R F – T E S T R E P O R T

- FCC Part 15.255, RSS210 -

Type / Model Name	:	60TR13EM011
Product Description	:	Form Factor Module with BGT60TR13C Radar
Applicant	:	Infineon Technologies AG
Address	:	Am Campeon 1-15
		85579 NEUBIBERG, GERMANY
Licence holder	:	Infineon Technologies AG
Address	:	Am Campeon 1-15
		85579 NEUBIBERG, GERMANY

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

Test Report No. : T46134-02-00HS	02. June 2021 Date of issue

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

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.

Contents

1 TEST STANDARDS 3

2 EQUIPMENT UNDER TEST 4

2.1 Information provided by the Client 4
2.2 Sampling 4
2.3 Photo documentation of the EUT – Detailed photos see attachment A 4
2.4 Equipment category 4
2.5 Short description of the equipment under test (EUT) 4
2.6 Variants of the EUT 4
2.7 Operation frequency and channel plan 4
2.8 Transmit operating modes 4
2.9 Antenna 5
2.10 Power supply system utilised 5
2.11 Peripheral devices and interface cables 5
2.12 Determination of worst case conditions for final measurement 5

3 TEST RESULT SUMMARY 6

3.1 Final assessment 6

4 TEST ENVIRONMENT 7

4.1 Address of the test laboratory 7
4.2 Environmental conditions 7
4.3 Statement of the measurement uncertainty 7
4.4 Conformity Decision Rule 8
4.5 Measurement protocol for FCC and ISED 8

5 TEST CONDITIONS AND RESULTS 12

5.1 AC power line conducted emissions 12
5.2 EIRP 16
5.3 Peak conducted output power 22
5.4 Correction for pulse operation (duty cycle) 26
5.5 Spurious emissions 28
5.6 Frequency stability 49
5.7 Antenna requirement 51

6 USED TEST EQUIPMENT AND ACCESSORIES 52

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2019)

Part 15, Subpart A, Section 15.31	Measurement standards

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2019)

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
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2

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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 is a field distubance sensor

2.5 Short description of the equipment under test (EUT)

Form Factor Module with BGT60TR13C Radar for use cases such as presence detection.

Number of tested samples: 1
Serial number: B5F695102A222FED
Firmware ID: V1.0.0

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

2.6 Variants of the EUT

There are no variants.

2.7 Operation frequency and channel plan

The operating frequency is 61.0 GHz to 61.5 GHz.
The operation range is used as one channel.

2.8 Transmit operating modes

As soon as the equipment is powered on, TX starts operating independent of a possible connected control PC in last operation mode that was set before the devices switched off.

The device has one operating mode available:
Stand alone:
Primary radar 0.5 GHz OBW

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2.9 Antenna

The following integrated antennas are used with the EUT:

- Integrated linear polarised strip patch array antenna, gain 5.0 dBi.

2.10 Power supply system utilised

Power supply voltage : 5 VDC (USB supply)

2.11 Peripheral devices and interface cables

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

- Control PC Model : Siemens
- USB cable, 1.5 m Model : Common
- - 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 flat position.

As worst case, the following channels and test modes are selected for the final test:

Due to the need of FCC 15.31 c), the sweep has to be stopped for measurement, 3 frequencies are selected for measurement:

Frequency	Tested Channel	Power setting	Modulation	Modulation type
60.5 GHz	1	Pdef	FMCW	-

2.12.1 Test jig

No test jig is used.

2.12.2 Test software

For test mode TX CW a test software is used.

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3 TEST RESULT SUMMARY

Operating in the 61.0 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	n.a.
15.255(f)	RSS210 J.6	Frequency stability	passed

n.a. not applicable

The mentioned RSS Rule Parts in the above table are related to:
RSS Gen, Issue 5, Amendment 2019
RSS 210, Issue 9, August 2016

3.1 Final assessment

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

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

Testing commenced on : 27 March 2020

Testing concluded on : 11 May 2020

Checked by:

Jürgen Pessinger
2021.06.02 09:54:51
+02'00'

Jürgen Pessinger
Radio Team

Tested by:

I am the author of this document
2021.06.02 09:27:15
+02'00'

Hermann Smetana
Radio Team

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

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

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

4.3 Statement of the measurement uncertainty

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

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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 conformity decision rule is based on the ILAC G8 published at the time of reporting.

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.

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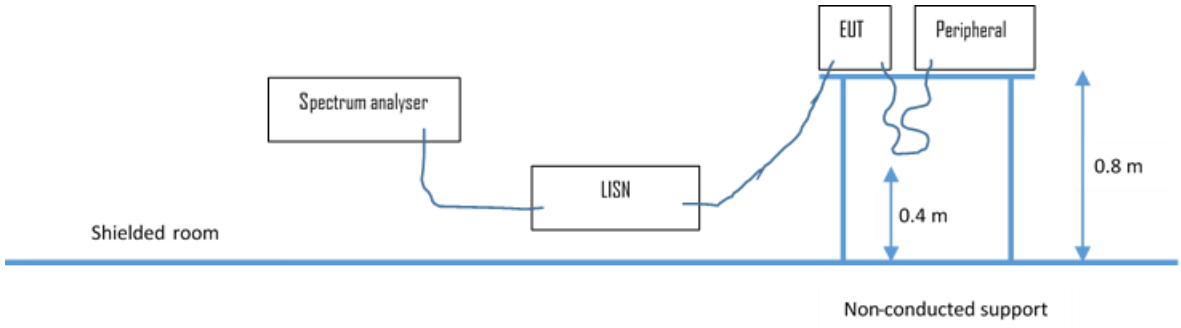
4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



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

To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)

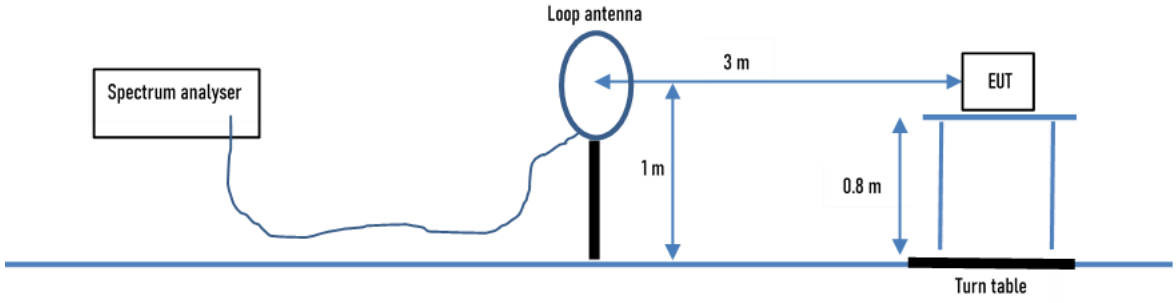
μV = Inverse log(dBμV/20)

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 μH (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 kHz 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 from the EUT. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

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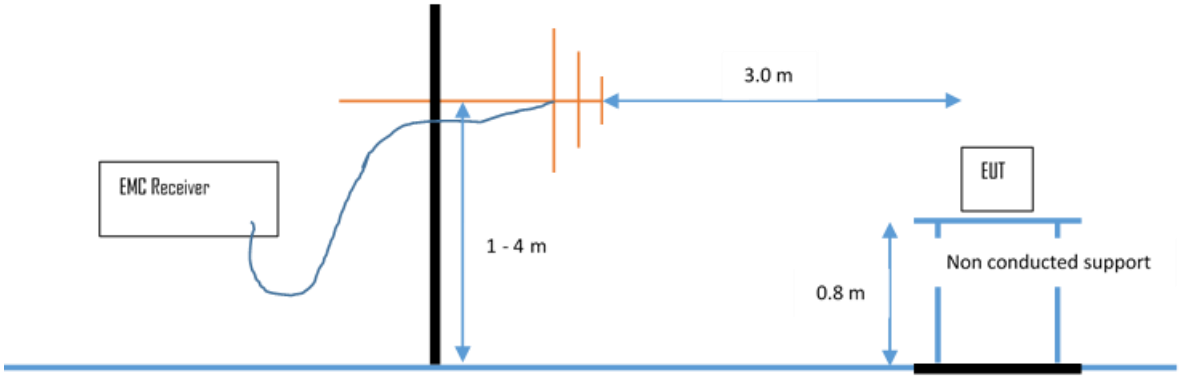
4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

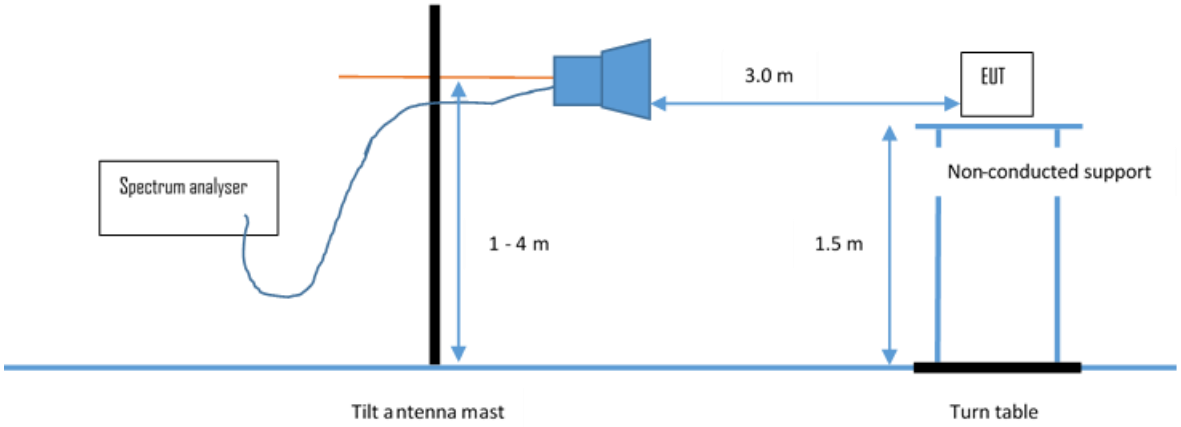
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded

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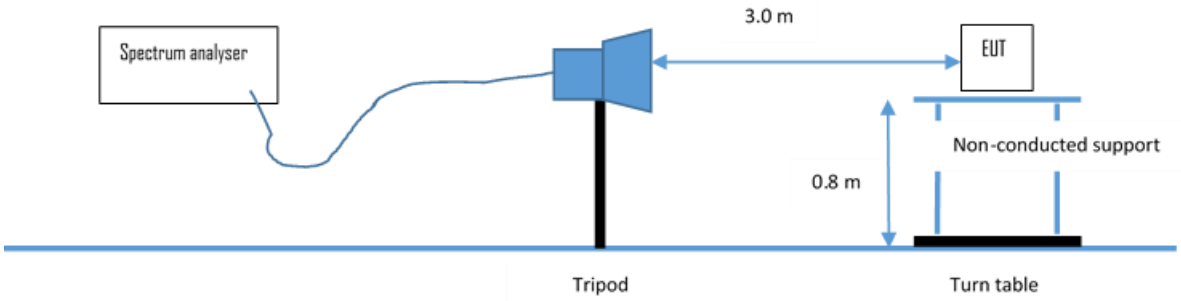
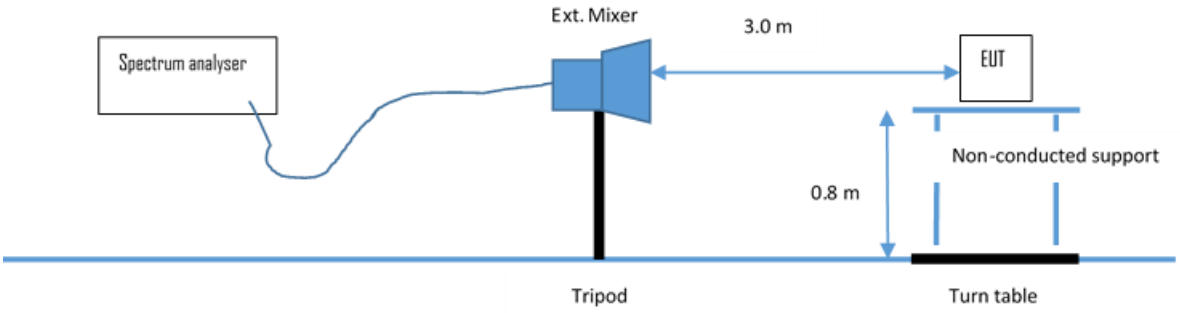
back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement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

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5 TEST CONDITIONS AND RESULTS

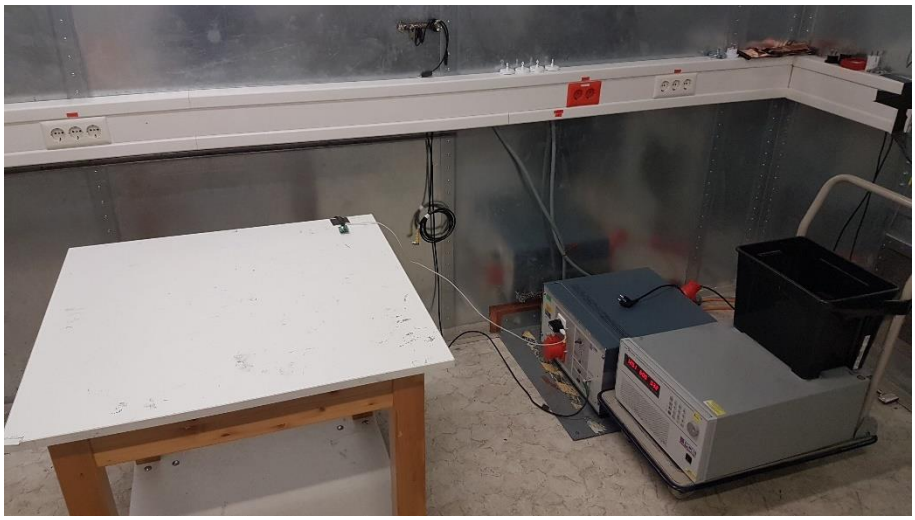
5.1 AC power line conducted emissions

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

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):
Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

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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 -18.7 at 0.449 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

The requirements are **FULFILLED.**

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

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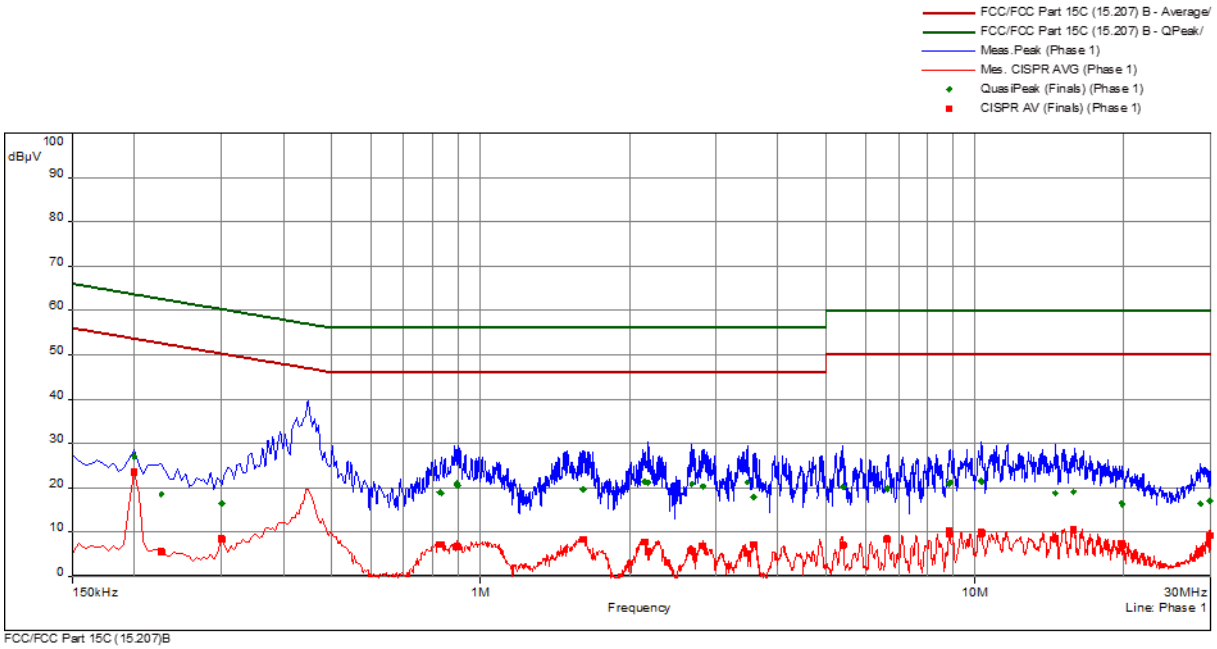
5.1.6 Test protocol

Test point L1
Operation mode: TX modulated
Remarks: -

Result: passed



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.200	1	27.1	-36.6	63.6	23.5	-30.2	53.6	Phase 1	10.3
0.227	1	18.6	-44.0	62.6	5.6	-47.0	52.6	Phase 1	10.3
0.300	1	16.5	-43.8	60.2	8.4	-41.8	50.2	Phase 1	10.2
0.830	3	19.0	-37.0	56.0	7.2	-38.8	46.0	Phase 1	10.2
0.834	3	18.8	-37.2	56.0	7.1	-38.9	46.0	Phase 1	10.2
0.897	3	21.0	-35.0	56.0	6.8	-39.2	46.0	Phase 1	10.2
0.902	3	20.5	-35.5	56.0	6.7	-39.3	46.0	Phase 1	10.2
1.610	4	19.6	-36.4	56.0	8.4	-37.6	46.0	Phase 1	10.3
1.614	4	19.8	-36.2	56.0	8.3	-37.7	46.0	Phase 1	10.3
2.150	4	21.4	-34.6	56.0	7.8	-38.2	46.0	Phase 1	10.3
2.186	4	21.2	-34.8	56.0	5.6	-40.4	46.0	Phase 1	10.3
2.675	5	20.9	-35.1	56.0	5.8	-40.2	46.0	Phase 1	10.3
2.819	5	20.3	-35.7	56.0	6.9	-39.1	46.0	Phase 1	10.3
3.462	5	21.2	-34.8	56.0	5.2	-40.8	46.0	Phase 1	10.3
3.575	5	17.9	-38.1	56.0	7.2	-38.8	46.0	Phase 1	10.3
5.403	6	20.2	-39.8	60.0	7.0	-43.0	50.0	Phase 1	10.4
6.654	6	19.8	-40.2	60.0	8.5	-41.6	50.0	Phase 1	10.4
8.873	6	20.9	-39.1	60.0	10.3	-39.7	50.0	Phase 1	10.5
8.904	6	21.2	-38.8	60.0	9.6	-40.4	50.0	Phase 1	10.5
10.307	7	21.6	-38.4	60.0	10.0	-40.0	50.0	Phase 1	10.5
10.311	7	21.3	-38.7	60.0	9.7	-40.3	50.0	Phase 1	10.5
14.541	7	18.8	-41.2	60.0	8.5	-41.5	50.0	Phase 1	10.6
15.797	7	19.1	-40.9	60.0	10.5	-39.6	50.0	Phase 1	10.7
19.803	8	16.4	-43.6	60.0	7.5	-42.5	50.0	Phase 1	10.7
19.826	8	16.3	-43.7	60.0	7.0	-43.0	50.0	Phase 1	10.7
28.533	8	16.3	-43.7	60.0	5.4	-44.7	50.0	Phase 1	11.1
29.816	8	17.0	-43.0	60.0	9.2	-40.8	50.0	Phase 1	11.1

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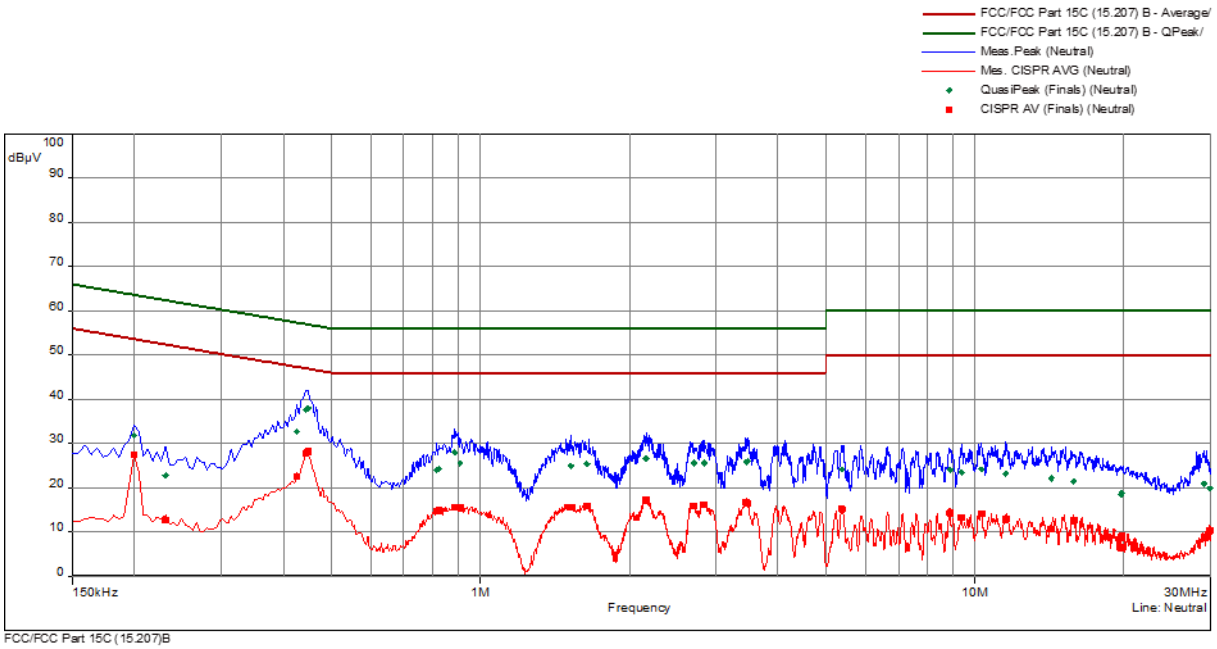
Test point: N
Operation mode: TX modulated
Remarks: -

Result: passed



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.200	9	31.8	-31.8	63.6	27.5	-26.1	53.6	Neutral	10.3
0.231	9	22.8	-39.6	62.4	12.7	-39.7	52.4	Neutral	10.3
0.426	10	32.7	-24.6	57.3	22.6	-24.7	47.3	Neutral	10.2
0.444	10	37.6	-19.4	57.0	27.8	-19.2	47.0	Neutral	10.2
0.449	10	38.1	-18.9	56.9	28.2	-18.7	46.9	Neutral	10.2
0.816	11	24.0	-32.0	56.0	14.7	-31.3	46.0	Neutral	10.2
0.825	11	24.3	-31.7	56.0	14.9	-31.1	46.0	Neutral	10.2
0.888	11	28.0	-28.0	56.0	15.7	-30.3	46.0	Neutral	10.2
0.911	11	25.6	-30.4	56.0	15.6	-30.5	46.0	Neutral	10.2
1.524	12	25.0	-31.0	56.0	15.6	-30.4	46.0	Neutral	10.3
1.641	12	25.4	-30.6	56.0	15.9	-30.1	46.0	Neutral	10.3
2.163	12	26.6	-29.4	56.0	17.2	-28.8	46.0	Neutral	10.3
2.168	12	26.6	-29.4	56.0	17.2	-28.8	46.0	Neutral	10.3
2.702	13	25.6	-30.4	56.0	16.0	-30.0	46.0	Neutral	10.3
2.832	13	25.7	-30.4	56.0	16.2	-29.9	46.0	Neutral	10.3
3.449	13	25.8	-30.2	56.0	16.8	-29.2	46.0	Neutral	10.3
3.462	13	26.0	-30.0	56.0	16.6	-29.4	46.0	Neutral	10.3
5.385	14	24.2	-35.8	60.0	15.3	-34.7	50.0	Neutral	10.4
8.900	14	24.1	-35.9	60.0	14.3	-35.7	50.0	Neutral	10.5
9.399	14	23.5	-36.5	60.0	13.4	-36.6	50.0	Neutral	10.5
10.302	15	24.3	-35.8	60.0	14.3	-35.7	50.0	Neutral	10.5
11.531	15	23.2	-36.8	60.0	12.9	-37.1	50.0	Neutral	10.6
14.285	15	22.2	-37.8	60.0	10.6	-39.4	50.0	Neutral	10.6
15.824	15	21.5	-38.5	60.0	12.7	-37.4	50.0	Neutral	10.7
19.731	16	18.4	-41.6	60.0	6.6	-43.4	50.0	Neutral	10.7
19.781	16	18.9	-41.1	60.0	9.1	-40.9	50.0	Neutral	10.7
29.105	16	21.0	-39.0	60.0	8.7	-41.3	50.0	Neutral	11.1
29.816	16	19.9	-40.2	60.0	10.3	-39.7	50.0	Neutral	11.1

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.

5.2 EIRP

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

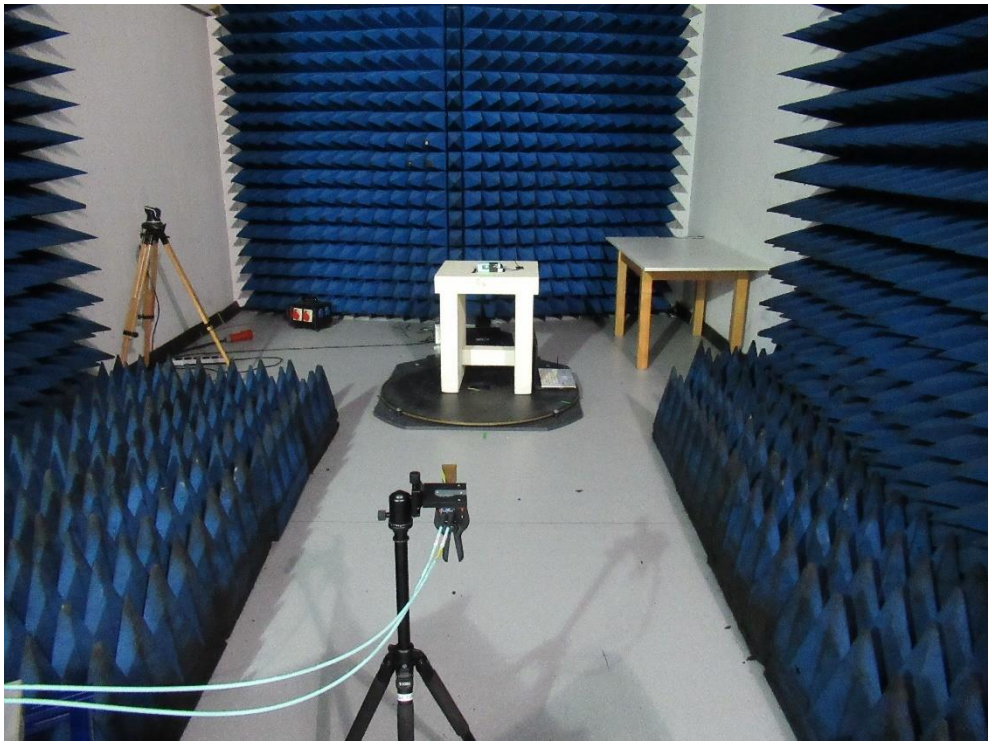
5.2.1 Description of the test location

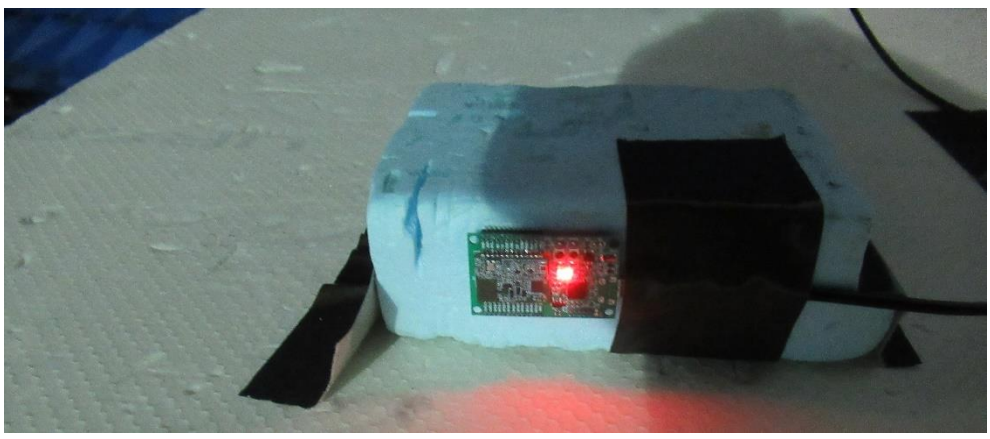
Test location: Anechoic chamber 2
Test distance: 3 m

5.2.2 Applicable standard

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

5.2.3 Photo documentation of the test set-up





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.

5.2.4 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: 1 MHz	VBW: 3 MHz	Detector: PK	Trace. Max hold
AV measurement:	RBW: 10 MHz	VBW: 28 MHz	Detector: RMS	Trace. Max hold

ANSI C63.10, 2013, Item 9.11 f) 1):
For radiated measurements:

1) Calculate the maximum peak and average field strength of the emission at the measurement distance, using Equation (19) and the peak and average (respectively) substitution power at the output of the test antenna (input to the instrumentation system) as recorded in step e).

Example:
Equation (19): $E = 126.8 - 20\log(\lambda) + P - G$
λ (61.0 GHz) = 0.00491; $20\log(\lambda) = -46.2$;
G = 24 dBi;
P (meas) (Pk) = -44.3 dBm;
P (meas) (AVG) = -45.9 dBm;

Emeas (Pk) = 126.8 + 46.2 – 44.5 - 24 = 104.5 dBµV/m;
Emeas (AVG) = 126.8 + 46.2 - 44.9 - 24 = 104.1 dBµV/m;

2) Calculate the peak and average EIRP from the measured peak and average (respectively) field strength using Equation (22), and then convert to linear form using Equation (24).

Example:
Equation (22): $EIRP = Emeas + 20\log(d_{Meas}) - 104.7$;
d_{Meas} = 3 m;

EIRP (Pk) = 104.5 + 9.5 – 104.7 = 9.3 dBm;
EIRP (AVG) = 104.1 + 9.5 – 104.7 = 8.9 dBm;
Equation (24): $EIRPLinear = 10^{[(EIRPLog - 30)/10]}$;
EIRP (Pk) = 0.008546 W;
EIRP (AVG) = 0.007785 W;

3) For peak measurements, calculate the peak conducted output power from the peak EIRP using Equation (27).

Example:
Equation (27): $P_{cond} = EIRPl_{in} / G_{EUT}$;
G_{EUT} = 5.0 dBi; 3.16

P_{cond} = 11.4 / 3.16 = 3.6 mW;

5.2.5 Test result

Frequency	Level PK	Limit PK	Margin PK	Level AV	Limit AV	Margin AV
(GHz)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
61.019	9.3	43.0	-33.7	8.9	40.0	-31.1
61.249	10.6	43.0	-32.4	10.2	40.0	-29.8
61.479	9.9	43.0	-33.1	9.2	40.0	-30.8

Note: The peak and average values are radiated values.

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.

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

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.

The requirements are **FULFILLED.**

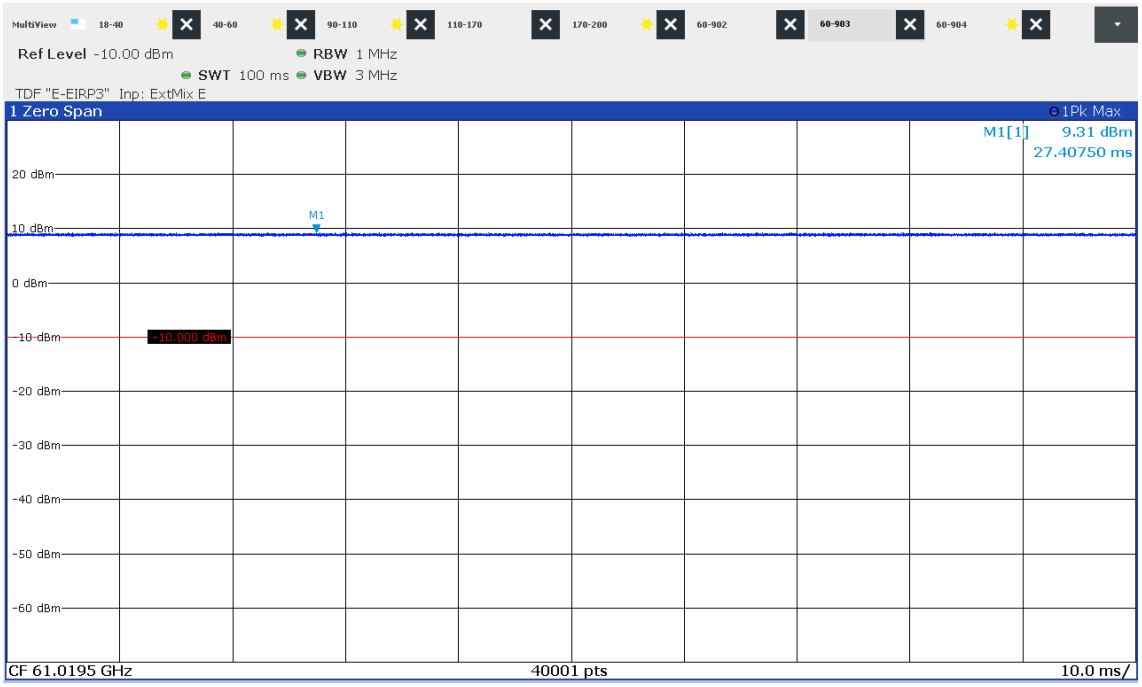
Remarks: _____

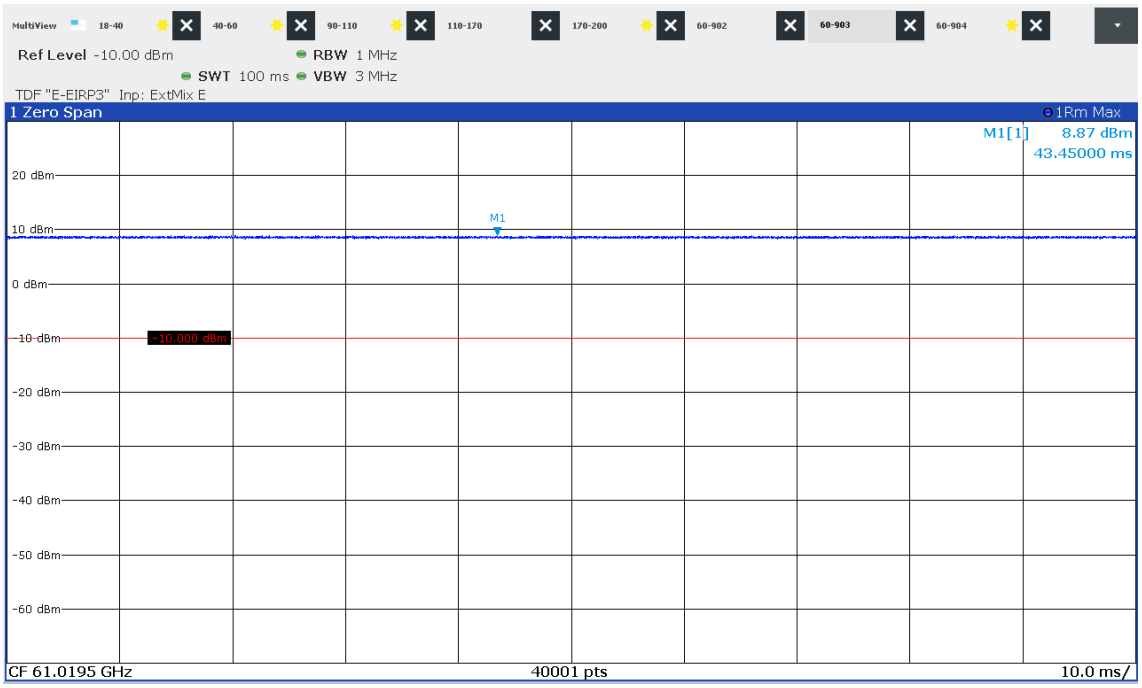
_____

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.

5.2.6 Test protocols

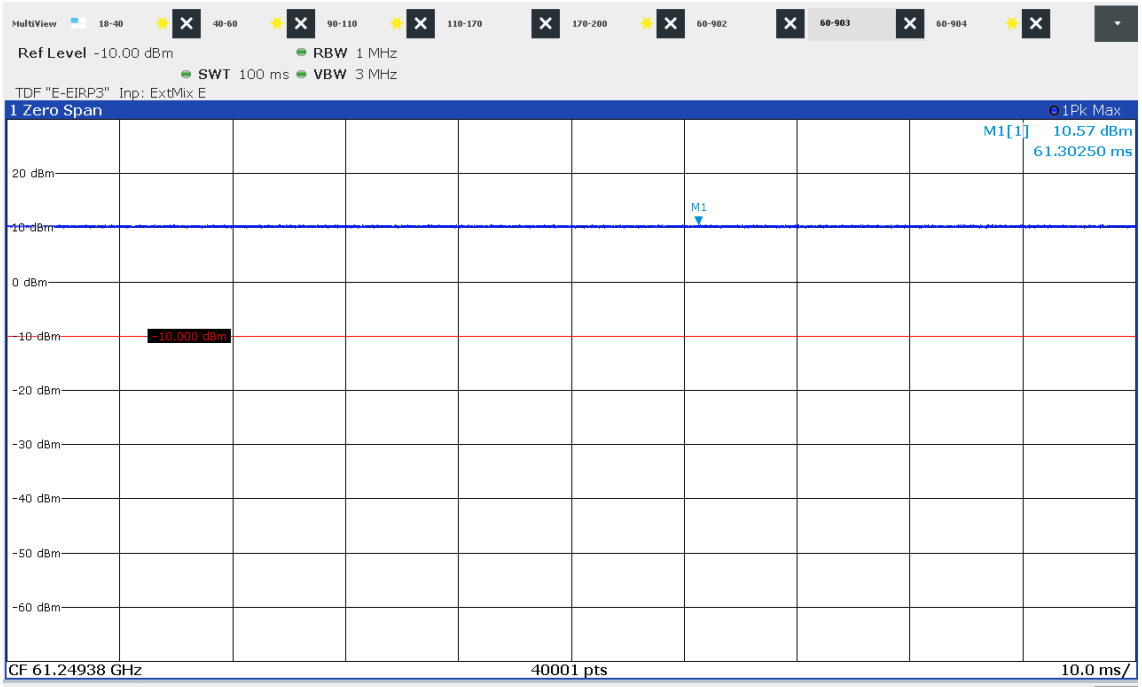
Low:

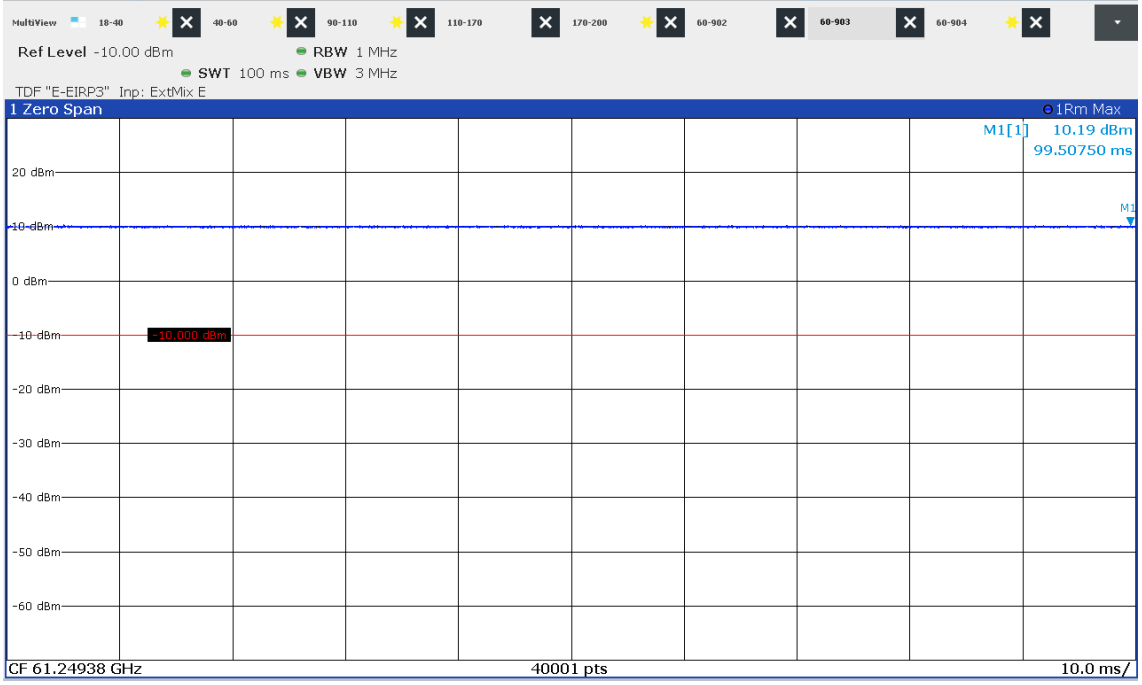




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

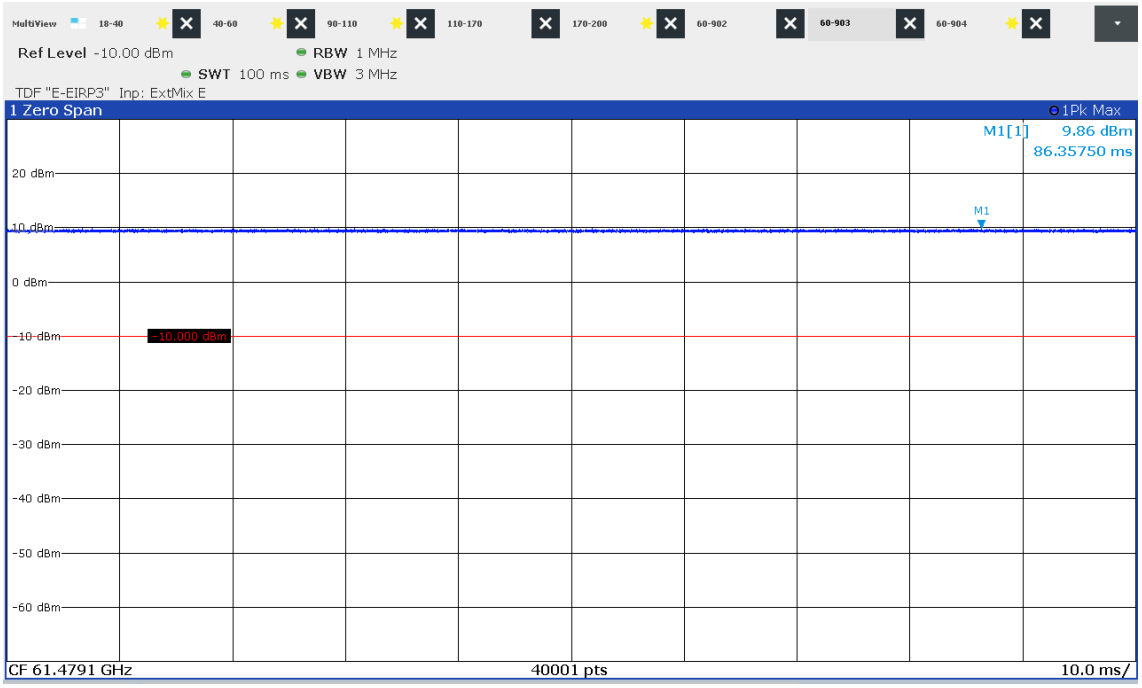
Mid:

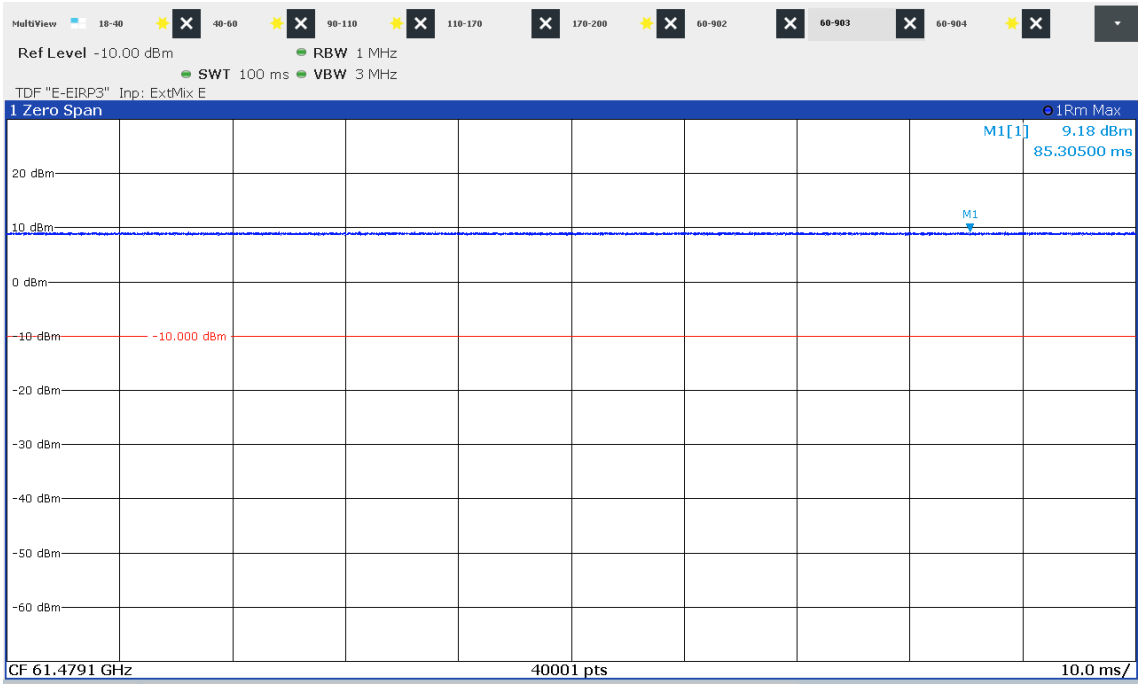




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

High:





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.

5.3 Peak conducted output power

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

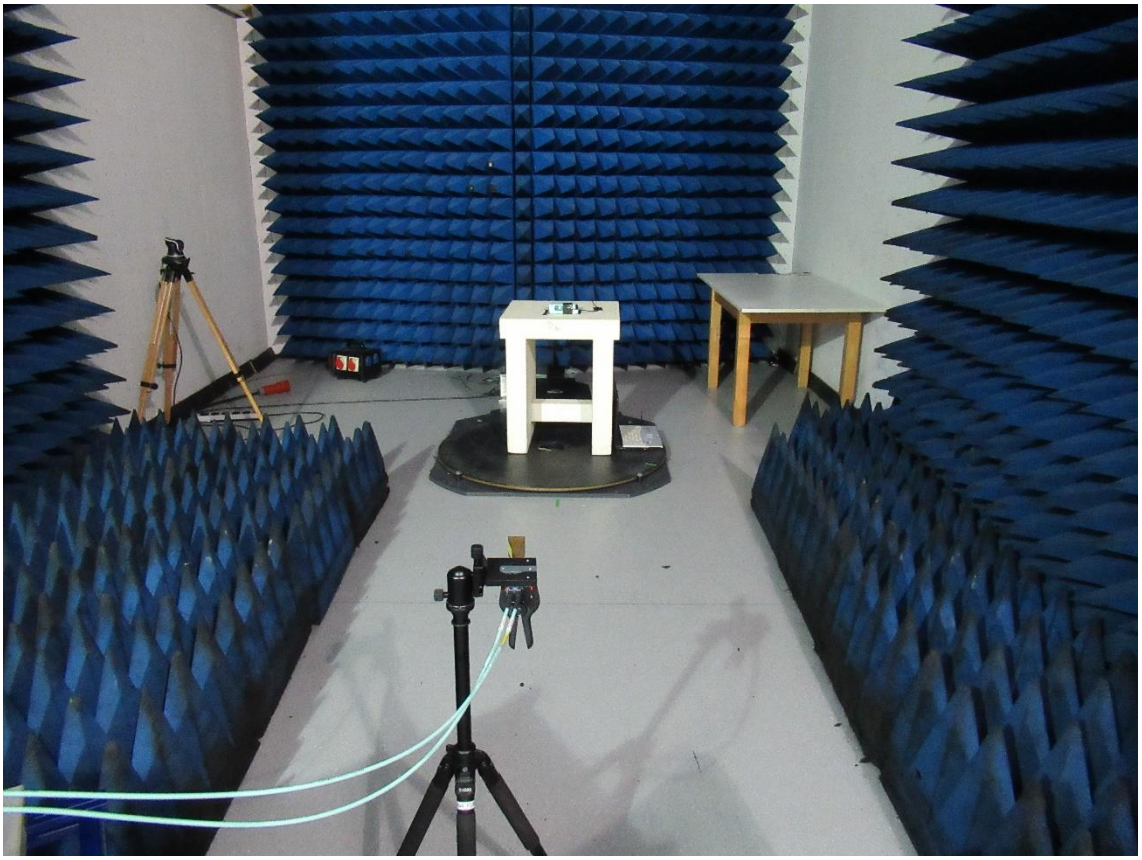
5.3.1 Description of the test location

Test location: Anechoic chamber 2
Test distance: 3 m

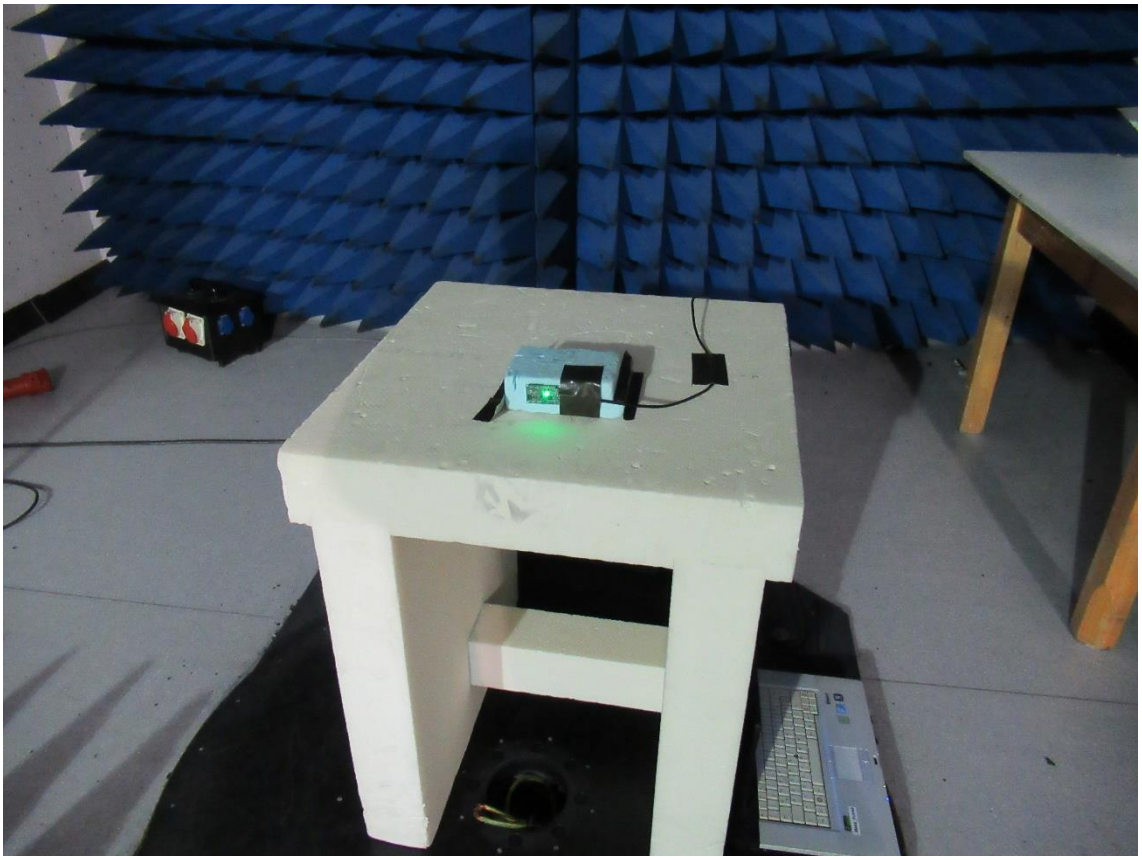
5.3.2 Applicable standard

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.

5.3.3 Photo documentation of the test set-up



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.



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: 1 MHz	VBW: 3 MHz	Detector: PK	Trace. Max hold
AV measurement:	RBW: 10 MHz	VBW: 28 MHz	Detector: RMS	Trace. Max hold

5.3.5 Test result

The conducted output power is calculated because it can not be measured.
The calculation is based on the following formula:
Conducted peak level = Peak EIRP – Antenna gain;
Example: Conducted peak level = 20.2 dBm – 5.0 dBi = 15.2 dBm

Frequency	Level PK	Gain	Level Pk cond	Limit PK cond	Margin PK cond
(GHz)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
61.019	9.3	5.0	4.3	27.0	-22.7
61.249	10.6	5.0	5.6	27.0	-21.4
61.479	9.9	5.0	4.9	27.0	-22.1

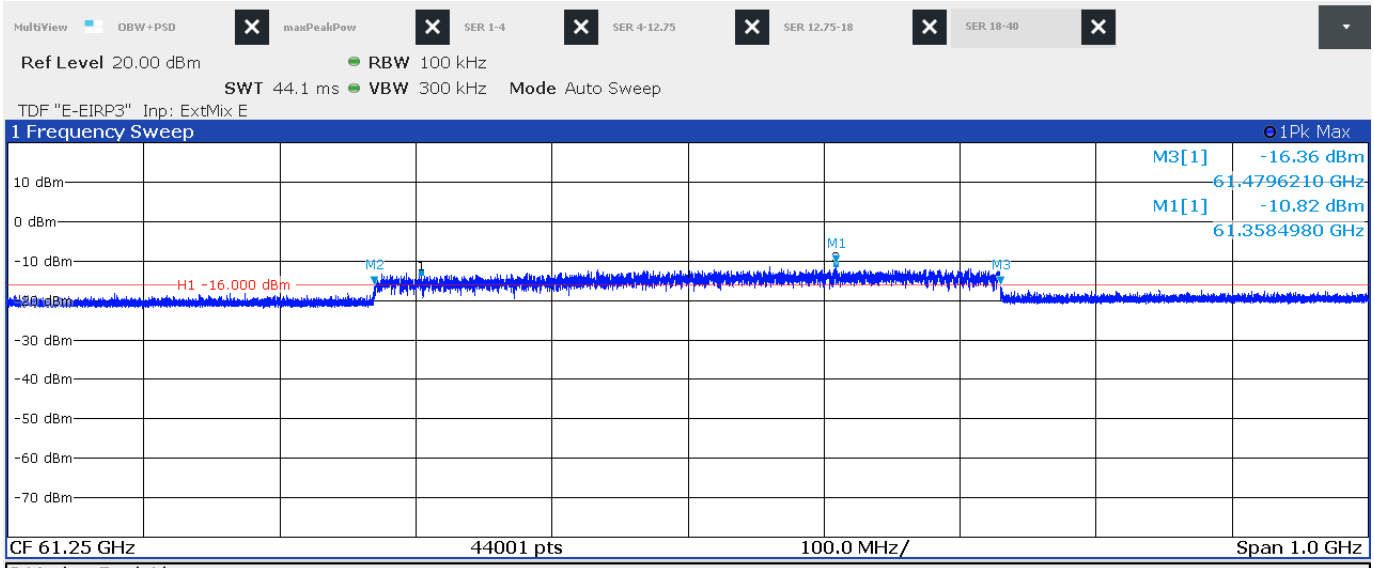
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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).

Determination of the limit:

Emission bandwidth 6 dB



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	61.053732 GHz	-13.122 dBm	2	61.358498 GHz	-10.818 dBm

3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**61.358498 GHz**	**-10.82 dBm**		
M2		1	**61.019642 GHz**	**-16.42 dBm**		
M3		1	**61.479621 GHz**	**-16.36 dBm**		

The limit is given as 500 mW * EBW 6 dB (100 kHz RBW) / 100 MHz;

For 60.5 GHz band: **EBW = 460 MHz**; Limit = 500 mW;

The requirements are **FULFILLED.**

Remarks: _____

_____

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.

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.

5.4 Correction for pulse operation (duty cycle)

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

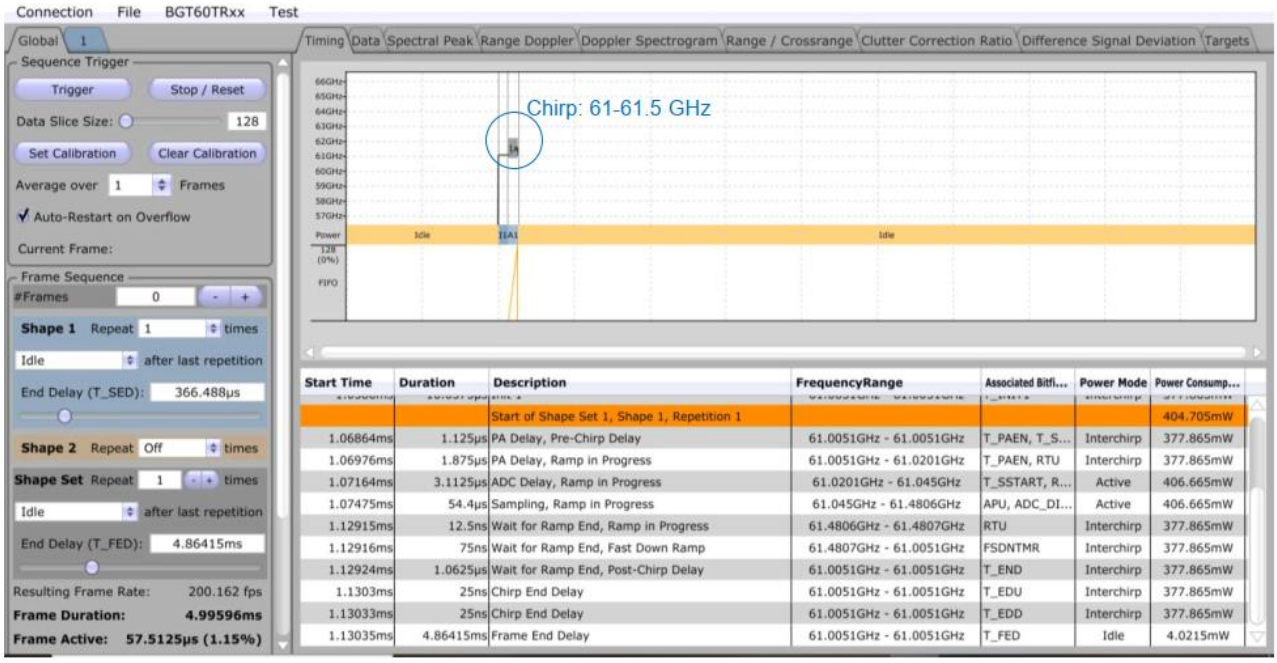
5.4.1 Description of the test location

Test location: NONE

5.4.1 Applicable standard

According to FCC Part 15A, Section 15.35(c):
When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

5.4.2 Description of Measurement



Note: This time schedule is delivered by the customer.

The radar emits one chirp every 5ms
The active time (chirp emission) is ca. 57.5µs
20 chip within 100 ms.
Active time within 100 ms: 20 chip * 57.5 µs = 1150 µs

The duty cycle factor (dB) is calculated applying the following formula:

$$K_E = 20 \log \left((t_{iw}/T_w) * (t_{iB}/T_B) \right)$$

K_E: pulse operation correction factor
t_{iw} pulse duration for one complete pulse track
T_w a period of the pulse track

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.

Total length of period (T_w)	100 ms
Max. On time Port4 (t_{iw})	1.150 ms
KE	0.0115
Log. Correction factor	-38.8 dB

Remarks: The pulse train (*Tw*) exceeds 100 ms, therefore the duty cycle has been calculated by averaging the sum of the pulse widths over the 100 ms with the highest average value.

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.

5.5 Spurious emissions

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

5.5.1 Description of the test location

Test location: OATS 1
Test distance: 3 m

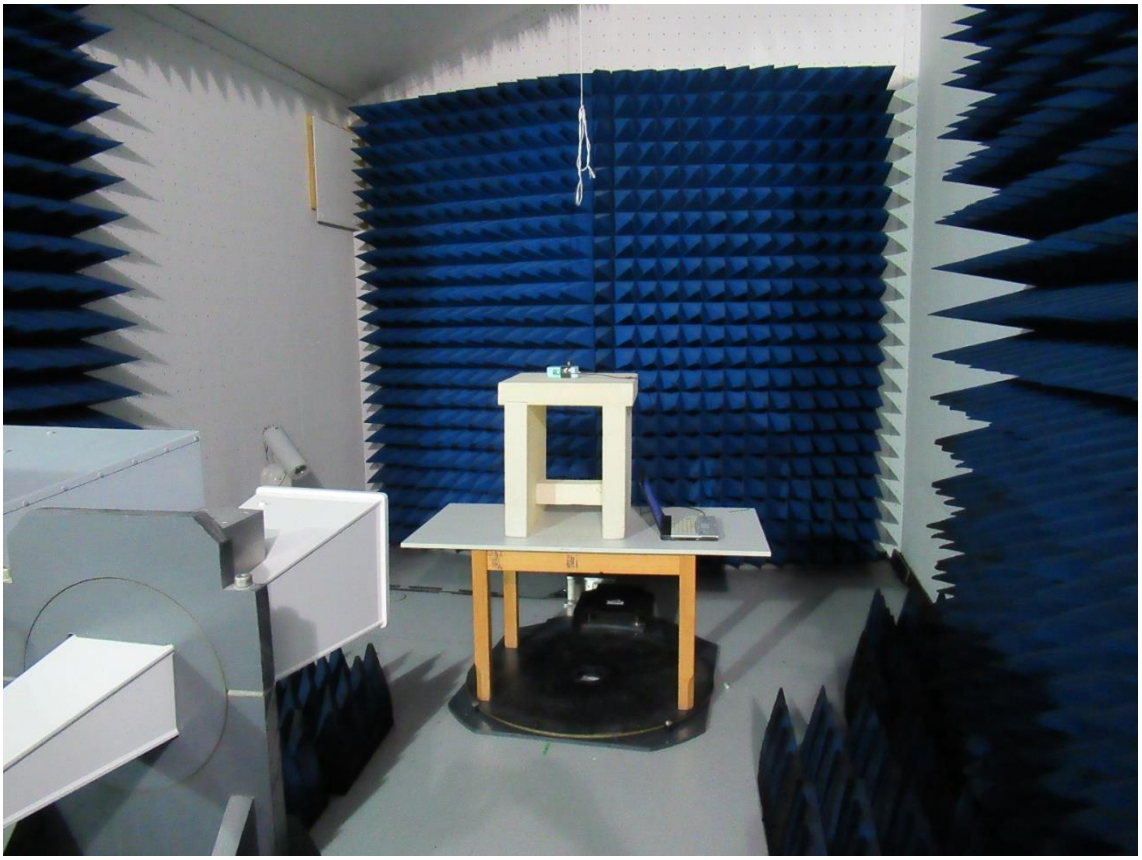
Test location: Anechoic chamber 2
Test distance: 3 m

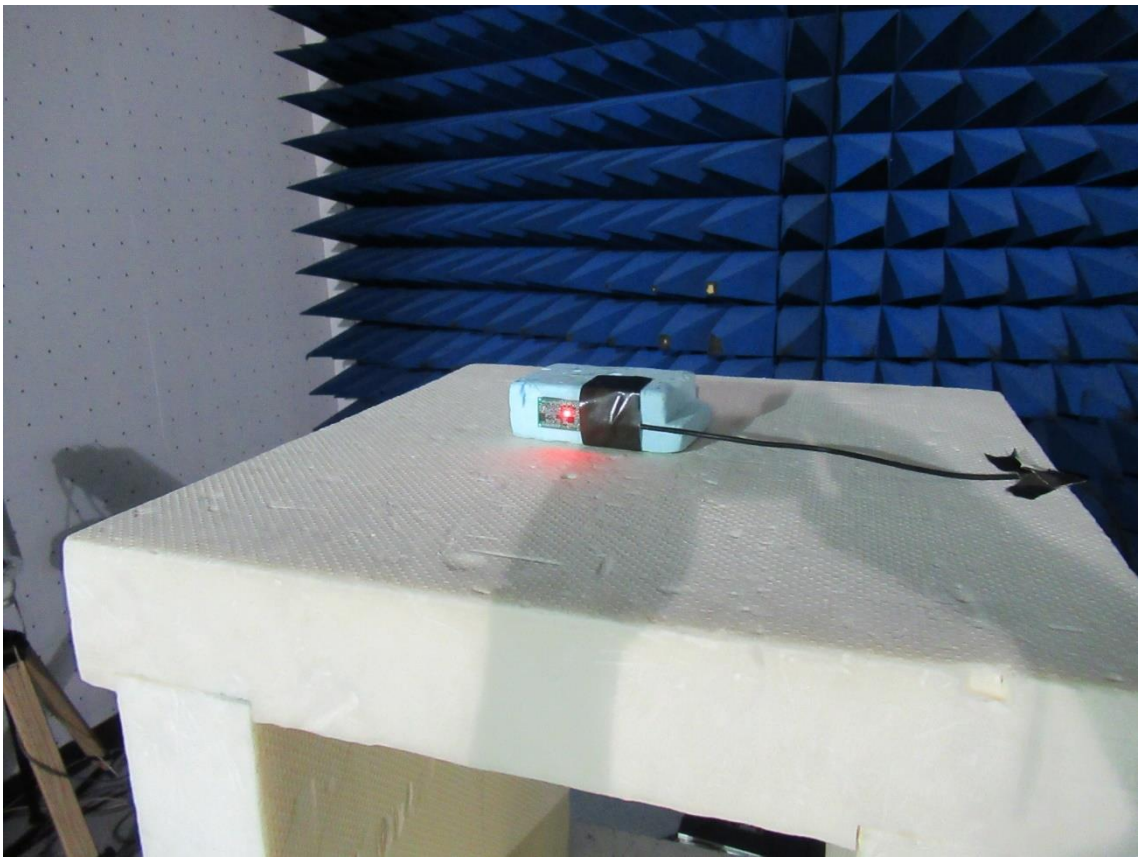
5.5.2 Photo documentation of the test set-up

30 MHz – 1 GHz

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.

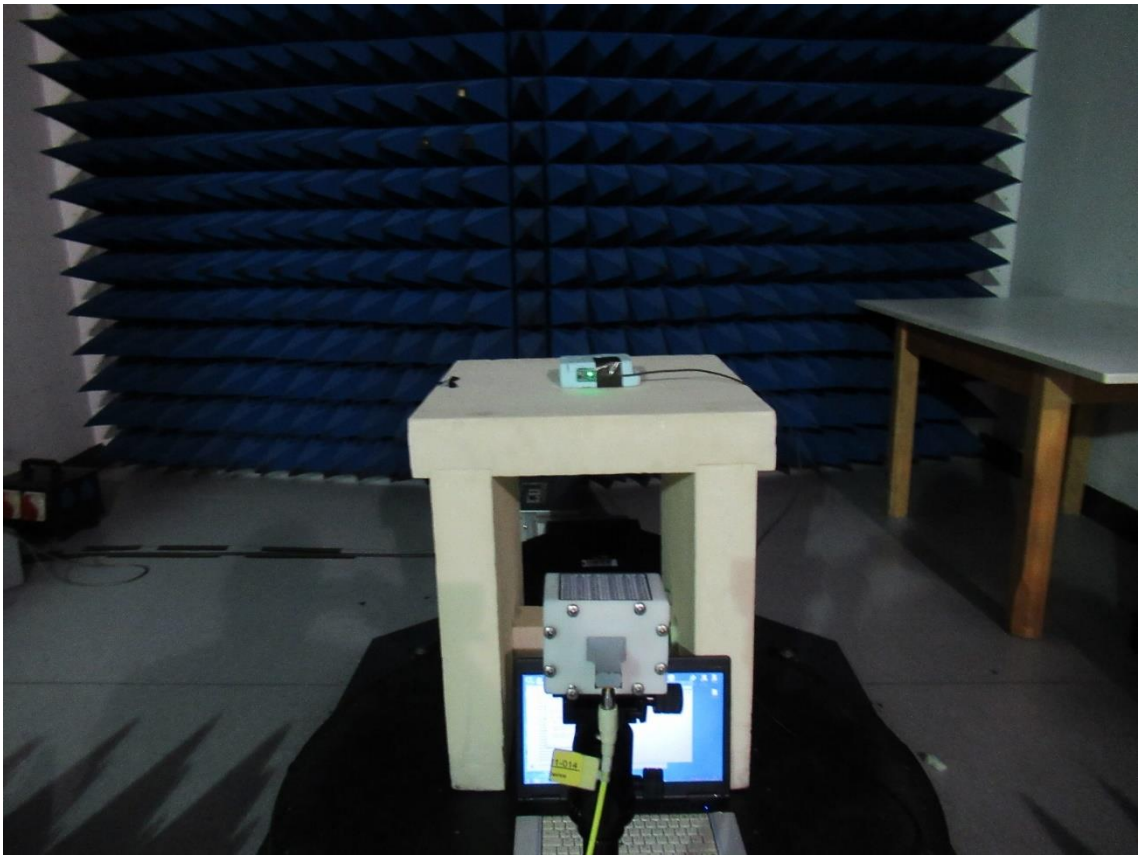
1 GHz – 18 GHz



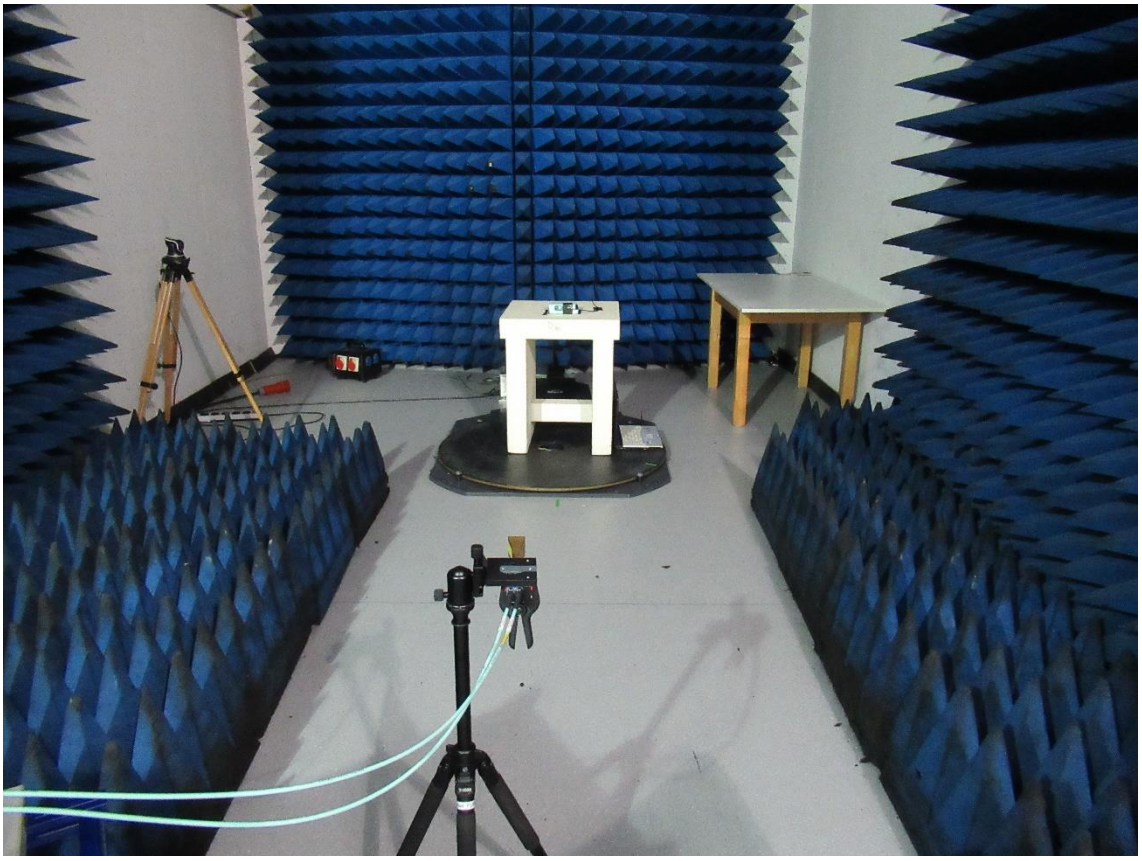


18 GHz – 40 GHz

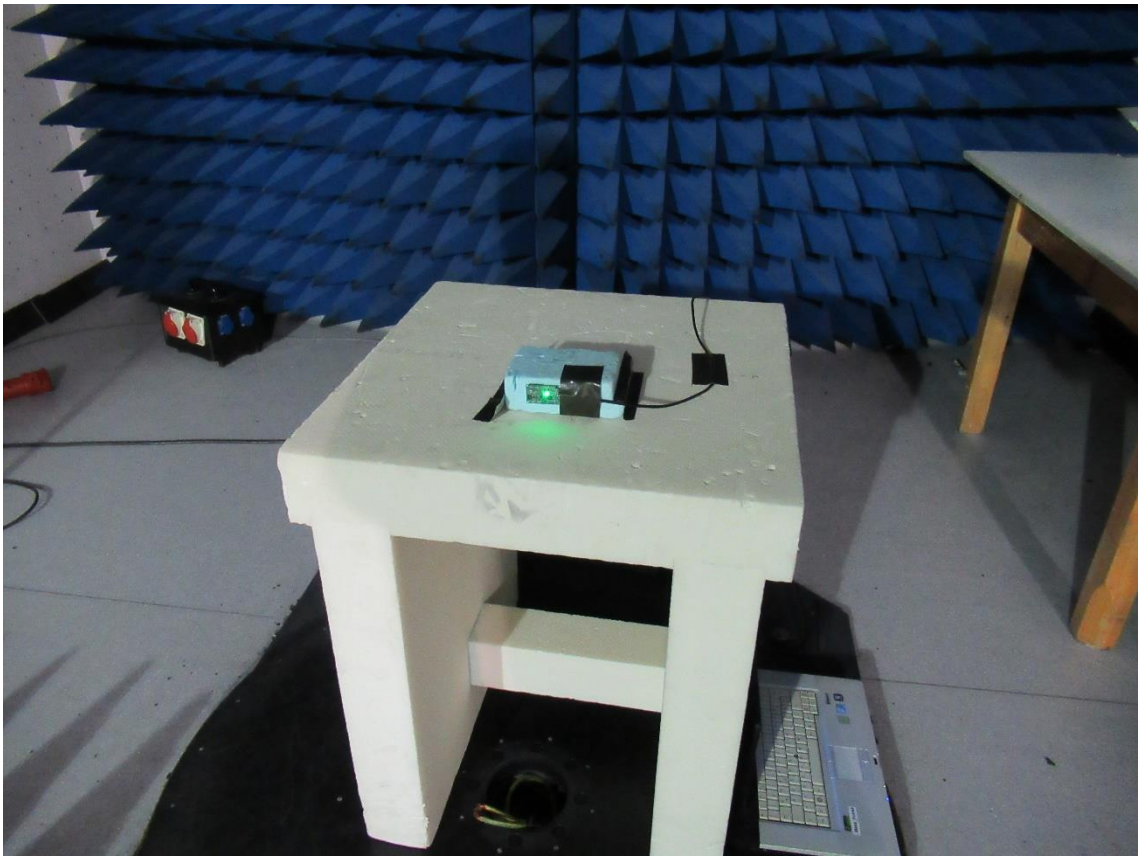
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



40 GHz – 200 GHz



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.



5.5.3 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.

5.5.4 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:

30 MHz – 1000 MHz:	RBW: 120 kHz;
1000 MHz – 200 GHz	RBW: 1 MHz, VBW: 3 MHz;

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.

5.5.5 Test result f < 1 GHz

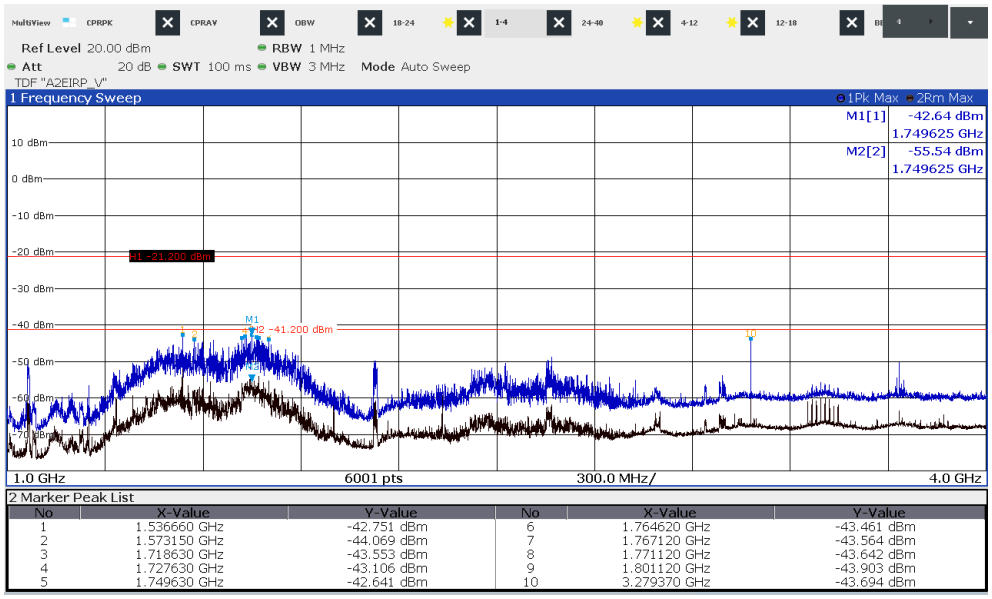
Tx sweeping:

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)
50.00	5.3	2.6	15.2	14.2	20.5	16.8	40.0	-19.5
150.00	1.1	0.5	13.9	14.8	15.0	15.3	43.5	-28.2
200.00	5.7	3.2	11.3	12.0	17.0	15.2	43.5	-26.5
400.00	2.4	3.9	19.8	19.6	22.2	23.5	46.0	-22.5
600.00	3.8	2.5	25.5	25.3	29.3	27.8	46.0	-16.7

Note: For frequencies < 1 GHz the general radiated limits has been applied.

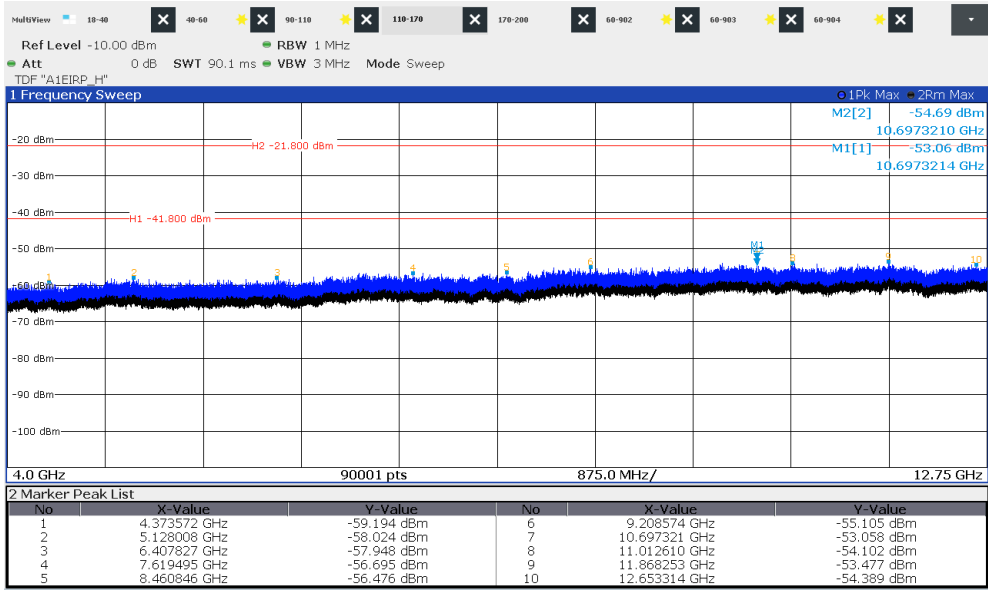
5.5.6 Test result f > 1 GHz

5.5.6.1 Low



2 Marker Peak List

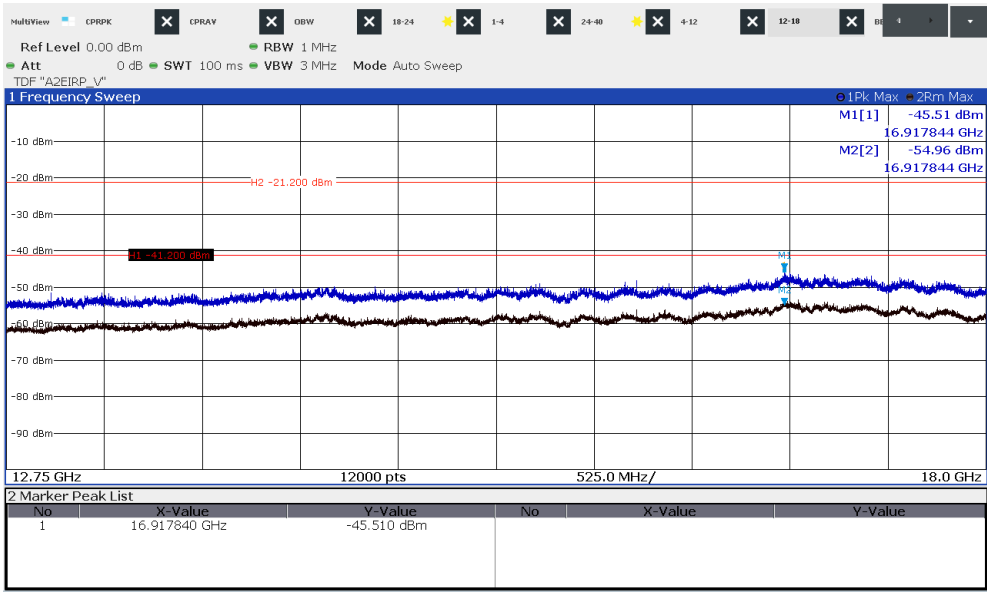
No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.536660 GHz	-42.751 dBm	6	1.764620 GHz	-43.461 dBm
2	1.573150 GHz	-44.069 dBm	7	1.767120 GHz	-43.564 dBm
3	1.718630 GHz	-43.553 dBm	8	1.771120 GHz	-43.642 dBm
4	1.727630 GHz	-43.106 dBm	9	1.801120 GHz	-43.903 dBm
5	1.749630 GHz	-42.641 dBm	10	3.279370 GHz	-43.694 dBm

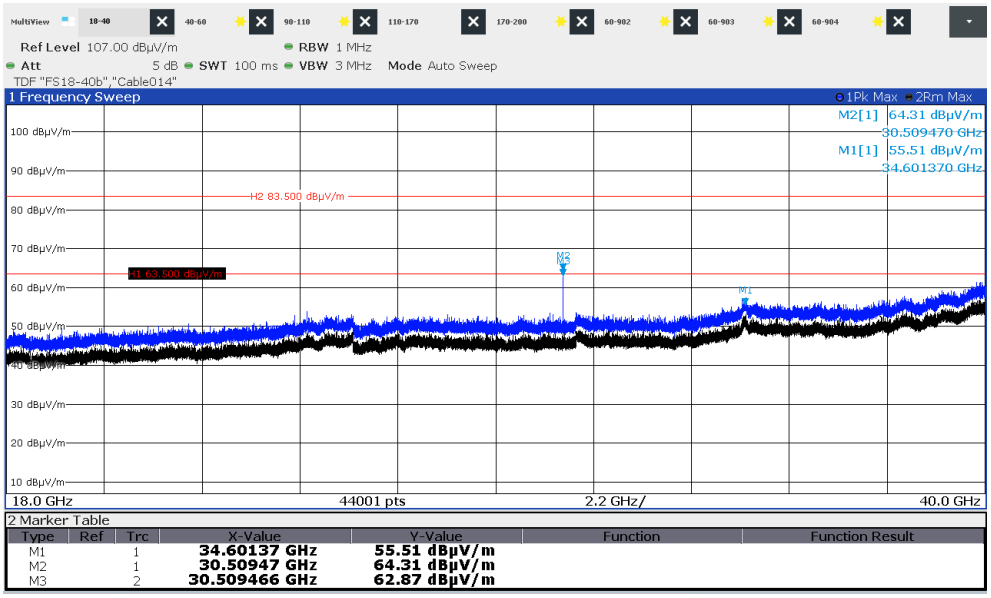


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	4.373572 GHz	-59.194 dBm	6	9.208574 GHz	-55.105 dBm
2	5.128008 GHz	-58.024 dBm	7	10.697321 GHz	-53.058 dBm
3	6.407827 GHz	-57.948 dBm	8	11.012610 GHz	-54.102 dBm
4	7.619495 GHz	-56.695 dBm	9	11.868253 GHz	-53.477 dBm
5	8.460846 GHz	-56.476 dBm	10	12.653314 GHz	-54.389 dBm

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.



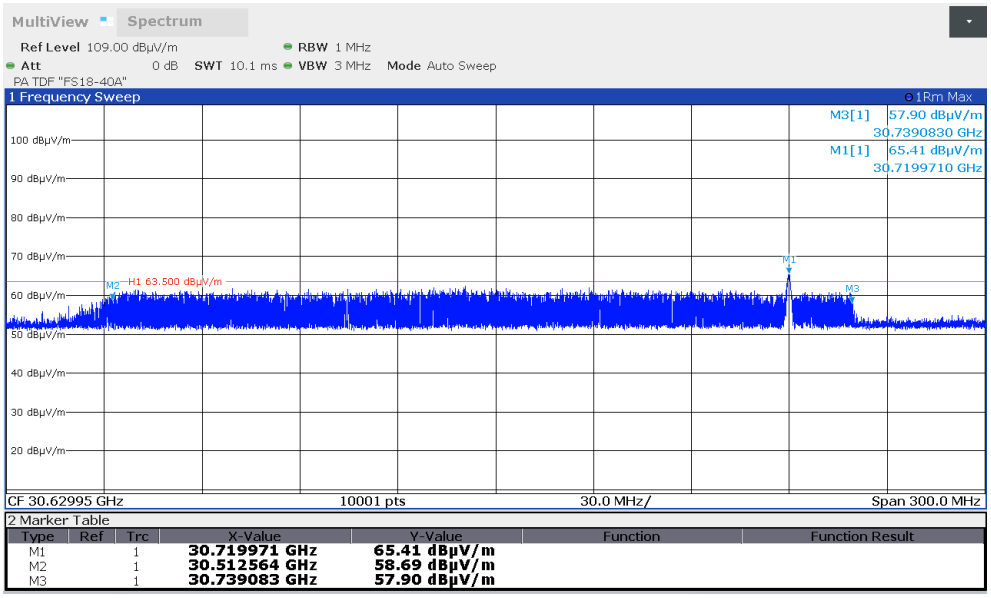


Note: The measurement distance is reduced to 1 m, therefore the limit is adopted.

AV-Limit at 1m distance: 54 dBµV/m + 20log(d) = 54 + 9.5 = **63.5 dBµV/m**
PK-Limit at 1m distance: 74 dBµV/m + 20log(d) = 74 + 9.5 = **83.5 dBµV/m**

AV value of emission 30.509 GHz = PK value – DC; DC= 1.15 % (20log(0.0115)=-38.8 dB)
= 64.3 – 38.8 = **25.5 dBµV/m**

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.



Note: The emission at 30.6299 GHz is part of the basic band generation and sweeps as the carrier, the emission is assessed with the duty cycle of the carrier for calculating the AV value.

Determination of the EIRP emission limit for > 40 GHz:
For calculation the limit the friis formula is used.

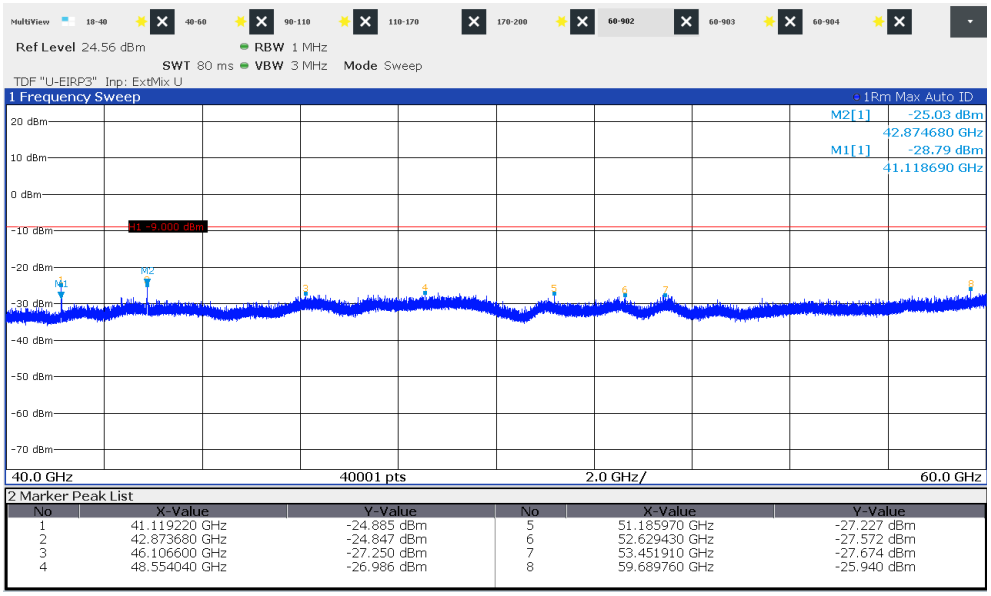
$$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

Pout * G = EIRP;
Therefore

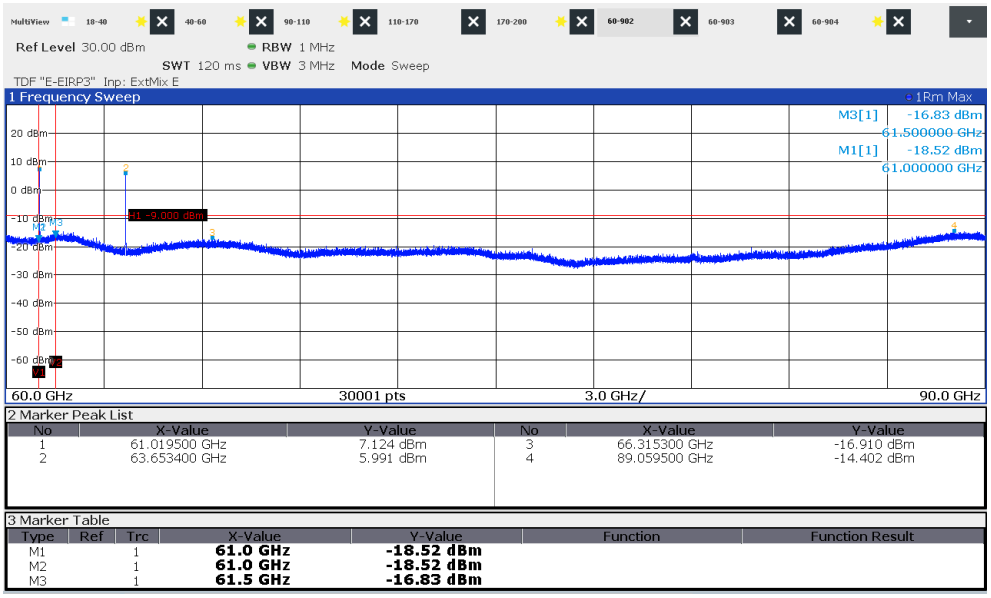
$$EIRP = P_d * 4 * \pi * r^2$$

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

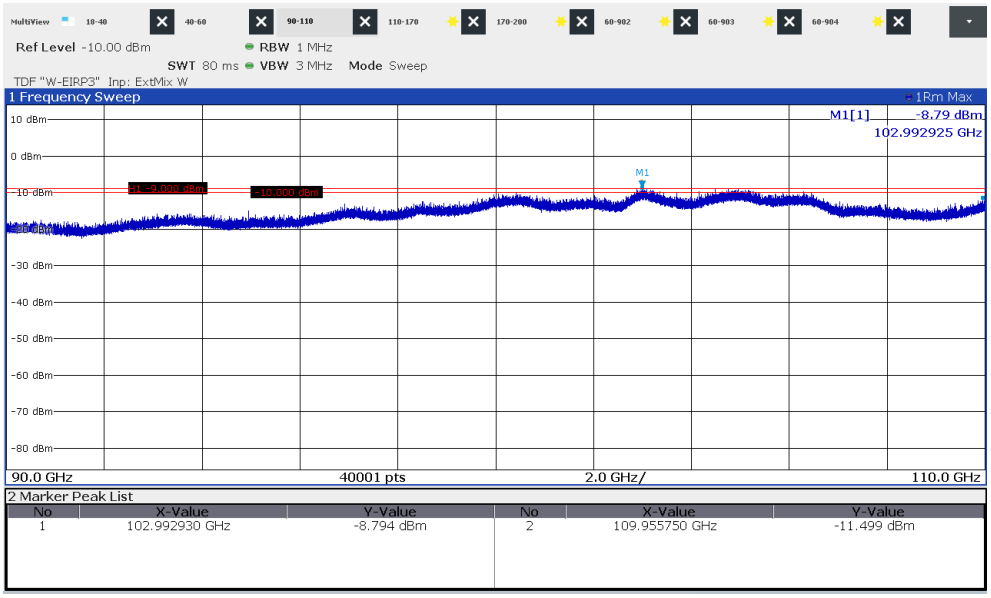
Where:
r is the measurement distance (3 m)
P_d is the emission density (90 pW/cm^2



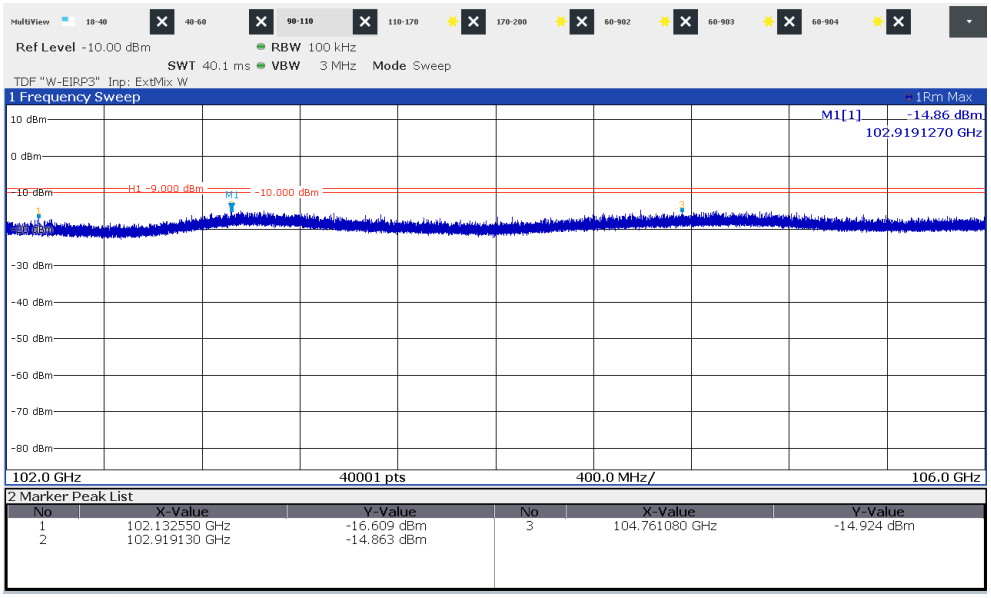
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



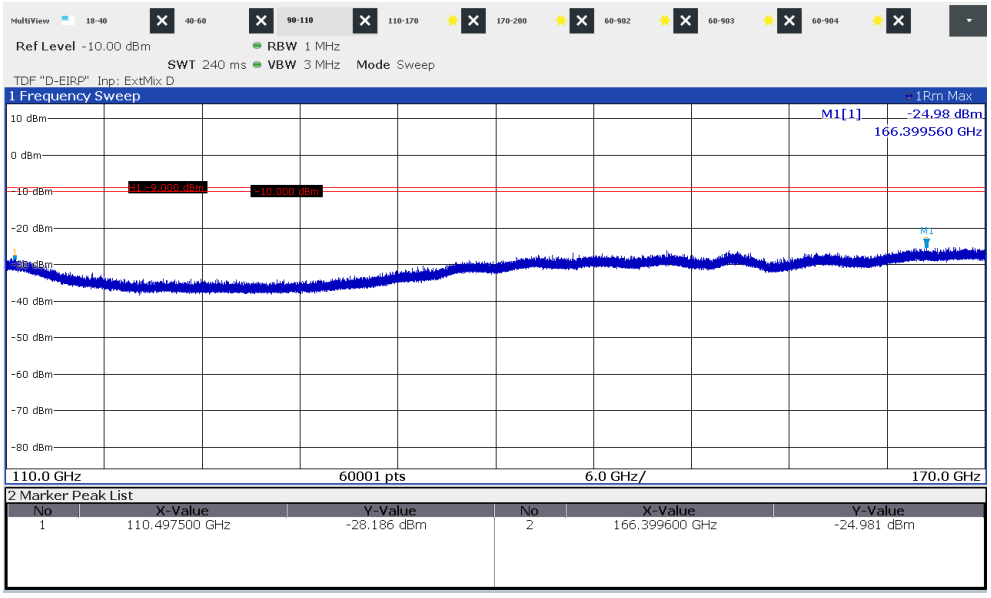
Note: The emission at 63.653 GHz is caused by the external mixer.



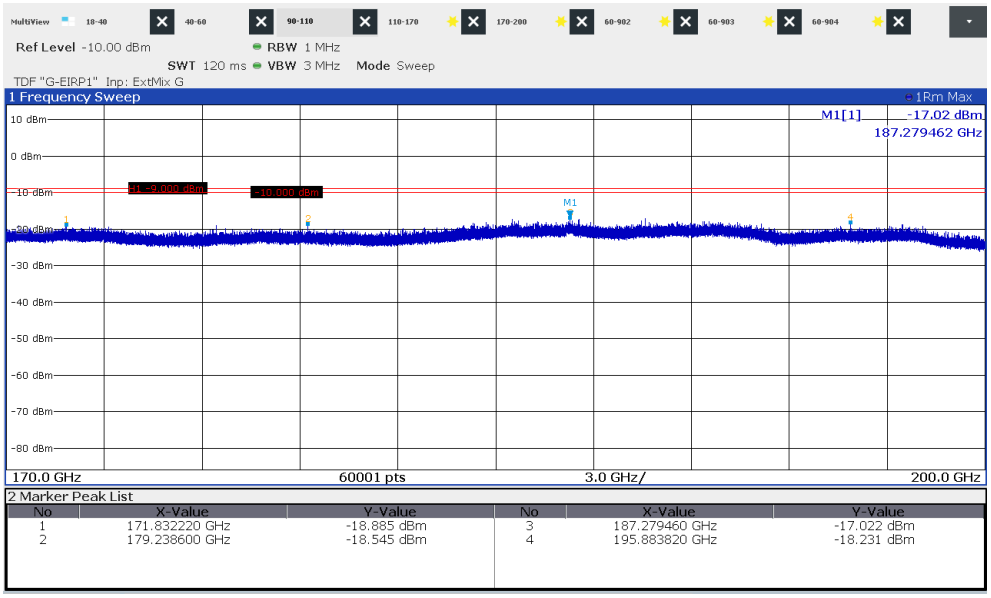
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



Note: The range from 102 GHz to 106 GHz is re-measured with RBW=100 kHz in order to show that there is no emission hide by the noise level.

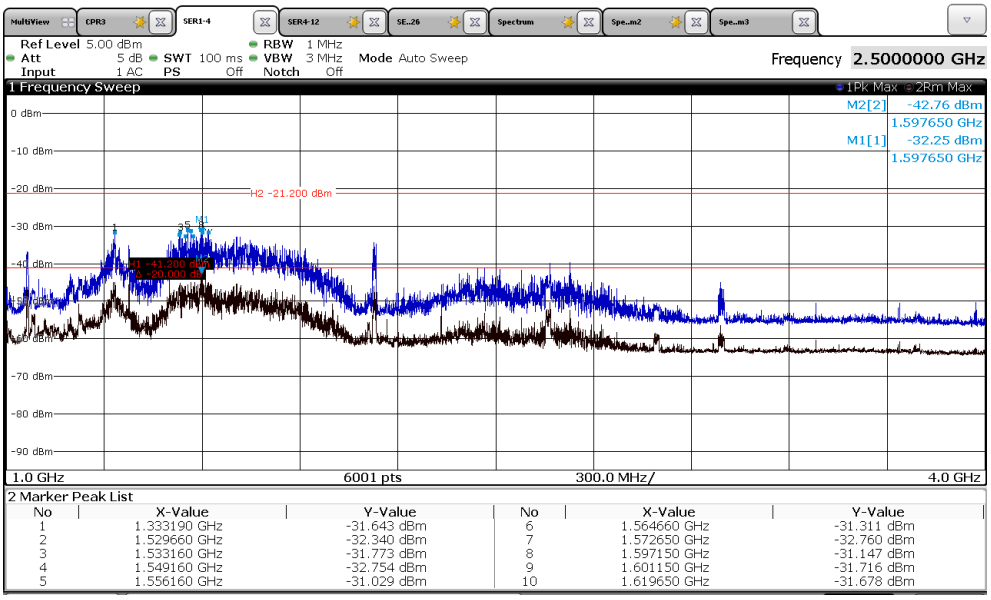


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



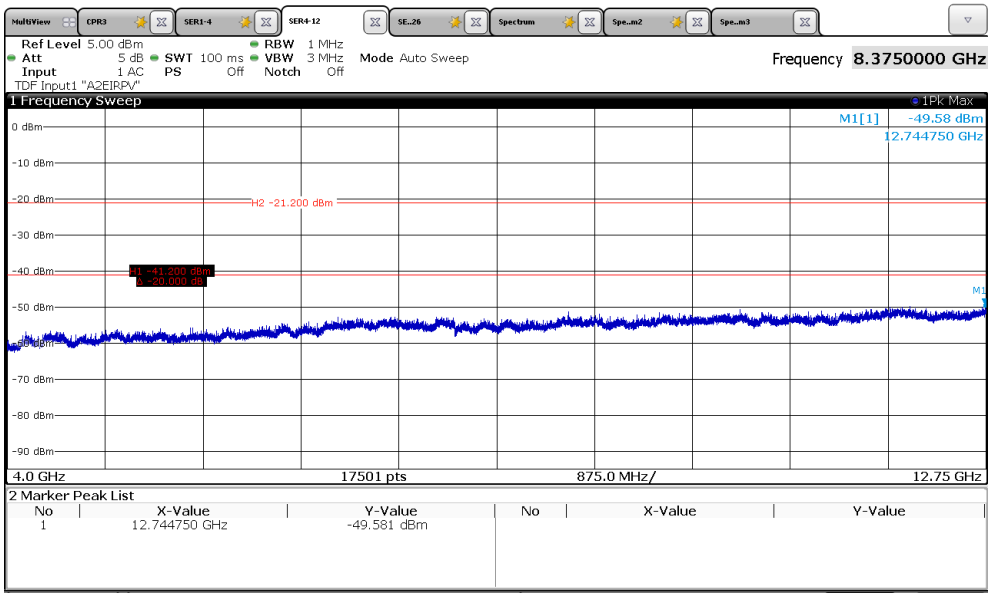
No	X-Value	Y-Value	No	X-Value	Y-Value
1	171.832220 GHz	-18.885 dBm	3	187.279460 GHz	-17.022 dBm
2	179.238600 GHz	-18.545 dBm	4	195.883820 GHz	-18.231 dBm

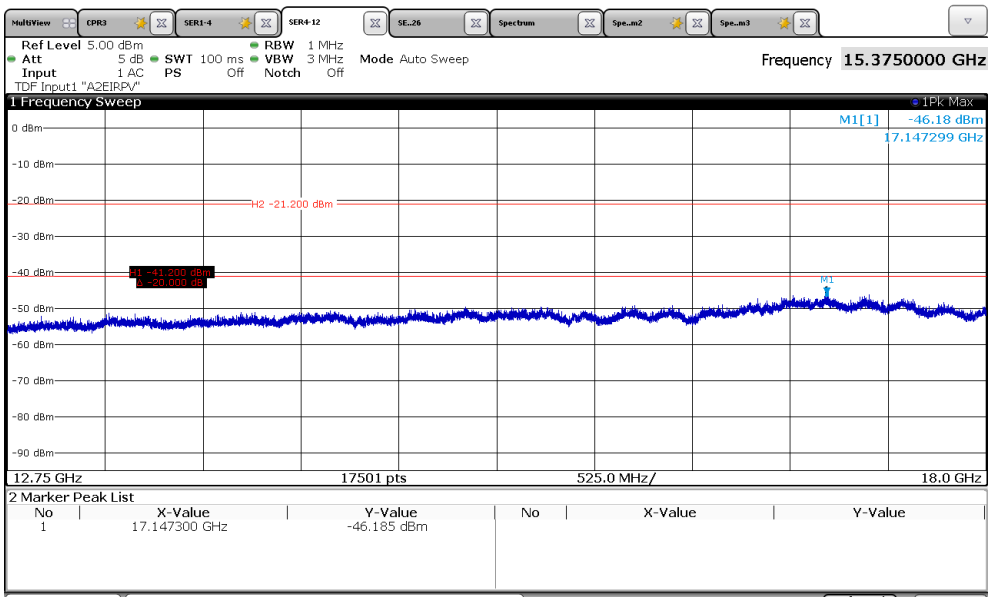
5.5.6.2 Mid



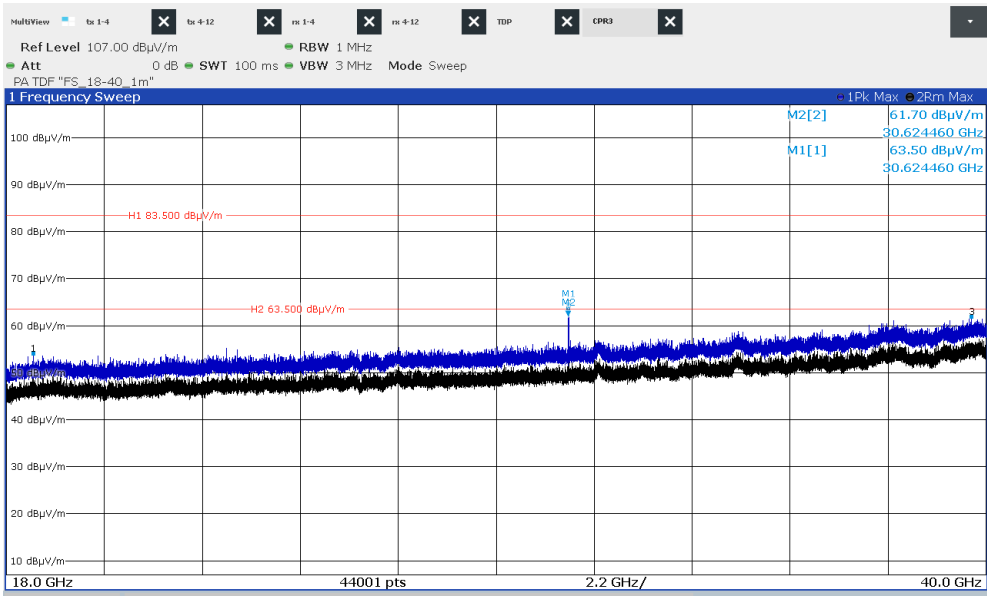
No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.333190 GHz	-31.643 dBm	6	1.564660 GHz	-31.311 dBm
2	1.529660 GHz	-32.340 dBm	7	1.572650 GHz	-32.760 dBm
3	1.533160 GHz	-31.773 dBm	8	1.597150 GHz	-31.147 dBm
4	1.549160 GHz	-32.754 dBm	9	1.601150 GHz	-31.716 dBm
5	1.556160 GHz	-31.029 dBm	10	1.619650 GHz	-31.678 dBm

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.





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.

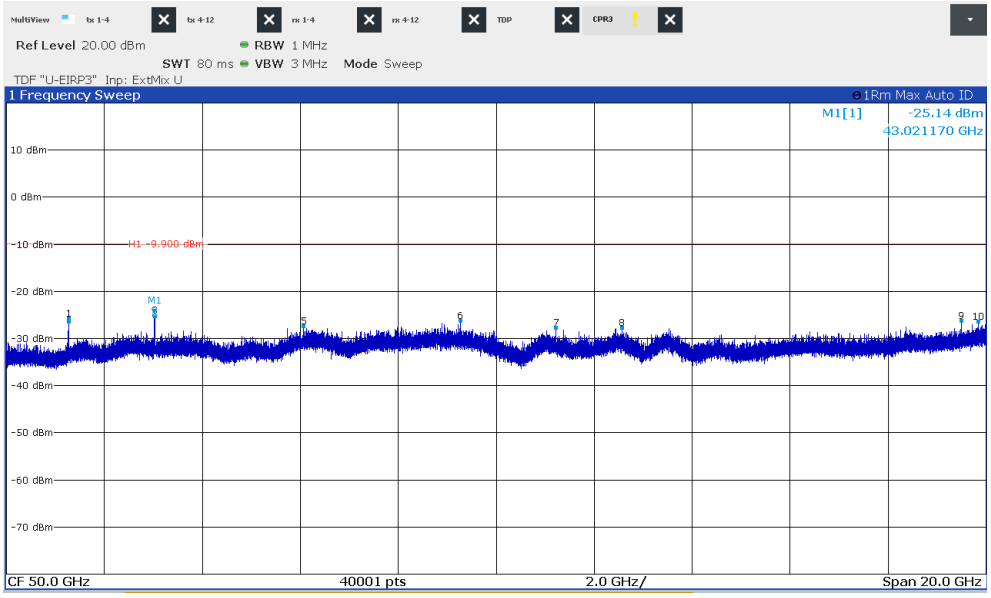


Note: The measurement distance is reduced to 1 m, therefore the limit is adopted.

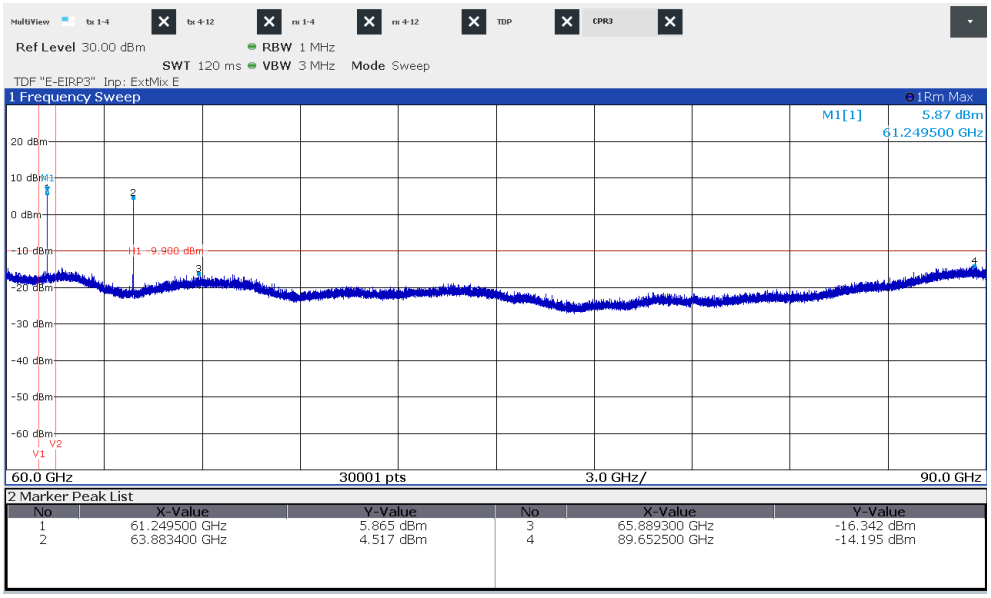
AV-Limit at 1m distance: 54 dBµV/m + 20log(d) = 54 + 9.5 = **63.5 dBµV/m**
PK-Limit at 1m distance: 74 dBµV/m + 20log(d) = 74 + 9.5 = **83.5 dBµV/m**

Note: The emission at 30.624 GHz is part of the basic band generation and sweeps as the carrier, the emission is assessed with the duty cycle of the carrier for calculating the AV value.

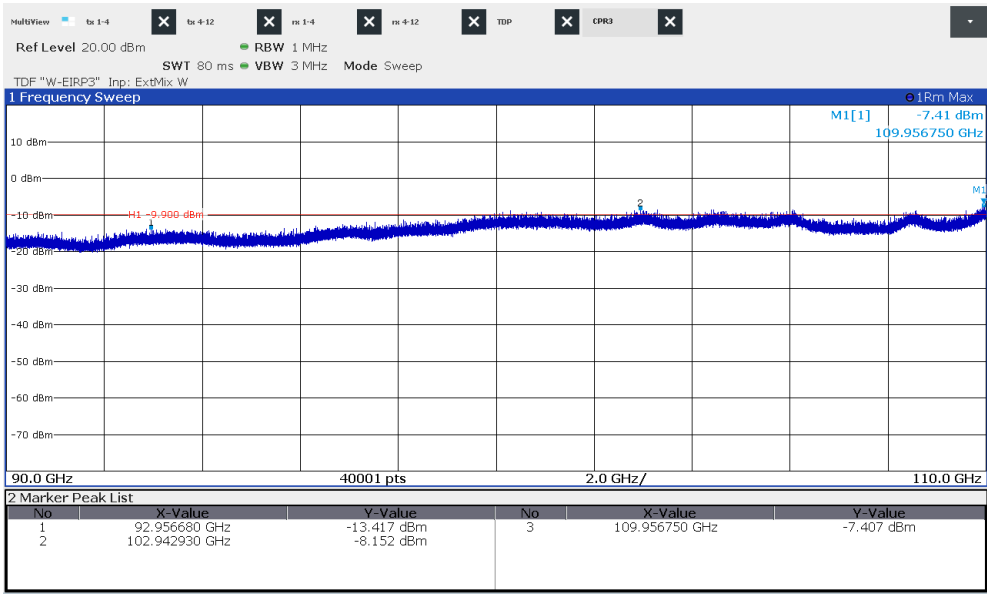
AV value of emission 30.624 GHz = PK value – DC; DC= 1.15 % (20log(0.0115)=-38.8 dB)
= 63.5 – 38.8 = **25.7 dBµV/m**



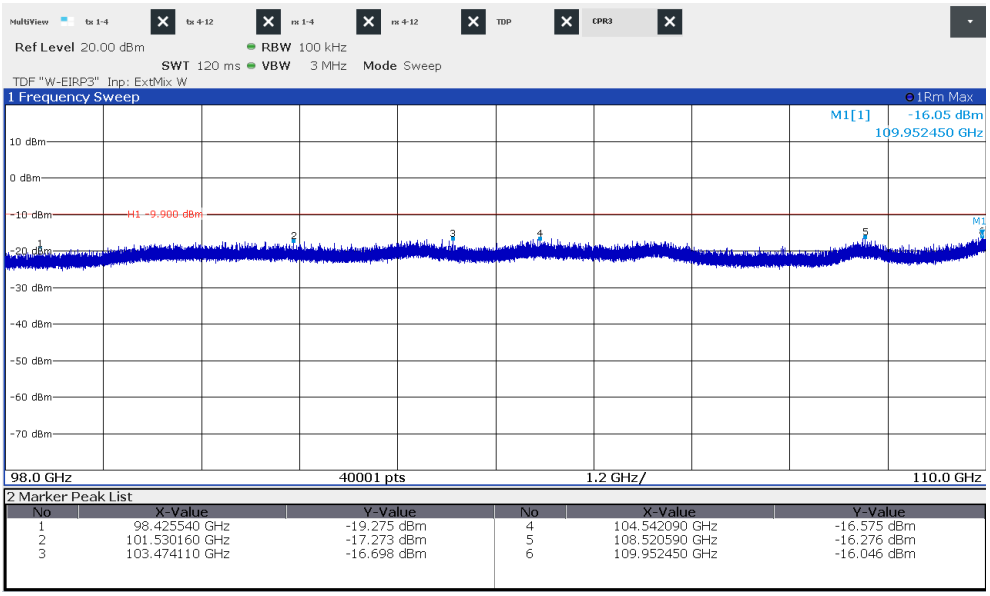
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



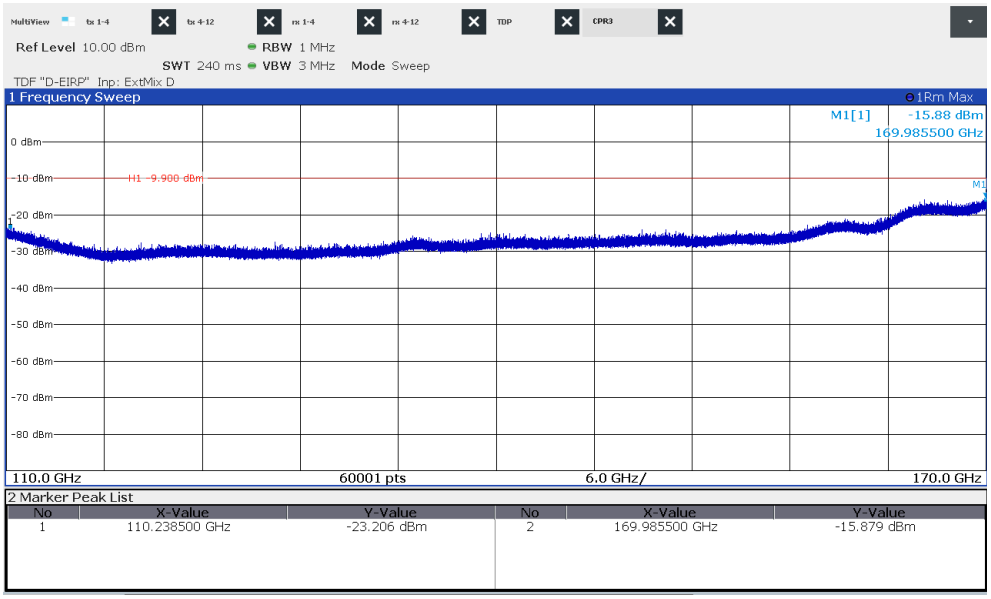
Note: The emission at 63.883 GHz is caused by the external mixer.



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.



Note: The range from 98 GHz to 110 GHz is re-measured with RBW=100 kHz in order to show that there is no emission hide by the noise level.



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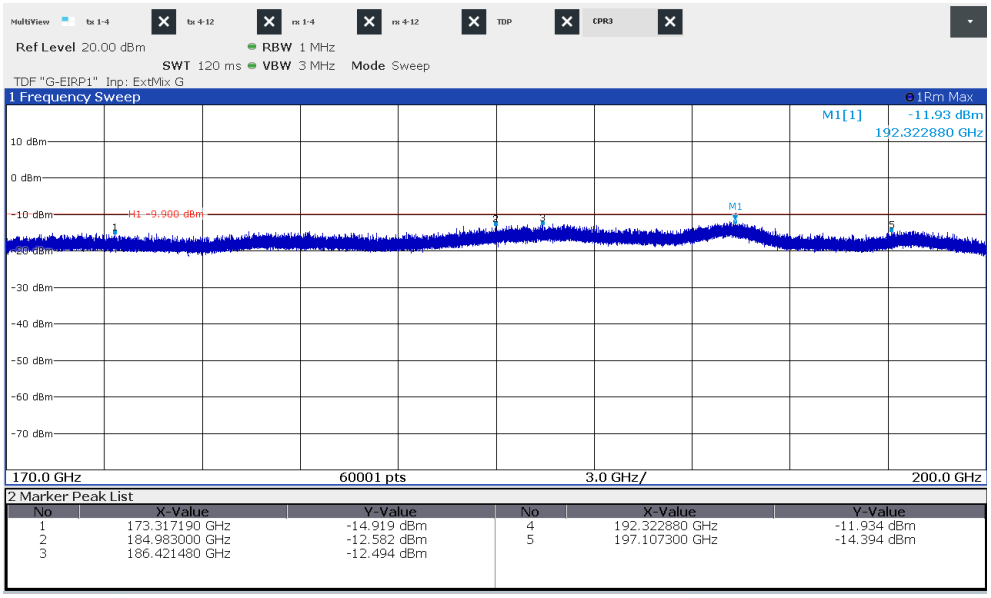
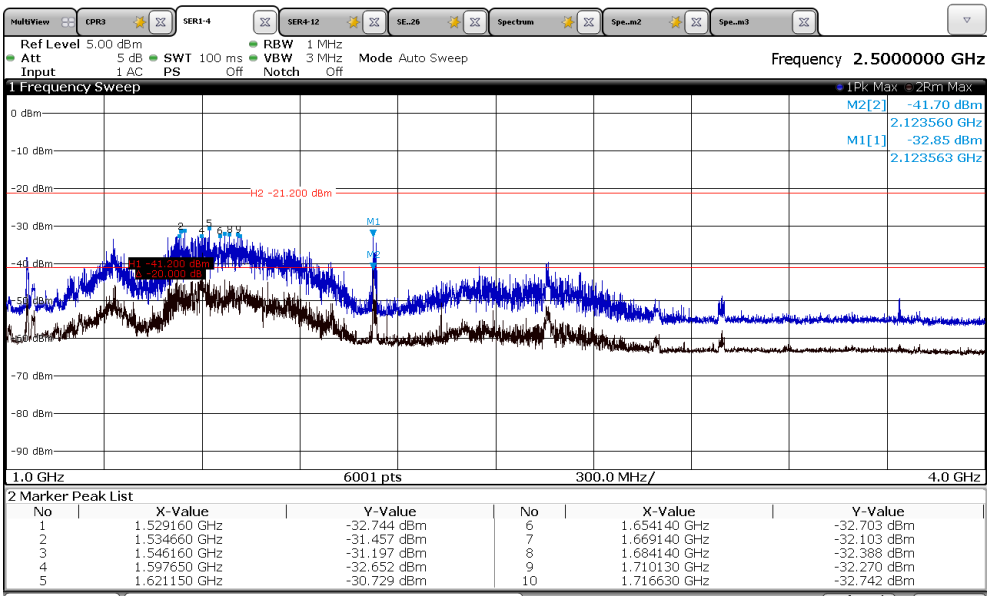


5.5.6.3 High



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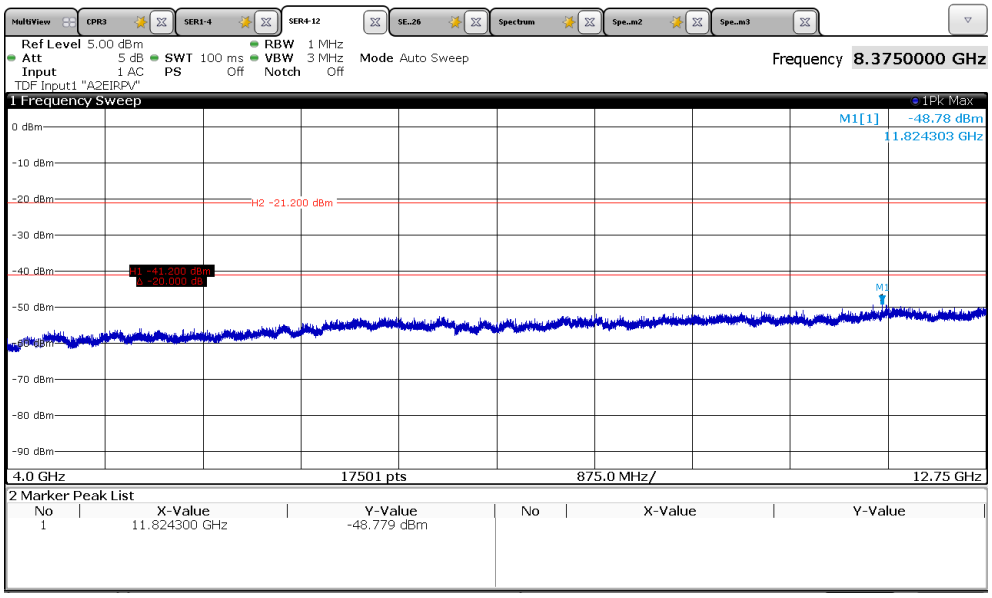
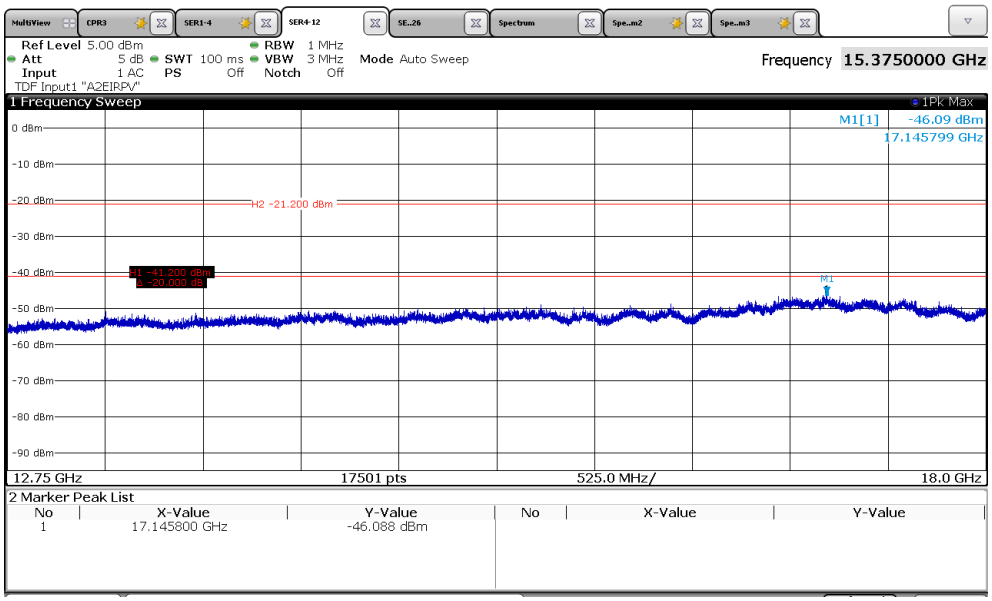
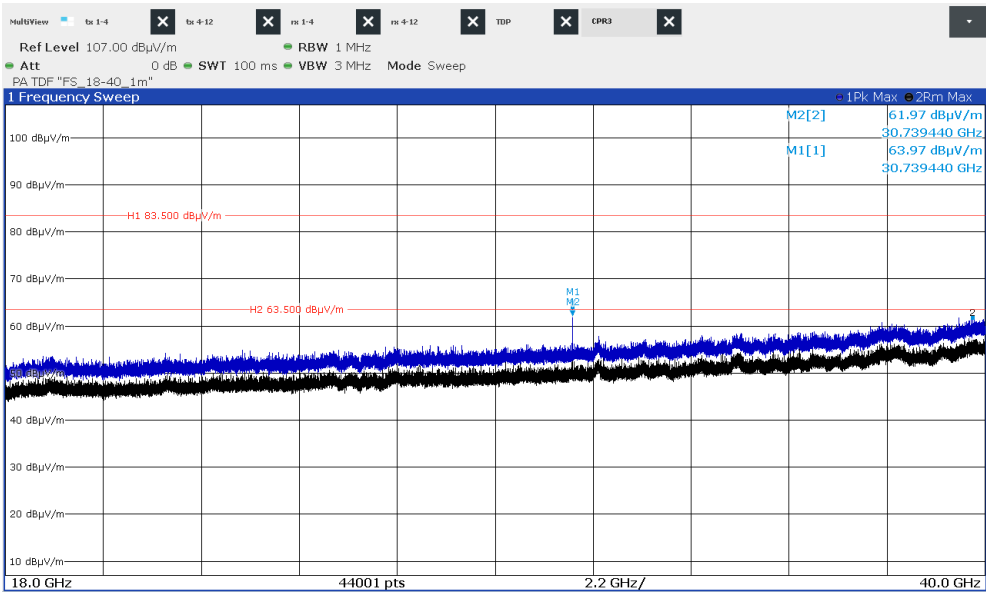




The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

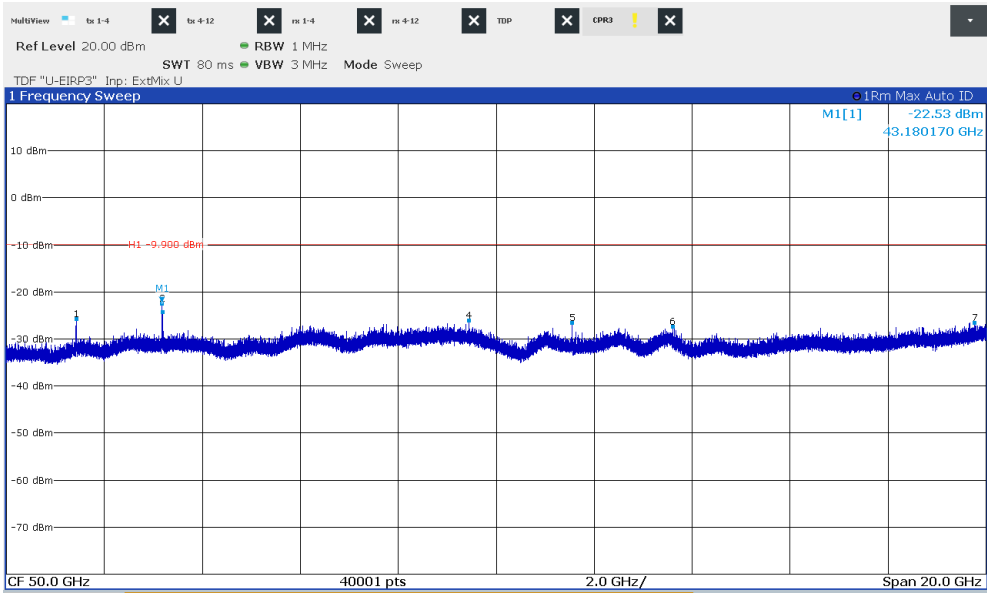


Note: The measurement distance is reduced to 1 m, therefore the limit is adopted.

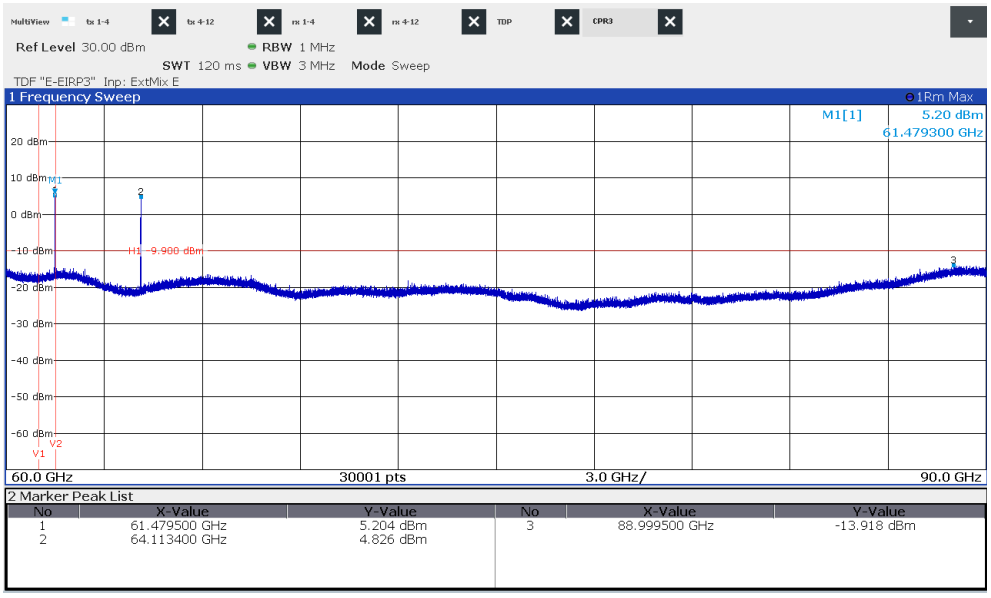
AV-Limit at 1m distance: 54 dBµV/m + 20log(d) = 54 + 9.5 = **63.5 dBµV/m**
PK-Limit at 1m distance: 74 dBµV/m + 20log(d) = 74 + 9.5 = **83.5 dBµV/m**

Note: The emission at 30.739 GHz is part of the basic band generation and sweeps as the carrier, the emission is assessed with the duty cycle of the carrier for calculating the AV value.

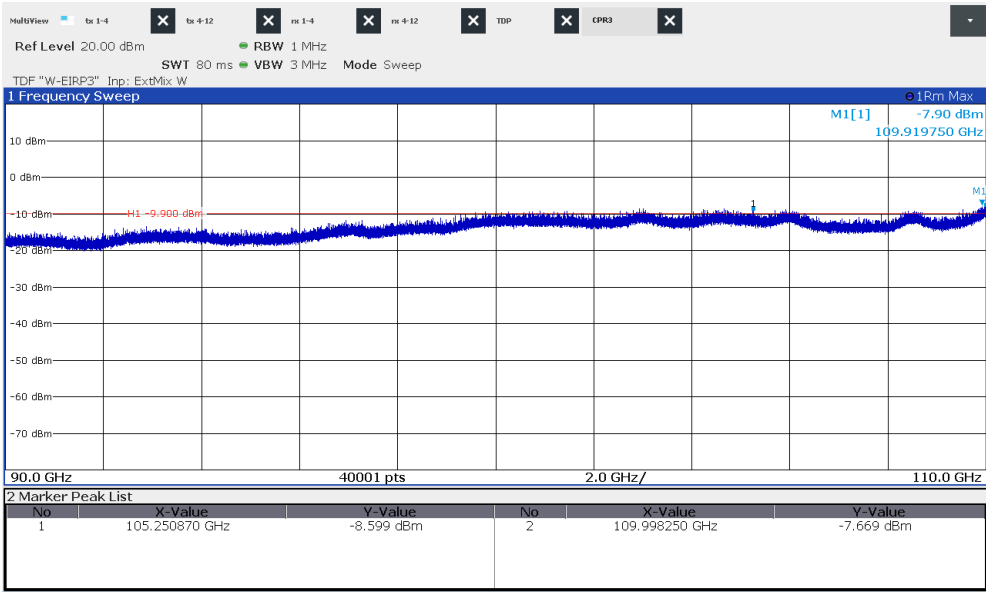
AV value of emission 30.739 GHz = PK value – DC; DC= 1.15 % (20log(0.0115)=-38.8 dB)
= 64.0 – 38.8 = **25.2 dBµV/m**



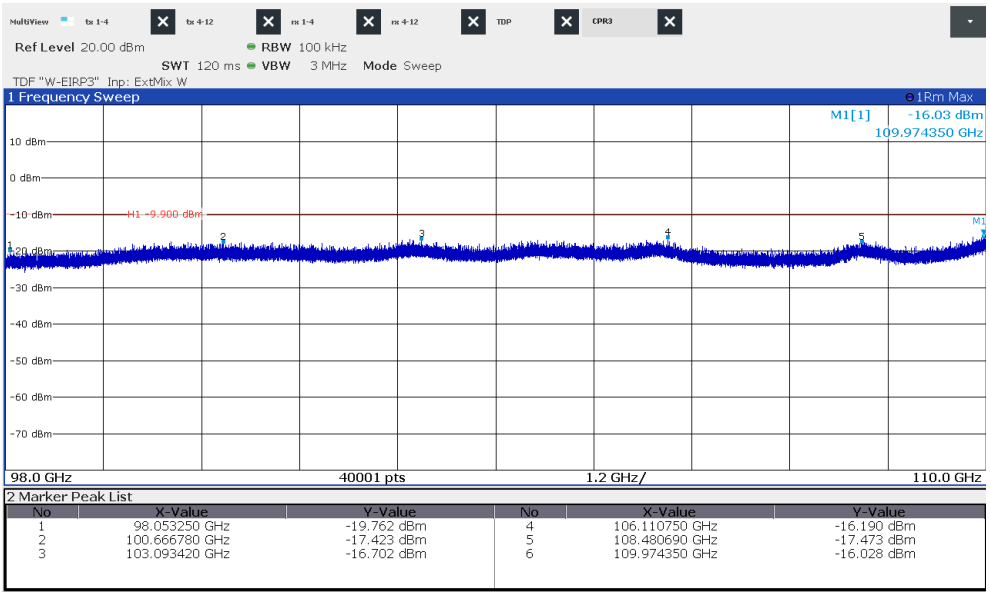
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



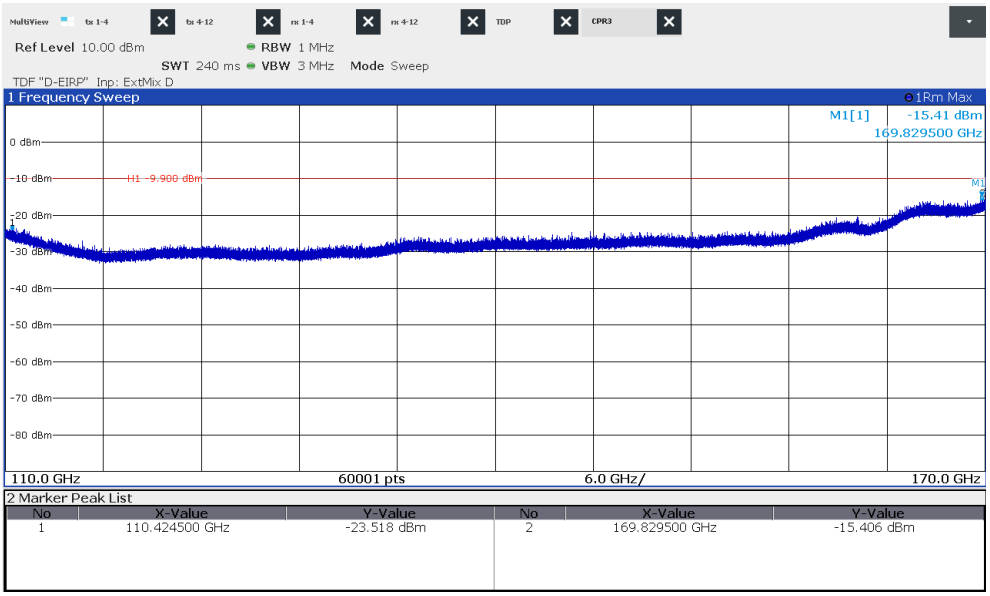
Note: The emission at 64.113 GHz is caused by the external mixer.



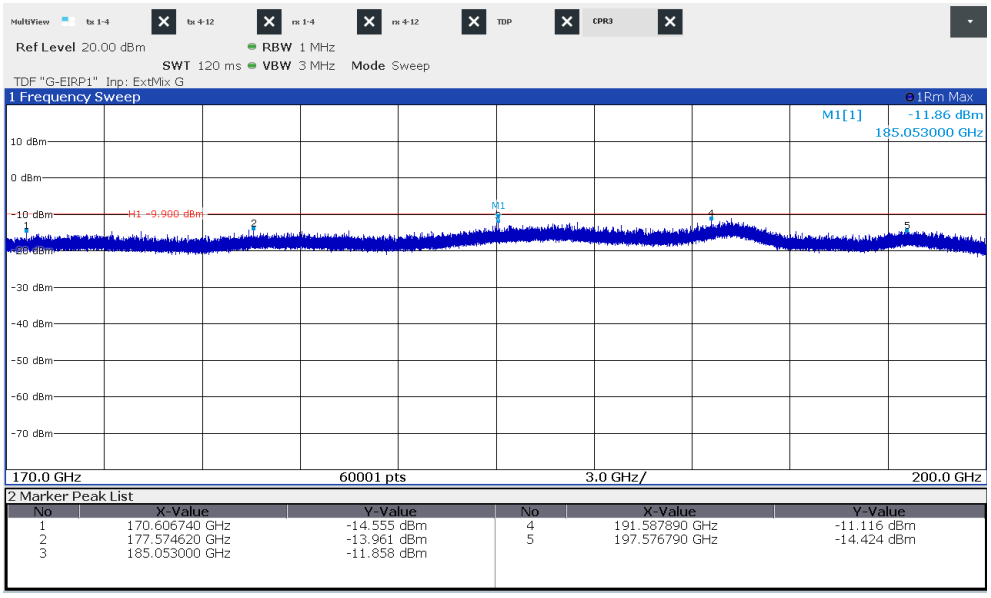
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



Note: The range from 98 GHz to 110 GHz is re-measured with RBW=100 kHz in order to show that there is no emission hide by the noise level.



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.



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/cm^2 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 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.

Restricted bands of operation:

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

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

RSS-Gen, Table 6 – Restricted Frequency Bands

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

The requirements are **FULFILLED.**

Remarks: The measurement was performed up to 200 GHz.

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.

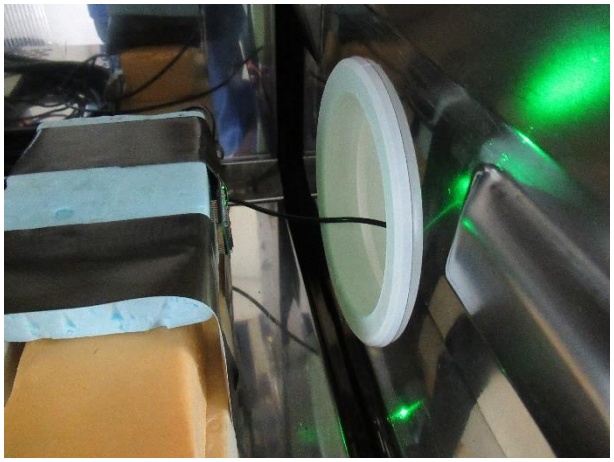
5.6 Frequency stability

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

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up



5.6.3 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.

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.

5.6.4 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.

5.6.5 Result

61.0 -61.5 GHz Range:

Test conditions		Test result
		Frequency (GHz)
T_{min} (-20°C)	V_{nom}	61.02050
T (-10°C)	V_{nom}	61.02048
T (0°C)	V_{nom}	61.02030
T (10°C)	V_{nom}	61.02012
T_{nom} (20°C)	V_{min} (4.25 V)	61.01973
T_{nom} (20°C)	V_{nom} (5 V)	61.01973
T_{nom} (20°C)	V_{max} (5.75 V)	61.01973
T (30°C)	V_{nom}	61.01972
T (40°C)	V_{nom}	61.01955
T_{max} (50°C)	V_{nom}	61.01950

Carrier frequency f_c	61.019729 MHz
Max tolerance	no limit
Highest frequency f_h	61.0205 MHz
Lowest frequency f_l	61.0195 MHz
Negative tolerance $f_l - f_c$	-0.229 kHz
Positive tolerance $f_h - f_c$	0.771 kHz

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: _____

_____

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.

5.7 Antenna requirement

5.7.1 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: _____

_____

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

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.18.0.26	01-02/68-13-001				
	ESCI	02-02/03-15-001	02/07/2020	02/07/2019		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2021	31/10/2019	04/11/2020	04/05/2020
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	12/11/2020	12/05/2020
CPR 3	FS-Z90	02-02/11-14-003	09/04/2021	09/04/2020	09/10/2020	09/04/2020
	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	QWH-EPRR00/WR-12/60-90	02-02/24-14-004				
MB	FS-Z90	02-02/11-14-003	09/04/2021	09/04/2020	09/10/2020	09/04/2020
	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	QWH-EPRR00/WR-12/60-90	02-02/24-14-004				
	WK-340/40	02-02/45-05-001	18/07/2020	18/04/2019	23/10/2020	23/04/2020
SER 2	ESVS 30	02-02/03-05-006	19/08/2020	19/08/2019		
	VULB 9168	02-02/24-05-005	19/07/2020	19/07/2019		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 3	FS-Z110	02-02/11-14-002	08/04/2021	08/04/2020	08/10/2020	08/04/2020
	FS-Z90	02-02/11-14-003	09/04/2021	09/04/2020	09/10/2020	09/04/2020
	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	RPG FS-Z170	02-02/11-17-001	09/04/2021	09/04/2020		
	RPG FS-Z220	02-02/11-17-002	20/04/2021	20/04/2020		
	FS-Z60	02-02/11-18-001	08/04/2021	08/04/2020	08/10/2020	08/04/2020
	JS4-18004000-30-5A	02-02/17-05-017				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	BBHA 9120 E 251	02-02/24-05-006	15/07/2020	15/07/2019	05/09/2020	05/03/2020
	BBHA 9170	02-02/24-05-014	12/06/2021	12/06/2018	14/01/2021	14/01/2020
	WBH2-18NHG	02-02/24-08-002	15/07/2020	15/07/2019	05/09/2020	05/03/2020
	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	02-02/24-17-002				
	05-HA25	02-02/24-17-004				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	KMS102-0.2 m	02-02/50-11-020				
	SF104/11SMA/11N/2000MM	02-02/50-15-003				
	SF104/11SMA/11N/2000MM	02-02/50-15-004				

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.