TEST REPORT

Test Report No. : UL-RPT-RP-11829235-1616-FCC

Applicant	:	Visteon Electronics Germany GmbH
Model No.	:	MFA2
FCC ID	:	2AA98-DBMFA2C5
Technology	:	WLAN (a/n)
Test Standard(s)	:	FCC Parts 15.209(a) & 15.407 For details of applied tests refer to test result summary

1. This test report shall not be reproduced in full or partial, without the written approval of UL International Germany GmbH.
2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. Test Report Version 1.6 – Supersede Version 1.5
5. Result of the tested sample: **PASS**

Prepared by: Segun, Adeniji
Title: Laboratory Engineer
Date: 21.03.2018

Approved by: Jakob, Reschke
Title: Test Engineer
Date: 25.05.2018

Deutsche Akkreditierungsstelle D-PL-19381-02-00

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

UL INTERNATIONAL GERMANY GMBH
Hedelfinger Str. 61
70327 Stuttgart, Germany
STU.CTECHLab@ul.com

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Table of Contents

1. Customer Information

1.1. Applicant Information

Company Name:	Visteon Electronics Germany GmbH
Company Address:	Visteonstrasse 4-10 50170 Kerpen Germany
Contact Person:	Dr.-Ing. Dennis Prill
Contact E-Mail Address:	dprill@visteon.com
Contact Phone No.:	+49 721 4766 1026

1.2. Manufacturer Information

Company Name:	Visteon Electronics Germany GmbH
Company Address:	Visteonstrasse 4-10 50170 Kerpen Germany
Contact Person:	Dr.-Ing. Dennis Prill
Contact E-Mail Address:	dprill@visteon.com
Contact Phone No.:	+49 721 4766 1026

2. Summary of Testing

2.1. General Information

Applied Standards

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:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Test Firm Registration:	399704

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany

Date information

Order Date:	21 June 2017
EUT arrived:	28 September 2017
Test Dates:	28 November 2017 to 08 February 2018
EUT returned:	-/-

2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
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	☒	☐	☐	☐
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 Peak Power Spectral Density (5.15-5.25 GHz band)	☒	☐	☐	☐
Part 15.407(a)(2)	Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)	☐	☐	☐	☒
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(h)(1)	Transmitter Power Control (1)	☐	☐	☐	☒

Note(s):

1. 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 v01r04 May 2, 2017
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E

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 specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Sample Identification	Sample for all other measurements except spurious emission
Brand Name:	Visteon
Model Name or Number:	MFA2
Serial Number:	WAAZ000217
Hardware Version Number:	VPJMKF-10849
Software Version Number:	11.0.11
FCC ID:	2AA98-DBMFA2C5

Sample Identification	Spurious emission sample
Brand Name:	Visteon
Model Name or Number:	MFA2
Serial Number:	WAAZ000551
Hardware Version Number:	VPJMKF-10849
Software Version Number:	13.0.5
FCC ID:	2AA98-DBMFA2C5

3.2. Description of EUT

The equipment under test (EUT) was an infotainment system that supports Bluetooth and WLAN functionality for use within different vehicles. The WLAN functionality is the subject of this test report. The EUT has an external antenna as detailed above in section 3.5 below

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) / U-NII		
Type of Unit:	Transceiver		
Modulation:	DBPSK, DQPSK, BPSK, QPSK, 16QAM & 64QAM		
Data rates:	802.11a	6, 9, 12, 18, 24, 36 ,48 & 54 Mbps	
	802.11n HT20	MCS0 to MCS7 (1 spatial stream) GI = 800 ns	
	802.11n HT40	MCS0 to MCS7 (1 spatial stream) GI = 800 ns or	
Power Supply Requirement(s):	Nominal	13.5 VDC	
Antenna Gains:	5.15 to 5.25 GHz	5 dBi	
	5.725 to 5.85 GHz	5 dBi	
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
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:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	151	5755
	Top	159	5795

3.5. Additional Antenna Information

Antenna Gain:	5.0 dBi
Antenna Type:	Patch-Antenna (external antenna)
Manufacturer	Rosenberger
Part Number	A 177 905 29 02

3.6. Support Equipment

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

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Laptop Computer	DELL	LATITUDE E5530	249945
2	Power supply wires (Length 2 metres)	Not marked or stated	Not marked or stated	Not marked or stated
3	Wire Harness	Not marked or stated	Not marked or stated	Not marked or stated
4	CAN Interface	Vector Informatik GmbH	VN1630A CAN/LIN Interface	Not marked or stated
5	USB cable (Length 1 metres)	Not marked or stated	Not marked or stated	Not marked or stated
6	Laboratory Power Supply	Conrad Electronic Germany	PS -2403D	Not marked or stated

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):

- Controlled using a terminal application on the laptop PC along with instructions provided by the customer. The document was called “MFA2| WLAN SDIO interface-CLK Signal Investigation”,WiFi_BT-RBS_Spec(5)
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth for all bands were:
    - Highest power
        - 802.11a – BPSK / 6 Mbps
        - 802.11n HT20 – BPSK / 7.2 Mbps / MCS0 (GI=400 ns)
        - 802.11n HT40 – BPSK / 15 Mbps / MCS0 (GI=400 ns)
    - Highest power spectral density
        - 802.11a – BPSK / 6 Mbps
        - 802.11n HT20 – BPSK / 7.2 Mbps / MCS0 (GI=400 ns)
        - 802.11n HT40 – BPSK / 15 Mbps / MCS0 (GI=400 ns)
    - Widest bandwidth
        - 802.11a – BPSK / 48 Mbps
        - 802.11n HT20 – BPSK / 7.2 Mbps / MCS0 (GI=400 ns)
        - 802.11n HT40 – BPSK / 15 Mbps / MCS0 (GI=400 ns)
    - Narrowest bandwidth
        - 802.11a – BPSK / 6 Mbps
        - 802.11n HT20 – BPSK / 72.2 Mbps / MCS0 (GI=800 ns)
        - 802.11n HT40 – BPSK / 135 Mbps / MCS0 (GI=800 ns)

- 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 cabinet radiated spurious emissions were performed with the EUT in normal position at the center of a table in 3 m Semi- Anechoic chamber at a distance of 3 m to receiving measurement antennas whilst the device in operation. The RF Port of the device was terminated with a 50 Ohms load for cabinet radiation and with antenna for the radiated band edge compliance.
- Software EMC32 V10.1.0

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 DAkkS 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 26 dB Emission Bandwidth

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	10 November 2017 29 January 2018 08 February 2018
Test Sample Serial Number:	WAAZ000217		
Test Site Identification	SR 9		

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

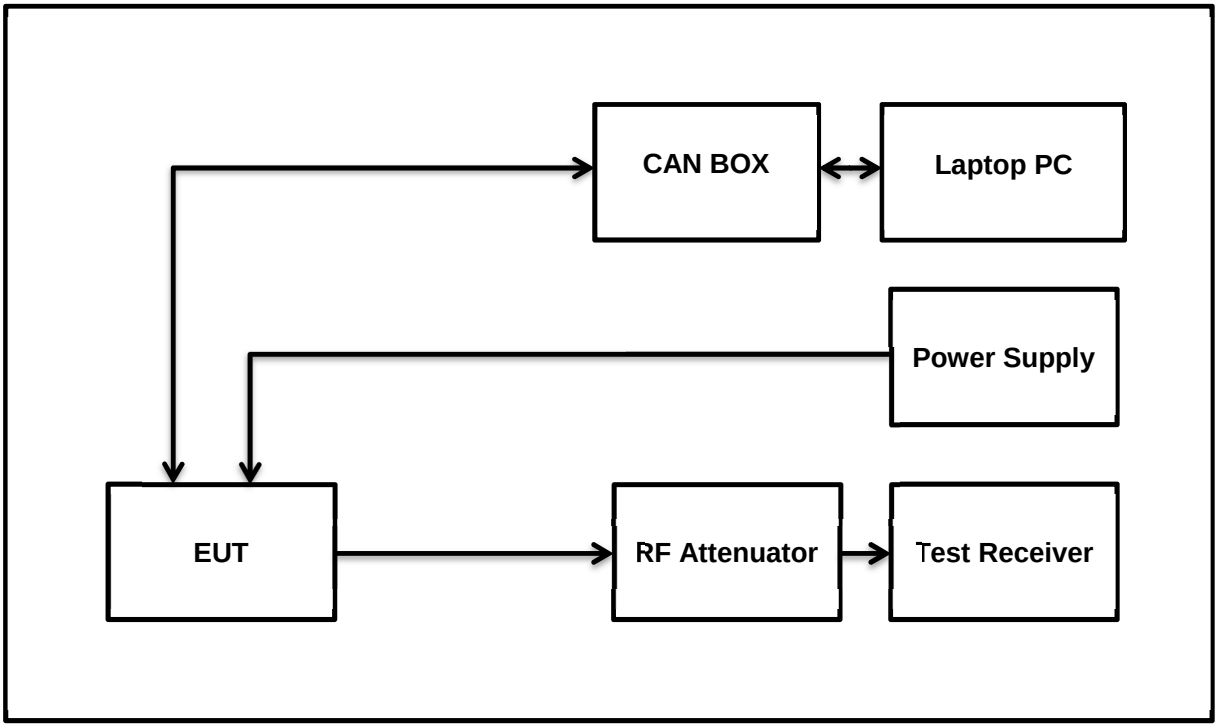
Environmental Conditions:

Temperatures (°C):	22.7
Relative Humidity (%):	43

Note(s):

- All configurations supported by the EUT were investigated on the one channel in accordance with KDB 789033 Section II.C.1. Emission Bandwidth (EBW) test procedure. The data rates that produced the widest bandwidth and therefore deemed worst case were:
- 802.11a HT20 – BPSK / 48 Mbps
- 802.11n HT20 – BPSK / 7.2 Mbps / MCS0 (GI=400 ns)
- 802.11n HT40 – BPSK / 15 Mbps / MCS0 (GI=400 ns)
- Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top or single channels.
- Plots for all data rates are archived on the Company server and available for inspection upon request.
- The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable.

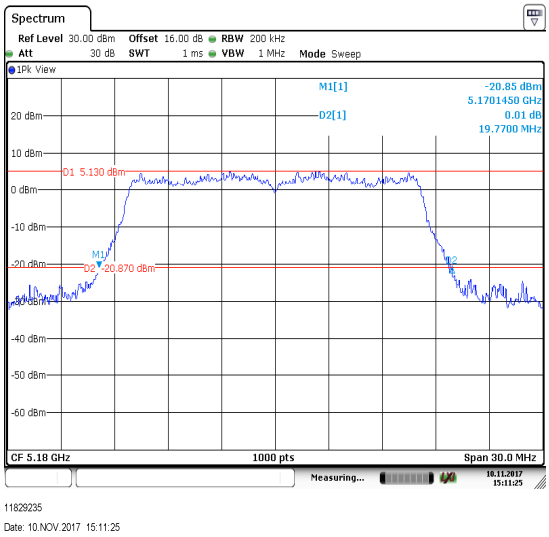
Transmitter Minimum 26 dB Bandwidth (continued)
Test Setup:



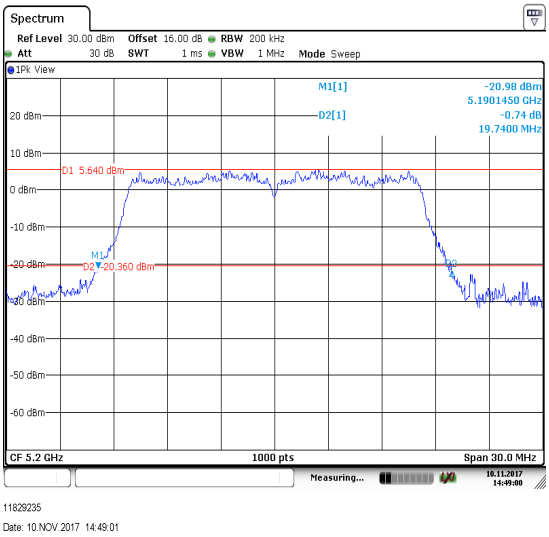
Transmitter Minimum 26 dB Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.15-5.25 GHz band

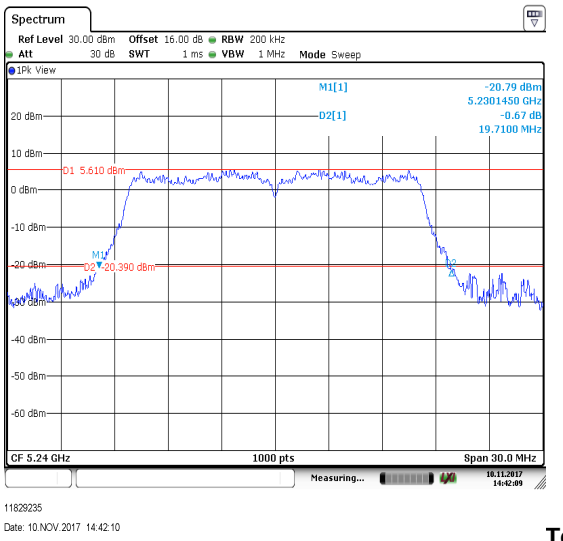
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6	19.770
Middle	5200	BPSK	6	19.740
Top	5240	BPSK	6	19.710



Bottom Channel



Middle Channel



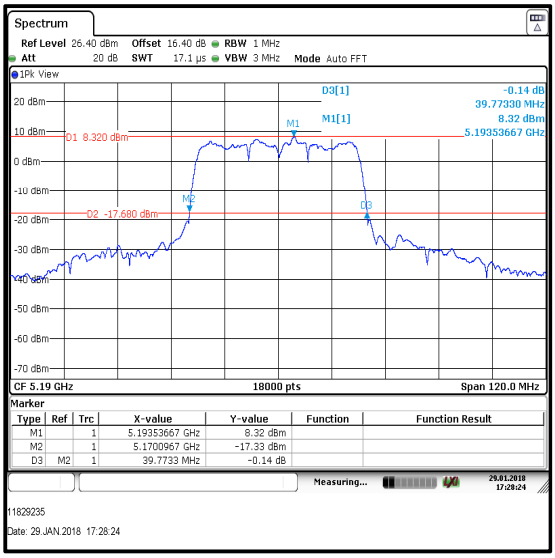
Top Channel

Result: Pass

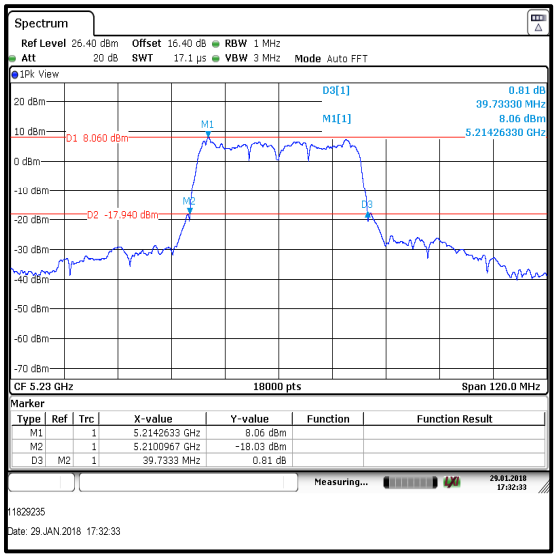
Transmitter Minimum 26 dB Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	15	39773
Top	5230	BPSK	15	39773



Bottom Channel



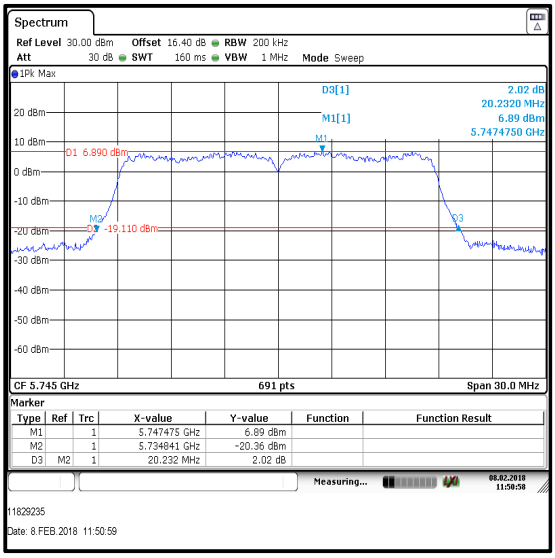
Top Channel

Result: Pass

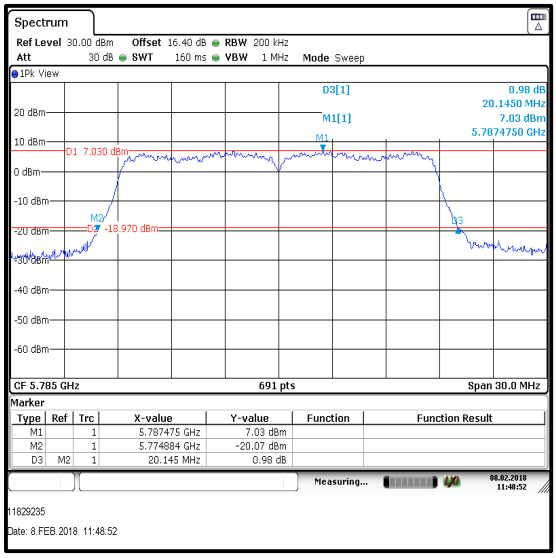
Transmitter Minimum 26 dB Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.85 GHz band

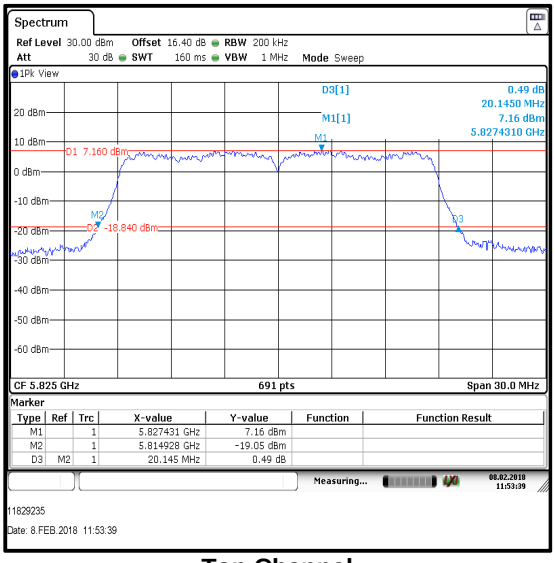
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	7.2	20.23
Middle	5785	BPSK	7.2	20.14
Top	5825	BPSK	7.2	20.14



Bottom Channel



Middle Channel



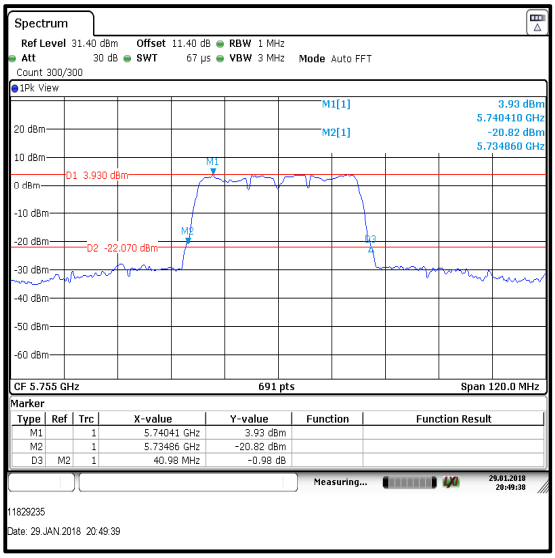
Top Channel

Result: Pass

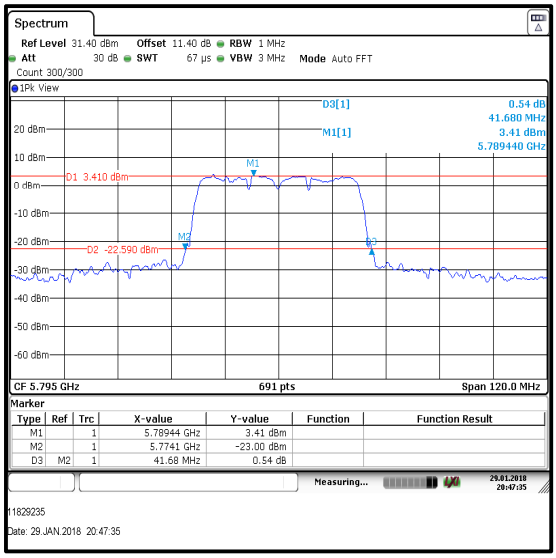
Transmitter Minimum 26 dB Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.725-5.85 GHz band

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	7.2	40.98
Top	5795	BPSK	7.2	41.68



Bottom Channel



Top Channel

Result: Pass

5.2.2. Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band)

Test Summary:

Test Engineer:	Segun I. Adeniji	**Test Date:**	29 January 2018 08 February 2018
Test Sample Serial Number:	WAAZ000217		
Test Site Identification	SR 9		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	32

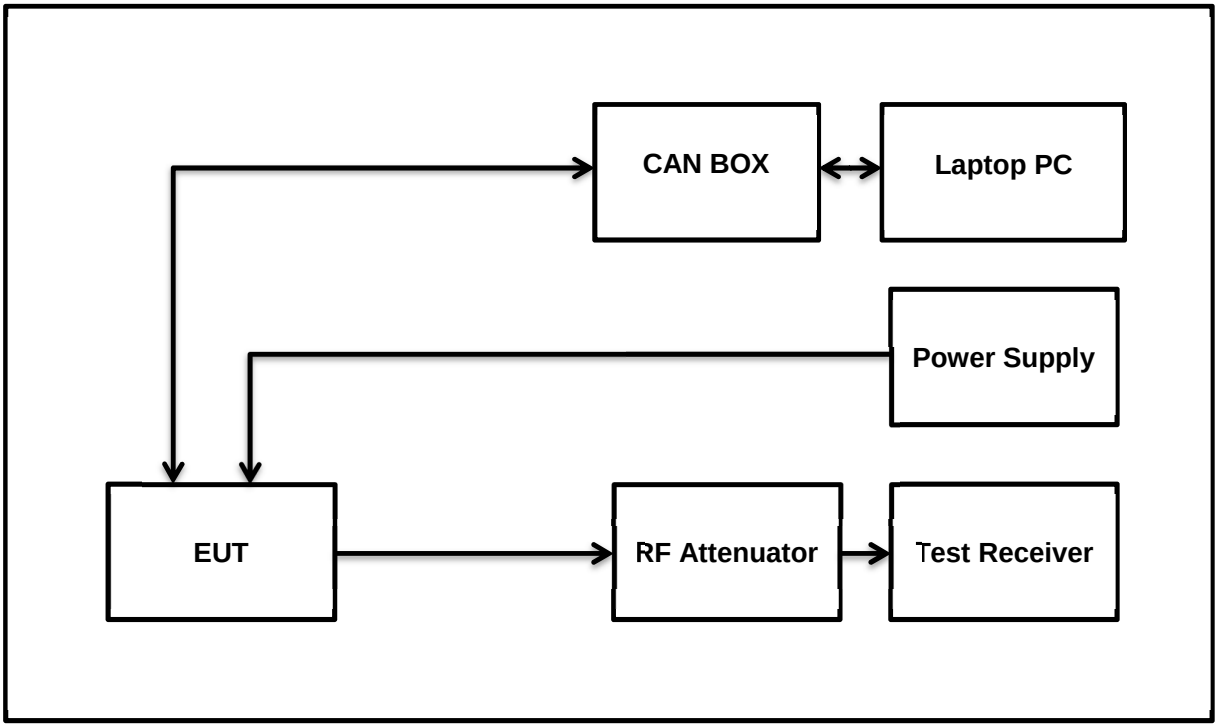
Settings of the Instrument

RBW/VBW	200 kHz/ 1 MHz
Span	30 MHz & 120 MHz
Sweep time	Auto
Detector	Peak

Note(s):

- All configurations supported by the EUT were investigated on one channel in accordance with KDB 789033 Section II.C.2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz measurement procedure. The signal analyser resolution bandwidth was set to 200 kHz and video bandwidth 1 MHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 30 MHz for 20 MHz channels and 120 MHz for 40 MHz channels. The bandwidth was measured at 6 dB down from the peak of the signal.The data rates that produced the narrowest bandwidth and therefore deemed worst case were:
- 802.11n HT20 – BPSK / 72.2 Mbps / MCS0 (GI=800 ns)
- 802.11n HT40 – BPSK / 135 Mbps / MCS0 (GI=800 ns)
- Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top or single channels.
- Plots for all data rates are archived on the Company server and available for inspection upon request.
- The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable.

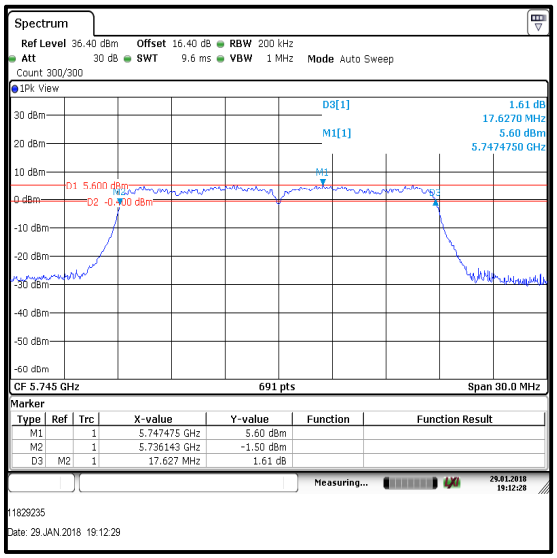
Transmitter Minimum 6 dB Bandwidth (continued)
Test Setup:



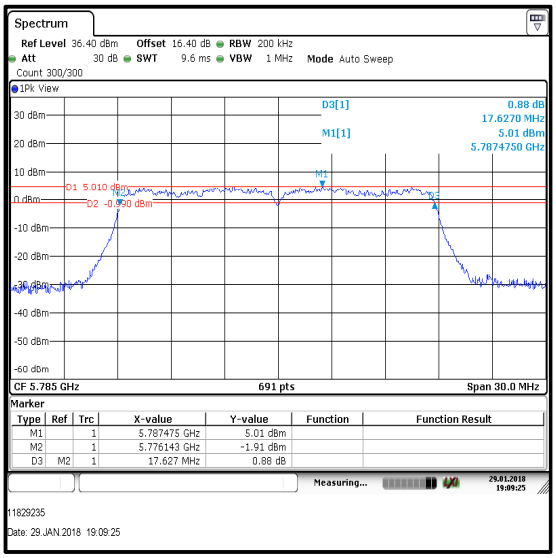
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 20 MHz / BPSK / 72.2 Mbps

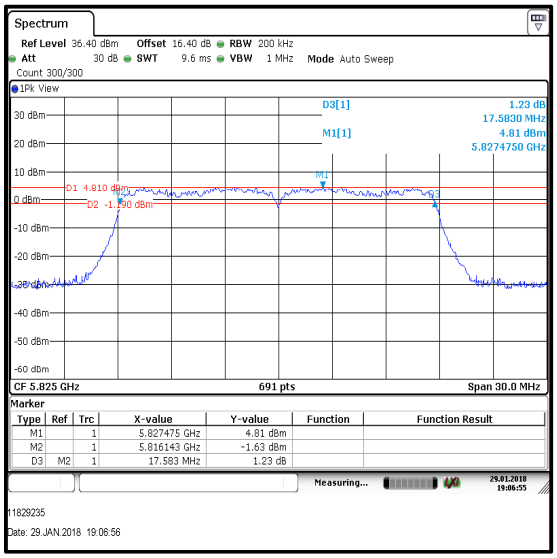
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17627	≥500	17127	Complied
Middle	17627	≥500	17127	Complied
Top	17583	≥500	17083	Complied



Bottom Channel



Middle Channel

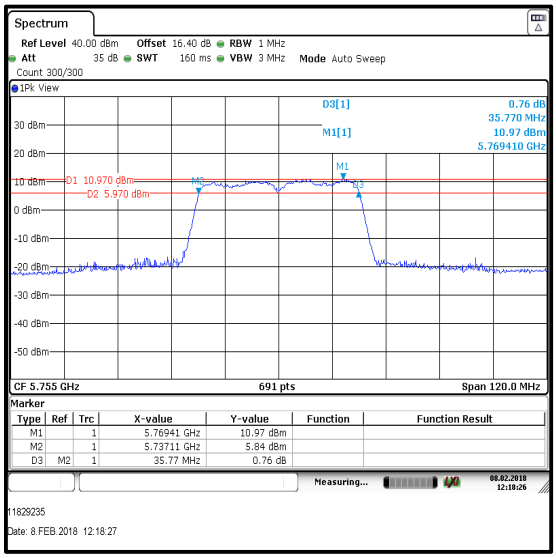


Top Channel

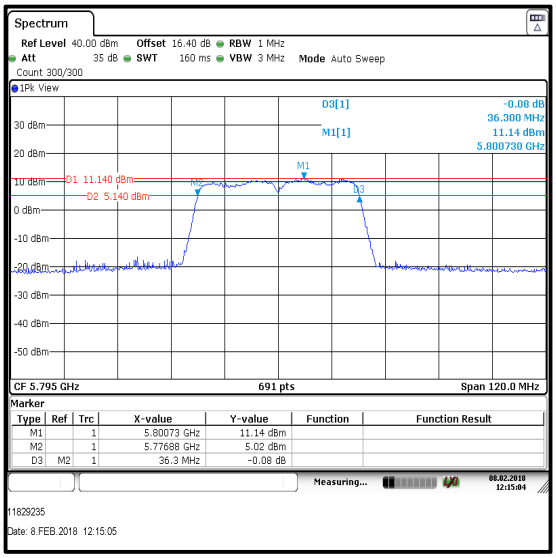
Transmitter Minimum 6 dB Bandwidth (5.725-5.85 GHz band) (continued)

Results: 802.11n / 40 MHz / BPSK / 72.2 Mbps

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	35770	≥500	35270	Complied
Top	36300	≥500	35800	Complied



Bottom Channel



Top Channel

5.2.3. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	13 November 2017 29 January 2018
Test Sample Serial Number:	WAAZ000217		
Test Site Identification	SR 9		

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

Environmental Conditions:

Temperature (°C):	22.8
Relative Humidity (%):	43

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 spectrum analyser in the time domain and calculated by using the following calculation:

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

   802.11a / 20 MHz / 6 Mbps duty cycle 10 log (1 / (2.0725/6.1449)) = 4.7 dB

   802.11a / 20 MHz / 48 Mbps duty cycle 10 log (1 / (0.276/1.074)) = 5.9 dB

   *802.11n / 20 MHz / 7.2 Mbps duty cycle 10 log (1 / (*1.9617/4.8608*))* = 3.94 *dB*

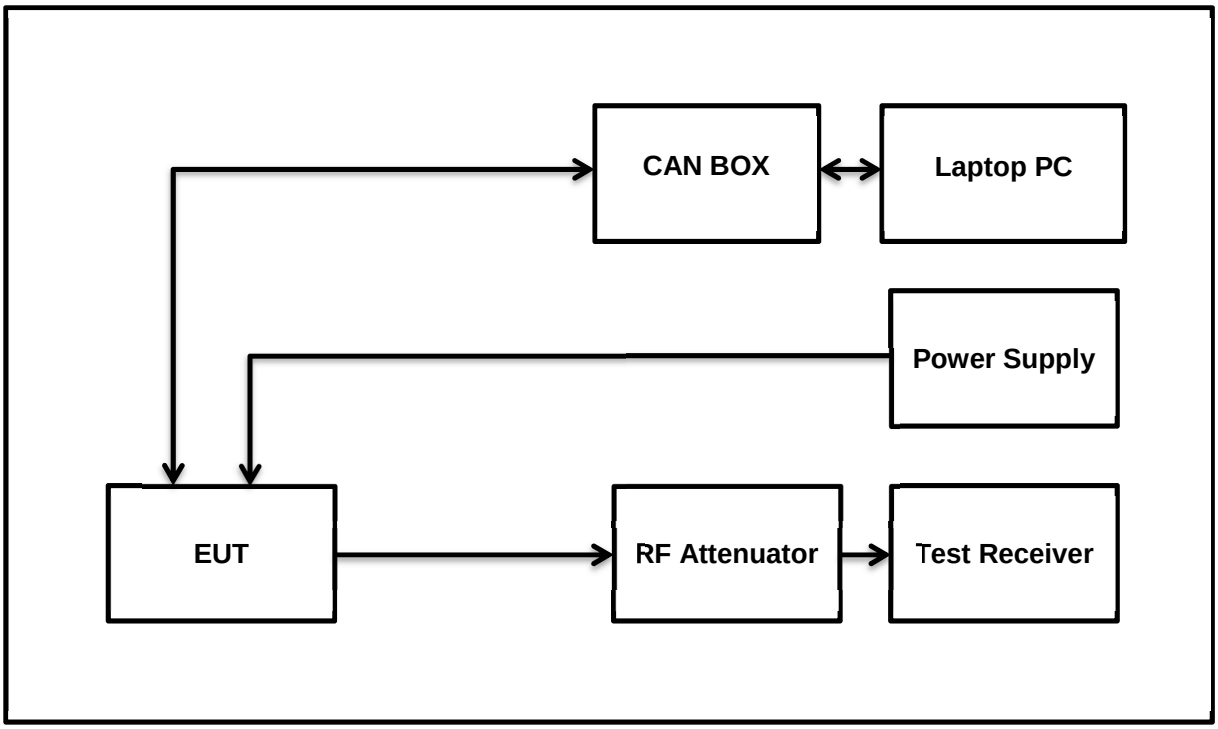
   *802.11n / 20 MHz / 72 Mbps duty cycle 10 log (1 / (*0.2365/4.6939*))* = 12.977*dB*

   *802.11n / 40 MHz / 15 Mbps duty cycle 10 log (1 / (*0.9461*/5.5704))* = 7.69*dB*

   *802.11n / 40 MHz / 150 Mbps duty cycle 10 log (1 / (*0.1339/5.0826*)) = 15.79 dB*

Transmitter Duty Cycle (continued)

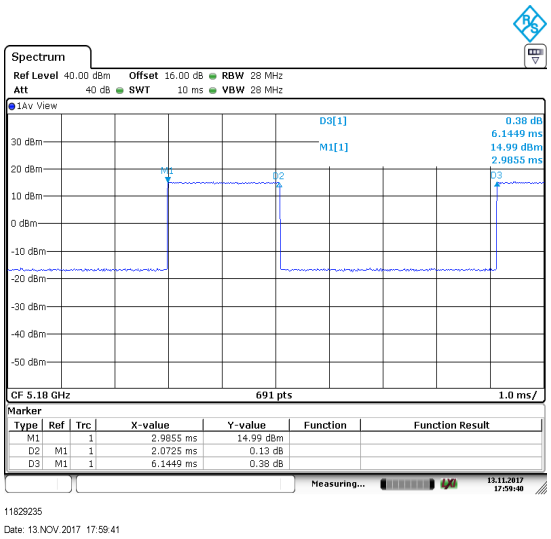
Test setup:



Transmitter Duty Cycle (continued)

Results: 802.11a / 20 MHz / 6 Mbps

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
2.0725	6.1449	4.7

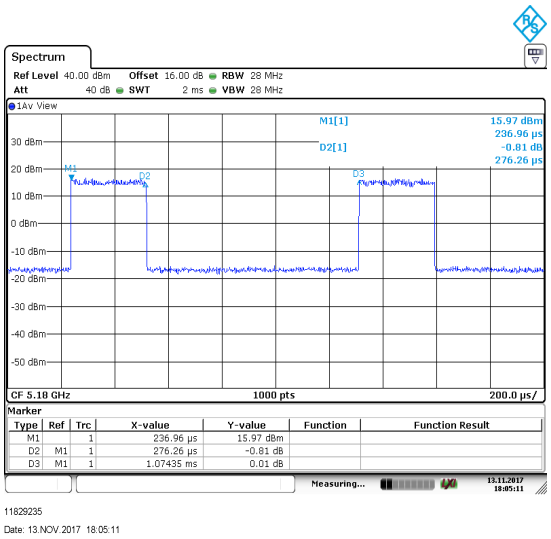


Result: Pass

Transmitter Duty Cycle (continued)

Results: 802.11a / 20 MHz / 48 Mbps

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
0.276	1.074	5.9

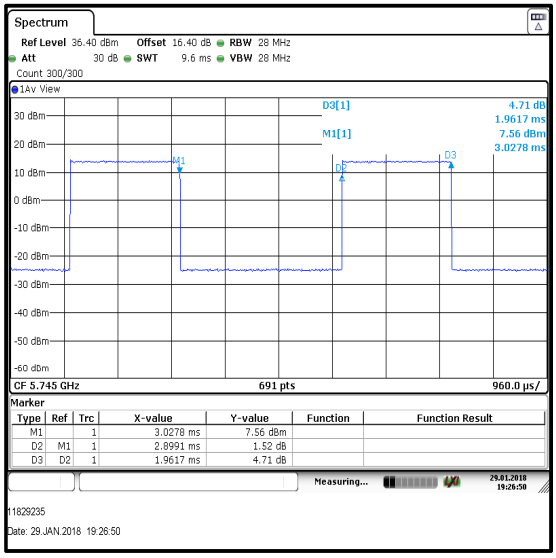


Result: Pass

Transmitter Duty Cycle (continued)

Results: 802.11n / 20 MHz / 7.2 Mbps

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
1.9617	4.8608	3.94

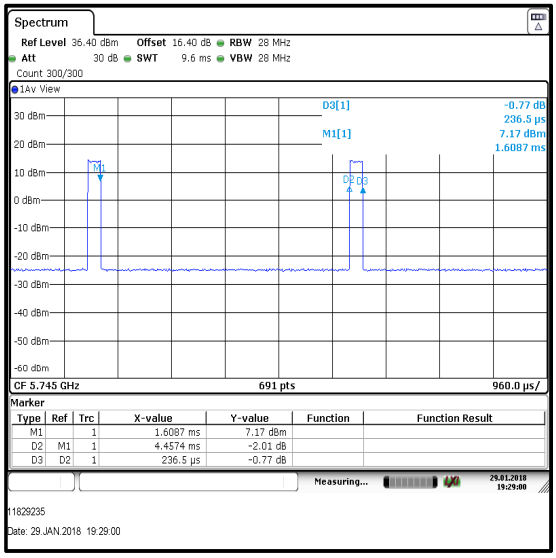


Result: Pass

Transmitter Duty Cycle (continued)

Results: 802.11n / 20 MHz / 72.2 Mbps

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
0.2365	4.6939	12.977

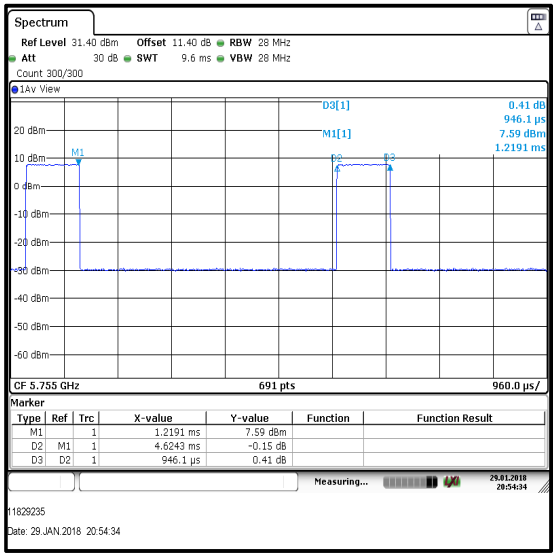


Result: Pass

Transmitter Duty Cycle (continued)

Results: 802.11n / 40 MHz / 15 Mbps

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
0.9461	5.5704	7.69

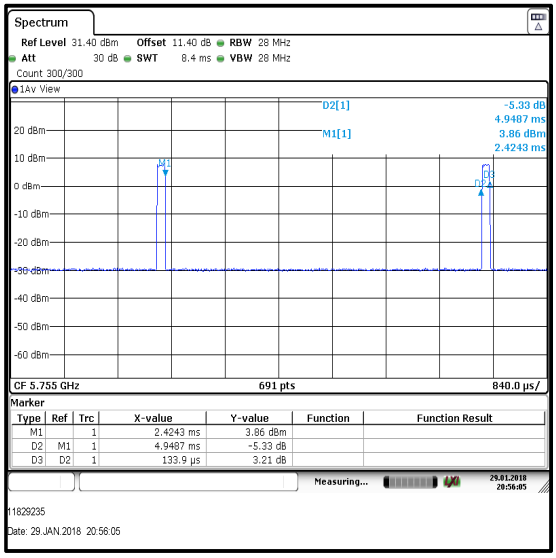


Result: Pass

Transmitter Duty Cycle (continued)

Results: 802.11n / 40 MHz / 150 Mbps

Pulse Duration (ms)	Period (ms)	Duty Cycle (dB)
0.1339	5.0826	15.79



Result: Pass

5.2.4. Transmitter Maximum Conducted Output Power

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	13 November 2017 29 January 2018 6 February 2018
Test Sample Serial Number:	WAAZ000217		
Test Site Identification	SR 9		

FCC Reference:	Part 15.407(a)(1)(i) & (a)(3)
Test Method Used:	KDB 789033 D02 Section II.E.2.f

Environmental Conditions:

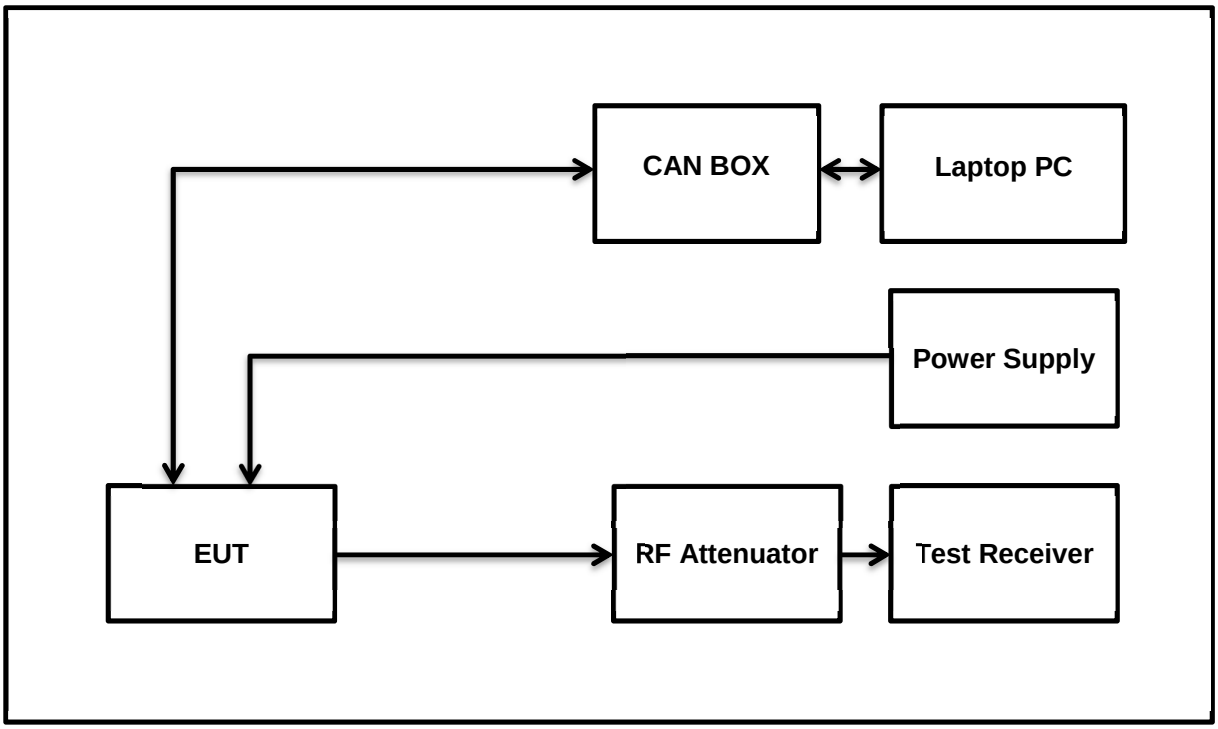
Temperature (°C):	22.8
Relative Humidity (%):	42

Note(s):

- The duty cycle is <98%, hence the measurements were performed in accordance with FCC KDB 789033 II.E.2.f) Method SA-3.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and therefore deemed worst case were:
    - 802.11a – BPSK / 6 Mbps
    - 802.11n HT20 – BPSK / 7.2 Mbps / MCS0 (GI=400 ns)
    - 802.11n HT40 – BPSK / 15 Mbps / MCS0 (GI=400 ns)
- For all modes, the EUT antenna has a gain of 5 dBi.
- Measurements were then performed in these modes on bottom, middle and top channels in all operating bands.
- The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.
- The Part 15.407(a)(1)(i) limit shall not exceed 250 mW (30.0 dBm).
- Power setting 11 was used on the 20 MHz band on 5.725 to 5.85 GHz while 13 was used on the 40 MHz band.

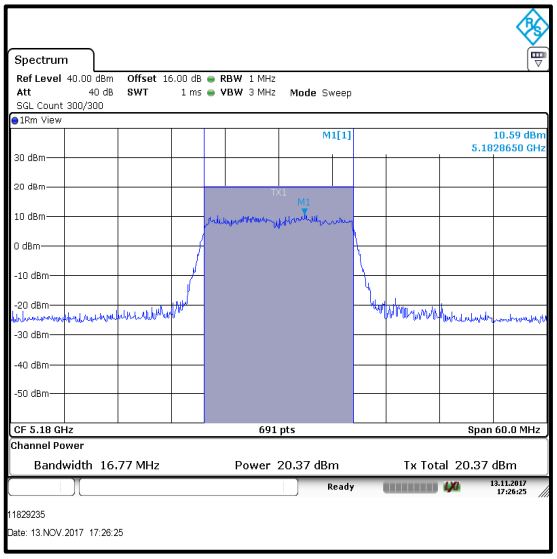
Transmitter Maximum Conducted Output Power (continued)

Test setup:

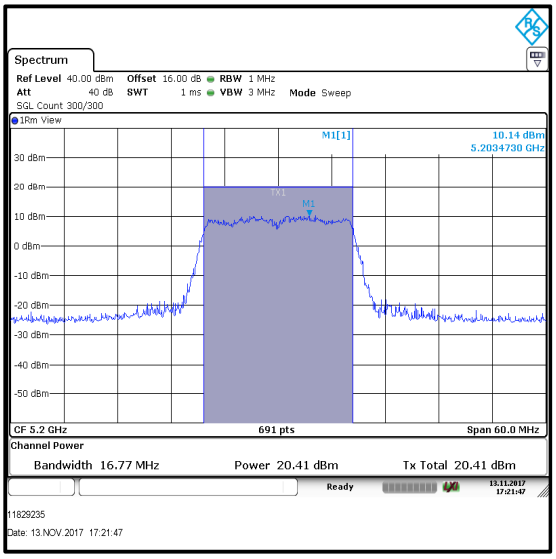


Results: 802.11a / 20 MHz / BPSK / 6 Mbps (5.15-5.25 GHz band)

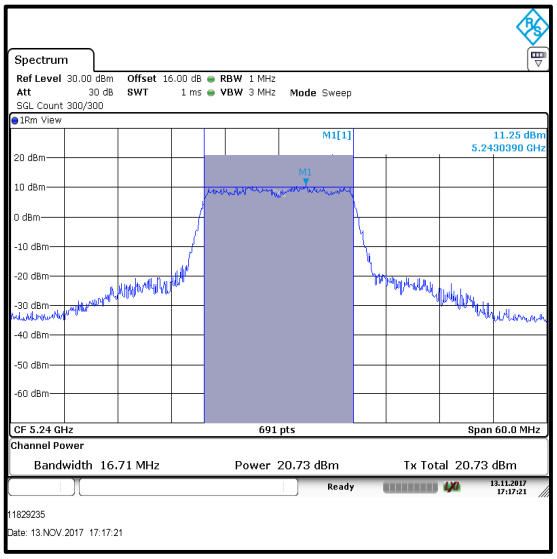
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5180	20.4	30.0	9.6	Complied
Middle	5200	20.4	30.0	9.6	Complied
Top	5240	20.7	30.0	9.3	Complied



Bottom Channel



Middle Channel



Top Channel

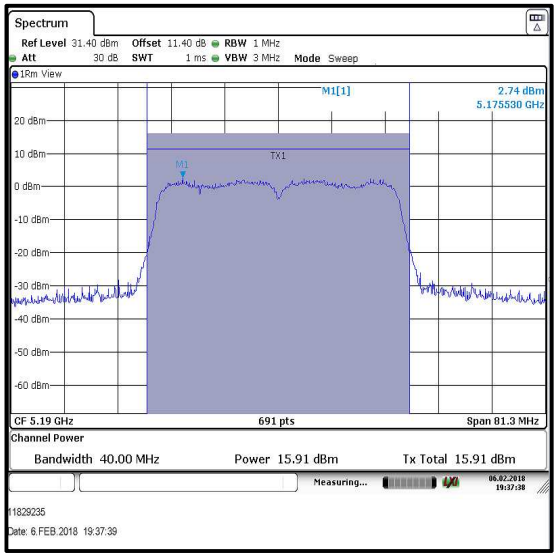
Result: Pass

Note:

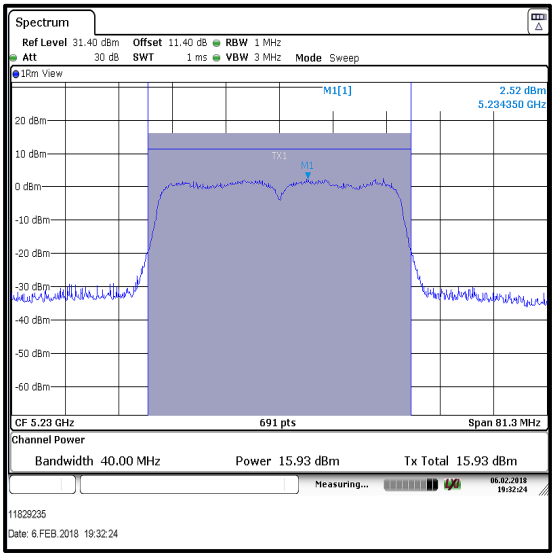
1. For the result listed above, the antenna gain has been added as an offset on the spectrum analyzer, hence no antenna gain correction is needed in the table.

Results: 802.11n / 40 MHz / BPSK / 15 Mbps (5.15-5.25 GHz band)

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5190	15.91	5.0	20.91	30.0	9.09	Complied
Top	5310	15.93	5.0	20.93	30.0	9.07	Complied



Bottom Channel

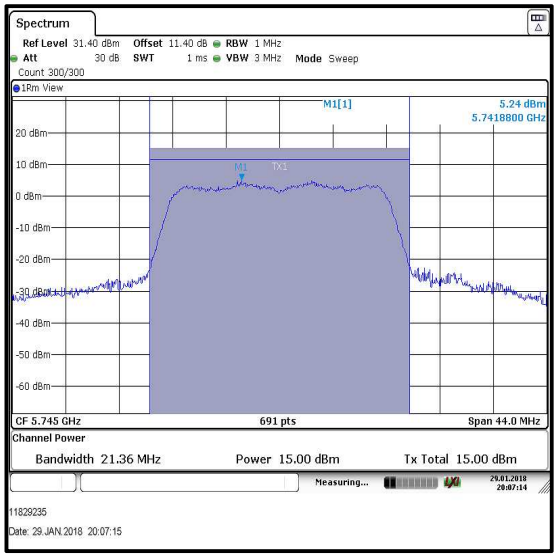


Top Channel

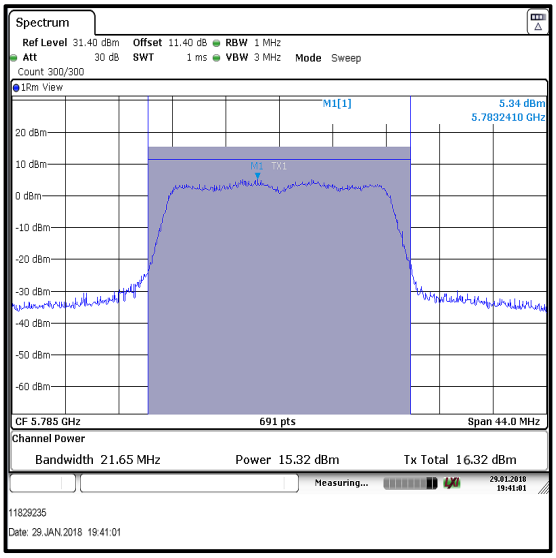
Result: Pass

Results: 802.11n / 20 MHz / BPSK / 7.2 Mbps (5.725-5.85 GHz Band)

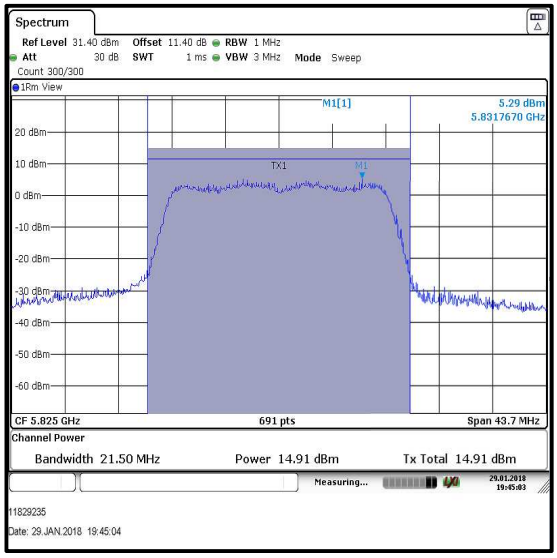
Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	15.00	5.0	20.0	30.0	10.0	Complied
Middle	5785	16.32	5.0	21.32	30.0	8.68	Complied
Top	5825	14.91	5.0	19.61	30.0	11.39	Complied



Bottom Channel



Middle Channel

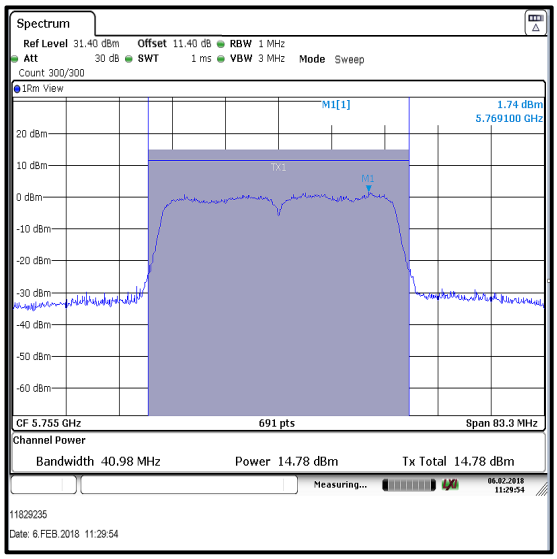


Top Channel

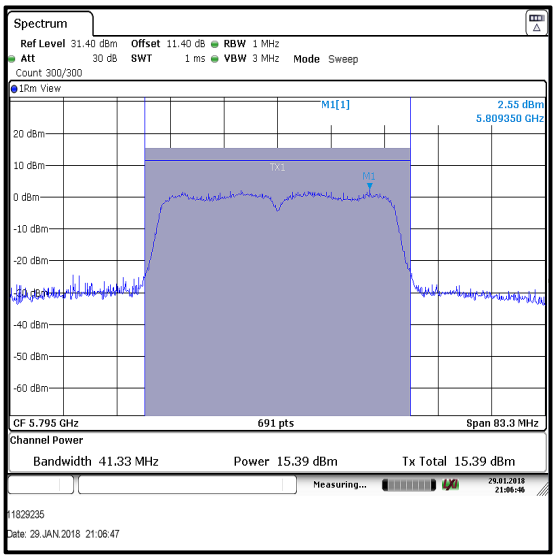
Result: Pass

Results: 802.11n / 40 MHz / BPSK / 15 Mbps (5.725-5.85 GHz Band)

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5755	14.78	5.0	19.78	30.0	10.22	Complied
Top	5795	15.39	5.0	20.39	30.0	9.61	Complied



Bottom Channel



Top Channel

Result: Pass

5.2.5. Transmitter Maximum Power Spectral Density

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	06 February 2018 & 07 February 2018
Test Sample Serial Number:	WAAZ000217		
Test Site Identification	SR 9		

FCC Reference:	Part 15.407(a)(1)(i) & (a)(3)
Test Method Used:	KDB 789033 D02 Section II.F. referencing II.E.2.f)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	34

Note(s):

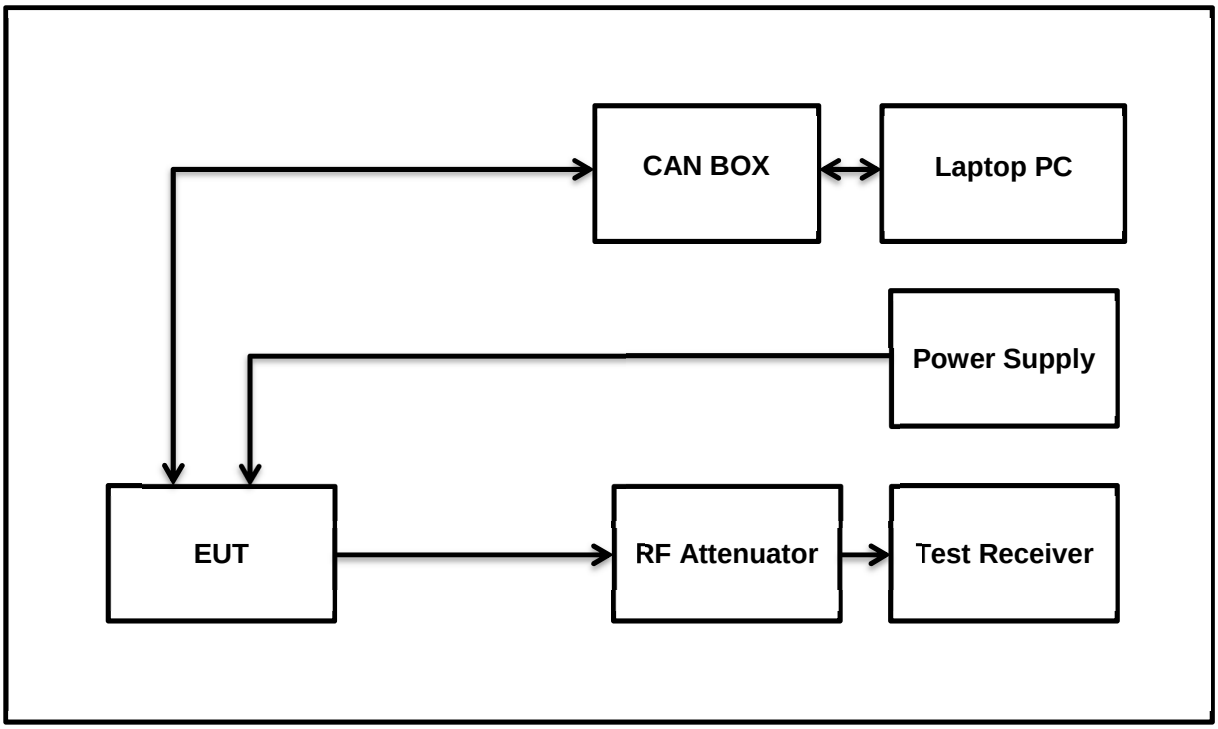
- Transmitter Maximum Power Spectral Density tests in all bands were performed using a test receiver in accordance with KDB 789033 II. F referencing II.E.2.f) Method SA-3.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and therefore deemed worst case were:
- 802.11a – BPSK / 6 Mbps
- 802.11n HT20 – BPSK / 7.2 Mbps / MCS0 (GI=400 ns)
- 802.11n HT40 – BPSK / 15 Mbps / MCS0 (GI=400 ns)

Measurements were then performed in these modes on bottom, middle and top channels in all operating bands.

- Since method SA-3 was used for the power measurement, therefore no duty cycle correction was required.
- The EUT antenna has a gain of 5 dBi in all bands.
- The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.
- The measurement was performed with the method in KDB 789033 II. F referencing II.E.2.f) Method SA-3.A resolution bandwidth of 1 MHz instead of 500 kHz was used and therefore the result is overrated.
- Power setting 11 was used in the 20 MHz band on 5.725 to 5.85 GHz while 13 was used on the 40 MHz band.

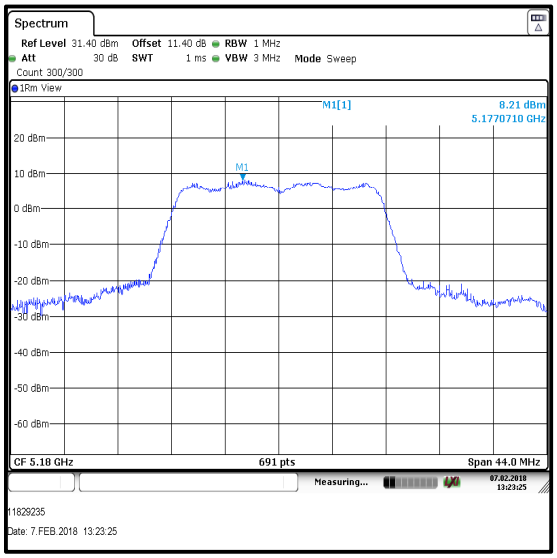
Transmitter Maximum Power Spectral Density (continued)

Test setup:

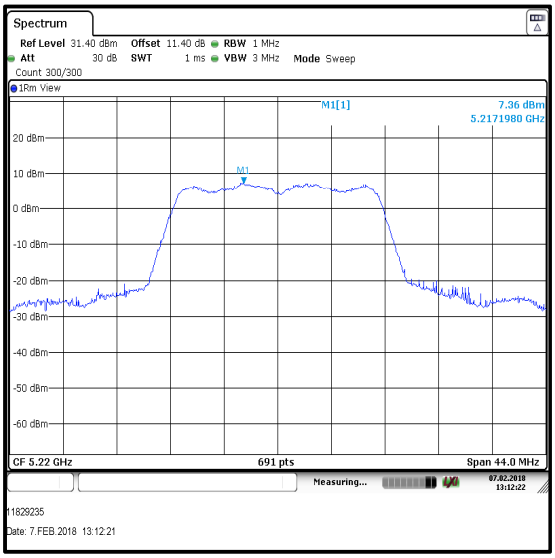


Results: 802.11a / 20 MHz / BPSK / 6 Mbps (5.15-5.25 GHz band)

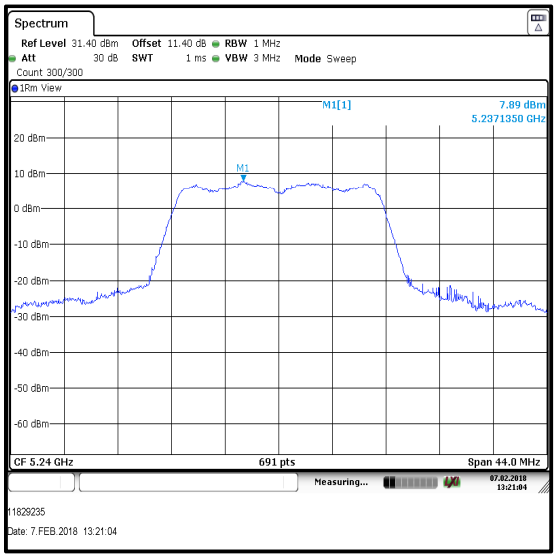
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Antenna Gain (dBi)	Corrected PPSD (dBm/MHz	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5180	8.21	5.0	13.21	17.0	3.79	Complied
Middle	5200	7.36	5.0	12.36	17.0	4.64	Complied
Top	5240	7.89	5.0	12.89	17.0	4.11	Complied



Bottom Channel



Middle Channel

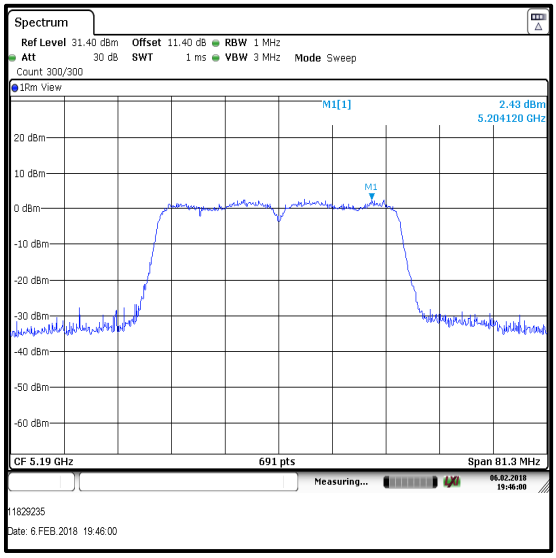


Top Channel

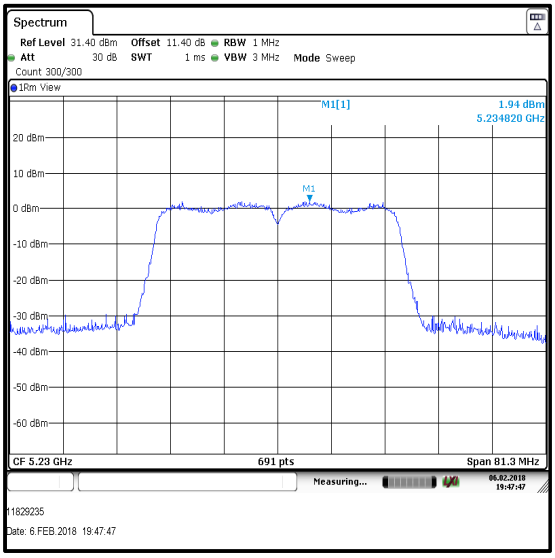
Result: Pass

Results: 802.11n / 40 MHz / BPSK / 15 Mbps (5.15-5.25 GHz band)

Channel	Frequency (MHz)	PPSD (dBm /1 MHz)	Antenna Gain (dBi)	Corrected PPSD (dBm/ MHz)	Limit (dBm/500kHz)	Margin (dB)	Result
Bottom	5745	2.43	5.0	7.43	30.0	22.57	Complied
Top	5825	1.94	5.0	6.94	30.0	23.06	Complied



Bottom Channel

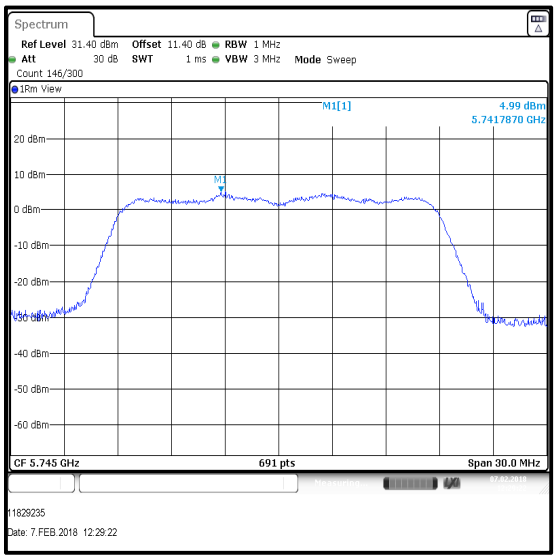


Top Channel

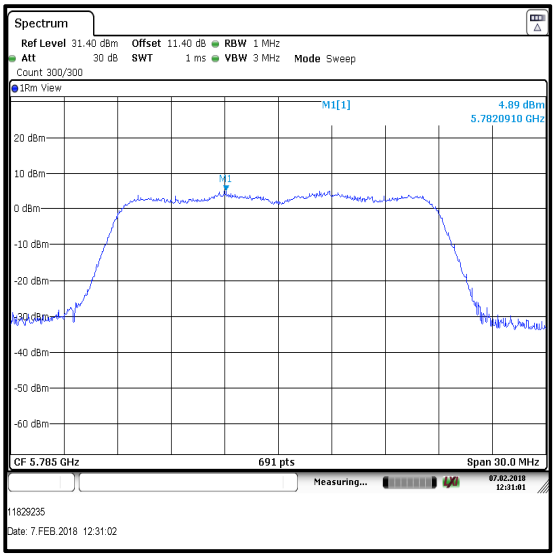
Result: Pass

Results: 802.11n / 20 MHz / BPSK / 7.2 Mbps (5.725-5.85 GHz band)

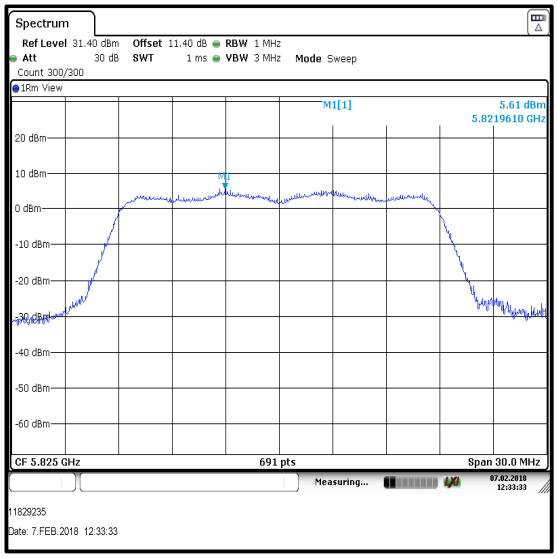
Channel	Frequency (MHz)	PPSD (dBm /1 MHz)	Antenna Gain (dBi)	Corrected PPSD (dBm/ MHz)	Limit (dBm/500kHz)	Margin (dB)	Result
Bottom	5745	4.99	5.0	9.99	30.0	20.01	Complied
Middle	5785	4.89	5.0	9.89	30.0	20.11	Complied
Top	5825	5.61	5.0	10.61	30.0	19.39	Complied



Bottom Channel



Middle Channel

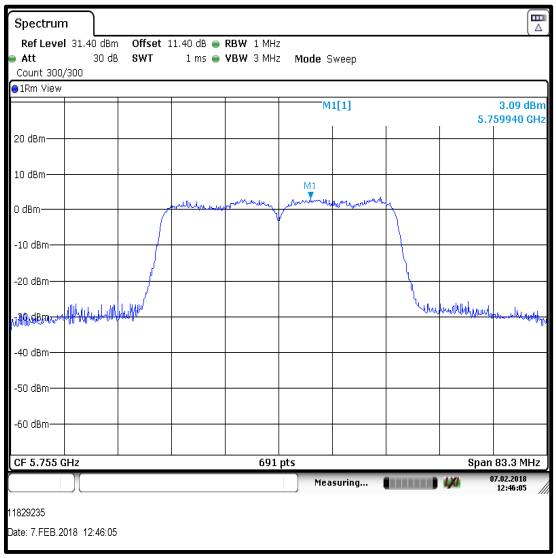


Top Channel

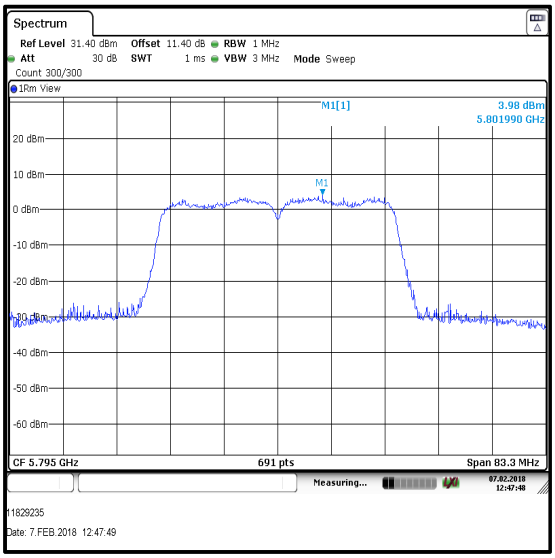
Result: Pass

Results: 802.11n / 40 MHz / BPSK / 15 Mbps (5.725-5.85 GHz band)

Channel	Frequency (MHz)	PPSD (dBm /1 MHz)	Antenna Gain (dBi)	Corrected PPSD (dBm/ MHz)	Limit (dBm/500kHz)	Margin (dB)	Result
Bottom	5745	3.09	5.0	8.09	30.0	21.91	Complied
Top	5825	3.98	5.0	8.98	30.0	21.02	Complied



Bottom Channel



Top Channel

Result: Pass

5.2.6. Transmitter Out of Band Emissions (Conducted)

Test Summary:

Test Engineer:	Segun I. Adeniji	**Test Date:**	18 January 2018
Test Sample Serial Number:	WAAZ000551		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.407(b)(2),(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):	24
Relative Humidity (%):	35

Settings of the Instrument

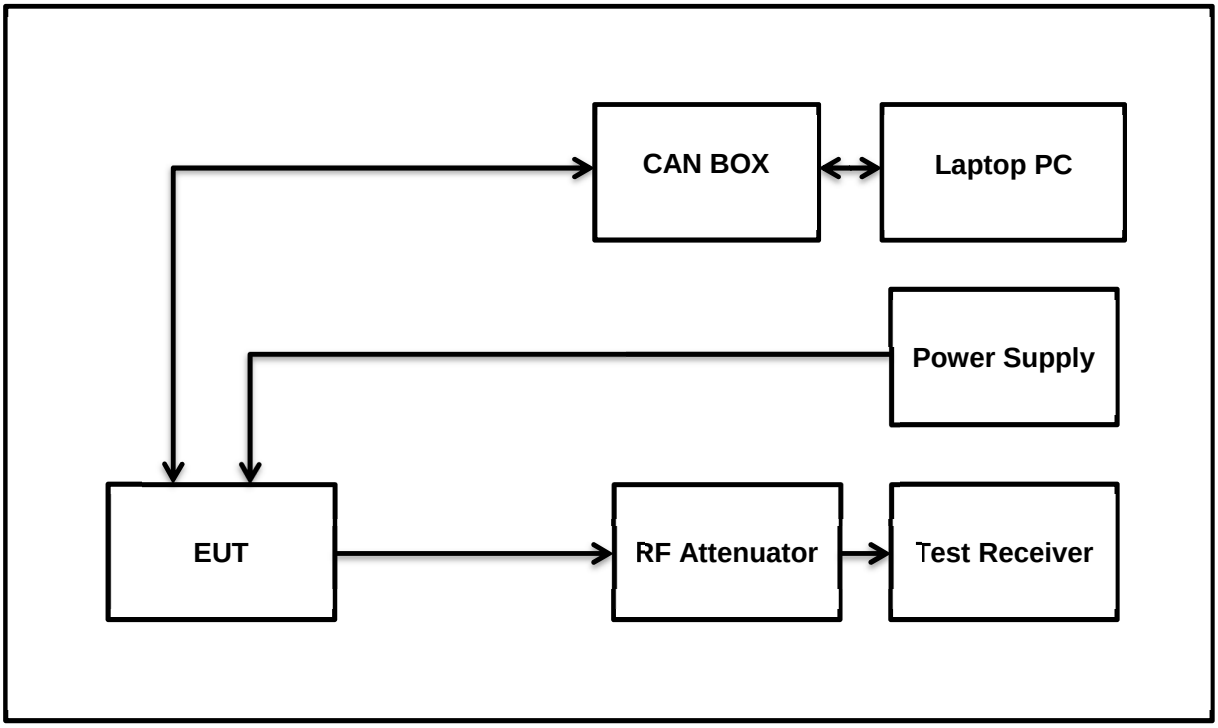
RBW/VBW	100 kHz / 300 kHz
Detector	Peak

Note(s):

1. Transmitter conducted spurious emissions tests were performed with the EUT transmitting in 802.11n / 20 MHz / 7.2 Mbps mode. Considering KDB 789033 II.G.3 (ii) this mode was found to transmit the highest power for all the sub bands and has the highest duty cycle. The measurement was done at the EUT antenna port.
2. The customer declared that due to hardware limitations, a 100 % duty circle could not be achieved.
3. The maximum achievable duty cycle was 40.36 % and this was used for the measurement.
4. As required by KDB 789033 II.G.3 (ii), an Auto sweep time was used whereas a long waiting time was used for averaging the traces. The waiting time was 5 minutes for each of the trace.
5. The final measured value, for the given emission, in the table below incorporates the attenuator value and cable loss.
6. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final emissions measurements were performed with the EUT set to the top channel only.
7. As no spurious was found, hence only the measurement equipment noise floor has been recorded below in the table.
8. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
9. Since the EUT complied to the spurious emission limit with peak detector, therefore no quasi-peak measurement was necessary according to KDB 789033.

Transmitter Spurious Emissions (continued)

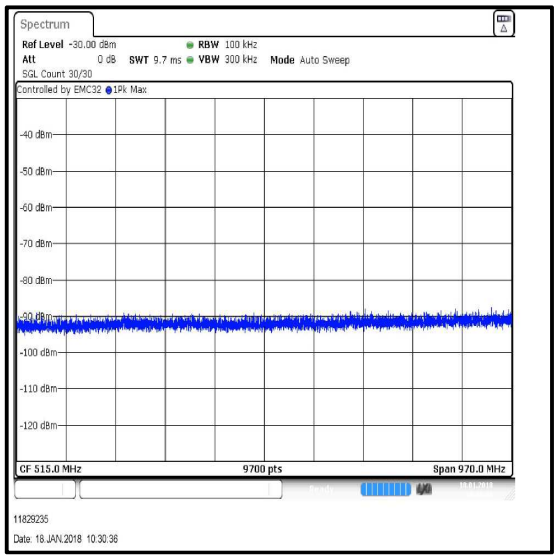
Test Setup:



Results: Middle Channel / 802.11n /20 MHz/ BPSK / 7.2 Mbps

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
987.5	Horizontal	-86.2	-41.2	16.2	Complied
987.9	Vertical	-86.9	-41.2	17.1	Complied

Transmitter Spurious Emissions (Conducted) Plot from 30 MHz to 1 GHz



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

Result: Pass

Test Summary:

Test Engineer:	Segun I. Adeniji	**Test Date:**	18 January 2018 6 February 2018
Test Sample Serial Number:	WAAZ000551		
Test Site Identification	SR 9		

FCC Reference:	Parts 15.407(b)(2),(6),(7) & 15.209(a)
Test Method Used:	KDB 789033 II.G. & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	35

Settings of the Instrument

RBW/VBW	1 MHz / 3 MHz
Detector	Peak

Note(s):

1. Transmitter conducted spurious emissions tests were performed with the EUT transmitting in 802.11n / 20 MHz / 7.2 Mbps mode. Considering KDB 789033 II.G.3 (ii) this mode was found to transmit the highest power for all the sub bands and has the highest duty cycle. The measurement was done at the EUT antenna port.
2. The customer declared that due to hardware limitations, a 100 % duty circle could not be achieved.
3. The maximum achievable duty cycle was 40.36 % and this was used for the measurement.
4. As required by KDB 789033 II.G.3 (ii), an Auto sweep time was used whereas a long waiting time was used for averaging the traces. The waiting time was 5 minutes for each of the trace.
5. The final measured value, for the given emission, in the table below incorporates the attenuator and cable loss.
6. During the initial pre-scan, it was discovered that the worst case spurious emission was found when the EUT was set to a particular channel on the middle channel compared to bottom channel, top channel. Therefore the plots have only shown the middle channel results.
7. The emission shown on the 5.745. GHz plot is the EUT fundamental.
8. *In accordance with ANSI C63.10 Section 6.6.4.3 (Note 1), if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
9. All emissions on the pre-scans were investigated and found to be ambient, or > 20 dB below the average limit.
10. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.

Results: Peak / Bottom channel

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1150.1	-68.2	-27.0	41.2	Complied
4421.4	-68.8	-27.0	41.8	Complied
5851.2	-50.0	-27.0	23.0	Complied

Results: Peak / Middle channel

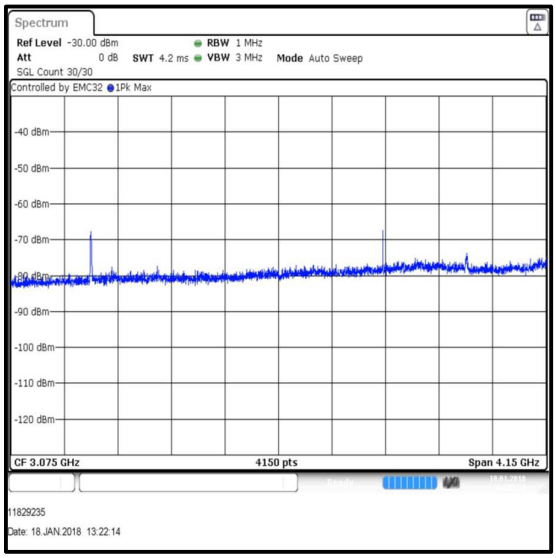
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1150.5	-68.3	-27.0	41.3	Complied
4421.4	-68.5	-27.0	41.5	Complied
5851.2	-50.0	-27.0	23.0	Complied

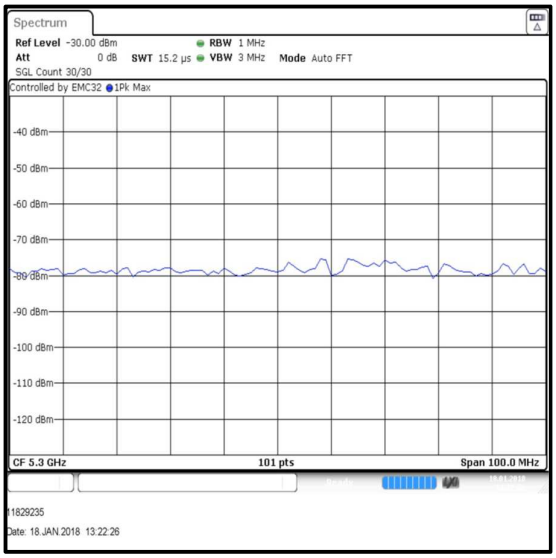
Results: Peak / Top channel

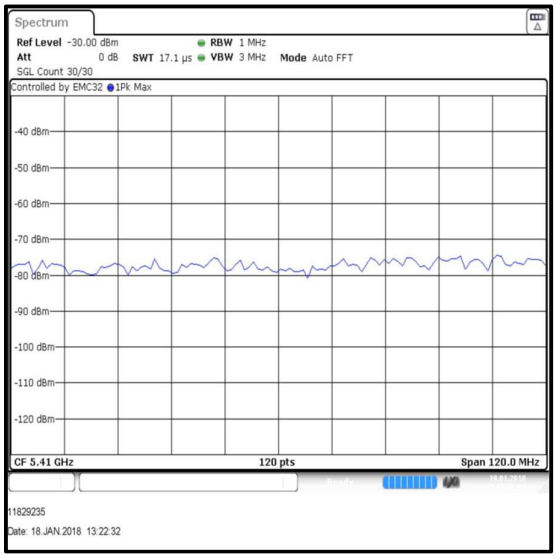
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1150.4	-68.3	-27.0	41.3	Complied
4421.4	-68.4	-27.0	41.4	Complied
5851.3	-50.0	-27.0	23.0	Complied

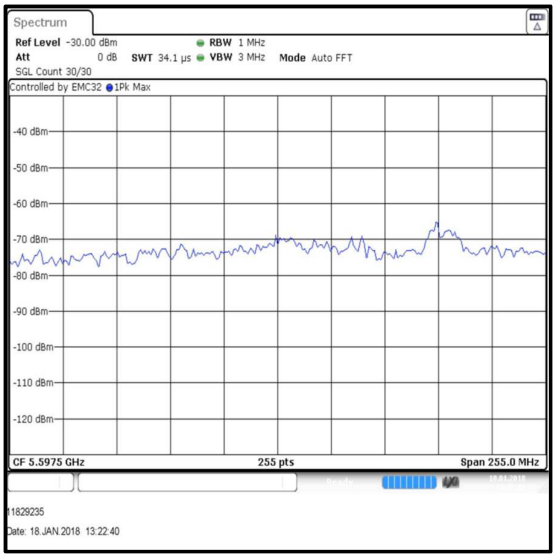
Result: Pass

Transmitter Spurious Emissions (Conducted) Plot from 30 MHz to 40 GHz segmented



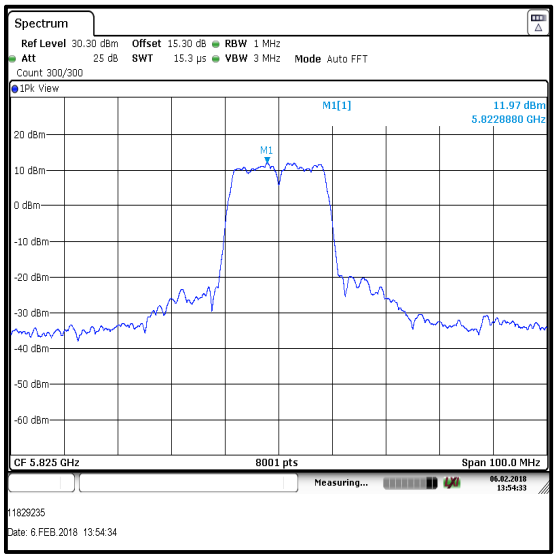


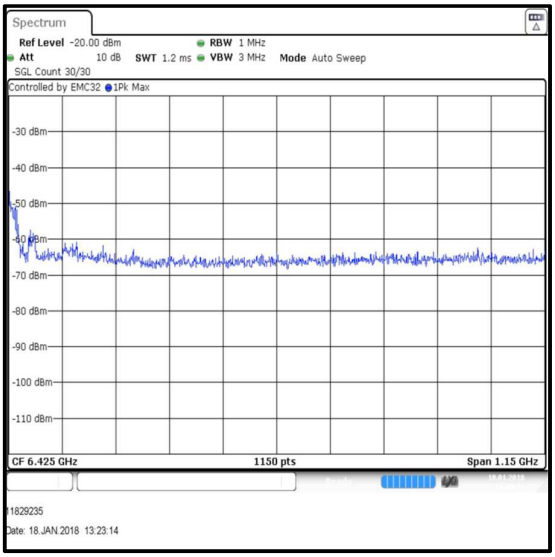


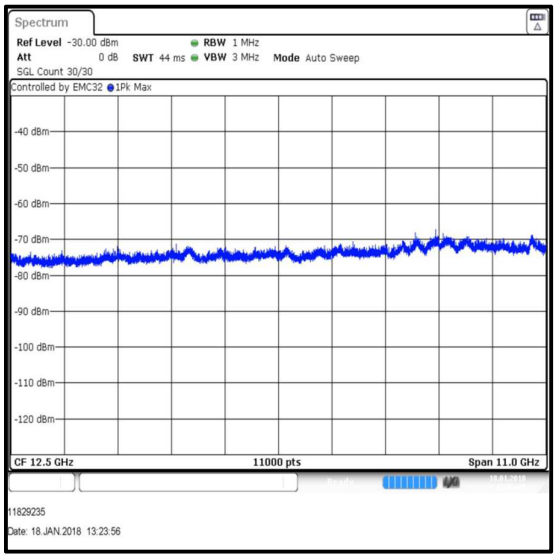


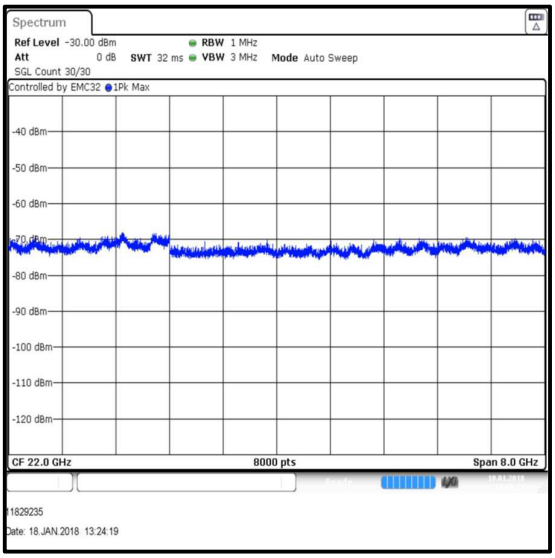
Segmented scan plots with peak detector. Note that they are for indication purposes only therefore for final measurements, see accompanying tables.

Transmitter Spurious Emissions (Conducted) Plot from 30 MHz to 40 GHz segmented (Contd.)



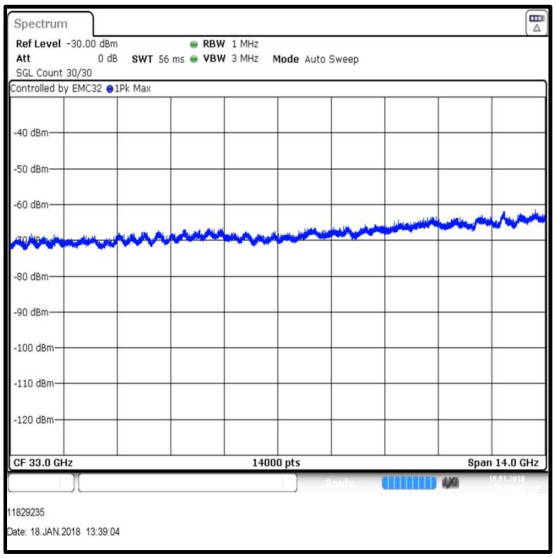






Segmented scan plots with peak detector. Note that they are for indication purposes only therefore for final measurements, see accompanying tables.

Transmitter Spurious Emissions (Conducted) Plot from 30 MHz to 40 GHz segmented (Contd.)



Segmented scan plots with peak detector. Note that they are for indication purposes only therefore for final measurements, see accompanying tables.

5.2.7. Transmitter Out of Band Radiated Emissions (Cabinet Radiation)

Test Summary:

Test Engineer:	Segun I. Adeniji	**Test Date:**	15 January 2018
Test Sample Serial Number:	WAAZ000551		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.407(b)(2),(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:

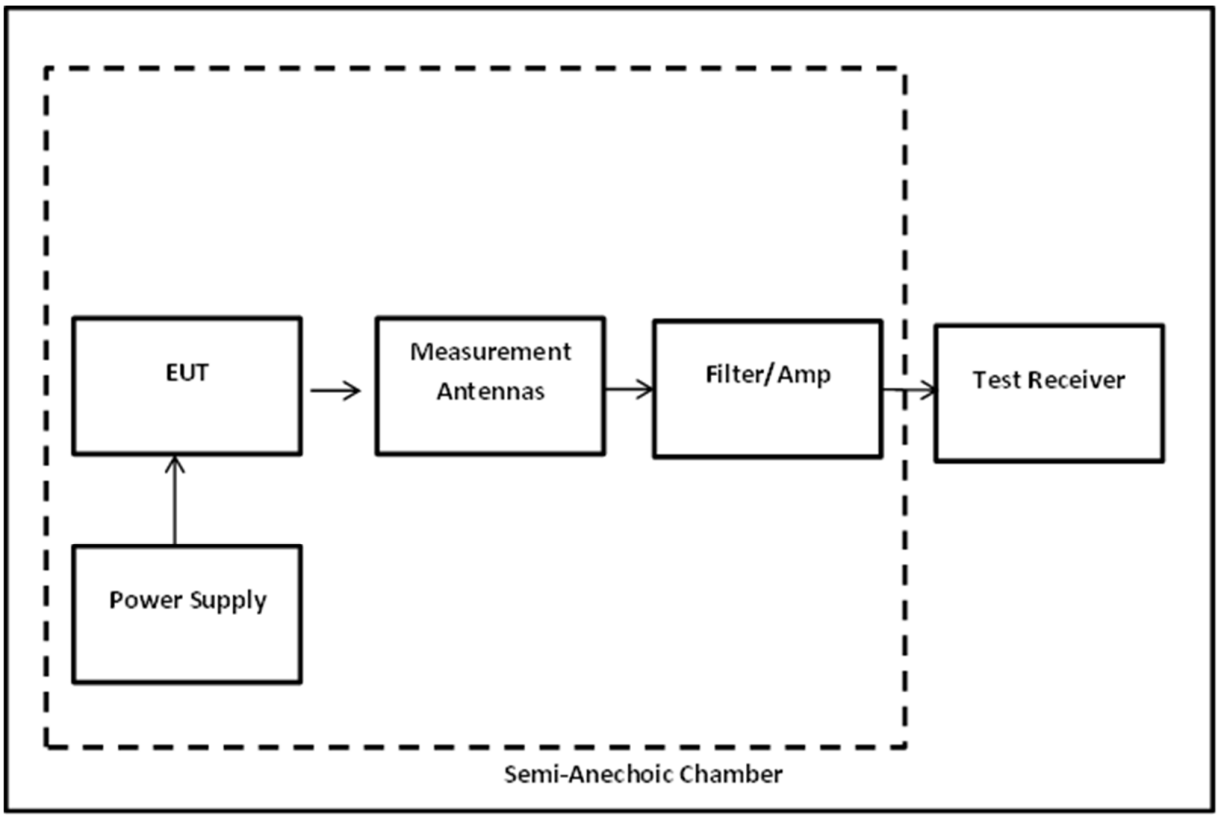
Temperature (°C):	24
Relative Humidity (%):	31

Note(s):

1. Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11n / 20 MHz / 7.2 Mbps mode. Considering KDB 789033 II.G.3 (ii) this mode was found to transmit the highest power for all the sub bands and has the highest duty cycle. The measurement was done at the EUT antenna port.
2. The customer declared that due to hardware limitations, a 100 % duty circle could not be achieved.
3. The maximum achievable duty cycle was 40.36 % and this was used for the measurement.
4. Pre-scans with the EUT transmitting on the middle channel were measured according to FCC Part 15.407(b)(2) which states for transmitters operating in the band 5.725-5.85 GHz: all emissions outside of the band 5.725-5.85 GHz band shall not exceed -27 dBm/ MHz. Part(b)(6) states unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Part(b)(7) states the provisions of 15.205 apply, e.g. restricted bands of operation. The same applies for the 5.725-5.85 GHz band.
5. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
6. 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 top channel only.
7. In accordance with FCC part 15.33, pre-scans were performed from 9 kHz to 30 MHz. As there were no emissions observed within 20 dB of the limit, in accordance with 15.31(o), no pre-scans are included in this test report. The pre-scans are kept on file and available upon request.
8. All emissions shown on the pre-scan plots were found to be below the measurement system noise floor or ambient, therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
9. Measurements below 1 GHz were performed in a semi-anechoic 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.
10. Measurement was made with the antenna port terminated with a matched load as required.

Transmitter Out of Band Radiated Emissions (continued)

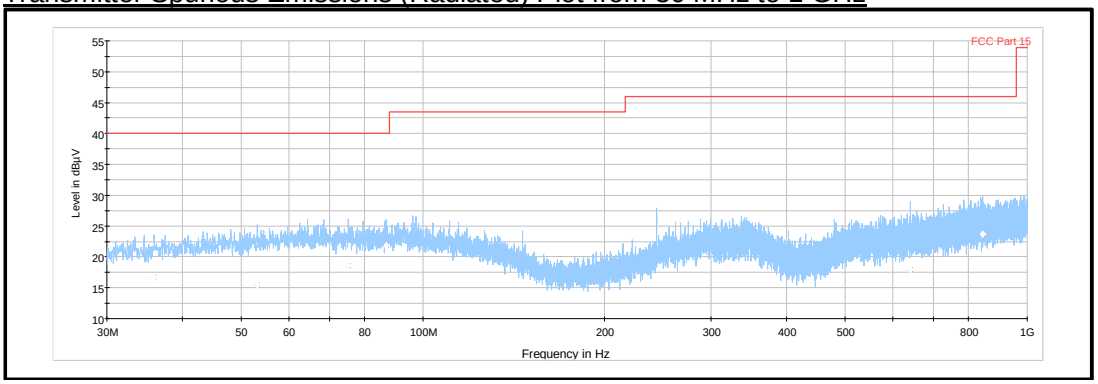
Test Setup:



Results: Middle Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
243.083	Horizontal	29.8	46.0	16.2	Complied
641.292	Vertical	28.9	46.0	17.1	Complied

Transmitter Spurious Emissions (Radiated) Plot from 30 MHz to 1 GHz



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

Test Summary:

Test Engineer:	Segun I. Adeniji	**Test Date:**	15 January 2018 05 February 2018 08 February 2018
Test Sample Serial Number:	WAAZ000217		
Test Site Identification	SR 1/2		

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):	24
Relative Humidity (%):	31

Note(s):

1. FCC Part 15.407(b)(1) states for transmitters operating in the band 5.725-5.85 GHz: all emissions outside of the 5.725-5.85 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. Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11n / 20 MHz / 7.2 Mbps mode. Considering KDB 789033 II.G.3 (ii) this mode was found to transmit the highest power for all the sub bands and has the highest duty cycle. The measurement was done at the EUT antenna port.
3. The customer declared that due to hardware limitations, a 100 % duty circle could not be achieved.
4. The maximum achievable duty cycle was 40.36 % and this was used for the measurement.
5. Pre-scans were performed with the EUT transmitting on top channel in the 5.725-5.85 GHz band.
6. The pre-scan was initially made on all bands and this 5.725-5.85 GHz band was seen to be the worst case as per spurious emission
7. All spurious emission found measured with a peak detector complies with the average limit. Hence only measurement noise floor was measured.
8. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
9. 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.
10. In accordance with KDB 789033 Section II.G.1.c) if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.
11. 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.
12. Pre-scans above 1 GHz were performed in a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT.. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1150.5	Vertical	-55.7	-27.0	28.7	Complied

Results: Bottom Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
1150.5	Vertical	39.5	54.0	14.50	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1150.6	Vertical	-55.45	-27.0	28.45	Complied

Results: Middle Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
1150.6	Vertical	39.75	54.0	14.25	Complied

Results: Top Channel / EIRP

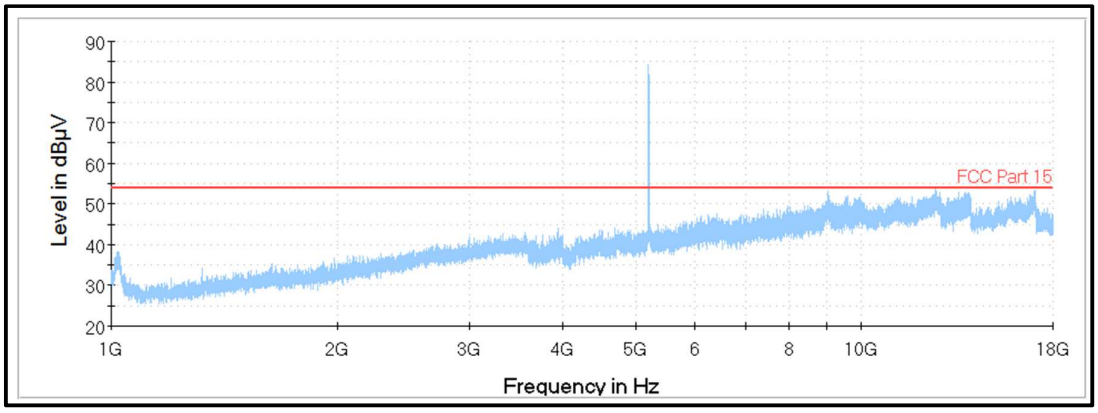
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1150.6	Vertical	-55.95	-27.0	28.95	Complied

Results: Top Channel / Field Strength

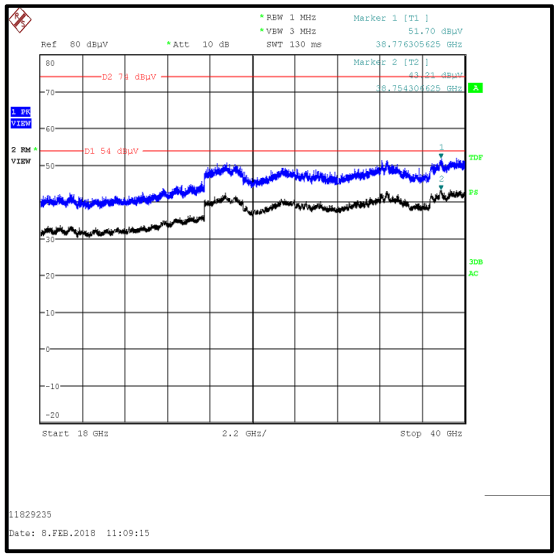
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
1150.6	Vertical	39.65	54.0	14.35	Complied

Result: Pass

Cabinet Radiated out of band spurious emission plot from 1 GHz to 18 GHz



Cabinet Radiated out of band spurious emission plot from 18 GHz to 40 GHz



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

5.2.8. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	11 December 2017 15 January 2018 30 January 2018 08 February 2018
Test Sample Serial Number:	WAAZ000217 with connected antenna		
Test Site Identification	SR 1/2		

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:

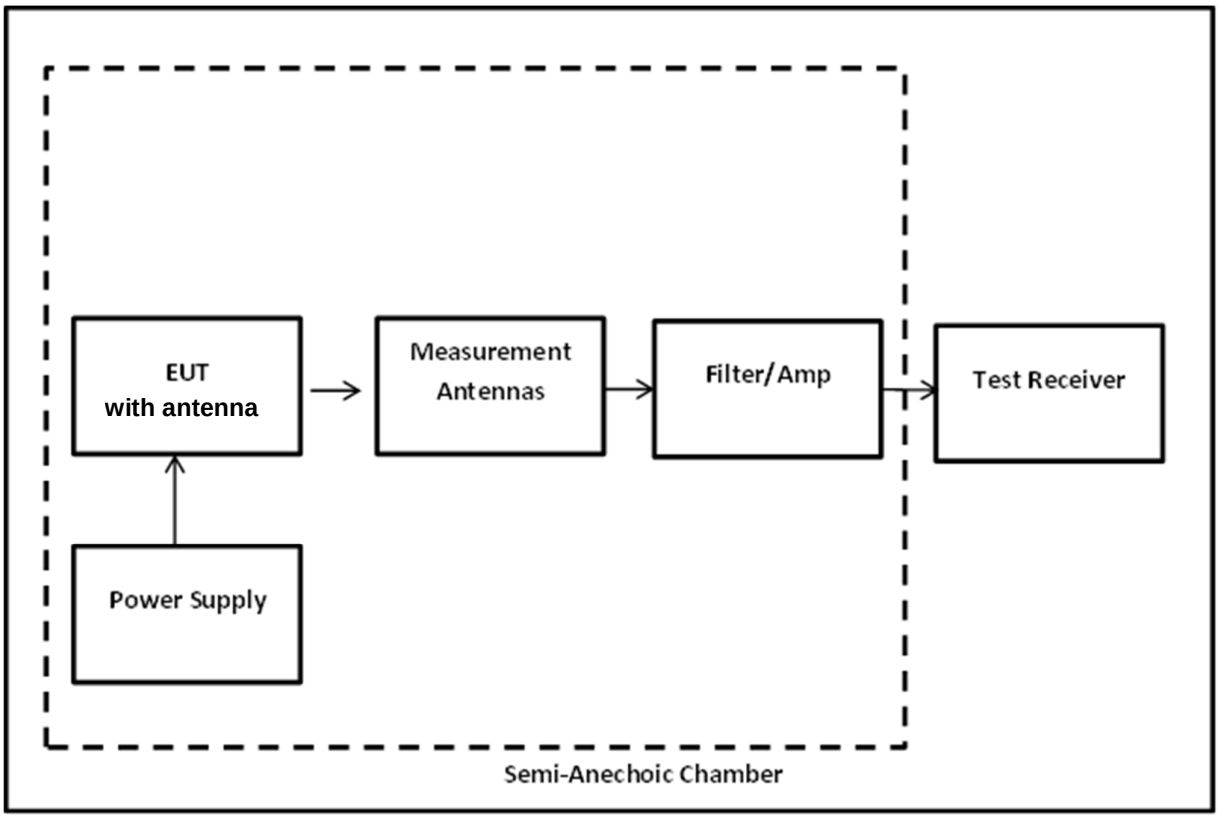
Temperature (°C):	20.6
Relative Humidity (%):	27

Note(s):

1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a - BPSK / 6 Mbps.
    - 802.11n -HT20/ BPSK / 7.2 Mbps.
    - 802.11n – HT40/ BPSK / 15 Mbps.
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 5.15-5.25 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 5.25-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.25 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits. The restricted band measurement was done on only the band and mode that produces the highest power.
5. In accordance with KDB 789033 Section II.G.6.d) Method VB, for average measurements, data rates where the EUT was transmitting <98% duty cycle and no duty cycle correction applies.

Transmitter Band Edge Radiated Emissions (continued)

Test Setup:



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

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

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5149.487	64.8	74.0	9.2	Complied
5150	63.5	74.0	10.5	Complied
5350	56.1	74.0	17.9	Complied
5370.000	56.7	74.0	17.3	Complied

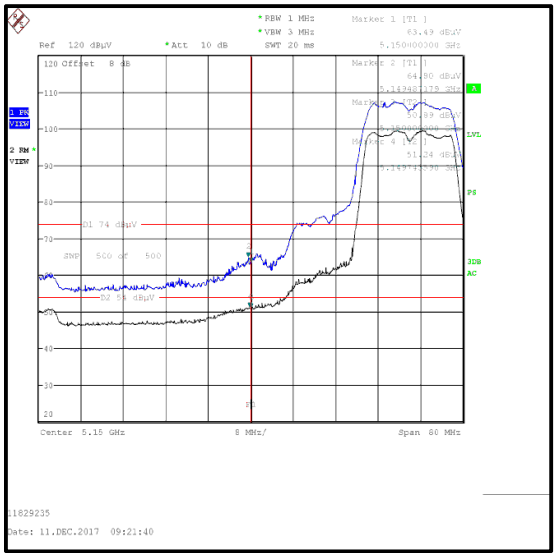
Results: 802.11a / 20 MHz / BPSK / 6 Mbps / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5149.744	51.2	54.0	2.8	Complied
5150	50.9	54.0	3.1	Complied
5350	46.3	54.0	7.7	Complied
5405.000	46.8	54.0	7.2	Complied

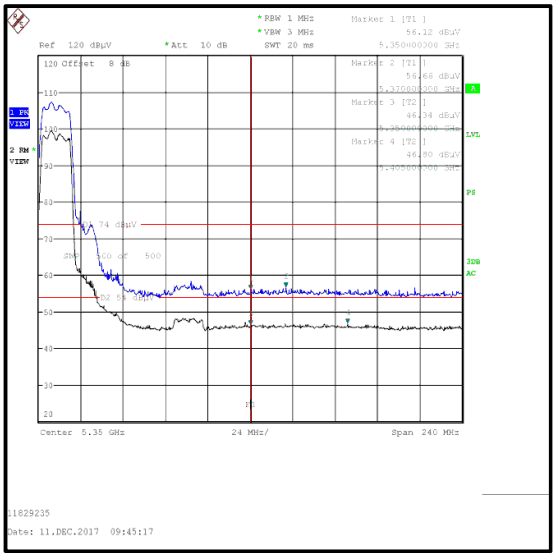
Result: Pass

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

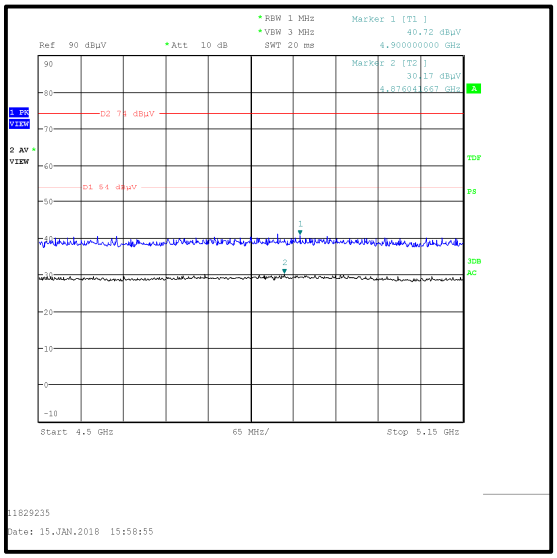
Results: 802.11a / 20 MHz / BPSK / 6 Mbps



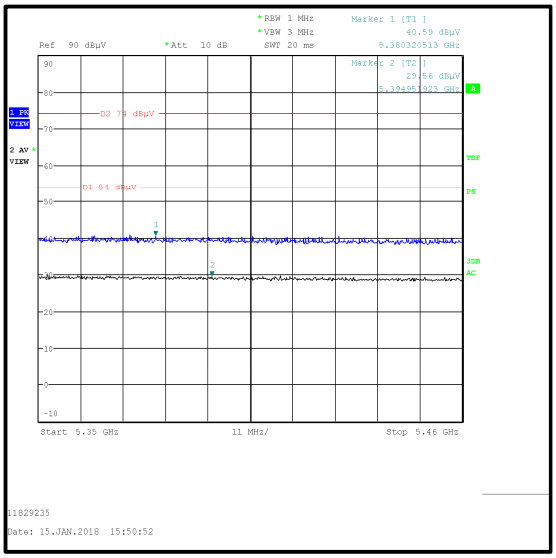
Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Restricted Band 4.5 GHz to 5.15 GHz



Restricted Band 5.35 GHz to 5.46 GHz

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

Results: 802.11a / 20 MHz / BPSK / 48 Mbps / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5146.923	62.9	74.0	11.1	Complied
5150	61.2	74.0	12.8	Complied
5350	56.3	74.0	17.7	Complied
5377.692	56.6	74.0	17.4	Complied

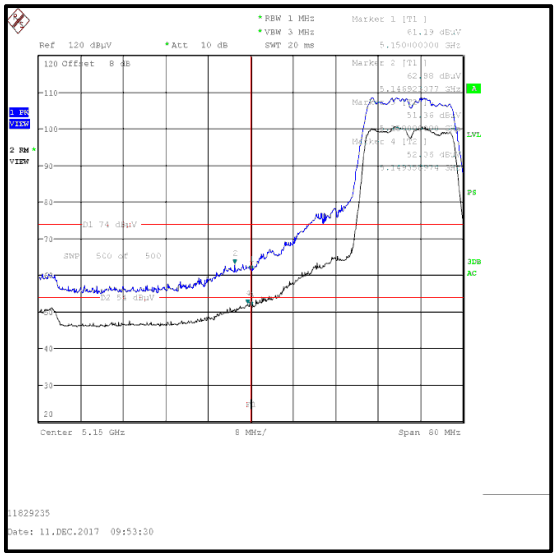
Results: 802.11a / 20 MHz / BPSK / 48 Mbps / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5149.359	52.0	54.0	2.0	Complied
5150	51.4	54.0	2.6	Complied
5350	46.0	54.0	8.0	Complied
5355.385	46.9	54.0	7.1	Complied

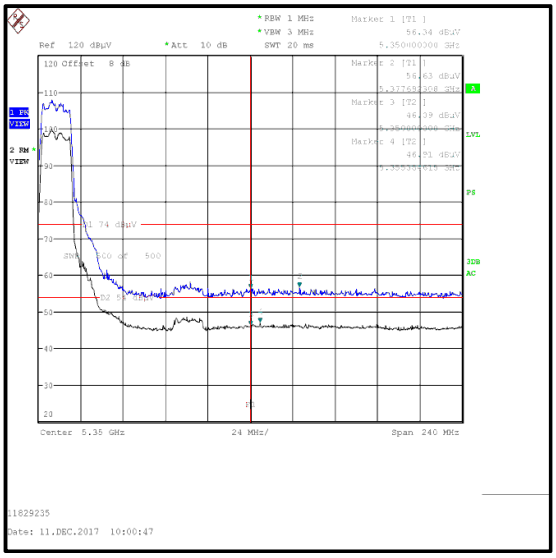
Result: Pass

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

Results: 802.11n / 20 MHz / BPSK / 48 Mbps



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

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

Results: 802.11n / 40 MHz / BPSK / 15 Mbps / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	62.75	74.0	11.25	Complied
5350	55.85	74.0	18.15	Complied
5469.23	56.93	74.0	17.07	Complied

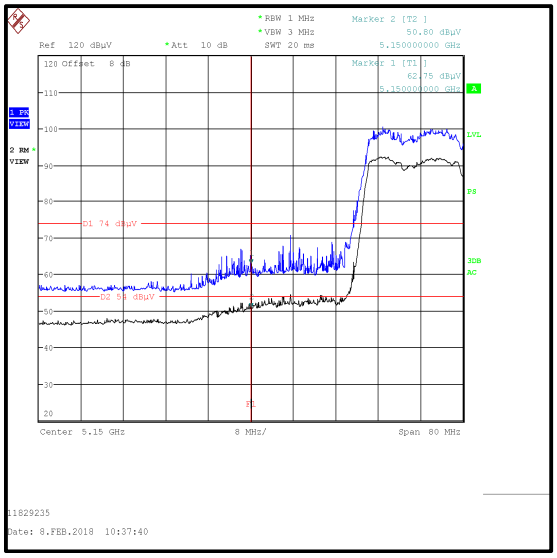
Results: 802.11a / 20 MHz / BPSK / 48 Mbps / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	50.80	54.0	3.20	Complied
5350	46.60	54.0	7.40	Complied
5408.46	46.89	54.0	7.11	Complied

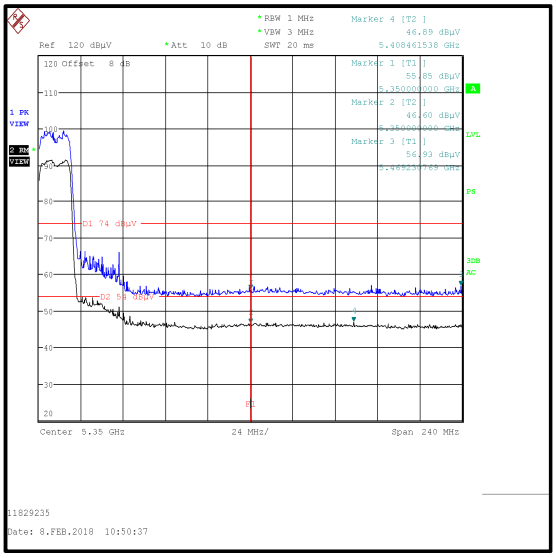
Result: Pass

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

Results: 802.11n / 40 MHz / BPSK / 15 Mbps



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

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

Results: 802.11n / 20 MHz / BPSK / 7.2 Mbps / Peak

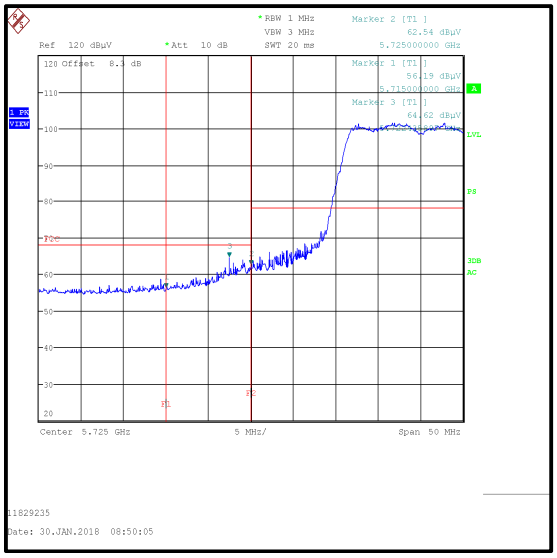
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-39.01	-27.0	12.01	Complied
5725	-32.66	-17.0	15.66	Complied
5722	-30.58	-17.0	13.58	Complied
5850	-36.42	-17.0	19.42	Complied
5860	-38.44	-27.0	11.44	Complied
5856	-35.83	-17.0	18.83	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	56.19	68.2	12.01	Complied
5725	62.54	78.2	15.66	Complied
5722	64.62	78.2	13.58	Complied
5850	58.78	78.2	19.42	Complied
5860	56.76	68.2	11.44	Complied
5856	59.37	78.2	18.83	Complied

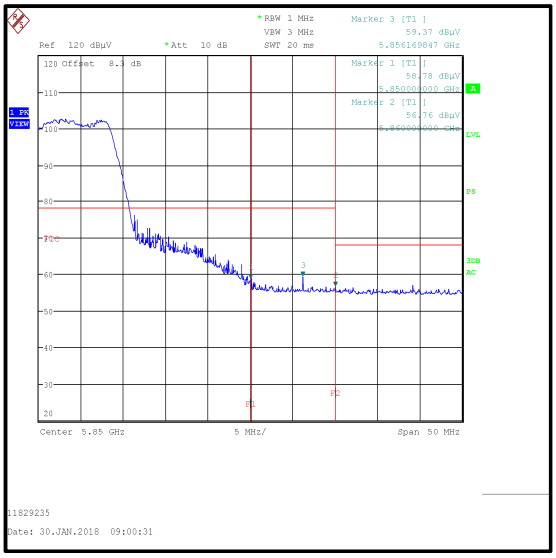
Result: Pass

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

Results: 802.11n / 20 MHz / BPSK / 7.2 Mbps



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

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

Results: 802.11n / 40 MHz / BPSK / 15 Mbps / Peak

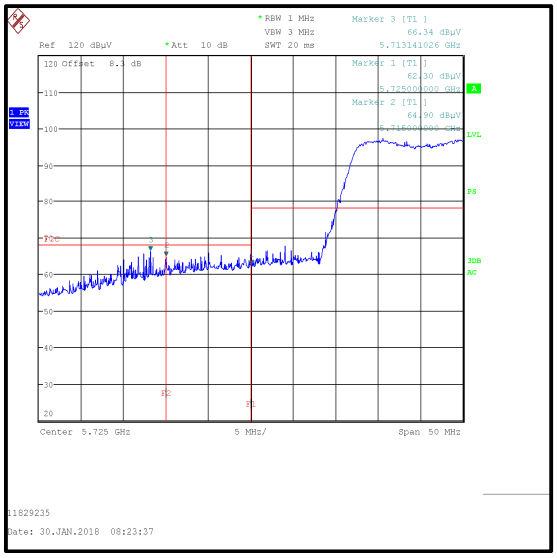
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-30.30	-27.0	3.30	Complied
5725	-32.90	-17.0	15.90	Complied
5713	-30.30	-17.0	13.30	Complied
5850	-39.78	-17.0	22.78	Complied
5860	-39.87	-27.0	12.87	Complied
5853	-38.00	-17.0	21.00	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	64.90	68.2	3.30	Complied
5725	62.30	78.2	15.90	Complied
5713	64.90	78.2	13.30	Complied
5850	55.42	78.2	22.78	Complied
5860	55.33	68.2	12.87	Complied
5853	57.20	78.2	21.00	Complied

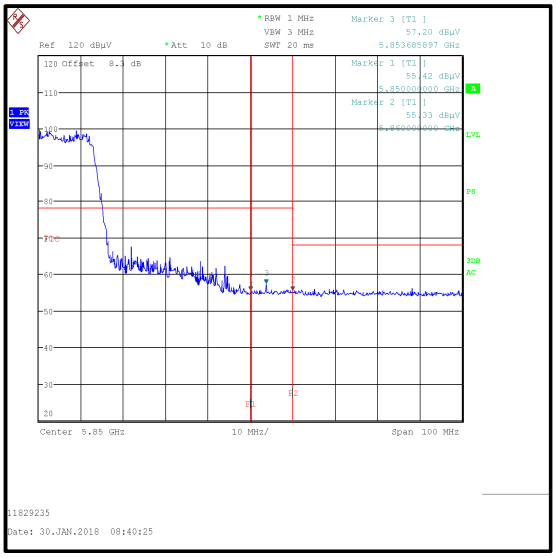
Result: Pass

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

Results: 802.11n / 40 MHz / BPSK / 15 Mbps



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

6. Measurement Uncertainty

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	Confidence Level (%)	Calculated Uncertainty
Radiated Maximum Peak Output Power	95%	±3.10 dB
Conducted Maximum Peak Output Power	95%	±0.59 dB
Conducted Spurious Emissions	95%	±0.59 dB
Radiated Spurious Emissions	95%	±3.10 dB
Band Edge Radiated Emissions	95%	±3.10 dB
Transmitter Duty Cycle	95%	±3.4%
Minimum 6 dB Bandwidth	95%	±0.87 %
99% Emission Bandwidth	95%	±0.87 %
20 dB Bandwidth	95%	±0.87 %

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. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	8/5/2016	36
103	EMCO	Antenna, Horn	3115	9008/3485	7/20/2016	36
104	EMCO	Antenna, Horn	3115	9008/3486	7/20/2016	36
156	Rohde & Schwarz	V-Network	ESH3-Z6	843864/004	7/12/2017	12
350	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/014	7/13/2017	12
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	7/11/2017	12
383	Rohde & Schwarz	Antenna, Rod	HFH2-Z1	890151/11	7/14/2017	24
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	055929	7/12/2017	12
424	EMCO	Antenna, Horn	EMCO 3116	00046537	7/28/2016	24
425	Agilent	Generator, CW Signal	E8247C	MY43320849	7/19/2016	24
426	Agilent	Spectrum Analyzer	E4446A	US44020316	7/20/2016	24
460	Deisl	Turntable	DT 4250 S		n/a	n/a
465	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	8/8/2016	36
474	Agilent	Analyzer, ENA Network	E5071C	MY46100912	7/20/2016	24
495	Rohde & Schwarz	Antenna, Log.- Periodical	HL050	100296	7/20/2016	24
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	7/20/2016	24
497	Schwarzbeck	Antenna, Biconical	VHBB 9124	423	7/7/2016	36
499	Schwarzbeck	Antenna, log.-per	VUSLP 9111	317	8/2/2016	36
587	Maturo	antenna mast, tilting	TAM 4.0-E	011/7180311	n/a	n/a
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	7/12/2017	12
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	7/28/2016	24
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	4/8/2014	60
363	Wainwright	Notch Filter GSM900	WW-NF9	100002	Lab verification	n/a
611	Wainwright Instruments	Band Reject Filter DL LTE	WRCGV8-	1	Lab verification	n/a
612	Wainwright Instruments	Band Reject Filter UL LTE	WRCGV8-	1	Lab verification	n/a
613	Wainwright Instruments	Band Reject Filter WLAN/ BT	WRCTF12-	1	Lab verification	n/a
614	Wainwright Instruments	Highpass Filter 3GHz	WHKX10-	1	Lab verification	n/a
615	Wainwright Instruments	Highpass Filter 1GHz	WHKX12-	3	Lab verification	n/a
620	Bonn Elektronik	pre-amplifier	BLNA 0110-01N	1510111	7/12/2017	24
624	Wainwright	6 GHz high-pass filter	WHKX10-5850-6500-18000-40SS	5	Lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a

Test site: SR 9

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
424	EMCO	Antenna, Horn	EMCO 3116	00046537	7/28/2016	24
472	Rohde & Schwarz	Generator, Vektorsignal	SMU200A	102409	7/11/2017	12
592	Rohde & Schwarz	Wideband Radio Communication tester	CMW 500	119593	8/15/2017	12
622	Rohde & Schwarz	Step Attenuator	RSC	101904	7/13/2017	12
625	Schwarzbeck	Antenna, H-field	HFSL 7101	109	Verification - only relative measurements	n/a
626	Rohde & Schwarz	Bluetooth Tester	CBT	100481	Signaling Only	24
635	Rohde & Schwarz	Signal generator	SMB100A	179875	7/11/2017	12
636	Rohde & Schwarz	switching unit	OSP120	101698	7/14/2017	12
637	Rohde & Schwarz	Spectrum Analyzer	FSV40	101587	7/11/2017	12
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	7/21/2016	24
451	Rohde & Schwarz	Power Meter, Dual Channel	NRVD	101190	7/10/2017	12
427	Rohde & Schwarz	Probe, Power Sensor	NRV-Z5	1019	7/11/2017	12
195	SPS	Power Supply	TOE8842-24	51455	Verified by Multimeter	12
216	Agilent	Multimeter	34401A	US36017458	7/11/2017	24
378	ESPEC/ Thermotec	Climatic Chamber	PL-1FT	5100869	8/9/2016	36

8. Report Revision History

Version Number	Revision Details		
	Page No(s)	**Clause**	**Details**
1.0	-	-	Initial Version
1.1	4	1	Applicant and Manufacturer changed (from Karlsruhe to Kerpen)
1.2	1,8	3	Model number changed
1.3	34 to 36	-	Corrected conducted power change to EIRP
1.4	1,8	3	Model number changed
1.5	10	3.5	Added antenna information
1.6	4.2 57,58	9 5.2.8	Added clarification regarding antenna termination Added that antenna was used for Band Edge measurements