FCC Part 15C
Measurement and Test Report

For

Shenzhen Saswell Technology&Development Co., Ltd

3/F Building K, 8th East Region, Shangxue Industry & Science Park, Bantian Town, Shenzhen City, China

FCC ID: 2AOIFSAS6000UTK

FCC Rule(s):	FCC Part 15C
Product Description:	Room Thermostat
Tested Model:	SAS6000UTK-7-WIFI
Report No.:	STR17118328I
Sample Receipt Date:	2017-11-27
Tested Date:	2017-11-28 to 2017-12-07
Issued Date:	2017-12-07
Tested By:	Bin Mei / Engineer
Reviewed By:	Silin Chen / EMC Manager
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Shenzhen Saswell Technology&Development Co., Ltd
Address of applicant:	3/F Building K, 8th East Region, Shangxue Industry & Science Park, Bantian Town, Shenzhen City, China
Manufacturer:	Shenzhen Saswell Technology&Development Co., Ltd
Address of manufacturer:	3/F Building K, 8th East Region, Shangxue Industry & Science Park, Bantian Town, Shenzhen City, China

General Description of EUT	
Product Name:	Room Thermostat
Trade Name:	/
Model No.:	SAS6000UTK-7-WIFI
Adding Model(s):	SAS6000STK-7, SAS6000UTK-7
Rated Voltage:	24VAC, 2*AA by battery(1.5V)
Power Adapter Model:	/
Software Version:	U2.0
Hardware Version:	V1.4
Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model SAS6000UTK-7-WIFI, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz
RF Output Power:	16.73dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	3dBi
Lowest Internal Frequency	/

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Saswell Technology&Development Co., Ltd in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

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

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

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v04 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

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

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

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

1.6 Measurement Uncertainty

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

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2017-08-15	2018-08-14
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2017-03-09	2018-03-08

2. SUMMARY OF TEST RESULTS

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

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

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

4. Antenna Requirement

4.1 Standard Applicable

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

4.2 Evaluation Information

This product has an integral antenna, fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Procedure

According to the KDB 558074 D01 v04, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

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

5.3 Environmental Conditions

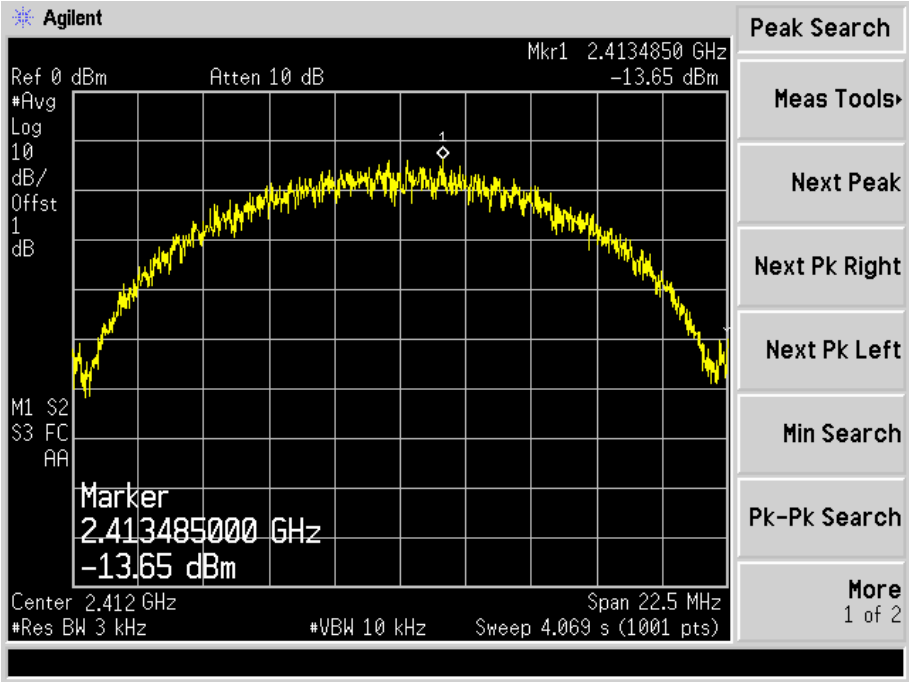
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

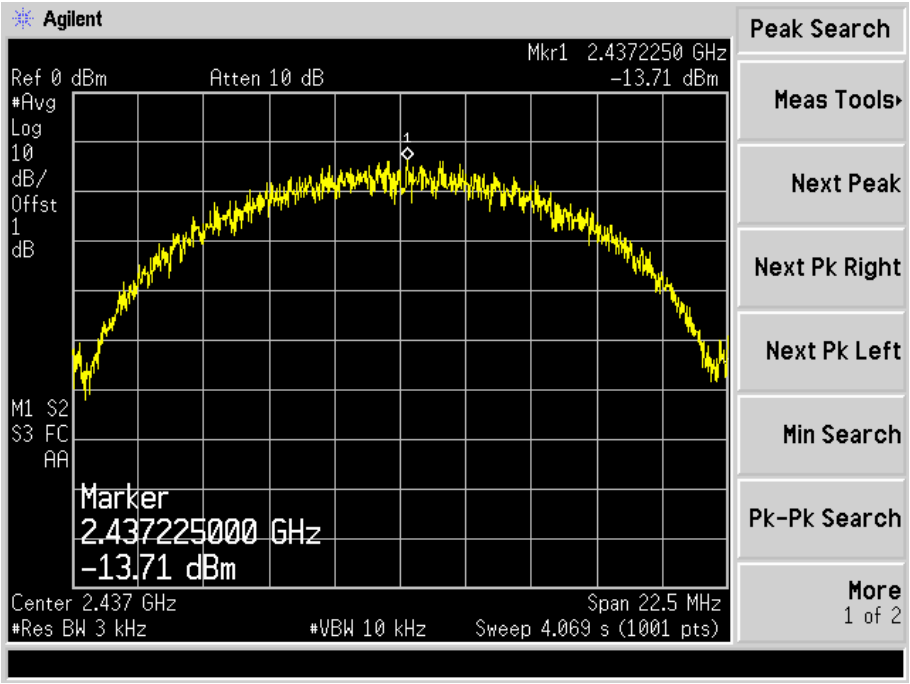
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-13.65	8
	2437	-13.71	8
	2462	-13.92	8
802.11g	2412	-18.08	8
	2437	-18.46	8
	2462	-18.65	8
802.11n HT20	2412	-20.52	8
	2437	-20.84	8
	2462	-21.18	8

Please refer to the following test plots:

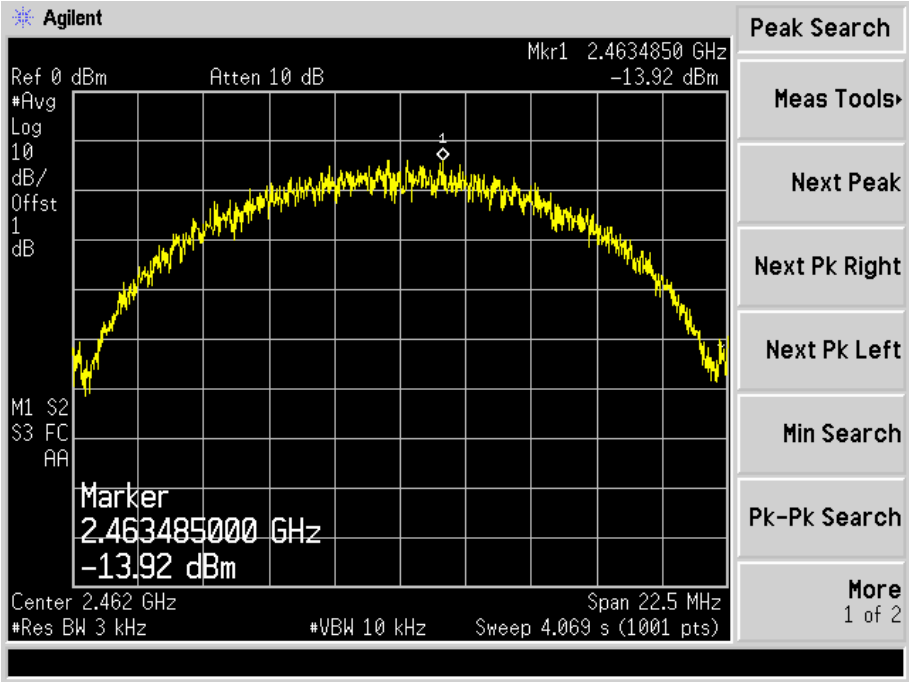
802.11b-Low Channel



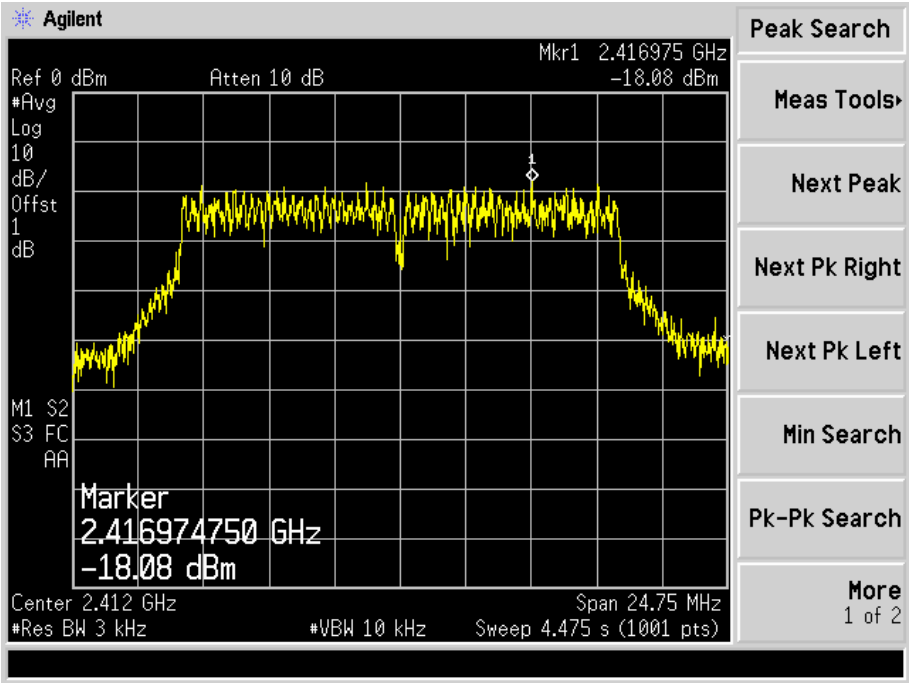
802.11b-Middle Channel



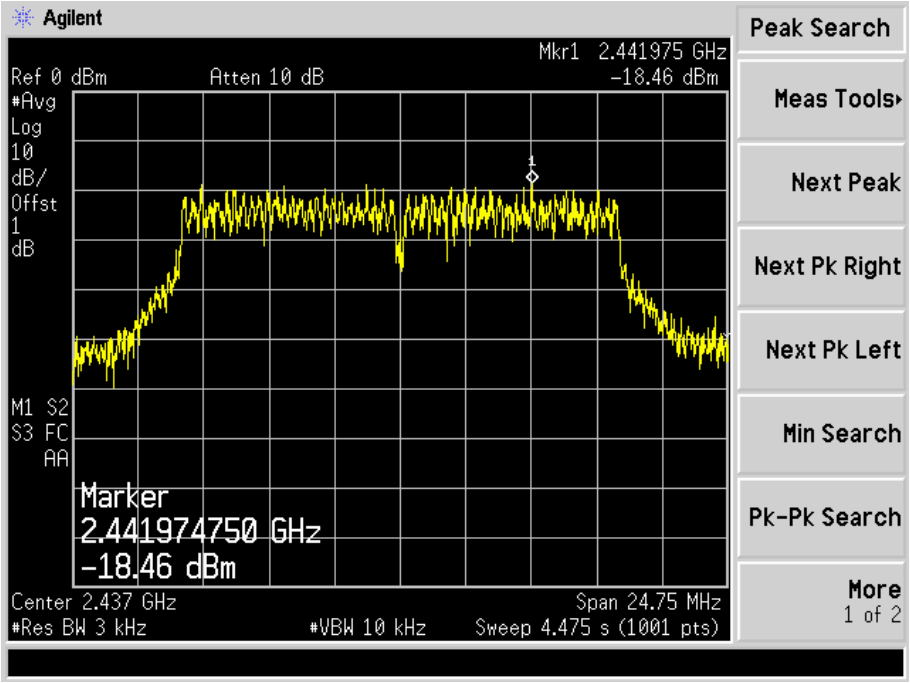
802.11b-High Channel



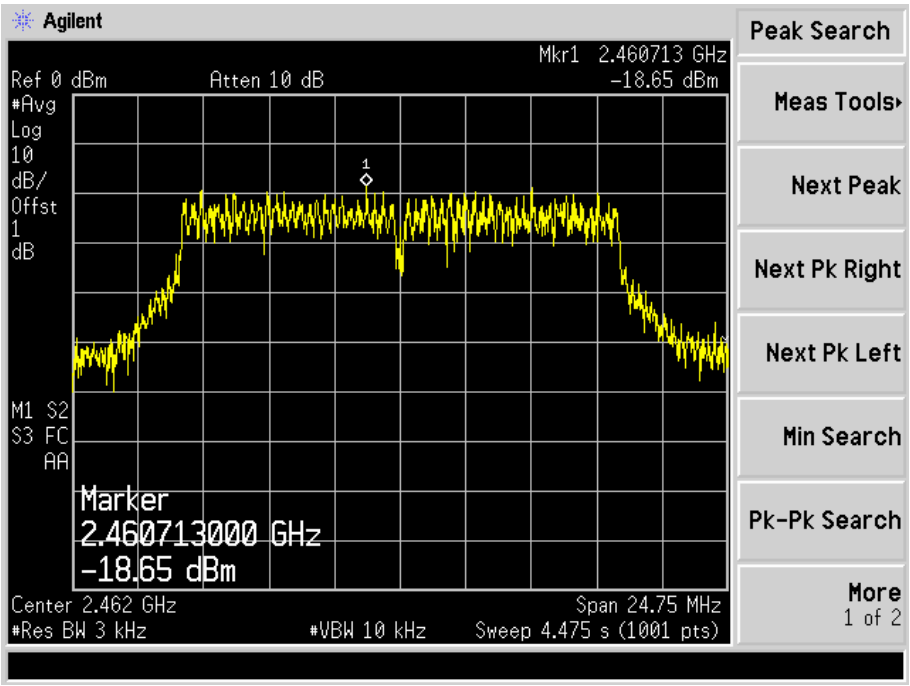
802.11g-Low Channel



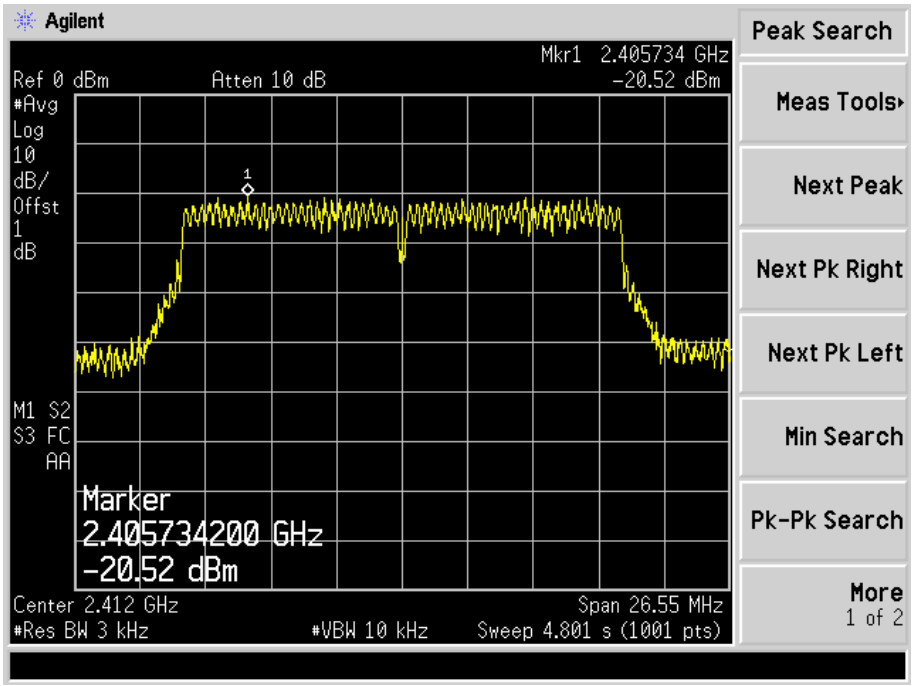
802.11g-Middle Channel



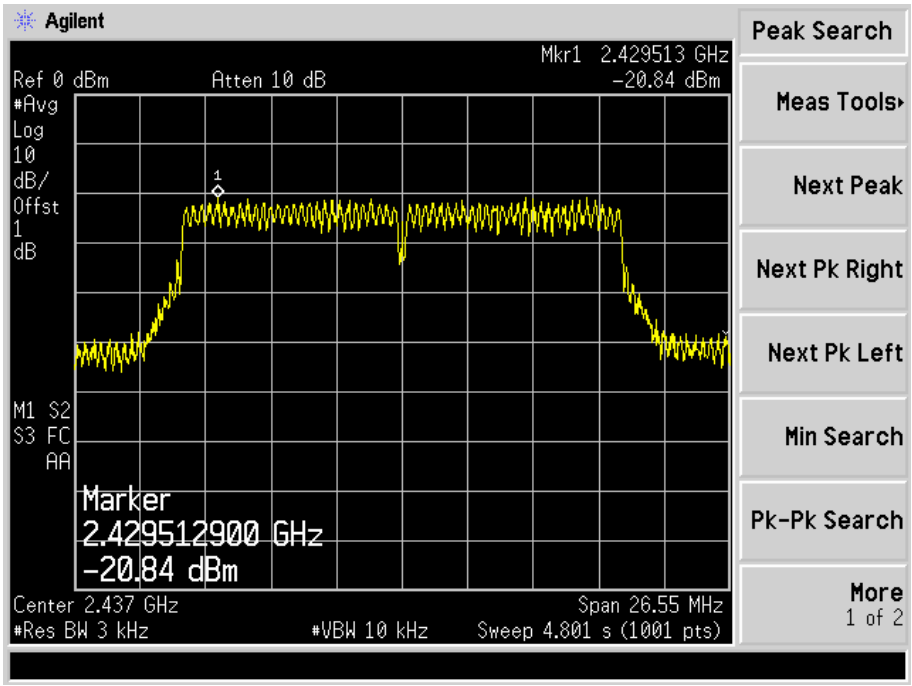
802.11g-High Channel



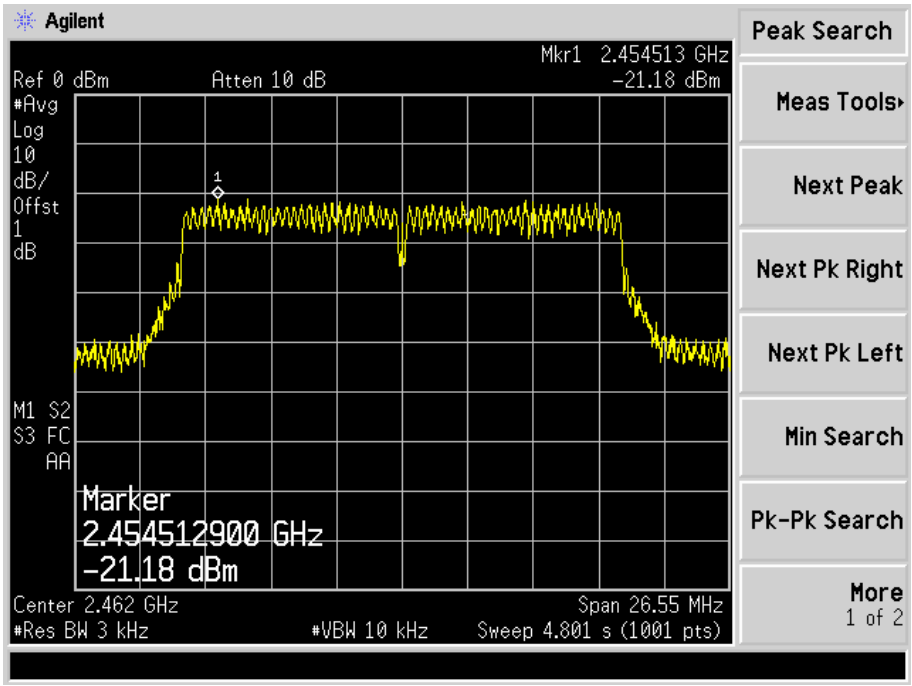
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



6. 6dB Bandwidth

6.1 Standard Applicable

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

6.2 Test Procedure

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

6.3 Environmental Conditions

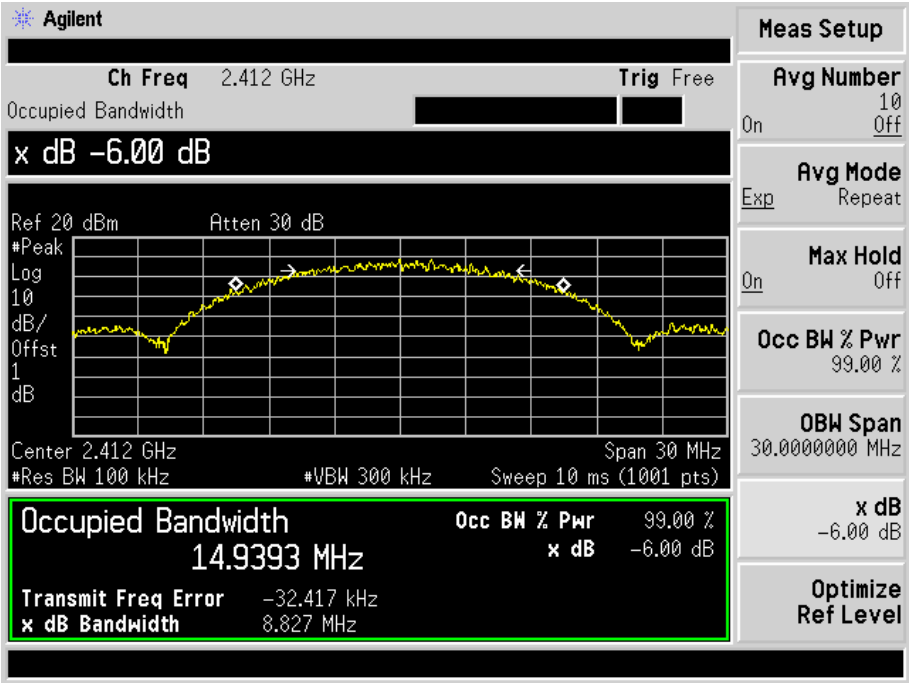
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

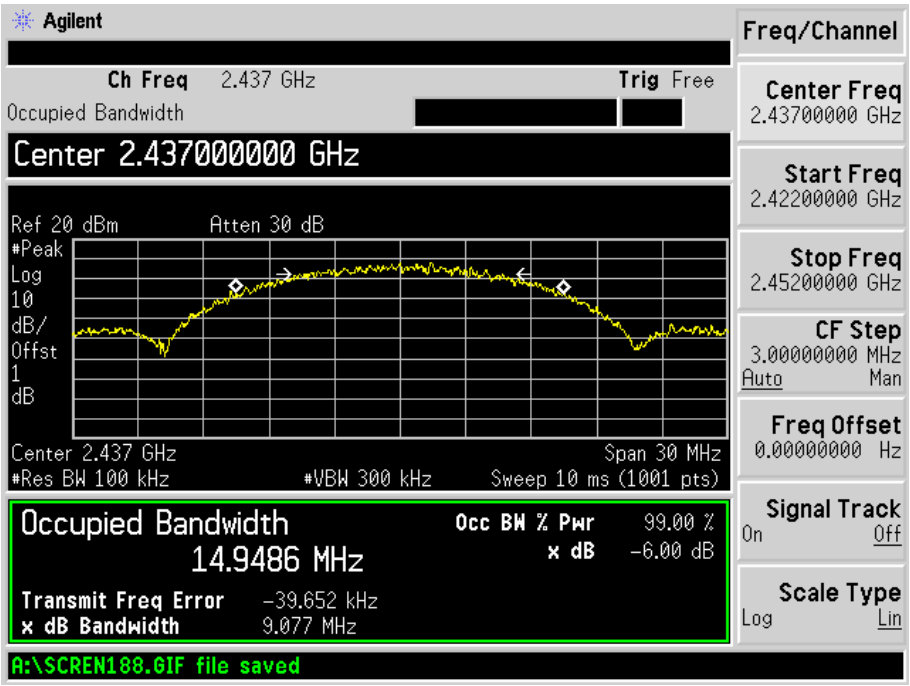
Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11b	2412	8.827	14.9393	≥500
	2437	9.077	14.9486	≥500
	2462	8.460	14.9527	≥500
802.11g	2412	16.412	16.4440	≥500
	2437	16.405	16.4498	≥500
	2462	16.386	16.4306	≥500
802.11n-HT20	2412	17.665	17.6598	≥500
	2437	17.629	17.6257	≥500
	2462	17.743	17.6986	≥500

Please refer to the following test plots:

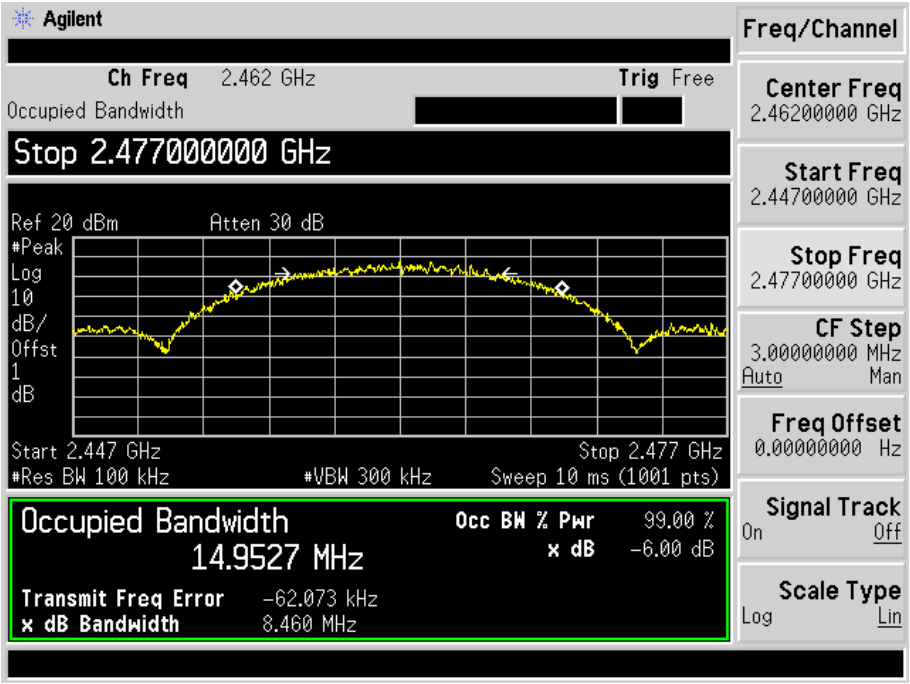
802.11b-Low Channel



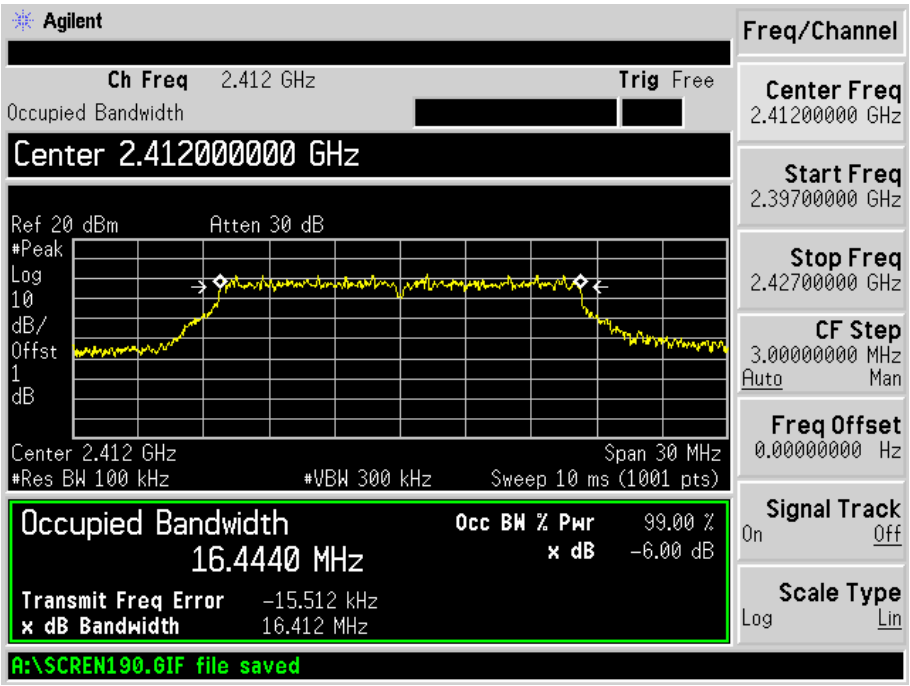
802.11b-Middle Channel



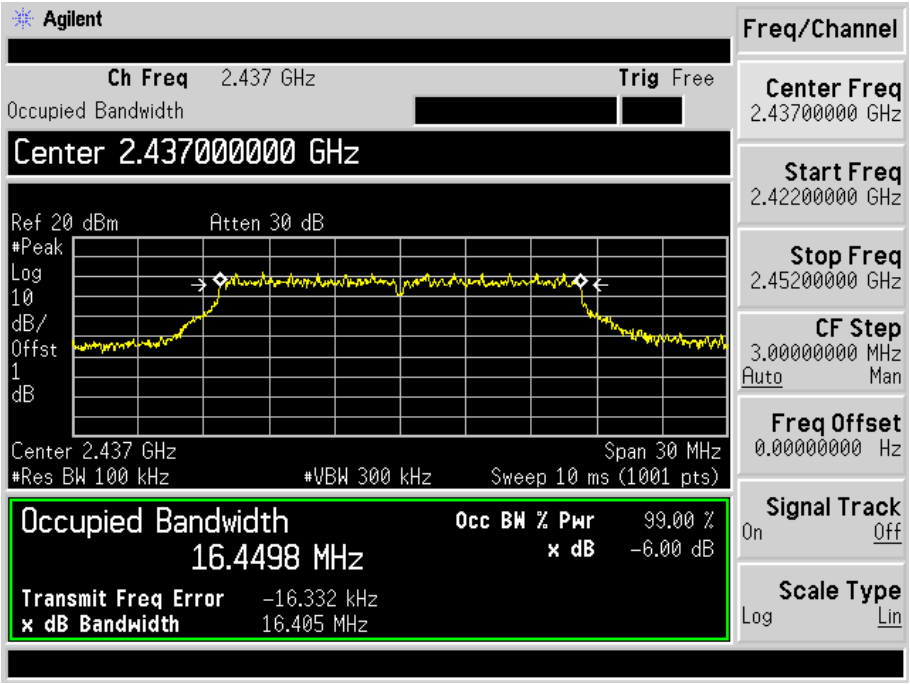
802.11b-High Channel



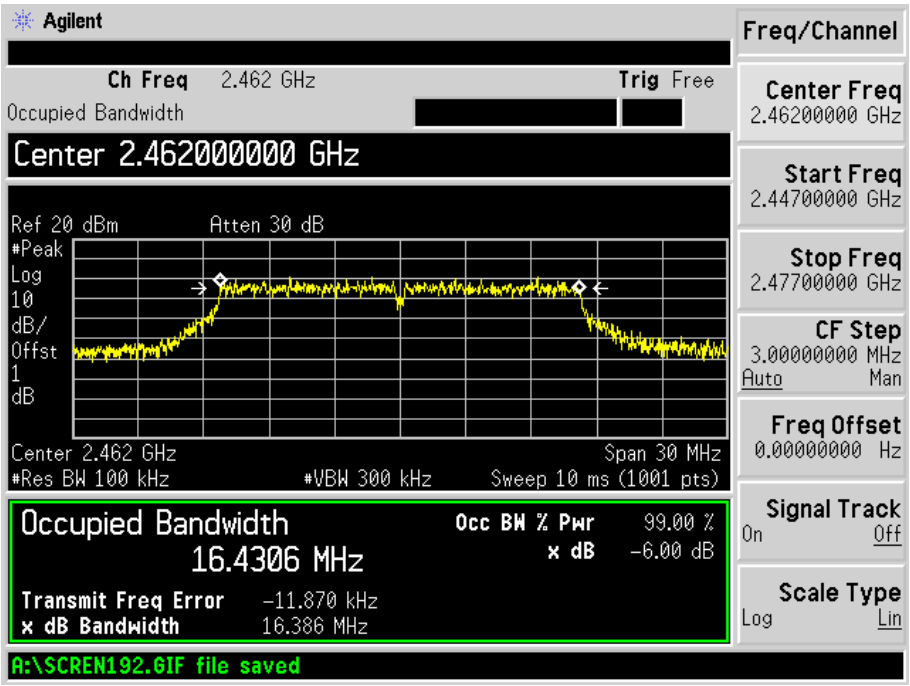
802.11g-Low Channel



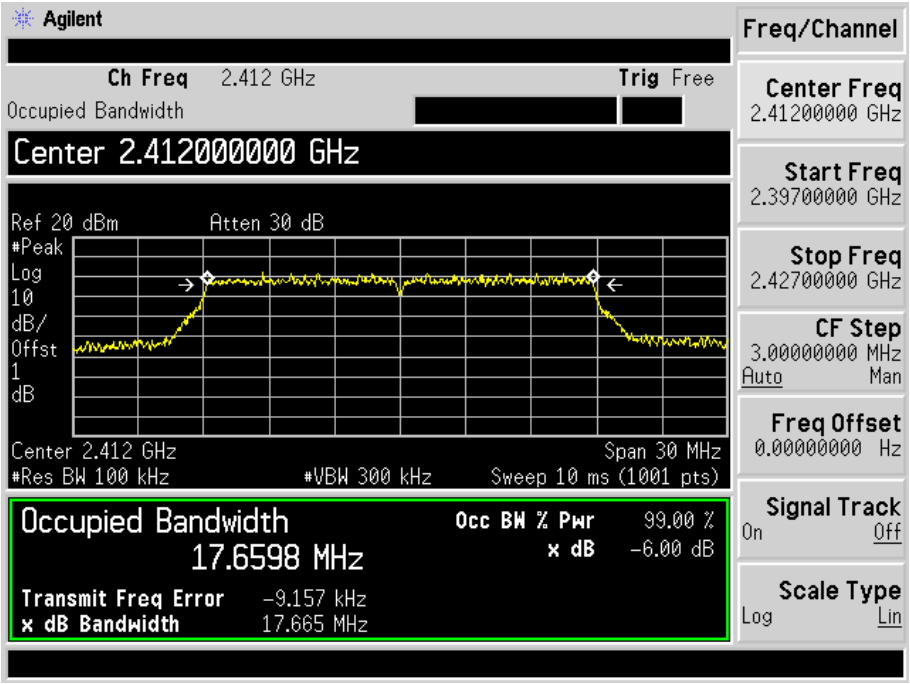
802.11g-Middle Channel



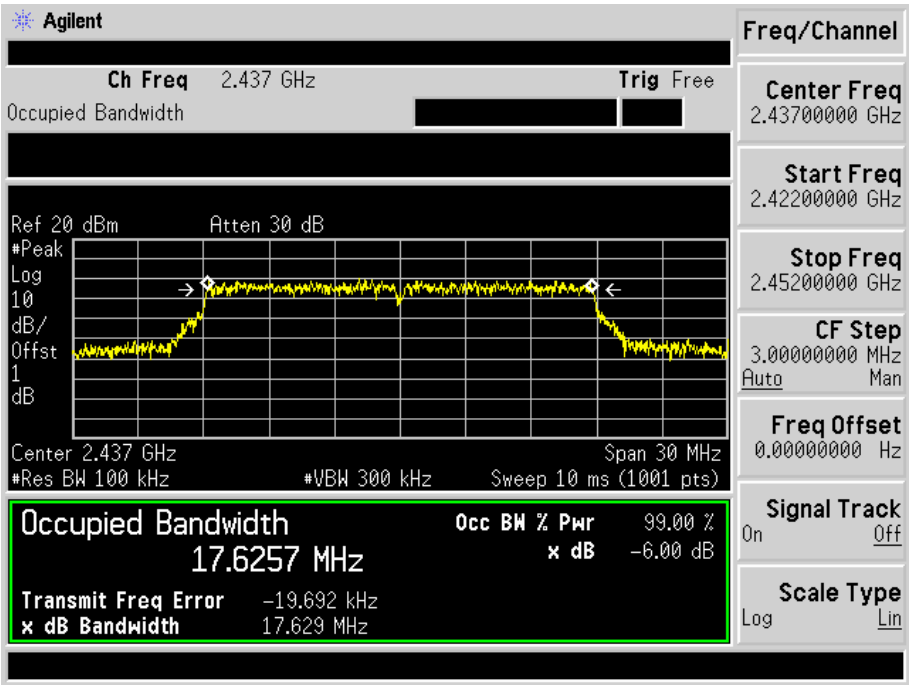
802.11g-High Channel



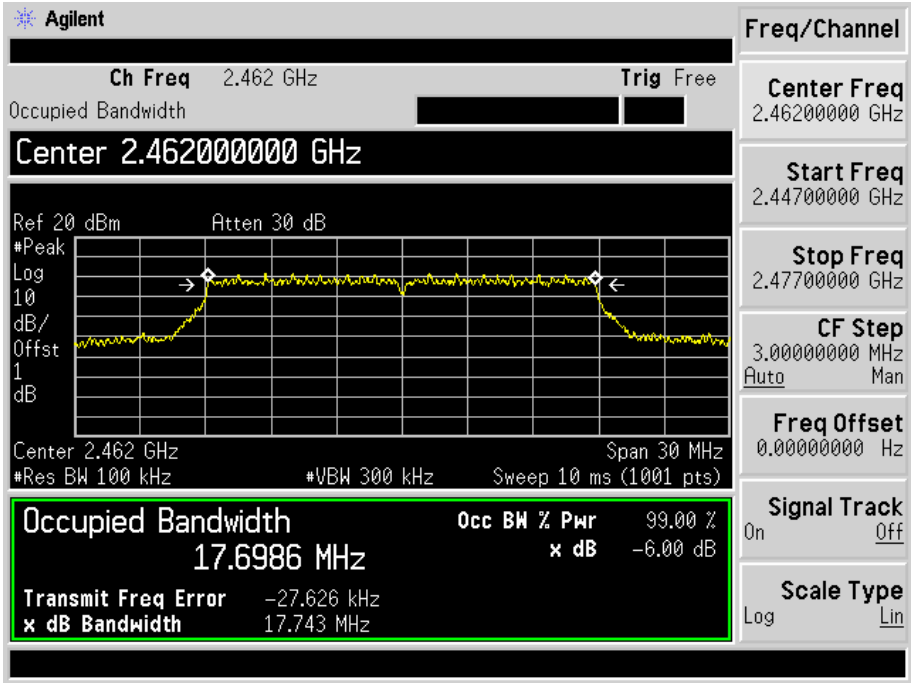
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



7. RF Output Power

7.1 Standard Applicable

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

7.2 Test Procedure

According to the KDB-558074 D01 v04, 9.2.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

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

7.3 Environmental Conditions

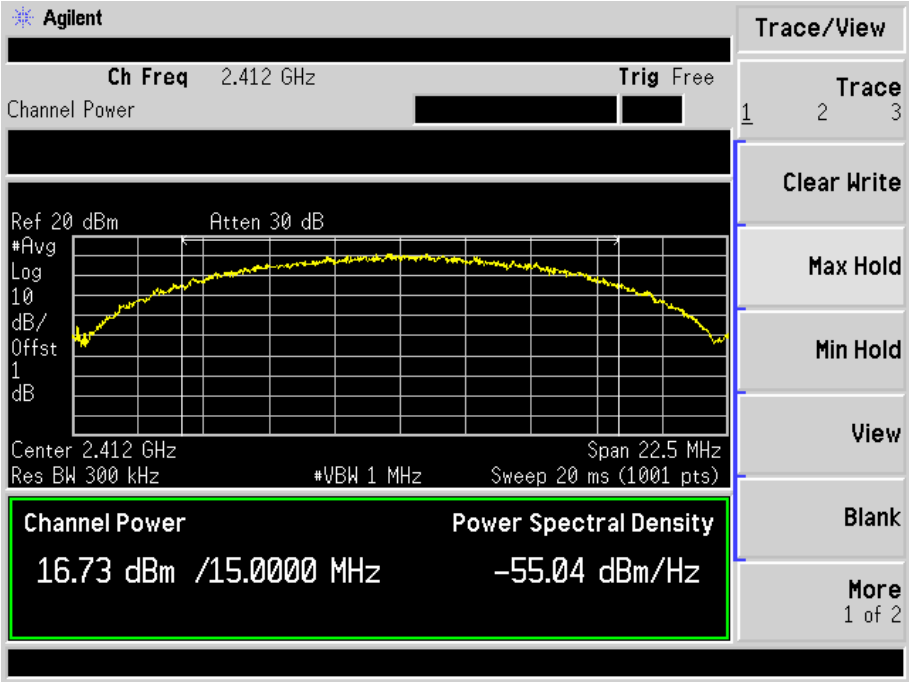
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

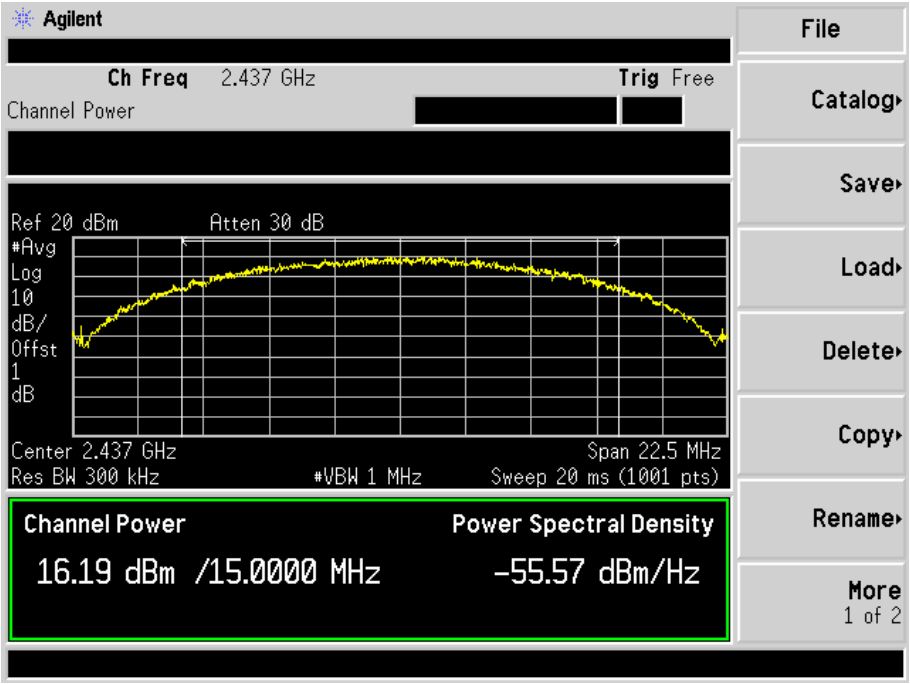
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b _ 11Mbps	2412	16.73	47.10	1000
	2437	16.19	41.59	1000
	2462	15.87	38.64	1000
802.11g_54Mbps	2412	12.72	18.71	1000
	2437	12.42	17.46	1000
	2462	12.11	16.26	1000
802.11n HT20_MCS7	2412	12.83	19.19	1000
	2437	12.67	18.49	1000
	2462	12.32	17.06	1000

Please refer to the following test plots:

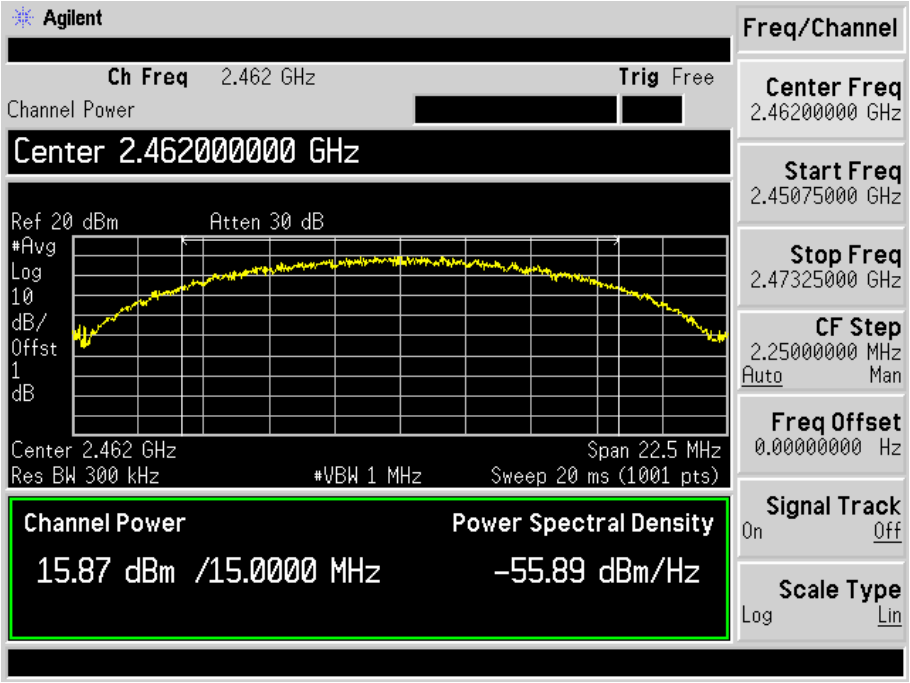
802.11b-11Mbps-Low Channel



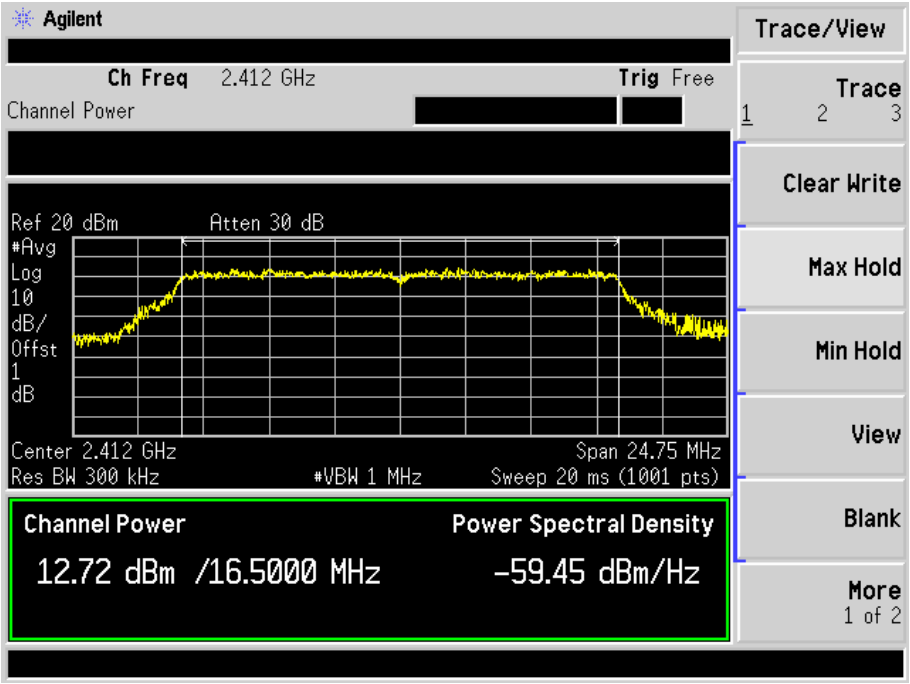
802.11b -11Mbps-Middle Channel



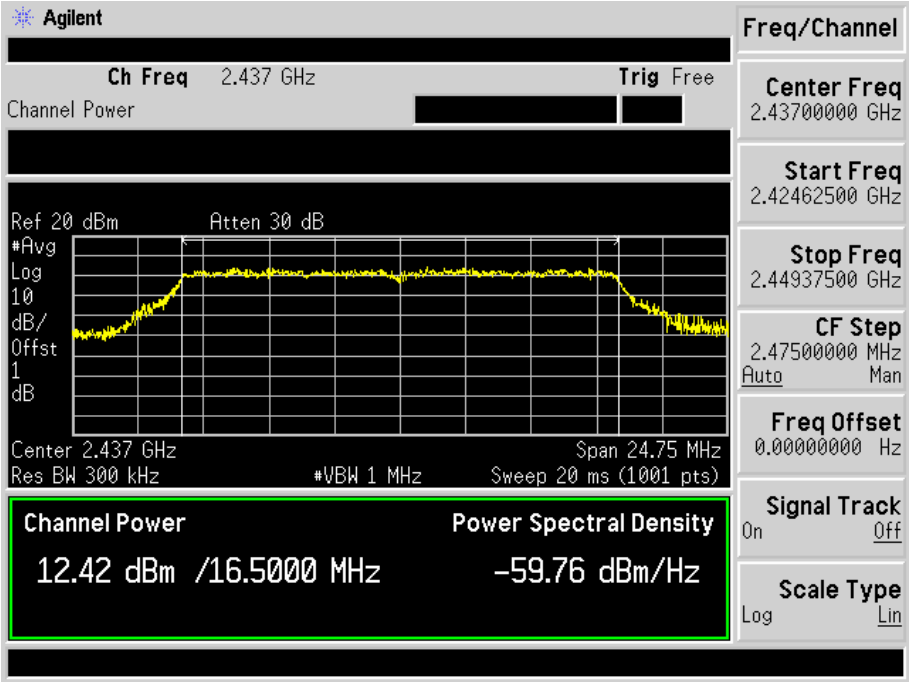
802.11b -11Mpbs-High Channel



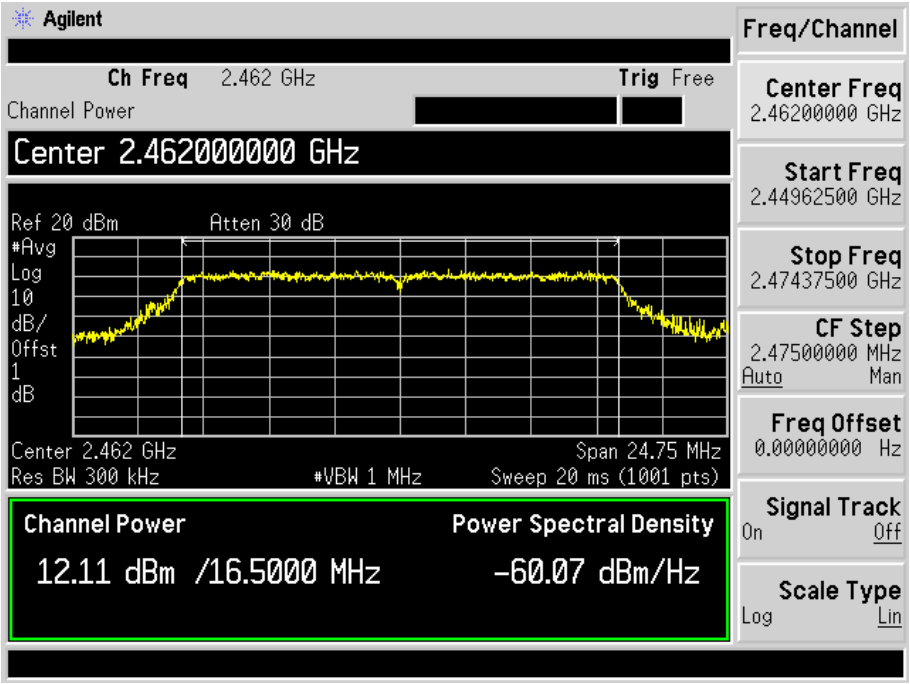
802.11g-54Mbps-Low Channel



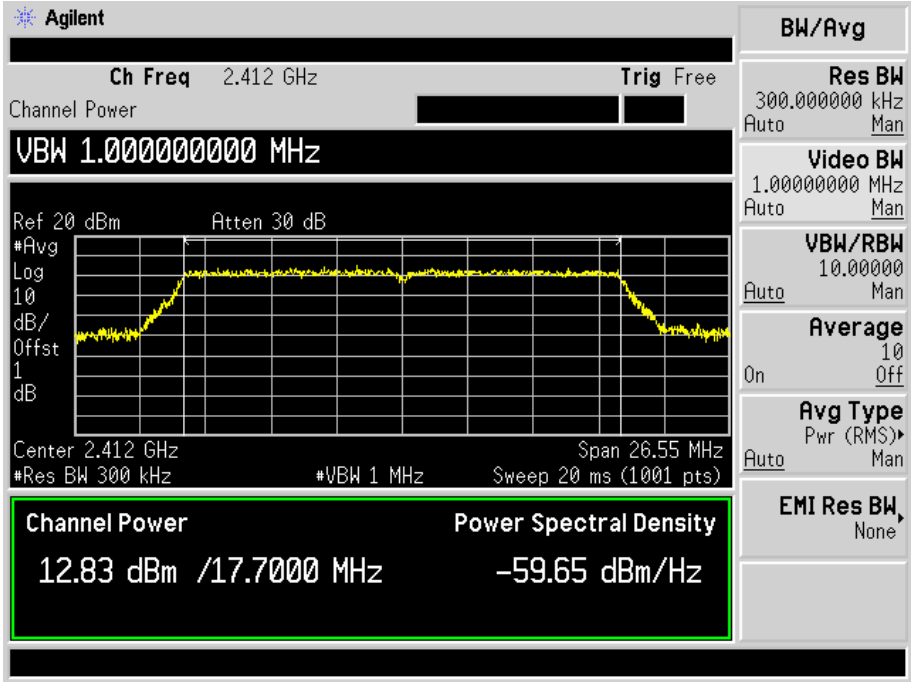
802.11g-54Mbps-Middle Channel



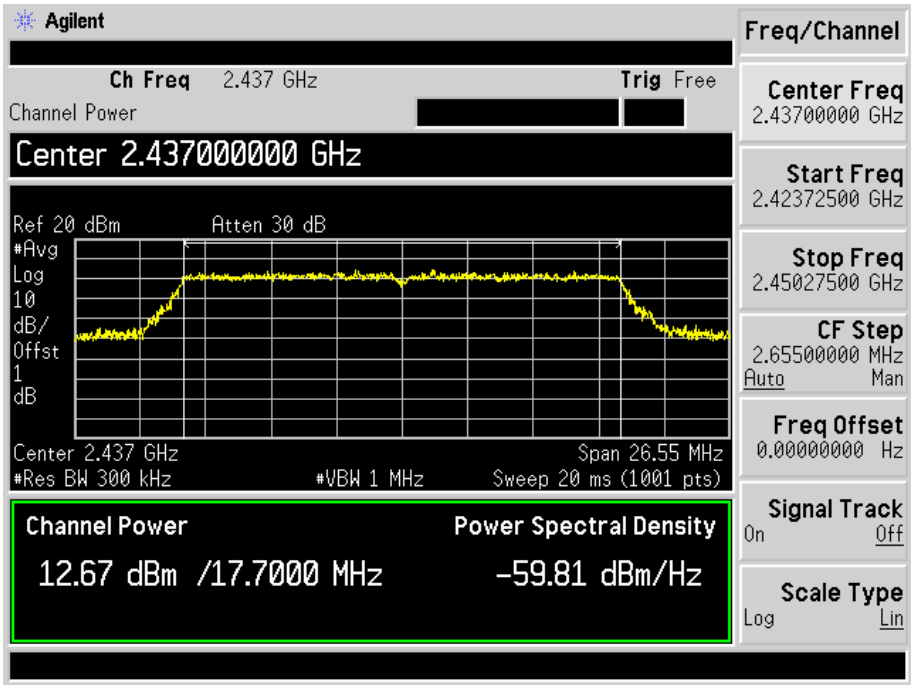
802.11g-54Mpbs-High Channel



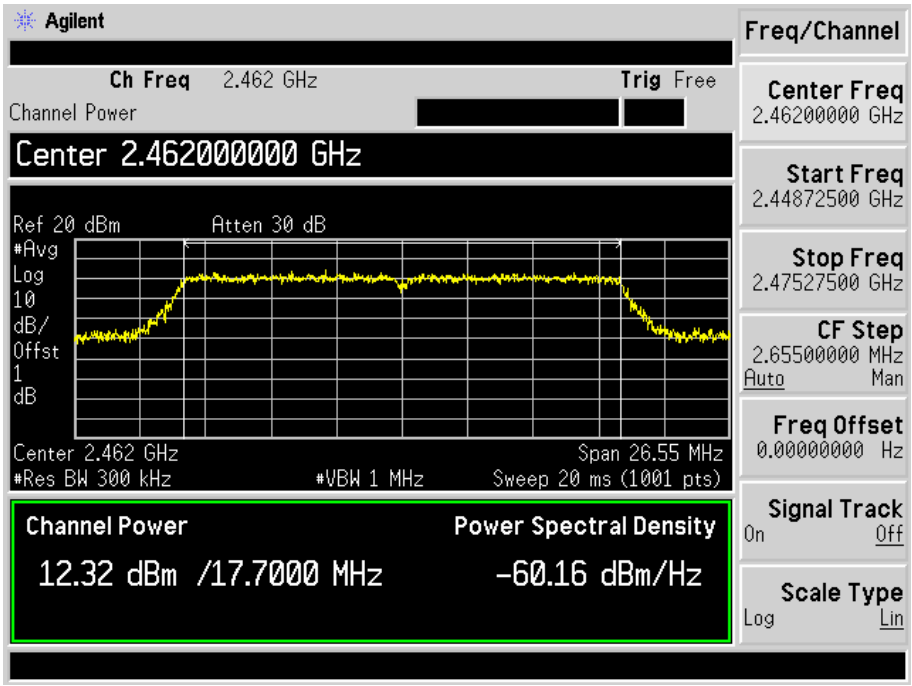
802.11n-HT20-MCS7-Low Channel



802.11n-HT20-MCS7-Middle Channel



802.11n-HT20-MCS7-High Channel



8. Field Strength of Spurious Emissions

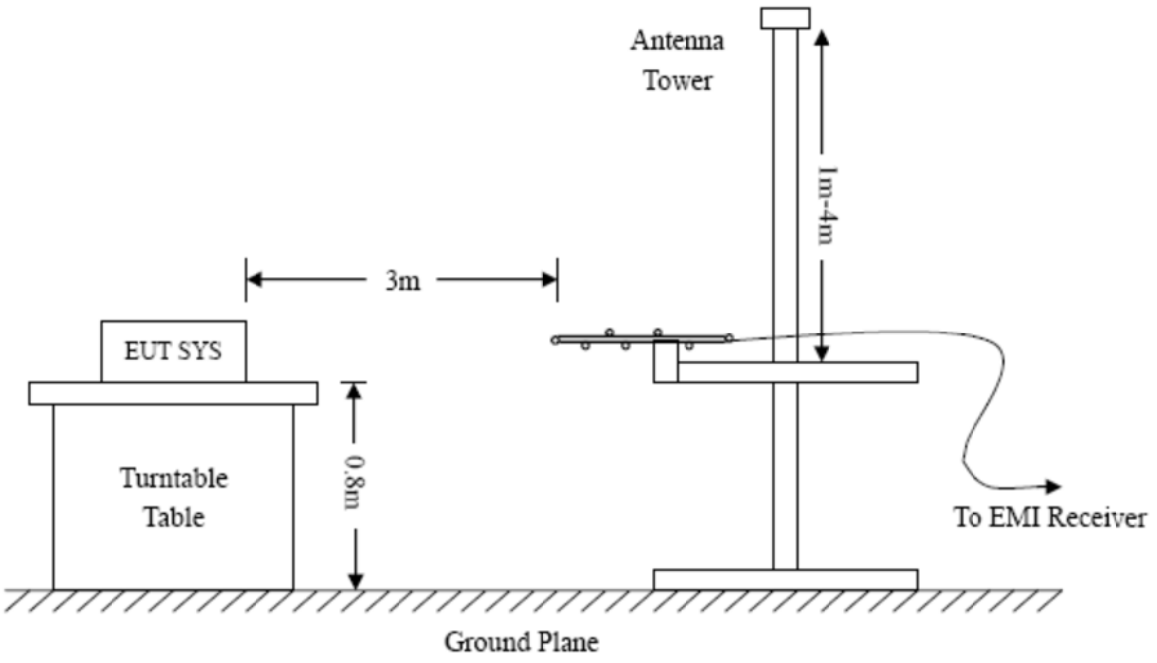
8.1 Standard Applicable

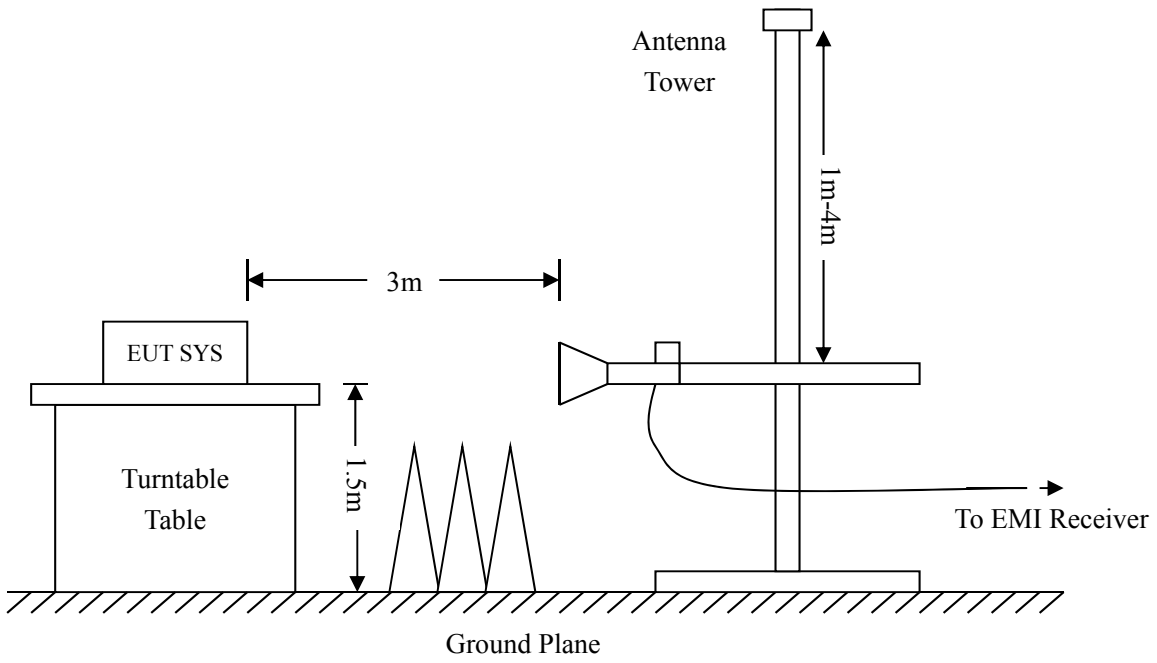
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

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

8.2 Test Procedure

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





Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=360KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

8.3 Corrected Amplitude & Margin Calculation

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

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

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

Margin = Corr. Ampl. – FCC Part 15 Limit

8.4 Environmental Conditions

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

8.5 Summary of Test Results/Plots

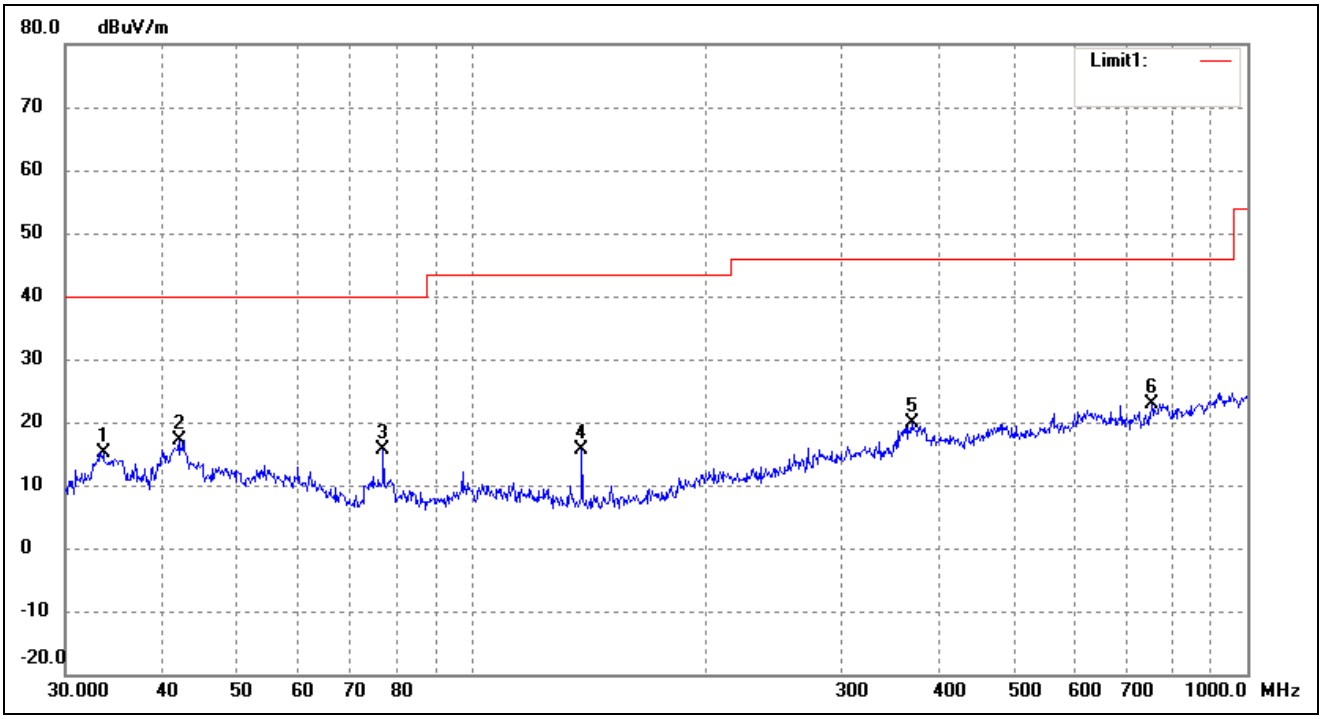
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

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

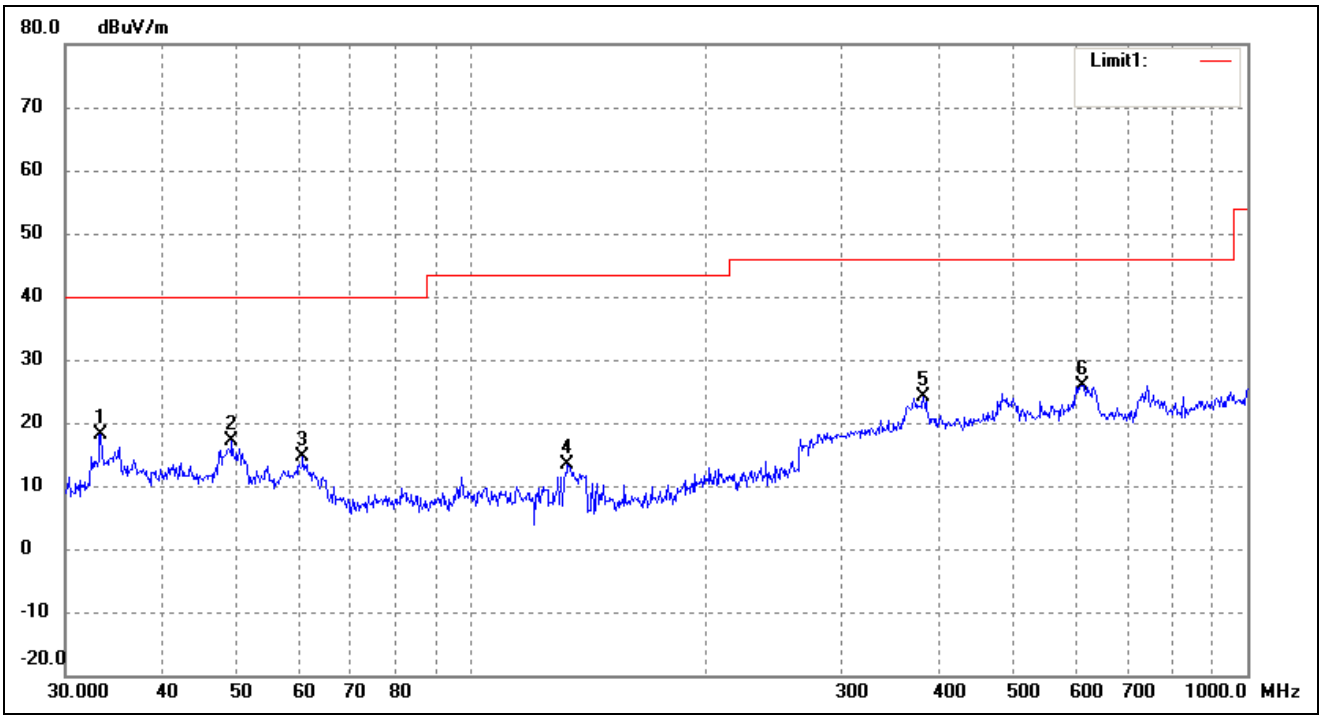
EUT: *Room Thermostat*
Tested Model: *SAS6000UTK-7-WIFI*
Operating Condition: *802.11b Transmitting*
Comment: *2*AA by battery(1.5V)*

Test Specification: *Horizontal*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	33.5624	24.47	-9.40	15.07	40.00	-24.93	276	100	peak
2	42.0066	24.92	-7.80	17.12	40.00	-22.88	96	100	peak
3	77.0505	27.86	-12.24	15.62	40.00	-24.38	168	100	peak
4	138.8735	28.13	-12.49	15.64	43.50	-27.86	91	100	peak
5	369.4047	22.69	-2.71	19.98	46.00	-26.02	202	100	peak
6	752.7432	20.86	1.92	22.78	46.00	-23.22	295	100	peak

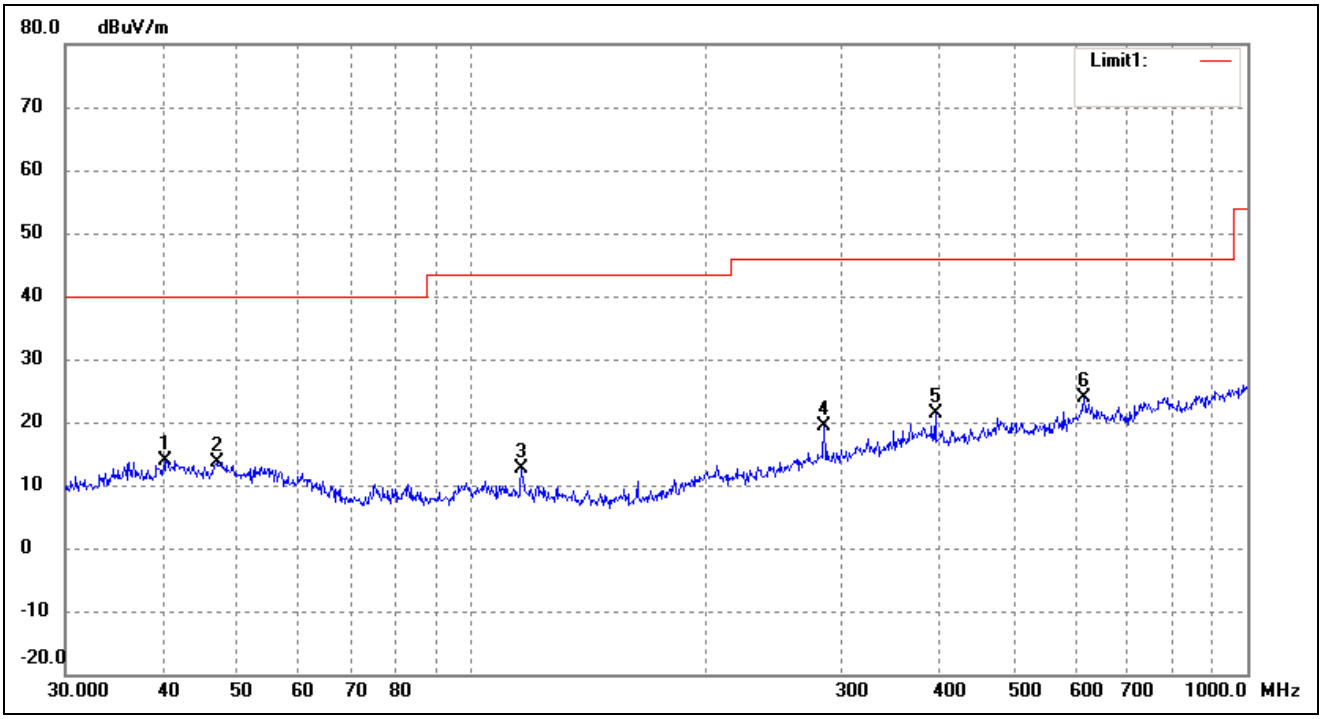
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	33.3279	27.64	-9.46	18.18	40.00	-21.82	291	100	peak
2	49.1866	25.33	-8.27	17.06	40.00	-22.94	93	100	peak
3	60.7044	24.49	-9.81	14.68	40.00	-25.32	50	100	peak
4	133.1511	25.43	-12.17	13.26	43.50	-30.24	119	100	peak
5	382.5879	26.32	-2.23	24.09	46.00	-21.91	195	100	peak
6	614.2142	25.00	0.83	25.83	46.00	-20.17	277	100	peak

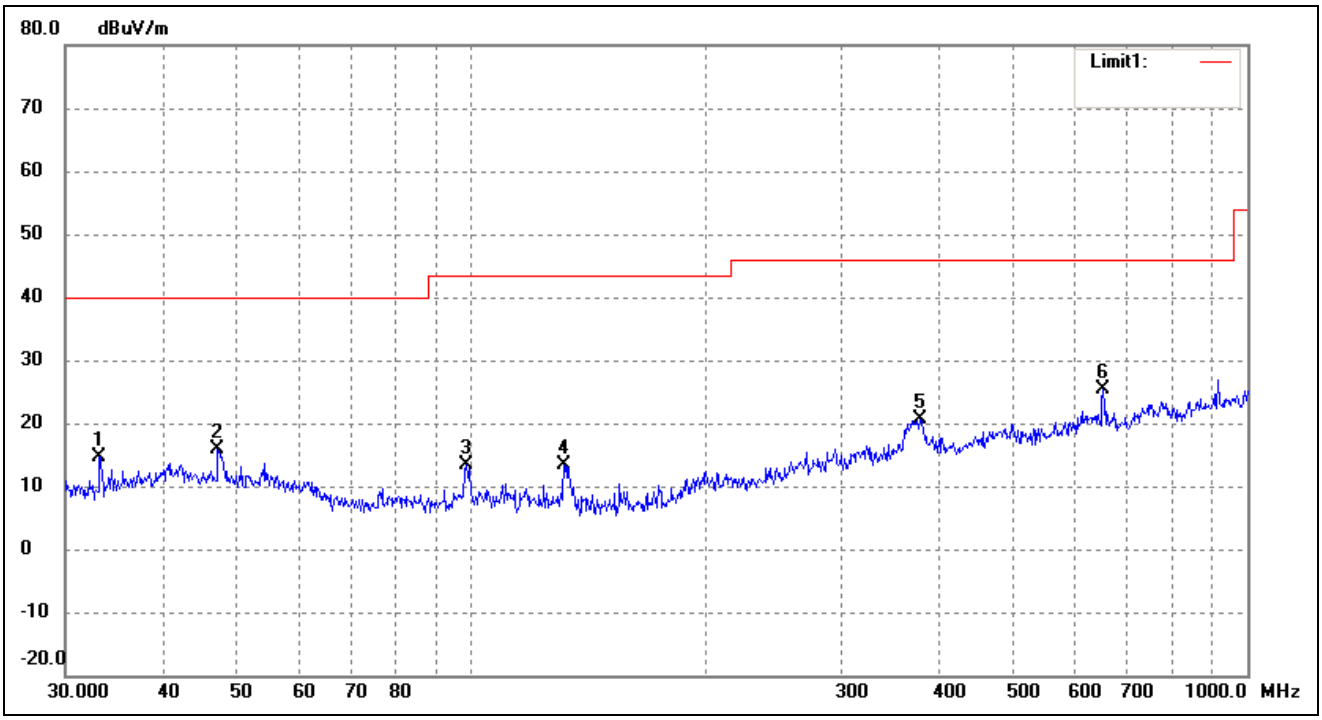
Operating Condition: *802.11g Transmitting*
Comment: *2*AA by battery(1.5V)*

Test Specification: *Horizontal*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	40.4172	21.59	-7.70	13.89	40.00	-26.11	224	100	peak
2	46.9948	21.85	-8.13	13.72	40.00	-26.28	102	100	peak
3	116.1321	24.05	-11.33	12.72	43.50	-30.78	66	100	peak
4	284.9767	25.49	-5.99	19.50	46.00	-26.50	176	100	peak
5	396.2415	24.30	-2.95	21.35	46.00	-24.65	326	100	peak
6	616.3718	22.92	0.99	23.91	46.00	-22.09	205	100	peak

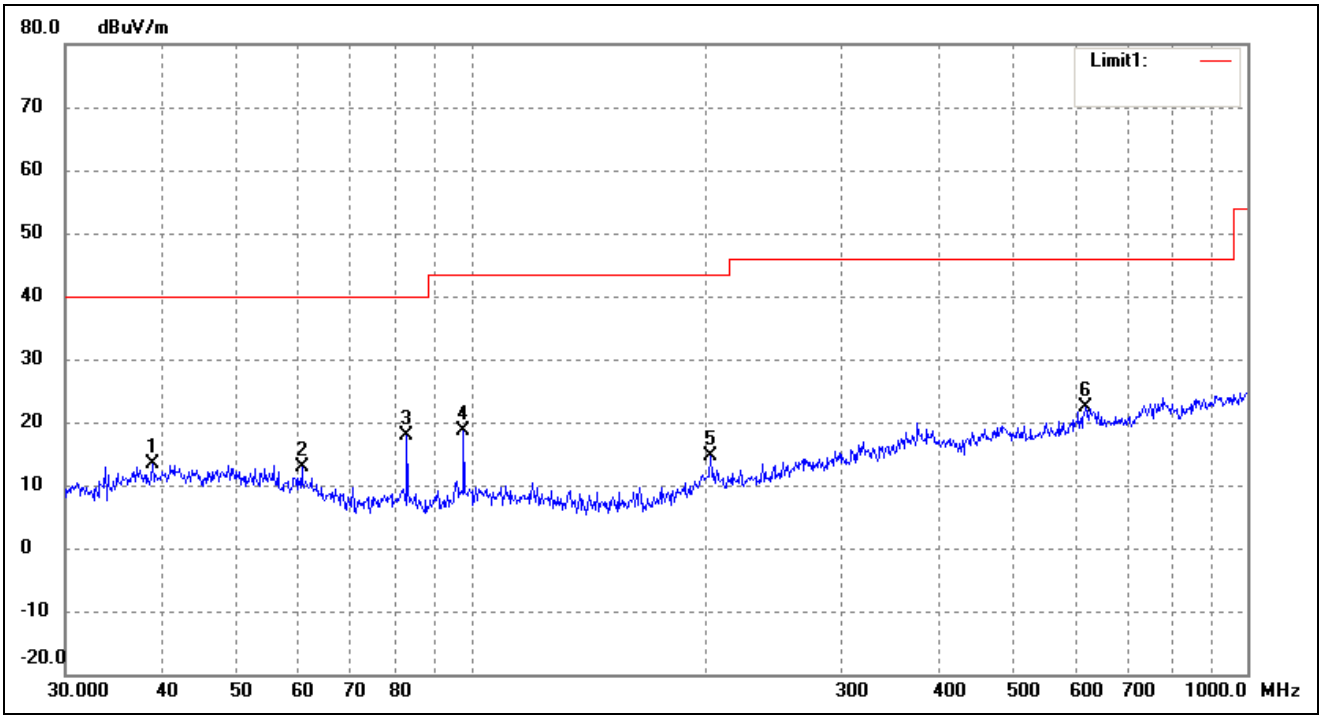
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	33.2112	24.18	-9.50	14.68	40.00	-25.32	57	100	peak
2	47.1599	24.04	-8.14	15.90	40.00	-24.10	125	100	peak
3	98.4866	24.61	-11.21	13.40	43.50	-30.10	51	100	peak
4	131.7577	25.51	-12.10	13.41	43.50	-30.09	274	100	peak
5	378.5843	22.92	-2.17	20.75	46.00	-25.25	132	100	peak
6	651.9417	24.82	0.46	25.28	46.00	-20.72	335	100	peak

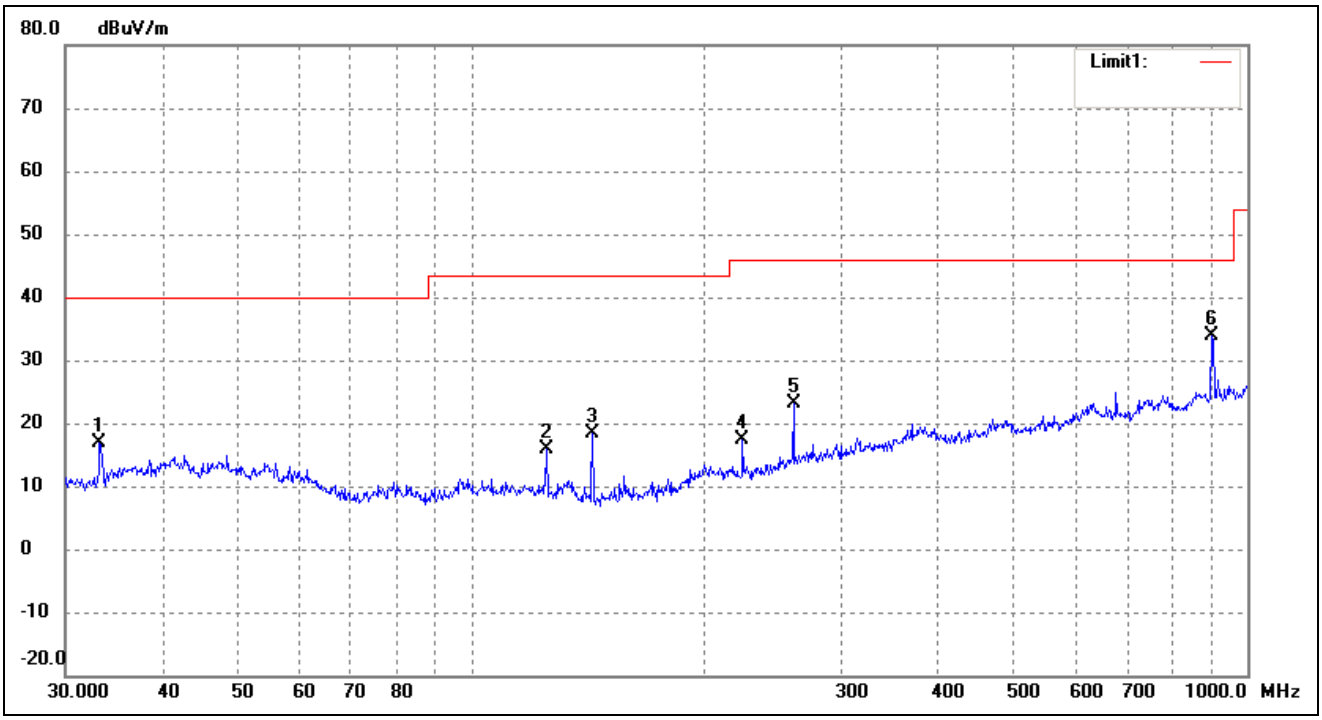
Operating Condition: *802.11n-HT20 Transmitting*
Comment: *2*AA by battery(1.5V)*

Test Specification: *Horizontal*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	38.8879	21.46	-7.97	13.49	40.00	-26.51	137	100	peak
2	60.4919	22.55	-9.74	12.81	40.00	-27.19	158	100	peak
3	82.6482	30.03	-12.24	17.79	40.00	-22.21	61	100	peak
4	97.7983	30.01	-11.35	18.66	43.50	-24.84	126	100	peak
5	203.5228	23.30	-8.68	14.62	43.50	-28.88	213	100	peak
6	618.5369	21.34	1.14	22.48	46.00	-23.52	277	100	peak

Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	33.2112	26.29	-9.50	16.79	40.00	-23.21	56	100	peak
2	125.0066	27.64	-11.71	15.93	43.50	-27.57	155	100	peak
3	143.3261	30.89	-12.51	18.38	43.50	-25.12	106	100	peak
4	223.7334	26.10	-8.75	17.35	46.00	-28.65	90	100	peak
5	260.1444	30.02	-6.95	23.07	46.00	-22.93	131	100	peak
6	900.1474	30.74	3.15	33.89	46.00	-12.11	273	100	peak

Spurious Emissions Above 1GHz

Test Mode: 802.11b

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	64.83	-3.87	60.96	74	-13.04	H	PK
4824.000	46.27	-3.87	42.4	54	-11.6	H	AV
7236.000	57.26	1.14	58.4	74	-15.6	H	PK
7236.000	41.59	1.19	42.78	54	-11.22	H	AV
4824.000	64.36	-3.86	60.5	74	-13.5	V	PK
4824.000	46.13	-3.86	42.27	54	-11.73	V	AV
7236.000	56.68	1.1	57.78	74	-16.22	V	PK
7236.000	41.29	1.1	42.39	54	-11.61	V	AV
Middle Channel-2437MHz							
4874.000	64.47	-3.74	60.73	74	-13.27	H	PK
4874.000	46.38	-3.74	42.64	54	-11.36	H	AV
7311.000	56.97	1.47	58.44	74	-15.56	H	PK
7311.000	41.28	1.47	42.75	54	-11.25	H	AV
4874.000	63.99	-3.74	60.25	74	-13.75	V	PK
4874.000	46.52	-3.74	42.78	54	-11.22	V	AV
7311.000	55.21	1.47	56.68	74	-17.32	V	PK
7311.000	40.97	1.47	42.44	54	-11.56	V	AV
High Channel-2462MHz							
4924.000	64.25	-3.59	60.66	74	-13.34	H	PK
4924.000	46.28	-3.59	42.69	54	-11.31	H	AV
7386.000	56.74	1.79	58.53	74	-15.47	H	PK
7386.000	41.03	1.79	42.82	54	-11.18	H	AV
4924.000	64.16	-3.59	60.57	74	-13.43	V	PK
4924.000	46.03	-3.59	42.44	54	-11.56	V	AV
7386.000	55.33	1.79	57.12	74	-16.88	V	PK
7386.000	41.18	1.79	42.97	54	-11.03	V	AV

Test Mode: 802.11g

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.000	63.14	-3.87	59.27	74	-14.73	H	PK
4824.000	44.69	-3.87	40.82	54	-13.18	H	AV
7236.000	56.81	1.14	57.95	74	-16.05	H	PK
7236.000	40.23	1.19	41.42	54	-12.58	H	AV
4824.000	63.06	-3.86	59.2	74	-14.8	V	PK
4824.000	45.23	-3.86	41.37	54	-12.63	V	AV
7236.000	56.47	1.1	57.57	74	-16.43	V	PK
7236.000	40.64	1.1	41.74	54	-12.26	V	AV
Middle Channel-2437MHz							
4874.000	62.58	-3.74	58.84	74	-15.16	H	PK
4874.000	45.61	-3.74	41.87	54	-12.13	H	AV
7311.000	55.86	1.47	57.33	74	-16.67	H	PK
7311.000	40.67	1.47	42.14	54	-11.86	H	AV
4874.000	62.19	-3.74	58.45	74	-15.55	V	PK
4874.000	45.39	-3.74	41.65	54	-12.35	V	AV
7311.000	55.07	1.47	56.54	74	-17.46	V	PK
7311.000	40.23	1.47	41.7	54	-12.3	V	AV
High Channel-2462MHz							
4924.000	63.01	-3.59	59.42	74	-14.58	H	PK
4924.000	45.63	-3.59	42.04	54	-11.96	H	AV
7386.000	55.14	1.79	56.93	74	-17.07	H	PK
7386.000	40.67	1.79	42.46	54	-11.54	H	AV
4924.000	62.18	-3.59	58.59	74	-15.41	V	PK
4924.000	44.78	-3.59	41.19	54	-12.81	V	AV
7386.000	54.96	1.79	56.75	74	-17.25	V	PK
7386.000	40.47	1.79	42.26	54	-11.74	V	AV

Test Mode: 802.11n-HT20

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.000	62.88	-3.87	59.01	74	-14.99	H	PK
4824.000	45.63	-3.87	41.76	54	-12.24	H	AV
7236.000	55.76	1.14	56.9	74	-17.1	H	PK
7236.000	40.11	1.19	41.3	54	-12.7	H	AV
4824.000	62.99	-3.86	59.13	74	-14.87	V	PK
4824.000	45.78	-3.86	41.92	54	-12.08	V	AV
7236.000	55.92	1.1	57.02	74	-16.98	V	PK
7236.000	40.37	1.1	41.47	54	-12.53	V	AV
Middle Channel-2437MHz							
4874.000	62.07	-3.74	58.33	74	-15.67	H	PK
4874.000	45.28	-3.74	41.54	54	-12.46	H	AV
7311.000	54.39	1.47	55.86	74	-18.14	H	PK
7311.000	39.97	1.47	41.44	54	-12.56	H	AV
4874.000	62.45	-3.74	58.71	74	-15.29	V	PK
4874.000	45.73	-3.74	41.99	54	-12.01	V	AV
7311.000	55.12	1.47	56.59	74	-17.41	V	PK
7311.000	40.69	1.47	42.16	54	-11.84	V	AV
High Channel-2462MHz							
4924.000	61.98	-3.59	58.39	74	-15.61	H	PK
4924.000	45.06	-3.59	41.47	54	-12.53	H	AV
7386.000	54.97	1.79	56.76	74	-17.24	H	PK
7386.000	40.33	1.79	42.12	54	-11.88	H	AV
4924.000	61.74	-3.59	58.15	74	-15.85	V	PK
4924.000	45.29	-3.59	41.7	54	-12.3	V	AV
7386.000	55.37	1.79	57.16	74	-16.84	V	PK
7386.000	40.62	1.79	42.41	54	-11.59	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Out of Band Emissions

9.1 Standard Applicable

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

9.2 Test Procedure

According to the KDB 558074D01 v04, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)
RBW = 1MHz, VBW = 1MHz for peak value measured
RBW = 1MHz, VBW = 10Hz for average value measured
Sweep = auto; Detector function = peak/average; Trace = max hold
All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:
1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW ≥ 300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

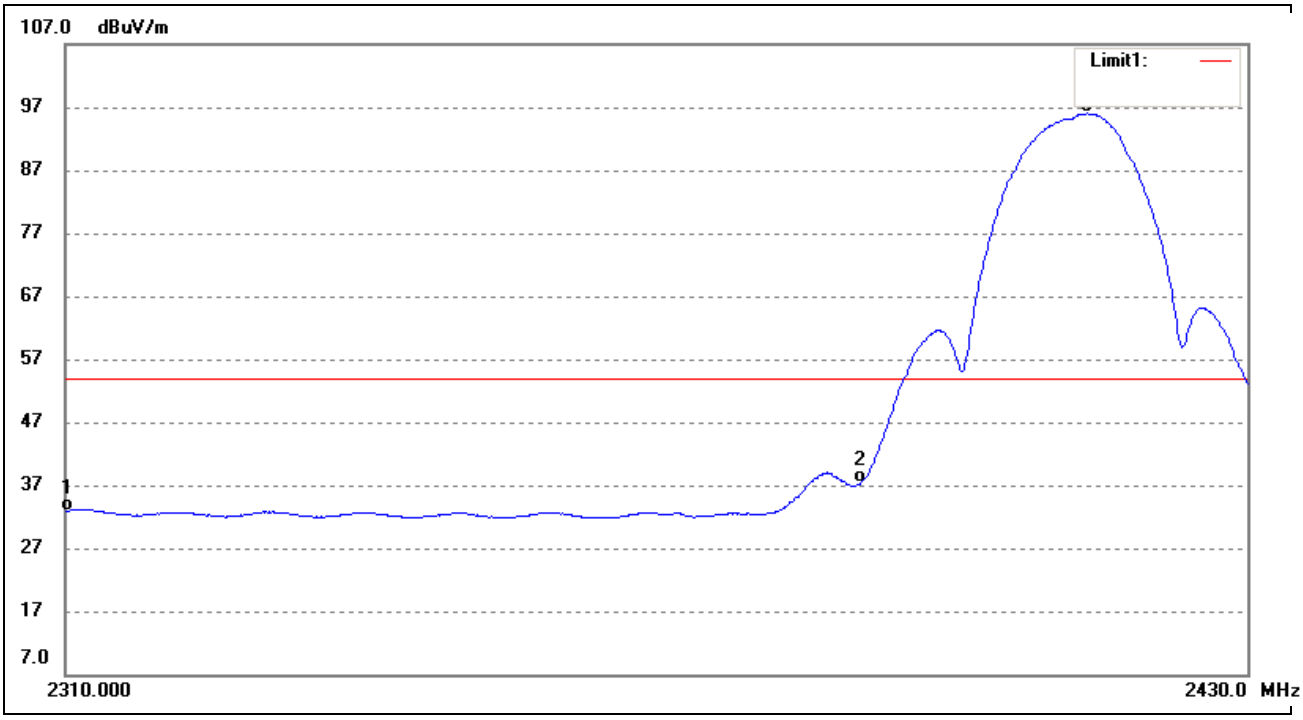
9.3 Environmental Conditions

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

9.4 Summary of Test Results/Plots

802.11b-Lowest Bandedge

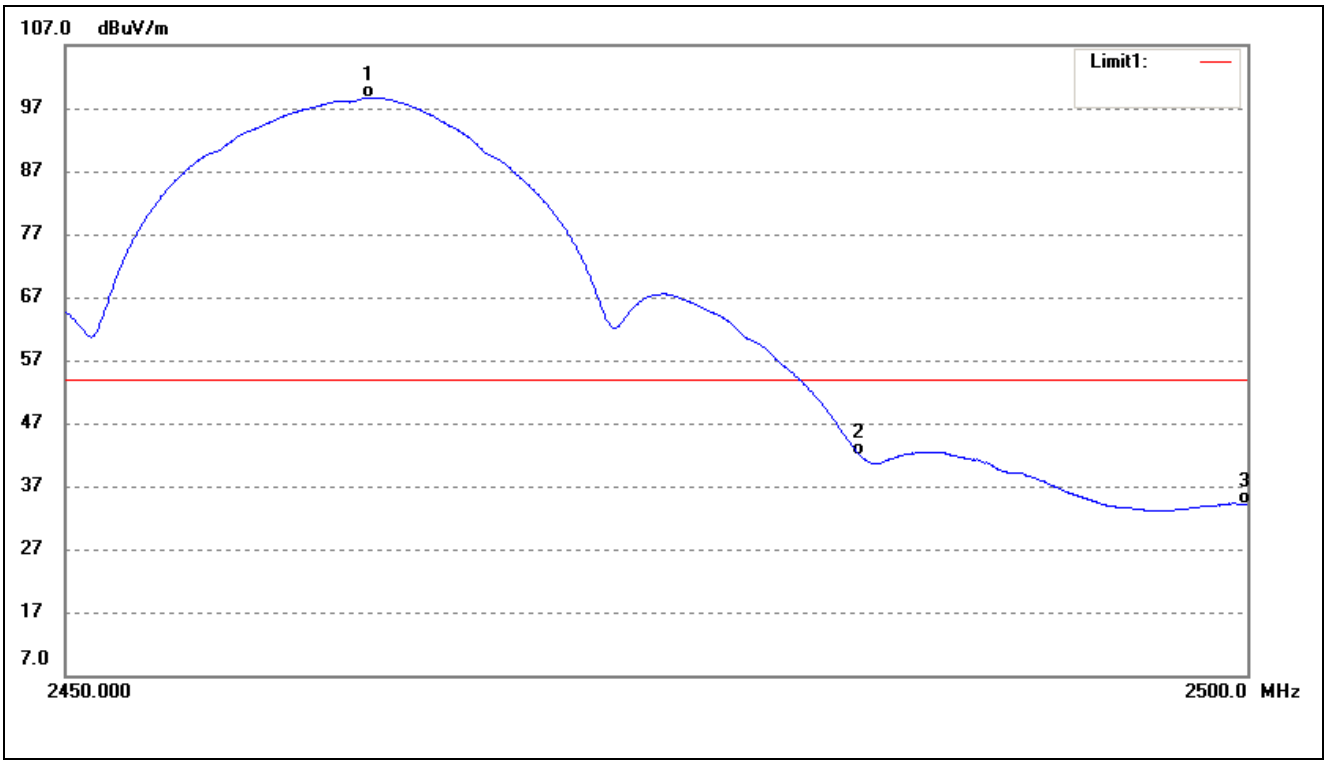
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.00	39.26	-6.38	32.88	54.00	-21.12	Average Detector
	2310.00	51.92	-6.38	45.54	74.00	-28.46	Peak Detector
2	2390.00	44.64	-7.26	37.38	54.00	-16.62	Average Detector
	2390.00	73.85	-7.26	66.59	74.00	-7.41	Peak Detector
3	2413.44	103.41	-7.40	96.01	/	/	Average Detector
	2412.47	114.62	-7.41	107.21	/	/	Peak Detector

802.11b-Highest Bandedge

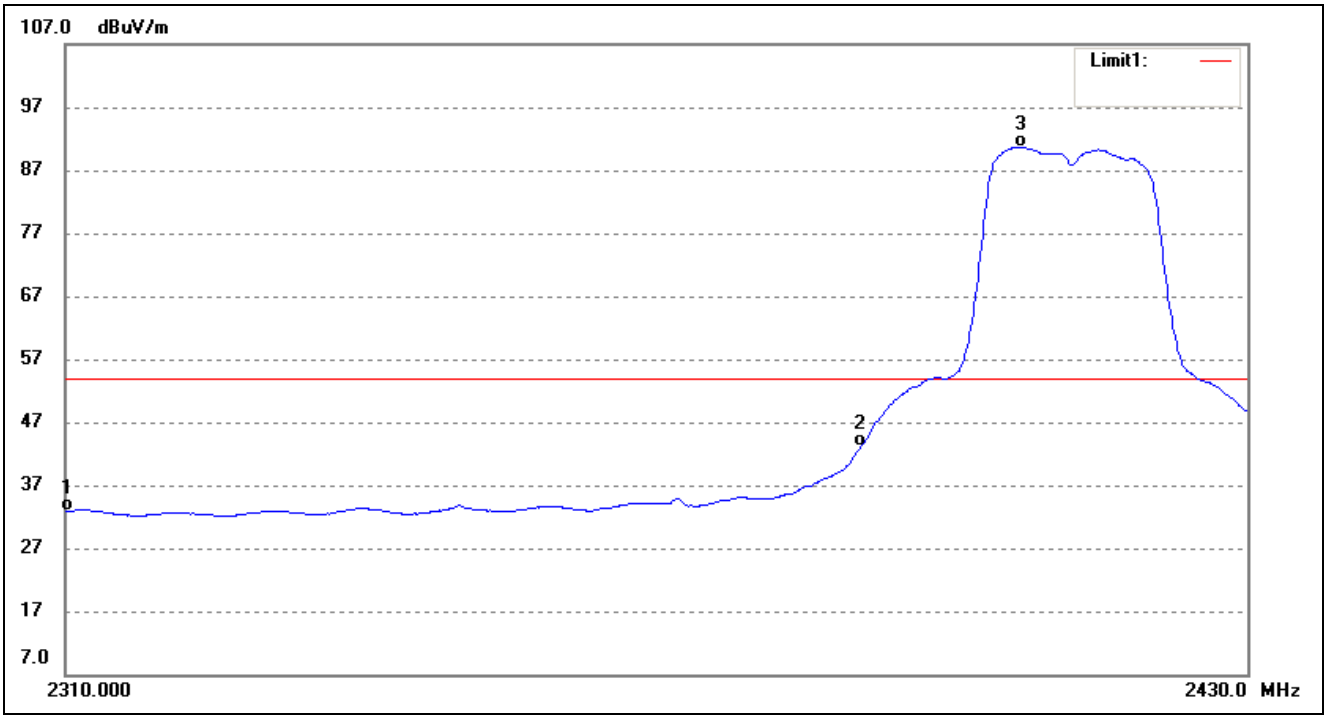
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	2462.75	105.99	-7.31	98.68	/	/	Average Detector
	2462.60	115.25	-7.31	107.94	/	/	Peak Detector
2	2483.50	49.08	-7.28	41.80	54.00	-12.20	Average Detector
	2483.50	76.53	-7.28	69.25	74.00	-4.75	Peak Detector
3	2500.00	41.42	-7.25	34.17	54.00	-19.83	Average Detector
	2500.00	70.03	-7.25	62.78	74.00	-11.22	Peak Detector

802.11g-Lowest Bandedge

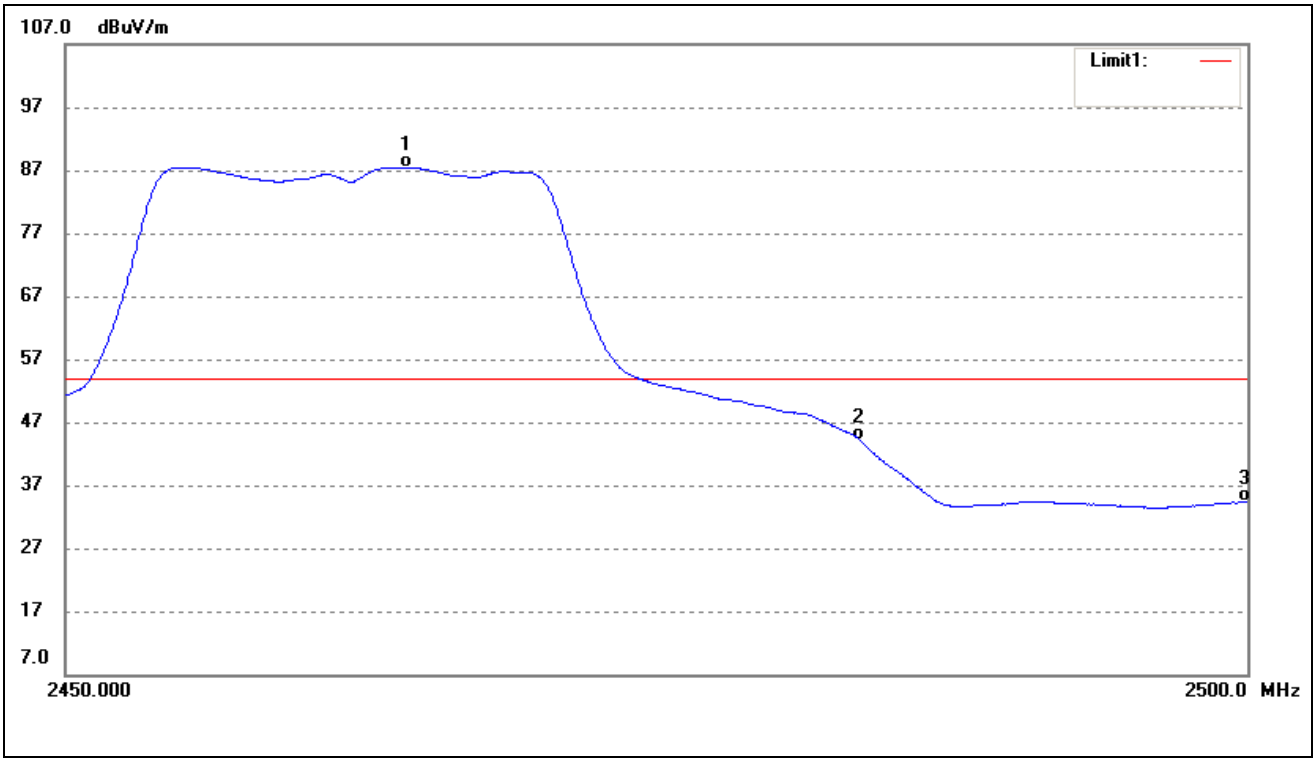
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.00	39.24	-6.38	32.86	54.00	-21.14	Average Detector
	2310.00	51.56	-6.38	45.18	74.00	-28.82	Peak Detector
2	2390.00	50.51	-7.26	43.25	54.00	-10.75	Average Detector
	2390.00	70.39	-7.26	63.13	74.00	-10.87	Peak Detector
3	2406.61	98.12	-7.42	90.70	/	/	Average Detector
	2415.40	109.67	-7.40	102.27	/	/	Peak Detector

802.11g-Highest Bandedge

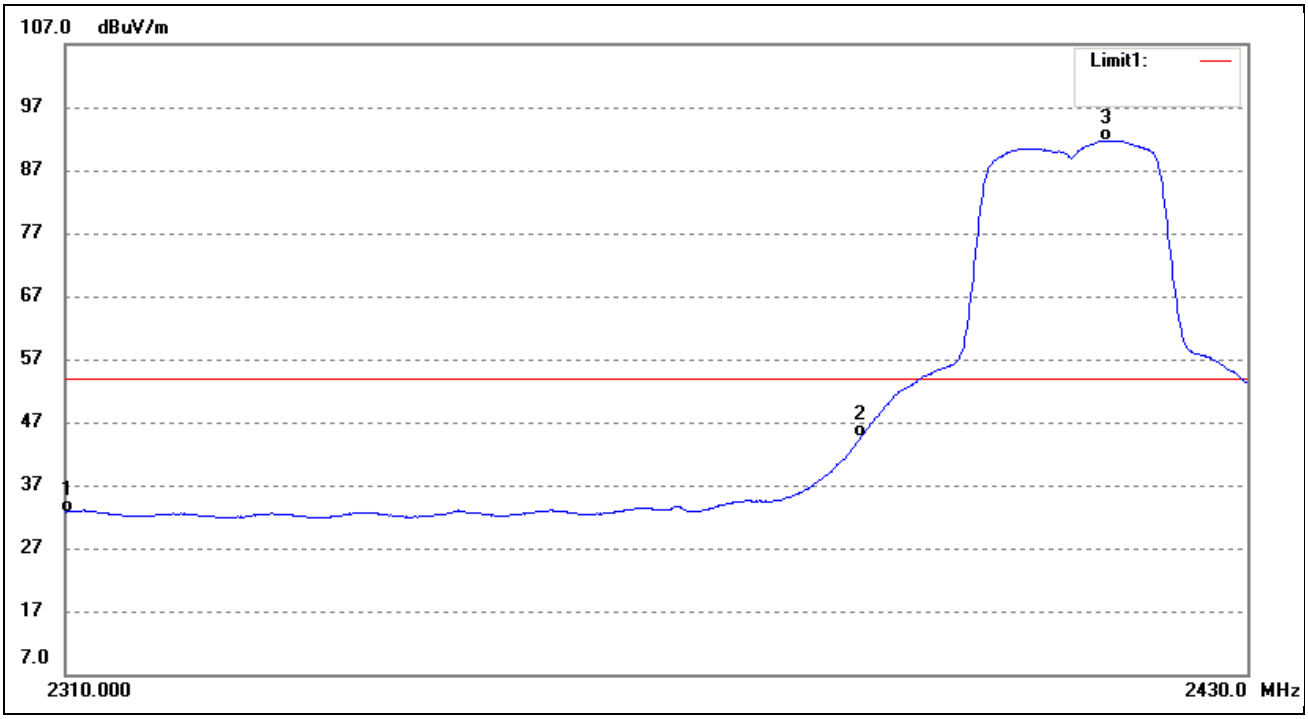
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2464.30	94.77	-7.31	87.46	/	/	Average Detector
	2465.49	110.21	-7.31	102.90	/	/	Peak Detector
2	2483.50	51.31	-7.28	44.03	54.00	-9.97	Average Detector
	2483.50	75.09	-7.28	67.81	74.00	-6.19	Peak Detector
3	2500.00	41.62	-7.25	34.37	54.00	-19.63	Average Detector
	2500.00	73.41	-7.25	66.16	74.00	-7.84	Peak Detector

802.11n-HT20-Lowest Bandedge

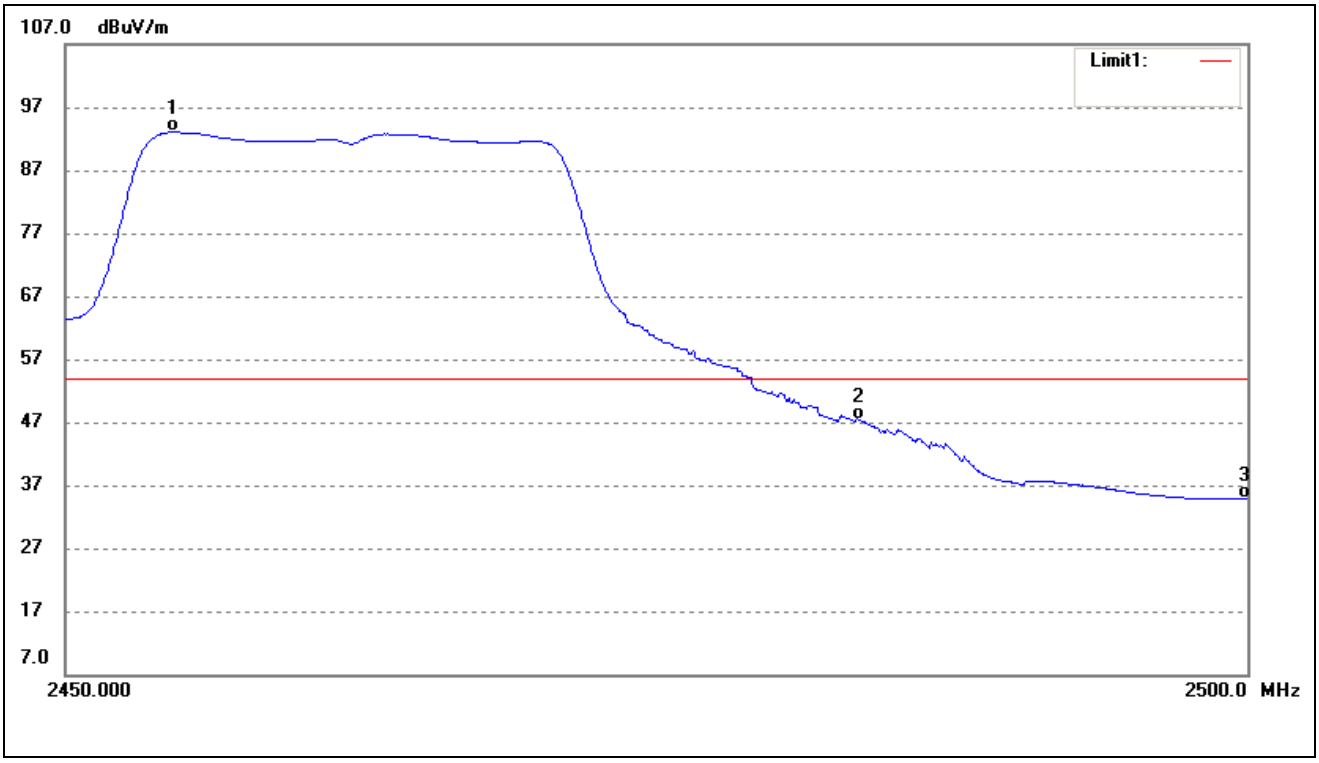
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.00	39.09	-6.38	32.71	54.00	-21.29	Average Detector
	2310.00	51.10	-6.38	44.72	74.00	-29.28	Peak Detector
2	2390.00	51.83	-7.26	44.57	54.00	-9.43	Average Detector
	2390.00	71.77	-7.26	64.51	74.00	-9.49	Peak Detector
3	2415.28	99.09	-7.40	91.69	/	/	Average Detector
	2415.89	109.69	-7.39	102.30	/	/	Peak Detector

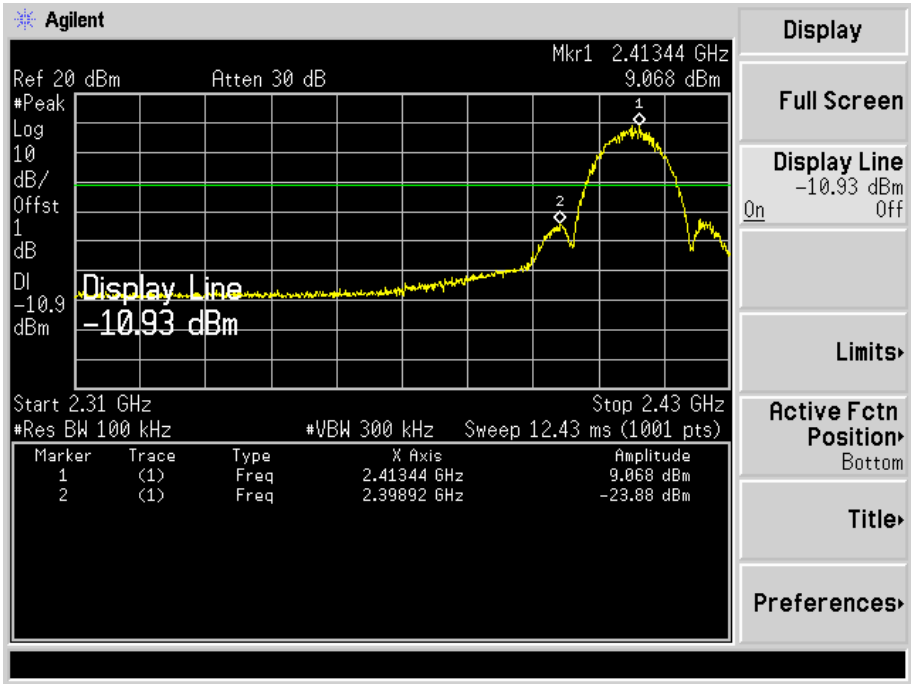
802.11n-HT20-Highest Bandedge

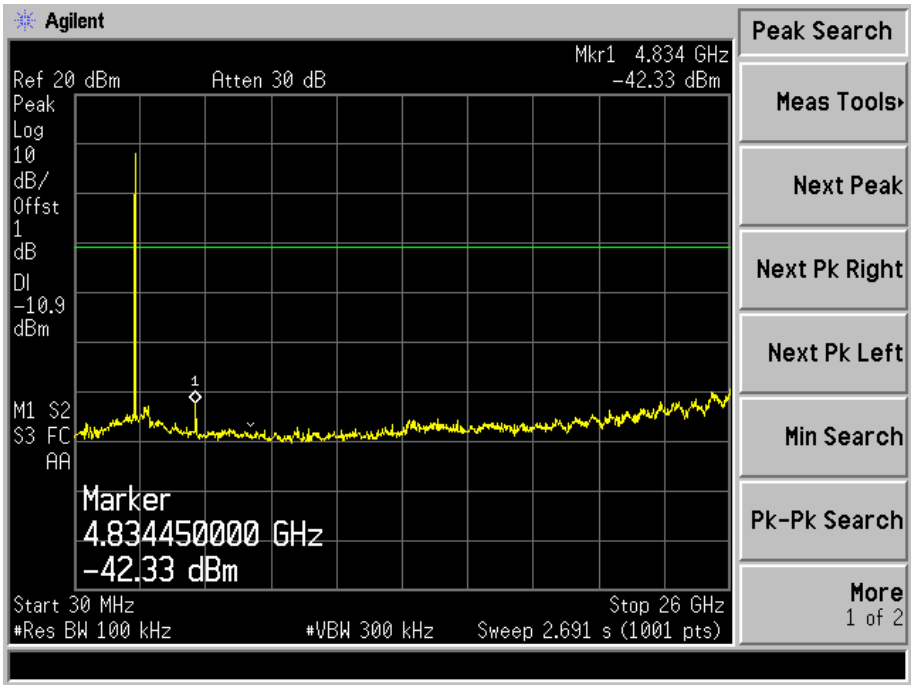
Vertical (Worst case)



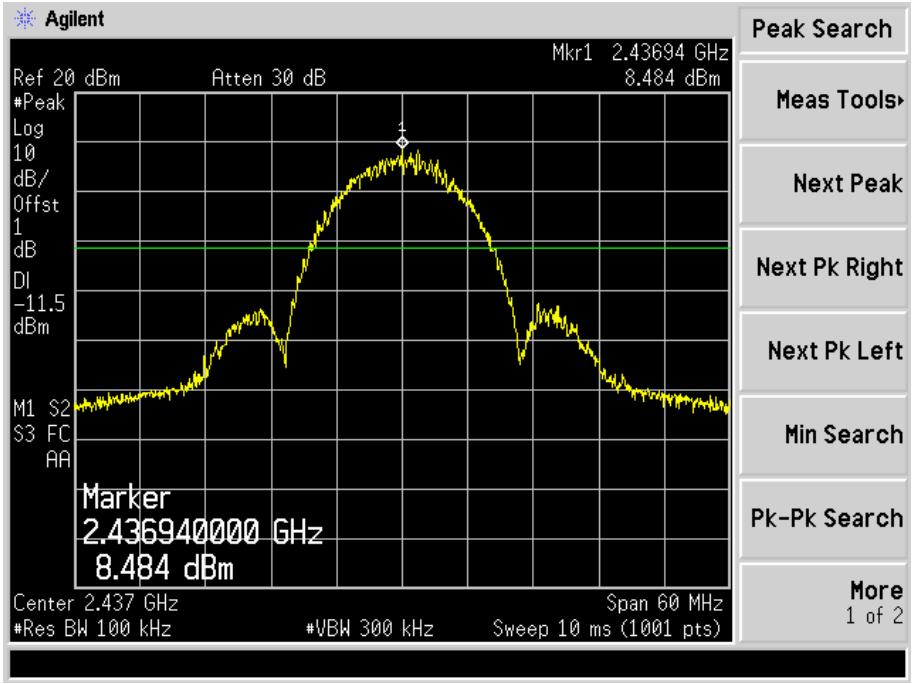
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2454.51	100.40	-7.33	93.07	/	/	Average Detector
	2454.56	111.53	-7.33	104.20	/	/	Peak Detector
2	2483.50	54.56	-7.28	47.28	54.00	-6.72	Average Detector
	2483.50	75.55	-7.28	68.27	74.00	-5.73	Peak Detector
3	2500.00	42.07	-7.25	34.82	54.00	-19.18	Average Detector
	2500.00	68.29	-7.25	61.04	74.00	-12.96	Peak Detector

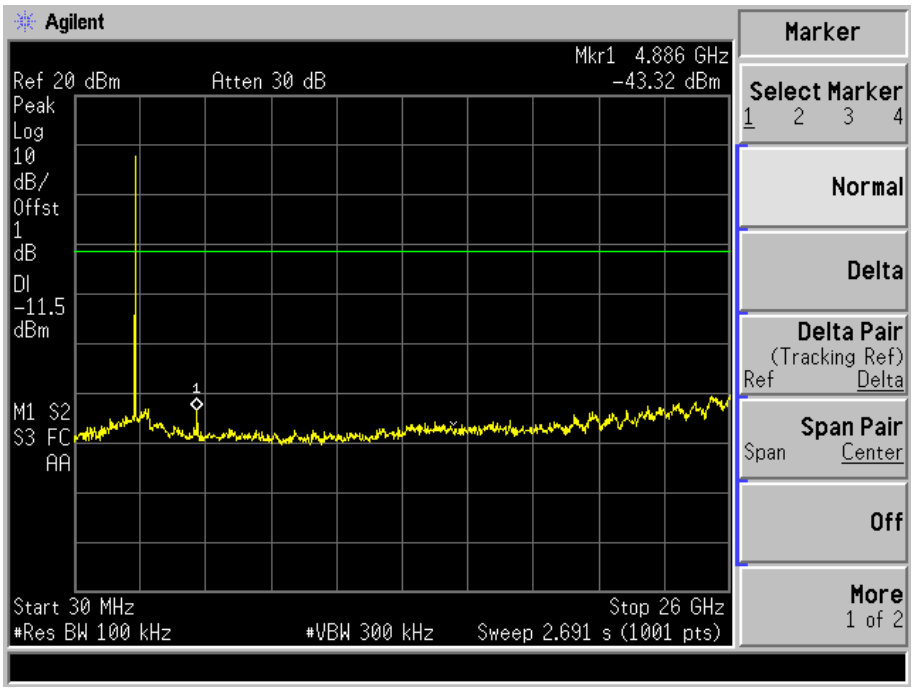
Spurious (Conducted)
802.11b-Lowest
Lowest



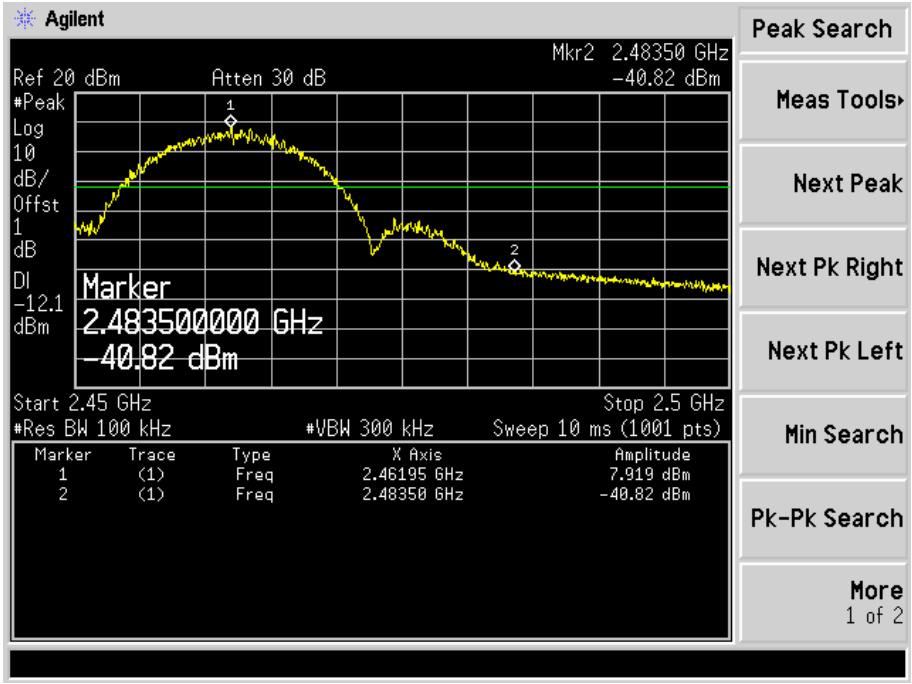


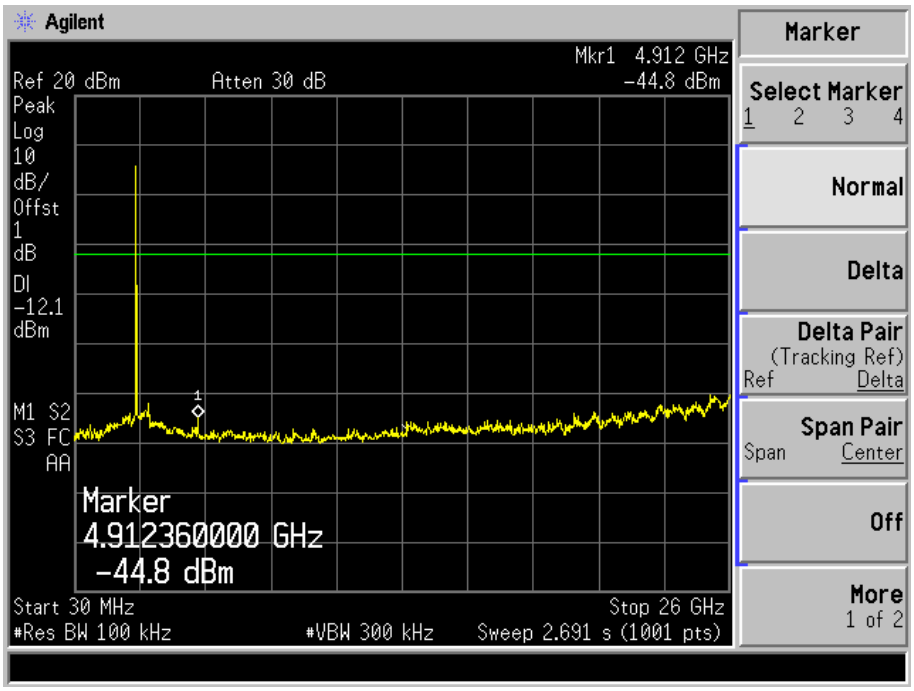
Middle


Agilent
Mkr1 2.43694 GHz
Ref 20 dBm
Atten 30 dB
8.484 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-11.5
dBm
M1 S2
S3 FC
AA
Marker
2.436940000 GHz
8.484 dBm
Center 2.437 GHz
Span 60 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 10 ms (1001 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

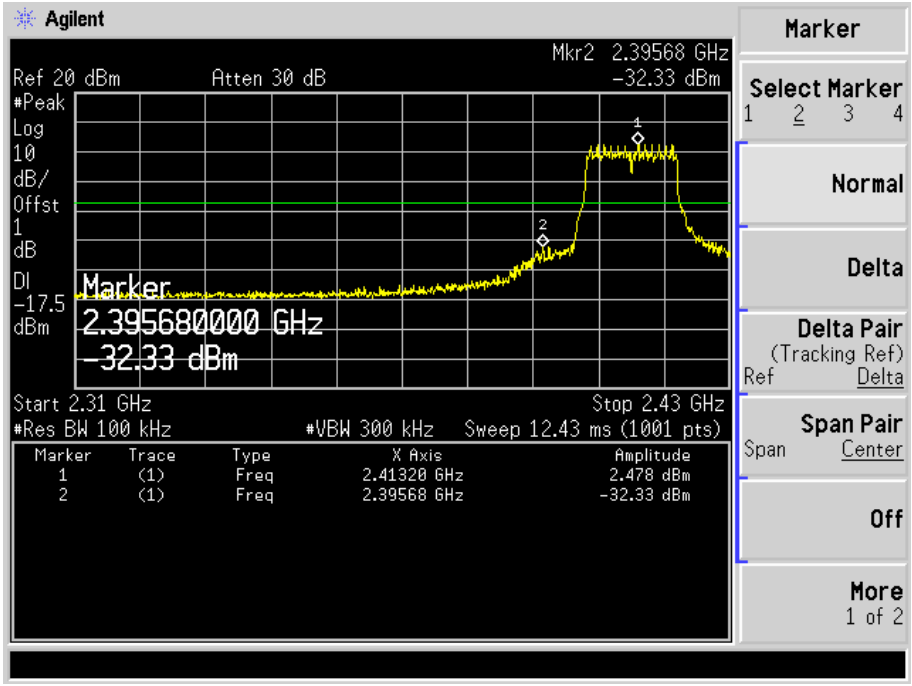

Agilent
Mkr1 4.886 GHz
Ref 20 dBm
Atten 30 dB
-43.32 dBm
Peak
Log
10
dB/
Offst
1
dB
Dl
-11.5
dBm
M1 S2
S3 FC
AA
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

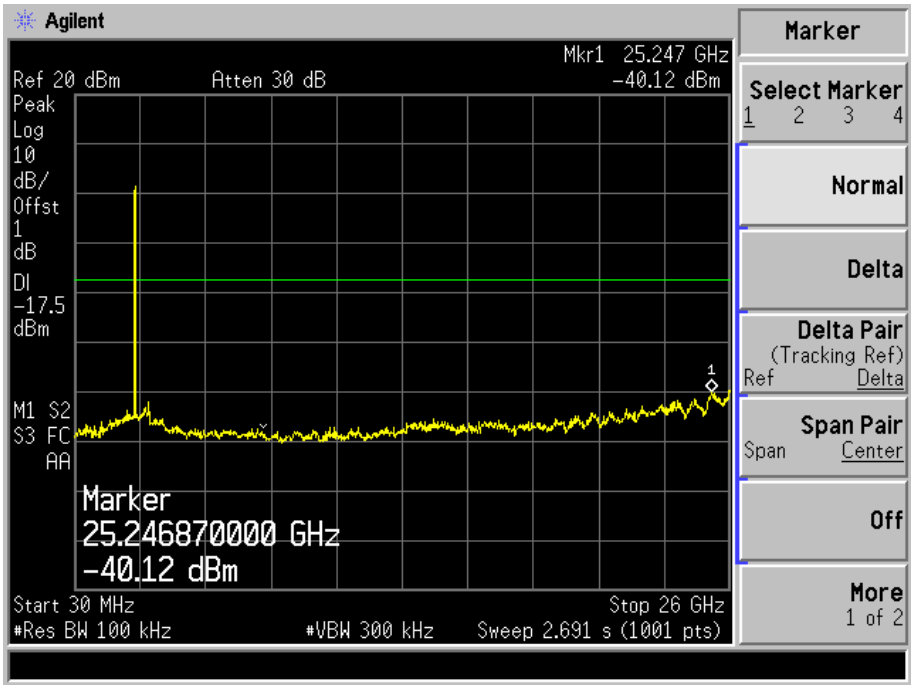
Highest


Agilent
Mkr2 2.48350 GHz
Ref 20 dBm
Atten 30 dB
-40.82 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-12.1
dBm
Marker
2.483500000 GHz
-40.82 dBm
Start 2.45 GHz
Stop 2.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 10 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.46195 GHz 7.919 dBm
2 (1) Freq 2.48350 GHz -40.82 dBm
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

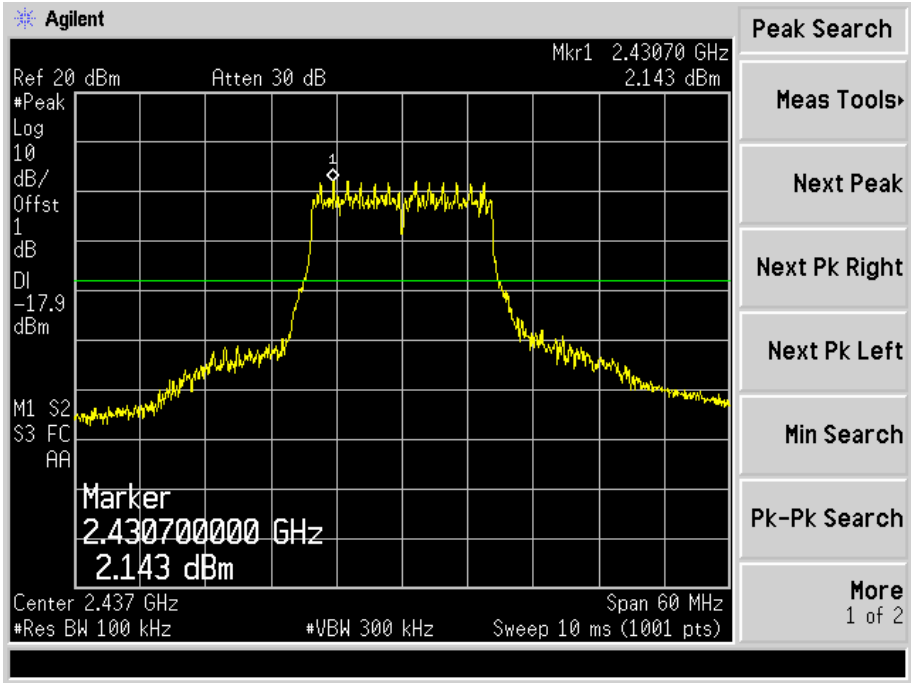

Agilent
Mkr1 4.912 GHz
Ref 20 dBm
Atten 30 dB
-44.8 dBm
Peak
Log
10
dB/
Offst
1
dB
Dl
-12.1
dBm
M1 S2
S3 FC
AA
Marker
4.912360000 GHz
-44.8 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

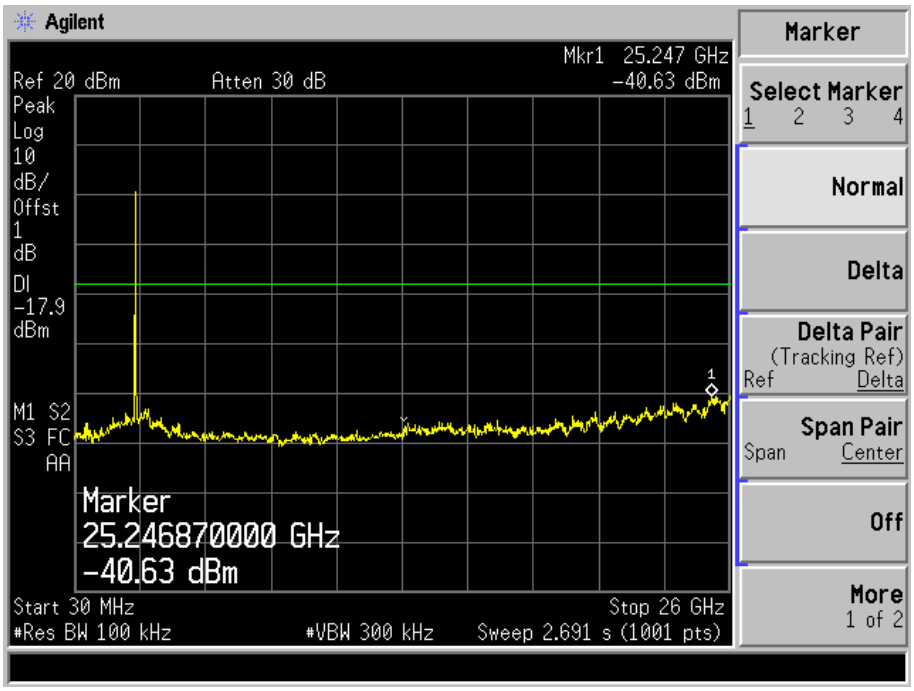
Spurious (Conducted)
802.11g-Lowest
Lowest



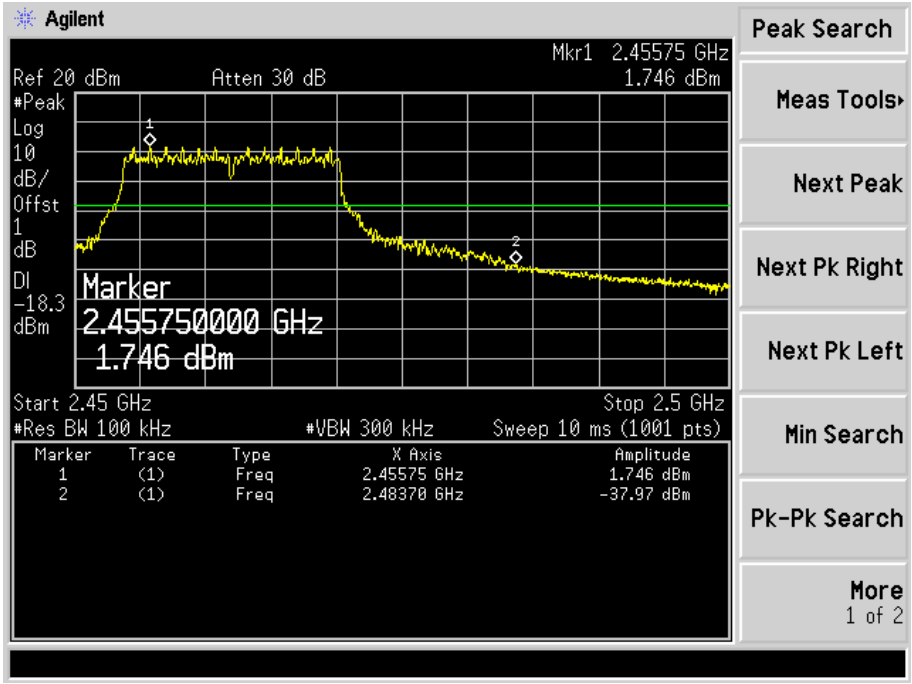


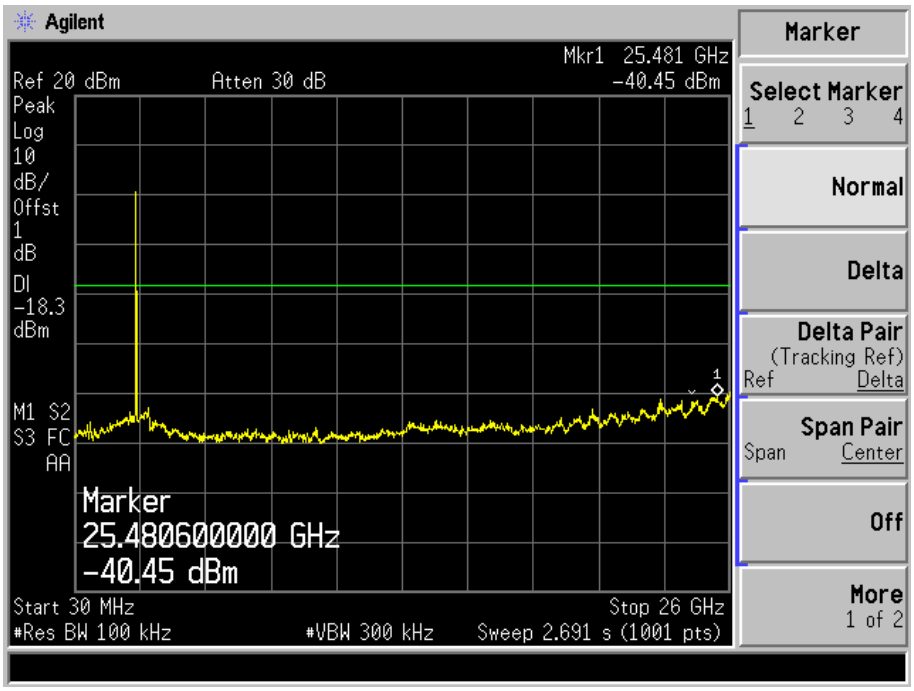
Middle


Agilent
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2
Mkr1 2.43070 GHz
2.143 dBm
Ref 20 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.9
dBm
M1 S2
S3 FC
AA
Marker
2.430700000 GHz
2.143 dBm
Center 2.437 GHz
Span 60 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 10 ms (1001 pts)

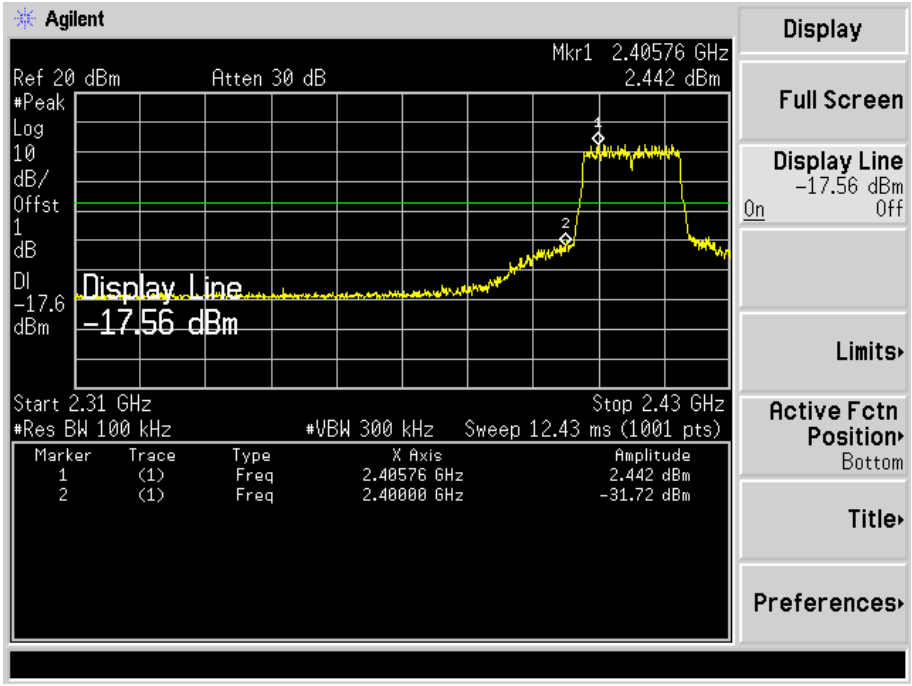

Agilent
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2
Mkr1 25.247 GHz
-40.63 dBm
Ref 20 dBm
Atten 30 dB
Peak
Log
10
dB/
Offst
1
dB
Dl
-17.9
dBm
M1 S2
S3 FC
AA
Marker
25.246870000 GHz
-40.63 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)

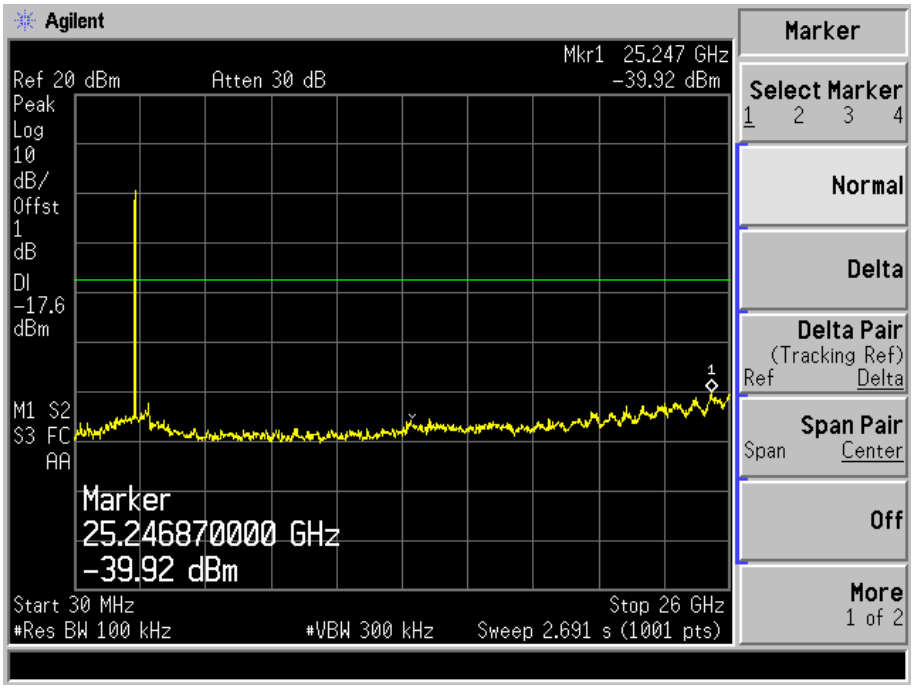
Highest


Agilent
Mkr1 2.45575 GHz
Ref 20 dBm
Atten 30 dB
1.746 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-18.3
dBm
Marker
2.455750000 GHz
1.746 dBm
Start 2.45 GHz
Stop 2.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 10 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.45575 GHz 1.746 dBm
2 (1) Freq 2.48370 GHz -37.97 dBm
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

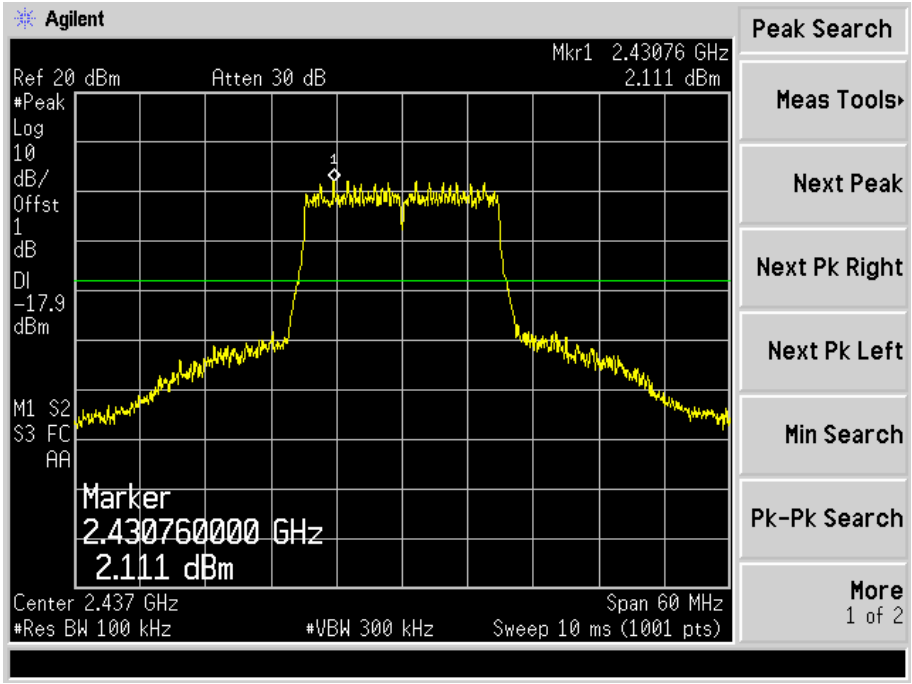

Agilent
Mkr1 25.481 GHz
Ref 20 dBm
Atten 30 dB
-40.45 dBm
Peak
Log
10
dB/
Offst
1
dB
Dl
-18.3
dBm
M1 S2
S3 FC
AA
Marker
25.480600000 GHz
-40.45 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

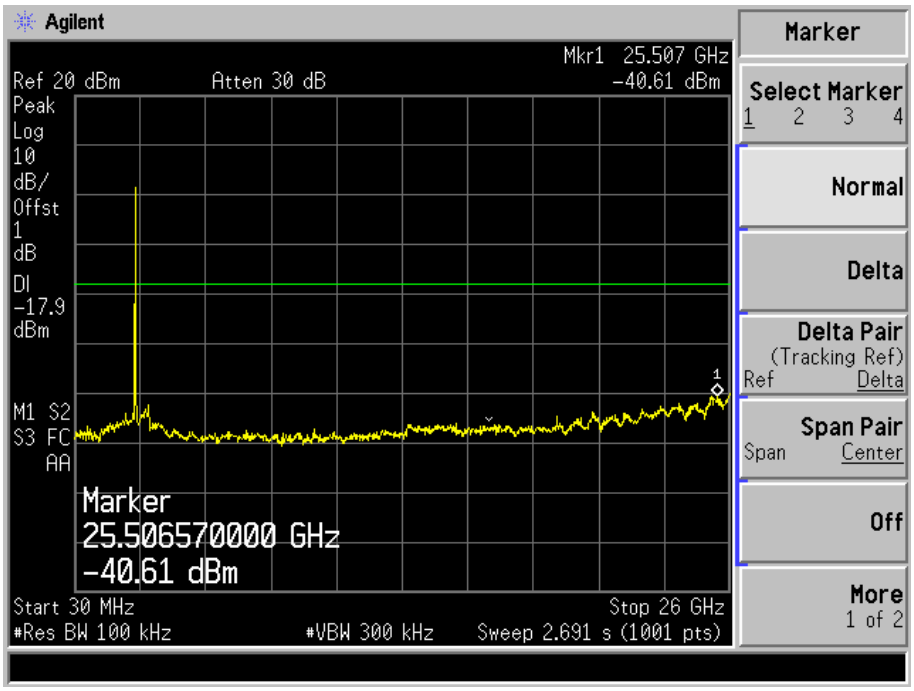
Spurious (Conducted)
802.11n-HT20-Lowest
Lowest



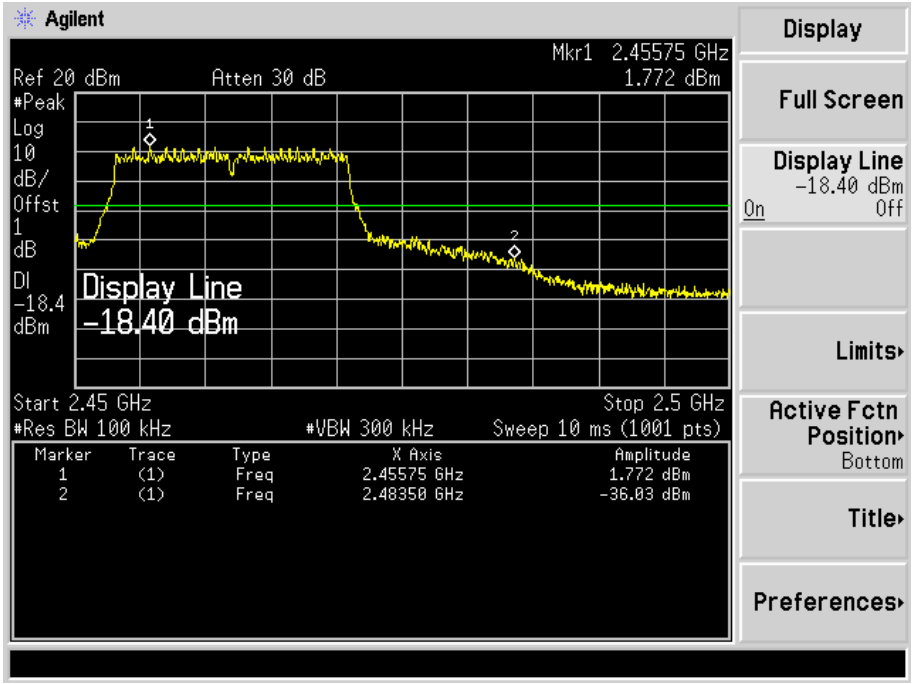


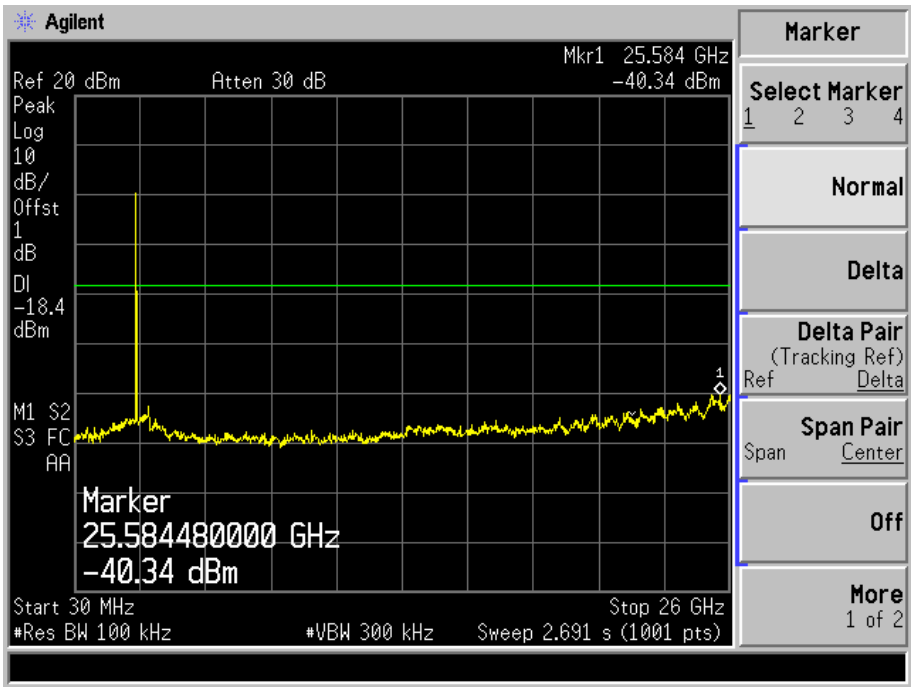
Middle


Agilent
Mkr1 2.43076 GHz
Ref 20 dBm
Atten 30 dB
2.111 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.9
dBm
M1 S2
S3 FC
AA
Marker
2.430760000 GHz
2.111 dBm
Center 2.437 GHz
Span 60 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 10 ms (1001 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
Mkr1 25.507 GHz
Ref 20 dBm
Atten 30 dB
-40.61 dBm
Peak
Log
10
dB/
Offst
1
dB
Dl
-17.9
dBm
M1 S2
S3 FC
AA
Marker
25.506570000 GHz
-40.61 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

Highest


Agilent
Mkr1 2.45575 GHz
Ref 20 dBm
Atten 30 dB
1.772 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-18.4
dBm
Display Line
-18.40 dBm
Start 2.45 GHz
Stop 2.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 10 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.45575 GHz 1.772 dBm
2 (1) Freq 2.48350 GHz -36.03 dBm
Display
Full Screen
Display Line
-18.40 dBm
On Off
Limits
Active Fctn
Position
Bottom
Title
Preferences

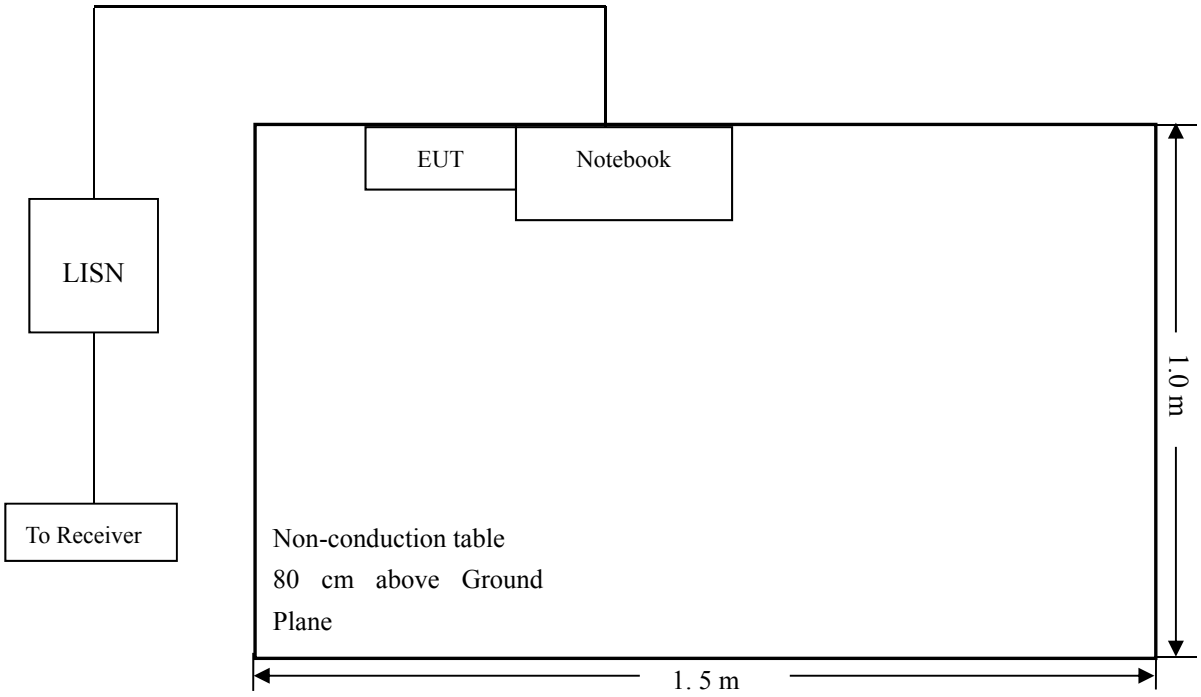

Agilent
Mkr1 25.584 GHz
Ref 20 dBm
Atten 30 dB
-40.34 dBm
Peak
Log
10
dB/
Offst
1
dB
Dl
-18.4
dBm
M1 S2
S3 FC
AA
Marker
25.584480000 GHz
-40.34 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

10. Conducted Emissions

10.1 Test Procedure

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

10.2 Basic Test Setup Block Diagram



10.3 Environmental Conditions

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

10.4 Test Receiver Setup

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

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

10.5 Summary of Test Results/Plots

According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

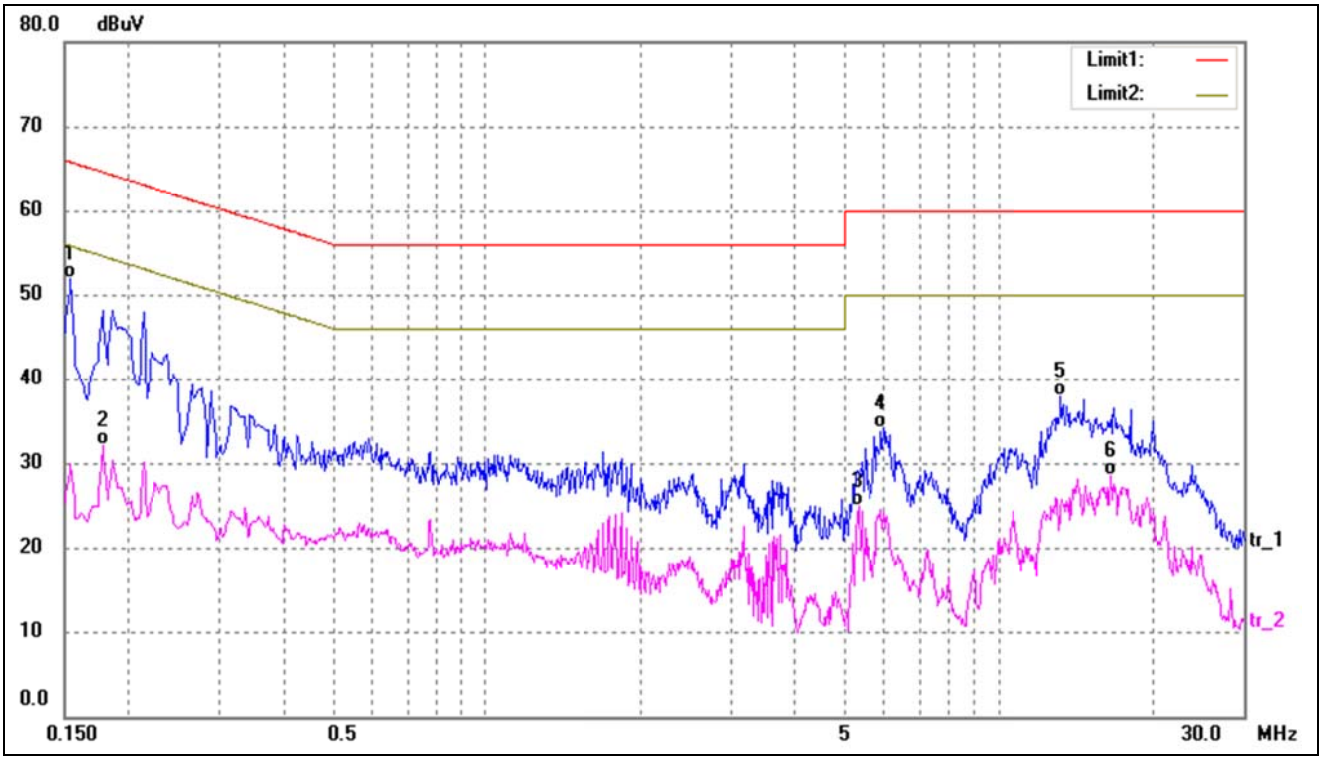
-13.93 dB at **0.1540 MHz** in the **Neutal, QP** detector, 0.15-30MHz

10.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

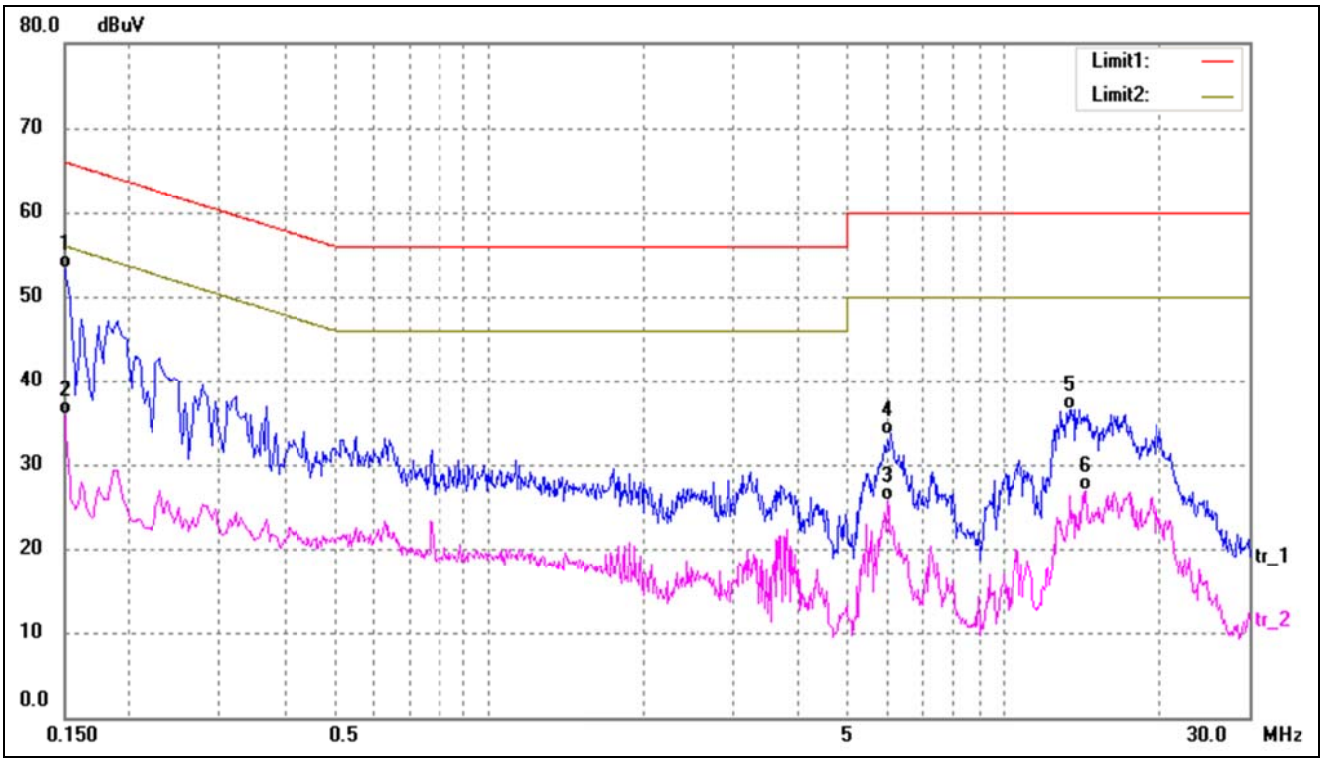
EUT: *Room Thermostat*
Tested Model: *SAS6000UTK-7-WIFI*
Operating Condition: *Transmitting*
Comment: *DC 12V*

Test Specification: *Neutral*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1540	42.00	9.85	51.85	65.78	-13.93	QP
2	0.1780	22.20	9.82	32.02	54.58	-22.56	AVG
3	5.3500	15.21	9.65	24.86	50.00	-25.14	AVG
4	5.9660	24.43	9.63	34.06	60.00	-25.94	QP
5	13.2620	28.41	9.58	37.99	60.00	-22.01	QP
6	16.5500	18.85	9.63	28.48	50.00	-21.52	AVG

Test Specification: *Line*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1500	43.55	9.85	53.40	66.00	-12.60	QP
2	0.1500	25.96	9.85	35.81	56.00	-20.19	AVG
3	5.9700	16.14	9.63	25.77	50.00	-24.23	AVG
4	6.0620	23.97	9.63	33.60	60.00	-26.40	QP
5	13.4780	26.93	9.58	36.51	60.00	-23.49	QP
6	14.5020	17.26	9.60	26.86	50.00	-23.14	AVG

******* END OF REPORT *******