



TEST REPORT

Test Report No. : UL-RPT-RP11913492-2416A1913492-2416A

Manufacturer : Raspberry Pi (Trading) Ltd
Model No. : Raspberry Pi 3 Model B+
FCC ID : 2ABCB-RPI3BP
Technology : WLAN
Test Standard(s) : FCC Parts 15.207, 15.209(a) & 15.407

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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 1.0

Date of Issue: 28 February 2018

Checked by: Sarah Williams
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Company Signatory:

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UL VS LTD



This laboratory is accredited by UKAS.
The tests reported herein have been
performed in accordance with its terms
of accreditation.

UL VS LTD

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1. Customer Information

Company Name:	Raspberry Pi (Trading) Ltd
Address:	30 Station Road Cambridge CB1 2JH United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.407 and 47CFR15.403
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Sections 15.403 and 15.407
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:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	23 January 2018 to 22 February 2018

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result	
Part 15.207	Transmitter AC Conducted Emissions	✓	
Part 15.403(i)	Transmitter 26 dB Emission Bandwidth	✓	
Part 15.407(e)	Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band)	✓	
Part 15.35(c)	Transmitter Duty Cycle	Note 1	
Part 15.407(a)(1)(iv)	Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band)	✓	
Part 15.407(a)(2)	Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)	✓	
Part 15.407(a)(3)	Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)	✓	
Part 15.407(a)(1)(iv)	Transmitter Maximum Power Spectral Density (5.15-5.25 GHz band)	✓	
Part 15.407(a)(2)	Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)	✓	
Part 15.407(a)(3)	Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band)	✓	
Part 15.407(b)/15.209(a)	Transmitter Out of Band Radiated Emissions	✓	
Part 15.407(b)/15.209(a)	Transmitter Band Edge Radiated Emissions	✓	
Part 15.407(g)	Transmitter Frequency Stability (Temperature Variation)	Note 2	
Part 15.407(h)(1)	Transmitter Power Control	Note 3	
Key to Results			
	= Complied		= Did not comply

Note(s):

1. The measurement was performed to assist in the calculation of the level of average output power, power spectral density, peak excursion and emissions as the EUT employs pulsed operation.
2. Frequency stability is better than 20 ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.
3. Transmit Power Control was not tested as the maximum EIRP is less than 500 mW (27 dBm).

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01 December 14, 2017
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. 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 specifications identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Raspberry Pi
Model Name or Number:	Raspberry Pi 3 Model B+
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample #1</i>)
Hardware Version:	V1.1
Software Version:	4.4
FCC ID:	2ABCB-RPI3BP

Brand Name:	Raspberry Pi
Model Name or Number:	Raspberry Pi 3 Model B+
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)
Hardware Version:	V1.0
Software Version:	4.4
FCC ID:	2ABCB-RPI3BP

3.2. Description of EUT

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

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	WLAN (IEEE 802.11a,n,ac) / U-NII		
Type of Unit:	Transceiver		
Modulation:	BPSK, QPSK, 16QAM, 64QAM & 256QAM		
Data rates:	802.11a	6, 9, 12, 18, 24, 36 ,48 & 54 Mbps	
	802.11n HT20	MCS0 to MCS7 (SISO)	
	802.11n HT40	MCS0 to MCS7 (SISO)	
	802.11ac VHT20	MCS0 to MCS8 (SISO)	
	802.11ac VHT40	MCS0 to MCS9 (SISO)	
	802.11ac VHT80	MCS0 to MCS9 (SISO)	
Power Supply Requirement(s):	Nominal	5 VDC via 120 VAC 60 Hz adaptor	
Antenna Gain:	2.3 dBi		
Maximum Conducted Output Power:	20 MHz	11.7 dBm	
	40 MHz	14.1 dBm	
	80 MHz	13.6 dBm	
Channel Spacing:	20 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	36	5180
	Middle	40	5200
	Top	48	5240
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	52	5260
	Middle	56	5280
	Top	64	5320

Additional Information Related to Testing (continued)

Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	100	5500
	Middle	116	5580
	Top	140	5700
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	149	5745
	Middle	157	5785
	Top	165	5825
Channel Spacing:	40 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	38	5190
	Top	46	5230
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	54	5270
	Top	62	5310
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	102	5510
	Middle	110	5550
	Top	134	5670
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	151	5755
	Top	159	5795

Additional Information Related to Testing (continued)

Channel Spacing:	80 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Single	42	5210
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Single	58	5290
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Single	106	5530
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Single	155	5775

3.5. Support Equipment

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

Description:	LCD Monitor
Brand Name:	Asus
Model Name or Number:	ProArt
Serial Number:	F4LMTF022693

Description:	USB Keyboard
Brand Name:	Dell
Model Name or Number:	KB212-B
Serial Number:	CN-0C643N-71616-42B-09XA-A00

Description:	USB Mouse
Brand Name:	Dell
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Support Equipment (continued)

Description:	USB Mouse
Brand Name:	Microsoft
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Power Supply. 230 VAC Input / 5 VDC output
Brand Name:	Strontronics Ltd
Model Name or Number:	DSA-13PFC-05
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. Quantity 1. Length 1.9 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	USB cable. Quantity 4. 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:	Ethernet cable. Quantity 1. Length 8.0 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 3.0 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:	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

Description:	PHF
Brand Name:	Samsung
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	HDMI Hub
Brand Name:	SUMVISION
Model Name or Number:	Cyclone Micro
Serial Number:	SUM091104017 (UL Asset No. A1986)

Description:	USB Hub
Brand Name:	Belkin
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

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

Description:	5 Port Ethernet Switch
Brand Name:	Netgear
Model Name or Number:	GS605
Serial Number:	1YG194390218E

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Continuously transmitting with a modulated carrier at maximum power on the bottom, middle and top channels as required using the supported data rates/modulation types.

4.2. 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:
 - 802.11a – BPSK / 6 Mbps
 - 802.11n HT20 – BPSK / MCS0
 - 802.11n HT40 – BPSK / MCS0
 - 802.11ac VHT80 – BPSK / MCS0
- Testing was performed using the power settings defined in section 4.3.
- RF cables and attenuators connecting the test equipment to the EUT were calibrated before use and the calibration data incorporated into the conducted measurement results.
- 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 802.11n HT40 / MCS0, as this mode was found to transmit the highest power.
- Transmitter spurious emissions were performed with the EUT transmitting with a data rate of 802.11n HT40 / MCS0. This was found to be the worst case modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest transmit output power level, it was deemed to be the worst case.
- Radiated emissions tests pre-scans were initially checked in X,Y& Z orientations, while connected to its power supply. All active ports were terminated with suitable terminations. The worst case orientations were:
 - Below 1 GHz: Z Axis with the EUT back against the table
 - Above 1 GHz: X Axis with the EUT side against the table.
- For radiated emissions the EUT was configured using a test laptop running putty to control the EUT. The test laptop was placed outside of the anechoic chamber. All other terminations apart from PHF were placed underneath the turntable.
- AC conducted tests were performed with all ports terminated, employing all available accessories.
- The conducted sample was used for 26 dB bandwidth, minimum 6 dB bandwidth, duty cycle, maximum output power and maximum power spectral density tests.
- The radiated sample was used for all other tests.

4.3. Power Settings

The power settings below have been used for testing:

Channel:	Mode	Q value Used
36	a (6 Mbps)	44
64	a (6 Mbps)	38
100	a (6 Mbps)	34
140	a (6 Mbps)	38
149	a (6 Mbps)	38
165	a (6 Mbps)	38
36	HT20 (MCS0)	42
64	HT20 (MCS0)	38
100	HT20 (MCS0)	34
140	HT20 (MCS0)	38
149	HT20 (MCS0)	38
165	HT20 (MCS0)	38
38	HT40 (MCS0)	54
62	HT40 (MCS0)	48
102	HT40 (MCS0)	40
134	HT40 (MCS0)	48
151	HT40 (MCS0)	48
159	HT40 (MCS0)	48
42	VHT80 (MCS0x1)	54
58	VHT80 (MCS0x1)	48
106	VHT80 (MCS0x1)	45
122	VHT80 (MCS0x1)	48
155	VHT80 (MCS0x1)	48

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6 Measurement Uncertainty* for details.

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.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Doug Freegard	Test Date:	23 January 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

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

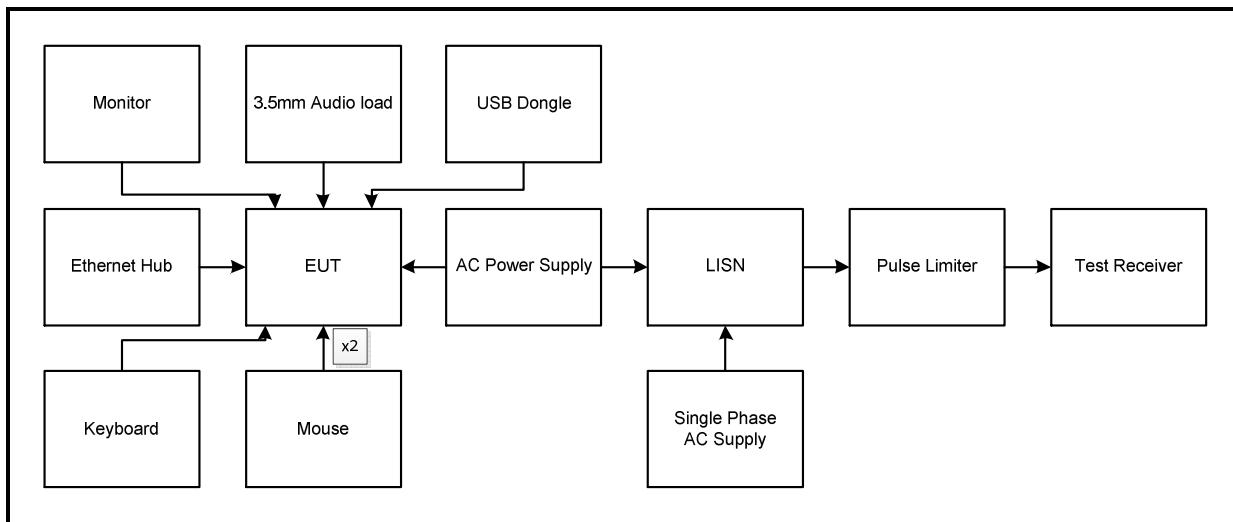
Environmental Conditions:

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

Note(s):

1. The EUT was connected to a DC power supply which supplied the unit with 5.0 VDC. The DC power supply 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 5.0 V DC 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.

Test setup:



Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Live	51.1	66.0	14.9	Complied
0.290	Live	42.9	60.5	17.6	Complied
0.587	Live	36.5	56.0	19.5	Complied
0.839	Live	37.1	56.0	18.9	Complied
1.383	Live	36.2	56.0	19.8	Complied
5.528	Live	35.8	60.0	24.2	Complied

Results: Live / Average / 120 VAC 60 Hz

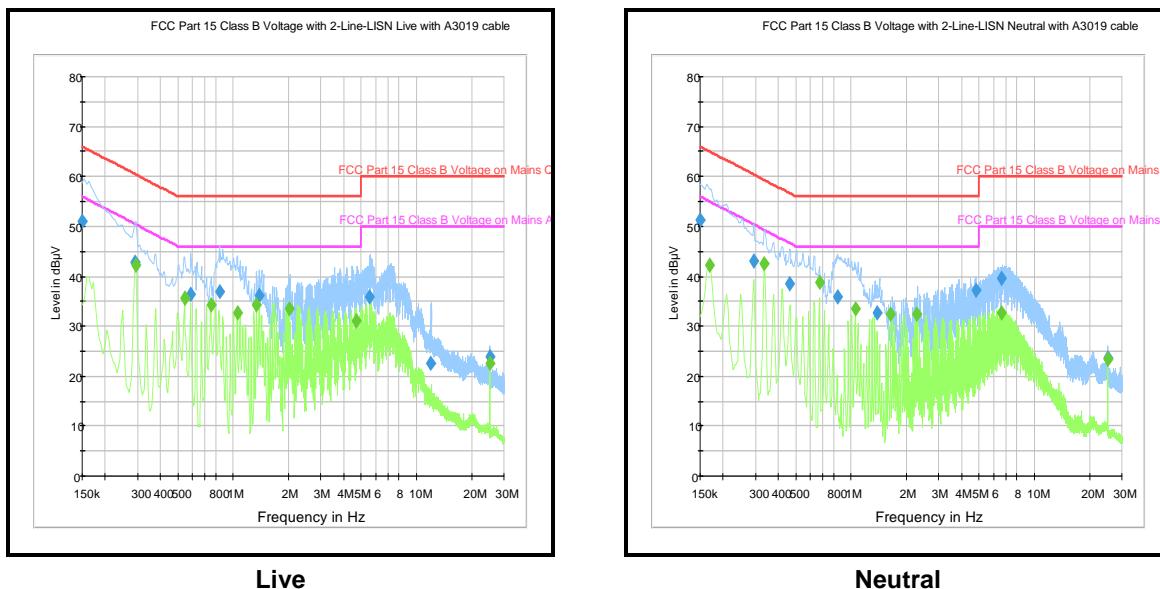
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.294	Live	42.3	50.4	8.1	Complied
0.542	Live	35.6	46.0	10.4	Complied
0.758	Live	34.3	46.0	11.7	Complied
1.050	Live	32.6	46.0	13.4	Complied
1.343	Live	34.2	46.0	11.8	Complied
2.013	Live	33.4	46.0	12.6	Complied
4.695	Live	31.0	46.0	15.0	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	51.3	66.0	14.7	Complied
0.294	Neutral	43.1	60.4	17.3	Complied
0.461	Neutral	38.5	56.7	18.2	Complied
0.839	Neutral	35.9	56.0	20.1	Complied
4.790	Neutral	37.2	56.0	18.8	Complied
6.635	Neutral	39.6	60.0	20.4	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Neutral	42.2	55.1	12.9	Complied
0.335	Neutral	42.5	49.3	6.8	Complied
0.672	Neutral	38.8	46.0	7.2	Complied
1.050	Neutral	33.4	46.0	12.6	Complied
1.635	Neutral	32.5	46.0	13.5	Complied
2.265	Neutral	32.5	46.0	13.5	Complied
6.590	Neutral	32.8	50.0	17.2	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: 120 VAC 60 Hz**

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 (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	49.6	65.3	15.7	Complied
0.798	Live	41.1	56.0	14.9	Complied
1.293	Live	40.8	56.0	15.2	Complied
1.892	Live	42.0	56.0	14.0	Complied
3.453	Live	43.3	56.0	12.7	Complied
4.547	Live	45.5	56.0	10.5	Complied
5.645	Live	44.1	60.0	15.9	Complied

Results: Live / Average / 240 VAC 60 Hz

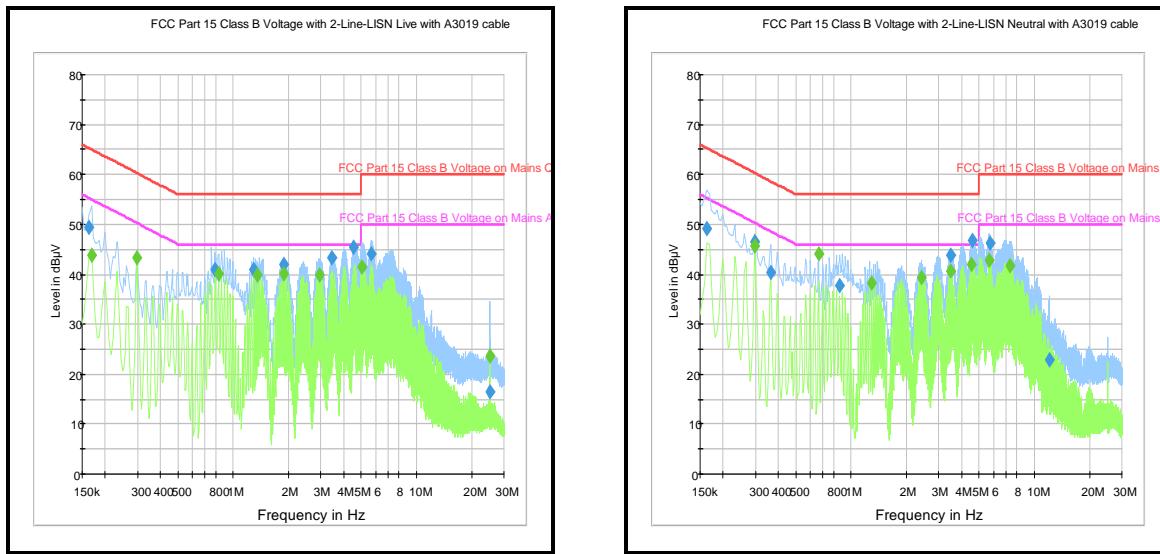
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.168	Live	43.8	55.1	11.3	Complied
0.299	Live	43.4	50.3	6.9	Complied
0.830	Live	40.2	46.0	5.8	Complied
1.361	Live	39.9	46.0	6.1	Complied
1.892	Live	40.2	46.0	5.8	Complied
2.954	Live	39.8	46.0	6.2	Complied
5.046	Live	41.5	50.0	8.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Neutral	49.2	65.3	16.1	Complied
0.299	Neutral	46.5	60.3	13.8	Complied
0.366	Neutral	40.5	58.6	18.1	Complied
0.861	Neutral	37.6	56.0	18.4	Complied
3.485	Neutral	43.9	56.0	12.1	Complied
4.583	Neutral	46.7	56.0	9.3	Complied
5.708	Neutral	46.2	60.0	13.8	Complied

Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.299	Neutral	45.7	50.3	4.6	Complied
0.663	Neutral	44.1	46.0	1.9	Complied
1.293	Neutral	38.4	46.0	7.6	Complied
2.423	Neutral	39.3	46.0	6.7	Complied
3.485	Neutral	40.8	46.0	5.2	Complied
4.547	Neutral	42.0	46.0	4.0	Complied
5.676	Neutral	42.9	50.0	7.1	Complied
7.337	Neutral	41.7	50.0	8.3	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.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2013	Thermohygrometer	Testo	608-H1	45046424	20 Jun 2018	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	09 Aug 2018	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	09 May 2018	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	13 Nov 2018	12
A2953	Power Supply	Tacima	SC 5467	Not stated	Calibrated before use	-
M1229	Multimeter	Fluke	179	87640015	12 May 2018	12

5.2.2. Transmitter 26 dB Emission Bandwidth

Test Summary:

Test Engineer:	Max Passell	Test Dates:	08 February 2018 to 21 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.403(i)
Test Method Used:	KDB 789033 D02 Section II.C.1.

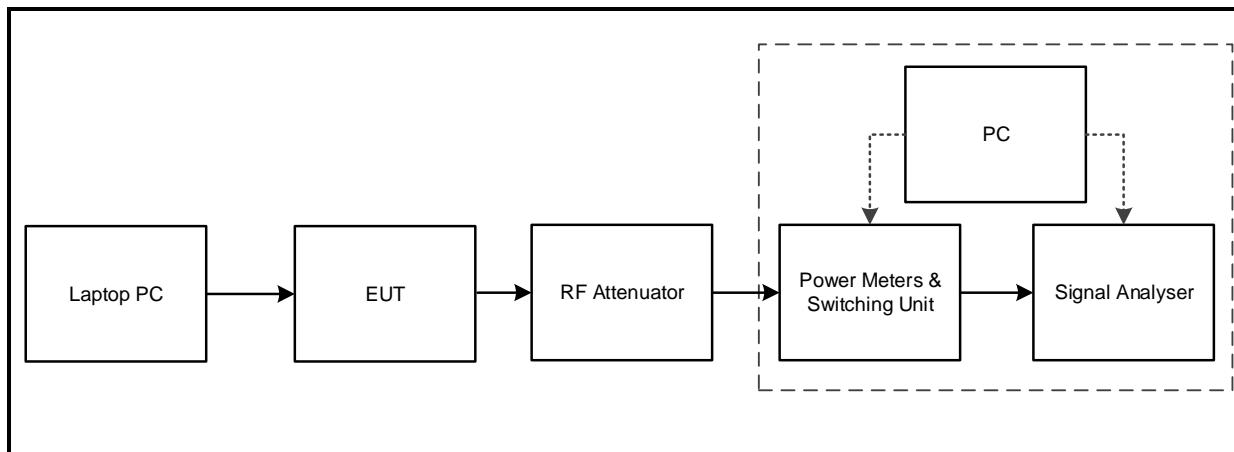
Environmental Conditions:

Temperatures (°C):	22 to 23
Relative Humidity (%):	29 to 34

Note(s):

1. Measurements were performed in accordance with KDB 789033 Section II.C.1. Emission Bandwidth (EBW) test procedure on the relevant channels in all supported operating bands.
2. The signal analyser's resolution bandwidth was set to approximately 1% of the measured 26 dB emission bandwidth.
3. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the switch, attenuators and RF cables.

Test setup:



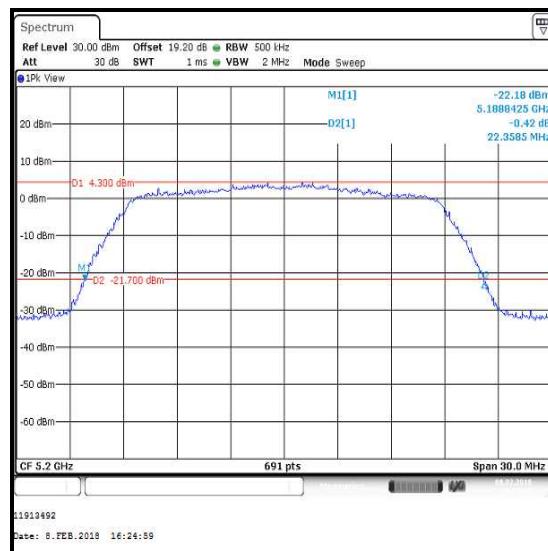
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / 5.15-5.25 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6	22.142
Middle	5200	BPSK	6	22.142
Top	5240	BPSK	6	22.055

**Bottom Channel****Middle Channel****Top Channel**

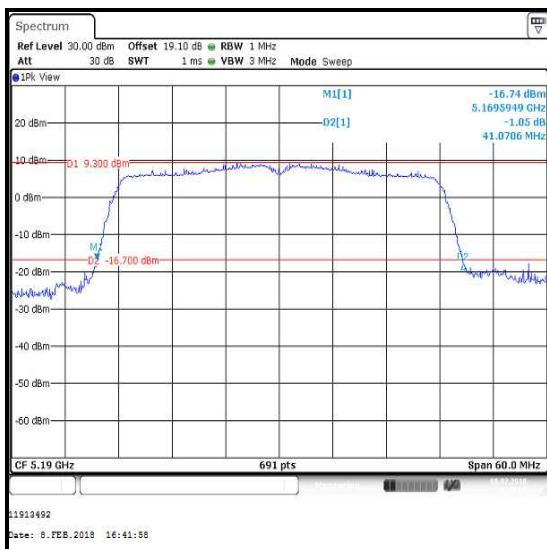
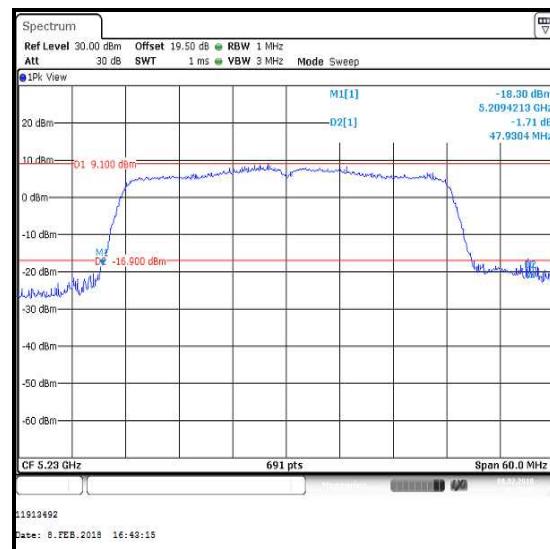
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.15-5.25 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	0	22.316
Middle	5200	BPSK	0	22.359
Top	5240	BPSK	0	22.489

**Bottom Channel****Middle Channel****Top Channel**

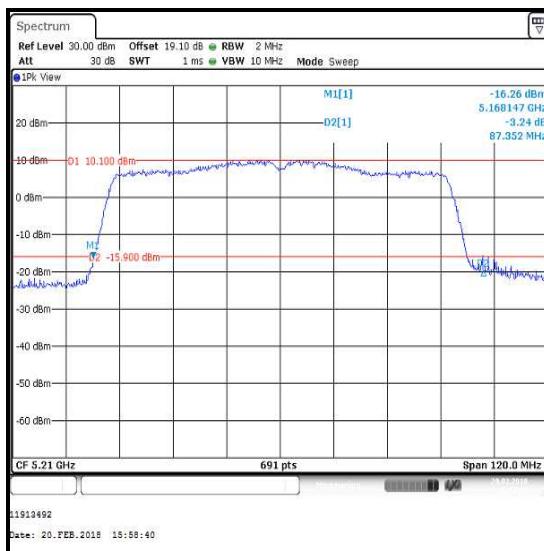
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.15-5.25 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	0	41.071
Top	5230	BPSK	0	47.930

**Bottom Channel****Top Channel**

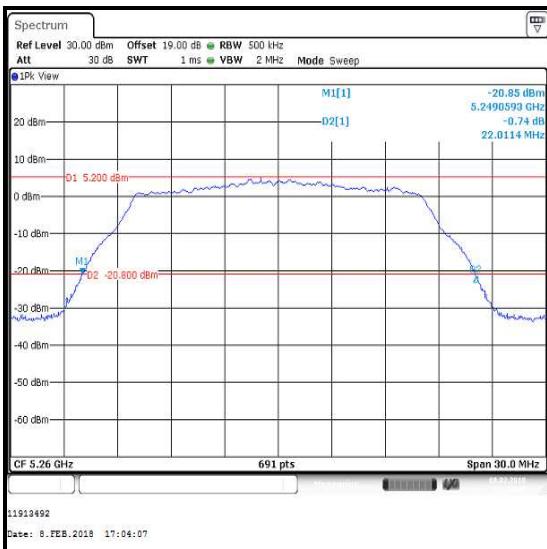
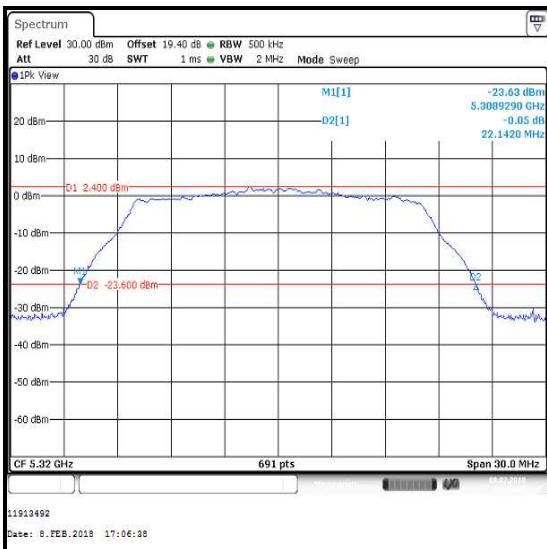
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11ac / 80 MHz / 5.15-5.25 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Single	5210	BPSK	0x1	87.352

**Single Channel**

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / 5.25-5.35 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6	22.011
Middle	5280	BPSK	6	22.098
Top	5320	BPSK	6	22.142

**Bottom Channel****Middle Channel****Top Channel**

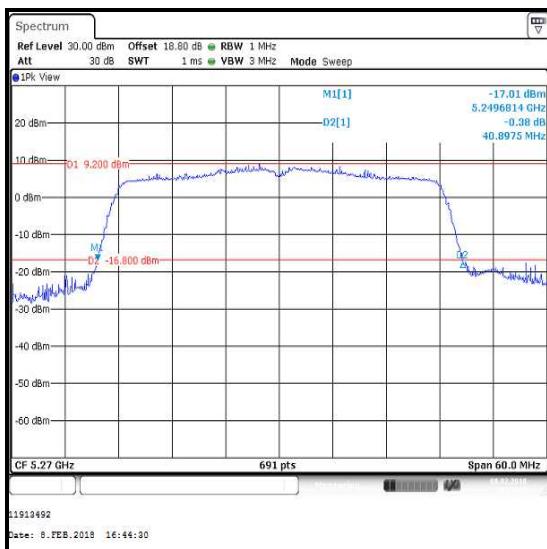
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.25-5.35 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	0	22.359
Middle	5280	BPSK	0	22.402
Top	5320	BPSK	0	22.402

**Bottom Channel****Middle Channel****Top Channel**

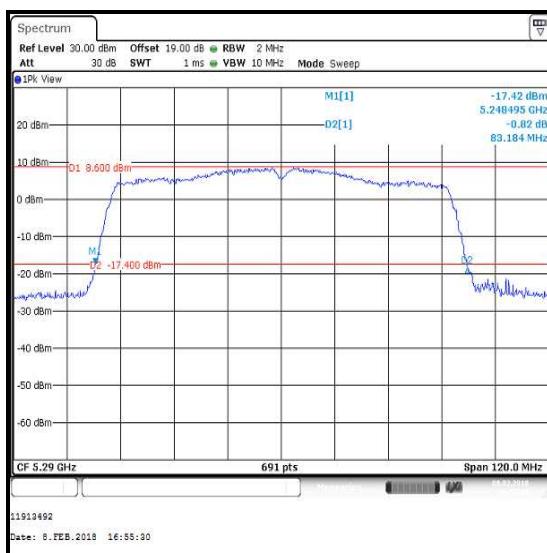
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.25-5.35 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	0	40.898
Top	5310	BPSK	0	40.898

**Bottom Channel****Top Channel**

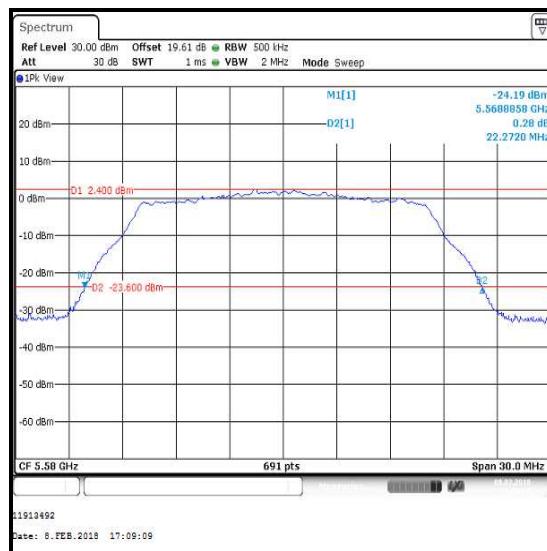
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11ac / 80 MHz / 5.25-5.35 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Single	5290	BPSK	0x1	83.184

**Single Channel**

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6	22.142
Middle	5580	BPSK	6	22.272
Top	5700	BPSK	6	22.272

**Bottom Channel****Middle Channel****Top Channel**

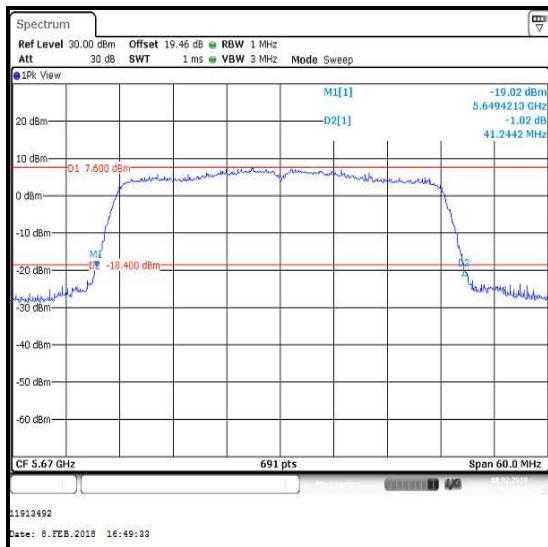
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	0	22.359
Middle	5580	BPSK	0	22.359
Top	5700	BPSK	0	22.359

**Bottom Channel****Middle Channel****Top Channel**

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	0	41.158
Middle	5550	BPSK	0	41.071
Top	5670	BPSK	0	41.244

**Bottom Channel****Middle Channel****Top Channel**

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11ac / 80 MHz / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Single	5530	BPSK	0x1	83.705

**Single Channel**

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / 5.725-5.85 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6	22.229
Middle	5785	BPSK	6	22.186
Top	5825	BPSK	6	22.186

**Bottom Channel****Middle Channel****Top Channel**

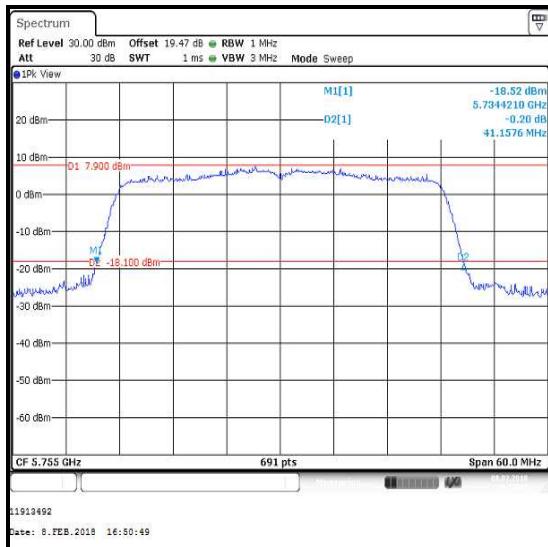
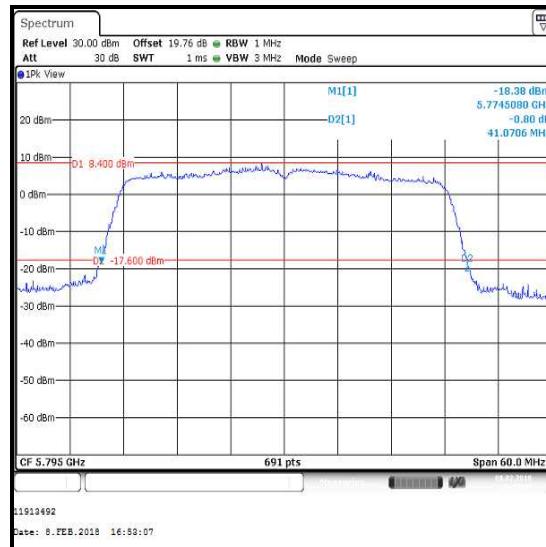
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / 5.725-5.85 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	0	22.533
Middle	5785	BPSK	0	22.316
Top	5825	BPSK	0	22.403

**Bottom Channel****Middle Channel****Top Channel**

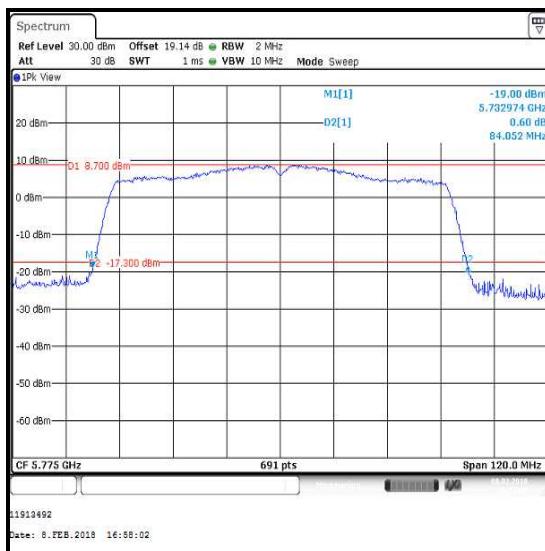
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / 5.725-5.85 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	0	41.158
Top	5795	BPSK	0	41.071

**Bottom Channel****Top Channel**

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11ac / 80 MHz / 5.725-5.85 GHz band**

Channel	Frequency (MHz)	Modulation scheme	Data Rate MCS	26 dB Emission Bandwidth (MHz)
Single	5775	BPSK	0x1	84.052

**Single Channel****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	22 Feb 2018	12
M2019	Power Sensor	Boonton	55006	10078	23 Mar 2018	12
M2018	Signal Analyser	Rohde & Schwarz	FSV7	102699	23 Mar 2018	12
G0607	Signal Generator	Rohde & Schwarz	SMU2001	100943	10 May 2019	36
A3038	Attenuator	Pasternack	PE7013-10	Not stated	Calibrated before use	-
A3004	RF Switch	Pickering Interfaces	64-102-002	XZ363230	Calibrated before use	-

5.2.3. Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band)**Test Summary:**

Test Engineer:	Max Passell	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

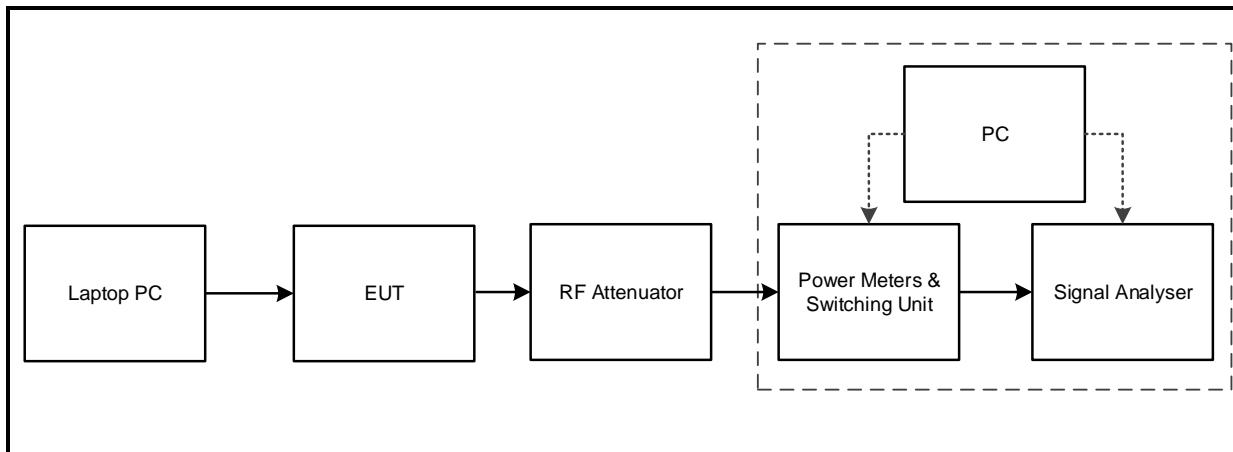
FCC Reference:	Part 15.407(e)
Test Method Used:	KDB 789033 D02 Section II.C.2.

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

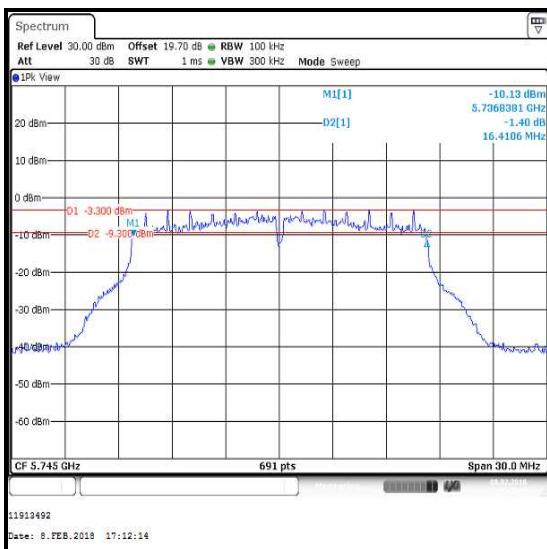
Note(s):

1. Measurements were performed in accordance with KDB 789033 Section II.C.2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz measurement procedure on the relevant channels in all supported operating bands.
2. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the switch, attenuators and RF cables.

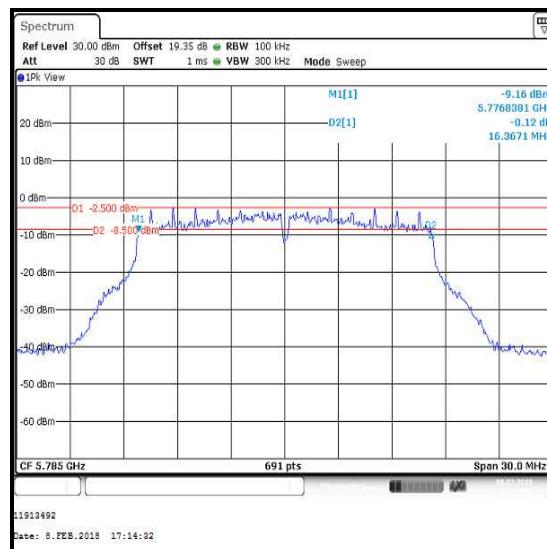
Test setup:

Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps**

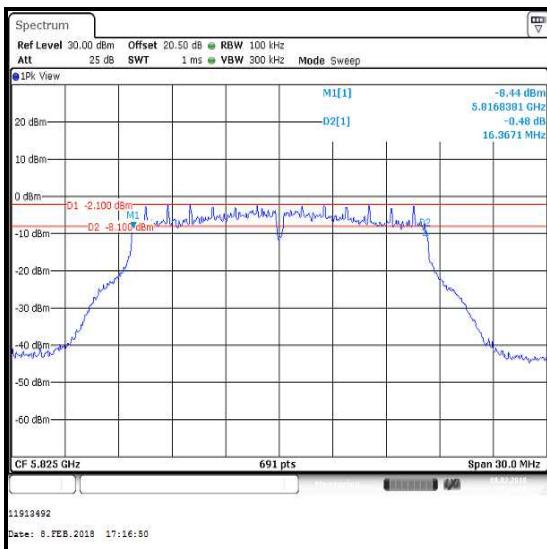
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16411	≥500	15911	Complied
Middle	16367	≥500	15867	Complied
Top	16367	≥500	15867	Complied



Bottom Channel



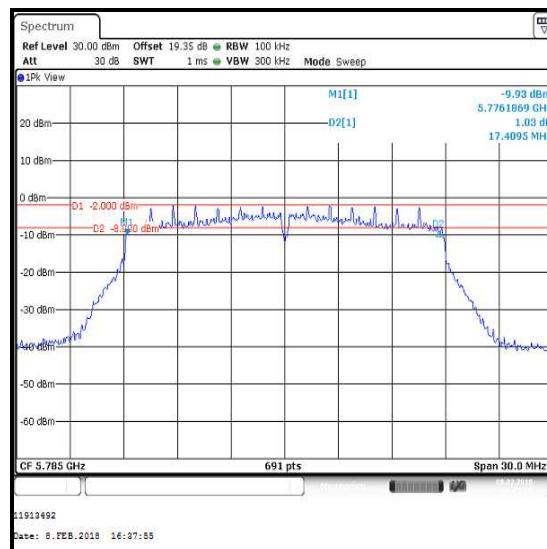
Middle Channel



Top Channel

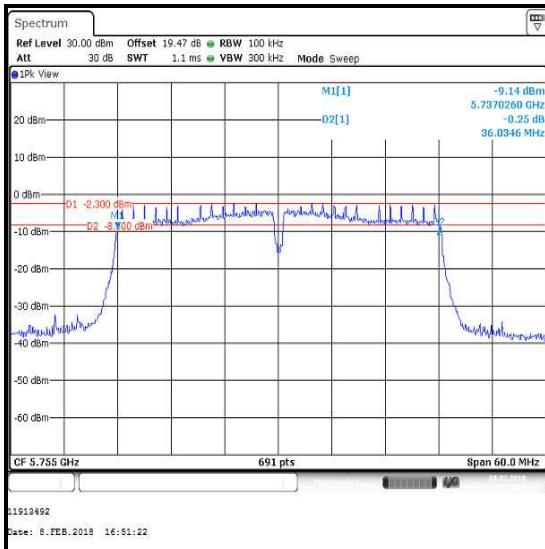
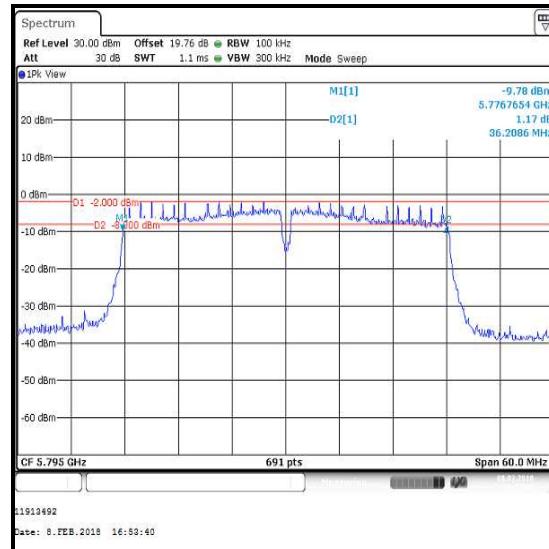
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0**

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17627	≥500	17127	Complied
Middle	17410	≥500	16910	Complied
Top	17670	≥500	17170	Complied

**Bottom Channel****Middle Channel****Top Channel**

Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0**

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	36035	≥500	35535	Complied
Top	36209	≥500	35709	Complied

**Bottom Channel****Top Channel**

Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1**

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Single	75543	≥500	75043	Complied

**Single Channel****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	22 Feb 2018	12
M2019	Power Sensor	Boonton	55006	10078	23 Mar 2018	12
M2018	Signal Analyser	Rohde & Schwarz	FSV7	102699	23 Mar 2018	12
G0607	Signal Generator	Rohde & Schwarz	SMU2001	100943	10 May 2019	36
A3038	Attenuator	Pasternack	PE7013-10	Not stated	Calibrated before use	-
A3004	RF Switch	Pickering Interfaces	64-102-002	XZ363230	Calibrated before use	-

5.2.4. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Max Passell	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.35(c)
Test Method Used:	KDB 789033 D02 Section II.B.2.b

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Note(s):

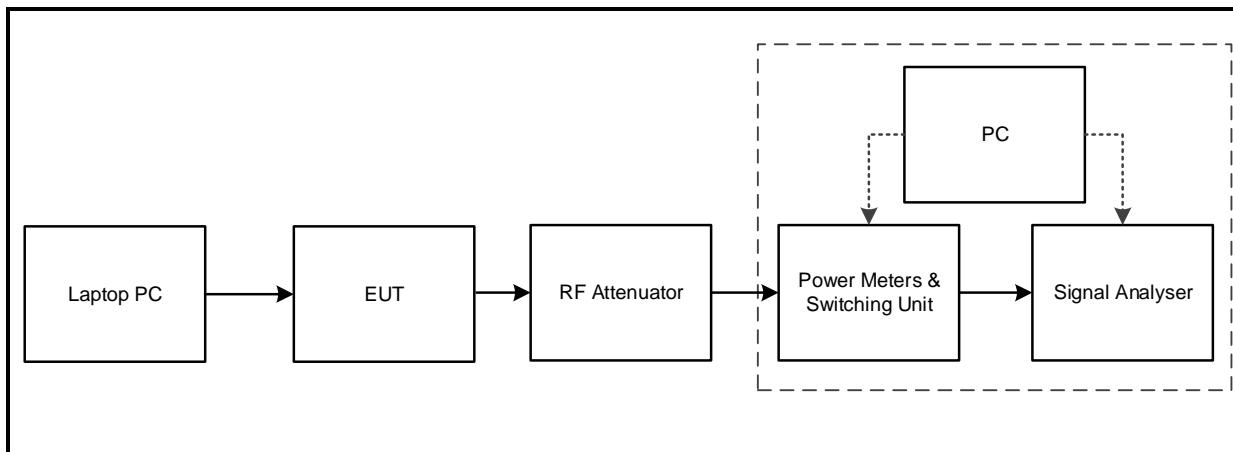
1. In order to assist with the determination of the average level of fundamental and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a signal analyser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

$$10 \log 1 / (\text{On Time} / [\text{Period or } 100\text{ms whichever is the lesser}]).$$

$$\begin{aligned} 802.11n \text{ HT40 / MCS0 duty cycle: } & 10 \log (1 / (0.9427 / 0.9668)) = 0.1 \\ 802.11ac \text{ VHT80 / MCS0x1 duty cycle: } & 10 \log (1 / (0.4587 / 0.4816)) = 0.2 \end{aligned}$$

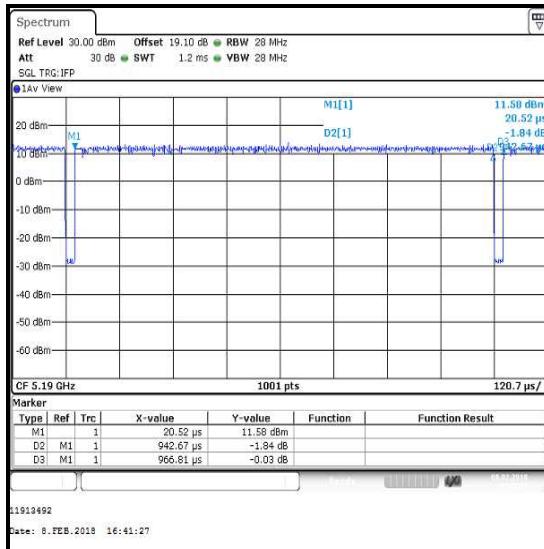
2. Plots below are for data rates with a duty cycle less than 98%. Results for all other modes having a duty cycle >98% are archived on the Company server and available for inspection if required.

Test setup:

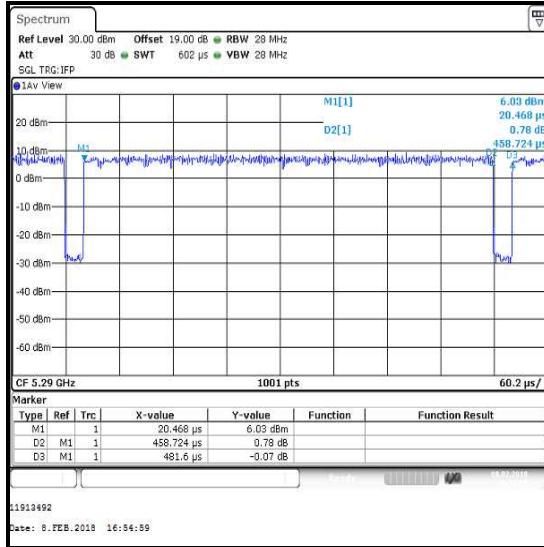


Transmitter Duty Cycle (continued)**Results: 802.11n / 40 MHz / MCS0**

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
0.9427	0.9668	98.0

**Results: 802.11ac / 80 MHz / BPSK / MCS0x1**

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
0.4587	0.4816	96.0



Transmitter Duty Cycle (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	22 Feb 2018	12
M2019	Power Sensor	Boonton	55006	10078	23 Mar 2018	12
M2018	Signal Analyser	Rohde & Schwarz	FSV7	102699	23 Mar 2018	12
G0607	Signal Generator	Rohde & Schwarz	SMU2001	100943	10 May 2019	36
A3038	Attenuator	Pasternack	PE7013-10	Not stated	Calibrated before use	-
A3004	RF Switch	Pickering Interfaces	64-102-002	XZ363230	Calibrated before use	-

5.2.5. Transmitter Maximum Conducted Output Power

Test Summary:

Test Engineer:	Max Passell	Test Dates:	08 February 2018 & 20 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.407(a)(1)(iv)
Test Method Used:	KDB 789033 D02 Section II.E.2.b) and II.E.2.d)

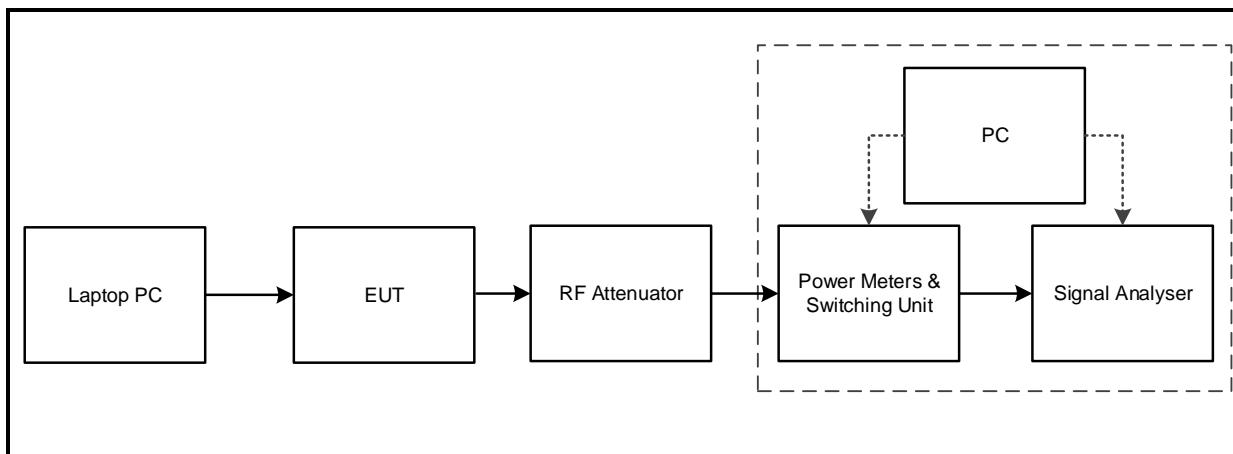
Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	29 to 34

Note(s):

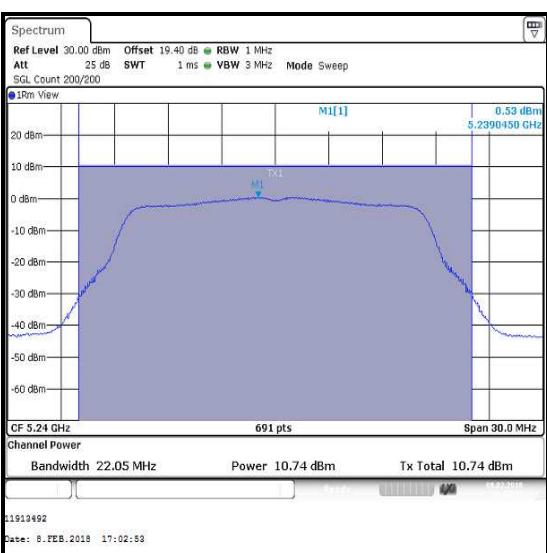
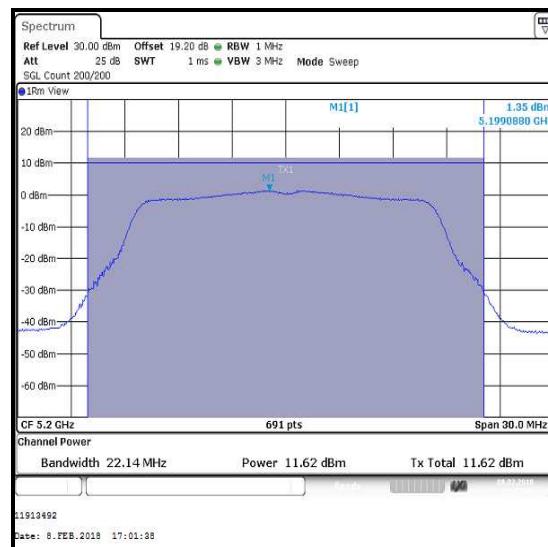
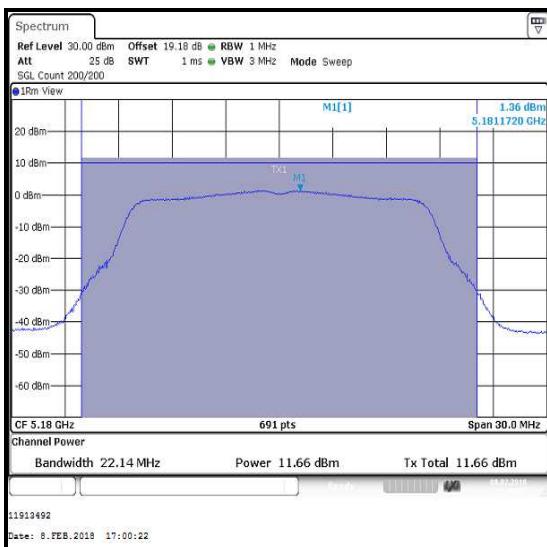
1. For conducted power tests where the duty cycle is >98%, the measurements were performed using a signal analyser in accordance with FCC KDB 789033 II.E.2.b) Method SA-1. Where the duty cycle is <98%, the measurements were performed in accordance with FCC KDB 789033 II.E.2.d) Method SA-2. The signal analyser's integration function was used to integrate across the 26 dB emission bandwidth. The resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. An RMS detector was used and sweep time was set to auto and 200 traces performed. The span was set to encompass the entire 26 dB emission bandwidth. The channel power results are recorded in the tables below.
2. For data rates where the EUT was transmitting at <98% duty cycle, the calculated duty cycle in section 5.2.4 was added to the measured power in order to compute the average power during the actual transmission time.
3. For all modes of operation, the EUT antenna gain is <6 dBi.
4. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the switch, attenuators and RF cables.
5. The Part 15.407(a)(1)(iv) limit shall not exceed 250 mW (24.0 dBm).

Test setup:



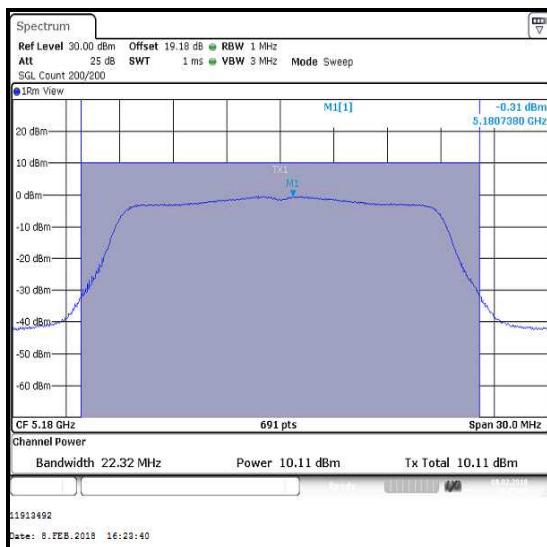
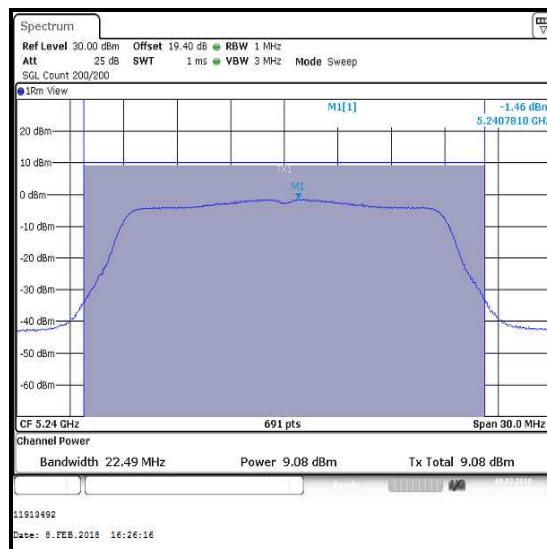
Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5180	11.7	24.0	12.3	Complied
Middle	5200	11.6	24.0	12.4	Complied
Top	5240	10.7	24.0	13.3	Complied



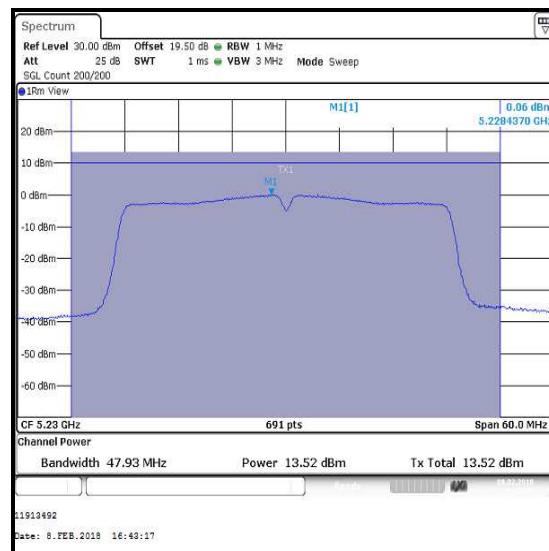
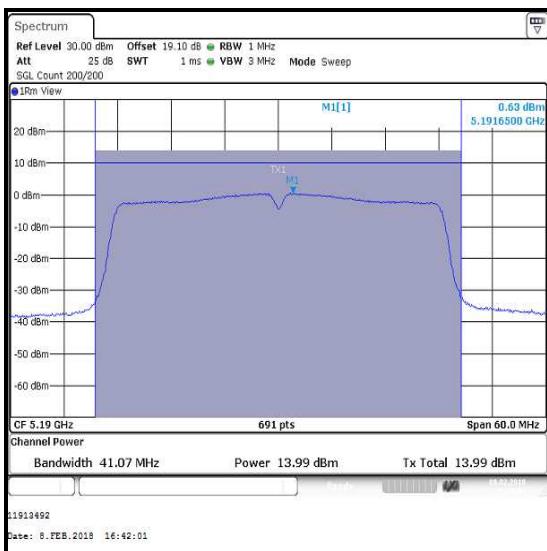
Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5180	10.1	24.0	13.9	Complied
Middle	5200	9.9	24.0	14.1	Complied
Top	5240	9.1	24.0	14.9	Complied

**Bottom Channel****Middle Channel****Top Channel**

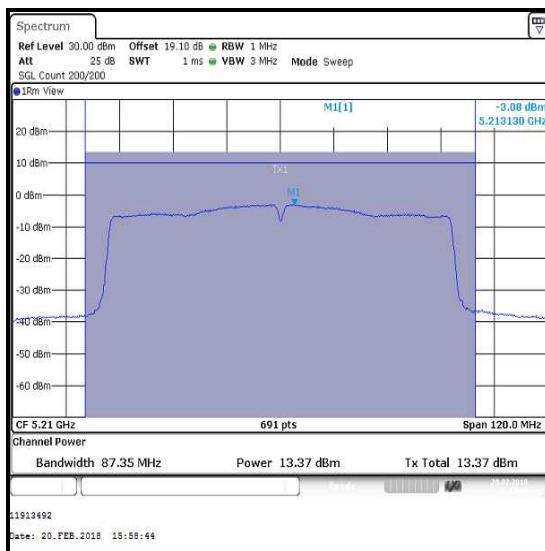
Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5190	14.0	0.1	14.1	24.0	9.9	Complied
Top	5230	13.5	0.1	13.6	24.0	10.4	Complied



Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1**

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Single	5210	13.4	0.2	13.6	24.0	10.4	Complied

**Single Channel**

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)**Test Summary:**

Test Engineer:	Max Passell	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.407(a)(2)
Test Method Used:	KDB 789033 D02 Section II.E.2.b) and II.E.2.d)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Note(s):

1. The FCC Part 15.407(a)(2) limit is the lesser of 250 mW (24.0 dBm) or $11 \text{ dBm} + 10 \log_{10} B$, where B is the previously measured 26 dB emission bandwidth in MHz. For both U-NII-2A band and U-NII-2C band the 26 dB EBW is greater than 20 MHz.

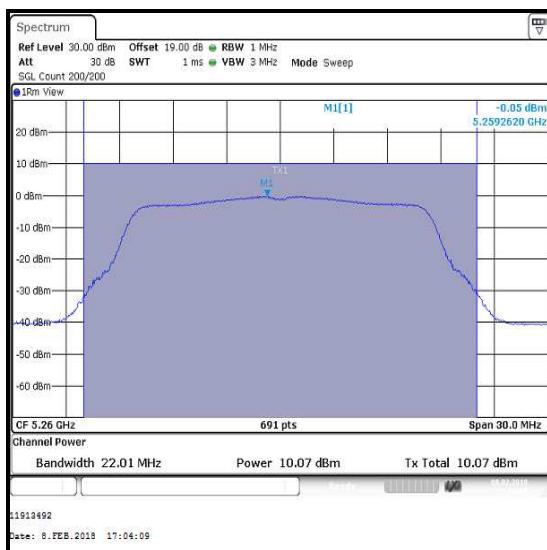
$$\begin{aligned} &\text{For } B > 20 \text{ MHz} \rightarrow \\ &\rightarrow \log_{10} B > \log_{10} 20 \rightarrow \\ &\rightarrow 10 \log_{10} B > 10 \log_{10} 20 \rightarrow \\ &\rightarrow 11 + 10 \log_{10} B > 11 + 10 \log_{10} 20 \rightarrow \\ &\rightarrow 11 + 10 \log_{10} B > 24.0 \text{ dBm} \end{aligned}$$

Therefore for measured emission bandwidths greater than 20 MHz, the lesser of the two limits is the fixed limit of 250 mW (24.0 dBm). This was applied to the results.

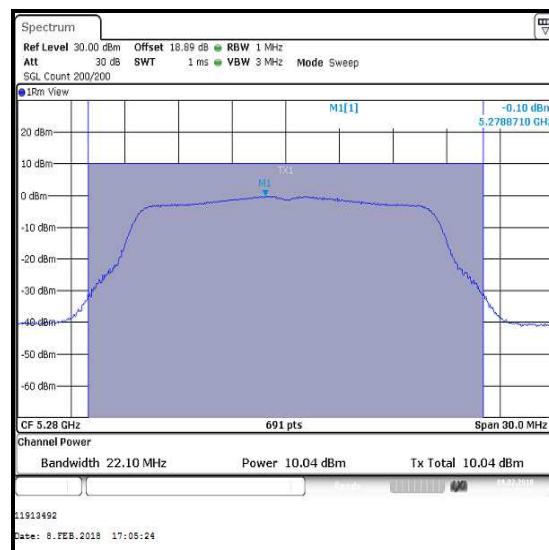
**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11a / 20 MHz / BPSK / 6 Mbps / 5.25-5.35 GHz band

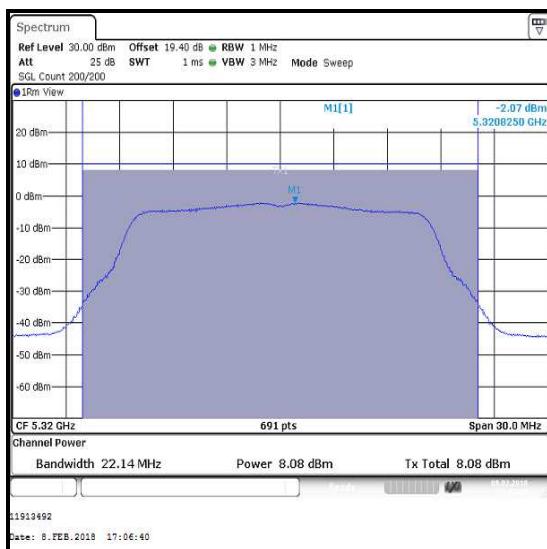
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	10.1	24.0	13.9	Complied
Middle	5280	10.0	24.0	14.0	Complied
Top	5320	8.1	24.0	15.9	Complied



Bottom Channel



Middle Channel

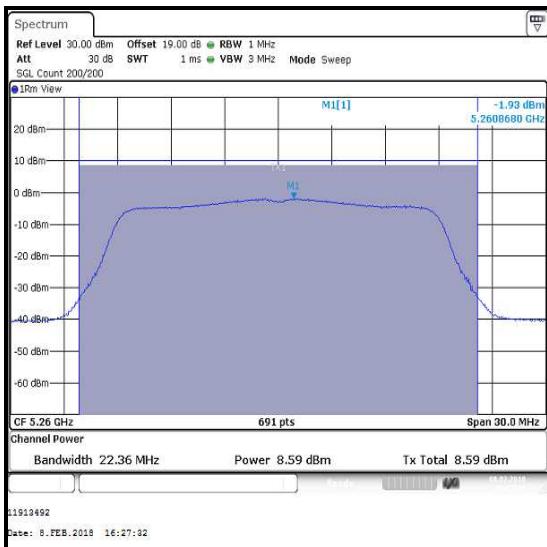


Top Channel

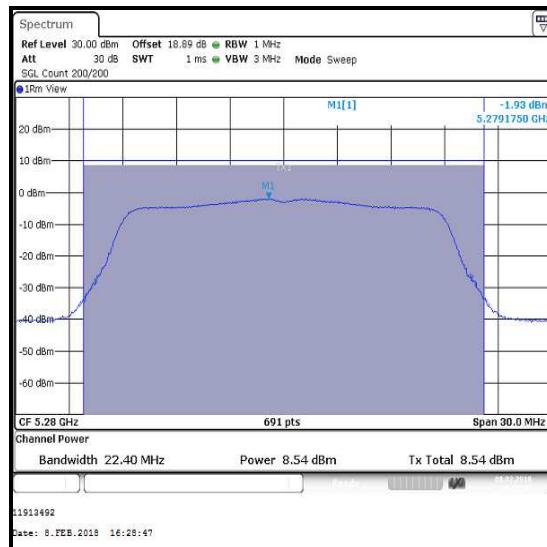
**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11n / 20 MHz / BPSK / MCS0 / 5.25-5.35 GHz band

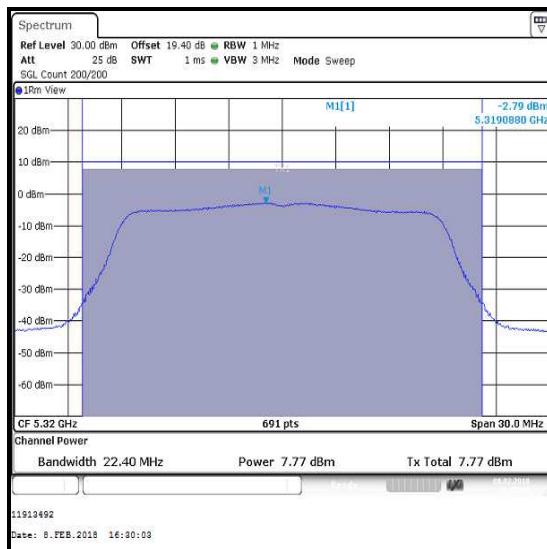
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	8.6	24.0	15.4	Complied
Middle	5280	8.5	24.0	15.5	Complied
Top	5320	7.8	24.0	16.2	Complied



Bottom Channel



Middle Channel

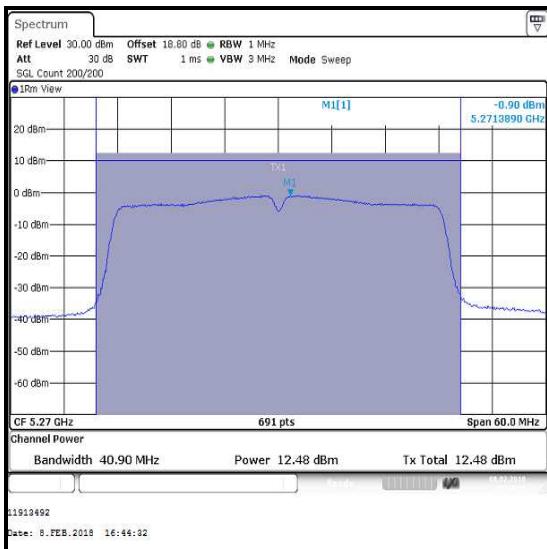


Top Channel

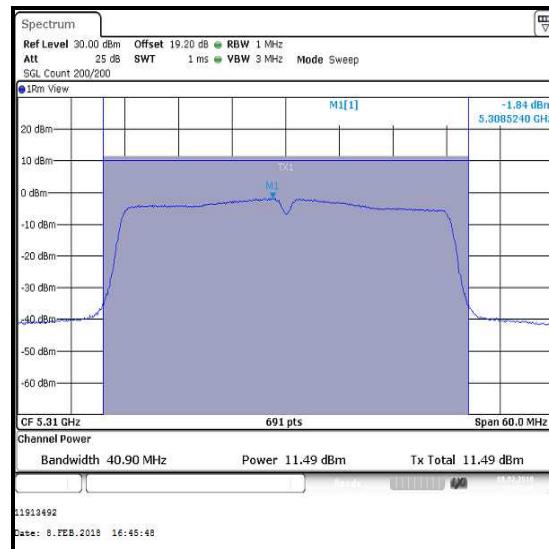
**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11n / 40 MHz / BPSK / MCS0 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5270	12.5	0.1	12.6	24.0	11.4	Complied
Top	5310	11.5	0.1	11.6	24.0	12.4	Complied



Bottom Channel

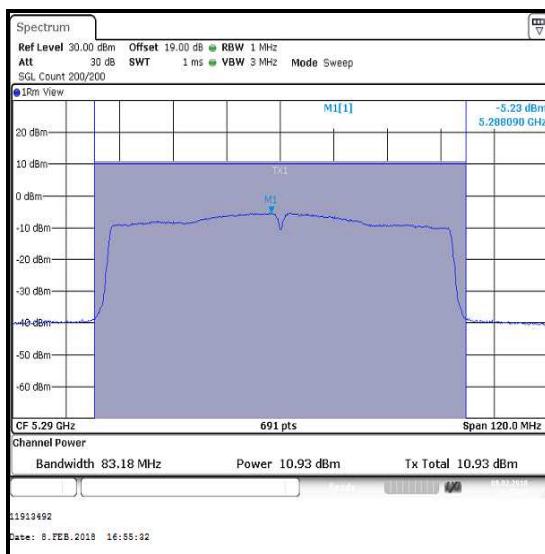


Top Channel

**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11ac / 80 MHz / BPSK / MCS0x1 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Single	5290	10.9	0.2	11.1	24.0	12.9	Complied

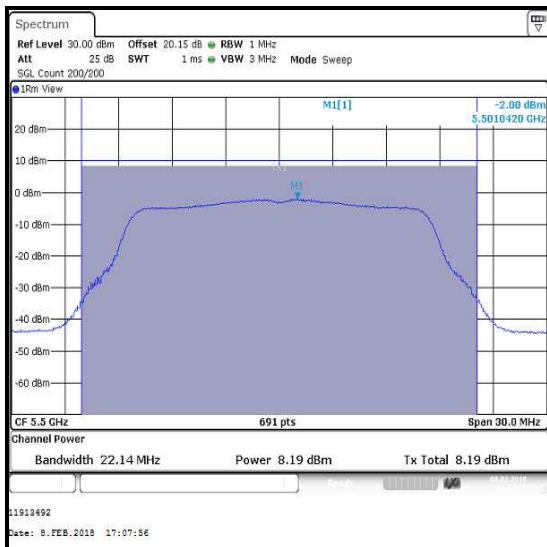


Single Channel

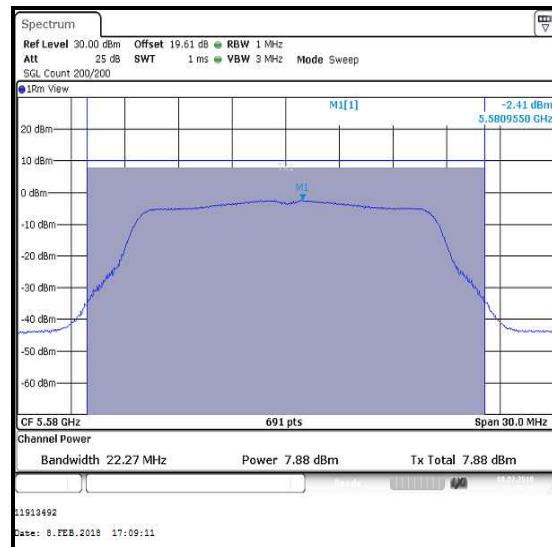
**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11a / 20 MHz / BPSK / 6 Mbps / 5.47-5.725 GHz band

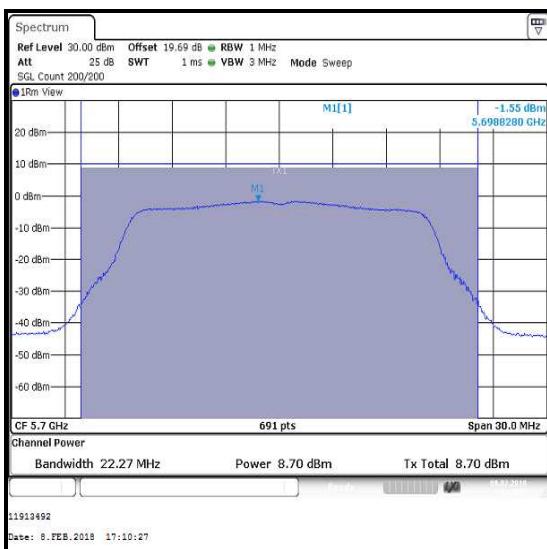
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.2	24.0	15.8	Complied
Middle	5580	7.9	24.0	16.1	Complied
Top	5700	8.7	24.0	15.3	Complied



Bottom Channel



Middle Channel

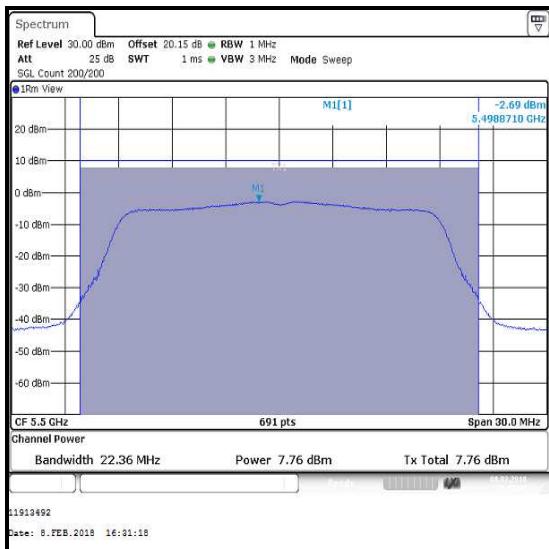


Top Channel

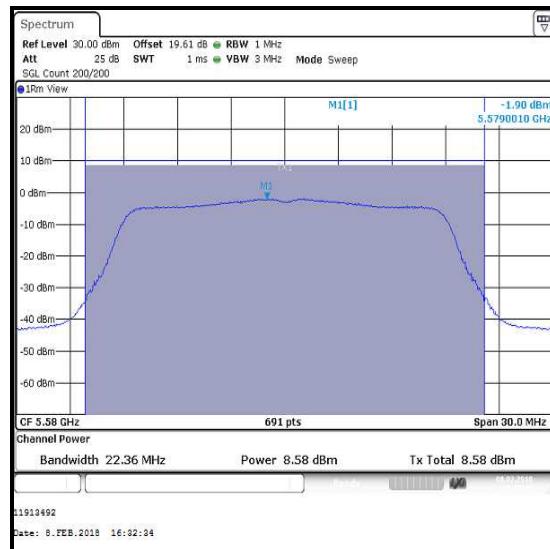
**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11n / 20 MHz / BPSK / MCS0 / 5.47-5.725 GHz band

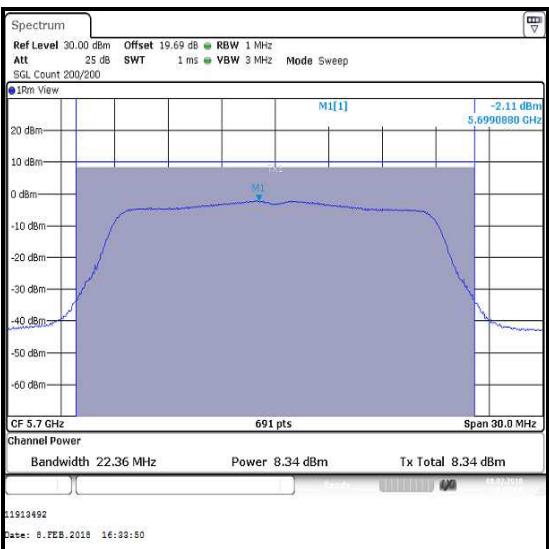
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	7.8	24.0	16.2	Complied
Middle	5580	8.6	24.0	15.4	Complied
Top	5700	8.3	24.0	15.7	Complied



Bottom Channel



Middle Channel

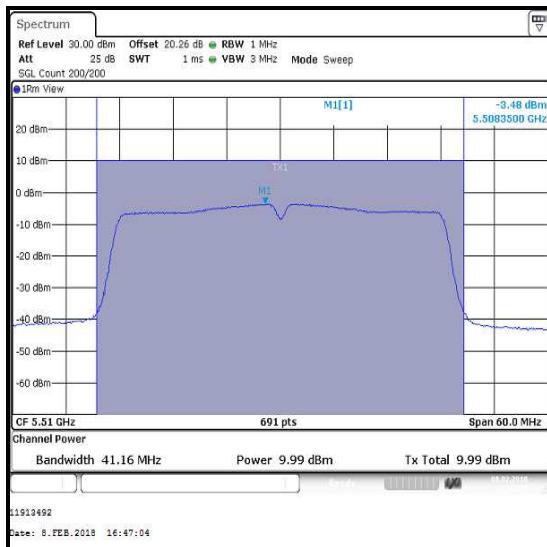


Top Channel

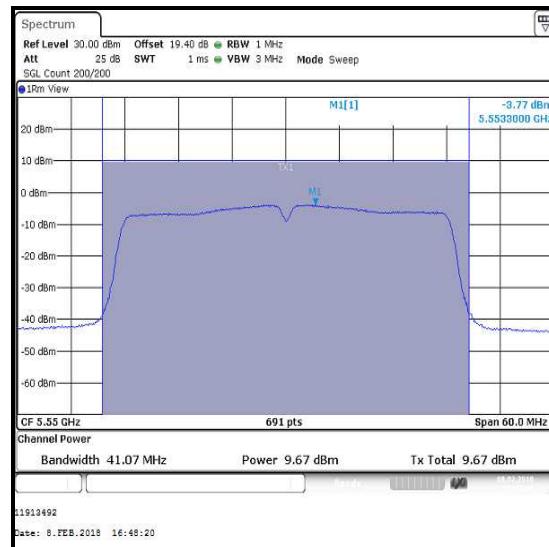
**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11n / 40 MHz / BPSK / MCS0 / 5.47-5.725 GHz band

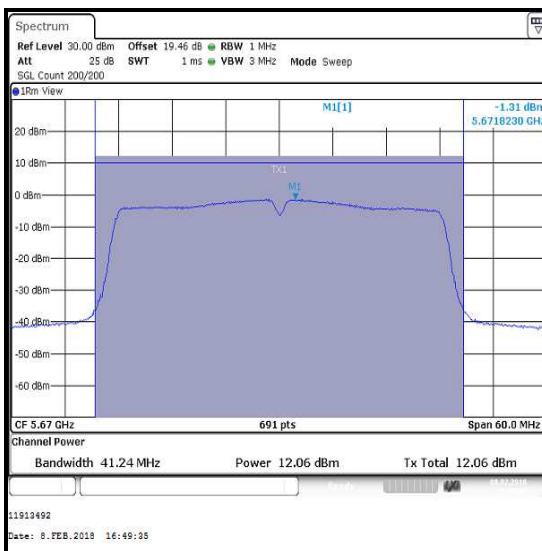
Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5510	10.0	0.1	10.1	24.0	13.9	Complied
Middle	5550	9.7	0.1	9.8	24.0	14.2	Complied
Top	5670	12.1	0.1	12.2	24.0	11.8	Complied



Bottom Channel



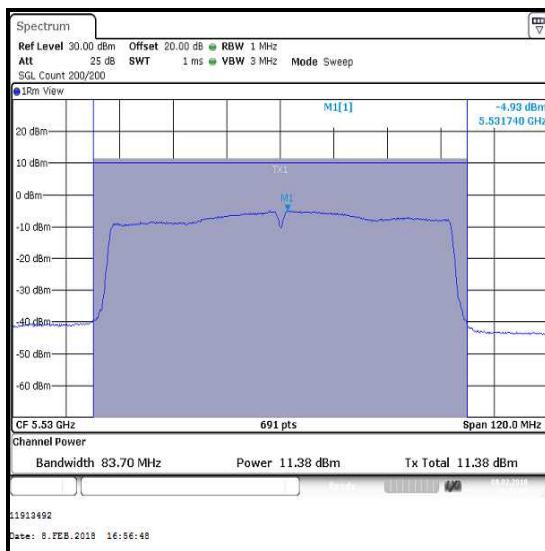
Middle Channel



Top Channel

**Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)****Results: 802.11ac / 80 MHz / BPSK / MCS0x1 / 5.47-5.725 GHz band**

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Single	5530	11.4	0.2	11.6	24.0	12.4	Complied

**Single Channel**

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)**Test Summary:**

Test Engineer:	Max Passell	Test Dates:	08 February 2018 & 22 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.407(a)(3)
Test Method Used:	KDB 789033 D02 Section II.E.2.b) and II.E.2.d)

Environmental Conditions:

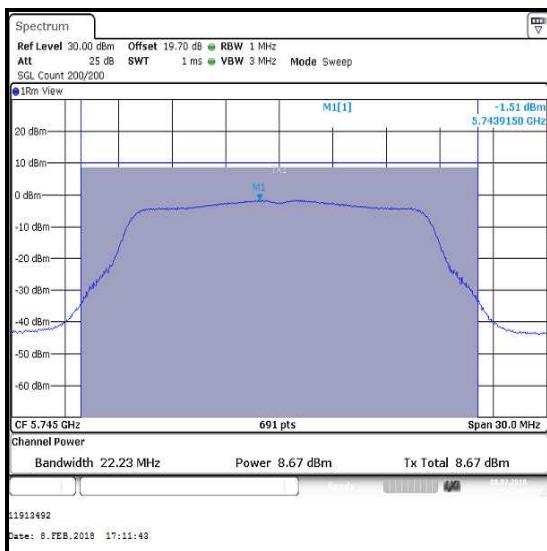
Temperature (°C):	22 to 24
Relative Humidity (%):	32 to 34

Note(s):

1. The FCC Part 15.407(a)(3) limit shall not exceed 1 W (30.0 dBm).

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps**

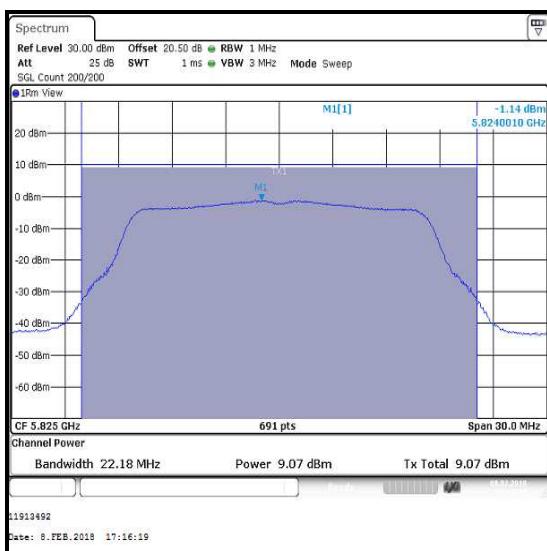
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	8.7	30.0	21.3	Complied
Middle	5785	8.8	30.0	21.2	Complied
Top	5825	9.1	30.0	20.9	Complied



Bottom Channel



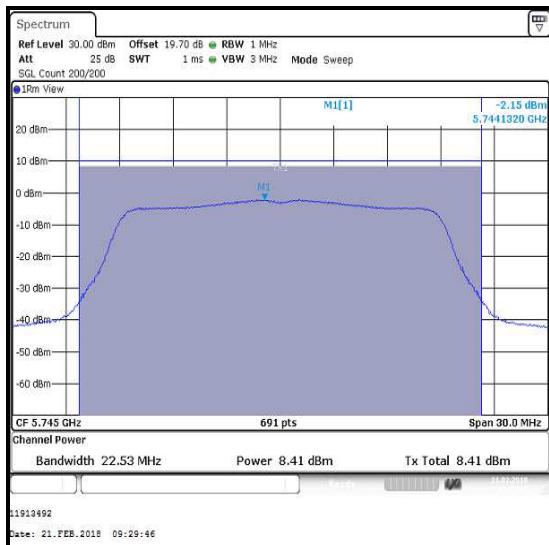
Middle Channel



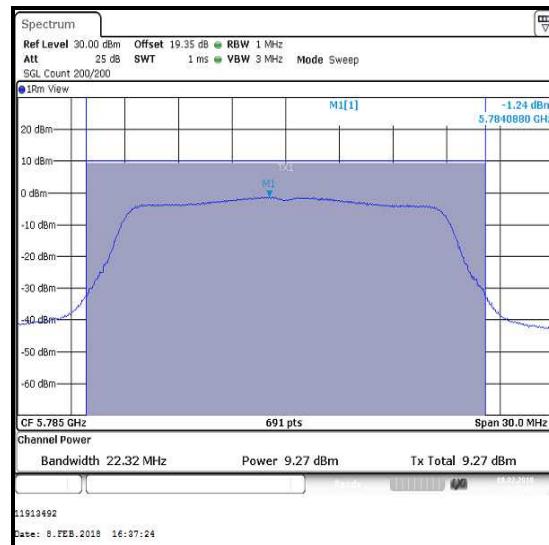
Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0**

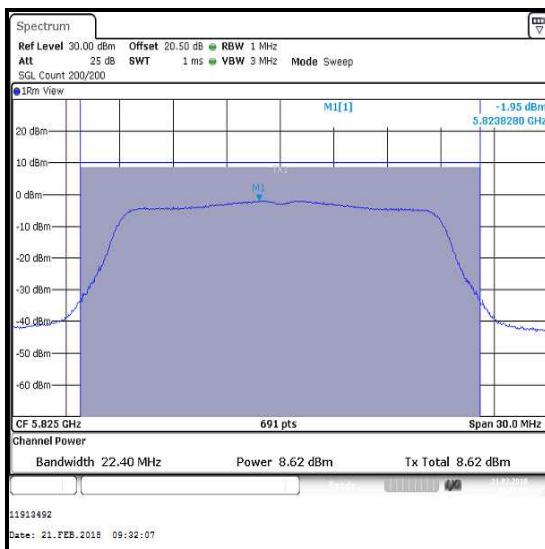
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	8.4	30.0	21.6	Complied
Middle	5785	9.3	30.0	20.7	Complied
Top	5825	8.6	30.0	21.4	Complied



Bottom Channel



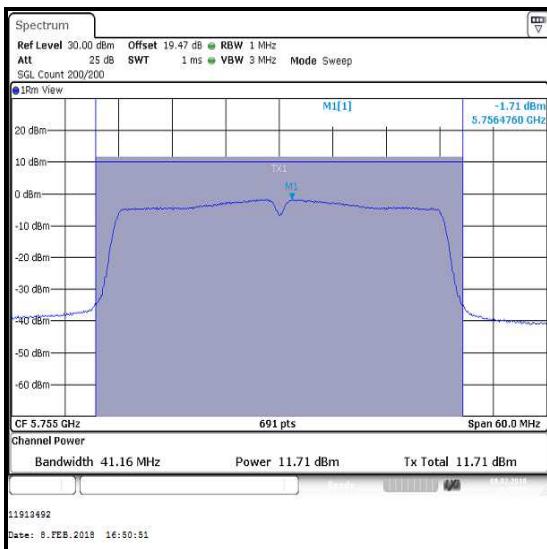
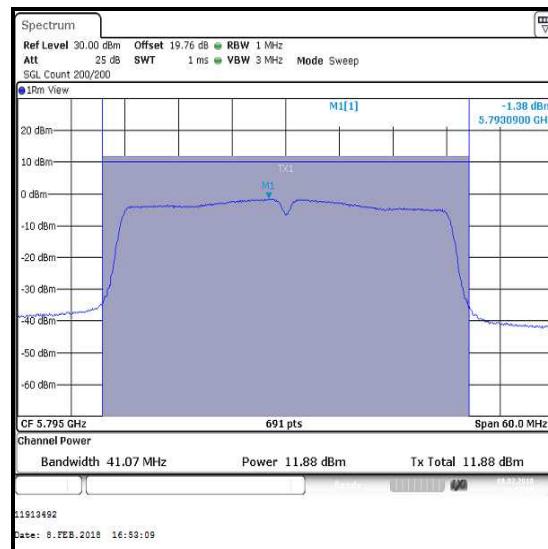
Middle Channel



Top Channel

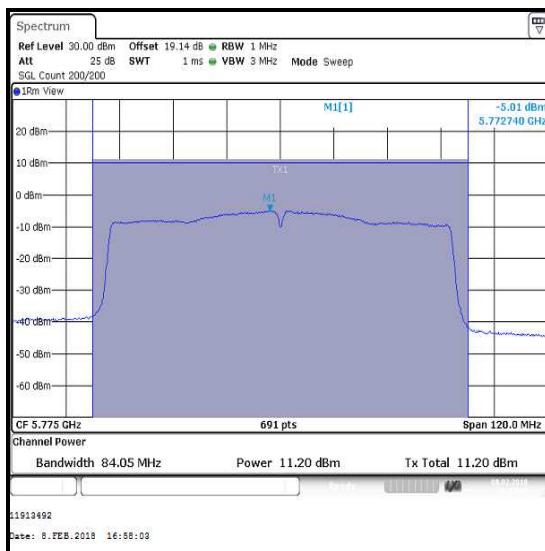
Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0**

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty Cycle Correction (dB)	Corrected Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5755	11.7	0.1	11.8	30.0	18.2	Complied
Top	5795	11.9	0.1	12.0	30.0	18.0	Complied

**Bottom Channel****Top Channel**

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1**

Channel	Frequency (MHz)	Conducted Power (dBm)	Duty cycle correction factor (dB)	Corrected Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Single	5775	11.2	0.2	11.4	30.0	18.6	Complied

**Single Channel**

Transmitter Maximum Conducted Output Power (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	22 Feb 2018	12
M2019	Power Sensor	Boonton	55006	10078	23 Mar 2018	12
M2018	Signal Analyser	Rohde & Schwarz	FSV7	102699	23 Mar 2018	12
G0607	Signal Generator	Rohde & Schwarz	SMU2001	100943	10 May 2019	36
A3038	Attenuator	Pasternack	PE7013-10	Not stated	Calibrated before use	-
A3004	RF Switch	Pickering Interfaces	64-102-002	XZ363230	Calibrated before use	-

5.2.6. Transmitter Maximum Power Spectral Density

Test Summary:

Test Engineer:	Max Passell	Test Dates:	08 February 2018 & 20 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.407(a)(1)(iv)
Test Method Used:	KDB 789033 D02 Section II.F. referencing II.E.2.b) and II.E.2.d)

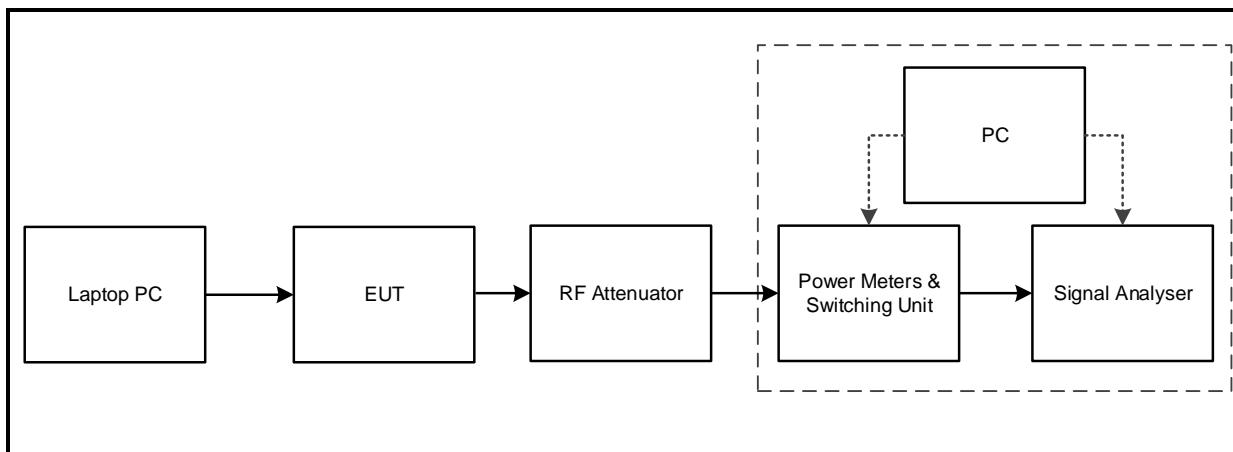
Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	29 to 34

Note(s):

1. Transmitter Maximum Power Spectral Density tests were performed using a signal analyser in accordance with KDB 789033 II. F referencing II.E.2.b) Method SA-1 where the duty cycle is >98% and II.E.2.d) Method SA-2 where the duty cycle was <98%.
2. For data rates where the EUT was transmitting at <98% duty cycle, the calculated duty cycle in section 5.2.4 was added to the measured maximum power spectral density in order to compute the average power spectral density during the actual transmission time.
3. For all modes of operation, the EUT antenna gain is <6 dBi.
4. The signal analyser was connected to the RF port on the EUT using an RF switch, suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the switch, attenuators and RF cables.
5. As the power spectral density test uses the same test method as the output power test, before the power is integrated across the 26 dB bandwidth, the conducted power spectral density plots are located in the conducted output power section 5.2.5 of this test report. The peak spectral density was measured by placing a marker on the peak of the signal and the results entered in the tables below.
6. The Part 15.407(a)(1)(iv) limit for PSD is <11 dBm/MHz.

Test setup:



Transmitter Maximum Power Spectral Density (5.15-5.25 GHz band) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps**

Channel	Frequency (MHz)	PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5180	1.4	11.0	9.6	Complied
Middle	5200	1.4	11.0	9.6	Complied
Top	5240	0.5	11.0	10.5	Complied

Results: 802.11n / 40 MHz / BPSK / MCS0

Channel	Frequency (MHz)	PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5190	0.6	11.0	10.4	Complied
Top	5230	0.1	11.0	10.9	Complied

Results: 802.11n / 40 MHz / BPSK / MCS0

Channel	Frequency (MHz)	PSD (dBm /MHz)	Duty cycle correction (dB)	Corrected PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5190	0.6	0.1	0.7	11.0	10.3	Complied
Top	5230	0.1	0.1	0.2	11.0	10.8	Complied

Results: 802.11ac / 80 MHz / BPSK / MCS0x1

Channel	Frequency (MHz)	PSD (dBm /MHz)	Duty cycle correction (dB)	Corrected PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Single	5210	-3.1	0.2	-2.9	11.0	13.9	Complied

Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)**Test Summary:**

Test Engineer:	Max Passell	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.407(a)(2)
Test Method Used:	KDB 789033 D02 Section II.F. referencing II.E.2.b) and II.E.2.d)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Note(s):

1. FCC Part 15.407(a)(2) limit for PSD in the 5.25-5.35 GHz and 5.47-5.725 GHz operating bands is <11 dBm/MHz.
2. As the power spectral density test uses the same test method as the output power test, before the power is integrated across the 26 dB bandwidth, the conducted power spectral density plots are located in the conducted ouput power section 5.2.5 of this test report. The peak spectral density was measured by placing a marker on the peak of the signal and the results entered in the tables below.

**Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11a / 20 MHz / BPSK / 6 Mbps / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	0.0	11.0	11.0	Complied
Middle	5280	-0.1	11.0	11.1	Complied
Top	5320	-2.1	11.0	13.1	Complied

Results: 802.11n / 20 MHz / BPSK / MCS0 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	-1.9	11.0	12.9	Complied
Middle	5280	-1.9	11.0	12.9	Complied
Top	5320	-2.8	11.0	13.8	Complied

Results: 802.11n / 40 MHz / BPSK / MCS0 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5270	-0.9	0.1	-0.8	11.0	11.8	Complied
Top	5310	-1.8	0.1	-1.7	11.0	12.7	Complied

Results: 802.11ac / 80 MHz / BPSK / MCS0x1 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Single	5290	-5.2	0.2	-5.0	11.0	16.0	Complied

**Transmitter Maximum Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)
(continued)**

Results: 802.11a / 20 MHz / BPSK / 6 Mbps / 5.47-5.725 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-2.0	11.0	13.0	Complied
Middle	5580	-2.4	11.0	13.4	Complied
Top	5700	-1.5	11.0	12.5	Complied

Results: 802.11n / 20 MHz / BPSK / MCS0 / 5.47-5.725 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-2.7	11.0	13.7	Complied
Middle	5580	-1.9	11.0	12.9	Complied
Top	5700	-2.1	11.0	13.1	Complied

Results: 802.11n / 40 MHz / BPSK / MCS0 / 5.47-5.725 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Duty cycle correction (dB)	Corrected PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5510	-3.5	0.1	-3.4	11.0	14.4	Complied
Middle	5550	-3.8	0.1	-3.7	11.0	14.7	Complied
Top	5670	-1.3	0.1	-1.2	11.0	12.2	Complied

Results: 802.11ac / 80 MHz / BPSK / MCS0x1 / 5.47-5.725 GHz band

Channel	Frequency (MHz)	PSD (dBm /MHz)	Duty cycle correction factor (dB)	Corrected PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Single	5530	-4.9	0.2	-4.7	11.0	15.7	Complied

Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band)**Test Summary:**

Test Engineer:	Max Passell	Test Dates:	08 February 2018 & 22 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Conducted Sample with RF port</i>)		

FCC Reference:	Part 15.407(a)(3)
Test Method Used:	KDB 789033 D02 Section II.F. referencing II.E.2.b) and II.E.2.d)

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	29 to 34

Note(s):

1. FCC Part 15.407(a)(3) limit for PSD in the 5.725-5.85 GHz operating band is <30 dBm/500 kHz.
2. In accordance with ANSI C63.10 Section 4.1.4.1, use of bandwidths greater than those specified can produce higher readings. Compliance against the applicable limits is shown using a 1 MHz resolution bandwidth. This was deemed worst case.
3. As the power spectral density test uses the same test method as the output power test, before the power is integrated across the 26 dB bandwidth, the conducted power spectral density plots are located in the conducted output power section 5.2.5 of this test report. The peak spectral density was measured by placing a marker on the peak of the signal and the results entered in the tables below.

Transmitter Maximum Power Spectral Density (5.725-5.85 GHz band) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps**

Channel	Frequency (MHz)	PSD (dBm / 1 MHz)	Limit (dBm / 500 kHz)	Margin (dB)	Result
Bottom	5745	-1.5	30.0	31.5	Complied
Middle	5785	-1.4	30.0	31.4	Complied
Top	5825	-1.1	30.0	31.1	Complied

Results: 802.11n / 20 MHz / BPSK / MCS0

Channel	Frequency (MHz)	PSD (dBm / 1 MHz)	Limit (dBm / 500 kHz)	Margin (dB)	Result
Bottom	5745	-2.1	30.0	32.1	Complied
Middle	5785	-1.2	30.0	31.2	Complied
Top	5825	-1.9	30.0	31.9	Complied

Results: 802.11n / 40 MHz / BPSK / MCS0

Channel	Frequency (MHz)	PSD (dBm / 1 MHz)	Duty cycle correction (dB)	Corrected PSD (dBm / 1 MHz)	Limit (dBm / 500 kHz)	Margin (dB)	Result
Bottom	5755	-1.7	0.1	-1.6	30.0	31.6	Complied
Top	5795	-1.4	0.1	-1.3	30.0	31.3	Complied

Results: 802.11ac / 80 MHz / BPSK / MCS0x1

Channel	Frequency (MHz)	PSD (dBm / 1 MHz)	Duty cycle correction factor (dB)	Corrected PSD (dBm / 1 MHz)	Limit (dBm / 500 kHz)	Margin (dB)	Result
Single	5775	-5.0	0.2	-4.8	30.0	34.8	Complied

Transmitter Maximum Power Spectral Density (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	22 Feb 2018	12
M2019	Power Sensor	Boonton	55006	10078	23 Mar 2018	12
M2018	Signal Analyser	Rohde & Schwarz	FSV7	102699	23 Mar 2018	12
G0607	Signal Generator	Rohde & Schwarz	SMU2001	100943	10 May 2019	36
A3038	Attenuator	Pasternack	PE7013-10	Not stated	Calibrated before use	-
A3004	RF Switch	Pickering Interfaces	64-102-002	XZ363230	Calibrated before use	-

5.2.7. Transmitter Out of Band Radiated Emissions**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	09 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

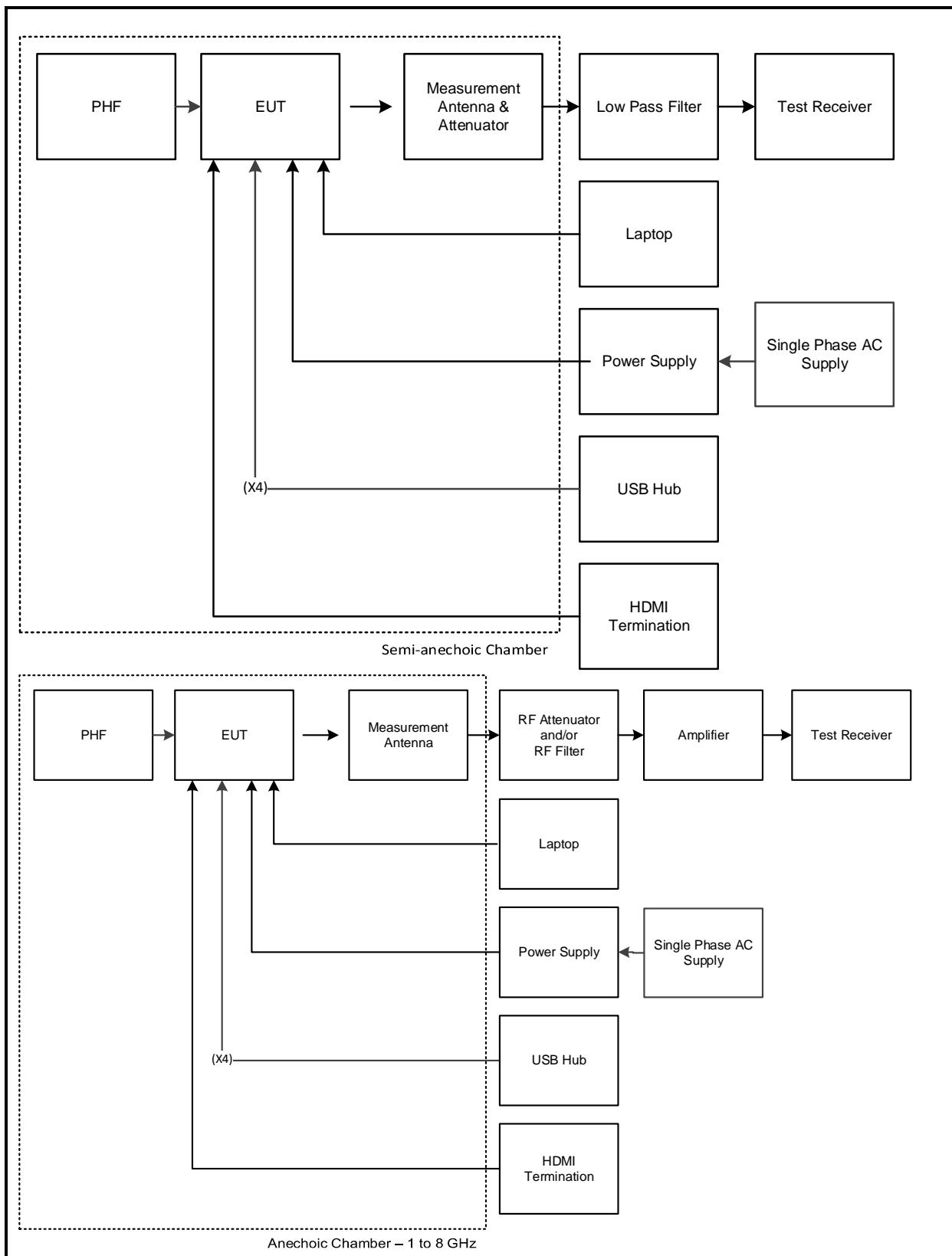
FCC Reference:	Parts 15.407(b)(1),(6),(7) & 15.209(a)
Test Method Used:	KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 1000 MHz

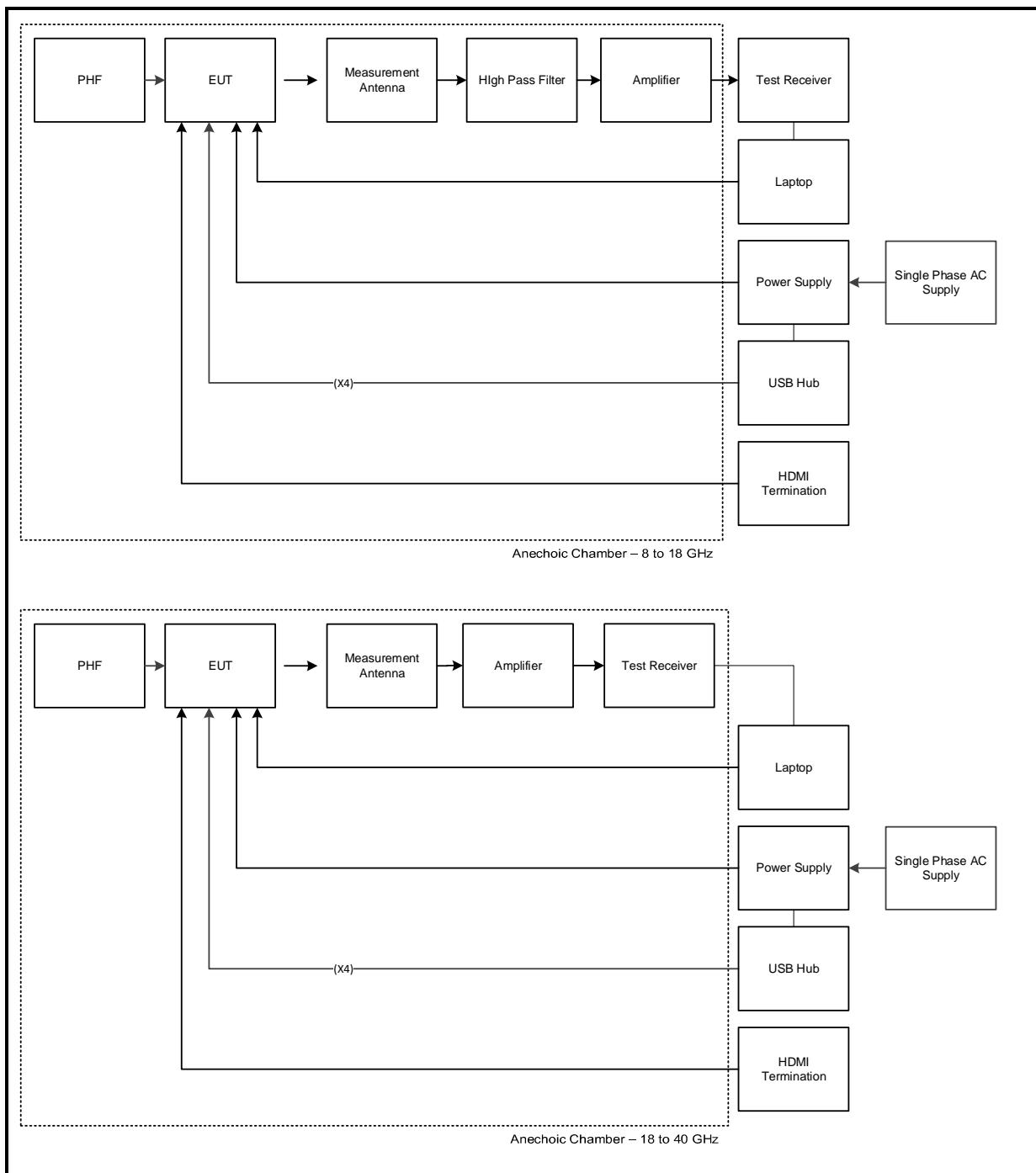
Environmental Conditions:

Temperature (°C):	20 to 21
Relative Humidity (%):	33 to 34

Note(s):

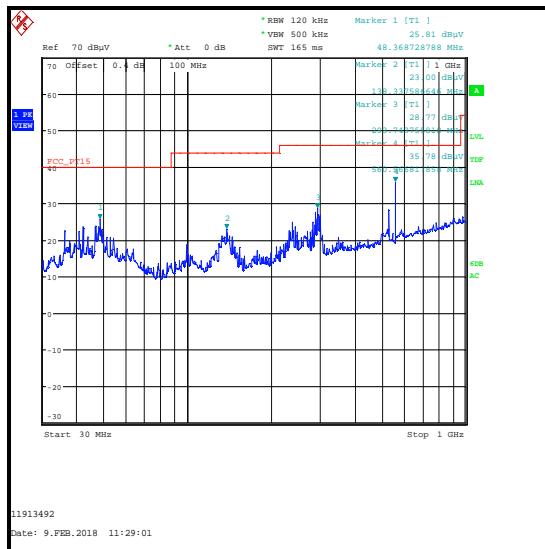
1. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
2. Pre-scans were performed with the EUT transmitting in the 5.15 to 5.25 GHz band with a configuration of 802.11n / HT40 / MCS0 on bottom channel as it produced the highest power and was therefore deemed worst case. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power / power spectral density and all final measurements should be performed on any emissions seen in each band.
3. 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 bottom channel only.
4. 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.
5. Measurements below 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 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.
6. 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.
7. 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 big enough to see the whole emission.

Transmitter Out of Band Radiated Emissions (continued)**Test setup for radiated measurements:**

Transmitter Out of Band Radiated Emissions (continued)**Test setup for radiated measurements (continued):**

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: Quasi Peak / Bottom Channel / 802.11n / HT40 / MCS0**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
37.692	Horizontal	20.1	40.0	19.9	Complied



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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	25 Apr 2018	12
A2147	Attenuator	AtlanTecRF	AN18-06	09020206-06	25 Apr 2018	12
A2131	Low Pass Filter	AtlanTecRF	AFL-02000	JFB1004-002	27 Feb 2018	12

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	09 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Part 15.407(b)(1),(7) & 15.209(a)
Test Method Used:	KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	20 to 21
Relative Humidity (%):	33 to 34

Note(s):

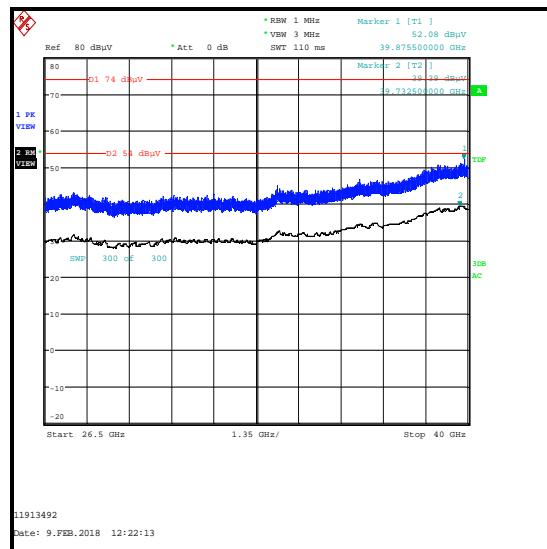
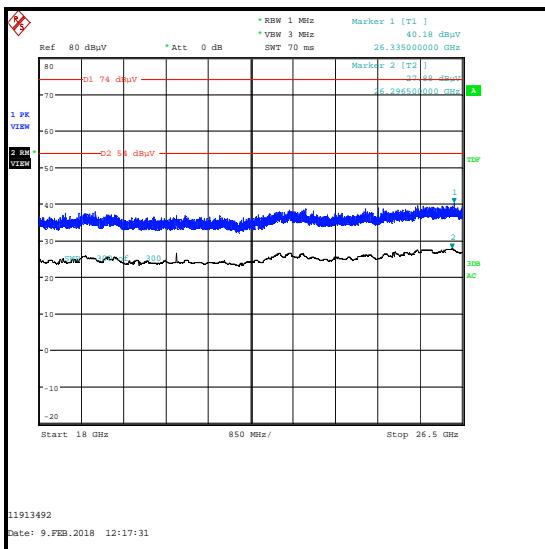
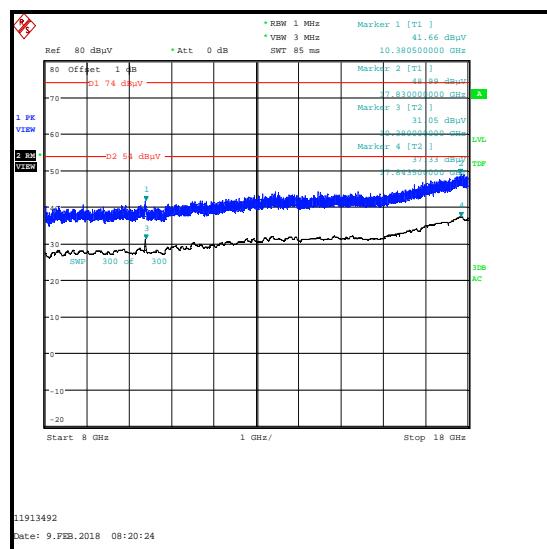
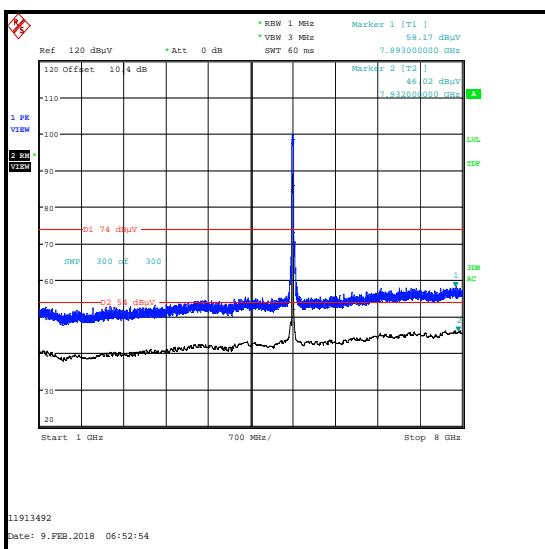
1. FCC Part 15.407(b)(1) states for transmitters operating in the band 5.15 to 5.25 GHz: all emissions outside of the 5.15 to 5.35 GHz band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Pre-scans were performed with the EUT transmitting on bottom channel in this band with a data rate of 802.11n / HT40 / MCS0 as it produced the highest power and was therefore deemed worst case. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
3. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
4. All 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. Therefore the highest peak and average noise floor readings of the measuring receiver were recorded.
5. The emission shown on the 1 GHz to 8 GHz plot is the EUT fundamental.
6. Measurements were performed across the two restricted bands closest to the bands of operation with the EUT transmitting on the bottom channel of this band and bottom channel of 5.47 to 5.725 GHz range. Plots are included in this section of the test report. Peak and average measurements were made.
7. Measurements 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. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

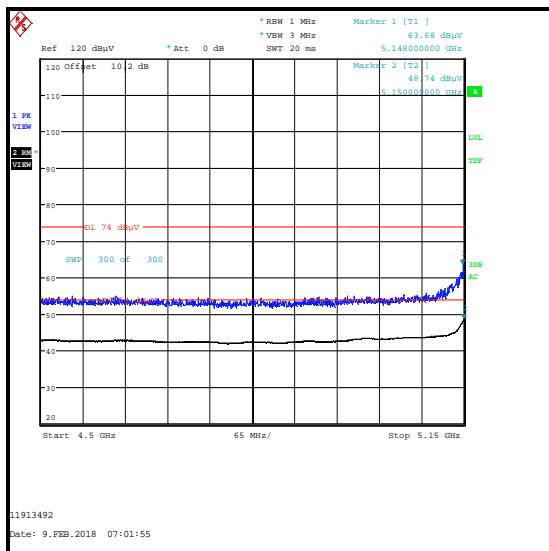
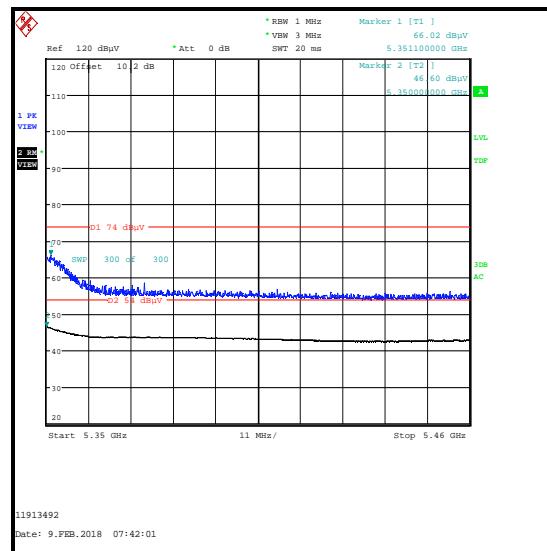
Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 40 MHz / MCS0 / Field Strength / Peak**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
7893.000	Vertical	58.2	74.0	15.8	Complied

Results: 802.11n / 40 MHz / MCS0 / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Measured Level (dB μ V/m)	Duty cycle correction factor (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
7932.000	Vertical	46.0	0.1	46.1	54.0	7.9	Complied



Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Restricted Band 4.5 GHz to 5.15 GHz****Restricted Band 5.35 GHz to 5.46 GHz**

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	09 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Part 15.407(b)(2),(7) & 15.209(a)
Test Method Used:	KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	20 to 21
Relative Humidity (%):	33 to 34

Note(s):

1. FCC Part 15.407(b)(2) states for transmitters operating in the band 5.25 to 5.35 GHz: all emissions outside of the 5.15-5.35 GHz band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
3. In accordance with ANSI C63.10-2013 Section 6.5.4, emissions more than 20 dB below the limit do not need to be reported.
4. Pre-scans were performed with the EUT transmitting on bottom channel in the 5.15 to 5.25 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
5. All emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor. Therefore the highest peak and average noise floor readings of the measuring receiver were recorded in the 5.15 to 5.25 GHz results section of this report.
6. Measurements 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. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	09 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Part 15.407(b)(3),(7) & 15.209(a)
Test Method Used:	KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	20 to 21
Relative Humidity (%):	33 to 34

Note(s):

1. FCC Part 15.407(b)(3) states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
3. In accordance with ANSI C63.10-2013 Section 6.5.4, emissions more than 20 dB below the limit do not need to be reported.
4. Pre-scans were performed with the EUT transmitting on bottom channel in the 5.15 to 5.25 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
5. All emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor. Therefore the highest peak and average noise floor readings of the measuring receiver were recorded in the 5.15 to 5.25 GHz results section of this report.
6. Measurements 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. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	09 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Part 15.407(b)(4)(i),(7) & 15.209(a)
Test Method Used:	KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	20 to 21
Relative Humidity (%):	33 to 34

Note(s):

1. FCC Part 15.407(b)(4)(i) states for transmitters operating in the band 5.725 to 5.85 GHz: all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Appropriate RF filters and attenuators were used during pre-scans and final measurements. Insertion losses were entered on the spectrum analyser as RF levels offsets.
3. In accordance with ANSI C63.10-2013 Section 6.5.4, emissions more than 20 dB below the limit do not need to be reported.
4. Pre-scans were performed with the EUT transmitting on bottom channel in the 5.15 to 5.25 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emissions seen in each band.
5. All emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor. Therefore the highest peak and average noise floor readings of the measuring receiver were recorded in the 5.15 to 5.25 GHz results section of this report.
6. Measurements 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. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	11 Apr 2018	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	03 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	18 May 2018	12
S0538	Bench Power Supply	TTI	PL154	250135	Calibrated before use	-

5.2.8. Transmitter Band Edge Radiated Emissions**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Parts 15.407(b)(1),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.10 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	35

Note(s):

1. The customer declared the following data rates to be used for all measurements as:
 - 802.11a / BPSK / 6 Mbit/s
 - 802.11n HT20 / BPSK / MCS0
 - 802.11n HT40 / BPSK / MCS0
 - 802.11ac VHT80 / BPSK / MCS0x1
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation, the results are included in the transmitter 5.15-5.25 GHz band radiated spurious emission section of this test report
4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
5. For all average measurements of this section, 300 sweeps were used. This satisfies the requirement for the minimum number of sweep points, as stated in KDB 789033 Section II.G.6.c) Method AD (vi).
6. In accordance with KDB 789033 Section II.G.6.c) Method AD (vii), for average measurements, data rates where the EUT was transmitting <98% duty cycle, the duty cycle correction factor calculated in Section 5.2.4 of this report was added to the measured result.

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)

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

Results: Lower Band Edge / Peak

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5148.846	61.4	74.0	12.6	Complied
5150	59.7	74.0	14.3	Complied

Results: Upper Band Edge / Peak

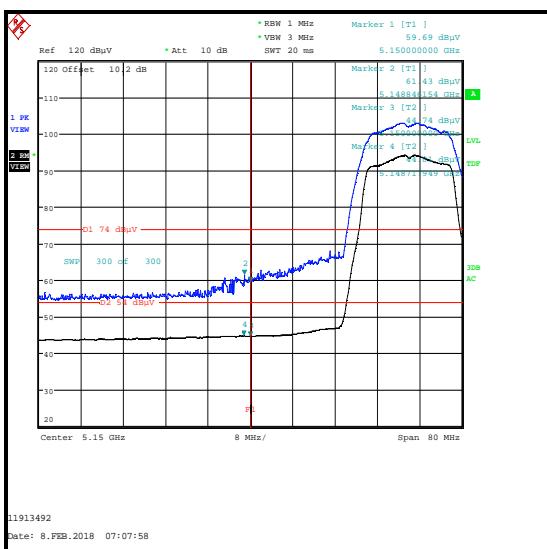
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	54.9	74.0	19.1	Complied
5356.923	56.3	74.0	17.7	Complied

Results: Lower Band Edge / Average

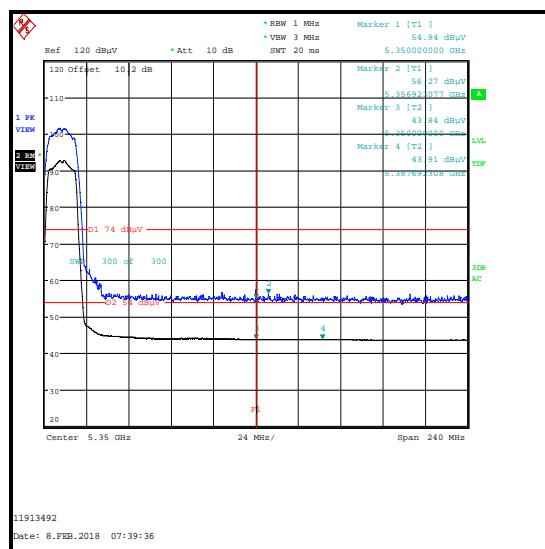
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5148.718	44.8	54.0	9.2	Complied
5150	44.7	54.0	9.3	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	43.8	54.0	10.2	Complied
5387.692	43.9	54.0	10.1	Complied



Lower Band Edge Measurement



Upper Band Edge Measurement

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0****Results: Lower Band Edge / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5146.667	57.3	74.0	16.7	Complied
5150	56.0	74.0	18.0	Complied

Results: Upper Band Edge / Peak

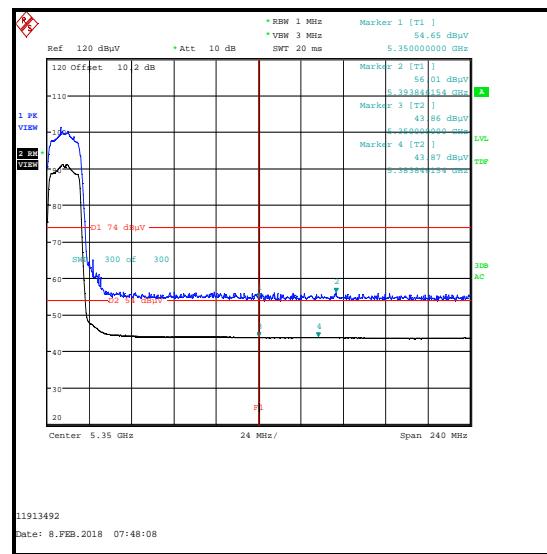
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	54.7	74.0	19.3	Complied
5393.846	56.0	74.0	18.0	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5148.205	44.6	54.0	9.4	Complied
5150	44.5	54.0	9.5	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	43.9	54.0	10.1	Complied



Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0****Results: Lower Band Edge / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5147.308	65.2	74.0	8.8	Complied
5150	63.6	74.0	10.4	Complied

Results: Upper Band Edge / Peak

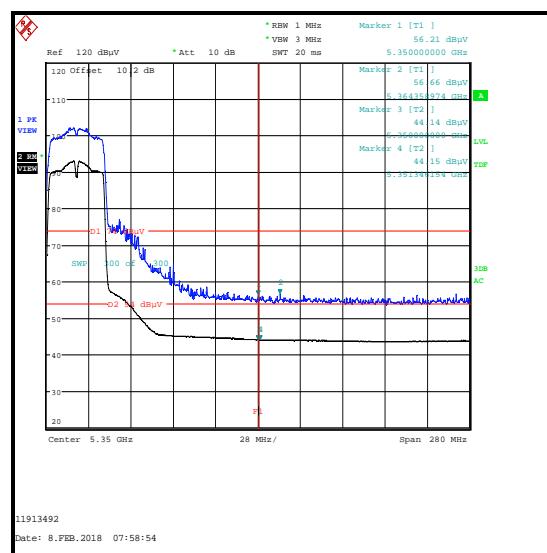
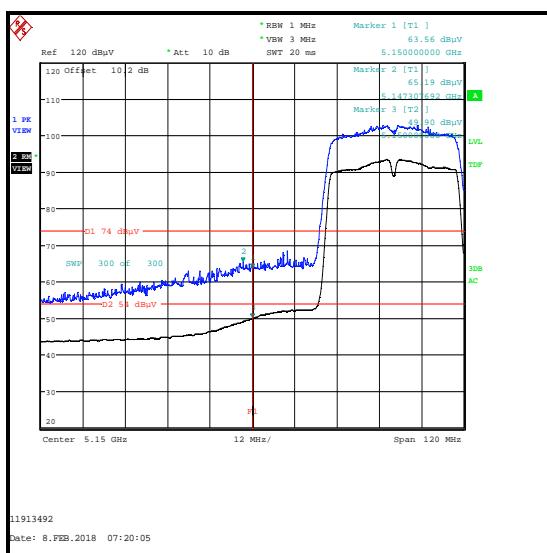
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	56.2	74.0	17.8	Complied
5364.359	56.7	74.0	17.3	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5150	49.9	0.1	50.0	54.0	4.0	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	44.1	0.1	44.2	54.0	9.8	Complied
5351.346	44.2	0.1	44.3	54.0	9.7	Complied



Lower Band Edge Measurement

Upper Band Edge Measurement

Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1****Results: Lower Band Edge / Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5150	63.5	74.0	10.5	Complied

Results: Upper Band Edge / Peak

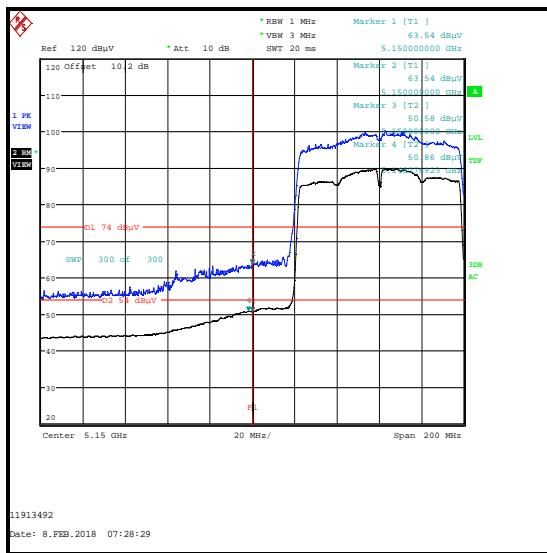
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	63.2	74.0	10.8	Complied
5354.808	64.8	74.0	9.2	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5148.077	50.9	0.2	51.1	54.0	2.9	Complied
5150	50.6	0.2	50.8	54.0	3.2	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	49.0	0.2	49.2	54.0	4.8	Complied
5350.641	49.1	0.2	49.3	54.0	4.7	Complied



Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band)**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Parts 15.407(b)(2),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.10 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	35

Note(s):

1. The customer declared the following data rates to be used for all measurements as:
 - 802.11a / BPSK / 6 Mbit/s
 - 802.11n HT20 / BPSK / MCS0
 - 802.11n HT40 / BPSK / MCS0
 - 802.11ac VHT80 / BPSK / MCS0x1
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation, the results are included in the transmitter 5.15-5.25 GHz band radiated spurious emission section of this test report.
4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
5. For all average measurements of this section, 300 sweeps were used. This satisfies the requirement for the minimum number of sweep points, as stated in KDB 789033 Section II.G.6.c) Method AD (vi).
6. In accordance with KDB 789033 Section II.G.6.c) Method AD (vii), for average measurements, data rates where the EUT was transmitting <98% duty cycle, the duty cycle correction factor calculated in Section 5.2.4 of this report was added to the measured result.

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5056.538	56.4	74.0	17.6	Complied
5150	54.3	74.0	19.7	Complied

Results: Upper Band Edge / Peak

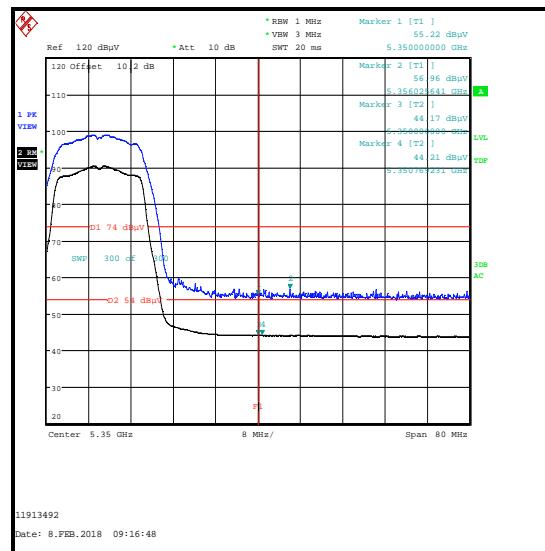
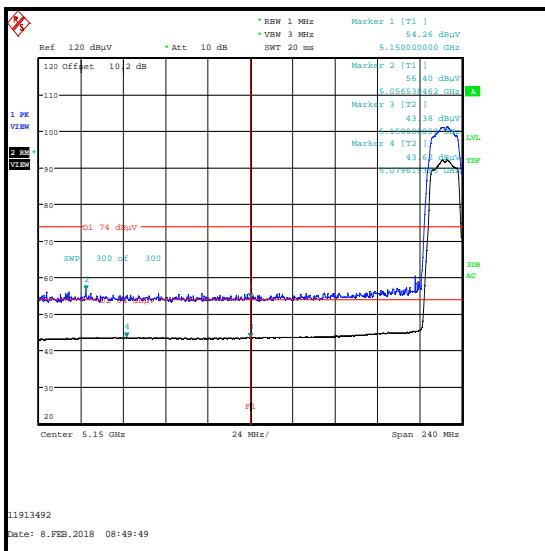
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	55.2	74.0	18.8	Complied
5356.026	57.0	74.0	17.0	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5079.615	43.6	54.0	10.4	Complied
5150	43.4	54.0	10.6	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	44.2	54.0	9.8	Complied



Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5107.692	55.6	74.0	18.4	Complied
5150	55.0	74.0	19.0	Complied

Results: Upper Band Edge / Peak

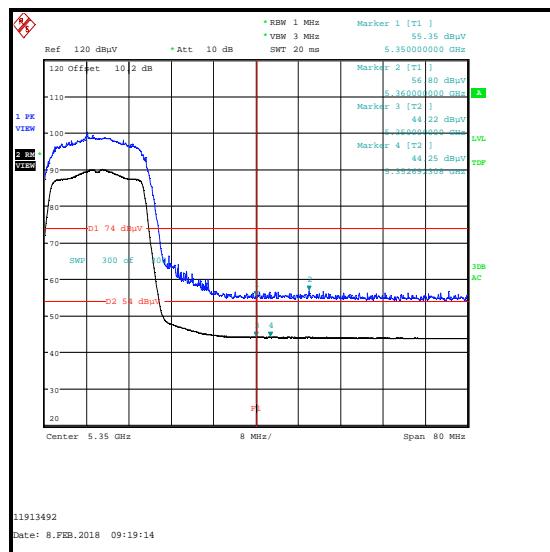
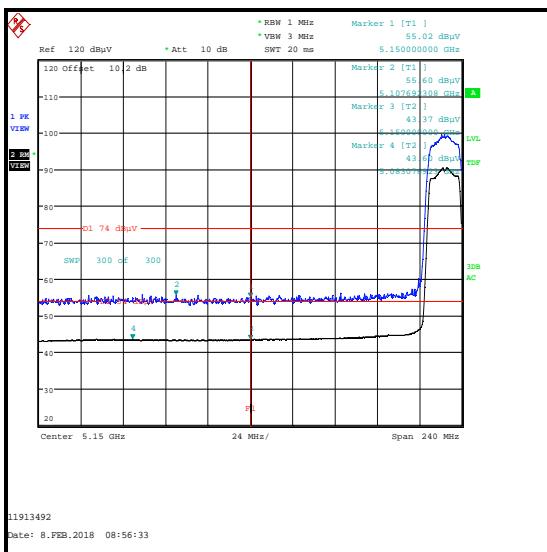
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	55.4	74.0	18.6	Complied
5360.000	56.8	74.0	17.2	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5083.077	43.6	54.0	10.4	Complied
5150	43.4	54.0	10.6	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	44.2	54.0	9.8	Complied
5352.692	44.3	54.0	9.7	Complied



Lower Band Edge Measurement

Upper Band Edge Measurement

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5130.256	56.5	74.0	17.5	Complied
5150	54.7	74.0	19.3	Complied

Results: Upper Band Edge / Peak

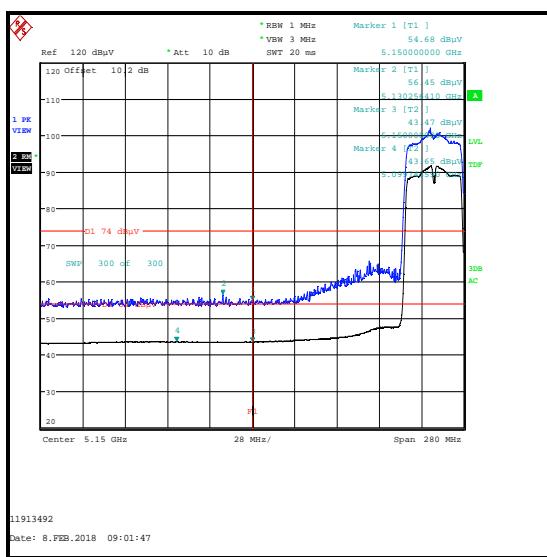
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	67.3	74.0	6.7	Complied
5350.961	68.0	74.0	6.0	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5099.744	43.7	0.1	43.8	54.0	10.2	Complied
5150	43.5	0.1	43.6	54.0	10.4	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	48.5	0.1	48.6	54.0	5.4	Complied



Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1****Results: Lower Band Edge / Peak**

Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5150	63.5	74.0	10.5	Complied

Results: Upper Band Edge / Peak

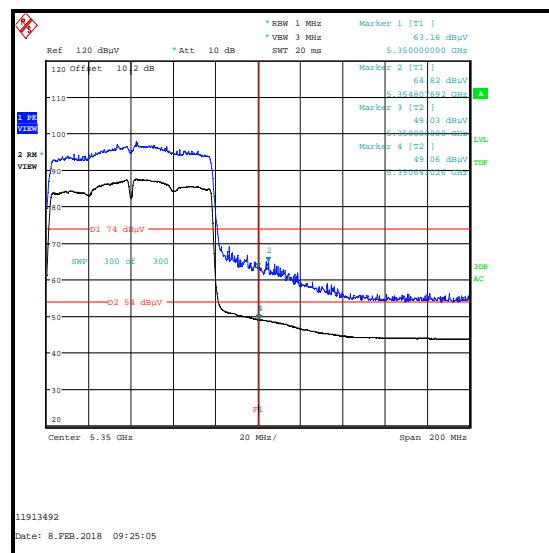
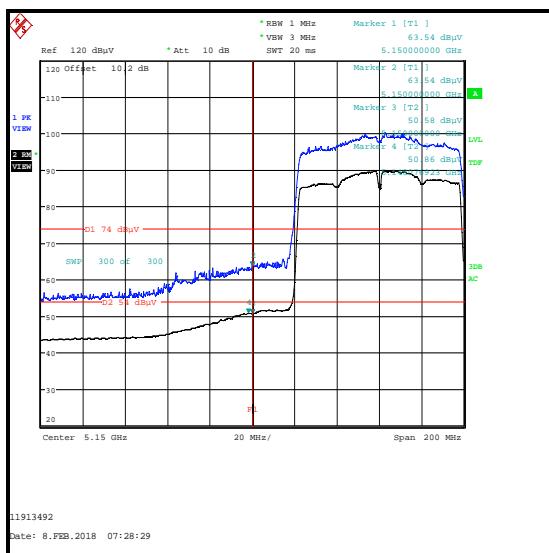
Frequency (MHz)	Peak Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	63.2	74.0	10.8	Complied
5354.808	64.8	74.0	9.2	Complied

Results: Lower Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5148.077	50.9	0.2	51.1	54.0	2.9	Complied
5150	50.6	0.2	50.8	54.0	3.2	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dB μ V/m)	Duty Cycle correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5350	49.0	0.2	49.2	54.0	4.8	Complied
5350.641	49.1	0.2	49.3	54.0	4.7	Complied



Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band)**Test Summary:**

Test Engineer:	John Ferdinand	Test Date:	08 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Parts 15.407(b)(3),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.10 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	35

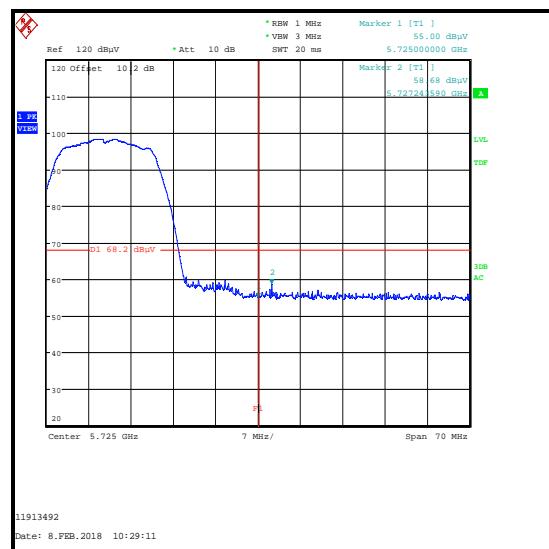
Note(s):

1. The customer declared the following data rates to be used for all measurements as:
 - 802.11a / BPSK / 6 Mbit/s
 - 802.11n HT20 / BPSK / MCS0
 - 802.11n HT40 / BPSK / MCS0
 - 802.11ac VHT80 / BPSK / MCS0x1
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel.
Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation with the EUT transmitting on the bottom and top channels within 5.47-5.725 GHz band, the results are included in the transmitter 5.15-5.25 GHz band radiated spurious emissions section of this test report.
4. For completeness, results are also shown as EIRP in dBm and also as field strength in dB μ V/m.
Measured field strength was converted to EIRP in accordance with KDB 789033 II.G.2.c)(iii) using a conversion factor of 95.2.

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-40.1	-27.0	13.1	Complied
5725	-40.2	-27.0	13.2	Complied
5727.244	-36.5	-27.0	9.5	Complied

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5470	55.1	68.2	13.1	Complied
5725	55.0	68.2	13.2	Complied
5727.244	58.7	68.2	9.5	Complied



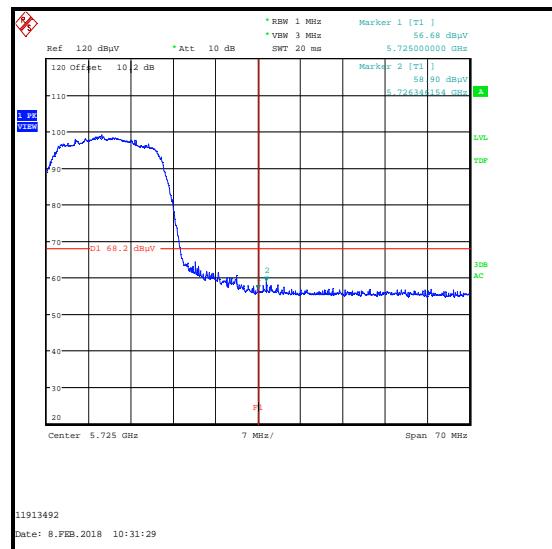
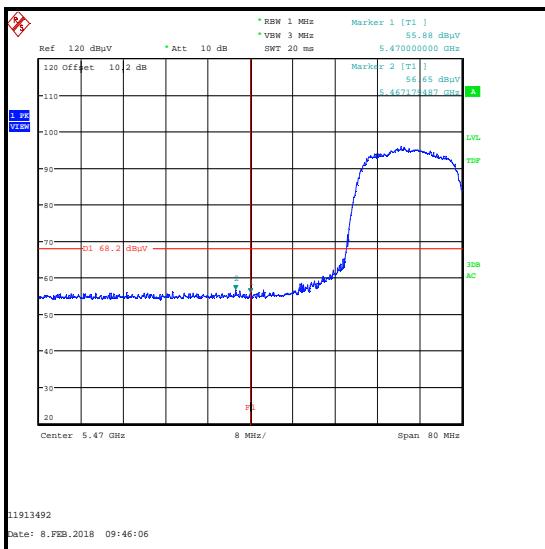
Lower Band Edge Measurement

Upper Band Edge Measurement

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5467.179	-38.5	-27.0	11.5	Complied
5470	-39.3	-27.0	12.3	Complied
5725	-38.5	-27.0	11.5	Complied
5726.346	-36.3	-27.0	9.3	Complied

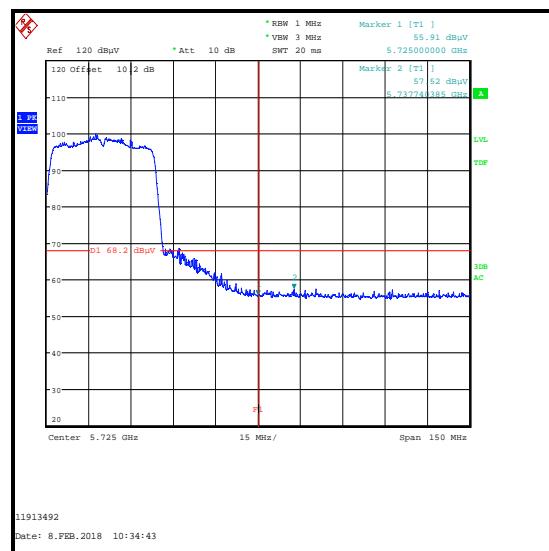
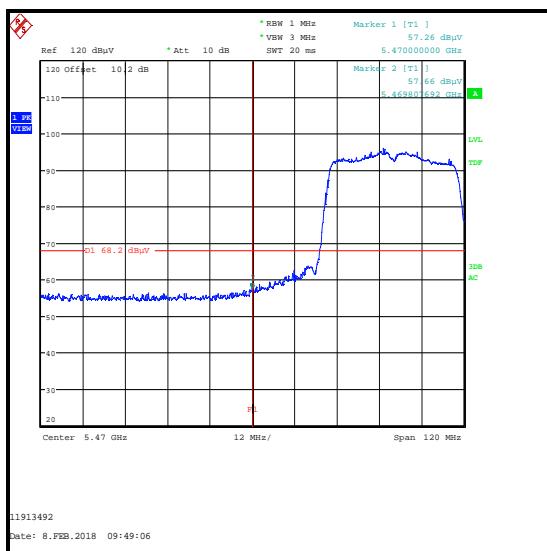
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5467.179	56.7	68.2	11.5	Complied
5470	55.9	68.2	12.3	Complied
5725	56.7	68.2	11.5	Complied
5726.346	58.9	68.2	9.3	Complied



Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5469.808	-37.5	-27.0	10.5	Complied
5470	-37.9	-27.0	10.9	Complied
5725	-39.3	-27.0	12.3	Complied
5737.740	-37.7	-27.0	10.7	Complied

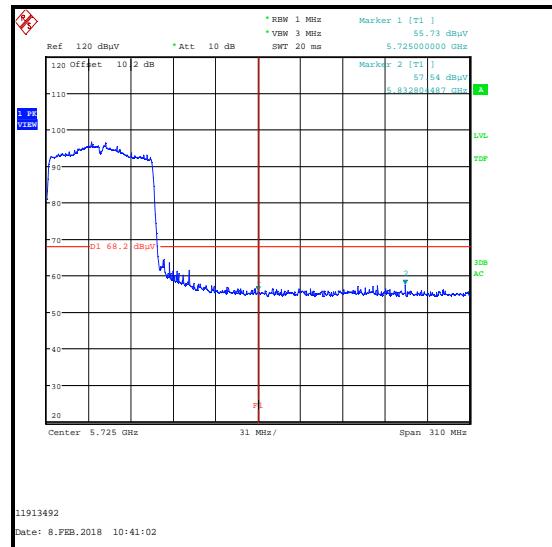
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5469.808	57.7	68.2	10.5	Complied
5470	57.3	68.2	10.9	Complied
5725	55.9	68.2	12.3	Complied
5737.740	57.5	68.2	10.7	Complied



Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5466.795	-34.7	-27.0	7.7	Complied
5470	-35.4	-27.0	8.4	Complied
5725	-39.5	-27.0	12.5	Complied
5832.804	-37.7	-27.0	10.7	Complied

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5466.795	60.5	68.2	7.7	Complied
5470	59.8	68.2	8.4	Complied
5725	55.7	68.2	12.5	Complied
5832.804	57.5	68.2	10.7	Complied



Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band)

Test Engineer:	John Ferdinand	Test Date:	16 February 2018
Test Sample Serial Number:	Not marked or stated (<i>Radiated Sample #1</i>)		

FCC Reference:	Parts 15.407(b)(4)(i),(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.10 & KDB 789033 II.G.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	31

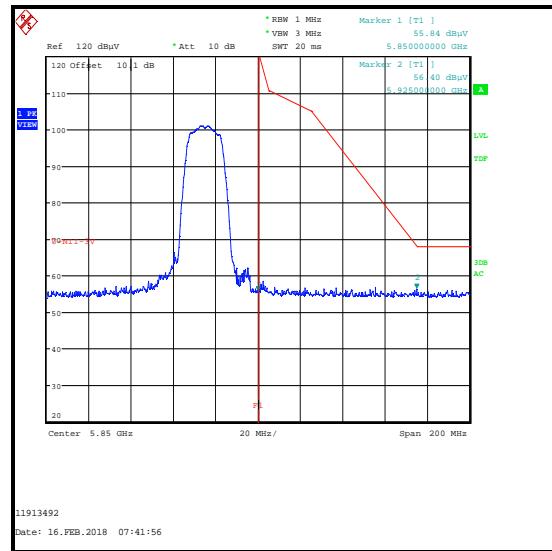
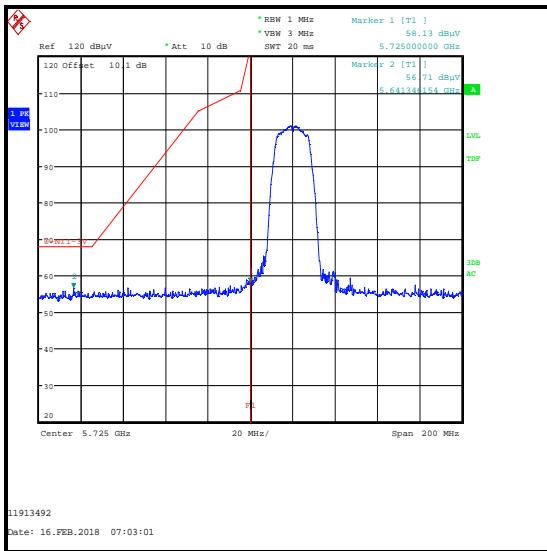
Note(s):

1. The customer declared the following data rates to be used for all measurements as:
 - 802.11a / BPSK / 6 Mbit/s
 - 802.11n HT20 / BPSK / MCS0
 - 802.11n HT40 / BPSK / MCS0
 - 802.11ac VHT80 / BPSK / MCS0x1
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For completeness, results are also shown as EIRP in dBm and also as field strength in dB μ V/m. Measured field strength was converted to EIRP in accordance with KDB 789033 II.G.2.c(iii) using a conversion factor of 95.2.

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11a / 20 MHz / BPSK / 6 Mbps / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5641.346	-38.5	-27.0	11.5	Complied
5725	-37.1	27.0	64.1	Complied
5850	-39.4	27.0	66.4	Complied
5925.000	-38.8	-27.0	11.8	Complied

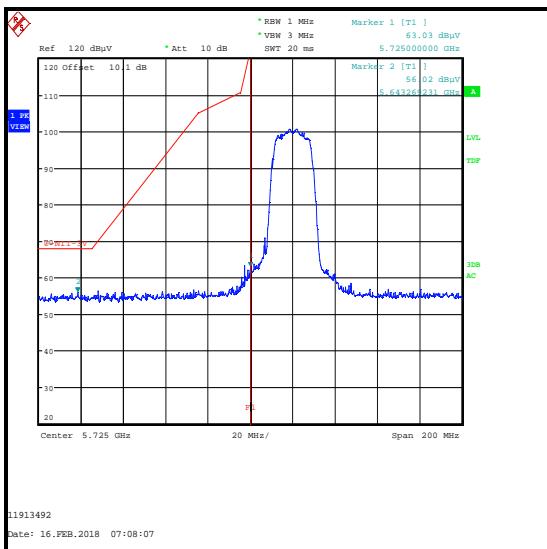
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5641.346	56.7	68.2	11.5	Complied
5725	58.1	122.2	64.1	Complied
5850	55.8	122.2	66.4	Complied
5925.000	56.4	68.2	11.8	Complied



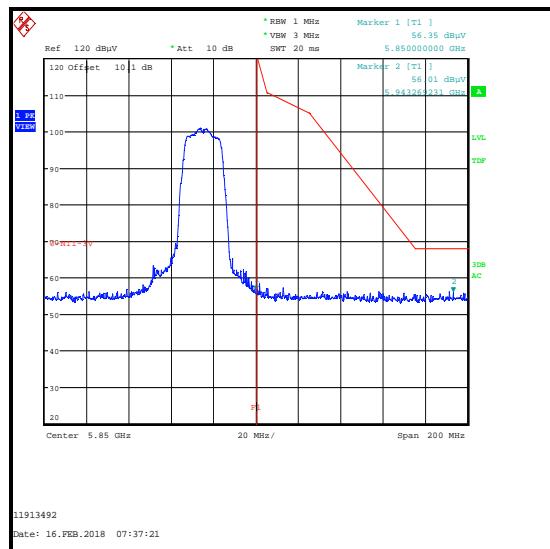
Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11n / 20 MHz / BPSK / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5643.269	-39.2	-27.0	12.2	Complied
5725	-32.2	27.0	59.2	Complied
5850	-38.8	27.0	65.8	Complied
5943.269	-39.2	-27.0	12.2	Complied

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5643.269	56.0	68.2	12.2	Complied
5725	63.0	122.2	59.2	Complied
5850	56.4	122.2	65.8	Complied
5943.269	56.0	68.2	12.2	Complied



Lower Band Edge Measurement



Upper Band Edge Measurement

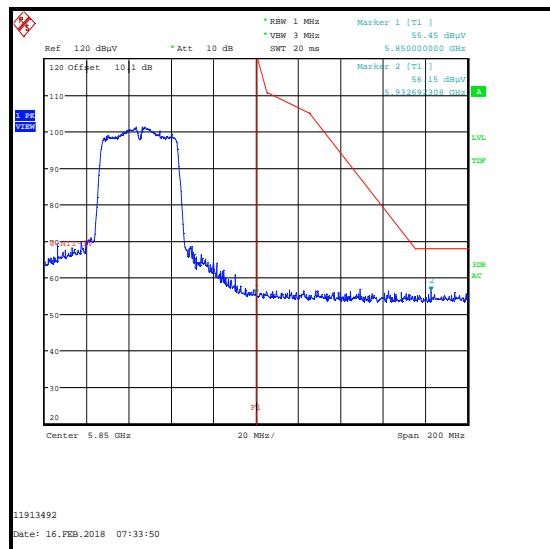
Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11n / 40 MHz / BPSK / MCS0 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5643.590	-39.1	-27.0	12.1	Complied
5725	-25.7	27.0	52.7	Complied
5850	-39.7	27.0	66.7	Complied
5932.692	-39.0	-27.0	12.0	Complied

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5643.590	56.1	68.2	12.1	Complied
5725	69.5	122.2	52.7	Complied
5850	55.5	122.2	66.7	Complied
5932.692	56.2	68.2	12.0	Complied



Lower Band Edge Measurement

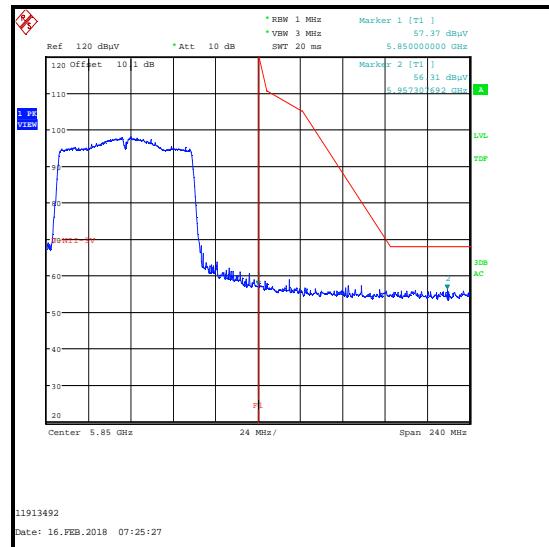


Upper Band Edge Measurement

Transmitter Band Edge Radiated Emissions (5.725-5.85 GHz band operation) (continued)**Results: 802.11ac / 80 MHz / BPSK / MCS0x1 / Peak**

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5639.103	-38.6	-27.0	11.6	Complied
5725	-27.2	27.0	54.2	Complied
5850	-37.8	27.0	64.8	Complied
5957.308	-38.9	-27.0	11.9	Complied

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
5639.103	56.6	68.2	11.6	Complied
5725	68.0	122.2	54.2	Complied
5850	57.4	122.2	64.8	Complied
5957.308	56.3	68.2	11.9	Complied



Transmitter Band Edge Radiated Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Apr 2018	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	13 Apr 2018	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	03 Mar 2018	12

6. 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 of the measurand (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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±2.40 dB
Maximum Conducted Output Power	5.15 GHz to 5.850 GHz	95%	±1.13 dB
Maximum Power Spectral Density	5.15 GHz to 5.850 GHz	95%	±1.13 dB
Minimum 6 dB Emission Bandwidth	5.15 GHz to 5.850 GHz	95%	±4.59 %
26 dB Emission Bandwidth	5.15 GHz to 5.850 GHz	95%	±4.59 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±4.65 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 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.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version

--- END OF REPORT ---