FCC Part 15C
Measurement and Test Report

For

Shenzhen WeDo Century Industrial Co.,Ltd

3rd Building, 6th, QingNingRoad, QingHu Village. LongHua, ShenZhen,

518109, China

FCC ID: 2AC9AHD5

FCC Rule(s):	FCC Part 15.247
Product Description:	TV BOX
Tested Model:	HD5
Report No.:	STR14098130I-1
Tested Date:	2014-09-17 to 2014-11-20
Issued Date:	2014-11-21
Tested By:	Vigoss Liang / Engineer
Reviewed By:	Lahm Peng / EMC Manager
Approved & Authorized By:	Jandy so / PSQ Manager

Prepared By:

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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 WeDo Century lndustrial Co.,ltd
Address of applicant:	3rd Building, 6th, QingNingRoad, QingHu Village. LongHua, ShenZhen, 518109, China
Manufacturer:	Shenzhen WeDo Century lndustrial Co.,ltd
Address of manufacturer:	3rd Building, 6th, QingNingRoad, QingHu Village. LongHua, ShenZhen, 518109, China

General Description of EUT	
Product Name:	TV BOX
Trade Name:	TVPRO
Model No.:	HD5
Adding Model(s):	AllCamHD5
Rated Voltage:	Adapter DC 5V
Power Adaptor:	CH0515000C
	Input: AC100-240V~50/60Hz; Output: DC 5V, 2.0A
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 HD5, 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-HT20
Frequency Range:	2412-2472MHz
RF Output Power:	13.37dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	13
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	2dBi
Lowest Internal Frequency	32.768 KHz

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen WeDo Century lndustrial 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 C63.4-2003, 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 V03r02 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

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.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

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, 2442MHz, 2472MHz
TM2	802.11g	2412MHz, 2442MHz, 2472MHz
TM3	802.11n-HT20	2412MHz, 2442MHz, 2472MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
USB/DC Cable	1.20	Unshielded	Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
HDMI	2.40	Shielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Display	DELL	U2410f	50642P246601H(B) ZL
USB Disk	SONY	8GB	/
TF Card	/	1GB	/
Mouse	Lenovo	/	/

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
§ 15.207(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 a 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 Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

5.3 Test Procedure

According to the KDB 558074 D01 V03r02, 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).

5.4 Environmental Conditions

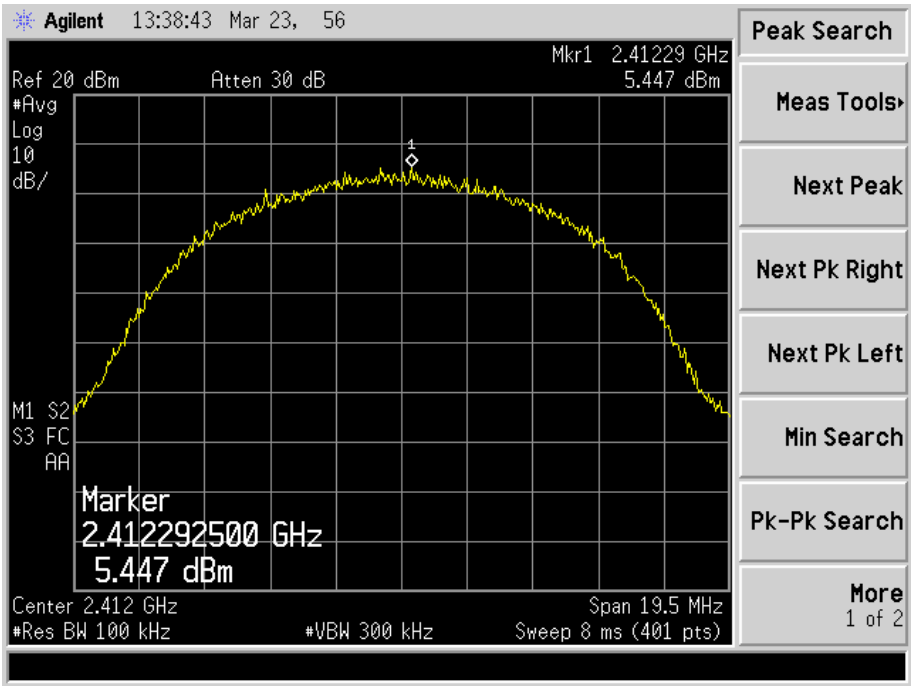
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.5 Summary of Test Results/Plots

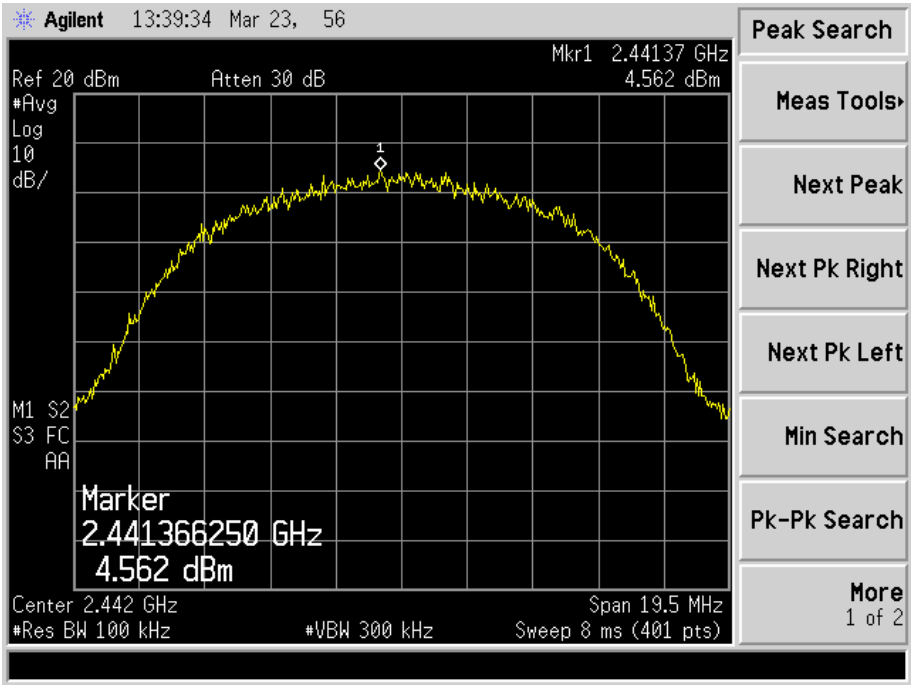
Test Mode	Test Channel MHz	Power Spectral Density dBm/100kHz	Limit dBm/3kHz
802.11b	2412	5.447	8
	2442	4.562	8
	2472	4.332	8
802.11g	2412	1.419	8
	2442	1.872	8
	2472	1.114	8
802.11n HT20	2412	0.404	8
	2442	0.452	8
	2472	0.046	8

Please refer to the following test plots:

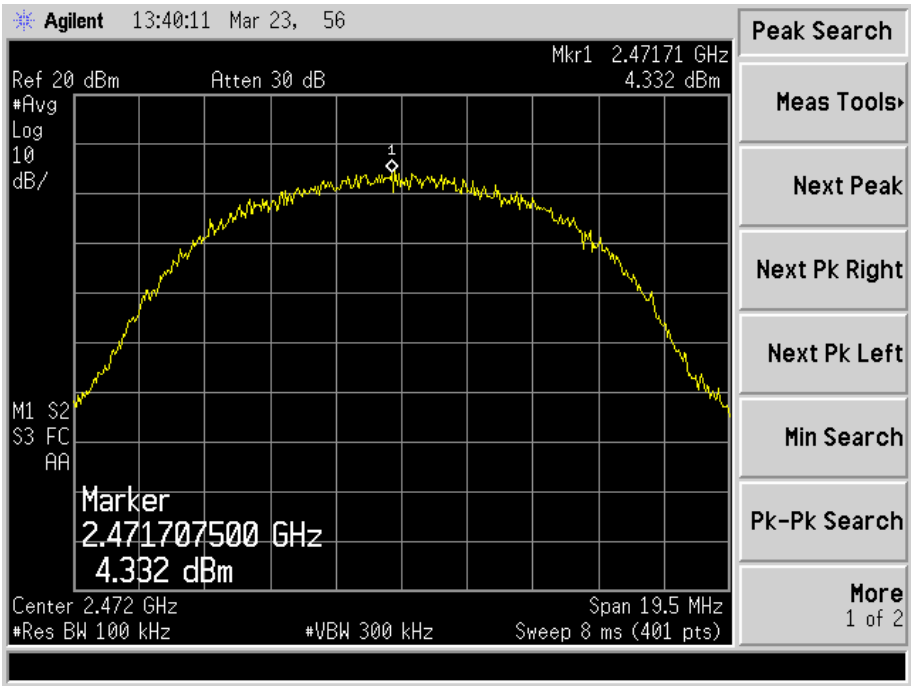
802.11b-Low Channel



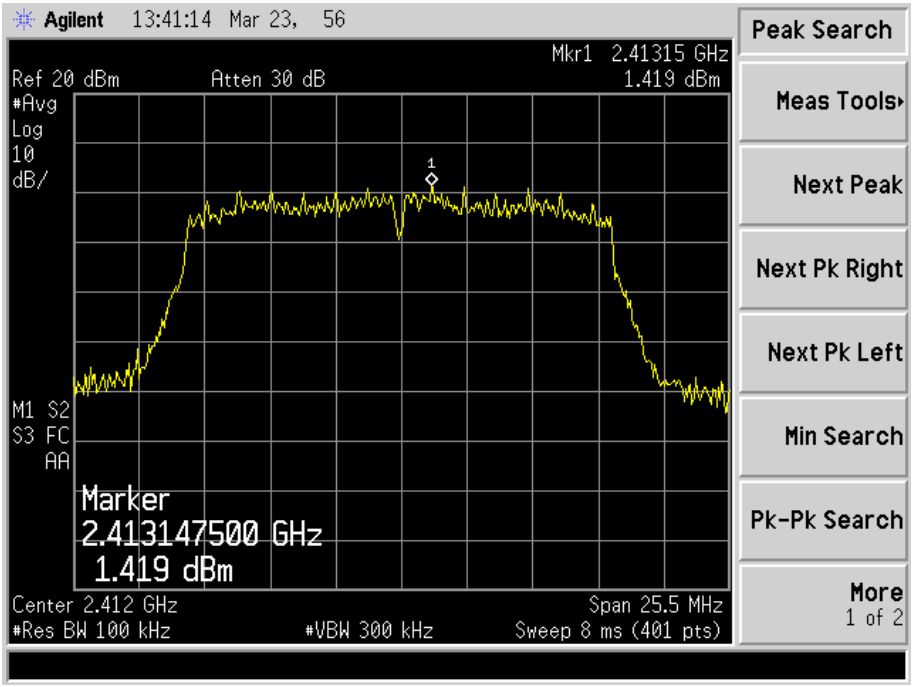
802.11b-Middle Channel



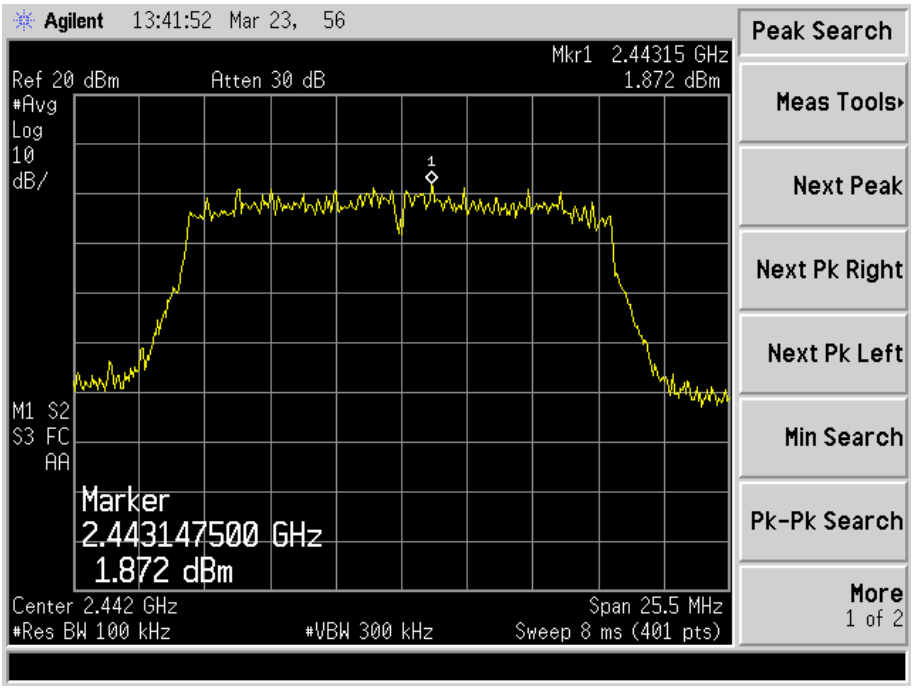
802.11b-High Channel



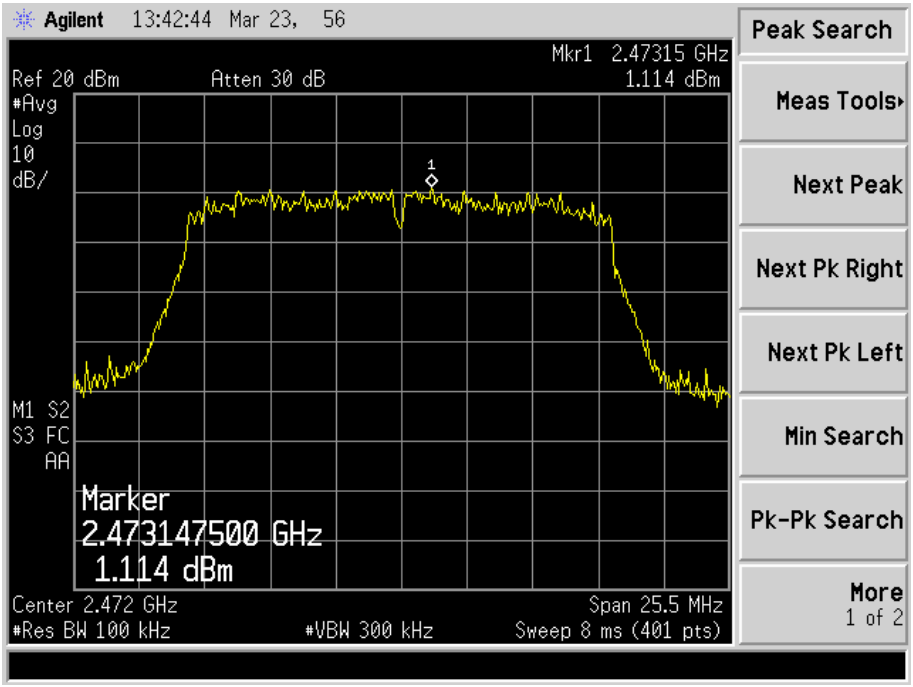
802.11g-Low Channel



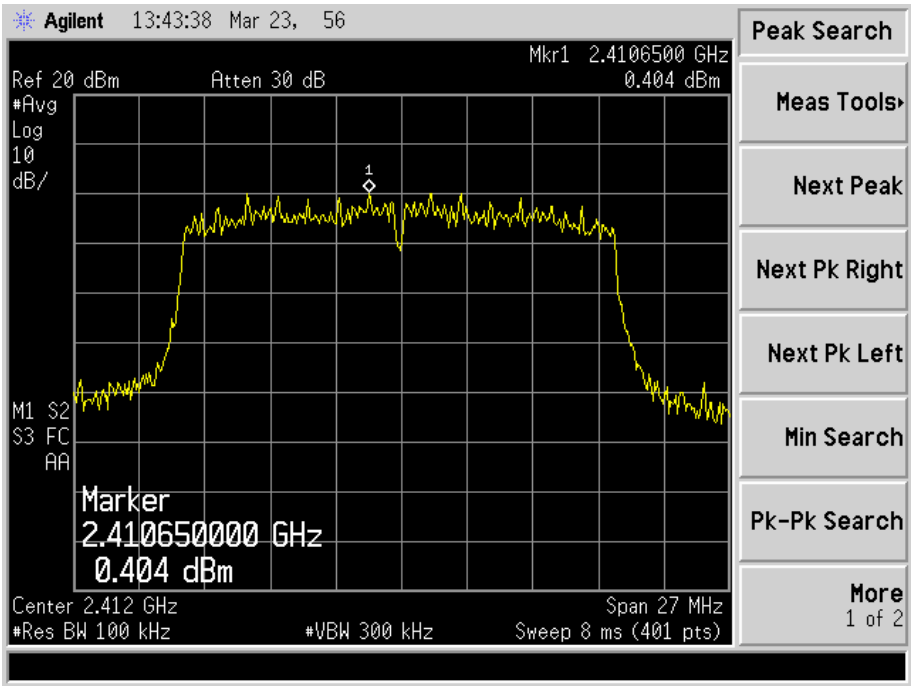
802.11g-Middle Channel



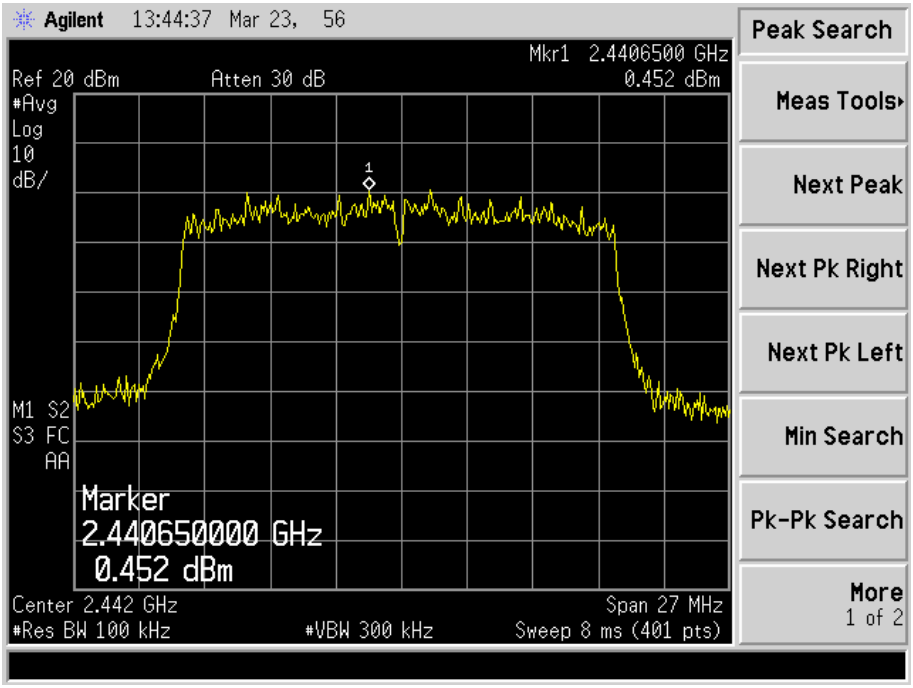
802.11g-High Channel



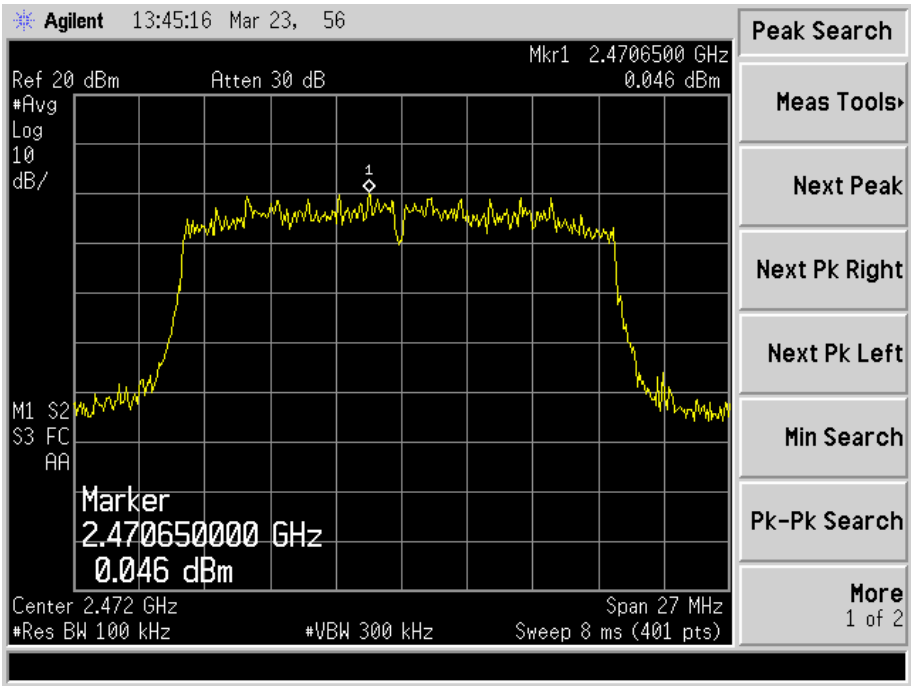
802.11n-HT20-Low Channel



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 Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

6.3 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.

6.4 Environmental Conditions

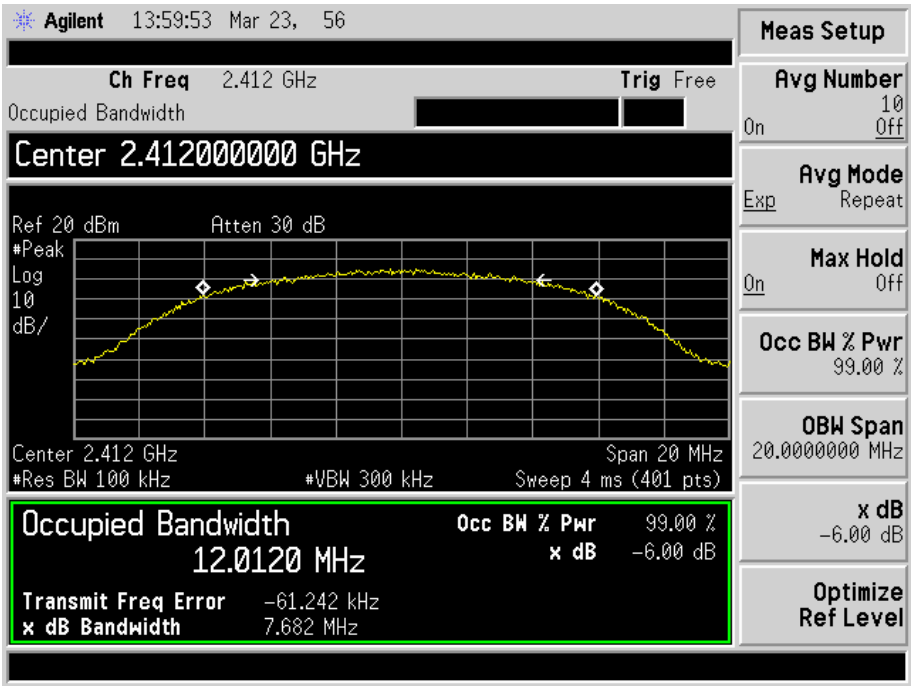
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

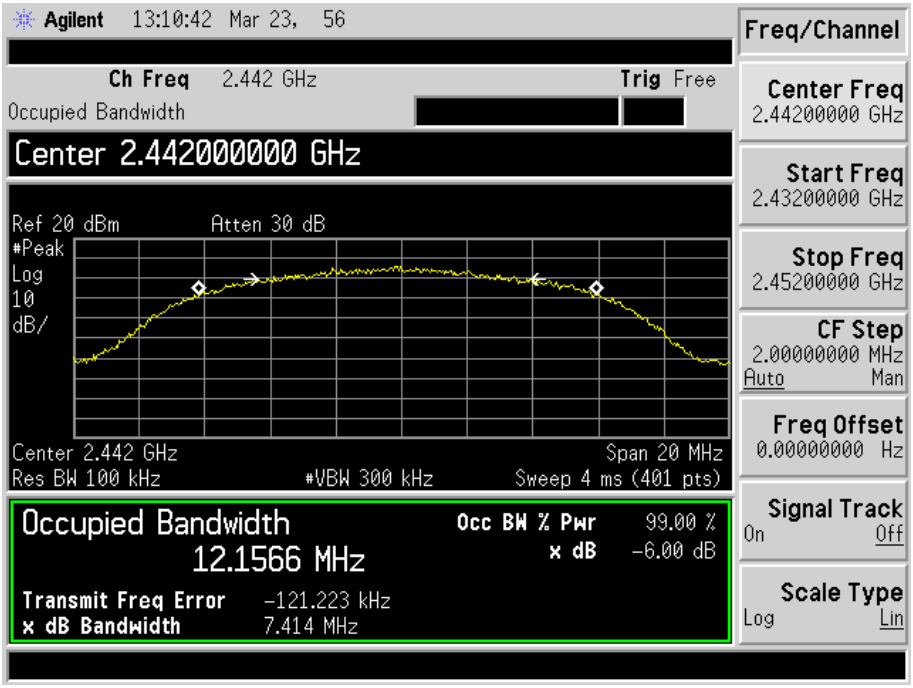
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
802.11b	2412	7682	12012.0	500
	2442	7414	12156.6	500
	2472	7717	12229.9	500
802.11g	2412	16028	16286.5	500
	2442	15735	16283.3	500
	2472	16021	16284.0	500
802.11n-HT20	2412	16624	17454.0	500
	2442	16924	17440.5	500
	2472	17283	17454.5	500

Please refer to the following test plots:

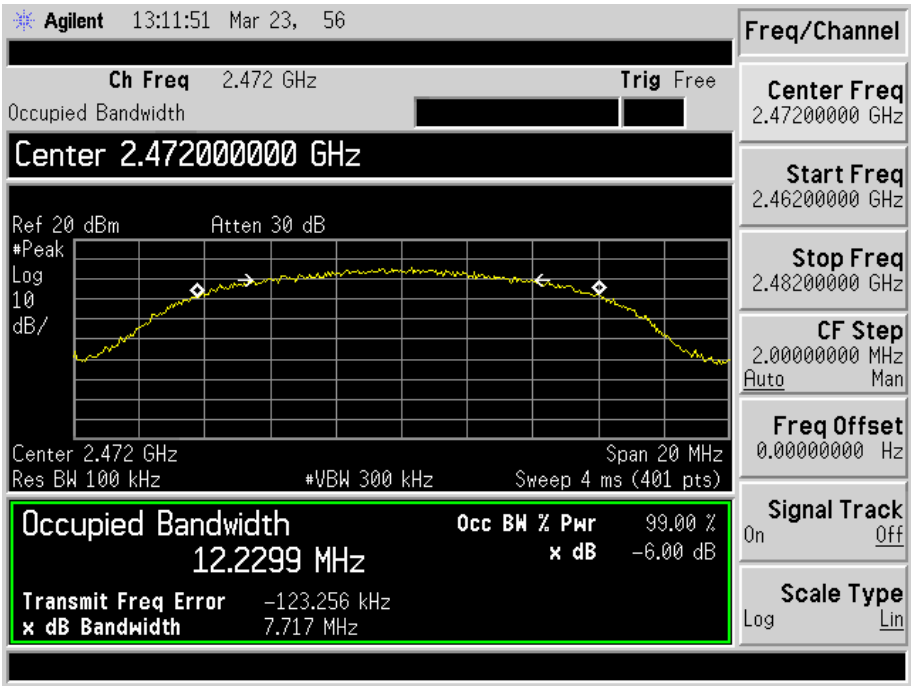
802.11b-Low Channel



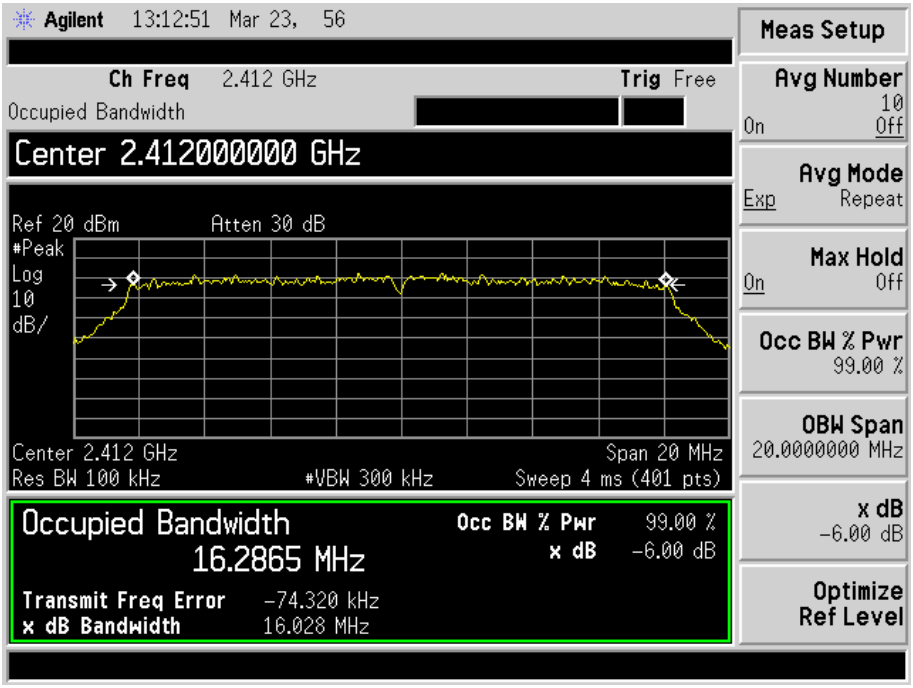
802.11b-Middle Channel



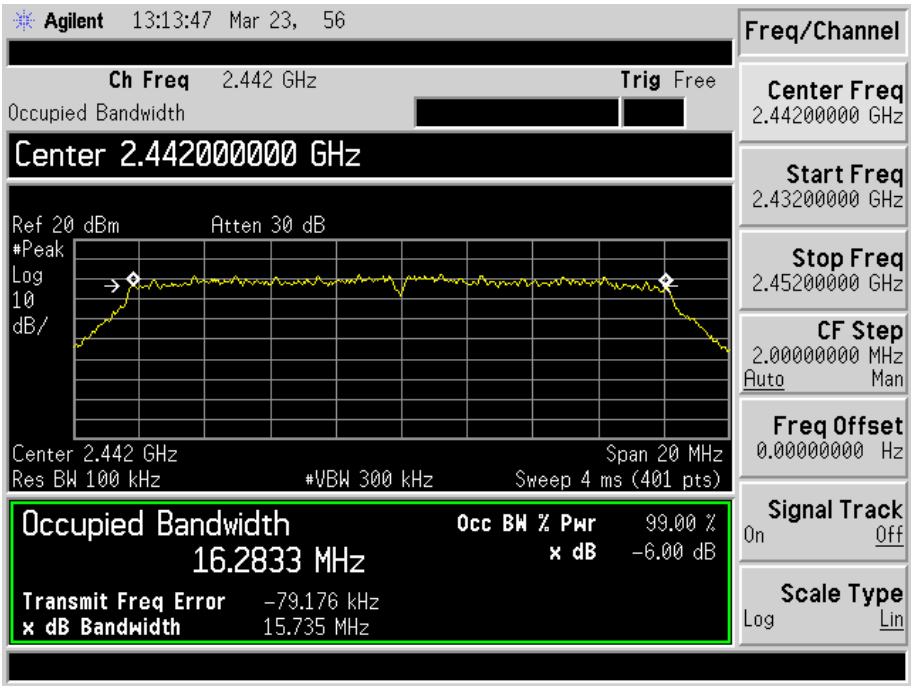
802.11b-High Channel



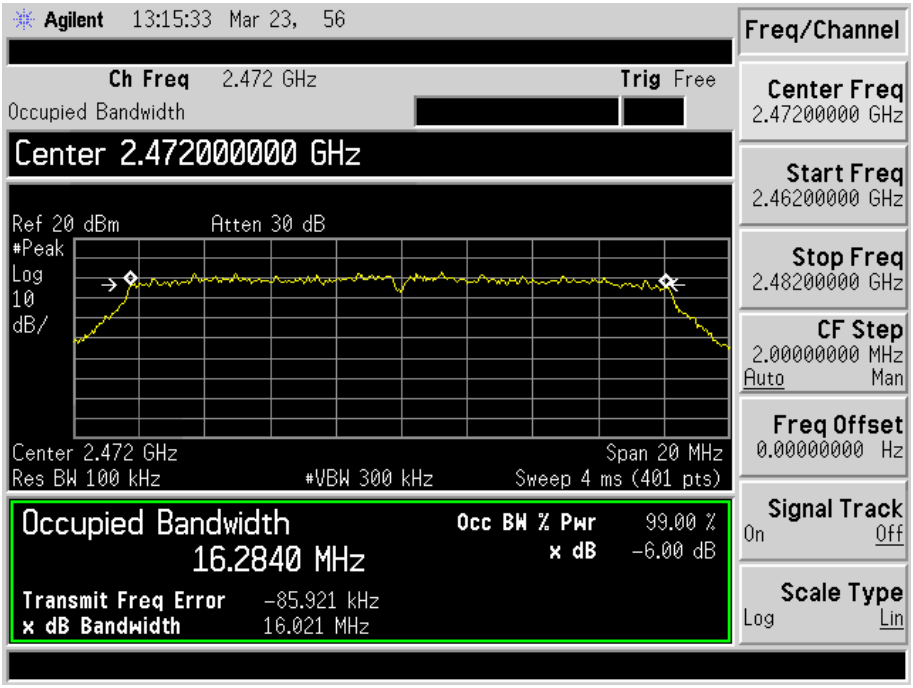
802.11g-Low Channel



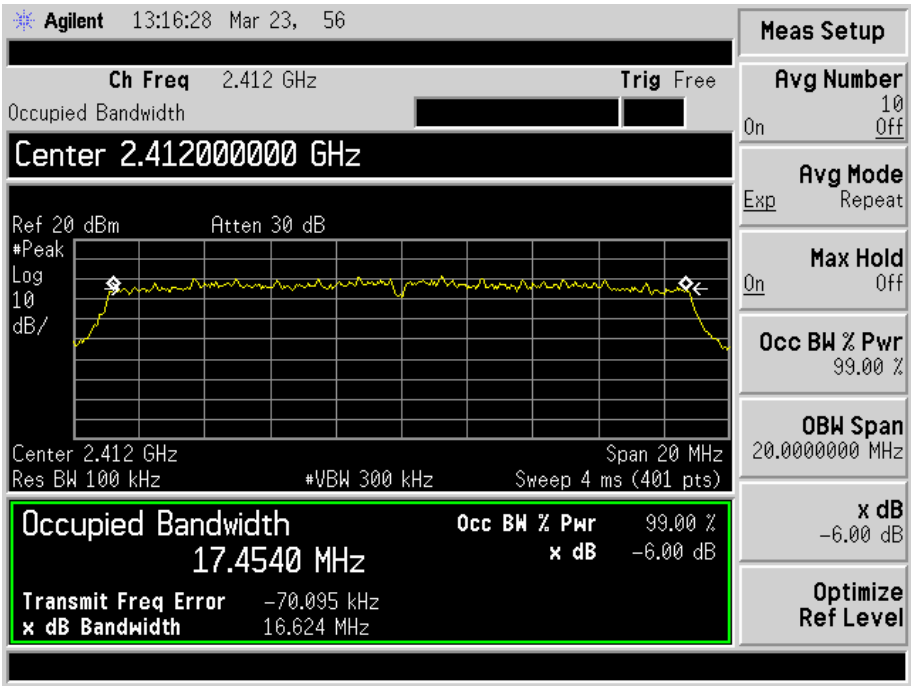
802.11g-Middle Channel



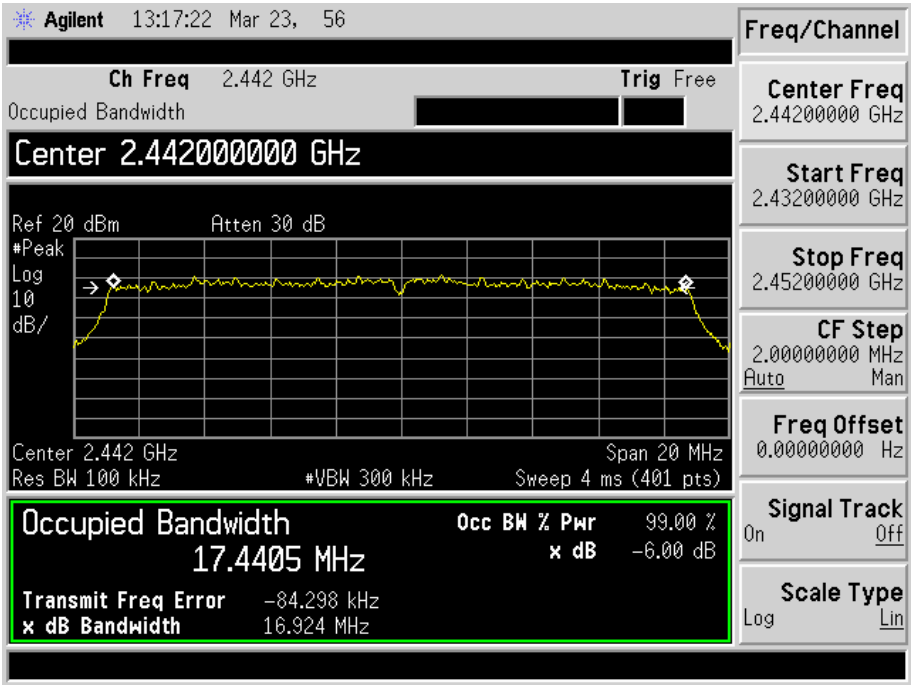
802.11g-High Channel



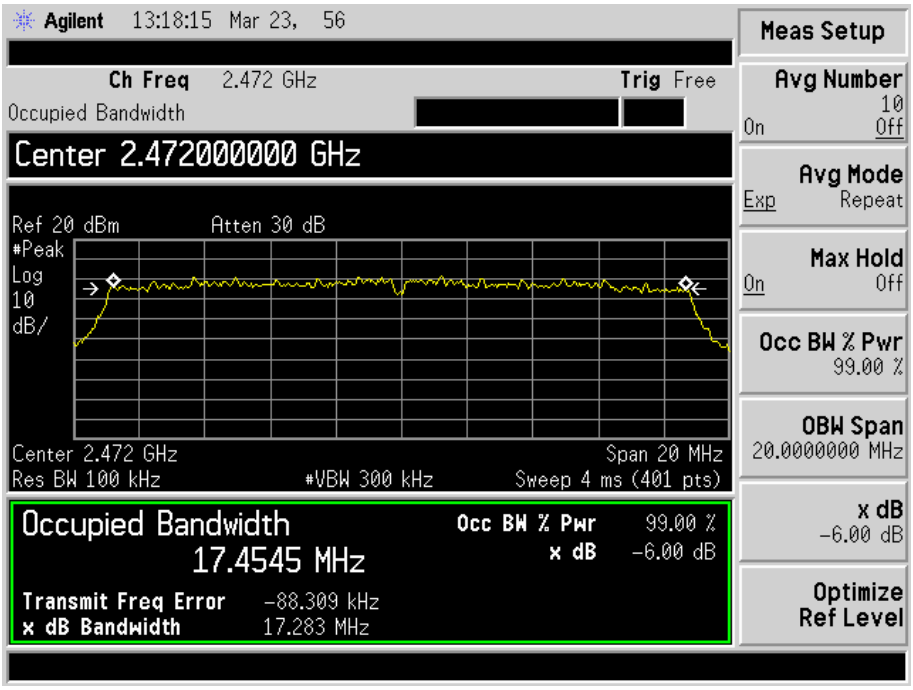
802.11n-HT20-Low Channel



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 Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

7.3 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 D01 V03r02, 9.2.2.2 (channel integration method) 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.

7.4 Environmental Conditions

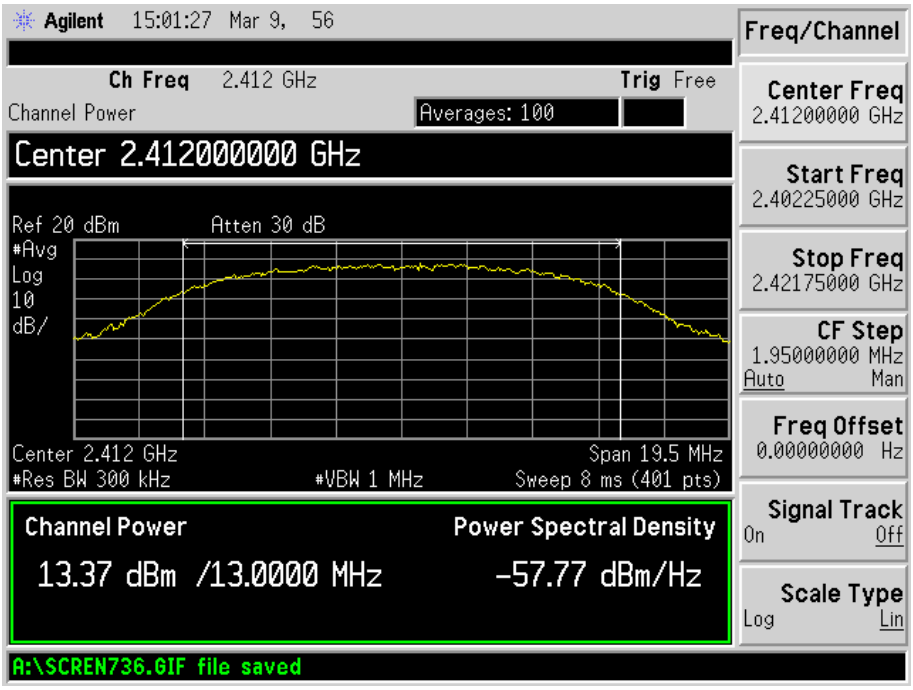
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.5 Summary of Test Results/Plots

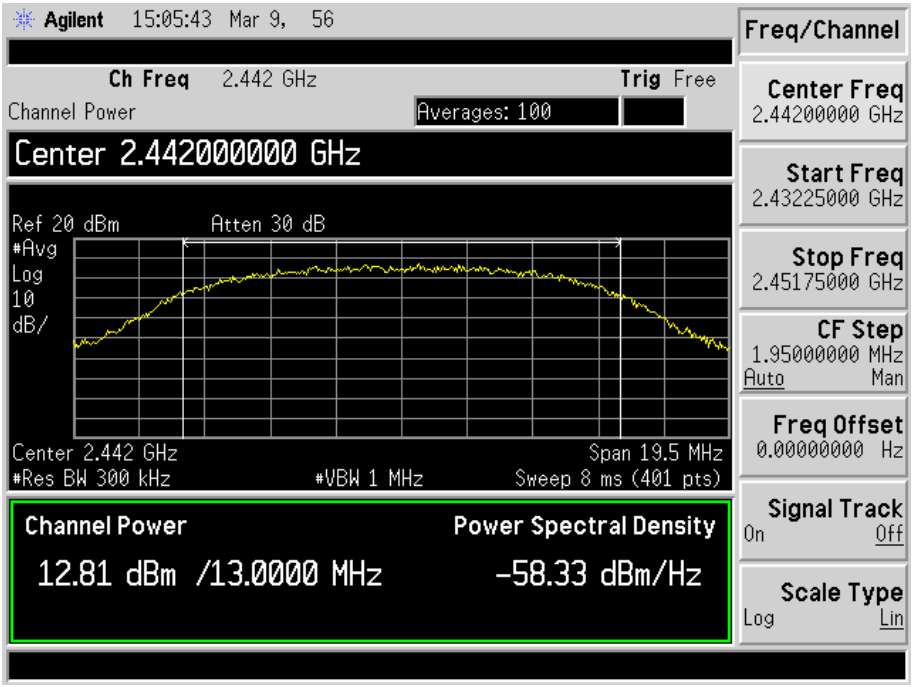
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b _ 11Mbps	2412	13.37	21.73	1000
	2442	12.81	19.10	1000
	2472	12.25	16.79	1000
802.11g_54Mbps	2412	10.35	10.84	1000
	2442	9.92	9.82	1000
	2472	9.67	9.27	1000
802.11n HT20_MCS7	2412	10.65	11.61	1000
	2442	10.16	10.38	1000
	2472	9.94	9.86	1000

Please refer to the following test plots:

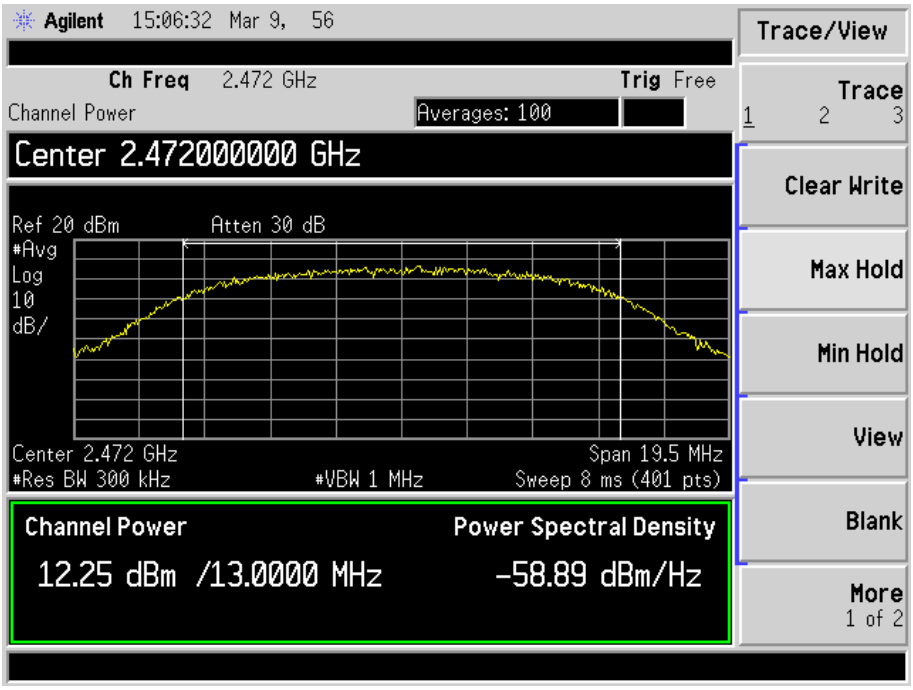
802.11-11Mbps-Low Channel



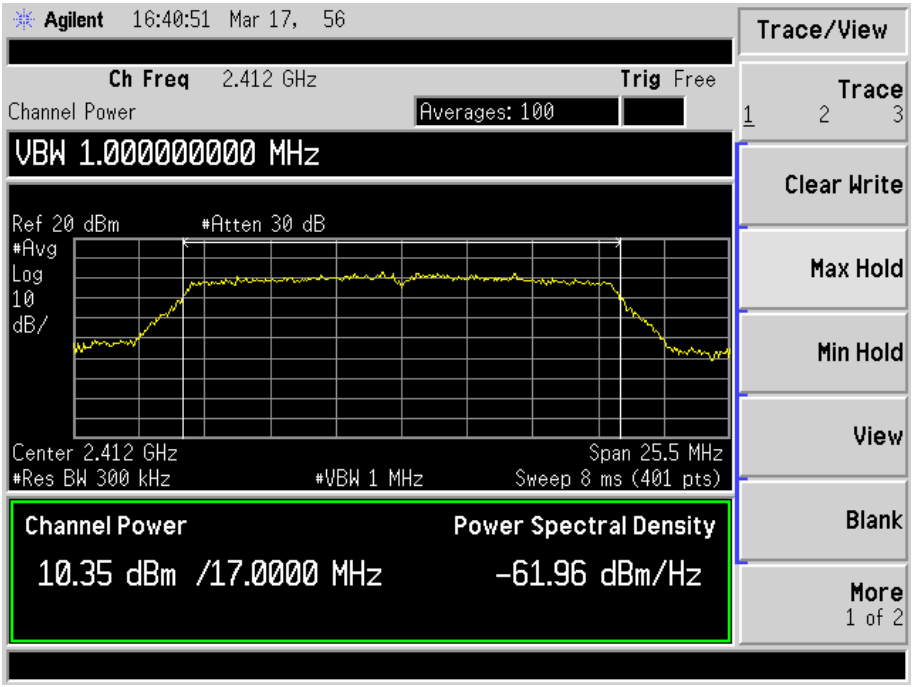
802.11b -11Mbps-Middle Channel



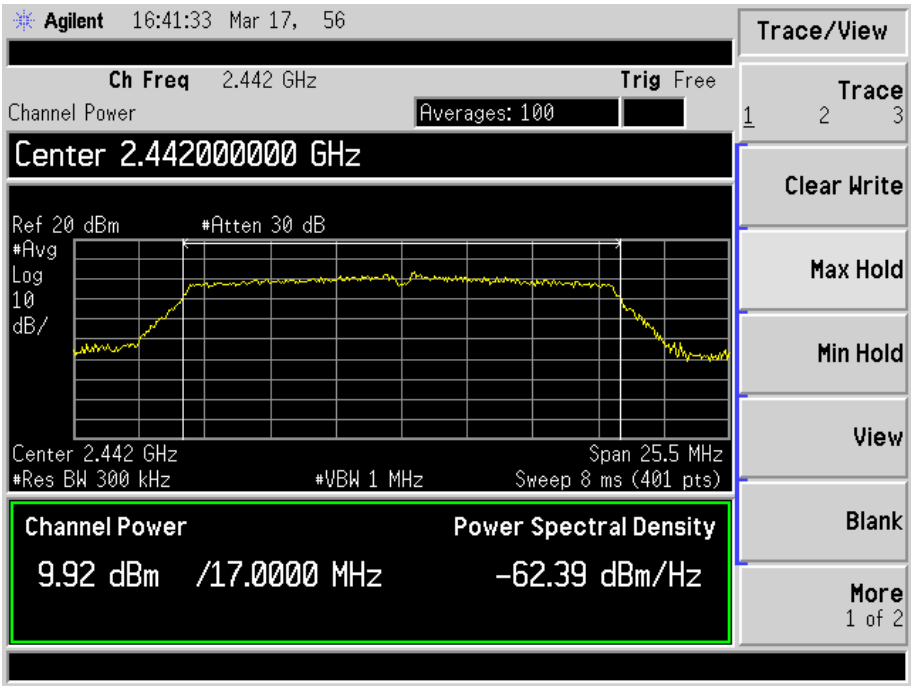
802.11b -11Mpbs-High Channel



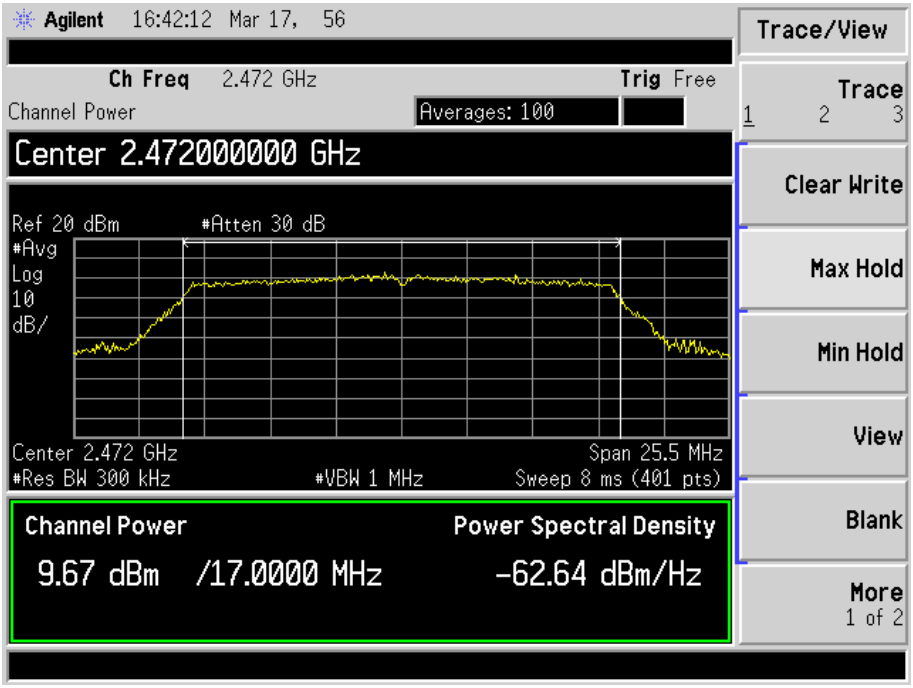
802.11g-54Mbps-Low Channel



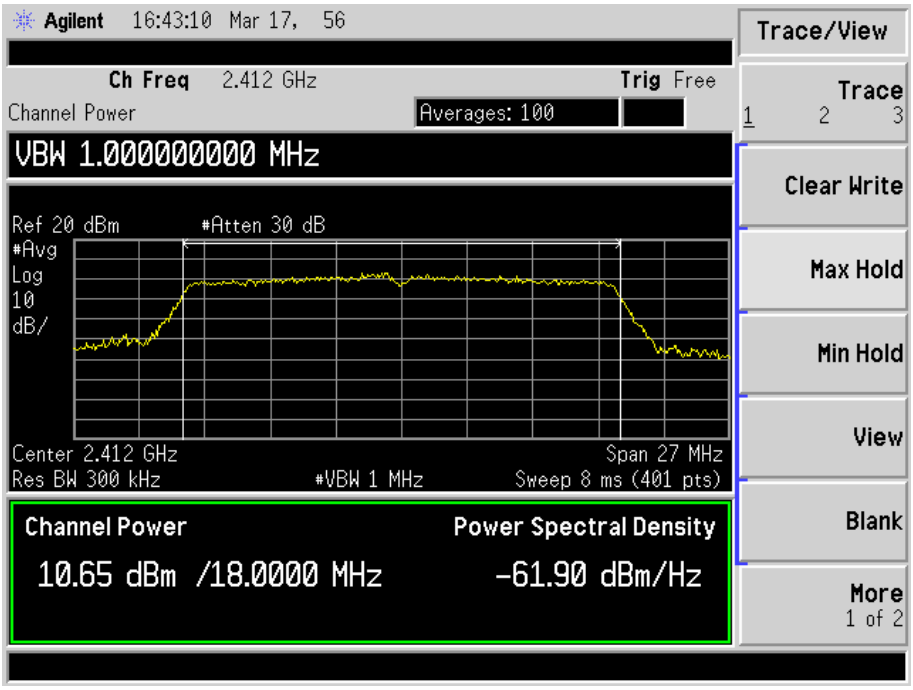
802.11g-54Mbps-Middle Channel



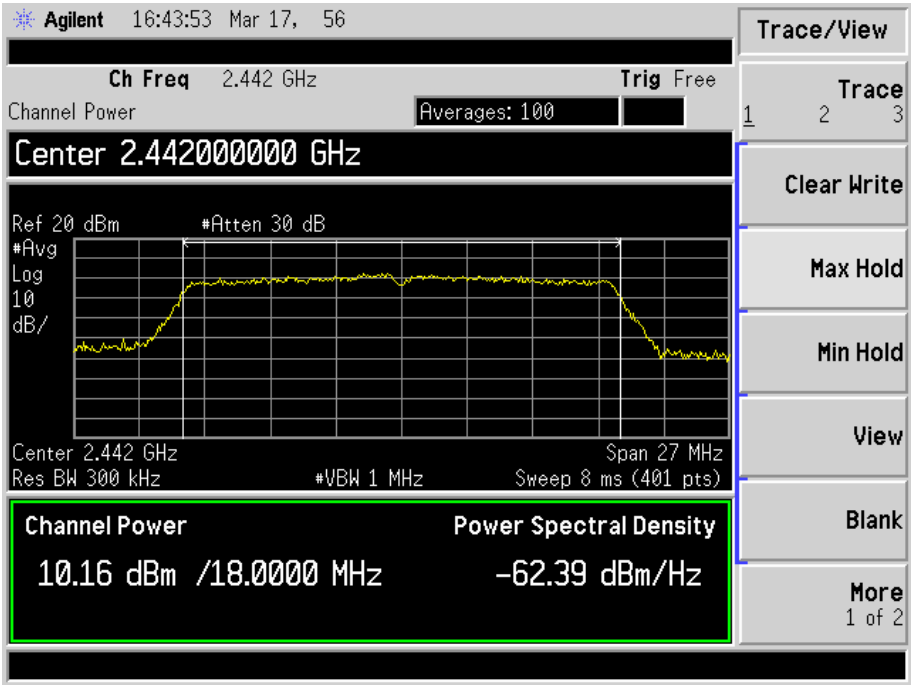
802.11g-54Mpbs-High Channel



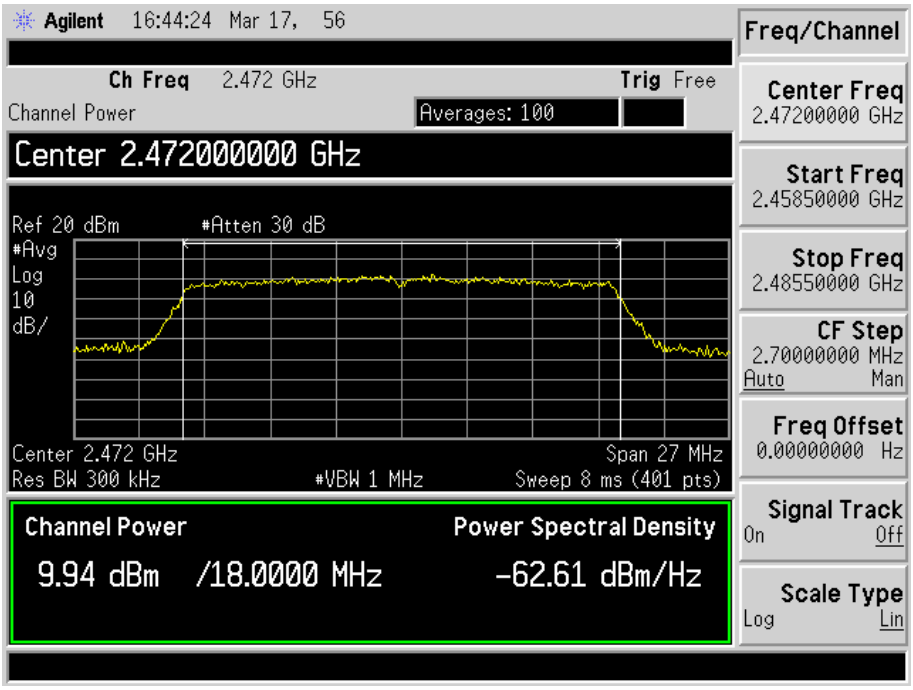
802.11n-HT20-MCS7-Low Channel



802.11n-HT20-MCS7-Middle Channel



802.11n-HT20-MCS7-High Channel



8. Field Strength of Spurious Emissions

8.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±5.10 dB.

8.2 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).

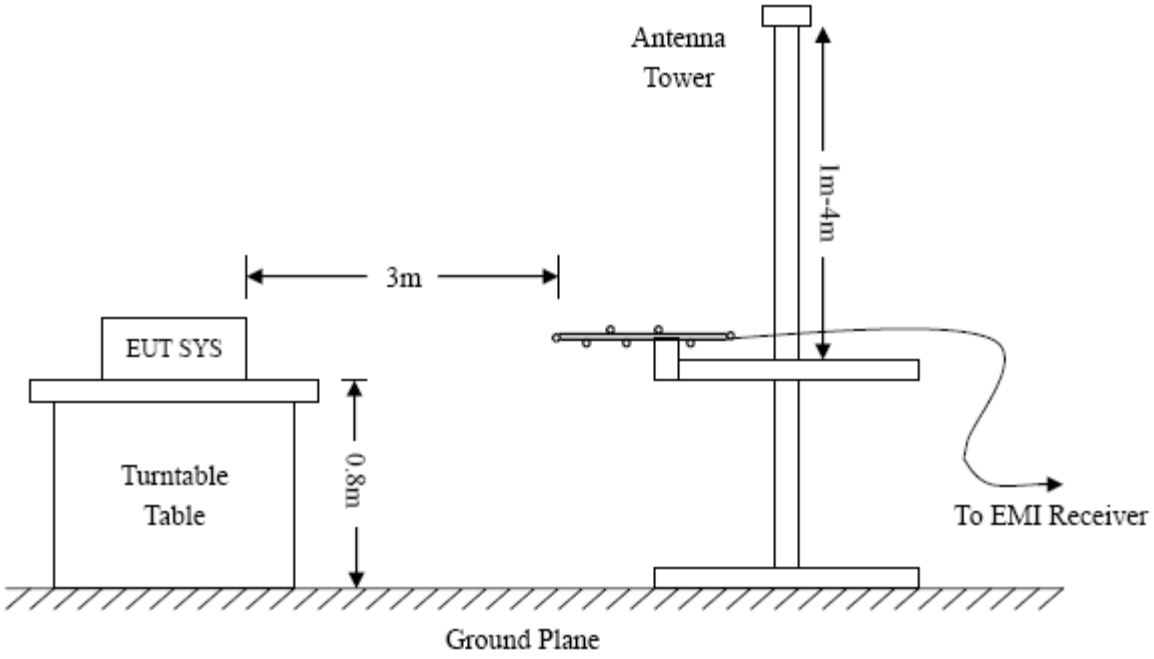
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-28	2015-05-27
EMI Test Receiver	R&S	ESVB	825471/005	2014-05-28	2015-05-27
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-28	2015-05-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-28	2015-05-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-24	2015-05-23
Horn Antenna	ETS	3117	00086197	2014-05-24	2015-05-23
Horn Antenna	ETS	3116B	00088203	2014-05-24	2015-05-23
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2014-05-24	2015-05-23

8.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 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=300KHz	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

8.5 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 for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

8.6 Environmental Conditions

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

8.7 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)

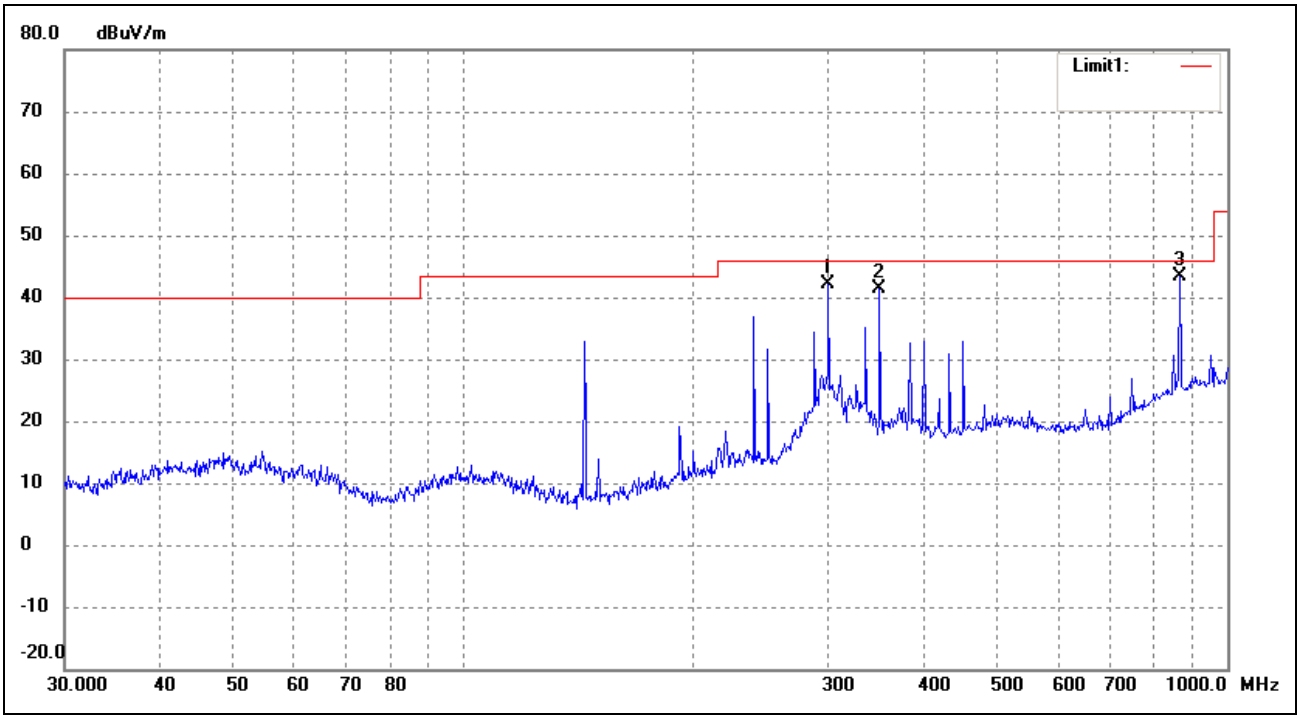
EUT: *TV BOX*

Tested Model: *HD5*

Operating Condition: *802.11b Transmitting Low Channel-2412MHz*

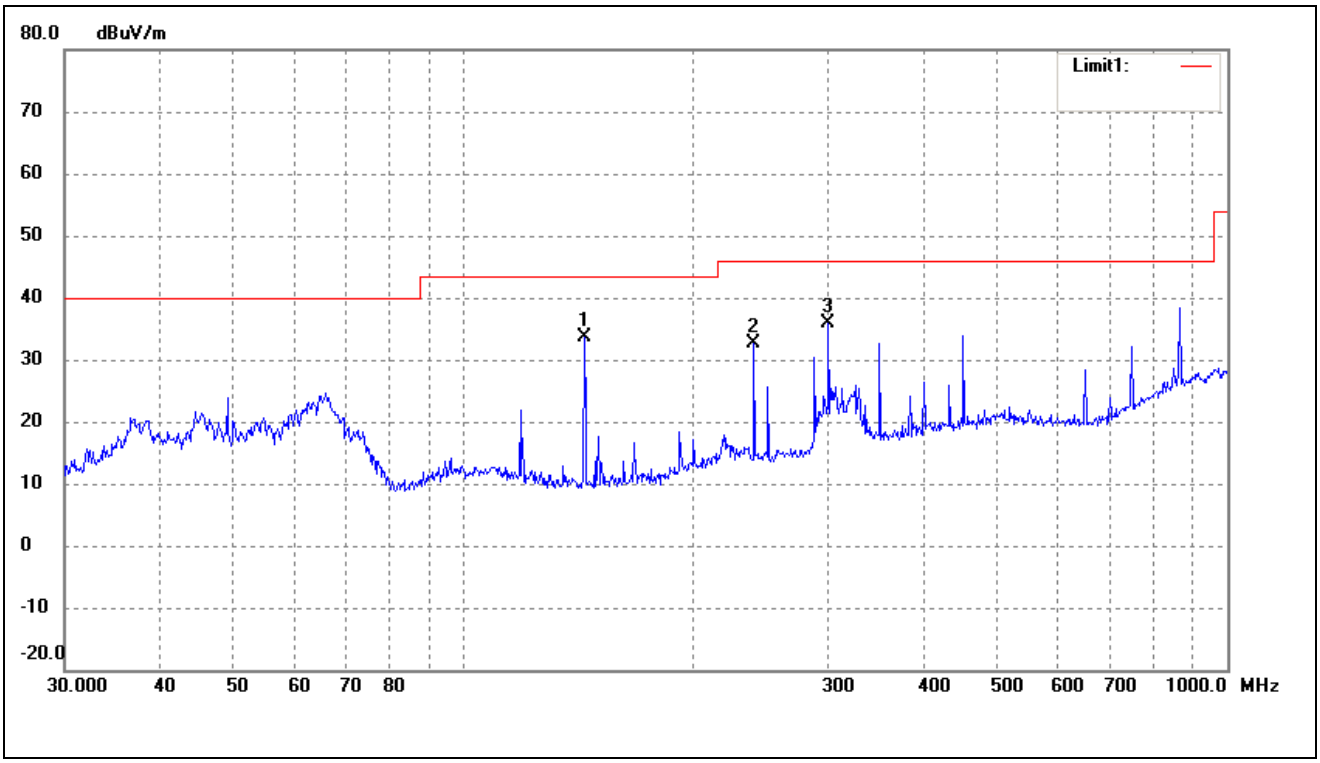
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	48.23	-6.15	42.08	46.00	-3.92	254	100	peak
2	350.4768	45.73	-4.25	41.48	46.00	-4.52	113	100	peak
3	866.0879	39.08	4.37	43.45	46.00	-2.55	284	100	peak

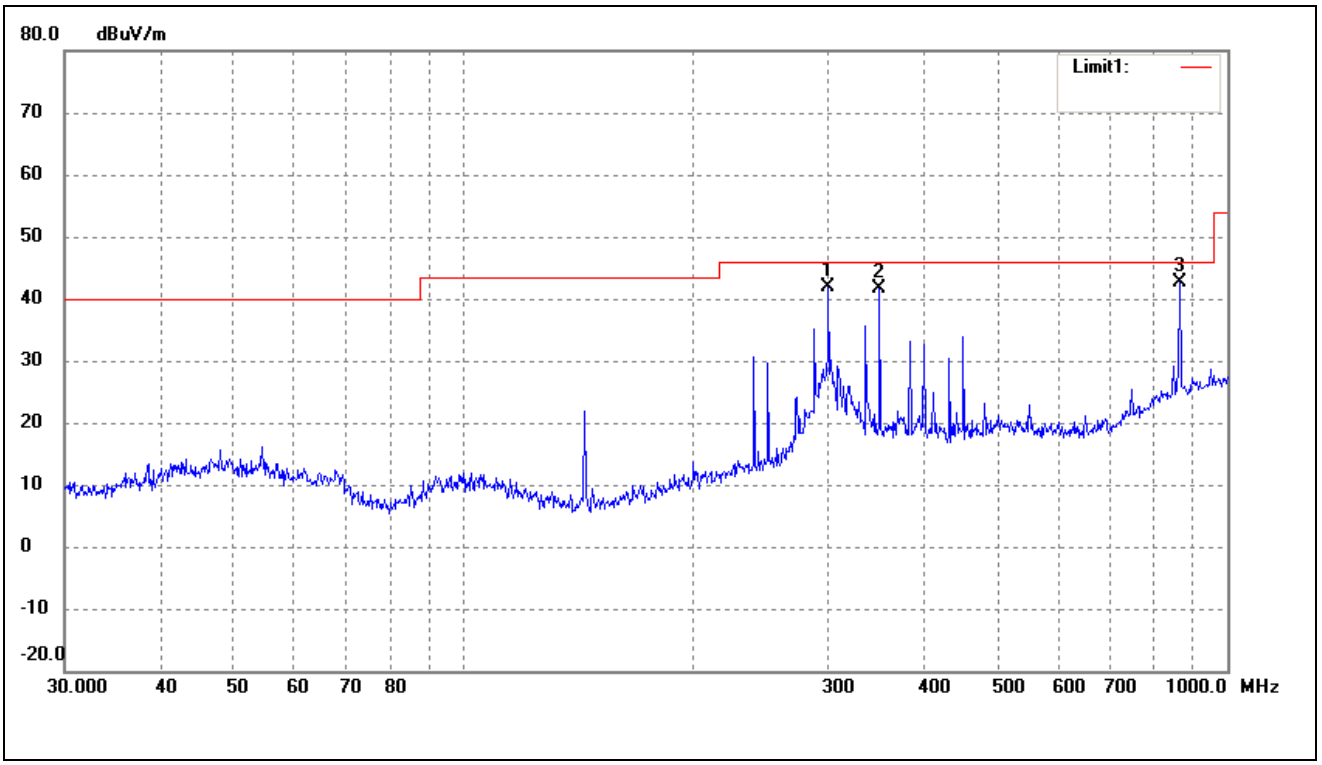
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	143.8295	46.79	-13.08	33.71	43.50	-9.79	114	100	peak
2	239.9874	40.33	-7.79	32.54	46.00	-13.46	270	100	peak
3	300.3673	42.02	-6.15	35.87	46.00	-10.13	360	100	peak

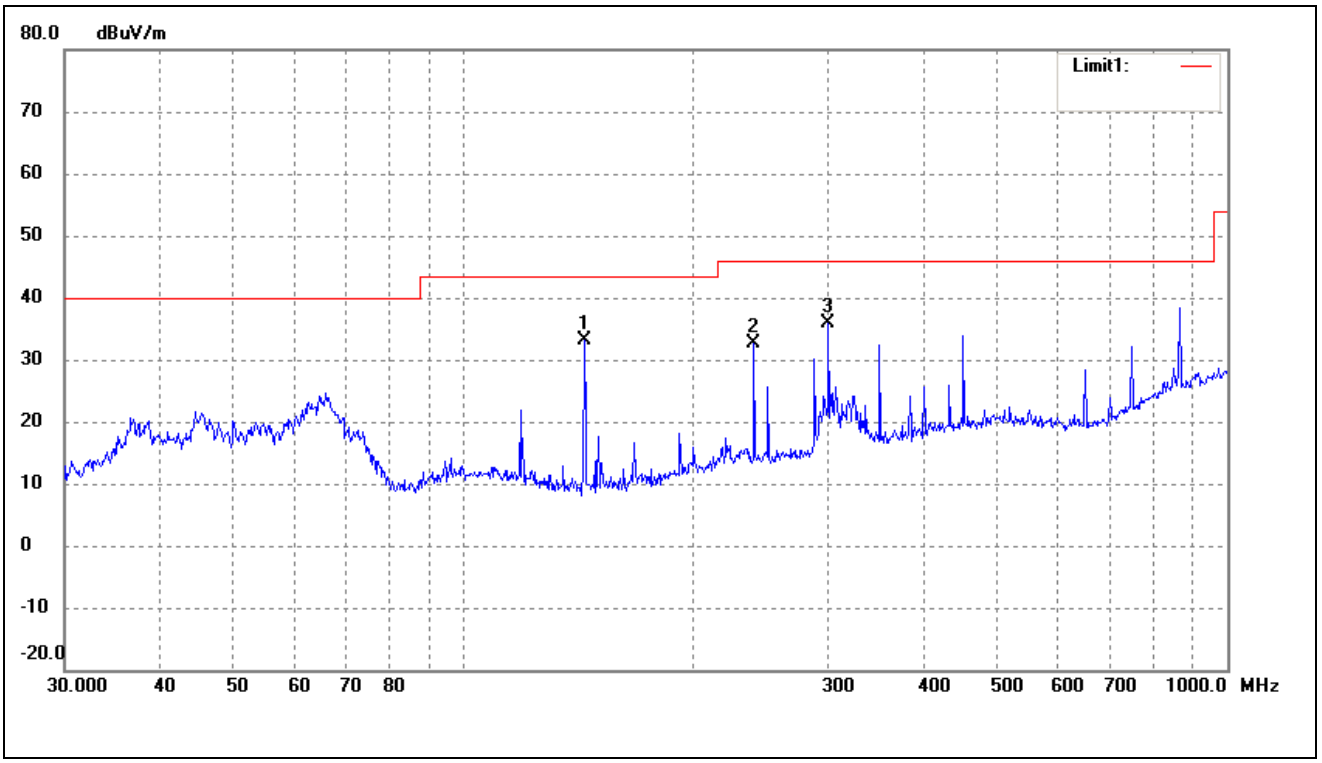
Operating Condition: *802.11b Transmitting Middle Channel-2442MHz*
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	47.93	-6.15	41.78	46.00	-4.22	178	100	peak
2	350.4768	45.87	-4.25	41.62	46.00	-4.38	224	100	peak
3	866.0879	38.21	4.37	42.58	46.00	-3.42	160	100	peak

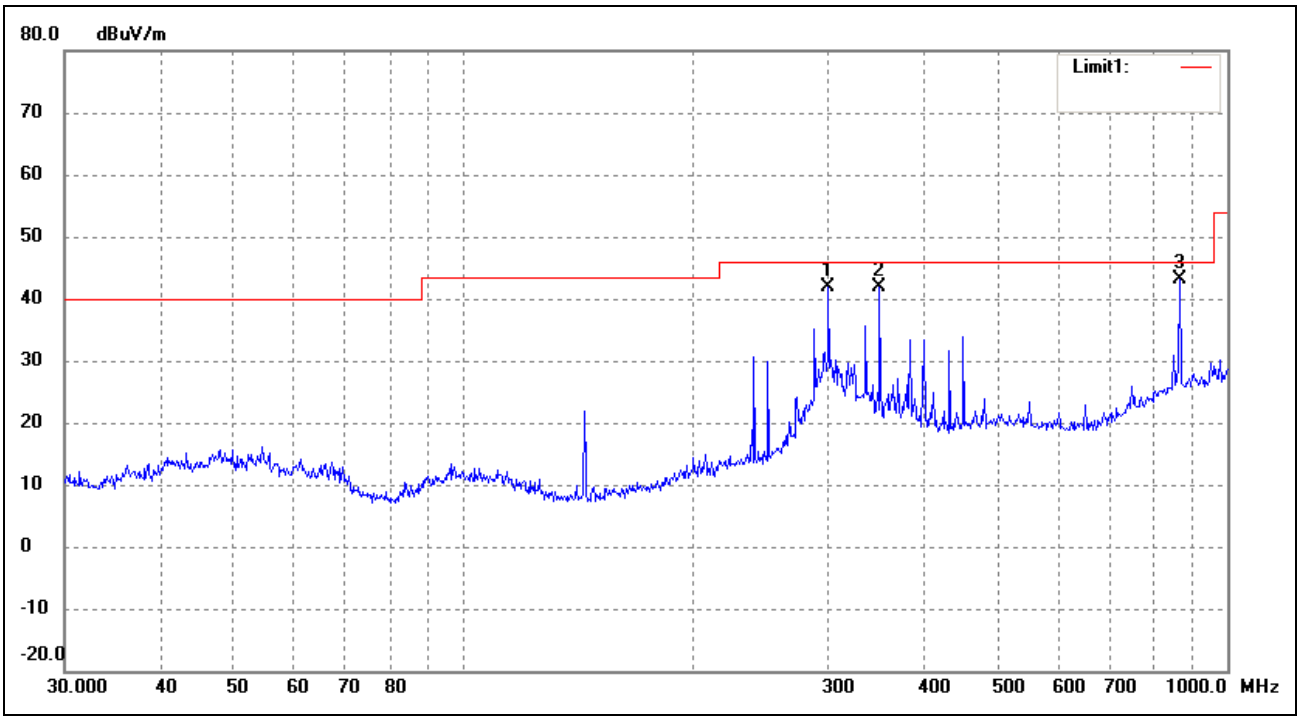
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	143.8295	46.31	-13.08	33.23	43.50	-10.27	256	100	peak
2	239.9874	40.33	-7.79	32.54	46.00	-13.46	360	100	peak
3	300.3673	42.02	-6.15	35.87	46.00	-10.13	360	100	peak

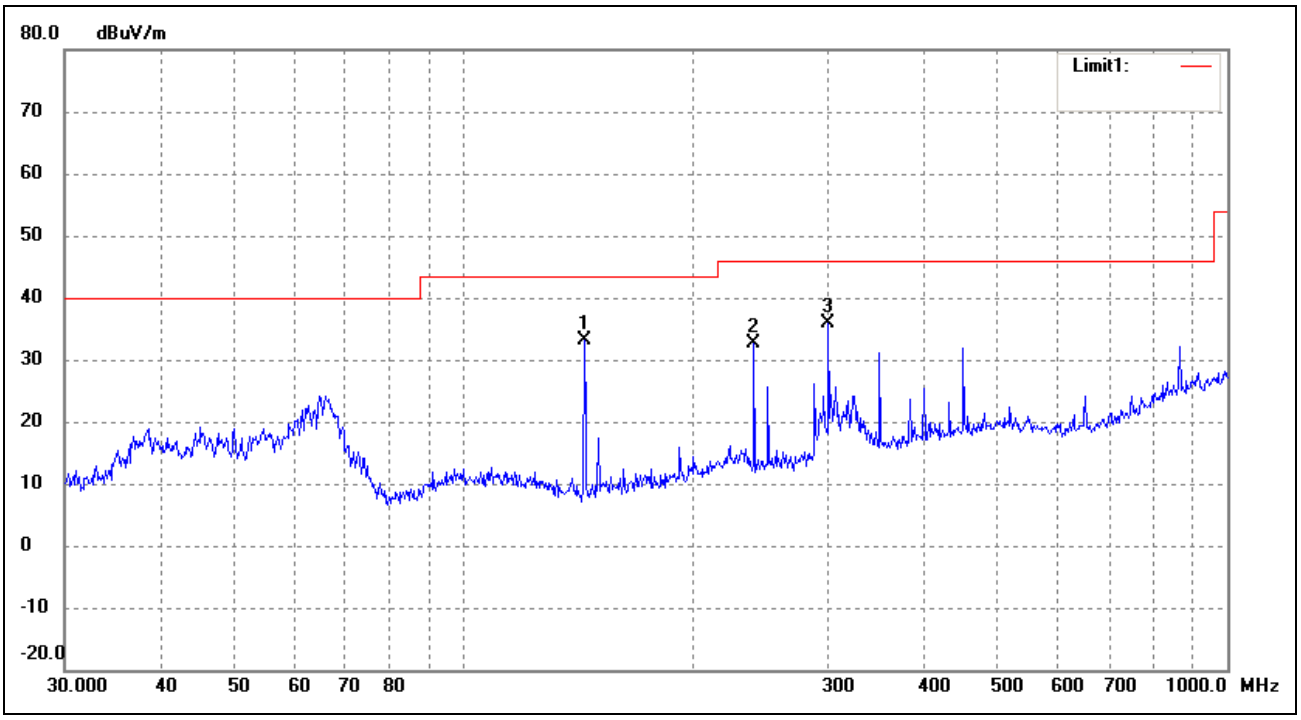
Operating Condition: *802.11b Transmitting High Channel-2472MHz*
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	48.02	-6.15	41.87	46.00	-4.13	176	100	peak
2	350.4768	46.23	-4.25	41.98	46.00	-4.02	255	100	peak
3	866.0879	38.84	4.37	43.21	46.00	-2.79	360	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	143.8295	46.31	-13.08	33.23	43.50	-10.27	360	100	peak
2	239.9874	40.33	-7.79	32.54	46.00	-13.46	225	100	peak
3	300.3673	41.93	-6.15	35.78	46.00	-10.22	160	100	peak

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

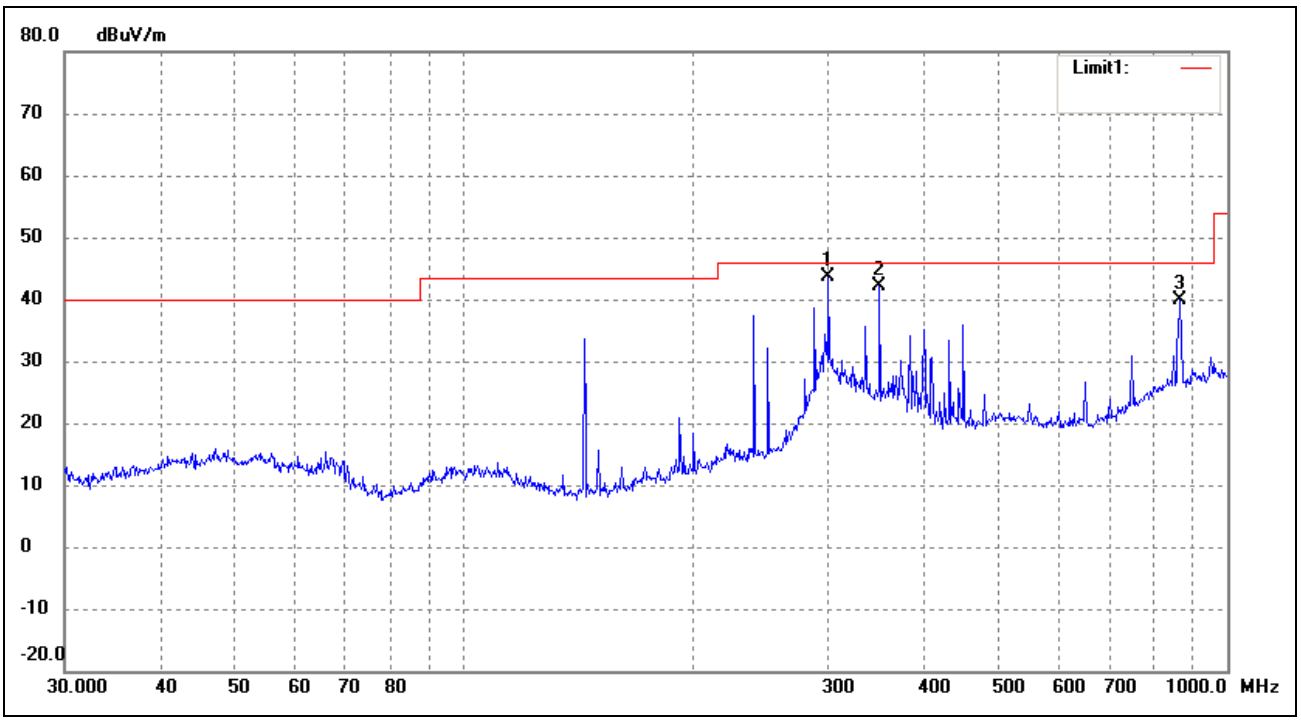
EUT: *TV BOX*

Tested Model: *HD5*

Operating Condition: *802.11g Transmitting Low Channel-2412MHz*

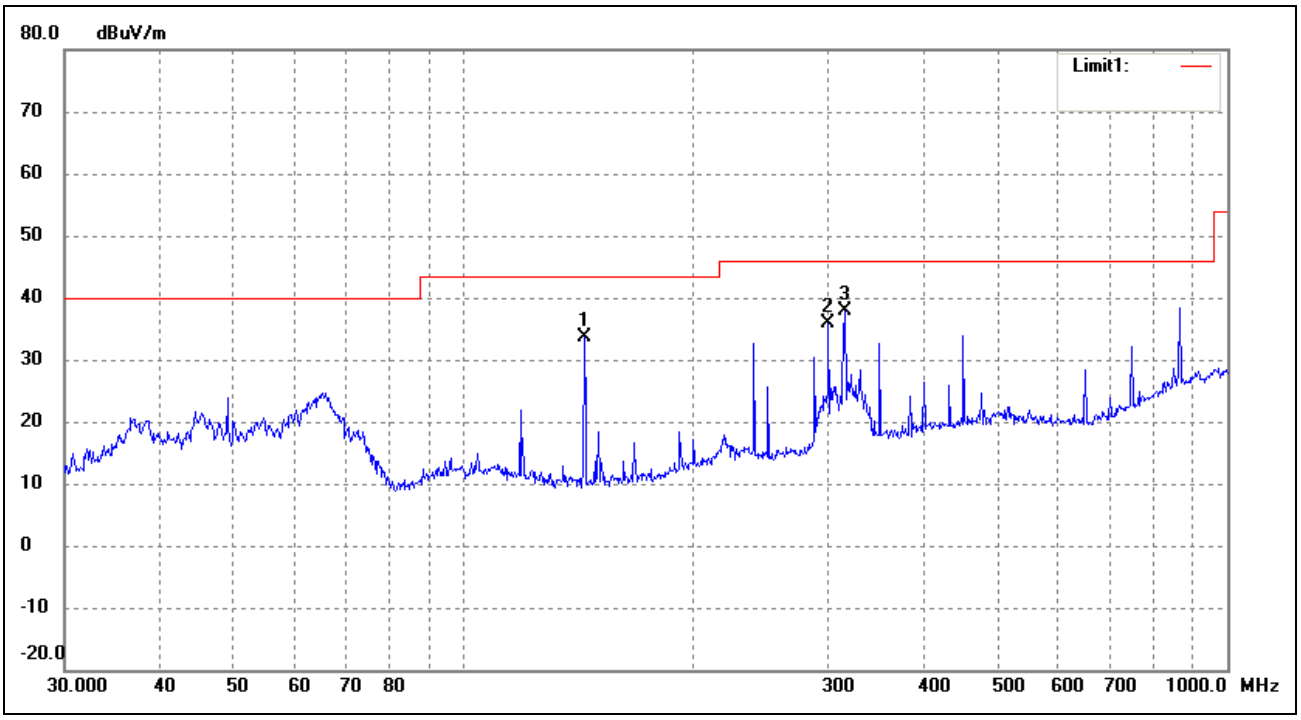
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	49.83	-6.15	43.68	46.00	-2.32	174	100	peak
2	350.4768	46.31	-4.25	42.06	46.00	-3.94	160	100	peak
3	866.0879	35.54	4.37	39.91	46.00	-6.09	320	100	peak

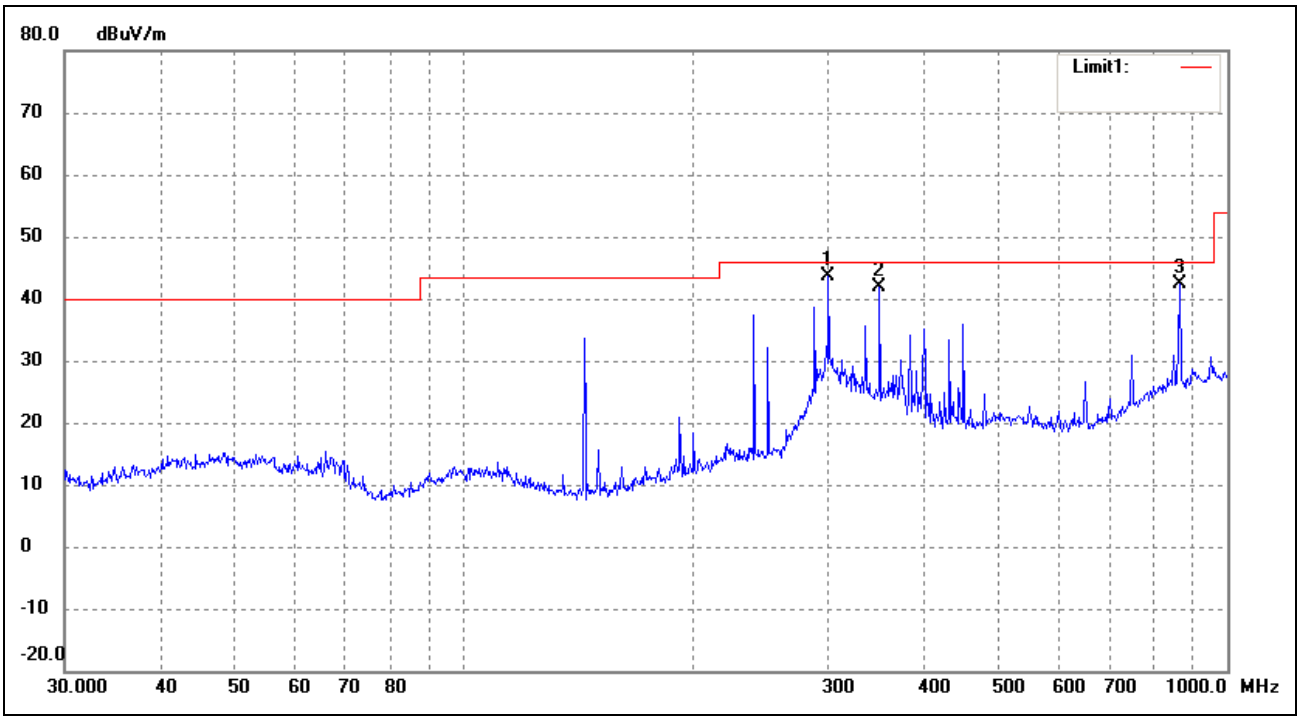
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	143.8295	46.81	-13.08	33.73	43.50	-9.77	177	100	peak
2	300.3673	42.02	-6.15	35.87	46.00	-10.13	90	100	peak
3	315.4808	43.48	-5.68	37.80	46.00	-8.20	336	100	peak

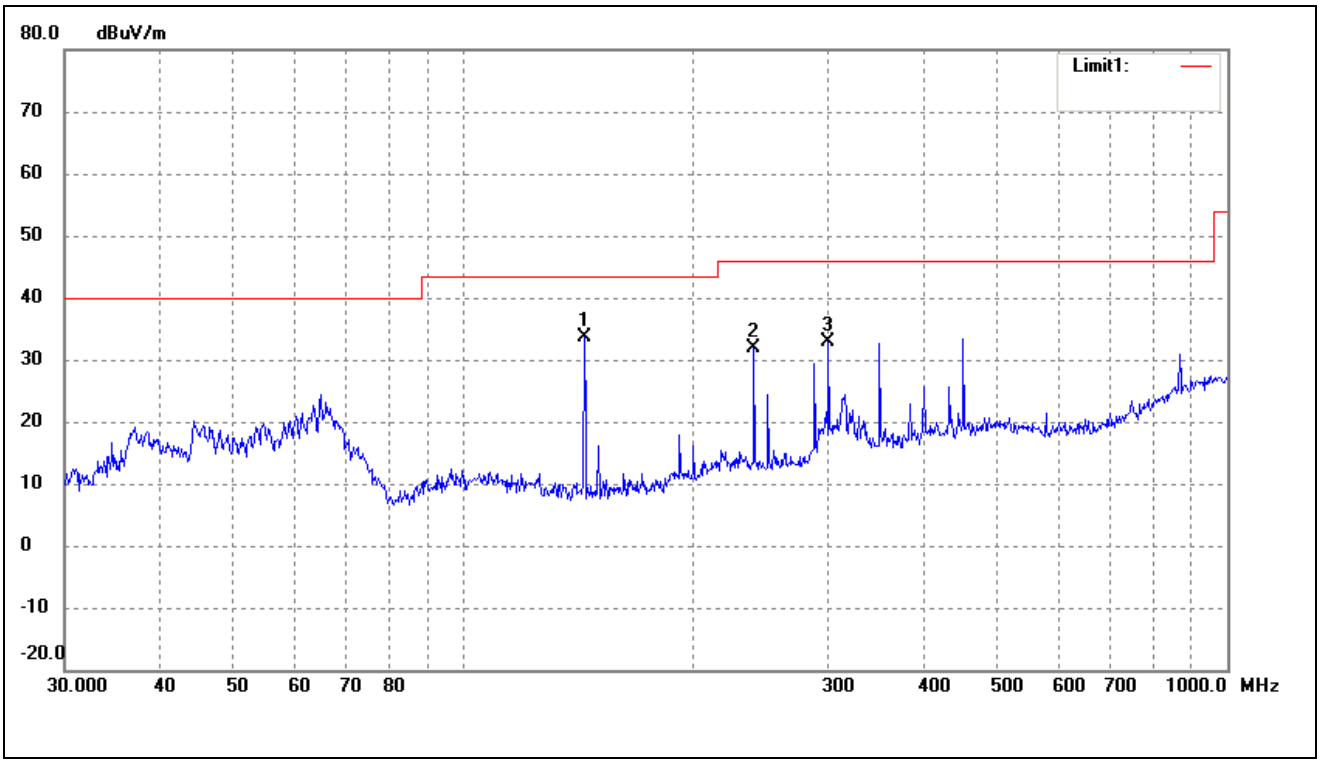
Operating Condition: *802.11g Transmitting Middle Channel-2442MHz*
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	49.83	-6.15	43.68	46.00	-2.32	270	100	peak
2	350.4768	46.19	-4.25	41.94	46.00	-4.06	164	100	peak
3	866.0879	38.04	4.37	42.41	46.00	-3.59	228	200	peak

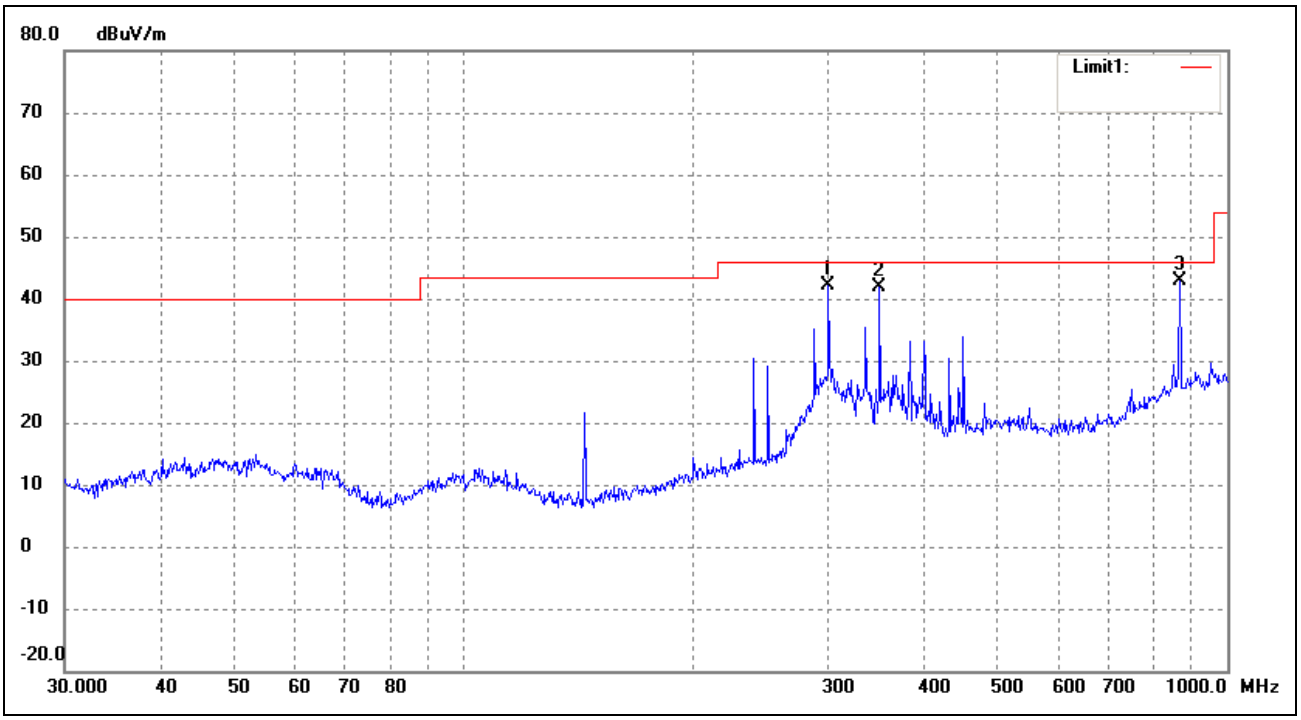
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	143.8295	46.67	-13.08	33.59	43.50	-9.91	360	100	peak
2	239.9874	39.76	-7.79	31.97	46.00	-14.03	255	100	peak
3	300.3673	39.05	-6.15	32.90	46.00	-13.10	270	100	peak

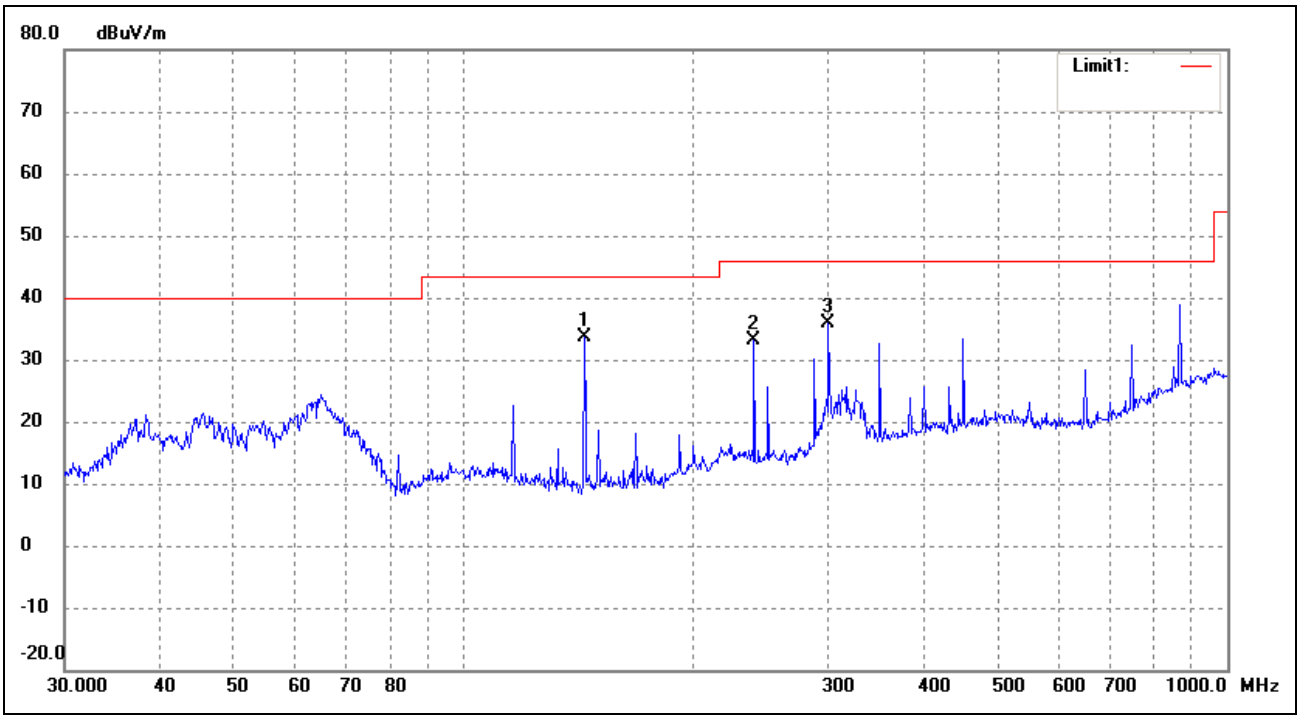
Operating Condition: *802.11g Transmitting High Channel-2472MHz*
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	48.22	-6.15	42.07	46.00	-3.93	270	100	peak
2	350.4768	46.19	-4.25	41.94	46.00	-4.06	51	200	peak
3	866.0879	38.62	4.37	42.99	46.00	-3.01	360	200	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	143.8295	46.67	-13.08	33.59	43.50	-9.91	360	100	peak
2	239.9874	40.99	-7.79	33.20	46.00	-12.80	180	100	peak
3	300.3673	41.96	-6.15	35.81	46.00	-10.19	225	100	peak

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

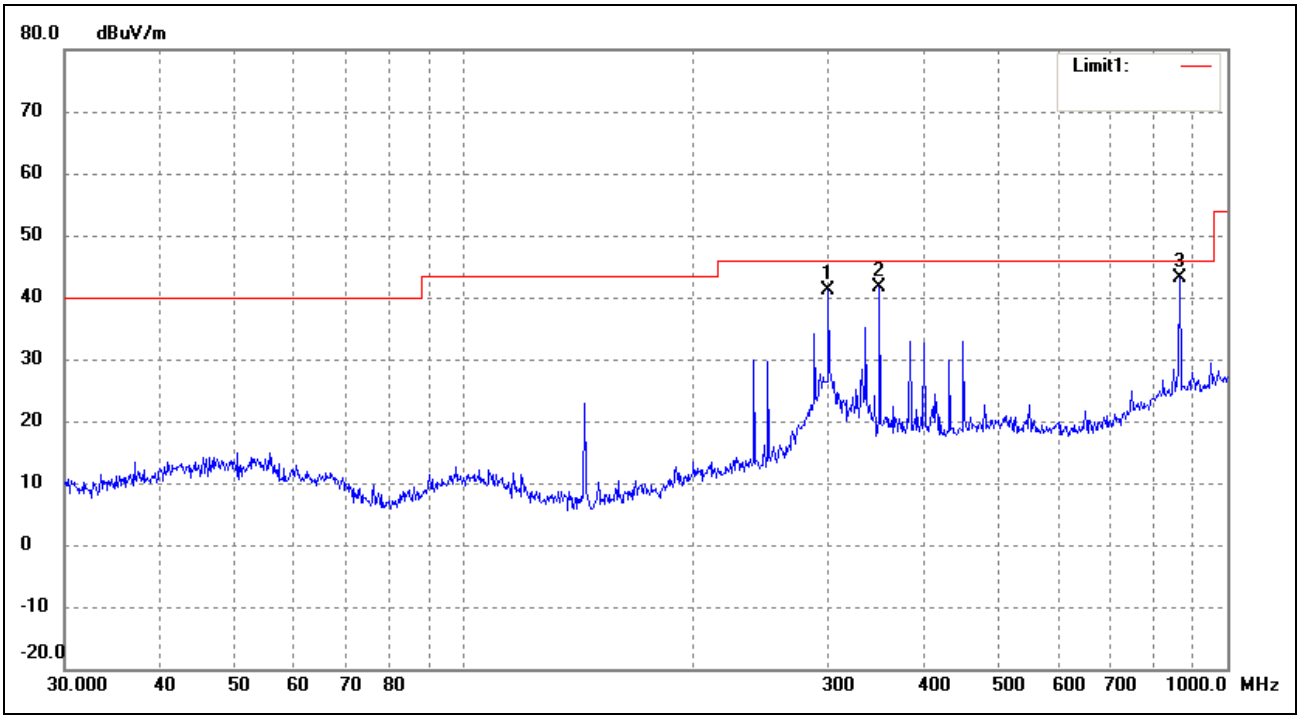
EUT: *TV BOX*

Tested Model: *HD5*

Operating Condition: *802.11n-HT20 Transmitting Low Channel-2412MHz*

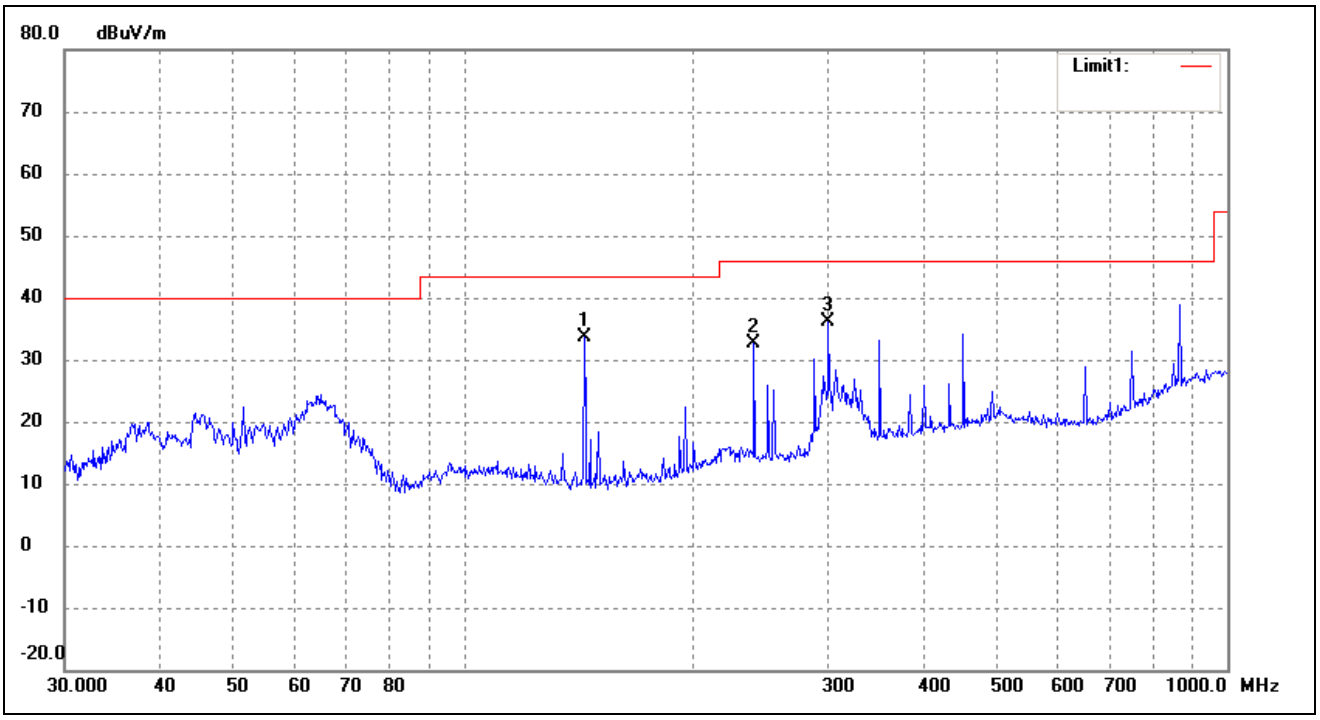
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	47.17	-6.15	41.02	46.00	-4.98	260	100	peak
2	350.4768	45.92	-4.25	41.67	46.00	-4.33	131	200	peak
3	866.0879	38.65	4.37	43.02	46.00	-2.98	285	200	peak

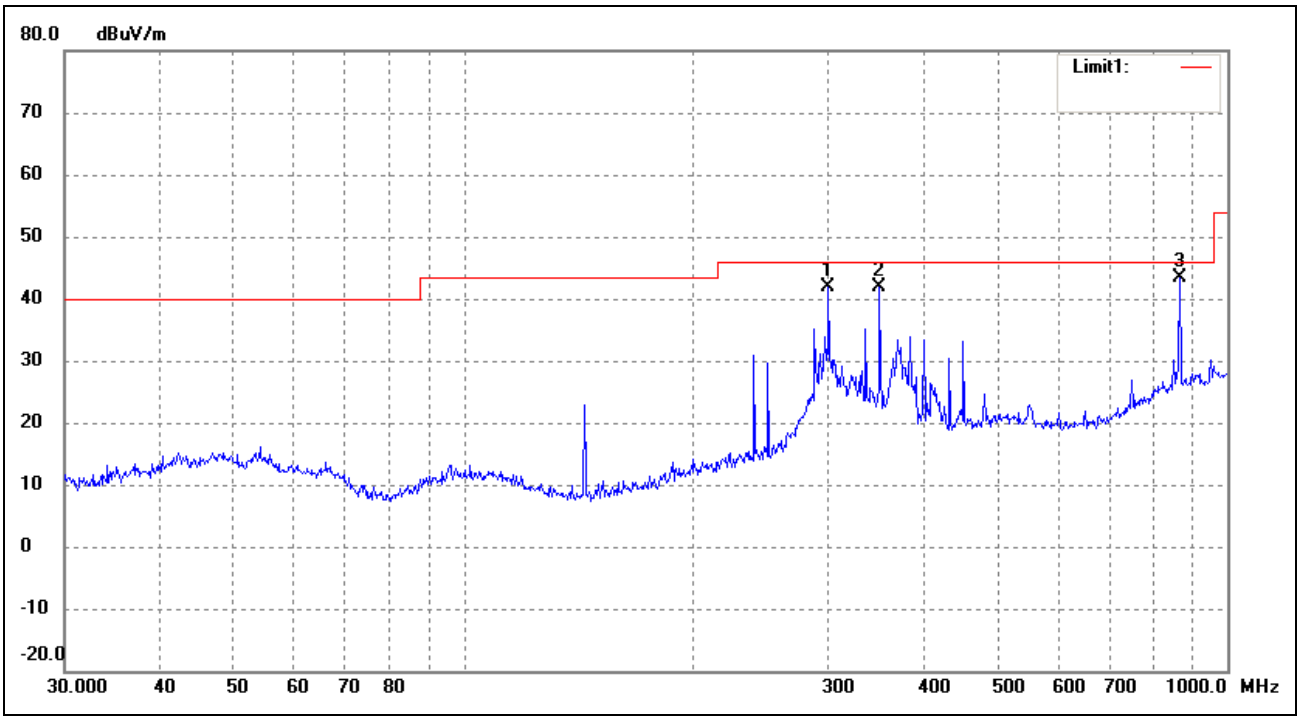
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	143.8295	46.71	-13.08	33.63	43.50	-9.87	155	100	peak
2	239.9874	40.46	-7.79	32.67	46.00	-13.33	197	100	peak
3	300.3673	42.26	-6.15	36.11	46.00	-9.89	310	100	peak

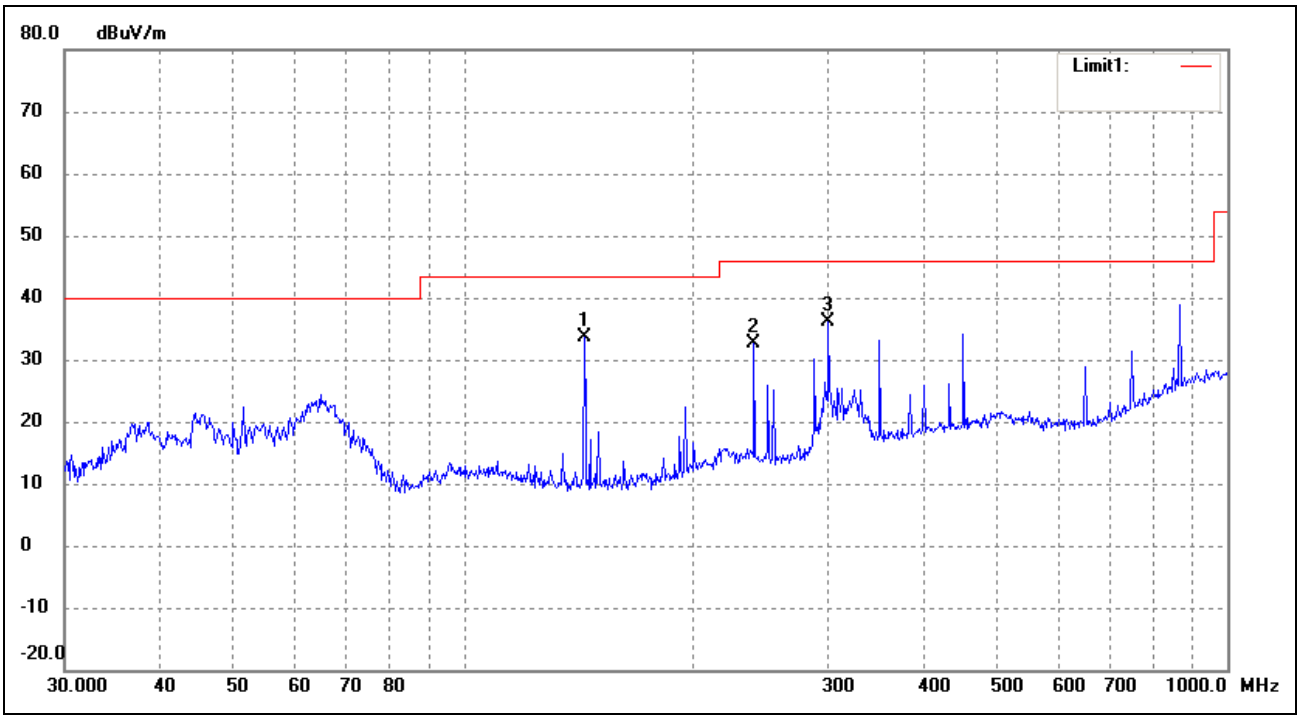
Operating Condition: *802.11n-HT20 Transmitting Middle Channel-2442MHz*
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	48.09	-6.15	41.94	46.00	-4.06	274	100	peak
2	350.4768	46.15	-4.25	41.90	46.00	-4.10	116	100	peak
3	866.0879	38.90	4.37	43.27	46.00	-2.73	82	100	peak

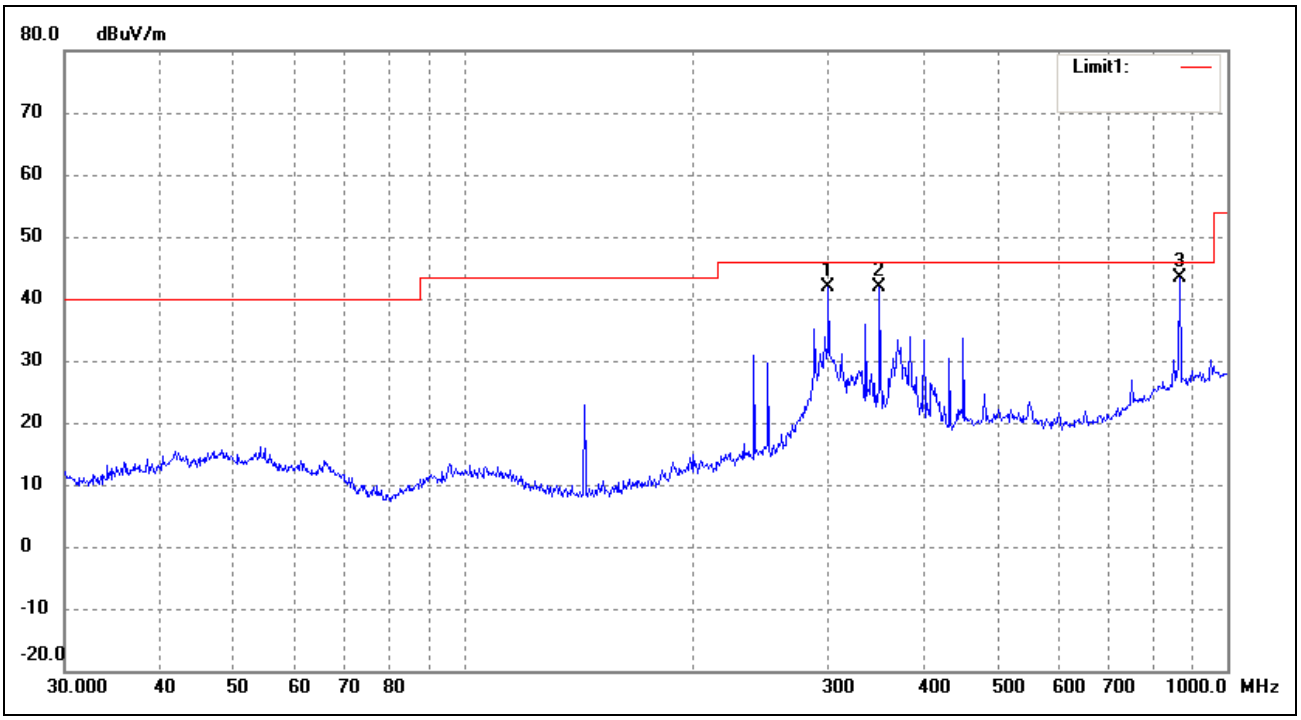
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	143.8295	46.67	-13.08	33.59	43.50	-9.91	264	100	peak
2	239.9874	40.46	-7.79	32.67	46.00	-13.33	110	100	peak
3	300.3673	42.25	-6.15	36.10	46.00	-9.90	136	100	peak

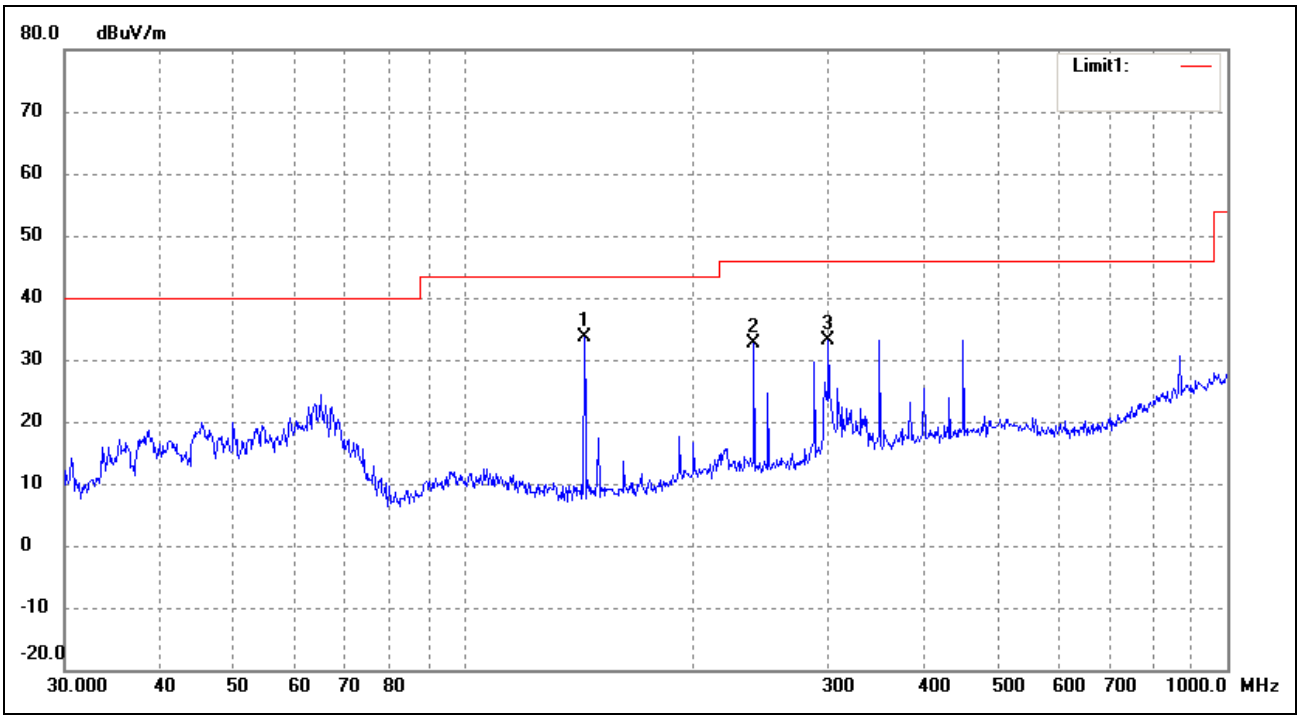
Operating Condition: *802.11n-HT20 Transmitting High Channel-2472MHz*
Comment: *AC120V/60Hz; Adapter DC 5V*

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	300.3673	48.09	-6.15	41.94	46.00	-4.06	360	100	peak
2	350.4768	46.21	-4.25	41.96	46.00	-4.04	112	100	peak
3	866.0879	38.90	4.37	43.27	46.00	-2.73	180	200	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	143.8295	46.67	-13.08	33.59	43.50	-9.91	267	100	peak
2	239.9874	40.32	-7.79	32.53	46.00	-13.47	116	100	peak
3	300.3673	39.18	-6.15	33.03	46.00	-12.97	360	100	peak

Spurious Emissions Above 1GHz

Test Mode: 802.11b

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824.000	54.47	-3.87	50.61	74.00	-23.39	H	PK
4824.000	39.22	-3.87	35.36	54.00	-18.64	H	AV
7236.000	46.68	1.14	47.78	74.00	-26.22	H	PK
7236.000	35.36	1.19	36.46	54.00	-17.54	H	AV
4824.000	57.69	-3.86	53.83	74.00	-20.17	V	PK
4824.000	40.88	-3.86	37.02	54.00	-16.98	V	AV
7236.000	49.49	1.10	50.59	74.00	-23.41	V	PK
7236.000	37.82	1.10	38.92	54.00	-15.08	V	AV
Middle Channel-2442MHz							
4884.000	55.58	-3.74	51.84	74.00	-22.16	H	PK
4884.000	40.83	-3.74	37.09	54.00	-16.91	H	AV
7326.000	48.61	1.47	50.08	74.00	-23.92	H	PK
7326.000	33.94	1.47	35.41	54.00	-18.59	H	AV
4884.000	54.81	-3.74	51.07	74.00	-22.93	V	PK
4884.000	41.73	-3.74	37.99	54.00	-16.01	V	AV
7326.000	48.82	1.47	50.29	74.00	-23.71	V	PK
7326.000	34.92	1.47	36.39	54.00	-17.61	V	AV
High Channel-2472MHz							
4944.000	56.46	-3.59	52.87	74.00	-21.13	H	PK
4944.000	42.40	-3.59	38.81	54.00	-15.19	H	AV
7416.000	47.02	1.79	48.81	74.00	-25.19	H	PK
7416.000	35.47	1.79	37.26	54.00	-16.74	H	AV
4944.000	55.58	-3.59	51.99	74.00	-22.01	V	PK
4944.000	42.68	-3.59	39.09	54.00	-14.91	V	AV
7416.000	48.63	1.79	50.42	74.00	-23.58	V	PK
7416.000	35.82	1.79	37.61	54.00	-16.39	V	AV

Test Mode: 802.11g

Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.000	55.88	-3.86	52.02	74.00	-21.98	H	PK
4824.000	42.61	-3.86	38.75	54.00	-15.25	H	AV
7236.000	48.80	1.10	49.9	74.00	-24.10	H	PK
7236.000	34.78	1.10	35.88	54.00	-18.12	H	AV
4824.000	56.37	-3.86	52.51	74.00	-21.49	V	PK
4824.000	43.03	-3.86	39.17	54.00	-14.83	V	AV
7236.000	49.60	1.10	50.7	74.00	-23.30	V	PK
7236.000	35.92	1.10	37.02	54.00	-16.98	V	AV
Middle Channel-2442MHz							
4884.000	55.94	-3.74	52.2	74.00	-21.8	H	PK
4884.000	44.12	-3.74	40.38	54.00	-13.62	H	AV
7326.000	48.22	1.47	49.69	74.00	-24.31	H	PK
7326.000	36.11	1.47	37.58	54.00	-16.42	H	AV
4884.000	57.91	-3.74	54.17	74.00	-19.83	V	PK
4884.000	44.70	-3.74	40.96	54.00	-13.04	V	AV
7326.000	49.24	1.47	50.71	74.00	-23.29	V	PK
7326.000	36.17	1.47	37.64	54.00	-16.36	V	AV
High Channel-2472MHz							
4944.000	54.64	-3.59	51.05	74.00	-22.95	H	PK
4944.000	41.39	-3.59	37.80	54.00	-16.20	H	AV
7416.000	47.82	1.79	49.61	74.00	-24.39	H	PK
7416.000	35.37	1.79	37.16	54.00	-16.84	H	AV
4944.000	56.75	-3.59	53.16	74.00	-20.84	V	PK
4944.000	43.33	-3.59	39.74	54.00	-14.26	V	AV
7416.000	49.22	1.79	51.01	74.00	-22.99	V	PK
7416.000	36.59	1.79	38.38	54.00	-15.62	V	AV

Test Mode: 802.11n-HT20

Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.000	55.98	-3.86	52.12	74.00	-21.88	H	PK
4824.000	40.92	-3.86	37.06	54.00	-16.94	H	AV
7236.000	47.64	1.10	48.74	74.00	-25.26	H	PK
7236.000	34.82	1.10	35.92	54.00	-18.08	H	AV
4824.000	57.09	-3.86	53.23	74.00	-20.77	V	PK
4824.000	43.56	-3.86	39.70	54.00	-14.30	V	AV
7236.000	49.59	1.10	50.69	74.00	-23.31	V	PK
7236.000	36.15	1.10	37.25	54.00	-16.75	V	AV
Middle Channel-2442MHz							
4884.000	55.00	-3.74	51.26	74.00	-22.74	H	PK
4884.000	43.32	-3.74	39.58	54.00	-14.42	H	AV
7326.000	49.58	1.47	51.05	74.00	-22.95	H	PK
7326.000	33.94	1.47	35.41	54.00	-18.59	H	AV
4884.000	55.76	-3.74	52.02	74.00	-21.98	V	PK
4884.000	43.46	-3.74	39.72	54.00	-14.28	V	AV
7326.000	49.33	1.47	50.80	74.00	-23.20	V	PK
7326.000	36.04	1.47	37.51	54.00	-16.49	V	AV
High Channel-2472MHz							
4944.000	54.54	-3.59	50.95	74.00	-23.05	H	PK
4944.000	43.87	-3.59	40.28	54.00	-13.72	H	AV
7416.000	48.95	1.79	50.74	74.00	-23.26	H	PK
7416.000	36.74	1.79	38.53	54.00	-15.47	H	AV
4944.000	56.34	-3.59	52.75	74.00	-21.25	V	PK
4944.000	42.12	-3.59	38.53	54.00	-15.47	V	AV
7416.000	49.19	1.79	50.98	74.00	-23.02	V	PK
7416.000	36.00	1.79	37.79	54.00	-16.21	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3^{th} Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
The measurements greater than 20dB below the limit from 9kHz to 30MHz.

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 Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-28	2015-05-27
EMI Test Receiver	R&S	ESVB	825471/005	2014-05-28	2015-05-27
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-28	2015-05-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-28	2015-05-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-24	2015-05-23
Horn Antenna	ETS	3117	00086197	2014-05-24	2015-05-23

9.3 Test Procedure

According to the KDB 558074D01 v03r02, 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 V03r02, 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.

9.4 Environmental Conditions

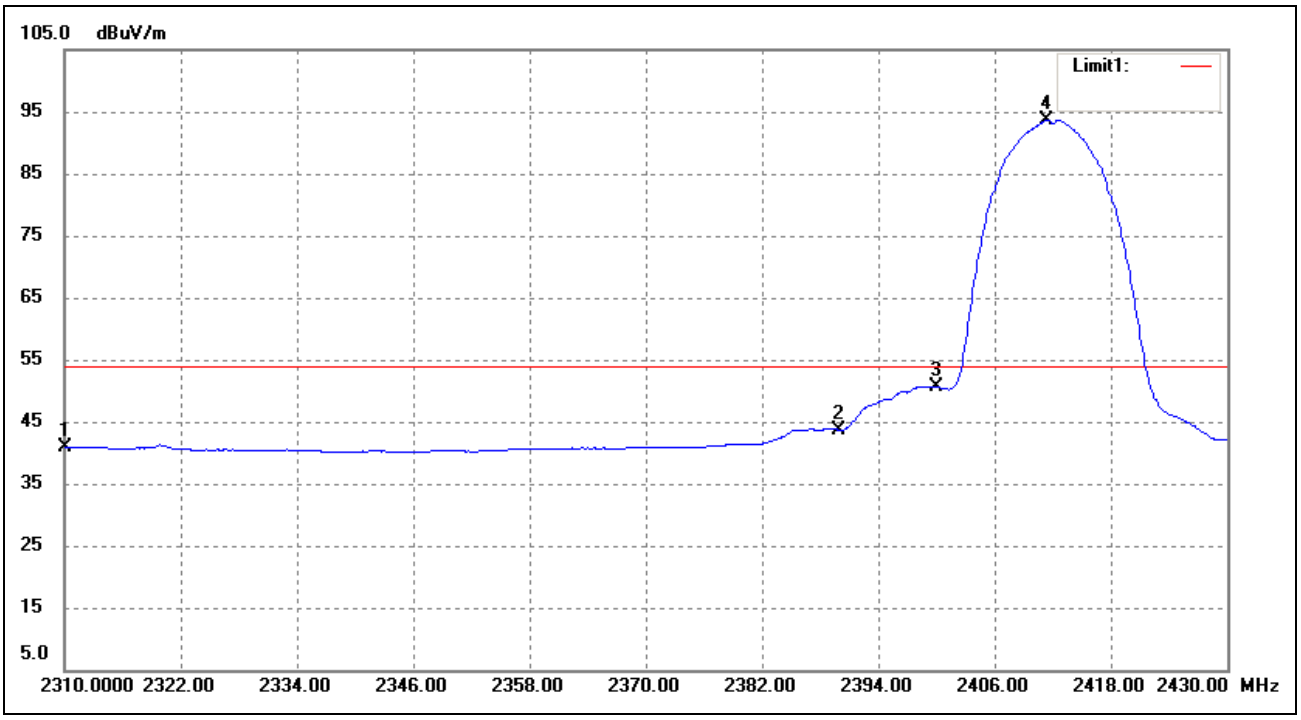
Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.5 Summary of Test Results/Plots

Please refer to the test plots as below.

802.11b-Lowest Bandedge

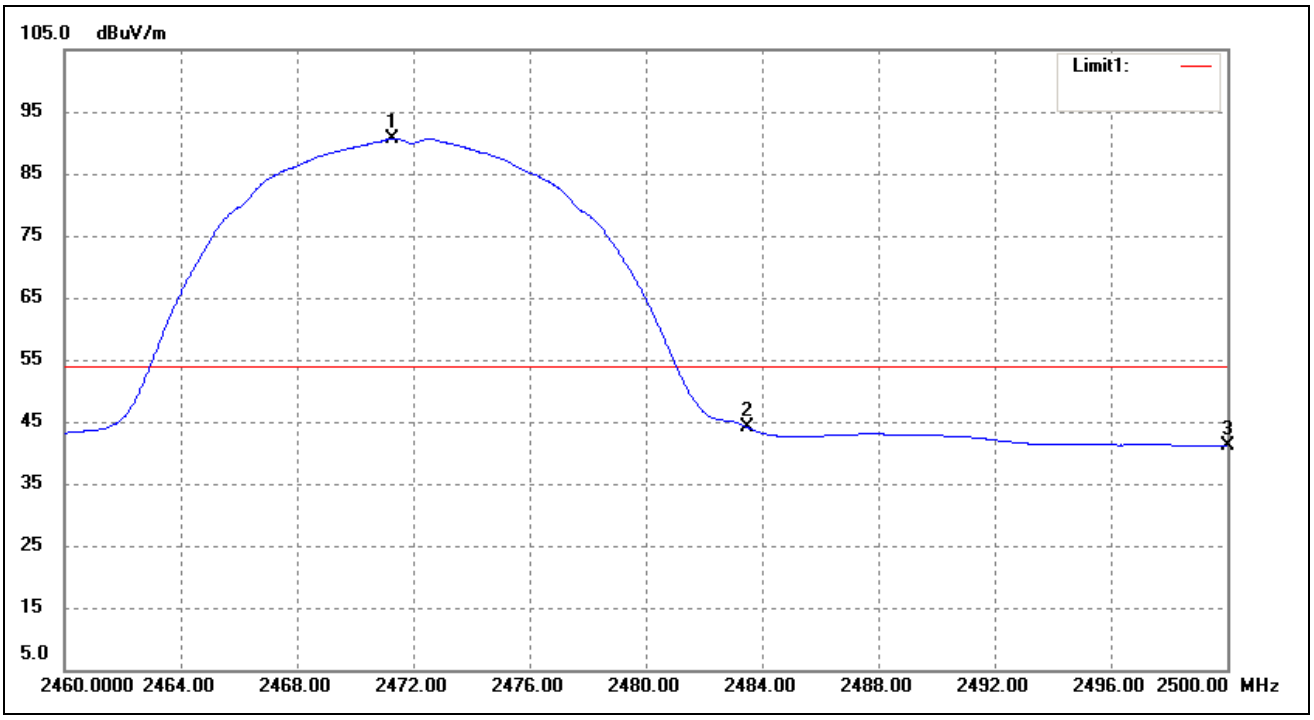
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	24.42	16.34	40.76	54.00	-13.24	Average Detector
	2310.000	35.54	16.34	51.88	74.00	-22.12	Peak Detector
2	2390.000	26.67	17.03	43.70	54.00	-10.30	Average Detector
	2390.000	38.54	17.03	55.57	74.00	-18.43	Peak Detector
3	2400.000	33.53	17.11	50.64	Delta =43.03dBc		Average Detector
4	2411.400	76.48	17.19	93.67			Average Detector

802.11b-Highest Bandedge

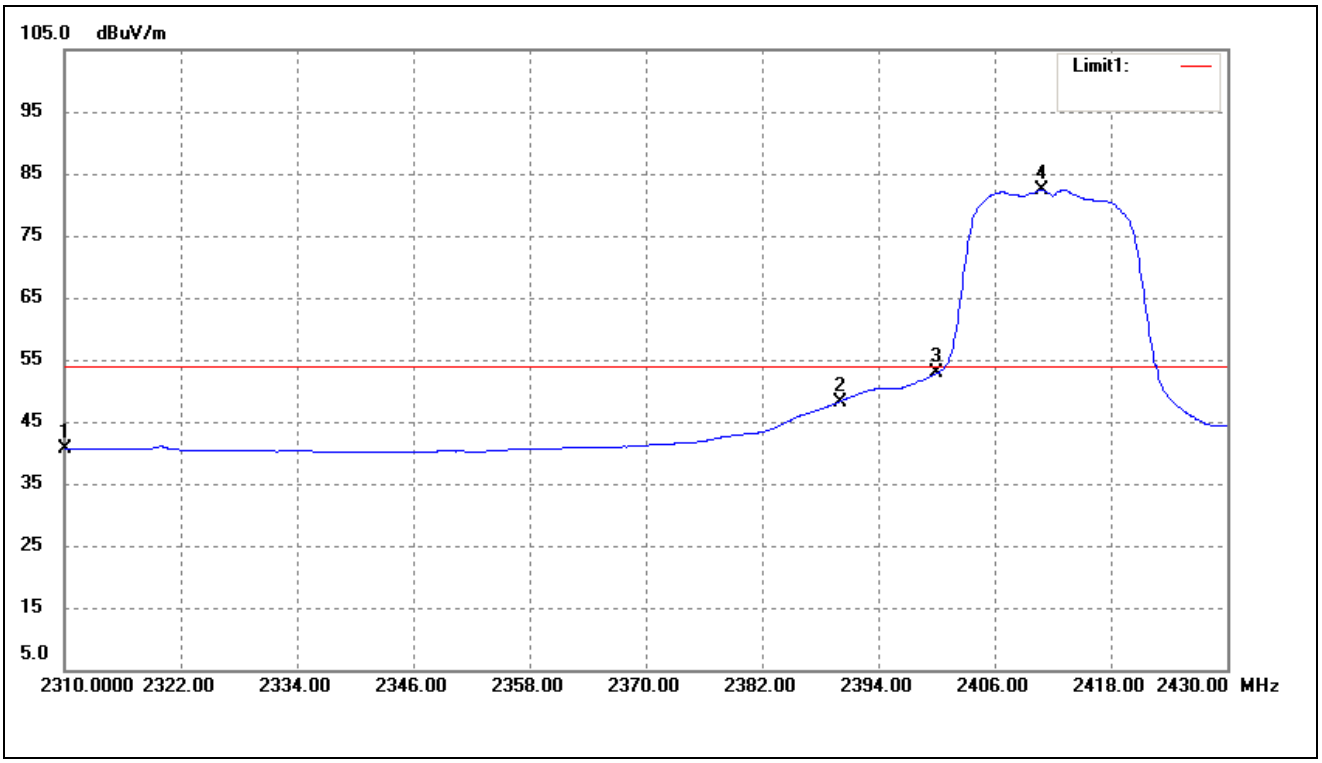
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2471.280	73.03	17.65	90.68	/	/	Average Detector
	2472.200	79.84	17.66	97.50	/	/	Peak Detector
2	2483.500	Delta = 46.64dBc		44.04	54.00	-9.96	Average Detector
	2483.500			54.42	74.00	-19.58	Peak Detector
4	2500.000	23.23	17.86	41.09	54.00	-12.91	Average Detector
	2500.000	35.59	17.86	53.45	74.00	-20.55	Peak Detector

802.11g-Lowest Bandedge

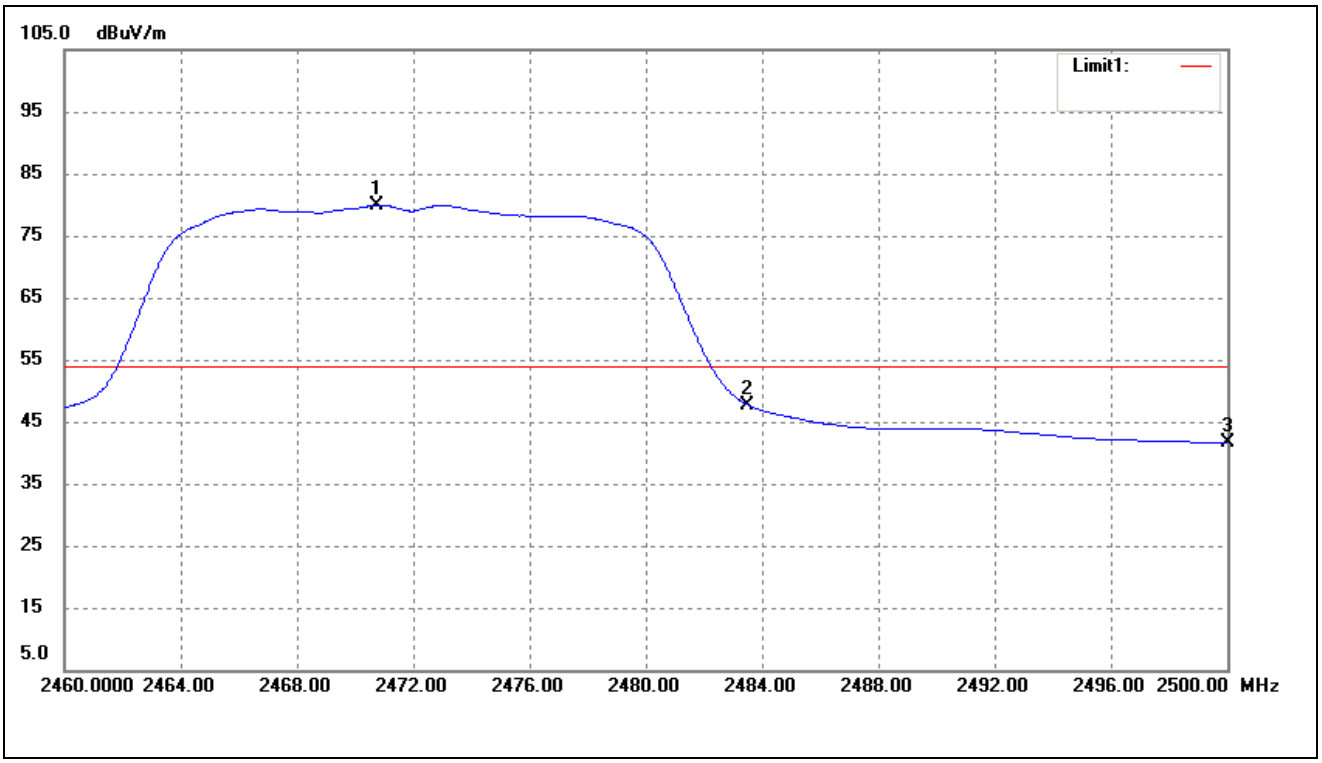
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	24.27	16.34	40.61	54.00	-13.39	Average Detector
	2310.000	35.90	16.34	52.24	74.00	-21.76	Peak Detector
2	2390.000	31.22	17.03	48.25	54.00	-5.75	Average Detector
	2390.000	50.13	17.03	67.16	74.00	-6.84	Peak Detector
3	2400.000	35.70	17.11	52.81	Delta =29.52dBc		Average Detector
4	2410.800	65.14	17.19	82.33			Average Detector

802.11g-Highest Bandedge

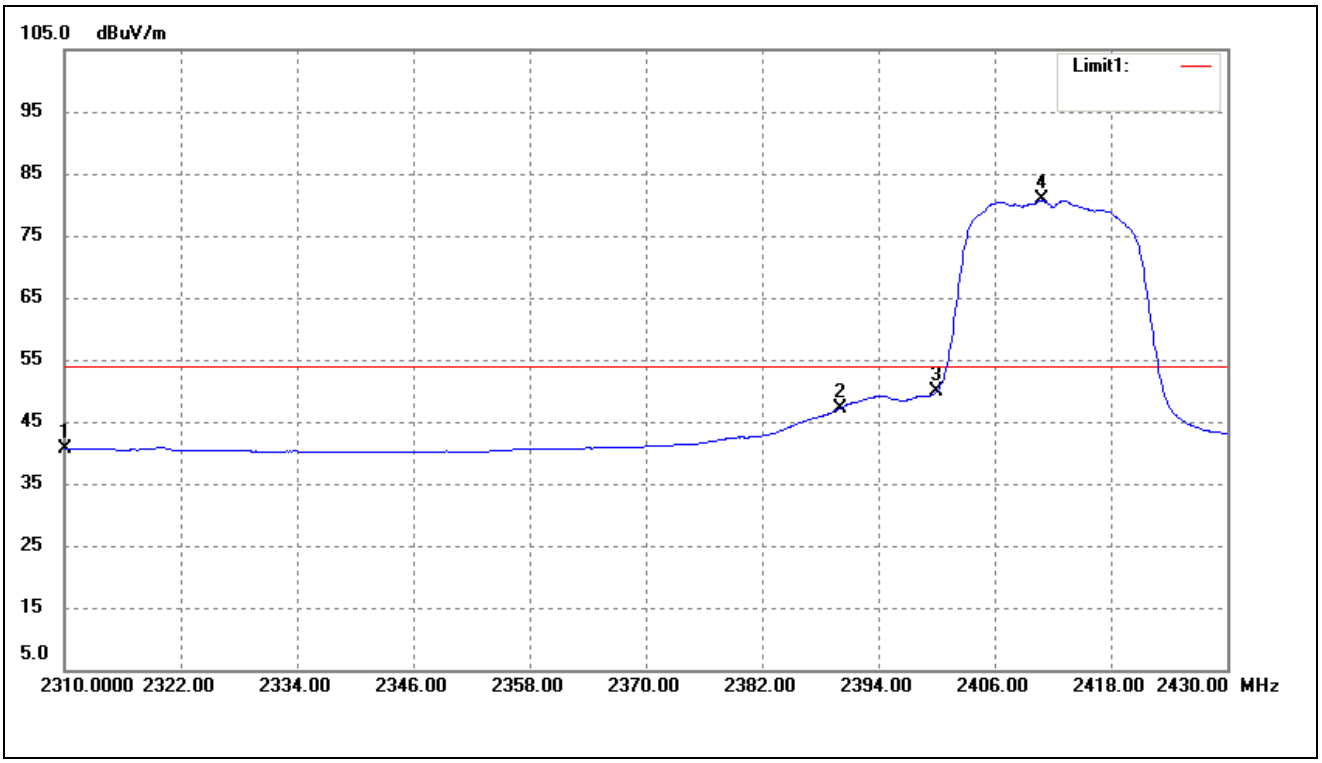
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2470.760	62.29	17.64	79.93	/	/	Average Detector
	2471.080	83.04	17.64	100.68	/	/	Peak Detector
2	2483.500	Delta = 32.24dBc		47.69	54.00	-6.31	Average Detector
	2483.500			70.05	74.00	-3.95	Peak Detector
3	2500.000	23.67	17.86	41.53	54.00	-12.47	Average Detector
	2500.000	34.77	17.86	52.63	74.00	-21.37	Peak Detector

802.11n-HT20-Lowest Bandedge

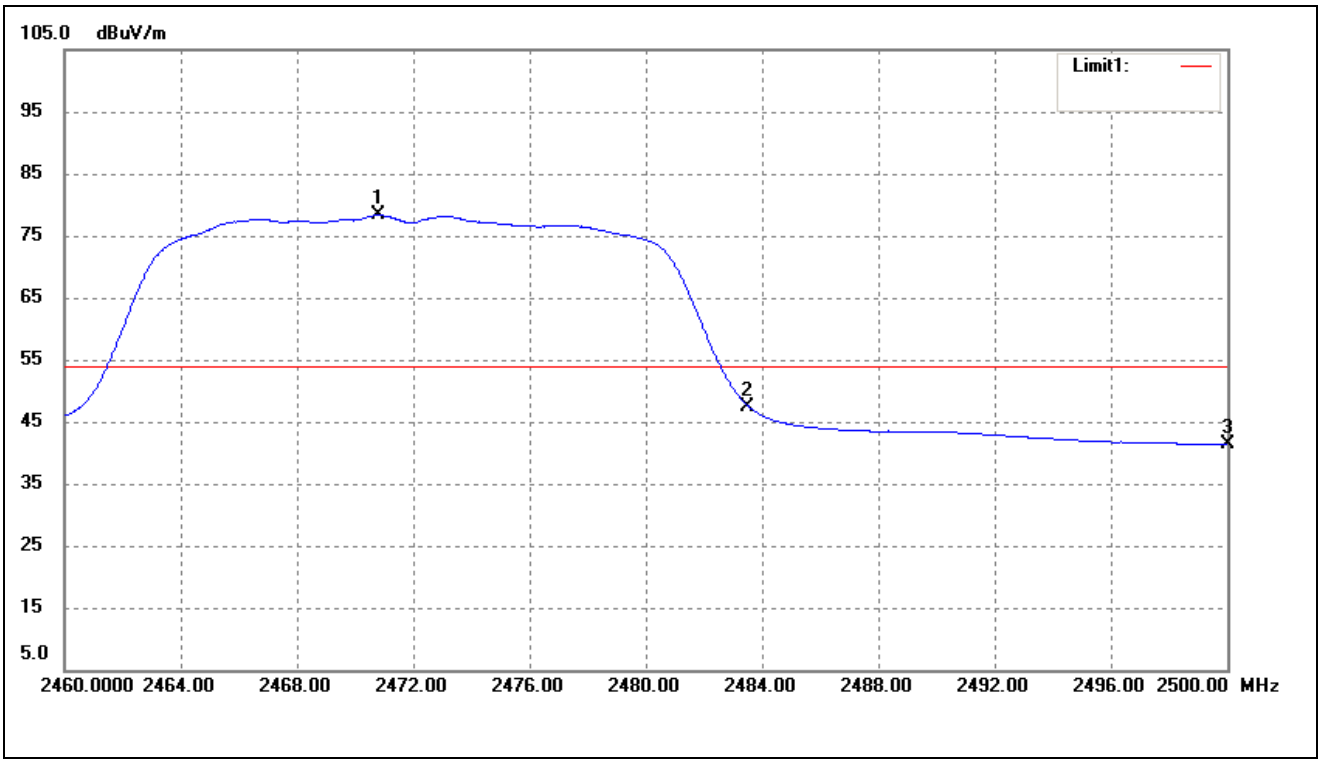
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	24.18	16.34	40.52	54.00	-13.48	Average Detector
	2310.000	36.45	16.34	52.79	74.00	-21.21	Peak Detector
2	2390.000	30.14	17.03	47.17	54.00	-6.83	Average Detector
	2390.000	47.20	17.03	64.23	74.00	-9.77	Peak Detector
3	2400.000	32.75	17.11	49.86	Delta =30.90dBc		Average Detector
4	2410.920	63.57	17.19	80.76			Average 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	2470.800	60.68	17.64	78.32	/	/	Average Detector
	2469.680	81.72	17.62	99.34	/	/	Peak Detector
2	2483.500	Delta = 30.82dBc		47.50	54.00	-6.50	Average Detector
	2483.500			68.94	74.00	-5.06	Peak Detector
3	2500.000	23.47	17.86	41.33	54.00	-12.67	Average Detector
	2500.000	34.98	17.86	52.84	74.00	-21.16	Peak Detector

10. Conducted Emissions

10.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

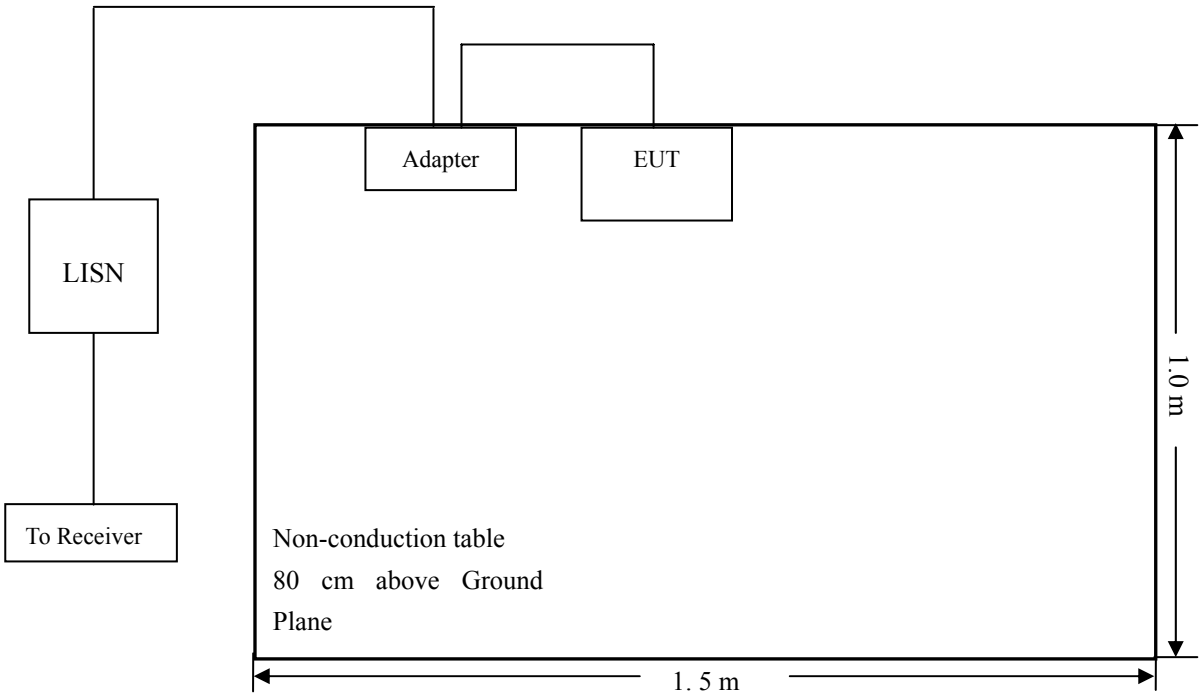
10.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2014-05-28	2015-05-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2014-05-28	2015-05-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2014-05-28	2015-05-27

10.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 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.

10.4 Basic Test Setup Block Diagram



10.5 Environmental Conditions

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

10.6 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

10.7 Summary of Test Results/Plots

According to the data in section 9.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-1.14 dB at **0.5500 MHz** in the **Neutral**, **TM1** Mode, **Peak** detector, **0.15-30**MHz

10.8 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

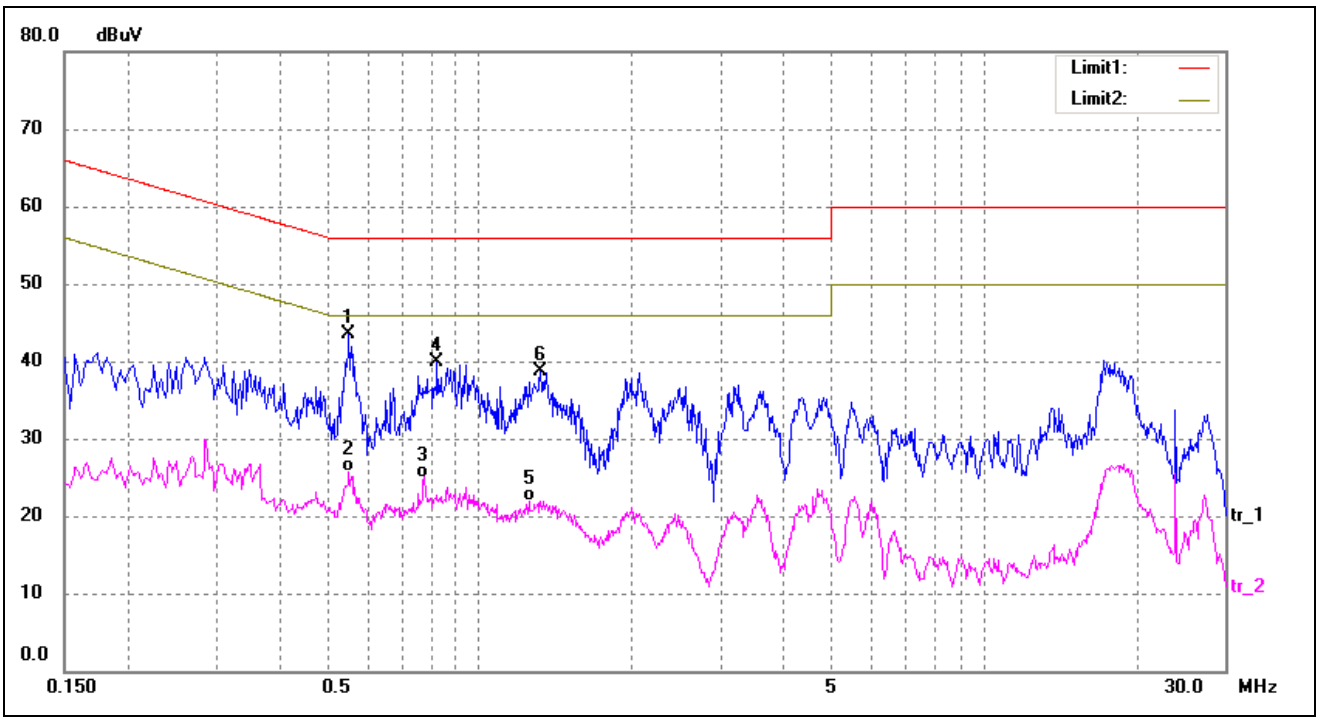
EUT: *TV BOX*

Tested Model: *HD5*

Operating Condition: *Transmitting(Wi-Fi)*

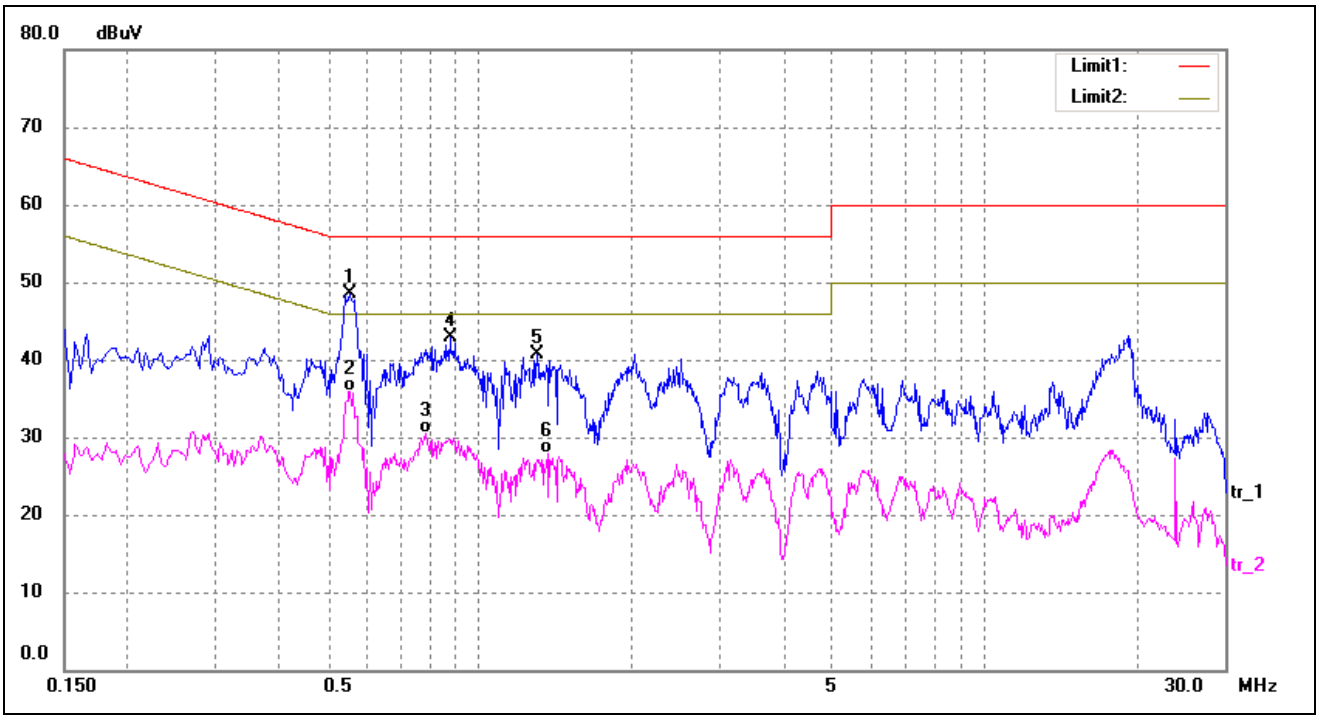
Comment: *AC120V/60Hz; Adapter DC 5V*

Test Specification: *Neutral*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.5500	33.96	9.55	43.51	56.00	-12.49	peak
2	0.5500	16.25	9.55	25.80	46.00	-20.20	AVG
3	0.7780	15.22	9.78	25.00	46.00	-21.00	AVG
4	0.8260	30.07	9.83	39.90	56.00	-16.10	peak
5	1.2500	11.83	10.00	21.83	46.00	-24.17	AVG
6	1.3180	28.62	10.00	38.62	56.00	-17.38	peak

Test Specification: *Line*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.5540	38.92	9.55	48.47	56.00	-7.53	peak
2	0.5540	26.39	9.55	35.94	46.00	-10.06	AVG
3	0.7820	20.65	9.78	30.43	46.00	-15.57	AVG
4	0.8740	33.09	9.87	42.96	56.00	-13.04	peak
5	1.2980	30.62	10.00	40.62	56.00	-15.38	peak
6	1.3660	17.85	10.00	27.85	46.00	-18.15	AVG

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