
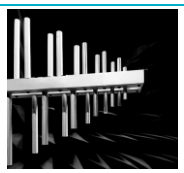
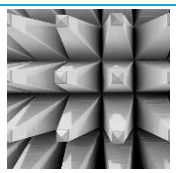

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-5965_23-03-03

Deutsche Akkreditierungsstelle D-PL-12047-01-00

Testing laboratory

cetecom advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: https://www.cetecomadvanced.com
e-mail: mail@cetecomadvanced.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 with the registration number: D-PL-12047-01-00.
ISED Testing Laboratory Recognized Listing Number: DE0001
FCC designation number: DE0002

Applicant

Baumer Electric AG
Hummelstr. 17
8501 Frauenfeld - SWITZERLAND / SWITZERLAND
Phone: +41 52 728 1404
Contact: Rainer Mauch
E-Mail: rmauch@baumer.com

Manufacturer

Baumer Electric AG
Hummelstr. 17
8501 Frauenfeld - SWITZERLAND / SWITZERLAND

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

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

Test Item

Kind of test item:	**122-123 GHz FMCW Radar**
Model name:	**RR30**
FCC ID:	**PGP-RR30-01**
Frequency:	122 – 123 GHz
Antenna:	Integrated antenna (Linse 2)
Power supply:	9.0 V to 16.0 V DC by external power supply
Temperature range:	-40°C to +70°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=cetecom advanced GmbH, ou=VOG-230609, email=thomas.vogler@cetecomadvanced.com, c=DE
2025.06.05 10:42:23 +02'00'

Thomas Vogler
Lab Manager
Radio Labs

Test performed:

M. Walla

cn=Meheza Walla, o=cetecom advanced GmbH, ou=WAL-310325, email=meheza.walla@cetecomadvanced.com, c=DE
2025.06.05 10:24:44 +02'00'

Meheza Walla
Lab Manager
Radio Labs

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. cetecom 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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2.2 Application details

Date of receipt of order:	2023-06-07
Date of receipt of test item:	2023-09-18
Start of test:*	2024-01-02
End of test:*	2024-03-26
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

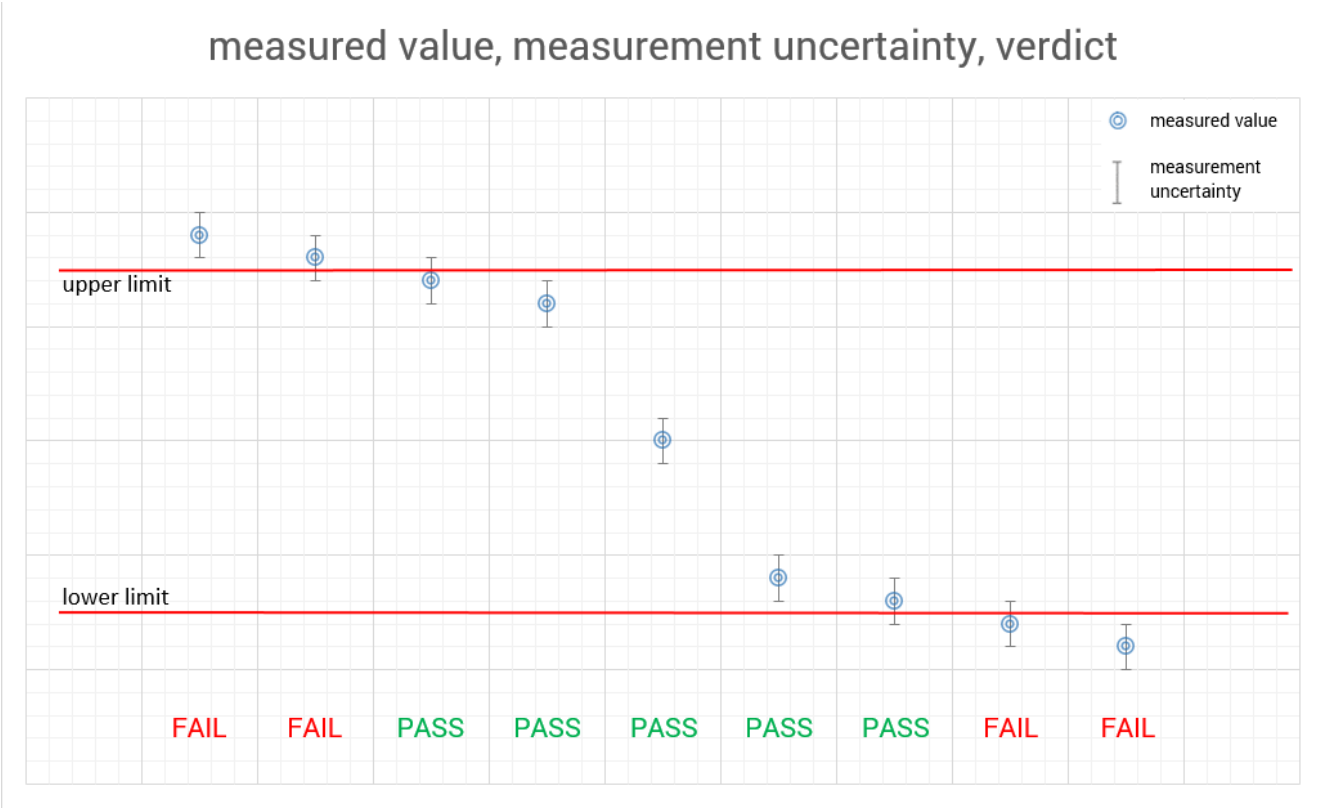
3 Test standard/s, references and accreditations

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

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

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 +50°C during high temperature tests -20°C during low temperature tests
Relative humidity content	:		49 %
Barometric pressure	:		990 hPa to 1010 hPa
Power supply	:	V_{nom} V_{max} V_{min}	12.0 V DC by external power supply 16.0 V 9.0 V

6 Test item

6.1 General description

Kind of test item	:	122-123 GHz FMCW Radar
Model name	:	RR30
S/N serial number	:	EUT 1: S/N 103219186_0002 EUT 2: S/N 103219186_0003 EUT 3: S/N 103219186_0004 EUT 4: S/N 103219186_0001
Hardware status	:	11175059, 11705175, 11705173, 11700320, 11202183
Software status	:	N/A
Firmware status	:	FW_RR30AIOF_S_01-10-00, FW_RR30AIRF_S_01-05-00
Frequency band	:	122 – 123 GHz
Type of modulation	:	FMCW
Antenna	:	Integrated antenna (Linse 2)
Power supply	:	9.0 V to 16.0 V DC by battery
Temperature range	:	-40°C to +70°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: 1-5965/23-03-01_AnnexA
1-5965/23-03-01_Annex B
1-5965/23-03-01_Annex D

Test Device:

- EUT 1: Normal operation mode

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

- EUT 2: Stop mode, low frequency: 122.03 GHz
- EUT 3: Stop mode, middle frequency: 122.5 GHz
- EUT 4: Stop mode, high frequency: 122.97 GHz

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).

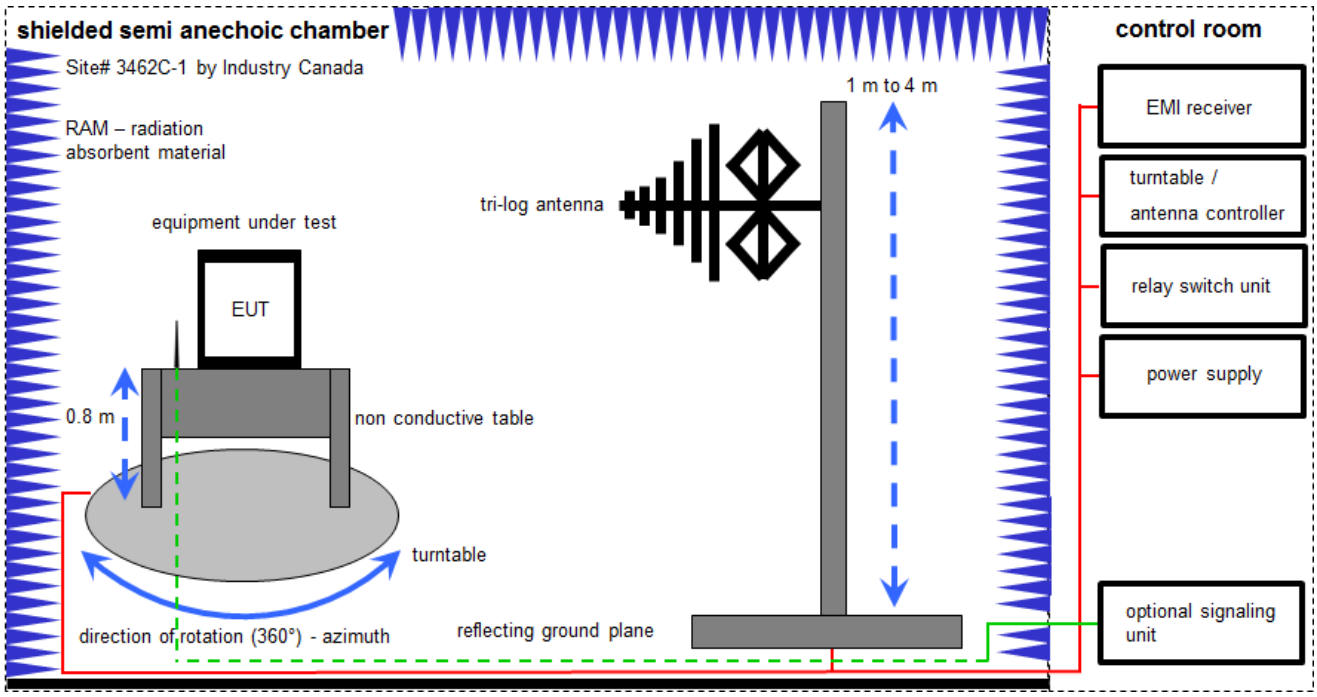
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

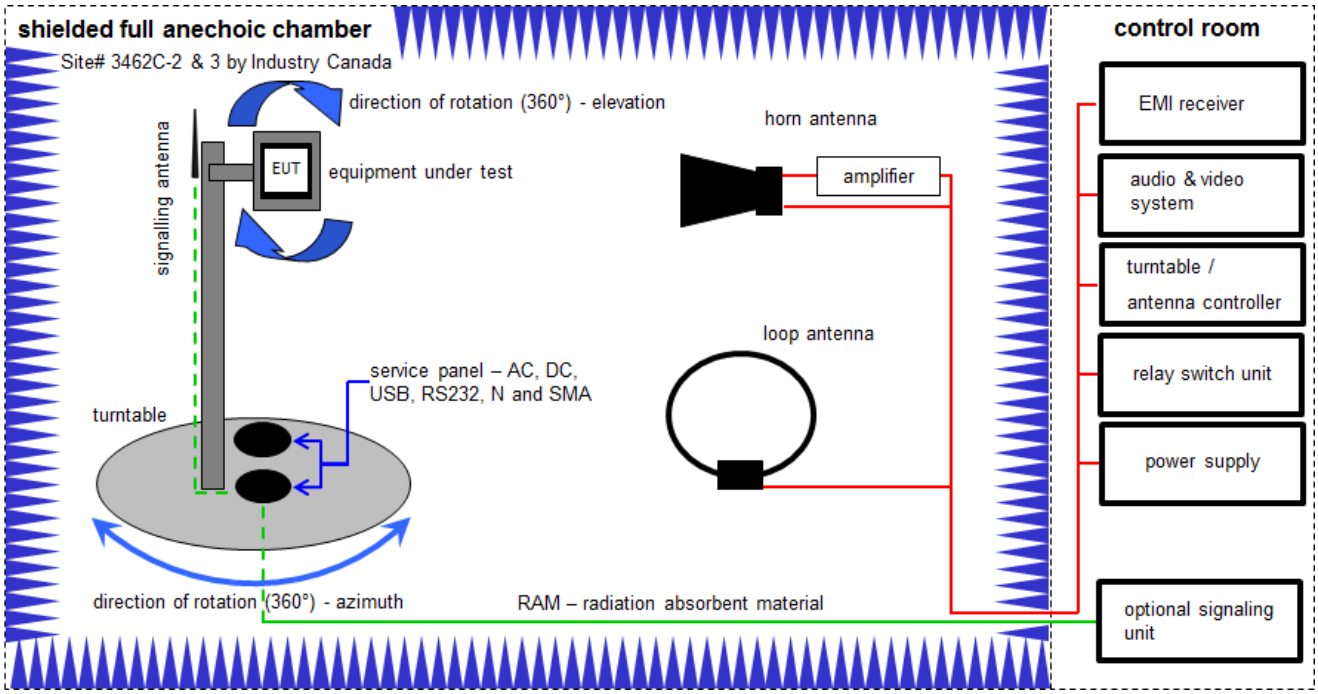
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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.	Turntable	2089-4.0	EMCO		300004394	ne	-/-	-/-
2	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	216	300003288	vIKI!	31.08.2023	31.08.2025
3	n. a.	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
4	n. a.	Semi anechoic chamber	3000023	MWB AG		300000551	ne	-/-	-/-
5	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	n. a.	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	06.12.2023	31.12.2024
7	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
8	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-

7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter / loop antenna 3 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)

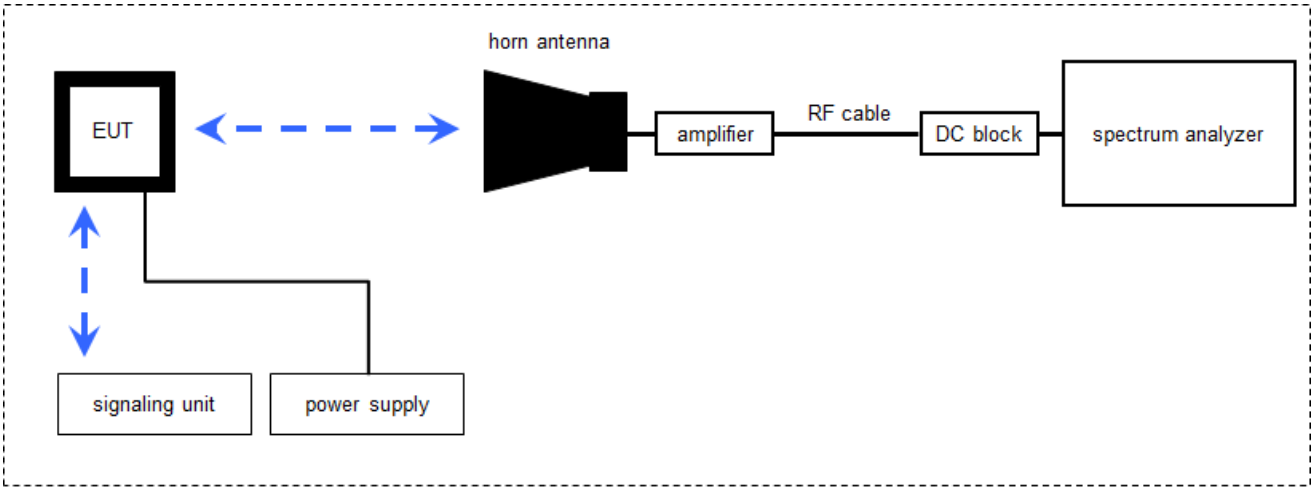
OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

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

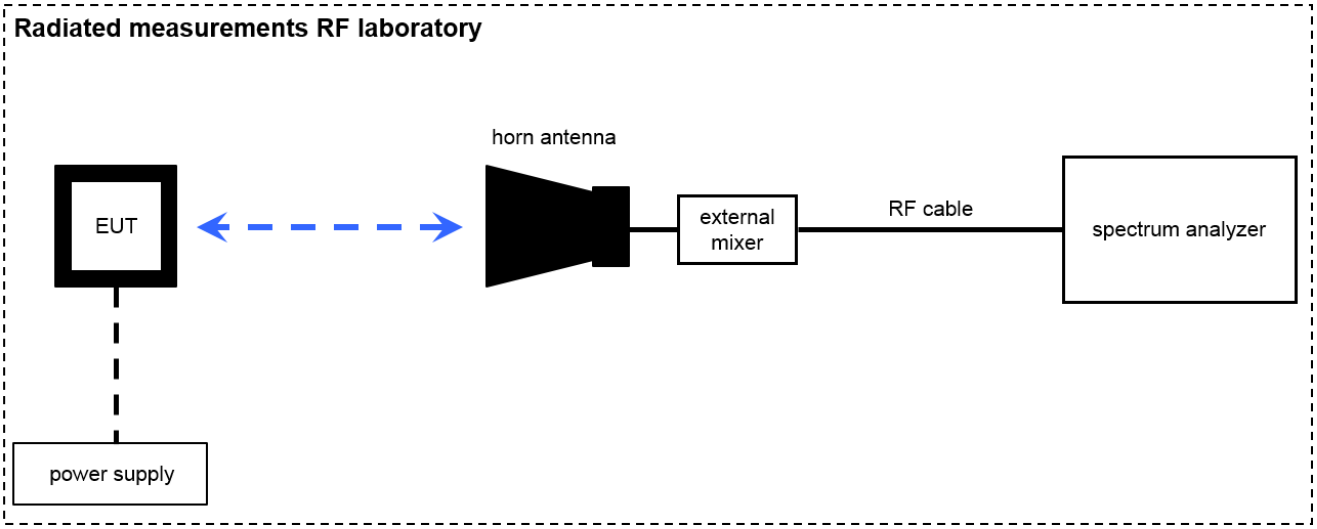
Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Variable isolating transformer	MPL IEC625 Bus Variable isolating transformer	Erfi	91350	300001155	ne	-/-	-/-
2	n. a.	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
3	n. a.	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-
4	n. a.	NEXIO EMV-Software	BAT EMC V2022.0.32.0	Nexio		300004682	ne	-/-	-/-
5	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	vIKI!	07.12.2022	31.12.2025
6	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
7	n. a.	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2023	31.12.2024
8	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3089	300000307	vIKI!	11.02.2022	29.02.2024
9	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	vIKI!	05.12.2023	31.12.2026
10	n. a.	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
11	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
12	n. a.	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	vIKI!	19.07.2023	31.07.2025
13	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-

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)

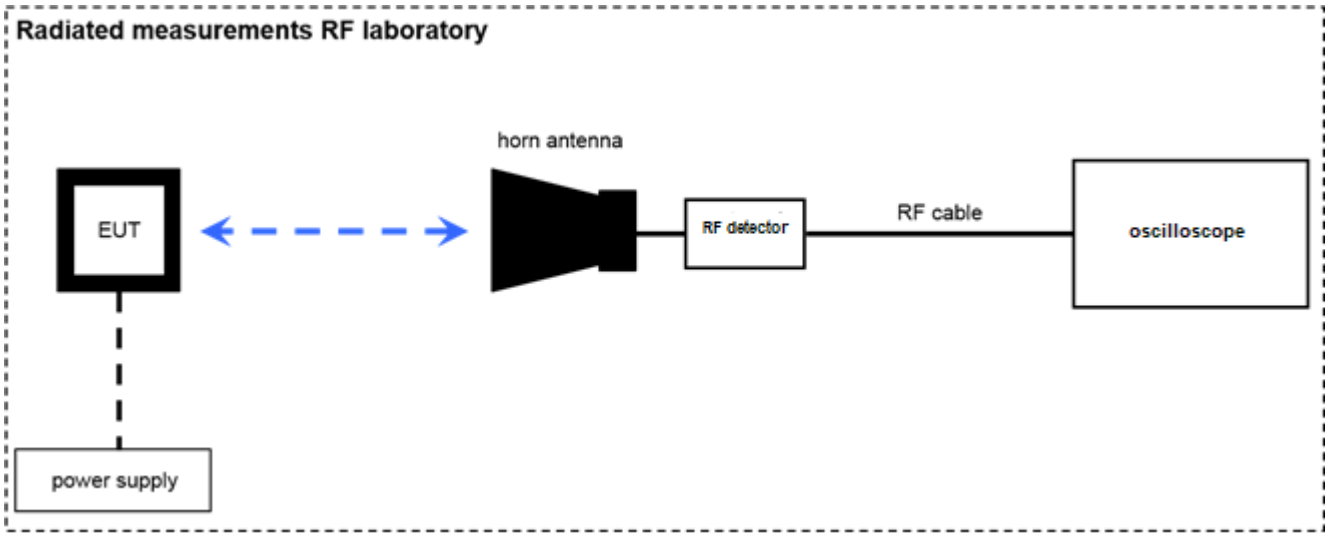
Note: conversion loss of mixer is already included in analyzer value.

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540	ev	09.05.2022	31.05.2024
2	n. a.	Std. Gain Horn Antenna 92.3-140 GHz	2824-20	Flann	*	300001993	ne	-/-	-/-
3	n. a.	Std. Gain Horn Antenna 73.8-112 GHz	2724-20	Flann	*	300001988	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 49.9-75.8 GHz	2524-20	Flann	*	300001983	ne	-/-	-/-
6	n. a.	Std. Gain Horn Antenna 33.0-50.1 GHz	2324-20	Flann	57	400000683	ne	-/-	-/-
7	n. a.	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ne	-/-	-/-
8	n. a.	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	82-16	300000510	vIKI!	17.01.2022	31.01.2024
9	n. a.	Std. Gain Horn Antenna 217-330 GHz	32240-20	Flann	233278	300004960	ne	-/-	-/-
10	n. a.	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda	01096	300000486	vIKI!	17.01.2022	31.01.2024
11	n. a.	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda	8205	300002442	k	17.01.2022	31.01.2024
12	n. a.	Std. Gain Horn Antenna 145-220 GHz	3024-20	Flann	*	300002000	ne	-/-	-/-
13	n. a.	Std. Gain Horn Antenna 114-173 GHz	2924-20	Flann	*	300001999	ne	-/-	-/-
14	n. a.	Standard Gain Horn 325-500 GHz	570240-20 1785-2a	Flann Microwave	273569	300006097	ev	-/-	-/-
15	n. a.	Signal Generator 100 kHz - 40 GHz	SMB100A	Rohde & Schwarz	183320	300006330	k	21.06.2022	20.06.2025
16	n. a.	Signal- and Spectrum Analyzer 3 Hz - 50 GHz	PXA N9030A	Agilent Technologies	US51350267	300004338	k	13.04.2023	30.04.2024
17	n. a.	Signal- and Spectrum Analyzer 2 Hz - 85 GHz	FSW85	Rohde&Schwarz	101333	300005568	k	02.08.2023	31.08.2024
18	n. a.	Signal- and Spectrum Analyzer 2 Hz - 50 GHz	FSW50	Rohde&Schwarz	101332	300005935	k	23.03.2023	31.03.2024
19	n. a.	Signal- and Spectrum Analyzer 2 Hz - 50 GHz	FSW50	Rohde&Schwarz	101560	300006179	k	04.04.2023	30.04.2024
20	n. a.	Power supply	N5767A	Agilent Technologies	US14J1569P	300004851	vIKI!	06.12.2023	31.12.2026
21	n. a.	Oscilloscope	DPO5054	Tektronix	C010174	300004169	k	05.12.2023	31.12.2025
22	n. a.	Horn Antenna 18,0-40,0 GHz	LHAF180	Microw.Devel	39180-103-021	300001747	vIKI!	17.01.2022	31.01.2024
23	n. a.	Horn Antenna 18,0-40,0 GHz	LHAF180	Microw.Devel	39180-103-022	300001748	NK!	-/-	-/-
24	n. a.	Harmonic Mixer 3-port, 90-140 GHz	FS-Z140	Rohde & Schwarz	101119	300005581	k	03.08.2023	31.08.2024
25	n. a.	Harmonic Mixer 3-Port, 75-110 GHz	FS-Z110	Rohde & Schwarz	101411	300004959	k	21.07.2023	31.07.2024

26	n. a.	Harmonic Mixer 3-Port, 60-90 GHz	FS-Z90	R&S	101555	300004691	k	25.08.2023	31.08.2024
27	n. a.	Harmonic Mixer 3-Port, 50-75 GHz	FS-Z75	Rohde & Schwarz	101578	300005788	k	19.07.2023	31.07.2024
28	n. a.	Harmonic Mixer 3-Port, 325-500GHz	FS-Z500	Rohde & Schwarz	101016	300006096	k	11.08.2023	31.08.2024
29	n. a.	Harmonic Mixer 3-Port, 220-325 GHz	SAM-325	Radiometer Physics GmbH	100002	300004158	k	02.08.2023	31.08.2024
30	n. a.	Harmonic Mixer 3-Port, 140-220 GHz	SAM-220	Radiometer Physics GmbH	200001	300004157	k	02.08.2023	31.08.2024
31	n. a.	Harmonic Mixer 3-Port, 110-170 GHz	FS-Z170	Radiometer Physics GmbH	100014	300004156	k	21.07.2023	31.07.2024
32	n. a.	DC Power Supply 0 – 32V	1108-32	Heiden Elektronik	003202	300001187	vlKl!	14.12.2021	31.12.2024
33	n. a.	Broadband LNA 18-50 GHz	CBL18503070PN	CERNEX	25240	300004948	ev	09.03.2022	08.03.2024

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



Note: EUT is replaced by reference source for substitution measurement

Measurement distance: horn antenna e.g. 50 cm

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Waveguide Amplifier 90-140 GHz	VDI-WR8.0AMP	VDI	1-13	300006234	ev	-/-	-/-
2	n. a.	Std. Gain Horn Antenna 90-140 GHz	COR 90_140	Thomson CSF		300000799	ev	-/-	-/-
3	n. a.	Std. Gain Horn Antenna 114-173 GHz	2924-20	Flann	*	300001999	ne	-/-	-/-
4	n. a.	Signal Generator 100 kHz - 40 GHz	SMB100A	Rohde & Schwarz	183320	300006330	k	21.06.2022	20.06.2025
5	n. a.	SG Extension Module 110 - 170 GHz	E8257DV06	VDI	US53250018	300005540	ev	-/-	-/-
6	n. a.	Oscilloscope	DPO5054	Tektronix	C010174	300004169	k	05.12.2023	31.12.2025
7	n. a.	F-Band Positive Amplitude Detector	SFD-903144-08SF-P1	Sage Millimeter Inc.	07354-1	300006119	ev	-/-	-/-

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 Summary of measurement results

☒	**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	2025-06-05	-/-

Test specification clause	Test case	Temperature conditions	Power supply	Pass	Fail	NA	NP	Remark
§15.258 (d)	Occupied bandwidth	Nominal	Nominal	☒	☐	☐	☐	
§15.258 (b)	Maximum E.I.R.P.	Nominal	Nominal	☒	☐	☐	☐	
-/-	Duty cycle	Nominal	Nominal	☐	☐	☒	☐	
§15.258 (c)	Spurious Emissions	Nominal	Nominal	☒	☐	☐	☐	
§15.258 (d)	Frequency stability	Extreme Nominal	Extreme Nominal	☒	☐	☐	☐	
§15.207	Conducted emissions < 30 MHz (AC power line)	Nominal	Nominal	☐	☐	☒	☐	

Note: NA = Not applicable; NP = Not performed

11 Additional comments

Reference documents:
- None

Special test descriptions:
- None

Configuration descriptions:
- Eache sample is configured for a special purpose and works directly after connecting the power.
- No additional software is needed.

Test devices (EUT):
- EUT1: The normal operation mode (intended use) is used.
- EUT2: The below described Stop-Modes are used.
- EUT3: The below described Stop-Modes are used.
- EUT4: The below described Stop-Modes are used.

Additional test modes:

☐ No test modes available

☐ Special test modes/special software (see description below)

☒ Stop-Modes (see description below)

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

- EUT 2: Stop mode, low frequency: 122.03 GHz
- EUT 3: Stop mode, middle frequency: 122.5 GHz
- EUT 4: Stop mode, high frequency: 122.97 GHz

12 Measurement results

12.1 Occupied bandwidth (6 dB Bandwidth)

Description:

Measurement of the bandwidth of the wanted signal.

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

Note: please also see chapter 12.4.

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Resolution bandwidth:	100 kHz / 1 MHz
Video bandwidth:	300 kHz / 3 MHz
Trace-Mode:	Max Hold

Measurement results:

6 dB bandwidth:

EUT	Mode	Test condition	f_L [GHz]	f_H [GHz]	Bandwidth [GHz]
EUT1	Normal	T_{nom} / V_{nom}	122.032 611	122.989 717	0.944

99% bandwidth:

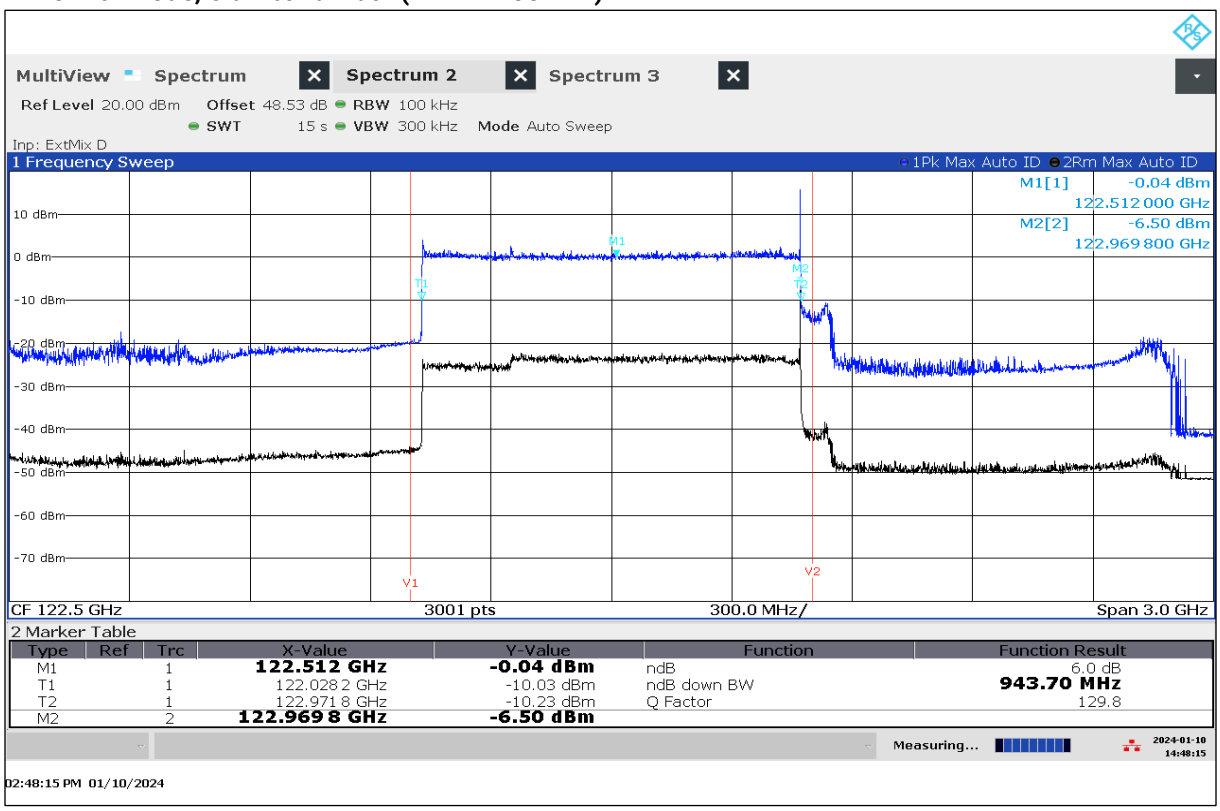
EUT	Mode	Test condition	f_L [GHz]	f_H [GHz]	Bandwidth [GHz]
EUT1	Normal	T_{nom} / V_{nom}	122.029 494	122.969 948	0.940

Note:

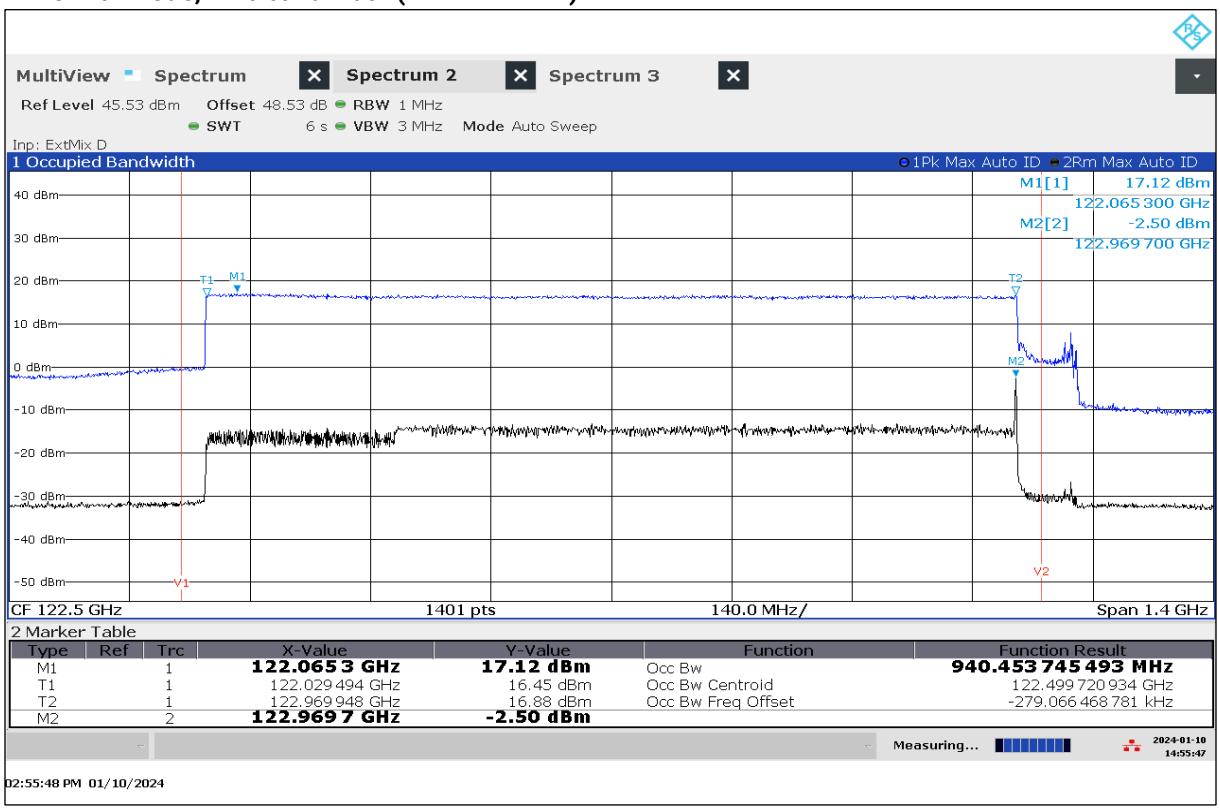
- The customer specified the mid-band frequency as 122.5 GHz.

Verdict: Compliant

Plot 1: Normal mode, 6 dB bandwidth (RBW = 100 kHz)



Plot 2: Normal mode, 99% bandwidth (RBW = 1 MHz)



12.2 Maximum E.I.R.P.

Description:

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

Limits:

§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:

(1) 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) 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.

Measurement:

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

Measurement results:

EUT	Mode	Test condition	Peak E.I.R.P.	Limit Peak E.I.R.P	Average E.I.R.P.	Limit Average E.I.R.P
EUT1	Normal Mode	T_{nom} / V_{nom}	17.27 dBm	43 dBm	16.36 dBm	40 dBm

EUT	Mode	Test condition	Duty cycle
EUT1	Normal Mode	T_{nom} / V_{nom}	48.78 %

Verdict: Compliant

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}
   - Average readout value on oscilloscope: $V_{average}$
   - Duty cycle: D_{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} and $V_{average}$ by far field attenuation

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

Measurement step	Measurement parameter	EUT 1
1)	Measurement distance d_{EUT}	0.5 m
	Maximum readout value V_{max}	5.3 mV
	Duty cycle D_{EUT}	48.78 %
2)	Output power P_{REF}	28.4 dBm
	Frequency f_{REF}	122.5 GHz
	Measurement distance $d_{REF,max}$	1.8 m
	Measurement distance $d_{REF,average}$	2.0 m
3)	Max E.I.R.P.	17.27 dBm
	Average E.I.R.P.	16.36 dBm

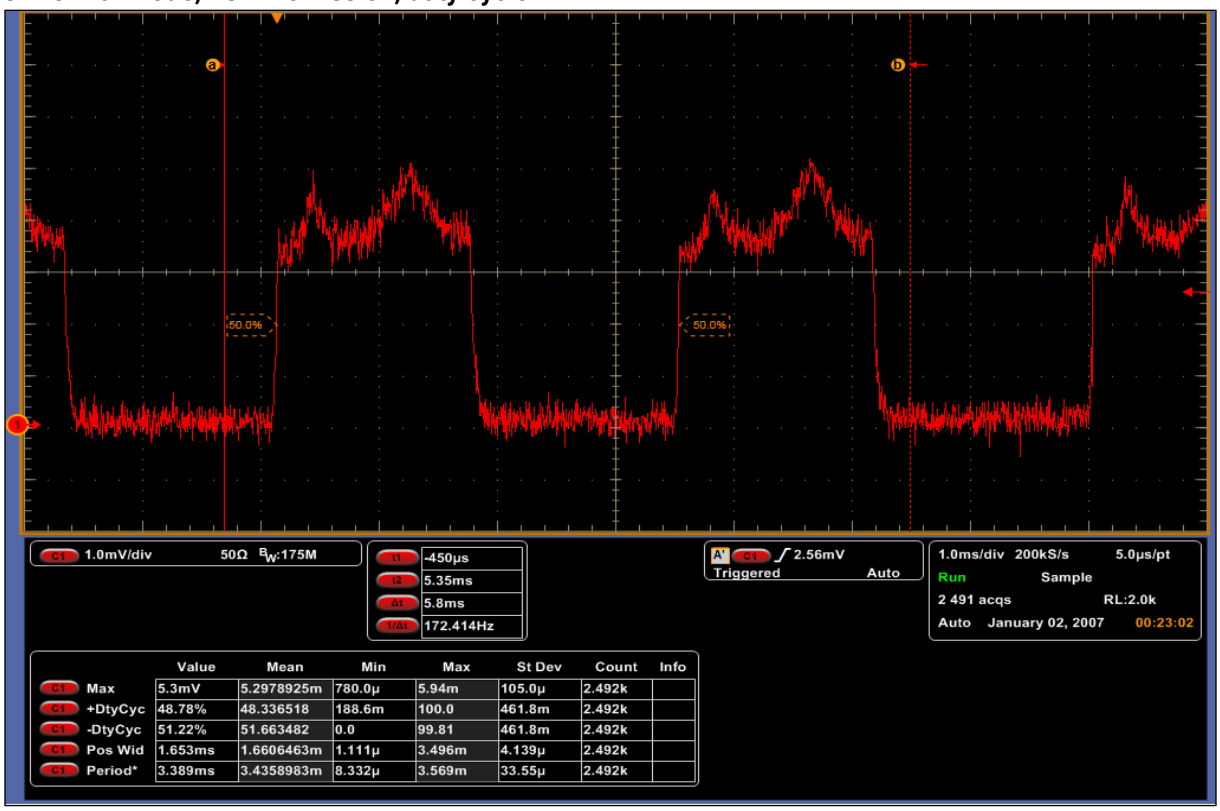
Setup of the substitution:

Note:

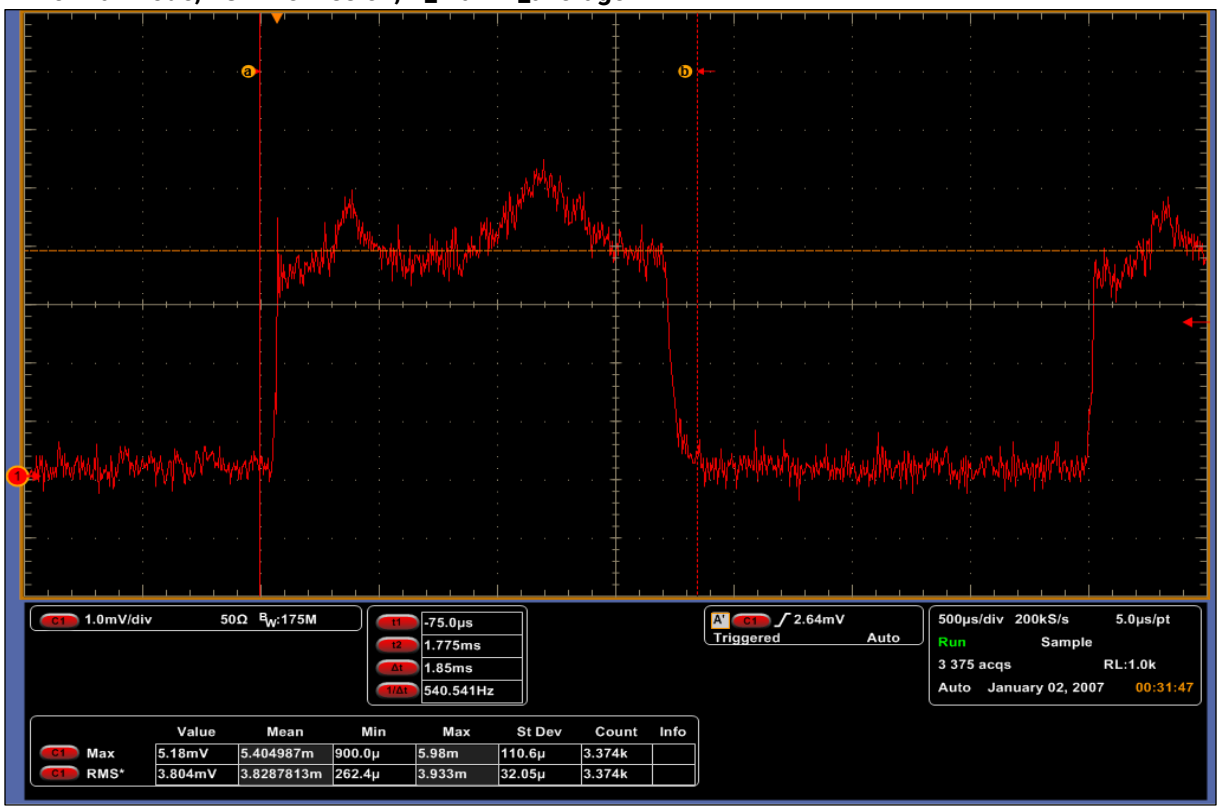
- Top of picture: SG Extension Module 110 - 170 GHz & Std. Gain Horn Antenna 114-173 GHz

- Bottom of picture: F-Band Positive Amplitude Detector & Waveguide Amplifier & Std. Gain Horn Antenna 90-140 GHz

Plot 3: Normal mode, EUT 1 emission, duty cycle



Plot 4: Normal mode, EUT 1 emission, V_max V_average



12.3 Spurious emissions radiated

Description:

Measurement of the radiated spurious emissions.

Limits:

FCC Part 15.258 (c)
Spurious emissions shall be limited as follows:

(1) 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.

(3) Between 40 GHz and the highest frequency specified in § 15.33, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

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

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

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:

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 380 GHz
Trace-Mode:	Max Hold

Measurement results:

EUT1, Normal mode:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
-/-	-/-	1	-/-	-/-	-/-
Please refer to the following plots for more information on the level of spurious emissions					

EUT2, Stop mode, low frequency:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
-/-	-/-	1	-/-	-/-	-/-
Please refer to the following plots for more information on the level of spurious emissions					

EUT3, Stop mode, middle frequency:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
-/-	-/-	1	-/-	-/-	-/-
Please refer to the following plots for more information on the level of spurious emissions					

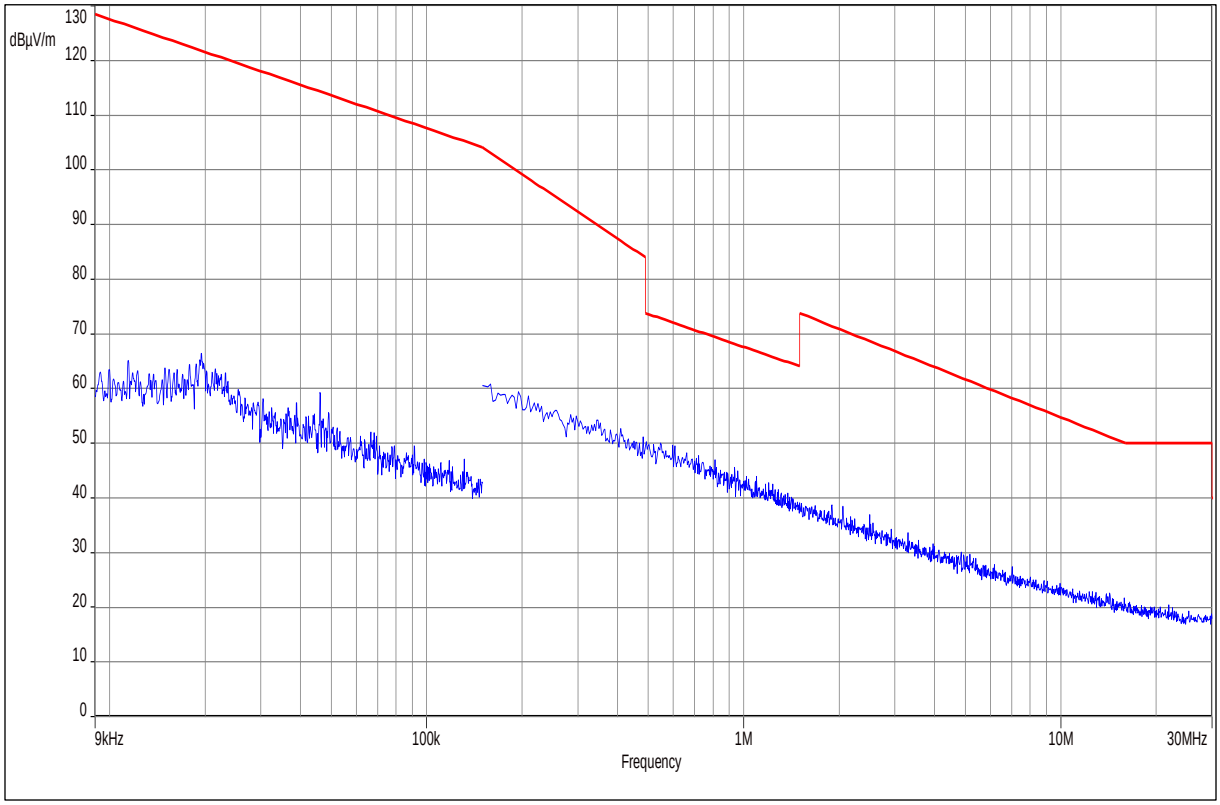
EUT4, Stop mode, high frequency:

Frequency [GHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
-/-	-/-	1	-/-	-/-	-/-
Please refer to the following plots for more information on the level of spurious emissions					

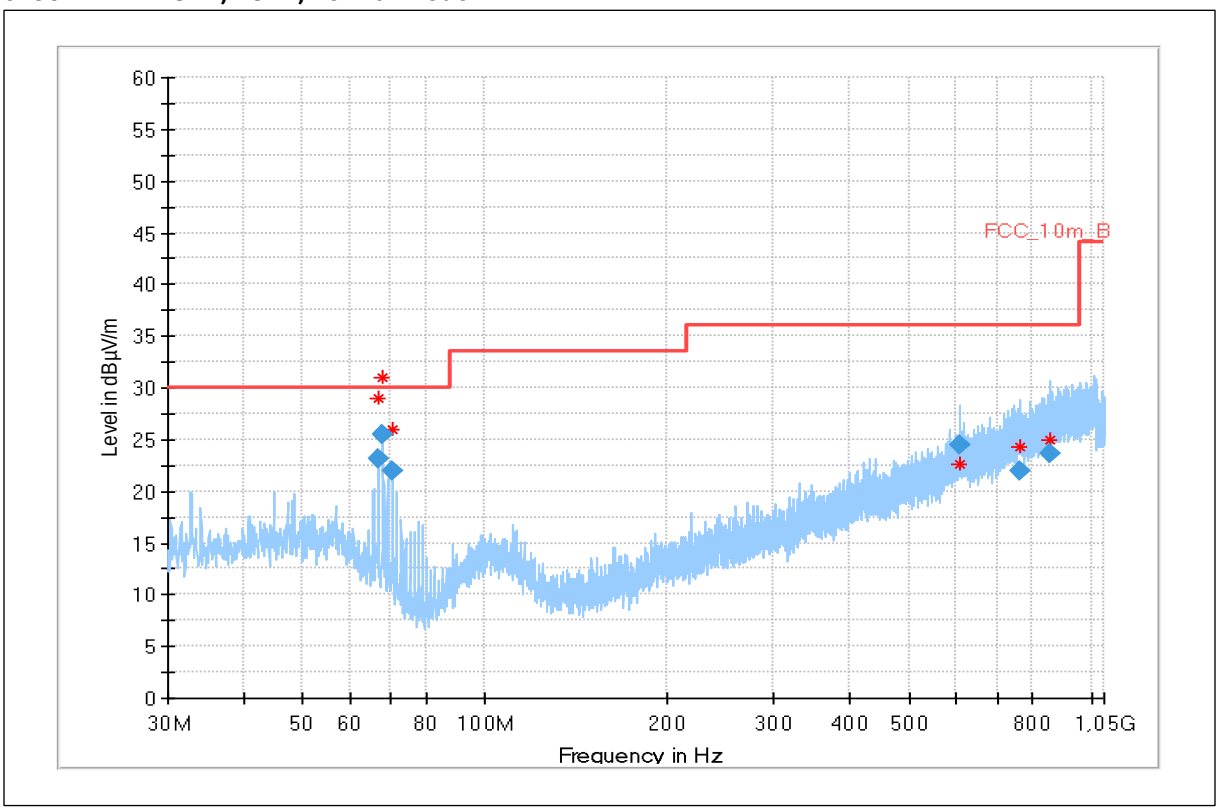
Verdict: Compliant

12.3.1 Spurious emissions radiated for normal mode

Plot 5: 9 kHz – 30 MHz, EUT1, normal mode

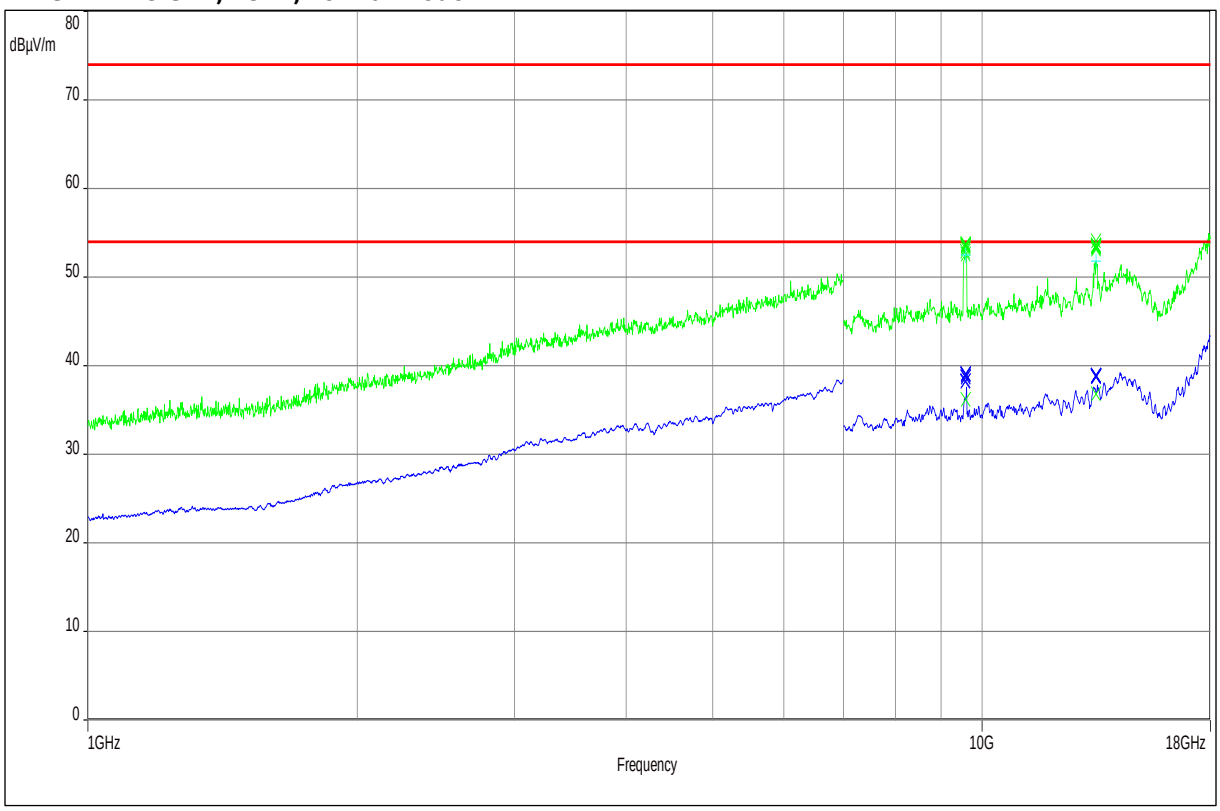


Plot 6: 30 MHz – 1GHz, EUT1, normal mode

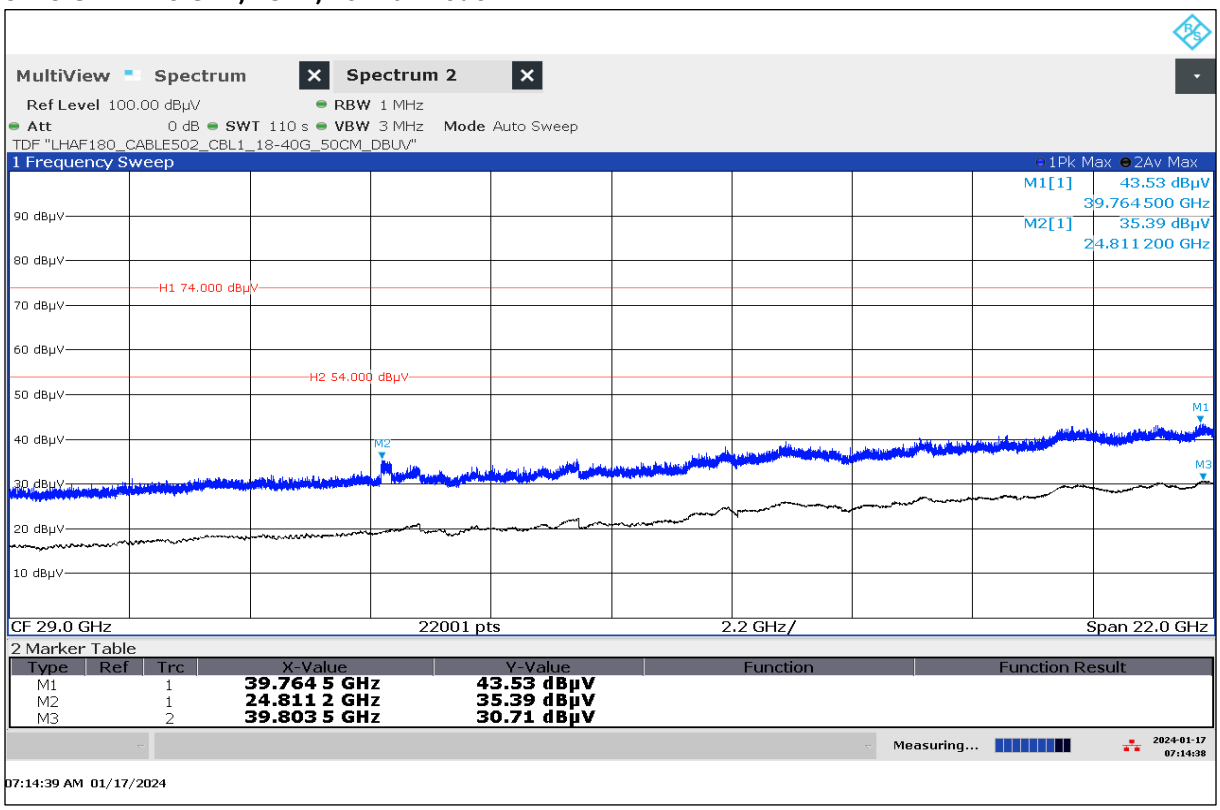


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
66.520	23.09	30.0	6.9	1000	120.0	195.0	V	290	12
67.744	25.41	30.0	4.6	1000	120.0	195.0	V	288	11
70.183	21.89	30.0	8.1	1000	120.0	195.0	V	197	10
604.942	24.55	36.0	11.5	1000	120.0	133.0	V	232	22
759.940	22.03	36.0	14.0	1000	120.0	110.0	H	232	24
855.542	23.59	36.0	12.4	1000	120.0	195.0	V	53	25

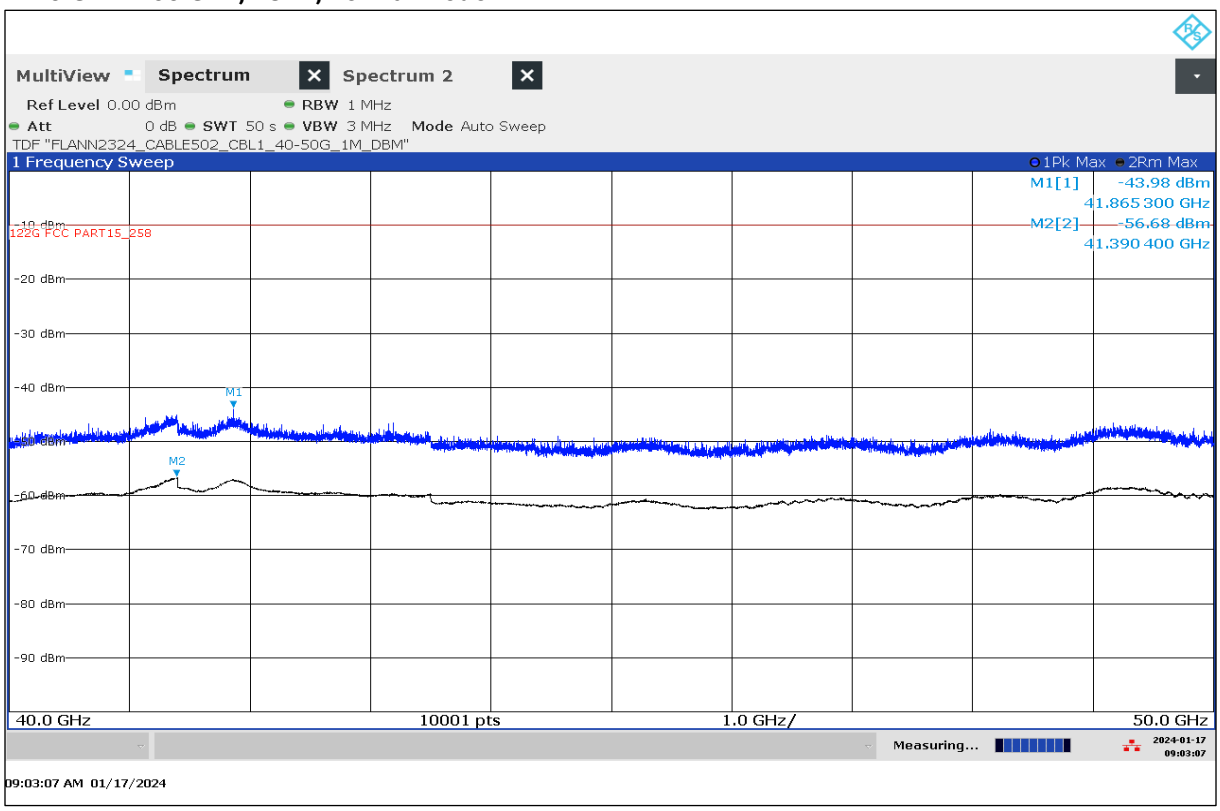
Plot 7: 1GHz – 18 GHz, EUT1, normal mode



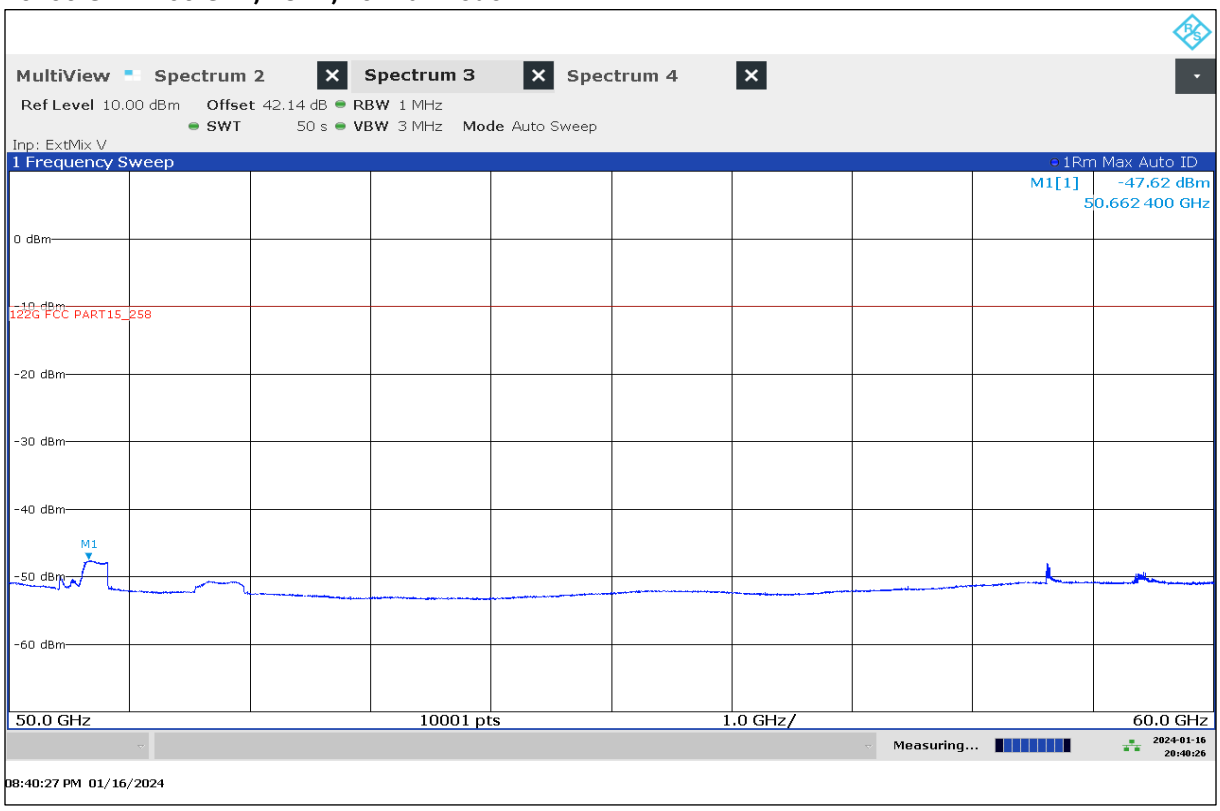
Plot 8: 18 GHz – 40 GHz, EUT1, normal mode



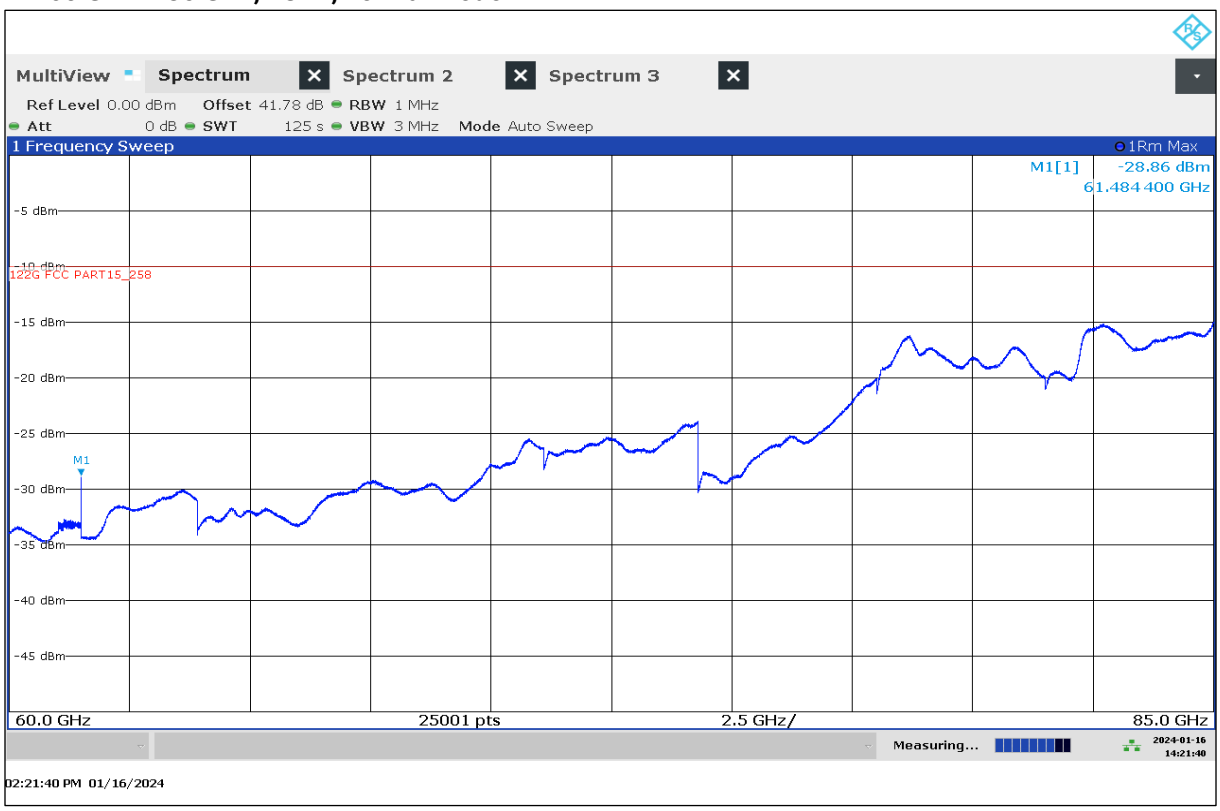
Plot 9: 40 GHz – 50 GHz, EUT1, normal mode



Plot 10: 50 GHz – 60 GHz, EUT1, normal mode

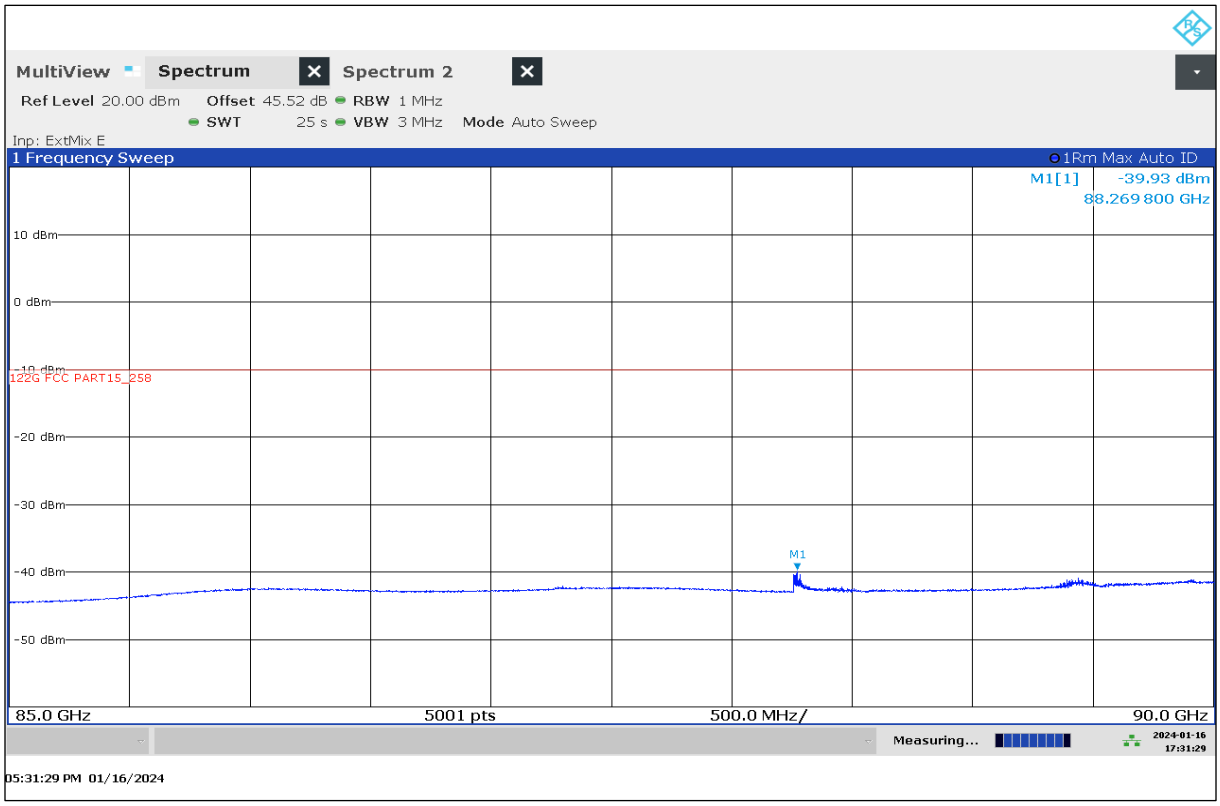


Plot 11: 60 GHz – 85 GHz, EUT1, normal mode

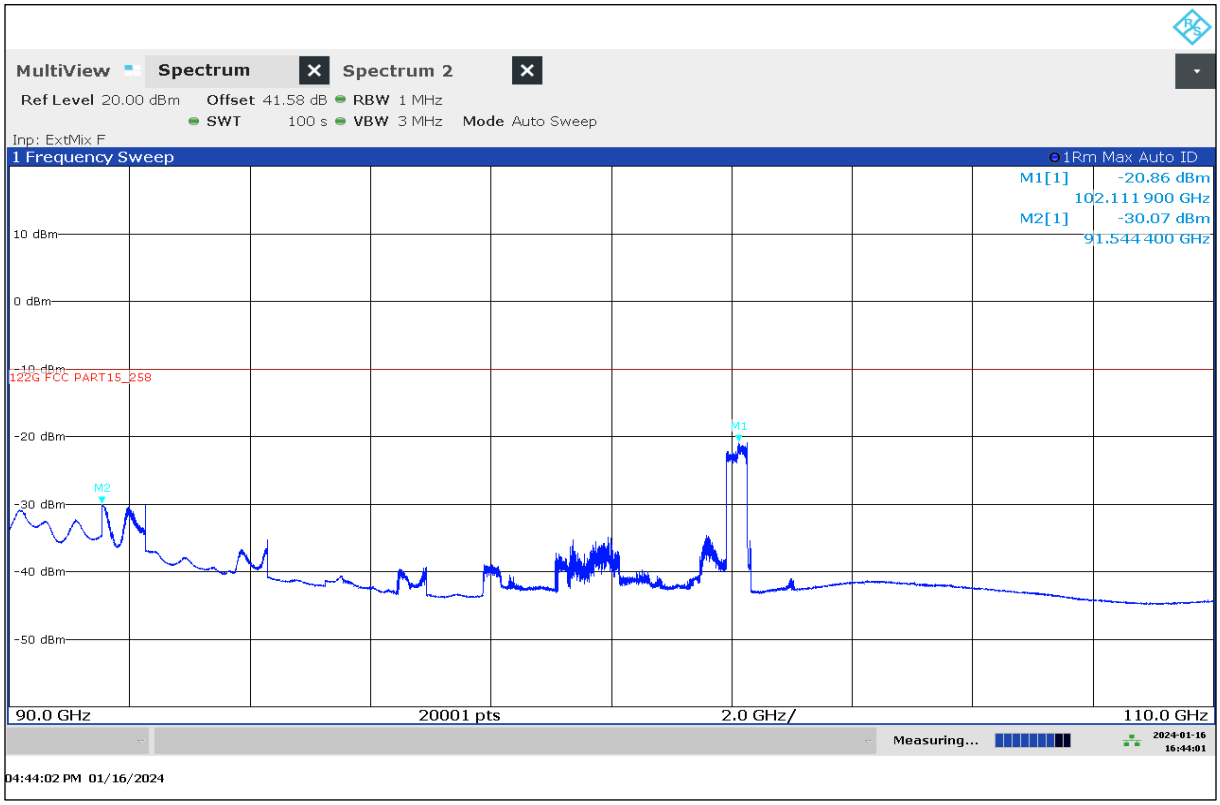


Plot 12: 61 GHz, EUT1, normal mode

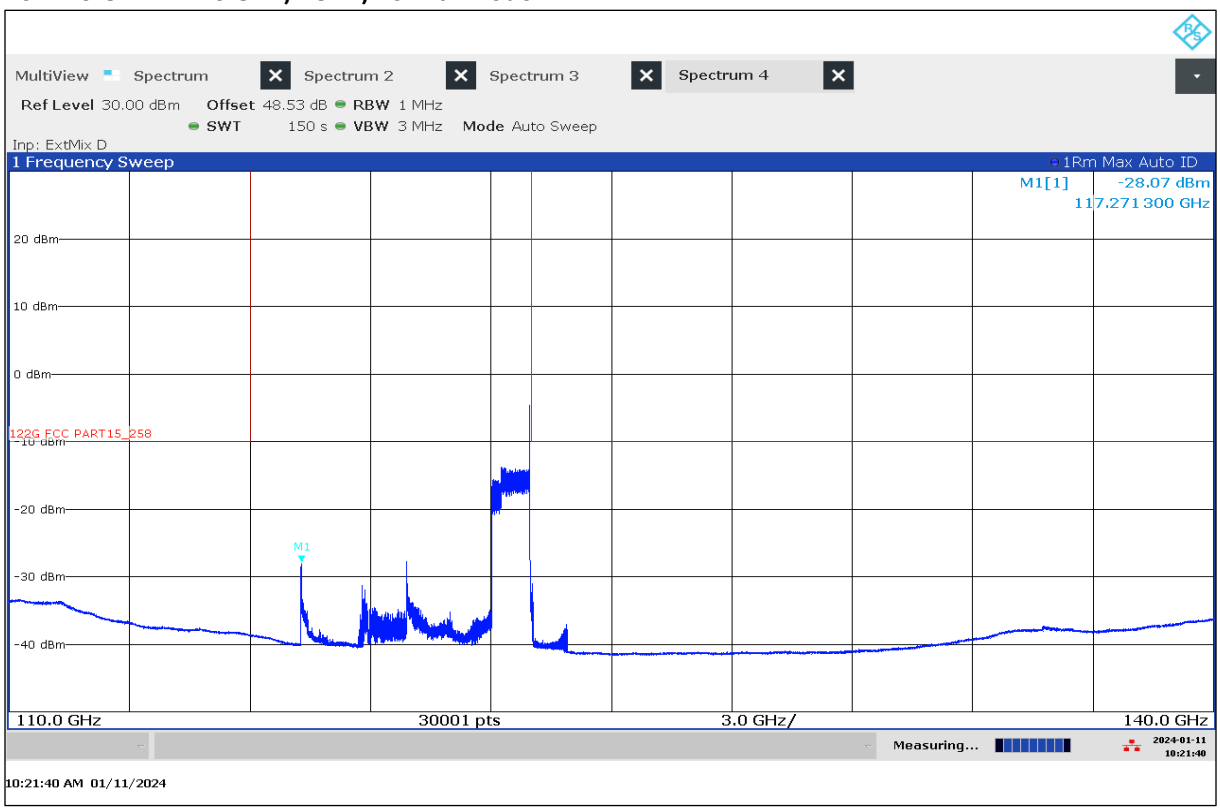
Plot 13: 85 GHz – 90 GHz, EUT1, normal mode



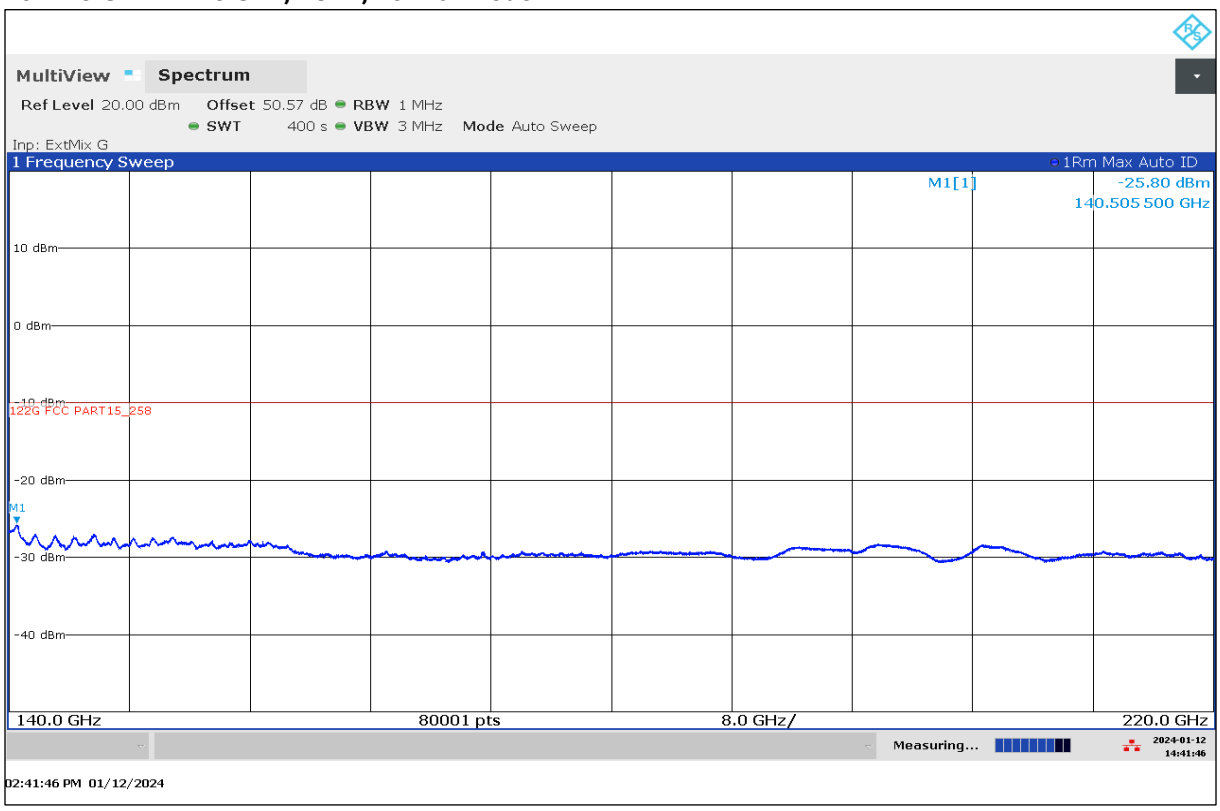
Plot 14: 90 GHz – 110 GHz, EUT1, normal mode



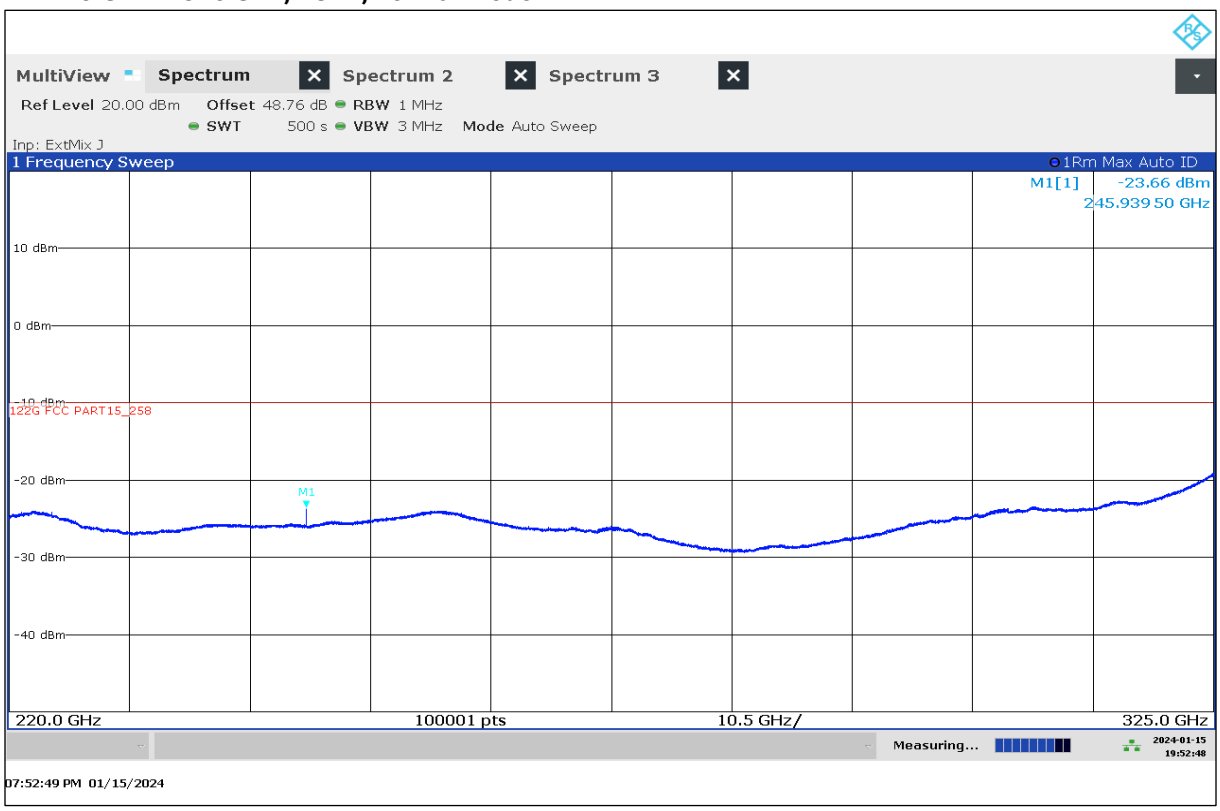
Plot 15: 110 GHz – 140 GHz, EUT1, normal mode



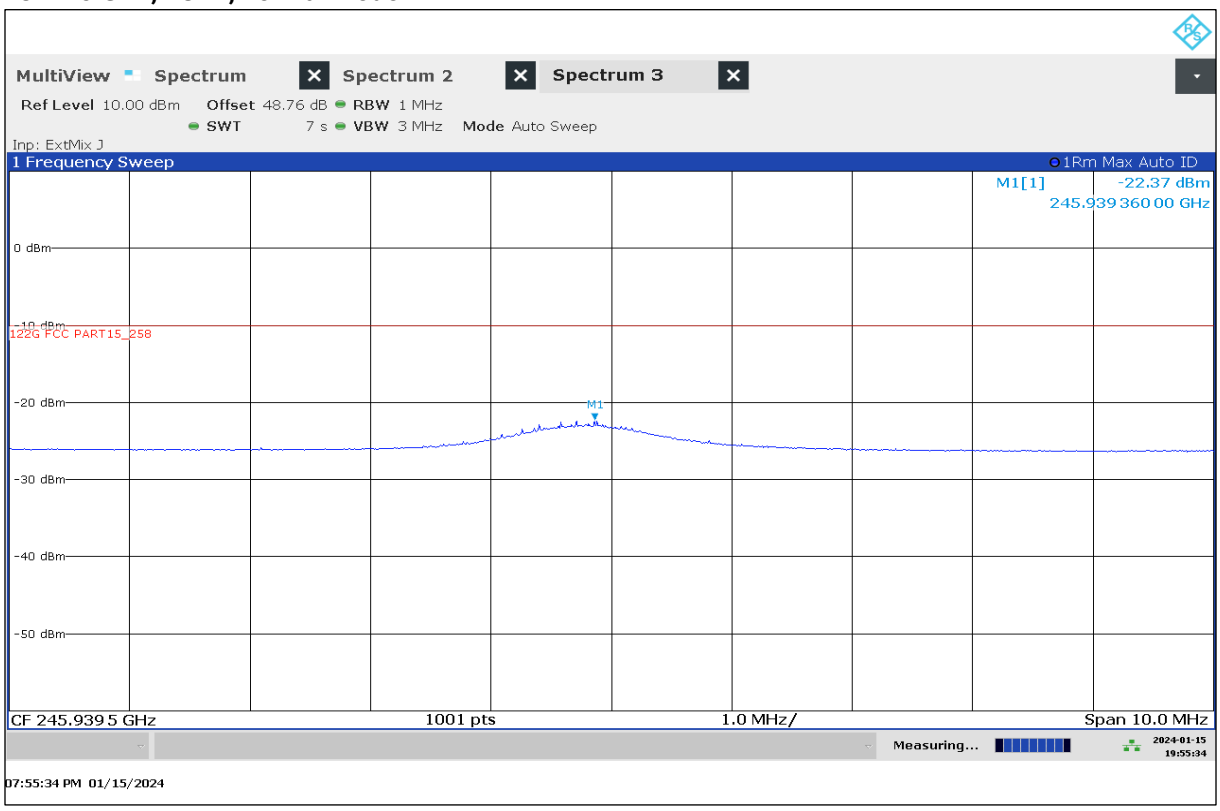
Plot 16: 140 GHz – 220 GHz, EUT1, normal mode



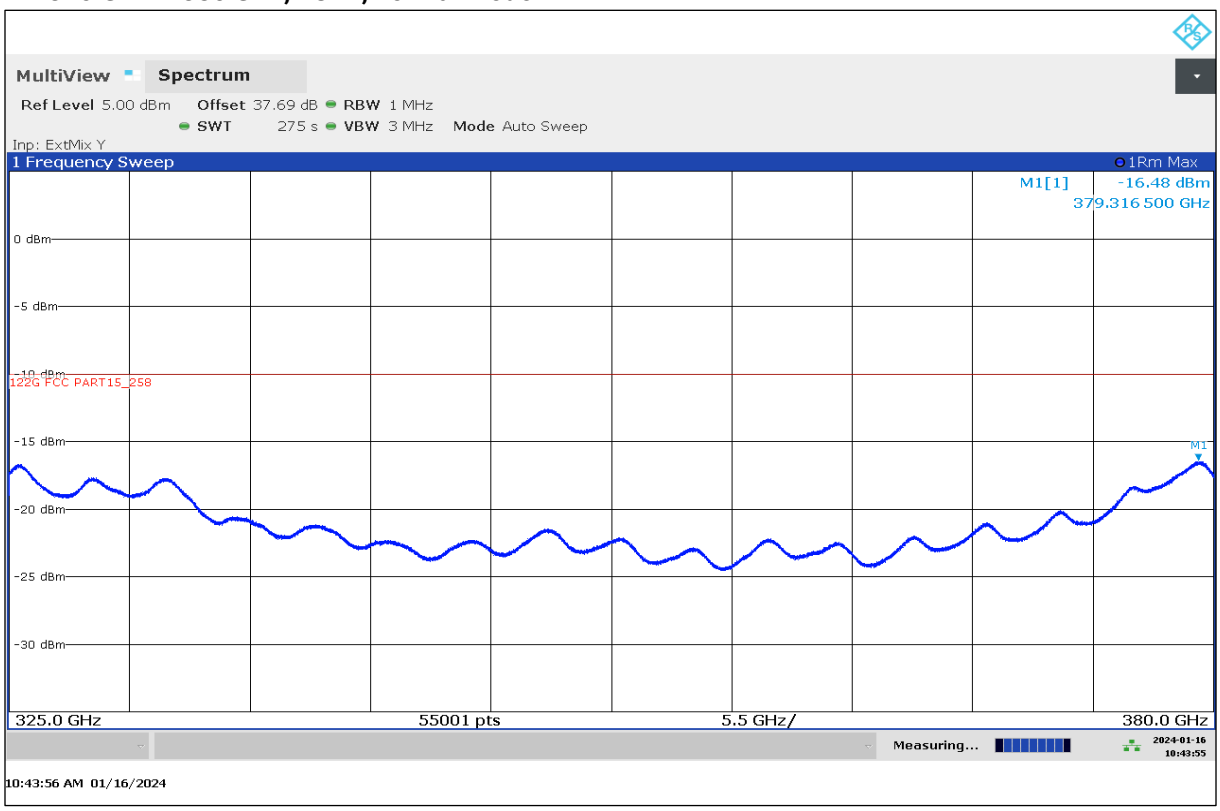
Plot 17: 220 GHz – 325 GHz, EUT1, normal mode



Plot 18: 245 GHz, EUT1, normal mode

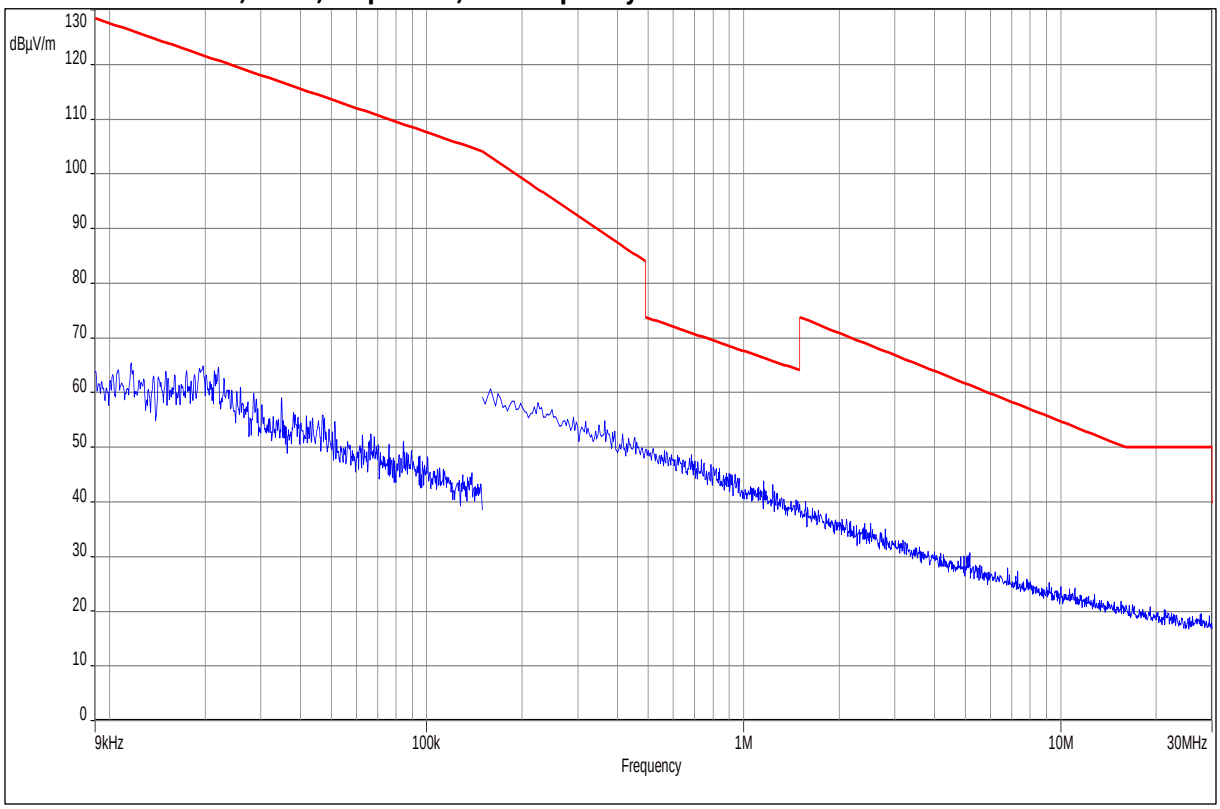


Plot 19: 325 GHz – 380 GHz, EUT1, normal mode

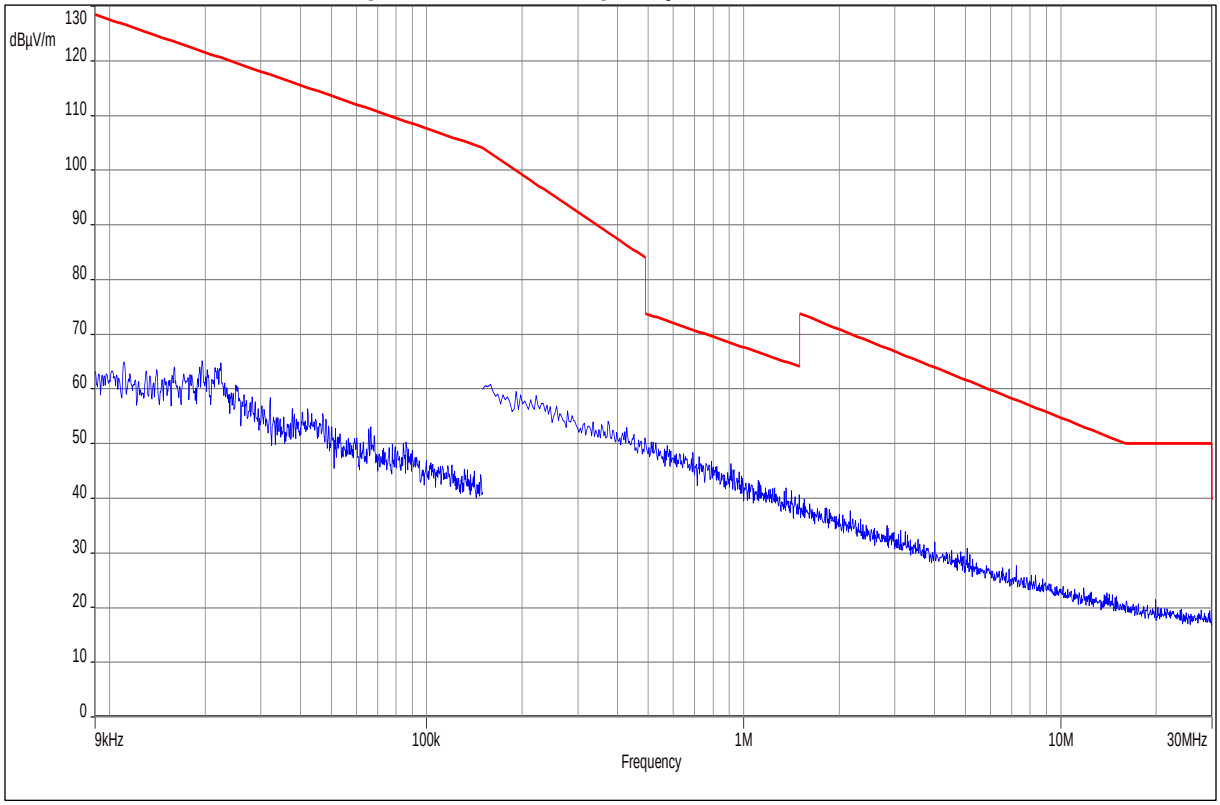


12.3.2 Spurious emissions radiated for stop mode

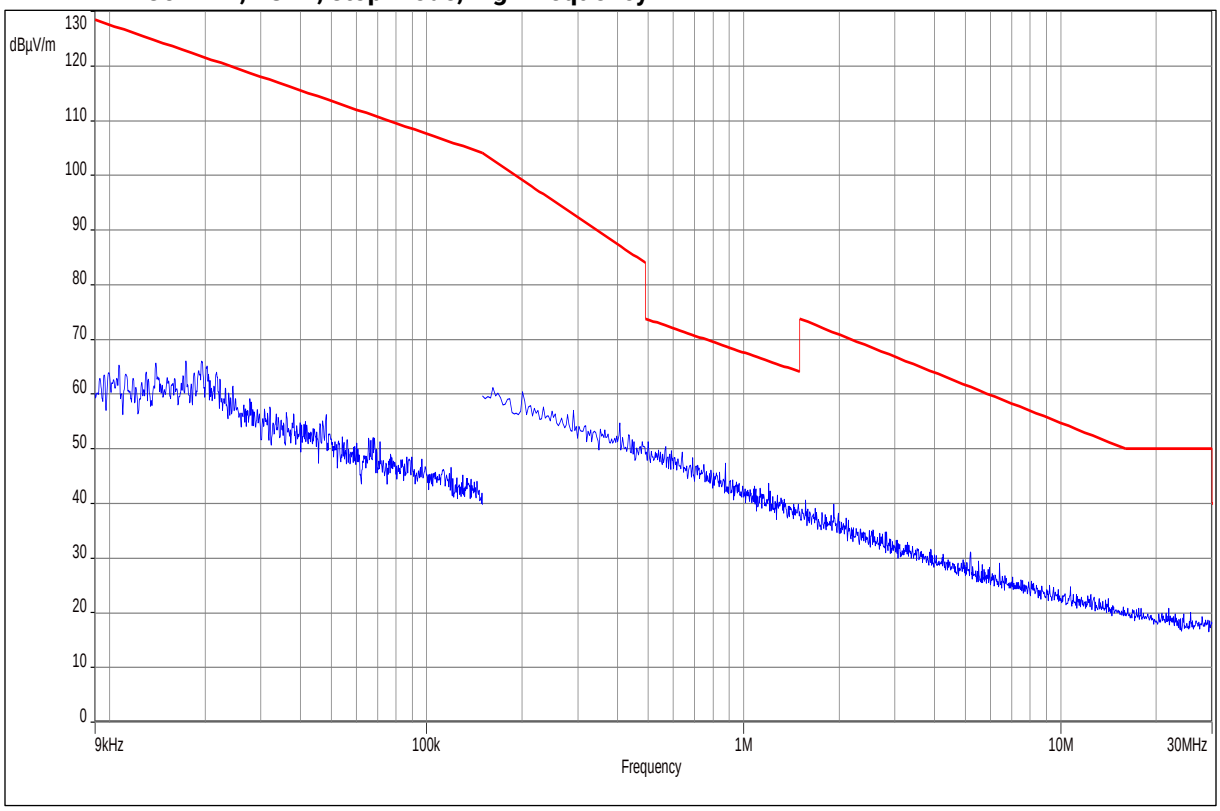
Plot 20: 9 kHz – 30 MHz, EUT2, stop mode, low frequency



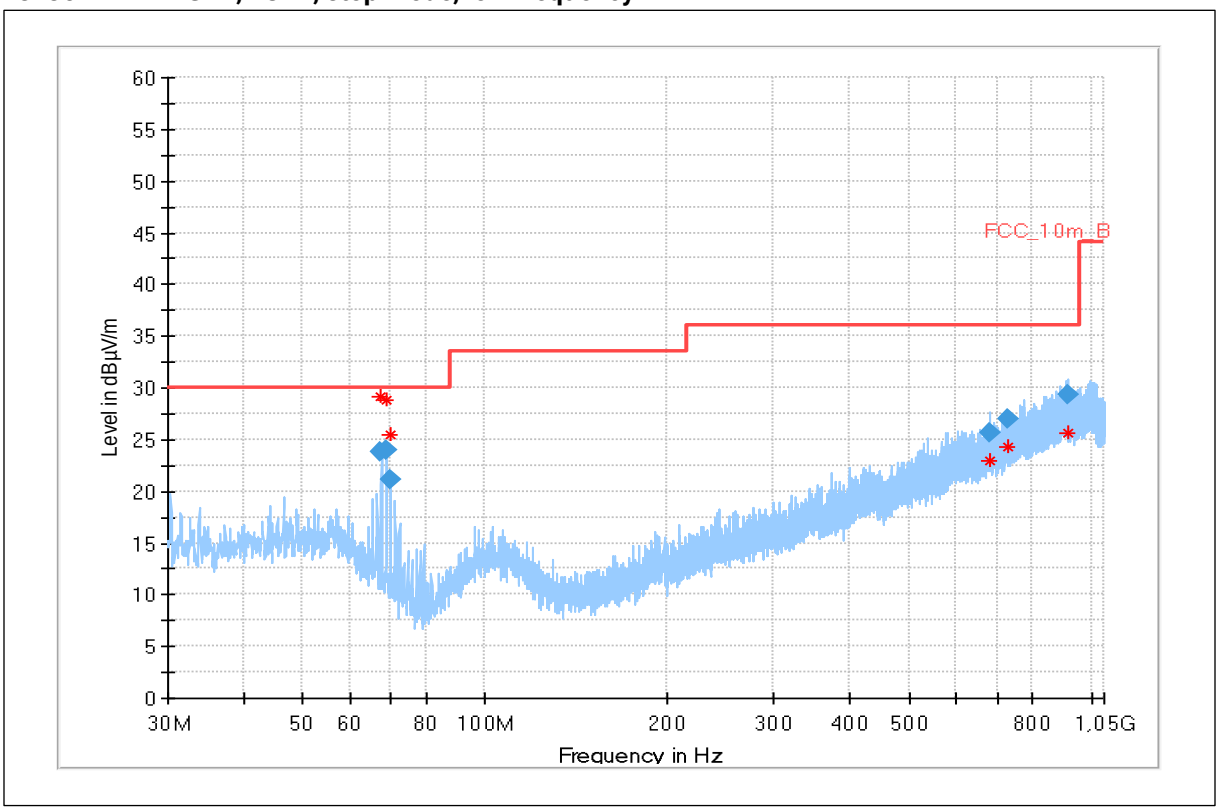
Plot 21: 9 kHz – 30 MHz, EUT3, stop mode, middle frequency



Plot 22: 9 kHz – 30 MHz, EUT4, stop mode, high frequency

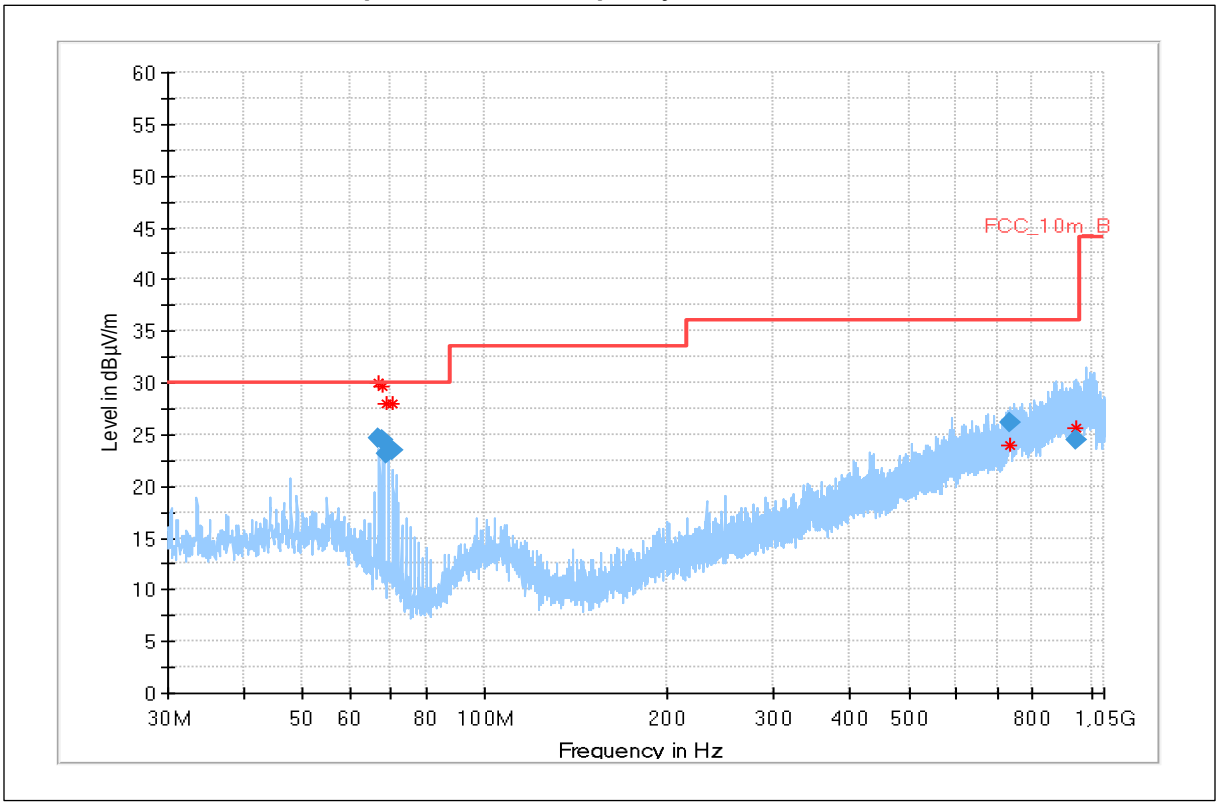


Plot 23: 30 MHz – 1GHz, EUT2, stop mode, low frequency



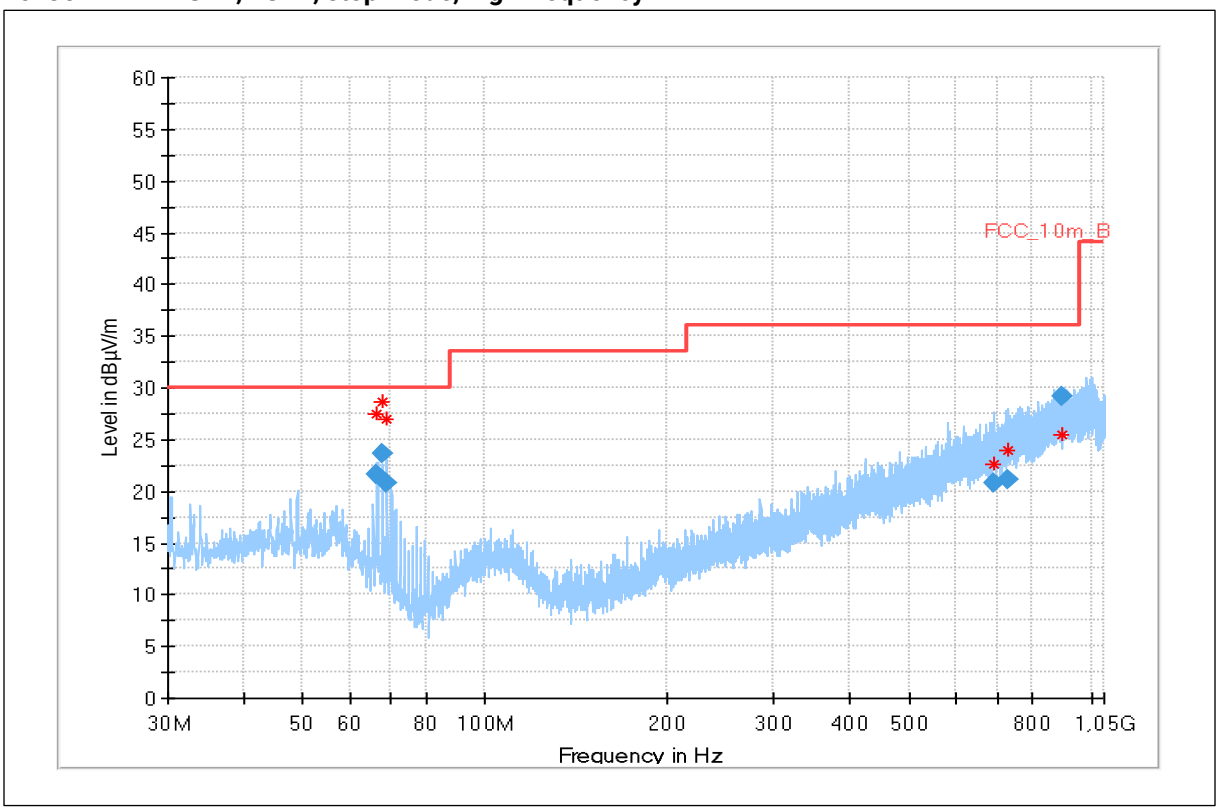
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
67.447	23.84	30.0	6.2	1000	120.0	195.0	V	184	11
68.595	23.90	30.0	6.1	1000	120.0	195.0	V	217	11
69.755	21.04	30.0	9.0	1000	120.0	195.0	V	155	11
677.764	25.58	36.0	10.4	1000	120.0	188.0	V	206	22
729.011	26.97	36.0	9.0	1000	120.0	195.0	V	-12	23
914.109	29.30	36.0	6.7	1000	120.0	195.0	H	232	25

Plot 24: 30 MHz – 1GHz, EUT3, stop mode, middle frequency



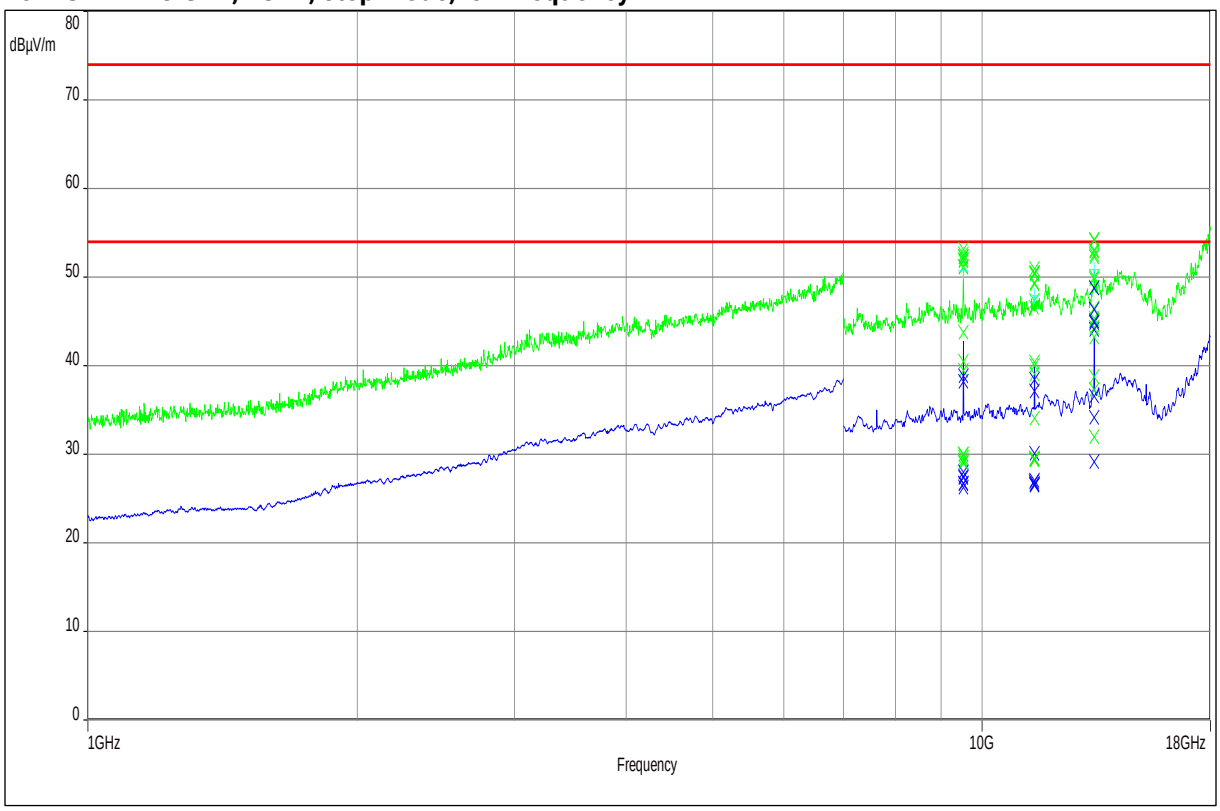
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
66.689	24.67	30.0	5.3	1000	120.0	195.0	V	242	12
67.933	24.45	30.0	5.6	1000	120.0	195.0	V	178	11
69.003	23.16	30.0	6.8	1000	120.0	195.0	V	232	11
70.274	23.43	30.0	6.6	1000	120.0	195.0	V	281	10
734.239	26.13	36.0	9.9	1000	120.0	195.0	V	142	23
946.697	24.42	36.0	11.6	1000	120.0	136.0	H	93	25

Plot 25: 30 MHz – 1GHz, EUT4, stop mode, high frequency

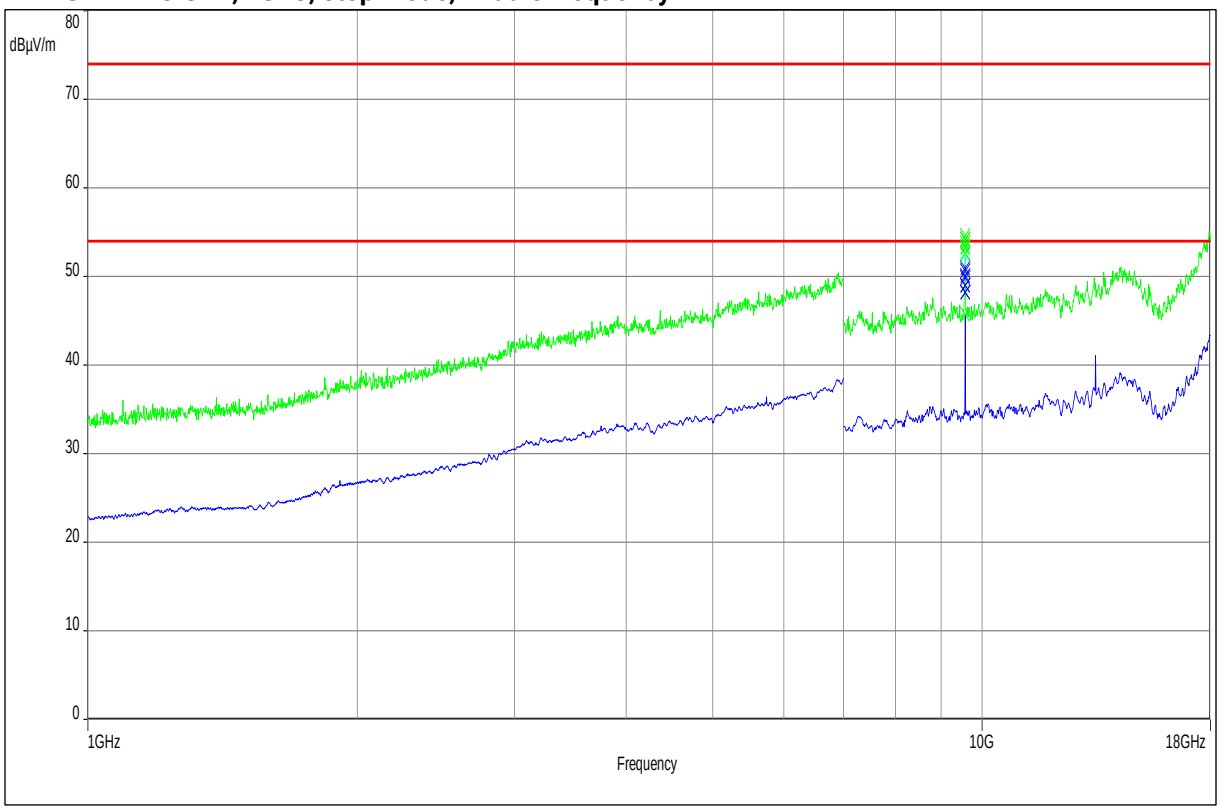


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
66.394	21.58	30.0	8.4	1000	120.0	195.0	V	270	12
67.607	23.63	30.0	6.4	1000	120.0	195.0	V	76	11
68.798	20.84	30.0	9.2	1000	120.0	190.0	V	307	11
690.728	20.71	36.0	15.3	1000	120.0	184.0	V	232	22
730.024	21.12	36.0	14.9	1000	120.0	167.0	H	142	23
895.557	29.18	36.0	6.8	1000	120.0	107.0	H	142	25

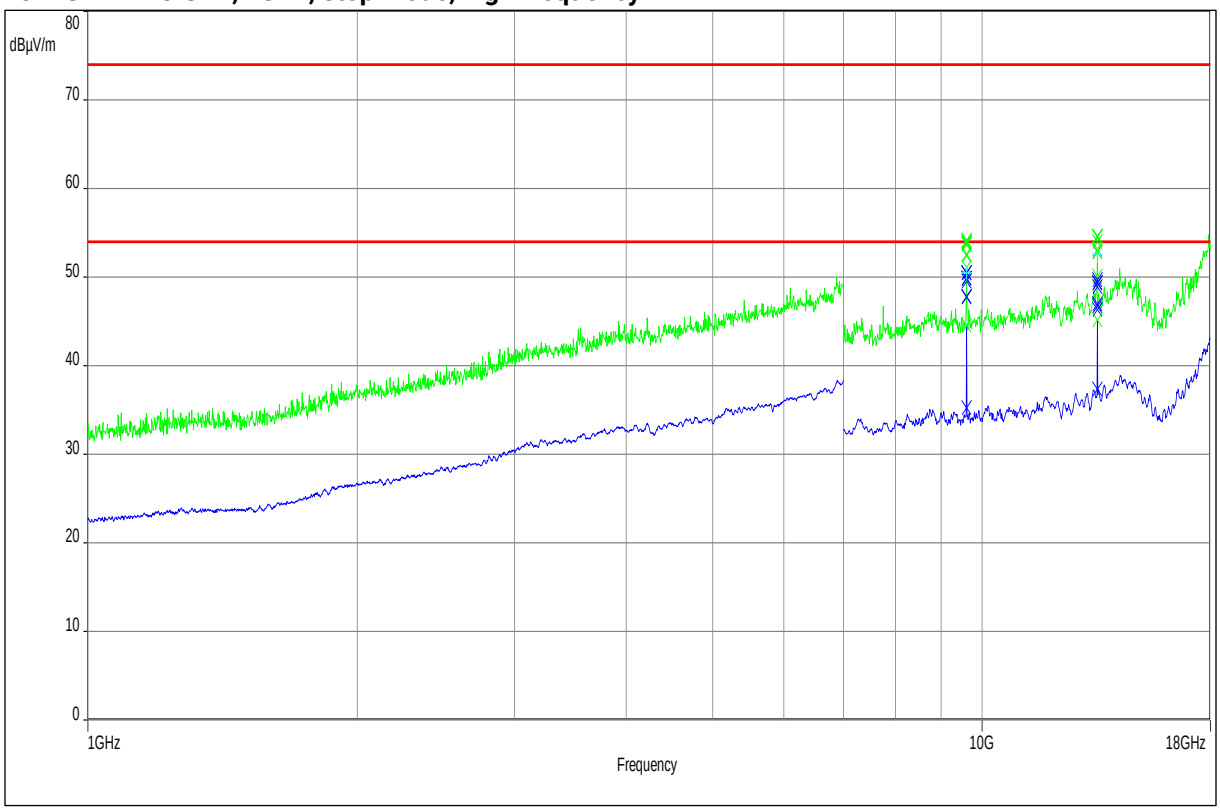
Plot 26: 1GHz – 18 GHz, EUT2, stop mode, low frequency



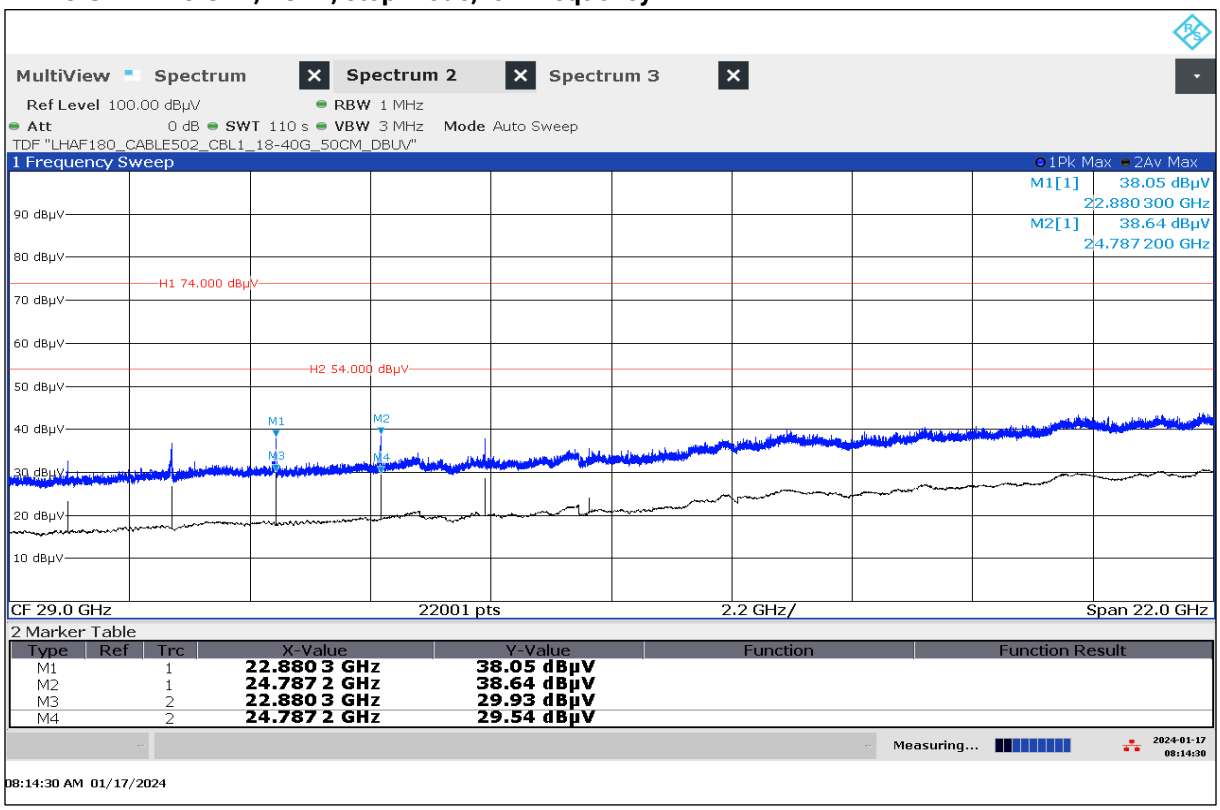
Plot 27: 1GHz – 18 GHz, EUT3, stop mode, middle frequency



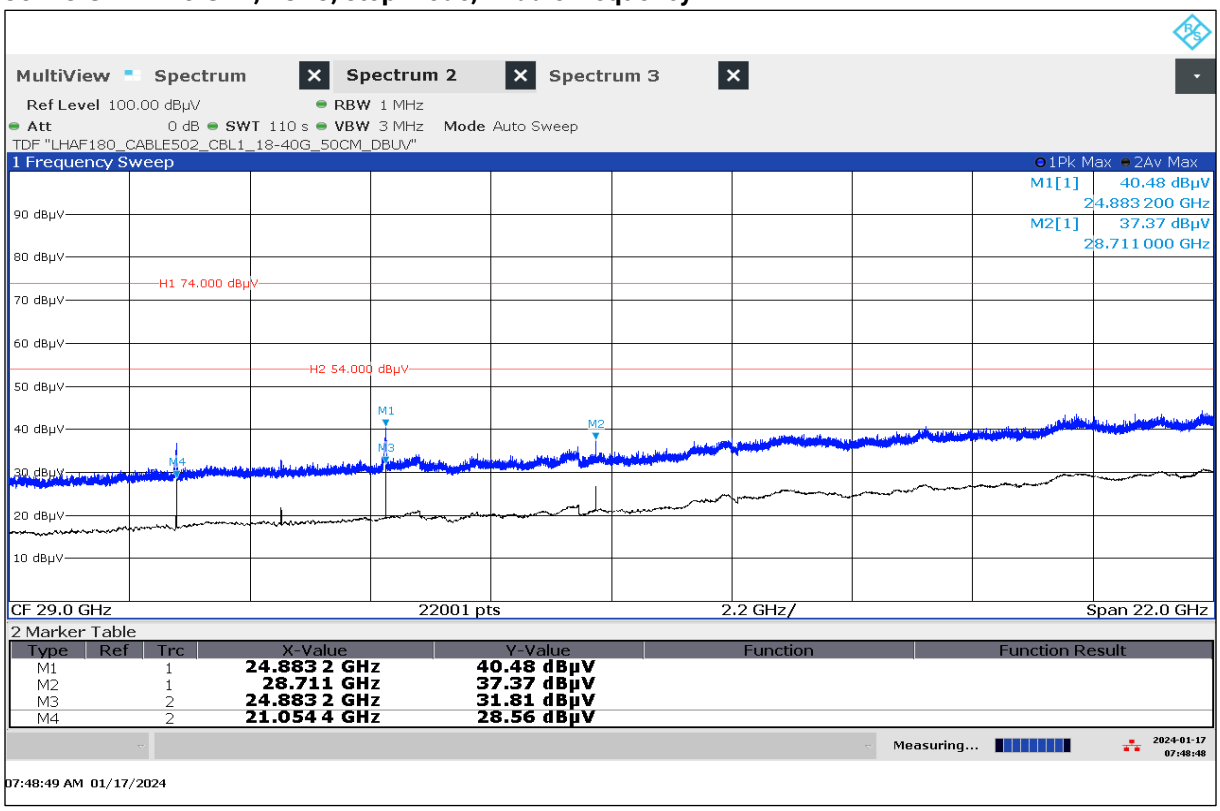
Plot 28: 1GHz – 18 GHz, EUT4, stop mode, high frequency



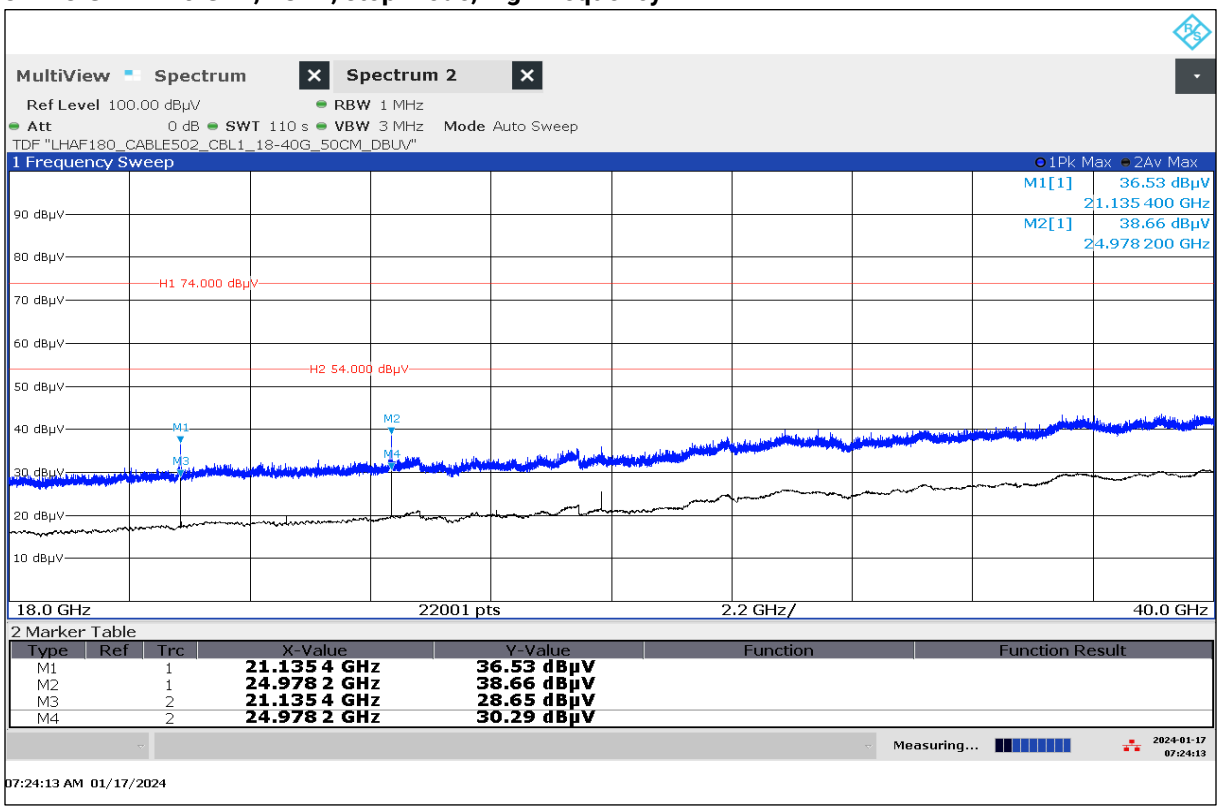
Plot 29: 18 GHz – 40 GHz, EUT2, stop mode, low frequency



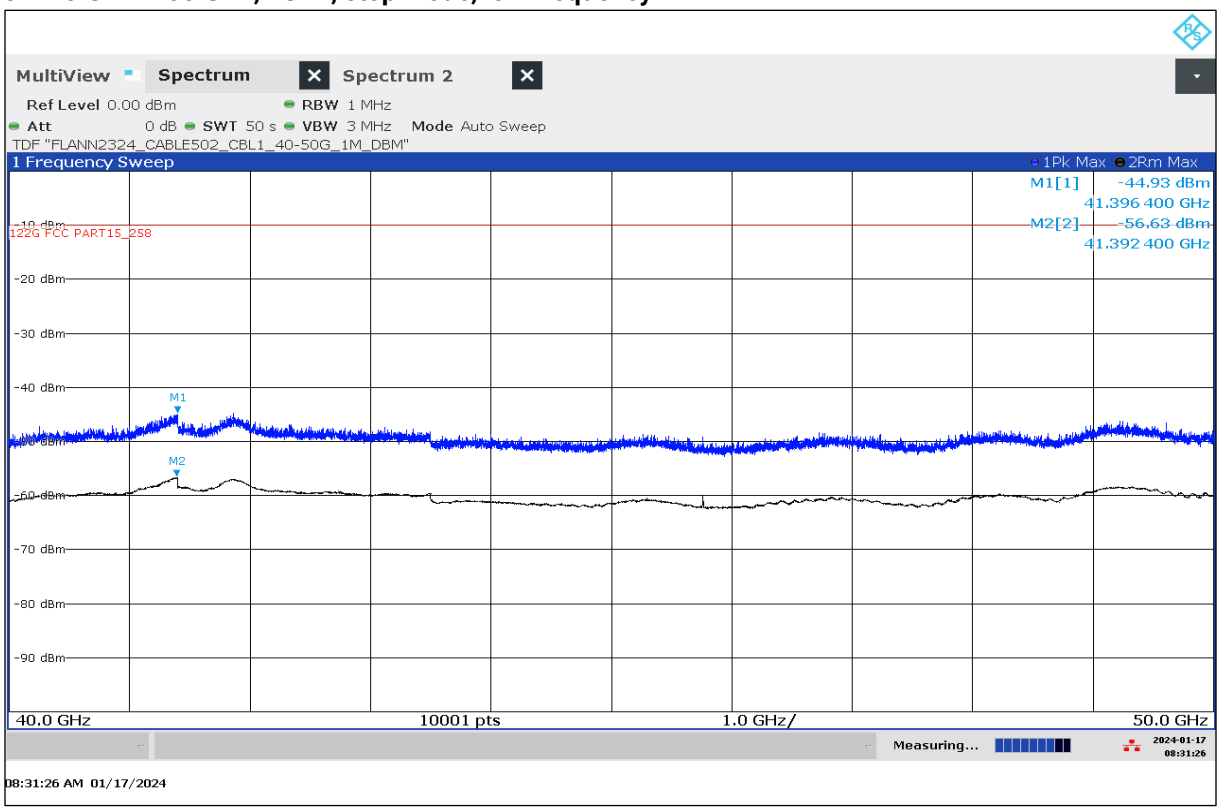
Plot 30: 18 GHz – 40 GHz, EUT3, stop mode, middle frequency



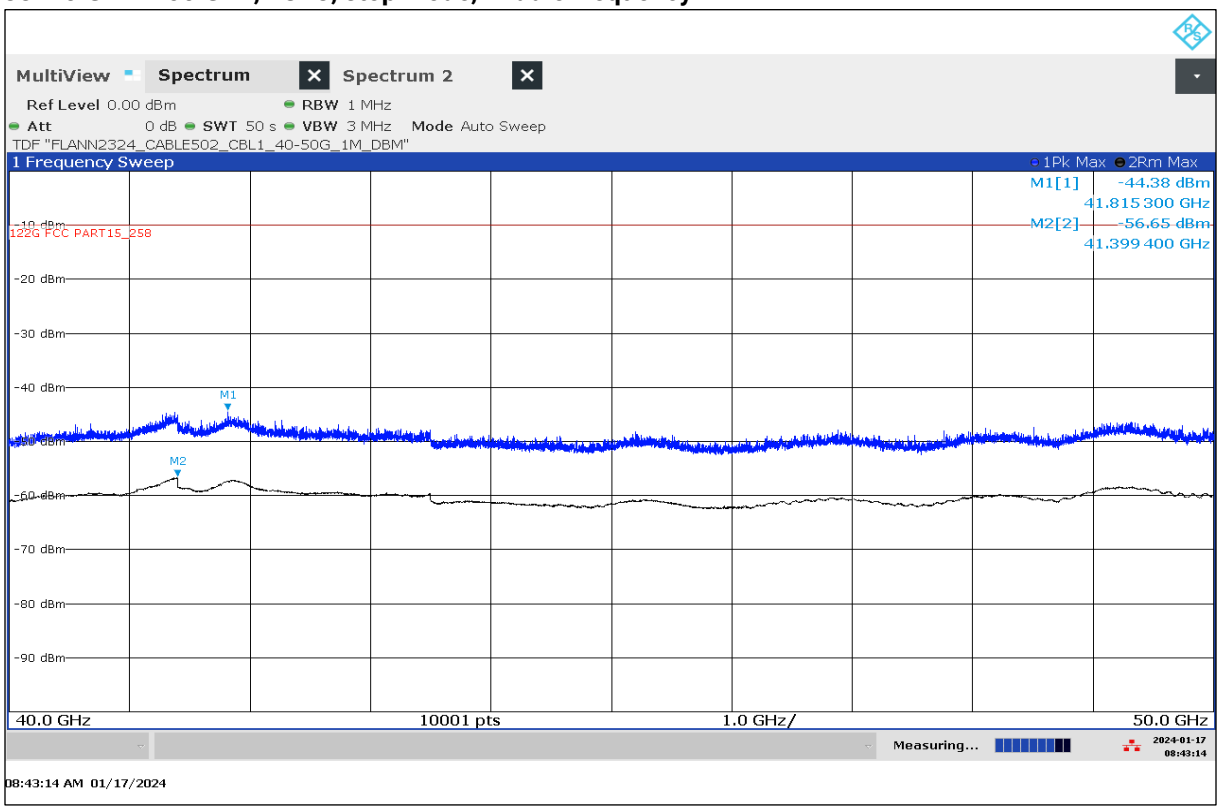
Plot 31: 18 GHz – 40 GHz, EUT4, stop mode, high frequency



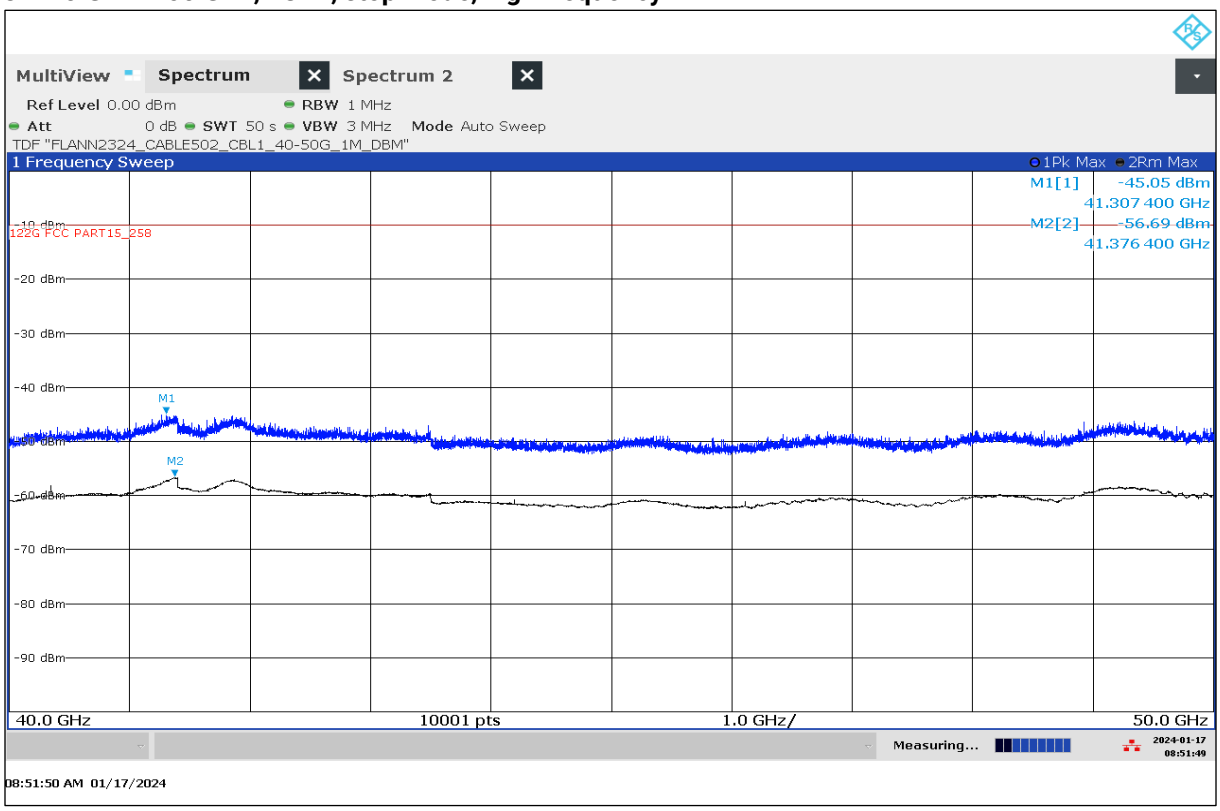
Plot 32: 40 GHz – 50 GHz, EUT2, stop mode, low frequency



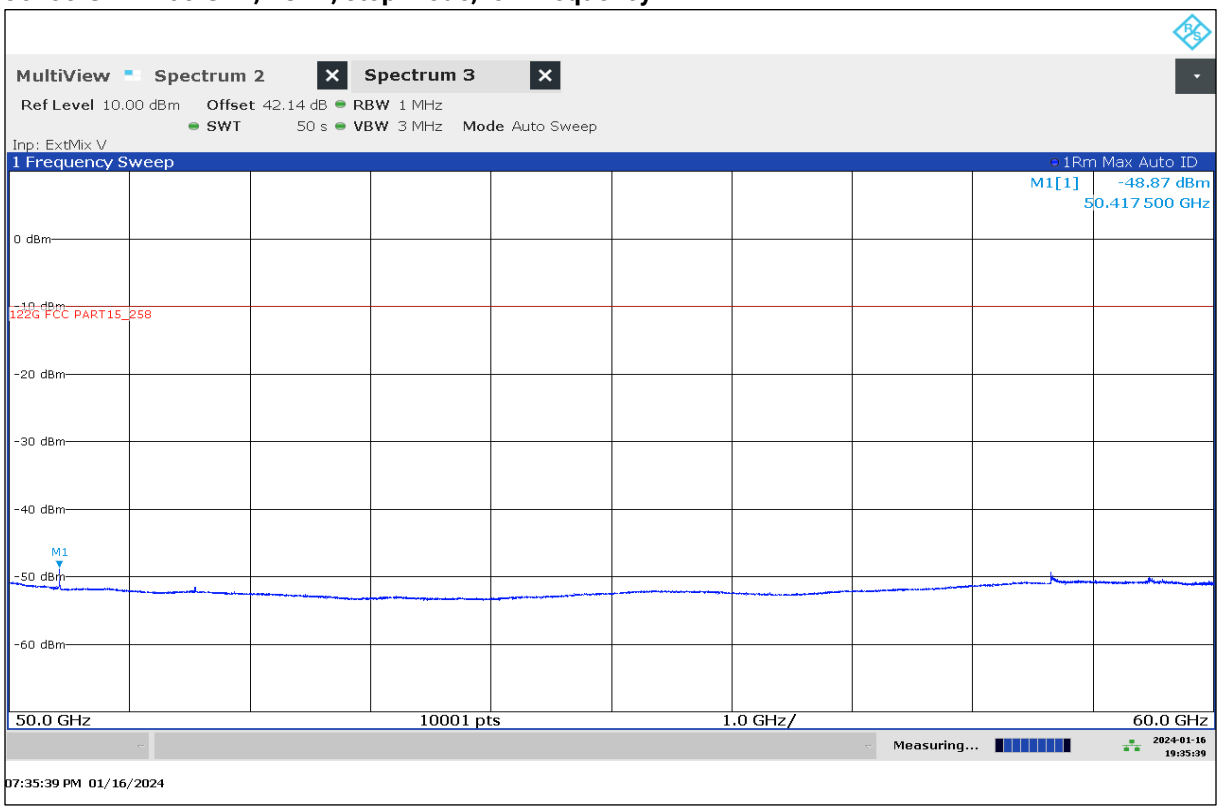
Plot 33: 40 GHz – 50 GHz, EUT3, stop mode, middle frequency



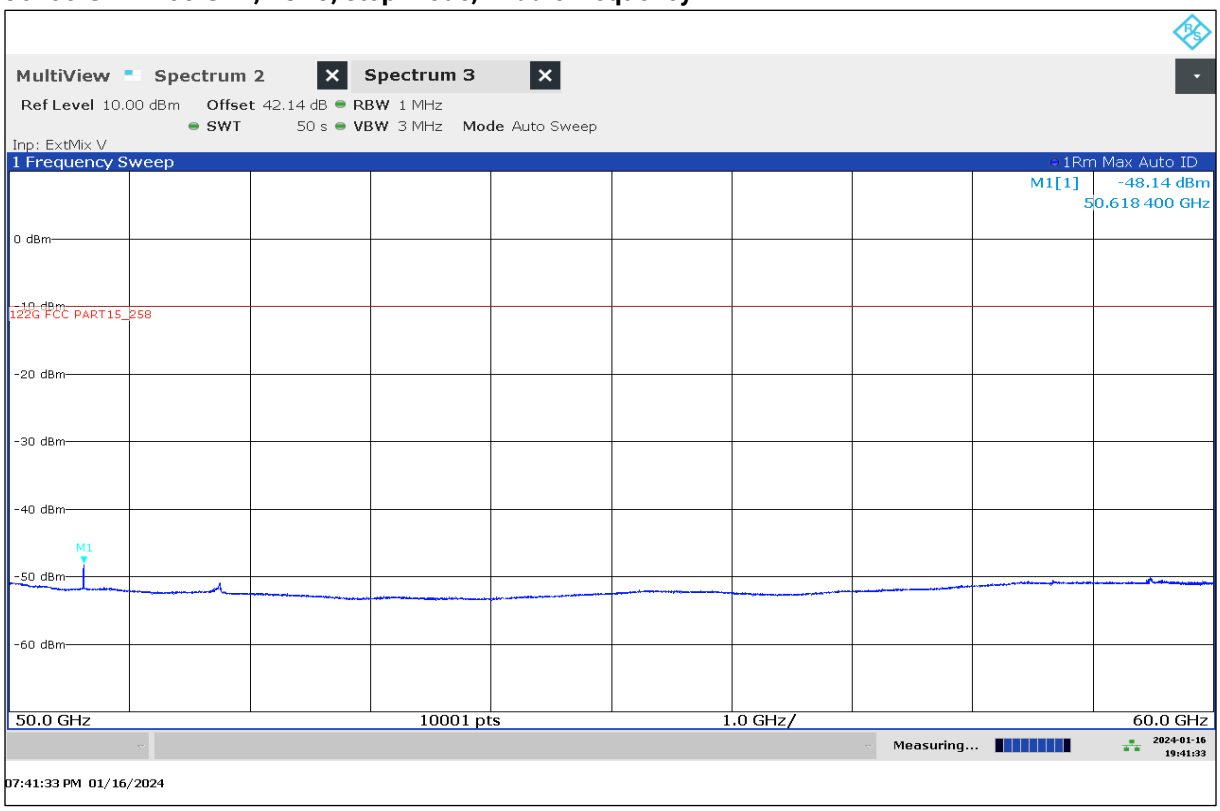
Plot 34: 40 GHz – 50 GHz, EUT4, stop mode, high frequency



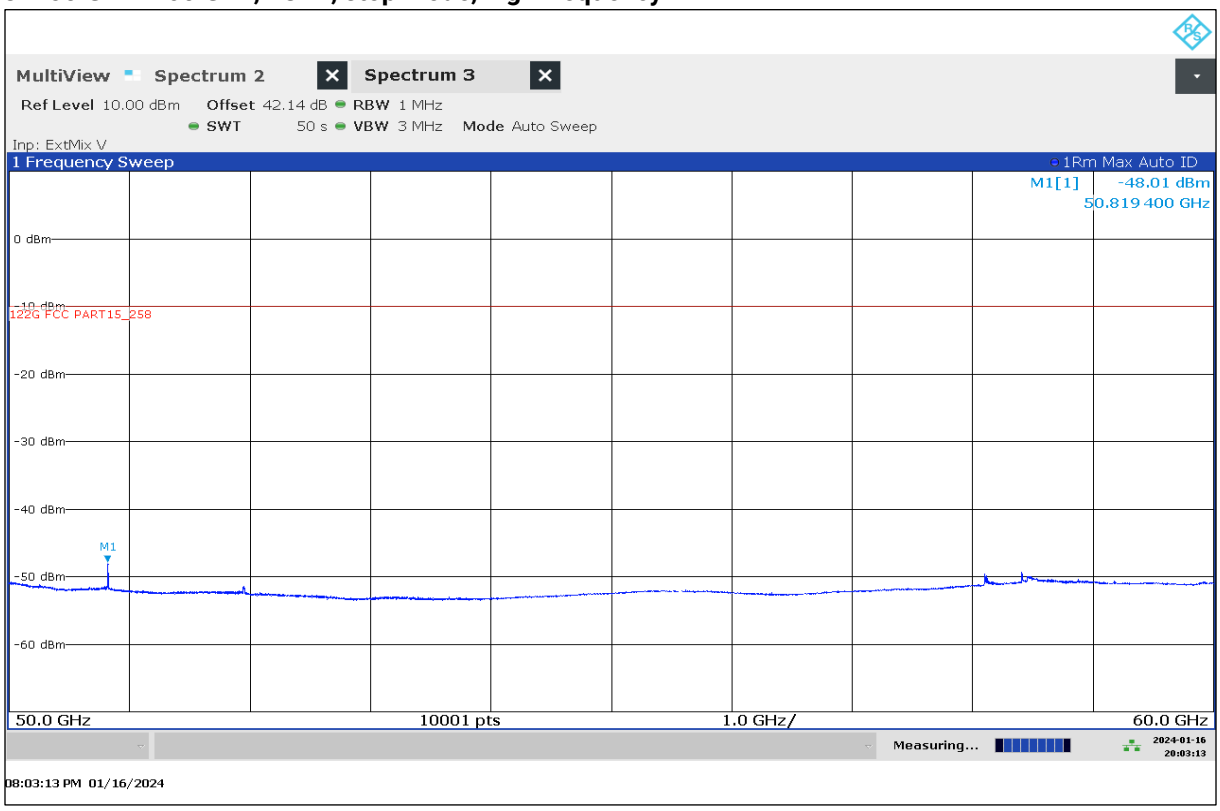
Plot 35: 50 GHz – 60 GHz, EUT2, stop mode, low frequency



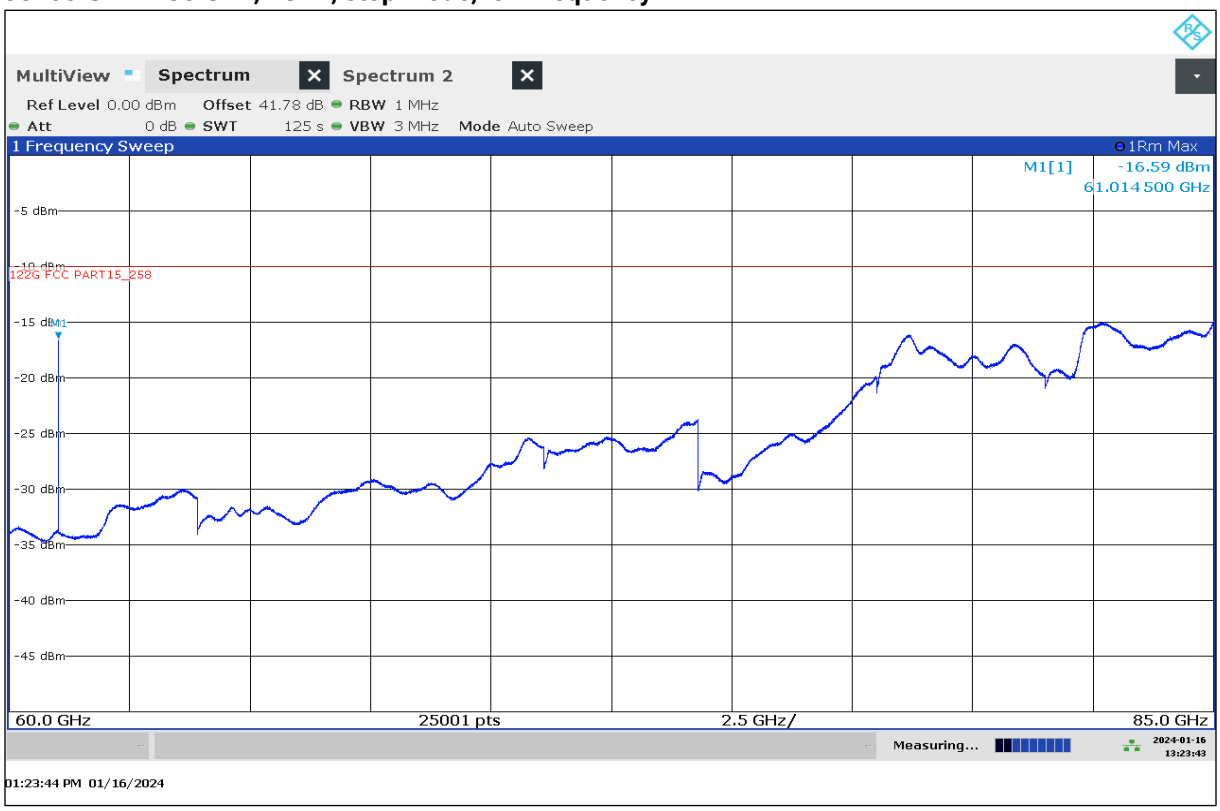
Plot 36: 50 GHz – 60 GHz, EUT3, stop mode, middle frequency



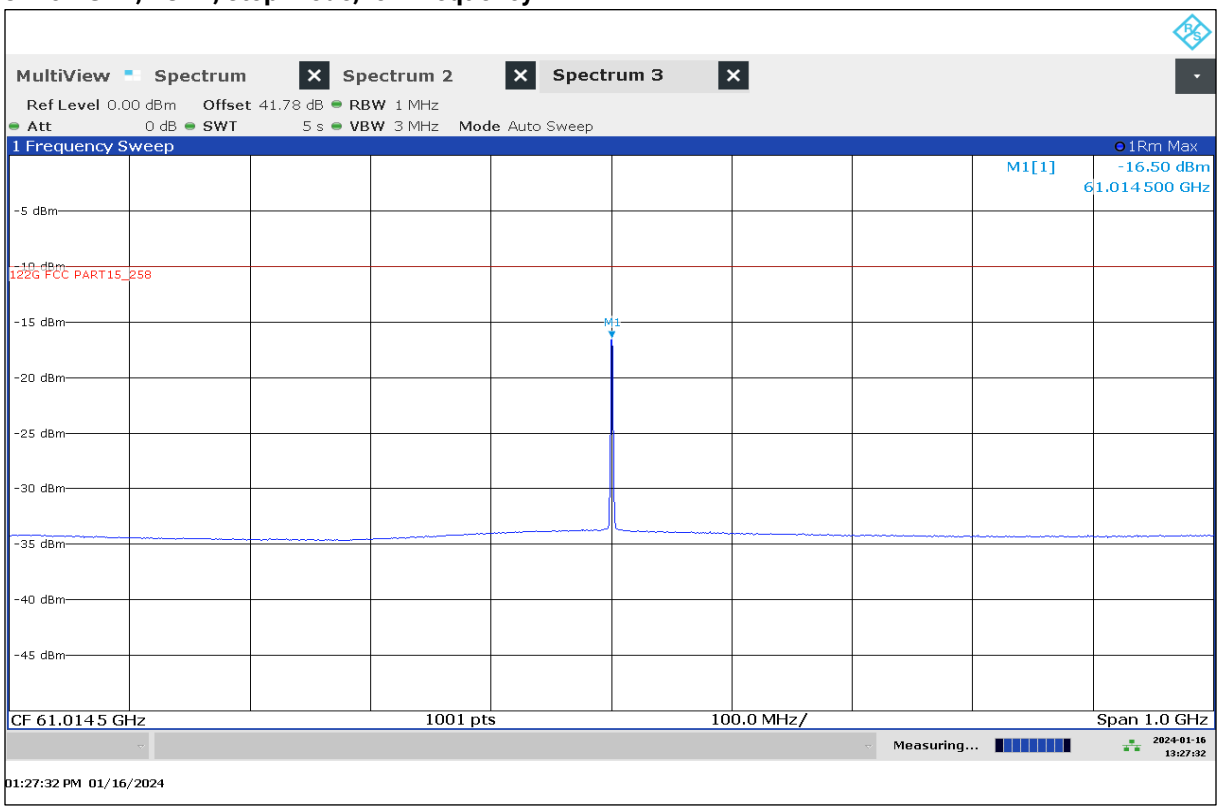
Plot 37: 50 GHz – 60 GHz, EUT4, stop mode, high frequency



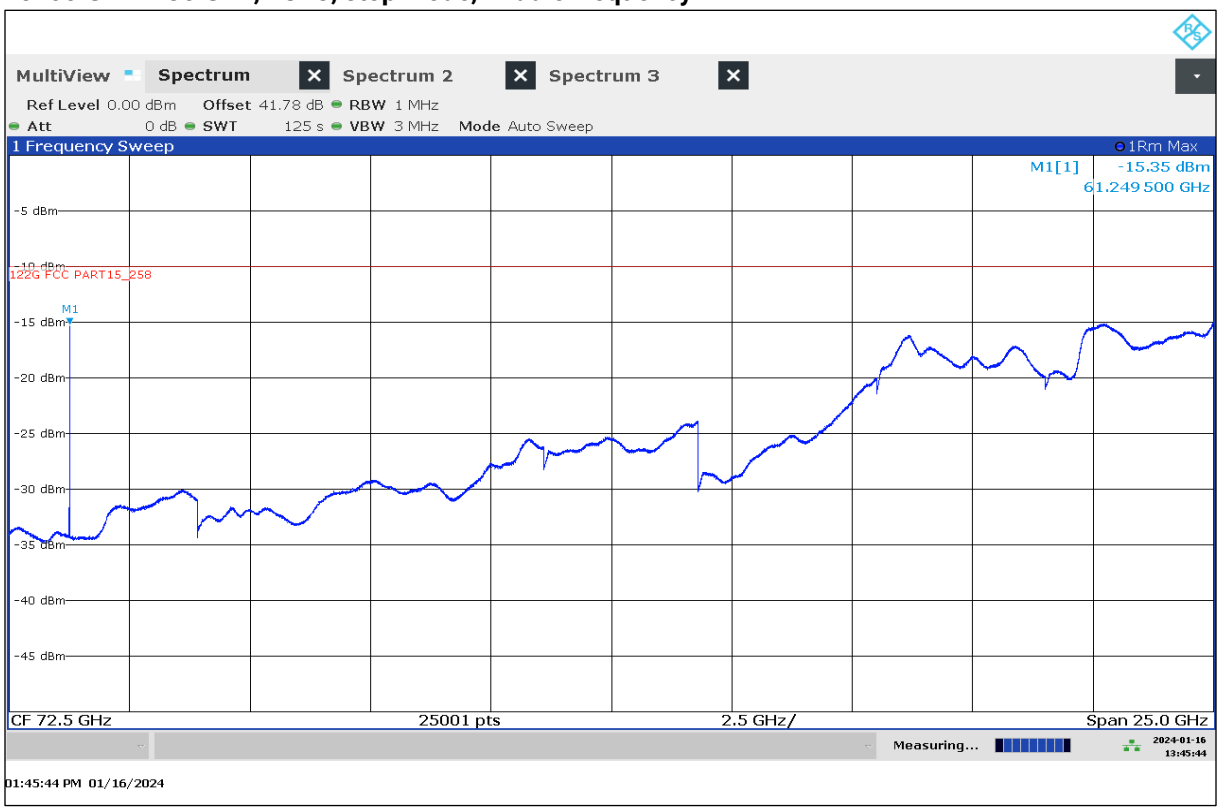
Plot 38: 60 GHz – 85 GHz, EUT2, stop mode, low frequency



Plot 39: 61 GHz, EUT2, stop mode, low frequency

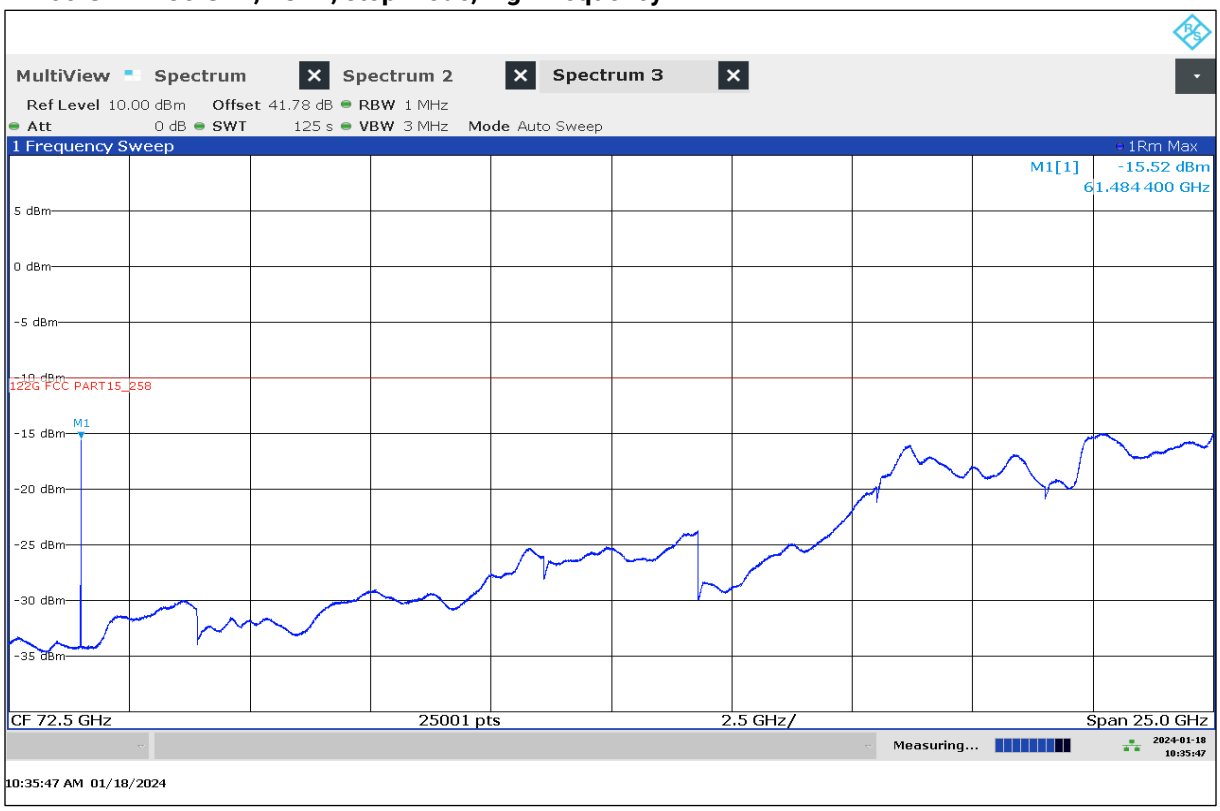


Plot 40: 60 GHz – 85 GHz, EUT3, stop mode, middle frequency

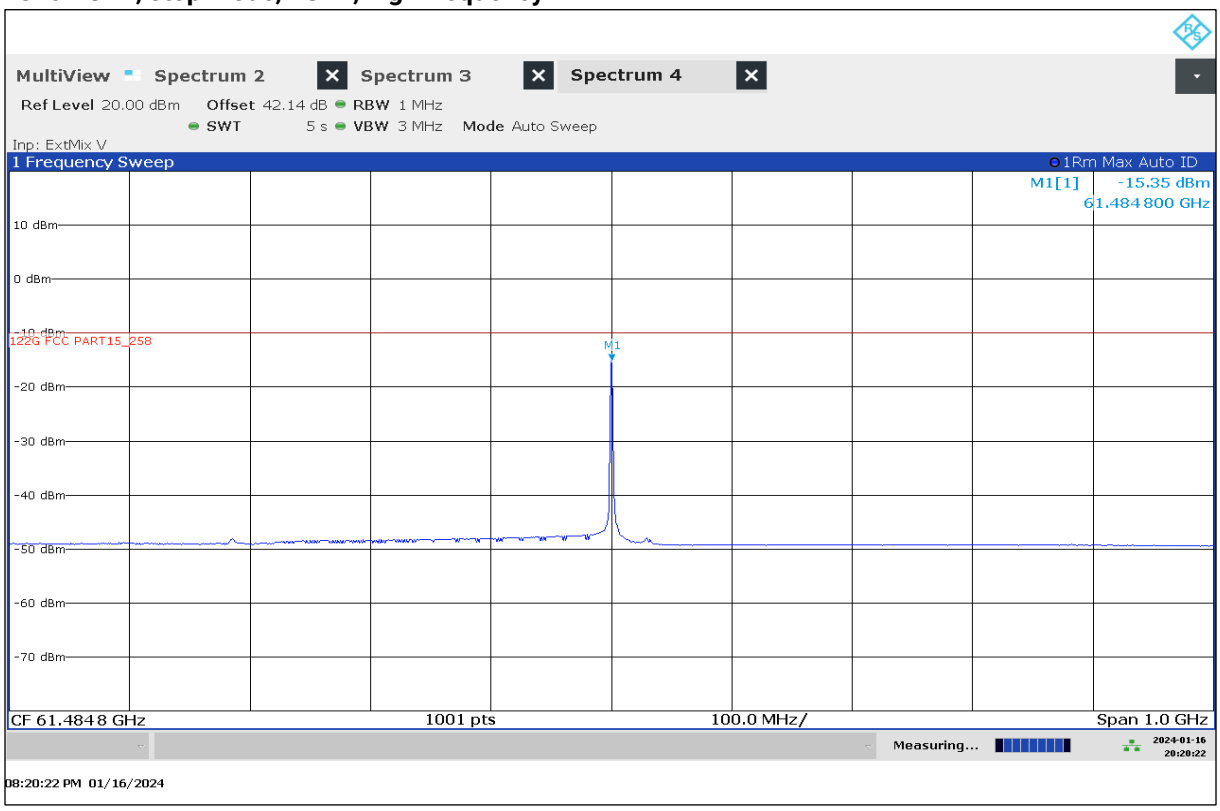


Plot 41: 61 GHz, EUT3, stop mode, middle frequency

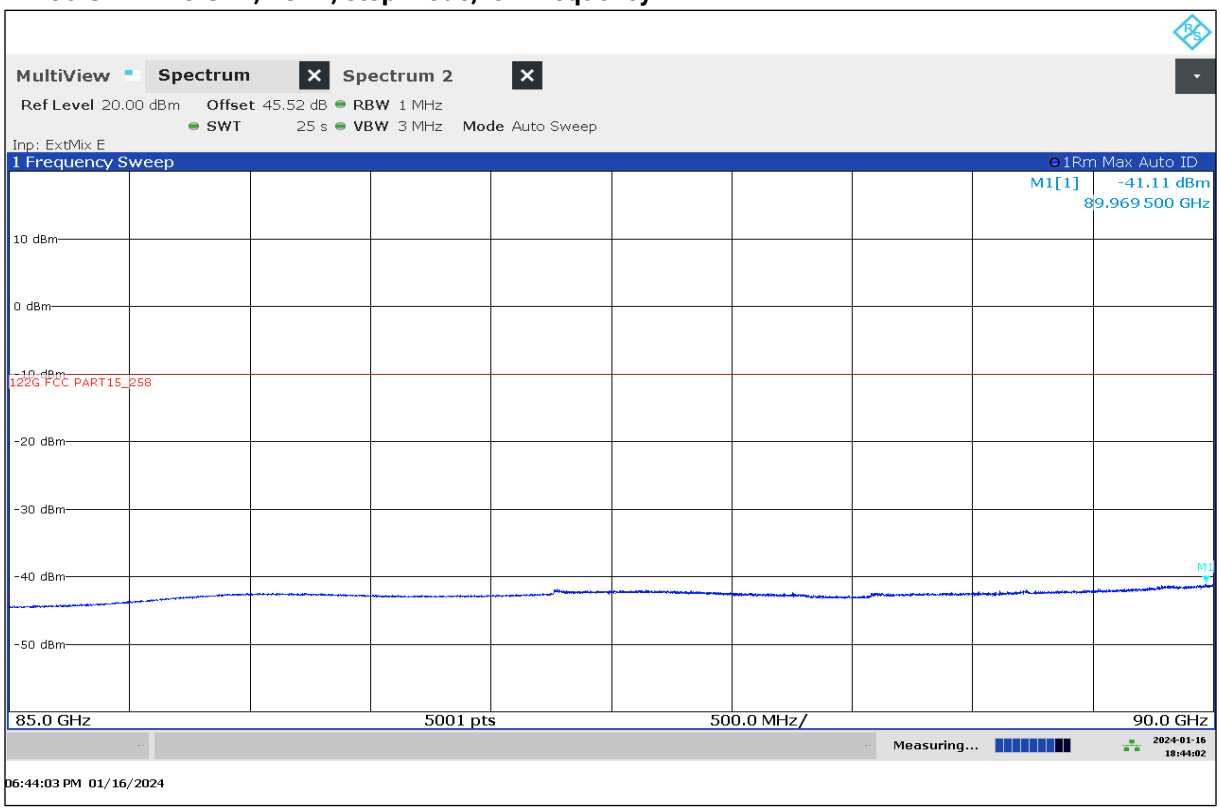
Plot 42: 60 GHz – 85 GHz, EUT4, stop mode, high frequency



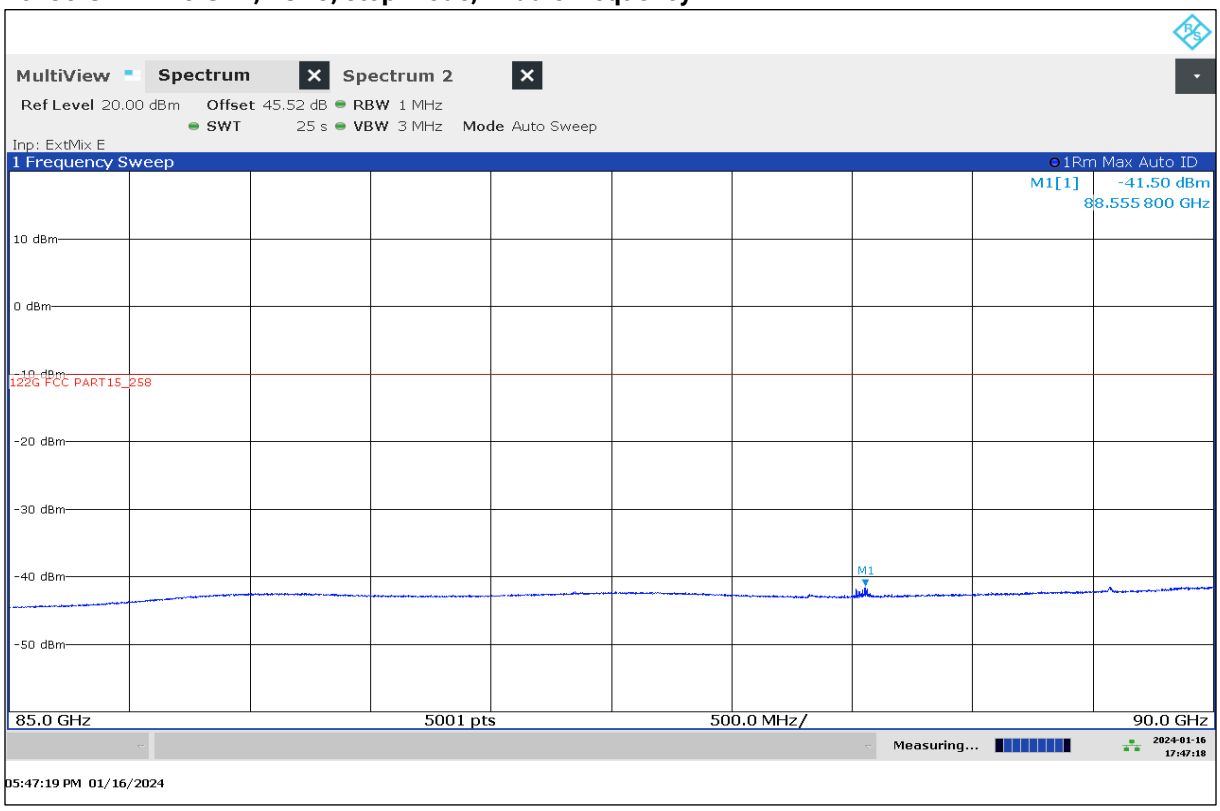
Plot 43: 61 GHz, stop mode, EUT4, high frequency



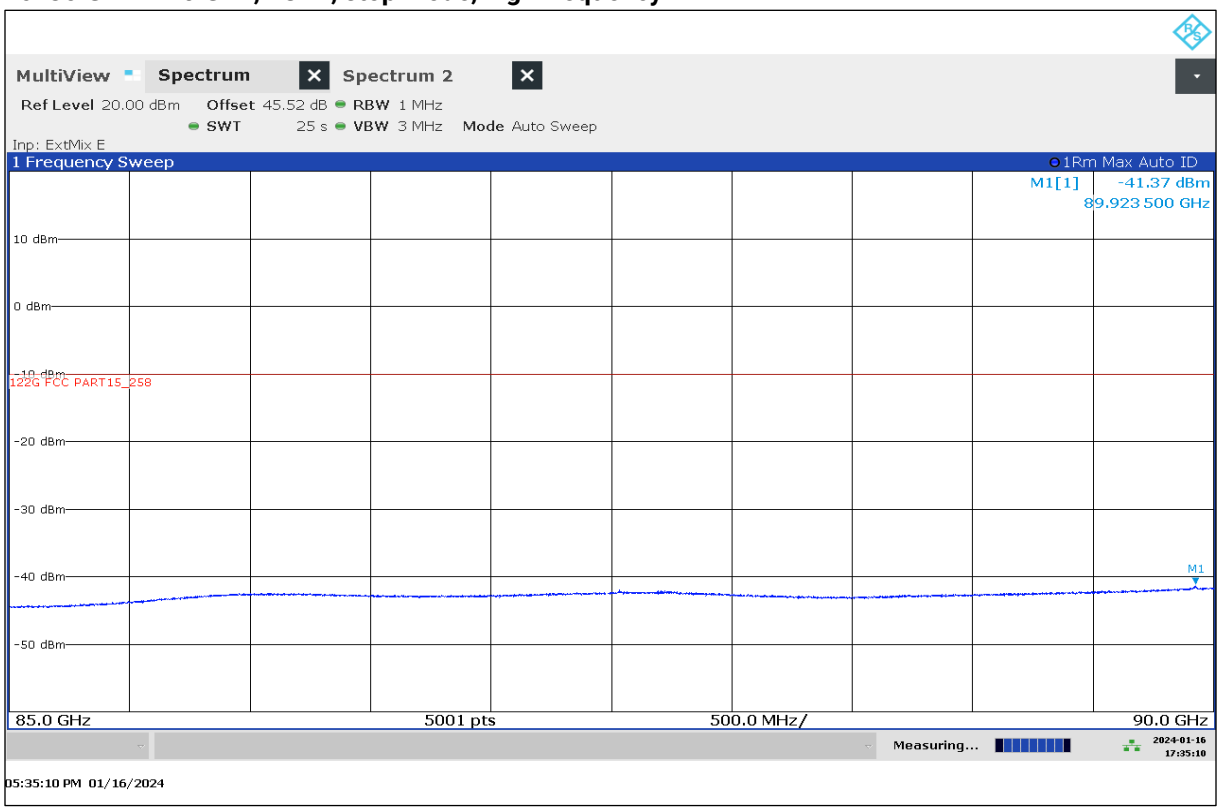
Plot 44: 85 GHz – 90 GHz, EUT2, stop mode, low frequency



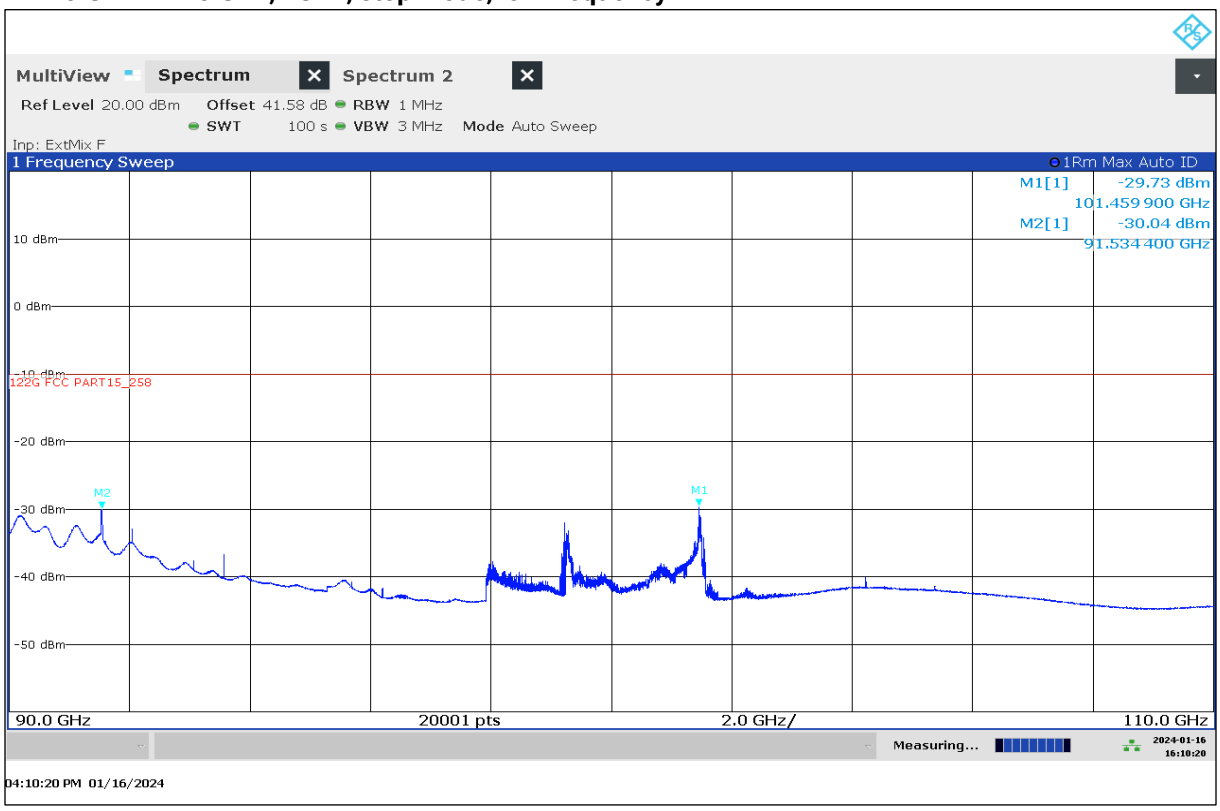
Plot 45: 85 GHz – 90 GHz, EUT3, stop mode, middle frequency



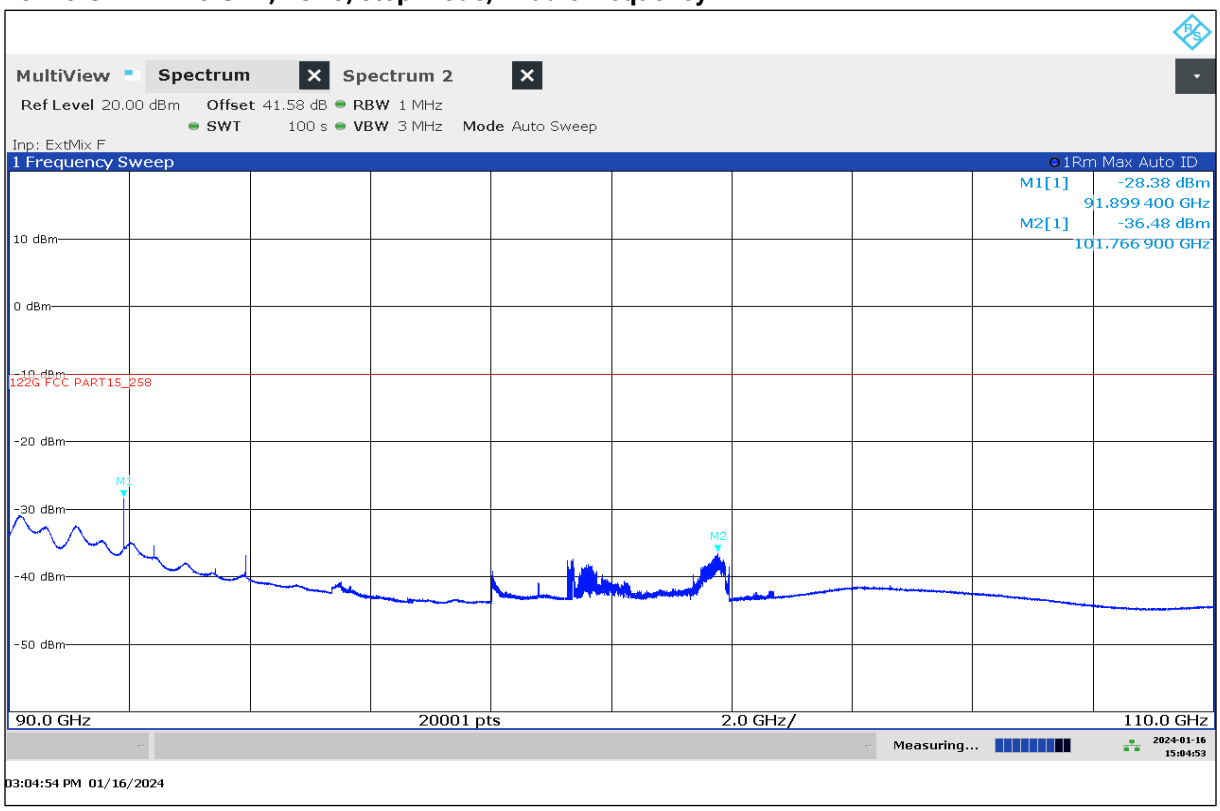
Plot 46: 85 GHz – 90 GHz, EUT4, stop mode, high frequency



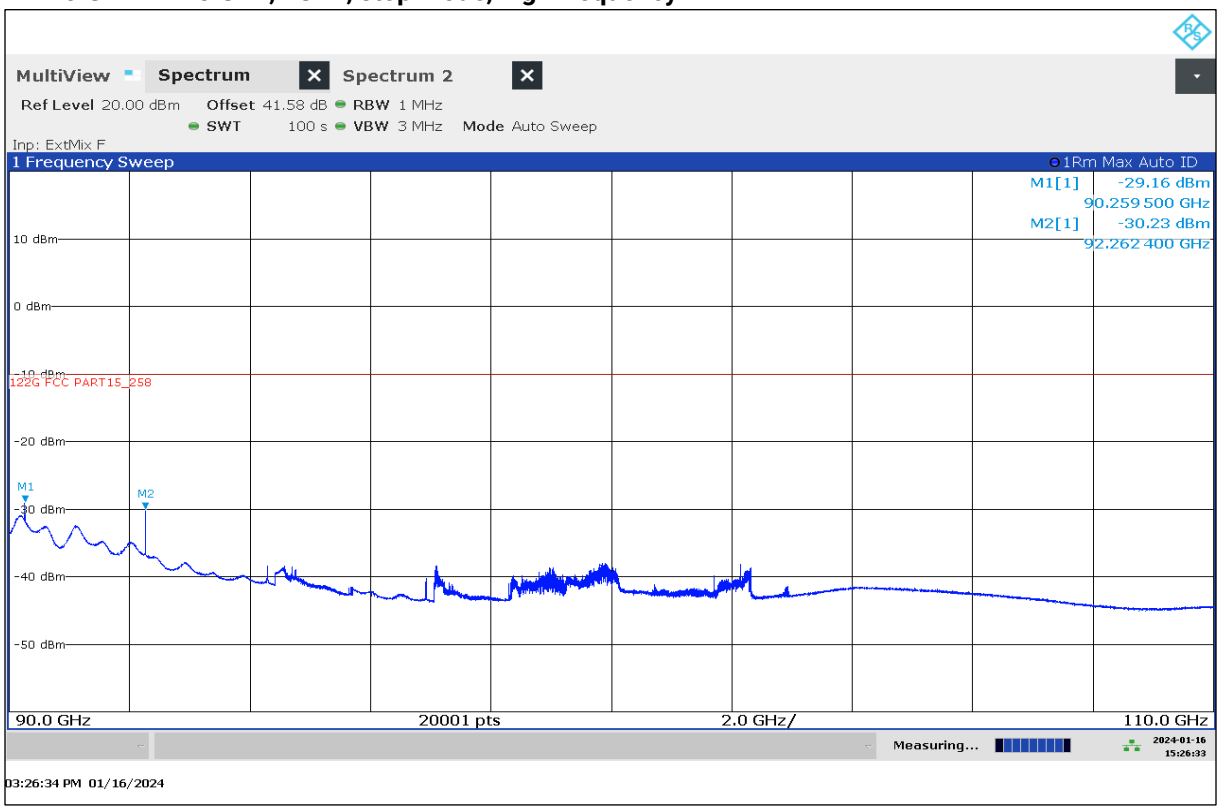
Plot 47: 90 GHz – 110 GHz, EUT2, stop mode, low frequency



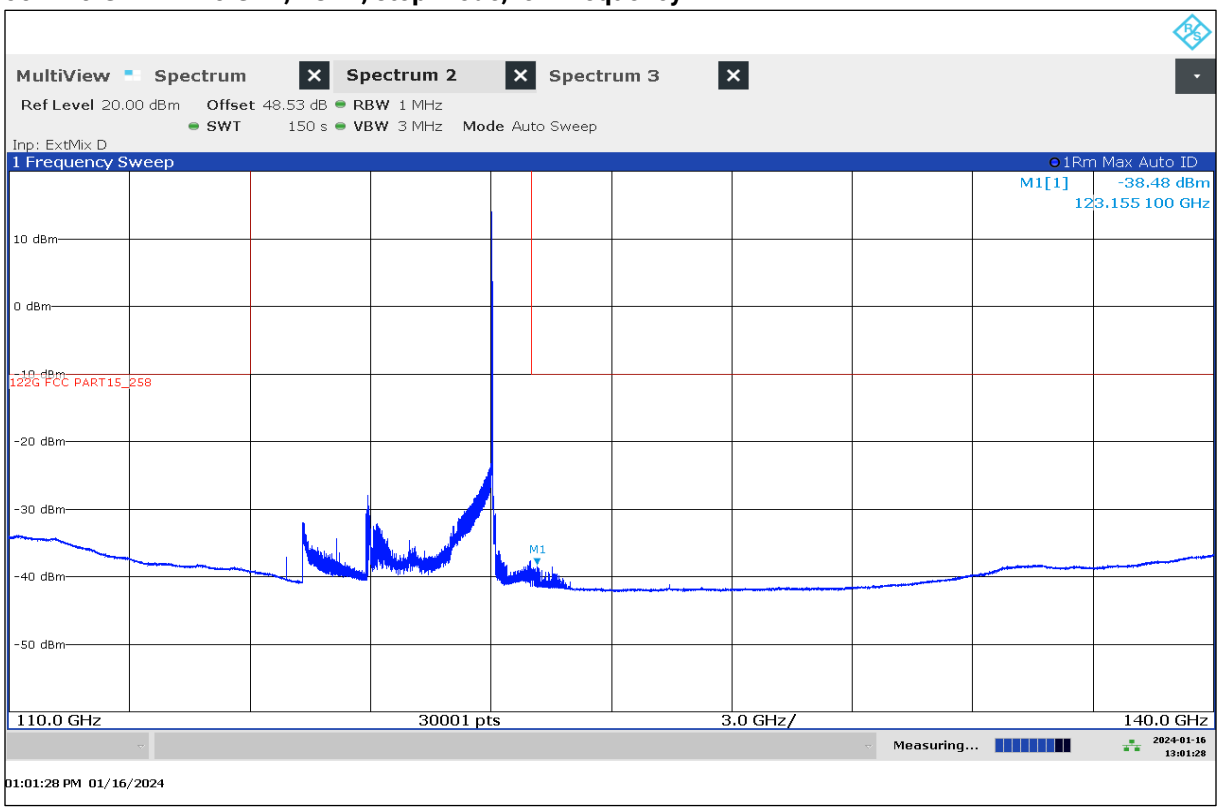
Plot 48: 90 GHz – 110 GHz, EUT3, stop mode, middle frequency



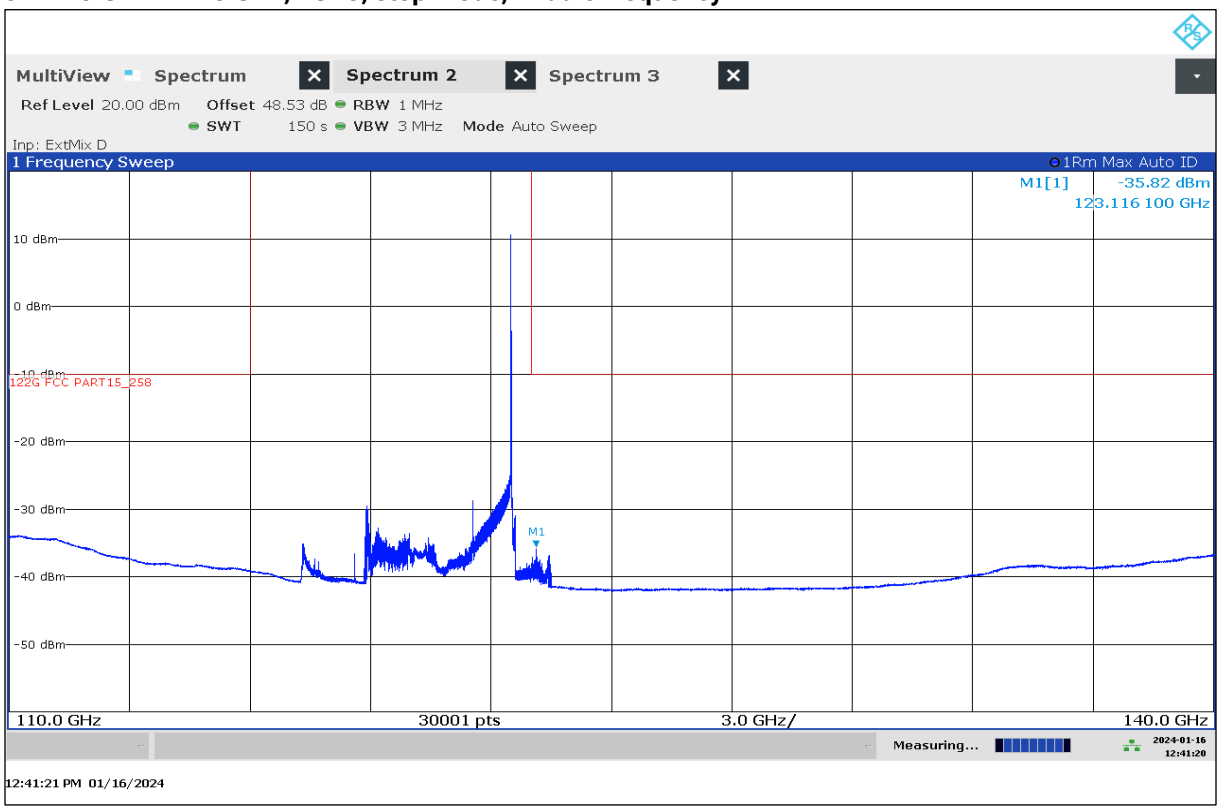
Plot 49: 90 GHz – 110 GHz, EUT4, stop mode, high frequency



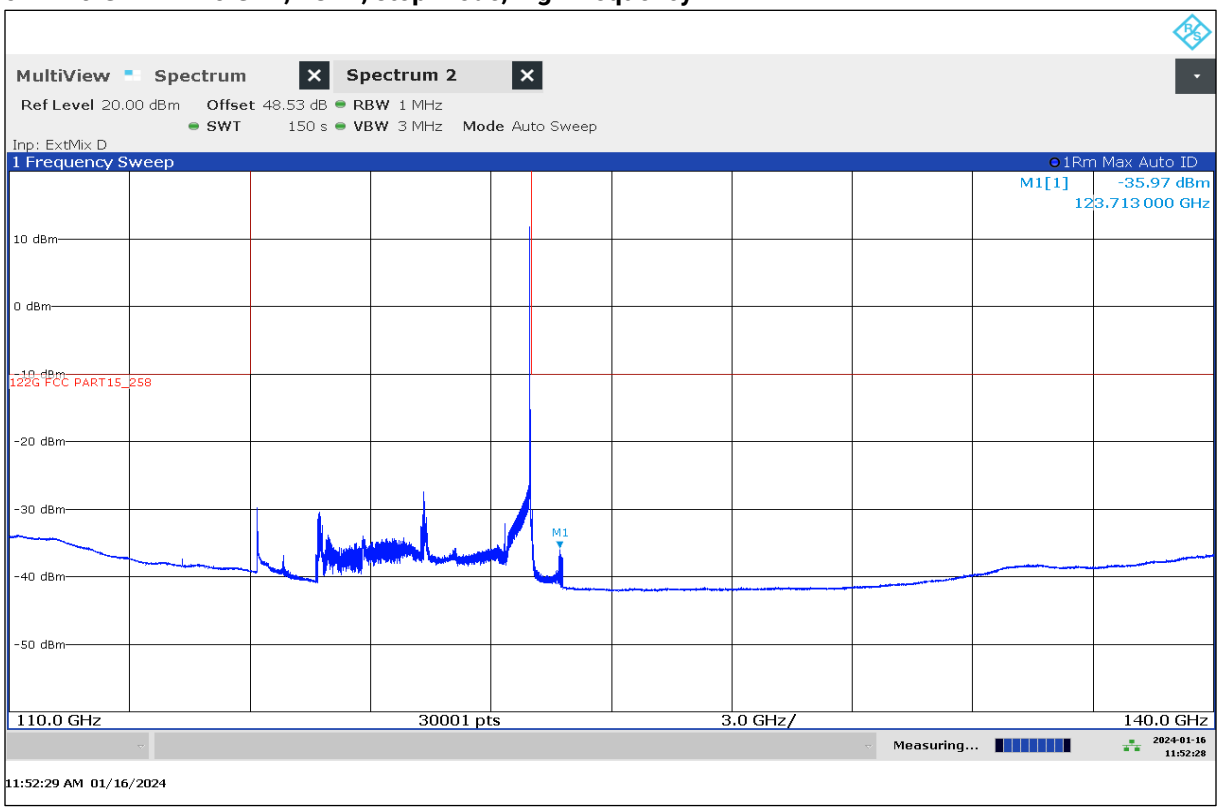
Plot 50: 110 GHz – 140 GHz, EUT2, stop mode, low frequency



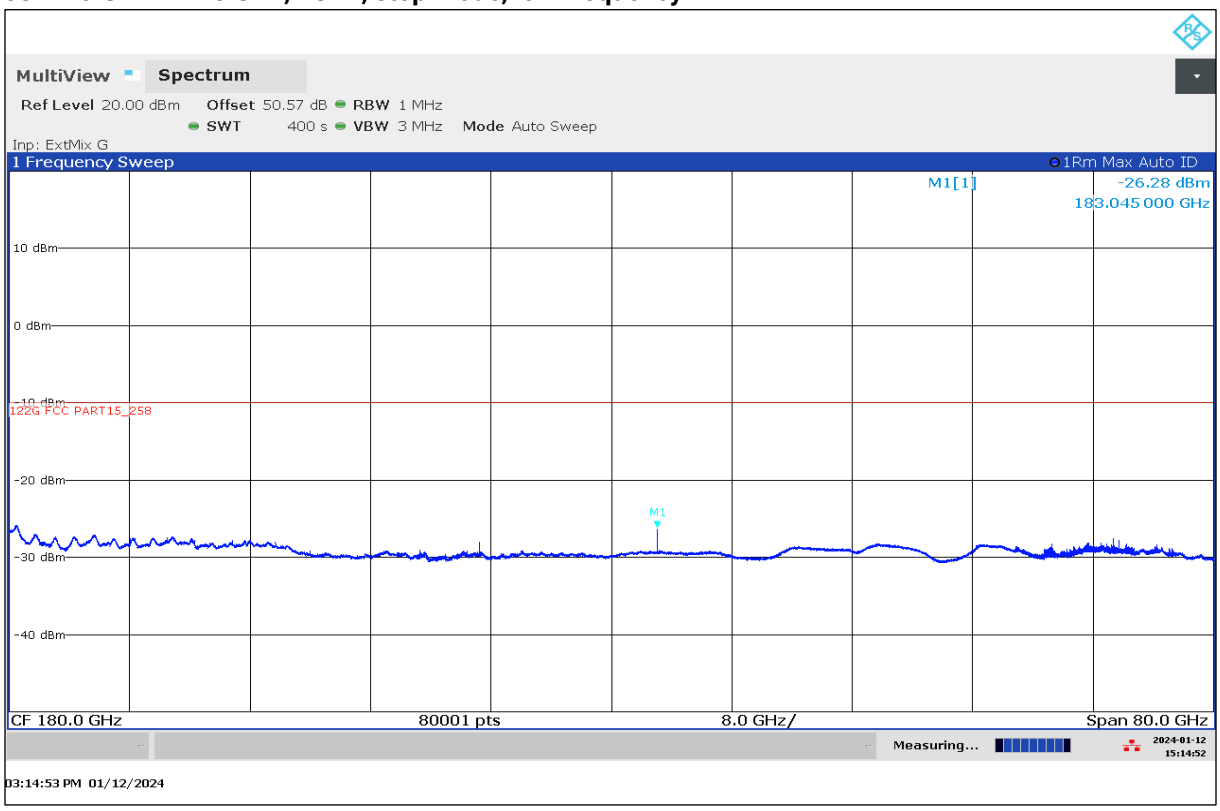
Plot 51: 110 GHz – 140 GHz, EUT3, stop mode, middle frequency



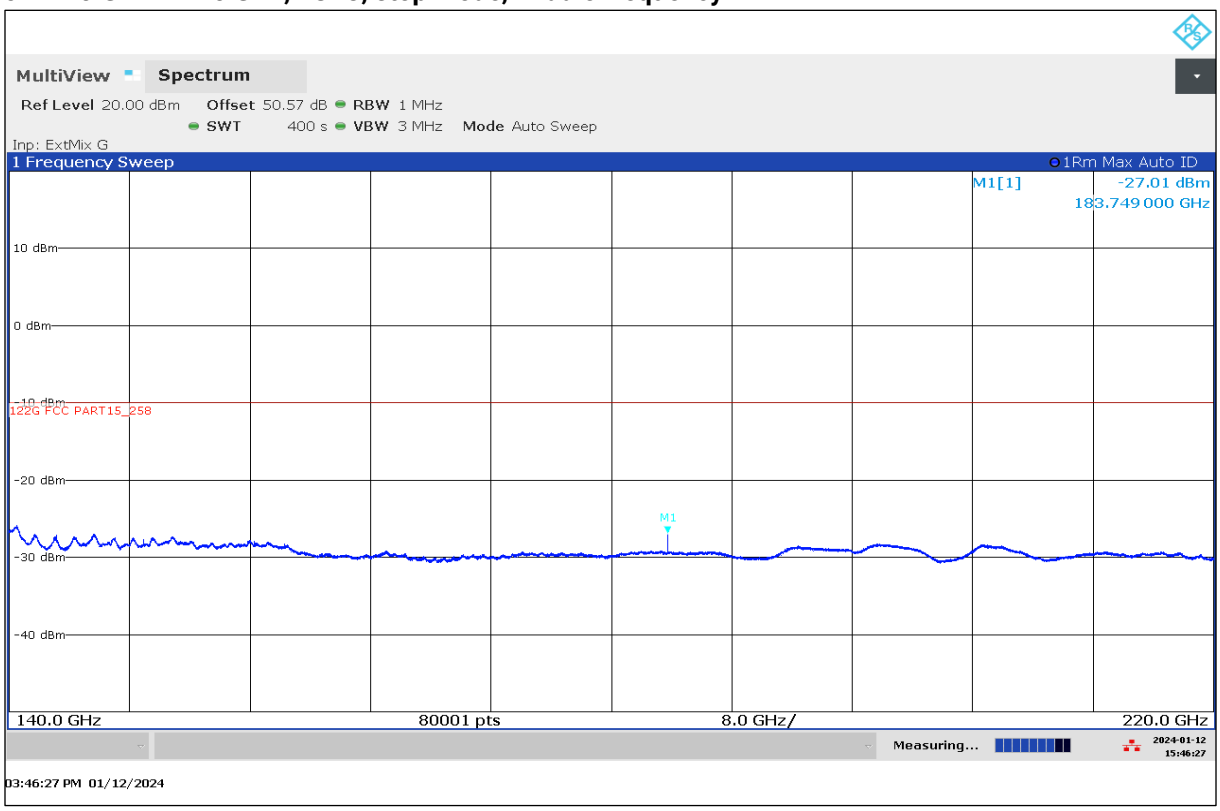
Plot 52: 110 GHz – 140 GHz, EUT4, stop mode, high frequency



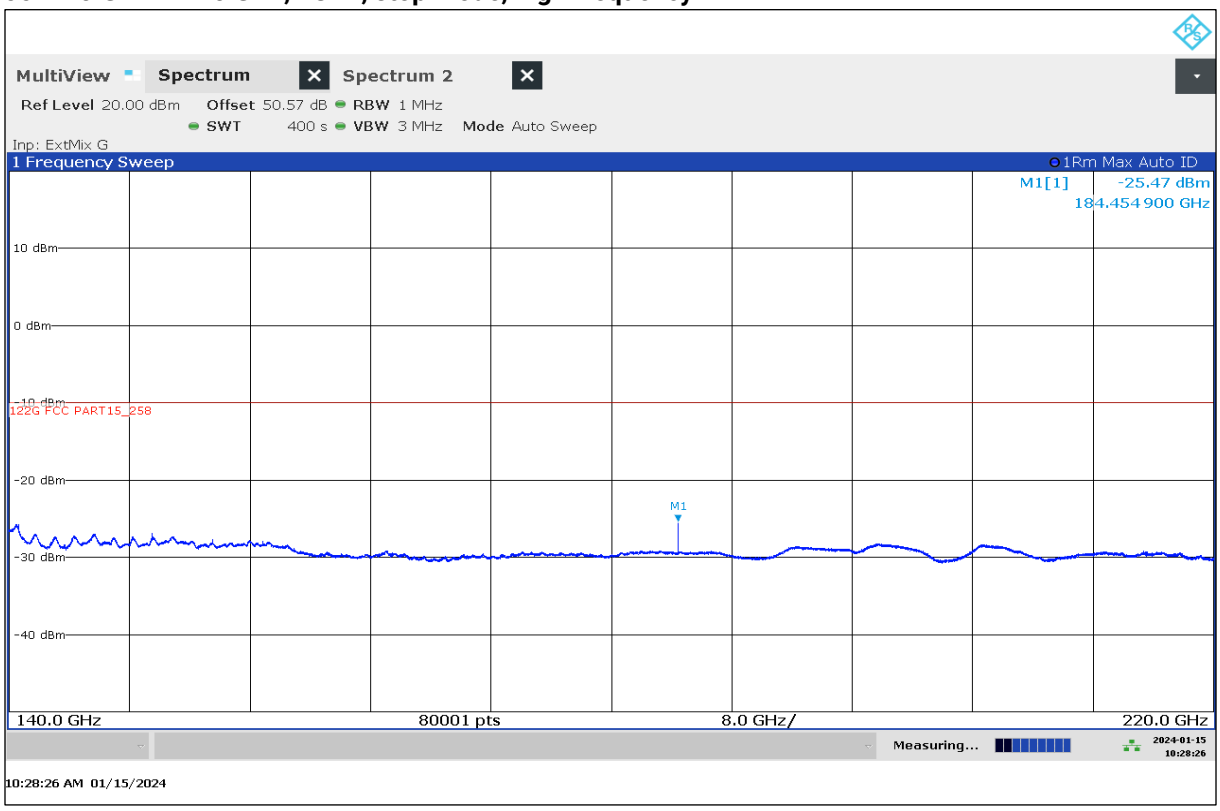
Plot 53: 140 GHz – 220 GHz, EUT2, stop mode, low frequency



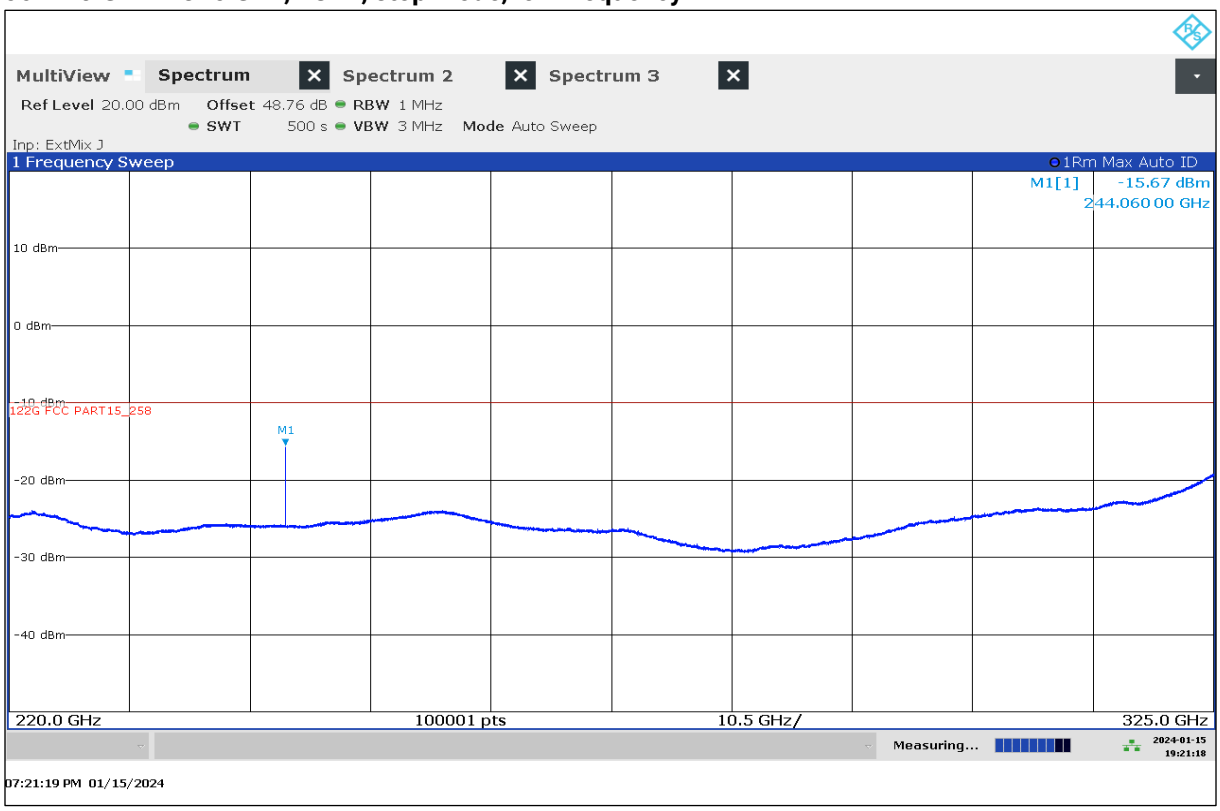
Plot 54: 140 GHz – 220 GHz, EUT3, stop mode, middle frequency



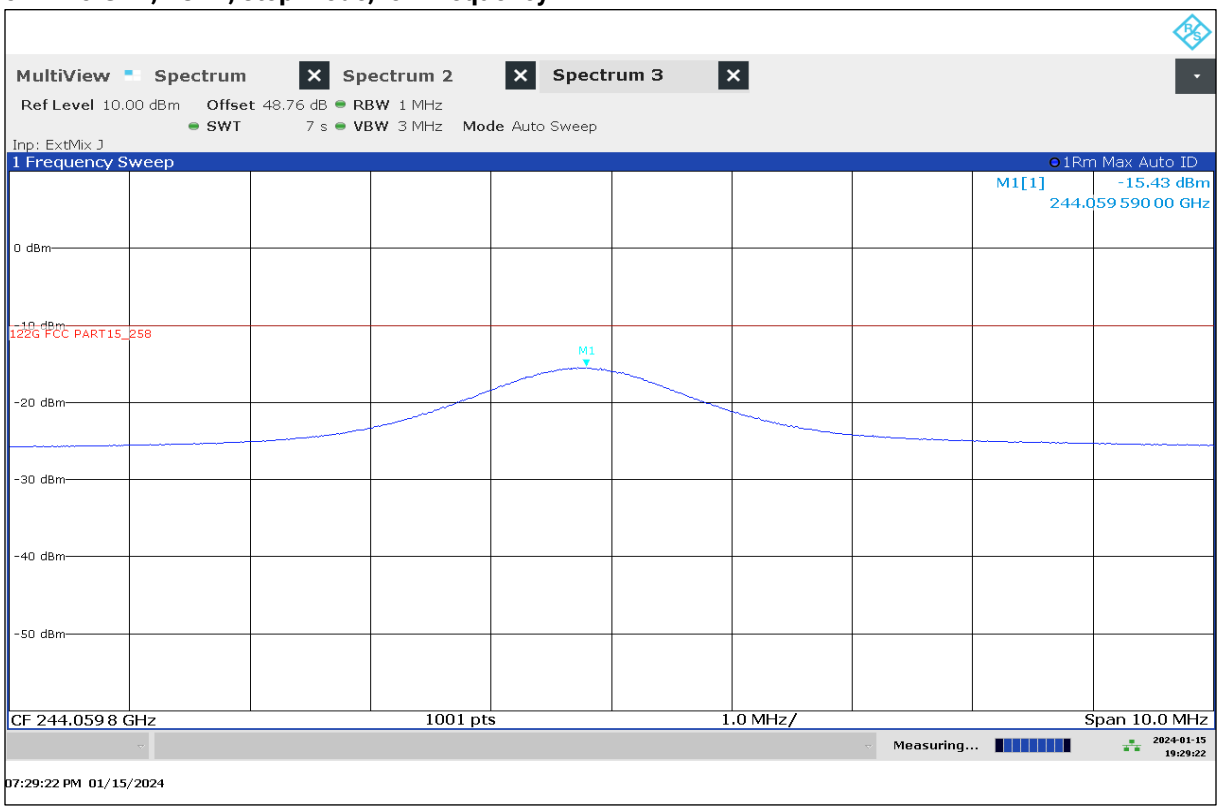
Plot 55: 140 GHz – 220 GHz, EUT4, stop mode, high frequency



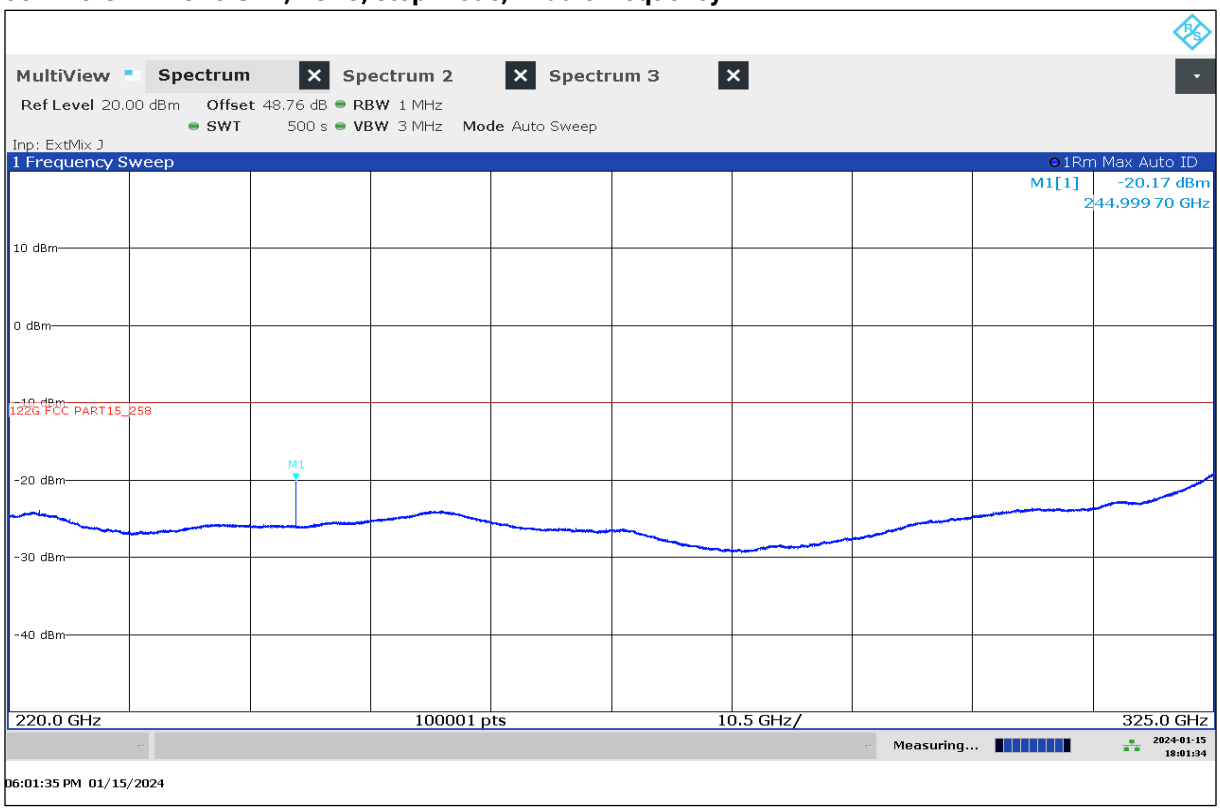
Plot 56: 220 GHz – 325 GHz, EUT2, stop mode, low frequency



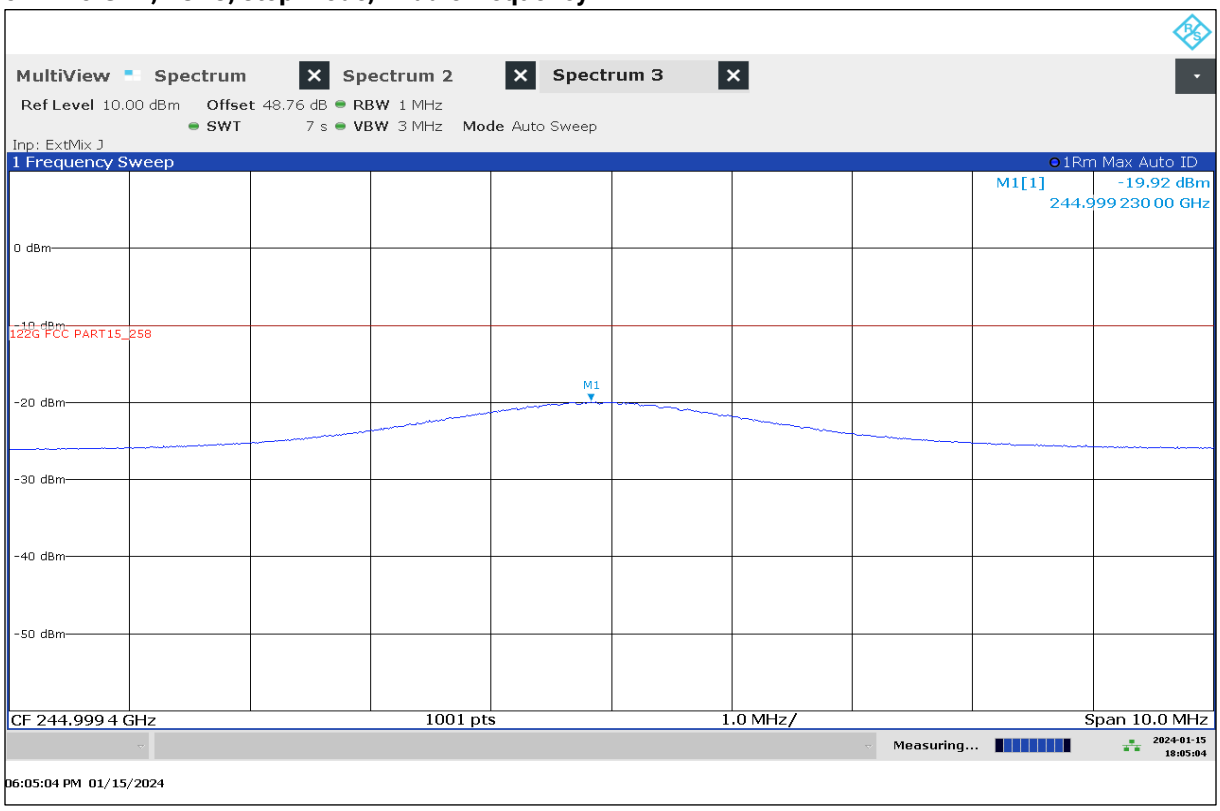
Plot 57: 245 GHz, EUT2, stop mode, low frequency



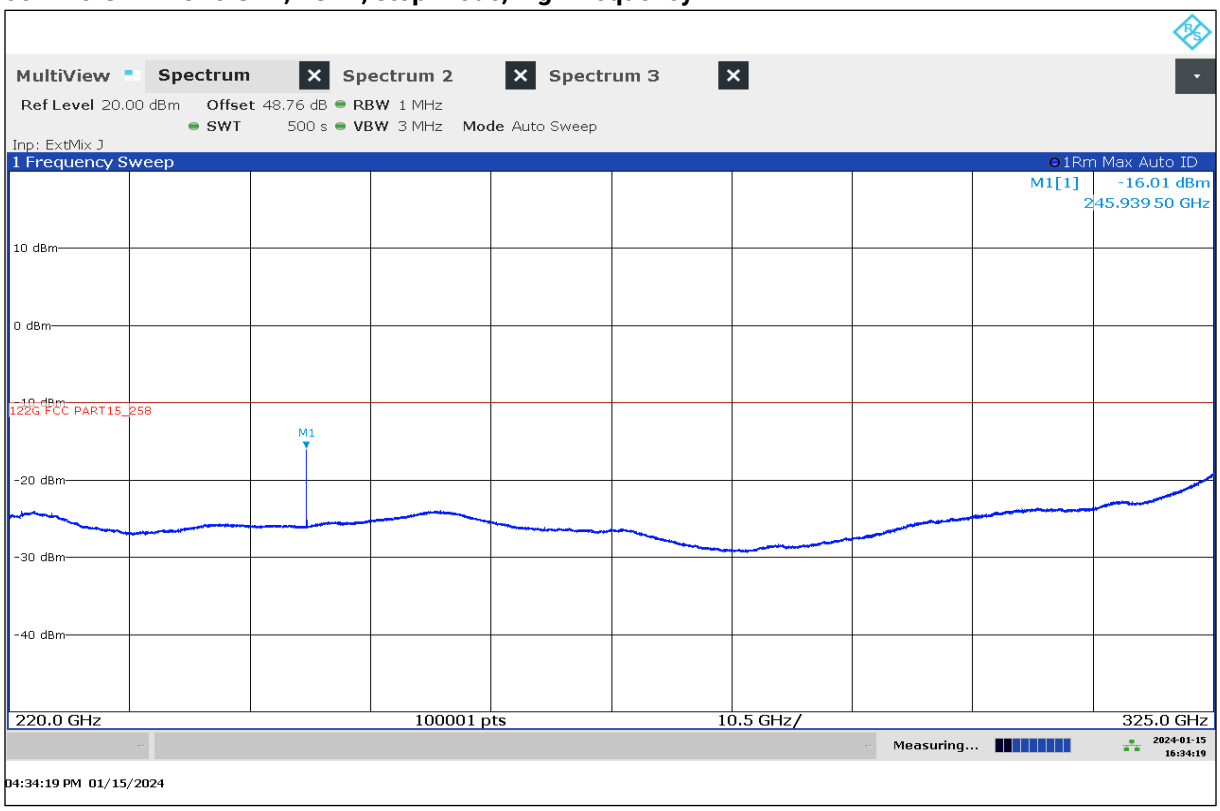
Plot 58: 220 GHz – 325 GHz, EUT3, stop mode, middle frequency



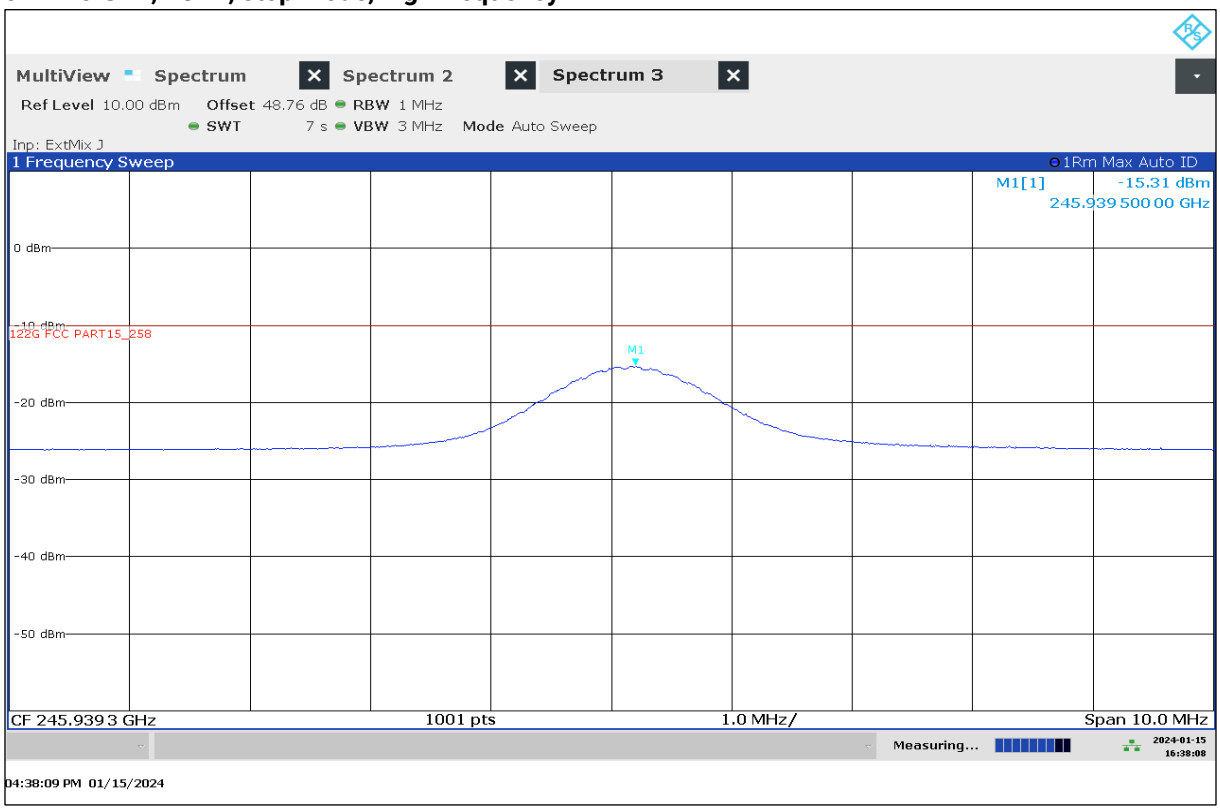
Plot 59: 245 GHz, EUT3, stop mode, middle frequency



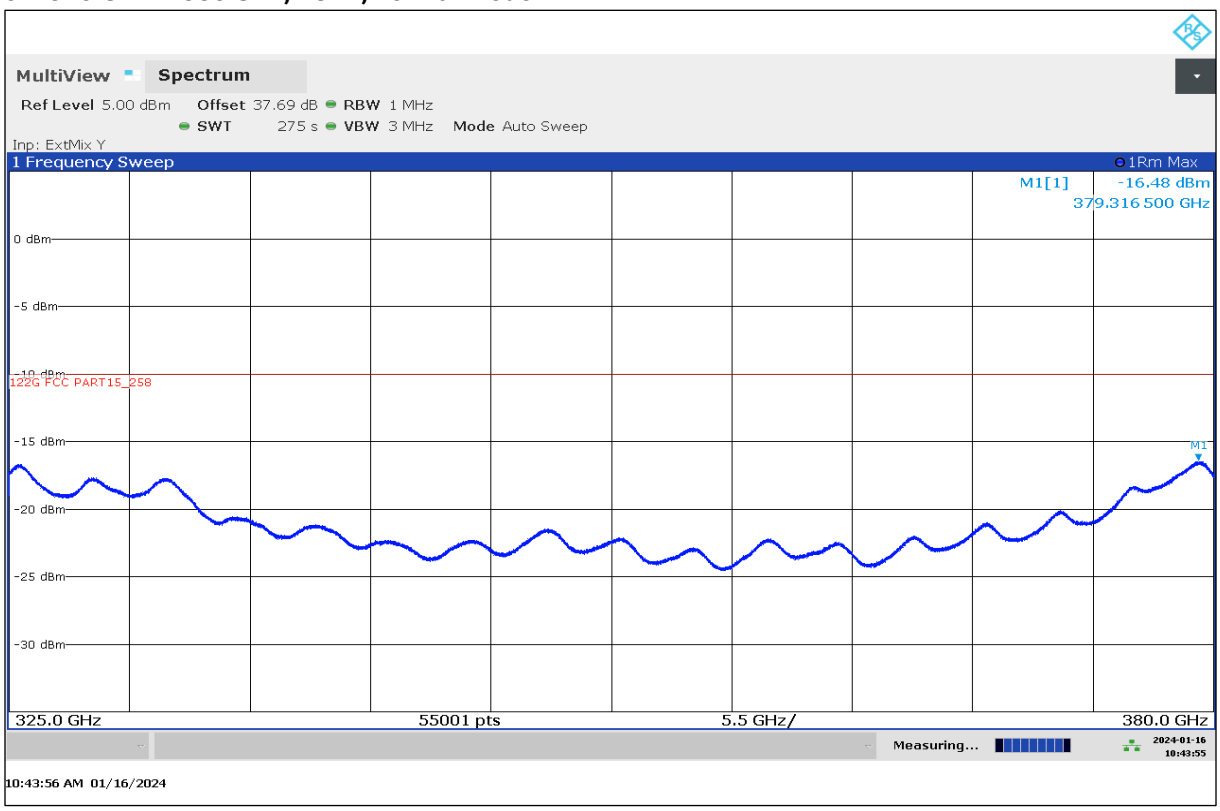
Plot 60: 220 GHz – 325 GHz, EUT4, stop mode, high frequency



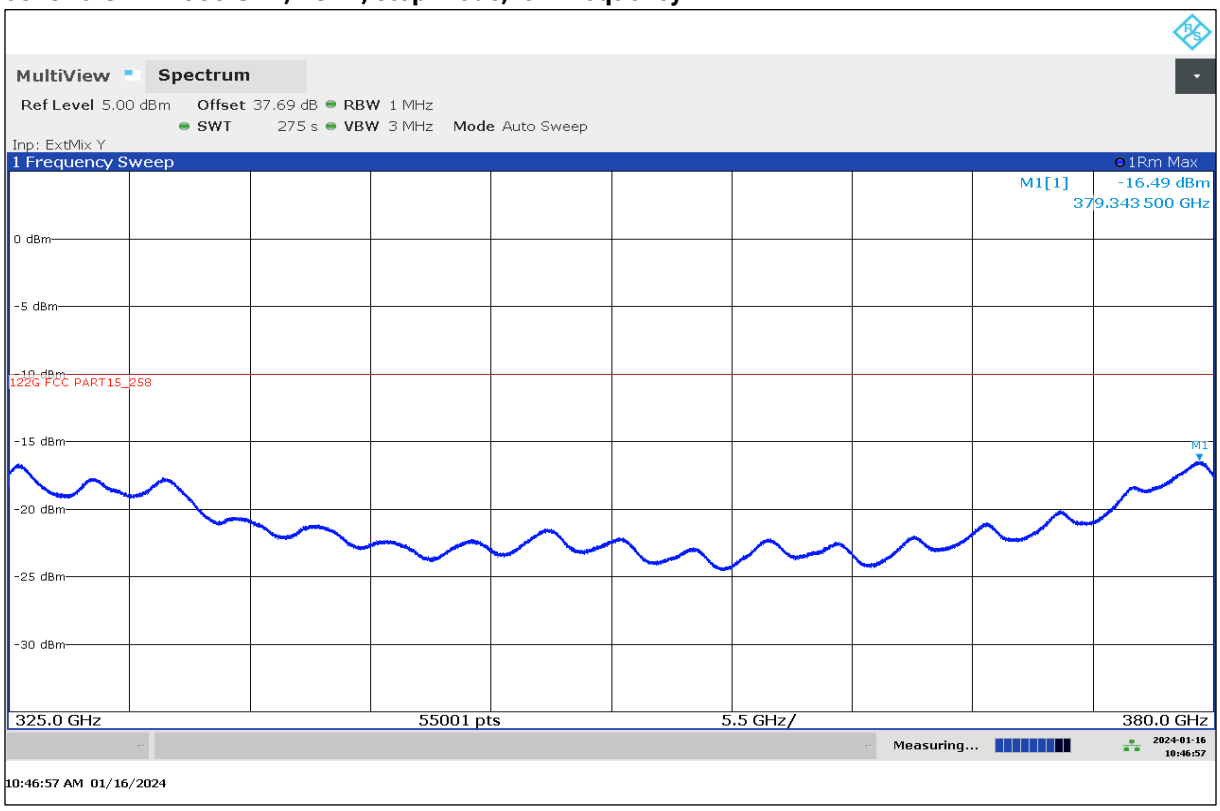
Plot 61: 245 GHz, EUT4, stop mode, high frequency



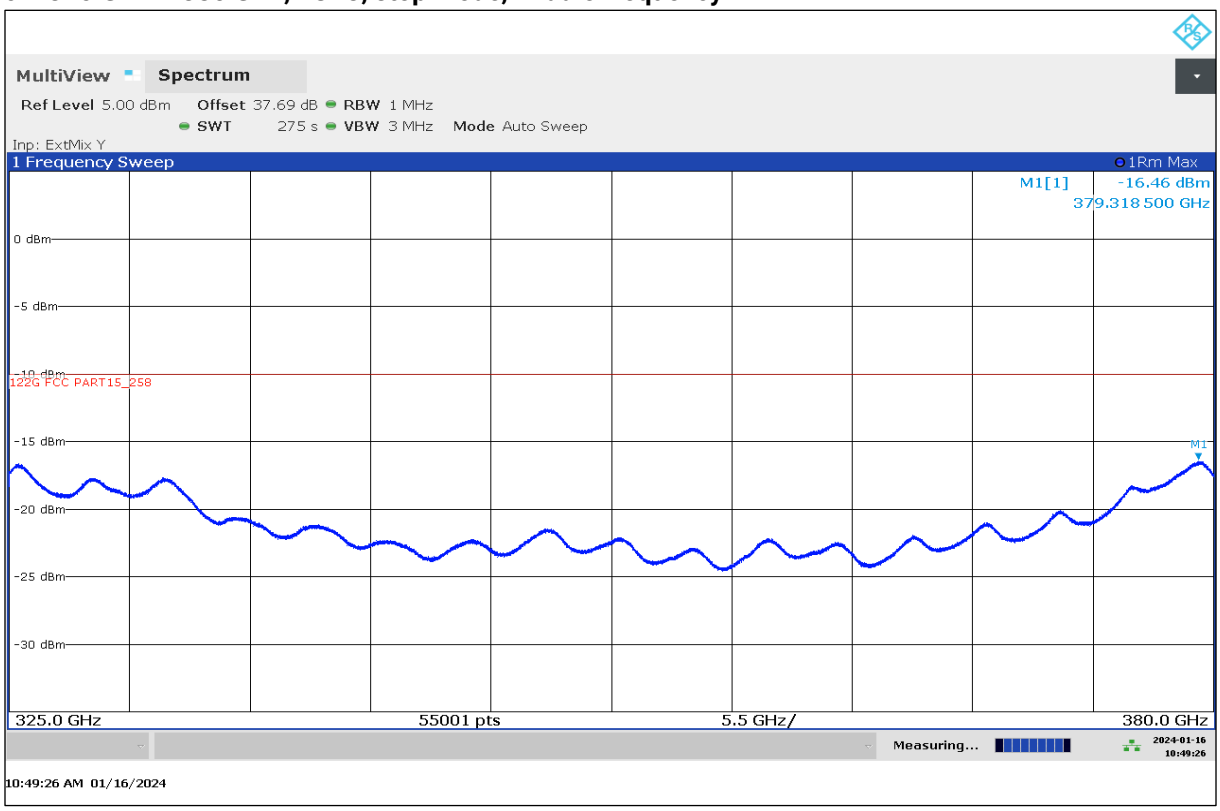
Plot 62: 325 GHz – 380 GHz, EUT1, normal mode



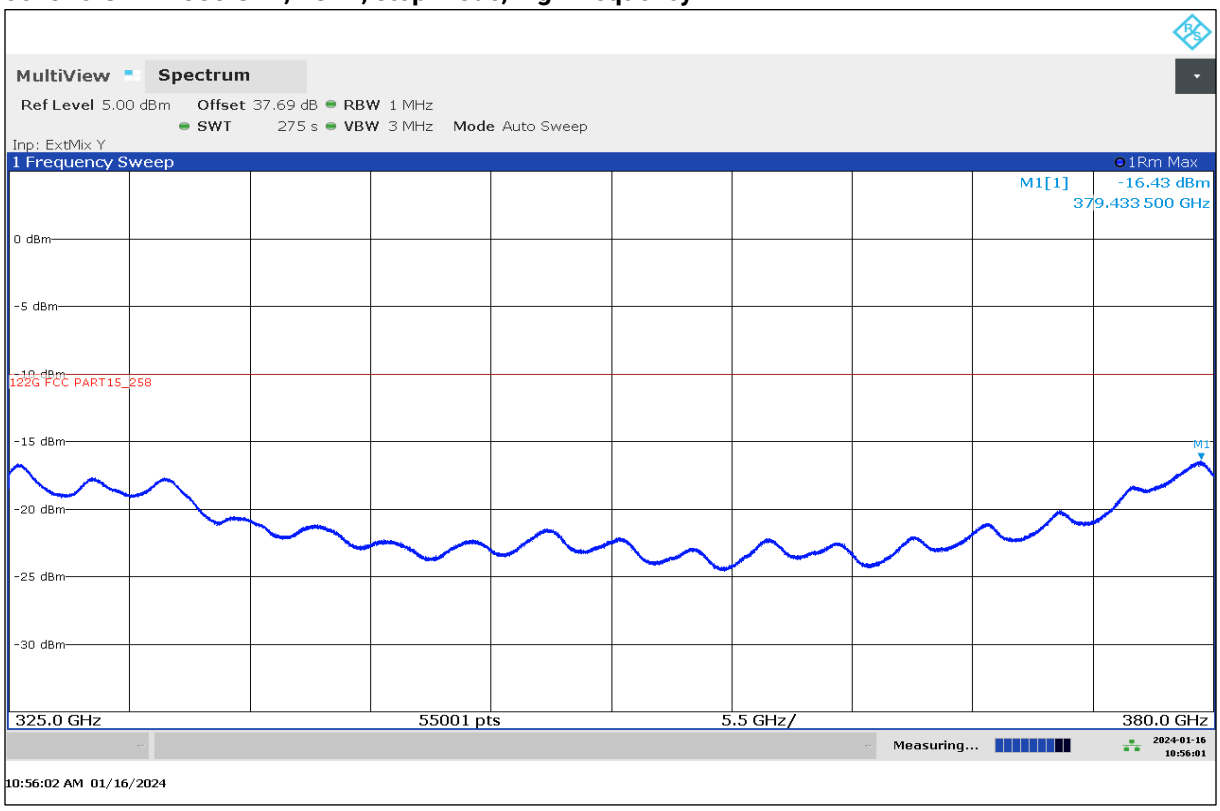
Plot 63: 325 GHz – 380 GHz, EUT2, stop mode, low frequency



Plot 64: 325 GHz – 380 GHz, EUT3, stop mode, middle frequency



Plot 65: 325 GHz – 380 GHz, EUT4, stop mode, high frequency



12.4 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.

§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.

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

Measurement:

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

Note:

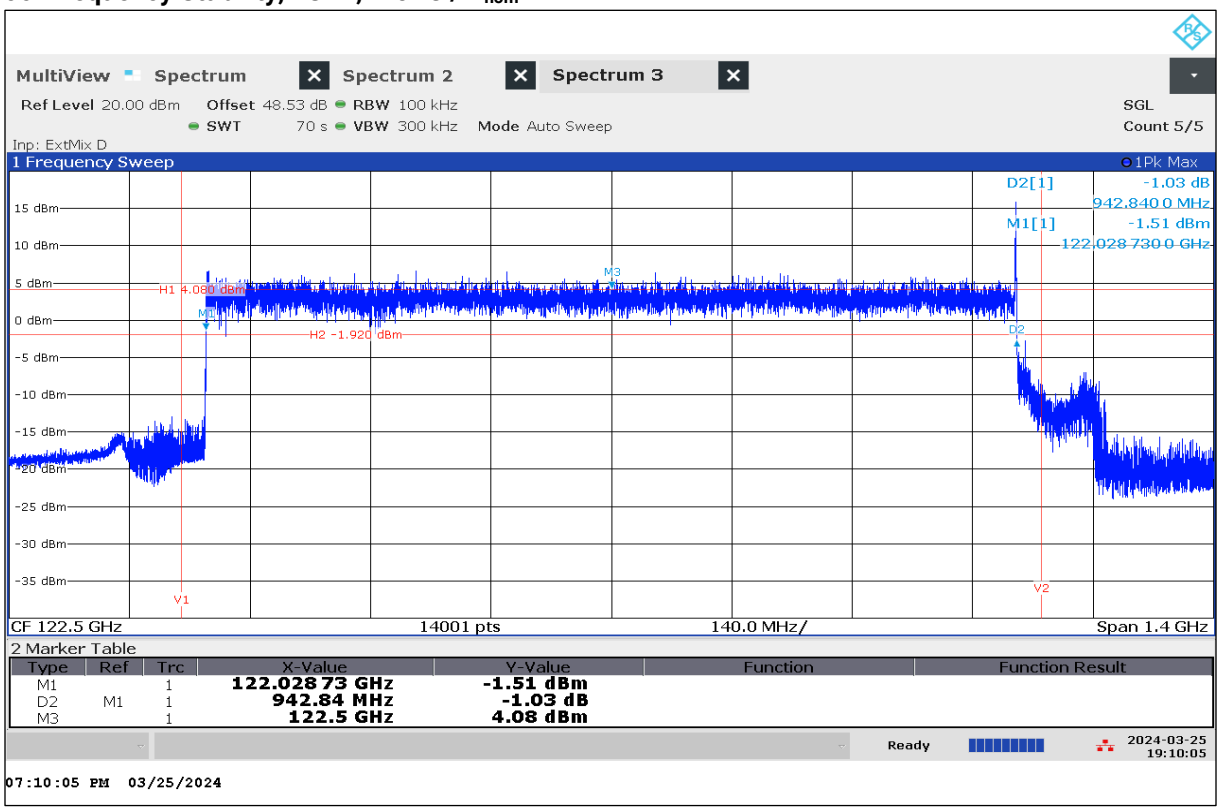
- The 99% bandwidth is used to demonstrate the frequency stability

Measurement results:

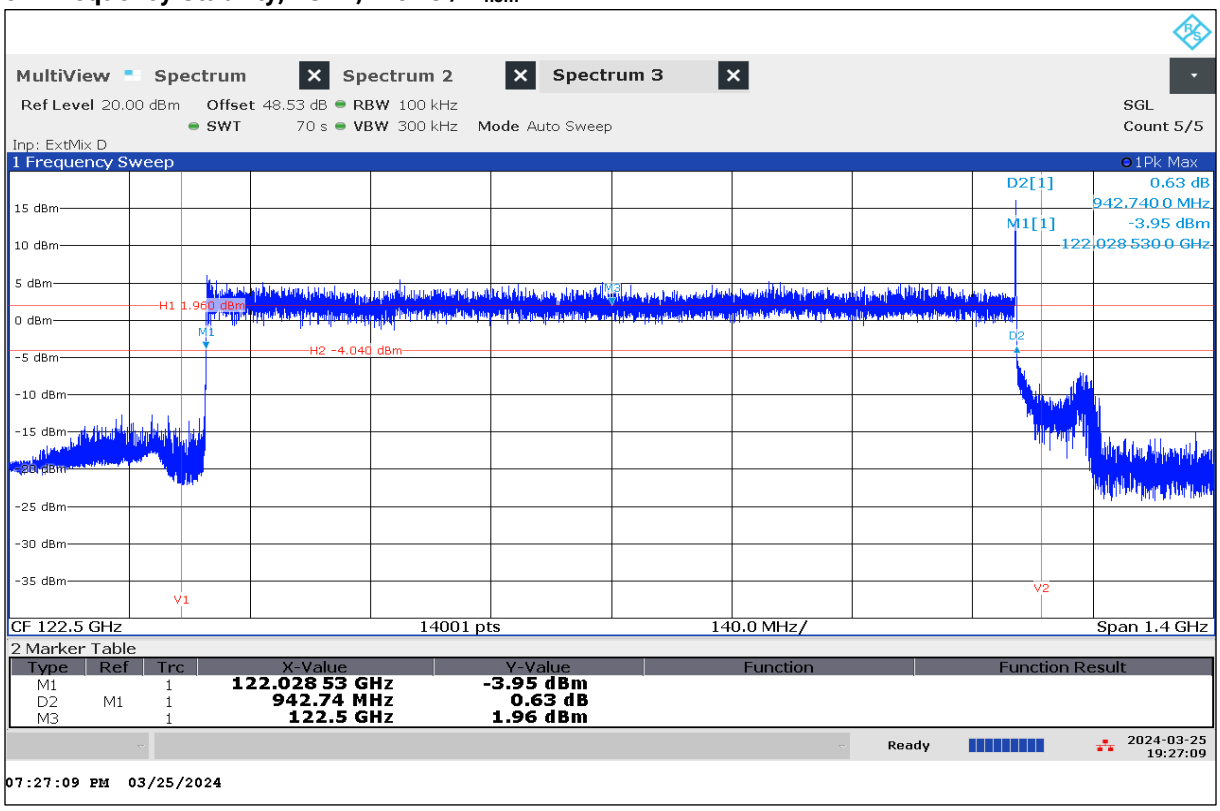
Test condition	Frequency f_L [GHz]	Frequency f_H [GHz]	Bandwidth [MHz]
-20 °C / V_{nom}	122.028 730	122.971 570	942.84
-10 °C / V_{nom}	122.028 530	122.971 270	942.74
0 °C / V_{nom}	122.028 430	122.971 370	942.94
10 °C / V_{nom}	122.028 530	122.971 170	942.64
20 °C / V_{nom}	122.028 630	122.970 970	942.34
20 °C / V_{min}	122.028 630	122.971 070	942.44
20 °C / V_{max}	122.028 630	122.971 170	942.54
30 °C / V_{nom}	122.028 530	122.971 170	942.64
40 °C / V_{nom}	122.028 530	122.970 970	942.44
50 °C / V_{nom}	122.028 630	122.970 970	942.34

Verdict: Compliant

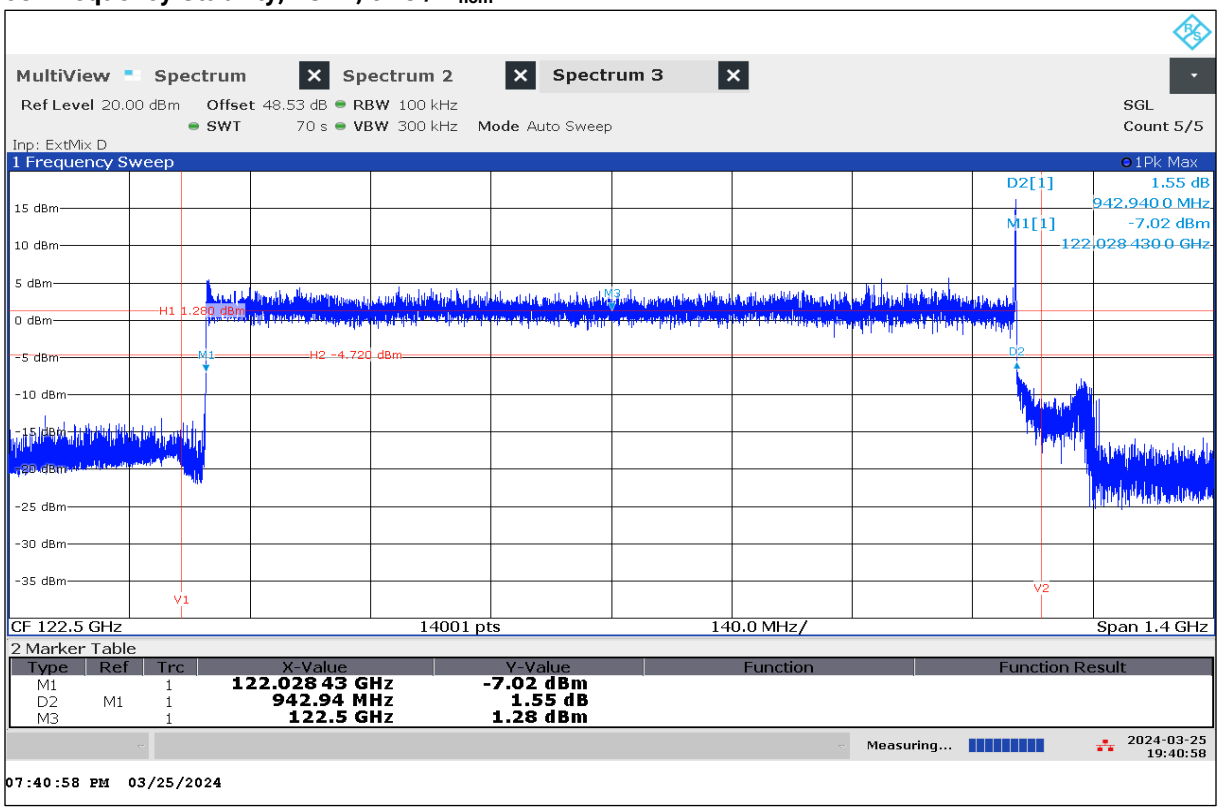
Plot 66: Frequency Stability, EUT1, -20 °C / V_{nom}



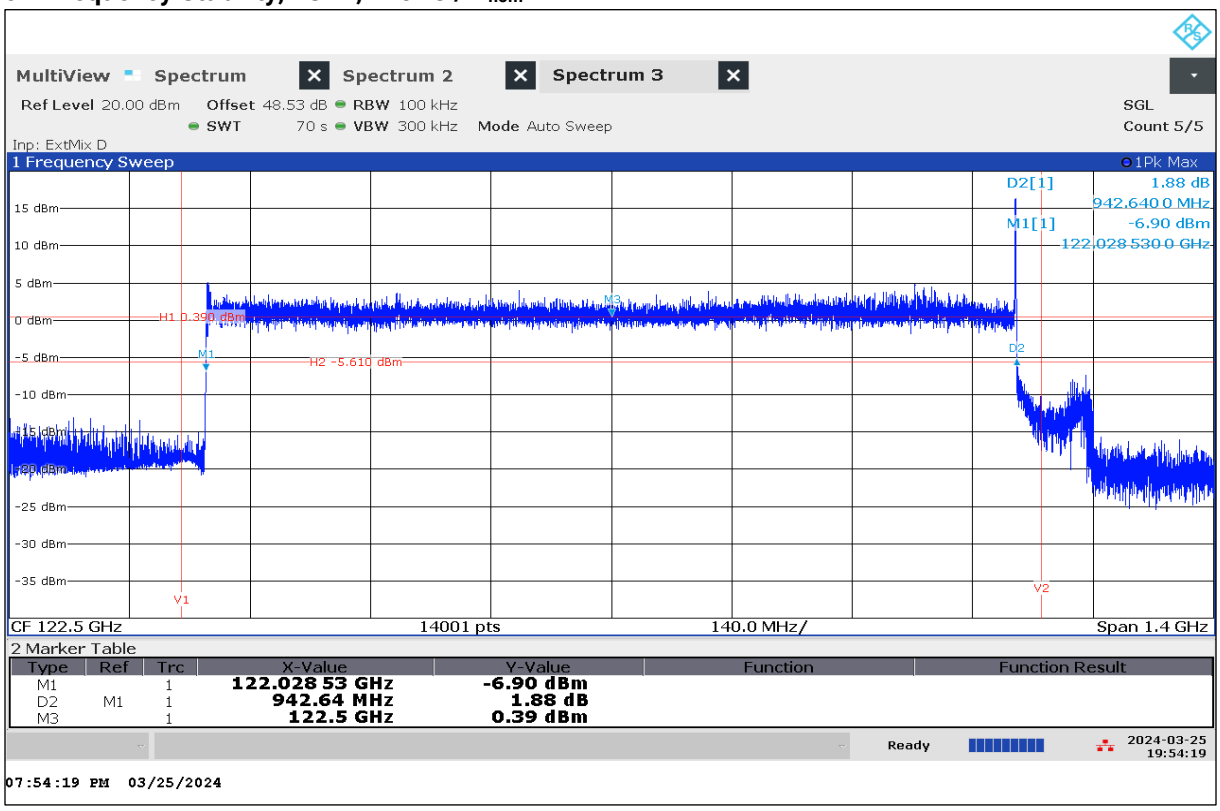
Plot 67: Frequency Stability, EUT1, -10 °C / V_{nom}



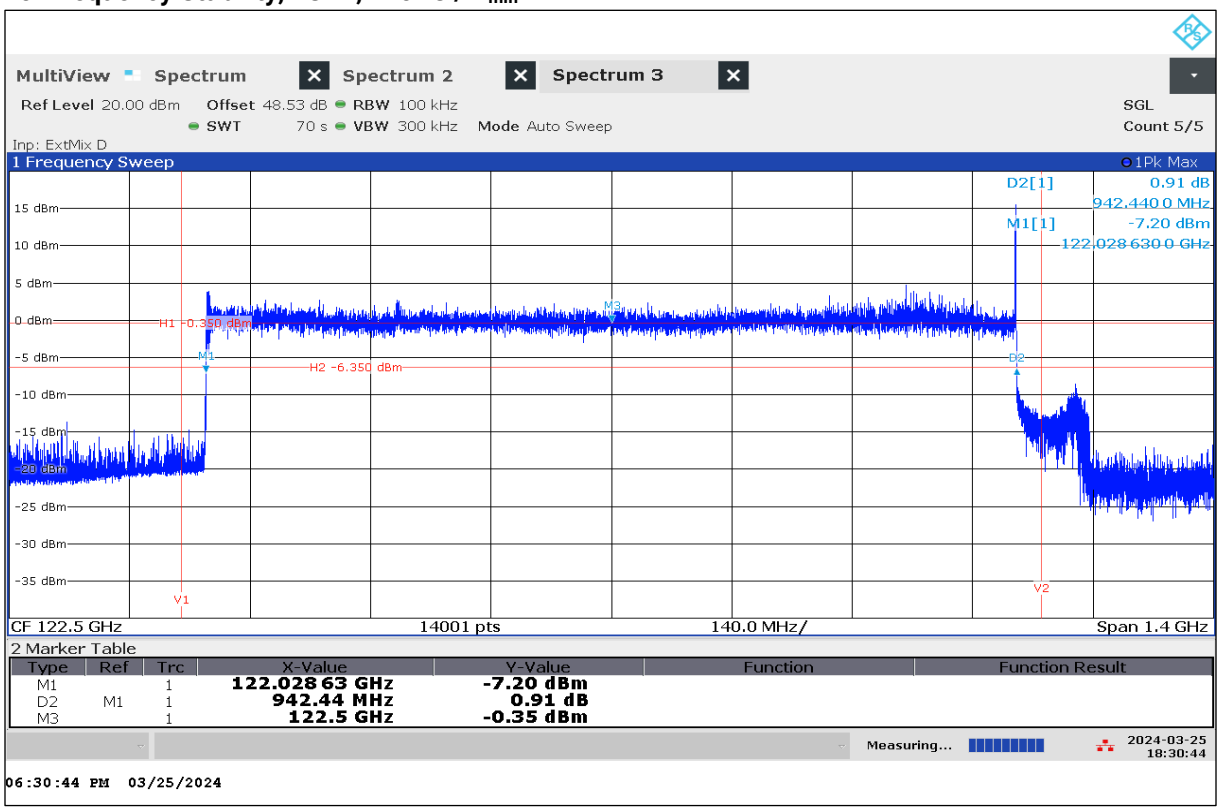
Plot 68: Frequency Stability, EUT1, 0 °C / V_{nom}



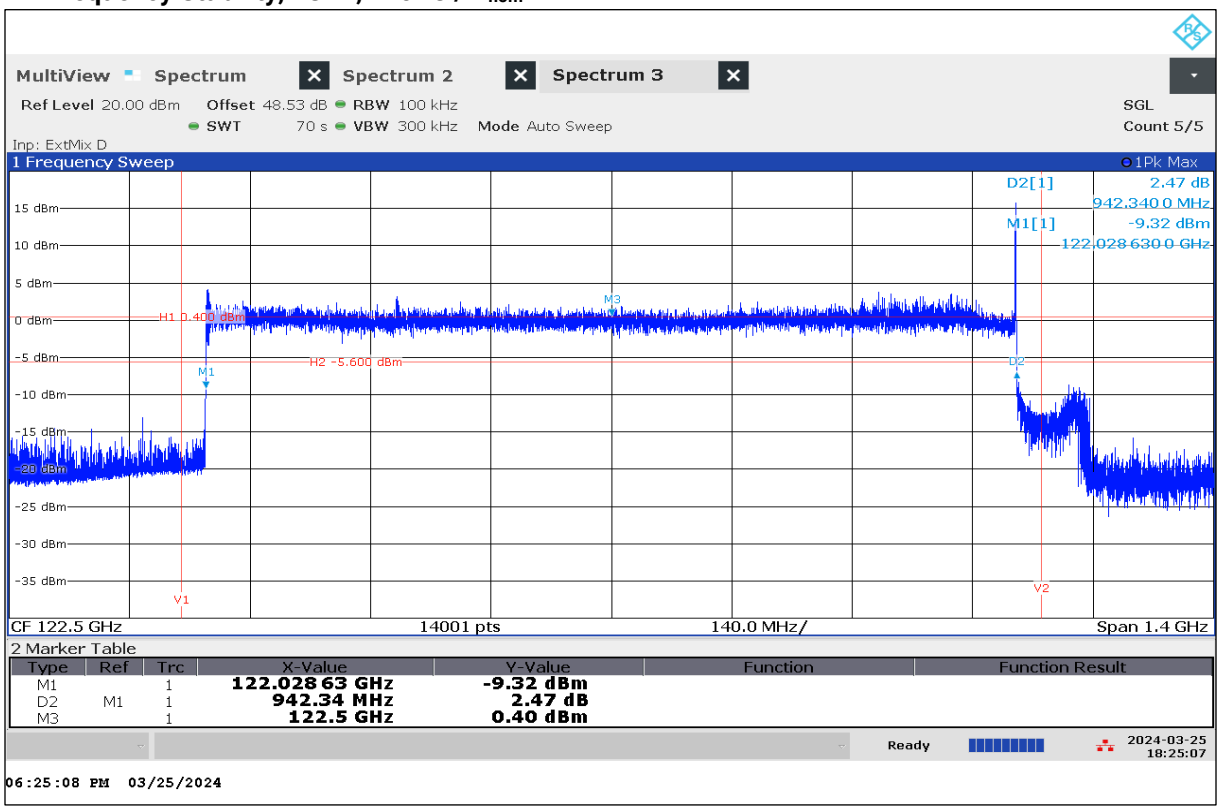
Plot 69: Frequency Stability, EUT1, +10 °C / V_{nom}



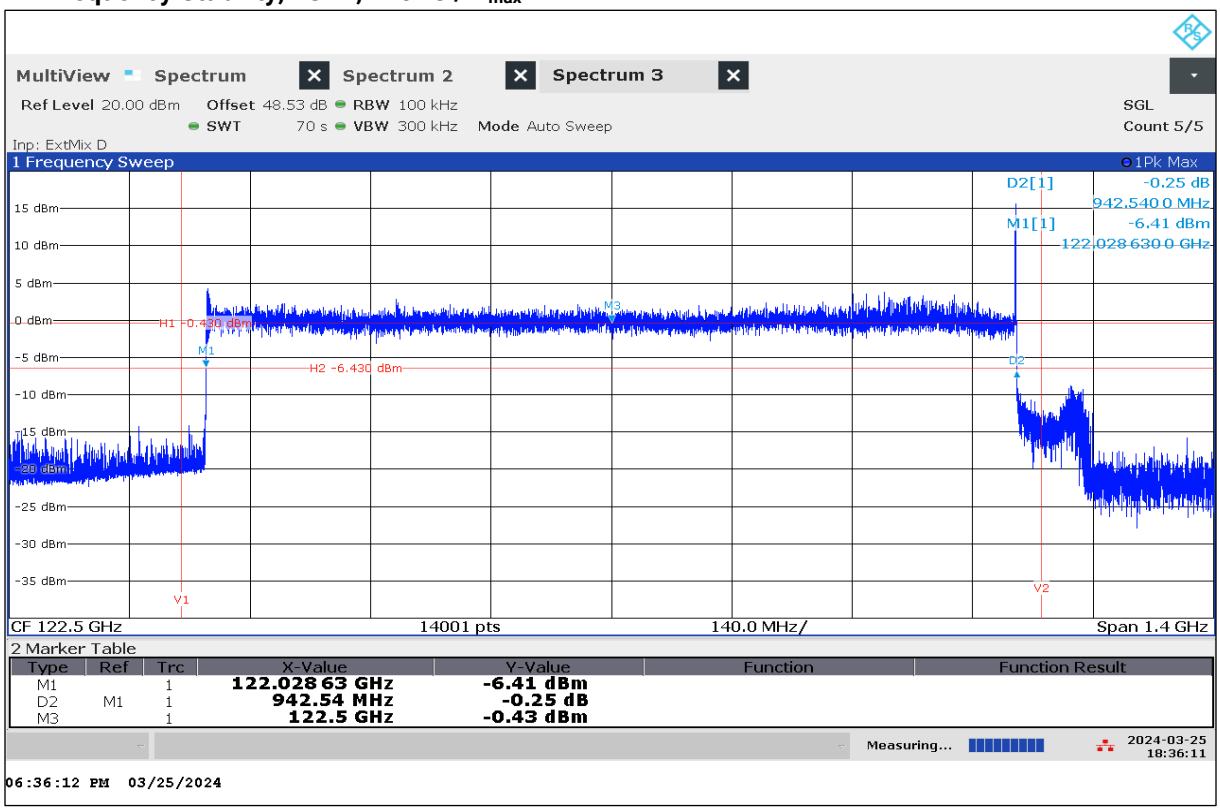
Plot 70: Frequency Stability, EUT1, +20 °C / V_{min}



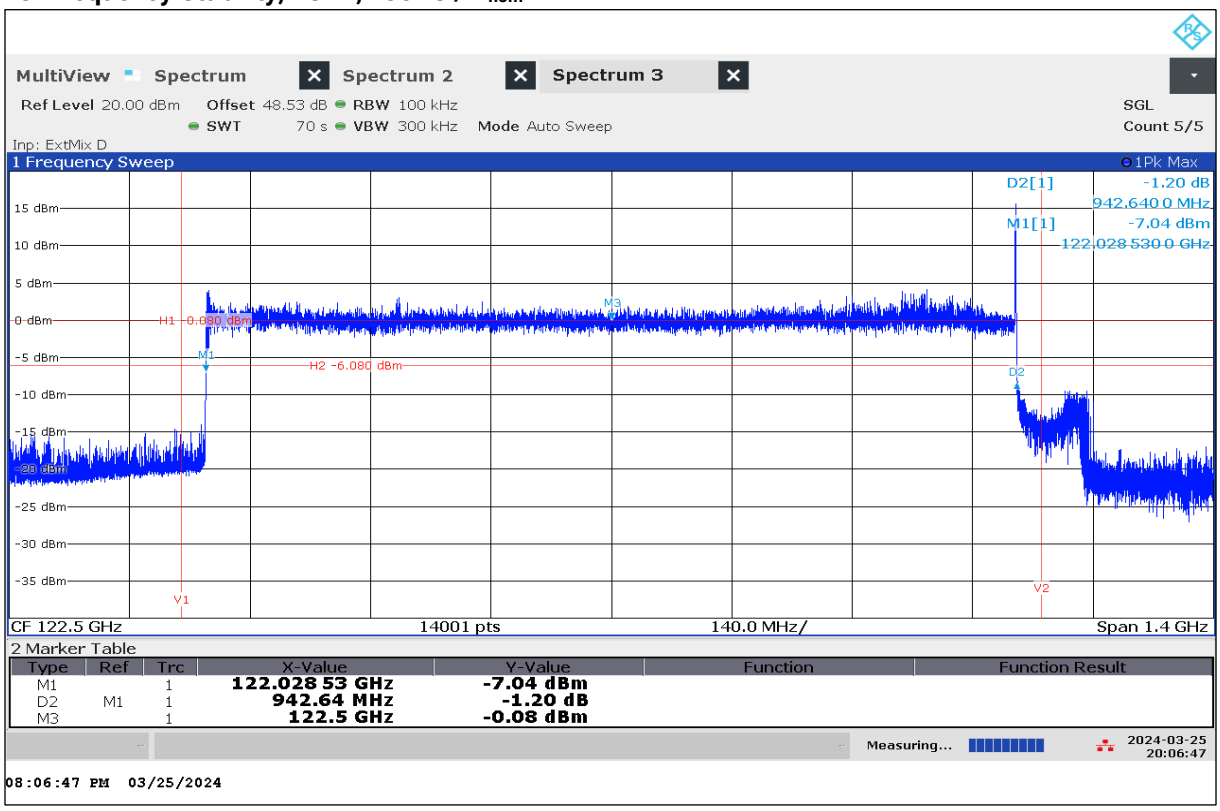
Plot 71: Frequency Stability, EUT1, +20 °C / V_{nom}



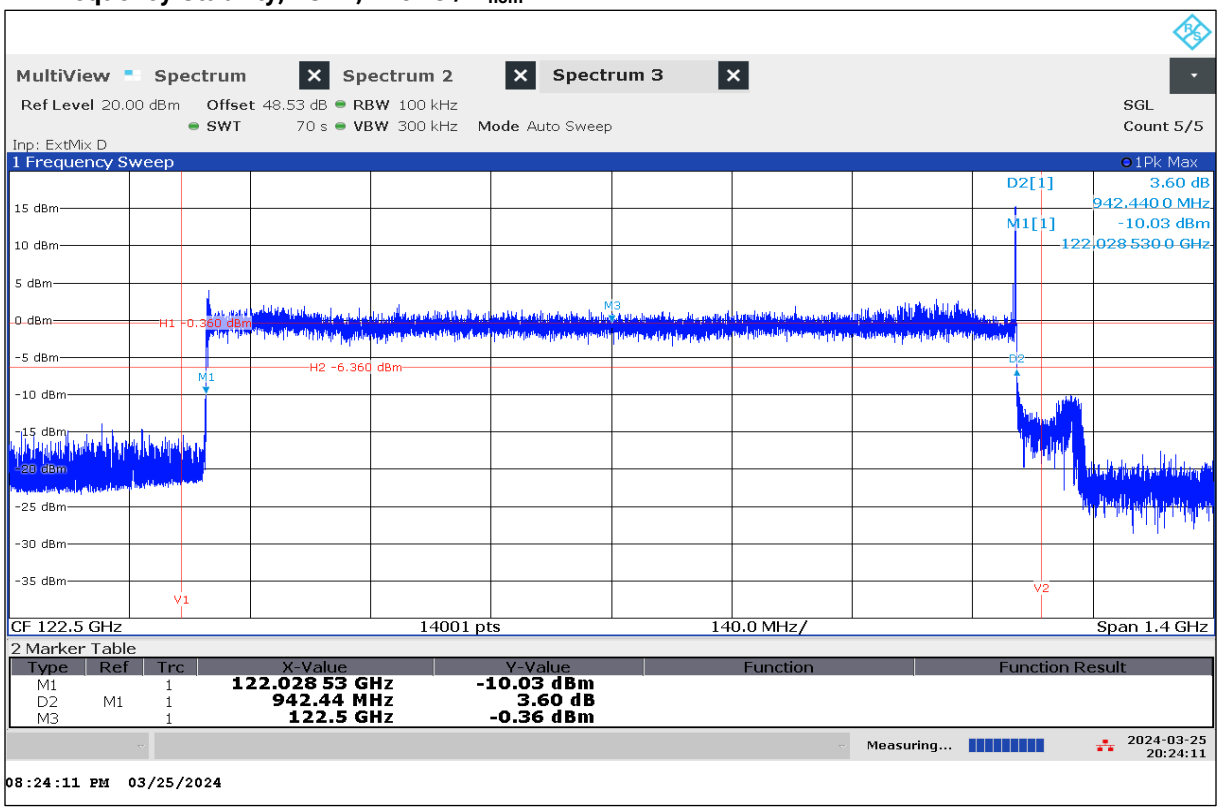
Plot 72: Frequency Stability, EUT1, +20 °C / V_{max}



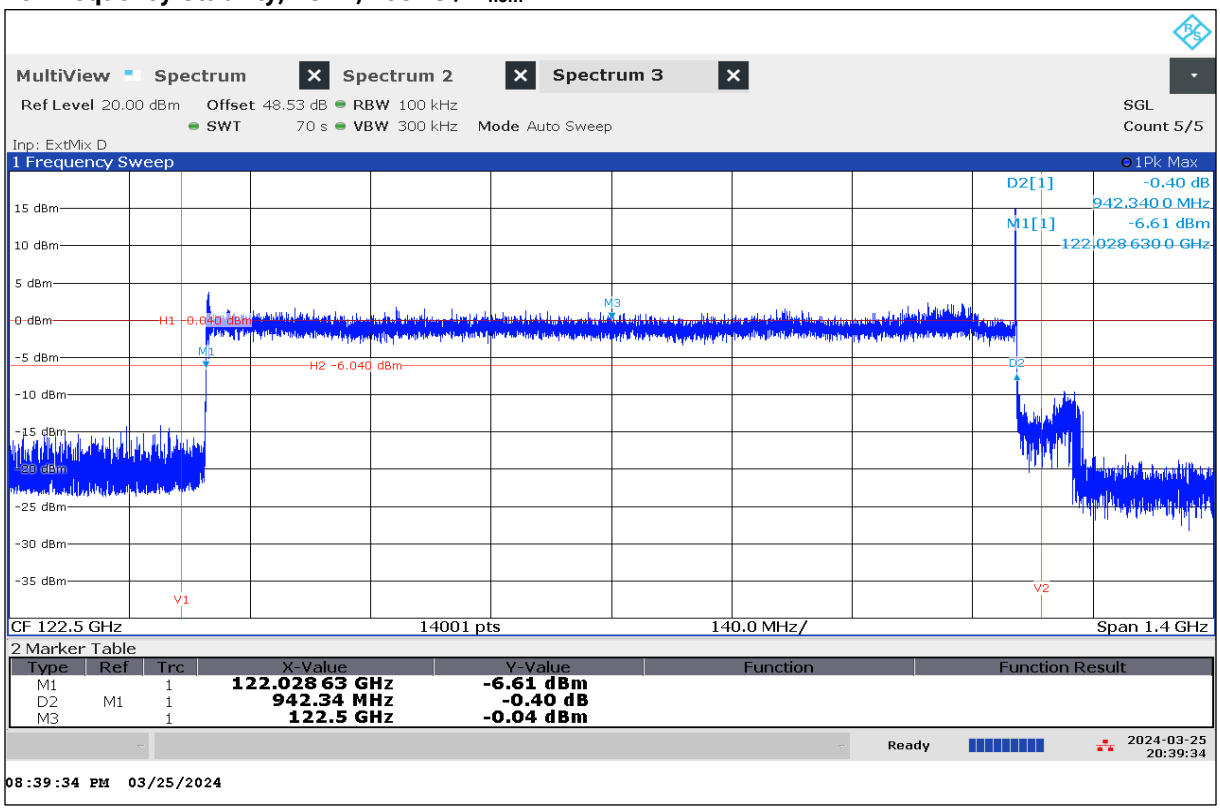
Plot 73: Frequency Stability, EUT1, +30 °C / V_{nom}



Plot 74: Frequency Stability, EUT1, +40 °C / V_{nom}



Plot 75: Frequency Stability, EUT1, +50 °C / V_{nom}



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 - DRAFT	2024-02-20
-/-	6.1 General description (Updated)	2025-06-05

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