



RF - TEST REPORT

- FCC Part 15.255, RSS210 -

Type / Model Name : MPH-AC008A

Product Description : Access control terminal VisionPass SP

Applicant : IDEMIA Identity & Security France

Address : 2 Place Samuel Champlain
COURBEVOIE 92400, FRANCE

Manufacturer : IDEMIA Identity & Security France

Address : 2 Place Samuel Champlain
COURBEVOIE 92400, FRANCE

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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Test Report No. : 80182763-02 Rev_1	14. May 2024 Date of issue
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Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

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Attachment A as separate supplement

Attachment B as separate supplement

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (June 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 (June 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 15.255	Operation within the band 57-71 GHz.
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices

ISED Canada Rules and Regulations (June 2023)

RSS-Gen, Issue 5 + Amendment 1 + 2	General Requirements for Compliance of Radio Apparatus
RSS-210, Issue 10 + Amendment 1	Licence-Exempt Radio Apparatus: Category I Equipment
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 his/her instructions.

2.3 Photo documentation of the EUT – Detailed photos see attachment A

2.4 Equipment category

The EUT qualifies under 15.255 (c) (2) (v) as a field disturbance sensor.

2.5 Short description of the equipment under test (EUT)

The EUT is a field disturbance sensor in the operating band of 61.0 GHz – 61.5 GHz. This report covers the emissions of the host device VisionPass SP Terminal “MPH-AC008A” with the module “BGT60LTR11AIP” integrated into it. The channels 1-4 are for positioning evaluation and data transmission. The VisionPass SP series are access control terminals using biometric technology with RFID.

Number of tested samples: 3
Serial number:
#1 (CW) 2337SMK0000017
#2 (pulsed) 2337SMK0000016
#3 (CW) 2337SMK0000024
Firmware version:
1.5.5-SNAPSHOT
RF relevant register settings hard coded.
Only channel selection in 61.0-61.5 GHz band possible (CH1-4)

2.6 Variants of the EUT

There are two variants of the VisionPass SP series:

- Vision Pass SP MD
- Vision Pass SP MDI

2.7 Operation frequency and channel plan

The operating frequency is 61.0 GHz to 61.5 GHz.

Channel	Frequency (GHz)
1	61.1
2	61.2
3	61.3
4	61.4

Note: The blue marked channels are measured.

2.8 Transmit operating modes

TX modulated
TX CW

2.9 Antenna

The following integrated antennas are used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)
1	linear	On chip patch antenna for TX	-	61.0-61.5	5.0
2	linear	On chip patch antenna for RX	-	61.0-61.5	5.0

The antennas cannot be unattached by the user.

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 12 - 24 V_{DC}, 12 V_{DC}

2.11 Peripheral devices and interface cables

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

- laptop Model : LENOVO R500
- - Model : -

2.12 Determination of worst case conditions for final measurement

Exploratory measurements have been 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 Y position.

Preliminary tests were performed to find the worst case mode from all possible combinations between available bandwidth, measurement rates.

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

Available channels	Tested channels	Power setting	Modulation	Modulation type
1 - 4	1, 2, 4	P_{max}	digital	OOK

2.12.1 Test jig

No test jig is used.

2.12.2 Test software

For test mode TX CW a test software is needed.

3 TEST RESULT SUMMARY

Operating in the 61 GHz – 61.5 GHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.203	RSS-Gen 6.7	Antenna requirement	passed
15.205(a)	RSS-Gen 8.10	Emissions in restricted bands	passed
15.207(a)	RSS-Gen 8.8	AC power line conducted emissions	passed
15.209(a)	RSS-Gen 8.9	Radiated emission limits; general requirements	passed
15.255(c)(2)	RSS210 J.2.2	EIRP	passed
15.255(d)	RSS210 J.3	Spurious emissions	passed
15.255(e)	RSS210 J.4	Peak conducted output power	passed
15.255(f)	RSS210 J.6	Frequency stability	passed

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80182763-02	0	08 November 2023	Initial test report
80182763-02	1	14 May 2024	Duty Cycle Measurement added, FCC Part specified

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 : 04 October 2023

Testing concluded on : 27 October 2023

Checked by:



Thomas Weise
Laboratory Manager

Tested by:



Christopher
Thaller
2024.05.14
15:10:06 +02'00'

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
Output power ERP, radiated	40000 MHz to 110000 MHz	95%	± 5.41 dB
Field strength of the fundamental	1000 MHz to 40000 MHz	95%	± 2.34 dB
Field strength of the fundamental	40000 MHz to 110000 MHz	95%	± 5.41 dB
Power spectral density	40000 MHz to 110000 MHz	95%	± 5.41 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 40000 MHz	95%	± 2.89 dB
Spurious Emissions, radiated	40000 MHz to 60000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	60000 MHz to 90000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	75000 MHz to 110000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	110000 MHz to 170000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	140000 MHz to 220000 MHz	95%	± 5.04 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".

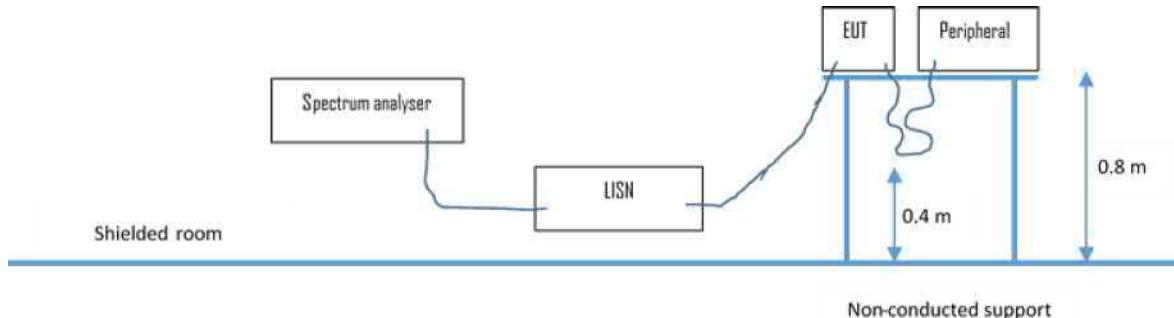
4.5.2.1 Justification

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 $\text{dB}\mu\text{V}$, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between $\text{dB}\mu\text{V}$ and μV , the following conversions apply:

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

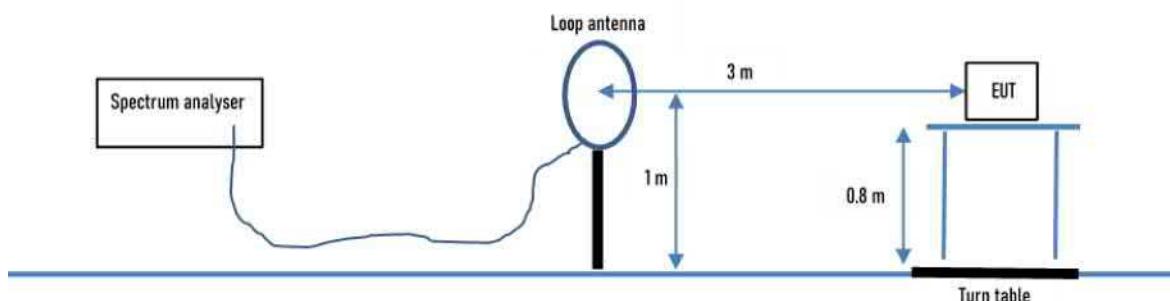
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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 $50 \Omega / 50 \mu\text{H}$ (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):

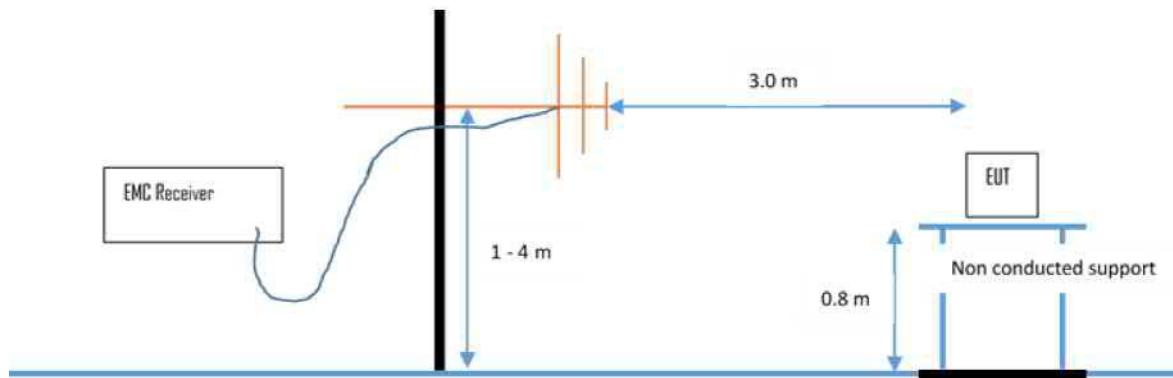
Test setup according ANSI C63.10



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 1.0×1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the 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 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 center 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:

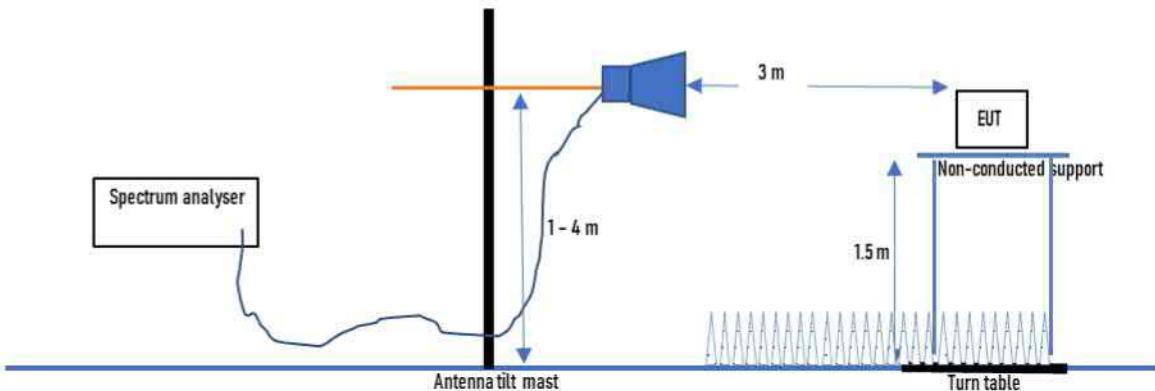
30 MHz – 1000 MHz: RBW: 120 kHz

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)

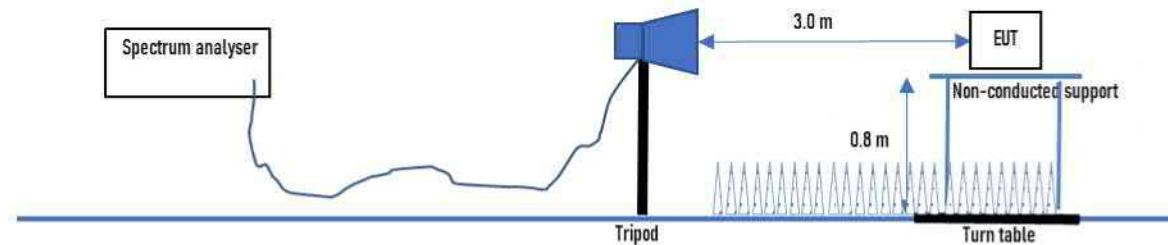
Test setup according ANSI C63.10.



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

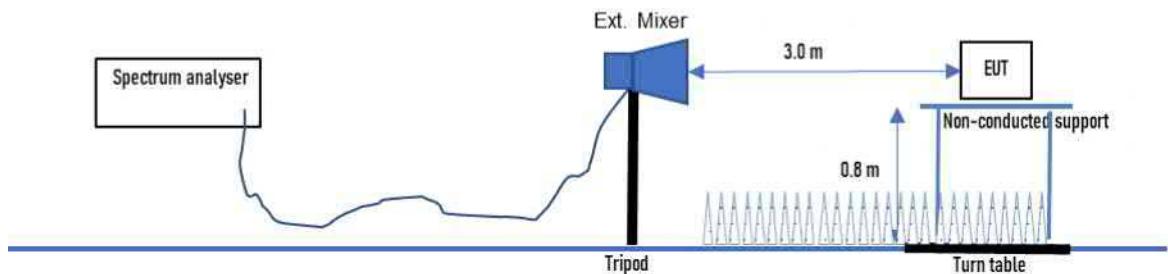
back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement 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 center, forming a bundle 30 cm to 40 cm long. Measurements are made in 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 are adopted.

4.5.3.2.5 Anechoic chamber 1 (40 GHz – 200 GHz)



Emissions from the EUT are measured in the frequency range 40 GHz up to 200 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and external mixer with standard gain horn. 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 center, forming a bundle 30 cm to 40 cm long. Measurements are made in 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 are 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 – Please see 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. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

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.

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin -5.6 dB @ 15.55 MHz

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

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	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

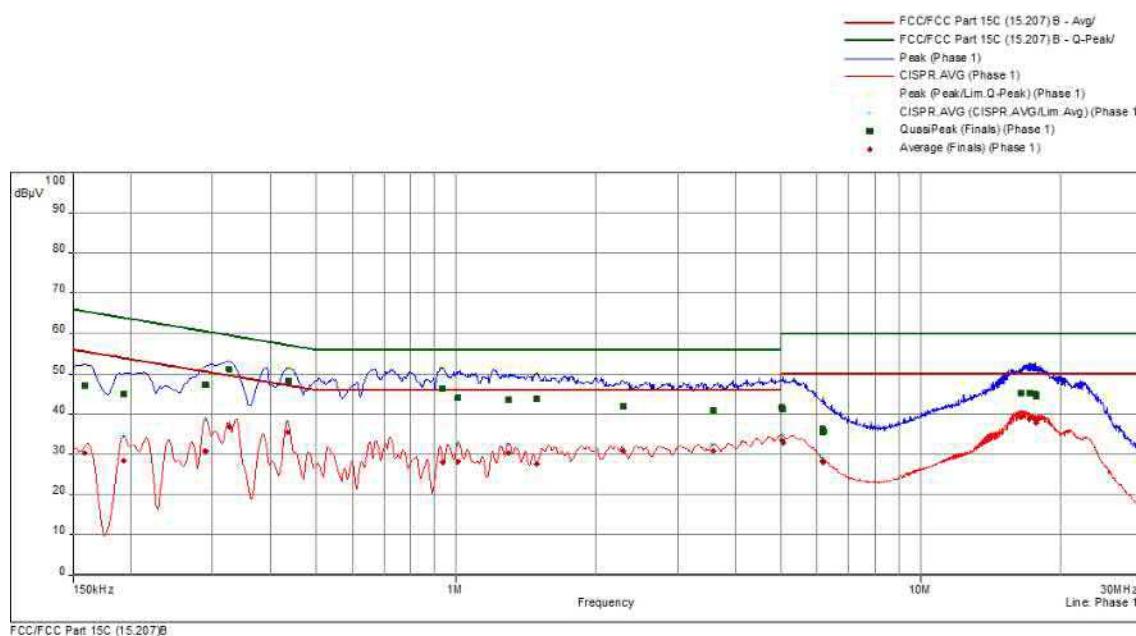
Limit according to RSS-Gen 8.8:

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	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.
PoE power supply: AC adapter ZyXEL, model number PoE12-HP
DC powered mode performed with commercially available laboratory DC power supply HM8143.

5.1.6 Test protocol
Test point
L1
Operation mode:
60 GHz TX, Power over ethernet, RFID deactivated
Result: passed


freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV		dB
0.159	47.1	18.4	65.5	30.3	25.2	55.5	Phase 1	10.1
0.193	44.9	19.0	63.9	28.4	25.5	53.9	Phase 1	10.1
0.290	47.4	13.1	60.5	30.9	19.6	50.5	Phase 1	10.1
0.326	51.3	8.3	59.6	36.9	12.7	49.6	Phase 1	10.1
0.436	48.3	8.9	57.1	35.6	11.5	47.1	Phase 1	10.2
0.938	46.3	9.7	56.0	28.0	18.0	46.0	Phase 1	10.2
1.010	44.2	11.8	56.0	28.2	17.8	46.0	Phase 1	10.2
1.298	43.7	12.3	56.0	30.3	15.7	46.0	Phase 1	10.3
1.493	44.1	11.9	56.0	27.7	18.3	46.0	Phase 1	10.3
2.290	42.1	13.9	56.0	30.9	15.1	46.0	Phase 1	10.3
3.575	41.0	15.0	56.0	30.9	15.1	46.0	Phase 1	10.3
5.033	41.7	18.3	60.0	33.6	16.4	50.0	Phase 1	10.4
5.060	41.1	18.9	60.0	32.9	17.1	50.0	Phase 1	10.4
6.153	36.3	23.7	60.0	28.4	21.6	50.0	Phase 1	10.5
6.173	35.7	24.3	60.0	28.2	21.8	50.0	Phase 1	10.5
16.454	45.4	14.7	60.0	39.3	10.7	50.0	Phase 1	11.1
17.178	45.2	14.8	60.0	38.8	11.2	50.0	Phase 1	11.1
17.720	44.9	15.1	60.0	38.6	11.4	50.0	Phase 1	11.2
17.725	44.4	15.6	60.0	37.9	12.1	50.0	Phase 1	11.2

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

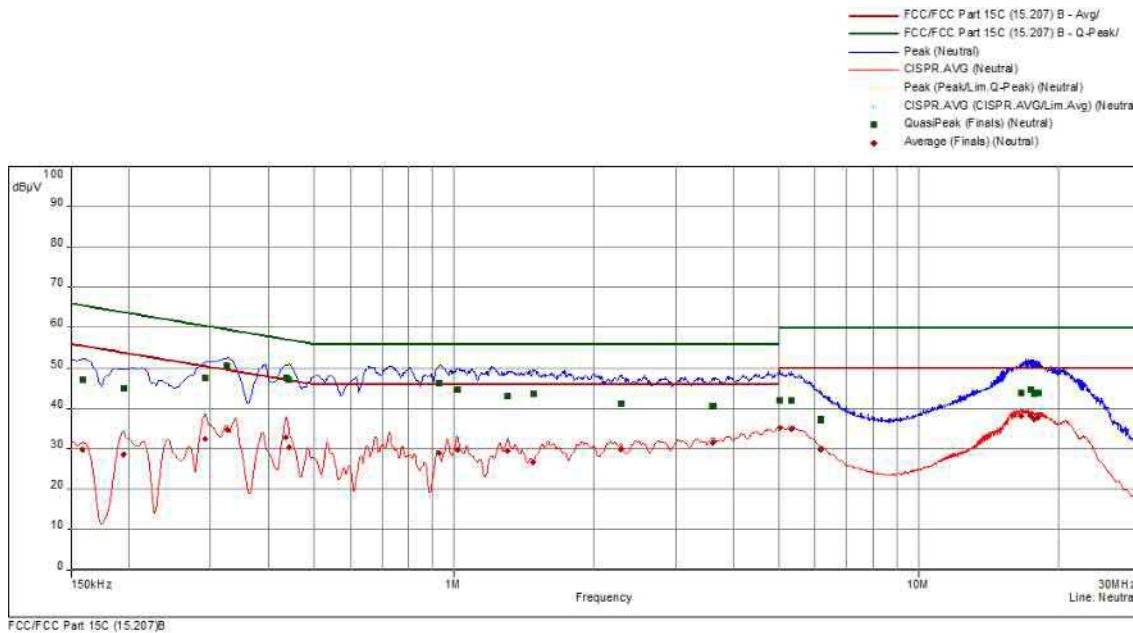
Test point:

N

Operation mode:

60 GHz TX, Power over ethernet, RFID deactivated

Result: passed



freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV		dB
0.159	47.2	18.3	65.5	29.9	25.6	55.5	Neutral	10.1
0.195	44.9	18.9	63.8	28.7	25.1	53.8	Neutral	10.1
0.292	47.7	12.8	60.5	32.6	17.9	50.5	Neutral	10.2
0.326	50.7	8.9	59.6	34.9	14.7	49.6	Neutral	10.2
0.436	47.6	9.5	57.1	32.8	14.3	47.1	Neutral	10.2
0.443	47.2	9.8	57.0	30.4	16.6	47.0	Neutral	10.2
0.931	46.4	9.6	56.0	29.0	17.0	46.0	Neutral	10.2
1.019	44.6	11.4	56.0	29.8	16.2	46.0	Neutral	10.2
1.307	43.2	12.8	56.0	29.5	16.5	46.0	Neutral	10.3
1.482	43.6	12.4	56.0	26.8	19.2	46.0	Neutral	10.3
2.294	41.4	14.6	56.0	29.9	16.1	46.0	Neutral	10.3
3.615	40.7	15.3	56.0	31.6	14.4	46.0	Neutral	10.4
5.035	42.2	17.8	60.0	35.3	14.8	50.0	Neutral	10.5
5.332	42.2	17.8	60.0	35.0	15.0	50.0	Neutral	10.5
6.153	37.6	22.4	60.0	30.0	20.0	50.0	Neutral	10.5
6.167	37.2	22.8	60.0	29.8	20.2	50.0	Neutral	10.5
16.645	43.9	16.1	60.0	38.1	11.9	50.0	Neutral	11.0
17.457	44.7	15.3	60.0	38.2	11.8	50.0	Neutral	11.0
17.734	43.7	16.3	60.0	37.5	12.5	50.0	Neutral	11.0
18.092	43.9	16.1	60.0	37.7	12.3	50.0	Neutral	11.0

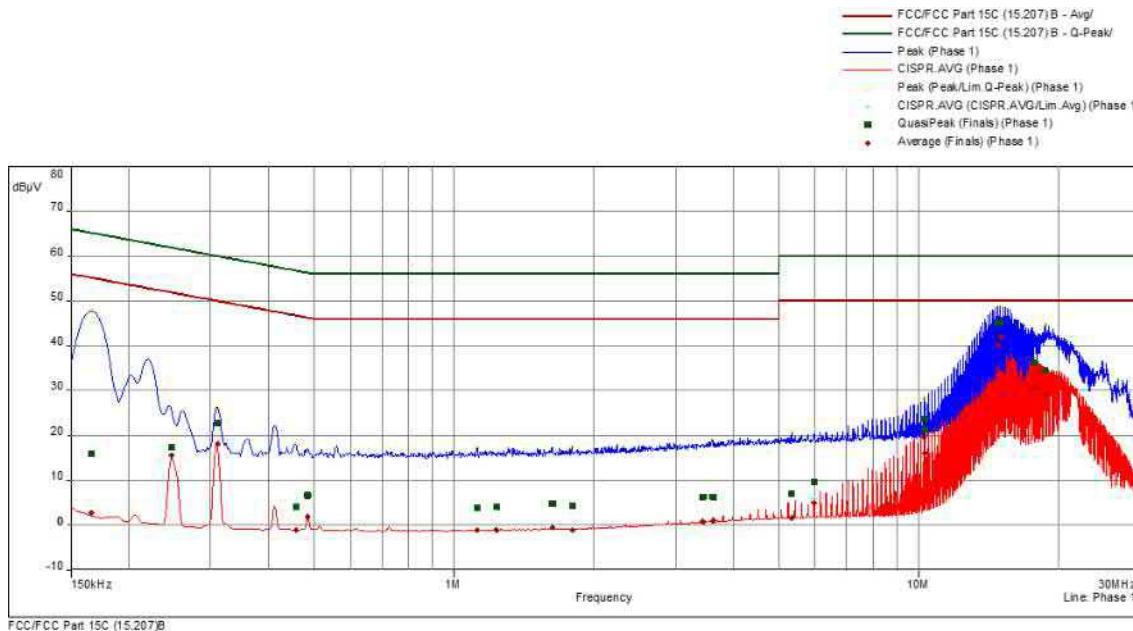
FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

Test point

L1

Operation mode: 60 GHz TX, DC power supply, RFID deactivated

Result: passed



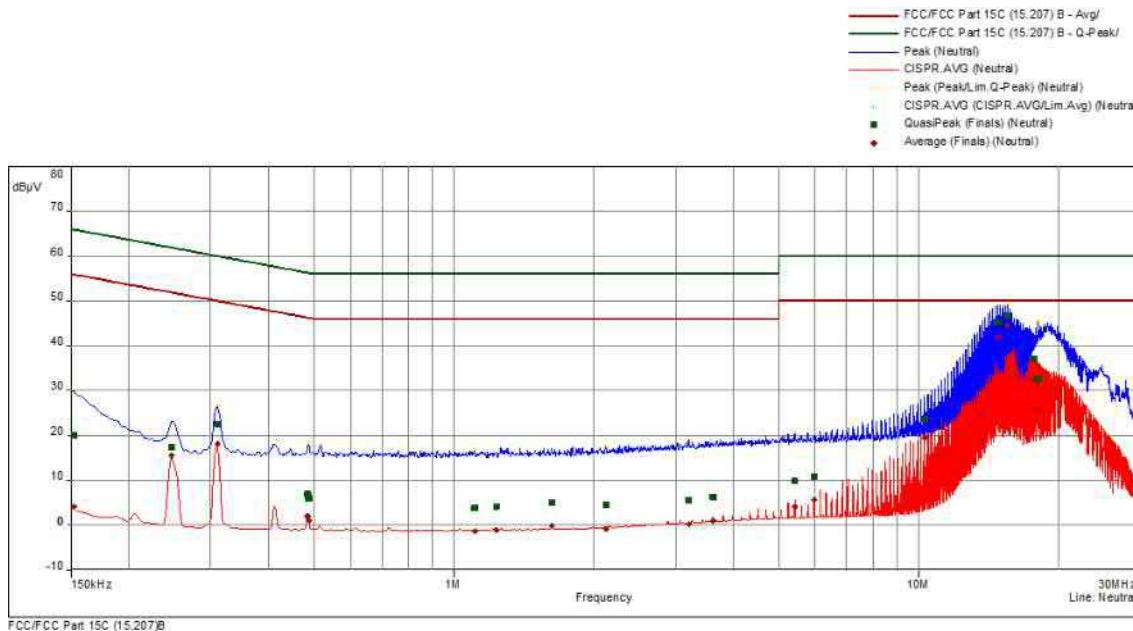
freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB μ V	dB	dB μ V	dB μ V	dB	dB μ V		dB
0.166	15.9	49.3	65.2	2.7	52.5	55.2	Phase 1	10.1
0.247	17.4	44.5	61.9	15.6	36.2	51.9	Phase 1	10.1
0.310	22.7	37.3	60.0	18.2	31.8	50.0	Phase 1	10.1
0.458	4.2	52.6	56.7	-1.1	47.8	46.7	Phase 1	10.2
0.485	6.7	49.5	56.3	2.0	44.3	46.3	Phase 1	10.2
1.124	3.9	52.1	56.0	-1.2	47.2	46.0	Phase 1	10.2
1.235	4.2	51.8	56.0	-1.1	47.1	46.0	Phase 1	10.2
1.631	4.9	51.1	56.0	-0.5	46.5	46.0	Phase 1	10.3
1.797	4.3	51.7	56.0	-1.0	47.0	46.0	Phase 1	10.3
3.440	6.4	49.6	56.0	0.9	45.1	46.0	Phase 1	10.3
3.615	6.4	49.6	56.0	1.1	45.0	46.0	Phase 1	10.3
5.339	7.0	53.0	60.0	1.7	48.3	50.0	Phase 1	10.5
5.973	9.8	50.2	60.0	5.0	45.0	50.0	Phase 1	10.5
10.316	23.6	36.4	60.0	19.6	30.4	50.0	Phase 1	10.7
10.318	21.3	38.8	60.0	16.1	33.9	50.0	Phase 1	10.7
14.840	45.3	14.7	60.0	40.2	9.8	50.0	Phase 1	11.0
15.020	45.4	14.6	60.0	42.1	7.9	50.0	Phase 1	11.1
17.736	36.2	23.8	60.0	30.7	19.3	50.0	Phase 1	11.2
18.731	34.6	25.4	60.0	29.1	20.9	50.0	Phase 1	11.2

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

Test point:
Operation mode:

N
60 GHz TX, DC power supply, RFID deactivated

Result: passed



freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV		dB
0.152	20.1	45.8	65.9	4.2	51.7	55.9	Neutral	10.1
0.247	17.4	44.5	61.9	15.6	36.3	51.9	Neutral	10.1
0.310	22.6	37.4	60.0	18.2	31.8	50.0	Neutral	10.2
0.485	7.0	49.3	56.3	2.0	44.2	46.3	Neutral	10.2
0.488	6.1	50.2	56.2	1.1	45.1	46.2	Neutral	10.2
1.109	3.9	52.1	56.0	-1.4	47.4	46.0	Neutral	10.2
1.235	4.2	51.8	56.0	-1.1	47.1	46.0	Neutral	10.3
1.628	5.1	50.9	56.0	-0.1	46.1	46.0	Neutral	10.3
2.126	4.6	51.4	56.0	-0.7	46.7	46.0	Neutral	10.3
3.203	5.7	50.4	56.0	0.3	45.7	46.0	Neutral	10.4
3.615	6.4	49.6	56.0	1.0	45.0	46.0	Neutral	10.4
5.424	9.9	50.1	60.0	4.1	45.9	50.0	Neutral	10.5
5.969	10.9	49.1	60.0	5.8	44.2	50.0	Neutral	10.5
10.311	23.8	36.2	60.0	19.5	30.5	50.0	Neutral	10.7
14.834	45.2	14.8	60.0	41.9	8.1	50.0	Neutral	10.9
15.554	46.7	13.3	60.0	44.4	5.6	50.0	Neutral	10.9
17.727	37.0	23.0	60.0	32.4	17.6	50.0	Neutral	11.0
18.092	32.7	27.3	60.0	25.8	24.2	50.0	Neutral	11.0

5.2 EBW and OBW

For test instruments and accessories used see section 6 Part **CPR3**.

5.2.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 1 m

5.2.2 Photo documentation of the test set-up

See Attachment B for detailed photo documentation of the test set-up.

5.2.3 Applicable standard

According to FCC Part 15, Section 15.255(c)(2)(v):

For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm.

According to FCC Part 15, Section 15.255(e)(1):

Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz.

According to RSS-210 J.4(c):

For the purpose of this standard, emission bandwidth is defined as the instantaneous frequency range occupied by a steady radiated signal with modulation, outside which the radiated power spectral density shall be 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth. The centre frequency must be stationary during the measurement interval, even if not stationary during normal operation.

According to RSS-Gen 6.7:

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

5.2.4 Description of Measurement

According to FCC Part 15, Section 15.255(e)(1):

For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

According to RSS-Gen 6.7:

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Spectrum analyser settings for EBW:

RBW: 100 kHz, VBW: 3 x RBW, Detector: Max peak, Sweep time: auto, Span: > 2 EBW;

Spectrum analyser settings for OBW:

RBW: 300 kHz, VBW: 3 x RBW, Detector: Max peak, Sweep time: auto, Span: > 2 OBW;

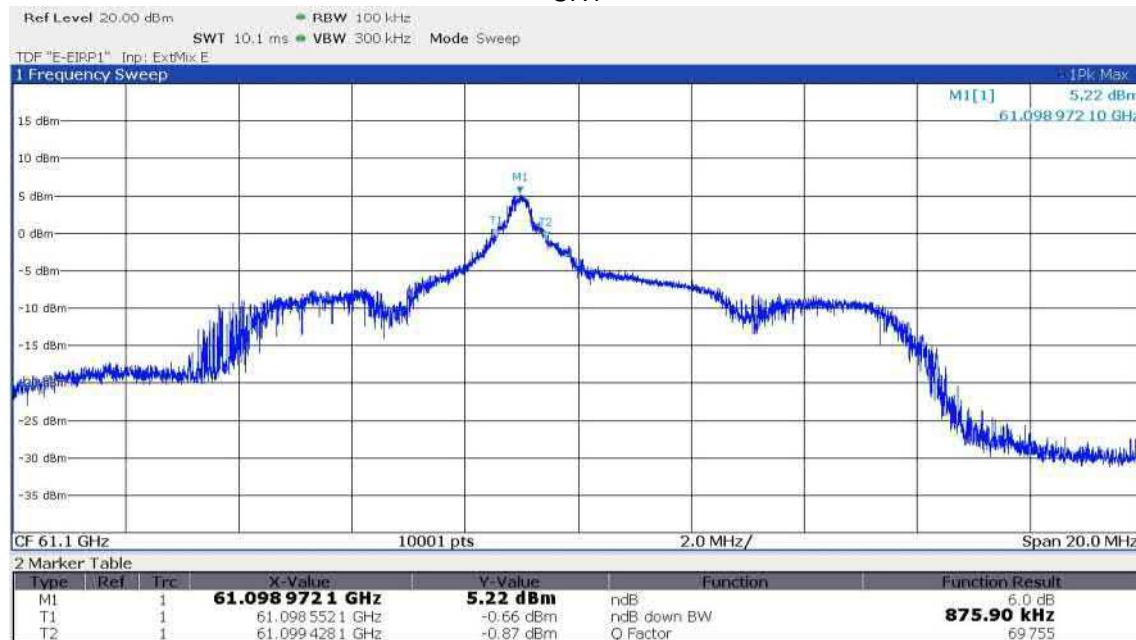
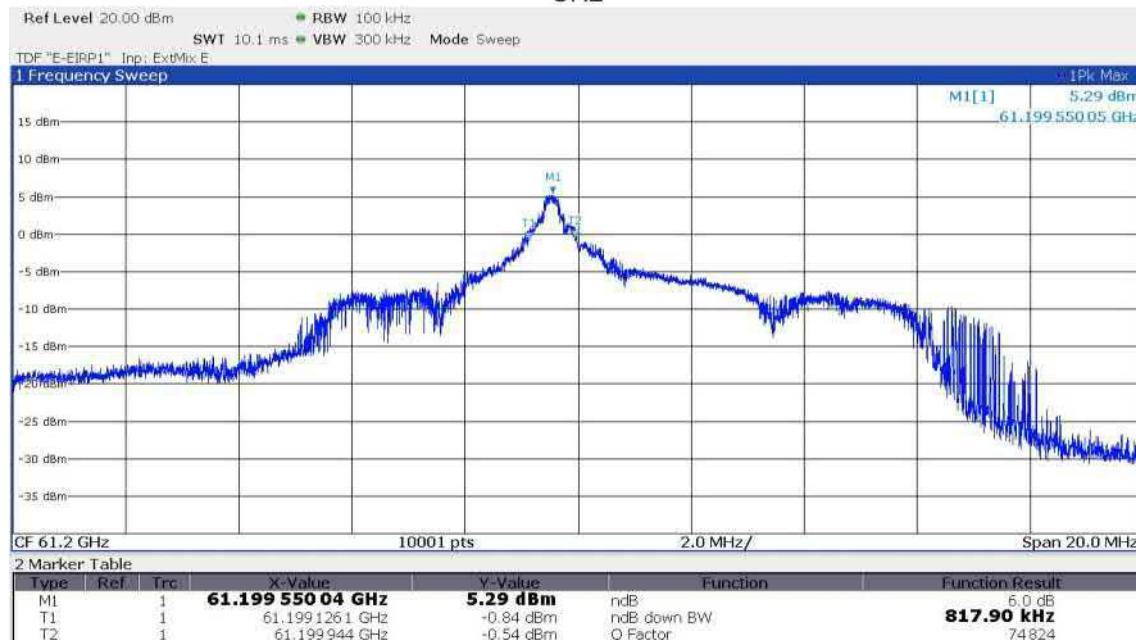
5.2.5 Test result

Channel	f_{low} (MHz)	f_{high} (MHz)	EBW 6dB
1	61098.5521	61099.428	0.876
2	61199.1261	61199.944	0.818
4	61398.2542	61399.108	0.854

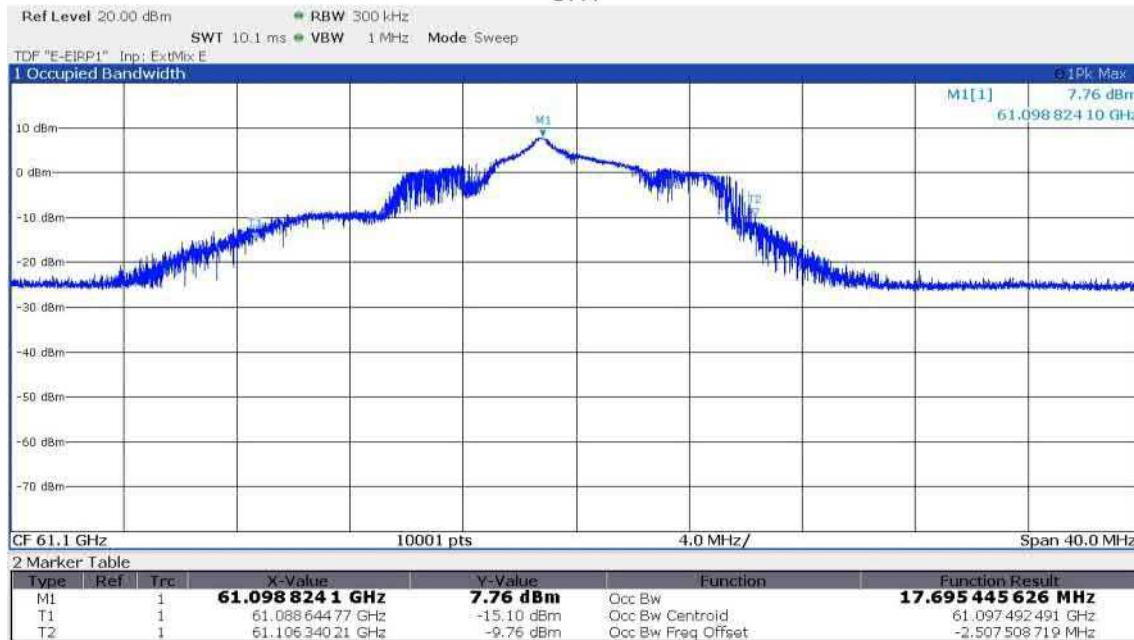
Channel	f_{low} (MHz)	f_{high} (MHz)	OBW 99%
1	61088.6448	61106.3402	17.695
2	61189.1887	61206.8824	17.694
4	61388.8657	61406.3659	17.500

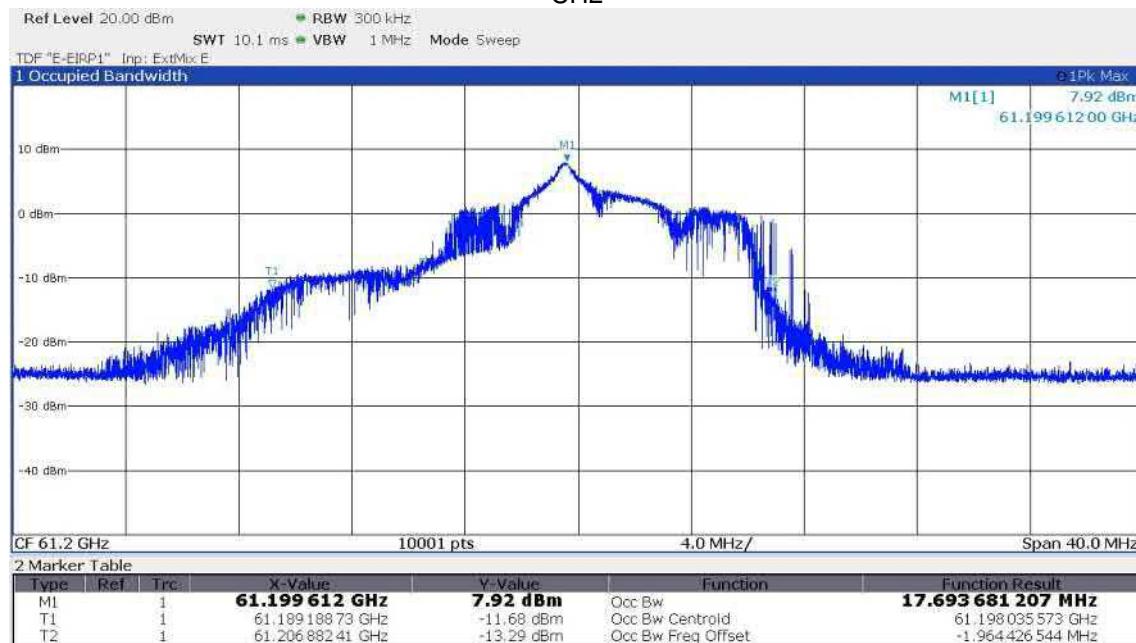
The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols. No limit defined for the occupied bandwidth!

5.2.6 Test protocols
6dB EBW
CH1

CH2


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
CH4

99% OBW
CH1


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
CH2

CH4


5.3 EIRP

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 Applicable standard

According to FCC Part 15C, Section 15.255(c)(2)(v):

For field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm.

According to RSS-210 J.2.1:

For field disturbance sensors that occupy a bandwidth of 500 MHz or less and for which the bandwidth is contained wholly within the frequency band 61.0-61.5 GHz, the equipment's average and peak e.i.r.p. in the channel bandwidth shall not exceed 40 dBm and 43 dBm respectively. In addition, the average and peak e.i.r.p. of any emission outside of the band 61.0-61.5 GHz, but still within the band 57-71 GHz, shall not exceed 10 dBm and 13 dBm respectively.

5.3.3 Photo documentation of the test set-up – Please see attachment B

5.3.4 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 9.11. The EUT is measured in TX continuous unmodulated under normal conditions.

Analyser settings:

PK measurement:	RBW: 30 MHz	VBW: 80 MHz	Detector: PK	Trace. Max hold
AV measurement:	RBW: 30 MHz	VBW: 80 MHz	Detector: RMS	Trace. Max hold

FCC ID: ZBW-MPHAC008A**IC: 11472A-MPHAC008A****5.3.5 Test result**

Frequency (MHz)	Level PK (dBm)	Limit PK (dBm)	Margin PK (dB)	Level AV (dBm)	Limit AV (dBm)	Margin AV (dB)
61.1	9.8	43.0	-33.2	8.4	40.0	-31.7
61.2	9.8	43.0	-33.2	8.1	40.0	-31.9
61.4	10.9	43.0	-32.1	9.5	40.0	-30.6

EIRP limit according to FCC Part 15C, Section 15.255(c)(2)(v):

For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm.

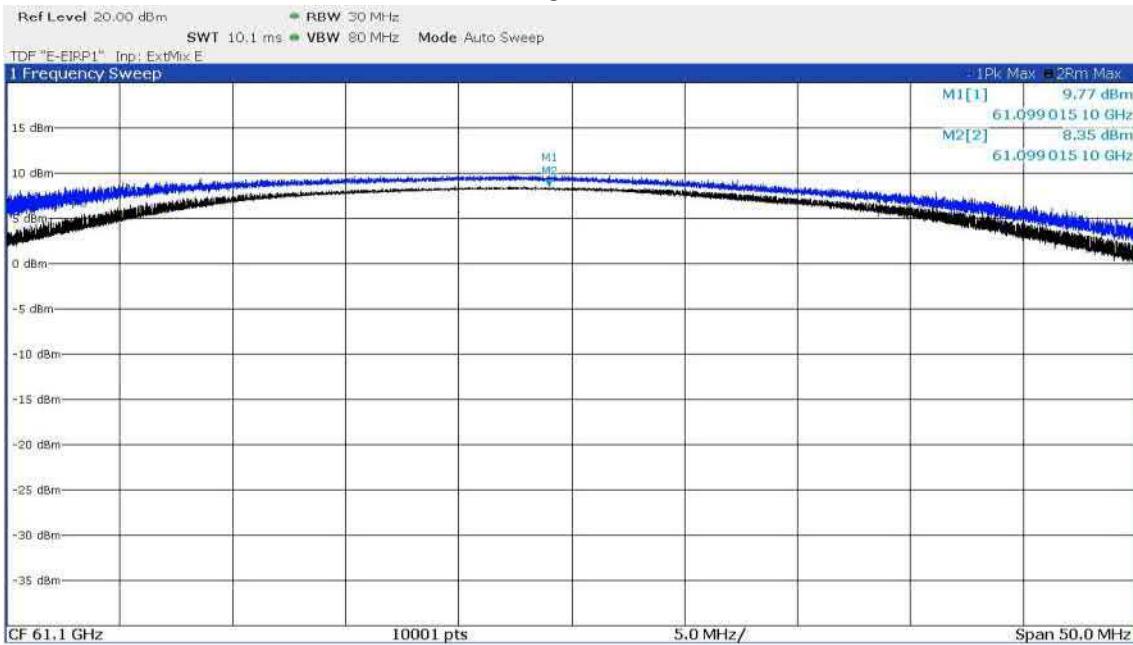
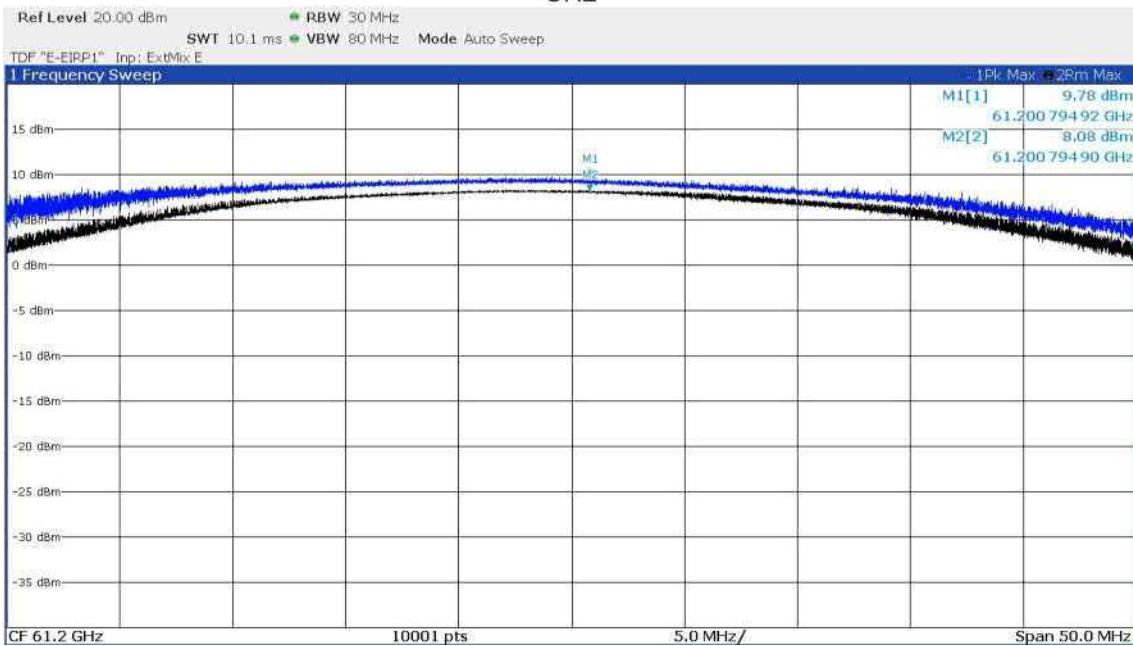
Limit according to RSS-210 J.2.1(a):

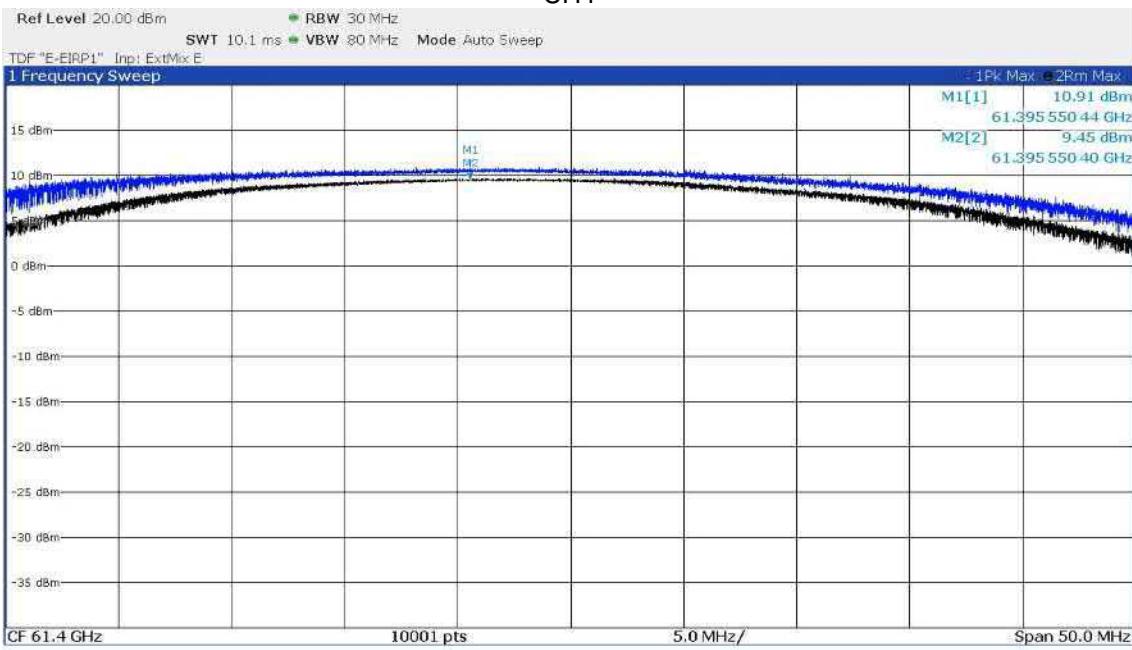
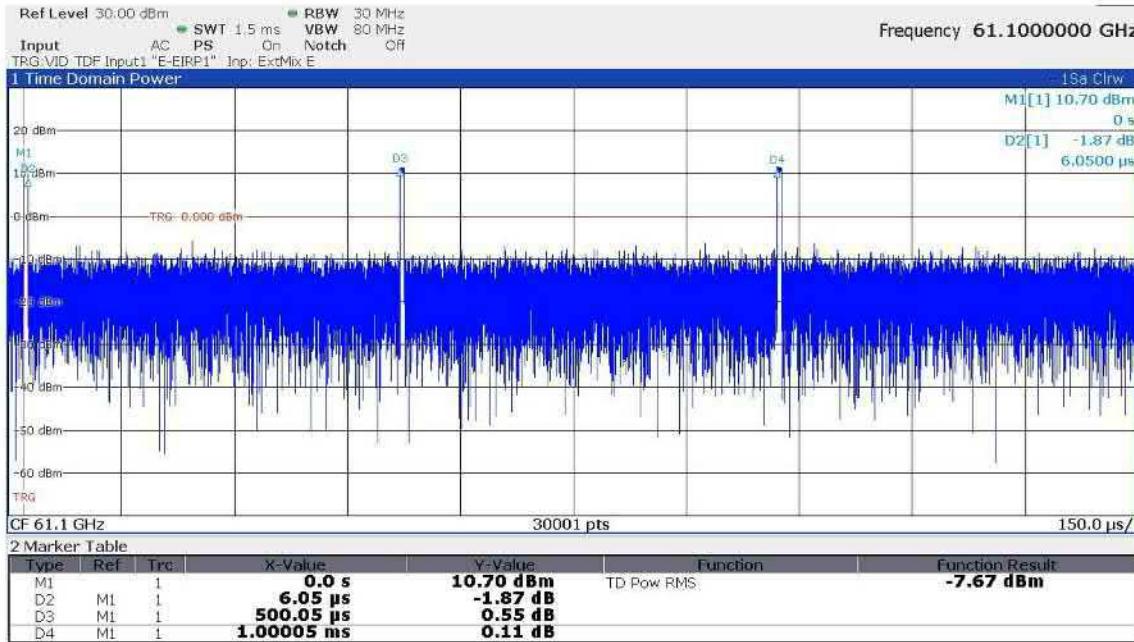
For fixed field disturbance sensors that occupy a bandwidth of 500 MHz or less and for which the bandwidth is contained wholly within the frequency band 61.0-61.5 GHz, the equipment's average and peak e.i.r.p. in the channel bandwidth shall not exceed 40 dBm and 43 dBm respectively. In addition, the average and peak e.i.r.p. of any emission outside of the band 61.0-61.5 GHz, but still within the band 57-71 GHz, shall not exceed 10 dBm and 13 dBm respectively.

The requirements are **FULFILLED**.

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

5.3.6 Test protocols

CH1

CH2


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
CH4

Duty Cycle measurement:


5.4 Peak conducted output power

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

5.4.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 1 m

5.4.2 Applicable standard

According to FCC Part 15C, Section 15.255(e):

Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (c) of this section.

According to RSS-210 J.4(a):

For devices with an emission bandwidth greater than or equal to 100 MHz, the peak transmitter output power shall not exceed 500 mW. For devices with an emission bandwidth less than 100 MHz, the peak transmitter output power shall be less than the product of 500 mW and their emission bandwidth divided by 100 MHz.

5.4.3 Photo documentation of the test set-up – Please see attachment B

5.4.4 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 9.11. The EUT is measured in TX modulated under normal conditions.

Analyser settings:

AV measurement:	RBW: 100 kHz	VBW: 300 kHz	Detector: RMS	Trace. Max hold
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5.4.5 Test result

Determination of the conducted output power limit:

The emission of the EUT is less than 500 MHz within the frequency band 61.0-61.5 GHz.

Determination of the limit:

The limit is given as $500 \text{ mW} * \text{EBW } 6 \text{ dB} (100 \text{ kHz RBW}) / 100 \text{ MHz}$;

For CH1: EBW = 876 kHz; Limit = $500 \text{ mW} * 876 \text{ kHz} / 100 \text{ MHz} = 4.38 \text{ mW}$

For CH2: EBW = 818 kHz; Limit = $500 \text{ mW} * 818 \text{ kHz} / 100 \text{ MHz} = 4.09 \text{ mW}$

For CH4: EBW = 854 kHz; Limit = $500 \text{ mW} * 854 \text{ kHz} / 100 \text{ MHz} = 4.27 \text{ mW}$

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

Calculation of the peak transmitter output power:

Frequency (MHz)	Level EIRP PK (dBm)	Antenna gain (dBi)	Conducted level PK (dBm)	Conducted level PK (mW)	Limit (mW)	Margin (mW)
61.1	9.8	5.0	4.8	3.0	4.4	-1.4
61.2	9.8	5.0	4.8	3.0	4.1	-1.1
61.4	10.9	5.0	5.9	3.9	4.3	-0.4

EIRP limit according to FCC Part 15C, Section 15.255(e):

Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (c) of this section.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

EIRP limit according to RSS-210 J.4:

For devices with an emission bandwidth greater than or equal to 100 MHz, the peak transmitter output power shall not exceed 500 mW. For devices with an emission bandwidth less than 100 MHz, the peak transmitter output power shall be less than the product of 500 mW and their emission bandwidth divided by 100 MHz.

For the purposes of demonstrating compliance with this RSS, corrections to the transmitter output power may be made to compensate for antenna and circuit loss.

For the purpose of this standard, emission bandwidth is defined as the instantaneous frequency range occupied by a steady radiated signal with modulation, outside which the radiated power spectral density shall be 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth. The centre frequency must be stationary during the measurement interval, even if not stationary during normal operation.

Determination of the limit:

The limit is given as $500 \text{ mW} * \text{EBW } 6 \text{ dB (100 kHz RBW)} / 100 \text{ MHz}$;

For CH1: EBW = 876 kHz; Limit = $500 \text{ mW} * 876 \text{ kHz} / 100 \text{ MHz} = 4.38 \text{ mW}$

For CH2: EBW = 818 kHz; Limit = $500 \text{ mW} * 818 \text{ kHz} / 100 \text{ MHz} = 4.09 \text{ mW}$

For CH4: EBW = 854 kHz; Limit = $500 \text{ mW} * 854 \text{ kHz} / 100 \text{ MHz} = 4.27 \text{ mW}$

The requirements are **FULFILLED**.

Remarks: None.

5.5 Duty Cycle

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

5.5.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 1 m

5.5.2 Applicable standard

According to FCC Part 15C, Section 15.255(c)(2)(v):

For field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm.

According to RSS-210 J.2.1:

For field disturbance sensors that occupy a bandwidth of 500 MHz or less and for which the bandwidth is contained wholly within the frequency band 61.0-61.5 GHz, the equipment's average and peak e.i.r.p. in the channel bandwidth shall not exceed 40 dBm and 43 dBm respectively. In addition, the average and peak e.i.r.p. of any emission outside of the band 61.0-61.5 GHz, but still within the band 57-71 GHz, shall not exceed 10 dBm and 13 dBm respectively.

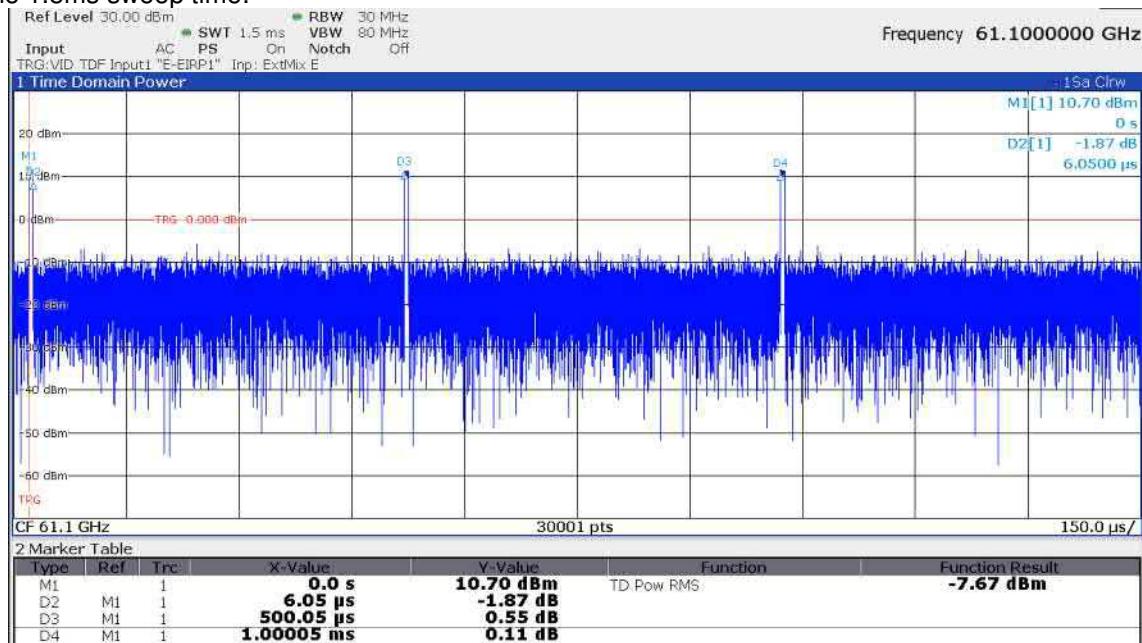
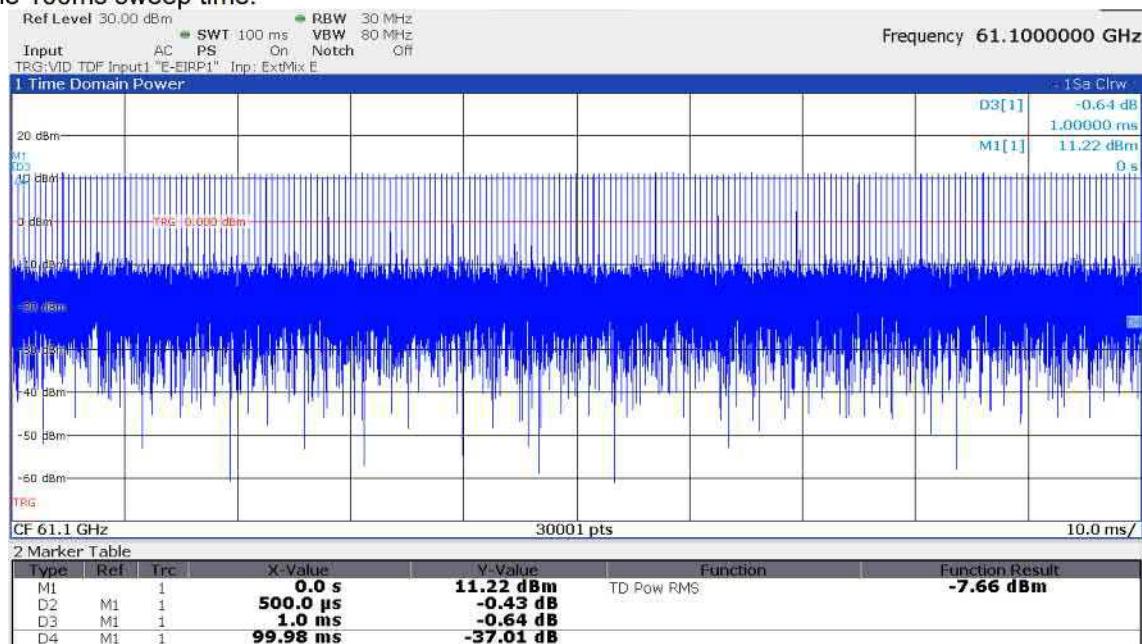
5.5.3 Photo documentation of the test set-up – Please see attachment B

5.5.4 Test result

Determination of the Duty Cycle:

Total length of period	500.05 μ s
Max. On time	6.05 μ s
DC	0.01
Correction factor	-38.3 dB

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

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
Duty Cycle 1.5ms sweep time:

Duty Cycle 100ms sweep time:


5.6 Spurious emissions

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

5.6.1 Description of the test location

Test location: OATS 1
Test distance: 3 m

Test location: Anechoic chamber 1
Test distance: 3 m (1 GHz – 40 GHz)
Test distance: 1 m (40 GHz – 200 GHz)

5.6.2 Photo documentation of the test set-up – Please see attachment B

5.6.3 Applicable standard

According to FCC Part 15C, Section 15.255 (d):

- (1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.
- (2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.
- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

According to RSS-210 J.3:

The power of any emissions outside the band 57-71 GHz shall consist solely of spurious emissions and shall not exceed:

- a) the fundamental emission levels
- b) the general field strength limits specified in RSS-Gen for emissions below 40 GHz
- c) 90 pW/cm² at a distance of 3 m for emissions between 40 GHz and 200 GHz

5.6.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 9. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EUT is measured in TX continuous mode under normal conditions.

Instrument settings:

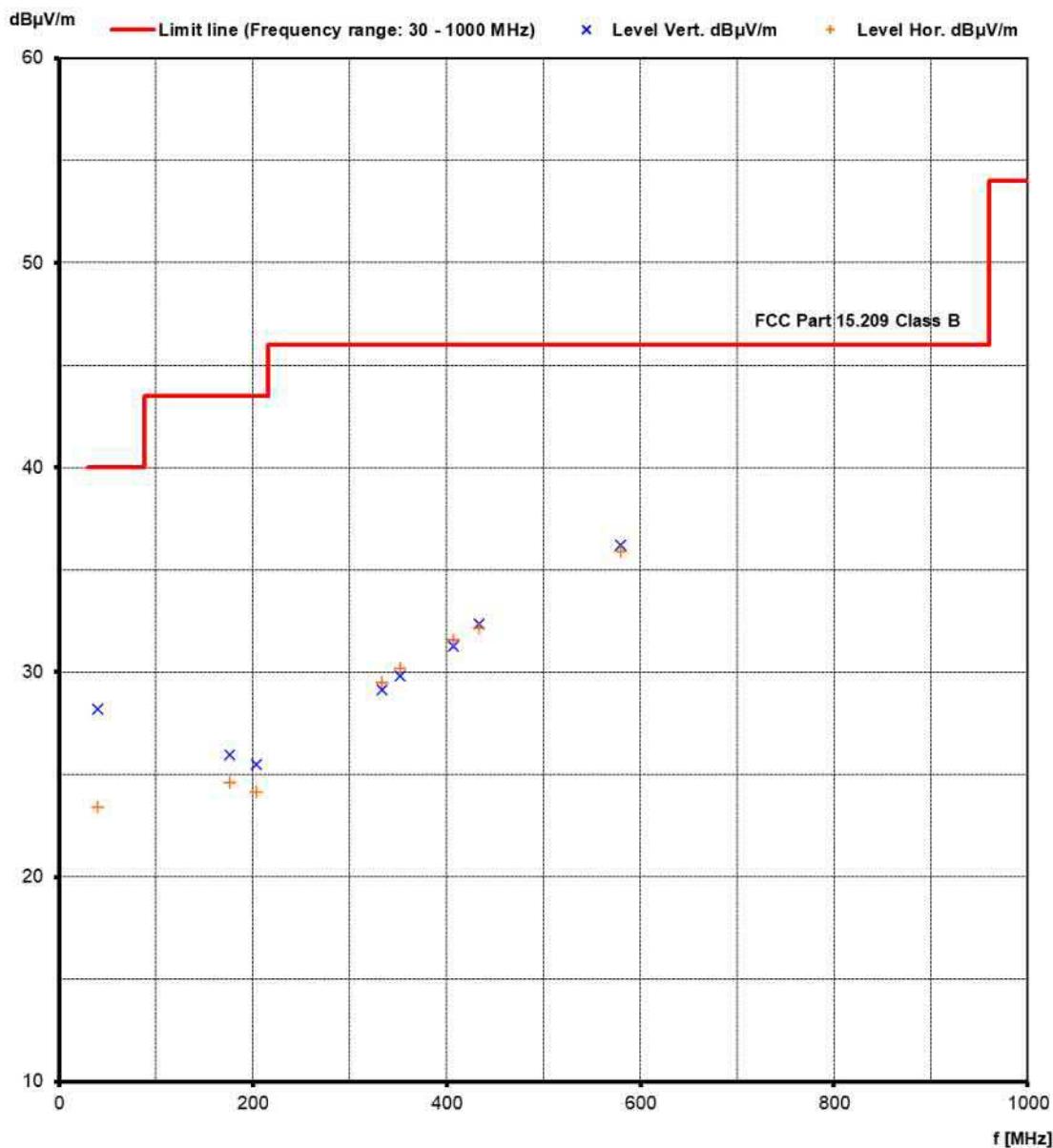
9 kHz – 150 kHz:	RBW: 200 Hz,	Detector: Quasi peak, Mes. Time: 1 s,
150 kHz – 30 MHz:	RBW: 9 kHz,	Detector: Quasi peak, Mes. Time: 1 s,
30 MHz – 1 GHz:	RBW: 120 MHz,	Detector: Quasi peak, Mes. Time: 1 s,
1 GHz – 26 GHz:	RBW: 1 MHz, VBW: 3 MHz,	Detector: Max. peak, Trace: Max. hold, Sweep: Auto

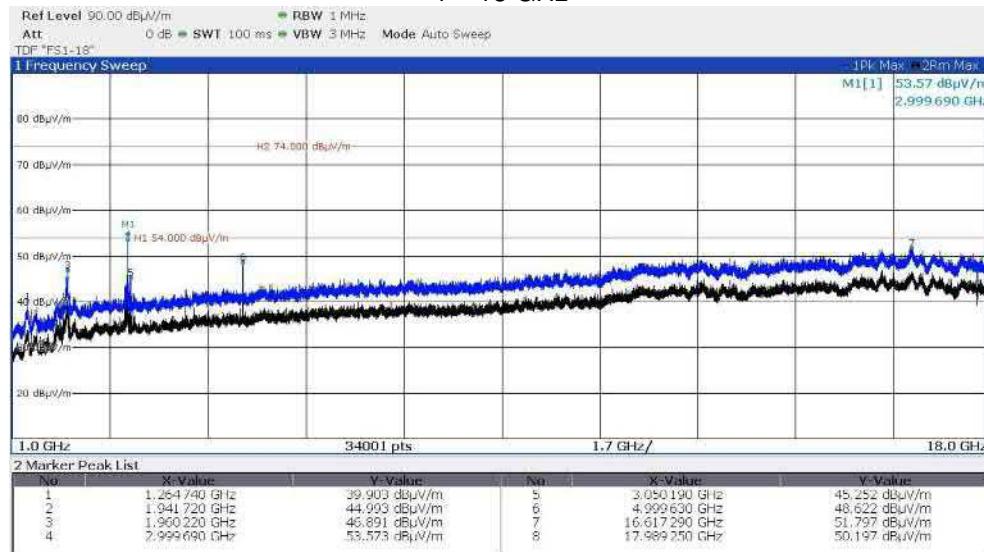
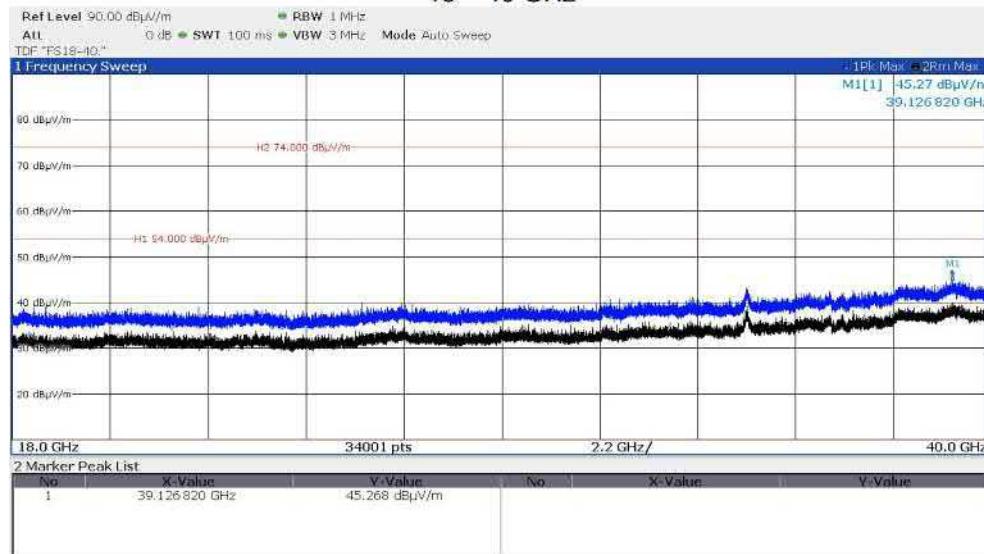
FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
5.6.5 Test result f < 1 GHz

FCC Part 15.209 Radiated emission limits; general requirements (< 30 MHz)									
Frequency (kHz)	PK reading (dB μ V)	QP reading (dB μ V)	Duty cycle corr. (dB)	Ant. factor (dB)	Distance corr. (dB)	QP level (dB μ V/m)	AV (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
50.000	20.5	17.3	0.0	20.0	-80.0	-42.7	-39.5	33.6	-93.6
200.000	31.0	28.0	0.0	20.0	-80.0	-32.0	-29.0	21.6	-81.6
1200.000	5.6	3.3	0.0	20.0	-40.0	-16.7	-14.4	26.0	-42.7
3500.000	1.4	-7.3	0.0	20.0	-40.0	-27.3	-18.6	29.5	-56.8
6000.000	4.8	-7.5	0.0	20.0	-40.0	-27.5	-15.2	29.5	-57.0
8000.000	1.6	-11.9	0.0	20.0	-40.0	-31.9	-18.4	29.5	-61.4
14000.000	-0.6	-15.0	0.0	20.0	-40.0	-35.0	-20.6	29.5	-64.5
22000.000	-0.1	-16.5	0.0	20.0	-40.0	-36.5	-20.1	29.5	-66.0
26000.000	-2.5	-17.0	0.0	20.0	-40.0	-37.0	-22.5	29.5	-66.5
29000.000	-4.6	-11.2	0.0	20.0	-40.0	-31.2	-24.6	29.5	-60.7

RSS-Gen 8.9 Radiated emission limits; general requirements (< 30 MHz)								
Frequency (kHz)	QP reading (dB μ V)	QP calc. (dB μ A)	Duty cycle corr. (dB)	Ant. factor (dB)	Distance corr. (dB)	Corr. QP level (dB μ A/m)	Limit (dB μ A/m)	Dlimit (dB)
50.0	17.3	-34.2	0.0	20.0	-80.0	-94.2	2.1	-96.3
200.0	28.0	-23.5	0.0	20.0	-80.0	-83.5	-9.9	-73.6
1200.0	3.3	-48.2	0.0	20.0	-40.0	-68.2	-25.5	-42.7
3500.0	-7.3	-58.8	0.0	20.0	-40.0	-78.8	-21.9	-56.9
6000.0	-7.5	-59.0	0.0	20.0	-40.0	-79.0	-21.9	-57.1
8000.0	-11.9	-63.4	0.0	20.0	-40.0	-83.4	-21.9	-61.5
14000.0	-15.0	-66.5	0.0	20.0	-40.0	-86.5	-21.9	-64.6
22000.0	-16.5	-68.0	0.0	20.0	-40.0	-88.0	-21.9	-66.1
26000.0	-17.0	-68.5	0.0	20.0	-40.0	-88.5	-21.9	-66.6
29000.0	-11.2	-62.7	0.0	20.0	-40.0	-82.7	-21.9	-60.8

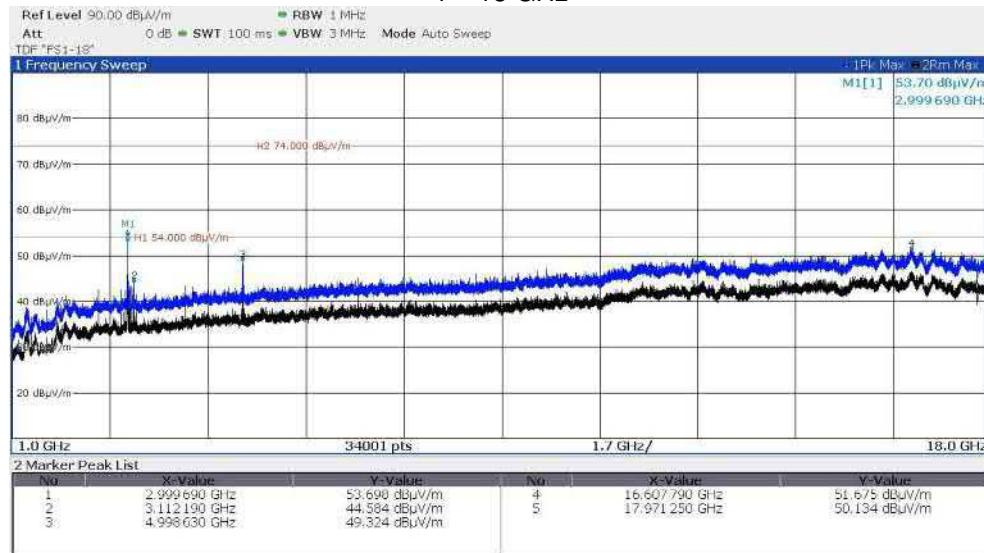
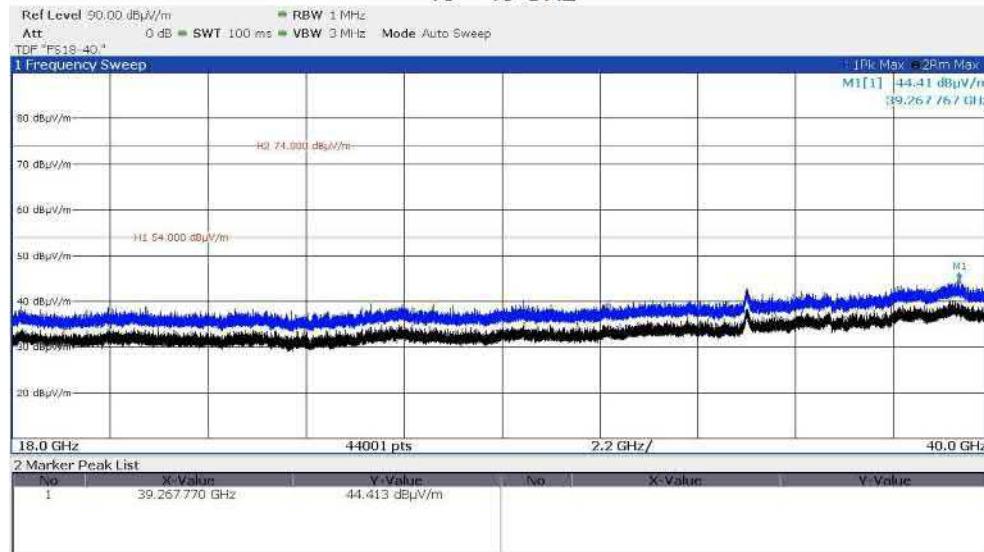
Frequency (MHz)	Reading Vert. (dB μ V)	Reading Hor. (dB μ V)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dB μ V/m)	Level Hor. (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
39.21	11.5	5.5	16.7	17.9	28.2	23.4	40.0	-11.8
175.84	7.3	6.5	18.7	18.1	26.0	24.6	43.5	-17.5
202.97	8.4	7.5	17.1	16.6	25.5	24.1	43.5	-18.0
332.82	7.9	7.8	21.2	21.7	29.1	29.5	46.0	-16.5
352.20	8.0	7.9	21.8	22.3	29.8	30.2	46.0	-15.8
406.47	7.8	7.8	23.5	23.8	31.3	31.6	46.0	-14.4
433.60	8.2	7.7	24.1	24.4	32.3	32.1	46.0	-13.7
579.93	8.4	7.8	27.8	28.1	36.2	35.9	46.0	-9.8

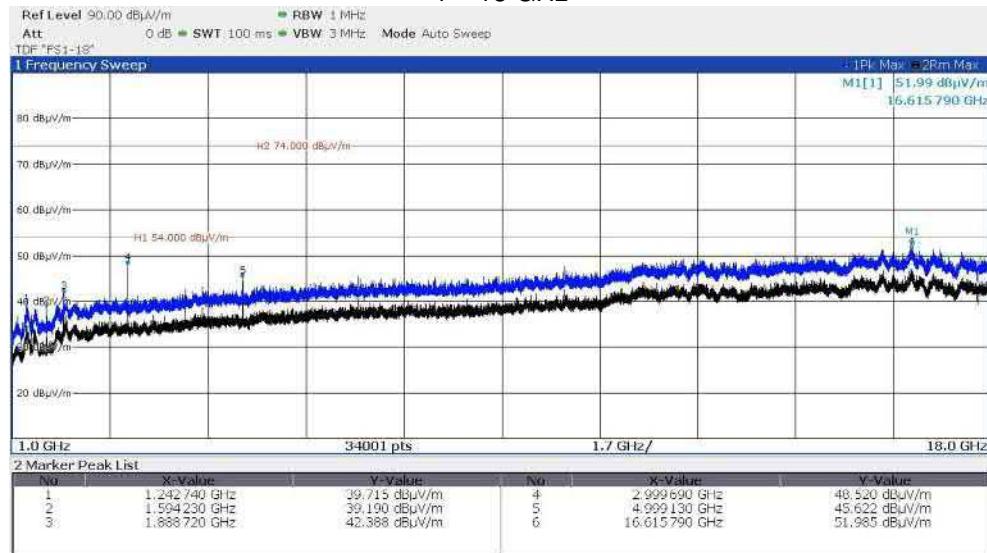
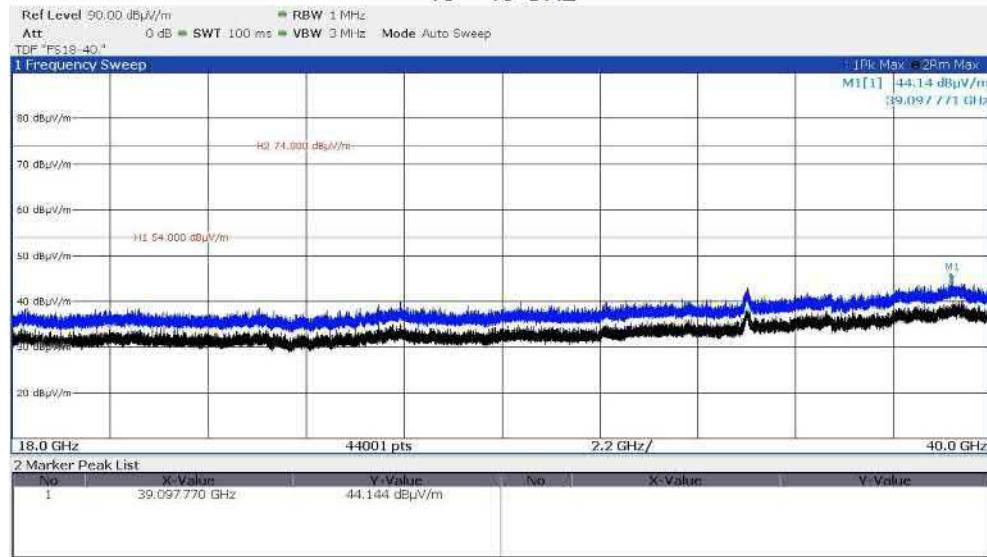
FCC ID: ZBW-MPHAC008A**IC: 11472A-MPHAC008A**

5.6.6 Test result f > 1 GHz
Channel 1:
1 – 18 GHz

18 – 40 GHz


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

Channel 2:

1 – 18 GHz

18 – 40 GHz


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
Channel 4:
1 – 18 GHz

18 – 40 GHz


Note: For frequencies < 40 GHz the general radiated limits have been applied.

FCC ID: ZBW-MPHAC008A

IC: 11472A-MPHAC008A

Determination of the EIRP emission limit for > 40 GHz:

For calculation the friis formula is used.

$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

$P_{out} * G = \text{EIRP}$;

Therefore

$$\text{EIRP} = P_d * 4 * \pi * r^2$$

$$\text{EIRP} = -9.9 \text{ dBm}$$

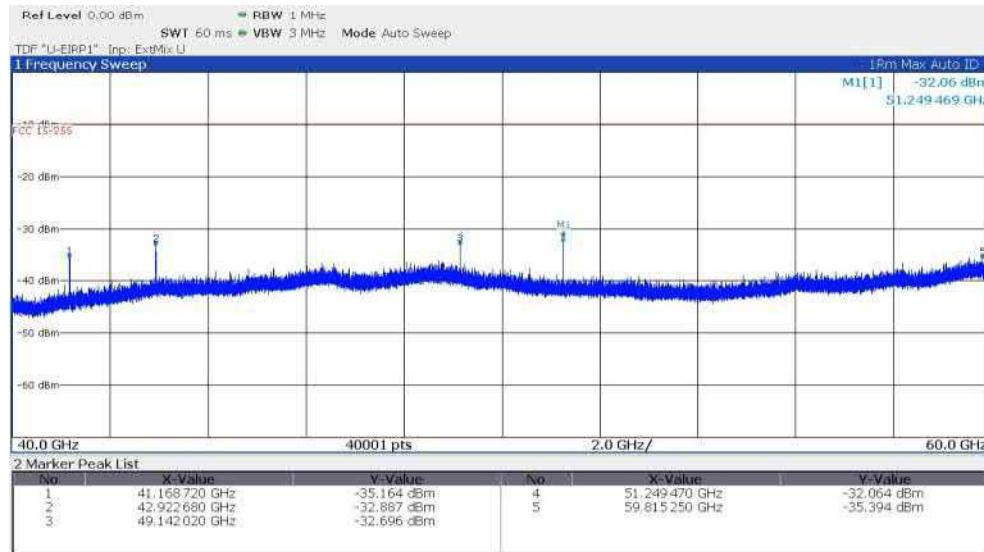
where

r is the measurement distance (3 m)

P_d is the emission density (90 pW/cm²)

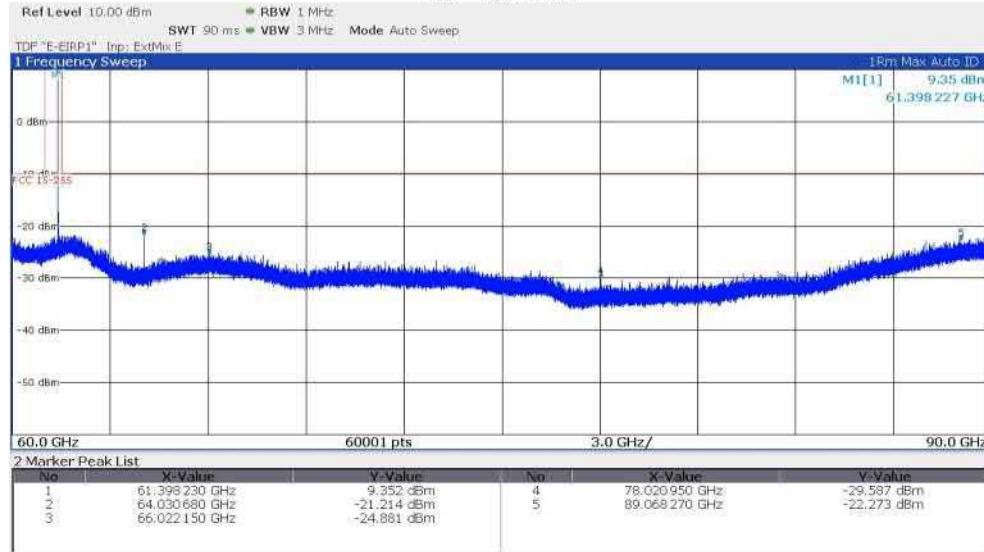
Channel 1:

40 – 60 GHz

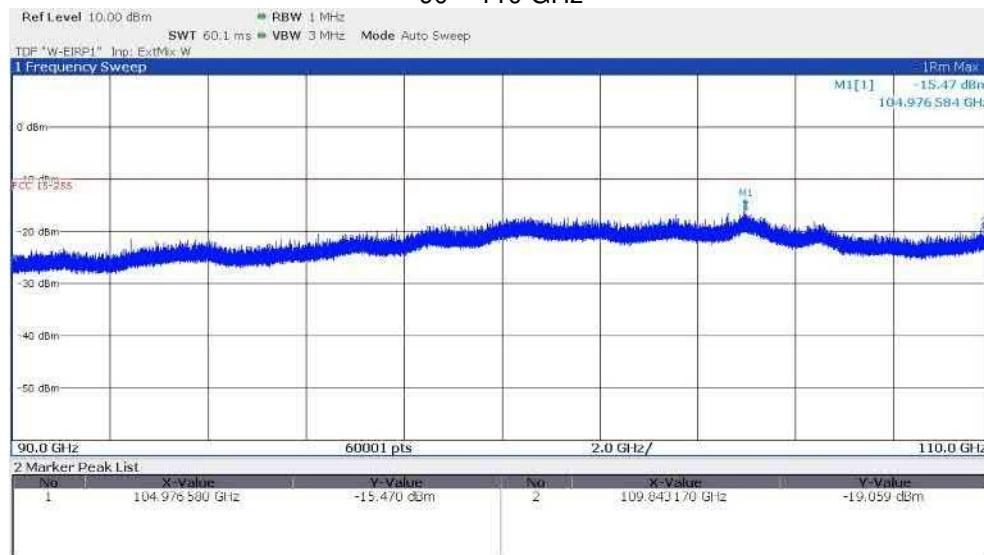
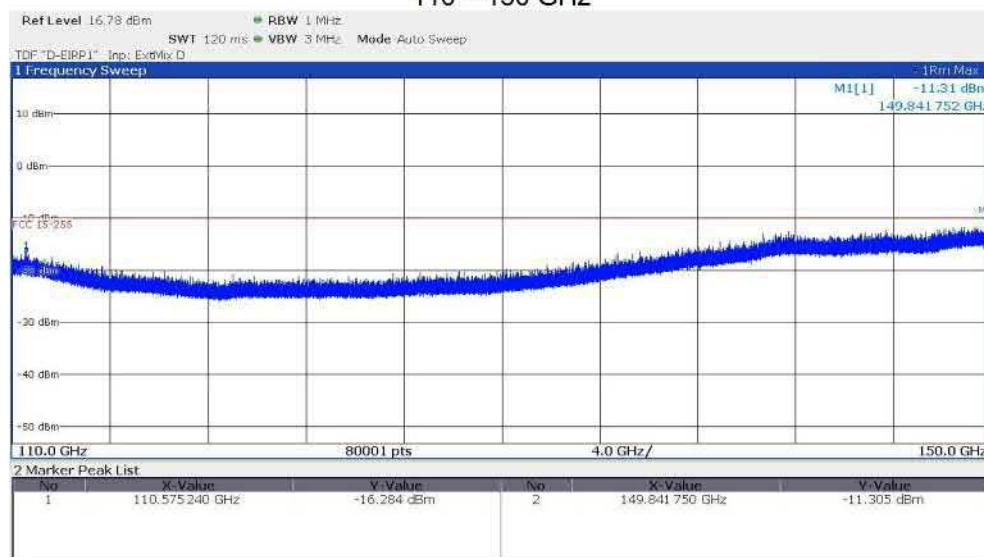


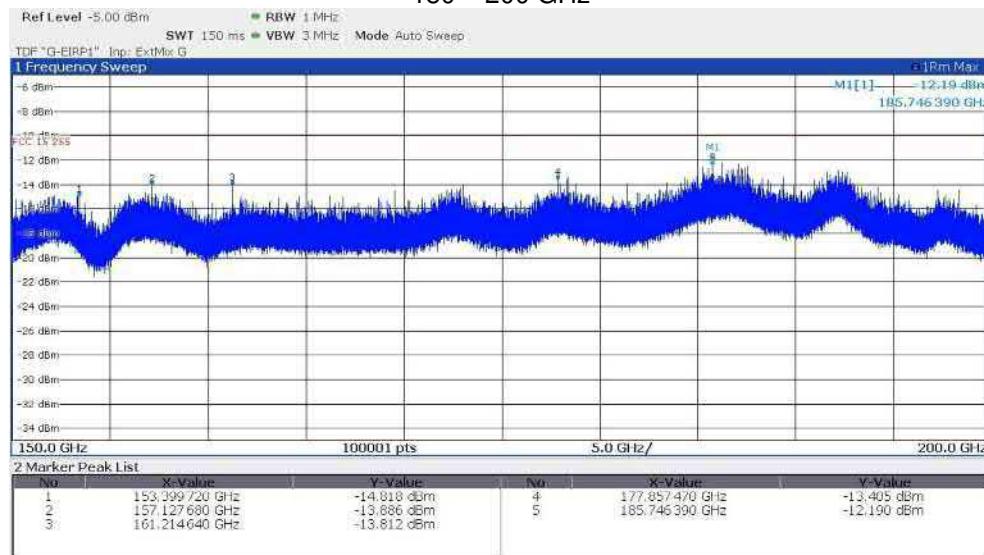
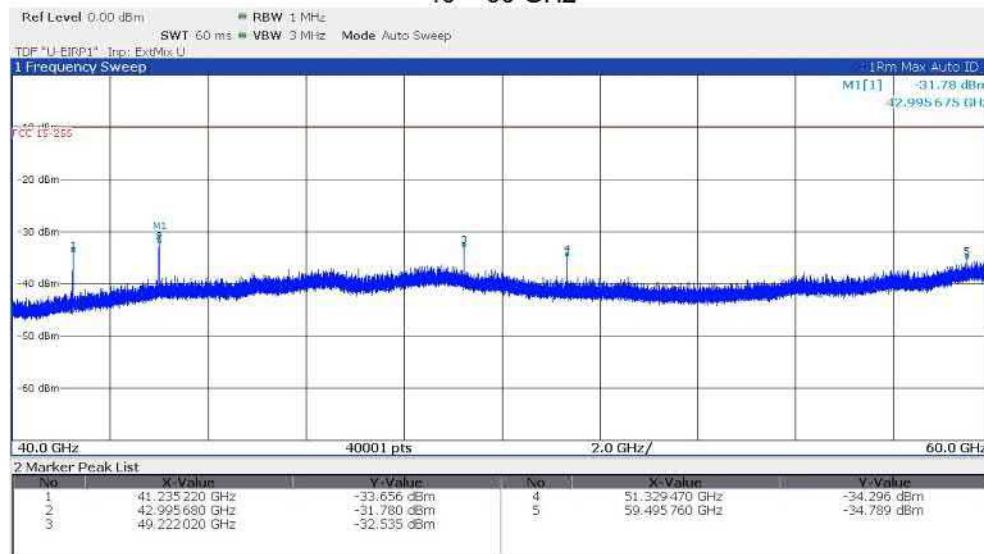
Note: To minimize unintended mixing products generated by the external mixer the Autold function was used.

60 – 90 GHz

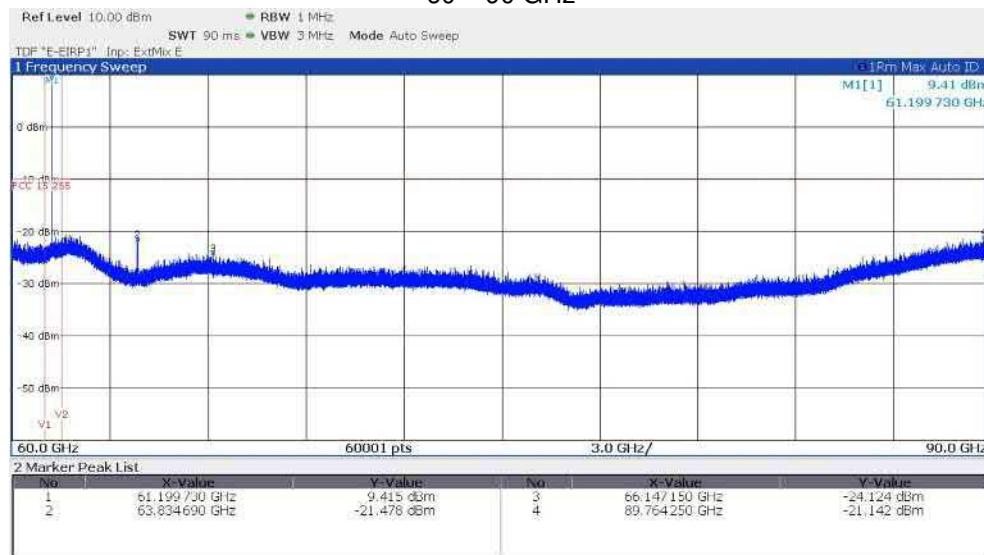


Note: To minimize unintended mixing products generated by the external mixer the Autold function was used.

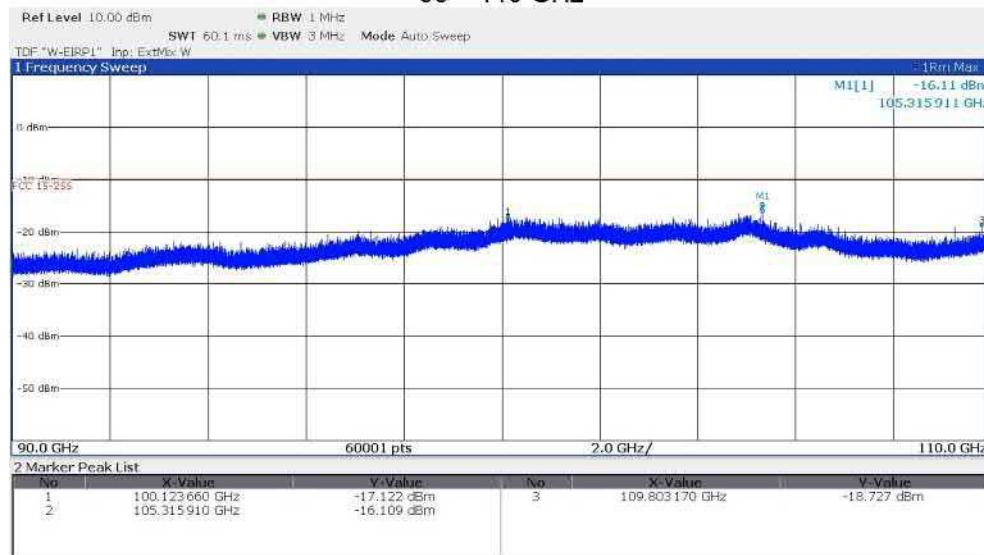
FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
90 – 110 GHz

110 – 150 GHz


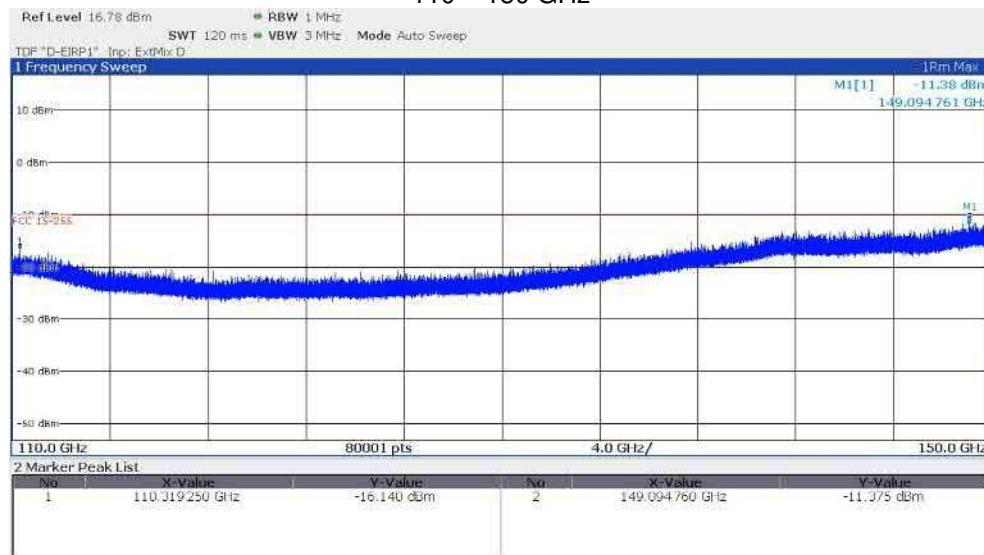
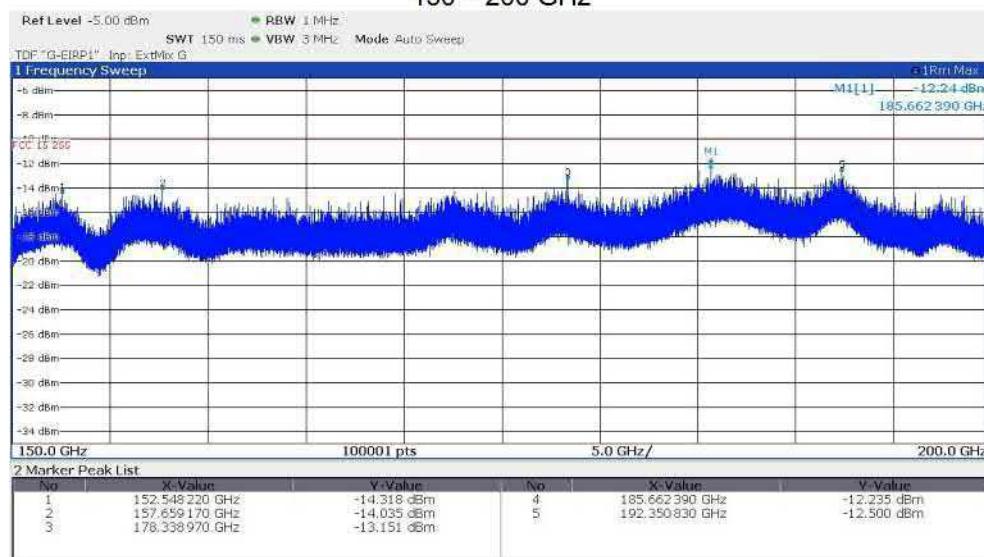
FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
150 – 200 GHz

Channel 2:
40 – 60 GHz


Note: To minimize unintended mixing products generated by the external mixer the AutoID function was used.

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
60 – 90 GHz


Note: To minimize unintended mixing products generated by the external mixer the AutoID function was used.

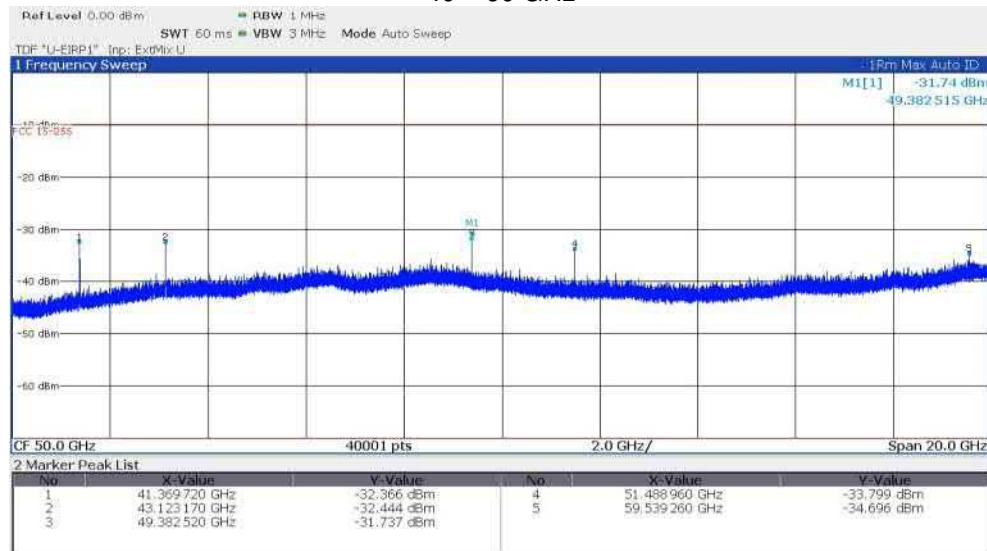
90 – 110 GHz


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
110 – 150 GHz

150 – 200 GHz


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

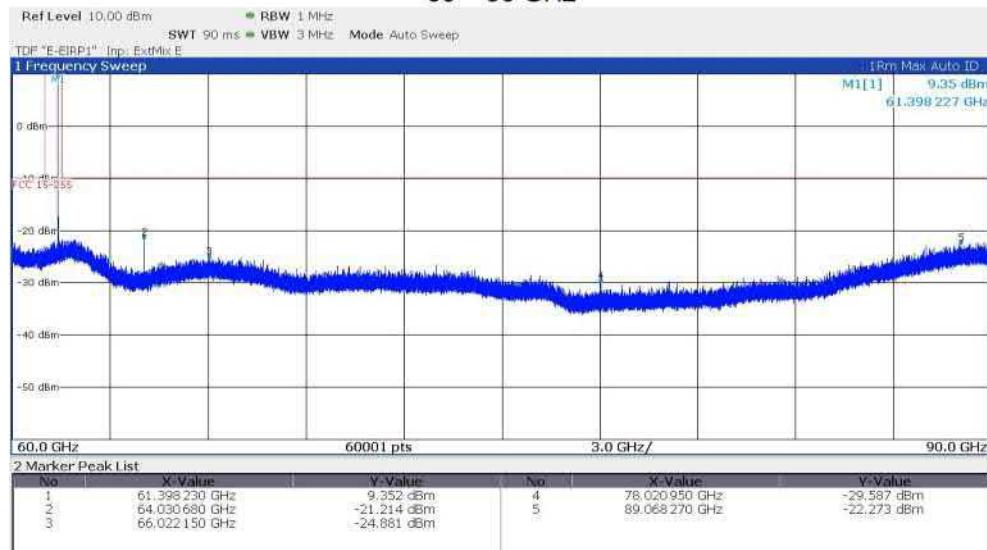
Channel 4:

40 – 60 GHz

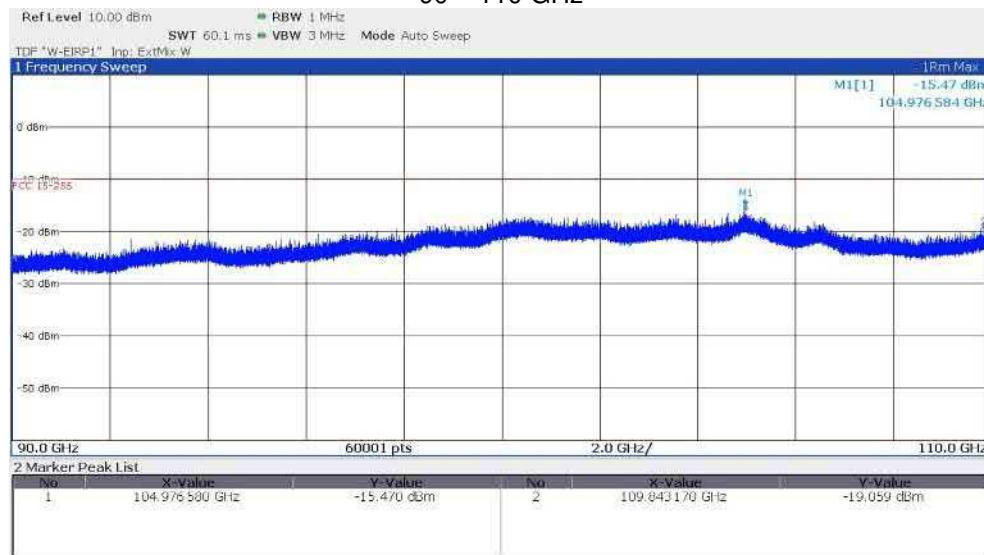
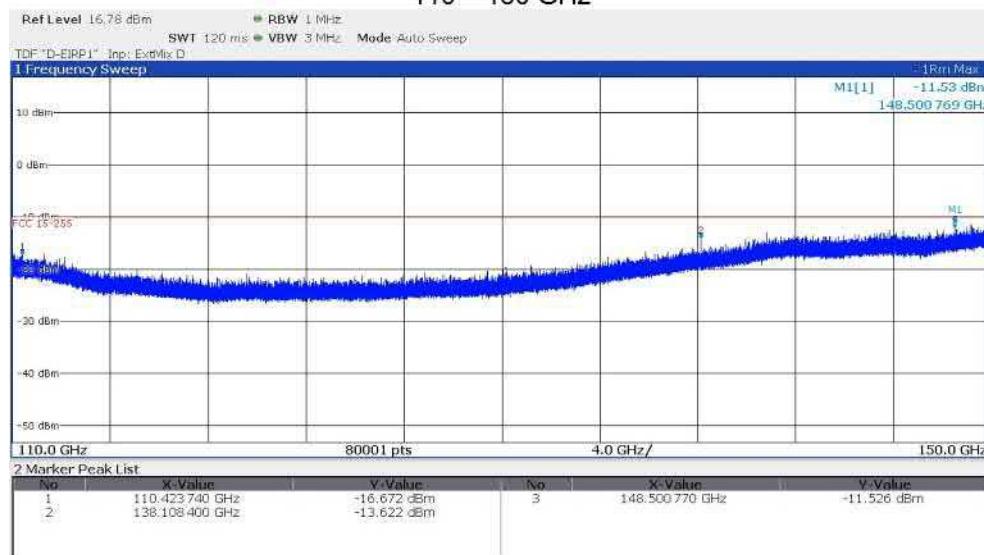


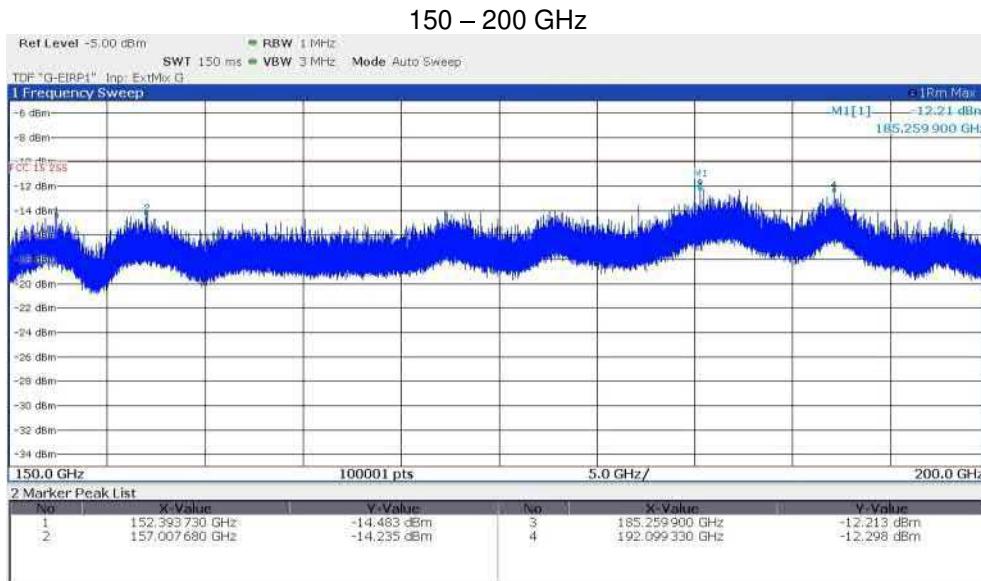
Note: To minimize unintended mixing products generated by the external mixer the AutoID function was used.

60 – 90 GHz



Note: To minimize unintended mixing products generated by the external mixer the AutoID function was used.

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A
90 – 110 GHz

110 – 150 GHz


FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A


Average limit according to FCC Part 15C, Section 15.255(d):

- (1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.
- (2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.
- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

General radiated limit according to FCC Part 15C, Section 15.209:

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

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to 200 GHz.

5.7 Frequency stability

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

5.7.1 Description of the test location

Test location: AREA4

5.7.2 Photo documentation of the test set-up – Please see attachment B

5.7.3 Applicable standard

According to FCC Part 15C, Section 15.255(f):

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

5.7.4 Description of Measurement

The frequency stability is measured with the spectrum analyser. The sweep points are set to maximum for higher the frequency resolution or the function "frequency counter" is used. The signal is unmodulated; the marker of the analyser is set to maximum amplitude at normal temperature, the frequency is recorded. Then the maximum supply voltage is set and the marker of the analyser is set to maximum amplitude. This procedure is done again for the minimum supply voltage. The EUT is now driven at normal supply voltage but in the climatic chamber to range the temperature from -20 °C to +50 °C in steps of 10 degrees. The drifting carrier is measured by setting the marker at the analyser.

From the bandwidth measurement at 20°C:

Channel	f_{low} (MHz)	f_{high} (MHz)	OBW 99%
1	61088.6448	61106.3402	17.695
2	61189.1887	61206.8824	17.694
4	61388.8657	61406.3659	17.500

5.7.5 Test results

Channel 1:

Test conditions		Test result
		Frequency (MHz)
T_{min} (-20)°C	V_{nom}	61099.34396
T (-10)°C	V_{nom}	61099.28265
T (0)°C	V_{nom}	61099.16076
T (10)°C	V_{nom}	61098.95428
T_{nom} (20)°C	V_{min} (10.2 V)	61098.56459
T_{nom} (20)°C	V_{nom} (12 V)	61098.78862
T_{nom} (20)°C	V_{max} (27.6 V)	61098.60665
T (30)°C	V_{nom}	61098.59688
T (40)°C	V_{nom}	61098.51903
T_{max} (50)°C	V_{nom}	61098.50920

 Carrier frequency f_c : 61098.78862 MHz

 Lowest frequency f_{low} : 61098.50920 MHz

 Negative tolerance $f_{low} - f_c$: -279.42 kHz

 Lowest frequency considering OBW: $61088.6448 \text{ MHz} - 0.27942 \text{ MHz} = 61088.36538 \text{ MHz}$

Lowest frequency is within in the band 61.0 GHz – 61.5 GHz.

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

Channel 4:

Test conditions		Test result
		Frequency (GHz)
T_{min} (-20)°C	V_{nom}	61399.34104
T (-10)°C	V_{nom}	61399.29358
T (0)°C	V_{nom}	61399.14010
T (10)°C	V_{nom}	61398.98148
T_{nom} (20)°C	V_{min} (10.2 V)	61398.55005
T_{nom} (20)°C	V_{nom} (12 V)	61398.78223
T_{nom} (20)°C	V_{max} (27.6 V)	61398.55664
T (30)°C	V_{nom}	61398.60786
T (40)°C	V_{nom}	61398.51377
T_{max} (50)°C	V_{nom}	61398.51439

 Carrier frequency f_c : 61398.78223 MHz

 highest frequency f_{high} : 61399.34104 MHz

 Negative tolerance $f_{high} - f_c$: 558.81 kHz

Highest frequency considering OBW: 61406.3659 MHz – 0.55881 MHz = 61405.80709 MHz

Highest frequency is within in the band 61.0 GHz – 61.5 GHz.

Limit according to FCC Part 15C, Section 15.255(f):

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

 The requirements are **FULFILLED**.

Remarks: None.

5.8 Antenna requirement

5.8.1 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. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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 and 15.204.

Remarks: No power reduction results from the defacto limit.

FCC ID: ZBW-MPHAC008A
IC: 11472A-MPHAC008A

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 2022.0.23.0	01-02/68-13-001				
	ESR 7	02-02/03-17-001	01/08/2024	01/08/2023		
	ESH 2 - Z 5	02-02/20-05-004	13/10/2025	13/10/2022	17/04/2024	17/04/2023
	N-4000-BNC	02-02/50-05-138				
	SP 103 /3.5-60	02-02/50-05-182				
	ESH 3 - Z 2	02-02/50-05-185	27/10/2025	27/10/2022	19/04/2024	19/10/2023
	HM 8143	02-02/50-10-016				
	Measurement equipment was calibrated and verified before measurement.					
CPR 3	FS-Z90	02-02/11-14-003	08/05/2024	08/05/2023	08/05/2024	08/05/2023
	FSW43	02-02/11-15-001	04/05/2024	04/05/2023		
	QWH-EPRR00/WR-12/60-90	02-02/24-14-004				
	UFA210A (LU7-022-1000)	02-02/50-17-030				
	UFA210A (LU7-022-1000)	02-02/50-17-031				
DC	FS-Z90	02-02/11-14-003	08/05/2024	08/05/2023	08/05/2024	08/05/2023
	QWH-EPRR00/WR-12/60-90	02-02/24-14-004				
	ESW44	09-16/03-24-001	21/11/2024	21/11/2023		
	Measurement equipment was calibrated and verified before measurement.					
MB	FS-Z90	02-02/11-14-003	08/05/2024	08/05/2023	08/05/2024	08/05/2023
	FSW43	02-02/11-15-001	04/05/2024	04/05/2023		
	QWH-EPRR00/WR-12/60-90	02-02/24-14-004				
	WK-340/40	02-02/45-05-001	27/07/2024	27/07/2023	27/01/2024	27/07/2023
	UFA210A (LU7-022-1000)	02-02/50-17-030				
	UFA210A (LU7-022-1000)	02-02/50-17-031				
SER 1	ESR 3	01-02/03-13-001	11/09/2024	11/09/2023		
	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				
	50F-003 N 3 dB	02-02/50-21-010				
SER 2	ESVS 30	02-02/03-05-006	27/07/2024	27/07/2023		
	VULB 9168	02-02/24-05-005	20/04/2024	20/04/2023	03/05/2024	03/05/2023
	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	FS-Z110	02-02/11-14-002	08/05/2024	08/05/2023	08/05/2024	08/05/2023
	FS-Z90	02-02/11-14-003	08/05/2024	08/05/2023	08/05/2024	08/05/2023
	FSW43	02-02/11-15-001	04/05/2024	04/05/2023		
	RPG FS-Z170	02-02/11-17-001	05/06/2024	05/06/2023		
	RPG FS-Z220	02-02/11-17-002	10/05/2024	10/05/2023		
	FS-Z60	02-02/11-18-001	08/05/2024	08/05/2023	08/05/2024	08/05/2023
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	LNA-40-18004000-33-5P	02-02/17-20-002				
	3117	02-02/24-05-009	12/07/2024	12/07/2023		
	BBHA 9170	02-02/24-05-013	21/03/2026	21/03/2023	21/03/2024	21/03/2023



FCC ID: ZBW-MPHAC008A

IC: 11472A-MPHAC008A

QWH-UPRR00/WR-19/40-60	02-02/24-14-001
QWH-EPRR00/WR-12/60-90	02-02/24-14-004
QWH-WPRR00/WR-10/75-11	02-02/24-14-006
FH-SG-170/WR6/110-170	02-02/24-17-002
05-HA25/WR5/140-220	02-02/24-17-004
BAM 4.5-P	02-02/50-17-024
NCD	02-02/50-17-025
UFA210A (LU7-022-1000)	02-02/50-17-030
UFA210A (LU7-022-1000)	02-02/50-17-031
KK-SF106-2X11N-6,5M	02-02/50-18-016
KMS116-GL140SE-KMS116-	02-02/50-20-026