EMI – TEST REPORT

- FCC Part 15.247, RSS247 -

Type / Model Name	:	FI-3000
Product Description	:	Wireless MPO inspection probe
Applicant	:	Fluke Electronics Corporation
Address	:	6920 Seaway Blvd.
		EVERETT, WA 98203, USA
Manufacturer	:	UAB Lifodas
Address	:	Naugarduko g. 41
		LT-03227 VILNIUS, LITHUANIA
Licence holder	:	Fluke Electronics Corporation
Address	:	6920 Seaway Blvd.
		EVERETT, WA 98203, USA

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

Test Report No. : T43966-00-03HS	07. June 2018 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2017)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September 2017)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2
KDB 558074 D01 v04	Guidance for performing compliance measurements on DTS operating under §15.247, April 5, 2017.

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.2 General remarks

The WLAN module (CC3220MODSF12MOB) is fully tested and approved according the FCC 15.247 (FCC ID: Z64-CC3220MOD, IC ID: 451I-CC3220MOD). This test report show the further compliance to the FCC 15.247 after integration into the EUT. Therefore, the re-test is partly done to the following requirements, only.

- **Maximum output power**
- **Spurious emission**

2.3 Equipment type

WLAN - AP

2.4 Short description of the equipment under test (EUT)

The EUT is a WLAN-AP provides connectivity to iOS and Android based devices. A probe, connected through Wi-Fi to Android device, communicates with a Tesla mobile application. The probe will also contain a USB port to allow wired connectivity to Fluke Network Versiv platform (Linux) or Windows PC. The primary use is for multi-fibre connector's end-face inspection in fibre optic networks of data centres.

Number of tested samples:	1
Serial number:	108013
Firmware version:	V3.6.0.3

EUT configuration:
(The CDF filled by the applicant can be viewed at the test laboratory.)

2.5 Variants of the EUT

There are no variants.

2.6 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan WLAN Standard 802.11b/g/n, HT20:

Channel	Frequency (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

Note: The marked frequencies are determined for final testing. The firmware supports no HT 40 mode.

2.7 Transmit operating modes

The EUT use DSSS or OFDM modulation and may operate under operating mode 2 and provide following data rates with auto-fall-back:

- 802.11b mode 11, 5.5, 2, 1 Mbps (Mbps = *megabits per second)*
- 802.11g mode 54, 48, 36, 24, 18, 12, 9, 6 Mbps (Mbps = *megabits per second)*
- 802.11n HT20, MCS 0 - 15

2.8 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)	Cable loss (dB)	Effective gain (dBi)
1	Omni	AF 216M245001 (chip)	-	2.4	1.6	0.0	1.6

2.9 Power supply system utilised

Power supply voltage, V_{nom} : 3.6 VDC (Li-ion battery)
Power supply voltage (alternative) for charging only : Input: 100-240 VAC, 50-60 Hz, 0.4 A
Output: 5.0 VDC

2.10 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- USB 3.0 cable, 2 m Model : Common
- - Model : -
- _____ Model : _____

2.11 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in X position.

The tests are carried out in the following frequency band:

2400 MHz – 2483.5 MHz

Preliminary tests are performed to find the worst case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate. The output power can be set by application software from 1 dBm to 20 dBm (P1 to P20) in 1 dB steps.

The test software for the EUT provides free power setting, the special test mode TX continuous mode, modulated. The EUT was set with test modulation to transmit data during the tests with a maximum duty cycle (0.99).

For the final test the following channels and test modes are selected:

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.11b	1 to 13	1, 6, 11	max	DSSS	QBPSK	1 Mbps
802.11g	1 to 13	1, 6, 11	max	OFDM	BPSK	6 Mbps
802.11n	1 to 13	1, 6, 11	max	OFDM	BPSK	MCS0

- TX continuous mode, 802.11 b
- TX continuous mode, 802.11 g
- TX continuous mode, 802.11n

2.11.1 Test jig

No test jig is used.

2.11.2 Test software

Special test software for TX continuous mode is used.

3 TEST RESULT SUMMARY

WLAN device using digital modulation:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 8.8	AC power line conducted emissions	N/A
15.247(a)(2)	RSS247, 5.2(1)	-6 dB EBW	NT
15.247(b)(3)	RSS247, 5.4(4)	Maximum peak output power	P
15.247(b)(4)	RSS247, 5.4(4)	Defacto limit	P
15.247(d)	RSS247, 5.5	Unwanted emission, radiated	N/A
15.247(d)	RSS-Gen, 8.10	Emissions in restricted bands	P
15.247(e)	RSS247, 5.2(2)	PSD	NT
15.35(c)	RSS-Gen, 6.10	Pulsed operation	N/A
15.247(b)(4)	-	Antenna requirement	P
	RSS-Gen, 6.11	Transmitter frequency stability	N/A
	RSS-Gen, 6.6	99 % Bandwidth	NT

The mentioned RSS Rule Parts in the above table are related to:
RSS Gen, Issue 4, November 2014
RSS 247, Issue 2, February 2017

Note: The tests declared as “NT” are done under the WLAN module assessment. Please refer to this test reports.

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 03 April 2018

Testing concluded on : 04 April 2018

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document.
2018.06.07 13:51:42 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Hermann Smetana
I am the author of this document.
2018.06.07 09:34:55 +02'00'

Hermann Smetana
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 °C
Humidity:	30-60 %
Atmospheric pressure:	86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 3000 MHz	95%	± 2.5 x 10^{-7}
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

4.4 Measurement protocol for FCC and ISED

4.4.1 General information

4.4.1.1 Test methodology

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A-1

The Anechoic chamber is a listed test site under the Canadian Test-Sites File-No:

IC 3009A-2

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.1.3 Radiated emission (electrical field 30 MHz - 1 GHz)

Description of measurement.

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.10.The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.
The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency	Level	+	Factor	=	Level	-	CISPR Limit	=	Delta
(MHz)	(dBµV)		(dB)		(dBµV/m)		(dBµV/m)		(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

4.4.1.4 Radiated emission (electrical field 1 GHz - 40 GHz)

Description of measurement.

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table, 1.5 metre above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyzer set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

5 TEST CONDITIONS AND RESULTS

5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part **A 4**.

5.1.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the EUT is power supplied by battery.

5.2 EBW and OBW

For test instruments and accessories used see section 6 Part **MB**.

5.2.1 Description of the test location

Test location: NONE

Remarks: For detailed test results please refer to following to test report of the WLAN module.

5.3 Maximum peak conducted output power

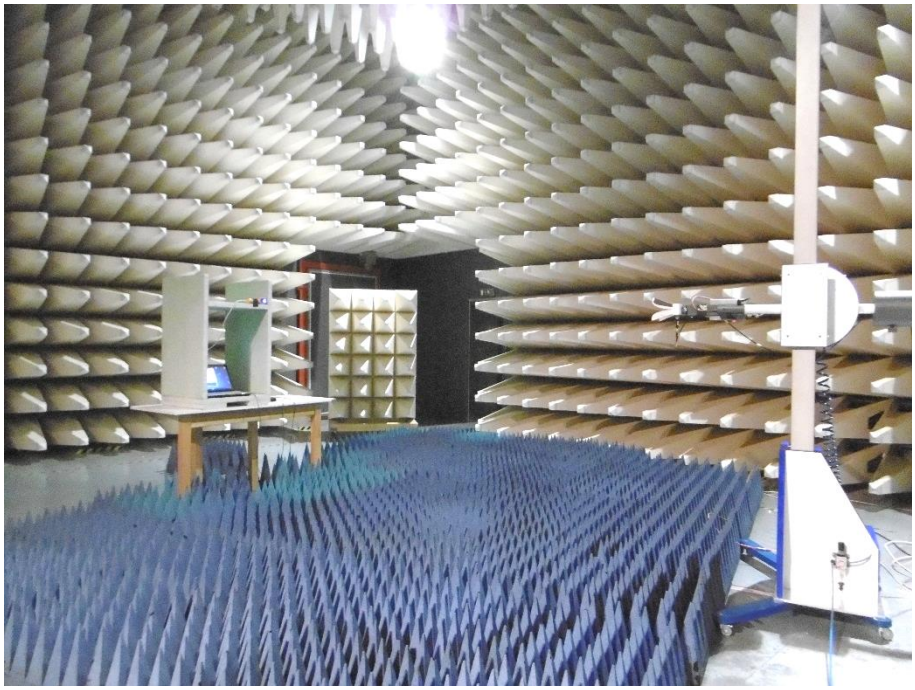
For test instruments and accessories used see section 6 Part **CPR 3**.

5.3.1 Description of the test location

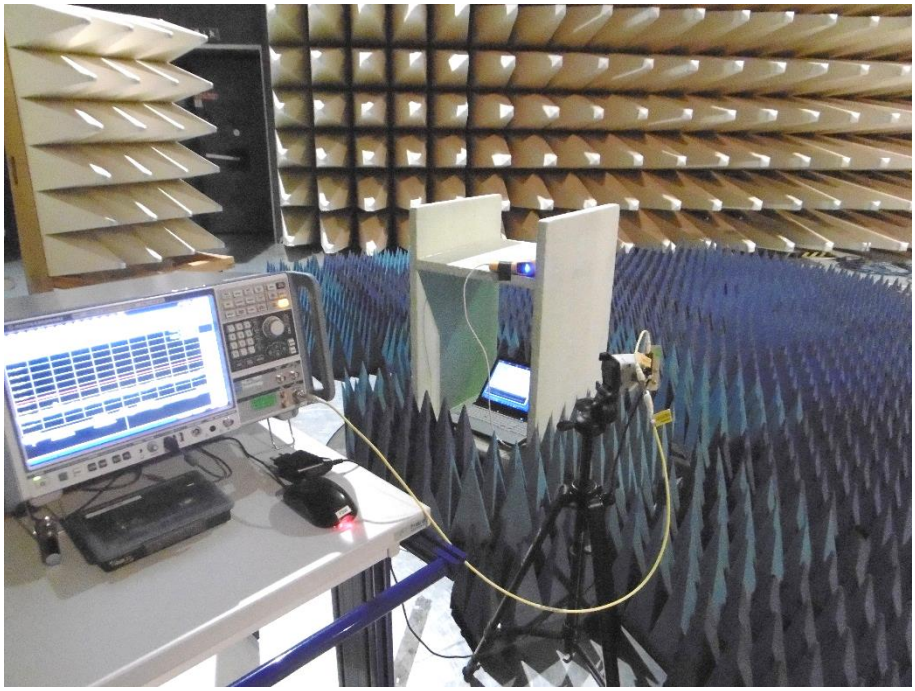
Test location: Anechoic chamber 1
Test distance: 3 m

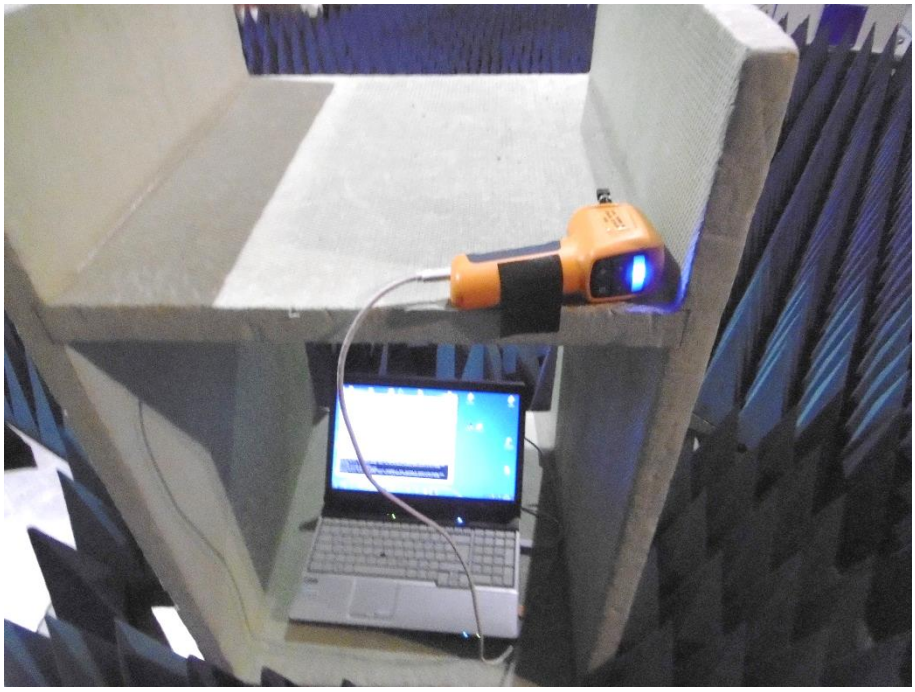
5.3.2 Photo documentation of the test set-up

1 GHz to 18 GHz:



18 GHz to 25 GHz:





5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):
For systems using digital modulation in the 2400 – 2483.5 MHz and 5725 – 5850 MHz bands, the maximum peak conducted output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

5.3.4 Description of Measurement

The maximum peak output power EIRP is measured radiated using a spectrum analyser according the procedure set out in KDB 558074, item 9.1.1. The EUT is set in TX continuous mode while measuring. The the maximum peak conducted output power is calculated from the EIRP using the formula A = P - G; the fieldstrength is converted with the fomula EIRP = FS – 95.3.

5.3.5 Test result

Maximum EIRP:

WLAN Standard 802.11b

802.11b, 1 Mbps, 1 TX Duty cycle: 99%		Test results radiated			
		FS (dBµV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	104.2	8.9	36.0	-27.1
Middle frequency: CH6					
T_{nom}	V_{nom}	101.6	6.3	36.0	-29.7
Highest frequency: CH11					
T_{nom}	V_{nom}	103.3	8.0	36.0	-28.0

WLAN Standard 802.11g

802.11g, 6 Mbps, 1 TX Duty cycle: 99%		Test results radiated			
		FS (dBµV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	104.9	9.6	36.0	-26.4
Middle frequency: CH6					
T_{nom}	V_{nom}	103.7	8.4	36.0	-27.6
Highest frequency: CH11					
T_{nom}	V_{nom}	104.9	9.6	36.0	-26.4

WLAN Standard 802.11n

802.11n HT20, MCS0, 1 TX Duty cycle: 99%		Test results radiated			
		FS (dBµV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	105.5	10.2	36.0	-25.8
Middle frequency: CH6					
T_{nom}	V_{nom}	104.2	8.9	36.0	-27.1
Highest frequency: CH11					
T_{nom}	V_{nom}	105.1	9.8	36.0	-26.2

Maximun conducted output power (calculated):

A = P-G; Antennagain 1.6 dBi, the conducted output power is calculated using the formula A = EIRP - Gain.

WLAN Standard 802.11b

802.11b, 1 Mbps, 1 TX Duty cycle: 99%		Test results conducted		
		A [Pmax] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	7.3	30.0	-22.7
Middle frequency: CH6				
T_{nom}	V_{nom}	4.7	30.0	-25.3
Highest frequency: CH11				
T_{nom}	V_{nom}	6.4	30.0	-23.6

WLAN Standard 802.11g

802.11g, 6 Mbps, 1 TX Duty cycle: 99%		Test results conducted		
		A [Pmax] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	8.0	30.0	-22.0
Middle frequency: CH6				
T_{nom}	V_{nom}	6.8	30.0	-23.2
Highest frequency: CH11				
T_{nom}	V_{nom}	8.0	30.0	-22.0

WLAN Standard 802.11n

802.11n HT20, MCS0, 1 TX Duty cycle: 99%		Test results conducted		
		A [Pmax] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	8.6	30.0	-21.4
Middle frequency: CH6				
T_{nom}	V_{nom}	7.3	30.0	-22.7
Highest frequency: CH11				
T_{nom}	V_{nom}	8.2	30.0	-21.8

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1.0
2400-2483.5	**30**	**1.0**
5725-5850	30	1.0

The requirements are **FULFILLED.**

Remarks: _____

5.4 Power spectral density

For test instruments and accessories used see section 6 Part **CPC 3**.

5.4.1 Description of the test location

Test location: AREA4

Remarks: For detailed test results please refer to following to test report of the WLAN module.

5.5 Band edge compliance

For test instruments and accessories used see section 6 Part **MB**.

5.5.1 Description of the test location

Test location: AREA4

Remarks: For detailed test results please refer to following to test report of the WLAN module.

5.6 Unwanted emissions

For test instruments and accessories used see section 6 Part **SEC 2, SEC 3**.

5.6.1 Description of the test location

Test location: AREA4

Remarks: The measurement is not necessary the emissions are below the 15.209 limit.

5.7 Unwanted emissions in restricted bands, radiated

For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

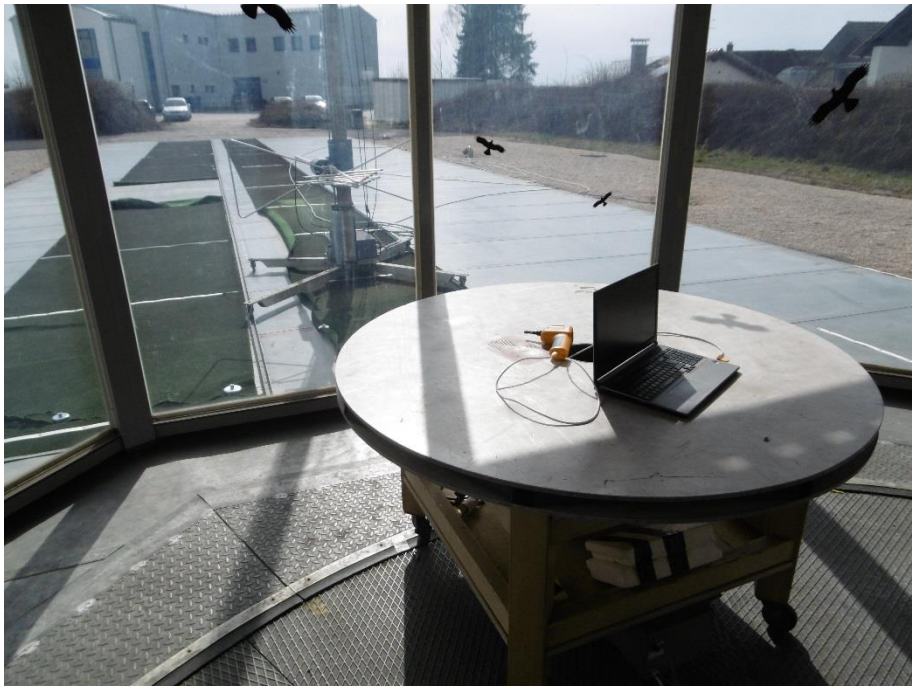
5.7.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

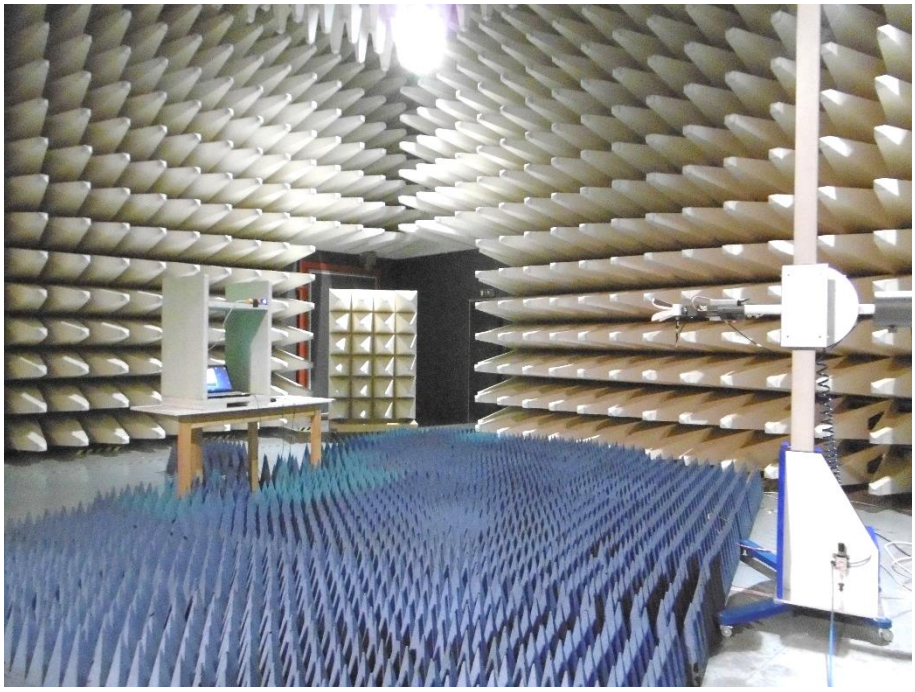
Test distance: 3 m

5.7.2 Photo documentation of the test set-up

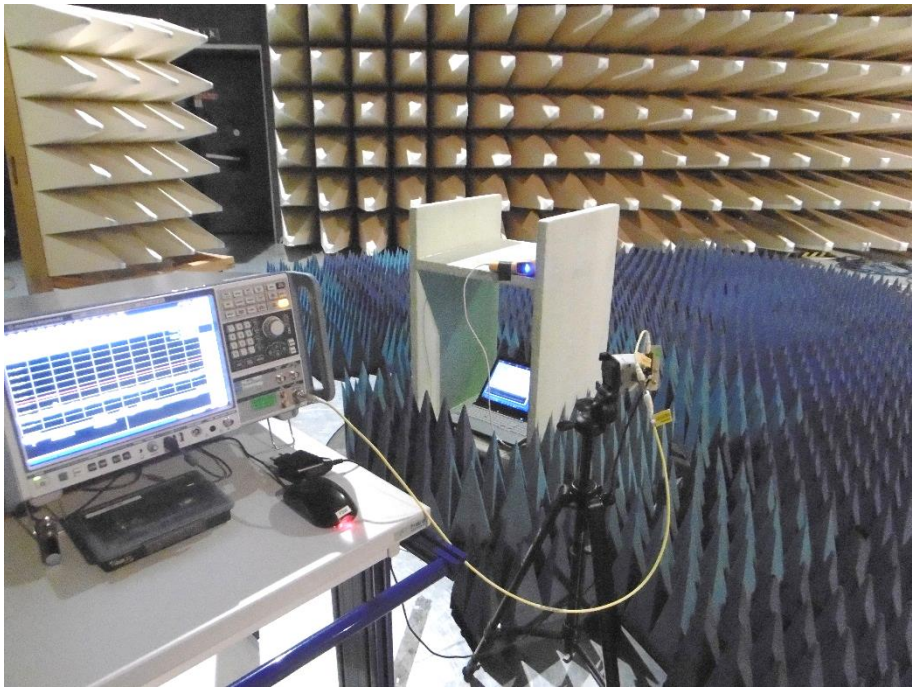
30 MHz to 1000 MHz

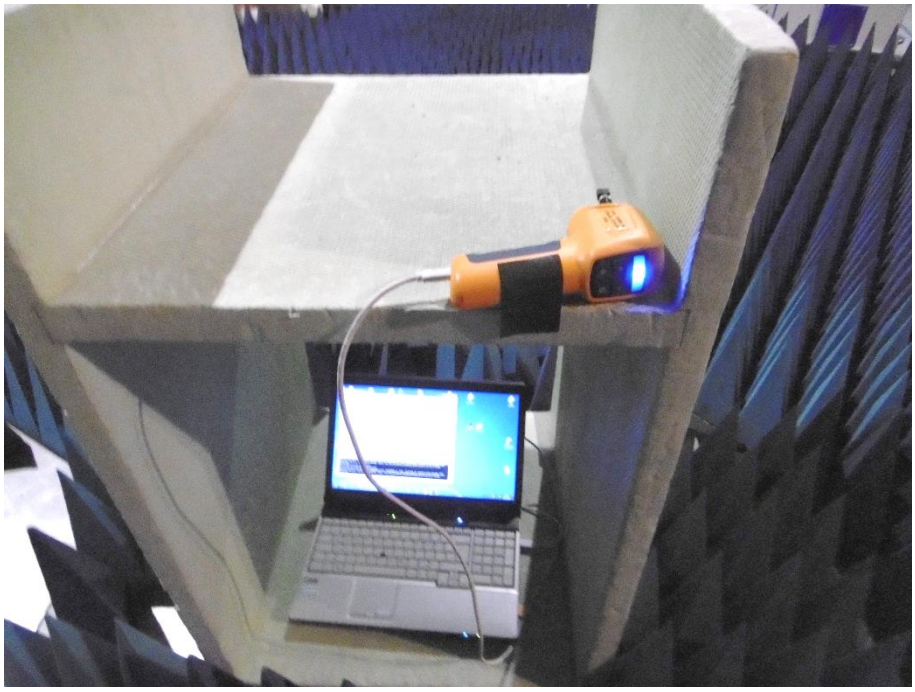


1 GHz to 18 GHz:



18 GHz to 25 GHz:





According to FCC Part 15, Section 15.205(a):
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.7.3 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

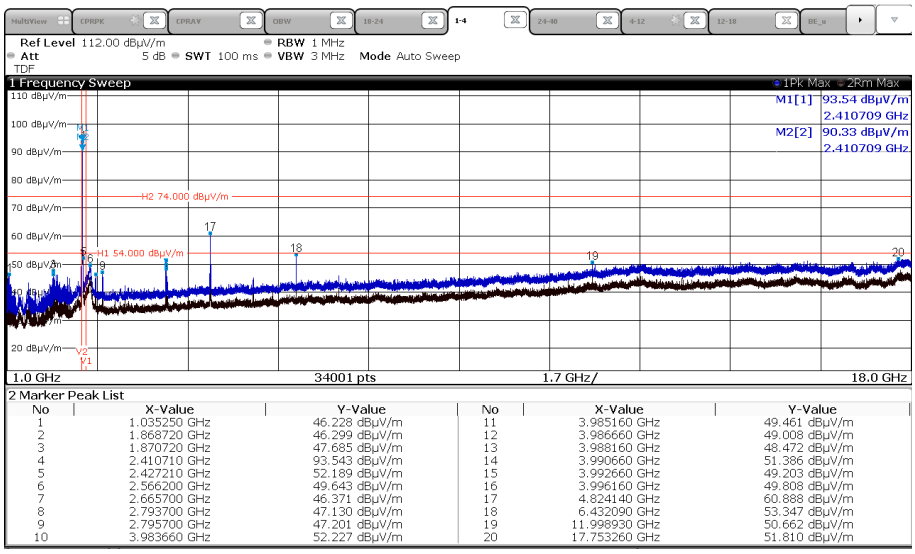
Spectrum analyser settings:
30 MHz – 1000 MHz: RBW: 120 kHz
1000 MHz – 25 GHz: RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Peak

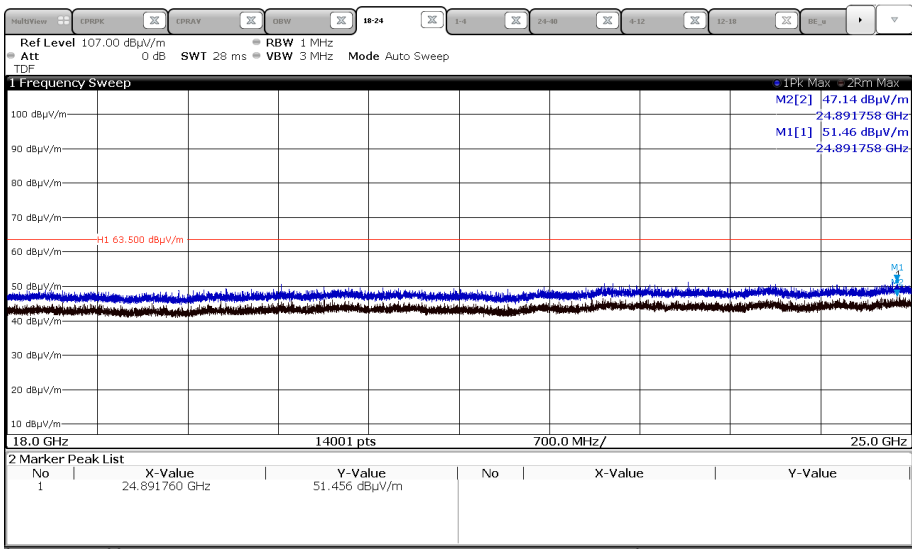
5.7.1 Test result

f < 1000 MHz

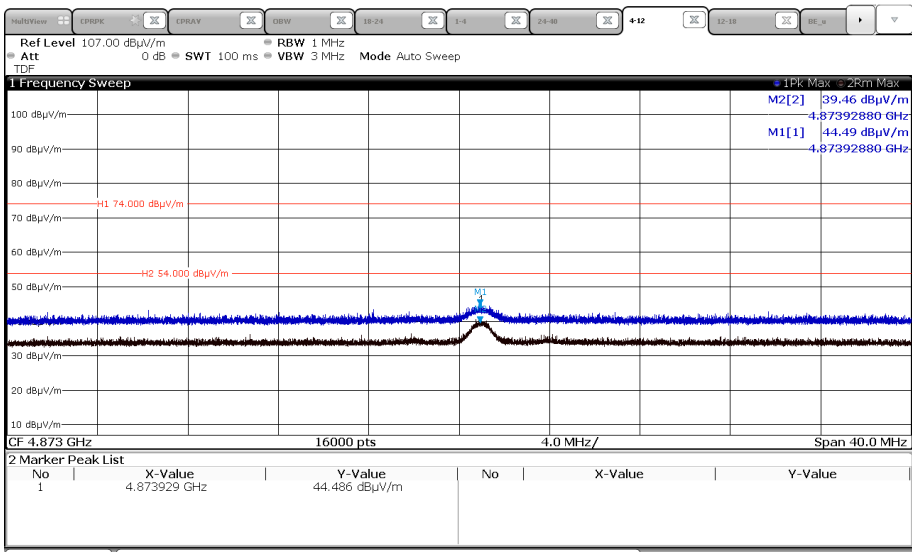
Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
66.28	5.7	5.1	10.6	10.6	16.3	15.7	40.0	-23.7
450.00	2.4	3.8	20.3	20.3	22.7	24.1	46.0	-21.9
500.00	1.6	6.1	21.5	21.5	23.1	27.6	46.0	-18.4
538.00	-0.5	4.3	22.4	22.4	21.9	26.7	46.0	-19.3
560.00	0.1	8.0	22.9	22.9	23.0	30.9	46.0	-15.1

f > 1000 MHz
802.11b
CH1:

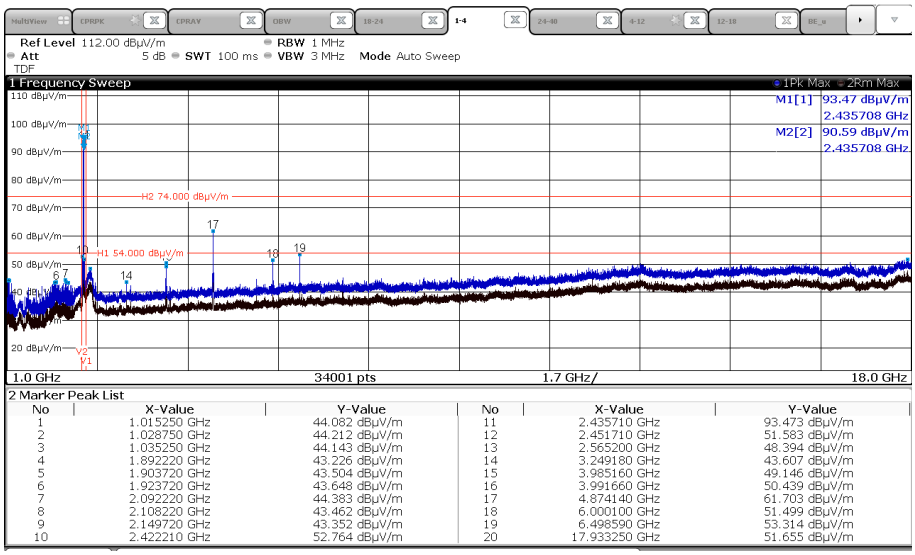


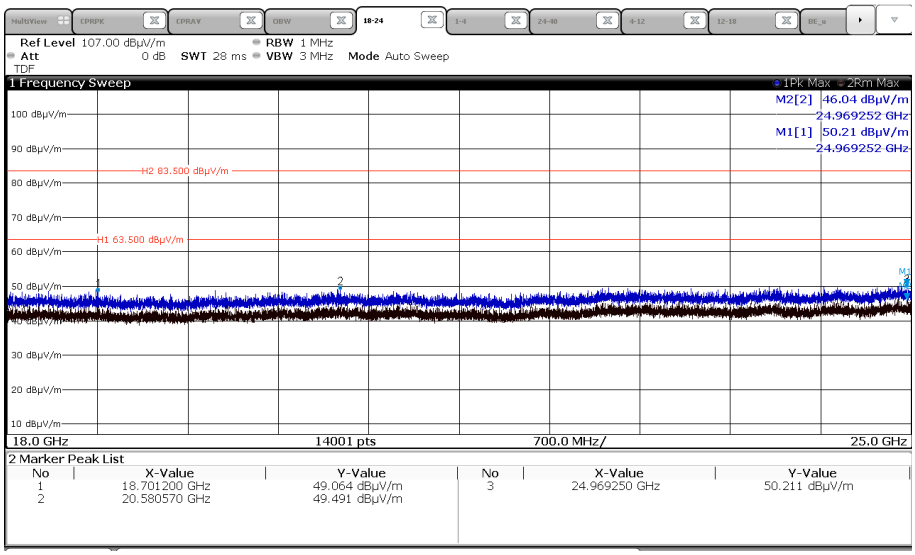


Final measurement:

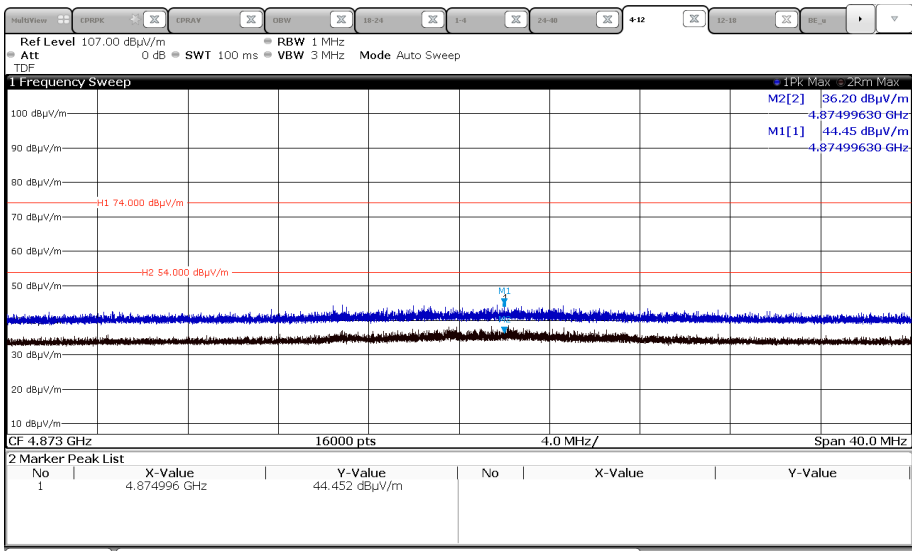


CH6:

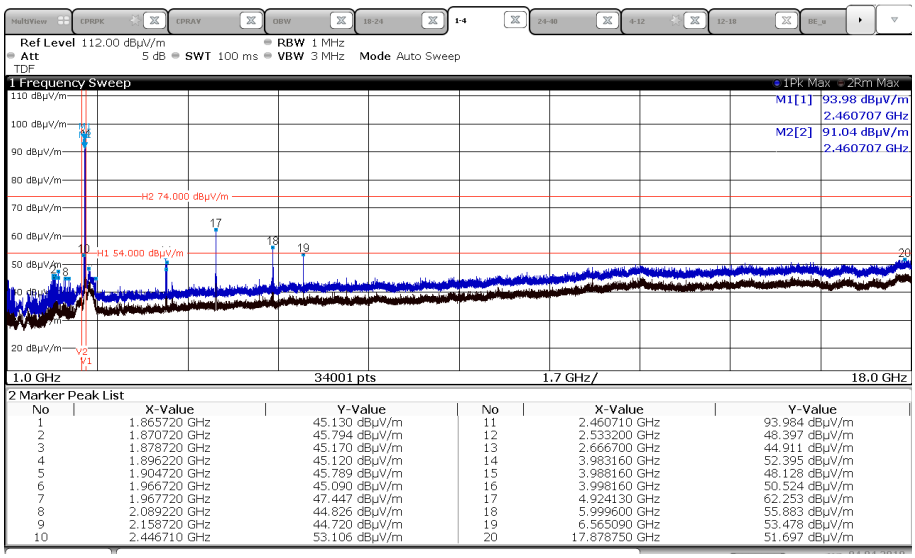


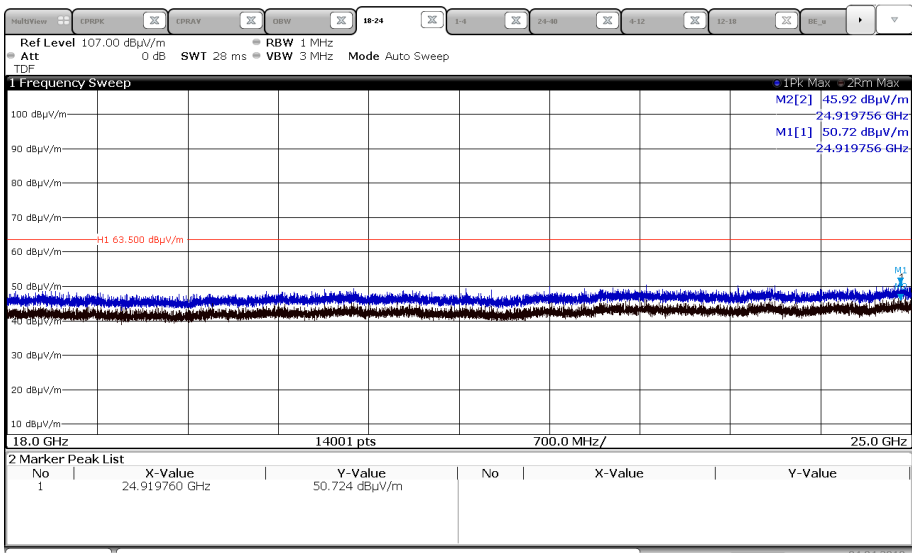


Final measurement:

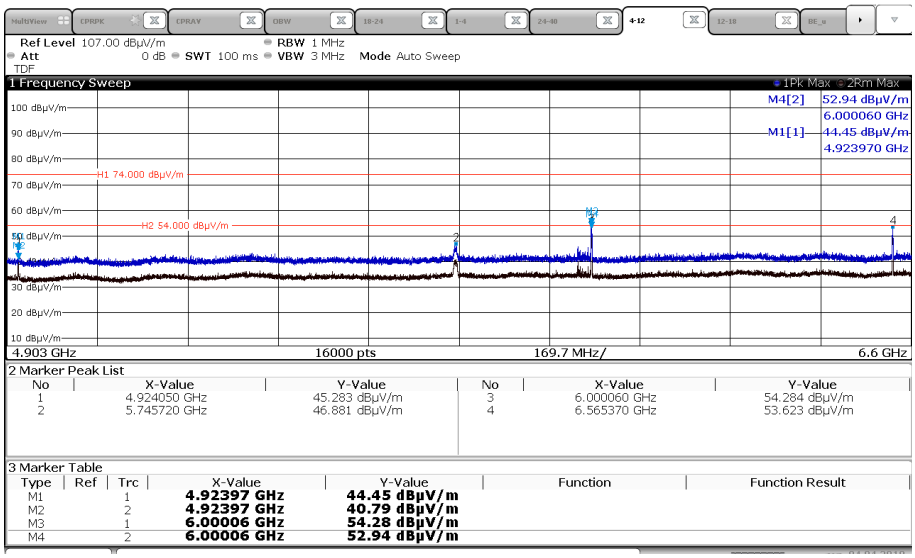


CH11:



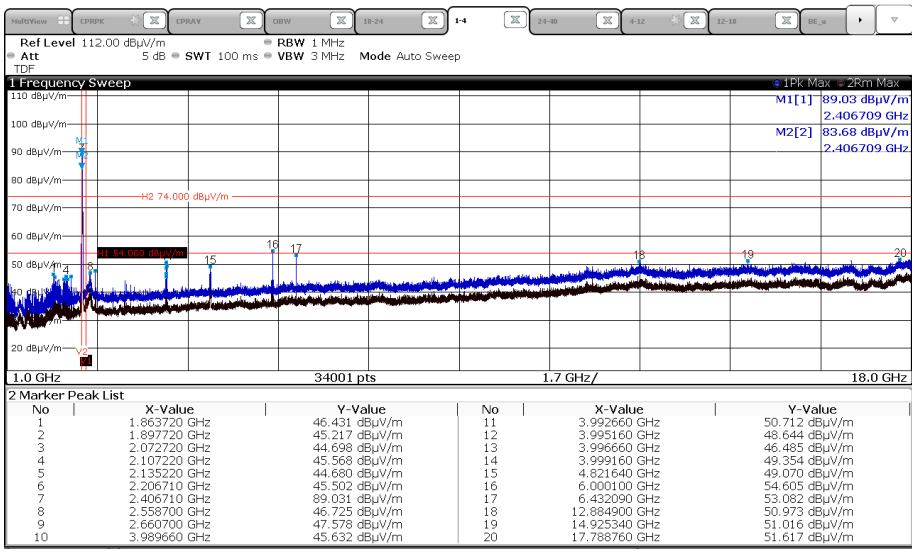


Final measurement:



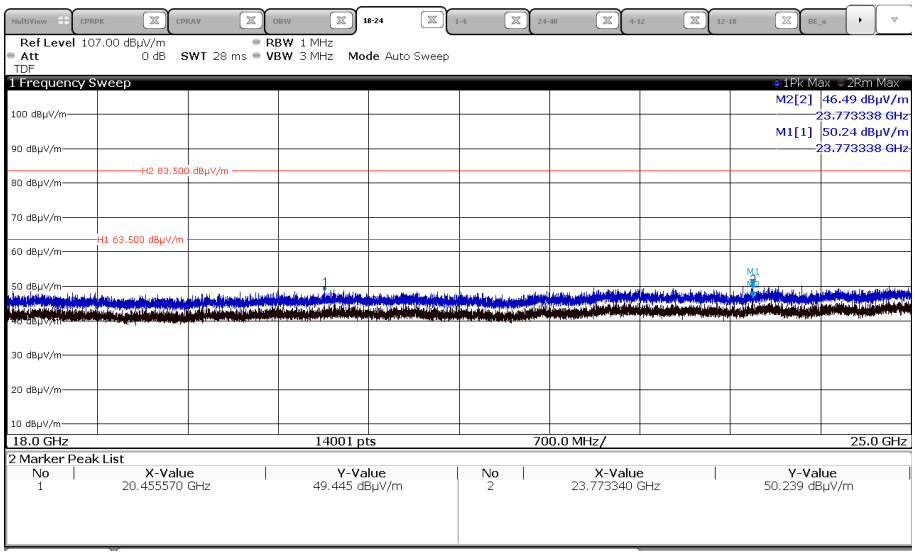
Remark: All peak emissions were below the limits of part 15.209.

802.11g



2 Marker Peak List

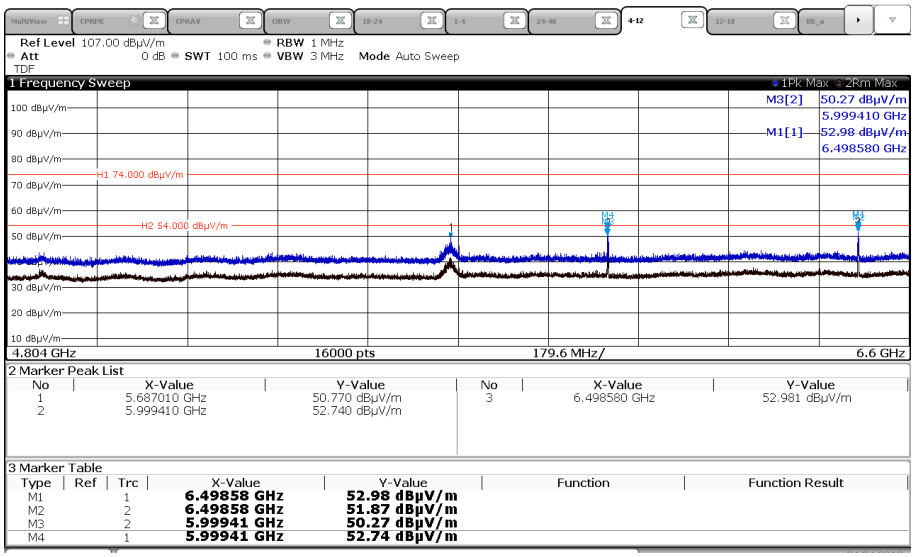
No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.863720 GHz	46.431 dBµV/m	11	3.992660 GHz	50.712 dBµV/m
2	1.897720 GHz	45.217 dBµV/m	12	3.995160 GHz	48.644 dBµV/m
3	2.072720 GHz	44.698 dBµV/m	13	3.996660 GHz	46.485 dBµV/m
4	2.107220 GHz	45.568 dBµV/m	14	3.999160 GHz	49.354 dBµV/m
5	2.135220 GHz	44.680 dBµV/m	15	4.821640 GHz	49.070 dBµV/m
6	2.206710 GHz	45.502 dBµV/m	16	6.000100 GHz	54.605 dBµV/m
7	2.406710 GHz	89.031 dBµV/m	17	6.432090 GHz	53.082 dBµV/m
8	2.558700 GHz	46.725 dBµV/m	18	12.884900 GHz	50.973 dBµV/m
9	2.660700 GHz	47.578 dBµV/m	19	14.925340 GHz	51.016 dBµV/m
10	3.989660 GHz	45.632 dBµV/m	20	17.788760 GHz	51.617 dBµV/m



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	20.455570 GHz	49.445 dBµV/m	2	23.773340 GHz	50.239 dBµV/m

Final measurement:



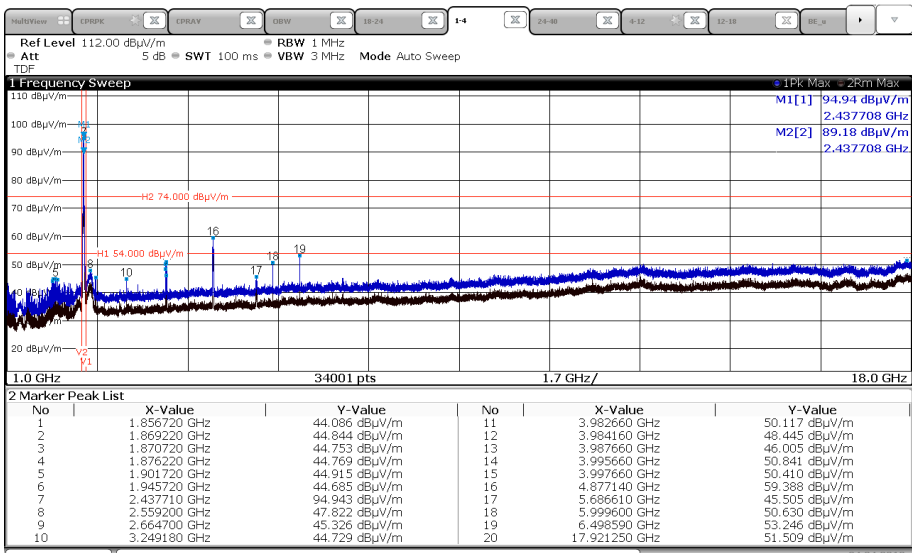
2 Marker Peak List

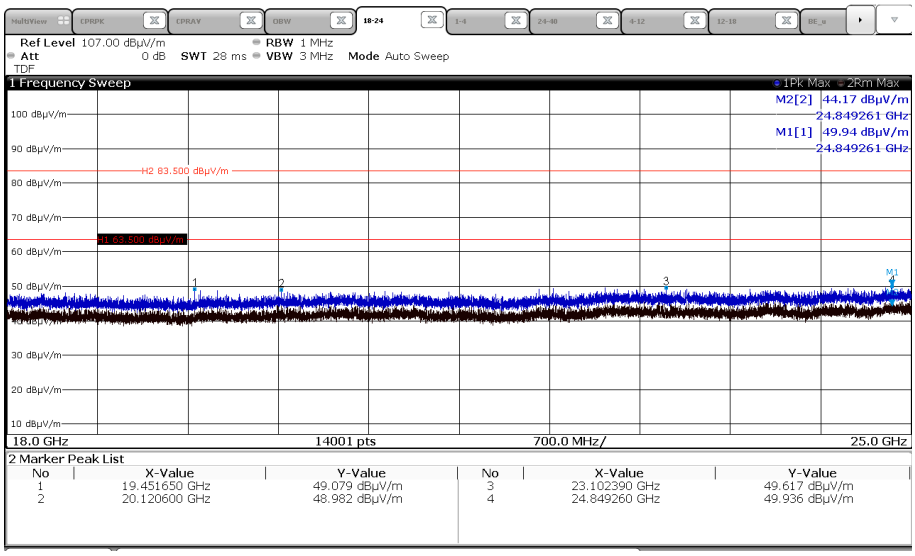
No	X-Value	Y-Value	No	X-Value	Y-Value
1	5.687010 GHz	50.770 dBµV/m	3	6.498580 GHz	52.981 dBµV/m
2	5.999410 GHz	52.740 dBµV/m			

3 Marker Table

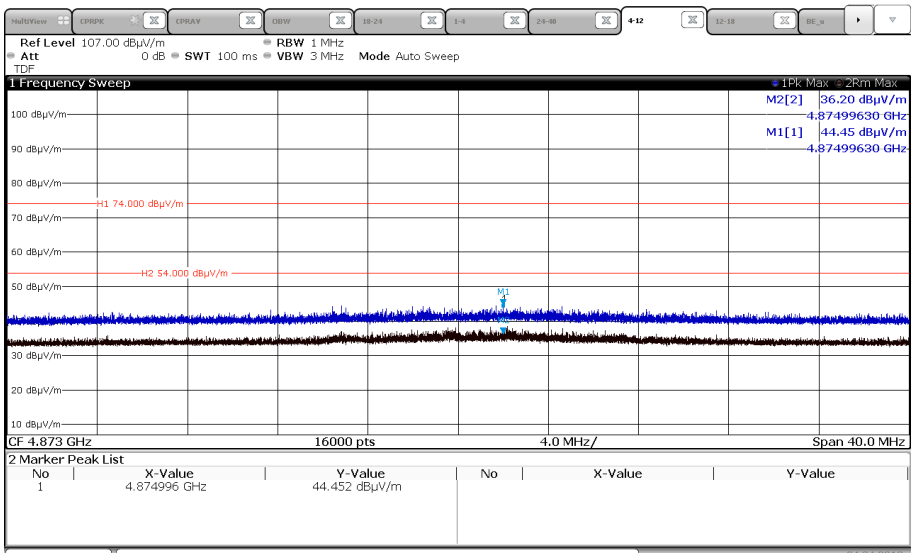
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**6.49858 GHz**	**52.98 dBµV/m**		
M2		2	**6.49858 GHz**	**51.87 dBµV/m**		
M3		2	**5.99941 GHz**	**50.27 dBµV/m**		
M4		1	**5.99941 GHz**	**52.74 dBµV/m**		

CH6:

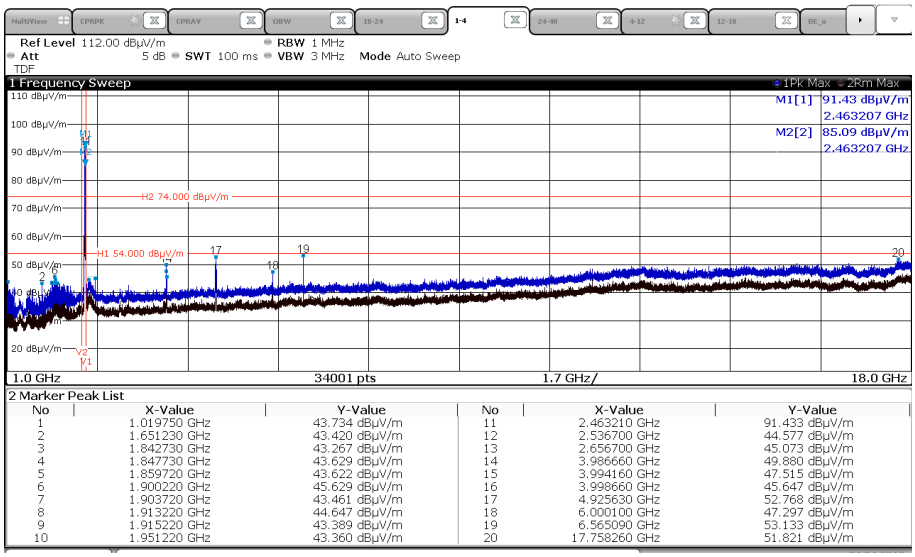


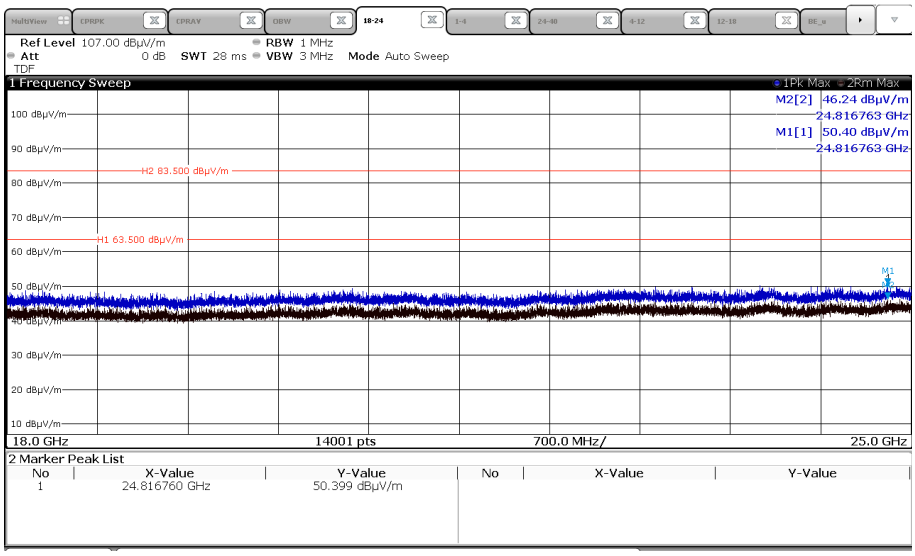


Final measurement:



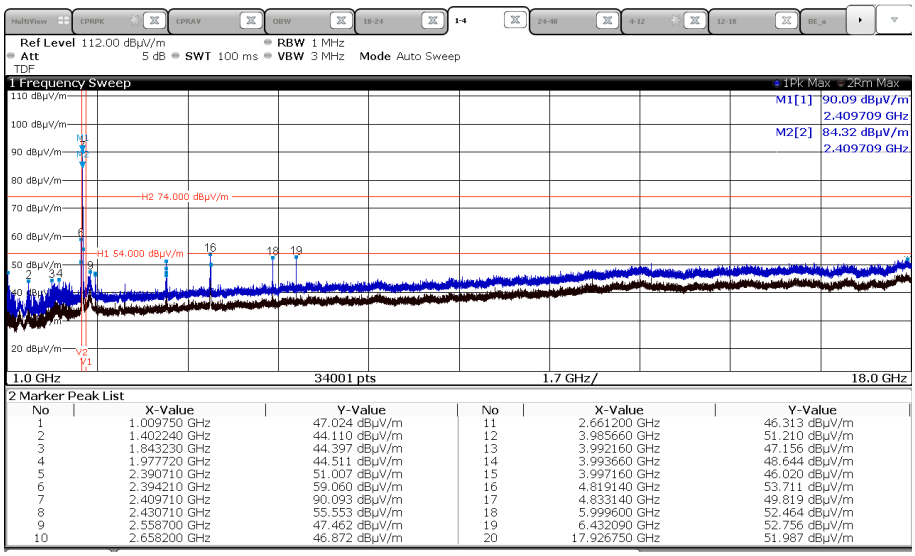
CH11:





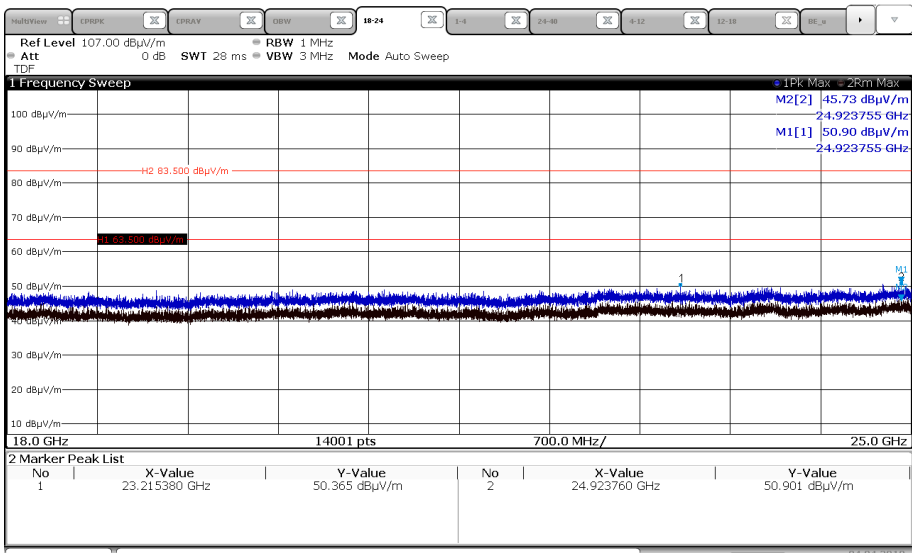
Remark: All peak emissions were below the limits of part 15.209.

802.11n HT20



2 Marker Peak List

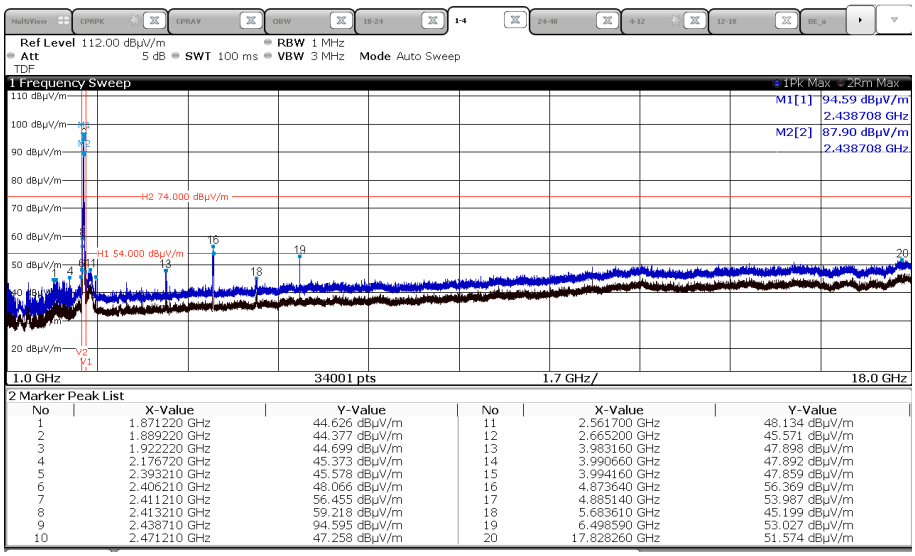
No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.009750 GHz	47.024 dBµV/m	11	2.661200 GHz	46.313 dBµV/m
2	1.402240 GHz	44.110 dBµV/m	12	3.985660 GHz	51.210 dBµV/m
3	1.843230 GHz	44.397 dBµV/m	13	3.992160 GHz	47.156 dBµV/m
4	1.977720 GHz	44.511 dBµV/m	14	3.993660 GHz	48.644 dBµV/m
5	2.390710 GHz	51.007 dBµV/m	15	3.997160 GHz	46.020 dBµV/m
6	2.394210 GHz	59.060 dBµV/m	16	4.819140 GHz	53.711 dBµV/m
7	2.409710 GHz	90.093 dBµV/m	17	4.833140 GHz	49.819 dBµV/m
8	2.430710 GHz	55.553 dBµV/m	18	5.999600 GHz	52.464 dBµV/m
9	2.558700 GHz	47.462 dBµV/m	19	6.432090 GHz	52.756 dBµV/m
10	2.658200 GHz	46.872 dBµV/m	20	17.926750 GHz	51.987 dBµV/m

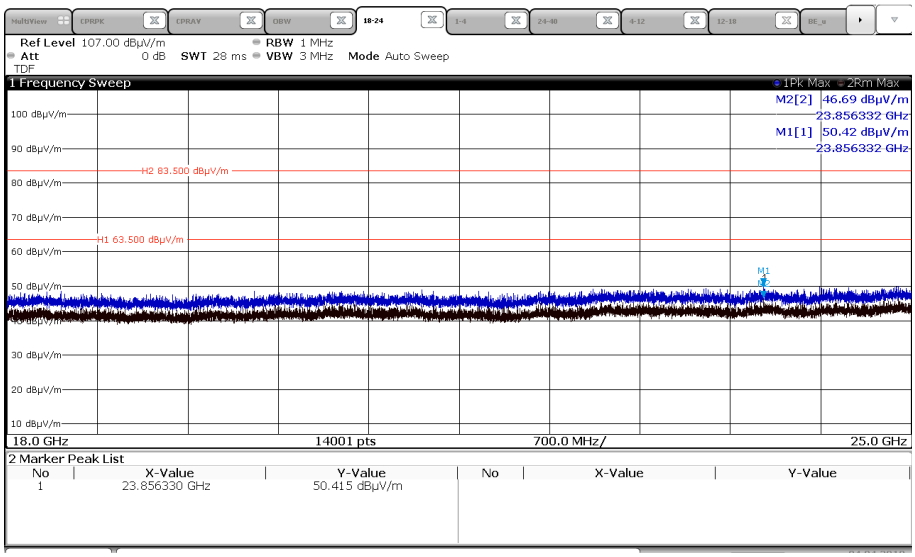


2 Marker Peak List

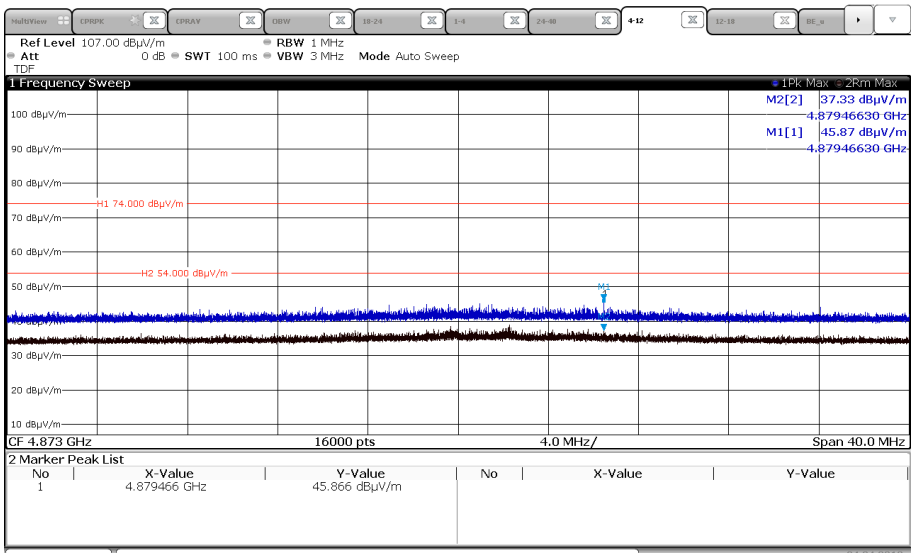
No	X-Value	Y-Value	No	X-Value	Y-Value
1	23.215380 GHz	50.365 dBµV/m	2	24.923760 GHz	50.901 dBµV/m

CH6:

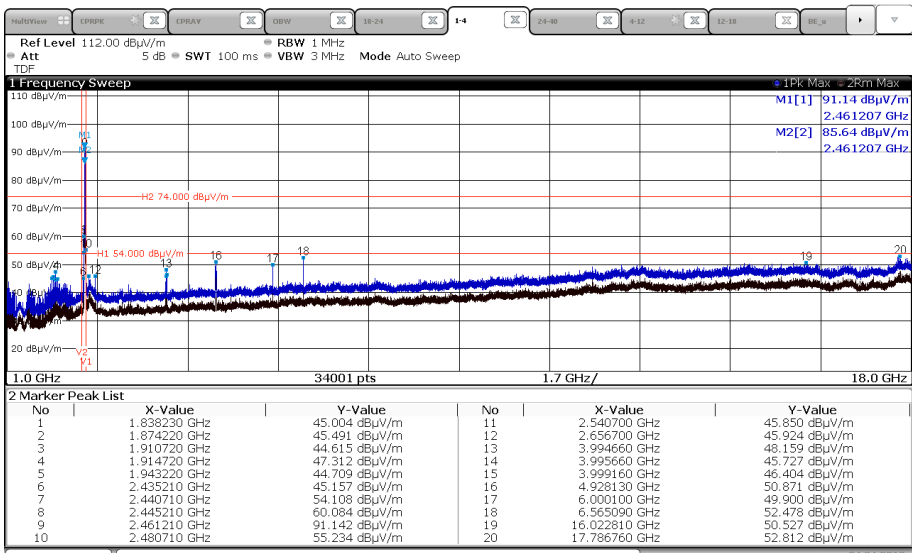


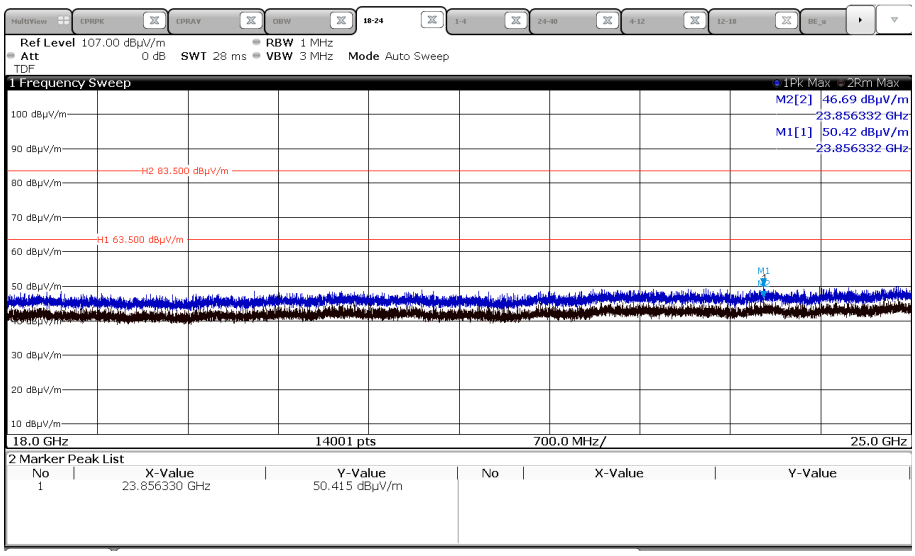


Final measurement:



CH11:





Remark: All peak emissions were below the limits of part 15.209.

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED.**

Remarks: _____

_____

5.9 Antenna application

5.9.1 Applicable standard

According to FCC Part 15C, Section 15.203:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated antenna. No other antenna can be used with the device.

All supplied antennas meet the requirements of part 15.203 and 15.204.

5.9.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):
The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Defacto EIRP-Limit:

Pout = 30 – (Gx – 6);

Antenna	Gx	Cond. limit	max. G	A [max]	Limit P_{out}	Reduction	P set
	(dBi)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)	2.4 GHz
AH 216M245001 (chip)	1.6	30.0	6.0	10.2	34.4	-24.2	Pmax

Remarks: No power reduction results from the defacto limit.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	FSW43	02-02/11-15-001	19/03/2019	19/03/2018		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	10/05/2018	10/05/2017		
	SF104/11N/11N/300MM	02-02/50-13-008				
	18N-20	02-02/50-17-003				
	NMS111-GL200SC01-NMS11	02-02/50-17-012				
	Bandpass Filter	02-02/50-17-019				
SER 2	ESVS 30	02-02/03-05-006	03/07/2018	03/07/2017		
	VULB 9168	02-02/24-05-005	12/04/2018	12/04/2017	21/09/2018	21/03/2018
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 3	FSP 40	02-02/11-11-001	09/10/2018	09/10/2017		
	FSW43	02-02/11-15-001	19/03/2019	19/03/2018		
	JS4-18004000-30-5A	02-02/17-05-017				
	BBHA 9170	02-02/24-05-014	02/06/2018	02/06/2015	26/10/2018	26/10/2017
	KMS102-0.2 m	02-02/50-11-020				
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	10/05/2018	10/05/2017		
	SF104/11N/11N/300MM	02-02/50-13-008				
	18N-20	02-02/50-17-003				
	NMS111-GL200SC01-NMS11	02-02/50-17-012				
	Bandpass Filter	02-02/50-17-019				