TEST REPORT

Test Report No. : UL-RPT-RP12663640-1416A V2.0

Customer	:	Raspberry Pi (Trading) Ltd
Model No.	:	Raspberry Pi 4 Model B
FCC ID	:	2ABCB-RPI4B
Technology	:	WLAN
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.247
Test Laboratory	:	UL VS LTD, Basingstoke, Hampshire, RG24 8AH, United Kingdom

1. This test report shall not be reproduced except in full, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 18 June 2019

Checked by:

Sarah Williams
Senior Test Engineer, Radio Laboratory

Company Signatory:

Ben Mercer
Senior Test Engineer, Radio Laboratory
UL VS LTD

0644

UL VS LTD
Unit 1-3 Horizon, Kingsland Business Park, Wade Road, Basingstoke, Hampshire, RG24 8AH, UK
Telephone: +44 (0)1256 312000
Facsimile: +44 (0)1256 312001

Customer Information

Company Name:	Raspberry Pi (Trading) Ltd
Address:	Maurice Wilkes Building Cowley Road Cambridge CB4 0DS United Kingdom

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	16/05/2019	Initial Version	Sarah Williams
2.0	18/06/2019	Admin update	Sarah William

Table of Contents

1. Attestation of Test Results

1.1. Description of EUT

The Equipment Under Test was a single board computer. It contains a *Bluetooth* and 2.4 and 5 GHz WLAN module powered from an AC/DC power supply. The antenna is integral.

1.2. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	621311
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	17 April 2019 to 10 May 2019

1.3. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.247(e)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	Transmitter Maximum (Average) Output Power	✓
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	✓
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	✓
Part 15.207	Transmitter AC Conducted Emissions	✓
Key to Results ✓ = Complied ✗ = Did not comply		

Note(s):

1. The measurement was performed to assist in the calculation of the level of maximum conducted output power, power spectral density and emissions. The EUT cannot transmit continuously and sweep triggering/signal gating cannot be implemented.
2. For the data rates declared as worst case and reported in this test report, duty cycle was measured to be greater than 98%. Plots for these measurements are archived on the UL VS LTD IT server and available for inspection upon request.

1.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

2. Summary of Testing

2.1. Facilities and Accreditation

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom. The following table identifies which facilities were utilised for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

Site 1	-
Site 2	X
Site 17	X

UL VS LTD is accredited by UKAS. The tests reported herein have been performed in accordance with its terms of accreditation.

2.2. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 DTS Meas Guidance v05r02, April 2, 2019
Title:	Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.3. Calibration and Uncertainty

Measuring Instrument Calibration

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value measured (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Duty Cycle	2.4 GHz to 2.4835 GHz	95%	±1.14 %
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±4.59 %
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Conducted Maximum Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±4.65 dB
Radiated Spurious Emissions	1 GHz to 25 GHz	95%	±2.94 dB
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±2.40 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

2.4. Test and Measurement Equipment

Test Equipment Used for Transmitter Conducted Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	06 Jan 2020	12
M2033	Signal Analyser	Rohde & Schwarz	FSV13	101667	29 Jan 2020	12
M2024	Power Sensor	Boonton	55006	9824	11 Jan 2020	12
A3027	Attenuator	Broadwave Technologies Inc.	351-311-006	#1	Calibrated before use	-
A3004	RF Switch	Pickering Interfaces	64-102-002	XZ363230	Calibrated before use	-
A3180	Attenuator	Pasternack	PE7047-3	Not stated	Calibrated before use	-
G0615	Signal Generator	Rohde & Schwarz	SMBV100A	260473	08 May 2020	36
A3005	Replay Test Rack	N/A	N/A	N/A	Calibration not required	-

Test Measurement Software/Firmware Used for Transmitter Conducted Tests

Name	Version	Release Date
UL VS LTD Replay	20190208	08 February 2019

Test and Measurement Equipment (continued)

Test Equipment Used for Transmitter Radiated Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	06 Jan 2020	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	16 Feb 2020	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	20 Sep 2019	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	12 Feb 2020	12
A2893	Pre Amplifier	Schwarzbeck	BBV 9721	9721-021	15 Feb 2020	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	16 Feb 2020	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B653	12 Feb 2020	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	12 Feb 2020	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	20 Feb 2020	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	20 Feb 2020	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	20 Feb 2020	12
A3161	Antenna	Teseq	CBL6111D	50859	17 Dec 2019	12
A3083	Low Pass Filter	AtlanTecRF	AFL-01000	18010900076	09 Apr 2020	12

Test Equipment Used for Transmitter Band Edge Radiated Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2016	Thermohygrometer	Testo	608-H1	45046428	06 Jan 2020	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	08 Feb 2020	12
A3056	Pre-Amplifier	Com-Power	PAM-118A	18040040	08 Feb 2020	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	04 Dec 2019	12
A1818	Antenna	EMCO	3115	00075692	08 Feb 2020	12
A2141	Attenuator	AtlanTecRF	AN18-10	090918-04	18 Feb 2020	12

Test Equipment Used for Transmitter AC Conducted Emissions

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	06 Jan 2020	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	23 Aug 2019	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	10 Apr 2020	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	18 Dec 2019	12

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Raspberry Pi
Model Name or Number:	Raspberry Pi 4 Model B
Test Sample Serial Number:	000000007add4646 *(Conducted sample)*
Hardware Version:	V1.0
Software Version:	V1.0
FCC ID:	2ABCB-RPI4B

Brand Name:	Raspberry Pi
Model Name or Number:	Raspberry Pi 4 Model B
Test Sample Serial Number:	0000000027a0c96b *(Radiated sample #1)*
Hardware Version:	V1.0
Software Version:	V1.0
FCC ID:	2ABCB-RPI4B

Brand Name:	Raspberry Pi
Model Name or Number:	Raspberry Pi 4 Model B
Test Sample Serial Number:	000000003f9edf4a *(Radiated sample #2)*
Hardware Version:	V1.0
Software Version:	V1.0
FCC ID:	2ABCB-RPI4B

3.2. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3. Additional Information Related to Testing

Technology Tested:	WLAN (IEEE 802.11b,g,n) / Digital Transmission System		
Type of Unit:	Transceiver		
Modulation Type:	DBPSK, DQPSK, BPSK, QPSK, 16QAM & 64QAM		
Data Rates:	802.11b	1, 2, 5.5 & 11 Mbps (SISO)	
	802.11g	6, 9, 12, 18, 24, 36, 48 & 54 Mbps (SISO)	
	802.11n HT20	MCS0 to MCS7 (SISO)	
	802.11n HT40	MCS0 to MCS7 (SISO)	
Power Supply Requirement(s):	Nominal	5.0 VDC	
Maximum Conducted Output Power:	13.4 dBm		
Channel Spacing:	20 MHz		
Transmit Frequency Range:	2412 MHz to 2462 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2412
	Middle	6	2437
	Top	11	2462
Channel Spacing:	40 MHz		
Transmit Frequency Range:	2422 MHz to 2452 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	3	2422
	Top	9	2452

3.4. Description of Available Antennas

The radio utilizes an integrated antenna, with the following maximum gain:

Frequency Range (MHz)	Antenna Gain (dBi)
2400-2480	3.5

3.5. Description of Test Setup

Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	LCD Monitor
Brand Name:	Logik
Model Name or Number:	L22FE12A
Serial Number:	1309020661

Description:	USB Mouse
Brand Name:	Raspberry Pi
Model Name or Number:	RPI-MOUSE
Serial Number:	Not marked or stated

Description:	USB Keyboard
Brand Name:	Raspberry Pi
Model Name or Number:	RPI-KYB
Serial Number:	Not marked or stated

Description:	Power Supply. 100-230 VAC Input / 5 VDC output
Brand Name:	Belkin
Model Name or Number:	F7U011dr
Serial Number:	Not marked or stated

Description:	16 GB Micro SD card
Brand Name:	SanDisk
Model Name or Number:	HCI
Serial Number:	Not marked or stated

Description:	HDMI Cable Type A to Type D. Quantity 1. Length 1.05 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Ethernet cable. Quantity 1. Length 1.0 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Support Equipment (continued)

Description:	USB cable. Quantity 3. Length 3.0 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	USB Hub
Brand Name:	Hama
Model Name or Number:	00078498
Serial Number:	09825891600

Description:	Ethernet Router
Brand Name:	Netgear
Model Name or Number:	GS605
Serial Number:	1YG194390218E

Description:	HDMI Hub
Brand Name:	Sumvision
Model Name or Number:	Cyclone Micro
Serial Number:	SUM091104017

Description:	Cat 5 Ethernet Cable. Quantity 1. Length 2.0 metres
Brand Name:	AWN
Model Name or Number:	2835
Serial Number:	E87647

Description:	Test Laptop
Brand Name:	Lenovo
Model Name or Number:	L440
Serial Number:	R9-019EA1 14/04

Description:	Generic Headphones (ear buds)
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Support Equipment (continued)

Description:	USB Thumb Drive
Brand Name:	Sandisk
Model Name or Number:	Ultra flair USB 3.0
Serial Number:	BM182025896Z

Description:	USB Thumb Drive
Brand Name:	Sandisk
Model Name or Number:	Ultra flair USB 3.0
Serial Number:	BM190125896Z

Operating Modes

The EUT was tested in the following operating mode(s):

- Continuously transmitting with a modulated carrier at maximum power on the relevant channels as required using the supported data rates/modulation types.

Configuration and Peripherals

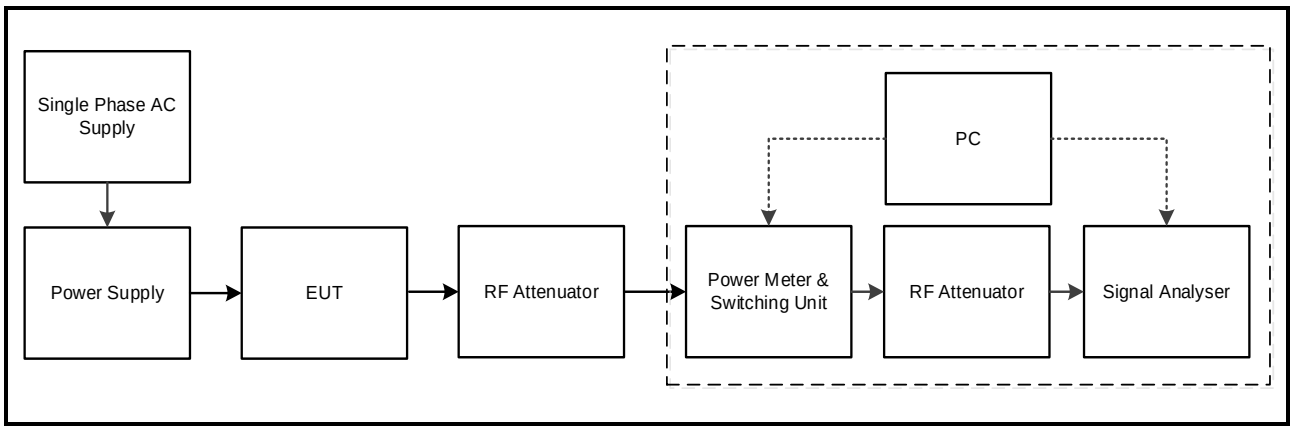
The EUT was tested in the following configuration(s):

- The customer's test application and supplied instructions were used to place the EUT into WLAN test mode. The supplied commands were entered into the console menu on the EUT. Test commands stated in the wlan_testing_3.sh file located on the /home/pi drive of the EUT were used to configure the EUT to enable a continuous transmission and to select the test channels, data rates and modulation schemes as required.
- The customer declared the following data rates to be used for all measurements as:
    - 802.11b - DBPSK / 1 Mbps / SISO
    - 802.11g - BPSK / 6 Mbps / SISO
    - 802.11n HT20 - BPSK / MCS0 / SISO
    - 802.11n HT40 – BPSK / MCS0 / SISO
- Testing was performed using the customer declared power settings:
    - 802.11b - 1 Mbps / Q power level 42
    - 802.11g - 6 Mbps / Q power level 42
    - 802.11n HT20 - MCS0 / Q power level 42
    - 802.11n HT40 – MCS0 / Q power level 45
- The EUT was powered via an AC/DC switch mode power supply.
- AC conducted emissions test was tested with the EUT transmitting on the middle channel using a data rate of 6 Mbps (802.11g), as this mode was found to transmit the highest power and highest PSD.
- Transmitter spurious emissions were performed with the EUT transmitting with a data rate of 6 Mbps (802.11g). This was found to be the worst case modulation scheme with regards to emissions after preliminary investigations and as this mode emits the highest output power level, it was deemed to be the worst case.
- Radiated spurious emissions were performed with the EUT in the Z plane (worst case) while connected to its power supply. Tests were performed with the EUT connected to its AC adaptor and USB cable. All other ports were terminated with suitable terminations.
- The LCD monitor was connected to the EUT using a 1.05 metre long HDMI cable.
- The keyboard and mouse were connected to the USB port on the EUT.
- AC conducted tests were performed with all ports terminated, employing all available accessories.

Test Setup Diagrams

Conducted Tests:

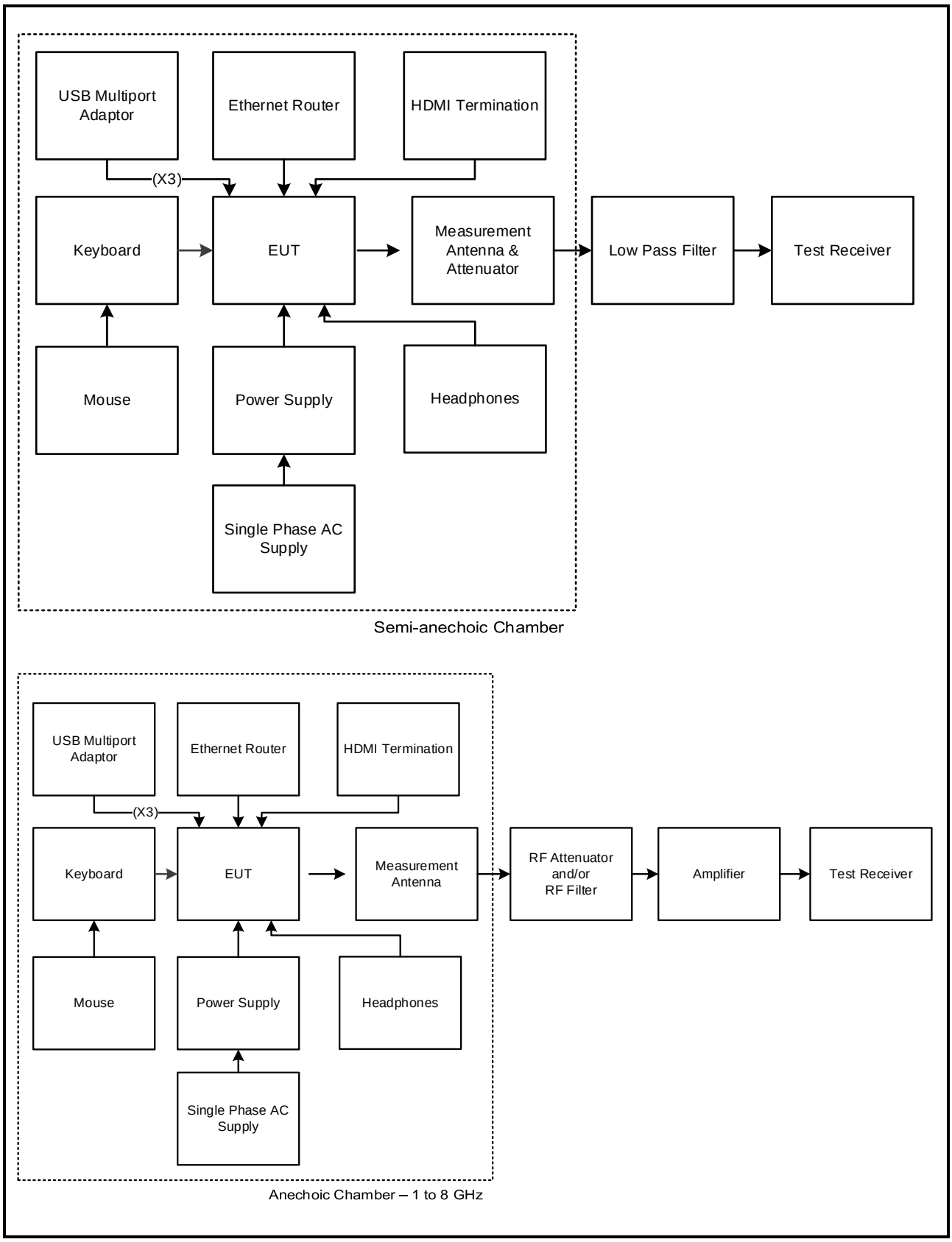
Test Setup for Conducted Transmitter Tests



Test Setup Diagrams (continued)

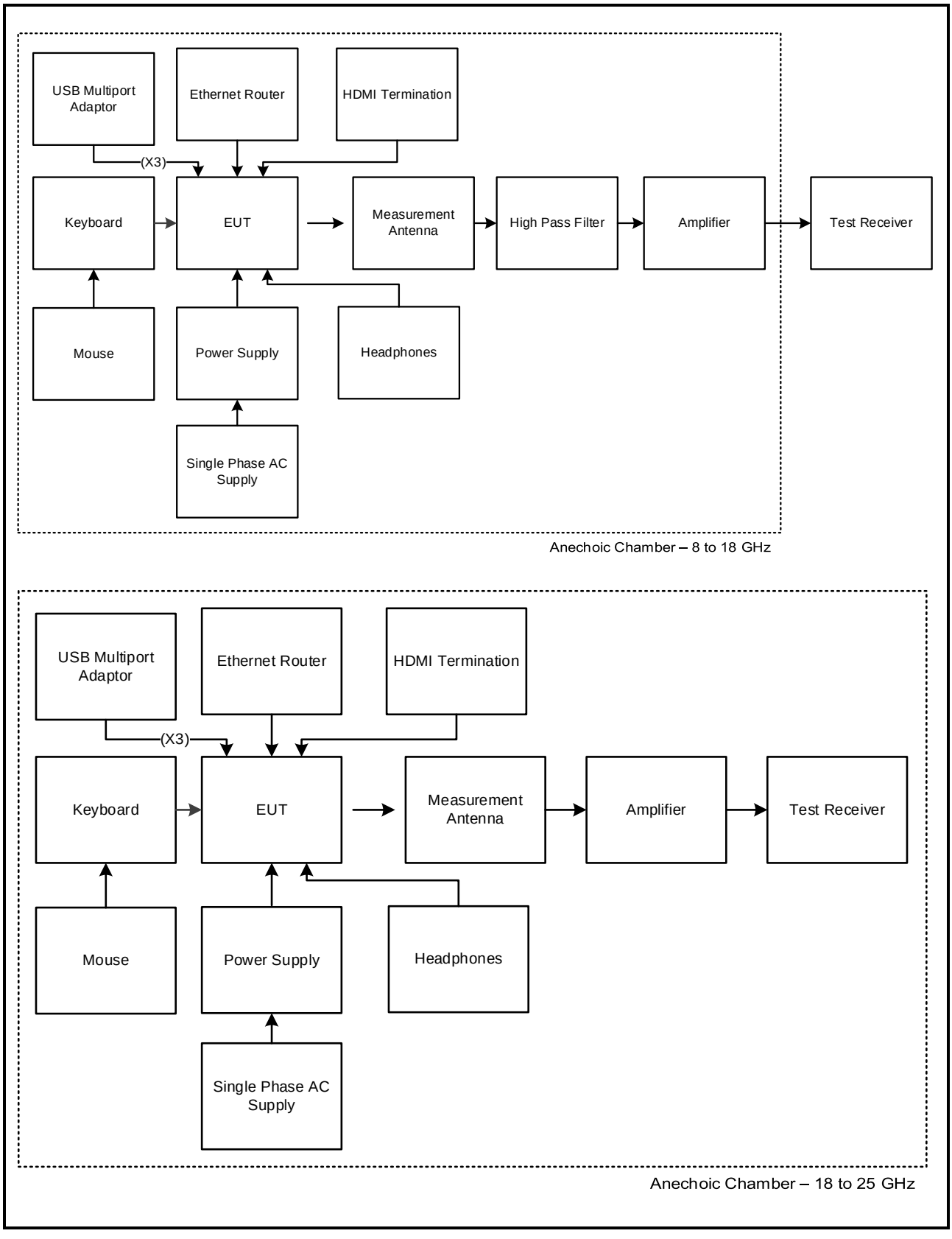
Radiated Tests:

Test Setup for Transmitter Radiated Emissions



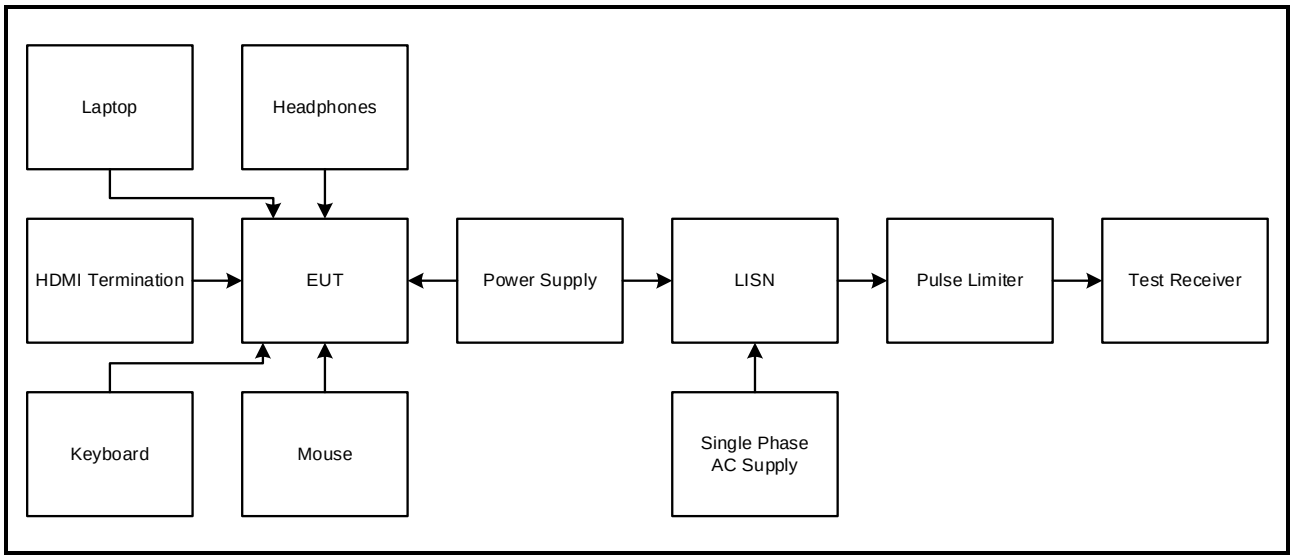
Test Setup Diagrams (continued)

Test setup for radiated measurements (continued):



Test Setup Diagrams (continued)

Test Setup for Transmitter AC Conducted Emissions



4. Antenna Port Test Results

4.1. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Max Passell	**Test Date:**	23 April 2019
Test Sample Serial Number:	000000007add4646		

FCC Reference:	Part 15.35(c)
Test Method Used:	FCC KDB 558074 Section 6 referencing ANSI C63.10 Section 11.6

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	37

Note(s):

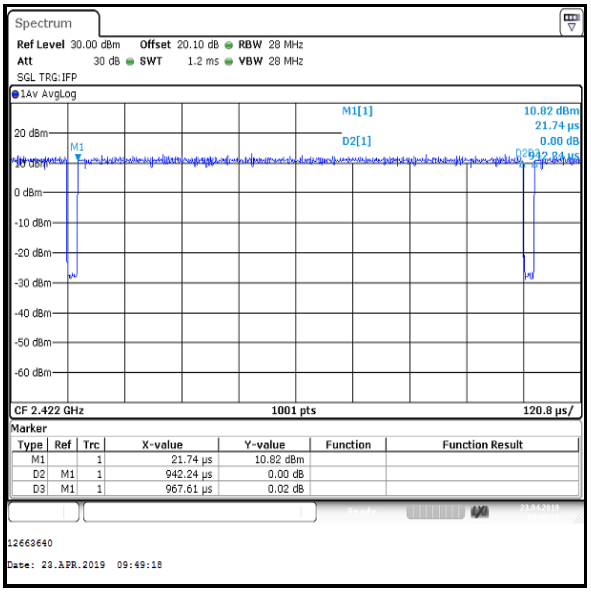
1. In order to assist with the determination of the average level of fundamental and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a signal analyser in the time domain and calculated by using the following calculation:

   10 log 1 / (On time / [Period or 100 ms whichever is the lesser]).

2. For all other modes, the duty cycle was measured and found to be greater than 98%. Plots for these measurements are archived on the UL VS LTD IT server and available for inspection upon request.

Results: 802.11n / HT40 / MCS0

Pulse Duration (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
0.942	0.968	97.3	0.1



4.2. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Max Passell	**Test Dates:**	23 April 2019 & 29 April 2019
Test Sample Serial Number:	000000007add4646		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.2 referencing ANSI C63.10 Section 11.8.1

Environmental Conditions:

Temperature (°C):	24 to 25
Relative Humidity (%):	33 to 37

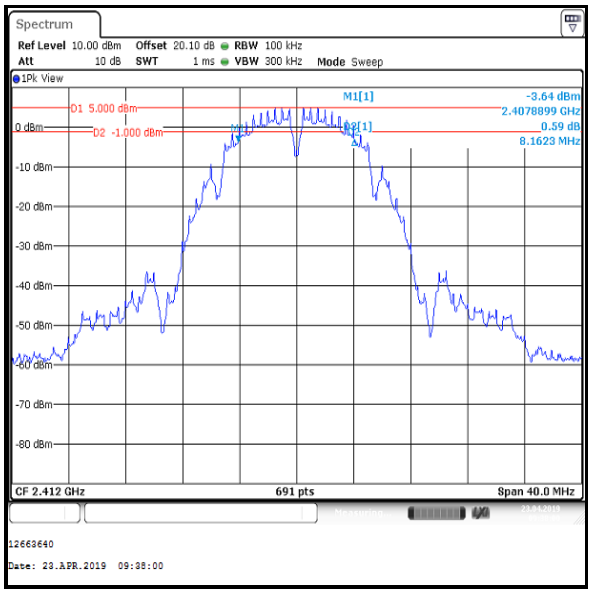
Note(s):

1. Final measurements were performed on the bottom, middle and top channels in accordance with ANSI C63.10 Section 11.8.1 Option 1 measurement procedure. The signal analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 40 MHz for 20 MHz channel bandwidths and 80 MHz for 40 MHz channel bandwidths. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
2. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF offset was entered on the signal analyser to compensate for the loss of the switch, attenuator and RF cables.

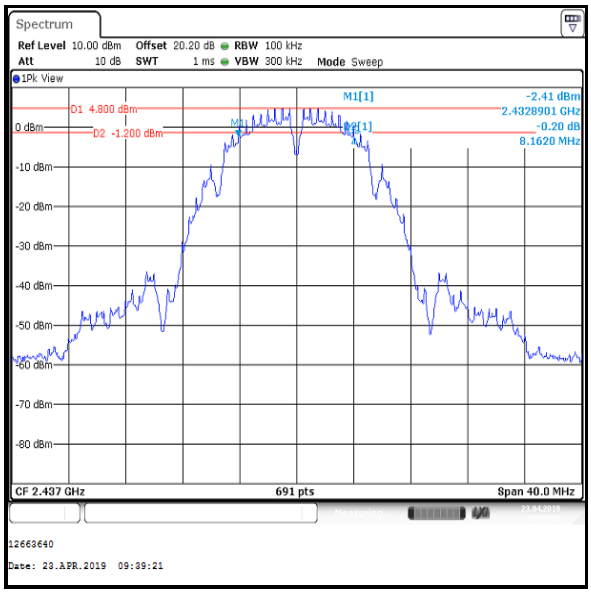
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11b / 20 MHz / DBPSK / 1 Mbps

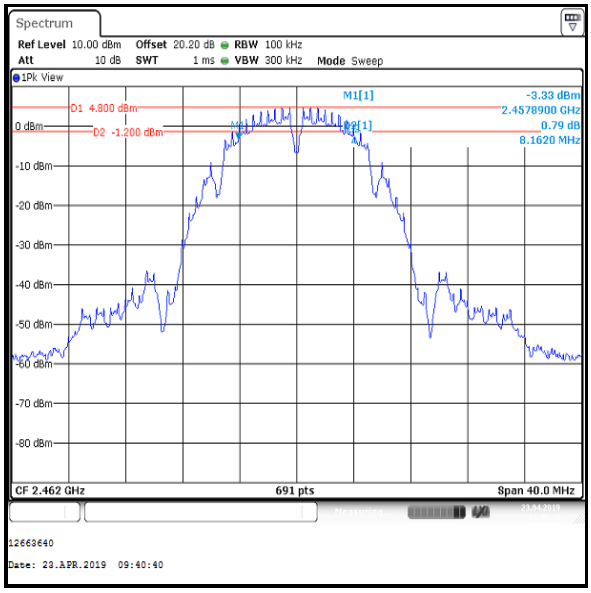
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	8162	≥500	7662	Complied
Middle	8162	≥500	7662	Complied
Top	8162	≥500	7662	Complied



Bottom Channel



Middle Channel

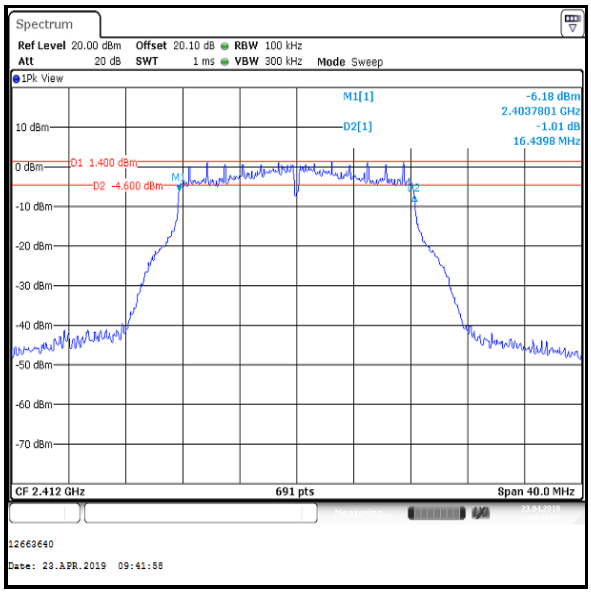


Top Channel

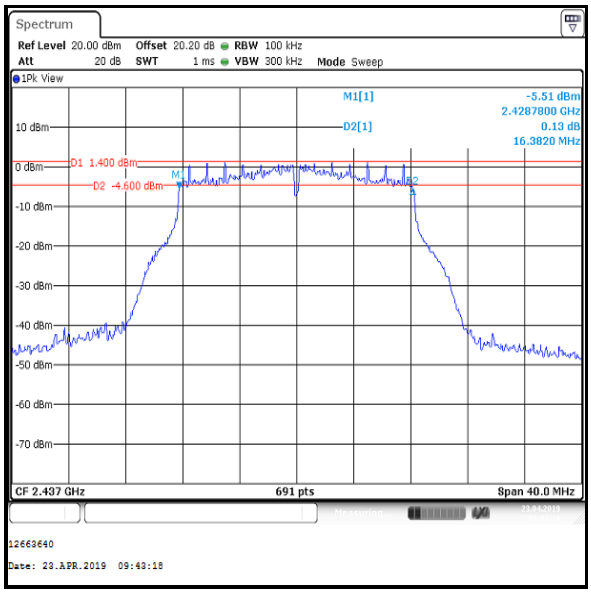
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11g / 20 MHz / BPSK / 6 Mbps

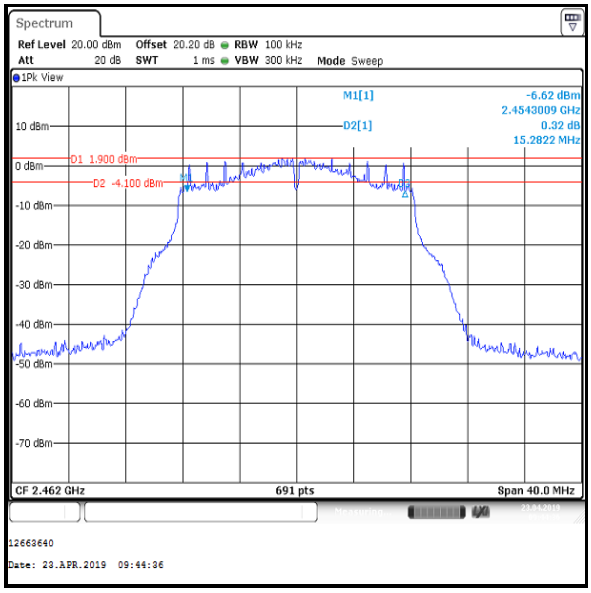
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16440	≥500	15940	Complied
Middle	16382	≥500	15882	Complied
Top	15282	≥500	14782	Complied



Bottom Channel



Middle Channel

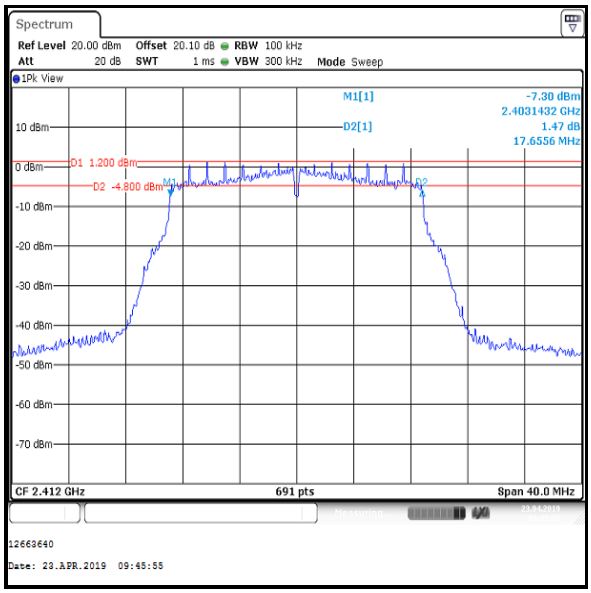


Top Channel

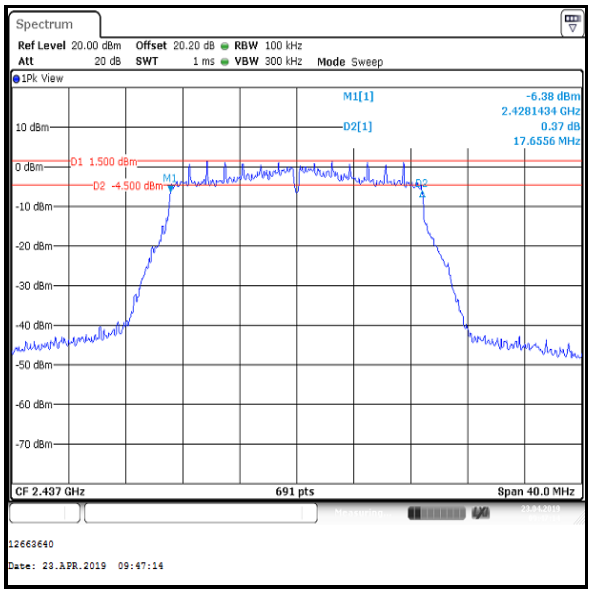
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11n / HT20 / BPSK / MCS0

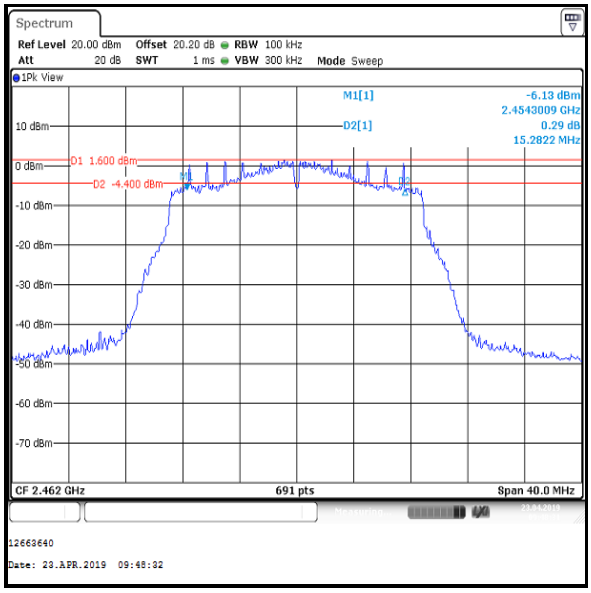
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17656	≥500	17156	Complied
Middle	17656	≥500	17156	Complied
Top	15282	≥500	14782	Complied



Bottom Channel



Middle Channel

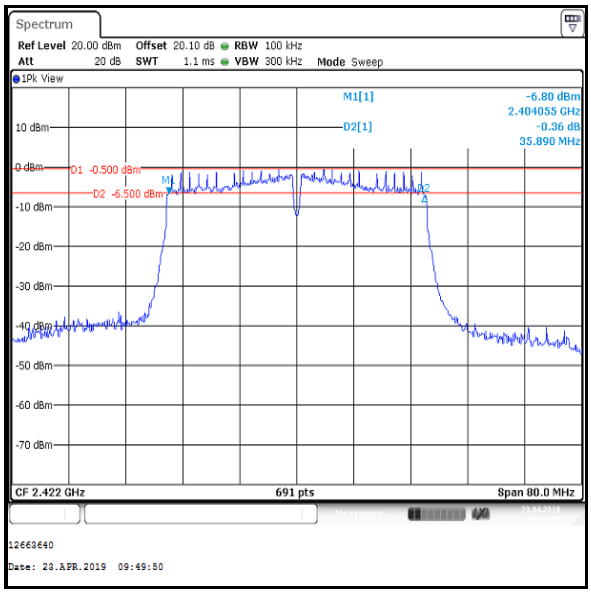


Top Channel

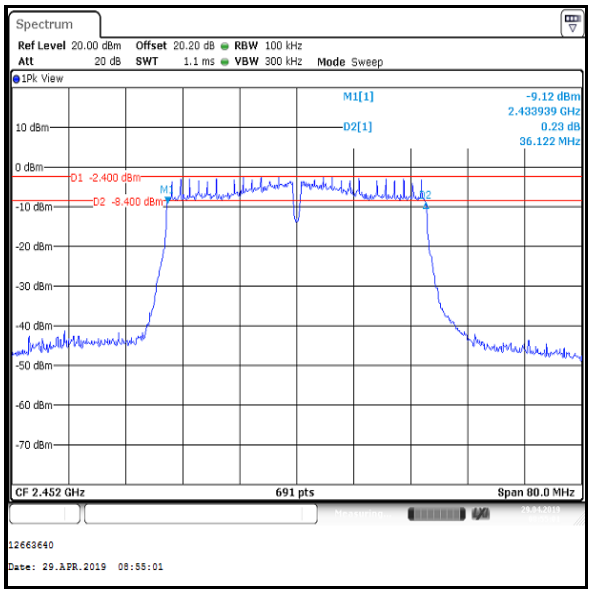
Transmitter Minimum 6 dB Bandwidth (continued)

Results: 802.11n / HT40 / BPSK / MCS0

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	35890	≥500	35390	Complied
Top	36122	≥500	35622	Complied



Bottom Channel



Top Channel

4.3. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Max Passell	**Test Dates:**	23 April 2019 & 29 April 2019
Test Sample Serial Number:	000000007add4646		

FCC Reference:	Part 15.247(e)
Test Method Used:	FCC KDB 558074 Section 8.4 referencing ANSI C63.10 Sections 11.10.3 & 11.10.5

Environmental Conditions:

Temperature (°C):	24 to 25
Relative Humidity (%):	33 to 37

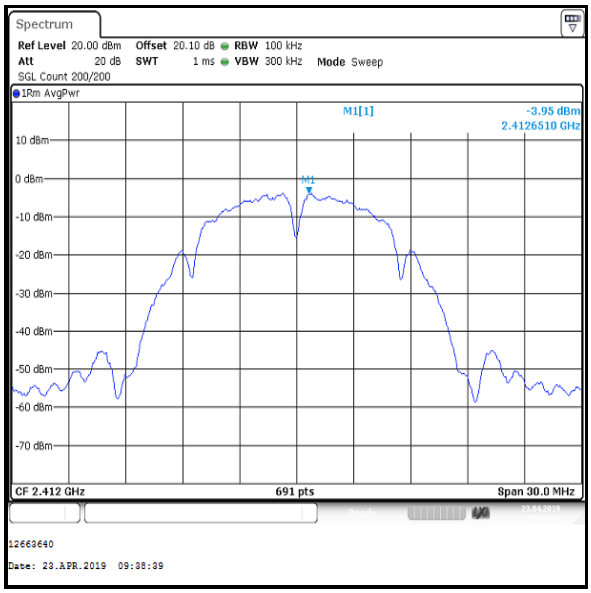
Note(s):

1. Final measurements were performed on the bottom, middle and top channels.
2. For 802.11b, 802.11g and 802.11n HT20, the EUT was transmitting at ≥ 98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.10.3 Method AVGPSD-1. The signal analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. An RMS detector was used and sweep time set to perfom trace averaging over 200 traces. The span was set greater than 1.5 times the 99% emission bandwidth (plots for occupied bandwidth are archived on the company server and available for inspection upon request). The highest peak of the measured signal was recorded.
3. For 802.11n HT40, the EUT was transmitting at <98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.10.5 Method AVGPSD-2. The signal analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. An RMS detector was used and sweep time set to perform trace averaging over 200 traces. The span was set greater than 1.5 times the 99% emission bandwidth. The highest peak of the measured signal was recorded. The calculated duty cycle in section 4.1 was added to the measured average power spectral density in order to compute the average power spectral density during the actual transmission time.
4. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF offset was entered on the signal analyser to compensate for the loss of the switch, attenuator and RF cables.

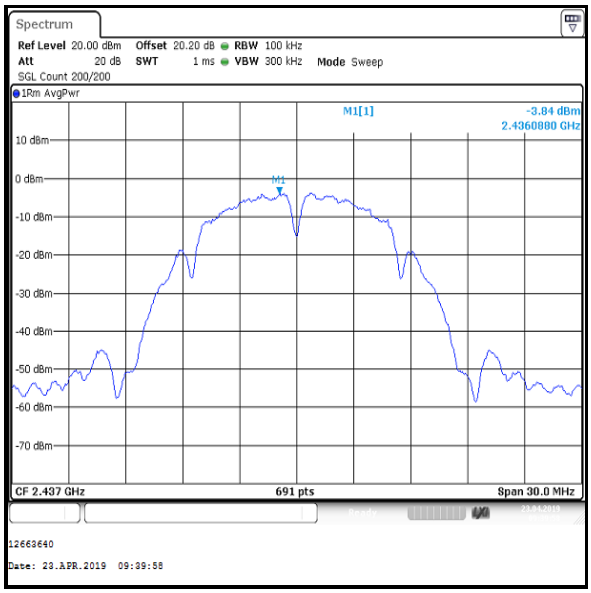
Transmitter Power Spectral Density (continued)

Results: 802.11b / 20 MHz / DBPSK / 1 Mbps

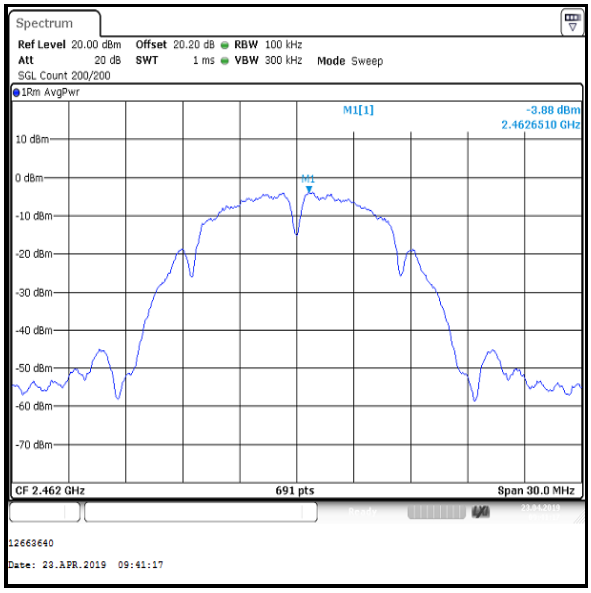
Channel	PSD (dBm/100 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-3.9	8.0	11.9	Complied
Middle	-3.8	8.0	11.8	Complied
Top	-3.9	8.0	11.9	Complied



Bottom Channel



Middle Channel

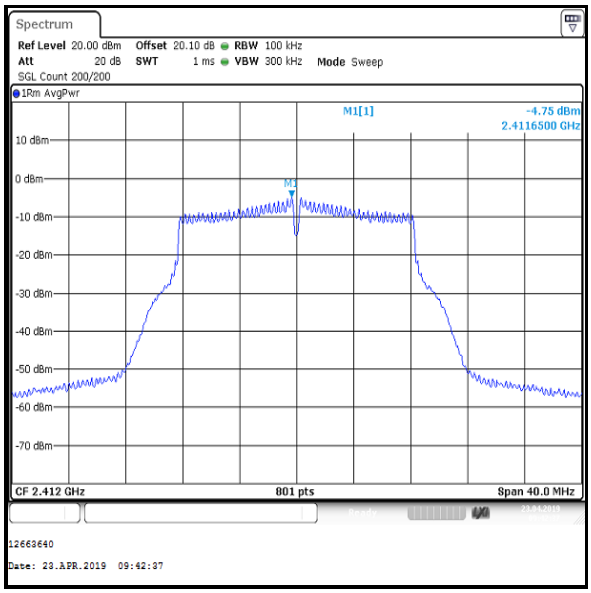


Top Channel

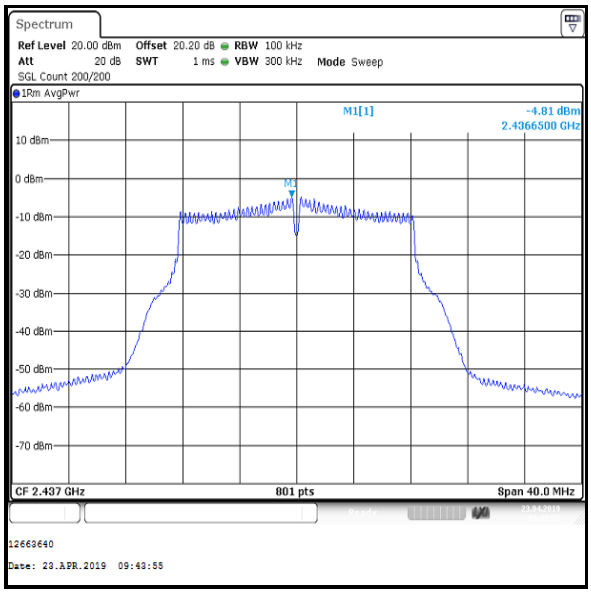
Transmitter Power Spectral Density (continued)

Results: 802.11g / 20 MHz / BPSK / 6 Mbps

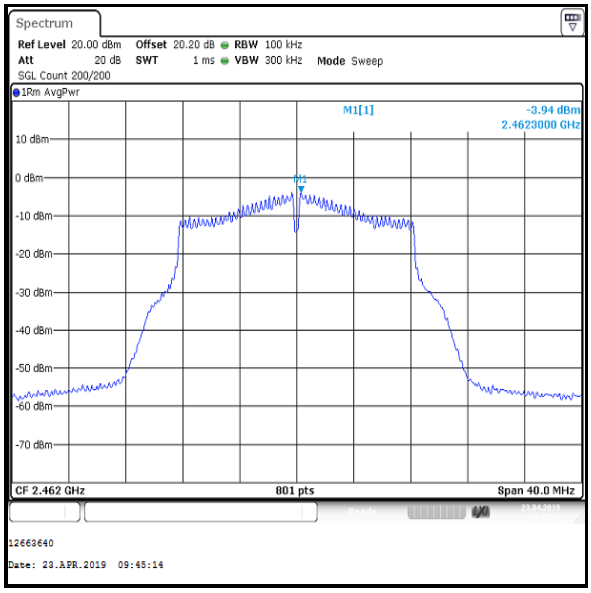
Channel	PSD (dBm/100 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-4.7	8.0	12.7	Complied
Middle	-4.8	8.0	12.8	Complied
Top	-3.9	8.0	11.9	Complied



Bottom Channel



Middle Channel

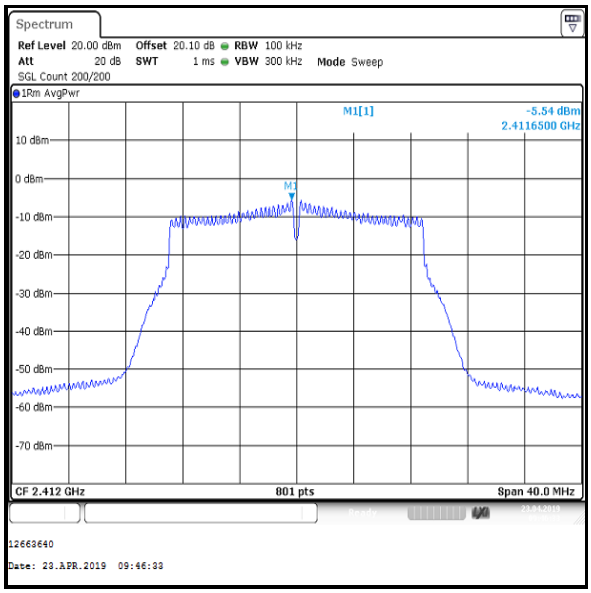


Top Channel

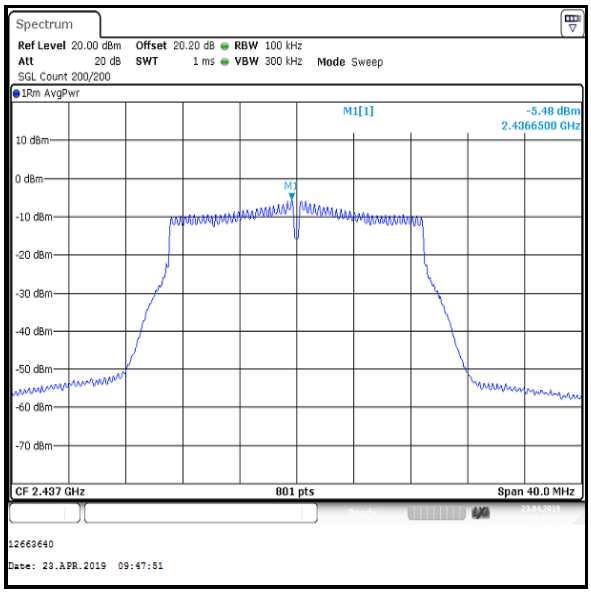
Transmitter Power Spectral Density (continued)

Results: 802.11n / HT20 / BSPK / MCS0

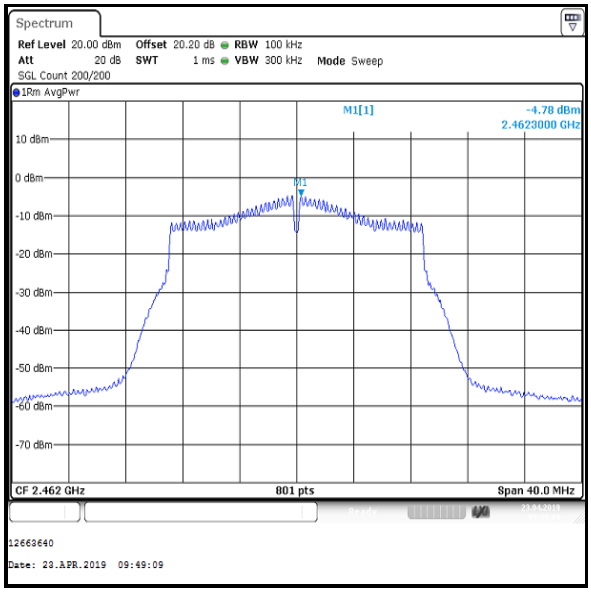
Channel	PSD (dBm/100 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-5.5	8.0	13.5	Complied
Middle	-5.5	8.0	13.5	Complied
Top	-4.8	8.0	12.8	Complied



Bottom Channel



Middle Channel

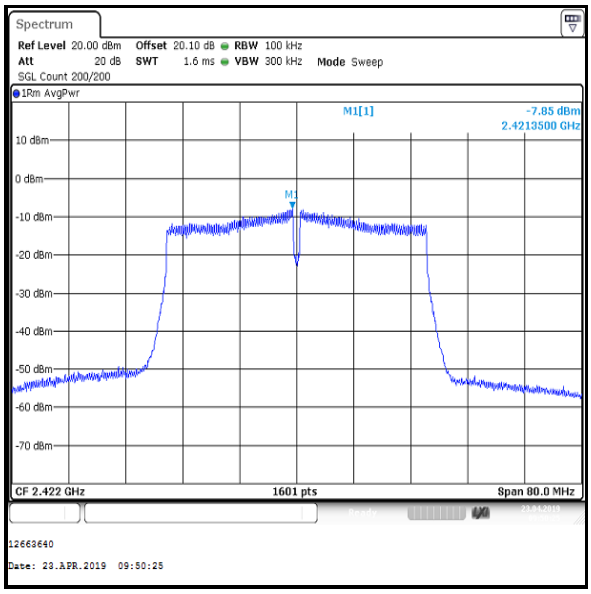


Top Channel

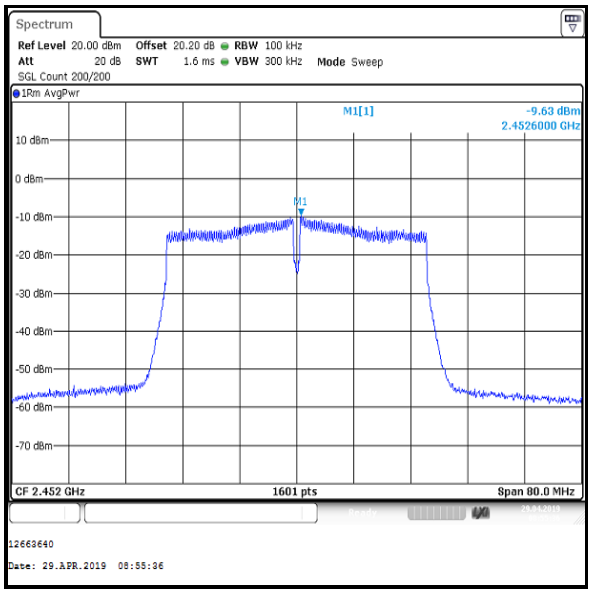
Transmitter Power Spectral Density (continued)

Results: 802.11n / HT40 / BPSK / MCS0

Channel	PSD (dBm/100 kHz)	Duty Cycle Correction Factor (dB)	Corrected PSD (dBm/100 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-7.8	0.1	-7.7	8.0	15.7	Complied
Top	-9.6	0.1	-9.5	8.0	17.5	Complied



Bottom Channel



Top Channel

4.4. Transmitter Maximum (Average) Output Power

Test Summary:

Test Engineer:	Max Passell	**Test Dates:**	23 April 2019 & 29 April 2019
Test Sample Serial Number:	000000007add4646		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 8.3.2.2 referencing ANSI C63.10 Sections 11.9.2.2.2 & 11.9.2.2.4

Environmental Conditions:

Temperature (°C):	24 to 25
Relative Humidity (%):	33 to 37

Note(s):

1. Final measurements were performed on the bottom, middle and top channels.
2. The power has been integrated over the 99% emission bandwidth. Plots for the emission bandwidth are archived on the company server and available for inspection upon request.
3. For 802.11b, the EUT was transmitting at ≥ 98% duty cycle and testing was peformed in accordance with ANSI C63.10 Section 11.9.2.2.2 Method AVGSA-1. The signal analyser's integration function was used to integrate across the 99% emission bandwidth.The signal analyser resolution bandwidth was set to 300 kHz and video bandwidth 1 MHz. An RMS detector was used and sweep time set to perform trace averaging over 200 traces. The span was set to at least 1.5 times the 99% emission bandwidth.
4. For 802.11g and 802.11n modes, the EUT was transmitting at ≥ 98% duty cycle and testing was peformed in accordance with ANSI C63.10 Section 11.9.2.2.2 Method AVGSA-1. The signal analyser's integration function was used to integrate across the 99% emission bandwidth. The signal analyser resolution bandwidth was set to 500 kHz and video bandwidth 2 MHz. An RMS detector was used and sweep time set to perform trace averaging over 200 traces. The span was set to at least 1.5 times the 99% emission bandwidth.
5. For 802.11n HT40, the EUT was transmitting at <98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.9.2.2.4 Method AVGSA-2. The signal analyser's integration function was used to integrate across the 99% emission bandwidth. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. An RMS detector was used and sweep time set manually to perform trace averaging over 200 traces. The span was set to at least 1.5 times the 99% emission bandwidth. The calculated duty cycle in section 4.1 was added to the measured power in order to compute the average power during the actual transmission time.
6. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF offset was entered on the signal analyser to compensate for the loss of the switch, attenuator and RF cables.

Transmitter Maximum (Average) Output Power (continued)

Results: 802.11b / 20 MHz / DBPSK / 1 Mbps

Conducted Peak Limit Comparison

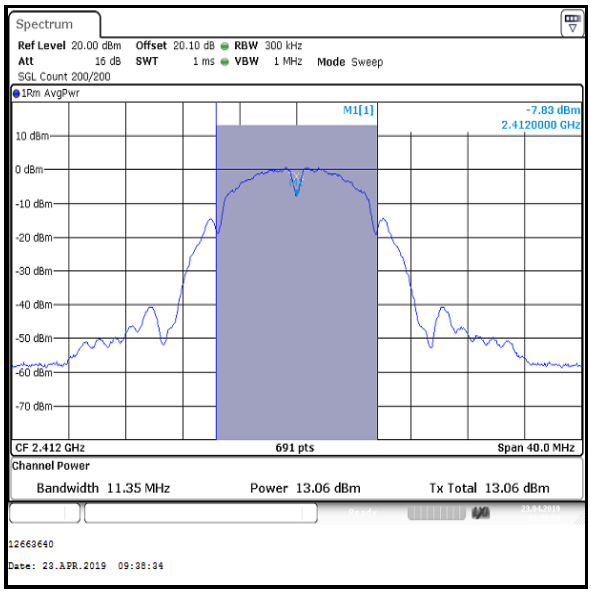
Channel	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	13.1	30.0	16.9	Complied
Middle	13.1	30.0	16.9	Complied
Top	13.0	30.0	17.0	Complied

EIRP Limit Comparison

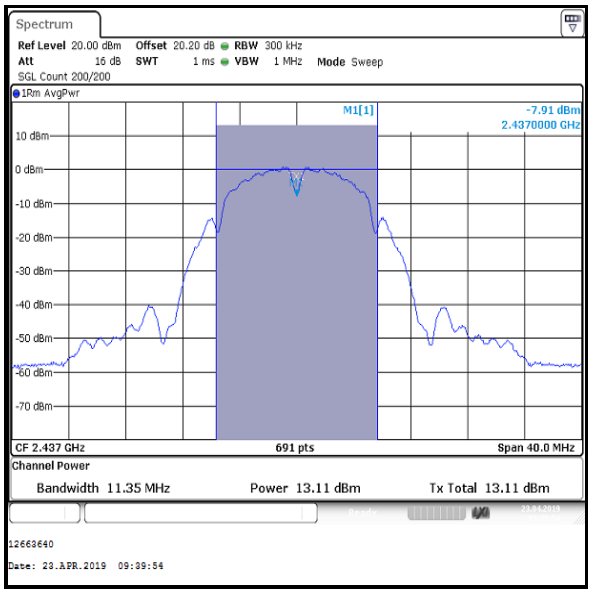
Channel	Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	13.1	3.5	16.6	36.0	19.4	Complied
Middle	13.1	3.5	16.6	36.0	19.4	Complied
Top	13.0	3.5	16.5	36.0	19.5	Complied

Transmitter Maximum (Average) Output Power (continued)

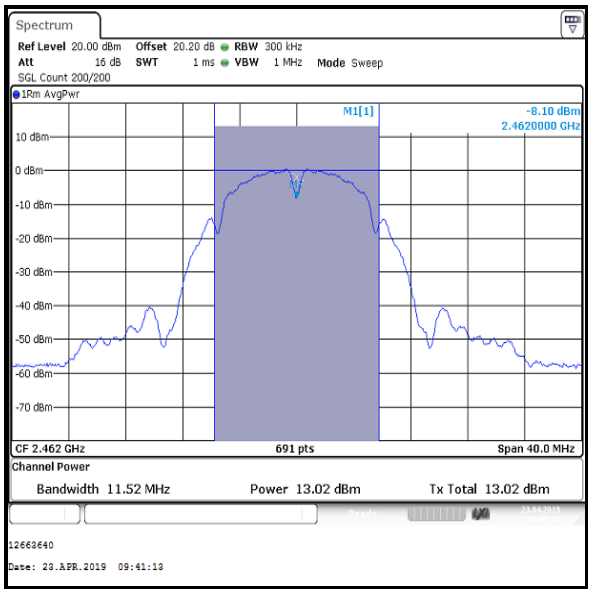
Results: 802.11b / 20 MHz / DBPSK / 1 Mbps



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum (Average) Output Power (continued)

Results: 802.11g / 20 MHz / BPSK / 6 Mbps

Conducted Peak Limit Comparison

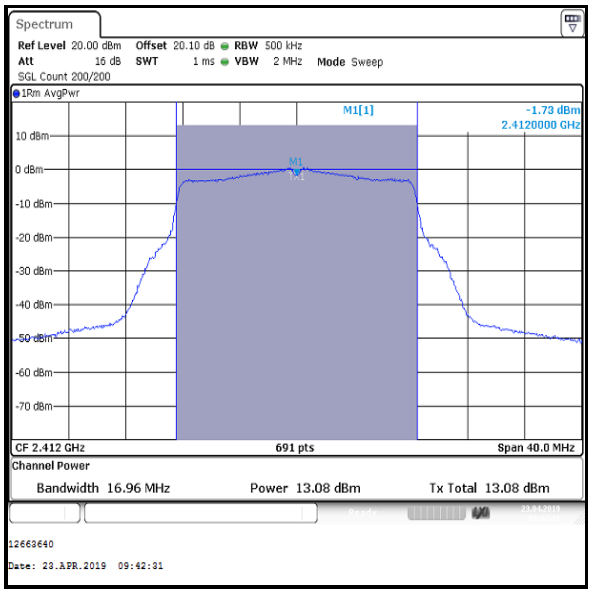
Channel	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	13.1	30.0	16.9	Complied
Middle	13.2	30.0	16.8	Complied
Top	13.3	30.0	16.7	Complied

EIRP Limit Comparison

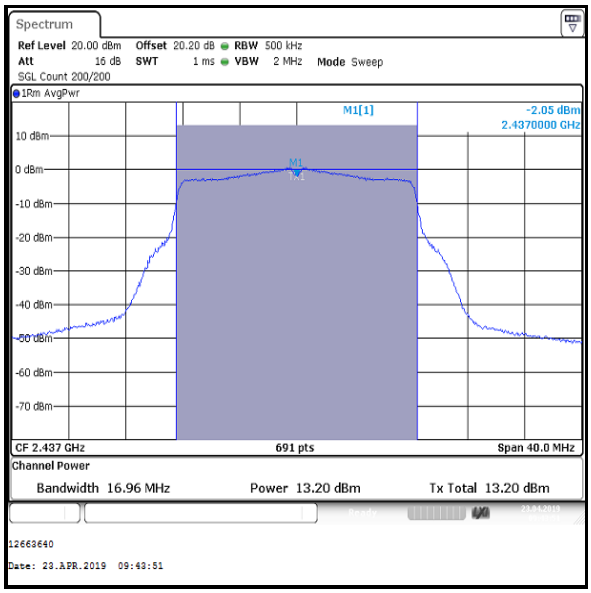
Channel	Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	13.1	3.5	16.6	36.0	19.4	Complied
Middle	13.2	3.5	16.7	36.0	19.3	Complied
Top	13.3	3.5	16.8	36.0	19.2	Complied

Transmitter Maximum (Average) Output Power (continued)

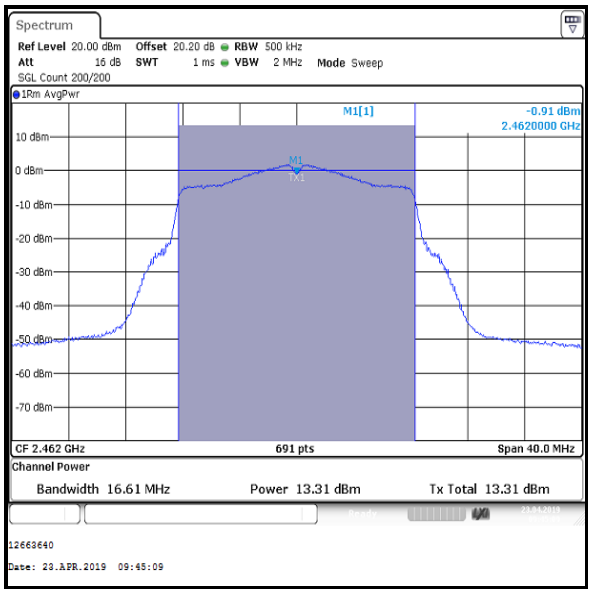
Results: 802.11g / 20 MHz / BPSK / 1 Mbps



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum (Average) Output Power (continued)

Results: 802.11n / HT20 / BPSK / MCS0

Conducted Peak Limit Comparison

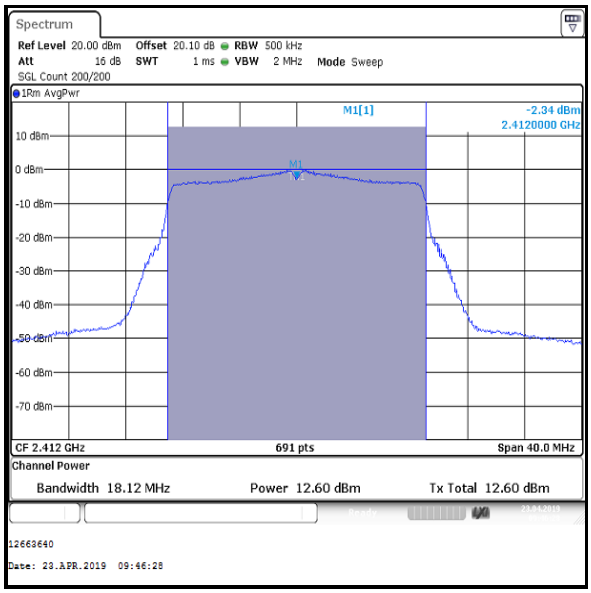
Channel	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	12.6	30.0	17.4	Complied
Middle	12.7	30.0	17.3	Complied
Top	12.7	30.0	17.3	Complied

EIRP Limit Comparison

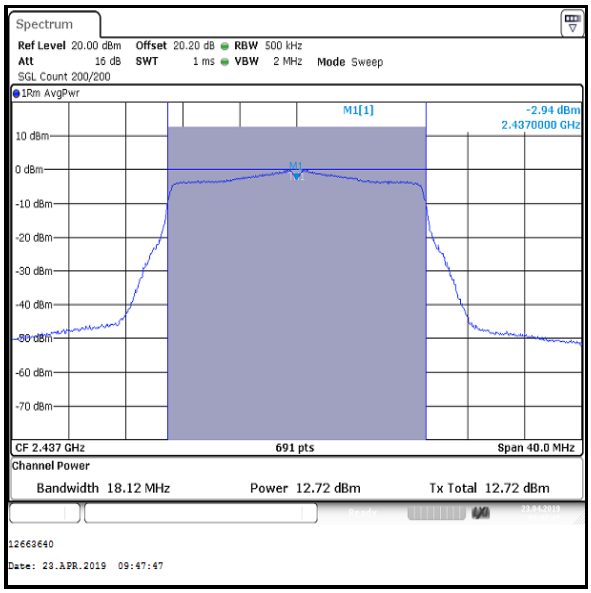
Channel	Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	12.6	3.5	16.1	36.0	19.9	Complied
Middle	12.7	3.5	16.2	36.0	19.8	Complied
Top	12.7	3.5	16.2	36.0	19.8	Complied

Transmitter Maximum (Average) Output Power (continued)

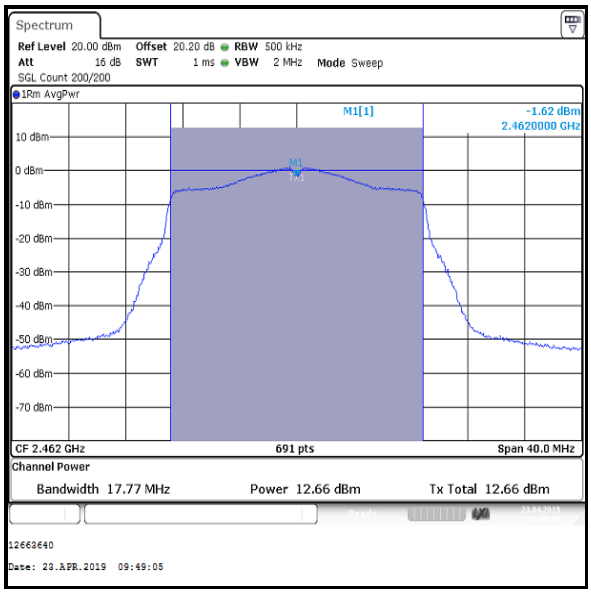
Results: 802.11n / HT20 / BSPK / MCS0



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum (Average) Output Power (continued)

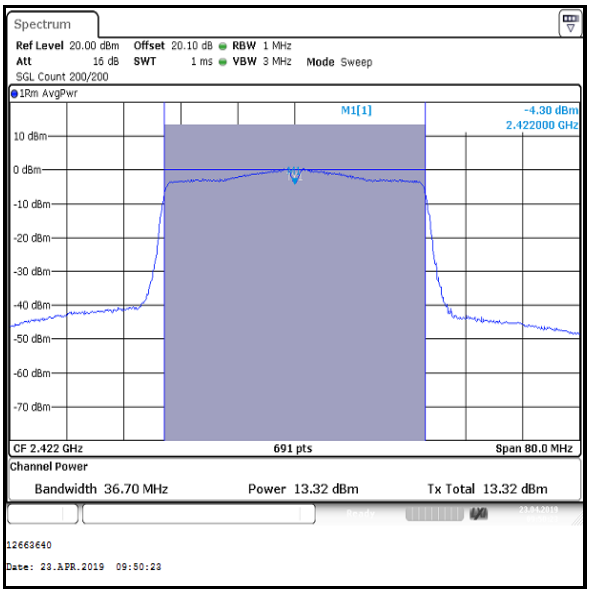
Results: 802.11n / HT40 / BPSK / MCS0

Conducted Peak Limit Comparison

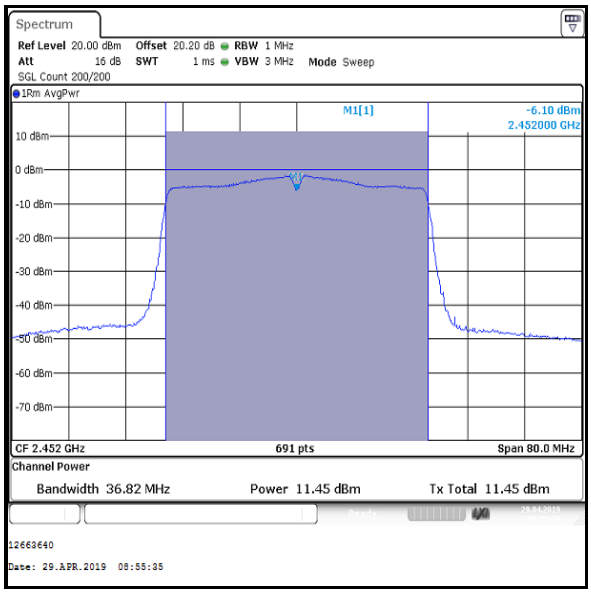
Channel	Conducted Power (dBm)	Duty Cycle Correction Factor (dB)	Corrected Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	13.3	0.1	13.4	30.0	16.6	Complied
Top	11.5	0.1	11.6	30.0	18.4	Complied

EIRP Limit Comparison

Channel	Corrected Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	13.4	3.5	16.9	36.0	19.1	Complied
Top	11.6	3.5	15.1	36.0	20.9	Complied



Bottom Channel



Top Channel

5. Radiated Test Results

5.1. Transmitter Radiated Emissions <1 GHz

Test Summary:

Test Engineer:	John Ferdinand	**Test Date:**	09 May 2019
Test Sample Serial Number:	000000003f9edf4a		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	38

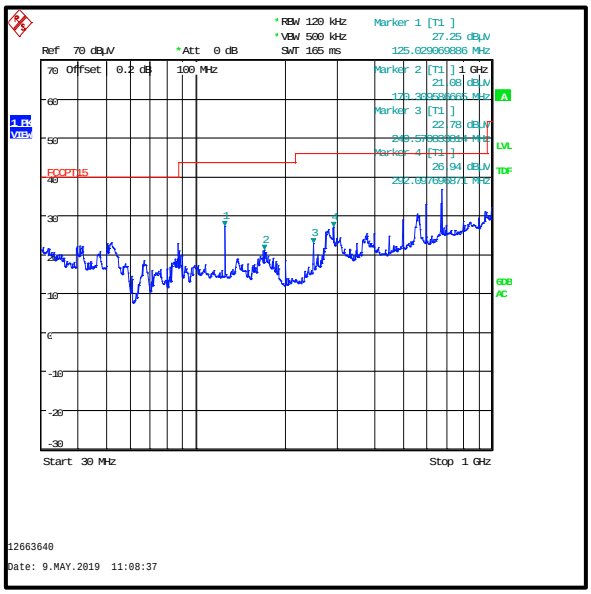
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the middle channel only.
3. All other emissions shown on the pre-scan plots were investigated and found to be ambient, or >20 dB below the applicable limit or below the measurement system noise floor and therefore not recorded.
4. Measurements below 1 GHz were performed in a fully anechoic chamber (Asset Number K00017) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth 500 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
6. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span wide enough to see the whole emission.

Transmitter Radiated Emissions (continued)

Results: Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
125.006	Vertical	26.2	43.5	17.3	Complied
281.755	Vertical	27.1	46.0	18.9	Complied
1000.000	Vertical	36.8	54.0	17.2	Complied



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

5.2. Transmitter Radiated Emissions >1 GHz

Test Summary:

Test Engineer:	John Ferdinand	**Test Dates:**	02 May 2019 & 10 May 2019
Test Sample Serial Number:	000000003f9edf4a		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 6.3, 6.6, 11.11, 11.12.2.4 & 11.12.2.5.2
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	21 to 24
Relative Humidity (%):	37 to 43

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The emission shown approximately at 2442 MHz on the 1 GHz to 3 GHz plot is the EUT fundamental.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.

Transmitter Radiated Emissions (continued)

Results: Peak / Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
3617.650	Horizontal	55.7	74.0	18.3	Complied

Results: Average / Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
3618.550	Horizontal	44.9	54.0	9.1	Complied

Results: Peak / Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
3655.350	Horizontal	54.4	74.0	19.6	Complied

Results: Average / Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
3655.100	Horizontal	42.9	54.0	11.1	Complied

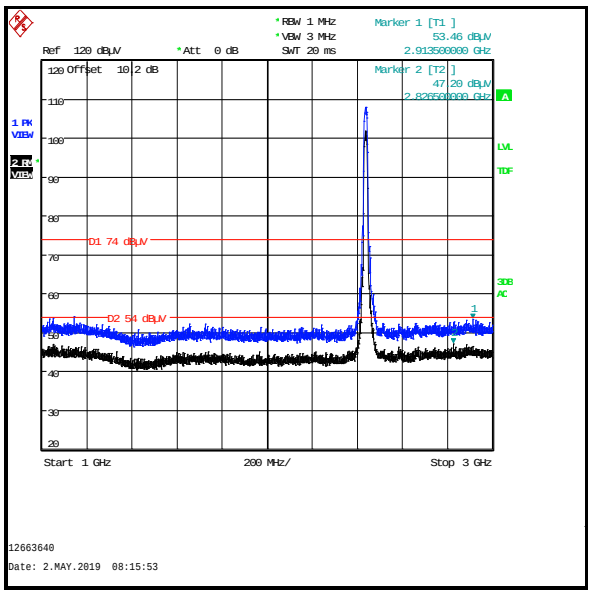
Results: Peak / Top Channel

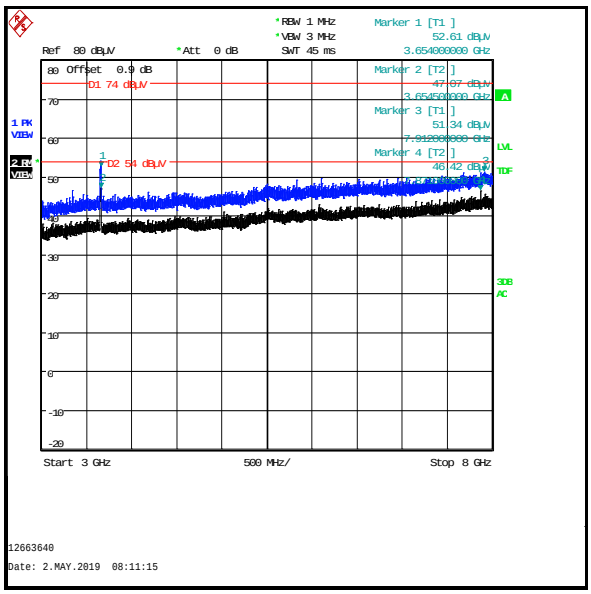
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
3692.900	Horizontal	54.5	74.0	19.5	Complied

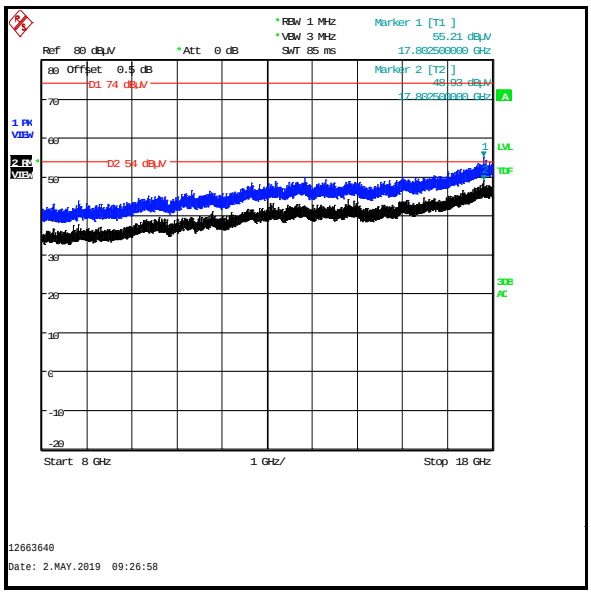
Results: Average / Top Channel

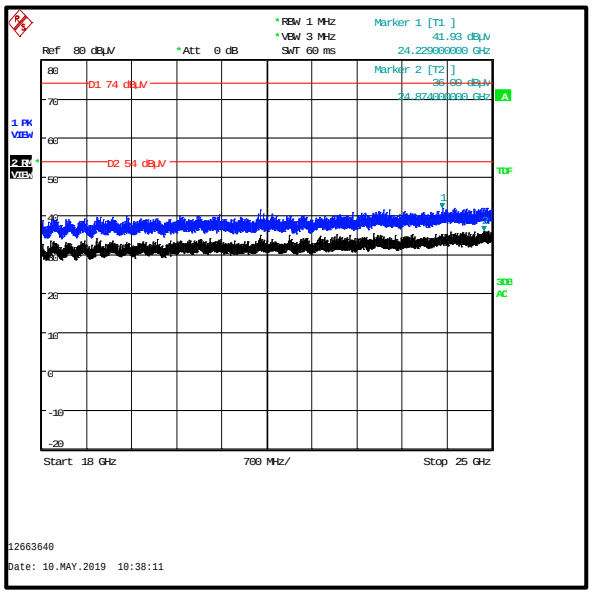
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
3692.650	Horizontal	44.0	54.0	10.0	Complied

Transmitter Radiated Emissions (continued)









Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

5.3. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 April 2019
Test Sample Serial Number:	000000003f9edf4a		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	KDB 558074 Section 8.7 referencing ANSI C63.10 Sections 6.10, 11.11, 11.12 & 11.13

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	40

Transmitter Band Edge Radiated Emissions (continued)

Note(s):

1. The customer declared the following data rates to be used for all measurements as:
    - 802.11b - DBPSK / 1 Mbps
    - 802.11g - BPSK / 6 Mbps
    - 802.11n HT20 - BPSK / MCS0
    - 802.11n HT40 - BPSK / MCS0

    Final measurements were performed with the above configurations.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. The maximum conducted (average) output power was previously measured. In accordance with FCC KDB 558074 Section 11.1(b), the lower band edge measurement should be performed with a peak detector and the -30 dBc limit applied.
4. As the lower band edge is adjacent to a non-restricted band, only peak measurements are required. In accordance with ANSI C63.10 Section 11.11.1, the test method in Section 11.11.3 was followed: the test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. As the maximum conducted (average) output power was measured using an RMS detector in accordance with ANSI C63.10 Section 11.9.2.2.2 or 11.9.2.2.4 an out-of-band limit line was placed 30 dB (ANSI C63.10 Section 11.11.1(b)) below the peak level. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent non-restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
5. As the upper band edge is adjacent to a restricted band both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. An RMS detector was used, sweep time was set to auto and trace mode was trace averaging over 300 sweeps. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
6. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.
7. For 802.11n HT40 the EUT was transmitting at <98% duty cycle, in accordance with KDB 558074 Section 11.12.2.5.2, the calculated duty cycle in section 4.1 was added to the measured result for average measurements.

Transmitter Band Edge Radiated Emissions (continued)

Results: 802.11b / 20 MHz / DBPSK / 1 Mbps

Results: Lower Band Edge

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	-30 dBc Limit (dBµV/m)	Margin (dB)	Result
2400	Vertical	50.2	68.6	18.4	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	53.0	74.0	21.0	Complied
2486.304	Vertical	55.9	74.0	18.1	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	39.5	54.0	14.5	Complied
2512.667	Vertical	39.7	54.0	14.3	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Peak

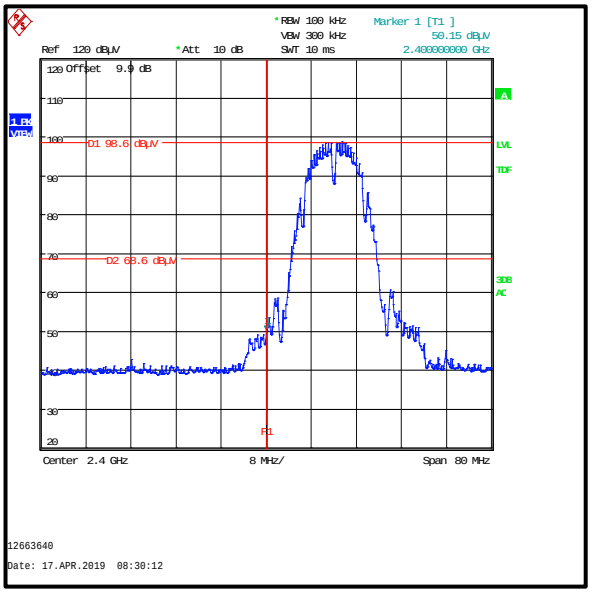
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.744	Vertical	54.1	74.0	19.9	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Average

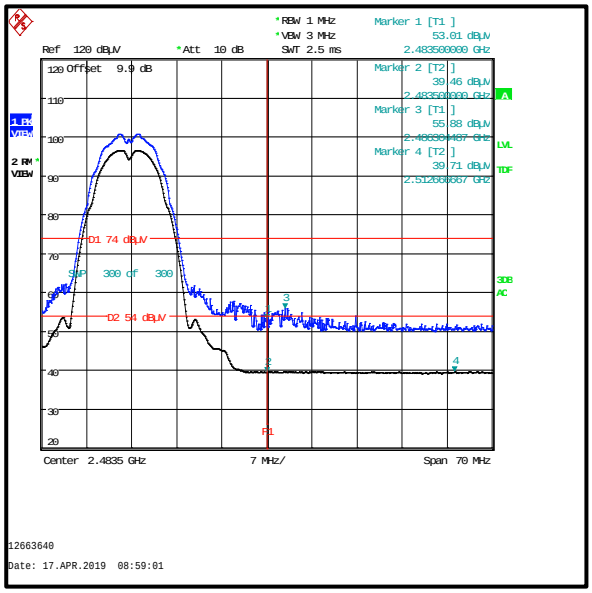
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2376.154	Vertical	39.8	54.0	14.2	Complied

Transmitter Band Edge Radiated Emissions (continued)

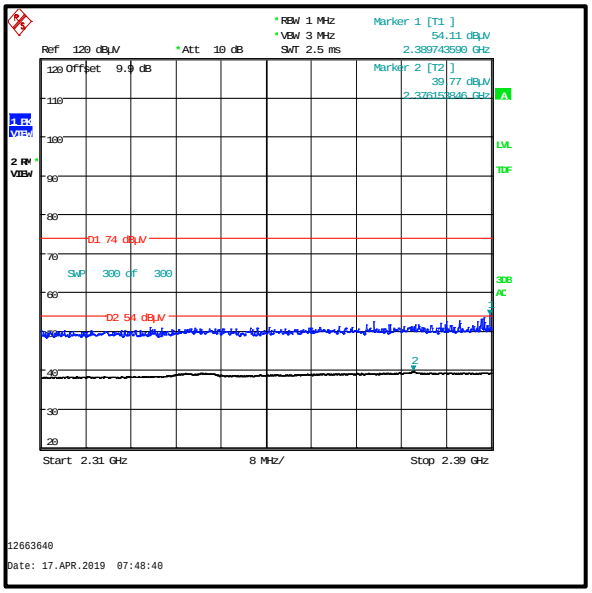
Results: 802.11b / 20 MHz / DBPSK / 1 Mbps



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

Transmitter Band Edge Radiated Emissions (continued)

Results: 802.11g / 20 MHz / BPSK / 6 Mbps

Results: Lower Band Edge

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	-30 dBc Limit (dBµV/m)	Margin (dB)	Result
2398.237	Vertical	56.8	65.8	9.0	Complied
2400	Vertical	55.4	65.8	10.4	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	57.5	74.0	16.5	Complied
2486.978	Vertical	59.1	74.0	14.9	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	42.9	54.0	11.1	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Peak

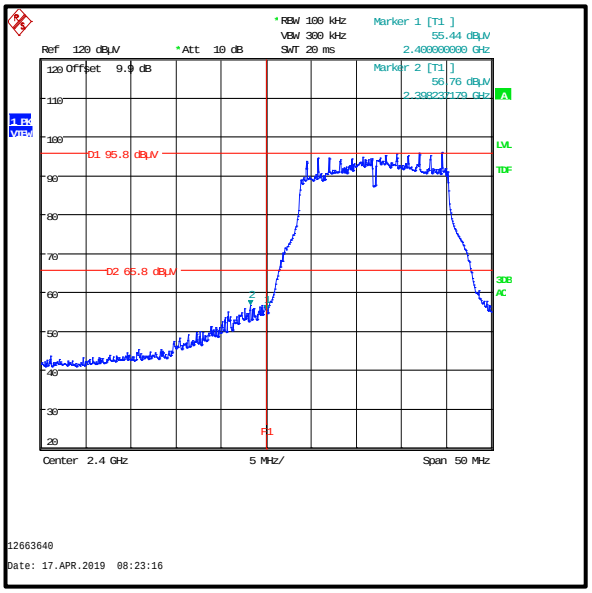
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.872	Vertical	62.6	74.0	11.4	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Average

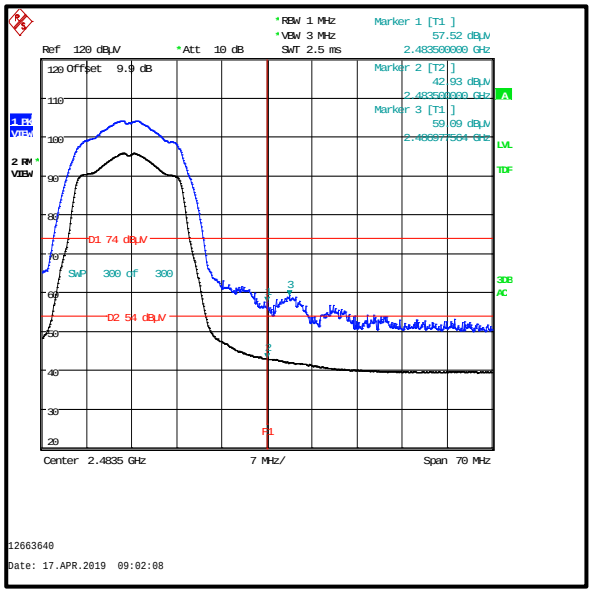
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2390.000	Vertical	44.5	54.0	9.5	Complied

Transmitter Band Edge Radiated Emissions (continued)

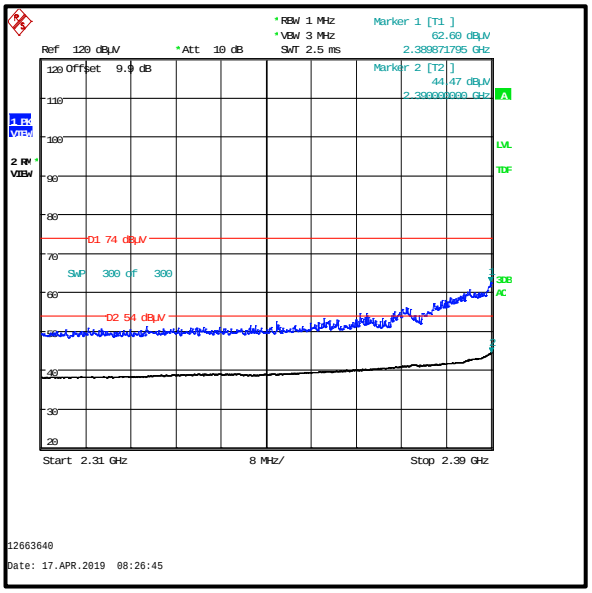
Results: 802.11g / 20 MHz / BPSK / 6 Mbps



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

Transmitter Band Edge Radiated Emissions (continued)

Results: 802.11n HT20 / BPSK / MCS0

Results: Lower Band Edge

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	-30 dBc Limit (dBµV/m)	Margin (dB)	Result
2399.119	Vertical	57.1	65.7	8.6	Complied
2400	Vertical	54.9	65.7	10.8	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	60.7	74.0	13.3	Complied
2483.837	Vertical	61.0	74.0	13.0	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	43.4	54.0	10.6	Complied
2483.724	Vertical	43.5	54.0	10.5	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Peak

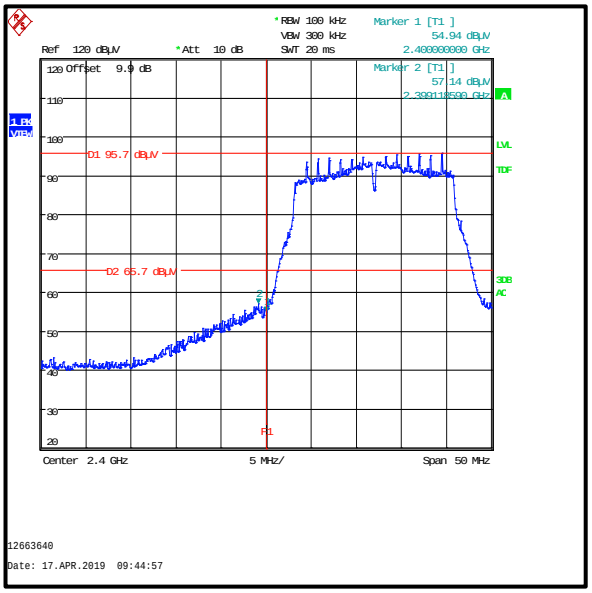
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.744	Vertical	63.8	74.0	10.2	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Average

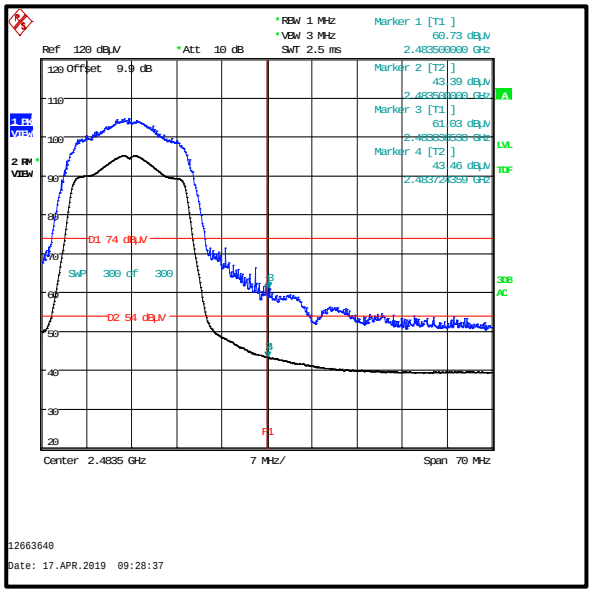
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.872	Vertical	44.7	54.0	9.3	Complied

Transmitter Band Edge Radiated Emissions (continued)

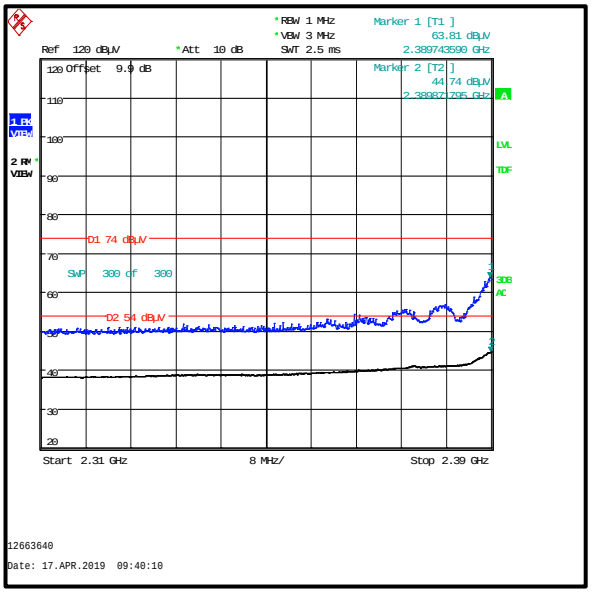
Results: 802.11n HT20 / BPSK / MCS0



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

Transmitter Band Edge Radiated Emissions (continued)

Results: 802.11n HT40 / BPSK / MCS0

Results: Lower Band Edge

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	-30 dBc Limit (dBµV/m)	Margin (dB)	Result
2396.971	Vertical	59.3	63.8	4.5	Complied
2400	Vertical	58.6	63.8	5.2	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	67.3	74.0	6.7	Complied
2484.205	Vertical	69.5	74.0	4.5	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.5	Vertical	51.2	0.1	51.3	54.0	2.7	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Peak

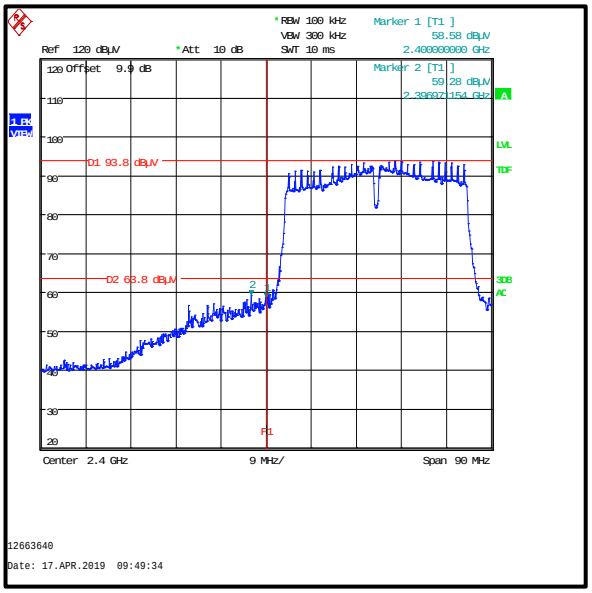
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2389.744	Vertical	71.0	74.0	3.0	Complied

Results: 2310 MHz to 2390 MHz Restricted Band / Average

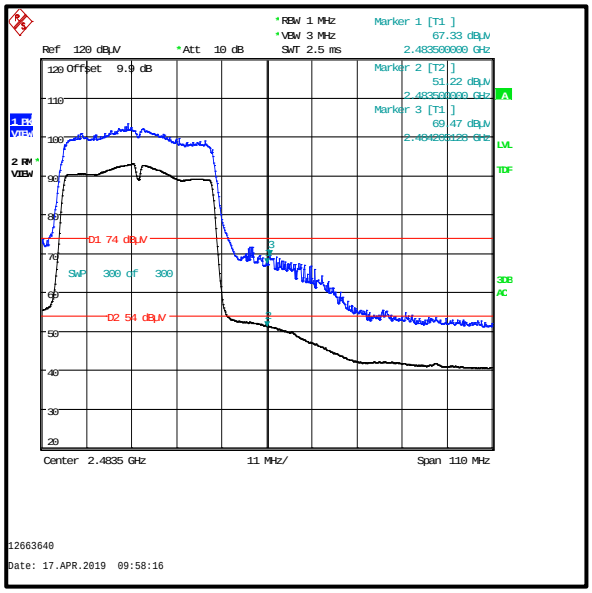
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2390.000	Vertical	52.6	0.1	52.7	54.0	1.3	Complied

Transmitter Band Edge Radiated Emissions (continued)

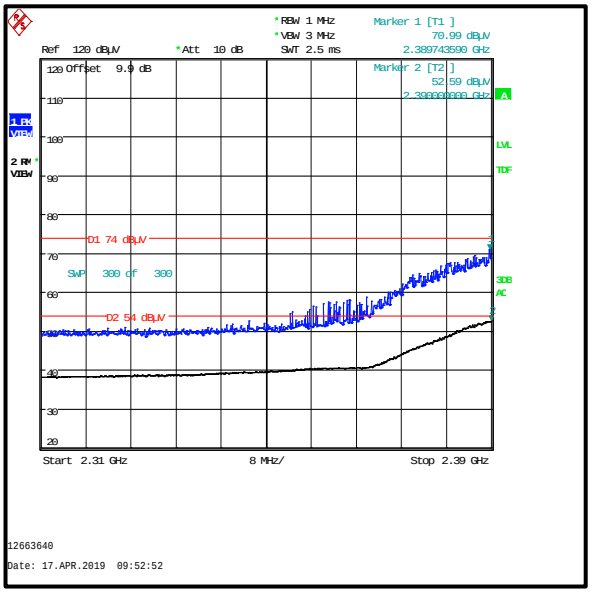
Results: 802.11n HT40 / BPSK / MCS0



Lower Band Edge



Upper Band Edge



2310 MHz to 2390 MHz Restricted Band

6. AC Power Line Conducted Emissions Test Results

6.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Victor Carmon	**Test Date:**	24 April 2019
Test Sample Serial Number:	0000000027a0c96b		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	46

Note(s):

1. The EUT was connected to the AC to DC switch mode power supply which was connected to 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the EUT's power supply.
3. A pulse limiter was fitted between the LISN and the test receiver.
4. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.173	Live	44.3	64.8	20.5	Complied
0.420	Live	35.8	57.4	21.6	Complied
0.515	Live	35.1	56.0	20.9	Complied
1.028	Live	32.8	56.0	23.2	Complied
11.355	Live	30.1	60.0	29.9	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.173	Live	28.6	54.8	26.2	Complied
0.195	Live	25.3	53.8	28.5	Complied
0.425	Live	24.6	47.4	22.8	Complied
0.519	Live	22.7	46.0	23.3	Complied
0.920	Live	21.6	46.0	24.4	Complied
11.418	Live	22.8	50.0	27.2	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

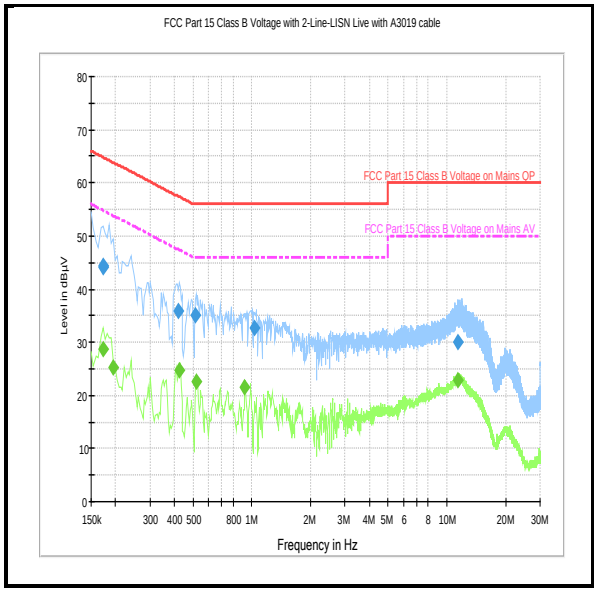
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.173	Neutral	39.5	64.8	25.3	Complied
0.429	Neutral	35.1	57.3	22.2	Complied
0.515	Neutral	35.9	56.0	20.1	Complied
1.221	Neutral	32.0	56.0	24.0	Complied
2.823	Neutral	31.0	56.0	25.0	Complied
11.445	Neutral	33.5	60.0	26.5	Complied

Results: Neutral / Average / 120 VAC 60 Hz

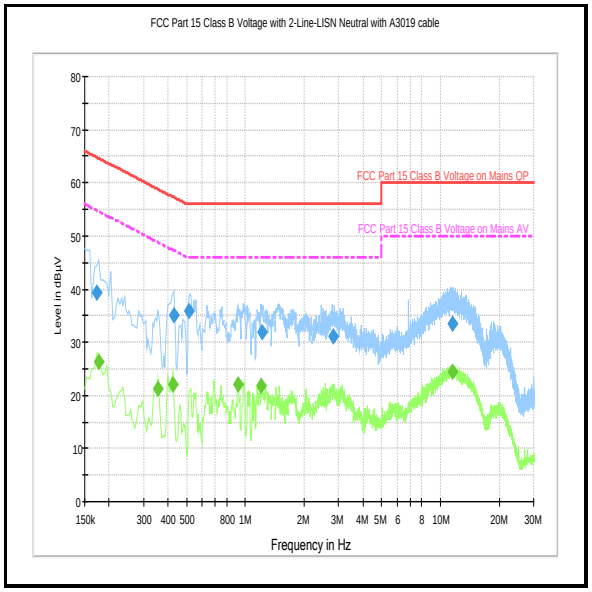
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.177	Neutral	26.2	54.6	28.4	Complied
0.357	Neutral	21.2	48.8	27.6	Complied
0.425	Neutral	22.0	47.4	25.4	Complied
0.915	Neutral	22.1	46.0	23.9	Complied
1.203	Neutral	21.7	46.0	24.3	Complied
11.450	Neutral	24.6	50.0	25.4	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 120 VAC 60 Hz



Live



Neutral

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.159	Live	39.1	65.5	26.4	Complied
0.362	Live	33.6	58.7	25.1	Complied
0.492	Live	36.5	56.1	19.6	Complied
1.532	Live	33.3	56.0	22.7	Complied
2.792	Live	32.4	56.0	23.6	Complied
11.175	Live	30.4	60.0	29.6	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.159	Live	26.8	55.5	28.7	Complied
0.272	Live	27.5	51.1	23.6	Complied
0.357	Live	26.4	48.8	22.4	Complied
0.713	Live	26.4	46.0	19.6	Complied
1.140	Live	25.9	46.0	20.1	Complied
11.418	Live	24.9	50.0	25.1	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

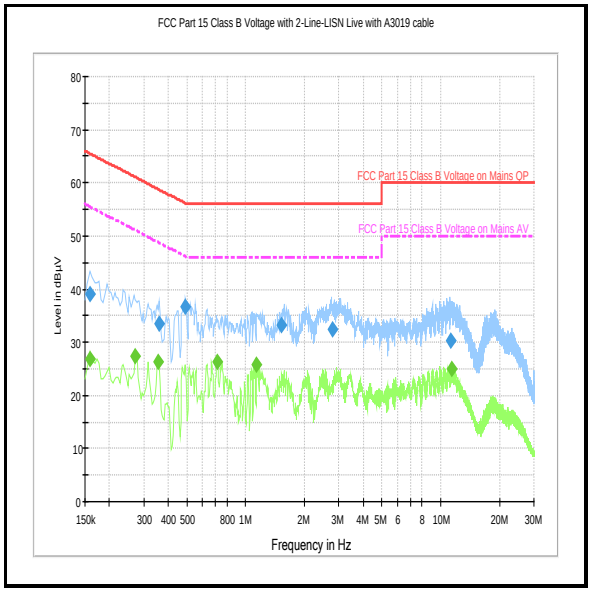
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.159	Neutral	36.8	65.5	28.7	Complied
0.488	Neutral	36.8	56.2	19.4	Complied
0.627	Neutral	35.6	56.0	20.4	Complied
1.590	Neutral	36.4	56.0	19.6	Complied
2.900	Neutral	32.9	56.0	23.1	Complied
9.947	Neutral	33.0	60.0	27.0	Complied

Results: Neutral / Average / 240 VAC 60 Hz

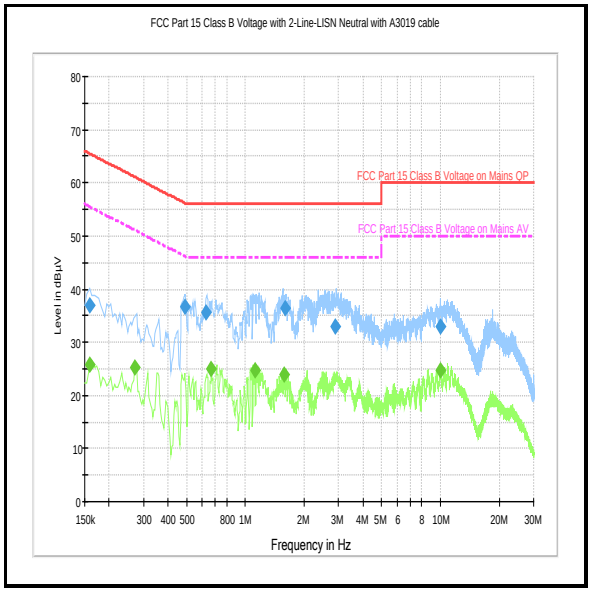
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.159	Neutral	25.7	55.5	29.8	Complied
0.272	Neutral	25.4	51.1	25.7	Complied
0.668	Neutral	25.0	46.0	21.0	Complied
1.118	Neutral	24.7	46.0	21.3	Complied
1.572	Neutral	23.8	46.0	22.2	Complied
9.996	Neutral	24.7	50.0	25.3	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 240 VAC 60 Hz



Live



Neutral

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

--- END OF REPORT ---