TEST REPORT

Test Report No. : UL-RPT-RP-13697467-116-FCC

Applicant	:	Boxine GmbH
Model No.	:	03-xxxx (colour coding)
FCC ID	:	2AU47-00002
Technology	:	WLAN 2.4 GHz (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-13697467-116-FCC Version 1.1, Issue Date 10 AUGUST 2021 replaces
   Test Report No. UL-RPT-RP-13697467-116-FCC Version 1.0, Issue Date 12 JULY 2021, which is no longer valid.
5. Result of the tested sample: **PASS**

Prepared by: Sercan, Usta
Title: Laboratory Engineer
Date: 10 August 2021

Approved by: Ajit, Phadtare
Title: Lead Test Engineer
Date: 10 August 2021

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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1. Customer Information

1.1.Applicant Information

Company Name:	Boxine GmbH
Company Address:	Grafenberger Allee 120, 40237 Düsseldorf, GERMANY
Contact Person:	Andrej Henkel
Contact E-Mail Address:	andrej.henkel@boxine.de
Contact Phone No.:	+49 211 542540-49

1.2.Manufacturer Information

Company Name:	Boxine GmbH
Company Address:	Grafenberger Allee 120, 40237 Düsseldorf, GERMANY
Contact Person:	Andrej Henkel
Contact E-Mail Address:	andrej.henkel@boxine.de
Contact Phone No.:	+49 211 542540-49

2. Summary of Testing

2.1. General Information

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

Applied Standards

Location

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

Date information

Order Date:	29 January 2021
EUT arrived:	06 April 2021
Test Dates:	14 April 2021 to 09 July 2021
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 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	☒	☐	☐	☐
Part 15.35(c)	Transmitter Duty Cycle(1)	☒	☐	☐	☐
Part 15.247(e)	Transmitter Power Spectral Density	☒	☐	☐	☐
Part 15.247(b)(3)	Transmitter Maximum (Peak) Output Power	☒	☐	☐	☐
Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	☒	☐	☐	☐
Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	☒	☐	☐	☐

Note(s):

1. The measurement was performed to assist in the calculation of the average measurements.

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 558074 D01 DTS Meas Guidance v05r02 April 2, 2019
Title:	Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC rules
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. 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)

Brand Name:	Toniebox Starterset
Model Name or Number:	03-xxxx (colour coding)
Serial Number:	TB1.5 *(Radiated RF Sample)*
MAC ID:	90-E2-02-20-AC-6C (TB 1.5 Radio 1)
Hardware Version Number:	1.5
Software Version Number:	Radio Tool Firmware für CC3235
FCC ID:	2AU47-00002

Brand Name:	Toniebox Starterset
Model Name or Number:	03-xxxx (colour coding)
Serial Number:	TB1.5 *(Conducted RF Sample)*
MAC ID:	90:E2:02:23:C5:B7 (TB 1.5 Radio 2)
Hardware Version Number:	1.5
Software Version Number:	Radio Tool Firmware für CC3235
FCC ID:	2AU47-00002

Brand Name:	Tonies
Model Name or Number:	DYS619-090150W-2
Serial Number:	DYS619-090150-16917A
Hardware Version Number:	1.0
Additional Details:	AC-DC Adapter- Switching Mode Power Supply
	100-240 V AC / 0.5 A / 50Hz to 9 V DC / 1.5 A

3.2. Description of EUT

The equipment under test was a Toniebox Starterset consists of the Toniebox itself, a power supply including docking station DYS 619 and Tonie Lauscher (headset). Toniebox Starterset is an Audio system for children. Tonie figures to be purchased separately are placed on the Toniebox (TB).

An RFID receiver in the Toniebox reads the product ID from the figure (passive RFID chip in the Tonie figure). Via the WLAN module in the TB, the audio content is downloaded from the Boxine-Tonie cloud to the TB's internal memory (flash drive) via the Internet and played back via the TB speaker or Headphone.

This device supports WLAN 2.4 GHz 802.11 b-, g-, n-modes, operations in 2.4 – 2.4835 GHz ISM & WLAN 5GHz a-, n-modes, operations in U-NII-1 5 GHz bands.

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 802.11b/g/n) / Digital Transmission System	
Type of Unit:	Transceiver	
Modulation Type:	DSSS, CCK, OFDM	
Supported Data Rates:	802.11b	1 Mbps &11 Mbps
	802.11g	54 Mbps
	802.11n	MCS7 (65 Mbps)
Power Supply Type 1:	AC-DC Adapter- Switching Mode Power Supply	
Power Supply Requirement(s):	100-240 V AC / 0.5 A / 50Hz to 9 V DC / 1.5 A	
Power Supply Type 2:	Internal Rechargeable Battery via AC /DC Adapter	
Power Supply Requirement(s):	3.6 V DC / 0.1 A	
Measured Maximum Conducted Output Power:	17.01 dBm	
Antenna Type:	PCB Antenna	
Antenna Description:	Integral	
Declared Antenna Gain:	4.0 dBi	
Channel Spacing:	20 MHz	
Transmit Frequency Range:	2412 MHz to 2462 MHz	
Transmit Channels Tested:	**Channel Number**	**Channel Frequency (MHz)**
	1	2412
	6	2437
	11	2462

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	-/-	-/-	-/-	-/-

B. Support Equipment (Manufacturer supplied)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Programming PCB	Boxine	Debug Board 1.0	N/A
2	Laptop with (Radio Tool Firmware für CC3235)	Lenovo	DE01244	PF-2CVWY5
3	USB Cable	N/A	N/A	N/A

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 maximum power setting and a combination of: • b-Mode | 11 Mbps | Packetsize 100 Bytes | Power Level 0* • g-Mode | 54 Mbps | Packetsize 1400 Bytes | Power Level 0* • n-Mode HT20 | MCS7 | Packetsize 1400 Bytes | Power Level 0*
*As per applicant's declration the EUT implments 802.11b mode 1 Mbps & 11 Mbps, 802.11g mode 54 Mbps and 802.11n mode MCS7. Multiple supported modulation schemes, nominal channel bandwidths were initially investigated to determine the above mentioned worst case data rates (terms highest output power, highest output power spectral density).

4.2. Configuration and Peripherals

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

EUT Power Supply:

- The EUT can powered via either with AC/DC power adapter or charged internal battery.
- The critical tests (RF output power, power spectral density, occupied bandwidth) were performed once with AC/DC power adapter and also with fully charged internal battery.
- All radiated spurious emissions have been performed only with EUT powered via AC/DC power adapter.
- For AC conducted line emissions measurement the EUT was powered via AC/DC power adapter The measurments were carried out with 120 VAC /60 Hz & 240 VAC/60 Hz.

Test Mode Activation:

- The EUT programmed via programming PCB which supplied by customer.
- The EUT was controlled using a software application named CC3235 Radio Tool supplied by the customer. The application was used to enable continuous transmission and to select the test channels as required.
- The transmitter test modes were configured to maximum supported power settings (PWR 0).
- As the EUT continuous transmission of the EUT (D ≥ 98%) cannot be achieved and EUT was transmitting continuously with a constant Duty Cycle of
    - 802.11b I 11 Mbps : 40.78 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 3.90 dB was added to all average measurements
    - 802.11g I 54 Mbps : 39.20 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 4.07 dB was added to all average measurements
    - 802.11n(HT20) I MCS7: 33.50 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 4.75 dB was added to all average measurements

  to compute the corrected average values of the emissions that would have been measured had the test been performed at 100% Duty Cycle.

Conducted Measurements:

- All conducted measurements were carried out by using conducted samples U.F.L to SMA (Female) RF Cable soldered on PCB by the customer. The maximum attenuation of 0.40 dB at the tested frequencies was added to a reference level offset to each of the conducted plots.

Radiated Measurements:

- In accordance with ANSI C63.10 section 5.10.7, the EUT allows for the connection of external accessories, including external electrical control signals. Hence emission tests shall be performed with the EUT and accessories configured in a manner that tends to produce maximum emissions;therefore all radiated tests were performed with EUT powered via AC/DC power adapter120 VAC / 60 Hz.
- Before starting final radiated spurious emission measurements “worst case verification” with the EUT in Staning-position & Laying-position was performed by Lab.
- The EUT in Laying-position was found to be the worst case, with the orientation of the Toniebox-Ears in upper case, therefore this report includes relevant results.
- The radiated measurements below 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the loop antenna height was set to 80 cm.
- The radiated measurements above 30 MHz 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.
- R&S® EMC32 V10.60.10 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:

Test Engineer:	Krume Ivanov	**Test Date:**	20 April 2021 to 22 April 2021
Test Sample Serial Number:	TB1.5 *(Radiated RF Sample)*		
Test Site Identification	SR 7/8		

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

Environmental Conditions:

Temperature (°C):	23.3 to 25.6
Relative Humidity (%):	35.2 to 43.8

Settings of the Instrument

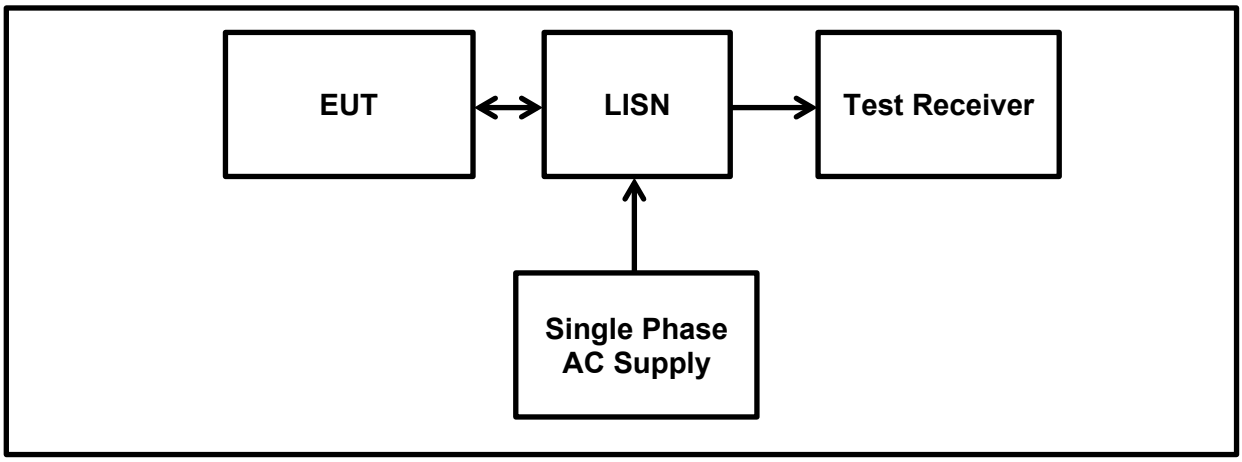
Detector	Quasi Peak/ Average Peak

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 with the following modes:
    - b-Mode | 11 Mbps | Power Level 0 | Channel 11: 2462 MHz
    - g-Mode | 54 Mbps | Power Level 0 | Channel 11: 2462 MHz
    - n-Mode HT20 | MCS7 | Power Level 0 | Channel 11: 2462 MHz
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 and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
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 in a 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: 802.11b / 20 MHz / 11Mbps / PWR 0

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1605	Live	47.00	65.40	18.40	Complied
0.1695	Live	43.50	65.00	21.50	Complied
0.1830	Live	44.40	64.30	19.90	Complied
0.1973	Live	38.00	63.70	25.70	Complied
0.2044	Live	42.60	63.40	20.80	Complied
0.2214	Live	35.10	62.80	27.70	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1605	Live	31.60	55.40	23.80	Complied
0.1695	Live	26.00	55.00	29.00	Complied
0.1830	Live	31.60	54.30	22.70	Complied
0.1973	Live	24.40	53.70	29.30	Complied
0.2044	Live	31.40	53.40	22.00	Complied
0.2214	Live	23.70	52.80	29.10	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1516	Neutral	51.60	65.90	14.30	Complied
0.1589	Neutral	50.00	65.50	15.50	Complied
0.1613	Neutral	46.60	65.40	18.80	Complied
0.1773	Neutral	46.50	64.60	18.10	Complied
0.1916	Neutral	40.20	64.00	23.80	Complied
0.2339	Neutral	34.10	62.30	28.20	Complied

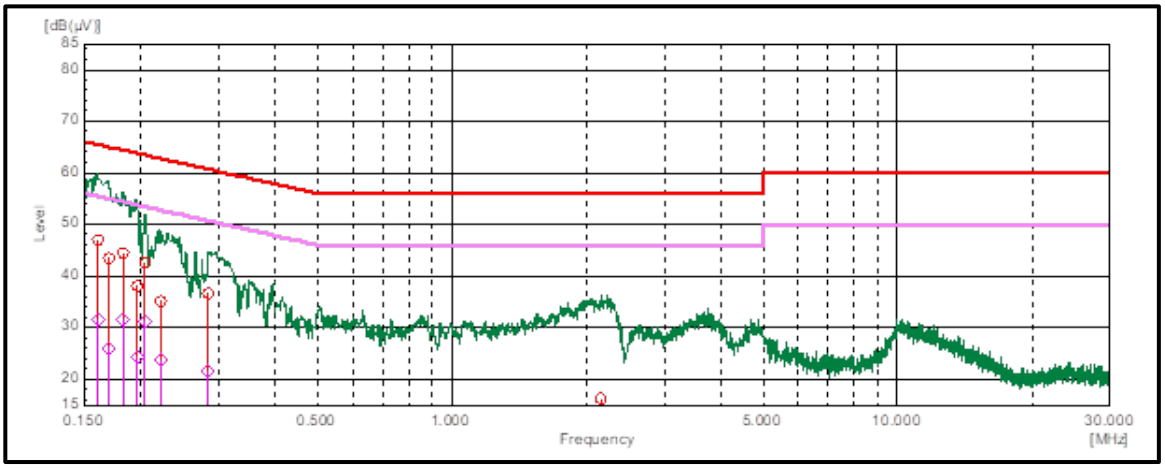
Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1516	Neutral	32.60	55.90	23.30	Complied
0.1589	Neutral	33.10	55.50	22.40	Complied
0.1613	Neutral	30.30	55.40	25.10	Complied
0.1773	Neutral	30.30	54.60	24.30	Complied
0.1916	Neutral	24.40	54.00	29.60	Complied
0.2339	Neutral	24.80	52.30	27.50	Complied

Transmitter AC Conducted Spurious Emissions (continued)

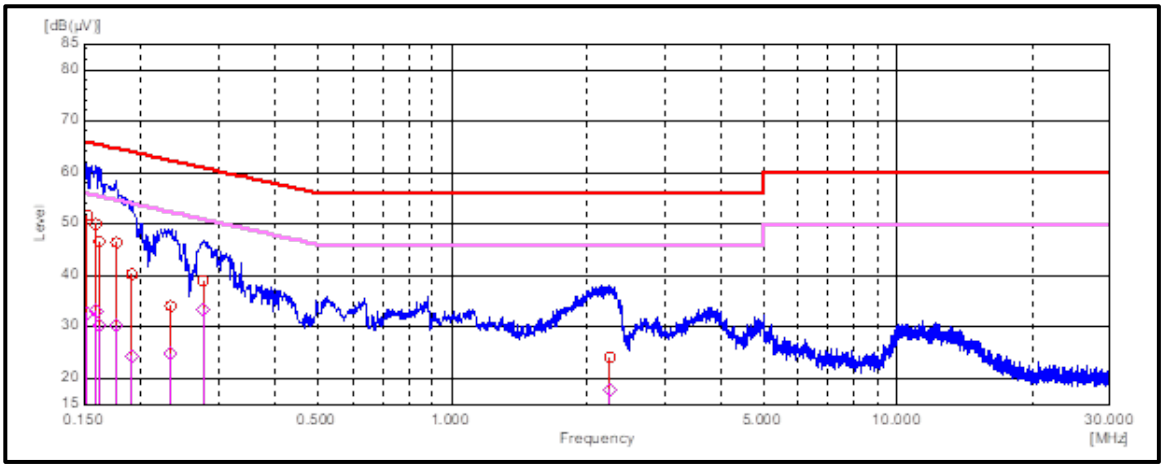
Results: 802.11b / 20 MHz / 11Mbps / PWR 0

Plot: Live Line / 120 VAC 60 Hz



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

Plot: Neutral Line / 120 VAC 60 Hz



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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Results: 802.11b / 20 MHz / 11Mbps / PWR 0

Results: Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1543	Live	45.40	65.80	20.40	Complied
0.1593	Live	44.70	65.50	20.80	Complied
0.1727	Live	44.20	64.80	20.60	Complied
0.1997	Live	40.00	63.60	23.60	Complied
0.2604	Live	39.30	61.40	22.10	Complied
2.1284	Live	28.80	56.00	27.20	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1543	Live	28.30	55.80	27.50	Complied
0.1593	Live	28.10	55.50	27.40	Complied
0.1727	Live	29.80	54.80	25.00	Complied
0.1997	Live	28.70	53.60	24.90	Complied
0.2604	Live	28.60	51.40	22.80	Complied
2.1284	Live	18.30	46.00	27.70	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1562	Neutral	51.90	65.70	13.80	Complied
0.1644	Neutral	49.60	65.20	15.60	Complied
0.2015	Neutral	45.90	63.50	17.60	Complied
0.2109	Neutral	46.50	63.20	16.70	Complied
0.2610	Neutral	38.90	61.40	22.50	Complied
2.0644	Neutral	29.90	56.00	26.10	Complied

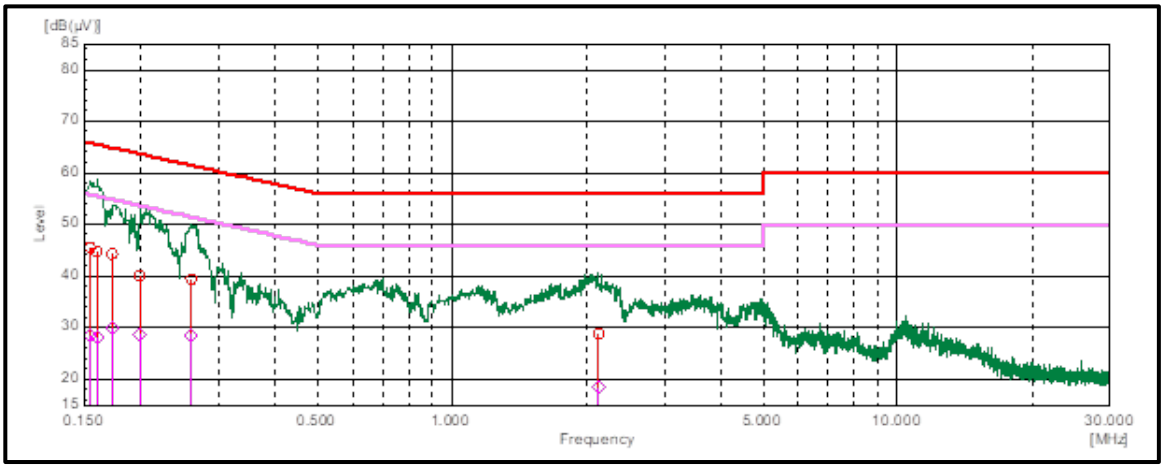
Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1562	Neutral	36.00	55.70	19.70	Complied
0.1644	Neutral	35.90	55.20	19.30	Complied
0.2015	Neutral	34.40	53.50	19.10	Complied
0.2109	Neutral	37.80	53.20	15.40	Complied
0.2610	Neutral	37.50	51.40	13.90	Complied
2.0644	Neutral	18.80	46.00	27.20	Complied

Transmitter AC Conducted Spurious Emissions (continued)

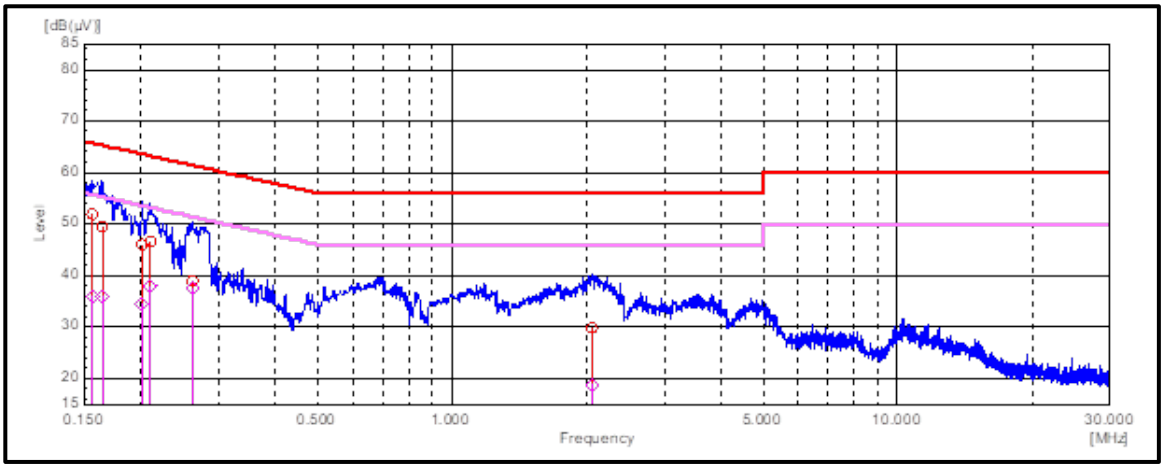
Results: 802.11b / 20 MHz / 11Mbps / PWR 0

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.

Plot: Neutral Line / 240 VAC 60 Hz



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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Results: 802.11g / 20 MHz / 54Mbps / PWR 0

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1593	Live	47.60	65.50	17.90	Complied
0.1654	Live	45.40	65.20	19.80	Complied
0.1900	Live	44.10	64.00	19.90	Complied
0.1987	Live	42.80	63.70	20.90	Complied
0.2784	Live	38.80	60.90	22.10	Complied
1.9920	Live	22.70	56.00	33.30	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1593	Live	47.60	65.50	17.90	Complied
0.1654	Live	45.40	65.20	19.80	Complied
0.1900	Live	44.10	64.00	19.90	Complied
0.1987	Live	42.80	63.70	20.90	Complied
0.2784	Live	38.80	60.90	22.10	Complied
1.9920	Live	22.70	56.00	33.30	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1542	Neutral	48.40	65.80	17.40	Complied
0.1752	Neutral	45.60	64.70	19.10	Complied
0.1835	Neutral	45.10	64.30	19.20	Complied
0.2306	Neutral	38.70	62.40	23.70	Complied
0.2718	Neutral	42.90	61.10	18.20	Complied
0.2965	Neutral	38.50	60.30	21.80	Complied

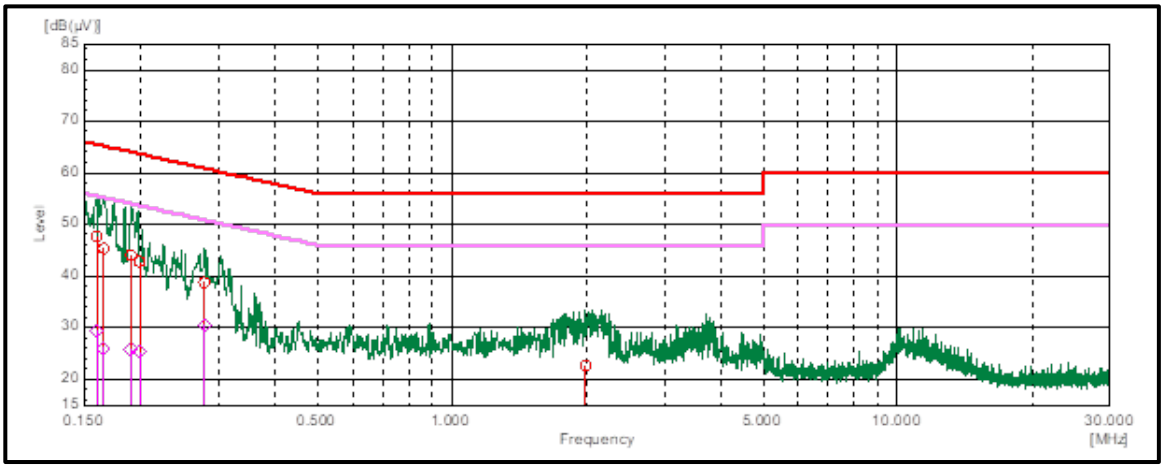
Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1542	Neutral	48.40	65.80	17.40	Complied
0.1752	Neutral	45.60	64.70	19.10	Complied
0.1835	Neutral	45.10	64.30	19.20	Complied
0.2306	Neutral	38.70	62.40	23.70	Complied
0.2718	Neutral	42.90	61.10	18.20	Complied
0.2965	Neutral	38.50	60.30	21.80	Complied

Transmitter AC Conducted Spurious Emissions (continued)

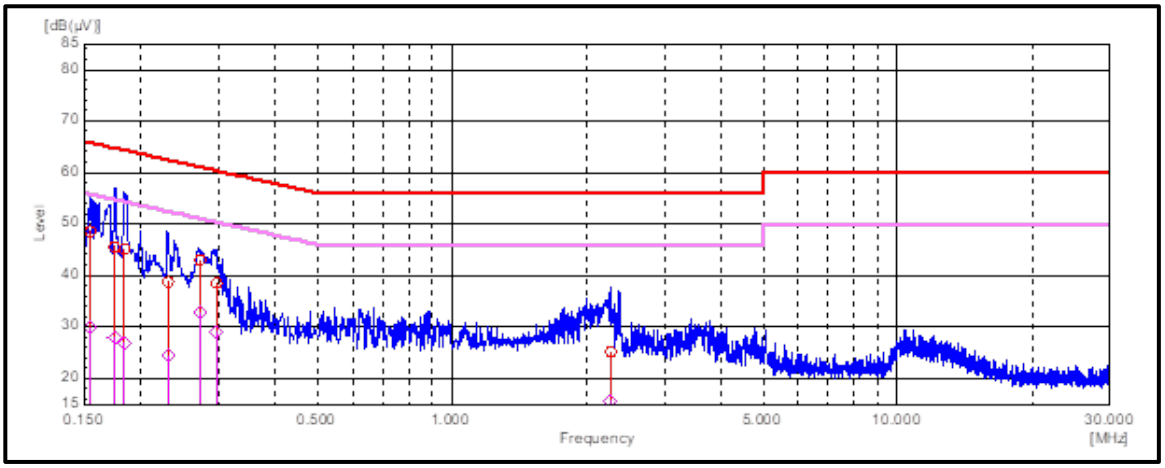
Results: 802.11g / 20 MHz / 54Mbps / PWR 0

Plot: Live Line / 120 VAC 60 Hz



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

Plot: Neutral Line / 120 VAC 60 Hz



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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Results: 802.11g / 20 MHz / 54Mbps / PWR 0

Results: Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1590	Live	40.1	65.5	25.4	Complied
0.1845	Live	35.9	64.3	28.4	Complied
0.2279	Live	38.3	62.5	24.2	Complied
0.2744	Live	41.2	61.0	19.8	Complied
1.7341	Live	22.8	56.0	33.2	Complied
2.1056	Live	26.0	56.0	30.0	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1590	Live	24.4	55.5	31.1	Complied
0.1845	Live	23.3	54.3	31.0	Complied
0.2279	Live	29.3	52.5	23.2	Complied
0.2744	Live	33.6	51.0	17.4	Complied
1.7341	Live	14.7	46.0	31.3	Complied
2.1056	Live	15.5	46.0	30.5	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1523	Neutral	35.50	65.90	30.40	Complied
0.1960	Neutral	29.50	63.80	34.30	Complied
0.2160	Neutral	29.60	63.00	33.40	Complied
0.2746	Neutral	41.80	61.00	19.20	Complied
2.0055	Neutral	25.50	56.00	30.50	Complied
2.1114	Neutral	24.20	56.00	31.80	Complied

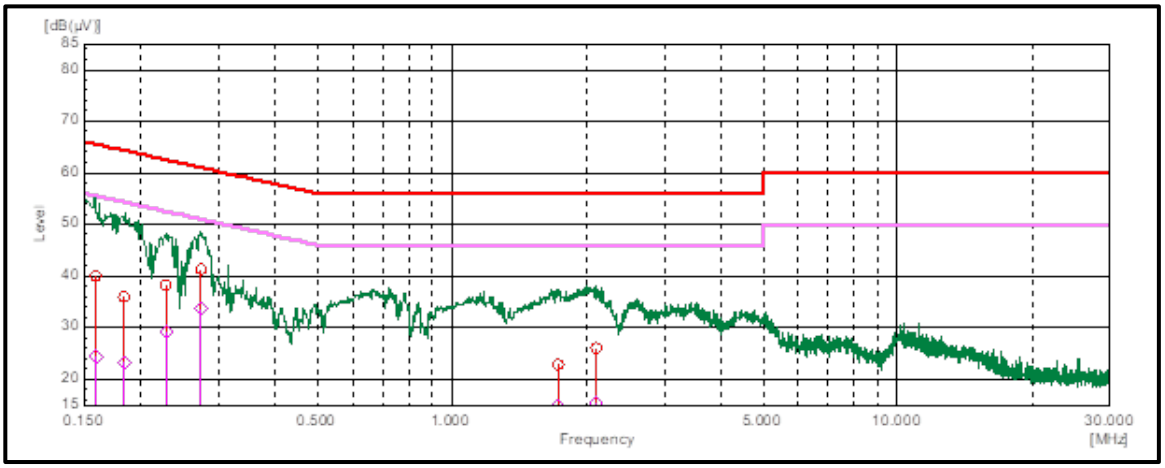
Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1523	Neutral	34.50	55.90	21.40	Complied
0.1960	Neutral	20.50	53.80	33.30	Complied
0.2160	Neutral	19.60	53.00	33.40	Complied
0.2746	Neutral	33.50	51.00	17.50	Complied
2.0055	Neutral	15.00	46.00	31.00	Complied
2.1114	Neutral	14.70	46.00	31.30	Complied

Transmitter AC Conducted Spurious Emissions (continued)

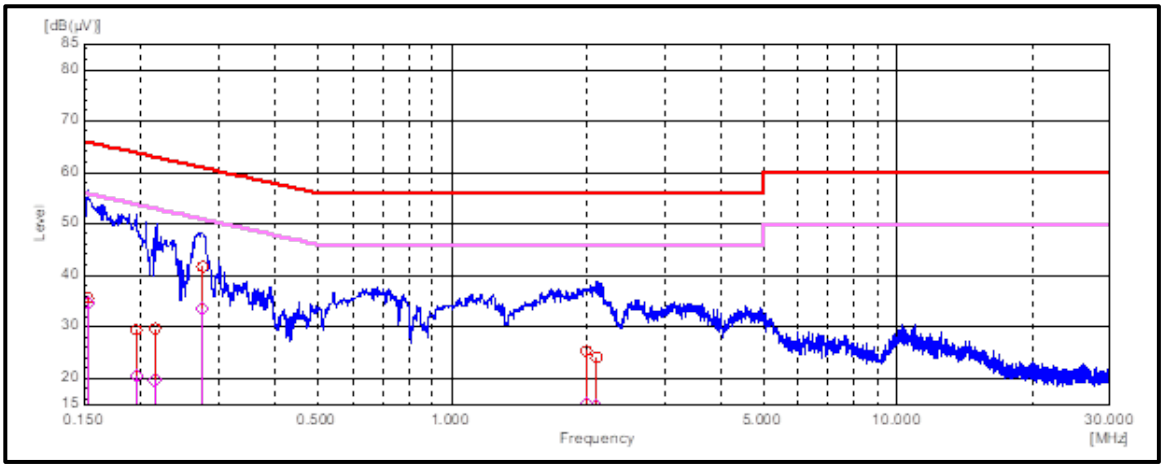
Results: 802.11g / 20 MHz / 54Mbps / PWR 0

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.

Plot: Neutral Line / 240 VAC 60 Hz



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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Results: 802.11n / 20 MHz / MCS7 / PWR 0

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1522	Live	46.50	65.90	19.40	Complied
0.1646	Live	45.40	65.20	19.80	Complied
0.1787	Live	42.10	64.50	22.40	Complied
0.1994	Live	38.30	63.60	25.30	Complied
0.2259	Live	34.80	62.60	27.80	Complied
0.2699	Live	36.70	61.10	24.40	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1522	Live	29.80	55.90	26.10	Complied
0.1646	Live	28.80	55.20	26.40	Complied
0.1787	Live	25.30	54.50	29.20	Complied
0.1994	Live	23.10	53.60	30.50	Complied
0.2259	Live	22.70	52.60	29.90	Complied
0.2699	Live	27.20	51.10	23.90	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1577	Neutral	44.90	65.60	20.70	Complied
0.1601	Neutral	47.00	65.50	18.50	Complied
0.1711	Neutral	44.90	64.90	20.00	Complied
0.1854	Neutral	45.10	64.20	19.10	Complied
0.2352	Neutral	38.50	62.30	23.80	Complied
0.2762	Neutral	42.20	60.90	18.70	Complied

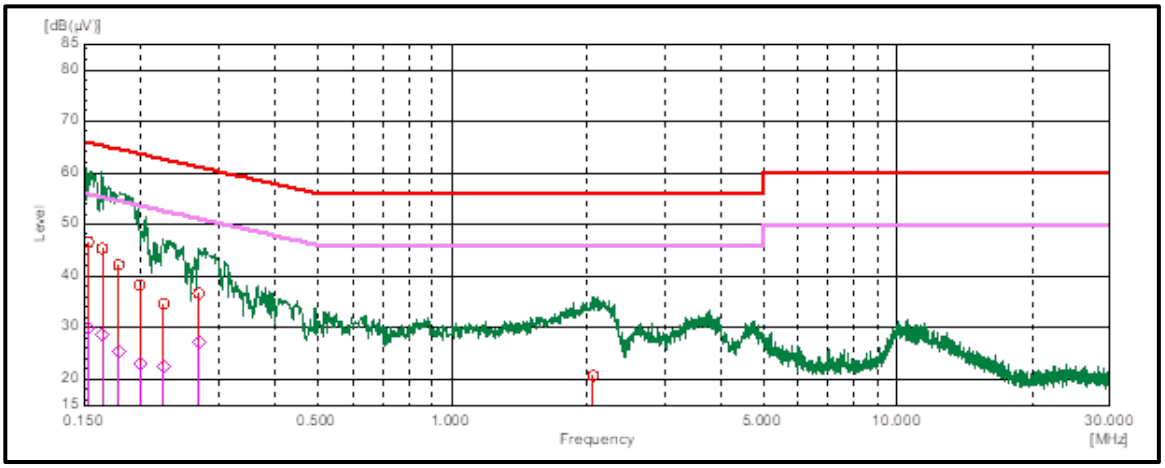
Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1577	Neutral	27.70	55.60	27.90	Complied
0.1601	Neutral	28.30	55.50	27.20	Complied
0.1711	Neutral	27.40	54.90	27.50	Complied
0.1854	Neutral	29.00	54.20	25.20	Complied
0.2352	Neutral	31.30	52.30	21.00	Complied
0.2762	Neutral	38.10	50.90	12.80	Complied

Transmitter AC Conducted Spurious Emissions (continued)

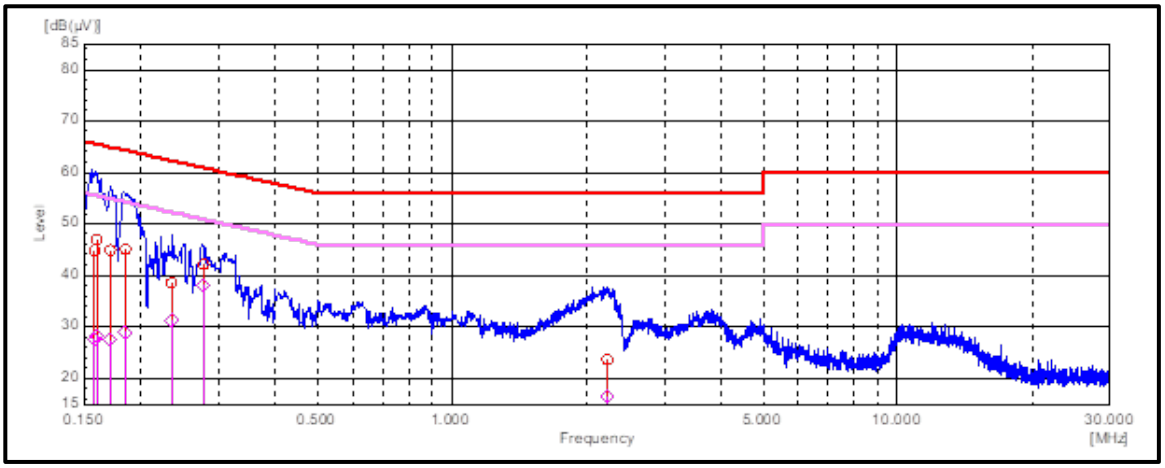
Results: 802.11n / 20 MHz / MCS7 / PWR 0

Plot: Live Line / 120 VAC 60 Hz



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

Plot: Neutral Line / 120 VAC 60 Hz



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

Result: Pass

Transmitter AC Conducted Spurious Emissions (continued)

Results: 802.11n / 20 MHz / MCS7 / PWR 0

Results: Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1605	Live	41.80	65.40	23.60	Complied
0.2035	Live	39.60	63.50	23.90	Complied
0.2502	Live	39.00	61.80	22.80	Complied
0.2928	Live	43.20	60.40	17.20	Complied
1.4826	Live	28.30	56.00	27.70	Complied
1.8682	Live	27.90	56.00	28.10	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1605	Live	25.60	55.40	29.80	Complied
0.2035	Live	28.70	53.50	24.80	Complied
0.2502	Live	31.80	51.80	20.00	Complied
0.2928	Live	34.50	50.40	15.90	Complied
1.4826	Live	19.80	46.00	26.20	Complied
1.8682	Live	17.60	46.00	28.40	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1579	Neutral	43.40	65.60	22.20	Complied
0.2245	Neutral	39.60	62.60	23.00	Complied
0.2939	Neutral	42.80	60.40	17.60	Complied
0.8581	Neutral	29.40	56.00	26.60	Complied
1.4028	Neutral	28.60	56.00	27.40	Complied
2.5993	Neutral	24.20	56.00	31.80	Complied

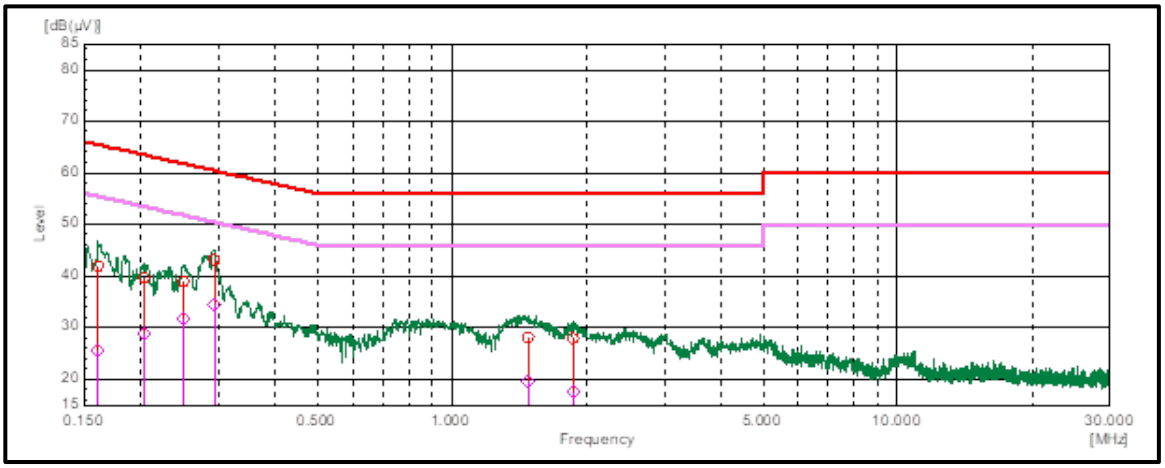
Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.1579	Neutral	26.40	55.60	29.20	Complied
0.2245	Neutral	29.90	52.60	22.70	Complied
0.2939	Neutral	34.70	50.40	15.70	Complied
0.8581	Neutral	23.00	46.00	23.00	Complied
1.4028	Neutral	18.70	46.00	27.30	Complied
2.5993	Neutral	15.00	46.00	31.00	Complied

Transmitter AC Conducted Spurious Emissions (continued)

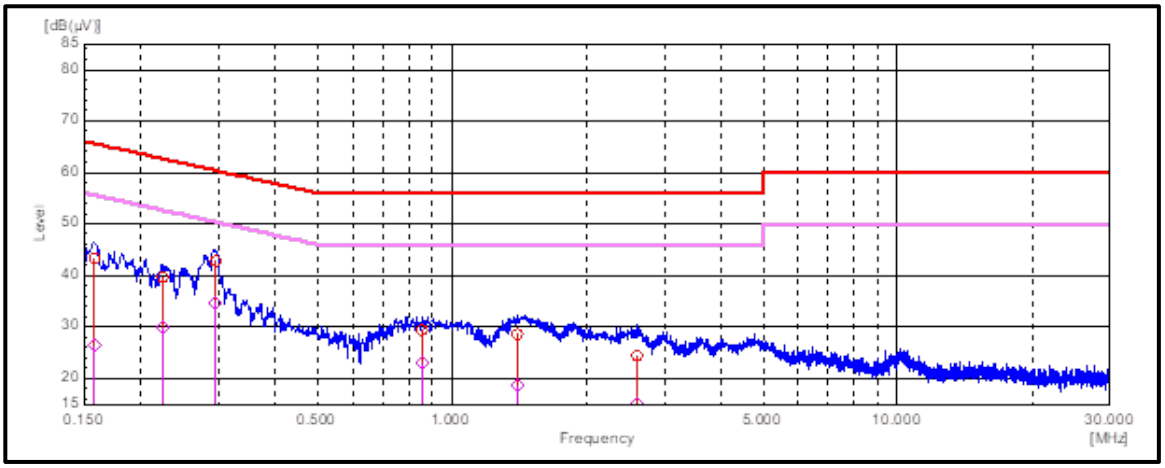
Results: 802.11n / 20 MHz / MCS7 / PWR 0

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.

Plot: Neutral Line / 240 VAC 60 Hz



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

Result: Pass

5.2.2. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	15 April 2021 to 30 April 2021
Test Sample Serial Number:	TB1.5 *(Conducted RF Sample)*		
Test Site Identification	SR 9		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.2 referencing ANSI C63.10:2013 Section 11.8.1 Option 1

Environmental Conditions:

Temperature (°C):	24.2 to 26.7
Relative Humidity (%):	31.3 to 37.4

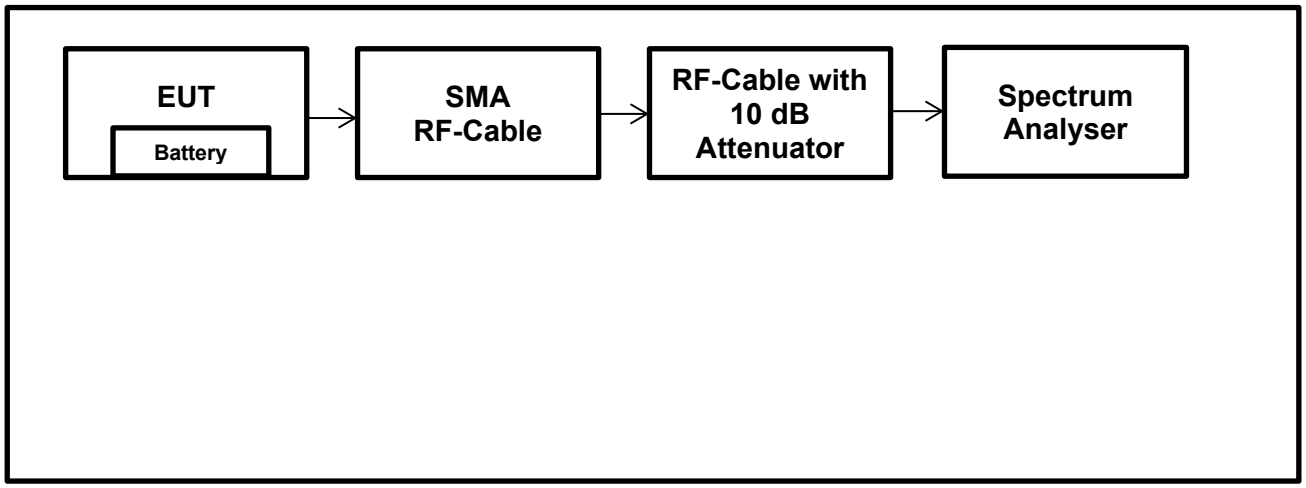
Notes:

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 1 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 takes into consideration the external attenuation correction factors.
    - The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.4 dB at the tested frequencies.
    - The RF cable attenuation maximum 0.6 dB@2.4GHz from the EUT to Analyzer including the 10 dB attenuation at the input of Spectrum Analyzer

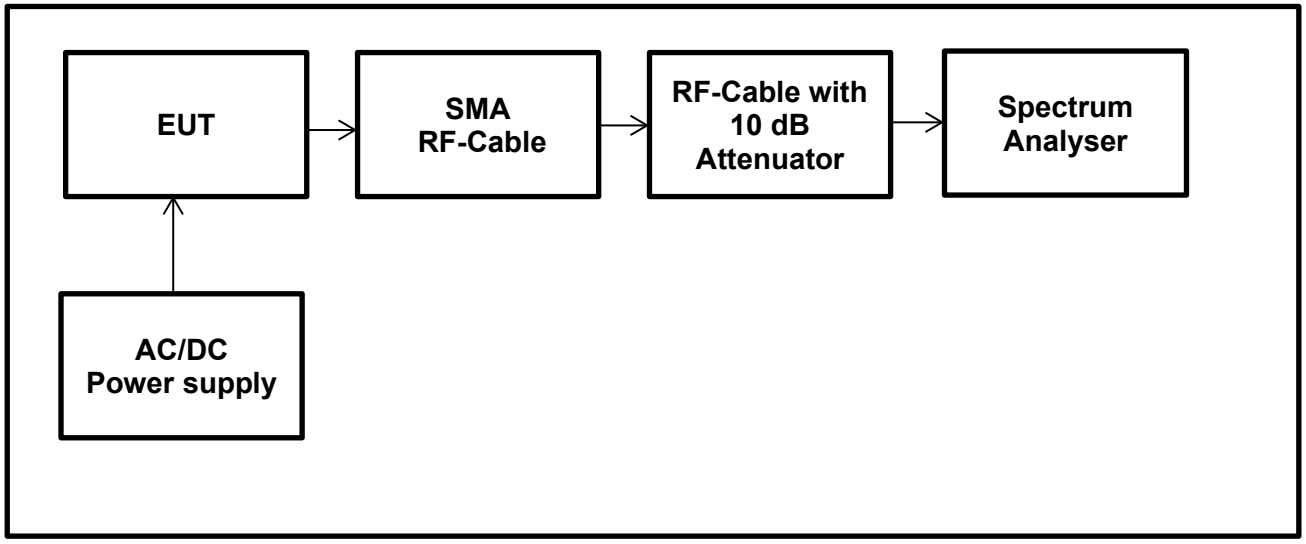
    Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots.

Transmitter Minimum 6 dB Bandwidth (continued)

Test Setup (Internal Battery Powered):



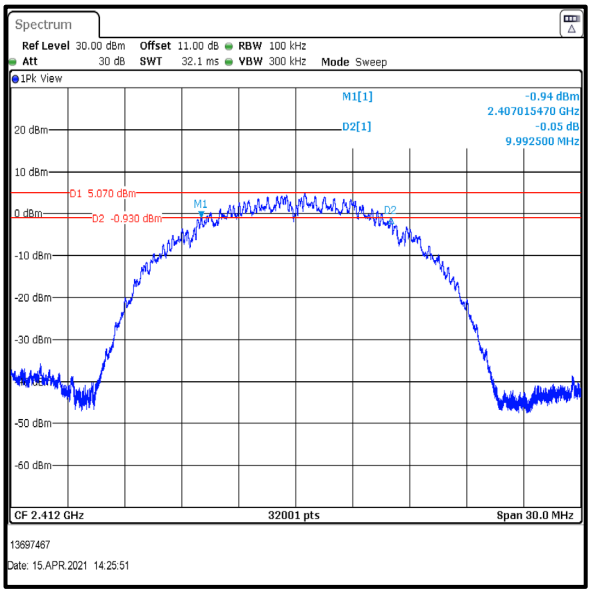
Test Setup (AC-DC Power Supply):



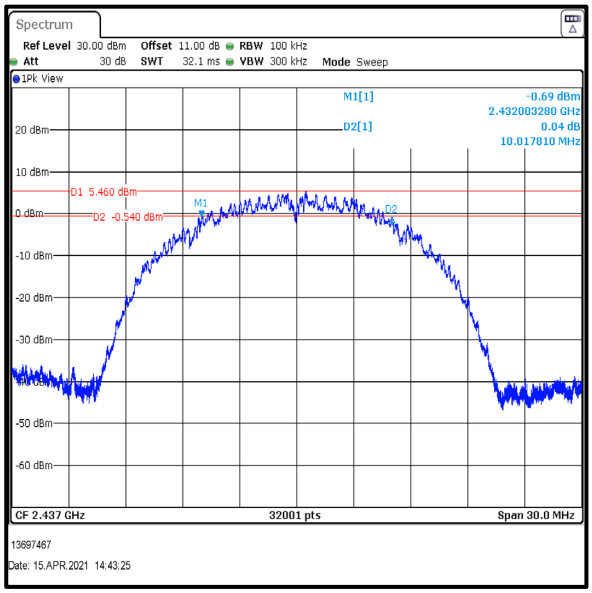
Transmitter Minimum 6 dB Bandwidth (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0

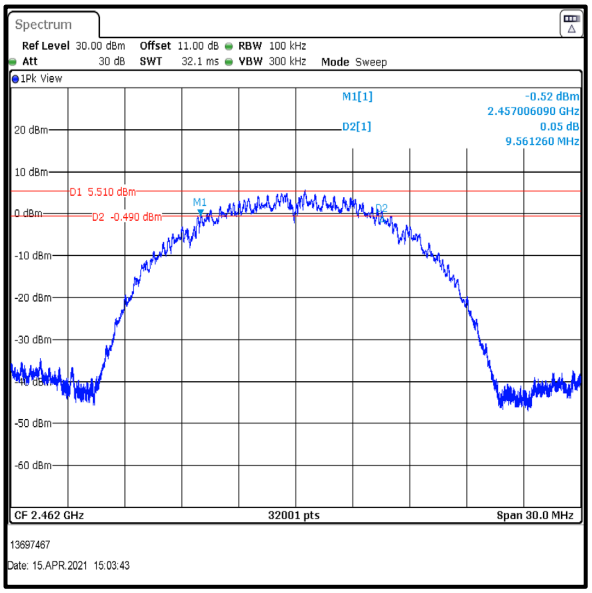
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	9992.500	≥ 500	9492.500	Complied
Middle	10017.810	≥ 500	9517.810	Complied
Top	9561.260	≥ 500	9061.260	Complied



Bottom Channel



Middle Channel



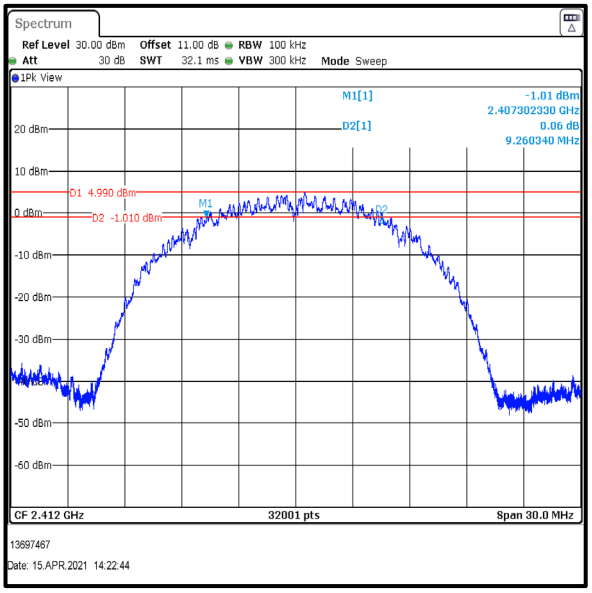
Top Channel

Result: Pass

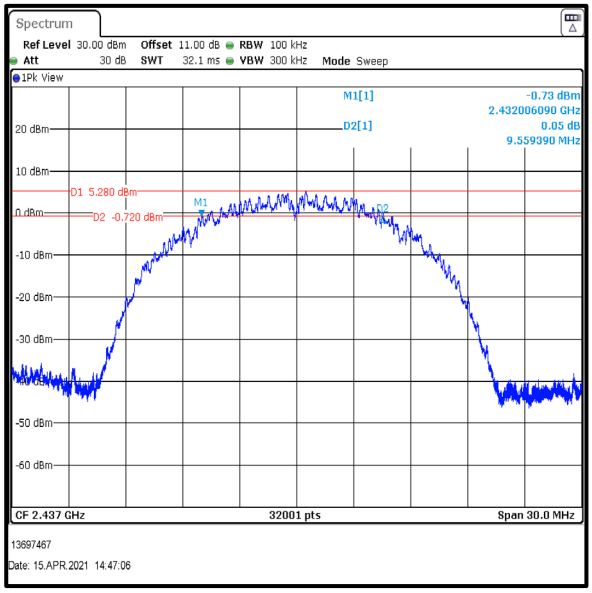
Transmitter Minimum 6 dB Bandwidth (continued)

Results: Fully Charged Internal Battery / 802.11b / 20 MHz / 11 Mbps / PWR 0

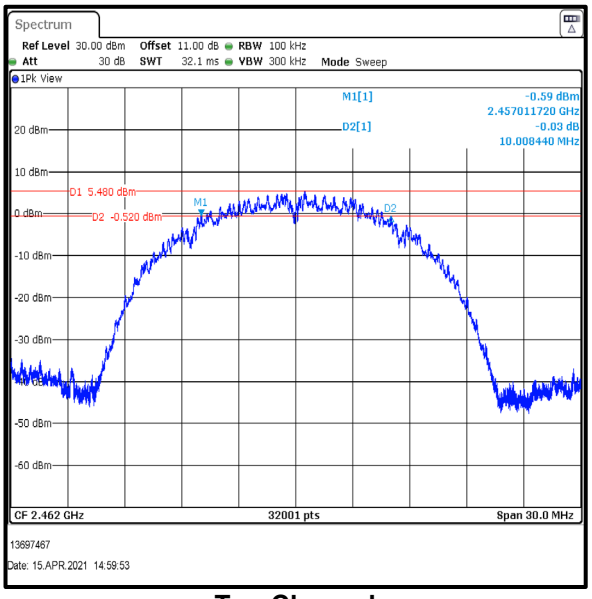
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	9260.340	≥ 500	8760.340	Complied
Middle	9559.390	≥ 500	9059.390	Complied
Top	10008.440	≥ 500	9508.440	Complied



Bottom Channel



Middle Channel



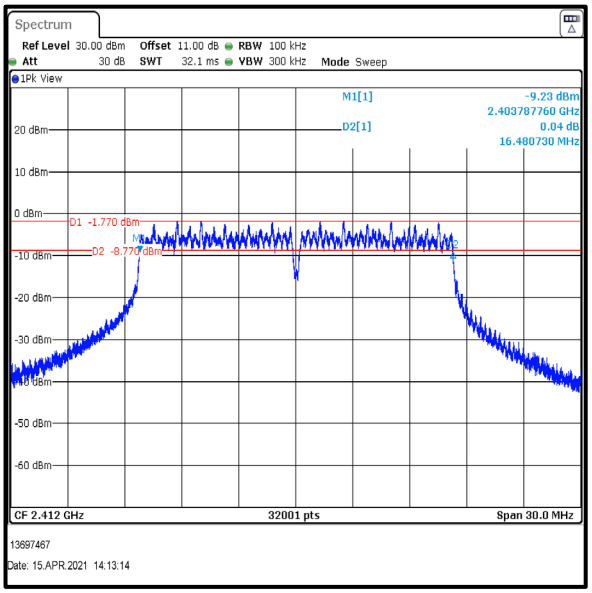
Top Channel

Result: Pass

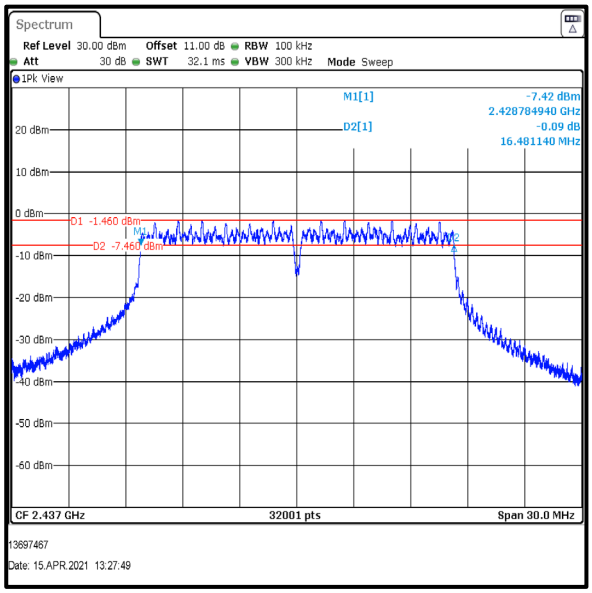
Transmitter Minimum 6 dB Bandwidth (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0

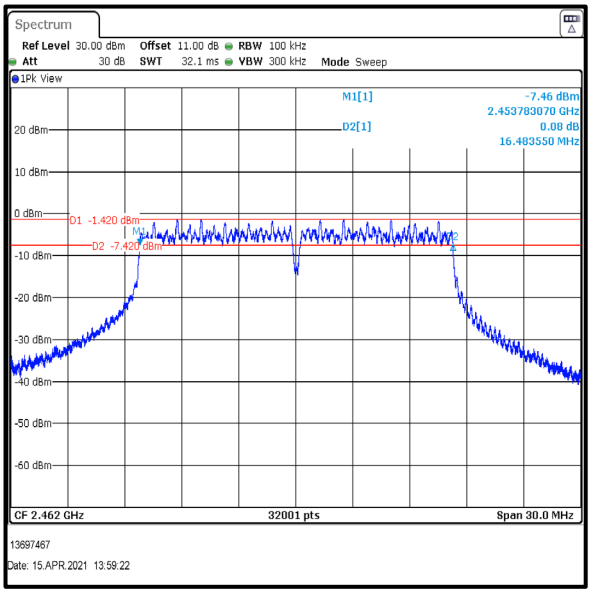
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16480.730	≥ 500	15980.730	Complied
Middle	16481.140	≥ 500	15981.140	Complied
Top	16483.550	≥ 500	15983.550	Complied



Bottom Channel



Middle Channel



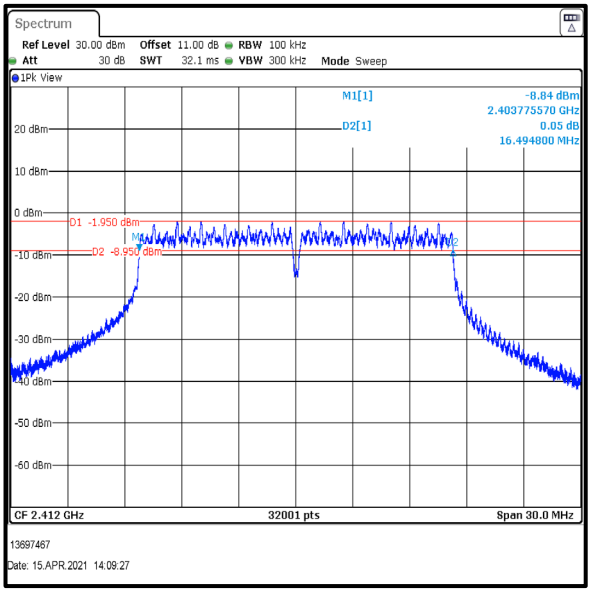
Top Channel

Result: Pass

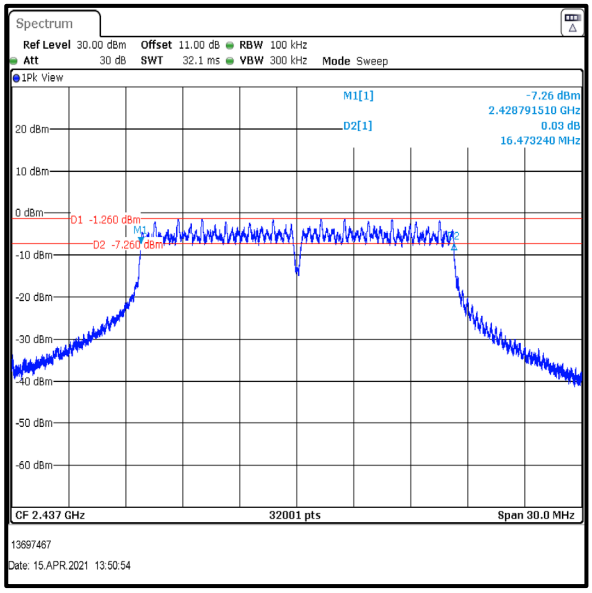
Transmitter Minimum 6 dB Bandwidth (continued)

Results: Fully Charged Internal Battery / 802.11g / 20 MHz / 54 Mbps / PWR 0

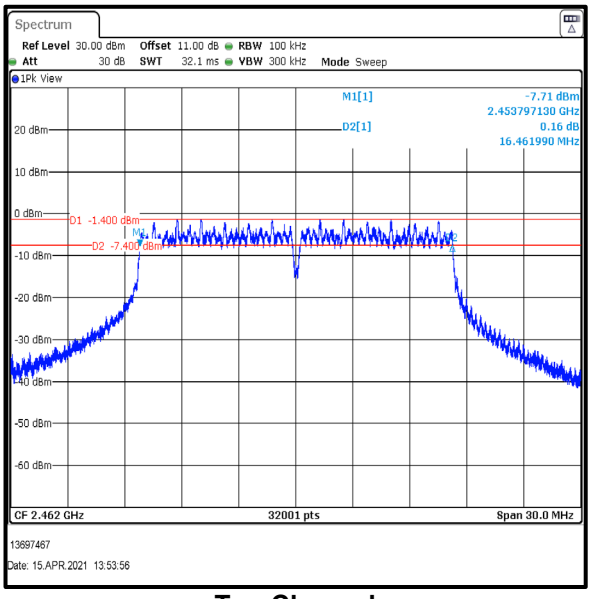
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	16494.800	≥ 500	15994.800	Complied
Middle	16473.240	≥ 500	15973.240	Complied
Top	16461.990	≥ 500	15961.990	Complied



Bottom Channel



Middle Channel



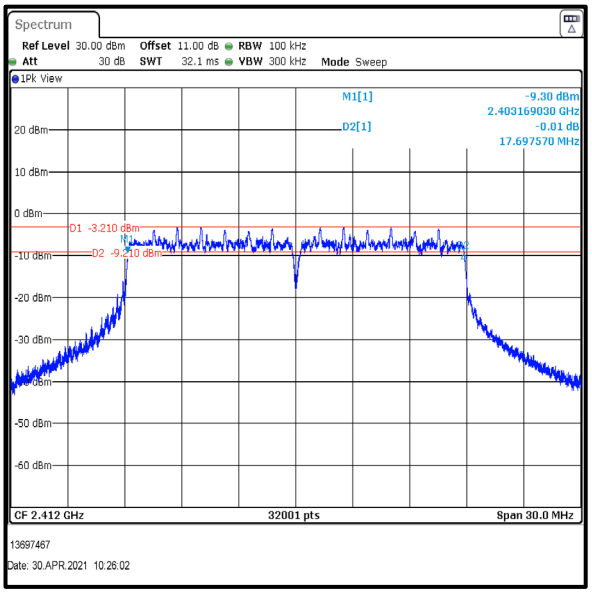
Top Channel

Result: Pass

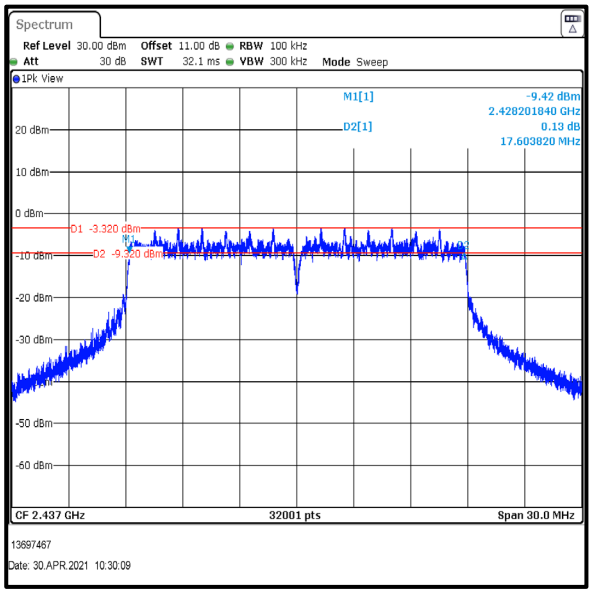
Transmitter Minimum 6 dB Bandwidth (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0

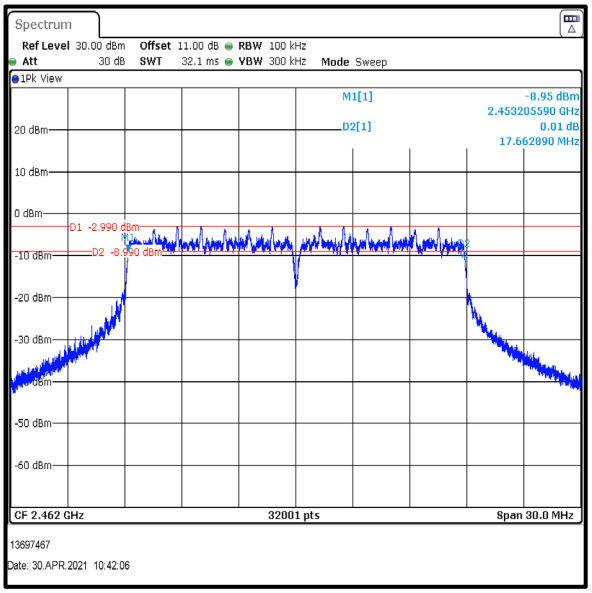
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17697.570	≥ 500	17197.570	Complied
Middle	17603.820	≥ 500	17103.820	Complied
Top	17662.890	≥ 500	17162.890	Complied



Bottom Channel



Middle Channel



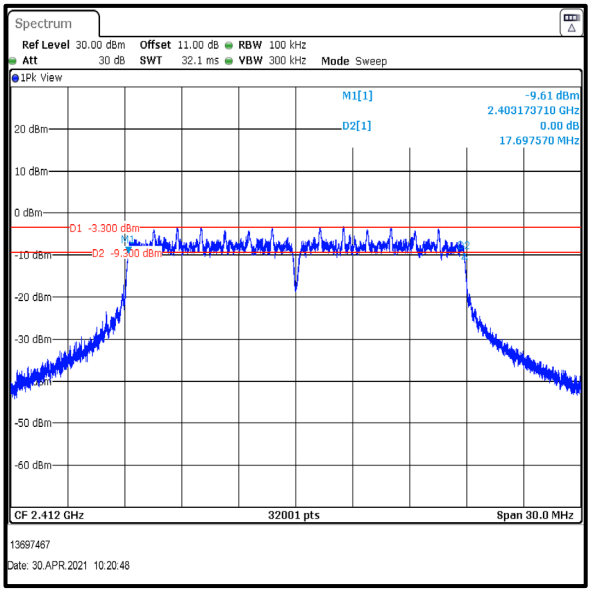
Top Channel

Result: Pass

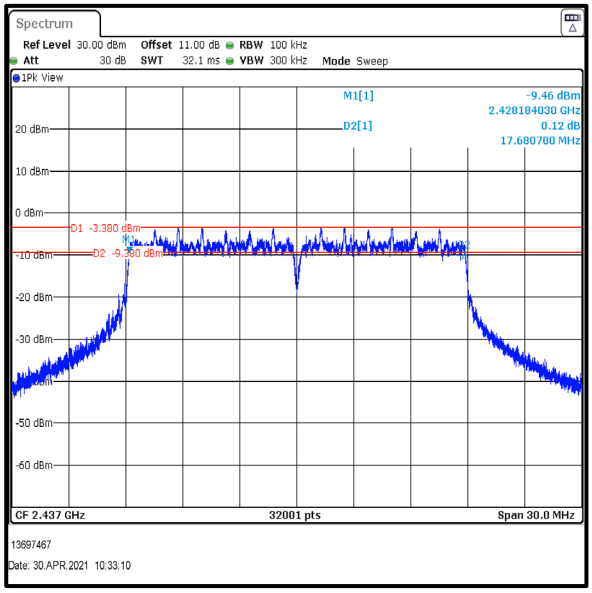
Transmitter Minimum 6 dB Bandwidth (continued)

Results: Fully Charged Internal Battery / 802.11n / 20 MHz / MSC7 / PWR 0

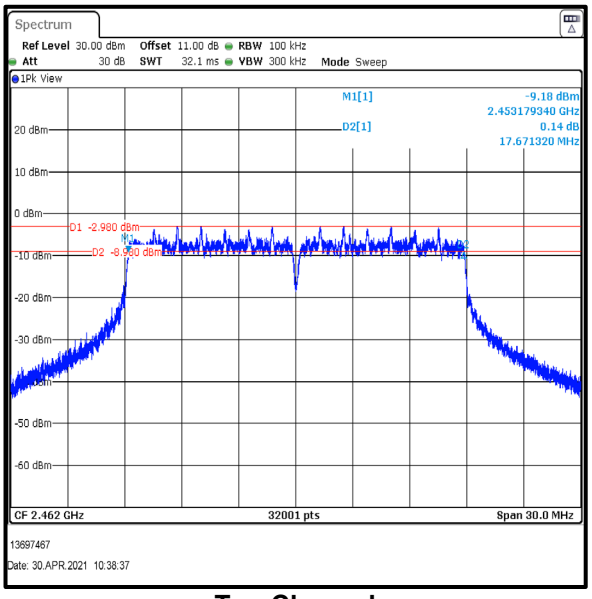
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	17697.570	≥ 500	17197.570	Complied
Middle	17680.700	≥ 500	17180.700	Complied
Top	17671.320	≥ 500	17171.320	Complied



Bottom Channel



Middle Channel



Top Channel

Result: Pass

5.2.3. Transmitter Duty Cycle

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	15 April 2021 to 28 April 2021
Test Sample Serial Number:	TB1.5 *(Conducted RF Sample)*		
Test Site Identification	SR 9		

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

Environmental Conditions:

Temperature (°C):	27.2 to 29.3
Relative Humidity (%):	32.1 to 36.7

Notes:

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

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

   Duty Cycle Correction Factor= 10 log 1 / [On Time (T_{ON})] / [Period(T_{ON}+ T_{OFF}) or 100ms whichever is the lesser]

   - Duty Cycle Correction Factor for b-mode 11 Mbps: 3.90 dB
   - Duty Cycle Correction Factor for g-mode 54 Mbps: 4.07 dB
   - Duty Cycle Correction Factor for n-mode HT20 MCS7: 4.75dB

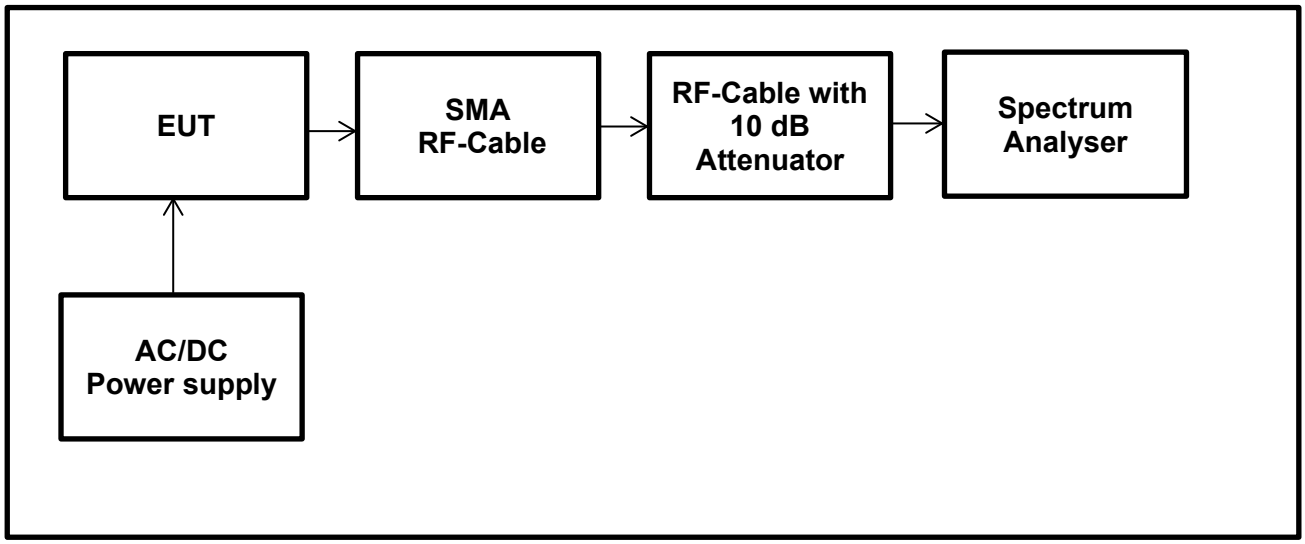
2. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values takes into consideration the external attenuation correction factors.

   - The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.4 dB at the tested frequencies.
   - The RF cable attenuation maximum 0.6 dB@2.4GHz from the EUT to Analyzer including the 10 dB attenuation 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.

Transmitter Duty Cycle (continued)

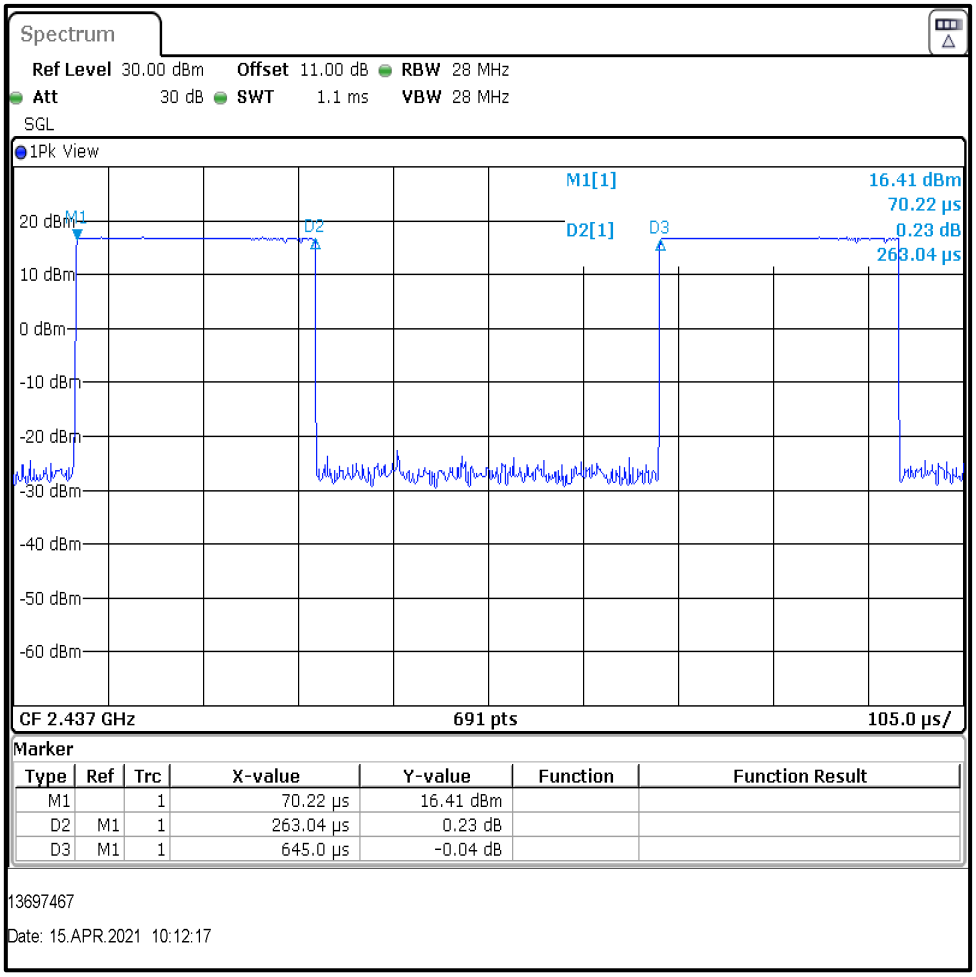
Test Setup (AC-DC Power Supply):



Transmitter Duty Cycle (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0

Pulse On Time (T_{ON}) (ms)	Pulse Period (T_{ON} +T_{OFF}) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
0.26304	0.64500	40.78	3.90

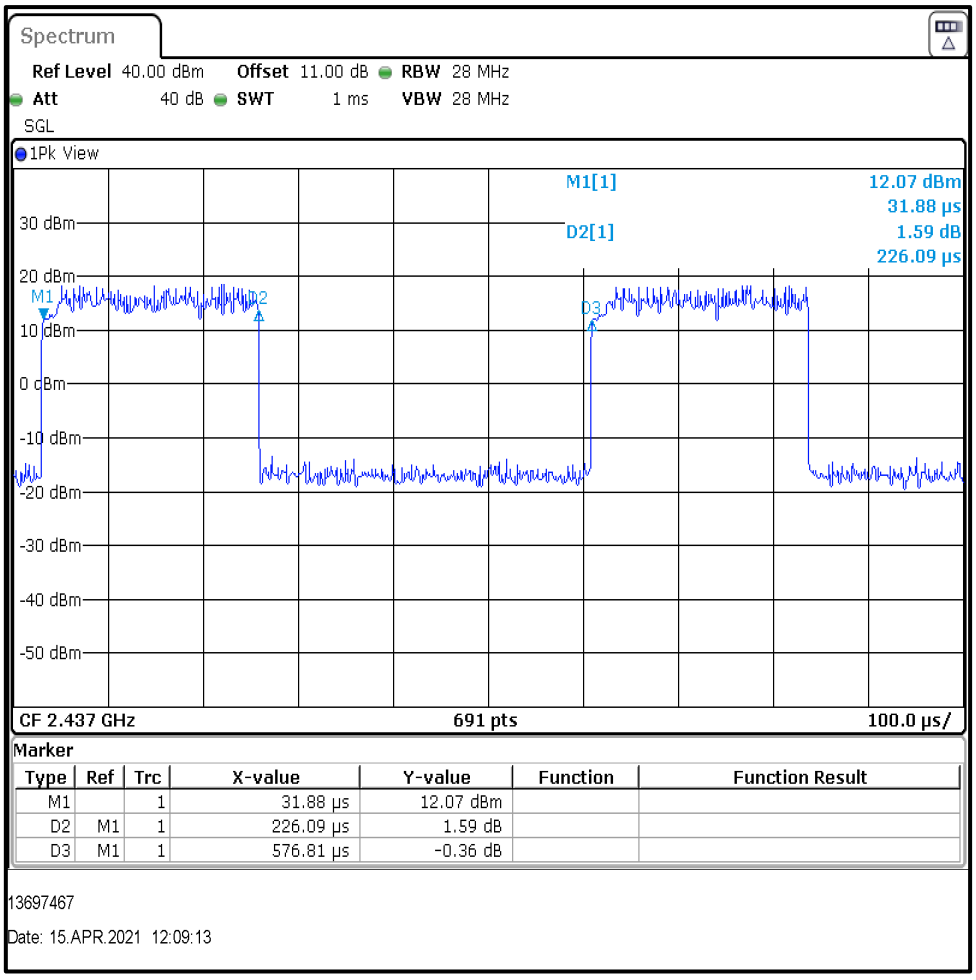


Result: Pass

Transmitter Duty Cycle (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0

Pulse On Time (T_{ON}) (ms)	Pulse Period (T_{ON} +T_{OFF}) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
0.22609	0.57681	39.20	4.07

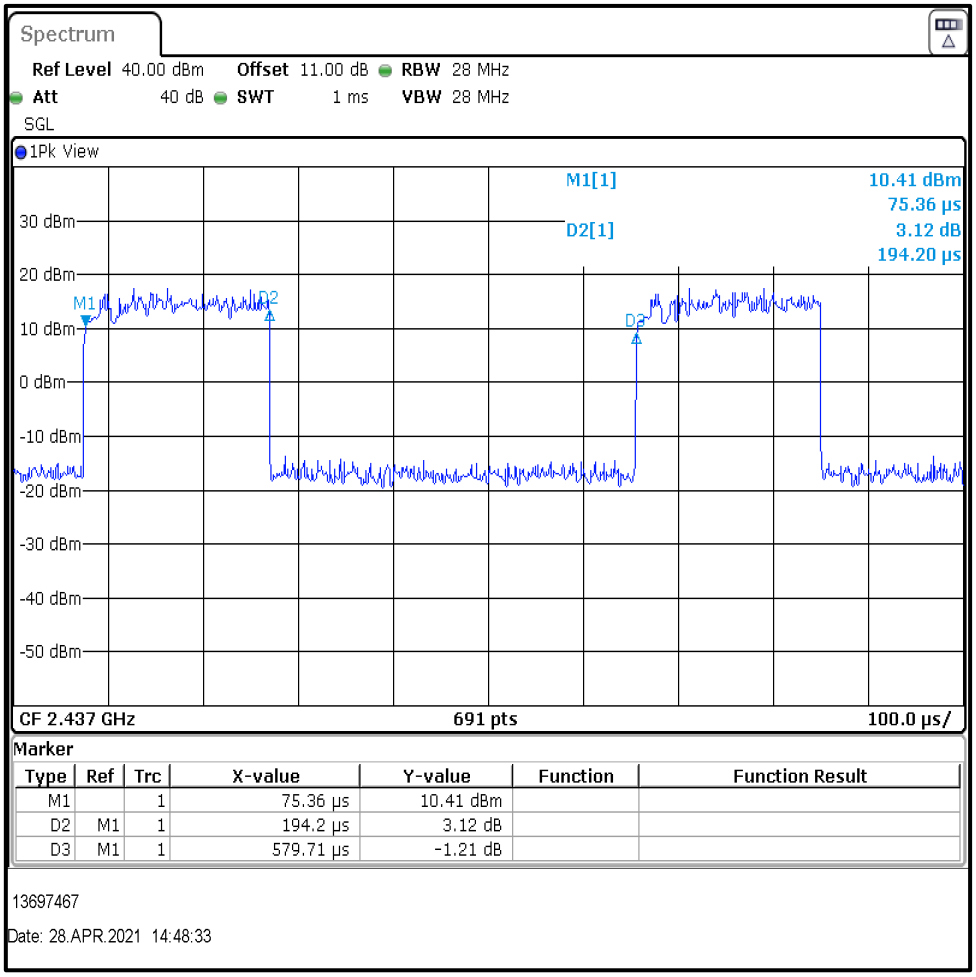


Result: Pass

Transmitter Duty Cycle (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0

Pulse On Time (T_{ON}) (ms)	Pulse Period (T_{ON} +T_{OFF}) (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
0.19420	0.57971	33.50	4.75



Result: Pass

5.2.4. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	30 April 2021
Test Sample Serial Number:	TB1.5 *(Conducted RF Sample)*		
Test Site Identification	SR 9		

FCC Reference:	Part 15.247(e)
Test Method Used:	FCC KDB 558074 Section 8.4 referencing ANSI C63.10 Sections 11.10.2

Environmental Conditions:

Temperature (°C):	27.1
Relative Humidity (%):	32.3

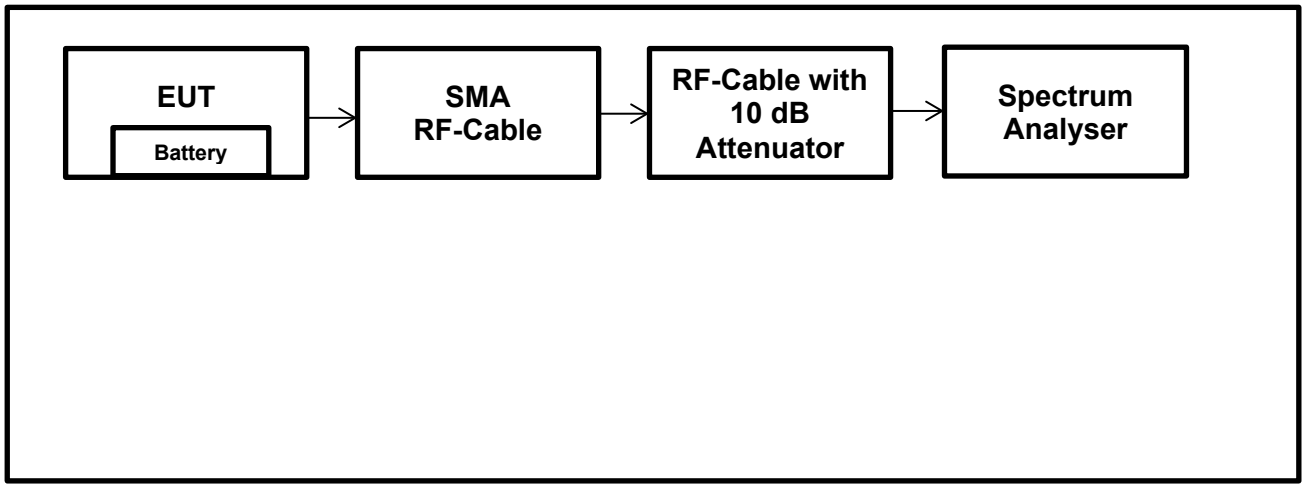
Notes:

1. Final measurements were performed using the below configurations on the bottom, middle and top channels.
2. The EUT was transmitting at < 98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.10.2 Method PKPSD.
3. The signal analyser resolution bandwidth was set to 3 kHz and video bandwidth 10 kHz. A Peak detector was used and sweep time was set to Auto. The span was set to 1.5 times the DTS 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 takes into consideration the external attenuation correction factors.
   - The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.4 dB at the tested frequencies.
   - The RF cable attenuation maximum 0.6 dB@2.4GHz from the EUT to Analyzer including the 10 dB attenuation at the input of Spectrum Analyzer

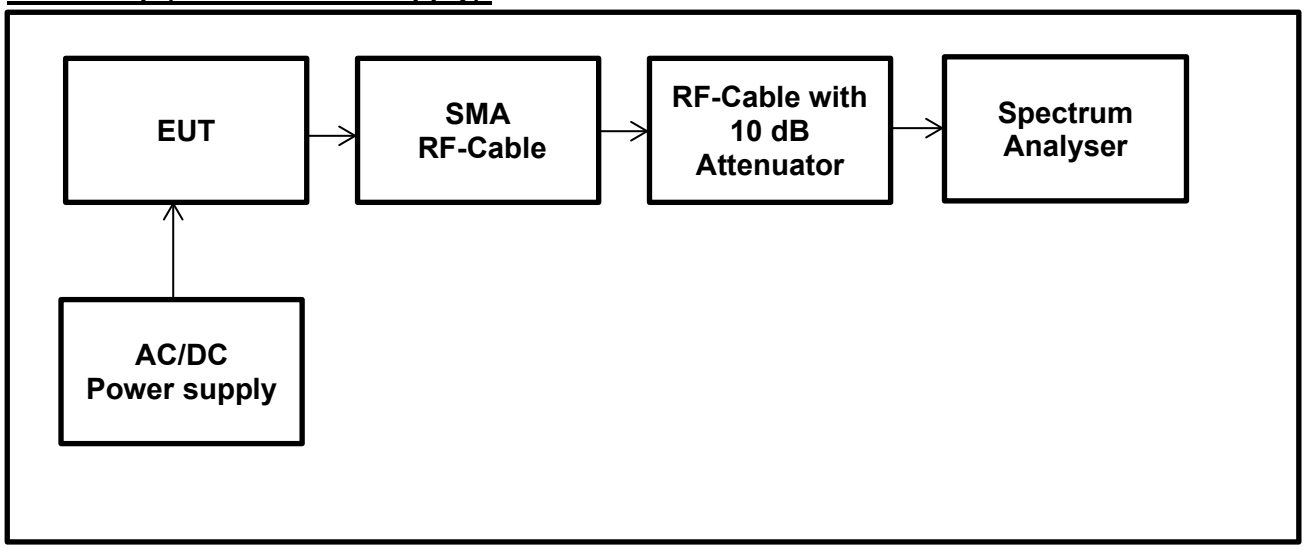
   Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots.

Transmitter Power Spectral Density (continued)

Test Setup (Internal Battery Powered):



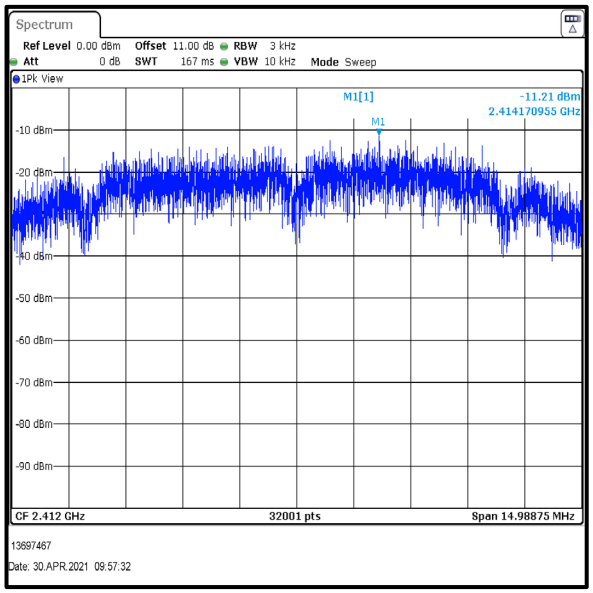
Test Setup (AC-DC Power Supply):



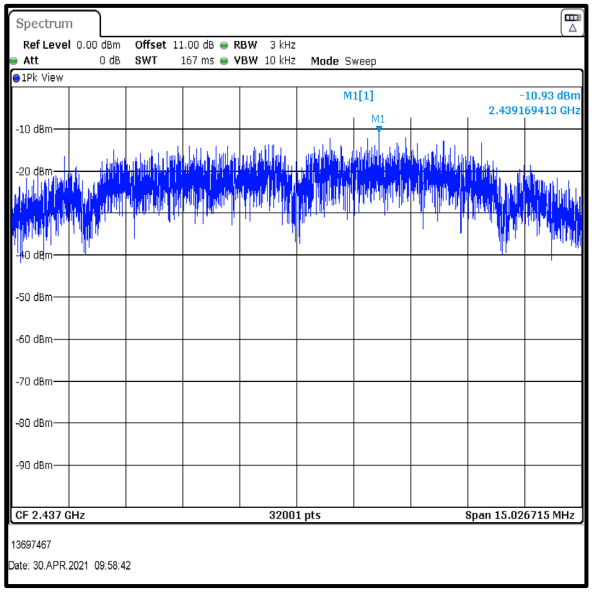
Transmitter Power Spectral Density (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0

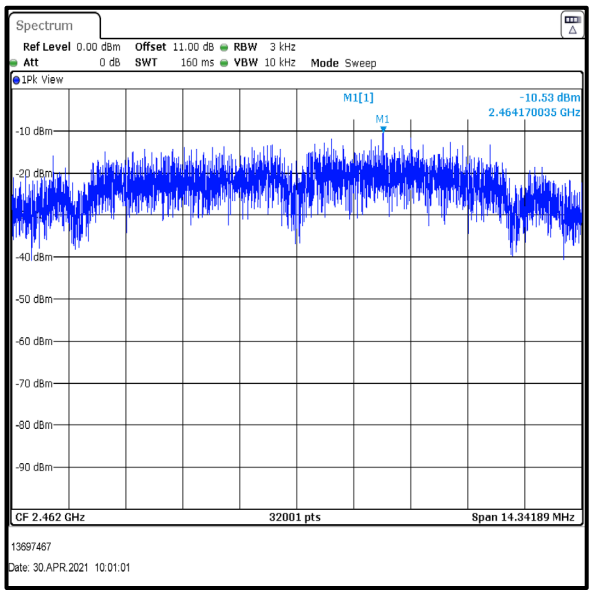
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-11.21	8.0	19.21	Complied
Middle	-10.93	8.0	18.93	Complied
Top	-10.53	8.0	18.53	Complied



Bottom Channel



Middle Channel



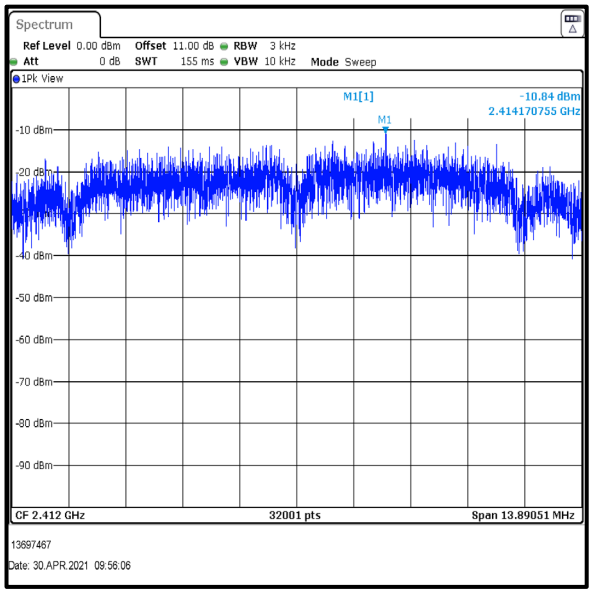
Top Channel

Result: Pass

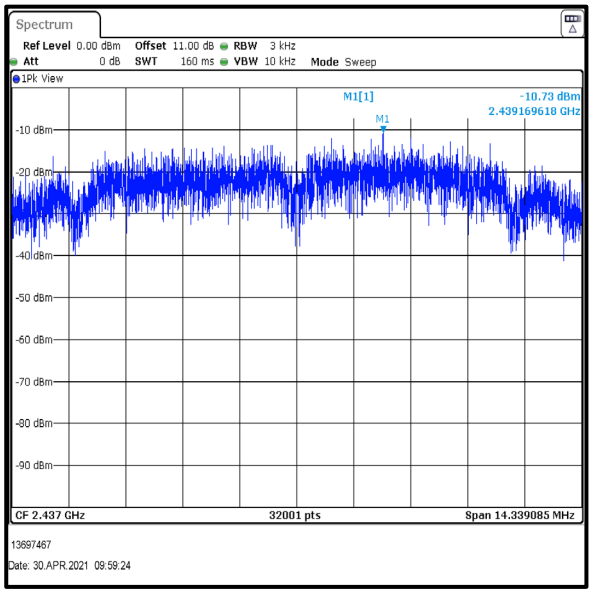
Transmitter Power Spectral Density (continued)

Results: Fully Charged Internal Battery / 802.11b / 20 MHz / 11 Mbps / PWR 0

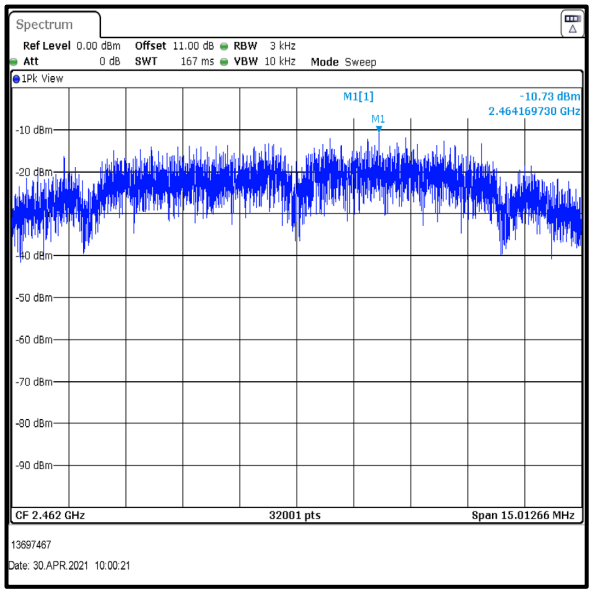
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-10.84	8.0	18.84	Complied
Middle	-10.73	8.0	18.73	Complied
Top	-10.73	8.0	18.73	Complied



Bottom Channel



Middle Channel



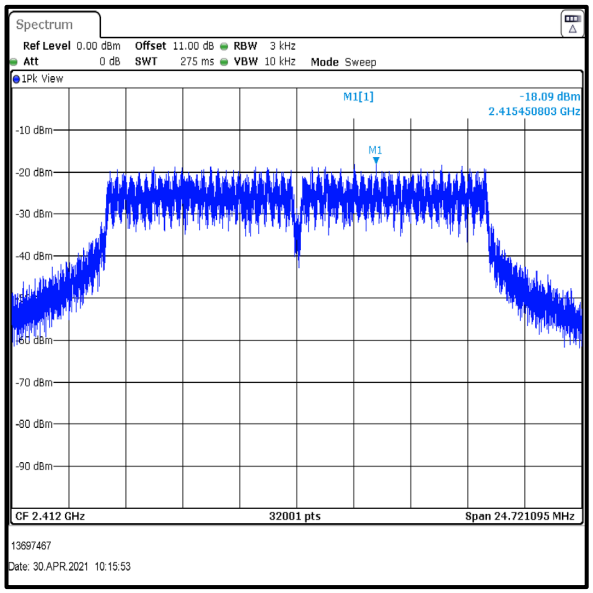
Top Channel

Result: Pass

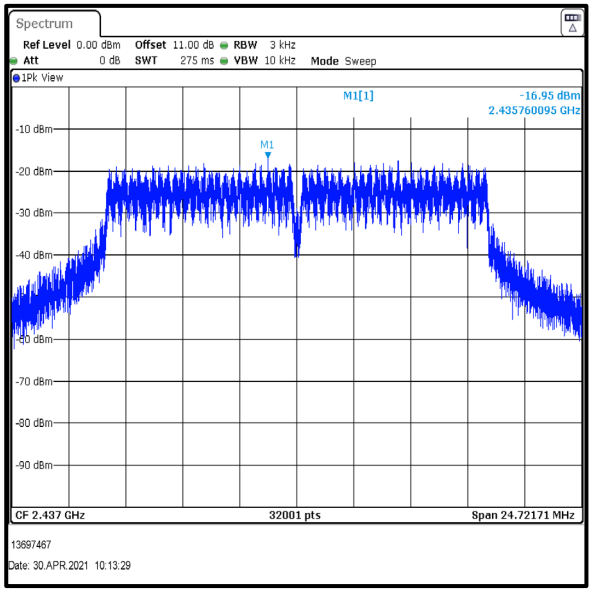
Transmitter Power Spectral Density (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0

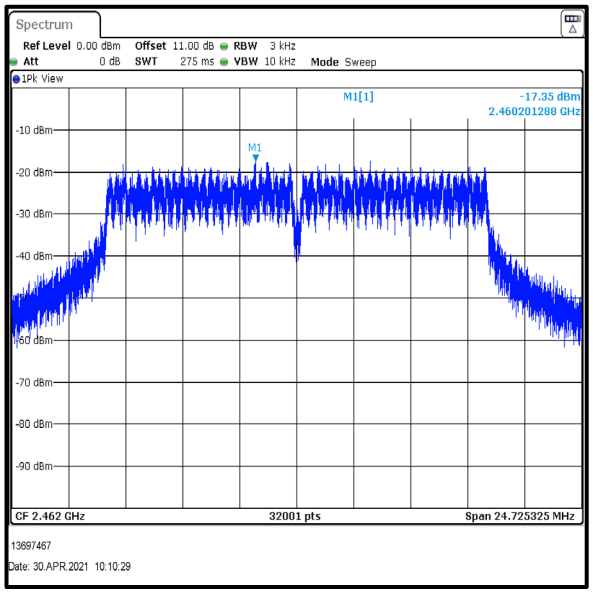
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-18.09	8.0	26.09	Complied
Middle	-16.95	8.0	24.95	Complied
Top	-17.35	8.0	25.35	Complied



Bottom Channel



Middle Channel



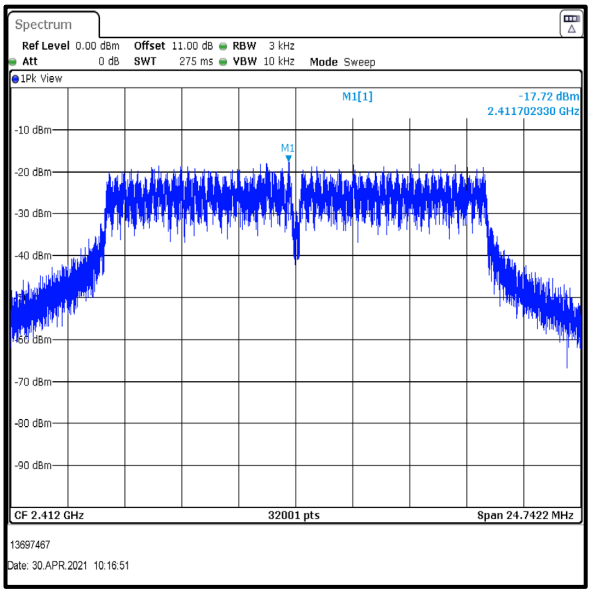
Top Channel

Result: Pass

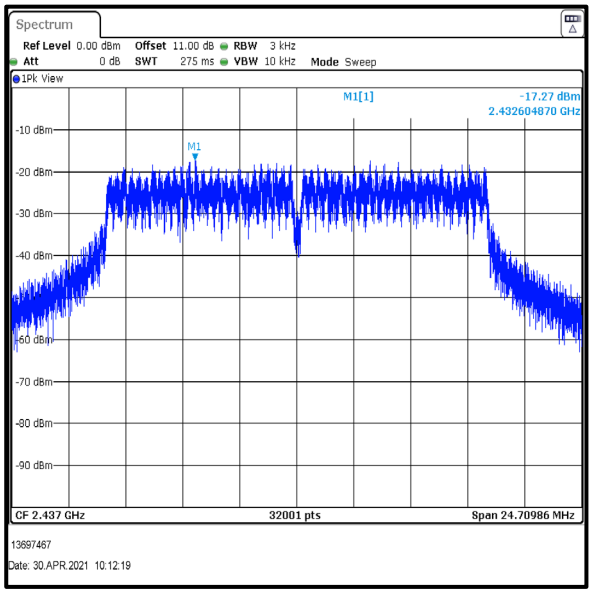
Transmitter Power Spectral Density (continued)

Results: Fully Charged Internal Battery / 802.11g / 20 MHz / 54 Mbps / PWR 0

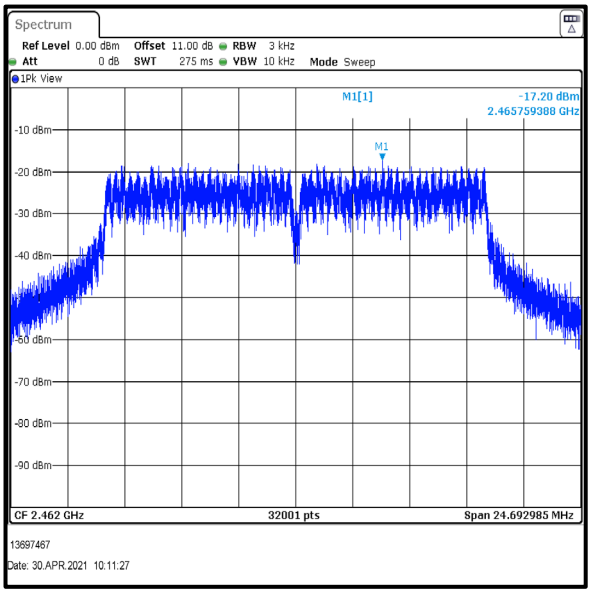
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-17.72	8.0	25.72	Complied
Middle	-17.27	8.0	25.27	Complied
Top	-17.20	8.0	25.20	Complied



Bottom Channel



Middle Channel



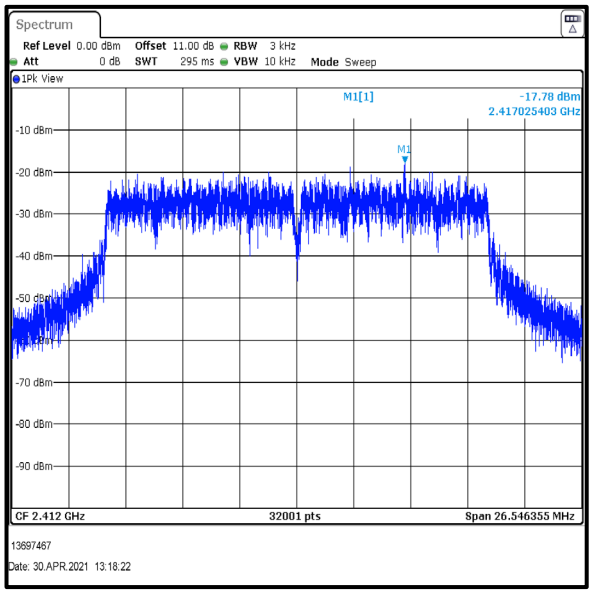
Top Channel

Result: Pass

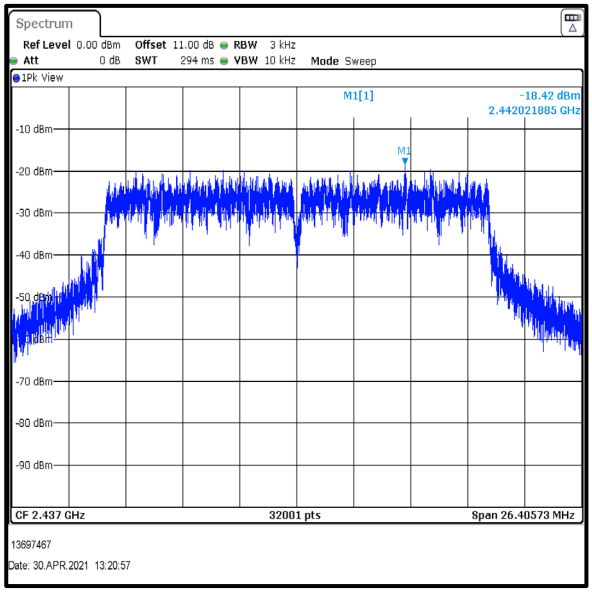
Transmitter Power Spectral Density (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0

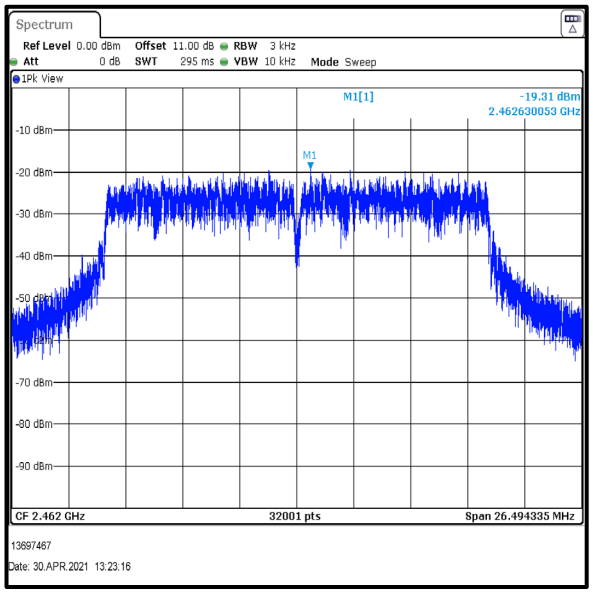
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-17.78	8.0	25.78	Complied
Middle	-18.42	8.0	26.42	Complied
Top	-19.31	8.0	27.31	Complied



Bottom Channel



Middle Channel



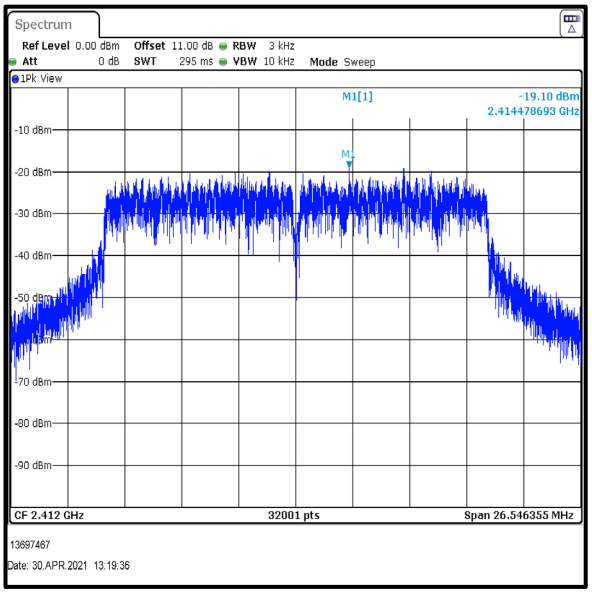
Top Channel

Result: Pass

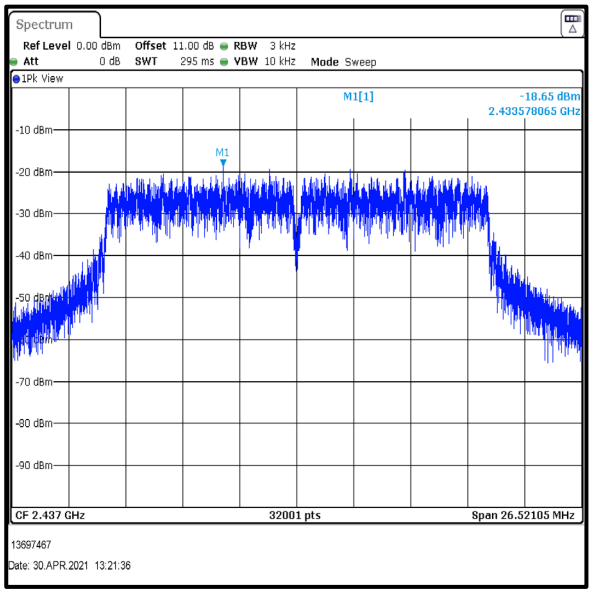
Transmitter Power Spectral Density (continued)

Results: Fully Charged Internal Battery / 802.11n / 20 MHz / MCS7 / PWR 0

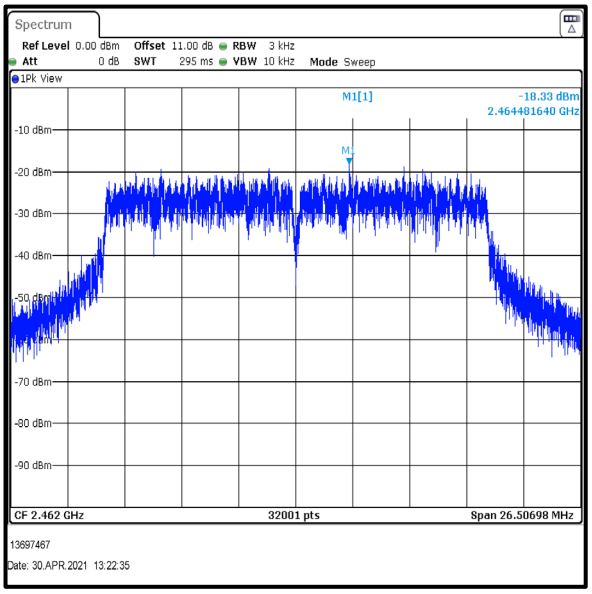
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-19.10	8.0	27.10	Complied
Middle	-18.65	8.0	26.65	Complied
Top	-18.33	8.0	26.33	Complied



Bottom Channel



Middle Channel



Top Channel

Result: Pass

5.2.5. Transmitter Maximum (Peak) Output Power

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	26 April 2021 to 25 May 2021
Test Sample Serial Number:	TB1.5 *(Conducted RF Sample)*		
Test Site Identification	SR 9		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 8.3.1.3 referencing ANSI C63.10 Sections 11.9.1.3

Environmental Conditions:

Temperature (°C):	24.3 to 27.2
Relative Humidity (%):	35.3 to 36.8

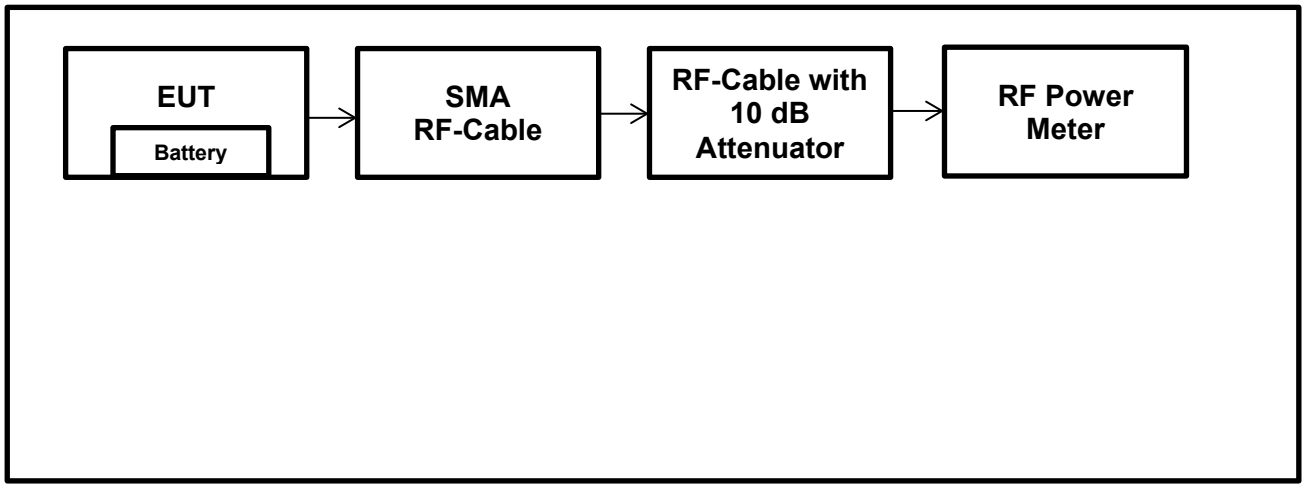
Notes:

1. Final measurements were performed using the below configurations on the bottom, middle and top channels.
2. The EUT was transmitting at <98% duty cycle and testing was performed in accordance with ANSI C63.10 Section 11.9.1.3 Method PKPM1. The broadband peak RF power meter (VBW ≥ EUT's DTS Bandwidth) was used to measure the signal power.
3. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values takes into consideration the external attenuation correction factors.
   - The SMA (Female) RF Cable soldered on PCB with maximum attenuation of 0.4 dB at the tested frequencies.
   - The RF cable attenuation maximum 0.6 dB@2.4GHz from the EUT to RF power meter including the 10 dB attenuation at the input of RF power meter.

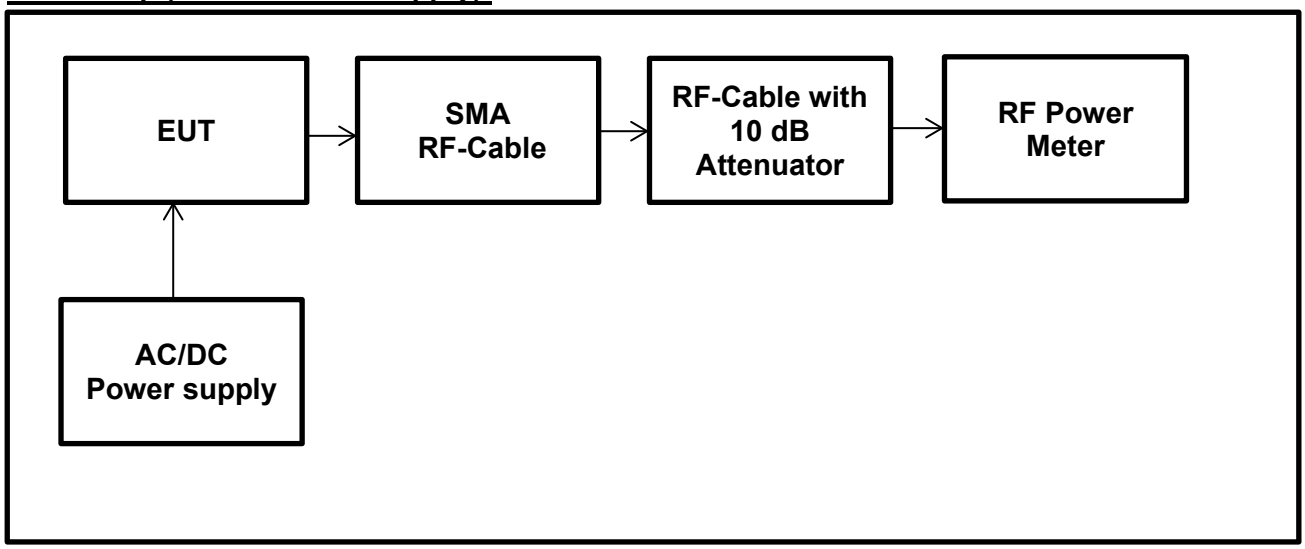
   Therefore, total a reference level offset 11.0 dB was added to each of measured value at the tested frequencies.

Transmitter Maximum (Peak) Output Power (continued)

Test Setup (Internal Battery Powered):



Test Setup (AC-DC Power Supply):



Transmitter Maximum (Peak) Output Power (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0

Conducted Power Limit Comparison

Channel	Conducted Peak Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	16.57	30.0	13.43	Complied
Middle	16.90	30.0	13.10	Complied
Top	17.01	30.0	12.99	Complied

De Facto EIRP Limit Comparison

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	16.57	4.0	20.57	36.0	15.43	Complied
Middle	16.90	4.0	20.90	36.0	15.10	Complied
Top	17.01	4.0	21.01	36.0	14.99	Complied

Result: Pass

Transmitter Maximum (Peak) Output Power (continued)

Results: Fully Charged Internal Battery / 802.11b / 20 MHz / 11 Mbps / PWR 0

Conducted Power Limit Comparison

Channel	Conducted Peak Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	16.46	30.0	13.54	Complied
Middle	16.94	30.0	13.06	Complied
Top	16.98	30.0	13.02	Complied

De Facto EIRP Limit Comparison

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	16.46	4.0	20.46	36.0	15.54	Complied
Middle	16.94	4.0	20.94	36.0	15.06	Complied
Top	16.98	4.0	20.98	36.0	15.02	Complied

Result: Pass

Transmitter Maximum (Peak) Output Power (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0

Conducted Power Limit Comparison

Channel	Conducted Peak Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	14.04	30.0	15.96	Complied
Middle	14.82	30.0	15.18	Complied
Top	14.29	30.0	15.71	Complied

De Facto EIRP Limit Comparison

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	14.04	4.0	18.04	36.0	17.96	Complied
Middle	14.82	4.0	18.82	36.0	17.18	Complied
Top	14.29	4.0	18.29	36.0	17.71	Complied

Result: Pass

Transmitter Maximum (Peak) Output Power (continued)

Results: Fully Charged Internal Battery / 802.11g / 20 MHz / 54 Mbps / PWR 0

Conducted Power Limit Comparison

Channel	Conducted Peak Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	13.67	30.0	16.33	Complied
Middle	15.06	30.0	14.94	Complied
Top	14.04	30.0	15.96	Complied

De Facto EIRP Limit Comparison

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	13.67	4.0	17.67	36.0	18.33	Complied
Middle	15.06	4.0	19.06	36.0	16.94	Complied
Top	14.04	4.0	18.04	36.0	17.96	Complied

Result: Pass

Transmitter Maximum (Peak) Output Power (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0

Conducted Power Limit Comparison

Channel	Conducted Peak Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	13.61	30.0	16.39	Complied
Middle	13.78	30.0	16.22	Complied
Top	13.89	30.0	16.11	Complied

De Facto EIRP Limit Comparison

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	13.61	4.0	17.61	36.0	18.39	Complied
Middle	13.78	4.0	17.78	36.0	18.22	Complied
Top	13.89	4.0	17.89	36.0	18.11	Complied

Result: Pass

Transmitter Maximum (Peak) Output Power (continued)

Results: Fully Charged Internal Battery / 802.11n / 20 MHz / MCS7 / PWR 0

Conducted Power Limit Comparison

Channel	Conducted Peak Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	13.17	30.0	16.83	Complied
Middle	13.23	30.0	16.77	Complied
Top	13.44	30.0	16.56	Complied

Facto EIRP Limit Comparison

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	13.17	4.0	17.17	36.0	18.83	Complied
Middle	13.23	4.0	17.23	36.0	18.77	Complied
Top	13.44	4.0	17.44	36.0	18.56	Complied

Result: Pass

5.2.6. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	20 April 2021
Test Sample Serial Number:	TB1.5 *(Radiated RF Sample)*		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.4
Frequency Range	9 kHz to 30 MHz

Environmental Conditions:

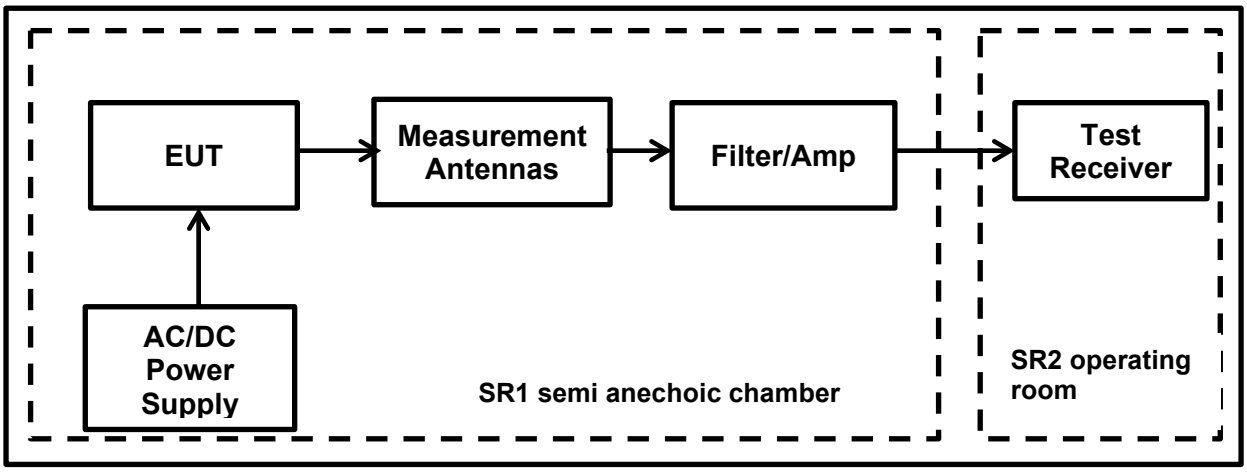
Temperature (°C):	21.7
Relative Humidity (%):	47.2

Note(s):

1. In accordance with FCC KDB 414788, an alternative test site may be used for the measurement below 30 MHz (The OATS / SAC comparison data is available upon request). Therefore the result from the semi-anechoic chamber tests is shown in this section of the test report.
2. The limits are specified at a test distance of 30 m & 300 m. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor.
3. Therefore the limit values are extrapolated to a measurement distance of 3 m.
    - 9 kHz- 490 kHz: limits extrapolated from 300 m to 3 m by adding 80 dB at 40 dB/deacde.
    - 490kHz-1705 kHz: limits extrapolated from 30 m to 3 m by adding 40 dB /deacde.
4. Measurements below 30 MHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The measurement loop antenna height was 80 cm.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was set to:
    - Frequency range: 9 kHz-150kHz : RBW: 300 Hz /VBW: 1 kHz
    - Frequency range: 150 kHz – 30 MHz: RBW: 10 kHz /VBW: 30 kHz
    - Detector: Max-Peak detector
    - Trace Mode: Max Hold
6. The preliminary scans showed similar emission levels below 30 MHz, for each channel & modes(b,g,n) of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
7. All emissions shown on the pre-scan plots were investigated and found to be below system noise floor.

Transmitter Radiated Emissions (continued)

Test Setup:

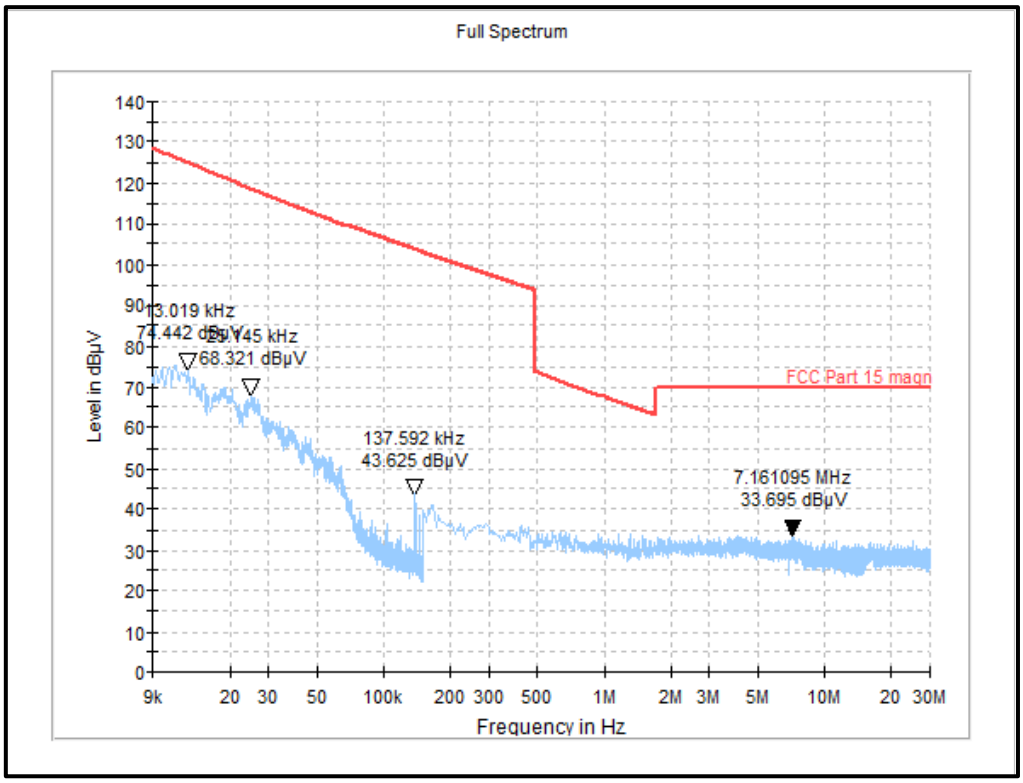


Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Top Channel

Frequency (MHz)	Loop Antenna Oriantation	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 9 kHz – 30 MHz



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

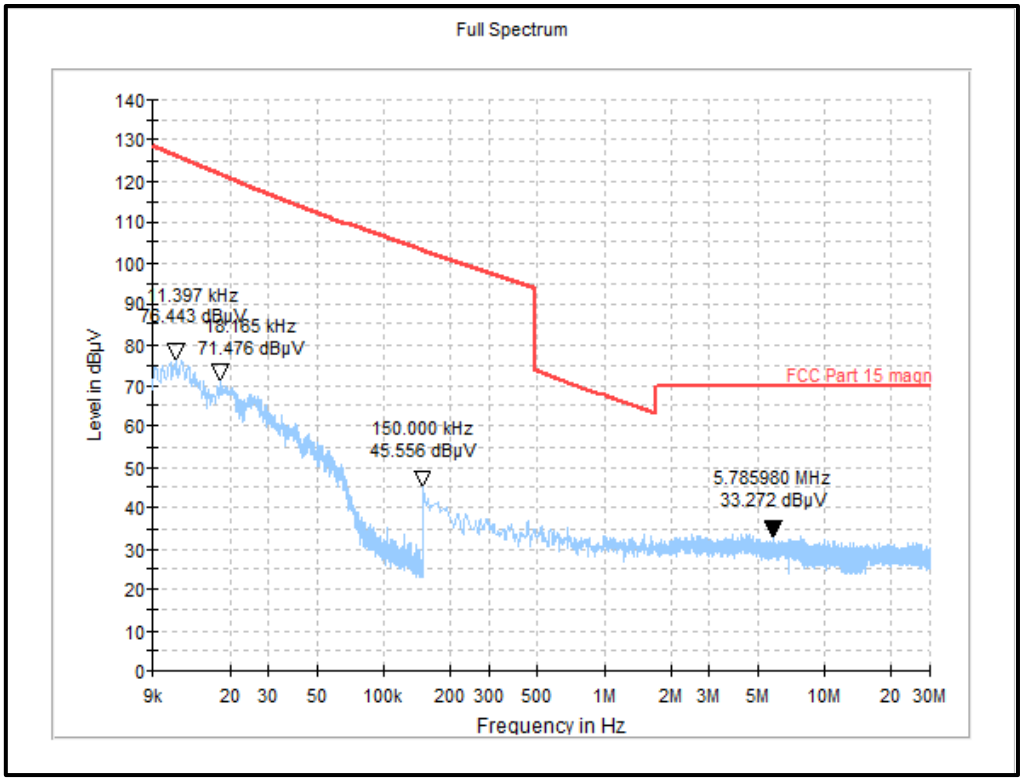
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0 / Top Channel

Frequency (MHz)	Loop Antenna Oriantation	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 9 kHz – 30 MHz



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

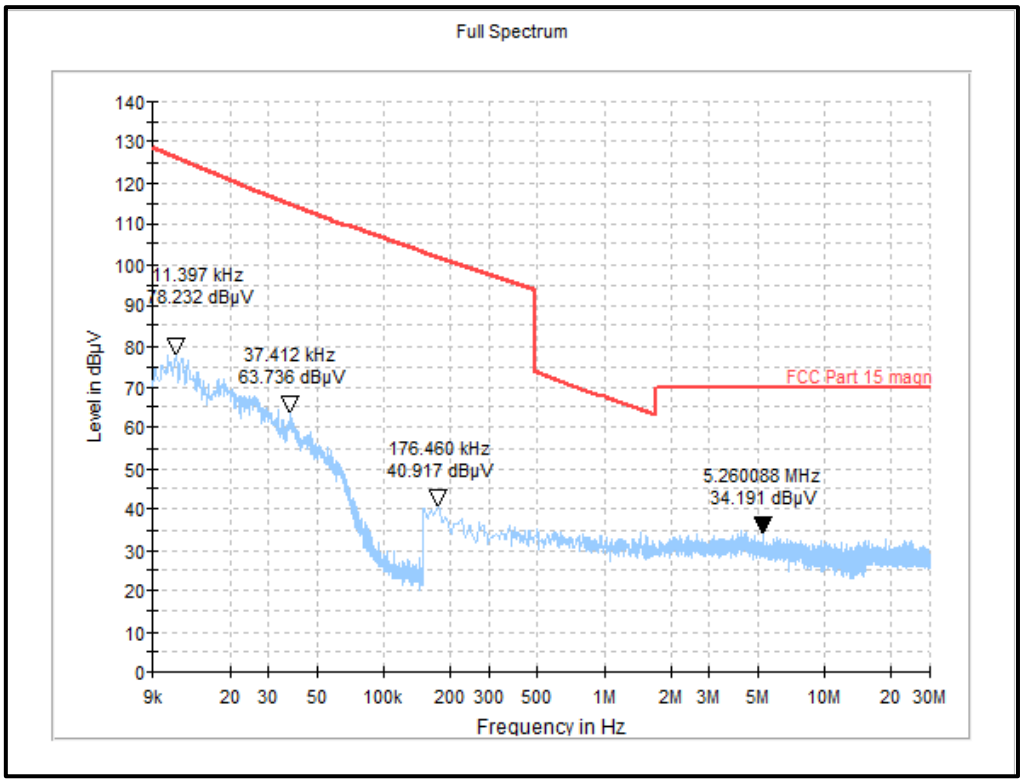
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0 / Top Channel

Frequency (MHz)	Loop Antenna Oriantation	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 9 kHz – 30 MHz



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

Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	14 April 2021 to 21 April 2021
Test Sample Serial Number:	TB1.5 *(Radiated RF Sample)*		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

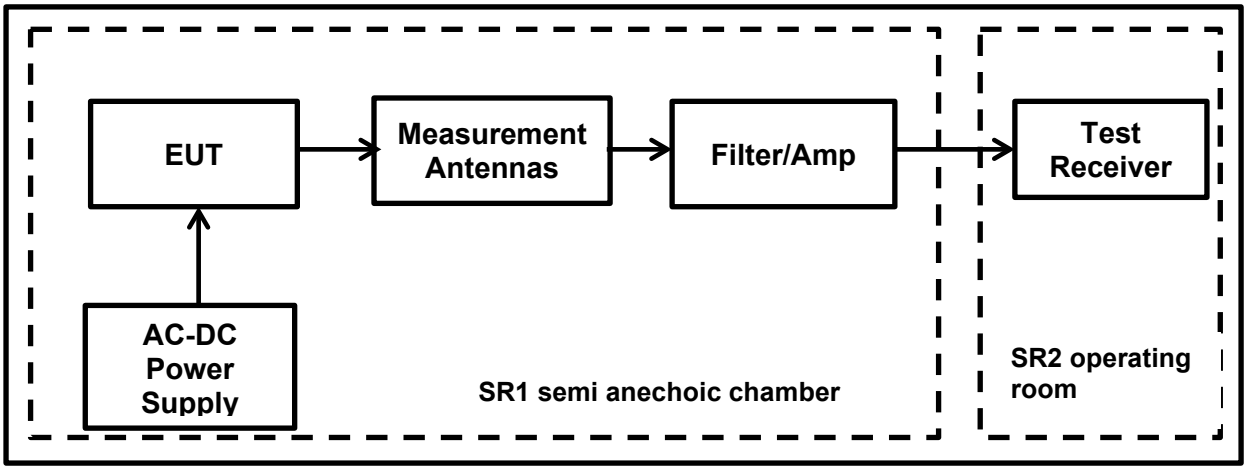
Temperature (°C):	23.0 to 25.2
Relative Humidity (%):	32.0 to 34.6

Note(s):

1. Measurements below 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) at a distance of 3 m. 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 m to 4 m.
2. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
3. The preliminary scans showed similar emission levels below 1000 MHz, for each channel & modes(b,g,n) of operation. Therefore, final radiated emissions measurements were performed with the EUT set to the top channel only.
4. All emissions shown on the pre-scan plots were investigated and found to be below system noise floor.

Transmitter Radiated Emissions (continued)

Test Setup:

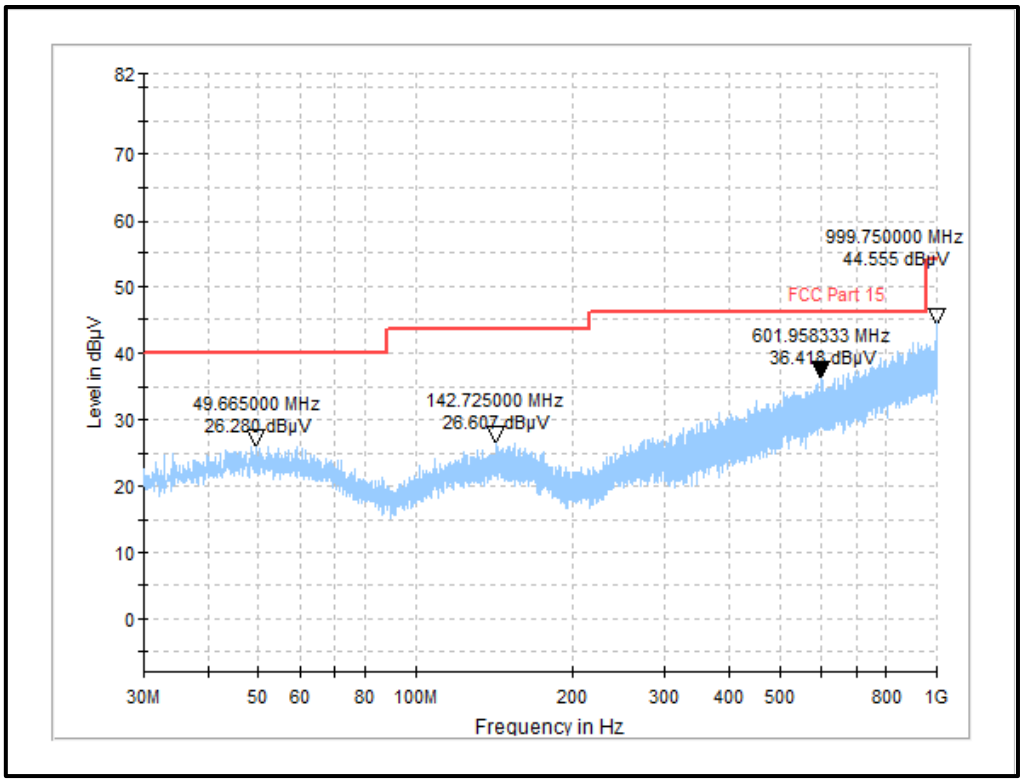


Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 30 MHz – 1 GHz



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

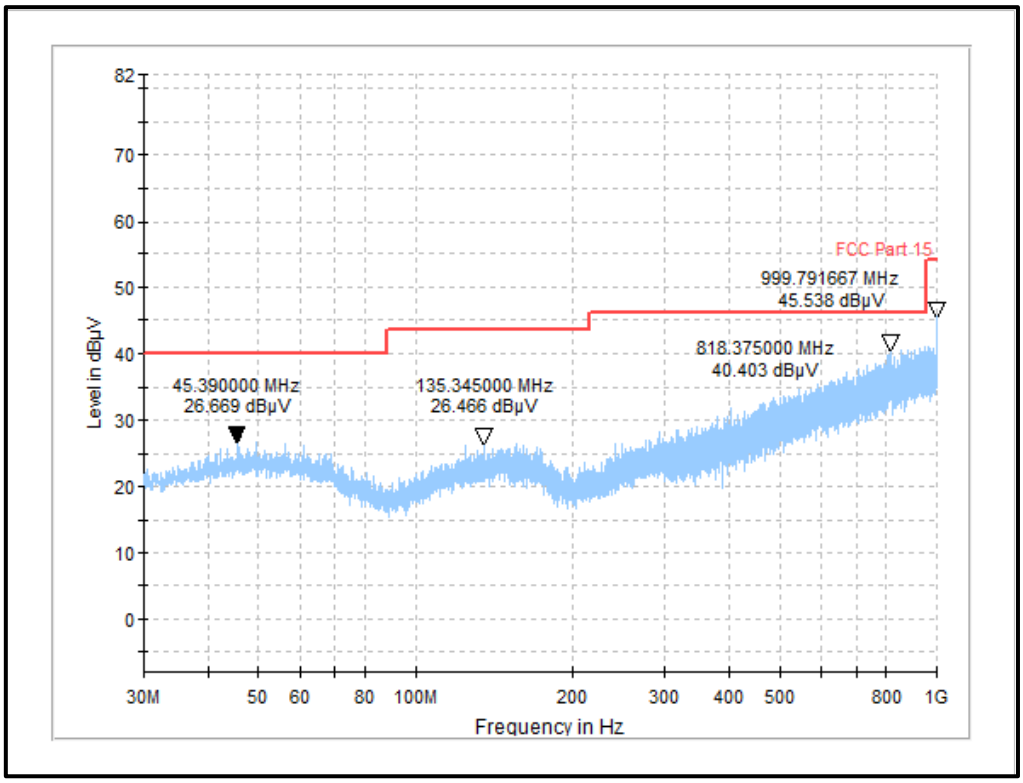
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 30 MHz – 1 GHz



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

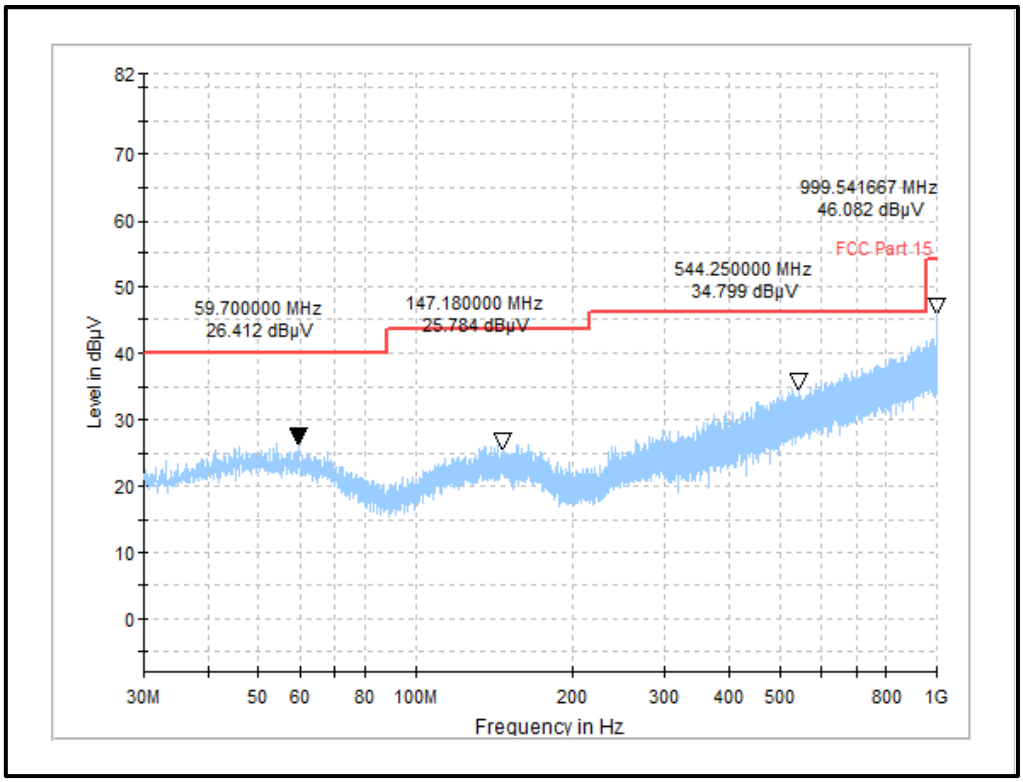
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 30 MHz – 1 GHz



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

Result: Pass

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	08 April 2021 to 09 July 2021
Test Sample Serial Number:	TB1.5 *(Radiated RF Sample)*		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d), 15.209(a) & 15.205(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referencing ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.6
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	23.1 to 24.7
Relative Humidity (%):	32.3 to 38.5

Note(s):

1. Pre-scans above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 m above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with absorber on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m.
2. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
3. The emissions shown at frequencies approximately 2.4 GHz to 2.4835 GHz on the 1 GHz to 18 GHz plots are the EUT fundamental for the tested channel.
4. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
5. All other emissions shown on the pre-scans were investigated and found to be below the noise floor of the measurement system.
6. *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.
7. **As the EUT was transmitting continuously with a Duty Cycle of ≤ 98 %, following Duty Cycle Correction Factor were added to all average measurements.
   Duty Cycle Correction Details (as mentioned below):
   - 802.11b I 11 Mbps : 40.78 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 3.90 dB was added to all average measurements
   - 802.11g I 54 Mbps : 39.20 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 4.07 dB was added to all average measurements
   - 802.11n(HT20) I MCS7: 33.50 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 4.75 dB was added to all average measurements

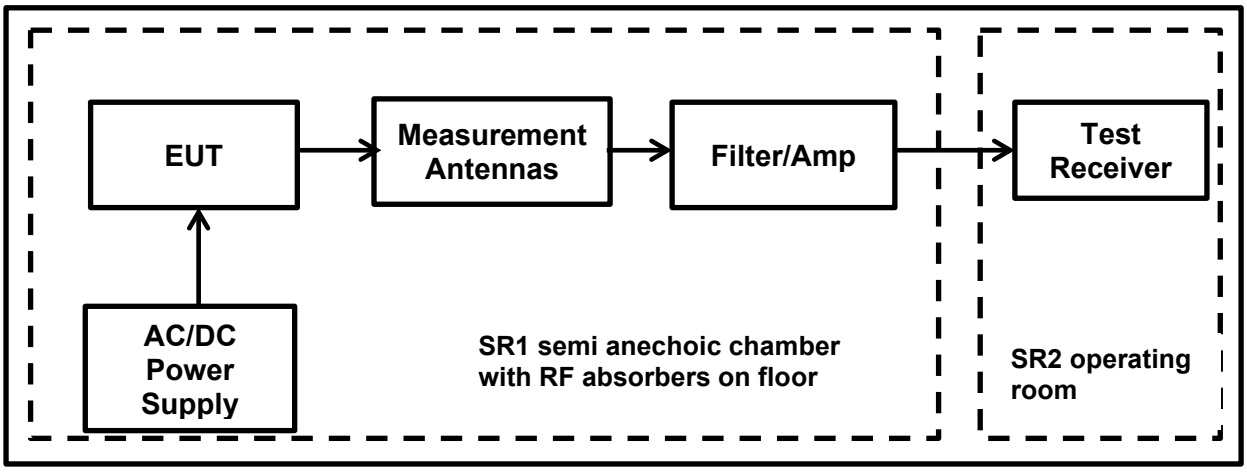
   to compute the corrected average values of the emissions that would have been measured had the test been performed at 100% Duty Cycle.

Transmitter Radiated Emissions (continued)

Note(s):

8. ***In accordance with FCC 15.247(d), the radio frequency power /emissions produced by the intentional radiator outside the operating frequency band which fall outside the restricted bands FCC 15.205(a); shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.
9. Since maximum conducted (Peak) output power was previously measured in accordance with ANSI C63.10 Section 11.11.1(a) with a peak detector the -20 dBc limit has been applied.
10. The preliminary scans showed similar emission levels above 18 GHz, for each channel & modes of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
11. For frequency range between 18 GHz and 25 GHz, no critical emissions were found. All emissions shown on the pre-scans were investigated and found to be below the noise floor of the measurement system.

Test Setup:



Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Bottom Channel

Results: 3600 *to 4400 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
3990.50	Vertical	49.21*	54.00	4.79	Complied

Results: 2310 *to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2314.53	Vertical	59.41	74.00	14.59	Complied

Results: 2310 *to 2390 MHz Restricted Band* / Average

Frequency (MHz)	Antenna Polarization	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2312.85	Vertical	48.81	3.90	48.81**	54.00	1.29	Complied

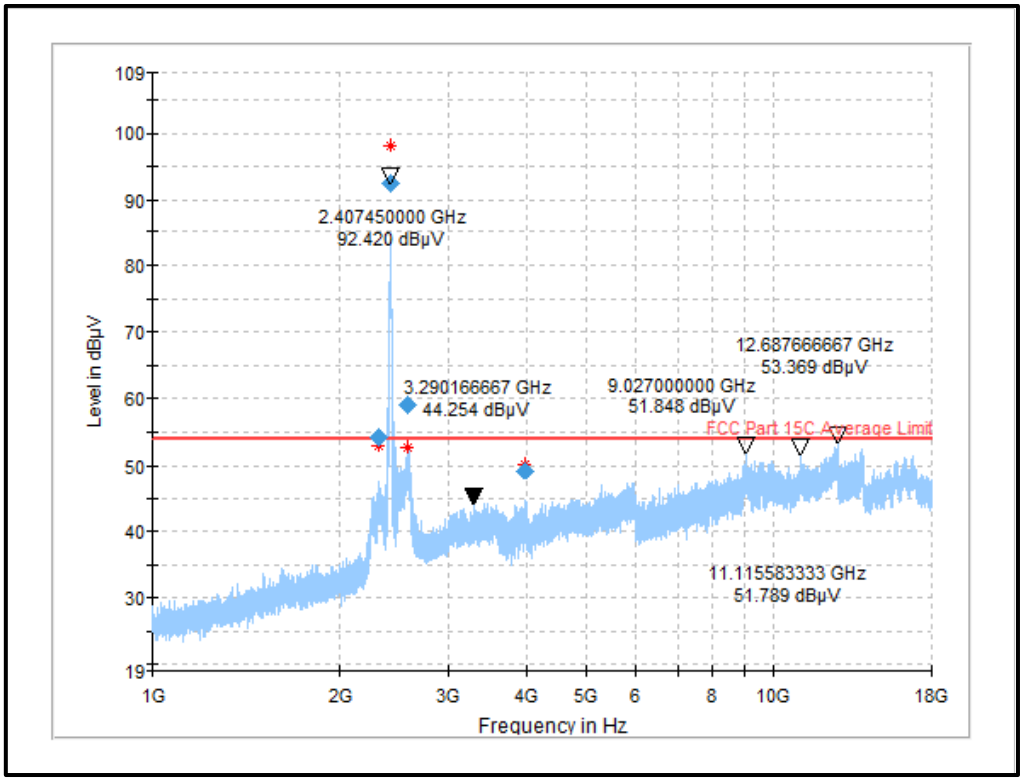
Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2555.28	Vertical	66.08***	80.59	14.51	Complied

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Bottom Channel

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Middle Channel

Results: 2310 *to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2316.45	Vertical	50.21*	54.00	3.79	Complied

Results: 3600 *to 4400 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
4061.00	Vertical	51.79*	54.00	2.21	Complied

Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2536.33	Vertical	63.84***	79.25	15.41	Complied

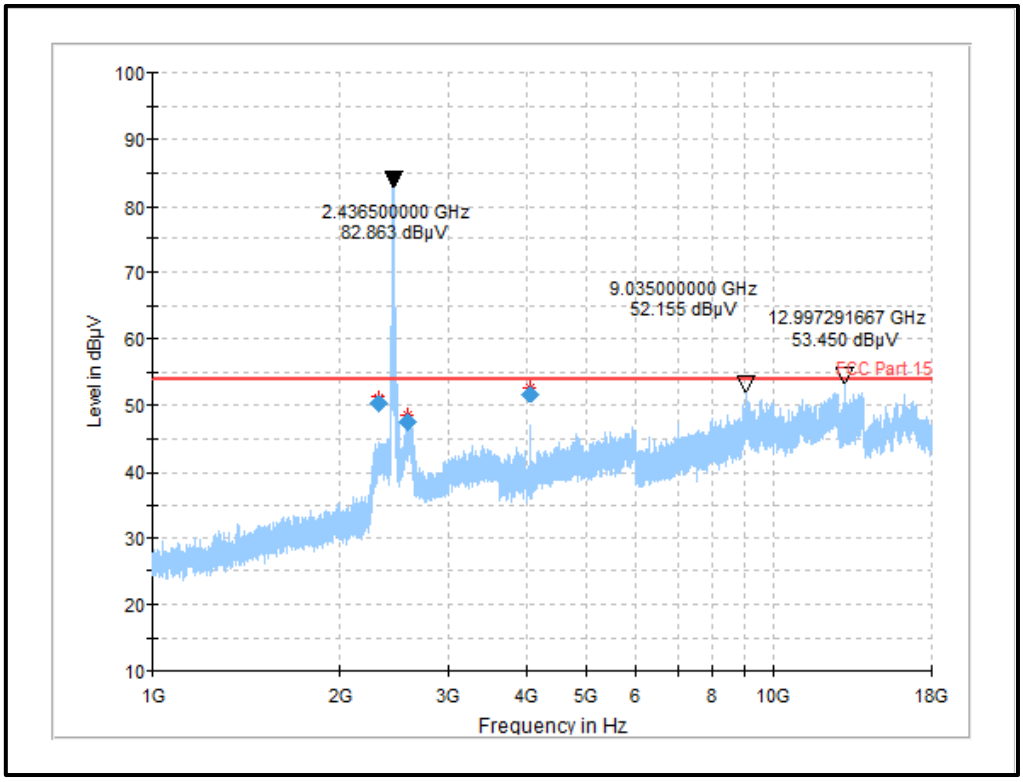
Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2559.81	Vertical	47.52*	54.00	6.48	Complied

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Middle Channel

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Top Channel

Results: 2310 *to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2315.86	Vertical	44.34*	54.00	9.66	Complied

Results: 2310 *to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2334.40	Vertical	55.24*	74.00	18.76	Complied

Results: 2310 *to 2390 MHz Restricted Band* / Average

Frequency (MHz)	Antenna Polarization	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2341.21	Vertical	44.65	3.90	48.55**	54.00	5.45	Complied

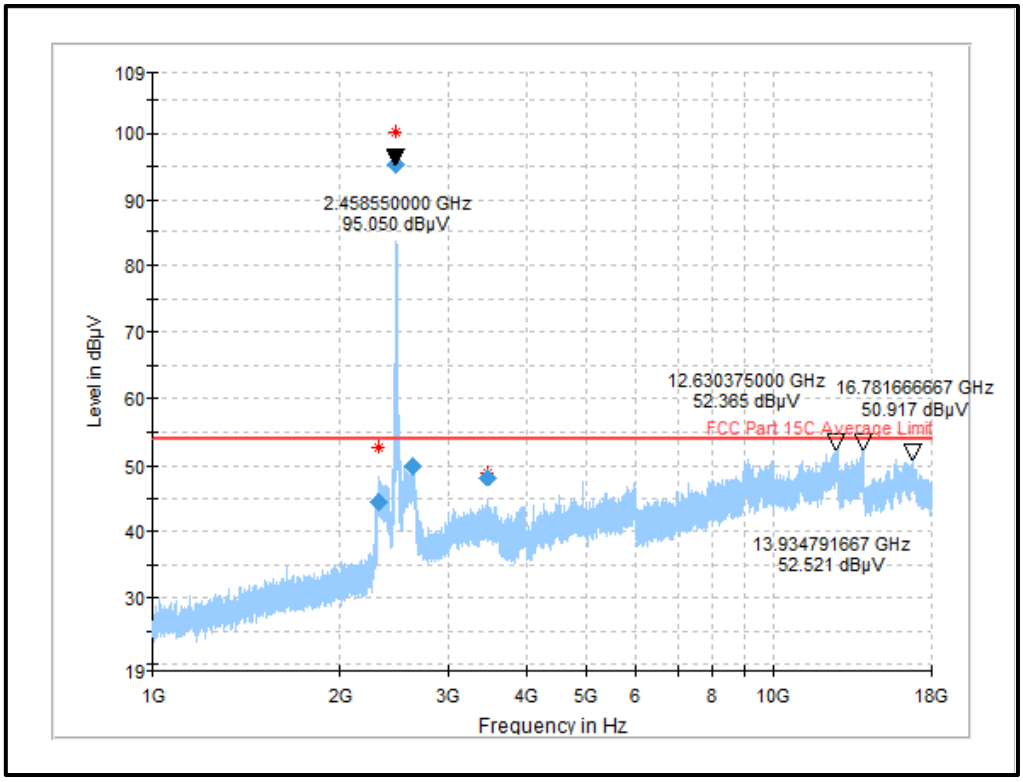
Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2615.23	Vertical	49.90*	54.00	4.10	Complied
3448.00	Vertical	48.28*	54.00	5.72	Complied

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Top Channel

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

Result: Pass

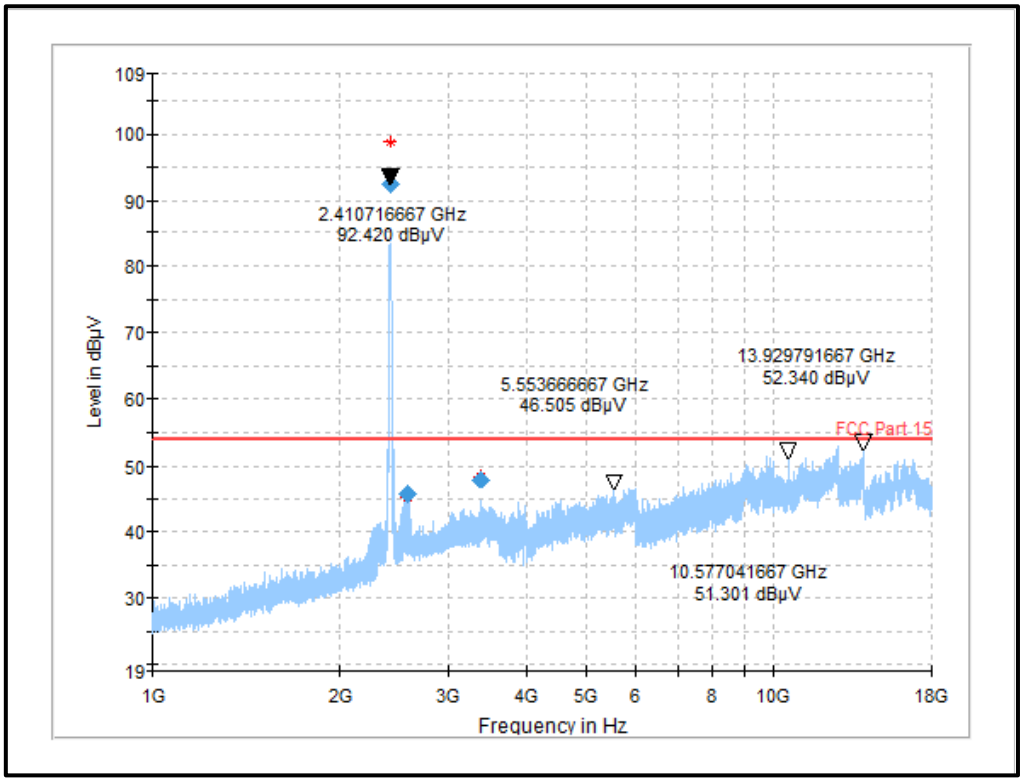
Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0 / Bottom Channel

Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2573.116	Vertical	45.61*	54.00	8.39	Complied
3363.166	Vertical	47.81*	54.00	6.19	Complied

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

Result: Pass

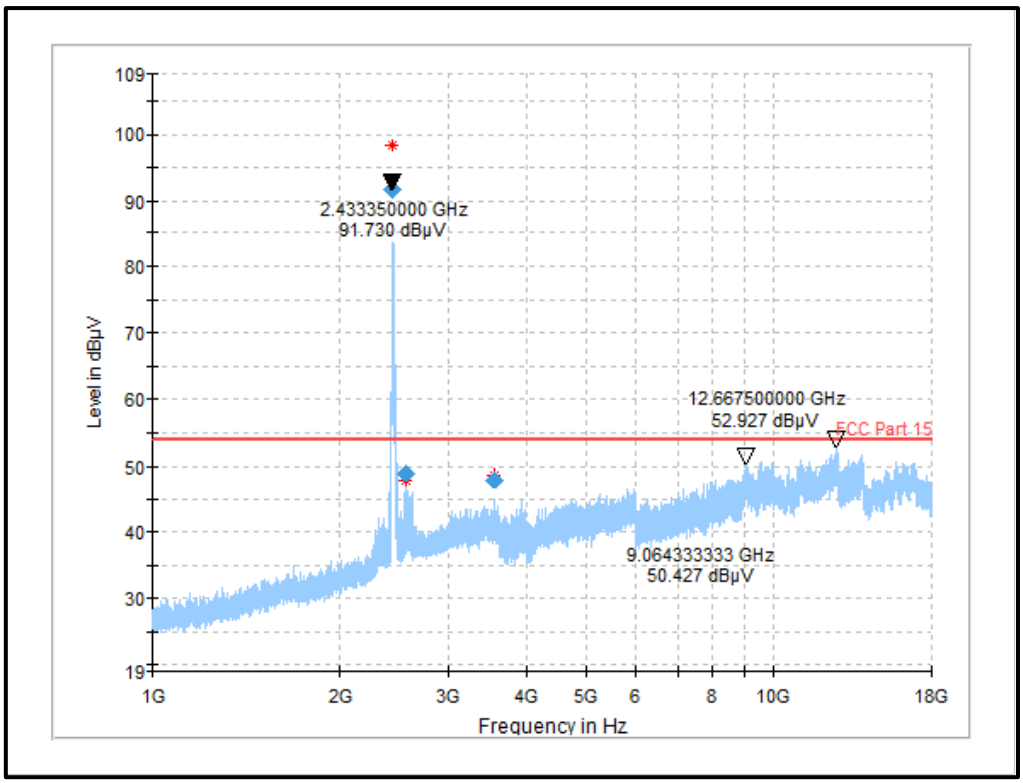
Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0 / Middle Channel

Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2552.000	Vertical	48.95*	54.00	5.05	Complied
3534.833	Vertical	47.85*	54.00	6.15	Complied

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0 / Top Channel

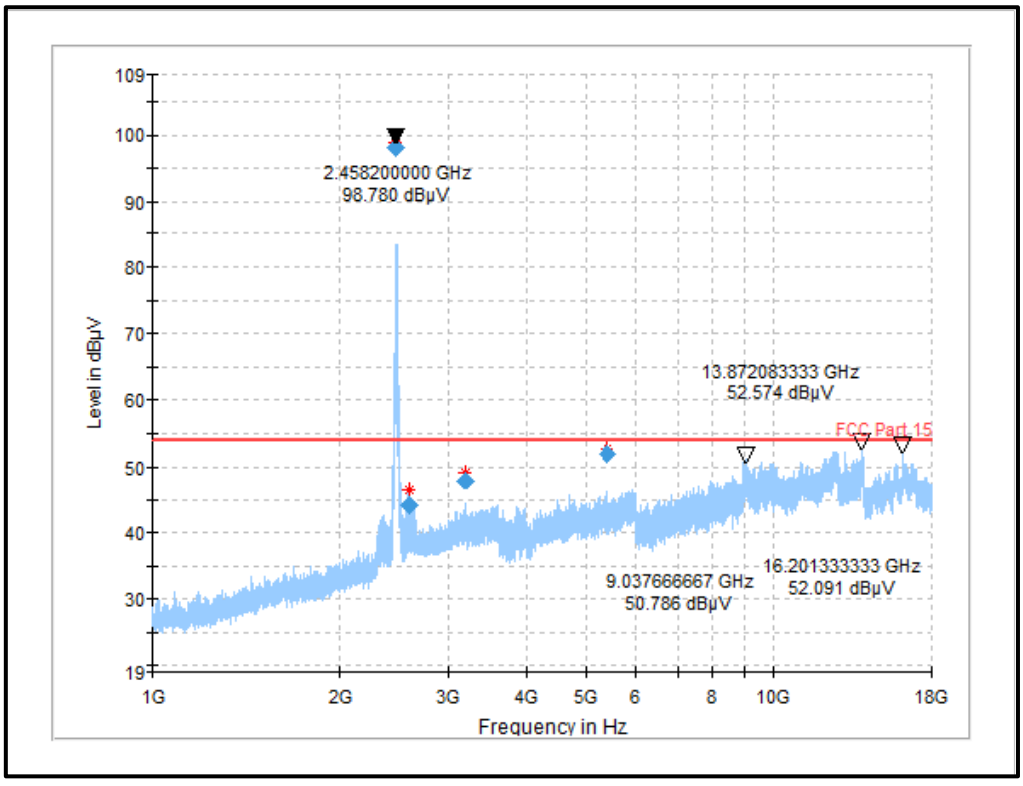
Results: Non-*Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2583.15	Vertical	44.17*	54.00	9.83	Complied
3180.66	Horizontal	47.85*	54.00	6.15	Complied

Results: 5350 *to 5460 MHz Restricted Band* / Peak

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
5387.33	Horizontal	51.95*	54.00	2.05	Complied

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

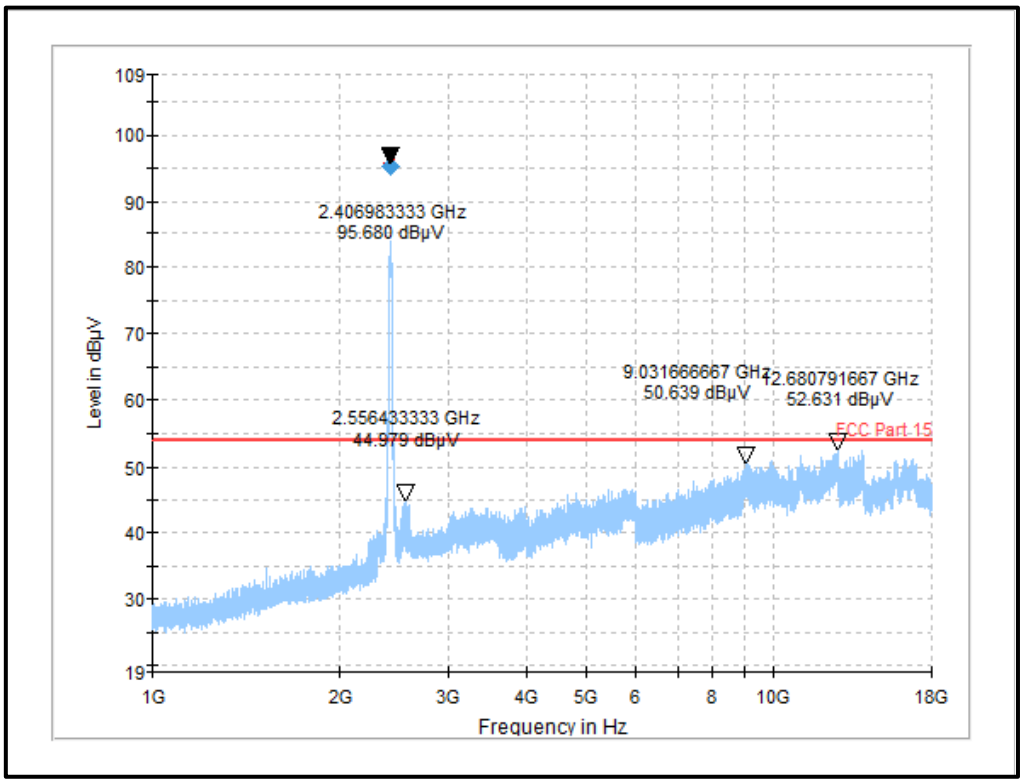
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0 / Bottom Channel

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

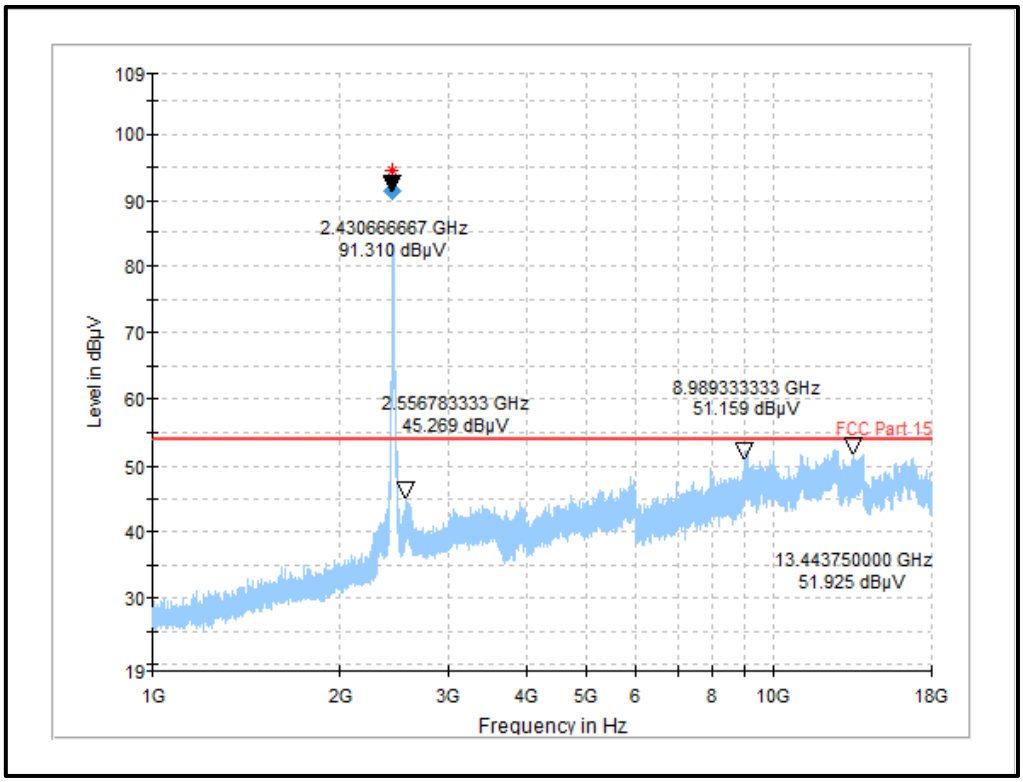
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0 / Middle Channel

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

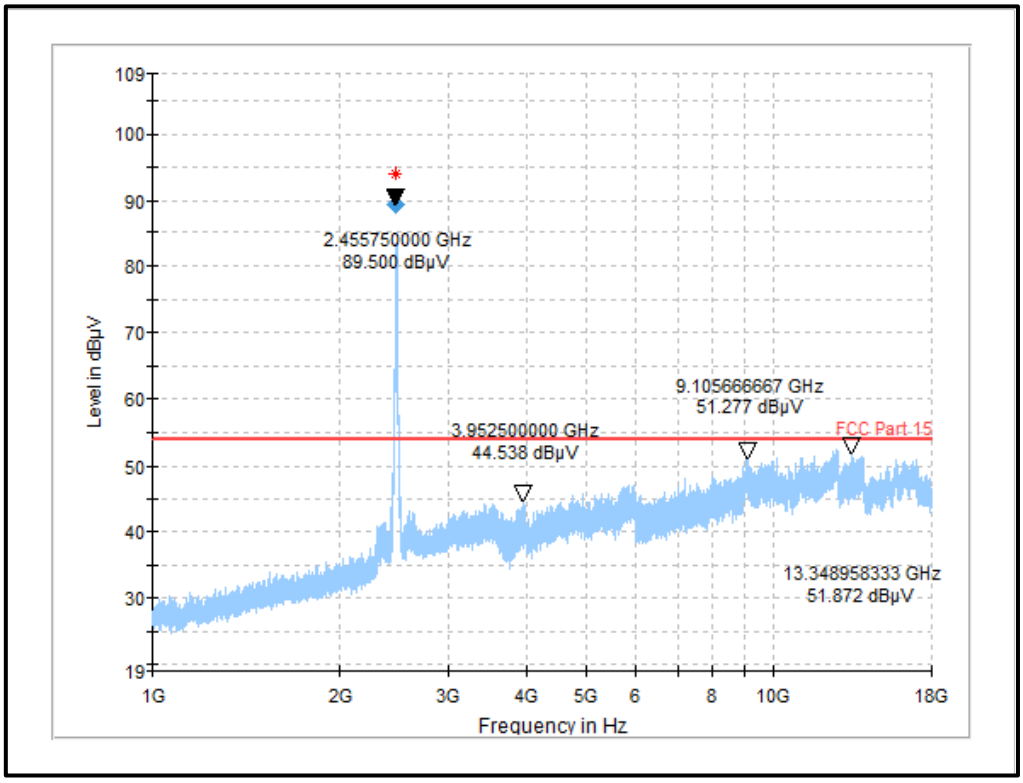
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 1 GHz – 18 GHz



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

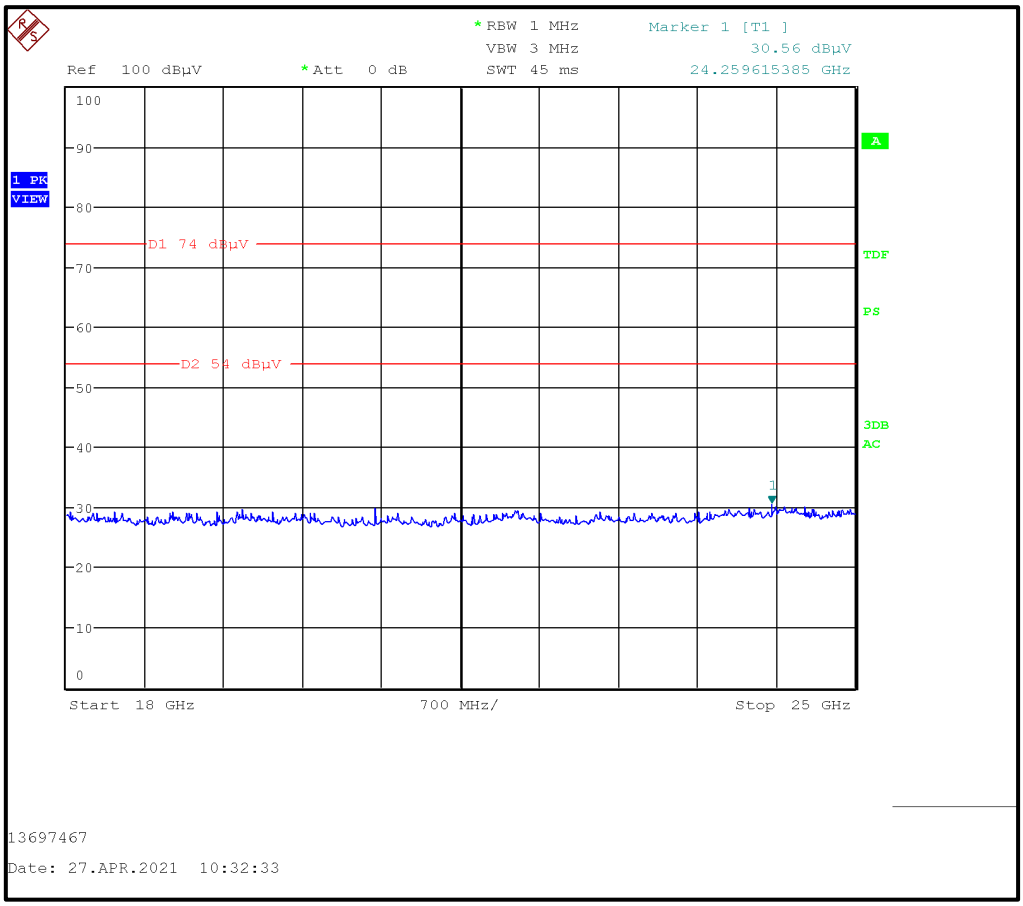
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 18 GHz – 25 GHz



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

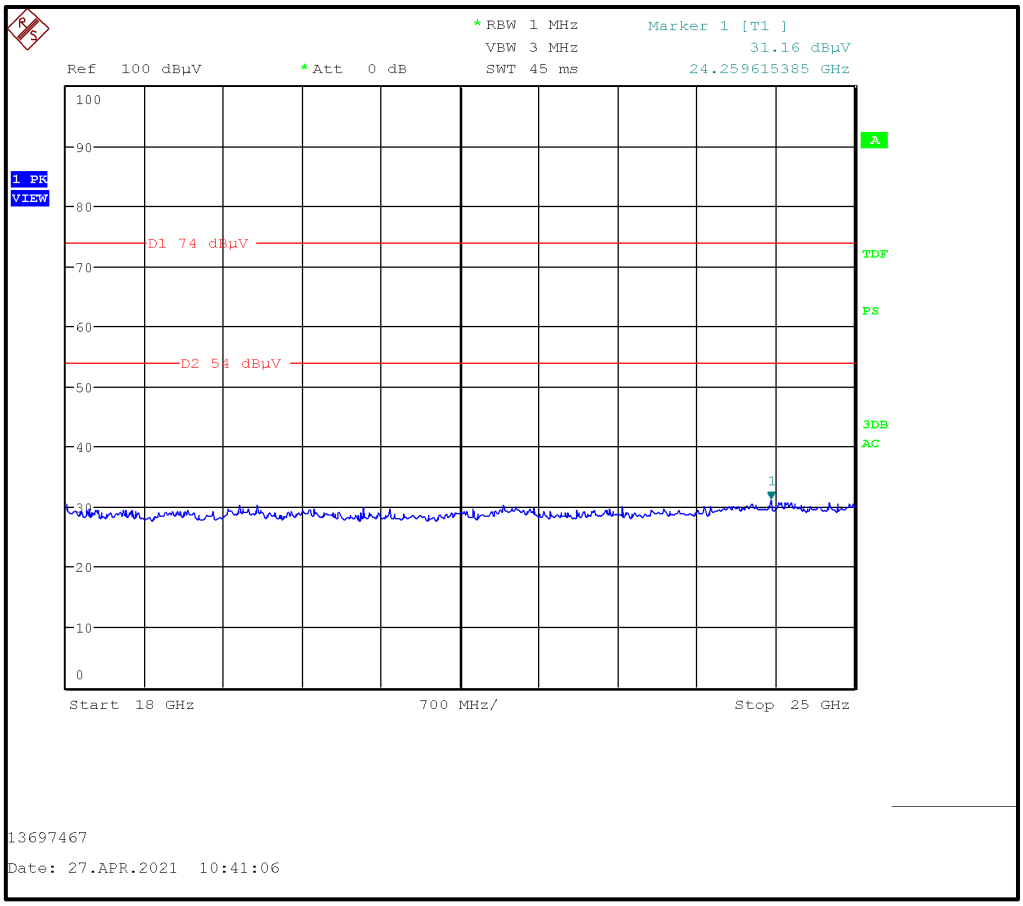
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 18 GHz – 25 GHz



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

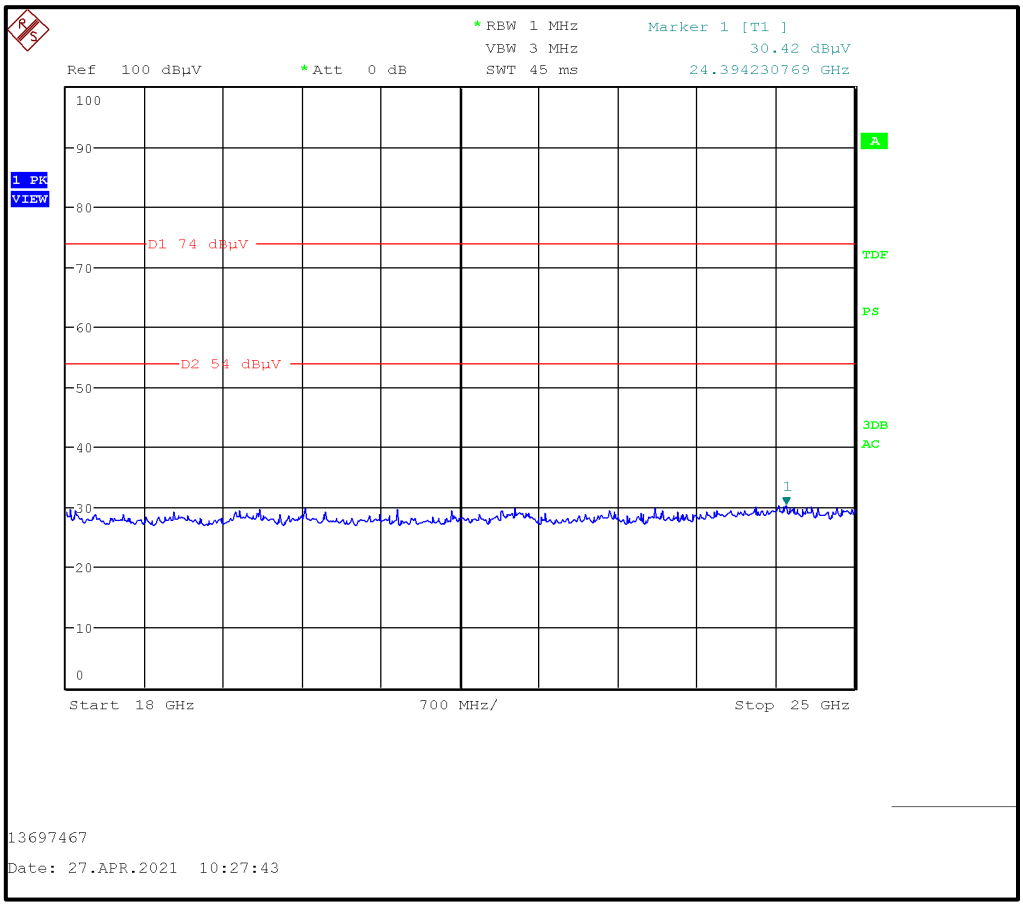
Result: Pass

Transmitter Radiated Emissions (continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0 / Top Channel

Frequency (MHz)	Antenna Polarization	MaxPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious emissions were found					

Plot: Radiated Transmitter spurious emission from 18 GHz – 25 GHz



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

Result: Pass

5.2.7. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Krume Ivanov	**Test Date:**	19 April 2021 to 28 April 2021
Test Sample Serial Number:	TB1.5 *(Radiated RF Sample)*		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d), 15.209(a) & 15.205(a)
Test Method Used:	DTS emissions in non-restricted frequency bands: FCC KDB 558074 Section 8.5 referencing ANSI C63.10:2013 Sections 11.11
	DTS emissions in restricted frequency bands: FCC KDB 558074 Section 8.6 referencing ANSI C63.10:2013 Sections 11.12
	ANSI C63.10:2013 Sections 6.10.4, 6.10.5

Environmental Conditions:

Temperature (°C):	22.2 to 26.8
Relative Humidity (%):	27.2 to 34.6

Note(s):

1. The measurments were in a semi-anechoic chamber SR1/ 2 (Asset Number 1603665) with RF absorbers on the floor at a distance of 3 m. The EUT was placed at a height of 1.5 m above the test chamber floor in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 m to 4 m
2. As the lower band edge falls within a non-restricted band, measurements were performed in accordance with FCC KDB 558074 Section 8.5 referencing ANSI C63.10 Section 11.11. Since maximum conducted (Peak) output power was previously measured in accordance with ANSI C63.10 Section 11.11.1(a) lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
3. As the lower band edge falls within a non-restricted band, only peak measurements are required. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. Marker frequencies and levels were recorded.
4. The restricted band peak measurements were performed in accordance with ANSI C63.10 Section 11.12.2.4.
5. As the EUT continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), the restricted band average measurements were performed in accordance with ANSI C63.10 Section 11.12.2.5.2.
6. As the upper band edge falls within a restricted band both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A RMS detector in power averaging mode was used. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.

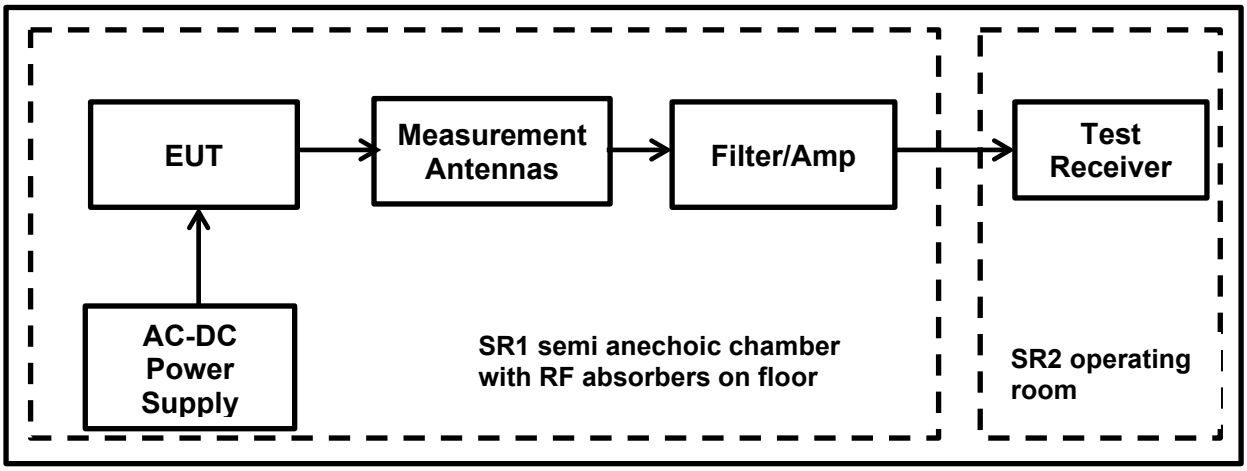
Transmitter Band Edge Radiated Emissions (continued)

Note(s): (continued)

7. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.
8. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
9. **As the EUT was transmitting continuously with a Duty Cycle of ≤ 98 %, following Duty Cycle Correction Factor were added to all average measurements.
   Duty Cycle Correction Details (as mentioned below):
   - 802.11b I 11 Mbps : 40.78 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 3.90 dB was added to all average measurements
   - 802.11g I 54 Mbps : 39.20 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 4.07 dB was added to all average measurements
   - 802.11n(HT20) I MCS7: 33.50 % (duty cycle variations are less than ±2%). Therefore, a Duty Cycle Correction Factor of 4.75 dB was added to all average measurements

to compute the corrected average values of the emissions that would have been measured had the test been performed at 100% Duty Cycle.

Test Setup:



Transmitter Band Edge Radiated Emissions (Continued)

Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0

Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2396.00	55.72	76.21	20.49	Complied
2400.00	49.60	76.21	26.61	Complied

Results: Lower Band Edge / *2310 to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2363.07	58.49	74.00	15.51	Complied

Results: Lower Band Edge / *2310 to 2390 MHz Restricted Band* / Average

Frequency (MHz)	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2363.97	45.62	3.90	49.52**	54.00	4.48	Complied

Results: Upper Band Edge / Peak

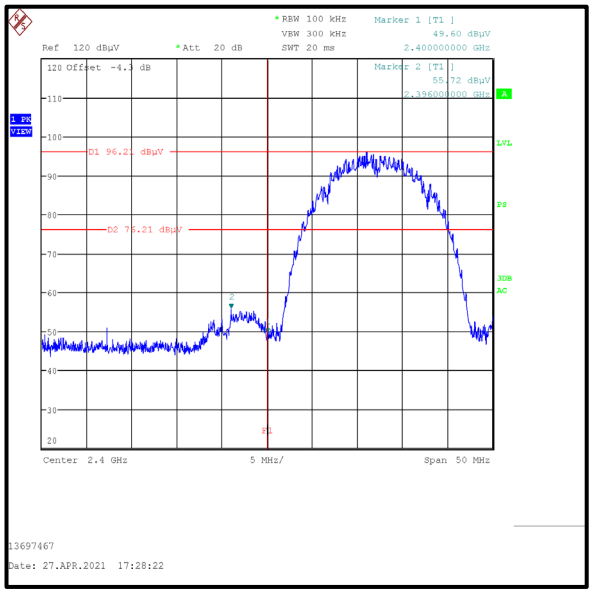
Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2483.50	60.50	74.00	13.50	Complied
2486.26	61.92	74.00	12.08	Complied

Results: Upper Band Edge / Average

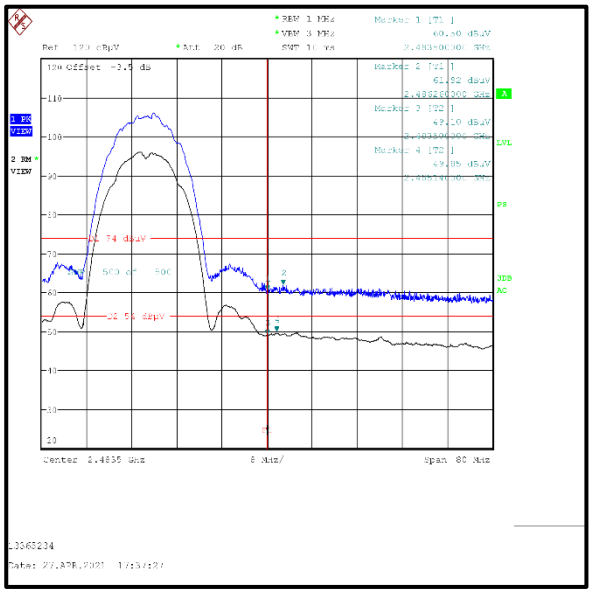
Frequency (MHz)	Peak Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2483.50	49.10	3.90	53.00**	54.00	1.00	Complied
2485.14	49.85	3.90	53.75**	54.00	0.25	Complied

Transmitter Band Edge Radiated Emissions (Continued)

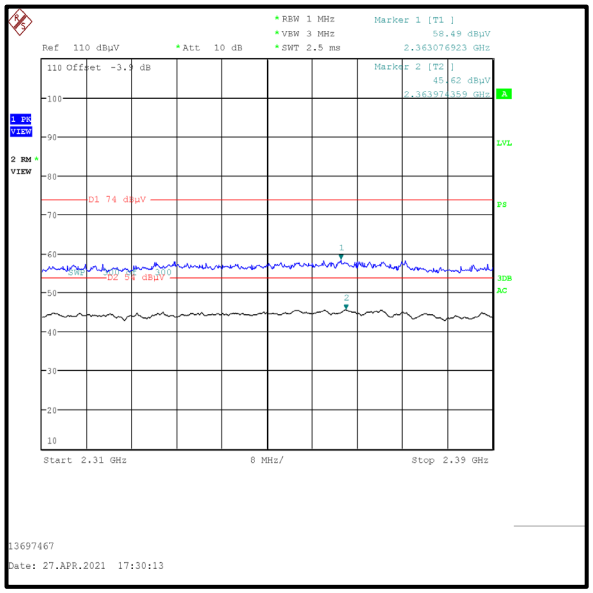
Results: AC-DC Power Supply / 802.11b / 20 MHz / 11 Mbps / PWR 0



Lower Band Edge Peak Measurement



Upper Band Edge Measurement



Restricted Band Edge Measurement

Result: Pass within Measurement Uncertainty

Transmitter Band Edge Radiated Emissions (Continued)

Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0

Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2397.02	55.13	69.45	14.32	Complied
2400.00	57.07	69.45	12.38	Complied

Results: Lower Band Edge / *2310 to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2390.00	65.61	74.00	8.398.39	Complied

Results: Lower Band Edge / *2310 to 2390 MHz Restricted Band* / Average

Frequency (MHz)	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2390.00	42.02	4.07	46.09**	54.00	7.91	Complied

Results: Upper Band Edge / Peak

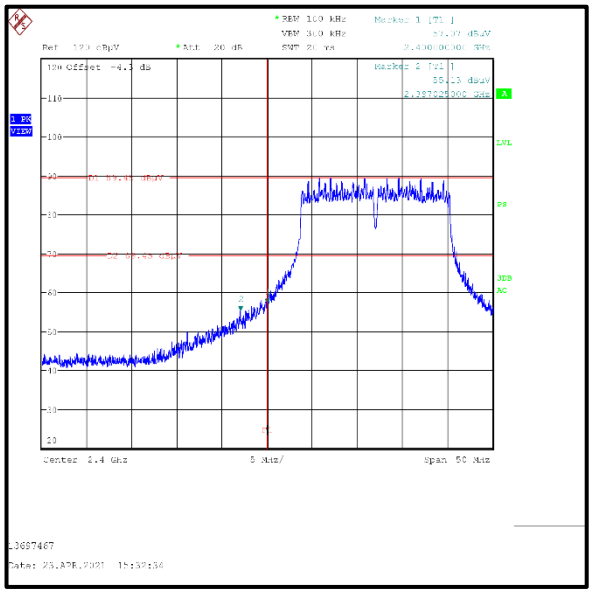
Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2483.50	65.00	74.00	9.00	Complied
2484.07	65.33	74.00	8.67	Complied

Results: Upper Band Edge / Average

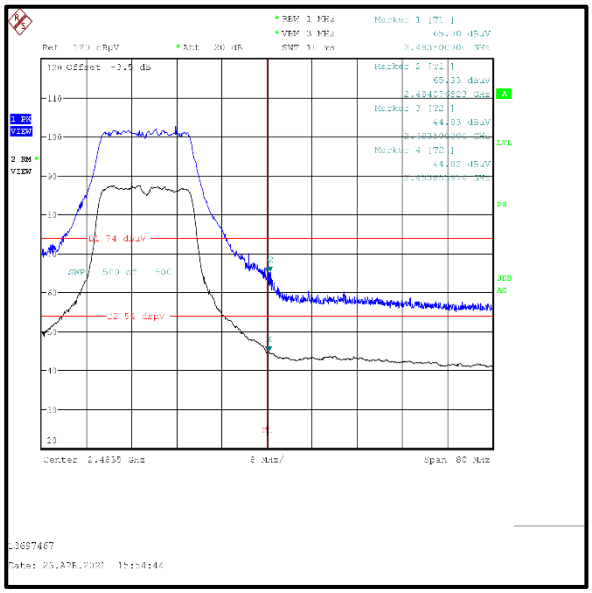
Frequency (MHz)	Peak Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2483.50	44.83	4.07	48.90**	54.00	5.10	Complied
2483.88	44.82	4.07	48.89**	54.00	5.11	Complied

Transmitter Band Edge Radiated Emissions (Continued)

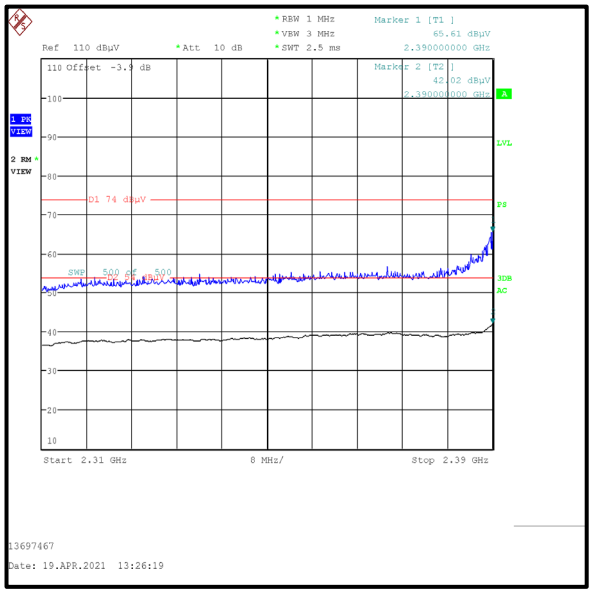
Results: AC-DC Power Supply / 802.11g / 20 MHz / 54 Mbps / PWR 0



Lower Band Edge Peak Measurement



Upper Band Edge Measurement



Restricted Band Edge Measurement

Result: Pass

Transmitter Band Edge Radiated Emissions (Continued)

Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0

Results: Lower Band Edge / Peak

Frequency (MHz)	Peak Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2399.09	57.84	68.87	11.03	Complied
2400.00	57.62	68.87	11.25	Complied

Results: Lower Band Edge / *2310 to 2390 MHz Restricted Band* / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2389.61	58.14	74.00	15.86	Complied

Results: Lower Band Edge / *2310 to 2390 MHz Restricted Band* / Average

Frequency (MHz)	Average Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2390.00	38.96	4.75	43.71**	54.00	10.29	Complied

Results: Upper Band Edge / Peak

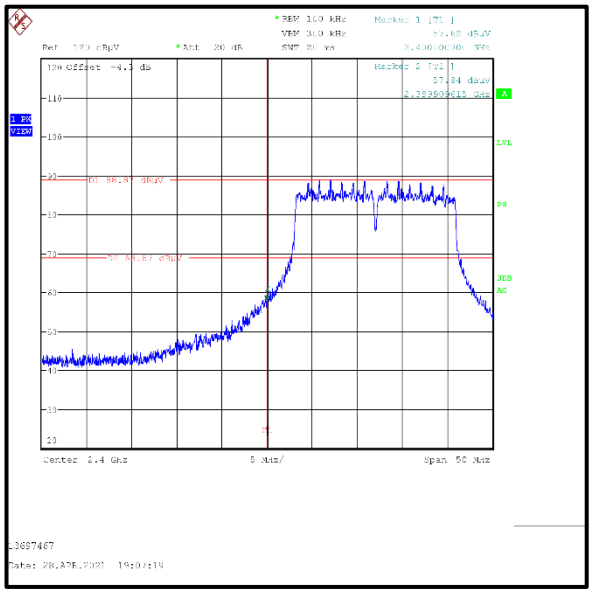
Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2483.50	57.21	74.00	16.79	Complied
2484.38	57.13	74.00	16.87	Complied

Results: Upper Band Edge / Average

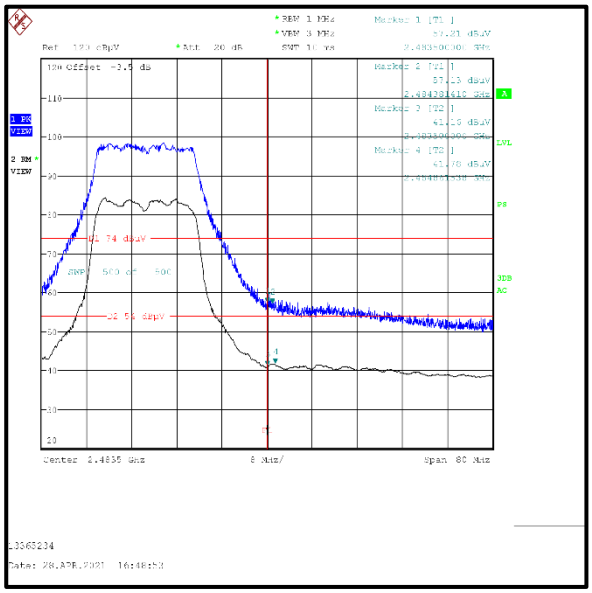
Frequency (MHz)	Peak Level (dBµV/m)	Duty Cycle Correction Factor (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2483.50	41.16	4.75	45.91**	54.00	8.09	Complied
2484.86	41.78	4.75	46.53**	54.00	7.47	Complied

Transmitter Band Edge Radiated Emissions (Continued)

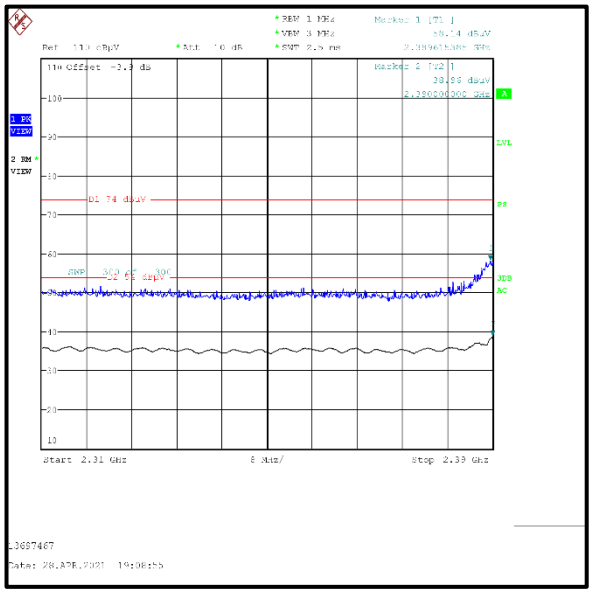
Results: AC-DC Power Supply / 802.11n / 20 MHz / MCS7 / PWR 0



Lower Band Edge Peak Measurement



Upper Band Edge Measurement



Restricted Band Edge Measurement

Result: Pass

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
AC Conducted Spurious Emissions	95%	±2.49 dB
Conducted Maximum Peak Output Power	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 %
Spectral Power Density	95%	±0.59 dB

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

7. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	10/07/2020	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	08/07/2020	12
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	09/07/2020	12
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
452	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	02/09/2020	24
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	05/08/2020	36
607	Schwarzbeck	Antenna broadband horn antenna	BBHA 9170	9170-561	15/10/2019	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	28/06/2021	12
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	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
-/-	Testo	Thermo-Hygrometer	608-H1	01	lab verification	n/a
328	SPS	AC/DC power distribution system	PAS 5000	A2464 00/2 0200	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/ 2	-/-	B83117-A1421-T161	n/a	n/a

Test site: SR 7/8

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
23	Rohde & Schwarz	Artificial Mains Network	ESH3-Z5	831767/013	07/07/2020	12
349	Rohde & Schwarz	Receiver, EMI Test	ESIB7	836697/009	09/07/2020	12
-/-	Testo	Thermo-Hygrometer	608-H1	08	lab verification	n/a
327	SPS	AC/DC power distribution system	PAS 5000	A2464 00/1 0200	lab verification	n/a

Test site: SR 9

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
445	Huber & Suhner	RF Attenuator (10dB)	6810.17.AC	--	lab verification	12
637	Rohde & Schwarz	Spectrum Analyzer	FSV40	101587	08/07/2020	12
636	Rohde & Schwarz	Switching Unit Power Meter	OSP-B157W8	101698	07/07/2020	12
-/-	Testo	Thermo-Hygrometer	608-H1	07	lab verification	n/a
-/-	Huber & Suhner	RF Cable (upto 18GHz)	-/-	-/-	lab verification	n/a
327	SPS	AC/DC power distribution system	PAS 5000	A2464 00/1 0200	lab verification	n/a
1603668	Siemens Matsushita Components	shielded room		B83117-B1422-T161	n/a	n/a

8. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
Test Report Version 1.1 supersede Version 1.0 with immediate effect Test Report No. UL-RPT-RP-13697467-116-FCC Version 1.1, Issue Date 10 AUGUST 2021 replaces Test Report No. UL-RPT-RP-13697467-116-FCC Version 1.0, Issue Date 12 JULY 2021, which is no longer valid.			
1.1	as below	as below	Current Version
	91	7.0	Test site: SR 1/2: Equipment No. 591 calibration date corrected to 28/06/2021