

TEST REPORT

Test report no.: 1-9946-25-01-04_TR1-R01



Deutsche
Akkreditierungsstelle
D-PL-12047-01-00

Testing laboratory

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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

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Peter-Dornier-Str. 10

88131 Lindau / GERMANY

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Manufacturer

ADC Automotive Distance Control Systems GmbH

Peter-Dornier-Str. 10

88131 Lindau / GERMANY

Test standard/s

FCC - Title 47 CFR Part 95 FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 95 - Personal Radio Services

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

Test Item

Kind of test item: **SRD for RTTT and other vehicle or fixed installation**
Model name: **ARS6-B**
FCC ID: **OAYARS6B**
Frequency: 76.5 GHz band (76 GHz – 77 GHz)
 79.0 GHz band (77 GHz – 81 GHz)
Technology tested: FMCW
Antenna: Integrated antenna
Power supply: 6.5 V to 19.0 V DC by external power supply
Temperature range: -40 °C to 85 °C

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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:	2025-06-11
Date of receipt of test item:	2025-10-07
Start of test:*	2025-10-10
End of test:*	2025-10-27
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 Involved test locations

Saarbruecken lab		Essen lab	
☒	Untertuerkheimer Str. 6-10 66117 Saarbruecken Germany	☐	Im Teelbruch 116 45219 Essen Germany

2.4 Test laboratories sub-contracted

None

2.5 Laboratory listings and recognitions

	Saarbruecken	Essen
FCC	DE0002	DE0003
ISED	DE0001 3462C	DE0001 3462D

3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 95	-/-	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 95 - Personal Radio Services

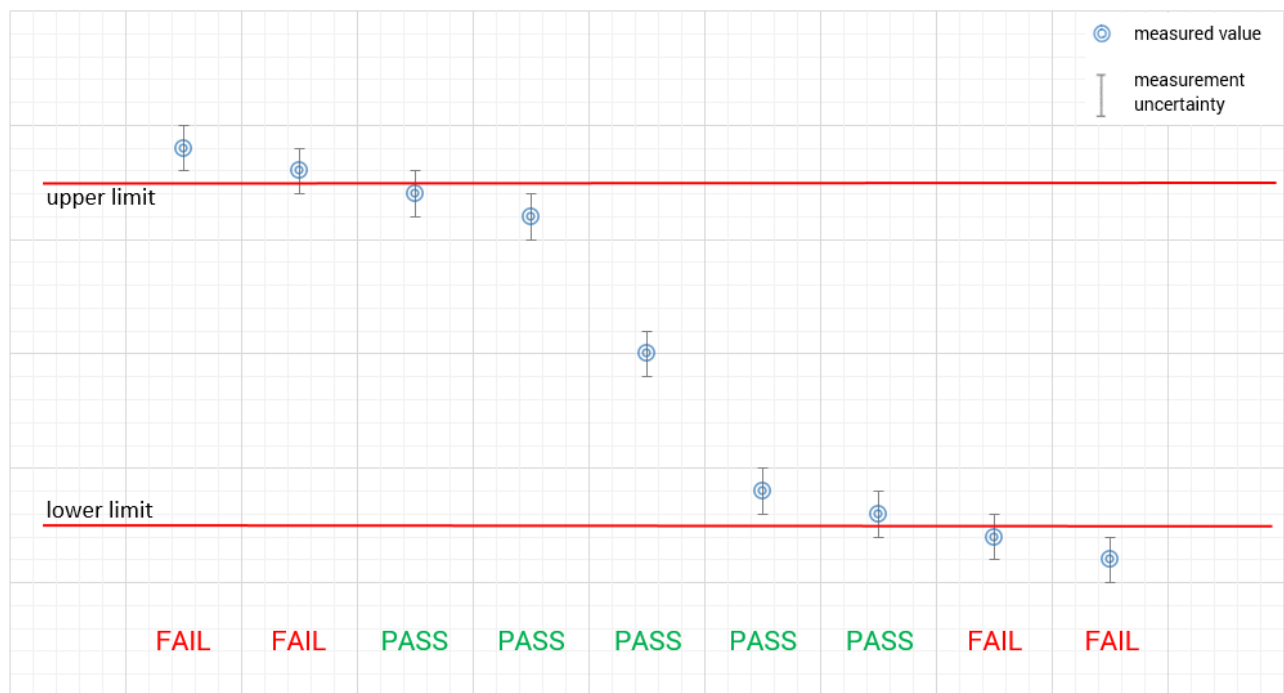
Guidance	Version	Description
ANSI C63.26-2015	-/-	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
76-81 GHz Radars KDB	v01r02	653005 D01 76-81 GHz Radars v01r02: EQUIPMENT AUTHORIZATION GUIDANCE FOR 76-81 GHz RADAR DEVICES

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.

measured value, measurement uncertainty, verdict



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	:		40-60 %
Barometric pressure	:		990 hPa to 1010 hPa
Power supply	:	V_{nom} V_{max} V_{min}	12.0 V DC by external power supply 13.8 V DC by external power supply ($1.15 * V_{nom}$) 10.2 V DC by external power supply ($0.85 * V_{nom}$)

6 Test item

6.1 General description

Kind of test item	:	SRD for RTTT and other vehicle or fixed installation
Model name	:	ARS6-B
S/N serial number	:	DUT24 SN: AAA27437000000022550500024 DUT25 SN: AAA27437000000022550500032
Hardware status	:	Version B1.0
Software status	:	Version 195.230.107
Frequency band	:	76.5 GHz band (76 GHz – 77 GHz) 79.0 GHz band (77 GHz – 81 GHz)
Type of radio transmission	:	Modulated carrier
Use of frequency spectrum	:	
Type of modulation	:	FMCW
Number of modes	:	76.5 GHz band: 5 modes 79.0 GHz band: 4 modes
Antenna	:	Integrated antenna
Power supply	:	6.5 V to 19.0 V DC by external 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:

- 1-9946-25-01-01_TR1-A101-R01 (External photographs of EUT)
- 1-9946-25-01-01_TR1-A102-R01 (Internal photographs of EUT, provided by customer)
- 1-9946-25-01-01_TR1-A103-R01 (Test set-up photographs)
- Note: The referenced photos show EUT delivered by the customer in this project, not necessarily the exact one used for the specific tests. EUT identification shown in the photos may differ.

Additional measurement reports – 76.5 GHz band (76 GHz – 77 GHz):

- 1-9946-25-01-02_TR1-A202-R01 (Occupied Bandwidth - DUT24 - Modes 01, 02, 03, 04, 78)
- 1-9946-25-01-02_TR1-A204-R01 (Average Power (EIRP) FCC/ISED - DUT24 - Modes 01, 02, 03, 04, 78)
- 1-9946-25-01-02_TR1-A205-R01 (Radiated Peak Power (EIRP) - DUT24 - Tnom/Vnom - Modes 01, 02, 03, 04, 78)

Additional measurement reports – 79 GHz band (77 GHz – 81 GHz):

- 1-9946-25-01-03_TR1-A202-R01 (Occupied Bandwidth - DUT24 - Modes 17c0, 17c1, 18c0, 18c1)
- 1-9946-25-01-03_TR1-A204-R01 (Average Power (EIRP) FCC/ISED - DUT24 - Modes 17c0, 17c1, 18c0, 18c1)
- 1-9946-25-01-03_TR1-A205-R01 (Radiated Peak Power (EIRP) - DUT24 - Tnom/Vnom - Modes 17c0, 17c1, 18c0, 18c1)

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).

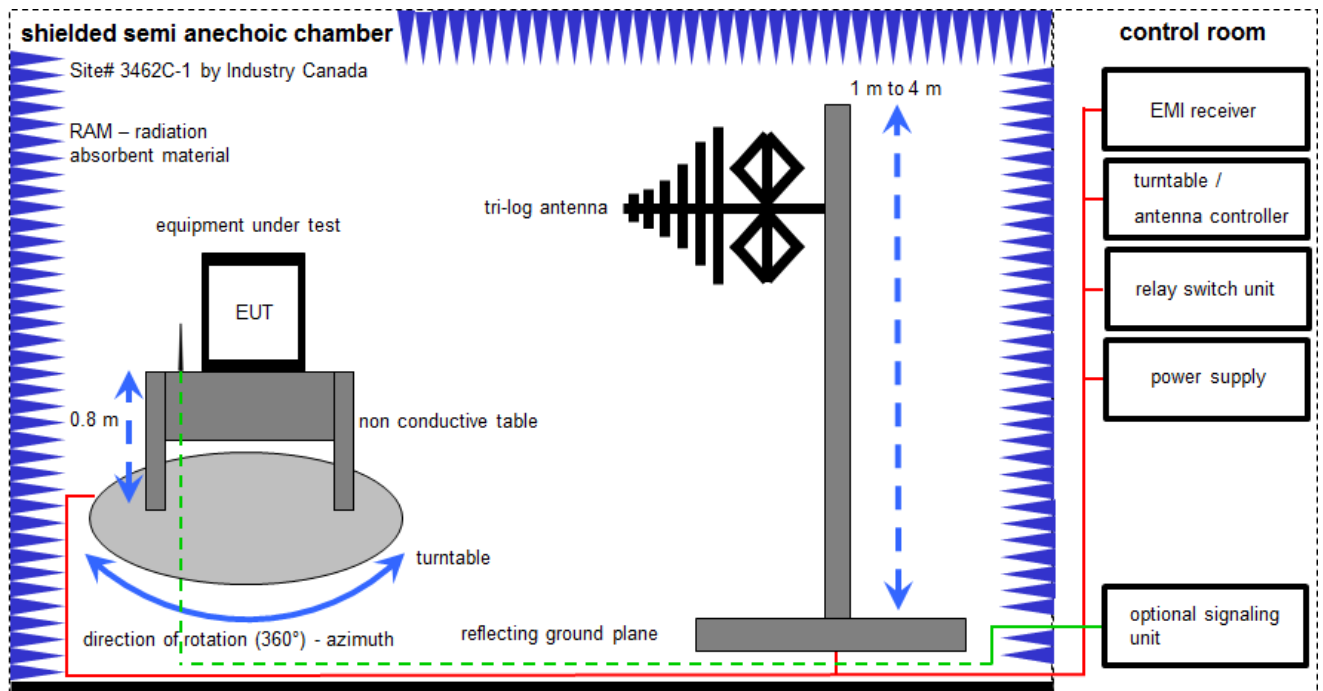
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k/cal	calibration / calibrated	EK	limited calibration
Ne/cnn	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
Ev/chk	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress
cpu	check prior usage		

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)

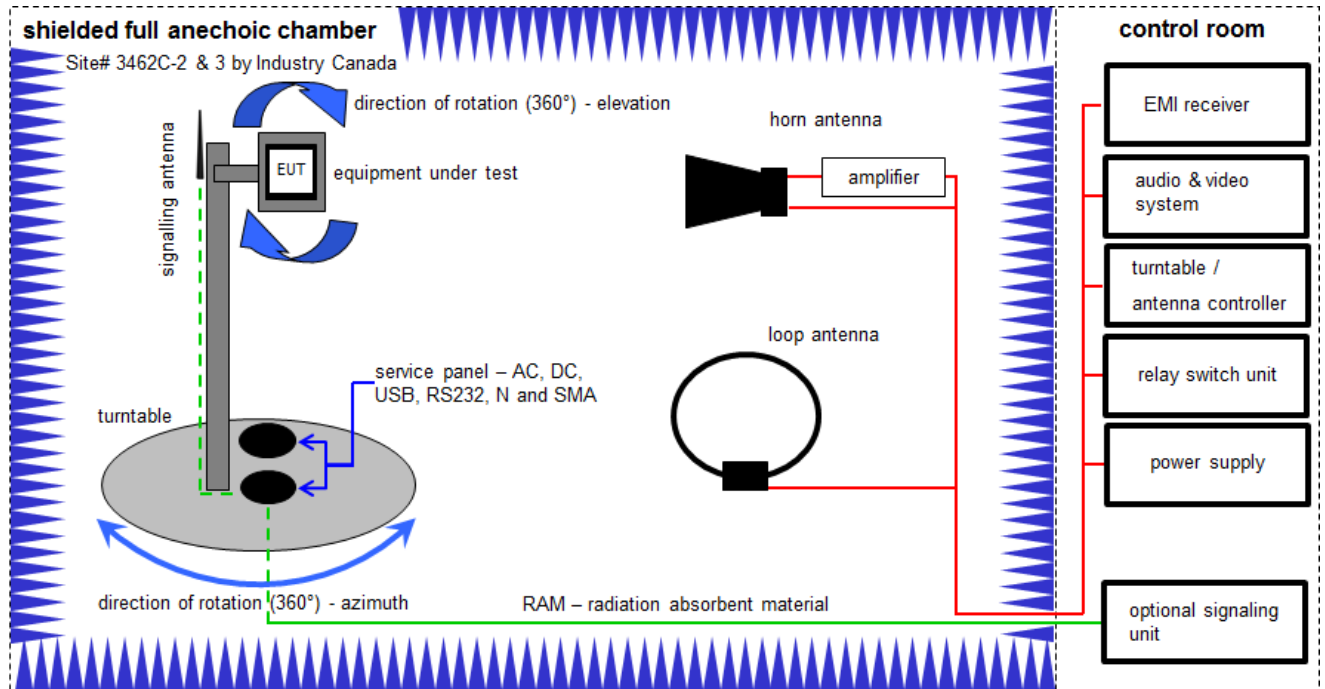
Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m) @ distance$$

Equipment table:

No.	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	Semi anechoic chamber	Semi anechoic chamber 3000023	MWB AG	*	300000551	cnn	-/-	-/-
2	TRILOG Broadband Antenna	TRILOG Broadband Antenna VULB9163	Schwarzbeck Mess-Elektronik OHG / Schönau	371	300003854	cal	11.07.2024	11.07.2026
3	Turntable	Turntable 2089-4.0	EMCO Elektronik GmbH / Gilching	*	300004394	cnn	-/-	-/-
4	Switch-Unit	Switch-Unit 3488A	Hewlett Packard	2719A14505	300000368	cpu	-/-	-/-
5	Power Supply	Power Supply 6032A	Hewlett Packard	2920A04466	300000580	cnn	-/-	-/-
6	Antenna Tower	Antenna Tower 2175	ETS-Lindgren GmbH / Taufkirchen	64762	300003745	cnn	-/-	-/-
7	Positioning Controller	Positioning Controller 2090	ETS-Lindgren GmbH / Taufkirchen	64672	300003746	cnn	-/-	-/-
8	TRILOG Broadband Antenna	TRILOG Broadband Antenna VULB9163	Schwarzbeck Mess-Elektronik OHG / Schönau	318	300003696	cal	31.01.2024	31.01.2026
9	EMI Test Receiver	EMI Test Receiver ESR3 9kHz-3.6GHz	Rohde & Schwarz Messgerätebau GmbH / Memmingen	102587	300005771	cal	05.12.2024	05.12.2025

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:

$$FS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} (71.61 \mu\text{V/m}) @ \text{ distance}$$

$$OP = AV + D - G + CA$$

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

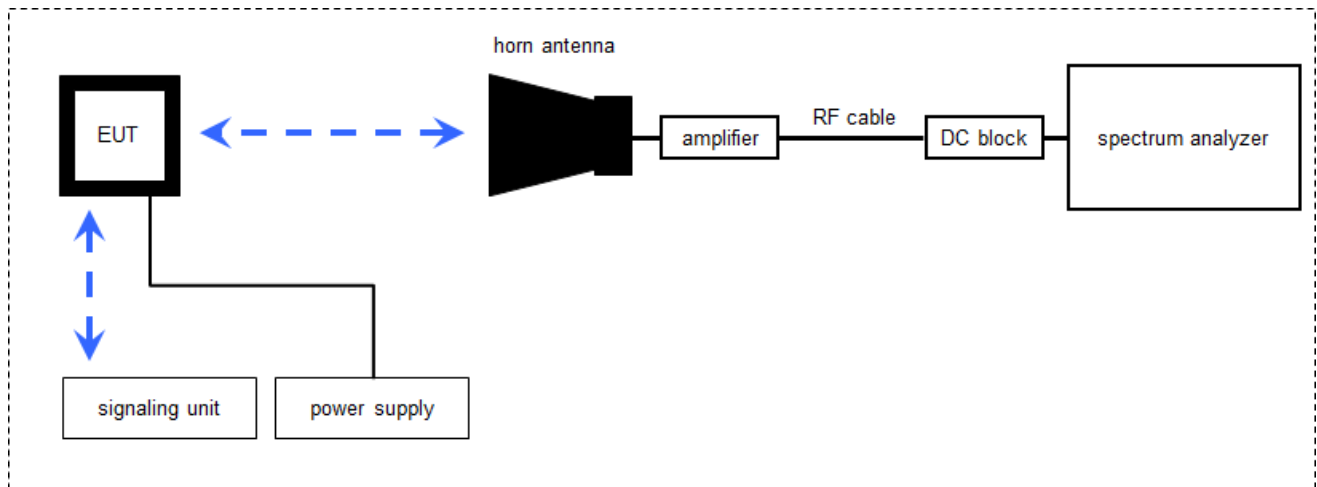
Example calculation:

$$OP \text{ [dBm]} = -65.0 \text{ [dBm]} + 50 \text{ [dB]} - 20 \text{ [dBi]} + 5 \text{ [dB]} = -30 \text{ [dBm]} (1 \mu\text{W})$$

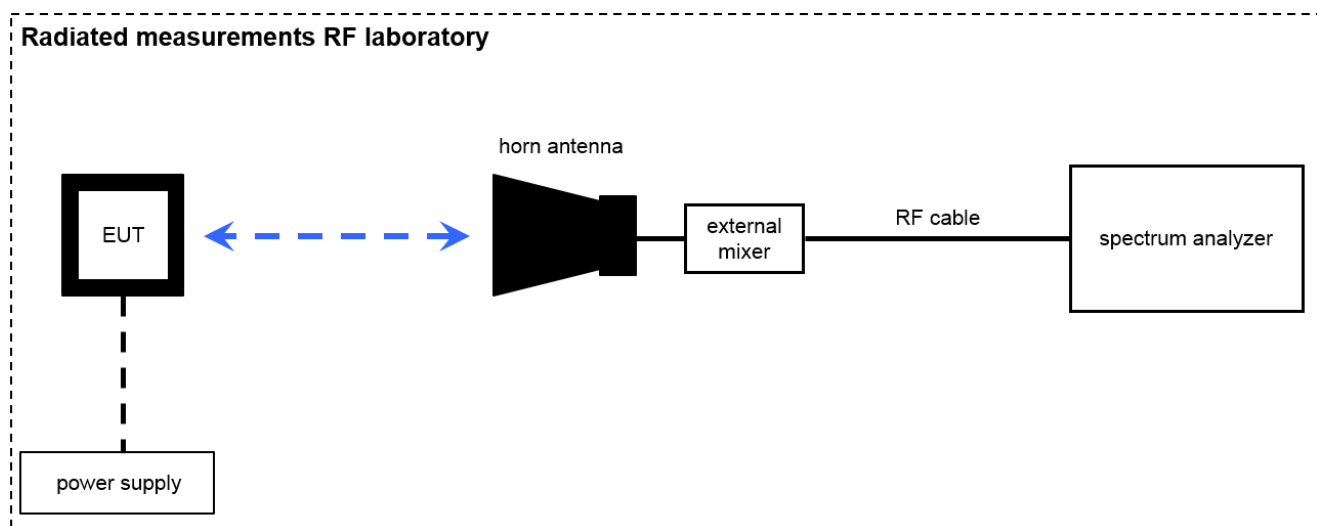
Equipment table:

No.	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	Double-Ridged Waveguide Horn Antenna	Double-Ridged Waveguide Horn Antenna 3115	EMCO Elektronik GmbH / Gilching	9107-3696	300001604	cal	15.04.2025	15.04.2027
2	Anechoic chamber	Anechoic chamber FAC 3/5m	MWB / TDK	87400/02	300000996	cpu	-/-	-/-
3	Switch / Control Unit	Switch / Control Unit 3488A	Hewlett Packard	*	300000199	cnn	-/-	-/-
4	Highpass Filter	Highpass Filter WHKX7.0/18G-8SS	Wainwright Instruments GmbH / Andechs	19	300003790	cnn	-/-	-/-
5	Broadband Amplifier 0.5-18 GHz	Broadband Amplifier 0.5-18 GHz CBLU5184540	CERNEX	22049	300004481	cpu	-/-	-/-
6	4U RF Switch Platform	4U RF Switch Platform L4491A	Agilent Technologies Deutschland GmbH / Böblingen	MY50000037	300004509	cnn	-/-	-/-
7	NEXIO EMV-Software	NEXIO EMV-Software BAT EMC V2022.0.32.0	Nexio	*	300004682	cnn	-/-	-/-
8	RF-Amplifier	RF-Amplifier AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	cpu	-/-	-/-
9	Active Loop Antenna	Active Loop Antenna 6502	EMCO Elektronik GmbH / Gilching	2210	300001015	cal	07.07.2025	07.07.2027
10	EMI Test Receiver	EMI Test Receiver ESU26	Rohde & Schwarz Messgerätebau GmbH / Memmingen	100037	300003555	cal	10.12.2024	10.12.2025

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:

$$FS [dB\mu V/m] = 40.0 [dB\mu V] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB\mu V/m] (6.79 \mu V/m) @ distance$$

$$OP = AV + D - G + CA$$

(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:

$$OP [dBm] = -59.0 [dBm] + 44.0 [dB] - 20.0 [dB] + 5.0 [dB] = -30 [dBm] (1 \mu W)$$

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

Equipment table:

No.	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	Temperature Test Chamber	Temperature Test Chamber T-40/50	CTS Clima Temperatur Systeme GmbH / Hechingen	064023	300003540	calchk	11.07.2024	11.07.2026
2	Low Noise Amplifier, Broadband 18-50 GHz	Low Noise Amplifier, Broadband 18-50 GHz BZT-18005000- 550835-SL2525-SL	B&Z Technologies	27888-27890	300006364	cpu	-/-	-/-
3	Std. Gain Horn Antenna 49.9-75.8 GHz	Std. Gain Horn Antenna 49.9-75.8 GHz 2524-20	Flann	*	300001983	cnn	-/-	-/-
4	Std. Gain Horn Antenna 114-173 GHz	Std. Gain Horn Antenna 114-173 GHz 2924-20	Flann	*	300001999	cnn	-/-	-/-
5	Std. Gain Horn Antenna 145-220 GHz	Std. Gain Horn Antenna 145-220 GHz 3024-20	Flann	*	300002000	cnn	-/-	-/-
6	Std. Gain Horn Antenna 33.0-50.1 GHz	Std. Gain Horn Antenna 33.0-50.1 GHz 2324-20	Flann	57	400000683	cnn	-/-	-/-
7	Std. Gain Horn Antenna 217-330 GHz	Std. Gain Horn Antenna 217-330 GHz 32240-20	Flann	233278	300004960	cnn	-/-	-/-
8	Std. Gain Horn Antenna 73.8-112 GHz	Std. Gain Horn Antenna 73.8-112 GHz 2724-20	Flann	*	300001988	cnn	-/-	-/-
9	Horn Antenna 18,0- 40,0 GHz	Horn Antenna 18,0- 40,0 GHz LHA180	Microw.Devel	39180-103-021	300001747	cal	24.01.2024	31.01.2026
10	Harmonic Mixer 3- Port, 110-170 GHz	Harmonic Mixer 3- Port, 110-170 GHz FS- Z170	Radiometer Physics GmbH	100014	300004156	cal	15.07.2025	15.07.2026
11	Harmonic Mixer 3- Port, 140-220 GHz	Harmonic Mixer 3- Port, 140-220 GHz SAM-220	Radiometer Physics GmbH	200001	300004157	cal	06.08.2025	06.08.2026
12	Harmonic Mixer 3- Port, 220-325 GHz	Harmonic Mixer 3- Port, 220-325 GHz SAM-325	Radiometer Physics GmbH	100002	300004158	cal	11.07.2025	11.07.2026
13	Std. Gain Horn Antenna 60-90 GHz	Std. Gain Horn Antenna 60-90 GHz COR 60_90	Thomson CSF	*	300000814	cpu	-/-	-/-
14	Signal- and Spectrum Analyzer 2 Hz - 85 GHz	Signal- and Spectrum Analyzer 2 Hz - 85 GHz FSW85	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101333	300005568	cal	28.08.2025	28.08.2026
15	Signal- and Spectrum Analyzer 2 Hz - 50 GHz	Signal- and Spectrum Analyzer 2 Hz - 50 GHz FSW50	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101560	300006179	cal	27.12.2024	27.12.2025
16	Harmonic Mixer 3- Port, 60-90 GHz	Harmonic Mixer 3- Port, 60-90 GHz FS- Z90	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101555	300004691	cal	01.09.2025	01.09.2026
17	Harmonic Mixer 3- Port, 75-110 GHz	Harmonic Mixer 3- Port, 75-110 GHz FS- Z110	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101411	300004959	cal	01.09.2025	01.09.2026
18	Harmonic Mixer 3- Port, 50-75 GHz	Harmonic Mixer 3- Port, 50-75 GHz FS- Z75	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101578	300005788	cal	11.03.2025	11.03.2026
19	Harmonic Mixer 3- port, 60-90 GHz	Harmonic Mixer 3- port, 60-90 GHz FS- Z90	Rohde & Schwarz Messgerätebau GmbH / Memmingen	102152	300006202	cal	10.03.2025	10.03.2026
20	Power Supply	HMP 2020	Rohde & Schwarz Messgerätebau GmbH / Memmingen	121993	140607641	cal	15.05.2025	15.05.2027

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 $\pm 45^\circ$ 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 ± 3.5 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)	± 3.5 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 boundary consideration for measurements above 18 GHz

Description:

All measurements are made in the far-field of the measurement antenna.

Far-field boundary for mm-wave antennas:

$$d_{\text{far}} = 2 \times D_{\text{dim}}^2 / \lambda$$

with

d_{far} Far-field boundary distance

D_{dim} Antenna dimension

λ wavelength

Fundamental emission measurements (OBW) - far-field boundary:

Antenna frequency range [GHz]	Highest measured frequency [GHz]	D_{dim} [cm]	λ [cm]	d_{far} [cm]
60 - 90	90	2.74	0.33	45.05

Spurious emission measurements - far-field boundary:

Antenna frequency range [GHz]	Highest measured frequency [GHz]	D_{dim} [cm]	λ [cm]	d_{far} [cm]
18 - 26.5	26.5	3.4	1.13	20.44
26.5 - 40	40	2.2	0.75	12.91
40 - 50	50	2.77	0.60	25.58
50 - 75	75	1.85	0.40	17.11
60 - 90	90	2.74	0.33	45.05
75 - 110	110	1.24	0.27	11.28
90 - 140	140	1.02	0.22	9.72
110 - 170	170	0.85	0.18	8.19
140 - 220	220	0.68	0.14	6.78
220 - 325	325	0.43	0.09	4.01
325 - 500	500	0.26	0.06	2.25

11 76.5 GHz band (76 GHz – 77 GHz)

11.1 Summary of measurement results

11.1.1 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	47 CFR Part 95 Subpart M	see below	2025-10-29	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Remark
§2.1046 §95.3367	Radiated power	Nominal	Nominal	☒	☐	☐	☐	complies
§2.1047	Modulation characteristics	-/-	-/-	☒	☐	☐	☐	complies
§2.1049 §2.1055 §95.3379 (b)	Occupied bandwidth / Frequency stability (99% bandwidth)	Nominal Extreme	Nominal Extreme	☒	☐	☐	☐	complies
§2.1051	Spurious emissions at antenna terminals	Nominal	Nominal	☐	☐	☒	☐	see note 2, DUT has integral/internal antenna
§2.1053 §95.3379 (a)	Unwanted emissions (radiated spurious)	Nominal	Nominal	☒	☐	☐	☐	complies

Note:

- 1) NA = Not applicable; NP = Not performed
- 2) ANSI C63.26-2015 5.5.1:
 "...many contemporary portable transmitters utilize integral antennas, precluding access to an antenna output port from which to perform conducted compliance measurements. For these types of transmitters, all of the data necessary to demonstrate compliance must be measured in a radiated test configuration..."

11.2 Additional comments

Reference documents:

- ARS6-B_RF_Test_Input_Doc_v6.1.pdf

Special test descriptions:

- ARS6-B_RF_Test_Input_Doc_v6.1.pdf

Configuration descriptions:

- ARS6-B_RF_Test_Input_Doc_v6.1.pdf

Test devices (EUT):

- DUT24: Normal operation modes, used for general purpose testing
- DUT25: Normal operation modes, used for general purpose testing

Associated equipment (AE):

- AE1: Control Input Display (Used to configure set the EUT mode)
- AE2: Vehicular Gateway (VG-4)

Normal operation modes, as declared by the customer:

Mode ID	Centre frequency [GHz]	Bandwidth [MHz]	Remark
1	76.492	917.7	Operation
2	76.492	912.3	Operation
3	76.492	733.4	Operation
4	76.492	829.9	Operation
78	76.492	816.9	EoL / Service

Details on test mode settings:

According to the customer's instructions, the following steps and commands were used to configure the test modes:

- Connect the EUT and associated equipment to an appropriate power supply
- On the Control Input Display:
 - Enter the mode ID
 - Press the "Set Mode" button
 - Press the "Start" button

11.3 Measurement results

11.3.1 Radiated power

Description:

§95.3367

The fundamental radiated emission limits within the 76-81 GHz band are expressed in terms of Equivalent Isotropically Radiated Power (EIRP) and are as shown below.

Limits and provisions:

FCC §95.3367 (a) (b)

Frequency	Limit (eirp)
76.0 - 81.0 GHz	50 dBm (Average)
76.0 - 81.0 GHz	55 dBm/MHz (PEAK)

Measurement:

Measurement parameter: Average Power	
Detector:	RMS
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

Measurement parameter: Peak Power	
Detector:	Pos-Peak
Resolution bandwidth:	50 MHz
Video bandwidth:	80 MHz
Trace-Mode:	Max Hold

Note: KDB 653005 4.(c)(1)

"Peak power measurements of swept frequency radar implementations (e.g., high sweep rate FMCW) may require a desensitization correction factor to be applied to the measurement results."

→ Peak power measurements are therefore performed using an optimized (usually larger) resolution bandwidth to mitigate issues with desensitization.

Measurement results:

EUT	Mode	Test condition	Radiated Peak Power (EIRP)	Radiated Mean Power (EIRP)
DUT24	01	T_{nom} / V_{nom}	37.66	27.06
DUT24	02	T_{nom} / V_{nom}	37.53	26.99
DUT24	03	T_{nom} / V_{nom}	37.71	27.08
DUT24	04	T_{nom} / V_{nom}	37.88	27.08
DUT24	78	T_{nom} / V_{nom}	31.51	20.88

Note:

- Detailed results of radiated peak power (EIRP) measurements can be found in the additional document **1-9946-25-01-02_TR1-A205-R01**
- Detailed results of radiated mean power (EIRP) measurements can be found in the additional document **1-9946-25-01-02_TR1-A204-R01**

Verdict: Compliant

11.3.2 Modulation characteristics

Description:

§2.1047 (d) *Other types of equipment.* A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

KDB 653005 D01 76-81 GHz Radars v01r02, section 3 (g)

Concerning the Section 2.1047 modulation characteristics requirement, the following information should be provided:

- 1) Pulsed radar: pulse width and pulse repetition frequency (if PRF is variable, then report maximum and minimum values).
- 2) Non-pulsed radar (e.g., FMCW): modulation type (i.e., sawtooth, sinusoid, triangle, or square wave) and sweep characteristics (sweep bandwidth, sweep rate, sweep time).

Information from manufacturer on modulation characteristics:

Modulation Type	FM-chirps, negative Sawtooth with linear change of center frequency over sweep bandwidth or single chirps
Modulation characteristics:	
Sweep bandwidth	See Chapter 11.2 for details about the sweep bandwidth
Sweep rate	Max 13 MHz/ μ s
Sweep time	50 ms

Note:

- Information provided by customer via the additional document
"ARS6-B_RF_Test_Input_Doc_v6.1.pdf"

11.3.3 Occupied bandwidth / Frequency stability

Description:

§2.1049 The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

§95.3379 (b) 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 and provisions:

FCC
FCC §2.1049/ §95.3379 (b)
The occupied bandwidth from intentional radiators operated within the specified frequency band shall comply during all conditions of operation with the following:
Frequency range
76 GHz – 81 GHz

Measurement:

Parameters	
Detector:	Pos-Peak
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

Measurement results:

EUT	Mode	Test Conditions	f_L in GHz	f_H in GHz	Occupied Bandwidth (99%) in MHz
DUT24	01	T_{min} / V_{nom}	76.051	76.960	909.0
DUT24	01	$-30\text{ °C} / V_{nom}$	76.052	76.959	907.2
DUT24	01	$-20\text{ °C} / V_{nom}$	76.052	76.960	907.7
DUT24	01	$-10\text{ °C} / V_{nom}$	76.052	76.961	909.3
DUT24	01	$0\text{ °C} / V_{nom}$	76.051	76.959	908.0
DUT24	01	$10\text{ °C} / V_{nom}$	76.050	76.959	909.8
DUT24	01	T_{nom} / V_{min}	76.051	76.959	907.7
DUT24	01	T_{nom} / V_{nom}	76.048	76.959	911.3
DUT24	01	T_{nom} / V_{max}	76.049	76.958	908.9
DUT24	01	$30\text{ °C} / V_{nom}$	76.048	76.959	910.9
DUT24	01	$40\text{ °C} / V_{nom}$	76.046	76.949	903.0
DUT24	01	$50\text{ °C} / V_{nom}$	76.047	76.958	911.0
DUT24	01	T_{max} / V_{nom}	76.048	76.959	911.4
DUT24	02	T_{nom} / V_{nom}	76.048	76.953	904.3
DUT24	03	T_{nom} / V_{nom}	76.136	76.946	810.0
DUT24	04	T_{nom} / V_{nom}	76.087	76.943	855.4
DUT24	78	T_{nom} / V_{nom}	76.127	76.932	804.4

Note:

- The EUT is tested in the temperature range from -20 °C to 50 °C specified by §95.3379 (b)
- If the operating temperature range of the device specified by the manufacturer exceeds the test temperature range (-20 °C to $+50\text{ °C}$), the customer is responsible for ensuring the frequency stability and proper functioning of the device within the extended operating temperature range
- Measurements under extreme test conditions performed using **Mode 01** as a worst-case analysis, as it is the mode with the highest occupied bandwidth under normal test conditions
- Detailed measurement results: see measurement report **1-9946-25-01-02_TR1-A202-R01**

Verdict: Compliant

11.3.4 Unwanted emissions (radiated spurious)

Description:

Measurement of the radiated unwanted emissions.

Limits and provisions:

FCC §95.3379

(a) The power density of any emissions outside the 76-81 GHz band shall consist solely of spurious emissions and shall not exceed the following:

(1) Radiated emissions below 40 GHz shall not exceed the field strength as shown in the following emissions table.

FCC		
CFR Part 95.3379 (a) (1) / CFR Part 95.3379 (a) (3)		
Radiated unwanted emissions		
Frequency (MHz)	Field Strength (µV/m)	Measurement distance (m)
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
960 – 40 000	500	3

- (i) In the emissions table in paragraph (a)(1) of this section, the tighter limit applies at the band edges.
 - (ii) The limits in the table in paragraph (a)(1) of this section are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
 - (iii) The emissions limits shown in the table in paragraph (a)(1) of this section are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9.0-90.0 kHz, 110.0-490.0 kHz, and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector with a 1 MHz RBW
- (2) The power density of radiated emissions outside the 76-81 GHz band above 40.0 GHz shall not exceed the following, based on measurements employing an average detector with a 1 MHz RBW:
- (i) For radiated emissions outside the 76-81 GHz band between 40 GHz and 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 600 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.

- (ii) For radiated emissions above 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 1000 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.

Frequency Range (GHz)	Power Density	EIRP
40 – 200	600 pW/cm ² @ 3m	-1.7 dBm
200 – 231	1000 pW/cm ² @ 3m	+0.5 dBm

- (3) For field disturbance sensors and radar systems operating in the 76-81 GHz band, the spectrum shall be investigated up to 231.0 GHz.

Note: KDB 653005 4. (e)

Unwanted emissions shall be examined from the lowest radio frequency signal generated by the EUT, without going below 9 kHz, up to at least 231 GHz (preferably 243 GHz)

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

$$\text{EIRP[dBm]} = 10 \times \log(4 \times \pi \times d^2 \times 1000 \times \text{PD[W/m}^2])$$

- 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 = 600 pW/cm² at a distance of d = 3 m corresponds to an equivalent isotropically radiated power of EIRP = -1.7 dBm.

Measurement:

Measurement parameter	
Detector:	Quasi Peak / Pos-Peak / Lin. Average / 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
Trace-Mode:	Max Hold

Measurement results:

Frequency [MHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
41.29	Quasi-Peak	0.120	5.03 dB μ V/m	30.0 dB μ V/m	25.0
56.77	Quasi-Peak	0.120	5.71 dB μ V/m	30.0 dB μ V/m	24.3
105.84	Quasi-Peak	0.120	18.96 dB μ V/m	33.5 dB μ V/m	14.5
118.94	Quasi-Peak	0.120	12.85 dB μ V/m	33.5 dB μ V/m	20.7
126.97	Quasi-Peak	0.120	17.50 dB μ V/m	33.5 dB μ V/m	16.0
149.24	Quasi-Peak	0.120	16.85 dB μ V/m	33.5 dB μ V/m	16.7

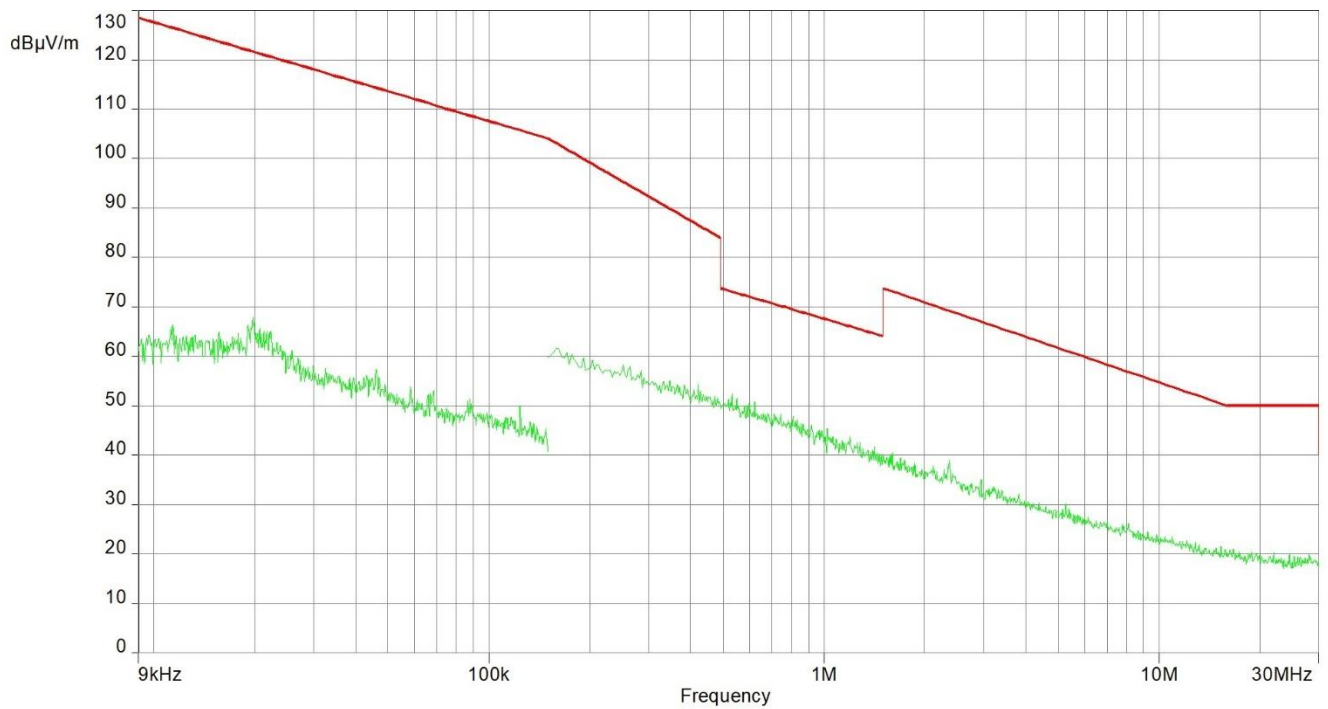
Please refer to the following plots for more information on the level of spurious emissions

Note:

- The mode with the highest peak power (Mode 04) is used as a worst-case analysis for unwanted emissions measurements. Unwanted emissions around the allowed frequency band are evaluated for all modes

Verdict: Compliant

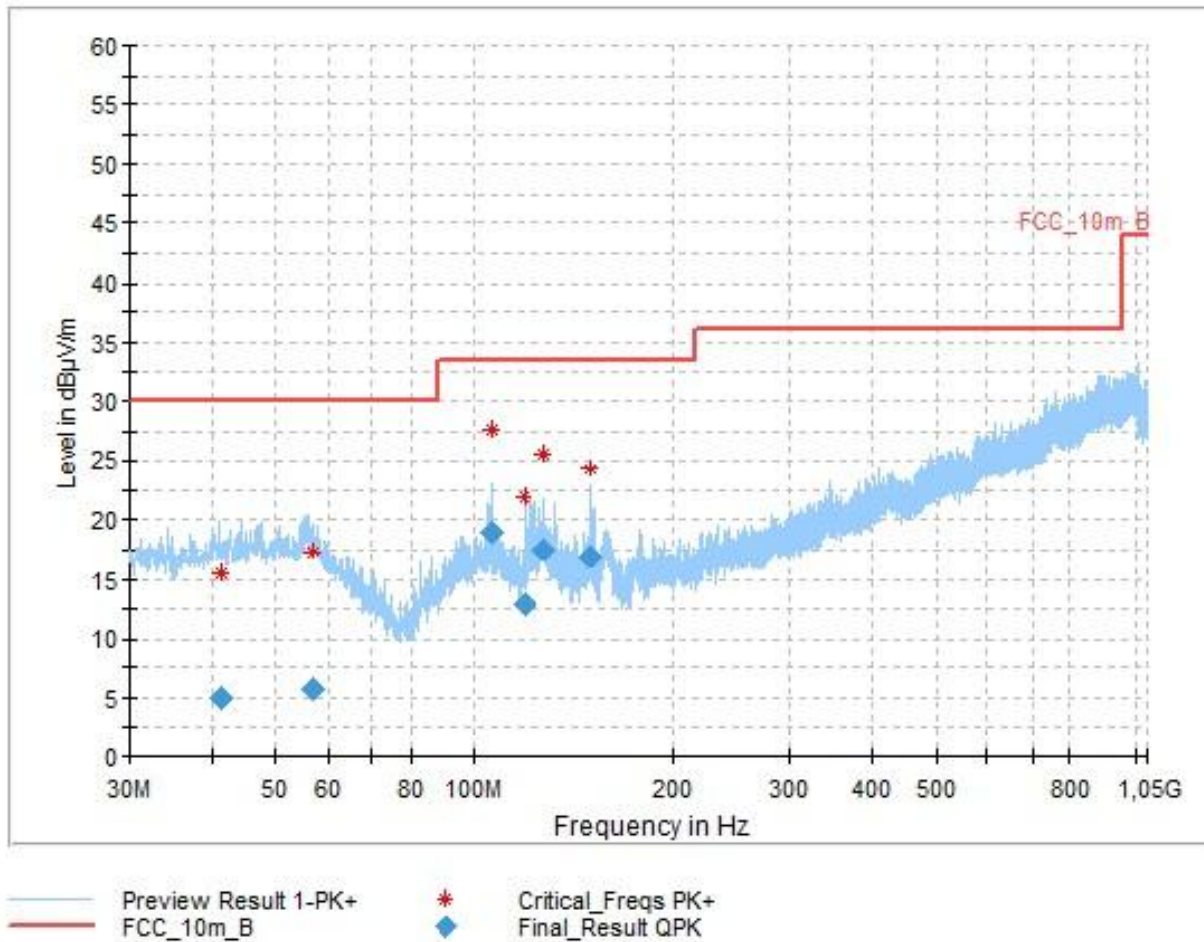
Plot 1: 9 kHz – 30 MHz, DUT25, Mode 04



Note:

- Green trace: Peak detector prescan
- Ferrite clamps on EUT cable during the measurement, see setup photographs

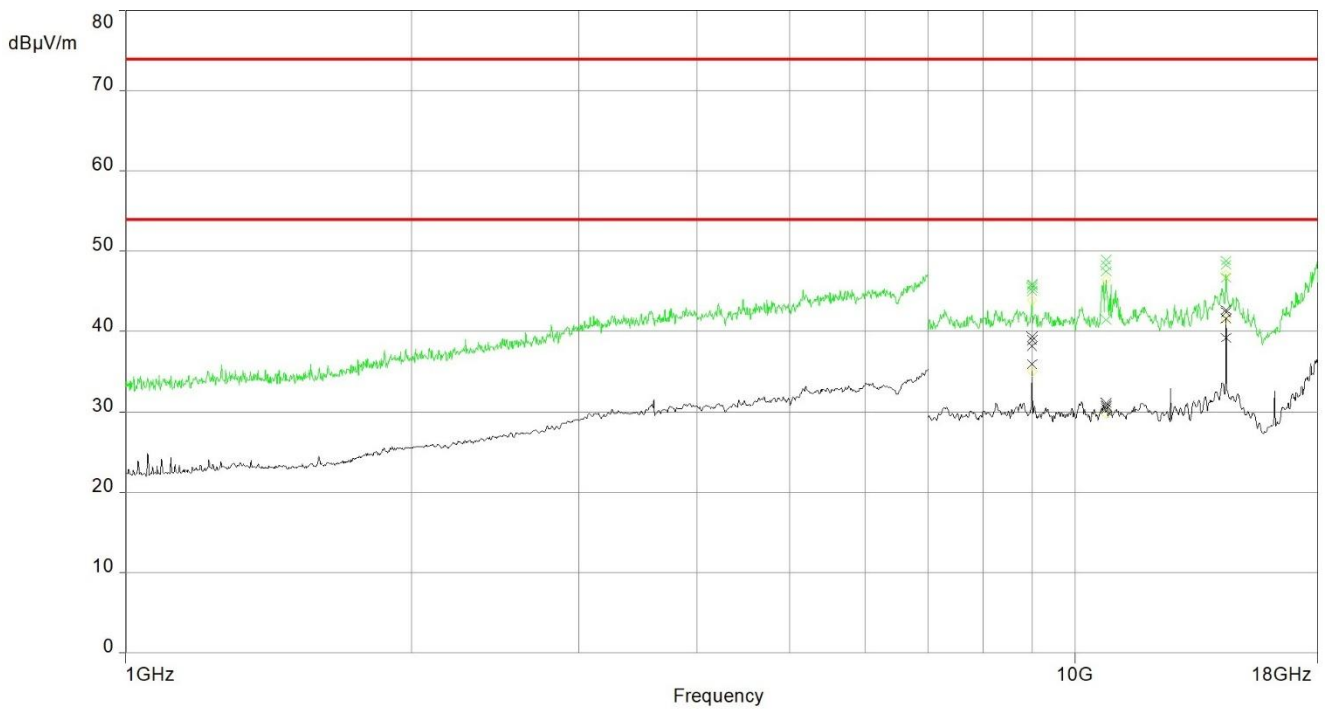
Plot 2: 30 MHz – 1 GHz, DUT25, Mode 04



Note:

- Ferrite clamps on EUT cable during the measurement, see setup photographs

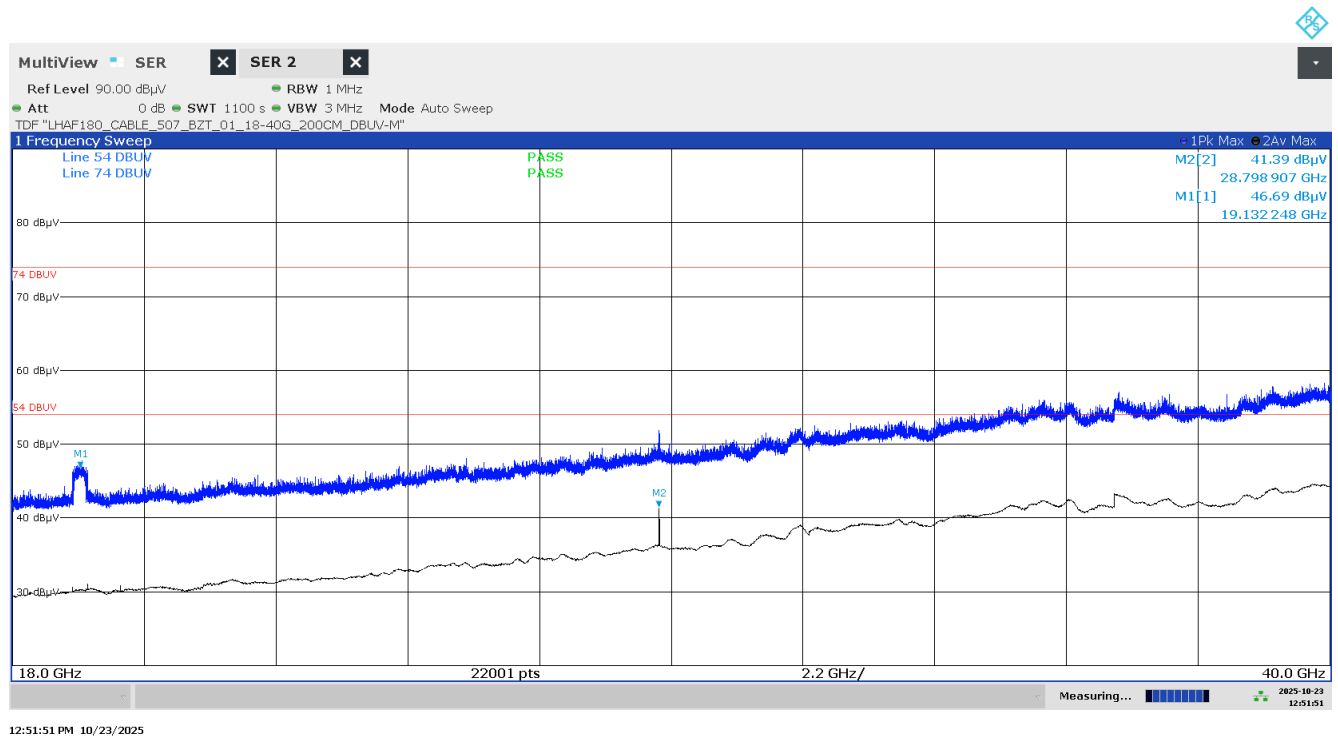
Plot 3: 1 GHz – 18 GHz, DUT25, Mode 04



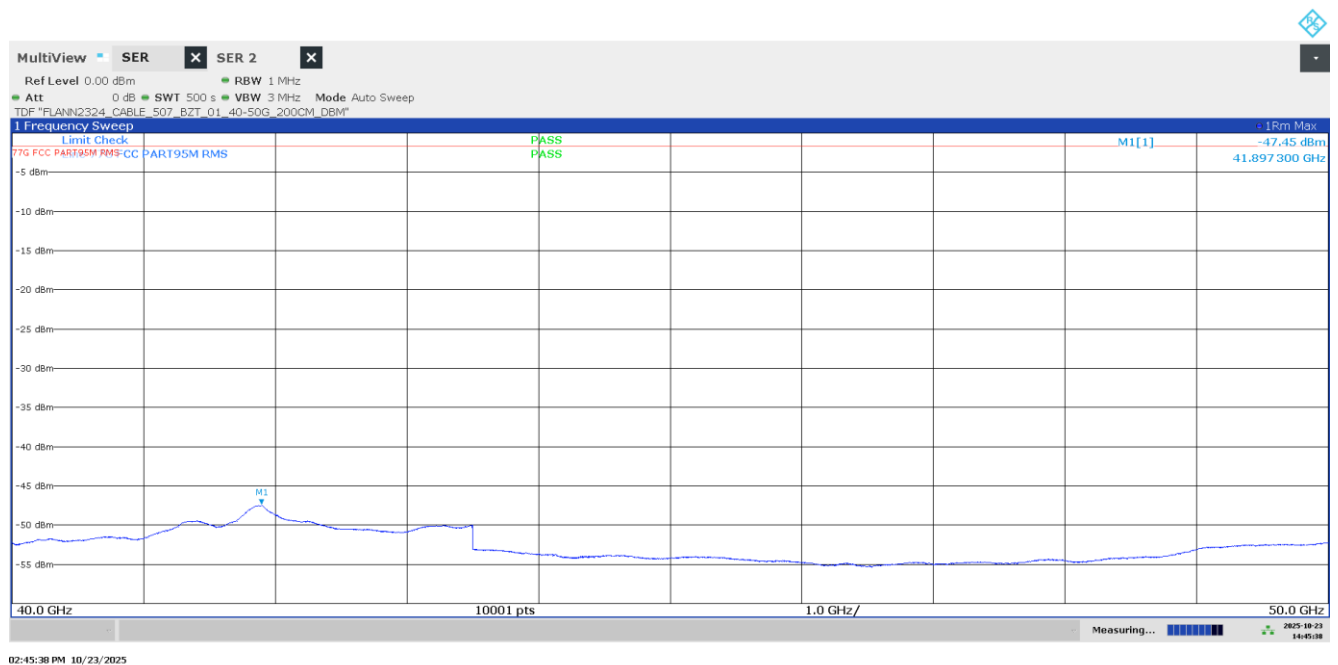
Note:

- Green trace: Peak detector prescan
- Black trace: RMS detector prescan
- Ferrite clamps on EUT cable during the measurement, see setup photographs

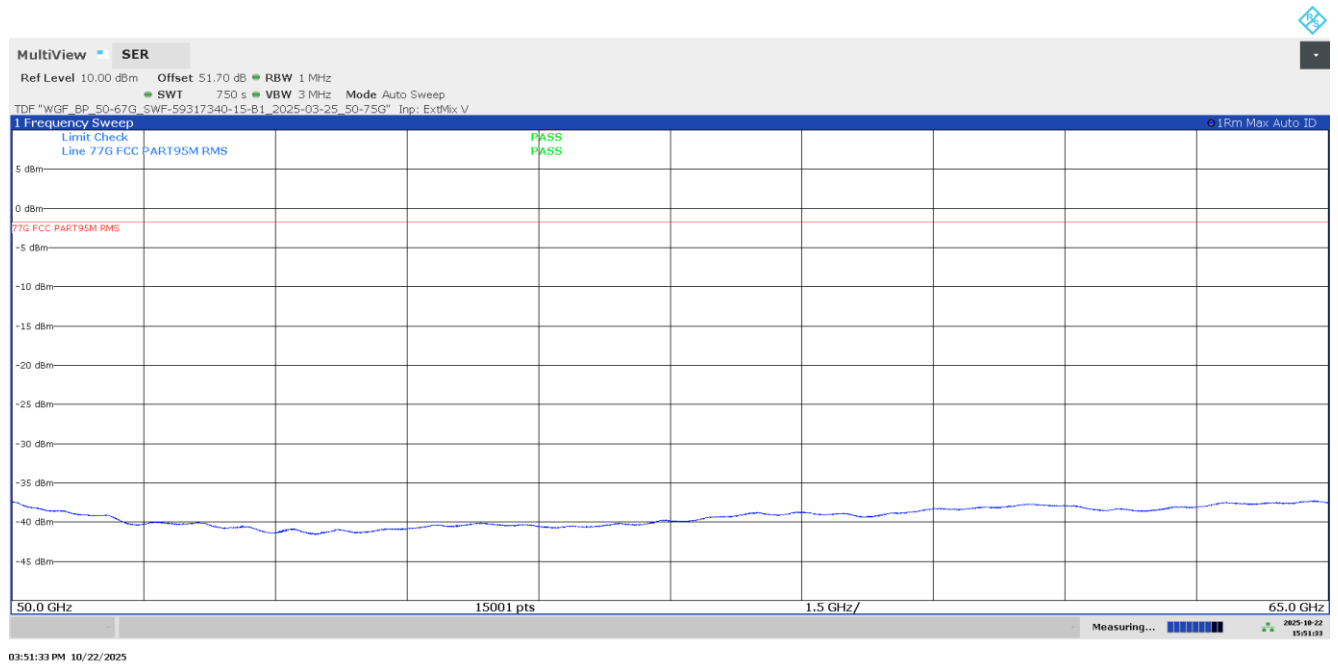
Plot 4: 18 GHz – 40 GHz, DUT24, Mode 04



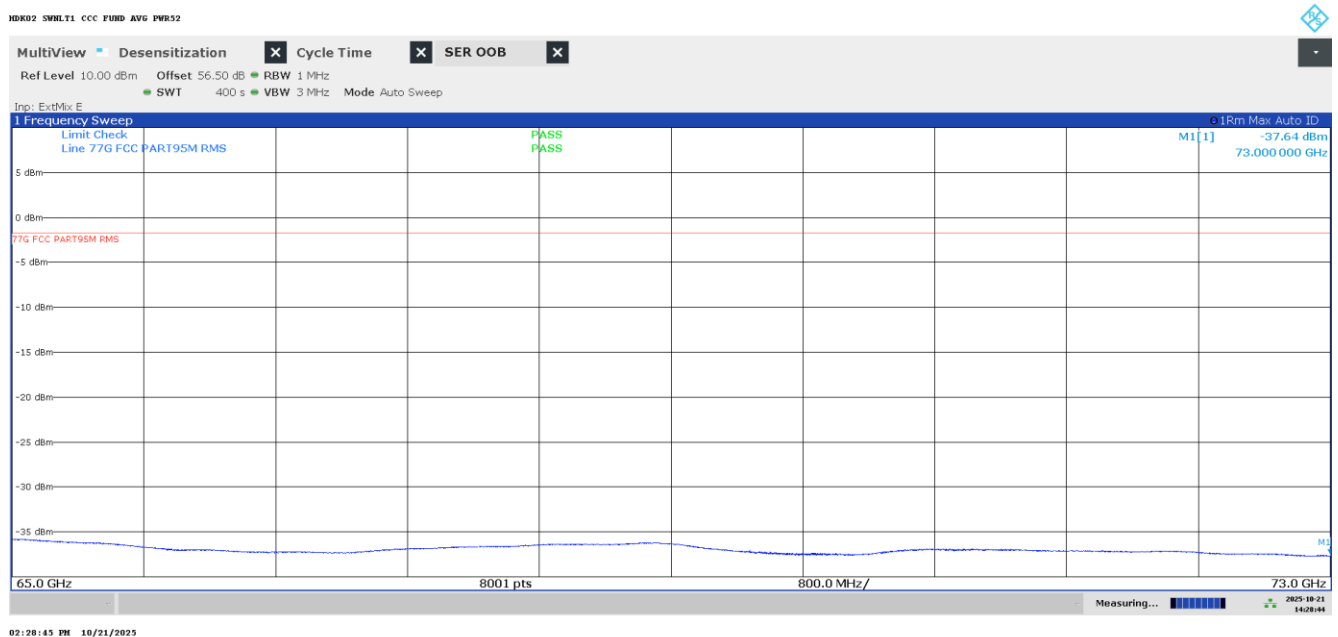
Plot 5: 40 GHz – 50 GHz, DUT24, Mode 04



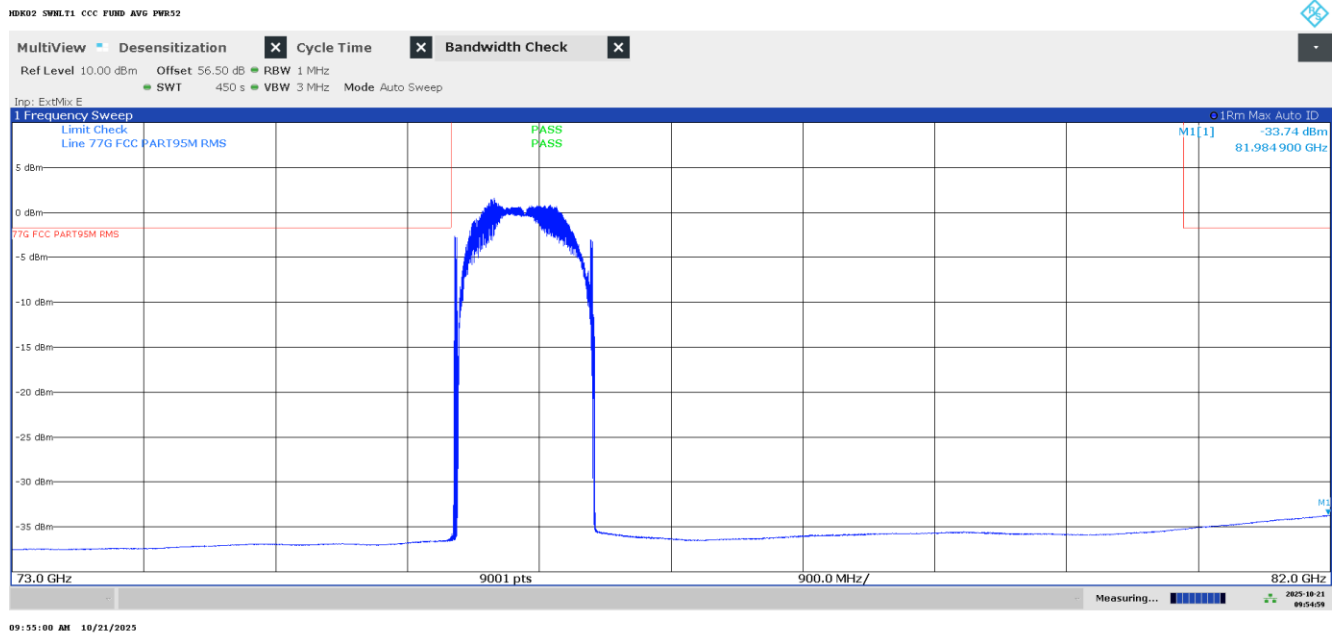
Plot 6: 50 GHz – 65 GHz, DUT24, Mode 04



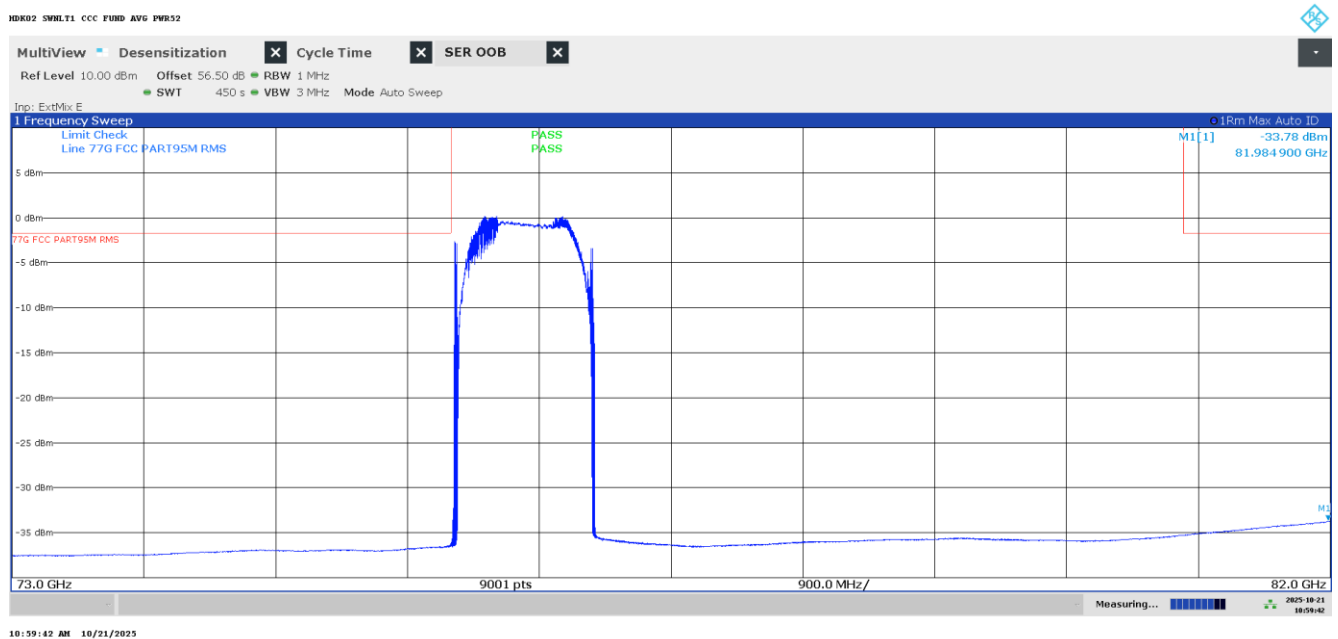
Plot 7: 65 GHz – 73 GHz, DUT24, Mode 04



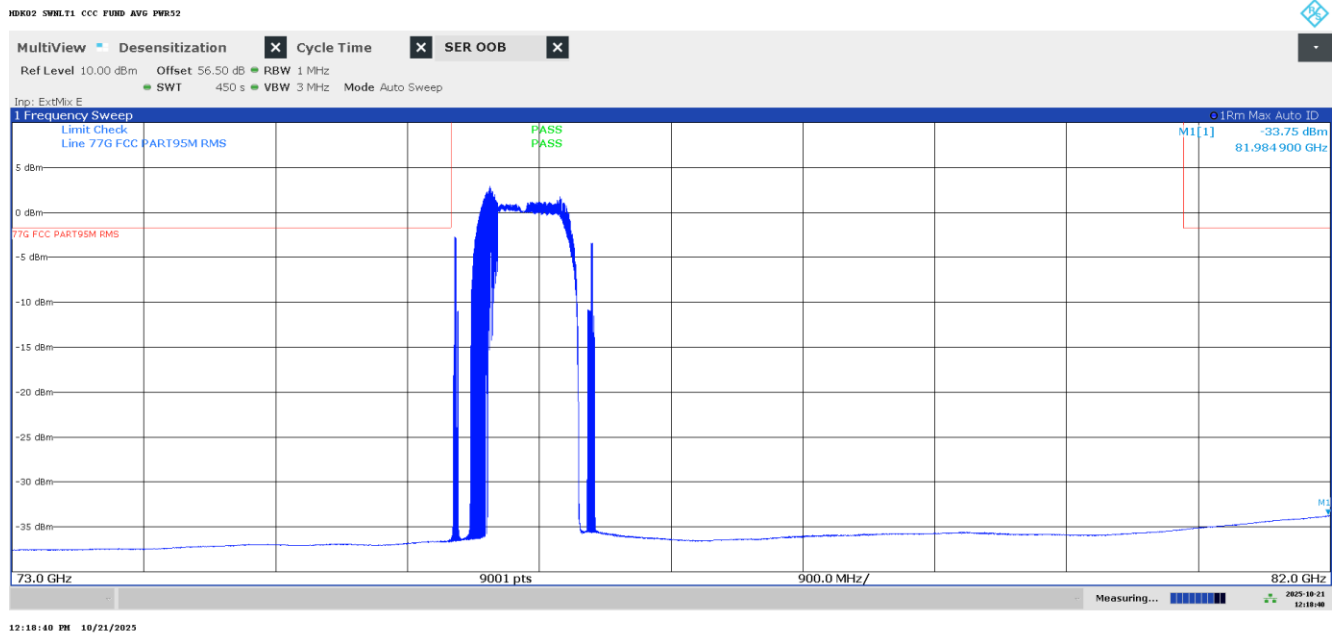
Plot 8: 73 GHz – 82 GHz, DUT24, Mode 01



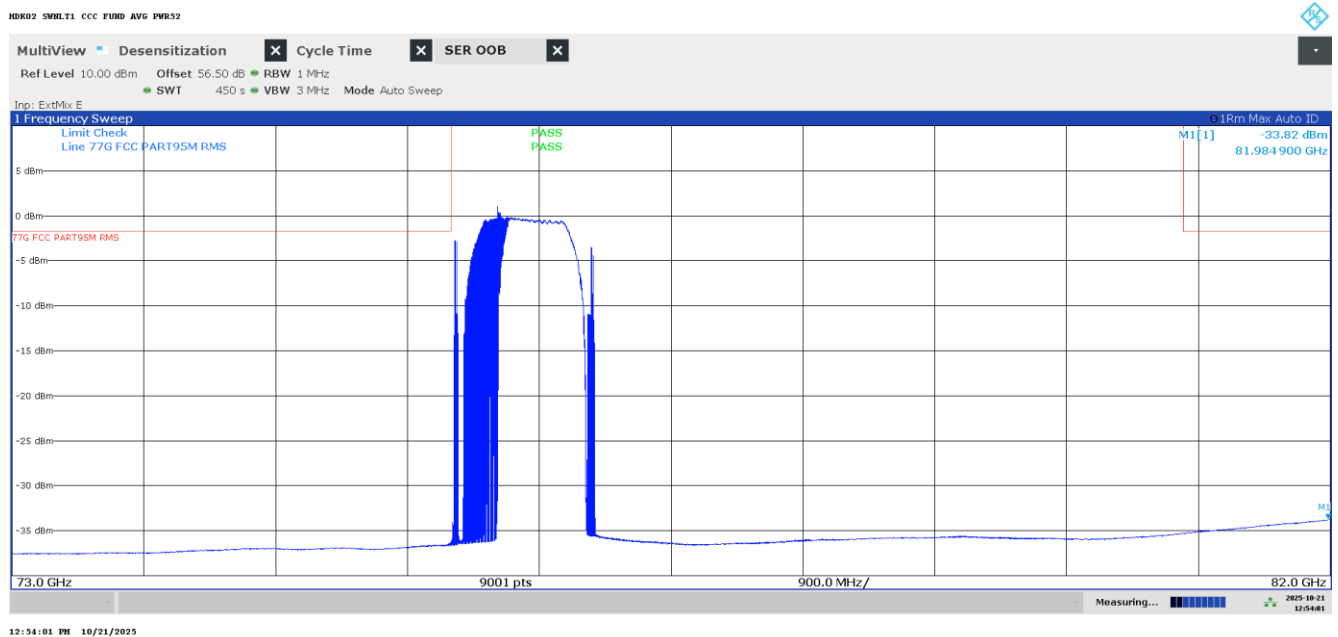
Plot 9: 73 GHz – 82 GHz, DUT24, Mode 02



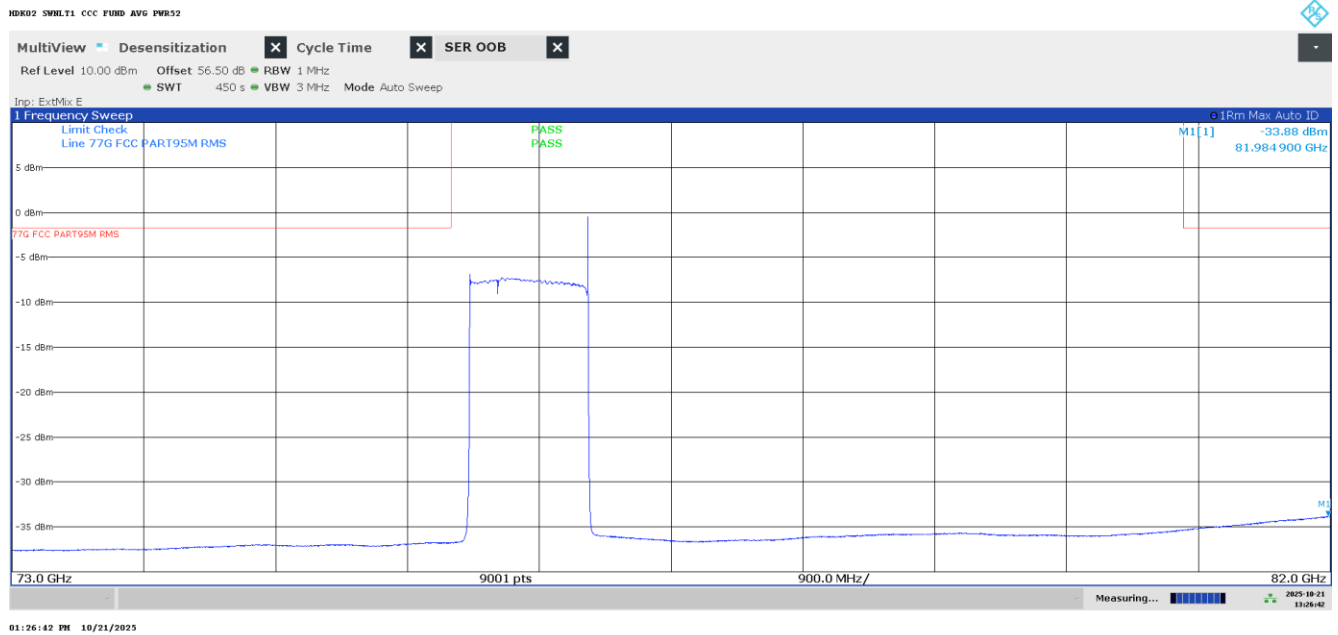
Plot 10: 73 GHz – 82 GHz, DUT24, Mode 03



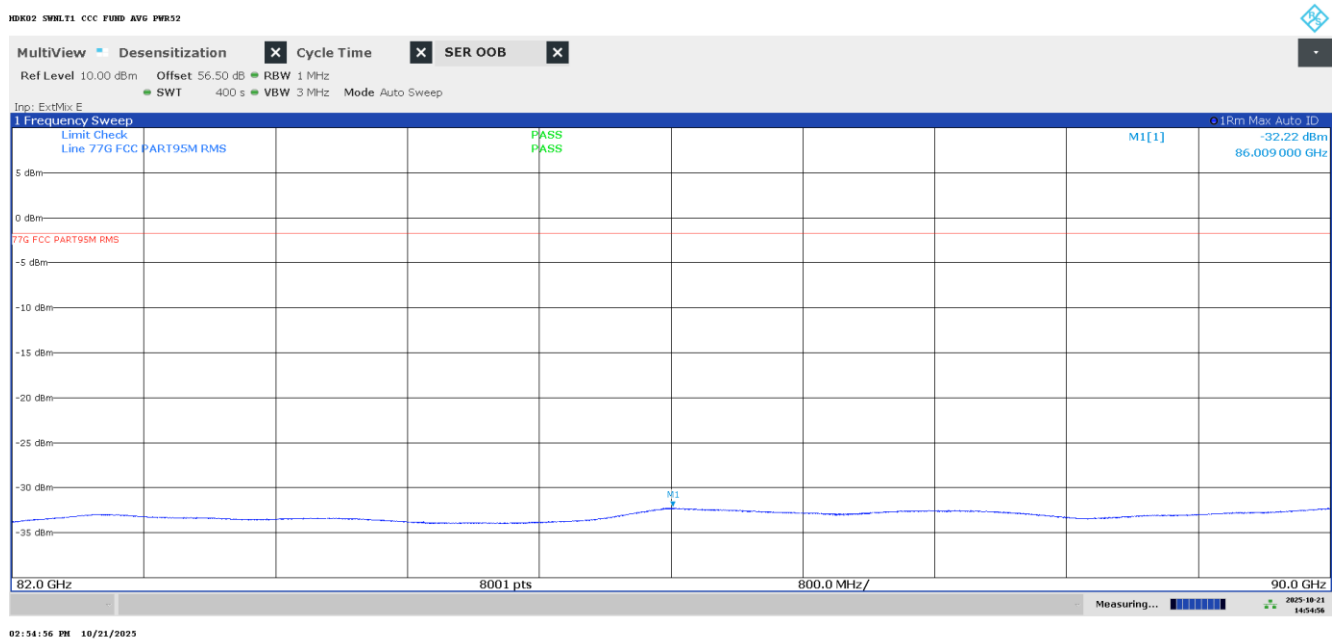
Plot 11: 73 GHz – 82 GHz, DUT24, Mode 04



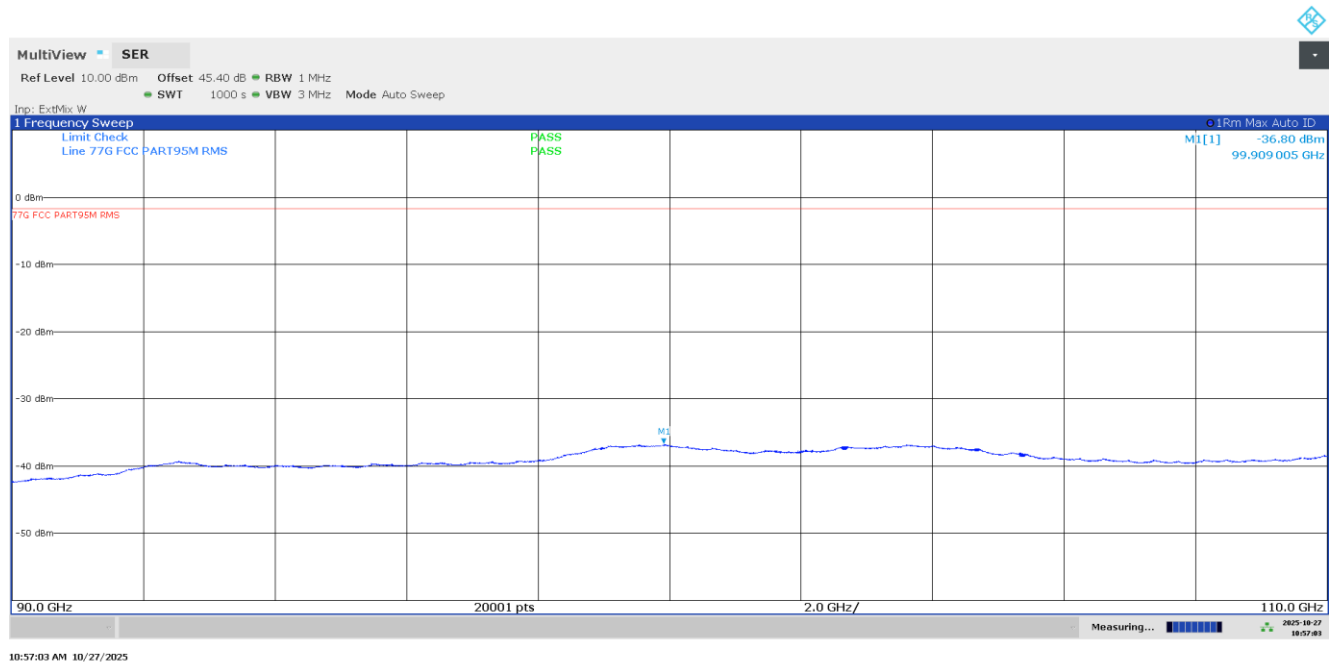
Plot 12: 73 GHz – 82 GHz, DUT24, Mode 78



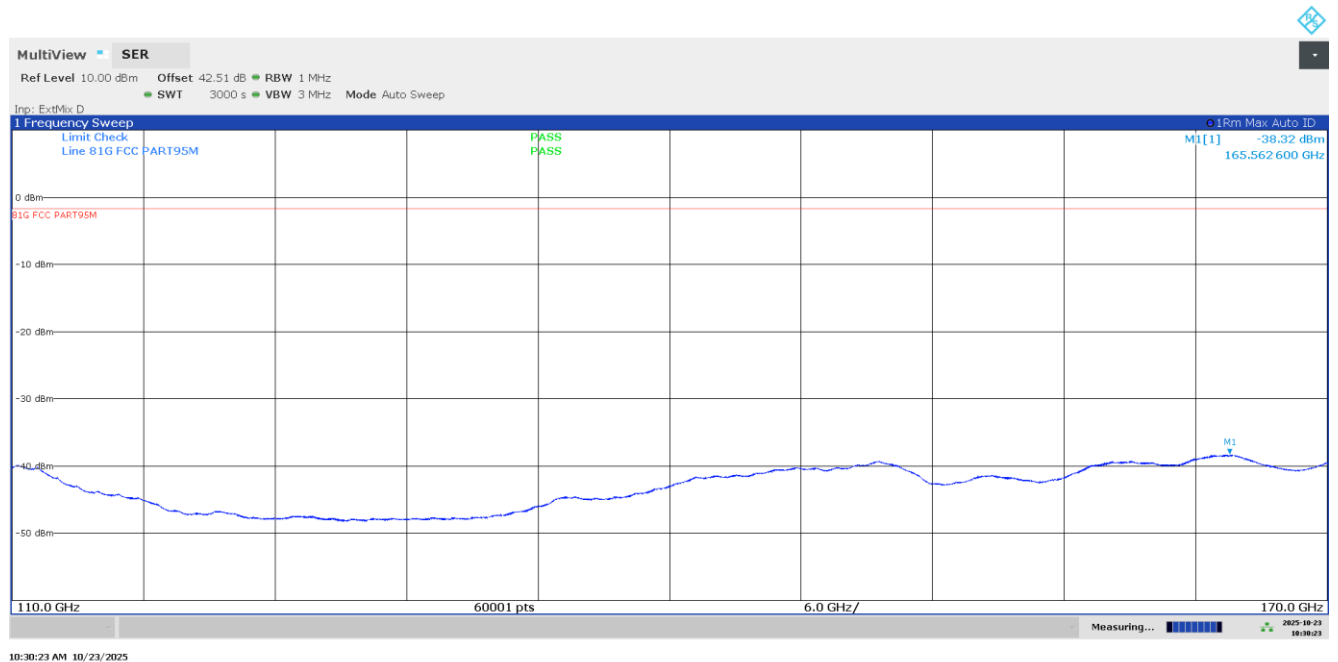
Plot 13: 82 GHz – 90 GHz, DUT24, Mode 04



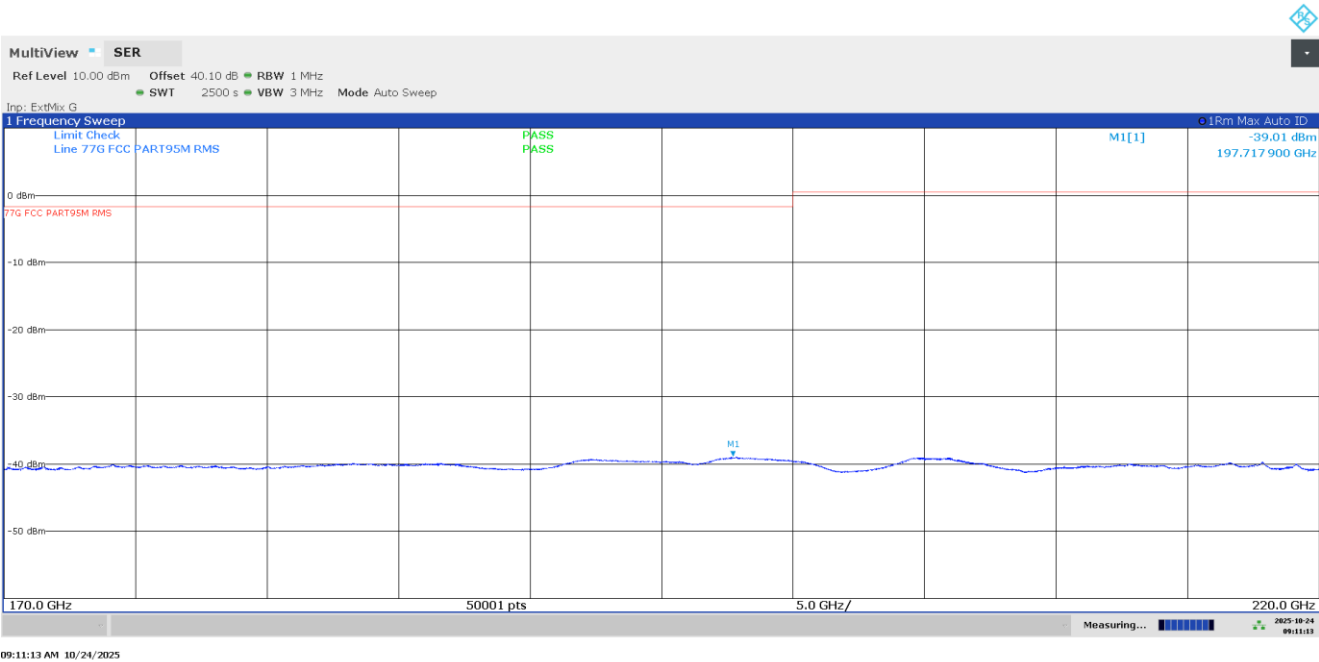
Plot 14: 90 GHz – 110 GHz, DUT24, Mode 04



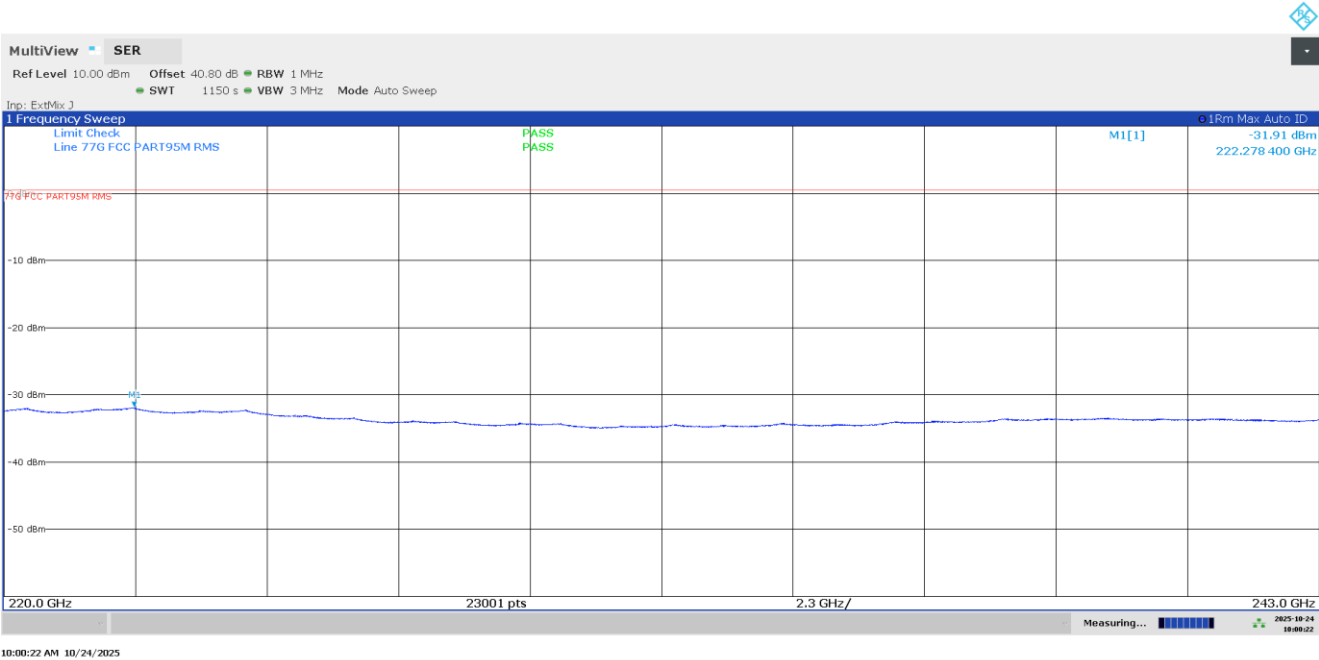
Plot 15: 110 GHz – 170 GHz, DUT24, Mode 04



Plot 16: 170 GHz – 220 GHz, DUT24, Mode 04



Plot 17: 220 GHz – 243 GHz, DUT24, Mode 04



12 79 GHz band (77 GHz – 81 GHz)

12.1 Summary of measurement results

12.1.1 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	47 CFR Part 95 Subpart M	see below	2025-10-29	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Remark
§2.1046 §95.3367	Radiated power	Nominal	Nominal	☒	☐	☐	☐	complies
§2.1047	Modulation characteristics	-/-	-/-	☒	☐	☐	☐	complies
§2.1049 §2.1055 §95.3379 (b)	Occupied bandwidth / Frequency stability (99% bandwidth)	Nominal Extreme	Nominal Extreme	☒	☐	☐	☐	complies
§2.1051	Spurious emissions at antenna terminals	Nominal	Nominal	☐	☐	☒	☐	see note 2, DUT has integral/internal antenna
§2.1053 §95.3379 (a)	Unwanted emissions (radiated spurious)	Nominal	Nominal	☒	☐	☐	☐	complies

Note:

- 1) NA = Not applicable; NP = Not performed
- 2) ANSI C63.26-2015 5.5.1:
 "...many contemporary portable transmitters utilize integral antennas, precluding access to an antenna output port from which to perform conducted compliance measurements. For these types of transmitters, all of the data necessary to demonstrate compliance must be measured in a radiated test configuration..."

12.2 Additional comments

Reference documents:

- ARS6-B_RF_Test_Input_Doc_v6.1.pdf

Special test descriptions:

- ARS6-B_RF_Test_Input_Doc_v6.1.pdf

Configuration descriptions:

- ARS6-B_RF_Test_Input_Doc_v6.1.pdf

Test devices (EUT):

- DUT24: Normal operation modes, used for general purpose testing
- DUT25: Normal operation modes, used for general purpose testing

Associated equipment (AE):

- AE1: Control Input Display (Used to configure set the EUT mode)
- AE2: Vehicular Gateway (VG-4)

Normal operation modes, as declared by the customer:

Mode ID	Centre frequency [GHz]	Bandwidth [GHz]	Remark
17 (c0)	77.928	1.8	Operation
17 (c1)	77.928	1.8	Operation
18 (c0)	78.781	3.6	Operation
18 (c1)	78.781	3.6	Operation

Details on test mode settings:

According to the customer's instructions, the following steps and commands were used to configure the test modes:

- Connect the EUT and associated equipment to an appropriate power supply
- On the Control Input Display:
 - Enter the mode ID
 - Press the "Set Mode" button
 - Enter a speed value of 0 kph for c0 or 20 kph for c1
 - Press the "Set Speed" button
 - Press the "Start" button

12.3 Measurement results

12.3.1 Radiated power

Description:

§95.3367

The fundamental radiated emission limits within the 76-81 GHz band are expressed in terms of Equivalent Isotropically Radiated Power (EIRP) and are as shown below.

Limits and provisions:

FCC §95.3367 (a) (b)

Frequency	Limit (eirp)
76.0 - 81.0 GHz	50 dBm (Average)
76.0 - 81.0 GHz	55 dBm/MHz (PEAK)

Measurement:

Measurement parameter: Average Power	
Detector:	RMS
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

Measurement parameter: Peak Power	
Detector:	Pos-Peak
Resolution bandwidth:	50 MHz
Video bandwidth:	80 MHz
Trace-Mode:	Max Hold

Note: KDB 653005 4.(c)(1)

"Peak power measurements of swept frequency radar implementations (e.g., high sweep rate FMCW) may require a desensitization correction factor to be applied to the measurement results."

→ Peak power measurements are therefore performed using an optimized (usually larger) resolution bandwidth to mitigate issues with desensitization.

Measurement results:

EUT	Mode	Test condition	Radiated Peak Power (EIRP)	Radiated Mean Power (EIRP)
DUT24	17 (c0)	T_{nom} / V_{nom}	31.41	17.21
DUT24	17 (c1)	T_{nom} / V_{nom}	31.58	17.22
DUT24	18 (c0)	T_{nom} / V_{nom}	32.33	18.72
DUT24	18 (c1)	T_{nom} / V_{nom}	32.54	18.74

Note:

- Detailed results of radiated peak power (EIRP) measurements can be found in the additional document **1-9946-25-01-03_TR1-A205-R01**
- Detailed results of radiated mean power (EIRP) measurements can be found in the additional document **1-9946-25-01-03_TR1-A204-R01**

Verdict: Compliant

12.3.2 Modulation characteristics

Description:

§2.1047 (d) *Other types of equipment.* A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

KDB 653005 D01 76-81 GHz Radars v01r02, section 3 (g)

Concerning the Section 2.1047 modulation characteristics requirement, the following information should be provided:

- 1) Pulsed radar: pulse width and pulse repetition frequency (if PRF is variable, then report maximum and minimum values).
- 2) Non-pulsed radar (e.g., FMCW): modulation type (i.e., sawtooth, sinusoid, triangle, or square wave) and sweep characteristics (sweep bandwidth, sweep rate, sweep time).

Information from manufacturer on modulation characteristics:

Modulation Type	FM-chirps, negative Sawtooth over sweep bandwidth
Modulation characteristics:	
Sweep bandwidth	See Chapter 12.2 for details about the sweep bandwidth
Sweep rate	Max 55 MHz/ μ s
Sweep time	100 ms

Note:

- Information provided by customer via the additional document
“ARS6-B_RF_Test_Input_Doc_v6.1.pdf”

12.3.3 Occupied bandwidth / Frequency stability

Description:

§2.1049 The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

§95.3379 (b) 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 and provisions:

FCC
FCC §2.1049/ §95.3379 (b)
The occupied bandwidth from intentional radiators operated within the specified frequency band shall comply during all conditions of operation with the following:
Frequency range
76 GHz – 81 GHz

Measurement:

Parameters	
Detector:	Pos-Peak
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

Measurement results:

EUT	Mode	Test Conditions	f_L in GHz	f_H in GHz	Occupied Bandwidth (99%) in MHz
DUT24	17 (c0)	T_{nom} / V_{nom}	77.083	78.967	1883.7
DUT24	17 (c1)	T_{nom} / V_{nom}	77.088	78.965	1877.2
DUT24	18 (c0)	T_{min} / V_{nom}	77.082	80.916	3834.6
DUT24	18 (c0)	-30 °C / V_{nom}	77.046	80.916	3869.9
DUT24	18 (c0)	-20 °C / V_{nom}	77.047	80.916	3868.7
DUT24	18 (c0)	-10 °C / V_{nom}	77.044	80.916	3871.2
DUT24	18 (c0)	0 °C / V_{nom}	77.043	80.915	3872.2
DUT24	18 (c0)	10 °C / V_{nom}	77.092	80.915	3822.8
DUT24	18 (c0)	T_{nom} / V_{min}	77.039	80.913	3873.9
DUT24	18 (c0)	T_{nom} / V_{nom}	77.038	80.914	3876.0
DUT24	18 (c0)	T_{nom} / V_{max}	77.043	80.914	3870.5
DUT24	18 (c0)	30 °C / V_{nom}	77.091	80.912	3820.9
DUT24	18 (c0)	40 °C / V_{nom}	77.084	80.912	3828.0
DUT24	18 (c0)	50 °C / V_{nom}	77.042	80.912	3870.1
DUT24	18 (c0)	T_{max} / V_{nom}	77.038	80.910	3871.9
DUT24	18 (c1)	T_{nom} / V_{nom}	77.092	80.913	3820.9

Note:

- The EUT is tested in the temperature range from -20°C to 50°C specified by §95.3379 (b)
- If the operating temperature range of the device specified by the manufacturer exceeds the test temperature range (-20°C to +50°C), the customer is responsible for ensuring the frequency stability and proper functioning of the device within the extended operating temperature range.
- Measurements under extreme test conditions were performed using **Mode 18 (c0)** as a worst-case analysis, as it is the mode with the highest occupied bandwidth under normal test conditions
- Detailed measurement results: see measurement report **1-9946-25-01-03_TR1-A202-R01**

Verdict: Compliant

12.3.4 Unwanted emissions (radiated spurious)

Description:

Measurement of the radiated unwanted emissions.

Limits and provisions:

FCC §95.3379

(b) The power density of any emissions outside the 76-81 GHz band shall consist solely of spurious emissions and shall not exceed the following:

(1) Radiated emissions below 40 GHz shall not exceed the field strength as shown in the following emissions table.

FCC		
CFR Part 95.3379 (a) (1) / CFR Part 95.3379 (a) (3)		
Radiated unwanted emissions		
Frequency (MHz)	Field Strength (µV/m)	Measurement distance (m)
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
960 – 40 000	500	3

- (i) In the emissions table in paragraph (a)(1) of this section, the tighter limit applies at the band edges.
 - (ii) The limits in the table in paragraph (a)(1) of this section are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
 - (iii) The emissions limits shown in the table in paragraph (a)(1) of this section are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9.0-90.0 kHz, 110.0-490.0 kHz, and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector with a 1 MHz RBW
- (2) The power density of radiated emissions outside the 76-81 GHz band above 40.0 GHz shall not exceed the following, based on measurements employing an average detector with a 1 MHz RBW:
- (i) For radiated emissions outside the 76-81 GHz band between 40 GHz and 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 600 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.

- (ii) For radiated emissions above 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 1000 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.

Frequency Range (GHz)	Power Density	EIRP
40 – 200	600 pW/cm ² @ 3m	-1.7 dBm
200 – 231	1000 pW/cm ² @ 3m	+0.5 dBm

- (3) For field disturbance sensors and radar systems operating in the 76-81 GHz band, the spectrum shall be investigated up to 231.0 GHz.

Note: KDB 653005 4. (e)

Unwanted emissions shall be examined from the lowest radio frequency signal generated by the EUT, without going below 9 kHz, up to at least 231 GHz (preferably 243 GHz)

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

$$\text{EIRP[dBm]} = 10 \times \log(4 \times \pi \times d^2 \times 1000 \times \text{PD[W/m}^2])$$

- 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 = 600 pW/cm² at a distance of d = 3 m corresponds to an equivalent isotropically radiated power of EIRP = -1.7 dBm.

Measurement:

Measurement parameter	
Detector:	Quasi Peak / Pos-Peak / Lin. Average / 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
Trace-Mode:	Max Hold

Measurement results:

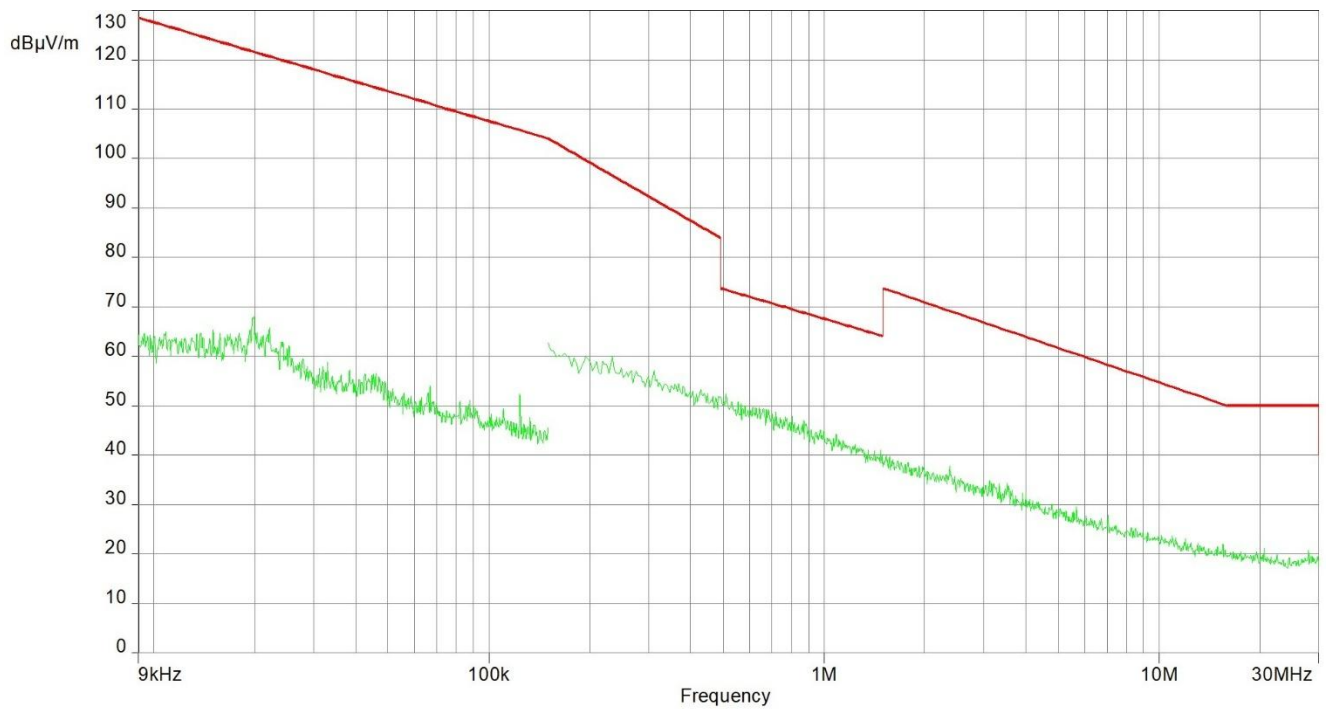
Frequency [MHz]	Detector	Bandwidth [MHz]	Level	Limit	Margin [dB]
53.518	Quasi-Peak	0.120	3.58 dB μ V/m	30.0 dB μ V/m	26.4
100.529	Quasi-Peak	0.120	20.38 dB μ V/m	33.5 dB μ V/m	13.1
104.715	Quasi-Peak	0.120	20.54 dB μ V/m	33.5 dB μ V/m	13.0
109.745	Quasi-Peak	0.120	17.91 dB μ V/m	33.5 dB μ V/m	15.6
124.236	Quasi-Peak	0.120	20.26 dB μ V/m	33.5 dB μ V/m	13.2
731.052	Quasi-Peak	0.120	13.67 dB μ V/m	36.0 dB μ V/m	22.3
Please refer to the following plots for more information on the level of spurious emissions					

Note:

- The mode with the highest peak power (Mode 18 (c1)) is used as a worst-case analysis for unwanted emissions measurements. Unwanted emissions around the allowed frequency band are evaluated for all modes

Verdict: Compliant

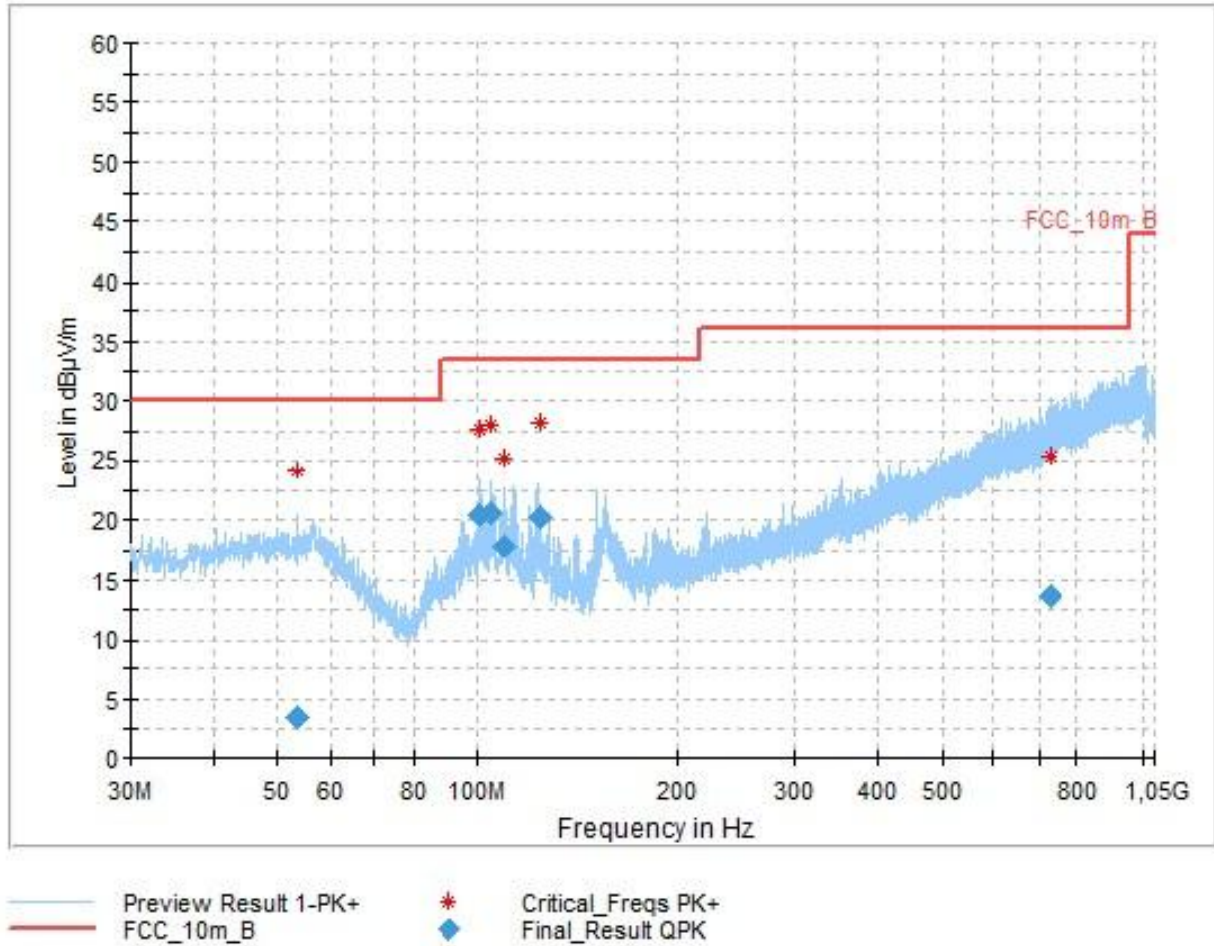
Plot 18: 9 kHz – 30 MHz, DUT25, Mode 18 (c1)



Note:

- Green trace: Peak detector prescan
- Ferrite clamps on EUT cable during the measurement, see setup photographs

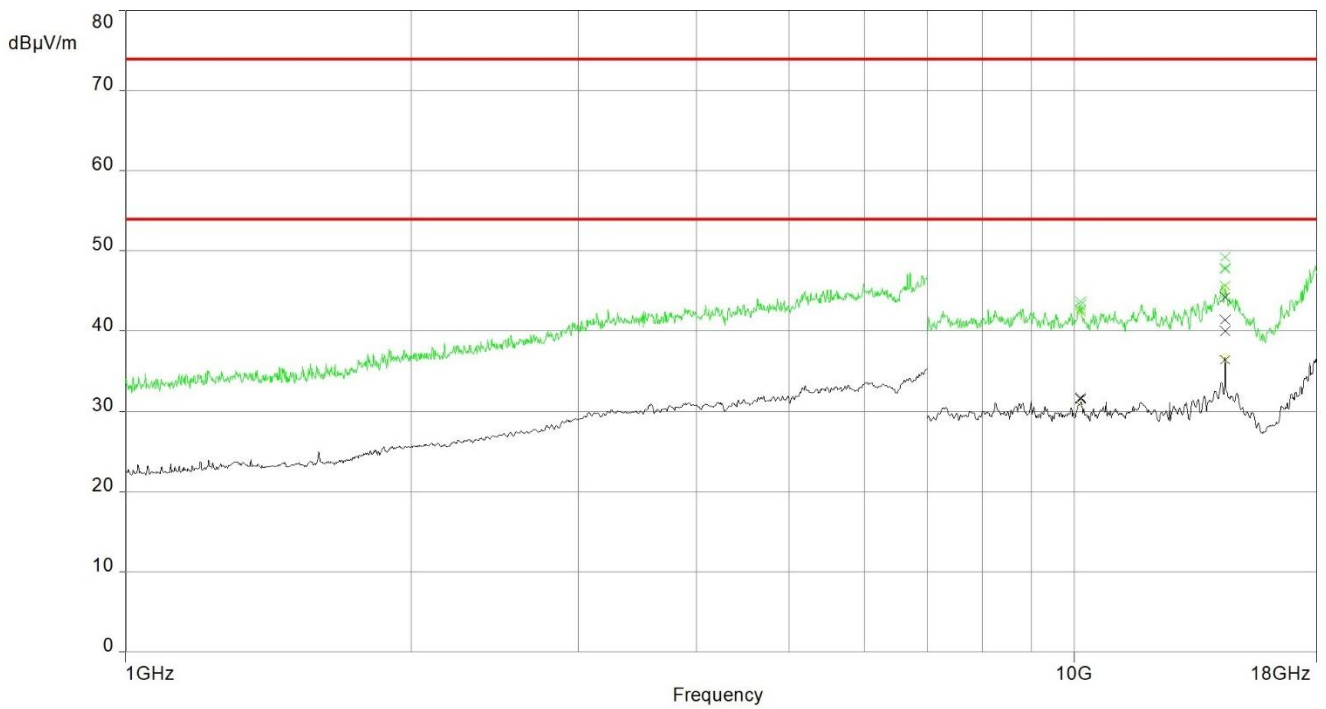
Plot 19: 30 MHz – 1 GHz, DUT25, Mode 18 (c1)



Note:

- Ferrite clamps on EUT cable during the measurement, see setup photographs

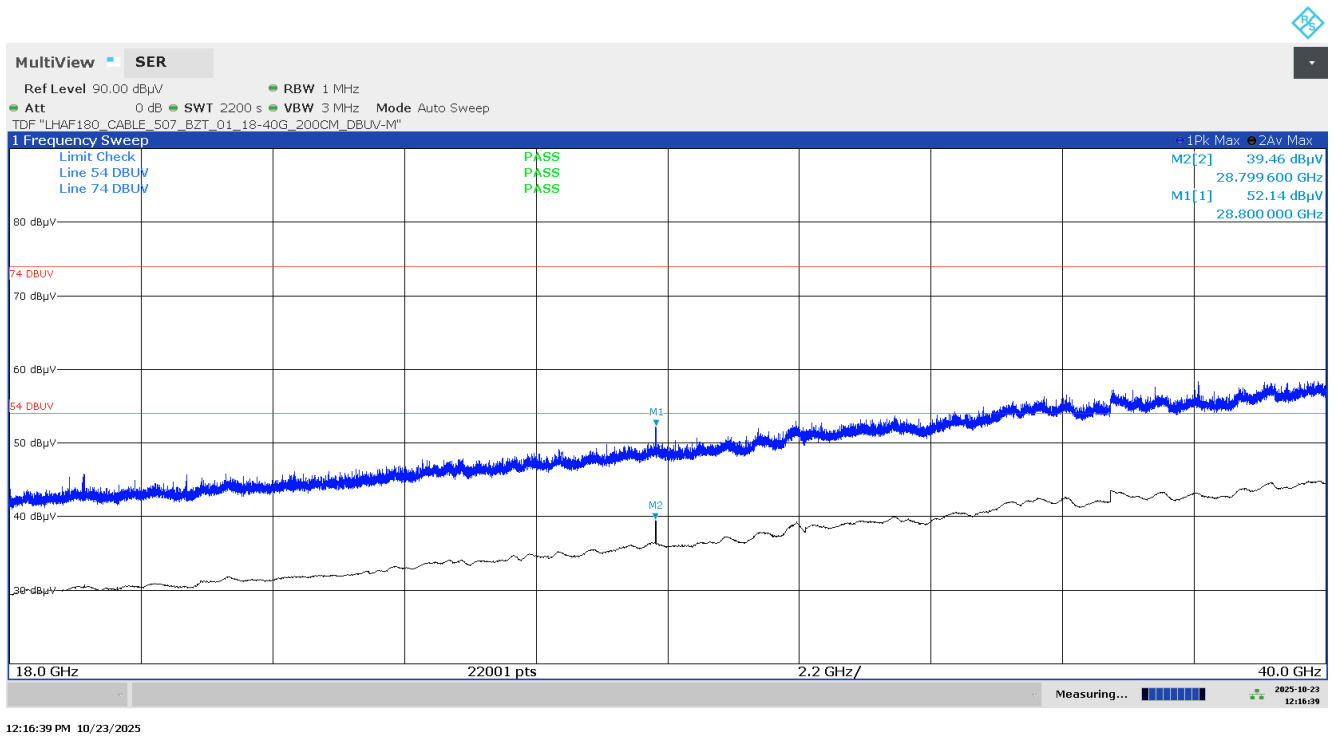
Plot 20: 1 GHz – 18 GHz, DUT25, Mode 18 (c1)



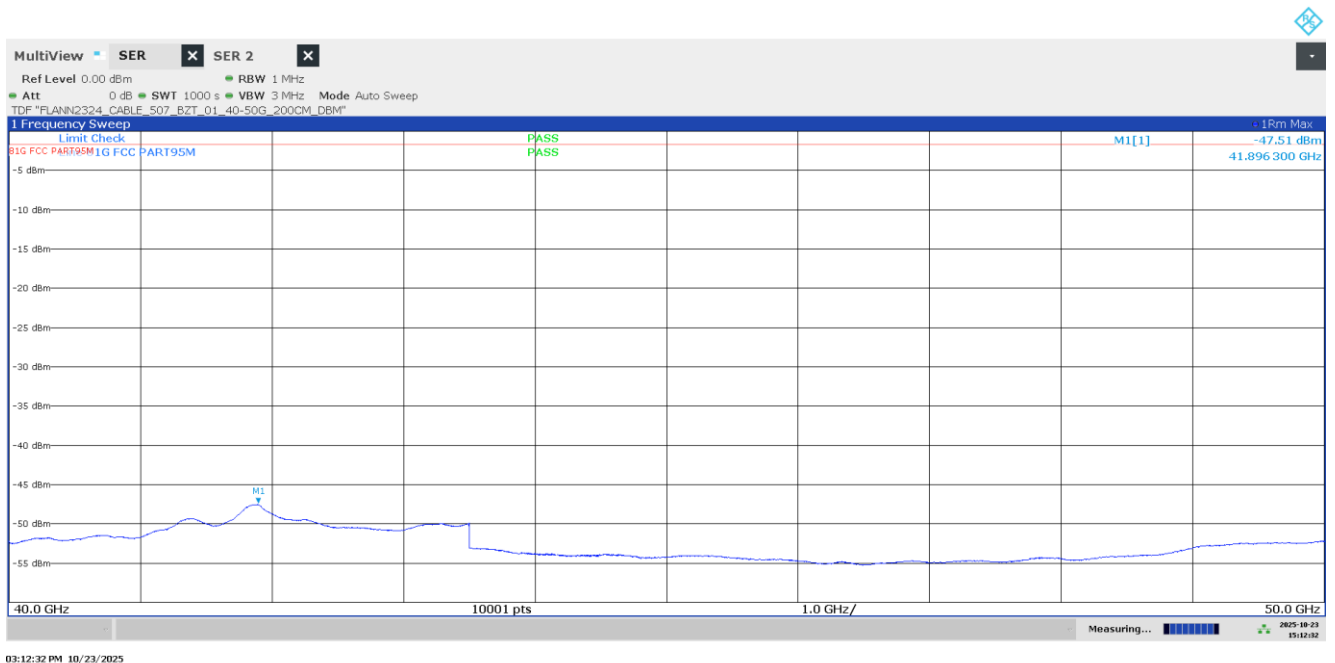
Note:

- Green trace: Peak detector prescan
- Black trace: RMS detector prescan
- Ferrite clamps on EUT cable during the measurement, see setup photographs

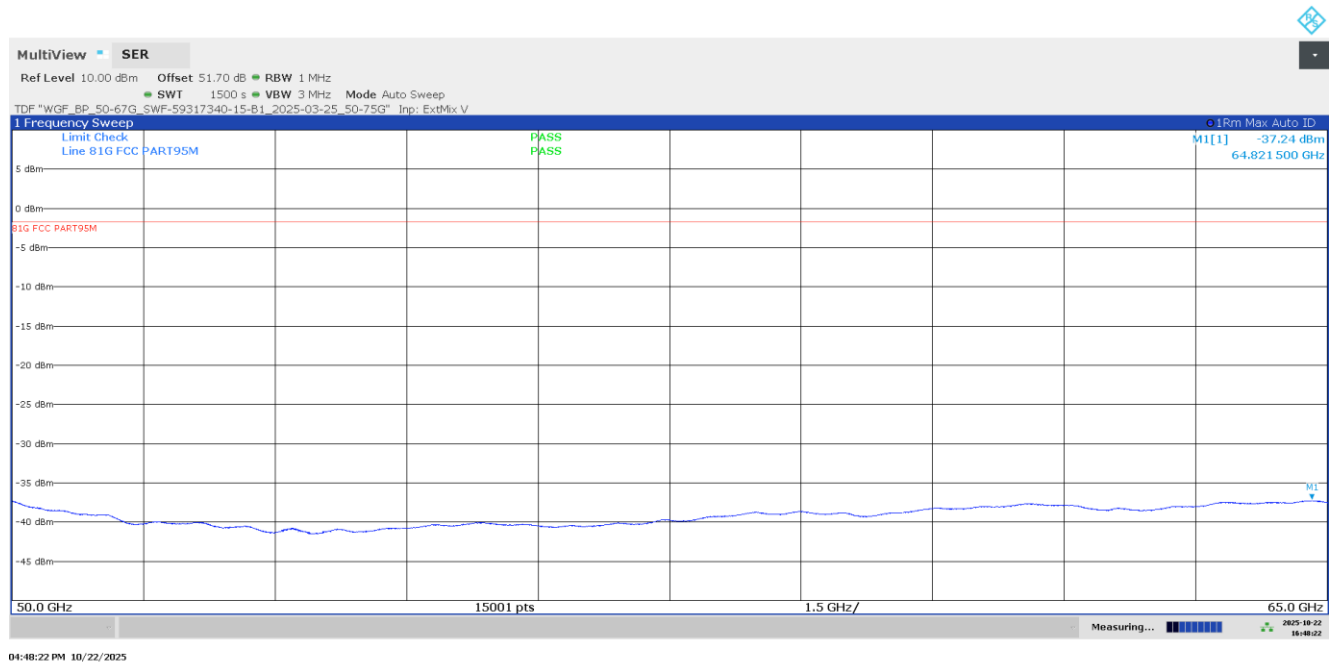
Plot 21: 18 GHz – 40 GHz, DUT24, Mode 18 (c1)



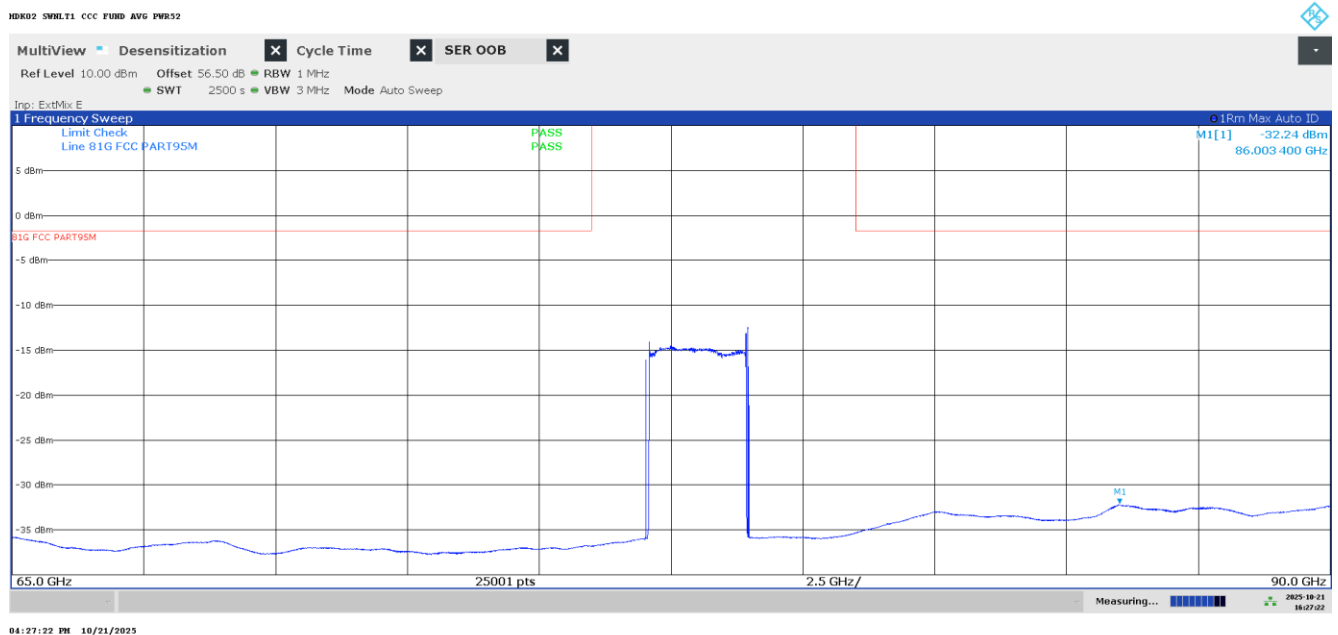
Plot 22: 40 GHz – 50 GHz, DUT24, Mode 18 (c1)



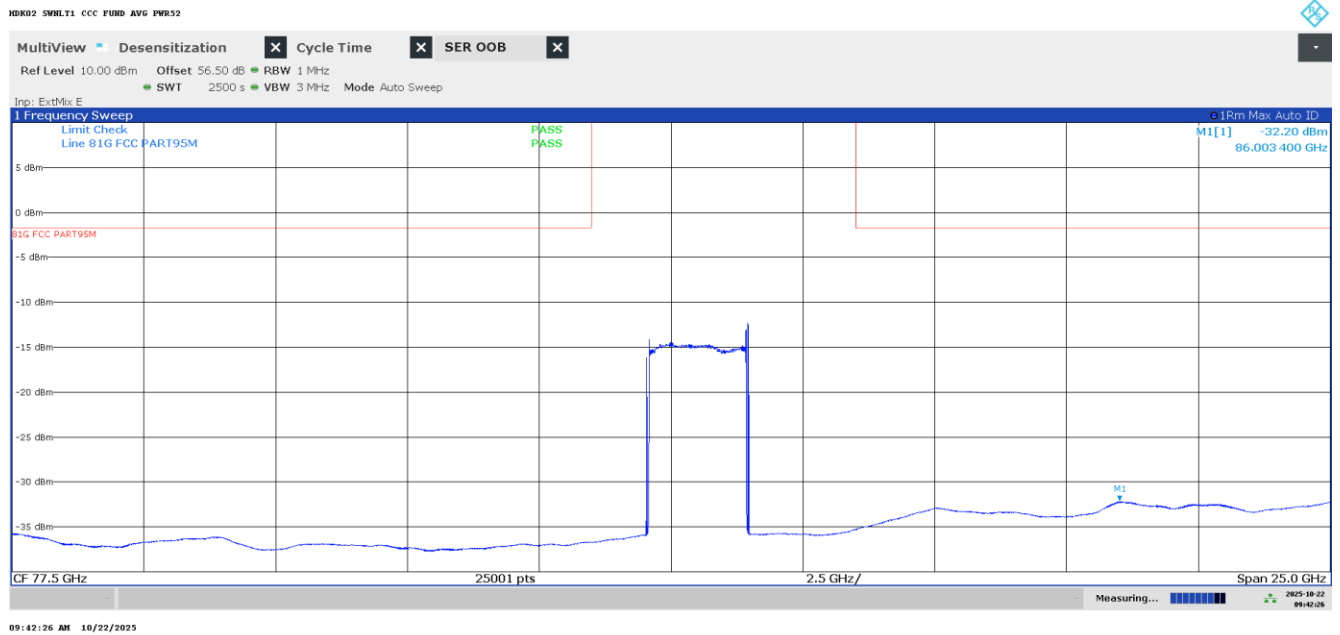
Plot 23: 50 GHz – 65 GHz, DUT24, Mode 18 (c1)



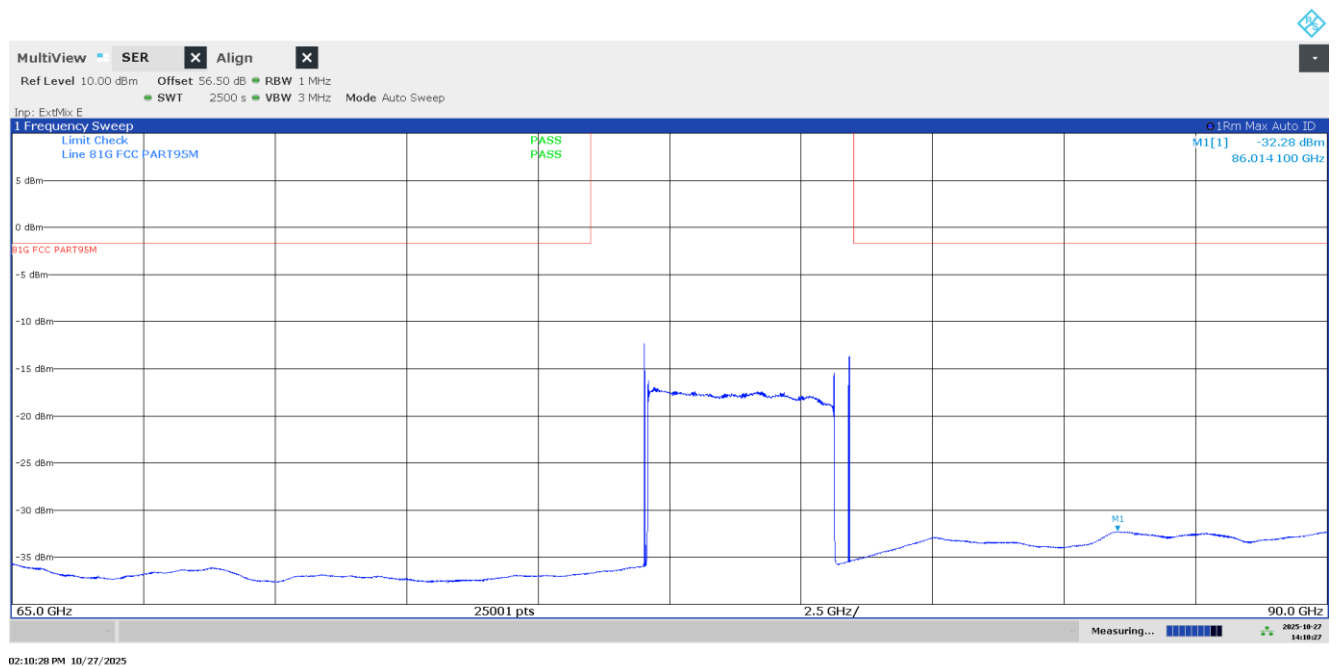
Plot 24: 65 GHz – 90 GHz, DUT24, Mode 17(c0)



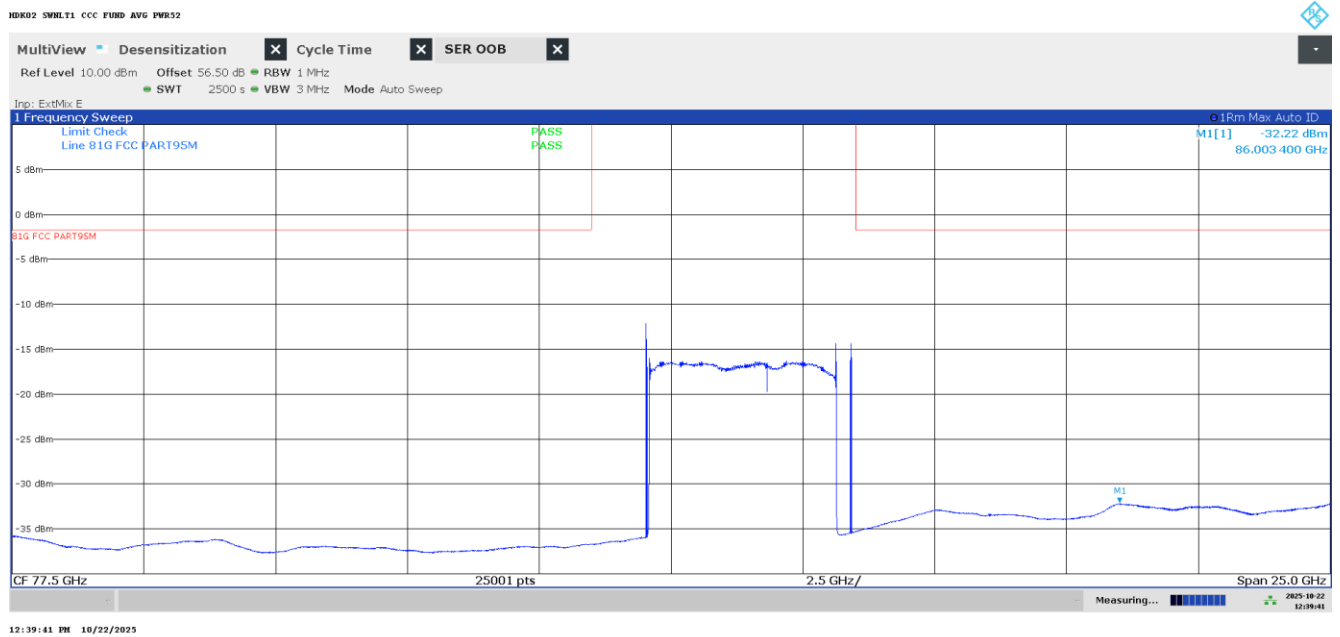
Plot 25: 65 GHz – 90 GHz, DUT24, Mode 17(c1)



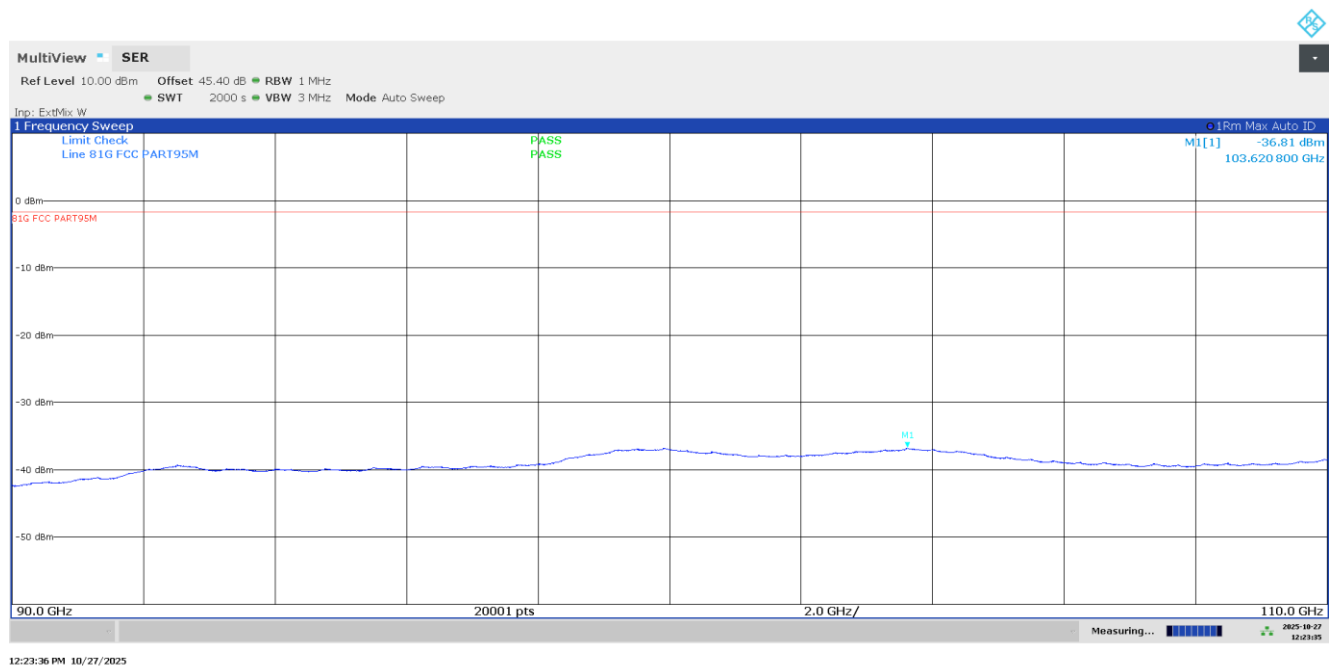
Plot 26: 65 GHz – 90 GHz, DUT24, Mode 18(c0)



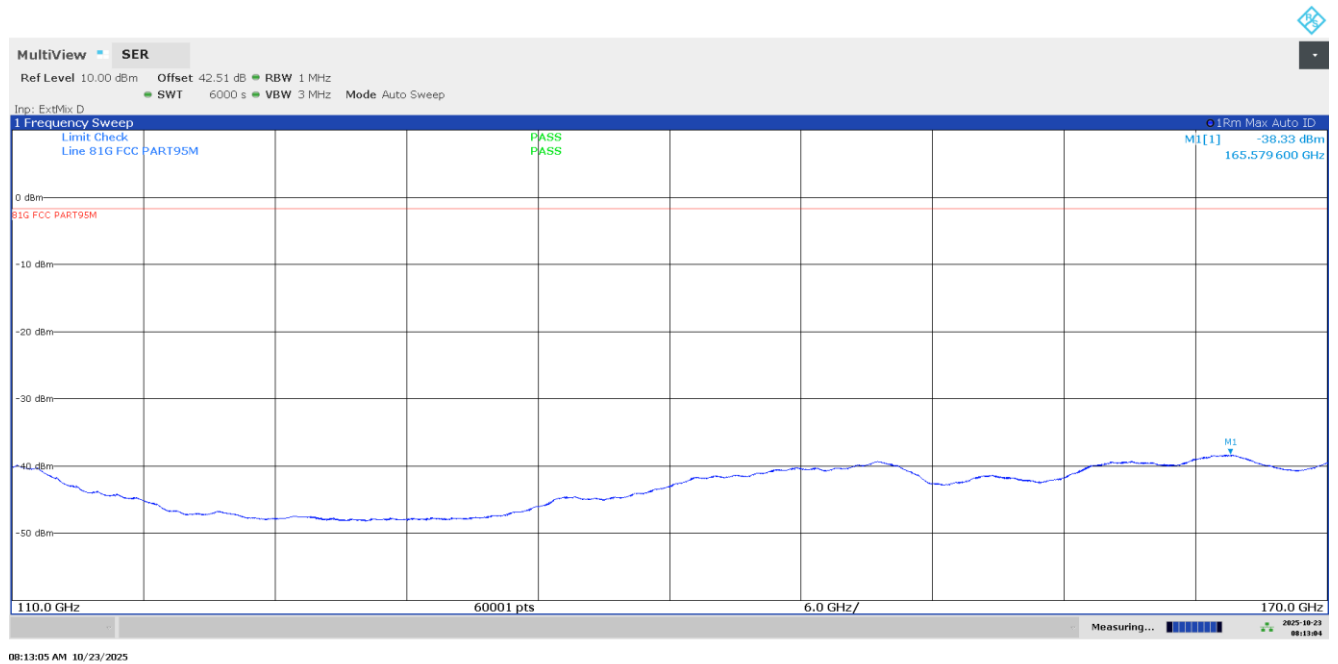
Plot 27: 65 GHz – 90 GHz, DUT24, Mode 18 (c1)



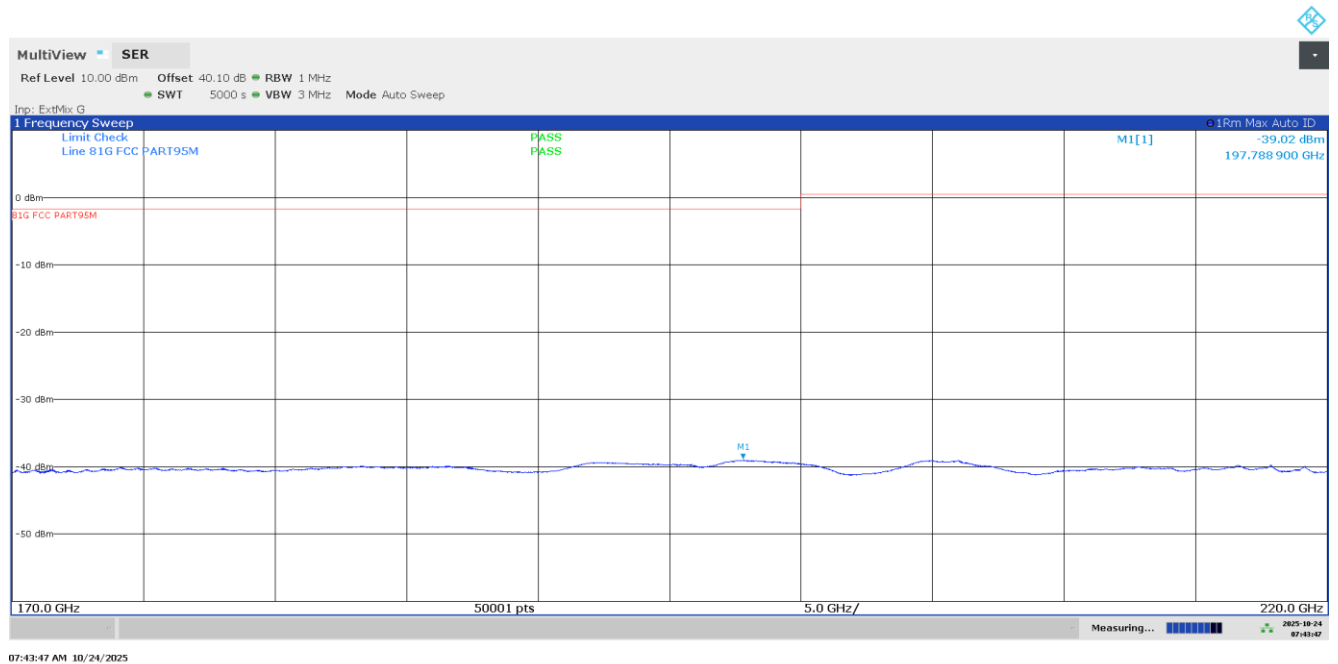
Plot 28: 90 GHz – 110 GHz, DUT24, Mode 18 (c1)



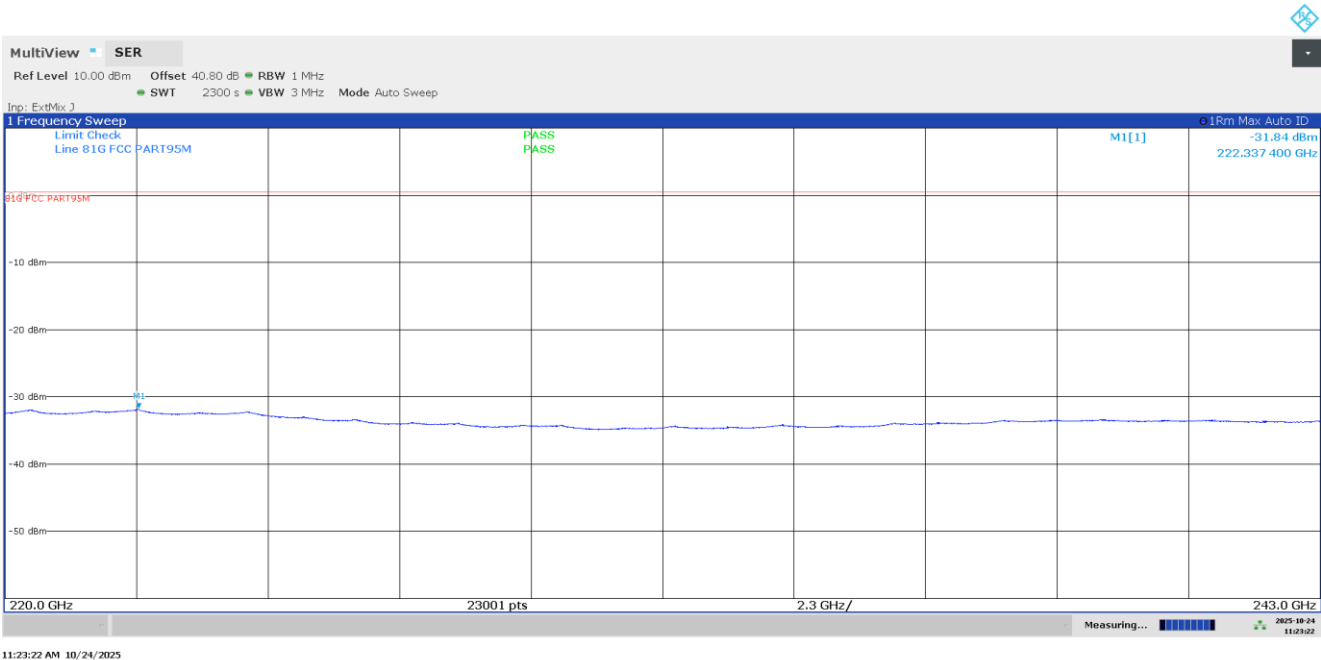
Plot 29: 110 GHz – 170 GHz, DUT24, Mode 18 (c1)



Plot 30: 170 GHz – 220 GHz, DUT24, Mode 18 (c1)



Plot 31: 220 GHz – 243 GHz, DUT24, Mode 18 (c1)



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	Combination of Grantee Code and Equipment Product Code
ISED	Innovation, Science and Economic Development 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	Continuous 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/N₀	Carrier to noise-density ratio, expressed in dB-Hz

14 Document history

Version	Applied changes	Date of release
R01-D1	Initial draft release	2025-10-29
R01	Initial release	2026-01-16

END OF TEST REPORT