FCC PART 15C
TEST REPORT
No.I22Z60885-IOT06

for

Razer Inc.

Gaming Tablet

RZ45-0461

With

FCC ID: RWO-RZ450461

Hardware Version: V4

Software Version: Razer Edge WiFi-12-user

Issued Date: 2022-10-28

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I22Z60885-IOT06	Rev.0	1st edition	2022-09-01
I22Z60885-IOT06	Rev.1	Update the result table of PSD. Add the result of 26dB.	2022-09-30
I22Z60885-IOT06	Rev.2	Update the result of transmitter spurious emissions(radiated)	2022-10-28

CONTENTS

1. TEST LATORATORY

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

1.3. TestingEnvironment

Normal Temperature: 15-35℃

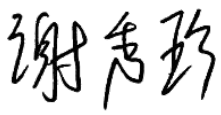
Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2022-04-20

Testing End Date: 2022-10-28

1.5. Signature



Xie Xiuzhen

(Prepared this test report)

Zheng Wei

(Reviewed this test report)

Pang Shuai

(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

Company Name:	Razer Inc.
Address /Post:	9 Pasteur, Suite 100, Irvine, CA 92618, USA.
Contact:	Johnsen Tia
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2.2. Manufacturer Information

Company Name:	Razer Inc.
Address /Post:	9 Pasteur, Suite 100, Irvine, CA 92618, USA.
Contact:	Johnsen Tia
Email:	Johnsen.tia@razer.com
Telephone:	+65 6571 6828

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT(AE)

3.1. About EUT

Description	Gaming Tablet
Model name	RZ45-0461
FCC ID	RWO-RZ450461
WLAN Frequency Band	ISM Band: 5850MHz~5895MHz
Type of modulation	OFDM/OFDMA
Antenna	Embedded Antenna
Voltage	3.87V

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
UT65a	/	V4	Razer Edge WiFi-12-user
UT35a	/	V4	Razer Edge WiFi-12-user
UT18a	/	V4	Razer Edge WiFi-12-user

*EUT ID: is used to identify the test sample in the lab internally.

* UT35a is used for Conduction test, UT65ais used for Radiation test.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	SN
AE1	Battery	/	CAC4060002C2
AE2	Dummy battery	/	/
AE3	USB Cable	/	LS2-A001A
AE4	Adapter	/	A849-200225C-US 1

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

Equipment Under Test (EUT) is a model of Gaming Tablet with embedded antenna. It consists of normal options: Battery and Charger.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the Client.

4. REFERENCE DOCUMENTS

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

FCC Part15	FCC CFR 47, Part 15, Subpart E: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.407 General technical requirements	2018
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
UNII: KDB 789033 D02	General U-NII Test Procedures New Rules v02r01	2017-12
KDB 291074 D02	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) 5.9 GHz DEVICES UNDER PART 15, SUBPART E	2022-03
KDB 662911 D01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band(e.g., MIMO, Smart Antenna, etc)	2013-10

5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.407 (a)	/	BR
Peak Power Spectral Density	15.407 (a)	/	BR
Occupied 6dB Bandwidth	15.407 (e)	/	BR
99% Occupied Bandwidth	15.407 (b)	/	BR
Out of Band Emissions	15.407 (b)	/	BR
Transmitter Spurious Emission - Radiated	15.407, 15.205, 15.209	/	P
AC Powerline Conducted Emission	15.107, 15.207	/	BR

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NM	Not measured, The test was not measured by CTTL
BR	Re-use test data from basic model report.
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Statements

CTTL has evaluated the test cases requested by the client/manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

KDB 291074 is not accredited by the NVLAP.

6.3. Explanation of re-use of test data

The Equipment Under Test (EUT) model RZ45-0461 (FCC ID: RWO-RZ450461) is a variant product of RZ45-0460VWQ (FCC ID: RWO-RZ450460), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check (power) measurements and transmitter spurious emission(radiated) were performed on this device, other test results are derived from test report No.I22Z60808-IOT08.

For detail differences between two models please refer the Declaration of Changes document.

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	26℃
Voltage	3.87V
Humidity	44%

7. TEST EQUIPMENTS UTILIZED

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2023-05-15
2	Test Receiver	ESCI 3	100344	Rohde & Schwarz	1 year	2023-02-21
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2022-06-29
4	Attenuator	10dB/2W	/	Rosenberger	/	/
5	Shielding Room	S81	/	ETS-Lindgren	/	/

Note:

The test dates were before the calibration due dates of equipment used (the LISN whose series number is 101200)

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103023	Rohde & Schwarz	1 year	2022-10-28
2	EMI Antenna	VULB 9163	483	SCHWARZBECK	1 year	2022-08-24
3	EMI Antenna	VULB 9163	1223	SCHWARZBECK	1 year	2023-07-25
3	EMI Antenna	3115	00167250	ETS-Lindgren	1 year	2023-06-20
4	EMI Antenna	3116	2663	ETS-Lindgren	1 Year	2022-08-11

Note:

The test dates were before the calibration due dates of equipment used (the EMI Antenna which series number is 483, the EMI Antenna which series number is 2663)

8. Measurement Uncertainty

8.1. Transmitter Output Power

Measurement Uncertainty: 0.387dB,k=1.96

8.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

8.3. Occupied 6dB Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

8.4. 99% Occupied Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

8.5. Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

8.6. Spurious Emissions

Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 2GHz	1.22
2GHz ≤ f ≤3.6GHz	1.22
3.6GHz ≤ f ≤8GHz	1.22
8GHz ≤ f ≤12.75GHz	1.51
12.75GHz ≤ f ≤26GHz	1.51
26GHz ≤ f ≤40GHz	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	4.92
30MHz ≤ f ≤ 1GHz	5.15
1GHz ≤ f ≤18GHz	5.54
18GHz ≤ f ≤40GHz	5.26

8.7. AC Power-line Conducted Emission

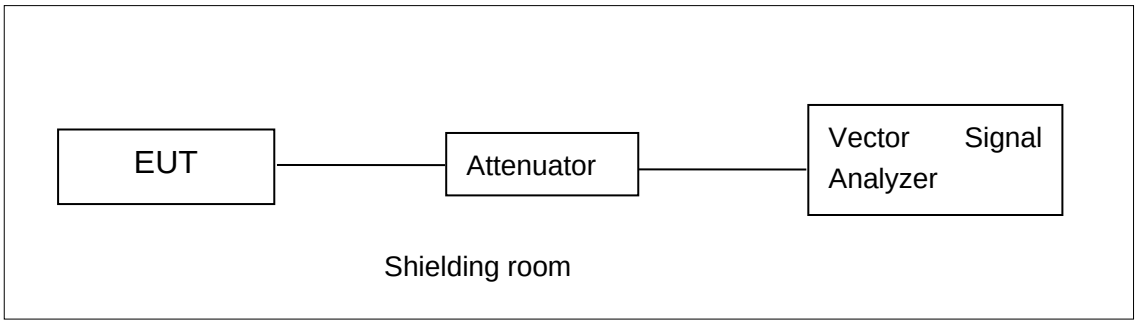
Measurement Uncertainty : 3.08dB,k=2

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

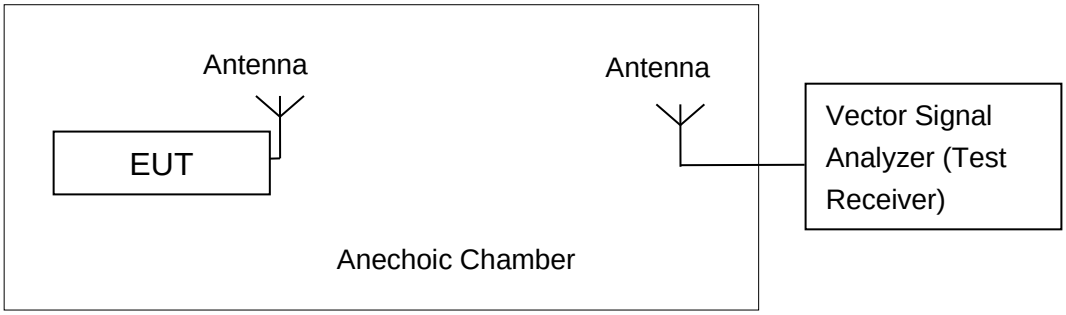
A.1.1. Conducted Measurements

1). Connect the EUT to the test system correctly.
2). Set the EUT to the required work mode.
3). Set the EUT to the required channel.
4). Set the spectrum analyzer to start measurement.
5). Record the values. Vector Signal Analyzer



A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,
Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;
Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;



The measurement is made according to ANSI C63.10 and KDB Publication 987594 D01.
The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

A.2. Maximum Peak Output Power

Measurement Limit and Method:

Standard	e.i.r.p Limit (dBm)
FCC CRF Part 15.407(a)	30

The measurementmethod SA-2 is made according to KDB 789033 and KDB 291074.

A.2.1 Directional Gain

Ant4(dBi)	Ant5(dBi)	DG(dBi) beamforming
-3.2	-3.3	-0.24

For BF transmissions, power and PSD directional gain is calculated as:

Directional gain = 10 log [(10G1 /20 + 10G2 /20 + … + 10Gn /20) 2 /NANT] dBi, as following table for PSD. NANT = number of transmit antennas NSS = number of spatial streams. (The worst case directional gain will occur when NSS = 1).

A.2.2. Maximum Average Output Power-Conducted

Measurement Results:

SISO

Mode	Channel	RF output power (dBm)				Conclusion
		ANT4		ANT5		
		Conducted	e.i.r.p	Conducted	e.i.r.p	
802.11a	5845MHz(Ch169)	11.30	8.44	11.02	7.72	P
	5865MHz(Ch173)	11.85	8.65	10.82	7.52	P
	5885MHz(Ch177)	11.77	8.57	11.15	7.85	P
802.11n-HT20	5845MHz(Ch169)	11.70	8.50	11.05	7.75	P
	5865MHz(Ch173)	11.33	8.13	11.01	7.71	P
	5885MHz(Ch177)	11.38	8.18	10.62	7.32	P
802.11ac-VHT20	5845MHz(Ch169)	11.52	8.32	10.78	7.48	P
	5865MHz(Ch173)	11.59	8.39	10.91	7.61	P
	5885MHz(Ch177)	11.59	8.39	10.63	7.33	P
802.11ax-HE20 (full RU)	5845MHz(Ch169)	13.59	10.39	12.75	9.45	P
	5865MHz(Ch173)	13.37	10.17	12.67	9.37	P
	5885MHz(Ch177)	13.34	10.14	12.62	9.32	P
802.11n-HT40	5835MHz(Ch167)	11.71	8.51	11.25	7.95	P
	5875MHz(Ch175)	11.34	8.14	11.01	7.71	P
802.11ac-VHT40	5835MHz(Ch167)	11.77	8.57	10.80	7.50	P
	5875MHz(Ch175)	11.54	8.34	11.08	7.78	P
802.11ax-HE40 (full RU)	5835MHz(Ch167)	13.46	10.26	12.80	9.50	P
	5875MHz(Ch175)	13.52	10.32	12.48	9.18	P
802.11ac-VHT80	5855MHz(Ch171)	10.22	7.02	10.33	7.03	P

802.11ax-HE80 (full RU)	5855MHz(Ch171)	13.45	10.25	12.76	9.46	P
802.11ac-VHT160	5815MHz(Ch163)	9.16	5.96	8.81	5.51	P
802.11ax-HE160 (full RU)	5815MHz(Ch163)	13.55	10.35	12.47	9.17	P

The data rate 6Mbps(802.11b), MCS0(802.11n/ac/ax) is selected as worst condition, and the following cases are performed with this condition.

Conclusion: PASS

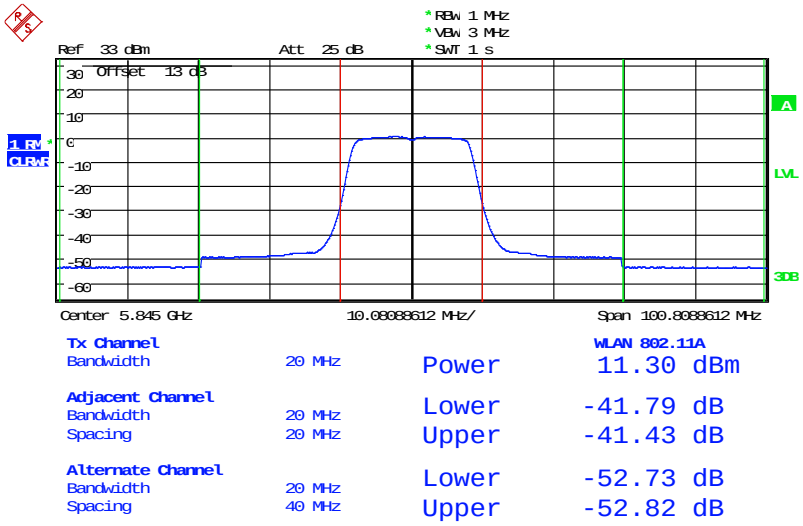
MIMO

Mode	Channel	RF output power (dBm)				Conclusion
		ANT4	ANT5	Conducted	e.i.r.p	
802.11a	5845MHz (Ch169)	11.77	11.15	14.48	14.24	P
	5865MHz (Ch173)	11.60	11.18	14.41	14.17	P
	5885MHz(Ch177)	11.52	11.22	14.38	14.14	P
802.11n-HT20	5845MHz (Ch169)	11.71	10.81	14.29	14.05	P
	5865MHz (Ch173)	11.66	10.8	14.26	14.02	P
	5885MHz(Ch177)	11.38	10.95	14.18	13.94	P
802.11ac-VHT20	5845MHz (Ch169)	11.48	10.59	14.07	13.83	P
	5865MHz (Ch173)	11.39	10.62	14.03	13.79	P
	5885MHz(Ch177)	11.41	10.61	14.04	13.80	P
802.11ax-HE20	5845MHz (Ch169)	13.57	13.10	16.35	16.11	P
	5865MHz (Ch173)	13.50	12.66	16.11	15.87	P
	5885MHz(Ch177)	13.38	12.31	15.89	15.65	P
802.11n-HT40	5835MHz (Ch167)	11.95	10.87	14.45	14.21	P
	5875MHz(Ch175)	11.91	10.76	14.38	14.14	P
802.11ac-VHT40	5835MHz (Ch167)	12.18	10.93	14.61	14.37	P
	5875MHz(Ch175)	11.77	10.89	14.36	14.12	P
802.11ax-HE40 (full RU)	5835MHz (Ch167)	13.51	12.58	16.08	15.84	P
	5875MHz(Ch175)	13.39	12.52	15.99	15.75	P
802.11ac-VHT80	5855MHz(Ch171)	10.15	10.45	13.31	13.07	P
802.11ax-HE80 (full RU)	5855MHz(Ch171)	13.32	12.30	15.85	15.61	P
802.11ac-VHT160	5815MHz(Ch163)	9.32	9.02	12.18	11.94	P
802.11ax-HE160 (full RU)	5815MHz(Ch163)	13.58	12.03	15.88	15.64	P

The data rate 6Mbps(802.11b), MCS0(802.11n/ac/ax) is selected as worst condition, and the following cases are performed with this condition.

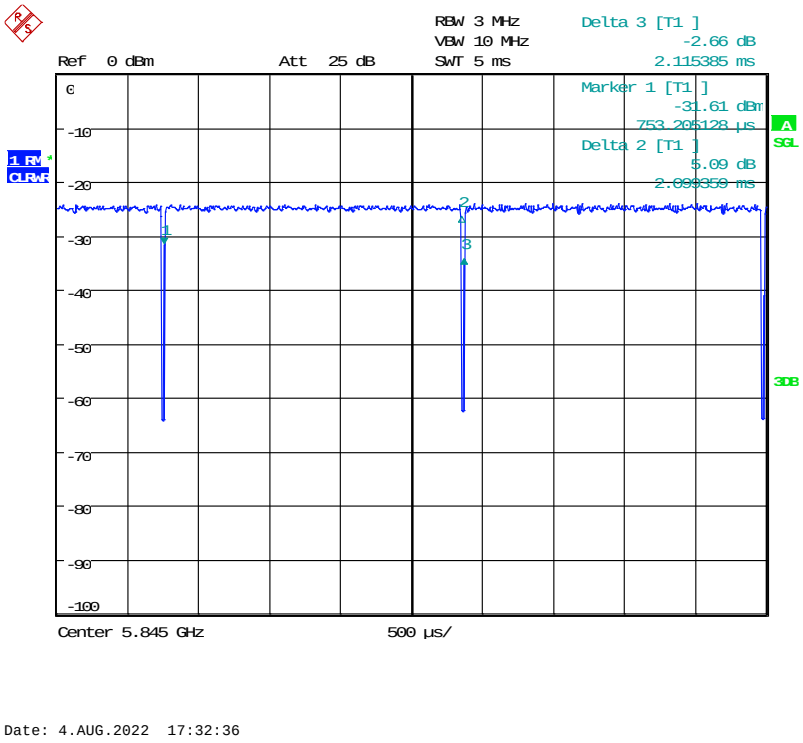
The spot check conducted result of average output power are 14.38dBm (ant4 802.11ax-HE20 MCS0 ch169 prototype result: 13.59dBm) and 17.41dBm (mimo 802.11ax-HE20 MCS0 ch169 prototype result: 16.35dBm).

802.11a-5845MHz-ant4:



Duty Cycle

Mode	11a	11n20	11ac20	11ax20	11n40	11ac40	11ax40	11ac80	11ax80	11ac160	11ax160
Duty Cycle	99%	99%	99%	99%	99%	99%	99%	99%	98%	99%	98%



Note: The following cases are performed with this condition:

a) 802.11a/n20/ac40/ac160 mode (Ant4) are selected as the worst condition (SISO),

802.11ax20/40/80/160 (full RU) mode (Ant4) is selected as the worst condition (SISO);

b) 802.11a/n20/ac40/ac160 mode (Ant4) are selected as the worst condition (MIMO);

802.11ax20/40/80/160 (full RU) mode (Ant4) is selected as the worst condition (MIMO);

c) The 802.11ax20 (full RU) mode (compare with 802.11n20/ac20), 802.11ax40 (full RU) mode (compare with 802.11n40/ac40), 802.11ax80 (full RU) mode (compare with 802.11ac80), 802.11ax160 (full RU) mode (compare with 802.11ac160) are selected as the worst condition (SISO Ant4).

d) The 802.11ax20 (full RU) mode (compare with 802.11n20/ac20), 802.11ax40 (full RU) mode (compare with 802.11n40/ac40), 802.11ax80 (full RU) mode (compare with 802.11ac80), 802.11ax160 (full RU) mode (compare with 802.11ac160) are selected as the worst condition (MIMO Ant4).

e) After evaluation, the maximum power and PSD of 802.11ax20/40/80/160 is in full RU, so all testing done under full RU.

Conclusion: PASS

A.3. Peak Power Spectral Density

Measurement Limit:

Standard	e.i.r.p Limit
FCC 47 CFR Part 15.407(a)	14

The measurement is made according to ANSI C63.10, KDB789033 D02 and KDB 291074.

Measurement Uncertainty:

Measurement Uncertainty	0.75dB

Measurement Results:

SISO-Ant4

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11a	169	-2.92	P
	173	-2.40	P
	177	-2.62	P
802.11n HT20	169	-2.85	P
	173	-3.06	P
	177	-2.90	P
802.11ac VHT40	167	-5.74	P
	175	-6.07	P
802.11ac VHT160	163	-14.46	P
802.11ax HE20 (full RU)	169	-1.19	P
	173	-1.18	P
	177	-1.19	P
802.11ax HE40 (full RU)	167	-3.93	P
	175	-4.19	P
802.11ax HE80 (full RU)	171	-7.14	P
802.11ax HE160 (full RU)	163	-9.74	P

SISO-Ant5

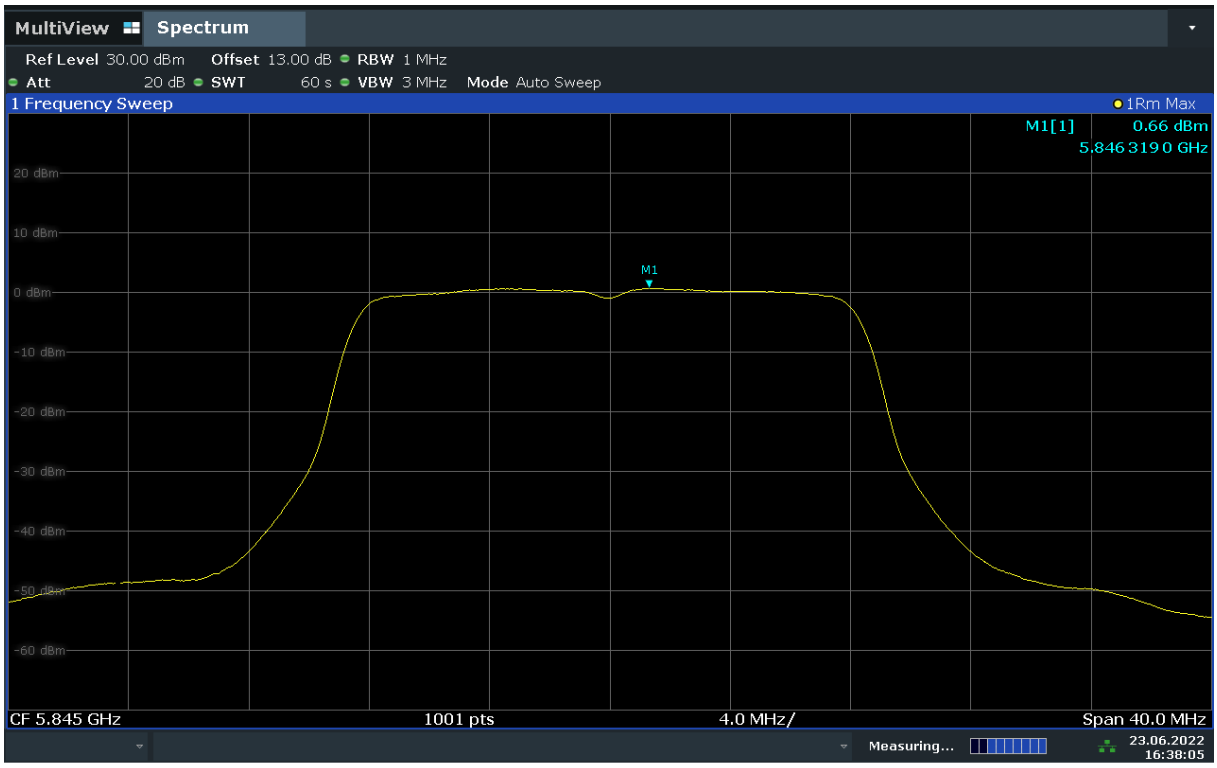
Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11ac VHT80	171	-10.51	P

MIMO

Mode	Channel	RF output power (dBm)				Conclusion
		ANT4	ANT5	Conducted	e.i.r.p	
802.11a	5845MHz (Ch169)	0.66	0.09	3.39	3.16	P
	5865MHz (Ch173)	0.70	0.31	3.52	3.28	P
	5885MHz(Ch177)	0.47	-0.21	3.15	2.91	P
802.11n-HT20	5845MHz (Ch169)	0.31	-0.15	3.10	2.86	P

	5865MHz (Ch173)	0.09	-0.53	2.80	2.56	P
	5885MHz(Ch177)	0.24	-0.68	2.81	2.58	P
802.11ax-HE20	5845MHz (Ch169)	2.33	1.42	4.91	4.67	P
	5865MHz (Ch173)	2.15	0.88	4.57	4.33	P
	5885MHz(Ch177)	2.05	0.64	4.41	4.17	P
802.11ac-VHT40	5835MHz (Ch167)	-2.59	-3.10	0.17	-0.07	P
	5875MHz(Ch175)	-2.46	-2.91	0.33	0.09	P
802.11ax-HE40 (full RU)	5835MHz (Ch167)	-0.60	-1.53	1.97	1.73	P
	5875MHz(Ch175)	-0.79	-1.53	1.87	1.63	P
802.11ac-VHT80	5855MHz(Ch171)	-7.53	-6.94	-4.21	-4.45	P
802.11ax-HE80 (full RU)	5855MHz(Ch171)	-3.84	-4.71	-1.24	-1.48	P
802.11ac-VHT160	5815MHz(Ch163)	-11.33	-11.34	-8.32	-8.56	P
802.11ax-HE160 (full RU)	5815MHz(Ch163)	-6.58	-7.61	-4.05	-4.29	P

802.11a-5845MHz-mimo ant4:



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Conclusion: PASS

A.4. Occupied 6dB Bandwidth

a) Set RBW = 100 kHz.

b) Set the video bandwidth (VBW) ≥ 3 × RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by

6 dB relative to the maximum level measured in the fundamental emission.

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.407 (e)	≥ 500

Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11a	169	Fig.1	16.32	P
	173	Fig.2	16.32	P
	177	Fig.3	16.32	P
802.11ax HE20	169	Fig.4	19.07	P
	173	Fig.5	19.06	P
	177	Fig.6	19.05	P
802.11ax HE40	167	Fig.7	38.09	P
	175	Fig.8	38.08	P
802.11ax HE80	171	Fig.9	78.05	P
802.11ax HE160	163	Fig.10	158.08	P

Conclusion: PASS

Test graphs as below:

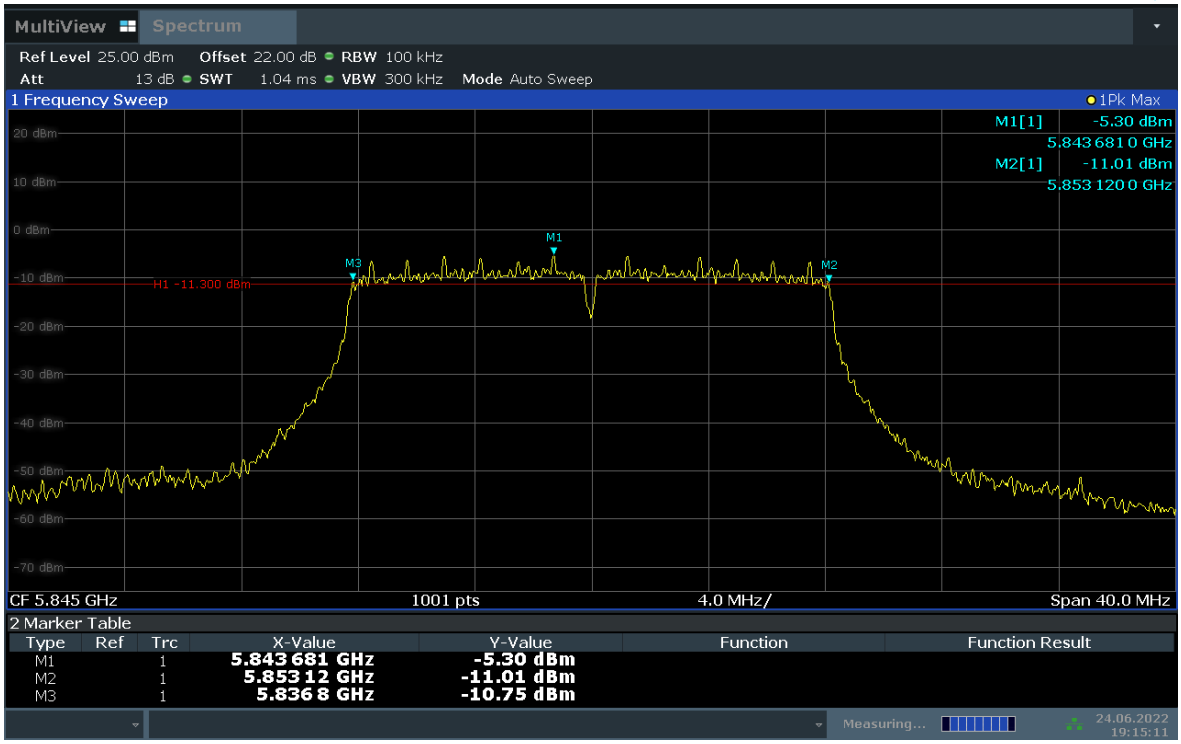

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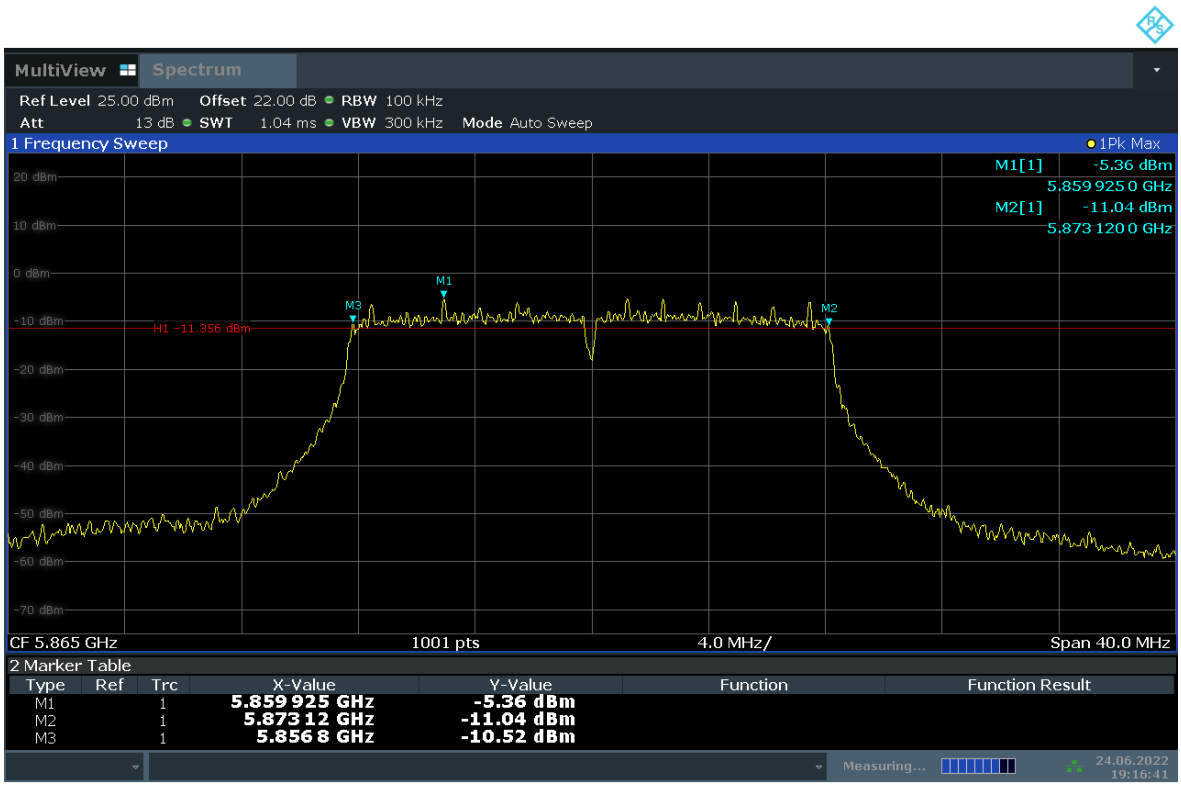
Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 169)



19:16:42 24.06.2022

Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 173)

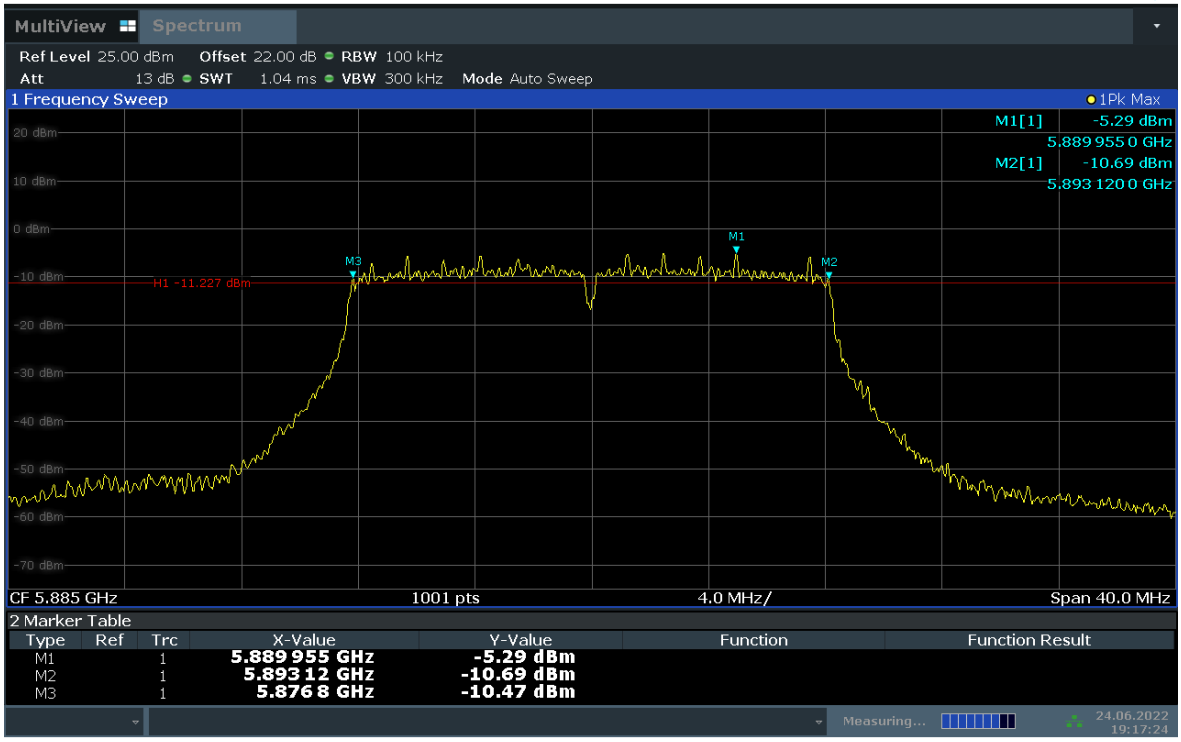


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 177)

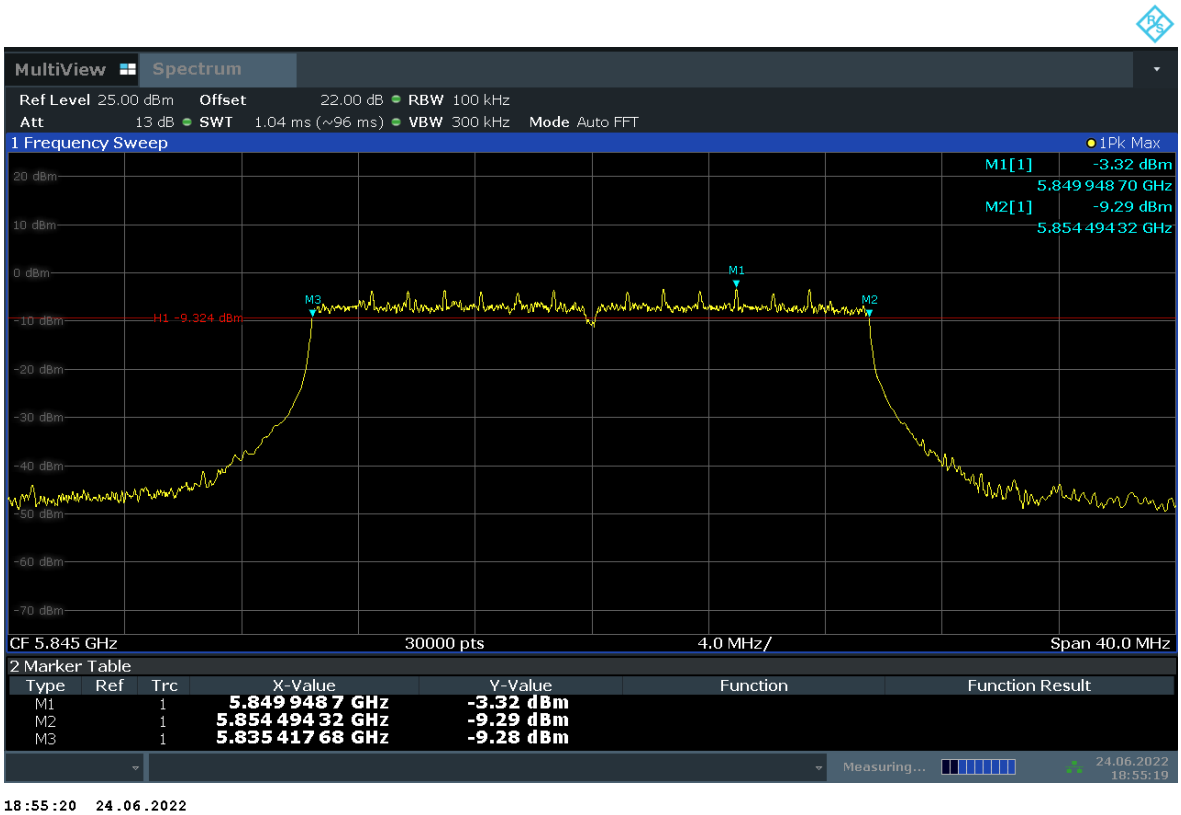
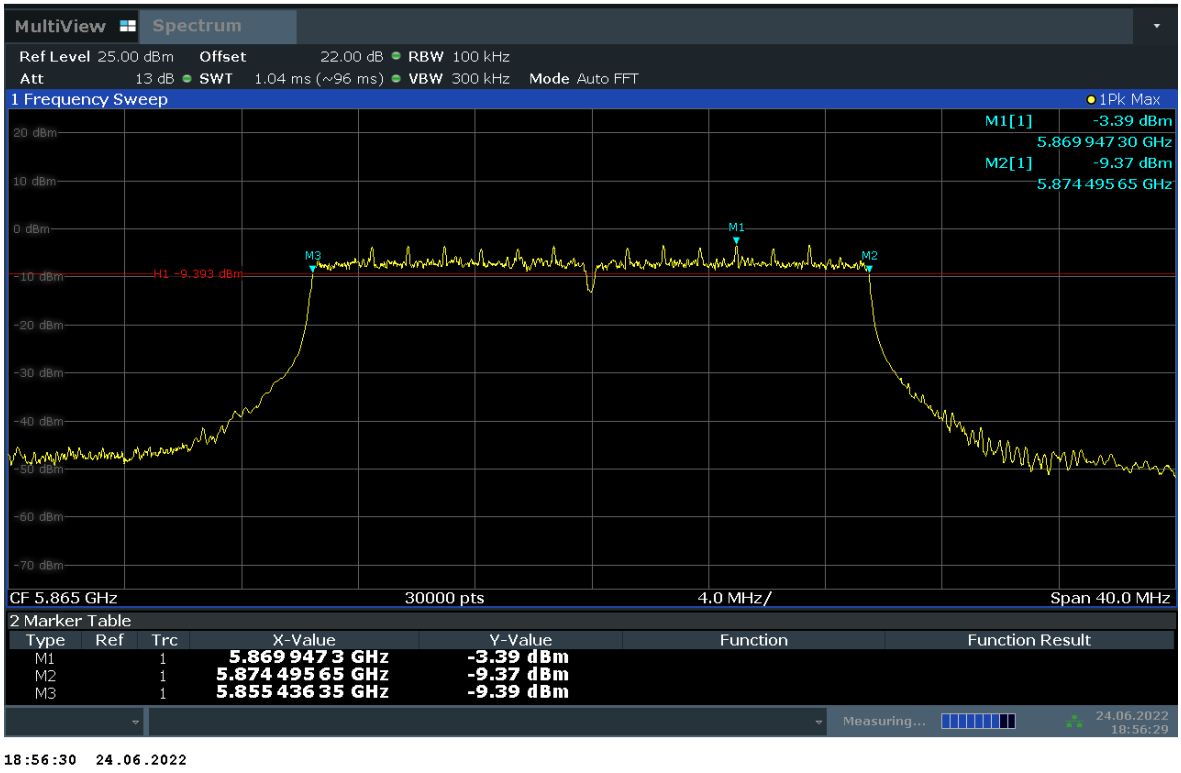
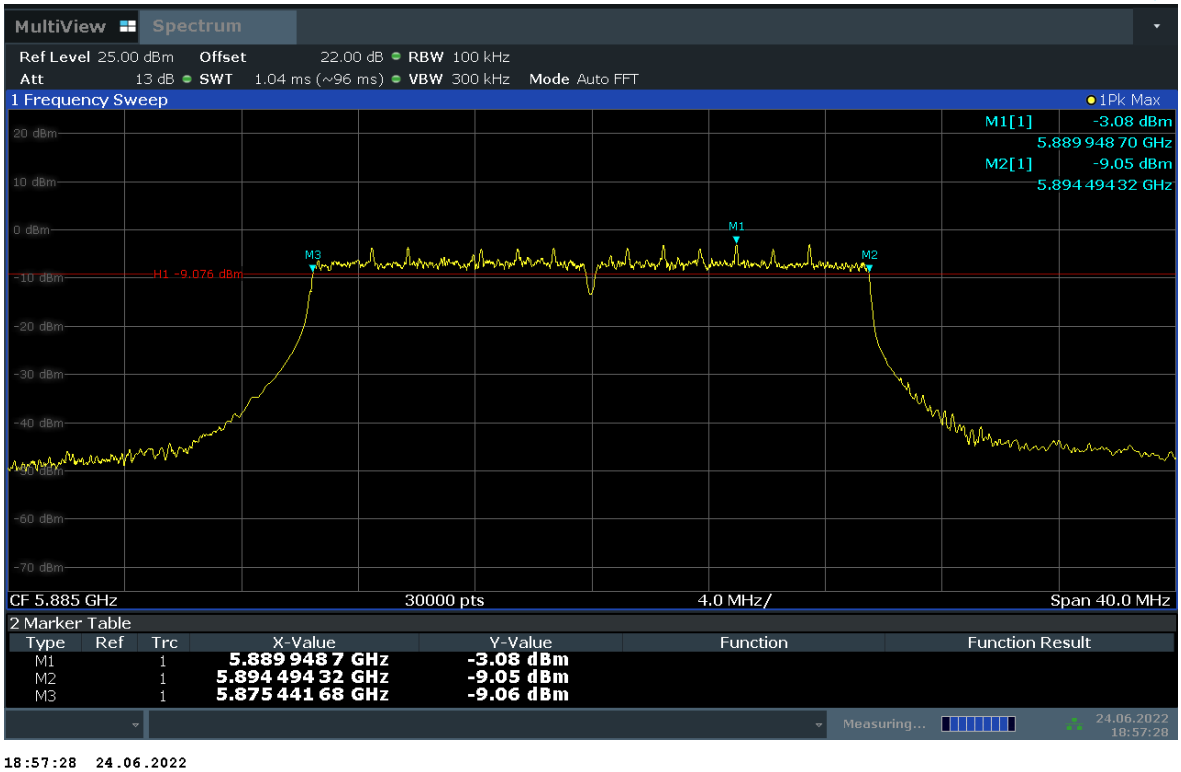


Fig. 4 Occupied 6dB Bandwidth (802.11ax-HE20, Ch 169)



18:56:30 24.06.2022

Fig. 5 Occupied 6dB Bandwidth (802.11ax-HE20, Ch 173)



18:57:28 24.06.2022

Fig. 6 Occupied 6dB Bandwidth (802.11ax-HE20, Ch 177)

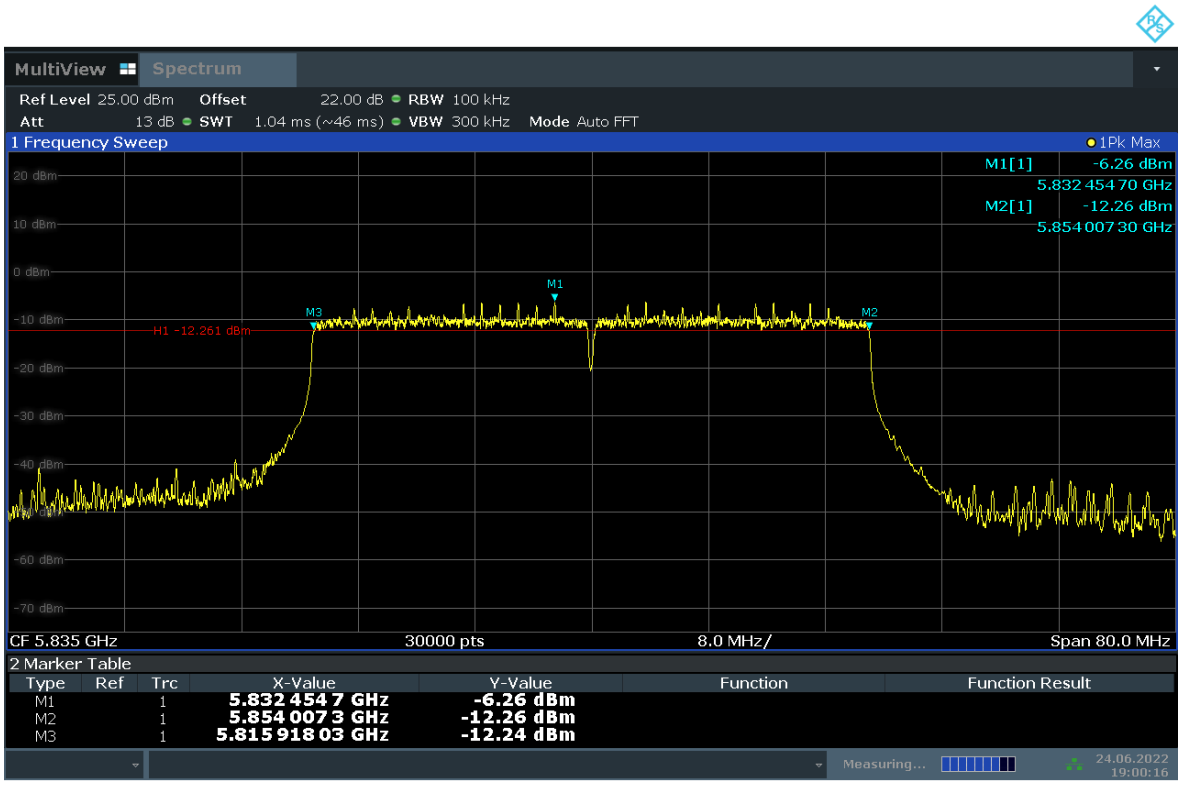


Fig. 7 Occupied 6dB Bandwidth (802.11ax-HE40, Ch 167)

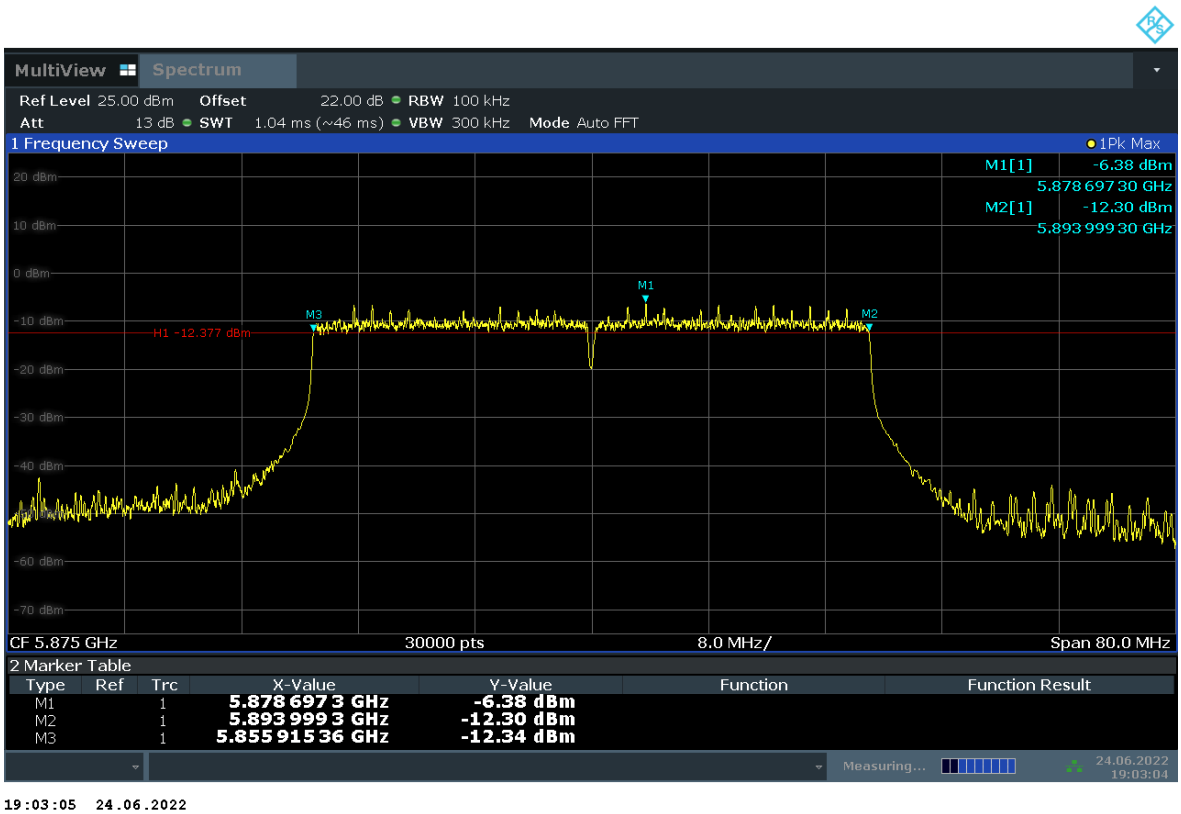


Fig. 8 Occupied 6dB Bandwidth (802.11ax-HE40, Ch 175)

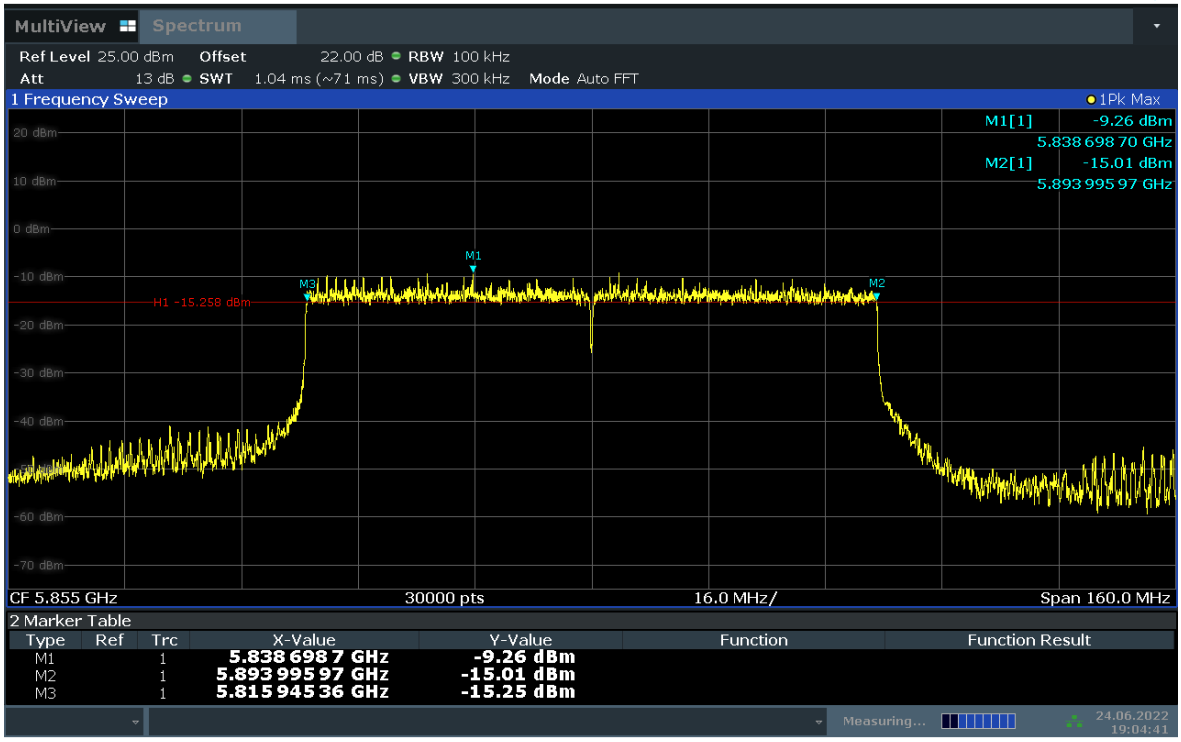


Fig. 9 Occupied 6dB Bandwidth (802.11ax-HE80, Ch 171)

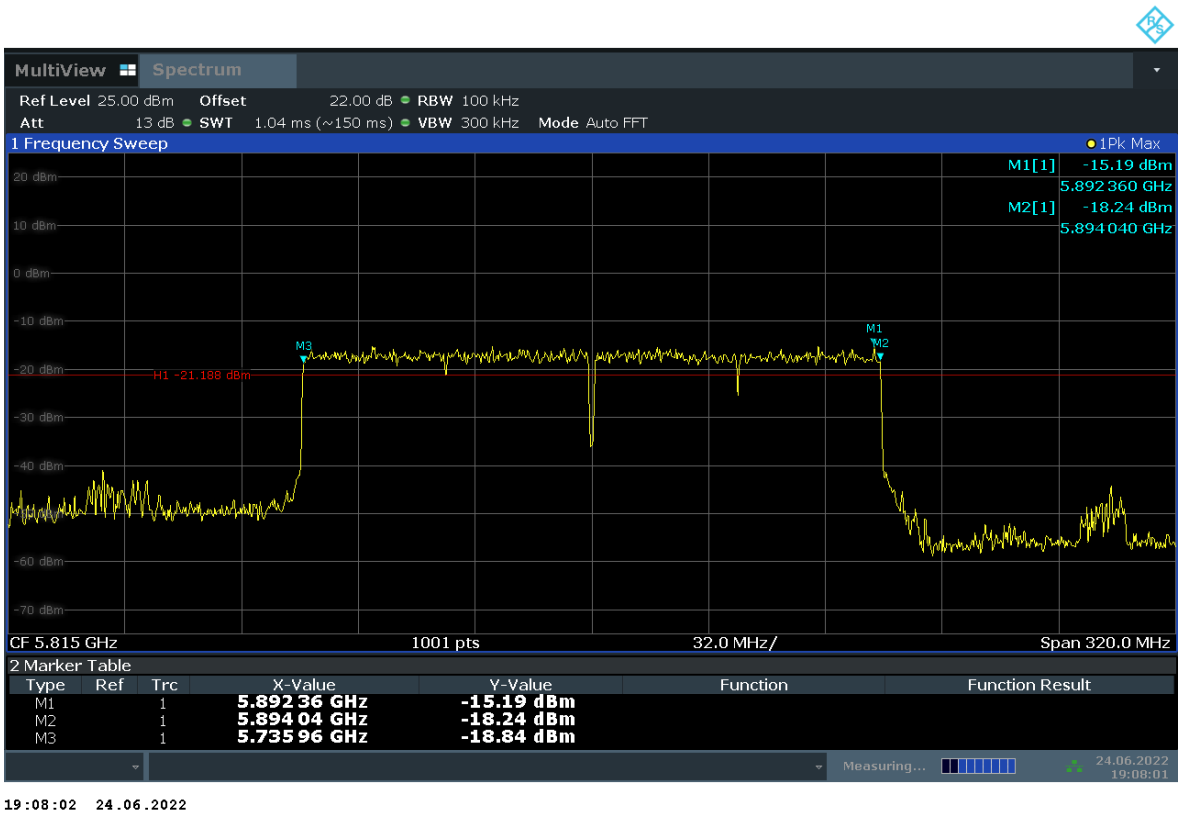


Fig. 10 Occupied 6dB Bandwidth (802.11ax-HE160, Ch 163)

A.5. 99% Occupied Bandwidth

Method of Measurement: See ANSI C63.10-2013 12.4.2.

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth. Authorized licensed use limited to: China Academy of Telecom Research (CATR). Downloaded on November 22,2013 at 00:08:06 UTC from IEEE Xplore. Restrictions apply. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices Copyright © 2013 IEEE. All rights reserved.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power 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; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

Measurement Result:

Mode	Channel	99% Occupied Bandwidth (MHz)		conclusion
802.11a	169	Fig.11	16.62	P
	173	Fig.12	16.61	P
	177	Fig.13	16.58	P
802.11ax HE20	169	Fig.14	19.25	P
	173	Fig.15	19.23	P
	177	Fig.16	19.23	P
802.11ax HE40	167	Fig.17	38.44	P
	175	Fig.18	38.49	P
802.11ax HE80	171	Fig.19	78.46	P
802.11ax HE160	163	Fig.20	157.27	P

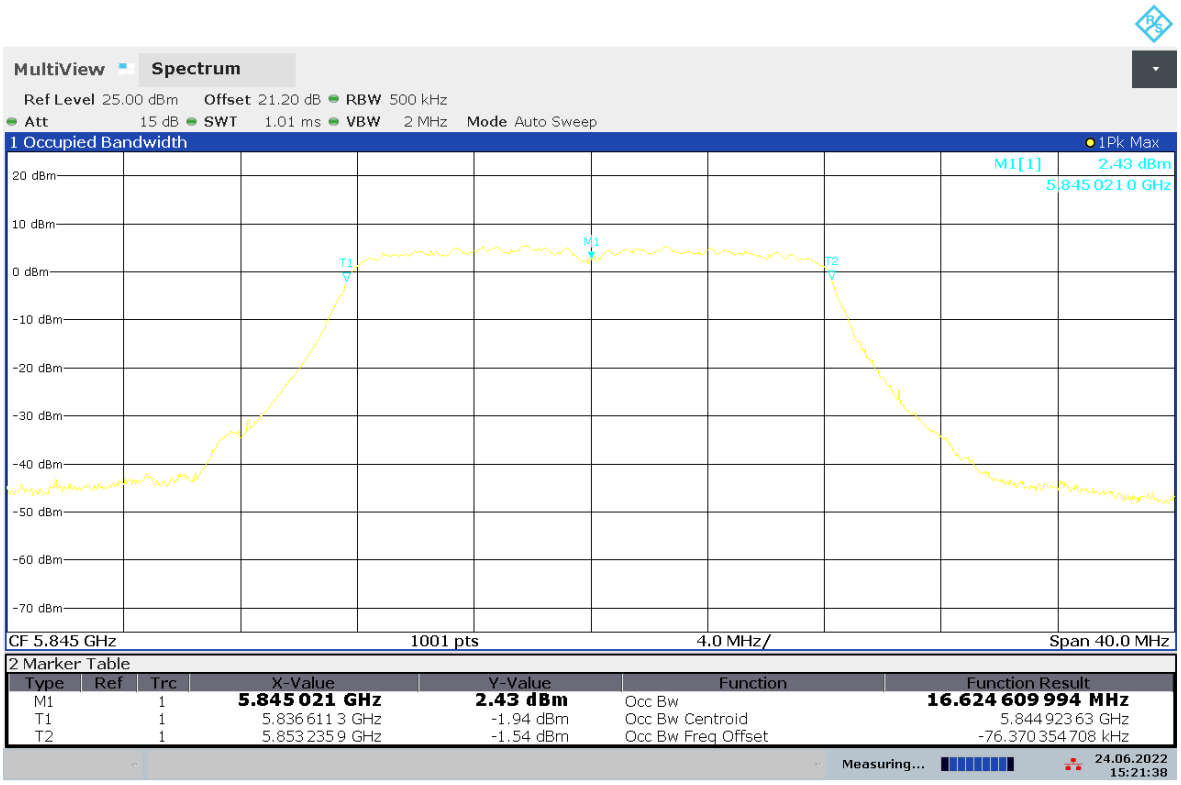


Fig. 11 99% Occupied Bandwidth (802.11a, Ch 169)

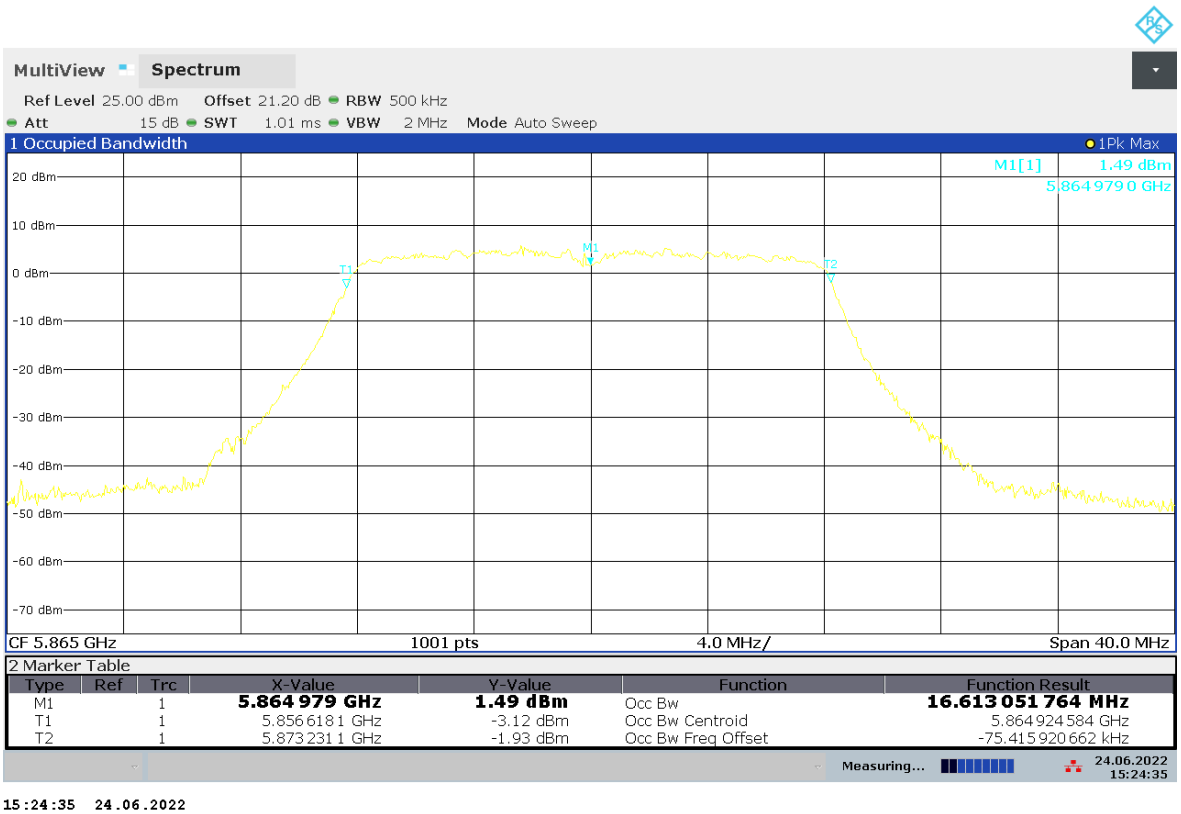


Fig. 12 99% Occupied Bandwidth (802.11a, Ch 173)

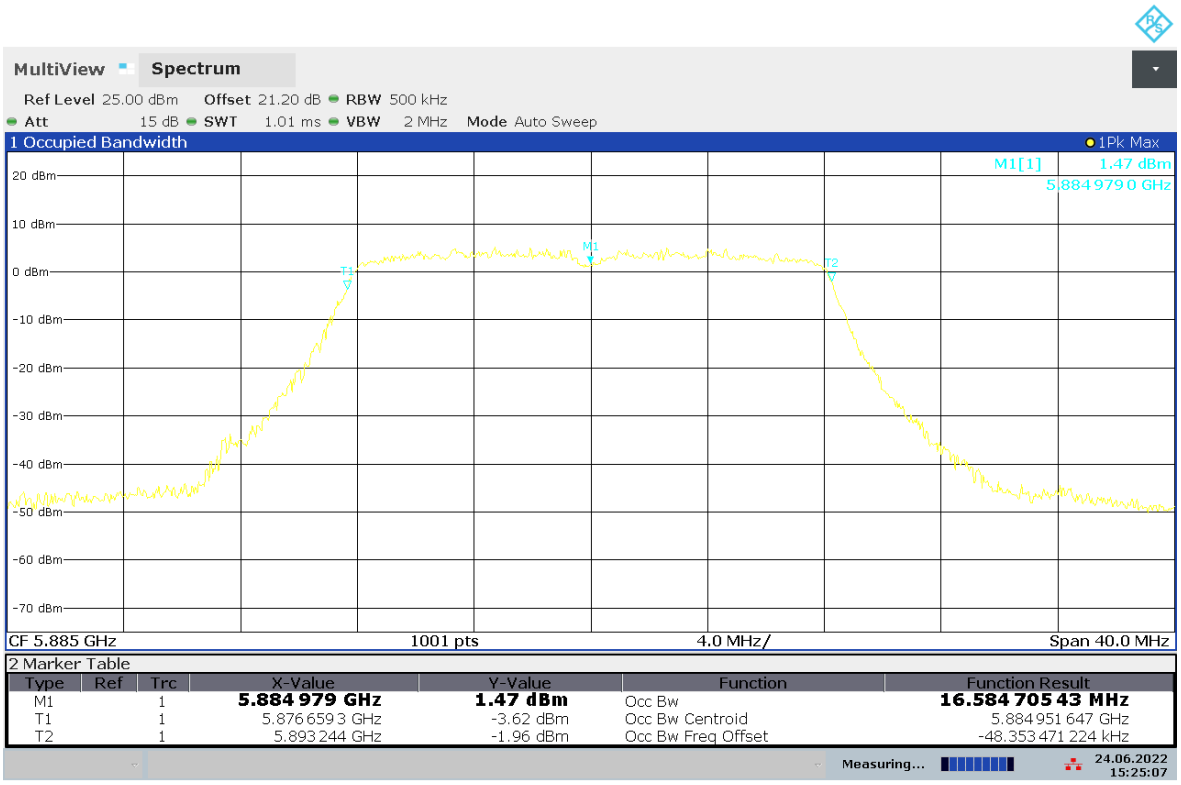


Fig. 13 99% Occupied Bandwidth (802.11a, Ch 177)

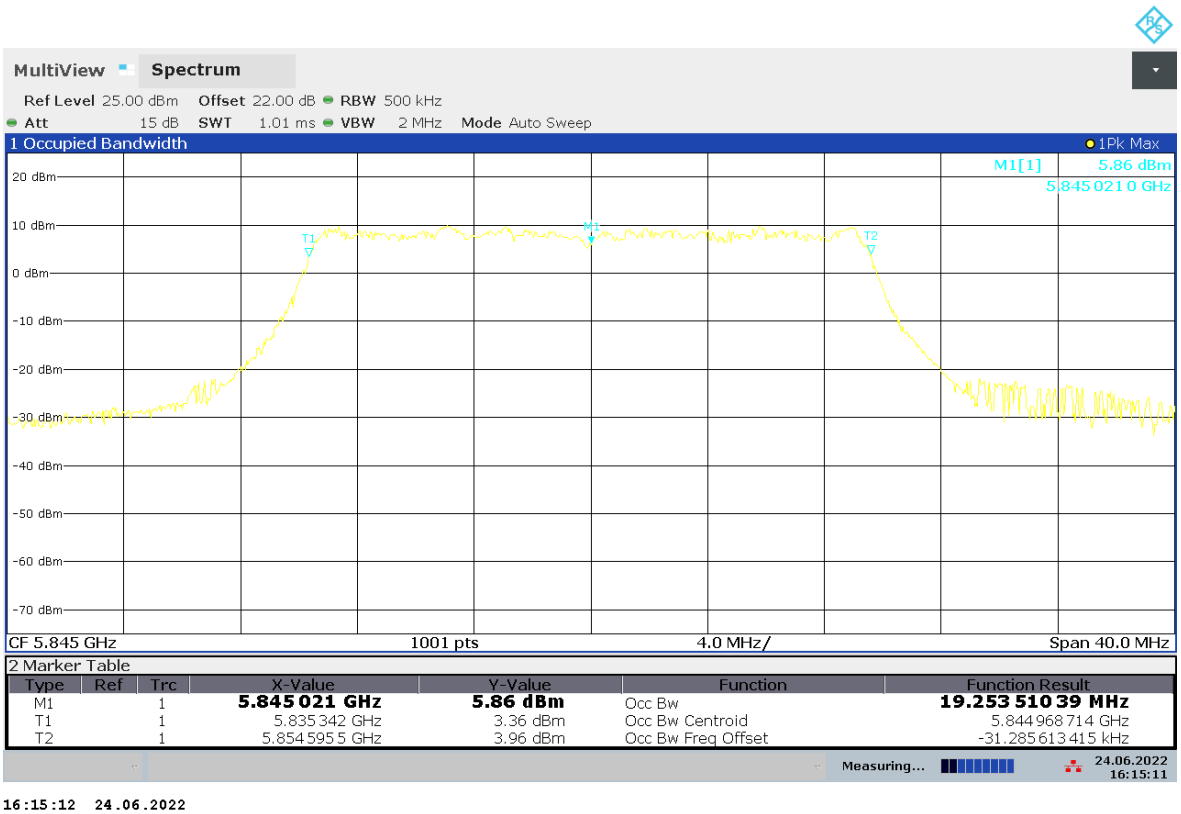


Fig. 14 99% Occupied Bandwidth (802.11ax-HE20, Ch 169)

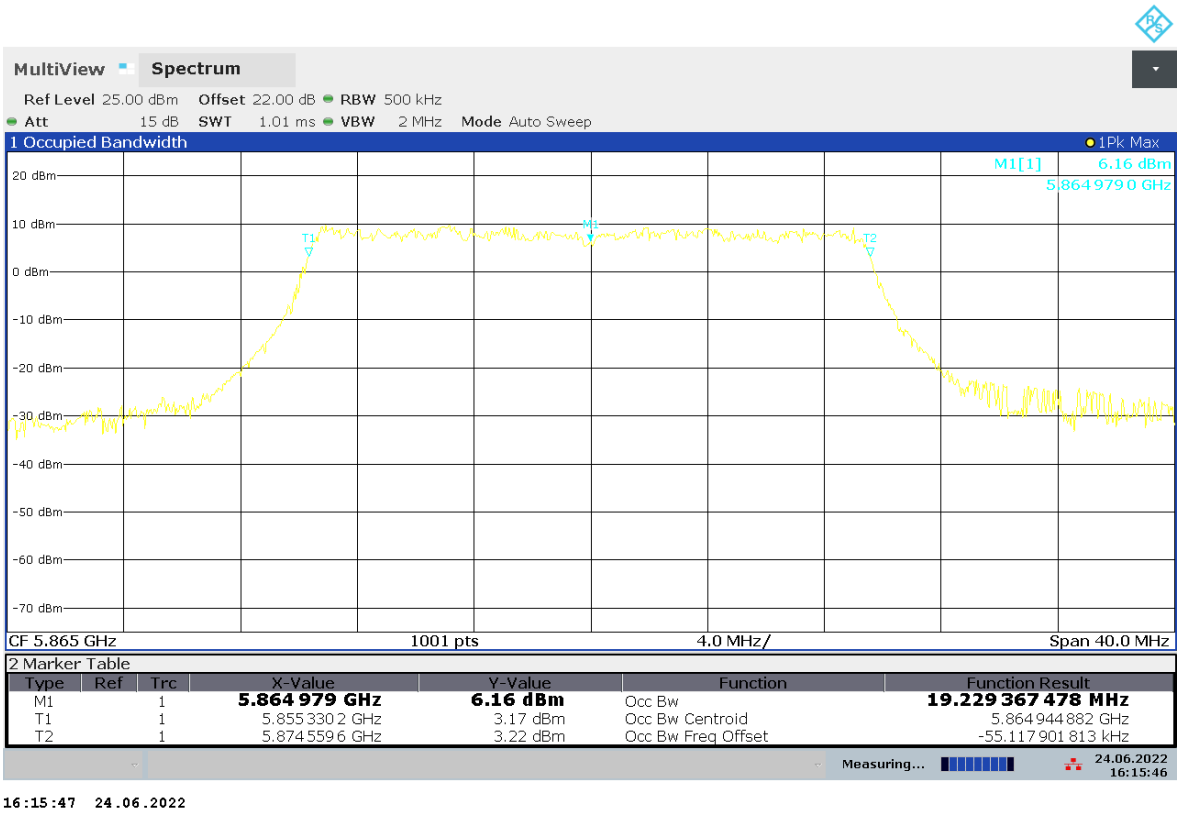


Fig. 15 99% Occupied Bandwidth (802.11ax-HE20, Ch 173)

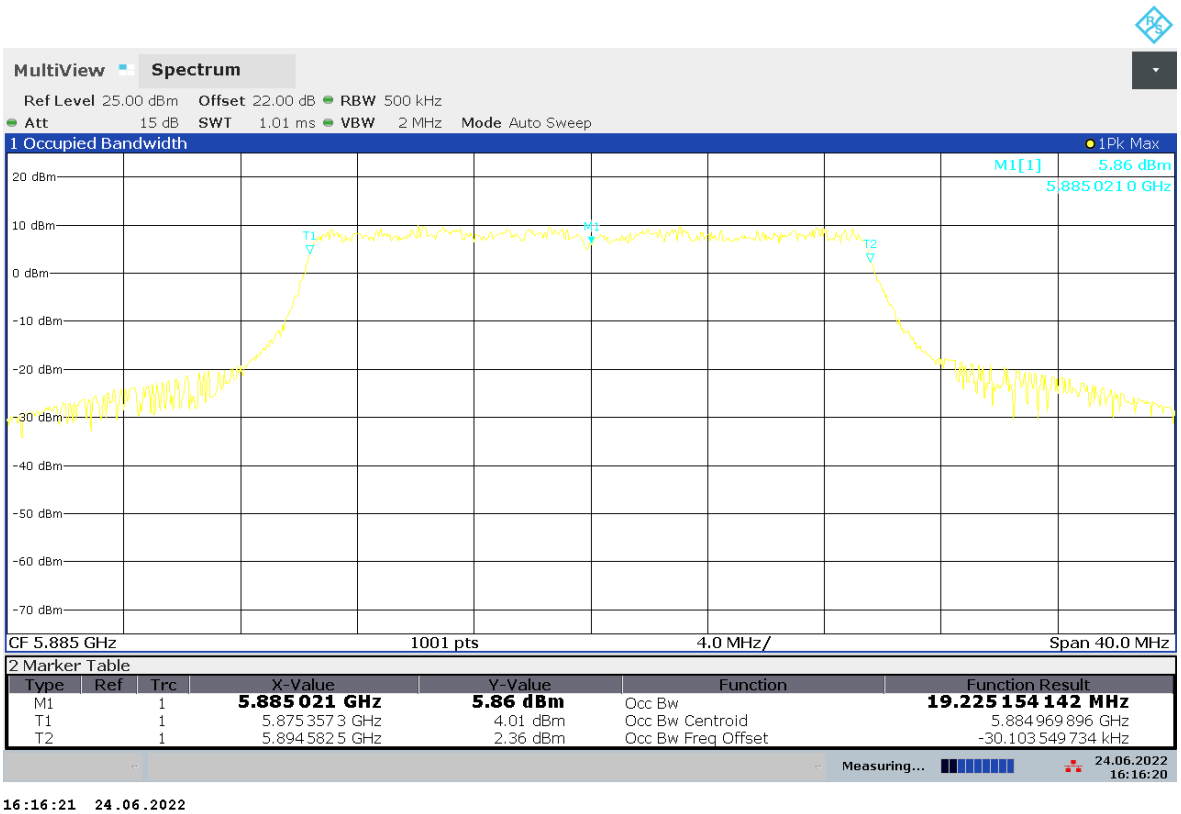


Fig. 16 99% Occupied Bandwidth (802.11ax-HE20, Ch 177)

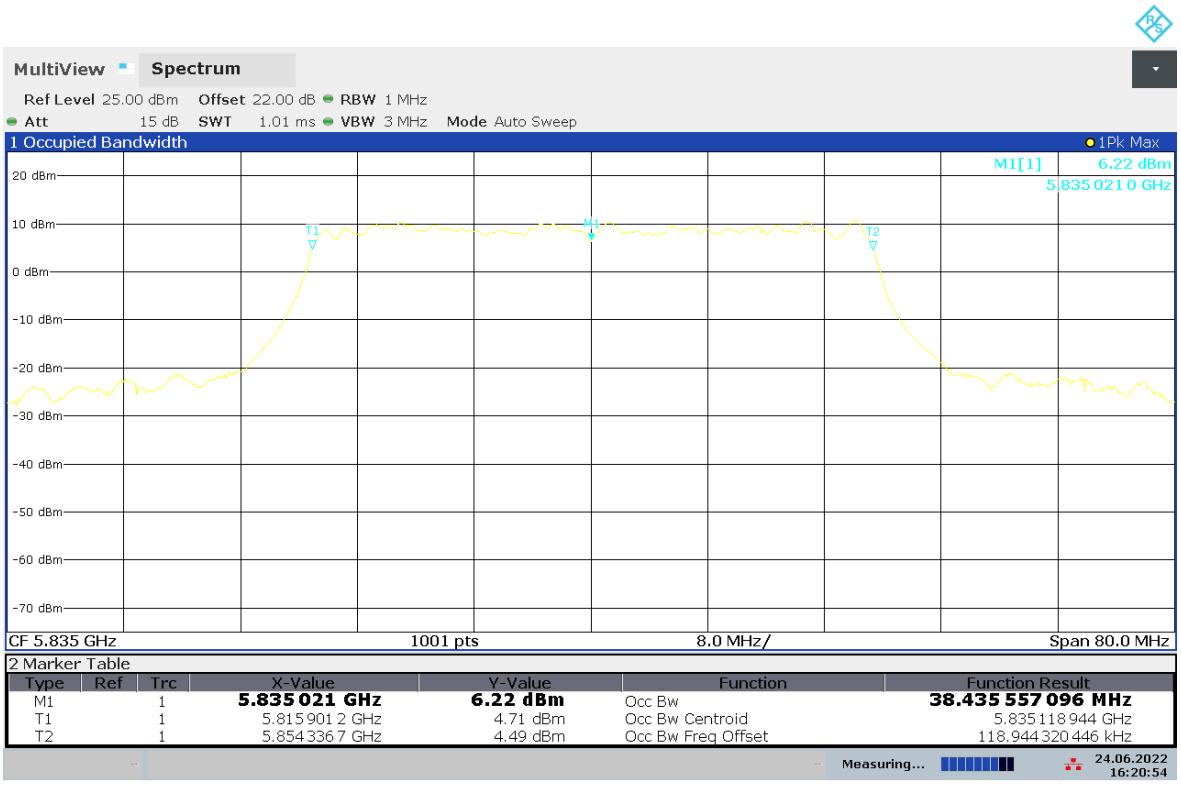


Fig. 17 99% Occupied Bandwidth (802.11ax-HE40, Ch 167)

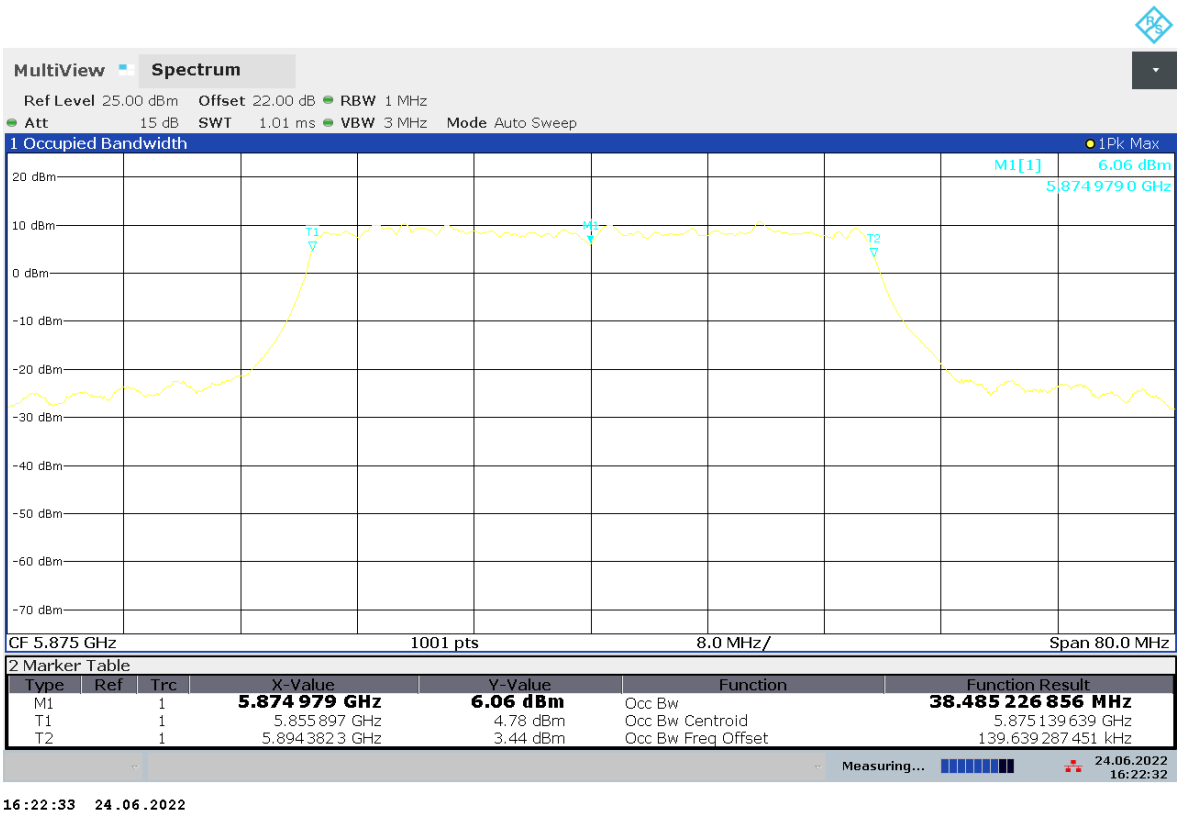


Fig. 18 99% Occupied Bandwidth (802.11ax-HE40, Ch 175)

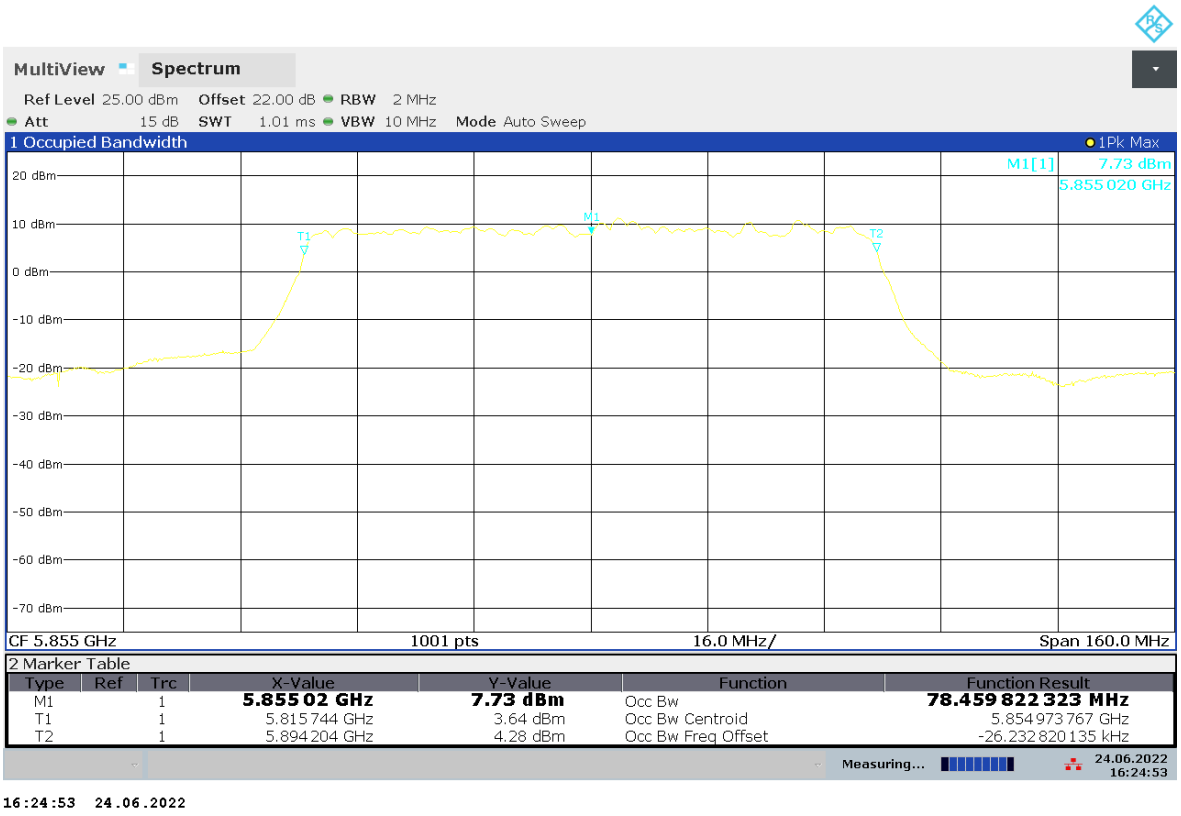


Fig. 19 99% Occupied Bandwidth (802.11ax-HE80, Ch 171)

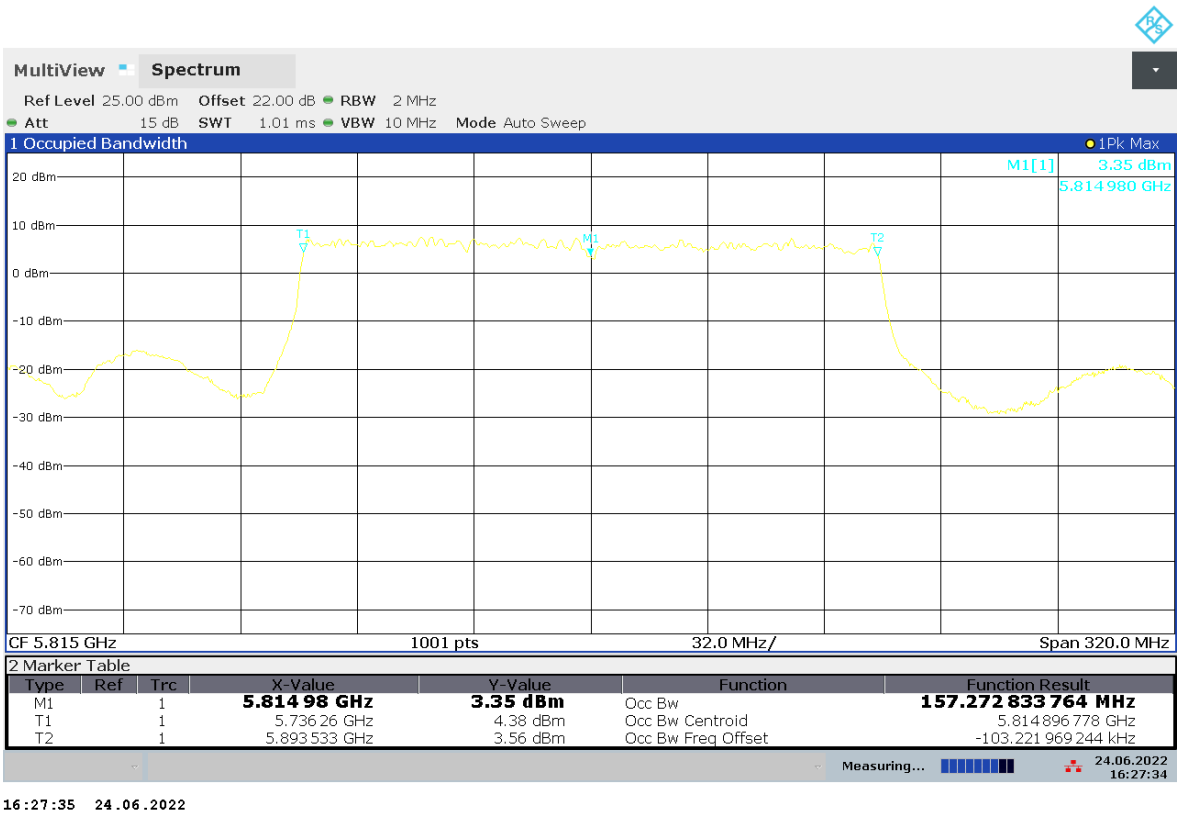


Fig. 20 99% Occupied Bandwidth (802.11ax-HE160, Ch 163)

A.6. Out of Band Emissions

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.407 (b)	For a client device or an outdoor access point, all emissions at or above 5.895 GHz shall not exceed an EIRP of -5 dBm/MHz and shall decrease linearly to an EIRP of -27 dBm/MHz at or above 5.925 GHz. For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an EIRP of −27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

The measurement is made according to C63.10 2020-clause 12.7, KDB 789033 and KDB 291074

EUT ID: EUT2

Measurement Results:

SISO-Ant4

Mode	Channel	Out of Band Emissions	conclusion
802.11a	169	Fig.21	P
		Fig.22	P
	177	Fig.23	P
		Fig.24	P
802.11n HT20	169	Fig.25	P
		Fig.26	P
	177	Fig.27	P
		Fig.28	P
802.11ac VHT40	167	Fig.29	P
		Fig.30	P
	175	Fig.31	P
		Fig.32	P
802.11ac VHT160	163	Fig.33	P
		Fig.34	P
802.11ax HE20 (full RU)	169	Fig.35	P
		Fig.36	P
	177	Fig.37	P
		Fig.38	P
802.11ax HE40 (full RU)	167	Fig.39	P
		Fig.40	P
	175	Fig.41	P
		Fig.42	P
802.11ax HE80	171	Fig.43	P

(full RU)		Fig.44	P
802.11ax HE160 (full RU)	163	Fig.45	P
		Fig.46	P

SISO-Ant5

Mode	Channel	Out of Band Emissions	conclusion
802.11ac VHT80	171	Fig.47	P
		Fig.48	P

MIMO-Ant4

Mode	Channel	Out of Band Emissions	conclusion
802.11a	169	Fig.49	P
		Fig.50	P
	177	Fig.51	P
		Fig.52	P
802.11n HT20	169	Fig.53	P
		Fig.54	P
	177	Fig.55	P
		Fig.56	P
802.11ac VHT40	167	Fig.57	P
		Fig.58	P
	175	Fig.59	P
		Fig.60	P
802.11ac VHT160	163	Fig.61	P
		Fig.62	P
802.11ax HE20 (full RU)	169	Fig.63	P
		Fig.64	P
	177	Fig.65	P
		Fig.66	P
802.11ax HE40 (full RU)	167	Fig.67	P
		Fig.68	P
	175	Fig.69	P
		Fig.70	P
802.11ax HE80 (full RU)	171	Fig.71	P
		Fig.72	P
802.11ax HE160 (full RU)	163	Fig.73	P
		Fig.74	P

MIMO-Ant5

Mode	Channel	Out of Band Emissions	conclusion
802.11ac VHT80	171	Fig.75	P

		Fig.76	P

Note: All Antenna are tested, only the worst-case emissions have been reported.

SISO-Ant4

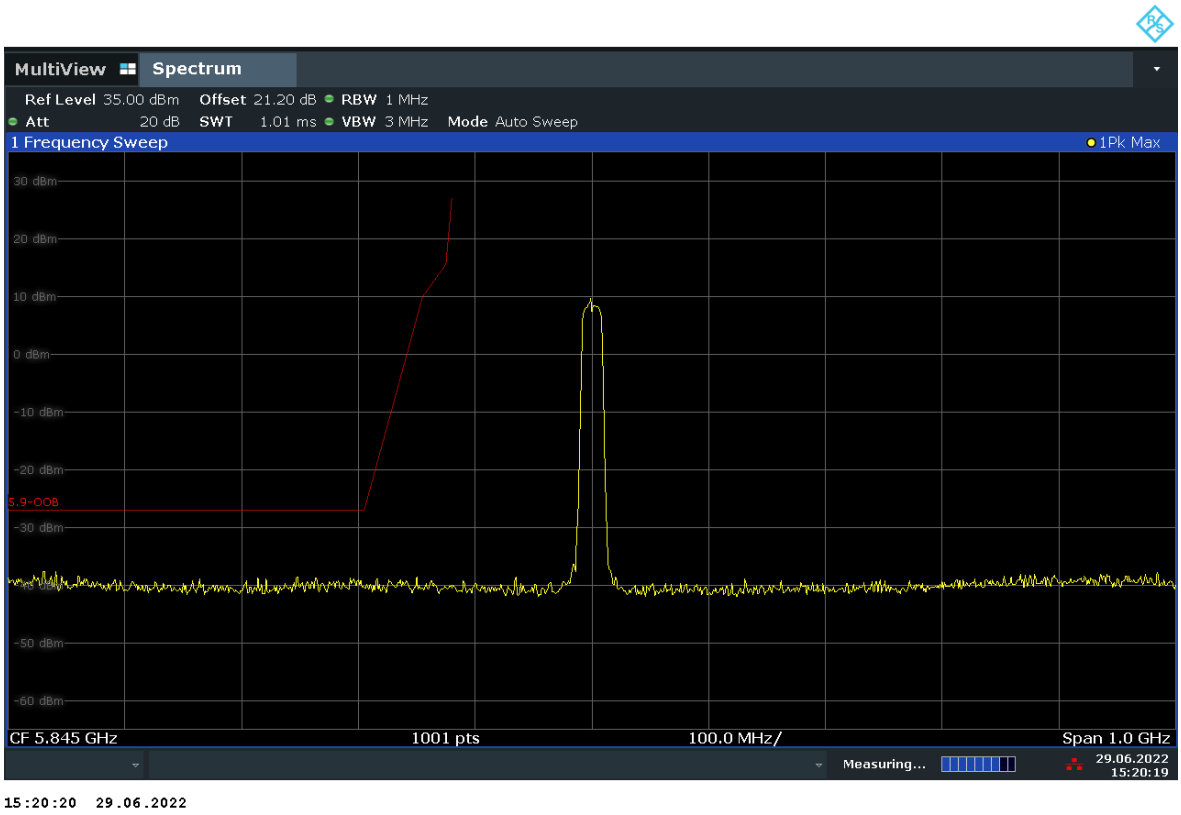


Fig. 21 Out of Band Emission - Conducted (802.11a, Ch169)

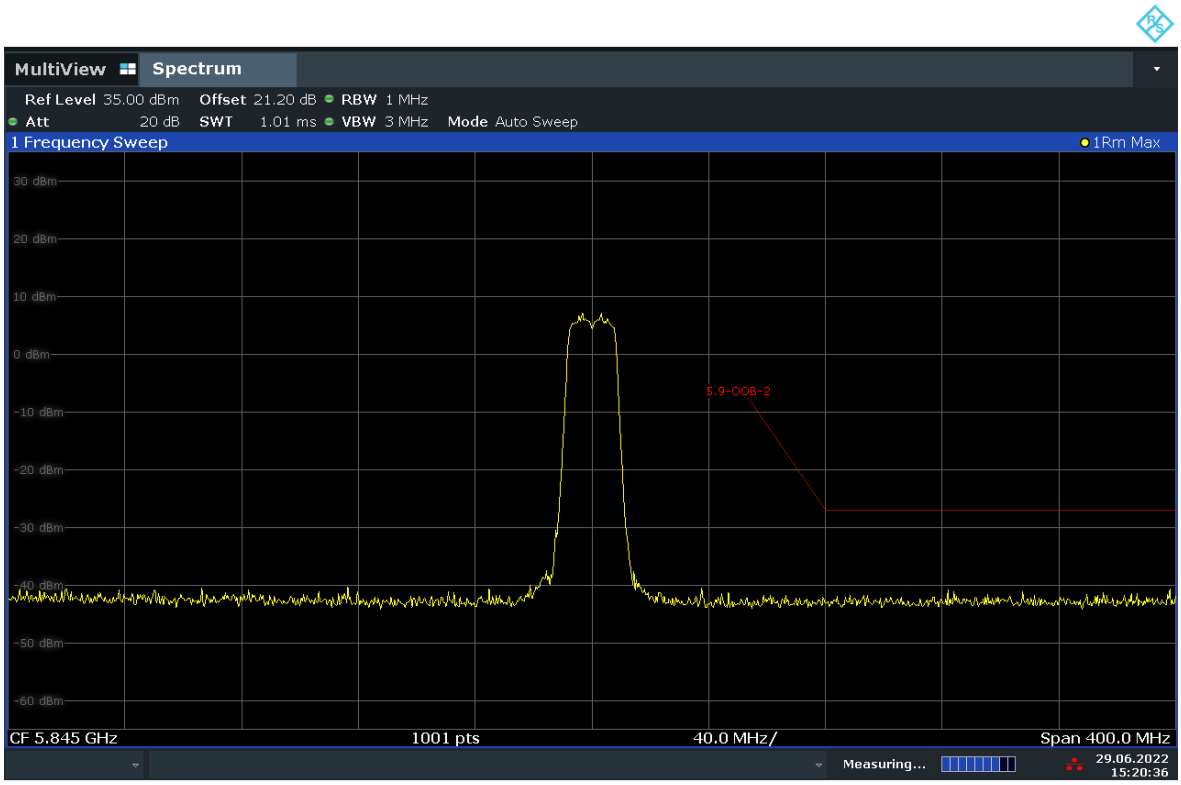


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Fig. 22 Out of Band Emission - Conducted (802.11a, Ch169)

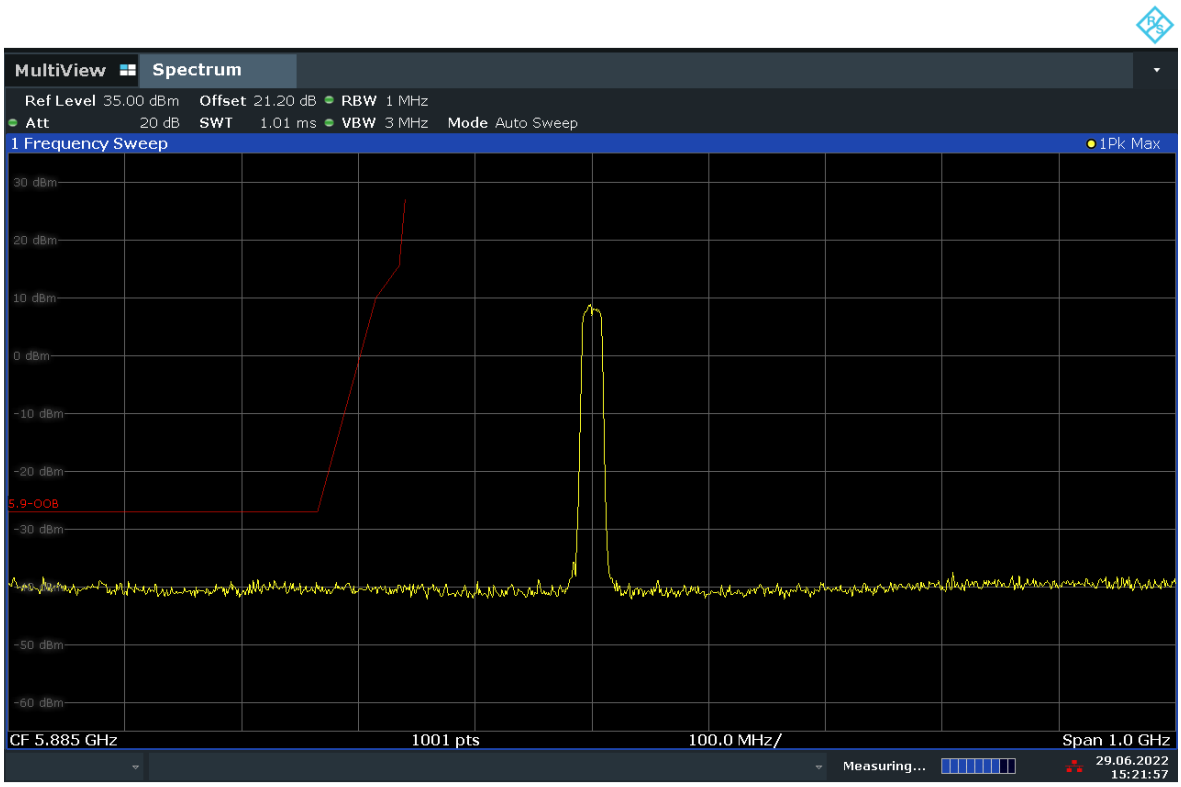

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Fig. 23 Out of Band Emission - Conducted (802.11a, Ch177)

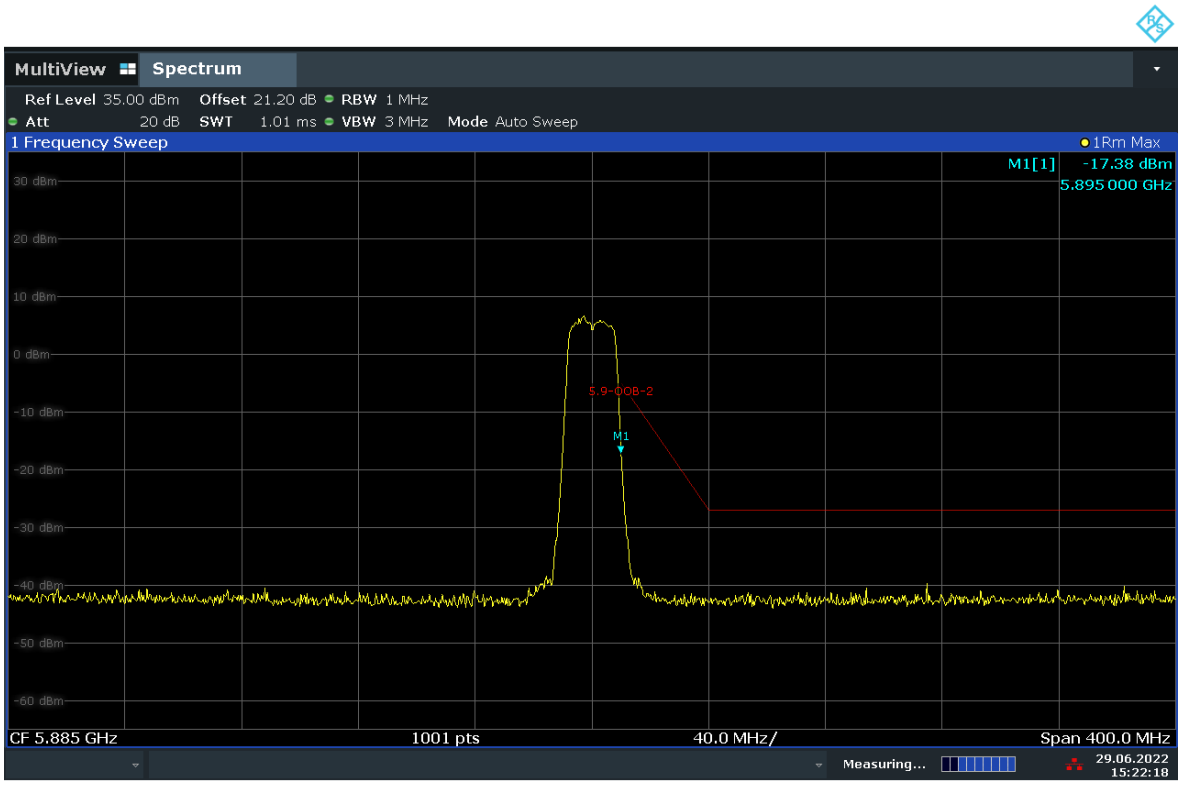

Fig. 24 Out of Band Emission - Conducted (802.11a, Ch177)

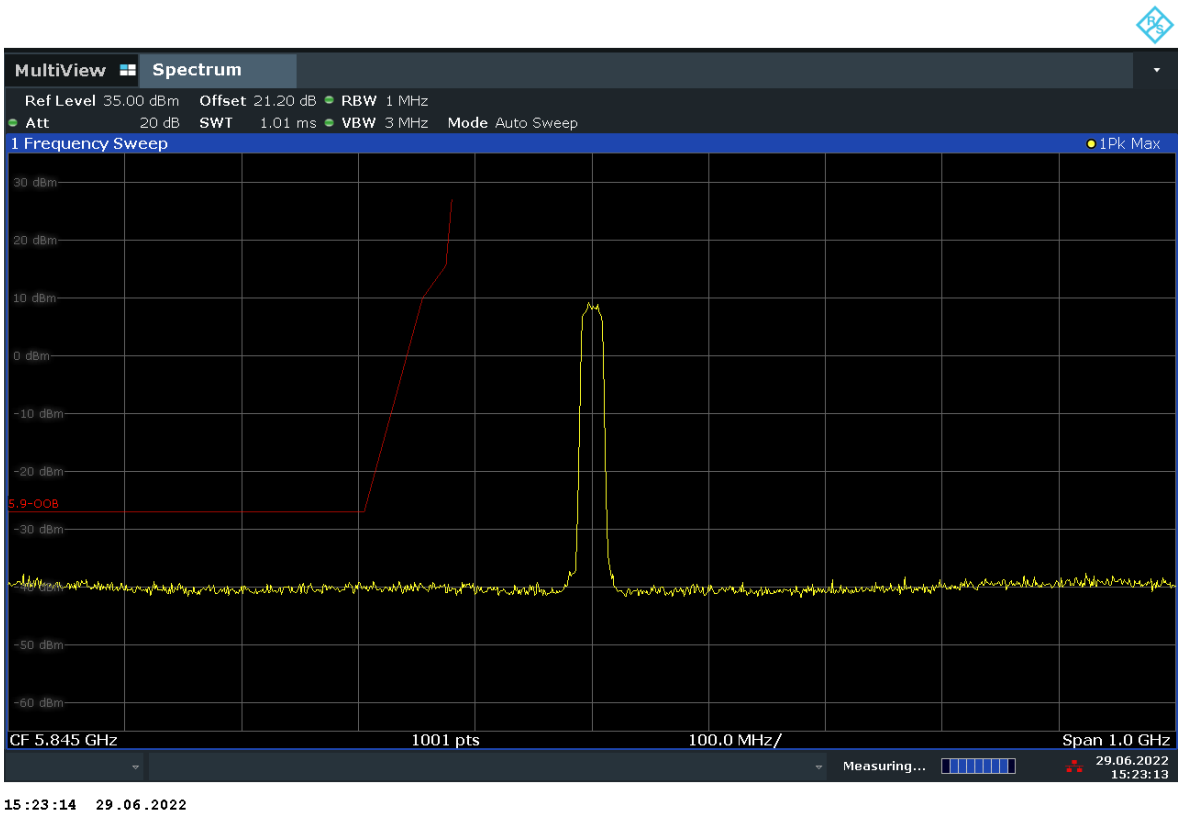

Fig. 25 Out of Band Emission - Conducted (802.11n-HT20, Ch169)

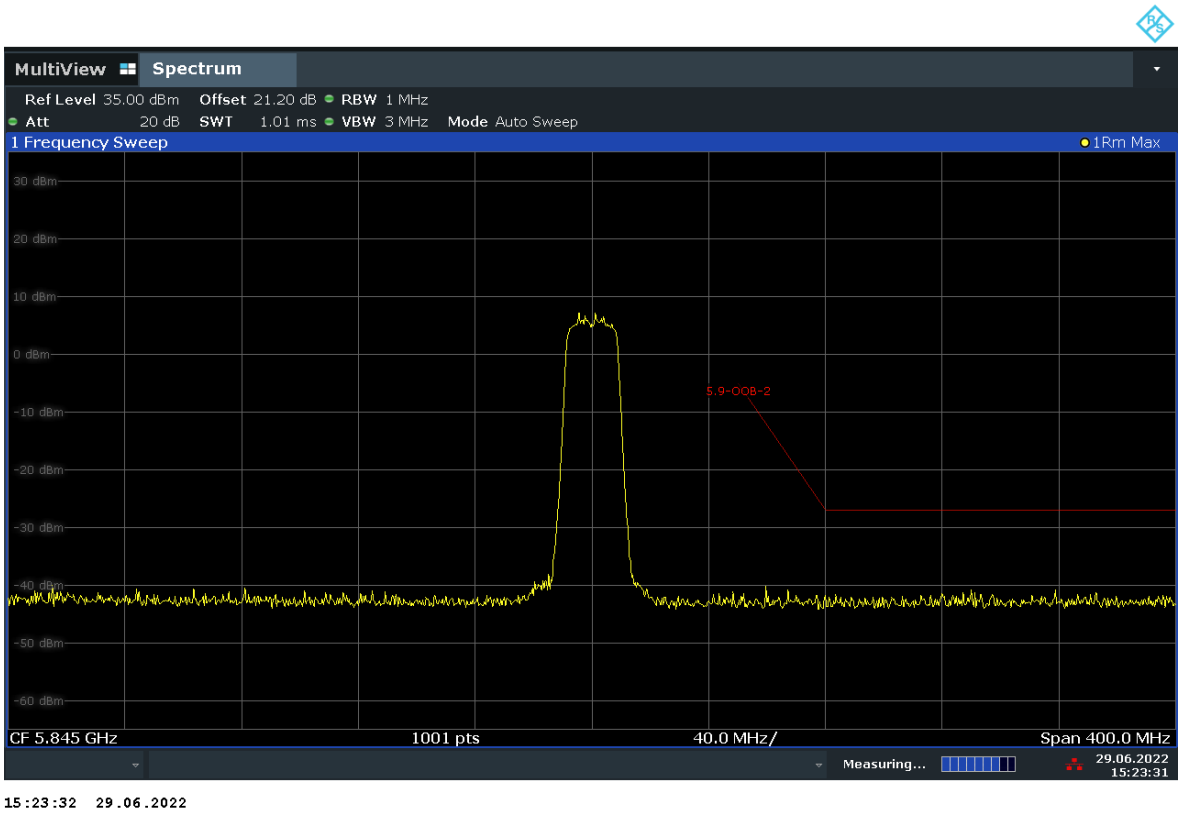

Fig. 26 Out of Band Emission - Conducted (802.11n-HT20, Ch169)

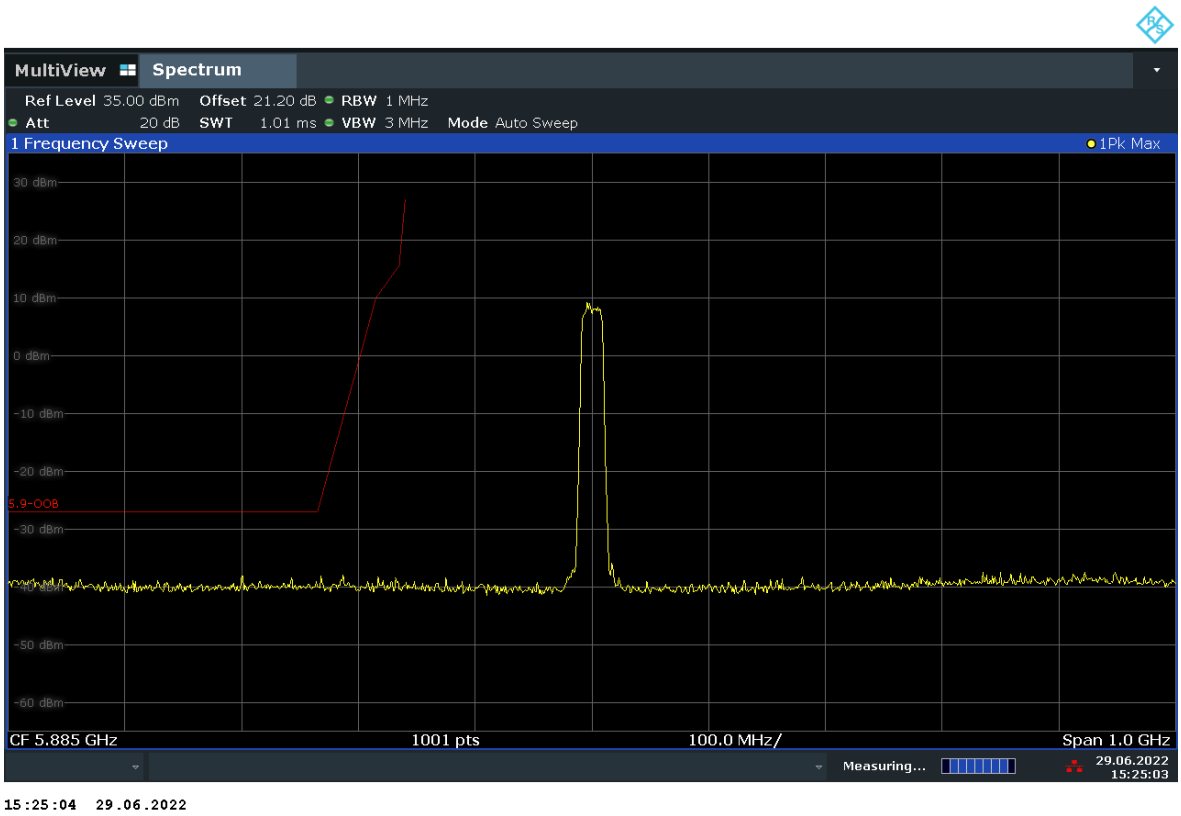

Fig. 27 Out of Band Emission - Conducted (802.11n-HT20, Ch177)

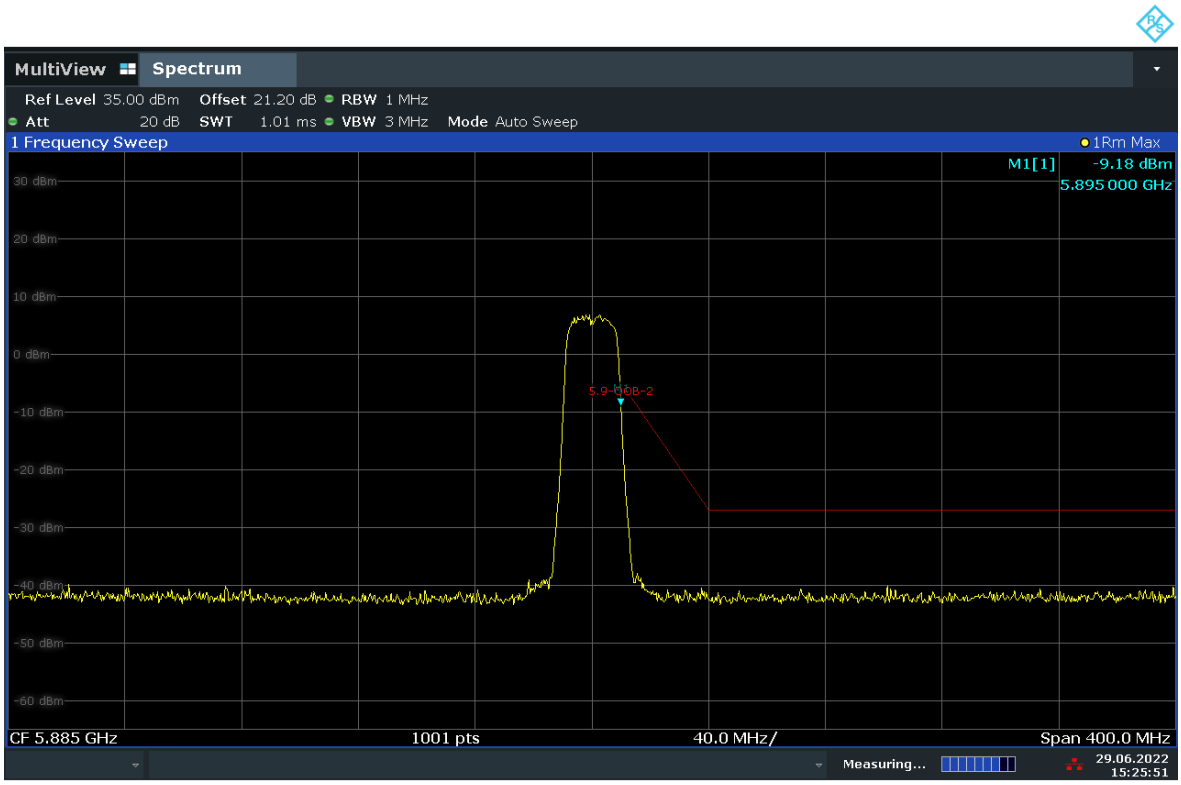

Fig. 28 Out of Band Emission - Conducted (802.11n-HT20, Ch177)

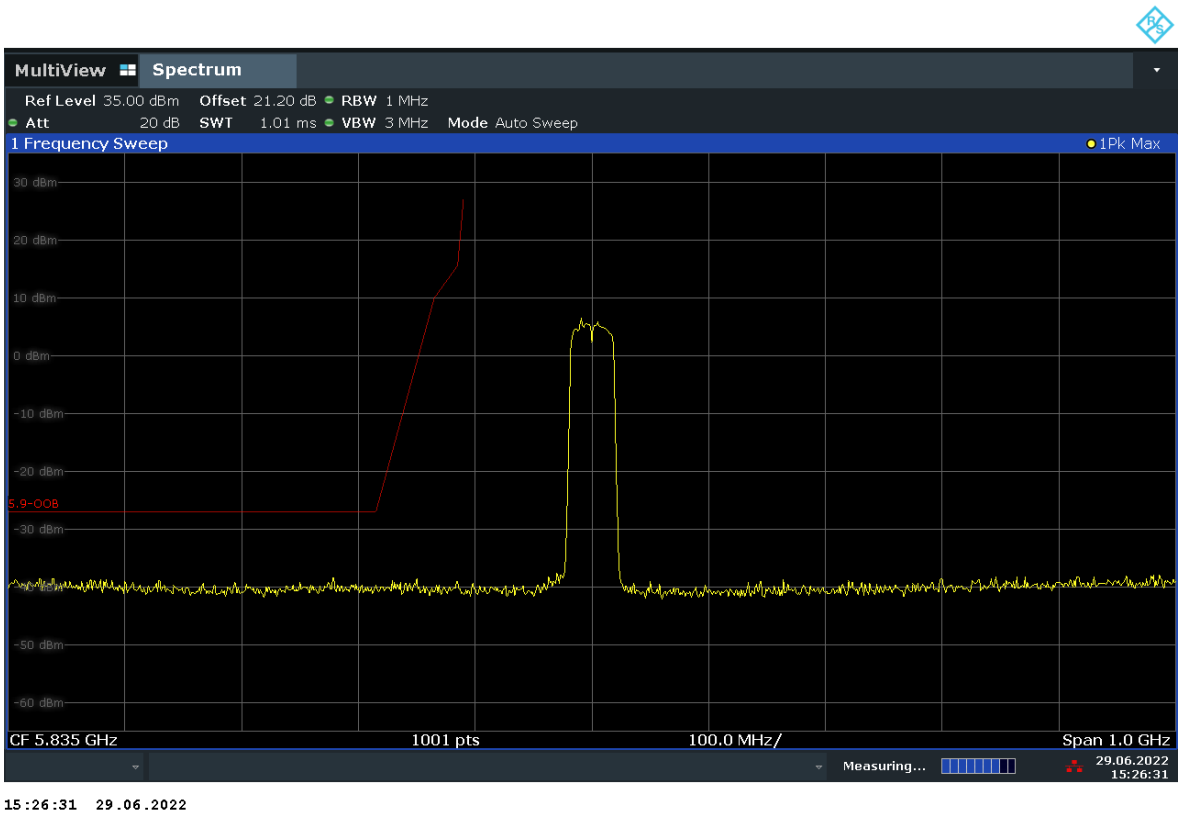

Fig. 29 Out of Band Emission - Conducted (802.11ac-VHT40, Ch167)

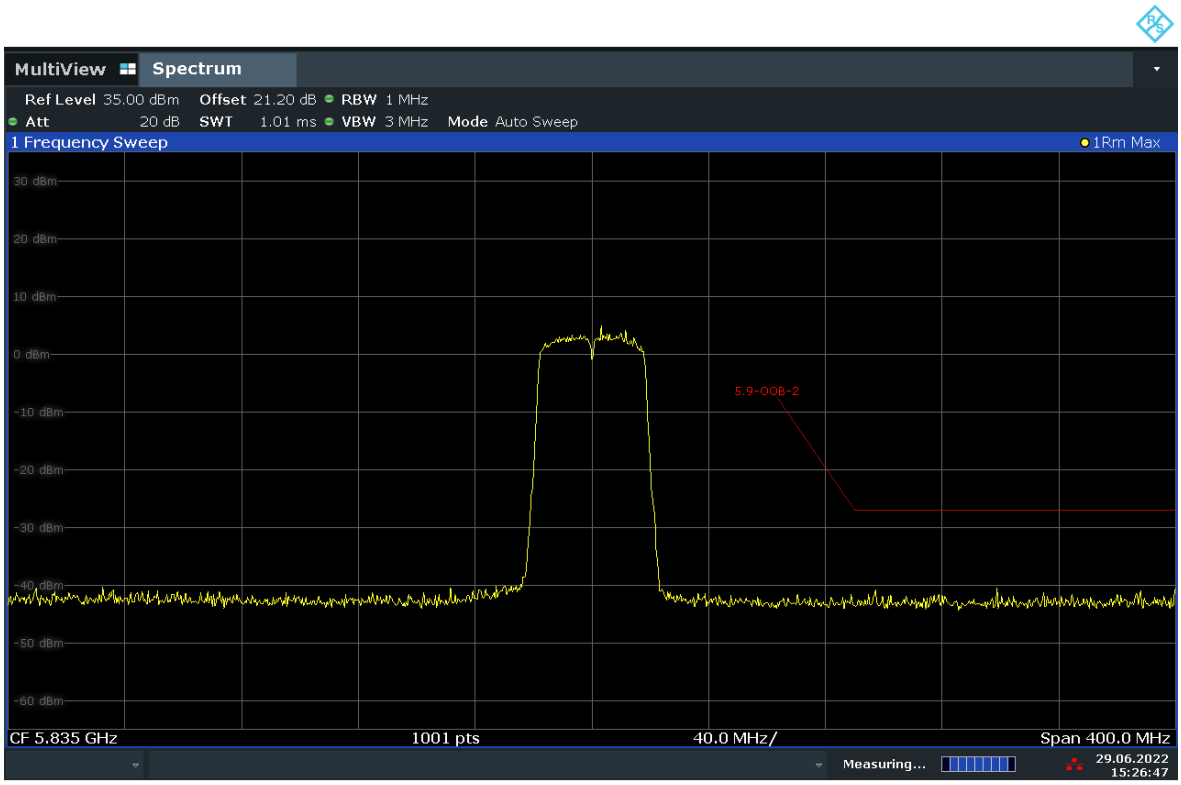

Fig. 30 Out of Band Emission - Conducted (802.11ac-VHT40, Ch167)

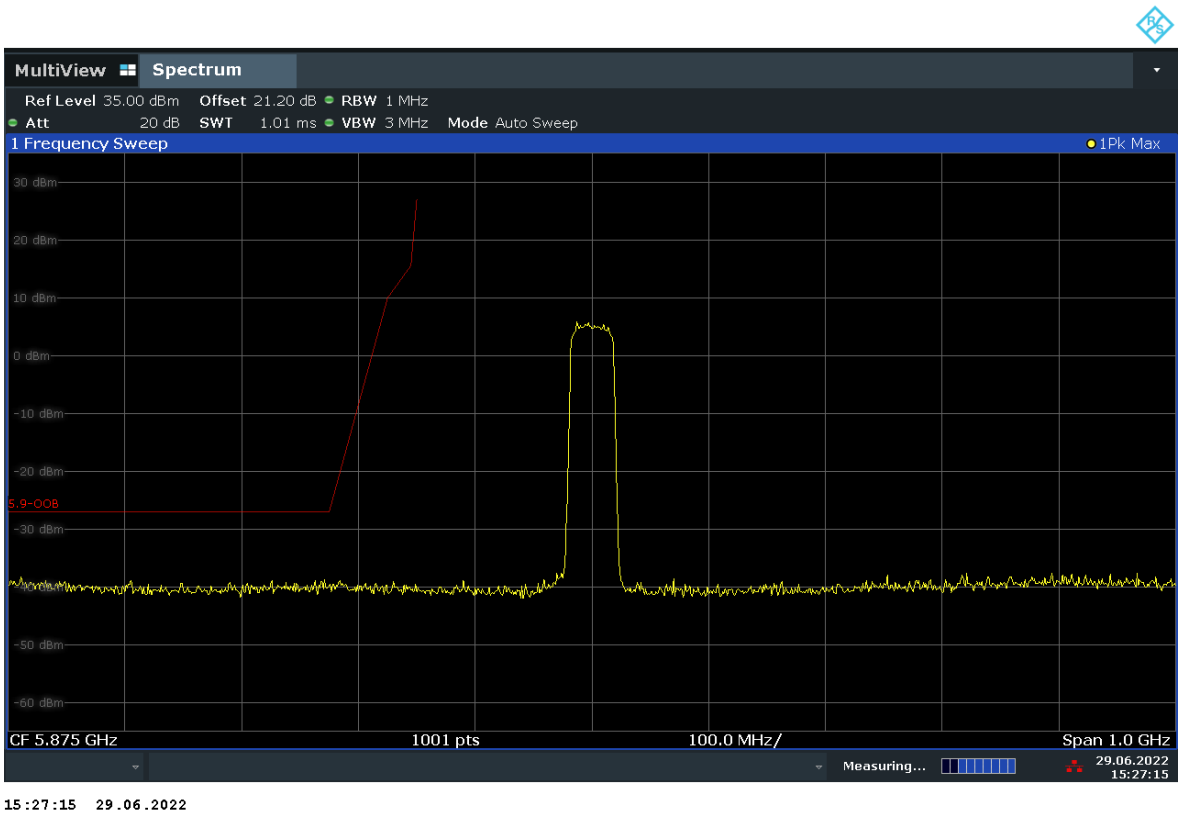

Fig. 31 Out of Band Emission - Conducted (802.11ac-VHT40, Ch175)

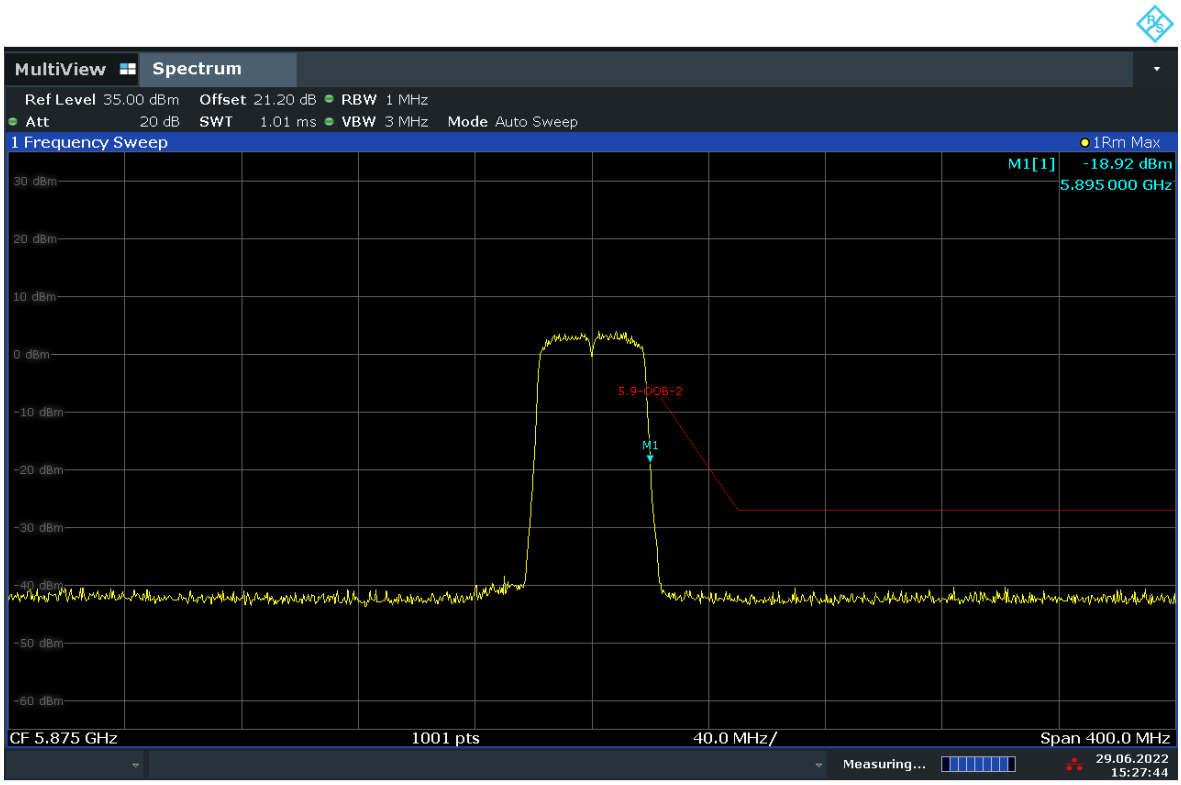

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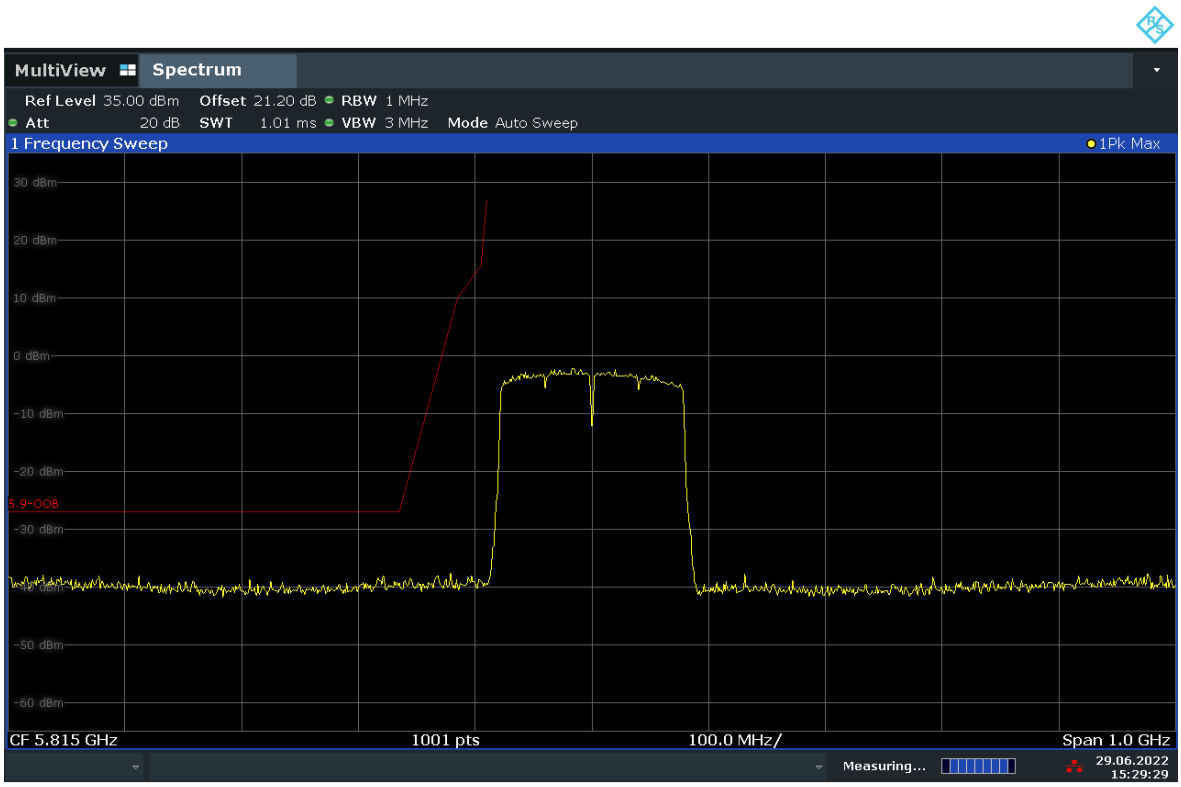
Fig. 32 Out of Band Emission - Conducted (802.11ac-VHT40, Ch175)



15:29:29 29.06.2022

Fig. 33 Out of Band Emission - Conducted (802.11ac-VHT160, Ch163)

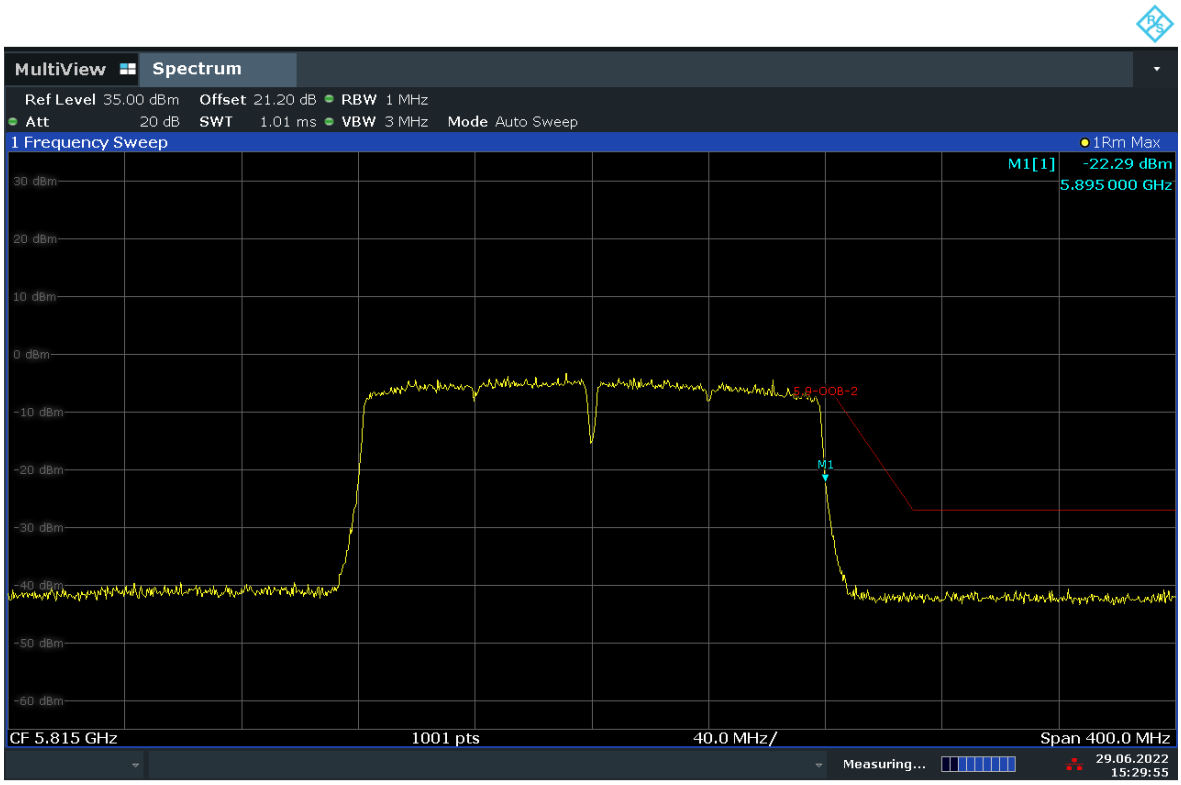


Fig. 34 Out of Band Emission - Conducted (802.11ac-VHT160, Ch163)

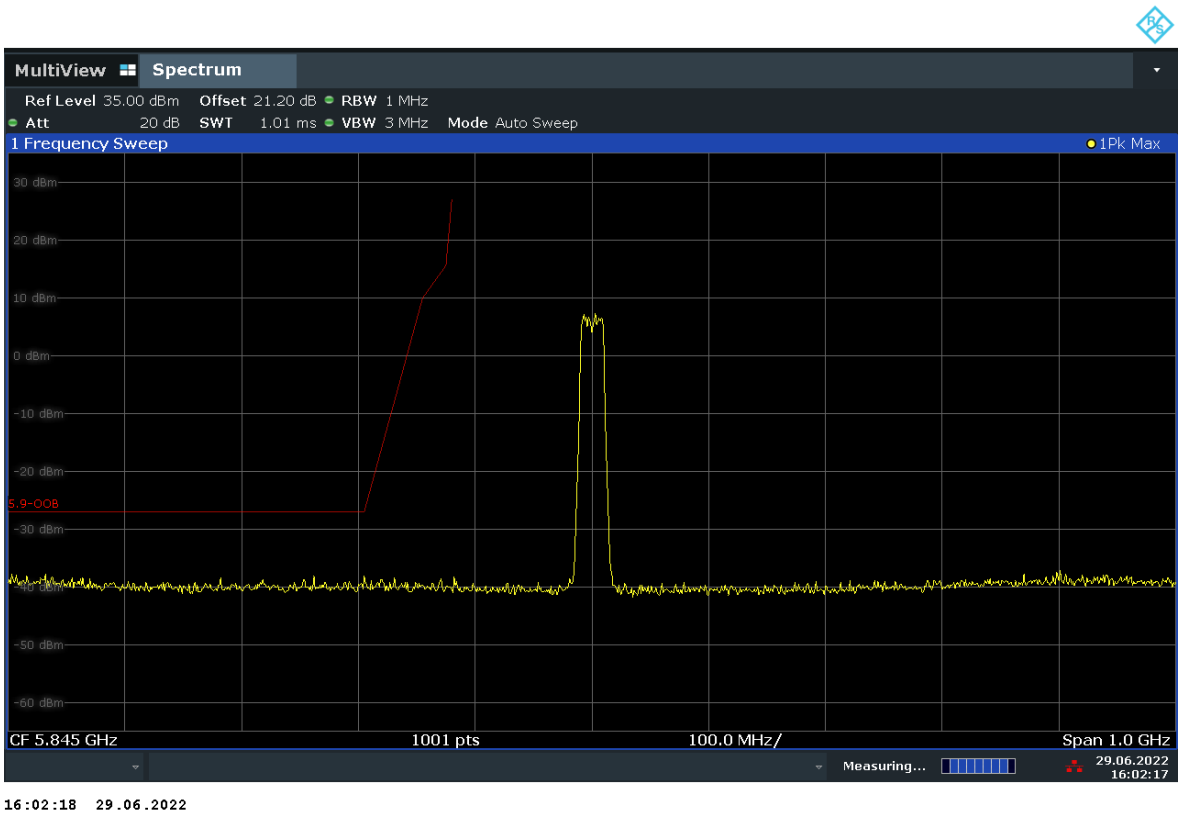


Fig. 35 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch169)

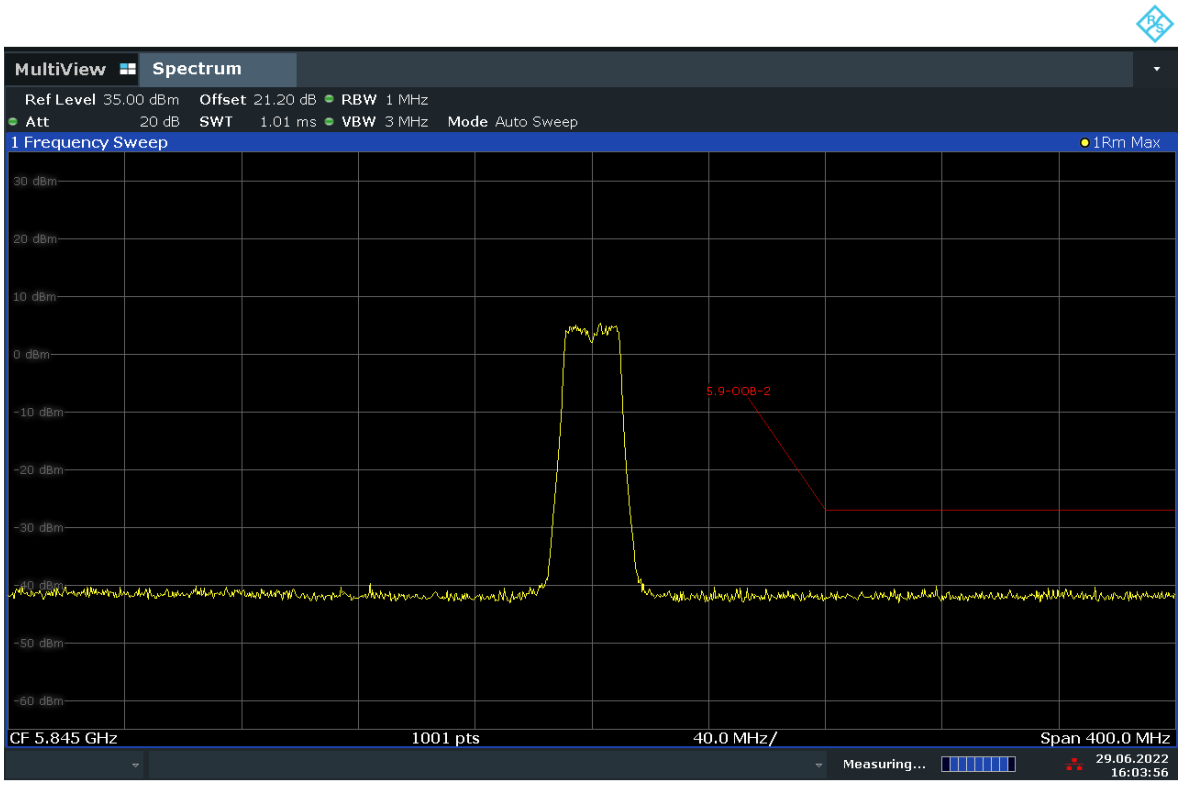


Fig. 36 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch169)

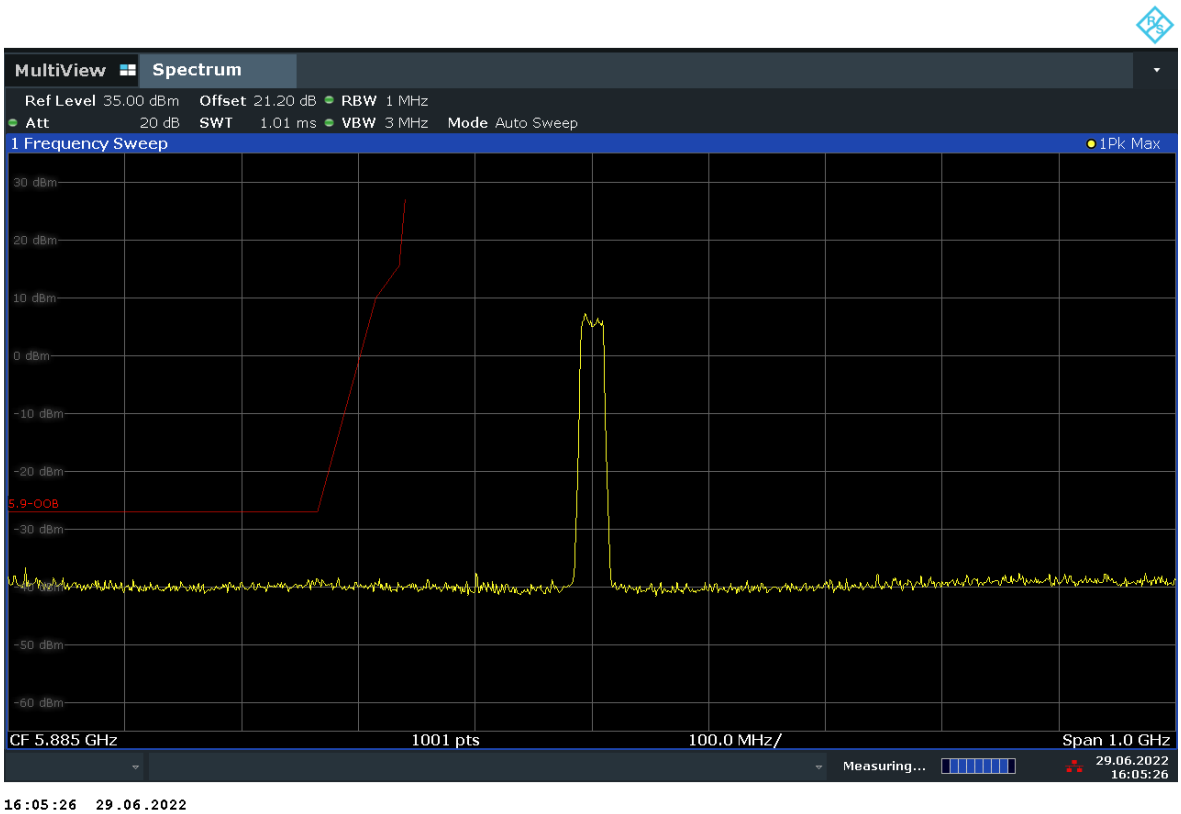


Fig. 37 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch177)

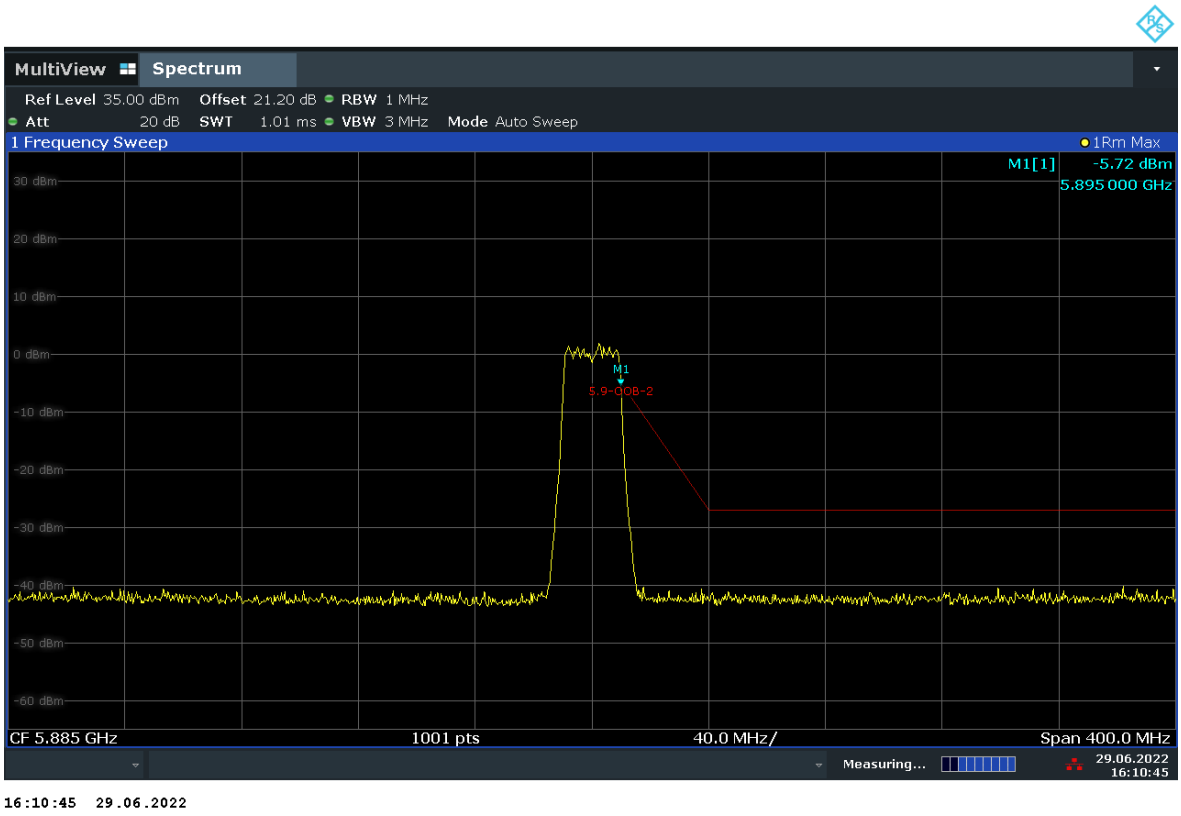


Fig. 38 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch177)

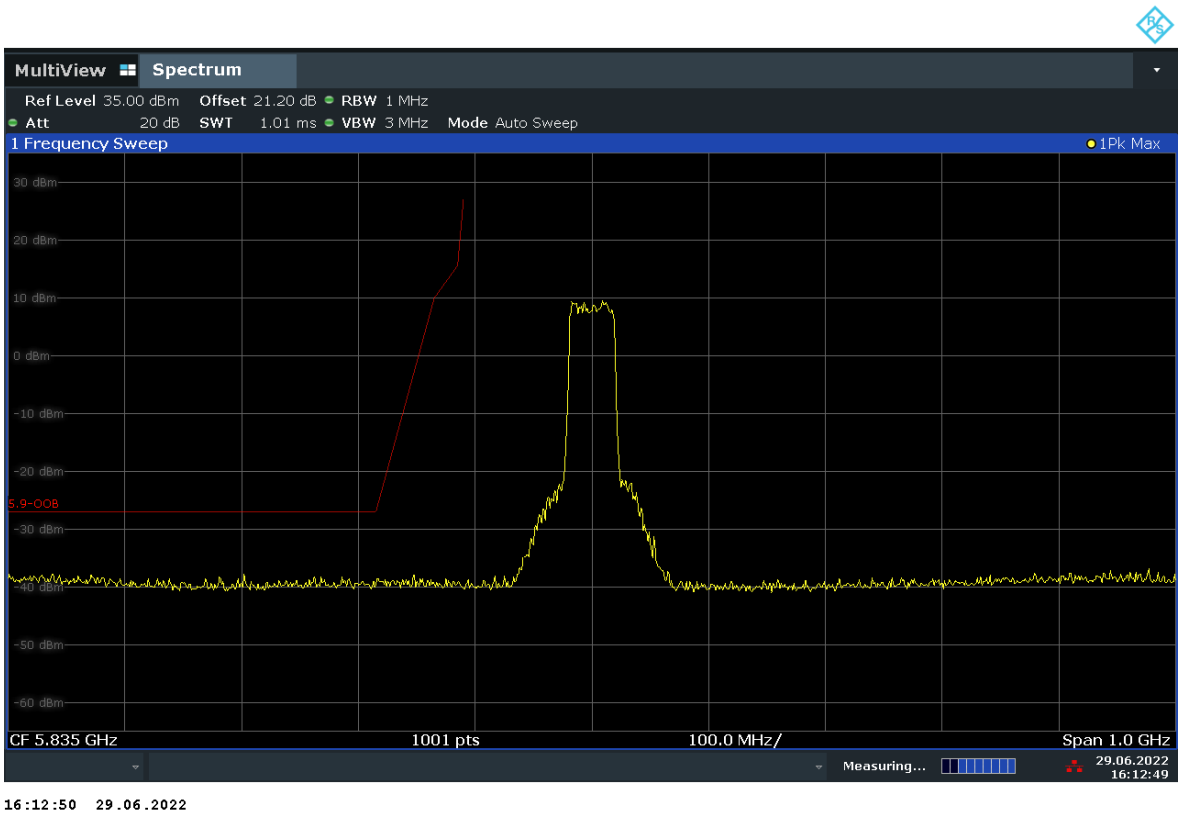


Fig. 39 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch167)

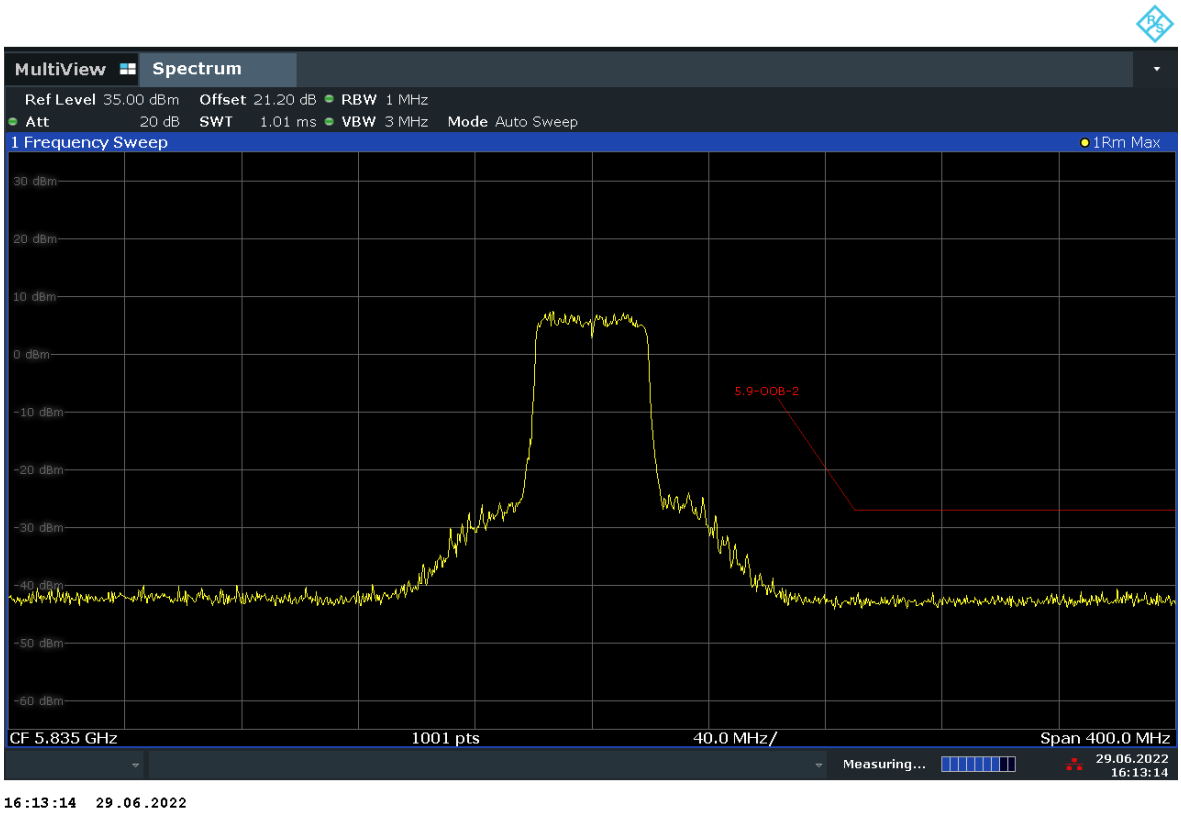


Fig. 40 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch167)

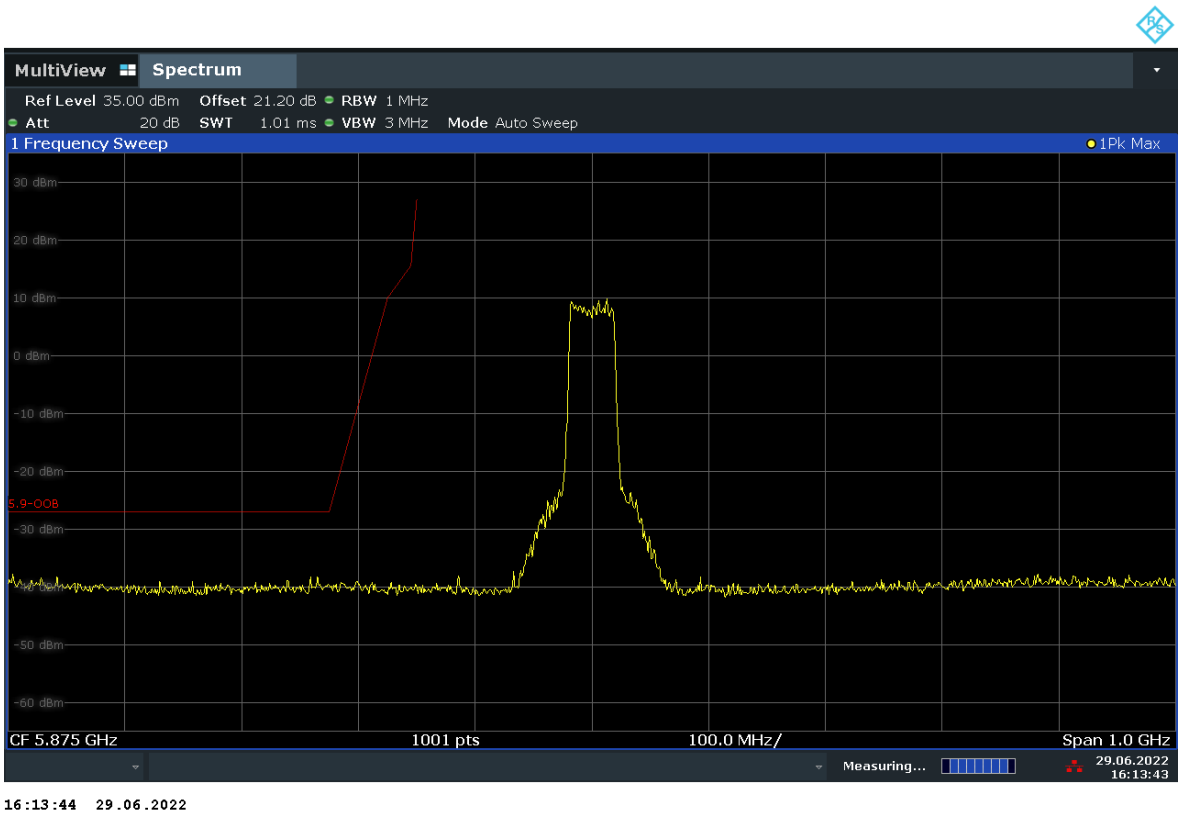


Fig. 41 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch175)

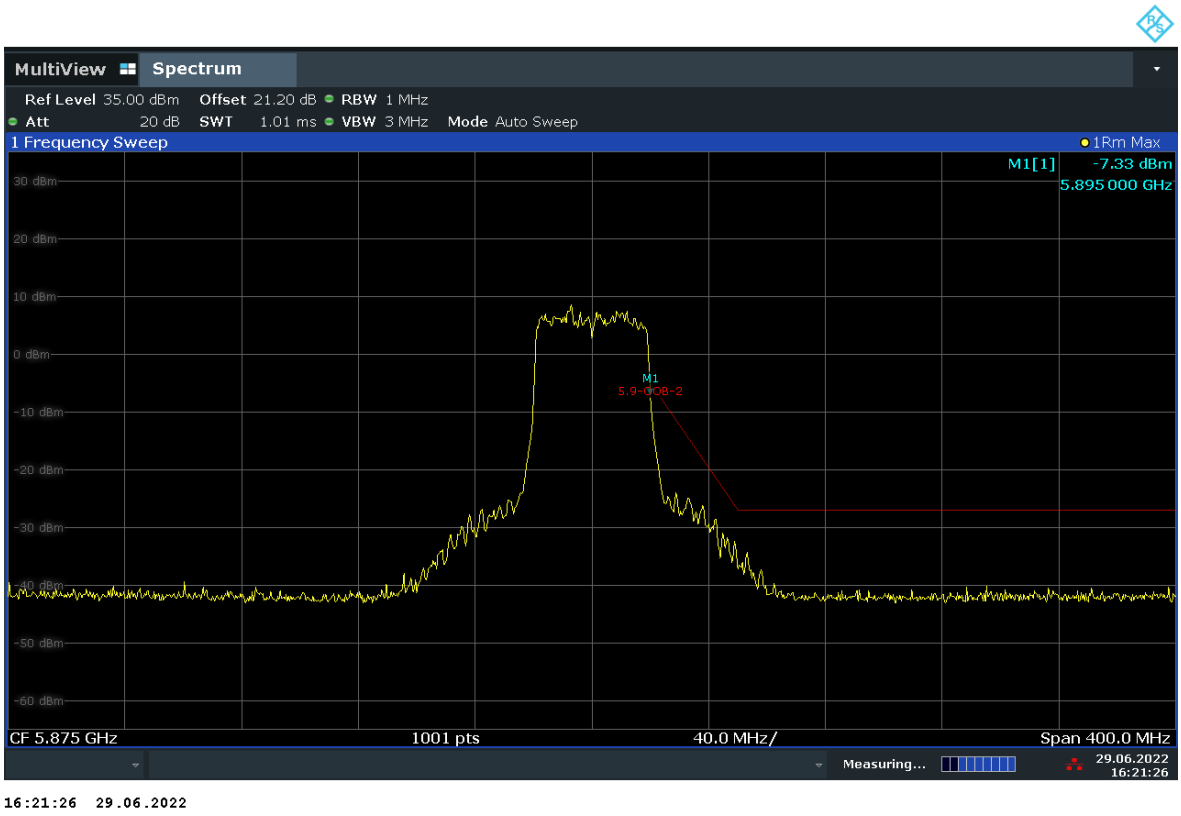


Fig. 42 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch175)

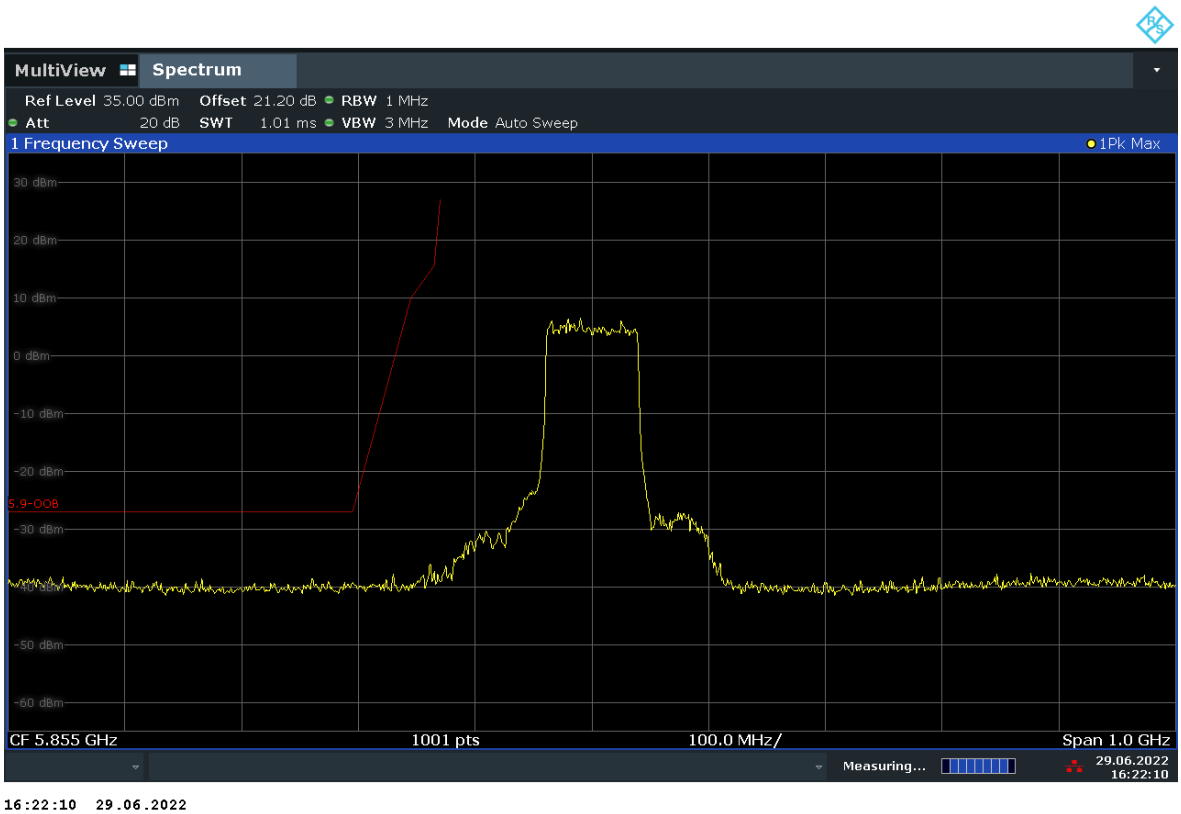


Fig. 43 Out of Band Emission - Conducted (802.11ax-HE80 full RU, Ch171)

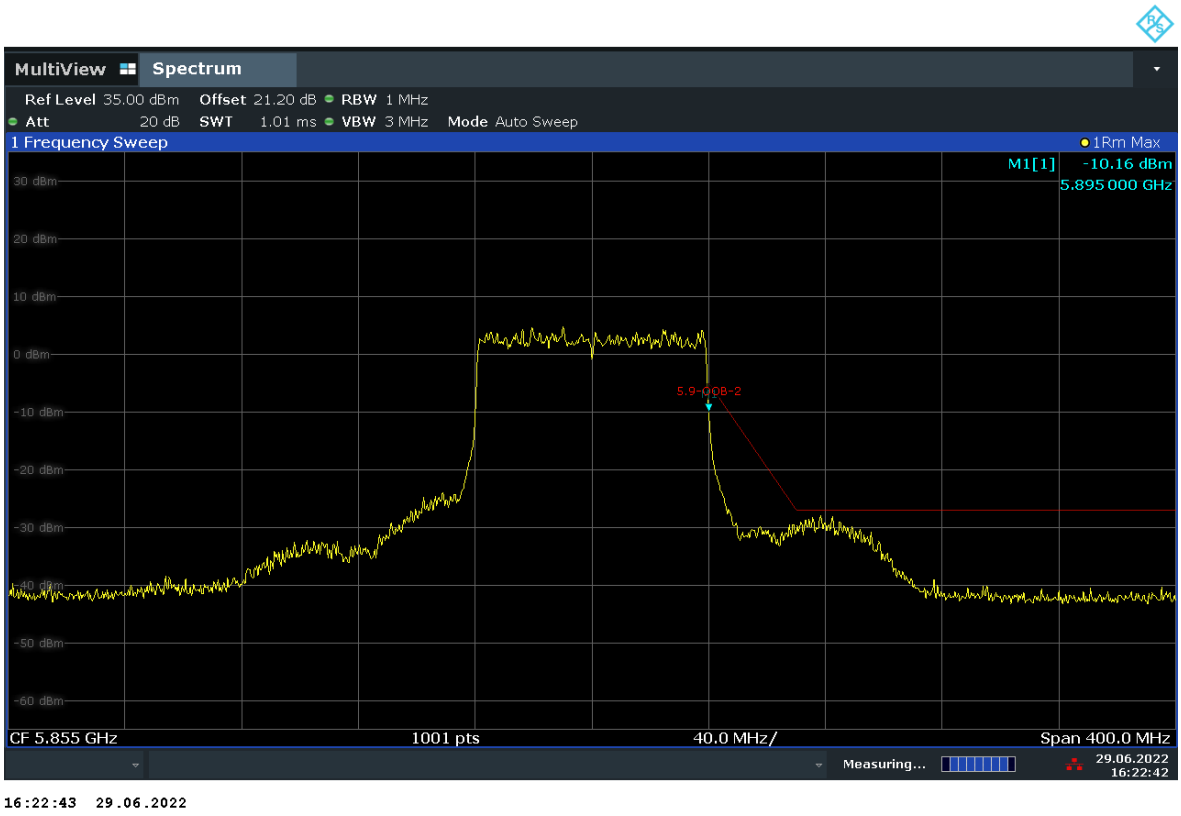


Fig. 44 Out of Band Emission - Conducted (802.11ax-HE80 full RU, Ch171)

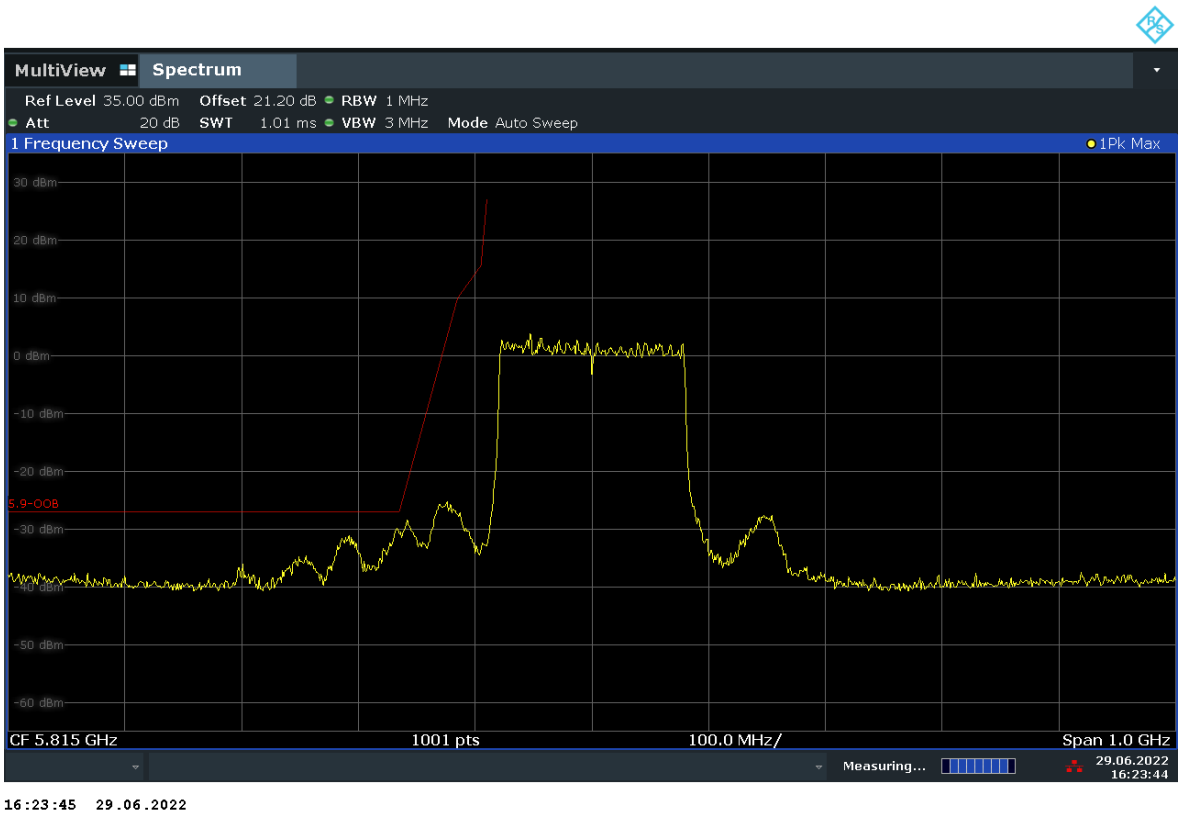


Fig. 45 Out of Band Emission - Conducted (802.11ax-HE160 full RU, Ch163)

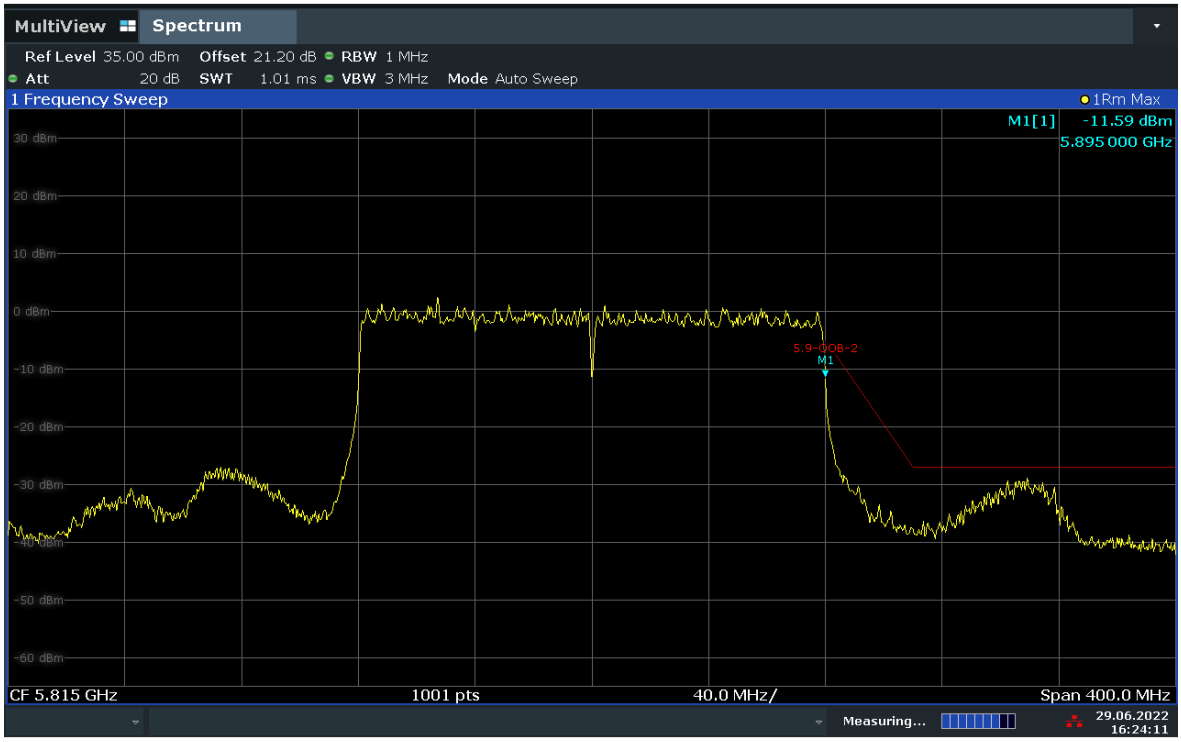


Fig. 46 Out of Band Emission - Conducted (802.11ax-HE160 full RU, Ch163)

SISO-Ant5

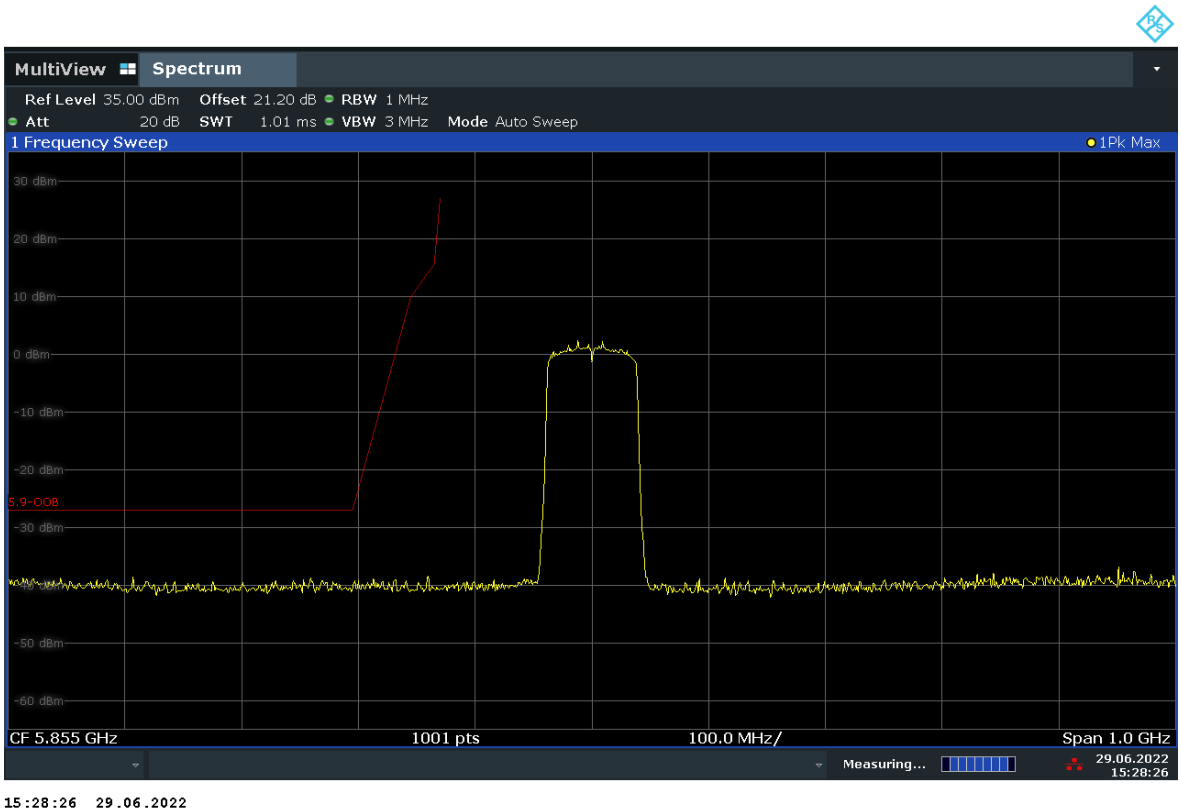


Fig. 47 Out of Band Emission - Conducted (802.11ac-VHT80, Ch171)

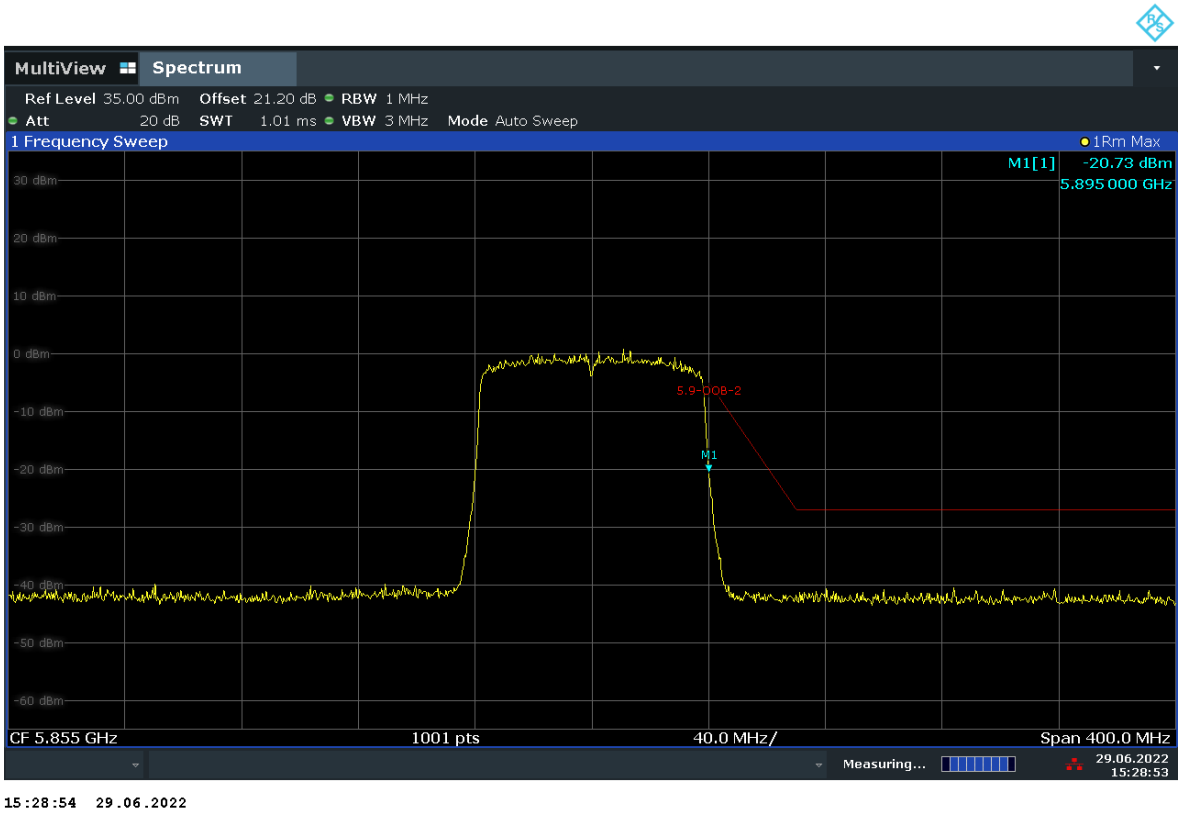


Fig. 48 Out of Band Emission - Conducted (802.11ac-VHT80, Ch171)

MIMO-Ant4

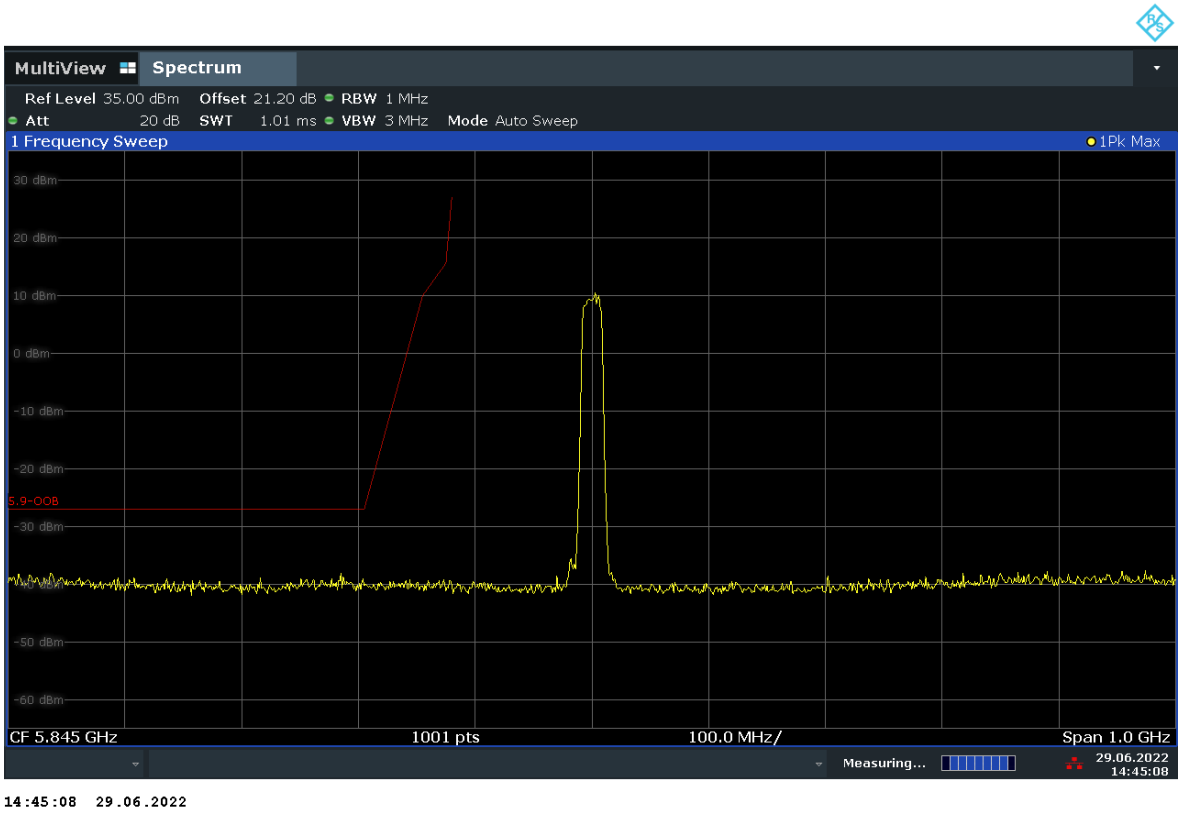
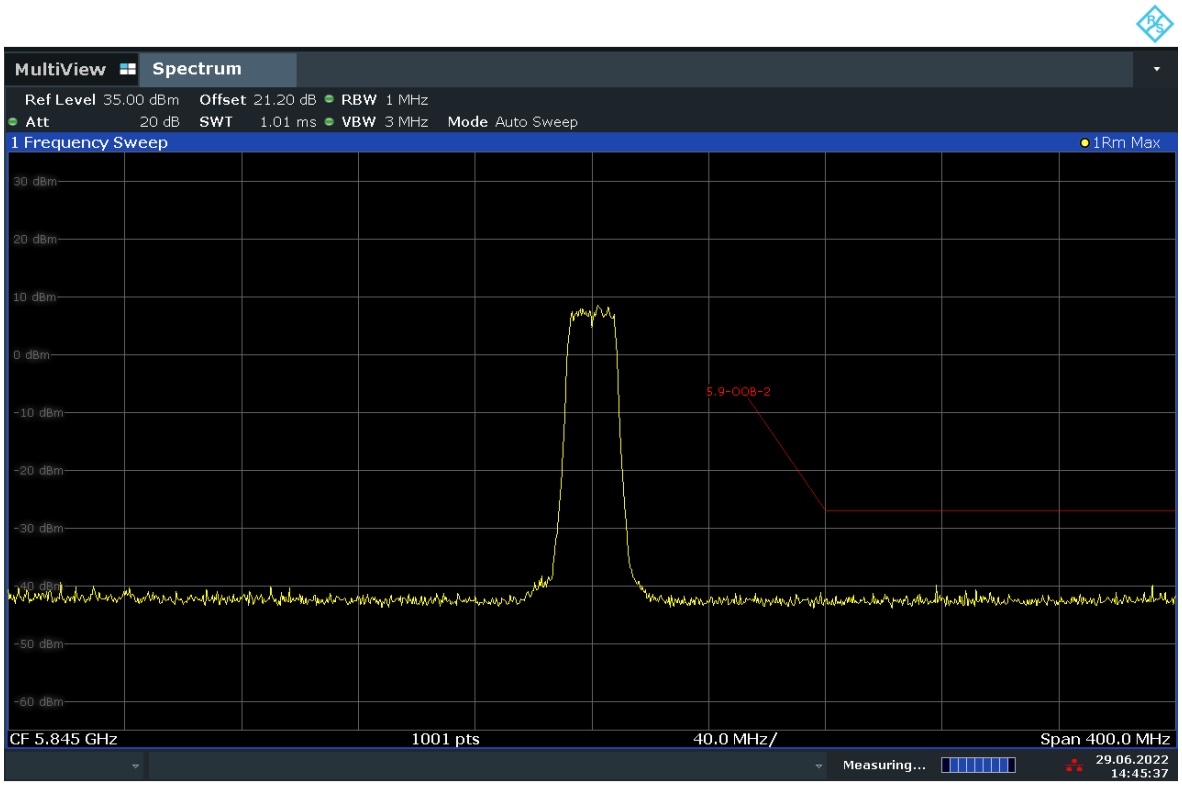
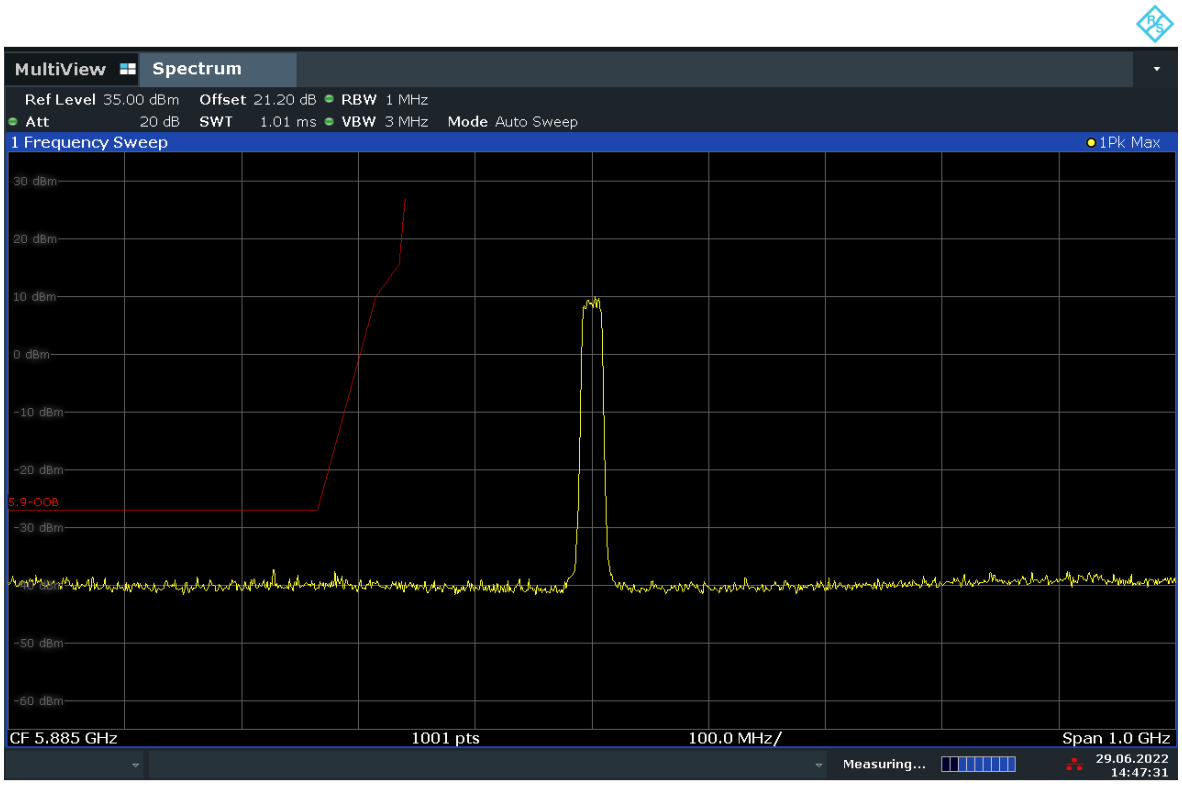


Fig. 49 Out of Band Emission - Conducted (802.11a, Ch169)



14:45:38 29.06.2022

Fig. 50 Out of Band Emission - Conducted (802.11a, Ch169)



14:47:31 29.06.2022

Fig. 51 Out of Band Emission - Conducted (802.11a, Ch177)

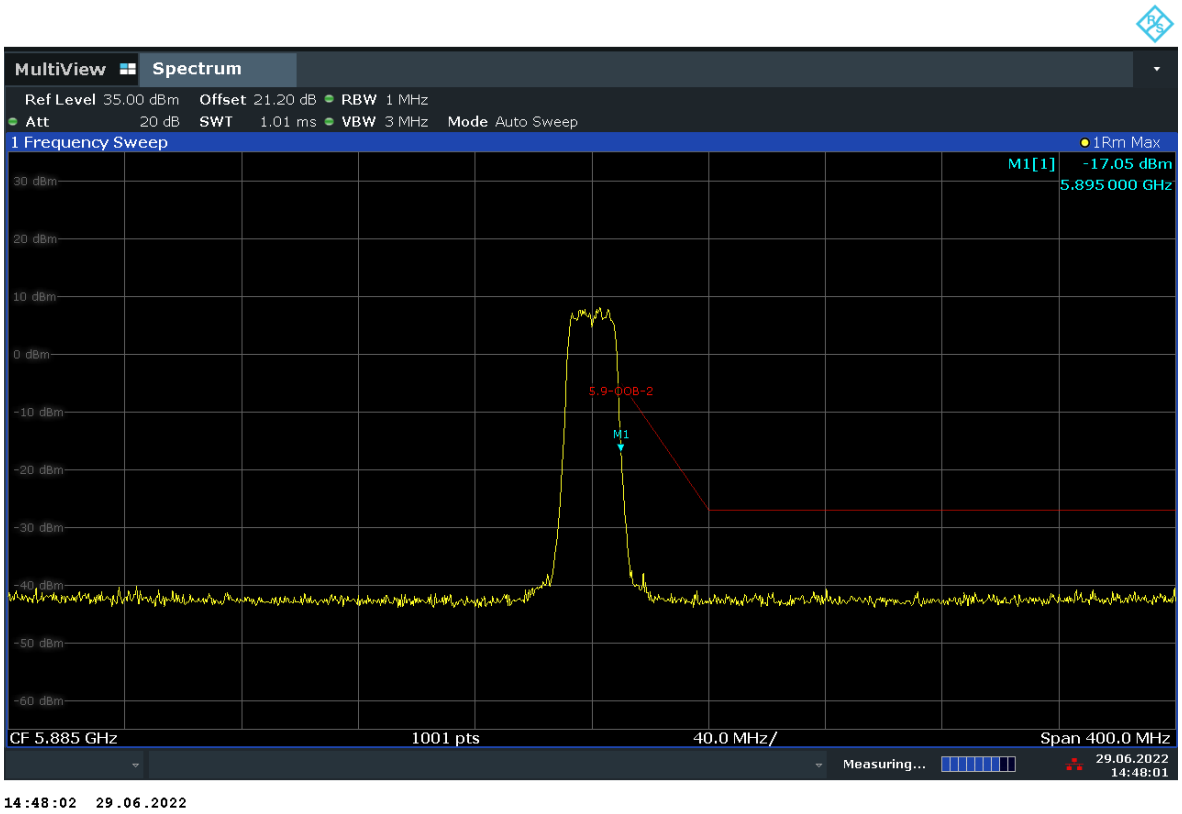


Fig. 52 Out of Band Emission - Conducted (802.11a, Ch177)

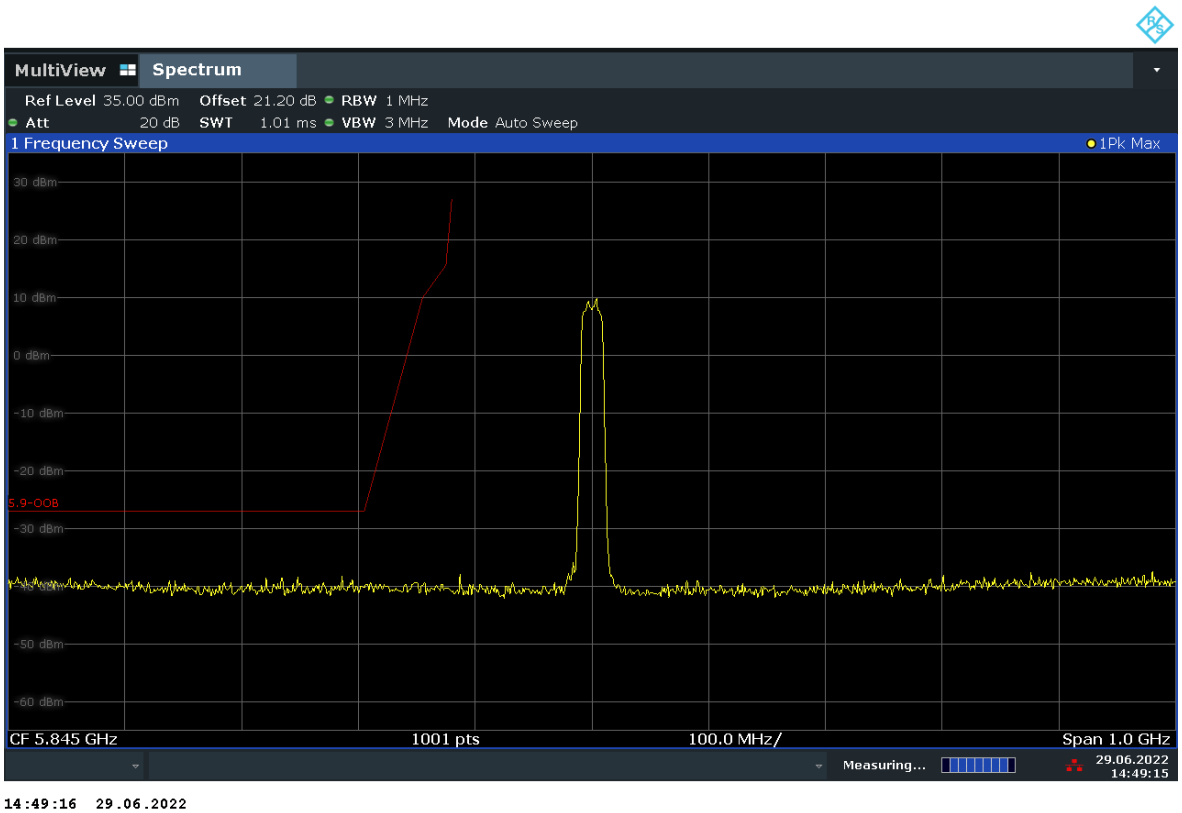


Fig. 53 Out of Band Emission - Conducted (802.11n-HT20, Ch169)

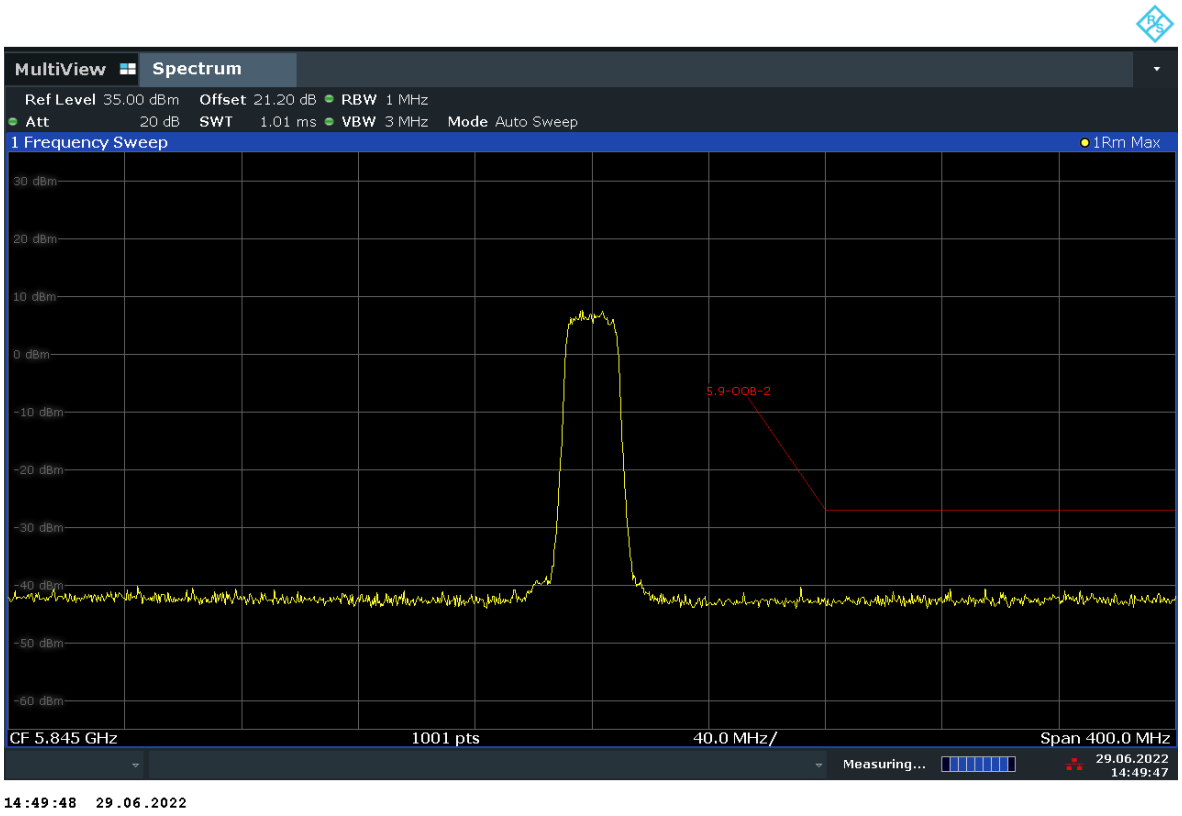


Fig. 54 Out of Band Emission - Conducted (802.11n-HT20, Ch169)

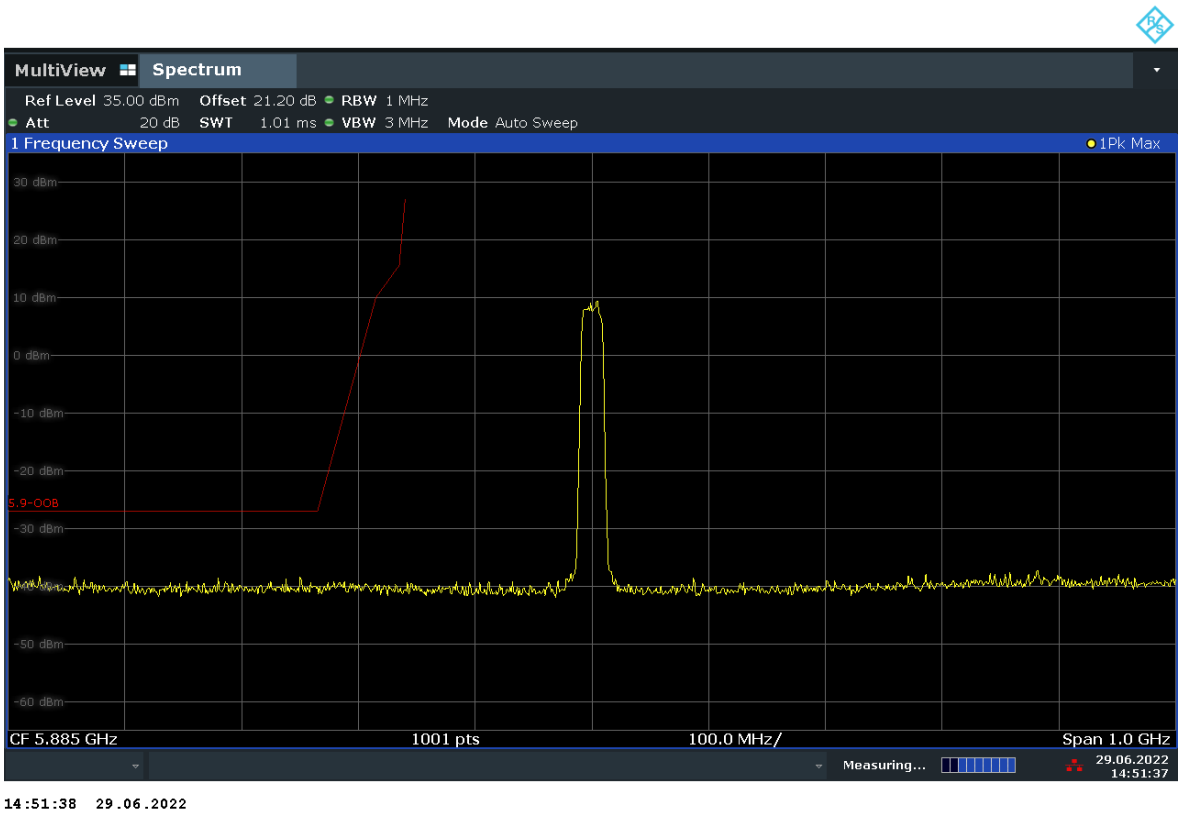
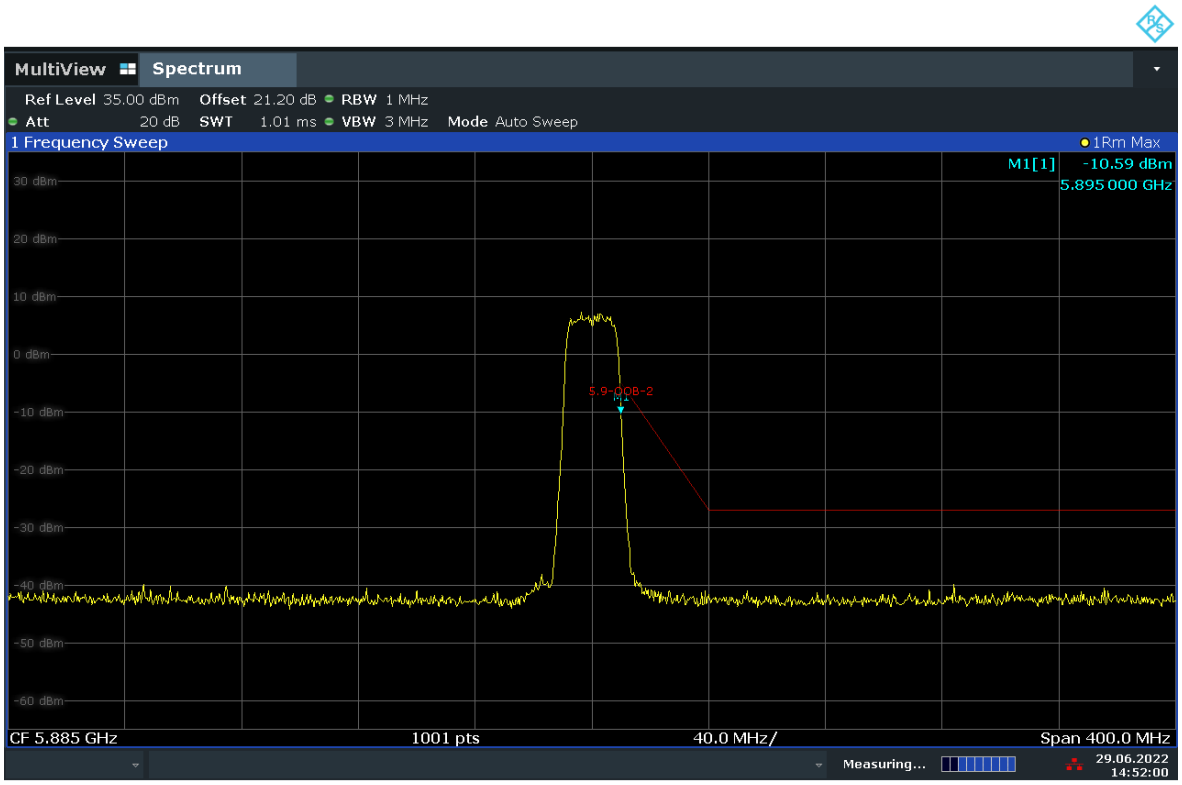
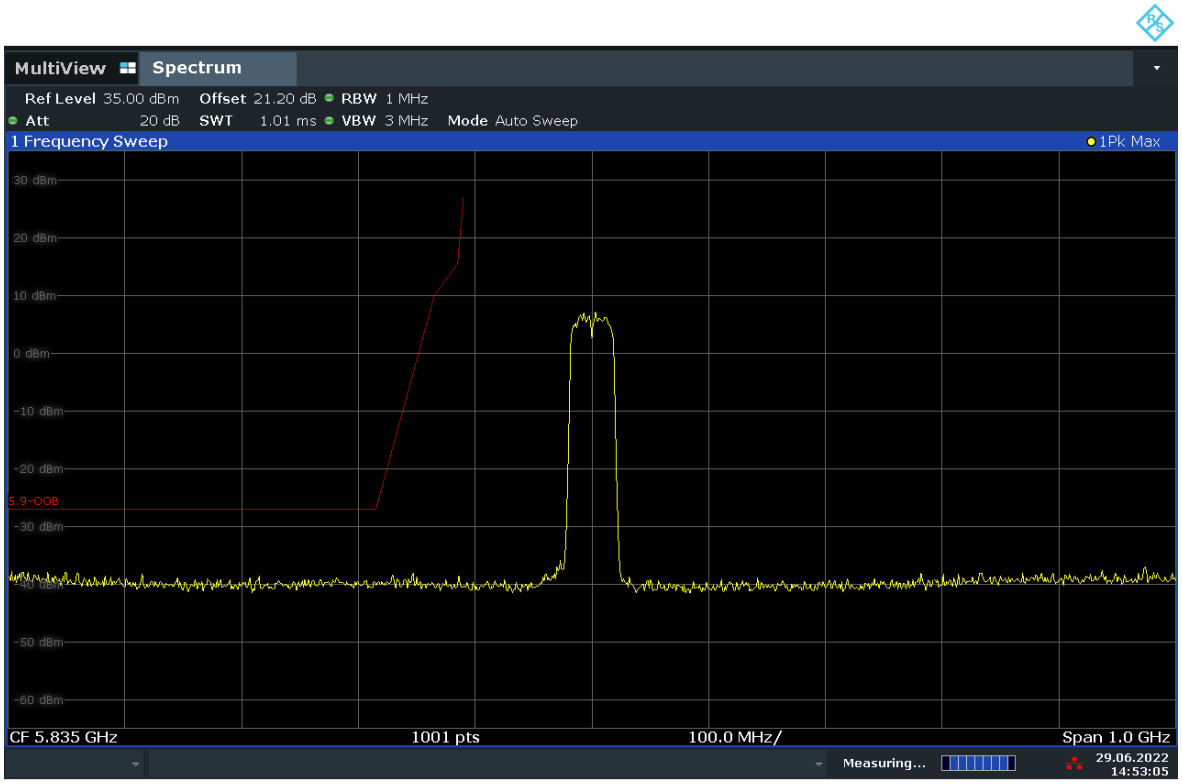


Fig. 55 Out of Band Emission - Conducted (802.11n-HT20, Ch177)



14:52:01 29.06.2022

Fig. 56 Out of Band Emission - Conducted (802.11n-HT20, Ch177)



14:53:05 29.06.2022

Fig. 57 Out of Band Emission - Conducted (802.11ac-VHT40, Ch167)

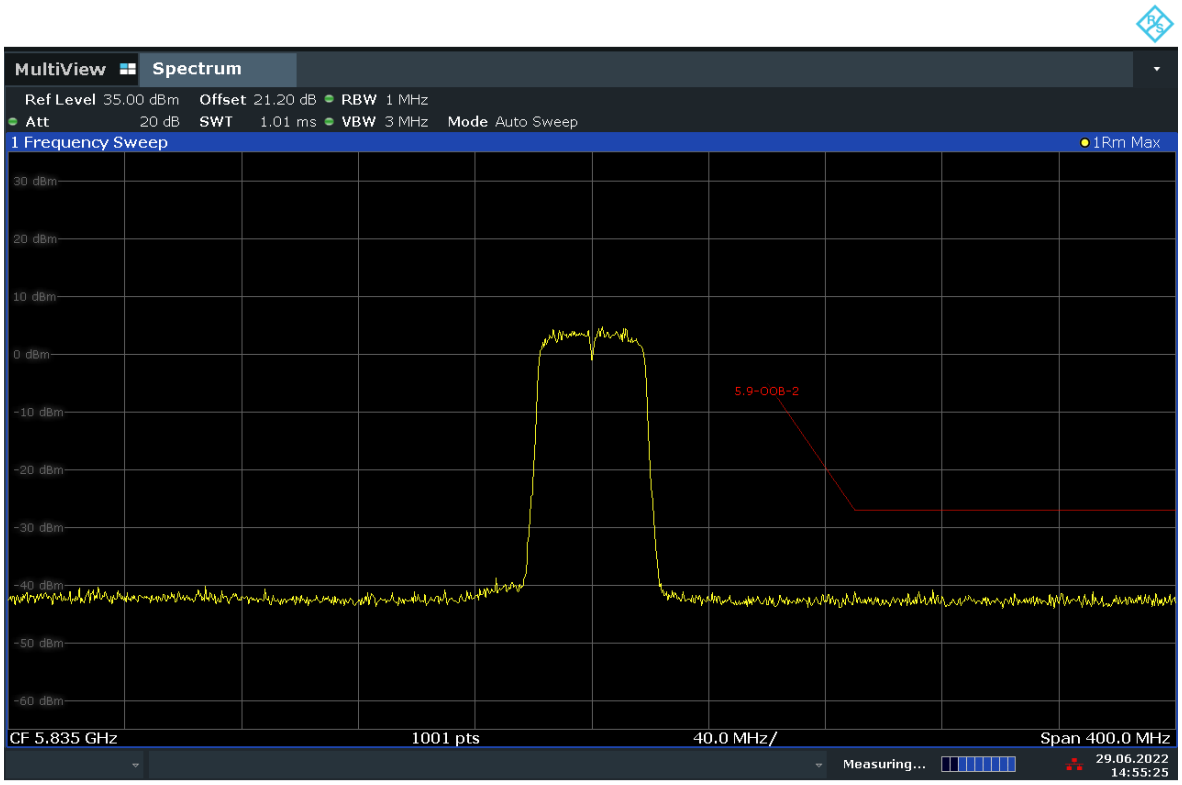


Fig. 58 Out of Band Emission - Conducted (802.11ac-VHT40, Ch167)

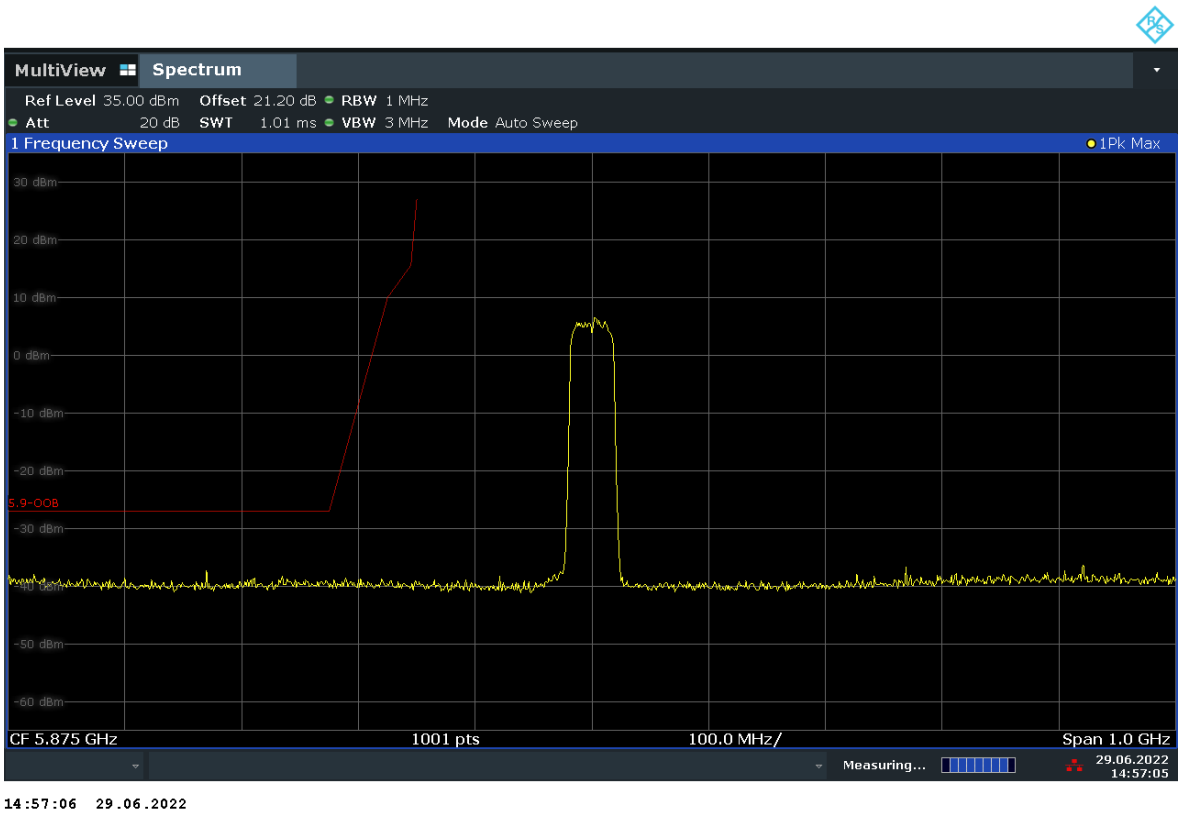
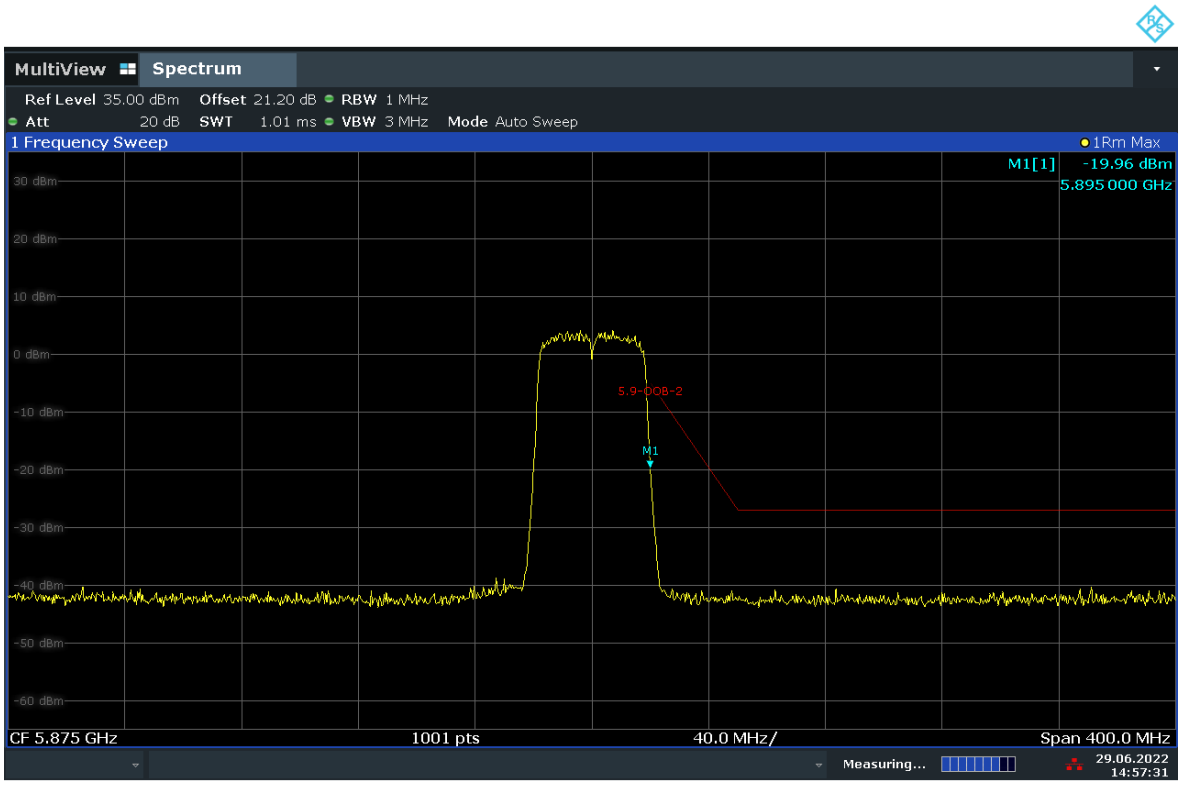
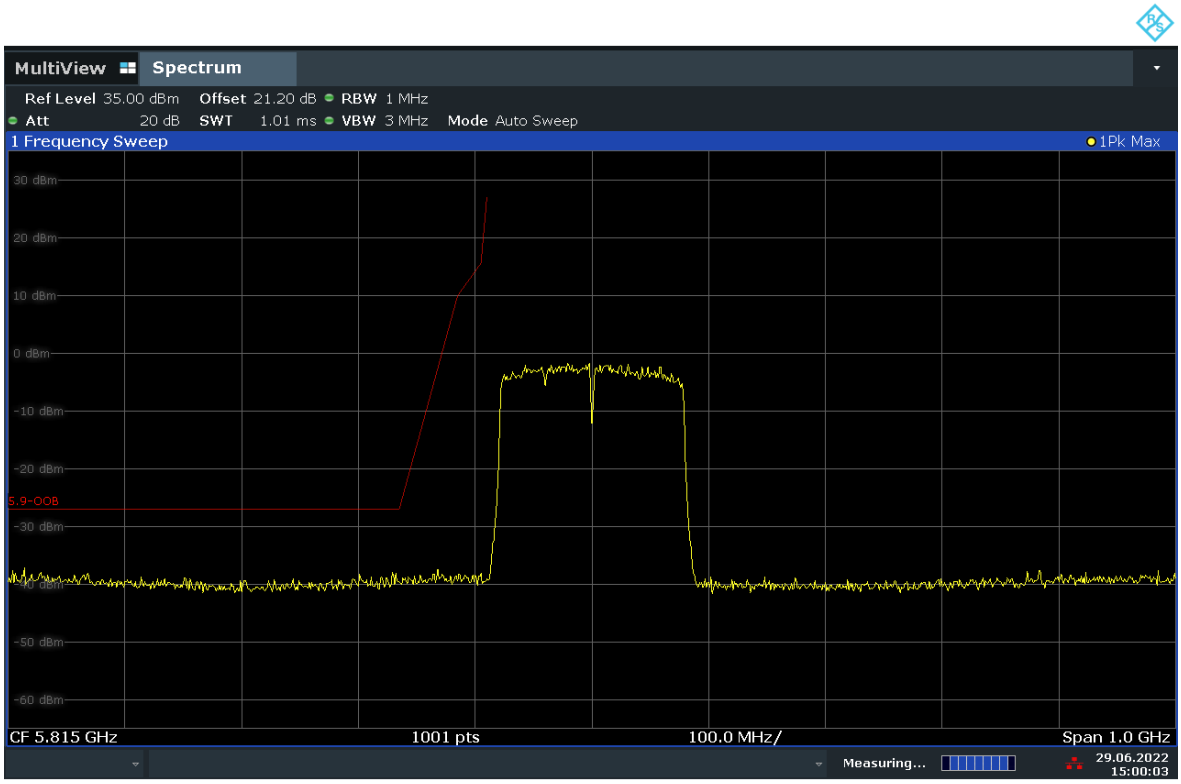


Fig. 59 Out of Band Emission - Conducted (802.11ac-VHT40, Ch175)



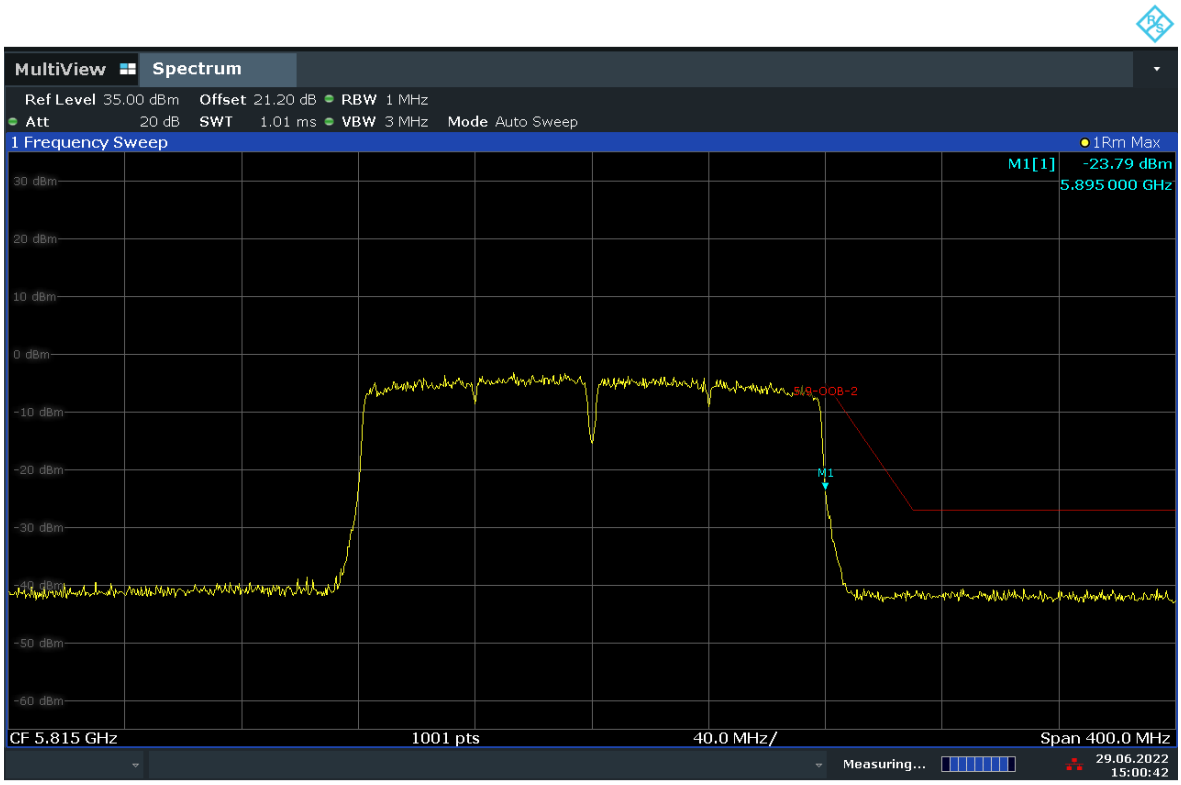
14:57:31 29.06.2022

Fig. 60 Out of Band Emission - Conducted (802.11ac-VHT40, Ch175)



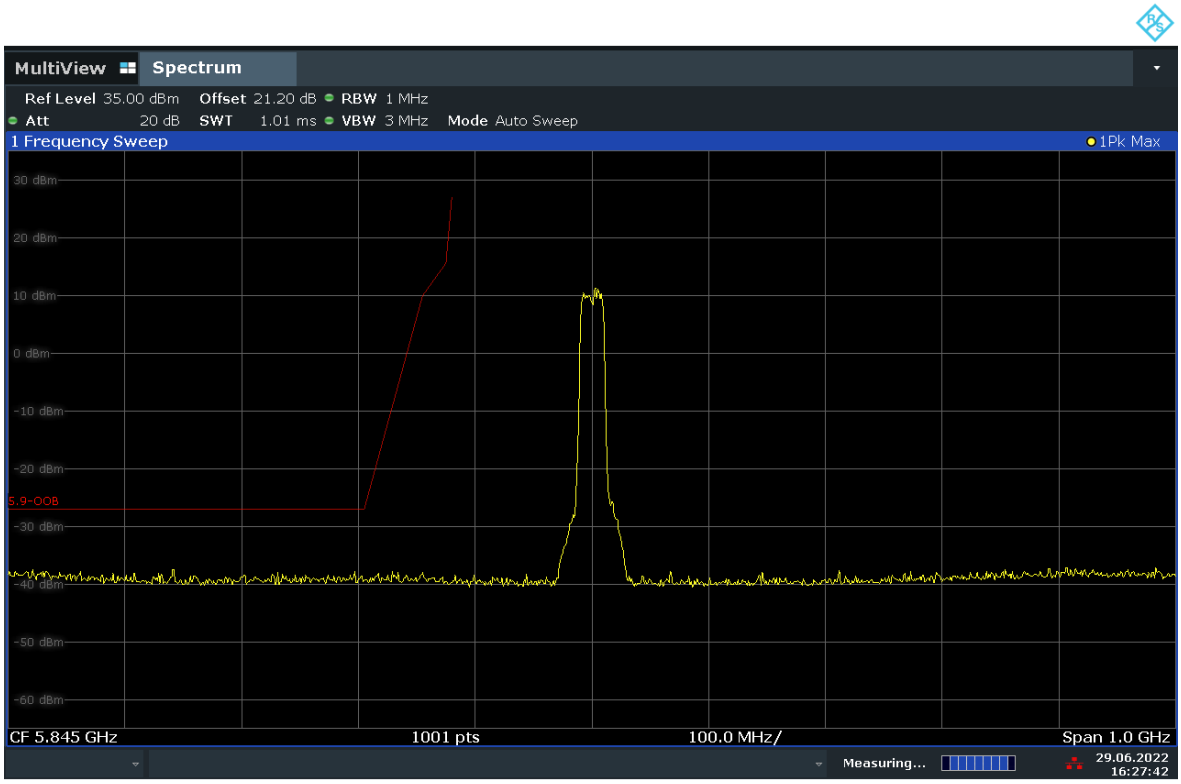
15:00:03 29.06.2022

Fig. 61 Out of Band Emission - Conducted (802.11ac-VHT160, Ch163)



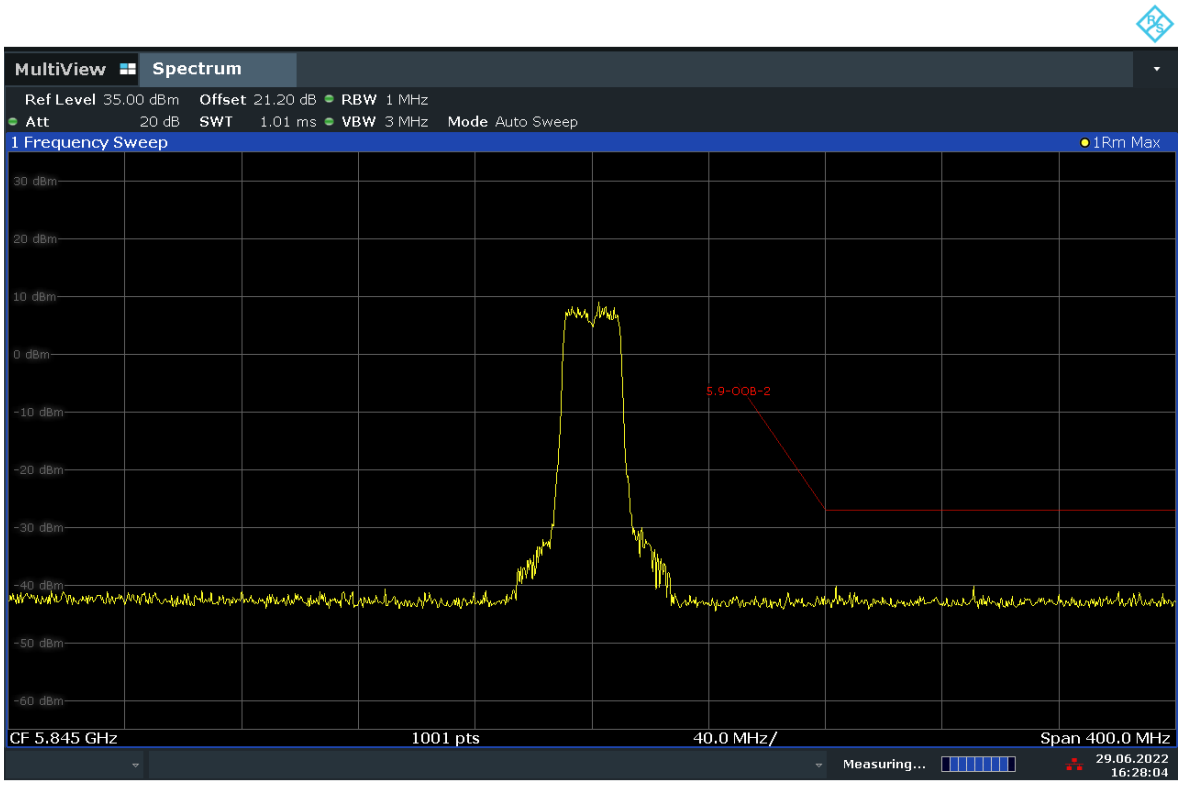
15:00:42 29.06.2022

Fig. 62 Out of Band Emission - Conducted (802.11ac-VHT160, Ch163)



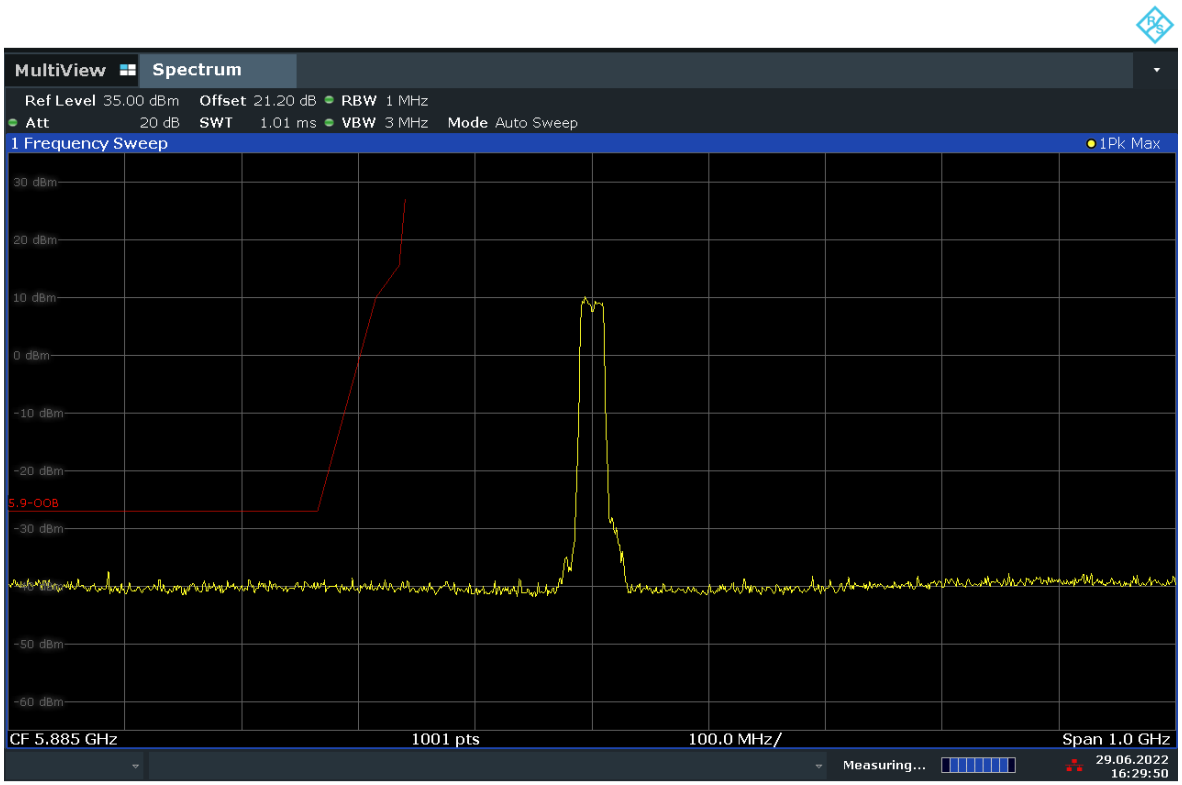
16:27:42 29.06.2022

Fig. 63 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch169)



16:28:04 29.06.2022

Fig. 64 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch169)



16:29:50 29.06.2022

Fig. 65 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch177)

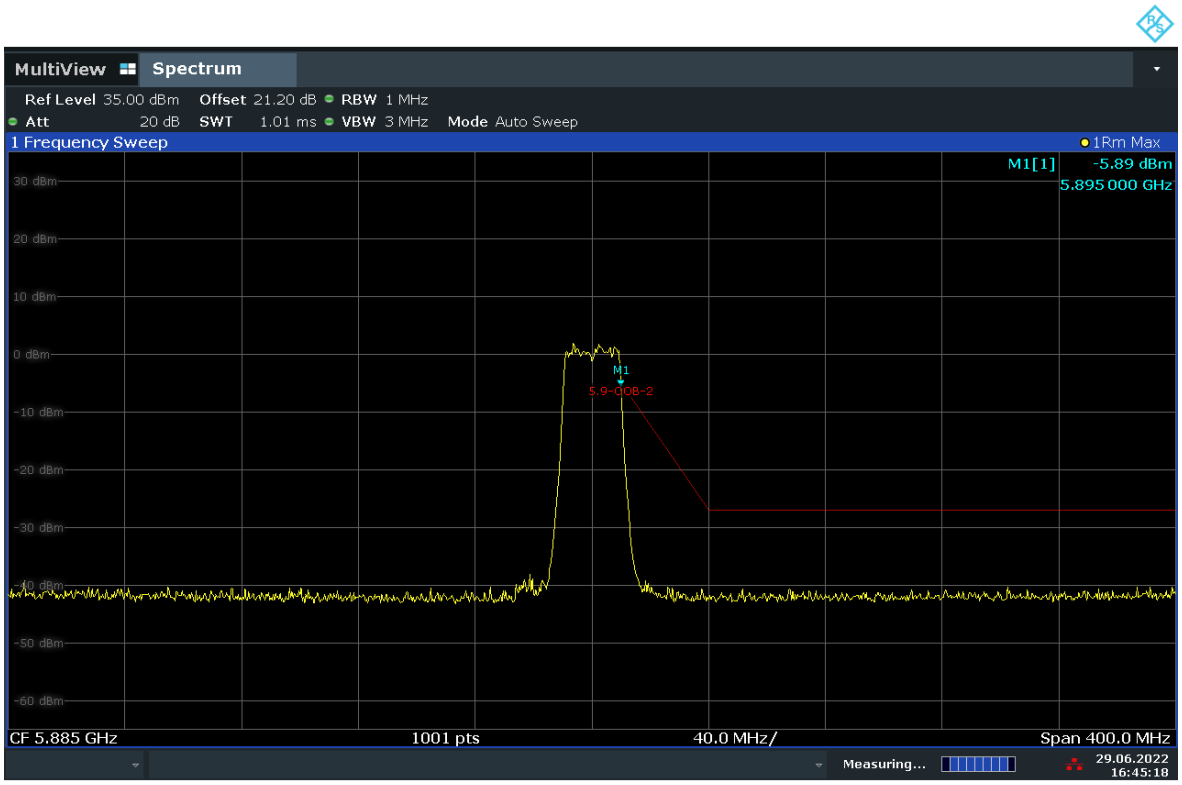


Fig. 66 Out of Band Emission - Conducted (802.11ax-HE20 full RU, Ch177)

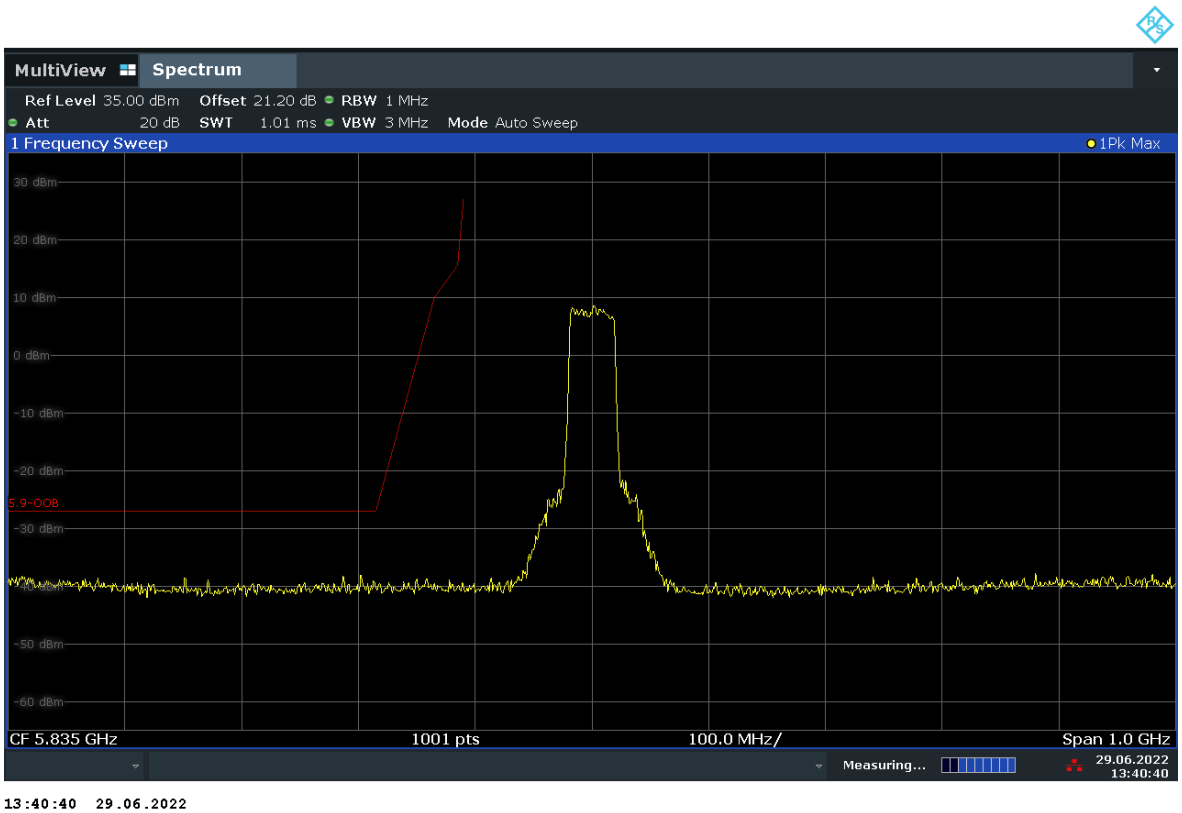


Fig. 67 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch167)

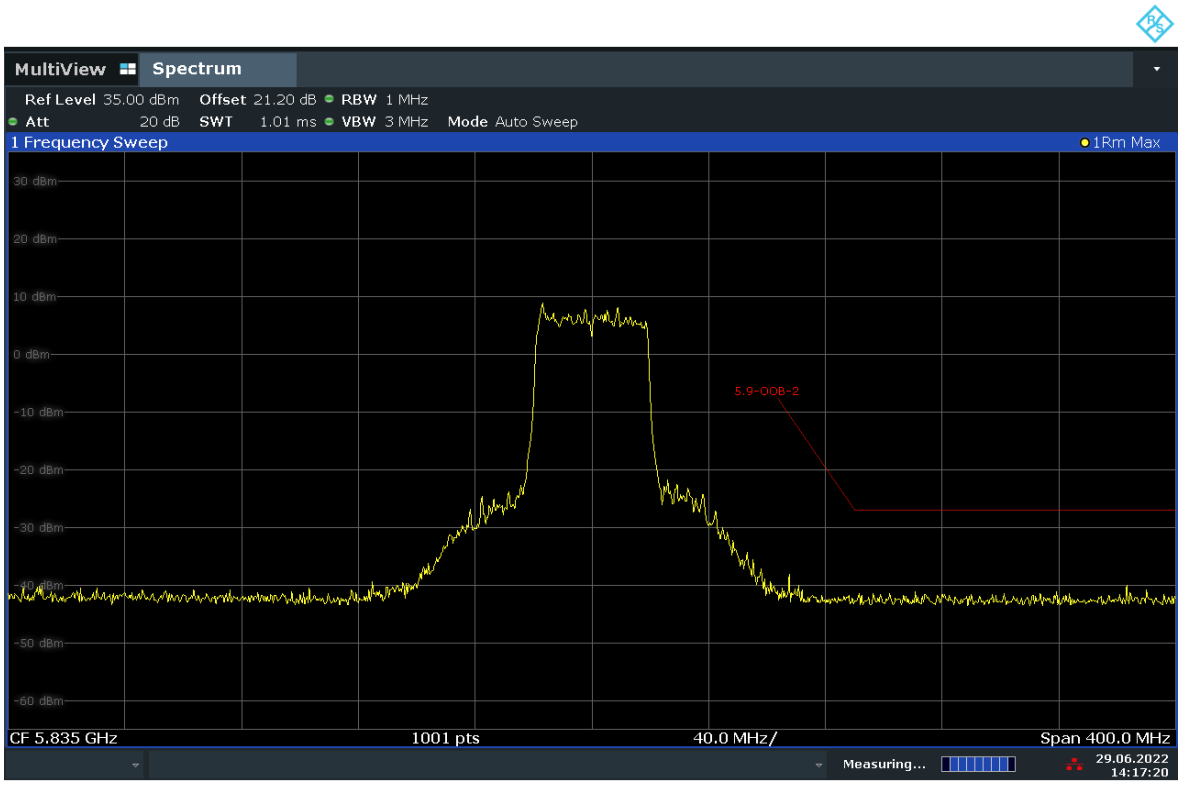


Fig. 68 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch167)

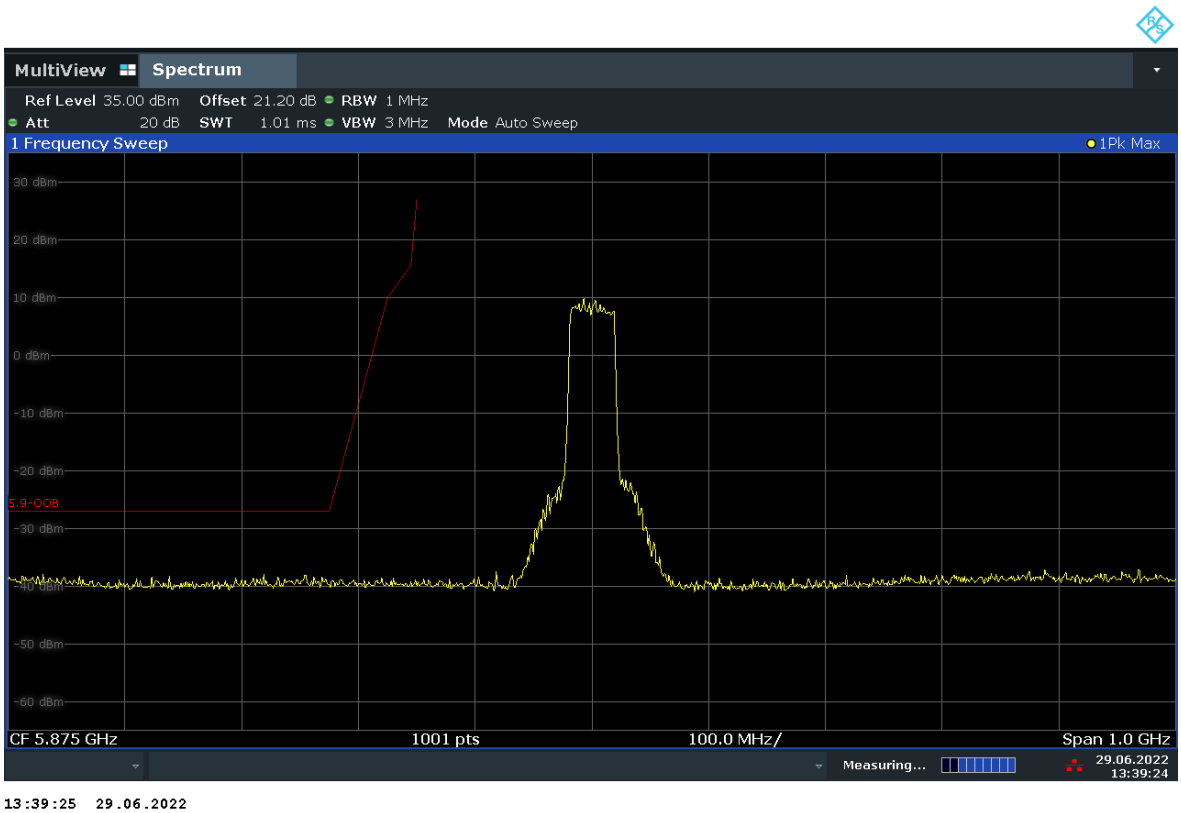


Fig. 69 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch175)

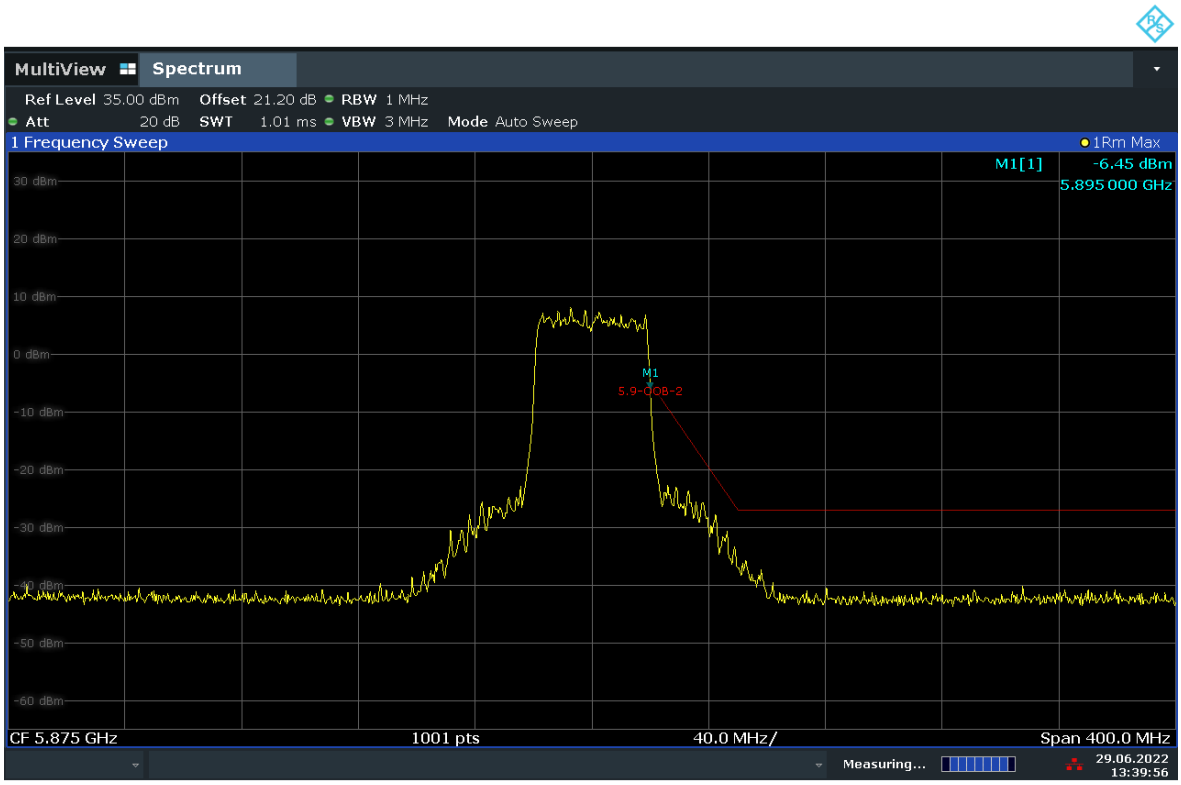


Fig. 70 Out of Band Emission - Conducted (802.11ax-HE40 full RU, Ch175)

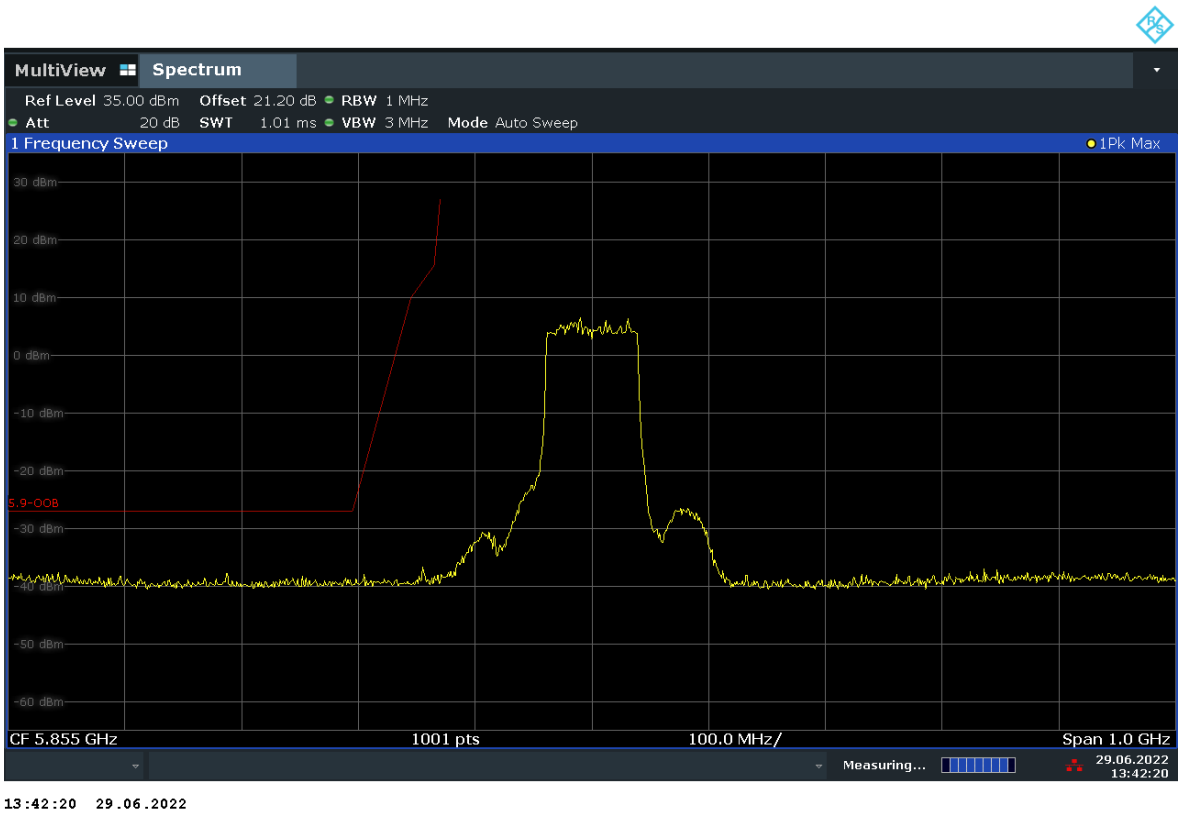


Fig. 71 Out of Band Emission - Conducted (802.11ax-HE80 full RU, Ch171)

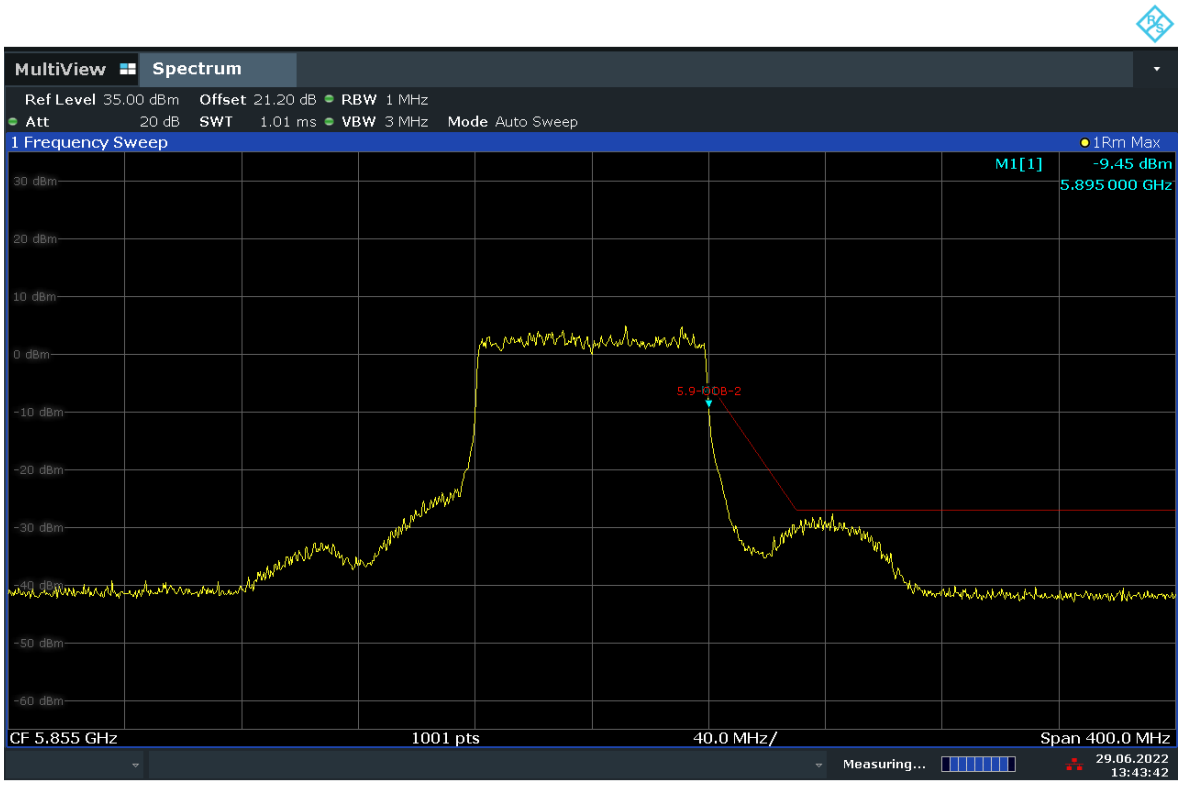


Fig. 72 Out of Band Emission - Conducted (802.11ax-HE80 full RU, Ch171)

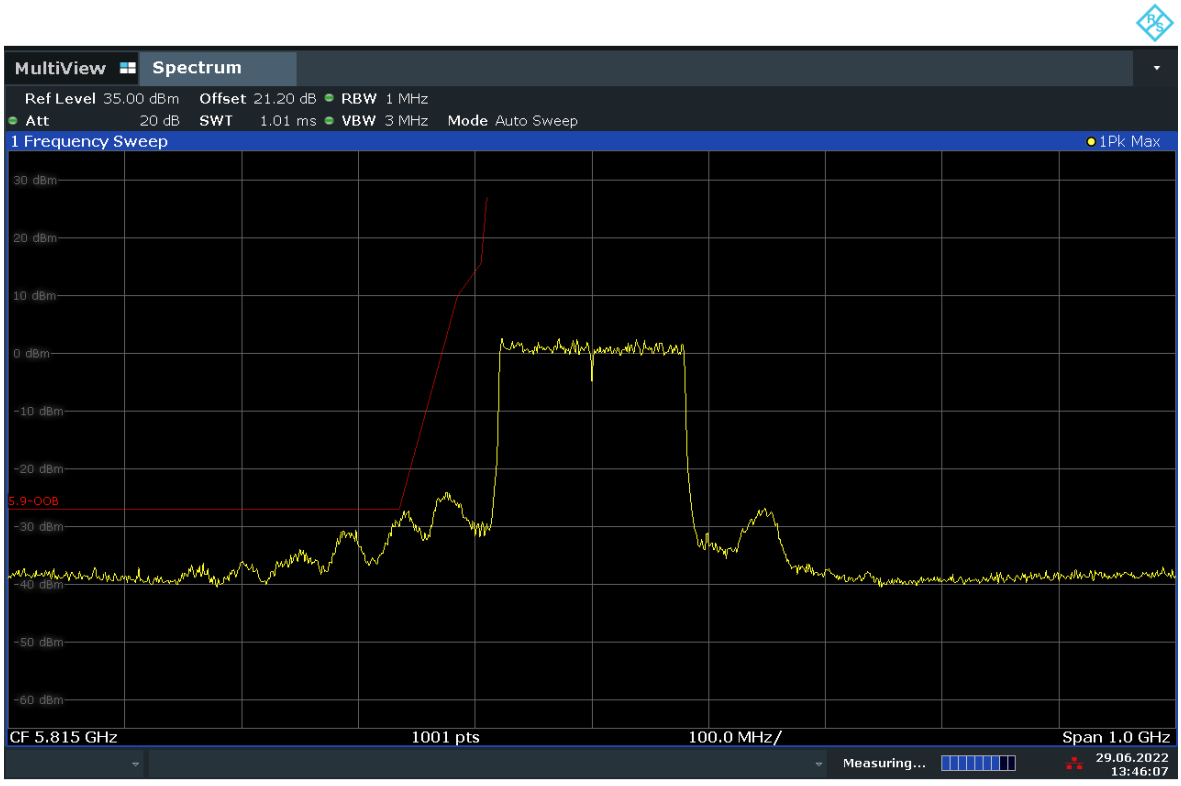


Fig. 73 Out of Band Emission - Conducted (802.11ax-HE160 full RU, Ch163)

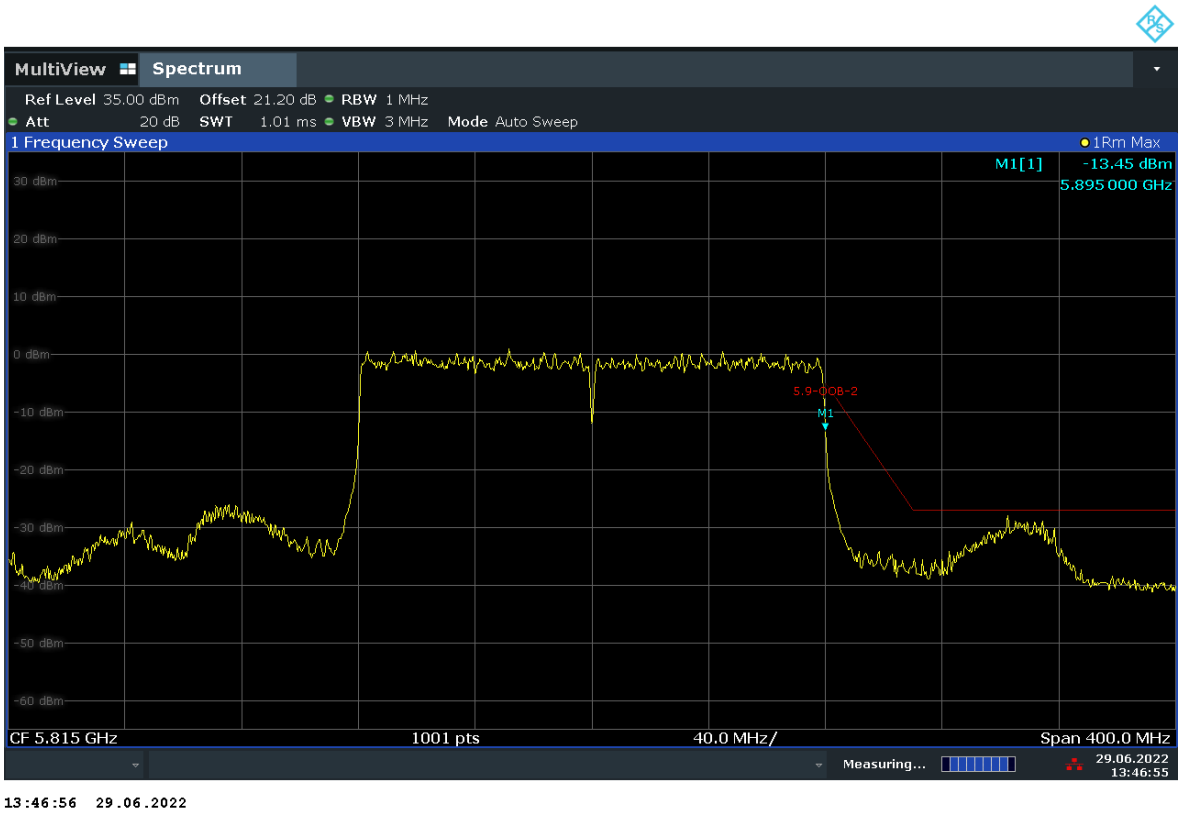
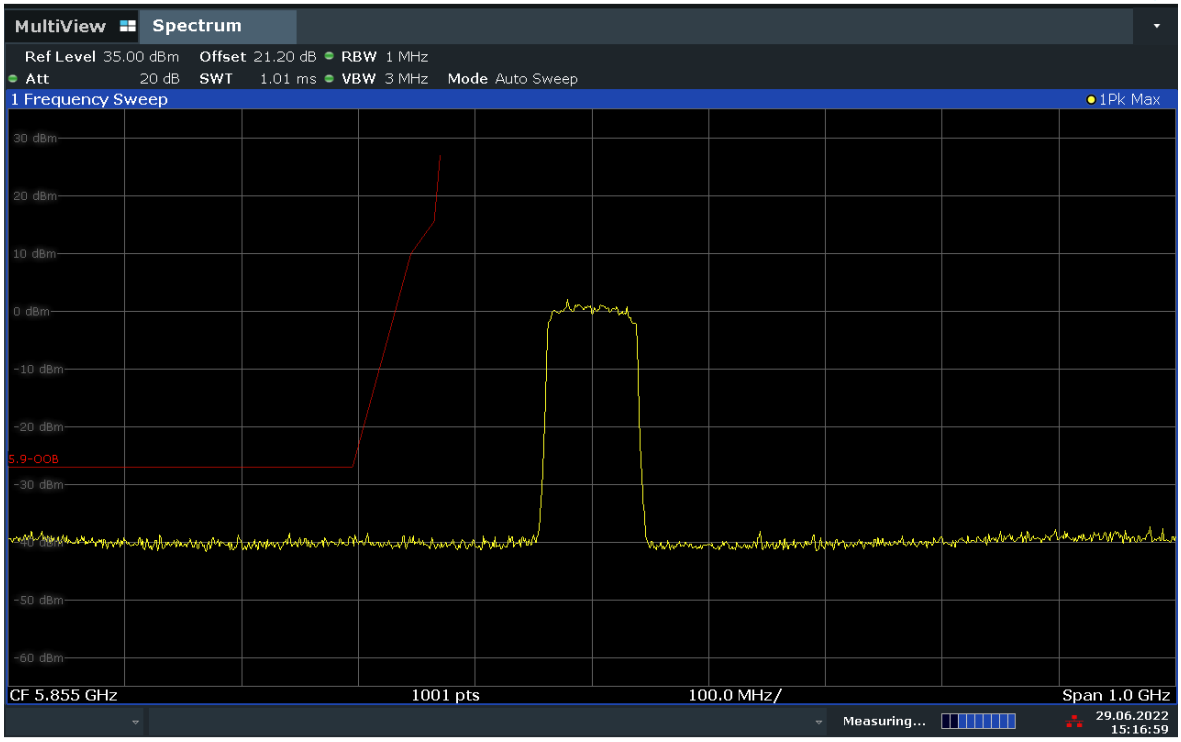


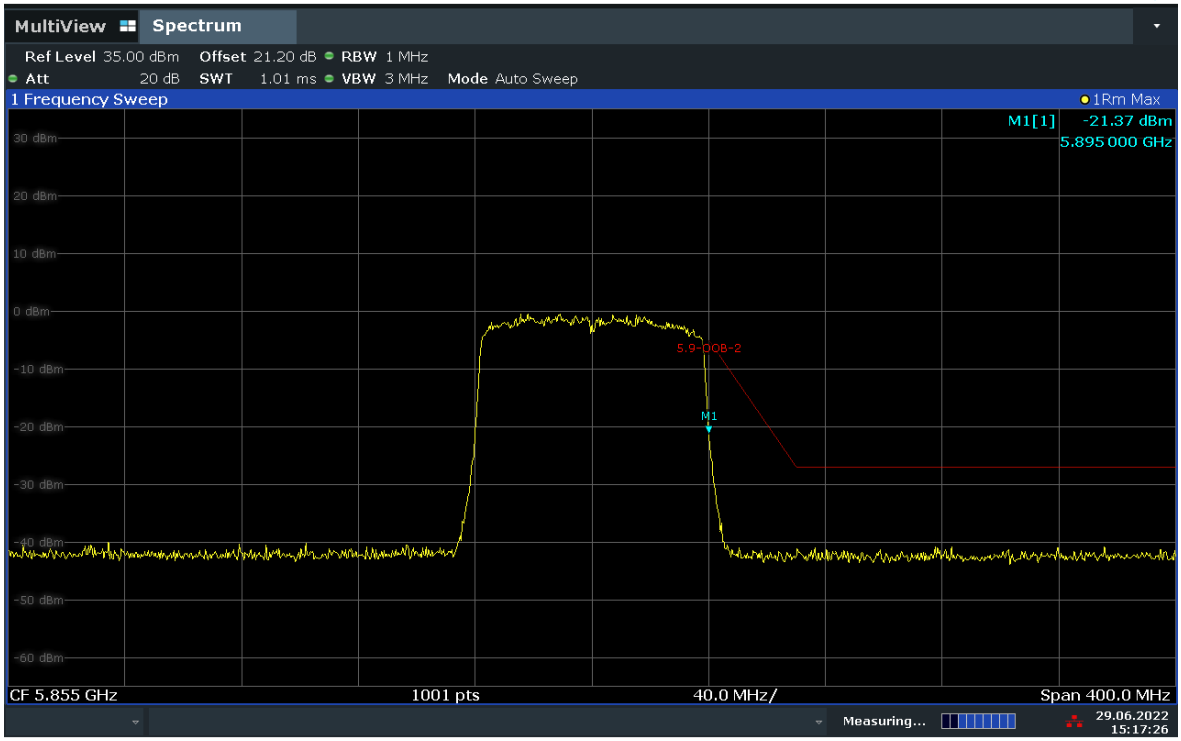
Fig. 74 Out of Band Emission - Conducted (802.11ax-HE160 full RU, Ch163)

MIMO-Ant5



15:16:59 29.06.2022

Fig. 75 Out of Band Emission - Conducted (802.11ac-VHT80, Ch171)



15:17:26 29.06.2022

Fig. 76 Out of Band Emission - Conducted (802.11ac-VHT80, Ch171)

A.7. Occupied 26dB Bandwidth(conducted)

Measurement Limit and Method:

Standard	Limit (kHz)
FCC 47 CFR Part 15.403 (i)	/

The measurement is made according to KDB 291074 and KDB 789033

Measurement Result:

Mode	Channel	Occupied 26dB Bandwidth (MHz)		conclusion
802.11a	169	Fig.77	19.82	P
	173	Fig.78	19.70	P
	177	Fig.79	19.78	P
802.11ax HE20	169	Fig.80	22.94	P
	173	Fig.81	23.14	P
	177	Fig.82	23.14	P
802.11ax HE40	167	Fig.83	43.40	P
	175	Fig.84	42.60	P
802.11ax HE80	171	Fig.85	87.27	P
802.11ax HE160	163	Fig.86	167.19	P

Fig. 77 Occupied 26dB Bandwidth (802.11a, channel 169)

11:45:22 27.09.2022

Fig. 78 Occupied 26dB Bandwidth (802.11a, channel 173)

11:46:18 27.09.2022

Fig. 79 Occupied 26dB Bandwidth (802.11a, channel 177)

11:57:09 27.09.2022

Fig. 80 Occupied 26dB Bandwidth (802.11ax-HE20, channel 169)

11:58:48 27.09.2022

Fig. 81 Occupied 26dB Bandwidth (802.11ax-HE20, channel 173)

11:59:41 27.09.2022

Fig. 82 Occupied 26dB Bandwidth (802.11ax-HE20, channel 177)

12:01:27 27.09.2022

Fig. 83 Occupied 26dB Bandwidth (802.11ax-HE40, channel 167)

Fig. 84 Occupied 26dB Bandwidth (802.11ax-HE40, channel 175)

Fig. 85 Occupied 26dB Bandwidth (802.11ax-HE80, channel 171)

Fig. 86 Occupied 26dB Bandwidth (802.11ax-HE160, channel 163)

A.8. Transmitter Spurious Emission

A.8.1 Transmitter Spurious Emission - Radiated

Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC 47 CFR Part 15.407	5725MHz~5850MHz	< -27

The measurement is made according to ANSI C63.10 .

In addition, 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)).

Limit in restricted band:

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBμV/m)	Measurement distance(m)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Measurement Results:

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

P_{Mea} is the field strength recorded from the instrument.

We tested all the antennas and only the worst results in this report

MIMO Results

Average Results：

802.11a

Ch169

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17855.350	42.67	-25.50	46.66	21.51	54.00	11.33	H
17941.150	42.62	-25.50	46.66	21.46	54.00	11.38	H
15919.350	41.85	-27.35	38.54	30.66	54.00	12.15	H
15973.250	41.75	-27.35	38.54	30.56	54.00	12.25	H
11990.150	37.51	-31.48	39.09	29.90	54.00	16.49	V
11986.850	37.28	-31.48	39.09	29.67	54.00	16.72	V

Ch173

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17941.150	43.21	-25.50	46.66	22.05	54.00	10.79	H
17857.550	43.03	-25.50	46.66	21.87	54.00	10.97	H
16021.650	41.90	-27.35	38.54	30.71	54.00	12.10	H
16005.150	41.89	-27.35	38.54	30.70	54.00	12.11	V
11993.450	37.28	-31.48	39.09	29.67	54.00	16.72	H
11719.550	37.08	-31.99	38.98	30.09	54.00	16.92	V

Ch177

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17967.000	42.86	-25.50	46.66	21.70	54.00	11.14	V
17985.700	42.47	-25.50	46.66	21.31	54.00	11.53	H
15958.400	41.91	-27.35	38.54	30.72	54.00	12.09	H
16036.500	41.73	-27.35	38.54	30.54	54.00	12.27	H
11982.450	37.14	-31.48	39.09	29.53	54.00	16.86	V
11997.300	37.00	-31.48	39.09	29.39	54.00	17.00	H

802.11n-HT20

Ch169

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17839.400	43.09	-25.50	46.66	21.93	54.00	10.91	H
17938.400	42.63	-25.50	46.66	21.47	54.00	11.37	V
15955.100	42.15	-27.35	38.54	30.96	54.00	11.85	V
16044.750	41.93	-27.35	38.54	30.74	54.00	12.07	H
11983.550	37.14	-31.48	39.09	29.53	54.00	16.86	V
11723.950	36.80	-31.99	38.98	29.81	54.00	17.20	V

Ch173

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17951.600	43.32	-25.50	46.66	22.16	54.00	10.68	H
17839.400	42.93	-25.50	46.66	21.77	54.00	11.07	H
15962.250	41.84	-27.35	38.54	30.65	54.00	12.16	H
16042.550	41.74	-27.35	38.54	30.55	54.00	12.26	H
11856.500	37.23	-31.85	39.05	30.03	54.00	16.77	V
11833.950	37.17	-31.85	39.05	29.97	54.00	16.83	V

Ch177

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17865.800	43.01	-25.50	46.66	21.85	54.00	10.99	H
17941.150	42.83	-25.50	46.66	21.67	54.00	11.17	V
15999.100	41.58	-27.35	38.54	30.39	54.00	12.42	H
15954.000	41.52	-27.35	38.54	30.33	54.00	12.48	H
11991.250	37.06	-31.48	39.09	29.45	54.00	16.94	V
11735.500	37.05	-31.99	38.98	30.06	54.00	16.95	H

802.11n-HT40

Ch167

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17877.350	43.42	-25.50	46.66	22.26	54.00	10.58	H
17882.300	42.86	-25.50	46.66	21.70	54.00	11.14	H
16033.750	42.15	-27.35	38.54	30.96	54.00	11.85	V
16027.700	41.90	-27.35	38.54	30.71	54.00	12.10	H
11990.700	37.16	-31.48	39.09	29.55	54.00	16.84	V
11860.350	36.77	-31.85	39.05	29.57	54.00	17.23	H

Ch175

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17983.500	43.33	-25.50	46.66	22.17	54.00	10.67	H
17949.400	42.93	-25.50	46.66	21.77	54.00	11.07	V
15947.950	41.66	-27.35	38.54	30.47	54.00	12.34	H
16005.150	41.65	-27.35	38.54	30.46	54.00	12.35	H
11969.250	37.15	-31.48	39.09	29.54	54.00	16.85	H
11949.450	37.07	-31.48	39.09	29.46	54.00	16.93	H

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Ch169

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17870.750	43.30	-25.50	46.66	22.14	54.00	10.70	V
17865.800	42.80	-25.50	46.66	21.64	54.00	11.20	H
15939.150	42.37	-27.35	38.54	31.18	54.00	11.63	H
15954.000	41.93	-27.35	38.54	30.74	54.00	12.07	V
11970.350	37.05	-31.48	39.09	29.44	54.00	16.95	V
11763.000	37.03	-31.99	38.98	30.04	54.00	16.97	H

Ch173

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17934.550	42.78	-25.50	46.66	21.62	54.00	11.22	V
17931.800	42.73	-25.50	46.66	21.57	54.00	11.27	V
16030.450	41.83	-27.35	38.54	30.64	54.00	12.17	V
16000.750	41.81	-27.35	38.54	30.62	54.00	12.19	V
11999.500	36.91	-31.48	39.09	29.30	54.00	17.09	V
11945.050	36.81	-31.48	39.09	29.20	54.00	17.19	H

Ch177

Frequency (MHz)	Meas. Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17934.550	42.56	-25.50	46.66	21.40	54.00	11.44	H
17957.650	42.52	-25.50	46.66	21.36	54.00	11.48	H
15891.300	41.88	-26.97	38.48	30.37	54.00	12.12	V
15966.650	41.78	-27.35	38.54	30.59	54.00	12.22	V
11973.100	37.24	-31.48	39.09	29.63	54.00	16.76	V
11942.850	37.09	-31.48	39.09	29.48	54.00	16.91	H