



RF - TEST REPORT

- FCC Part 15.407, RSS-247 -

Type / Model Name : AMNPTTX01

Product Description : Video Transceiver

Applicant : TQ-Systems GmbH

Address : Gut Delling, Mühlstraße 2

82229 SEEFELD, GERMANY

Manufacturer : Amimon Ltd.

Address : 26, Zarhin St.

RA'ANANA 4366250, ISRAEL

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

POSITIVE

Test Report No. : **80171238-14 Rev_0**

31. January 2024

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

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ATTACHMENTs A, B as separate supplements

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2023)

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 2023)

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 15.212	Modular transmitters

FCC Rules and Regulations Part 15, Subpart E – Unlicensed National Information Infrastructure Devices (September 2023)

Part 15, Subpart E, Section 15.407	Operation within the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.85 GHz
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
KDB 789033 D02 v02r01	Guidelines for compliance testing of UNII-Devices Part 15, Subpart E, December 14, 2017.

ISED Canada Rules and Regulations (October 2023)

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

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 to his/her instructions.

2.3 General remarks

This report covers the emissions of the Module “Amimon AMNPTTX01” in combination with the host device Polaris Surgical Light.

Performed tests:

- AC power line conducted emissions
- Maximum output power, conducted
- Undesirable emissions, radiated

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

2.5 Equipment category

Wireless medium operating in the 5GHz band

2.6 Short description of the equipment under test (EUT)

The EUT is designed to modulate and transmit downstream video and audio content over the wireless medium and receive a control channel over the wireless upstream.

The EUT is mounted on a WL.V.TX Carrier Board and integrated in a surgical light (incl. necessary electronics).

The EUT uses modulation with 40 MHz bandwidth and is carried over the 5 GHz band, only.

It is equipped with internal antennas and has no TPC function.

Number of tested samples:	1
Serial number:	Prototype
Firmware version:	JayTx_VER_7_6_9

2.7 Variants of the EUT

There are no variants.

2.8 Operation frequency and channel plan

The operating frequency is 5150 MHz to 5250 MHz, 5250 MHz to 5350 MHz, 5470 MHz to 5725 MHz and 5725 MHz to 5850 MHz.

Channel	Frequency (MHz)
38	5190
46	5230
54	5270
62	5310
102	5510
110	5550
118	5590
126	5630
134	5670
142	5710
150	5750
158	5790
166	5830

Note: For use in Canada channels 118 and 126 are blocked.

2.9 Transmit operating modes

- only the 40MHz BW is supported by the EUT

2.10 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Name	Connector	Frequency band	Gain
1	PCB slot antenna @ control board of EUT (dia ~250mm)	X22	U.FI	5 GHz – 7 GHz	2.5 dBi
2	PCB slot antenna @ control board of EUT (dia ~250mm)	X23	U.FI	5 GHz – 7 GHz	2.5 dBi

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 24 V/DC +/-5% (AC-Adapter, 100..240 V/AC, 50Hz..60Hz)

2.12 Peripheral devices and interface cables

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

- AC-Adapter Model : MISP1270A1965, SL Power Electronics Corp.

2.13 Determination of worst-case conditions for final measurement

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the final measurement the EUT is set in Y position.

Following channels and test modes were selected for the final test as listed below:

Available Channel	Tested Channel	Power Setting	Modulation	Modulation Type	BW
38 - 166	38, 62, 102, 166	P9	OFDM	BPSK	40 MHz

TX continuous mode, BW 40MHz

2.13.1 Test jig

No test jig is used.

2.13.2 Test software

The Amimon module can be set into test mode, simulating a continuous transmission with 100% duty cycle. The frequency and power of operation can be programmed using a PC tool and a serial communication connector provided by the customer.

3 TEST RESULT SUMMARY

UNII device using the operating bands 5150 MHz – 5250 MHz, 5250 MHz – 5350 MHz, 5470 MHz – 5725 MHz and 5725 MHz – 5850 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 8.8	AC power line conducted emission	passed
15.407(a)	RSS-247, 6.2	EBW, OBW	Not tested
15.407(a)	RSS-247, 6.2	Output power	passed
15.407(a)	RSS-247, 6.2	PSD	Not tested
15.407(b)	RSS-247, 6.2	Undesirable emission	passed
15.205(a)	RSS-Gen, 8.10	Emission in restricted bands	passed
15.407(g)	RSS-Gen, 6.11	Transmitter frequency stability	Not tested
15.407(h)(1)	RSS-247, 6.2.	TPC	Not tested
15.203	-	Antenna requirement	passed

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80171238-14	0	31 January 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 : 21 June 2022

Testing concluded on : 24 October 2023

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Sabine Kugler
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 30000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Output power ERP, radiated	1000 MHz to 7000 MHz	95%	± 2.71 dB
Field strength of the fundamental	1000 MHz to 7000 MHz	95%	± 2.71 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Spurious Emissions, conducted	9 kHz to 10000 MHz	95%	± 2.15 dB
Spurious Emissions, conducted	10000 MHz to 40000 MHz	95%	± 3.47 dB
Spurious Emissions, radiated	9 kHz to 30 MHz	95%	± 3.53 dB
Spurious Emissions, radiated	30 MHz to 1000 MHz	95%	± 4.44 dB
Spurious Emissions, radiated	1000 MHz to 30000 MHz	95%	± 2.34 dB
Spurious Emissions, radiated	30000 MHz to 40000 MHz	95%	± 5.13 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 ISCED

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".

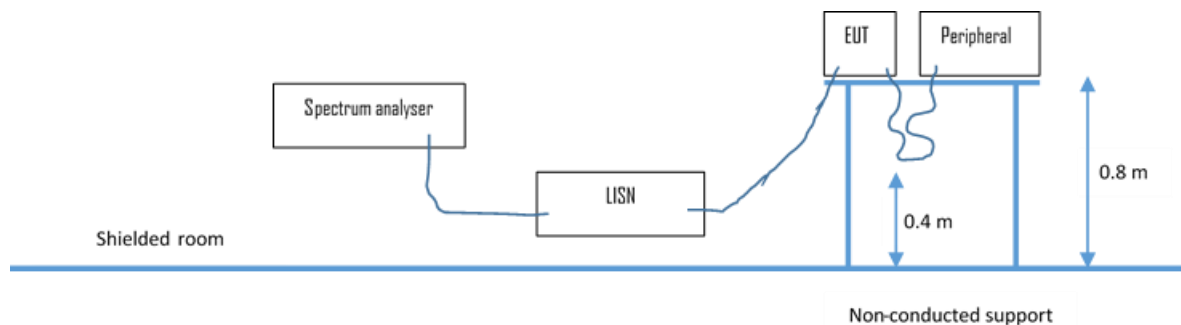
4.5.2.1 Justification

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:

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

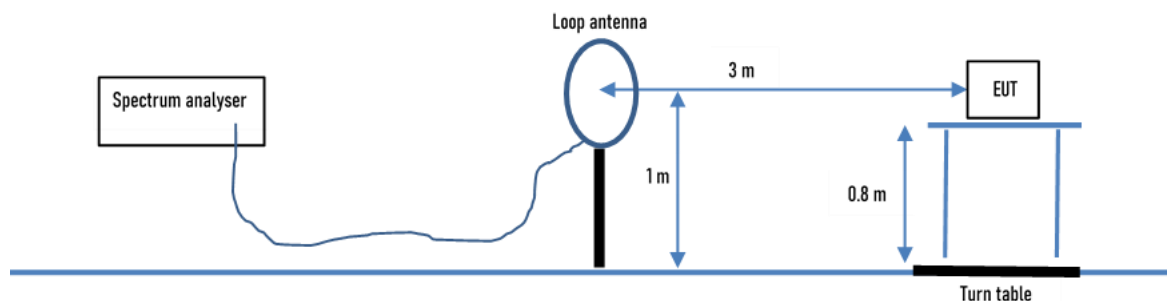
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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):

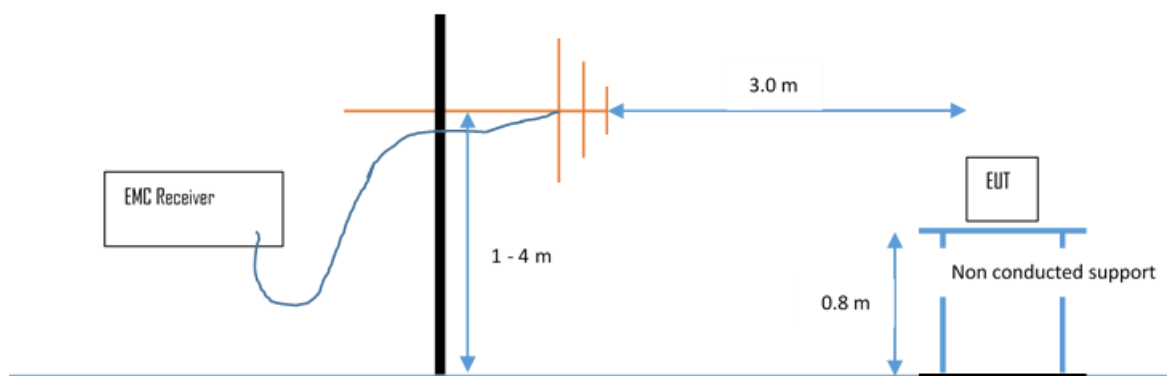
Test setup according ANSI C63.10



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 dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) 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:

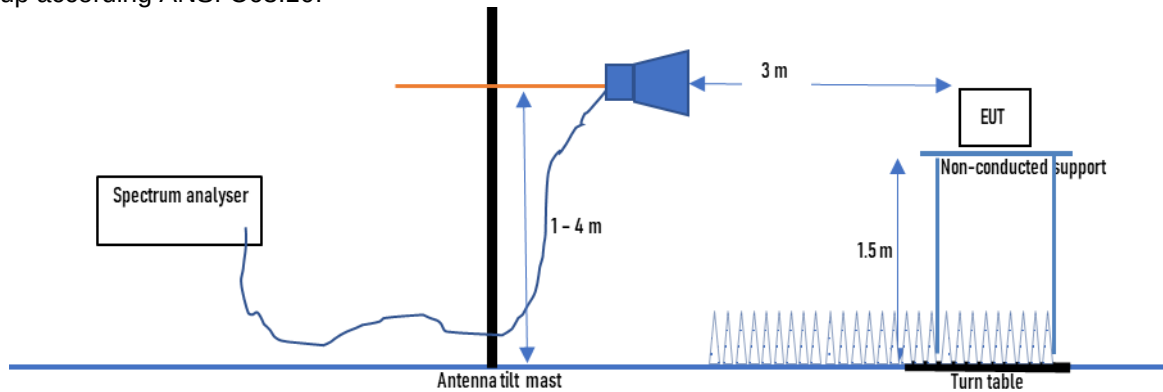
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

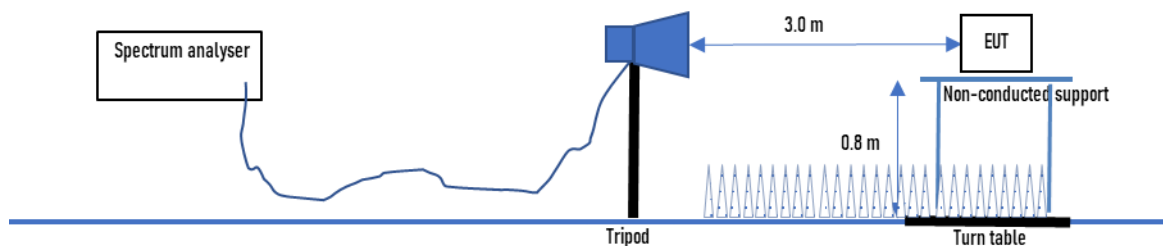
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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, 0.8 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

For detailed photo documentation of test set-up please refer to Attachment B.

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.

According to RSS-Gen 8.8:

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μ H / 50 Ω line impedance stabilization network.

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 -6.3 dB at 0.794 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

* Decreases with the logarithm of the frequency

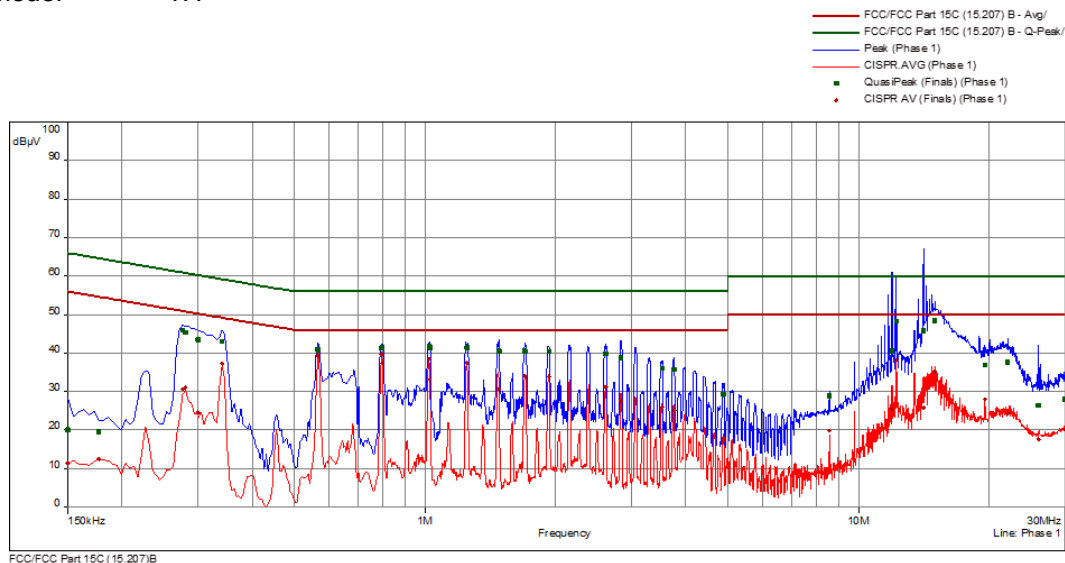
The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols.

5.1.6 Test protocol

Test point L1
Operation mode: TX

Result: passed

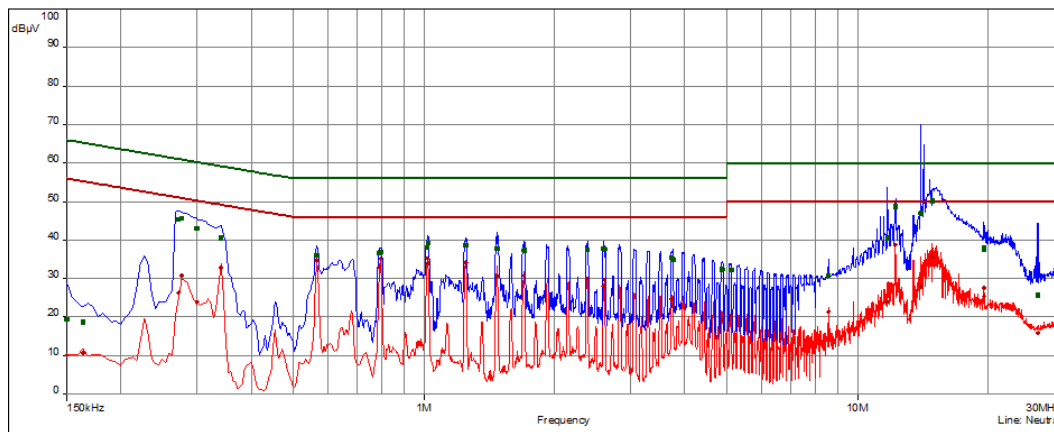


freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.150	1	20.1	-45.9	66.0	11.4	-44.6	56.0	Phase 1	10.1
0.177	1	19.5	-45.1	64.6	12.4	-42.2	54.6	Phase 1	10.1
0.276	1	45.9	-15.1	60.9	30.7	-20.3	50.9	Phase 1	10.2
0.281	1	45.3	-15.5	60.8	31.1	-19.7	50.8	Phase 1	10.2
0.300	2	43.5	-16.8	60.2	24.7	-25.6	50.2	Phase 1	10.2
0.341	2	43.1	-16.1	59.2	37.3	-11.9	49.2	Phase 1	10.2
0.566	2	40.9	-15.1	56.0	39.3	-6.7	46.0	Phase 1	10.2
0.794	3	41.3	-14.7	56.0	39.7	-6.3	46.0	Phase 1	10.2
0.798	3	41.5	-14.5	56.0	37.3	-8.7	46.0	Phase 1	10.2
1.023	3	42.0	-14.0	56.0	38.4	-7.6	46.0	Phase 1	10.3
1.028	3	41.4	-14.6	56.0	33.1	-12.9	46.0	Phase 1	10.3
1.250	4	41.5	-14.6	56.0	37.4	-8.6	46.0	Phase 1	10.3
1.484	4	40.5	-15.5	56.0	30.5	-15.5	46.0	Phase 1	10.3
1.700	4	40.5	-15.5	56.0	34.0	-12.0	46.0	Phase 1	10.3
1.934	4	40.4	-15.7	56.0	33.9	-12.1	46.0	Phase 1	10.3
2.616	5	39.8	-16.2	56.0	31.2	-14.8	46.0	Phase 1	10.4
2.832	5	38.9	-17.1	56.0	27.5	-18.5	46.0	Phase 1	10.4
3.525	5	36.1	-19.9	56.0	26.0	-20.0	46.0	Phase 1	10.4
3.759	5	35.8	-20.2	56.0	25.2	-20.8	46.0	Phase 1	10.5
4.886	6	29.2	-26.8	56.0	17.2	-28.8	46.0	Phase 1	10.5
4.899	6	29.3	-26.7	56.0	17.8	-28.2	46.0	Phase 1	10.5
8.571	6	29.0	-31.0	60.0	19.8	-30.2	50.0	Phase 1	10.8
11.958	7	40.6	-19.4	60.0	25.6	-24.4	50.0	Phase 1	11.0
12.246	7	48.3	-11.7	60.0	38.1	-11.9	50.0	Phase 1	11.1
14.141	7	45.8	-14.2	60.0	25.8	-24.2	50.0	Phase 1	11.2
15.018	7	48.5	-11.5	60.0	35.2	-14.9	50.0	Phase 1	11.3
19.592	8	36.9	-23.1	60.0	28.0	-22.0	50.0	Phase 1	11.6
22.125	8	37.6	-22.4	60.0	24.4	-25.6	50.0	Phase 1	11.7
26.013	8	26.3	-33.7	60.0	17.6	-32.4	50.0	Phase 1	11.8
29.852	8	28.1	-31.9	60.0	20.2	-29.8	50.0	Phase 1	11.9

Test point: N
Operation mode: TX

Result: passed

— FCC/FCC Part 15C (15.207) B - Avg/
— FCC/FCC Part 15C (15.207) B - Q-Peak/
— Peak (Neutral)
— CISPR AVG (Neutral)
■ Quasi Peak (FinaIs) (Neutral)
• CISPR AV (FinaIs) (Neutral)



FCC/FCC Part 15C (15.207)B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.150	9	19.5	-46.5	66.0	10.0	-46.0	56.0	Neutral	10.1
0.164	9	18.7	-46.6	65.3	10.6	-44.7	55.3	Neutral	10.1
0.272	9	45.3	-15.8	61.1	26.3	-24.8	51.1	Neutral	10.2
0.276	9	45.7	-15.2	60.9	30.8	-20.2	50.9	Neutral	10.2
0.300	10	43.1	-17.2	60.2	23.9	-26.3	50.2	Neutral	10.2
0.341	10	40.5	-18.7	59.2	32.8	-16.4	49.2	Neutral	10.2
0.566	10	36.1	-19.9	56.0	34.7	-11.3	46.0	Neutral	10.2
0.789	11	36.7	-19.3	56.0	33.0	-13.0	46.0	Neutral	10.2
0.794	11	36.8	-19.2	56.0	35.2	-10.8	46.0	Neutral	10.2
1.019	11	38.1	-18.0	56.0	35.3	-10.7	46.0	Neutral	10.3
1.023	11	39.3	-16.7	56.0	34.0	-12.1	46.0	Neutral	10.3
1.250	12	38.6	-17.4	56.0	34.2	-11.8	46.0	Neutral	10.3
1.479	12	37.7	-18.3	56.0	30.6	-15.4	46.0	Neutral	10.3
1.704	12	37.4	-18.6	56.0	30.8	-15.2	46.0	Neutral	10.3
2.384	12	37.5	-18.5	56.0	30.1	-15.9	46.0	Neutral	10.4
2.598	13	37.8	-18.2	56.0	28.1	-17.9	46.0	Neutral	10.4
2.612	13	37.6	-18.4	56.0	29.7	-16.4	46.0	Neutral	10.4
3.723	13	35.4	-20.6	56.0	24.6	-21.4	46.0	Neutral	10.4
3.755	13	35.0	-21.0	56.0	22.9	-23.1	46.0	Neutral	10.4
4.872	14	32.5	-23.6	56.0	19.3	-26.7	46.0	Neutral	10.5
5.115	14	32.2	-27.8	60.0	20.4	-29.6	50.0	Neutral	10.5
8.571	14	30.8	-29.2	60.0	21.4	-28.6	50.0	Neutral	10.7
11.747	15	40.6	-19.4	60.0	24.0	-26.0	50.0	Neutral	10.9
12.246	15	48.7	-11.3	60.0	38.8	-11.2	50.0	Neutral	10.9
14.015	15	47.0	-13.0	60.0	28.0	-22.1	50.0	Neutral	11.1
14.892	15	50.2	-9.9	60.0	35.7	-14.3	50.0	Neutral	11.1
19.592	16	38.1	-22.0	60.0	27.6	-22.4	50.0	Neutral	11.4
19.596	16	37.4	-22.6	60.0	25.4	-24.6	50.0	Neutral	11.4
26.085	16	25.7	-34.3	60.0	15.9	-34.2	50.0	Neutral	11.4
29.861	16	27.6	-32.4	60.0	19.8	-30.2	50.0	Neutral	11.3

5.2 Maximum output power, conducted

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

5.2.1 Description of the test location

Test location: Shielded Room S6

5.2.2 Photo documentation of the test set-up

For detailed photo documentation of test set-up please refer to Attachment B.

5.2.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):

The maximum conducted output power over the frequency band of operation shall not exceed the effective values. If transmitting antennas of directional gain are greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-247 6.2:

The output power and e.i.r.p. of the equipment wanted emission shall be measured in terms of average value.

5.2.4 Description of Measurement

The output power is measured conducted using a spectrum analyser. The EUT has a constant duty cycle and may be smaller than 98% therefore the procedure according the KDB 789033 D02; item E d) Method SA-2 Alternative is followed. The EUT is set while measuring in TX continuous mode with a maximum duty cycle. The insertion loss of the measurement cable is taken into account with amplitude offset while measuring. The output power is integrated across the channel bandwidth.

Spectrum analyser settings:

RBW: 1 MHz, VBW: 3 MHz,
Power mode: max hold;

Detector: RMS (power averaging),
Band power function: OBW, Span: >OBW

5.2.5 Test result

Test results conducted according to FCC §15.407(a)										
40 MHz, 2 Port	Output power conducted						Calculated EIRP			
Channel	Power set	A _{Port1} (dBm)	A _{Port2} (dBm)	A _{total} * (dBm)	Limit (dBm)	Margin (dB)	G (dBi)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
38	P9	9.8	9.8	12.8	24.0	-14.2	2.5	15.3	30.0	-14.7
62	P10	10.5	10.7	13.6	24.0	-13.3	2.5	16.1	30.0	-13.9
102	P10	10.3	10.3	13.3	24.0	-13.7	2.5	15.8	30.0	-14.2
166	P9	8.7	9.9	12.4	30.0	-20.1	2.5	14.9	36.0	-21.1

* Total output power A_{total} [dBm] = 10*log (A_{Port1}[W] + A_{Port2}[W])

Test results conducted according to RSS-247 6.2										
40 MHz, 2 Port	Output power conducted						Calculated EIRP			
Channel	Power set	A _{Port1} (dBm)	A _{Port2} (dBm)	A _{total} * (dBm)	Limit (dBm)	Margin (dB)	G (dBi)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
38	P9	9.8	9.8	12.8	N/A	N/A	2.5	15.3	23.0	-20.5
62	P10	10.5	10.7	13.6	24.0	-10.4	2.5	16.1	30.0	-27.5
102	P10	10.3	10.3	13.3	24.0	-10.7	2.5	15.8	30.0	-27.5
166	P9	8.7	9.9	12.4	24.0	-11.6	2.5	14.9	30.0	-27.5

* Total output power A_{total} [dBm] = 10*log (A_{Port1}[W] + A_{Port2}[W])

Peak power limit according to FCC Part 15E, Section 15.407(a):

Frequency	Radiated Power Limit	Conducted Power Limit
GHz	dBm	dBm
5.150 – 5.250	30	24
5.250 – 5.350	30	11 + 10*log(EBW) or 24
5.470 – 5.725	30	11 + 10*log(EBW) or 24
5.725 – 5.850	36	30

Whichever is the lesser applies.

Peak power limit according to RSS-247 6.2:

Frequency	Radiated Power Limit	Conducted Power Limit
GHz	dBm	dBm
5.150 – 5.250	11 + 10*log(OBW) or 23	11 + 10*log(OBW) or 23
5.250 – 5.350	17 + 10*log(OBW) or 30	11 + 10*log(OBW) or 24
5.470 – 5.600	17 + 10*log(OBW) or 30	11 + 10*log(OBW) or 24
5.650 – 5.725	17 + 10*log(OBW) or 30	11 + 10*log(OBW) or 24
5.725 – 5.850	36	30

Whichever is the lesser applies.

The requirements are **FULFILLED**.

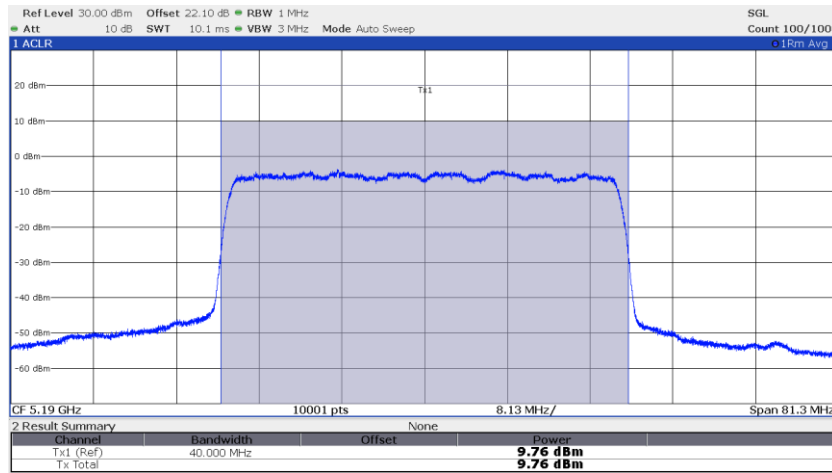
Remarks: For detailed test results please refer to following test protocols.

Offset composed of 20dB attenuator (02-02/50-23-003) and cable losses of Minibend cable

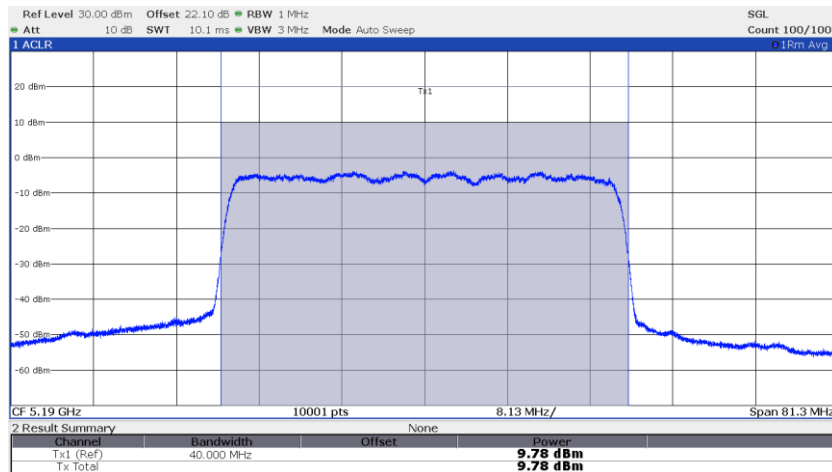
(02-02/50-16-018) and U.FI-SMA adapter cable (IL[dB]=0.34*sqrt(f[GHz])).

5.2.6 Test protocols

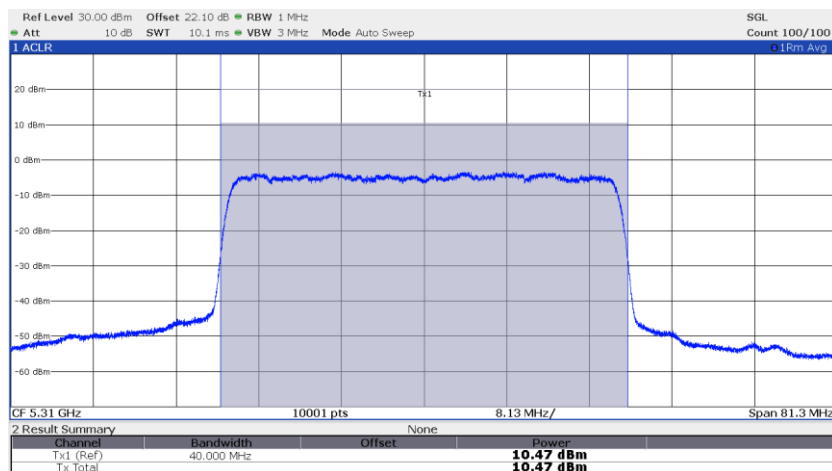
CH38 – Ant 1



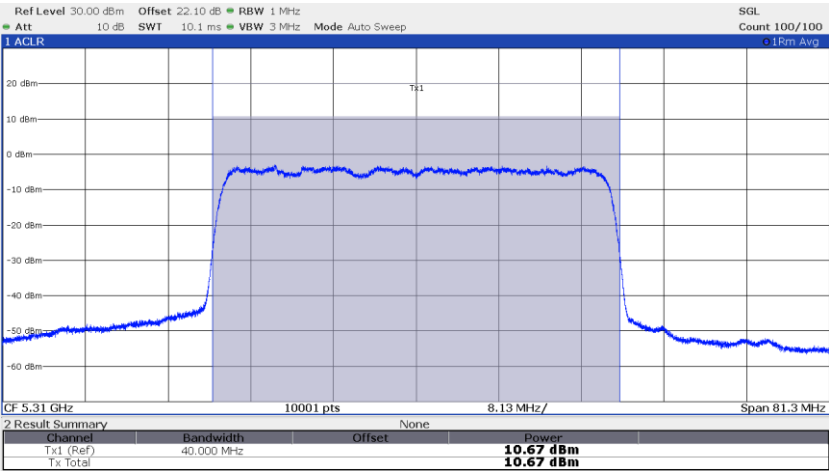
CH38 – Ant 2



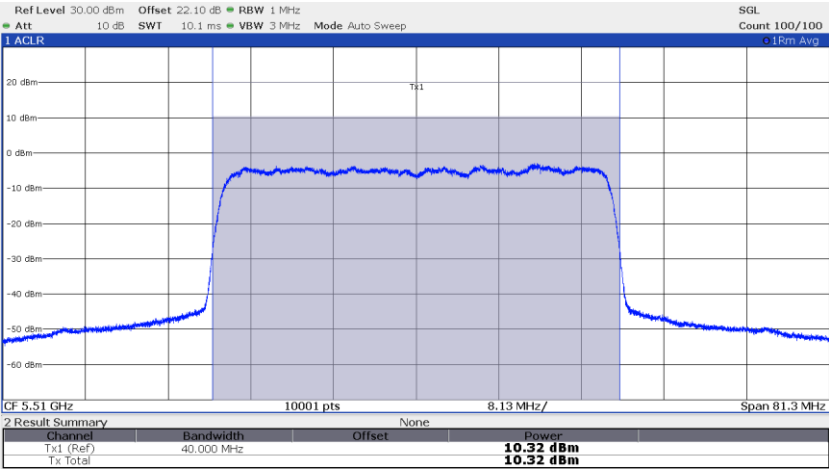
CH62 – Ant 1



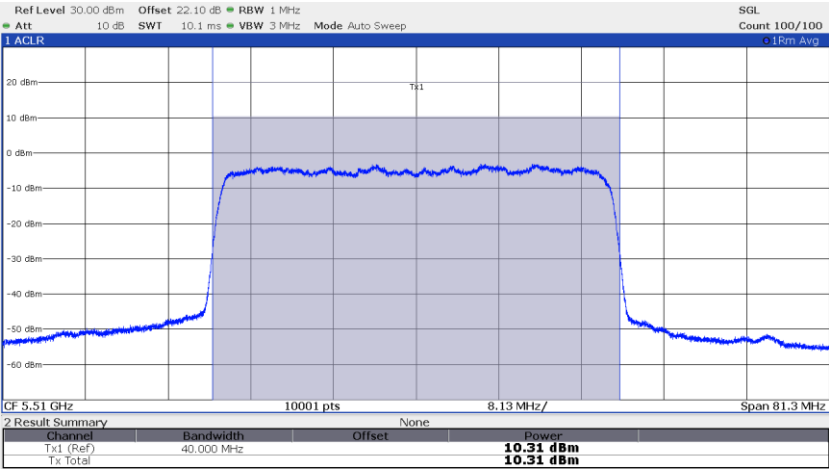
CH62 – Ant 2



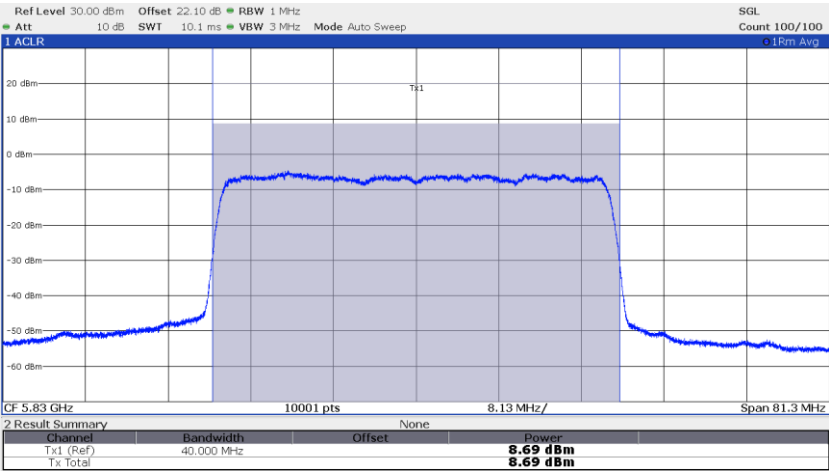
CH102 – Ant 1



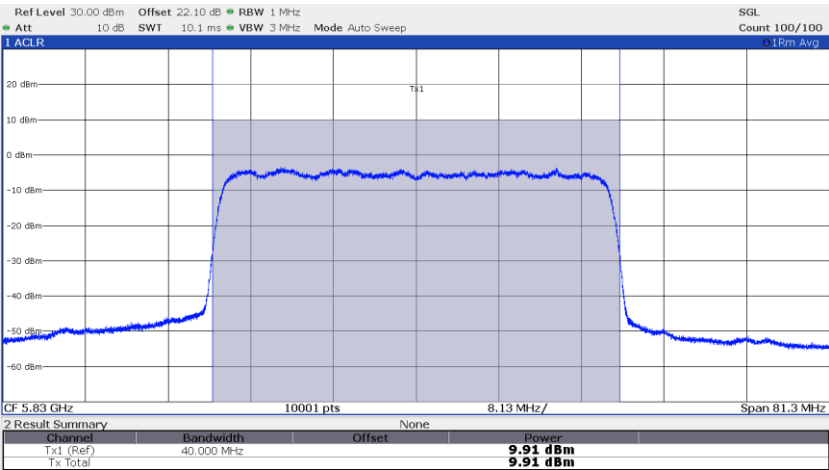
CH102 – Ant 2



CH166 – Ant 1



CH166 – Ant 2



5.3 Undesirable emissions, radiated

For test instruments and accessories used see section 6 Part **SER 1, SER 2 and 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

For detailed photo documentation of test set-up please refer to Attachment B.

5.3.3 Applicable standard

According to FCC Part 15E, Section 15.407(b):

Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the appropriate limits.

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) (see Section 15.205(c)).

According to RSS-6.2:

The power and e.i.r.p. of the equipment unwanted emission shall be measured in peak value. However, the equipment is required to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands which are listed in the same standard.

5.3.4 Description of Measurement

Unwanted emission is measured with the setup set out in ANSI C63.10, item 12.7. The plots show the general limit average 54 dBµV/m and the peak limit for out of band emission -27 dBm/MHz (68.3 dBµV/m). This way we are able to verify the undesirable limit and the general limit within the restricted bands in one plot.

If the emission level of the EUT in peak mode complies with the average limit 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. Up from 8 GHz a HP filter is used. A conversion EIRP to Field strength is done with the formula which applies at 3 m measurement distance only.

$$\frac{EIRP}{dBm} = \frac{FS}{dB\left(\frac{\mu V}{m}\right)} + 95.2$$

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-40GHz	RBW: 1 MHz	Detector: Max. peak	Trace: Max. hold	Sweep: Auto
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5.3.5 Test result
f < 30 MHz:

FCC Part 15.209 Radiated emission limits; general requirements (< 30 MHz)									
Frequency (kHz)	PK reading (dBμV)	QP reading (dBμV)	AV (dBμV)	Ant. factor (dB)	Distance corr. (dB)	corr. AV level (dBμV/m)	QP level (dBμV/m)	Limit (dBμV/m)	Dlimit (dB)
29.000	47.1	39.4	36.8	20.0	-80.0	-23.2	-20.6	38.4	-61.6
126.100	19.9	12.8	10.5	20.0	-80.0	-49.5	-47.2	25.6	-75.1
187.300	53.8	36.4	28.7	20.0	-80.0	-31.3	-23.6	22.2	-53.5
2883.300	23.3	9.0	2.5	20.0	-40.0	-17.5	-11.0	29.5	-40.5
20000.000	18.5	6.9	2.1	20.0	-40.0	-17.9	-13.1	29.5	-42.6

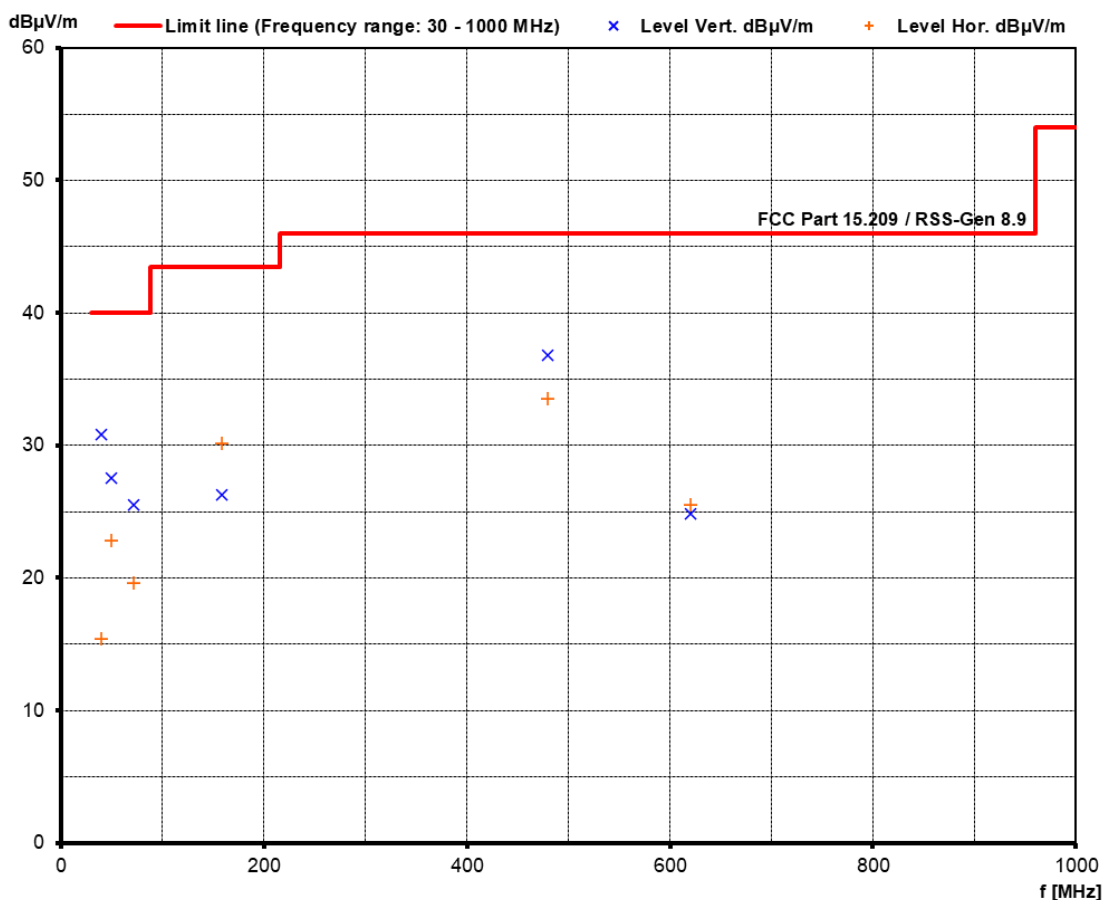
Note: frequencies in bold characters fall into AV ranges.

RSS-Gen 8.9 Radiated emission limits; general requirements (< 30 MHz)							
Frequency (kHz)	QP reading (dBμV)	QP calc. (dBμA)	Ant. factor (dB)	Distance corr. (dB)	Corr. QP level (dBμA/m)	Limit (dBμA/m)	Dlimit (dB)
29.0	39.4	-12.1	20.0	-80.0	-72.1	6.8	-78.9
126.1	12.8	-38.7	20.0	-80.0	-98.7	-5.9	-92.8
187.3	36.4	-15.1	20.0	-80.0	-75.1	-9.4	-65.7
2883.3	9.0	-42.5	20.0	-40.0	-62.5	-21.9	-40.6
20000.0	6.9	-44.6	20.0	-40.0	-64.6	-21.9	-42.7

Note: The measurement results from distance 3m are extrapolated (D factor) to the specific distance. During the measurements no emissions from the EUT could be detected in the frequency range 9 kHz to 30 MHz, given values only represent the noise floor.

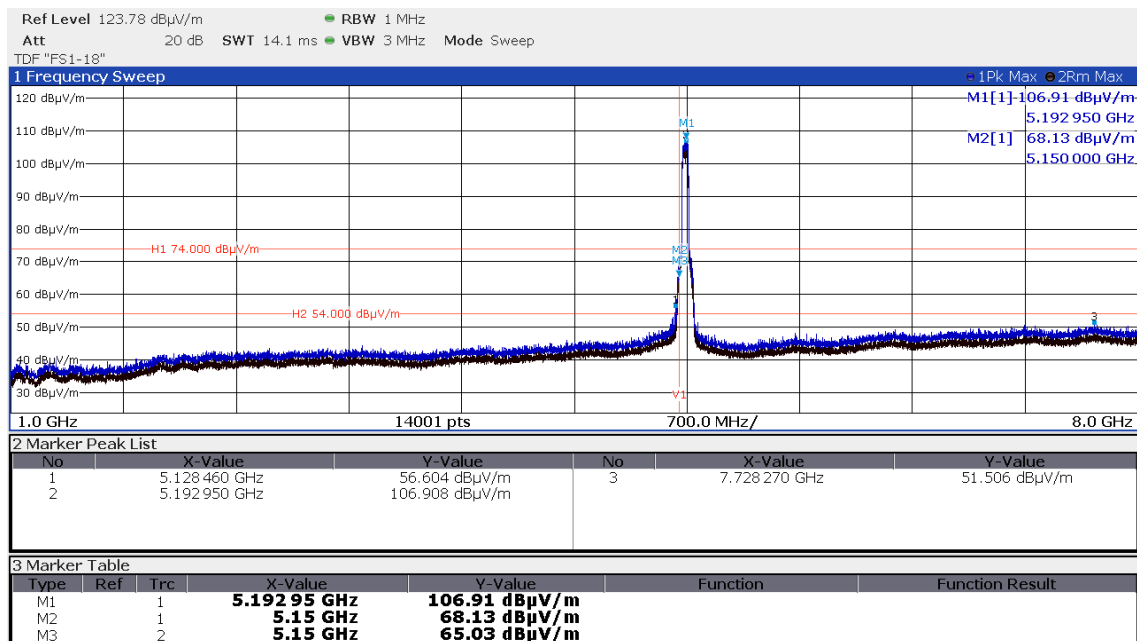
30 MHz < f < 1000 MHz:

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	14.0	-2.6	16.8	18.0	30.8	15.4	40.0	-9.2
50.00	10.0	4.0	17.5	18.8	27.5	22.8	40.0	-12.5
72.00	10.0	3.6	15.5	16.0	25.5	19.6	40.0	-14.5
158.00	6.5	11.0	19.8	19.1	26.3	30.1	43.5	-13.4
480.00	11.6	8.0	25.2	25.5	36.8	33.5	46.0	-9.2
620.00	-3.5	-3.2	28.3	28.7	24.8	25.5	46.0	-20.5

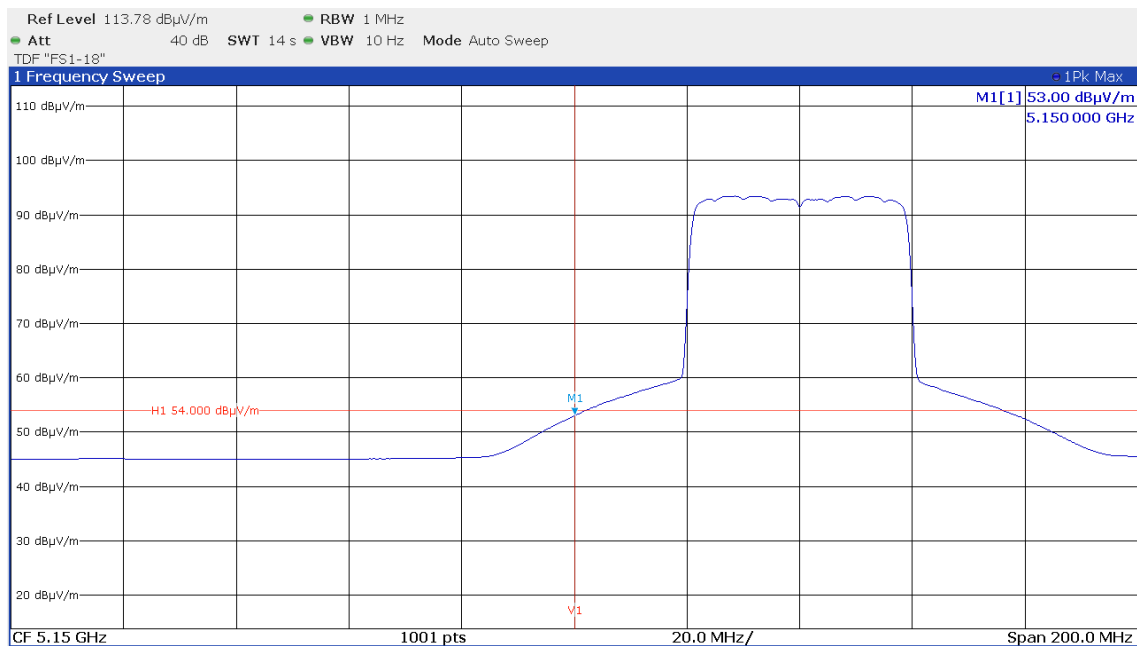


f > 1000 MHz:

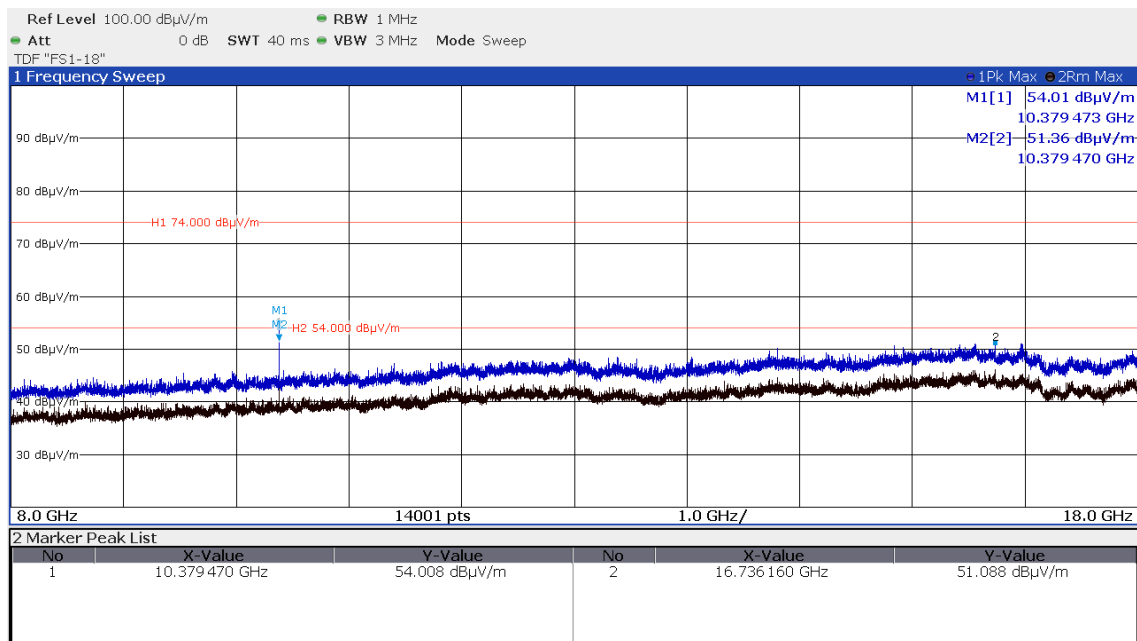
CH38, P9, 40MHz:



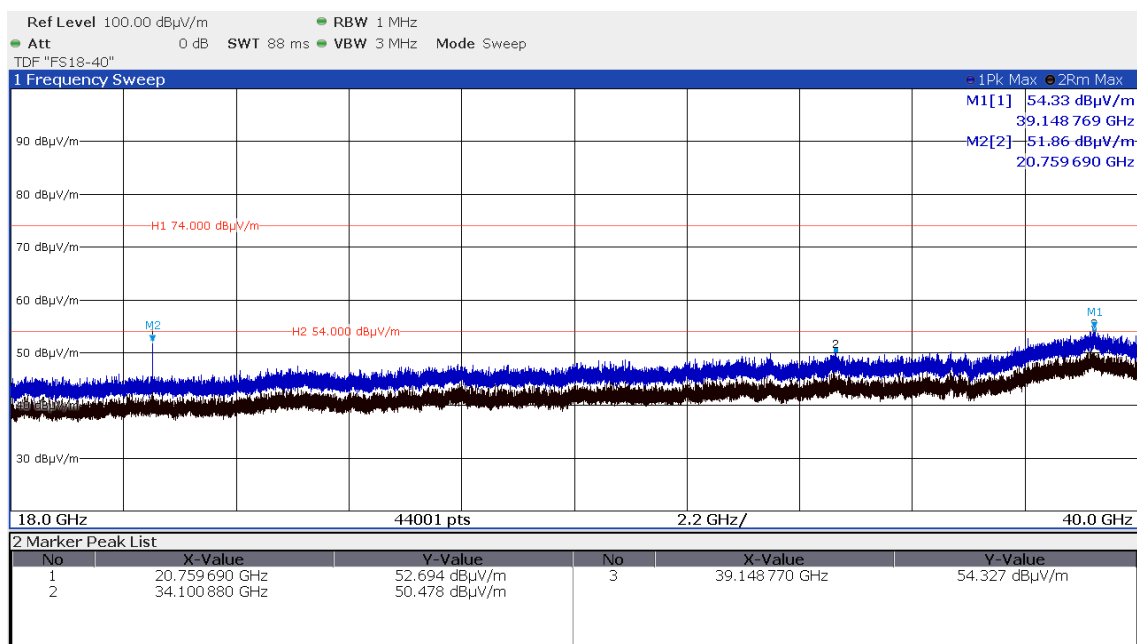
Note: Marker M2 shows compliance with PK general limit and spurious emissions limit. For compliance with AV general limit see detail band edge low measurement below.



Note: Detail band edge low, average measurement

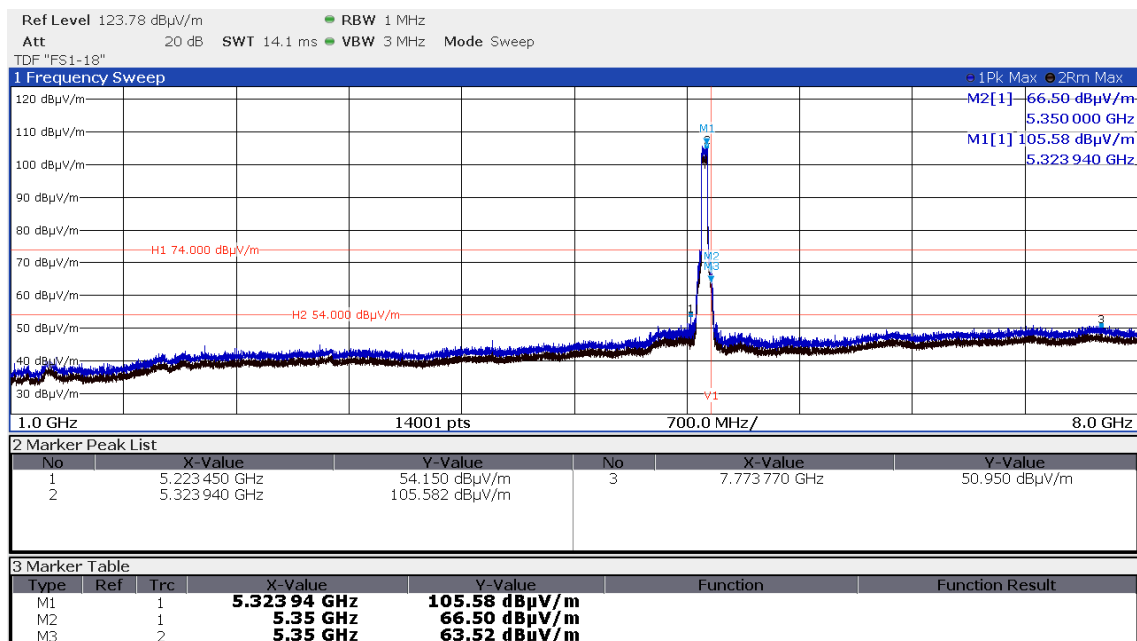


Note: Marker M2 shows compliance with average limit

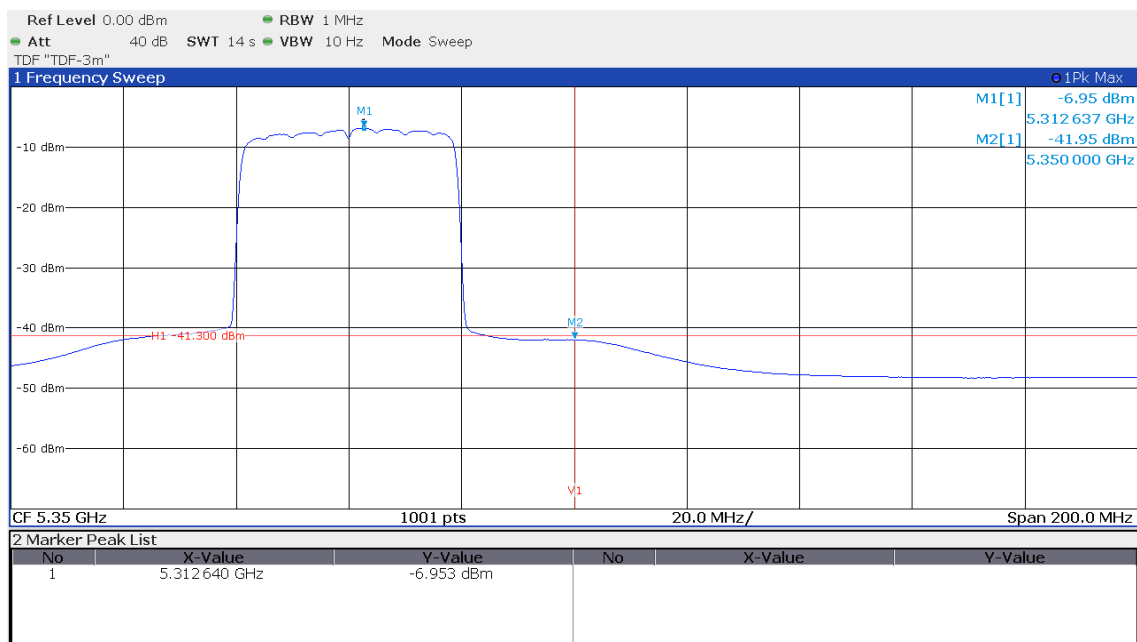


Note: Emission at 39.148769 GHz solely from noise level. RMS trace below AV limit of 54 dBµV/m.

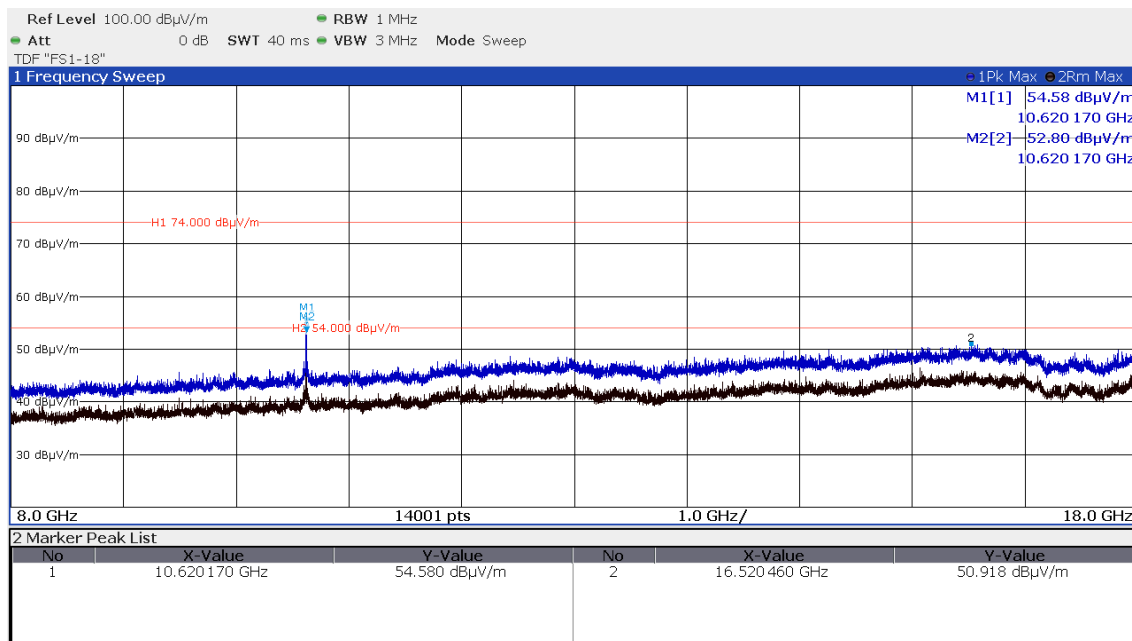
CH62, P10, 40MHz:



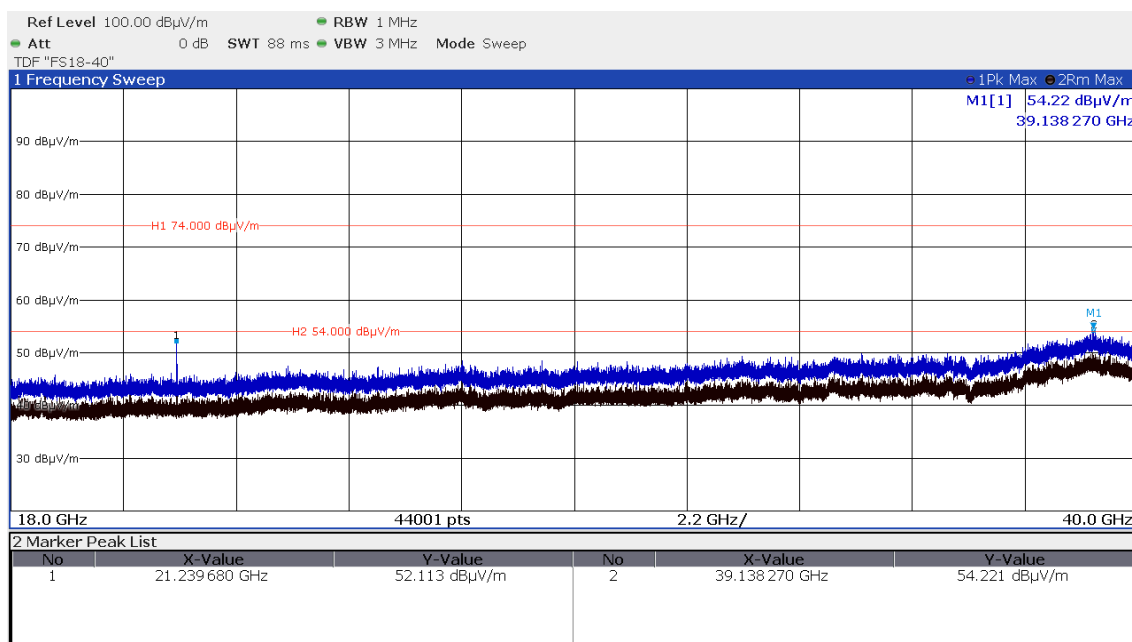
Note: Marker M2 shows compliance with PK general limit and spurious emissions limit. For compliance with AV general limit see detail band edge high measurement below.



Note: Detail band edge high, average measurement

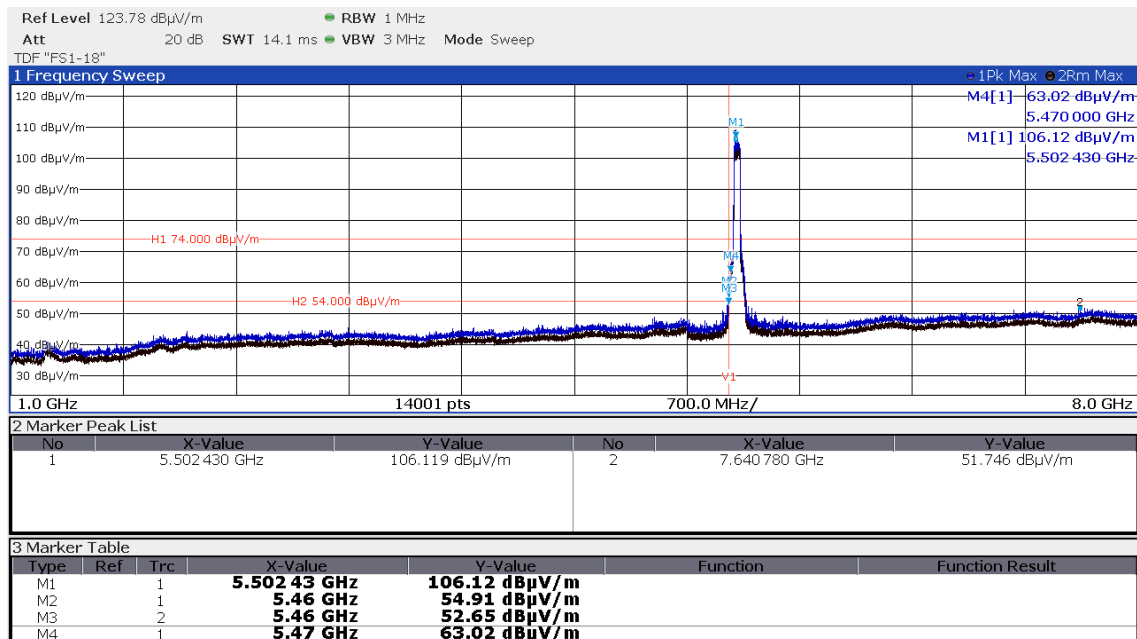


Note: Marker M2 shows compliance with average limit

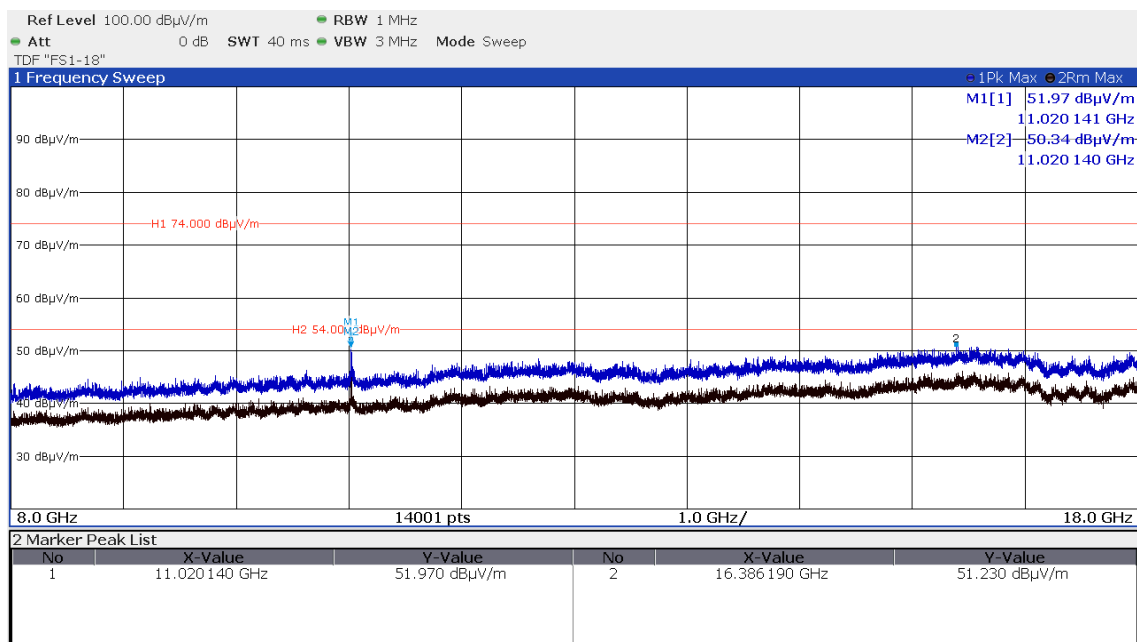


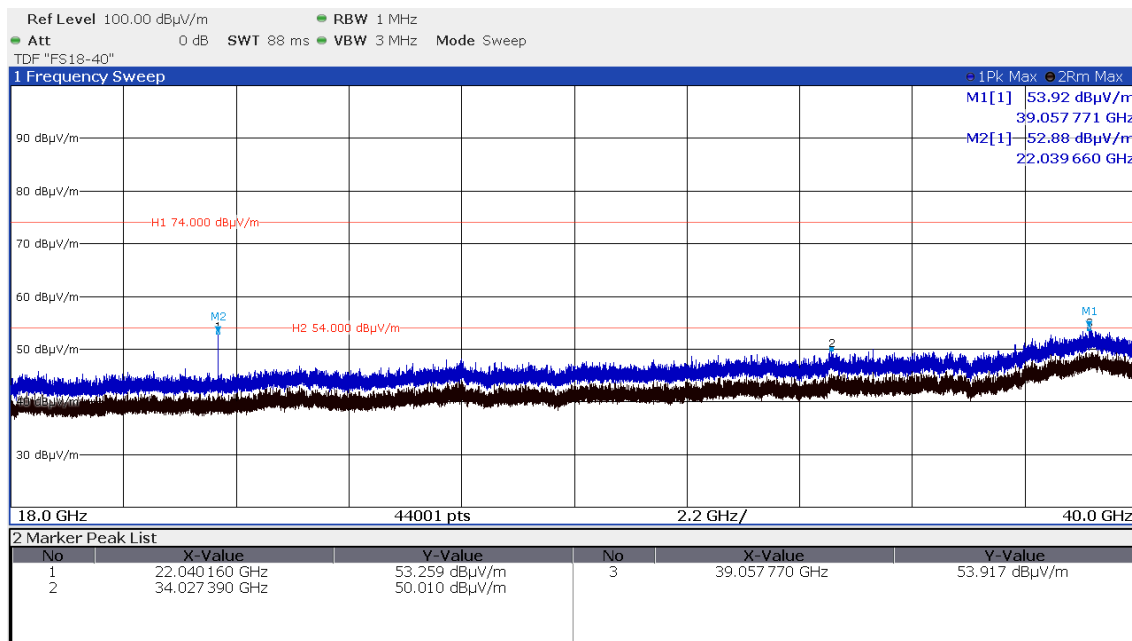
Note: Emission at 39.13827 GHz solely from noise level. RMS trace below AV limit of 54 dBµV/m.

CH102, P10, 40MHz:

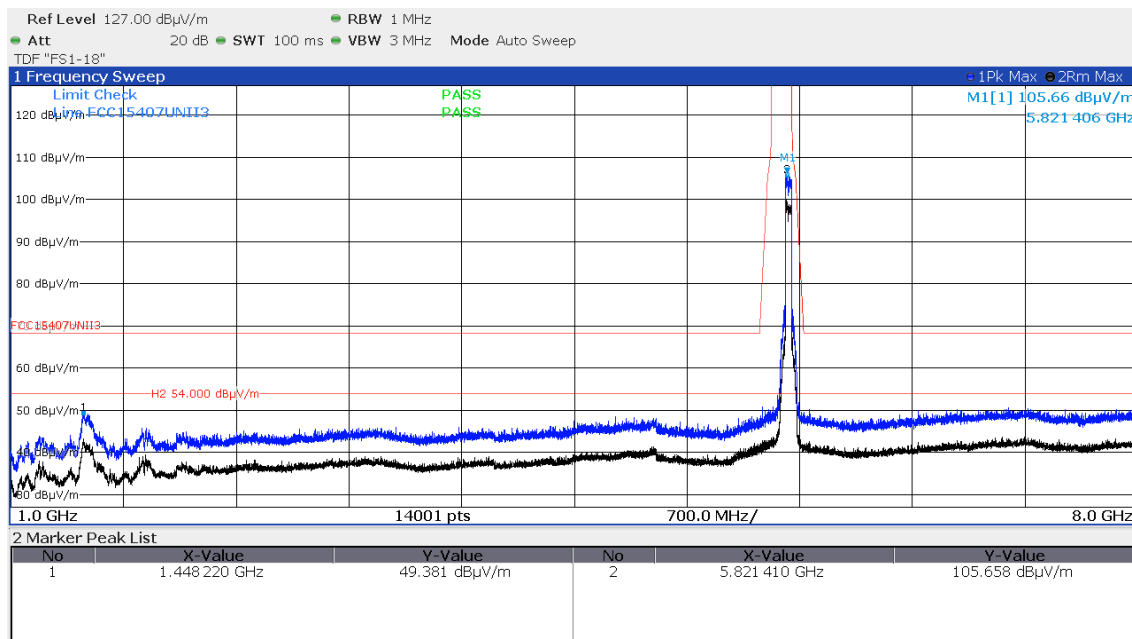


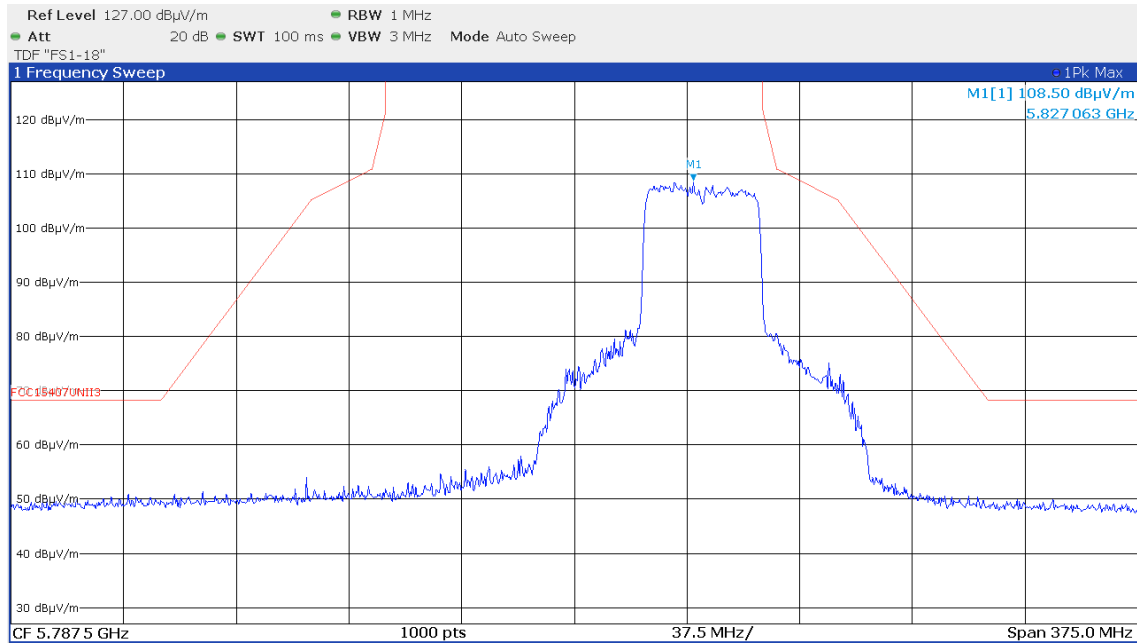
Note: Marker M2 shows compliance with PK general limit, Marker M3 shows compliance with AV general limit, Marker M4 shows compliance with spurious emissions limit.



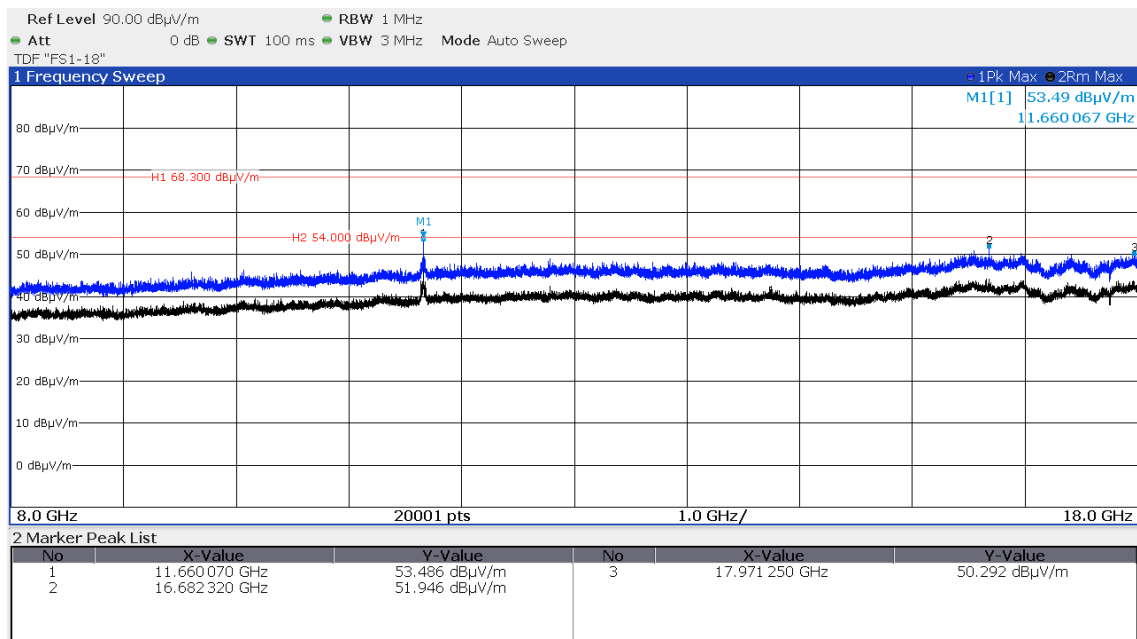


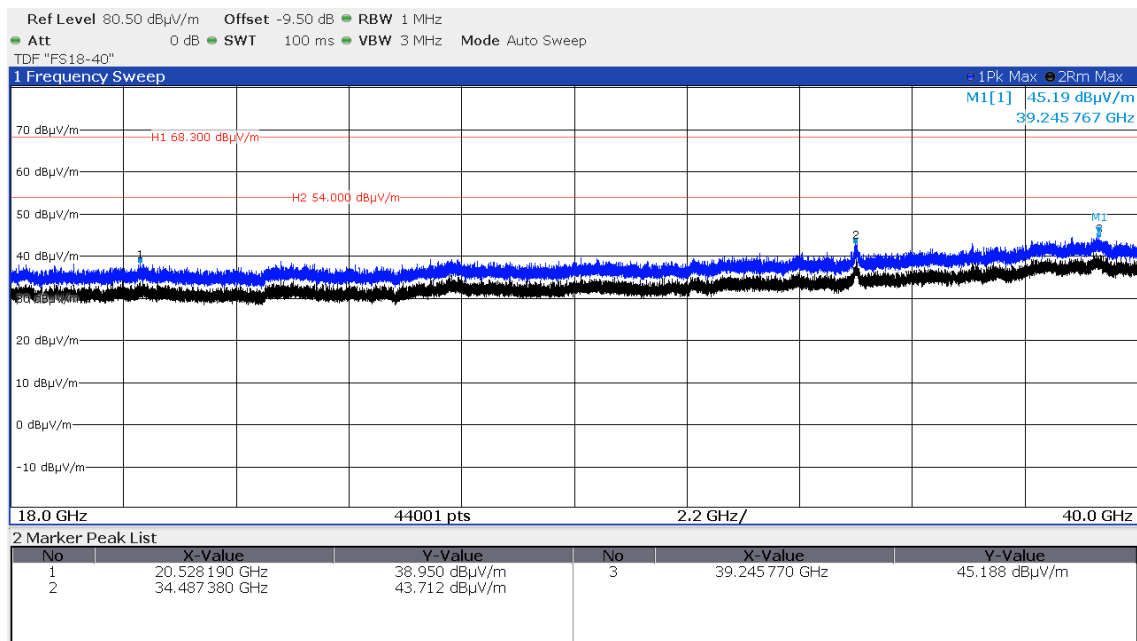
CH166, P9, 40MHz:





Note: Detail band edge operating frequency band 5725-5850 MHz





Limit according to FCC Part 15E, Section 15.407(b):

Operating Frequency range (MHz)	Frequency ranges from band edge (MHz)	Undesirable emission limit, EIRP (dBm / MHz)	Undesirable emission limit, EIRP (dBμV/m / MHz)
5150 - 5250	-	-27.0	68.3
5250 - 5350	-	-27.0	68.3
5470 - 5725	-	-27.0	68.3
5725 - 5850	± 5	27.0 decreasing linearly to 15.6	122.2 decreasing linearly to 110.8
	± 5 - ± 25	15.6 decreasing linearly to 10.0	110.8 decreasing linearly to 105.2
	± 25 - ± 75	10.0 decreasing linearly to -27.0	105.2 decreasing linearly to 68.3
	± 75	-27.0	68.3

Limit according to RSS-247 6.2:

Operating Frequency range (MHz)	Frequency ranges from band edge (MHz)	Undesirable emission limit, EIRP (dBm / MHz)	Undesirable emission limit, EIRP (dBμV/m / MHz)
5150 - 5250	-	-27.0	68.3
5250 - 5350	-	-27.0	68.3
5470 - 5600	-	-27.0	68.3
5650 - 5725	-	-27.0	68.3
5725 - 5850	± 5	27.0 decreasing linearly to 15.6	122.2 decreasing linearly to 110.8
	± 5 - ± 25	15.6 decreasing linearly to 10.0	110.8 decreasing linearly to 105.2
	± 25 - ± 75	10.0 decreasing linearly to -27.0	105.2 decreasing linearly to 68.3
	± 75	-27.0	68.3

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

Restricted bands of operation FCC Part 15C, Section 15.205:

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

Restricted frequency bands RSS-Gen, Table 6:

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 40 GHz. Only the worst case of the 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 uses the listed antennas for 2x2 MIMO technique. The equipment connector is subject to the end product.

The supplied antenna meets the requirements of part 15.203.

The requirements are **FULFILLED**.

Remarks:

None

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.
CPC 3 performed on 24/10/2023:						
CPC 3	FSW43	02-02/11-21-001	22/05/2024	22/05/2023		
	minibend KR-16	02-02/50-16-018				
	4768-20 DC-40GHz	02-02/50-23-003			28/12/2023	28/06/2023
SER3 for Channel 166 performed on 06/06/2023:						
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	02-02/24-05-015	02/03/2025	02/03/2022		
	3117	02-02/24-20-007	18/11/2023	18/11/2022		
	WHKX 7.5/18G-8SS	02-02/50-07-010				
	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				
All other measurements performed in the time period 21/06/2022 to 22/08/2022 (SER2 performed on 29/06/2022):						
A 4	BAT-EMC 3.21.0.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	17/06/2023	17/06/2022		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2022	31/10/2019	22/09/2022	22/03/2022
	N-4000-BNC	02-02/50-05-138				
	SP 103 /3.5-60	02-02/50-05-182				
	6430	02-02/50-13-014				
SER 1	FMZB 1516	01-02/24-01-018			05/01/2023	05/01/2022
	ESR 7	02-02/03-13-001	11/03/2023	11/03/2022		
	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	ESVS 30	02-02/03-05-006	09/07/2022	09/07/2021		
	VULB 9168	02-02/24-05-005	20/12/2022	20/12/2021	07/07/2022	07/07/2021
	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	02-02/11-15-001	22/04/2023	22/04/2022		
	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	19/05/2023	19/05/2020	10/03/2023	10/03/2022
	3117	02-02/24-20-007	09/11/2022	09/11/2021		
	WHKX 7.5/18G-8SS	02-02/50-07-010				
	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 -

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.