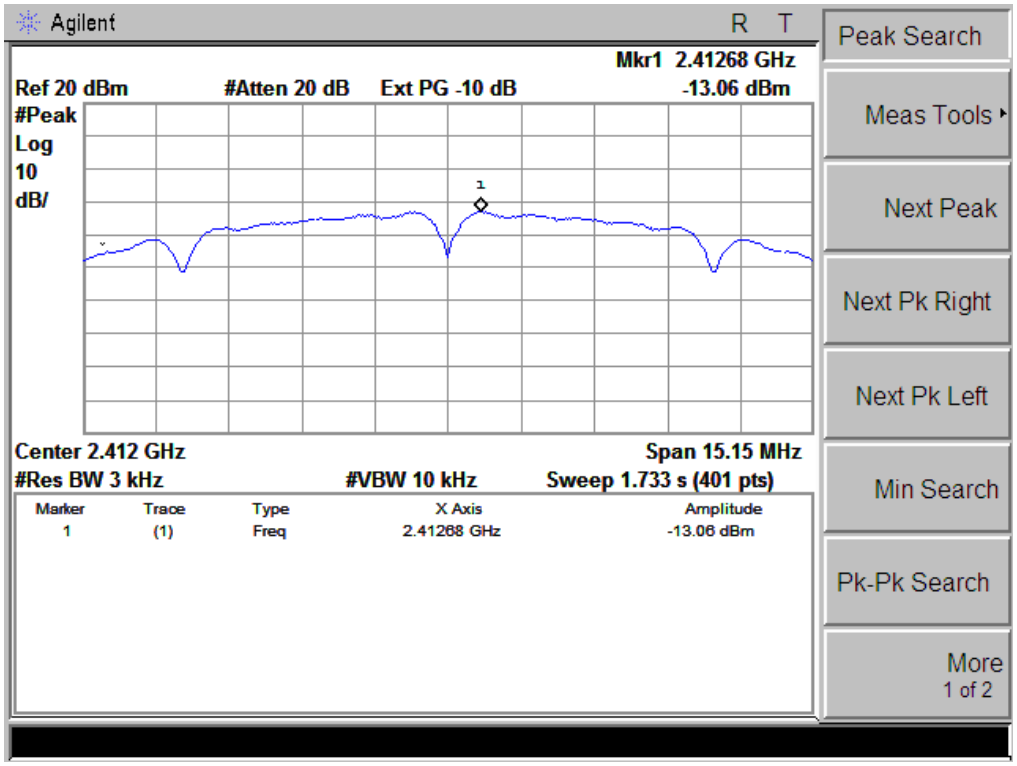
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

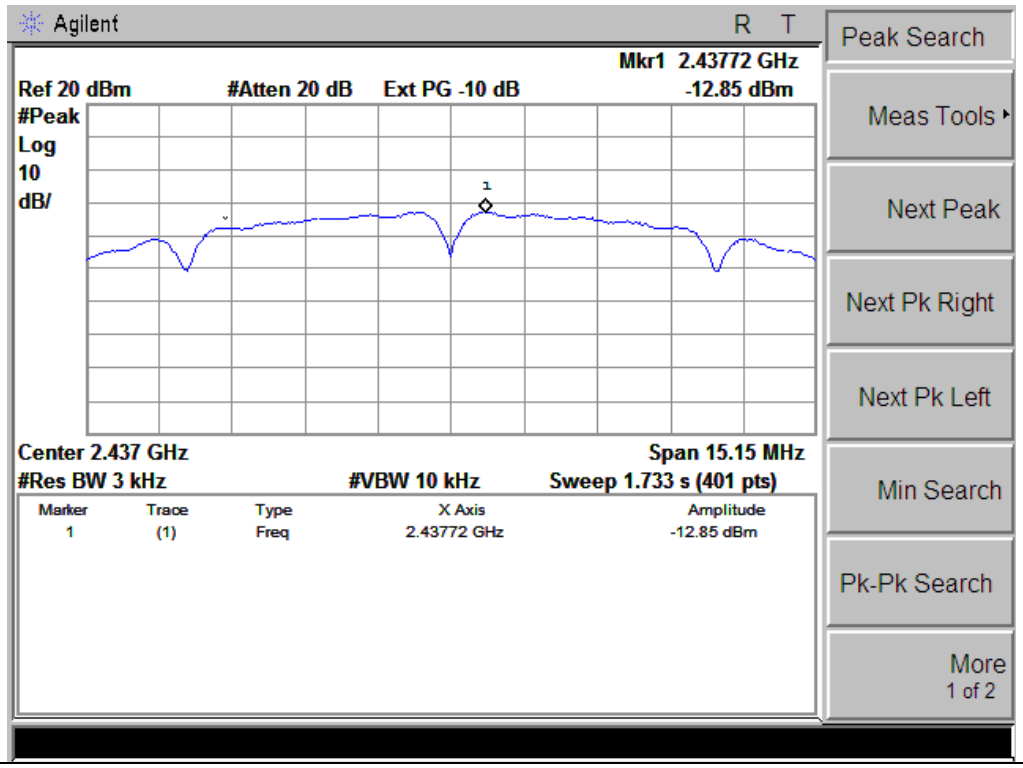
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX b Mode /CH01, CH06, CH11-Ant A		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-13.06	8	PASS
2437 MHz	-12.85	8	PASS
2462 MHz	-12.33	8	PASS

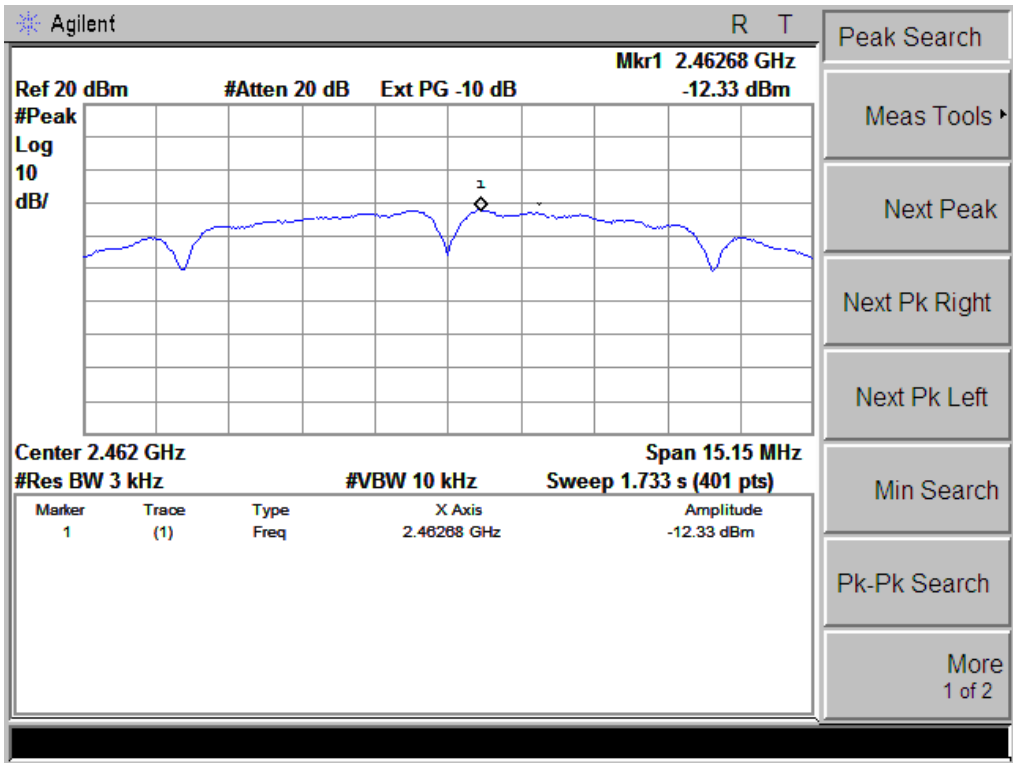
TX CH01



TX CH06



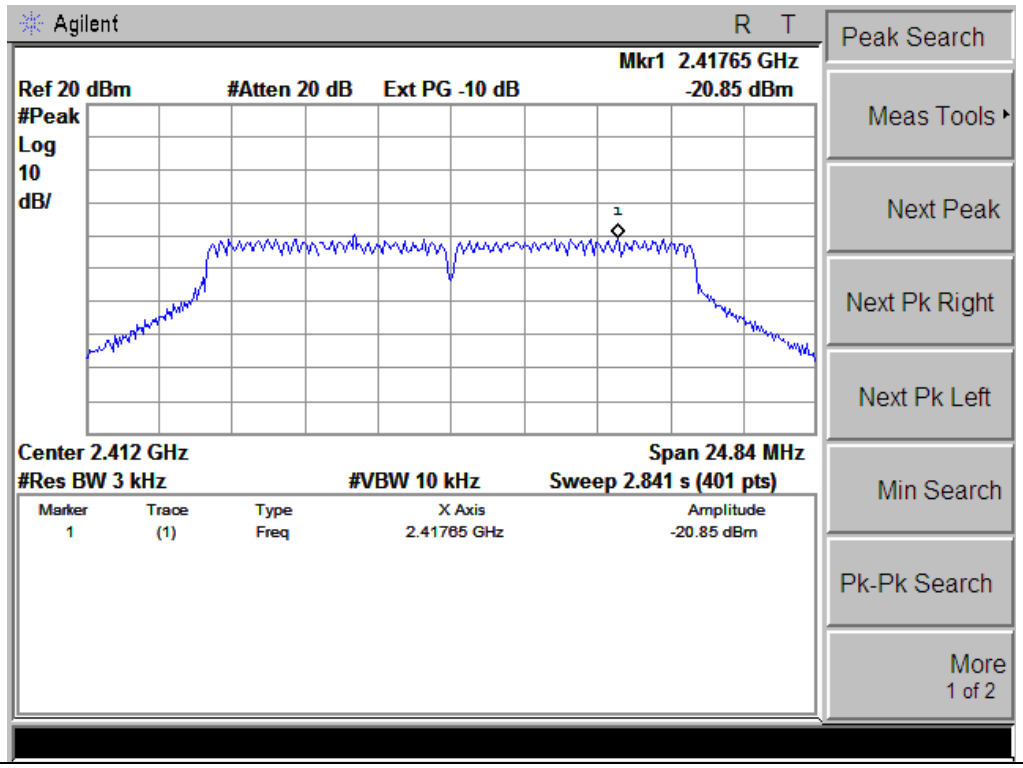
TX CH11



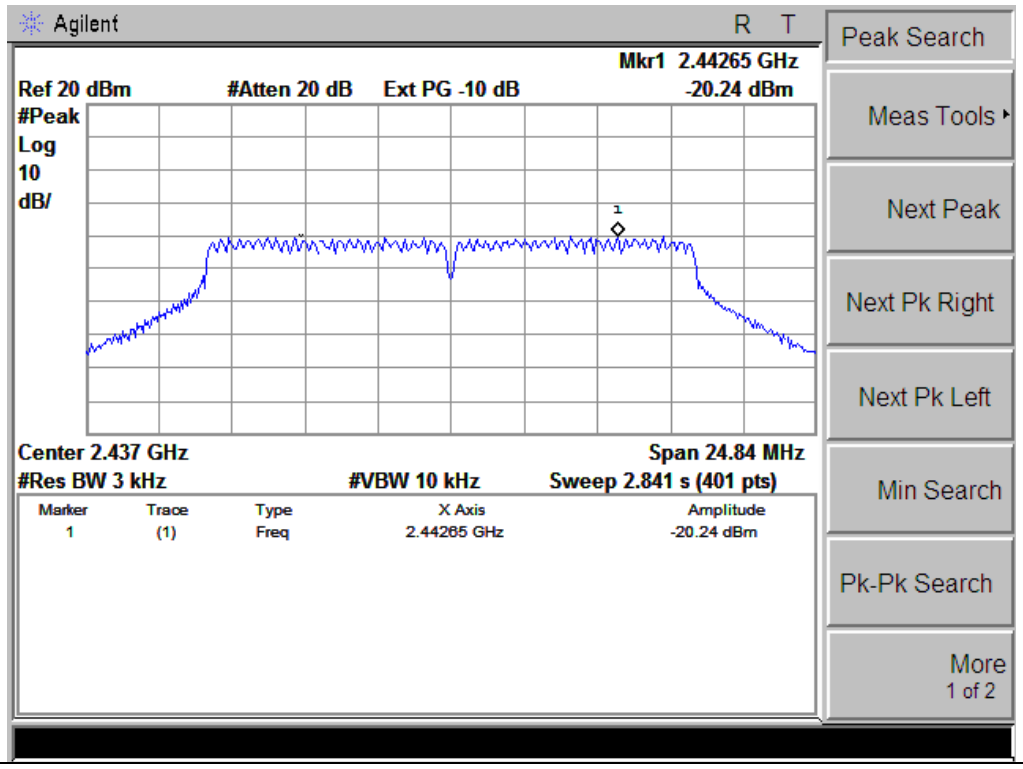
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX g Mode /CH01, CH06, CH11-Ant A		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-20.85	8	PASS
2437 MHz	-20.24	8	PASS
2462 MHz	-19.77	8	PASS

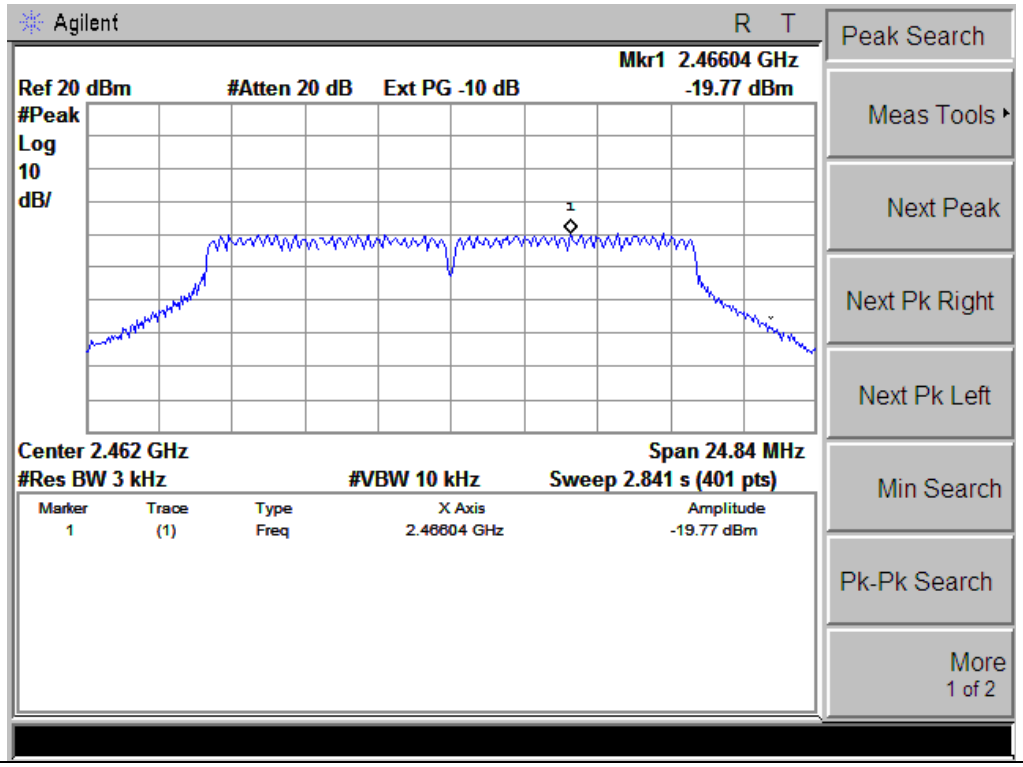
TX CH01



TX CH06



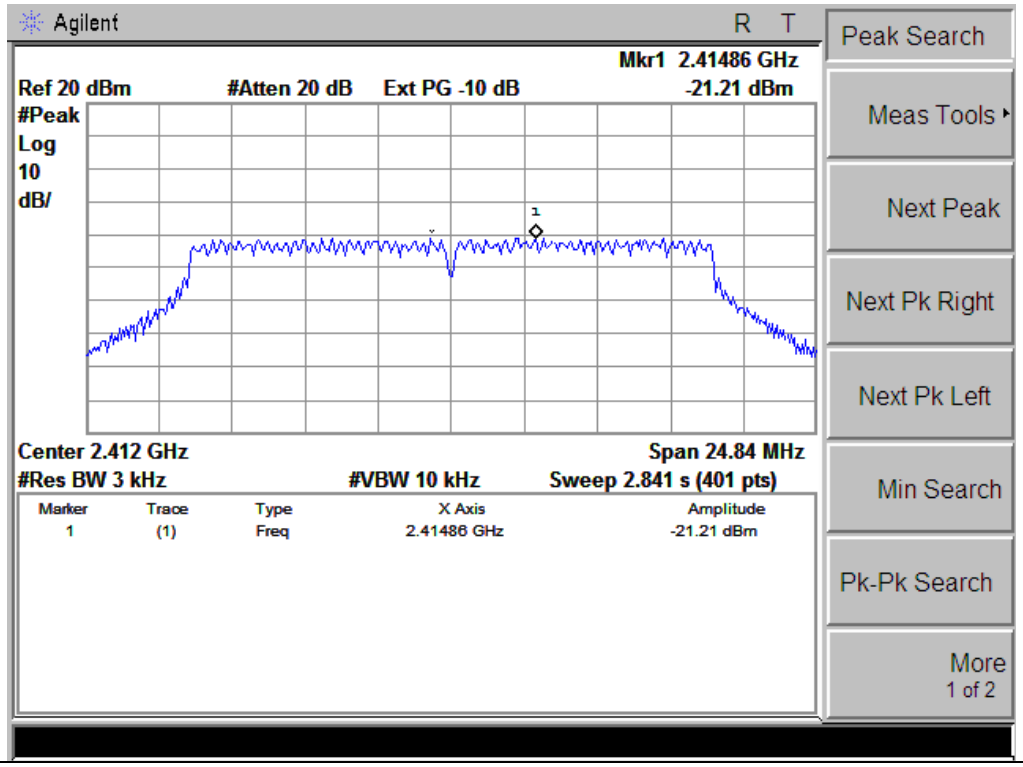
TX CH11



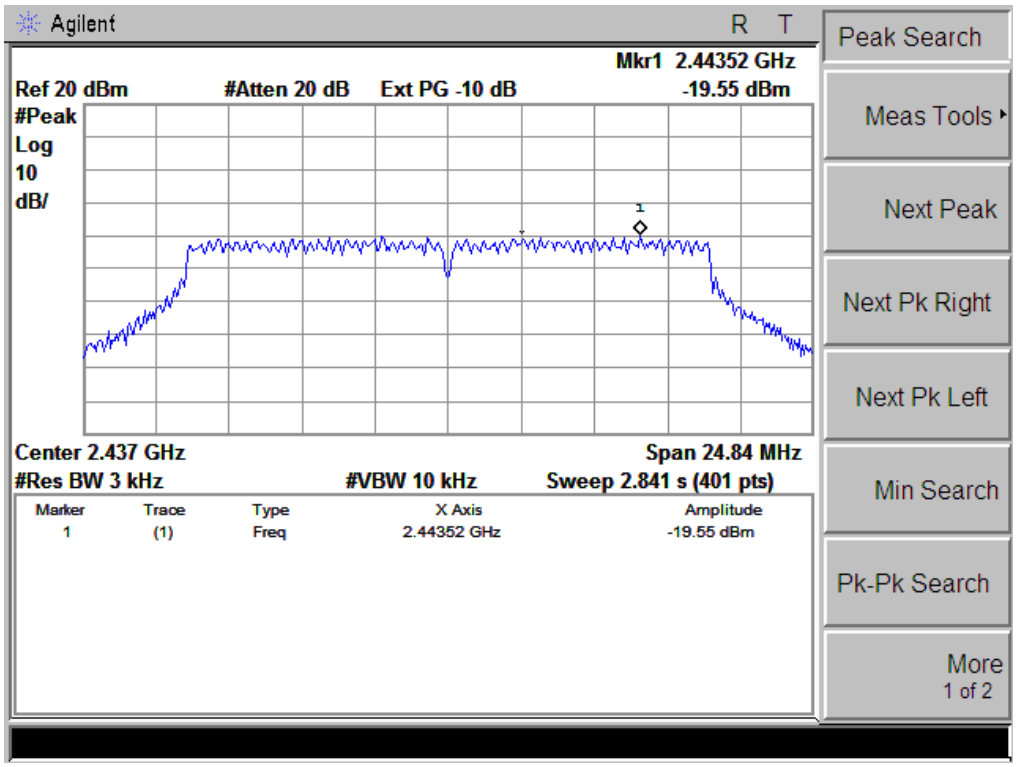
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX n Mode(20M) /CH01, CH06, CH11-Ant A		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-21.21	8	PASS
2437 MHz	-19.55	8	PASS
2462 MHz	-19.26	8	PASS

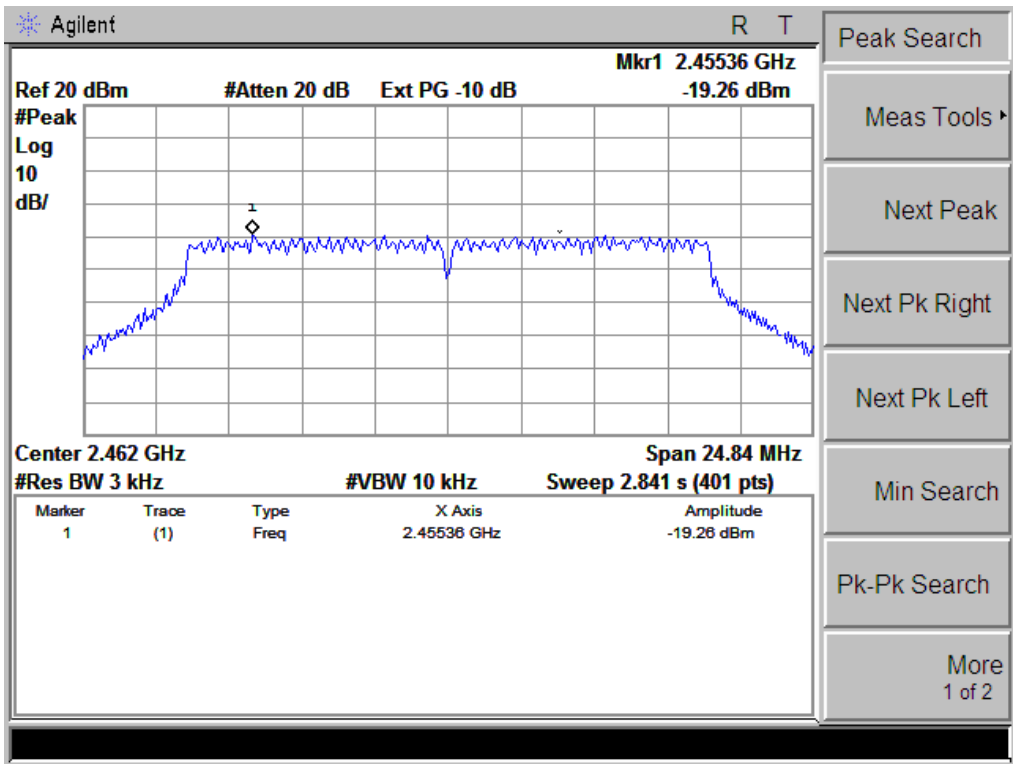
TX CH01



TX CH06



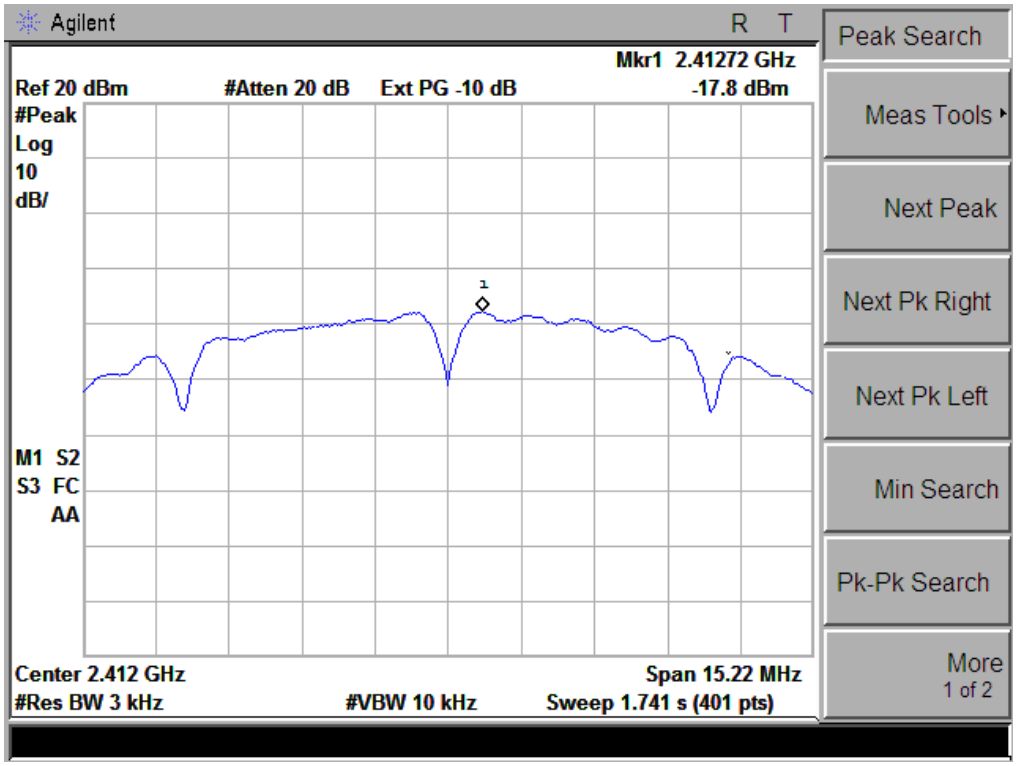
TX CH11



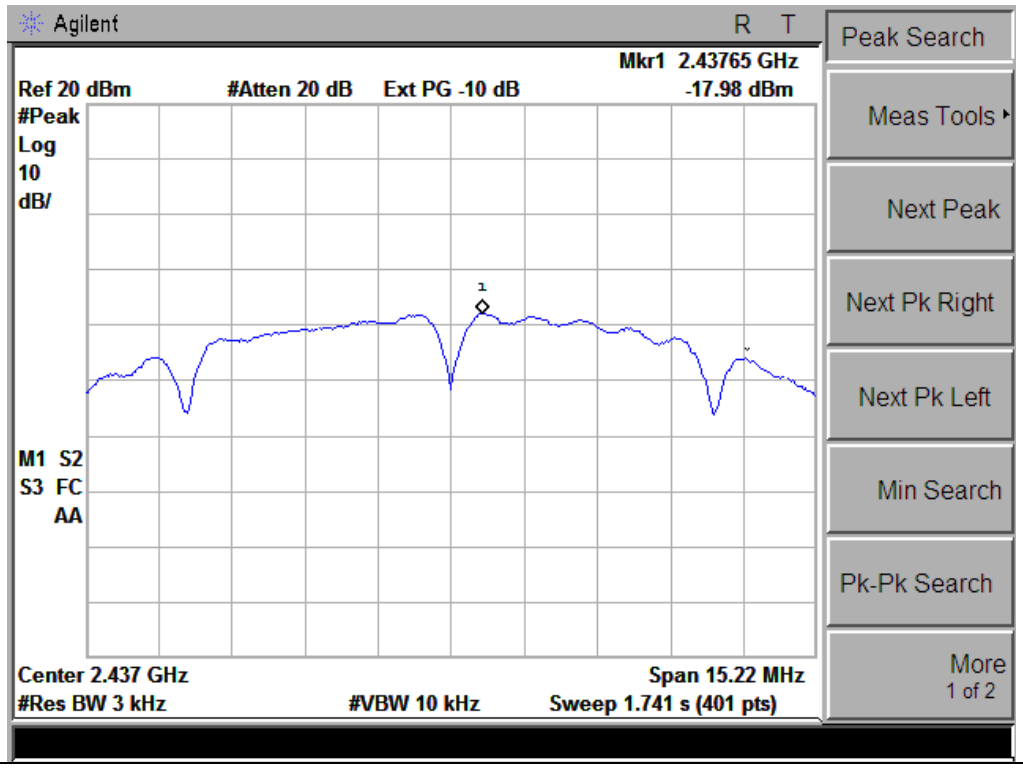
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX b Mode /CH01, CH06, CH11-Ant B		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-17.80	8	PASS
2437 MHz	-17.98	8	PASS
2462 MHz	-17.16	8	PASS

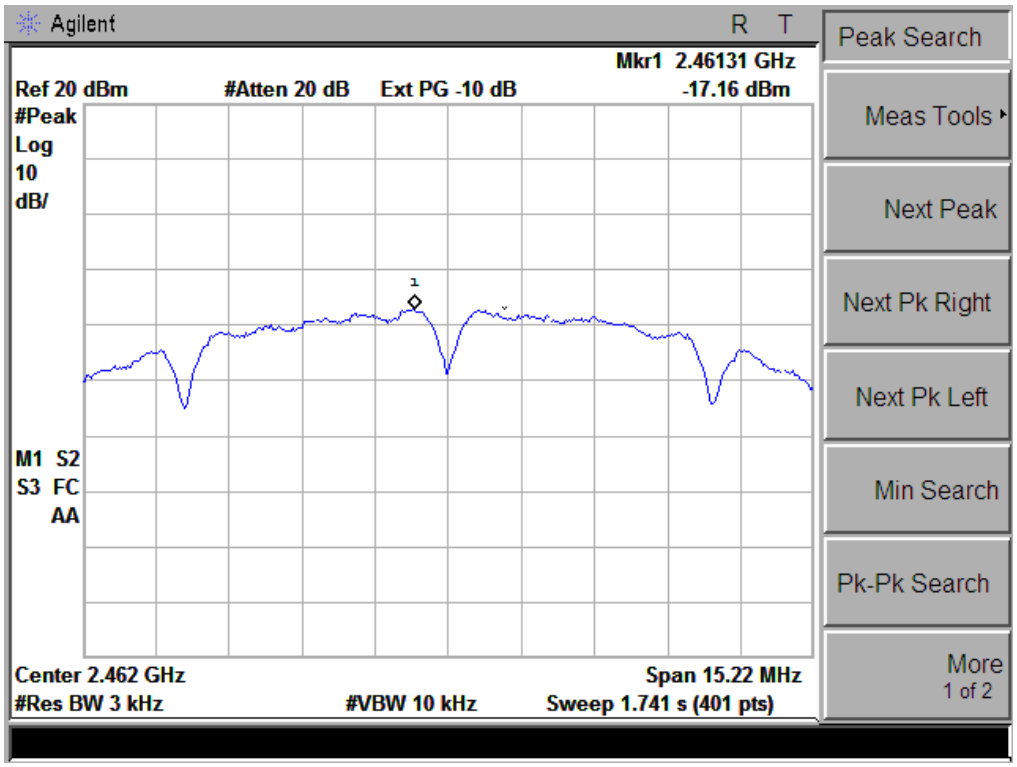
TX CH01



TX CH06



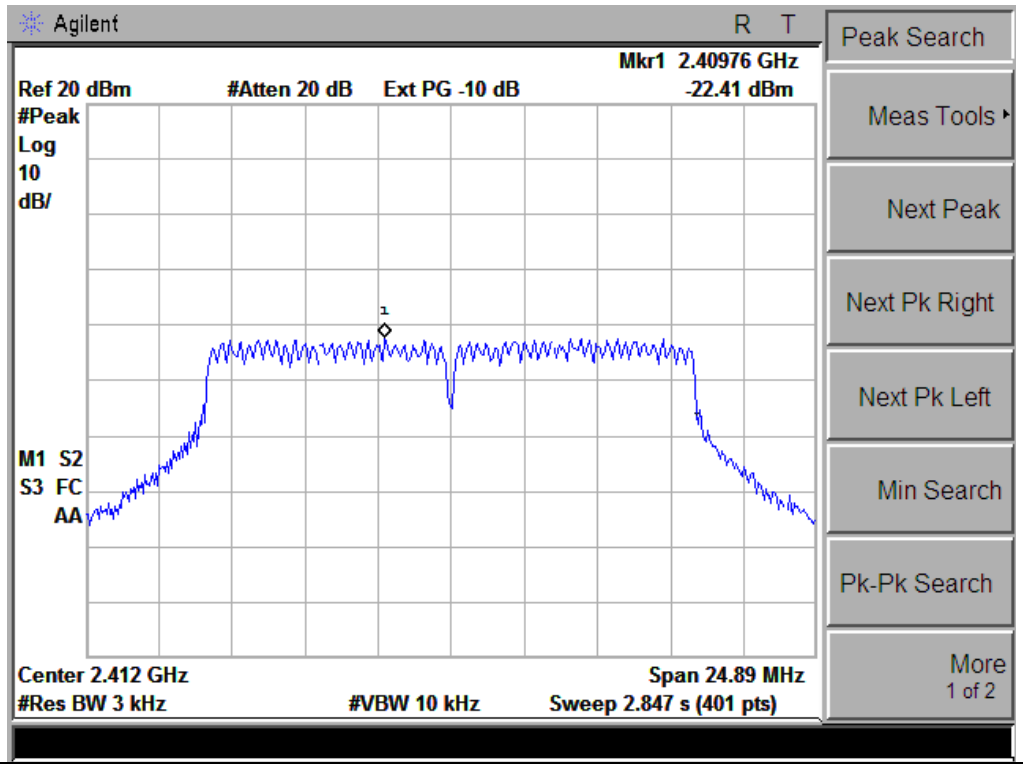
TX CH11



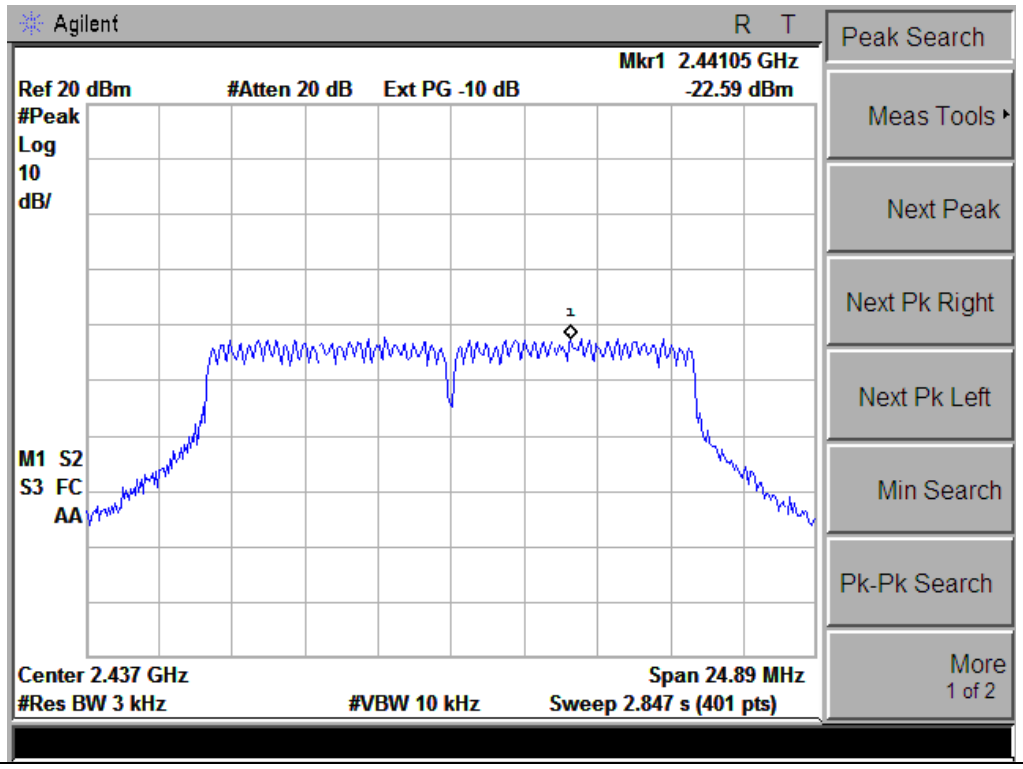
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX g Mode /CH01, CH06, CH11-Ant B		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-22.41	8	PASS
2437 MHz	-22.59	8	PASS
2462 MHz	-22.12	8	PASS

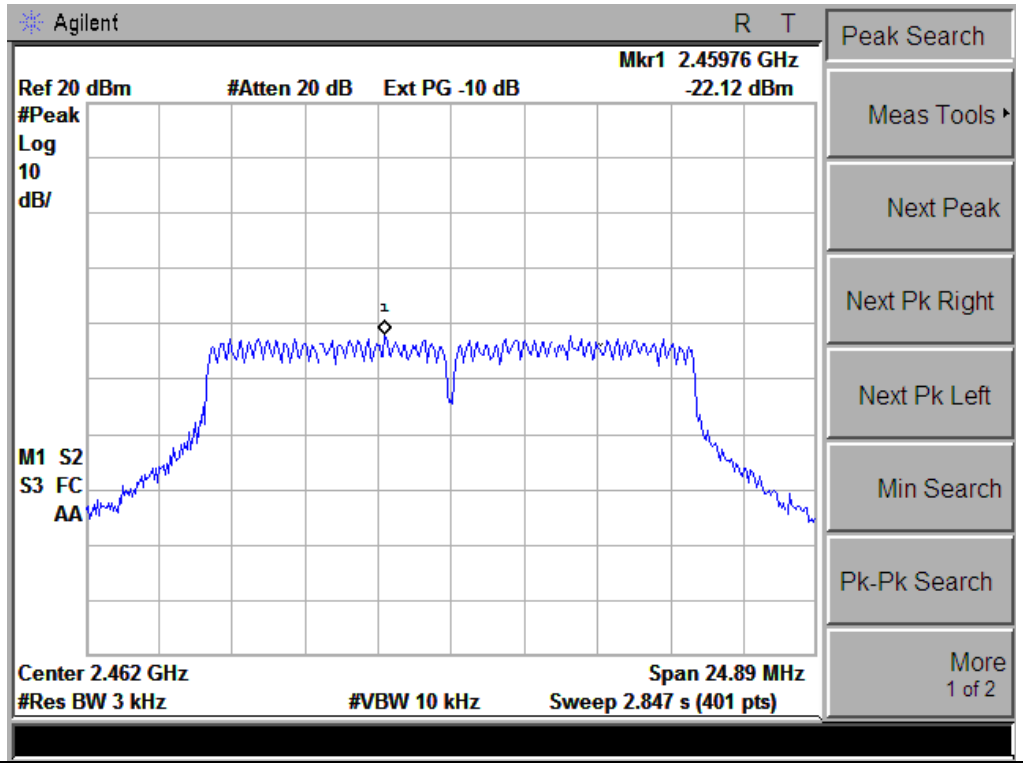
TX CH01



TX CH06



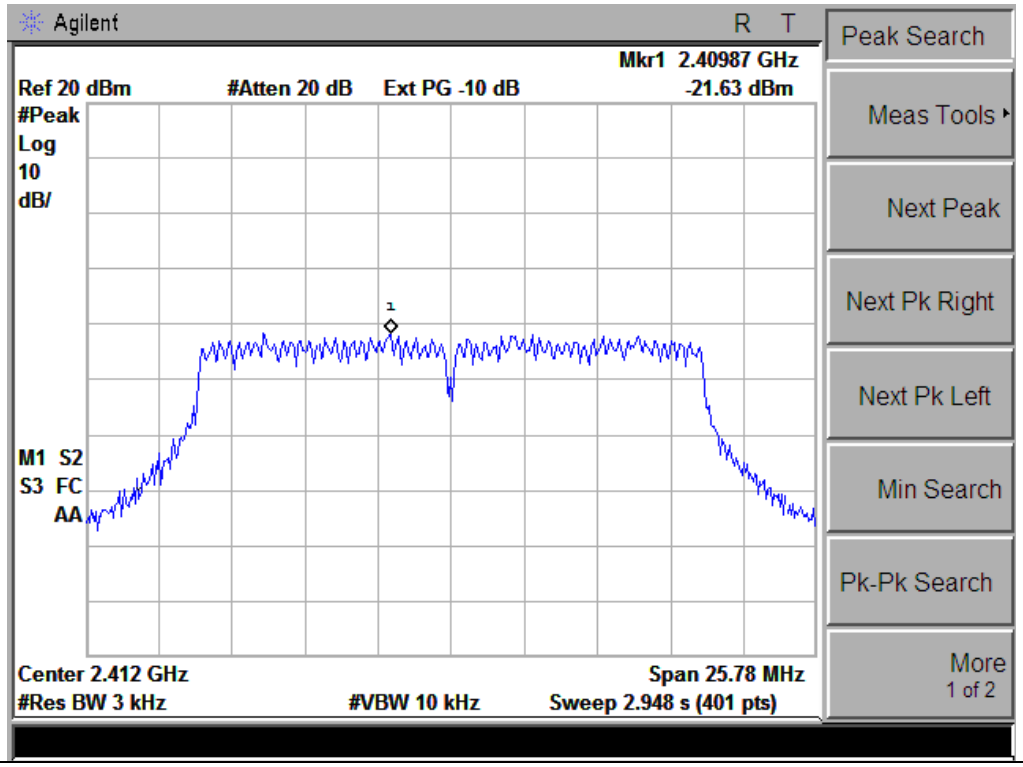
TX CH11



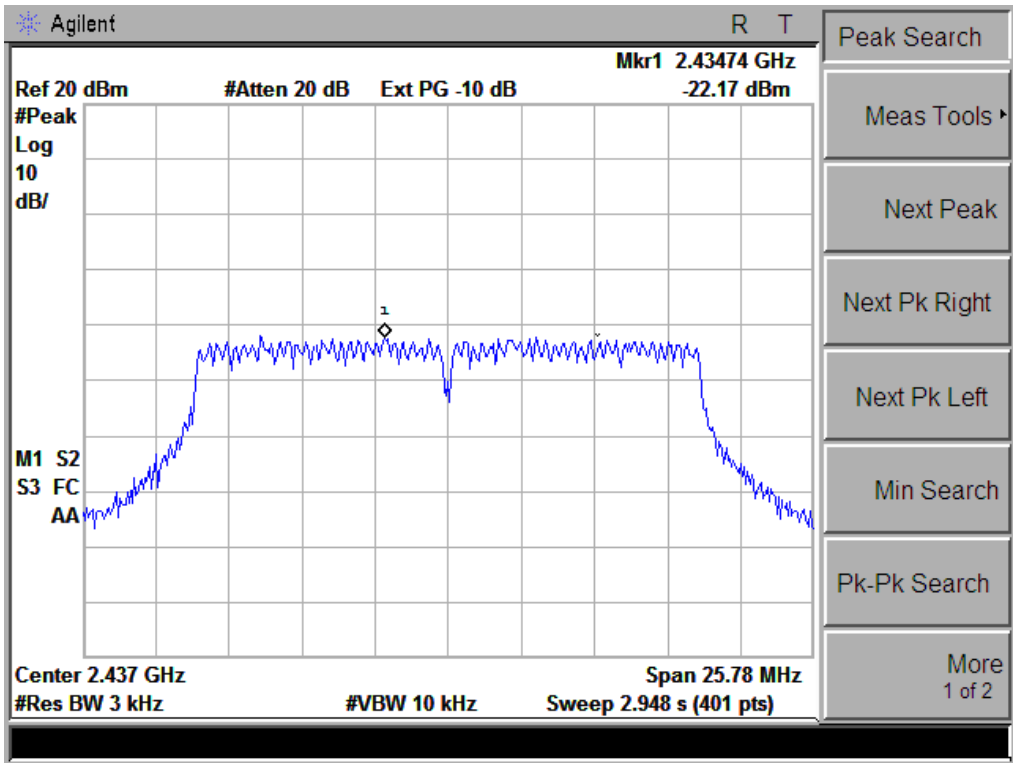
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX n Mode(20M) /CH01, CH06, CH11-Ant B		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-21.63	8	PASS
2437 MHz	-22.17	8	PASS
2462 MHz	-17.13	8	PASS

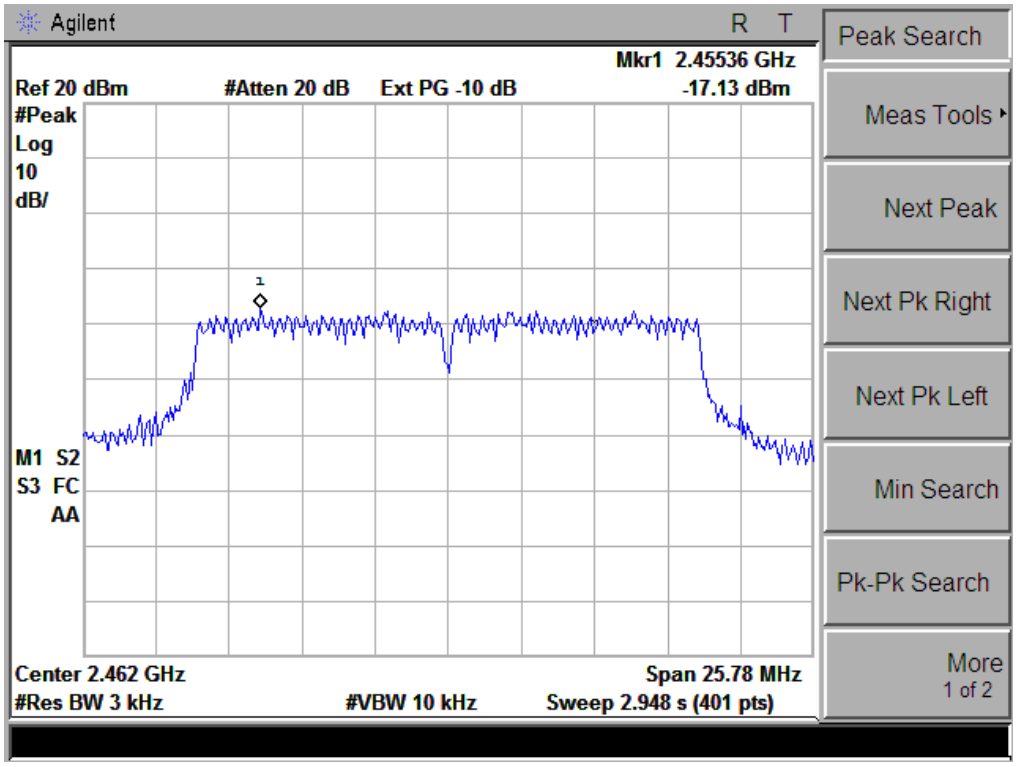
TX CH01



TX CH06



TX CH11



5. BANDWIDTH TEST

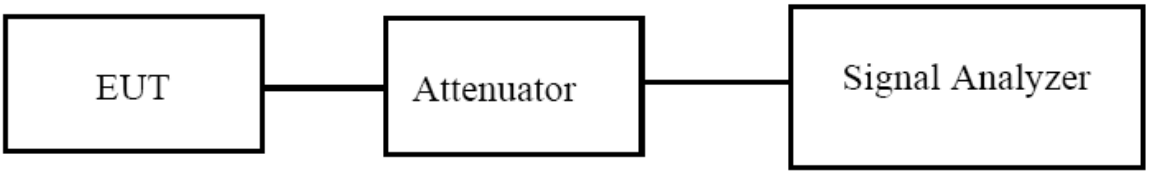
5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

5.1.1 TEST PROCEDURE

According to KDB 558074 D01 DTS Meas Guidance v03r01

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



5.1.2 EUT OPERATION CONDITIONS

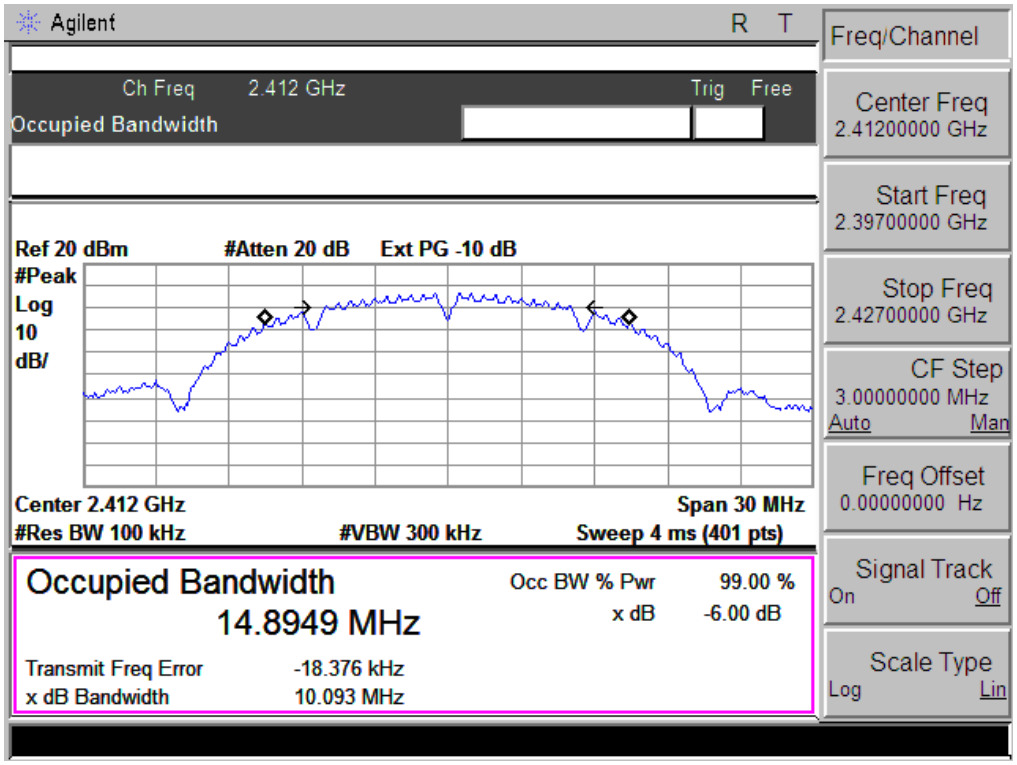
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.3 TEST RESULTS

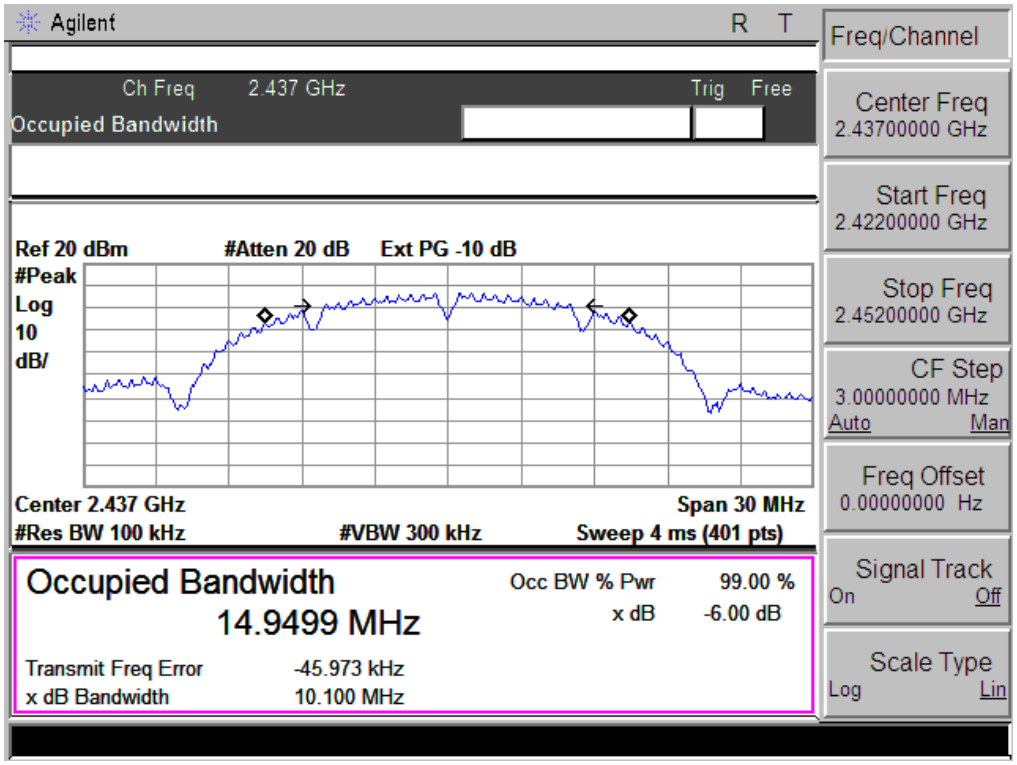
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX b Mode /CH01, CH06, CH11-Ant A		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.093	500	Pass
Middle	2437	10.100	500	Pass
High	2462	10.097	500	Pass

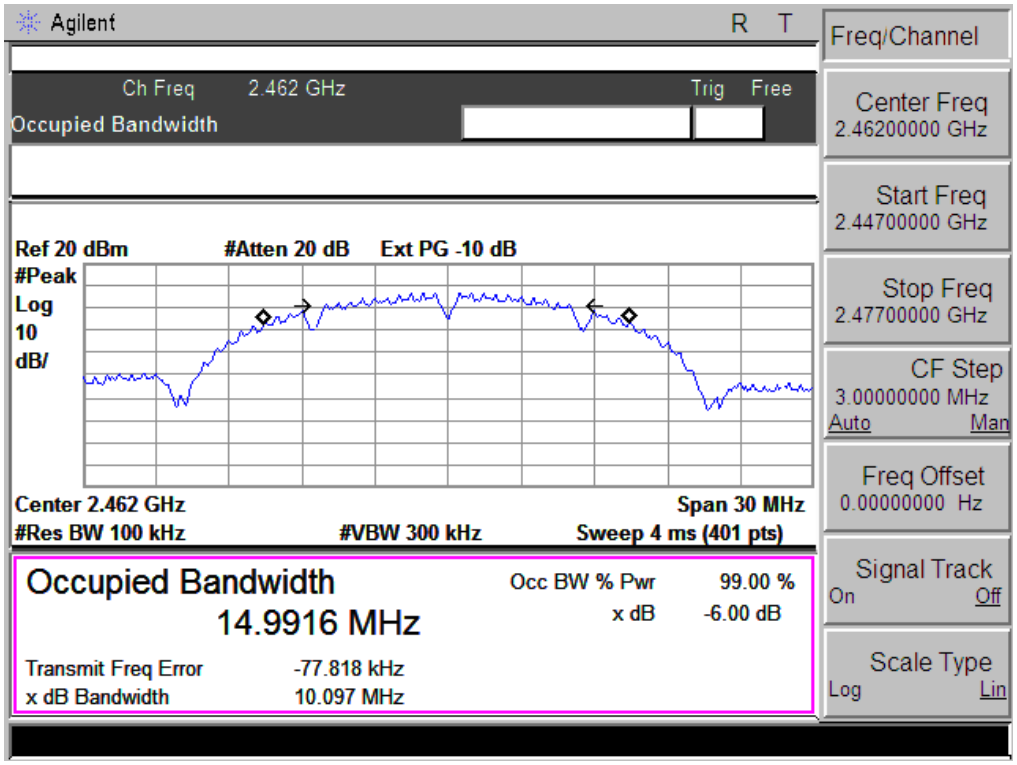
TX CH 01



TX CH 06



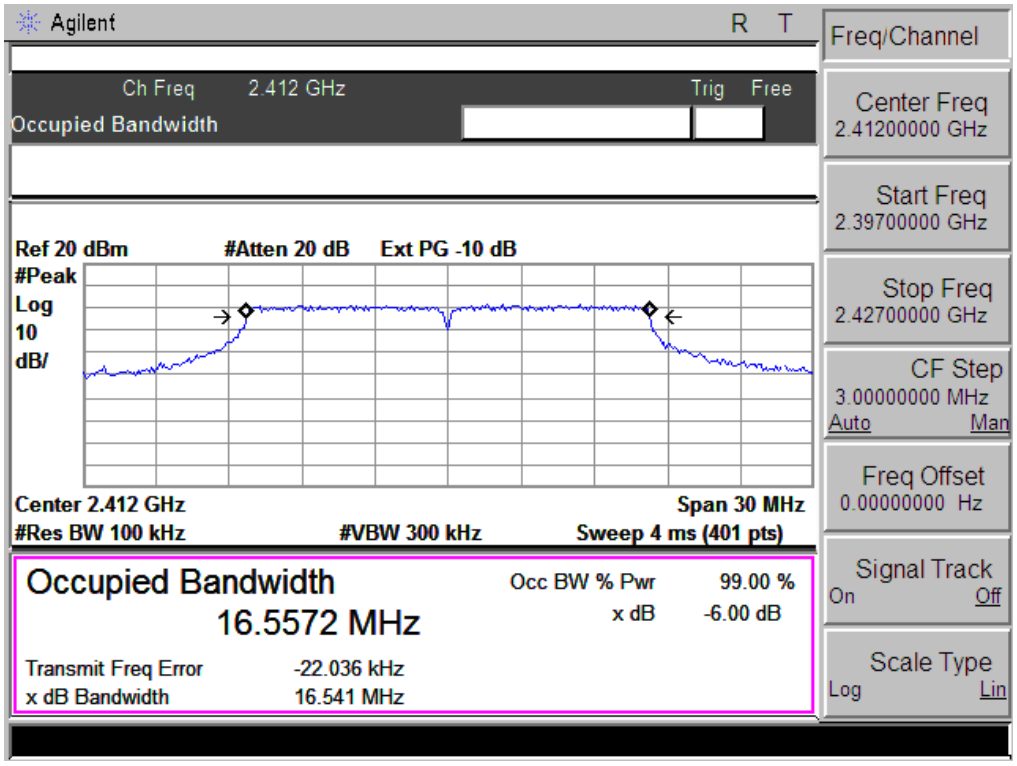
TX CH 11



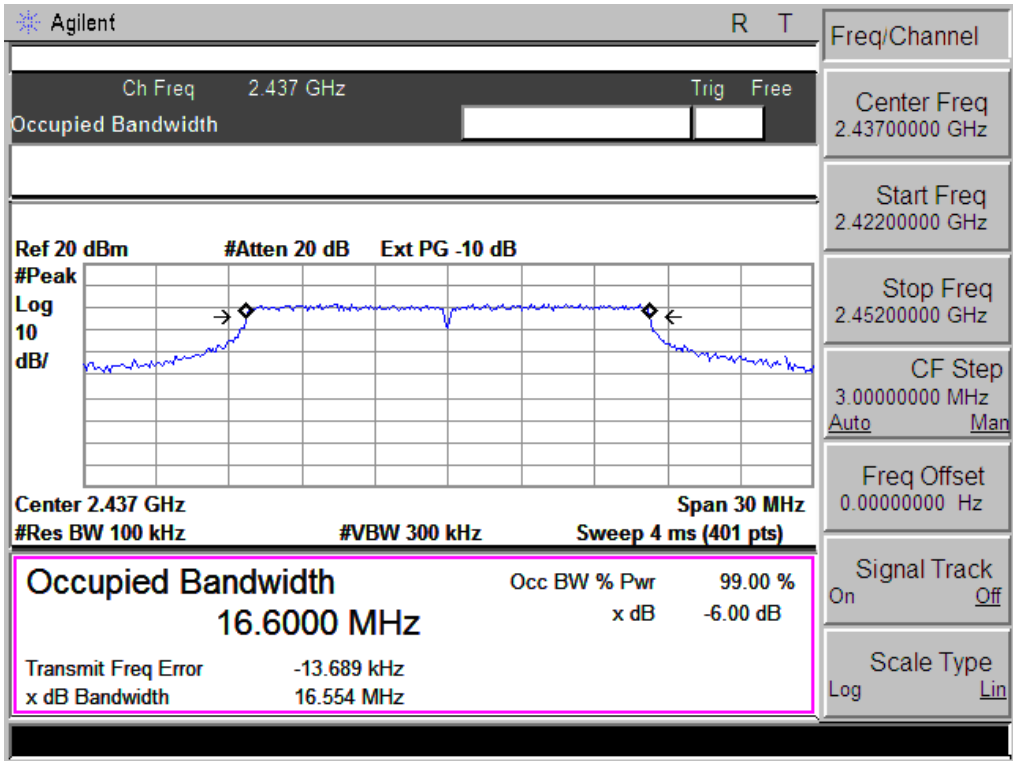
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX g Mode /CH01, CH06, CH11-Ant A		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.541	500	Pass
Middle	2437	16.554	500	Pass
High	2462	16.543	500	Pass

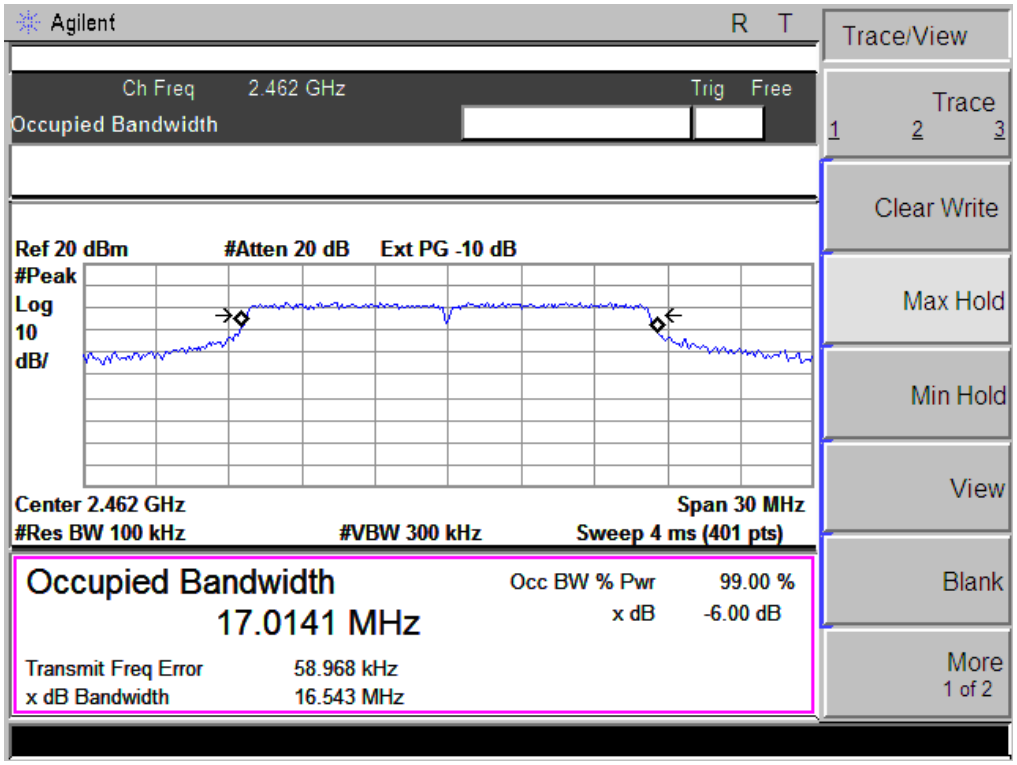
TX CH 01



TX CH 06



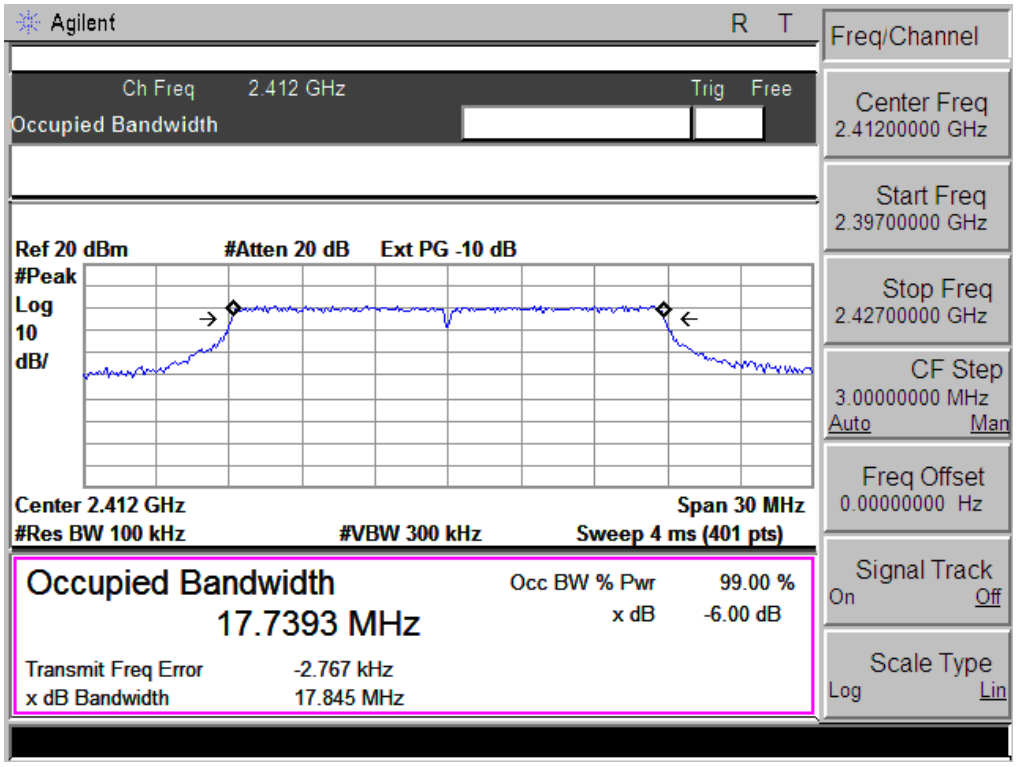
TX CH 11



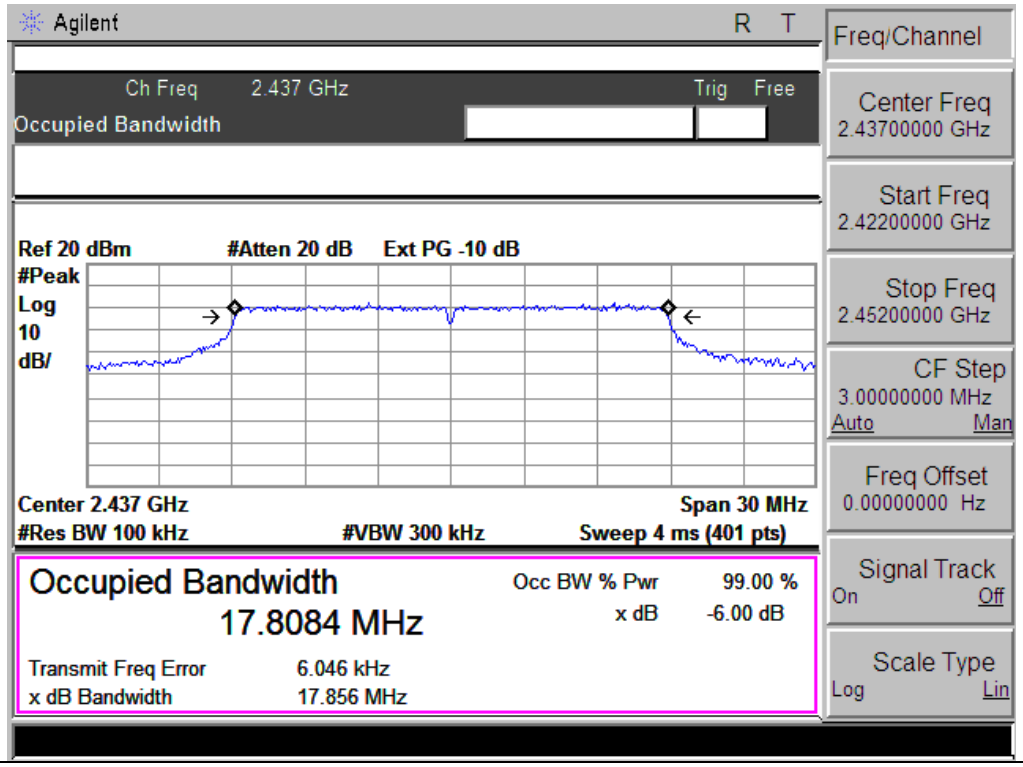
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX n Mode(20M) /CH01, CH06, CH11-Ant A		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.845	500	Pass
Middle	2437	17.856	500	Pass
High	2462	17.876	500	Pass

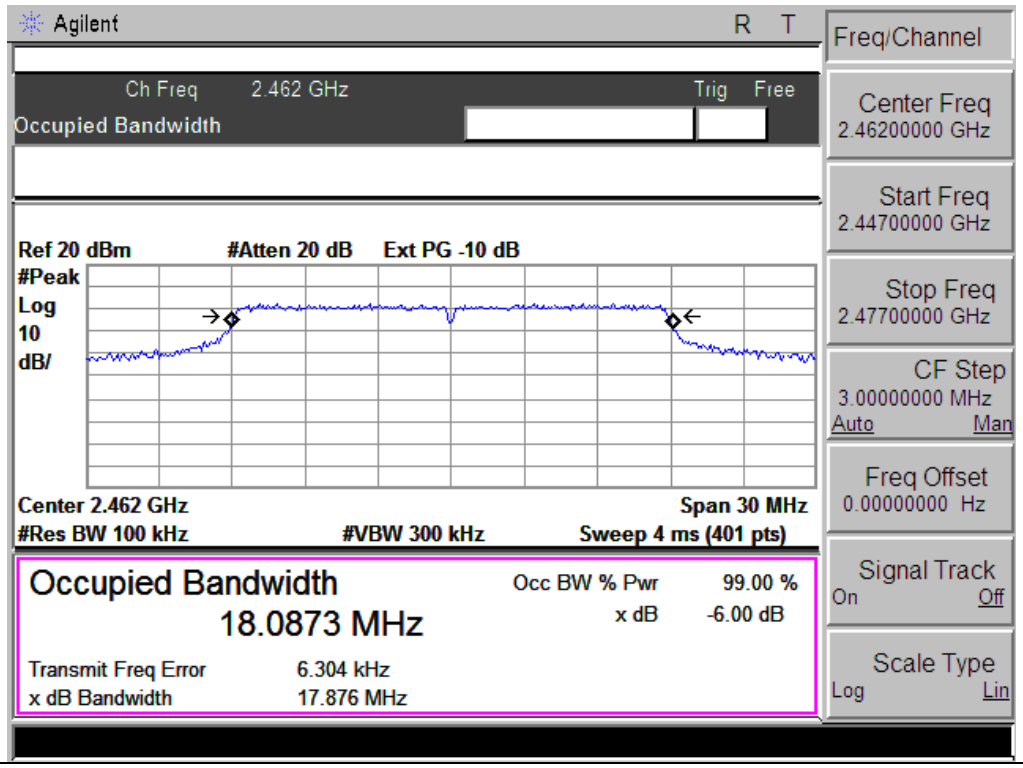
TX CH 01



TX CH 06



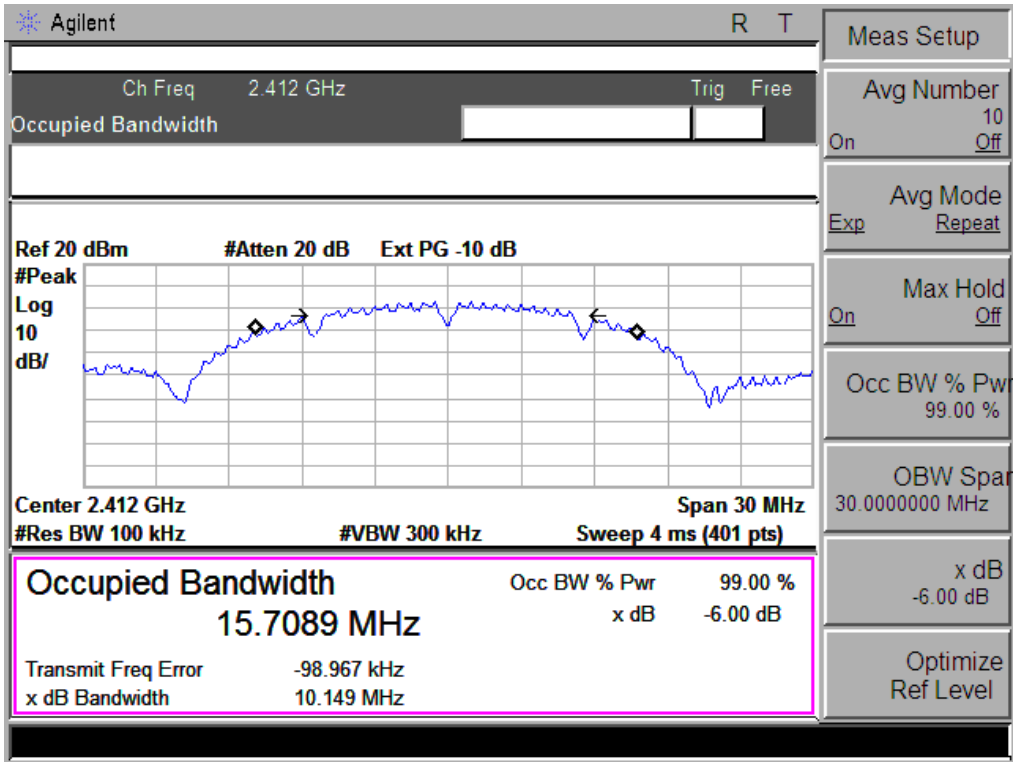
TX CH 11



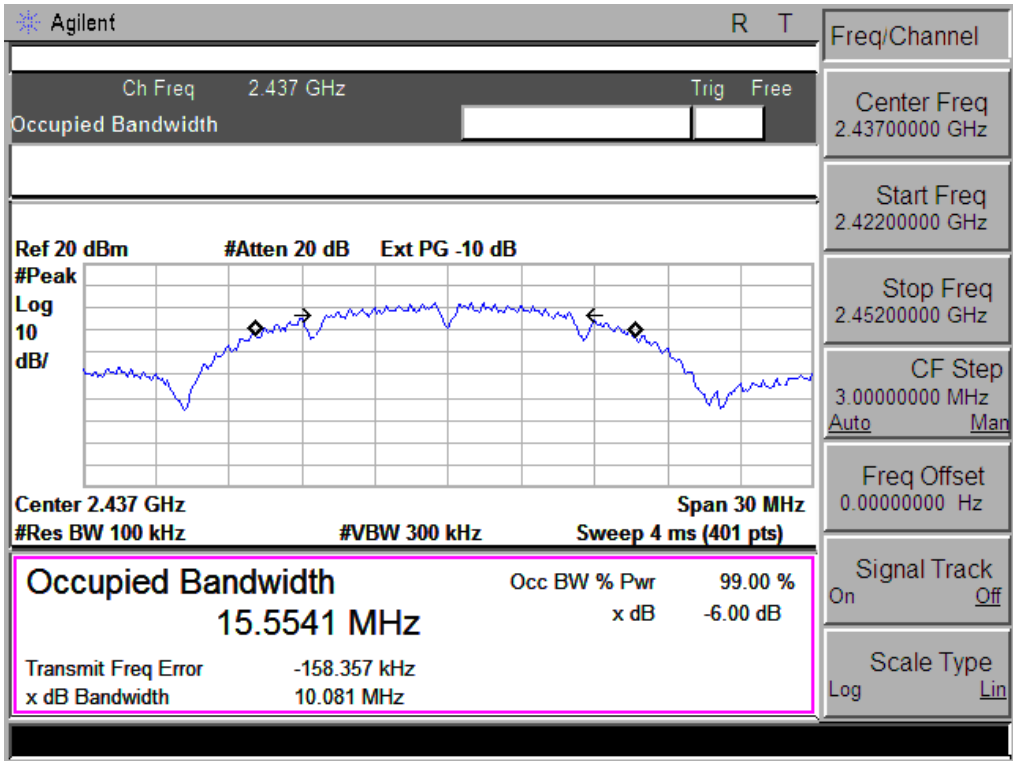
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX b Mode /CH01, CH06, CH11-Ant B		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2412	10.149	500	Pass
Middle	2437	10.081	500	Pass
High	2462	10.137	500	Pass

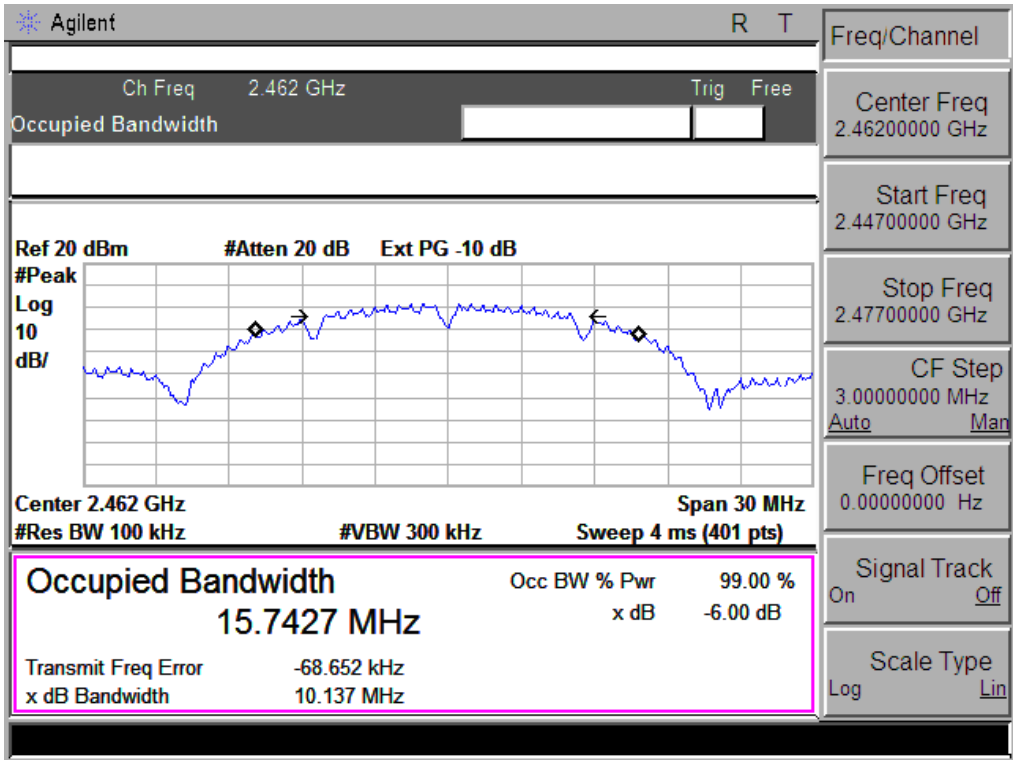
TX CH 01



TX CH 06



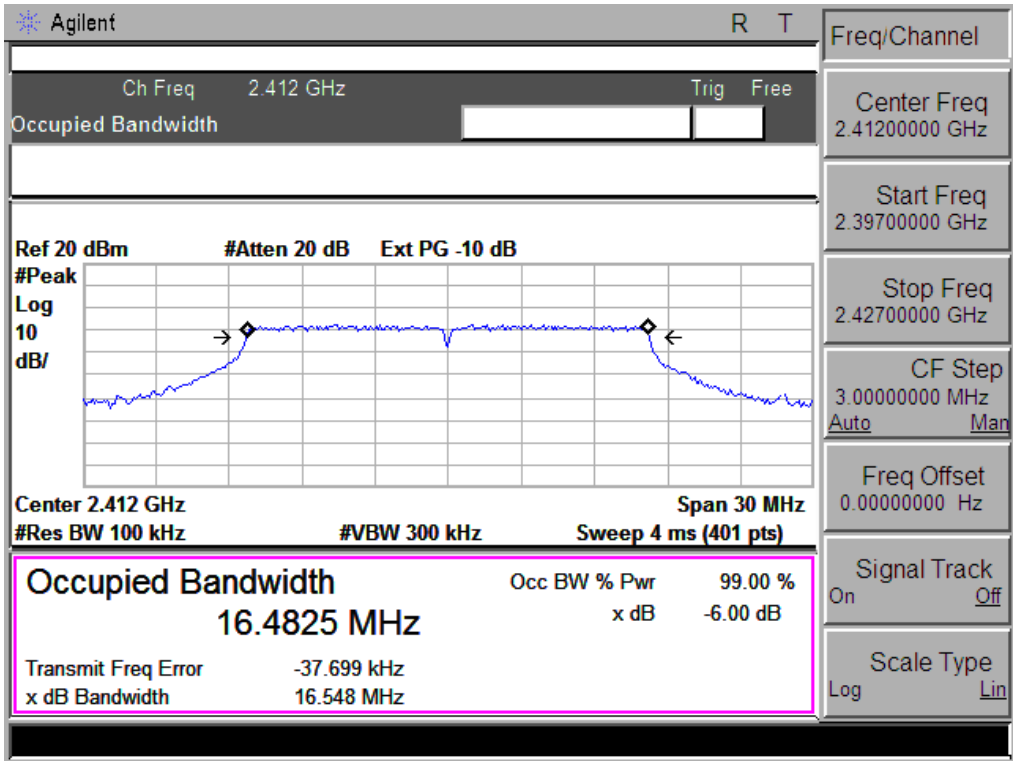
TX CH 11



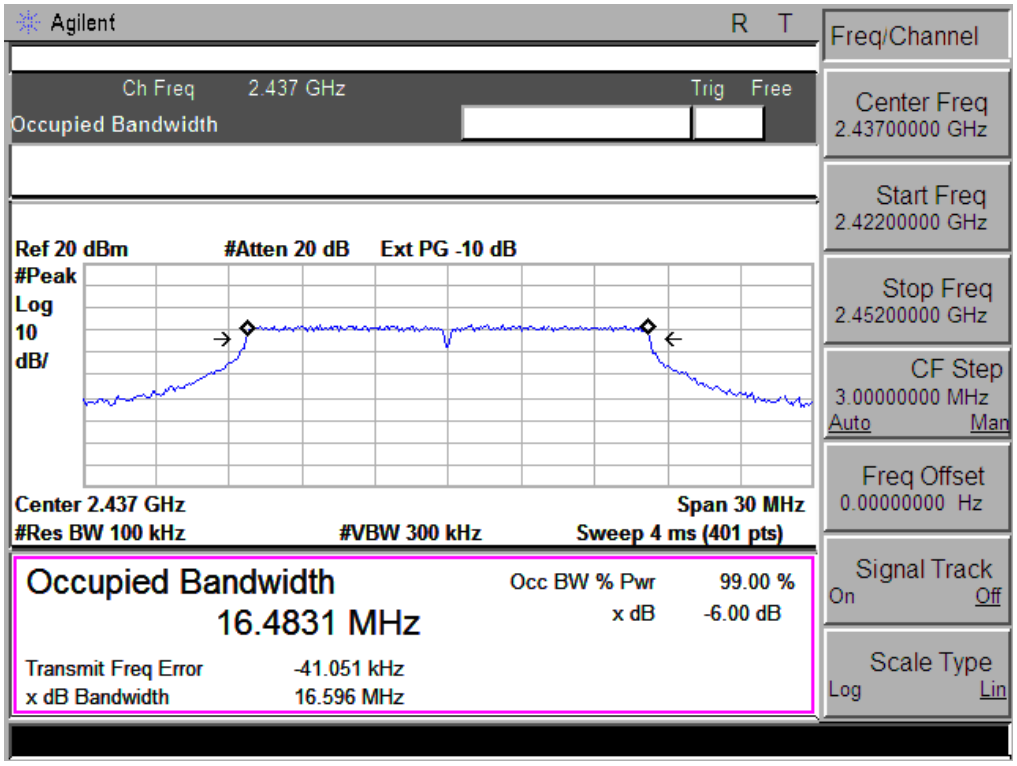
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX g Mode /CH01, CH06, CH11-Ant B		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2412	16.548	500	Pass
Middle	2437	16.596	500	Pass
High	2462	16.547	500	Pass

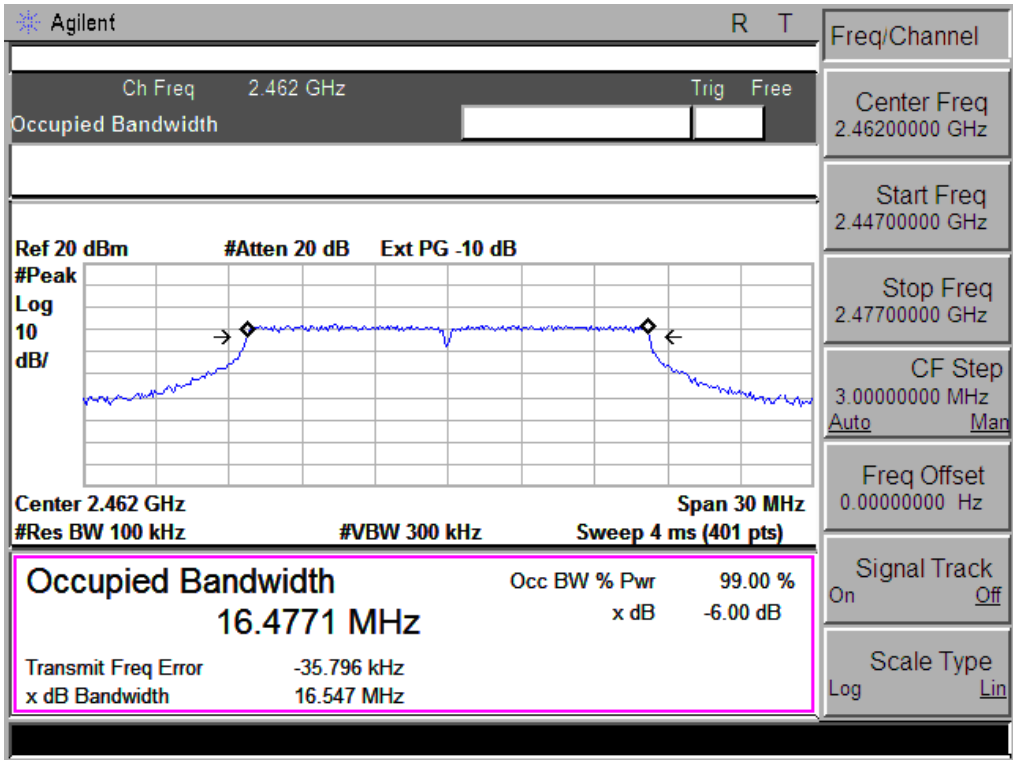
TX CH 01



TX CH 06



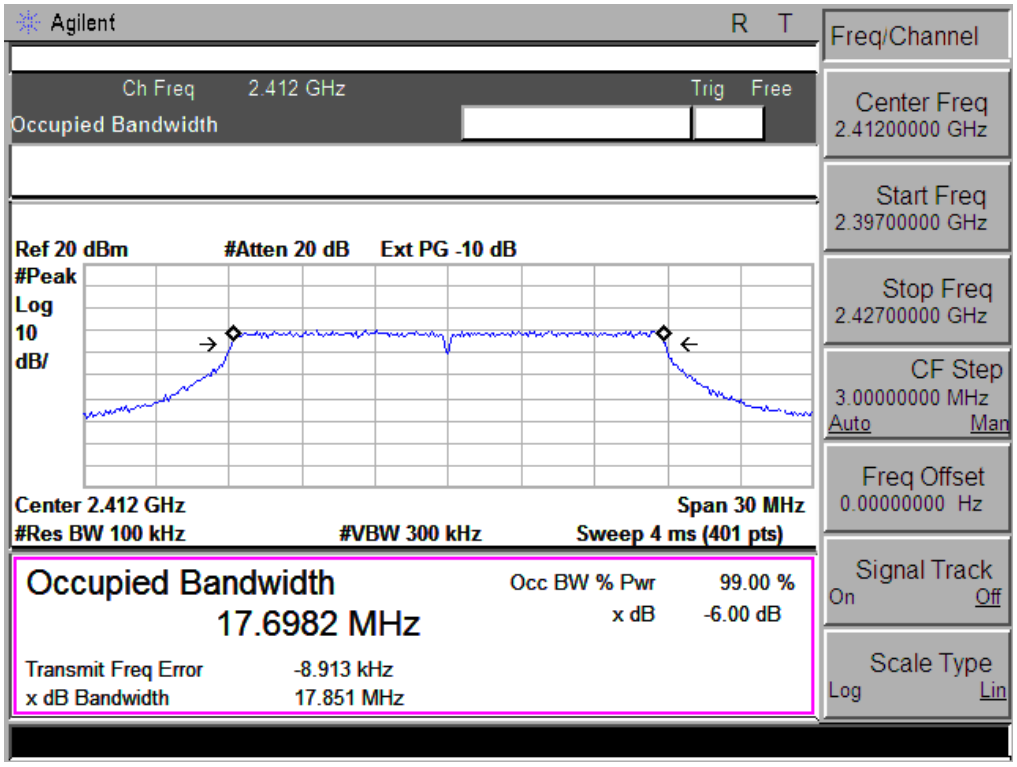
TX CH 11



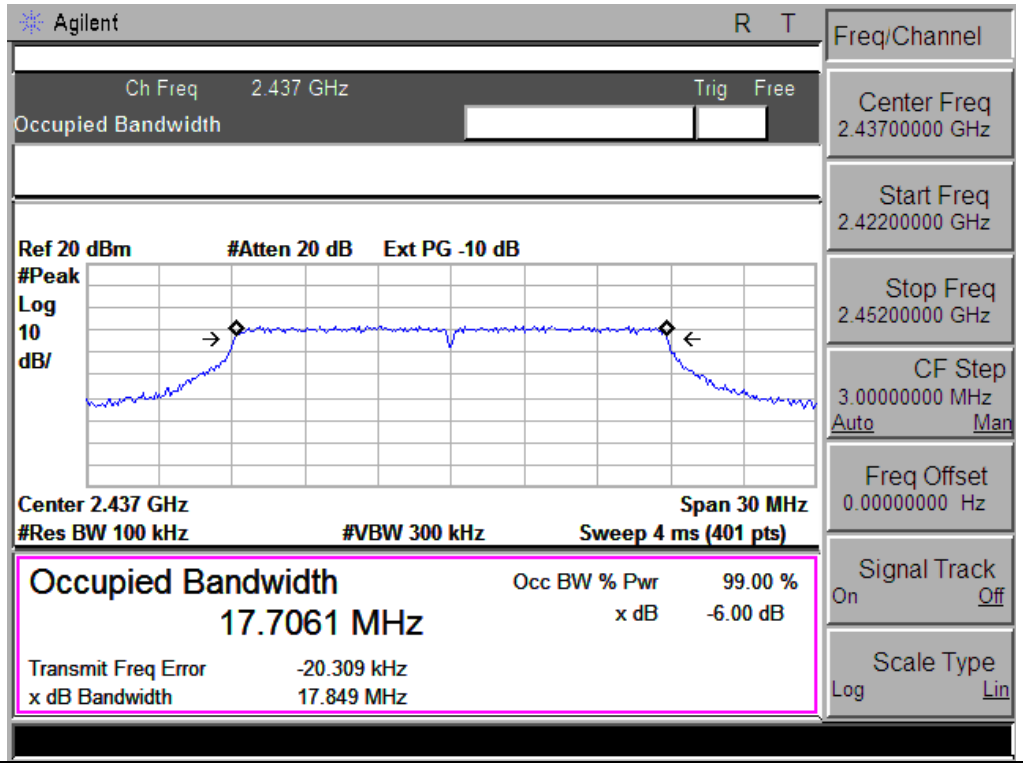
EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX n Mode(20M) /CH01, CH06, CH11-Ant B		

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2412	17.851	500	Pass
Middle	2437	17.849	500	Pass
High	2462	17.851	500	Pass

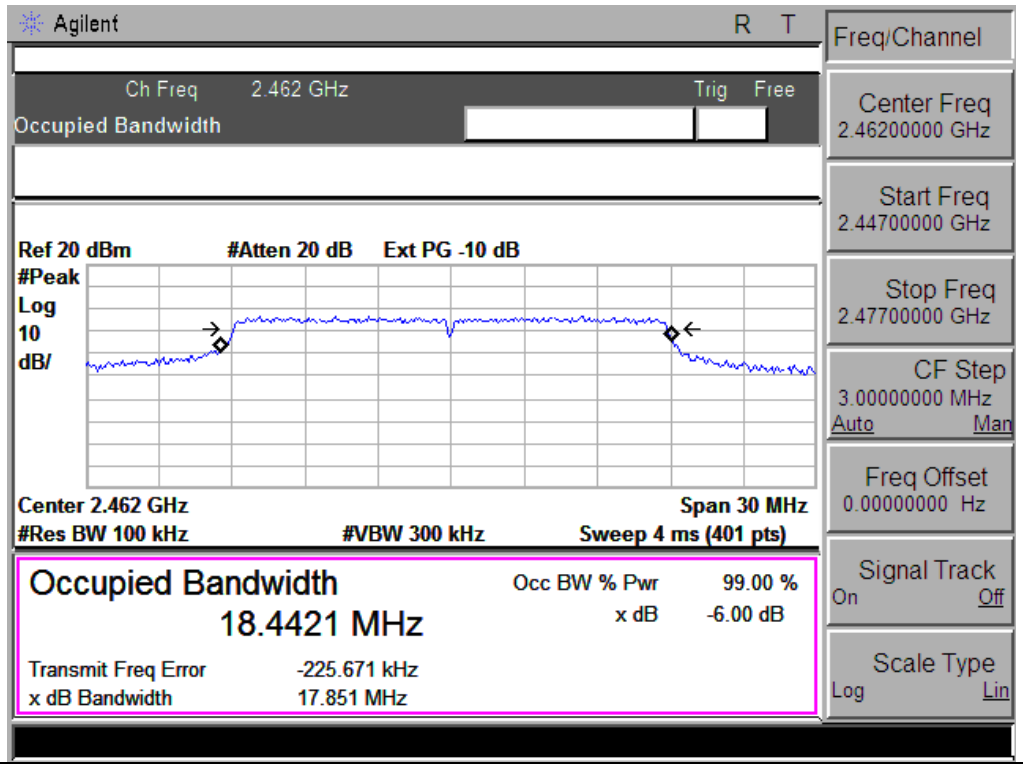
TX CH 01



TX CH 06



TX CH 11



6. PEAK OUTPUT POWER TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

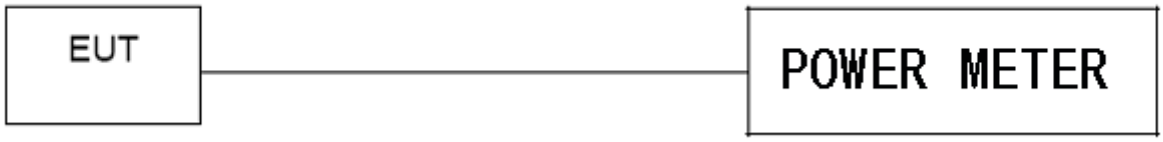
6.1.1 TEST PROCEDURE

a. The EUT was directly connected to the Power meter

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 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.

6.1.5 TEST RESULTS

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX b/g/n Mode-Ant A		

TX 802.11b Mode				
Test Channe	Frequency	Maximum Conducted Output Power(PK)	Maximum Conducted Output Power(AV)	LIMIT
	(MHz)	(dBm)	(dBm)	(dBm)
CH01	2412	13.37	9.34	30
CH06	2437	13.55	9.53	30
CH11	2462	13.68	9.48	30
TX 802.11g Mode				
CH01	2412	12.34	8.67	30
CH06	2437	12.65	8.48	30
CH11	2462	12.42	8.33	30
TX 802.11n-HT20 Mode				
CH01	2412	11.99	7.58	30
CH06	2437	11.83	7.74	30
CH11	2462	11.75	7.84	30

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	TX b/g/n Mode-Ant B		

TX 802.11b Mode				
Test Channe	Frequency	Maximum Peak Conducted Output Power（PK）	Maximum Peak Conducted Output Power（AV）	LIMIT
	(MHz)	(dBm)	(dBm)	dBm
CH01	2412	13.13	9.14	30
CH06	2437	13.25	9.32	30
CH11	2462	13.34	9.54	30
TX 802.11g Mode				
CH01	2412	12.43	8.34	30
CH06	2437	12.61	8.56	30
CH11	2462	12.55	8.43	30
TX 802.11n(20) Mode				
CH01	2412	12.04	7.42	30
CH06	2437	12.28	7.51	30
CH11	2462	12.13	7.36	30

7. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

APPLICABLE STANDARD

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)).

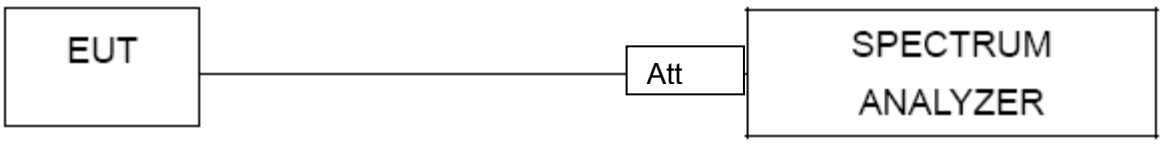
TEST PROCEDURE

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.

7.1 DEVIATION FROM STANDARD

No deviation.

7.2 TEST SETUP



7.3 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.

7.4 TEST RESULTS

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	Ant A		

Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
802.11b mode			
Left-band	38.61	20	Pass
Right-band	52.86	20	Pass
802.11g mode			
Left-band	26.81	20	Pass
Right-band	32.33	20	Pass
802.11n20 mode			
Left-band	25.64	20	Pass
Right-band	31.23	20	Pass

Radiated band edge:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
802.11b							
2390	54.14	-13.06	41.08	74	-32.92	peak	Vertical
2390	53.45	-13.06	40.39	74	-33.61	peak	Horizontal
2483.5	54.18	-12.78	41.4	74	-32.60	peak	Vertical
2483.5	55.76	-12.78	42.98	74	-31.02	peak	Horizontal
802.11g							
2390	52.31	-13.06	39.25	74	-34.75	peak	Vertical
2390	53.88	-13.06	40.82	74	-33.18	peak	Horizontal
2483.5	52.47	-12.78	39.69	74	-34.31	peak	Vertical
2483.5	55.13	-12.78	42.35	74	-31.65	peak	Horizontal
802.11n（20）							
2390	50.98	-13.06	37.92	74	-36.08	peak	Vertical
2390	51.76	-13.06	38.7	74	-35.3	peak	Horizontal
2483.5	52.21	-12.78	39.43	74	-34.57	peak	Vertical
2483.5	53.76	-12.78	40.98	74	-33.02	peak	Horizontal

Note: Test method to see chapter 3.2 . When PK value is lower than the Average value limit, average not record.

EUT：	Streaming wireless speaker	Model Name ：	HK OMNI 10
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 19V form Adapter AC 120V/60Hz
Test Mode ：	Ant B		

Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
802.11b mode			
Left-band	29.56	20	Pass
Right-band	49.54	20	Pass
802.11g mode			
Left-band	29.93	20	Pass
Right-band	40.33	20	Pass
802.11n20 mode			
Left-band	29.88	20	Pass
Right-band	36.97	20	Pass

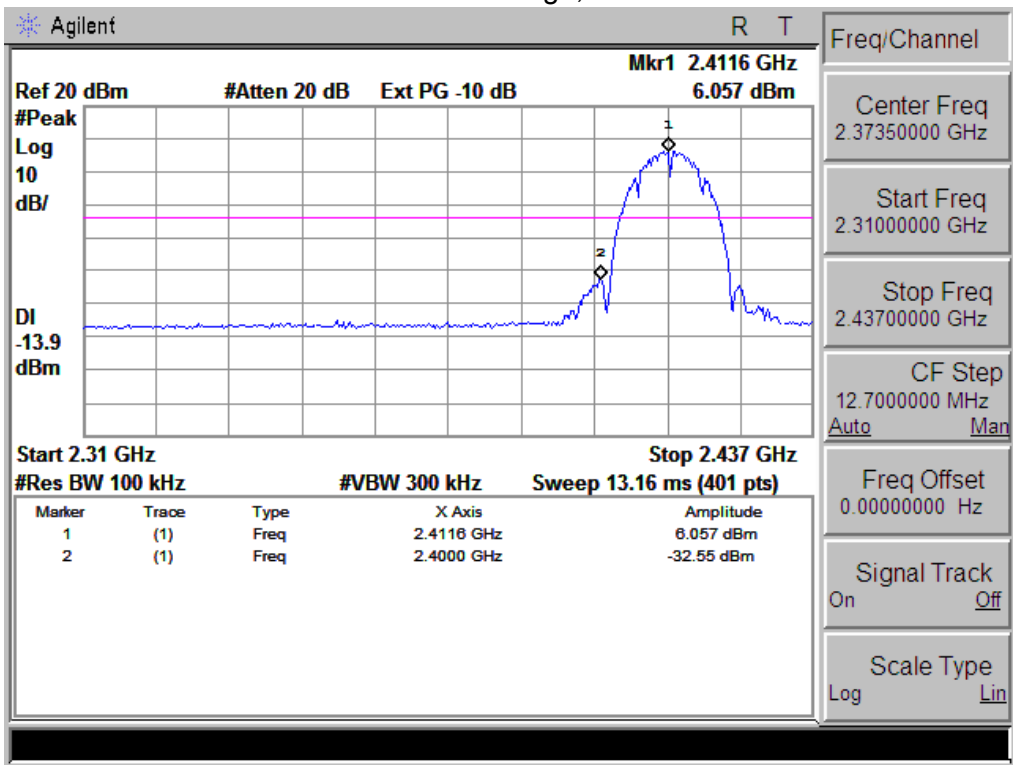
Radiated band edge:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
802.11b							
2390	61.23	-13.06	48.17	74	-25.83	peak	Vertical
2390	58.77	-13.06	45.71	74	-28.29	peak	Horizontal
2483.5	59.03	-12.78	46.25	74	-27.75	peak	Vertical
2483.5	57.13	-12.78	44.35	74	-29.65	peak	Horizontal
802.11g							
2390	58.35	-13.06	45.29	74	-28.71	peak	Vertical
2390	57.12	-13.06	44.06	74	-29.94	peak	Horizontal
2483.5	59.17	-12.78	46.39	74	-27.61	peak	Vertical
2483.5	57.89	-12.78	45.11	74	-28.89	peak	Horizontal
802.11n（20）							
2390	59.05	-13.06	45.99	74	-28.01	peak	Vertical
2390	56.23	-13.06	43.17	74	-30.83	peak	Horizontal
2483.5	55.17	-12.78	42.39	74	-31.61	peak	Vertical
2483.5	58.09	-12.78	45.31	74	-28.69	peak	Horizontal

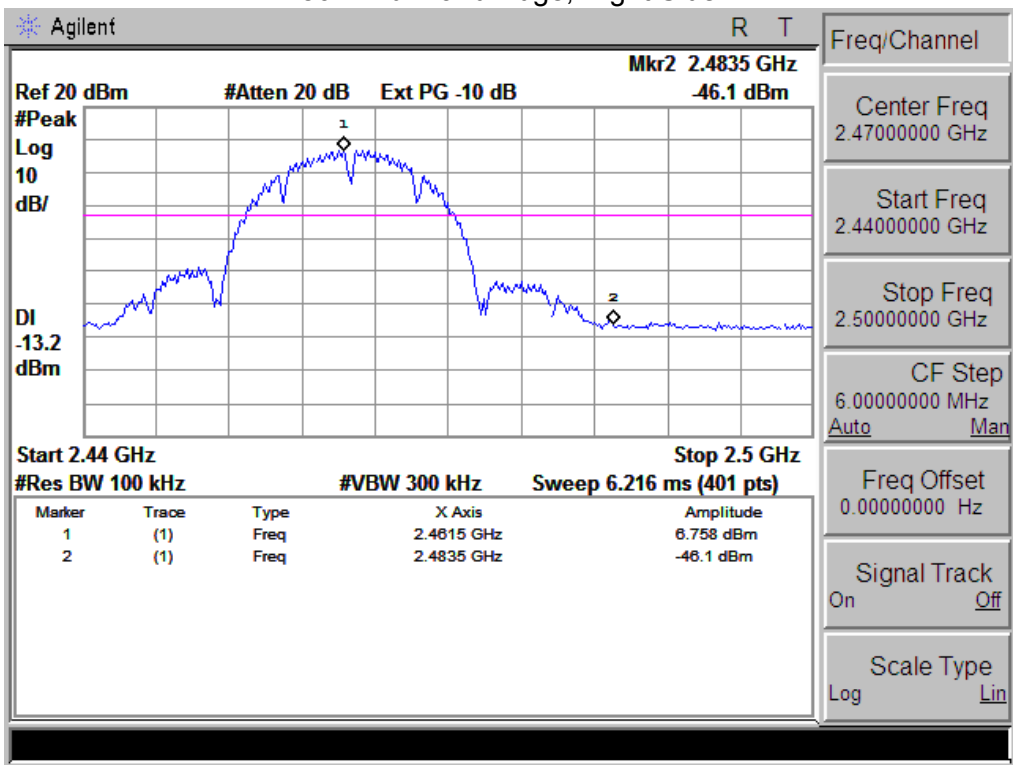
Note: Test method to see chapter 3.2 . When PK value is lower than the Average value limit, average not record.

Ant A

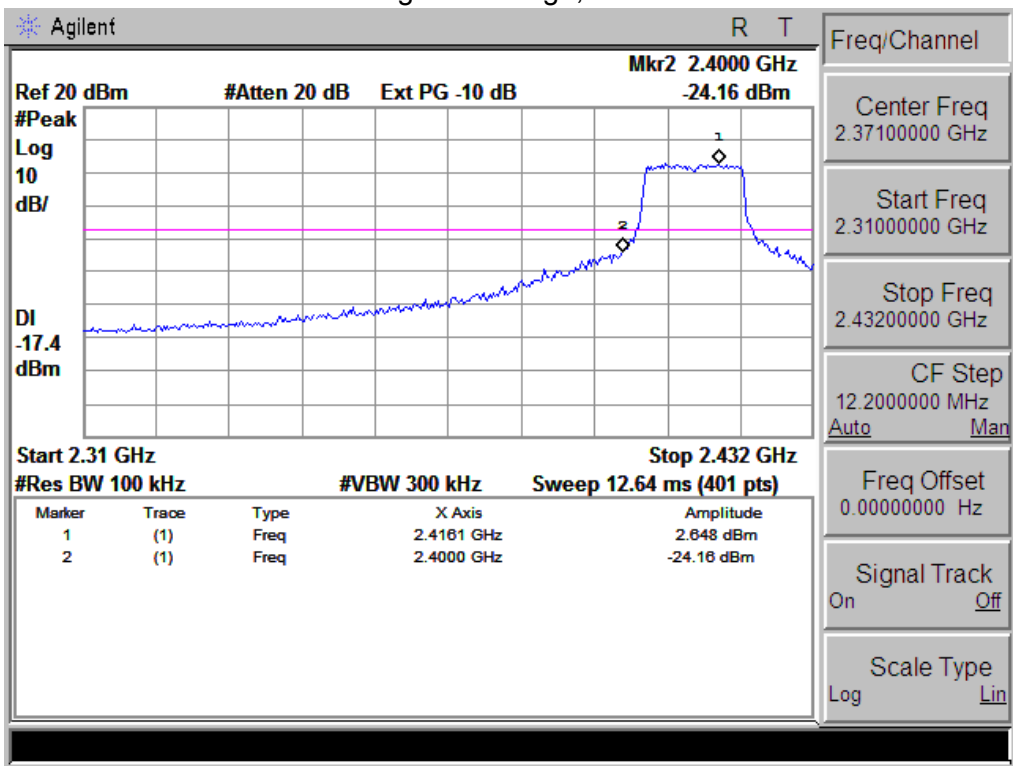
802.11b: Band Edge, Left Side



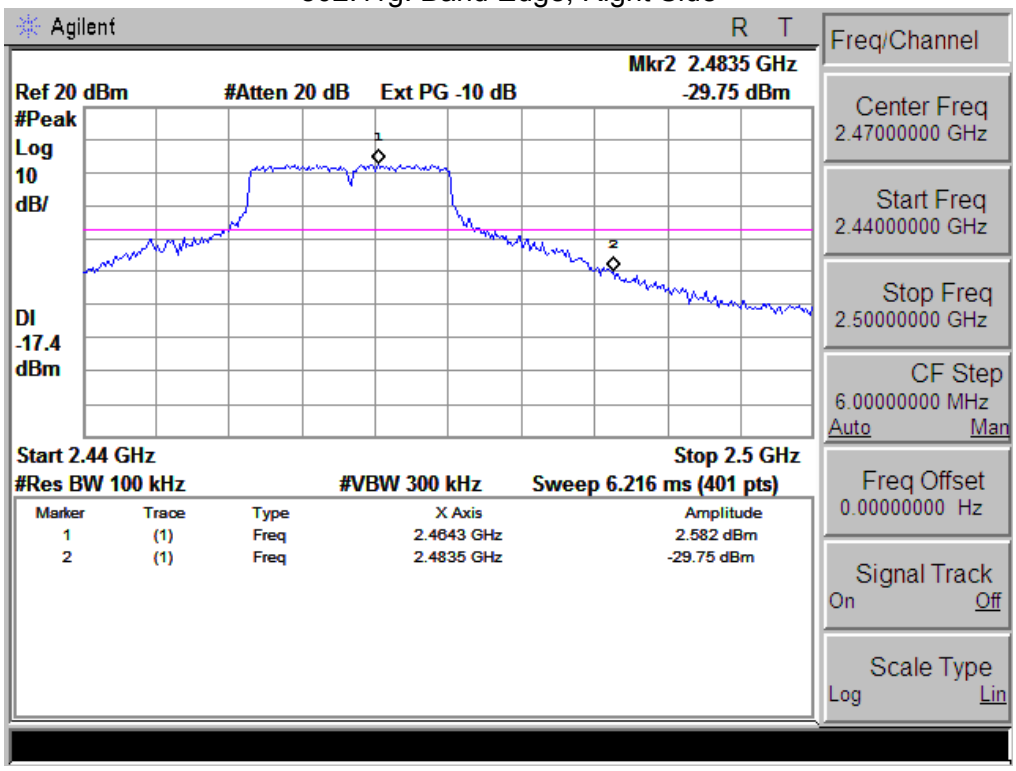
802.11b: Band Edge, Right Side



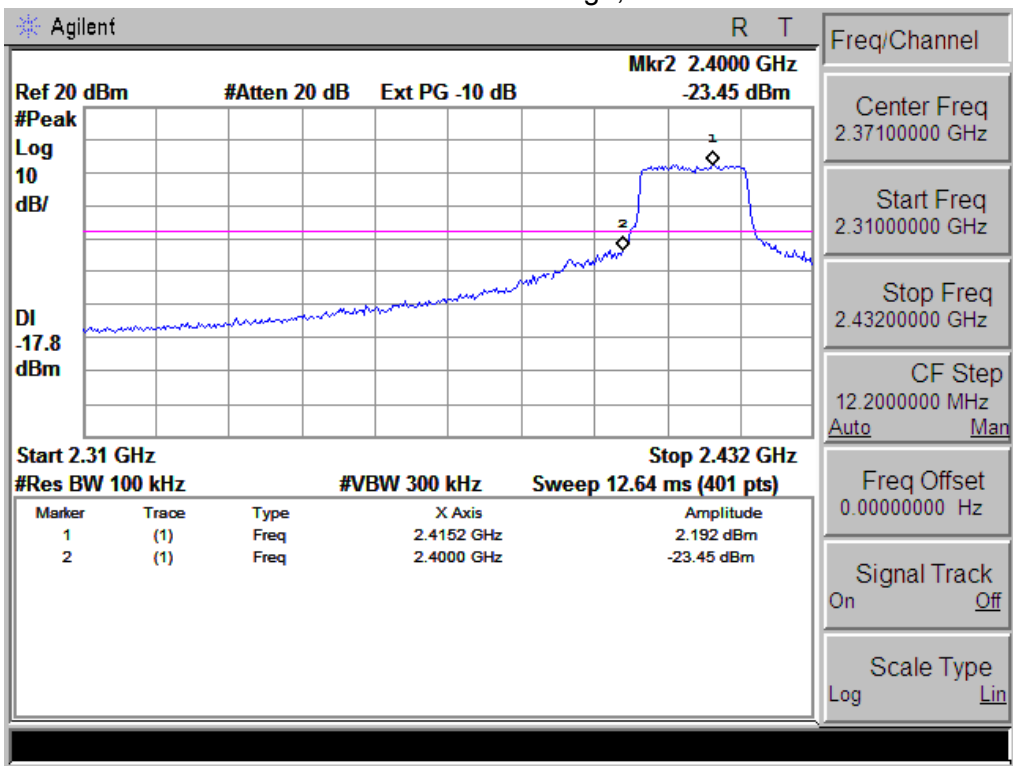
802.11g: Band Edge, Left Side



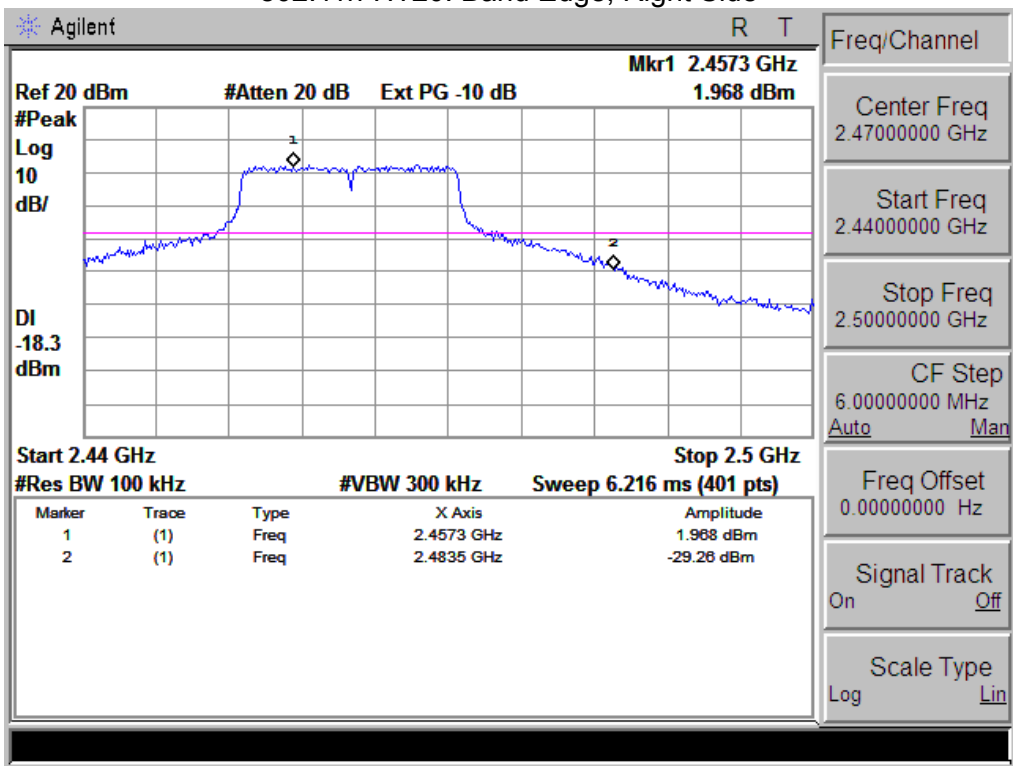
802.11g: Band Edge, Right Side



802.11n-HT20: Band Edge, Left Side

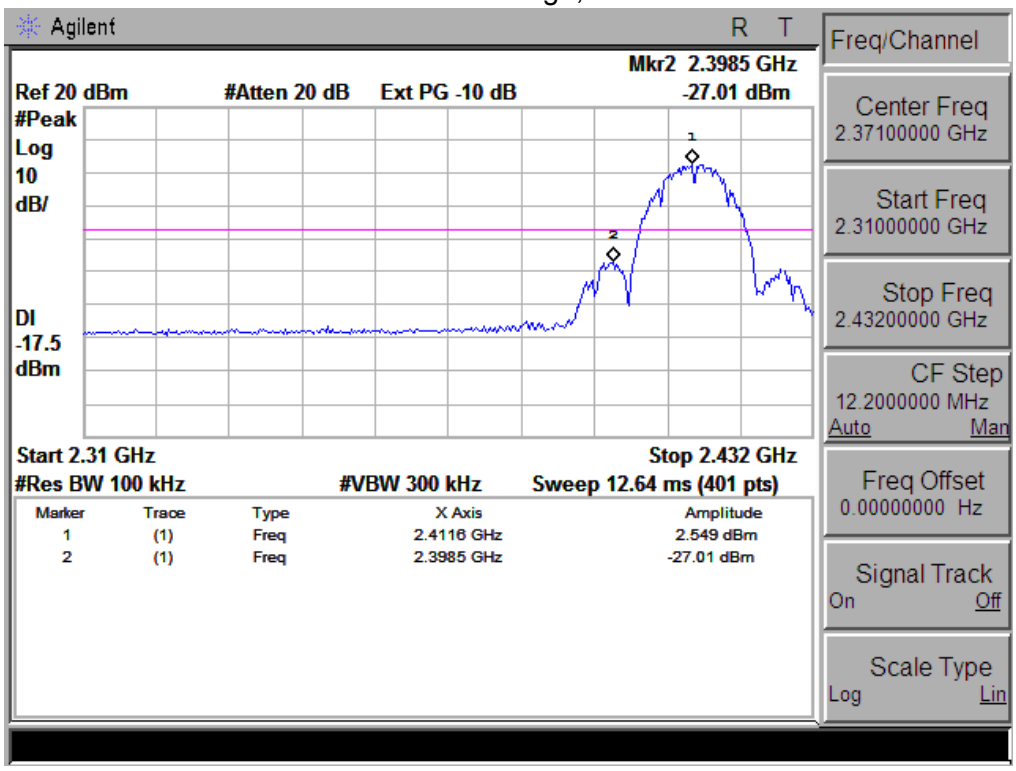


802.11n-HT20: Band Edge, Right Side

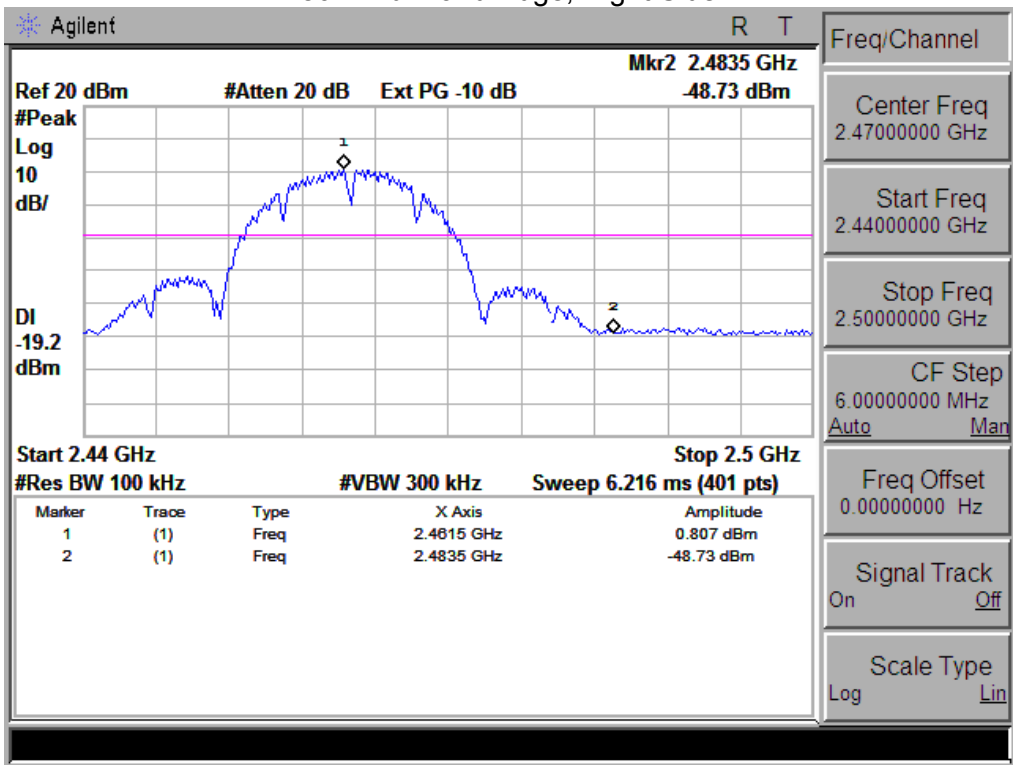


Ant B

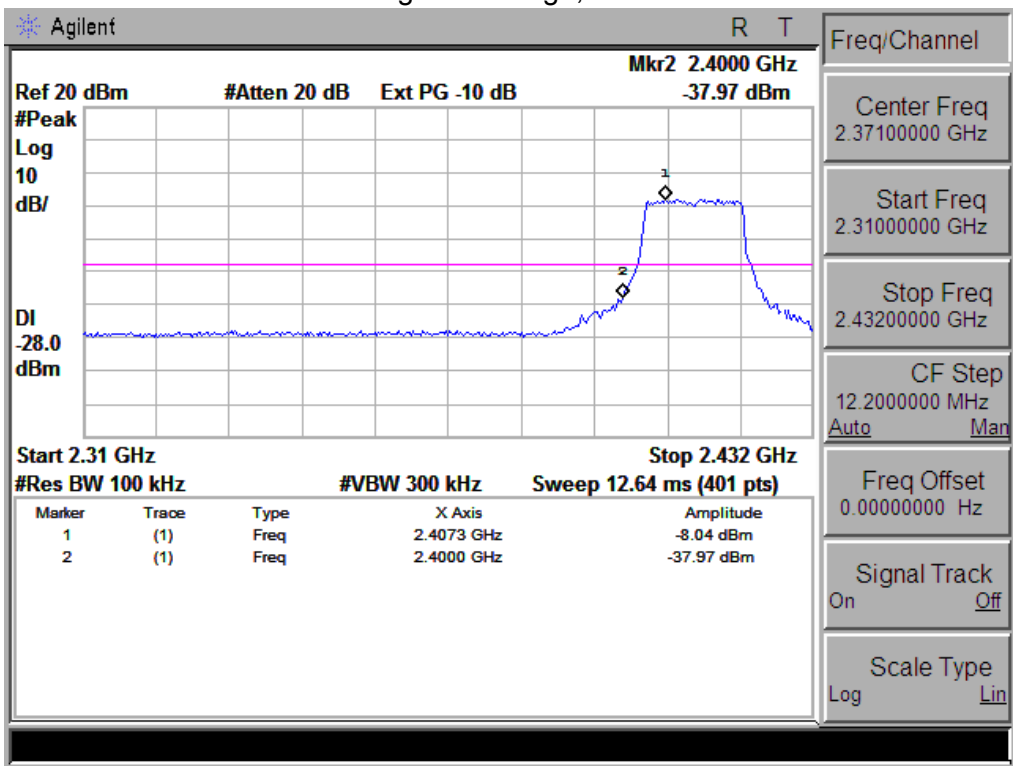
802.11b: Band Edge, Left Side



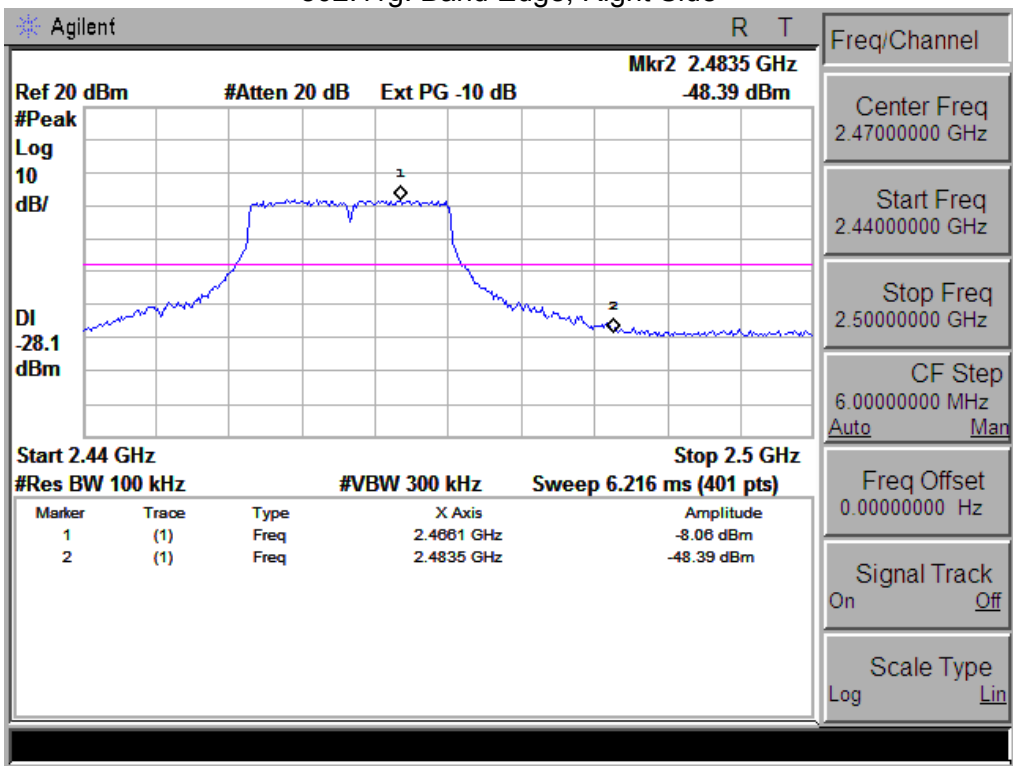
802.11b: Band Edge, Right Side



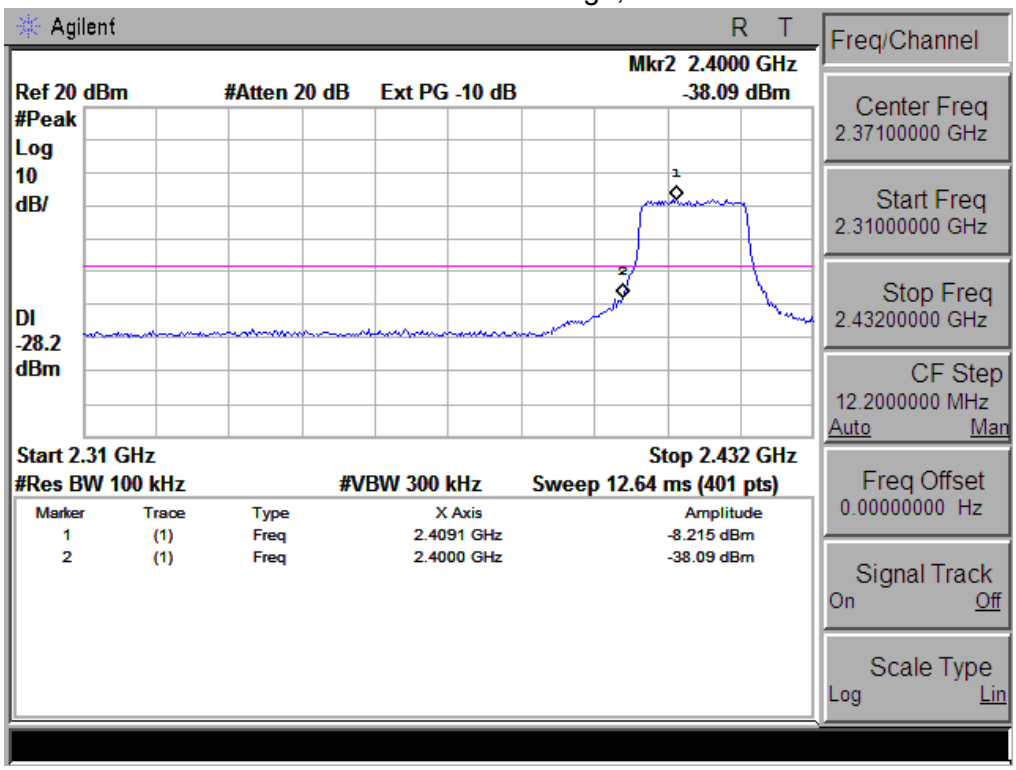
802.11g: Band Edge, Left Side



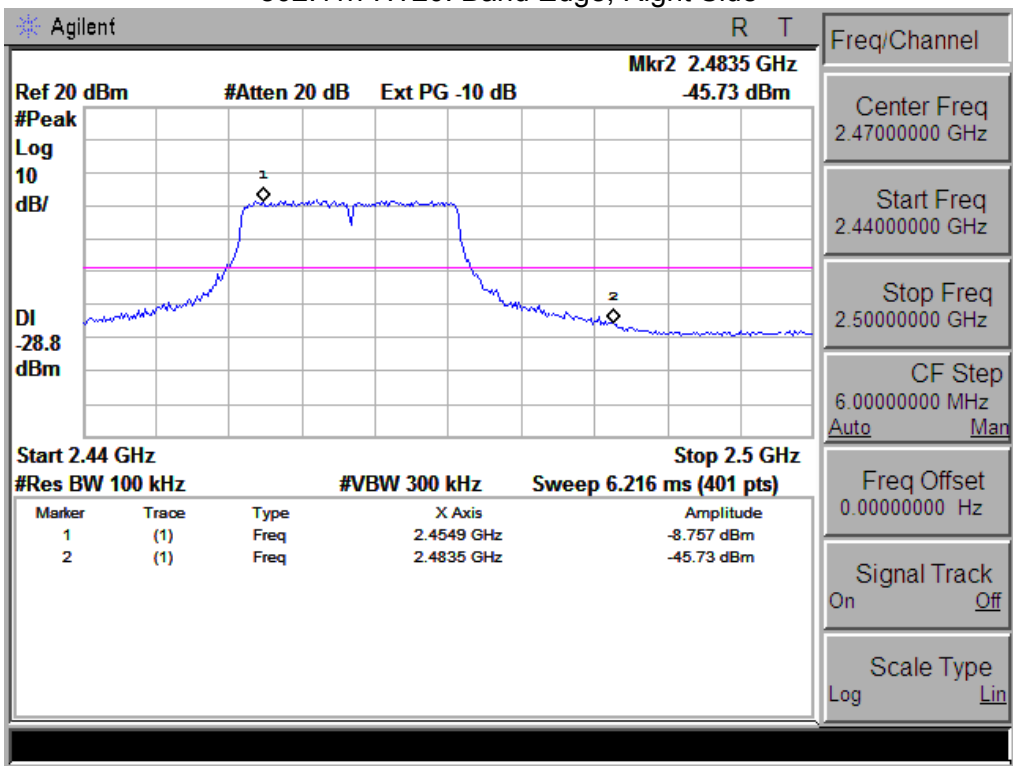
802.11g: Band Edge, Right Side



802.11n-HT20: Band Edge, Left Side



802.11n-HT20: Band Edge, Right Side



8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

8.2 EUT ANTENNA

The EUT antenna is FPCB antenna. It comply with the standard requirement