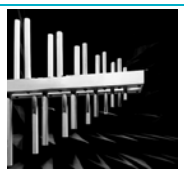
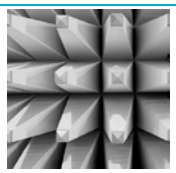




Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-1100/20-01-03-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

InnoSenT GmbH Innovative Sensor-Technik
Am Rödertor 30
97499 Donnersdorf / GERMANY
Phone: +49 9528 9518-0
Contact: Thomas Horn
e-mail: Thomas.Horn@innosent.de

Manufacturer

InnoSenT GmbH Innovative Sensor-Technik
Am Rödertor 30
97499 Donnersdorf / GERMANY

Test standard/s

FCC - Title 47 CFR	FCC - Title 47 of the Code of Federal Regulations; Chapter I;
Part 15	Part 15 - Radio frequency devices
RSS - 210 Issue 10	Radio Standards Specification - Licence-Exempt Radio Apparatus: Category II Equipment
RSS-GEN	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:	**60 GHz Distance Measurement System**
Model name:	**iSYS-6030**
FCC ID:	**UXS-ISYS-6030**
IC ID:	**6902A-ISYS6030**
Frequency:	57 – 71 GHz
Antenna:	Integrated and separated Tx- / Rx-Patch antenna
Power supply:	3.6 – 16 V DC
Temperature range:	-40°C to +85°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:

Thomas Vogler

cn=Thomas Vogler, o=CTC advanced GmbH, ou=VOG-211118, email=thomas.vogler@ctcadvanced.com, c=DE
2022.04.07 16:42:55 +02'00'

Thomas Vogler
Lab Manager
Radio Communications & EMC

Test performed:

M. Walla

cn=Meheza Walla, o=CTC advanced GmbH, ou=WAL-200806, email=meheza.walla@ctcadvanced.com, c=DE
2022.04.07 16:10:06 +02'00'

Meheza Walla
Lab 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.
The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.
The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".
CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.
Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.
Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.
All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH.
In no case this test report can be considered as a Letter of Approval.

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.

2.2 Application details

Date of receipt of order:	2021-04-29
Date of receipt of test item:	2021-05-08
Start of test:*	2021-05-10
End of test:*	2021-08-20
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

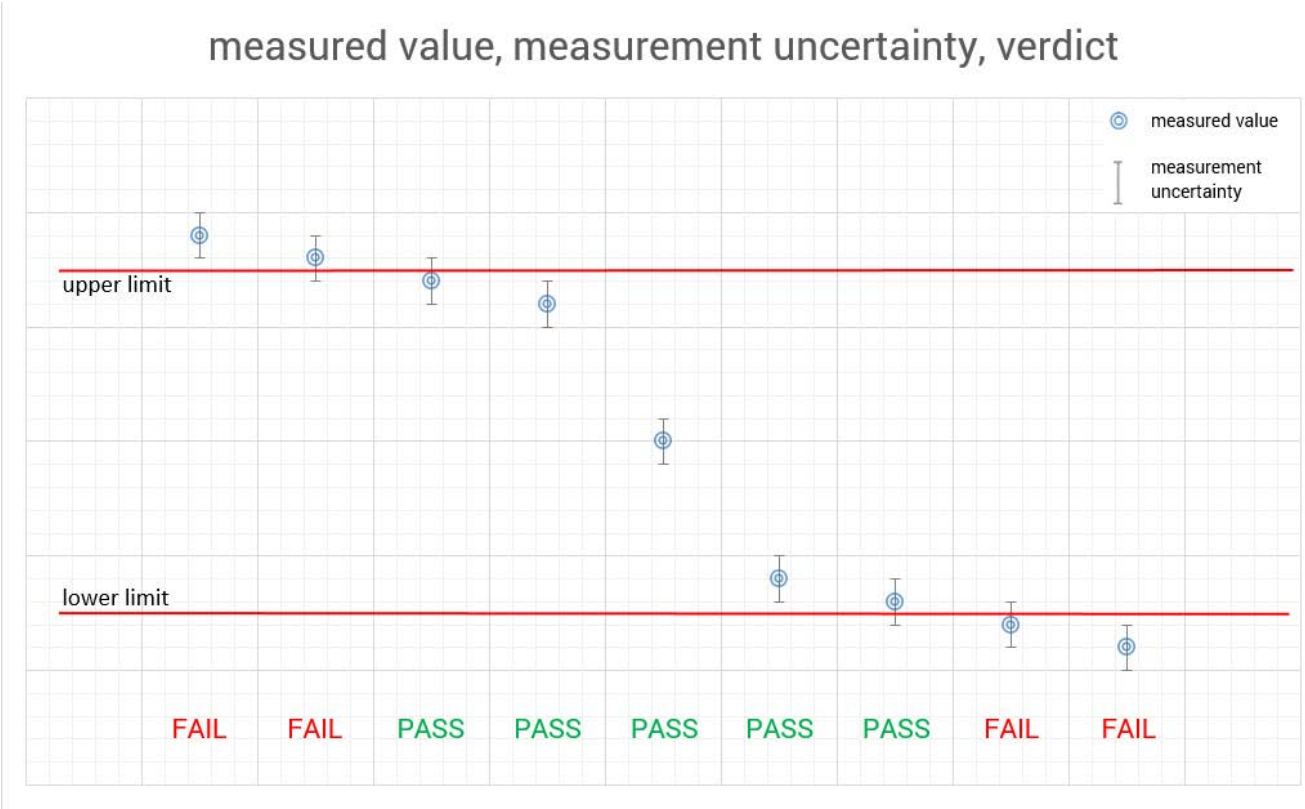
Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 10	12-2019	Radio Standards Specification - Licence-Exempt Radio Apparatus: Category II Equipment
RSS-GEN	03-2019	General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
ANSI C63.4-2017	-/-	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/as/ast/d/D-PL-12076-01-04.pdf	
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/as/ast/d/D-PL-12076-01-05.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}	+20 °C during room temperature tests +85 °C during high temperature tests -40 °C during low temperature tests
Relative humidity content	:		55 %
Power supply	:	V_{nom} V_{min} V_{max}	5.0 V DC 16.0 V DC 3.6 V DC

6 Test item

6.1 General description

Kind of test item	:	60 GHz Distance Measurement System
Type identification	:	iSYS-6030
S/N serial number	:	00001531
HW hardware status	:	Rev4_01
SW software status / FW firmware status	:	1.000, 1.004
PMN	:	iSYS-6030
HVIN	:	iSYS-6030
FVIN	:	-/-
HMN	:	-/-
Frequency band	:	57 – 71 GHz
Type of modulation	:	FMCW
Antenna	:	Integrated and separated Tx- / Rx-Patch antenna
Power supply	:	3.6 – 16.0 V DC from power supply
Temperature range	:	-40°C to +85°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: 1-1100/20-01-01_AnnexA
1-1100/20-01-01_AnnexB
1-1100/20-01-01_AnnexD

Tests were performed on 4 modulations: Single Target Mode (STM)
Multi Target Mode 10 Hz (MTM10)
Long Integration Mode (LIM)
Multi Target Mode 25 Hz (MTM25)

The occupied bandwidth, the maximum E.I.R.P:and the peak transmitter conducted output power were measured on all modulations at T_{nom} / V_{nom}.

Special test software was used to change from normal operation mode to stop mode as required by CFR 47 Part 15.31(m) to perform the spurious emissions.

fb = Sweep stopped near the bottom edge of the range of operation frequency: 60.0 GHz
fm = Sweep stopped at the middle of the range of operation frequency: 61.8 GHz
ft = Sweep stopped near the top edge of the range of operating frequency: 63.6 GHz

Spurious emissions in normal mode and tests under extreme test conditions (Frequency Stability) were done according to ANSI 63.10 as worst case mode for given tests:

Single Target Mode (STM)

7 Sequence of testing

7.1 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.

7.2 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.

7.3 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.

7.4 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.

7.5 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.

8 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).

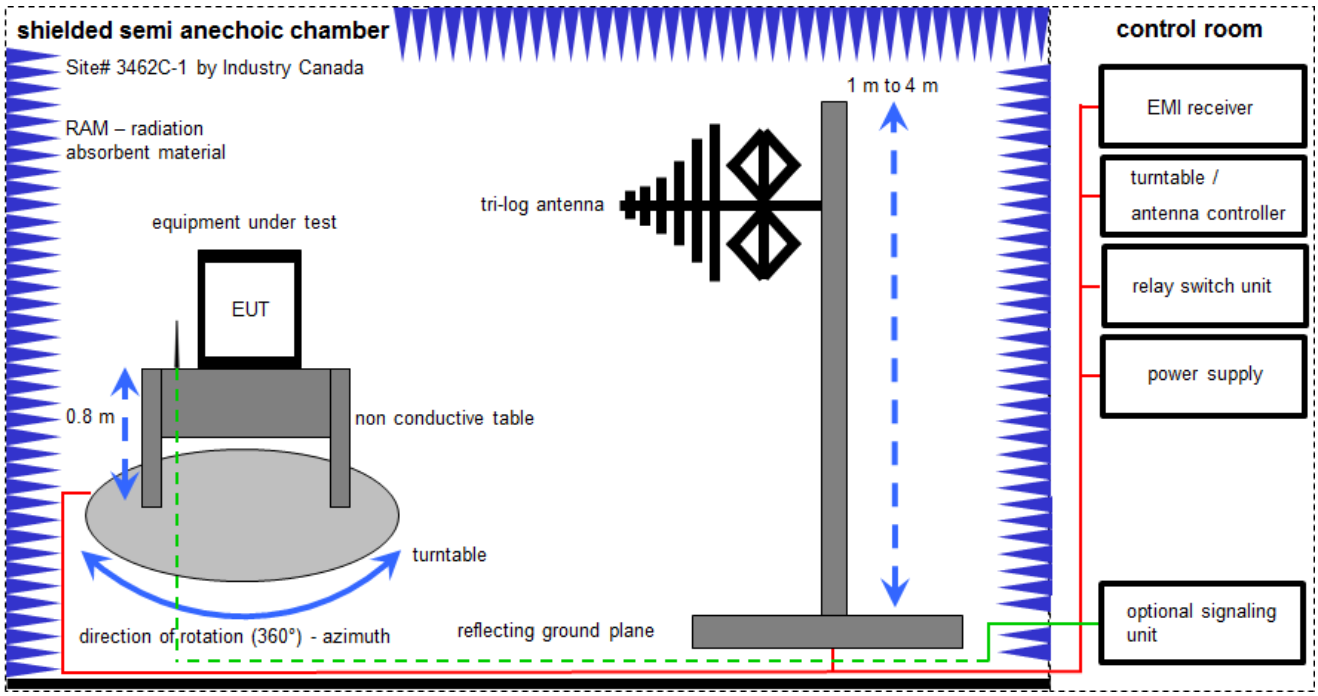
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

8.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz 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 confirmed with 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.

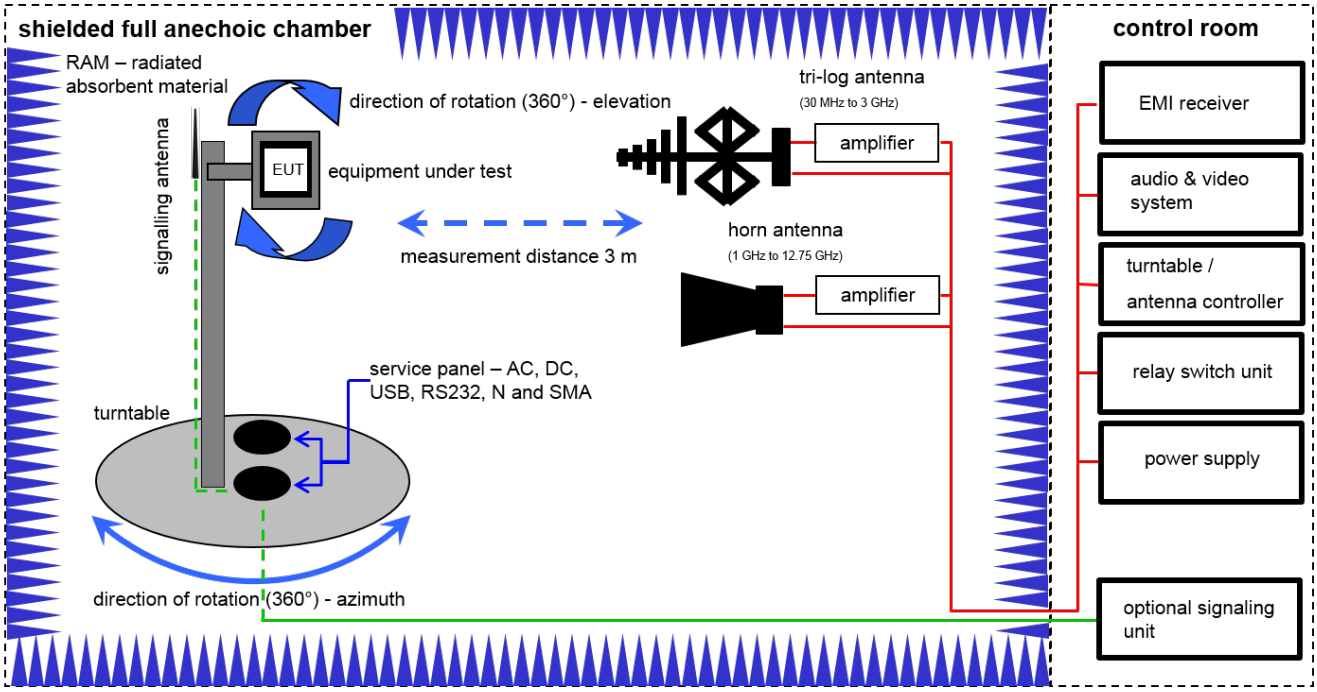


Measurement distance: tri-log antenna 10 meter

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.	Meßkabine 1	HF-Absorberhalle	MWB AG 300023		300000551	ne	-/-	-/-
4	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	09.12.2020	08.12.2021
5	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
6	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
7	n. a.	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	318	300003696	vlKl!	04.09.2019	03.09.2021
9	n. a.	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
10	n. a.	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	10.12.2020	09.12.2021

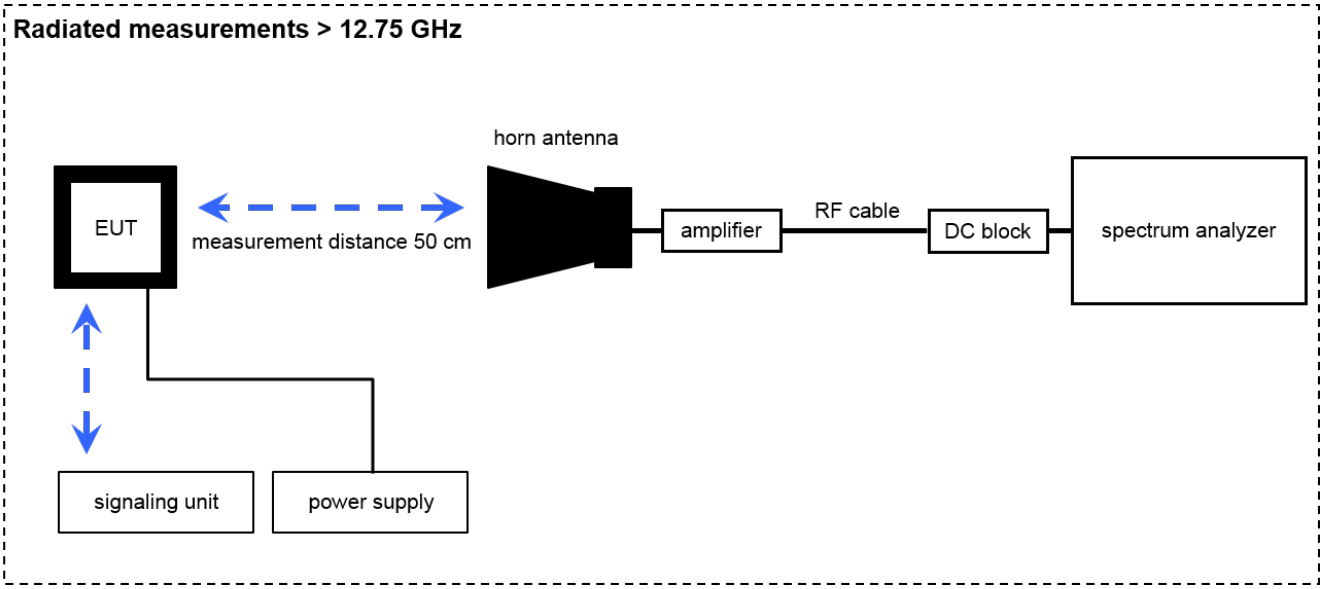
8.2 Radiated measurements fully anechoic chamber



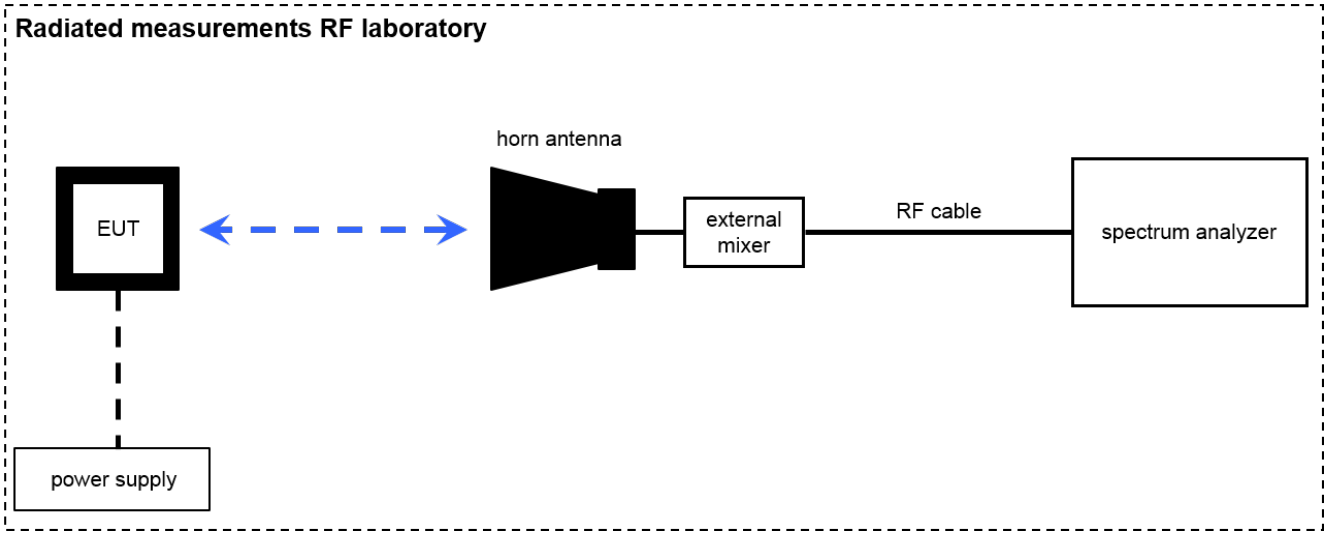
Equipment table (Chamber C):

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	vIKI!	09.12.2020	08.12.2023
2	n. a.	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vIKI!	13.06.2019	12.06.2022
3	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
4	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	371	300003854	vIKI!	14.01.2020	13.01.2022
5	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5289	300000213	vIKI!	14.07.2020	13.07.2022
6	n. a.	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
7	n. a.	Variable isolating transformer	MPL IEC625 Bus Variable isolating transformer	Erfi	91350	300001155	ne	-/-	-/-
8	n. a.	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2020	10.12.2021
9	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
10	n. a.	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
11	n. a.	Broadband Amplifier 5-13 GHz	CBLU5135235	CERNEX	22010	300004491	ev	-/-	-/-
12	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
13	n. a.	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO		300004682	ne	-/-	-/-
14	n. a.	PC	ExOne	F+W		300004703	ne	-/-	-/-
15	n. a.	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-

8.3 Radiated measurements 18 GHz to 50 GHz in test lab

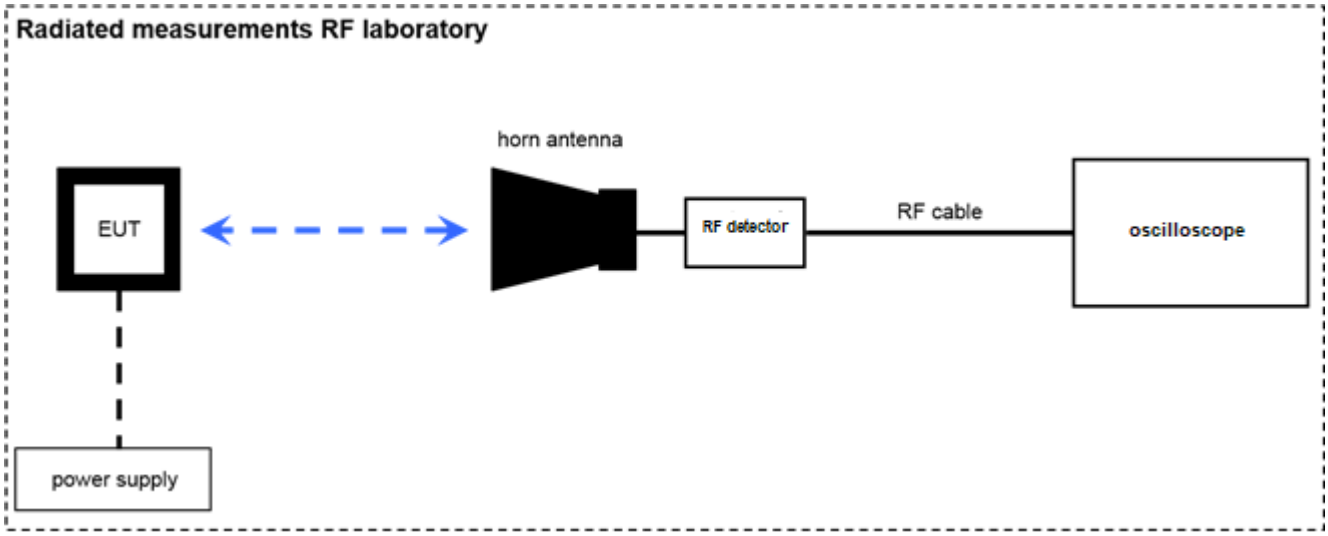


8.4 Radiated measurements > 50 GHz in test lab



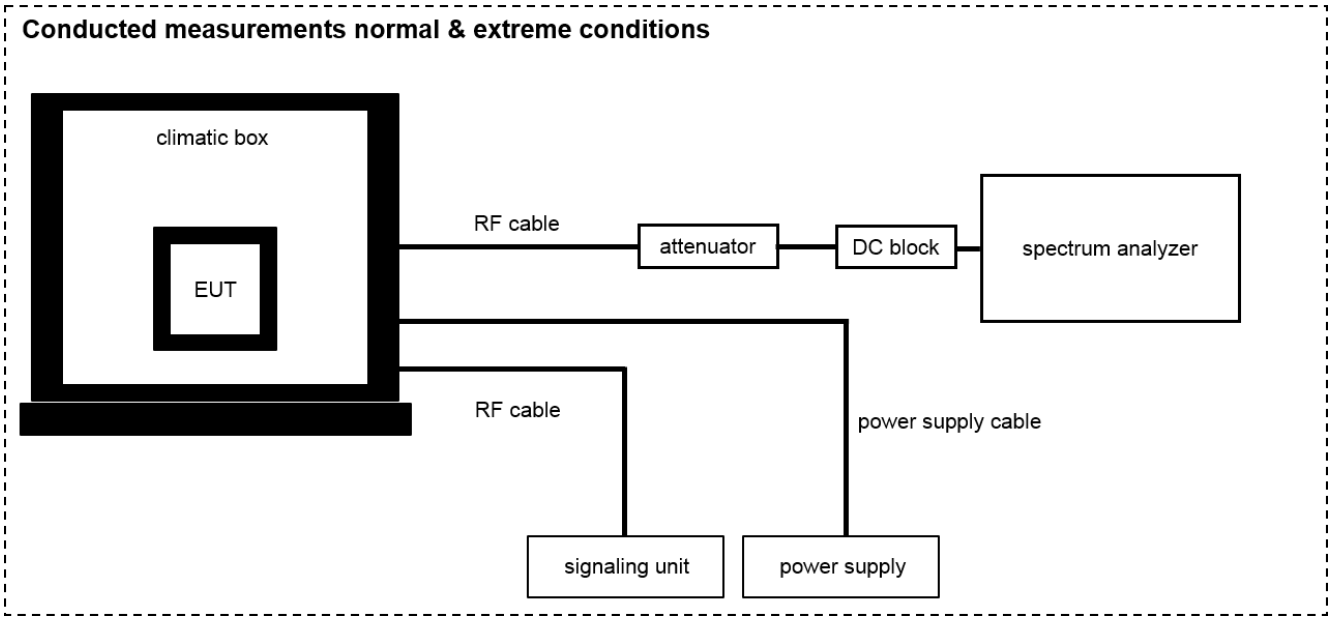
Note: conversion loss of mixer is already included in analyzer value.

8.5 Radiated measurements with RF detector > 50 GHz in test lab



Note: EUT is replaced by reference source for substitution measurement

8.6 Conducted measurements under extreme conditions (frequency error)

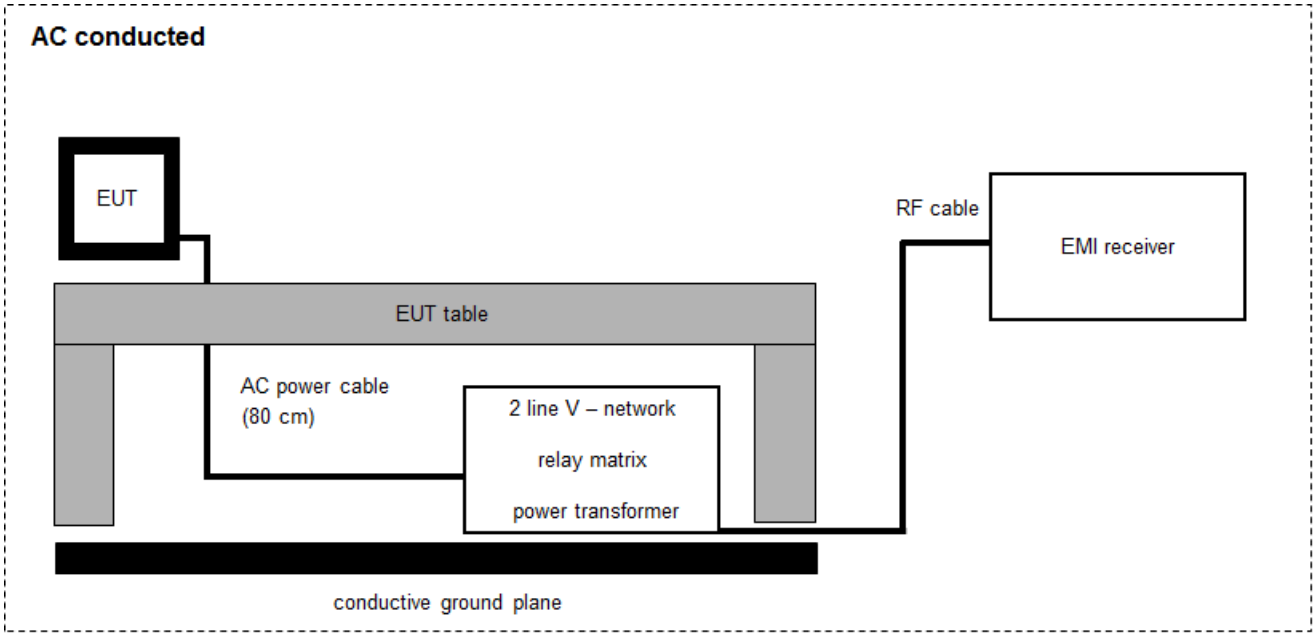


Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda		300000486	vlKl!	21.01.2020	20.01.2022
2	n. a.	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ne	23.01.2020	22.01.2022
3	n. a.	Std. Gain Horn Antenna 39.3-59.7 GHz	2424-20	Flann	75	300001979	ne	-/-	-/-
4	n. a.	Std. Gain Horn Antenna 60-90 GHz	COR 60_90	Thomson CSF		300000814	ev	-/-	-/-
5	n. a.	Std. Gain Horn Antenna 73.8-112 GHz	2724-20	Flann	*	300001988	ne	-/-	-/-
6	n. a.	Std. Gain Horn Antenna 114-173 GHz	2924-20	Flann	*	300001999	ne	-/-	-/-
7	n. a.	Std. Gain Horn Antenna 145-220 GHz	3024-20	Flann	*	300002000	ne	-/-	-/-
8	n. a.	Broadband LNA 18-50 GHz	CBL18503070PN	CERNEX	25240	300004948	ev	09.03.2020	08.03.2022
9	n. a.	Harmonic Mixer 3-port, 75-110 GHz	FS-Z110	Rohde & Schwarz	101411	300004959	k	15.06.2021	14.06.2022
10	n. a.	Harmonic Mixer 3-port, 110-170 GHz	FS-Z170	Rohde & Schwarz	100014	300004156	k	11.06.2021	10.06.2022
11	n. a.	Harmonic Mixer 3-Port, 140-220 GHz	SAM-220	Radiometer Physics GmbH	200001	300004157	k	22.07.2021	21.07.2022
12	n. a.	Harmonic Mixer 3-Port, 60-90 GHz	FS-Z90	R&S	102152	300006202	k	21.01.2021	20.01.2022
13	n. a.	Signal- and Spectrum Analyzer 2 Hz - 85 GHz	FSW85	Rohde & Schwarz	101333	300005568	k	30.06.2021	29.06.2022
14	n.a.	Spectrum Analyzer 20 Hz - 50 GHz	FSW50	Rohde & Schwarz	101560	300006179	k	05.03.2021	04.03.2022
15	n.a.	Waveguide, 60.5 to 92.0 GHz, 800 mm	26441-800MM UG387/U-AC	Flann	227502	300004809 -0007	ev	-/-	-/-
16	n.a.	Waveguide, 60.5 to 92.0 GHz, 150 mm	26441-150MM UG387/U-AC	Flann	227499	300004809 -0006	ev	-/-	-/-
17	n.a.	Waveguide Termination 60.5 to 92.0 GHz	26040 UG387/U-AC	Flann	227492	300004809 -0004	ev	-/-	-/-
18	n.a.	Directional Coupler, 3 Port, 10 dB	26136-10	Flann	227494	300004809 -0009	ev	-/-	-/-
19	n.a.	Waveguide Attenuator 10dB, max. 30 dBm	QAF-E20000	Quinstar	1142400028	Customer Property	ev	-/-	-/-
20	n.a.	Waveguide Attenuator 10dB, WR12, 60-90GHz	CAF-1210-S1	Ducommun	1012800-01	300004841	ev	-/-	-/-
21	n.a.	Cable Load Generator	CLGD	Rohde & Schwarz	101576	Property of Rohde & Schwarz	ev	-/-	-/-
22	n.a.	Thermal Power Sensor, DC-110GHz, 300nW-100mW	NRP-Z58	Rohde & Schwarz	100913	300004808	k	07.01.2020	06.01.2022
23	n.a.	Power Meter	NRP	Rohde & Schwarz	100212	300003780	k	11.12.2019	10.12.2021
24	n.a.	Impedance Matching Pad	AIR IMP1-N50-75F	AIR	n.a.	Customer Property	ev	-/-	-/-
25	n.a.	SG Extension Module 50 – 75 GHz	E8257DV15	VDI	US54250124	300005541	ev	-/-	-/-
26	n.a.	Std. Gain Horn Antenna 50-75 GHz	COR 50_75	Thomson CSF		300000813	ev	-/-	-/-
27	n.a.	Std. Gain Horn Antenna 50-75 GHz, 25 dBi	25240-25	Flann	107	300002699	ev	-/-	-/-
28	n.a.	Std. Gain Horn Antenna 49.9-75.8 GHz	2524-20	Flann	*	300001986	ne	-/-	-/-
29	n.a.	RF Detector	SFD-503753-15SF-P1	Eravant	07353-1	300006118	ev	-/-	-/-
30	n.a.	Oscilloscope	DPO7254	Tektronix	B022702	300003573	k	07.12.2020	05.12.2022
31	n. a.	WG Rotary Attenuator	25110 UG-385/U-AC	Flann Microwave	266740	300005798	ev	-/-	-/-
32	n. a.	Synthesized Sweeper 10 MHz - 40 GHz	83640A	HP	3119A00458	300002266	vlKl!	13.12.2019	12.12.2021

33	n.a.	Low Noise Amplifier, Waveguide, 50-75 GHz	AFB-V30LN-02	Ducommun Incorporated	1026151-01	300005899	ev	-/-	-/-

8.7 AC power-line conducted emissions



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	-/-	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	892475/017	300002209	vIKI!	11.12.2019	10.12.2021
2	-/-	RF-Filter-section	85420E	HP	3427A00162	300002214	NK!	-/-	-/-
3	-/-	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	09.12.2020	08.12.2021
4	-/-	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	-/-	-/-

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	26	3.4	1.15	20.04
26-40	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
110-170	170	0.85	0.18	8.19
170-220	220	0.68	0.14	6.78

In band measurement (EIRP, OBW):

Antenna frequency range in GHz	Highest measured frequency in GHz	Antenna dimension in cm	Wavelength in cm	far field distance in cm
50-75	71	5	0.46	116

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 IC RSS-210 Issue 10 IC RSS-Gen Issue 5	see below	2022-04-07	-/-

Test specification clause	Test case	Temperature conditions	Power supply	Pass	Fail	NA	NP	Results (max.)
§15.215 RSS-Gen 6.7	Occupied bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.255(e) RSS-210 J.4	Maximum conducted output power	Nominal	Nominal	☒	☐	☐	☐	complies
§15.255 (a) (c) RSS-210 J.2	Maximum E.I.R.P.	Nominal	Nominal	☒	☐	☐	☐	complies
§15.255(d) RSS-210 J.3	Spurious Emissions	Nominal	Nominal	☒	☐	☐	☐	complies
§15.255(f) RSS-210 J.6	Frequency stability	Extreme Nominal	Extreme Nominal	☒	☐	☐	☐	complies
§15.255(h) RSS-210 J.7	Beamforming	Nominal	Nominal	☐	☐	☒	☐	-/-

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

12 Measurement results

12.1 Occupied bandwidth (99%, 20 dB Bandwidth)

Description:

Measurement of the Bandwidth of the wanted signal.

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Sweep time:	See plot
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	See plot
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.255	RSS-Gen 6.7
The occupied bandwidth from intentional radiators operated within the specified frequency band shall comply with the following:	
Frequency range	
57 GHz – 71 GHz	

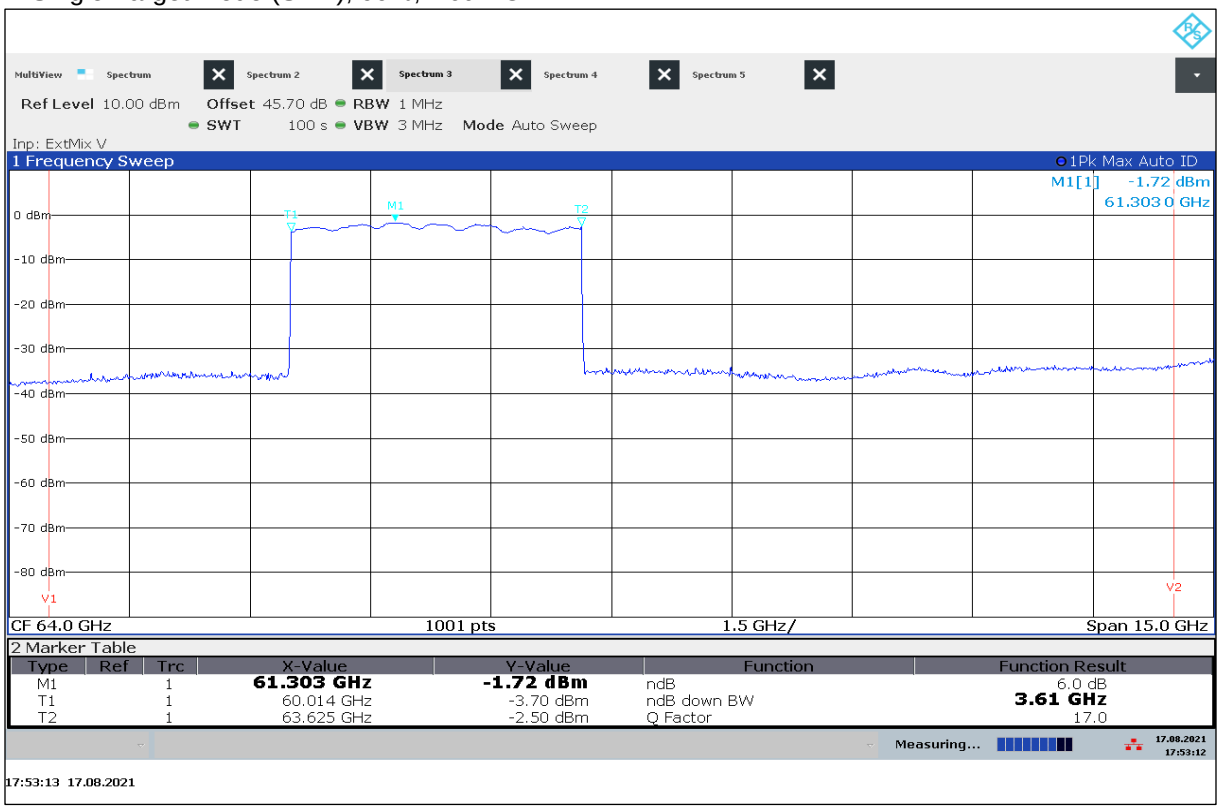
Results:

Test condition T_{nom} / V_{nom}	**F_L** **in GHz**	**F_H** **in GHz**	**99%, N6dB OBW** **in GHz**
Single Target Mode (STM)	60.014	63.625	3.61
Multi Target Mode 10 Hz (MTM10)	60.014	63.610	3.60
Long Integration Mode (LIM)	60.014	63.625	3.61
Multi Target Mode 25 Hz (MTM25)	60.014	63.625	3.61
Measurement uncertainty	± span/1000		

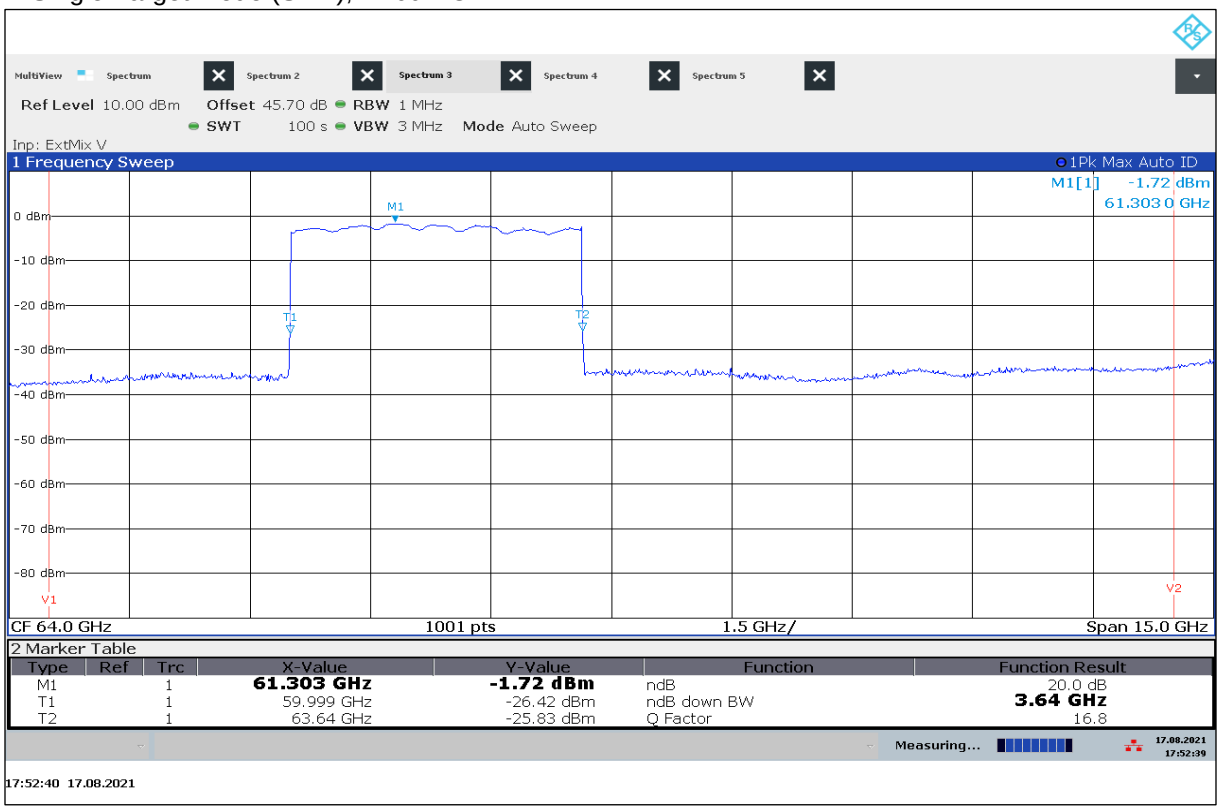
Test condition T_{nom} / V_{nom}	**F_L** **in GHz**	**F_H** **in GHz**	**N20dB OBW** **in GHz**
Single Target Mode (STM)	59.999	63.640	3.64
Multi Target Mode 10 Hz (MTM10)	59.999	63.625	3.63
Long Integration Mode (LIM)	59.999	63.640	3.64
Multi Target Mode 25 Hz (MTM25)	59.999	63.640	3.64
Measurement uncertainty	± span/1000		

Result: The measurement is passed.

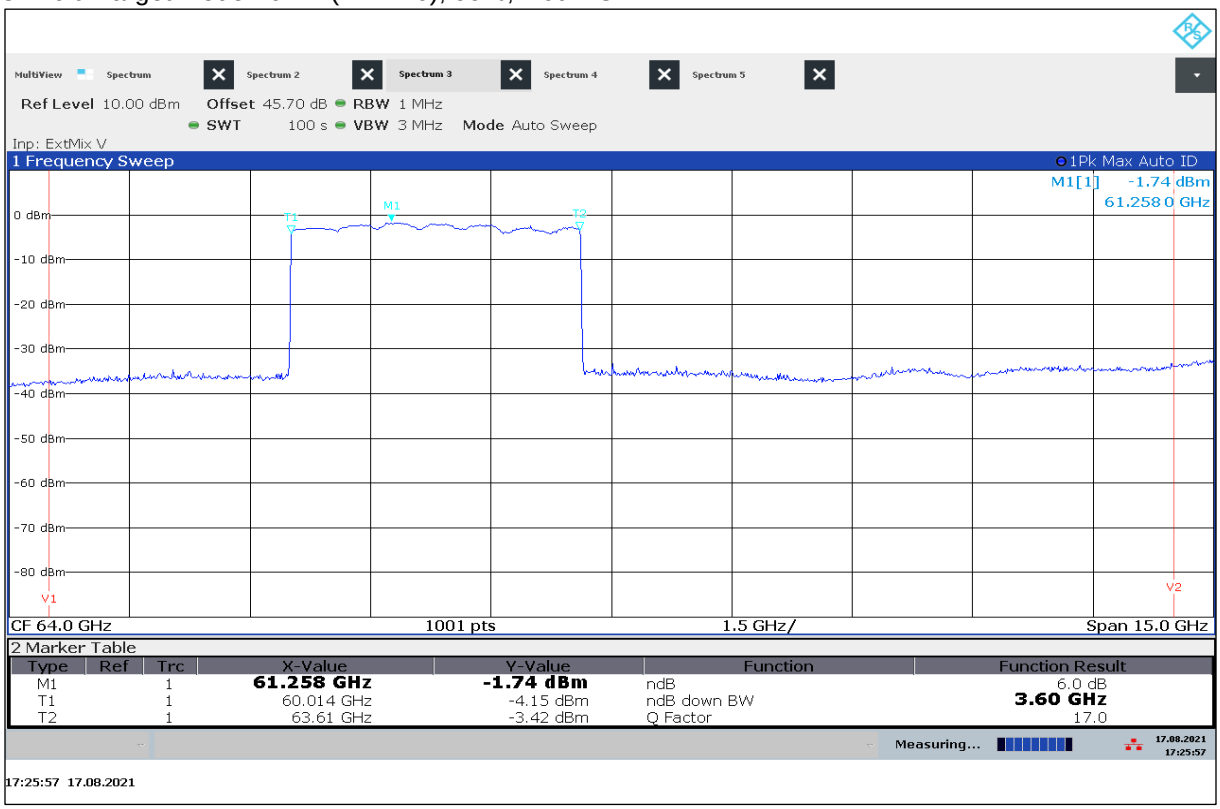
Plot 1: Single Target Mode (STM), 99%, N6dB OBW



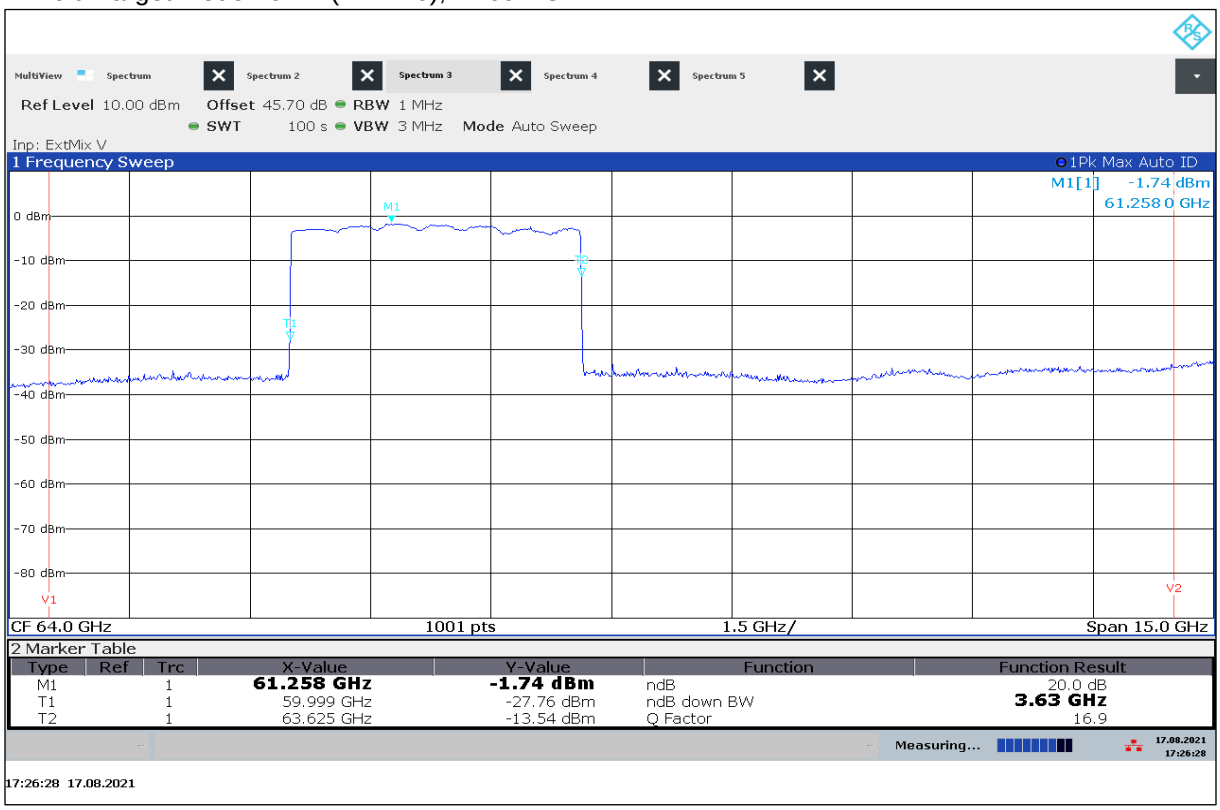
Plot 2: Single Target Mode (STM), N20dB OBW



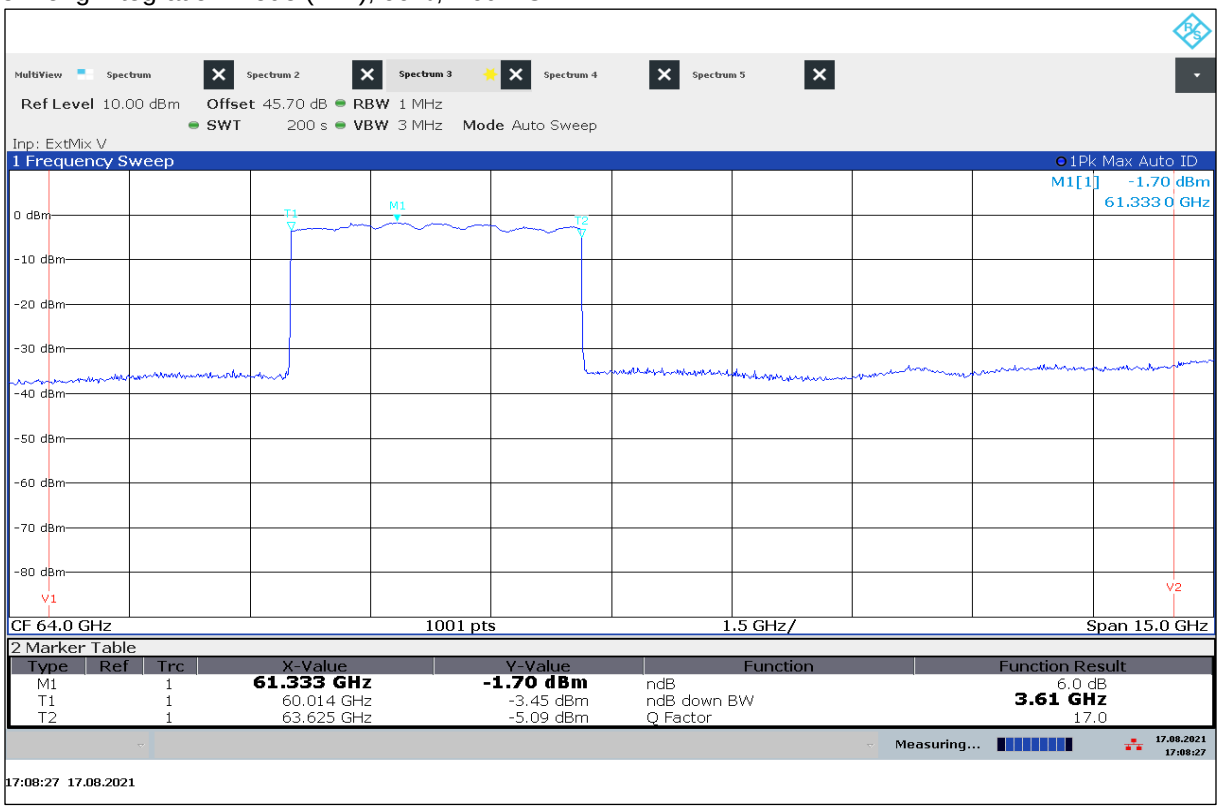
Plot 3: Multi Target Mode 10 Hz (MTM10), 99%, N6dB OBW



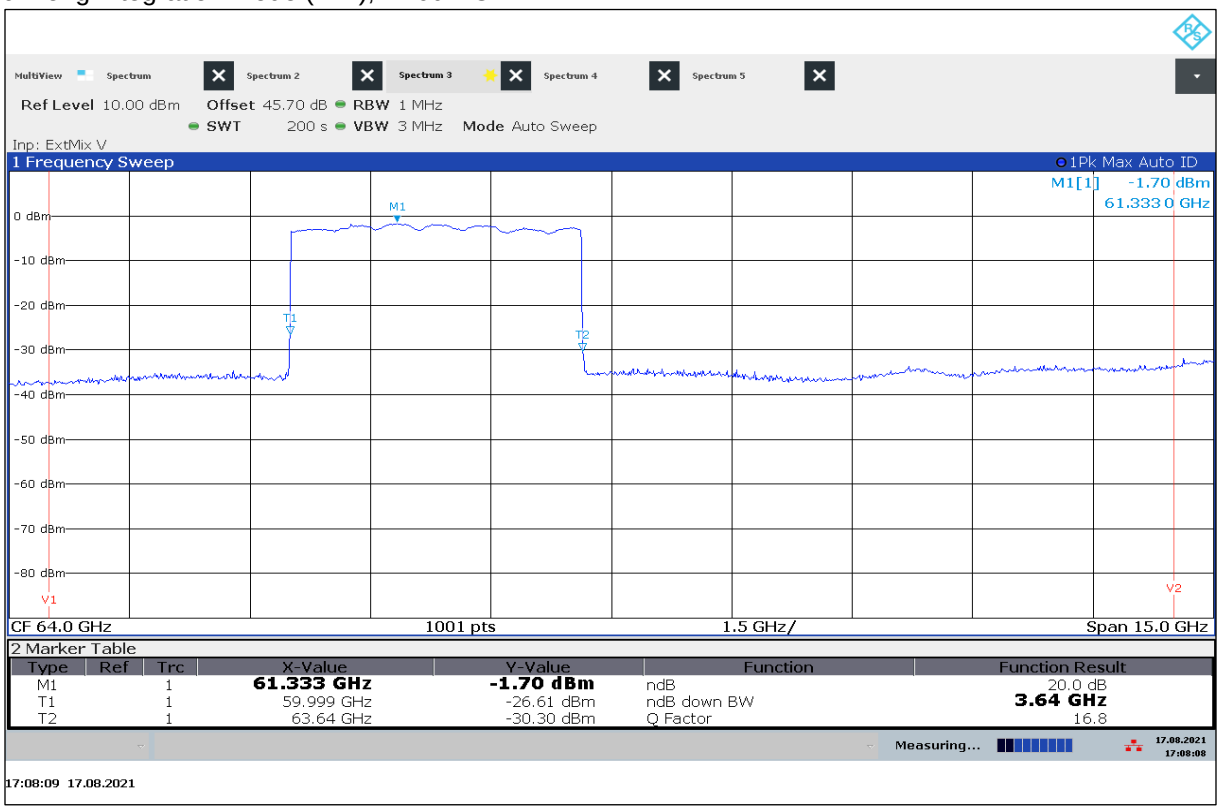
Plot 4: Multi Target Mode 10 Hz (MTM10), N20dB OBW



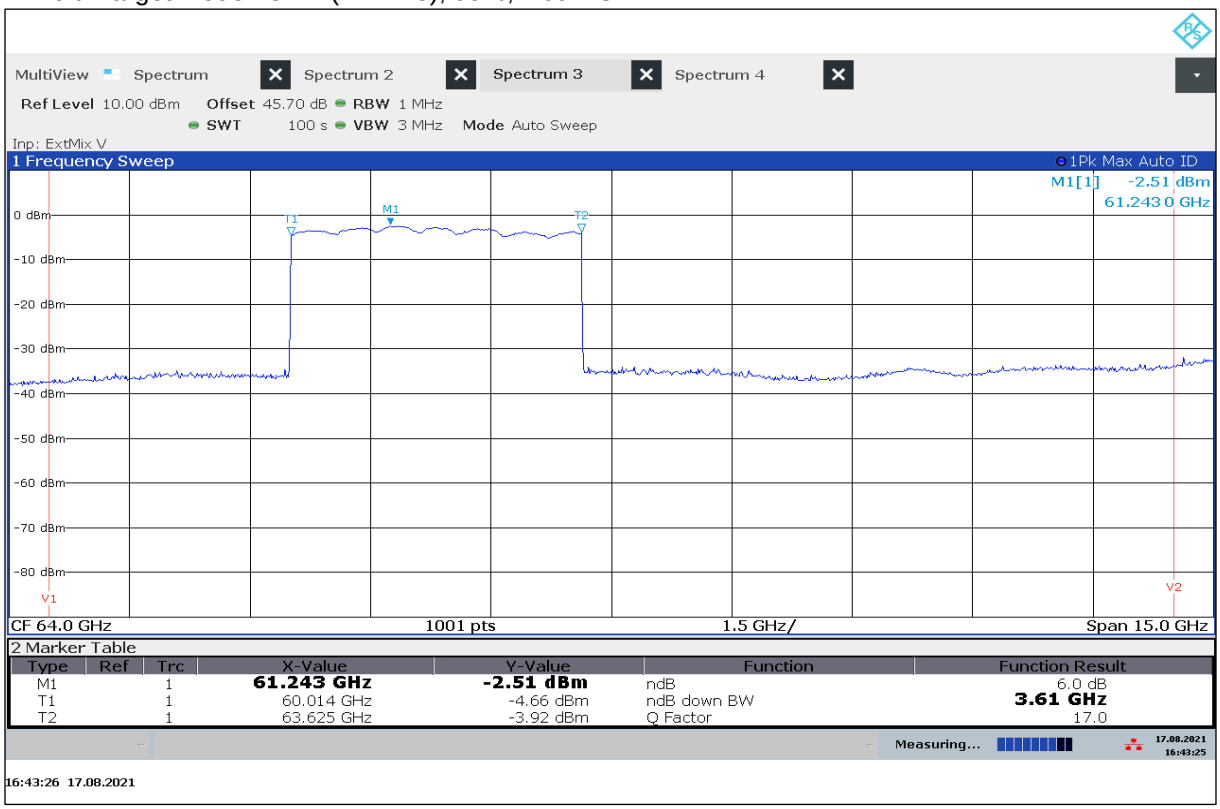
Plot 5: Long Integration Mode (LIM), 99%, N6dB OBW



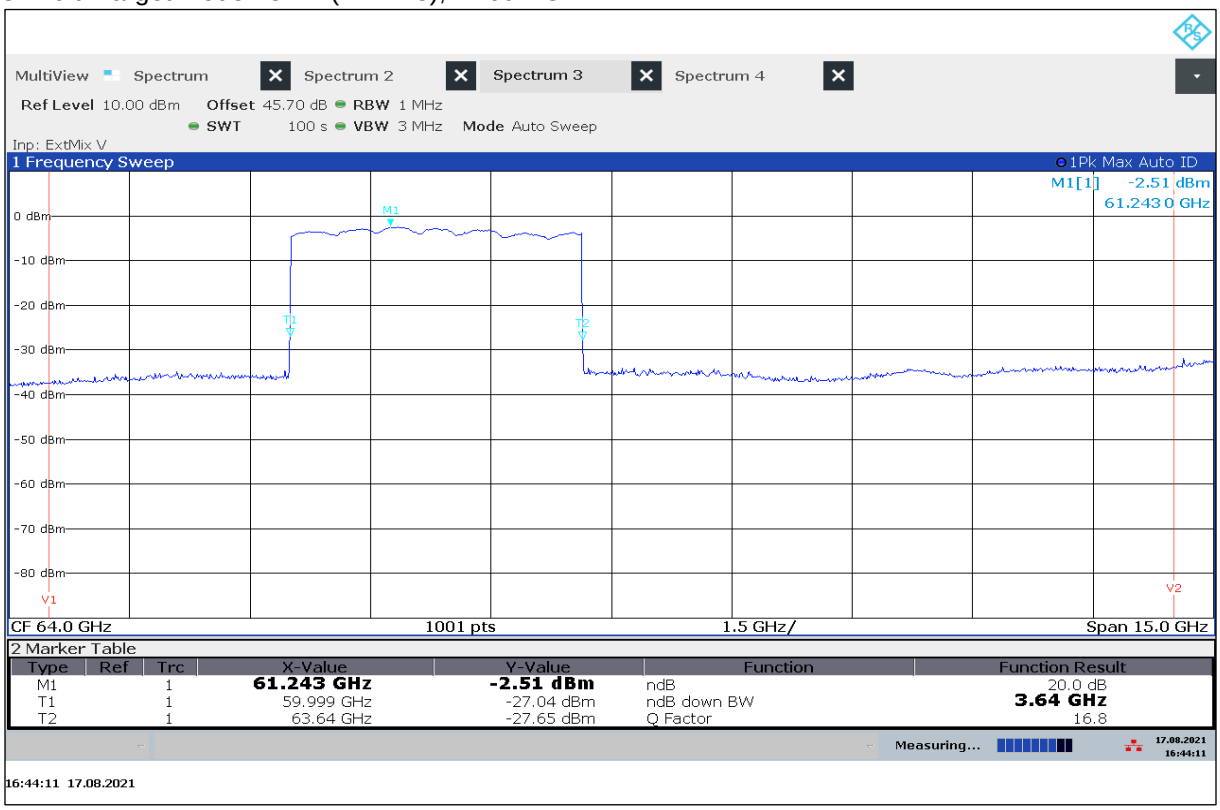
Plot 6: Long Integration Mode (LIM), N20dB OBW



Plot 7: Multi Target Mode 25 Hz (MTM25), 99%, N6dB OBW



Plot 8: Multi Target Mode 25 Hz (MTM25), N20dB OBW



12.2 Maximum E.I.R.P. / Peak transmitter conducted output power

Description:

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

Limits: **FCC Part 15.255**

(c) Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(1) Products other than fixed field disturbance sensors and short-range devices for interactive motion sensing shall comply with one of the following emission limits, as measured during the transmit interval:

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

(ii) 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.

(A) The provisions in this paragraph 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)(i) of this section.

(B) The provisions of §15.204(c)(2) and (4) that permit the use of different antennas of the same type and of equal or less directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in §2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.

(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. In addition, the average power of any emission outside of the 61.0-61.5 GHz band, measured during the transmit interval, but still within the 57-71 GHz band, shall not exceed 10 dBm, and the peak power of any emission shall not exceed 13 dBm.

(3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (b)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed −10 dBm and the peak EIRP level shall not exceed 10 dBm.

(4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

(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 (b) 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).
(2) Peak transmitter conducted output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and that has a video bandwidth of at least 10 MHz.
(3) For purposes of demonstrating compliance with this paragraph, corrections to the transmitter conducted output power may be made due to the antenna and circuit loss.

Limits: **RSS-210 J.2.2 b.**

Within the band 57-64 GHz, the power of any emissions, measured during in the transmit interval, shall comply with the e.i.r.p. limits in this section.

For the purpose of this standard, the terms" average e.i.r.p." and "peak e.i.r.p." refer to e.i.r.p. with transmitter output power measured in terms of average value or peak value respectively.

Measurement:

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

Measurement results:

Test condition T_{nom} / V_{nom}	**Peak E.I.R.P. 10 MHz VBW**	**Peak E.I.R.P Limit**	**Antenna gain (EUT)**	**Peak transmitter conducted output power**	**Peak transmitter conducted output power Limit**
Single Target Mode (STM)	9.7 dBm	10 dBm	20 dBi	-10.3 dBm	-10 dBm
Multi Target Mode 10 Hz (MTM10)	9.8 dBm	10 dBm	20 dBi	-10.2 dBm	-10 dBm
Long Integration Mode (LIM)	9.8 dBm	10 dBm	20 dBi	-10.2 dBm	-10 dBm
Multi Target Mode 25 Hz (MTM25)	9.7 dBm	10 dBm	20 dBi	-10.3 dBm	-10 dBm

Note: FW 1.004

Calculation of the peak transmitter conducted output power:

Peak transmitter conducted output power = Peak E.I.R.P – Antenna gain (EUT)

Result: The measurement is passed.

Declaration of the antenna gain (EUT):

Referenced document of the customer: *iSYS-6030_Antenna_Gain_Declaration.pdf*

InnoSenT sets standards - worldwide

InnoSenT

iSYS-6030 Antenna Gain Declaration

The radar sensor iSYS-6030 uses a directional, integrated and separated Tx- / Rx-Patch antenna with a normalized TX antenna gain pattern as shown in figure 1 and a TX antenna gain of **20 dBi** in the main beam.

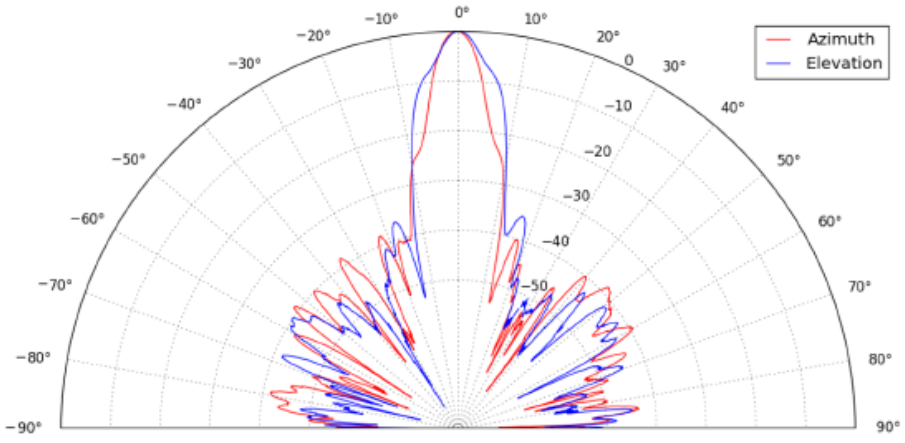


Figure 1: Normalized antenna gain pattern

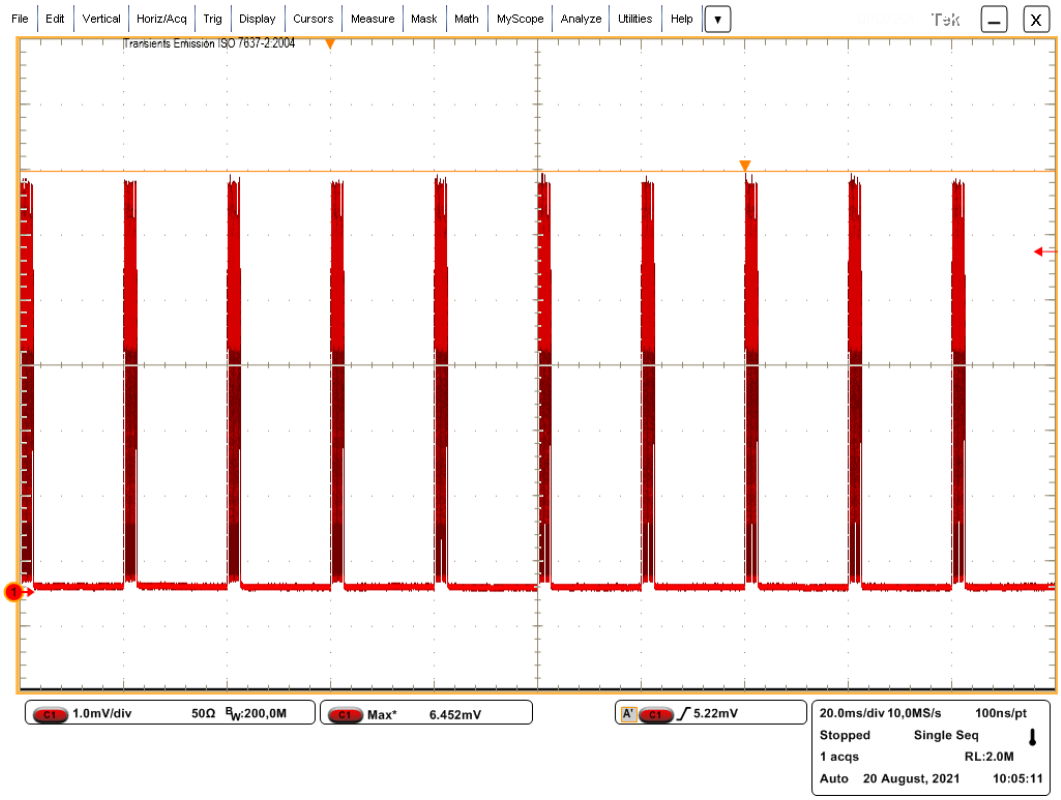
InnoSenT

InnoSenT GmbH
Am Roedertor 30
97499 Donnersdorf
GERMANY

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

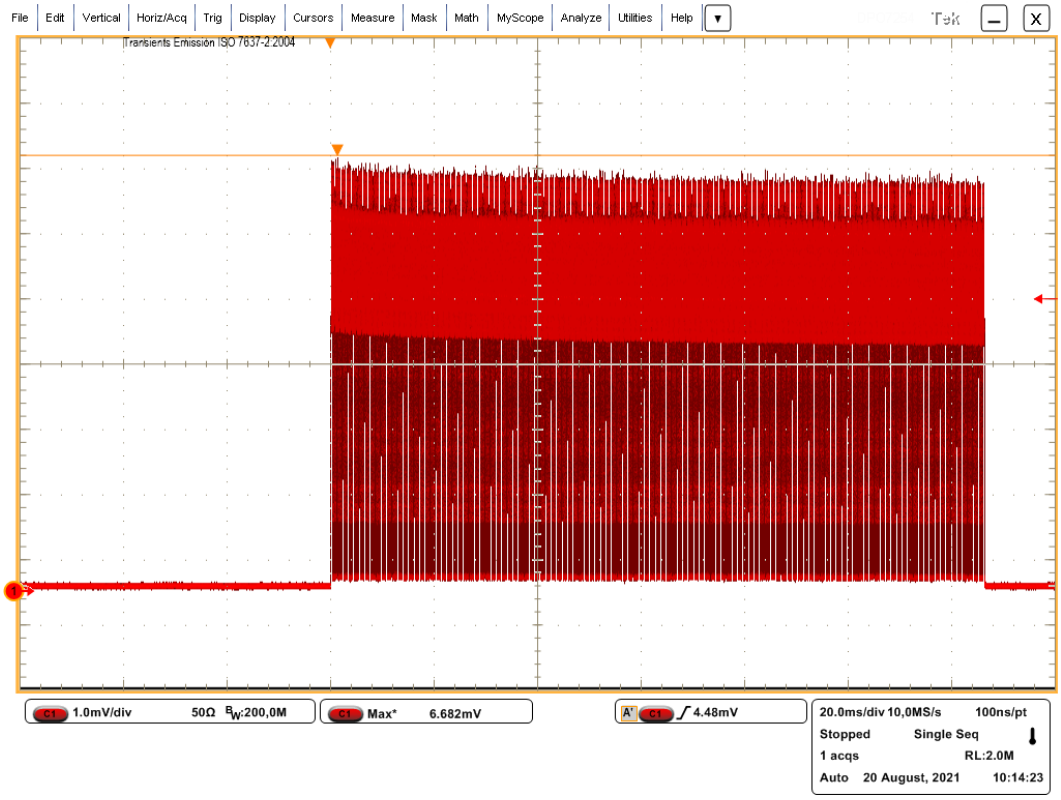
	Single Target Mode (STM)	Multi Target Mode 10 Hz (MTM10)	Long Integration Mode (LIM)	Multi Target Mode 25 Hz (MTM25)
1) EUT emission measured with RF-detector and oscilloscope: • Measurement distance d = 1.0 m	V = 6.5 mV	V = 6.7 mV	V = 6.7 mV	V = 6.5 mV
2) Substitution of EUT by a cw reference source: • Frequency f = 61.82 GHz • Adjustment of rotary attenuator so that equal voltage value is measured	V = 6.5 mV	V = 6.7 mV	V = 6.7 mV	V = 6.5 mV
3) Measurement of the conducted output power P_{cond} of the cw reference source (without horn antenna)	-10.4 dBm	-10.3 dBm	-10.3 dBm	-10.4 dBm
4) Antenna gain of horn antenna G_{ant}	20.1 dBi	20.1 dBi	20.1 dBi	20.1 dBi
5) Calculation of Peak E.I.R.P • Peak E.I.R.P = P_{cond} + G_{ant}	9.7 dBm	9.8 dBm	9.8 dBm	9.7 dBm

Plot 9: Single Target Mode (STM), RF-detector measurement

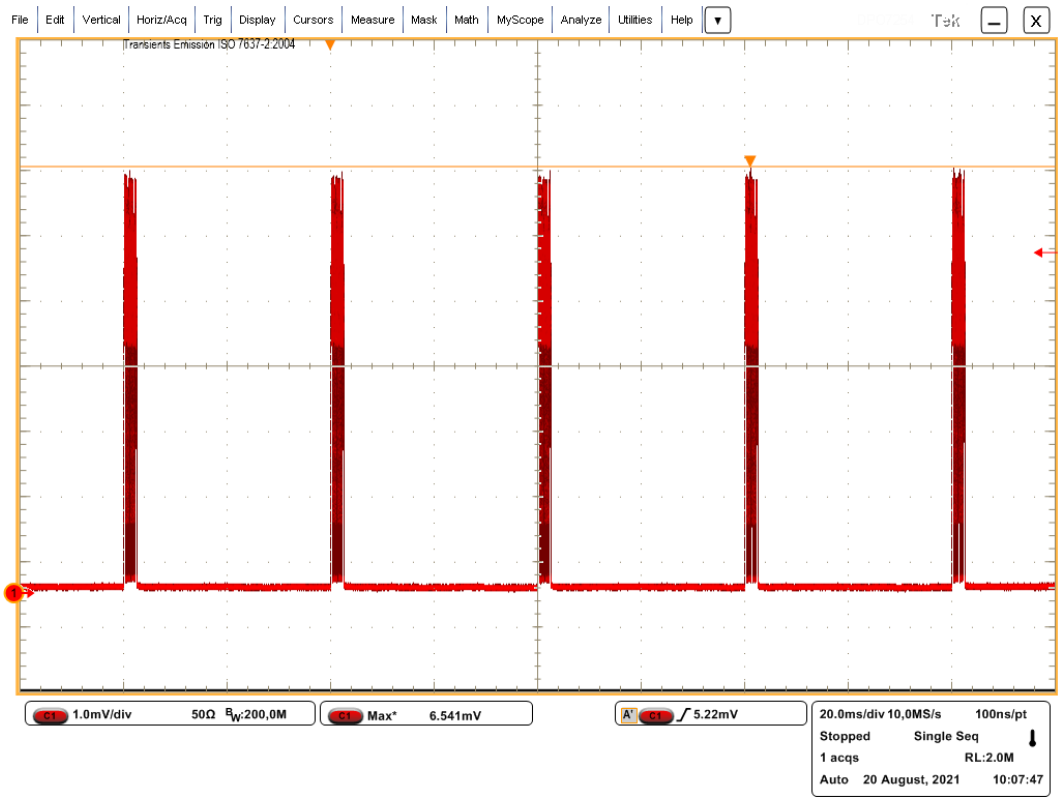


Plot 10: Multi Target Mode 10 Hz (MTM10), RF-detector measurement

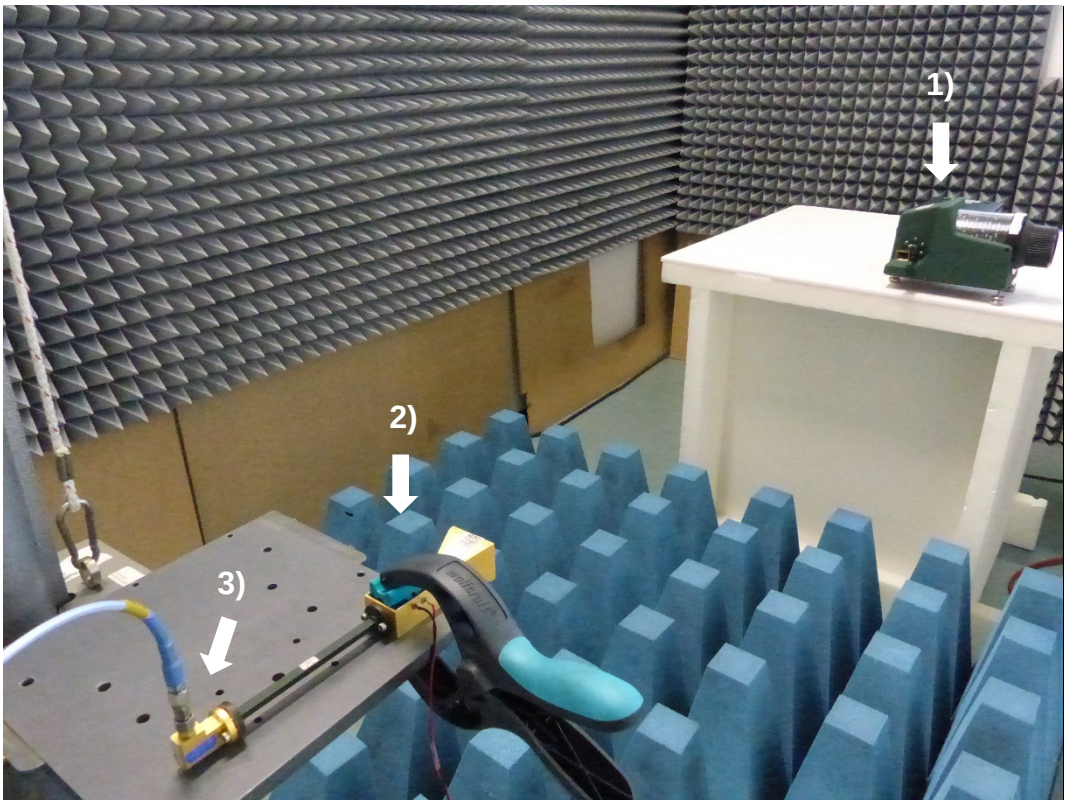
Plot 11: Long Integration Mode (LIM), RF-detector measurement



Plot 12: Multi Target Mode 25 Hz (MTM25), RF-detector measurement



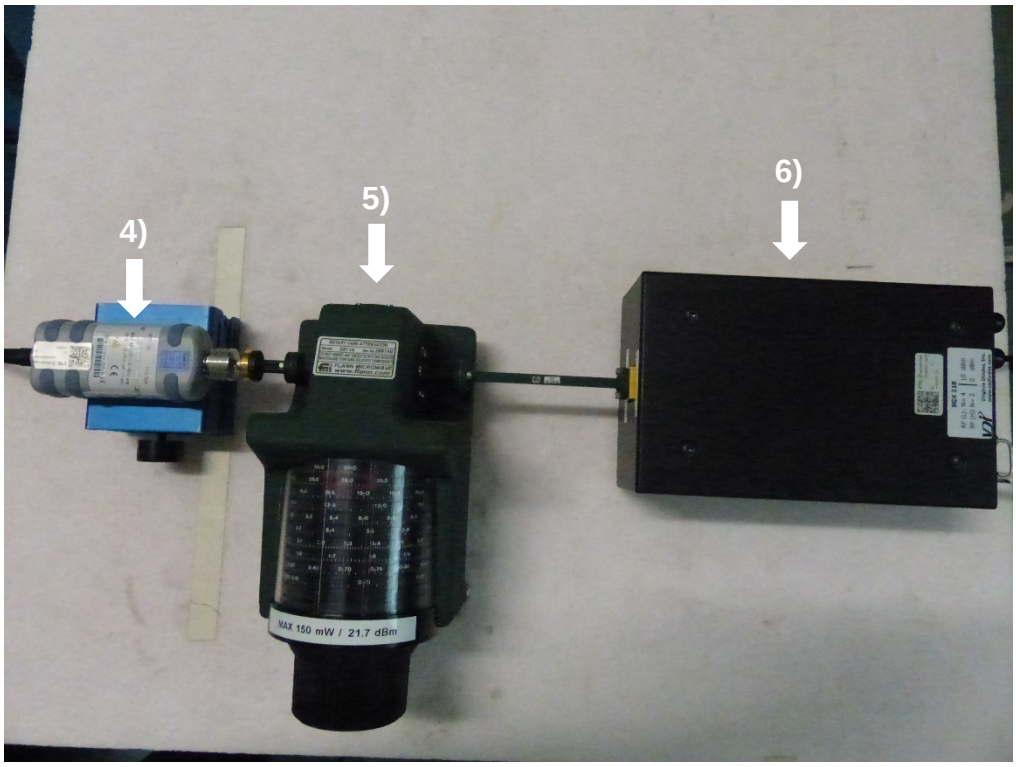
Setup of the substitution:



1) CW reference source:
SG Extension Module 50 - 75 GHz & Rotary Attenuator & Std. Gain Horn Antenna 49.9-75.8 GHz

2) Low Noise Amplifier Waveguide & Std. Gain Horn Antenna 50-75 GHz

3) RF Detector



4) Power Meter

5) Rotary Attenuator

6) SG Extension Module 50 - 75 GHz (connected to Synthesized Sweeper 10 MHz - 40 GHz)

12.3 Spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode.

Limits: **FCC Part 15.255 / RSS-210 J.3**

(c) Limits on spurious emissions:

(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.

FCC / IC		
CFR Part 15.209(a) / RSS-210 / RSS-Gen		
Radiated Spurious Emissions		
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 (-10dBm) at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

Limit conversion:

P[dBm] = 10×log(4×π×d²×P[W/m²])

d = distance of the limit defined in W/m²

With this calculation an emission limit of 90 pW/cm² corresponds to -10 dBm.

Measurement:

Measurement parameter	
Detector:	Quasi Peak / Pos-Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	Auto
Frequency range:	30 MHz to 220 GHz
Trace-Mode:	Max Hold

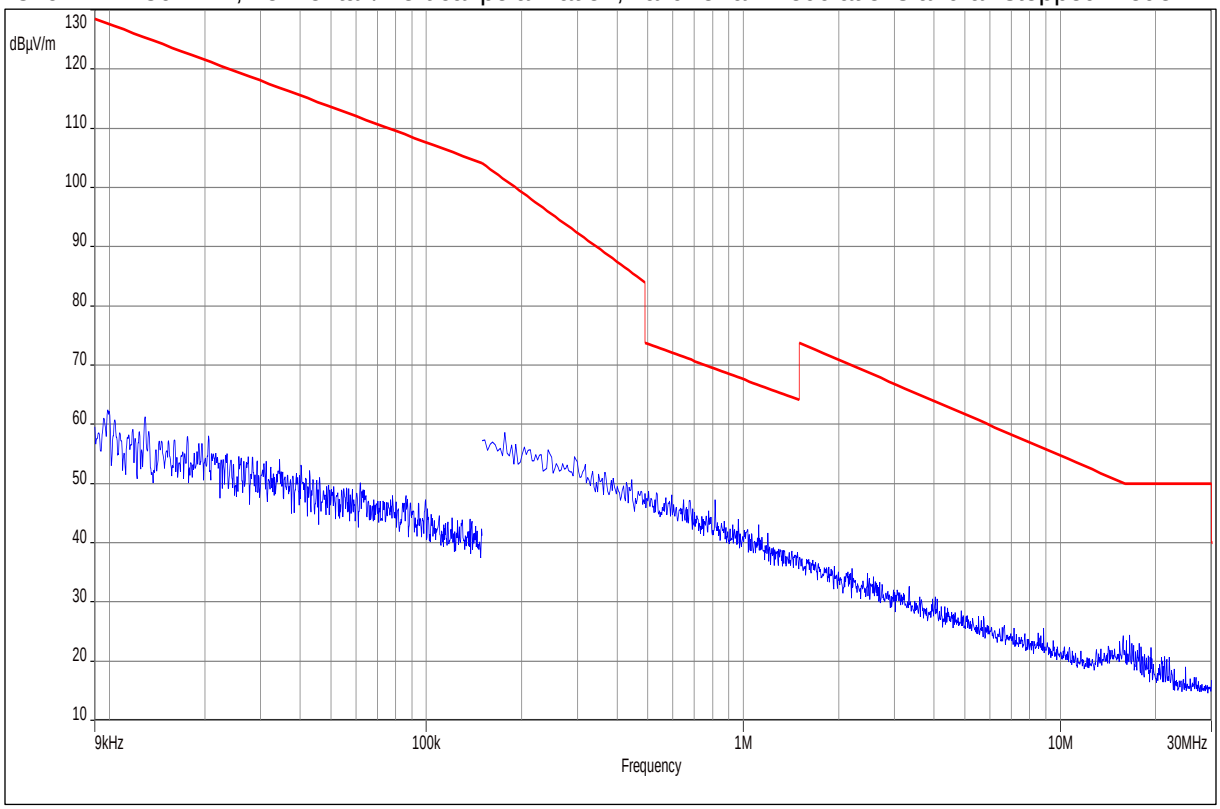
Measurement results:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level [dBµV/m]	Limit [dBµV/m]
1.60	PK	1.0	47.5	74
1.60	AVG	1.0	43.3	54
28.8	PK	1.0	51.2	74
28.8	AVG	1.0	46.7	54

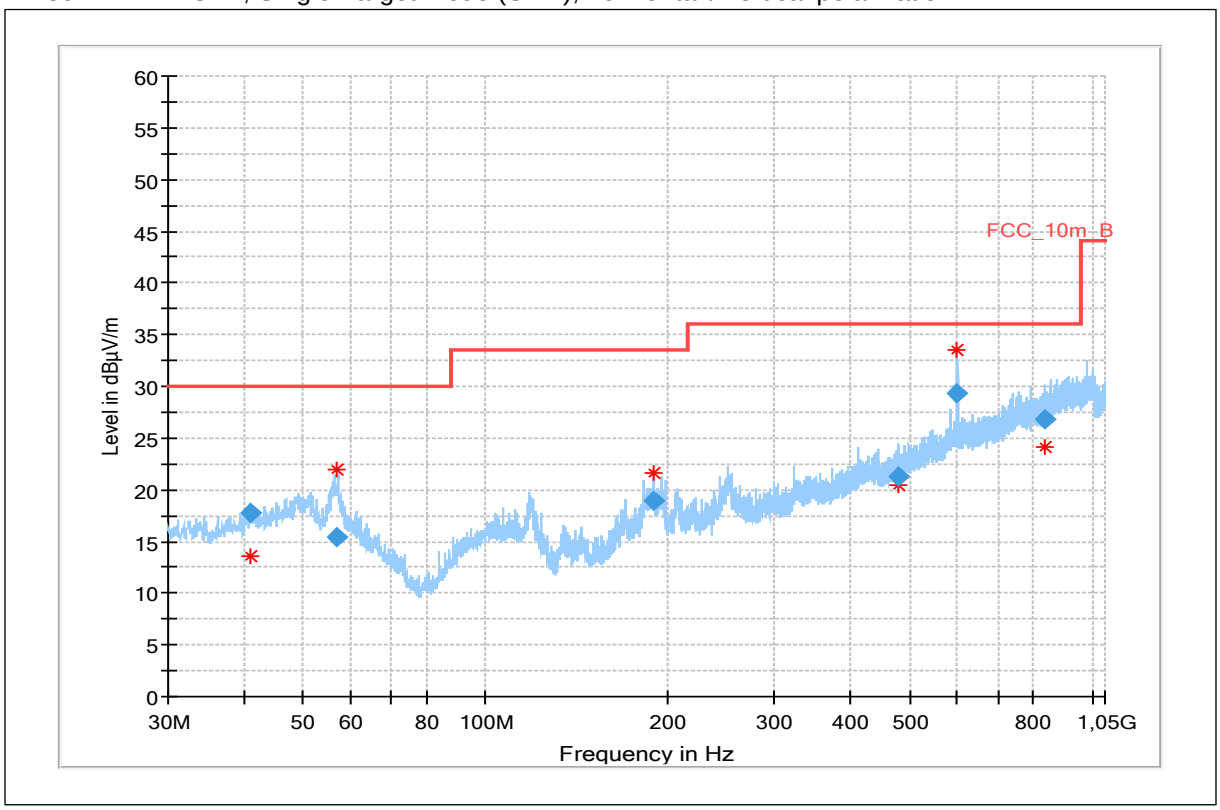
Valid for all Channels

Result: **The measurement is passed**

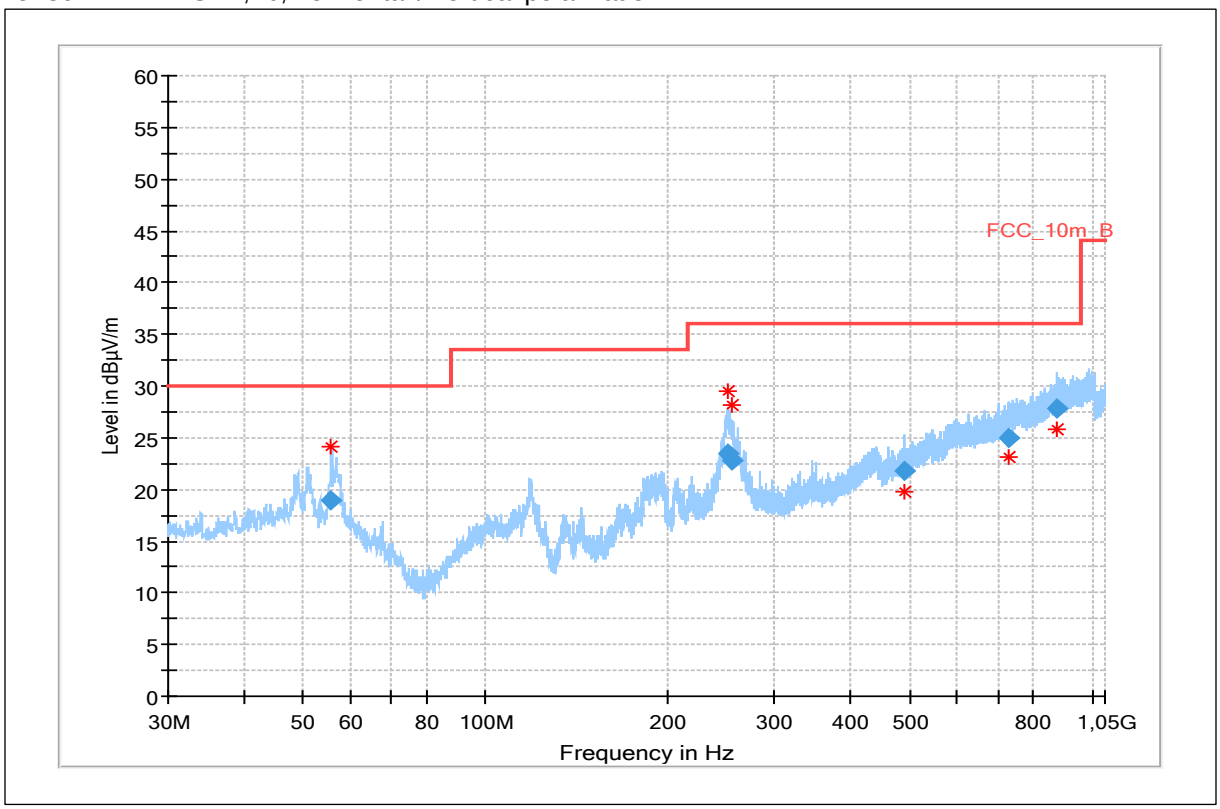
Plot 13: 9 kHz – 30 MHz, horizontal / vertical polarization, valid for all modulations and all stopped mode



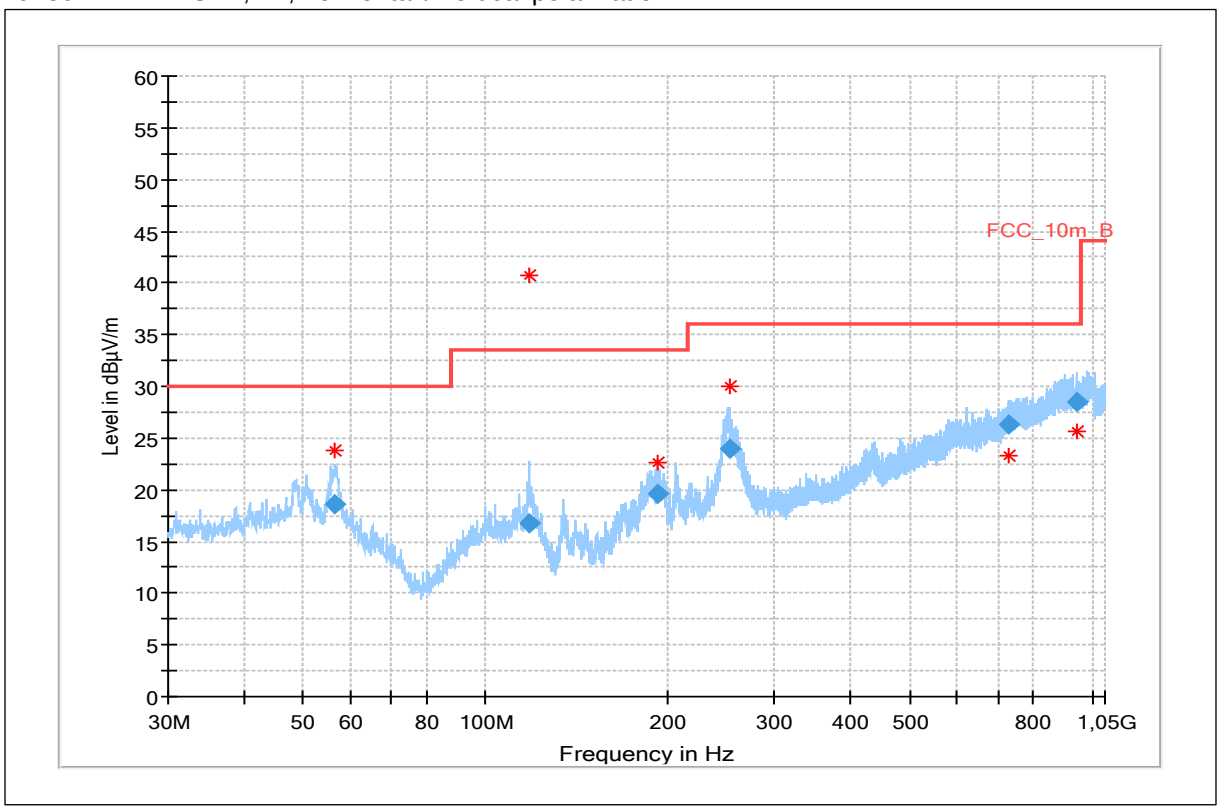
Plot 14: 30 MHz – 1 GHz, Single Target Mode (STM), horizontal / vertical polarization



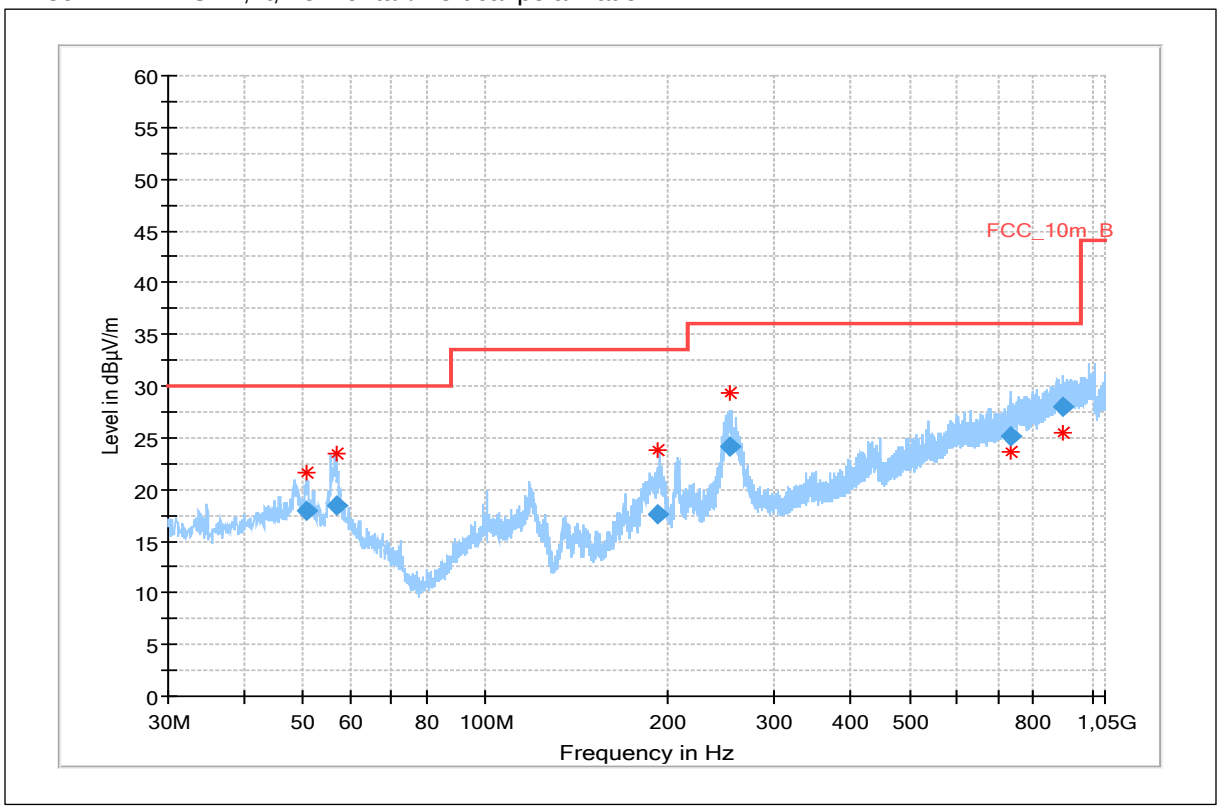
Plot 15: 30 MHz – 1 GHz, fb, horizontal / vertical polarization



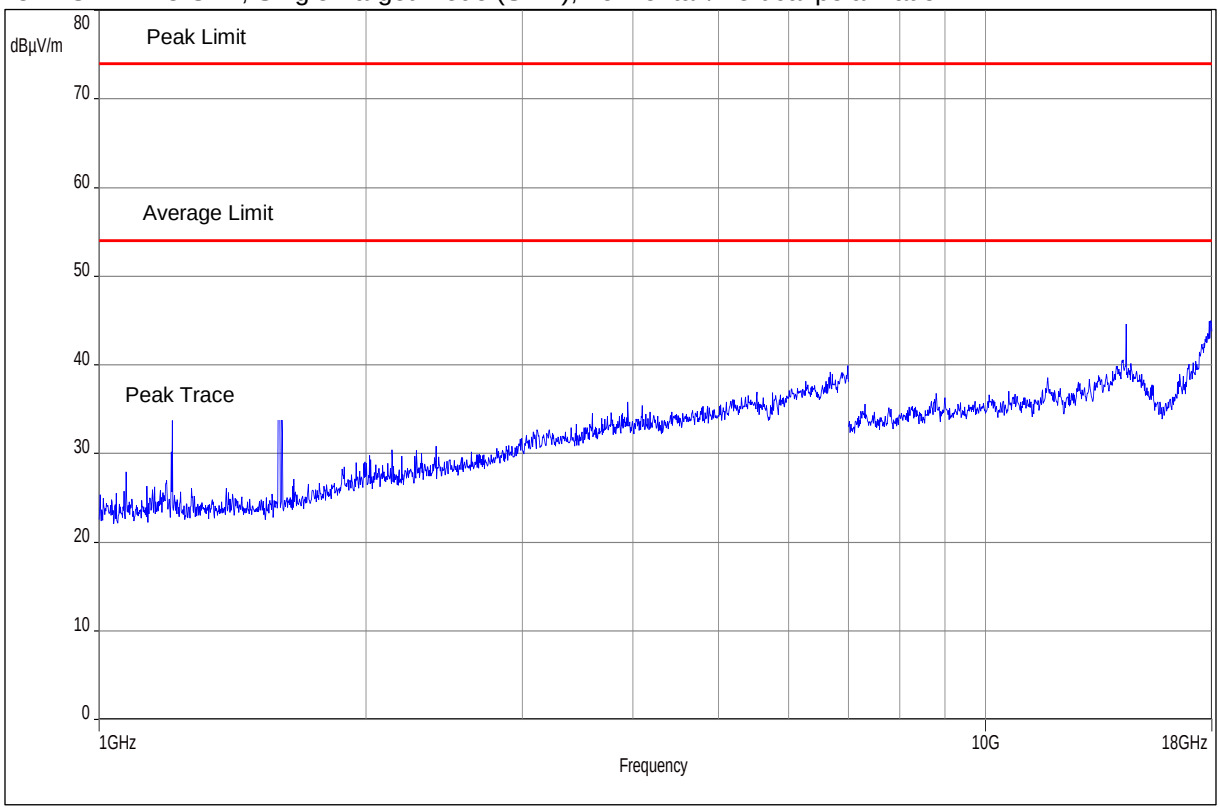
Plot 16: 30 MHz – 1 GHz, fm, horizontal / vertical polarization



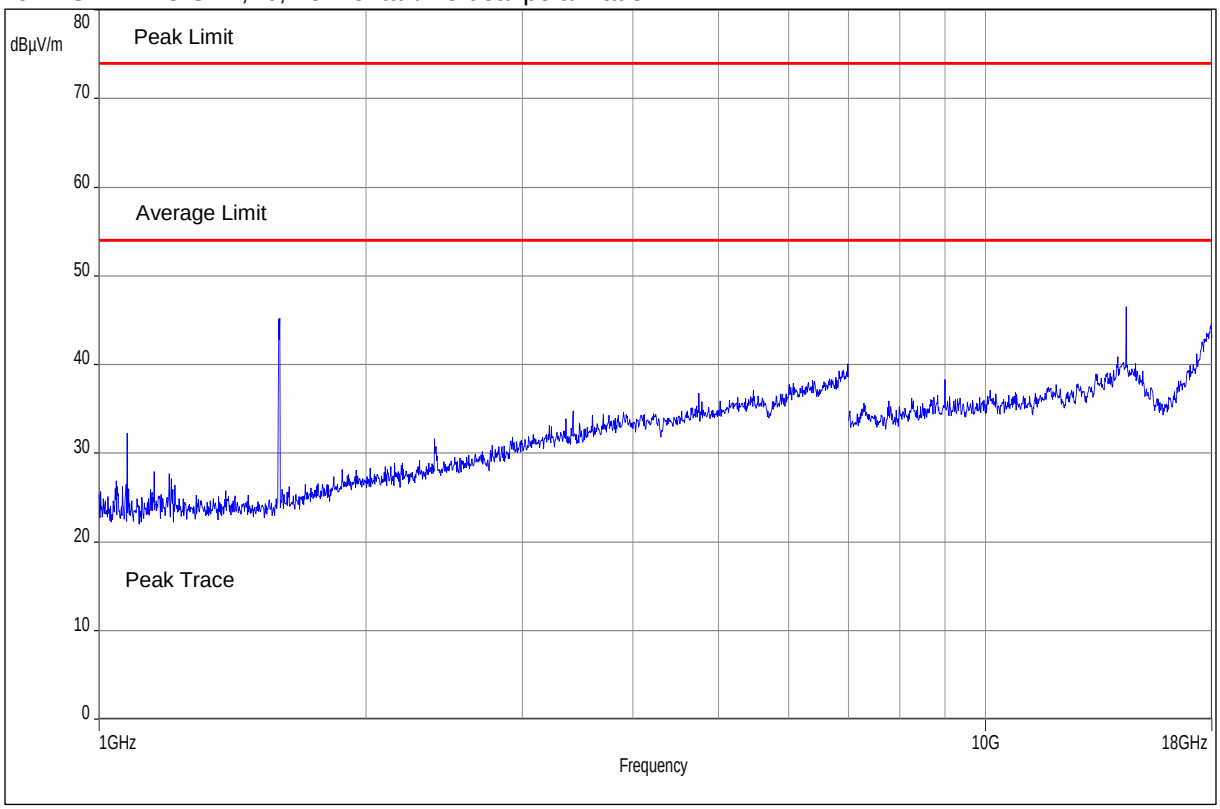
Plot 17: 30 MHz – 1 GHz, ft, horizontal / vertical polarization



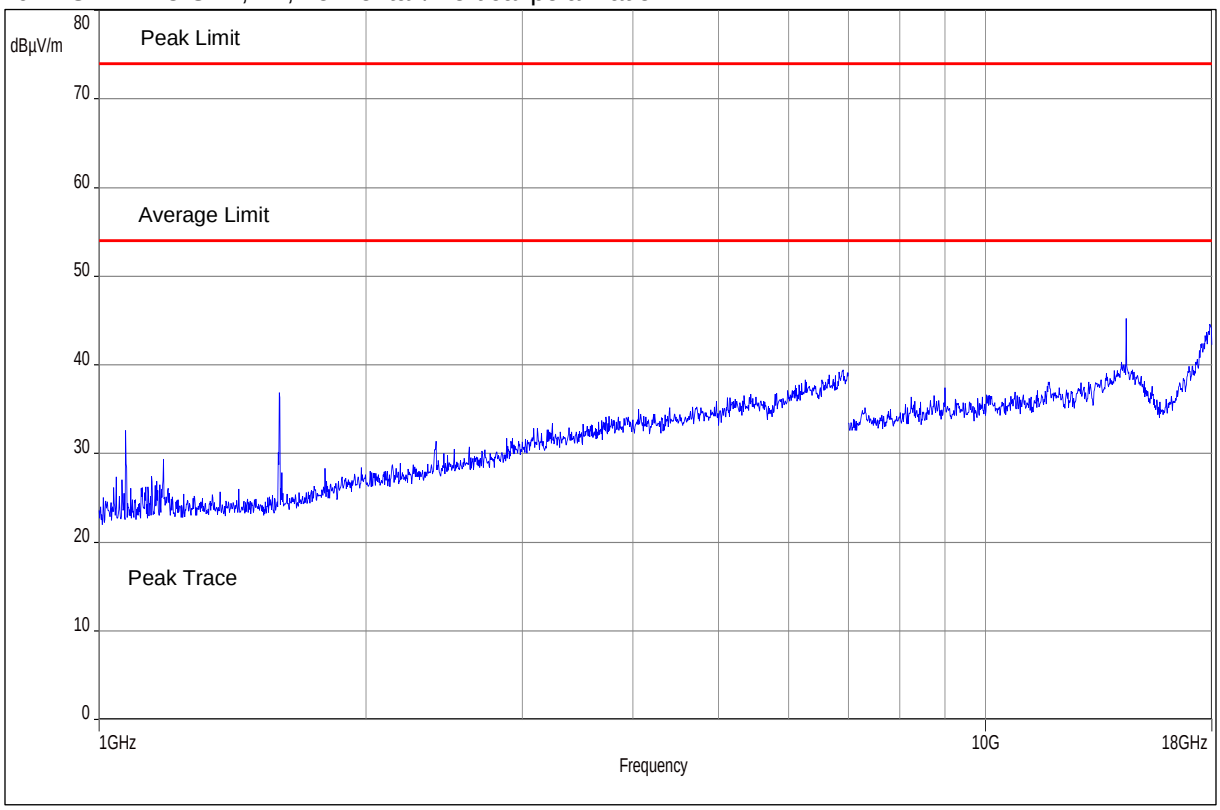
Plot 18: 1 GHz – 18 GHz, Single Target Mode (STM), horizontal / vertical polarization



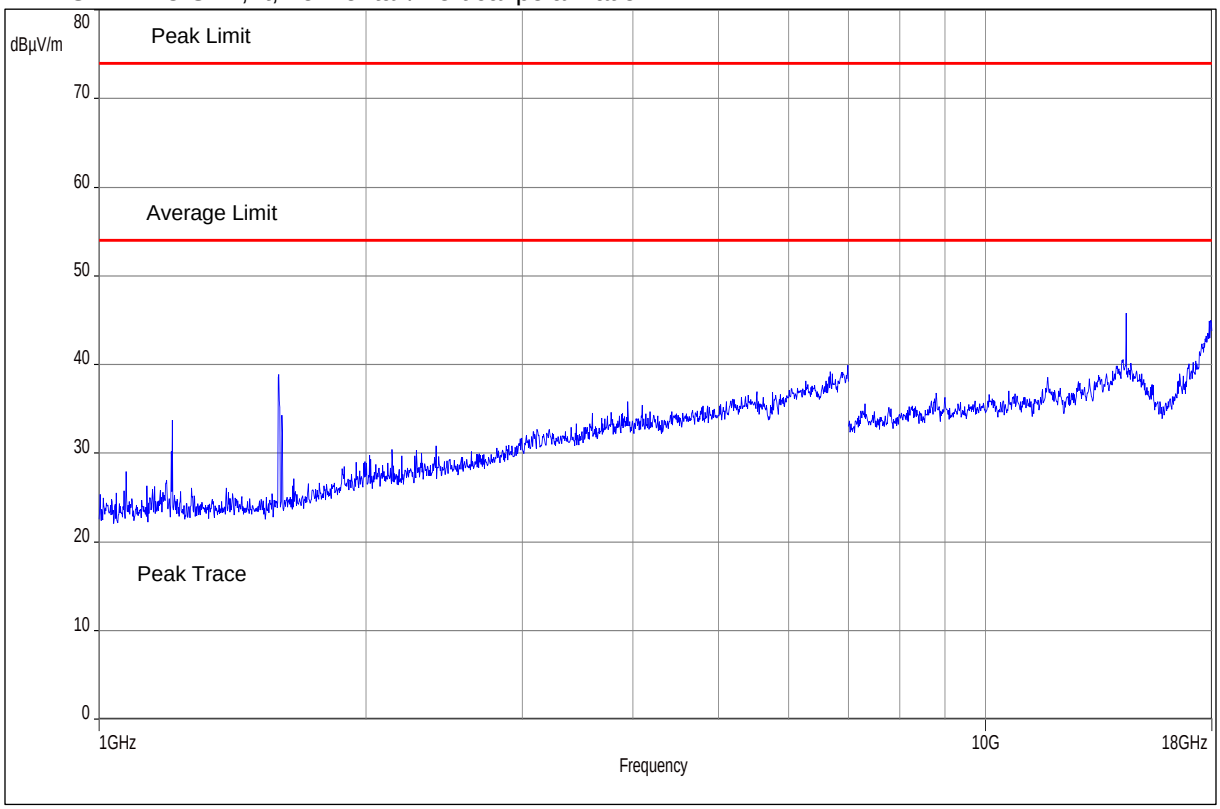
Plot 19: 1 GHz – 18 GHz, fb, horizontal / vertical polarization



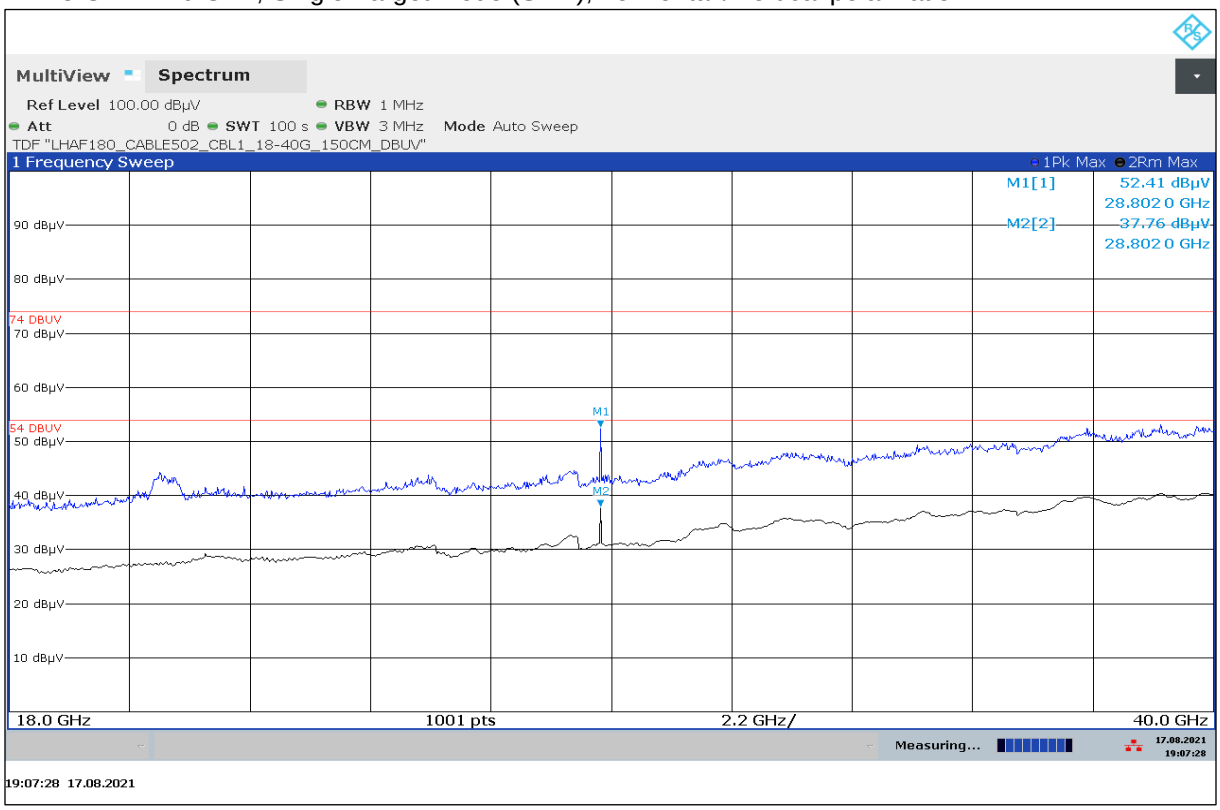
Plot 20: 1 GHz – 18 GHz, fm, horizontal / vertical polarization



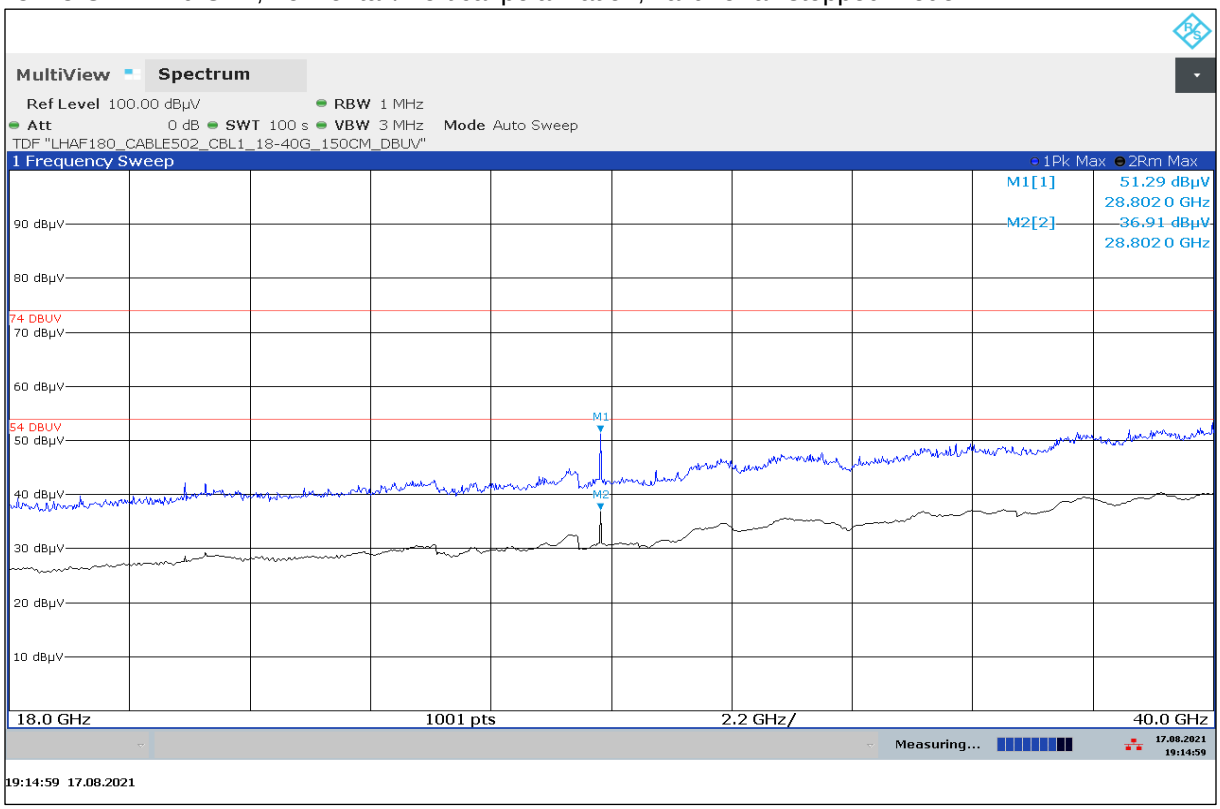
Plot 21: 1 GHz – 18 GHz, ft, horizontal / vertical polarization



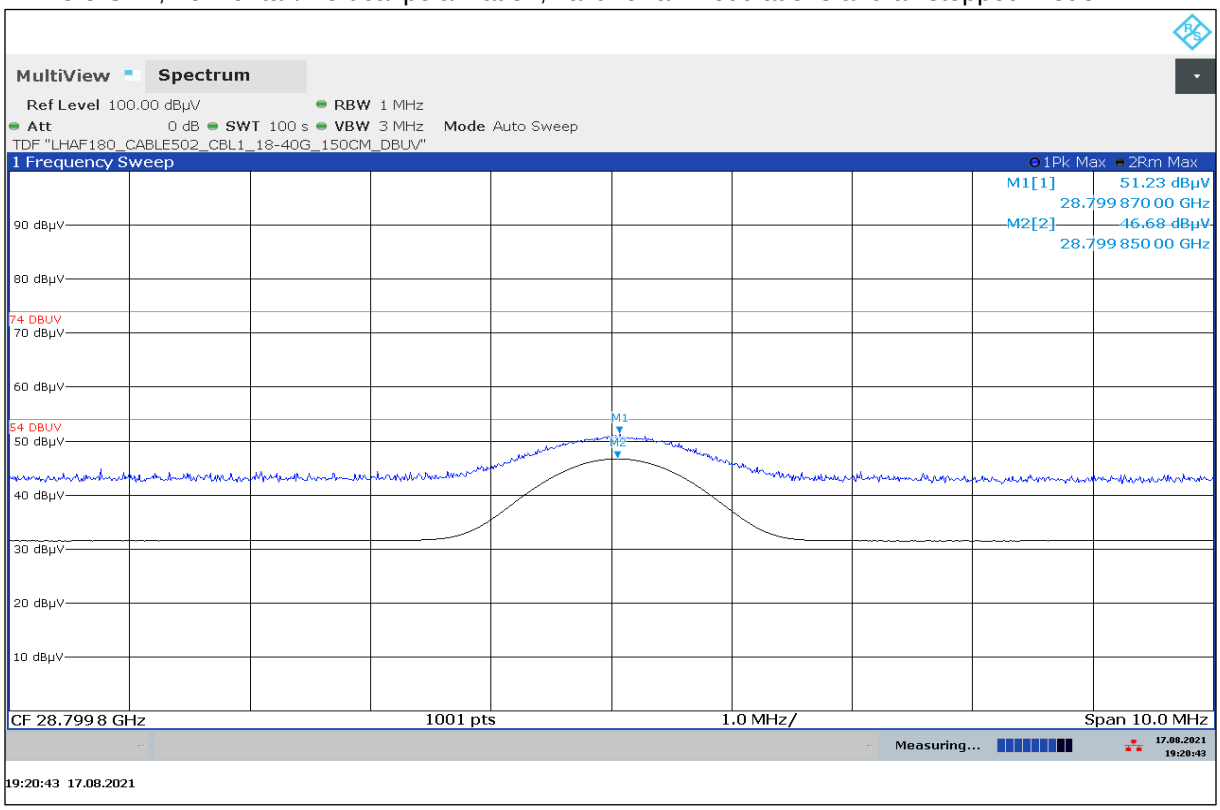
Plot 22: 18 GHz – 40 GHz, Single Target Mode (STM), horizontal / vertical polarization



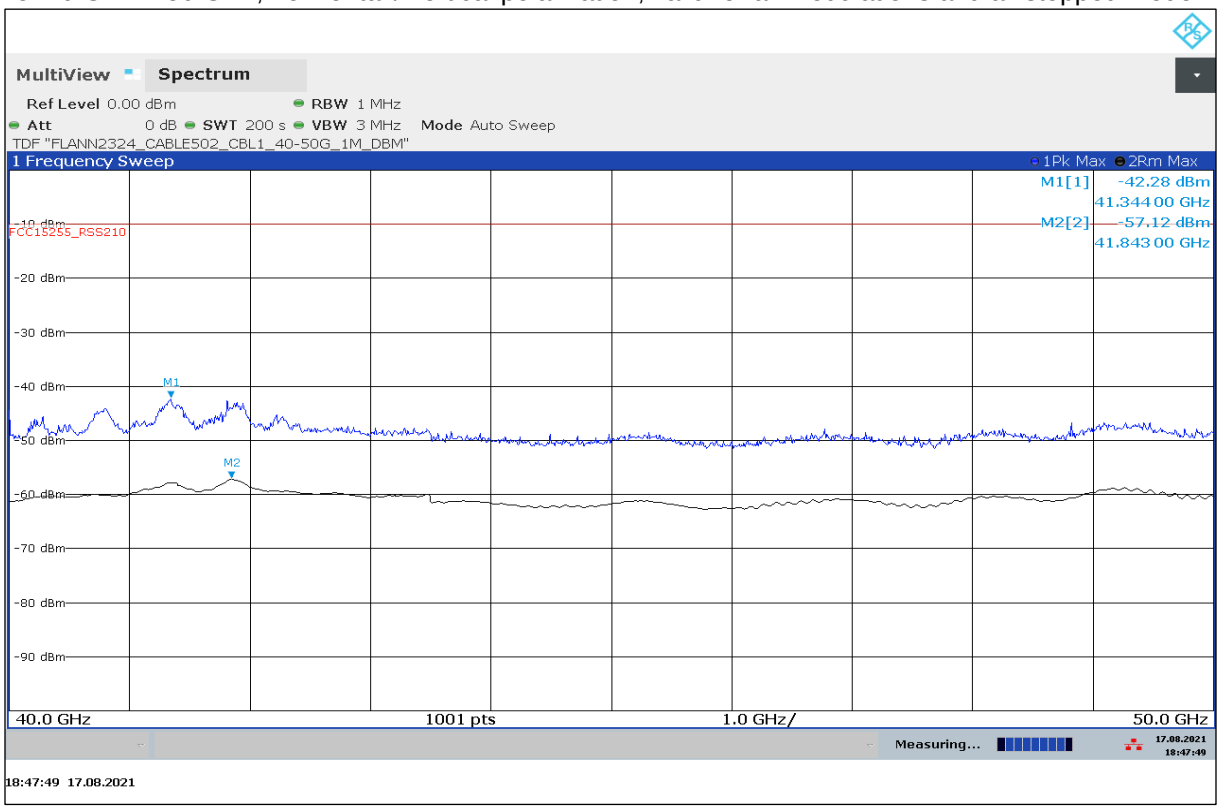
Plot 23: 18 GHz – 40 GHz, horizontal / vertical polarization, valid for all stopped mode



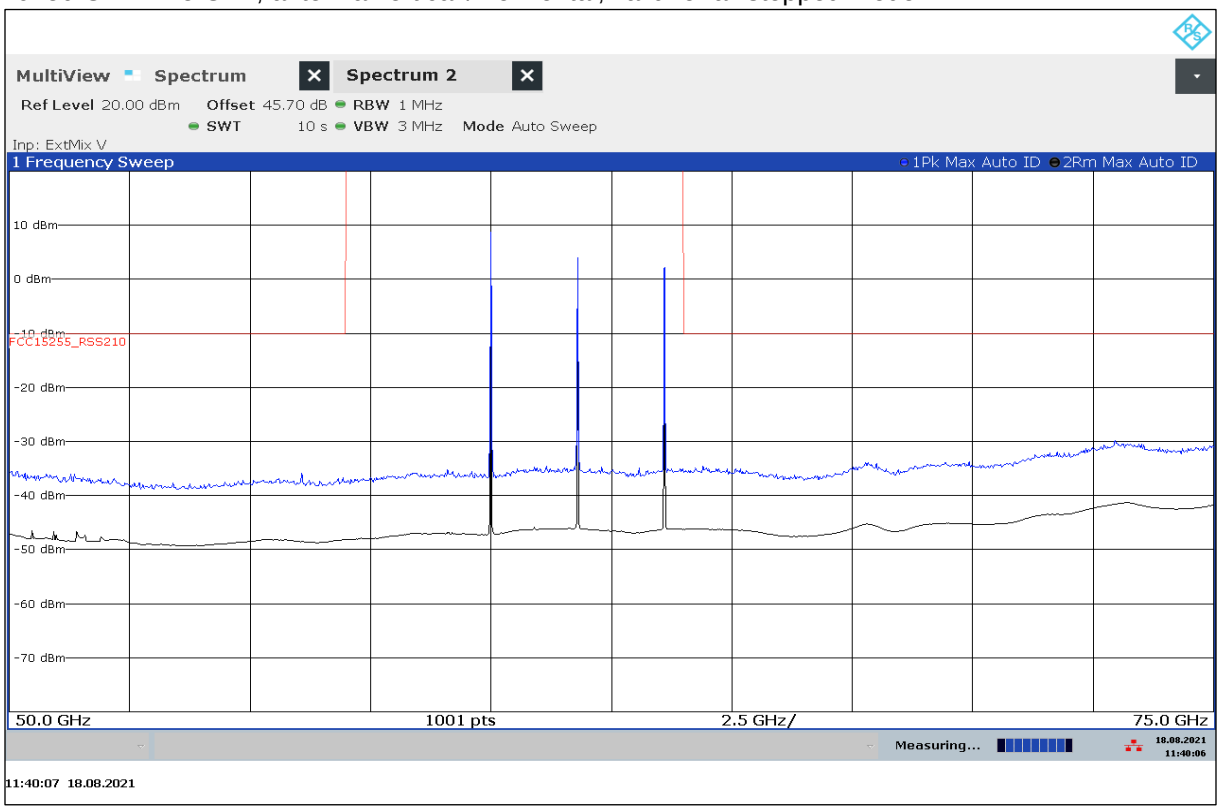
Plot 24: 28.8 GHz, horizontal / vertical polarization, valid for all modulations and all stopped mode



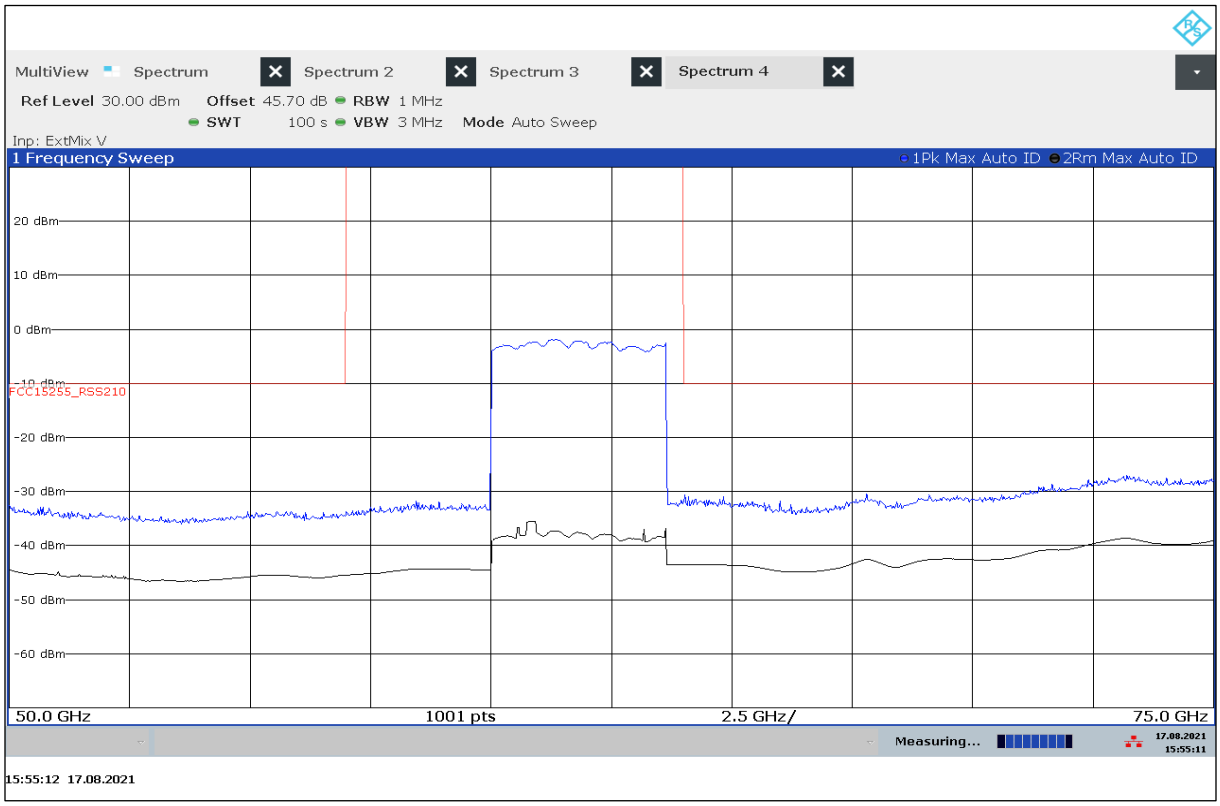
Plot 25: 40 GHz – 50 GHz, horizontal / vertical polarization, valid for all modulations and all stopped mode



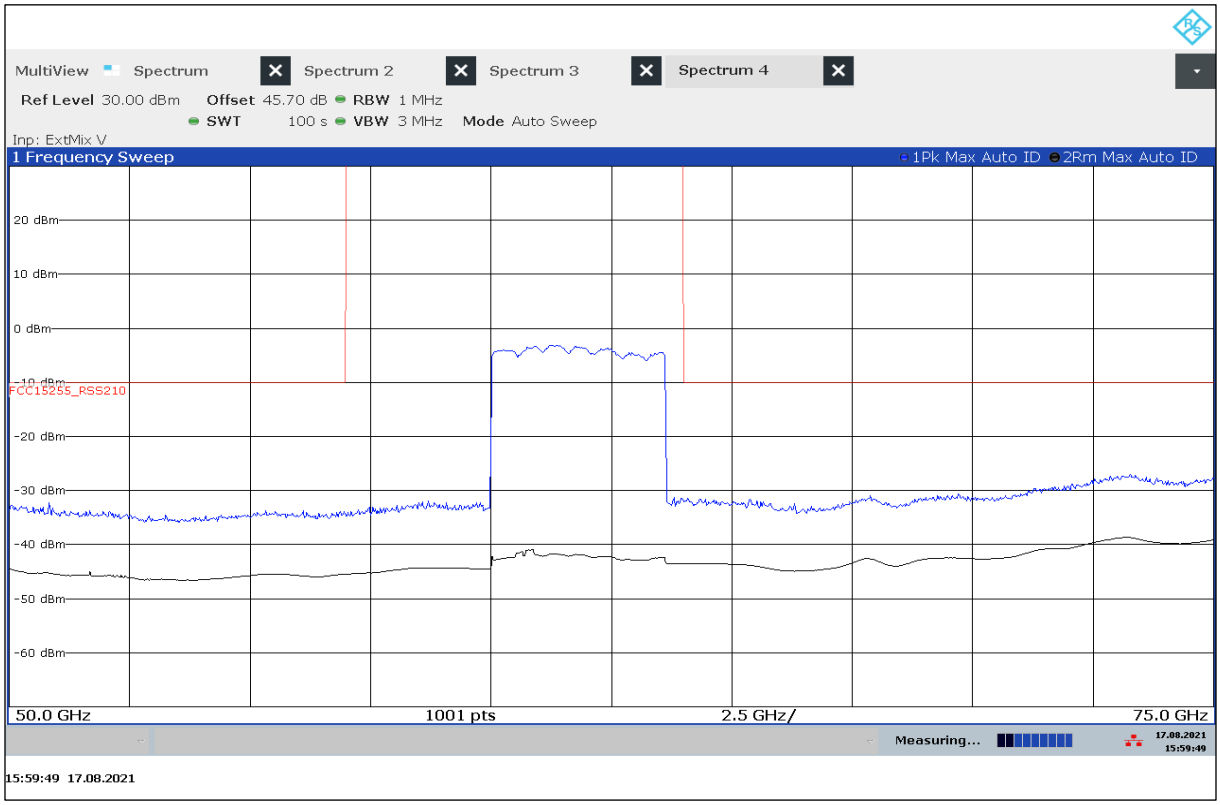
Plot 26: 50 GHz – 75 GHz, antenna vertical / horizontal, valid for all stopped mode



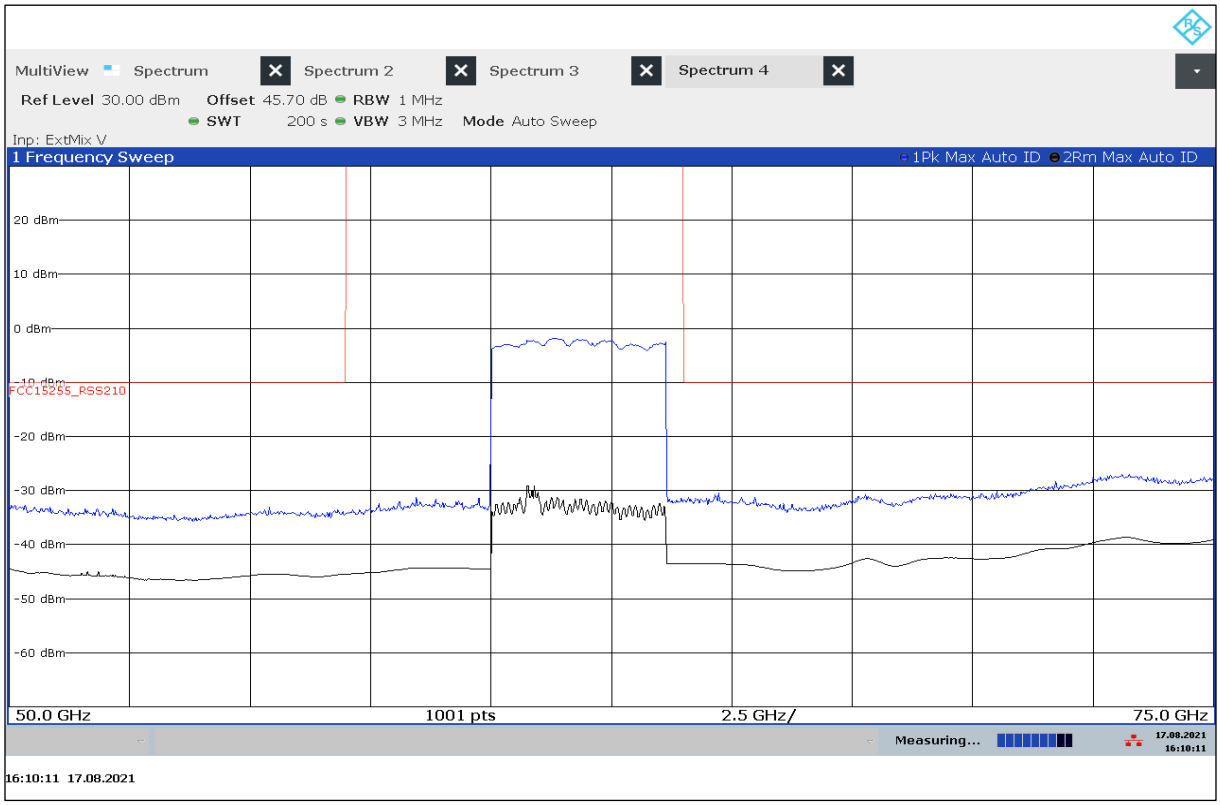
Plot 27: 50 GHz – 75 GHz, antenna vertical / horizontal, STM



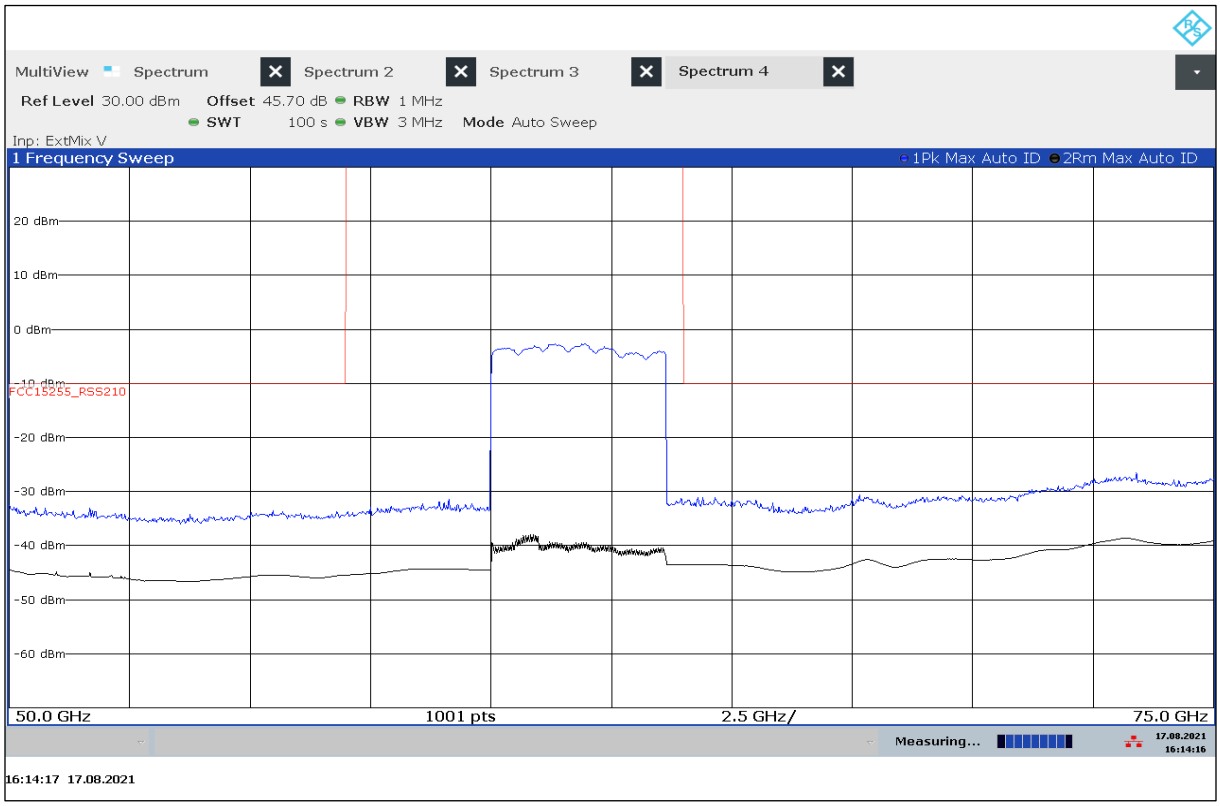
Plot 28: 50 GHz – 75 GHz, antenna vertical / horizontal, MTM10



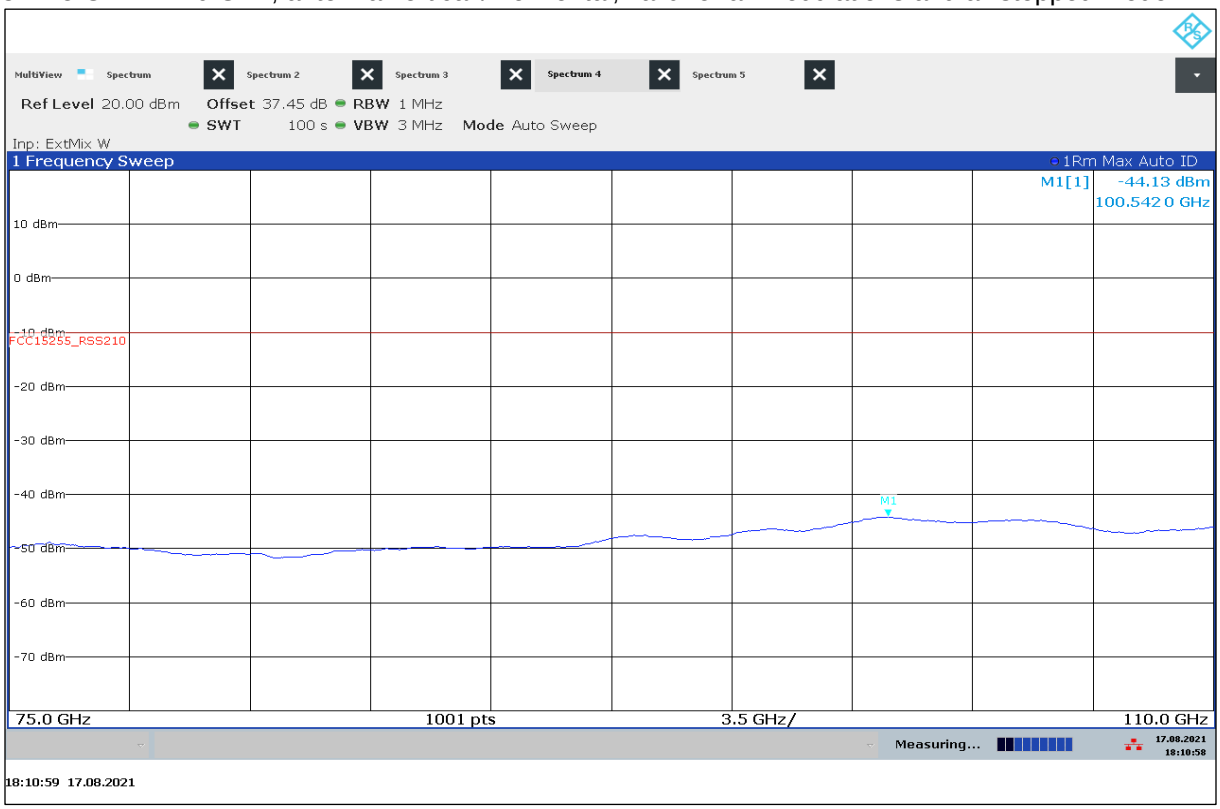
Plot 29: 50 GHz – 75 GHz, antenna vertical / horizontal, LIM



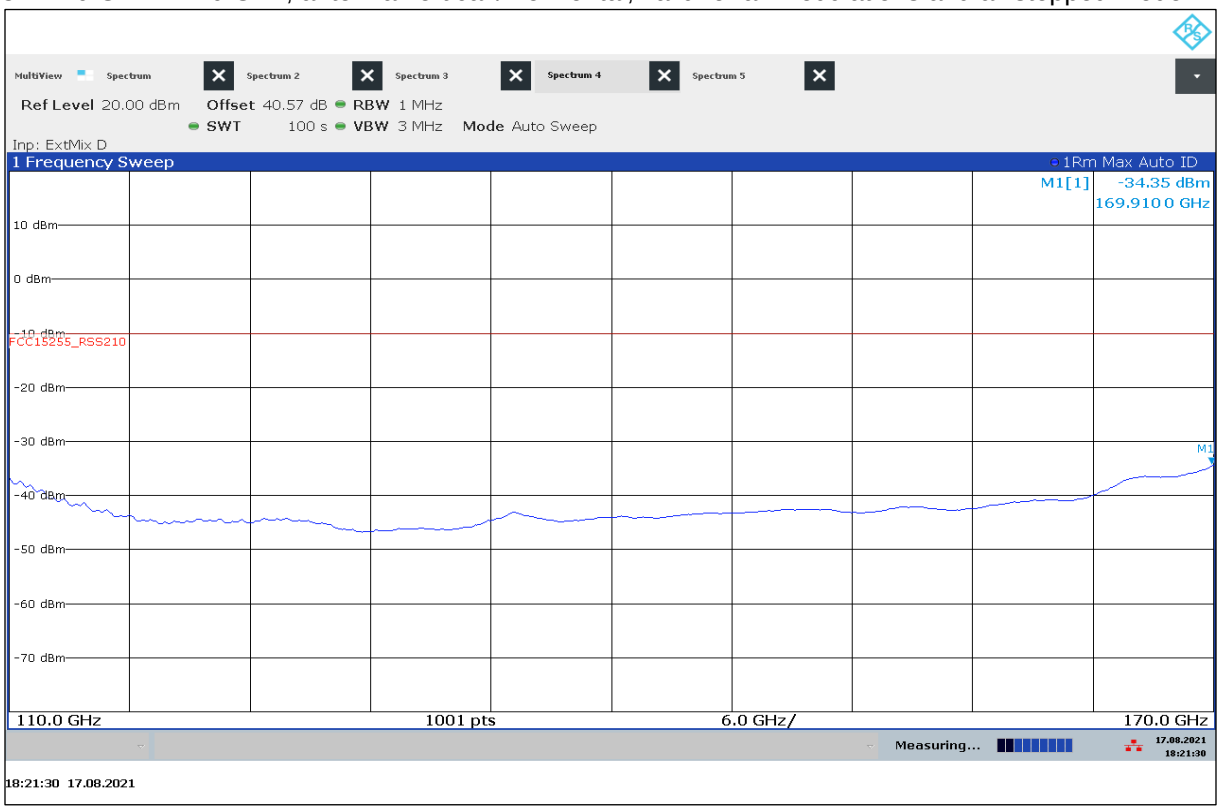
Plot 30: 50 GHz – 75 GHz, antenna vertical / horizontal, MTM25



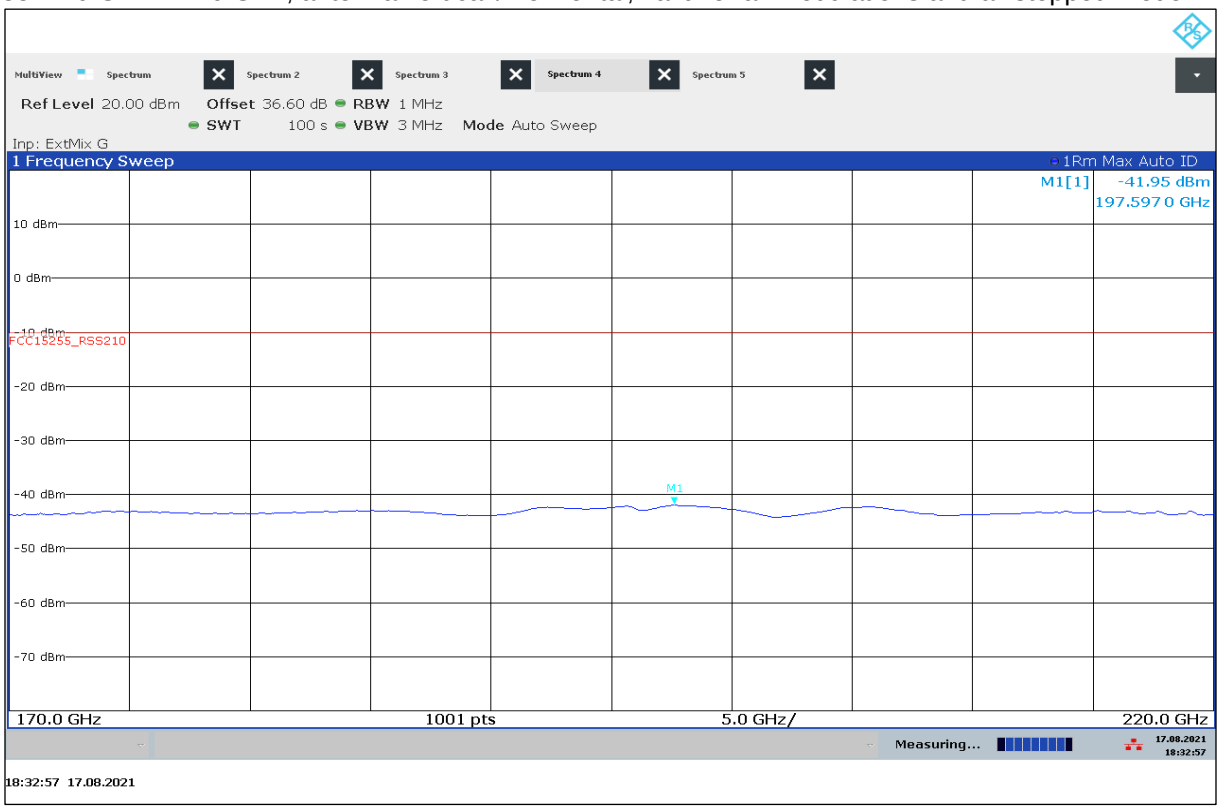
Plot 31: 75 GHz – 110 GHz, antenna vertical / horizontal, valid for all modulations and all stopped mode



Plot 32: 110 GHz – 170 GHz, antenna vertical / horizontal, valid for all modulations and all stopped mode



Plot 33: 140 GHz – 220 GHz, antenna vertical / horizontal, valid for all modulations and all stopped mode



12.4 Spurious emissions conducted < 30 MHz (AC power line)

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

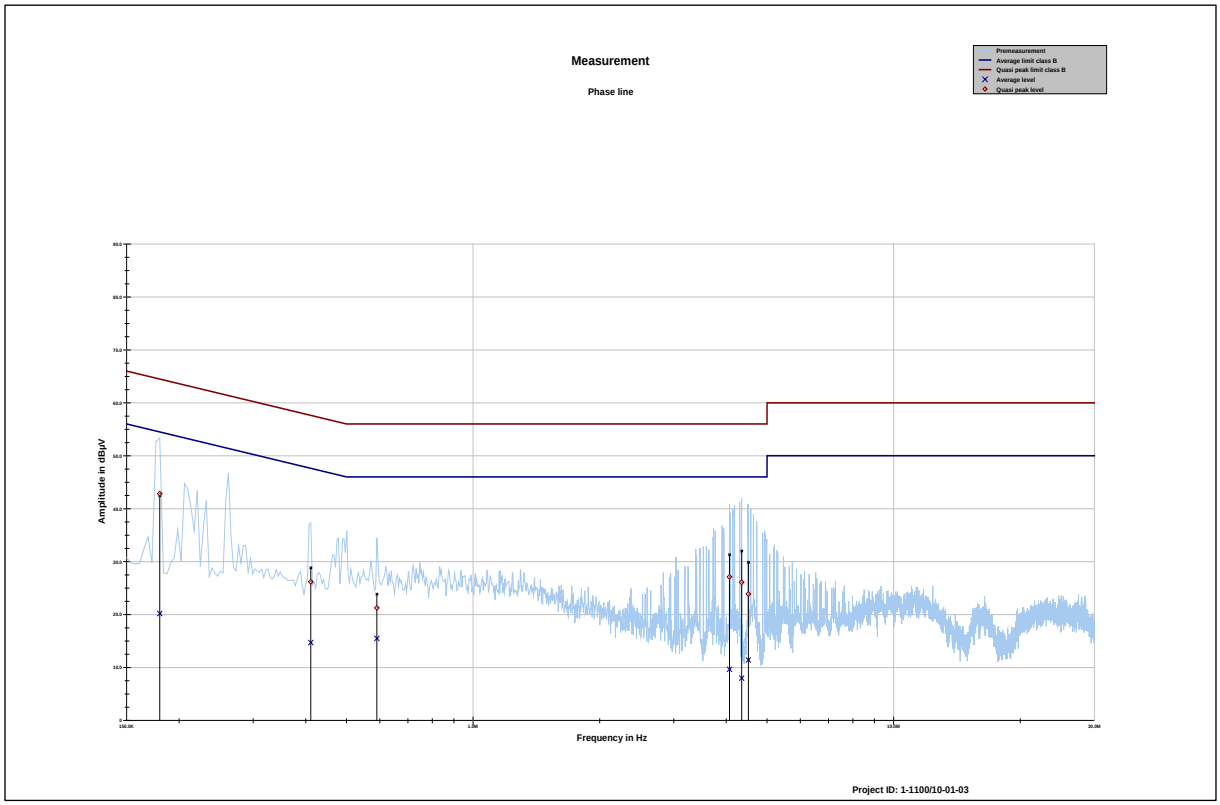
Limits:

FCC		IC
CFR Part 15.107 / 15.207(a)		RSS-Gen 8.8
Conducted Spurious Emissions < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	79 (Class A) 66 to 56* (Class B)	66 (Class A) 56 to 46* (Class B)
0.5 – 5	73 (Class A) 56 (Class B)	63 (Class A) 46 (Class B)
5 – 30.0	73 (Class A) 60 (Class B)	63 (Class A) 50 (Class B)

*Decreases with the logarithm of the frequency

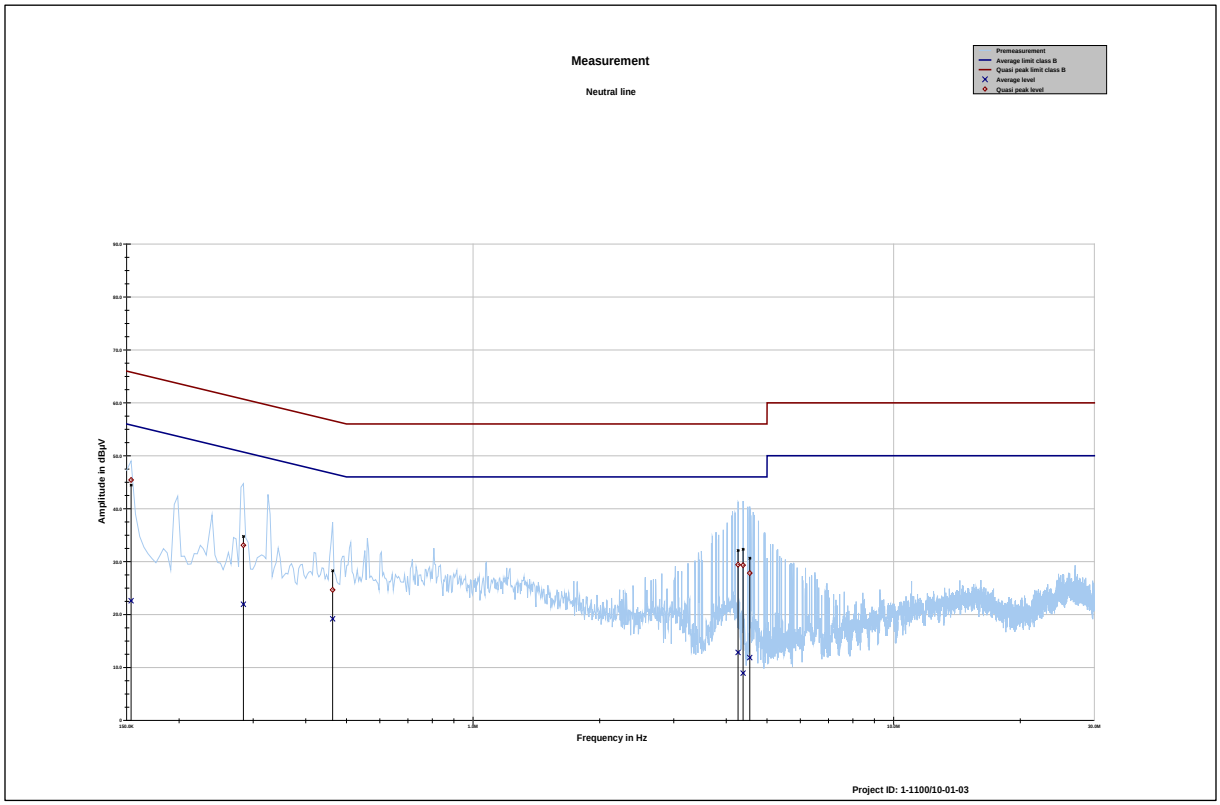
Result: **The measurement is passed**

Plot No. 34: Phase line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.179850	42.82	21.67	64.493	20.19	34.95	55.147
0.411187	26.18	31.44	57.624	14.70	33.84	48.538
0.590287	21.27	34.73	56.000	15.49	30.51	46.000
4.071544	27.12	28.88	56.000	9.64	36.36	46.000
4.351388	26.09	29.91	56.000	7.98	38.02	46.000
4.515562	23.89	32.11	56.000	11.42	34.58	46.000

Plot No. 35: Neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.153731	45.42	20.37	65.796	22.61	33.28	55.893
0.284325	33.09	27.60	60.689	21.94	30.22	52.162
0.463425	24.65	31.98	56.631	19.19	27.86	47.045
4.265569	29.42	26.58	56.000	12.85	33.15	46.000
4.384969	29.33	26.67	56.000	8.92	37.08	46.000
4.549144	27.83	28.17	56.000	11.87	34.13	46.000

12.5 Frequency Stability

Description:

§15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

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:

f_C is the point in the radiation where the power is at maximum. The frequency points where the power falls 10 dB below the f_C level and above f_C level are designated as f_L and f_H respectively.
The operating frequency range (i.e. the frequency band of operation) is defined as f_H - f_L.

Measurement parameter	
Detector:	Peak
Sweep time:	10 s
Resolution bandwidth:	2 MHz
Video bandwidth:	5 MHz
Span:	300 MHz
Trace-Mode:	Max Hold
Temperature:	-20 °C / +55 °C

Limits:

FCC	IC
CFR Part 15.255 (f)	RSS-Gen 6.11 / RSS-210 J.6
The occupied bandwidth from intentional radiators operated within the specified frequency band shall comply with the following:	
Frequency range	
57 GHz – 71 GHz	

Measurement Results:

Temperature variation

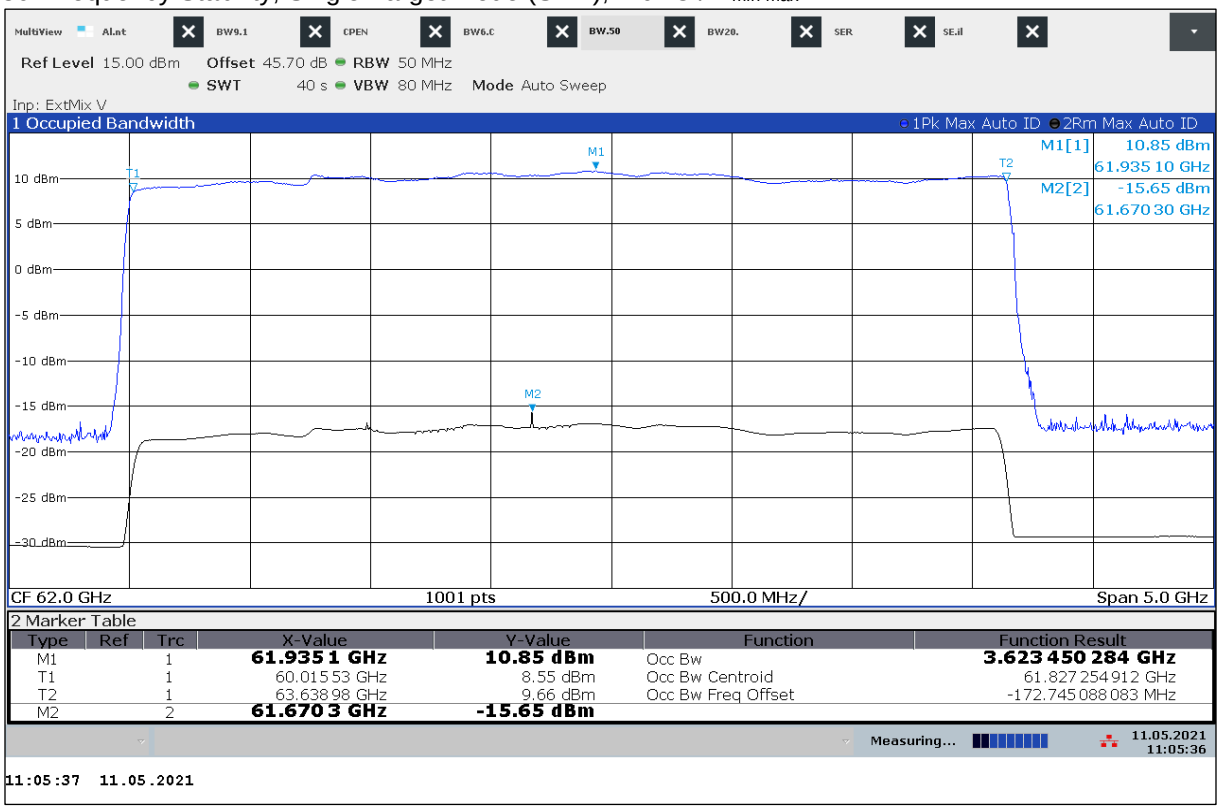
Test Conditions	Transmitter Frequency Range [GHz]		Occupied Bandwidth [GHz]
	f_L	f_H	
-40 °C / $V_{min-max}$	60.015 530	63.638 980	3.62
-30 °C / $V_{min-max}$	60.010 900	63.637 640	3.63
-20 °C / $V_{min-max}$	60.011 160	63.637 260	3.63
-10 °C / $V_{min-max}$	60.011 070	63.636 130	3.63
0 °C / $V_{min-max}$	60.009 650	63.636 020	3.63
10 °C / $V_{min-max}$	60.008 270	63.636 520	3.63
20 °C / $V_{min-max}$	60.005 330	63.636 640	3.63
30 °C / $V_{min-max}$	60.008 070	63.636 400	3.63
40 °C / $V_{min-max}$	60.006 190	63.636 920	3.63
50 °C / $V_{min-max}$	60.009 310	63.637 680	3.63
85 °C / $V_{min-max}$	60.007 340	63.636 870	3.63

Voltage variation

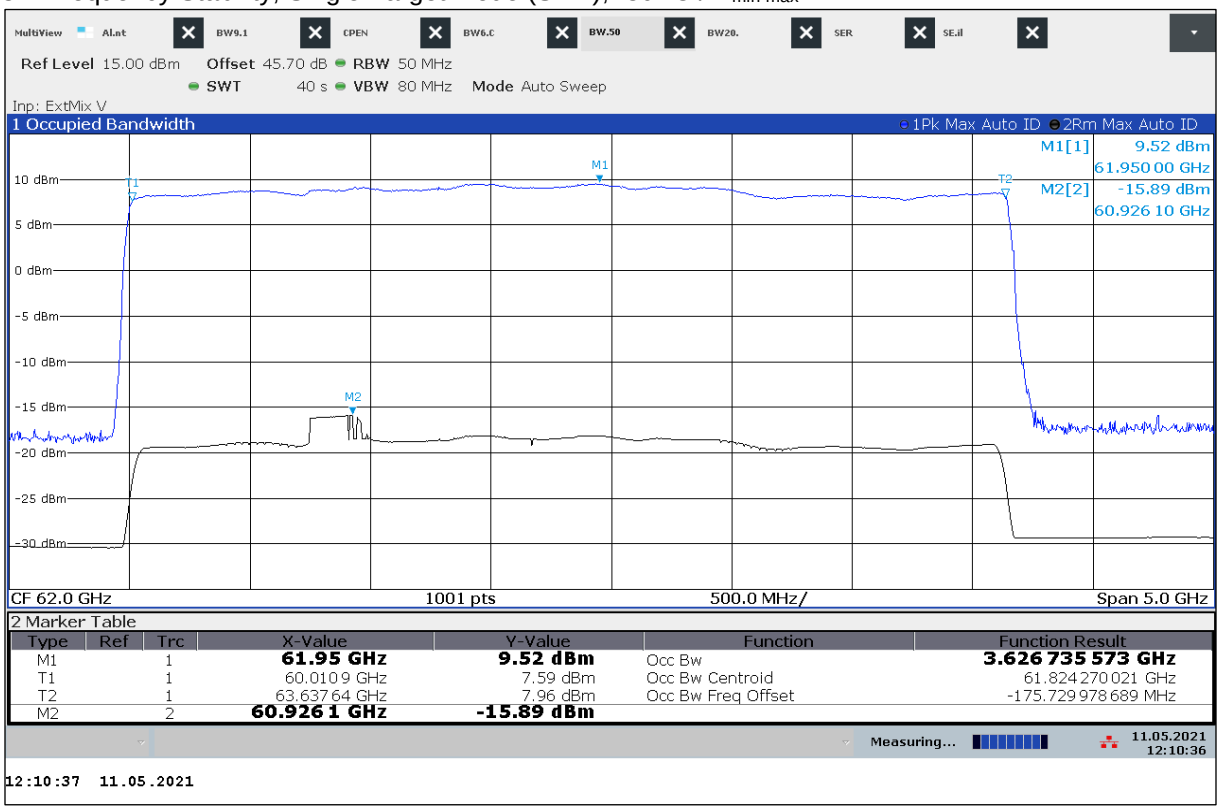
Voltage variation of rated input voltage	f_L in GHz	f_H in GHz
< 85 % of U	Voltage variation does not affect the radiated signal	
> 115 % of U		

Result: **The measurement is passed.**

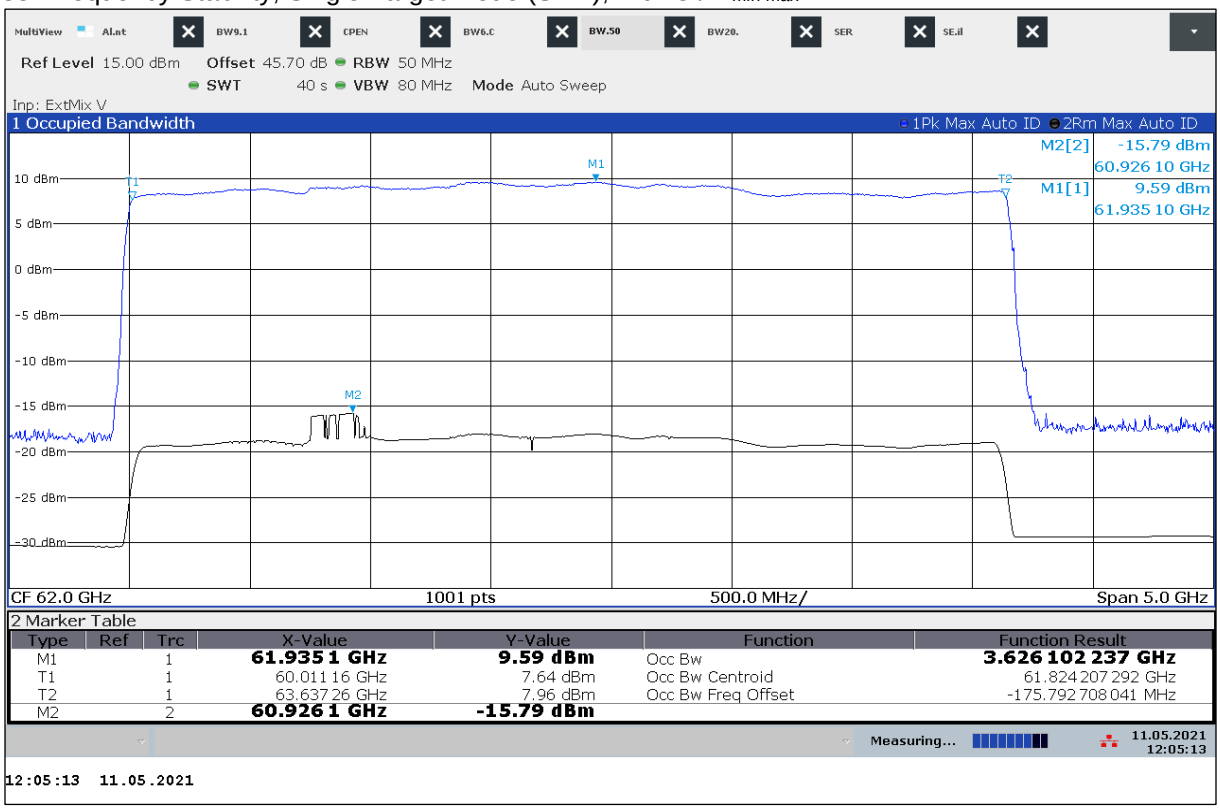
Plot 36: Frequency Stability, Single Target Mode (STM), -40 °C / $V_{min-max}$



Plot 37: Frequency Stability, Single Target Mode (STM), -30 °C / $V_{min-max}$

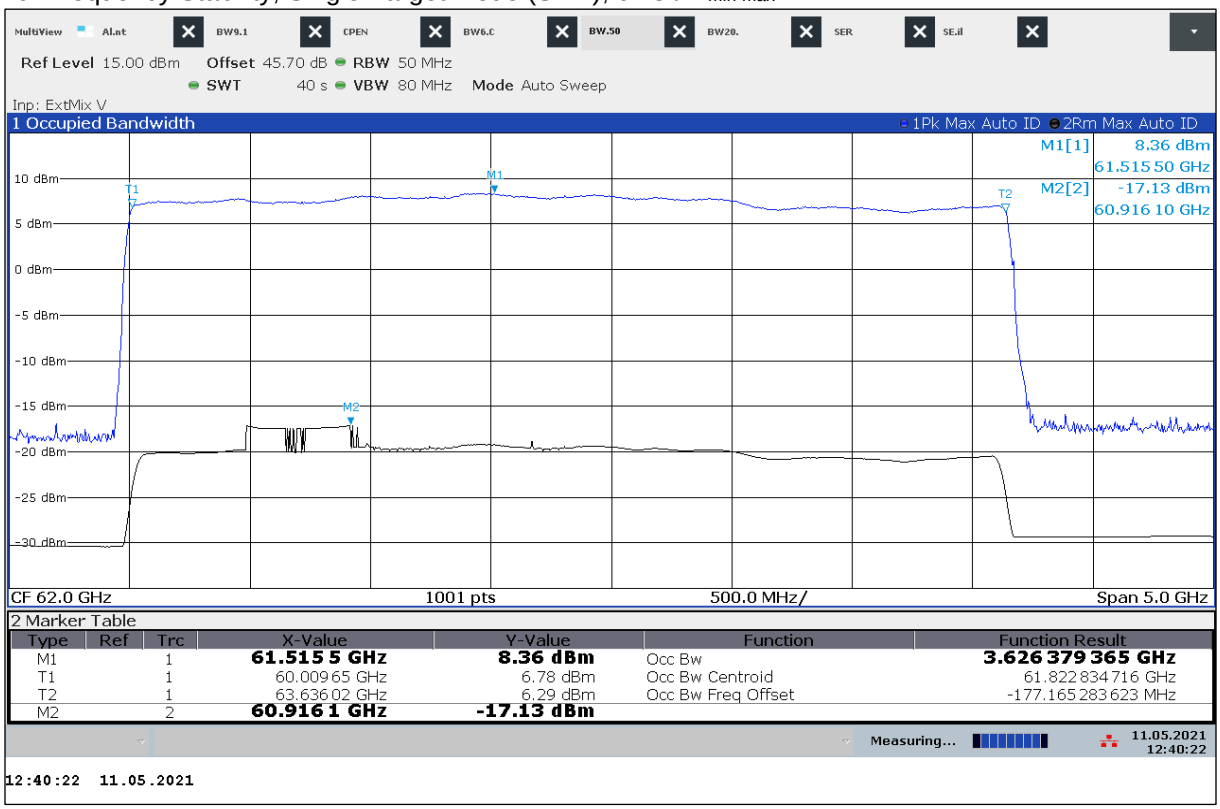


Plot 38: Frequency Stability, Single Target Mode (STM), -20 °C / $V_{min-max}$

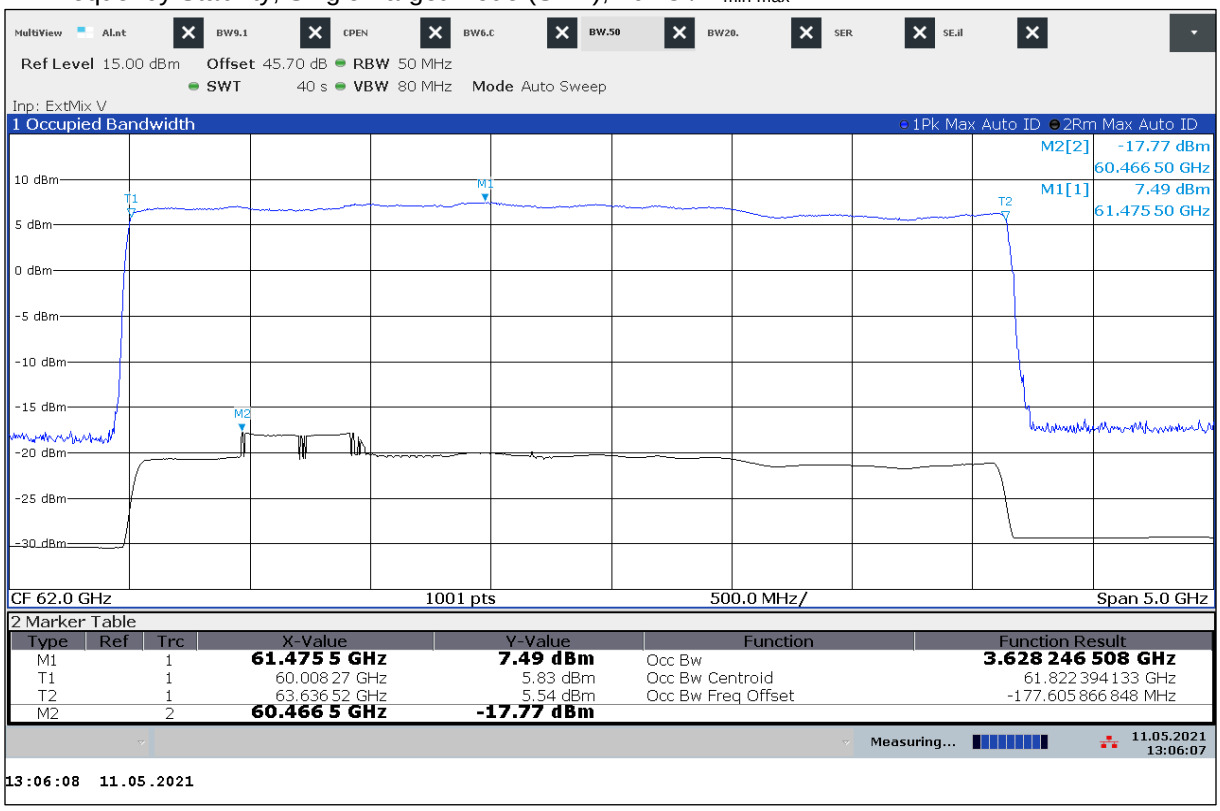


Plot 39: Frequency Stability, Single Target Mode (STM), -10 °C / $V_{min-max}$

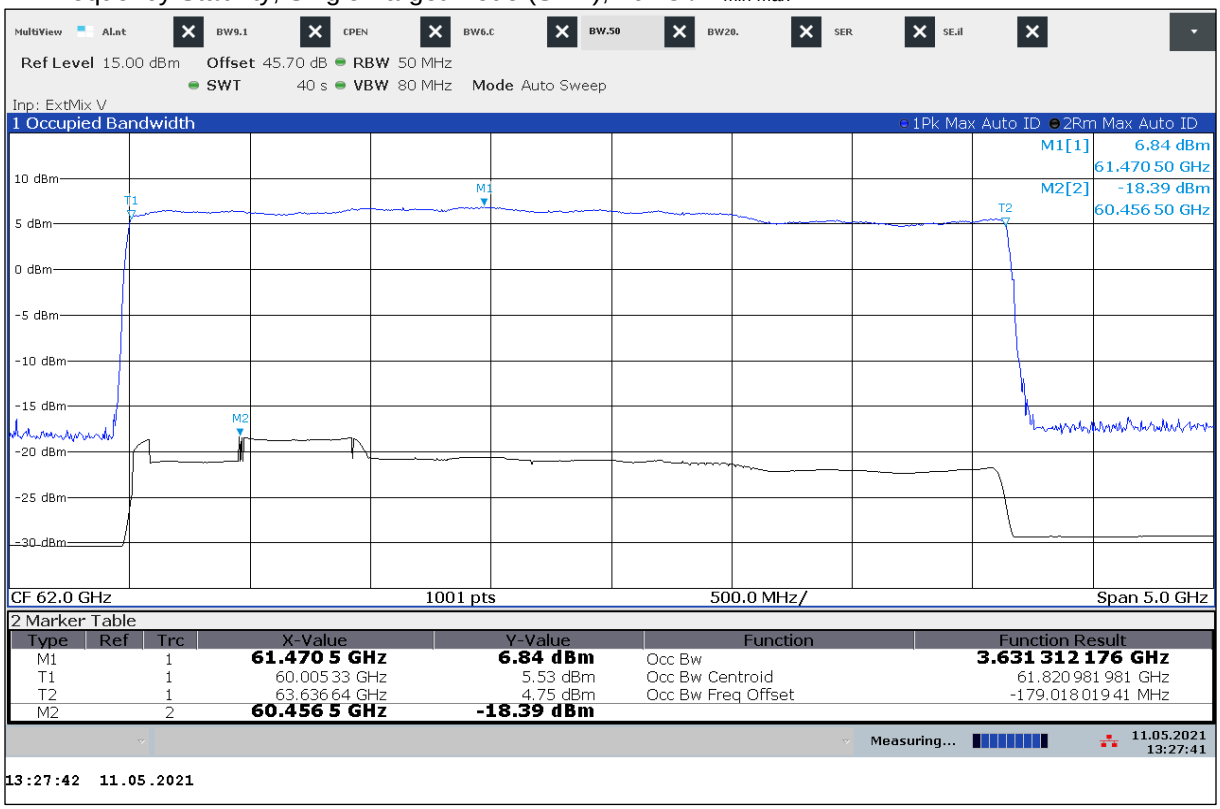
Plot 40: Frequency Stability, Single Target Mode (STM), 0 °C / $V_{min-max}$



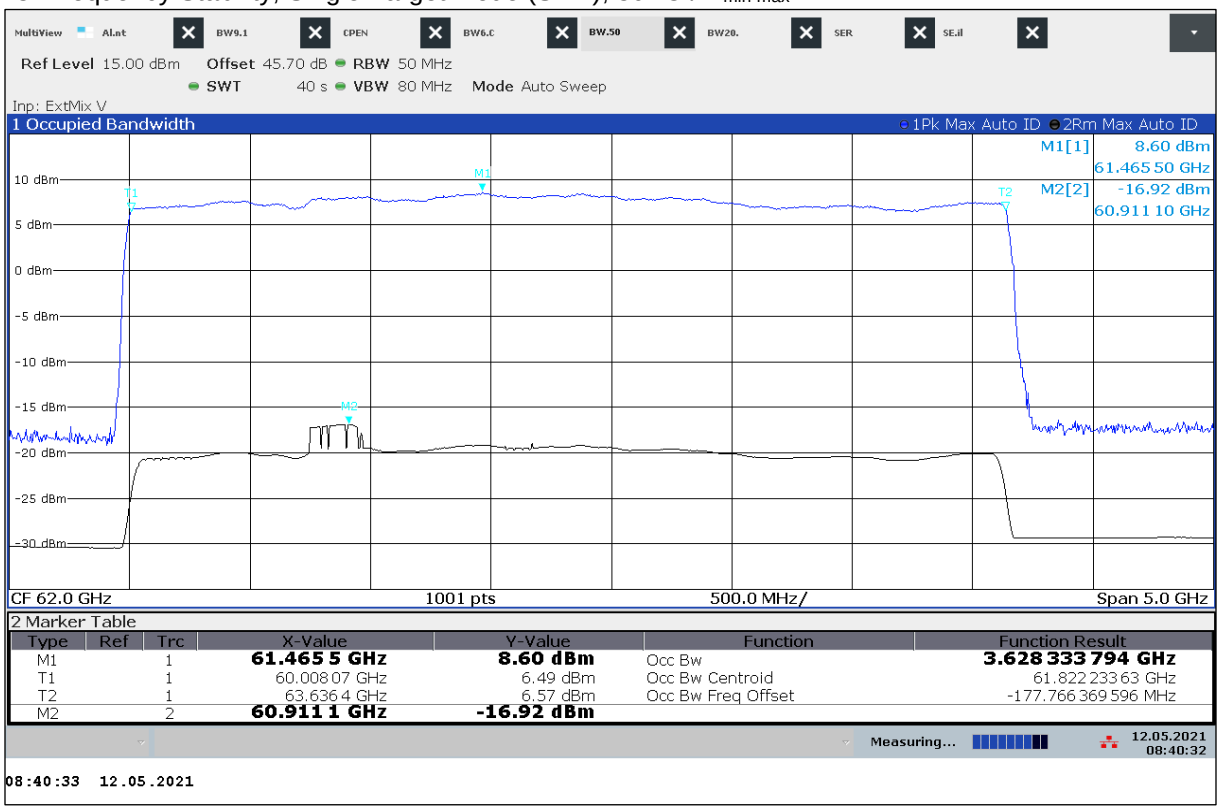
Plot 41: Frequency Stability, Single Target Mode (STM), 10 °C / $V_{min-max}$



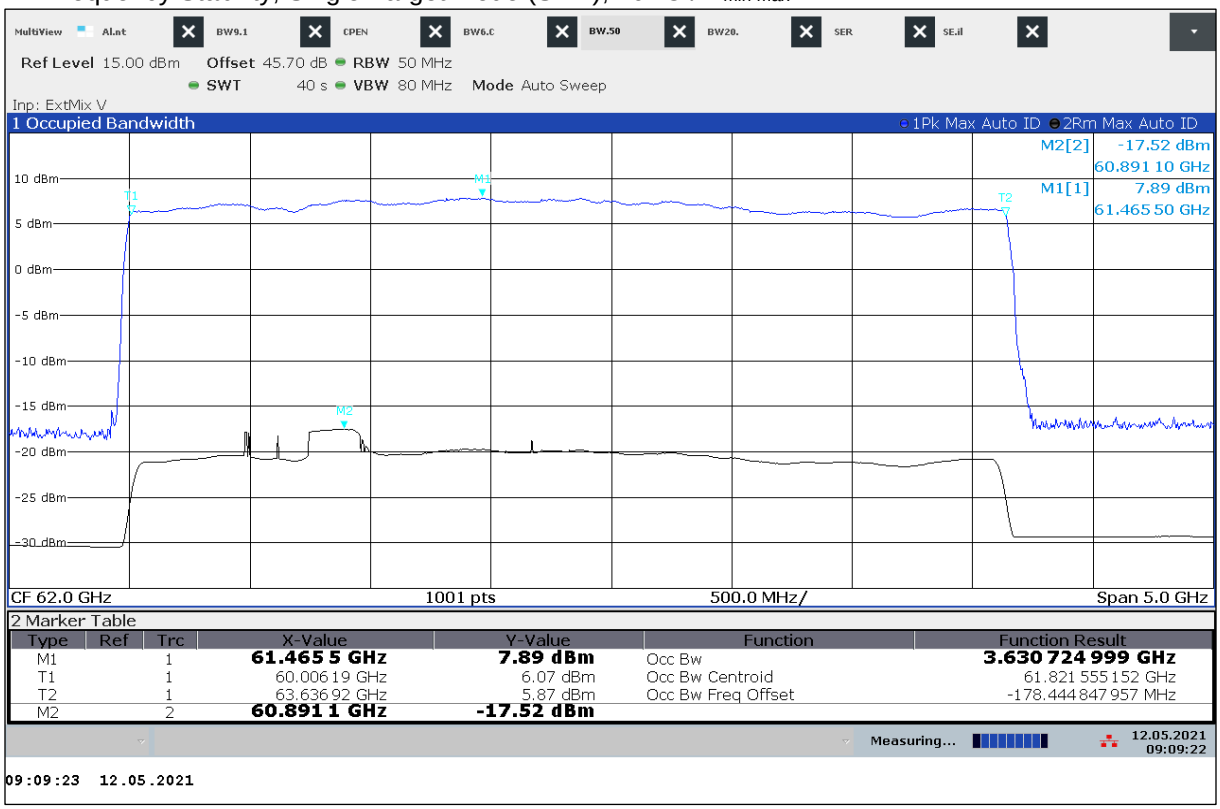
Plot 42: Frequency Stability, Single Target Mode (STM), 20 °C / $V_{min-max}$



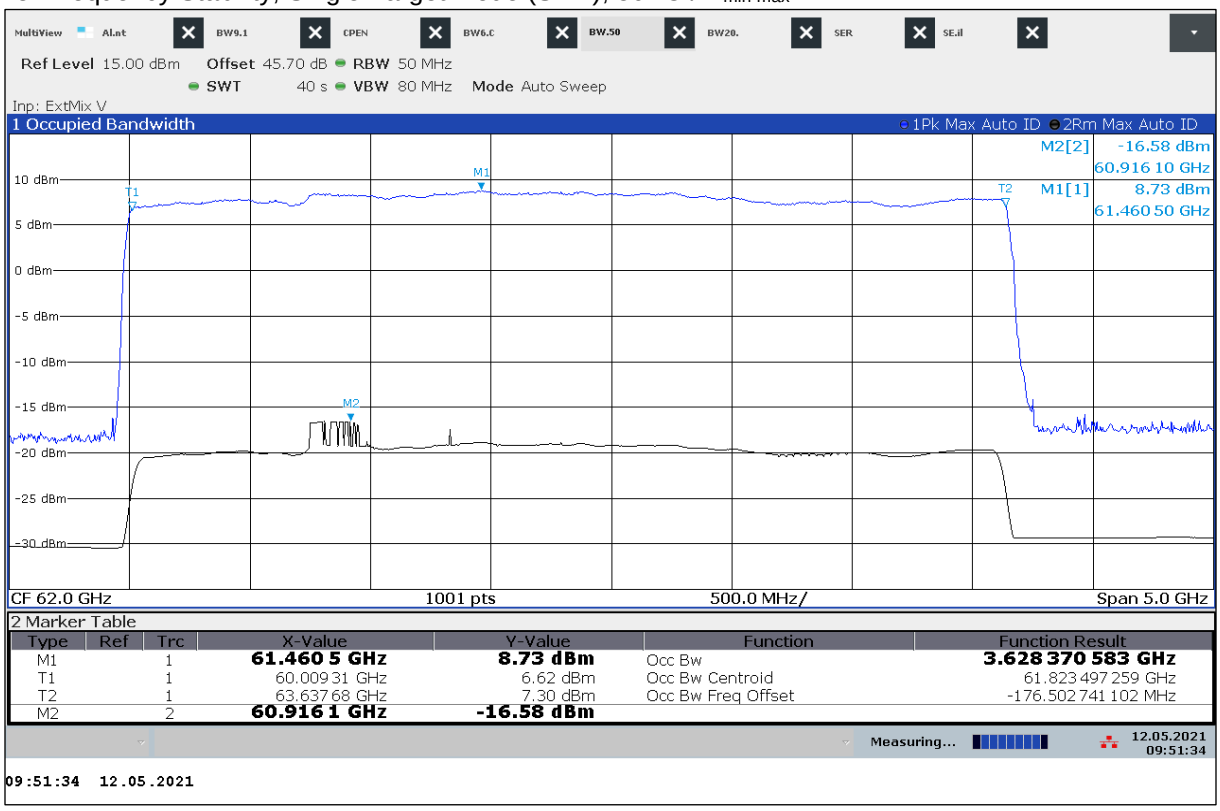
Plot 43: Frequency Stability, Single Target Mode (STM), 30 °C / $V_{min-max}$



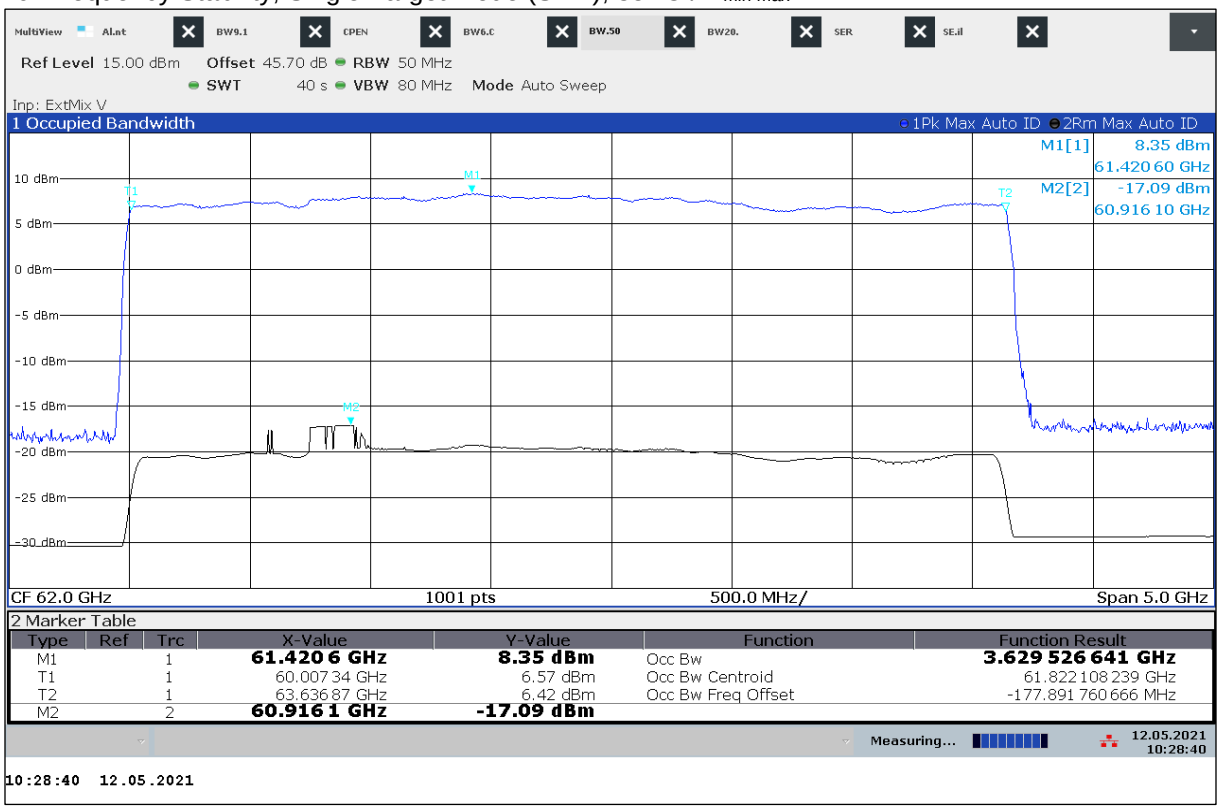
Plot 44: Frequency Stability, Single Target Mode (STM), 40 °C / $V_{min-max}$



Plot 45: Frequency Stability, Single Target Mode (STM), 50 °C / $V_{min-max}$



Plot 46: Frequency Stability, Single Target Mode (STM), 85 °C / $V_{min-max}$



12.6 Simultaneous operation

Description:

§15.255 (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

Result: No beamforming in use

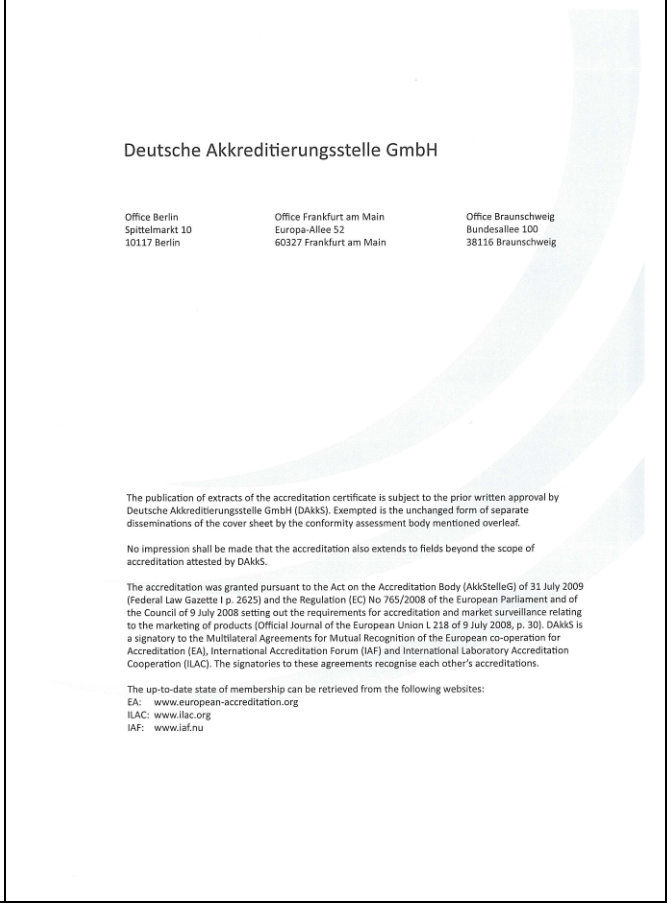
13 Glossary

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

14 Document history

Version	Applied changes	Date of release
-/-	Initial release	2021-09-03
-/-	Update “6.2 Additional information”	2022-04-06

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

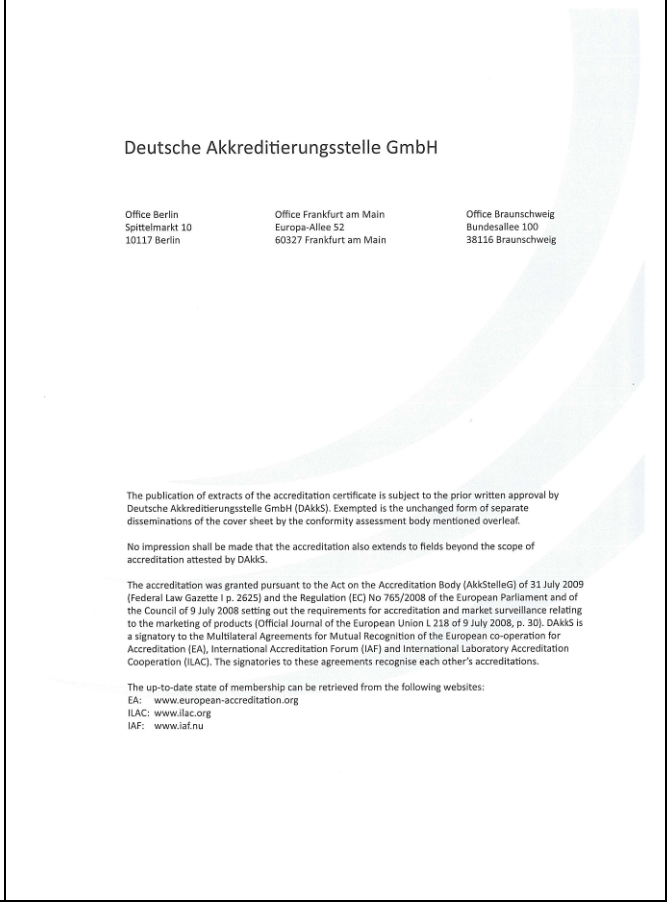
first page	last page
	

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

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04.pdf

or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf

16 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-12076-01-05.pdf

or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf

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