



427 West 12800 South  
Draper, UT 84020

## Test Report Certification

<b>FCC ID</b>	SWX-U6P
<b>ISED ID</b>	6545A-U6P
<b>Equipment Under Test</b>	U6+
<b>Test Report Serial Number</b>	TR7527_05
<b>Date of Tests</b>	August 28 through October 5, 2022, April 5, 2023
<b>Report Issue Date</b>	April 5, 2023

<b>Test Specification</b>	<b>Applicant</b>
47 CFR FCC Part 15, Subpart E RSS-247	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.



NVLAP LAB CODE 600241-0

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## Certification of Engineering Report

This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

<b>Applicant</b>	Ubiquiti Inc.
<b>Manufacturer</b>	Ubiquiti Inc.
<b>Brand Name</b>	UniFi
<b>Model Number</b>	U6+
<b>FCC ID</b>	SWX-U6P
<b>ISED ID</b>	6545A-U6P

On this 5<sup>th</sup> day of April 2023, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory



Written By: Clay Allred



Reviewed By: Joseph W. Jackson

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<b>Revision History</b>		
<b>Revision</b>	<b>Description</b>	<b>Date</b>
01	Original Report Release	6 October 2022
02	Added Test for AX mode to the report	12 October 2022
03	Corrected RSS-247 references and added test data per RSS-247	October 17, 2022
04	Corrected NVALP expiration dates	October 19, 2022
05	Corrected Antenna description, Gains and results	April 5, 2023

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# 1 Client Information

## 1.1 Applicant

<b>Company</b>	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
<b>Contact Name</b>	Alex Macon
<b>Title</b>	Compliance

## 1.2 Manufacturer

<b>Company</b>	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
<b>Contact Name</b>	Alex Macon
<b>Title</b>	Compliance

## 2 Equipment Under Test (EUT)

### 2.1 Identification of EUT

<b>Brand Name</b>	UniFi
<b>Model Number</b>	U6+
<b>Serial Number</b>	N/A
<b>Dimensions (cm)</b>	16      x      16      x      0.33

### 2.2 Description of EUT

The U6+ is a Wi-Fi 6 access point designed for wide-ranging wireless coverage while maintaining overall network capacity. It delivers an aggregate radio rate of up to 1.5 Gbps with 5 GHz (2x2 MU-MIMO and OFDMA) and 2.4 GHz (2x2 MIMO) radios. U6-Pro uses a sophisticated antenna design with sideways amplification to offer excellent range when mounted horizontally. U6+ combines its purpose-built antenna with powerful Wi-Fi 6 features like OFDMA, beamforming, and BSS coloring for reliable long-range wireless performance.

Band	WiFi Mode	Modulation Bandwidth	Modulation Type	Frequency (MHz)
UNII-1	a	20 MHz	OFDM	5180, 5200, 5210, 5240
	n	20 MHz	HT	5180, 5200, 5210, 5240
	n	40 MHz	HT	5190, 5230
	ac	20 MHz	VHT	5180, 5200, 5210, 5240
	ac	40 MHz	VHT	5190, 5230
	ac	80 MHz	VHT	5210
	ax	20 MHz	HE	5180, 5200, 5210, 5240
	ax	40 MHz	HE	5190, 5230
	ax	80 MHz	HE	5210

This report covers the circuitry of the device subject to FCC Part 15, Subpart E. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory test report.

## 2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

<b>Brand Name Model Number Serial Number</b>	<b>Description</b>	<b>Name of Interface Ports / Interface Cables</b>
BN: UniFi MN: U6+ (Note 1) SN: N/A	Wireless Access Point	See Section 2.4
BN: Ubiquiti, Inc. MN: U-POE-at SN: N/A	PoE Injector Power Supply	Shielded or Un-shielded Cat 5e cable (Note 2)
BN: Dell MN: XPS 13 SN: N/A	Laptop Computer	Shielded or Un-shielded Cat 5e cable (Note 2)

Notes: (1) EUT

(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

## 2.4 Interface Ports on EUT

<b>Name of Ports</b>	<b>No. of Ports Fitted to EUT</b>	<b>Cable Description/Length</b>
Ethernet/PoE	1	Shielded or Un-shielded Cat 5e cable

## 2.5 Operating Environment

<b>Power Supply</b>	120 Volts AC to 48 Volts PoE
<b>AC Mains Frequency</b>	60 Hz
<b>Temperature</b>	22.1-22.8 °C
<b>Humidity</b>	19.3-23.9 %
<b>Barometric Pressure</b>	1009 mBar

## 2.6 Operating Modes

The U6+ was tested using test software in order to enable a constant transmission. The measurements within this report are corrected to reference a 100% duty cycle. All emission modes of 802.11 ax, a, ac and n were investigated.

## 2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.

## 2.8 Block Diagram of Test Configuration

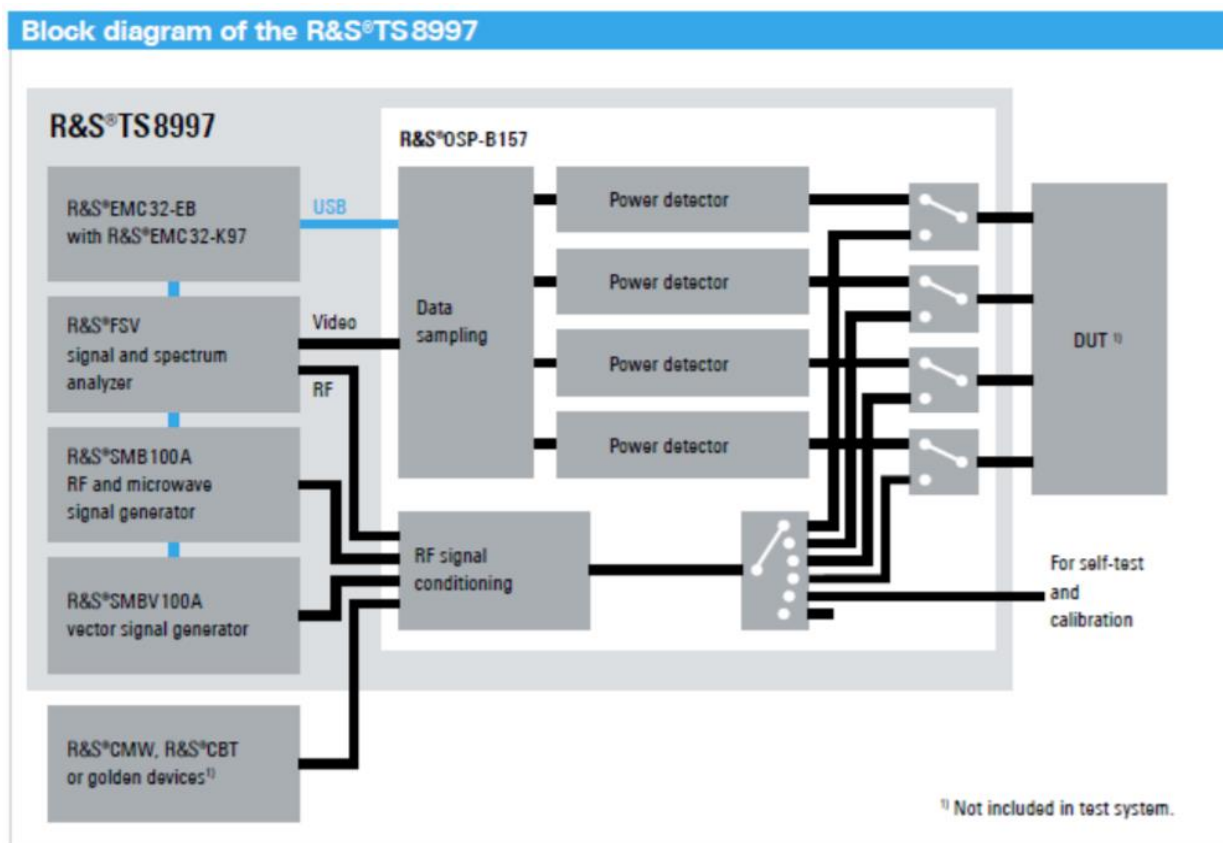


Diagram 1: Test Configuration Block Diagram

## 2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

## 2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

There were no deviations, opinions, additional information or interpretations from the test specification.



## 3 Test Specification, Method and Procedures

### 3.1 Test Specification

<b>Title</b>	47 CFR FCC Part 15, Subpart E, Section 15.407 Limits and methods of measurement of radio interference characteristics of Unlicensed National Information Infrastructure Devices
<b>Purpose of Test</b>	The tests were performed to demonstrate initial compliance

### 3.2 Methods & Procedures

#### 3.2.1 47 CFR FCC Part 15 Section 15.407

See test standard for details.

### 3.3 FCC Part 15, Subpart E

#### 3.3.1 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.407(a)	N/A	Antenna requirements	Structural Requirement	Compliant
15.407(b)	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	N/A
15.407(c)	RSS-247 §6.2.1	Bandwidth Requirement	5165 to 5240	Compliant
15.407(e)	RSS-247 §6.2.1	Peak Output Power	5165 to 5240	Compliant
15.407(f)	RSS-247 §6.2.1	Antenna Conducted Spurious Emissions	0.009 to 40000	N/A
15.407(g)	RSS-247 §6.2.1	Radiated Spurious Emissions	30 to 40000	Compliant
15.407(h)	RSS-247 §6.2.1	Peak Power Spectral Density	5165 to 5240	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.				

### 3.4 Results

In the configuration tested, the EUT complied with the requirements of the specification.

### **3.5 Test Location**

Testing was performed at the Unified Compliance Laboratory 3-meter and 10-meter chambers located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2023. This site has also been registered with Innovations, Science and Economic Development (ISED) department as was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until 30 June 2023. Unified Compliance Laboratory has been assigned Conformity Assessment Number US0223 by ISED.

## 4 Test Equipment

### 4.1 Direct Connect at the Antenna Port Tests

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	R&S	FSV40	UCL-2861	1/03/2022	1/03/2023
Signal Generator	R&S	SMB100A	UCL-2864	N/A	N/A
Vector Signal Generator	R&S	SMBV100A	UCL-2873	N/A	N/A
Switch Extension	R&S	OSP-B157WX	UCL-2867	1/03/2022	1/03/2023
Switch Extension	R&S	OSP-150W	UCL-2870	1/03/2022	1/03/2023

Table 1: List of equipment used for Direct Connect at the Antenna Port

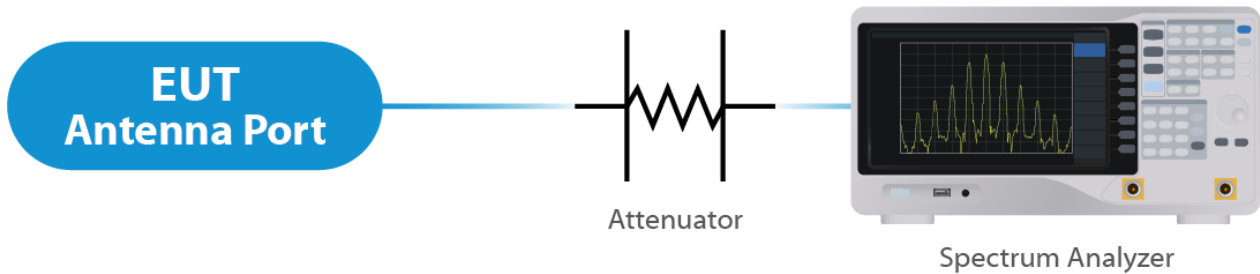


Figure 1: Direct Connect at the Antenna Port Test



Figure 2: Output Power Measurement

## 4.2 Radiated Emissions

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	Keysight	N9038A	UCL-2778	1/4/2022	1/4/2023
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-2889	10/7/2021	10/7/2022
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3062	8/28/2020	8/27/2022
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3071	5/19/2020	5/19/2022
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	7/8/2021	7/8/2022
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	11/16/2020	11/16/2022
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	5/21/2020	5/21/2022
1 – 18 GHz Amplifier	Com-Power	PAM 118A	UCL-3833	10/7/2021	10/7/2022
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 2: List of equipment used for Radiated Emissions

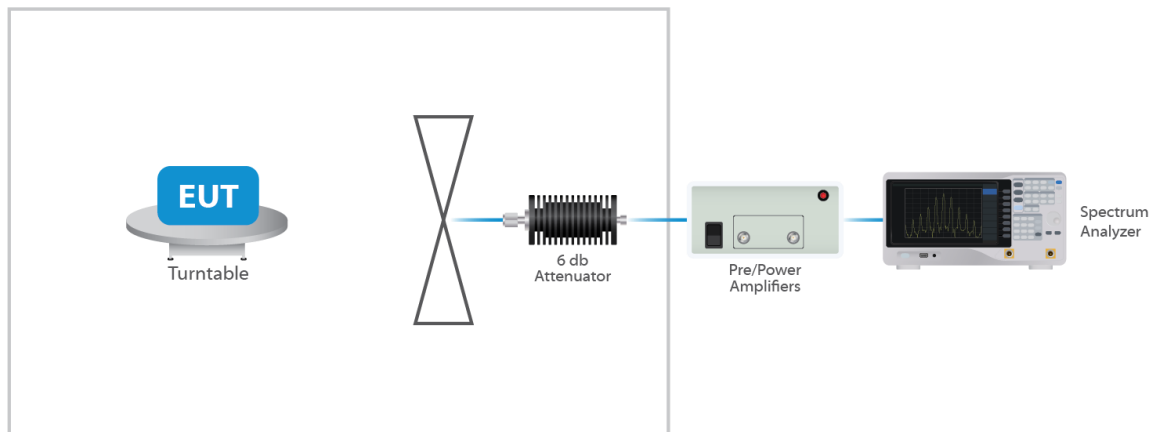


Figure 3: Radiated Emissions Test

## 4.3 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

#### 4.4 Measurement Uncertainty

Test	Uncertainty ( $\pm$ dB)	Confidence (%)
Conducted Emissions	1.44	95
Radiated Emissions (9 kHz to 30 MHz)	2.50	95
Radiated Emissions (30 MHz to 1 GHz)	4.38	95
Radiated Emissions (1 GHz to 18 GHz)	4.37	95
Radiated Emissions (18 GHz to 40 GHz)	3.93	95
<b>Direct Connect Tests</b>	<b>K Factor</b>	<b>Value</b>
Emissions Bandwidth	2	2.0%
Output Power	2	1.0 dB
Peak Power Spectral Density	2	1.3 dB
Band Edge	2	0.8 dB
Transmitter Spurious Emissions	2	1.8 dB

## 5 Test Results

### 5.1 §15.203 Antenna Requirements

The EUT uses an integral folding antenna structure. The maximum gain of the antenna per chain is 5.4 dBi, per the manufacturer. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The antenna is not user replaceable.

For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for  $N_{ANT} \leq 4$ ;

For PSD measurements when  $N_{ss}=1$ : Array Gain =  $10 \log(N_{ant}/N_{ss})$  dB = 3.01dB for a total of 8.41 dBi.

#### **Results**

The EUT complied with the specification

## 5.2 §15.403(i) 26 dB and 99% Emissions Bandwidth

All chains were measured under the guidance of KDB 789033 Section II.C. and KDB 66291 D01. Please see associated annex for details on instrument settings.

Tested at CFR 47 Part 15.407 test Limit (30dBm)

Modulation	Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
OFDM	20	5180	16.7	24.5
OFDM	20	5210	17.0	29.1
OFDM	20	5240	25.0	39.3
HT	20	5180	17.9	28.4
HT	20	5210	18.1	30.7
HT	20	5240	28.9	47.5
HT	40	5190	36.5	54.3
HT	40	5230	36.5	40.5
VHT	20	5180	17.8	25.1
VHT	20	5210	18.3	26.3
VHT	20	5240	28.9	44.7
VHT	40	5190	36.5	53.7
VHT	40	5230	36.8	47.0
VHT	80	5210	75.5	88.0
HE	20	5180	19.1	25.7
HE	20	5210	19.2	29.6
HE	20	5240	25.9	44.8
HE	40	5190	37.8	53.9
HE	40	5230	38.3	65.4
HE	80	5210	77.5	83.0

**Tested at RSS-247 test limit (23dBm)**

Modulation	Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
OFDM	20	5180	16.7	27.7
OFDM	20	5210	16.5	19.8
OFDM	20	5240	16.8	20.0
HT	20	5180	18.0	25.9
HT	20	5210	17.7	21.3
HT	20	5240	17.7	20.6
HT	40	5190	36.5	57.3
HT	40	5230	36.3	40.7
VHT	20	5180	17.8	26.9
VHT	20	5210	17.7	21.2
VHT	20	5240	17.7	20.4
VHT	40	5190	36.3	52.2
VHT	40	5230	36.3	40.7
VHT	80	5210	75.5	98.5
HE	20	5180	19.1	27.0
HE	20	5210	19.1	21.5
HE	20	5240	18.9	20.1
HE	40	5190	37.8	47.0
HE	40	5230	37.8	39.6
HE	80	5210	77.5	97.5

**Result**

All chains were tested and the highest bandwidth per chain is reported above.

The 26 dB bandwidths are reported for information purposes. Please see Annex for all bandwidth measurements.



### 5.3 §15.407(a)(2) Maximum Average Output Power

All chains were measured and summed under the guidance of KDB 789033 Section II. E.2. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average RF conducted output power measured for this device was 26.6 dBm or 457.1 mW. The limit is 30 dBm, or 1 Watt when using an antenna with 6 dBi or less gain. See Section 5.1 for antenna gain information.

**Tested at CFR 47 Part 15.407 test Limit (30dBm)**

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	19.5	22.0	22.0	7.9
OFDM 20	5210	Mcs0	21.5	24.2	24.2	9.8
OFDM 20	5240	Mcs0	23.5	25.8	25.8	11.3
HT 20	5180	Mcs0	19.5	22.0	22.0	7.4
HT 20	5210	Mcs0	21.5	24.2	24.2	9.6
HT 20	5240	Mcs0	24.0	26.6	26.6	11.6
HT 40	5190	Mcs0	17.5	20.3	20.3	3.3
HT 40	5230	Mcs0	20.0	22.9	22.9	5.9
VHT 20	5180	Mcs0	19.5	22.0	22.0	7.4
VHT 20	5210	Mcs0	21.5	24.2	24.2	9.6
VHT 20	5240	Mcs0	24.0	26.6	26.6	11.6
VHT 40	5190	Mcs0	17.5	20.4	20.4	3.5
VHT 40	5230	Mcs0	20.0	22.9	22.9	5.9
VHT 80	5210	Mcs0	15.5	18.2	18.2	-1.7
HE 20	5180	Mcs0	19.5	22.2	22.2	7.3
HE 20	5210	Mcs0	21.0	23.9	23.9	9.0
HE 20	5240	Mcs0	23.5	26.0	26.0	11.0
HE 40	5190	Mcs0	17.5	20.5	20.5	3.3
HE 40	5230	Mcs0	19.5	22.7	22.7	5.5
HE 80	5210	Mcs0	15.0	18.0	18.0	-2.2

**Tested at RSS-247 test limit (23dBm)**

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	14.0	17.4	22.8	2.9
OFDM 20	5210	Mcs0	13.5	17.3	22.7	2.8
OFDM 20	5240	Mcs0	13.5	17.3	22.7	2.2
HT 20	5180	Mcs0	14.0	17.3	22.7	2.6
HT 20	5210	Mcs0	13.5	17.3	22.7	2.4
HT 20	5240	Mcs0	13.5	17.2	22.6	2.0
HT 40	5190	Mcs0	14.0	17.4	22.8	0.0
HT 40	5230	Mcs0	13.5	17.2	22.6	-0.1
VHT 20	5180	Mcs0	14.0	17.3	22.7	2.5
VHT 20	5210	Mcs0	13.5	17.3	22.7	2.3
VHT 20	5240	Mcs0	13.5	17.2	22.6	1.9
VHT 40	5190	Mcs0	14.0	17.4	22.8	-0.1
VHT 40	5230	Mcs0	13.5	17.2	22.6	0.0
VHT 80	5210	Mcs0	14.0	17.4	22.8	-2.9
HE 20	5180	Mcs0	14.0	17.5	22.9	2.2
HE 20	5210	Mcs0	13.5	17.5	22.9	2.1
HE 20	5240	Mcs0	13.5	17.5	22.9	1.9
HE 40	5190	Mcs0	14.0	17.6	23.0	0.0
HE 40	5230	Mcs0	13.5	17.5	22.9	-0.1
HE 80	5210	Mcs0	14.0	17.6	23.0	-2.9

**Result**

In the configuration tested, the maximum summed average RF output power was less than 1 watt; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plots in attached Annex).

## 5.4 §15.407(b) Spurious Emissions

### 5.4.1 Conducted Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The graphs show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown below are plots with the EUT turned to the upper and lower channels with the antenna gain of 18.2 dBi accounted for. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be remain below -27 dBm EIRP.

#### Result

Conducted spurious emissions were below -27 dBm; therefore, the EUT complies with the specification.

### 5.4.2 Radiated Spurious Emissions in the Restricted Bands of § 15.205

The EUT uses various power settings based on the channel in use. In order to reduce test time, the radiated spurious emissions at the lowest, middle, and highest channel were measured at the maximum power of TP39, as this setting was found to be worst case for spurious emissions. Power was subsequently reduced during in-band and band edge testing. The band edge at the restricted band ending at 5150 MHz was measured using radiated measurement. All emissions modes were tested, and the worst-case measurement are shown below. For frequencies above 1 GHz, a measurement of 3 meters was used. For frequencies below 1 GHz, a measurement distance of 10 meters was used.

Correction Factor = Antenna Factor + Cable Loss - Pre-Amplifier Gain, and is added to the Receiver reading.

#### Result

All emissions in the restricted bands of § 15.205 met the limits specified in § 15.209; therefore, the EUT complies with the specification. All emissions me the limits specified in § 15.407(b). Representative band edge plots are included in this report. Testing was applied to CFR 47 Part 15.407 output power limits, which are considered worst case.

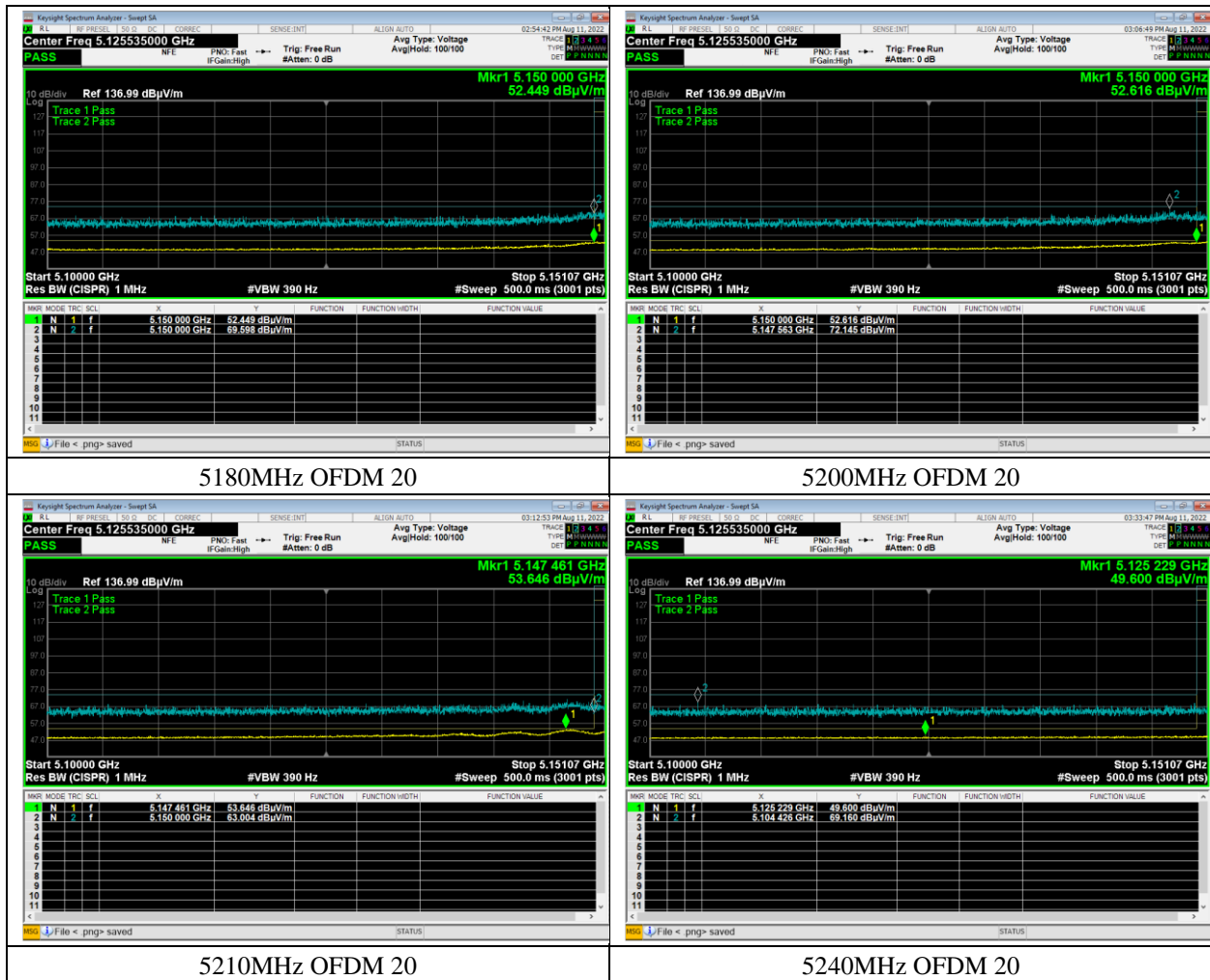
Frequency	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Meas. Time (s)	RBW (Hz)	Detector	Correction (dB)
10.479 GHz	53.476	74	-20.524	226	1.5	Vertical	5	1000000	Peak	1.334
15.72 GHz	55.584	74	-18.416	206	3.154	Vertical	5	1000000	Peak	5.057
10.479 GHz	39.325	54	-14.675	226	1.5	Vertical	5	1000000	Average	1.334
15.72 GHz	41.395	54	-12.605	206	3.154	Vertical	5	1000000	Average	5.057
10.481 GHz	55.124	74	-18.876	176	2.142	Horizontal	5	1000000	Peak	1.357
15.72 GHz	52.916	74	-21.084	196	2.142	Horizontal	5	1000000	Peak	5.057
10.481 GHz	40.814	54	-13.186	176	2.142	Horizontal	5	1000000	Average	1.357
15.72 GHz	39.415	54	-14.585	196	2.142	Horizontal	5	1000000	Average	5.057
10.364 GHz	53.619	74	-20.381	178	2.324	Vertical	5	1000000	Peak	0.98
15.546 GHz	54.909	74	-19.091	199	2.65	Vertical	5	1000000	Peak	5.104
10.364 GHz	39.384	54	-14.616	178	2.324	Vertical	5	1000000	Average	0.98
15.546 GHz	40.653	54	-13.347	199	2.65	Vertical	5	1000000	Average	5.104
10.359 GHz	55.472	74	-18.528	205	1.643	Horizontal	5	1000000	Peak	1.036
15.023 GHz	52.869	74	-21.131	276	2.146	Horizontal	5	1000000	Peak	8.048
10.359 GHz	41.34	54	-12.66	205	1.643	Horizontal	5	1000000	Average	1.036
15.023 GHz	39.35	54	-14.65	276	2.146	Horizontal	5	1000000	Average	8.048
10.42 GHz	52.852	74	-21.148	181	2.324	Vertical	5	1000000	Peak	2.19
15.629 GHz	56.983	74	-17.017	198	2.142	Vertical	5	1000000	Peak	5.053
10.42 GHz	39.167	54	-14.833	181	2.324	Vertical	5	1000000	Average	2.19
15.629 GHz	43.126	54	-10.874	198	2.142	Vertical	5	1000000	Average	5.053
10.423 GHz	58.097	74	-15.903	211	3.798	Horizontal	5	1000000	Peak	2.167
15.022 GHz	52.275	74	-21.725	313	3.802	Horizontal	5	1000000	Peak	8.007
10.423 GHz	43.349	54	-10.651	211	3.798	Horizontal	5	1000000	Average	2.167
15.022 GHz	39.146	54	-14.854	313	3.802	Horizontal	5	1000000	Average	8.007

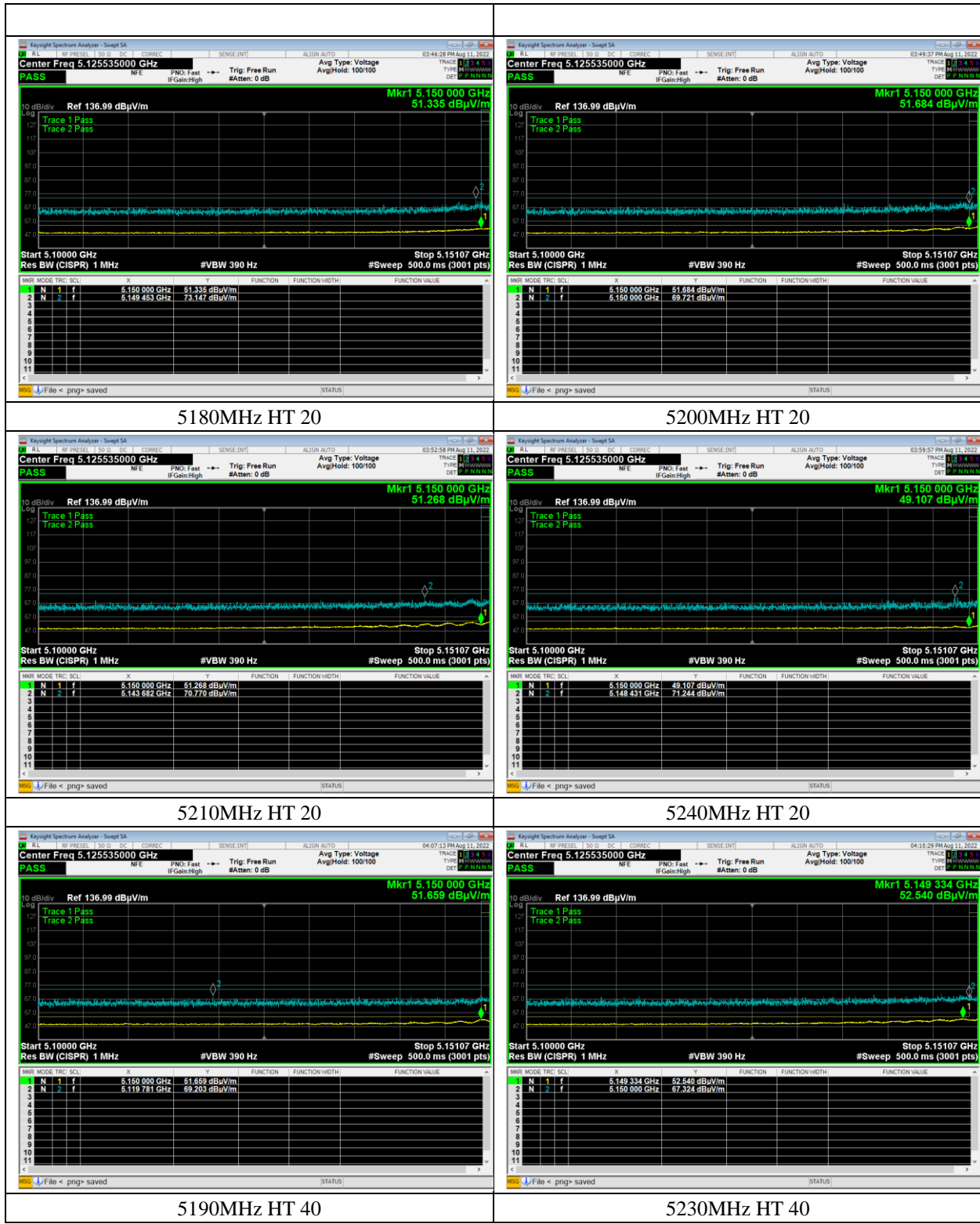
**Table 3: Radiated Emissions within 1-17GHz**

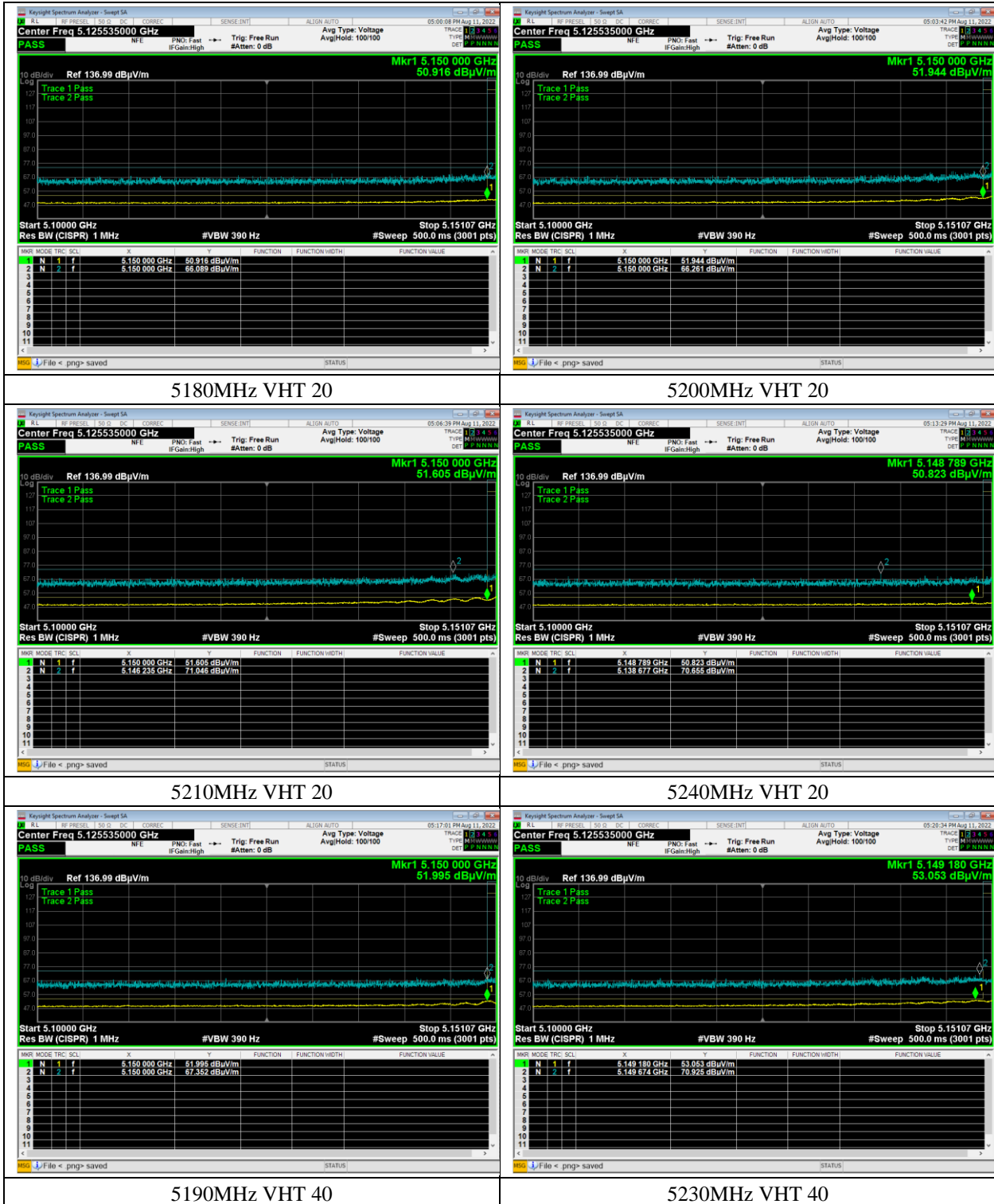
Frequency	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Pol.	Meas. Time (s)	RBW (Hz)	Detector	Correction (dB)
20.969 GHz	56.487	74	-17.513	198	Vertical	5	1000000	Peak	-2.249
20.969 GHz	41.104	54	-12.896	198	Vertical	5	1000000	Average	-2.249
20.954 GHz	55.908	74	-18.092	231	Horizontal	5	1000000	Peak	-2.297
20.954 GHz	40.984	54	-13.016	231	Horizontal	5	1000000	Average	-2.297
20.727 GHz	53.045	74	-20.955	219	Vertical	5	1000000	Peak	-1.802
20.727 GHz	38.915	54	-15.085	219	Vertical	5	1000000	Average	-1.802
20.715 GHz	61.486	74	-12.514	254	Horizontal	5	1000000	Peak	-1.864
20.715 GHz	46.268	54	-7.732	254	Horizontal	5	1000000	Average	-1.864
20.846 GHz	56.029	74	-17.971	200	Vertical	5	1000000	Peak	-1.984
20.846 GHz	41.532	54	-12.468	200	Vertical	5	1000000	Average	-1.984
20.848 GHz	60.543	74	-13.457	238	Horizontal	5	1000000	Peak	-1.99
20.848 GHz	45.986	54	-8.014	238	Horizontal	5	1000000	Average	-1.99

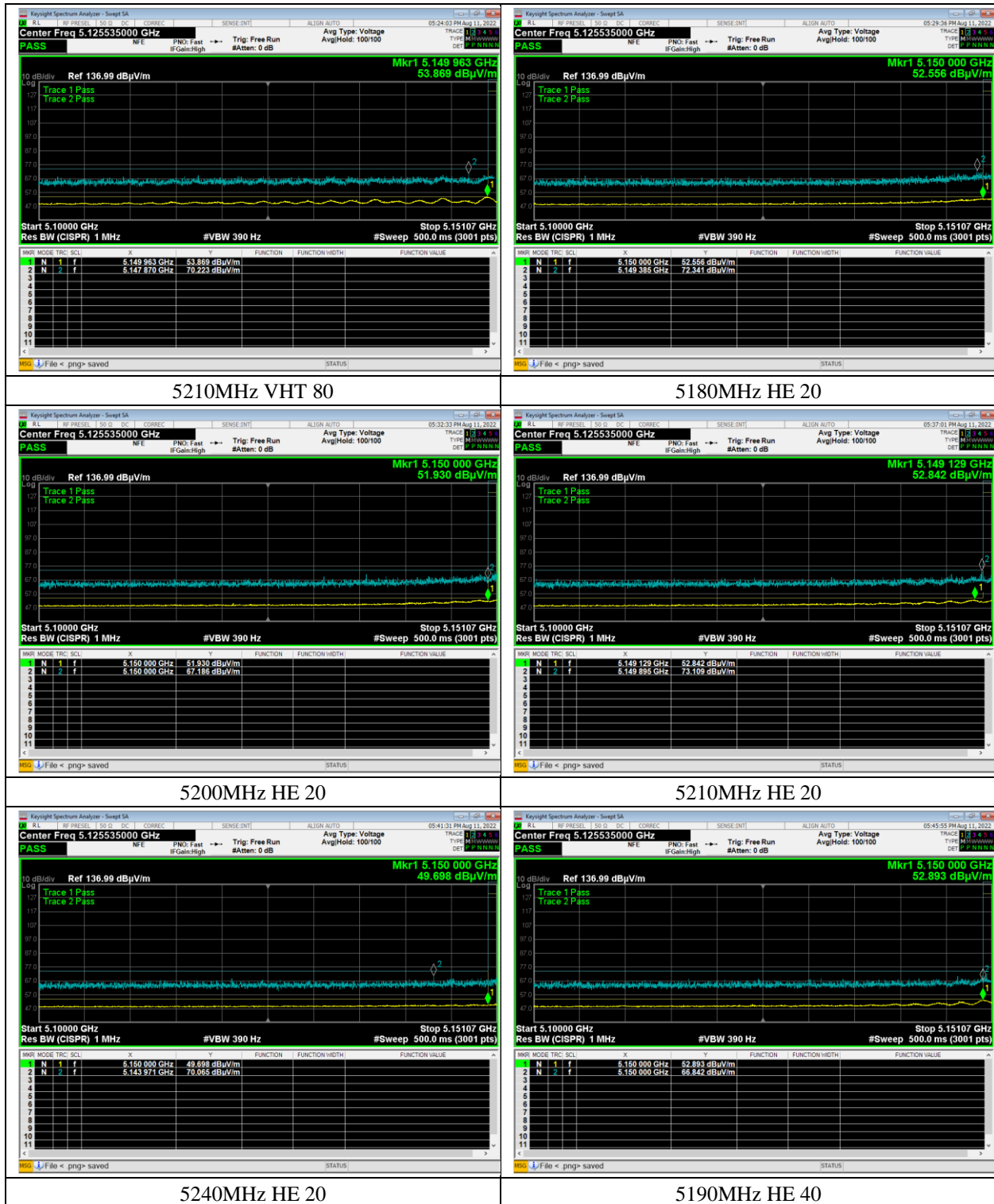
**Table 4: Radiated Emissions within 17-40GHz**

### 5.4.3 Band Edge Results

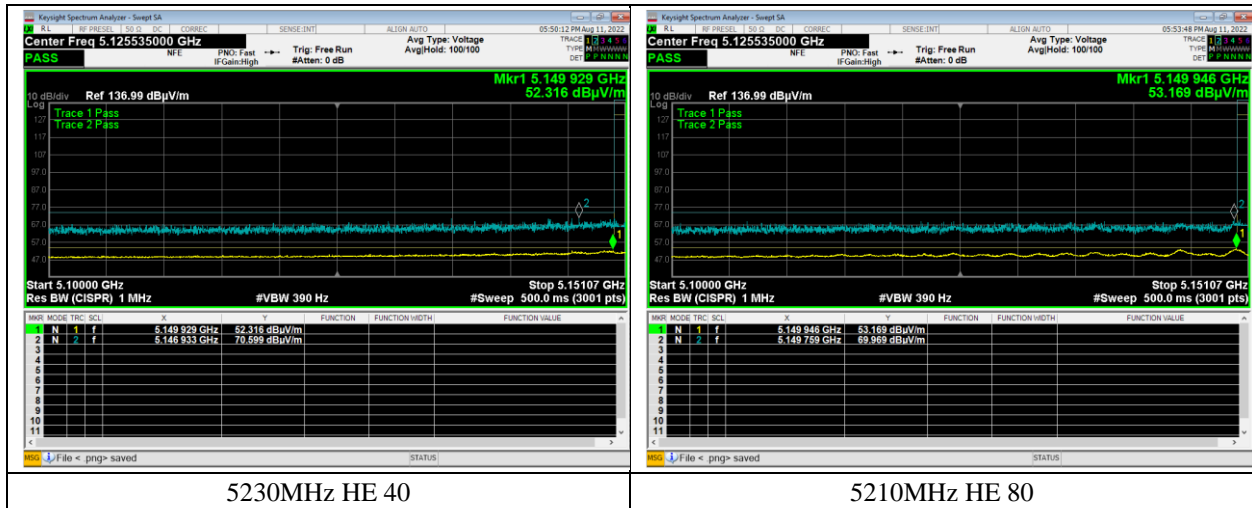












## 5.5 §15.407(a) Maximum Power Spectral Density

All chains were measured and summed under the guidance of KDB 789033 Section II. F. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average power spectral density conducted from the intentional radiator shall not be greater than 14.59 dBm (17-8.41+6) in any 1 MHz band during any time interval of continuous transmission.

Results of this testing are summarized.

**Tested at CFR 47 Part 15.407 test Limit (30dBm)**

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	19.5	22.0	22.0	7.9
OFDM 20	5210	Mcs0	21.5	24.2	24.2	9.8
OFDM 20	5240	Mcs0	23.5	25.8	25.8	11.3
HT 20	5180	Mcs0	19.5	22.0	22.0	7.4
HT 20	5210	Mcs0	21.5	24.2	24.2	9.6
HT 20	5240	Mcs0	24.0	26.6	26.6	11.6
HT 40	5190	Mcs0	17.5	20.3	20.3	3.3
HT 40	5230	Mcs0	20.0	22.9	22.9	5.9
VHT 20	5180	Mcs0	19.5	22.0	22.0	7.4
VHT 20	5210	Mcs0	21.5	24.2	24.2	9.6
VHT 20	5240	Mcs0	24.0	26.6	26.6	11.6
VHT 40	5190	Mcs0	17.5	20.4	20.4	3.5
VHT 40	5230	Mcs0	20.0	22.9	22.9	5.9
VHT 80	5210	Mcs0	15.5	18.2	18.2	-1.7
HE 20	5180	Mcs0	19.5	22.2	22.2	7.3
HE 20	5210	Mcs0	21.0	23.9	23.9	9.0
HE 20	5240	Mcs0	23.5	26.0	26.0	11.0
HE 40	5190	Mcs0	17.5	20.5	20.5	3.3
HE 40	5230	Mcs0	19.5	22.7	22.7	5.5
HE 80	5210	Mcs0	15.0	18.0	18.0	-2.2

**Tested at RSS-247 test limit (23dBm)**

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	14.0	17.4	22.8	2.9
OFDM 20	5210	Mcs0	13.5	17.3	22.7	2.8
OFDM 20	5240	Mcs0	13.5	17.3	22.7	2.2
HT 20	5180	Mcs0	14.0	17.3	22.7	2.6
HT 20	5210	Mcs0	13.5	17.3	22.7	2.4
HT 20	5240	Mcs0	13.5	17.2	22.6	2.0
HT 40	5190	Mcs0	14.0	17.4	22.8	0.0
HT 40	5230	Mcs0	13.5	17.2	22.6	-0.1
VHT 20	5180	Mcs0	14.0	17.3	22.7	2.5
VHT 20	5210	Mcs0	13.5	17.3	22.7	2.3
VHT 20	5240	Mcs0	13.5	17.2	22.6	1.9
VHT 40	5190	Mcs0	14.0	17.4	22.8	-0.1
VHT 40	5230	Mcs0	13.5	17.2	22.6	0.0
VHT 80	5210	Mcs0	14.0	17.4	22.8	-2.9
HE 20	5180	Mcs0	14.0	17.5	22.9	2.2
HE 20	5210	Mcs0	13.5	17.5	22.9	2.1
HE 20	5240	Mcs0	13.5	17.5	22.9	1.9
HE 40	5190	Mcs0	14.0	17.6	23.0	0.0
HE 40	5230	Mcs0	13.5	17.5	22.9	-0.1
HE 80	5210	Mcs0	14.0	17.6	23.0	-2.9

**Result**

The maximum summed average power spectral density was less than the limit of 14.59dBm; therefore, the EUT complies with the specification.

## **Test Results UNII-1 AX mode**

(Note AX mode is considered worst case and is displayed here. All other modes were tested but omitted due to report size.)

# FCC 15.407 2018

## DUT Information

### Frequencies

WLAN CH 36 (5180 MHz)	WLAN CH 38 (5190 MHz)	WLAN CH 40 (5200 MHz)
WLAN CH 42 (5210 MHz)	WLAN CH 44 (5220 MHz)	WLAN CH 46 (5230 MHz)
WLAN CH 48 (5240 MHz)	WLAN CH 50 (5250 MHz)	WLAN CH 52 (5260 MHz)
WLAN CH 54 (5270 MHz)	WLAN CH 56 (5280 MHz)	WLAN CH 58 (5290 MHz)
WLAN CH 60 (5300 MHz)	WLAN CH 62 (5310 MHz)	WLAN CH 64 (5320 MHz)
WLAN CH 100 (5500 MHz)	WLAN CH 102 (5510 MHz)	WLAN CH 104 (5520 MHz)
WLAN CH 106 (5530 MHz)	WLAN CH 108 (5540 MHz)	WLAN CH 110 (5550 MHz)
WLAN CH 112 (5560 MHz)	WLAN CH 114 (5570 MHz)	WLAN CH 116 (5580 MHz)
WLAN CH 118 (5590 MHz)	WLAN CH 120 (5600 MHz)	WLAN CH 122 (5610 MHz)
WLAN CH 124 (5620 MHz)	WLAN CH 126 (5630 MHz)	WLAN CH 128 (5640 MHz)
WLAN CH 130 (5650 MHz)	WLAN CH 132 (5660 MHz)	WLAN CH 134 (5670 MHz)
WLAN CH 136 (5680 MHz)	WLAN CH 138 (5690 MHz)	WLAN CH 140 (5700 MHz)
WLAN CH 142 (5710 MHz)	WLAN CH 144 (5720 MHz)	WLAN CH 149 (5745 MHz)
WLAN CH 151 (5755 MHz)	WLAN CH 153 (5765 MHz)	WLAN CH 155 (5775 MHz)
WLAN CH 157 (5785 MHz)	WLAN CH 159 (5795 MHz)	WLAN CH 161 (5805 MHz)
WLAN CH 163 (5815 MHz)	WLAN CH 165 (5825 MHz)	

### Bandwidths

20 MHz (20 MHz)	40 MHz (40 MHz)	80 MHz (80 MHz)
160 MHz (160 MHz)		

### Power

24.000 dBm (24 dBm)

### Beamforming Gain

Powerstep name (value)  
24.000 dBm (24 dBm)

Beamforming gain table names  
---

### Gain Tables

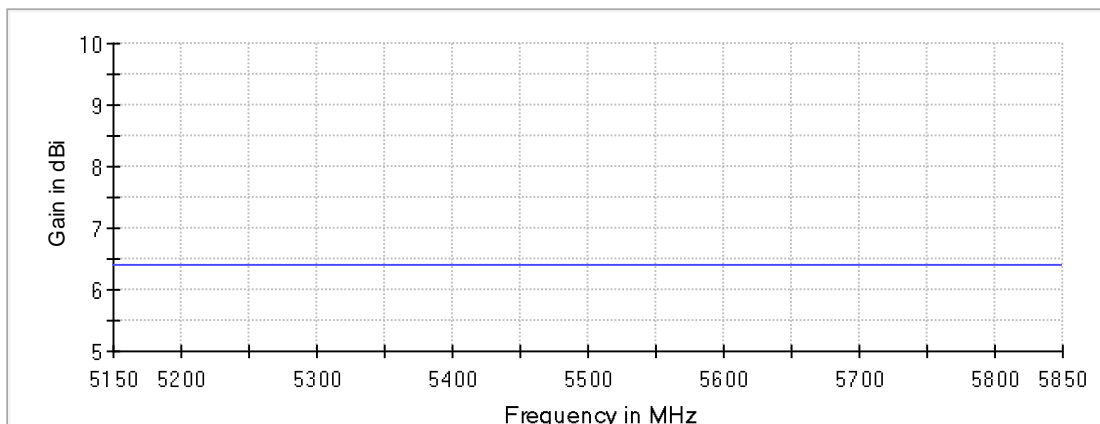
Powerstep name (value)  
24.000 dBm (24 dBm)

Gain table names  
Port 1: Nom. Ant.; Port 2: Nom. Ant.;

### DUT Settings

No. of transmission chains	2
DFS capability	Yes
DFS Mode	Client with radar detection
Equipment Type	Outdoor AP
TPC	No

Gaintable Nom. Ant.



— Gaintable: Nom. Ant.

## Hardware Setup: WMS Measurements\TS8997 Hardware Setup

Spectrum Analyzer: SA FSV 40 (SA FSV 40) @ VISA (ADR TCPIP::192.168.48.100::inst0::instr), SN 1321.3008K40/101752, FW 3.70

Vector Generator: VG SMW200A (VG SMW200A) @ VISA (ADR TCPIP0::A-N5182B-301471::inst0::INSTR), SN 101752, FW 3.70

Generator: SMB100A (SMB100A) @ VISA (ADR TCPIP::192.168.48.110::inst0::INSTR), SN 180599, FW 3.20.390.24 / Drv:Rev 2.21.0, 07/2016, CVI 2015

OSP: OSP-B157W8PLUS (OSP-B157W8PLUS) @ VISA (ADR TCPIP::192.168.48.157::inst0::instr), SN 1527.1144.06 / 100955, FW 2.00.1.0

## Summary

Test	Frequency (MHz)	Nominal Power (dBm)	Nominal Bandwidth (MHz)	Result
Emission Bandwidth 26 dB	5180.000	24.0	20.000000	PASS
RF output power	5180.000	24.0	20.000000	PASS
Power Spectral Density	5180.000	24.0	20.000000	PASS
Occupied Channel Bandwidth 99%	5180.000	24.0	20.000000	PASS
Emission Bandwidth 26 dB	5210.000	24.0	20.000000	PASS
Occupied Channel Bandwidth 99%	5210.000	24.0	20.000000	PASS
Emission Bandwidth 26 dB	5240.000	24.0	20.000000	PASS
Occupied Channel Bandwidth 99%	5240.000	24.0	20.000000	PASS
Emission Bandwidth 26 dB	5190.000	24.0	40.000000	PASS
Occupied Channel Bandwidth 99%	5190.000	24.0	40.000000	PASS
Emission Bandwidth 26 dB	5230.000	24.0	40.000000	PASS
Occupied Channel Bandwidth 99%	5230.000	24.0	40.000000	PASS
Emission Bandwidth 26 dB	5210.000	24.0	80.000000	PASS
Occupied Channel Bandwidth 99%	5210.000	24.0	80.000000	PASS

## Emission Bandwidth 26 dB (5180 MHz; 24.000 dBm; 20 MHz)

Customized settings.

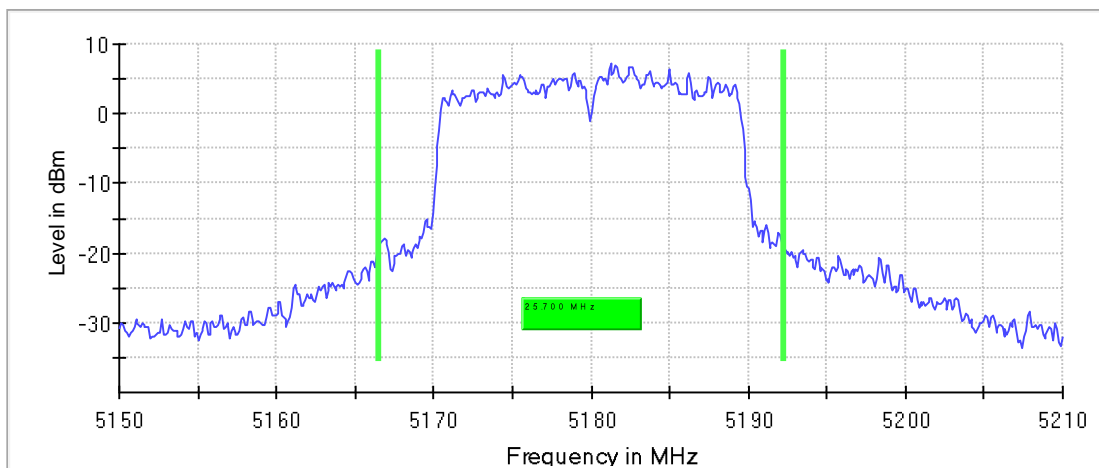
### 26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5180.000000	25.700000	---	---	5166.550000	5192.250000

(continuation of the "26 dB Bandwidth" table from column 6 ...)

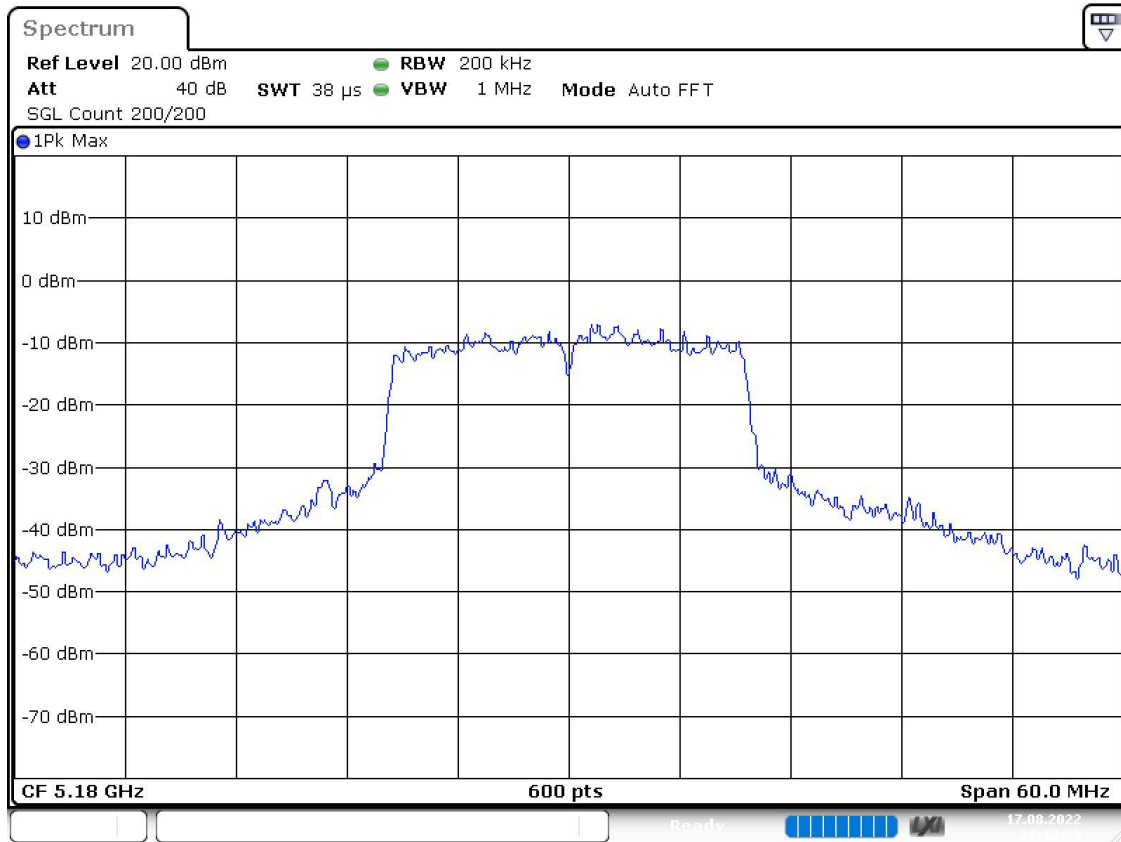
DUT Frequency (MHz)	Max Level (dBm)	Result
5180.000000	7.2	PASS

26 dB Bandwidth



Bandwidth





Date: 17.AUG.2022 22:12:21

### Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.15000 GHz	5.15000 GHz
Stop Frequency	5.21000 GHz	5.21000 GHz
Span	60.000 MHz	60.000 MHz
RBW	200.000 kHz	~ 200.000 kHz
VBW	1.000 MHz	>= 600.000 kHz
SweepPoints	600	~ 600
SweepTime	37.969 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off

## RF output power (5180 MHz; 24.000 dBm; 20 MHz)

Customized settings.

### Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5180.000000	22.2	30.0	22.2	90.028	PASS

### OSP PowerMeter settings

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

## Power Spectral Density (5180 MHz; 24.000 dBm; 20 MHz)

Customized settings.

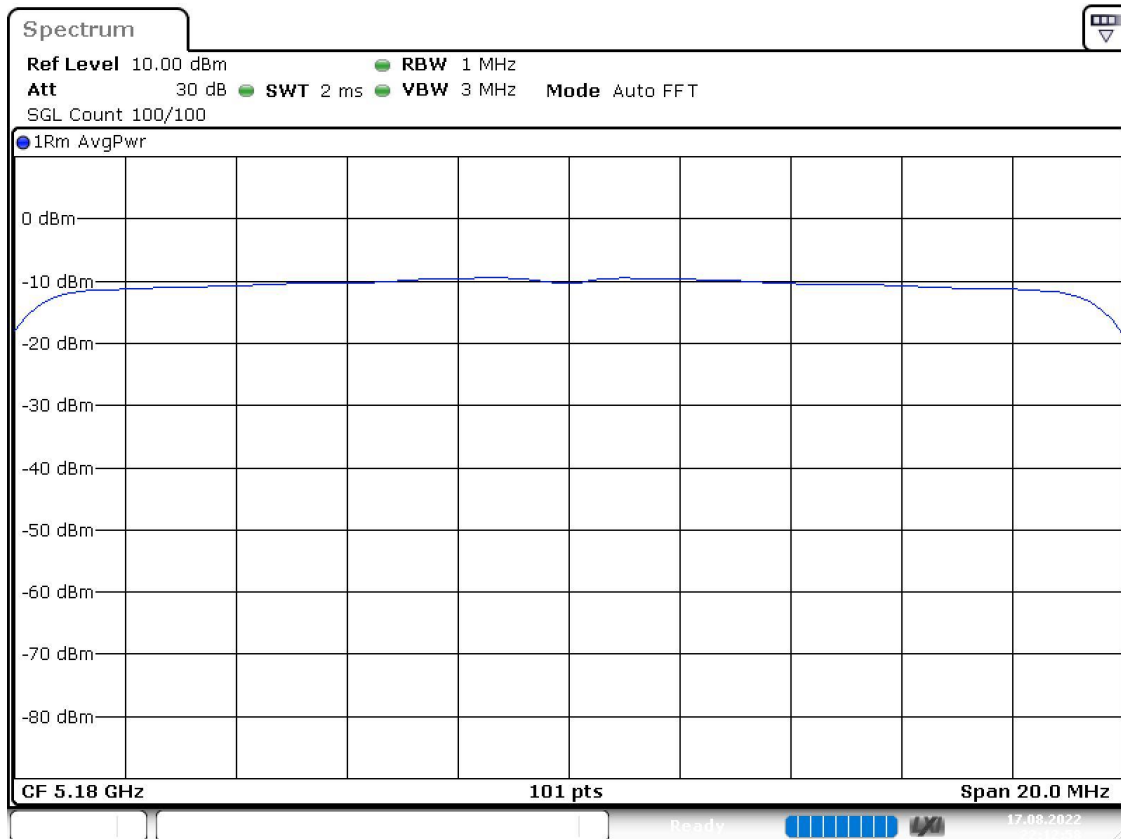
### Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
5180.000000	5181.188119	7.273	17.0	PASS

### Ports

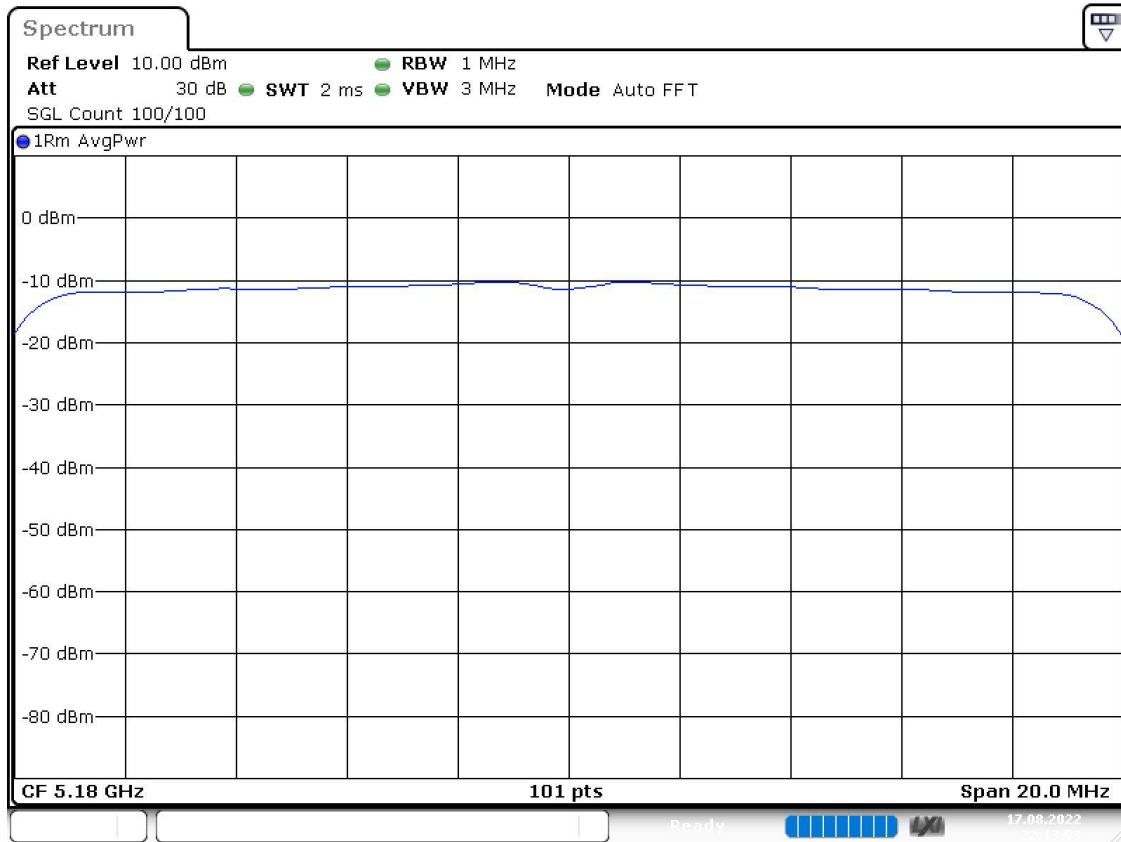
Port	State
1	used
2	used

### PSD Connector 1



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### PSD Connector 2



Date: 17.AUG.2022 22:13:04

## Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.17000 GHz	5.17000 GHz
Stop Frequency	5.19000 GHz	5.19000 GHz
Span	20.000 MHz	20.000 MHz
RBW	1.000 MHz	<= 1.000 MHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	101	~ 40
SweepTime	2.020 ms	2.020 ms
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	RMS	RMS
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Average Power	Average Power
SweepType	FFT	AUTO
Preamp	off	off

## Occupied Channel Bandwidth 99% (5180 MHz; 24.000 dBm; 20 MHz)

Customized settings.

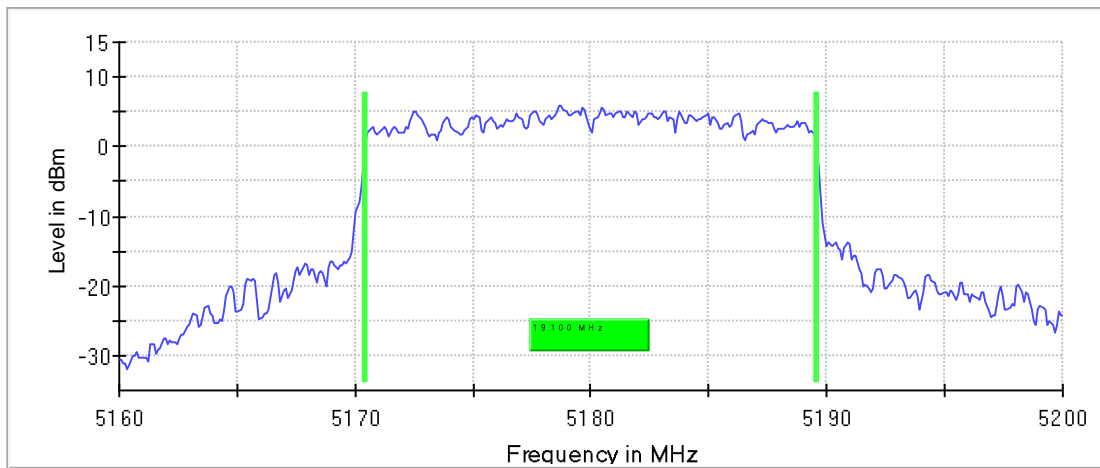
### 99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5180.000000	19.100000	---	---	5170.450000	5189.550000

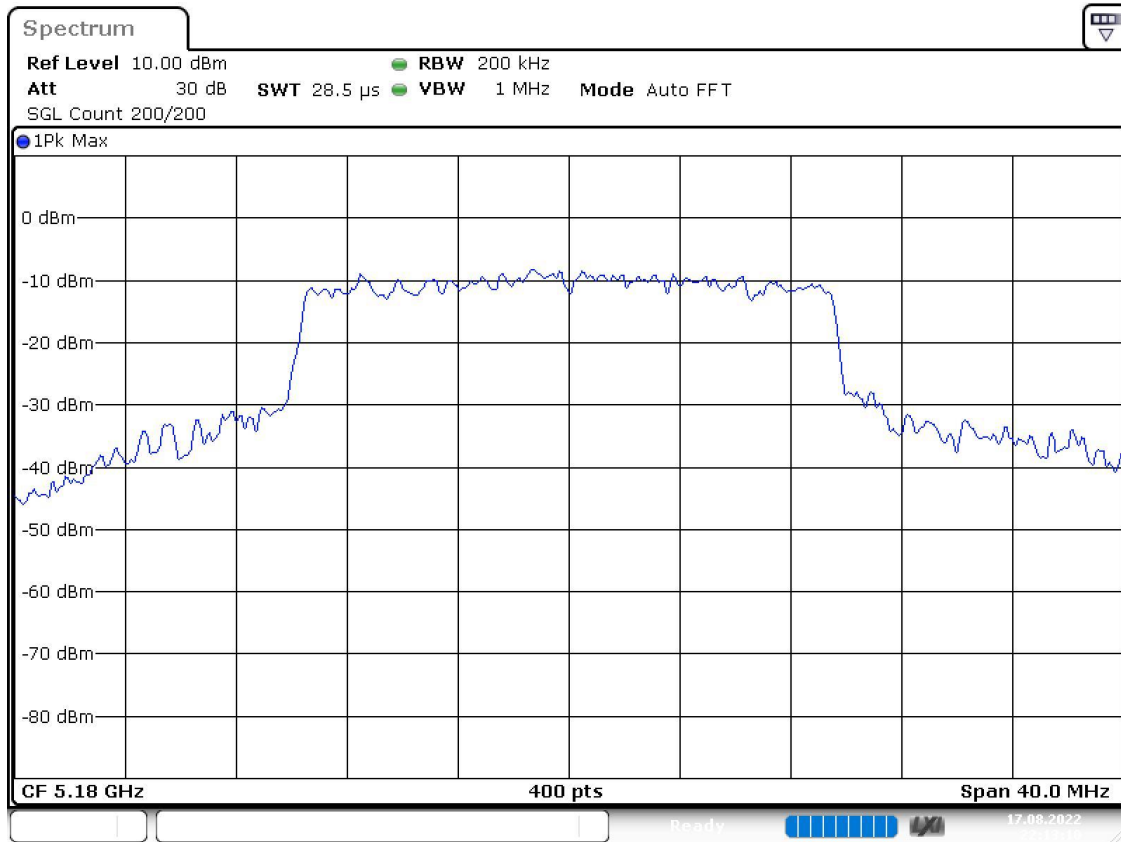
(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5180.000000	PASS

99 % Bandwidth



Bandwidth



Date: 17.AUG.2022 22:13:10

## Measurement

Setting	Instrument Value	Target Value
Start Frequency	5.16000 GHz	5.16000 GHz
Stop Frequency	5.20000 GHz	5.20000 GHz
Span	40.000 MHz	40.000 MHz
RBW	200.000 kHz	$\geq$ 200.000 kHz
VBW	1.000 MHz	$\geq$ 600.000 kHz
SweepPoints	400	$\sim$ 400
SweepTime	28.477 $\mu$ s	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off

## Emission Bandwidth 26 dB (5210 MHz; 24.000 dBm; 20 MHz)

Customized settings.

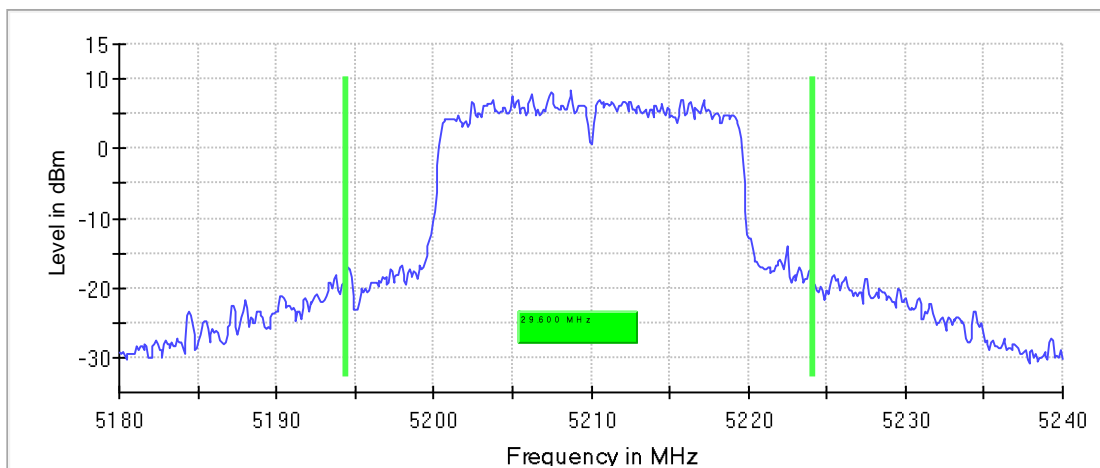
### 26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5210.000000	29.600000	---	---	5194.450000	5224.050000

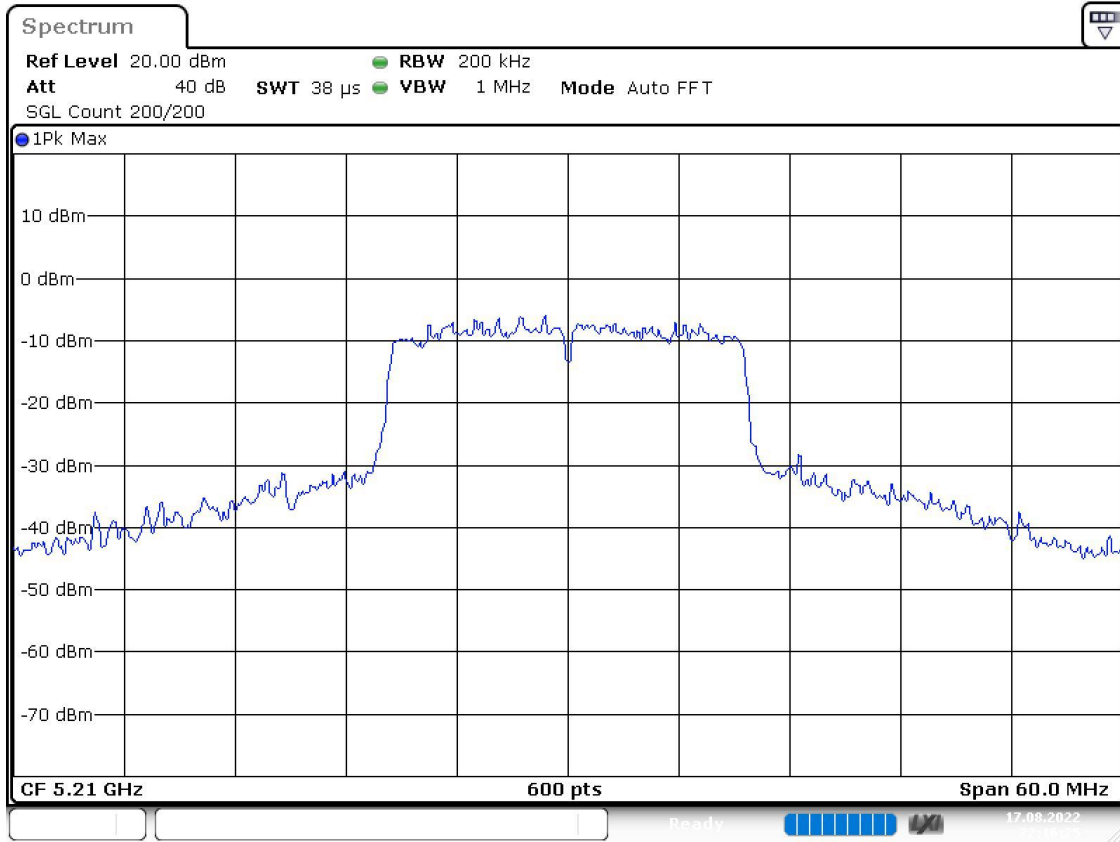
(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5210.000000	8.3	PASS

26 dB Bandwidth



Bandwidth



Date: 17.AUG.2022 22:16:26



## Occupied Channel Bandwidth 99% (5210 MHz; 24.000 dBm; 20 MHz)

Customized settings.

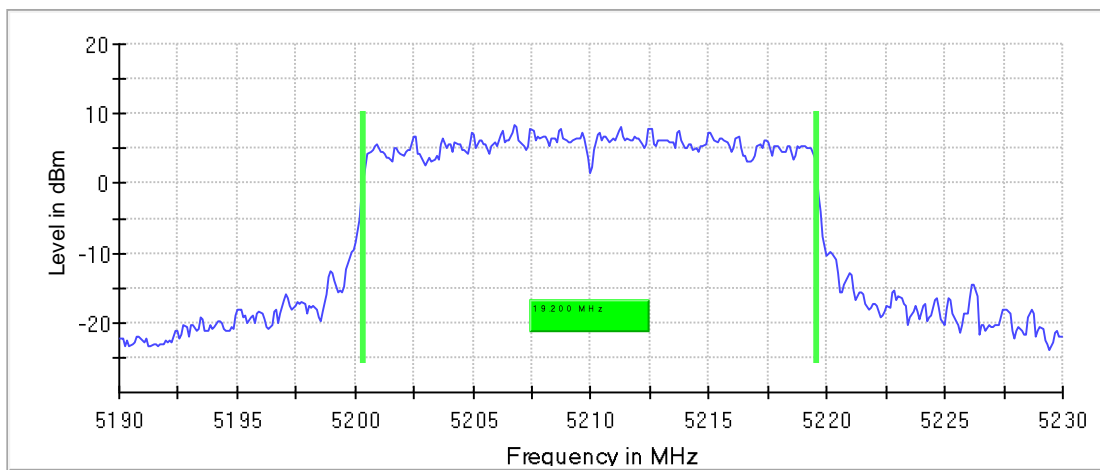
### 99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5210.000000	19.200000	---	---	5200.350000	5219.550000

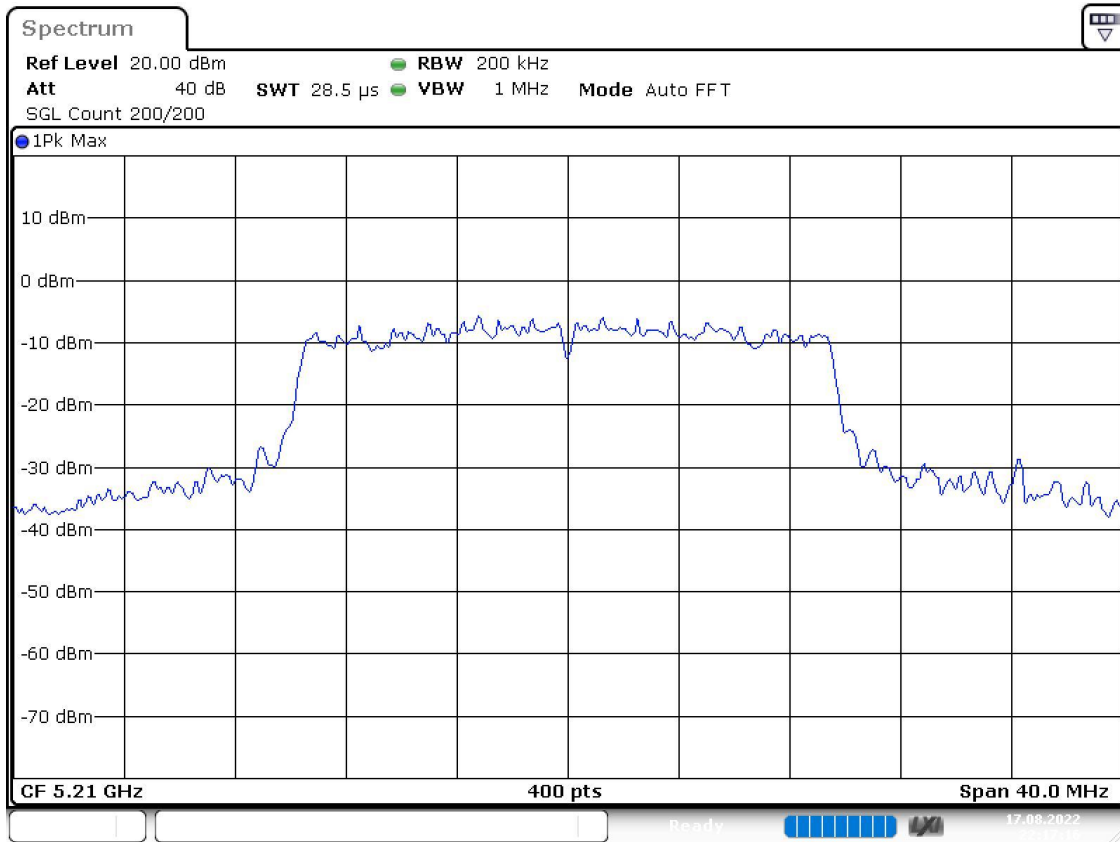
(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5210.000000	PASS

99 % Bandwidth



Bandwidth



Date: 17.AUG.2022 22:17:17

## Emission Bandwidth 26 dB (5240 MHz; 24.000 dBm; 20 MHz)

Customized settings.

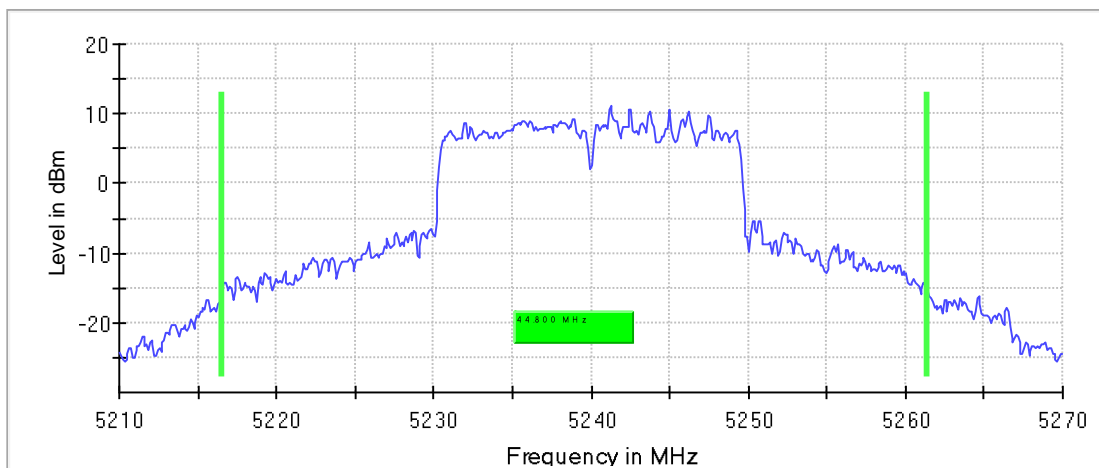
### 26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5240.000000	44.800000	---	---	5216.550000	5261.350000

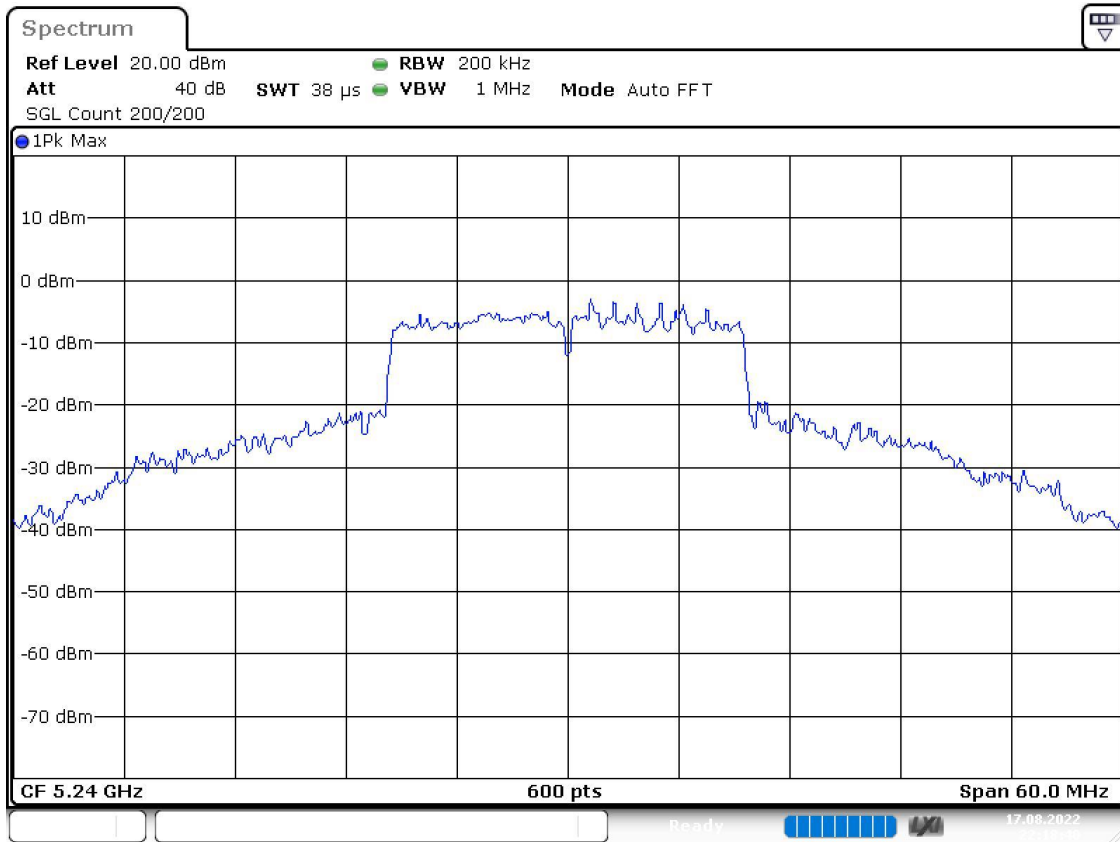
(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5240.000000	11.2	PASS

26 dB Bandwidth



Bandwidth



Date: 17.AUG.2022 22:18:41

## Occupied Channel Bandwidth 99% (5240 MHz; 24.000 dBm; 20 MHz)

Customized settings.

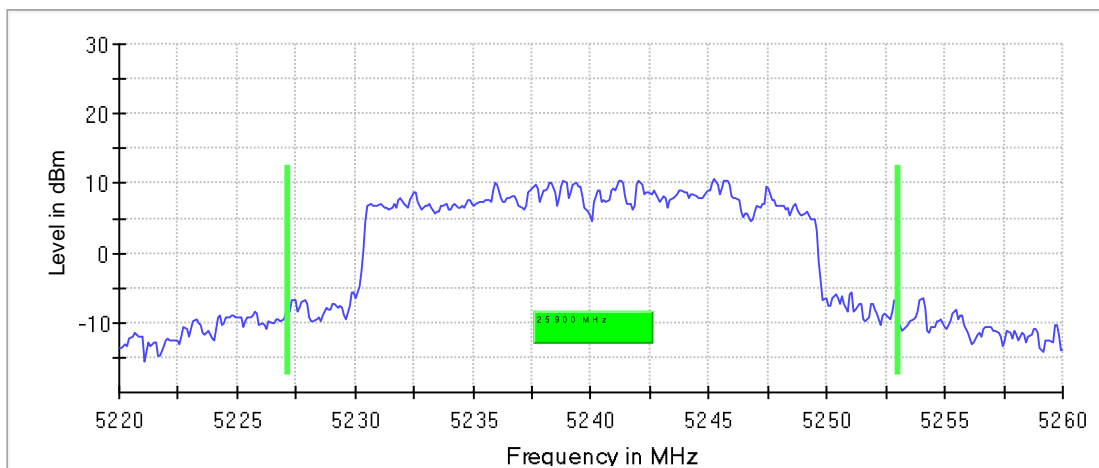
### 99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5240.000000	25.900000	---	---	5227.150000	5253.050000

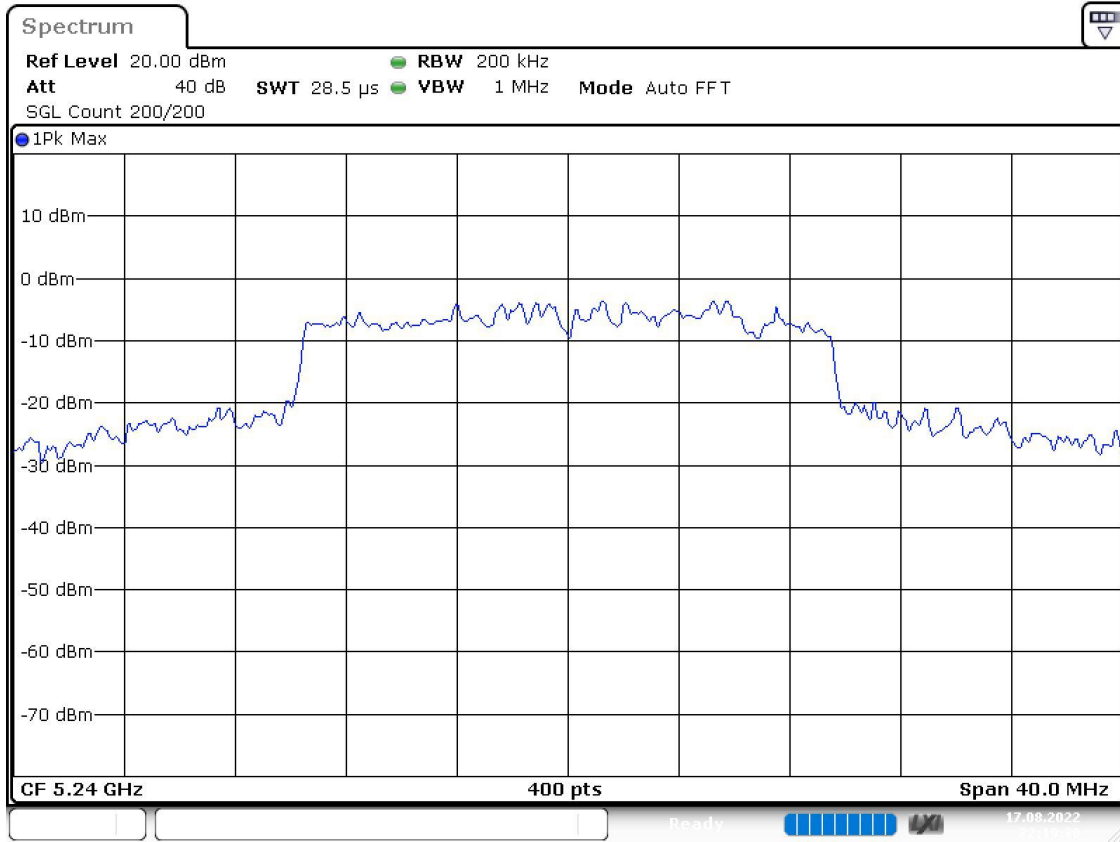
(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5240.000000	PASS

99 % Bandwidth



Bandwidth



Date: 17.AUG.2022 22:19:31

## Emission Bandwidth 26 dB (5190 MHz; 24.000 dBm; 40 MHz)

Customized settings.

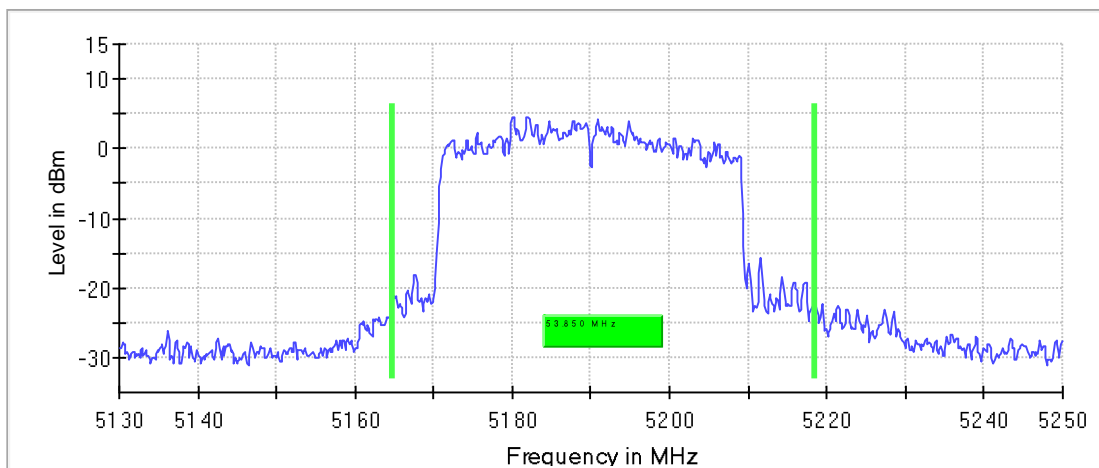
### 26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5190.000000	53.850000	---	---	5164.725000	5218.575000

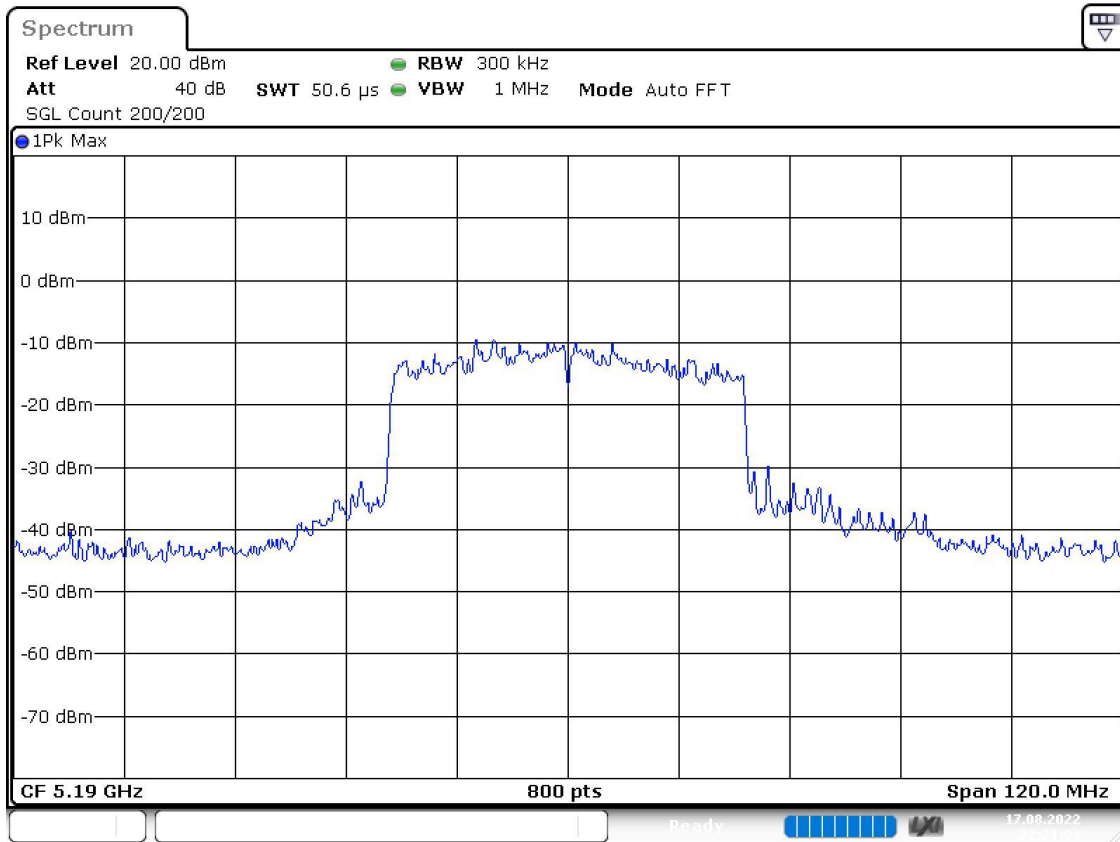
(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5190.000000	4.5	PASS

26 dB Bandwidth



Bandwidth



Date: 17.AUG.2022 22:21:01



## Occupied Channel Bandwidth 99% (5190 MHz; 24.000 dBm; 40 MHz)

Customized settings.

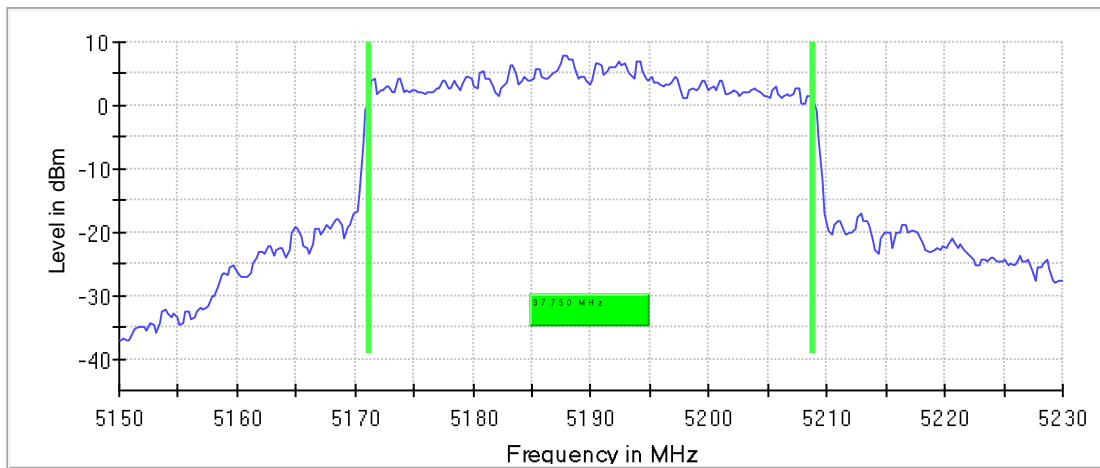
### 99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5190.000000	37.750000	---	---	5171.125000	5208.875000

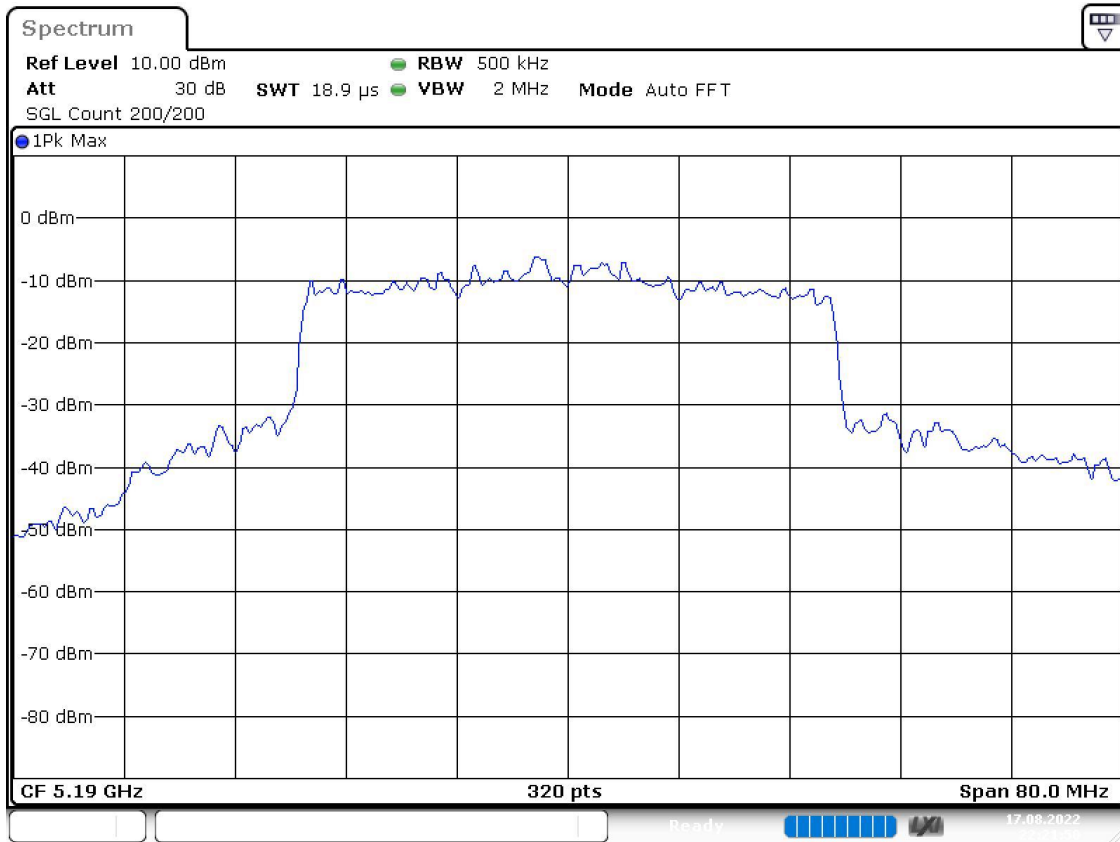
(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5190.000000	PASS

99 % Bandwidth



Bandwidth



Date: 17.AUG.2022 22:21:51

## Emission Bandwidth 26 dB (5230 MHz; 24.000 dBm; 40 MHz)

Customized settings.

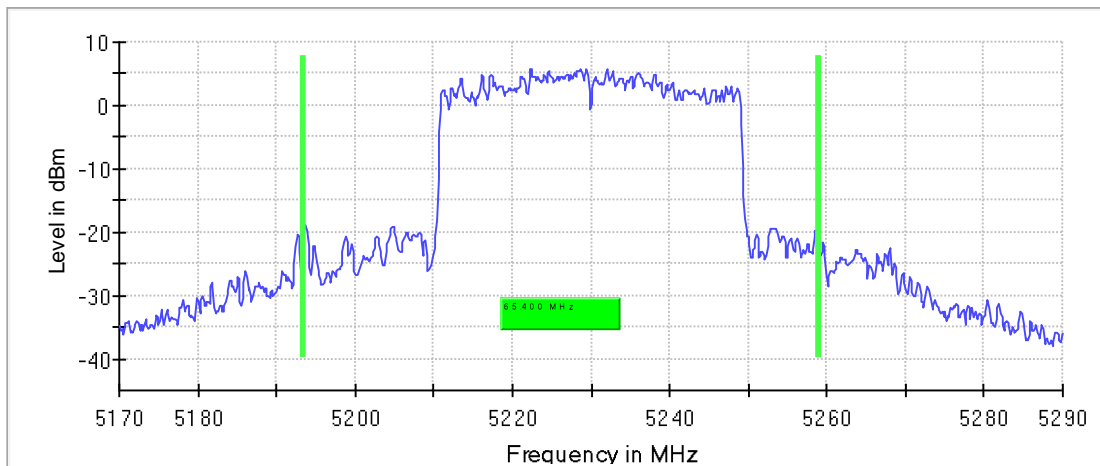
### 26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5230.000000	65.400000	---	---	5193.475000	5258.875000

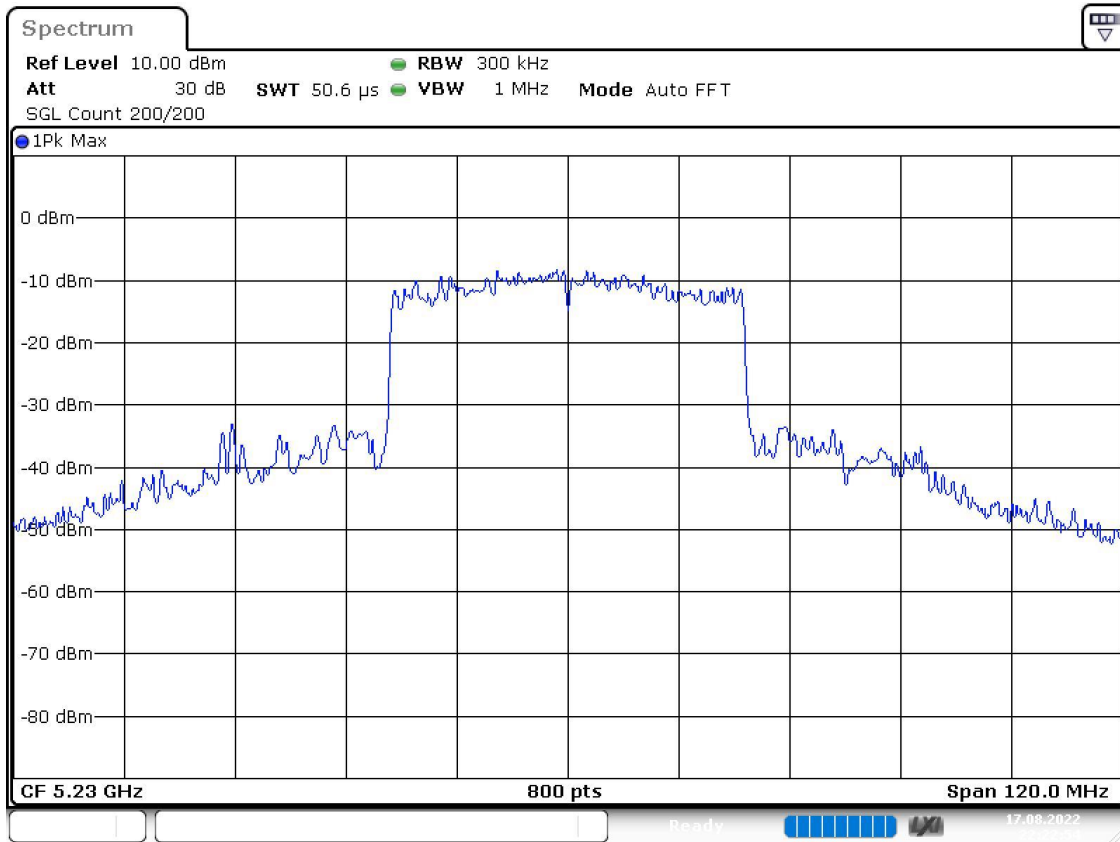
(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5230.000000	5.9	PASS

26 dB Bandwidth



Bandwidth



Date: 17.AUG.2022 22:22:55

## Occupied Channel Bandwidth 99% (5230 MHz; 24.000 dBm; 40 MHz)

Customized settings.

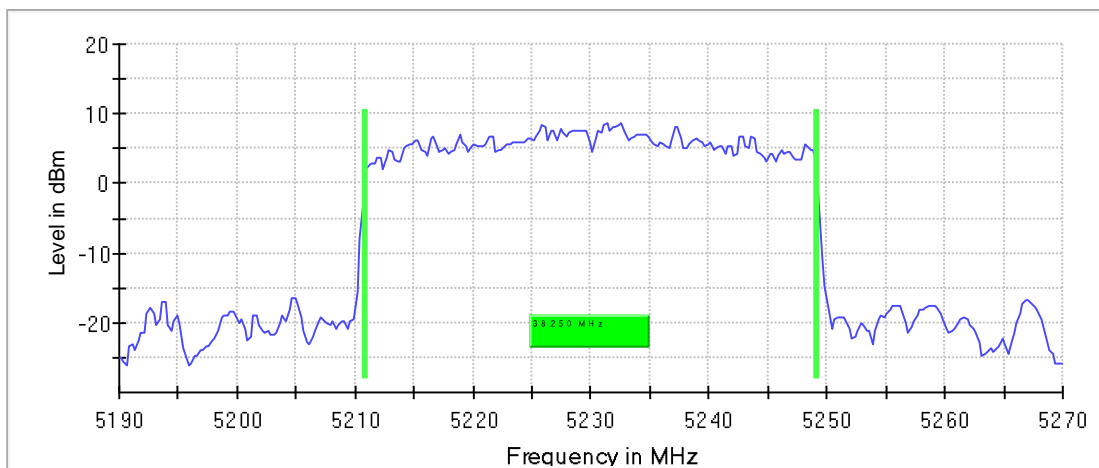
### 99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5230.000000	38.250000	---	---	5210.875000	5249.125000

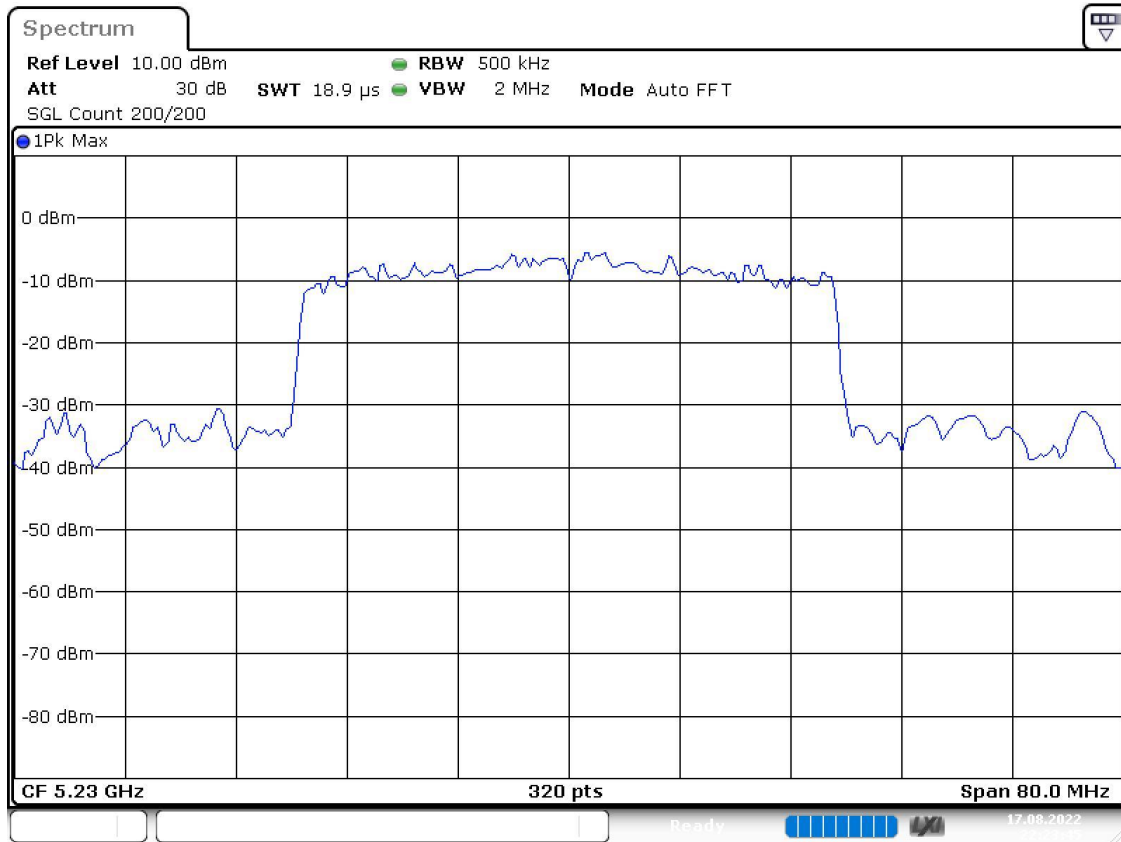
(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5230.000000	PASS

99 % Bandwidth



Bandwidth



Date: 17.AUG.2022 22:23:46

## Emission Bandwidth 26 dB (5210 MHz; 24.000 dBm; 80 MHz)

Customized settings.

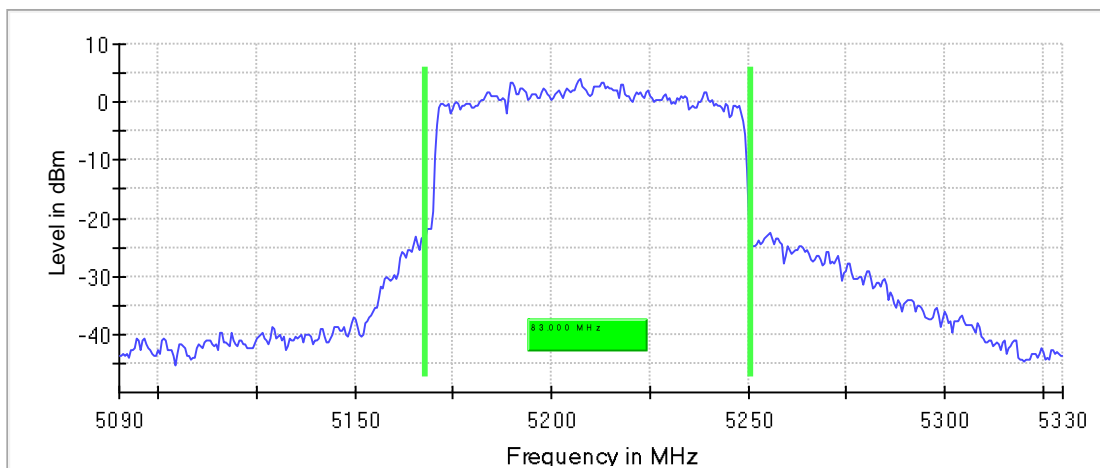
### 26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5210.000000	83.000000	---	---	5167.750000	5250.750000

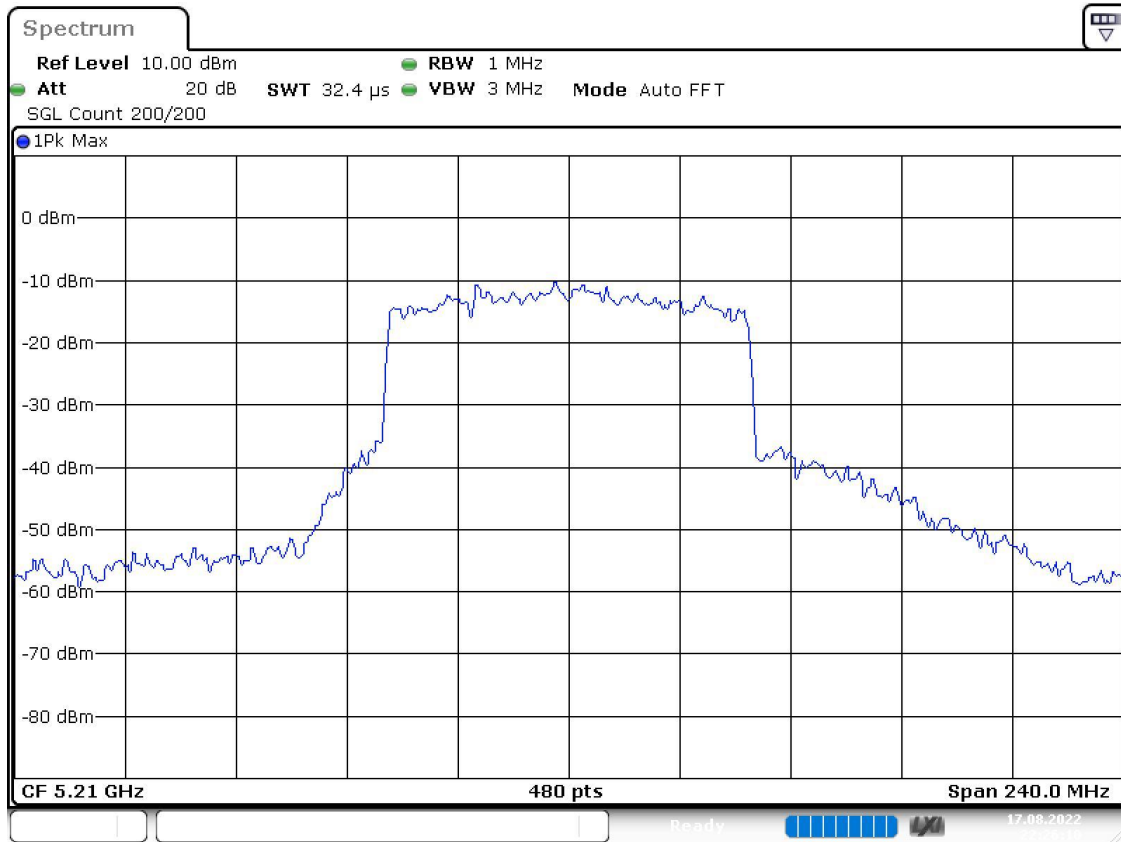
(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5210.000000	3.9	PASS

26 dB Bandwidth



Bandwidth



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## Occupied Channel Bandwidth 99% (5210 MHz; 24.000 dBm; 80 MHz)

Customized settings.

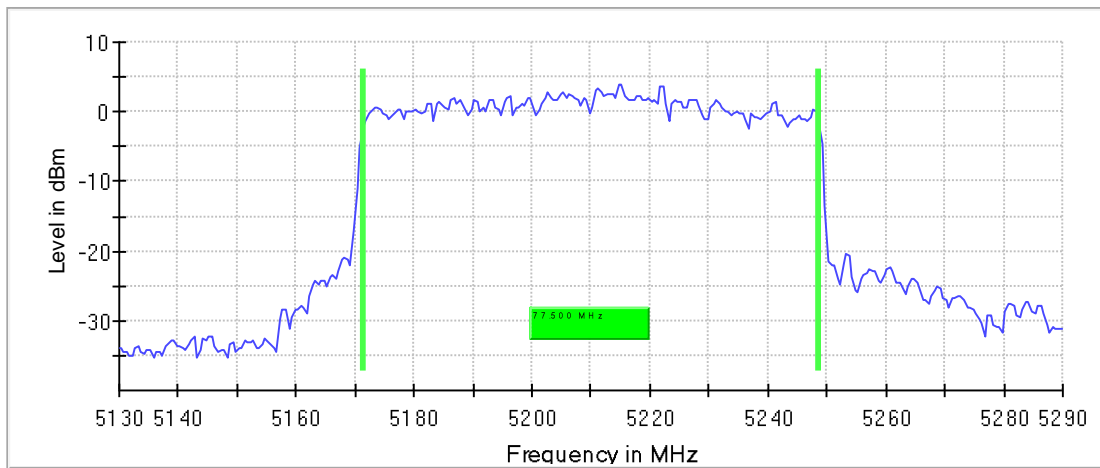
### 99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5210.000000	77.500000	---	---	5171.250000	5248.750000

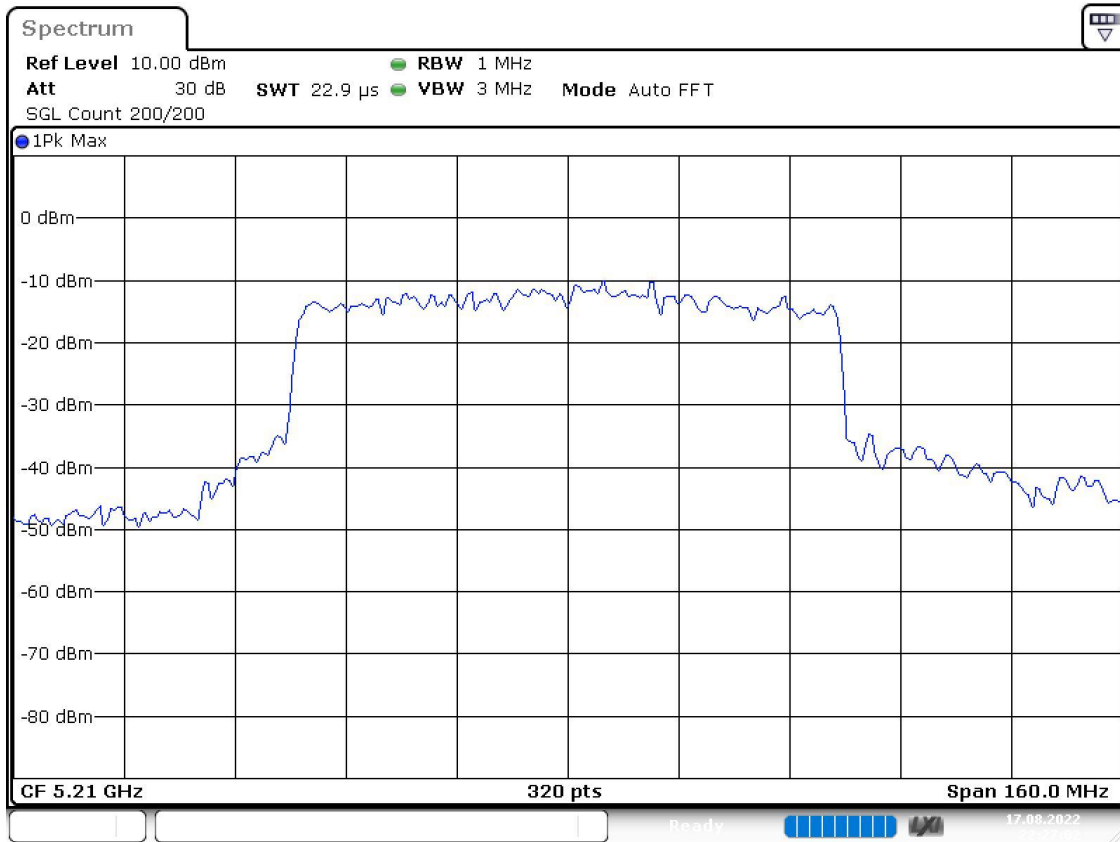
(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5210.000000	PASS

99 % Bandwidth



Bandwidth



Date: 17.AUG.2022 22:27:03

-- End of Test Report --