

ISED CABid: ES1909

Test Report No:
NIE: 69534RRF.008

Test Report

USA FCC Part 15.407, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive Infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG6NQ ENTRY/MID
Other identification of the product	HW version: D10 SW version: E875.014 FCC ID: T8GNTG6NQEM IC: 6434A-NTG6NQEM
(*) Features	FM, AM, DAB, USB, Bluetooth, WLAN (2,4 / 5 GHz), GNSS.
Applicant	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH BECKER-GOERING-STR. 16; 76307 KARLSBAD GERMANY
Test method requested, standard	USA FCC Part 15.407 (10-1-20) Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.209 (10-1-20) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 Amendment 2 (February 2021). 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)	Rafael López EMC Consumer & RF Lab. Manager
Date of issue	2022-01-20
Report template No	FDT08_23 (*) "Data provided by the client"

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Competences and guarantees

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DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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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 model NTG6NQ ENTRY/MID is an automotive head unit to be installed in cars with the following features: FM, AM, DAB, USB, Bluetooth, WLAN and GNSS.

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 result.

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
69534B /042	Automotive infotainment System	NTG6N ENTRY/MID	HBM580M96F8P73	2021-11-15
69534B /076	Harness	--	--	2021-11-15

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
69534B /086	USB to Ethernet Adapter	UE300	--	2021-11-15
69534B /095	Ethernet Cable	--	--	2021-11-15

Sample S/01 has undergone the following test(s): The Conducted tests indicated in the Appendixes A, B, C.

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

Control N°	Description	Model	Serial N°	Date of reception
69534/041	Automotive Infotainment System	NTG6NQ ENTRY/MID	HBM580M96DRU3M	2021/11/15
69534/074	Harness	---	---	2021/11/15
68534/102	BT/WLAN antenna	---	---	2021/11/15
69534/105	BT/WLAN antenna	---	---	2021/11/15

Auxiliary elements used with the Sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
69534/084	USB to Ethernet adapter	UE300	---	2021/11/15
69534/092	Ethernet cable	---	---	2021/11/15
69534/112	SMA adapter	---	---	2021/11/15

Sample S/02 has undergone the following test(s): The Radiated tests indicated in the Appendixes B, C.

Test sample description

Ports..... :	Port name and description		Cable					
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Car Connector A and B		>3m	☒	☐	☐		
	Display Connector CID/PIP / RVC		>3m	☒	☒	☐		
	USB, Eth. Connector		<3m, >3m	☒	☒	☐		
	BT / WLAN-Antenna		>3m	☒	☒	☐		
	FM/AM, TV/SDARS Antenna		>3m	☒	☒	☐		
GPS Antenna		>3m	☒	☒	☐			
Supplementary information to the ports..... :	For EMC-Testing all cables should be connected to the connectors							
Rated power supply	Voltage and Frequency			Reference poles				
				L1	L2	L3	N	PE
	☐ AC:			☐	☐	☐	☐	☐
☒ DC: 12V Car battery / attenuator (9,5-15,5V normal operation)								
Rated Power	9,5-15,5V normal operation							
Clock frequencies.....	see schematics							
Other parameters	FCC ID: T8GNTG6NQEM / IC: 6434A-NTG6NQEM							
Software version	E875.014							
Hardware version	D10 / Serial Product							
Dimensions in cm (W x H x D)	182 x 78 x 160 mm							
Mounting position	☐ Table top equipment							
	☐ Wall/Ceiling mounted equipment							
	☐ Floor standing equipment							
	☐ Hand-held equipment							
	☒ Other: n/a - automotive headunit							
Modules/parts..... :	Module/parts of test item		Type		Manufacturer			
	--							
Accessories (not part of the test item)	Description		Type		Manufacturer			
	Display (vehicle touch display)		A247 905 69		DAIMLER original			
	CAN-Box		-		HBAS			
	Cable harness		-		HBAS			
	BT/WLAN-Antenna		A247 905 83		Hirschmann			
Documents as provided by the applicant..... :	Description		File name		Issue date			
	Technical Description							
	--							

⁽³⁾ Only for Medical Equipment

Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GOERING-STR. 16, 76307 KARLSBAD, GERMANY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-12-02
Date (finish)	2021-12-10

Document history

Report number	Date	Description
69534RRF.008	2022-01-20	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 %

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 %

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. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: José Manuel Jiménez, Javier Miguel Nadales Lisboa, Antonio Ruiz and Rafael Fernandez Martin.

Used instrumentation:

Radiated Measurements

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber FRANKONIA SAC-3	N/A	N/A
2.	Shielded Room FRANKONIA	N/A	N/A
3.	Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2021/09	2024/09
4.	RF Preamplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	N/A	N/A
5.	EMI Test Receiver 20Hz-26.5GHz ROHDE AND SCHWARZ ESU26	2020/05	2022/05
6.	DC Power Supply 150V/22A, AGILENT TECHNOLOGIES N8740A	N/A	N/A
7.	Digital Multimeter FLUKE 175	2021/11	2022/11
8.	Horn Antenna 1-18 GHz SCHWARZBECK MESS- ELEKTRONIK BBHA 9120 D	2021/07	2024/07
9.	Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10.	Preamplifier 30 dB 500MHz-18GHz SCHWARZBECK BBV 9718 C	2021/06	2022/06
11.	Pre-Amplifier G>30dB 17-40GHz BONN ELEKTRONIK BLMA 1840-4A	2021/09	2022/09
12.	EMI Test Receiver 2Hz-44GHz ROHDE AND SCHWARZ ESW44	2021/09	2023/09
13.	Digital Multimeter FLUKE 179	2021/10	2022/10
14.	DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N/A	N/A

Conducted Measurements:

		Last Calibration	Due Calibration
1.	Shielded Room ETS LINDGREN S101	N/A	N/A
2.	Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2021/02	2023/02
3.	Extension for Open Switch Unit up to 40 GHz ROHDE AND SCHWARZ OSP-B157Wx	N/A	N/A
4.	Open Switch Unit up to 7.5GHz ROHDE AND SCHWARZ OSP-B157W8 PLUS	2021/08	2023/08
5.	DC Power Supply 40V/40A Rohde & Schwarz NGPE40	N/A	N/A
6.	Digital Multimeter FLUKE 175	2021/11	2022/11

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		
Test case	Verdict	Remark
Duty Cycle	P	
99% Occupied Bandwidth	P	
26 dB Emission Bandwidth (EBW)	P	
<u>Supplementary information and remarks:</u> None.		

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	
<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)(6) / RSS-247 6.2.4.2	Transmitter Out of Band Radiated Emissions	P	
FCC 15.407 (b)(4) / RSS-247 6.2.4.2	Transmitter Band Edge Radiated Emissions	P	
<u>Supplementary information and remarks:</u>			
None.			

Appendix A: Test Common requirements for all bands

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Transmitter Duty Cycle 12

Transmitter 99% Occupied Bandwidth 17

Transmitter 26 dB Emission Bandwidth (EBW) 43

TEST CONDITIONS

(*) Declared by the Client.

POWER SUPPLY (V):

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

ANTENNA:

Type of Antenna: External.
Maximum Declared Antenna Gain: +0.9 dBi (antenna gain plus antenna cable loss).

TEST FREQUENCIES (*):

Band U-NII-1: 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 port.	
Beamforming:	No.	
Frequency Range:	5150 MHz to 5250 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 36	5180
	Middle: 40	5200
	High: 48	5240
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 38	5190
	High: 46	5230
Channel Spacing:	80 MHz	
Transmit Channels	Middle: 42	5210

Band U-NII-3:

Technology Tested:	WLAN (IEEE 802.11 a/n/ac): U-NII-3 band	
Modes:	802.11a: 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 MCS8	
	802.11ac VHT40: MCS0 to MCS9	
	802.11ac VHT80: MCS0 to MCS9	
Setting of cores / ports:	One port.	
Beamforming:	No	
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 149	5745
	Middle: 157	5785
	High: 165	5825
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Low: 151	5755
	High: 159	5795
Channel Spacing:	80 MHz	
Transmit Channels	Middle: 155	5775

POWER SETTINGS (*):

U-NII-1. FCC:

WLAN1

Channel	Frequency	11a	11n	11ac
36	5180 MHz	16	16	16
40	5200 MHz	16	16	16
44	5220 MHz	16	16	16
48	5240 MHz	16	16	16
38	5190 MHz		16	16
46	5230 MHz		16	16
42	5210 MHz			16

U-NII-1. IC:

WLAN1

Channel	Frequency	11a	11n	11ac
36	5180 MHz	12	12	12
40	5200 MHz	12	12	12
44	5220 MHz	12	12	12
48	5240 MHz	12	12	12
38	5190 MHz		12	12
46	5230 MHz		12	12
42	5210 MHz			12

U-NII-3. FCC and IC:

WLAN1

Channel	Frequency	11a	11n	11ac
149	5745 MHz	16	16	16
157	5785 MHz	16	16	16
165	5825 MHz	17	17	17
151	5755 MHz		16	16
159	5795 MHz		16	16
155	5775 MHz			16

Transmitter Duty Cycle

SPECIFICATION:

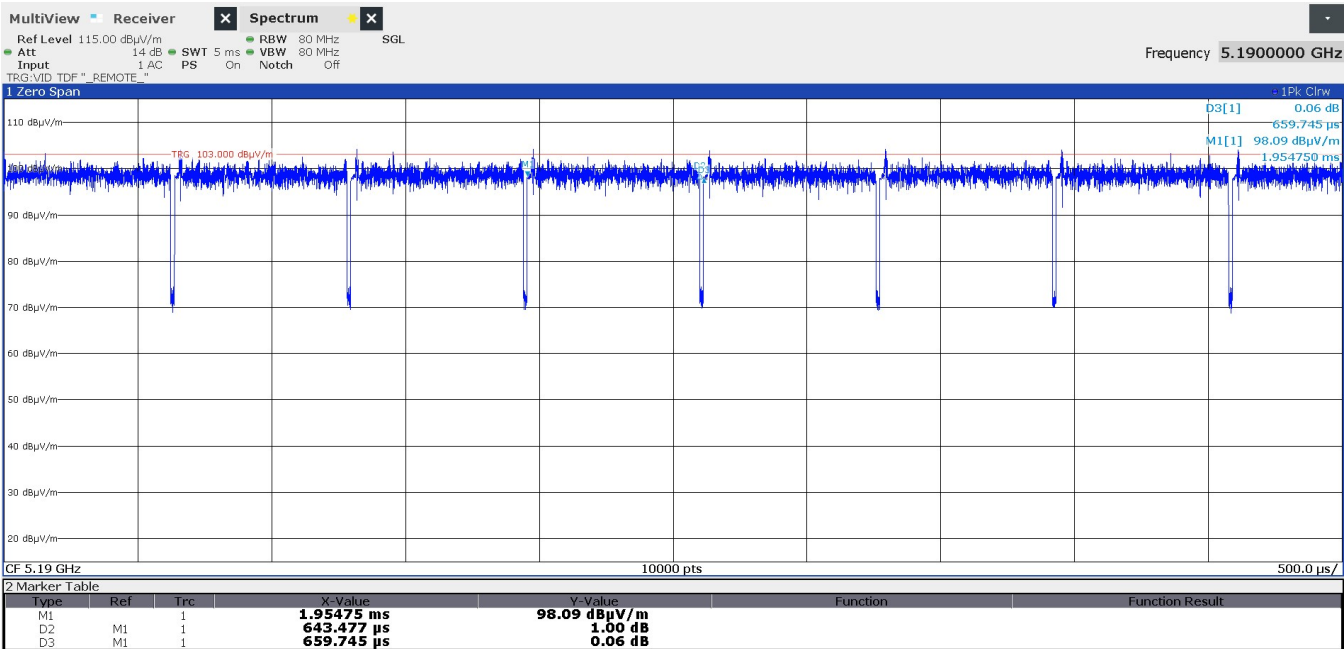
Unless otherwise specified, e.g. §15.255(b) and §15.256(l)(5), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking 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:

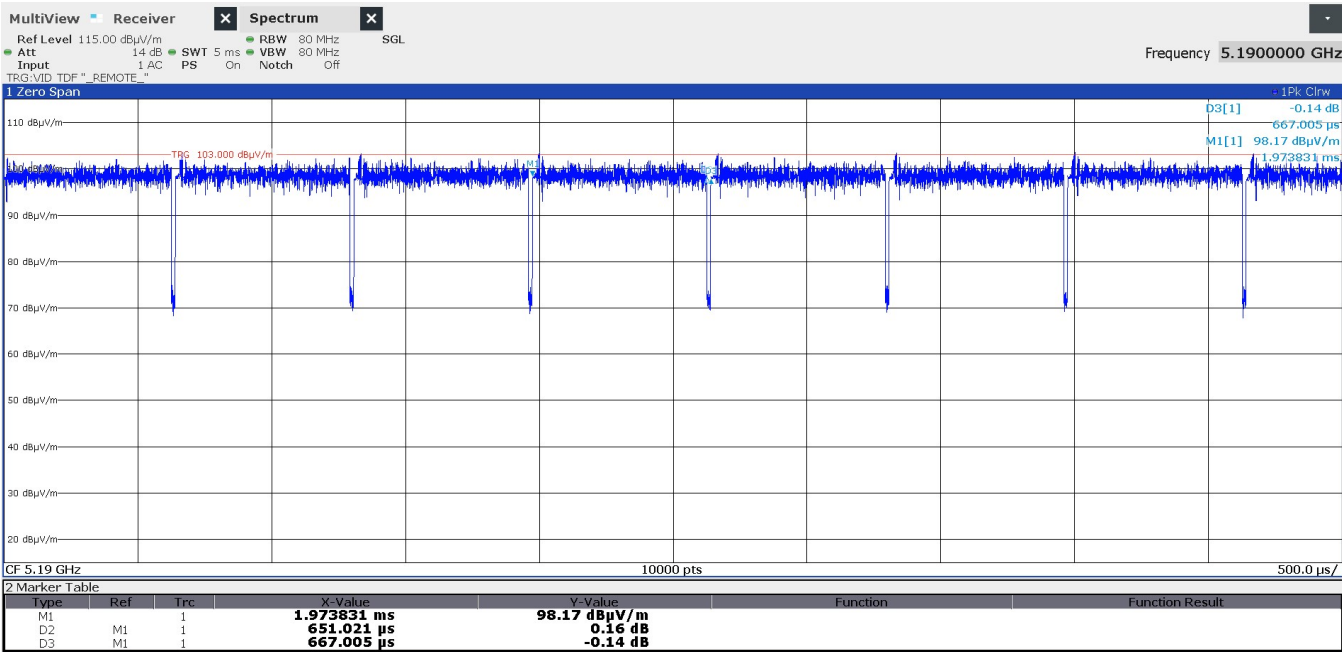
The results below are for data rates with a duty cycle less than 98%. The results for all rest of modes having a value > 98%.

Mode	Sub-band U-NII-1 & Sub-band U-NII-3		
	Pulse Duration (ms)	Period (ms)	Duty Cycle Correction (dB)
802.11n40	0.643477	0.10843	0.10843
802.11ac40	0.651021	0.10534	0.10534
802.11ac80	0.32326	0.21025	0.21025

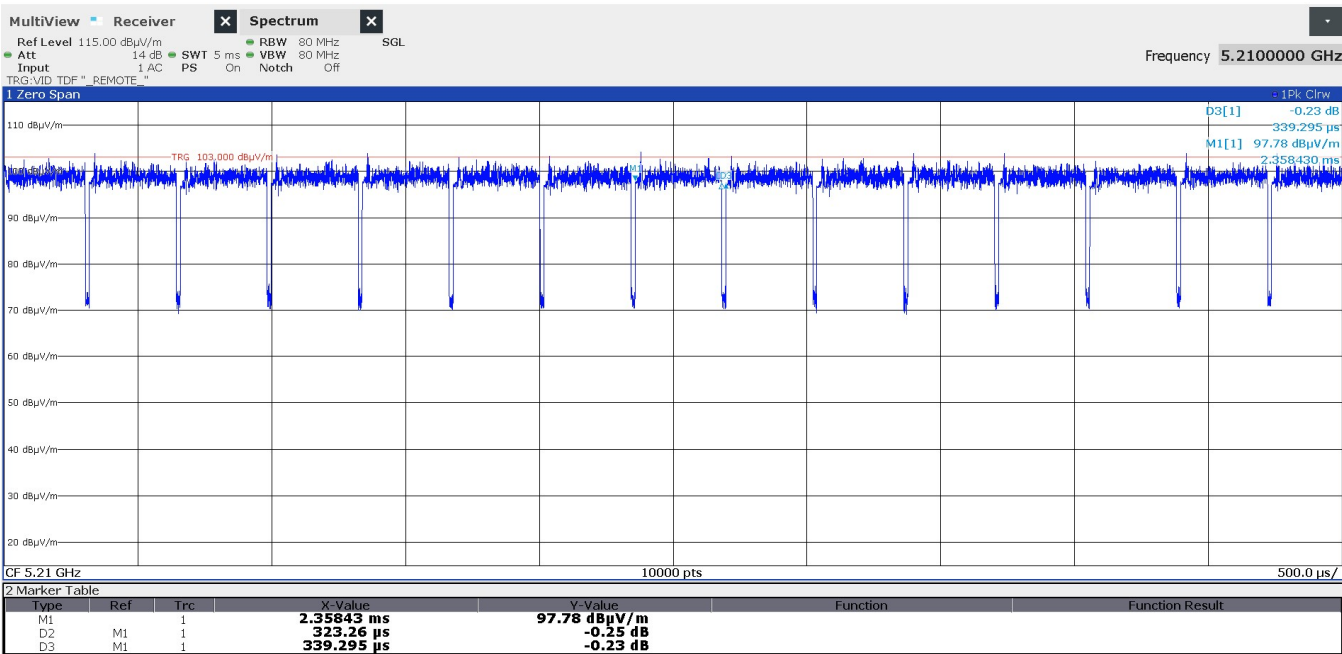
Mode 802.11 n40:



Mode 802.11 ac40:



Mode 802.11 ac80:



Transmitter 99% Occupied Bandwidth

SPECIFICATION:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

U-NII-1 (5150-5250 MHz) / U-NII-3 (5725-5850 MHz):

- 802.11a20: 6 Mbit/s / SISO
- 802.11n HT20: MCS0 / SISO
- 802.11ac VHT20: MCS0 / SISO
- 802.11n HT40: MCS0 / SISO
- 802.11ac VHT40: MCS0 / SISO
- 802.11ac VHT80: MCS0x1 / SISO

RESULTS:

FCC power setting

Mode 802.11 a20:

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	16.60	16.60	16.70
Measurement uncertainty (%)	<± 2.00		

Mode 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.60	17.60	17.60
Measurement uncertainty (%)	<± 2.00		

Mode 802.11 ac20 (VHT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.70	17.60	17.70
Measurement uncertainty (%)	<± 2.00		

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)	36.25	36.50
Measurement uncertainty (%)	<± 2.00	

Mode 802.11 ac40 (VHT40):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	36.25	36.25
Measurement uncertainty (%)	<± 2.00	

Mode 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz)

Channel	Single Channel 42 (5210 MHz)
99% Occupied Bandwidth (MHz)	76.50
Measurement uncertainty (%)	<± 2.00

IC power setting

Mode 802.11 a20:

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	16.796	16.804	16.804
Measurement uncertainty (kHz)	<±36.95		

Mode 802.11 n20 (HT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.704	17.704	17.724
Measurement uncertainty (kHz)	<±36.95		

Mode 802.11 ac20 (VHT20):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 36 (5180 MHz)	Middle Channel 44 (5220 MHz)	High Channel 48 (5240 MHz)
99% Occupied Bandwidth (MHz)	17.692	17.700	17.700
Measurement uncertainty (kHz)	<±36.95		

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)	36.184	36.200
Measurement uncertainty (kHz)	<±62.36	

Mode 802.11 ac40 (VHT40):

U-NII-1 (5150-5250 MHz)

Channels	Low Channel 38 (5190 MHz)	High Channel 46 (5230 MHz)
99% Occupied Bandwidth (MHz)	36.200	36.208
Measurement uncertainty (kHz)	<±62.36	

Mode 802.11 ac80 (VHT80):

U-NII-1 (5150-5250 MHz)

Channel	Single Channel 42 (5210 MHz)
99% Occupied Bandwidth (MHz)	76.304
Measurement uncertainty (kHz)	<±124.71

FCC and IC power setting

Mode 802.11 a20:

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)	16.70	16.60	16.70
Measurement uncertainty (%)	<± 2.00		

Mode 802.11 n20 (HT20):

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)	17.70	17.60	17.60
Measurement uncertainty (%)	<± 2.00		

Mode 802.11 ac20 (VHT20):

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)	17.70	17.60	17.60
Measurement uncertainty (%)	<± 2.00		