



RF - TEST REPORT

- FCC Part 15.247, RSS-247 -

Model Name : LIQ-200 DUO

Product Description : Network tester with WLAN

Applicant : Fluke Corporation

Address : 6920 Seaway Blvd

EVERETT, WA 89203, USA

Manufacturer : Fluke Corporation

Address : 6920 Seaway Blvd

EVERETT, WA 89203, USA

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

POSITIVE

Test Report No. : 80178981-06 Rev_0

31. July 2024

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00

Contents

<u>1</u>	<u>TEST STANDARDS</u>	<u>3</u>
<u>2</u>	<u>EQUIPMENT UNDER TEST</u>	<u>4</u>
2.1	Information provided by the Client	4
2.2	Sampling	4
2.3	General remarks	4
2.4	Photo documentation of the EUT – Detailed photos see ATTACHMENT A	4
2.5	Equipment type	4
2.6	Short description of the equipment under test (EUT)	4
2.7	Variants of the EUT	4
2.8	Operation frequency and channel plan	4
2.9	Transmit operating modes	5
2.10	Antenna	5
2.11	Power supply system utilised	5
2.12	Peripheral devices and interface cables	5
2.13	Determination of worst-case conditions for final measurement	6
<u>3</u>	<u>TEST RESULT SUMMARY</u>	<u>7</u>
3.1	Revision history of test report	7
3.2	Final assessment	7
<u>4</u>	<u>TEST ENVIRONMENT</u>	<u>8</u>
4.1	Address of the test laboratory	8
4.2	Environmental conditions	8
4.3	Statement of the measurement uncertainty	8
4.4	Conformity Decision Rule	9
4.5	Measurement protocol for FCC and ISED	9
<u>5</u>	<u>TEST CONDITIONS AND RESULTS</u>	<u>12</u>
5.1	AC power line conducted emissions	12
5.2	Maximum peak conducted output power	16
5.3	Spurious emissions radiated	19
5.4	Antenna application	30
<u>6</u>	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	<u>31</u>

ATTACHMENT A as separate supplement

1 TEST STANDARDS

The tests were performed **partly** according to following standards:

FCC Rules and Regulations (July 2024)

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
KDB 558074 D01 v05r02	Guidance for compliance measurements on DTS; FHSS and hybrid system devices operating under Section 15.247 of the FCC rules, April 2, 2019.

ISED Canada Rules and Regulations

RSS-Gen, Issue 5 + Amendment 1 + 2	General Requirements for Compliance of Radio Apparatus
RSS-247, Issue 3	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

2.3 General remarks

This report covers the emissions of the radio module Ezurio Sona IF573 in combination with the host device.

Performed tests:

- AC power line conducted emissions
- RF output power, radiated
- Transmitter unwanted emissions, radiated

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

2.5 Equipment type

WLAN - client

2.6 Short description of the equipment under test (EUT)

The EUT is a tool for troubleshooting networks. It is equipped with a WiFi 6E module Ezurio Sona IF573 and uses WLAN 2.4 GHz, 5 GHz and 6 GHz.

Number of tested samples	:	1
Serial number	:	24110552
Firmware number	:	1.2 Build 0

2.7 Variants of the EUT

There are no variants.

2.8 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan 802.11b, g, n HT20, ac VT20, ax HE20:

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

2.9 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	11, 5.5, 2, 1 Mbps	(Mbps = megabits per second)
- 802.11g	54, 48, 36, 24, 18, 12, 9, 6 Mbps	(Mbps = megabits per second)
- 802.11n	HT20, MCS 0 – 7	
- 802.11ac	VT20, MCS 0 – 8	
- 802.11ax	HE20, MCS 0 – 11	

2.10 Antenna

The following antenna shall be used with the EUT:

Number	Characteristic	Name	Connector	Frequency band (GHz)	Gain (dBi)
1	omnidirectional	Ezurio FlexMIMO 6E	MHF4 (2x)	2.400 - 2.500 4.900 - 5.925 5.925 - 7.125	2.2 3.8 3.3

2.11 Power supply system utilised

Power supply voltage	: 3.6 V/DC (battery pack)
Power supply voltage alternative	: 5.0 V/DC (USB-C)

2.12 Peripheral devices and interface cables

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

- none	Model: -
-	Model: -

2.13 Determination of worst-case conditions for final measurement

Preliminary tests are performed in all three orthogonal axes of the EUT to locate at which position and at what setting of the EUT produces the maximum of the emissions.

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

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.11g	1 to 11	1, 6, 11	P_{def}	OFDM	BPSK	6 Mbps
802.11ax HE20	1 to 11	1, 6, 11	P_{def}	OFDM	BPSK	MCS0

2.13.1 Test jig

No test jig is used.

2.13.2 Test software

A regulatory test tool software LWB provided by the customer is used to set the EUT into RX and TX modulated continuous mode. It allows to set channels, bandwidth, modulation type and FCC or ETSI power setting.

3 TEST RESULT SUMMARY

WLAN device using digital modulation and operates in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	passed
15.247(a)(2)	RSS-247, 5.2(a)	-6 dB EBW	Not tested ¹
15.247(b)(3) 15.247(b)(4)	RSS-247, 5.4(d)	Maximum peak radiated output power	passed
15.247(d)	RSS-247, 5.5	Spurious emissions	passed
15.209	RSS-Gen, 8.9 RSS-Gen 8.10	Restricted frequency bands	passed
15.247(e)	RSS-247, 5.2(b)	PSD	Not tested ¹
15.35(c)	RSS-Gen, 8.2	Pulsed operation	Not tested ¹
15.203	-	Antenna requirement	passed
-	RSS-Gen, 6.7	99 % Bandwidth	Not tested ¹

Notes: ¹ not tested, module integration measurements, thus only radiated measurements are performed

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80178981-06	0	31 July 2024	Initial test report

The test report with the highest revision number replaces the previous test reports.

3.2 Final assessment

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

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

Testing commenced on : 12 April 2024

Testing concluded on : 24 April 2024

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Christopher Thaller
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 on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. 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%	$\pm 2.5 \times 10^{-7}$
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 30000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

4.5 Measurement protocol for FCC and ISED

4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

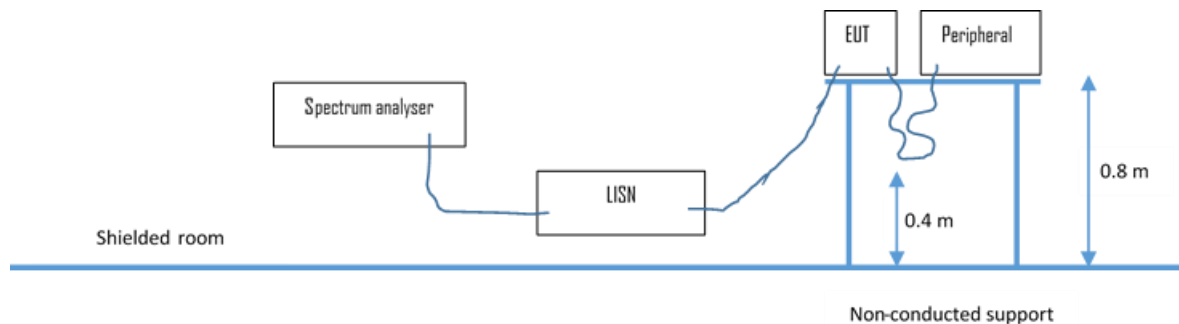
4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dB μ V, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

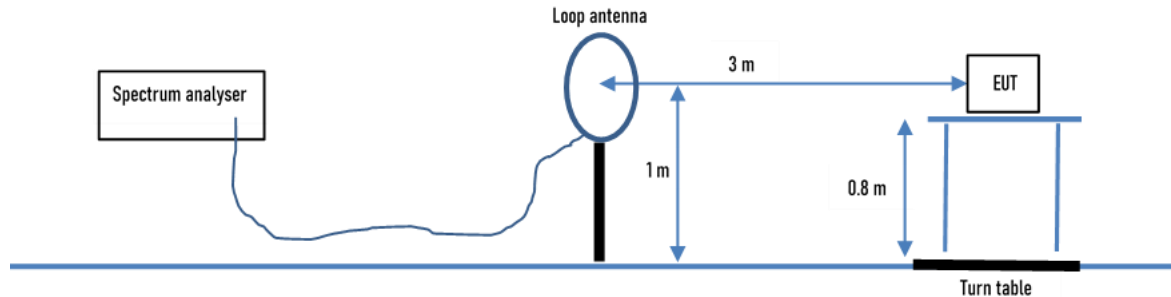
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.5.3.2 Radiated emission

4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

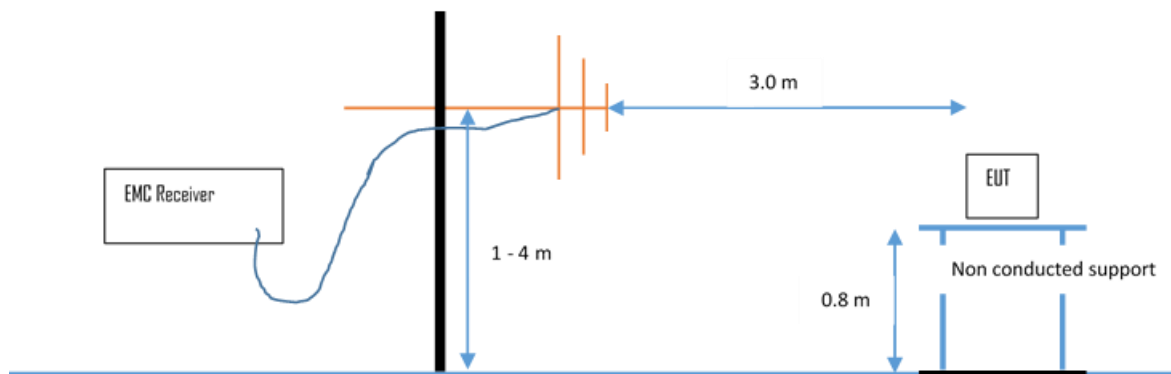
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre 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 along the site axis and the EUT is rotated 360 degrees.

4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



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. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. 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 limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

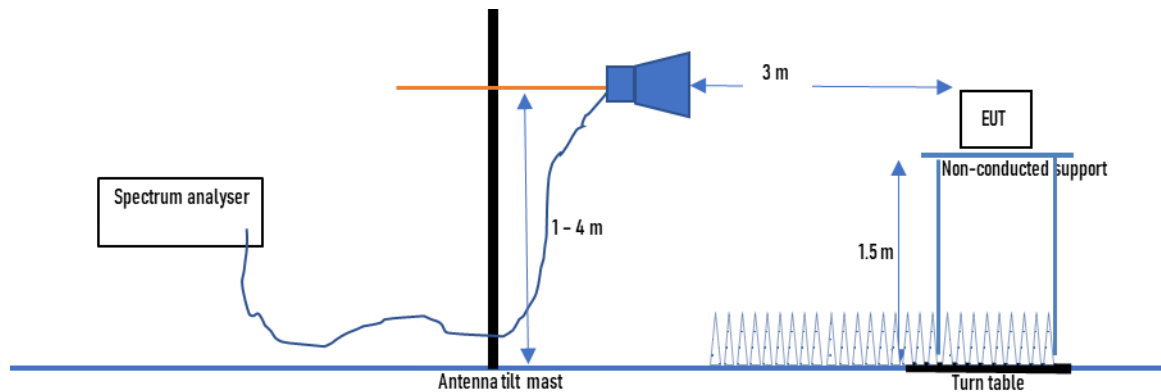
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

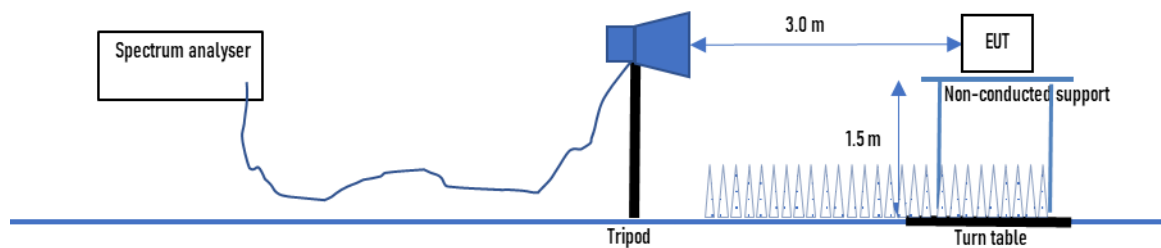
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz 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 non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the centre, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.5.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz 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 non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the centre, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit is adopted.

5 TEST CONDITIONS AND RESULTS

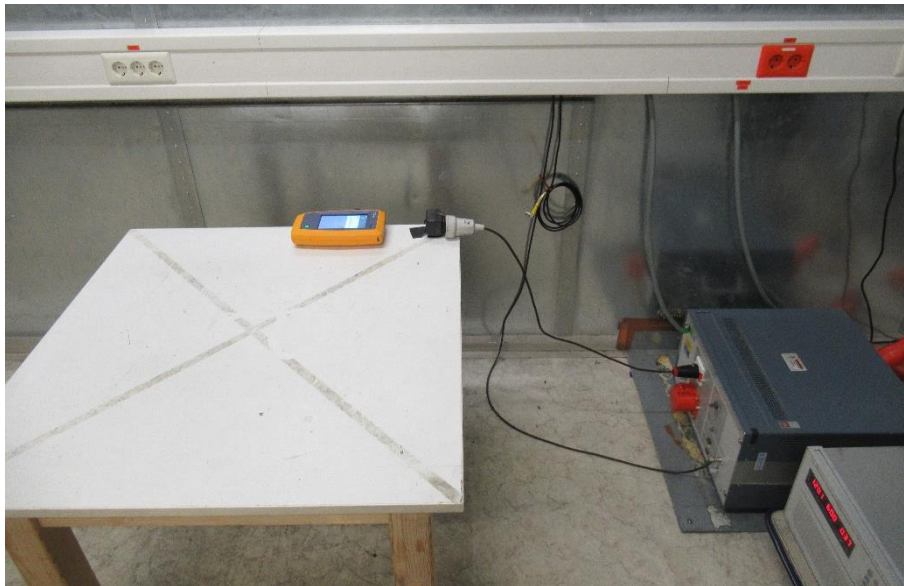
5.1 AC power line conducted emissions

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

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 19.6 dB at 0.159 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Limit according to RSS-Gen 8.8:

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* The level decreases linearly with the logarithm of the frequency.

The requirements are **FULFILLED**.

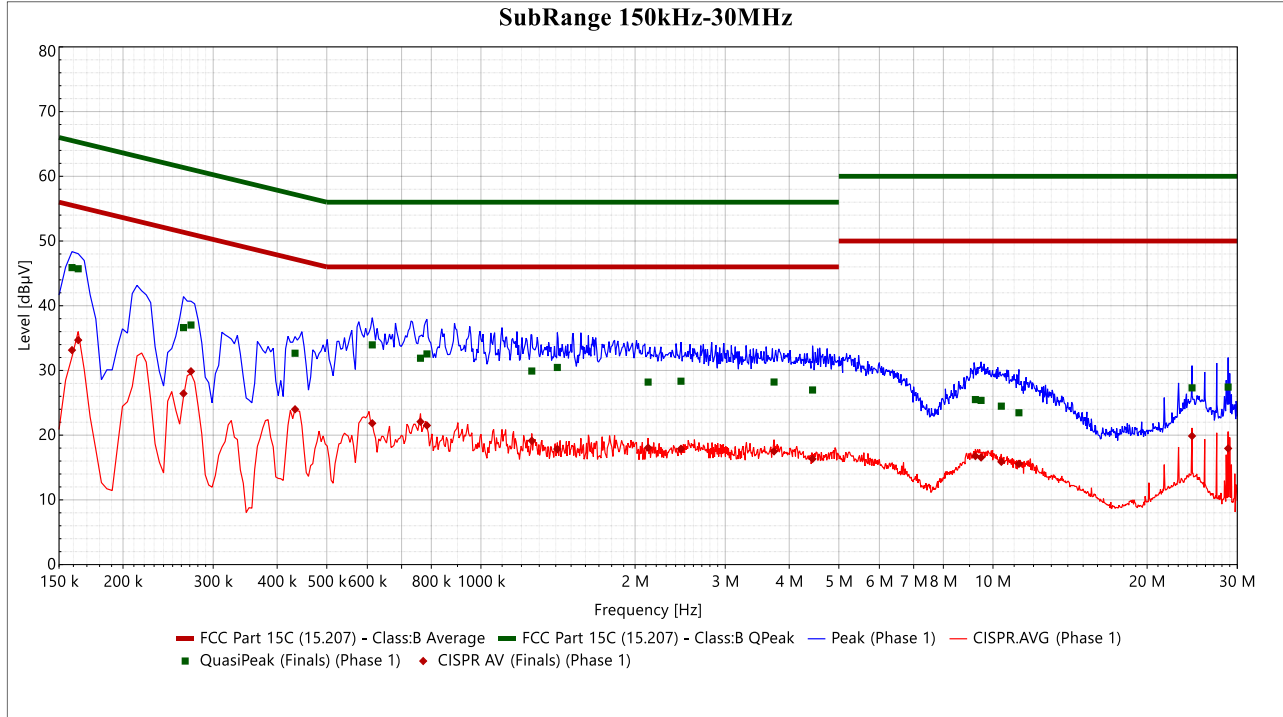
Remarks: For detailed test result please see the following test protocols.

Test performed with AC adapter KSAS0120500200D5.

5.1.6 Test protocol

Test point L1
Operation mode: Transmission at 2.4 GHz

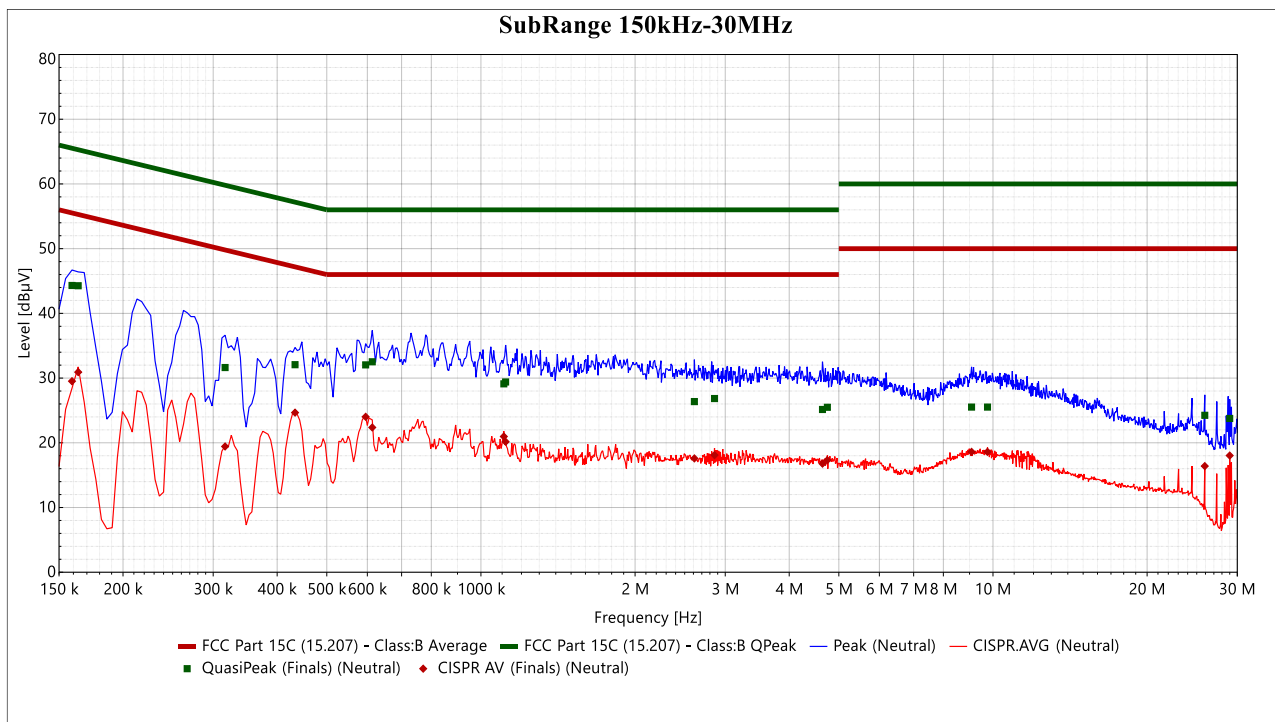
Result: passed



Frequency (Hz)	QuasiPeak (dBμV)	QP Margin	QP Limit (dBμV)	CISPR AV (dBμV)	CISPR AV Margin	AV Limit (dBμV)	Line	Correction (dB)
159 k	45.892	-19.624	65.516	33.139	-22.377	55.516	Phase 1	10.076
163.5 k	45.71	-19.575	65.284	34.686	-20.599	55.284	Phase 1	10.077
262.5 k	36.618	-24.734	61.352	26.428	-24.924	51.352	Phase 1	10.1
271.5 k	37.021	-24.051	61.072	29.87	-21.202	51.072	Phase 1	10.102
433.5 k	32.656	-24.53	57.185	23.995	-23.19	47.185	Phase 1	10.147
613.5 k	33.948	-22.052	56	21.837	-24.163	46	Phase 1	10.162
762 k	31.886	-24.114	56	22.085	-23.915	46	Phase 1	10.183
784.5 k	32.545	-23.455	56	21.499	-24.501	46	Phase 1	10.185
1.257 M	29.912	-26.088	56	19.136	-26.864	46	Phase 1	10.245
1.41 M	30.462	-25.538	56	17.863	-28.137	46	Phase 1	10.26
2.121 M	28.199	-27.801	56	18.064	-27.936	46	Phase 1	10.277
2.4585 M	28.343	-27.657	56	17.891	-28.109	46	Phase 1	10.305
3.7365 M	28.207	-27.793	56	17.499	-28.501	46	Phase 1	10.358
4.443 M	26.978	-29.022	56	16.328	-29.672	46	Phase 1	10.408
9.24 M	25.497	-34.503	60	16.766	-33.234	50	Phase 1	10.647
9.4785 M	25.374	-34.626	60	16.552	-33.448	50	Phase 1	10.645
10.383 M	24.478	-35.522	60	15.88	-34.12	50	Phase 1	10.687
11.238 M	23.464	-36.536	60	15.555	-34.445	50	Phase 1	10.779
24.477 M	27.309	-32.691	60	19.875	-30.125	50	Phase 1	11.469
28.7925 M	27.434	-32.566	60	17.95	-32.05	50	Phase 1	11.467

Test point N
Operation mode: Transmission at 2.4 GHz

Result: passed



Frequency (Hz)	QuasiPeak (dBμV)	QP Margin	QP Limit (dBμV)	CISPR AV (dBμV)	CISPR AV Margin	AV Limit (dBμV)	Line	Correction (dB)
159 k	44.311	-21.205	65.516	29.519	-25.997	55.516	Neutral	10.107
163.5 k	44.272	-21.012	65.284	30.917	-24.367	55.284	Neutral	10.108
316.5 k	31.635	-28.163	59.798	19.431	-30.367	49.798	Neutral	10.154
433.5 k	32.073	-25.112	57.185	24.664	-22.521	47.185	Neutral	10.173
595.5 k	32.044	-23.956	56	24.017	-21.983	46	Neutral	10.186
613.5 k	32.516	-23.484	56	22.366	-23.634	46	Neutral	10.188
1.1085 M	29.11	-26.89	56	20.97	-25.03	46	Neutral	10.239
1.1175 M	29.4	-26.6	56	20.159	-25.841	46	Neutral	10.24
2.6115 M	26.374	-29.626	56	17.586	-28.414	46	Neutral	10.357
2.859 M	26.838	-29.162	56	18.092	-27.908	46	Neutral	10.372
4.6455 M	25.151	-30.849	56	16.779	-29.221	46	Neutral	10.433
4.749 M	25.487	-30.513	56	17.324	-28.676	46	Neutral	10.434
9.0825 M	25.525	-34.475	60	18.604	-31.396	50	Neutral	10.638
9.7575 M	25.52	-34.48	60	18.604	-31.396	50	Neutral	10.644
25.9215 M	24.25	-35.75	60	16.396	-33.604	50	Neutral	11.109
28.995 M	23.763	-36.237	60	18.034	-31.966	50	Neutral	11.023

5.2 Maximum peak conducted output power

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

5.2.1 Description of the test location

Test location: Anechoic chamber 1

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

According to RSS-247 5.4(d):

For DTSSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

5.2.4 Description of Measurement

The maximum peak radiated output power is measured using a spectrum analyser following the procedure set out in ANSI C63.10, item 11.9.2.2. The EUT is set in TX continuous mode while measuring.

5.2.5 Test result

EIRP results (measured radiated):

Radiated Measurement						
15.247(b)(3)						
Modulation	Channel	Frequency	Measured fieldstrength	Calculated EIRP	Peak cond. Limit	Margin (cond)
		MHz	dB(μV/m)	dBm	dBm	dB
802.11g 6 Mbps	CH1	2412	114.9	19.7	30	-10.3
	CH6	2437	121.8	26.6	30	-3.4
	CH11	2462	115.9	20.7	30	-9.3
802.11n HT20, MCS0	CH1	2412	117.5	22.3	30	-7.7
	CH6	2437	119.9	24.7	30	-5.3
	CH11	2462	116.6	21.4	30	-8.6

Radiated Measurement								
RSS-247 5.4 (d)								
Modulation	Channel	Frequency	Measured fieldstrength	Calculated EIRP	EIRP Limit	Margin (EIRP)	Peak cond. Limit	Margin (cond)
		MHz	dB(μV/m)	dBm	dBm	dB	dBm	dB
802.11g 6 Mbps	CH1	2412	114.9	19.7	36.0	-16.3	30	-10.3
	CH6	2437	121.8	26.6	36.0	-9.4	30	-3.4
	CH11	2462	115.9	20.7	36.0	-15.3	30	-9.3
802.11n HT20, MCS0	CH1	2412	117.5	22.3	36.0	-13.7	30	-7.7
	CH6	2437	119.9	24.7	36.0	-11.3	30	-5.3
	CH11	2462	116.6	21.4	36.0	-14.6	30	-8.6

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

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

Peak output power limit according to RSS-247 5.4(d):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(W)
902-928	30	1.0
2400-2483.5	30	1.0

Frequency (MHz)	EIRP Limit	
	(dBm)	(W)
902-928	36	4.0
2400-2483.5	36	4.0

The requirements are **FULFILLED**.

Remarks: Note: Conducted limits are consulted despite radiated measurement, for antenna gain please refer to section 2.10.

5.3 Spurious emissions radiated

For test instruments and accessories used see section 6 Part **SER1, SER 2, SER 3**.

5.3.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1

Test distance: 3 m

5.3.2 Photo documentation of the test set-up

9 kHz - 30 MHz:



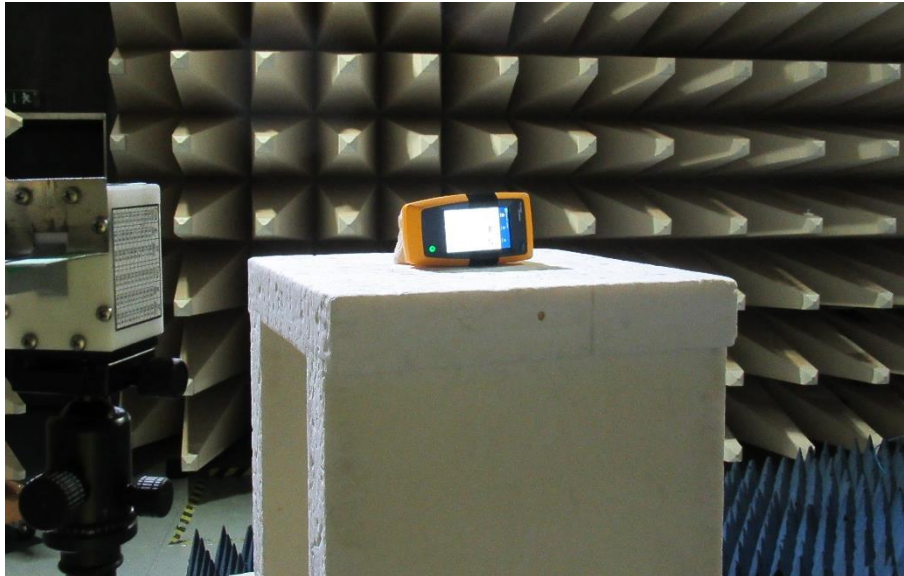
30 MHz - 1 GHz:



1 GHz - 18 GHz:



18 GHz - 25 GHz:



5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Attenuation below the general limits specified in § 15.209(a) is not required. 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)).

According to RSS-247 5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

5.3.4 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.

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

Measurements are performed in following order:

1) Measurement of emissions according to General Limit specified in section 15.209(a):

Test receiver settings for SER1, SER2:

9kHz-150kHz	RBW: 200 Hz	Detector: Quasi peak*	Meas. Time: 1 s,
150kHz-30MHz	RBW: 9 kHz	Detector: Quasi peak*	Meas. Time: 1 s,
30MHz-1GHz	RBW: 120 MHz	Detector: Quasi peak	Meas. Time: 1 s,

*AV Detector in the ranges 9-90kHz and 110-490kHz

Spectrum analyser settings for SER3:

1GHz-26GHz	RBW: 1 MHz	Detector: Max. peak	Trace: Max. hold	Sweep: Auto
------------	------------	---------------------	------------------	-------------

2) If emissions outside the Restricted Bands are above General Limit additional measurements of emissions according to Spurious Emissions Limit specified in section 15.247(d) are performed:

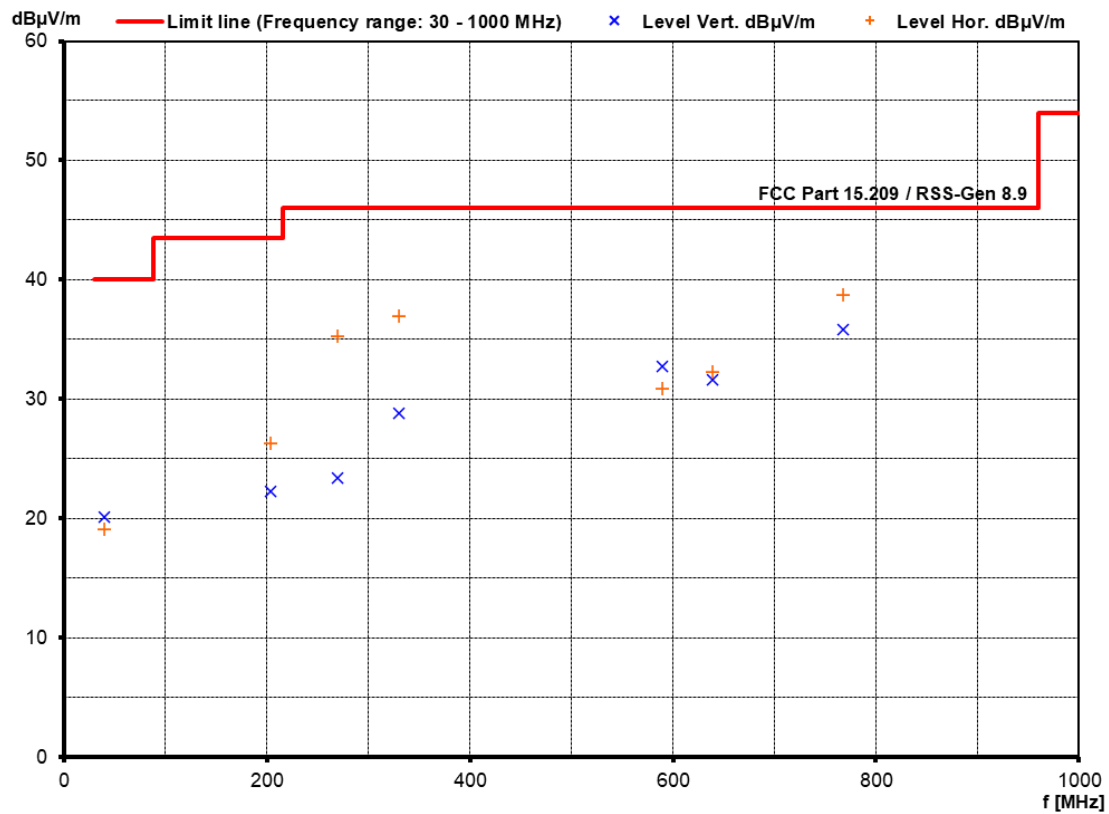
Spectrum analyser settings:

RBW: 100 kHz	VBW: 300 kHz	Detector: Max. peak	Trace: Max. hold	Sweep: Auto
--------------	--------------	---------------------	------------------	-------------

5.3.5 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)
40.00	3.3	1.1	16.8	18.0	20.1	19.1	40.0	-19.9
203.50	5.1	9.6	17.1	16.7	22.2	26.3	43.5	-17.2
270.00	4.0	15.7	19.4	19.5	23.4	35.2	46.0	-10.8
330.00	7.7	15.3	21.1	21.6	28.8	36.9	46.0	-9.1
589.00	4.7	2.5	28.0	28.3	32.7	30.8	46.0	-13.3
638.70	2.7	3.0	28.9	29.3	31.6	32.3	46.0	-13.7
768.00	4.8	7.3	31.0	31.4	35.8	38.7	46.0	-7.3

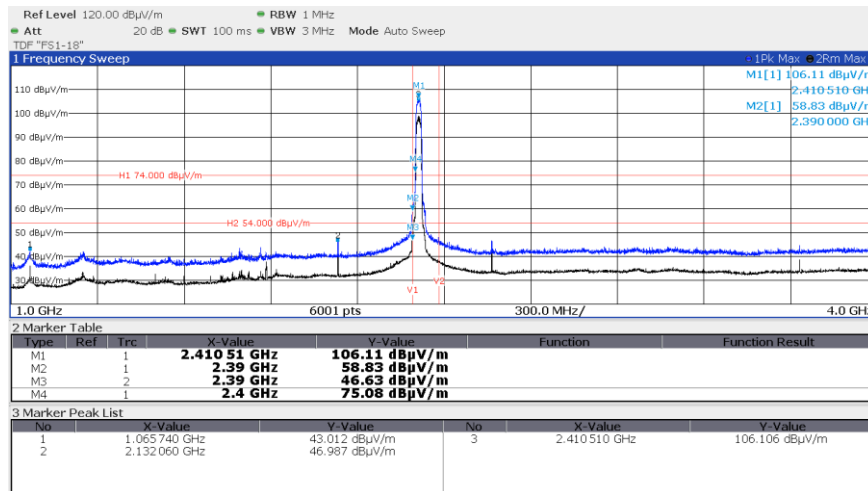


Note: No emissions detected in the frequency range 9 kHz to 30 MHz.

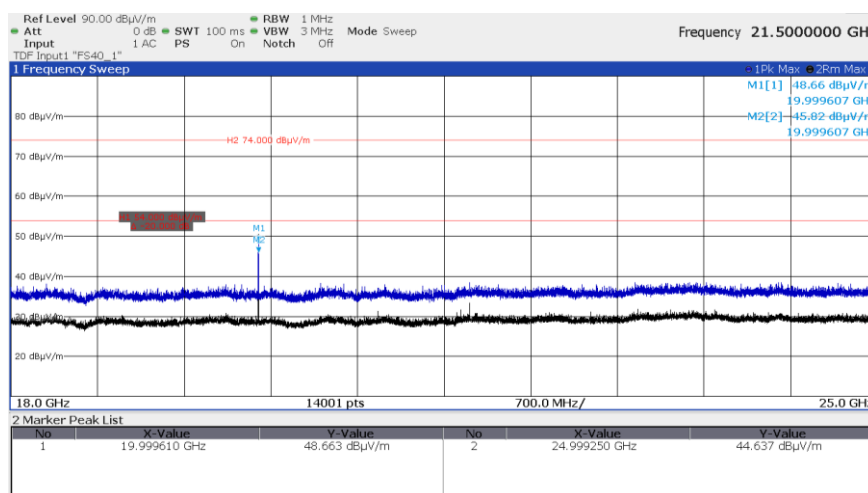
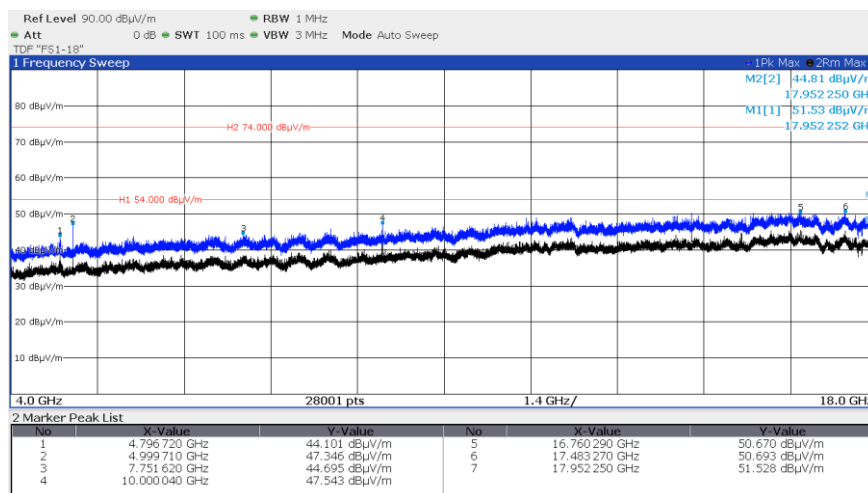
f > 1000 MHz

1) Measurement of emissions according to General Limit specified in section 15.209(a) / RSS-Gen 8.9:

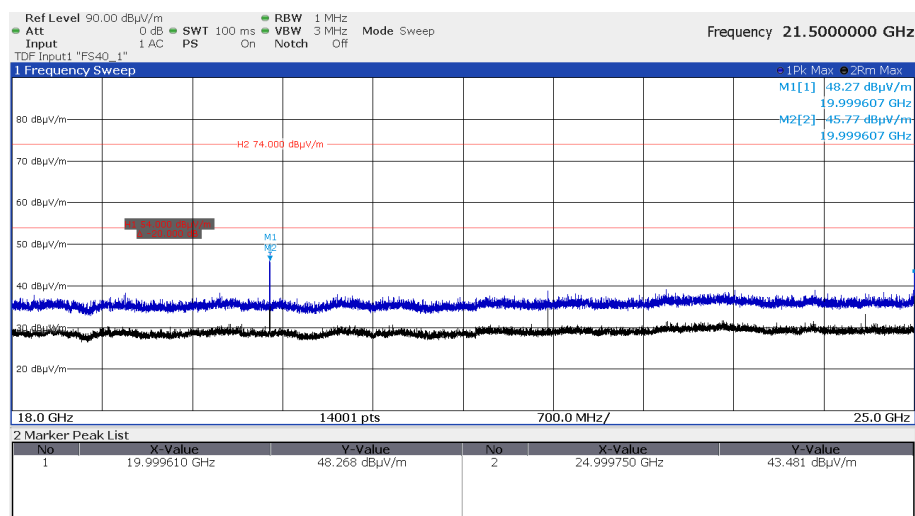
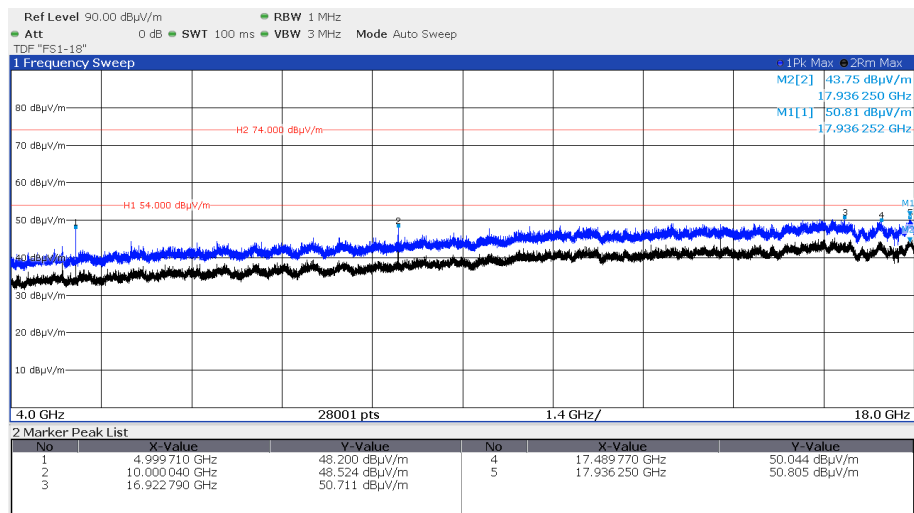
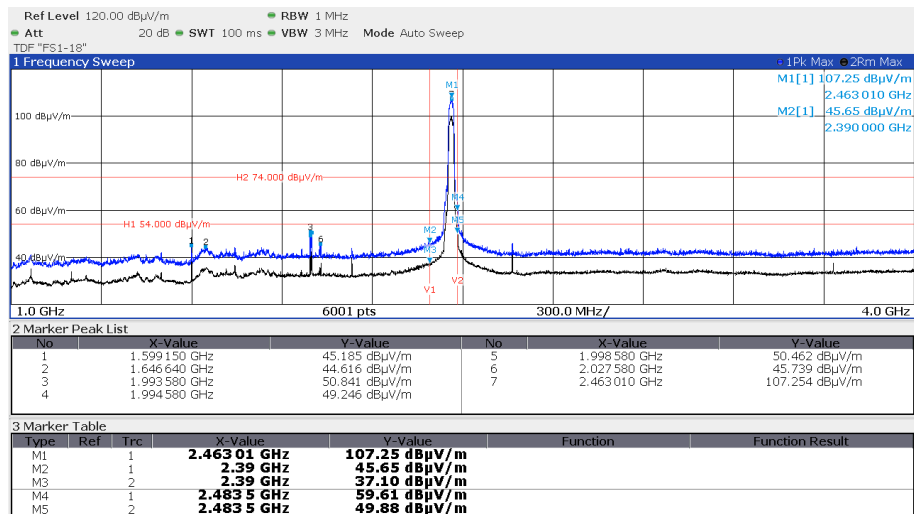
802.11g 6Mbps CH1 (2412 MHz):



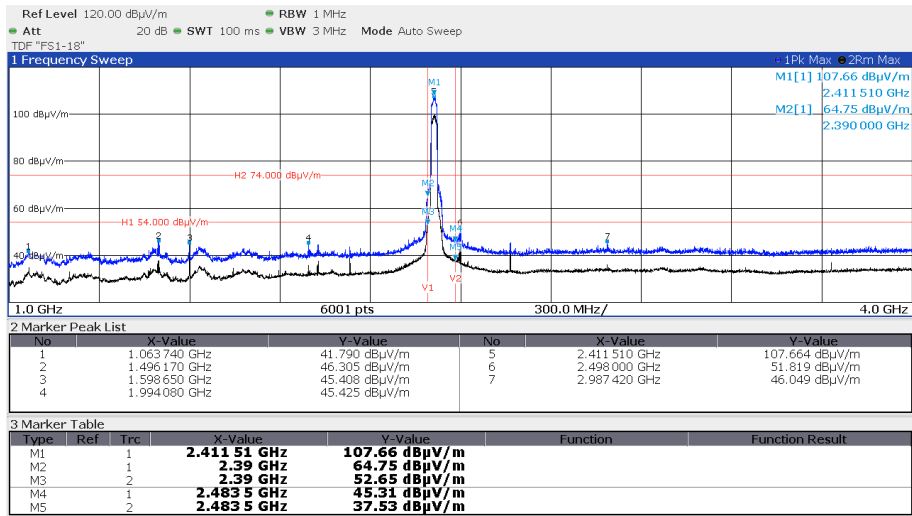
Note: For measurement of emission at 2.4GHz (marker M4) according to 15.247(d) / RSS-247 5.5 please see 2) below.



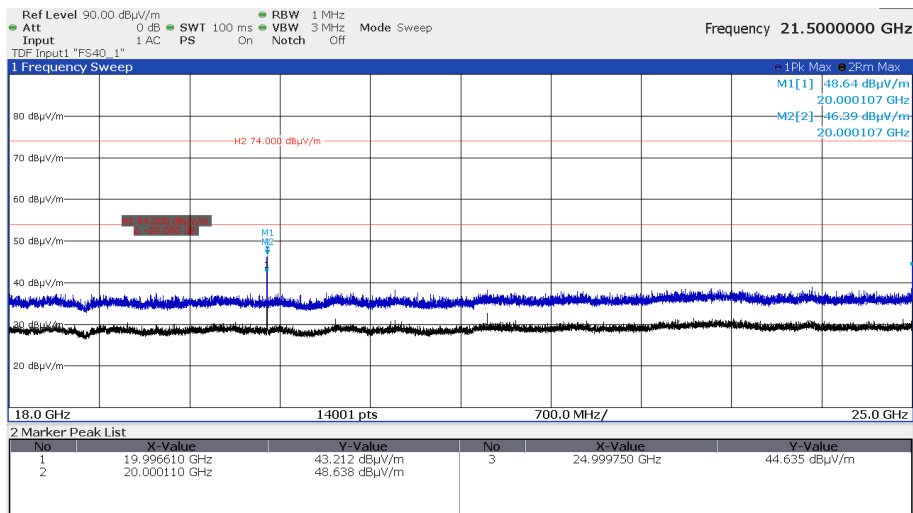
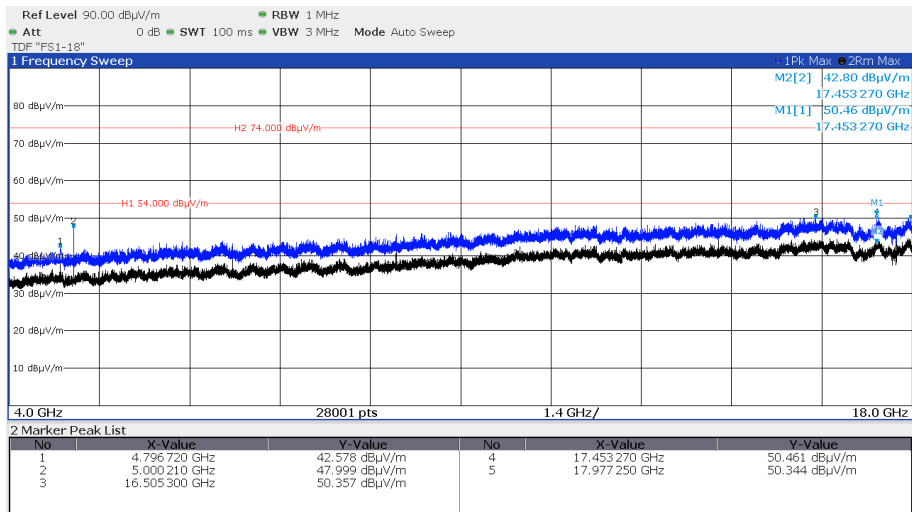
802.11g 6Mbps CH11 (2462 MHz):



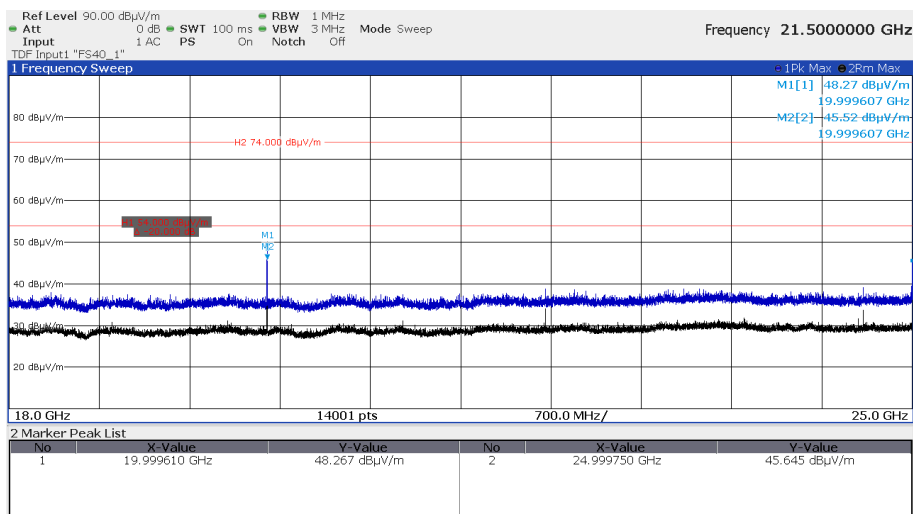
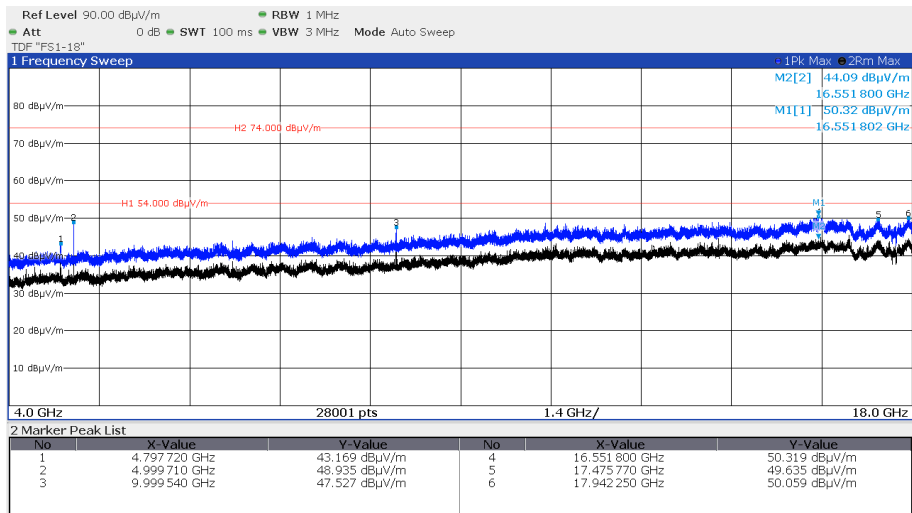
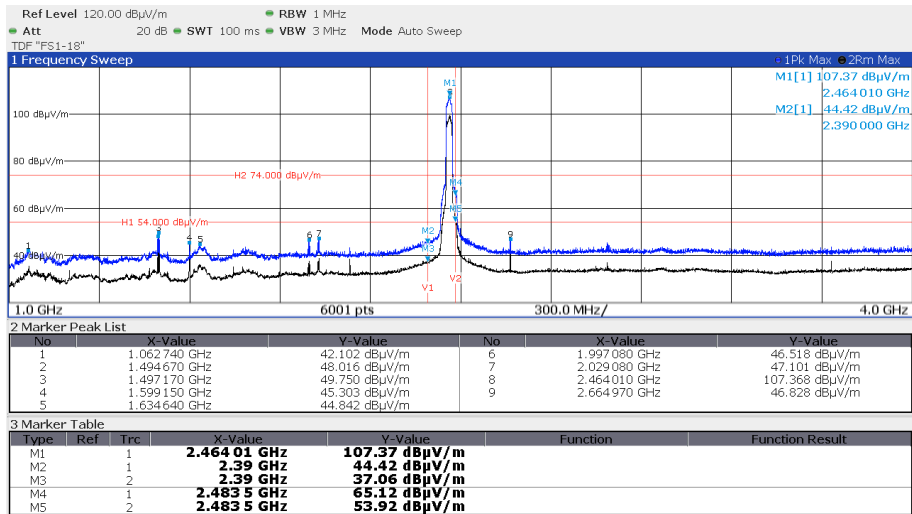
802.11ax HE20 MCS-0 CH1 (2412 MHz):



Note: For measurement of emission at 2.4GHz according to 15.247(d) / RSS-247 5.5 please see 2) below.

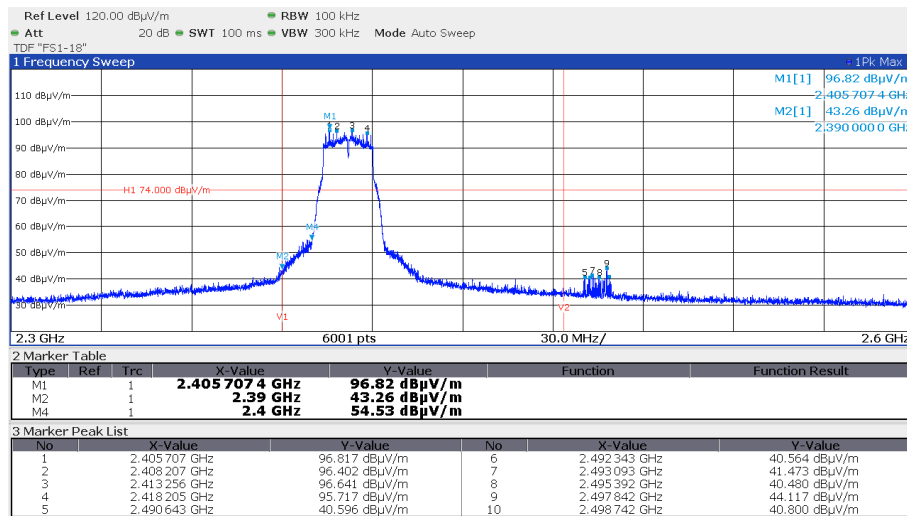


802.11ax HE20 MCS-0 CH11 (2462 MHz):

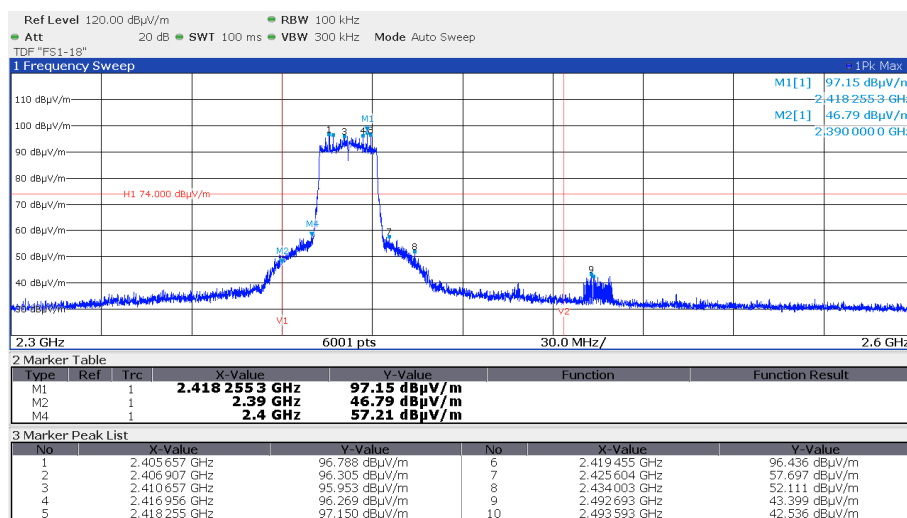


2) Measurements of emissions according to spurious emissions limit specified in section 15.247(d) / RSS-247 5.5:

802.11g 6Mbps CH1 (2412 MHz):



802.11ax HE20 MCS-0 CH1 (2412 MHz):



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

Frequency (MHz)	15.209 Limits (µV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Radiated limits according to RSS-Gen, 8.9 for spurious emissions which fall in restricted bands:

Frequency (MHz)	RSS-Gen Limits (µA/m)	Measurement distance (m)
0.009 - -0.49	63.7/f(kHz)	300
0.49 – 1.705	63.7/f(kHz)	30
1.705 – 30.0	0.08	30

Frequency (MHz)	RSS-Gen Limits (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Limit according to FCC Part 15, Section 15.247(d) for emissions falling not in restricted bands:

Frequency (MHz)	Spurious emission limit
Below 1000	20 dB below the highest level of the desired power
Above 1000	20 dB below the highest level of the desired power

Attenuation below the general limits specified in Section 15.209(a) is not required.

Limit according to RSS-247, 5.5 for emissions falling not in restricted bands:

Frequency (MHz)	Spurious emission limit
Below 1000	20 dB below the highest level of the desired power
Above 1000	20 dB below the highest level of the desired power

Attenuation below the general limits specified in RSS-Gen is not required.

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

RSS-Gen, Table 6 – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	12.57675 - 12.57725	399.9 - 410	7.250 - 7.750
0.495 - 0.505	13.36 - 13.41	608 - 614	8.025 – 8.500
2.1735 - 2.1905	16.42 - 16.423	960 - 1427	9.0 - 9.2
3.020 - 3.026	16.69475 - 16.69525	1435 - 1626.5	9.3 - 9.5
4.125 - 4.128	16.80425 - 16.80475	1645.5 - 1646.5	10.6 - 12.7
4.17725 - 4.17775	25.5 - 25.67	1660 - 1710	13.25 - 13.4
4.20725 - 4.20775	37.5 - 38.25	1718.8 - 1722.2	14.47 - 14.5
5.677 - 5.683	73 - 74.6	2200 - 2300	15.35 - 16.2
6.215 - 6.218	74.8 - 75.2	2310 - 2390	17.7 - 21.4
6.26775 - 6.26825	108 – 138	2483.5 - 2500	22.01 - 23.12
6.31175 - 6.31225	149.9 - 150.05	2655 - 2900	23.6 - 24.0
8.291 - 8.294	156.52475 - 156.52525	3260 – 3267	31.2 - 31.8
8.362 - 8.366	156.7 - 156.9	3332 - 3339	36.43 - 36.5
8.37625 - 8.38675	162.0125 - 167.17	3345.8 - 3358	Above 38.6
8.41425 - 8.41475	167.72 - 173.2	3500 - 4400	
12.29 - 12.293	240 – 285	4500 - 5150	
12.51975 - 12.52025	322 - 335.4	5350 - 5460	

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic. Only the worst-case plots are listed.

5.4 Antenna application

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.

The supplied antenna meets the requirements of part 15.203.

The requirements are **FULFILLED**.

Remarks:

None

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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.
A 4	BAT-EMC 2023.0.8.0	01-02/68-13-001				
	ESCI	02-02/03-15-001	03/07/2024	03/07/2023		
	ESH 2 - Z 5	02-02/20-05-004	13/10/2025	13/10/2022	19/03/2025	19/03/2024
	N-4000-BNC	02-02/50-05-138				
	ESH 3 - Z 2	02-02/50-05-155	09/11/2025	09/11/2022	06/08/2024	06/02/2024
CPR 3	FSW43	02-02/11-21-001	22/05/2024	22/05/2023		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-20-007	15/11/2024	15/11/2023		
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
SER 1	ESR 7	02-02/03-17-001	01/08/2024	01/08/2023		
	HFH 2 - Z 2	02-02/24-05-020	01/06/2025	01/06/2022	05/09/2024	05/09/2023
	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 2	VULB 9168	01-02/24-20-001	12/02/2025	12/02/2024		
	ESVS 30	02-02/03-05-006	27/07/2024	27/07/2023		
	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				
	50F-003 N 3 dB	02-02/50-21-010				
SER 3	FSW43	02-02/11-21-001	22/05/2024	22/05/2023		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	LNA-40-18004000-33-5P	02-02/17-20-002				
	BBHA 9170	02-02/24-05-013	21/03/2026	21/03/2023	22/01/2025	22/01/2024
	3117	02-02/24-20-007	15/11/2024	15/11/2023		
	WHK 3.0/18G-10EF	02-02/50-05-180				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	KMS116-GL140SE-KMS116-	02-02/50-20-026				

- End of test report -