R F – T E S T R E P O R T

- FCC Part 15.255 -

Type / Model Name	:	KY-LOC 1D.02.01
Product Description	:	Radar sensor
Applicant	:	Kymati GmbH
Address	:	Am Hochacker 5
		85630 GRASBRUNN, GERMANY
Manufacturer	:	Kymati GmbH
Address	:	Am Hochacker 5
		85630 GRASBRUNN, GERMANY

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

Test Report No. : T46910-00-03HS	17. May 2021 Date of issue

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

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2020)

Part 15, Subpart A, Section 15.31	Measurement standards

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2020)

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

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 (a) (2) as a field disturbance sensor for fixed operation.

2.5 Short description of the equipment under test (EUT)

The EUT is a radar sensor in the operating band 61.0 GHz to 61.5 GHz. It determines the distance in primary or secondary radar mode.

Number of tested samples: 1
Serial number: 00002005
Firmware version: 1.0

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 of the EUT.

2.7 Operation frequency

The operating frequency is 61.0 GHz to 61.5 GHz.

2.8 Transmit operating modes

Two operation modes are available:

Primary radar mode	0.5 GHz OBW, FMCW, passiv refection
Secondary radar mode	0.5 GHz OBW, FMCW and FSK(The communication link between device 1 and device 2 uses the FSK), two way ranging, active reflection

2.9 Antenna

The following antennas shall be used with the EUT:

- Antenna 0 Integrated linear polarised micro strip patch antenna, 7.0 dBi.
- Antenna 1 Integrated linear polarised micro strip patch antenna, 7.0 dBi.
- Antenna 2 Integrated linear polarised micro strip patch antenna, 7.0 dBi.

2.10 Power supply system utilised

Power supply voltage	:	120 VAC, 60 Hz
Alternative power supply PoE	:	55 VDC

2.11 Peripheral devices and interface cables

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

- Notebook Fujitsu Model : Lifebook, 02-01/01-13-014
- PoE switch, ZYXEL Model : GS1005HP
- Power supply PoE, 55 VDC, Topow Model : TPA187-72550-T3

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 up-right position.

As worst-case, the following 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:

The operation mode with the highest output power is selected for the final measurement:

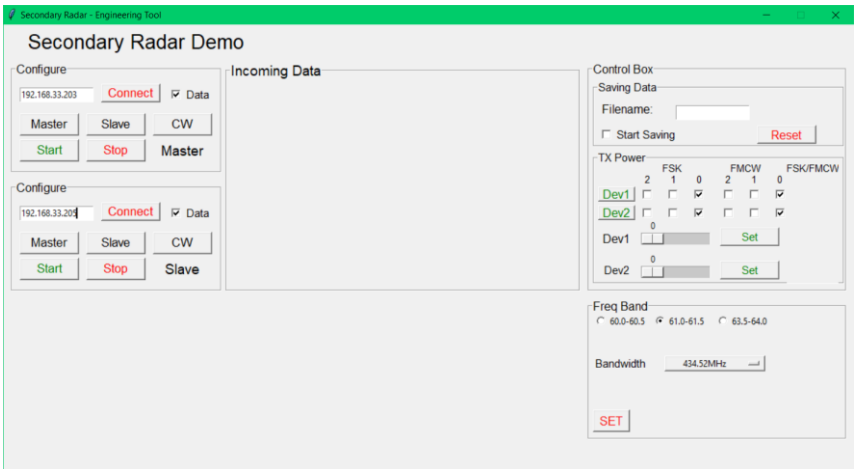
	Power setting	Used antenna	Modulation	Modulation type
Frequency “Low”	P0	0+2	Stopped	CW
Frequency “Mid”	P0	0+2	Stopped	CW
Frequency “High”	P0	0+2	Stopped	CW

2.12.1 Test jig

No test jig is used.

2.12.2 Test software

For test mode TX CW, primary- and secondary radar mode, the following test software is used.



3 TEST RESULT SUMMARY

Operating in the 57 GHz – 71 GHz band:

FCC Rule Part	Description	Result
15.203	Antenna requirement	passed
15.205(a)	Emissions in restricted bands	passed
15.207(a)	AC power line conducted emissions	passed
15.209(a)	Radiated emission limits; general requirements	passed
15.255(c)(2)	EIRP	passed
15.255(d)	Spurious emissions	passed
15.255(e)	Peak conducted output power	passed
15.255(f)	Frequency stability	passed

3.1 Final assessment

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

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

Testing commenced on : 04 December 2020

Testing concluded on : 14 December 2020

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document
2021.05.18 08:09:15 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

I am the author of this document
2021.05.17 16:17:57 +02'00'

Hermann Smetana
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

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

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

4.3 Statement of the measurement uncertainty

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

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
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.

4.1 Measurement protocol for FCC

4.1.1 General information

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

FCC: DE 0011

4.1.2 General Standard information

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

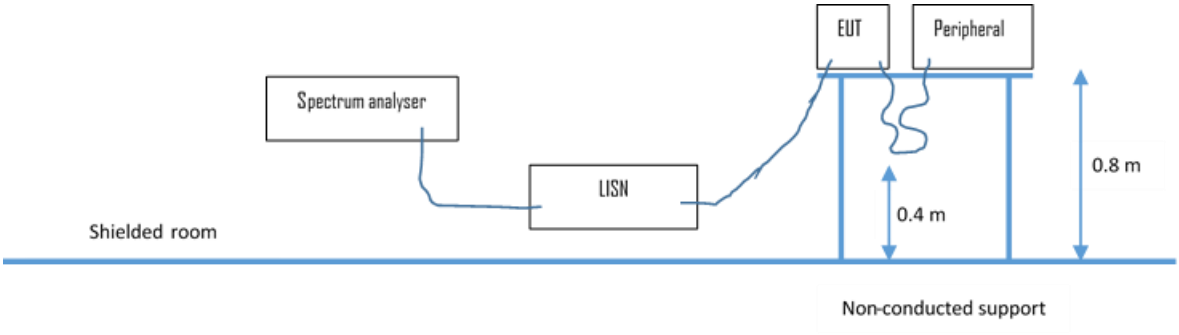
4.1.2.1 Justification

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

4.1.3 Details of test procedures

4.1.3.1 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)

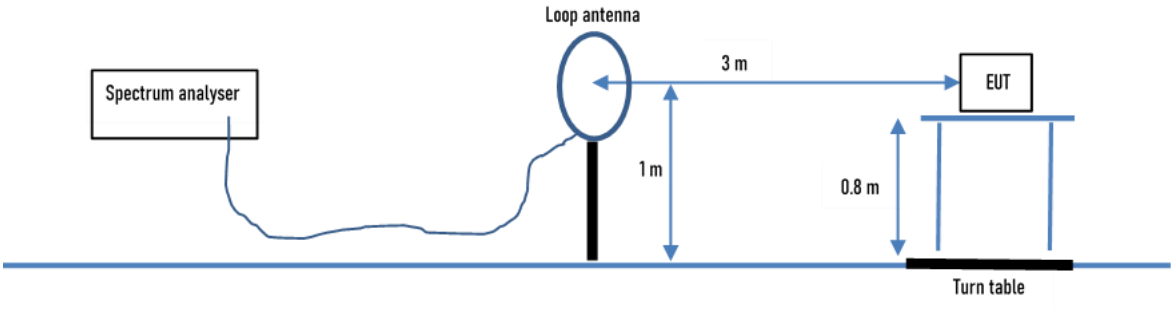
μV = Inverse log(dBμV/20)

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.

4.1.3.2 Radiated emission

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

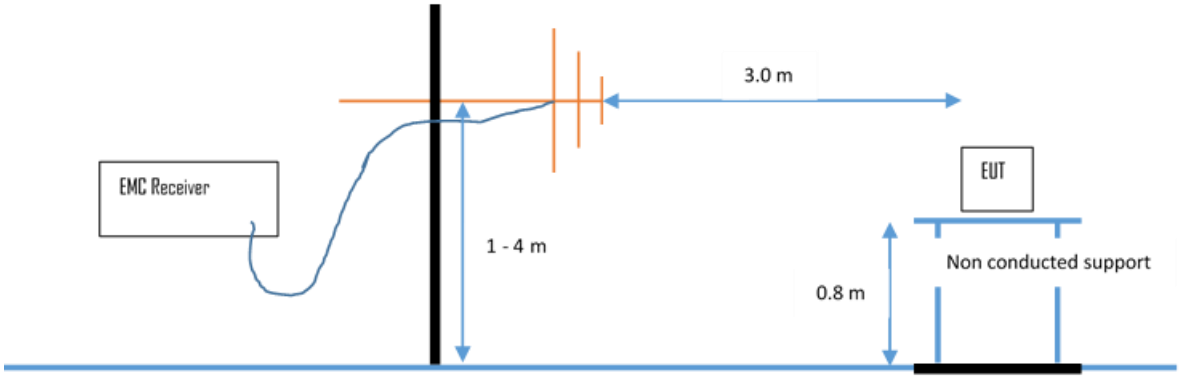
Test setup according ANSI C63.10



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

4.1.3.2.2 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 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.

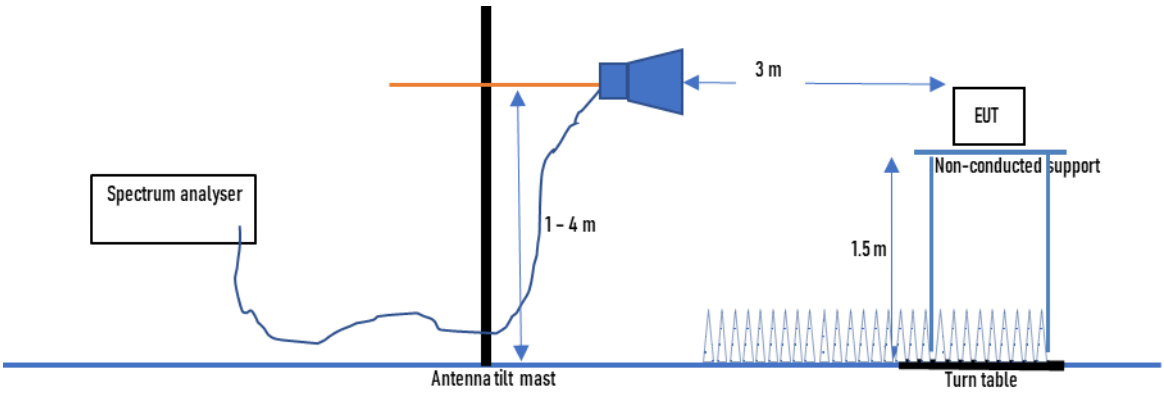
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

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

4.1.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

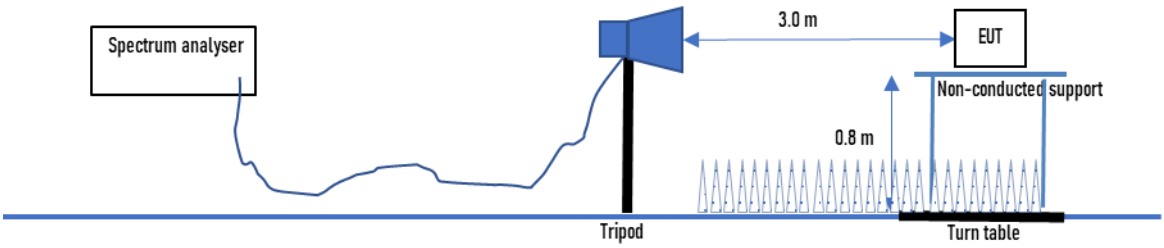
Test setup according ANSI C63.10.



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

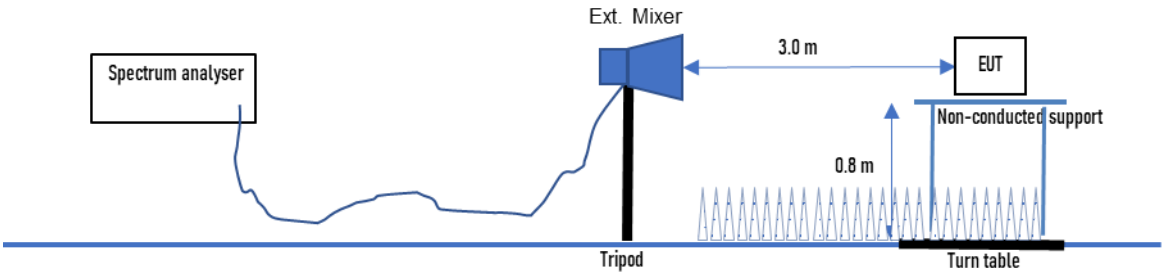
back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.1.3.2.4 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.

4.1.3.2.5 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

5.1.3 Applicable standard

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

5.1.4 Description of Measurement

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

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz
Min. limit margin -18.2 dB at 0.155 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

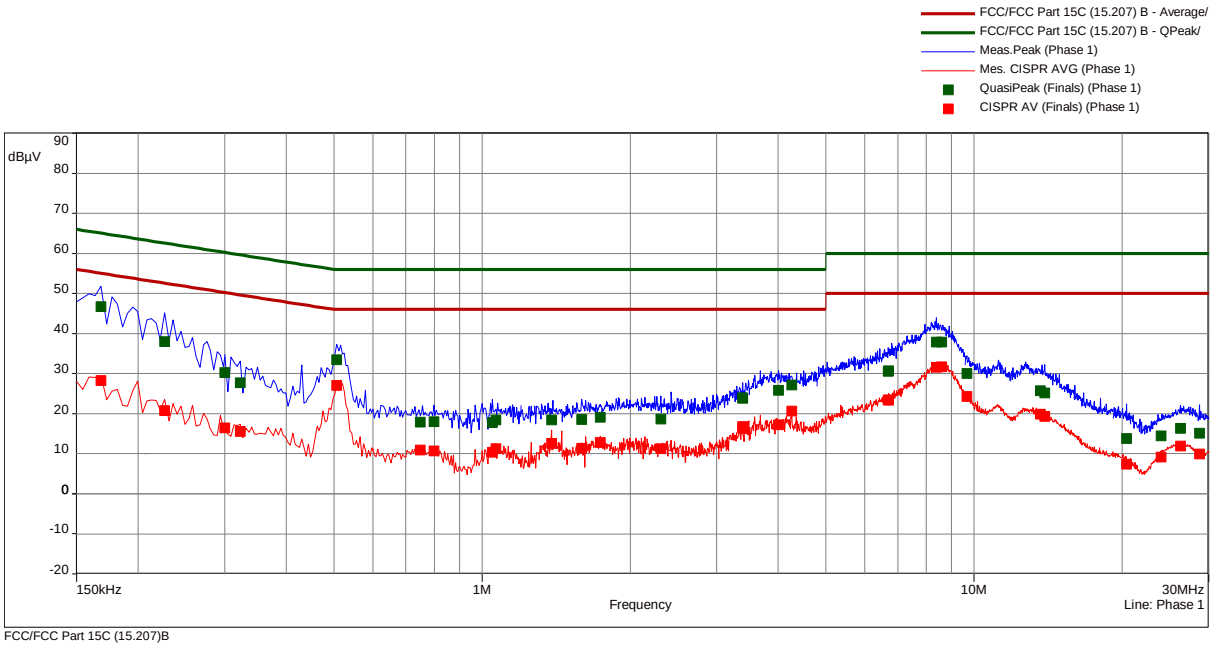
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED.**

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

5.1.6 Test protocol

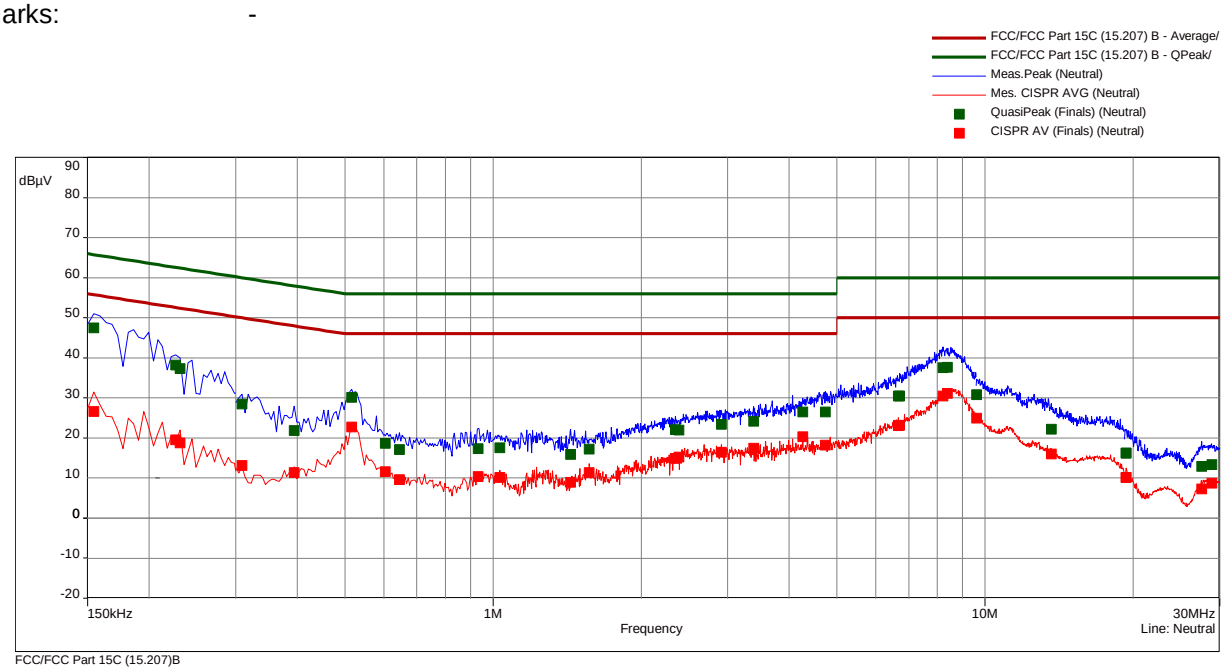
Test point L1 Result: passed
Operation mode: TX, primary radar mode
Remarks: -



freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.168	1	46.8	-18.3	65.1	28.3	-26.8	55.1	Phase 1	10.1
0.227	1	38.0	-24.6	62.6	20.8	-31.8	52.6	Phase 1	10.1
0.300	2	30.3	-29.9	60.2	16.5	-33.8	50.2	Phase 1	10.1
0.323	2	27.8	-31.9	59.6	15.6	-34.1	49.6	Phase 1	10.1
0.507	2	33.5	-22.5	56.0	27.1	-18.9	46.0	Phase 1	10.2
0.749	3	17.9	-38.1	56.0	10.9	-35.1	46.0	Phase 1	10.2
0.798	3	18.0	-38.1	56.0	10.7	-35.3	46.0	Phase 1	10.2
1.050	3	17.8	-38.2	56.0	10.4	-35.7	46.0	Phase 1	10.2
1.068	3	18.5	-37.5	56.0	11.3	-34.7	46.0	Phase 1	10.2
1.385	4	18.5	-37.5	56.0	12.6	-33.4	46.0	Phase 1	10.3
1.596	4	18.5	-37.5	56.0	11.4	-34.6	46.0	Phase 1	10.3
1.740	4	19.2	-36.8	56.0	12.8	-33.2	46.0	Phase 1	10.3
2.312	4	18.7	-37.3	56.0	11.3	-34.7	46.0	Phase 1	10.3
3.386	5	24.0	-32.0	56.0	16.8	-29.2	46.0	Phase 1	10.4
3.390	5	23.9	-32.1	56.0	16.4	-29.7	46.0	Phase 1	10.4
4.007	5	25.8	-30.2	56.0	17.3	-28.7	46.0	Phase 1	10.4
4.259	5	27.2	-28.8	56.0	20.7	-25.3	46.0	Phase 1	10.4
6.686	6	30.5	-29.5	60.0	23.4	-26.6	50.0	Phase 1	10.6
6.708	6	30.7	-29.3	60.0	23.4	-26.6	50.0	Phase 1	10.6
8.387	6	37.9	-22.1	60.0	31.6	-18.5	50.0	Phase 1	10.7
8.589	6	37.8	-22.2	60.0	31.7	-18.3	50.0	Phase 1	10.7
9.681	7	30.0	-30.0	60.0	24.3	-25.8	50.0	Phase 1	10.7
13.637	7	25.7	-34.3	60.0	19.8	-30.2	50.0	Phase 1	11.1
13.911	7	25.1	-34.9	60.0	19.4	-30.6	50.0	Phase 1	11.1
20.429	8	13.8	-46.2	60.0	7.4	-42.6	50.0	Phase 1	11.5
23.997	8	14.4	-45.6	60.0	9.2	-40.8	50.0	Phase 1	11.6
26.292	8	16.3	-43.7	60.0	11.9	-38.1	50.0	Phase 1	11.7
28.713	8	15.1	-44.9	60.0	9.9	-40.1	50.0	Phase 1	11.7

Test point: N
Operation mode: TX
Remarks: -

Result: passed



FCC/FCC Part 15C (15.207)B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.155	9	47.5	-18.2	65.8	26.7	-29.1	55.8	Neutral	10.1
0.227	9	38.2	-24.4	62.6	19.5	-33.1	52.6	Neutral	10.1
0.231	9	37.4	-25.1	62.4	18.8	-33.6	52.4	Neutral	10.1
0.309	10	28.5	-31.5	60.0	13.1	-36.9	50.0	Neutral	10.1
0.395	10	21.9	-36.1	58.0	11.4	-36.6	48.0	Neutral	10.2
0.516	10	30.1	-25.9	56.0	22.8	-23.2	46.0	Neutral	10.2
0.605	11	18.7	-37.3	56.0	11.6	-34.4	46.0	Neutral	10.2
0.645	11	17.1	-38.9	56.0	9.6	-36.4	46.0	Neutral	10.2
0.933	11	17.3	-38.7	56.0	10.4	-35.7	46.0	Neutral	10.2
1.032	11	17.6	-38.4	56.0	10.1	-35.9	46.0	Neutral	10.2
1.439	12	15.9	-40.1	56.0	8.9	-37.1	46.0	Neutral	10.3
1.569	12	17.2	-38.8	56.0	11.4	-34.7	46.0	Neutral	10.3
2.348	12	22.1	-34.0	56.0	14.9	-31.1	46.0	Neutral	10.3
2.388	12	22.0	-34.0	56.0	15.2	-30.8	46.0	Neutral	10.3
2.913	13	23.4	-32.6	56.0	16.4	-29.6	46.0	Neutral	10.3
3.390	13	24.2	-31.9	56.0	17.5	-28.5	46.0	Neutral	10.4
4.259	13	26.5	-29.5	56.0	20.3	-25.7	46.0	Neutral	10.4
4.740	13	26.5	-29.5	56.0	18.2	-27.8	46.0	Neutral	10.4
6.668	14	30.5	-29.5	60.0	23.1	-26.9	50.0	Neutral	10.6
6.708	14	30.5	-29.5	60.0	23.2	-26.8	50.0	Neutral	10.6
8.220	14	37.5	-22.5	60.0	30.5	-19.5	50.0	Neutral	10.6
8.378	14	37.7	-22.3	60.0	31.2	-18.8	50.0	Neutral	10.6
9.614	15	30.9	-29.1	60.0	24.9	-25.1	50.0	Neutral	10.7
13.646	15	22.3	-37.8	60.0	16.1	-34.0	50.0	Neutral	10.9
19.358	16	16.3	-43.7	60.0	10.2	-39.8	50.0	Neutral	11.2
19.362	16	16.2	-43.8	60.0	10.2	-39.8	50.0	Neutral	11.2
27.539	16	12.9	-47.1	60.0	7.3	-42.7	50.0	Neutral	11.2
28.902	16	13.4	-46.6	60.0	8.7	-41.3	50.0	Neutral	11.1

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 1
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

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: 1 MHz	VBW: 3 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 61.25 GHz, antenna 0:
Equation (19): $E = 126.8 - 20\log(\lambda) + P - G$
λ (61.25 GHz) = 0.00495; $20\log(\lambda) = -46.1$;
G = 22 dBi;
P (measured) (Pk) = -34.7 dBm;
P (measured) (AVG) = -34.9 dBm;

E (Pk) = 126.8 + 46.1 – 34.7 - 22 = 116.2 dBµV/m;
E (AVG) = 126.8 + 46.1 – 34.9 - 22 = 116.0 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) = 116.2 + 9.5 – 104.7 = 21.0 dBm;
EIRP (AVG) = 116.0 + 9.5 – 104.7 = 20.8 dBm;
Equation (24): $EIRPLinear = 10^{[(EIRPLog - 30)\ 10]}$;
EIRP (Pk) = 0.126 W;
EIRP (AVG) = 0.120 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} = 7.0 dBi; (5.0, lin)
EIRP = 21 dBm $P_{cond} = 126 / 5.0 = 25$ mW;

5.2.5 Test result

Frequency (MHz)	Antenna	Level PK (dBm)	Limit PK (dBm)	Margin PK (dB)	Level AV (dBm)	Limit AV (dBm)	Margin AV (dB)
61.05	0	19.8	43.0	-23.2	19.6	40.0	-20.4
61.25	0	21.0	43.0	-22.1	20.8	40.0	-19.2
61.45	0	20.3	43.0	-22.7	20.1	40.0	-19.9
61.05	1	20.1	43.0	-22.9	19.9	40.0	-20.1
61.25	1	20.9	43.0	-22.1	20.7	40.0	-19.3
61.45	1	21.0	43.0	-22.0	20.8	40.0	-19.2
61.05	2	20.6	43.0	-22.4	20.4	40.0	-19.6
61.25	2	21.6	43.0	-21.4	21.4	40.0	-18.6
61.45	2	21.0	43.0	-22.0	20.8	40.0	-19.2
61.05	0+1	22.7	43.0	-20.3	22.1	40.0	-17.9
61.25	0+1	23.1	43.0	-19.9	22.9	40.0	-17.1
61.45	0+1	21.9	43.0	-21.1	21.7	40.0	-18.3
61.05	0+2	23.6	43.0	-19.4	23.4	40.0	-16.6
61.25	0+2	25.3	43.0	-17.7	25.2	40.0	-14.8
61.45	0+2	25.1	43.0	-17.9	25.0	40.0	-15.0

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.**

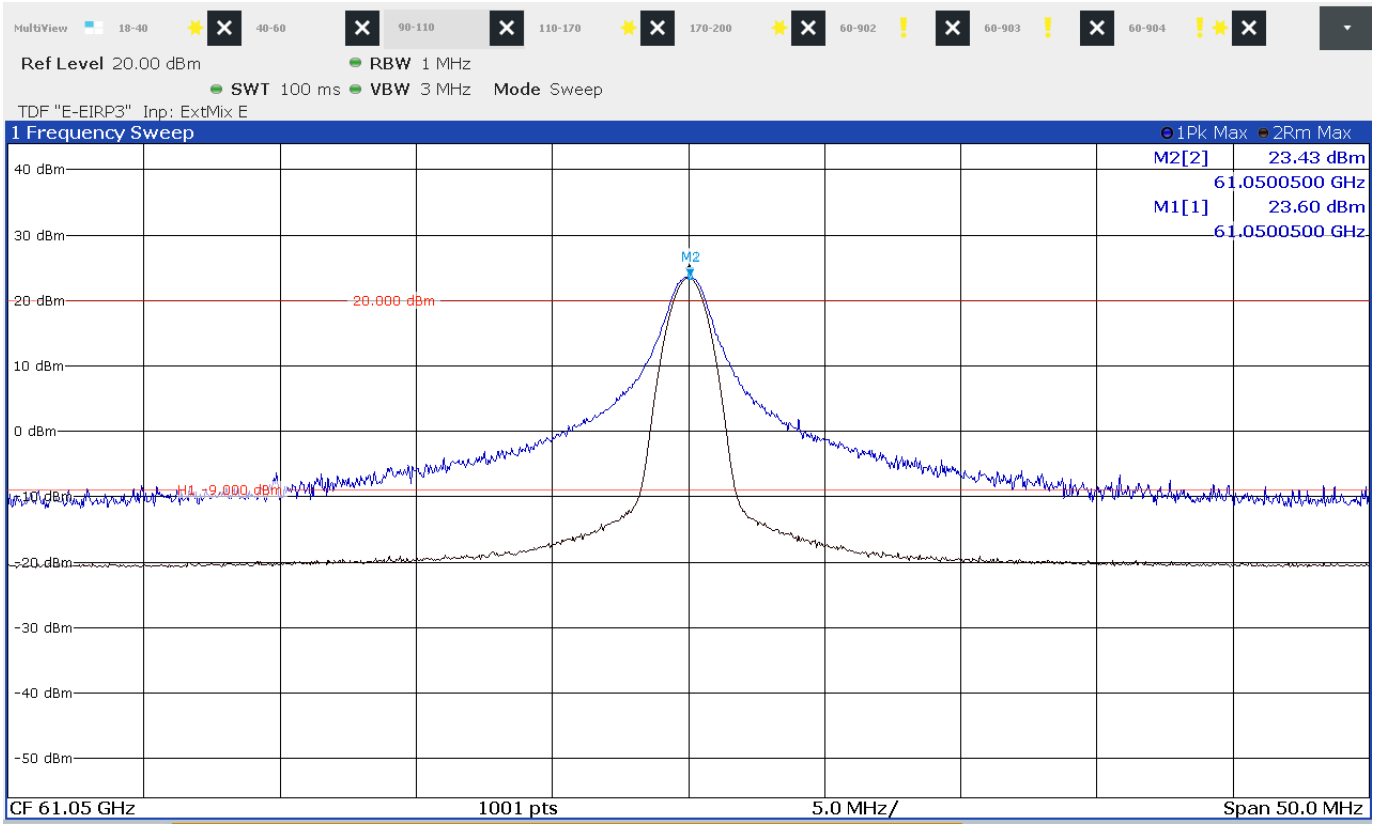
Remarks: _____

_____

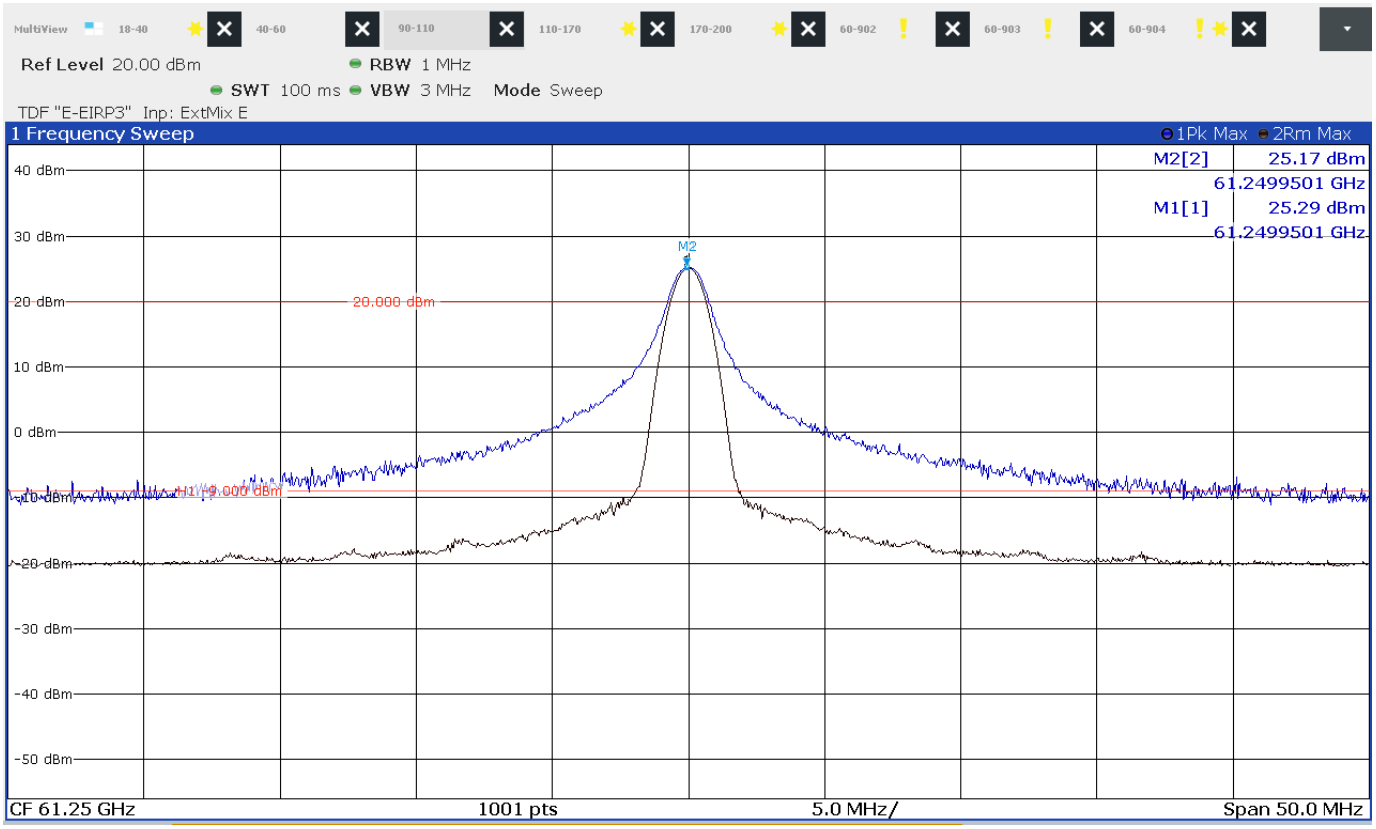
5.2.6 Test protocols

Antenna0+2

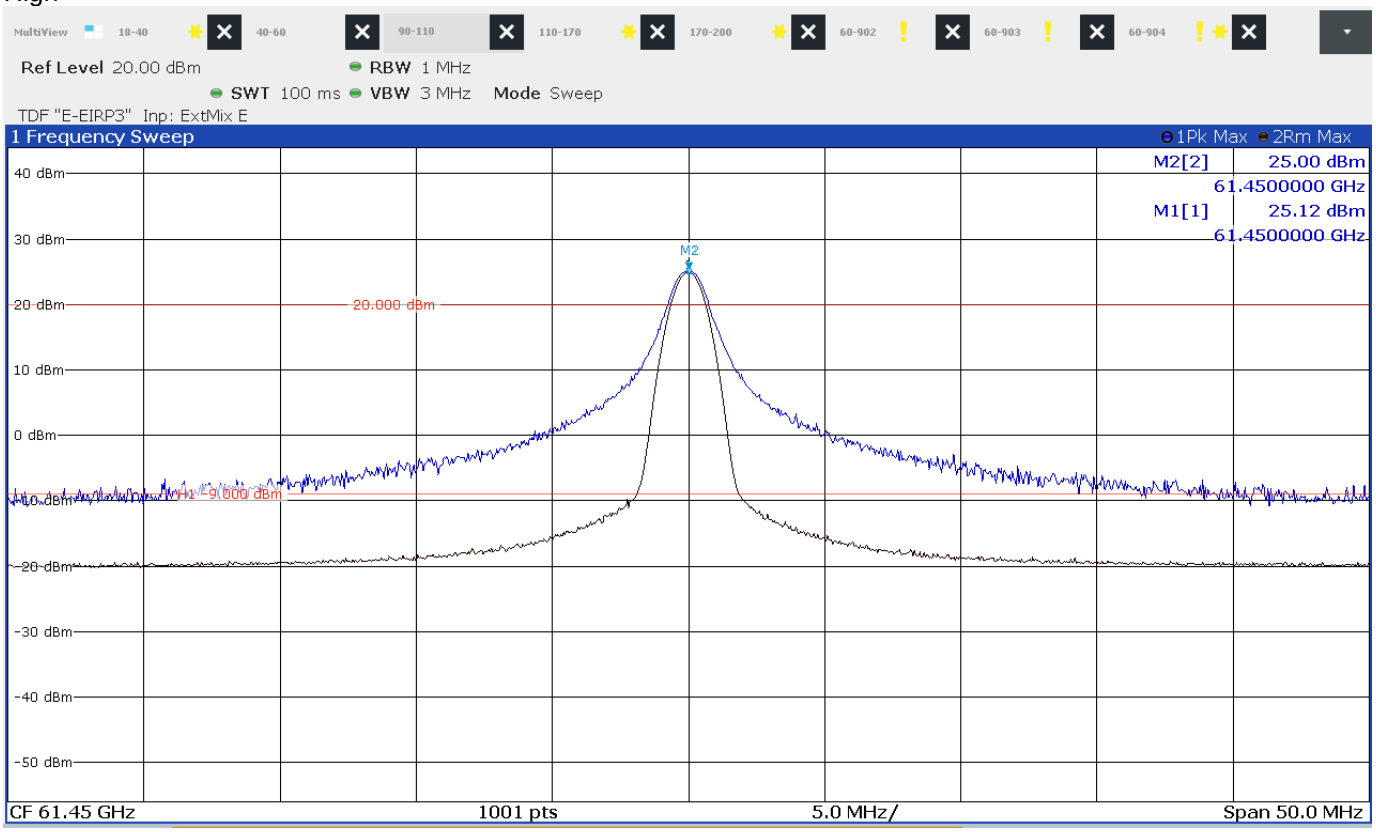
Low



Mid



High



5.3 Peak conducted output power

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

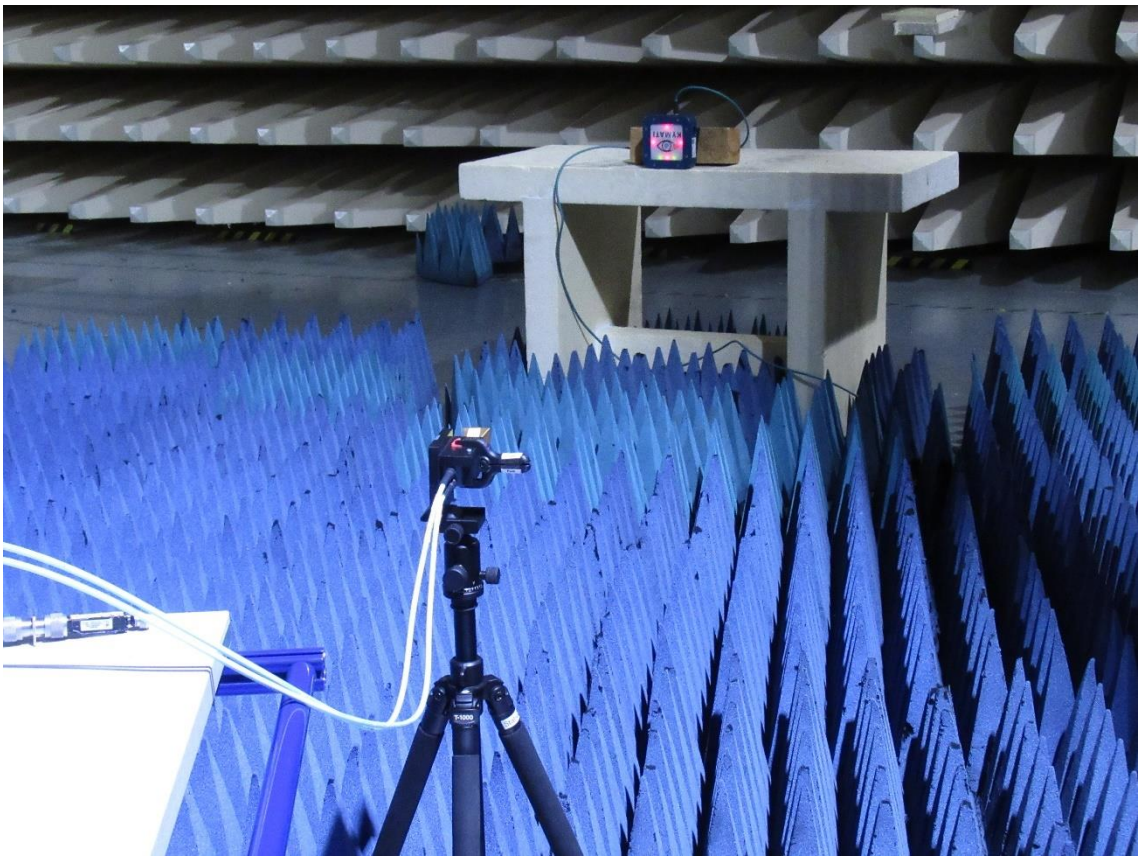
5.3.1 Description of the test location

Test location: Anechoic chamber 1
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



5.3.4 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate horn 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, FMCW stopped, under normal conditions.

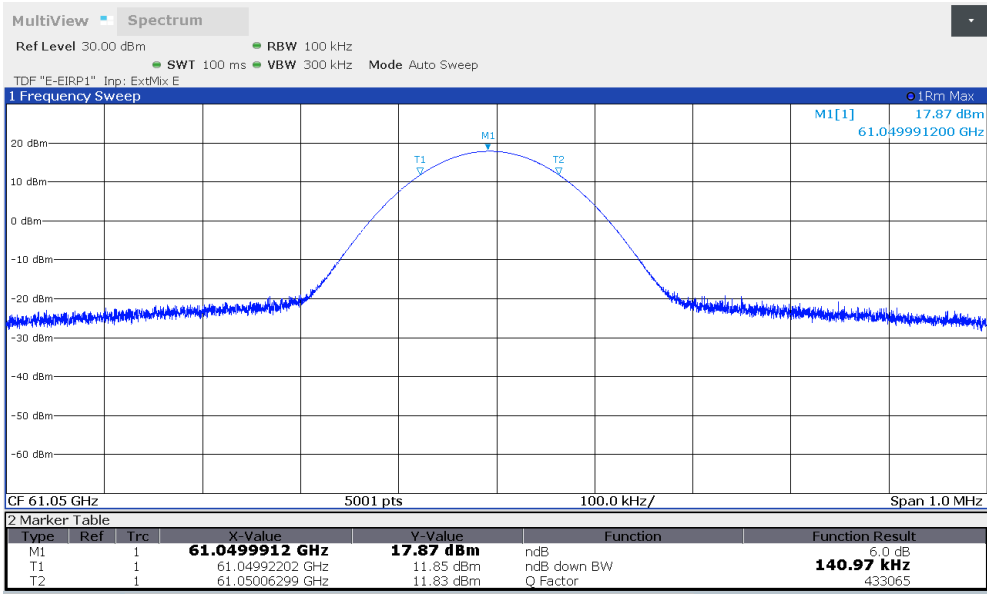
Analyser settings:
AV measurement: RBW: 100 kHz VBW: 300 kHz Detector: RMS Trace. Max hold

5.3.5 Test result

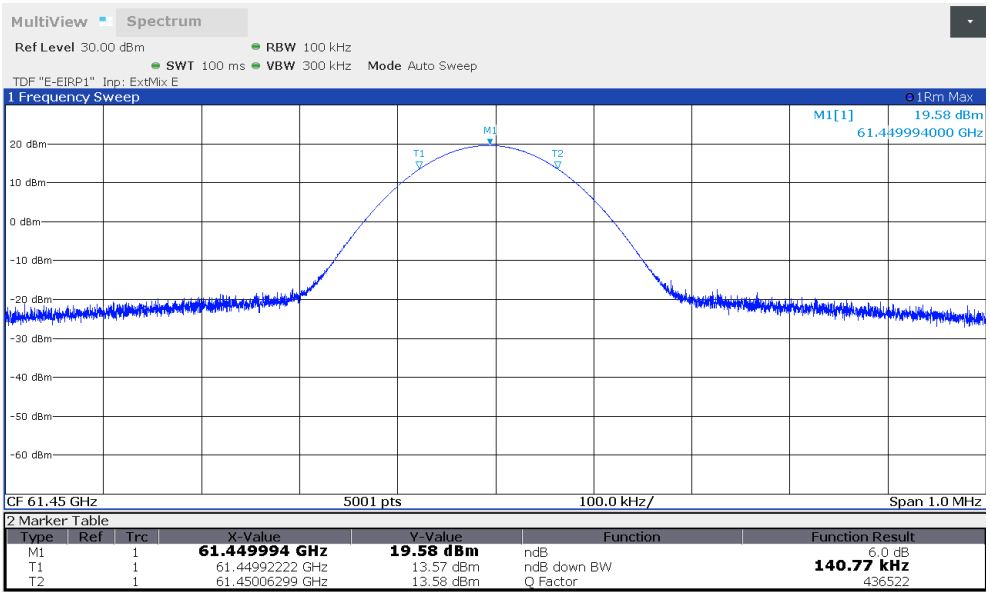
Determination of the conducted output power limit:

EBW6dB, antenna 0+2, secondary radar mode:

f_{low}



f_{high}



Calculation of the emission bandwidth:

flow	fhigh	EBW 6dB
(MHz)	(MHz)	(MHz)
61049.922	61450.630	400.708

The emission of the EUT is larger than 100 MHz, the limit applies is 500 mW.

Calculation of the peak transmitter conducted output power:

Frequency	Antenna	Level EIRP PK	Antenna gain	Array gain	Conducted level PK	Conducted level PK	Limit	Margin
(MHz)		(dBm)	(dBi)	(dBi)	(dBm)	(mW)	(mW)	(mW)
61.05	0	19.8	7	-	12.8	19.2	500	-480.8
61.25	0	21.0	7	-	14.0	24.8	500	-475.2
61.45	0	20.3	7	-	13.3	21.5	500	-478.5
61.05	1	20.1	7	-	13.1	20.3	500	-479.7
61.25	1	20.9	7	-	13.9	24.6	500	-475.4
61.45	1	21.0	7	-	14.0	25.3	500	-474.7
61.05	2	20.6	7	-	13.6	23.1	500	-476.9
61.25	2	21.6	7	-	14.6	29.0	500	-471.0
61.45	2	21.0	7	-	14.0	25.2	500	-474.8
61.05	0+1	22.1	7	3	12.1	16.2	500	-483.8
61.25	0+1	23.1	7	3	13.1	20.5	500	-479.5
61.45	0+1	21.9	7	3	11.9	15.4	500	-484.6
61.05	0+2	23.6	7	3	13.6	22.9	500	-477.1
61.25	0+2	25.3	7	3	15.3	33.8	500	-466.2
61.45	0+2	25.1	7	3	15.1	32.5	500	-467.5

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).

The requirements are **FULFILLED.**

Remarks: _____

5.4 Spurious emissions

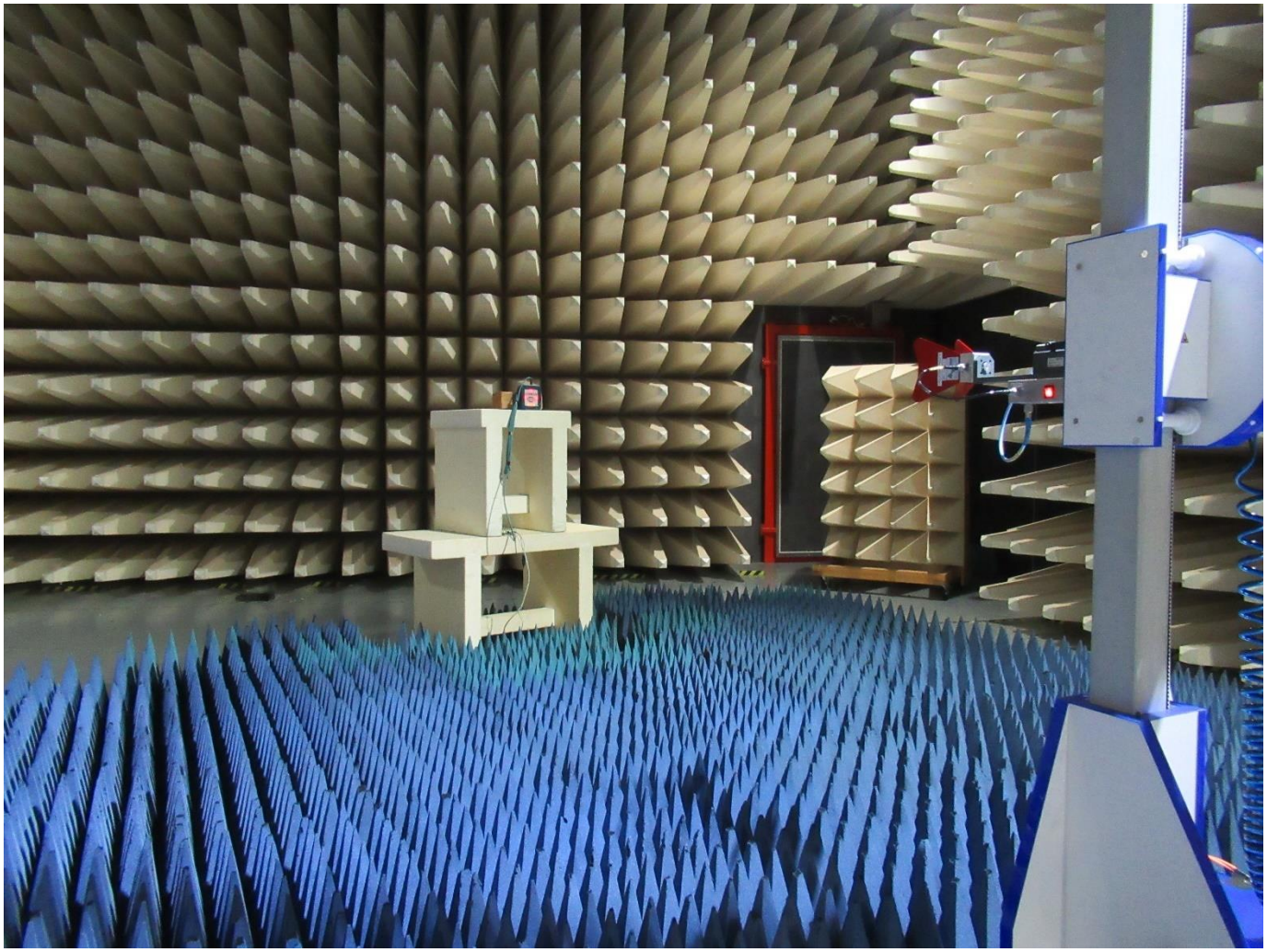
For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

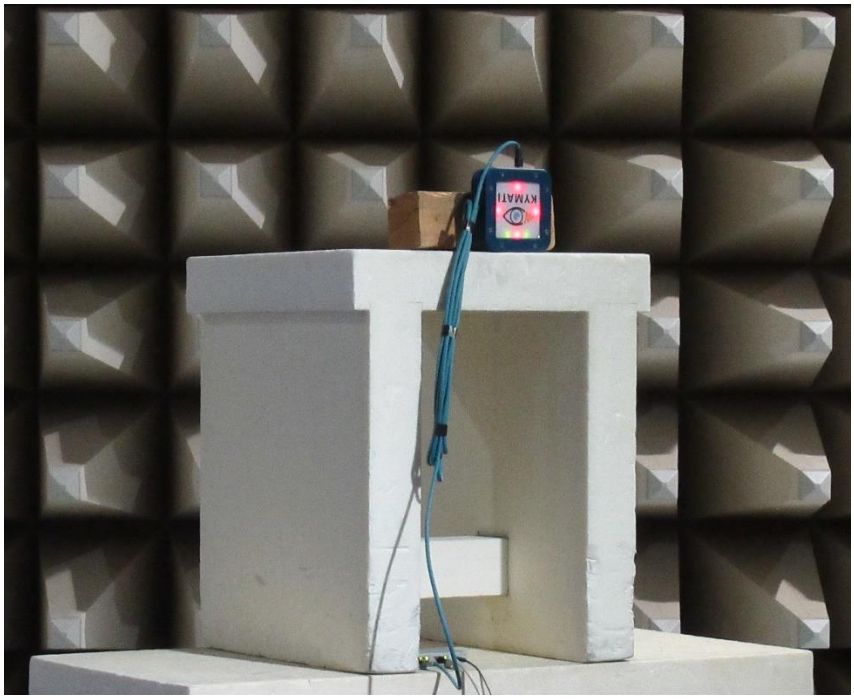
5.4.1 Description of the test location

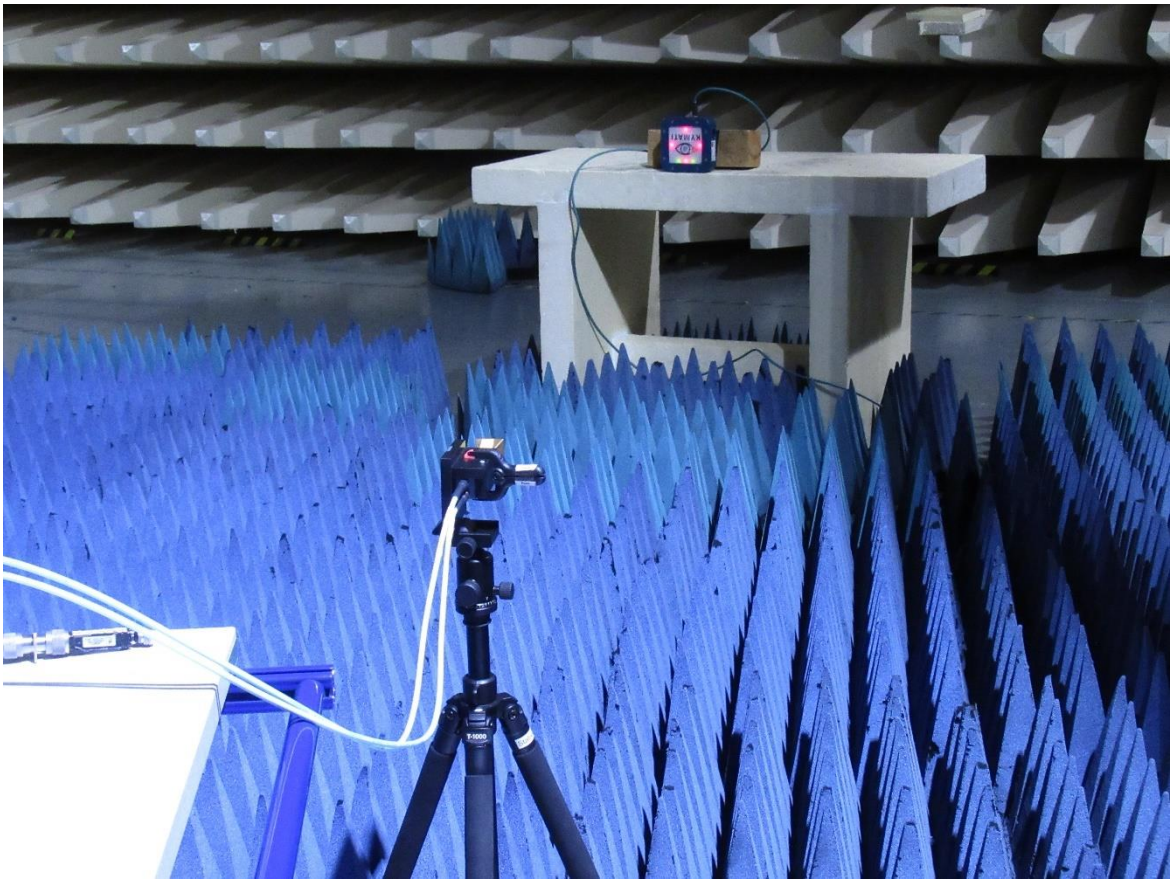
Test location: OATS 1
Test distance: 3 m

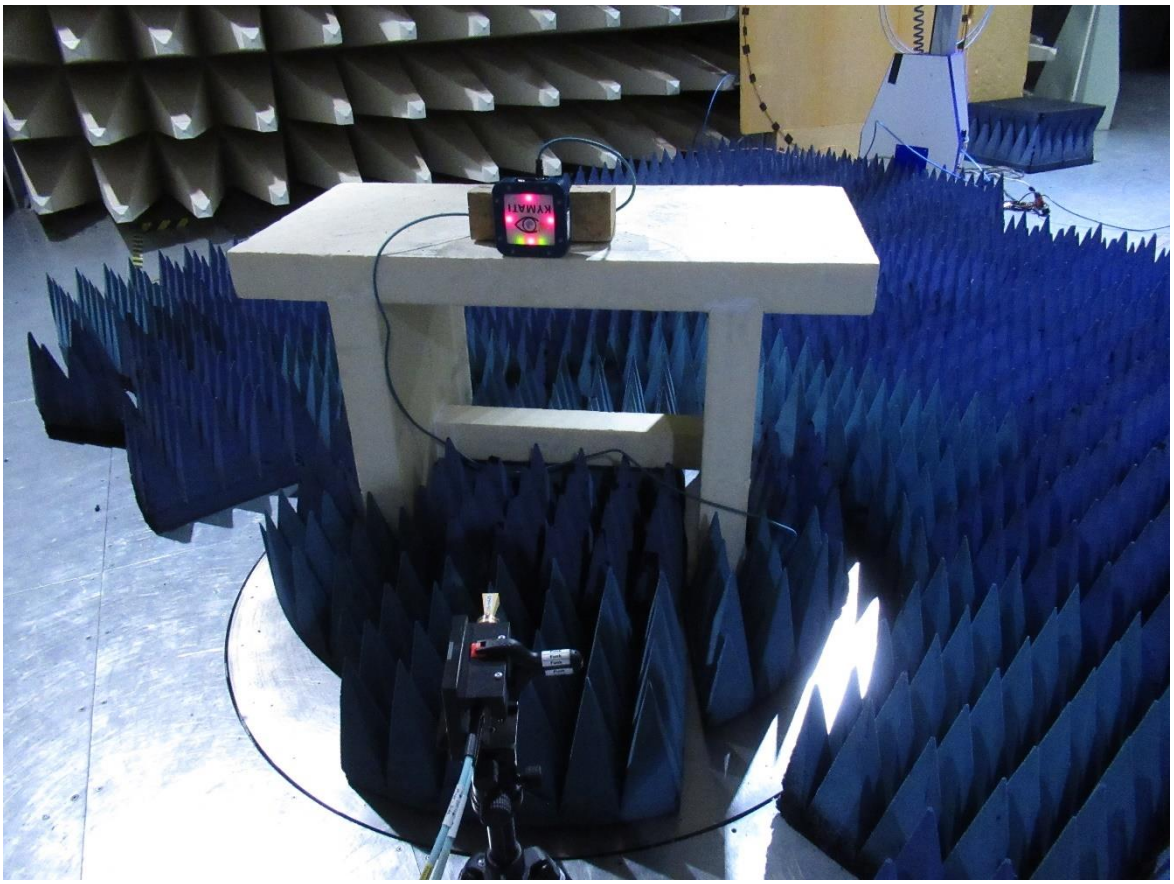
Test location: Anechoic chamber 1
Test distance: 3 m

5.4.2 Photo documentation of the test set-up









5.4.3 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.

5.4.4 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;

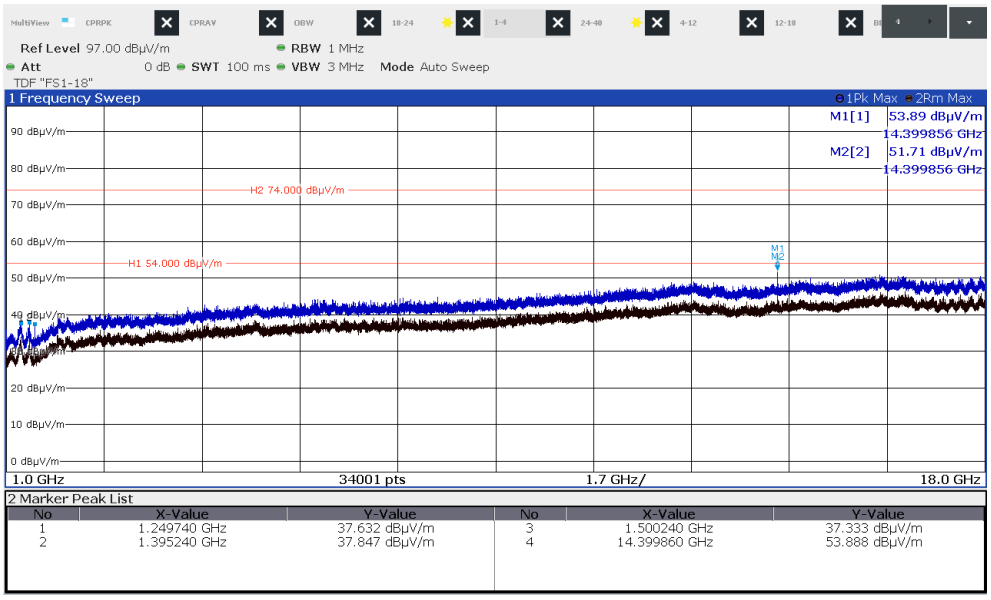
5.4.5 Test result f < 1 GHz

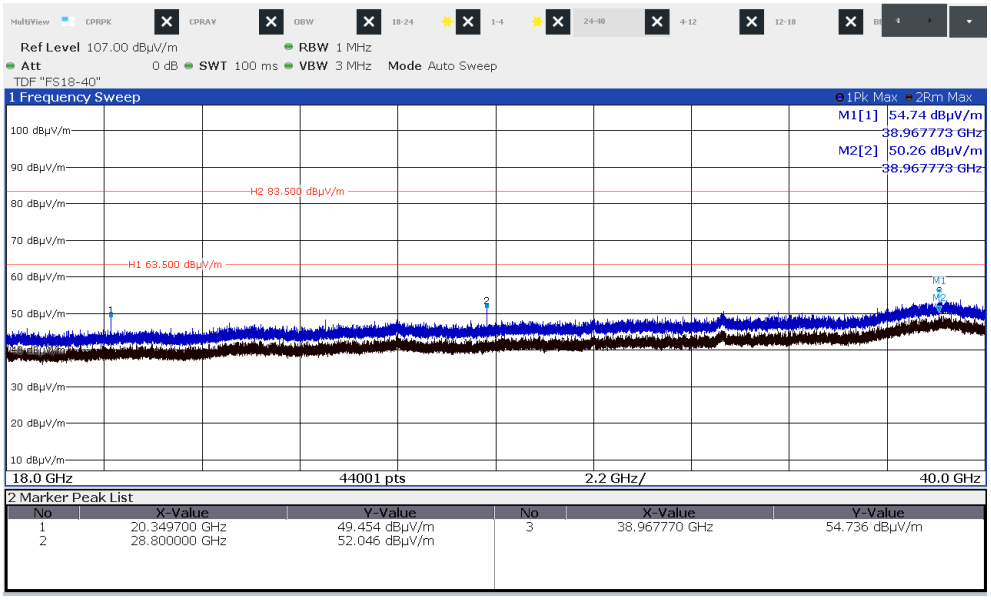
Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
46.70	6.6	8.8	14.7	15.6	21.3	24.4	40.0	-15.6
69.20	4.6	4.8	13.3	13.7	17.9	18.5	40.0	-21.5
162.30	4.1	1.6	16.9	16.3	21.0	17.9	43.5	-22.5
251.00	6.3	11.6	15.7	15.7	22.0	27.3	46.0	-18.7
339.00	2.8	2.2	18.4	18.7	21.2	20.9	46.0	-24.8
839.80	4.5	3.8	28.8	29.2	33.3	33.0	46.0	-12.7

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

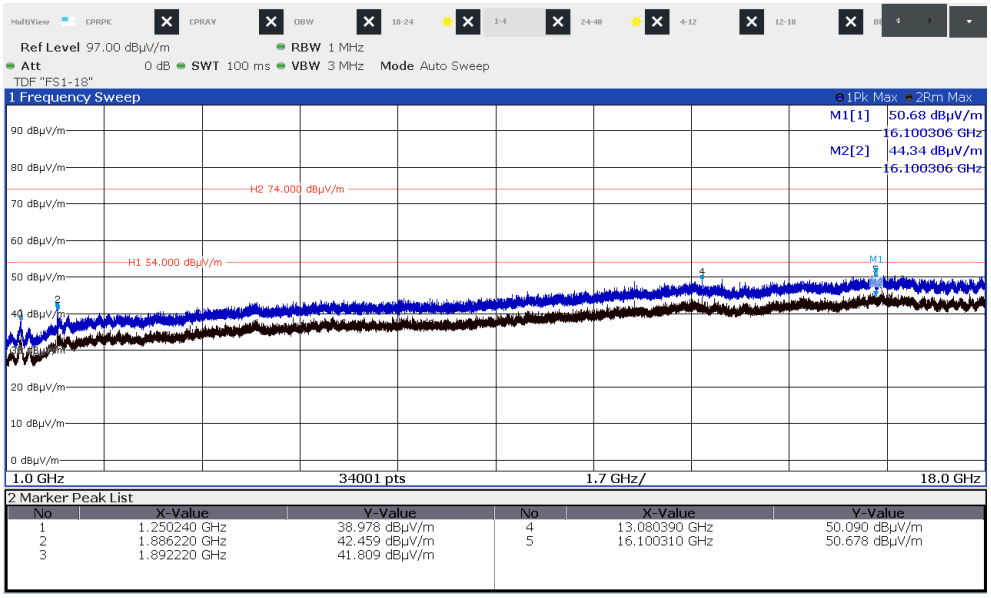
5.4.6 Test result f > 1 GHz

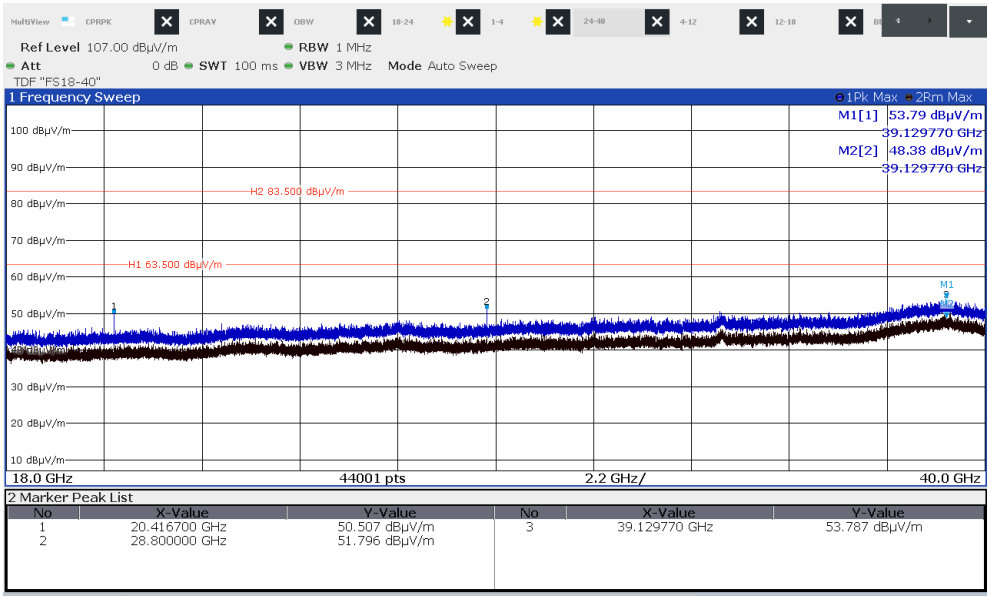
Low:



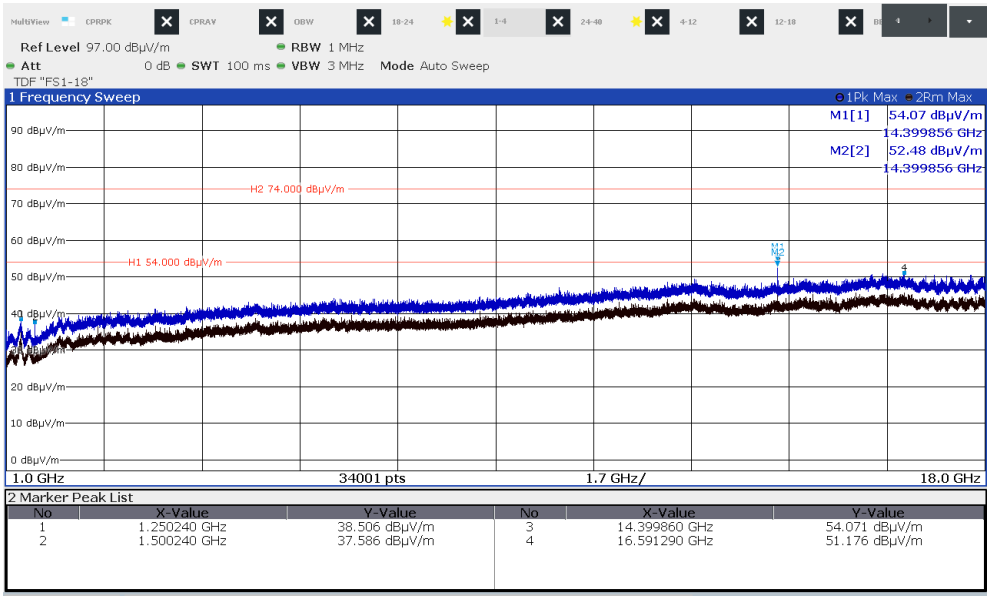


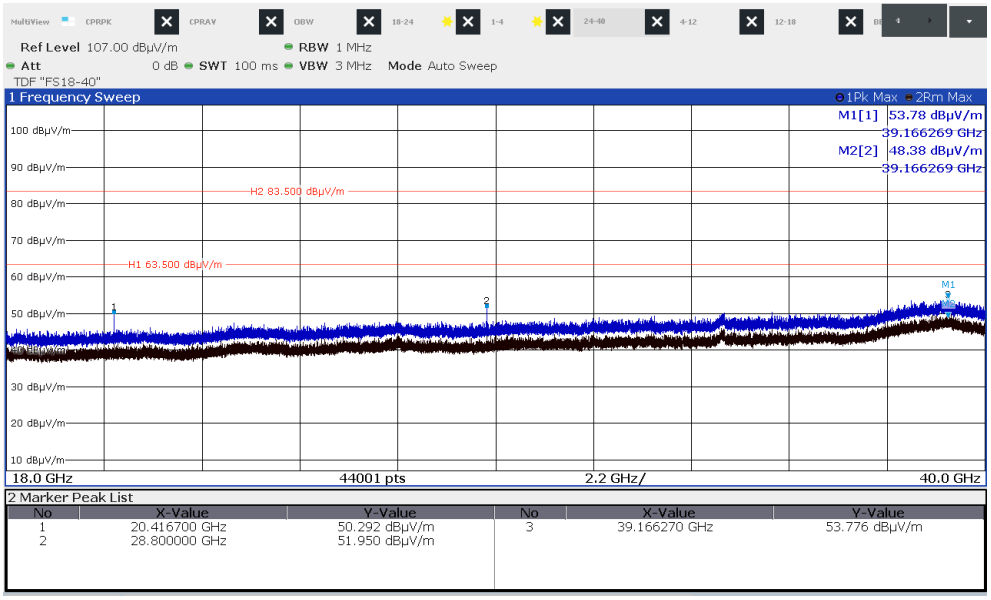
Mid:





High





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

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

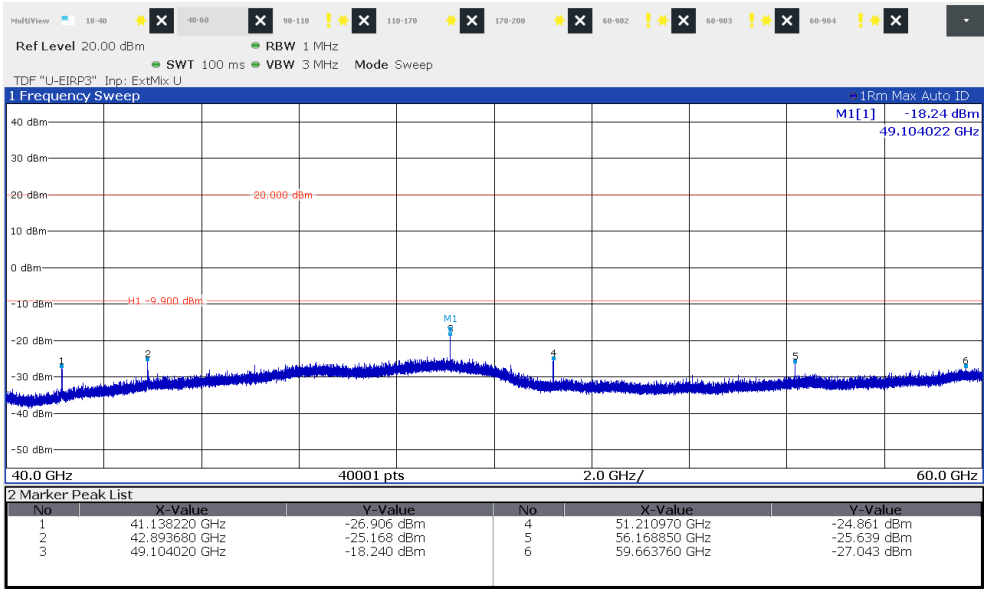
$$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

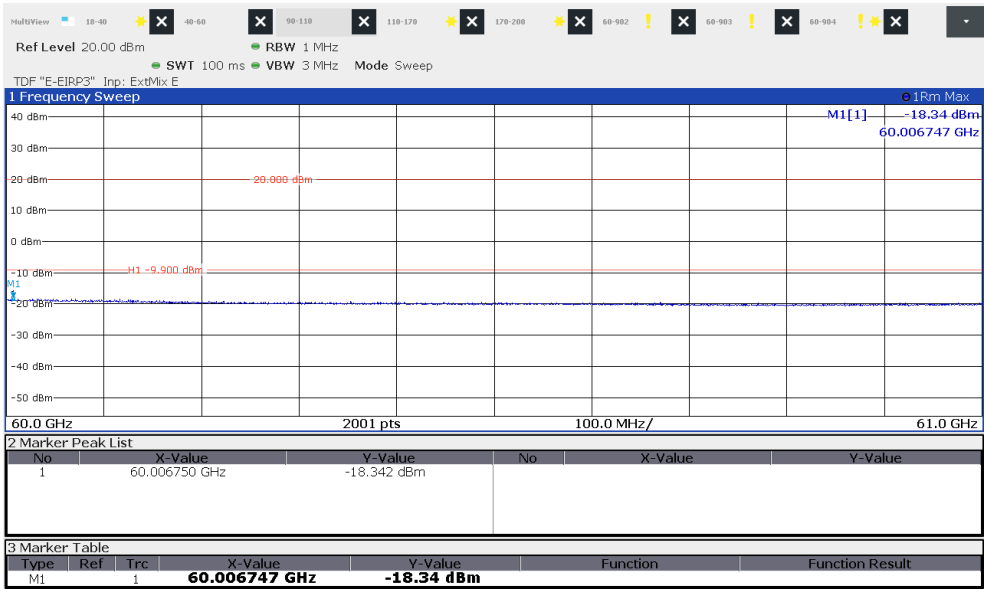
Pout * G = EIRP;
Therefore

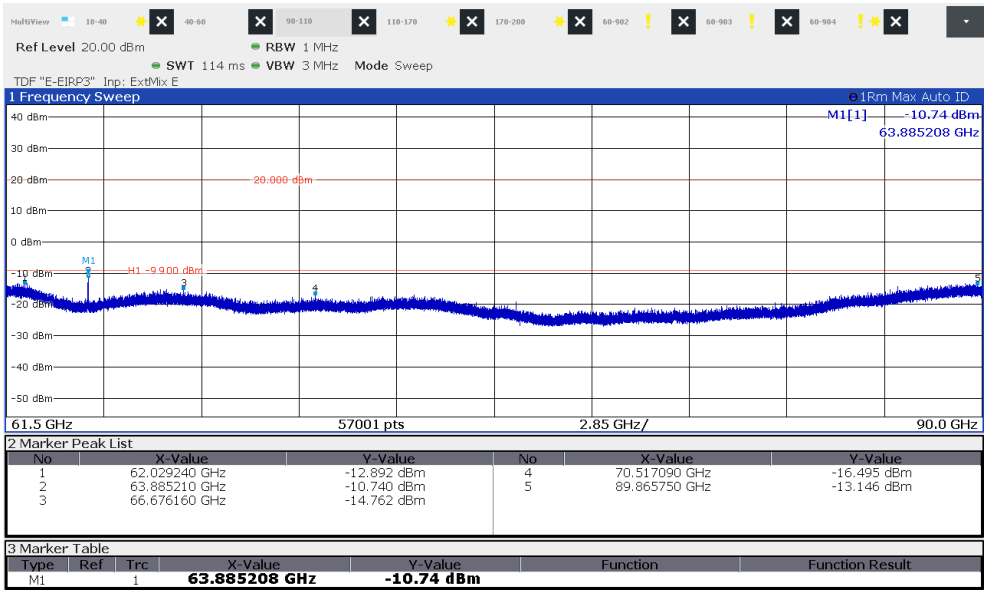
$EIRP = P_d * 4 * \pi * r^2$
EIRP = -9.9 dBm

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

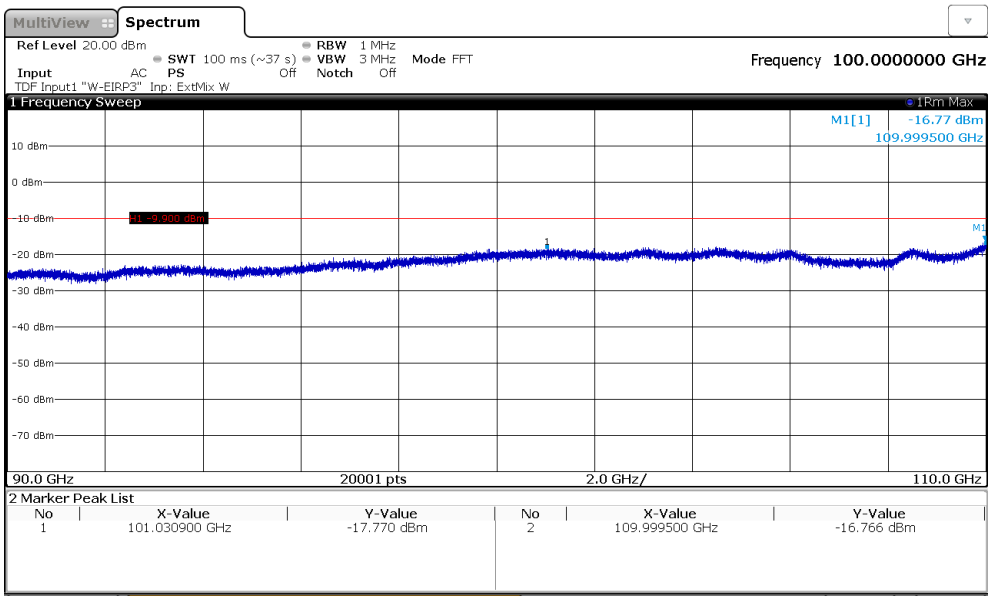
Low:

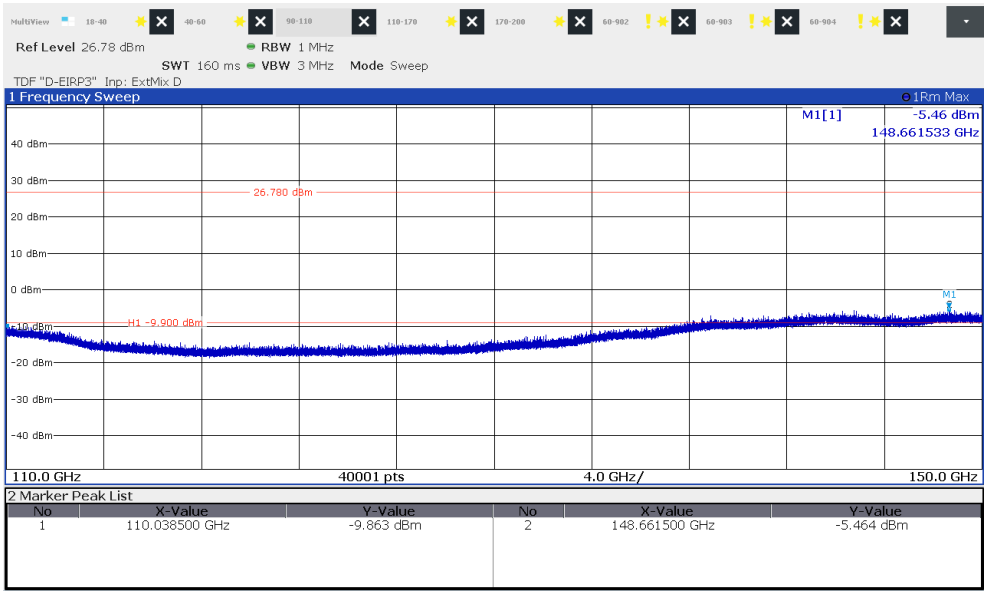


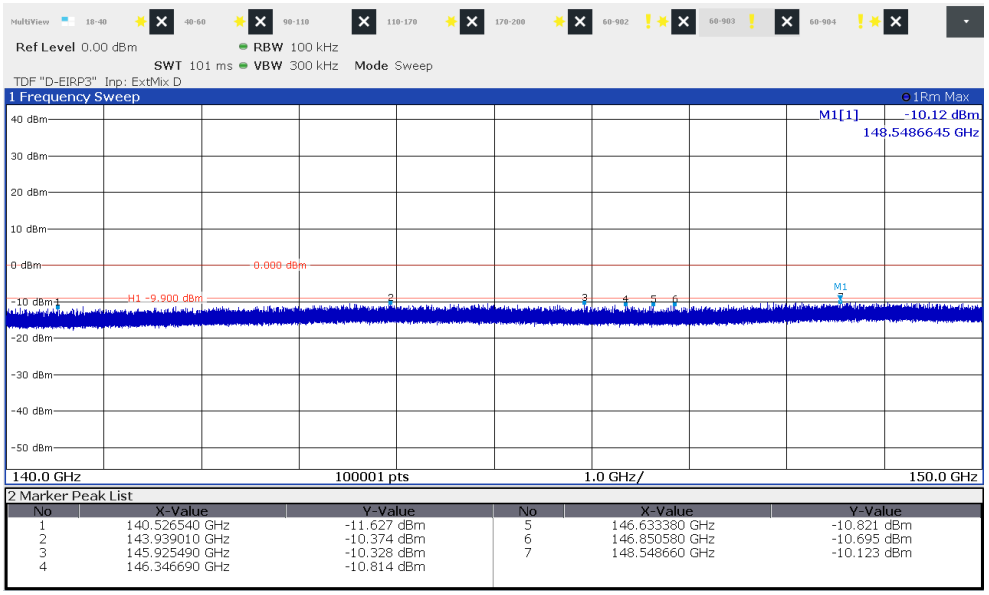




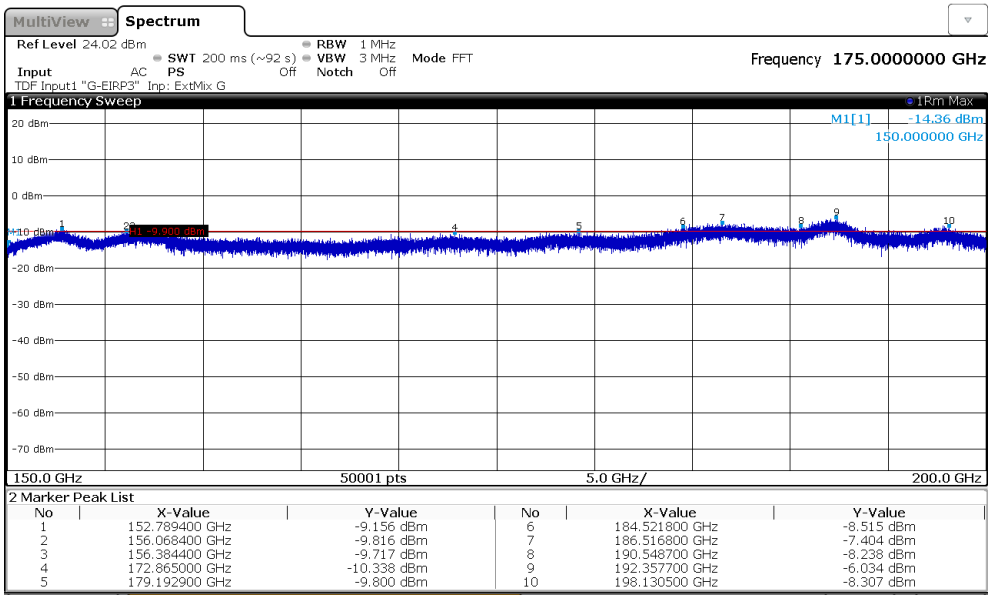
Note: The emission 63.885 GHz are caused by the external Mixer and is ignored.

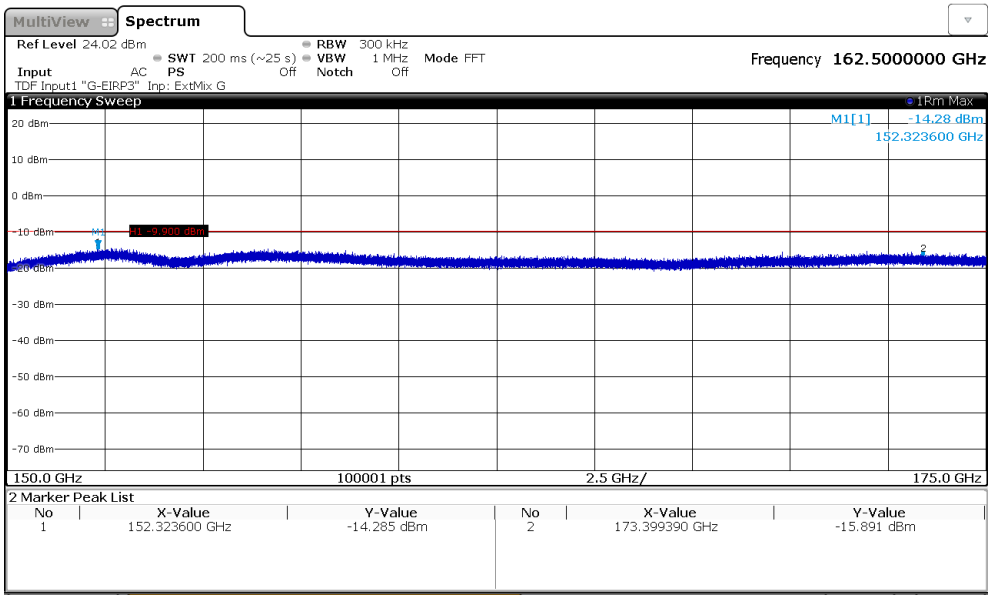




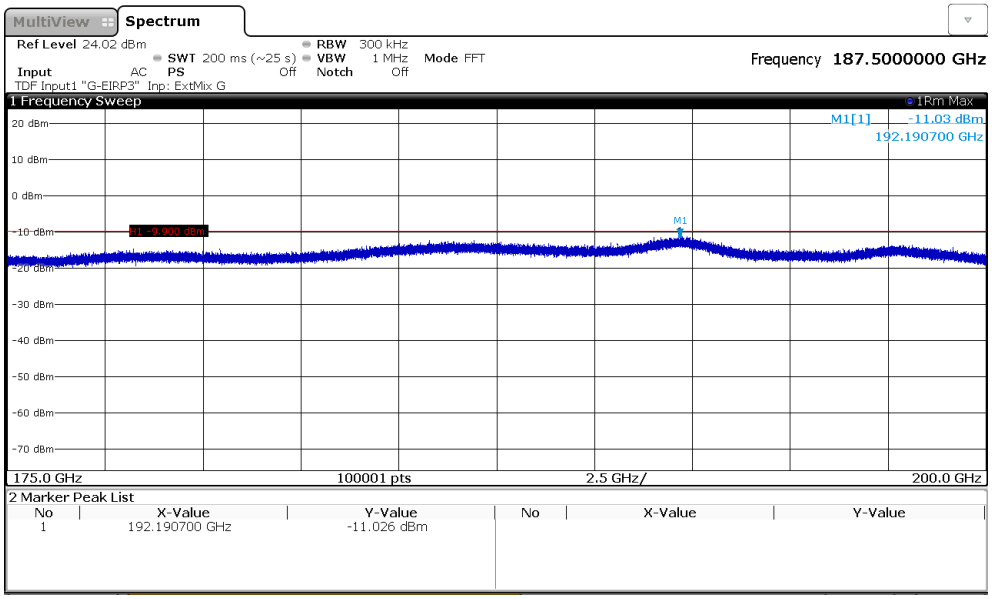


Note: This measurement is done with RBW=100 kHz in order to show no hidden emission is in the noise.



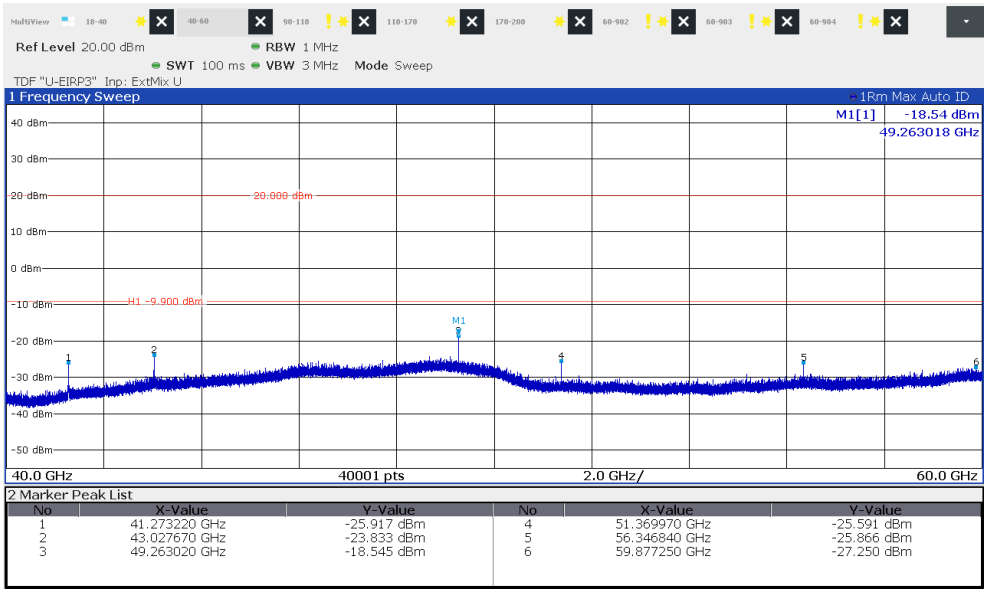


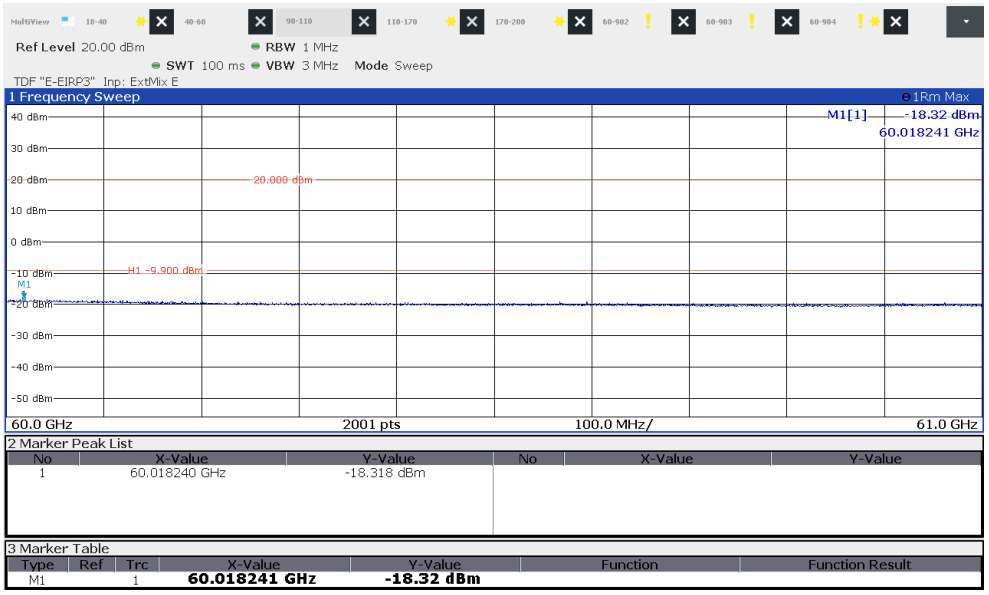
Note: This measurement is done with RBW=300 kHz in order to show no hidden emission is in the noise.



Note: This measurement is done with RBW=300 kHz in order to show no hidden emission is in the noise.

Mid:



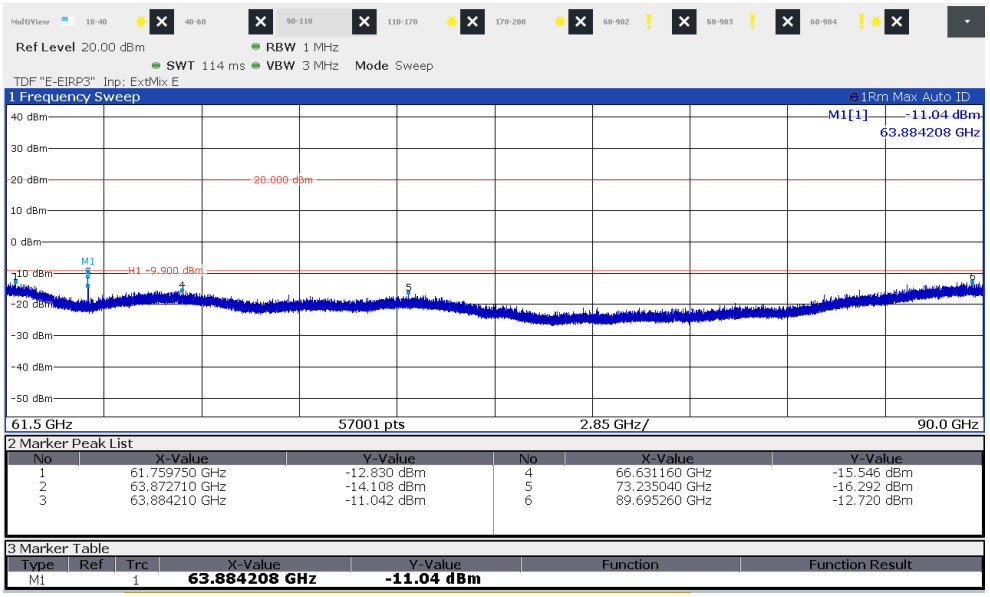


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	60.018240 GHz	-18.318 dBm			

3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**60.018241 GHz**	**-18.32 dBm**		

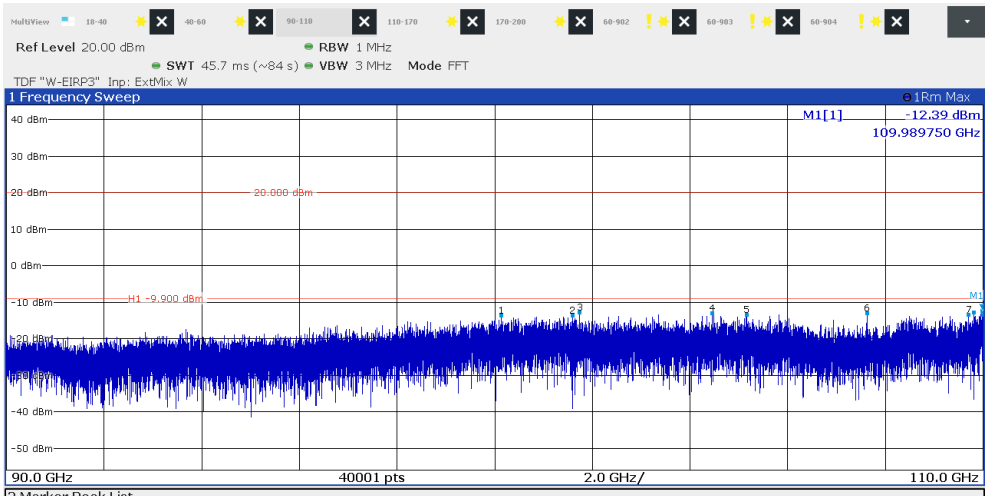


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	61.759750 GHz	-12.830 dBm	4	66.631160 GHz	-15.546 dBm
2	63.872710 GHz	-14.108 dBm	5	73.235040 GHz	-16.292 dBm
3	63.884210 GHz	-11.042 dBm	6	89.695260 GHz	-12.720 dBm

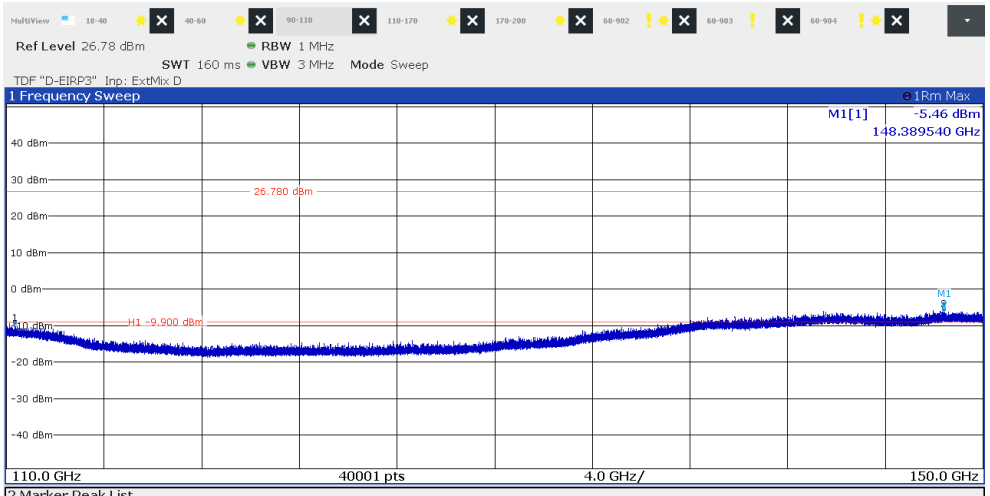
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**63.884208 GHz**	**-11.04 dBm**		



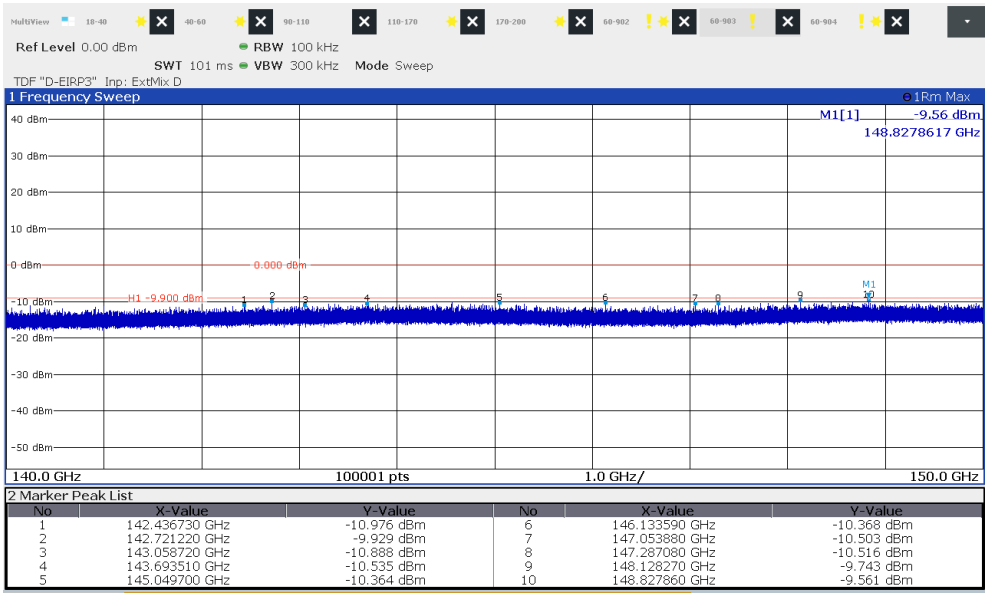
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	100.135000 GHz	-13.674 dBm	6	107.626810 GHz	-13.113 dBm
2	101.588960 GHz	-13.742 dBm	7	109.705260 GHz	-13.388 dBm
3	101.740460 GHz	-12.765 dBm	8	109.810750 GHz	-12.759 dBm
4	104.460890 GHz	-13.007 dBm	9	109.989750 GHz	-12.392 dBm
5	105.153870 GHz	-13.488 dBm	10	109.994250 GHz	-13.538 dBm



2 Marker Peak List

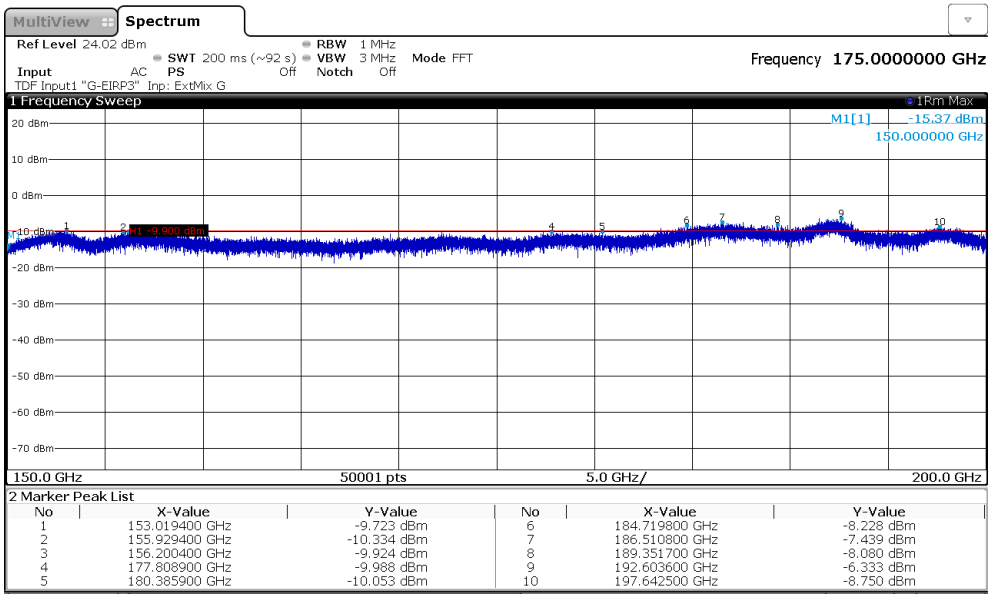
No	X-Value	Y-Value	No	X-Value	Y-Value
1	110.345500 GHz	-9.272 dBm	2	148.389500 GHz	-5.463 dBm



2 Marker Peak List

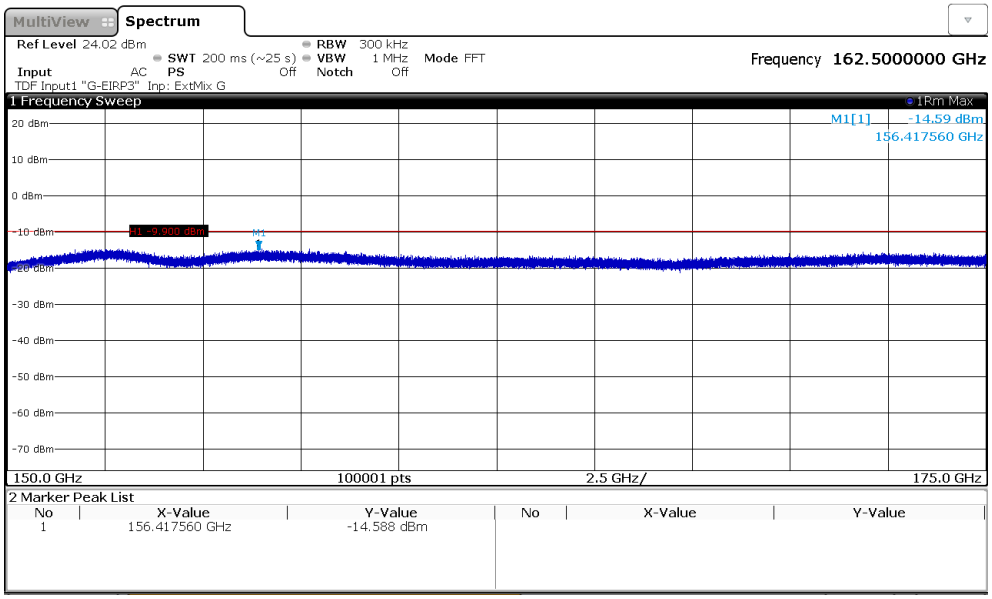
No	X-Value	Y-Value	No	X-Value	Y-Value
1	142.436730 GHz	-10.976 dBm	6	146.133590 GHz	-10.368 dBm
2	142.721220 GHz	-9.929 dBm	7	147.053880 GHz	-10.503 dBm
3	143.058720 GHz	-10.888 dBm	8	147.287080 GHz	-10.516 dBm
4	143.693510 GHz	-10.535 dBm	9	148.128270 GHz	-9.743 dBm
5	145.049700 GHz	-10.364 dBm	10	148.827860 GHz	-9.561 dBm

Note: This measurement is done with RBW=100 kHz in order to show no hidden emission is in the noise.

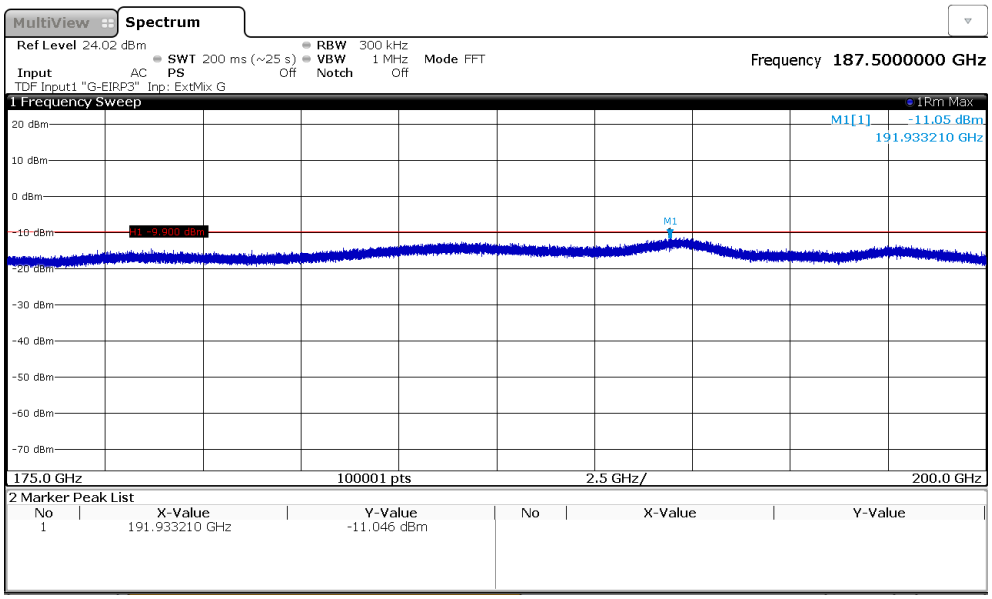


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	153.019400 GHz	-9.723 dBm	6	184.719800 GHz	-8.228 dBm
2	155.929400 GHz	-10.334 dBm	7	186.510800 GHz	-7.439 dBm
3	156.200400 GHz	-9.924 dBm	8	189.351700 GHz	-8.080 dBm
4	177.808900 GHz	-9.988 dBm	9	192.603600 GHz	-6.333 dBm
5	180.385900 GHz	-10.053 dBm	10	197.642500 GHz	-8.750 dBm

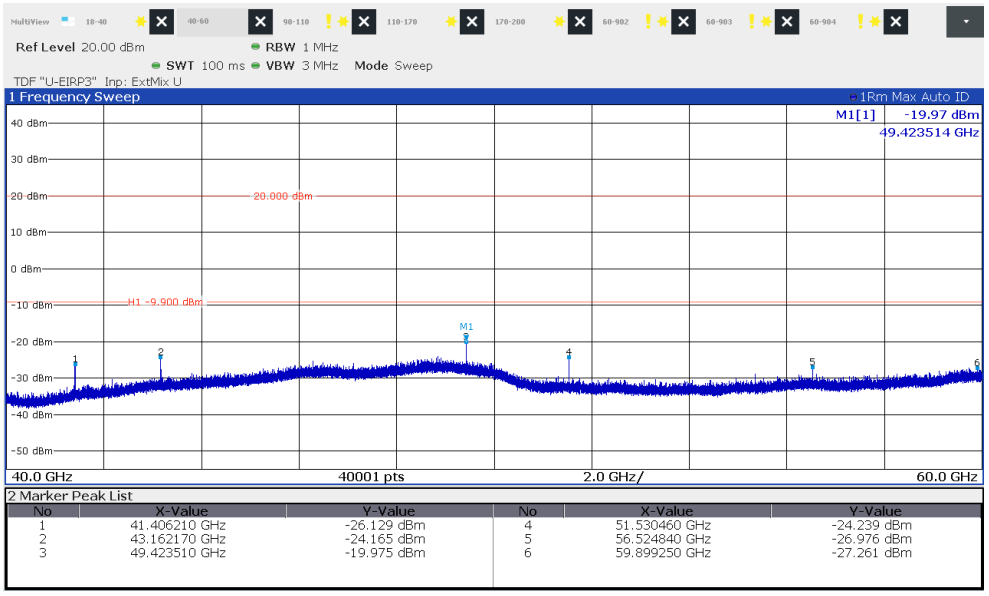


Note: This measurement is done with RBW=300 kHz in order to show no hidden emission is in the noise.



Note: This measurement is done with RBW=300 kHz in order to show no hidden emission is in the noise.

High:



2 Marker Peak List

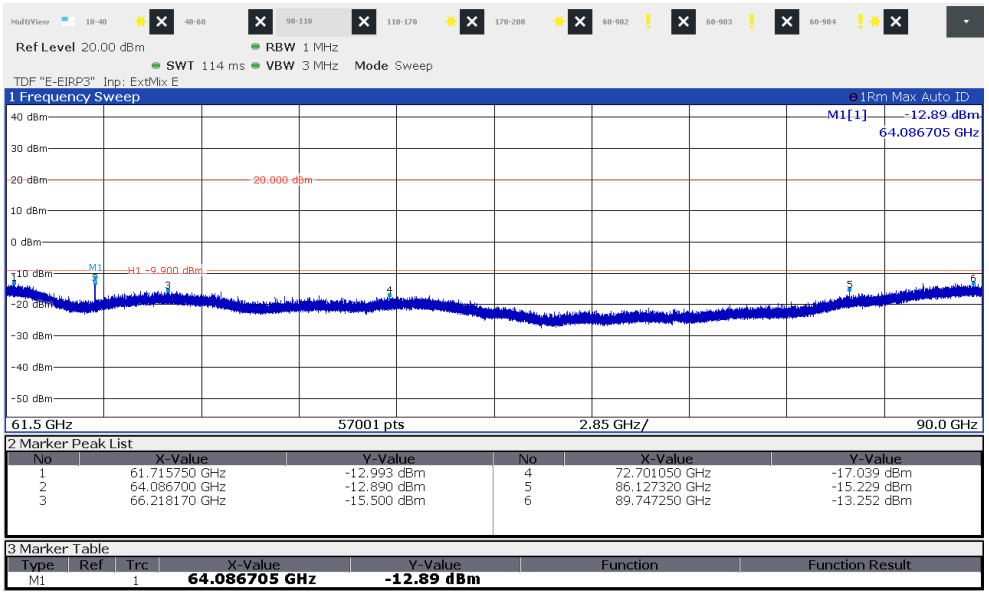
No	X-Value	Y-Value	No	X-Value	Y-Value
1	41.406210 GHz	-26.129 dBm	4	51.530460 GHz	-24.239 dBm
2	43.162170 GHz	-24.165 dBm	5	56.524840 GHz	-26.976 dBm
3	49.423510 GHz	-19.975 dBm	6	59.899250 GHz	-27.261 dBm

2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	60.035230 GHz	-18.318 dBm			

3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**60.035232 GHz**	**-18.32 dBm**		

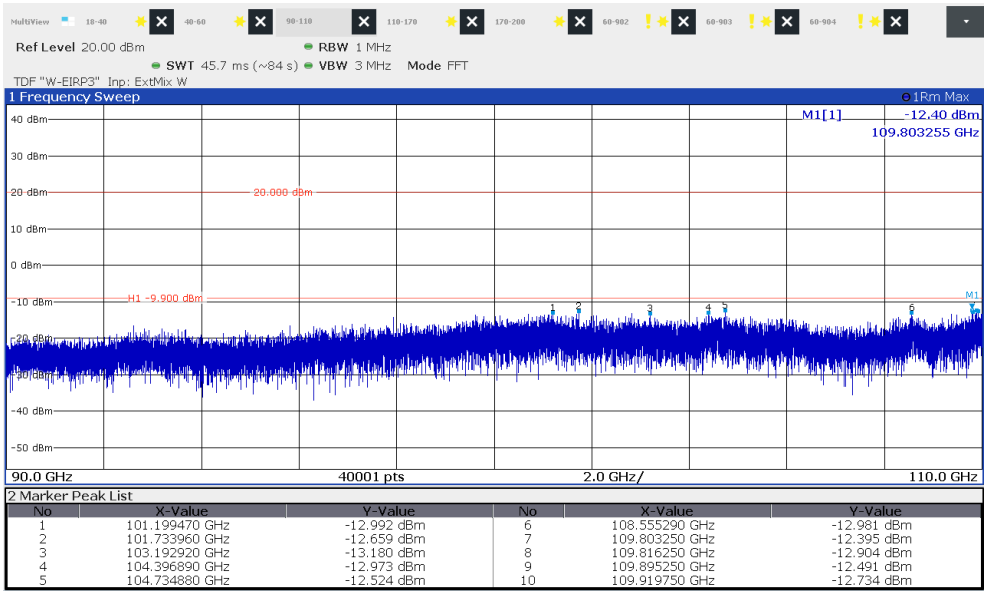


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	61.715750 GHz	-12.993 dBm	4	72.701050 GHz	-17.039 dBm
2	64.086700 GHz	-12.890 dBm	5	86.127320 GHz	-15.229 dBm
3	66.218170 GHz	-15.500 dBm	6	89.747250 GHz	-13.252 dBm

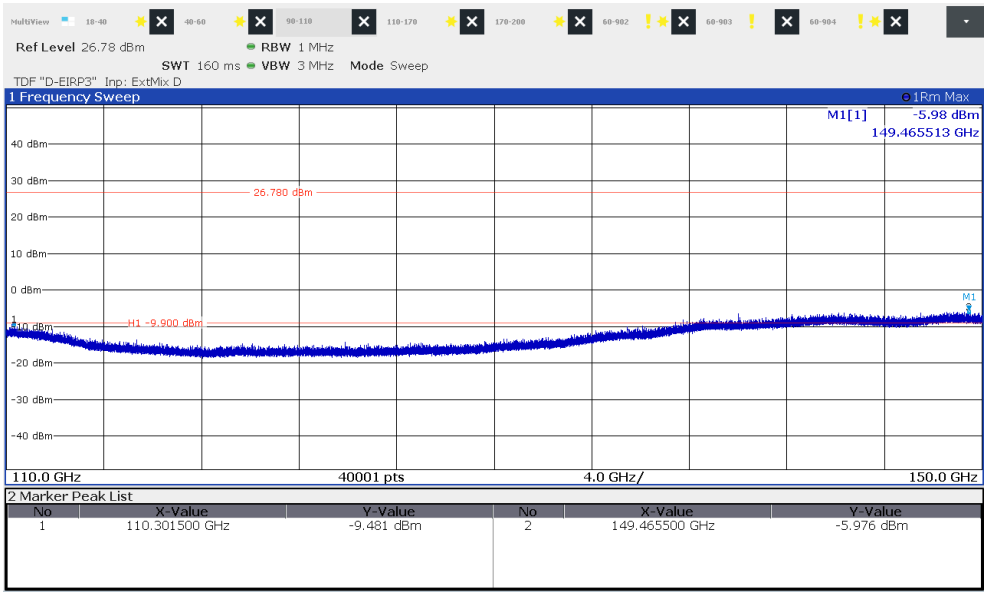
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**64.086705 GHz**	**-12.89 dBm**		



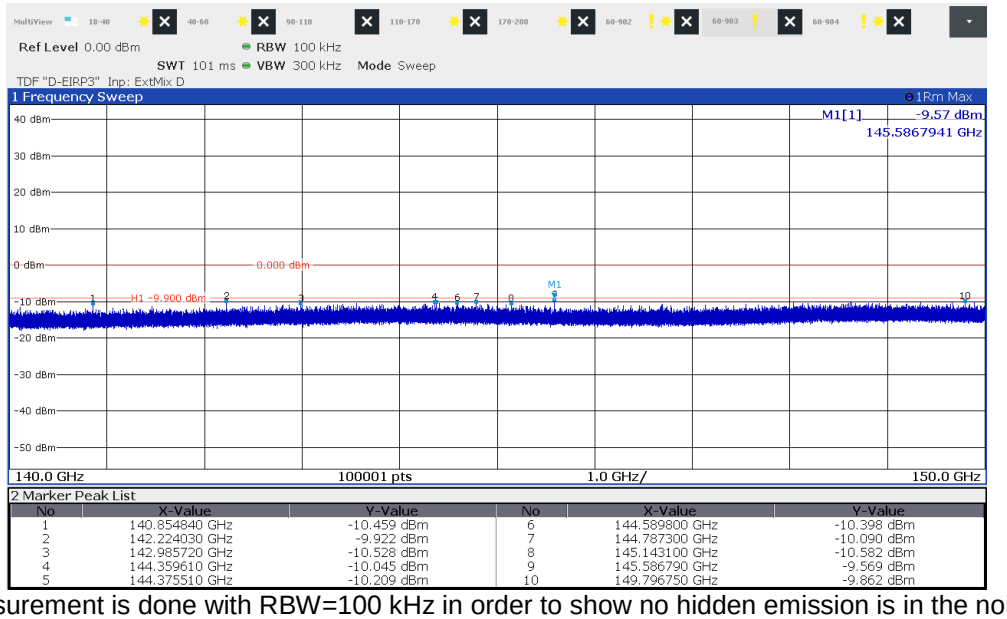
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	101.199470 GHz	-12.992 dBm	6	108.555290 GHz	-12.981 dBm
2	101.733960 GHz	-12.659 dBm	7	109.803250 GHz	-12.395 dBm
3	103.192920 GHz	-13.180 dBm	8	109.816250 GHz	-12.904 dBm
4	104.396890 GHz	-12.973 dBm	9	109.895250 GHz	-12.491 dBm
5	104.734880 GHz	-12.524 dBm	10	109.919750 GHz	-12.734 dBm



2 Marker Peak List

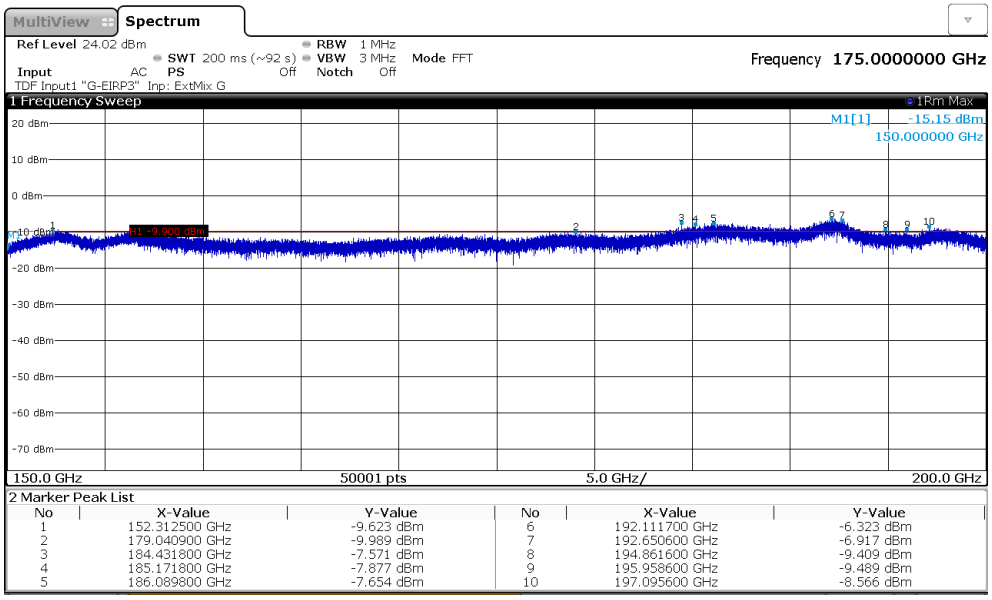
No	X-Value	Y-Value	No	X-Value	Y-Value
1	110.301500 GHz	-9.481 dBm	2	149.465500 GHz	-5.976 dBm

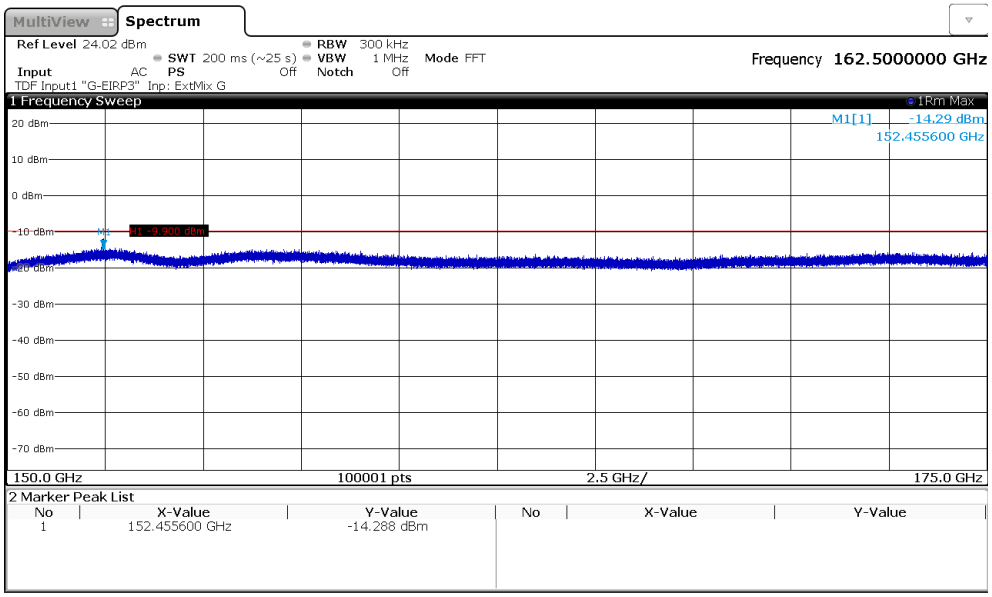


2 Marker Peak List

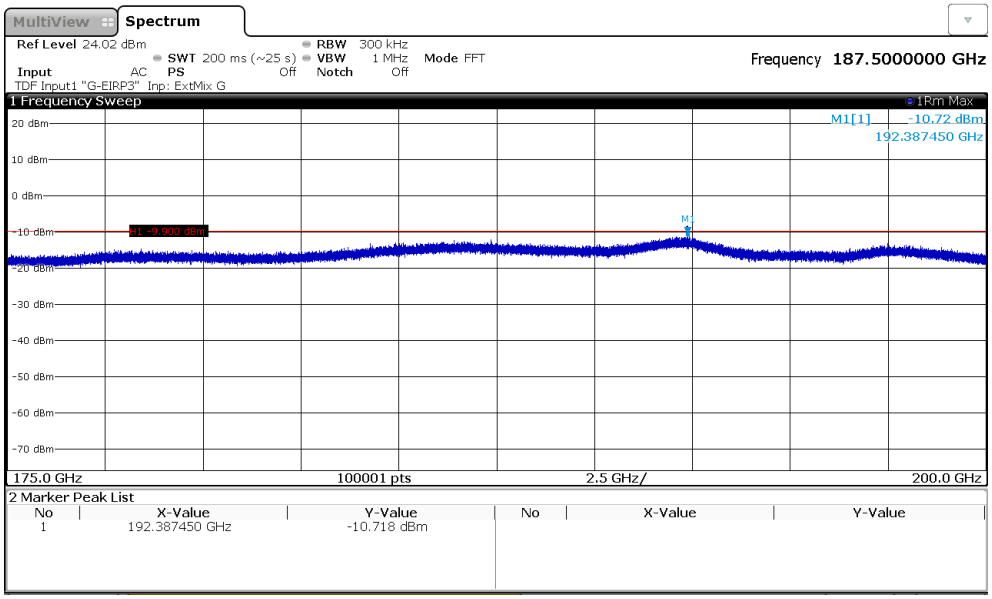
No	X-Value	Y-Value	No	X-Value	Y-Value
1	140.854840 GHz	-10.459 dBm	6	144.589800 GHz	-10.398 dBm
2	142.224030 GHz	-9.922 dBm	7	144.787300 GHz	-10.090 dBm
3	142.985720 GHz	-10.528 dBm	8	145.143100 GHz	-10.582 dBm
4	144.359610 GHz	-10.045 dBm	9	145.586790 GHz	-9.569 dBm
5	144.375510 GHz	-10.209 dBm	10	149.796750 GHz	-9.862 dBm

Note: This measurement is done with RBW=100 kHz in order to show no hidden emission is in the noise.





Note: This measurement is done with RBW=300 kHz in order to show no hidden emission is in the noise.



Note: This measurement is done with RBW=300 kHz in order to show no hidden emission is in the noise.

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 metres.
(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.

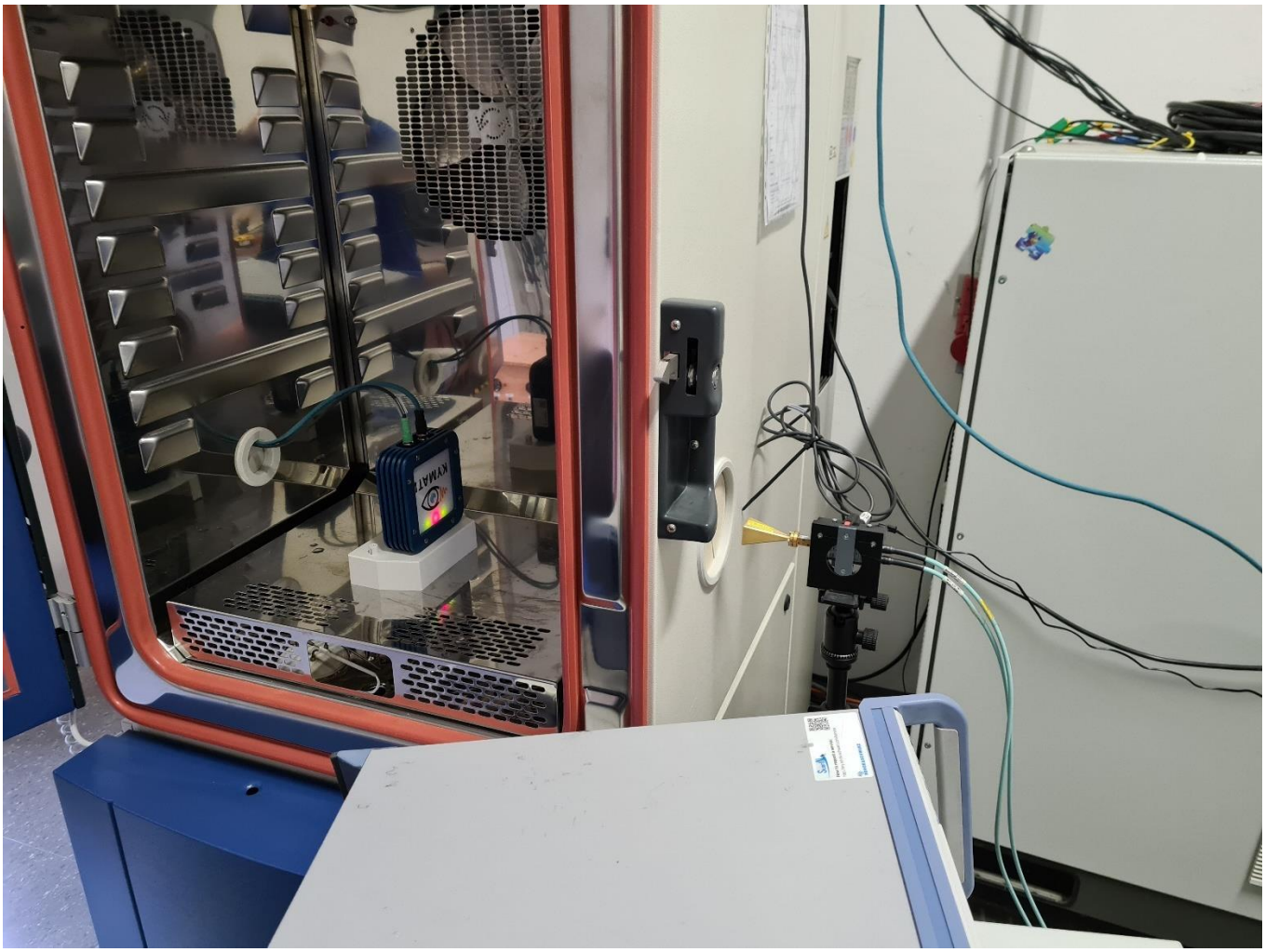
5.5 Frequency stability

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

5.5.1 Description of the test location

Test location: AREA Metrology

5.5.2 Photo documentation of the test set-up



5.5.3 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.

5.5.4 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.

5.5.5 Result

The stability measurent is done at swiched modulation off and set the carrier CW at lowest and highest frequency.

61.0 - 61.5 GHz Range:

Low

Test conditions		Test result
		Frequency (GHz)
T_{min} (-20)°C	V_{nom}	61.049998
T (-10)°C	V_{nom}	61.049978
T (0)°C	V_{nom}	61.049984
T (10)°C	V_{nom}	61.049981
T_{nom} (20)°C	V_{min} (8.5 V)	61.049982
T_{nom} (20)°C	V_{nom} (24 V)	61.049980
T_{nom} (20)°C	V_{max} (41.4 V)	61.049998
T (30)°C	V_{nom}	61.049979
T (40)°C	V_{nom}	61.049976
T_{max} (50)°C	V_{nom}	61.049990

Carrier frequency f_{clow}	61.04998	MHz
Max tolerance	no limit	
Highest frequency f_h	61.049998	MHz
Lowest frequency f_l	61.049976	MHz
Negative tolerance f_l - f_c	-0.004	MHz
Positive tolerance f_h - f_c	0.018	MHz

High

Test conditions		Test result
		Frequency (GHz)
T_{min} (-20)°C	V_{nom}	61.449980
T (-10)°C	V_{nom}	61.449979
T (0)°C	V_{nom}	61.449979
T (10)°C	V_{nom}	61.449982
T_{nom} (20)°C	V_{min} (8.5 V)	61.449983
T_{nom} (20)°C	V_{nom} (24 V)	61.449980
T_{nom} (20)°C	V_{max} (41.4 V)	61.449986
T (30)°C	V_{nom}	61.449970
T (40)°C	V_{nom}	61.449984
T_{max} (50)°C	V_{nom}	61.449985

Carrier frequency f_{cHigh}	61.44998	MHz
Max tolerance	no limit	
Highest frequency f_h	61.449986	MHz
Lowest frequency f_l	61.449970	MHz
Negative tolerance f_l - f_c	-0.010	MHz
Positive tolerance f_h - f_c	0.006	MHz

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 carrier is always inside of the operating range.

5.6 Antenna requirement

5.6.1 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:

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 3.19.1.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	24/06/2021	24/06/2020		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2021	31/10/2019	05/05/2021	05/11/2020
	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	10/05/2021	10/11/2020
	6430	02-02/50-13-014				
CPR 3	FS-Z90	02-02/11-14-003	09/04/2021	09/04/2020	09/06/2021	09/06/2020
	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	09/06/2021	09/06/2020
	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	QWH-EPRR00/WR-12/60-90	02-02/24-14-004				
SER 2	ESVS 30	02-02/03-05-006	15/07/2021	15/07/2020		
	VULB 9168	02-02/24-05-005	19/09/2020	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	09/06/2021	09/06/2020
	FS-Z90	02-02/11-14-003	09/04/2021	09/04/2020	09/06/2021	09/06/2020
	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	09/06/2021	09/06/2020
	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	18/06/2021	18/06/2020		
	BBHA 9170	02-02/24-05-013	19/05/2023	19/05/2020	14/01/2021	14/01/2020
	QWH-UPRR00/WR-19/40-60	02-02/24-14-001				
	QWH-WPRR00/WR-10/75-11	02-02/24-14-005				
	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				
	18N-20	02-02/50-17-003				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	KMS116-GL140SE-KMS116-	02-02/50-20-026				
	BAT-EMC 3.19.1.24	02-02/68-13-001				