FCC Part 15C
Measurement and Test Report

For

LUCIS TECHNOLOGIES (SHANG HAI) CO., LTD

No.57, East Caohejing, Building Lucis, Xuhui District, Shanghai City,

200235, China

FCC ID: 2AEONNUBRYTE

FCC Rule(s):	FCC Part 15C
Product Description:	Smart switch
Tested Model:	Nubryte -2
Report No.:	STR15048296I-1
Tested Date:	2015-04-30 to 2015-05-22
Issued Date:	2015-05-22
Tested By:	Lebron Wang / Engineer
Reviewed By:	Lahm Peng / EMC Manager
Approved & Authorized By:	Jandy so / PSQ Manager

Prepared By:

Shenzhen SEM.Test Technology Co., Ltd.
1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C.（518101）
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	LUCIS TECHNOLOGIES (SHANG HAI) CO., LTD
Address of applicant:	No.57, East Caohejing, Building Lucis, Xuhui District, Shanghai City, 200235, China.
Manufacturer:	LUCIS TECHNOLOGIES (SHANG HAI) CO., LTD
Address of manufacturer:	No.57, East Caohejing, Building Lucis, Xuhui District, Shanghai City, 200235, China.

General Description of EUT	
Product Name:	Smart switch
Trade Name:	/
Model No.:	Nubryte -2
Adding Model(s):	Nubryte -1
Rated Voltage:	AC 100~120V
Power Adapter Model:	/
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 Nubryte -2, 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:	12.69dBm (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 Gain:	3.0dBi
Lowest Internal Frequency	32.768KHz

1.2 Test Standards

The following report is prepared on behalf of the LUCIS TECHNOLOGIES (SHANG HAI) 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, 2437MHz, 2462MHz
TM2	802.11g	2412MHz, 2437MHz, 2462MHz
TM3	802.11n-HT20	2412MHz, 2437MHz, 2462MHz

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

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
AC Cable	0.8	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

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 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 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

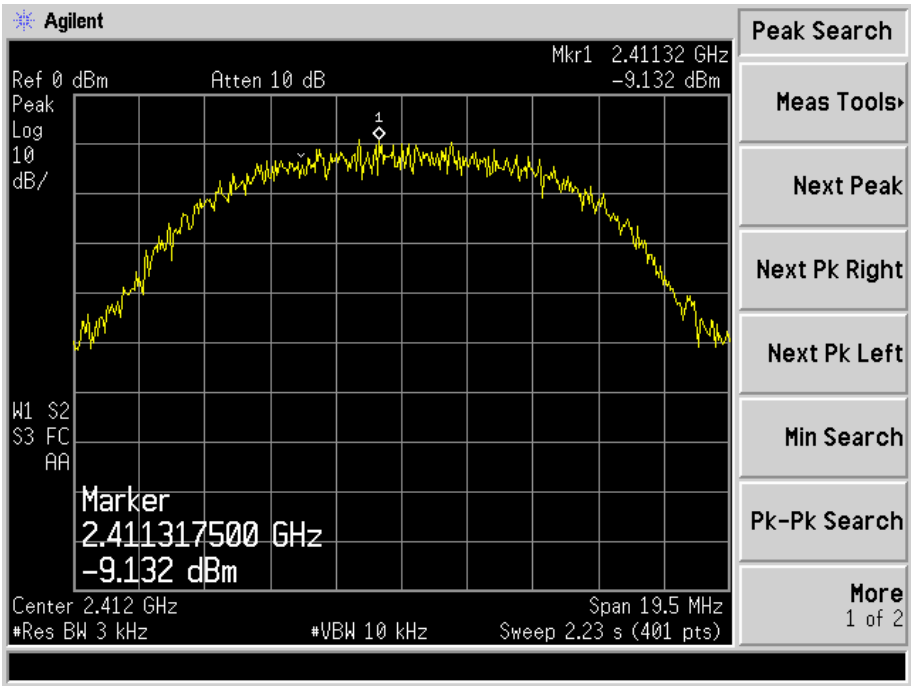
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.5 Summary of Test Results/Plots

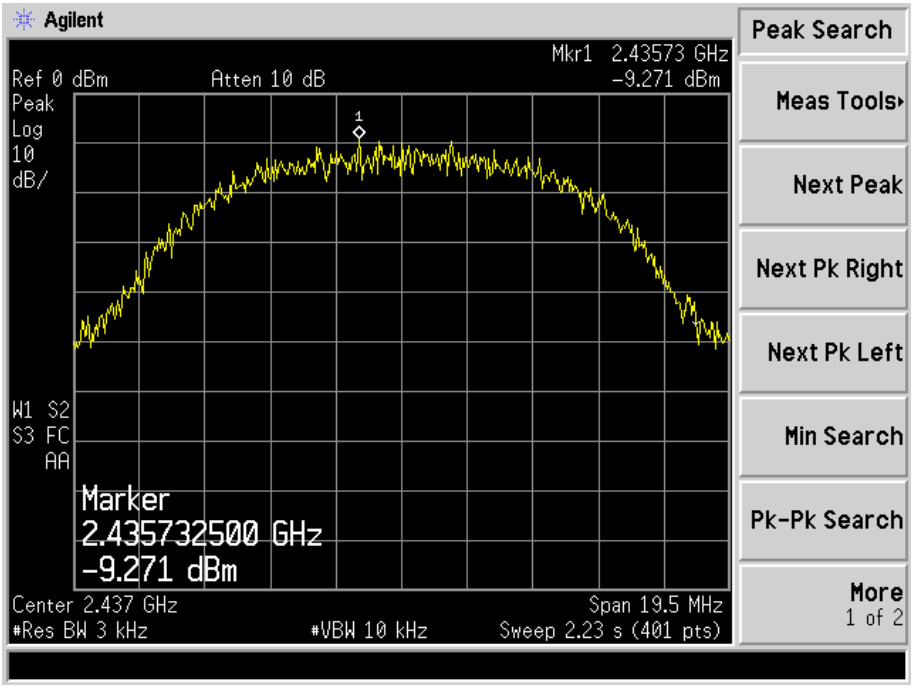
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-9.132	8
	2437	-9.271	8
	2462	-9.267	8
802.11g	2412	-13.12	8
	2437	-13.34	8
	2462	-12.92	8
802.11n HT20	2412	-13.14	8
	2437	-13.30	8
	2462	-12.62	8

Please refer to the following test plots:

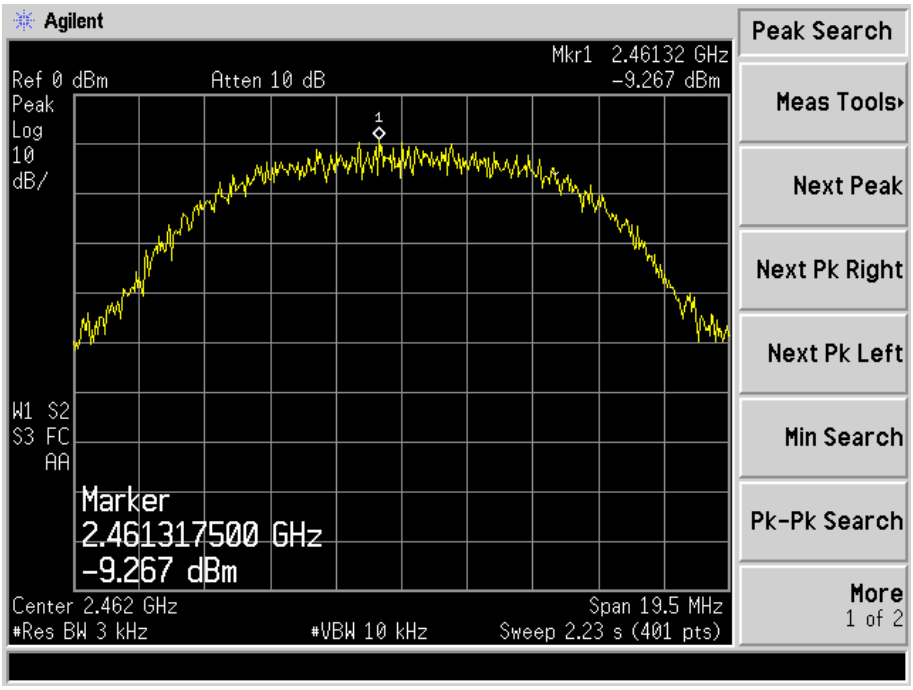
802.11b-Low Channel



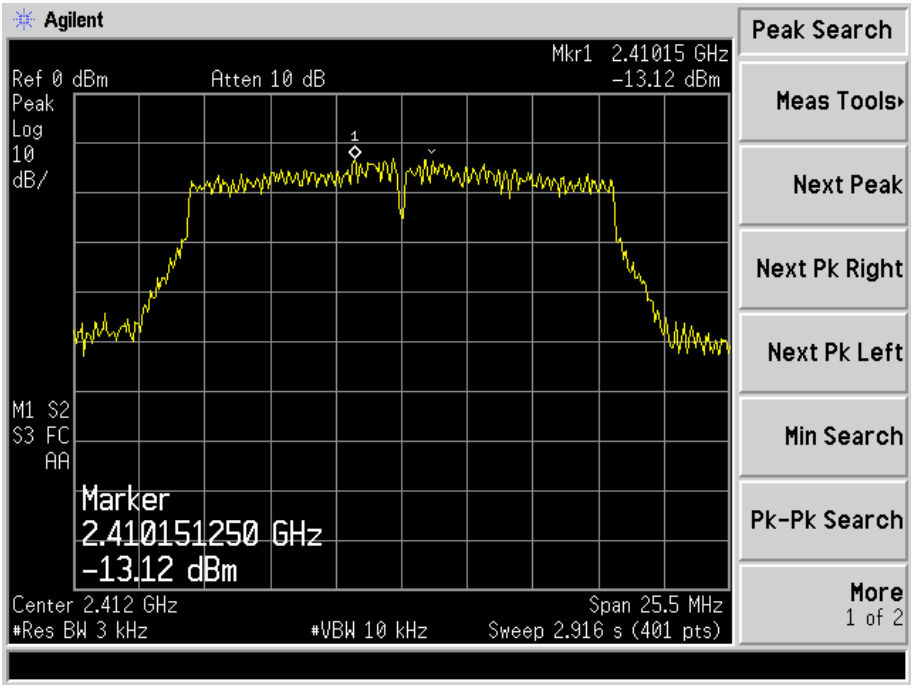
802.11b-Middle Channel



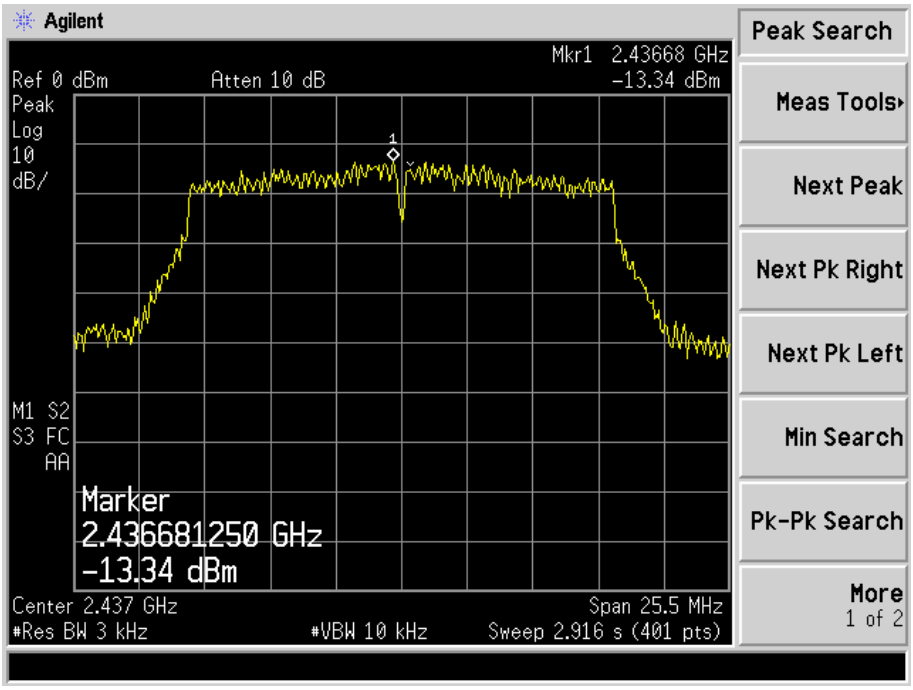
802.11b-High Channel



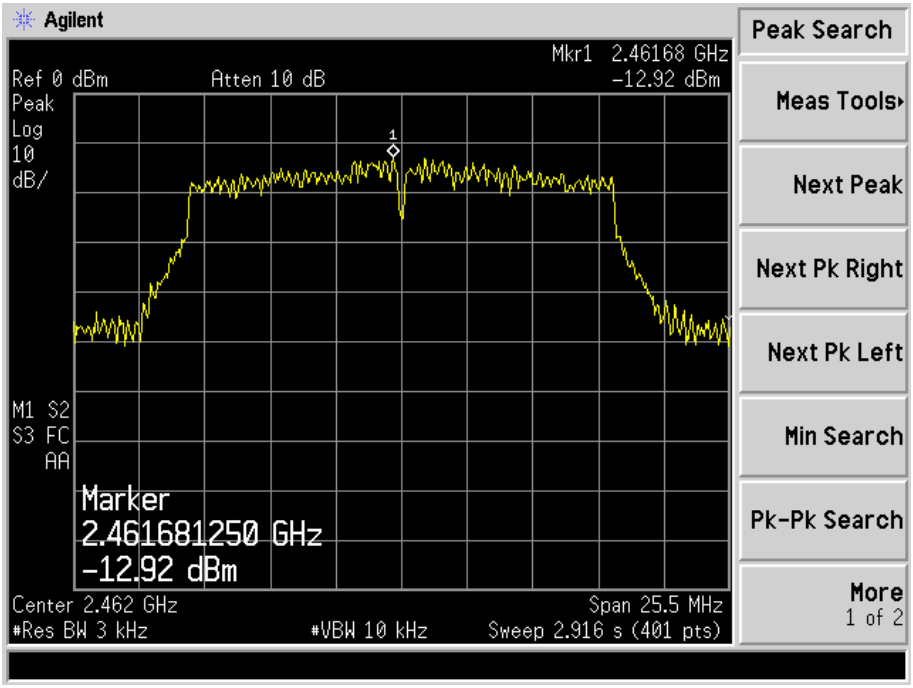
802.11g-Low Channel



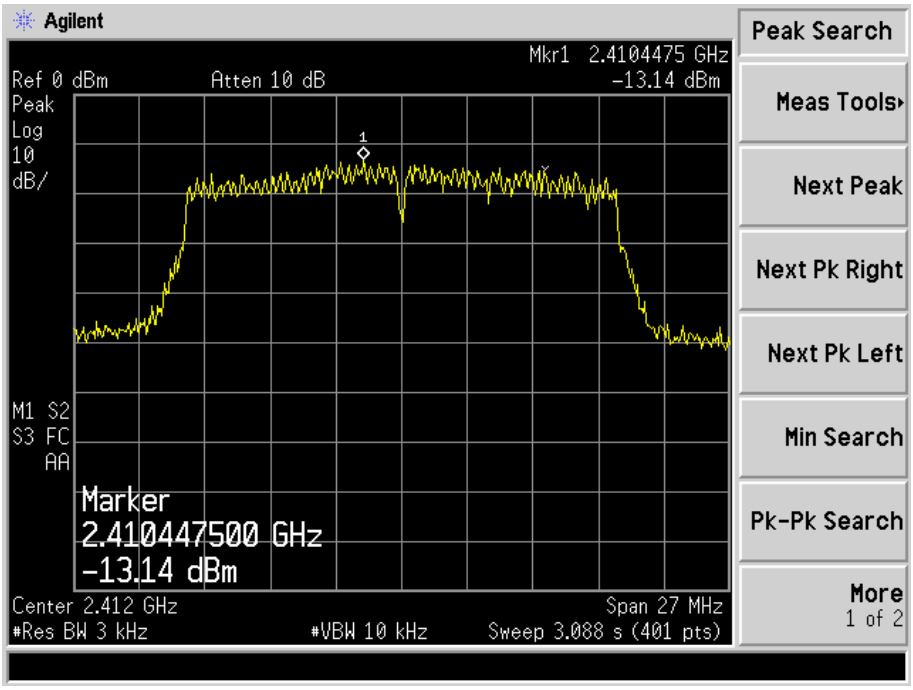
802.11g-Middle Channel



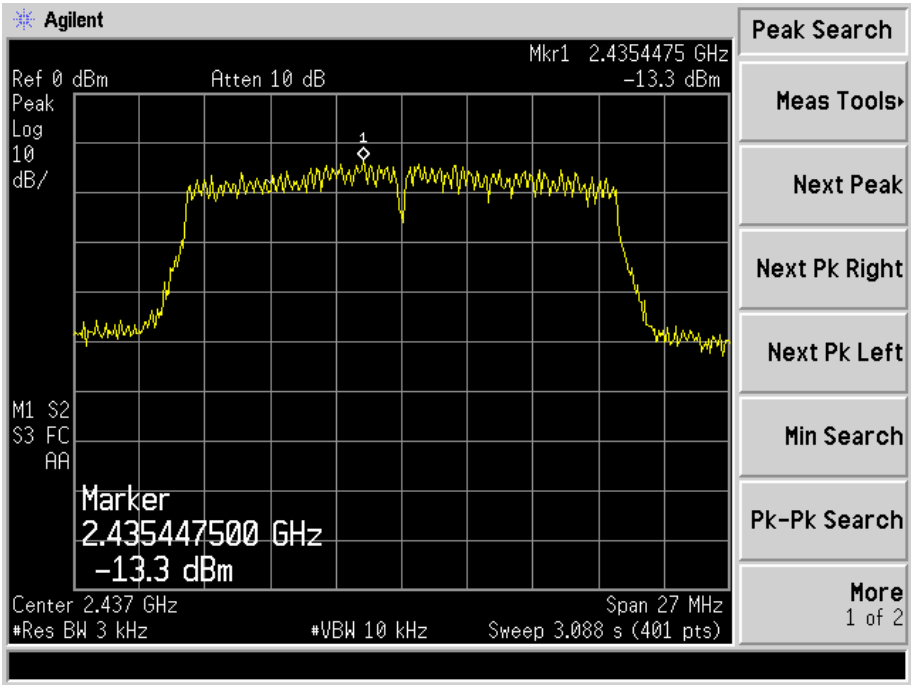
802.11g-High Channel



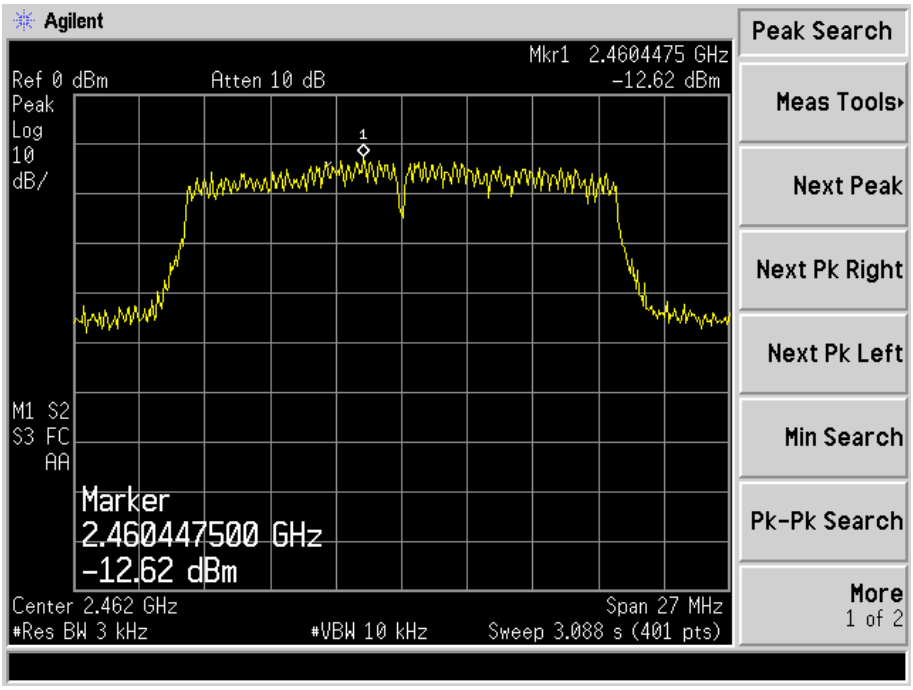
802.11n-HT20-Low Channel



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

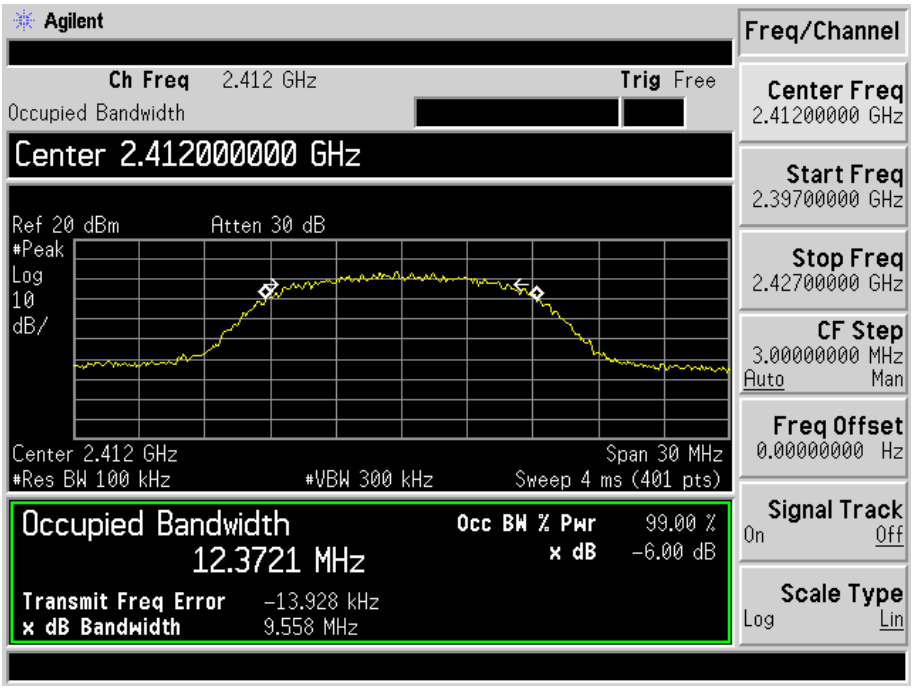
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

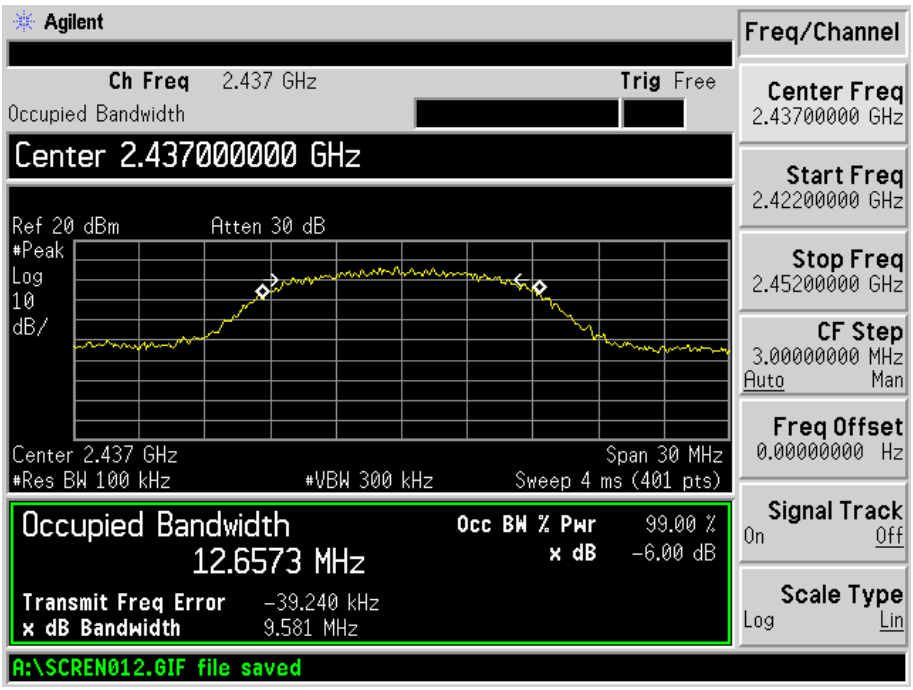
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
802.11b	2412	9558	12372.1	500
	2437	9581	12657.3	500
	2462	9571	12713.6	500
802.11g	2412	16482	16361.2	500
	2437	16468	16352.7	500
	2462	16465	16350.6	500
802.11n-HT20	2412	17600	17535.7	500
	2437	17695	17547.5	500
	2462	17575	17533.9	500

Please refer to the following test plots:

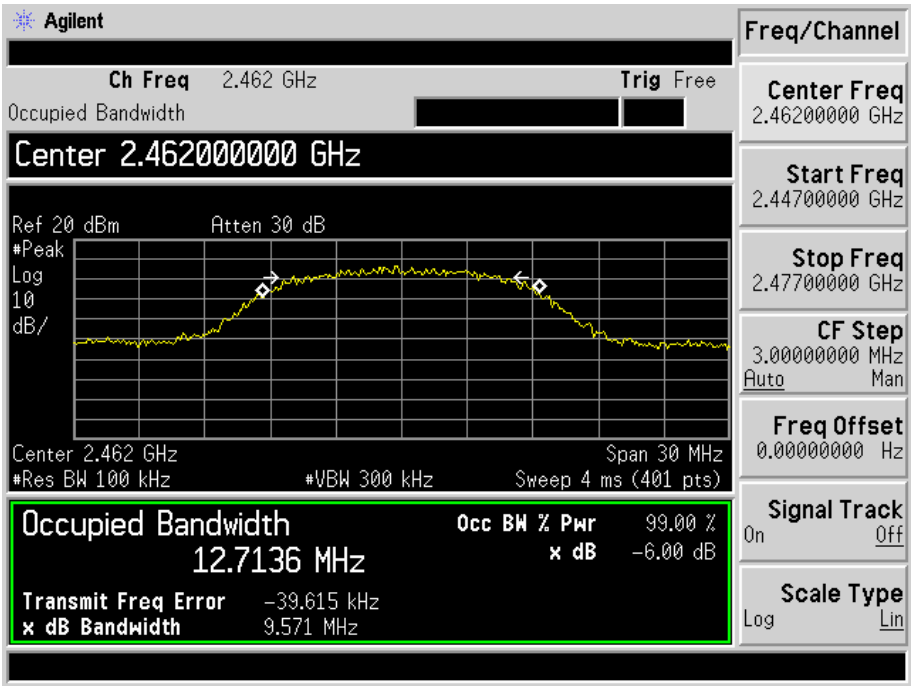
802.11b-Low Channel



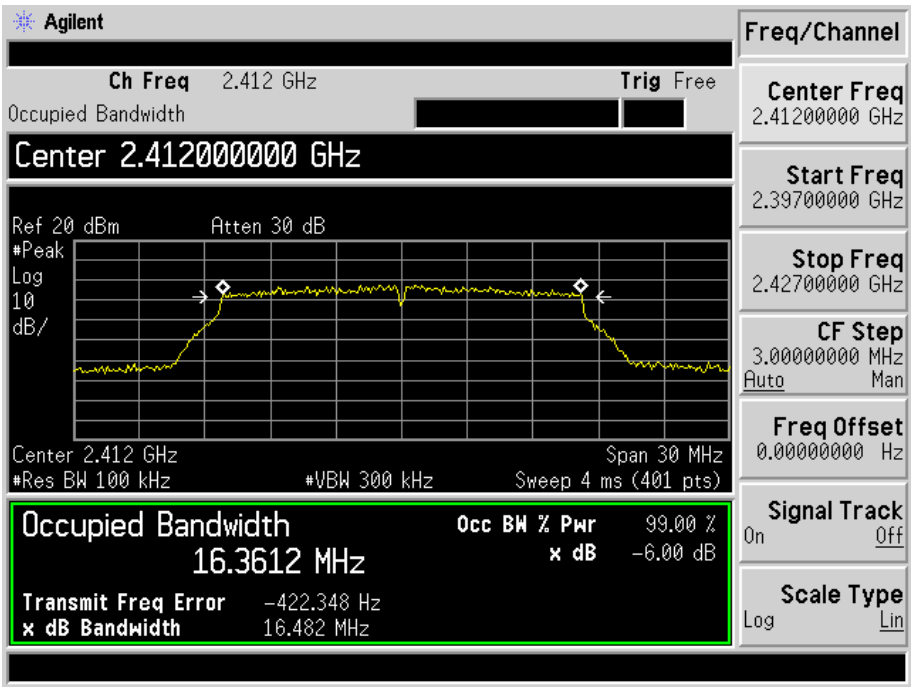
802.11b-Middle Channel



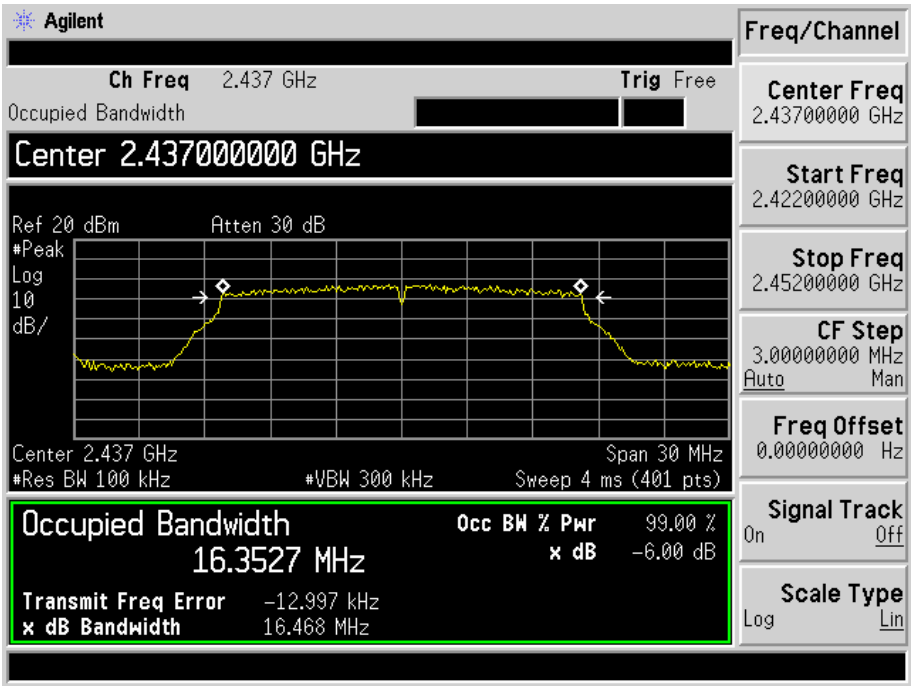
802.11b-High Channel



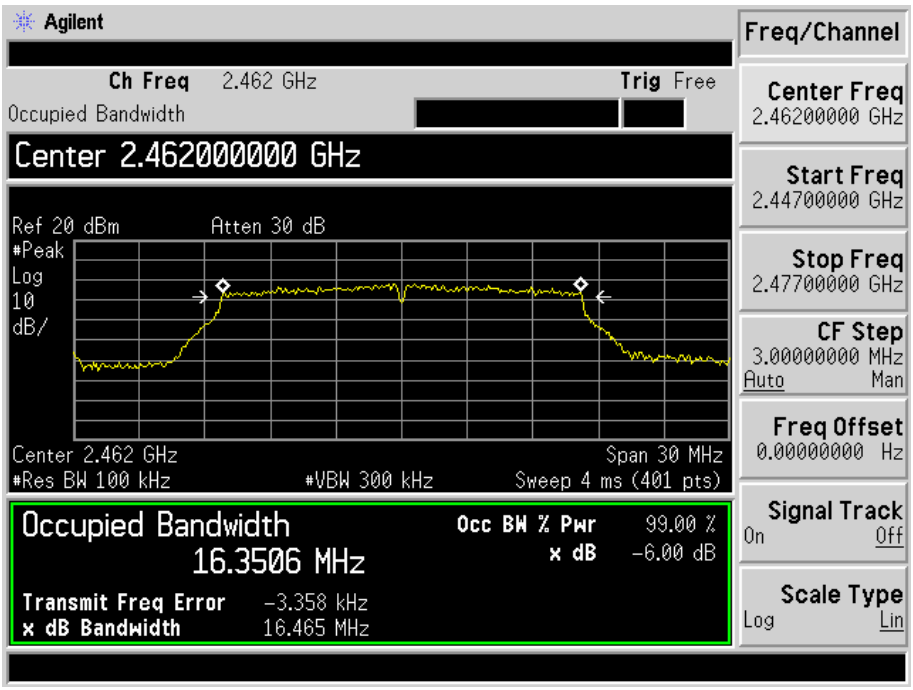
802.11g-Low Channel



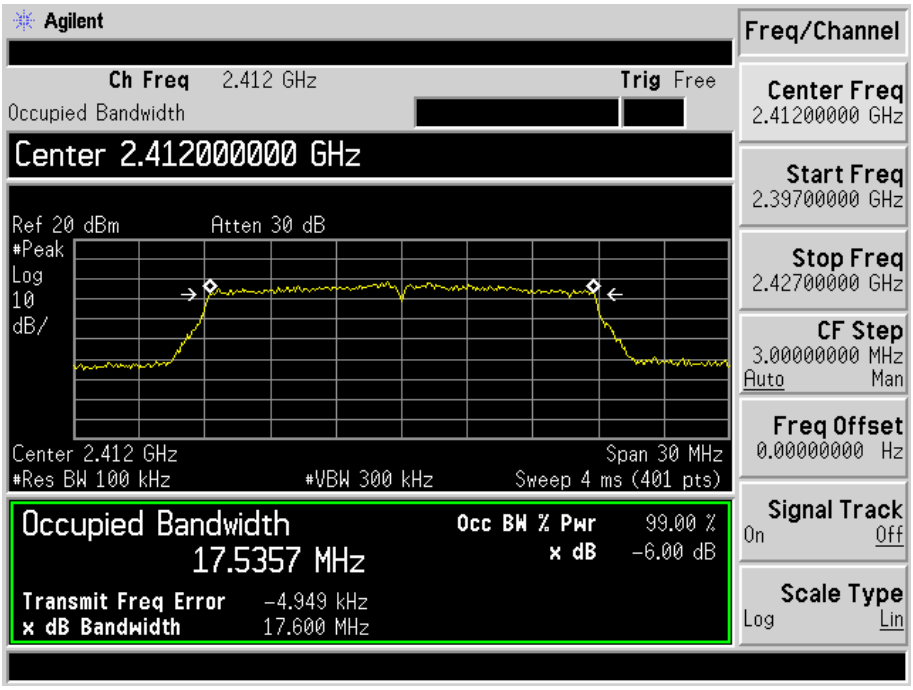
802.11g-Middle Channel



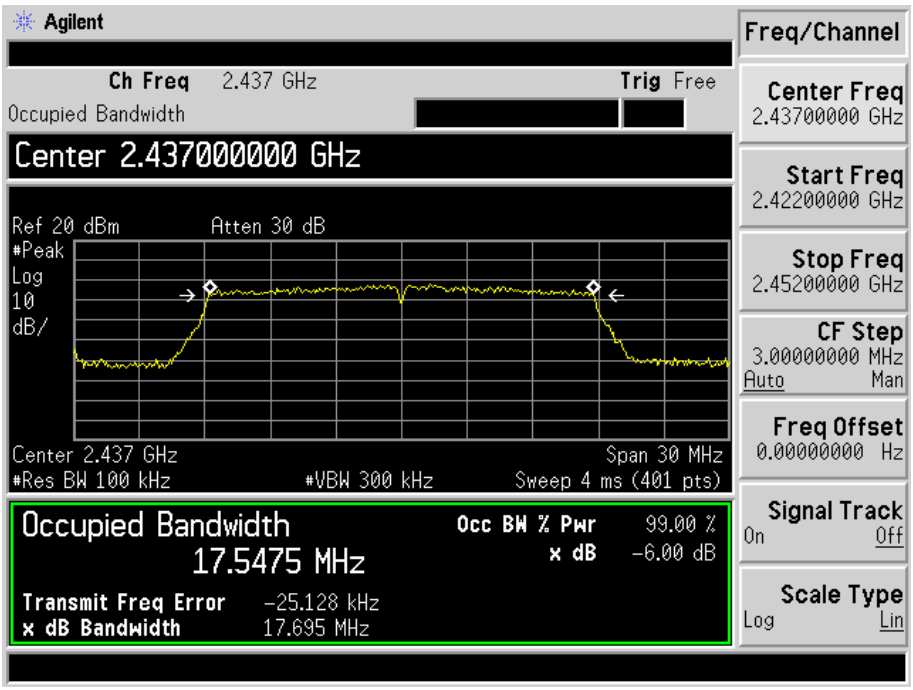
802.11g-High Channel



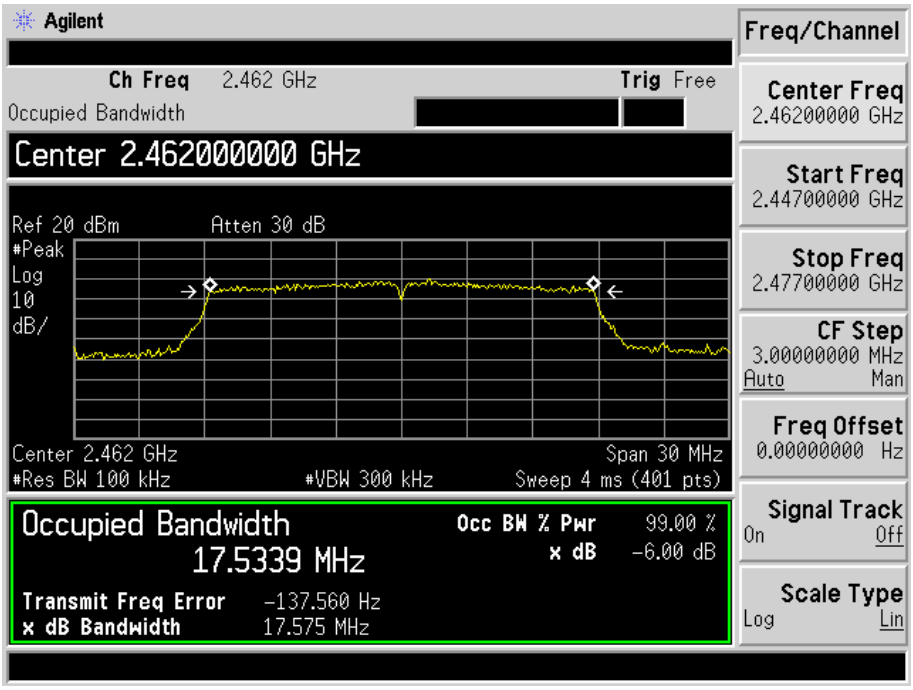
802.11n-HT20-Low Channel



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

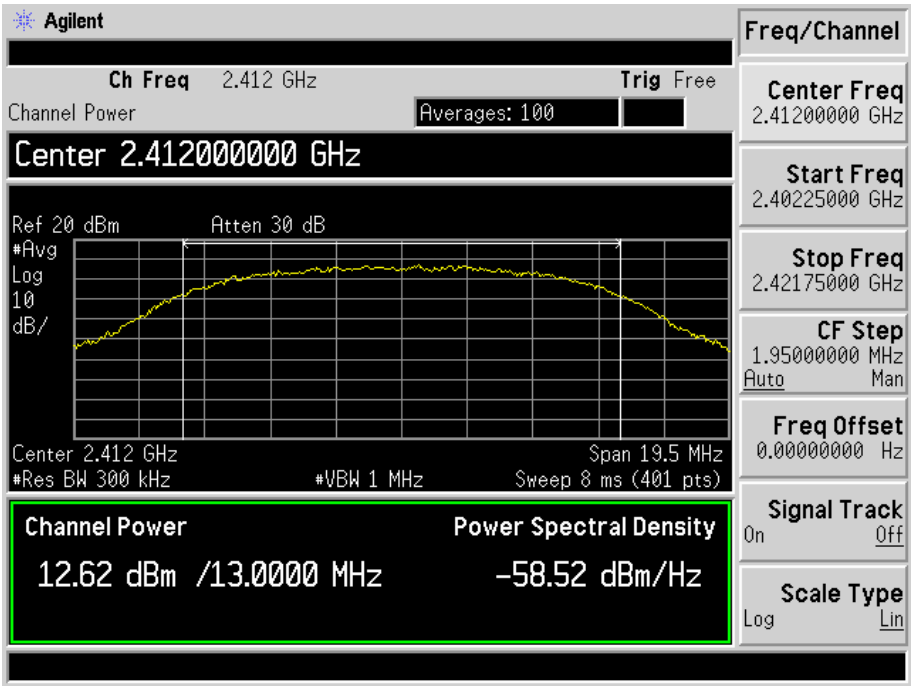
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.5 Summary of Test Results/Plots

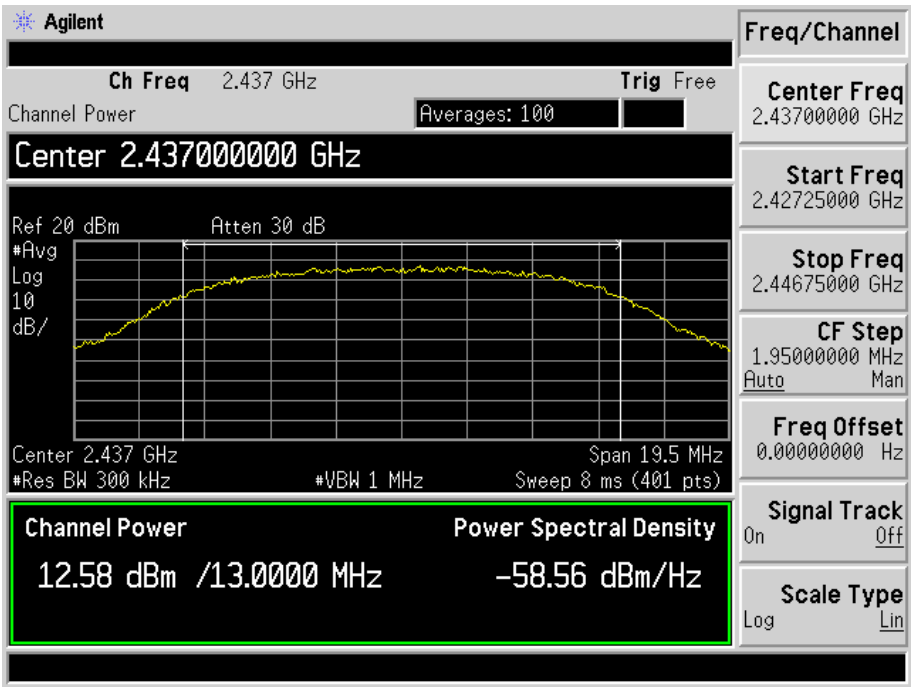
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b _ 11Mbps	2412	12.62	18.28	1000
	2437	12.58	18.11	1000
	2462	12.69	18.58	1000
802.11g_54Mbps	2412	10.66	11.64	1000
	2437	10.34	10.81	1000
	2462	10.90	12.30	1000
802.11n HT20_MCS7	2412	10.88	12.25	1000
	2437	10.72	11.80	1000
	2462	11.73	14.89	1000

Please refer to the following test plots:

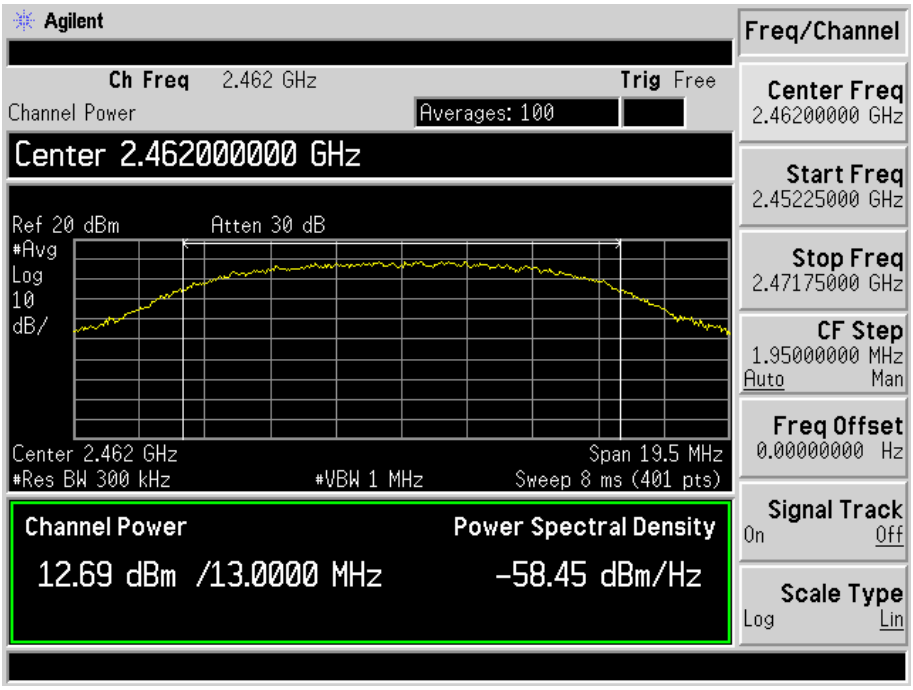
802.11b-Low Channel



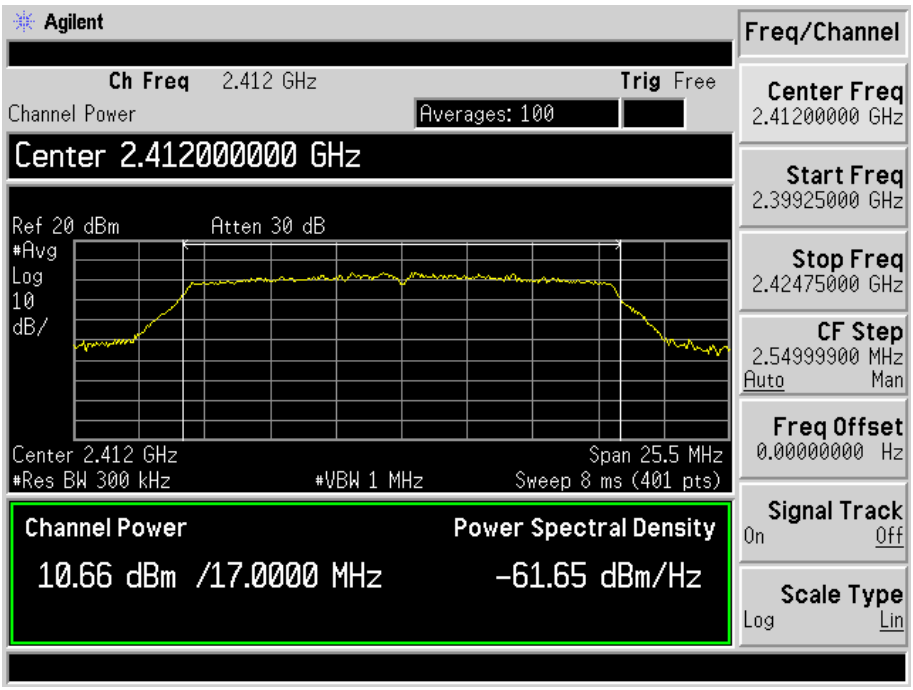
802.11b-Middle Channel



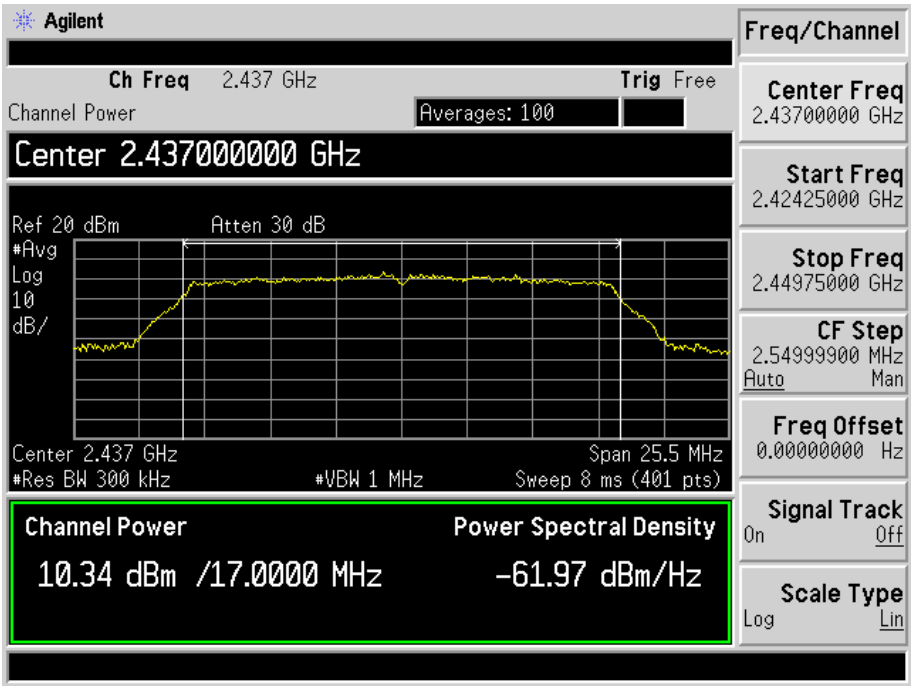
802.11b-High Channel



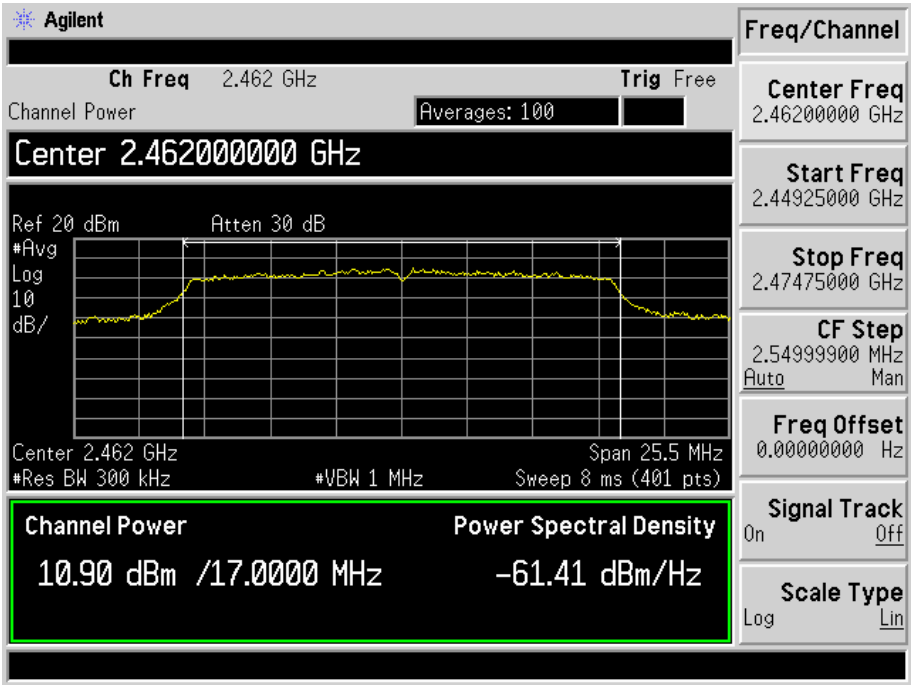
802.11g-Low Channel



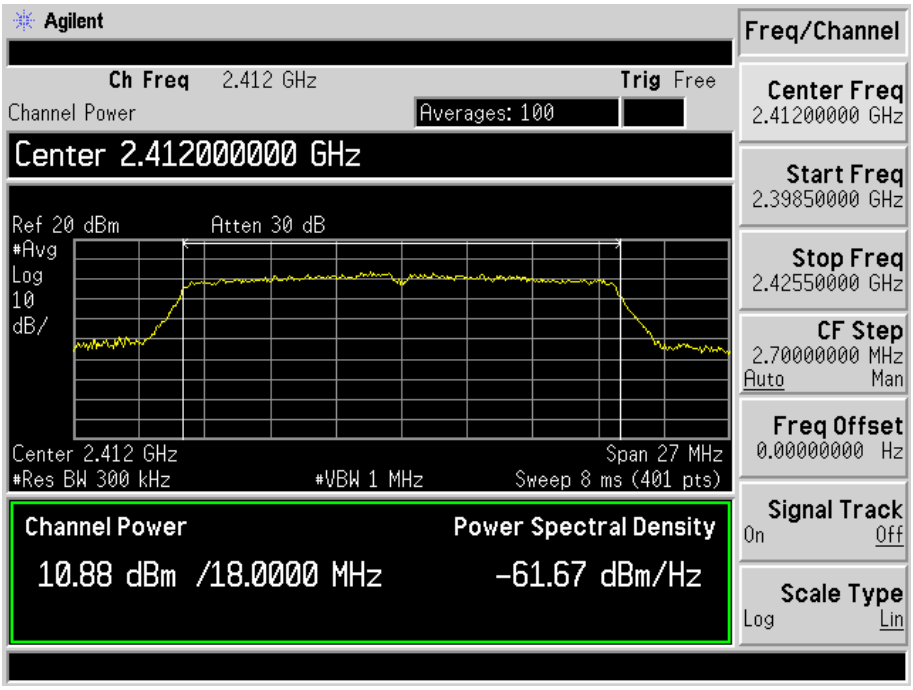
802.11g-Middle Channel



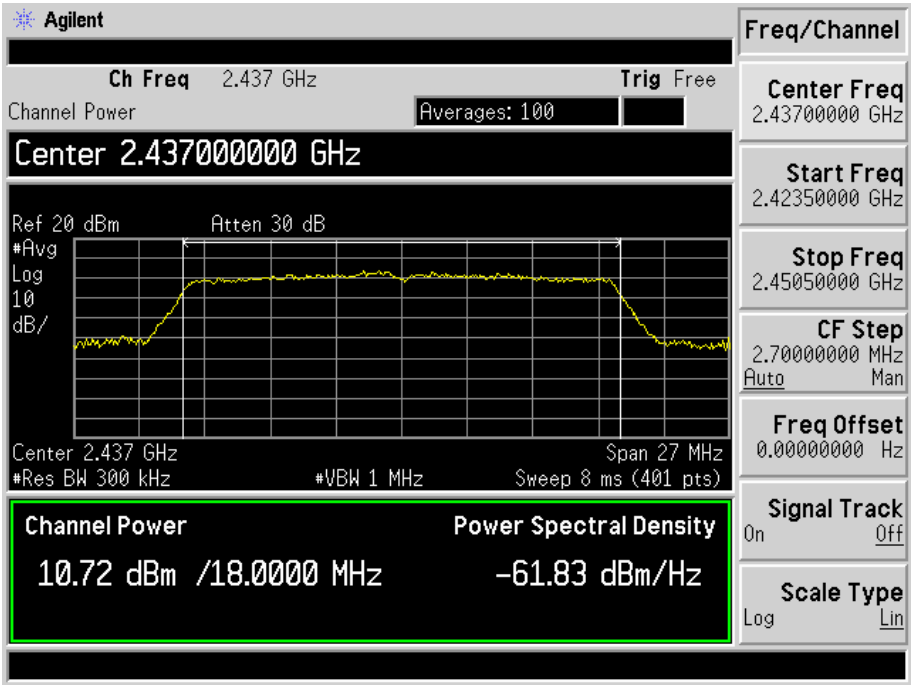
802.11g-High Channel



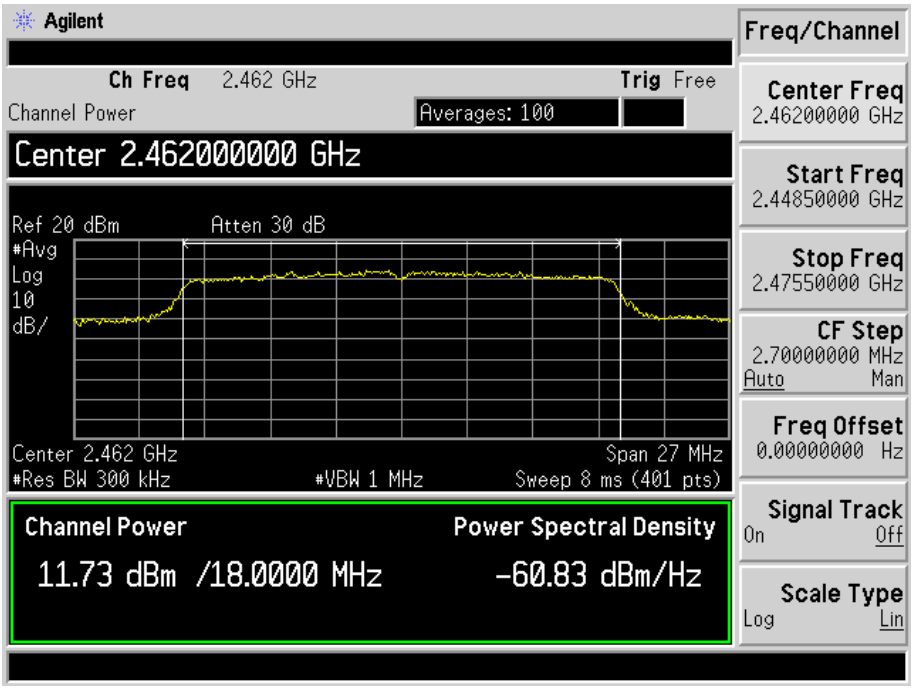
802.11n-HT20-Low Channel



802.11n-HT20-Middle Channel



802.11n-HT20-High Channel



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).

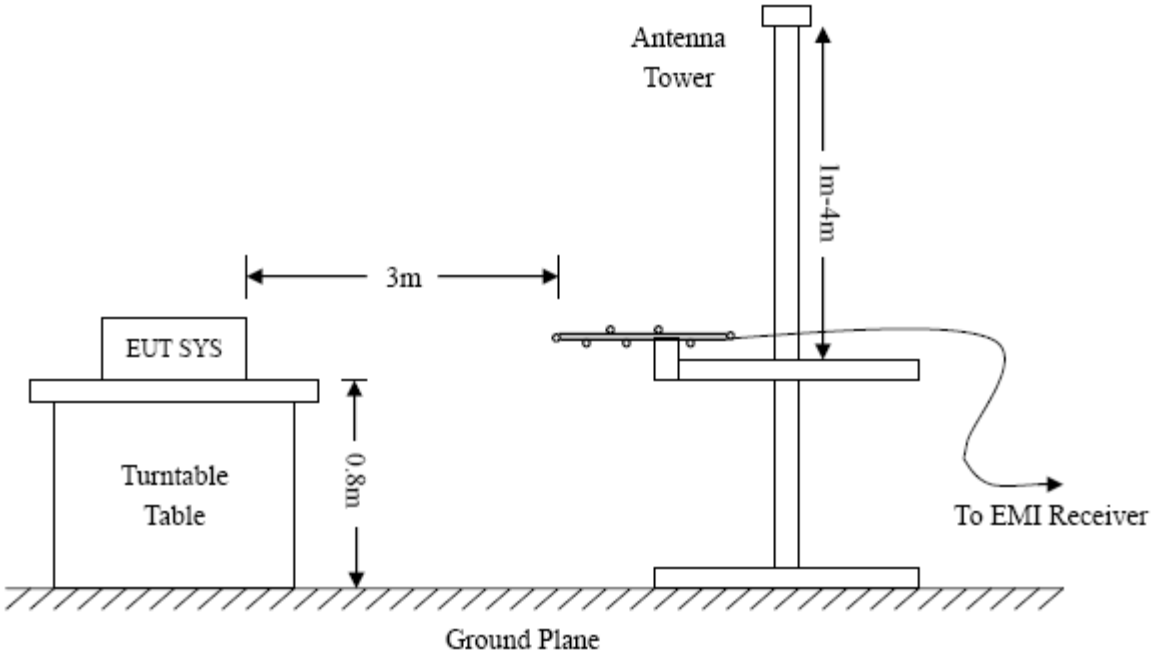
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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(QP), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = QP	Detector function = QP	Detector function = QP, 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

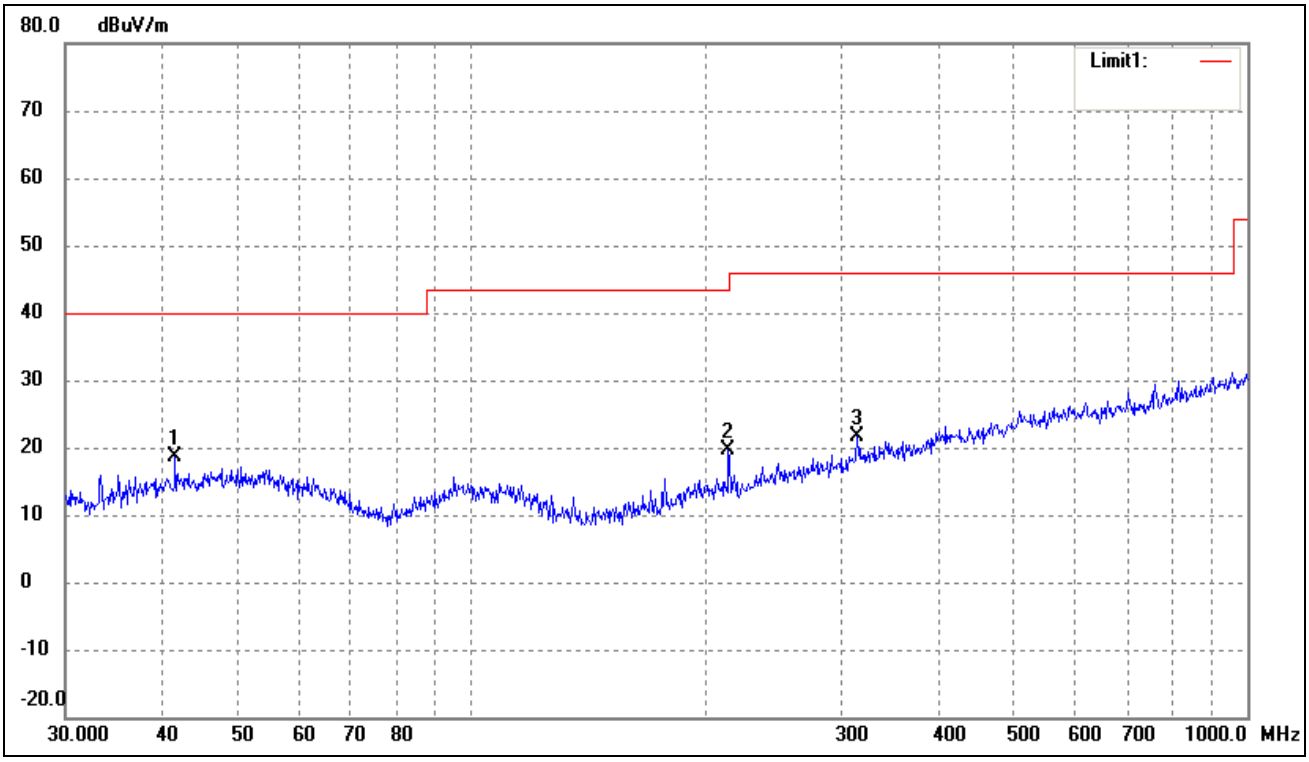
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

*Note: this EUT was tested in 3 orthogonal positions, the **WIFI antenna vertically** is worst case position and the data was reported.*

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

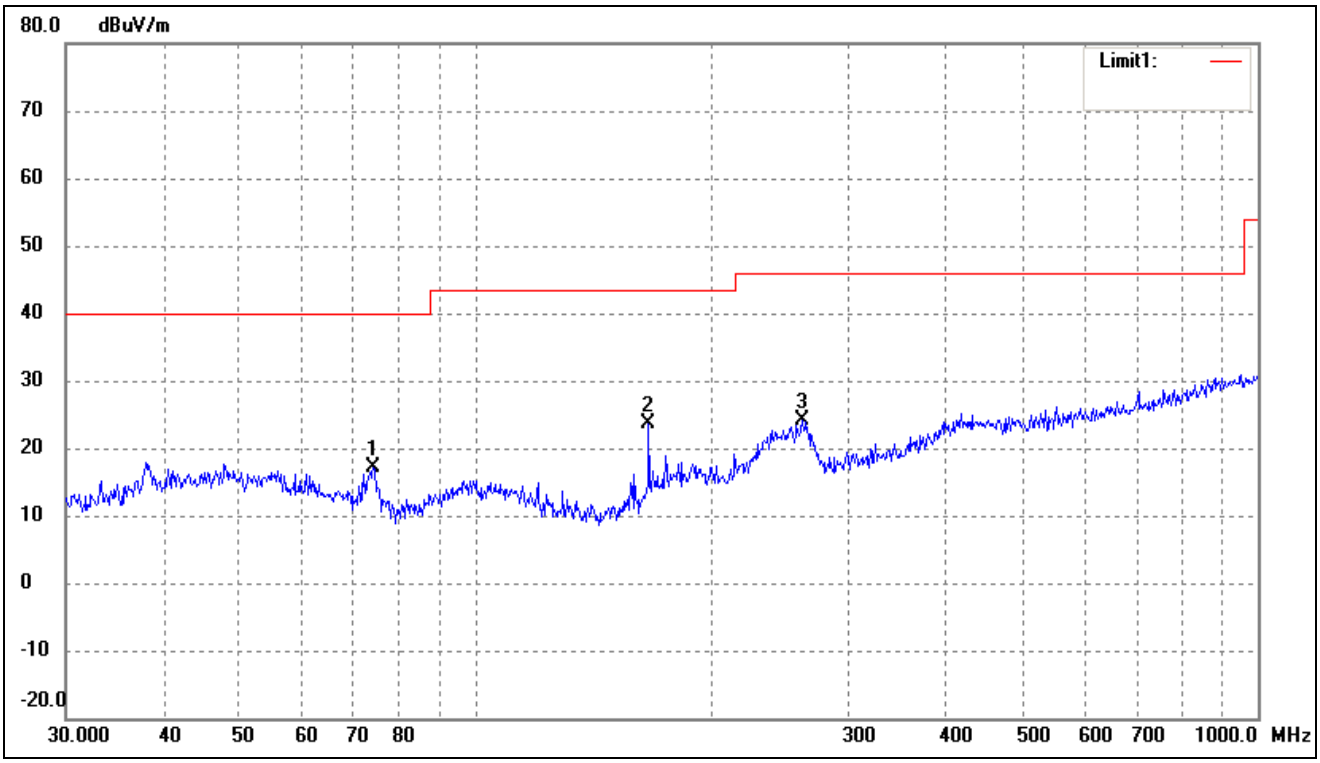
EUT: *Smart switch*
Tested Model: *Nubryte -2*
Operating Condition: *802.11b Transmitting Low Channel-2412MHz*
Comment: *AC Power 120V*

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	41.5670	26.81	-8.14	18.67	40.00	-21.33	254	100	QP
2	214.5143	28.70	-8.96	19.74	43.50	-23.76	113	100	QP
3	314.3765	27.28	-5.71	21.57	46.00	-24.43	284	100	QP

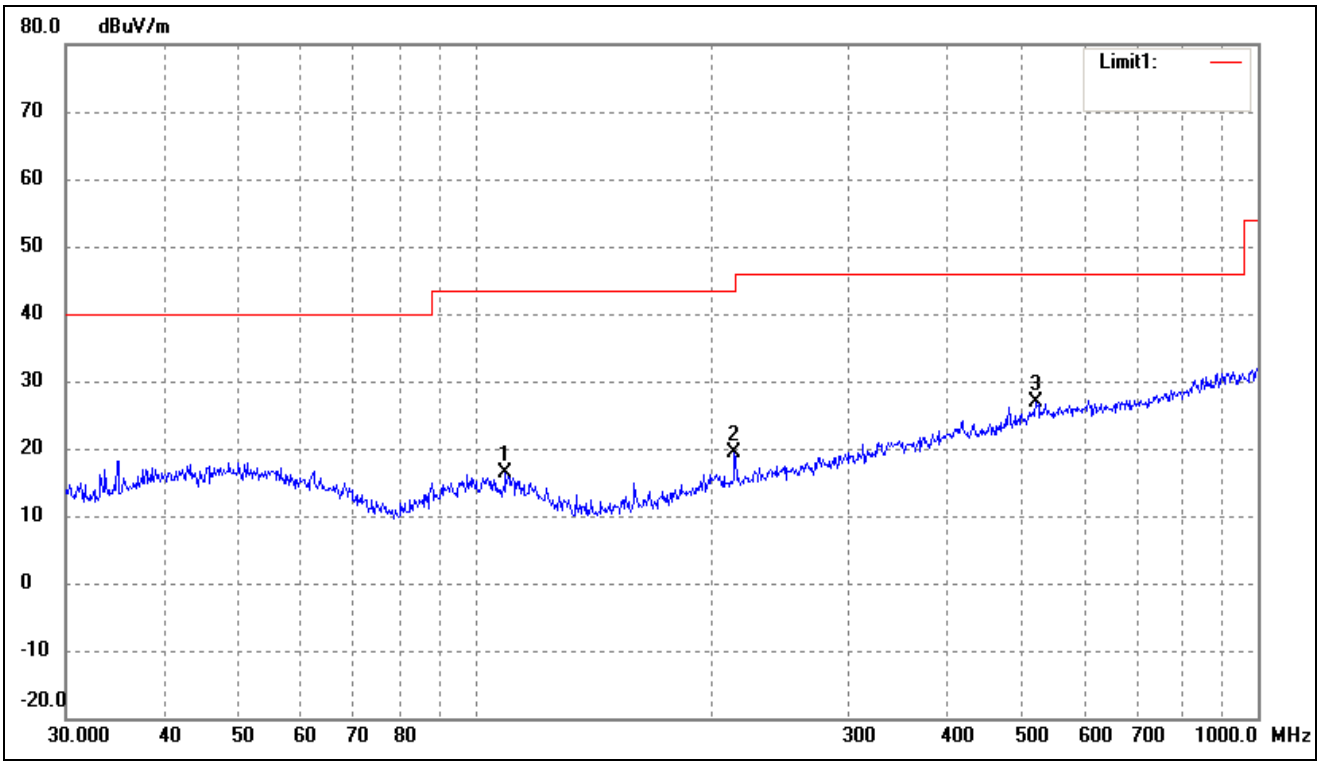
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	74.1351	30.04	-12.97	17.07	40.00	-22.93	114	100	QP
2	166.6514	35.74	-12.01	23.73	43.50	-19.77	270	100	QP
3	261.9753	31.21	-7.14	24.07	46.00	-21.93	360	100	QP

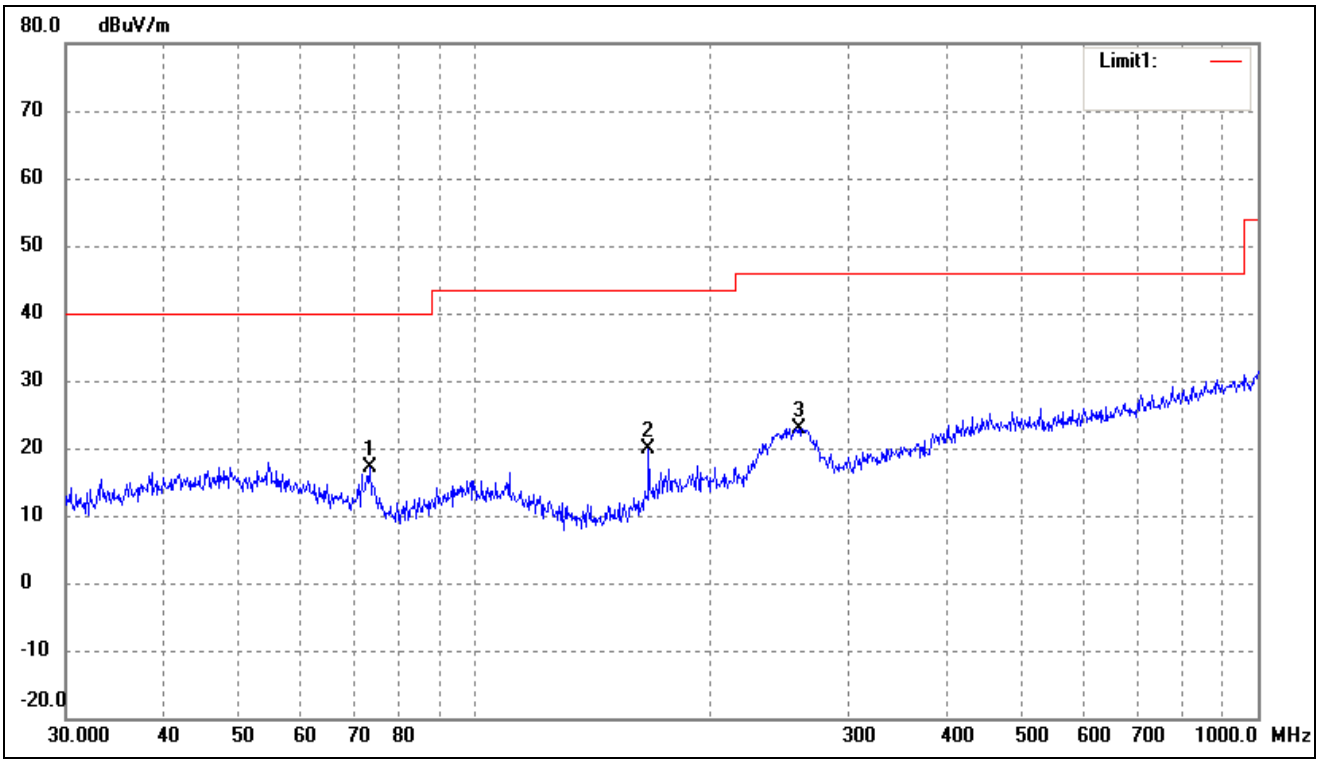
Operating Condition: *802.11b Transmitting Middle Channel-2437MHz*
Comment: *AC Power 120V*

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	109.4116	25.95	-9.59	16.36	43.50	-27.14	178	100	QP
2	214.5143	28.39	-8.96	19.43	43.50	-24.07	224	100	QP
3	520.8882	27.37	-0.60	26.77	46.00	-19.23	160	100	QP

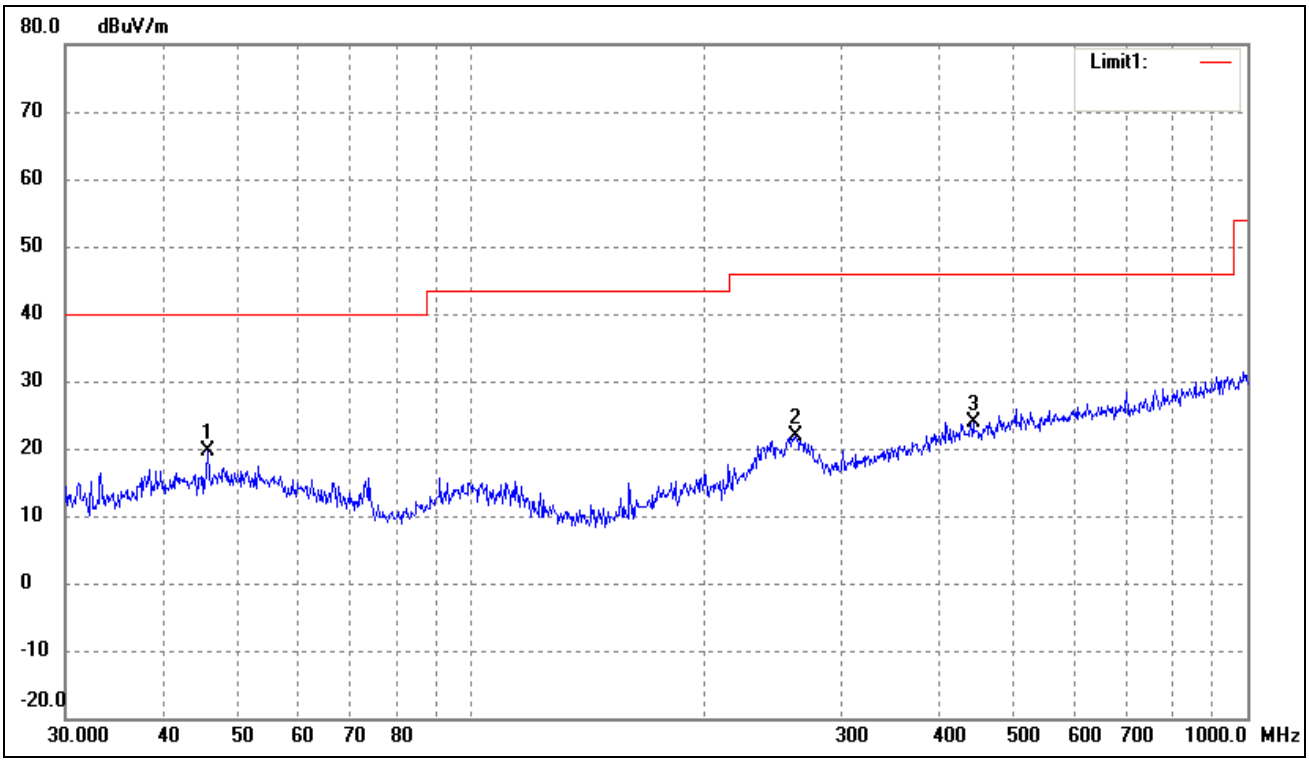
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	73.3593	29.75	-12.73	17.02	40.00	-22.98	256	100	QP
2	166.6514	31.80	-12.01	19.79	43.50	-23.71	360	100	QP
3	259.2338	30.17	-7.21	22.96	46.00	-23.04	360	100	QP

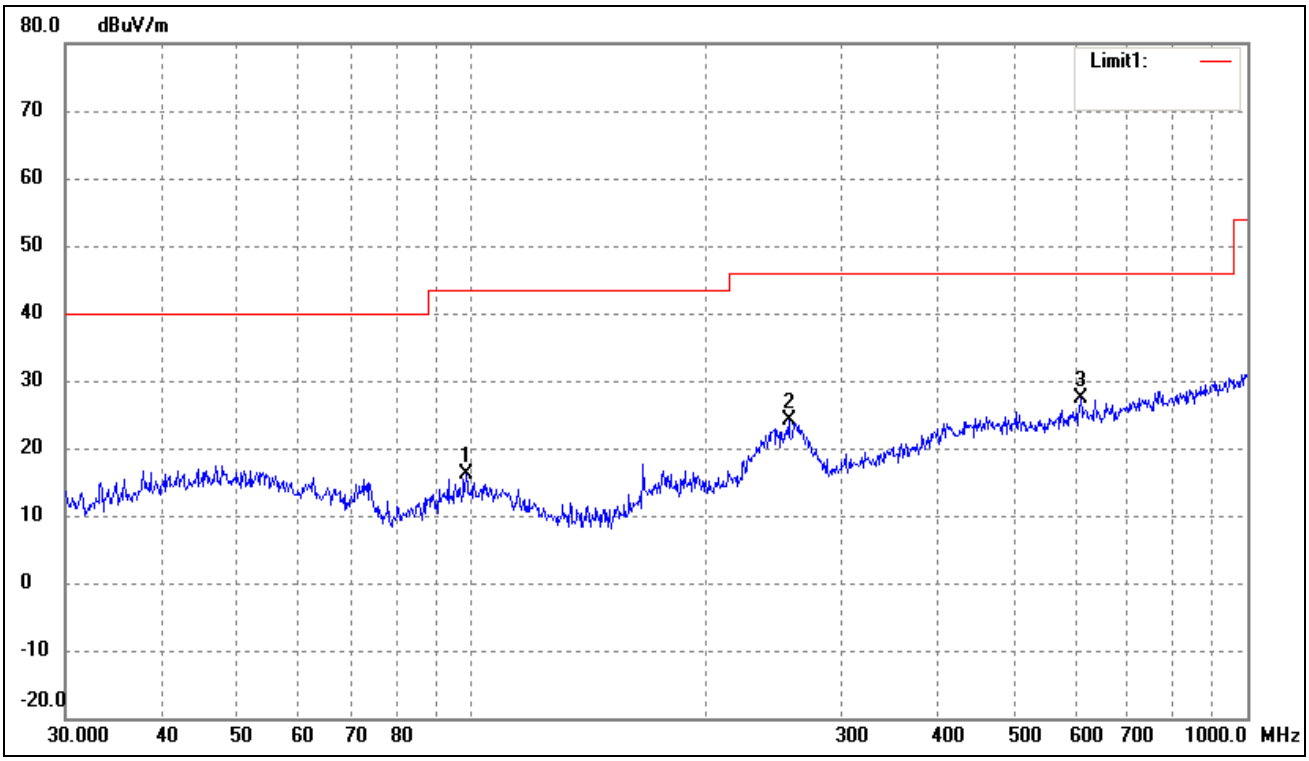
Operating Condition: *802.11b Transmitting High Channel-2462MHz*
Comment: *AC Power 120V*

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	45.8553	27.08	-7.47	19.61	40.00	-20.39	176	100	QP
2	261.9753	28.96	-7.14	21.82	46.00	-24.18	255	100	QP
3	443.2943	26.10	-2.23	23.87	46.00	-22.13	360	100	QP

Test Specification: *Vertical*

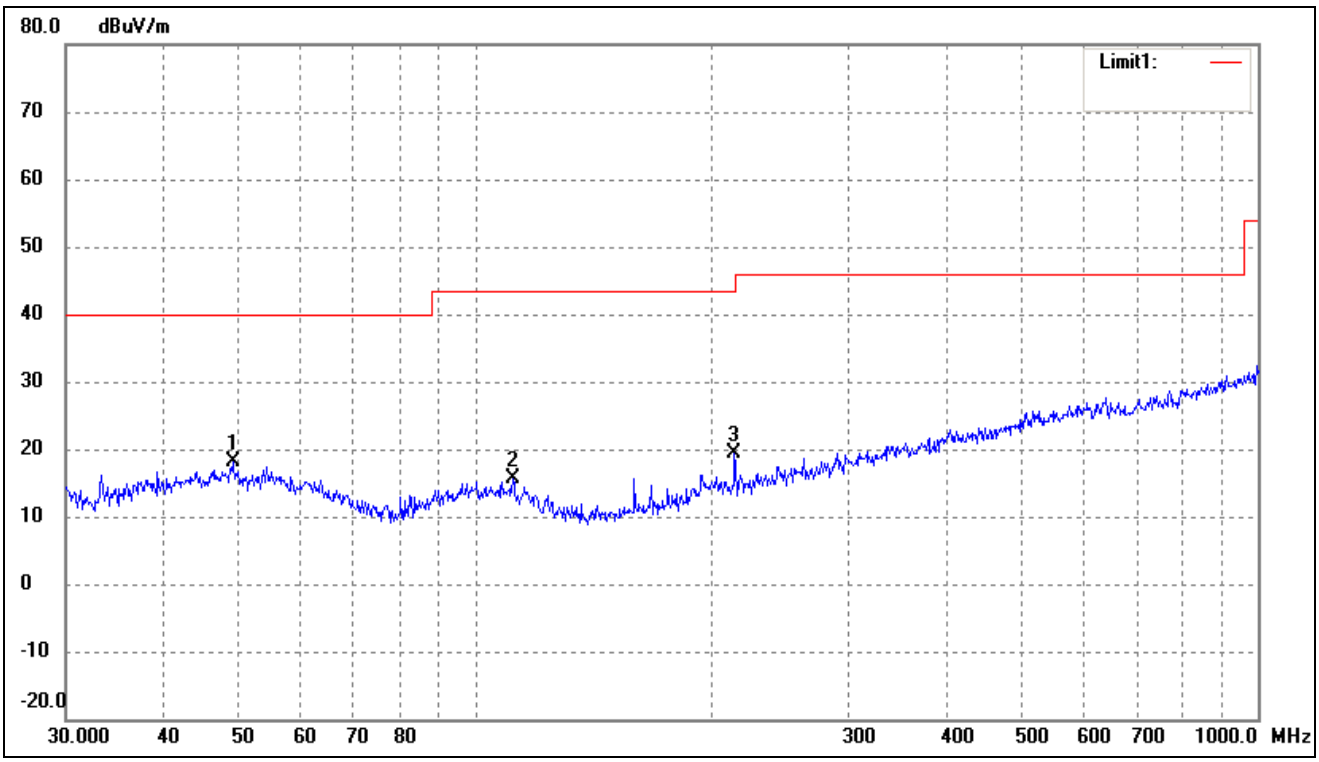


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	98.4866	25.81	-9.75	16.06	43.50	-27.44	360	100	QP
2	256.5211	31.32	-7.29	24.03	46.00	-21.97	225	100	QP
3	609.9217	26.06	1.28	27.34	46.00	-18.66	160	100	QP

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

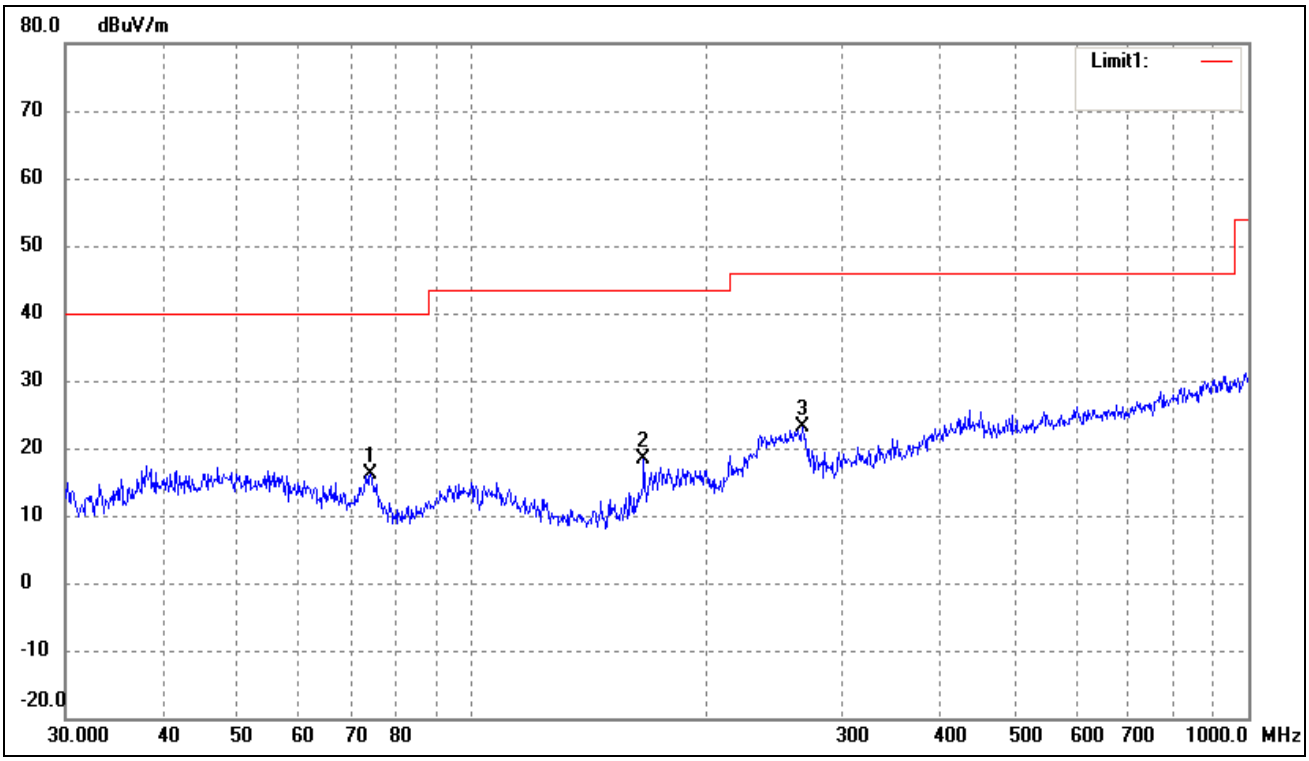
EUT: *Smart switch*
Tested Model: *Nubryte -2*
Operating Condition: *802.11g Transmitting Low Channel-2412MHz*
Comment: *AC Power 120V*

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	49.0145	25.65	-7.44	18.21	40.00	-21.79	174	100	QP
2	111.7380	25.58	-9.89	15.69	43.50	-27.81	160	100	QP
3	214.5143	28.30	-8.96	19.34	43.50	-24.16	320	100	QP

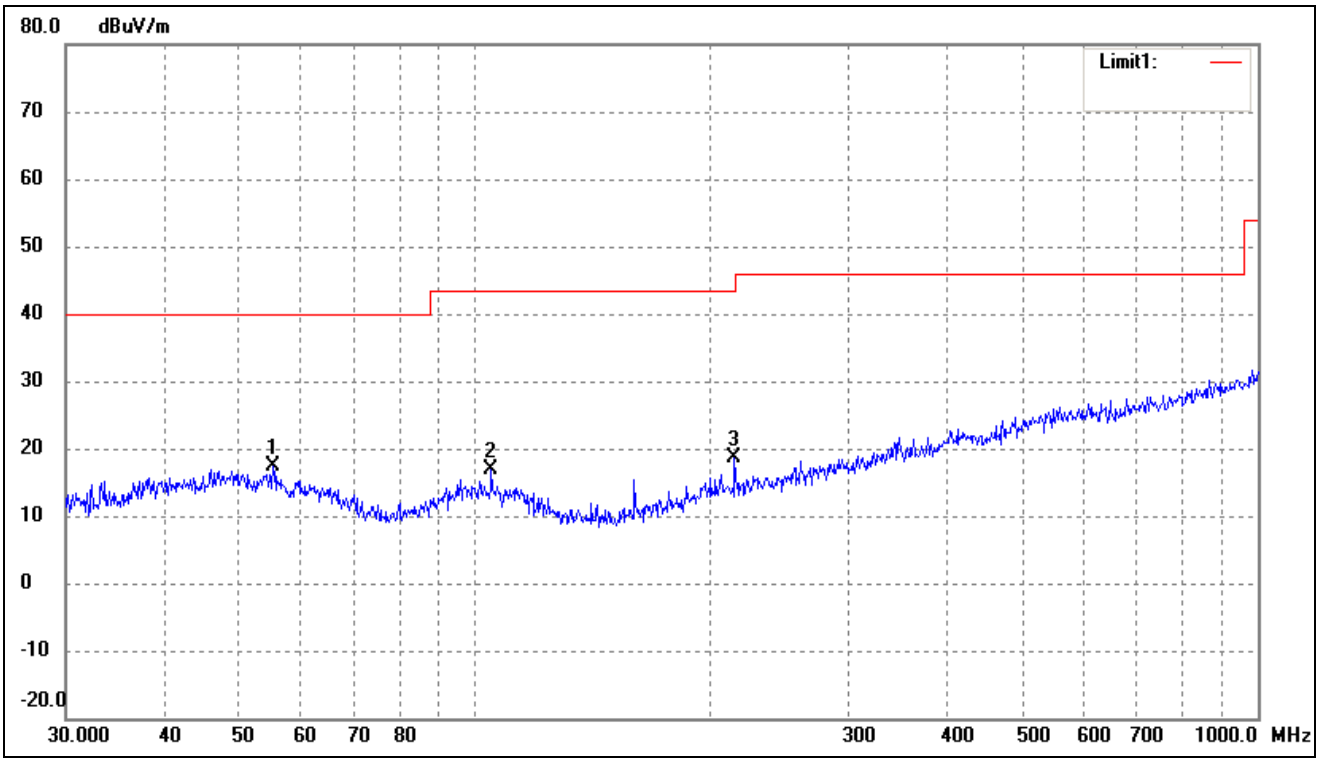
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	74.1351	29.12	-12.97	16.15	40.00	-23.85	177	100	QP
2	166.6514	30.46	-12.01	18.45	43.50	-25.05	90	100	QP
3	266.6089	30.22	-7.03	23.19	46.00	-22.81	336	100	QP

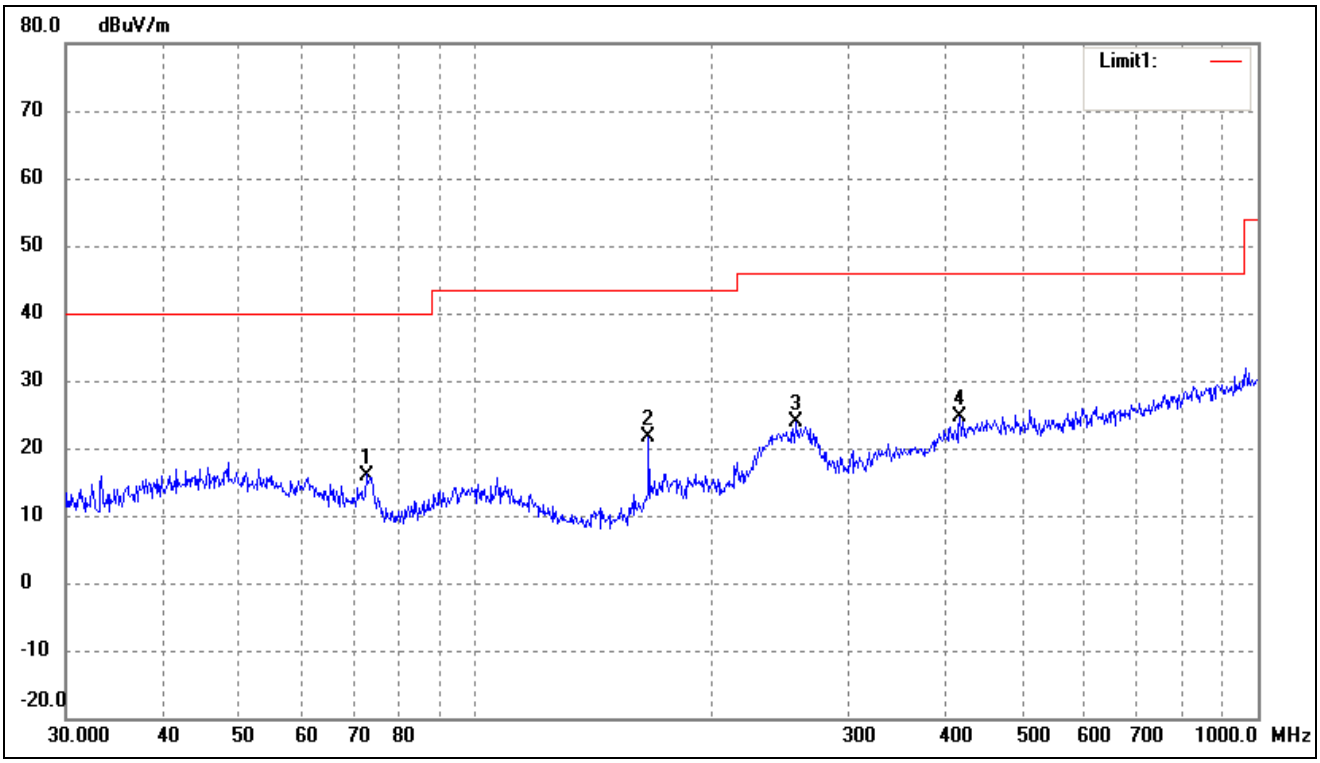
Operating Condition: *802.11g Transmitting Middle Channel-2437MHz*
Comment: *AC Power 120V*

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	55.2207	25.24	-7.97	17.27	40.00	-22.73	270	100	QP
2	104.9033	26.41	-9.58	16.83	43.50	-26.67	164	100	QP
3	214.5143	27.70	-8.96	18.74	43.50	-24.76	228	200	QP

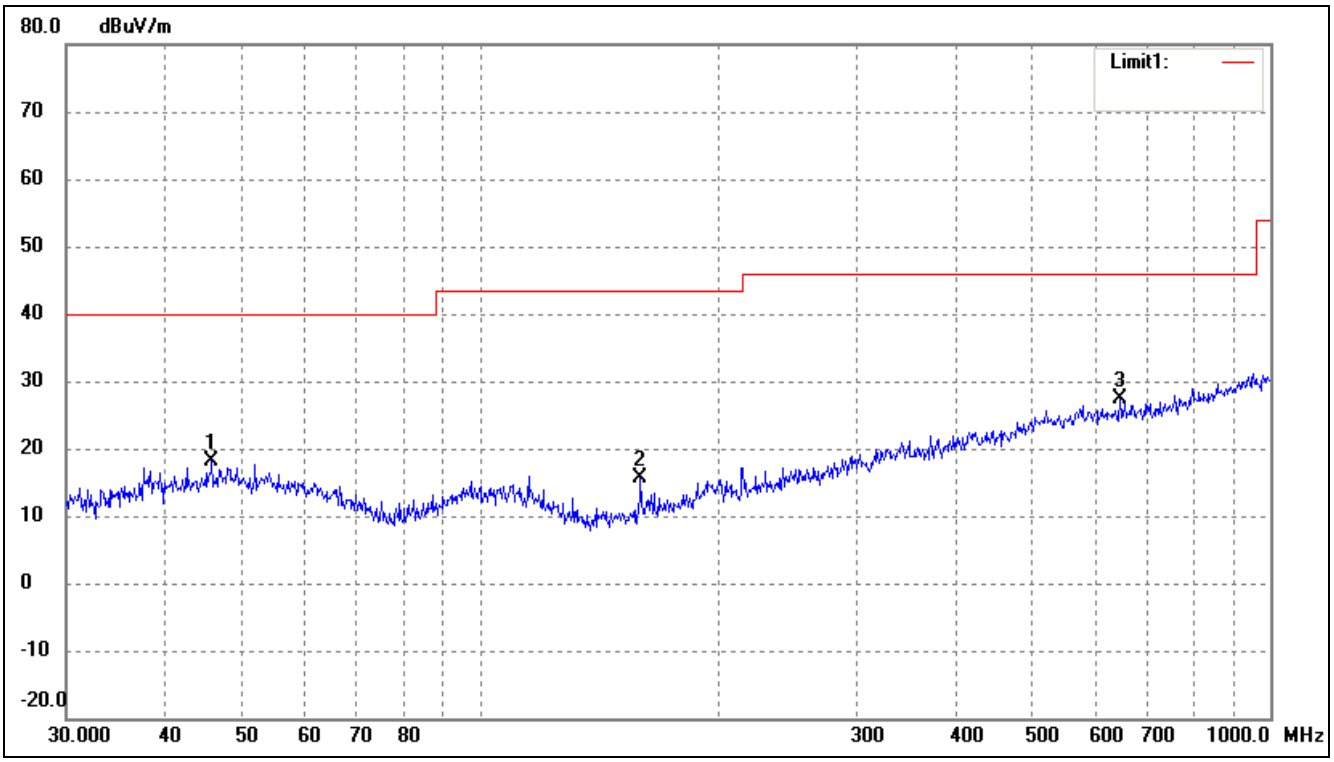
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	72.5917	28.49	-12.49	16.00	40.00	-24.00	360	100	QP
2	166.6514	33.67	-12.01	21.66	43.50	-21.84	255	100	QP
3	257.4222	31.04	-7.26	23.78	46.00	-22.22	270	100	QP
4	416.1791	27.22	-2.56	24.66	46.00	-21.34	180	100	QP

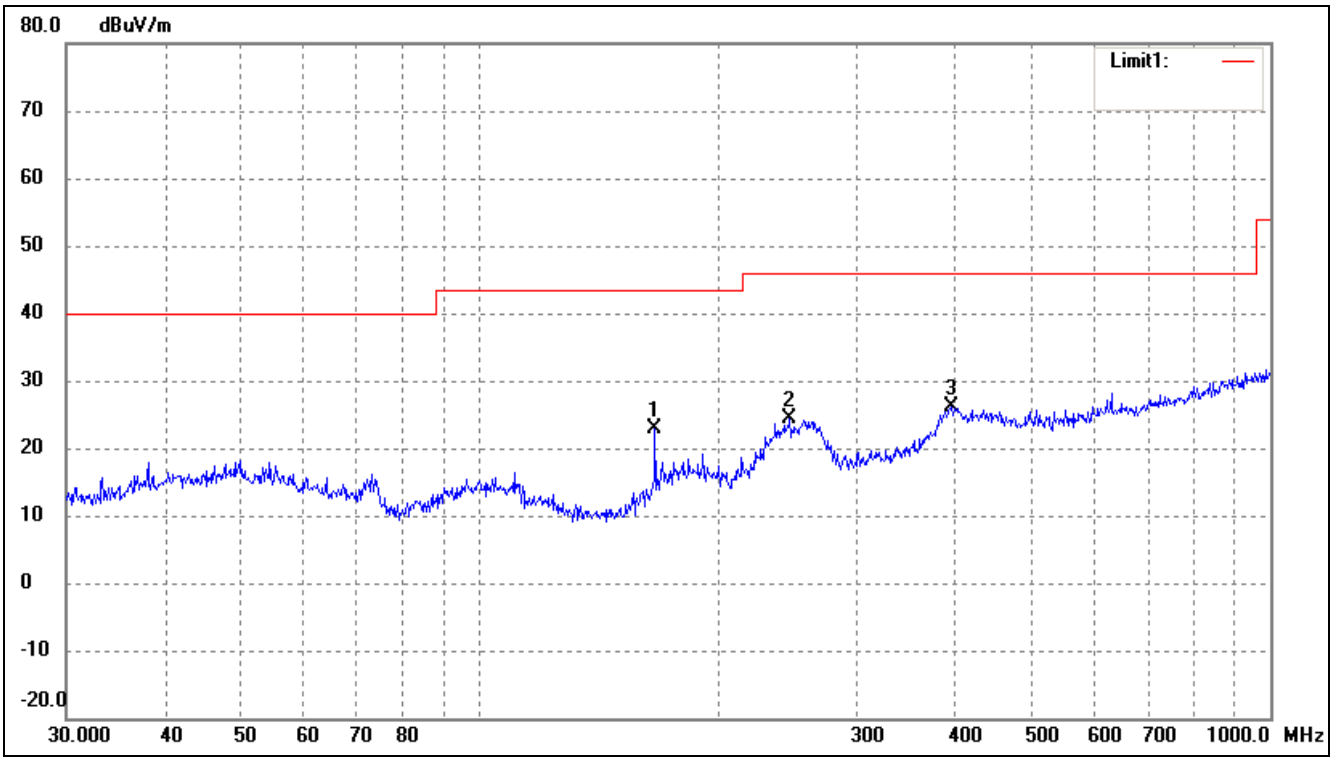
Operating Condition: *802.11g Transmitting High Channel-2462MHz*
Comment: *AC Power 120V*

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	45.8553	25.64	-7.47	18.17	40.00	-21.83	270	100	QP
2	159.7844	27.93	-12.35	15.58	43.50	-27.92	51	200	QP
3	645.1195	25.61	1.78	27.39	46.00	-18.61	360	200	QP

Test Specification: *Vertical*

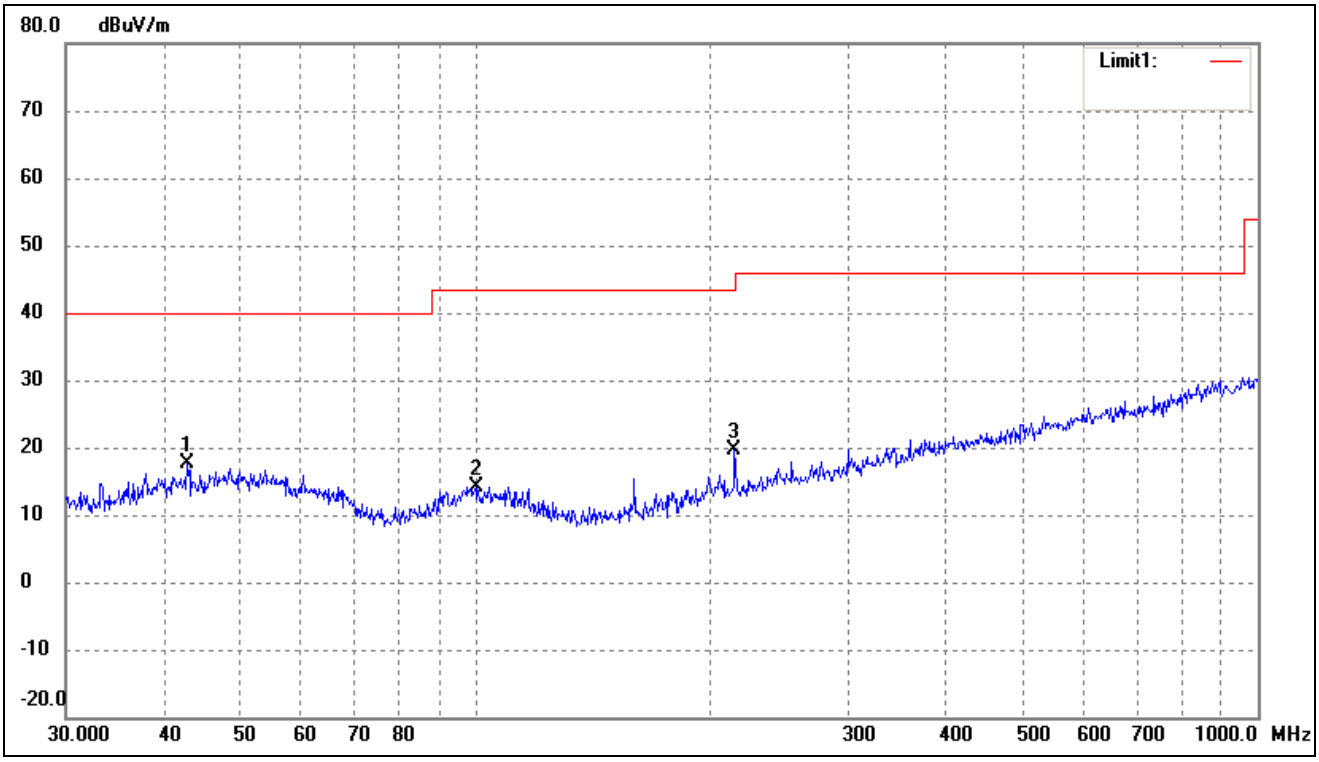


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	166.6514	34.87	-12.01	22.86	43.50	-20.64	360	100	QP
2	246.8149	31.91	-7.59	24.32	46.00	-21.68	180	100	QP
3	394.8545	29.14	-3.10	26.04	46.00	-19.96	225	100	QP

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

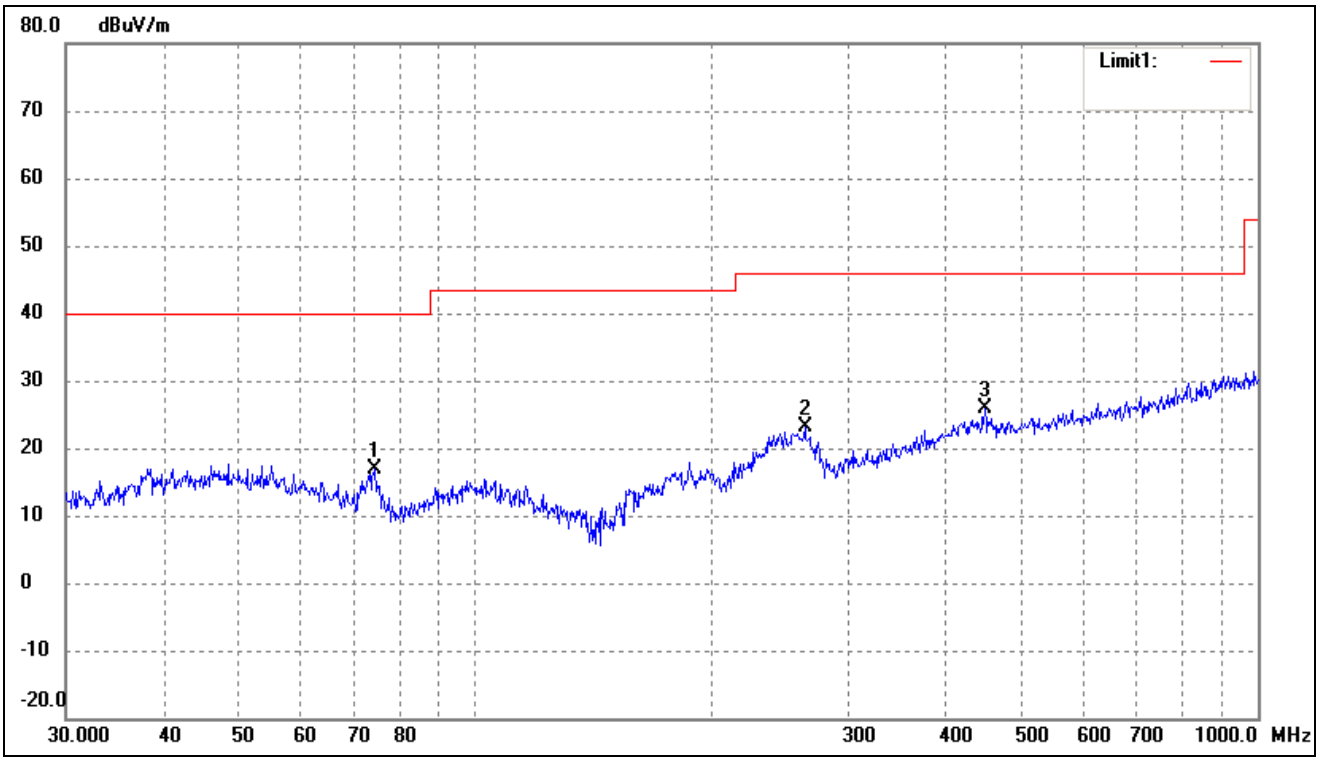
EUT: *Smart switch*
Tested Model: *Nubryte -2*
Operating Condition: *802.11n-HT20 Transmitting Low Channel-2412MHz*
Comment: *AC Power 120V*

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	42.8998	25.50	-7.87	17.63	40.00	-22.37	260	100	QP
2	100.2286	23.77	-9.56	14.21	43.50	-29.29	131	200	QP
3	214.5143	28.50	-8.96	19.54	43.50	-23.96	285	200	QP

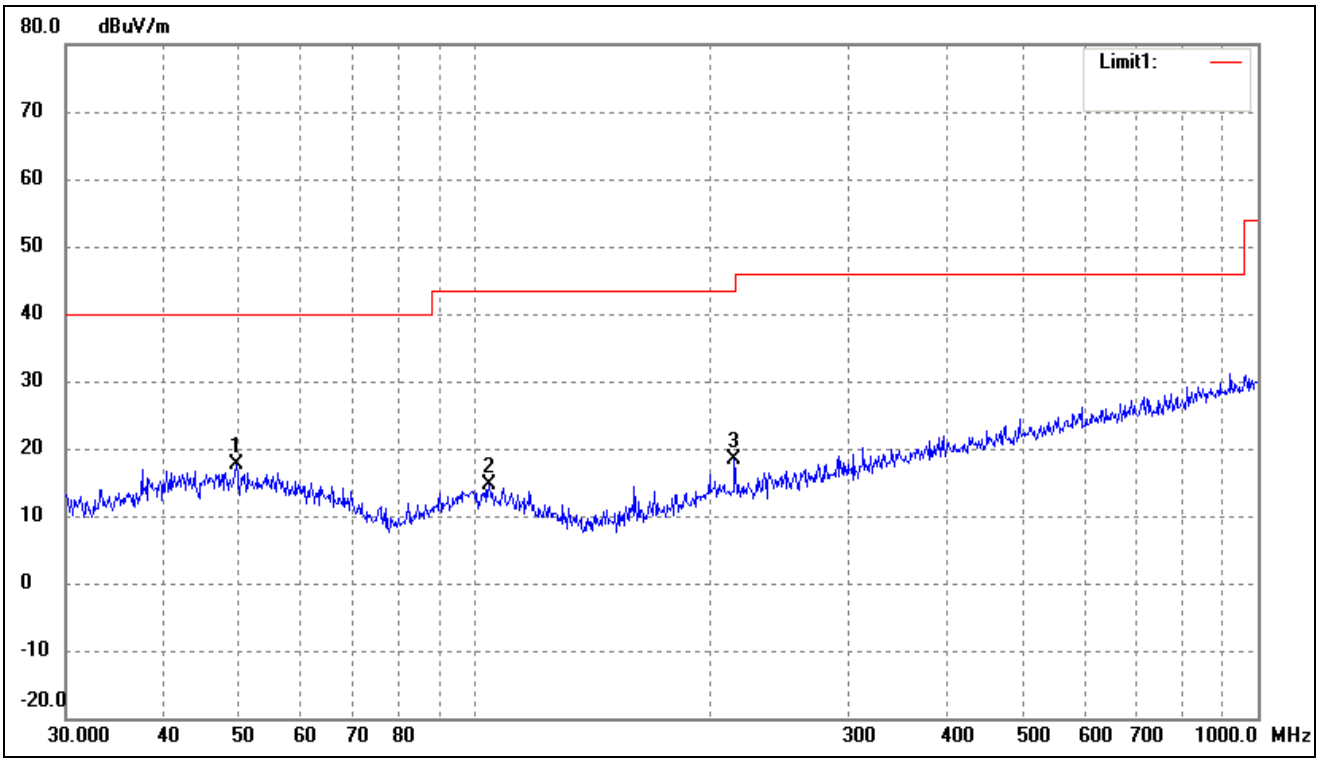
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	74.3955	30.02	-13.05	16.97	40.00	-23.03	155	100	QP
2	263.8190	30.11	-7.09	23.02	46.00	-22.98	197	100	QP
3	447.9822	28.00	-2.19	25.81	46.00	-20.19	310	100	QP

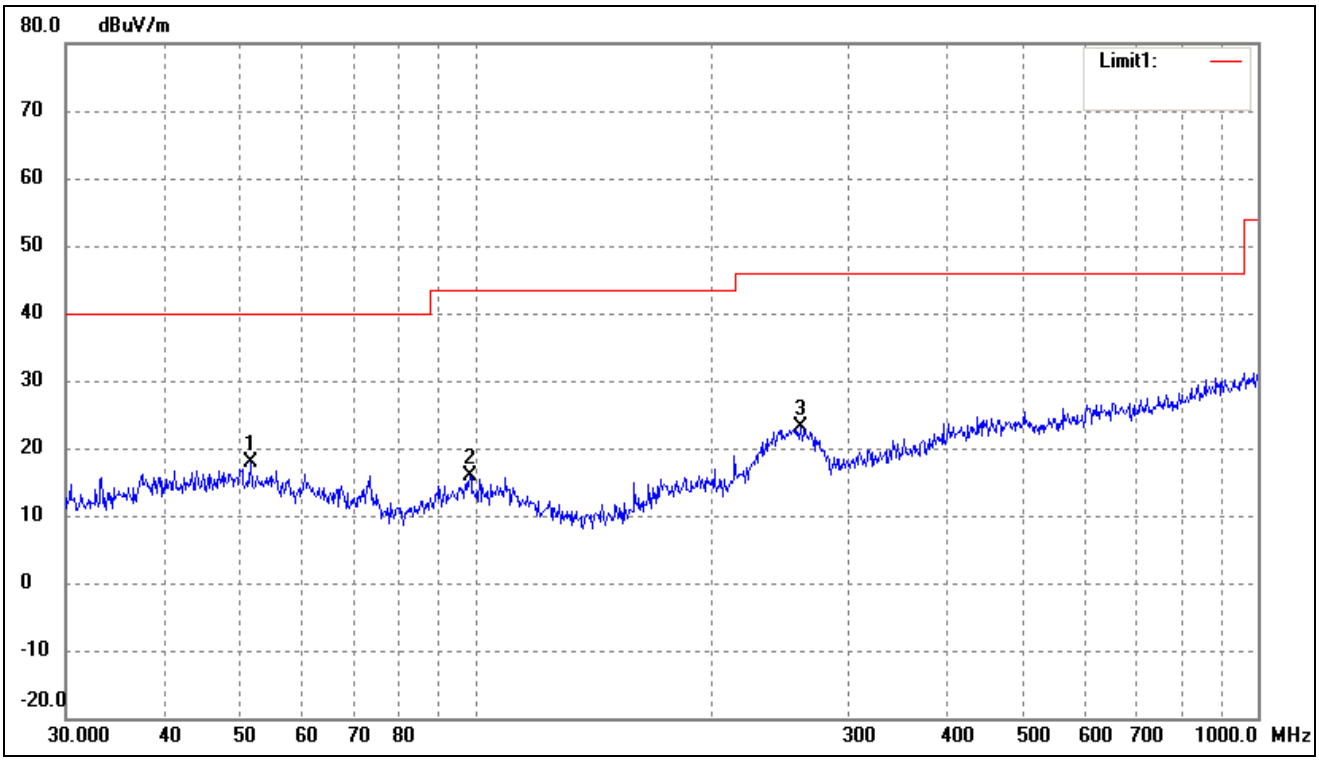
Operating Condition: *802.11n-HT20 Transmitting Middle Channel-2437MHz*
Comment: *AC Power 120V*

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	49.5328	25.05	-7.45	17.60	40.00	-22.40	274	100	QP
2	104.1701	24.23	-9.58	14.65	43.50	-28.85	116	100	QP
3	214.5143	27.29	-8.96	18.33	43.50	-25.17	82	100	QP

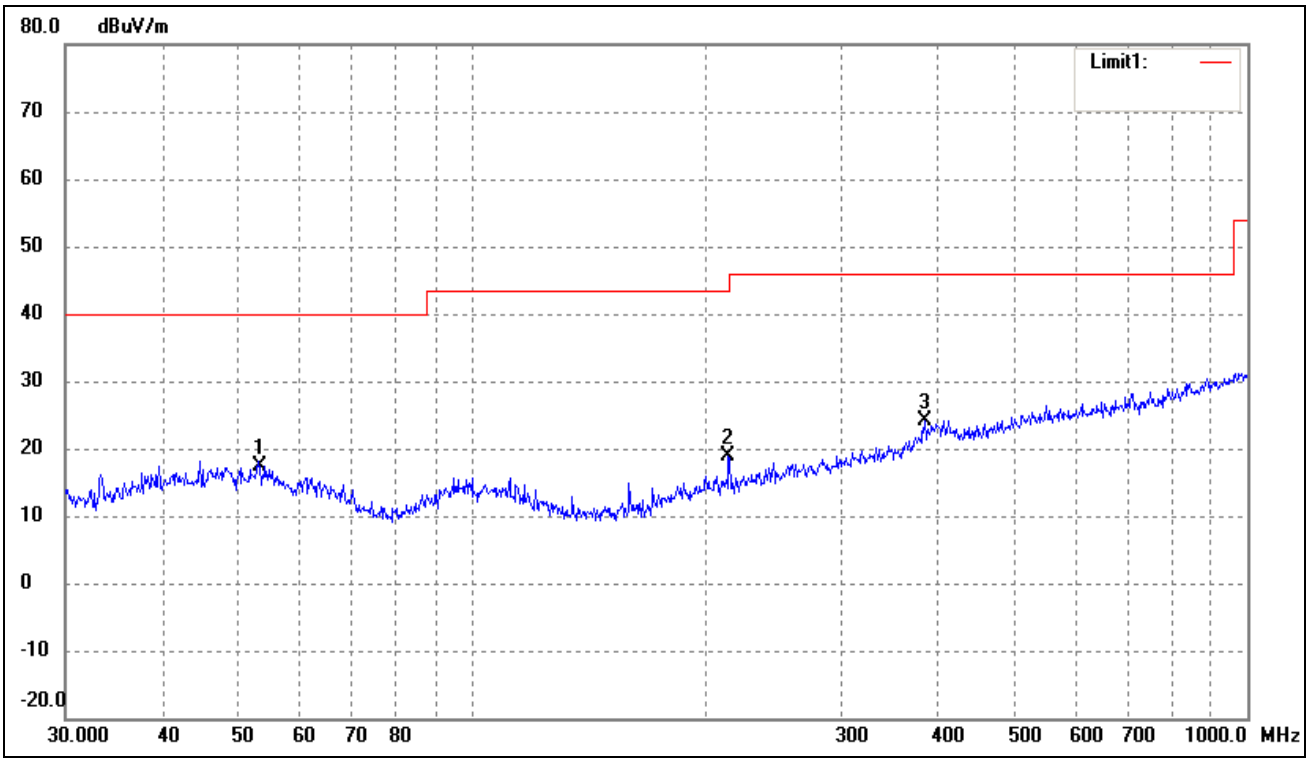
Test Specification: *Vertical*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	51.6616	25.49	-7.61	17.88	40.00	-22.12	264	100	QP
2	98.4866	25.63	-9.75	15.88	43.50	-27.62	110	100	QP
3	260.1444	30.40	-7.19	23.21	46.00	-22.79	136	100	QP

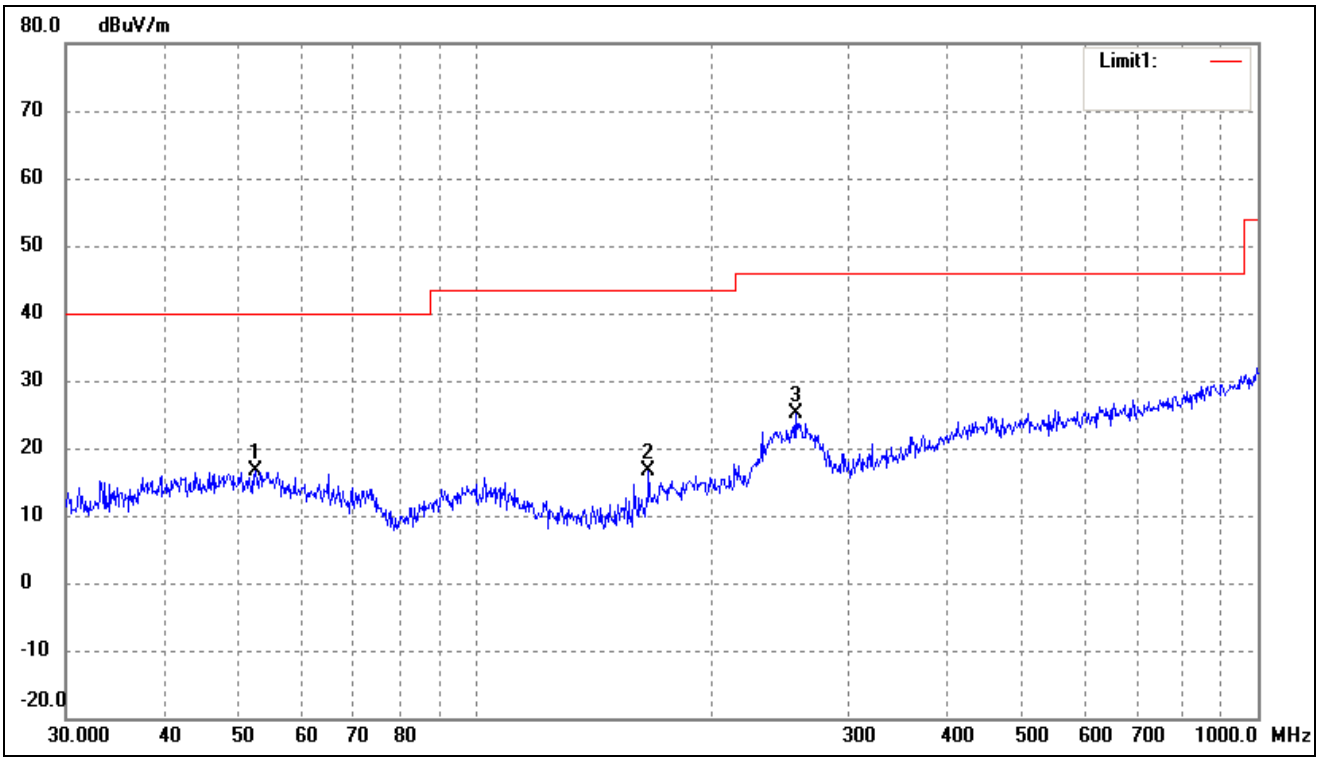
Operating Condition: *802.11n-HT20 Transmitting High Channel-2462MHz*
Comment: *AC Power 120V*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (•)	Height (cm)	Remark
1	53.5052	25.26	-7.80	17.46	40.00	-22.54	360	100	QP
2	214.5143	27.89	-8.96	18.93	43.50	-24.57	112	100	QP
3	383.9318	27.63	-3.46	24.17	46.00	-21.83	180	200	QP

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	52.3913	24.31	-7.68	16.63	40.00	-23.37	267	100	QP
2	166.6514	28.52	-12.01	16.51	43.50	-26.99	116	100	QP
3	256.5211	32.52	-7.29	25.23	46.00	-20.77	360	100	QP

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	50.05	0.57	50.62	74.00	-23.38	H	PK
4824	36.42	0.57	36.99	54.00	-17.01	H	AV
7236	29.92	3.69	33.61	74.00	-40.39	H	PK
7236	19.02	3.69	22.71	54.00	-31.29	H	AV
4824	59.08	0.57	59.65	74.00	-14.35	V	PK
4824	45.31	0.57	45.88	54.00	-8.12	V	AV
7236	30.65	3.69	34.34	74.00	-39.66	V	PK
7236	19.17	3.69	22.86	54.00	-31.14	V	AV
Middle Channel-2437MHz							
4874	45.13	0.64	45.77	74.00	-28.23	H	PK
4874	32.02	0.64	32.66	54.00	-21.34	H	AV
7311	31.77	3.75	35.52	74.00	-38.48	H	PK
7311	20.19	3.75	23.94	54.00	-30.06	H	AV
4874	56.82	0.64	57.46	74.00	-16.54	V	PK
4874	43.00	0.64	43.64	54.00	-10.36	V	AV
7311	19.67	3.75	23.42	54.00	-30.58	V	PK
7311	31.55	3.75	35.30	74.00	-38.70	V	AV
High Channel-2462MHz							
4924	29.96	0.74	30.70	54.00	-23.30	H	PK
4924	39.89	0.74	40.63	74.00	-33.37	H	AV
7386	31.47	3.83	35.30	74.00	-38.70	H	PK
7386	20.85	3.83	24.68	54.00	-29.32	H	AV
4924	55.88	0.74	56.62	74.00	-17.38	V	PK
4924	41.67	0.74	42.41	54.00	-11.59	V	AV
7386	21.55	3.83	25.38	54.00	-28.62	V	PK
7386	31.81	3.83	35.64	74.00	-38.36	V	AV

Test Mode: 802.11g

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824	43.60	0.57	44.17	74.00	-29.83	H	PK
4824	32.95	0.57	33.52	54.00	-20.48	H	AV
7236	18.51	3.69	22.20	54.00	-31.80	H	PK
7236	29.71	3.69	33.40	74.00	-40.60	H	AV
4824	53.82	0.57	54.39	74.00	-19.61	V	PK
4824	41.79	0.57	42.36	54.00	-11.64	V	AV
7236	18.39	3.69	22.08	54.00	-31.92	V	PK
7236	29.44	3.69	33.13	74.00	-40.87	V	AV
Middle Channel-2437MHz							
4874	29.81	0.64	30.45	54.00	-23.55	H	PK
4874	40.34	0.64	40.98	74.00	-33.02	H	AV
7311	30.71	3.75	34.46	74.00	-39.54	H	PK
7311	19.82	3.75	23.57	54.00	-30.43	H	AV
4874	48.50	0.64	49.14	74.00	-24.86	V	PK
4874	38.15	0.64	38.79	54.00	-15.21	V	AV
7311	31.12	3.75	34.87	74.00	-39.13	V	PK
7311	19.86	3.75	23.61	54.00	-30.39	V	AV
High Channel-2462MHz							
4924	40.70	0.74	41.44	74.00	-32.56	H	PK
4924	29.27	0.74	30.01	54.00	-23.99	H	AV
7386	21.06	3.83	24.89	54.00	-29.11	H	PK
7386	32.37	3.83	36.20	74.00	-37.80	H	AV
4924	50.18	0.74	50.92	74.00	-23.08	V	PK
4924	37.56	0.74	38.30	54.00	-15.70	V	AV
7386	32.92	3.83	36.75	74.00	-37.25	V	PK
7386	20.78	3.83	24.61	54.00	-29.39	V	AV

Test Mode: 802.11n-HT20

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2412MHz							
4824	43.76	0.57	44.33	74.00	-29.67	H	PK
4824	32.19	0.57	32.76	54.00	-21.24	H	AV
7236	17.89	3.69	21.58	54.00	-32.42	H	PK
7236	29.43	3.69	33.12	74.00	-40.88	H	AV
4824	52.24	0.57	52.81	74.00	-21.19	V	PK
4824	41.11	0.57	41.68	54.00	-12.32	V	AV
7236	30.03	3.69	33.72	74.00	-40.28	V	PK
7236	18.57	3.69	22.26	54.00	-31.74	V	AV
Middle Channel-2437MHz							
4874	41.58	0.64	42.22	74.00	-31.78	H	PK
4874	30.00	0.64	30.64	54.00	-23.36	H	AV
7311	30.97	3.75	34.72	74.00	-39.28	H	PK
7311	20.02	3.75	23.77	54.00	-30.23	H	AV
4874	48.83	0.64	49.47	74.00	-24.53	V	PK
4874	38.57	0.64	39.21	54.00	-14.79	V	AV
7311	19.45	3.75	23.20	54.00	-30.80	V	PK
7311	31.57	3.75	35.32	74.00	-38.68	V	AV
High Channel-2462MHz							
4924	29.70	0.74	30.44	54.00	-23.56	H	PK
4924	41.09	0.74	41.83	74.00	-32.17	H	AV
7386	32.24	3.83	36.07	74.00	-37.93	H	PK
7386	20.91	3.83	24.74	54.00	-29.26	H	AV
4924	37.68	0.74	38.42	54.00	-15.58	V	PK
4924	49.78	0.74	50.52	74.00	-23.48	V	AV
7386	21.12	3.83	24.95	54.00	-29.05	V	PK
7386	31.96	3.83	35.79	74.00	-38.21	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3th 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

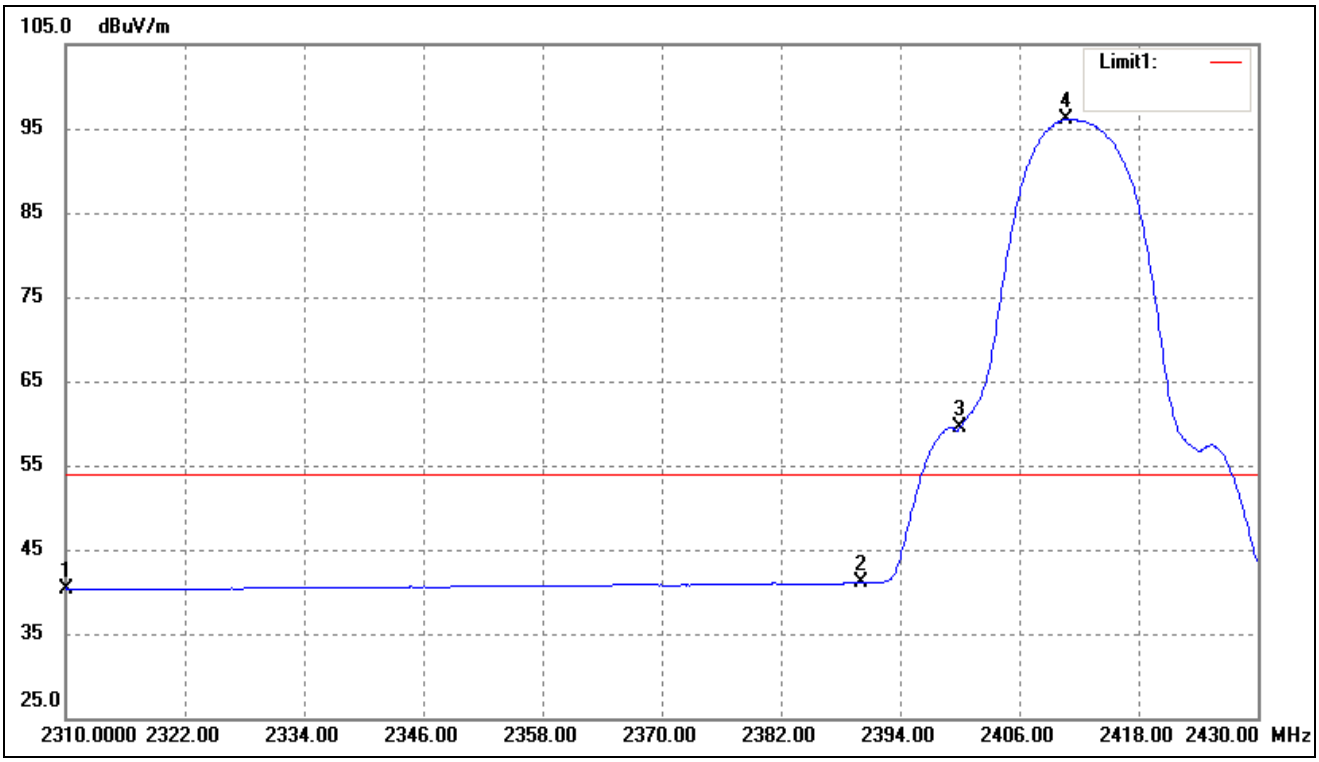
9.5 Summary of Test Results/Plots

Please refer to the test plots as below.

Bandedge (Radiated)

802.11b-Lowest Bandedge

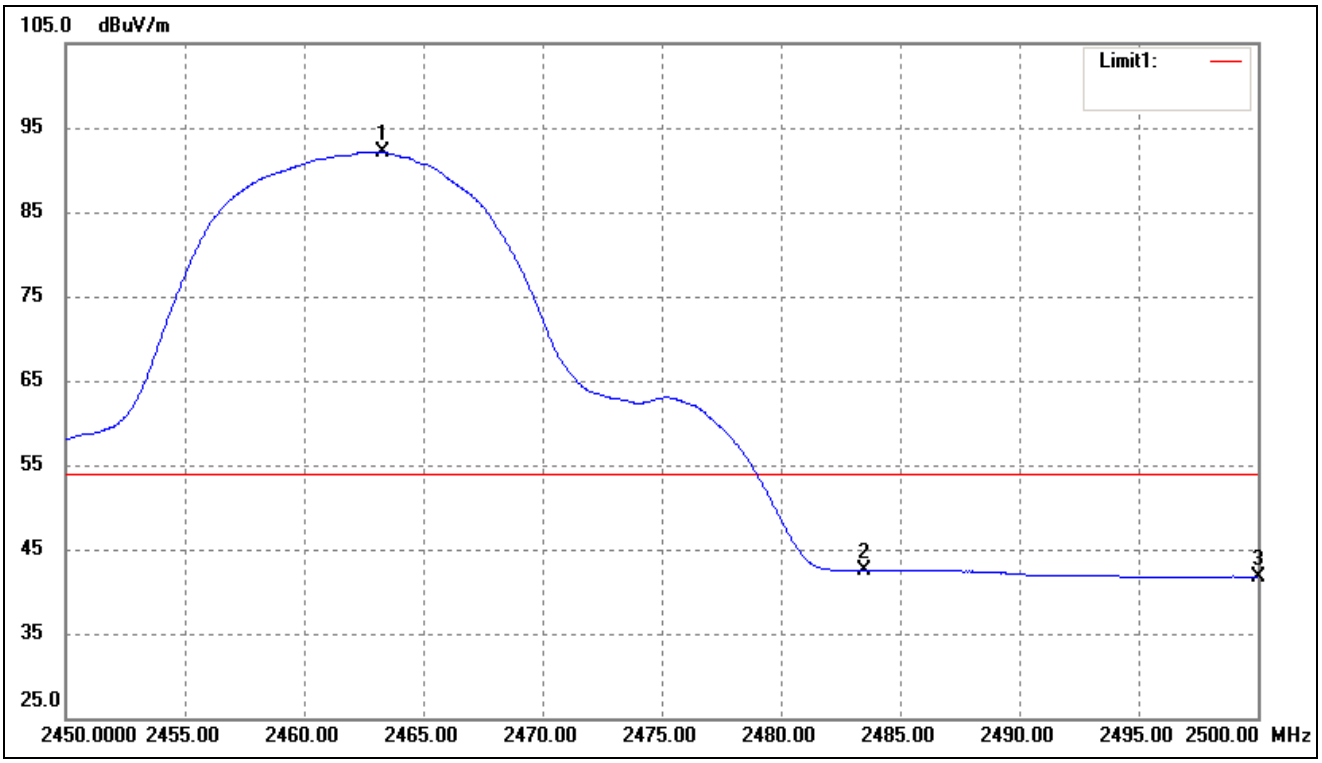
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	24.06	16.34	40.40	54.00	-13.60	Average Detector
	2310.000	34.52	16.34	50.86	74.00	-23.14	Peak Detector
2	2390.000	24.05	17.03	41.08	54.00	-12.92	Average Detector
	2390.000	35.17	17.03	52.20	74.00	-21.80	Peak Detector
3	2400.000	42.36	17.11	59.47	Delta=36.66dBc		Average Detector
4	2410.680	78.94	17.19	96.13			Average Detector

802.11b-Highest Bandedge

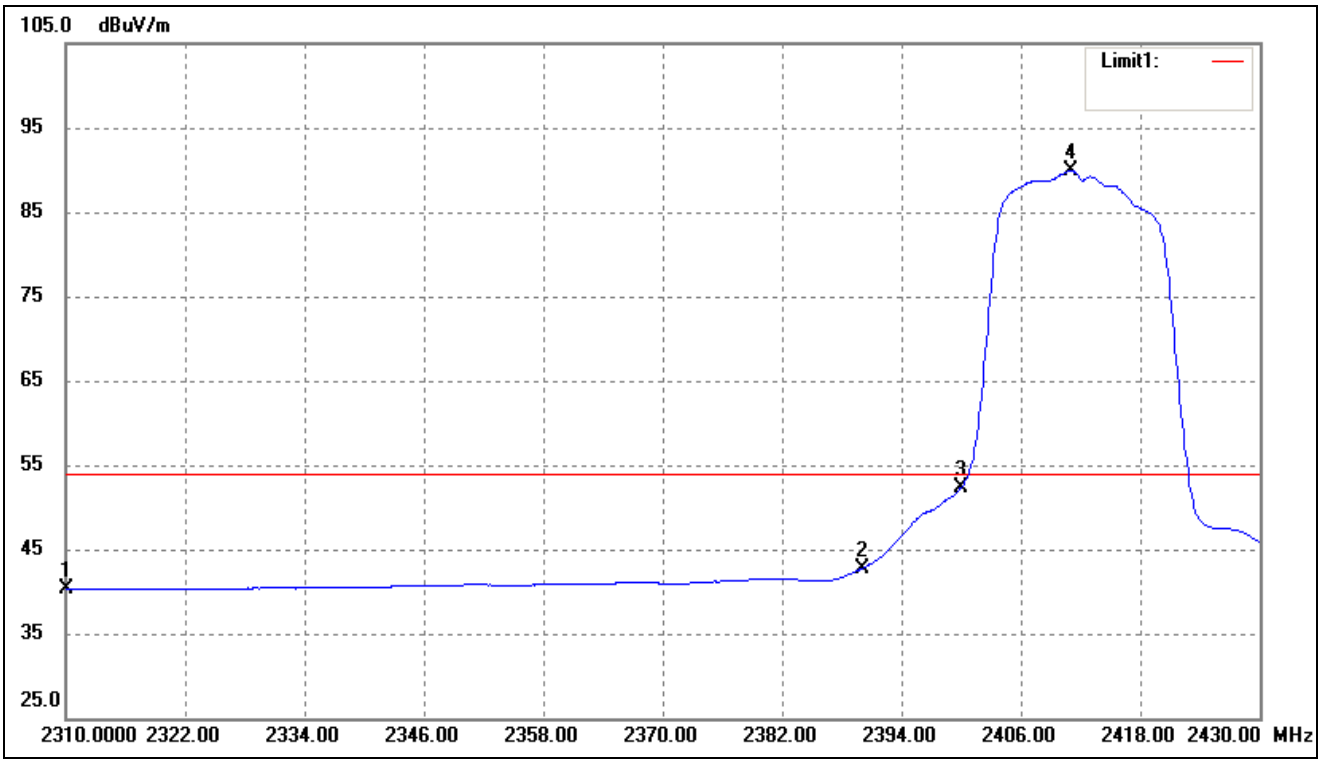
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2463.300	74.55	17.58	92.13	/	/	Average Detector
	2463.300	82.87	17.58	100.45			Peak Detector
2	2483.500	24.79	17.73	42.52	54.00	-11.48	Average Detector
	2483.500	36.10	17.73	53.83	74.00	-20.17	Peak Detector
3	2500.000	23.86	17.86	41.72	54.00	-12.28	Average Detector
	2500.000	34.29	17.86	52.15	74.00	-21.85	Peak Detector

802.11g-Lowest Bandedge

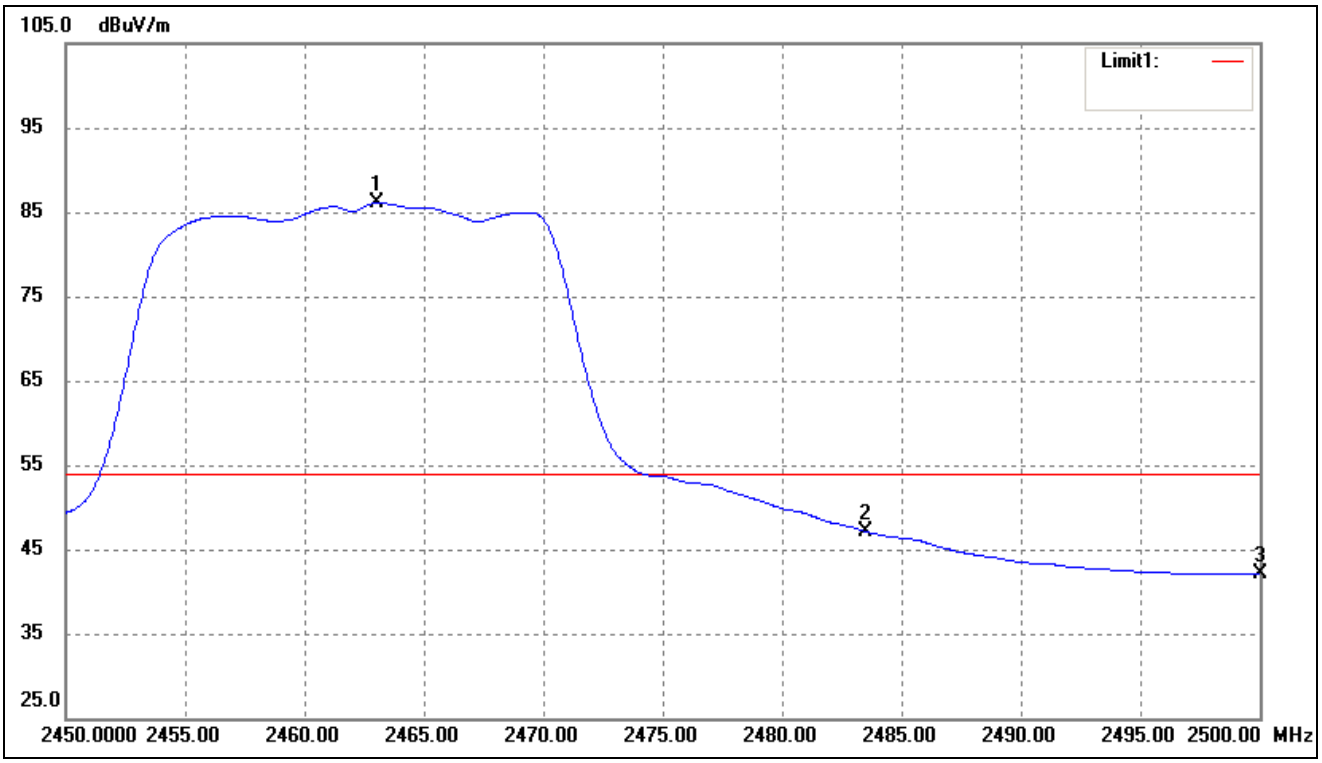
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	24.05	16.34	40.39	54.00	-13.61	Average Detector
	2310.000	35.06	16.34	51.40	74.00	-22.60	Peak Detector
2	2390.000	25.74	17.03	42.77	54.00	-11.23	Average Detector
	2390.000	40.51	17.03	57.54	74.00	-16.46	Peak Detector
3	2400.000	35.27	17.11	52.38	Delta=37.50dBc		Average Detector
4	2411.040	72.69	17.19	89.88			Average Detector

802.11g-Highest Bandedge

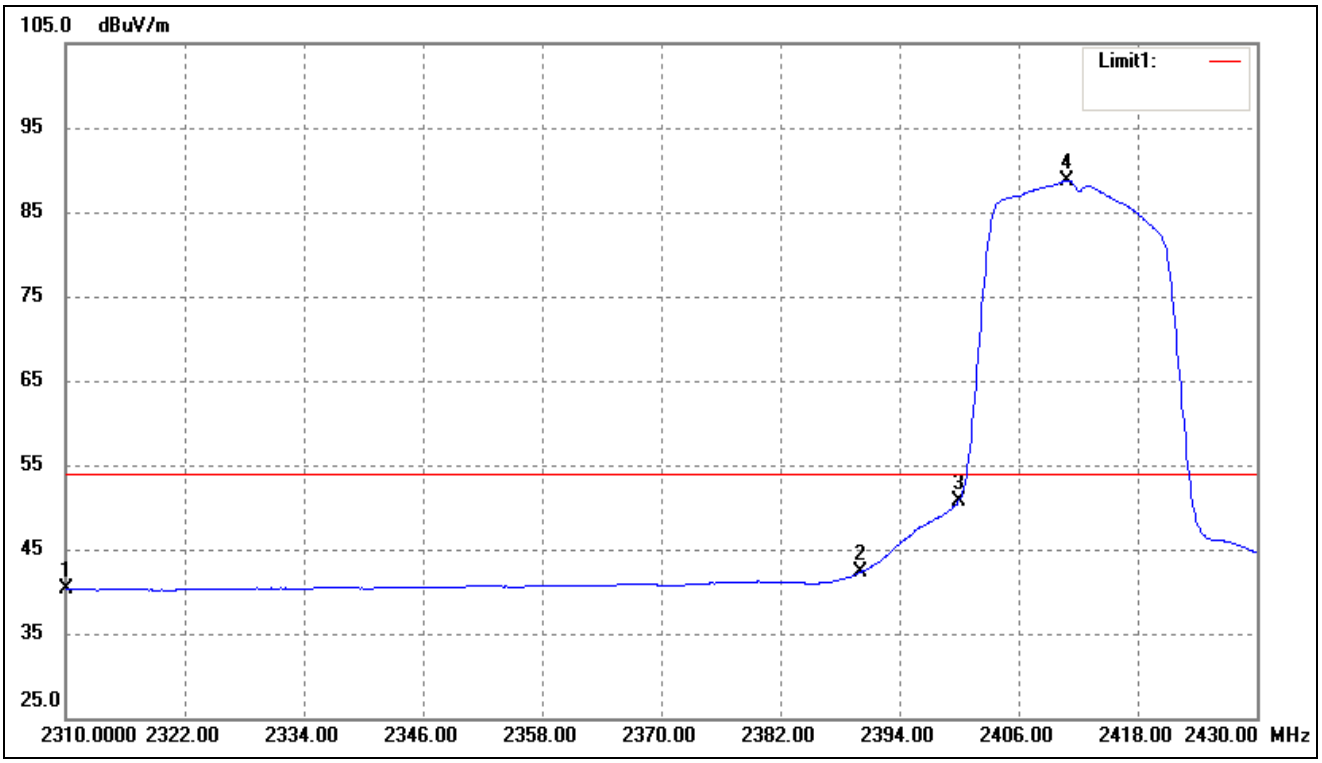
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2463.050	68.54	17.58	86.12	/	/	Average Detector
	2463.750	80.06	17.58	97.64	/	/	Peak Detector
2	2483.500	29.38	17.73	47.11	54.00	-6.89	Average Detector
	2483.500	46.43	17.73	64.16	74.00	-9.84	Peak Detector
3	2500.000	24.25	17.86	42.11	54.00	-11.89	Average Detector
	2500.000	35.64	17.86	53.50	74.00	-20.50	Peak Detector

802.11n-HT20-Lowest Bandedge

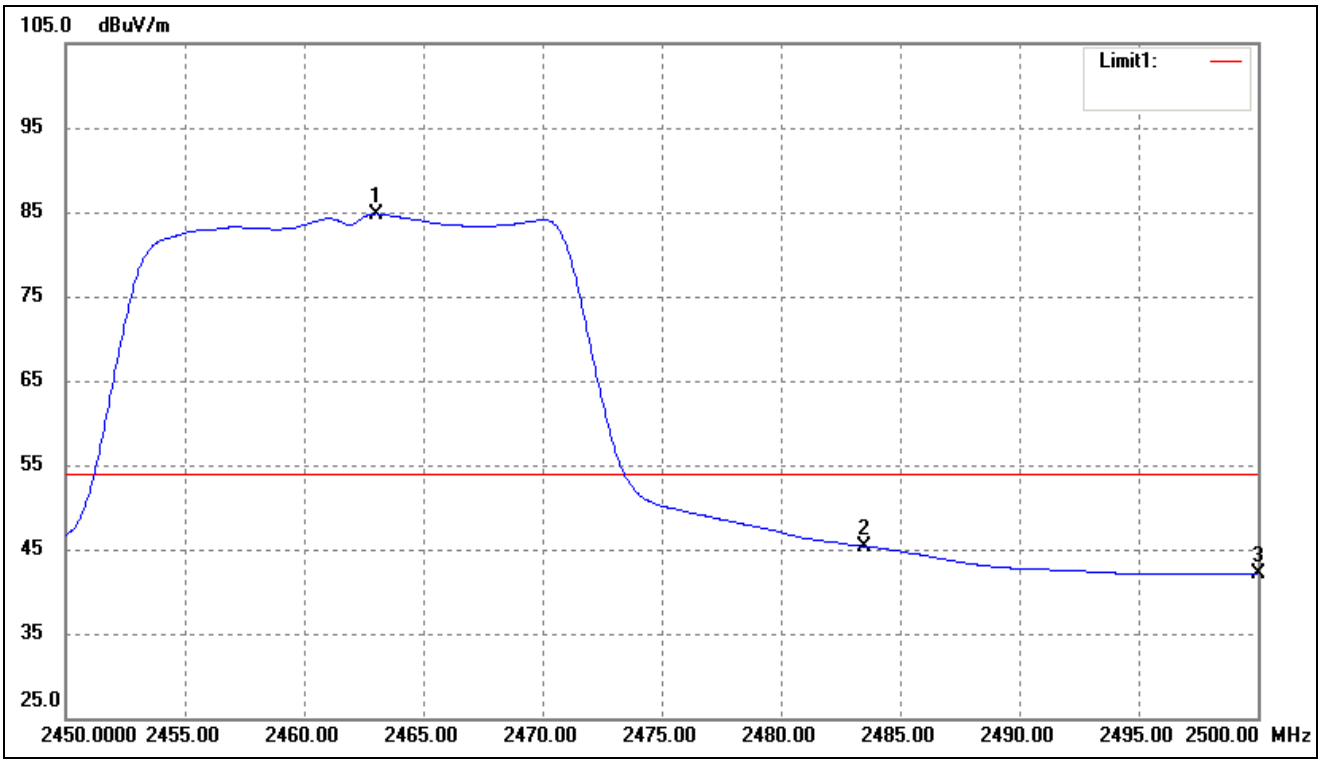
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	23.98	16.34	40.32	54.00	-13.68	Average Detector
	2310.000	35.67	16.34	52.01	74.00	-21.99	Peak Detector
2	2390.000	25.29	17.03	42.32	54.00	-11.68	Average Detector
	2390.000	38.91	17.03	55.94	74.00	-18.06	Peak Detector
3	2400.000	33.69	17.11	50.80	Delta=37.95dBc		Average Detector
	2410.800	71.56	17.19	88.75			Average Detector

802.11n-HT20-Highest Bandedge

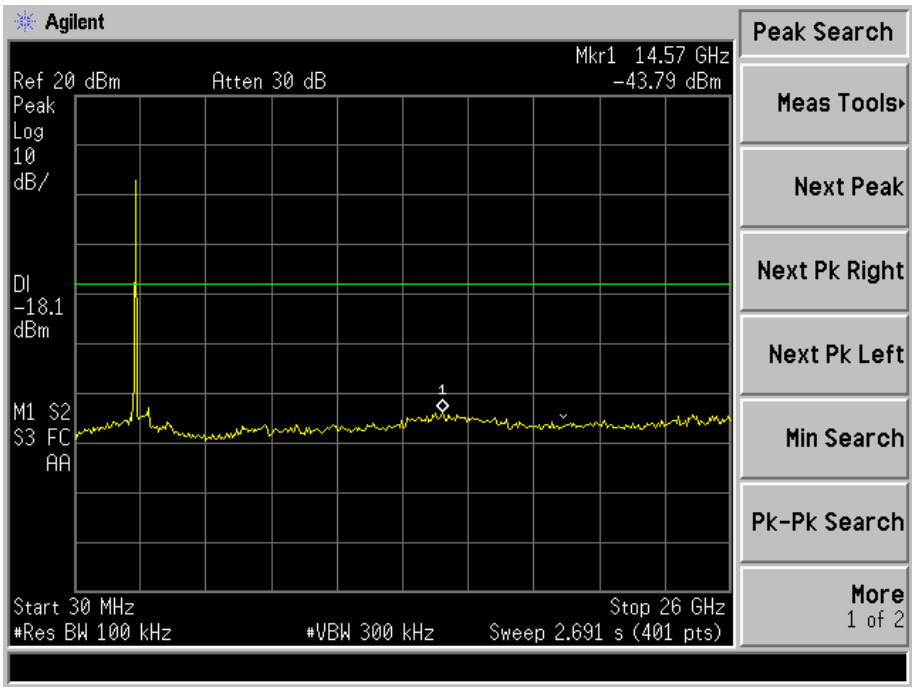
Vertical (Worst case)



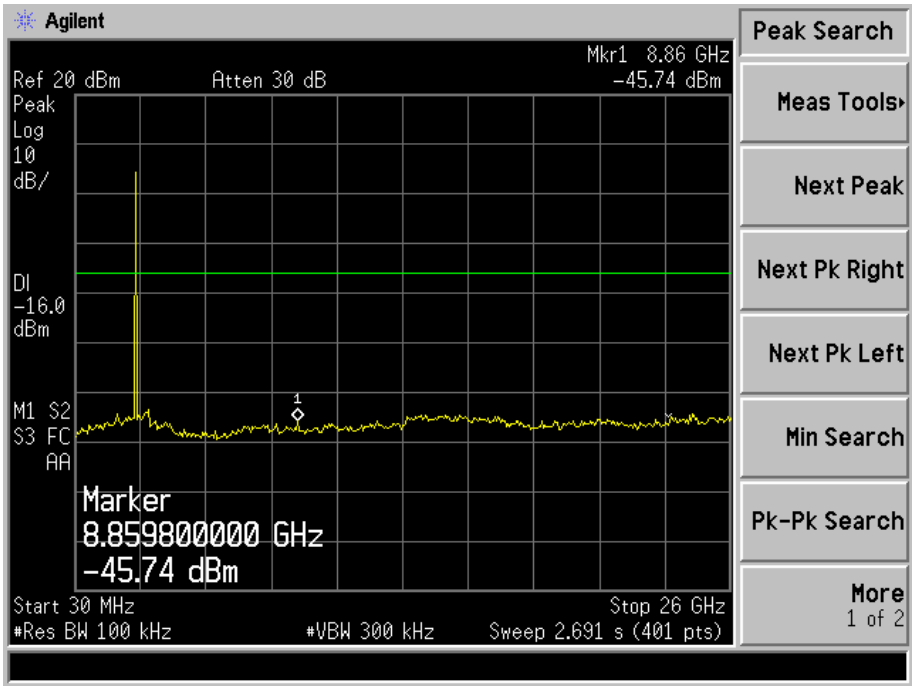
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2463.000	67.22	17.58	84.80	/	/	Average Detector
	2461.400	78.12	17.57	95.69	/	/	Peak Detector
2	2483.500	27.62	17.73	45.35	54.00	-8.65	Average Detector
	2483.500	46.81	17.73	64.54	74.00	-9.46	Peak Detector
3	2500.000	24.18	17.86	42.04	54.00	-11.96	Average Detector
	2500.000	36.81	17.86	54.67	74.00	-19.33	Peak Detector

Conducted Emissions in non-restricted Frequency Bands:

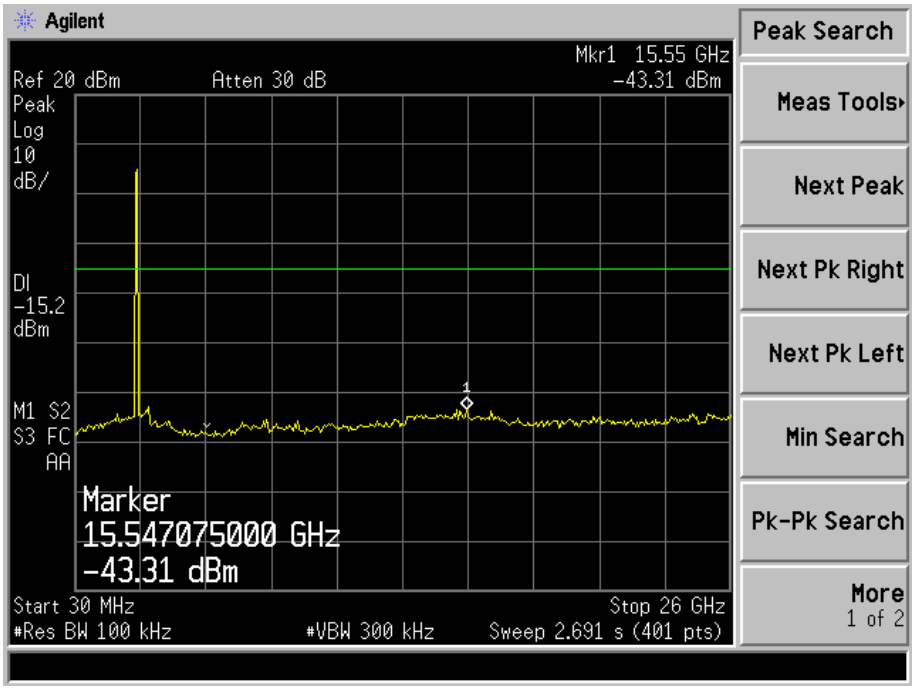
11b-Low



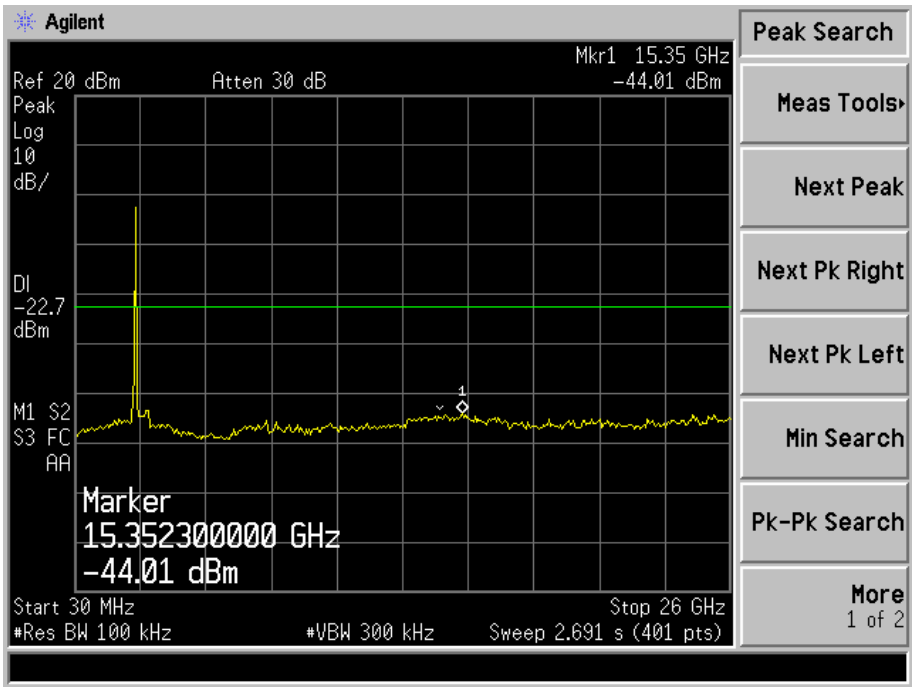
11b-Middle



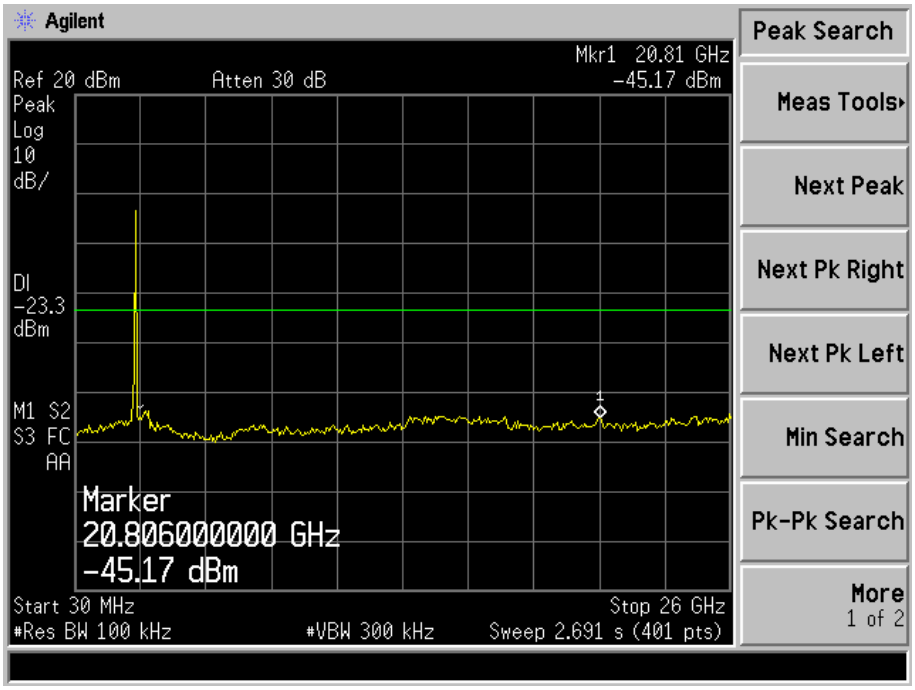
11b-High



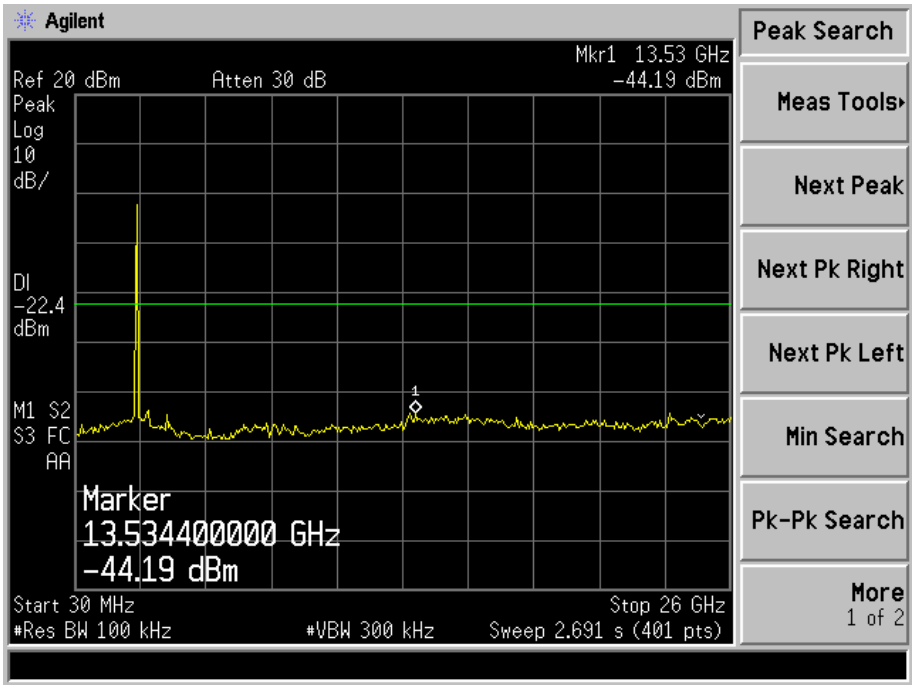
11g-Low



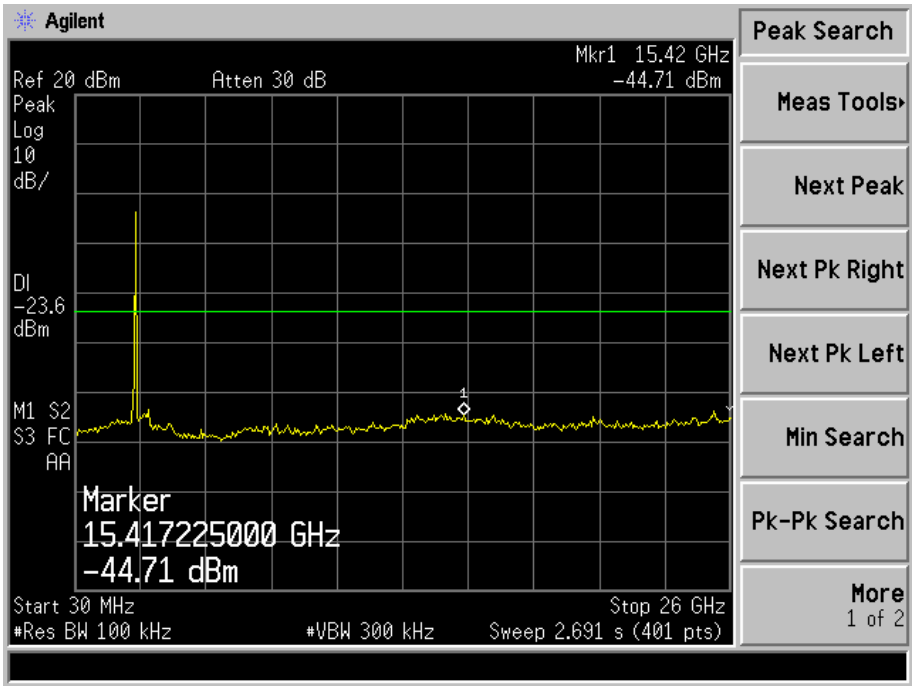
11g-Middle



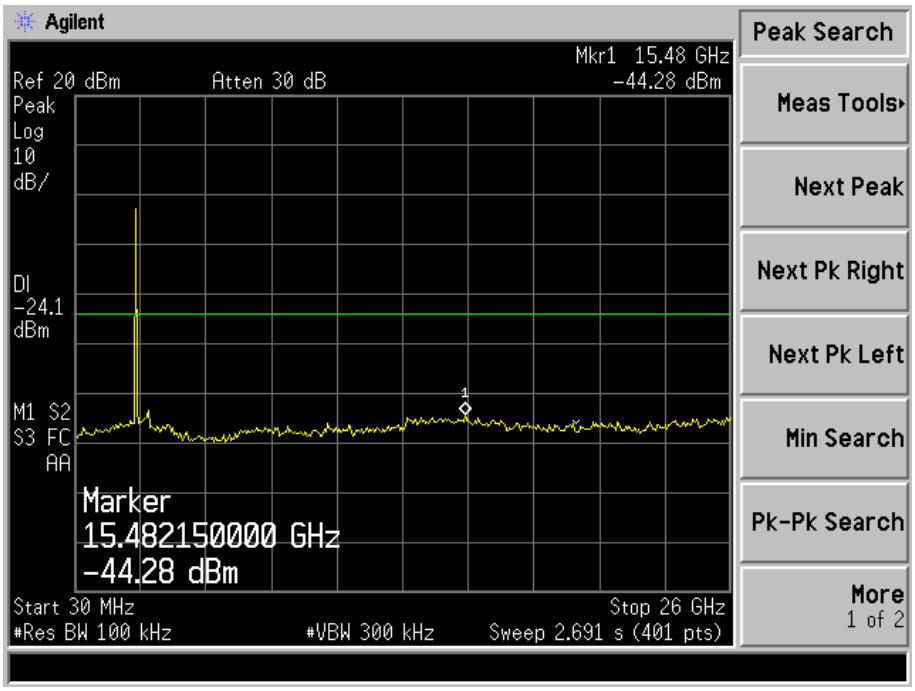
11g-High



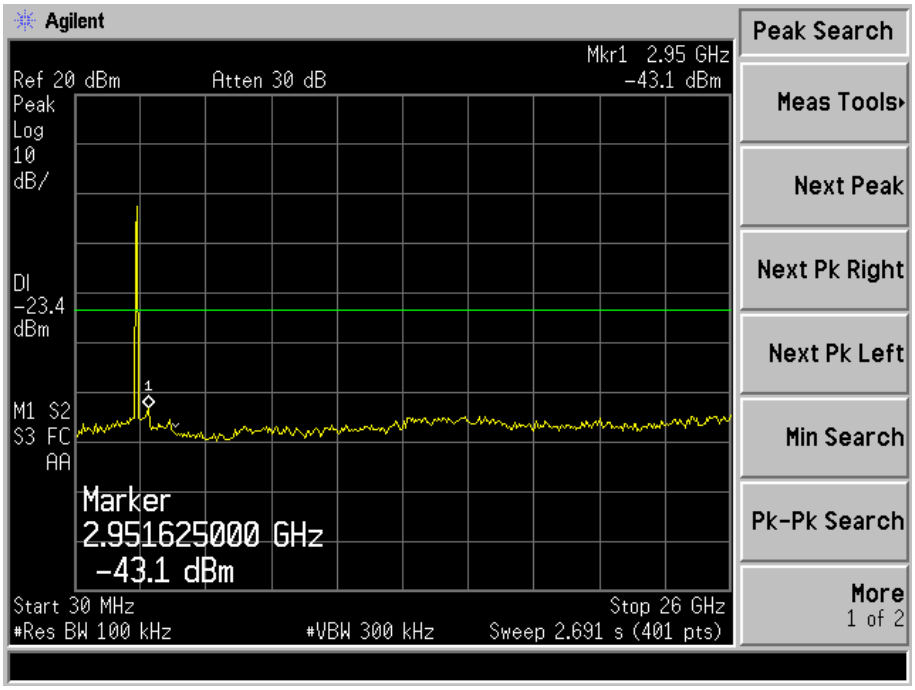
11n-Low



11n-Middle



11n-High


Agilent
Mkr1 2.95 GHz
Ref 20 dBm
Atten 30 dB
-43.1 dBm
Peak
Log
10
dB/
Dl
-23.4
dBm
M1 S2
S3 FC
AA
Marker
2.951625000 GHz
-43.1 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26 GHz
Sweep 2.691 s (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

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.

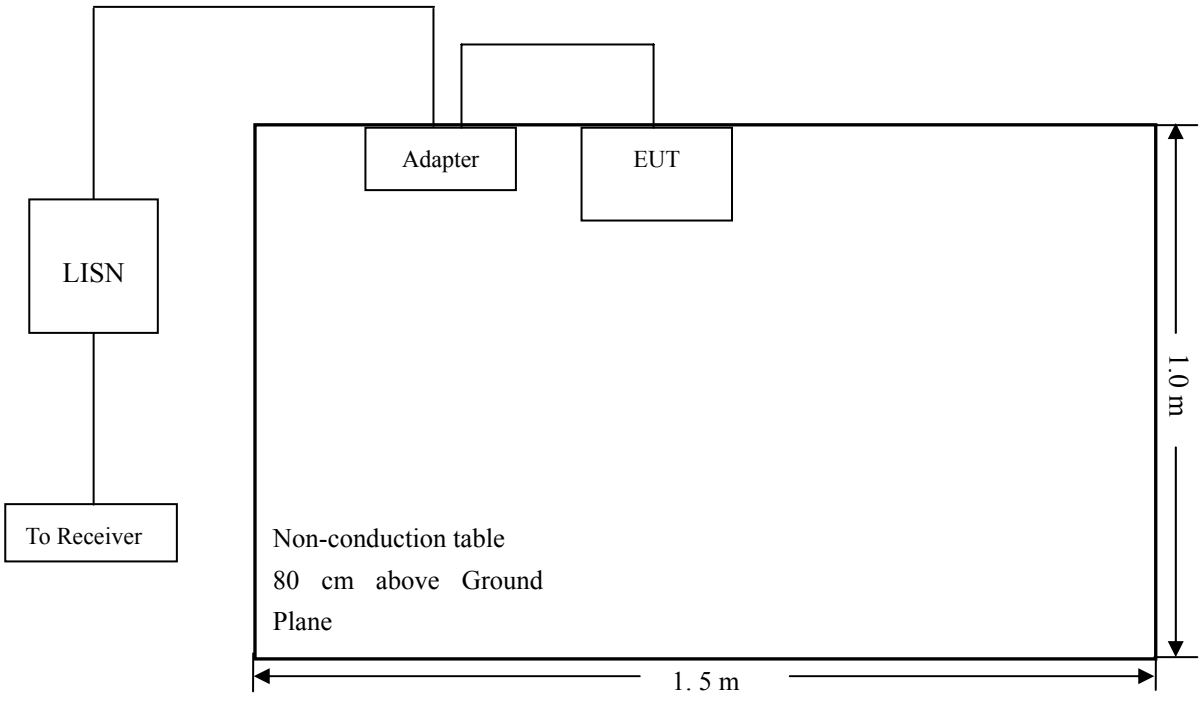
10.2 Test Equipment List and Details

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:

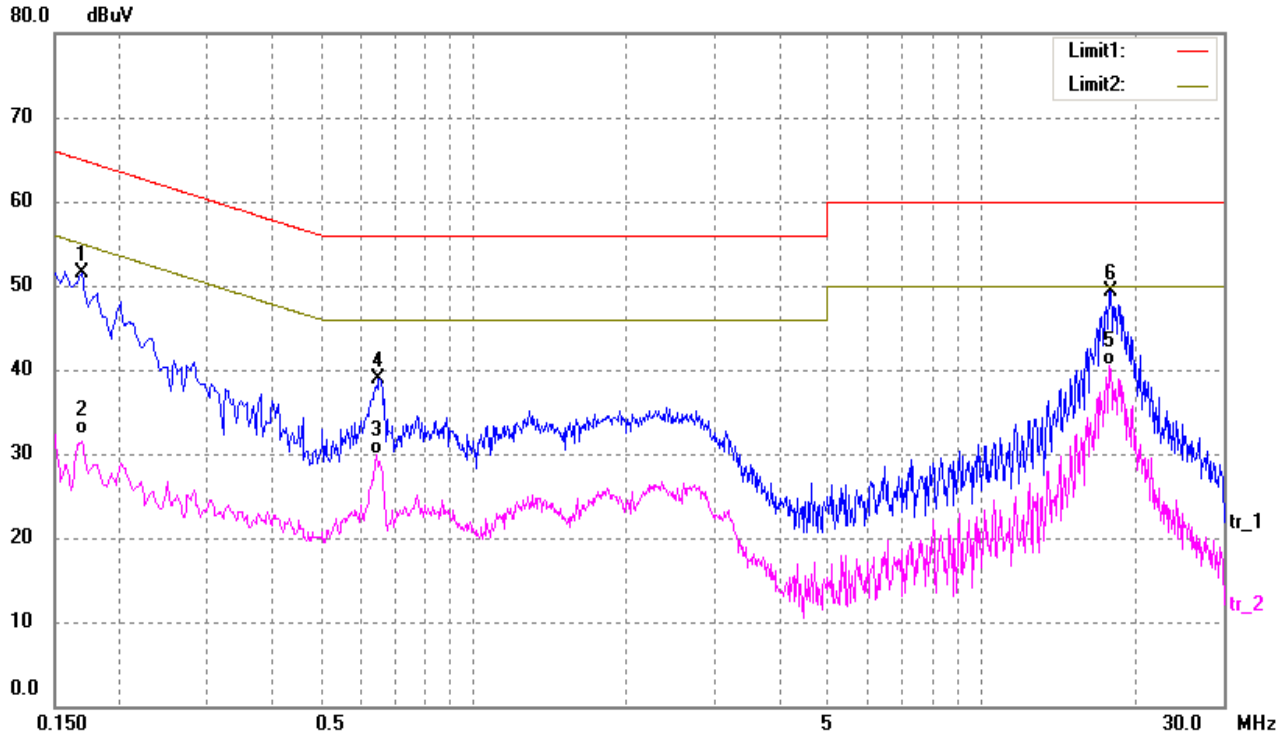
-8.89dB at **17.9820 MHz** in the **Line**, **Nubryte -2** Model, **Average** detector, 0.15-30MHz

10.8 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

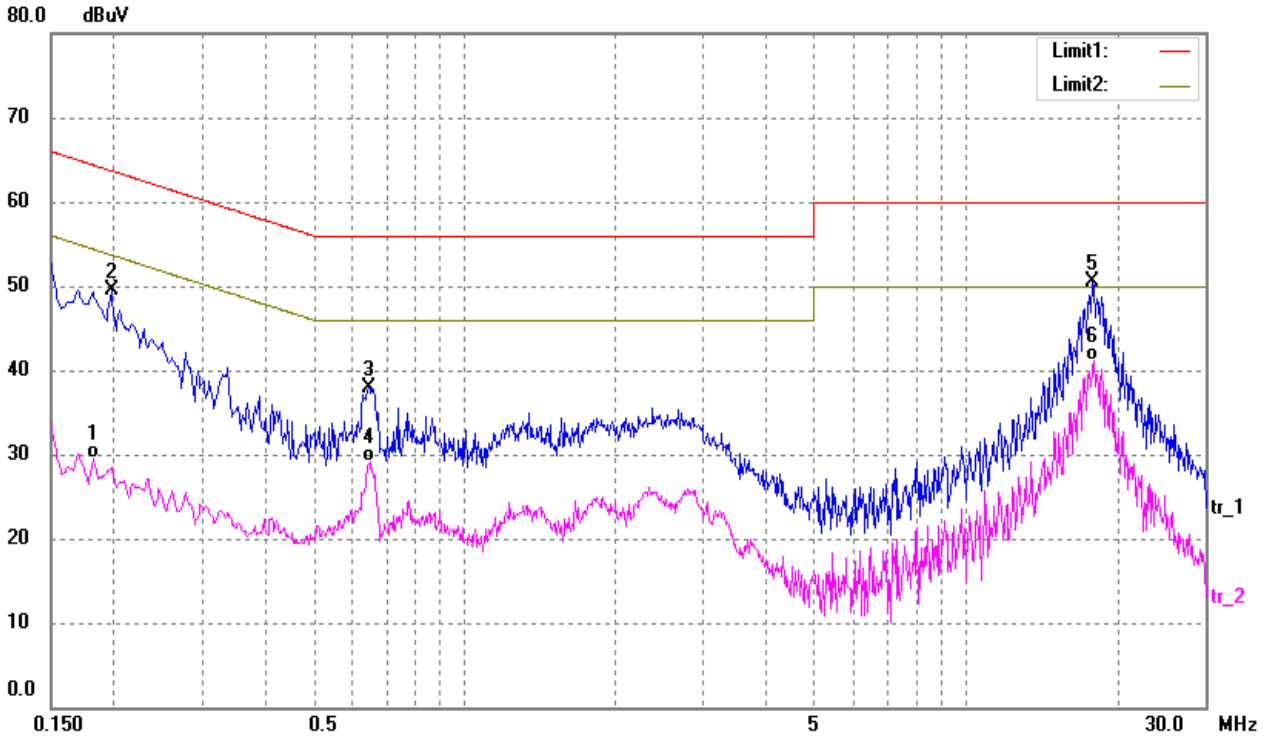
EUT: *Smart Switch*
Tested Model: *Nubryte -2*
Operating Condition: *Transmitting(Wi-Fi)*
Comment: *AC 120V/60Hz*

Test Specification: *Neutral*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.1700	42.06	9.50	51.56	64.96	-13.40	QP
2	0.1700	22.75	9.50	32.25	54.96	-22.71	AVG
3	0.6460	20.20	9.65	29.85	46.00	-16.15	AVG
4	0.6540	29.32	9.65	38.97	56.00	-17.03	QP
5	17.9420	28.99	11.59	40.58	50.00	-9.42	AVG
6	17.9460	37.74	11.59	49.33	60.00	-10.67	QP

Test Specification: *Line*



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.1820	20.04	9.50	29.54	54.39	-24.85	AVG
2	0.1980	39.91	9.50	49.41	63.69	-14.28	QP
3	0.6460	28.33	9.65	37.98	56.00	-18.02	QP
4	0.6500	19.36	9.65	29.01	46.00	-16.99	AVG
5	17.9140	38.86	11.58	50.44	60.00	-9.56	QP
6	17.9820	29.51	11.60	41.11	50.00	-8.89	AVG

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