
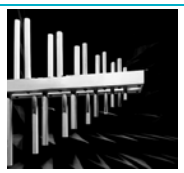
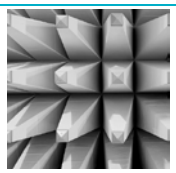

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

PARTIAL TEST REPORT

Test report no.: 1-2910/21-02-03-A

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: https://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

Banner Engineering Corp.
9714 10th Avenue North
Minneapolis, MN 55441 / UNITED STATES
Contact: Dennis Swanson
e-mail: dswanson@bannerengineering.com

Manufacturer

Banner Engineering Corp.
9714 10th Avenue North
Minneapolis, MN 55441 / UNITED STATES

Test standard/s

FCC - Title 47 CFR Part 15	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - Gen Issue 5 incl. Amendment 1 & 2*	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Industrial Radar Presence Detector**
Model name:	**T30R-4545**
FCC ID:	**UE3-T30R**
IC:	**7044A-T30R**
Frequency:	122 GHz to 123 GHz
Technology tested:	FMCW
Antenna:	Integrated patch antenna
Power supply:	10 V to 30 V DC
Temperature range:	-40°C to +65°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

M. Walla

cn=Meheza Walla, o=CTC advanced GmbH, ou=WAL-200806, email=meheza.walla@ctcadvanced.com, c=DE
2022.07.18 11:04:54 +02'00'

Meheza Walla
Lab Manager
Radio Communications & EMC

Test performed:

p.o. Thomas Vogler

cn=Thomas Vogler, o=CTC advanced GmbH, ou=VOG-211118, email=thomas.vogler@ctcadvanced.com, c=DE
2022.07.18 12:04:35 +02'00'

Frank Heussner
Testing Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report replaces the test report with the number 1-2910/21-02-03 and dated 2022-05-17

2.2 Application details

Date of receipt of order:	2021-11-12
Date of receipt of test item:	2021-11-26 (normal operation mode), 2021-12-20 (stop mode)
Start of test:*	2021-11-29
End of test:*	2022-03-17
Person(s) present during the test:	-/-

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Test laboratories sub-contracted

None

3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - Gen Issue 5 incl. Amendment 1 & 2*	February 2021	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus
RSS - 210 Issue 10*	December 2019	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment

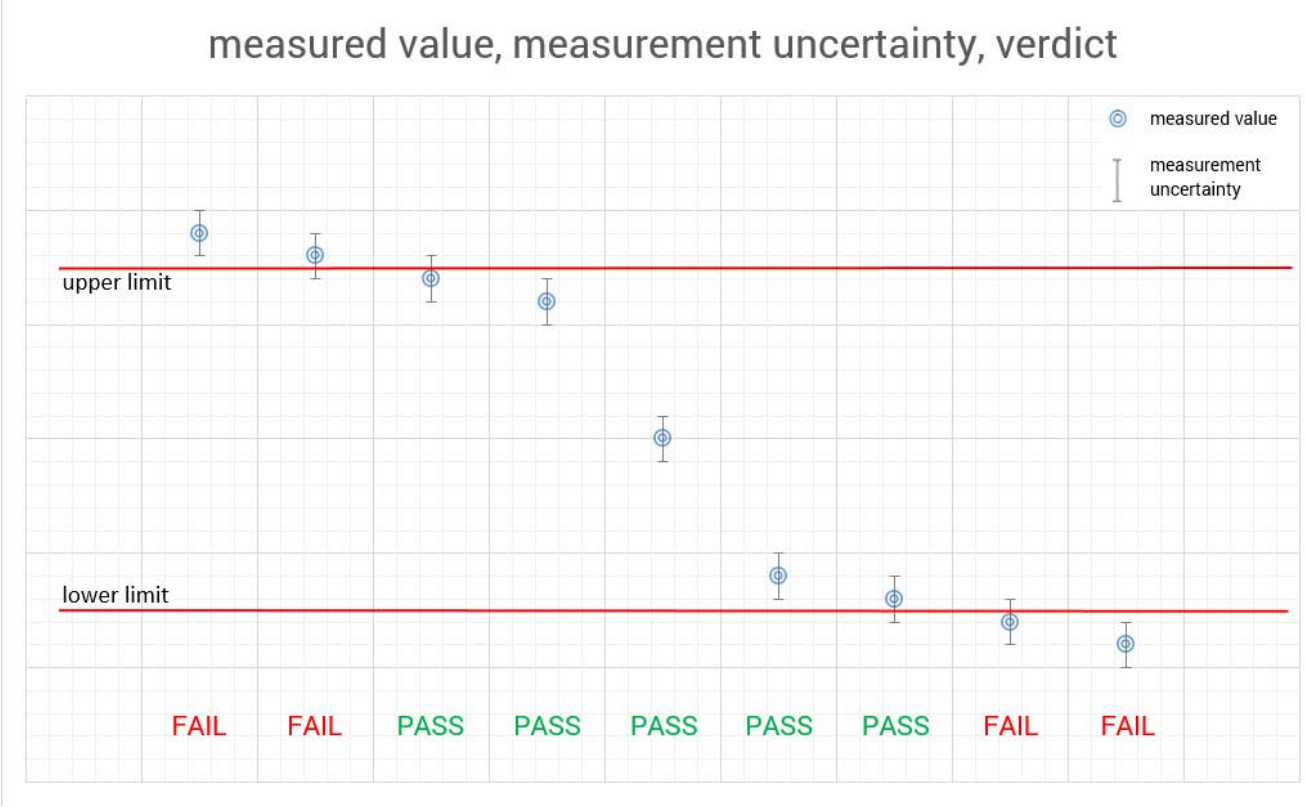
* For information only. Frequency band of operation is not subject to RSS-210 Issue 10.

Guidance	Version	Description
ANSI C63.4-2014	-/-	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04e.pdf
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests -/- °C during high temperature tests -/- °C during low temperature tests
Relative humidity content	:		49 %
Barometric pressure	:		990 hPa to 1010 hPa
Power supply	:	V_{nom} V_{max} V_{min}	24 V DC -/- V DC -/- V DC

6 Test item

6.1 General description

Kind of test item	:	Industrial Radar Presence Detector
Model name	:	T30R-4545
HMN	:	-/-
PMN	:	T30R
HVIN	:	T30R-4545
FVIN	:	-/-
S/N serial number	:	Engineering samples: • EUT 1: T30R-4545 Normal operation mode, sample received 2021-11-26 • EUT 2: T30R-4545 Stop mode, sample received 2021-12-20 (2nd version)
Hardware status	:	Rev C
Software status	:	3.3
Frequency band	:	122 GHz to 123 GHz
Type of modulation	:	FMCW
Number of channels	:	1 (Normal operation mode)
Antenna	:	Integrated patch antenna
Power supply	:	10 V to 30 V DC
Temperature range	:	-40°C to +65°C

6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-2910/21-02-01_AnnexA
1-2910/21-02-01_AnnexD

In addition to the normal operation mode, a test mode is used in accordance with CFR 47 Part §15.31 I & (m), in which the frequency sweep is stopped at the following positions in the range of operation:

- Stop mode, low frequency: 122.2 GHz
- Stop mode, middle frequency: 122.6 GHz
- Stop mode, high frequency: 122.9 GHz

As declared by customer, the EUT consists of the radar sensor including washer and nut (see 1-2910/21-02-01_AnnexA).

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

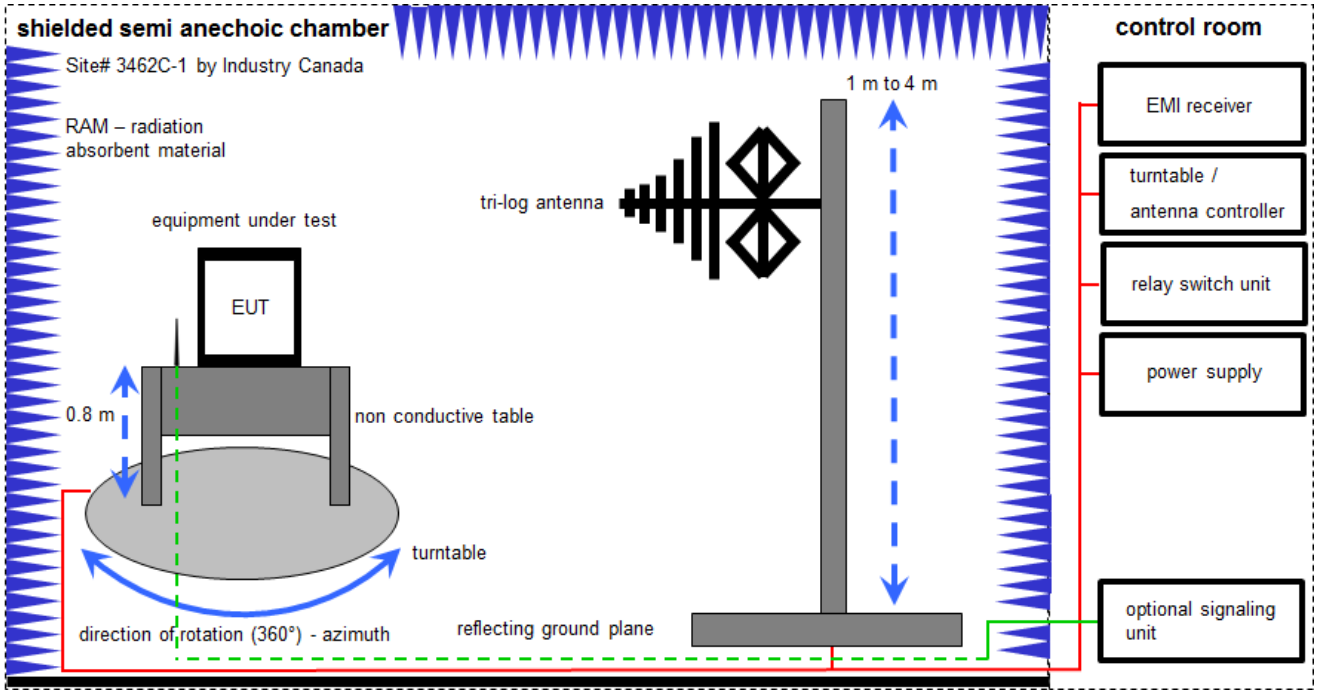
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

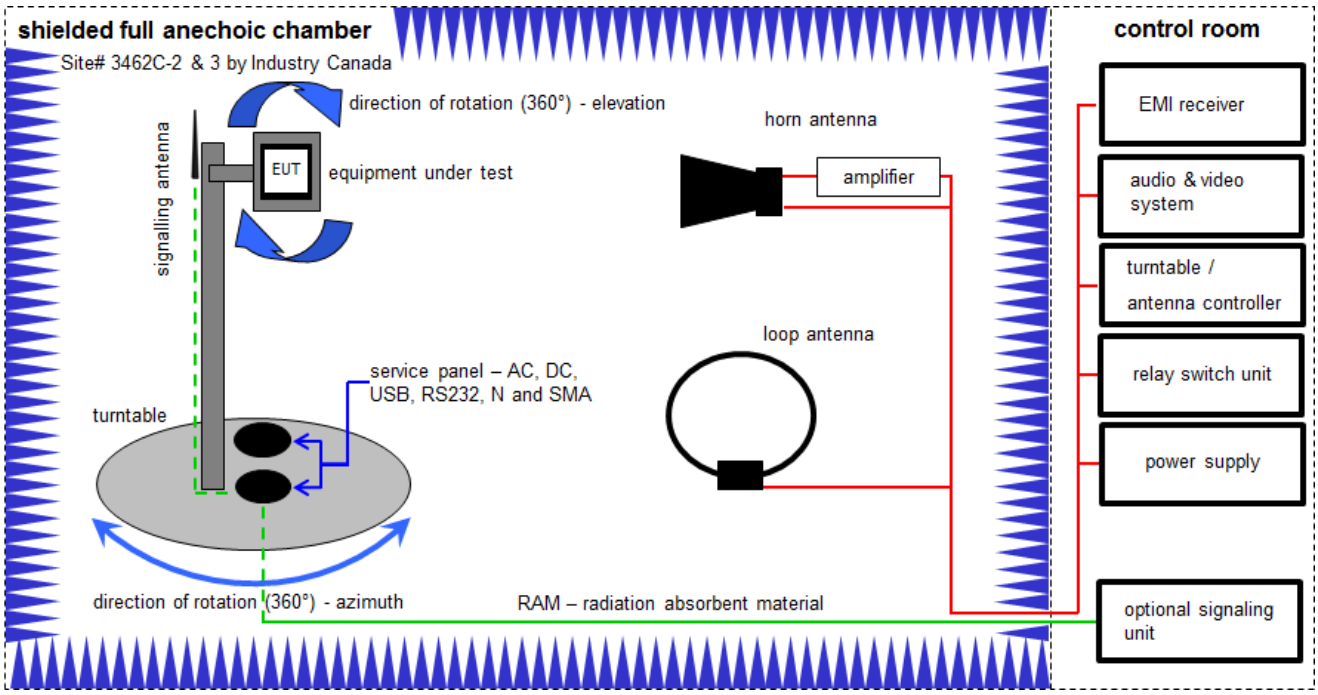
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
3	n. a.	Semi anechoic chamber	300023	MWB AG	-/-	300000551	ne	-/-	-/-
4	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	n. a.	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	n. a.	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	08.12.2021	07.12.2022
8	n. a.	PC	TecLine	F+W	-/-	300004388	ne	-/-	-/-
9	n. a.	TRILOG Broadband Test-Antenna 30 MHz – 3 GHz	VULB9163	Schwarzbeck Mess – Elektronik	295	300003787	vlKl!	12.04.2021	30.04.2023

7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter / 1 meter

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

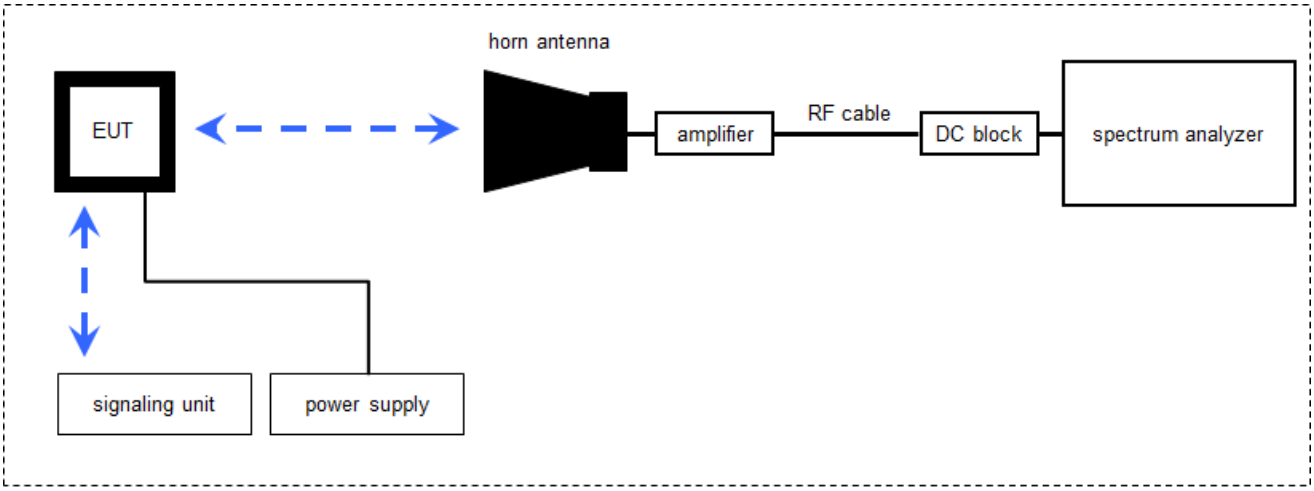
OP = AV + D – G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:
OP [dBm] = -65.0 [dBm] + 50 [dB] – 20 [dBi] + 5 [dB] = -30 [dBm] (1 µW)

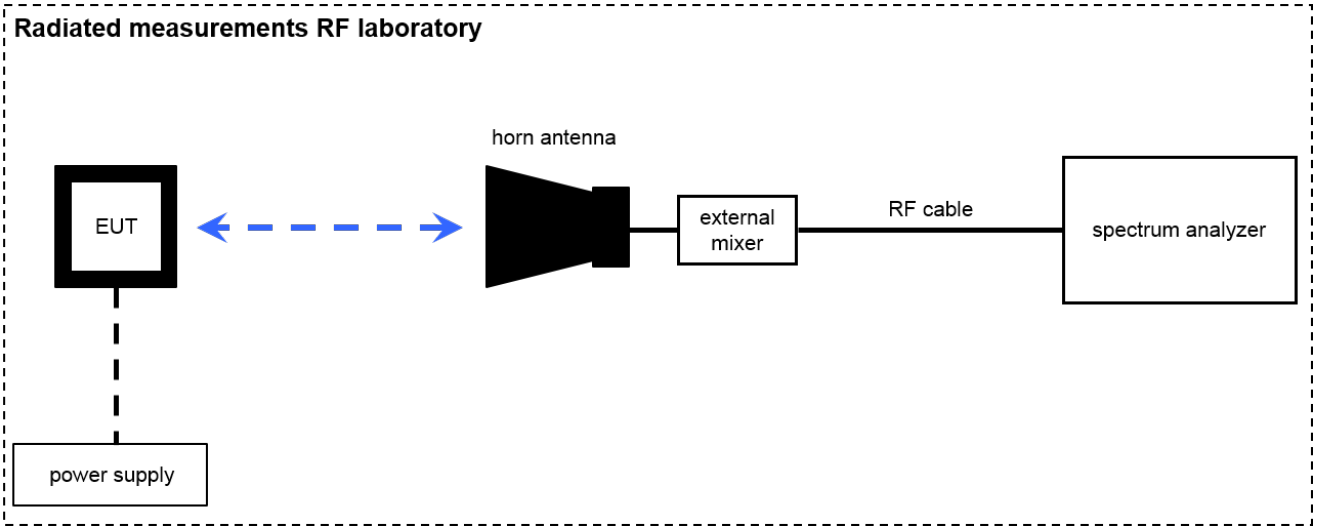
Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A,B,C	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	vIKI!	09.12.2020	08.12.2023
2	A,B,C	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A,B,C	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	A,B,C	Variable isolating transformer	MPL IEC625 Bus Variable isolating transformer	Erfi	91350	300001155	ne	-/-	-/-
5	A,B,C	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	09.12.2021	08.12.2022
6	A,B,C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
7	A,B,C	NEXIO EMV-Software	BAT EMC V3.21.0.27	EMCO		300004682	ne	-/-	-/-
8	A,B,C	PC	ExOne	F+W		300004703	ne	-/-	-/-
9	B	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
10	B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
11	B	Broadband Amplifier 5-13 GHz	CBLU5135235	CERNEX	22010	300004491	ev	-/-	-/-
12	B	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-
13	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vIKI!	12.03.2021	11.03.2023
14	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vIKI!	01.07.2021	30.06.2023

7.3 Radiated measurements > 18 GHz



7.4 Radiated measurements > 50/85 GHz



Measurement distance: horn antenna e.g. 75 cm

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

OP = AV + D – G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

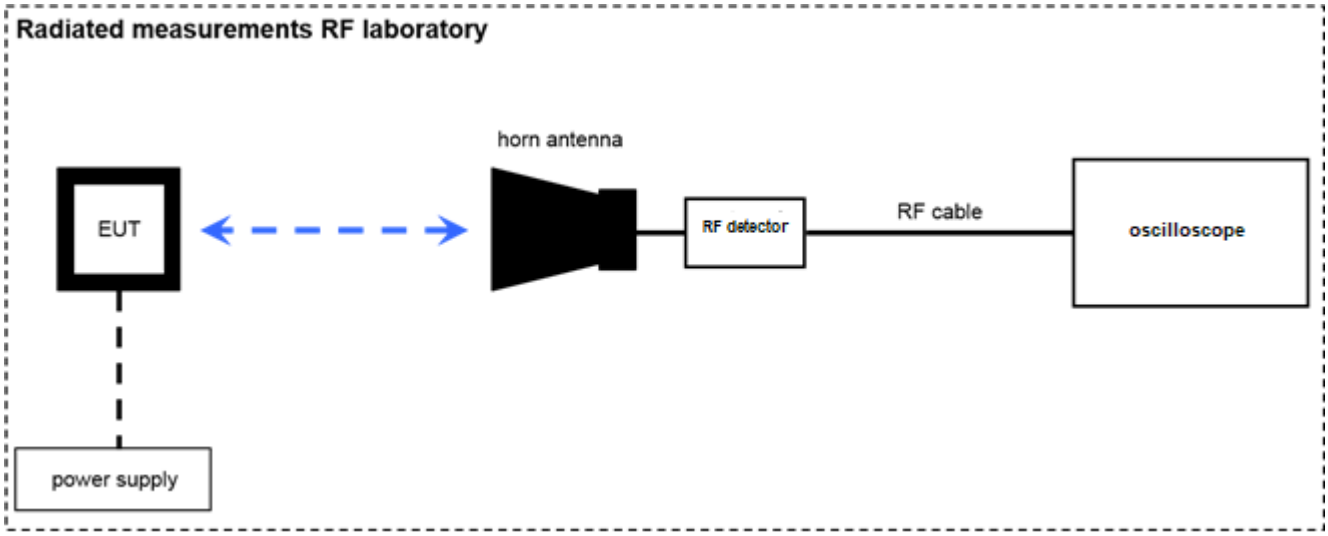
Example calculation:
OP [dBm] = -59.0 [dBm] + 44.0 [dB] – 20.0 [dBi] + 5.0 [dB] = -30 [dBm] (1 µW)

Note: conversion loss of mixer is already included in nalyser value.

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Spectrum Analyzer	FSW50	Rohde & Schwarz	101332	300005935	k	20.01.2022	31.01.2023
2	n. a.	Spectrum Analyzer	FSW50	Rohde & Schwarz	101560	300006179	k	19.03.2021 07.03.2022	18.03.2022 31.03.2023
3	n. a.	Spectrum Analyzer 2 Hz – 85 GHz	FSW85	R&S	101333	300005568	k	30.06.2021	29.06.2022
4	n. a.	Broadband LNA 18-50 GHz	CBL18503070PN	CERNEX	25240	300004948	ev	29.10.2021	28.10.2023
5	n.a.	DC Power Supply, 60V, 10A	6038A	HP	2848A07027	300001174	vlKl!	08.12.2020	07.12.2023
6	n. a.	Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540	ev	08.05.2020	07.05.2022
7	n.a.	Horn Antenna 18,0-40,0 GHz	LHAF180	Microw.Devel	39180-103-021	300001747	vlKl!	18.02.2019 17.01.2022	17.02.2022 31.01.2024
8	n. a.	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda		300000486	vlKl!	21.01.2020 17.01.2022	20.01.2022 31.01.2024
9	n. a.	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	82-16	300000510	vlKl!	23.01.2020 17.01.2022	22.01.2022 31.01.2024
10	n.a.	Std. Gain Horn Antenna 33.0-50.1 GHz	2324-20	Flann	57	400000683	ne	-/-	-/-
11	n. a.	Std. Gain Horn Antenna 49.9-75.8 GHz	2524-20	Flann	*	300001983	ne	-/-	-/-
12	n. a.	Harmonic Mixer 3-Port, 50-75 GHz	FS-Z75	Rohde & Schwarz	101578	300005788	k	15.06.2021	14.06.2022
13	n. a.	Std. Gain Horn Antenna 60-90 GHz	COR 60_90	Thomson CSF		300000814	ev	-/-	-/-
14	n. a.	Harmonic Mixer 3-Port, 60-90 GHz	FS-Z90	R&S	101555	300004691	k	22.07.2021	21.07.2022
15	n. a.	Std. Gain Horn Antenna 73.8-112 GHz	2724-20	Flann	*	300001988	ne	-/-	-/-
16	n. a.	Harmonic Mixer 3-Port, 75-110 GHz	FS-Z110	R&S	101411	300004959	k	15.06.2021	14.06.2022
17	n.a.	Std. Gain Horn Antenna 92.3-140 GHz	2824-20	Flann		300001993	ne	-/-	-/-
18	n.a.	Harmonic Mixer 3-port, 90-140 GHz	FS-Z140	Rohde & Schwarz	101119	300005581	k	22.07.2021	21.07.2022
19	n. a.	Std. Gain Horn Antenna 114-173 GHz	2924-20	Flann	*	300001999	ne	-/-	-/-
20	n. a.	Harmonic Mixer 3-Port, 110-170 GHz	FS-Z170	Radiometer Physics GmbH	100014	300004156	k	11.06.2021	10.06.2022
21	n. a.	Std. Gain Horn Antenna 145-220 GHz	3024-20	Flann	*	300002000	ne	-/-	-/-
22	n. a.	Harmonic Mixer 3-Port, 140-220 GHz	SAM-220	Radiometer Physics GmbH	200001	300004157	k	22.07.2021	21.07.2022
23	n. a.	Std. Gain Horn Antenna 217-330 GHz	32240-20	Flann	233278	300004960	ne	-/-	-/-
24	n. a.	Harmonic Mixer 3-Port, 220-325 GHz	SAM-325	Radiometer Physics GmbH	100002	300004158	k	22.07.2021	21.07.2022
25	n. a.	Standard Gain Horn 325-500 GHz	570240-20 1785-2a	Flann	273569	300006097	ev	25.05.2020	24.05.2022
26	n.a.	Harmonic Mixer 325-500GHz	FS-Z500	Radiometer Physics GmbH	101016	300006096	k	14.06.2021	13.06.2022

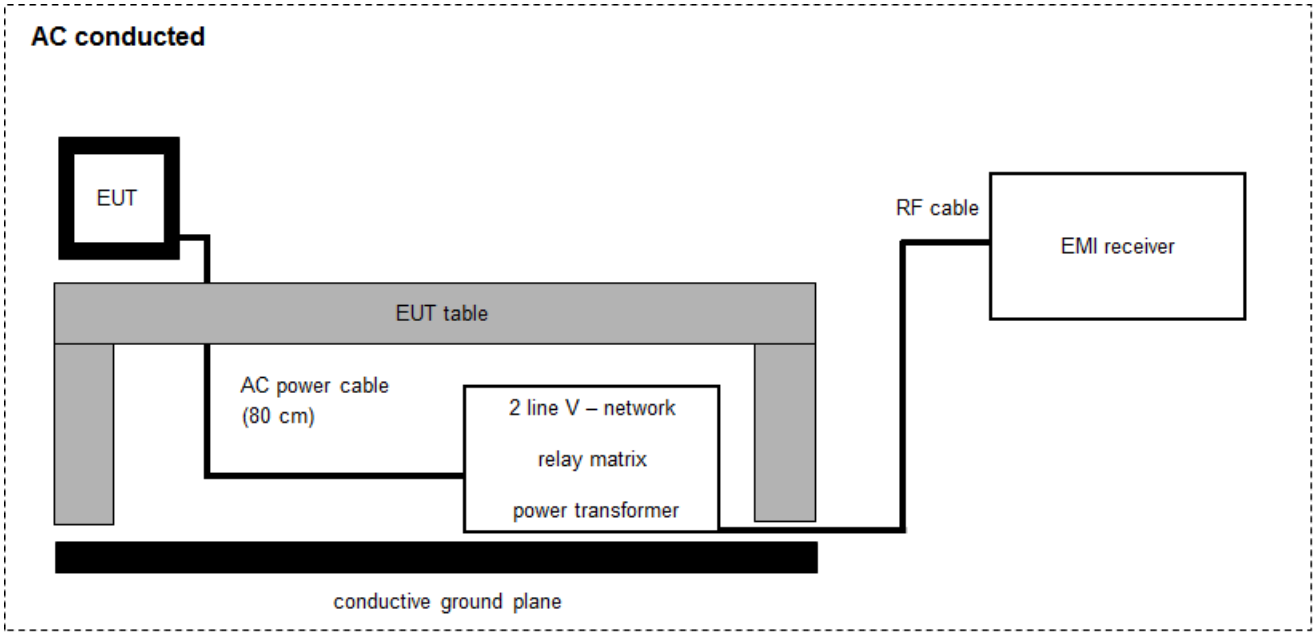
7.1 Radiated power measurements using RF detector according to ANSI C63.10-2013



Note: EUT is replaced by reference source for substitution measurement

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Std. Gain Horn Antenna 90-140 GHz	COR 90_140	Thomson CSF		300000799	ev	-/-	-/-
2	n. a.	F-Band Positive Amplitude Detector	SFD-903144-08SF-P1	Sage Millimeter Inc.	07354-1	300006119	ev	-/-	-/-
	n. a.	Waveguide Amplifier	VDI-WR8.0AMP	VDI	1-13	300006234	ev	-/-	-/-
3	n. a.	SG Extension Module 110 – 170 GHz	E8257DV06	VDI	US53250018	300005540	ev	-/-	-/-
4	n. a.	Std. Gain Horn Antenna 114-173 GHz	2924-20	Flann	*	300001999	ne	-/-	-/-
5	n. a.	Synthesized Sweeper 10 MHz – 40 GHz	83640A	HP	3119A00458	300002266	vIKI!	13.12.2019 10.12.2021	12.12.2021 31.12.2023
6	n. a.	2.5 GHz Digital Phosphor Oscilloscope	DPO7254	Tektronix	B022702	300003573	vIKI!	07.12.2020	06.12.2022

7.2 AC conducted



FS = UR + CF + VC
(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	892475/017	300002209	vIKI!	14.12.2021	13.12.2023
2	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	vIKI!	29.12.2021	28.12.2023
3	n. a.	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	-/-	-/-
4	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	09.12.2021	08.12.2022
5	n. a.	PC	TecLine	F+W	-/-	300003532	ne	-/-	-/-

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

*)Note: The sequence will be repeated three times with different EUT orientations.

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

8.5 Sequence of testing radiated spurious above 50 GHz with external mixers

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate for far field (e.g. 0.25 m).
- The EUT is set into operation.

Premeasurement

- The test antenna with external mixer is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.
- Caution is taken to reduce the possible overloading of the external mixer.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- As external mixers may generate false images care is taken to ensure that any emission measured by the spectrum analyzer does indeed originate in the EUT. Signal identification feature of spectrum analyzer is used to eliminate false mixer images (i.e., it is not the fundamental emission or a harmonic falling precisely at the measured frequency).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

9 Measurement uncertainty

Test case	Uncertainty
Equivalent isotropically radiated power (e.i.r.p.)	Conducted value ± 1 dB Radiated value ± 3 dB
Permitted range of operating frequencies	± 100 kHz
Conducted unwanted emissions in the spurious domain (up to 18 GHz)	± 1 dB
Radiated unwanted emissions in the spurious domain (up to 18 GHz)	± 3 dB
Conducted unwanted emissions in the spurious domain (18 to 40 GHz)	± 4 dB
Radiated unwanted emissions in the spurious domain (18 to 40 GHz)	± 4 dB
Conducted unwanted emissions in the spurious domain (40 to 50 GHz)	± 4.5 dB
Radiated unwanted emissions in the spurious domain (40 to 50 GHz)	± 4.5 dB
Conducted unwanted emissions in the spurious domain (above 50 GHz)	± 5 dB
Radiated unwanted emissions in the spurious domain (above 50 GHz)	± 5 dB
DC and low frequency voltages	± 3 %
Temperature	± 1 °C
Humidity	± 3 %

10 Far field consideration for measurements above 18 GHz

Far field distance calculation:

$D_{ff} = 2 \times D^2/\lambda$

with
D_{ff} Far field distance
D Antenna dimension
λ wavelength

Spurious emission measurements:

Antenna frequency range in GHz	Highest measured frequency in GHz	D in cm	λ in cm	D_{ff} in cm
18 – 26.5	26.5	3.4	1.13	20.44
26.5 – 40	40	2.2	0.75	12.91
40 – 50	50	2.77	0.60	25.58
50 – 75	75	1.85	0.40	17.11
75 – 110	110	1.24	0.27	11.28
90 – 140	140	1.02	0.22	9.72
110 – 170	170	0.85	0.18	8.19
140 – 220	220	0.68	0.14	6.78
220 – 325	325	0.43	0.09	4.01
325 – 500	500	0.26	0.06	2.25

In band measurement (OBW):

Antenna frequency range in GHz	Highest measured frequency in GHz	Antenna dimension in cm	Wavelength in cm	Far Field distance in cm
90 – 140	123.5	1.02	0.24	8.57

11 Measurement results

11.1 Summary

☐	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	**This test report is only a partial test report.** **The content and verdict of the performed test cases are listed below.**

TC identifier	Description	verdict	date	Remark
RF-Testing	FCC 47 CFR Part 15	see below	2022-07-14	-/-

Test specification clause	Test case	Temperature conditions	Power supply	Pass	Fail	NA	NP	Remark
§15.258 (d)	Occupied bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.258 (b)	Maximum E.I.R.P.	Nominal	Nominal	☒	☐	☐	☐	complies
§15.258 ©	Spurious Emissions	Nominal	Nominal	☒	☐	☐	☐	complies
§15.258 (d)	Frequency stability	Extreme Nominal	Extreme Nominal	☐	☐	☐	☒	-/-
§15.207	AC power-line conducted emissions	Nominal	Nominal	☐	☐	☐	☒	-/-

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

Model T30R-4545 (results presented here) differs from Model T30R-1515 (related test report 1-2910/21-02-02) only in the lens installed. Therefore only partial tests were performed.
The related test report 1-2910/21-02-02 contains information about the test cases “Frequency stability” and “AC power-line conducted emissions”.

12 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

13 Measurement results

13.1 Occupied bandwidth

Description:

Measurement of the bandwidth of the wanted signal.

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Trace-Mode:	Max Hold

Limits:

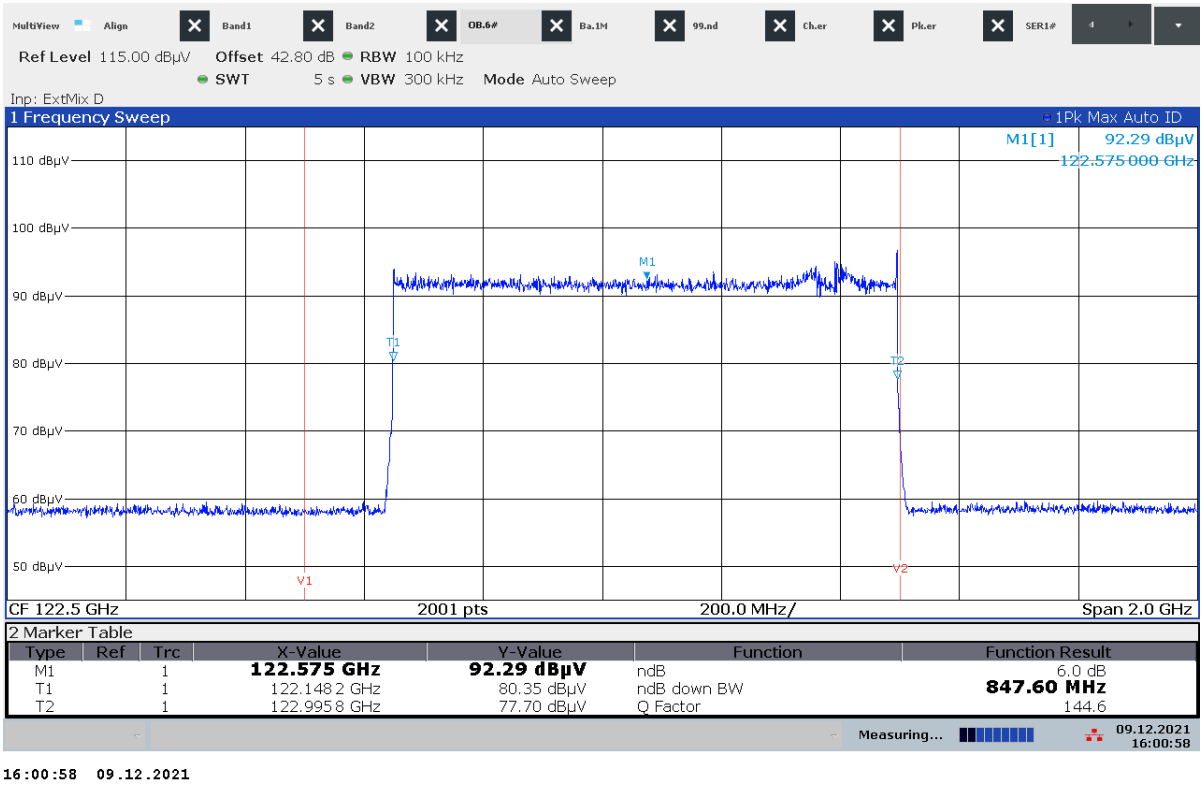
FCC
CFR Part 15.258
The occupied bandwidth from intentional radiators operated within the specified frequency band shall comply with the following:
Frequency range
116 GHz – 123 GHz

§15.258 (d)
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.

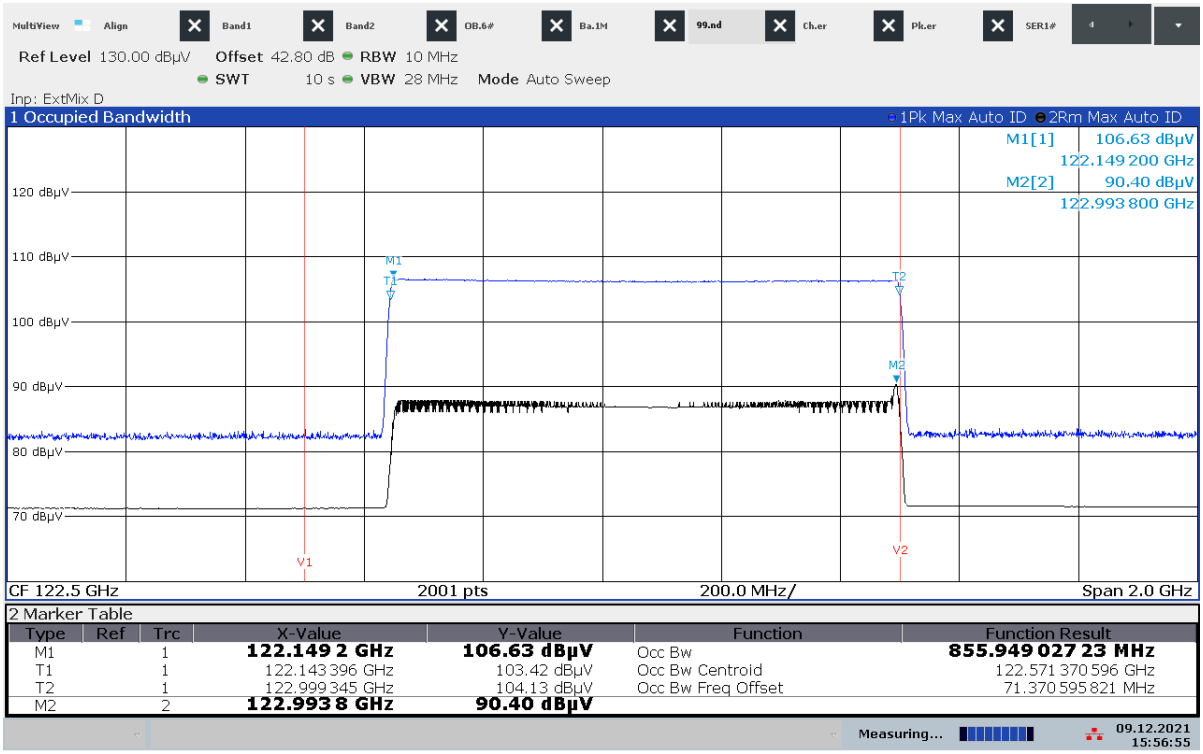
Measurement results:

EUT	Test condition	f_L [GHz]	f_H [GHz]	Bandwidth [MHz]
T30R-4545, EUT 1	T_{nom} / V_{nom} (6 dB bandwidth, RBW = 100 kHz)	122.1482	122.9958	847.6
T30R-4545, EUT 1	T_{nom} / V_{nom} (99% bandwidth, RBW = 10 MHz)	122.1434	122.9993	855.9
Measurement uncertainty		± span/1000		

Plot 1: 6 dB bandwidth (RBW = 100 kHz), EUT1 (FMCW)



Plot 2: 99% bandwidth, EUT 1 (FMCW)



13.2 Maximum E.I.R.P.

Description:

Measurement of the maximum radiated e.i.r.p. of the wanted signal.

Measurement:

Measurement parameter	
Detector:	Pos-Peak (RF-Detector)
Video bandwidth:	10 MHz
Trace-Mode:	Max Hold

Limits:

FCC Part 15.258 (b)
Emission levels within the 116-123 GHz, 174.8-182 GHz, 185-190 GHz and 244-246 GHz bands shall not exceed the following equivalent isotropically radiated power (EIRP) limits as measured during the transmit interval:

(2022) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(2) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions in this paragraph (b)(2) for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (b)(1) of this section.

(3) The peak power shall be measured with a detection bandwidth that encompasses the entire occupied bandwidth within the intended band of operation, e.g., 116-123 GHz, 174.8-182 GHz, 185-190 GHz or 244-246 GHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

(4) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak radiated power to the product of the maximum permissible radiated power (in milliwatts) times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph (b)(4), 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 nalyser. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

Measurement results:

EUT	Test condition	Max E.I.R.P. 10 MHz VBW	Average E.I.R.P. 10 MHz VBW
T30R-4545, EUT 1	T_{nom} / V_{nom}	11 dBm	11 dBm

EUT	Test condition	Duty cycle
T30R-4545, EUT 1	T_{nom} / V_{nom}	100 %

Description of the E.I.R.P. measurement by substitution method:

1) EUT emission measured with RF-detector:
   - Measurement distance: d_{EUT}
   - Maximum readout value on oscilloscope: V_{max}
   - Duty cycle: $Dirk_{EUT}$

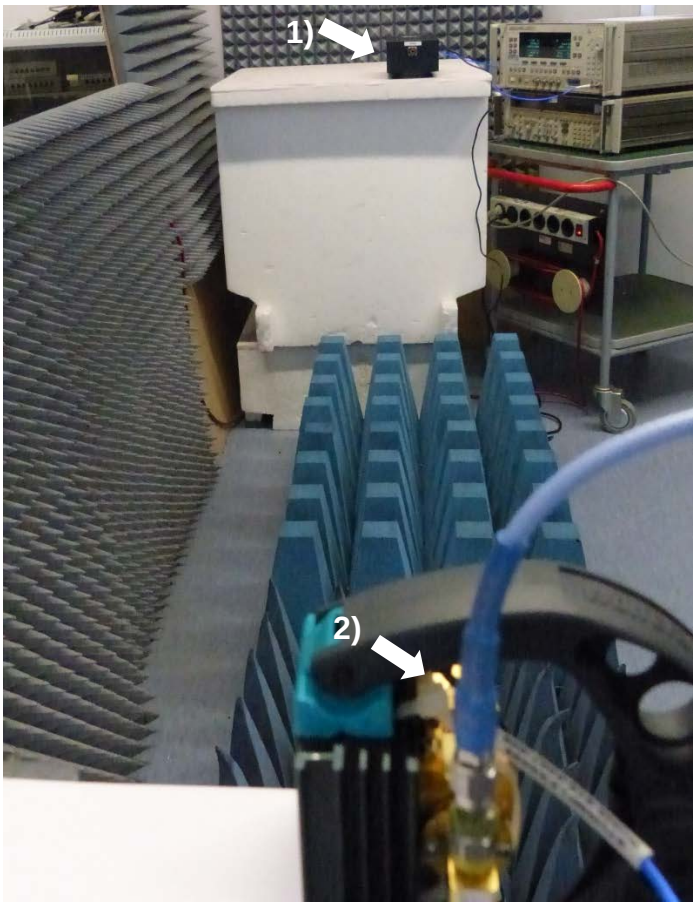
2) Substitution of EUT by a cw reference source with a frequency of f_{REF} and a fixed output power of P_{REF}
   - Readout value on oscilloscope adjusted to V_{max} by far field attenuation

3) Calculation of the Max E.I.R.P. of the EUT:
   - Free space loss: $FSL(d) = 20 \times \log(4 \times \pi \times d \times f / c)$, c: speed of light
   - Max E.I.R.P. = $P_{REF} - FSL(d_{REF}) + FSL(d_{EUT})$

4) Average E.I.R.P. of the EUT:
   - Duty cycle = 100 % → Average E.I.R.P. = Max E.I.R.P.

Measurement step	Measurement parameter	EUT			
		T30R-1515, EUT 1	-/-	-/-	-/-
1)	Measurement distance d_{EUT}	0.33 m	-/-	-/-	-/-
	Maximum readout value V_{max}	2.2 mV	-/-	-/-	-/-
	Duty cycle D_{EUT}	100 %	-/-	-/-	-/-
2)	Output power P_{REF}	28.4 dBm	-/-	-/-	-/-
	Frequency f_{REF}	122.57 GHz	-/-	-/-	-/-
	Measurement distance d_{REF}	2.55 m	-/-	-/-	-/-
3)	Max E.I.R.P.	11 dBm	-/-	-/-	-/-
4)	Average E.I.R.P.	11 dBm	-/-	-/-	-/-

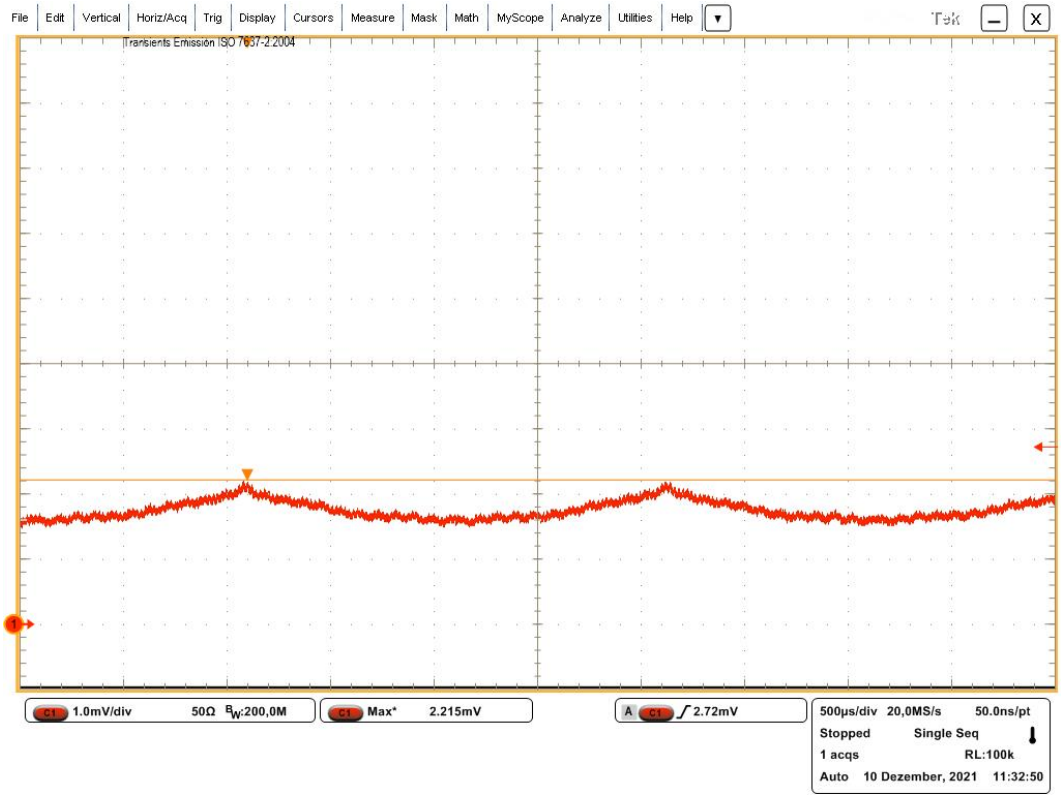
Setup of the substitution:



1) SG Extension Module 110 – 170 GHz & Std. Gain Horn Antenna 114-173 GHz

2) F-Band Positive Amplitude Detector & Waveguide Amplifier & Std. Gain Horn Antenna 90-140 GHz

Plot 3: EUT emission



13.3 Spurious emissions radiated

Description:

Measurement of the radiated spurious emissions.

Measurement:

Measurement parameter	
Detector:	Quasi Peak / Pos-Peak / RMS
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	F < 1 GHz: 300 kHz F > 1 GHz: 3 MHz
Frequency range:	30 MHz to 500 GHz
Trace-Mode:	Max Hold

Limits:

FCC Part 15.258 ©
Spurious emissions shall be limited as follows:

(2022) The power density of any emissions outside the band of operation, e.g., 116-123 GHz, 174.8-182 GHz, 185-190 GHz or 244-246 GHz, shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

FCC / IC		
CFR Part 15.209(a) / RSS-Gen 8.9		
Radiated emission limits		
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 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

(3) Between 40 GHz and the highest frequency specified in § 15.33, 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.

FCC Part 15.33 (a)
For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

Limit conversion (ANSI C63.10-2013 9.6):

$EIRP[dBm] = 10 \times \log(4 \times \pi \times d^2 \times PD[W/m^2])$

- Power density at the distance specified by the limit: PD [W/m²]
- Equivalent isotropically radiated power: EIRP [dBm]
- Distance at which the power density limit is specified: d [m]

According to this formula, an emission limit of PD = 90 pW/cm² at a distance of d = 3 m corresponds to an equivalent isotropically radiated power of EIRP = -10 dBm.

Measurement results:

Note:

(1) Measurements were performed in normal operation mode (frequency sweep) and in stop mode (frequency sweep stopped at three positions within the range of operation: near top, near middle, near bottom) in accordance with §15.31©, (m).

(2) If the results in the cases of the stopped frequency sweep are comparable, only the results with a stop in the middle of the operating frequency range are shown in the plots below.

(3) In some cases, the measurement results of all stop modes (low frequency, middle frequency, high frequency) are shown in a single plot. In these cases, the stop mode frequency was changed by the customer's software, for example, and the results were recorded successively using the "Max Hold" function of the spectrum analyser.

Normal operation mode:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
9.588	Average	1	43.2 dBuV	54 dBuV	10.8
9.588	Peak	1	55.5 dBuV	74 dBuV	18.5
61.497	Average	1	-35.7 dBm	-10 dBm	25.7

Stop mode, low frequency:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
9.547	Average	1	50.3 dBuV	54 dBuV	3.7
9.547	Peak	1	54.2 dBuV	74 dBuV	19.8
61.099	Average	1	-13.7 dBm	-10 dBm	3.7
244.396	Average	1	-17.9 dBm	-10 dBm	7.9

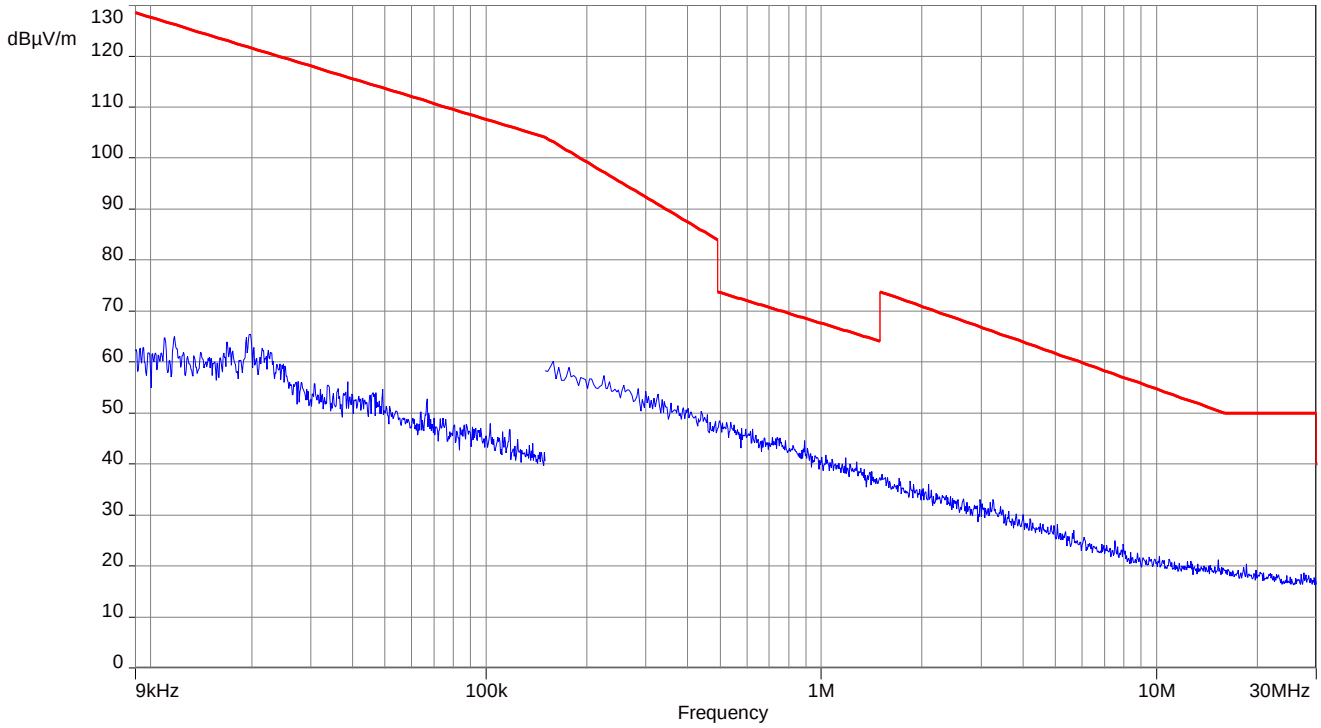
Stop mode, middle frequency:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
9.578	Average	1	50.8 dBuV	54 dBuV	3.2
9.578	Peak	1	54.6 dBuV	74 dBuV	19.4
61.299	Average	1	-13.1 dBm	-10 dBm	3.1
245.196	Average	1	-18.5 dBm	-10 dBm	8.5

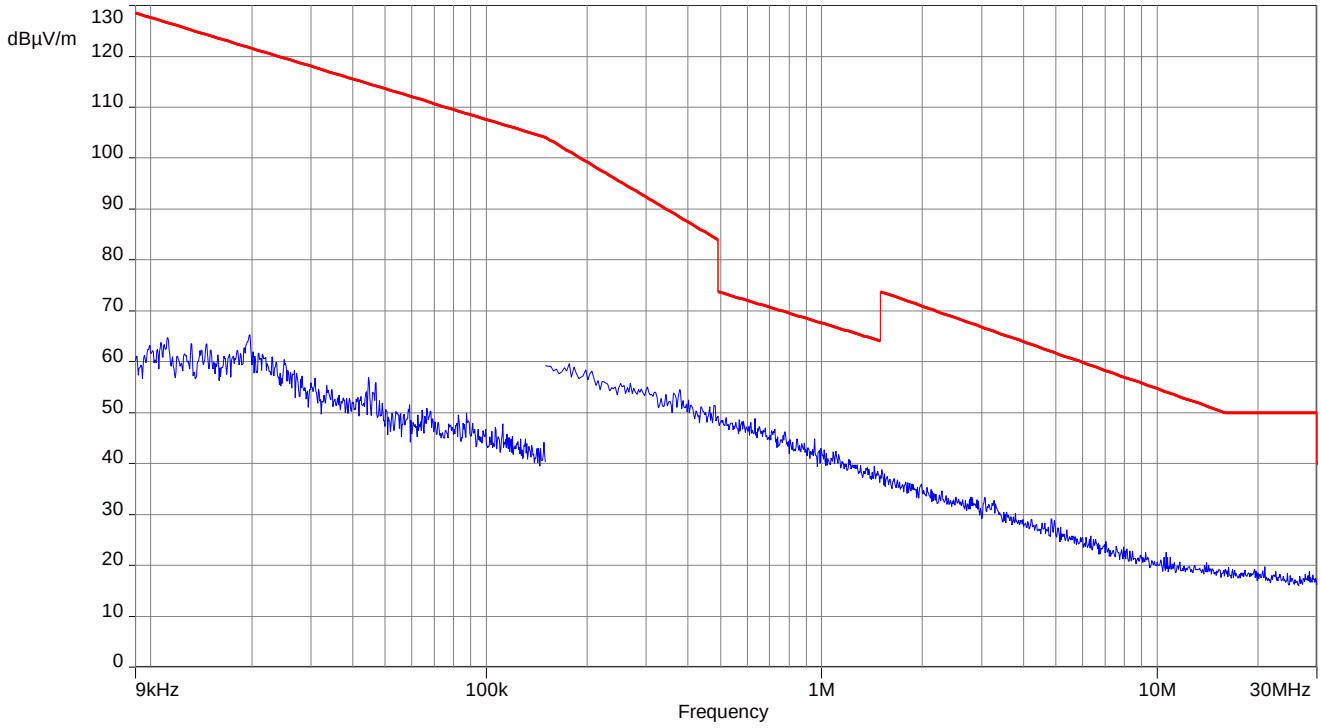
Stop mode, high frequency:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
9.601	Average	1	50.2 dBuV	54 dBuV	3.8
9.601	Peak	1	54.5 dBuV	74 dBuV	19.5
61.449	Average	1	-15.1 dBm	-10 dBm	5.1
245.796	Average	1	-19.8 dBm	-10 dBm	9.8

Plot 4: 9 kHz – 30 MHz, normal operation mode

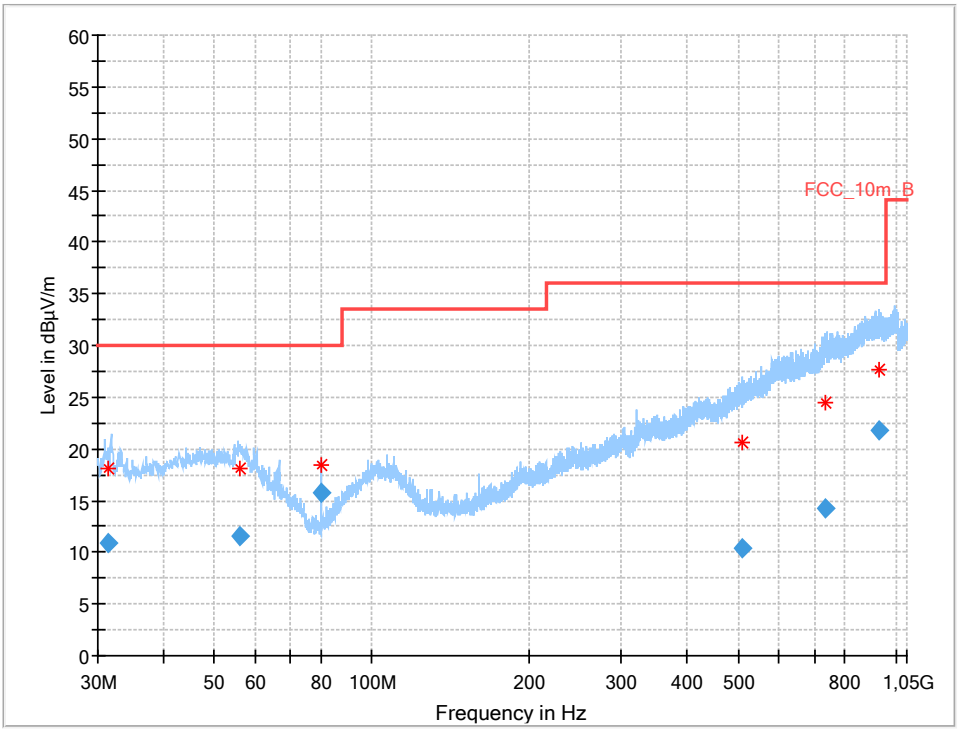


Plot 5: 9 kHz – 30 MHz, stop mode, middle frequency



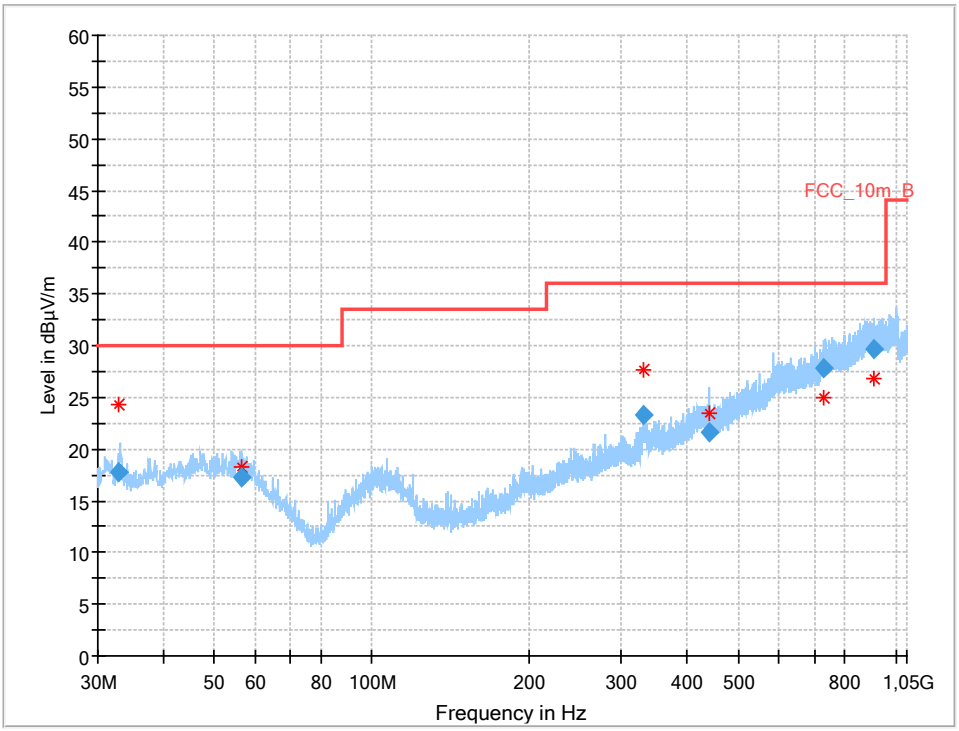
* see note (2)

Plot 6: 30 MHz – 1GHz, normal operation mode



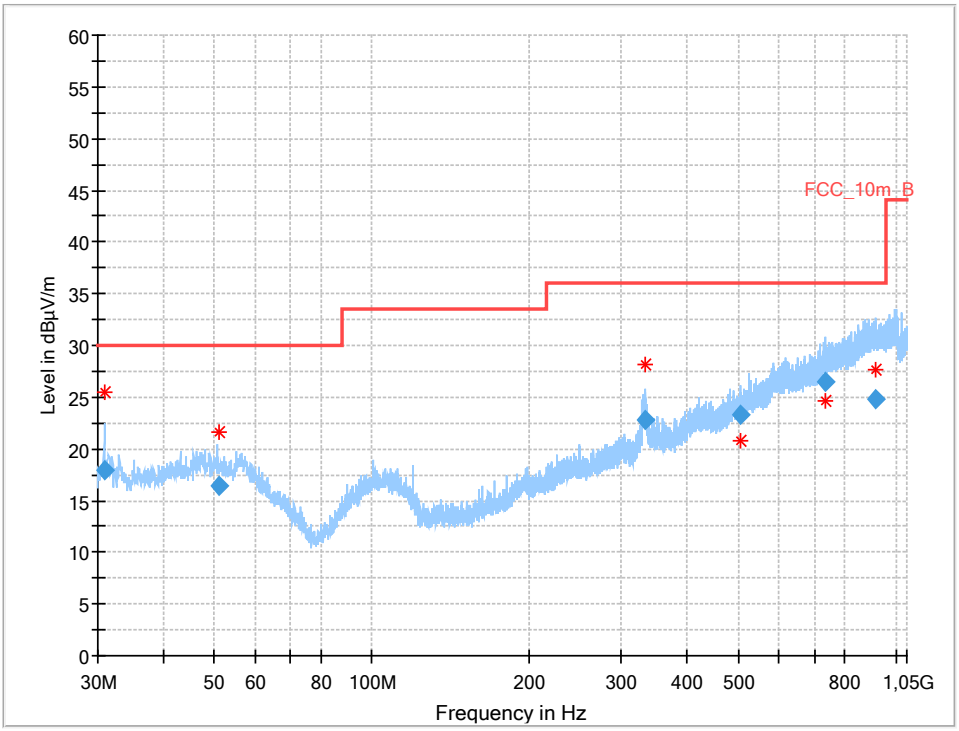
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.314	10.84	30.0	19.2	1000	120.0	100.0	V	133	13
55.994	11.52	30.0	18.5	1000	120.0	139.0	V	157	16
80.004	15.73	30.0	14.3	1000	120.0	203.0	V	170	8
508.351	10.37	36.0	25.6	1000	120.0	301.0	H	314	20
735.310	14.25	36.0	21.8	1000	120.0	353.0	H	225	23
931.499	21.77	36.0	14.2	1000	120.0	400.0	V	53	26

Plot 7: 30 MHz – 1GHz, stop mode, low frequency



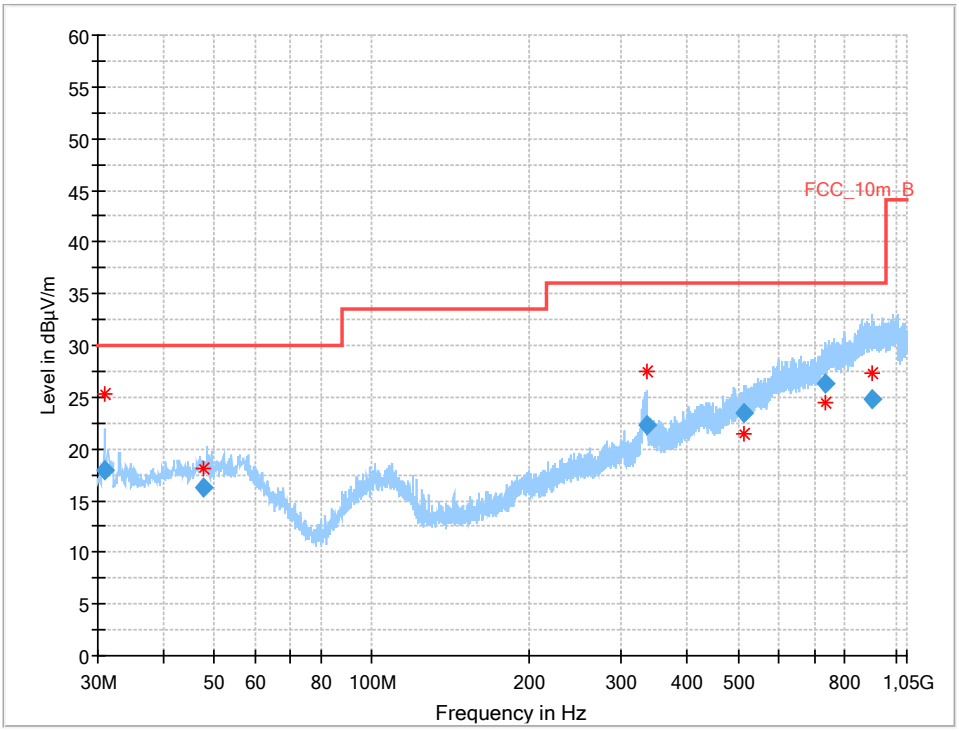
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.934	17.80	30.0	12.2	1000	120.0	168.0	V	119	13
56.249	17.23	30.0	12.8	1000	120.0	114.0	V	37	16
331.225	23.27	36.0	12.7	1000	120.0	195.0	H	287	16
441.337	21.64	36.0	14.4	1000	120.0	195.0	V	232	19
729.967	27.80	36.0	8.2	1000	120.0	195.0	H	232	23
910.143	29.67	36.0	6.3	1000	120.0	110.0	H	142	26

Plot 8: 30 MHz – 1GHz, stop mode, middle frequency



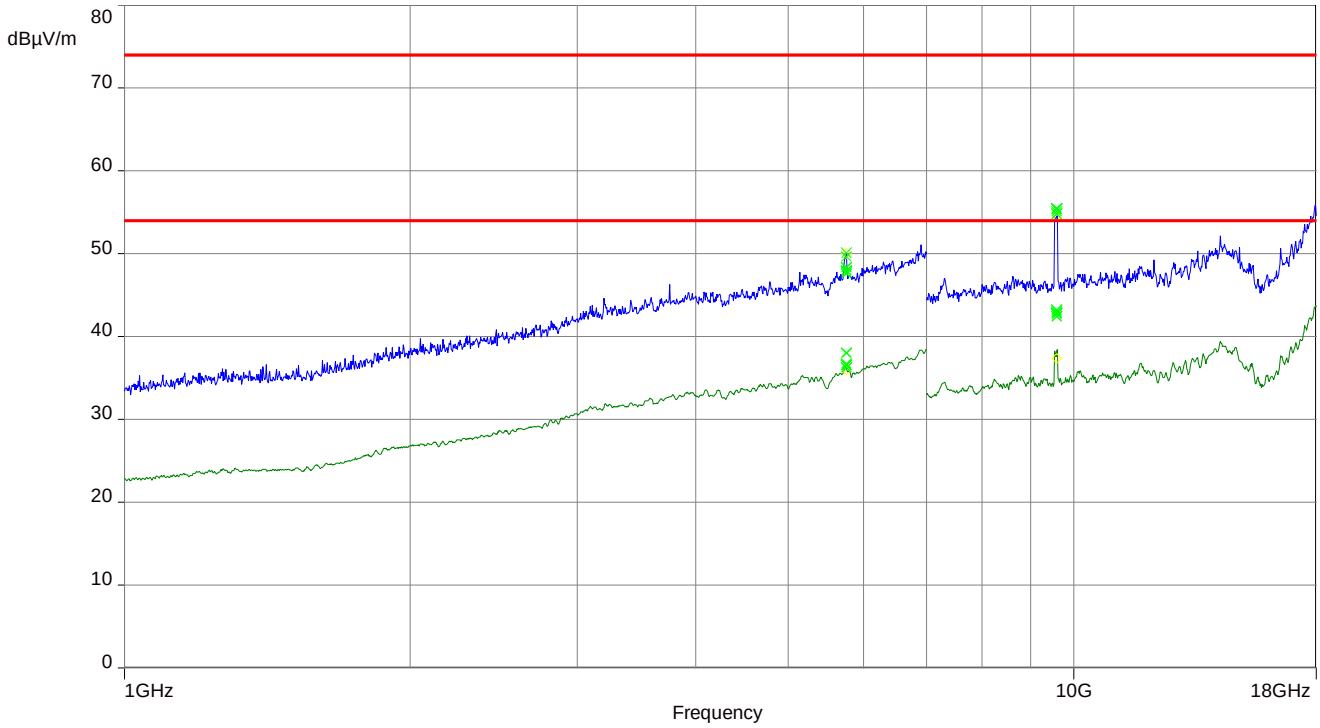
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.894	17.88	30.0	12.1	1000	120.0	161.0	V	52	13
50.948	16.38	30.0	13.6	1000	120.0	115.0	V	279	15
331.748	22.83	36.0	13.2	1000	120.0	195.0	H	275	16
506.214	23.29	36.0	12.7	1000	120.0	101.0	H	232	20
734.482	26.48	36.0	9.5	1000	120.0	195.0	V	232	23
912.320	24.77	36.0	11.2	1000	120.0	195.0	H	-36	26

Plot 9: 30 MHz – 1GHz, stop mode, high frequency

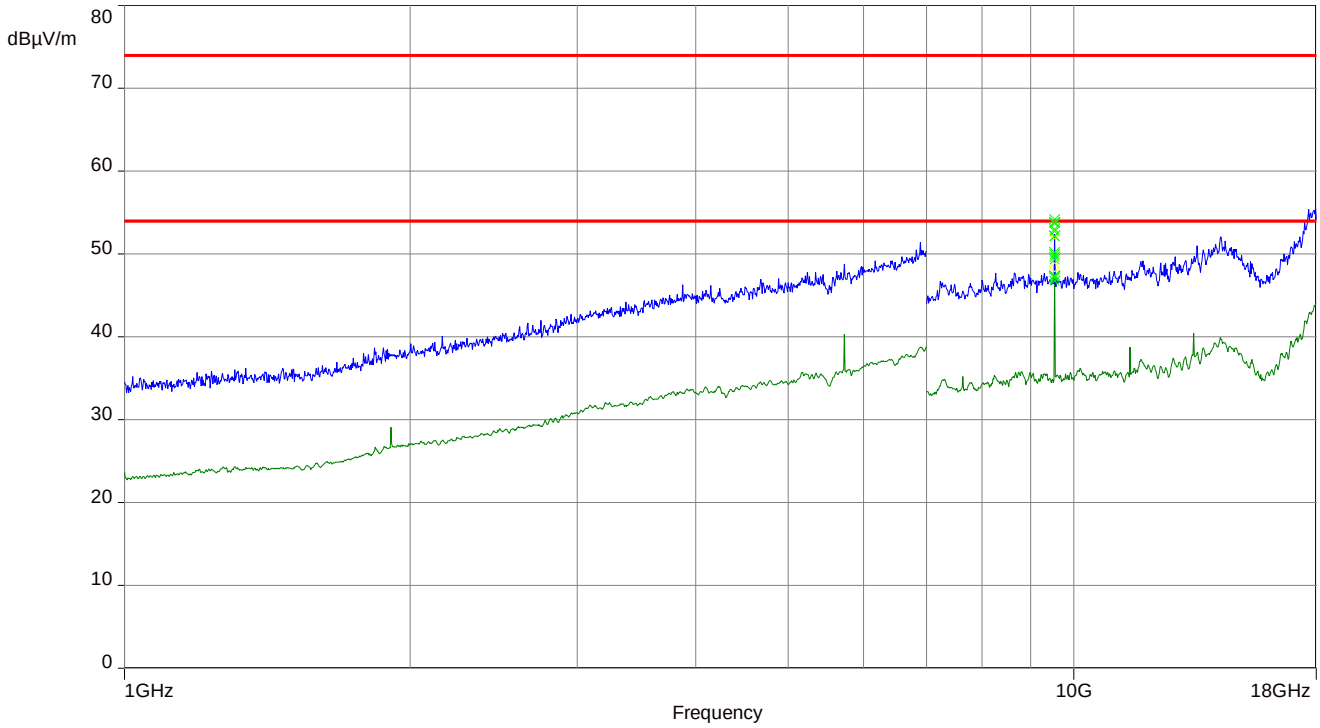


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.900	17.98	30.0	12.0	1000	120.0	106.0	V	-35	13
47.891	16.32	30.0	13.7	1000	120.0	114.0	V	201	15
334.634	22.26	36.0	13.7	1000	120.0	183.0	H	269	16
513.245	23.43	36.0	12.6	1000	120.0	195.0	V	142	20
732.192	26.39	36.0	9.6	1000	120.0	104.0	V	52	23
904.324	24.73	36.0	11.3	1000	120.0	148.0	H	52	26

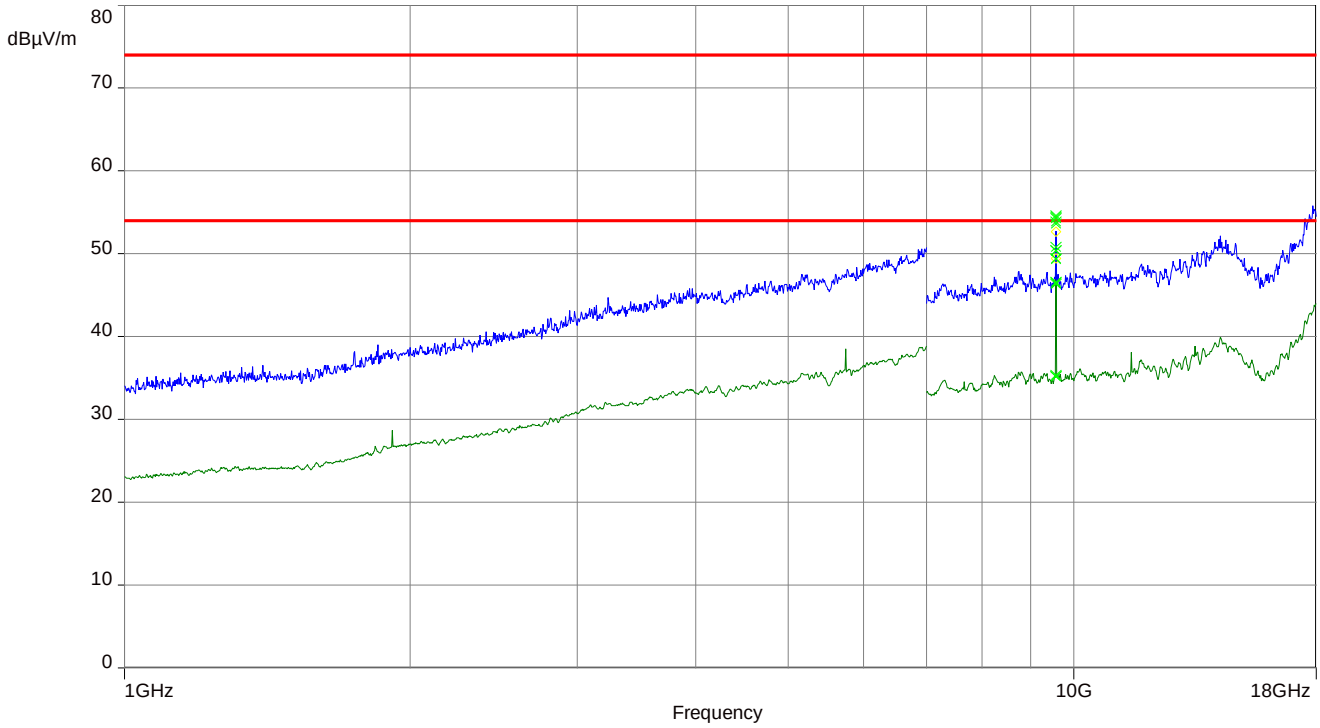
Plot 10: 1GHz – 18 GHz, normal operation mode



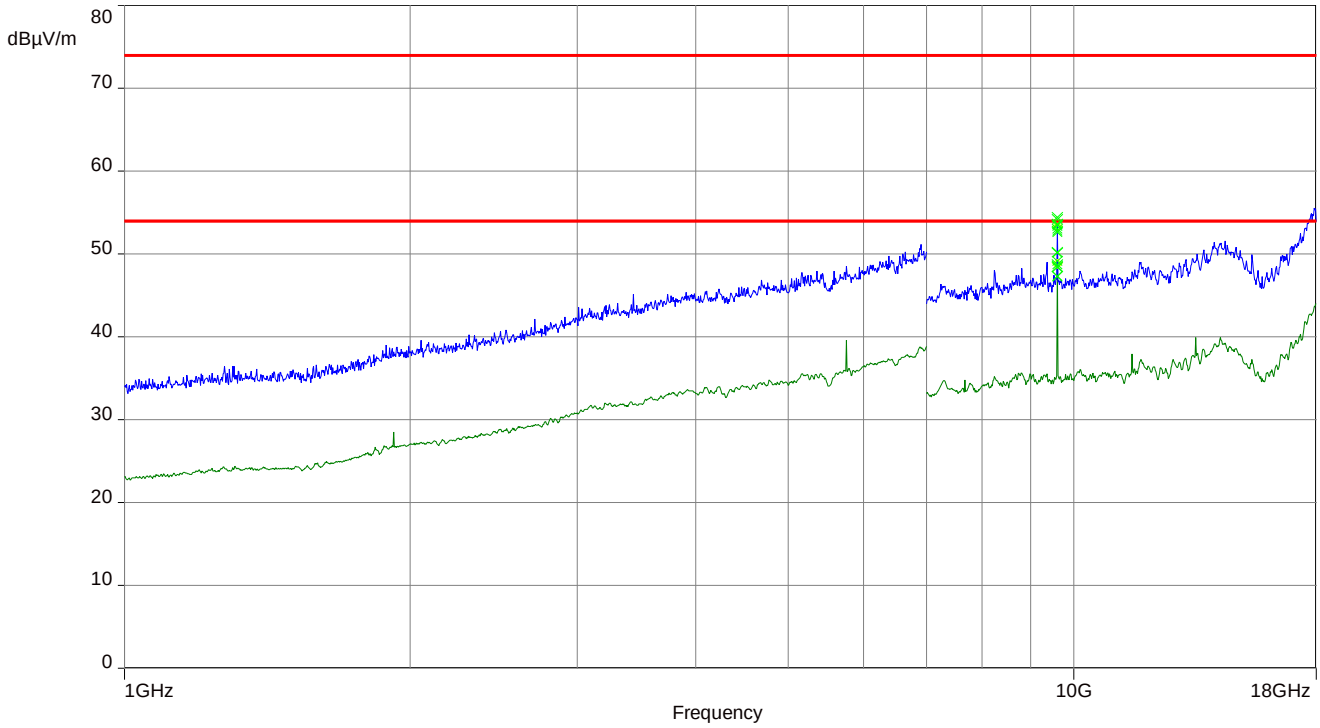
Plot 11: 1GHz – 18 GHz, stop mode, low frequency



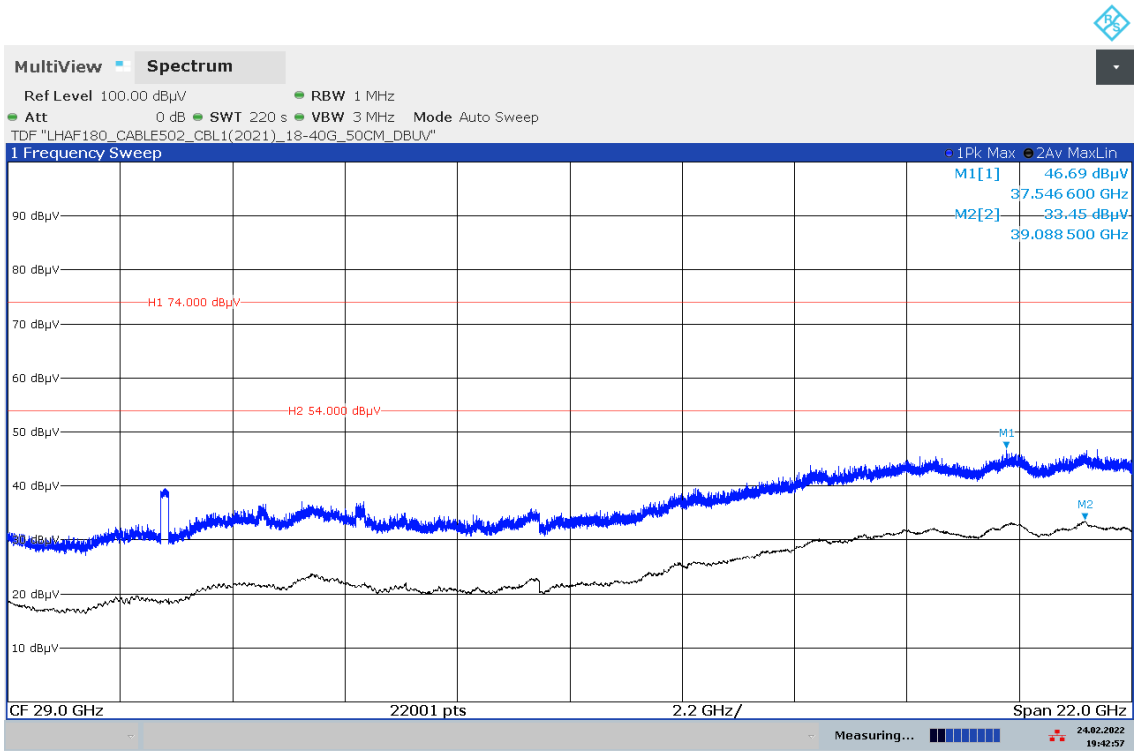
Plot 12: 1GHz – 18 GHz, stop mode, middle frequency



Plot 13: 1GHz – 18 GHz, stop mode, high frequency

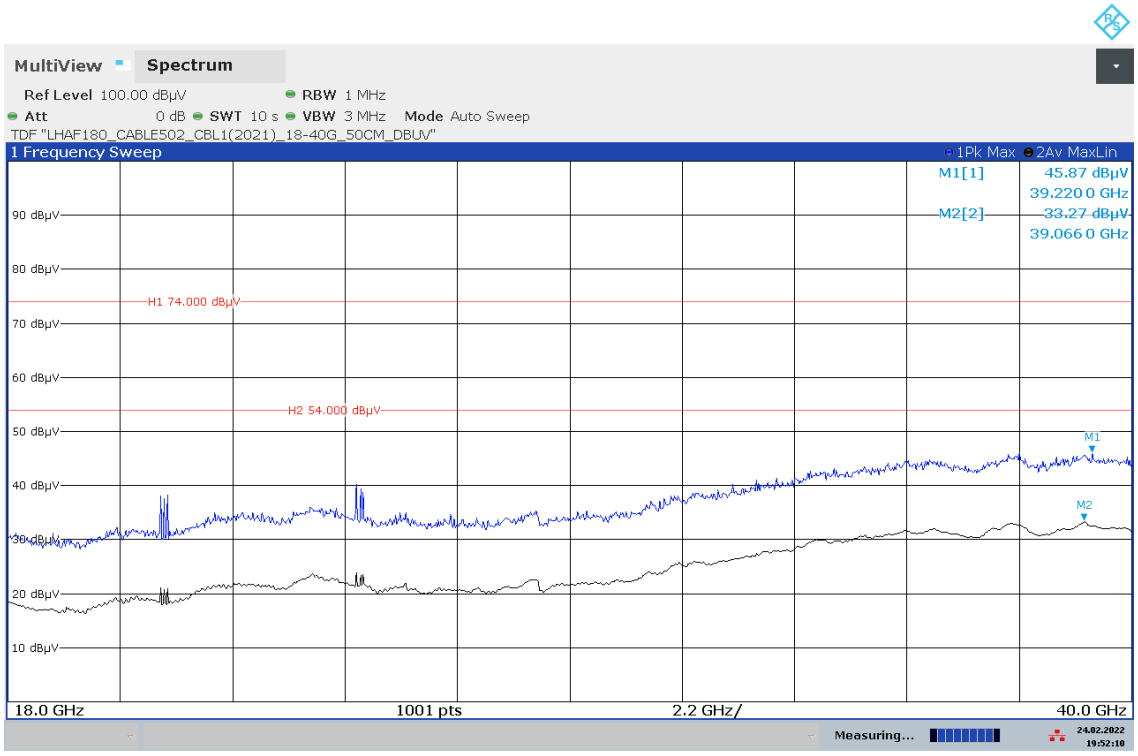


Plot 14: 18 GHz – 40 GHz, normal operation mode



19:42:58 24.02.2022

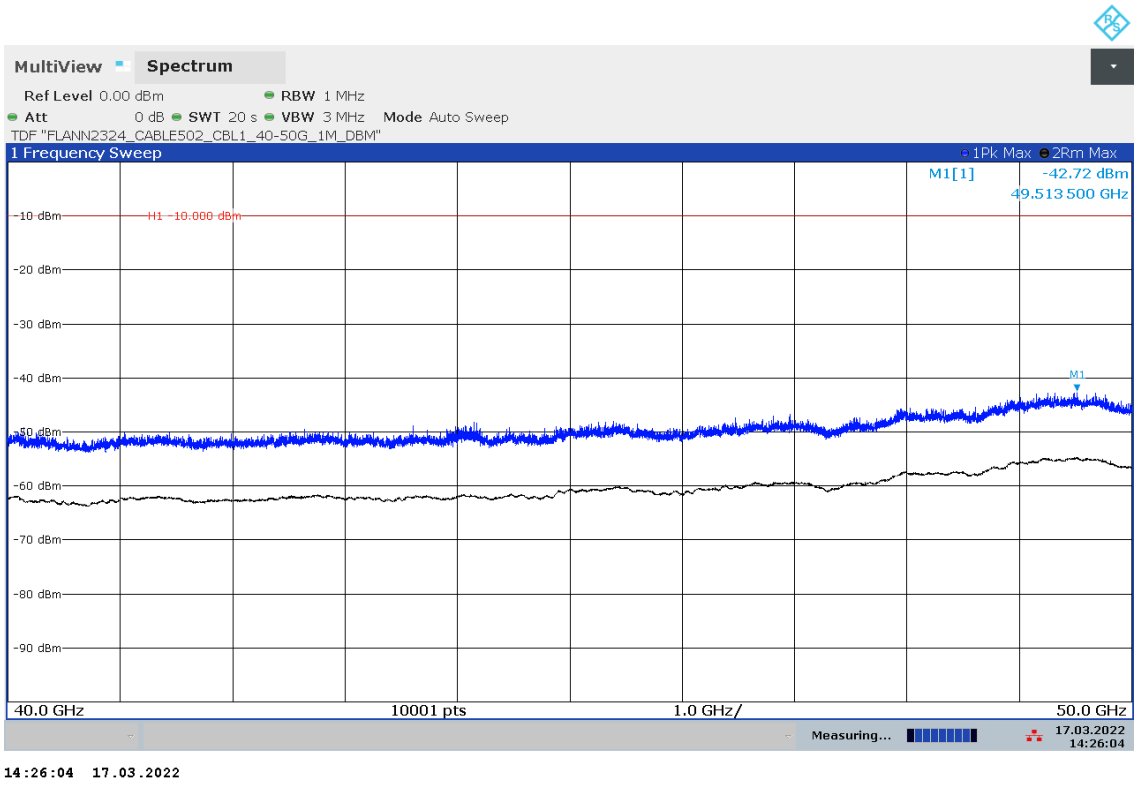
Plot 15: 18 GHz – 40 GHz, stop mode, low, middle and high frequency



19:52:11 24.02.2022

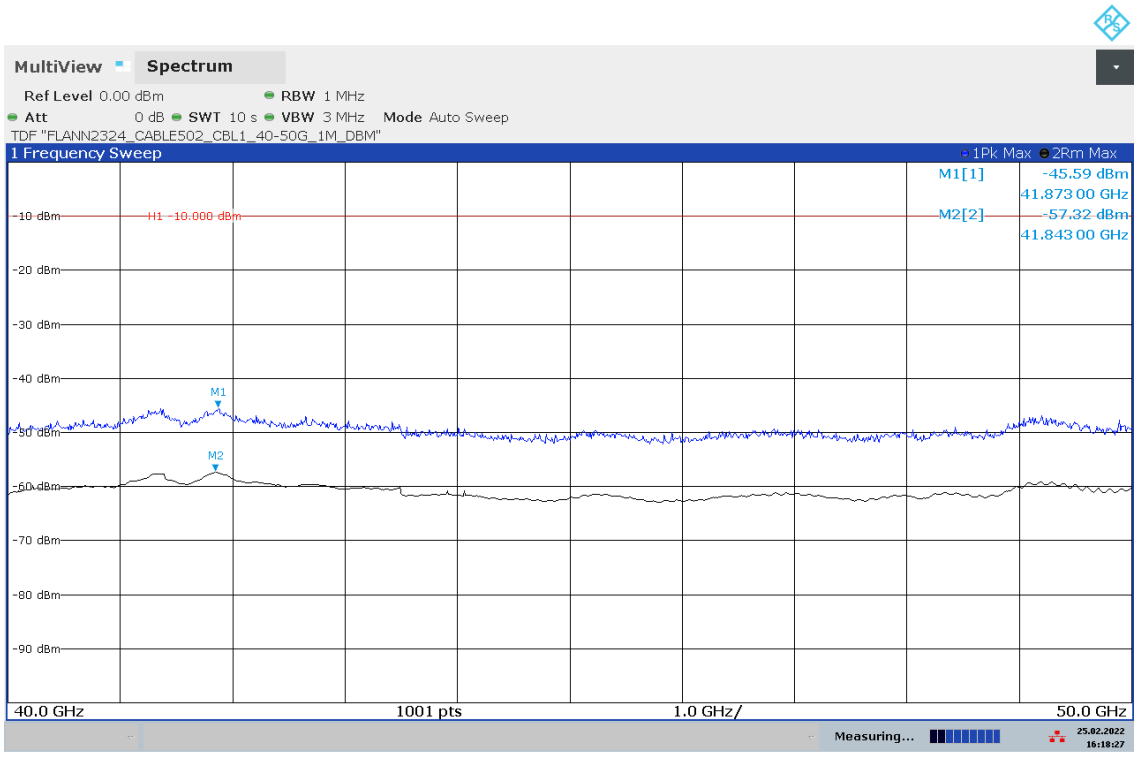
* see note (3)

Plot 16: 40 GHz – 50 GHz, normal operation mode



14:26:04 17.03.2022

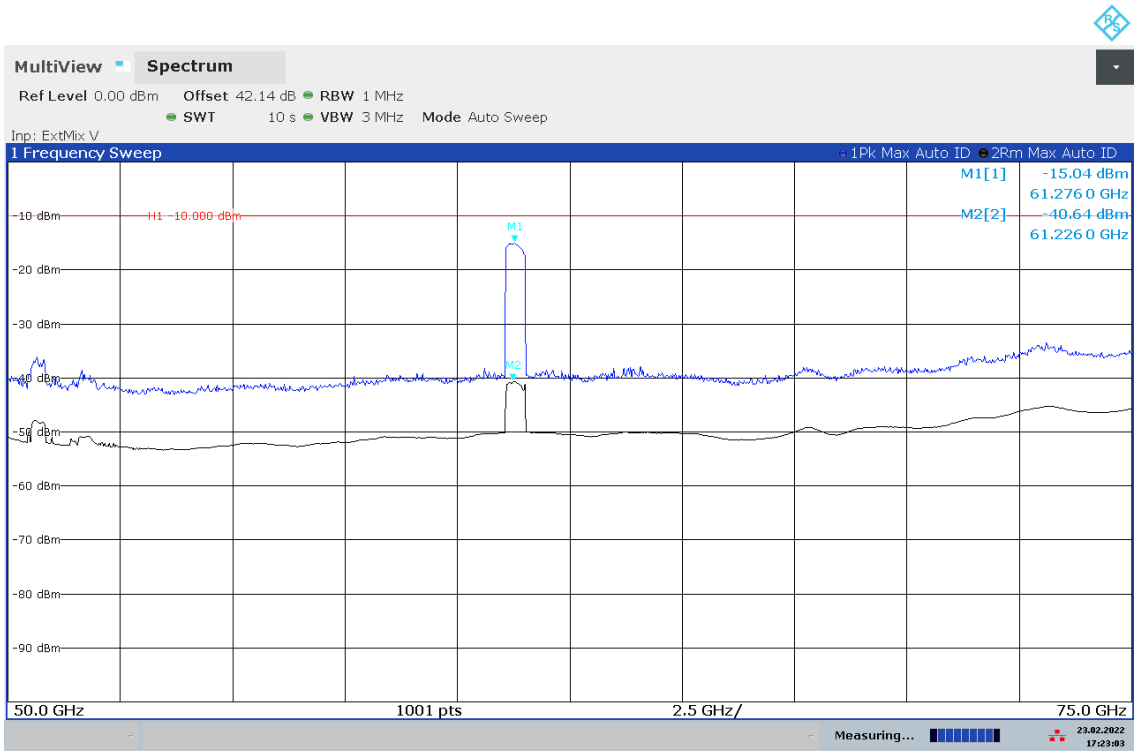
Plot 17: 40 GHz – 50 GHz, stop mode, low, middle and high frequency



16:18:28 25.02.2022

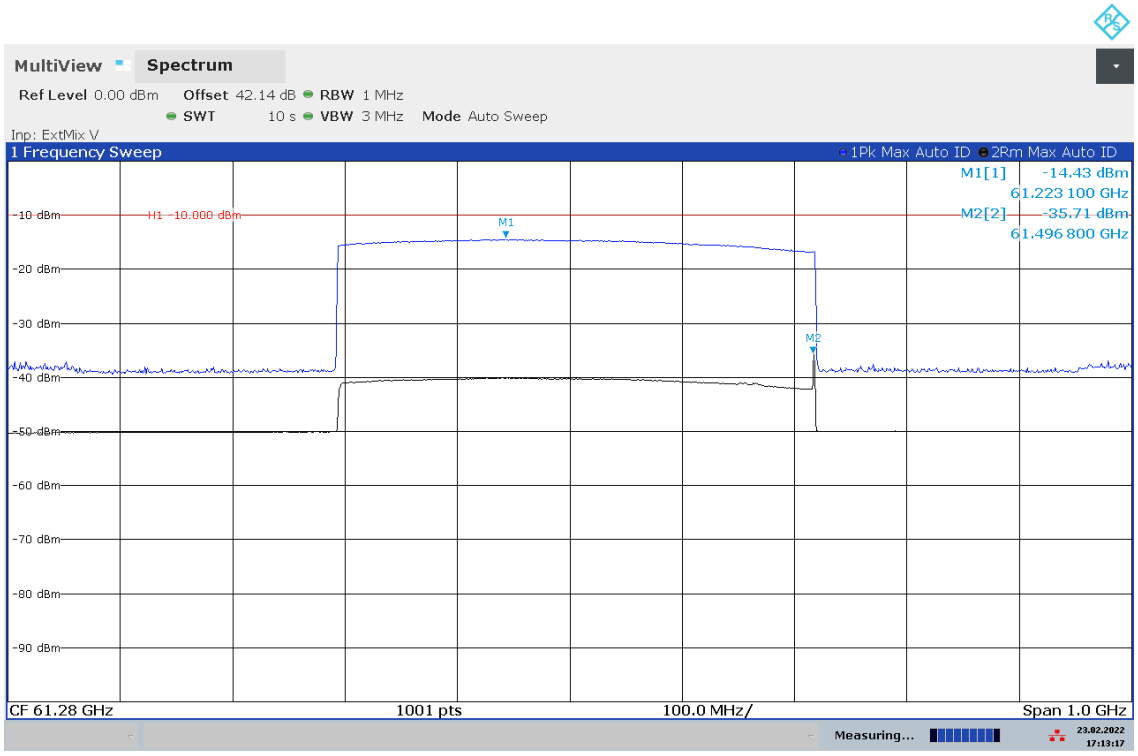
* see note (3)

Plot 18: 50 GHz – 75 GHz, normal operation mode



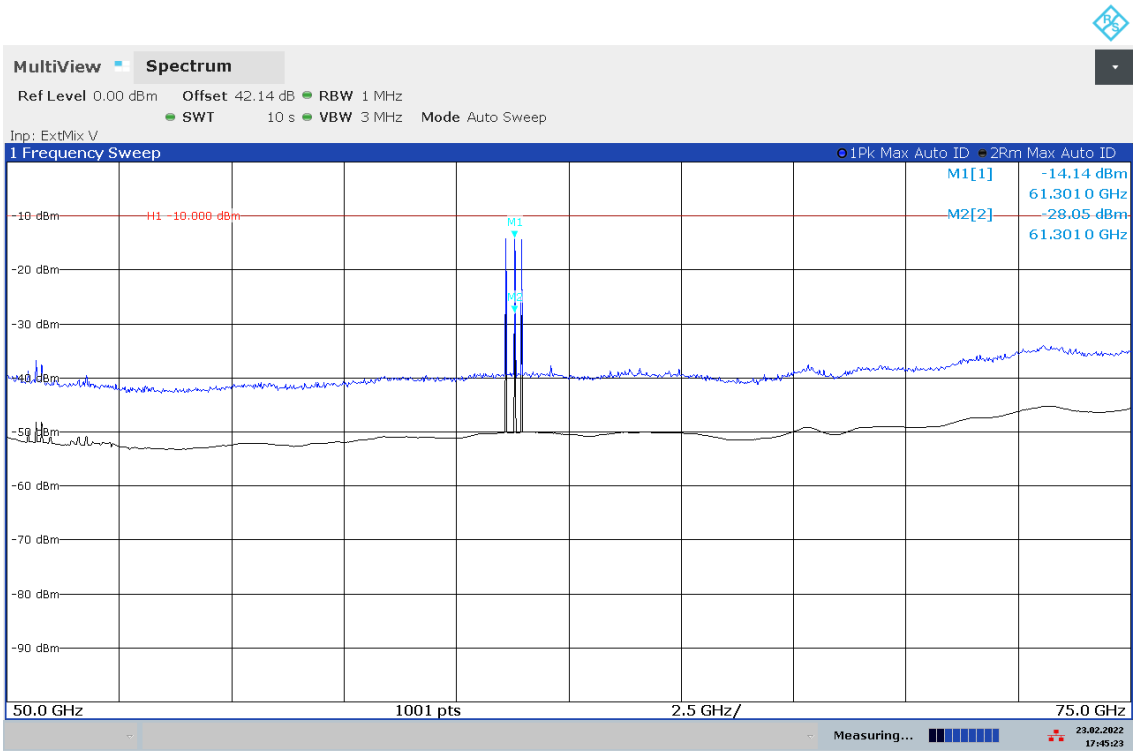
17:23:03 23.02.2022

Plot 19: 50 GHz – 75 GHz, normal operation mode, detail



17:13:18 23.02.2022

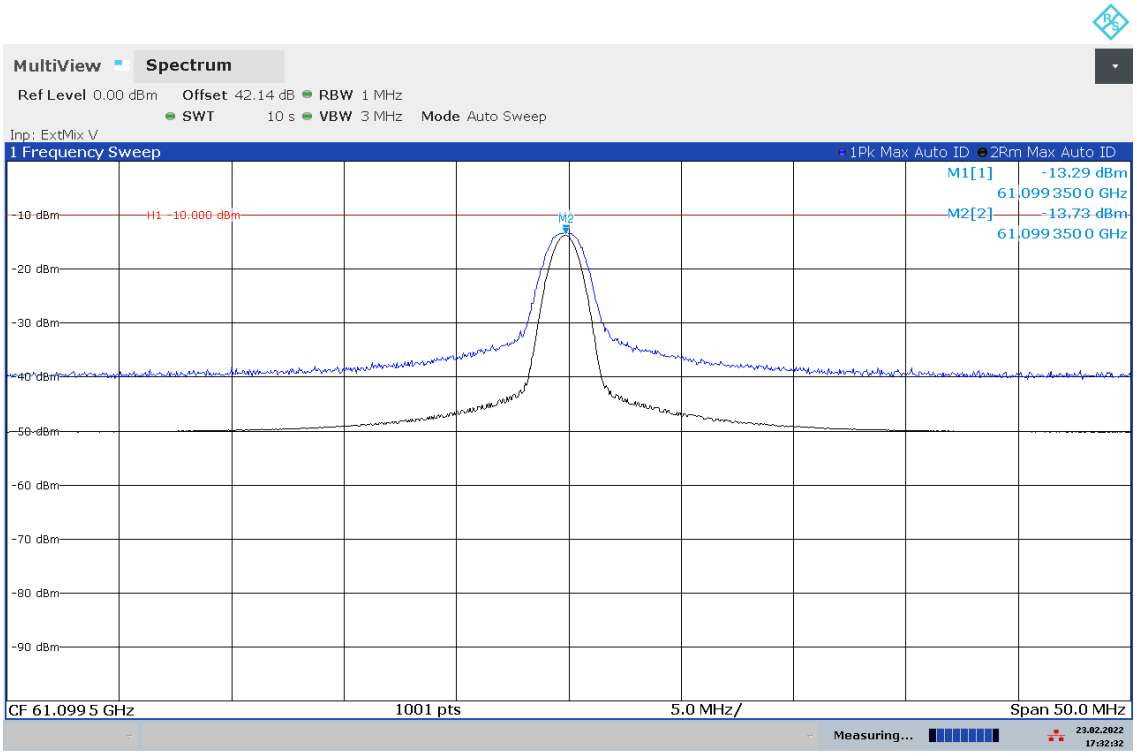
Plot 20: 50 GHz – 75 GHz, stop mode, low, middle and high frequency



17:45:23 23.02.2022

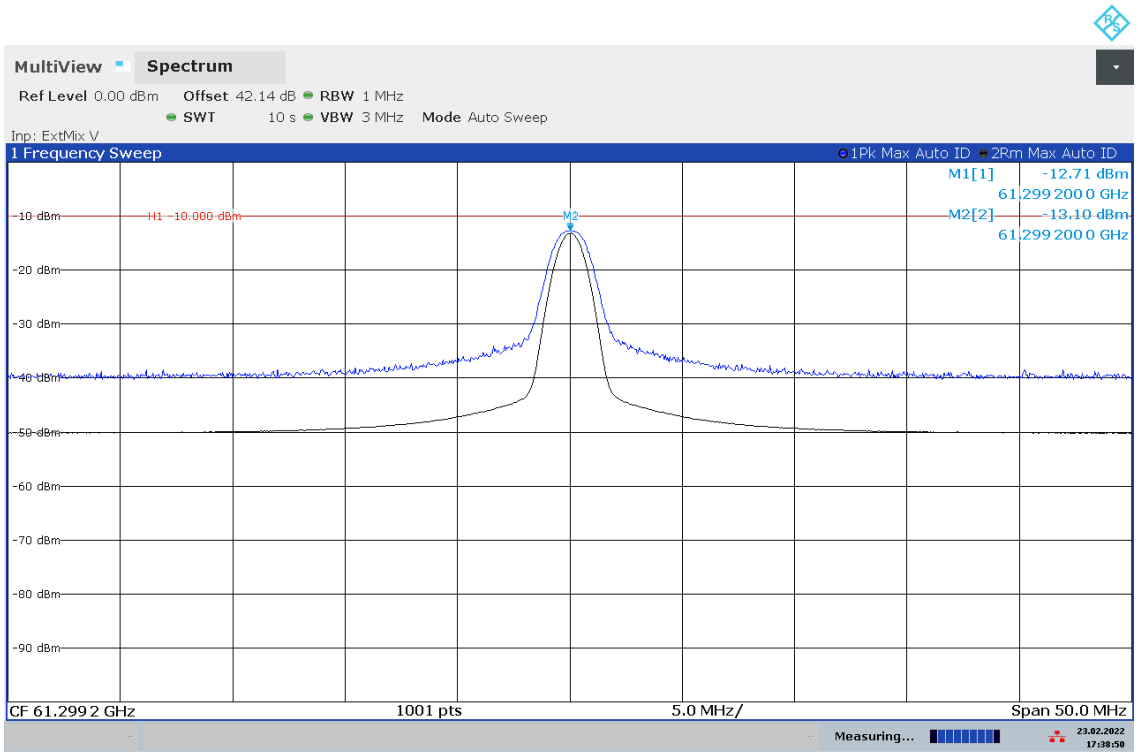
* see note (3)

Plot 21: 50 GHz – 75 GHz, stop mode, low frequency, detail



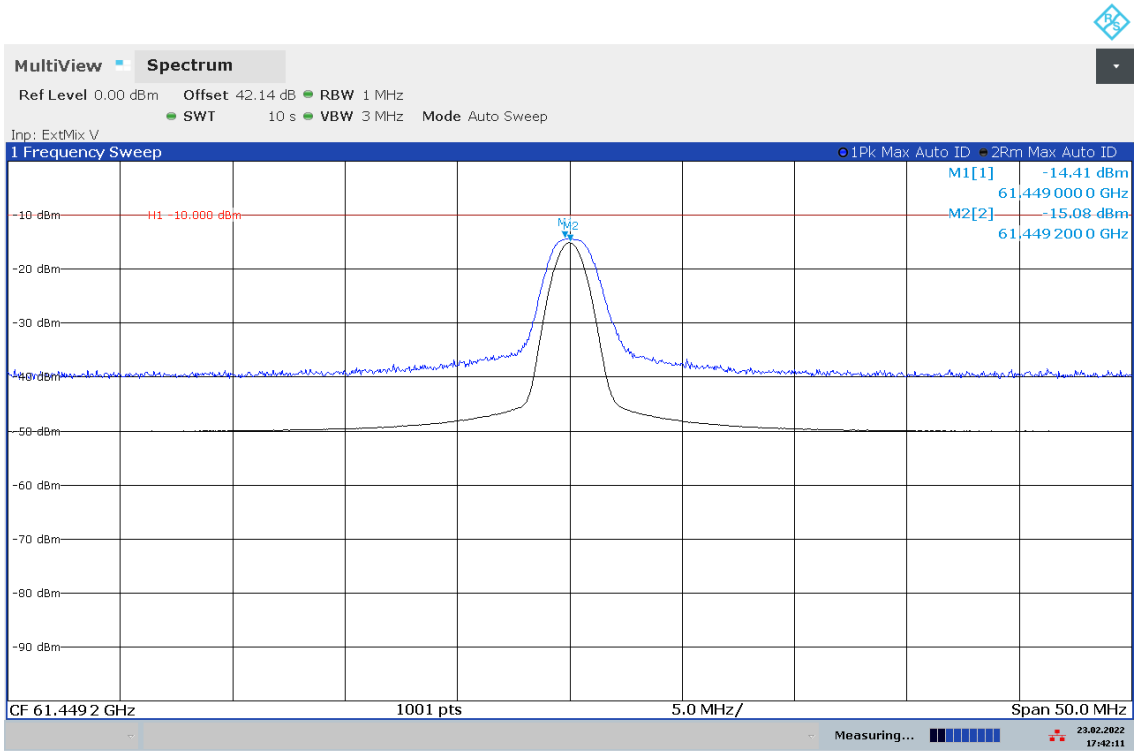
17:32:33 23.02.2022

Plot 22: 50 GHz – 75 GHz, stop mode, middle frequency, detail



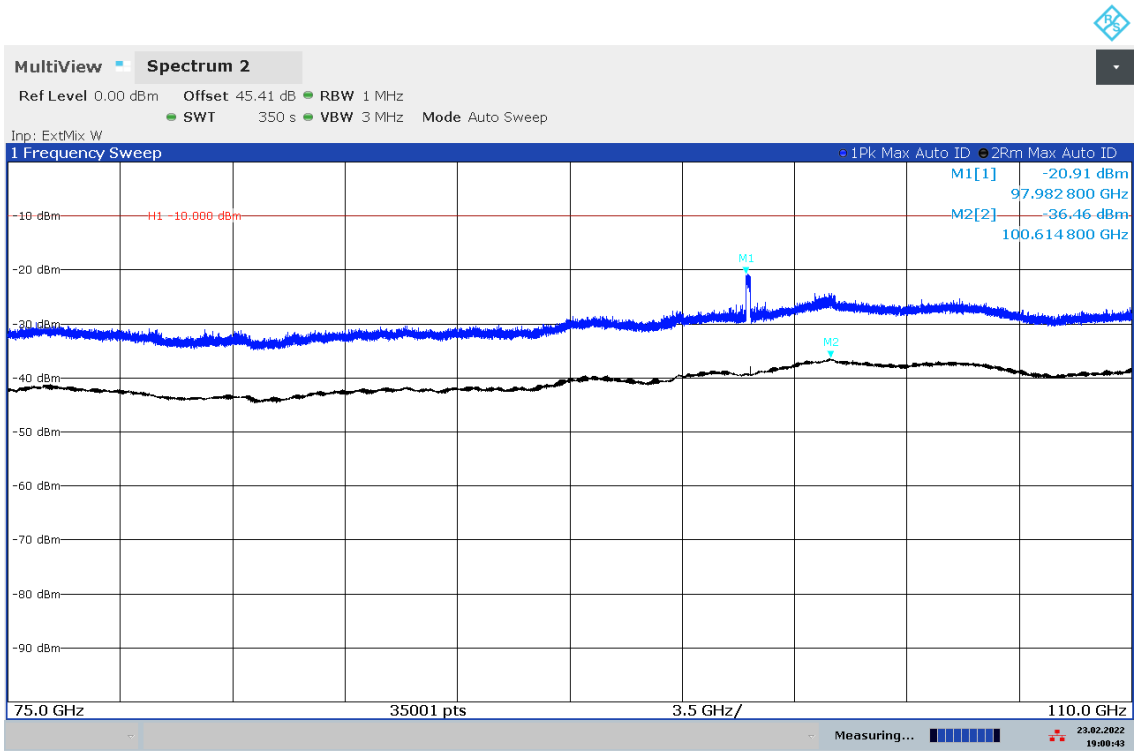
17:38:51 23.02.2022

Plot 23: 50 GHz – 75 GHz, stop mode, high frequency, detail



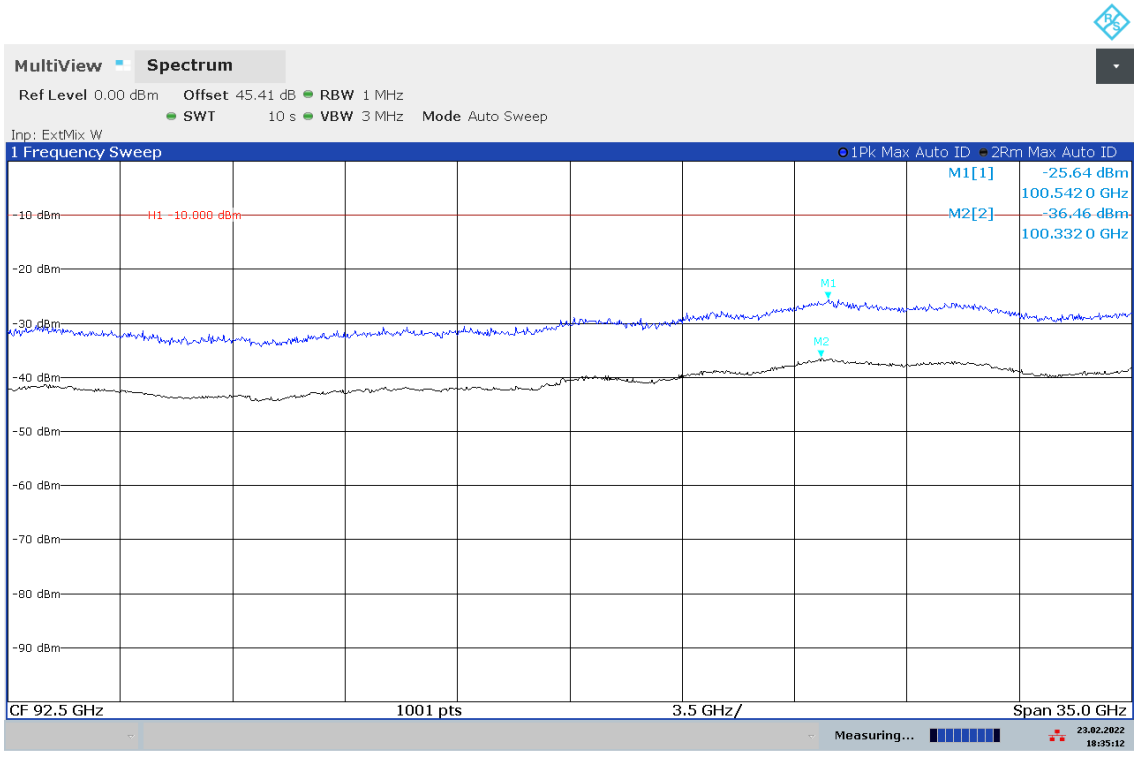
17:42:11 23.02.2022

Plot 24: 75 GHz – 110 GHz, normal operation mode



19:00:43 23.02.2022

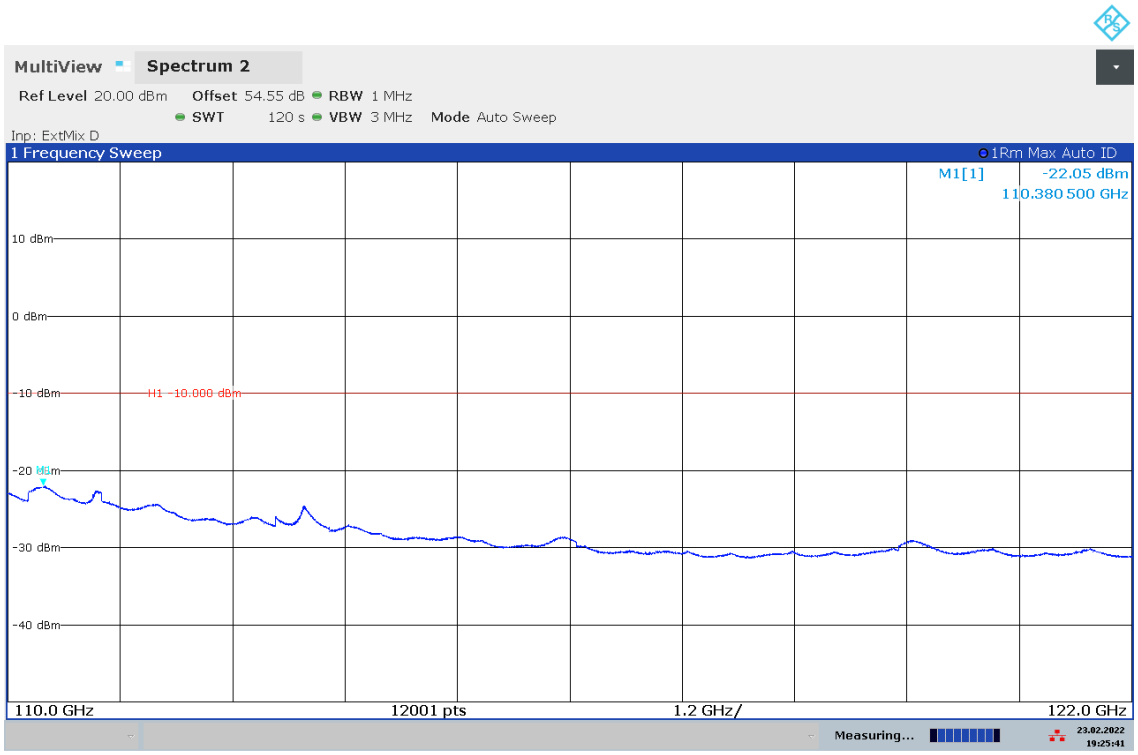
Plot 25: 75 GHz – 110 GHz, stop mode, low, middle and high frequency



18:35:12 23.02.2022

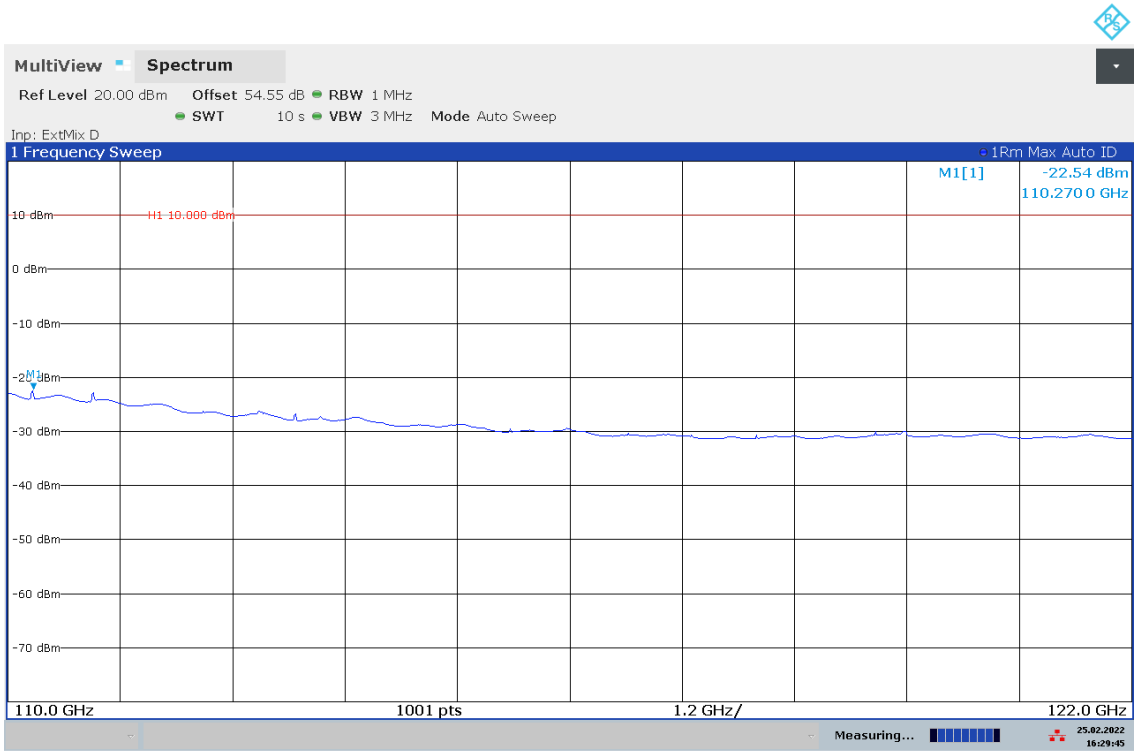
* see note (3)

Plot 26: 110 GHz – 122 GHz (incl. lower band edge), normal operation mode



19:25:42 23.02.2022

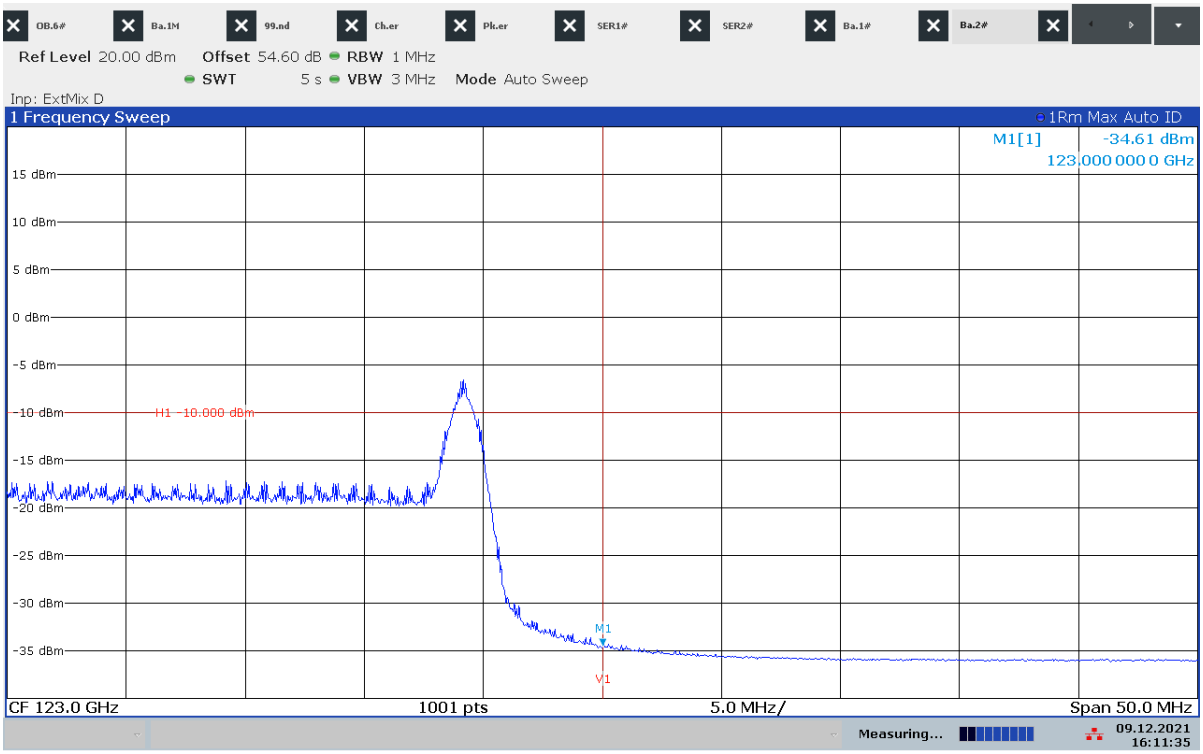
Plot 27: 110 GHz – 122 GHz (incl. lower band edge), stop mode, low, middle and high frequency



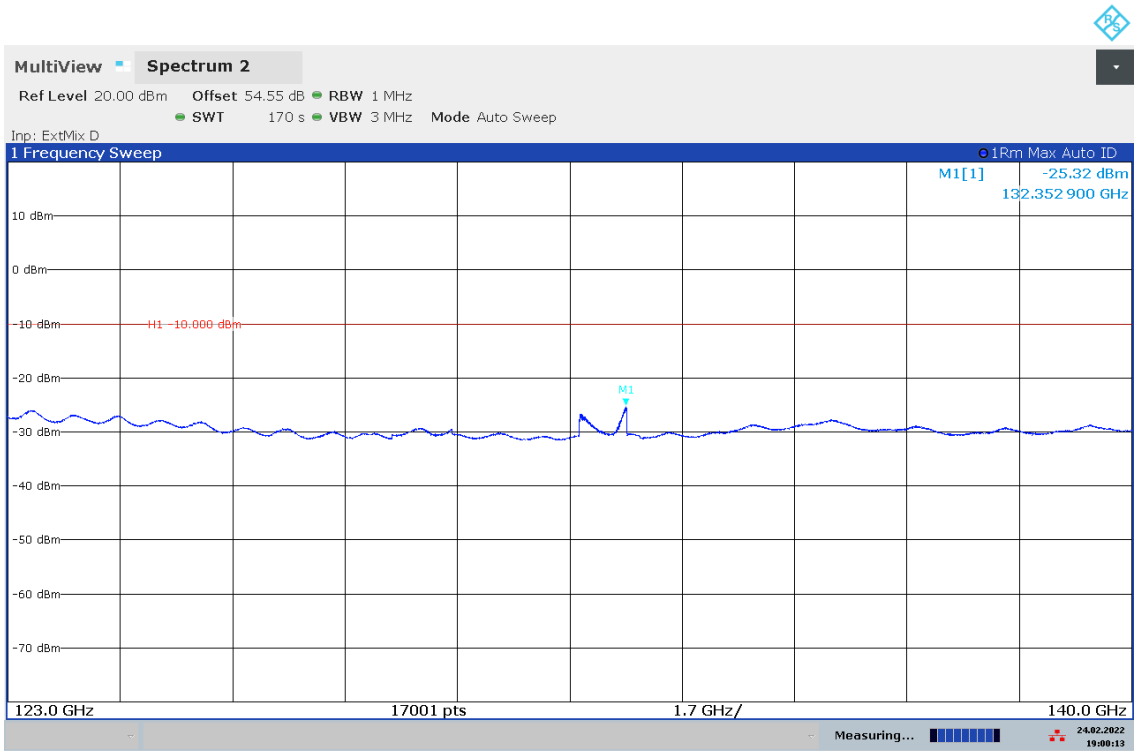
16:29:45 25.02.2022

* see note (3)

Plot 28: Upper band edge, normal operation mode, detail

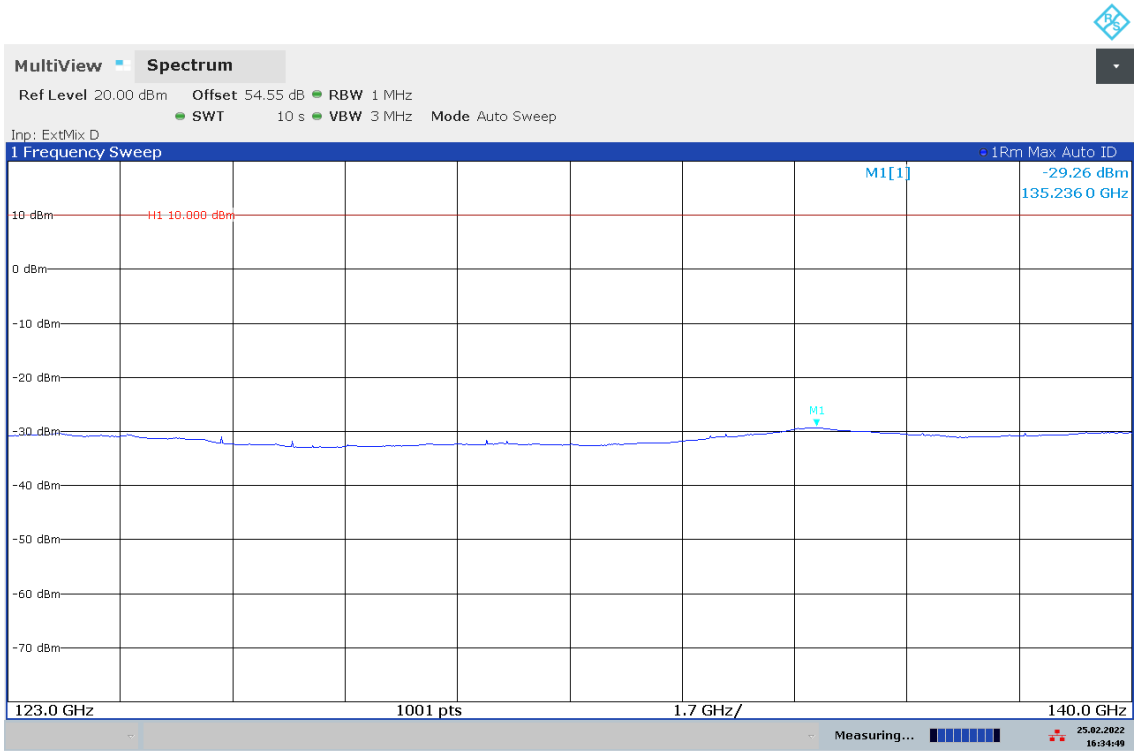


Plot 29: 123 GHz – 140 GHz, normal operation mode



19:00:14 24.02.2022

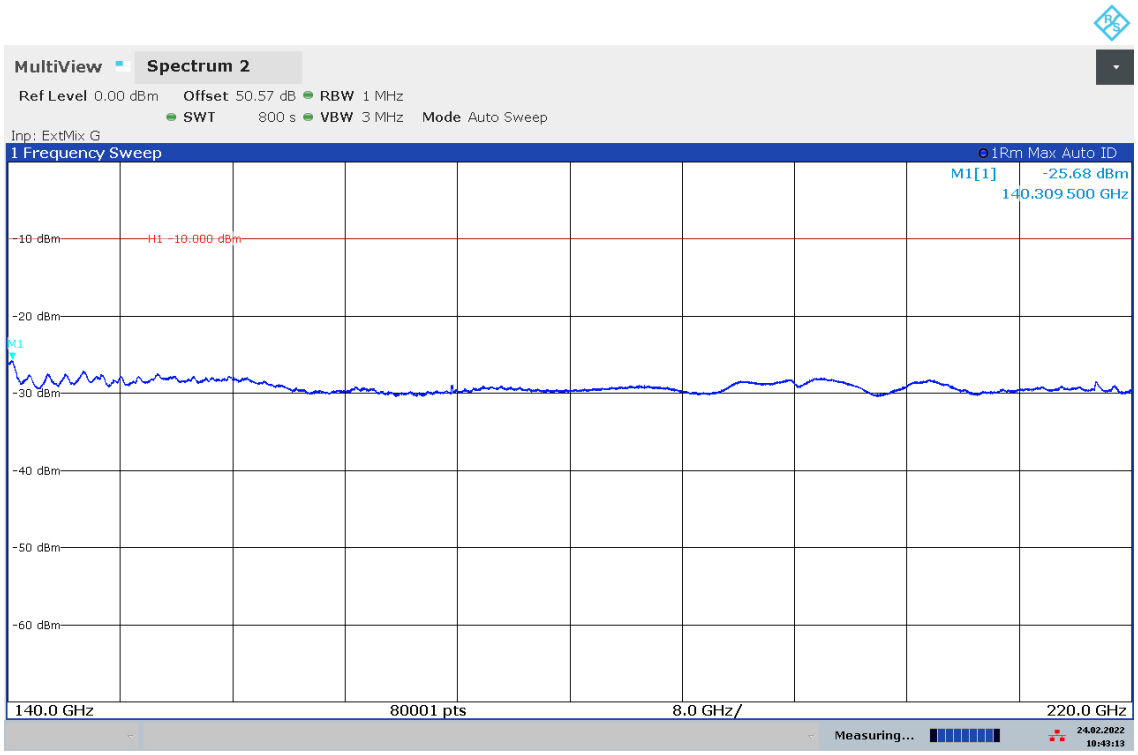
Plot 30: 123 GHz – 140 GHz, stop mode, low, middle and high frequency



16:34:49 25.02.2022

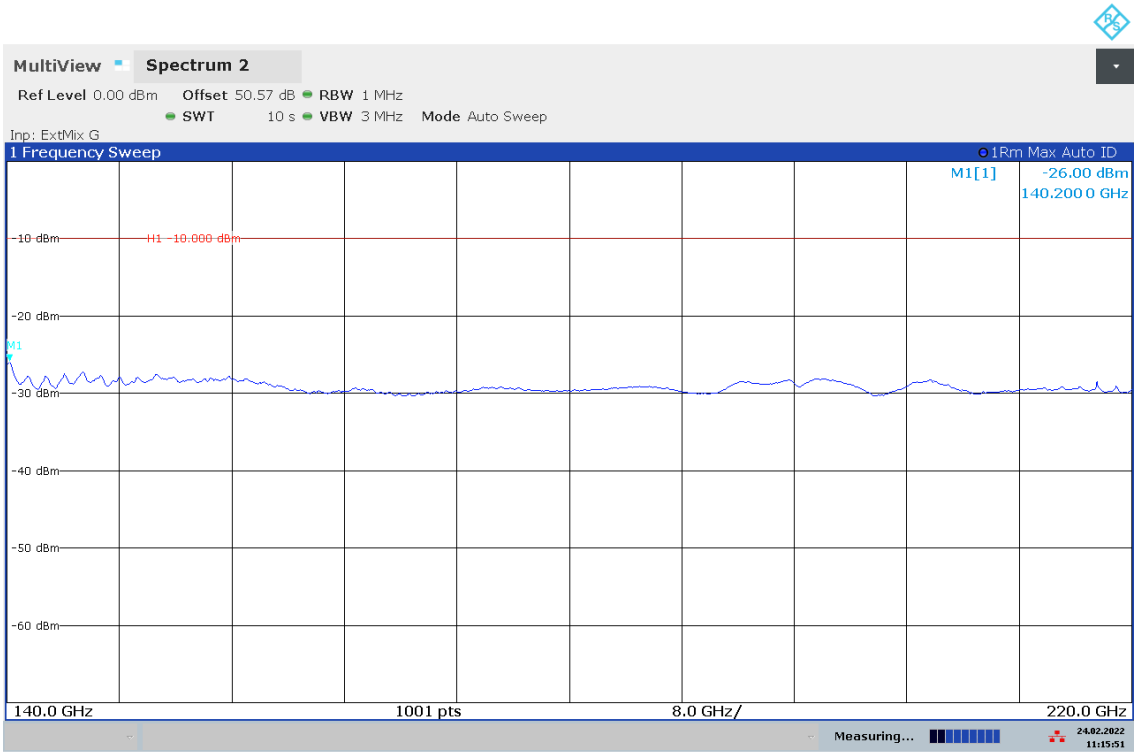
* see note (3)

Plot 31: 140 GHz – 220 GHz, normal operation mode



10:43:14 24.02.2022

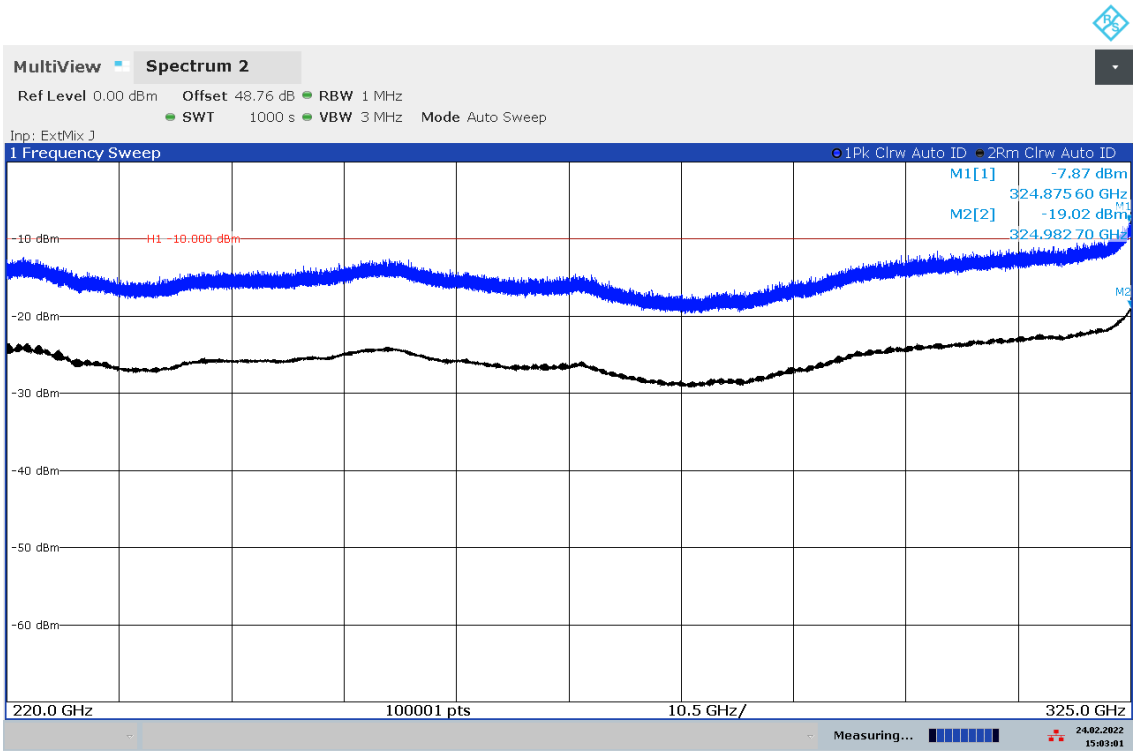
Plot 32: 140 GHz – 220 GHz, stop mode, low, middle and high frequency



11:15:51 24.02.2022

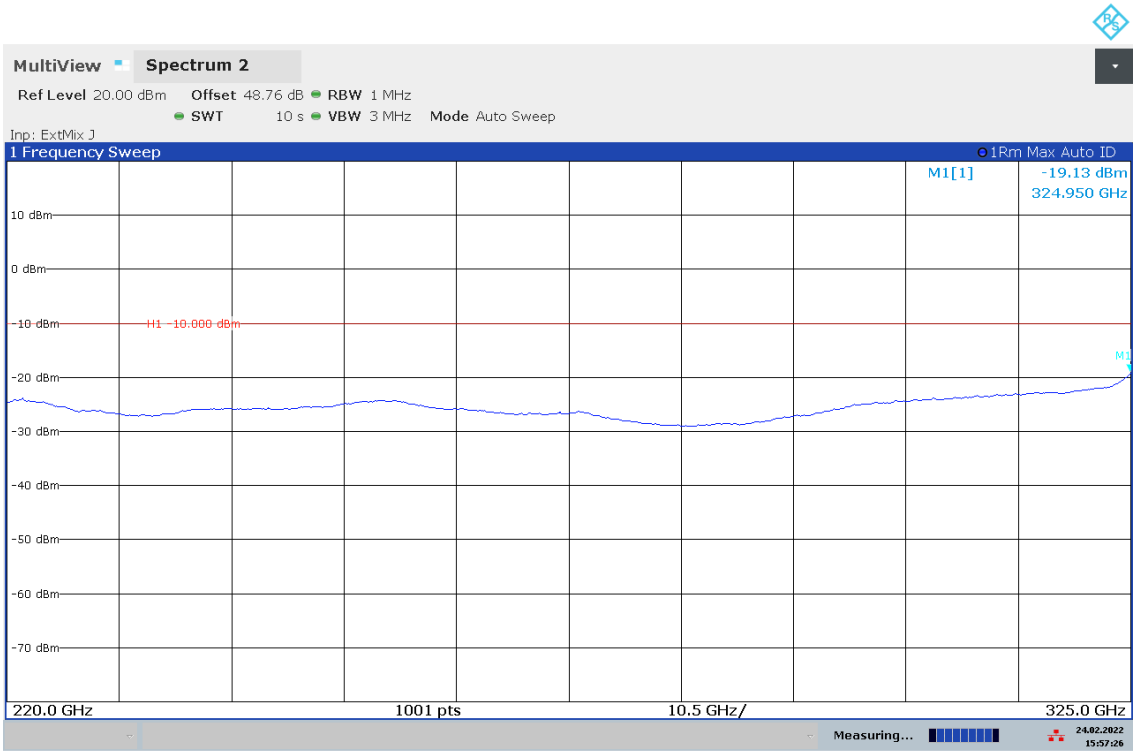
* see note (3)

Plot 33: 220 GHz – 325 GHz, normal operation mode



15:03:02 24.02.2022

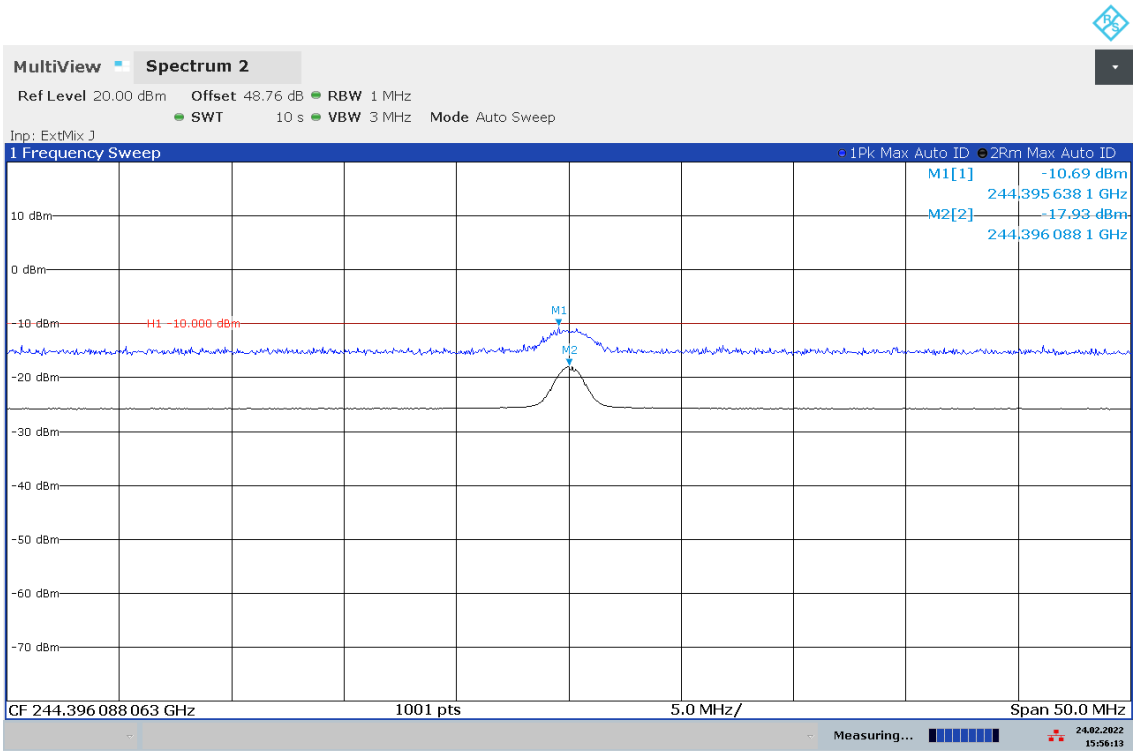
Plot 34: 220 GHz – 325 GHz, stop mode, low, middle and high frequency



15:57:27 24.02.2022

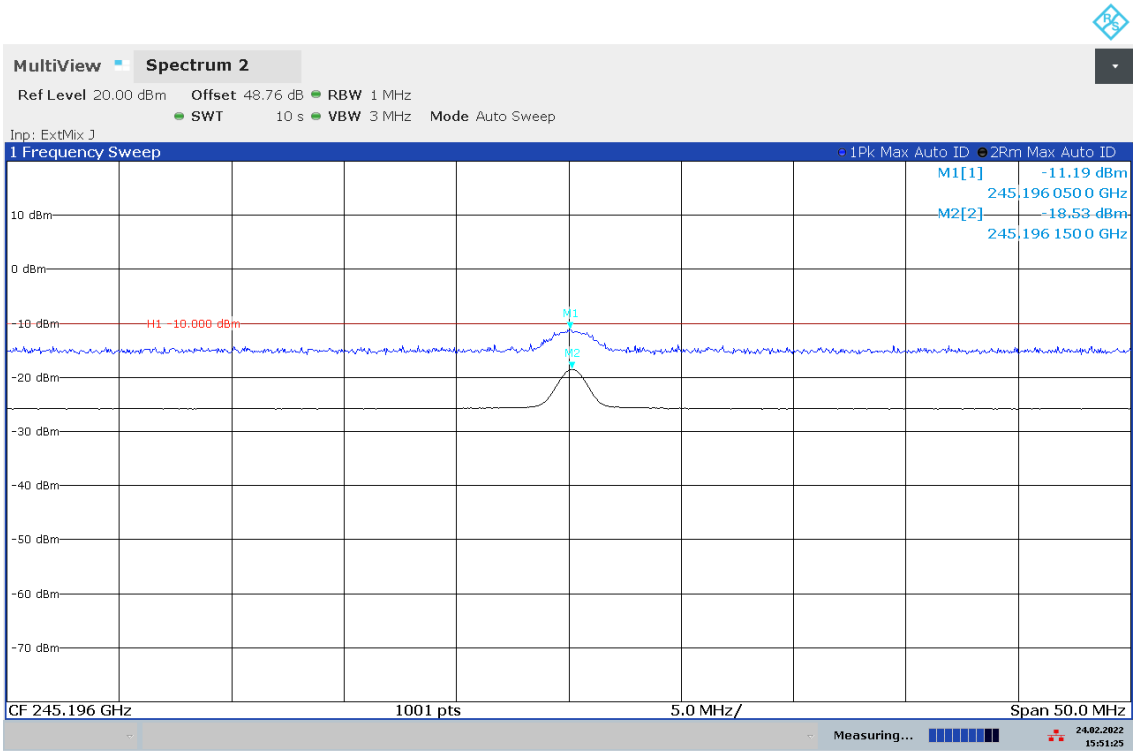
* see note (3)

Plot 35: 220 GHz – 325 GHz, stop mode, low frequency, detail



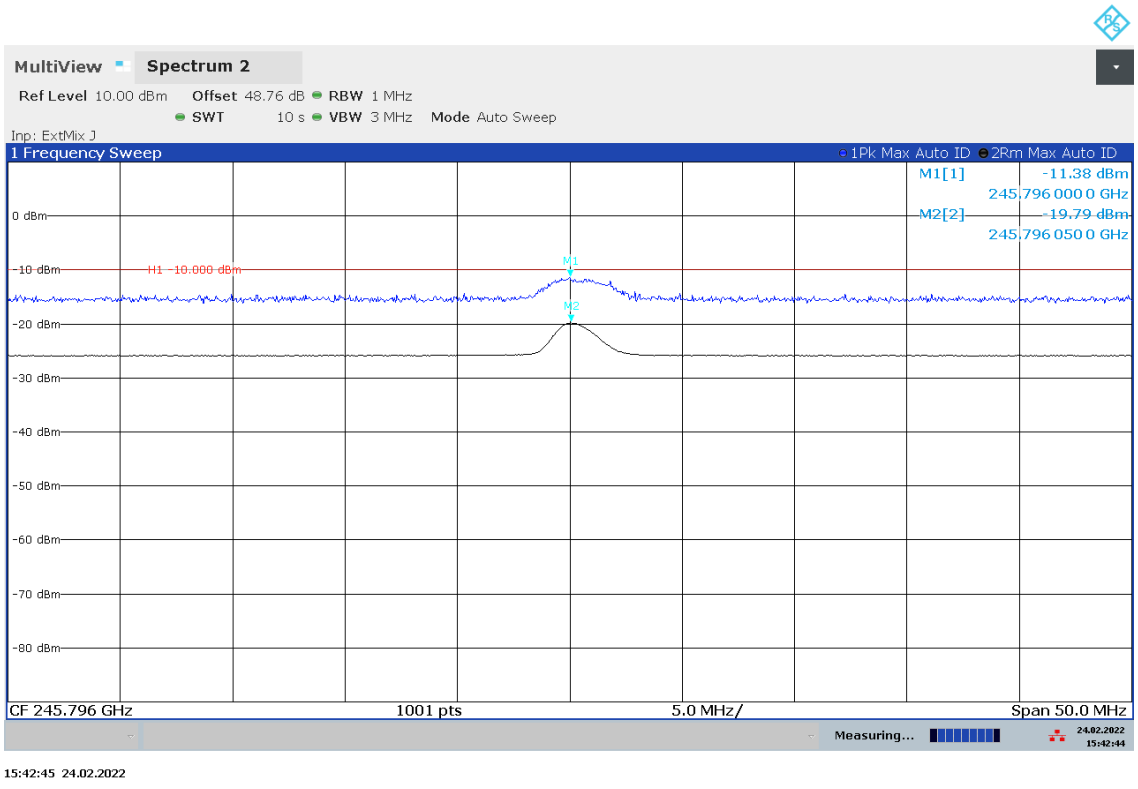
15:56:14 24.02.2022

Plot 36: 220 GHz – 325 GHz, stop mode, middle frequency, detail

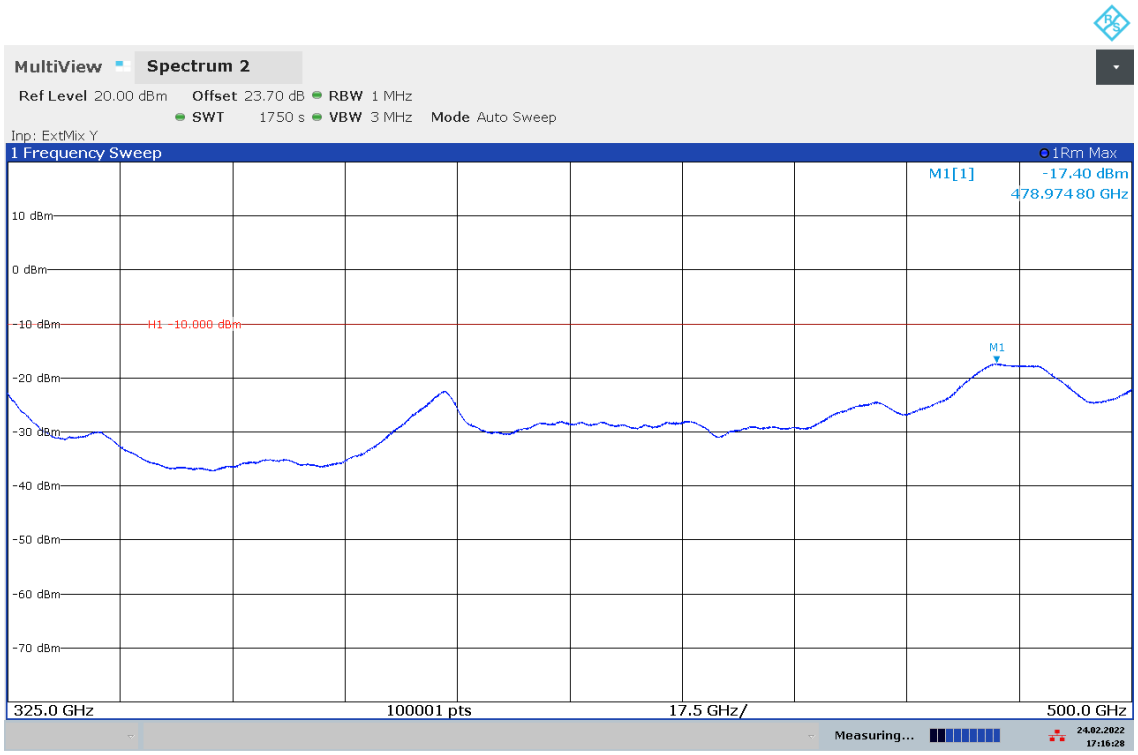


15:51:26 24.02.2022

Plot 37: 220 GHz – 300 GHz, stop mode, high frequency, detail

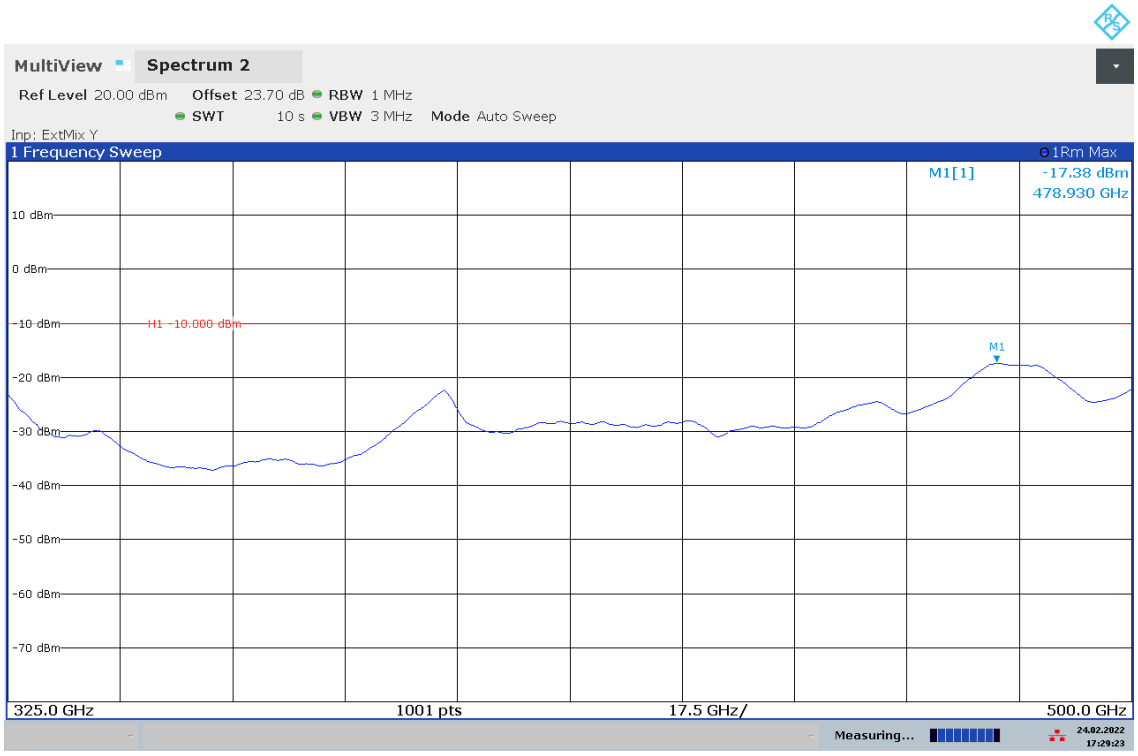


Plot 38: 325 GHz – 500 GHz, normal operation mode



17:16:29 24.02.2022

Plot 39: 325 GHz – 500 GHz, stop mode, low, middle and high frequency



17:29:24 24.02.2022

* see note (3)

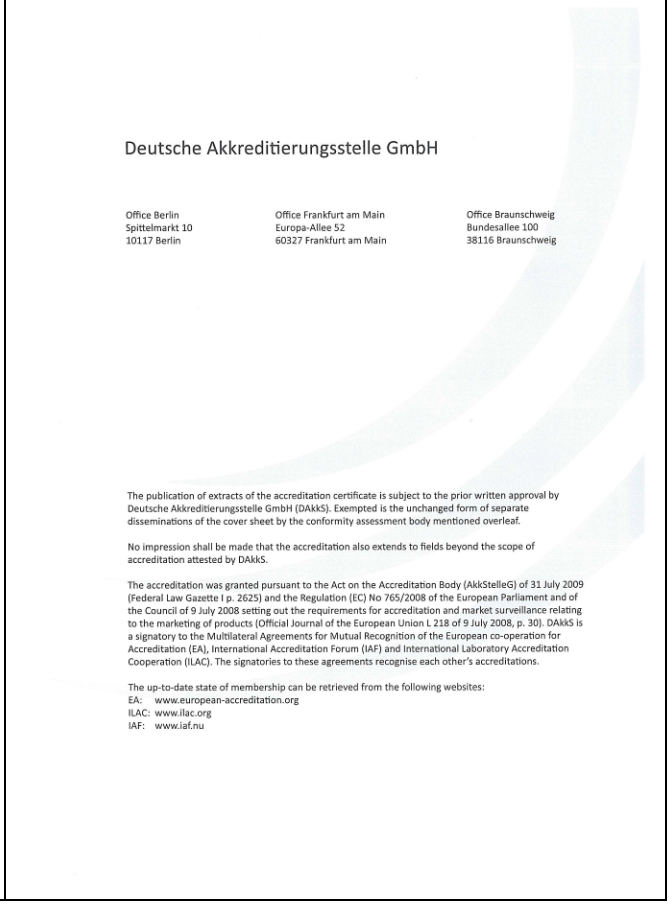
14 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

15 Document history

Version	Applied changes	Date of release
-/-	Initial release	2022-05-17
-A	PMN & HVIN changed	2022-07-14

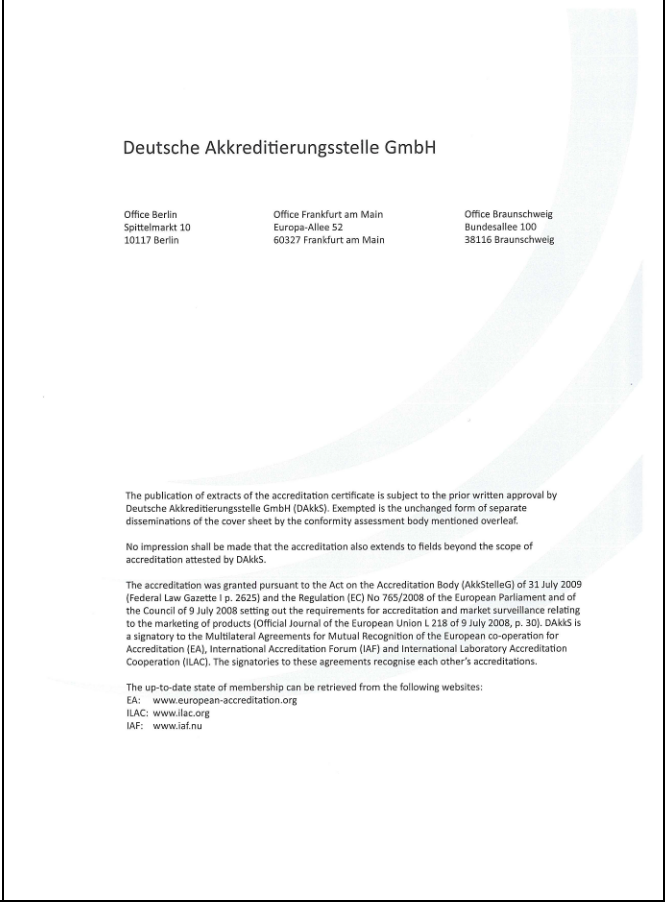
16 Accreditation Certificate – D-PL-12076-01-04

first page	last page
	

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04e.pdf
or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf

17 Accreditation Certificate – D-PL-12076-01-05

first page	last page
	

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf
or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf

########## END OF TEST REPORT ##########