



# TEST REPORT

**Test Report No. : UL-RPT-RP-13260875-616-FCC**

**Applicant** : Danfoss Srl  
**Model No.** : PR-OCTO  
**FCC ID** : 2ATXJ-OCTO2020  
**Technology** : WLAN (802.11 b,g,n)  
**Test Standard(s)** : FCC Parts 15.207, 15.209(a) & 15.247

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 1.1 supersede Version 1.0 with immediate effect**  
Test Report No. UL-RPT-RP-13260875-616-FCC Version 1.1, Issue Date 09 APRIL 2021 replaces  
Test Report No. UL-RPT-RP-13260875-616-FCC Version 1.0, Issue Date 06 APRIL 2021, which is no longer valid.
5. Result of the tested sample: **PASS**

Prepared by: Sercan, Usta  
Title: Laboratory Engineer  
Date: 09 April 2021

Approved by: Ajit, Phadtare  
Title: Lead Test Engineer  
Date: 09 April 2021



Deutsche  
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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.

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## **1. Customer Information**

### **1.1.Applicant Information**

<b>Company Name:</b>	Danfoss A/S
<b>Company Address:</b>	Nordborgvej 81, DK-6430 Nordborg, Denmark
<b>Company Phone No.:</b>	+45 7488 2222
<b>Company E-Mail:</b>	info@danfoss.com
<b>Contact Person:</b>	Thomas Krogh Nielsen
<b>Contact E-Mail Address:</b>	tni@danfoss.com
<b>Contact Phone No.:</b>	-/-

### **1.2.Manufacturer Information**

<b>Company Name:</b>	Danfoss A/S
<b>Company Address:</b>	Nordborgvej 81, DK-6430 Nordborg, Denmark
<b>Company Phone No.:</b>	+45 7488 2222
<b>Company E-Mail:</b>	info@danfoss.com
<b>Contact Person:</b>	Thomas Krogh Nielsen
<b>Contact E-Mail Address:</b>	tni@danfoss.com
<b>Contact Phone No.:</b>	-/-

## **2. Summary of Testing**

### **2.1. General Information**

#### **Applied Standards**

<b>Specification Reference:</b>	47CFR15.247
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
<b>Specification Reference:</b>	47CFR15.207 and 47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209

#### **Location**

<b>Location of Testing:</b>	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany
<b>Test Firm Registration:</b>	399704

#### **Date information**

<b>Order Date:</b>	27 February 2020
<b>EUT arrived:</b>	20 April 2020
<b>Test Dates:</b>	29 April 2020 to 12 August 2020
<b>EUT returned:</b>	-/-

## 2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
Part 15.207	Transmitter AC Conducted Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.35(c)	Transmitter Duty Cycle <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(e)	Transmitter Power Spectral Density	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(b)(3)	Transmitter Maximum (Average) Output Power	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Note(s):

1. The measurement was performed to assist in the calculation of the level of maximum conducted output power, power spectral density and emissions.

## 2.3. Methods and Procedures

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

## 2.4. Deviations from the Test Specification

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

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

<b>Brand Name:</b>	PR-OCTO
<b>Model Name or Number:</b>	PR-OCTO
<b>Test Sample Serial Number:</b>	EUT1 (Radiated Test Sample)
<b>Hardware Version Number:</b>	Rev. B (16 jan 2020)
<b>Software Version Number:</b>	V1.0
<b>FCC ID:</b>	2ATXJ-OCTO2020

<b>Brand Name:</b>	PR-OCTO
<b>Model Name or Number:</b>	PR-OCTO
<b>Test Sample Serial Number:</b>	EUT4 (Conducted Test Sample)
<b>Hardware Version Number:</b>	Rev. B (16 jan 2020)
<b>Software Version Number:</b>	V1.0
<b>FCC ID:</b>	2ATXJ-OCTO2020

#### **3.2. Description of EUT**

The equipment under test was a Model: PR-OCTO supporting WLAN 802.11 b,g,n & Bluetooth Low Energy operations in 2.4 - 2.4835 GHz ISM band.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

<b>Technology Tested:</b>	WLAN (IEEE 802.11 b,g,n) / Digital Transmission System	
<b>Type of Unit:</b>	Transceiver	
<b>Modulation Type:</b>	DBPSK, DQPSK, BPSK, QPSK, 16QAM & 64 QAM	
<b>Data Rates:</b>	802.11 b	1, 2, 5.5 & 11 Mbps
	802.11 g	6, 9, 12, 18, 24, 36, 48 & 54 Mbit/s
	802.11 n HT20	MCS0 to MCS7
	802.11 n HT40	MCS0 to MCS7
<b>Power Supply Requirement(s):</b>	85 - 265 V/AC	
<b>Maximum Conducted Output Power:</b>	7.19 dBm	
<b>Declared Antenna Gain:</b>	4.9 dBi	
<b>Antenna Type:</b>	OnBoard Antenna	
<b>Antenna Details:</b>	Proant PRO-OB-440	
<b>Channel Spacing:</b>	20 MHz	
<b>Transmit Frequency Range:</b>	2412 MHz to 2462 MHz	
<b>Transmit Channels Tested for 20 MHz:</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	1	2412
	6	2437
	11	2462
<b>Channel Spacing:</b>	40 MHz	
<b>Transmit Frequency Range:</b>	2422 MHz to 2452 MHz	
<b>Transmit Channels Tested for 40 MHz:</b>	3	2422
	6	2437
	9	2452

**3.5. Support Equipment**

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

**A. Support Equipment (In-house)**

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Test Laptop	HP	HP Probook 650 G1	5CG614419V

**B. Support Equipment (Manufacturer supplied)**

Item	Description	Brand Name	Model Name or Number	Serial Number
1	USB extension cable (USB A to TTL UART) 1m)	Not Marked or stated	Not Marked or stated	Not marked or stated
2	AC power cable (1m)	Not Marked or stated	Not Marked or stated	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 modulated carrier with combination of
  - Worst Case Mode\*: 802.11b: 1 Mbit/s | Power Settings : PWR 44
  - Worst Case Mode\*: 802.11g: 12 Mbit/s | Power Settings : PWR 44
  - Worst Case Mode\*: 802.11n HT20: MCS0 | Power Settings : PWR 44
  - Worst Case Mode\*: 802.11n HT40: MCS0 | Power Settings : PWR 44

\*All supported data rates, modulation schemes & nominal channel bandwidths configurations were initially investigated to determine the above-mentioned worst-cases for highest power and widest bandwidth

### **4.2. Configuration and Peripherals**

#### **EUT Power Supply:**

- The EUT was powered by 120 V AC supply.

#### **Test Mode Activation:**

- All EUTs have attached programming-USB connector to connect it to the test laptop.
- The test modes were activated using the program “EspRFtestTool.exe” supplied by the customer.
- This application was used to enable continuous transmission and to select the technology, the power level and the test channels as required.
- The transmitter test modes were configured to attenuation level 44 ( i.e. PWR 44).

#### **AC Conducted Line Measurements:**

- The EUT radiated sample was used for AC conducted emissions.
- The EUT was connected to either 120 VAC /60 Hz or 240 VAC/60 Hz single phase supply via a LISN.

#### **Conducted Measurements:**

- All conducted measurements were carried out by using conducted samples with SMA (Female) RF Cable soldered on PCB by the customer.
- The SMA (Female) RF cable’s attenuation (maximum 0.5 dB@2.4GHz) was added to a reference level offset to each of the conducted plots.

#### **Radiated Measurements:**

- The EUT radiated sample was used for radiated spurious emission & radiated band edge measurements.
- Before starting final radiated spurious emission measurements “worst case verification” with the EUT in Standing-position & Laying-position was performed by Lab.
- The EUT in Laying-position was found to be the worst case therefore this report includes relevant results.
- Radiated spurious emissions were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 to 4 m over the measurement frequency range.
- EMC32 V10.1.0 Software was used for the Radiated spurious emission measurements.

## **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 AC Conducted Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Devang Chauhan	<b>Test Date:</b>	10 August 2020
<b>Test Sample Serial Number:</b>	EUT1 (Radiated Test Sample)		
<b>Test Site Identification</b>	SR 7/8		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	35

**Settings of the Instrument**

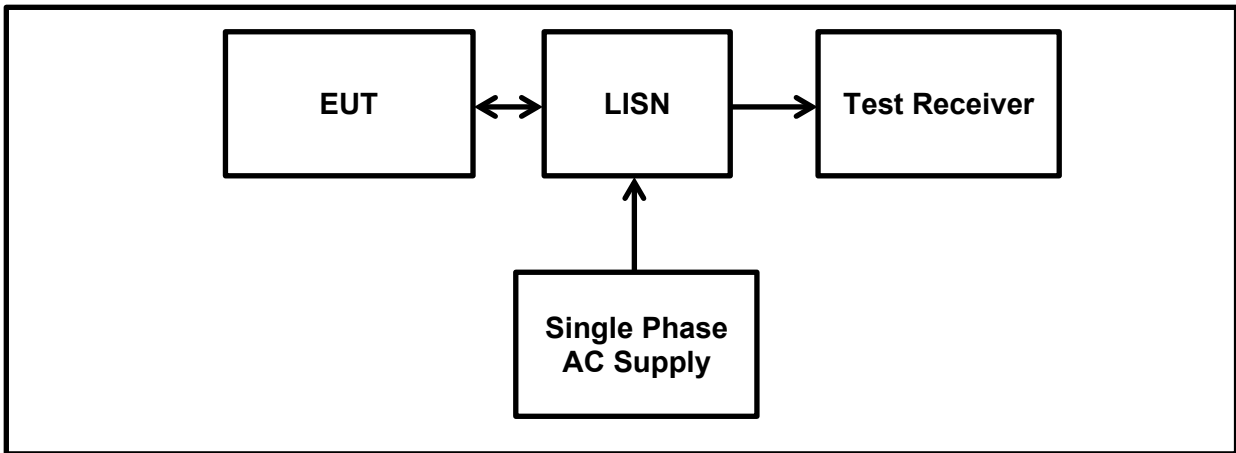
<b>Detector</b>	Quasi Peak/ Average Peak
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**Note(s):**

1. The EUT was plugged into a AC/DC Power Supply. The Power Supply was connected to 120 VAC / 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the 100-240 VAC~50/60 Hz power supply.
3. The EUT was configured on 802.11n HT40: MCS0 | Power Settings : PWR 44 | Middle Channel
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.
5. The final measured value, for the given emission, in the table below incorporates the cable loss.
6. All other emissions shown on the pre-scan plot were investigated. Only the highest 6 emissions have been reported in the tables below in accordance with ANSI C63.10 section 6.2.5.
7. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and at distance of 40 cm from the vertical ground plane at the edge of the table.
8. Measurement software used: Toyo EMI Software; CE measurement software EP5/CE Ver 4.0.1.

**Transmitter AC Conducted Spurious Emissions (continued)**

**Test setup:**



**Transmitter AC Conducted Spurious Emissions (continued)****Results: 802.11n / 40 MHz / MCS0 / PWR 44****Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1529	Live	42.10	65.80	23.70	Complied
0.2245	Live	56.60	62.60	6.00	Complied
0.3321	Live	43.60	59.40	15.80	Complied
0.4389	Live	35.20	57.10	21.90	Complied
0.5550	Live	28.90	56.00	27.10	Complied
1.2764	Live	23.70	56.00	32.30	Complied

**Results: Live / Average / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1529	Live	45.80	65.40	19.60	Complied
0.2245	Live	56.60	62.60	6.00	Complied
0.3321	Live	43.50	59.40	15.90	Complied
0.4389	Live	35.20	57.10	21.90	Complied
0.5550	Live	22.10	56.00	33.90	Complied
1.2764	Live	21.50	56.00	34.50	Complied

**Results: Neutral / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1610	Neutral	30.40	55.80	25.40	Complied
0.2247	Neutral	40.60	52.60	12.00	Complied
0.3309	Neutral	29.30	49.40	20.10	Complied
0.4398	Neutral	22.00	47.10	25.10	Complied
1.0257	Neutral	16.00	46.00	30.00	Complied
1.4854	Neutral	19.80	46.00	26.20	Complied

**Transmitter AC Conducted Spurious Emissions (continued)**

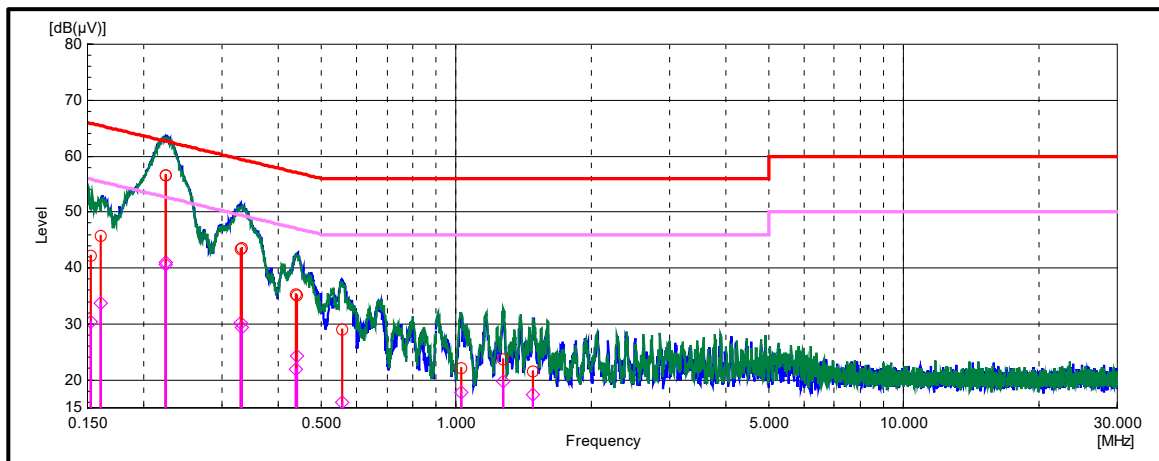
**Results: 802.11n / 40 MHz / MCS0 / PWR 44**

**Results: Neutral / Average / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1610	Neutral	33.70	55.40	21.70	Complied
0.2247	Neutral	41.00	52.60	11.60	Complied
0.3309	Neutral	30.20	49.40	19.20	Complied
0.4398	Neutral	24.30	47.10	22.80	Complied
1.0257	Neutral	17.70	46.00	28.30	Complied
1.4854	Neutral	17.40	46.00	28.60	Complied

**Result: Pass**

**Plot: Live and Neutral Line / 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: 802.11n / 40 MHz / MCS0 / PWR 44****Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.2214	Live	55.00	62.80	7.80	Complied
0.2791	Live	41.00	60.80	19.80	Complied
0.3351	Live	47.40	59.30	11.90	Complied
0.4478	Live	39.00	56.90	17.90	Complied
1.1374	Live	26.40	56.00	29.60	Complied
2.6124	Live	20.20	56.00	35.80	Complied

**Results: Live / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.2214	Live	39.70	52.80	13.10	Complied
0.2791	Live	25.60	50.80	25.20	Complied
0.3351	Live	31.20	49.30	18.10	Complied
0.4478	Live	23.40	46.90	23.50	Complied
1.1374	Live	21.80	46.00	24.20	Complied
2.6124	Live	16.20	46.00	29.80	Complied

**Results: Neutral / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.1655	Neutral	45.60	65.20	19.60	Complied
0.2212	Neutral	55.80	62.80	7.00	Complied
0.3350	Neutral	47.80	59.30	11.50	Complied
0.4479	Neutral	39.90	56.90	17.00	Complied
1.1415	Neutral	25.60	56.00	30.40	Complied
1.9312	Neutral	20.70	56.00	35.30	Complied

**Transmitter AC Conducted Spurious Emissions (continued)**

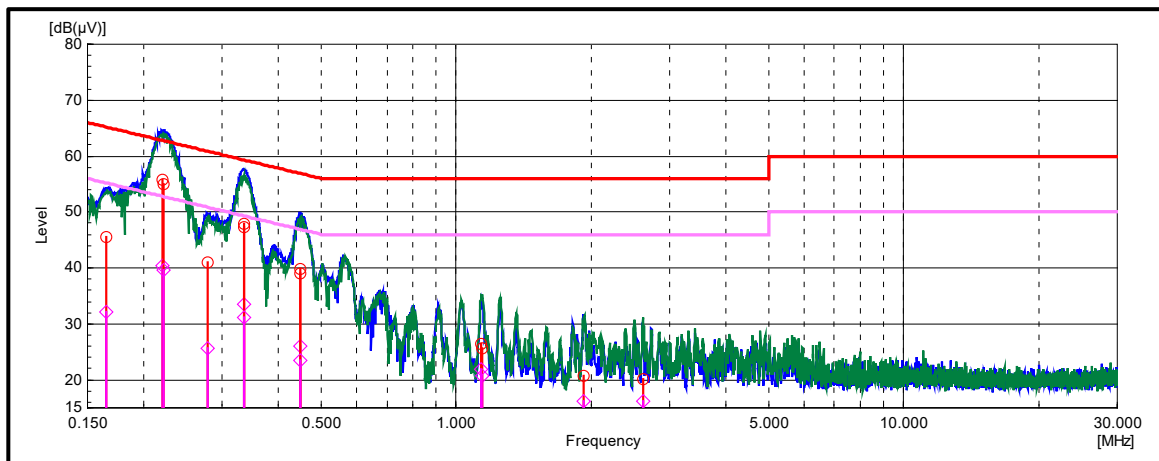
**Results: 802.11n / 40 MHz / MCS0 / PWR 44**

**Results: Neutral / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1655	Neutral	32.20	55.20	23.00	Complied
0.2212	Neutral	40.30	52.80	12.50	Complied
0.3350	Neutral	33.60	49.30	15.70	Complied
0.4479	Neutral	26.00	46.90	20.90	Complied
1.1415	Neutral	20.70	46.00	25.30	Complied
1.9312	Neutral	16.20	46.00	29.80	Complied

**Result: Pass**

**Plot: Live and Neutral Line / 240 VAC 60 Hz**



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



**5.2.2. Transmitter Minimum 6 dB Bandwidth**

**Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	12 August 2020
<b>Test Sample Serial Number:</b>	EUT4 (Conducted Test Sample)		
<b>Test Site Identification</b>	SR 9		

<b>FCC Reference:</b>	Part 15.247(a)(2)
<b>Test Method Used:</b>	FCC KDB 558074 Section 8.2 referencing ANSI C63.10:2013 Section 11.8.1 Option 2

**Environmental Conditions:**

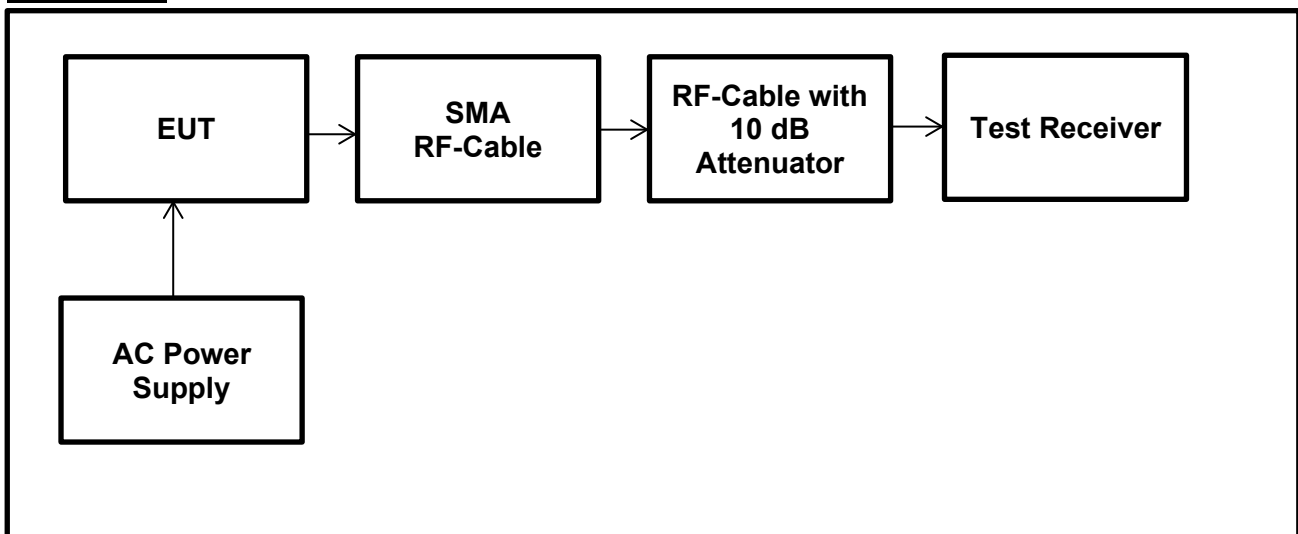
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	44

**Notes:**

1. The measurements were performed using the above configurations on the bottom, middle and top channels in accordance FCC KDB 558074 Section 8.2 referencing ANSI C63.10 Section 11.8 (11.8.1 Option 2 measurement procedure).
2. The spectrum analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
3. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.
  - o The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.5 dB at the tested frequencies.
  - o The RF cable from the EUT to Analyzer with maximum attenuation of 0.5 dB at the tested frequencies including the 10 dB attenuator at the input of Spectrum Analyzer

Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots.

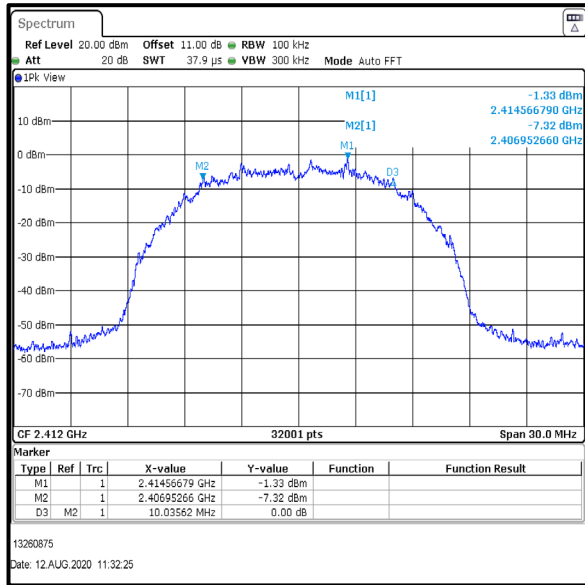
**Test Setup:**



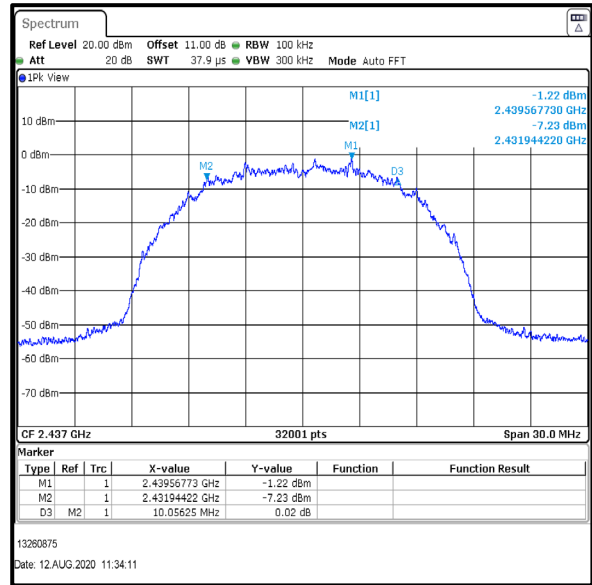
**Transmitter Minimum 6 dB Bandwidth (continued)**

**Results: 802.11b / 20 MHz / 1 Mbps / PWR 44**

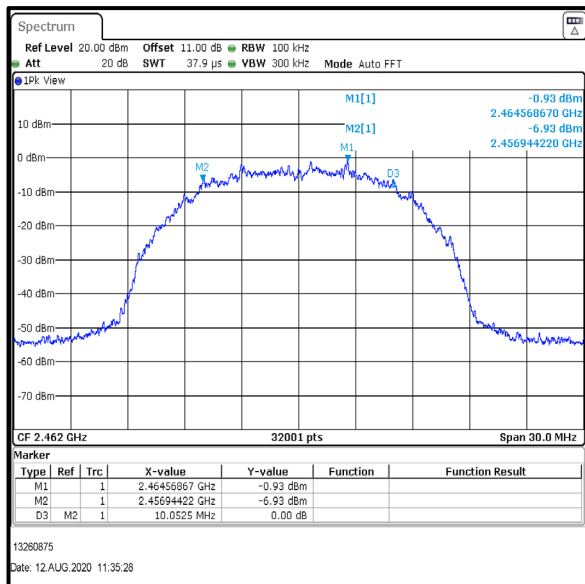
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	10035.62	≥ 500	9535.62	Complied
Middle	10056.25	≥ 500	9556.25	Complied
Top	10052.50	≥ 500	9552.50	Complied



**Bottom Channel**



**Middle Channel**



**Top Channel**

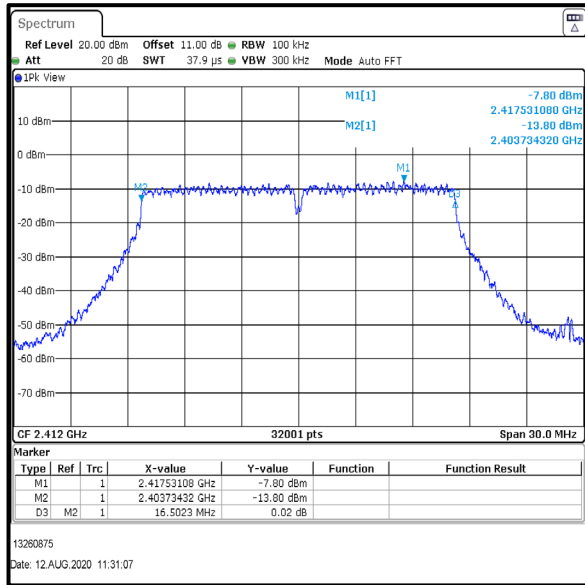
**Result: Pass**



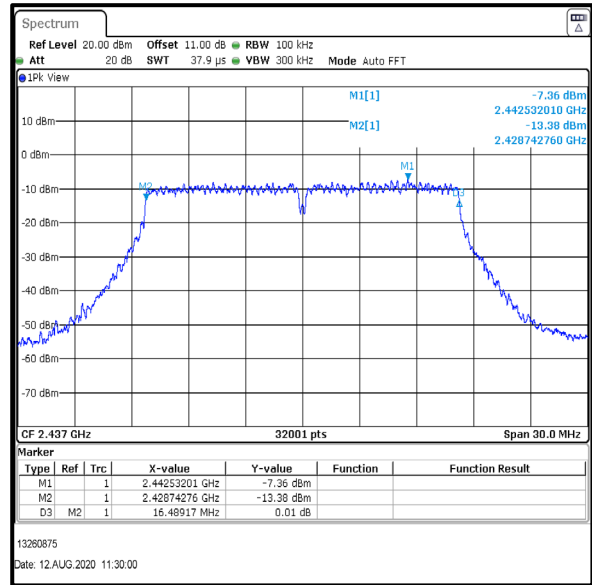
**Transmitter Minimum 6 dB Bandwidth (continued)**

**Results: 802.11g / 20 MHz / 12 Mbps / PWR 44**

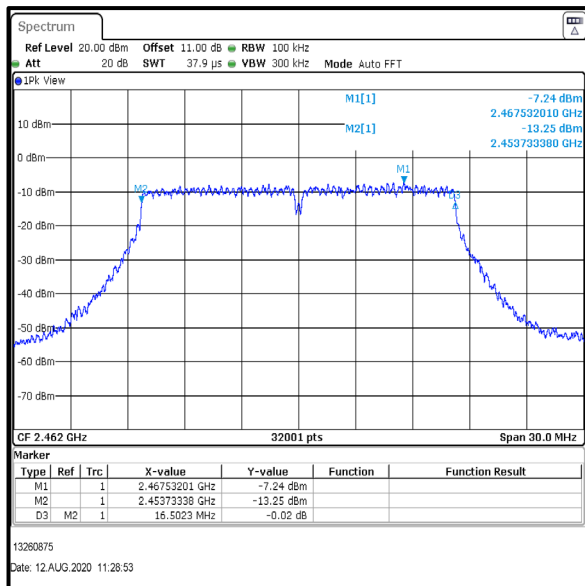
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16502.30	≥ 500	16002.30	Complied
Middle	16489.17	≥ 500	15989.17	Complied
Top	16502.30	≥ 500	16002.30	Complied



Bottom Channel



Middle Channel



Top Channel

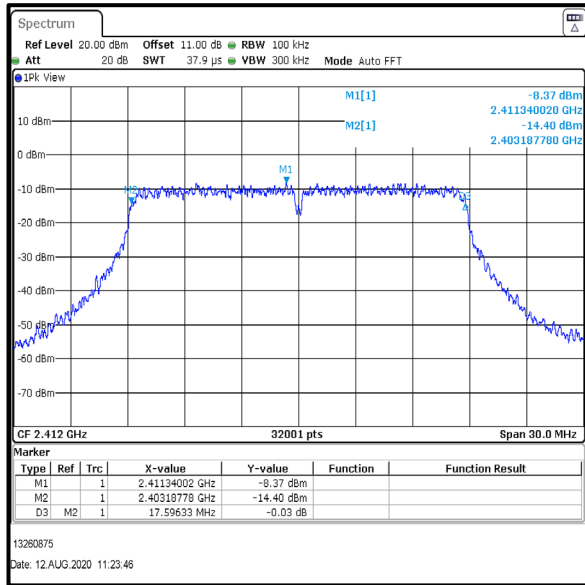
Result: **Pass**



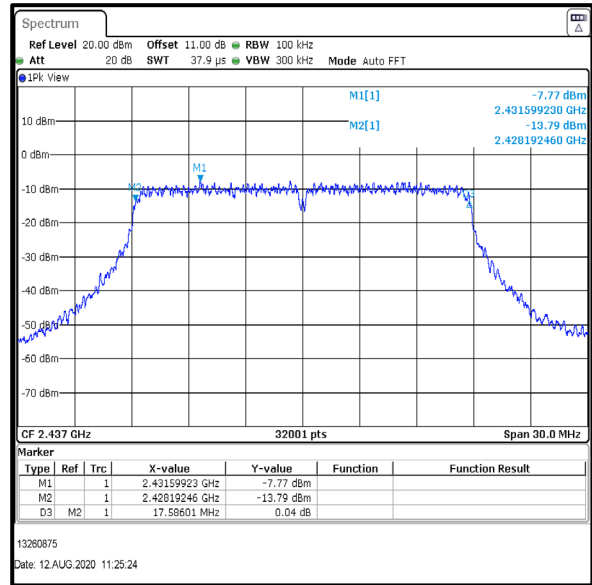
**Transmitter Minimum 6 dB Bandwidth (continued)**

**Results: 802.11n / 20 MHz / MCS0 / PWR 44**

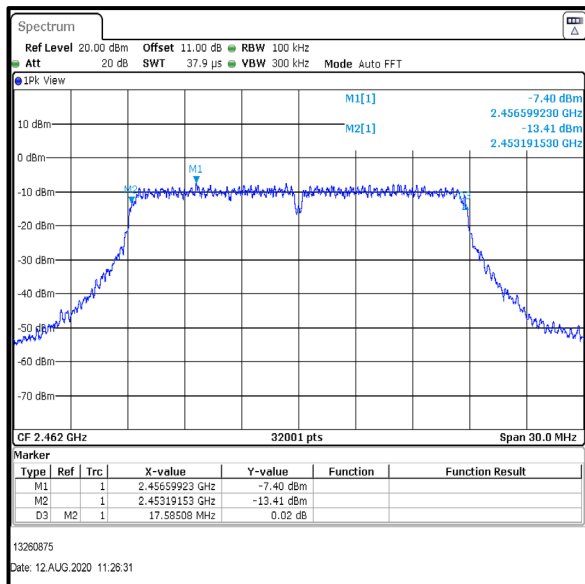
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17596.33	≥ 500	17096.33	Complied
Middle	17586.01	≥ 500	17086.01	Complied
Top	17585.08	≥ 500	17085.08	Complied



**Bottom Channel**



**Middle Channel**



**Top Channel**

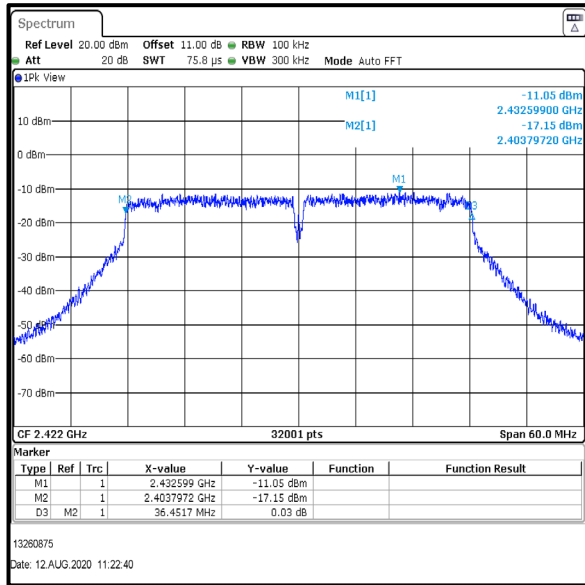
**Result: Pass**



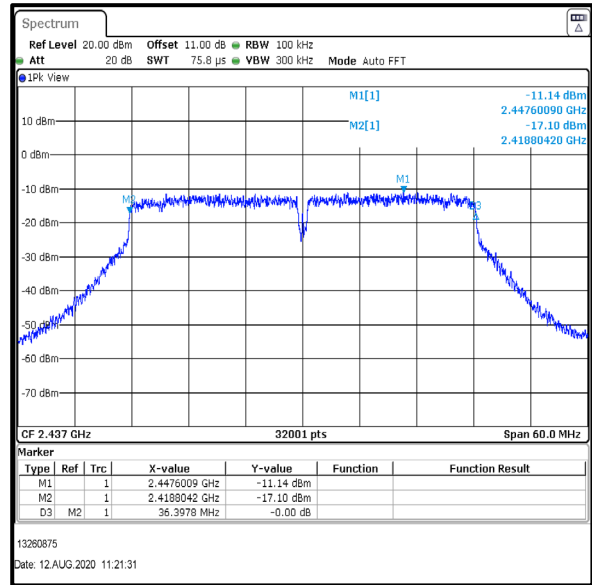
**Transmitter Minimum 6 dB Bandwidth (continued)**

**Results: 802.11n / 40 MHz / MCS0 / PWR 44**

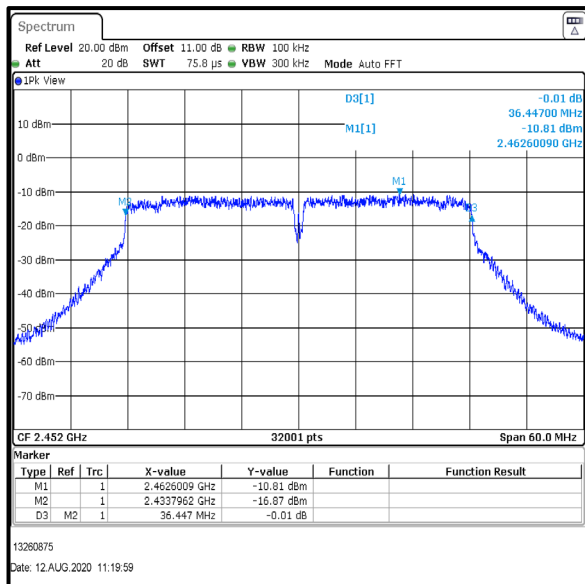
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	36451.70	≥ 500	35951.70	Complied
Middle	36397.80	≥ 500	35897.80	Complied
Top	36447.00	≥ 500	35947.00	Complied



Bottom Channel



Middle Channel



Top Channel

Result: **Pass**



**5.2.3. Transmitter Duty Cycle**

**Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	12 August 2020
<b>Test Sample Serial Number:</b>	EUT4 (Conducted Test Sample)		
<b>Test Site Identification</b>	SR 9		

<b>FCC Reference:</b>	Part 15.35(c)
<b>Test Method Used:</b>	FCC KDB 558074 Section 6.0 referencing ANSI C63.10 Section 11.6

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	44

**Notes:**

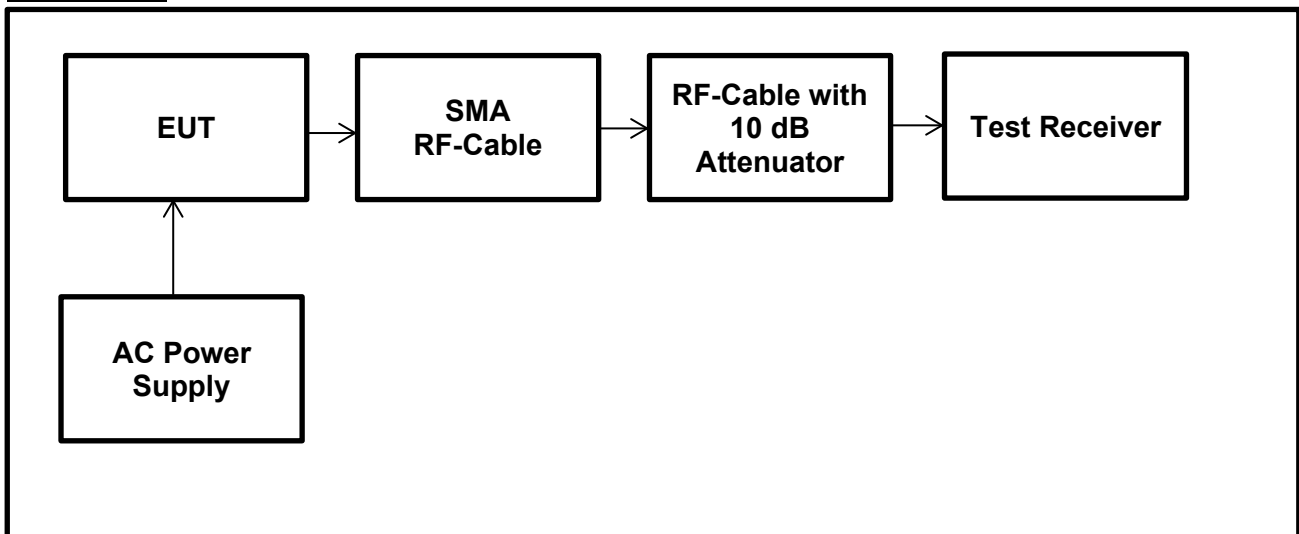
1. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:  

$$\text{Duty Cycle (\%)} = 100 \times [\text{On Time } (T_{ON})] / [\text{Period}(T_{ON} + T_{OFF}) \text{ or } 100\text{ms whichever is the lesser}]$$

$$\text{Duty Cycle Correction Factor} = 10 \log 1 / [\text{On Time } (T_{ON})] / [\text{Period}(T_{ON} + T_{OFF}) \text{ or } 100\text{ms whichever is the lesser}]$$
2. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.
  - o The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.5 dB at the tested frequencies.
  - o The RF cable from the EUT to Analyzer with maximum attenuation of 0.5 dB at the tested frequencies including the 10 dB attenuator at the input of Spectrum Analyzer

Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots.

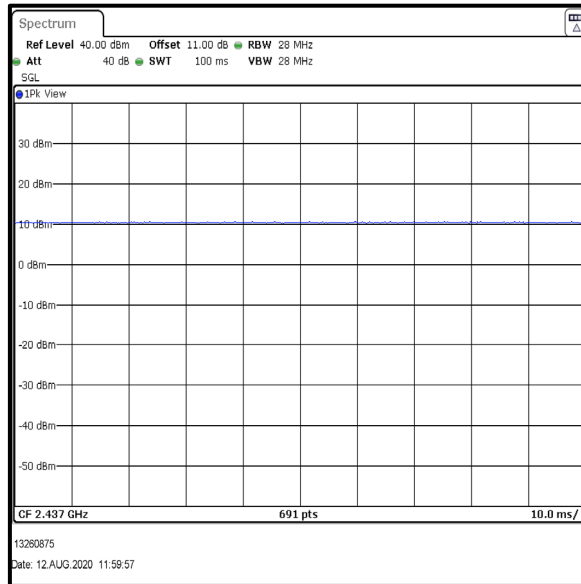
**Test Setup:**



**Transmitter Duty Cycle (continued)**

**Results: 802.11b / 20 MHz / 1 Mbps / PWR 44**

Pulse On Time (T <sub>ON</sub> ) (ms)	Pulse Period (T <sub>ON</sub> +T <sub>OFF</sub> ) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
100	100	100.00	0.0

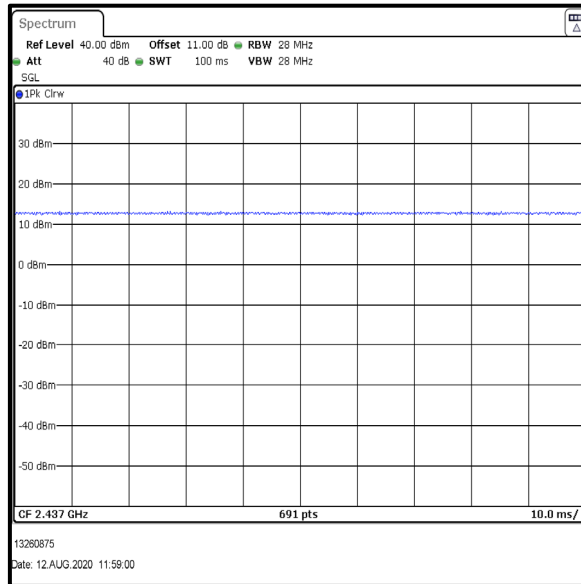


**Result: Pass**

**Transmitter Duty Cycle (continued)**

**Results: 802.11g / 20 MHz / 12 Mbps / PWR 44**

Pulse On Time (T <sub>ON</sub> ) (ms)	Pulse Period (T <sub>ON</sub> +T <sub>OFF</sub> ) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
100	100	100.00	0.0



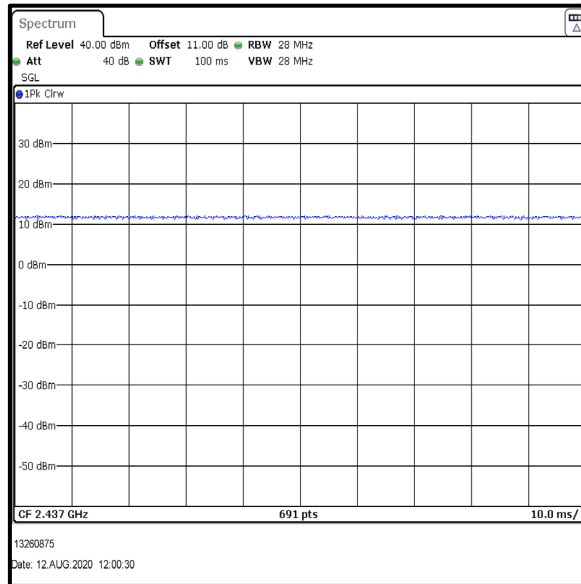
**Result: Pass**



**Transmitter Duty Cycle (continued)**

**Results: 802.11n / 20 MHz / MCS0 / PWR 44**

Pulse On Time (T <sub>ON</sub> ) (ms)	Pulse Period (T <sub>ON</sub> +T <sub>OFF</sub> ) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
100	100	100.00	0.0

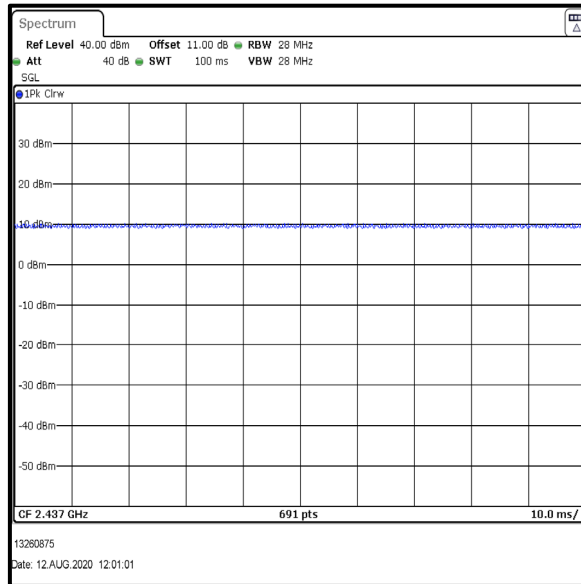


**Result: Pass**

**Transmitter Duty Cycle (continued)**

**Results: 802.11n / 40 MHz / MCS0 / PWR 44**

Pulse On Time (T <sub>ON</sub> ) (ms)	Pulse Period (T <sub>ON</sub> +T <sub>OFF</sub> ) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
100	100	100.00	0.0



**Result: Pass**

**5.2.4. Transmitter Power Spectral Density**

**Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	12 August 2020
<b>Test Sample Serial Number:</b>	EUT4 (Conducted Test Sample)		
<b>Test Site Identification</b>	SR 9		

<b>FCC Reference:</b>	Part 15.247(e)
<b>Test Method Used:</b>	FCC KDB 558074 Section 8.4 referencing ANSI C63.10 Sections 11.10.3

**Environmental Conditions:**

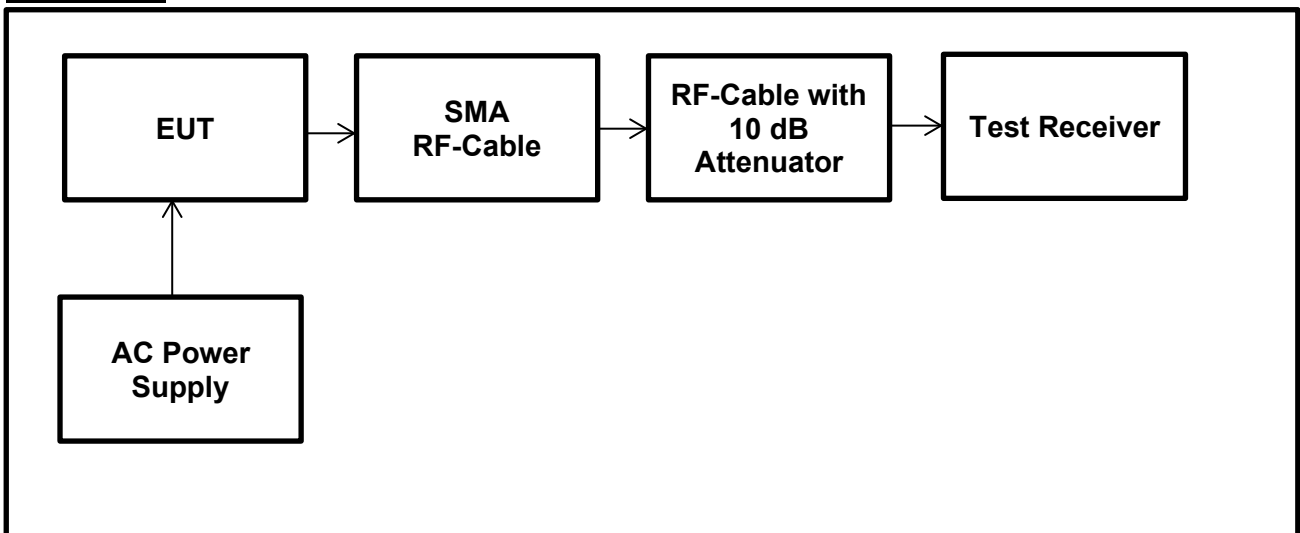
<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	44

**Notes:**

1. Final measurements were performed using the above configurations on the bottom, middle and top channels.
2. As the EUT was transmitting continuously at duty cycle  $\geq 98\%$ , the testing was performed in accordance with ANSI C63.10 Section 11.10.3 Method AVGPSSD-1. Therefore, no Duty Cycle Correction Factor is required for average measurements.
3. The signal analyser resolution bandwidth was set to 3 kHz and video bandwidth 10 kHz. An RMS detector was used and sweep time was set to Auto to perform power averaging over 200 traces. The span was set to  $>1.5$  times the DTS emission bandwidth. The highest peak of the measured signal was recorded.
4. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.
  - o The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.5 dB at the tested frequencies.
  - o The RF cable from the EUT to Analyzer with maximum attenuation of 0.5 dB at the tested frequencies including the 10 dB attenuator at the input of Spectrum Analyzer

Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots. The duty cycle measurement was performed with

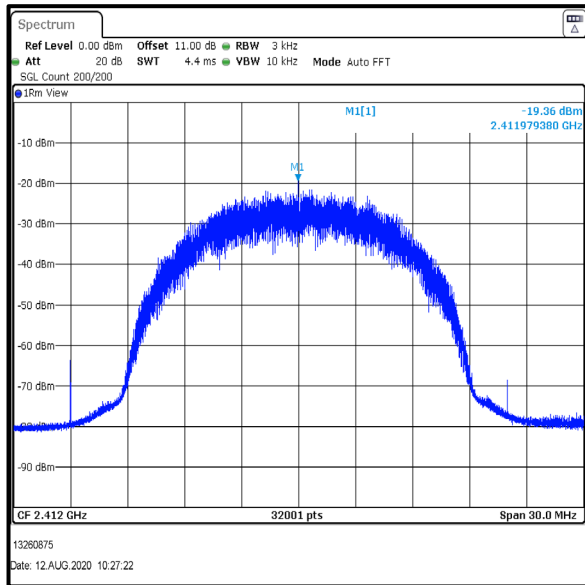
**Test Setup:**



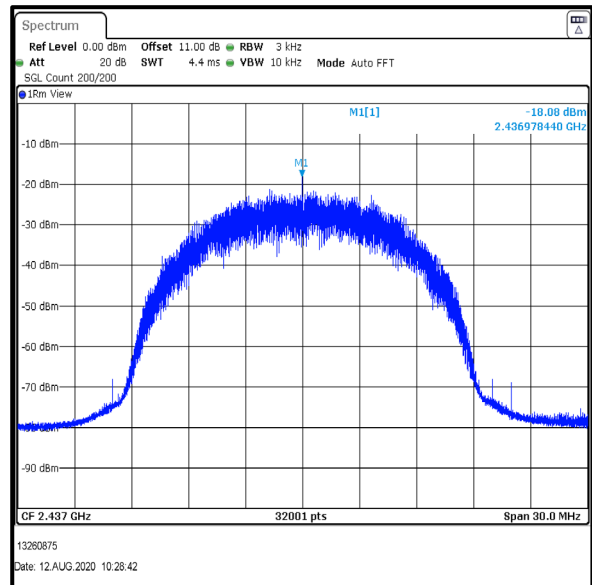
**Transmitter Power Spectral Density (continued)**

**Results: 802.11b / 20 MHz / 1 Mbps / PWR 44**

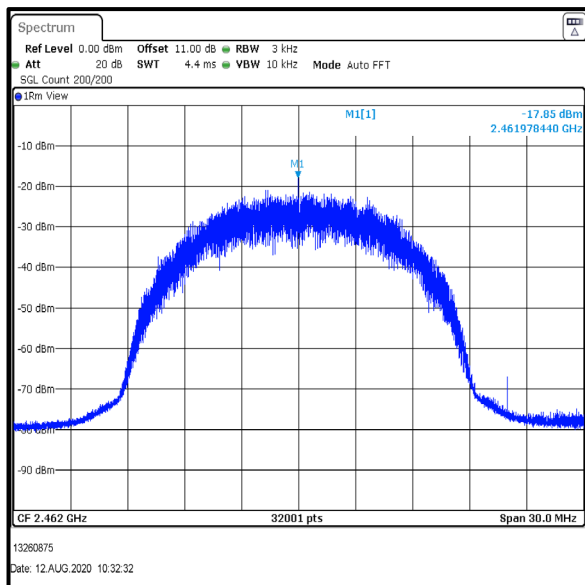
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-19.36	8.0	27.36	Complied
Middle	-18.08	8.0	26.08	Complied
Top	-17.85	8.0	25.85	Complied



**Bottom Channel**



**Middle Channel**



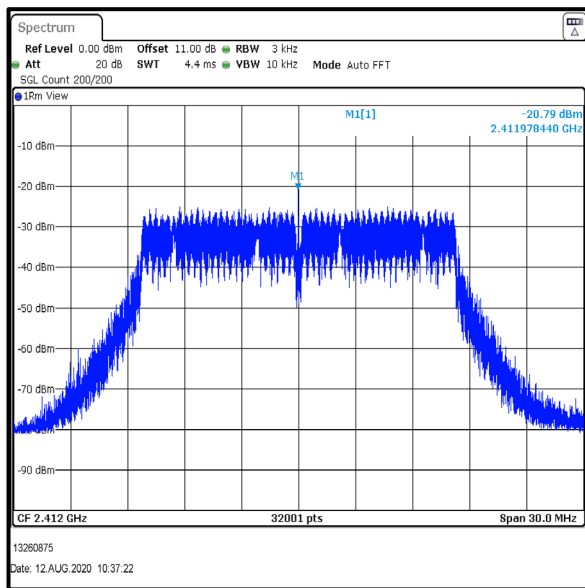
**Top Channel**

**Result: Pass**

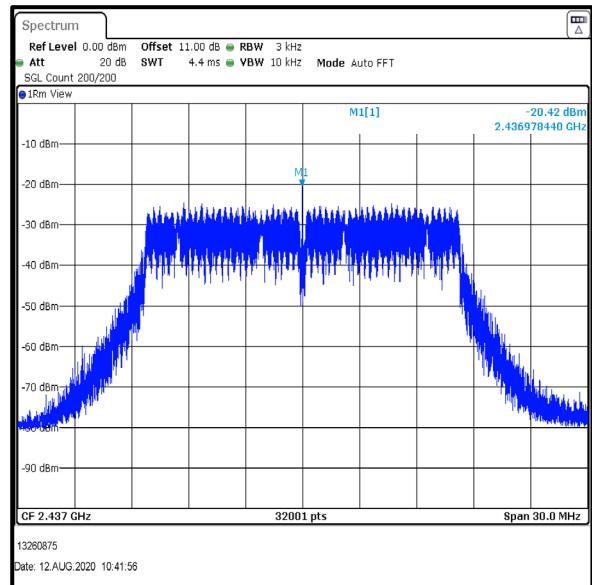
**Transmitter Power Spectral Density (continued)**

**Results: 802.11g / 20 MHz / 12 Mbps / PWR 44**

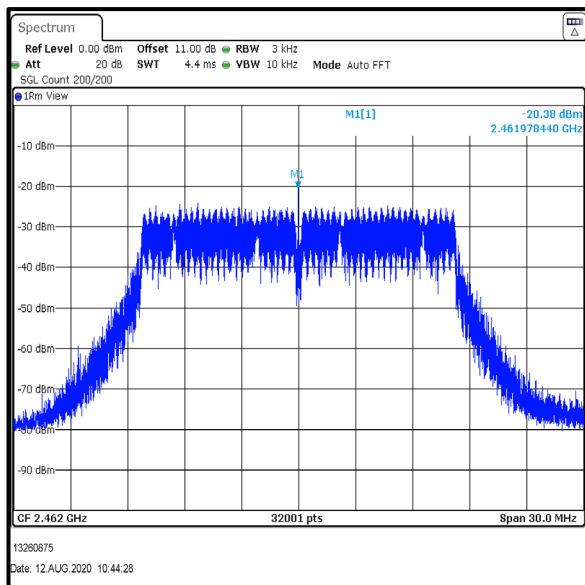
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-20.79	8.0	28.79	Complied
Middle	-20.42	8.0	28.42	Complied
Top	-20.38	8.0	28.38	Complied



**Bottom Channel**



**Middle Channel**



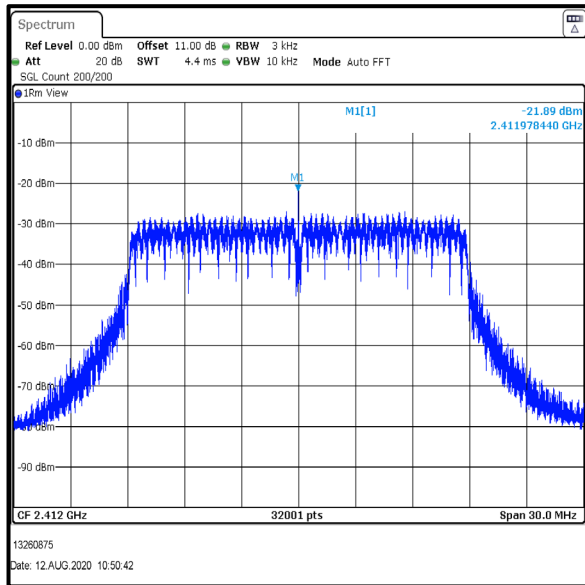
**Top Channel**

**Result: Pass**

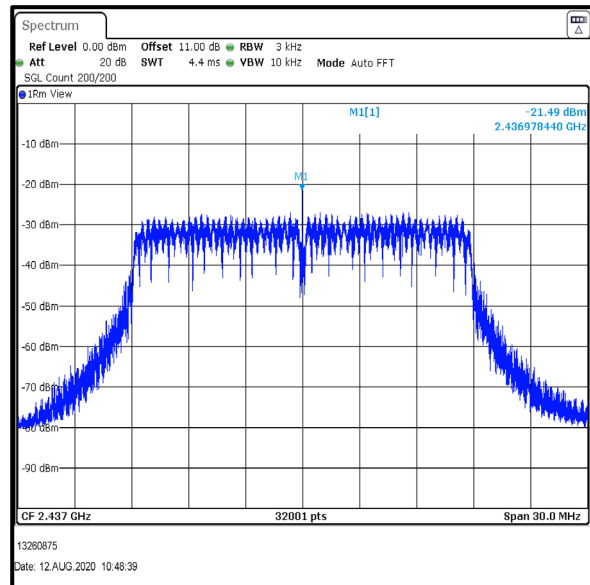
**Transmitter Power Spectral Density (continued)**

**Results: 802.11n / 20 MHz / MCS0 / PWR 44**

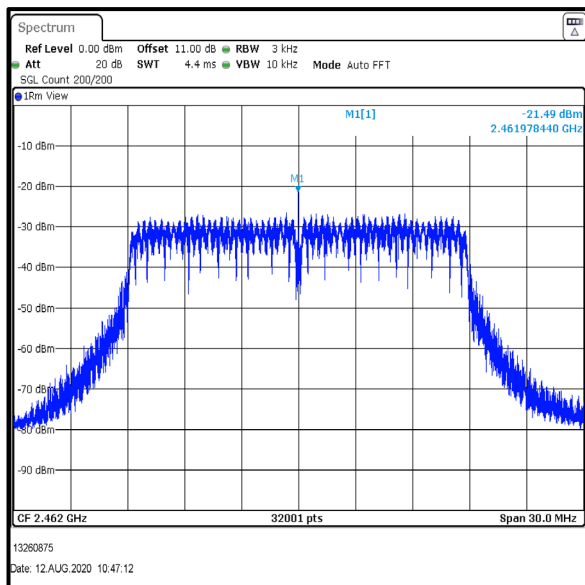
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-21.89	8.0	29.89	Complied
Middle	-21.49	8.0	29.49	Complied
Top	-21.49	8.0	29.49	Complied



**Bottom Channel**



**Middle Channel**



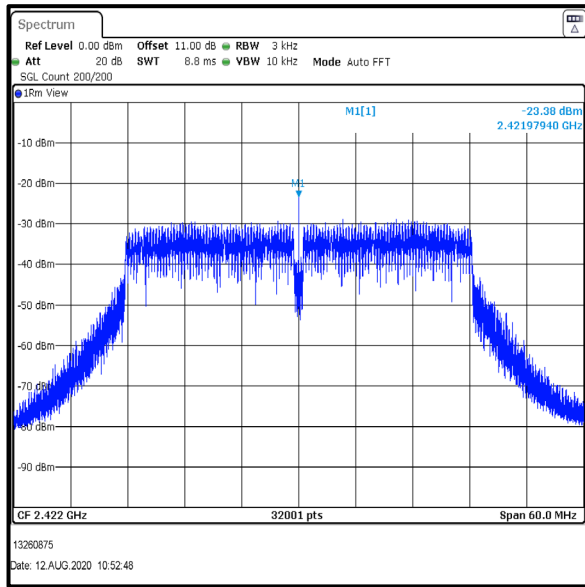
**Top Channel**

**Result: Pass**

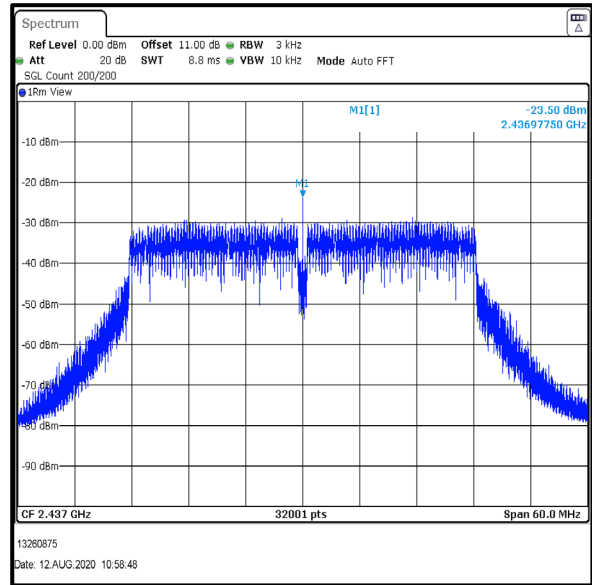
**Transmitter Power Spectral Density (continued)**

**Results: 802.11n / 40 MHz / MCS0 / PWR 44**

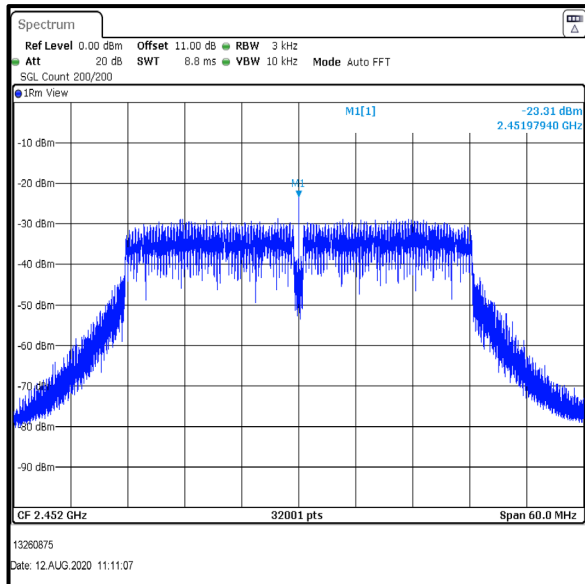
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-23.38	8.0	31.38	Complied
Middle	-23.50	8.0	31.50	Complied
Top	-23.31	8.0	31.31	Complied



**Bottom Channel**



**Middle Channel**



**Top Channel**

**Result: Pass**

**5.2.5. Transmitter Maximum (Average) Output Power****Test Summary:**

<b>Test Engineer:</b>	Sercan Usta	<b>Test Date:</b>	12 August 2020
<b>Test Sample Serial Number:</b>	EUT4 (Conducted Test Sample)		
<b>Test Site Identification</b>	SR 9		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	44

**Notes:**

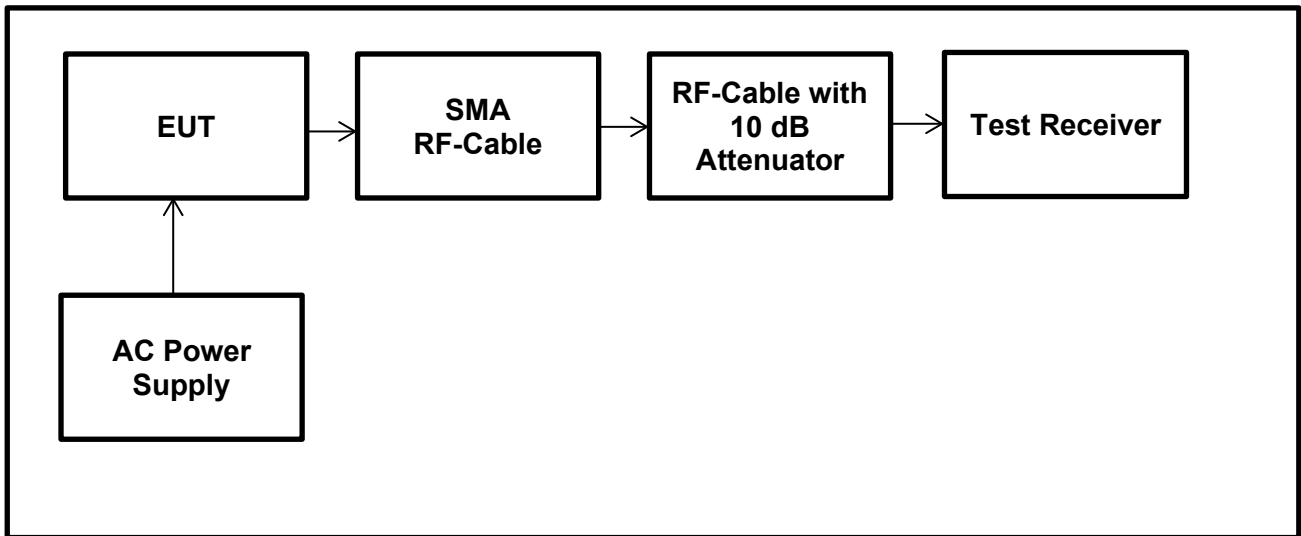
1. Final measurements were performed using the below configurations on the bottom, middle and top channels. The power has been integrated over the 99% emission bandwidth. Plots for the occupied bandwidth are archived on the company server and available for inspection upon request.
2. As the EUT was transmitting continuously at duty cycle  $\geq 98\%$ , the testing was performed in accordance with ANSI C63.10 Section 11.9.2.2.2 Method AVGSA-1. Therefore, no Duty Cycle Correction Factor is required for average measurements.
3. The signal analyser's integration function was used to integrate across the 99% occupied bandwidth. An RMS detector was used and sweep time was set to auto to perform power averaging over 300 traces. The span was set to  $> 1.5$  times the 99% occupied emission bandwidth.
  - For 20 MHz Bandwidth : resolution bandwidth 500 kHz and video bandwidth 2 MHz were used.
  - For 40 MHz Bandwidth : resolution bandwidth of 1 MHz and video bandwidth 3 MHz were used.
4. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.
  - The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.5 dB at the tested frequencies.
  - The RF cable from the EUT to Analyzer with maximum attenuation of 0.5 dB at the tested frequencies including the 10 dB attenuator at the input of Spectrum Analyzer

Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots. The duty cycle measurement was performed with



**Transmitter Maximum (Average) Output Power (continued)**

**Test Setup:**



**Transmitter Maximum (Average) Output Power (continued)****Results: 802.11b / 20 MHz / 1 Mbps / PWR 44****Conducted Power Limit Comparison**

Channel	Conducted Average Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	6.68	30.0	23.32	Complied
Middle	6.94	30.0	23.06	Complied
Top	7.19	30.0	22.81	Complied

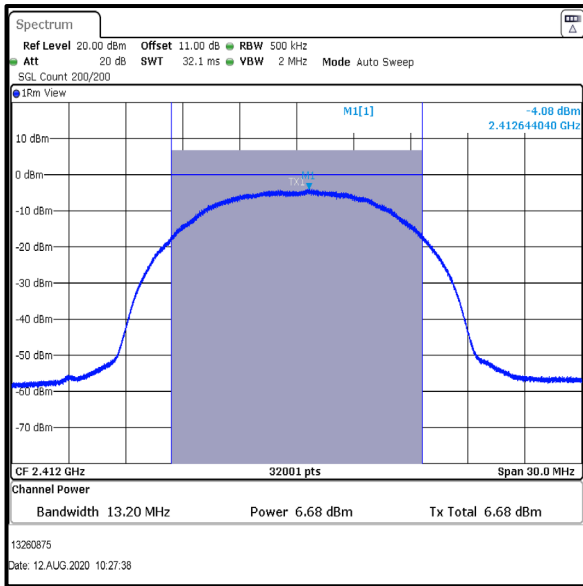
**De Facto EIRP Limit Comparison**

Channel	Conducted Average Power (dBm)	Declared Antenna Gain (dBi)	Average EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	6.68	4.9	11.58	36.0	24.42	Complied
Middle	6.94	4.9	11.84	36.0	24.16	Complied
Top	7.19	4.9	12.09	36.0	23.91	Complied

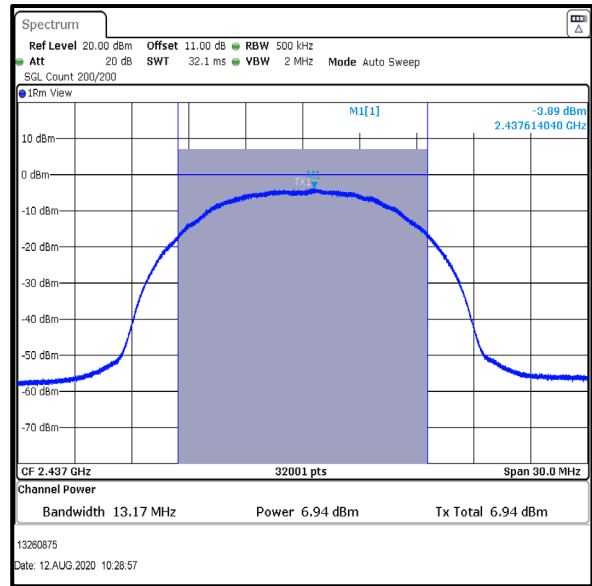
**Result: Pass**

### Transmitter Maximum (Average) Output Power (continued)

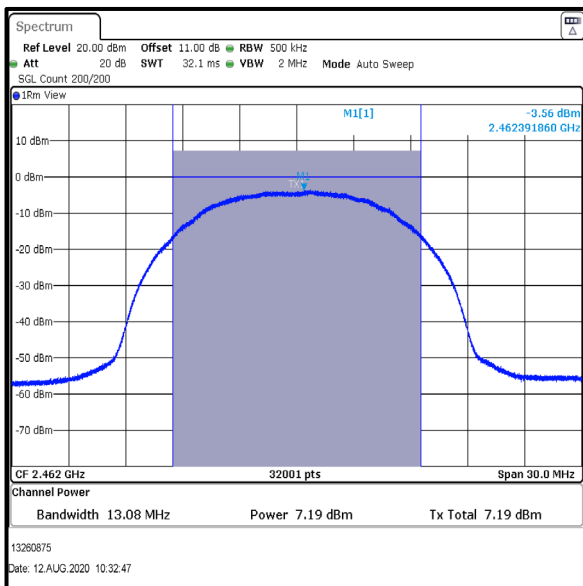
#### Results: 802.11b / 20 MHz / 1 Mbps / PWR 44



Bottom Channel



Middle Channel



Top Channel

**Transmitter Maximum (Average) Output Power (continued)****Results: 802.11g / 20 MHz / 12 Mbps / PWR 44****Conducted Power Limit Comparison**

Channel	Conducted Average Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	5.91	30.0	24.09	Complied
Middle	6.17	30.0	23.83	Complied
Top	6.41	30.0	23.59	Complied

**De Facto EIRP Limit Comparison**

Channel	Conducted Average Power (dBm)	Declared Antenna Gain (dBi)	Average EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	5.91	4.9	10.81	36.0	25.19	Complied
Middle	6.17	4.9	11.07	36.0	24.93	Complied
Top	6.41	4.9	11.31	36.0	24.69	Complied

**Result: Pass**