



FCC LISTED, REGISTRATION  
 NUMBER: 2764.01  
 ISED LISTED REGISTRATION  
 NUMBER: 23595-1

Test Report No:  
**3967ERM.016**

## Partial Test report

**USA FCC Part 15.407 (U-NII), 15.209; & CANADA RSS-247, RSS-Gen**  
 Unlicensed National Information Infrastructure Devices. General technical requirements.  
 License-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.  
 General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Infotainment Head Unit
(*) Trademark	Garmin
(*) Model and /or type reference	IDC23 High 8155
Other identification of the product	FCC ID: IPH-03911 IC:1792A-03911 HVIN: B03911 Hw version: B03911
(*) Features	Bluetooth classic; BLE; Wi-Fi 2.4GHz; Wi-Fi 5GHz; GNSS
Manufacturer	Garmin International, Inc. 1200 E. 151st Street Olathe, Kansas 66062 USA
Test method requested, standard	USA FCC Part 15.407 10-1-22 Edition: Unlicensed National Information Infrastructure Devices. General technical requirements. USA FCC Part 15.209 10-1-22 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). 789033 D02 General UNII Test Procedures New Rules v02r01 Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	08-28-2023
Report template No	FDT08_23 (*) "Data provided by the client"

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## Acronyms

Acronym ID	Acronym Description
	Emission Bandwidth
# of Tx Chains	Number of Transmission Chains
Avg Power	Maximum Average Conducted Output Power
DC	Duty Cycle
Freq	Frequency
Max EIRP	Maximum Burst EIRP
Mod	Modulation
Mode	Mode
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
PSD	Power Spectrum Density
Port	Active Port
TPC	TPC

## Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

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

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## General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

## Uncertainty

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

Test case	Frequency (MHz)	U (k=2)	Units
RF Power and PSD	5150-5850	0.88	dB
Occupied Bandwidth		1.87	%
Band Edge		0.64	dB
Radiated Spurious Emission	30-180	4.27	dB
	180-1000	3.14	dB
	1000-18000	3.30	dB
	18000-40000	3.49	dB

## 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 consists of Infotainment Head Unit to be installed in cars with the main functionalities: Navigation, USB, voice recognition and several interfaces to the vehicle and Bluetooth / WLAN.

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

## Usage of samples

Samples used for testing have been selected by: The client.

Sample S/01 is composed of the following element and accessories:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	3967/02	Garmin IDC23 RF Sample	IDC23	GPN0100286554	5/25/2023	Element Under Test
S/01	2874/11	Fakra to SMA Connector	-	-	03/26/2021	Accessory
S/01	2874/13	OABR Connector cable	-	-	03/26/2021	Accessory
S/01	3171/11	Ethernet Cable	-	-	03/05/2021	Accessory
S/01	3428/32	BMW Antenna-DA Fakra 5G-GNSS		6520 8705915-04	06/01/2022	Accessory
S/01	3967/42	CAN cable	-	-	06/14/2023	Accessory
S/01	3967/43	Harness	-	-	06/14/2023	Accessory

Sample S/01 was used for the test(s): All Conducted tests indicated in appendix A.

Sample S/02 is composed of the following elements and accessories:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/02	3967/02	Garmin IDC23 RF Sample	IDC23	GPN0100286554	5/25/2023	Element Under Test
S/02	3428/73	Antenna	-	-	-	Element Under Test
S/02	2874/11	Fakra to SMA Connector	-	-	03/26/2021	Accessory
S/02	2874/13	OABR Connector cable	-	-	03/26/2021	Accessory
S/02	3171/11	Ethernet Cable	-	-	03/05/2021	Accessory
S/02	3428/32	BMW Antenna-DA Fakra 5G-GNSS		6520 8705915-04	06/01/2022	Accessory
S/02	3967/42	CAN cable	-	-	06/14/2023	Accessory
S/02	3967/43	Harness	-	-	06/14/2023	Accessory

Sample S/02 was used for the test(s): All Radiated tests indicated in appendix A.

## Test sample description

Ports..... :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	BT/Wi-fi Antenna		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	USB1/2/3		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	Power		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	CID		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	AR-Cam		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	100 Base T1/1G Base T1/GPS/DCS/HUD/DFE		2	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports.....	No Data Provided						
Rated power supply .....	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	DC: 8V to 16V					
<input type="checkbox"/>	DC:						
Rated Power .....	No Data Provided						
Clock frequencies.....	No Data Provided						
Other parameters .....	No Data Provided						
Software version .....	No Data Provided						
Hardware version .....	B03911						
Dimensions in cm (W x H x D) .....	No Data Provided						
Mounting position .....	<input type="checkbox"/>	<i>Tabletop equipment</i>					
	<input type="checkbox"/>	<i>Wall/Ceiling mounted equipment</i>					
	<input type="checkbox"/>	<i>Floor standing equipment</i>					
	<input type="checkbox"/>	<i>Hand-held equipment</i>					
	<input checked="" type="checkbox"/>	<i>Other: Automotive</i>					
Modules/parts..... :	Module/parts of test item	Type		Manufacturer			
	No Data Provided						

Accessories (not part of the test item) .....	Description	Type	Manufacturer
	No Data Provided		
Documents as provided by the applicant .....	Description	File name	Issue date
	Declaration Equipment Data	FDT30_18 Declaration Equipment Data_IDC23 High 8155	08/01/2023

Copy of marking plate:

Product Name: Automotive Infotainment Head Unit  
 產品名稱: 汽車資訊娛樂主機  
 Manufactured by:  
 佳明 **GARMIN**  
 Model / 型號: IDC23 High 8155  
 Made in / 製造: Taiwan  
 Input / 輸入: 12V 12A  
 FCC ID: IPH-03911 IC: 1792A-03911 M/N: B03911

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 Dolby, Dolby Audio, Pro Logic, and the double-D symbol  
 are trademarks of Dolby Laboratories Licensing Corporation.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES, AND ISSED CANADA  
 LICENSE-EXEMPT RSS STANDARD (S). OPERATION IS SUBJECT TO THE FOLLOWING  
 TWO CONDITIONS:  
 (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND  
 (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE  
 THAT MAY CAUSE UNDESIRE OPERATION.

AGREE PAR LE MCPT (REPUBLIQUE DE DJIBOUTI)  
 Numéro d'agrément: 120/DDTIC/2022  
 Date d'agrément: 16/10/2022

Agré par l'ANRT Maroc  
 Numéro d'agrément: MR00034513ANRT2022  
 Date d'agrément: 14/09/2022

AGREE PAR L'ARE MAURITANIE  
 Numéro d'agrément: XXXXXXXX/XXXXX  
 Date d'agrément: XX/XX/XXXX

AGREE PAR ARTP SENEGAL  
 Numéro d'agrément: 072352/AG/ER

Connection and use of this communications  
 equipment is permitted by the Nigerian  
 Communications Commission

85709/SDPPI/2022  
 2651

BOCRA  
 REGISTERED No:  
 XXXXXXXX/XXXXX

Complies with  
 IMDA Standards  
 DA105282

Homologue per l'ARPCE 287/IR/HMG/DG/ARPCE/2023

GARMIN (Europe) Ltd.  
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 Hounslow Business Park  
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 BEETHOVENSTRASSE 1A  
 97060 WURZBURG, GERMANY

OMAN - TRA  
 D172338  
 TRA/TA - R/14686/22

XXXX XX

## Identification of the client

Garmin International, Inc.  
 1200 E. 151st Street  
 Olathe, Kansas 66062, USA.

## Testing period and place

<b>Test Location</b>	DEKRA Certification Inc.
<b>Date (start)</b>	06-12-2023
<b>Date (finish)</b>	07-05-2023

## Document history

Report number	Date	Description
3967ERM.016	08-28-2023	First release.

## Environmental conditions

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 20 % Max. = 75 %

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 20 % Max. = 75 %

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 20 % Max. = 75 %

## Remarks and comments

The tests have been performed by the technical personnel: Lakshmi, Qi Zhang and Yuri Barone.



## List of equipment used during the test

### Conducted Measurements

CONTROL NUMBER	DESCRIPTION	Serial No	LAST CALIBRATION	NEXT CALIBRATION
1039	Fsv40 Signal Analyzer 40GHz	101627	2022-11-01	2024-11-01
1041	SMB100A Signal Generator	180180	2022-10-06	2024-10-06
1042	SMBV100A Vector Signal Generator	262575	2022-03-16	2024-03-16
1107	Ethernet SNMP Thermometer	60038026952	2022-08-16	2023-08-16
1313	Wireless Measurement Software R&S WMS32	-	N/A	N/A

### Radiated Measurements

CONTROL NUMBER	DESCRIPTION	Serial No	LAST CALIBRATION	NEXT CALIBRATION
878	Power supply (AMETEK / PROG-DC-PS)	1707A01783	N/A	N/A
1012	ESR26 EMI Test Receiver	101478	2022-04-12	2024-04-12
1014	FSV40 Signal Analyzer 40GHz	101626	2022-08-01	2024-08-01
1055	3116C Double-Ridged Waveguide Horn Antenna	211394	2023-02-06	2026-02-06
1377	Double Ridged Horn Antenna	103050	2021-12-01	2024-12-01
1065	3142E Biconilog antenna	208587	2020-08-13	2023-08-13
1108	Ethernet SNMP Thermometer- SAC	60038026954	2022-10-18	2024-10-18
1111	Ethernet SNMP Thermometer	60038026577	2022-10-18	2024-10-18
1179	Semi-Anechoic Chamber	F169021	N/A	N/A
1314	Wireless Measurement Software R&S Emc32	1040-OT102236	N/A	N/A
1461	Low Noise Preamplifier (1-18GHz)	2213857B	2022-06-01	2024-06-01

## Testing verdicts

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

## Summary

FCC PART 15 PARAGRAPH / RSS-247			
Requirement	Test case	Verdict	Remark
FCC 15.407 (a) / RSS-247 6.2	Power Limits. Maximum Output Power	P	N/A
FCC 15.407 (a) / RSS-247 6.2	Maximum Power Spectral Density	N/M	Refer 3
FCC 2.1049 / RSS-Gen 6.7	99% Occupied Bandwidth	P	N/A
FCC 15.403 / RSS-Gen 6.7	26 dB Emission Bandwidth	N/M	Refer 3
FCC 15.407 (b) / RSS-247 6.2	Band-edge Conducted Emissions	N/M	Refer 3
FCC 15.407 (e) / RSS 247 6.2.4.1	6 dB Emission Bandwidth	N/M	Refer 1
FCC 15.407 (b)(6)15.207 / RSS Gen 8.8	Emission limitations Conducted	P	N/A
FCC 15.407 (b), 15.205 & 15.209 / RSS-Gen 8.9 & 8.10	Undesirable radiated emissions	P	N/A
FCC 15.407 (g) / RSS-Gen 6.11 & 8.11	Frequency Stability	N/M	Refer 2
<p><u>Supplementary information and remarks:</u></p> <ol style="list-style-type: none"> <li>Only applicable to sub-band U-NII-3: 5.725 - 5.85 GHz.</li> <li>The compliance is checked through a description of how this requirement is met that is provided by the applicant.</li> <li>Only Partial testing has been requested by the Customer.</li> </ol> <p>Appendix A.1: MIMO</p>			

## Appendix A: Test results. Wi-Fi 5GHz

## Appendix A

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## PRODUCT INFORMATION

(\*): The following information is provided by the client

Information	Description
Equipment type	Wi-Fi 5GHz
DFS Operating Mode	---
TPC Function	Yes
Antenna Specification	1/4 wave coax
Operating Frequency Range	5150 - 5250 MHz 5250 – 5350 MHz 5470 – 5725 MHz 5725 – 5825 MHz
Nominal Channel Bandwidth	20/ 40/ 80 MHz
Antenna type	MIMO Radio A + Radio B
RF Output Power	14 dBm
Antenna gain	-2.8 dBi
Supply Voltage	12 Vdc
Modulation:	OFDM (QPSK, BPSK,16QAM,64QAM,256QAM,1024QAM)
Communication Mode:	IP Based (Load Based)
Transmit Data Rate:	802 .11 a/n/ac/ax Rates:  IEEE 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11n: MCS0-7 IEEE 802.11ac: VHT SS1 MCS 0-9 VHT SS2 MCS 0-9  IEEE 802.11ax: HE SS1 MCS8 HE SS1 MCS9 HE SS1 MCS11
Geo-location capability	Yes

## TEST CONDITIONS

(\*): Data provided by the client.

TEST CONDITIONS	DESCRIPTION
TC#01 <sup>(1) (3)</sup> <b>(a mode)</b>	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Channel Bandwidth: 20 MHz</u> <u>Test Frequencies for Conducted/Radiated tests: (RADIO A+B)</u> <u>UNII-1</u> Lowest channel: 5180 MHz
TC#02 <sup>(1) (3)</sup> <b>(n mode)</b>	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Channel Bandwidth: 20 MHz</u> <u>Test Frequencies for Conducted/Radiated tests: (RADIO A+B)</u> <u>UNII-1</u> Lowest channel: 5180 MHz  <u>Channel Bandwidth: 40 MHz</u> <u>Test Frequencies for Conducted/Radiated tests: (RADIO A+B)</u>  <u>UNII-1</u> Lowest channel: 5190 MHz
TC#03 <sup>(1) (3)</sup> <b>(ac mode non-beam forming)</b>	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Channel Bandwidth: 20 MHz</u> <u>Test Frequencies for Conducted/Radiated tests: (RADIO A+B)</u>  <u>UNII-1</u> Lowest channel: 5180 MHz  <u>Channel Bandwidth: 40 MHz</u> <u>Test Frequencies for Conducted/Radiated tests: (Radio A, RADIO A+B)</u>  <u>UNII-1</u> Lowest channel: 5190 MHz  <u>Channel Bandwidth: 80 MHz</u> <u>Test Frequencies for Conducted/Radiated tests: (Radio A, RADIO A+B)</u>  <u>UNII-1</u> Lowest channel: 5210 MHz

TEST CONDITIONS	DESCRIPTION
<p>TC#04<sup>(1)(2)</sup>  <b>(ax mode non-beam forming)</b></p>	<p><u>Power supply (V):</u>  <math>V_{\text{nominal}} = 12 \text{ Vdc}</math></p> <p><u>Channel Bandwidth:</u> 20 MHz</p> <p><u>Test Frequencies for Conducted tests: (RADIO A+B)</u>  <u>UNII-1:</u>            Lowest range: 5180 MHz</p> <p><u>Channel Bandwidth:</u>40 MHz</p> <p><u>Test Frequencies for Conducted tests: (RADIO A+B)</u>  <u>UNII-1:</u>            Lowest channel: 5190 MHz</p> <p><u>Channel Bandwidth:</u> 80 MHz</p> <p><u>Test Frequencies for Conducted tests: (RADIO A+B)</u>  <u>UNII-1:</u>            Lowest channel: 5210 MHz</p>

Note (1): 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/modulation types.
- For spurious emissions for OFDM modes 802.11a, 802.11n20/40, 802.11ac20/40/80, and 11ax20/40/80 a preliminary scan was performed to determine the worst case. The following tables and plots show the results for the worst case in 802.11ac mode.
- The data rates of 54Mb/s for 802.11a, MCS 7 for 802.11n, MCS8 for 802.11ac20 and MCS9 for 802.11ac40/80, and MCS8 for ax20/40/80 were selected based on preliminary testing that identified those rates corresponding to the worst cases.
- 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.

Note (2): Preliminary measurements determined the PSD levels of partial RU is higher than the full RU in ax mode. RU 26 tone was identified as the worst-case RU (Resource Unit) carrier allocation for all non-beamforming ax mode testing.

The worst-case RU combinations used in the ax mode MIMO measurement are indicated as follows:

- 20 MHz BW - RU26 offset 0
- 40 MHz BW - RU26 offset 8
- 80 MHz BW - RU26 offset 0

Full RU combinations for ax mode MIMO measurement (all test cases) are indicated as follows:

- 20 MHz BW – RU242 offset 61
- 40 MHz BW – RU484 offset 65
- 80 MHz BW – RU996 offset 67

Note (3): For Maximum Output Power for OFDM modes 802.11a, 802.11n20/40, 802.11ac20/40/80 and 802.11ax20/40/80 a preliminary scan was performed to determine the degradation of the performance. The test results shown are the worst case. See below the comparison table between previous test results (test report 3428ERM.010A4) and test results with the new sample shown in this test report:

U-NII Sub-Band	Bandwidth (MHz)	Mode	Frequency (MHz)	Maximum conducted power (dBm)		Delta
				IDC23 - 3428 (test report 3428ERM.010A4)	IDC23 - 3967	
U-NII-1	20	a	5180	12.4	13.6	1.2
		n	5180	14.0	13.6	-0.4
		ac	5180	13.3	14.7	1.4
		ax	5180	8.3	9.2	0.9
	40	n	5190	11.0	12.5	1.5
		ac	5190	9.9	11.0	1.1
		ax	5190	7.2	8.1	0.9
	80	ac	5210	9.7	10.6	0.9
ax		5210	8.4	9.1	0.7	

Directional Antenna Gain Calculations for CDD MIMO In-Band Measurements:

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)i), directional gain was calculated as follows:

- For power measurements:
  - Directional gain POWER =  $G_{ANT}$  dBi ( $N_{ANT} < 4$ )
  - Directional gain POWER =  $G_{ANT} - 2.8$  dBi
  - Power Antenna Gain MIMO Chain 0 & 1: - 2.8 dBi



## TEST CASES DETAILS

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### FCC 15.407 (a) / RSS-247 6.2 Power Limits. Maximum Output Power

#### Limits

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, 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.

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. 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:

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

For devices other than devices installed in vehicles:

For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW (23 dBm) or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

For the 5.25-5.35 GHz, 5.470-5.6 GHz, and 5.650-5.725 GHz bands, the maximum conducted output power shall not exceed 250 mW (24 dBm) or  $11 + 10 \log_{10} B$ , dBm, whichever power is less. The maximum e.i.r.p. shall not exceed 1.0 W or  $17 + 10 \log_{10} B$ , dBm, whichever is less.

For the band 5.725-5.850 GHz, the maximum conducted output power shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11a (OFDM 54 Mbit/s)

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5180.00000	13.65	10.85

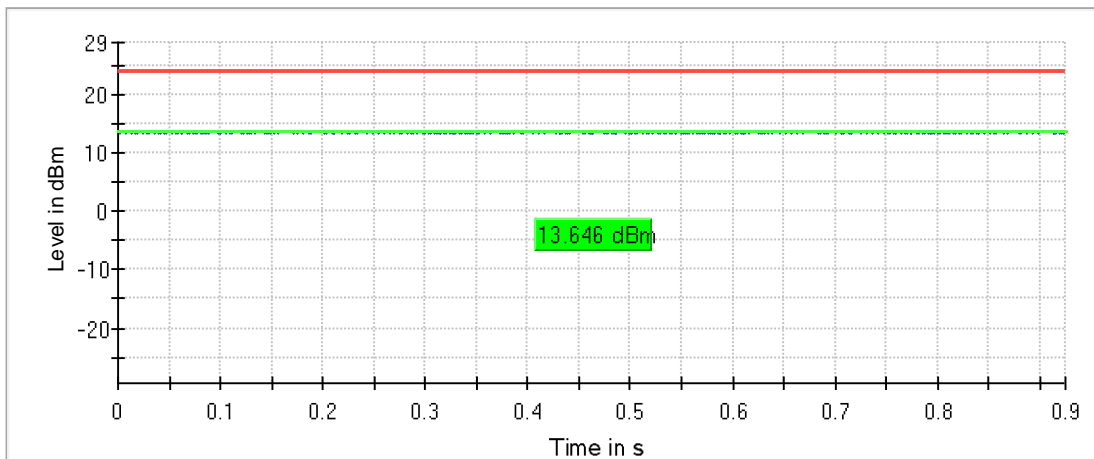
**Verdict**

Pass

**Attachments**

Frequency MHz = 5180.00000      Modulation = 802.11a (OFDM 54 Mbit/s)  
 TPC = No      Mode = MIMO CCD Mode 2x2  
 Number of Transmission Chains = 2

**Images:**



— Gated Trace    — Overall    — Limit

**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μs	1.000 μs

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11n HT20 (OFDM MCS7)

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5180.00000	13.58	10.78

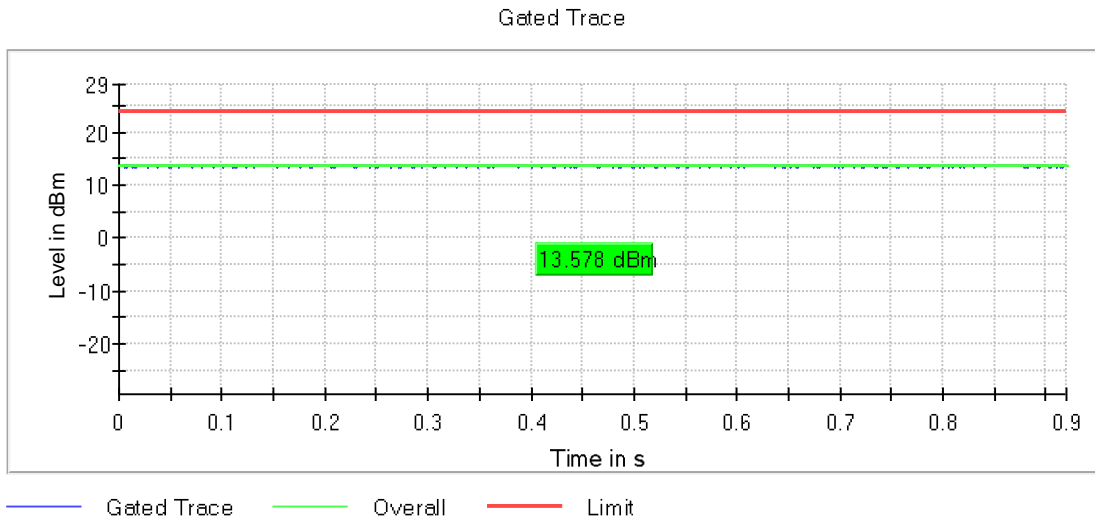
**Verdict**

Pass

**Attachments**

Frequency MHz = 5180.00000      Modulation = 802.11n HT20 (OFDM MCS7)  
 TPC = No      Mode = MIMO CCD Mode 2x2  
 Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11n HT40 (OFDM MCS7)

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5190.00000	12.47	9.67

**Verdict**

Pass

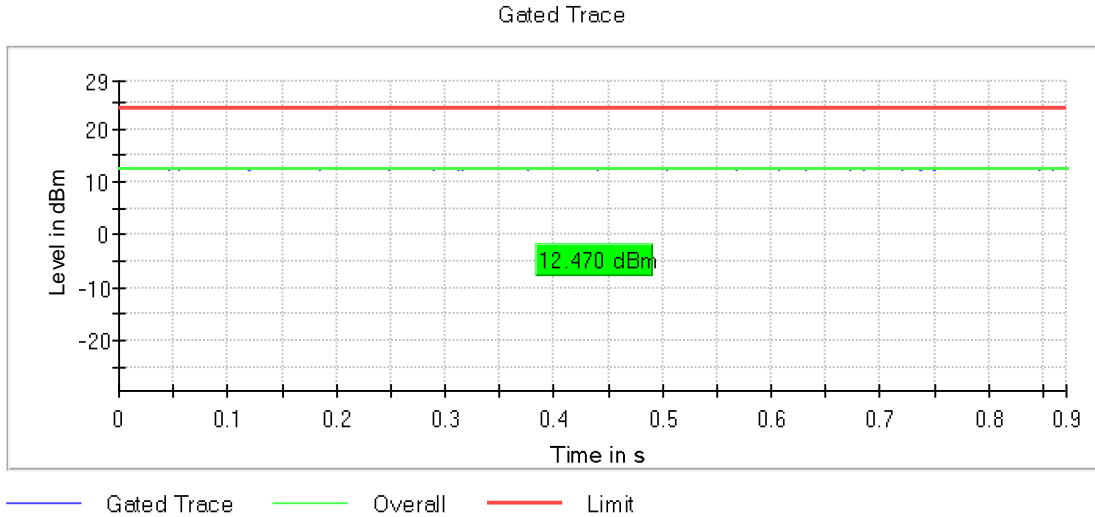
**Attachments**

Frequency MHz = 5190.00000      Modulation = 802.11n HT40 (OFDM MCS7)

TPC = No      Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 $\mu$ s	1.000 $\mu$ s

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11ac VHT20 SS1 (OFDM MCS8) non-beam forming

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5180.00000	14.67	11.87

**Verdict**

Pass

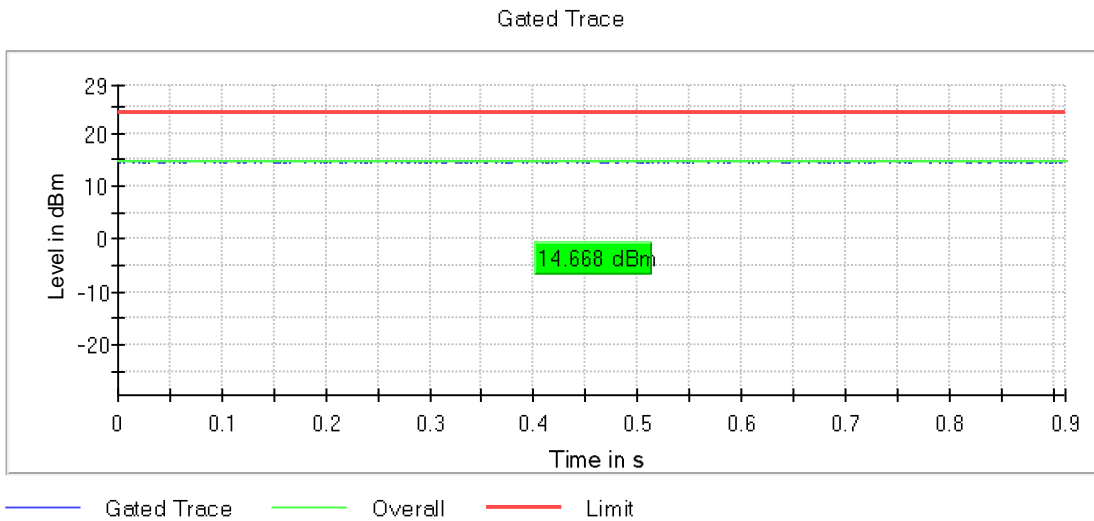
**Attachments**

Frequency MHz = 5180.00000      Modulation = 802.11ac VHT20 SS1 (OFDM MCS8)

TPC = No      Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 $\mu$ s	1.000 $\mu$ s

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11ac VHT40 SS1 (OFDM MCS9) non-beam forming

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5190.00000	11.01	8.21

**Verdict**

Pass

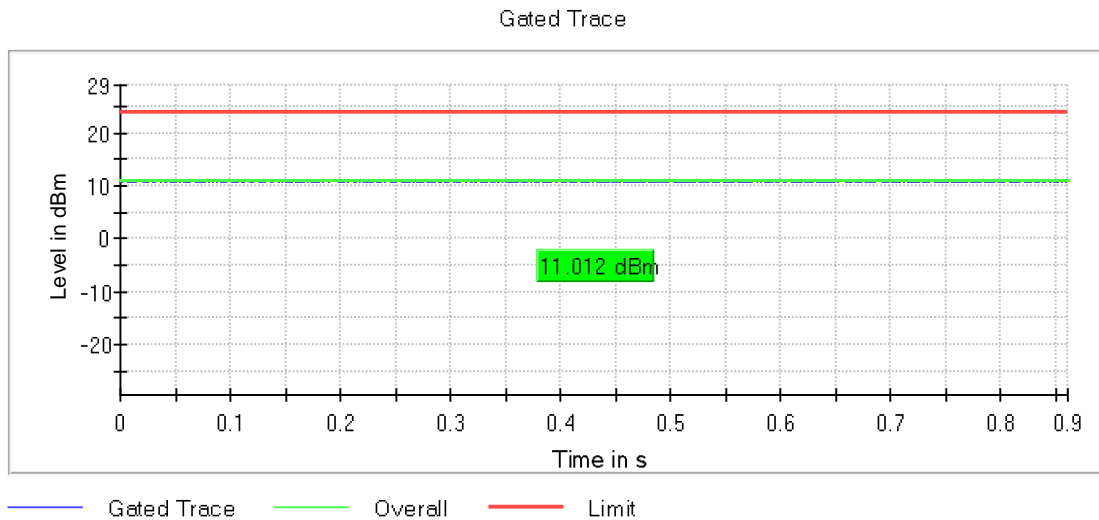
**Attachments**

Frequency MHz = 5190.00000      Modulation = 802.11ac VHT40 SS1 (OFDM MCS9)

TPC = No      Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 $\mu$ s	1.000 $\mu$ s

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11ac VHT80 SS1 (OFDM MCS9) non-beam forming

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5210.00000	10.64	7.84

**Verdict**

Pass

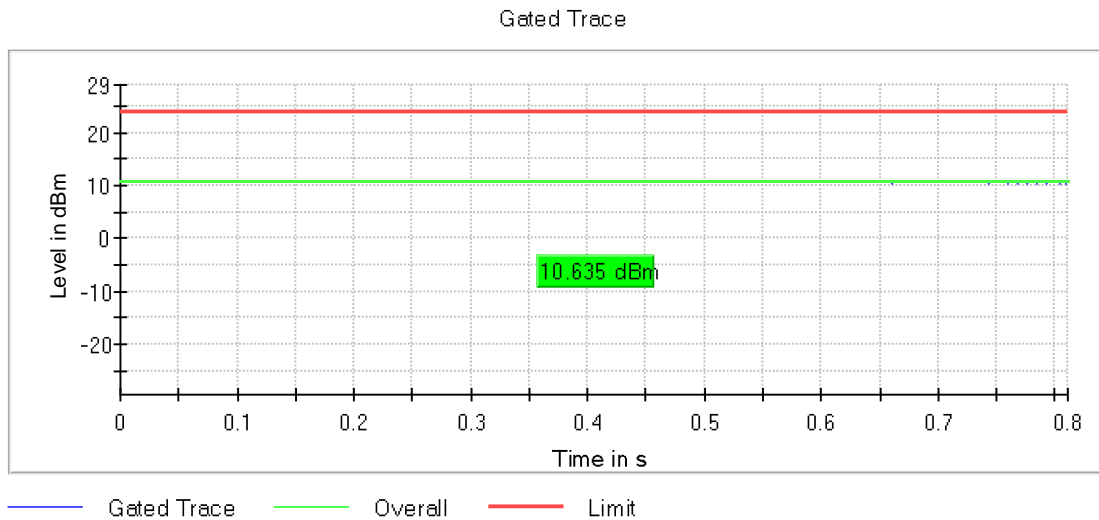
**Attachments**

Frequency MHz = 5210.00000      Modulation = 802.11ac VHT80 SS1 (OFDM MCS9)

TPC = No      Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 $\mu$ s	1.000 $\mu$ s

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11ax HE20 SS1 (OFDMA MCS8) - Partial RU

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5180.00000	9.22	6.42

**Verdict**

Pass

**Attachments**

Frequency MHz = 5180.00000

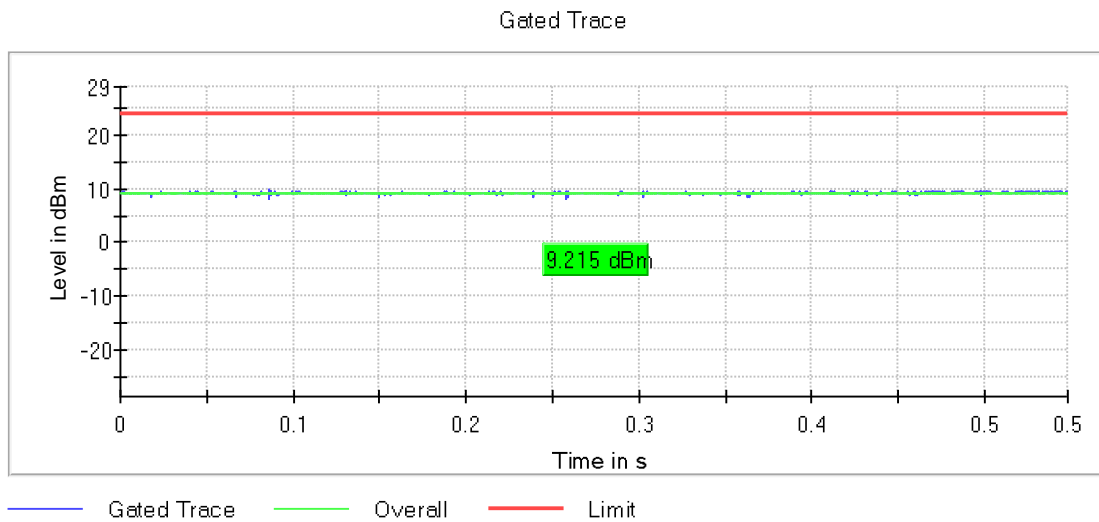
Modulation = 802.11ax HE20 SS1 (OFDMA MCS8)

TPC = No

Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 $\mu$ s	1.000 $\mu$ s



Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11ax HE40 SS1 (OFDMA MCS9) – Partial RU

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5190.00000	8.07	5.27

**Verdict**

Pass

**Attachments**

Frequency MHz = 5190.00000

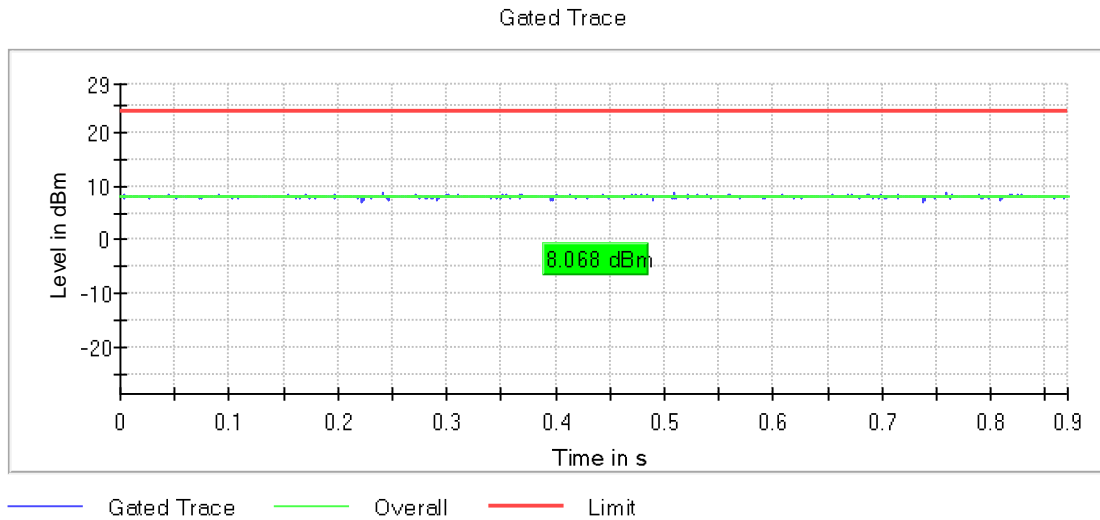
Modulation = 802.11ax HE40 SS1 (OFDMA MCS9)

TPC = No

Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 $\mu$ s	1.000 $\mu$ s

Antenna gain: -2.8 dBi

Mode: MIMO CCD Mode 2x2

Modulation: 802.11ax HE80 SS1 (OFDMA MCS11) – Partial RU

**Results**

Freq (MHz)	Avg Power (dBm)	Max EIRP (dBm)
5210.00000	9.10	6.30

**Verdict**

Pass

**Attachments**

Frequency MHz = 5210.00000

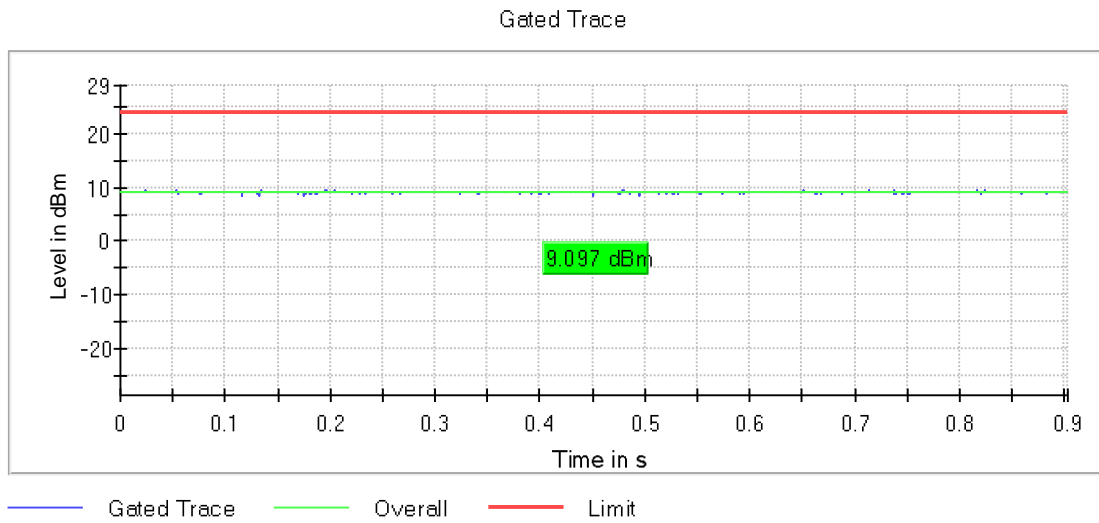
Modulation = 802.11ax HE80 SS1 (OFDMA MCS11)

TPC = No

Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**



**Tables:**

Spectrum Analyzer Parameters

Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 μs	1.000 μs

### FCC 2.1049 / RSS-Gen 6.7 99% Occupied Bandwidth

#### Limits

No requirements requested.

Mode: MIMO CCD Mode 2x2

Modulation: 802.11a (OFDM 54 Mbit/s)

#### Results

Freq (MHz)	Occ Ch BW (MHz)
5180.00000	16.500

#### Verdict

Pass

#### Attachments

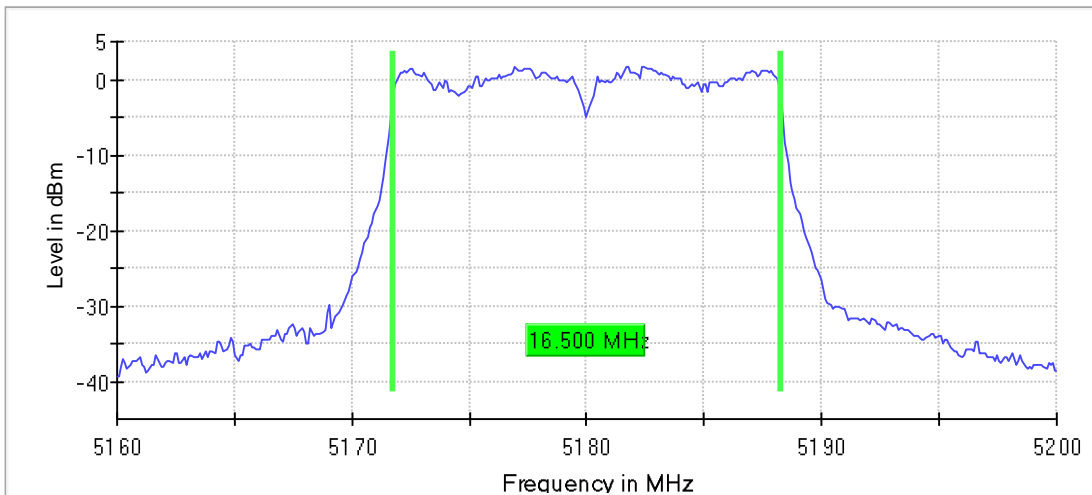
Frequency MHz = 5180.00000

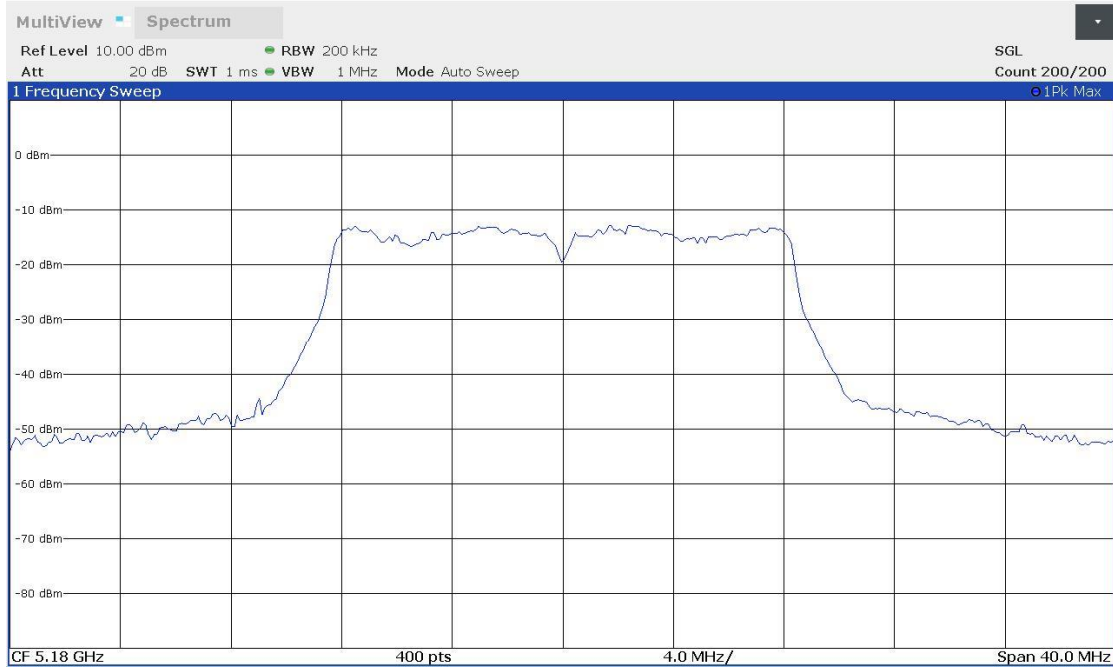
Modulation = 802.11a (OFDM 54 Mbit/s)

Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

#### Images:





Mode: MIMO CCD Mode 2x2

Modulation: 802.11n HT20 (OFDM MCS7)

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5180.00000	17.700

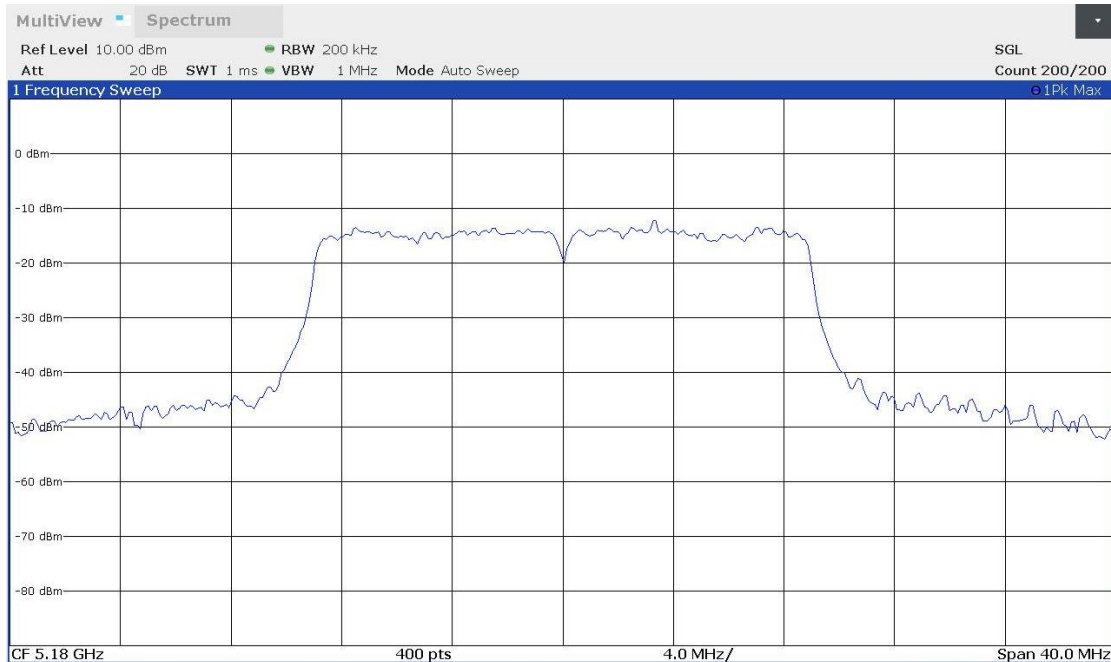
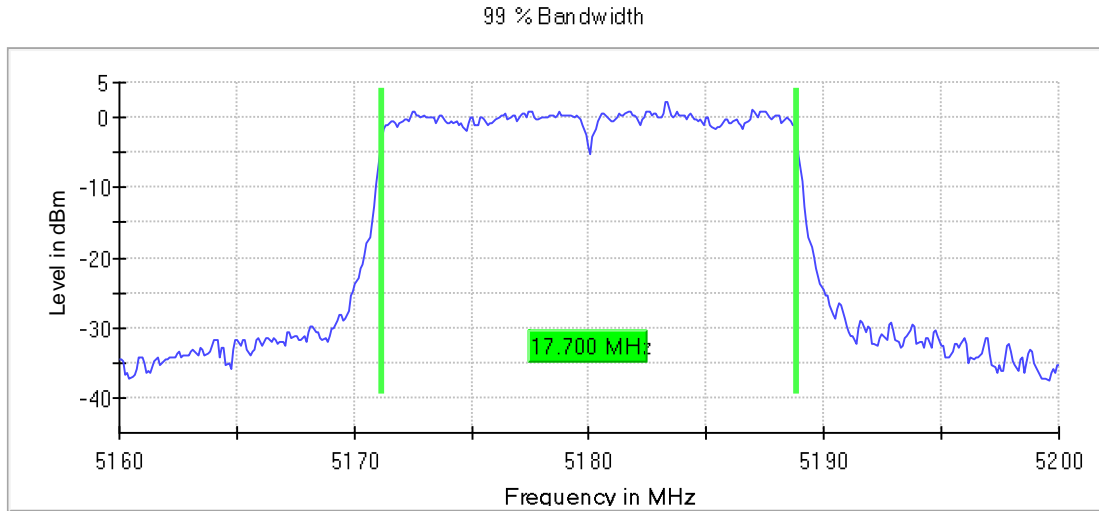
**Verdict**

Pass

**Attachments**

Frequency MHz = 5180.00000      Modulation = 802.11n HT20 (OFDM MCS7)  
Mode = MIMO CCD Mode 2x2      Number of Transmission Chains = 2

**Images:**



Mode: MIMO CCD Mode 2x2

Modulation: 802.11n HT40 (OFDM MCS7)

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5190.00000	36.250

**Verdict**

Pass

**Attachments**

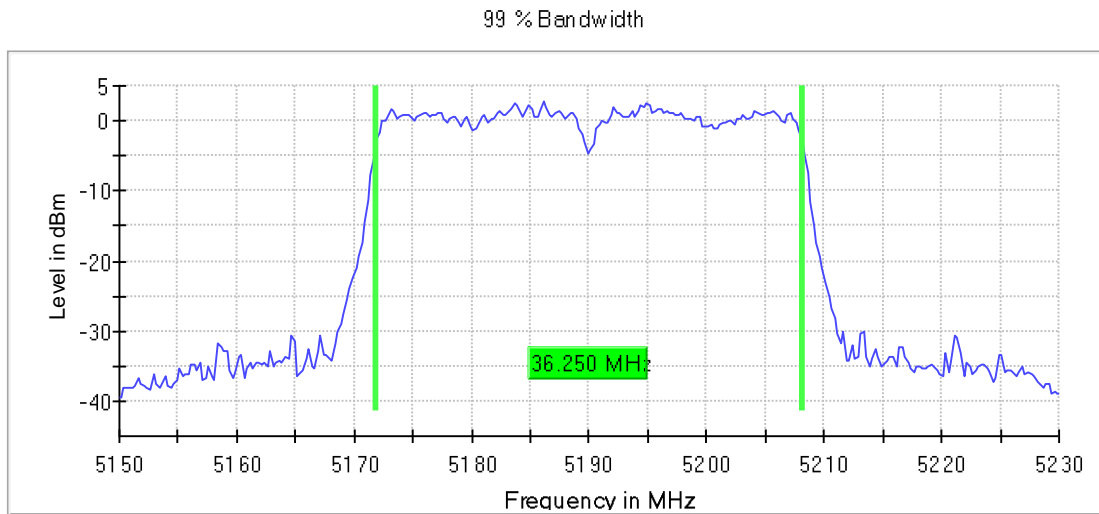
Frequency MHz = 5270.00000

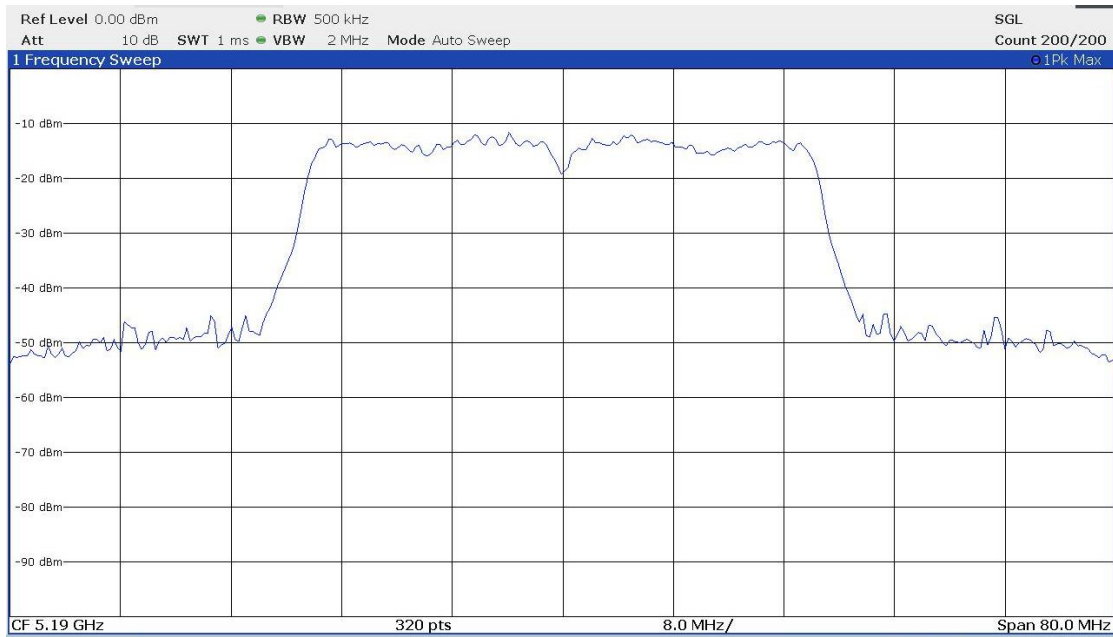
Modulation = 802.11n HT40 (OFDM MCS7)

Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**





Mode: MIMO CCD Mode 2x2

Modulation: 802.11ac VHT20 SS1 (OFDM MCS8) non-beam forming

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5180.00000	17.700

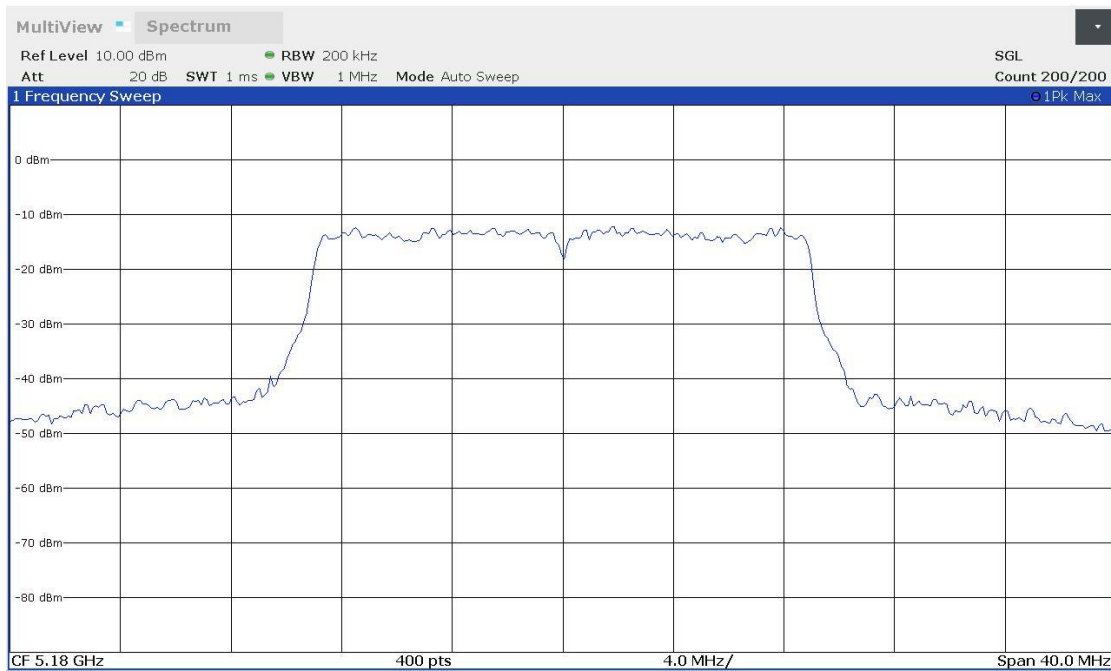
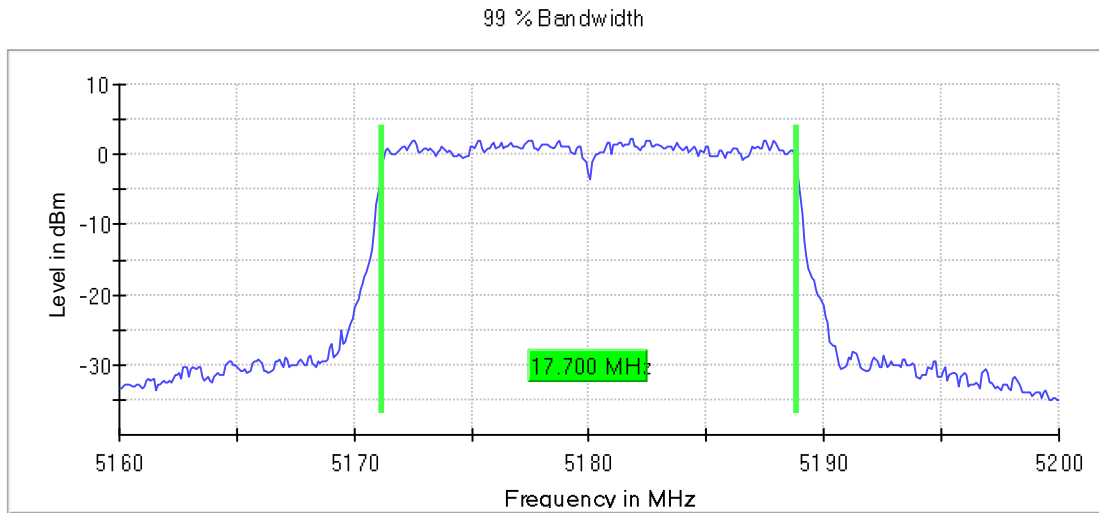
**Verdict**

Pass

**Attachments**

Frequency MHz = 5260.00000      Modulation = 802.11ac VHT20 SS1 (OFDM MCS8)  
Mode = MIMO CCD Mode 2x2      Number of Transmission Chains = 2

**Images:**





Mode: MIMO CCD Mode 2x2

Modulation: 802.11ac VHT40 SS1 (OFDM MCS9) non-beam forming

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5190.00000	36.250

**Verdict**

Pass

**Attachments**

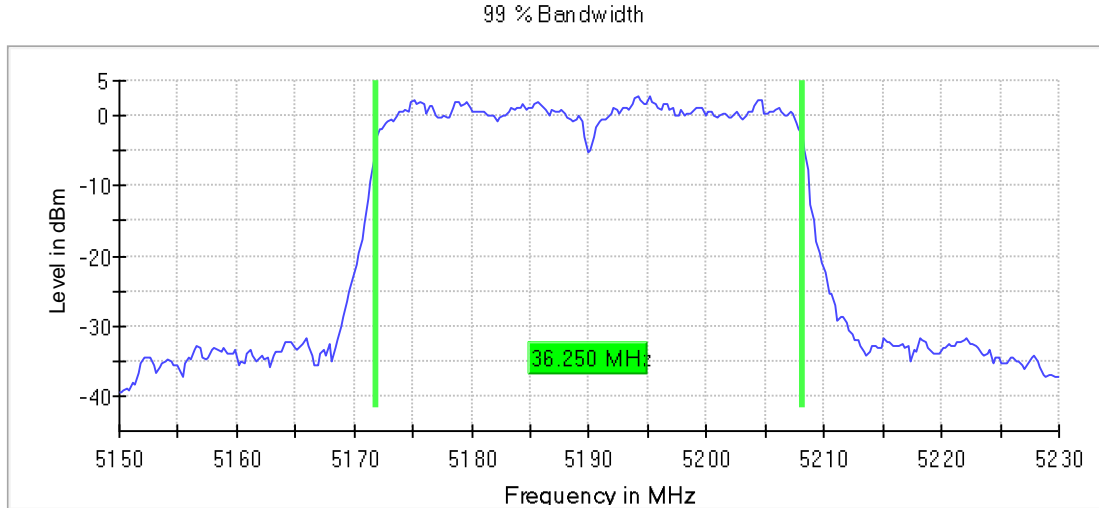
Frequency MHz = 5190.00000

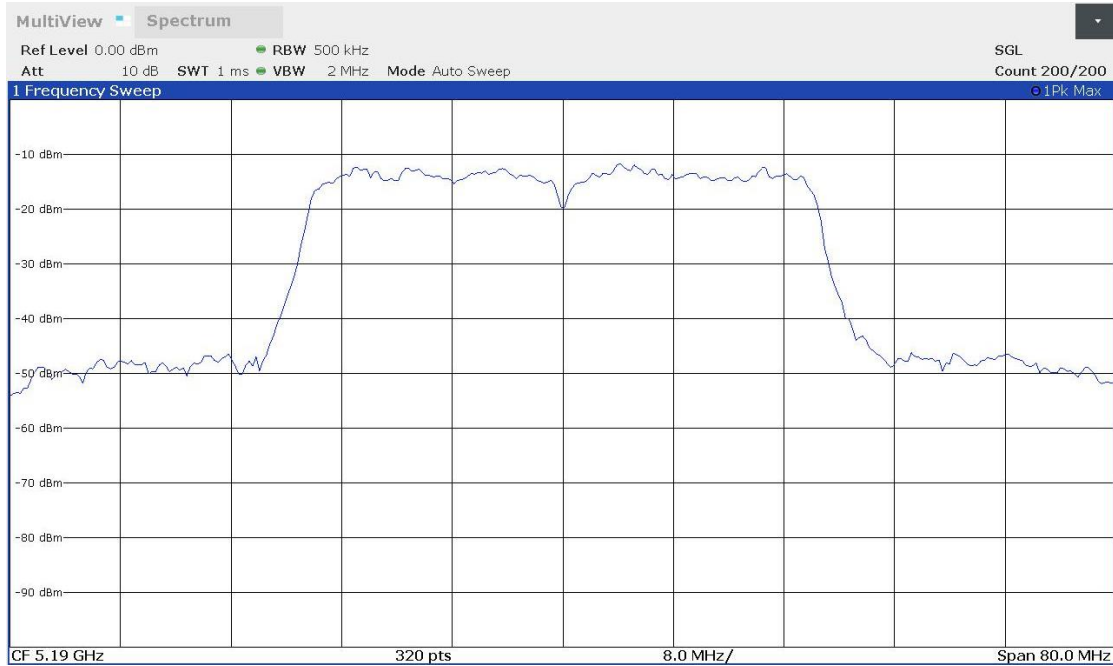
Modulation = 802.11ac VHT40 SS1 (OFDM MCS9)

Mode = MIMO CCD Mode 2x2

Number of Transmission Chains = 2

**Images:**





Mode: MIMO CCD Mode 2x2

Modulation: 802.11ac VHT80 SS1 (OFDM MCS9) non-beam forming

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5210.00000	76.500

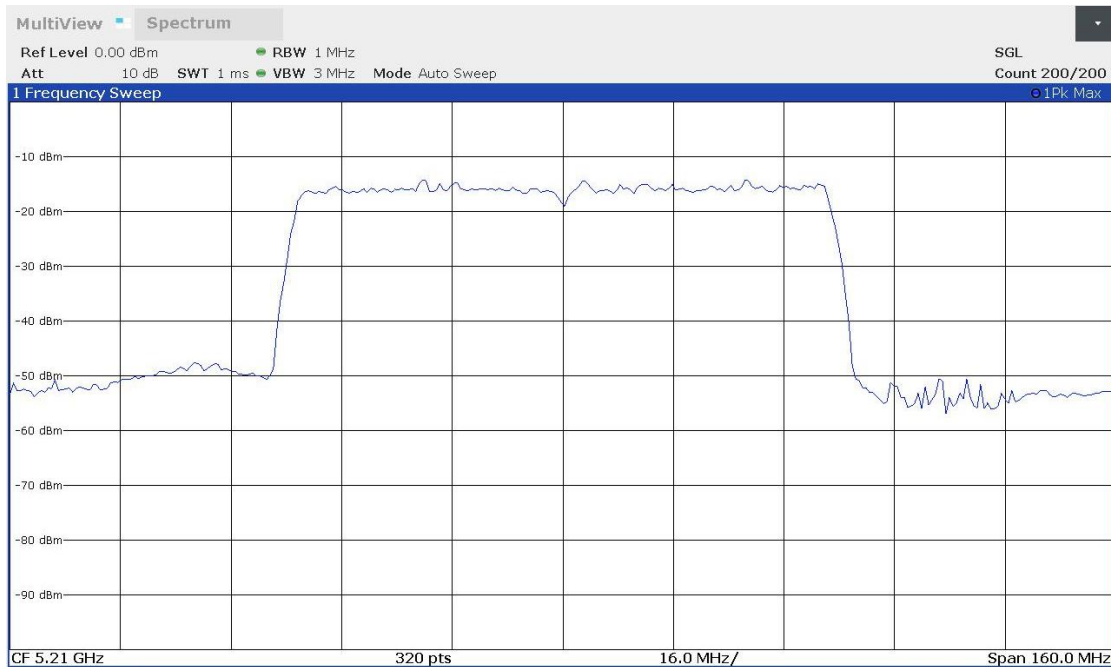
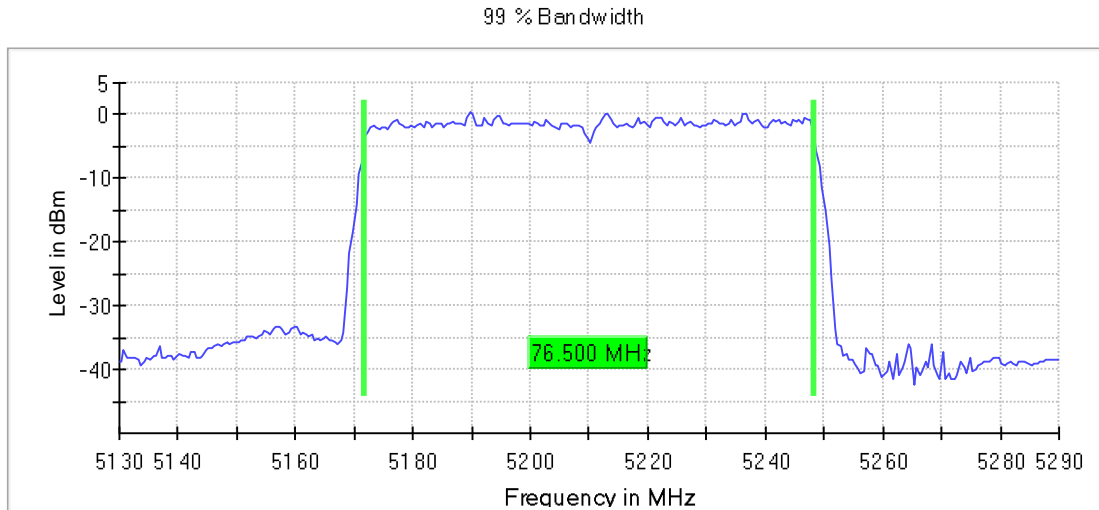
**Verdict**

Pass

**Attachments**

Frequency MHz = 5210.00000      Modulation = 802.11ac VHT80 SS1 (OFDM MCS9)  
Mode = MIMO CCD Mode 2x2      Number of Transmission Chains = 2

**Images:**



Mode: MIMO CCD Mode 2x2

Modulation: 802.11ax HE20 SS1 (OFDMA MCS8) - Partial RU

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5180.00000	18.100

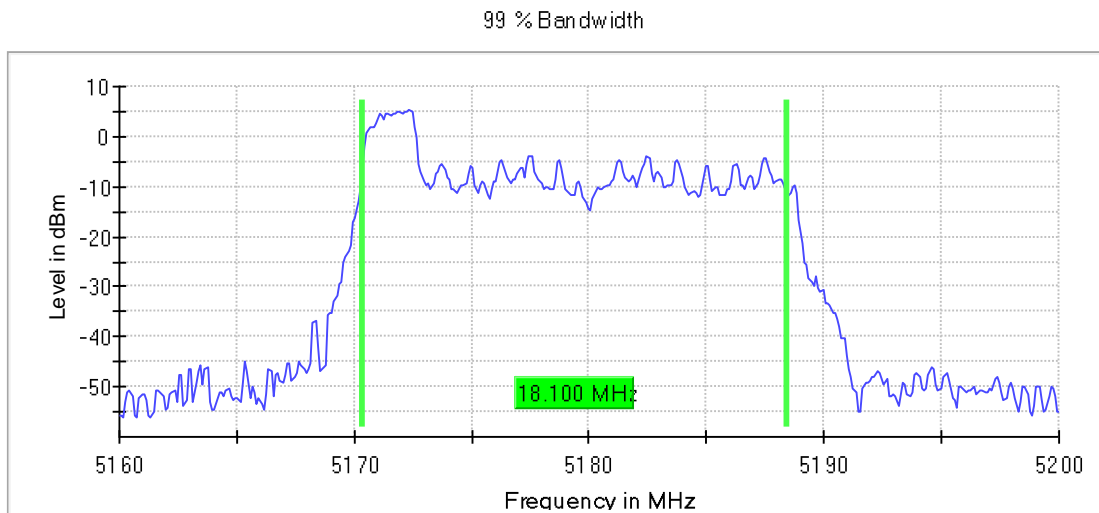
**Verdict**

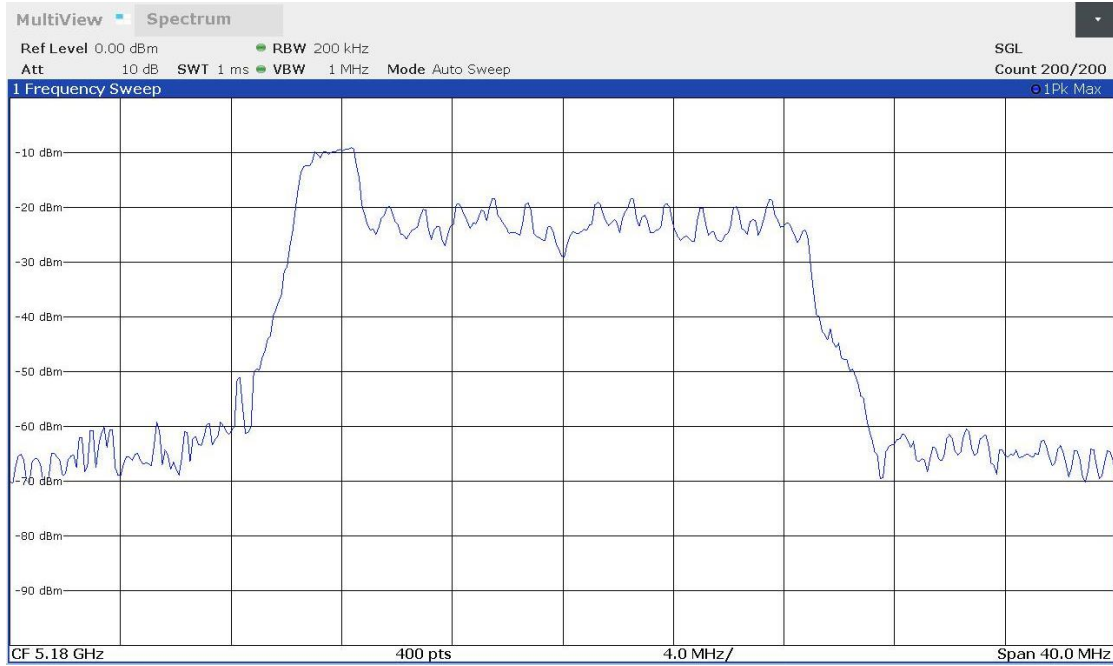
Pass

**Attachments**

Frequency MHz = 5180.00000 Modulation = 802.11ax HE20 SS1 (OFDMA MCS8)  
Mode = MIMO CCD Mode 2x2 Number of Transmission Chains = 2

**Images:**





Mode: MIMO CCD Mode 2x2

Modulation: 802.11ax HE40 SS1 (OFDMA MCS9) – Partial RU

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5190.00000	21.750

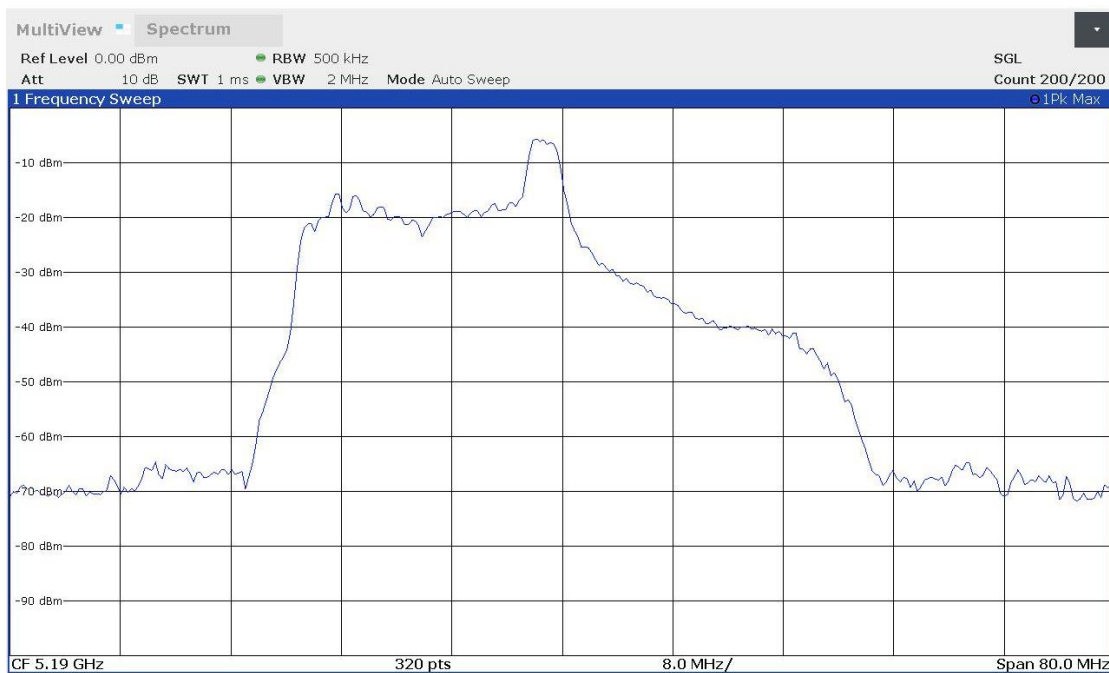
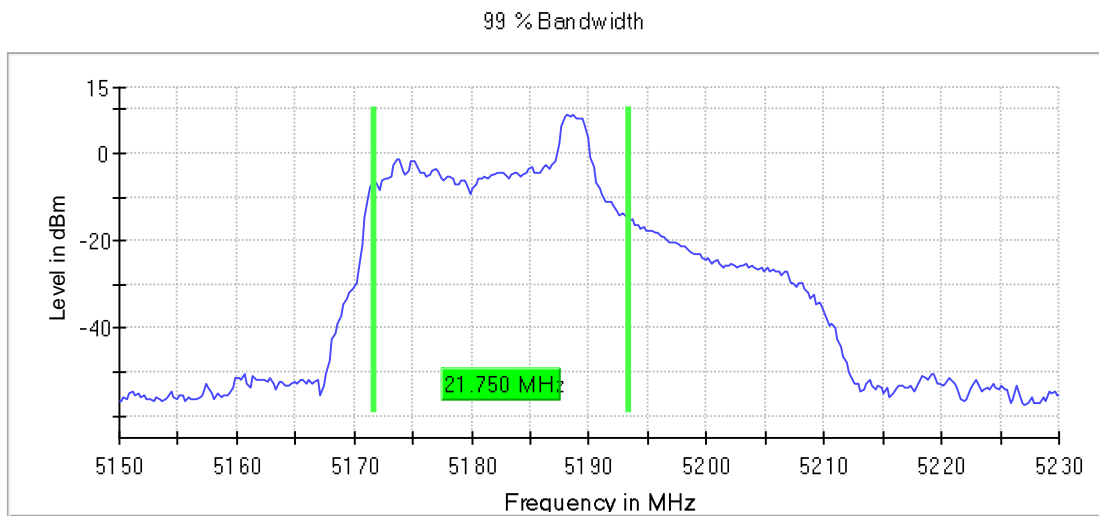
**Verdict**

Pass

**Attachments**

Frequency MHz = 5190.00000 Modulation = 802.11ax HE40 SS1 (OFDMA MCS9)  
Mode = MIMO CCD Mode 2x2 Number of Transmission Chains = 2

**Images:**



Mode: MIMO CCD Mode 2x2

Modulation: 802.11ax HE80 SS1 (OFDMA MCS11) – Partial RU

**Results**

Freq (MHz)	Occ Ch BW (MHz)
5210.00000	78.500

**Verdict**

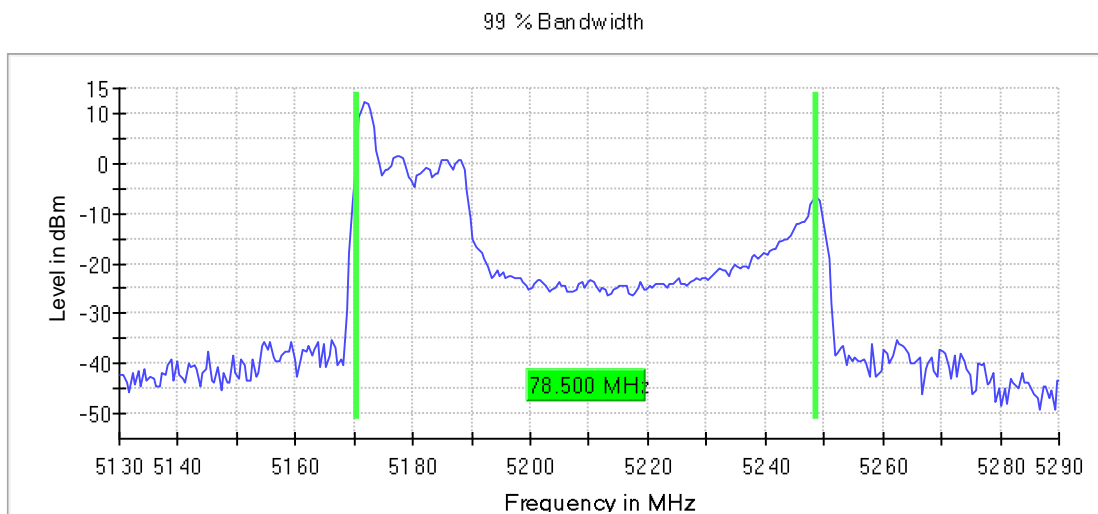
Pass

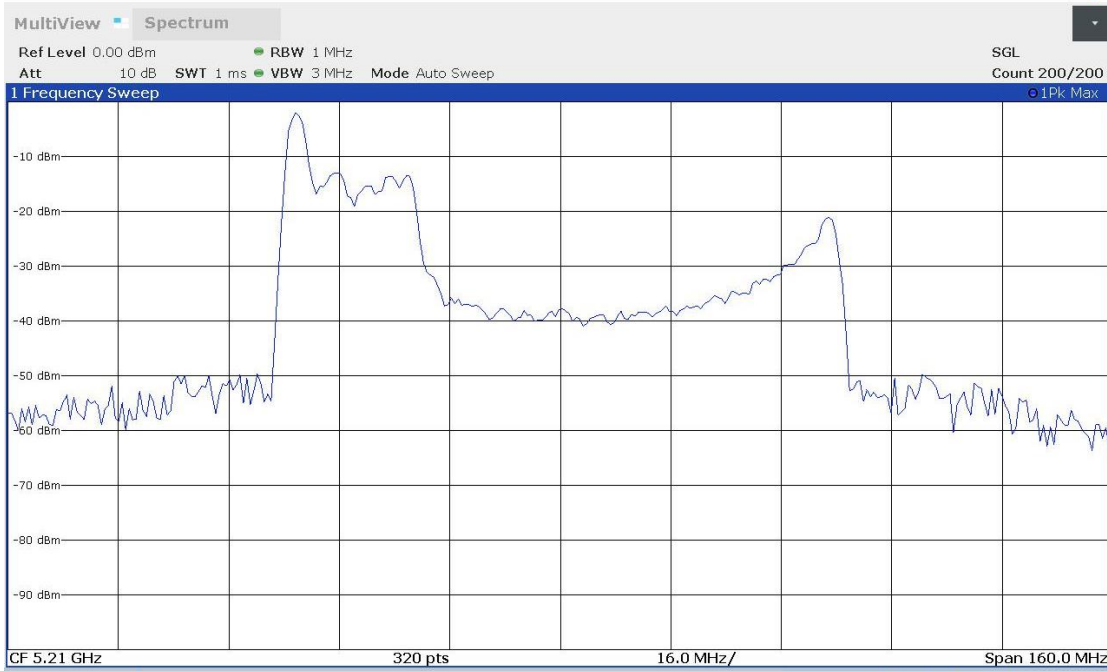
**Attachments**

Frequency MHz = 5210.00000 Modulation = 802.11ax HE80 SS1 (OFDMA MCS11)

Mode = MIMO CCD Mode 2x2 Number of Transmission Chains = 2

**Images:**





### Measurements

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	5.16000	5.15000 GHz	5.13000 GHz
Stop Frequency	5.20000	5.23000 GHz	5.29000 GHz
Span	40.000 MHz	80.000 MHz	160.000 MHz
RBW	200.000 kHz	500.000 kHz	1.000 MHz
VBW	1.000 MHz	2.000 MHz	3.000 MHz
SweepPoints	400	320	320
Sweeptime	1.000 ms	1.000 ms	1.000 ms
Reference Level	10.000 dBm	10.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	10.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.30 dB	0.30 dB	0.30 dB
Run	59 / max.	73 / max. 150	79 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable	0.09 dB	0.07 dB	0.00 dB



## FCC 15.407 (b)(6)15.207 / RSS Gen 8.8 Emission limitations Conducted

### Limits

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

### Results

Modulation: 802.11n40

#### Frequency: 5190 MHz

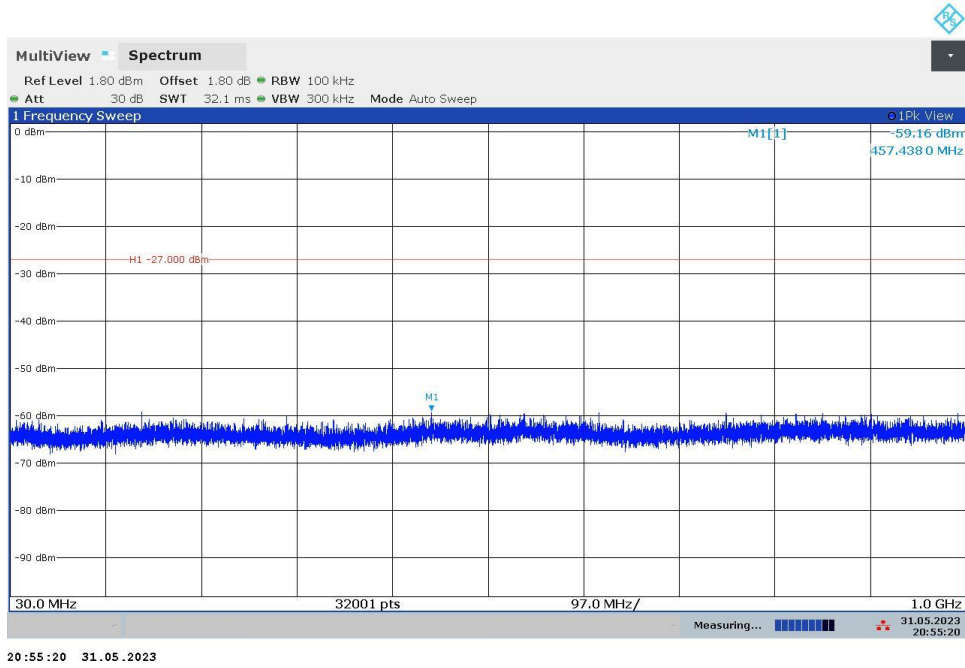
No spurious signal was detected at 7 dB below the limit or above for the channel.

### Verdict

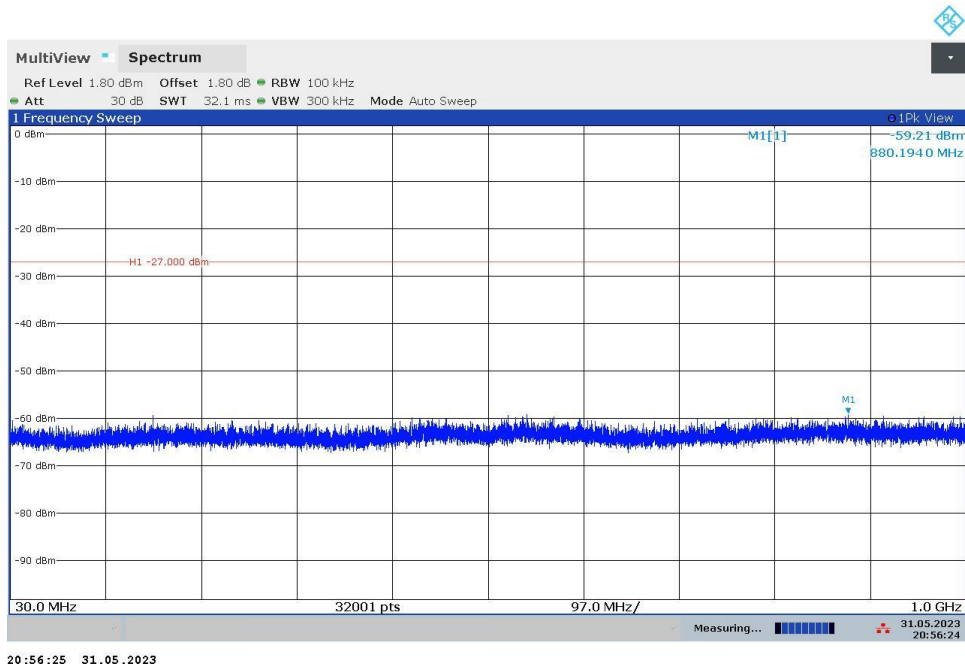
Pass

### Frequency range 0.03 - 1 GHz

Port 1

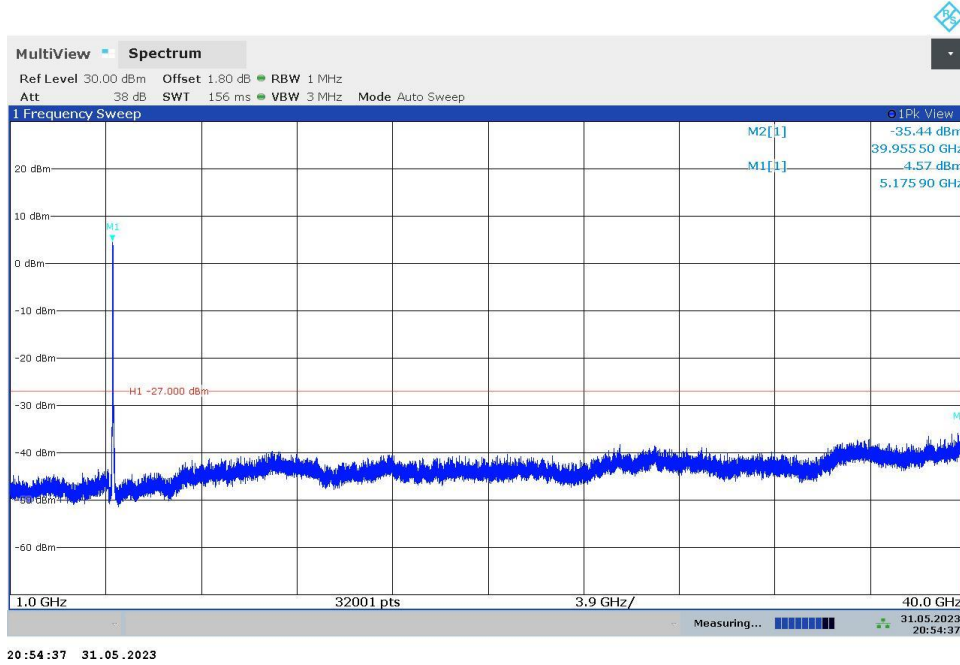


Port 4

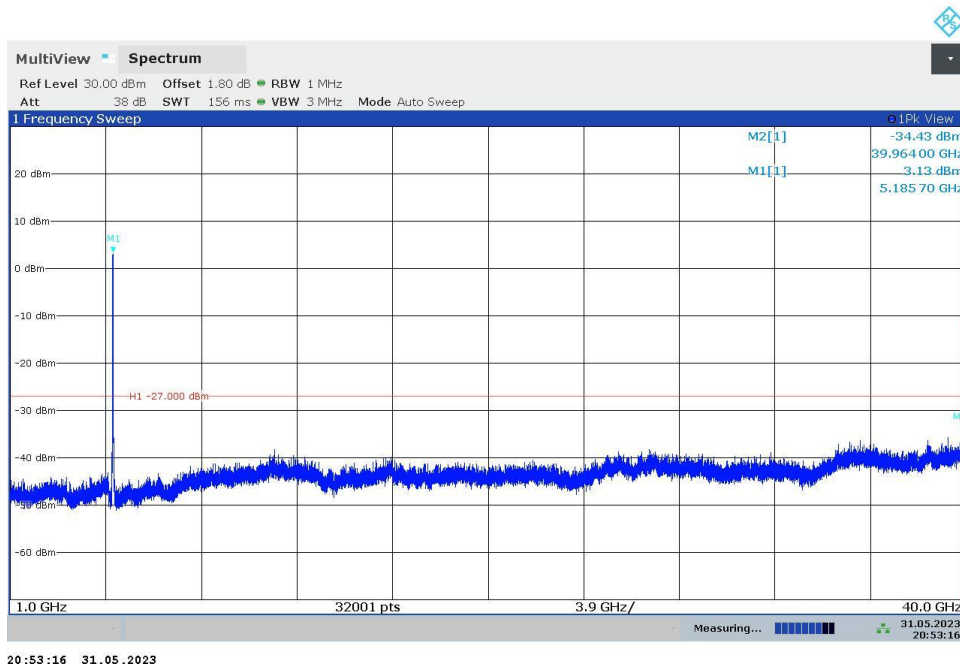


### Frequency range 1 – 40 GHz

Port 1



Port 4



The peak above the limit is the fundamental

## Results

Modulation: 802.11ac20

### Frequency: 5180 MHz

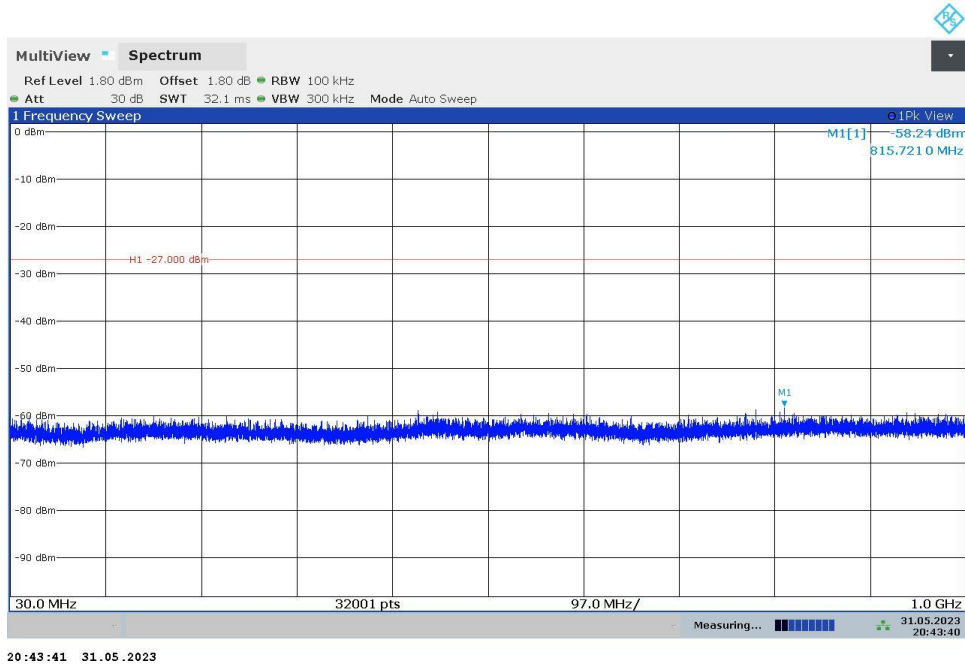
No spurious signal was detected at 8 dB below the limit or above for the channel.

## Verdict

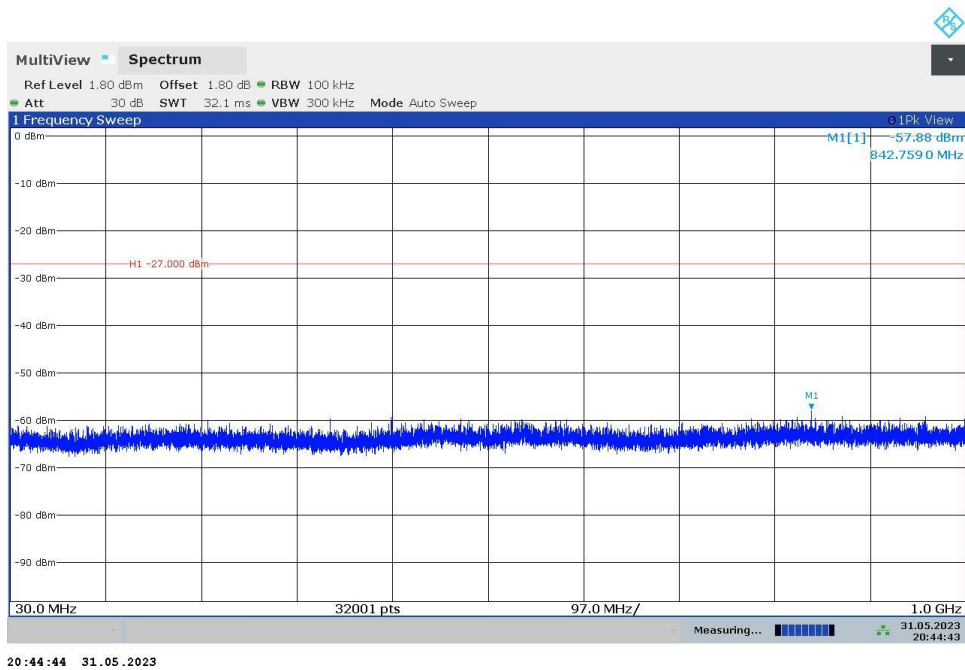
Pass

### Frequency range 0.03 - 1 GHz

Port 1

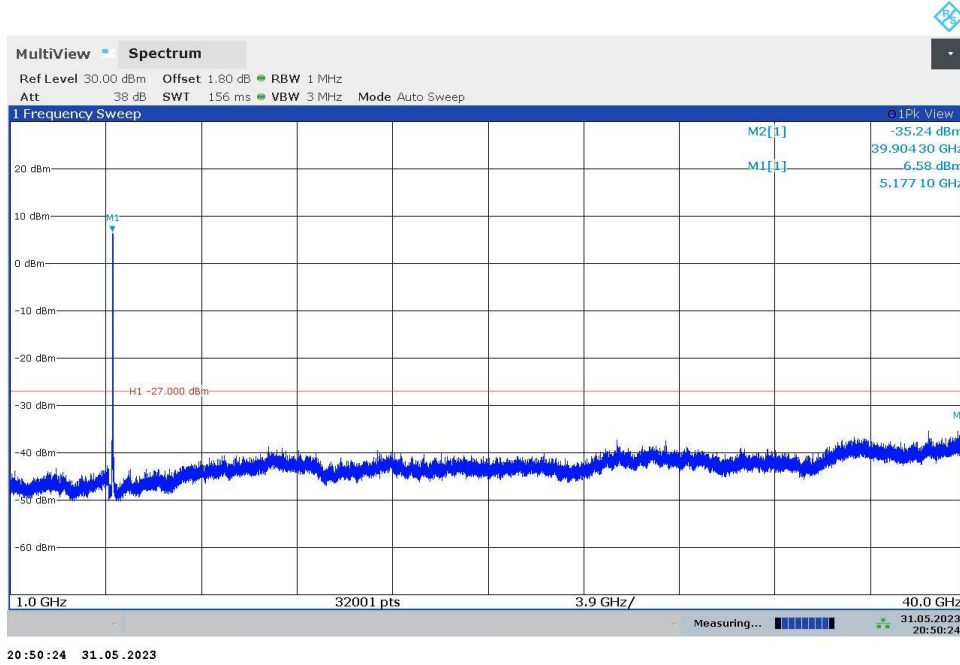


Port 4

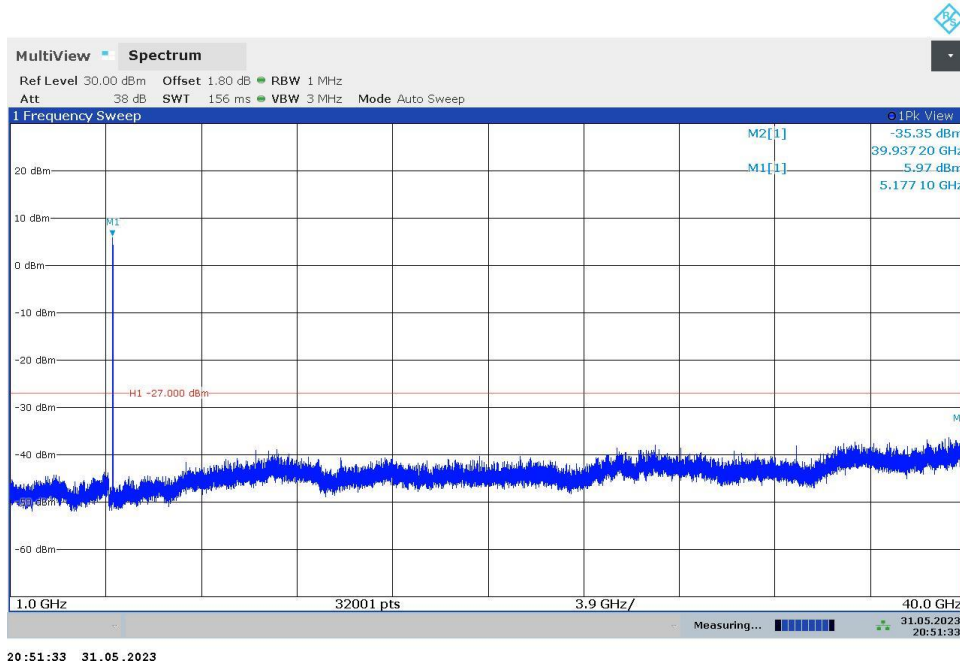


### Frequency range 1 – 40 GHz

Port 1



Port 4



The peak above the limit is the fundamental

## Results

Modulation: 802.11ac80

### Frequency: 5210 MHz

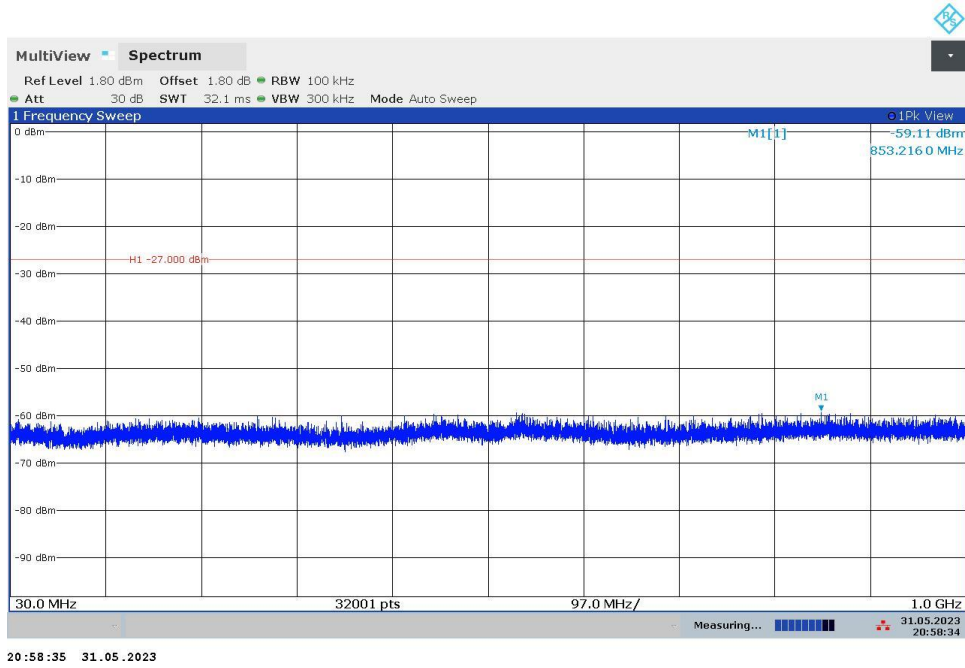
No spurious signal was detected at 8 dB below the limit or above for the channel.

## Verdict

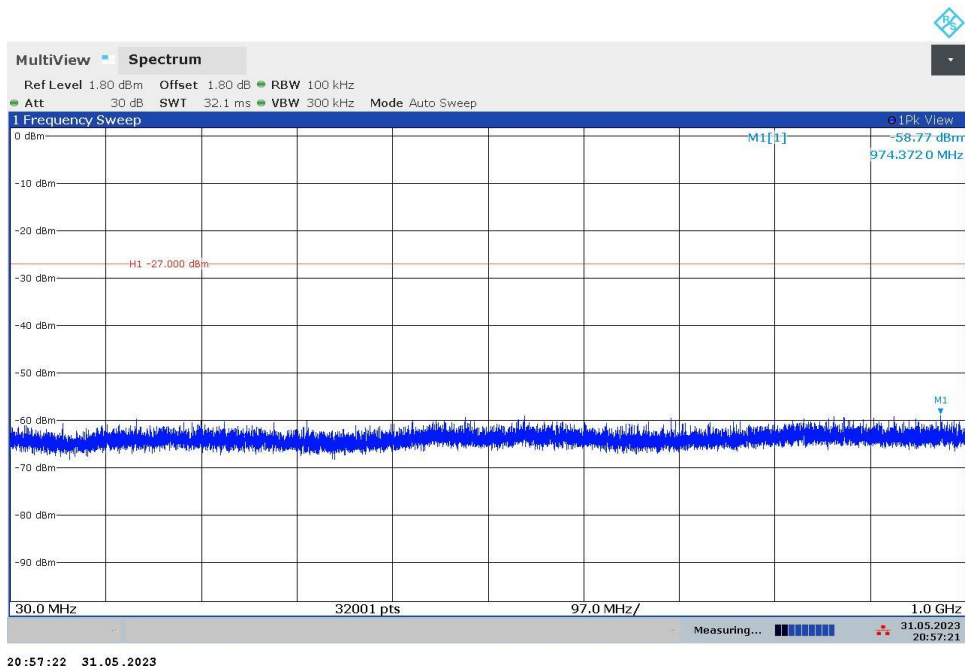
Pass

### Frequency range 0.03 - 1 GHz

Port 1



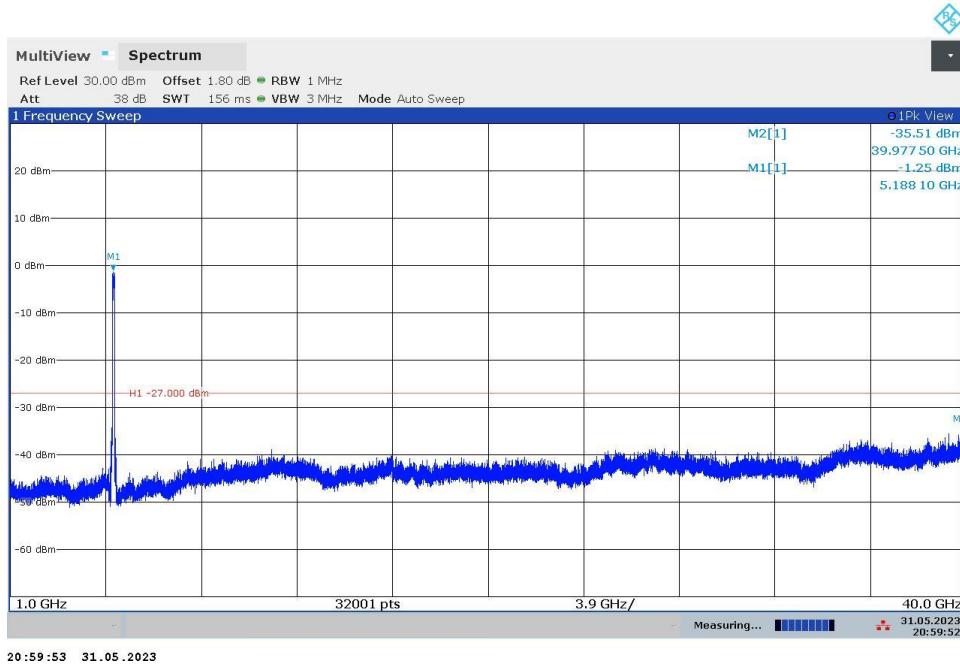
Port 4



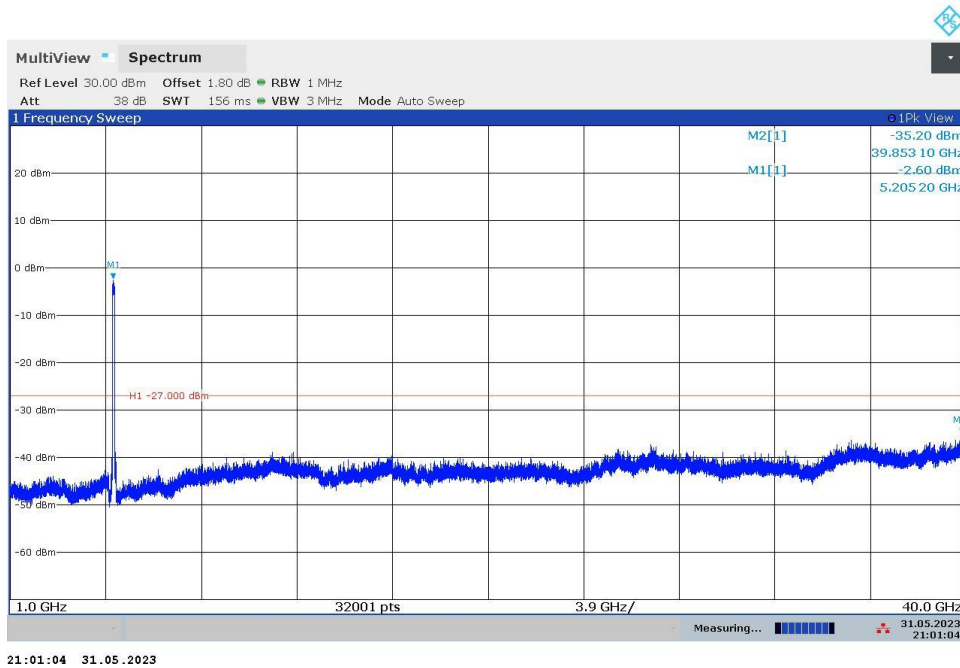


### Frequency range 1 – 40 GHz

Port 1



Port 4



The peak above the limit is the fundamental

FCC 15.407 (b), 15.205 & 15.209 / RSS-Gen 8.9 & 8.10 Undesirable radiated emissions

**Limits**

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

### Frequency range 0.03 - 1 GHz

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

Modulation: 802.11ac20 (OFDM MCS0)

### Results:

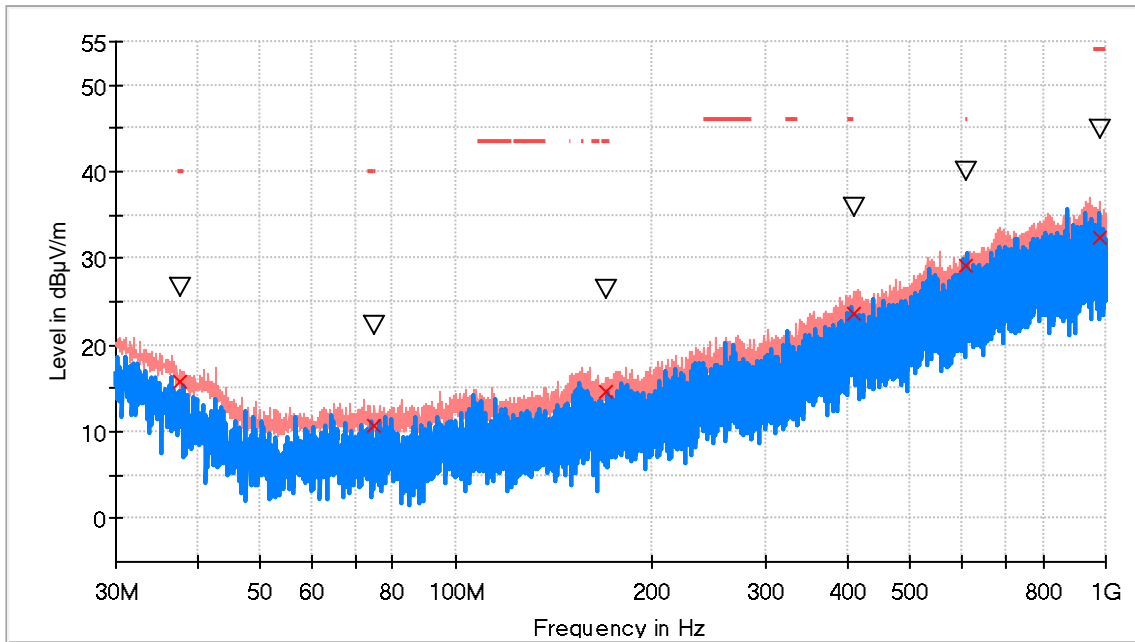
### Verdict

Pass

### Lowest Channel

Active Port = 2, Frequency Range GHz = [0.03, 1], Frequency MHz = 5180.00000, Modulation = 802.11ac (OFDM MCS0), MODE = MIMO,

Images:



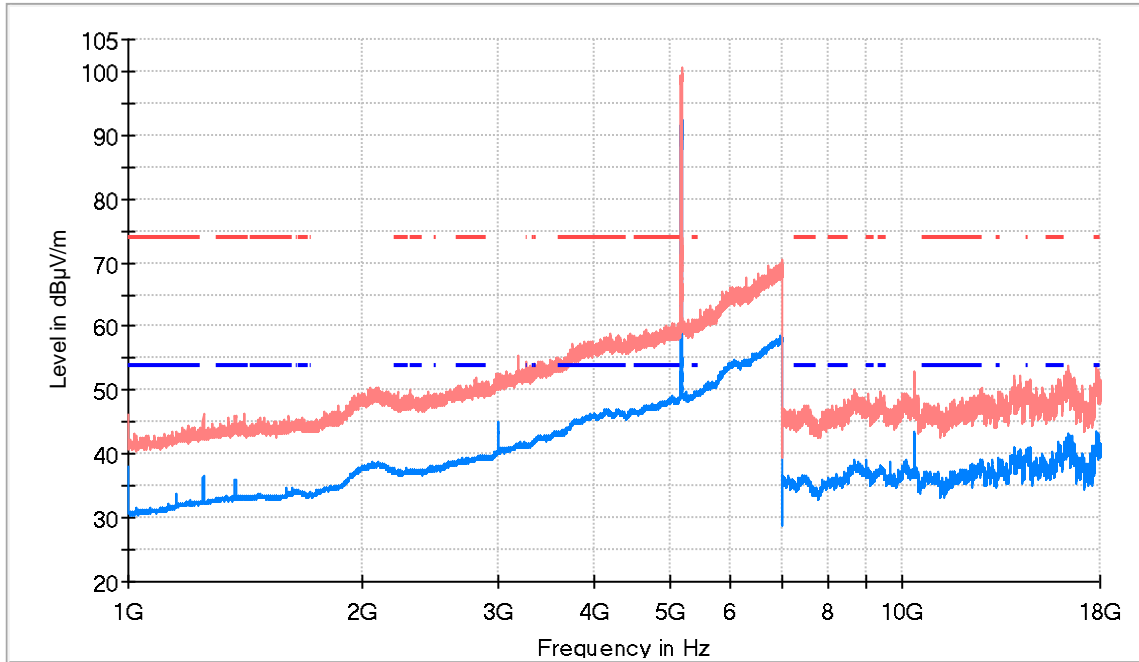
- PK+ MAXH
- PK+ CLRWR
- TX limits to Spurious Emission FCC15.407 (30MHz to 1GHz) Restricted Bands QPK Limit
- ▽ MaxPeak-PK+ (Single)
- × QuasiPeak-QPK (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Margin - QPK (dB)	Limit - QPK (dBµV/m)
37.566000	26.7	15.7	V	24.3	40.0
75.056500	22.2	10.7	V	29.3	40.0
170.213500	26.5	14.5	H	29.0	43.5
409.852000	35.8	23.6	V	22.5	46.0
611.127000	40.0	29.1	V	16.9	46.0
979.775500	44.9	32.5	V	21.5	54.0

**Frequency range 1 - 18 GHz**

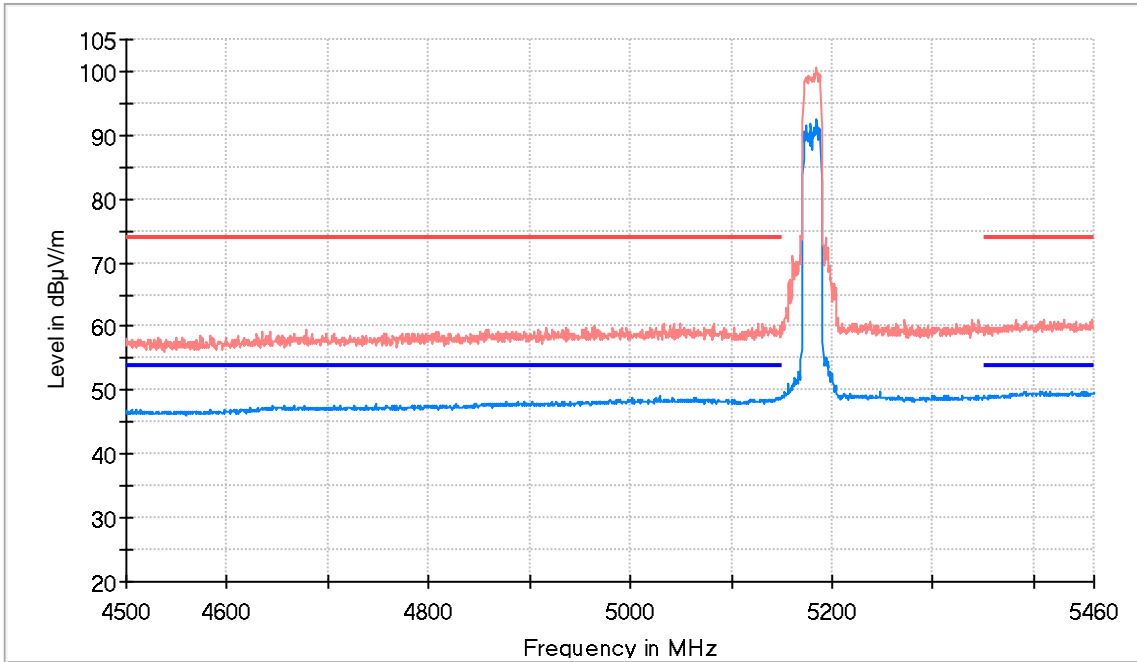
**Frequency Range GHz = [1, 18], Frequency MHz = 5180.00000, Modulation = 802.11ac (OFDM MCS0), Mode = MIMO CCD Mode 2x2**

**Images:**



- AVG\_MAXH
- PK+\_MAXH
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands AVG Limit

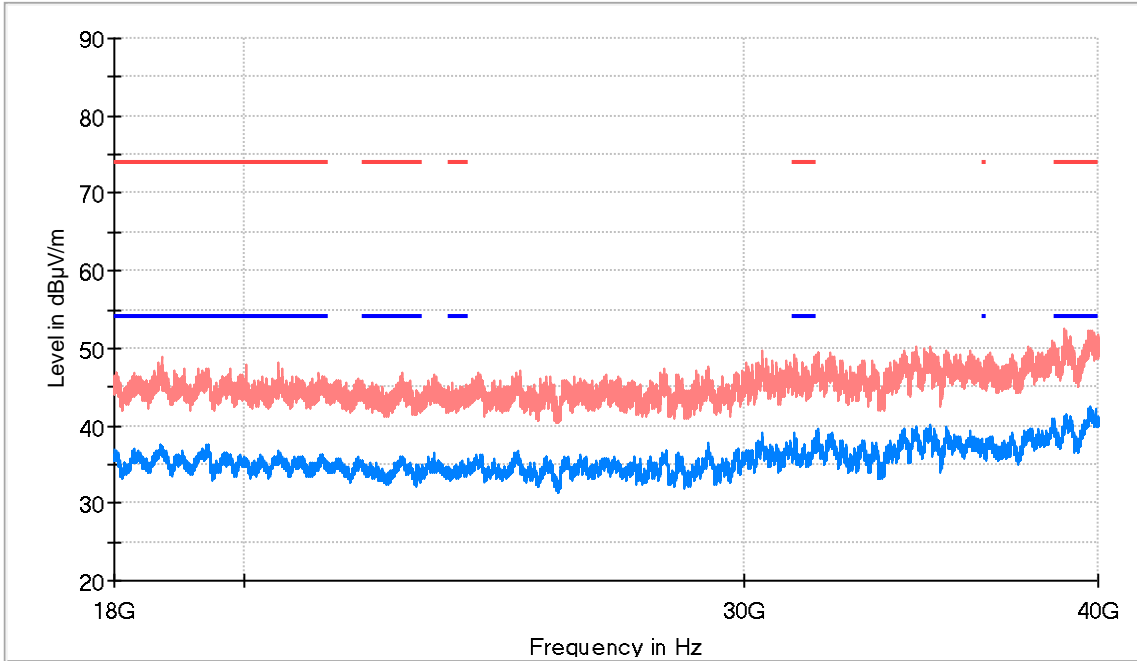
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
5184.000000	100.6	92.6	H	---	---	Fundamental
10365.500000	51.9	43.4	H	---	---	
17775.000000	54.0	42.5	V	11.5	54.0	



- AVG\_MAXH
- PK+\_MAXH
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands AVG Limit

Frequency Range GHz = [18, 40], Frequency MHz = 5180.00000, Modulation = 802.11ac (OFDM MCS0),  
 Mode = MIMO CCD Mode 2x2

Images:

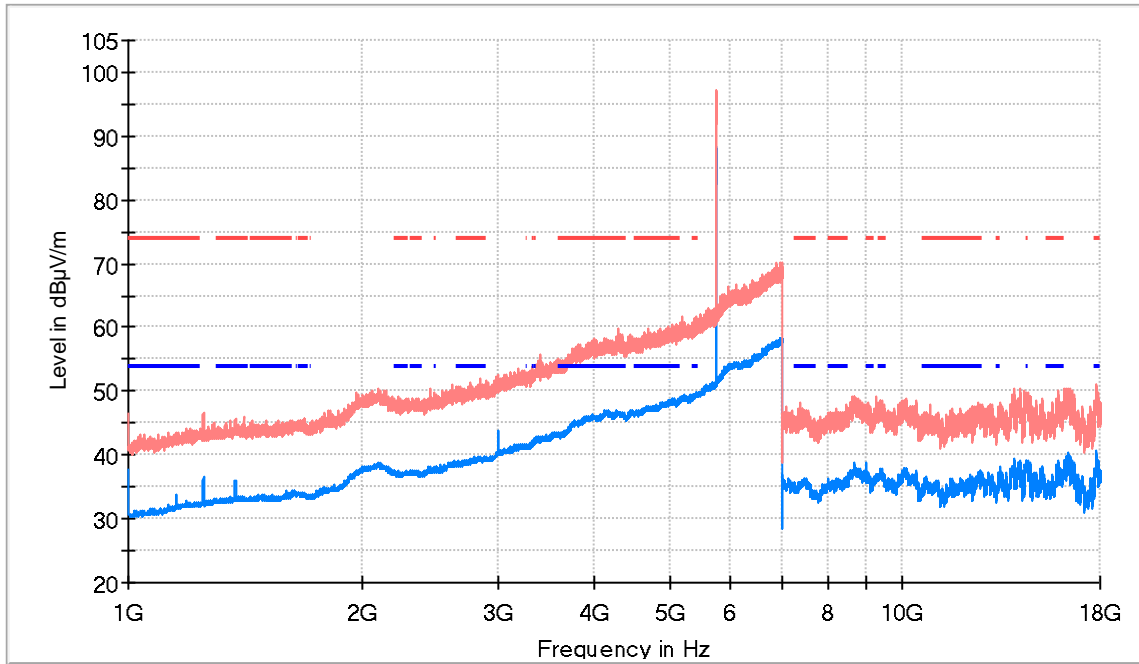


- AVG\_MAXH
- PK+\_MAXH
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
18699.875000	48.8	36.8	H	17.2	54.0
31277.687500	49.1	38.1	V	15.9	54.0
38926.125000	52.5	40.8	V	13.2	54.0

Frequency Range GHz = [1, 18], Frequency MHz = 5745.00000, Modulation = 802.11ac (OFDM MCS0), Mode = MIMO CCD Mode 2x2

Images:



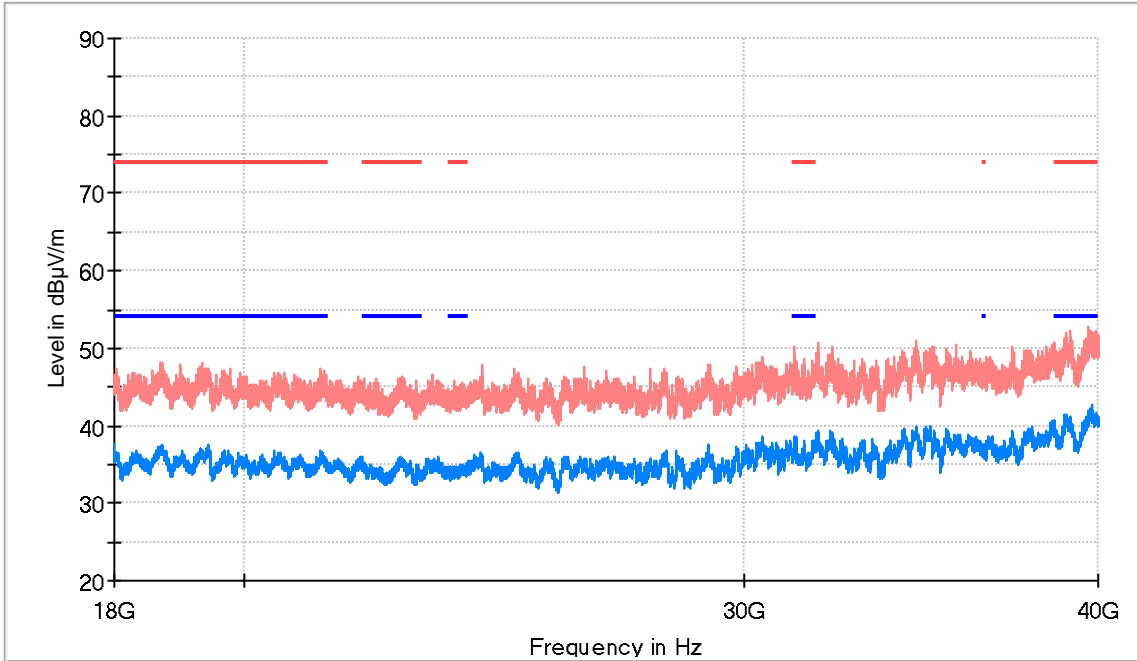
- AVG\_MAXH
- PK+\_MAXH
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
5399.000000	61.9	49.2	V	4.8	54.0	
5744.000000	96.9	88.3	H	---	---	Fundamental
17781.000000	50.8	40.3	V	13.7	54.0	



Frequency Range GHz = [18, 40], Frequency MHz = 5745.00000, Modulation = 802.11ac (OFDM MCS0), Mode = MIMO CCD Mode 2x2

Images:



- AVG\_MAXH
- PK+\_MAXH
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.407 (1GHz to 40 GHz) Restricted Bands AVG Limit

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Margin - AVG (dB)	Limit - AVG (dBµV/m)
18715.000000	48.1	36.4	V	17.6	54.0
31271.500000	50.2	38.2	V	15.8	54.0
39691.312500	52.9	41.7	V	12.3	54.0

**Measurements**

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s	20 dB
1 GHz - 7 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
7 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s	20 dB
18 GHz - 40 GHz	687.5 kHz	PK+ ; AVG	1 MHz	1 s	20 dB