FCC Part 15C
Measurement and Test Report

For

Shenzhen WOWOTO Technology Co., Ltd.

Floor 4th, Gaoxinqi Industrial Park, Liuxian 1st Road, district 67,

Bao'an, Shenzhen, China

FCC ID: 2AQYK-QSERIEC

FCC Rule(s):	FCC Part 15.247
Product Description:	SMART PROJECTOR
Tested Model:	Q1
Report No.:	STRD1807122I-1
Sample Receipt Date:	2018-07-26
Tested Date:	2018-07-26 to 2018-09-18
Issued Date:	2018-09-19
Tested By:	Ray Yang / Engineer
Reviewed By:	Silin Chen / EMC Manager
Approved & Authorized By:	Jandy So / PSQ Manager

Prepared By:

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Shenzhen WOWOTO Technology Co., Ltd.
Address of applicant:	Floor 4th, Gaoxinqi Industrial Park, Liuxian 1st Road, district 67, Bao'an, Shenzhen, China
Manufacturer:	Shenzhen WOWOTO Technology Co., Ltd.
Address of manufacturer:	Floor 4th, Gaoxinqi Industrial Park, Liuxian 1st Road, district 67, Bao'an, Shenzhen, China

General Description of EUT	
Product Name:	SMART PROJECTOR
Trade Name:	WOWOTO
Model No.:	Q1
Adding Model(s):	Q1 Pro, Q2, Q3, Q5, Q6, Q6 Pro, Q8, Q9
Rated Voltage:	DC 3.7V
Battery:	3800mAh
Power Adapter Model:	MODEL:AW015WR-0500300 INPUT:AC100-240V 50/60Hz 0.5A OUTPUT:DC5V/3A
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 Q1, 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:	2412-2462MHz
RF Output Power:	14.41dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 72.2Mbps
Quantity of Channels:	11
Channel Separation:	5MHz
Type of Antenna:	Integral
Antenna Gain:	0dBi
Lowest Internal Frequency of EUT:	32.768kHz

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
558074 D01 DTS Meas Guidance v04: GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

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

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB 558074 D01 DTS Meas Guidance v04
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

FCC – Registration No.: 125990
Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

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

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

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

Test Conditions	
Temperature:	22~25 °C
Relative humidity	50~55 %.
ATM Pressure:	1019 mbar

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
USB Cable	1.5	Unshielded	Without Core

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
USB Disk	SanDisk	CZ50	/
MicroSD(TF)	SanDisk	CLASS4	/
Router	TP-Link	TL-WE886N	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2018-05-22	2019-05-21
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2018-05-22	2019-05-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2018-05-22	2019-05-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2018-05-22	2019-05-21
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2018-05-22	2019-05-21
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2018-05-22	2019-05-21
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2018-05-22	2019-05-21
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2018-05-22	2019-05-21
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2018-05-22	2019-05-21
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2018-05-22	2019-05-21
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2018-05-22	2019-05-21
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2018-05-22	2019-05-21
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2018-05-22	2019-05-21
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2018-05-22	2019-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§2.1091	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1091, the mobile transmitter must comply the RF exposure requirements.

3.2 Test Result

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

4. Antenna Requirement

4.1 Standard Applicable

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

4.2 Evaluation Information

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

5. Power Spectral Density

5.1 Standard Applicable

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

5.2 Test Procedure

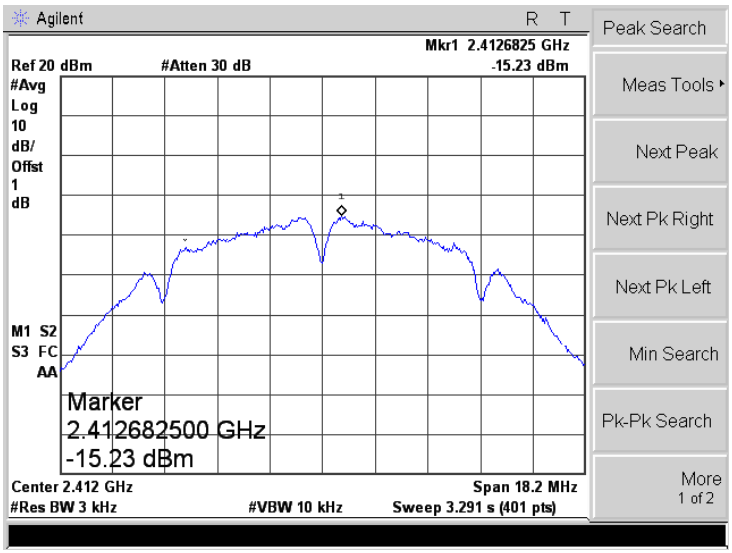
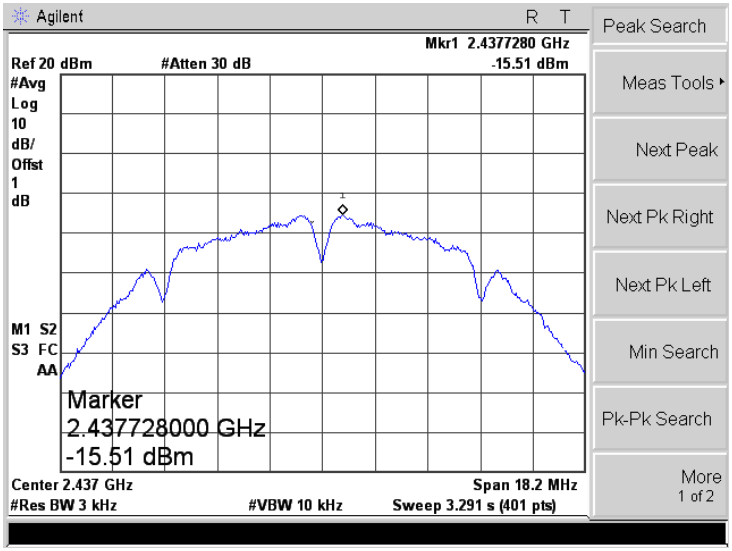
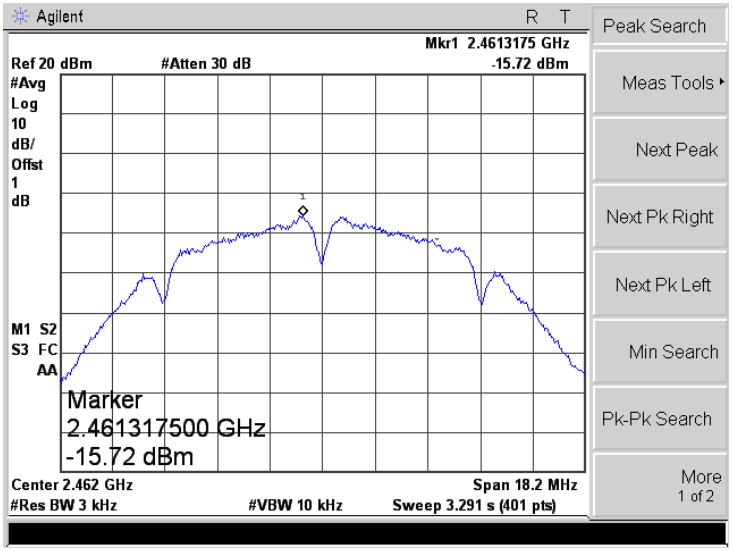
According to the KDB 558074 D01 v04, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

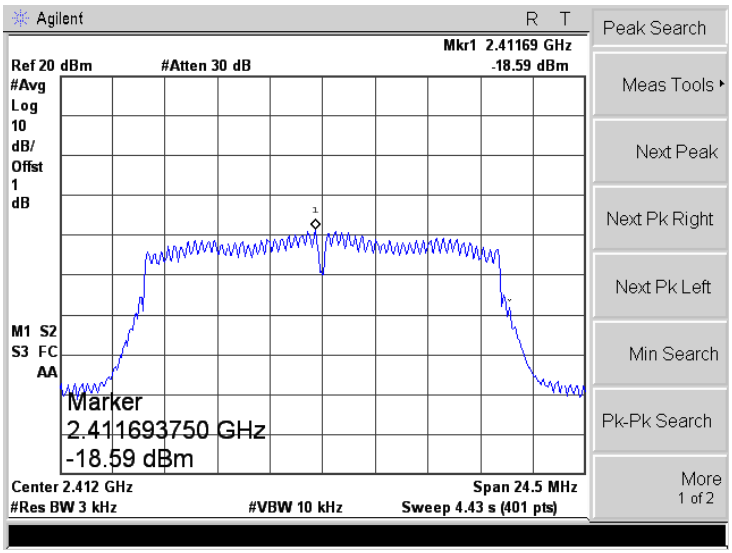
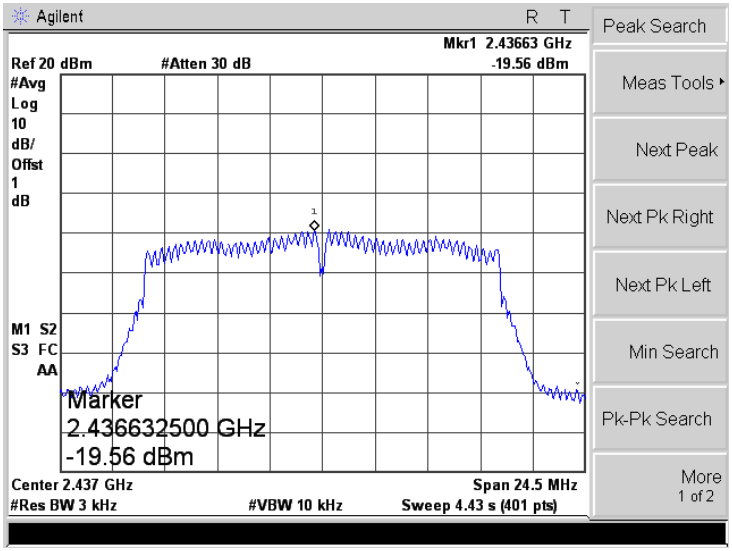
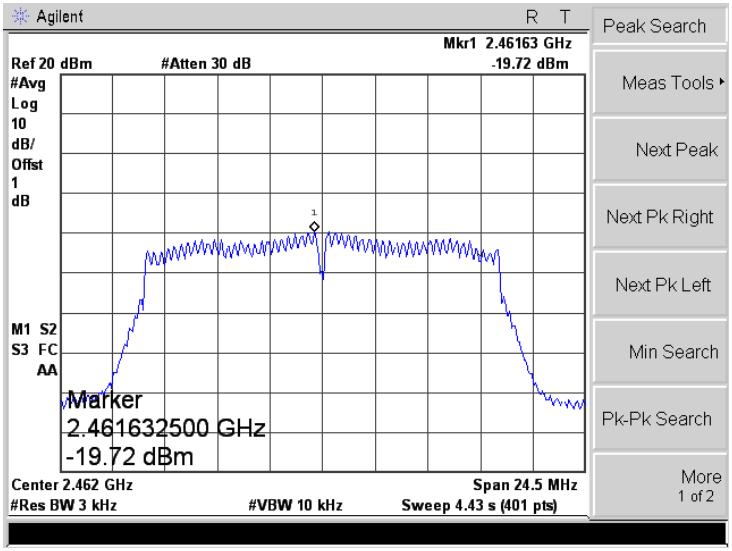
a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz. .
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points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

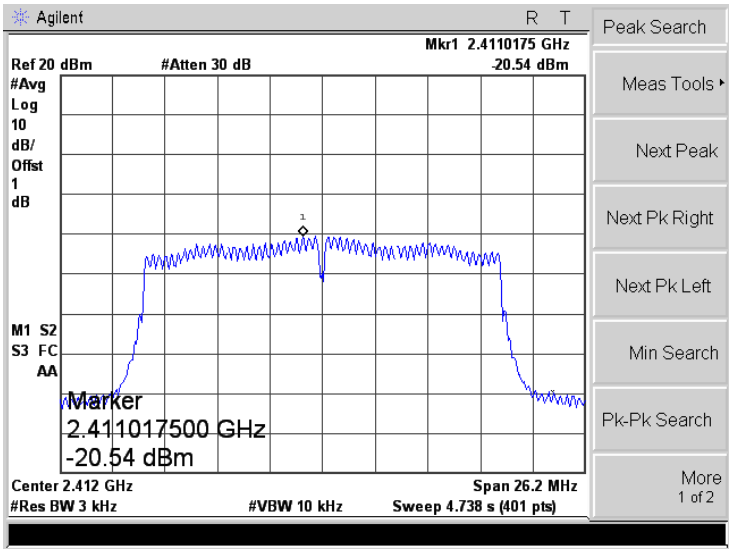
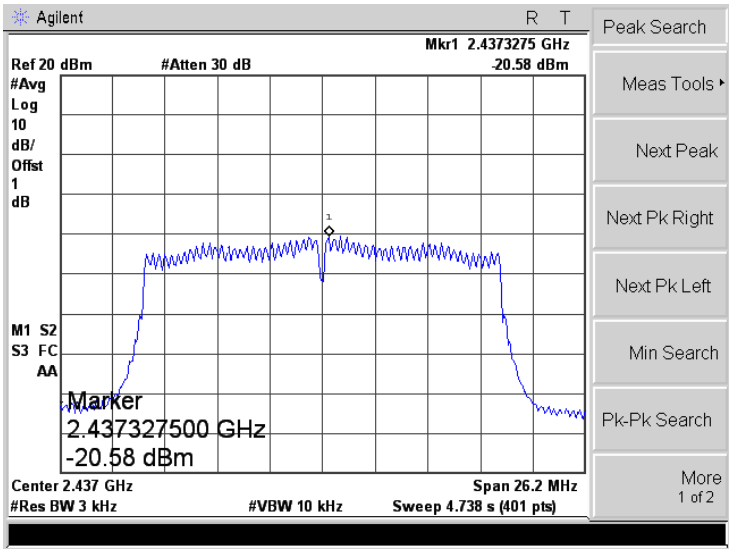
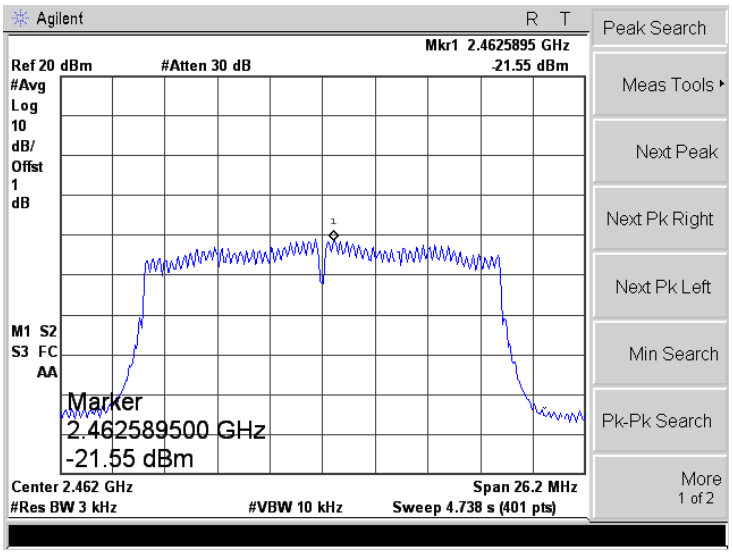
5.3 Summary of Test Results/Plots

Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
802.11b	2412	-15.23	8
	2437	-15.51	8
	2462	-15.72	8
802.11g	2412	-18.59	8
	2437	-19.56	8
	2462	-19.72	8
802.11n-HT20	2412	-20.54	8
	2437	-20.58	8
	2462	-21.55	8

Please refer to the following test plots:

802.11b-Low	
802.11b-Middle	
802.11b-High	

802.11g-Low	
802.11g-Middle	
802.11g-High	

802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

6. 6dB Bandwidth

6.1 Standard Applicable

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

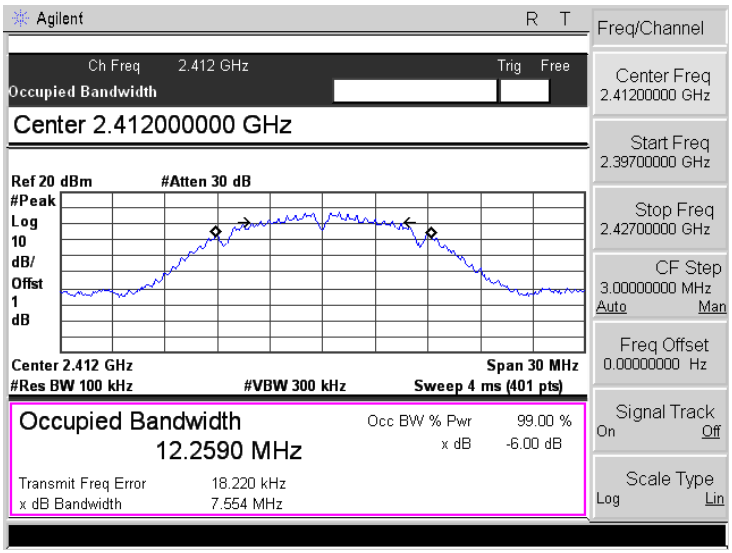
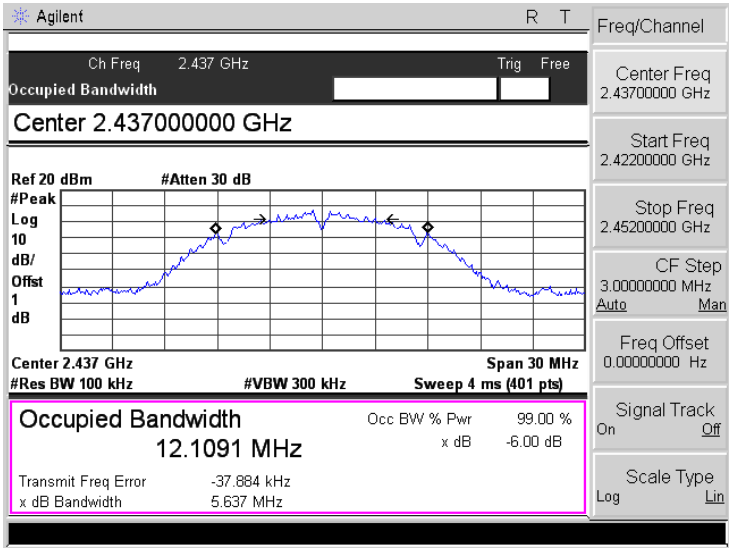
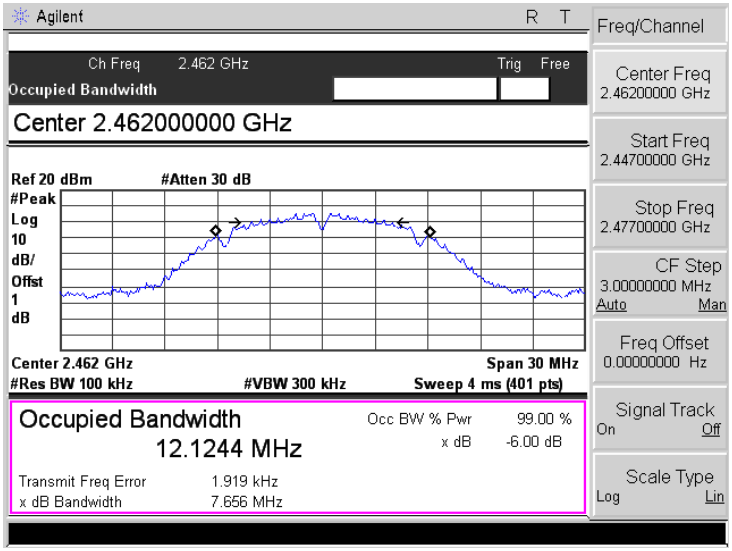
6.2 Test Procedure

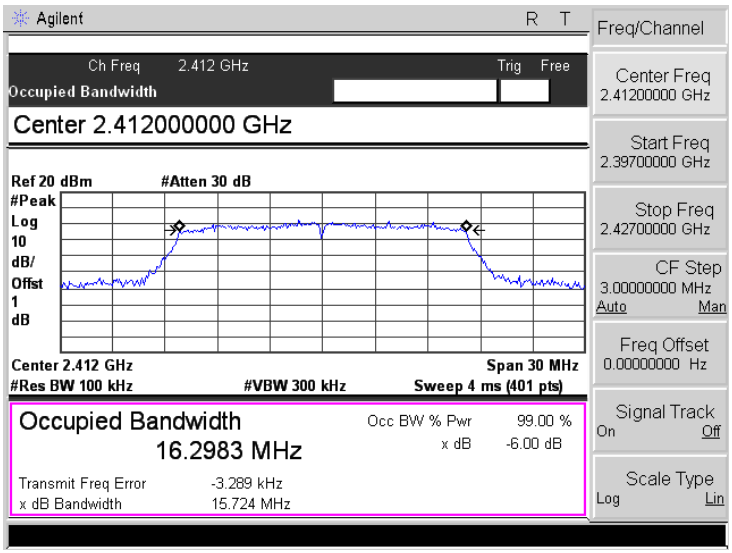
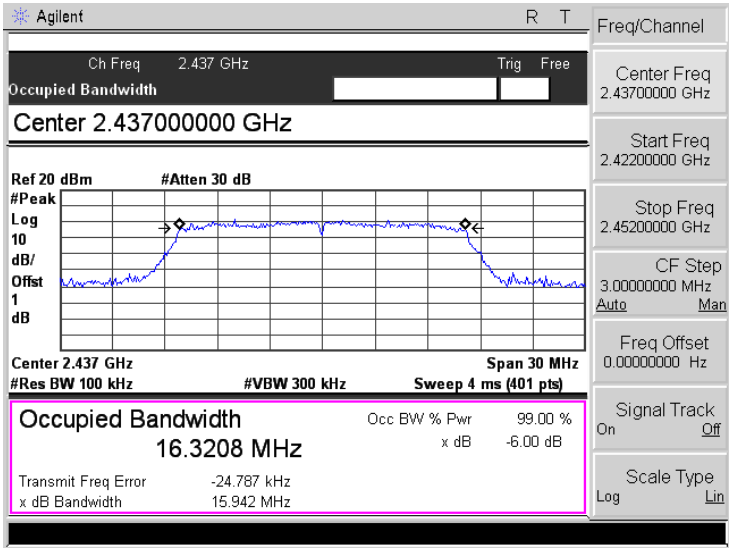
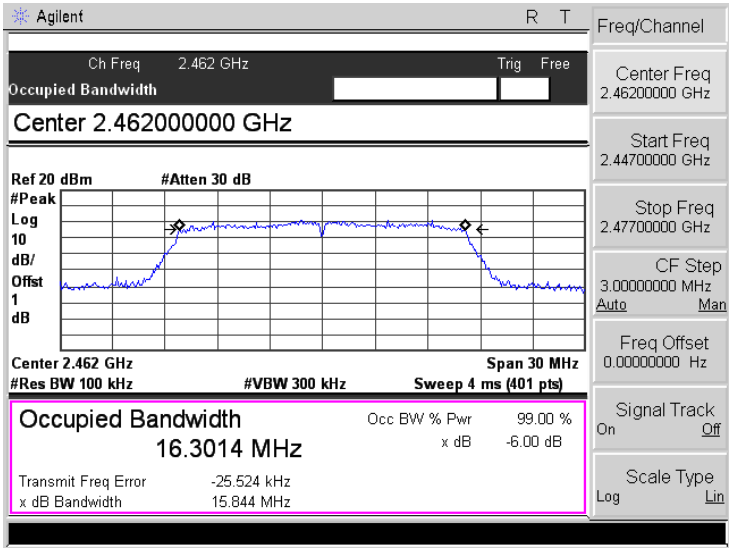
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points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

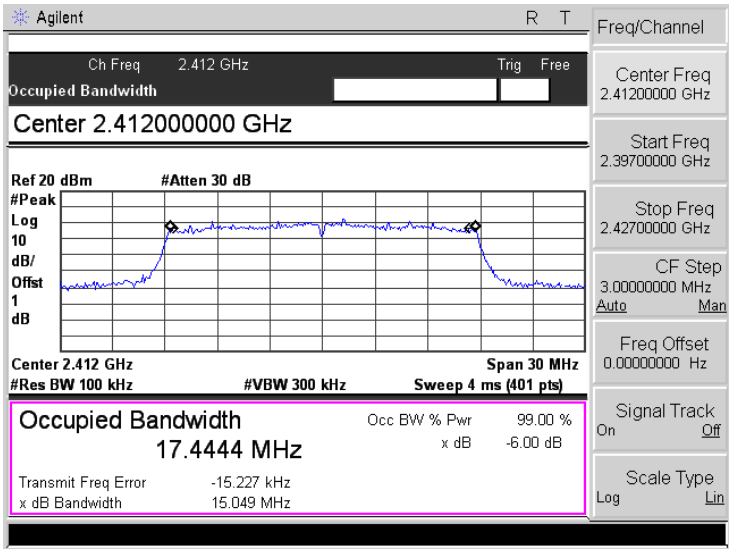
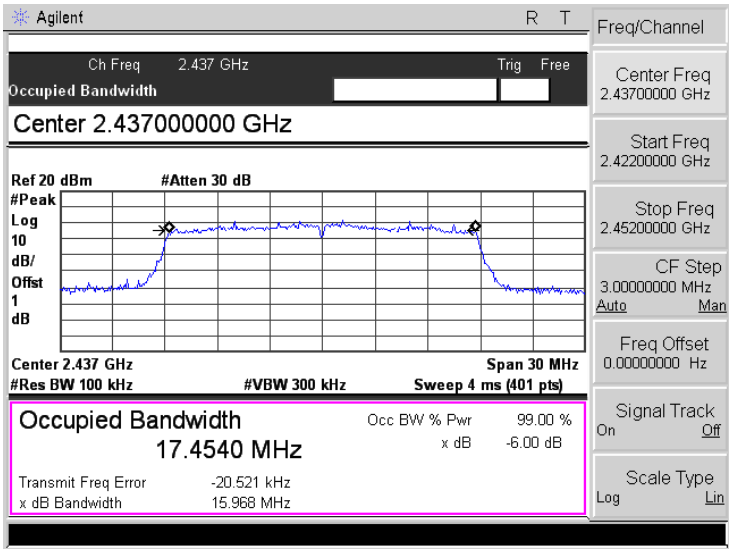
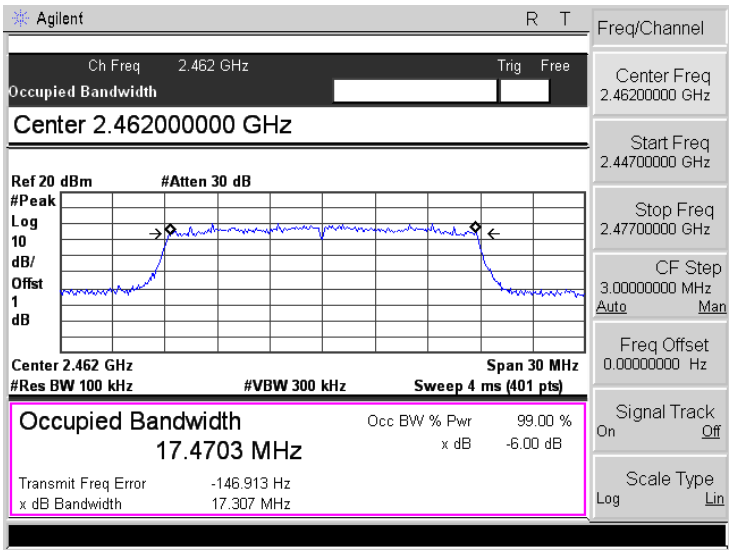
6.3 Summary of Test Results/Plots

Test Mode	Test Channel MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11b	2412	7.554	12.2590	≥500
	2437	5.637	12.1091	≥500
	2462	7.656	12.1244	≥500
802.11g	2412	15.724	16.2983	≥500
	2437	15.942	16.3208	≥500
	2462	15.844	16.3014	≥500
802.11n-HT20	2412	15.049	17.4444	≥500
	2437	15.968	17.4540	≥500
	2462	17.307	17.4703	≥500

Please refer to the following test plots:

802.11b-Low	
802.11b-Middle	
802.11b-High	

802.11g-Low	
802.11g-Middle	
802.11g-High	

802.11n-HT20-Low	
802.11n-HT20-Middle	
802.11n-HT20-High	

7. RF Output Power

7.1 Standard Applicable

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

7.2 Test Procedure

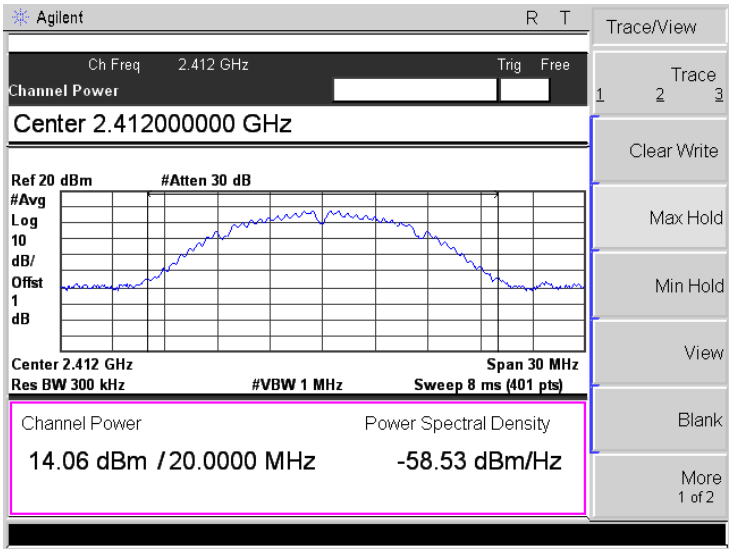
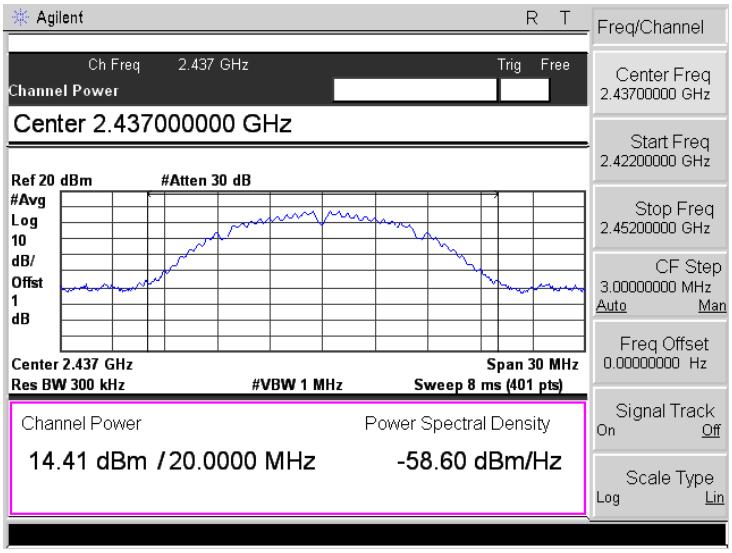
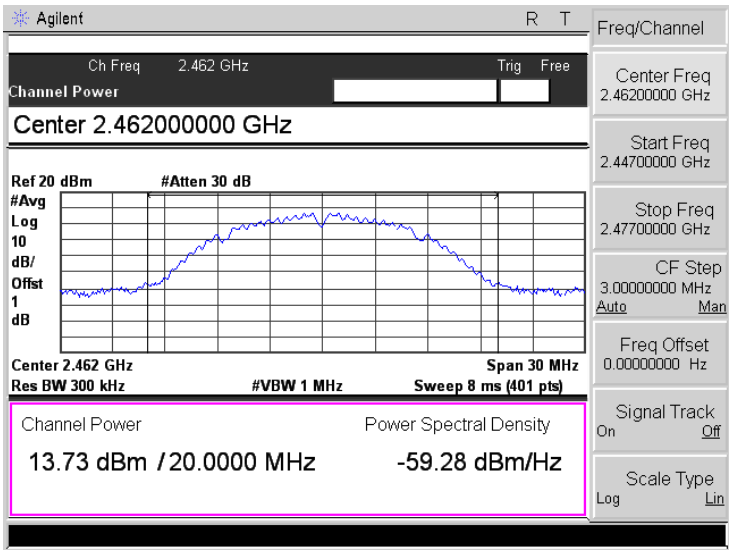
According to the KDB-558074 D01 v04, 9.2.2.2, when this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth

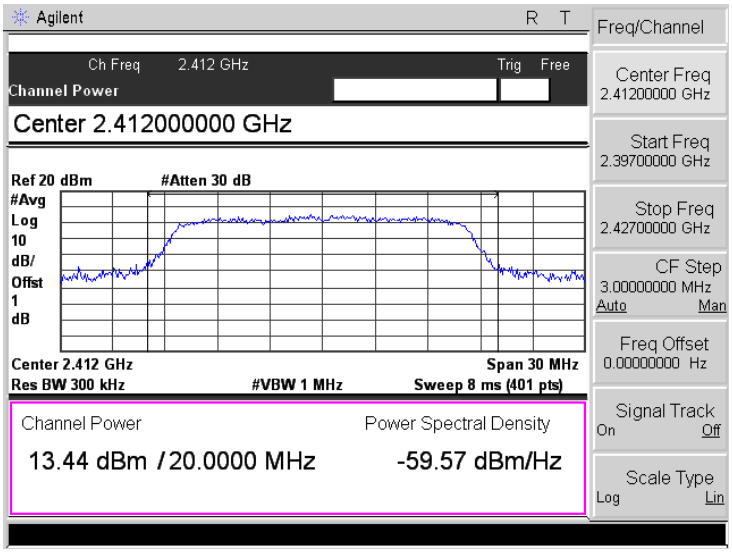
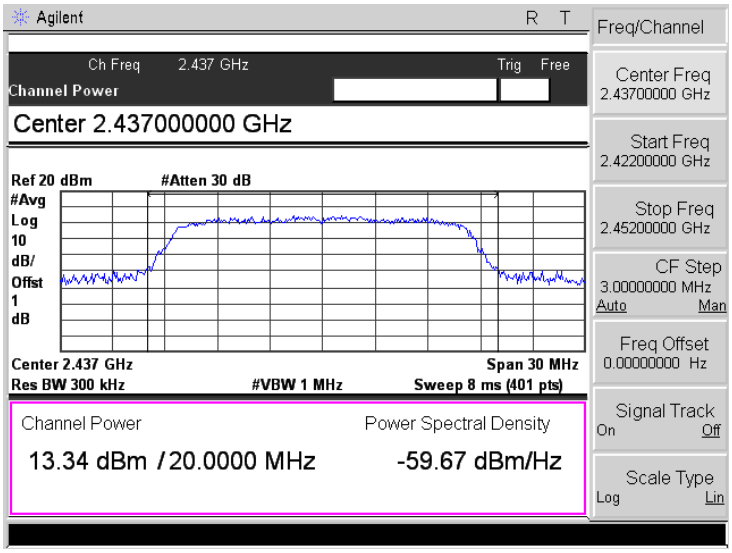
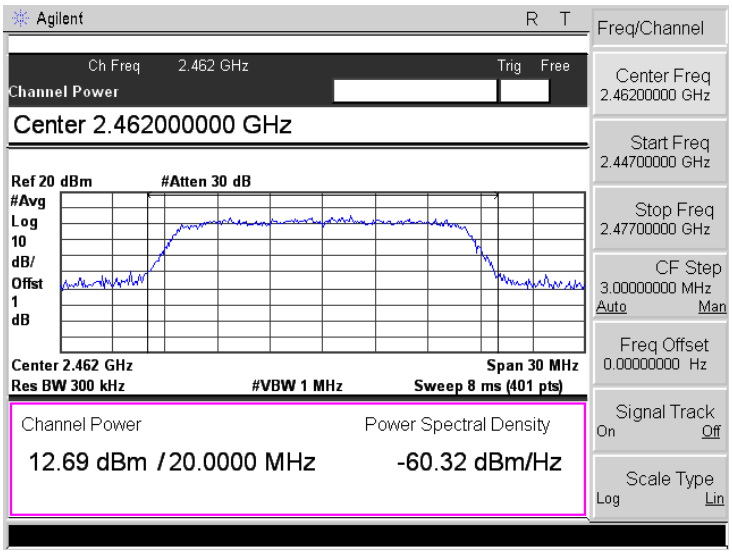
a) Set span to at least 1.5 times the OBW.
b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ 3 x RBW.
d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto.
f) Detector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

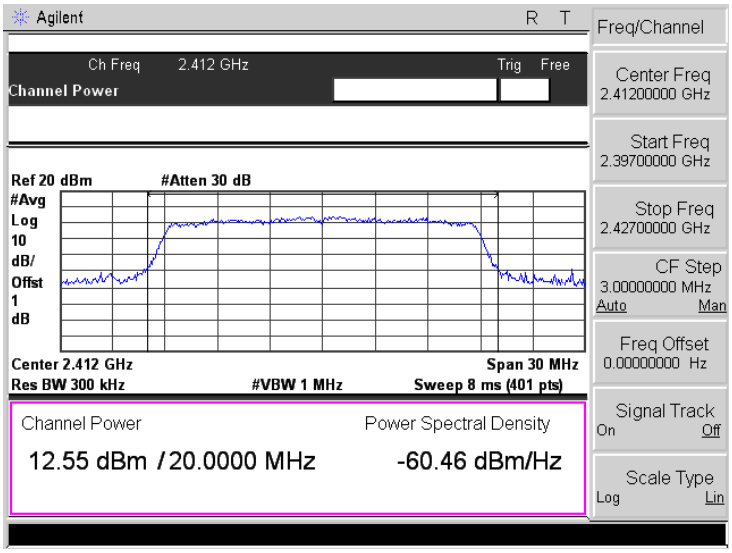
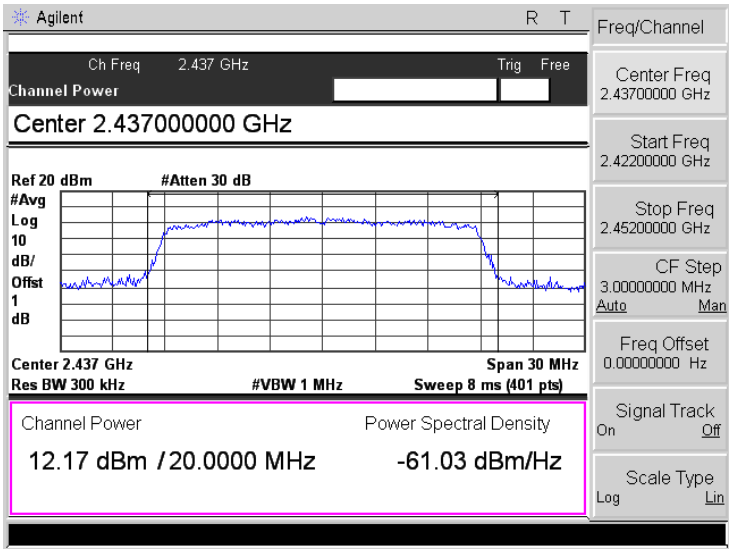
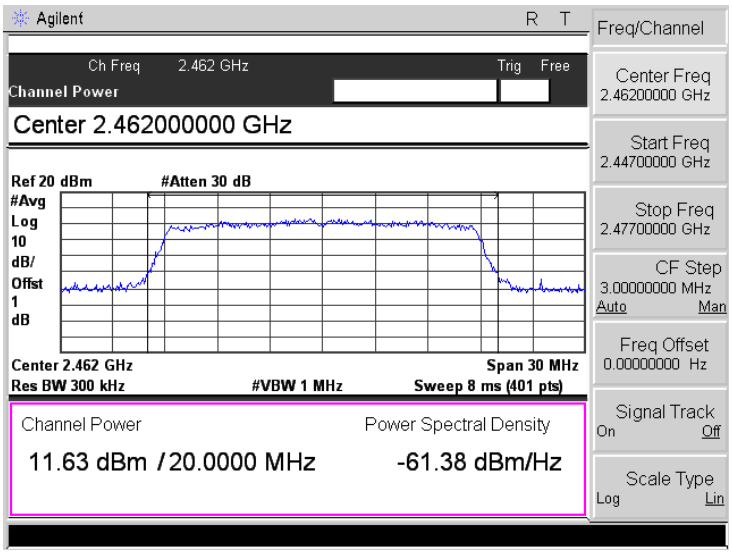
7.3 Summary of Test Results/Plots

Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
802.11b _11Mbps	2412	14.06	25.468	1000
	2437	14.41	27.606	1000
	2462	13.73	23.605	1000
802.11g_54Mbps	2412	13.44	22.080	1000
	2437	13.34	21.577	1000
	2462	12.69	18.578	1000
802.11n HT20_MCS7	2412	12.55	17.989	1000
	2437	12.17	16.482	1000
	2462	11.63	14.555	1000

Please refer to the following test plots:

802.11b-Low 11Mbps	
802.11b-Middle 11Mbps	
802.11b-High 11Mbps	

802.11g-Low 54Mbps	
802.11g-Middle 54Mbps	
802.11g-High 54Mbps	

802.11n-HT20-Low MCS7	
802.11n-HT20-Middle MCS7	
802.11n-HT20-High MCS7	

8. Field Strength of Spurious Emissions

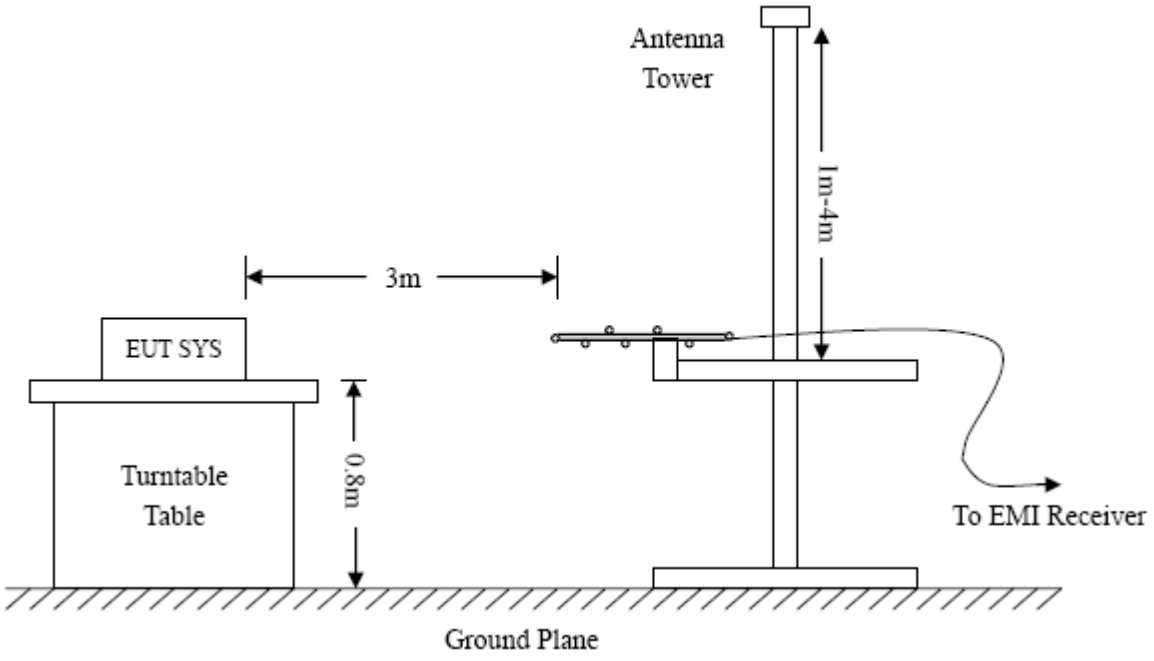
8.1 Standard Applicable

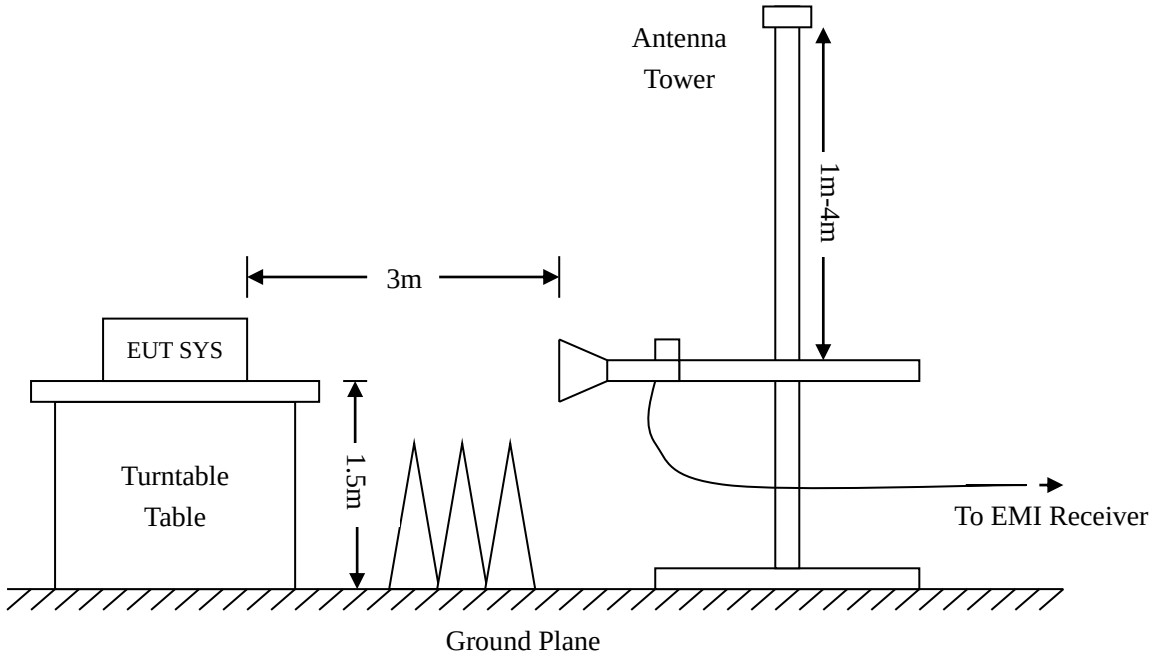
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

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

8.2 Test Procedure

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





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

8.3 Corrected Amplitude & Margin Calculation

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

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

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

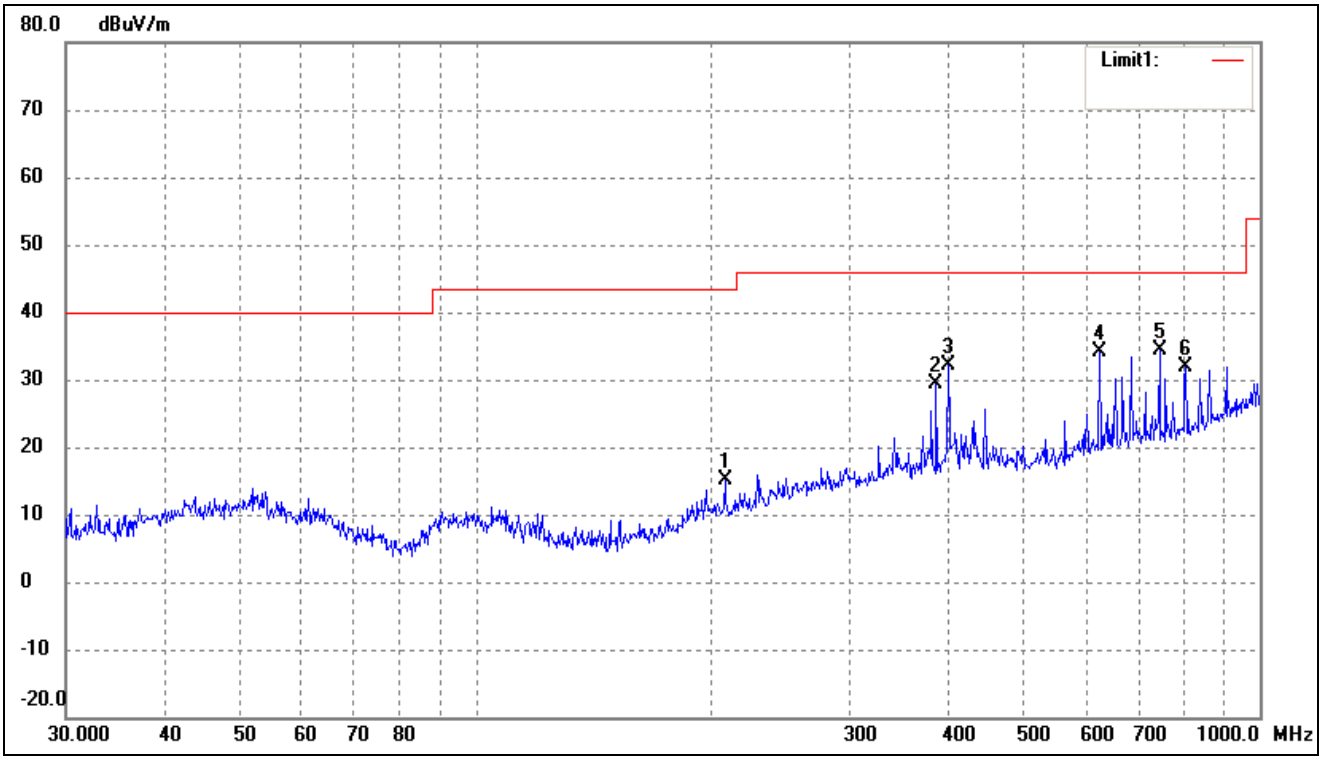
Margin = Corr. Ampl. – FCC Part 15 Limit

8.4 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.
All test modes (different data rate and different modulation) are performed, but only the worst case is recorded in this report.

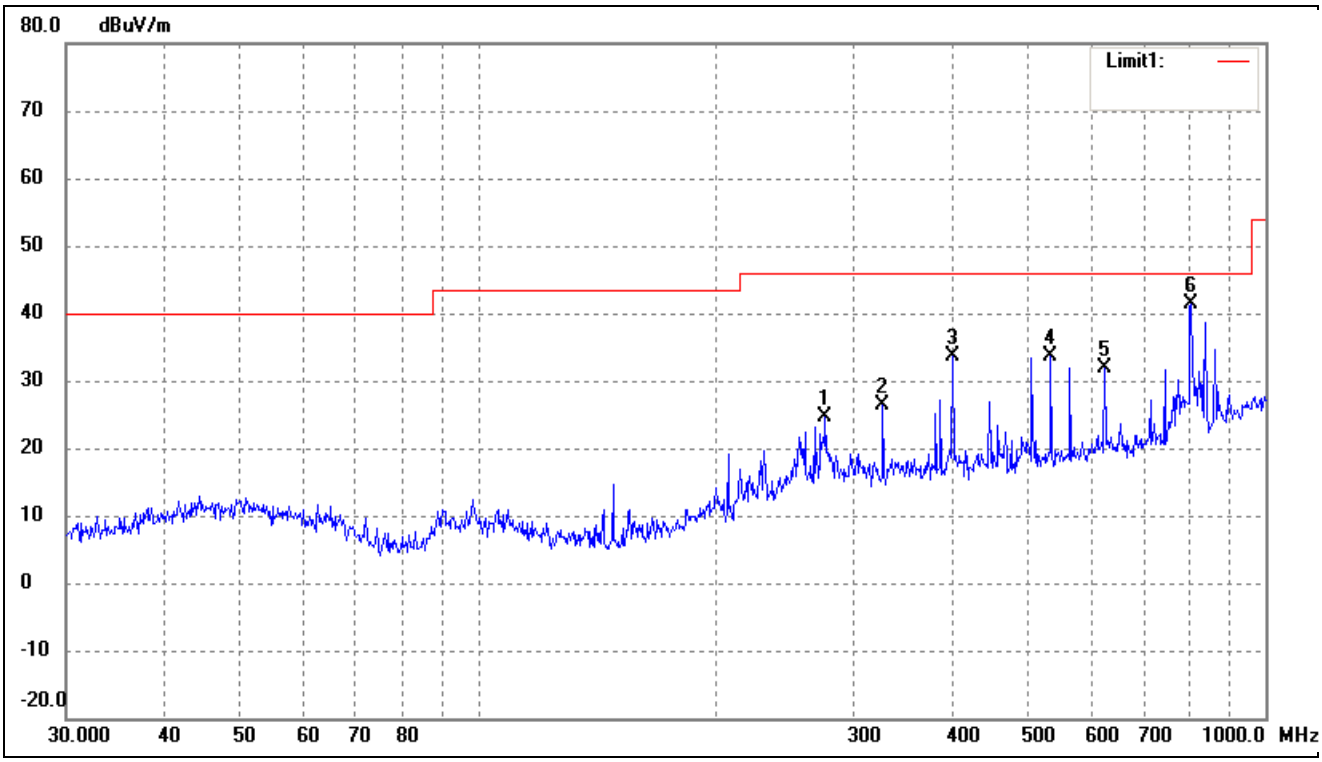
➢ Spurious Emissions Below 1GHz

802.11b			
Test Channel	Low	Polarity:	Horizontal



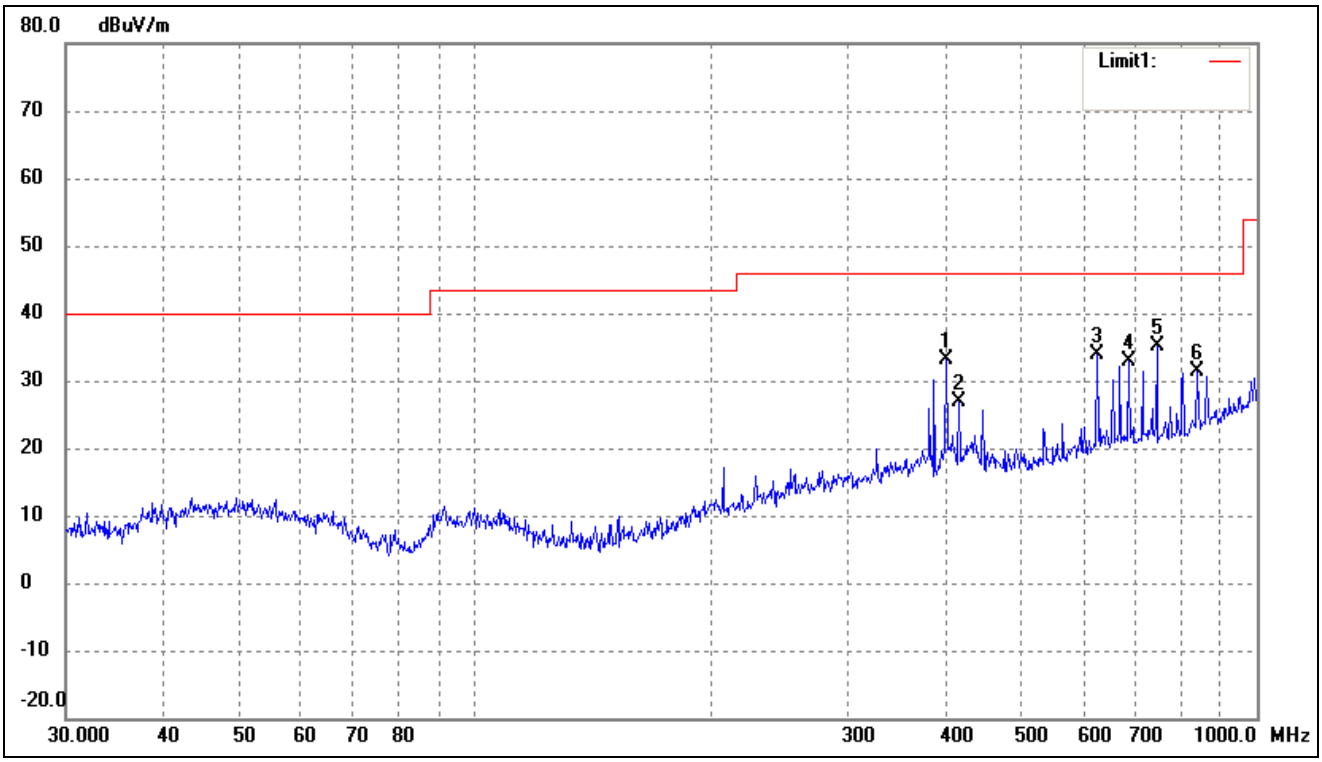
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	207.8501	29.02	-13.79	15.23	43.50	-28.27	339	100	peak
2	386.6338	38.16	-8.90	29.26	46.00	-16.74	98	100	peak
3	400.4319	40.71	-8.70	32.01	46.00	-13.99	279	100	peak
4	625.0780	40.41	-6.29	34.12	46.00	-11.88	90	100	peak
5	744.8661	39.38	-4.93	34.45	46.00	-11.55	304	100	peak
6	804.6028	35.50	-3.50	32.00	46.00	-14.00	232	100	peak

802.11b			
Test Channel	Low	Polarity:	Vertical



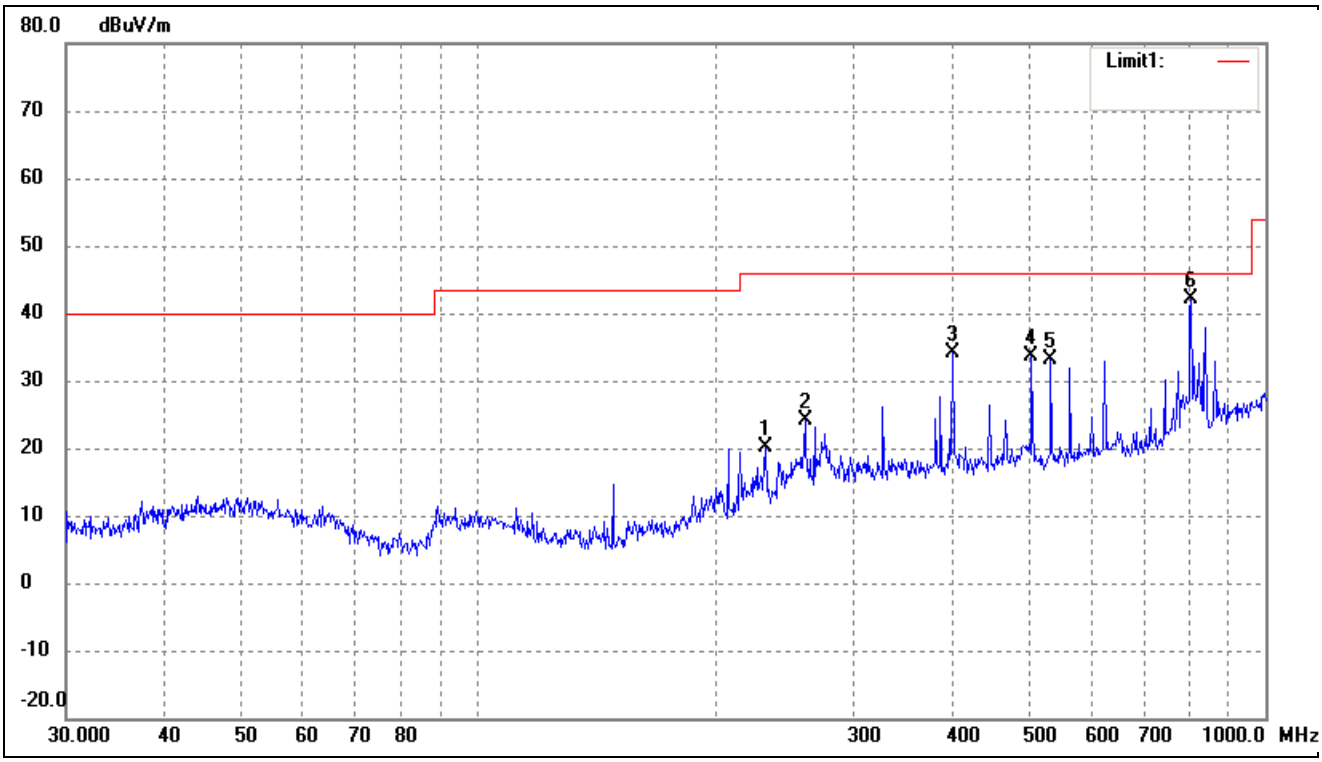
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	276.1236	34.93	-10.30	24.63	46.00	-21.37	219	100	peak
2	326.7395	35.38	-9.07	26.31	46.00	-19.69	96	100	peak
3	400.4319	42.43	-8.70	33.73	46.00	-12.27	317	100	peak
4	533.8321	41.62	-7.95	33.67	46.00	-12.33	94	100	peak
5	625.0780	38.20	-6.29	31.91	46.00	-14.09	93	100	peak
6	804.6028	44.83	-3.50	41.33	46.00	-4.67	133	100	peak

802.11b			
Test Channel	Middle	Polarity:	Horizontal



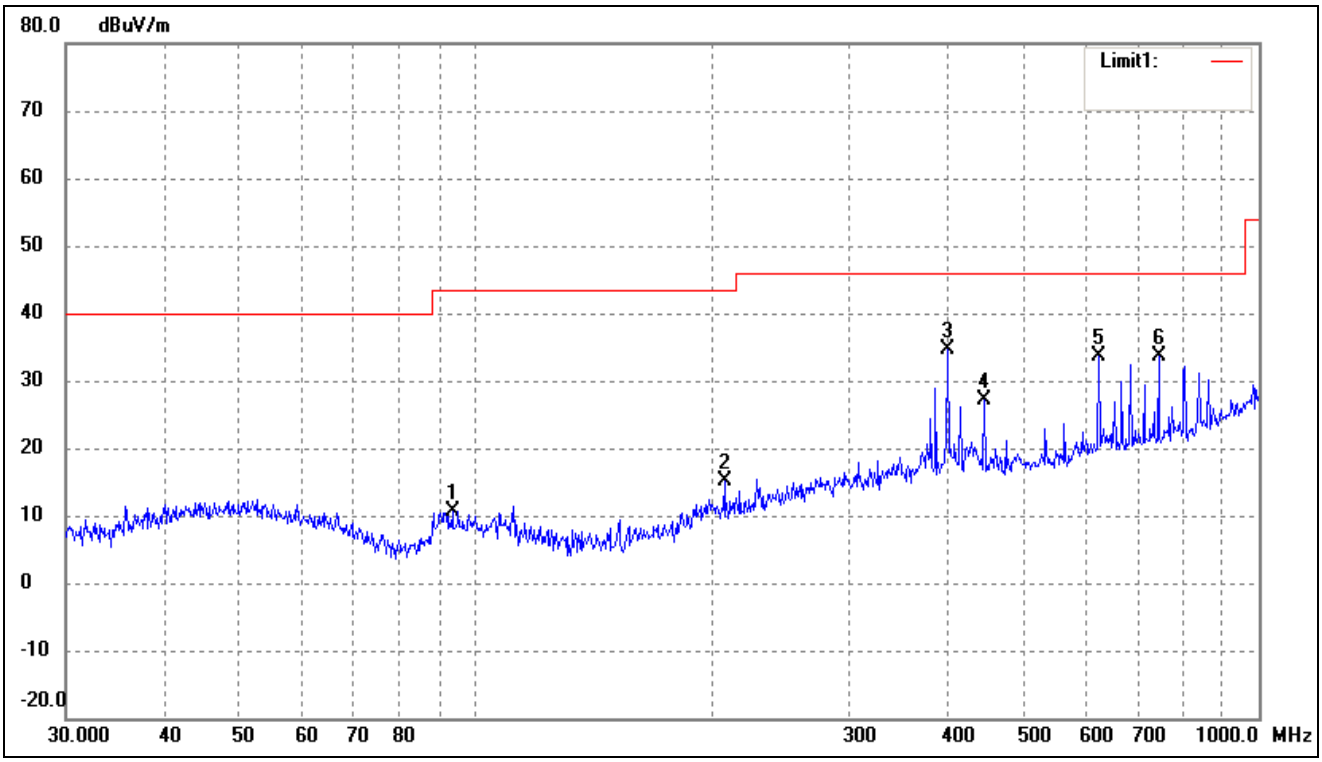
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	400.4319	41.94	-8.70	33.24	46.00	-12.76	75	100	peak
2	416.1791	35.45	-8.50	26.95	46.00	-19.05	320	100	peak
3	625.0780	40.06	-6.29	33.77	46.00	-12.23	60	100	peak
4	684.7454	38.57	-5.77	32.80	46.00	-13.20	332	100	peak
5	744.8661	40.16	-4.93	35.23	46.00	-10.77	59	100	peak
6	839.1818	34.18	-2.80	31.38	46.00	-14.62	146	100	peak

802.11b			
Test Channel	Middle	Polarity:	Vertical



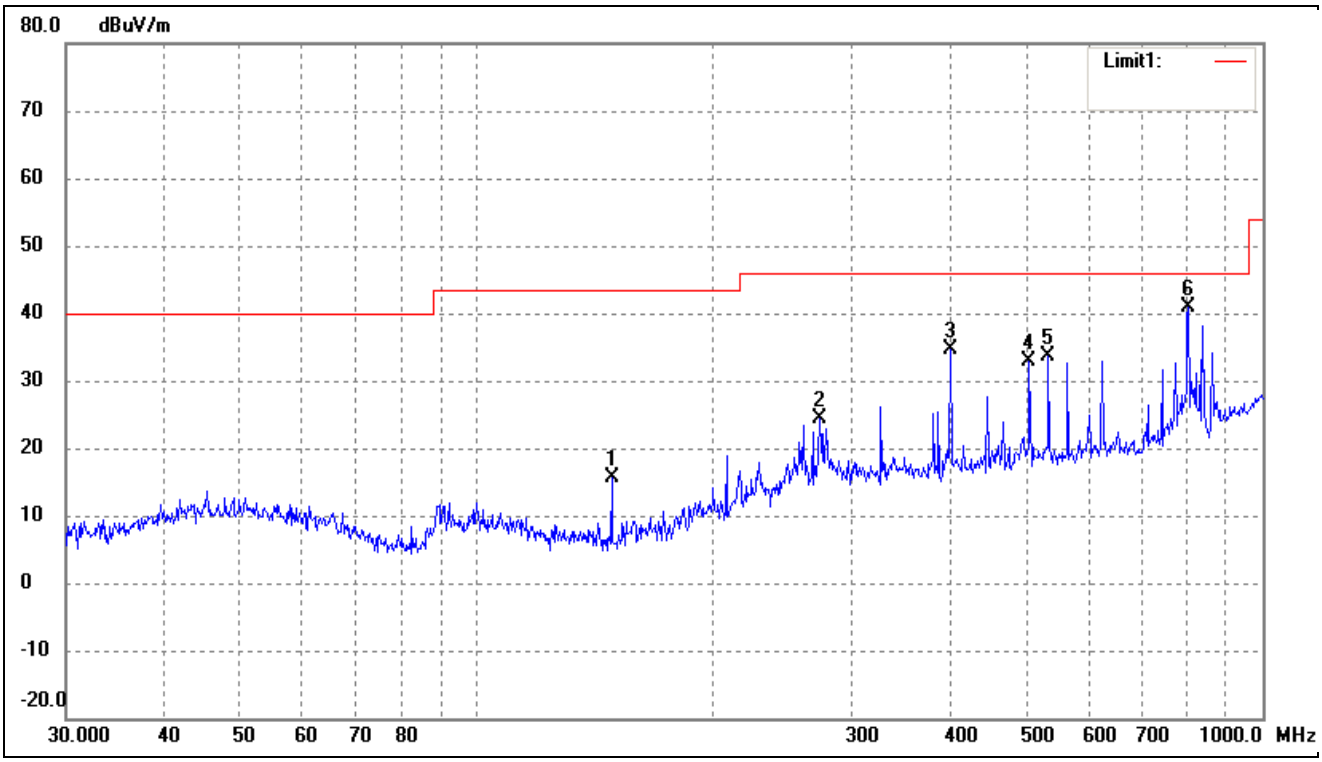
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	231.7179	32.46	-12.24	20.22	46.00	-25.78	137	100	peak
2	260.1444	35.08	-10.94	24.14	46.00	-21.86	143	100	peak
3	400.4319	42.89	-8.70	34.19	46.00	-11.81	89	100	peak
4	504.7062	42.08	-8.39	33.69	46.00	-12.31	234	100	peak
5	533.8321	41.04	-7.95	33.09	46.00	-12.91	99	100	peak
6	804.6028	45.66	-3.50	42.16	46.00	-3.84	131	100	peak

802.11b			
Test Channel	High	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	93.4402	26.80	-16.12	10.68	43.50	-32.82	165	100	peak
2	207.8501	28.95	-13.79	15.16	43.50	-28.34	121	100	peak
3	400.4319	43.25	-8.70	34.55	46.00	-11.45	90	100	peak
4	446.4141	35.75	-8.56	27.19	46.00	-18.81	145	100	peak
5	625.0780	40.00	-6.29	33.71	46.00	-12.29	80	100	peak
6	744.8661	38.62	-4.93	33.69	46.00	-12.31	251	100	peak

802.11b			
Test Channel	High	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	148.4410	34.22	-18.71	15.51	43.50	-27.99	69	100	peak
2	273.2341	34.93	-10.43	24.50	46.00	-21.50	90	100	peak
3	400.4319	43.36	-8.70	34.66	46.00	-11.34	142	100	peak
4	504.7062	41.24	-8.39	32.85	46.00	-13.15	95	100	peak
5	533.8321	41.61	-7.95	33.66	46.00	-12.34	83	100	peak
6	804.6028	44.43	-3.50	40.93	46.00	-5.07	208	100	peak

- Spurious Emissions Below 1GHz
- *Test Mode: 802.11b (worst case)*

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2412MHz							
4824.00	61.03	-3.87	57.16	74.00	-16.84	H	PK
4824.00	46.46	-3.87	42.59	54.00	-11.41	H	AV
7236.00	56.90	1.14	58.04	74.00	-15.96	H	PK
7236.00	42.44	1.19	43.63	54.00	-10.37	H	AV
4824.00	61.44	-3.86	57.58	74.00	-16.42	V	PK
4824.00	47.88	-3.86	44.02	54.00	-9.98	V	AV
7236.00	57.15	1.10	58.25	74.00	-15.75	V	PK
7236.00	42.80	1.10	43.90	54.00	-10.10	V	AV
Middle Channel-2437MHz							
4874.00	61.41	-3.74	57.67	74.00	-16.33	H	PK
4874.00	47.16	-3.74	43.42	54.00	-10.58	H	AV
7311.00	56.10	1.47	57.57	74.00	-16.43	H	PK
7311.00	42.69	1.47	44.16	54.00	-9.84	H	AV
4874.00	60.42	-3.74	56.68	74.00	-17.32	V	PK
4874.00	45.68	-3.74	41.94	54.00	-12.06	V	AV
7311.00	56.32	1.47	57.79	74.00	-16.21	V	PK
7311.00	41.12	1.47	42.59	54.00	-11.41	V	AV
High Channel-2462MHz							
4924.00	61.66	-3.59	58.07	74.00	-15.93	H	PK
4924.00	47.59	-3.59	44.00	54.00	-10.00	H	AV
7386.00	55.47	1.79	57.26	74.00	-16.74	H	PK
7386.00	40.91	1.79	42.70	54.00	-11.30	H	AV
4924.00	61.16	-3.59	57.57	74.00	-16.43	V	PK
4924.00	47.31	-3.59	43.72	54.00	-10.28	V	AV
7386.00	56.79	1.79	58.58	74.00	-15.42	V	PK
7440.00	42.12	1.79	43.91	54.00	-10.09	V	AV

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

9. Out of Band Emissions

9.1 Standard Applicable

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

9.2 Test Procedure

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

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

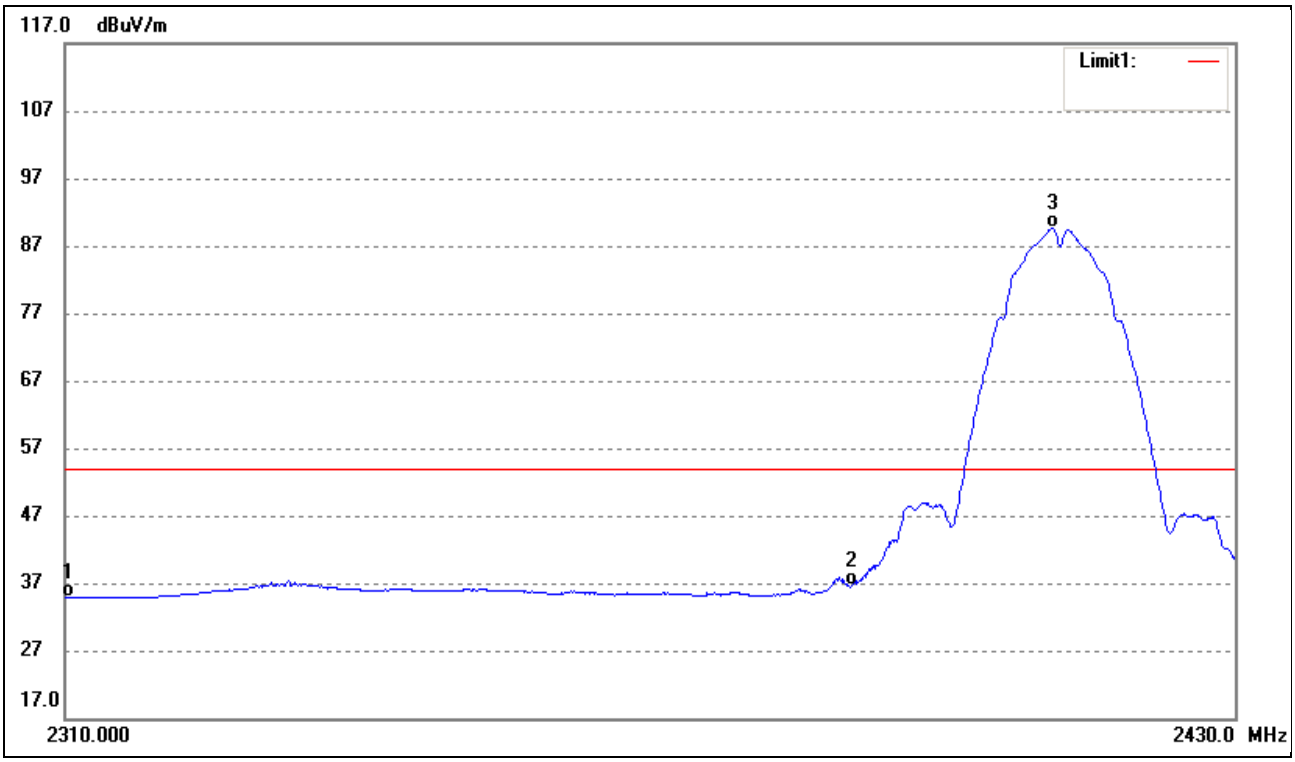
According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:
1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW ≥ 300 kHz.
5. Detector = peak.
6. Trace Mode = max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

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

9.3 Summary of Test Results/Plots

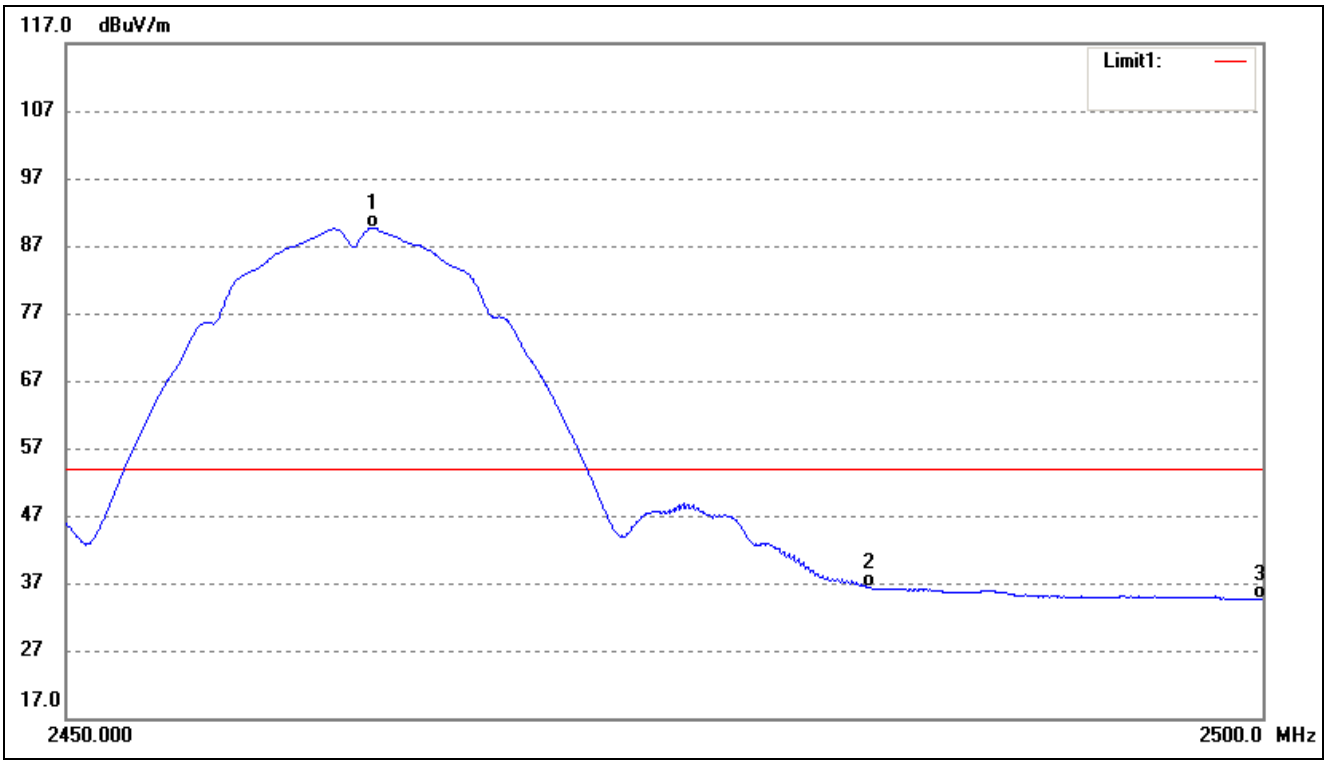
➢ Radiated test

802.11b			
Test Channel	Low	Polarity:	Vertical(worst case)



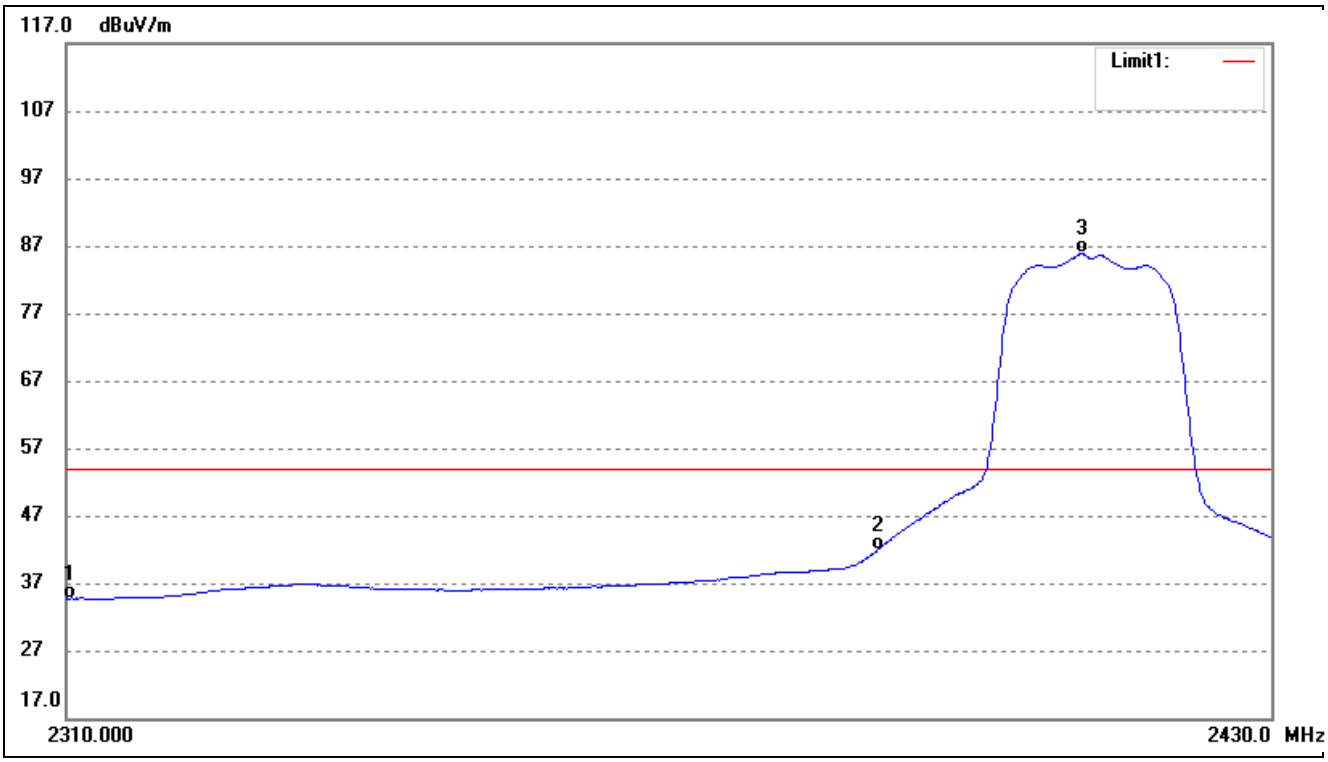
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	42.67	-7.78	34.89	54.00	-19.11	Average Detector
	2310.000	54.48	-7.78	46.70	74.00	-27.30	Peak Detector
2	2390.000	43.95	-7.32	36.63	54.00	-17.37	Average Detector
	2390.000	56.31	-7.32	48.99	74.00	-25.01	Peak Detector
3	2410.878	96.89	-7.19	89.70	/	/	Average Detector
	2410.633	101.33	-7.19	94.14	/	/	Peak Detector

802.11b			
Test Channel	High	Polarity:	Vertical(worst case)



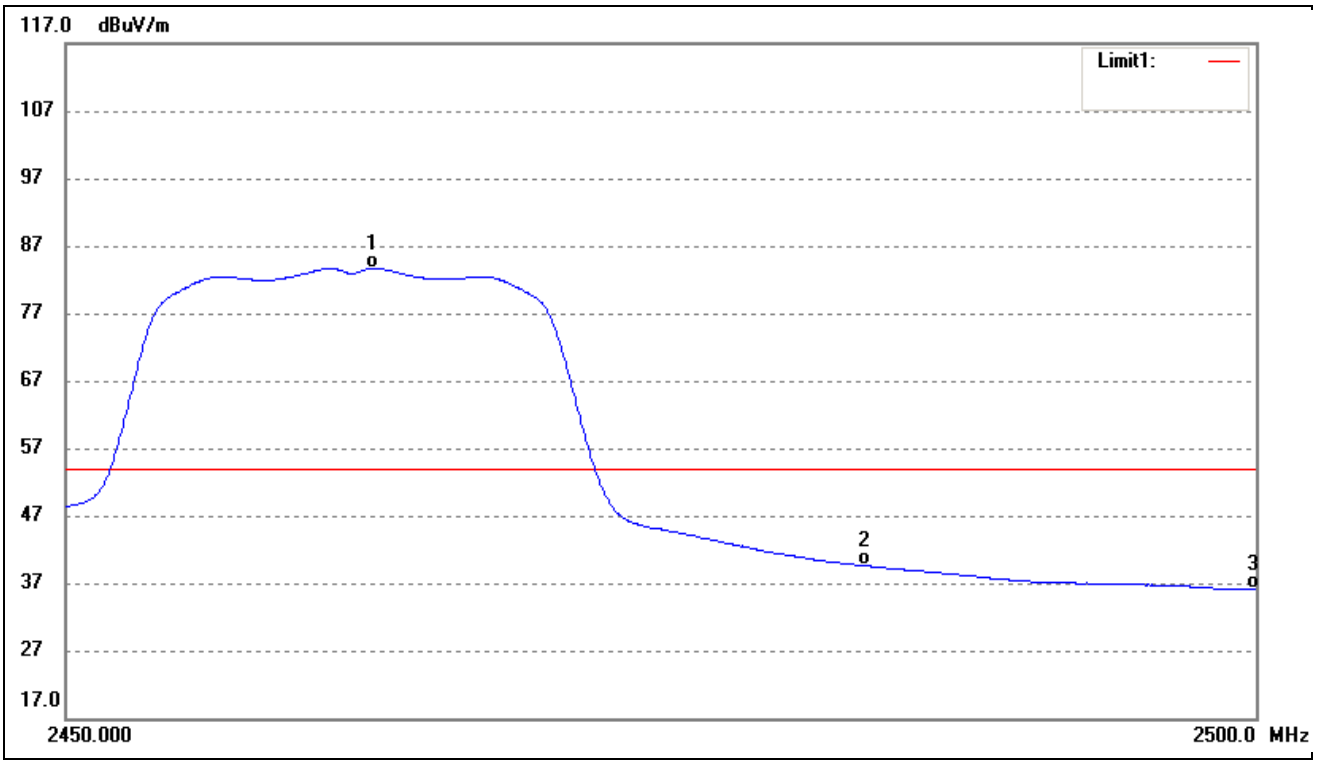
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	2462.704	96.59	-6.89	89.70	/	/	Average Detector
	2462.903	100.61	-6.89	93.72	/	/	Peak Detector
2	2483.500	43.03	-6.77	36.26	54.00	-17.74	Average Detector
	2483.500	55.03	-6.77	48.26	74.00	-25.74	Peak Detector
3	2500.000	41.35	-6.67	34.68	54.00	-19.32	Average Detector
	2500.000	53.90	-6.67	47.23	74.00	-26.77	Peak Detector

802.11g			
Test Channel	Low	Polarity:	Vertical(worst case)



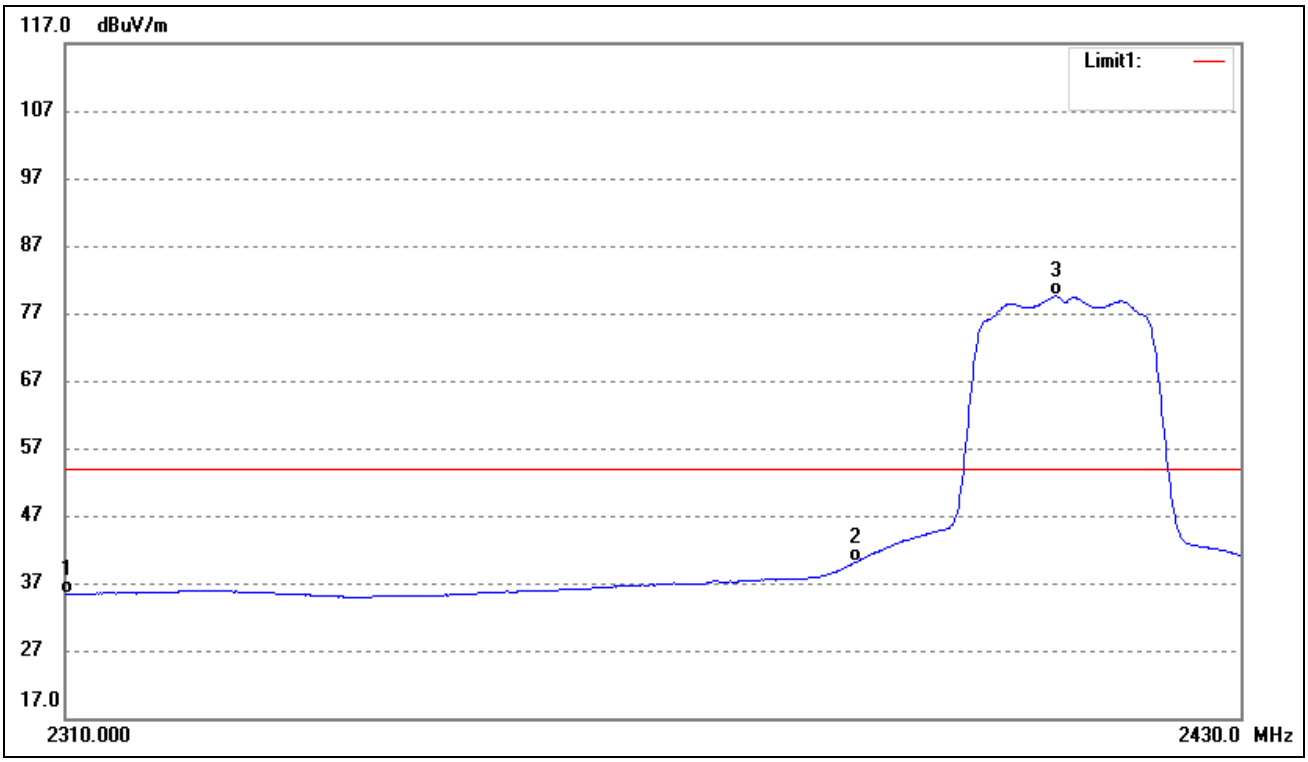
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	42.53	-7.78	34.75	54.00	-19.25	Average Detector
	2310.000	55.22	-7.78	47.44	74.00	-26.56	Peak Detector
2	2390.000	49.20	-7.32	41.88	54.00	-12.12	Average Detector
	2390.000	69.27	-7.32	61.95	74.00	-12.05	Peak Detector
3	2410.756	93.01	-7.19	85.82	/	/	Average Detector
	2411.366	104.21	-7.19	97.02	/	/	Peak Detector

802.11g			
Test Channel	High	Polarity:	Vertical(worst case)



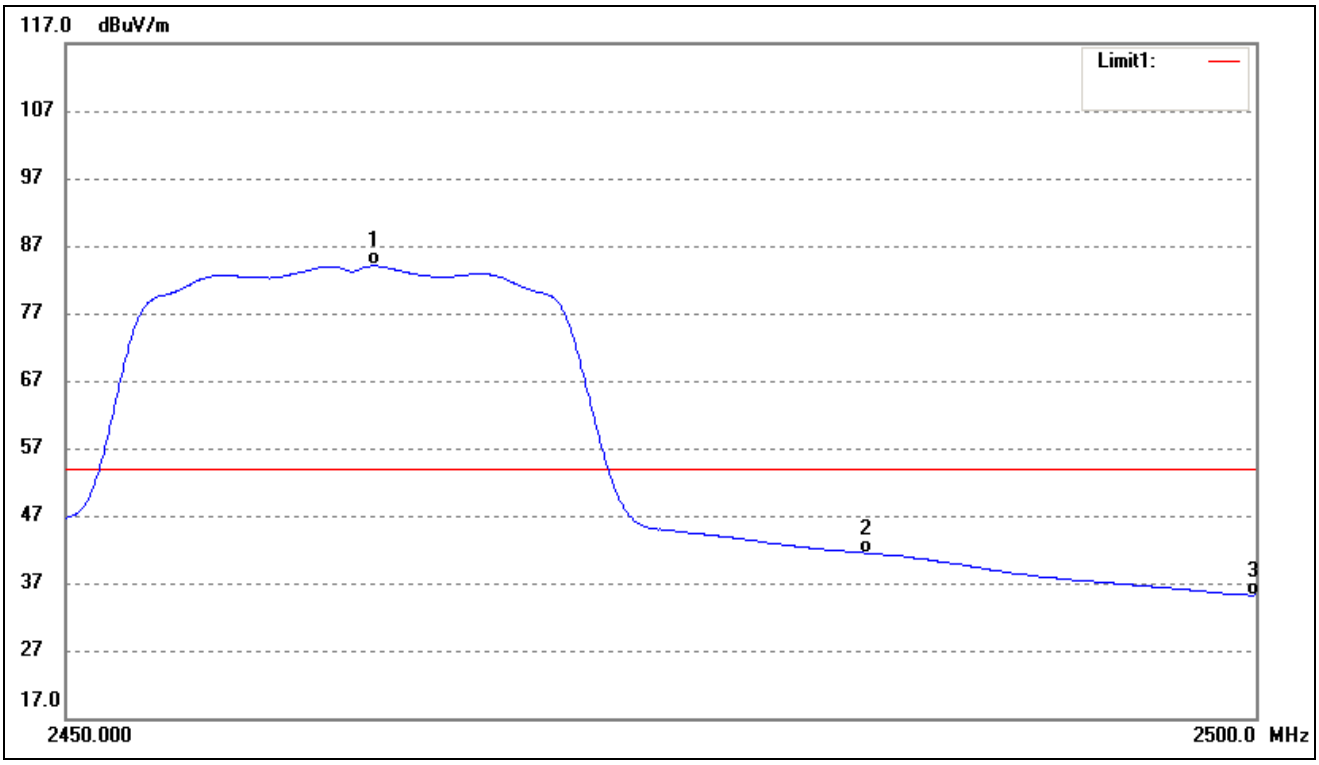
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2462.803	90.58	-6.89	83.69	/	/	Average Detector
	2461.908	101.96	-6.89	95.07	/	/	Peak Detector
2	2483.500	46.33	-6.77	39.56	54.00	-14.44	Average Detector
	2483.500	63.88	-6.77	57.11	74.00	-16.89	Peak Detector
3	2500.000	42.69	-6.67	36.02	54.00	-17.98	Average Detector
	2500.000	54.93	-6.67	48.26	74.00	-25.74	Peak Detector

802.11n-HT20			
Test Channel	Low	Polarity:	Vertical(worst case)



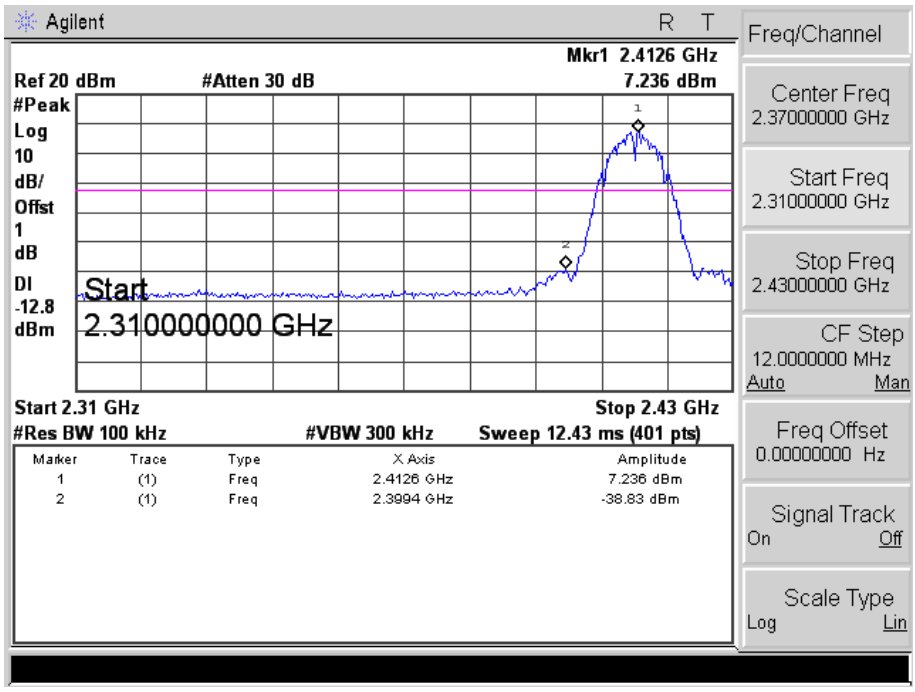
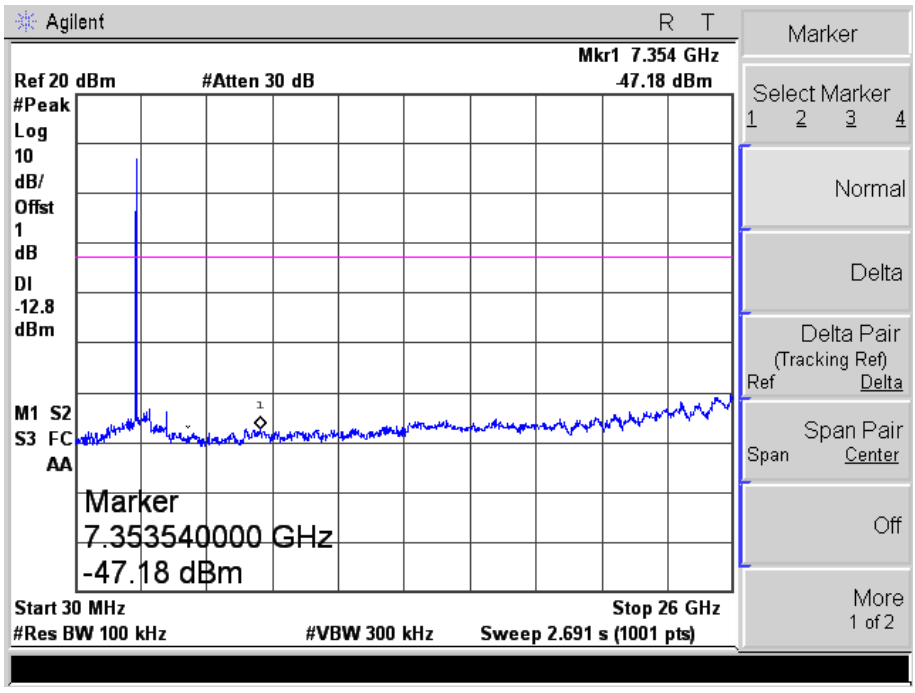
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	43.20	-7.78	35.42	54.00	-18.58	Average Detector
	2310.000	56.04	-7.78	48.26	74.00	-25.74	Peak Detector
2	2390.000	47.50	-7.32	40.18	54.00	-13.82	Average Detector
	2390.000	69.95	-7.32	62.63	74.00	-11.37	Peak Detector
3	2410.756	86.73	-7.19	79.54	/	/	Average Detector
	2410.267	102.03	-7.19	94.84	/	/	Peak Detector

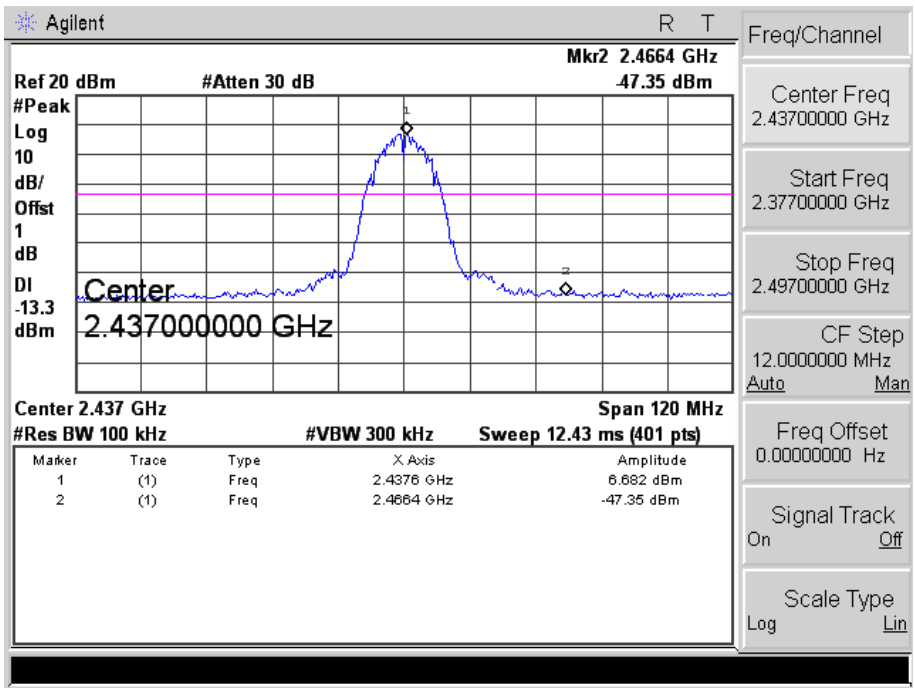
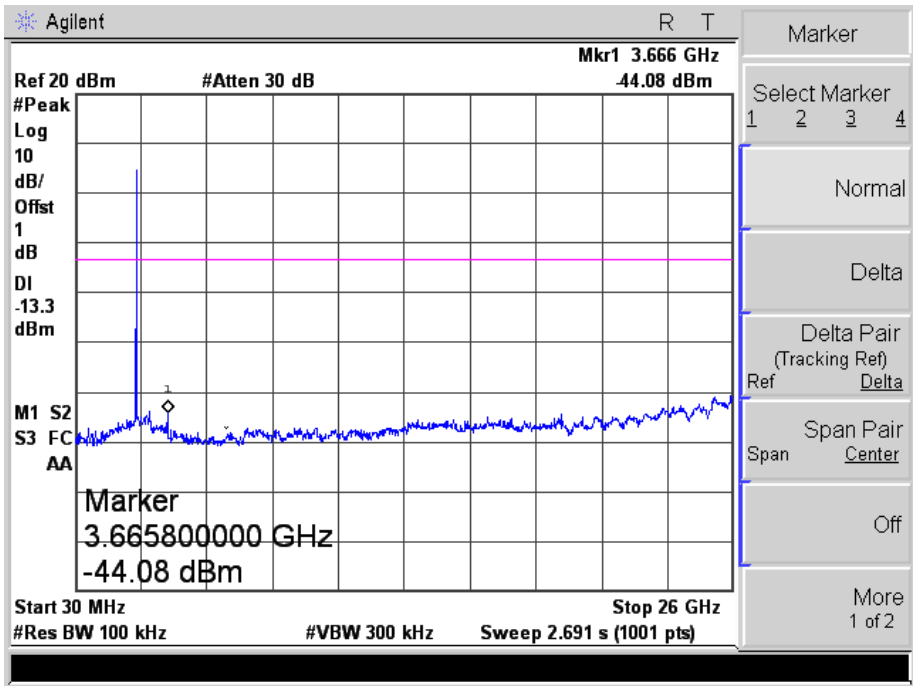
802.11n-HT20			
Test Channel	High	Polarity:	Vertical(worst case)

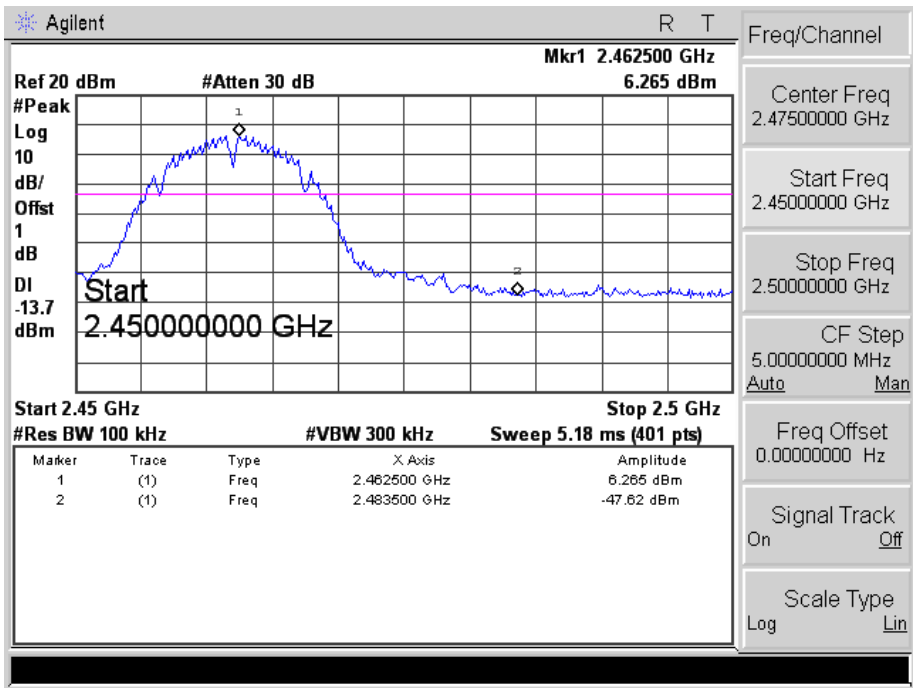
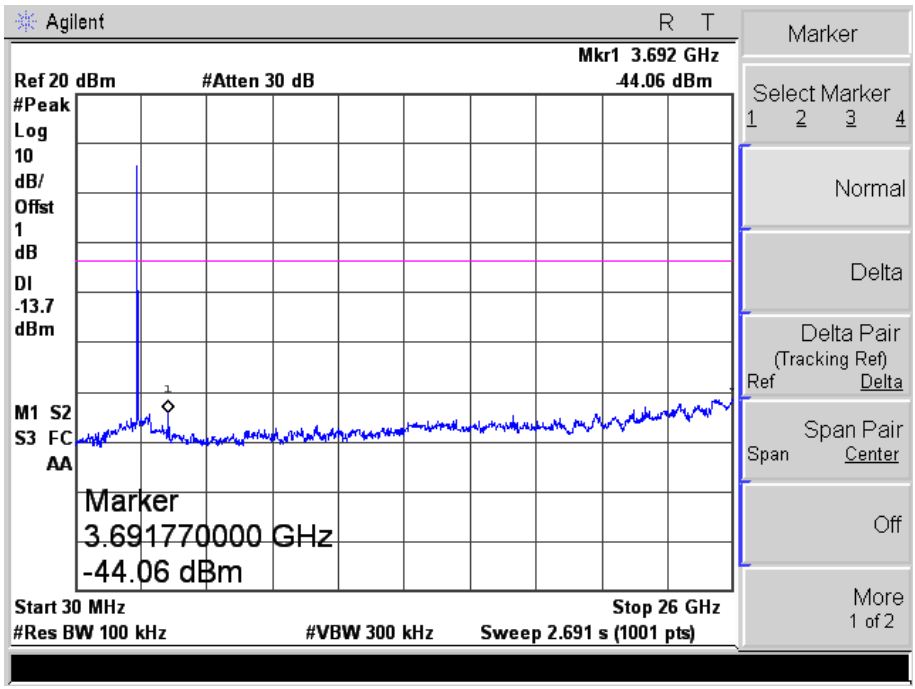


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2462.853	90.92	-6.89	84.03	/	/	Average Detector
	2461.858	102.28	-6.89	95.39	/	/	Peak Detector
2	2483.500	48.26	-6.77	41.49	54.00	-12.51	Average Detector
	2483.500	63.65	-6.77	56.88	74.00	-17.12	Peak Detector
3	2500.000	41.89	-6.67	35.22	54.00	-18.78	Average Detector
	2500.000	56.49	-6.67	49.82	74.00	-24.18	Peak Detector

➢ Conducted test

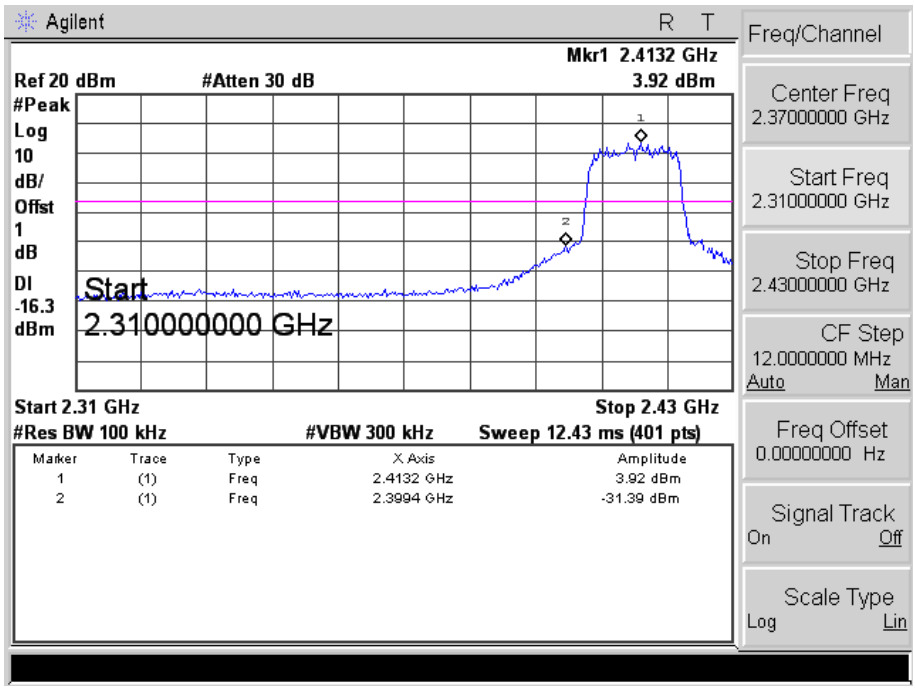
802.11b	
Low	 

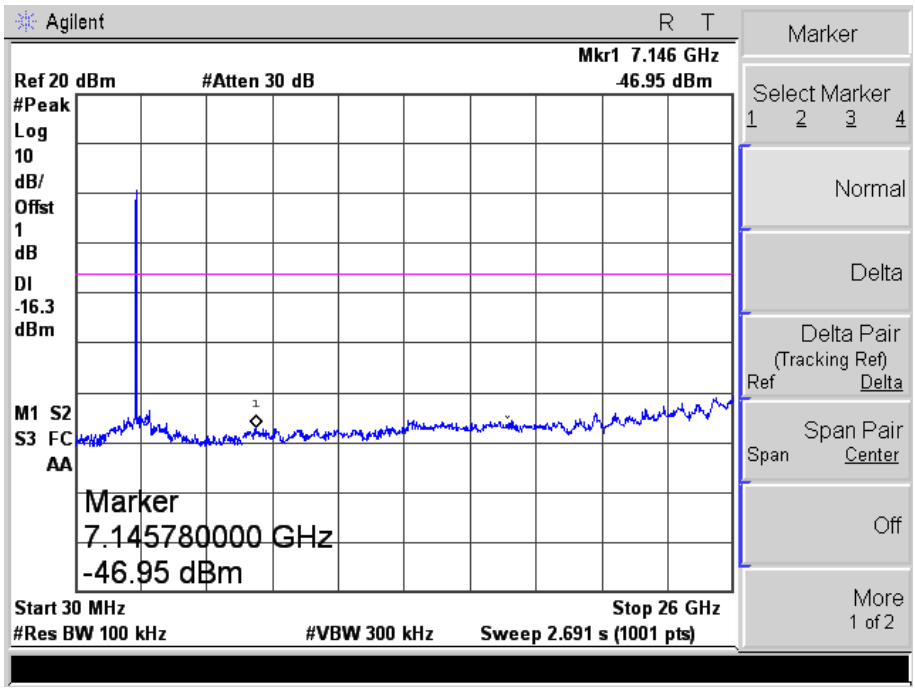
802.11b	
Middle	 

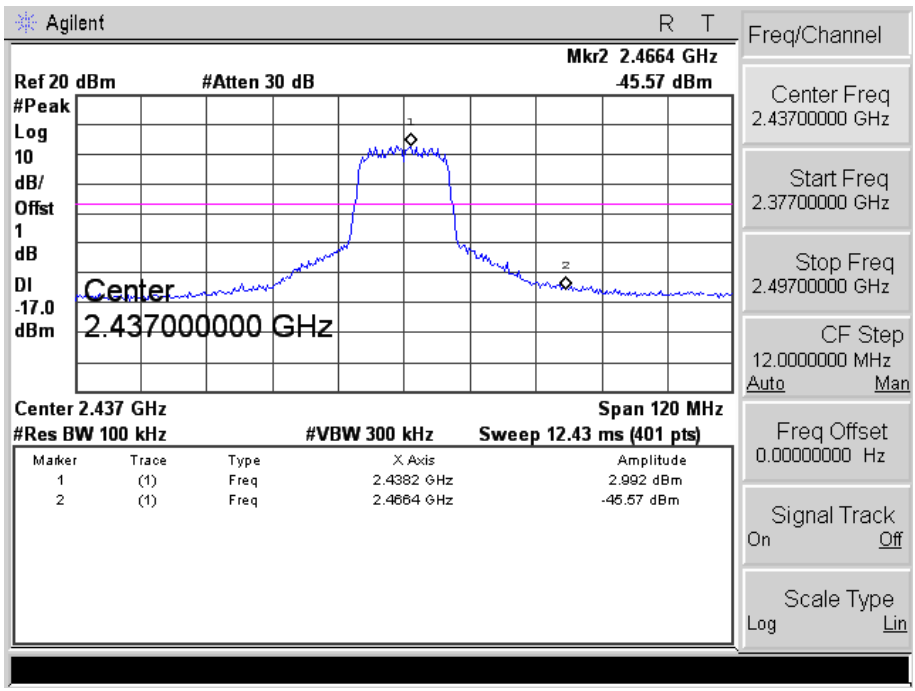
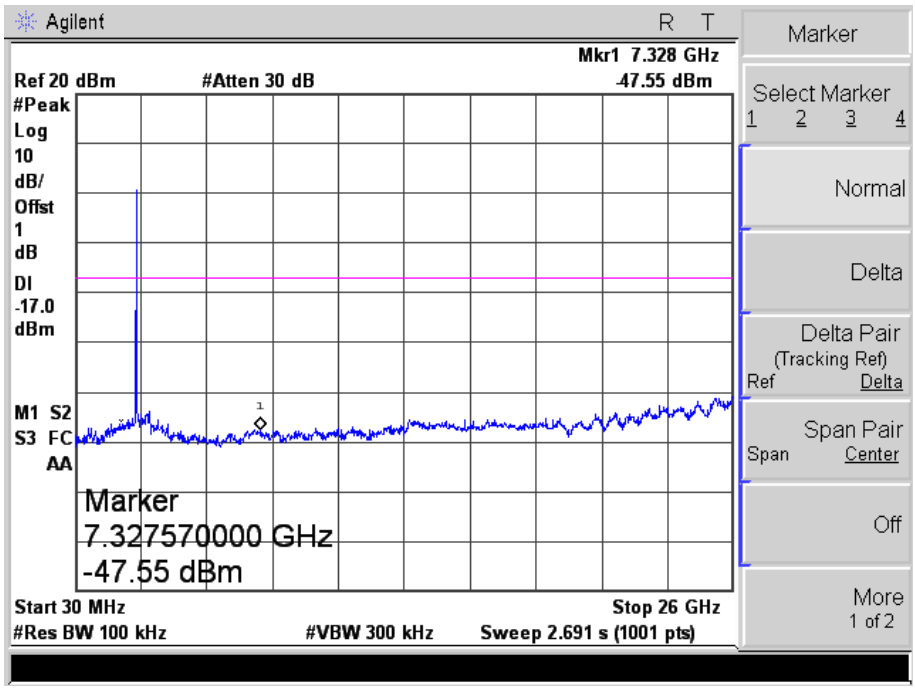
802.11b	
High	 

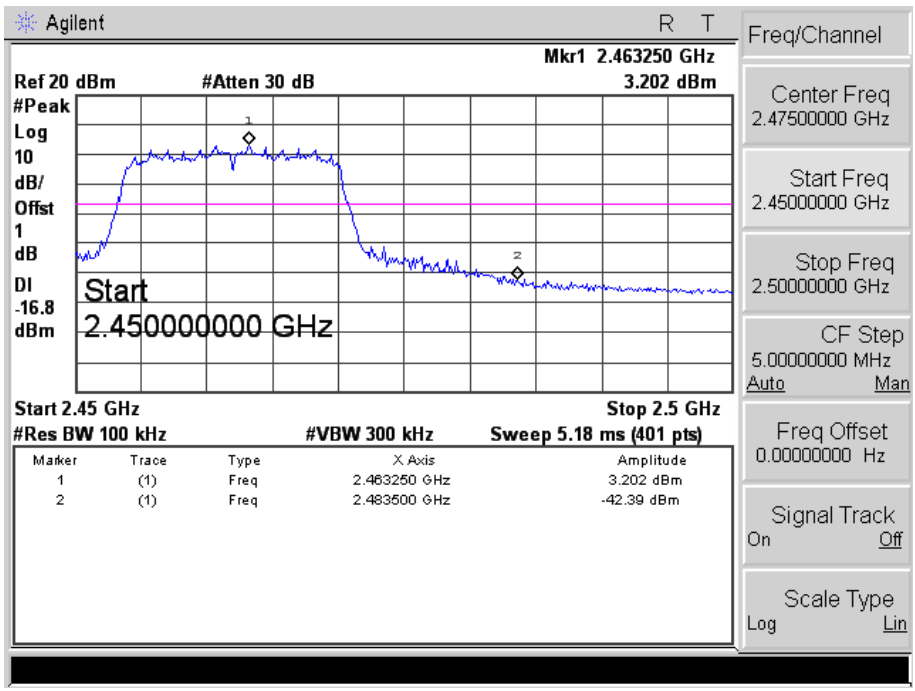
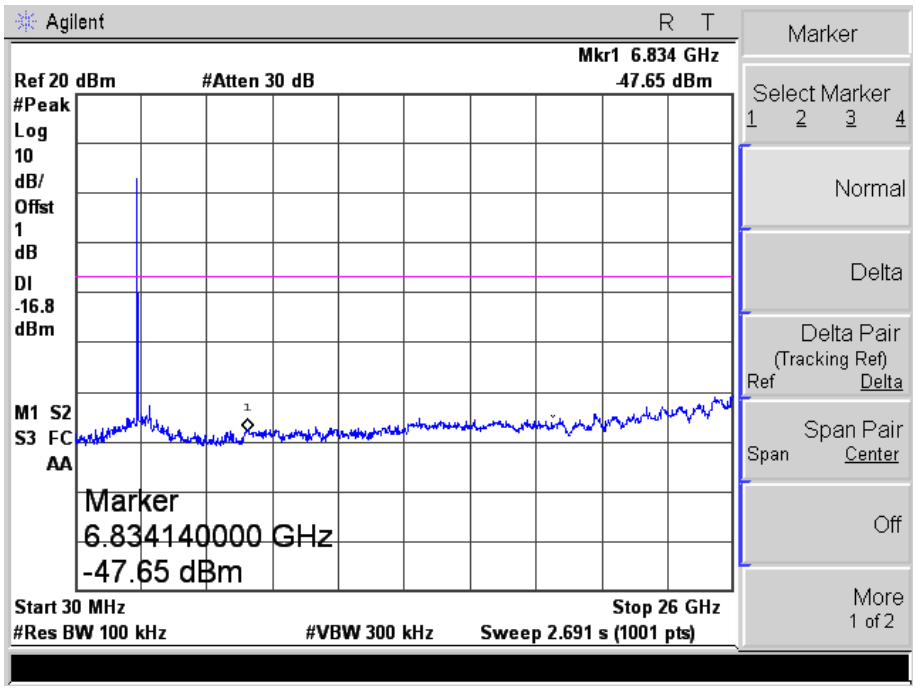
802.11g

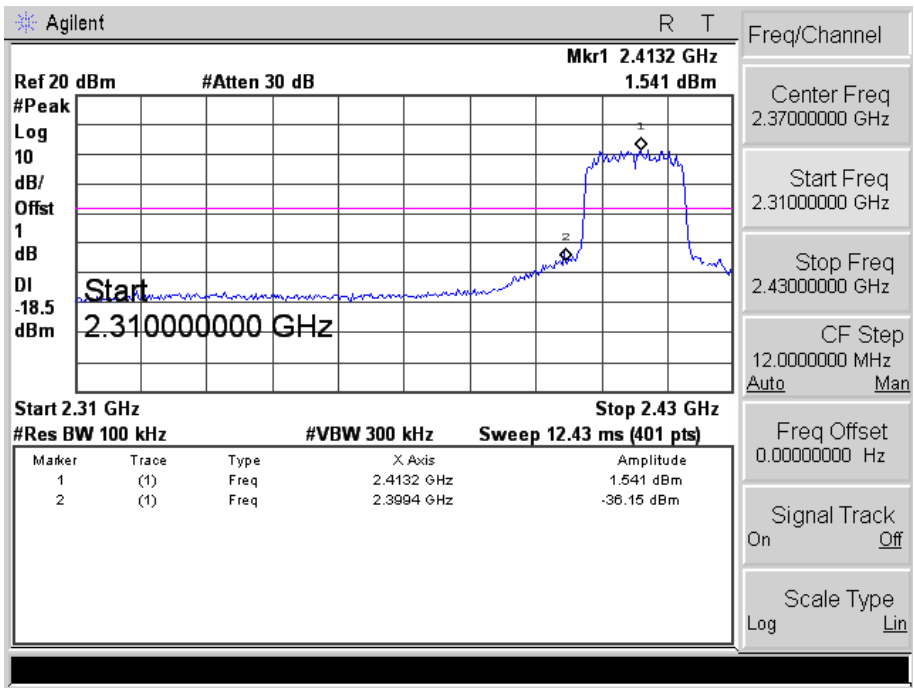
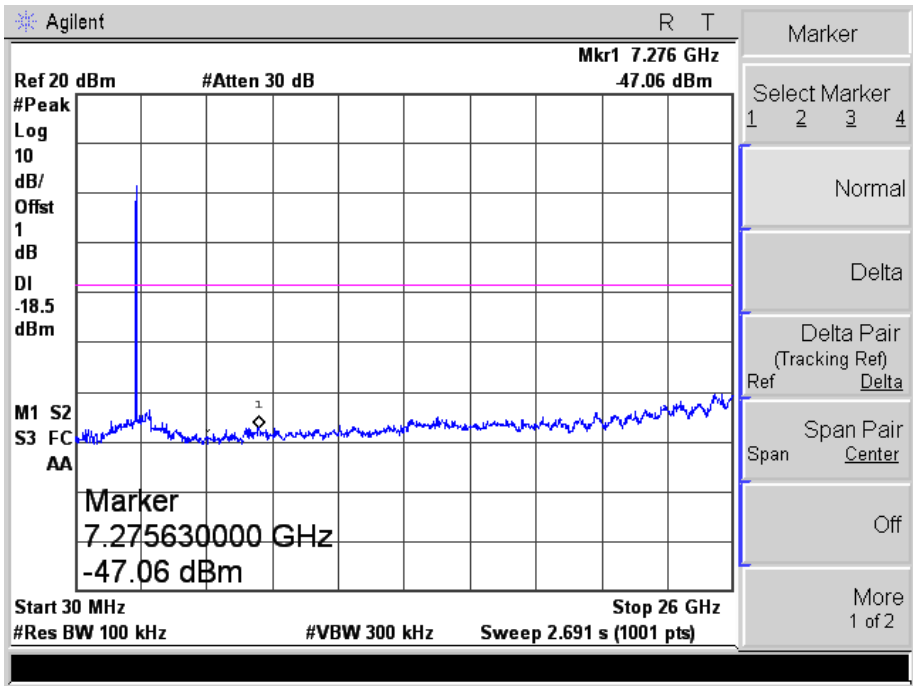
Low


Agilent
R T
Mkr1 2.4132 GHz
Ref 20 dBm
#Atten 30 dB
3.92 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-16.3
dBm
Start
2.310000000 GHz
Start 2.31 GHz
Stop 2.43 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 12.43 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.4132 GHz 3.92 dBm
2 (1) Freq 2.3994 GHz -31.39 dBm
Freq/Channel
Center Freq
2.37000000 GHz
Start Freq
2.31000000 GHz
Stop Freq
2.43000000 GHz
CF Step
12.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin


Agilent
R T
Mkr1 7.146 GHz
Ref 20 dBm
#Atten 30 dB
-46.95 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-16.3
dBm
M1 S2
S3 FC
AA
Marker
7.145780000 GHz
-46.95 dBm
Start 30 MHz
Stop 26 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.691 s (1001 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

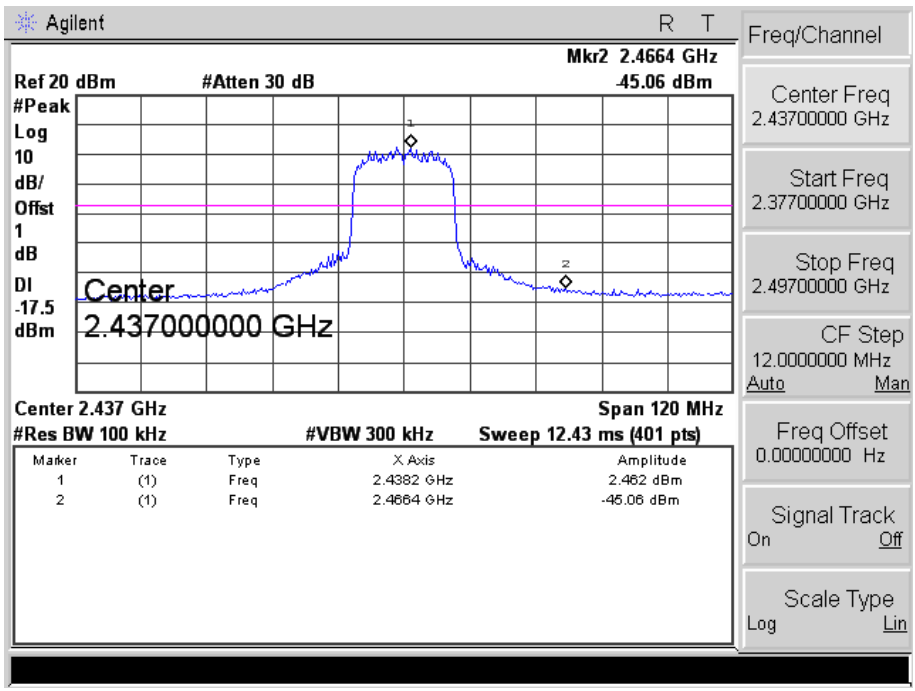
802.11g	
Middle	 

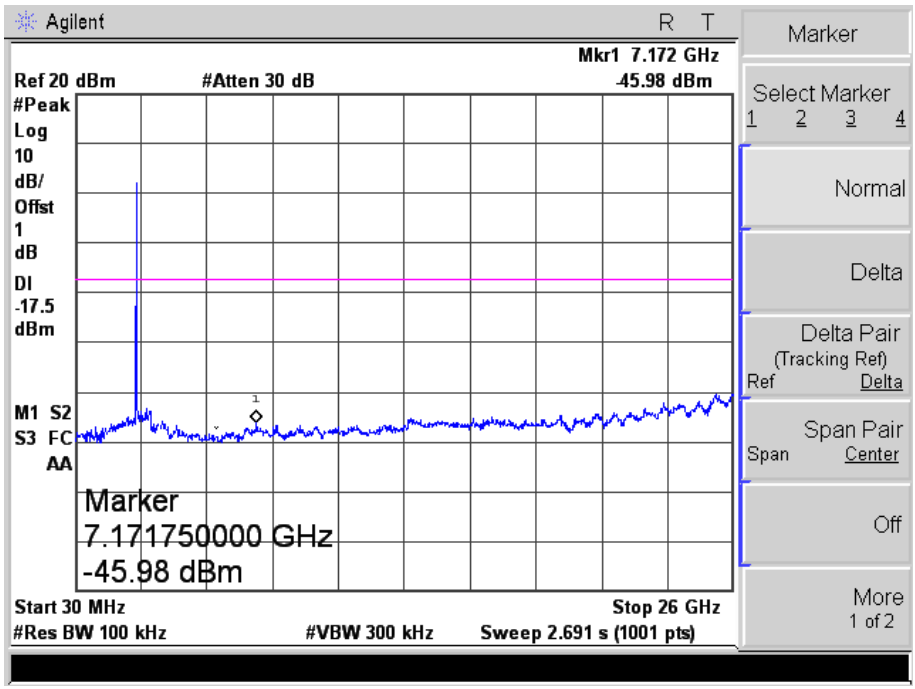
802.11g	
High	 

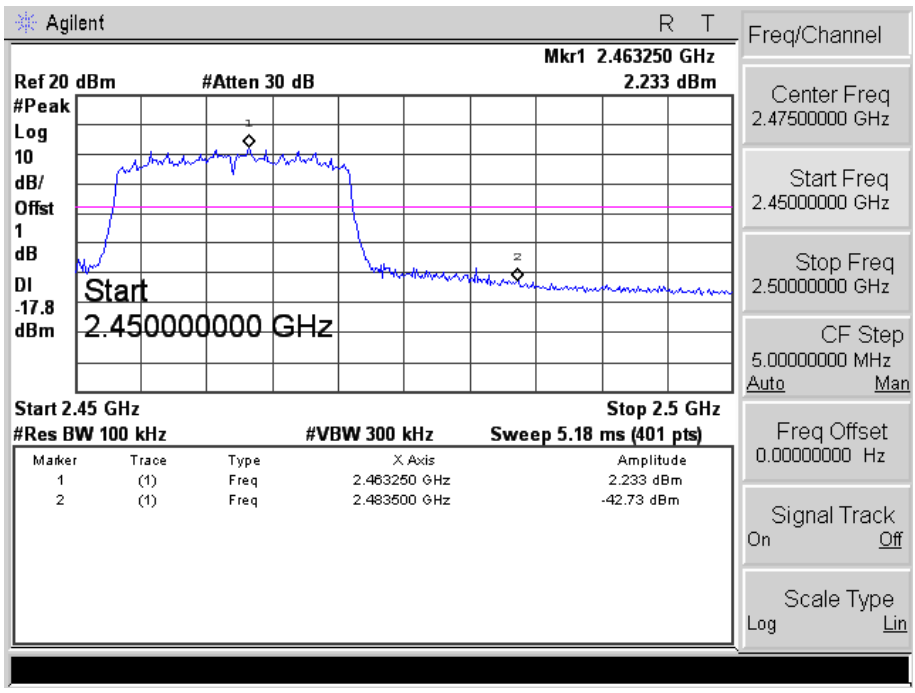
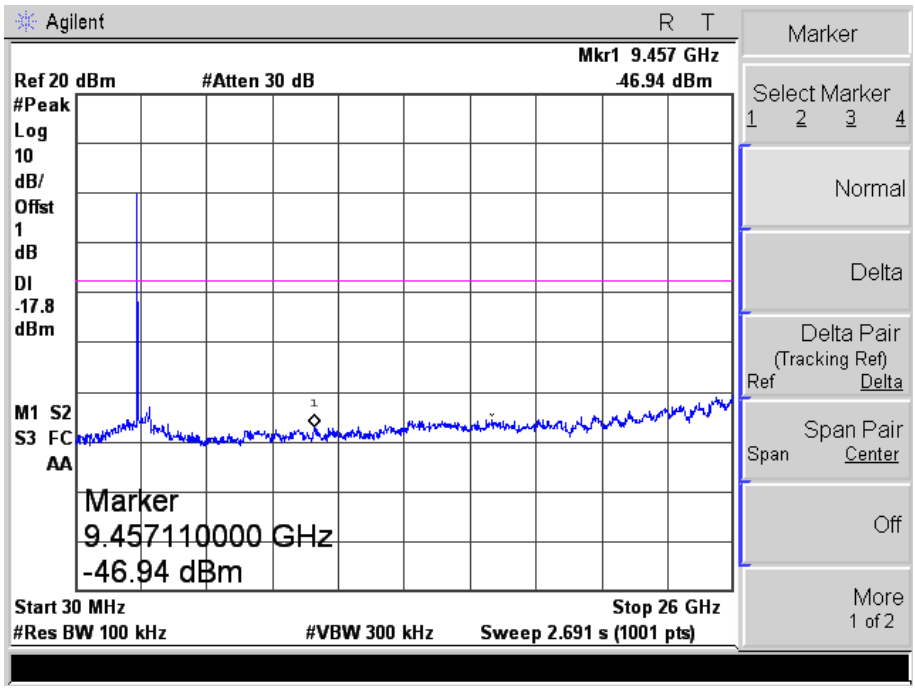
802.11n-HT20	
Low	 

802.11n-HT20

Middle





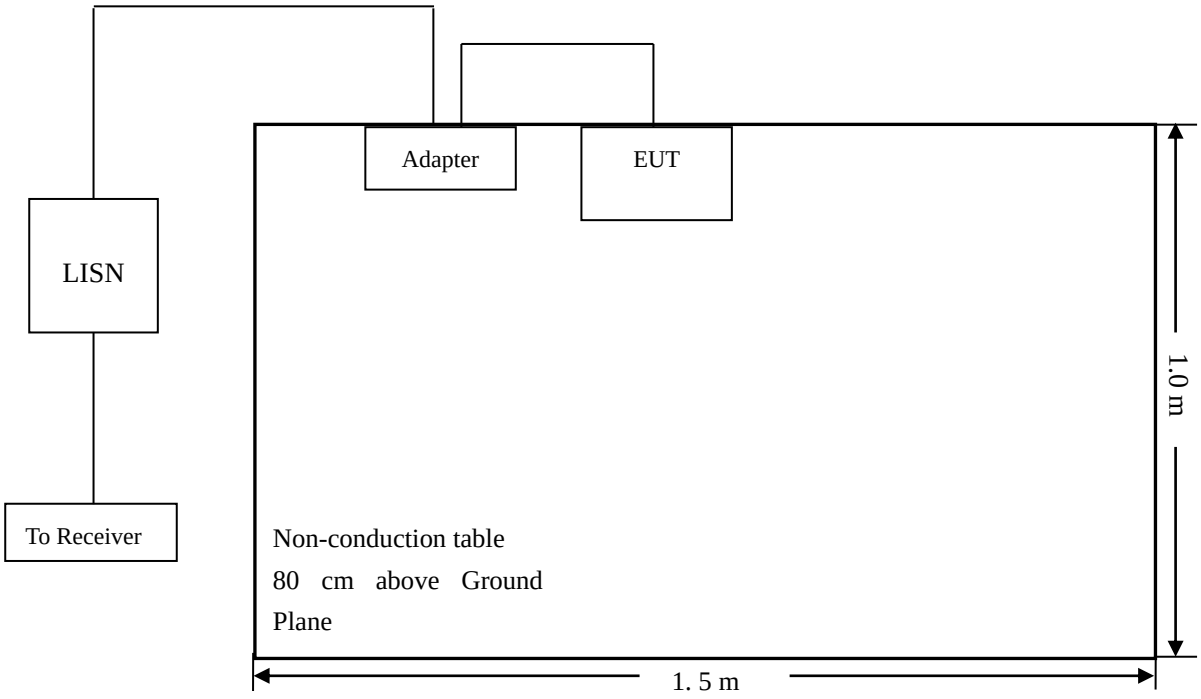
802.11n-HT20	
High	 

10. Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.

10.2 Basic Test Setup Block Diagram



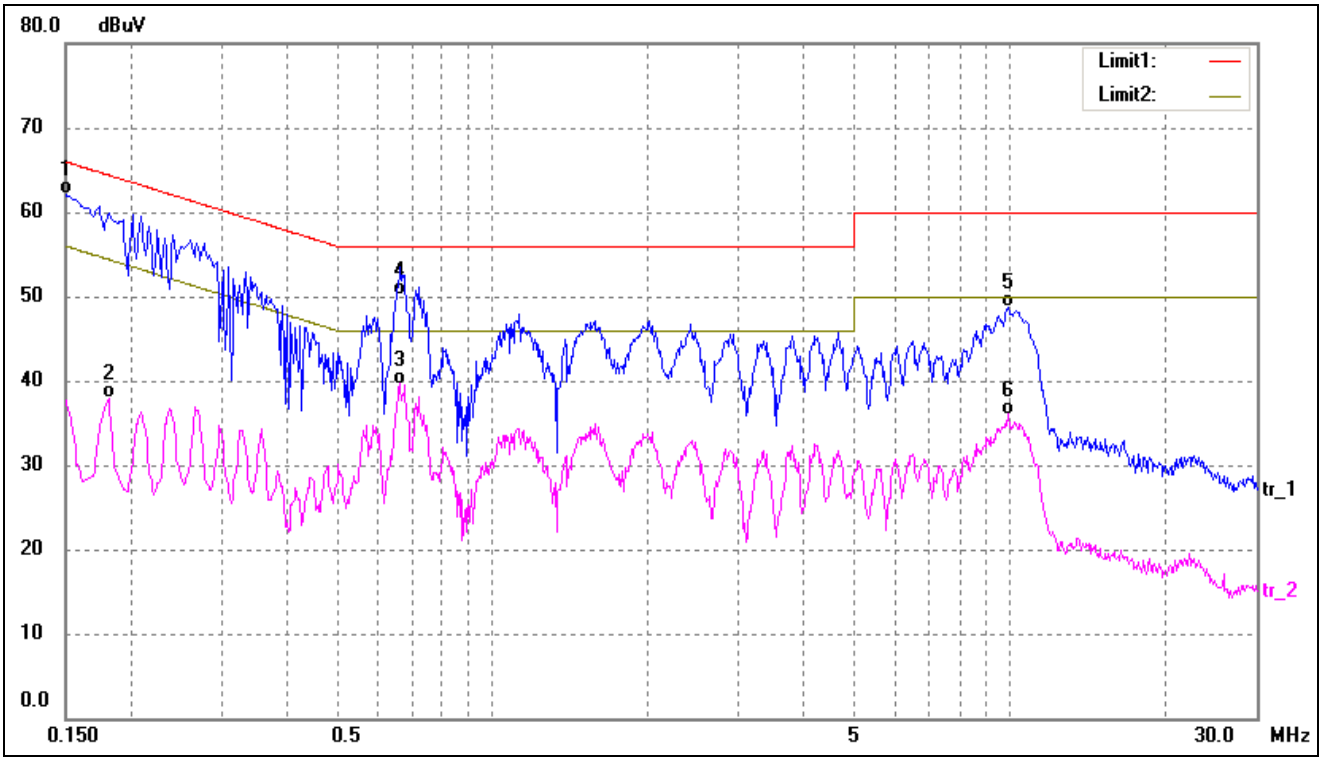
10.3 Test Receiver Setup

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

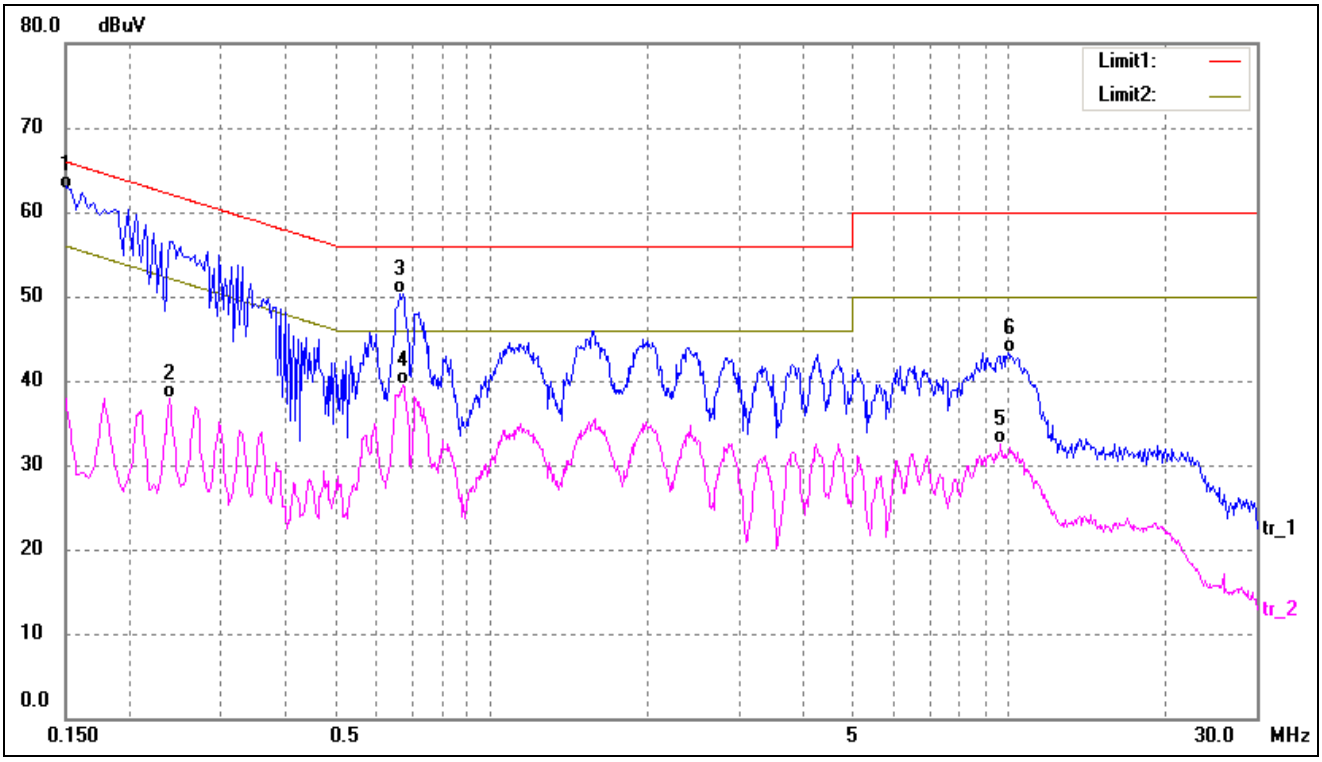
10.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1500	52.00	10.10	62.10	66.00	-3.90	QP
2	0.1820	27.75	10.11	37.86	54.39	-16.53	AVG
3	0.6620	29.22	10.38	39.60	46.00	-6.40	AVG
4	0.6660	39.71	10.38	50.09	56.00	-5.91	QP
5	9.9540	37.70	10.95	48.65	60.00	-11.35	QP
6	9.9540	25.05	10.95	36.00	50.00	-14.00	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1524	52.64	10.10	62.74	65.87	-3.13	QP
2	0.2380	27.66	10.15	37.81	52.17	-14.36	AVG
3	0.6620	39.98	10.38	50.36	56.00	-5.64	QP
4	0.6740	29.03	10.38	39.41	46.00	-6.59	AVG
5	9.6300	21.50	10.94	32.44	50.00	-17.56	AVG
6	9.9500	32.41	10.95	43.36	60.00	-16.64	QP

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