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Amended

FCC/IC Test Report

Includes NCEE Labs report R20170317-20-01B and its amendment in full

Prepared for:	**Hunter Douglas**
Address:	**2550 Midway Boulevard Broomfield, CO 80020**
Product:	**Wireless Window Blind Controller Hub**
Model:	**1DX**
Test Report No:	**R20170317-20-01C**
Approved By:	 **Nic S. Johnson, NCE** **Technical Manager** **iNARTE Certified EMC Engineer #EMC-003337-NE**
DATE:	**13 October 2017**
Total Pages:	**44**

ACCREDITED
TESTING LABORATORY
CERTIFICATE NO. 1953.01

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1.0 Summary of test results

1.1 Test Results

Testing was intended to cover a Class II Permissive Change on FCC ID:VPYLB1DX, IC:772C-LB1DX. A different antenna from the original grant was used, and the power level was reduced.

The module was tested in its intended configuration, installed onto the wireless hub from Hunter Douglas, FCC ID:UXU1DX, IC:7316A-1DX.

The EUT has been tested according to the following specifications:

APPLIED STANDARDS			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
FCC Part 15.247 RSS-247, Section 5.4	Peak Channel Power	NA	Informational only
FCC Part 15.209 RSS-Gen, Section 7.1	Receiver Radiated Emissions,	Pass	Meets the requirement of the limit.
FCC Part 15.247 RSS-247, Section 5.5 RSS-Gen, Section 6.13	Transmitter Radiated Emissions,	Pass	Meets the requirement of the limit.
FCC Part 15.247 FCC Part 15.209 RSS-247, Section 5.5 RSS-Gen, Section 6.13	Band Edge Measurement	Pass	Meets the requirement of the limit.
FCC Part 15.207 RSS-Gen, Section 8.8	Conducted Emissions	Pass	Representative Power supply was used

1.2 Reason for amendment

Data rate was changed in accordance to the original Murata grant, so all the radio related measurements were repeated and the new data was updated in this test report.

Updated to include measurement uncertainty for direct conducted measurements for output power.

2.0 Description

2.1 Equipment under test

The Equipment Under Test (EUT) was a wireless module used to control window blinds. It operates from 2412 to 2462 MHz and has transmit and receive capabilities. It is intended to be paired with a remote.

EUT Received Date: 2 May 2017
EUT Tested Dates: 4 May 2017 – 4 August 2017

Description	Wireless Window Blind Controller Hub
MODEL	MURATA WIFI Module
Serial No.	C8 (Receive Mode); 1706020071 (All other measurements)
POWER SUPPLY	5 VDC (MN: HDP-QB05010U)
ANTENNA TYPE	Antenna is not user replaceable

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 Laboratory description

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
4740 Discovery Drive
Lincoln, NE 68521

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 32 ± 4%
Temperature of 22 ± 3° Celsius

2.3 Description of test modes

The EUT operates on, and was tested at the frequencies below:

Channel	Frequency
Low	2412
Middle	2437
High	2462

These are the only three representative channels tested in the frequency range according to FCC Part 15.31 and RSS-Gen Table A1. See the operational description for a list of all channel frequency and designations.

2.4 Applied standards

The EUT uses digital modulation and operates between 2400.0MHz and 2483.5 MHz. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

(1) FCC Part 15, Subpart C (15.207, 15.209, 15.247)
(2) FCC Part 15, Subpart B (15.107, 15.109)
(3) ANSI C63.10:2013
(4) Industry Canada RSS-Gen Issue 4
(5) Industry Canada RSS-247 Issue 2

All test items have been performed and recorded as per the above.

2.5 Description of support units

None

2.6 Configuration of system under test

This EUT was set to transmit in a worse-case scenario with modulation on. The manufacturer modified the unit to transmit continuously on the lowest, highest and one channel in the middle.

AC/DC Power Supply used for testing:

Manufacturer:	HDP
M/N:	HDP-QB05010U
Input:	100 – 240VAC, 50/60Hz
Output:	5VDC, 1.0A

3.0 Test equipment used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Rohde & Schwarz Test Receiver	ES126	100037	24 Jan 2017	24 Jan 2018
EMCO Biconilog Antenna	3142B	1647	02 Aug 2017	02 Aug 2018
EMCO Biconilog Antenna	3141	1212	26 Jan 2017	26 Jan 2018
EMCO Horn Antenna	3115	6416	25 Jan 2016	25 Jan 2018
EMCO Horn Antenna	3116	2576	26 Jan 2016	26 Jan 2018
Rohde & Schwarz Preamplifier	TS-PR18	3545700803	9 Feb 2017*	9 Feb 2018*
Trilithic High Pass Filter	6HC330	23042	9 Feb 2017*	9 Feb 2018*
Rohde & Schwarz LISN	ESH3-Z5	100023	23 Jan 2017	23 Jan 2018

*Internal Characterization

4.0 Detailed results

4.1 Radiated emissions

Test Method: ANSI C63.10, Section(s) 6.5, 6.6, 11.11, 11.12
ANSI C63.4, Section(s) 8.6

4.1.1 Limits for radiated emissions measurements

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH (µV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (µV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.

4.1.2 Test procedures

a. The EUT was placed on the top of a rotating table above the ground plane in a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements form 30MHz-1Ghz and 1.5m for measurements from 1GHz and higher.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The EUT was maximized in all 3 orthogonal positions.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

4.1.3 Deviations from test standard

No deviation.

4.1.4 Test setup

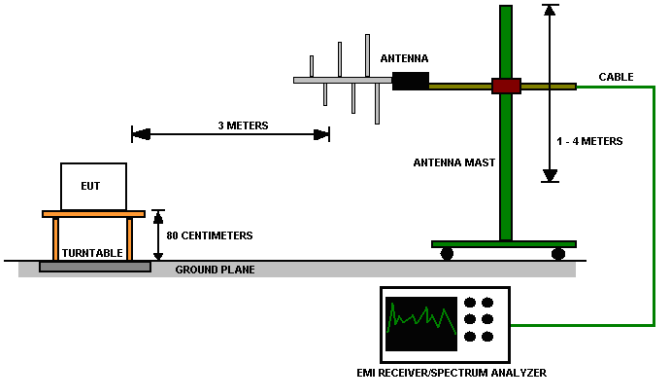

Figure 1 - Radiated Emissions Test Setup

The EUT was tested in all 3 orthogonal axis to meet the requirements from ANSI C63.10:2013, Section 5.10.1 and Annex H.2.

For measurements above 1GHz, the antenna was pointed in the direction of the EUT.

4.1.5 EUT operating conditions

The EUT was powered by 5 VDC unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

Preview measurements were performed in 802.11(b), (g) and (n) models. It was found that the spurious emissions were the highest in the 802.11(b) mode, so that was used for final spurious emissions.

4.1.6 Test results

EUT	Wireless window blind controller hub	MODE	Receive
INPUT POWER	5 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	32 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

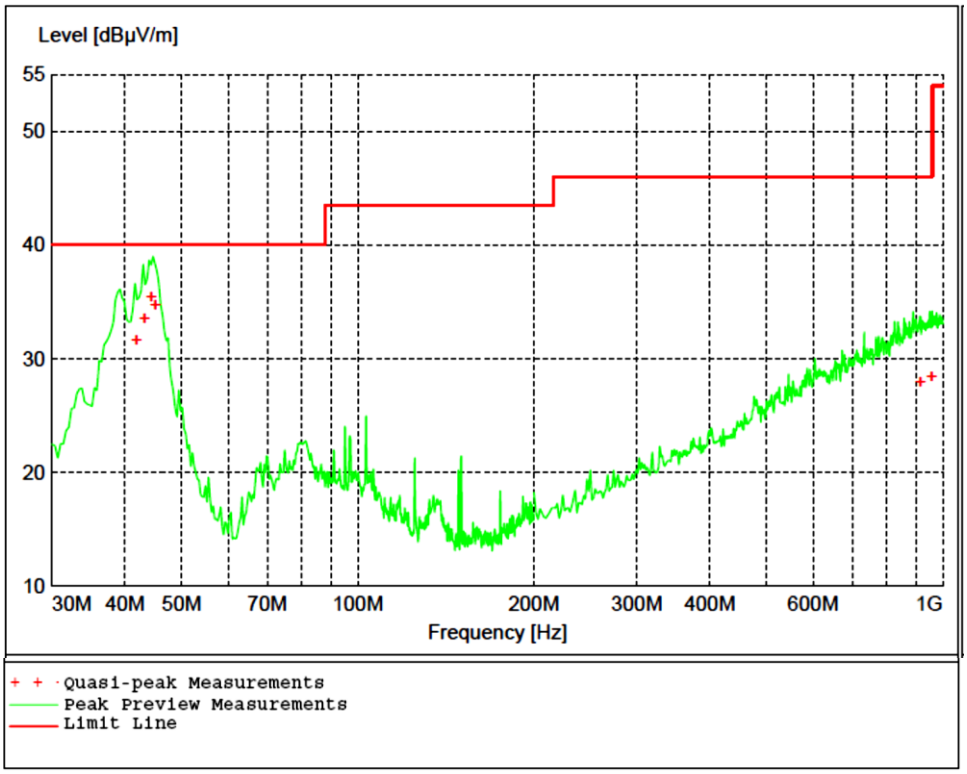

Figure 2 - Radiated Emissions Plot, Receive

Horizontal orientation of EUT (X-axis) was found to be the worse-case

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Since peak measurements were compliant with the average limit, average measurements were not required.
6. The EUT was measured in all 3 orthagonal axis. It was found that the X-axis produced the highest emissions, and this orientation was used for all testing. See the test setup photo exhbit for details on the orientations.

Table 1 - Radiated Emissions Quasi-peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
41.880000	31.58	40.00	8.40	100	239	VERT
43.200000	33.50	40.00	6.50	99	187	VERT
44.340000	35.36	40.00	4.60	98	255	VERT
45.120000	34.66	40.00	5.30	101	315	VERT
916.920000	27.93	46.00	18.10	190	18	VERT
958.440000	28.36	46.00	17.60	117	67	VERT

Table 2 - Radiated Emissions Peak Measurements vs. Average Limit, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2450.800000	35.59	54.00	18.40	99	41	VERT
4879.600000	41.59	54.00	12.40	98	277	HORI
5212.000000	42.17	54.00	11.80	400	326	VERT
7300.800000	42.83	54.00	11.20	400	169	HORI
9748.200000	46.35	54.00	7.60	308	275	VERT
12193.400000	40.68	54.00	13.30	98	296	VERT

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

EUT MODULE	Wireless window blind controller hub	MODE	Transmit, Low Channel
INPUT POWER	5 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	32 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

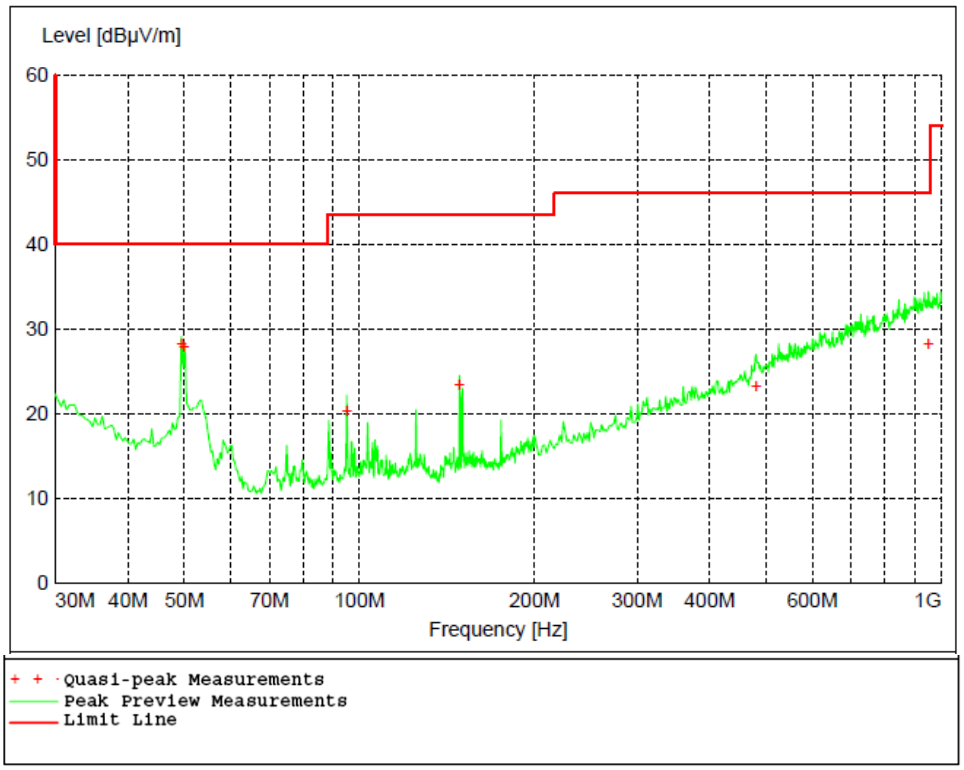

Figure 3 - Radiated Emissions Plot, Low Channel

Horizontal orientation of EUT (X-axis) was found to be the worse-case

Table 3 - Radiated Emissions Quasi-peak Measurements, Low Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
49.500000	28.36	40.00	11.60	98	29	VERT
49.980000	27.92	40.00	12.10	99	54	VERT
95.160000	20.36	43.50	23.20	102	119	VERT
148.500000	23.45	43.50	20.10	101	295	VERT
480.720000	23.25	46.00	22.80	400	360	HORI
950.580000	28.26	46.00	17.70	223	82	HORI

Table 4 - Radiated Emissions Peak Measurements, Low Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2390.000000*	46.81*	54.00	7.19	120	310	HORI
2412.000000	104.67	NA	NA	173	313	HORI
4824.000000	46.96	54.00	7.00	204	299	HORI
7236.000000	43.89	54.00	10.10	399	70	HORI
9621.600000	44.25	54.00	9.70	304	360	HORI
12056.400000	42.36	54.00	11.60	100	292	VERT

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed.

*Average detector was used on bandedge frequencies. This was used to correlate directly to the measurements performed in the original equipment grant as referenced in Section 1.1 of this report.

EUT MODULE	Wireless window blind controller hub	MODE	Transmit, Mid Channel
INPUT POWER	5 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	32 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

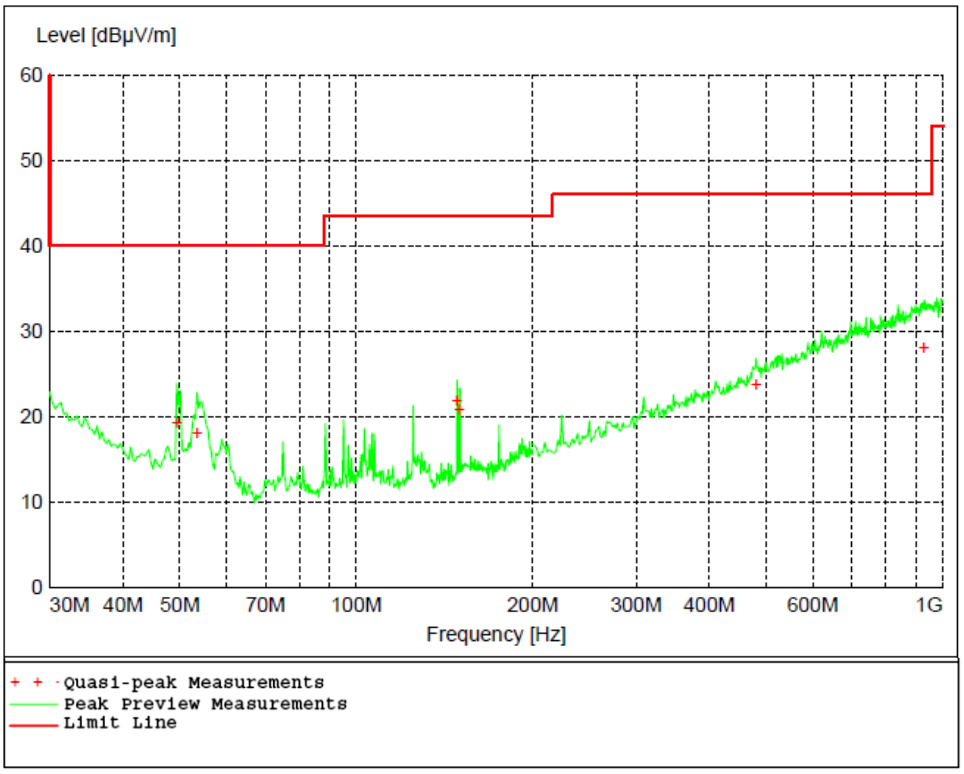

Figure 4 - Radiated Emissions Plot, Mid Channel

Horizontal orientation of EUT (X-axis) was found to be the worse-case

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The EUT was measured in both the horizontal and vertical orientation. It was found that the Horizontal position produced the highest emissions, and this orientation was used for all testing. See Annex A for test photos.

Table 5 - Radiated Emissions Quasi-peak Measurements, Mid Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
49.500000	19.44	40.00	20.60	104	0	VERT
53.580000	18.19	40.00	21.80	99	245	VERT
148.500000	21.99	43.50	21.50	98	266	VERT
150.000000	20.86	43.50	22.70	101	69	VERT
481.320000	23.83	46.00	22.20	102	324	VERT
929.340000	28.12	46.00	17.90	126	324	HORI

Table 6 - Radiated Emissions Peak Measurements, Mid Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2437.000000	108.37	NA	NA	139	322	HORI
4874.000000	42.08	54.00	11.90	156	300	HORI
7323.800000	43.89	54.00	10.10	365	14	VERT
9777.000000	45.45	54.00	8.50	399	2	VERT
12191.800000	42.31	54.00	11.70	399	58	VERT

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed.

EUT MODULE	Wireless window blind controller hub	MODE	Transmit, High Channel
INPUT POWER	5 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	32 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

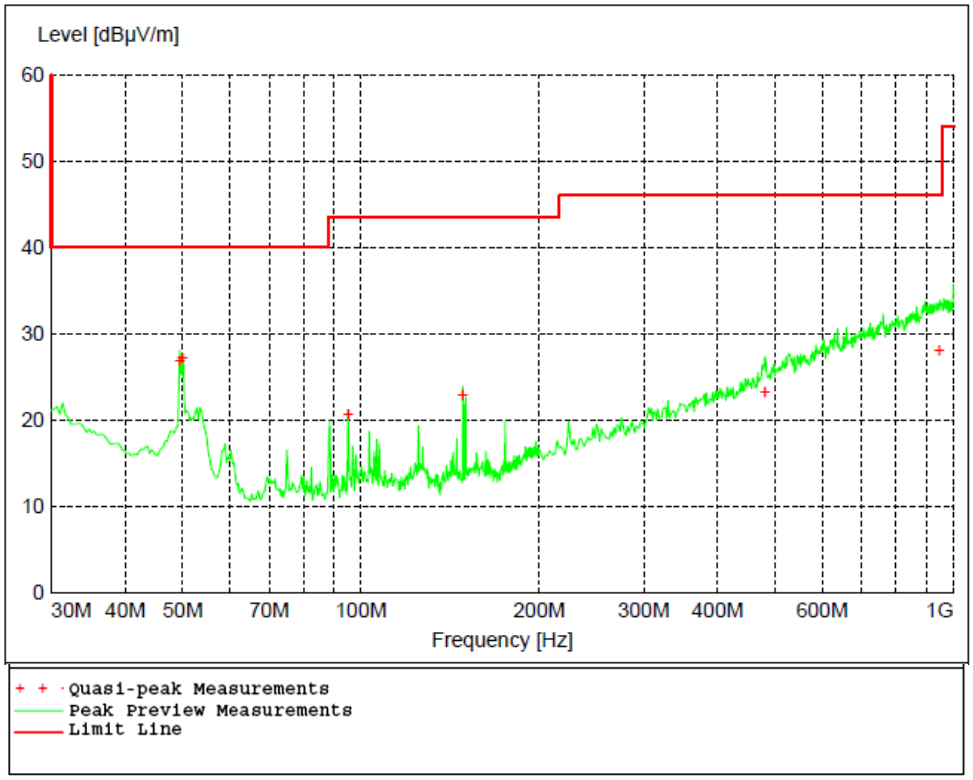

Figure 5 - Radiated Emissions Plot, High Channel

Horizontal orientation of EUT (X-axis) was found to be the worse-case

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The EUT was measured in both the horizontal and vertical orientation. It was found that the Horizontal position produced the highest emissions, and this orientation was used for all testing. See Annex A for test photos.

Table 7 - Radiated Emissions Quasi-peak Measurements, High Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
49.500000	26.98	40.00	13.00	100	136	VERT
49.980000	27.29	40.00	12.70	107	54	VERT
95.160000	20.69	43.50	22.80	99	118	VERT
148.500000	23.04	43.50	20.50	103	304	VERT
481.140000	23.28	46.00	22.70	298	353	HORI
947.160000	28.15	46.00	17.80	243	285	HORI

Table 8 - Radiated Emissions Peak Measurements, High Channel

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2483.500000*	47.50*	54.00	6.50	125	300	HORI
2462.000000	108.44	NA	NA	139	329	HORI
4923.800000	44.33	54.00	9.70	214	290	HORI
7382.400000	43.62	54.00	10.40	197	239	VERT
9833.400000	45.92	54.00	8.10	181	258	HORI
12316.400000	42.89	54.00	11.10	139	295	VERT

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

*Average detector was used on bandedge frequencies. This was used to correlate directly to the measurements performed in the original equipment grant as referenced in Section 1.1 of this report.

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. The EUT was measured in both the horizontal and vertical orientation. It was found that the Horizontal position produced the highest emissions, and this orientation was used for all testing. See Annex A for test photos.

4.2 Peak and Average Channel Power

Test Method: ANSI C63.10, Section(s) 6.7, 11.9

4.2.1 Limits of Power measurements

1 Watt

4.2.2 Test procedures

The EUT was connected to the spectrum analyzer directly with a low-loss shielded coaxial cable. The channel power function of the analyzer was used to calculate the total power in a 20 MHz bandwidth.

For peak power, a peak detector and max hold were used. For average power, 100 measurements were trace average using an RMS detector.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

Figure 6 – Peak Channel Power Measurements Test Setup

*The cable used to go from the spectrum analyzer to the EUT had a loss of 0.3 dB. The plot shows the corrected value.

4.3.5 EUT operating conditions

The EUT was powered by 5 VDC unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.3.6 Test results

EUT MODULE	Wireless window blind controller hub	MODE	Transmit
INPUT POWER	5 VDC	FREQUENCY RANGE	2412 – 2462 MHz
ENVIRONMENTAL CONDITIONS	32 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

Test Method: ANSI C63.10:2013, Section 11.9.1.2

Peak Channel Power, 802.11 (b)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	RESULT
1	2412	20.82	PASS
6	2437	21.19	PASS
11	2462	20.73	PASS

Peak Channel Power, 802.11 (g)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	RESULT
1	2412	22.56	PASS
6	2437	22.78	PASS
11	2462	22.35	PASS

Peak Channel Power, 802.11 (n)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	RESULT
1	2412	21.11	PASS
6	2437	21.21	PASS
11	2462	20.94	PASS

REMARKS:
Measurements are shown with cable loss applied.

All results were found to be less than or equal to the original granted power of 174 mW plus the devices expected measurement uncertainty of +/- 0.42 dB

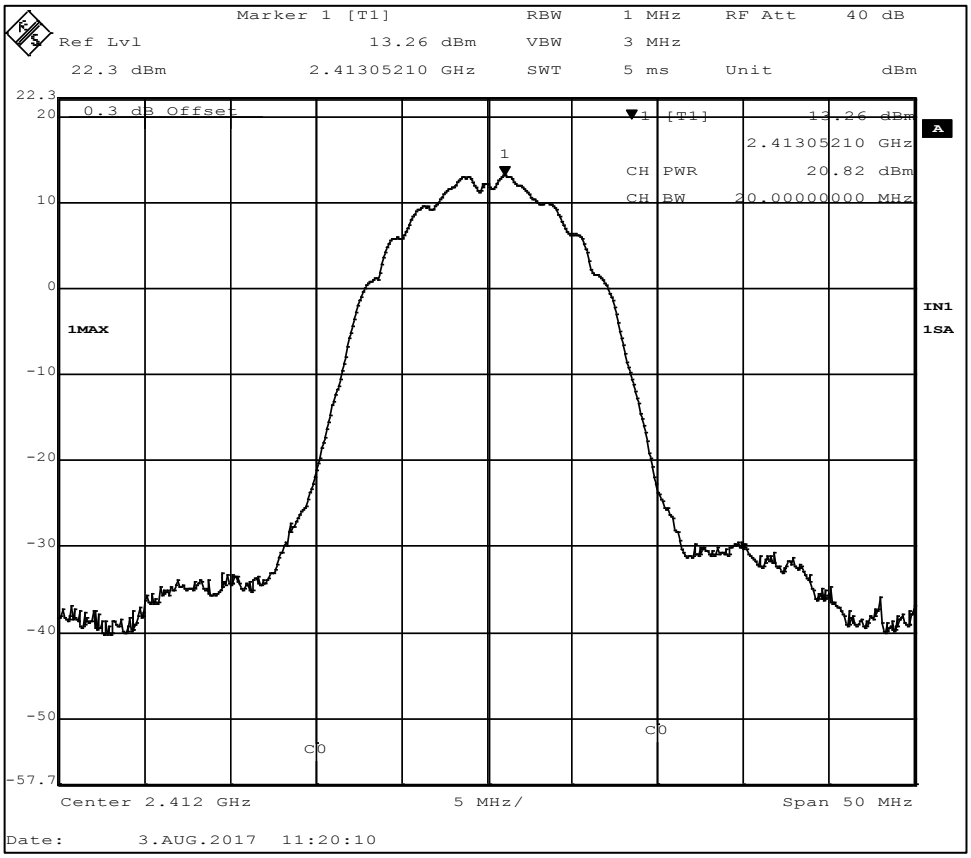

Figure 7 – Peak Channel Power, 802.11 (b), Low Channel.

Measurements are shown with cable loss applied.

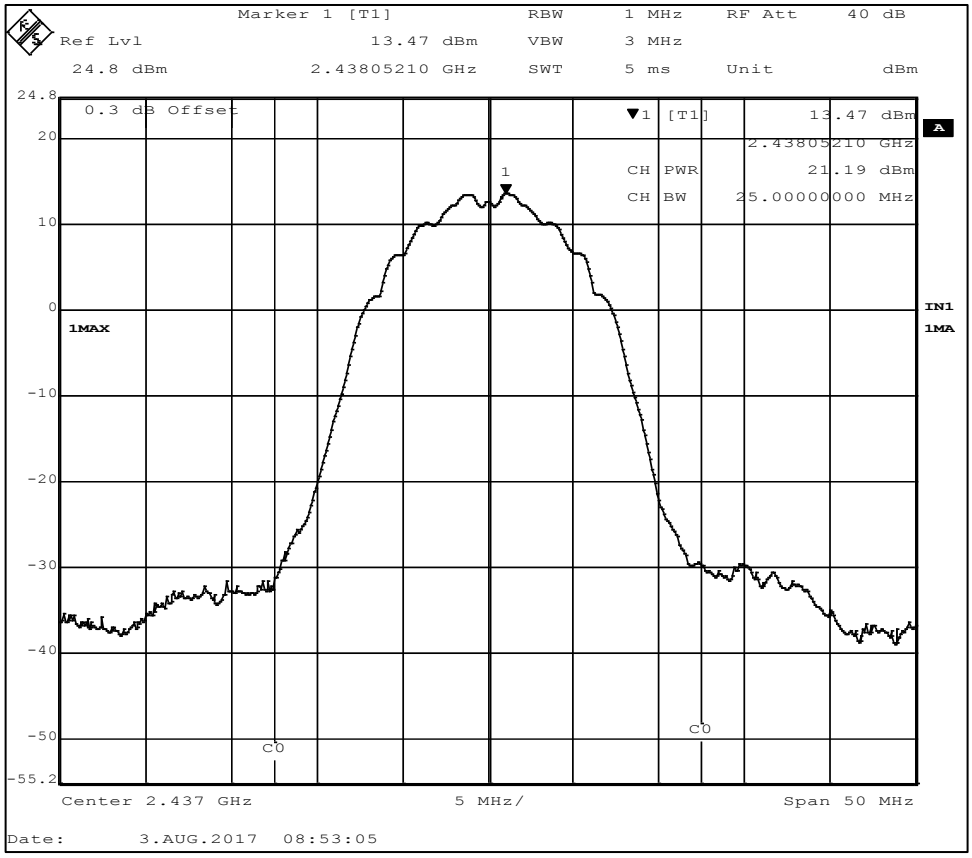

Figure 8 - Peak Channel Power, 802.11 (b), Mid Channel

Measurements are shown with cable loss applied.

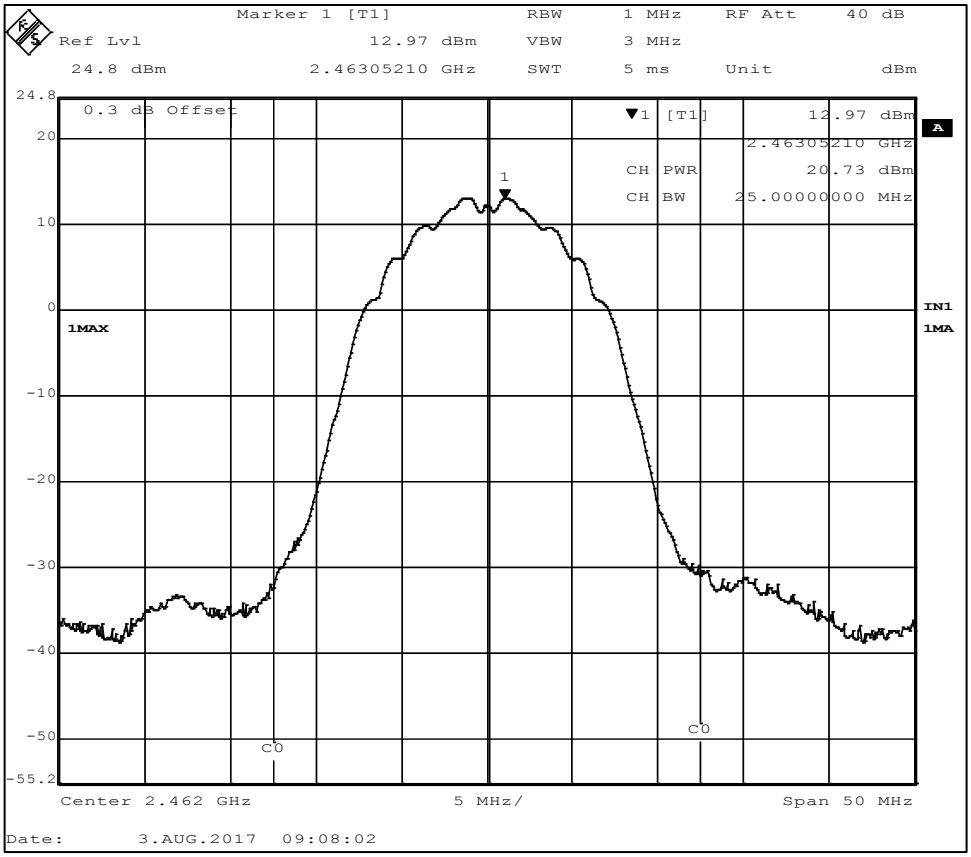

Figure 9 - Peak Channel Power, 802.11 (b), High Channel

Measurements are shown with cable loss applied.

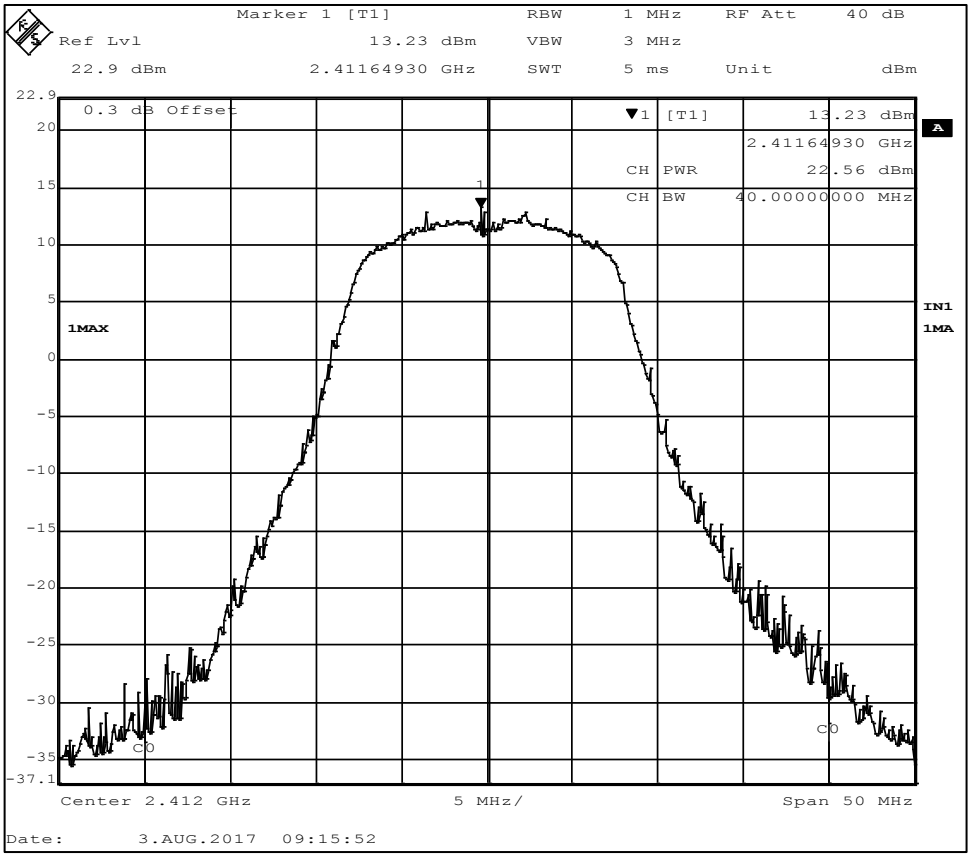

Figure 10 – Peak Channel Power, 802.11 (g), Low Channel.

Measurements are shown with cable loss applied.

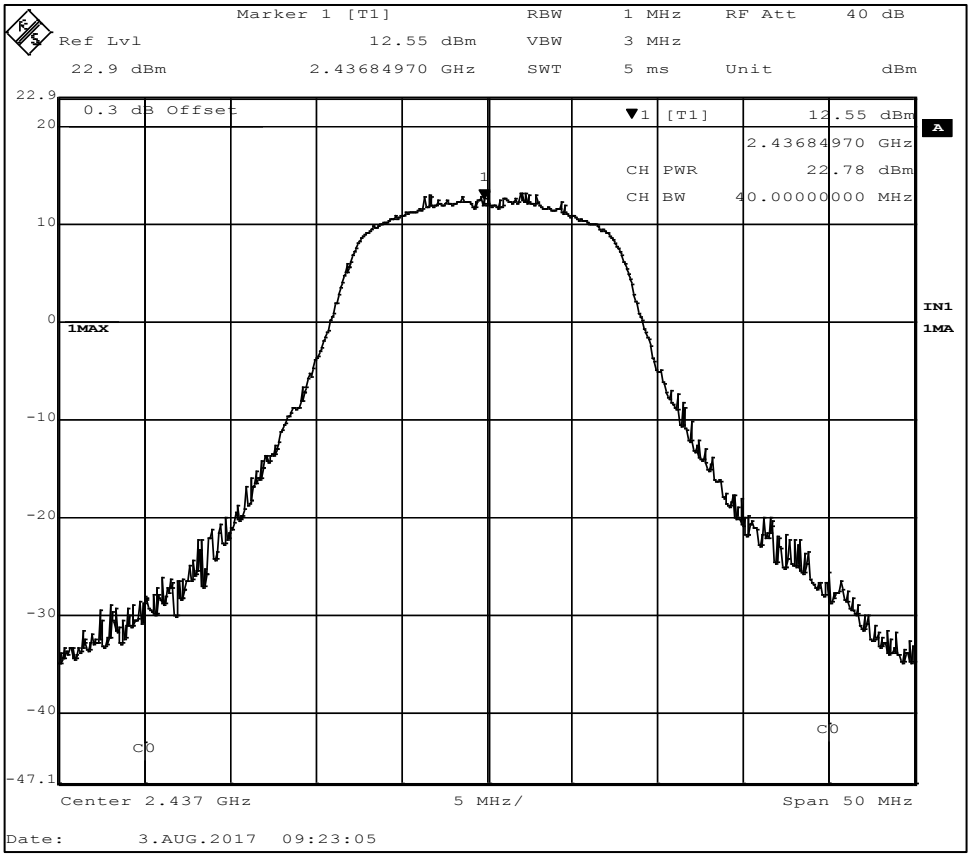

Figure 11 - Peak Channel Power, 802.11 (g), Mid Channel

Measurements are shown with cable loss applied.

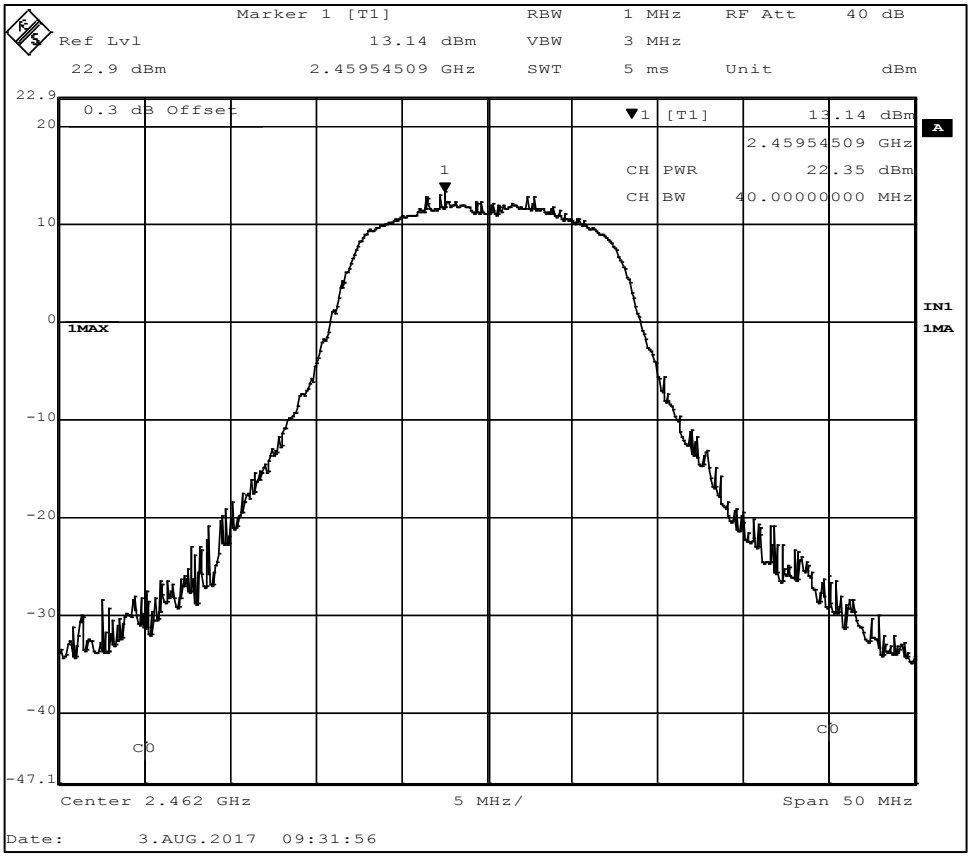

Figure 12 - Peak Channel Power, 802.11 (g), High Channel

Measurements are shown with cable loss applied.

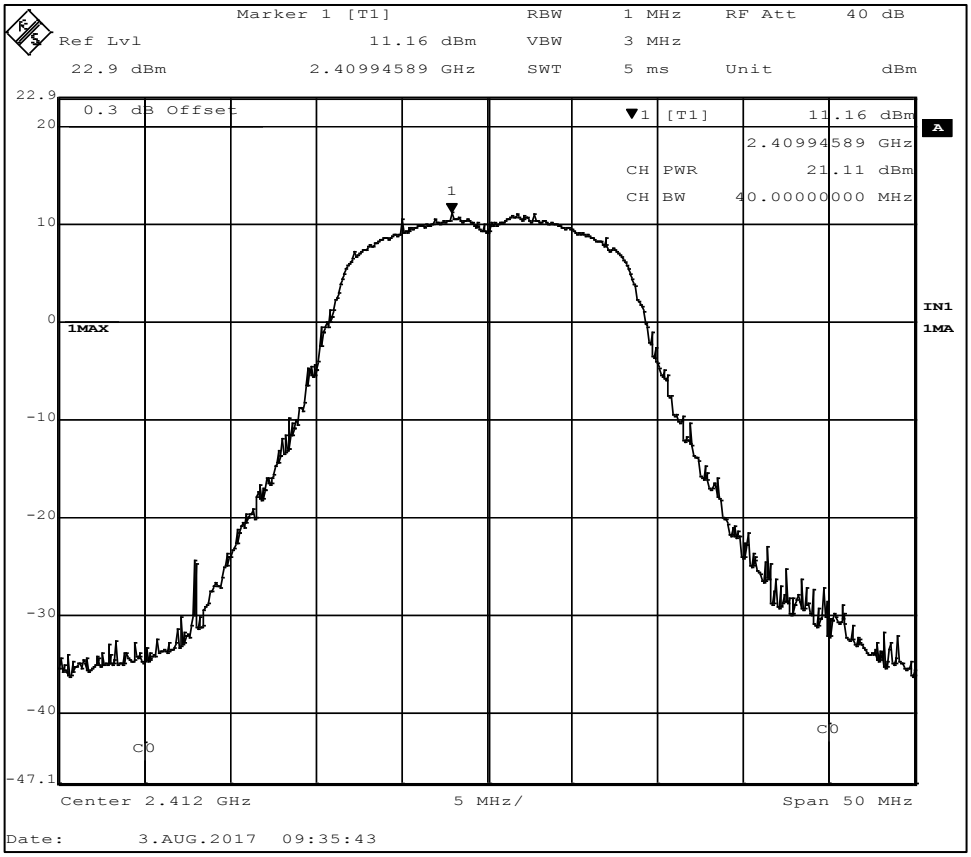

Figure 13 – Peak Channel Power, 802.11 (n), Low Channel.

Measurements are shown with cable loss applied.

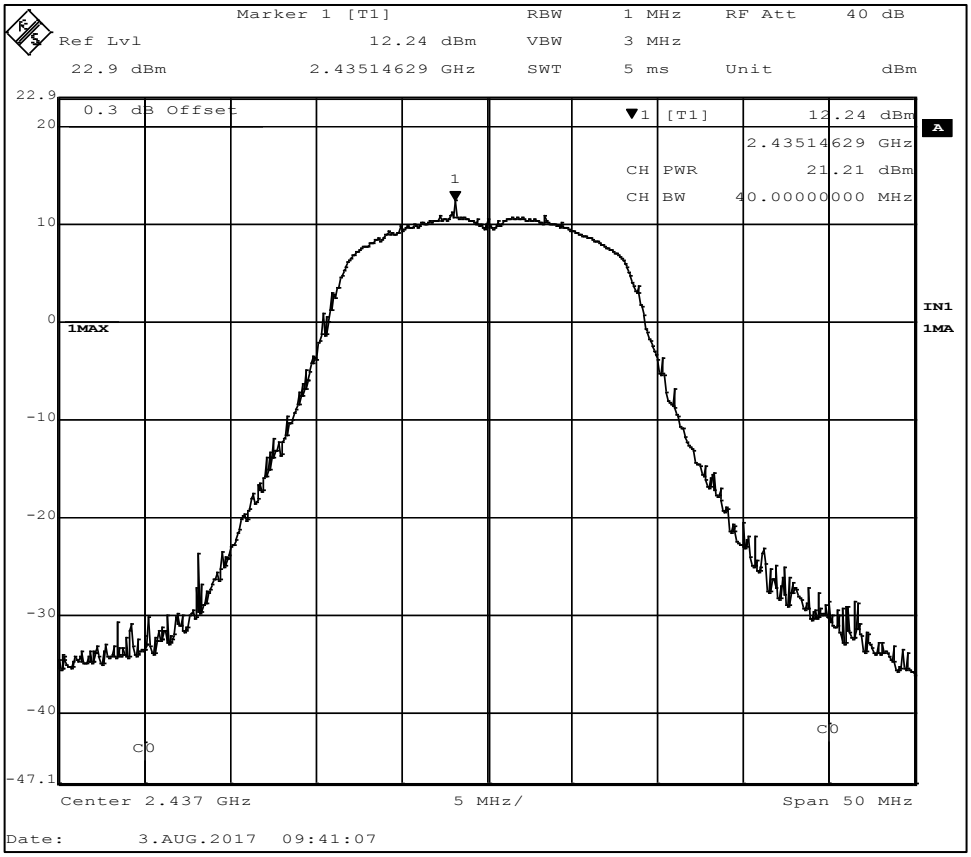

Figure 14 - Peak Channel Power, 802.11 (n), Mid Channel

Measurements are shown with cable loss applied.

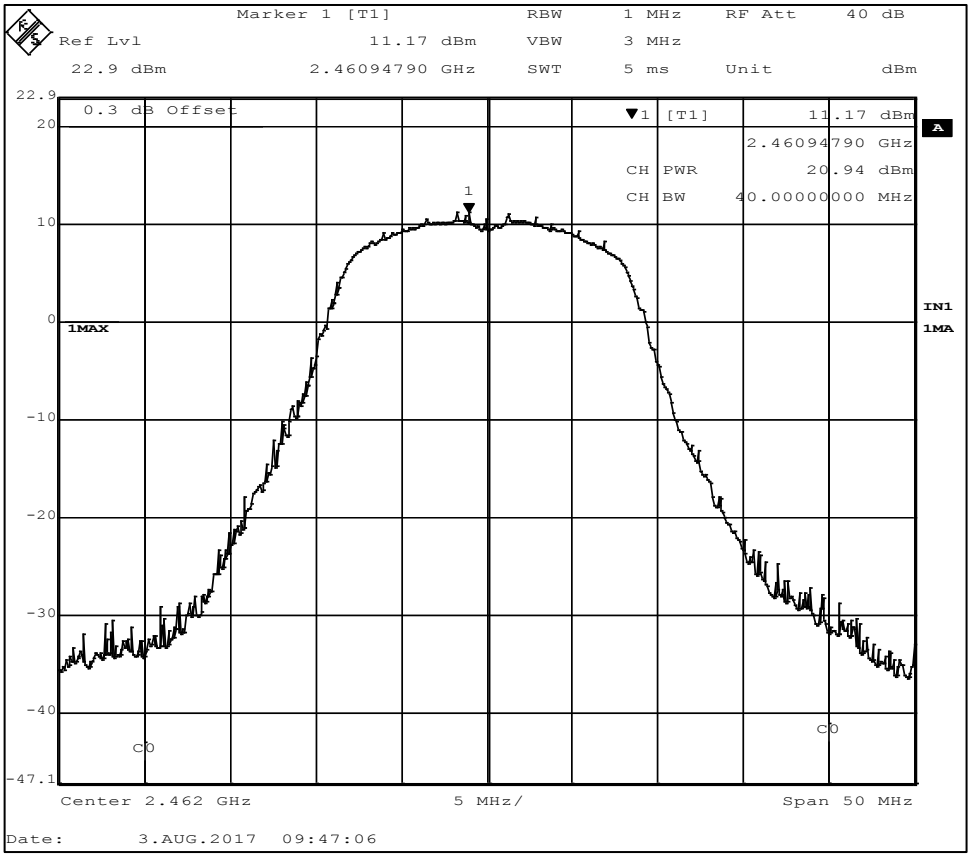

Figure 15 - Peak Channel Power, 802.11 (n), High Channel

Measurements are shown with cable loss applied.

Test Method: ANSI C63.10:2013, Section 11.9.2.2.2

Average Channel Power, 802.11 (b)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)	RESULT
1	2412	17.93	PASS
2	2437	17.70	PASS
3	2462	17.56	PASS

Average Channel Power, 802.11 (g)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)	RESULT
1	2412	14.46	PASS
2	2437	14.28	PASS
3	2462	14.06	PASS

Average Channel Power, 802.11 (n)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)	RESULT
1	2412	13.18	PASS
2	2437	13.28	PASS
3	2462	13.03	PASS

REMARKS:
Measurements are shown with cable loss applied.

All results were found to be less than or equal to the original granted power of 174 mW plus the devices expected measurement uncertainty of +/- 0.42 dB

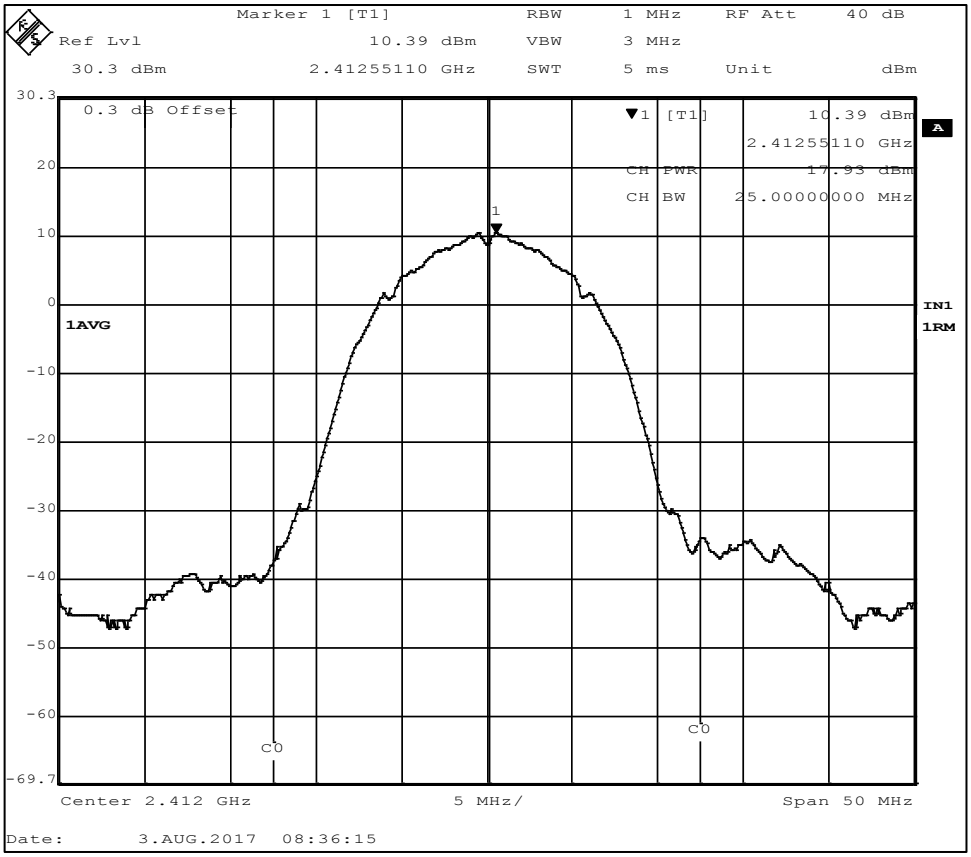

Figure 16 – Average Channel Power, 802.11 (b), Low Channel.

Measurements are shown with cable loss applied.

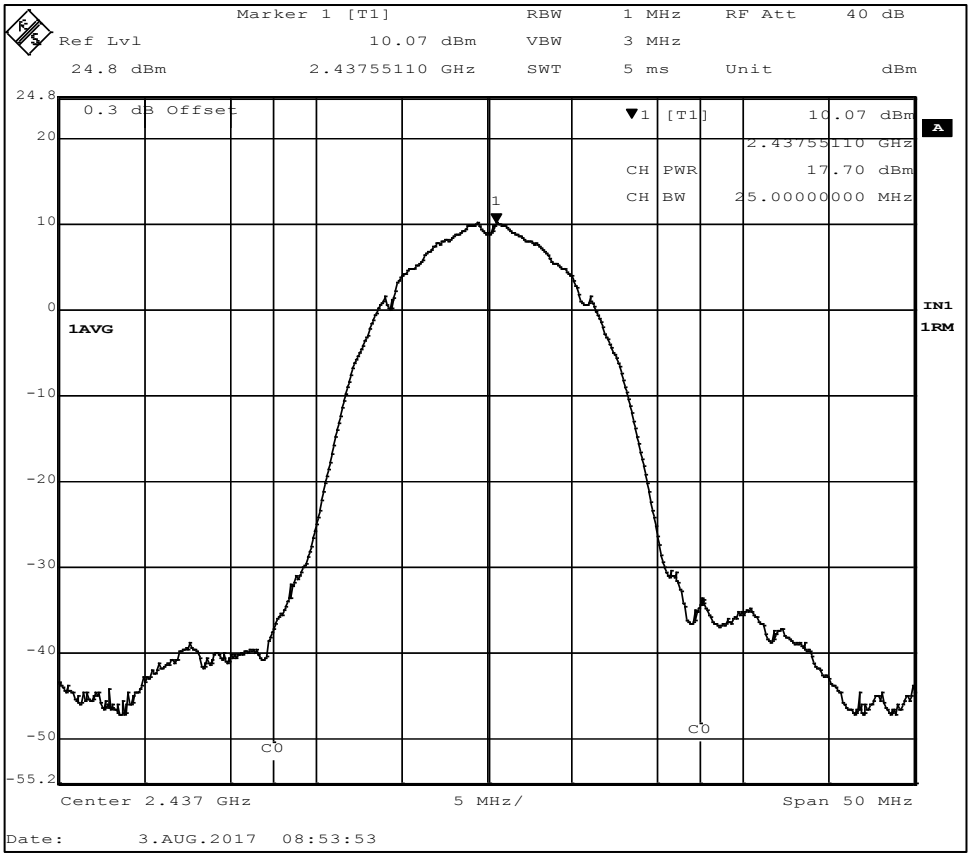

Figure 17 - Average Channel Power, 802.11 (b), Mid Channel

Measurements are shown with cable loss applied.

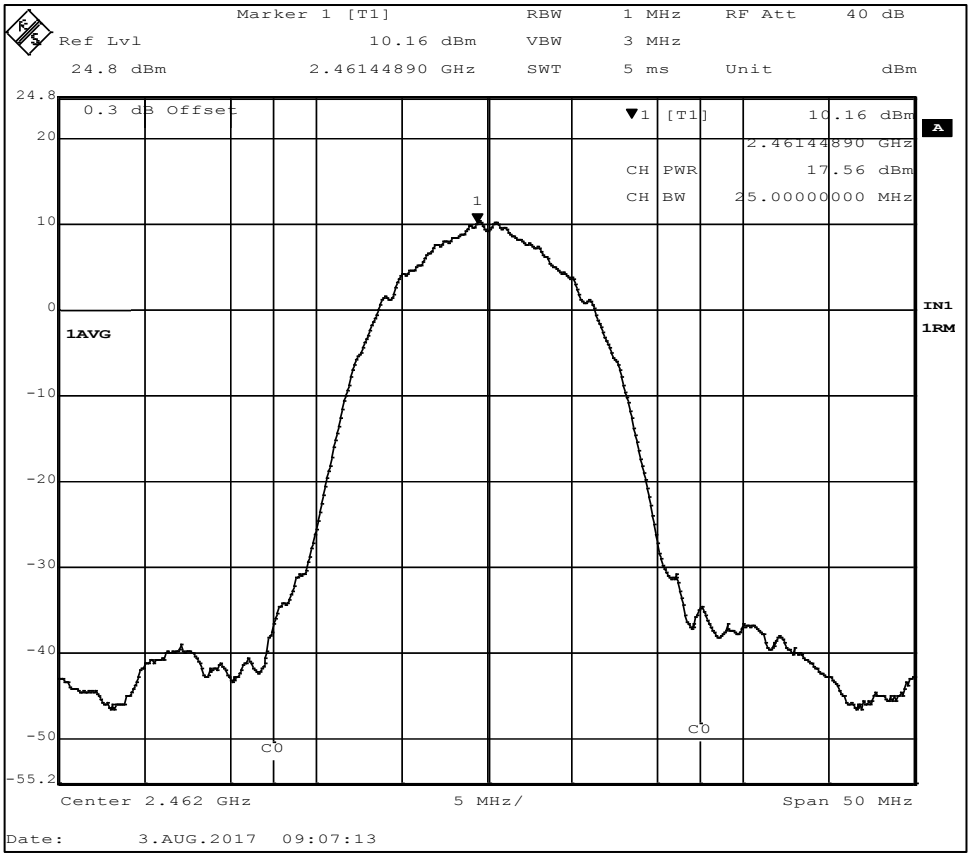

Figure 18 - Average Channel Power, 802.11 (b), High Channel

Measurements are shown with cable loss applied.

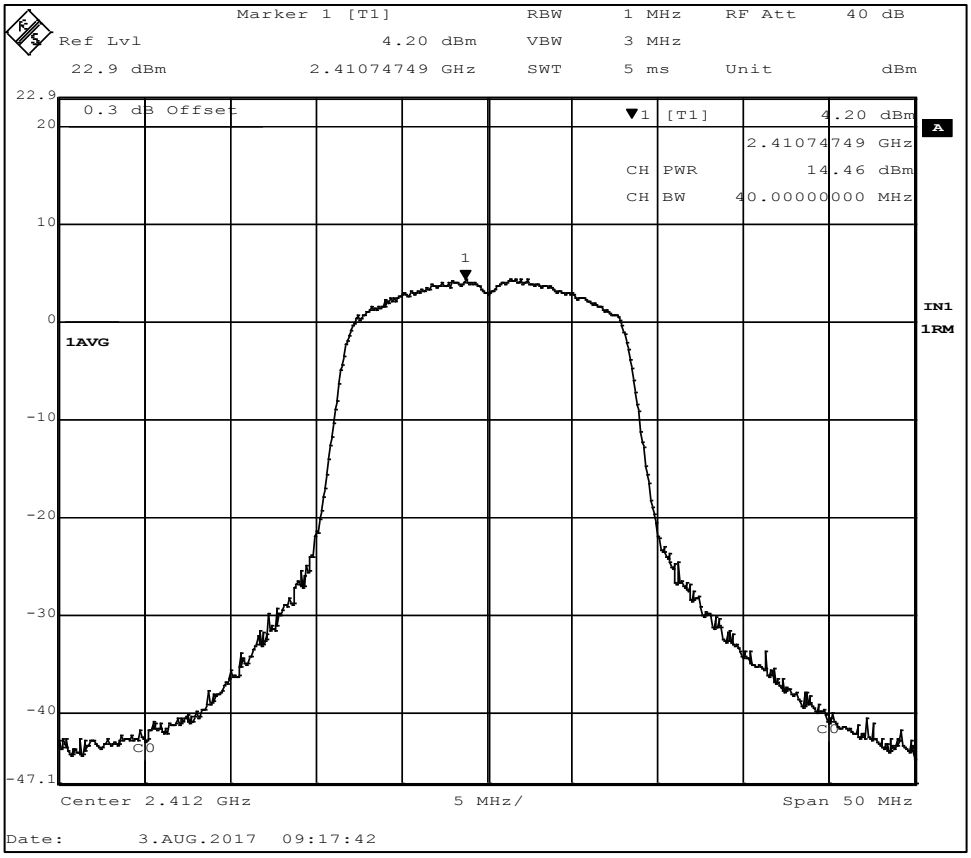

Figure 19 – Average Channel Power, 802.11 (g), Low Channel.

Measurements are shown with cable loss applied.

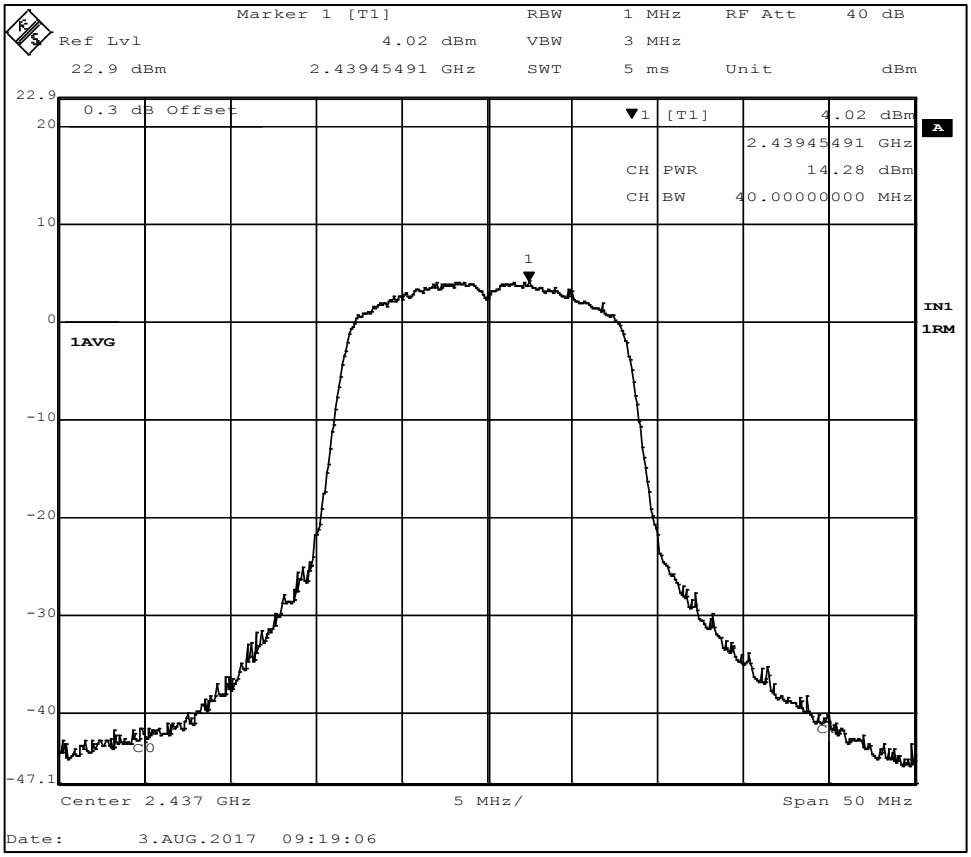

Figure 20 - Average Channel Power, 802.11 (g), Mid Channel

Measurements are shown with cable loss applied.

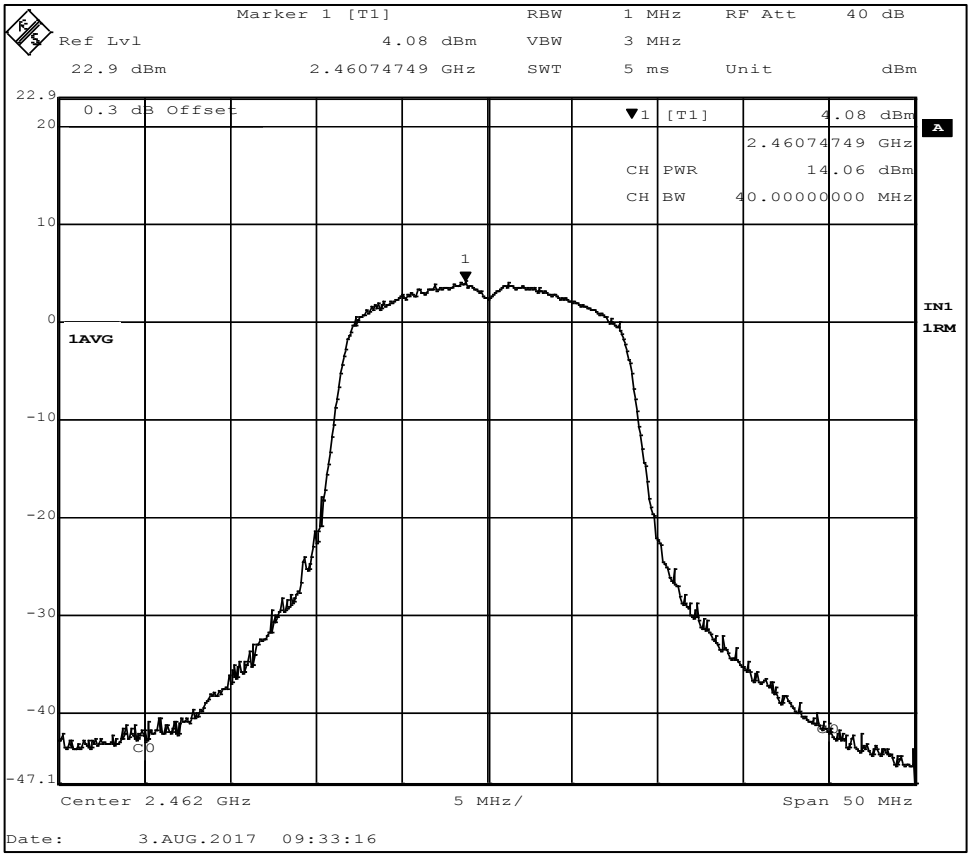

Figure 21 - Average Channel Power, 802.11 (g), High Channel

Measurements are shown with cable loss applied.

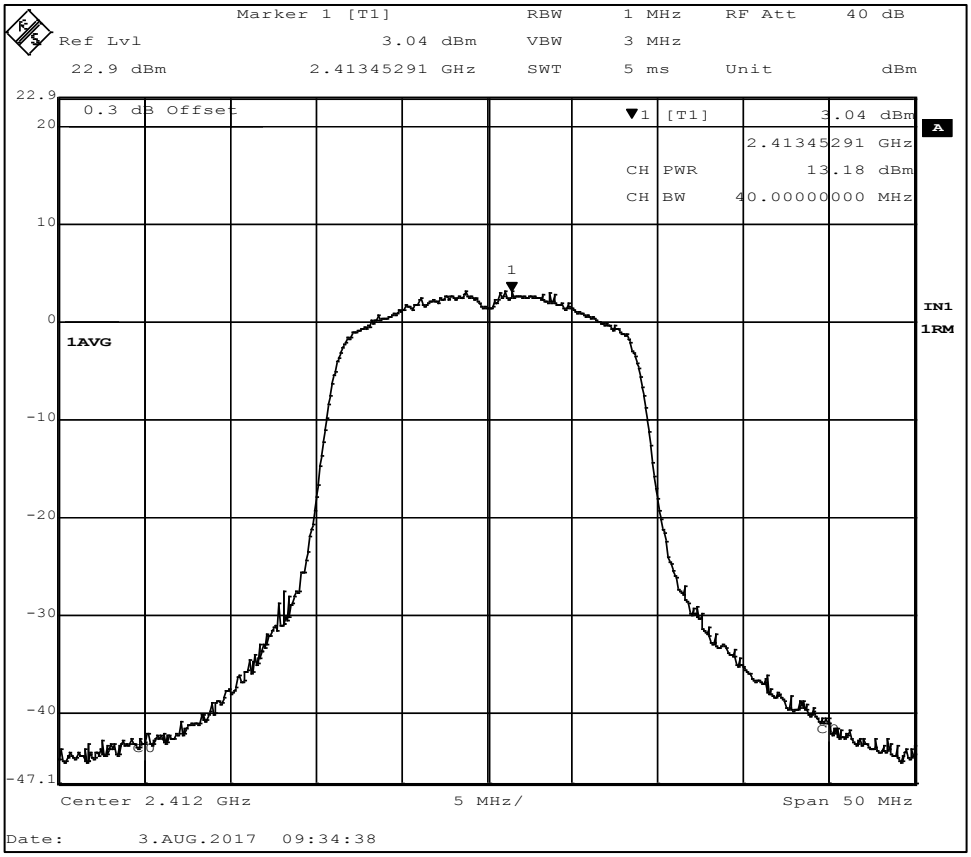

Figure 22 – Average Channel Power, 802.11 (n), Low Channel.

Measurements are shown with cable loss applied.

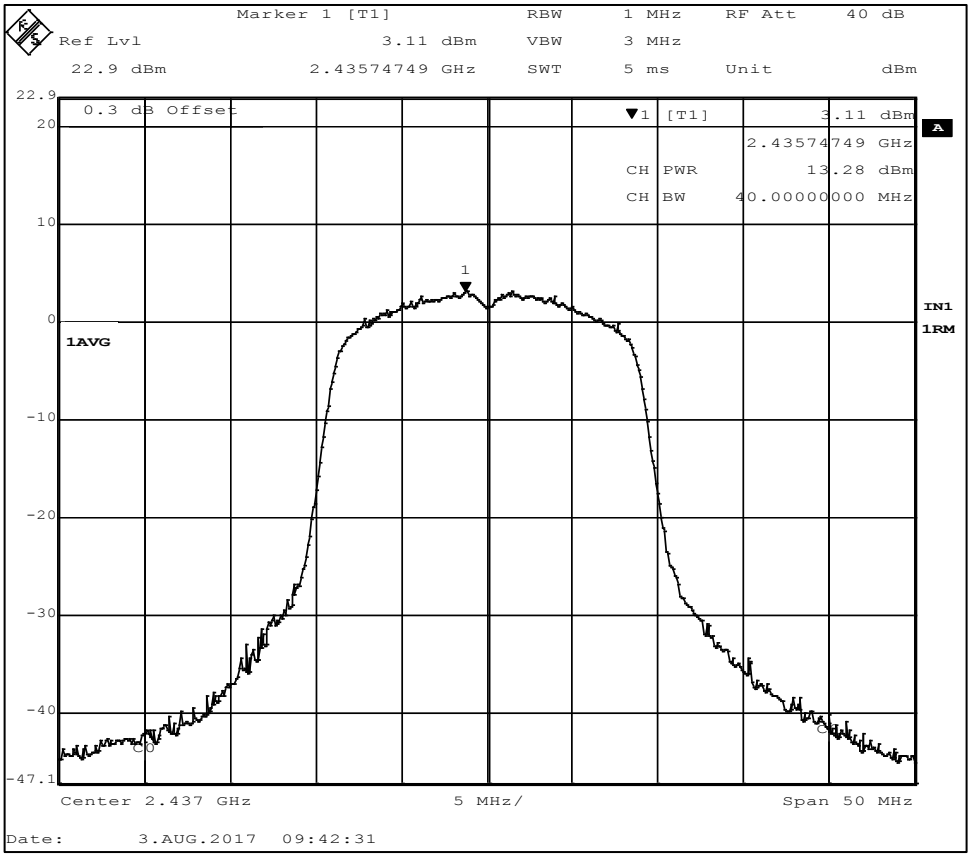

Figure 23 - Average Channel Power, 802.11 (n), Mid Channel

Measurements are shown with cable loss applied.

.

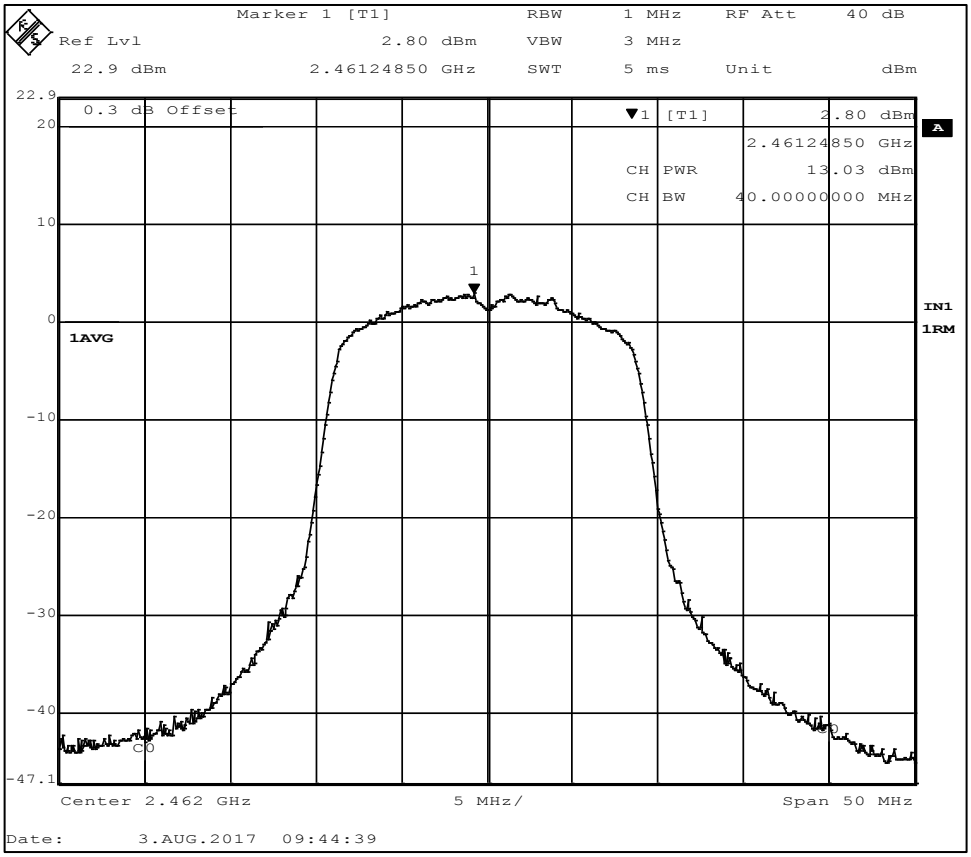

Figure 24 - Average Channel Power, 802.11 (n), High Channel

Measurements are shown with cable loss applied.

4.3 *Conducted AC Mains Emissions*

Test Method: ANSI C63.10, Section(s) 6.2
ANSI C63.4, Section(s) 7

4.4.1 Limits for conducted emissions measurements

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.3.2 Test Procedures

a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference as well as the ground.
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported.
d. Results were compared to the 15.207 limits.

4.3.3 Deviation from the test standard
No deviation

4.3.4 Test setup
The EUT was tested as part of a Hub system from Hunter Douglas.

4.3.5 EUT operating conditions

The EUT was powered by 5 VDC unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.4.6 Test Results

EUT MODULE	Wireless window blind controller hub	MODE	Transmit (middle channel used)
INPUT POWER	5 VDC	FREQUENCY RANGE	150kHz – 30MHz
ENVIRONMENTAL CONDITIONS	32 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

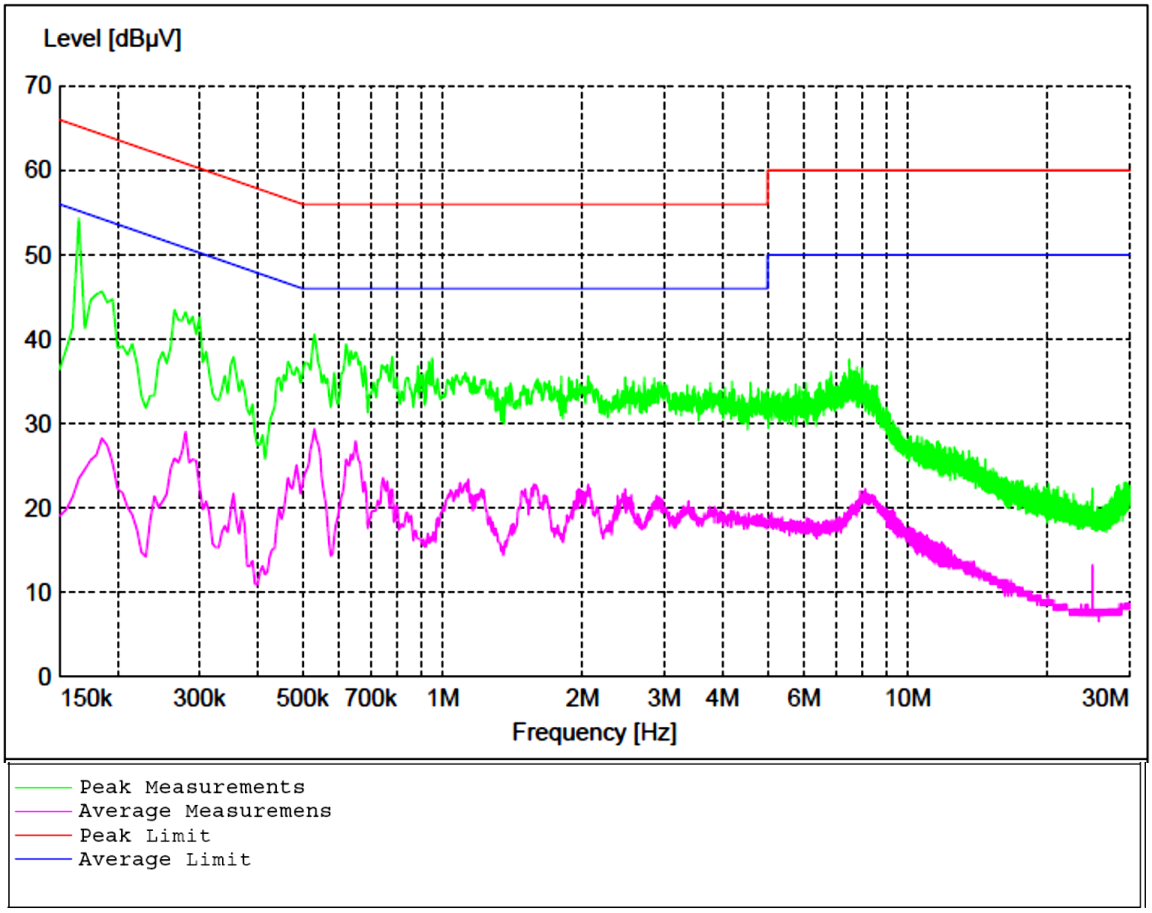

Figure 25 - Conducted Emissions Plot

*All measurements were found to be at least 10dB below the applicable limit.

Appendix A: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

EIRP (Watts) = [Field Strength (V/m) x antenna distance (m)]^2 / [30 x Gain (numeric)]

Power (watts) = 10^[Power (dBm)/10] x 1000

Field Strength (dBµV/m) = Field Strength (dBm) = 107 (for 50Ω measurement systems)

Field Strength (V/m) = 10^[Field Strength (dBµV/m) / 20] / 10^6

Gain = 1 (numeric gain for isotropic radiator)

Conversion from 3m field strength to EIRP (d=3):

EIRP = (FS x d^2)/30 = FS [(d^2)/30] = FS [0.3}

EIRP(dBm) = FS(dBµV/m) – 10(log 10^9)+ 10log[0.3] = -95.23

10log(10^) is the conversion from micro to milli

Annex B – Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	±3.82 dB
Radiated Emissions, 3m	1GHz – 27.5GHz	±4.44 dB
Emissions limits, conducted	150kHz – 18GHz	±3.30 dB
Direct antenna port conducted	9 kHz – 26.5 GHz	±0.42 dB

Expanded uncertainty values are calculated to a confidence level of 95%.

CISPR 16-4-2:2011 was used to calculate the above values.