



TEST REPORT

Test Report No. : UL-RPT-RP11618100JD02A V2.0

Manufacturer : Dataflex Design Communications Ltd
Model No. : H604V4
FCC ID : 2AASBH604V4
Technology : WLAN
Test Standard(s) : FCC Parts 15.207, 15.209(a), 15.403 & 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 2.0 supersedes all previous versions.

Date of Issue: 13 October 2017

Checked by:

Ian Watch
Senior Test Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Senior Test Engineer, Radio Laboratory
UL VS LTD



This laboratory is accredited by UKAS.
The tests reported herein have been
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UL VS LTD

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK
Telephone: +44 (0)1256 312000
Facsimile: +44 (0)1256 312001

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Customer Information

Company Name:	Dataflex Design Communications Ltd
Address:	8 Frederick Sanger Road Surrey Research Park Guildford Surrey GU2 7YD United Kingdom

Summary of Testing

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:	05 June 2017 to 18 August 2017

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)(3)	Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)	✓
Part 15.407(a)(1)(iv)	Transmitter Peak Power Spectral Density (5.15-5.25 GHz band)	✓
Part 15.407(a)(3)	Transmitter Peak 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 & Voltage 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 does not operate at 100% duty cycle.
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).

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 U-NII Test Procedures New Rules v01r04 May 2, 2017
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	KDB662911 D01 Multiple Transmitter Output v02r01 October 31, 2013
Title:	Emissions Testing of Transmitter with Multiple Outputs in the Same Band
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions
Reference:	KDB 905462 D02 U-NII DFS Compliance Procedures v02 April 8, 2016
Title:	Compliance Measurement Procedures For Unlicensed-National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection

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.

Equipment Under Test (EUT)

Identification of Equipment Under Test (EUT)

Brand Name:	Hera 604
Model Name or Number:	H604V4
Test Sample Serial Number:	04423851816340100265
Hardware Version:	EPCB238002
Software Version:	1.1.0
FCC ID:	2AASBH604V4

Description of EUT

The Equipment Under Test was an M2M indoor router. It supports 802.11a/n in the 5.15 GHz to 5.25 GHz, and 5.725 GHz to 5.850 GHz bands. The WLAN radio has two identical external antennas of 2.0 dBi gain with reverse SMA connectors. The device supports 5 GHz SISO or MIMO operation with either single-stream CDD or multi-stream SDM operation.

The EUT additionally has a GSM/GPRS/EDGE/CDMA/Umts HSPA/LTE cellular radio (FCC ID: N7NMC7355) connected to a second pair of antennas.

It also features Ethernet and RS-232 serial I/O.

Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

Additional Information Related to Testing

Technology Tested:	WLAN (IEEE 802.11a,n) / U-NII						
Type of Unit:	Transceiver						
Modulation:	BPSK, QPSK, 16QAM & 64QAM						
Data rates:	802.11a	6, 9, 12, 18, 24, 36 ,48 & 54 Mbit/s (SISO, or MIMO with CDD)					
	802.11n HT20	MCS0 to MCS7 (1 spatial stream) with or without CDD / (SISO, or MIMO with CDD/STBC) MCS8 to MCS15 (2 spatial streams) (MIMO SDM)					
	802.11n HT40	MCS0 to MCS7 with or without CDD / (SISO, or MIMO with CDD/STBC) MCS8 to MCS15 (MIMO SDM)					
Power Supply Requirement(s):	Nominal	12 VDC via 120 VAC 60 Hz adaptor					
Antenna Gains:	Frequency (GHz)	Wi-Fi ANT 1	Wi-Fi ANT 2	Array Gain			
	5.15 to 5.25 GHz	2.0 dBi	2.0 dBi	3 dB			
	5.725 to 5.85 GHz	2.0 dBi	2.0 dBi	3 dB			
Maximum Conducted Output Power:	20 MHz	22.3 dBm					
	40 MHz	21.3 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:	5725 MHz to 5850 MHz						
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)				
	Bottom	149	5745				
	Middle	157	5785				
	Top	165	5825				

Additional Information Related to Testing (continued)

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	151	5755
	Top	159	5795

Support Equipment

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

Description:	120 VAC to 12 VDC Power Adaptor
Brand Name:	Power Solve
Model Name or Number:	FJ-SW1201250N
Serial Number:	Not marked or stated

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Precision M65
Serial Number:	CN-03F242-48643-66F-0462

Description:	Ethernet cables. Quantity 4. Length 2 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Ethernet cable. Length 10 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	RJ45 cable. Quantity 2. Length 2 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Serial to USB cable. Quantity 2. Length 1 metre
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Wireless -G ADSL Gateway
Brand Name:	Linksys
Model Name or Number:	WAG54G
Serial Number:	CF61E100799 (UL Asset No. A2986)

Support Equipment (continued)

Description:	USB Hub
Brand Name:	Hama
Model Name or Number:	00078498
Serial Number:	Not marked or stated

Antenna

The table below lists the antennas that the manufacturer intends to use with this product when operating in the 5150 to 5250 MHz & 5725 to 5850 MHz bands. It additionally shows the cellular antennas utilised on their respective ports:

Type	Stated Gain (dBi)	Manufacturer	Antenna Name	Used for Testing	Note
AN2450-5505BRS	2.0	Cortec	WLAN Antennas	X	1
Q9018-24W	3 to 5	Asian Creation Communication Co. Ltd	Primary cellular	X	2,3
GA-GSM-06	3.5	Gantetech	RX diversity	X	2,4

X = This antenna was used for testing purposes

Note(s):

1. WLAN antennas to be used in final product deployment and connected for radiated emission measurements contained herein.
2. Used for termination of all ports.
3. Cellular primary antenna. Antenna gain is different depending on what band is being used.
4. Cellular receiver diversity antenna.

Operation and Monitoring of the EUT during Testing

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.

Configuration and Peripherals

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

- Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable continuous transmission and receive modes and to select the test channels, data rates and modulation schemes as required. The instructions were called '*'HERA600v4_Notes_for_configuring_test_modes.docx'*' dated 28 June 2017.
- All supported modes and channel widths were initially investigated on the middle channel of each band of operation. The modes that produced the highest power and widest bandwidth for all bands were:
 - Highest power
 - U-NII-1
 - 802.11a SISO – Antenna Wi-Fi 1 / 48 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 1 / 52 Mbit/s / MCS5
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 81 Mbit/s / MCS4
 - 802.11a MIMO with CDD - 6 Mbit/s
 - 802.11n HT20 MIMO with CDD – 52 Mbit/s / MCS5
 - 802.11n HT40 MIMO with CDD – 81 Mbit/s / MCS4
 - U-NII-3
 - 802.11a SISO – Antenna Wi-Fi 1 / 12 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 1 / 19.5 Mbit/s / MCS2
 - 802.11n HT40 SISO – Antenna Wi-Fi 1 / 40.5 Mbit/s / MCS2
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 26 Mbit/s / MCS3
 - 802.11n HT40 MIMO with CDD – 27 Mbit/s / MCS1
 - Highest power spectral density
 - U-NII-1
 - 802.11a SISO – Antenna Wi-Fi 2 / 6 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 1 / 6.5 Mbit/s / MCS0
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 40.5 Mbit/s / MCS2
 - 802.11a MIMO with CDD – 48 Mbit/s
 - 802.11n HT20 MIMO with CDD – 26 Mbit/s / MCS3
 - 802.11n HT40 MIMO with CDD – 81 Mbit/s / MCS4

Configuration and Peripherals (continued)

- U-NII-3
 - 802.11a - SISO Antenna Wi-Fi 2 / 6 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 1 / 6.5 Mbit/s / MCS0
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 54 Mbit/s / MCS3
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 6.5 Mbit/s / MCS0
 - 802.11n HT40 MIMO with CDD – 54 Mbit/s / MCS3
- Widest 26 dB bandwidth
 - U-NII-1
 - 802.11a – SISO Antenna Wi-Fi 2 / 9 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 2 / 6.5 Mbit/s / MCS0
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 13.5 Mbit/s / MCS0
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 6.5 Mbit/s / MCS0
 - 802.11n HT40 MIMO with CDD – 13.5 Mbit/s / MCS0
 - U-NII-3
 - 802.11a SISO – Antenna Wi-Fi 2 / 9 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 2 / 6.5 Mbit/s / MCS0
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 13.5 Mbit/s / MCS0
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 6.5 Mbit/s / MCS0
 - 802.11n HT40 MIMO with CDD – 13.5 Mbit/s / MCS0

Pre-scan results for all modes are archived on the UL VS LTD IT server and available for inspection if required.

- All supported modes and channel widths were initially investigated on the middle channel of the 5725 to 5850 MHz band. The modes that produced the narrowest bandwidth for the 5725 to 5850 MHz band were:
 - Narrowest bandwidth
 - U-NII-3
 - 802.11a SISO – BPSK / 6 Mbit/s
 - 802.11n HT20 SISO – QPSK / 13 Mbit/s / MCS1
 - 802.11n HT40 SISO – BPSK / 13.5 Mbit/s / MCS0
 - 802.11a MIMO with CDD – BPSK / 6 Mbit/s / Port Wi-Fi 1
 - 802.11a MIMO with CDD – QPSK / 12 Mbit/s / Port Wi-Fi 2
 - 802.11n HT20 MIMO with CDD – BPSK / 13 Mbit/s / MCS1
 - 802.11n HT40 MIMO with CDD – BPSK / 13.5 Mbit/s / MCS0

Configuration and Peripherals (continued)

- The EUT has two separate MIMO named 'Wi-Fi 1' and 'Wi-Fi 2'. These support using both transmit chains for single-stream operation with CDD, both transmit chains for 2-stream SDM modes, or SISO operation on either single port individually.
- 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.
- Transmitter spurious emissions were performed with the EUT transmitting with a data rate of 9 Mbit/s MIMO (802.11a). 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.
- Transmitter radiated spurious emissions tests were performed with the EUT in the orientation stated below as they were found to be the worst case during pre-scans. All the accessories were individually connected and measurements made during the pre-scans to determine the worst case combination.
 - Below 1 GHz
 - In the X-Axis (The EUT was horizontal positioned on its side with the antennas pointing straight at the measurement antenna).
 - Above 1 GHz
 - In the Z-Axis (on its back with the antennas pointing straight at the measurement antenna).
- Radiated band edge emissions were performed with the EUT and its antennas in the following orientation as this procedure the worst case position for band edge:
 - U-NII-1
 - SISO – Z Axis. The EUT was positioned on its back with the antennas at a right angle point up to the chamber ceiling.
 - MIMO – X Axis. The EUT was horizontal positioned on its side with the antennas pointing straight at the receiving antenna.
 - U-NII-3
 - SISO / MIMO – Z Axis. The EUT was positioned on its back with the antennas pointing straight at the receiving antenna.
- All active ports were terminated with the appropriate termination.

Measurements, Examinations and Derived Results

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.

Test Results

Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	26 June 2017
Test Sample Serial Number:	04423851816340100265		

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

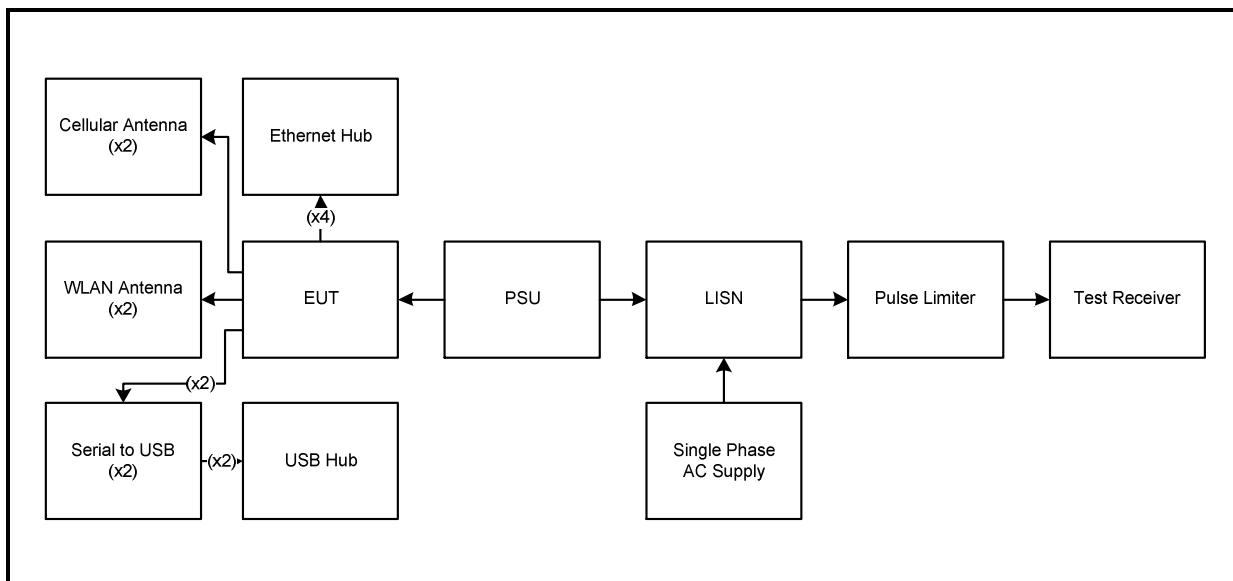
Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	50

Note(s):

1. The EUT was connected to a 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 power adaptor.
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	50.3	66.0	15.7	Complied
0.276	Live	39.4	60.9	21.5	Complied
0.416	Live	41.1	57.5	16.4	Complied
0.546	Live	32.8	56.0	23.2	Complied
0.762	Live	33.6	56.0	22.4	Complied
15.252	Live	33.0	60.0	27.0	Complied

Results: Live / Average / 120 VAC 60 Hz

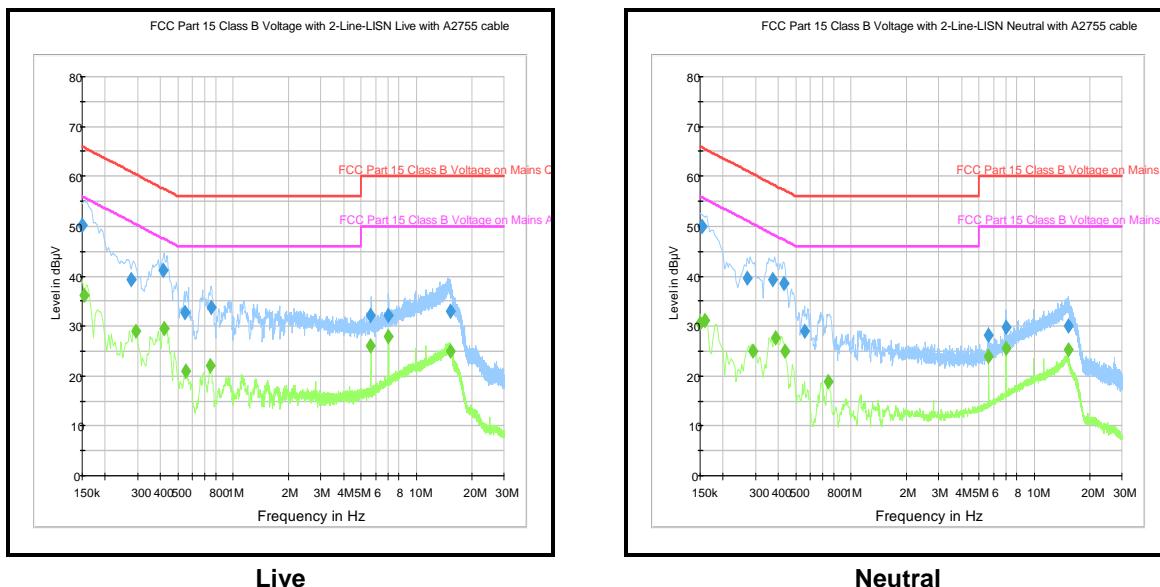
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.155	Live	36.3	55.8	19.5	Complied
0.294	Live	28.9	50.4	21.5	Complied
0.420	Live	29.5	47.4	17.9	Complied
0.551	Live	21.1	46.0	24.9	Complied
0.753	Live	22.1	46.0	23.9	Complied
7.031	Live	28.0	50.0	22.0	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.155	Neutral	50.0	65.8	15.8	Complied
0.272	Neutral	39.7	61.1	21.4	Complied
0.375	Neutral	39.4	58.4	19.0	Complied
0.429	Neutral	38.6	57.3	18.7	Complied
0.555	Neutral	28.8	56.0	27.2	Complied
15.248	Neutral	30.0	60.0	30.0	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	30.6	56.0	25.4	Complied
0.159	Neutral	31.2	55.5	24.3	Complied
0.389	Neutral	27.6	48.1	20.5	Complied
0.434	Neutral	25.0	47.2	22.2	Complied
7.031	Neutral	25.5	50.0	24.5	Complied
15.212	Neutral	25.2	50.0	24.8	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
0.159	Live	49.6	65.5	15.9	Complied
0.258	Live	45.3	61.5	16.2	Complied
0.438	Live	44.5	57.1	12.6	Complied
0.623	Live	37.5	56.0	18.5	Complied
0.929	Live	35.9	56.0	20.1	Complied
1.352	Live	35.8	56.0	20.2	Complied

Results: Live / Average / 240 VAC 60 Hz

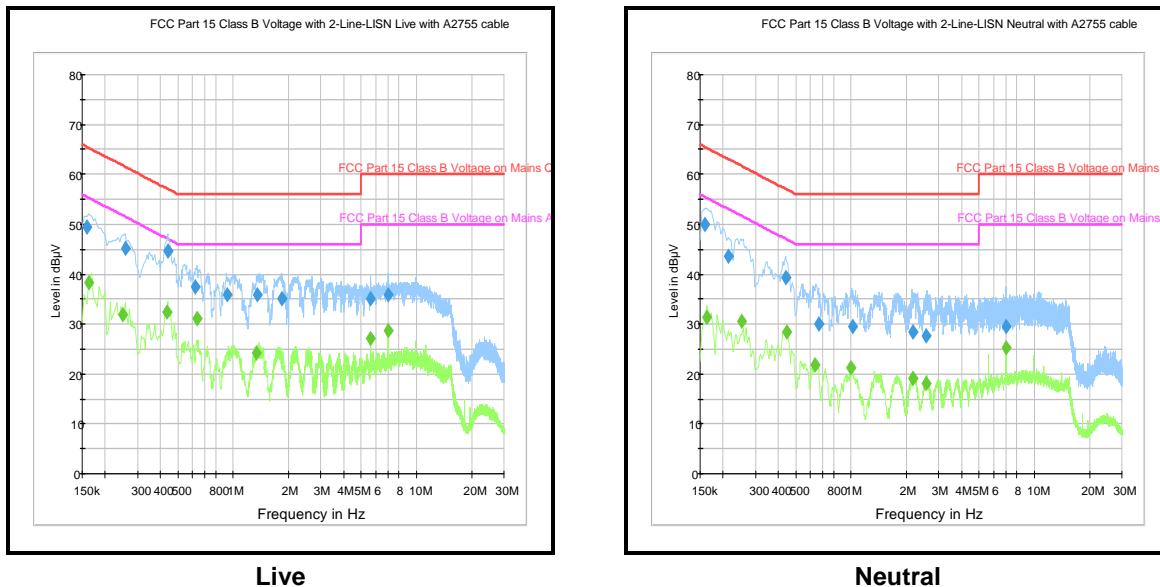
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Live	38.3	55.3	17.0	Complied
0.249	Live	31.9	51.8	19.9	Complied
0.434	Live	32.4	47.2	14.8	Complied
0.636	Live	31.1	46.0	14.9	Complied
1.343	Live	24.1	46.0	21.9	Complied
7.026	Live	28.6	50.0	21.4	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.159	Neutral	50.1	65.5	15.4	Complied
0.213	Neutral	43.7	63.1	19.4	Complied
0.438	Neutral	39.4	57.1	17.7	Complied
0.668	Neutral	30.0	56.0	26.0	Complied
1.014	Neutral	29.4	56.0	26.6	Complied
2.184	Neutral	28.5	56.0	27.5	Complied

Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.164	Neutral	31.3	55.3	24.0	Complied
0.254	Neutral	30.7	51.6	20.9	Complied
0.447	Neutral	28.5	46.9	18.4	Complied
0.636	Neutral	21.9	46.0	24.1	Complied
1.001	Neutral	21.3	46.0	24.7	Complied
7.026	Neutral	25.3	50.0	24.7	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: 240 VAC 60 Hz**

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	45046419	20 Jun 2018	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	07 Nov 2017	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	09 Aug 2017	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	09 May 2018	12
M1818	Multimeter	Fluke	79 Series III	71811580	12 Apr 2018	12

Transmitter 26 dB Emission Bandwidth**Test Summary:**

Test Engineer:	Philip Harrison	Test Dates:	02 June 2017 to 18 August 2017
Test Sample Serial Number:	04423851816340100265		

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

Environmental Conditions:

Temperature (°C):	20 to 24
Relative Humidity (%):	45 to 58

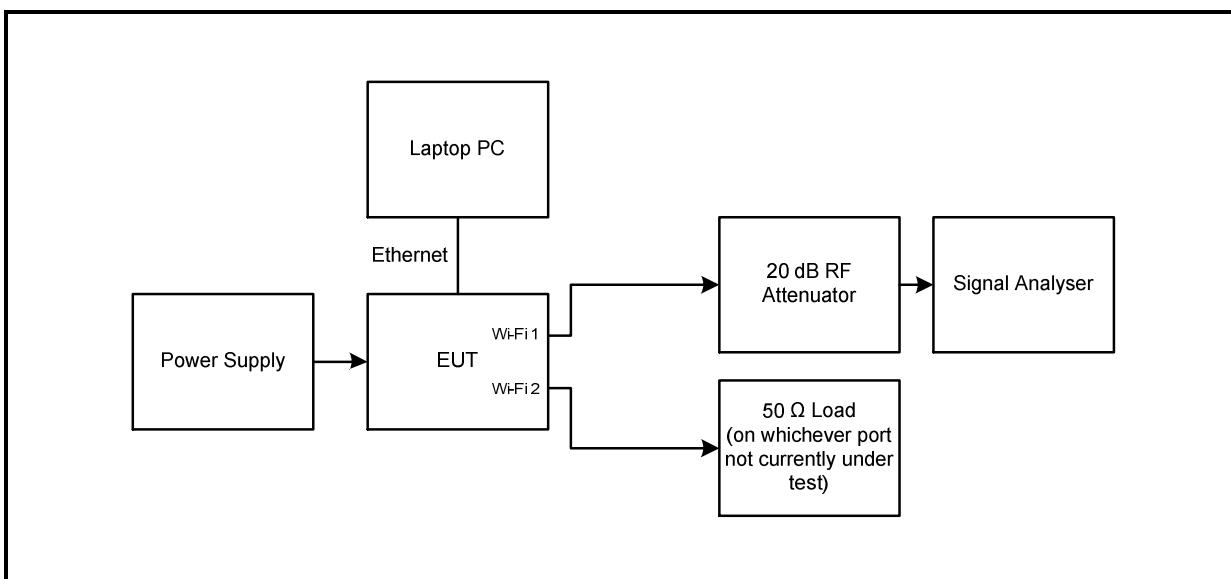
Note(s):

1. All configurations supported by the EUT were investigated on the middle channel of each band in accordance with KDB 789033 Section II.C.1. Emission Bandwidth (EBW) test procedure. The data rates that produced both the widest bandwidth and the highest powers when integrated over were then also tested on the bottom and top channels. The first results of this section details the EBW measurements found to result in the highest power levels. For the power measurements in this report, the highest power output level was recorded when the EUT was configured as:
 - U-NII-1
 - 802.11a SISO – Antenna Wi-Fi 1 / 48 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 1 / 52 Mbit/s / MCS5
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 81 Mbit/s / MCS4
 - 802.11a MIMO with CDD - 6 Mbit/s
 - 802.11n HT20 MIMO with CDD – 52 Mbit/s / MCS5
 - 802.11n HT40 MIMO with CDD – 81 Mbit/s / MCS4
 - U-NII-3
 - 802.11a SISO – Antenna Wi-Fi 1 / 12 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 1 / 19.5 Mbit/s / MCS2
 - 802.11n HT40 SISO – Antenna Wi-Fi 1 / 40.5 Mbit/s / MCS2
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 26 Mbit/s / MCS3
 - 802.11n HT40 MIMO with CDD – 27 Mbit/s / MCS1

Transmitter 26 dB Emission Bandwidth (continued)**Note(s) (continued):**

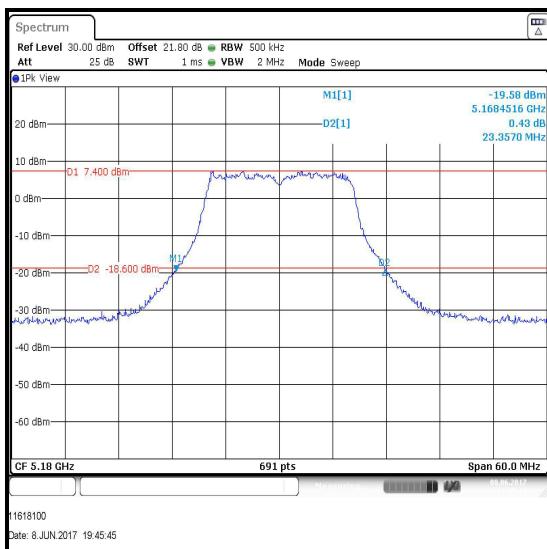
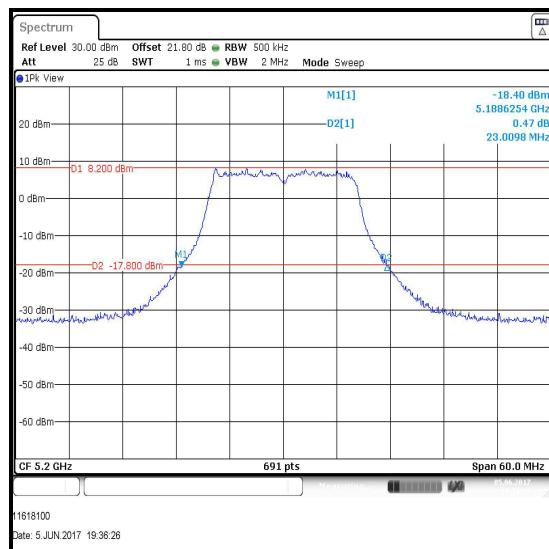
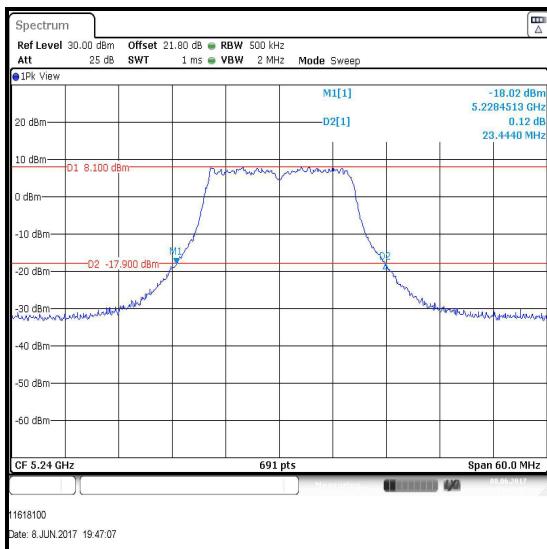
These are followed by the widest 26 dB bandwidths to show operation in-band with no additional DFS requirement. These were found to be:

- U-NII-1
 - 802.11a – SISO Antenna Wi-Fi 2 / 9 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 2 / 6.5 Mbit/s / MCS0
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 13.5 Mbit/s / MCS0
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 6.5 Mbit/s / MCS0
 - 802.11n HT40 MIMO with CDD – 13.5 Mbit/s / MCS0
 - U-NII-3
 - 802.11a SISO – Antenna Wi-Fi 2 / 9 Mbit/s
 - 802.11n HT20 SISO – Antenna Wi-Fi 2 / 6.5 Mbit/s / MCS0
 - 802.11n HT40 SISO – Antenna Wi-Fi 2 / 13.5 Mbit/s / MCS0
 - 802.11a MIMO with CDD – 9 Mbit/s
 - 802.11n HT20 MIMO with CDD – 6.5 Mbit/s / MCS0
 - 802.11n HT40 MIMO with CDD – 13.5 Mbit/s / MCS0
2. These widest 26 dB bandwidths fall into the 5.25-5.725 GHz band so DFS testing should be applicable. However, see the 99% Bandwidth results section for further details of DFS test requirements.
 3. Plots for all data rates are archived on the UL VS LTD IT server and available for inspection upon request.
 4. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

Test setup:

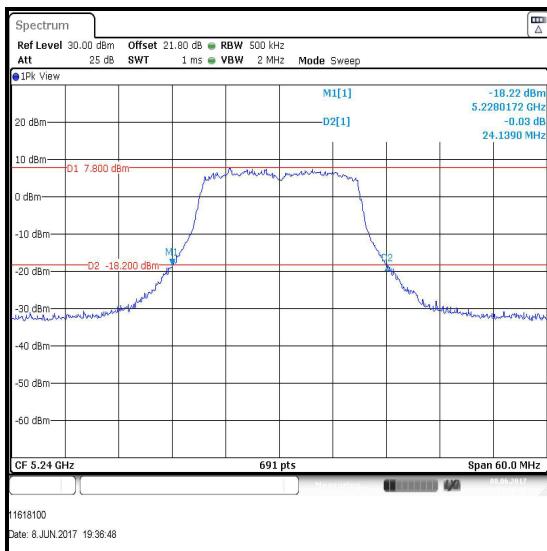
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / SISO / 5.15-5.25 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	64-QAM	48	23.357
Middle	5200	64-QAM	48	23.010
Top	5240	64-QAM	48	23.444

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

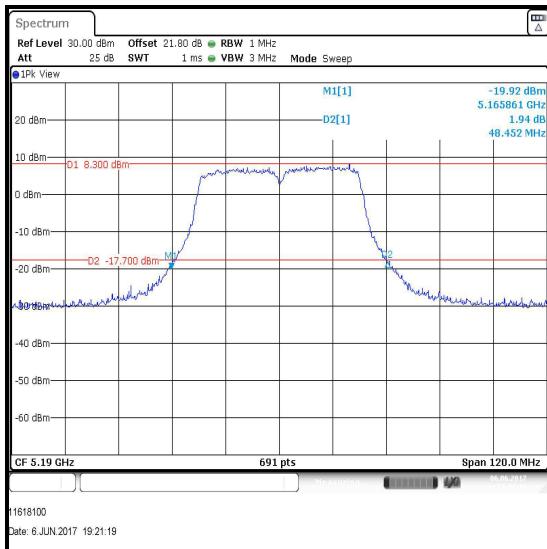
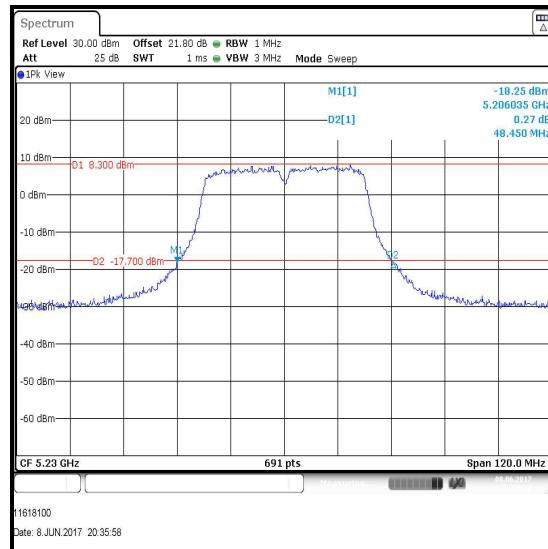
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / SISO / 5.15-5.25 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	64-QAM	MCS5	23.965
Middle	5200	64-QAM	MCS5	23.705
Top	5240	64-QAM	MCS5	24.139

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

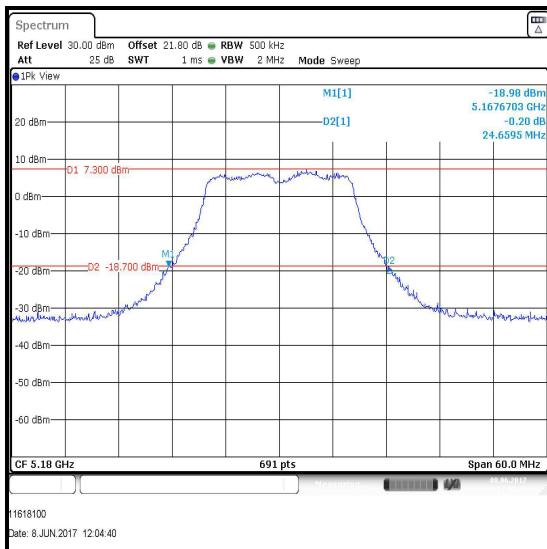
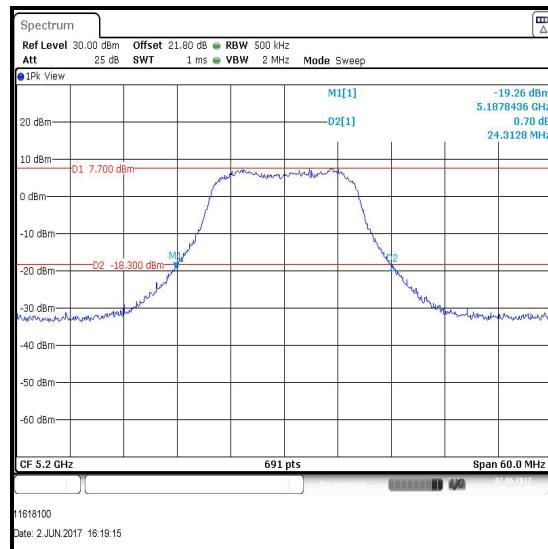
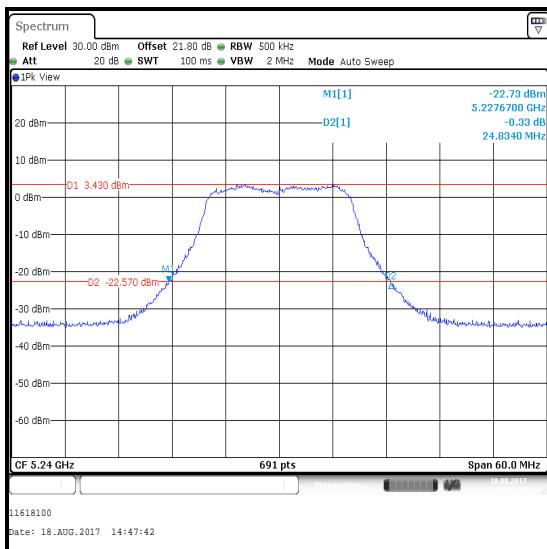
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / SISO / 5.15-5.25 GHz band / Port Wi-Fi 2**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	16-QAM	MCS4	48.452
Top	5230	16-QAM	MCS4	48.450

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

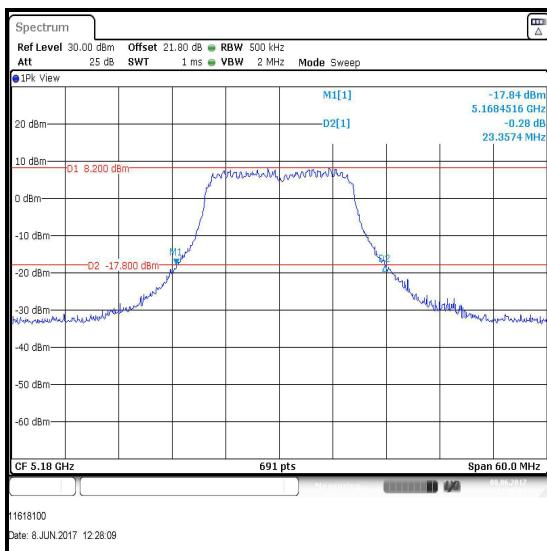
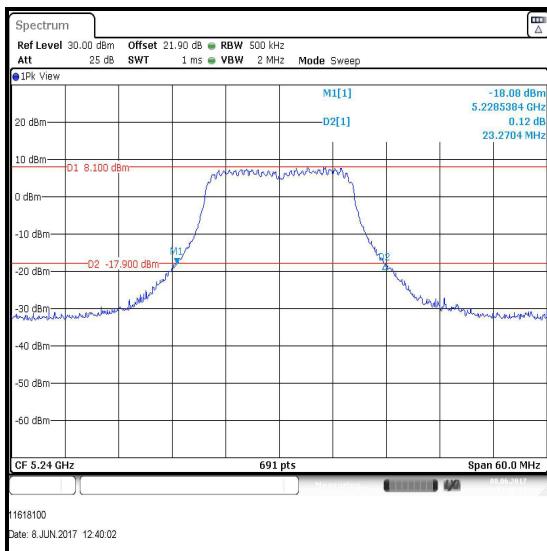
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / MIMO / 5.15-5.25 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6 Mbit/s	24.659
Middle	5200	BPSK	6 Mbit/s	24.313
Top	5240	BPSK	6 Mbit/s	24.834

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

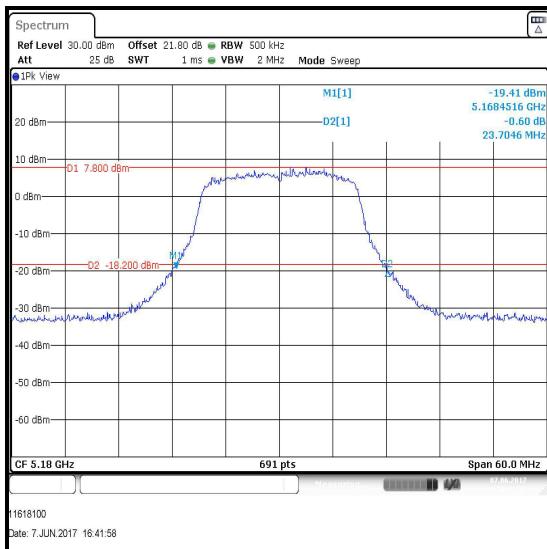
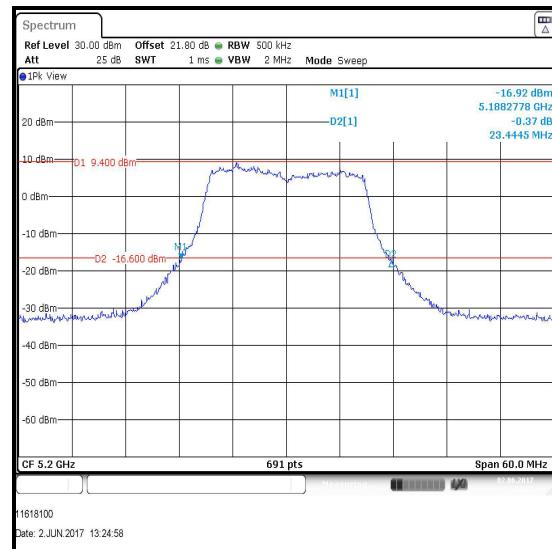
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / MIMO / 5.15-5.25 GHz band / Port Wi-Fi 2**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6 Mbit/s	23.357
Middle	5200	BPSK	6 Mbit/s	23.184
Top	5240	BPSK	6 Mbit/s	23.270

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

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / MIMO / 5.15-5.25 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	64-QAM	MCS5	23.705
Middle	5200	64-QAM	MCS5	23.444
Top	5240	64-QAM	MCS5	23.531

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

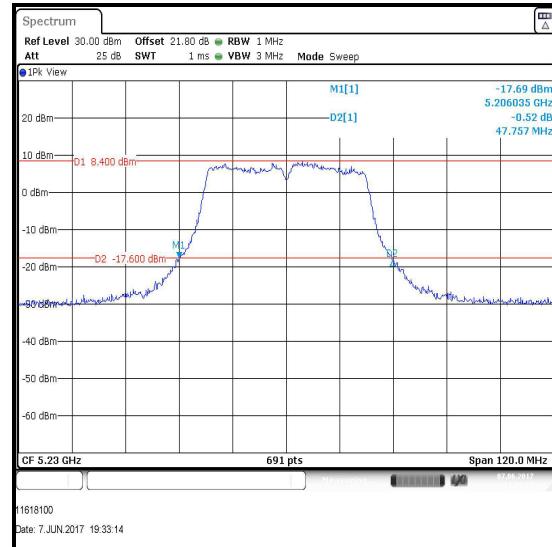
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / MIMO / 5.15-5.25 GHz band / Port Wi-Fi 2**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	64-QAM	MCS5	24.052
Middle	5200	64-QAM	MCS5	24.052
Top	5240	64-QAM	MCS5	24.399

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

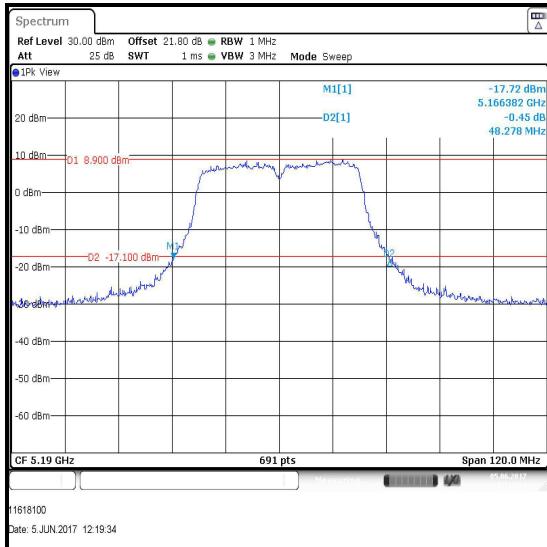
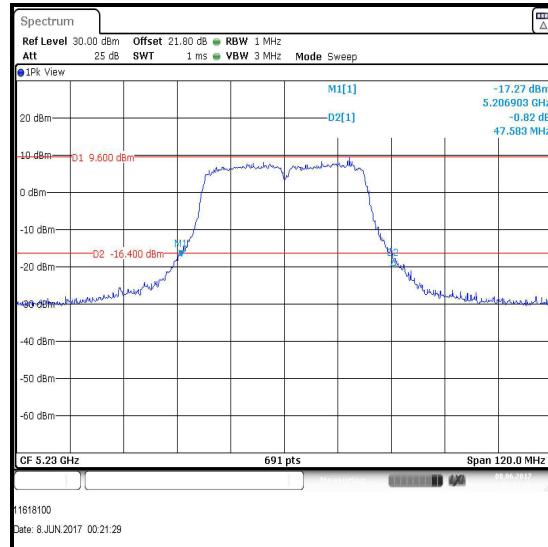
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / MIMO / 5.15-5.25 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	16-QAM	MCS4	47.410
Top	5230	16-QAM	MCS4	47.757

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

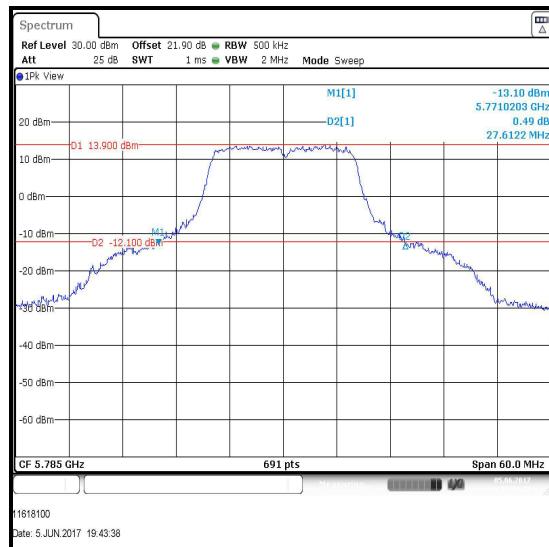
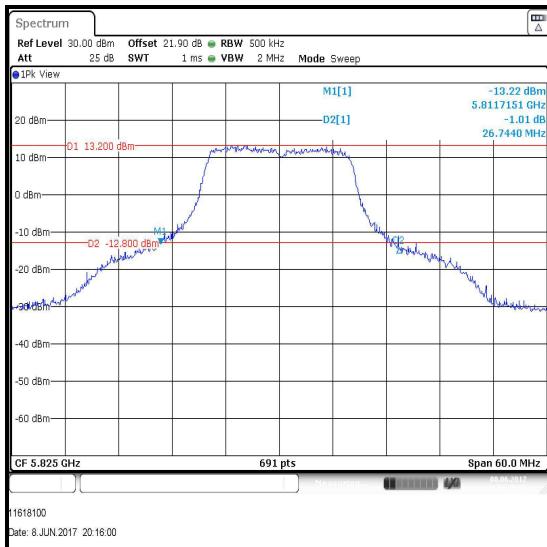
Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 40 MHz / MIMO / 5.15-5.25 GHz band / Port Wi-Fi 2**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	16-QAM	MCS4	48.278
Top	5230	16-QAM	MCS4	47.583

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

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11a / 20 MHz / SISO / 5.725-5.85 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	QPSK	12 Mbit/s	29.349
Middle	5785	QPSK	12 Mbit/s	27.612
Top	5825	QPSK	12 Mbit/s	26.744

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

Transmitter 26 dB Emission Bandwidth (continued)**Results: 802.11n / 20 MHz / SISO / 5.725-5.85 GHz band / Port Wi-Fi 1**

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	QPSK	MCS2	31.693
Middle	5785	QPSK	MCS2	26.917
Top	5825	QPSK	MCS2	25.528

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