



Test report No:
NIE: 59830RRF.006

Test report

USA FCC Part 15.407, 15.209

CANADA RSS-247, RSS-Gen

Unlicensed National Information Infrastructure (U-NII) Devices.

General technical requirements.

Radiated emission limits; general requirements.

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	TCAM: Telematics and Connectivity Antenna Module	
(*) Trademark	Continental	
(*) Model and /or type reference	TCAM1NA0	
Other identification of the product	HW version: E4.2 SW version: PI007.1 FCC ID: KR5TCAM1NA0 IC: 7812D-TCAM1NA0	
(*) Features	2G, 3G, LTE, GNSS, WLAN, BLE, ISM Receiver	
Applicant	Continental Automotive GmbH Siemensstrasse 12, 93055 Regensburg, Germany	
Test method requested, standard	USA FCC Part 15.407 (10-1-18) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.209 (10-1-18) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (March 2019). Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.	
Summary	IN COMPLIANCE	
Approved by (name / position & signature)	Jose Carlos Luque RF Lab. Supervisor	74841983Y JOSE Firmado digitalmente por CARLOS LUQUE LUQUE (CA:29507456) Fecha: 2020.04.16 12:59:54 +02'00'
Date of issue	2020-04-16	
Report template No	FDT08_22	
	(*) "Data provided by the client"	

Index

Competences and guarantees	3
General conditions	3
Uncertainty	3
Data provided by the client	3
Usage of samples	5
Test sample description	6
Identification of the client	7
Testing period and place	8
Document history	8
Environmental conditions	8
Remarks and comments	9
Testing verdicts	10
Summary	10
Appendix A: Test Common requirements for all bands	12
Appendix B: Tests results for the U-NII-1 Band 5.15 – 5.25 GHz	19
Appendix C: Test results for the U-NII-3 Band 5.725 – 5.85 GHz	46

Competences and guarantees

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of the Telematics and Connectivity Antenna Module model Continental TCAM1NA0 is a vehicle antenna module for telematic and connectivity purposes.

It consists of a fin antenna with integrated telematics transceivers for different wireless services as well as several interfaces to the vehicle.

The TCAM1NA0 main parts are:

Antennas for cellular, WLAN, BLE, ISM receiver (RKE), SDARS with LNA
GNSS with LNA for Navigation: Beidou, Galileo, GPS, Glonass
Antenna selection via RF switches
TCAM internal antennas (all are TCAM internal, no external antenna connections):
Tel1 ant: 2G, 3G, 4G/LTE1 (vehicle outside)
Tel2 ant: LTE2 (Rx only) (vehicle outside)
MIMO with LTE1- and LTE2-antenna. LTE2 is Rx only
Backup telephone antenna: 2G, 3G, 4G/LTE (vehicle inside)
Wi-Fi internal antenna (vehicle inside)
Wi-Fi external antenna (vehicle outside)
BLE antenna (vehicle outside)
Stacked patch antenna featuring GNSS
ISM receiver antenna
SDARS antenna

CAT4 NAD with 2G/3G/4G/LTE and GNSS, FCC certified

VoLTE

ISM receiver module (434MHz) for: RKE (Remote Keyless Entry), PASE (Passive Start and Entry,
TPMS (Tire Pressure Monitoring System), FCC tested

Wi-Fi chip

BLE chip

1st internal embedded Sim-IC

Service calls

External interfaces:

Main power supply

External backup battery

External SIM card slot (2nd private customer SIM, optional)

External microphone in the OHC (Overhead Compartment)

A2B

External backup speaker

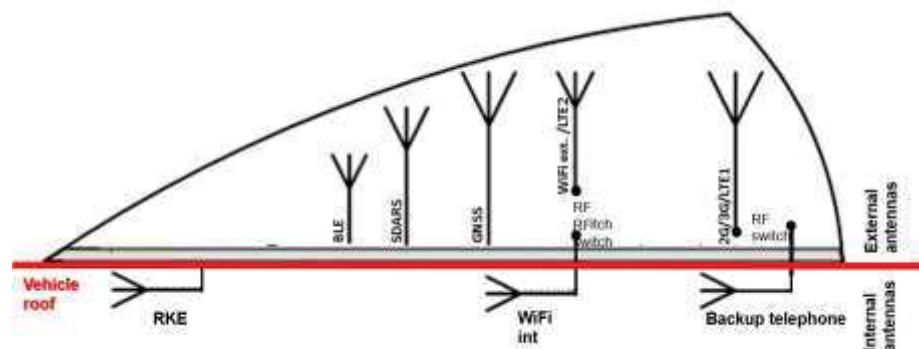
BroadR-Reach

CEM connection (K-Line)

Infotainment CAN

Airbag input

Debug interfaces (USB, UART)



DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
59830B/017	Telematics and Connectivity Antenna Module	Continental TCAM1NA0	SNRD004296	2019/10/22
59830B/025	Harness	--	--	2019/10/29
59830B/028	CAN-Box	CAN-STIM3	00047	2019/10/30

Sample S/01 has undergone the following test(s): All RADIATED tests indicated in Appendix A, B and C.

- Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
59830B/020	Telematics and Connectivity Antenna Module	Continental TCAM1NA0	SNRD004547	2019/10/22
59830B/034	Harness	--	--	2019/11/11
59830B/030	CAN-Box	CAN-STIM3	00266	2019/11/11

Sample S/02 has undergone the following test(s): All CONDUCTED tests indicated in Appendix A, B and C.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	USB diagnostic	~3m	☐	☐	☐		
	UART diagnostic	~3m	☐	☐	☐		
	BRR diagnostic	~3m	☐	☐	☐		
			☐	☐	☐		
			☐	☐	☐		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 12V					
	DC:						
Rated Power	4.2 W dc (cellular, Wi-Fi, BLE, GNSS active)						
Clock frequencies.....	32.768kHz, 16MHz, 19.2MHz, 24MHz, 25MHz, 27.6MHz, 48MHz						
Other parameters	Operating temperature Range: -40°C to 85°C Supply Voltage Range: 8 V to 16 V DC						
Software version	PI007.1						
Hardware version	E4.2						
Dimensions in cm (W x H x D)	10.5cm x 15.5cm x 9cm						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					

	☐	Hand-held equipment	
	☒	Other: Vehicular environment equipment	
Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	Network Access Device (NAD), (cellular, GNSS)	Model: BL28NA-001	Continental Automotive Systems
	ISM/RKE 434 MHz RF receiver module	Model: A2C38291300	Continental Automotive GmbH
Accessories (not part of the test item)	Description	Type	Manufacturer
	bracket		
	1x harness w/o USB		
	3x harness w USB		
	Inlay disc		
	Design cap		
Documents as provided by the applicant.....:	Description	File name	Issue date
	TCAM_Testhouse_Manual_29Oct2019_V1		

⁽³⁾ Only for Medical Equipment

Identification of the client

Continental Automotive GmbH
Siemensstrasse 12, 93055 Regensburg, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-11-18
Date (finish)	2020-02-10

Document history

Report number	Date	Description
59830RRF.006	2020-04-16	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 35 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Pablo Redondo, Javier Miguel Nadales, Miguel Ángel Torres, José Manuel Jiménez, Cristina Calle, José Carlos Moreno, Verónica García.

Used instrumentation:

Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2. Shielded Room ETS LINDGREN S101	N.A.	N.A.
3. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2018/10/23	2020/10/23
4. RF Pre-amplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	2020/02/07	2021/02/07
5. Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2017/09/27	2020/09/27
6. High Pass Filter 7-18 GHz, TEMSTRON /TEMWELL ST-7GA3619-HS	2019/10/29	2020/10/29
7. RF Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/11/22	2020/11/22
8. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2018/02/20	2020/02/20
9. Low Noise Amplifier G>30dB, 18 - 40 GHz BONN ELEKTRONIK BLMA 1840-1M	2018/02/11	2020/02/11
10. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01/03	2021/01/03
11. Broadband Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07/19	2021/07/19
12. Pre-amplifier, G>55dB 1-18GHz NARDA AMF-7D-01001800-22-10P	2019/02/21	2020/02/21
13. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
14. Digital multimeter FLUKE 179	2019/06/06	2020/06/06

Conducted Measurements

	Last Calibration	Due Calibration
1. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2019/10/11	2021/10/11
2. Shielded Room ETS LINDGREN S101	N.A.	N.A.
3. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
4. Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2019/09/27	2021/09/27
5. Digital multimeter FLUKE 179	2019/06/06	2020/06/06

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

A. Common requirements for all bands

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.35 (c) / RSS-Gen 8.2	Duty Cycle	P	
RSS-Gen 6.7 / RSS-247 6.2	99% Occupied Bandwidth	P	
FCC 15.403 (i)	26 dB Emission Bandwidth (EBW)	P	
FCC 15.407 (g) / RSS-Gen 6.11	Frequency Stability (Temperature & Voltage Variation)	N/M	(1)
<u>Supplementary information and remarks:</u>			
(1) The manufacturer is responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.			

B. U-NII-1 Band: 5.15 - 5.25 GHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.407 (a)(1)(iv)	Transmitter Maximum conducted Output Power	P	
RSS-247 6.2.1.1	Transmitter Maximum Equivalent Isotropically Radiated Power EIRP	P	
FCC 15.407 (a)(1)(iv)	Transmitter Maximum Power Spectral Density	P	
RSS-247 6.2.1.1	Transmitter EIRP Spectral Density	P	
FCC 15.407 (b)(1)(6) / RSS-247 6.2.1.2	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(1) / RSS-247 6.2.1.2	Transmitter Band Edge Radiated Emissions	P	
RSS-247 6.2.1.1	Transmitter Power Control	P	
<u>Supplementary information and remarks:</u>			
None.			

C. U-NII-3 Band: 5.725 - 5.85 GHz

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum conducted Output Power	P	
FCC 15.407 (e) / RSS-247 6.2.4.1	6 dB bandwidth.	P	
FCC 15.407 (a)(3) / RSS-247 6.2.4.1	Transmitter Maximum Power Spectral Density	P	
FCC 15.407 (b)(4) / RSS-247 6.2.4.2	Transmitter Band Edge Radiated Emissions	P	
FCC 15.407 (b)(4)(6) / RSS-247 6.2.4.2	Transmitter Out of Band Radiated Emissions	P	
FCC 15.40 (h)(1) / RSS-247 6.2.4.1	Transmitter Power Control	N/A	
<u>Supplementary information and remarks:</u>			
None			

Appendix A: Test Common requirements for all bands

INDEX

15.35 (c) / RSS-Gen 8.2 Transmitter Duty Cycle	14
RSS-Gen 6.7 / RSS-247 6.2 Transmitter 99% Occupied Bandwidth	15
15.403(i) Transmitter 26 dB Emission Bandwidth (EBW).....	17

15.35 (c) / RSS-Gen 8.2 Transmitter Duty Cycle

SPECIFICATION:

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

RESULTS:

The results below are for data rates with a duty cycle less than 98%. The results for all rest of modes having a value > 98%.

Mode	Sub-band U-NII-1			Sub-band U-NII-3		
	Pulse Duration (ms)	Period (ms)	Duty Cycle Correction (dB)	Pulse Duration (ms)	Period (ms)	Duty Cycle Correction (dB)
802.11a20	2.0558	2.2071	0.308	2.052507	2.159735	0.222
802.11n20	1.9219	2.042	0.263	1.913935	2.012668	0.218
802.11n40	0.94661	1.09175	0.620	0.932527	1.090476	0.680
802.11ac80	0.46246	0.62162	1.284	0.460572	0.632564	1.378



<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

RSS-Gen 6.7 / RSS-247 6.2 Transmitter 99% Occupied Bandwidth

The client supplied U.FL RF cables with the EUT in order to perform conducted measurements. The measured additional path loss was included in any path loss calculations.

Measurements were performed on the SISO modes for testing

- 802.11a: 6 Mbit/s / SISO
- 802.11n HT20: MCS0 / SISO
- 802.11n HT40: MCS0 / SISO
- 802.11ac VHT80: MCS0x1 / SISO

Mode 802.11 a20:

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	16.300	16.296	16.296
Measurement uncertainty (kHz)	<±5.00		

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	16.3400	16.316	16.32
Measurement uncertainty (kHz)	<±5.00		

Mode 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.416	17.412	17.404
Measurement uncertainty (kHz)	<±5.00		

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
99% Occupied Bandwidth (MHz)	17.424	17.412	17.42
Measurement uncertainty (kHz)	<±5.00		

Mode 802.11 n40 (HT40):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	36.136	36.144
Measurement uncertainty (kHz)	<±14.00	

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
99% Occupied Bandwidth (MHz)	36.008	36
Measurement uncertainty (kHz)	<±14.00	

Mode 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz)

Channel	Single Channel 42 (5210 MHz)
99% Occupied Bandwidth (MHz)	74.88
Measurement uncertainty (kHz)	<±18.00

U-NII-3 (5725-5850 MHz)

Channels	Single Channel 155 (5775 MHz)
99% Occupied Bandwidth (MHz)	74.912
Measurement uncertainty (kHz)	<±18.00

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

15.403(i) Transmitter 26 dB Emission Bandwidth (EBW)

SPECIFICATION:

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

RESULTS:

The 26 dB Emission Bandwidth was measured using the method according to point C) 1) of 789033 D02 General UNII Test Procedures New Rules v02r01.

Mode 802.11 a20:

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
26 dB Emission Bandwidth (MHz)	19.592	19.881	19.652
Measurement uncertainty (kHz)	<±5.00		

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
26 dB Emission Bandwidth (MHz)	20.326	20.0031	20.187
Measurement uncertainty (kHz)	<±5.00		

Mode 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
26 dB Emission Bandwidth (MHz)	20.620	20.977	20.916
Measurement uncertainty (kHz)	<±5.00		

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
26 dB Emission Bandwidth (MHz)	21.303	20.704	20.955
Measurement uncertainty (kHz)	<±5.00		

Mode 802.11 n40 (HT40):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
26 dB Emission Bandwidth (MHz)	47.552	46.576
Measurement uncertainty (kHz)	<±14.00	

U-NII-3 (5725-5850 MHz)

Channels	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
26 dB Emission Bandwidth (MHz)	46.317	45.218
Measurement uncertainty (kHz)	<±14.00	

Mode 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz)

Channel	Single Channel 42 (5210 MHz)
26 dB Emission Bandwidth (MHz)	81.735
Measurement uncertainty (kHz)	<±18.01

U-NII-3 (5725-5850 MHz)

Channel	Single Channel 155 (5775 MHz)
26 dB Emission Bandwidth (MHz)	81.604
Measurement uncertainty (kHz)	<±18.01

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

Appendix B: Tests results for the U-NII-1 Band 5.15 – 5.25 GHz

INDEX

TEST CONDITIONS.....	21
FCC 15.407 (a)(1)(iv) Transmitter Maximum Conducted Output Power / RSS-247 6.2.1.1 Transmitter Maximum Equivalent Isotropically Radiated Power	26
RSS-247 6.2.2.1 Transmitter Power Control	29
FCC 15.407 (a)(1)(iv) Transmitter Maximum Power Spectral Density / RSS-247 6.2.1.1 Transmitter EIRP Spectral Density.....	32
FCC 15.407 (b)(1)(6) / RSS-247 6.2.1.2 Transmitter Out of Band Radiated Emissions	35
FCC 15.407 (b) (1) / RSS-247 6.2.1.2 Transmitter Band Edge Radiated Emissions	39

TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 12 Vdc.
Type of Power Supply: External power supply (Car Battery).

ANTENNA:

Type of Antenna: Indoor the vehicle.
Outdoor the vehicle.

Max. Declared Gain: Indoor: +3.6 dBi. (Antenna gain plus antenna cable loss).
Outdoor: +2.3 dBi. (Antenna gain plus antenna cable loss).

TEST FREQUENCIES:

Technology Tested:	WLAN (IEEE 802.11 a,n,ac) / U-NII-1	
Modes:	802.11a20: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps	
	802.11n HT20: MCS0 to MCS7	
	802.11n HT40: MCS0 to MCS7	
	802.11ac VHT20: MCS0 to MCS9	
	802.11ac VHT40: MCS0 to MCS9	
	802.11ac VHT80: MCS0 to MCS9	
Setting of cores / ports:	One core.	
Beamforming:	No.	
Frequency Range:	5150 MHz to 5250 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Lowest: 36	5180
	Middle: 40	5200
	Highest: 48	5240
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Lowest: 38	5190
	Highest: 46	5230
Channel Spacing:	80 MHz	
Transmit Channels	Middle: 42	5210

802.11 a: Adjustment of Maximum RF Output Power: +9 dBm
802.11 n20/ac20: Adjustment of Maximum RF Output Power: +10 dBm
802.11 n40/ac40: Adjustment of Maximum RF Output Power: +10 dBm
802.11 ac80: Adjustment of Maximum RF Output Power: +9 dBm

The test set-up was made in accordance to the general provisions of FCC Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017.

The EUT was tested in the following operating mode:

- Continuously transmitting with a modulated carrier at maximum power in all required channels using the supported data rates/modulations types.

The field strength at the band edges was evaluated for each mode on the lowest and highest channels at the rated power for the channel under test.

For all modes, the EUT was configured in test mode using a software application. The application was used to enable a continuous transmission and to select the test channels as required. The client supplied instructions to configure the EUT. The customer supplied a document containing the setup instructions.

The worst cases for testing were identified for output power and spurious levels at the band edges which were selected based on preliminary testing that correspond to next data rates:

- 802.11a20: 6 Mbits
- 802.11n HT20: MCS0
- 802.11ac HT20: MCS0
- 802.11n HT40: MCS0
- 802.11ac HT40: MCS0
- 802.11ac VHT80: MCS0

The conducted test sample has only one connector. The client provided the antenna gains for both antennas (including the losses of lines and switches). The client considered the transmission lines and rf switches as part of the indoor and outdoor antenna.

The client supplied U.FL RF cables with the EUT in order to perform conducted measurements. The measured additional path loss was included in any path loss calculations.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



The DC supply voltage is applied using an external calibrated power supply with a multimeter.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 1 m for the frequency range 1 GHz-40 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

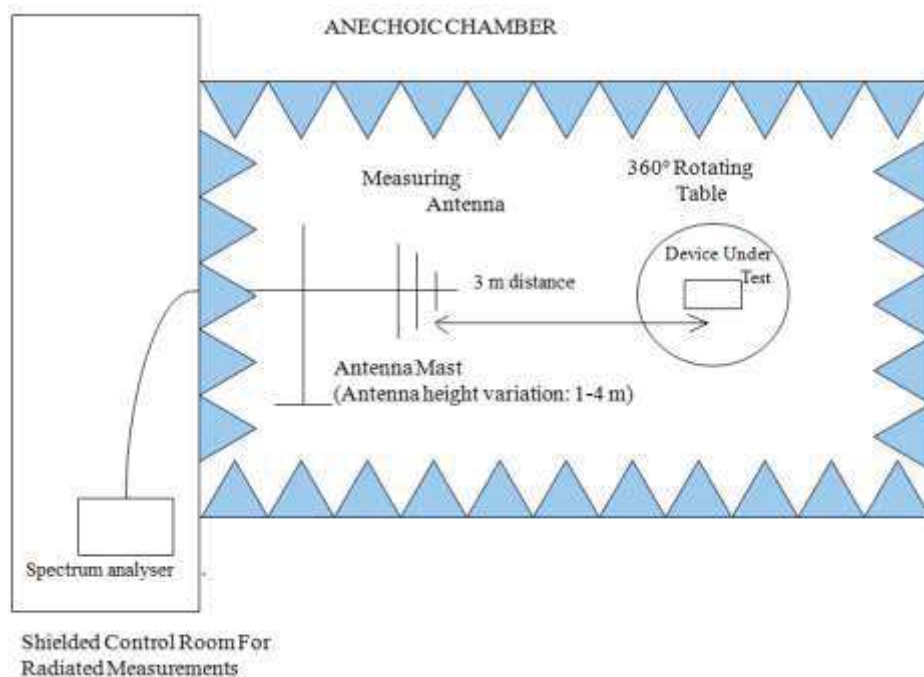
For radiated emissions in the range 1 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The EUT was placed at a height of 80 cm above the reference ground plane in the center of the chamber turntable to perform the measurements below 1GHz and the EUT was placed at a height of 1.5 meters above the test chamber floor in the center of the chamber turntable to perform the measurements above 1GHz. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

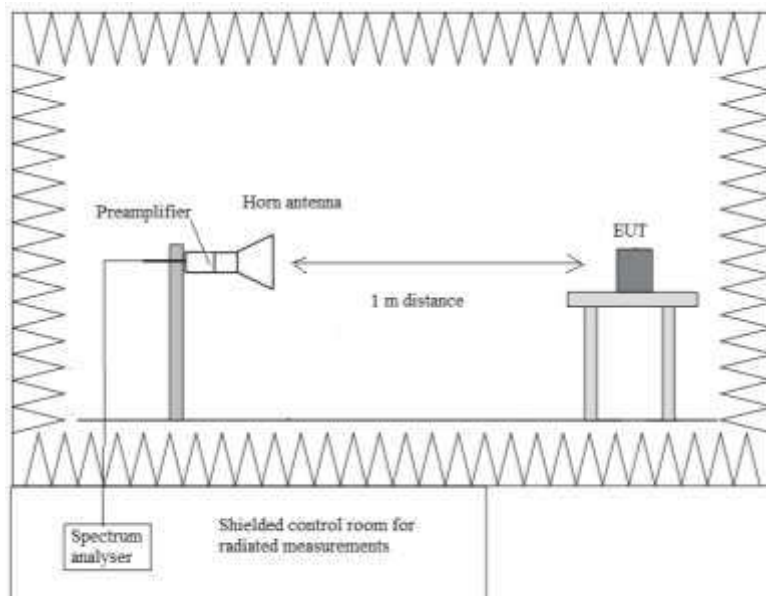
Measurements were made in both horizontal and vertical planes of polarization.

The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

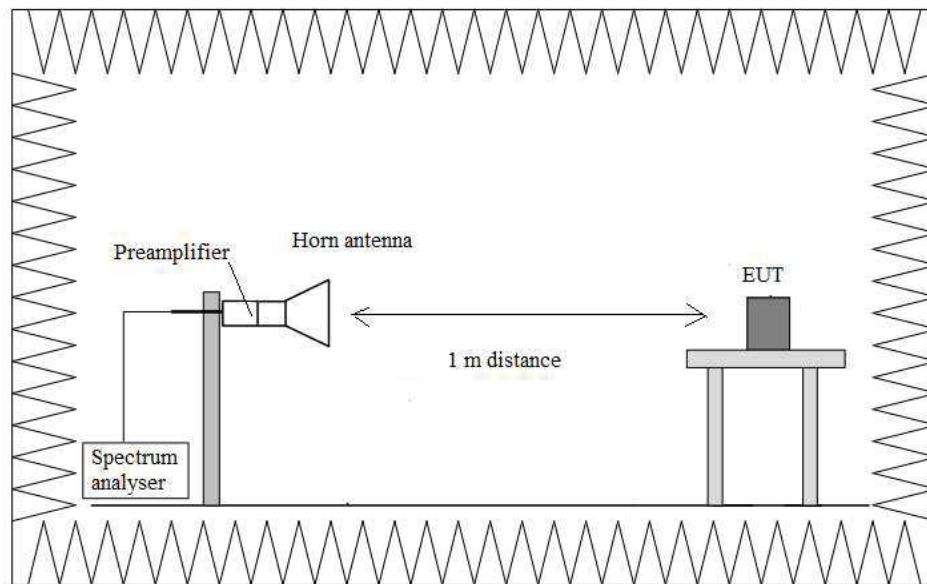
Radiated measurements setup $f < 1$ GHz.



Radiated measurements setup $f > 1$ GHz up to 18 GHz.



Radiated measurements setup $f > 18$ GHz up to 40 GHz.



FCC 15.407 (a)(1)(iv) Transmitter Maximum Conducted Output Power / RSS-247 6.2.1.1 Transmitter Maximum Equivalent Isotropically Radiated Power

SPECIFICATION:

FCC 15.407: For client devices in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24 dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247: For OEM devices installed in vehicles, the maximum e.i.r.p shall not exceed 30mW or $1.76 + 10\log_{10}B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p of 30mW.

RESULTS:

The maximum conducted output power was measured using the channel power integration method according to point E) 2) b) (Method SA-1) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is >98% and the channel power integration method according to point E) 2) d) (Method SA-2) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is <98%.

For data rates where the EUT was transmitting at <98% duty cycle, the duty calculated in Appendix A was added to the measured power in order to calculate the total average power during the actual transmission time.

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

For all modes of operation, the antenna gain is less than 6 dBi.

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +3.6 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	6.04	6.28	6.5
Duty Cycle Correction Factor (dB)	0.308		
Max. Conducted Power Corrected (dBm)	6.348	6.588	6.808
Max. EIRP power Corrected (dBm)	9.948	10.188	10.408
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n20 (HT20)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	7.08	7.02	7.24
Duty Cycle Correction Factor (dB)	0.263		
Max. Conducted Power Corrected (dBm)	7.343	7.463	7.503
Max. EIRP power Corrected (dBm)	10.943	11.063	11.103
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n40 (HT40)

	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
Max. Conducted Power (dBm)	6.95	7.12
Duty Cycle Correction Factor (dB)	0.620	
Max. Conducted Power Corrected (dBm)	7.570	7.740
Max. EIRP power Corrected (dBm)	10.550	10.720
Measurement uncertainty (dB)	<±1.20	

Mode 802.11 ac80 (VHT80)

	Single Channel 42 (5210 MHz)
Max. Conducted Power (dBm)	5.12
Duty Cycle Correction Factor (dB)	1.2845
Max. Conducted Power Corrected (dBm)	6.405
Max. EIRP power Corrected (dBm)	10.005
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +2.3 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	6.04	6.28	6.5
Duty Cycle Correction Factor (dB)	0.308		
Max. Conducted Power Corrected (dBm)	6.348	6.588	6.808
Max. EIRP power Corrected (dBm)	8.648	8.888	9.108
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n20 (HT20)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	7.08	7.02	7.24
Duty Cycle Correction Factor (dB)	0.263		
Max. Conducted Power Corrected (dBm)	7.343	7.283	7.503
Max. EIRP power Corrected (dBm)	9.643	9.583	9.803
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n40 (HT40)

	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
Max. Conducted Power (dBm)	6.95	7.12
Duty Cycle Correction Factor (dB)	0.620	
Max. Conducted Power Corrected (dBm)	7.570	7.740
Max. EIRP power Corrected (dBm)	9.870	10.040
Measurement uncertainty (dB)	<±1.20	

Mode 802.11 ac80 (VHT80)

	Single Channel 42 (5210 MHz)
Max. Conducted Power (dBm)	5.12
Duty Cycle Correction Factor (dB)	1.2845
Max. Conducted Power Corrected (dBm)	6.405
Max. EIRP power Corrected (dBm)	10.005
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

RSS-247 6.2.2.1 Transmitter Power Control

SPECIFICATION:

For OEM devices installed in vehicles, the maximum e.i.r.p shall not exceed 30mW or $1.76 + 10\log_{10}B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p of 30mW.

RESULTS:

The maximum conducted output power was measured using the channel power integration method according to point E) 2) b) (Method SA-1) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is >98% and the channel power integration method according to point E) 2) d) (Method SA-2) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is <98%.

For data rates where the EUT was transmitting at <98% duty cycle, the duty calculated in Appendix A was added to the measured power in order to calculate the total average power during the actual transmission time.

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

For all modes of operation, the antenna gain is less than 6 dBi.

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +3.6 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20 (TPC activated)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	3.6	3.45	3.88
Duty Cycle Correction Factor (dB)	0.308		
Max. Conducted Power Corrected (dBm)	3.908	3.758	4.188
Max. EIRP power Corrected (dBm)	7.508	7.358	7.788
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n20 (HT20) (TPC activated)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	4.5	4.15	4.78
Duty Cycle Correction Factor (dB)	0.263		
Max. Conducted Power Corrected (dBm)	4.763	4.413	5.043
Max. EIRP power Corrected (dBm)	8.363	8.013	8.643
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n40 (HT40) (TPC activated)

	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
Max. Conducted Power (dBm)	4.84	5.03
Duty Cycle Correction Factor (dB)	0.620	
Max. Conducted Power Corrected (dBm)	5.460	5.650
Max. EIRP power Corrected (dBm)	9.060	9.250
Measurement uncertainty (dB)	<±1.20	

Mode 802.11 ac80 (VHT80) (TPC activated)

	Single Channel 42 (5210 MHz)
Max. Conducted Power (dBm)	2.96
Duty Cycle Correction Factor (dB)	1.2845
Max. Conducted Power Corrected (dBm)	4.245
Max. EIRP power Corrected (dBm)	7.845
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +2.3 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20 (TPC activated)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	3.6	3.45	3.88
Duty Cycle Correction Factor (dB)	0.308		
Max. Conducted Power Corrected (dBm)	3.908	3.758	4.188
Max. EIRP power Corrected (dBm)	6.208	6.058	6.488
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n20 (HT20) (TPC activated)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Max. Conducted Power (dBm)	4.5	4.15	4.78
Duty Cycle Correction Factor (dB)	0.263		
Max. Conducted Power Corrected (dBm)	4.763	4.413	5.043
Max. EIRP power Corrected (dBm)	7.063	6.713	7.343
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n40 (HT40) (TPC activated)

	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
Max. Conducted Power (dBm)	4.84	5.03
Duty Cycle Correction Factor (dB)	0.620	
Max. Conducted Power Corrected (dBm)	5.460	5.650
Max. EIRP power Corrected (dBm)	7.76	7.95
Measurement uncertainty (dB)	<±1.20	

Mode 802.11 ac80 (VHT80) (TPC activated)

	Single Channel 42 (5210 MHz)
Max. Conducted Power (dBm)	2.96
Duty Cycle Correction Factor (dB)	1.2845
Max. Conducted Power Corrected (dBm)	4.245
Max. EIRP power Corrected (dBm)	6.545
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

FCC 15.407 (a)(1)(iv) Transmitter Maximum Power Spectral Density / RSS-247 6.2.1.1 Transmitter EIRP Spectral Density

SPECIFICATION:

FCC 15.407: The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247: The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RESULTS:

The maximum power spectral density (PSD) was measured using the method according to point F) referencing E.2.b) (Method SA-1) and E.2.b) (Method SA-2) of Guidance 789033 D02 General UNII Test Procedures New Rules v02r01.

The PSD test uses the same setup as the transmitter maximum conducted output power test. The result of the Peak PSD was measured by colocation a marker on the peak of the signal and the results are in the tables below.

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

For all modes of operation, the antenna gain is less than 6 dBi.

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +3.6 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Maximum Average PSD (dBm/MHz)	-4.15	-4.10	-3.69
Duty Cycle Correction Factor (dB)	0.308		
Maximum Average PSD Corrected (dBm/MHz)	-3.842	-3.972	-3.382
Maximum EIRP PSD Corrected (dBm/MHz)	-0.242	-0.192	0.218
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n20 (HT20)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Maximum Average PSD (dBm/MHz)	-3.23	-3.54	-3.24
Duty Cycle Correction Factor (dB)	0.263		
Maximum Average PSD Corrected (dBm/MHz)	-2.967	-3.277	-2.977
Maximum EIRP PSD Corrected (dBm/MHz)	0.633	0.323	0.623
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n40 (HT40)

	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
Maximum Average PSD (dBm/MHz)	-6.93	-6.59
Duty Cycle Correction Factor (dB)	0.620	
Maximum Average PSD Corrected (dBm/MHz)	-6.310	-5.970
Maximum EIRP PSD Corrected (dBm/MHz)	-2.710	-2.370
Measurement uncertainty (dB)	<±1.20	

Mode 802.11 ac80 (VHT80)

	Low Channel 42 (5210 MHz)
Maximum Average PSD (dBm/MHz)	-11.57
Duty Cycle Correction Factor (dB)	1.2845
Maximum Average PSD Corrected (dBm/MHz)	-10.285
Maximum EIRP PSD Corrected (dBm/MHz)	-6.685
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +3.6 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Maximum Average PSD (dBm/MHz)	-4.15	-4.10	-3.69
Duty Cycle Correction Factor (dB)	0.308		
Maximum Average PSD Corrected (dBm/MHz)	-3.842	-3.792	-3.382
Maximum EIRP PSD Corrected (dBm/MHz)	-1.542	-1.492	-1.082
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n20 (HT20)

	Low Channel 36 (5180 MHz)	Middle Channel 40 (5200 MHz)	High Channel 48 (5240 MHz)
Maximum Average PSD (dBm/MHz)	-3.23	-3.54	-3.24
Duty Cycle Correction Factor (dB)	0.263		
Maximum Average PSD Corrected (dBm/MHz)	-2.967	-3.277	-2.977
Maximum EIRP PSD Corrected (dBm/MHz)	-0.667	-0.977	-0.677
Measurement uncertainty (dB)	<±1.20		

Mode 802.11 n40 (HT40)

	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
Maximum Average PSD (dBm/MHz)	-6.93	-6.59
Duty Cycle Correction Factor (dB)	0.61952113	
Maximum Average PSD Corrected (dBm/MHz)	-6.310	-5.970
Maximum EIRP PSD Corrected (dBm/MHz)	-4.010	-3.670
Measurement uncertainty (dB)	<±1.20	

Mode 802.11 ac80 (VHT80)

	Low Channel 42 (5210 MHz)
Maximum Average PSD (dBm/MHz)	-11.57
Duty Cycle Correction Factor (dB)	1.2845
Maximum Average PSD Corrected (dBm/MHz)	-10.285
Maximum EIRP PSD Corrected (dBm/MHz)	-7.9855
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

FCC 15.407 (b)(1)(6) / RSS-247 6.2.1.2 Transmitter Out of Band Radiated Emissions

SPECIFICATION:

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.23 dBμV/m at 3 m distance).

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 1m for the frequency range 1 GHz-40 GHz and a distance of 3m for frequency range 30MHz-1GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Test performed on the following worst case:

- 802.11a20: 6 Mbits.

The worst case was determined by measuring the eirp density (radiated).

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +3.6 dBi (Antenna gain plus antenna cable loss).

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
52.262	26.8	V	Quasi-Peak	<±3.81
90.512	24.5	V	Quasi-Peak	<±3.81
336.084	26	V	Quasi-Peak	<±3.81
55.689	20.3	H	Quasi-Peak	<±3.81

Frequency range 1 - 40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz frequency range.

- **Mode 802.11 a20** (worst case)

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
10.3615	48.02	H	Peak	<±4.72
20.72025	41.28	V	Peak	<±4.72

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
10.39717	46.3	H	Peak	<±4.72
20.79998	42.42	V	Peak	<±4.72

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
10.48017	45.81	H	Peak	< $\pm$ 4.72
20.96022	42.66	V	Peak	< $\pm$ 4.72

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +2.3 dBi (Antenna gain plus antenna cable loss).

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
51.777	27.3	V	Quasi-Peak	< $\pm$ 3.81

Frequency range 1 - 40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz frequency range.

- **Mode 802.11 a20** (worst case)

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
10.35817	51.01	V	Peak	< $\pm$ 4.72
20.72025	42.57	V	Peak	< $\pm$ 4.72

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
10.40253	49.84	H	Peak	< $\pm$ 4.72
20.79998	42.39	V	Peak	< $\pm$ 4.72

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
10.4805	50.61	H	Peak	< $\pm$ 2.78
20.96022	41.83	V	Peak	< $\pm$ 4.72

Verdict: PASS

<< SEE GRAPHICS IN THE ATTACHED FILE 59830RRF006_Graphics_part0.7z >>

FCC 15.407 (b) (1) / RSS-247 6.2.1.2 Transmitter Band Edge Radiated Emissions

SPECIFICATION:

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.23 dBμV/m at 3 m distance).

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

All emissions outside of the 5.15-5.35GHz band shall not exceed an EIRP of -27dBm/MHz. There are restricted bands of operation below band edge at 4.5-5.15 GHz also above the upper band edge at 5.35-5.46GHz therefore the provision of FCC Part 15.205 apply.

Field strength measurements using peak and average detector performed in the restricted bands below 5.15GHz and above 5.35 GHz.

Test performed on the following worst cases modes in all relevant tests channels:

- 802.11a: 6 Mbit/s.
- 802.11n HT20: MCS0.
- 802.11ac VHT20: MCS0.
- 802.11n HT40: MCS0.
- 802.11ac VHT40: MCS0.
- 802.11ac VHT80: MCS0.

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +3.6 dBi (Antenna gain plus antenna cable loss).

- **Mode 802.11 a20**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14968	H	60.3	-	60.3	Peak	<±2.78
		45.09	0.308	45.40	Average	<±2.78

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.439815	V	57.69	-	57.69	Peak	<±2.78
		45.06	0.308	45.37	Average	<±2.78

- **Mode 802.11 n20 (HT20)**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14946	H	59.25	-	59.25	Peak	<±2.78
		45.15	0.263	45.41	Average	<±2.78

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.449642	V	57.29	-	57.29	Peak	<±2.78
		45.15	0.263	45.41	Average	<±2.78
5.391085	H	57.61	-	57.61	Peak	<±2.78
		44.89	0.263	45.15	Average	<±2.78

- **Mode 802.11 ac20 (HT20)**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14686	V	58.47	-	58.47	Peak	<±2.78
		45.08	0.263	45.34	Average	<±2.78

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.447882	H	57.64	-	57.64	Peak	<±2.78
		45.16	0.263	45.42	Average	<±2.78

- **Mode 802.11 n40 (HT40)**

- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14708	V	58.68	-	58.68	Peak	<±2.78
		45.24	0.620	45.86	Average	<±2.78

- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.449935	V	58.18	-	58.18	Peak	<±2.78
		45.17	0.620	45.79	Average	<±2.78

- **Mode 802.11 ac40 (VHT40)**

- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14924	V	59.78	-	59.78	Peak	<±2.78
		45.25	0.620	45.87	Average	<±2.78

- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.456462	V	57.48	-	57.48	Peak	<±2.78
		45.04	0.620	45.66	Average	<±2.78

- **Mode 802.11 ac80 (VHT80)**

- Middle Channel 42 (5210 MHz): Inside band spurious emissions in 4.50-5.15 GHz and 5.35-5.46 GHz adjacent bands.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.12281	H	57.13	-	57.13	Peak	<±2.78
		45.3	1.2845	46.59	Average	<±2.78
5.439082	V	57.48	-	57.48	Peak	<±2.78
		44.99	1.2845	46.28	Average	<±2.78

Verdict: PASS

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OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +2.3 dBi (Antenna gain plus antenna cable loss).

- **Mode 802.11 a20**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBµV/m)	Duty cycle Correction	Corrected Emission Level (dBµV/m)	Detector	Measurement Uncertainty (dB)
5.14404	V	58.77	-	58.77	Peak	<±2.78
		49.22	0.308	49.53	Average	<±2.78
5.09031	H	56.68	-	56.68	Peak	<±2.78
		48.61	0.308	48.92	Average	<±2.78

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBµV/m)	Duty cycle Correction	Corrected Emission Level (dBµV/m)	Detector	Measurement Uncertainty (dB)
5.430355	H	57.95	-	57.95	Peak	<±2.78
		49.73	0.308	50.04	Average	<±2.78

- **Mode 802.11 n20 (HT20)**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBµV/m)	Duty cycle Correction	Corrected Emission Level (dBµV/m)	Detector	Measurement Uncertainty (dB)
5.14751	V	59.91	-	59.91	Peak	<±2.78
		49.26	0.263	49.52	Average	<±2.78

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBµV/m)	Duty cycle Correction	Corrected Emission Level (dBµV/m)	Detector	Measurement Uncertainty (dB)
5.459652	V	57.22	-	57.22	Peak	<±2.78
		49.5	0.263	49.76	Average	<±2.78
5.407072	H	57.67	-	57.67	Peak	<±2.78
		49.67	0.263	49.93	Average	<±2.78

- **Mode 802.11 ac20 (HT20)**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14859	V	60.23	-	60.23	Peak	<±2.78
		48.77	0.263	49.03	Average	<±2.78
5.04134	H	56.66	-	56.66	Peak	<±2.78
		48.78	0.263	49.04	Average	<±2.78

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.371615	V	57.67	-	57.67	Peak	<±2.78
		49.32	0.263	49.58	Average	<±2.78
5.351925	H	57.83	-	57.83	Peak	<±2.78
		49.22	0.263	49.48	Average	<±2.78

- **Mode 802.11 n40 (HT40)**

- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14881	V	62.05	-	62.05	Peak	<±2.78
		50.81	0.620	51.43	Average	<±2.78

- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.386172	V	57.61	-	57.61	Peak	<±2.78
		49.6	0.620	50.42	Average	<±2.78
5.441318	H	57.29	-	57.29	Peak	<±2.78
		49.52	0.620	50.14	Average	<±2.78

- **Mode 802.11 ac40 (VHT40)**

- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.14838	V	60.41	-	60.41	Peak	<±2.78
		48.86	0.620	49.44	Average	<±2.78
5.05044	H	57.09	-	57.09	Peak	<±2.78
		48.74	0.620	49.36	Average	<±2.78

- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.376602	V	57.86	-	57.86	Peak	<±2.78
		49.32	0.620	49.94	Average	<±2.78
5.440218	H	57.46	-	57.46	Peak	<±2.78
		49.5	0.620	50.12	Average	<±2.78

- **Mode 802.11 ac80 (VHT80)**

- Middle Channel 42 (5210 MHz): Inside band spurious emissions in 4.50-5.15 GHz and 5.35-5.46 GHz adjacent bands.

Spurious frequency (GHz)	Polarization	Emission Level (dBμV/m)	Duty cycle Correction	Corrected Emission Level (dBμV/m)	Detector	Measurement Uncertainty (dB)
5.13798	V	57.3	-	57.3	Peak	<±2.78
		49.22	1.2845	50.51	Average	<±2.78
5.14426	H	56.78	-	56.78	Peak	<±2.78
		48.62	1.2845	49.91	Average	<±2.78
5.399592	V	57.66	-	57.66	Peak	<±2.78
		49.45	1.2845	50.74	Average	<±2.78
5.448505	H	57.46	-	57.46	Peak	<±2.78
		49.55	1.2845	50.84	Average	<±2.78

Verdict: PASS

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