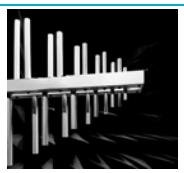
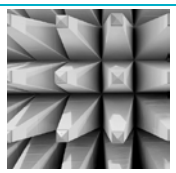

cetecom advanced

TEST REPORT

DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-00

Test report no.: 1-4378_22-01-02-B

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://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

Garrecht Avionik GmbH
Alfred-Nobel-Straße 2d
55411 Bingen / GERMANY
Phone: +49(0) 6721-498960
Contact: Johannes Garrecht
e-mail: Johannes@Garrecht.com

Manufacturer

Garrecht Avionik GmbH
Alfred-Nobel-Straße 2d
55411 Bingen / GERMANY

Test standard/s

FCC - Title 47 CFR Part 87 — FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 87 - Aviation Services

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

Test Item

Kind of test item:	**AirCom, VHF Air Band Radio**
Model name:	**AC-1**
FCC ID:	**2BFKKAC1**
Frequency:	117.975 MHz – 137 MHz
Technology tested:	Aeronautical Radio communication Equipment
Antenna:	BNC antenna connector
Power supply:	11.0 V to 30.3 V dc by power supply
Temperature range:	-30°C to +50°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:

cn=Christoph Schneider, o=cetecom advanced GmbH, ou=SND-230601, email=christoph.schneider@cetecomadvanced.com, c=DE
2024.04.24 06:28:16 +02'00'

Christoph Schneider
Lab Manager
Radio Labs

Test performed:

cn=Joachim Wolsdorfer, o=cetecom advanced GmbH, ou=WLD-230605, email=joachim.wolsdorfer@cetecomadvanced.com, c=DE
2024.04.24 06:30:54 +02'00'

Hans-Joachim Wolsdorfer
Lab Manager
Radio Labs

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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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This test report replaces the test report with the number 1-4378_22-01-02-A and dated 2024-04-12.

2.2 Application details

Date of receipt of order:	2024-02-14
Date of receipt of test item:	2024-02-14
Start of test:*	2024-02-14
End of test:*	2024-02-28
Person(s) present during the test:	Mr. Georg Garrecht

*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

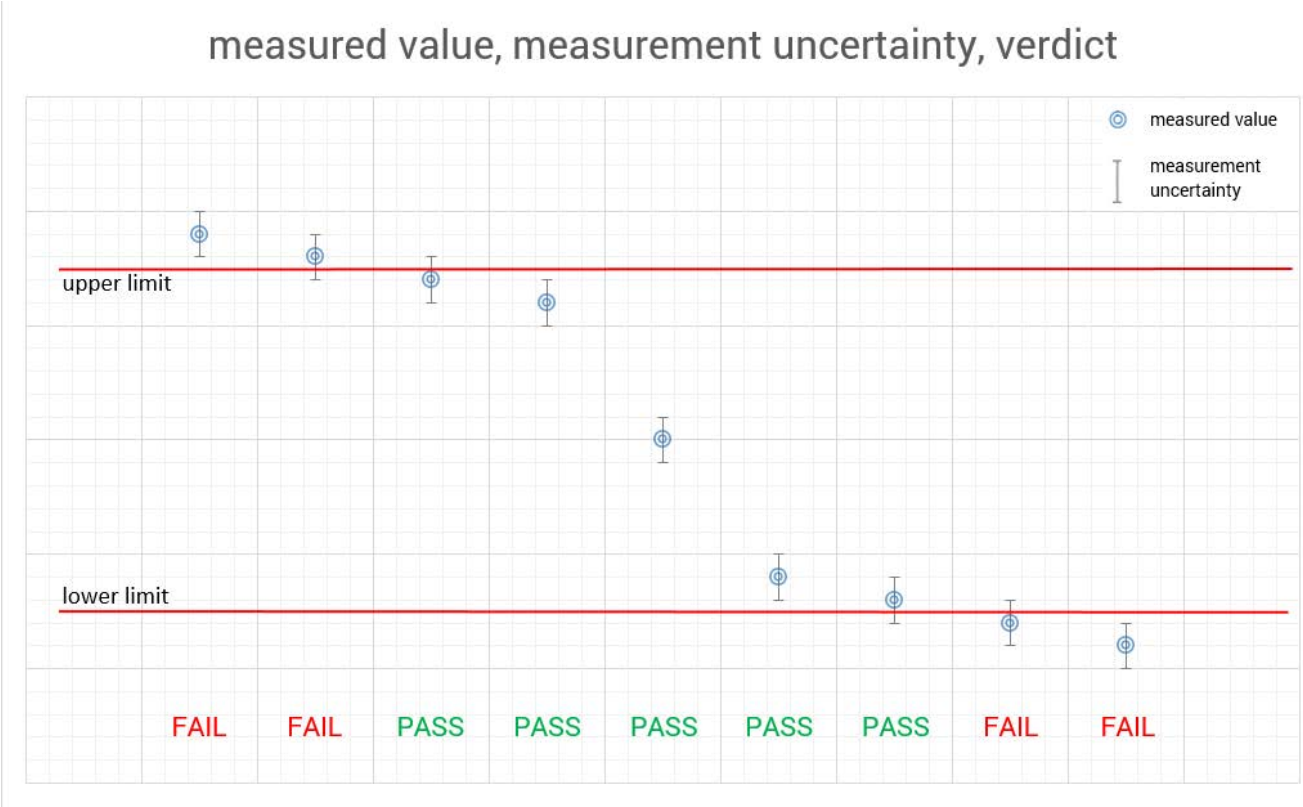
3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 87		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 87 - Aviation Services
RSS - 141	17.06.2010	Aeronautical Radiocommunication Equipment in the Frequency Band 117.975-137 MHz

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 C63.26-2015	-/-	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

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 8, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



5 Test environment

Temperature :	T_{nom} T_{max} T_{min}	+20 °C during room temperature tests +50 °C during high temperature tests -30 °C during low temperature tests
Relative humidity content :		55 %
Barometric pressure :		1021 hpa
Power supply :	V_{nom} V_{max} V_{min}	14.0 V dc by power supply 30.3 V 11.0 V

6 Test item

6.1 General description

Kind of test item :	AirCom, VHF Air Band Radio
Model name :	AC-1
S/N serial number :	AC1-00810
Hardware status :	2300
Software status :	-/-
Firmware status :	7
Frequency band :	117.975 MHz – 137 MHz
Type of radio transmission : Use of frequency spectrum :	modulated carrier
Type of modulation :	A3E
Number of channels :	760 (25 kHz) 2280 (8.33 kHz)
Antenna :	BNC antenna connector
Power supply :	11.0 V to 30.3 V dc by power supply
Temperature range :	-30°C to +50°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:

Annex A101 - Photographs - 1-4378_22-01-01_TR1-A101-R1
Annex A102 - Photographs - 1-4378_22-01-01_TR1-A102-R1
Annex A103 - Photographs - 1-4378_22-01-01_TR1-A103-R1

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).

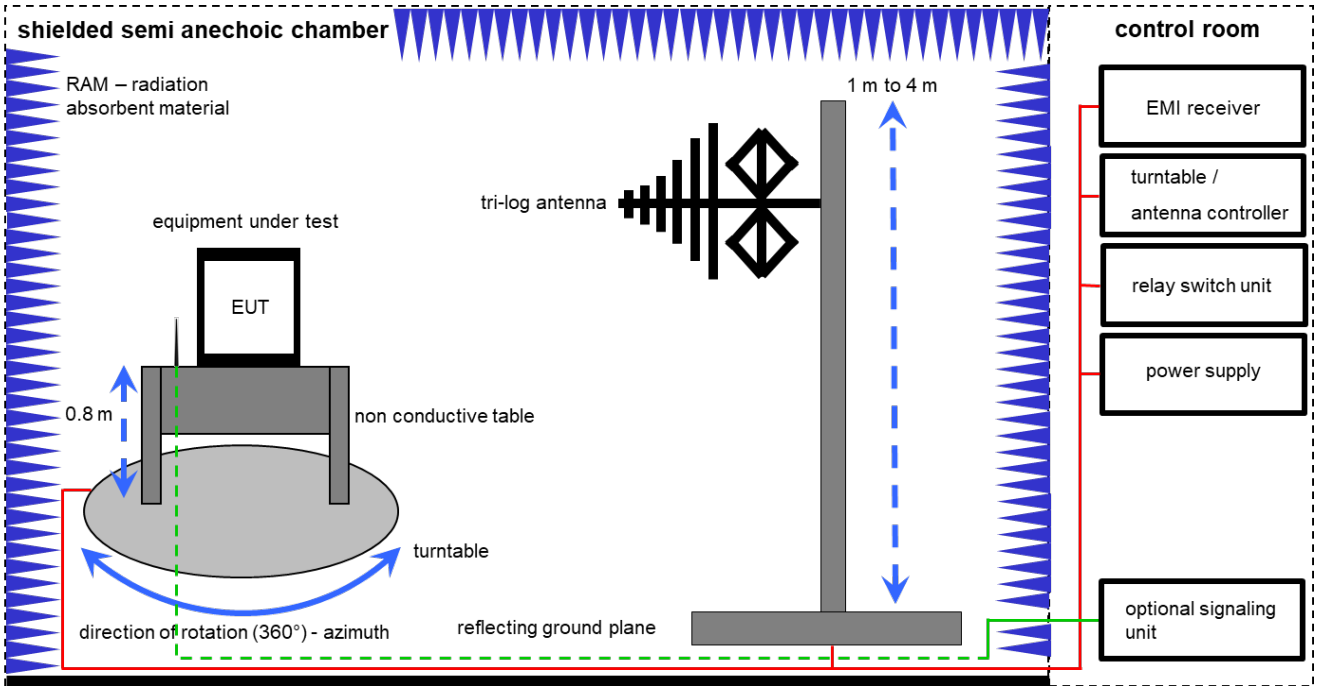
Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

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
EMC32 software version: 10.59.00

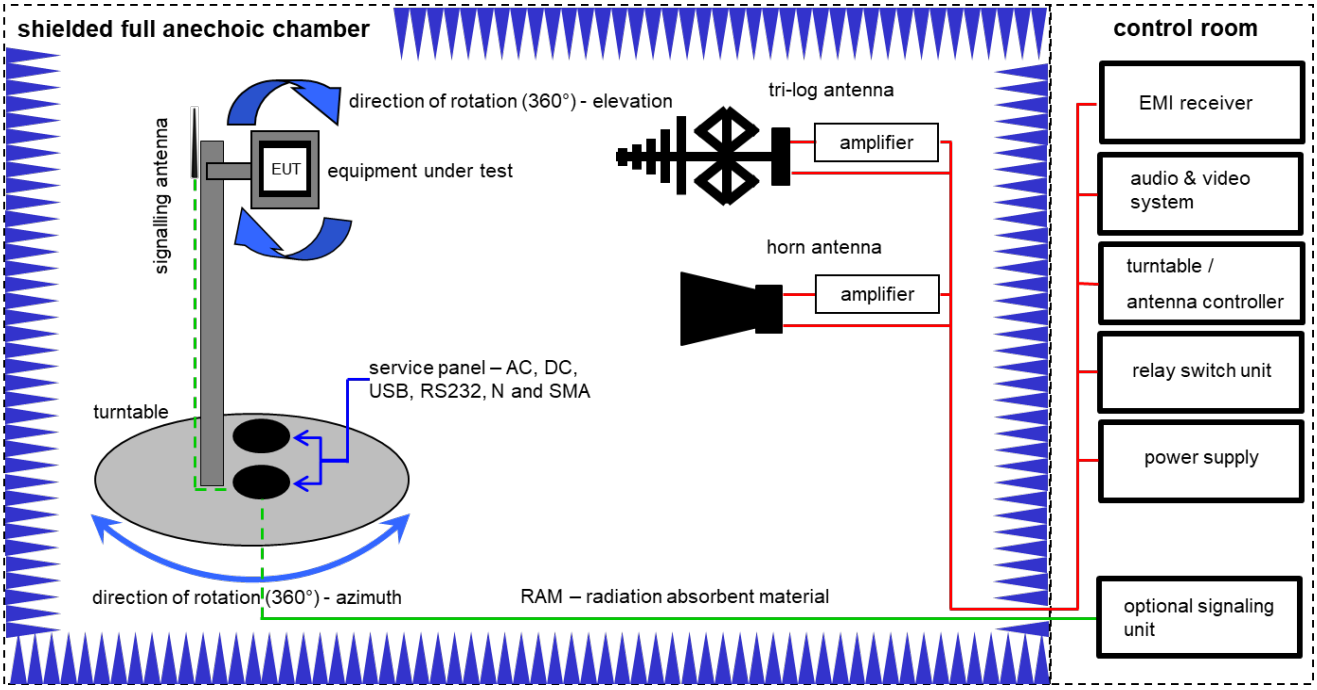
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
2	A	Semi anechoic chamber	3000023	MWB AG		300000551	ne	-/-	-/-
3	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
4	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
5	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	318	300003696	vlKl!	31.01.2024	30.01.2026
7	A	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	06.12.2023	31.12.2024
8	A	Turntable	2089-4.0	EMCO		300004394	ne	-/-	-/-
9	A	PC	TecLine	F+W		300004388	ne	-/-	-/-
10	A	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	06.12.2023	31.12.2024

7.2 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter

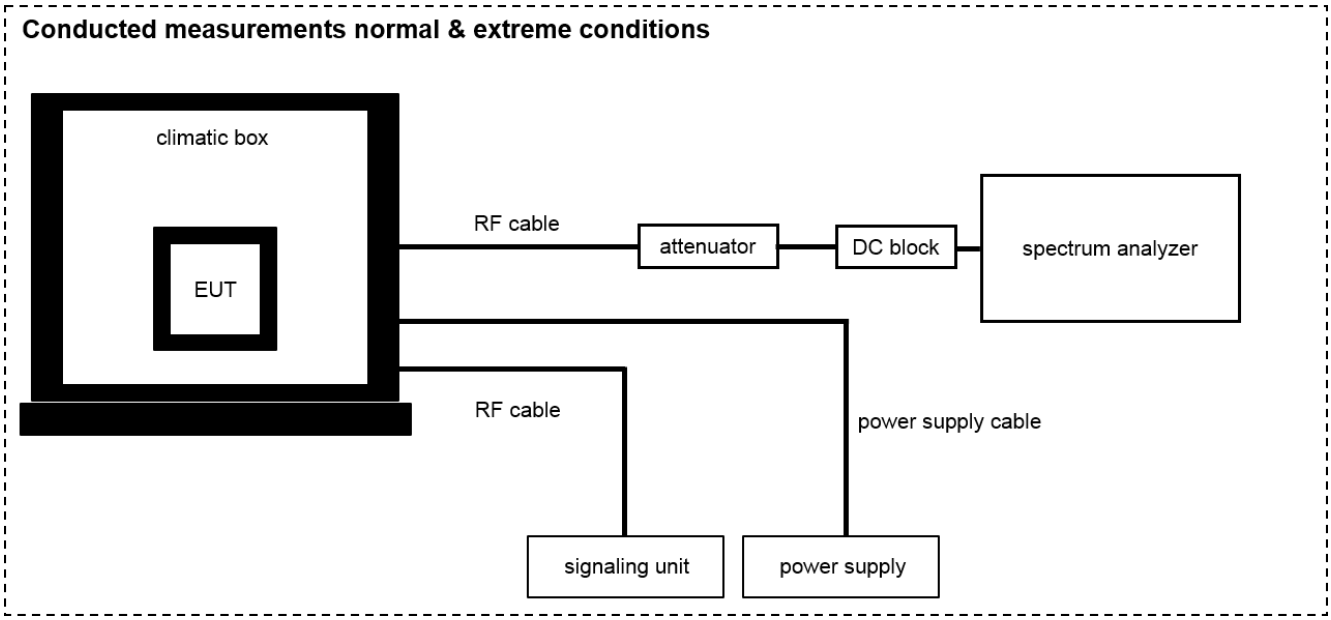
OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

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

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3696	300001604	vIKI!	20.03.2023	19.03.2025
2	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	371	300003854	vIKI!	04.02.2022	29.02.2024
3	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
4	A, B	NEXIO EMV-Software	BAT EMC V2022.0.32.0	Nexio		300004682	ne	-/-	-/-
5	A, B	Anechoic chamber		TDK		300003726	ne	-/-	-/-
6	A, B	EMI Test Receiver 9kHz-26,5GHz	ESR26	Rohde & Schwarz	101376	300005063	k	15.01.2024	14.01.2025
7	A, B	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011571	300005240	ev	-/-	-/-
8	A, B	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04590	300001041	vIKI!	04.12.2023	31.12.2026

7.3 Conducted measurements normal and extreme conditions



OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Signal analyzer	FSW26	Rohde&Schwarz	101455	300004528	k	14.12.2023	31.12.2024
2	A, B	Power Supply	HMP2020	Rohde & Schwarz	101961	300006102	k	15.12.2022	31.12.2024
3	B, C	Radio Test Set	CMA180	Rohde & Schwarz	103478	300006349	k	05.01.2024	04.01.2026
4	B	Temperature Test Chamber	VT 4011	Voetsch Industrietechnik	585662306000 10	300005363	ev	09.05.2022	31.05.2024
5	C	Audio Analyzer	UPV 1146.2003K02	R&S	100504	300003539	vIKI!	28.12.2022	31.12.2024

8 Sequence of testing

8.1 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.

8.2 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.

9 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
Spectrum bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Detailed conducted spurious emissions @ the band edge	± 1 dB
Band edge compliance radiated	± 3 dB
Spurious emissions conducted	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

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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 Part 87 RSS - 141, Issue 2 RSS-Gen Issue 5	See table!	2024-04-24	-/-

Test specification clause	Test case	Temperature conditions	Voltage conditions	C	NC	NA	NP	Remark
§2.1046 §87.131 RSS-141 -5.1	Transmitter output power	Nominal	Nominal	☒	☐	☐	☐	-/-
§2.1049 §87.135 RSS-141 -5.1	Occupied bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
§2.1055 §87.133 RSS-141 -5.1	Transmitter frequency stability	Nominal	Nominal	☒	☐	☐	☐	
		Extreme	Extreme	☒	☐	☐	☐	
§2.1051, §2.1053, §87.139 RSS-141 -5.2	Transmitter Unwanted Emissions	Nominal	Nominal	☒	☐	☐	☐	-/-
§2.1051 §87.139 RSS-141 -5.2	Spectrum Mask	Nominal	Nominal	☒	☐	☐	☐	-/-
§2.1047	Modulation characteristics	Nominal	Nominal	☒	☐	☐	☐	-/-
RSS-141 -5.3 RSS-Gen – 7.1	Receiver spurious emissions	Nominal	Nominal	☒	☐	☐	☐	-/-

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

11 Measurement results

11.1 Power and emissions

Measurement:

Measurement parameter	
EUT configuration:	Mean Power: Modulate the transmitter with a 2.5 kHz tone at a level 16 dB higher than that required to produce a frequency deviation of ± 75 kHz, or to produce 50% of the manufacturer's rated deviation, whichever is less.
Test setup:	See sub clause 7.3– B
Measurement uncertainty:	See sub clause 9

Limits:

FCC & IC
Aircraft (Communication) VHF 55 W / 47 dBm

Measurement results:

Test Conditions		conducted output power	
		8.33 kHz	25 kHz
118.000 MHz	T_{nom} / V_{nom}	38.63 dBm	38.62 dBm
127.500 MHz	T_{nom} / V_{nom}	38.12 dBm	38.13 dBm
136.975 MHz	T_{nom} / V_{nom}	38.25 dBm	38.24 dBm

11.2 Occupied bandwidth

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	see plots (1 % to 5 % of the occupied bandwidth)
Video bandwidth:	>RBW
Span:	30 kHz
Trace mode:	Max. hold
Analyzer function:	99% power occupied bandwidth function
EUT:	Modulated signal
Test setup:	See sub clause 7.3 A
Measurement uncertainty:	See sub clause 9

Limits:

FCC & IC		
Class of emission	**Authorized bandwidth (FCC)**	**Authorized bandwidth (IC)**
A3E	25 kHz	25 kHz
A3E	8.33 kHz	25 kHz

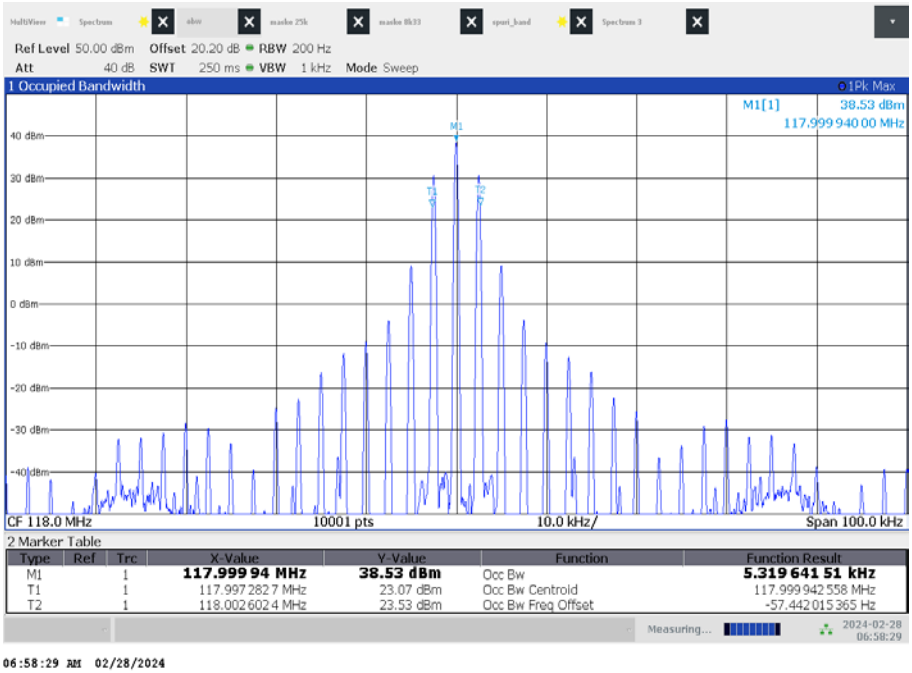
Results:

8.33 kHz channel bandwidth:

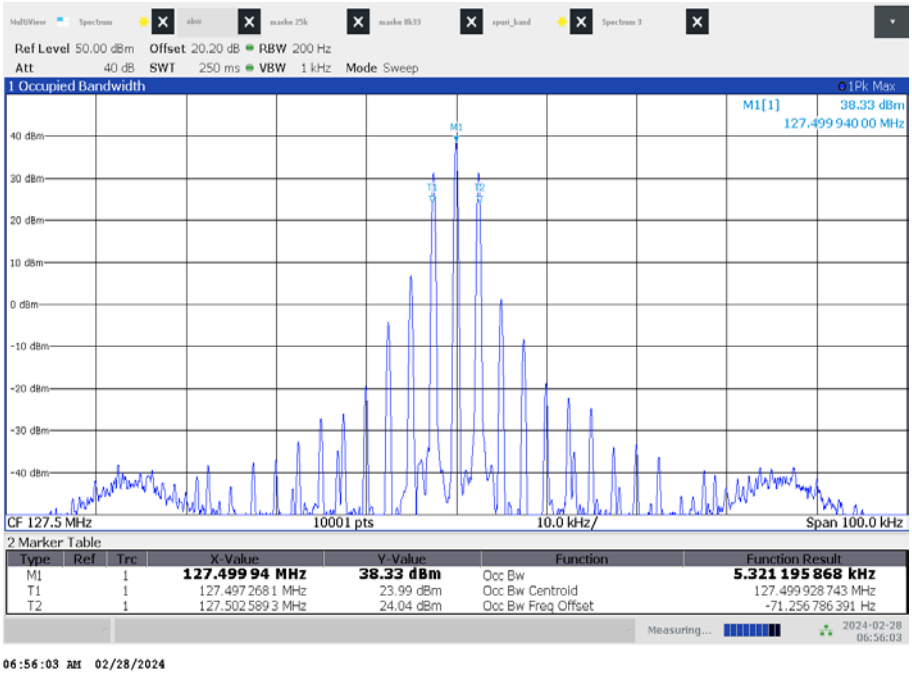
Occupied bandwidth		
Frequency	**8.33 kHz**	**25 kHz**
118.000 MHz	5.32 kHz	5.32 kHz
127.500 MHz	5.32 kHz	5.32 kHz
136.975 MHz	5.33 kHz	5.33 kHz

Plots: 8.33 kHz

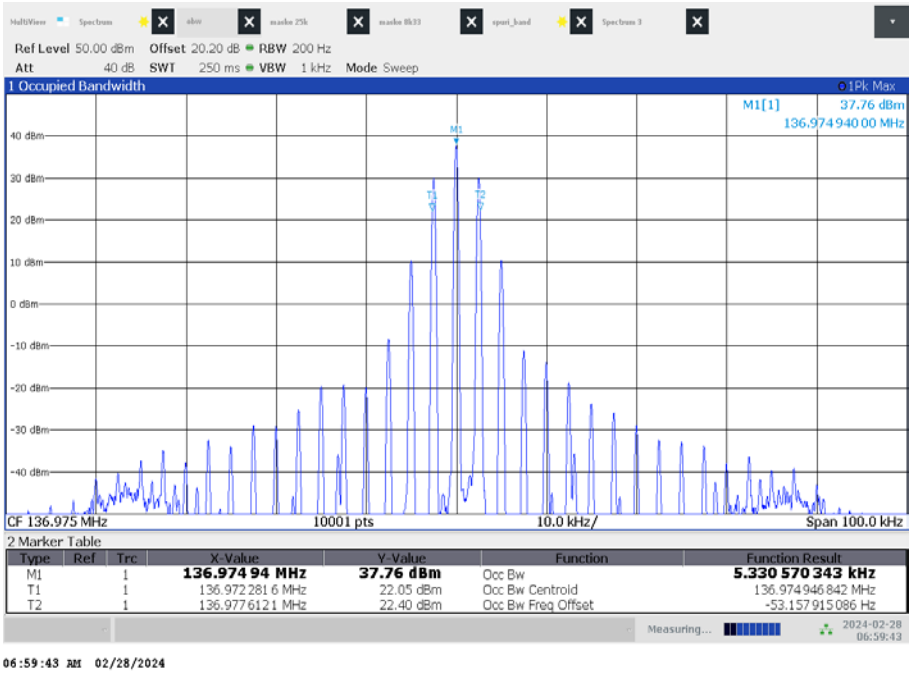
Plot 1: OBW 118.000 MHz



Plot 2: OBW 127.500 MHz

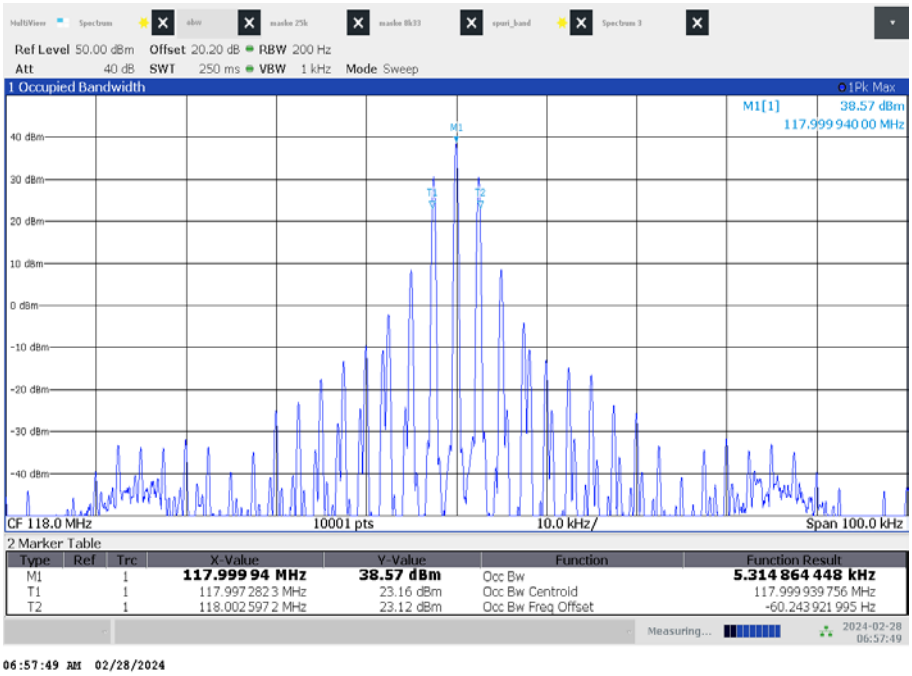


Plot 3: OBW 136.975 MHz

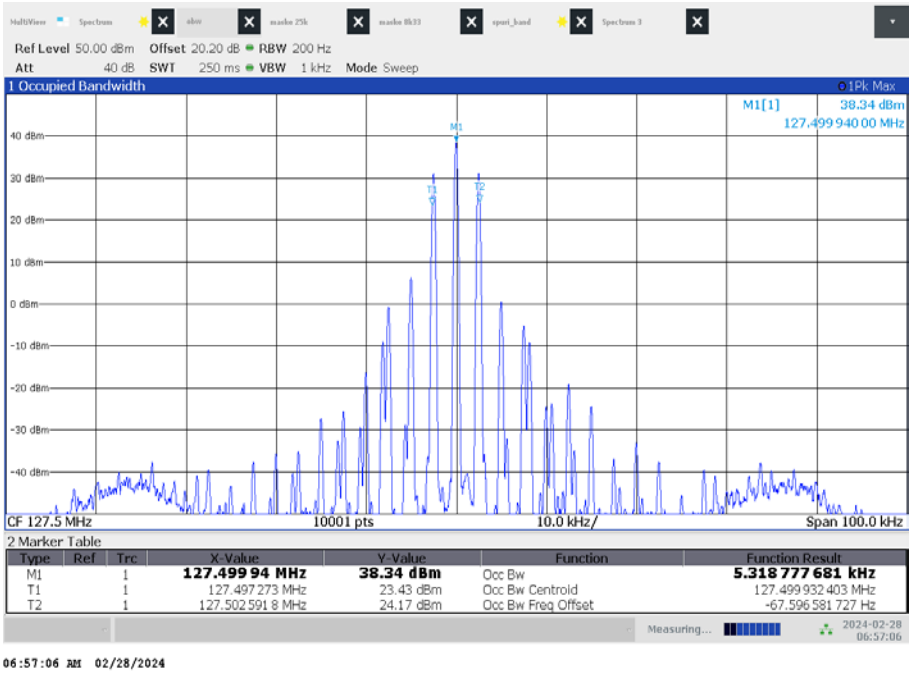


Plots: 25 kHz

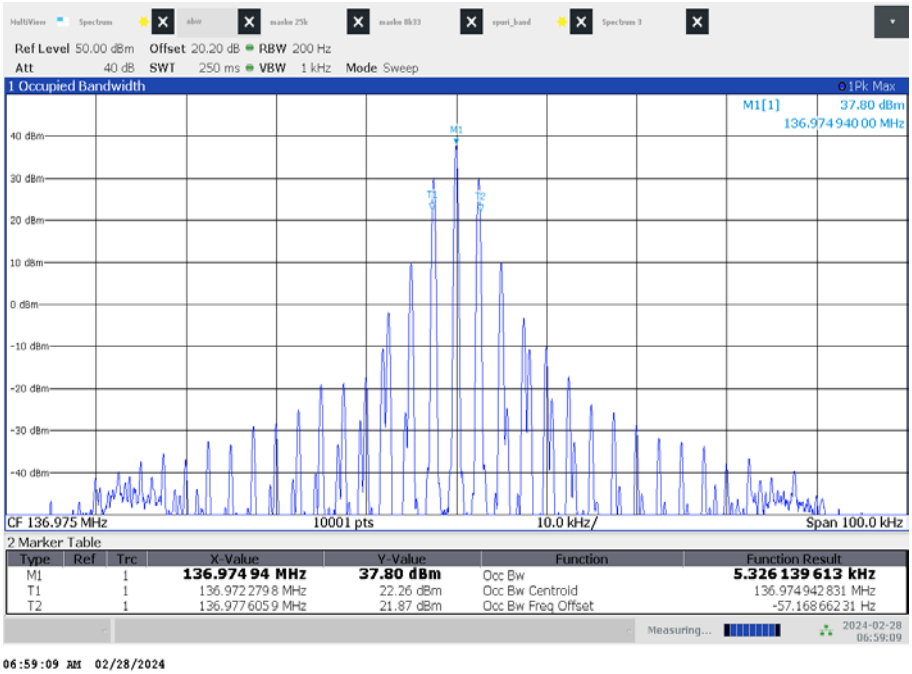
Plot 1: OBW 118.000 MHz



Plot 2: OBW 127.500 MHz



Plot 1: OBW 136.975 MHz



11.3 Transmitter frequency stability

Measurement:

Measurement parameter	
EUT:	CW signal
Test setup:	See sub clause 7.3 B
Measurement uncertainty:	See sub clause 9

Limits:

FCC & IC Ground Equipment		
117.975 MHz – 137 MHz:	A3E	± 20 ppm*

*) This tolerance is the maximum permitted after January 1, 1985 for new and replacement transmitters and to all transmitters after January 1, 1990.

Measurement result:

118.000 MHz					
Temperature / °C	Voltage / V DC	Reference Frequency / MHz	Measured Frequency / MHz	Deviation / Hz	Deviation / ppm
-30	14.0	118.000	118.0000041	4.1	0.035
-20	14.0	118.000	117.9999580	-42.0	-0.356
-10	14.0	118.000	117.9999415	-58.5	-0.496
0	14.0	118.000	117.9999457	-54.3	-0.460
10	14.0	118.000	117.9999573	-42.7	-0.362
20	14.0	118.000	117.9999621	-37.9	-0.321
30	14.0	118.000	117.9999729	-27.1	-0.230
40	14.0	118.000	117.9999923	-7.7	-0.065
50	14.0	118.000	117.9999984	-1.6	-0.014
+20 °C	11.90	118.000	118.0000346	34.6	0.293
+20 °C	14.00	118.000	118.0000343	34.3	0.291
+20 °C	16.10	118.000	118.0000339	33.9	0.287

127.500 MHz					
Temperature / °C	Voltage / V DC	Reference Frequency / MHz	Measured Frequency / MHz	Deviation / Hz	Deviation / ppm
-30	14.0	127.500	127.5000026	2.6	0.020
-20	14.0	127.500	127.4999551	-44.9	-0.352
-10	14.0	127.500	127.4999358	-64.2	-0.504
0	14.0	127.500	127.4999406	-59.4	-0.466
10	14.0	127.500	127.4999532	-46.8	-0.367
20	14.0	127.500	127.4999586	-41.4	-0.325
30	14.0	127.500	127.4999704	-29.6	-0.232
40	14.0	127.500	127.4999911	-8.9	-0.070
50	14.0	127.500	127.4999975	-2.5	-0.020
+20 °C	11.90	127.500	127.5000374	37.4	0.293
+20 °C	14.00	127.500	127.5000377	37.7	0.296
+20 °C	16.10	127.500	127.5000380	38.0	0.298

136.975 MHz					
Temperature / °C	Voltage / V DC	Reference Frequency / MHz	Measured Frequency / MHz	Deviation / Hz	Deviation / ppm
-30	14.0	136.975	136.9749961	-3.9	-0.028
-20	14.0	136.975	136.9749536	-46.4	-0.339
-10	14.0	136.975	136.9749304	-69.6	-0.508
0	14.0	136.975	136.9749360	-64.0	-0.467
10	14.0	136.975	136.9749492	-50.8	-0.371
20	14.0	136.975	136.9749552	-44.8	-0.327
30	14.0	136.975	136.9749680	-32.0	-0.234
40	14.0	136.975	136.9749902	-9.8	-0.072
50	14.0	136.975	136.9749960	-4.0	-0.029
+20 °C	11.90	136.975	136.9750421	42.1	0.307
+20 °C	14.00	136.975	136.9750416	41.6	0.304
+20 °C	16.10	136.975	136.9750413	41.3	0.302

11.4 Transmitter unwanted emissions

Measurement:

Measurement parameter		
Detector:	Peak (worst case) / Average (RMS)	
Sweep time:	Auto / 1 s	
Resolution bandwidth:	25 dBc and 35 dBc criteria:	300 Hz
	40 dBc	3 kHz
Video bandwidth:	3 x resolution bandwidth	
Trace mode:	Max. hold	
EUT:	Modulated signal	
Test setup:	See sub clause 7.2 A/B, 7.3 A	
Measurement uncertainty:	See sub clause 9	

The transmitter shall be operated into the standard output termination across the antenna terminals and modulated with a 2500 Hz sinusoidal signal at a level sufficient to produce 50% modulation. The level of the input modulation signal is then increased by 16 dB.

Limits:

FCC & IC
• When the frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the attenuation must be at least 25 dB; • When the frequency is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth the attenuation must be at least 35 dB. • When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least 43 + 10 $\log_{10}$ (pY) dB. Where pY is the mean power of the transmitter.

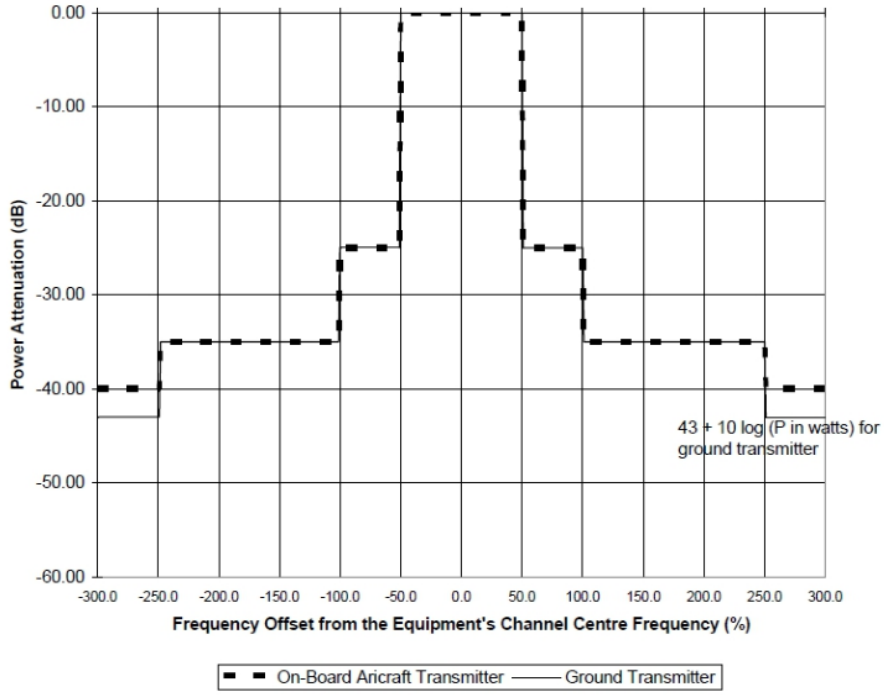


Figure 1: Unwanted Emissions Mask for Transmitters with A3E and A9W Emissions

The equipment's transmitted unwanted emission limits are plotted for a range of frequency offset percentage values. The x-axis represents the frequency offset from the equipment's channel frequency. The y-axis represents the power attenuation in dB. The solid line represents the unwanted emission mask for ground transmitters. The dashed line represents the unwanted emission mask for on-board aircraft transmitters.

Results:

Radiated			
carrier frequency / MHz	unwanted emission frequency / MHz	Limit / dBm	level dB / dBm or remark
All detected unwanted emissions are more than 20 dB below the spurious limit.			

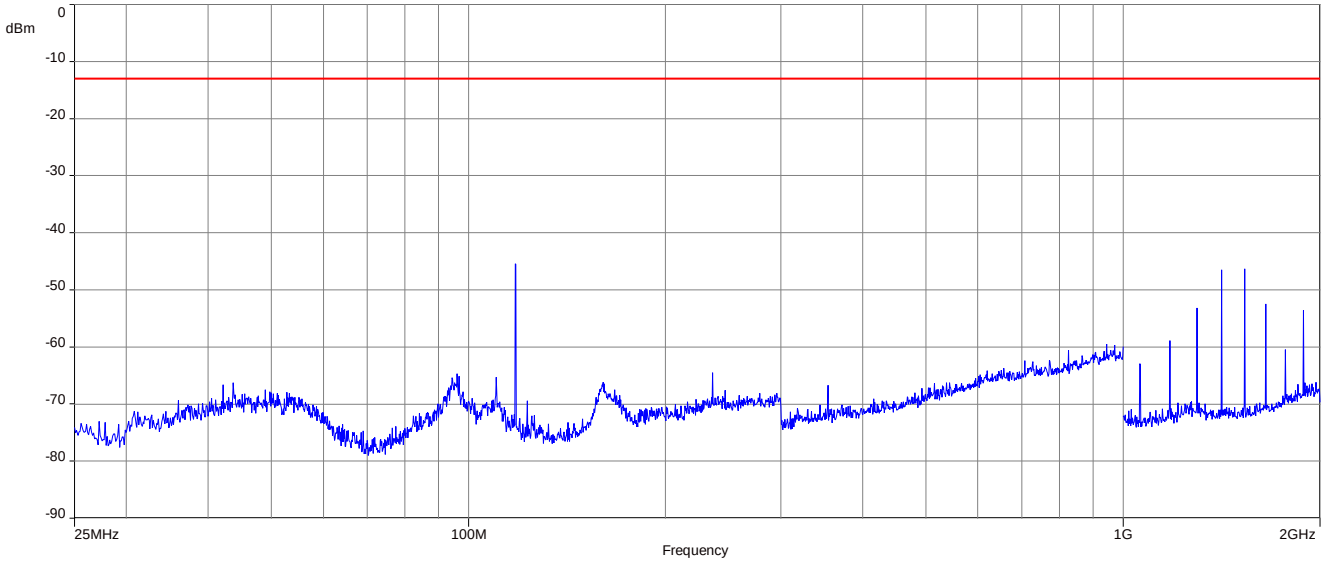
Where PP = Positive peak detector
RMS = Root mean square detector

Conducted			
channels	unwanted emission frequency / MHz	Limit / dBm	level dB / dBm or remark
118.000 (8.33kHz bw)	no peaks detected	-13.0	-/-
127.500 (8.33kHz bw)			-/-
136.975 (8.33kHz bw)			-/-
118.000 (25kHz bw)			-/-
127.500 (25kHz bw)			-/-
136.975 (25kHz bw)			-/-

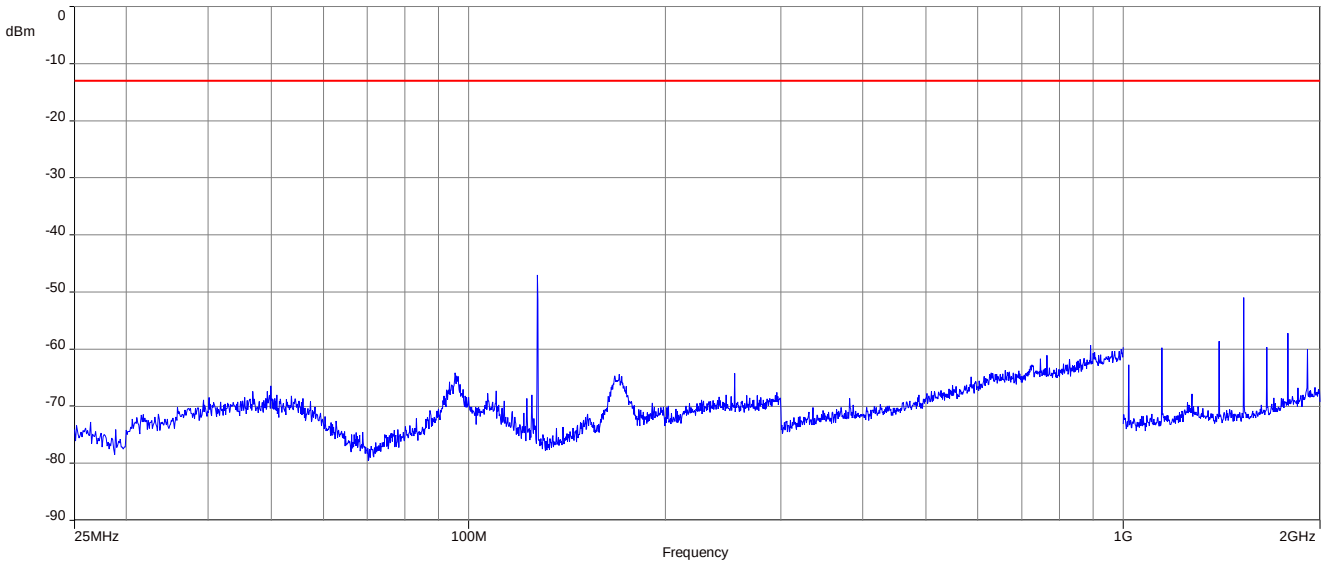
Where PP = Positive peak detector
RMS = Root mean square detector

Plots radiated (cabinet radiation, radio output terminated):

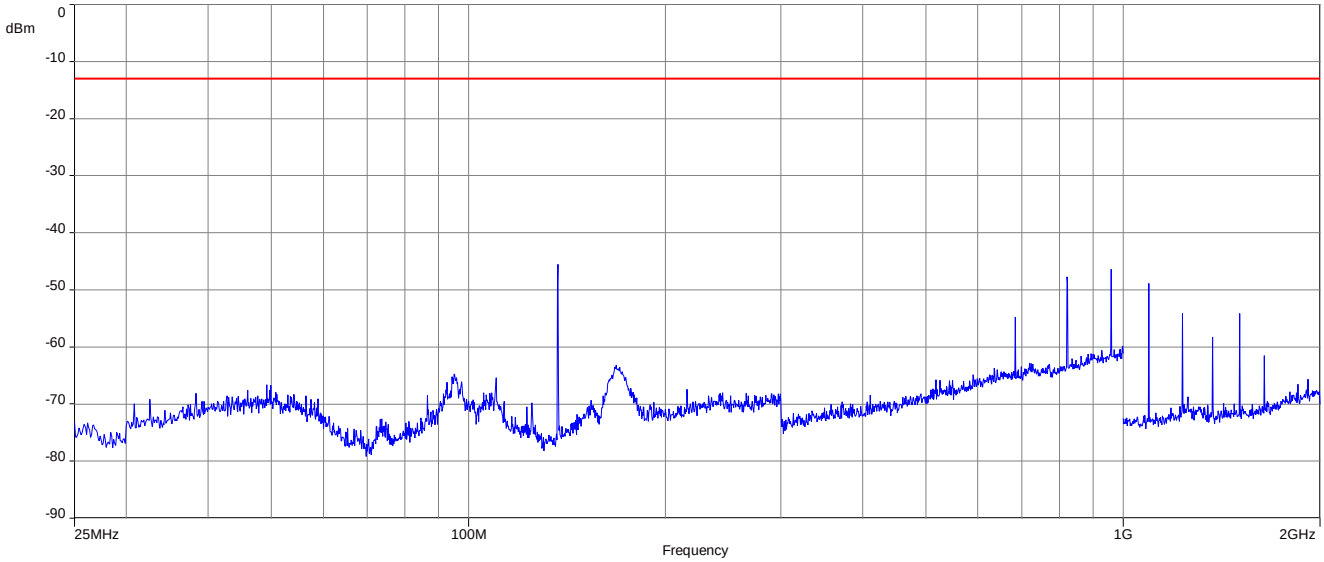
Plot 1: 118.000 MHz, 8.33 kHz channel bandwidth



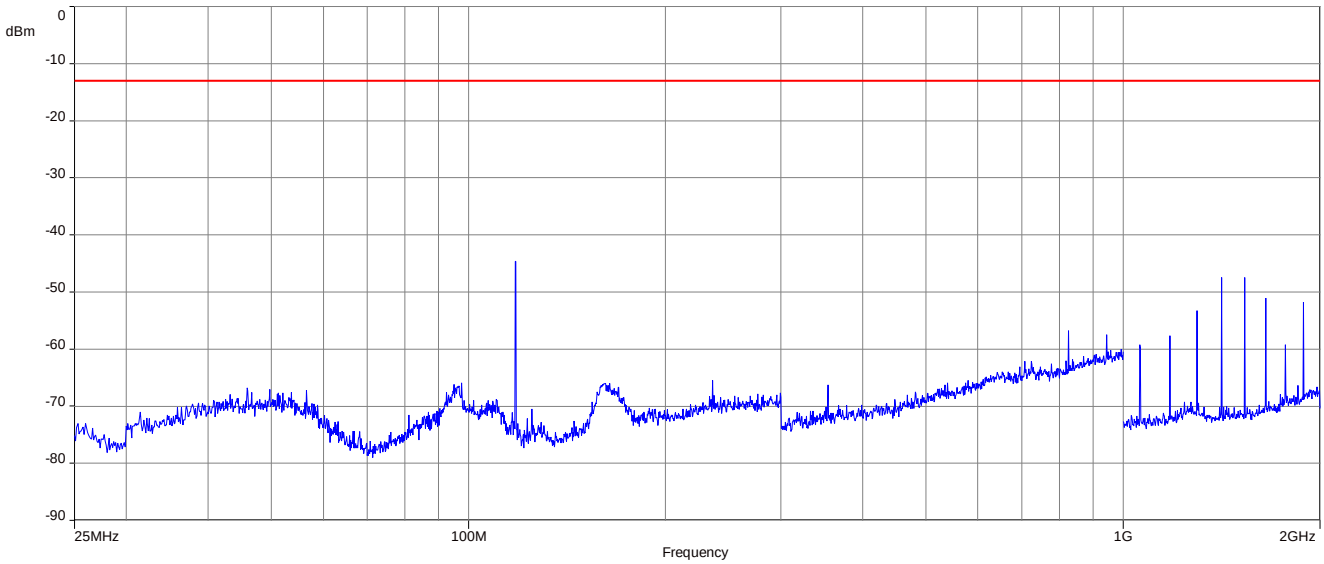
Plot 2: 127.500 MHz, 8.33 kHz channel bandwidth



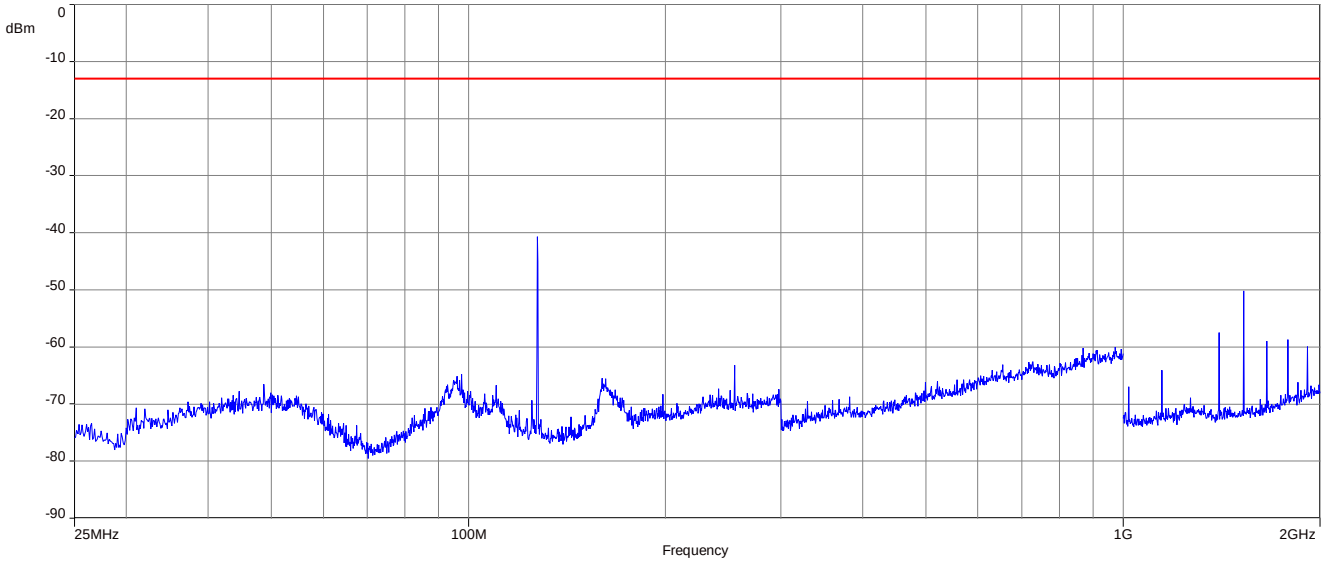
Plot 3: 136.975 MHz, 8.33 kHz channel bandwidth



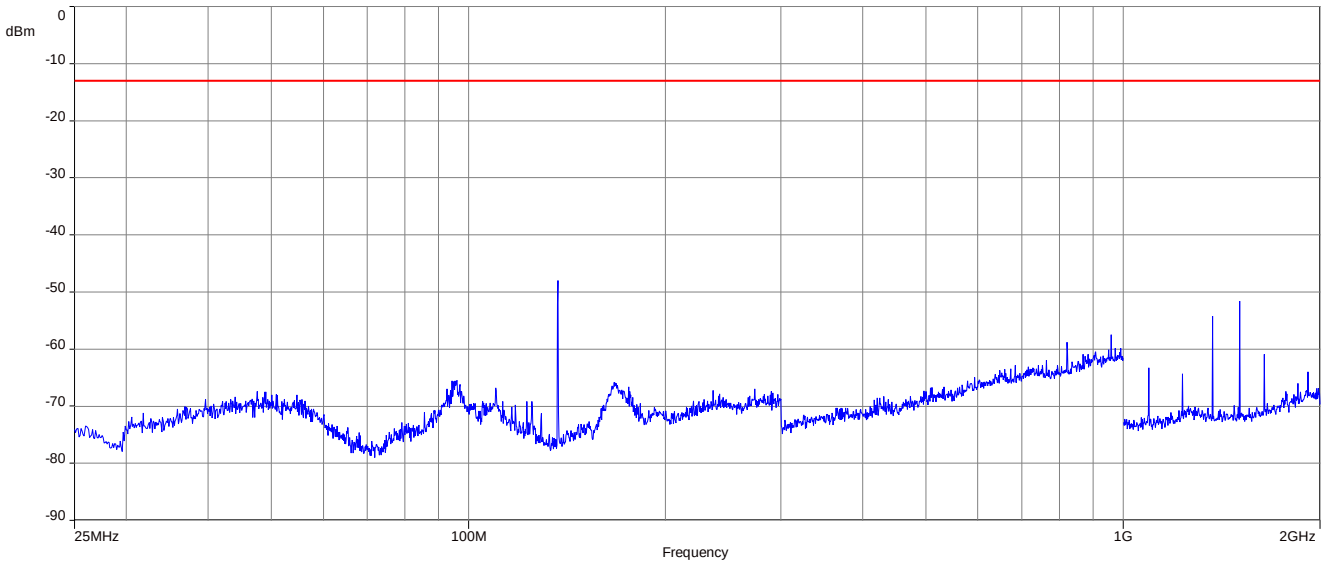
Plot 4: 118.000 MHz, 25 kHz channel bandwidth



Plot 5: 127.500 MHz, 25 kHz channel bandwidth

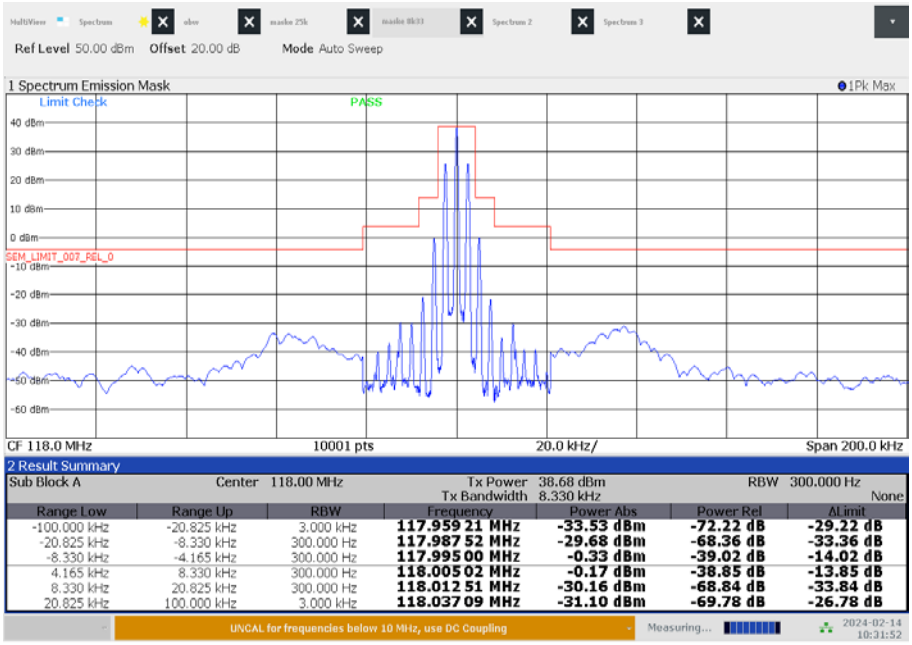


Plot 6: 136.975 MHz, 25 kHz channel bandwidth

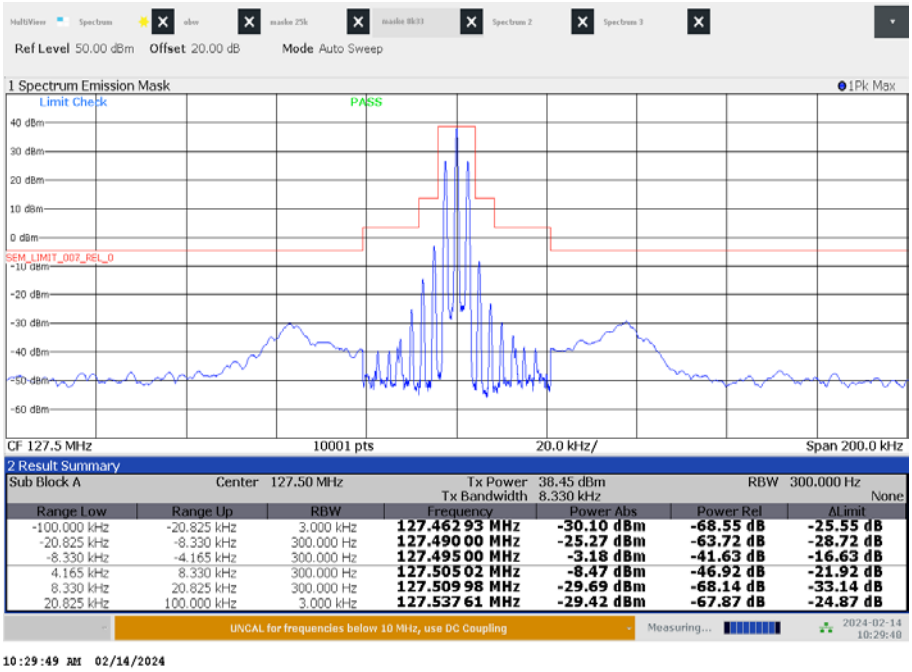


Plots conducted (channel mask):

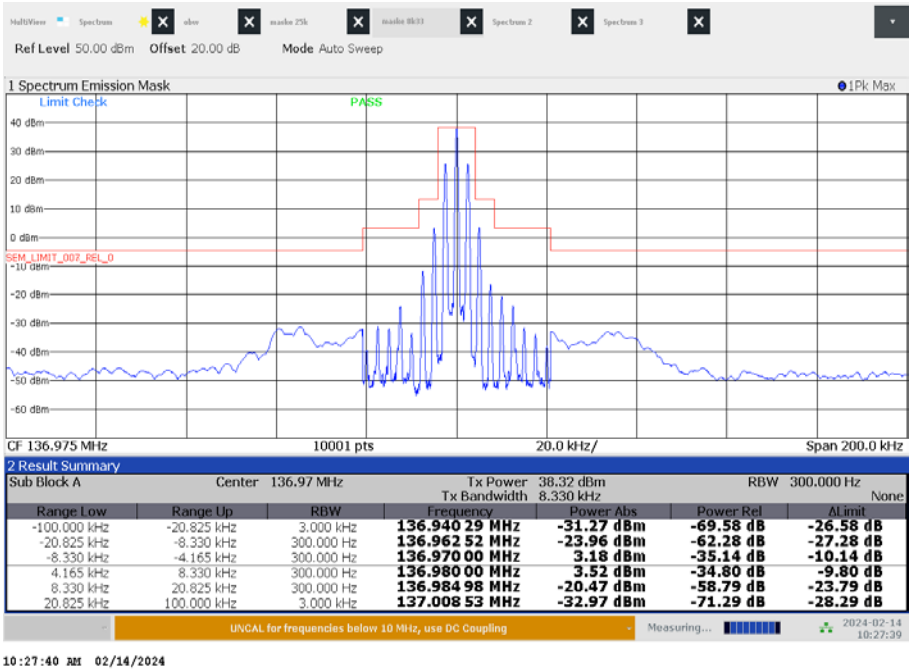
Plot 1: 118.000 MHz, 8.33 kHz channel bandwidth



Plot 2: 127.500 MHz, 8.33 kHz channel bandwidth

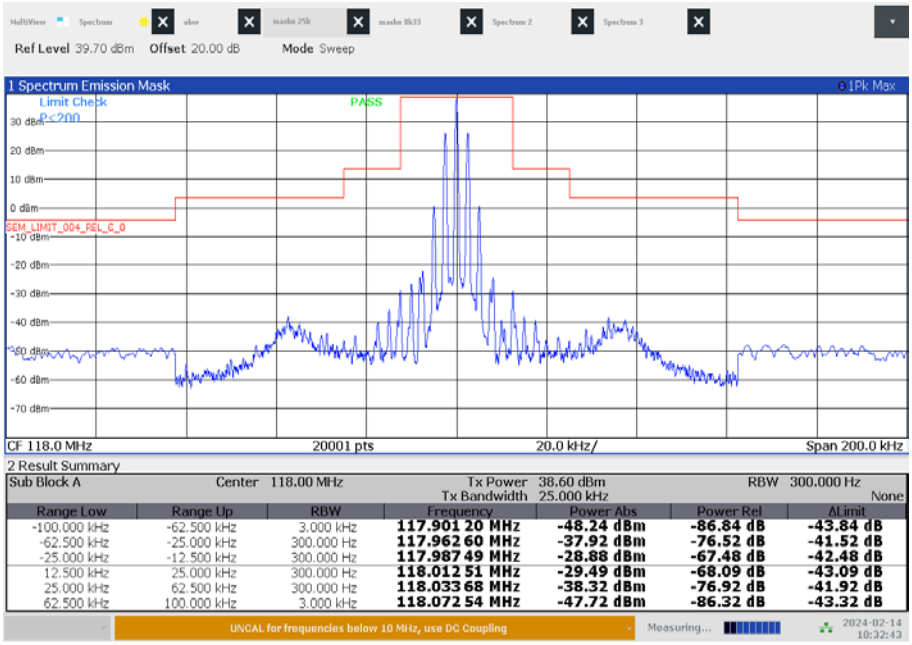


Plot 3: 136.975 MHz, 8.33 kHz channel bandwidth



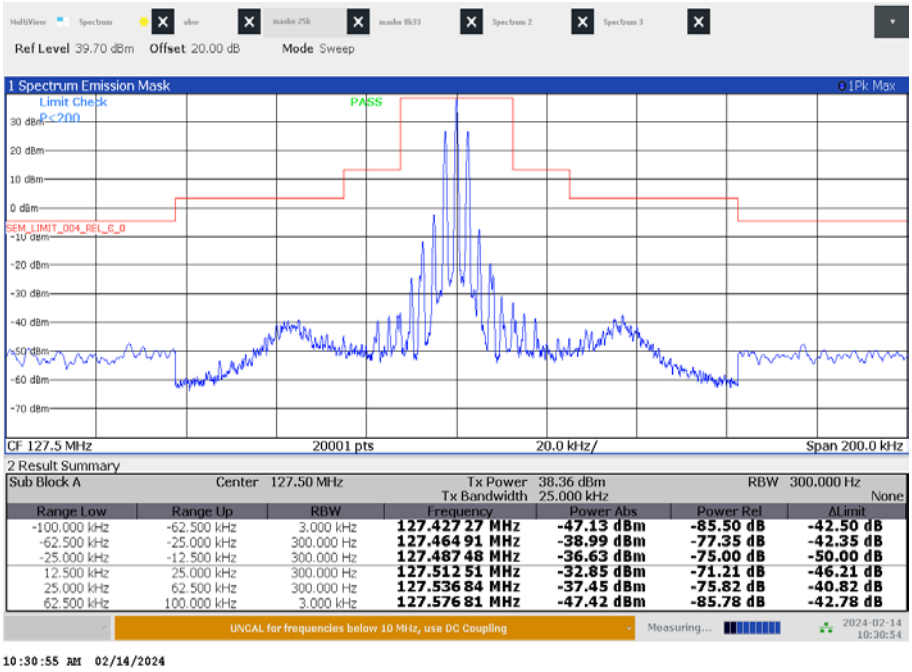
10:27:40 AM 02/14/2024

Plot 4: 118.000 MHz, 25 kHz channel bandwidth

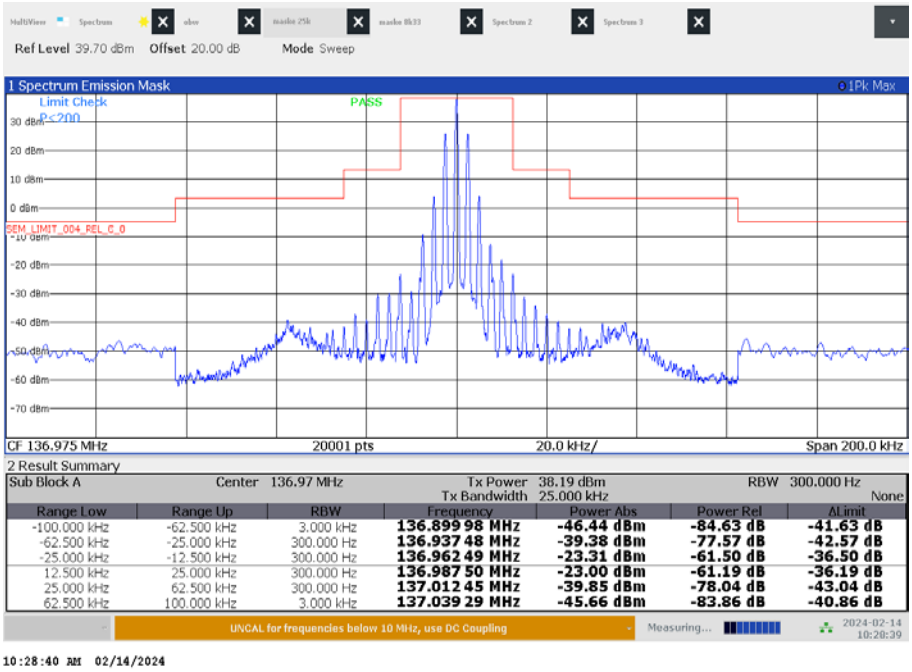


10:32:44 AM 02/14/2024

Plot 5: 127.500 MHz, 25 kHz channel bandwidth

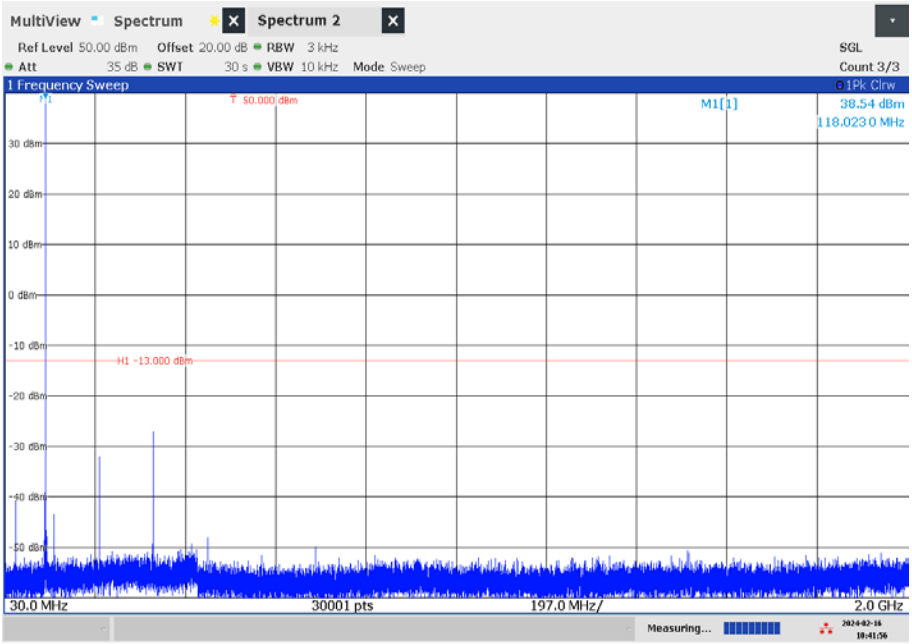


Plot 6: 136.975 MHz, 25 kHz channel bandwidth

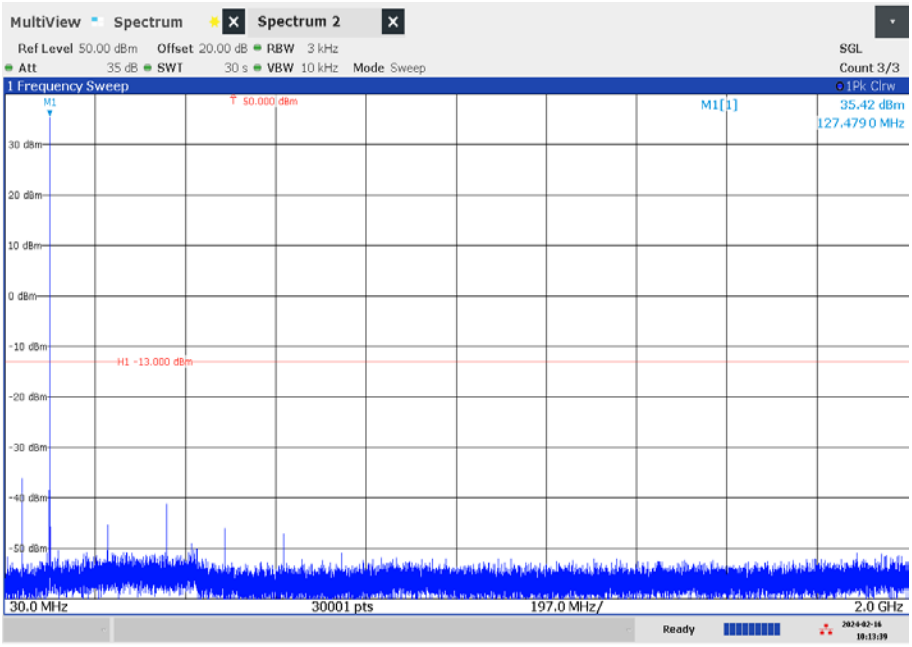


Plots conducted (unwanted emissions):

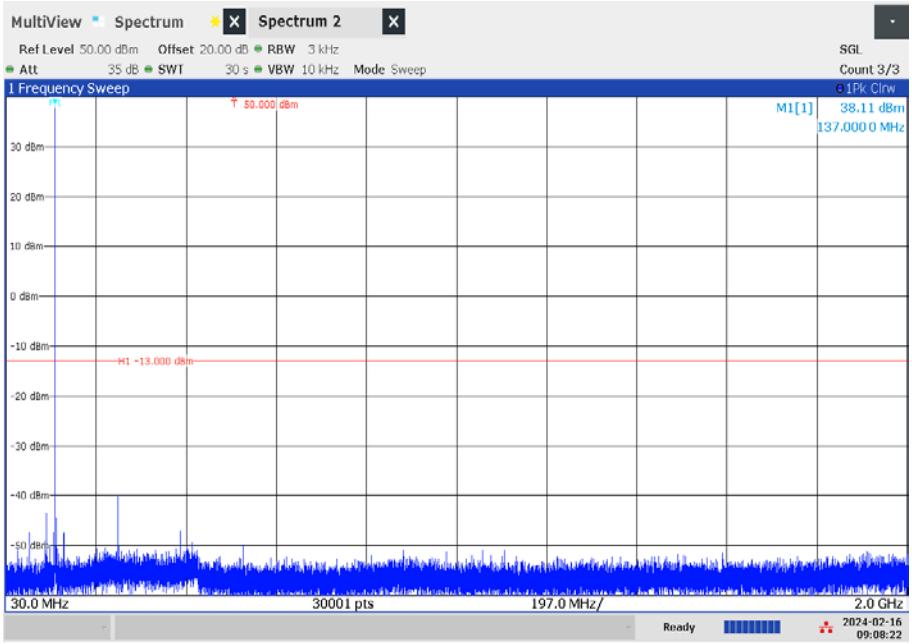
Plot 1: 118.000 MHz, 8.33 kHz channel bandwidth



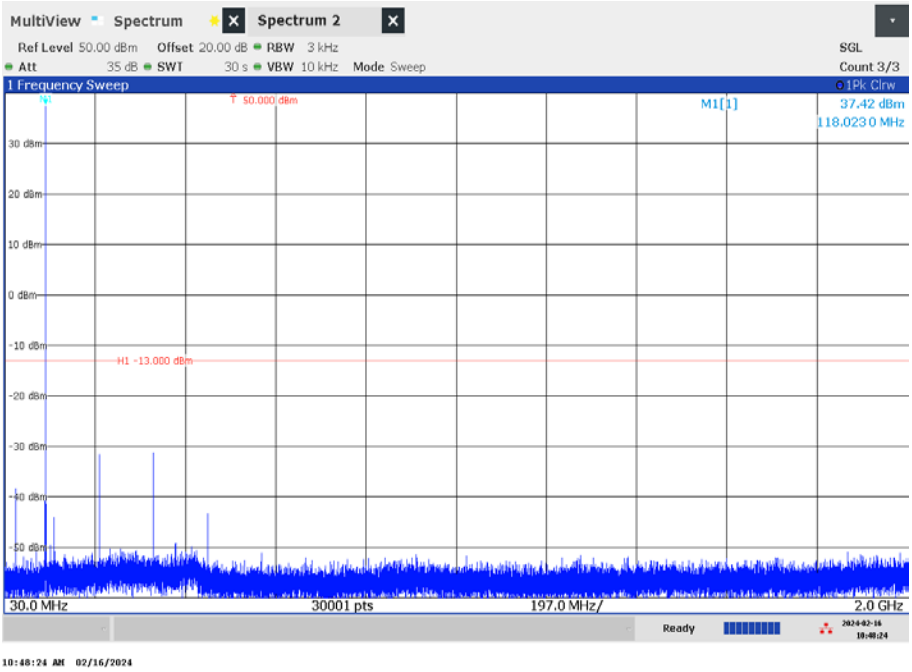
Plot 2: 127.500 MHz, 8.33 kHz channel bandwidth



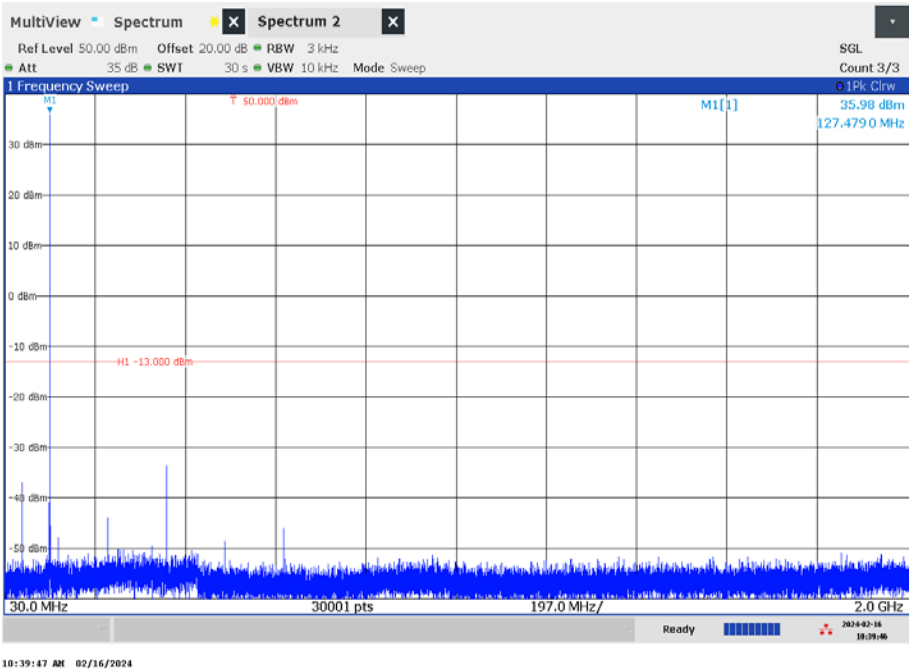
Plot 3: 136.975 MHz, 8.33 kHz channel bandwidth



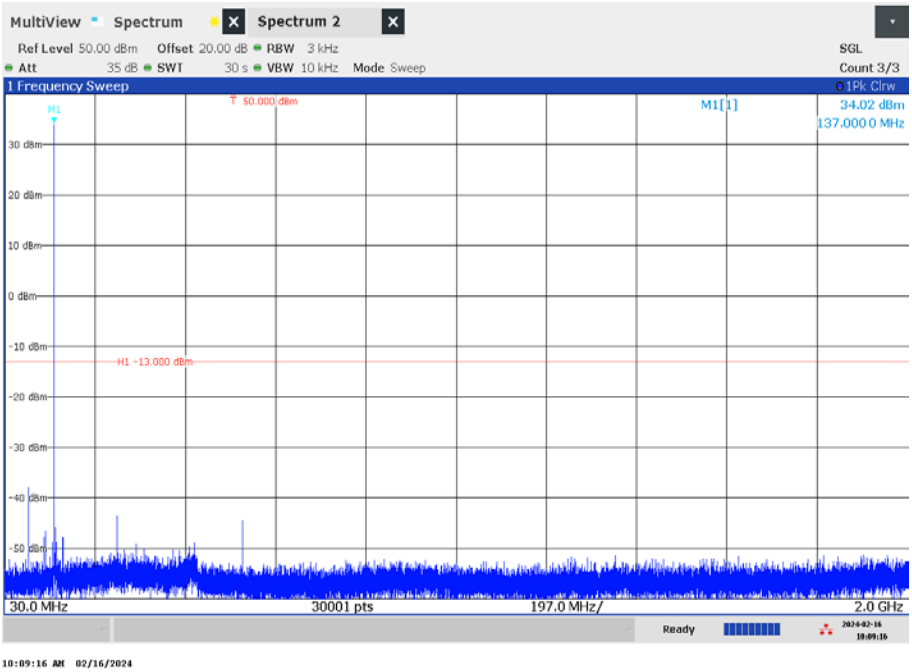
Plot 4: 118.000 MHz, 25 kHz channel bandwidth



Plot 5: 127.500 MHz, 25 kHz channel bandwidth



Plot 6: 136.975 MHz, 25 kHz channel bandwidth



11.5 Modulation characteristics

Method of measurement:

Measurement parameter	
Test setup:	See sub clause 7.3 C
Measurement uncertainty:	See sub clause 9

The audio frequency response was measured in accordance with ANSI/TIA-603-D; 2010, chapter 2.2.6.2.2 with the exception that for an AM modulated transmitter the input was varied for a constant modulation of 20 %.

Receiver audio response = $20 \cdot \log_{10}\left(\frac{V_{FREQ}}{V_{REF}}\right)$

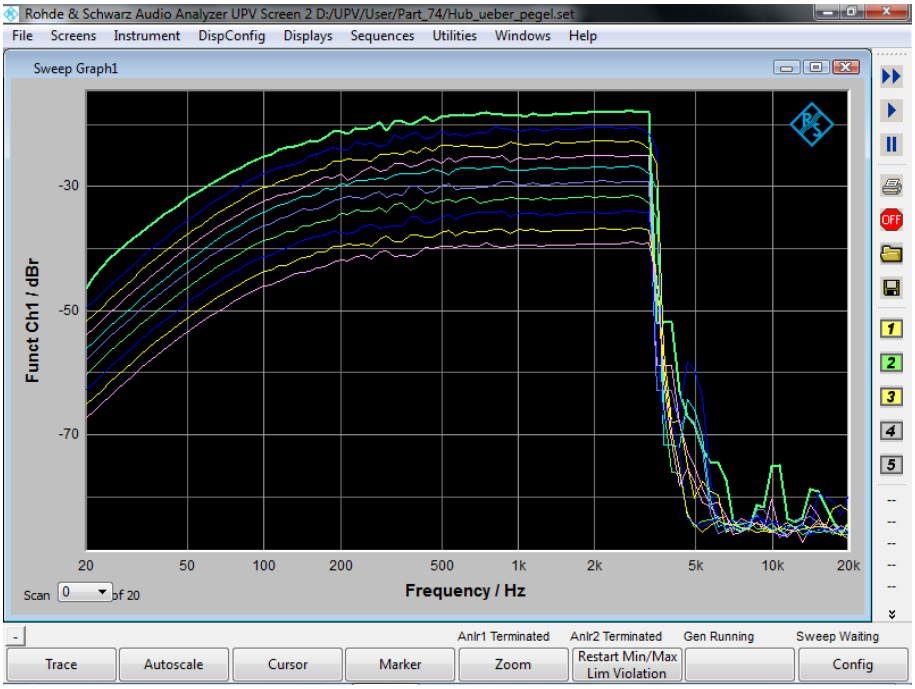
Where: V_{REF}: audio output level with 1 kHz generator modulation to 20% of the maximum rated system deviation

V_{FREQ}: audio output level when the modulation frequency is varied

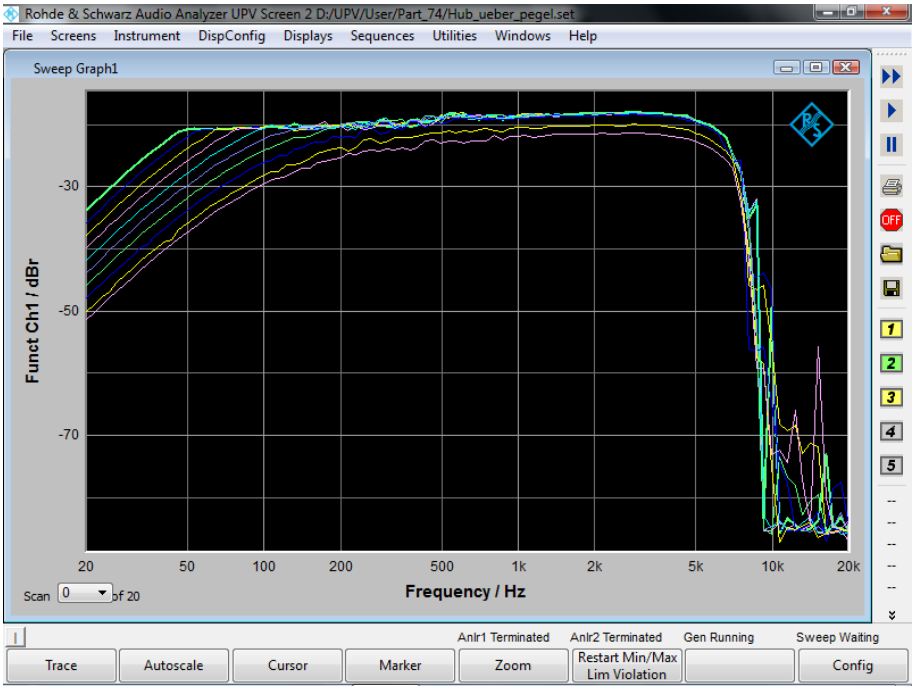
A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.)

A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

Plot 1: 10 curves with voltage and frequency variation 8.33 kHz



Plot 2: 10 curves with voltage and frequency variation 25 kHz



11.6 Receiver unwanted emissions

Measurement:

Measurement parameter	
Detector:	Quasi peak / Average
Sweep time:	Auto
Resolution bandwidth:	120 kHz / 1 MHz
Video bandwidth:	3 x resolution bandwidth
Trace mode:	Max. hold
EUT:	RX-mode
Test setup:	See sub clause 7.1 A
Measurement uncertainty:	See sub clause 9

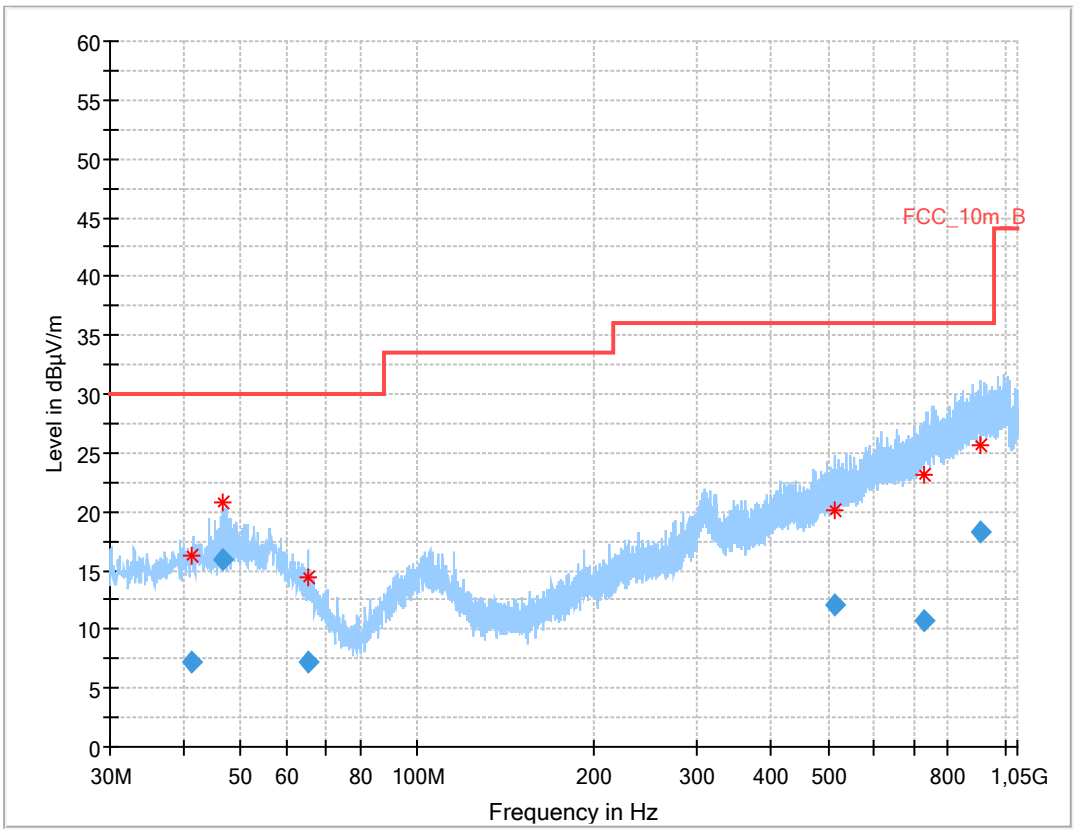
Limits:

IC	
Frequency / MHz	**Field Strength / µv/m at 3 meters***
30-88	100
88-216	150
216-960	200
Above 960	500

*) Measurements for compliance with limits in the above table may be performed at distances other than 3 meters, in accordance with RSS-Gen Section 6.5.

Results: See table below plots!

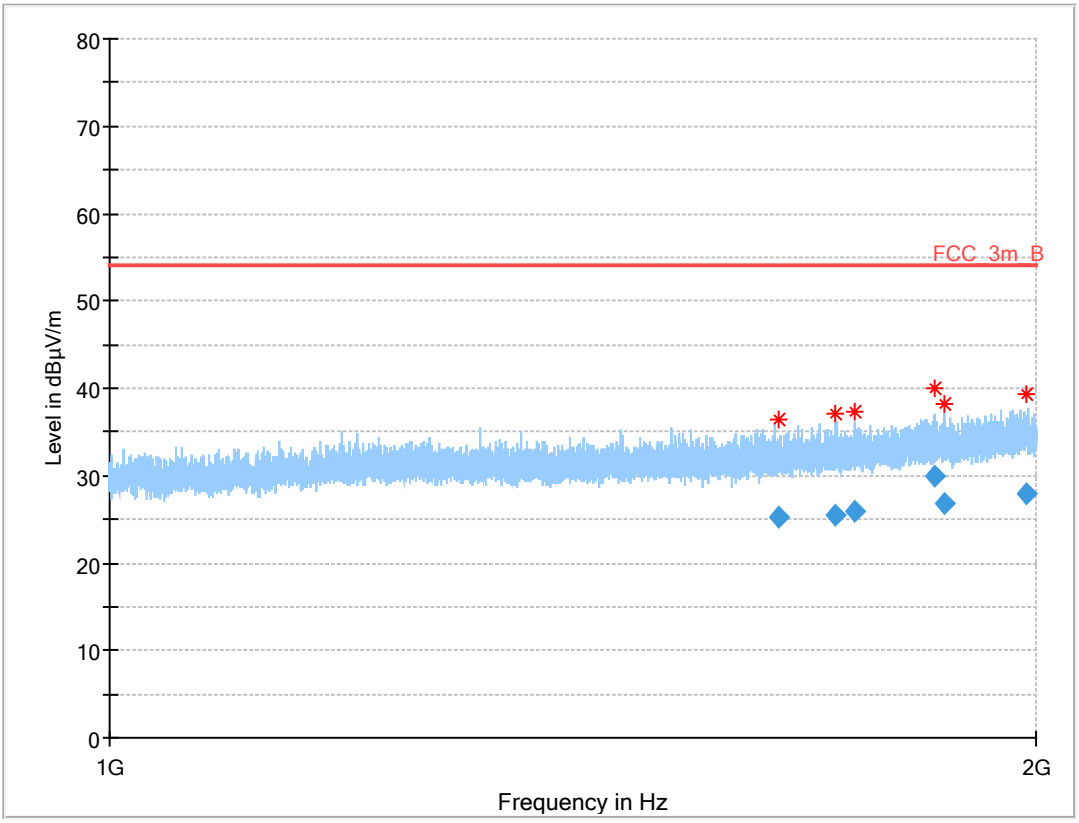
Plot 1: RX spurious emissions 8.33 kHz, 30 MHz – 1 GHz



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
41.438	7.14	30.0	22.9	1000	120.0	329.0	H	113	14
46.696	15.99	30.0	14.0	1000	120.0	104.0	V	192	15
64.981	7.15	30.0	22.9	1000	120.0	146.0	V	245	12
514.188	12.08	36.0	23.9	1000	120.0	400.0	H	45	20
728.661	10.72	36.0	25.3	1000	120.0	127.0	V	45	23
905.981	18.24	36.0	17.8	1000	120.0	169.0	H	45	25

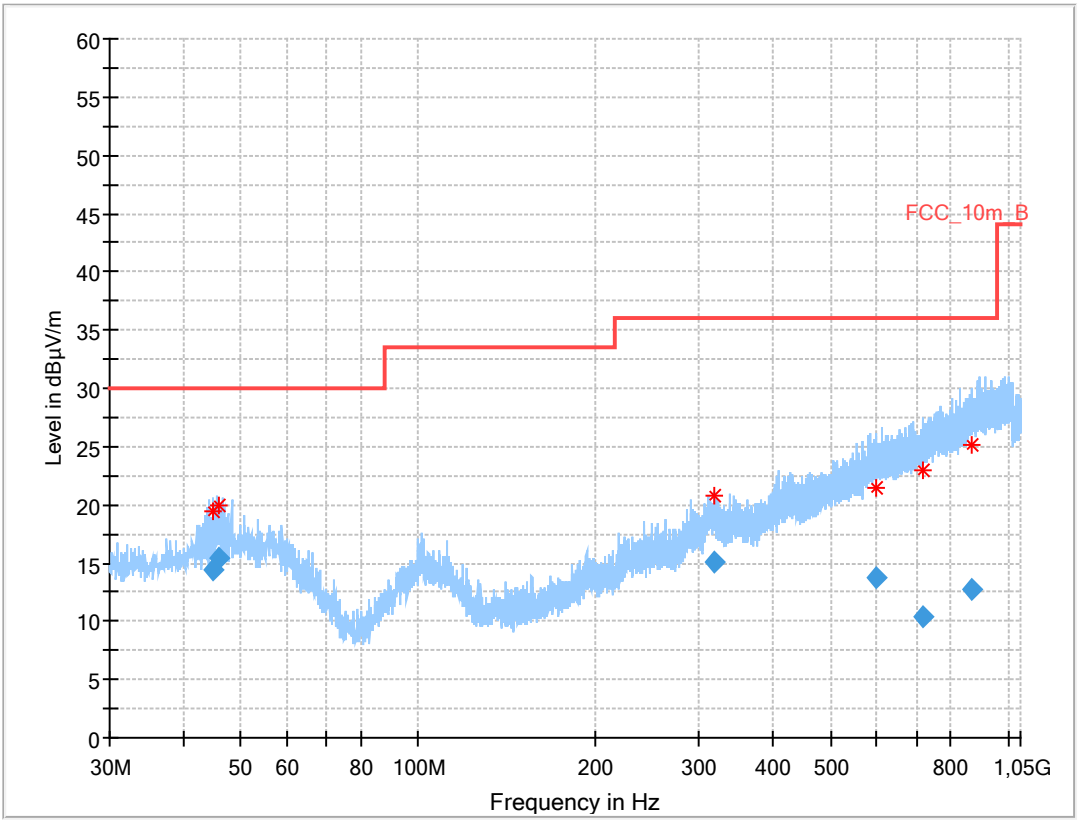
Plot 2: RX spurious emissions 8.33 kHz, 1 GHz – 2 GHz



Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
1648.931	25.27	54.0	28.7	1000	1000.0	V	337	-7
1720.959	25.48	54.0	28.5	1000	1000.0	V	201	-7
1745.518	25.92	54.0	28.1	1000	1000.0	H	160	-7
1852.647	29.96	54.0	24.0	1000	1000.0	V	323	-6
1868.503	26.81	54.0	27.2	1000	1000.0	H	208	-6
1984.479	27.86	54.0	26.1	1000	1000.0	V	75	-5

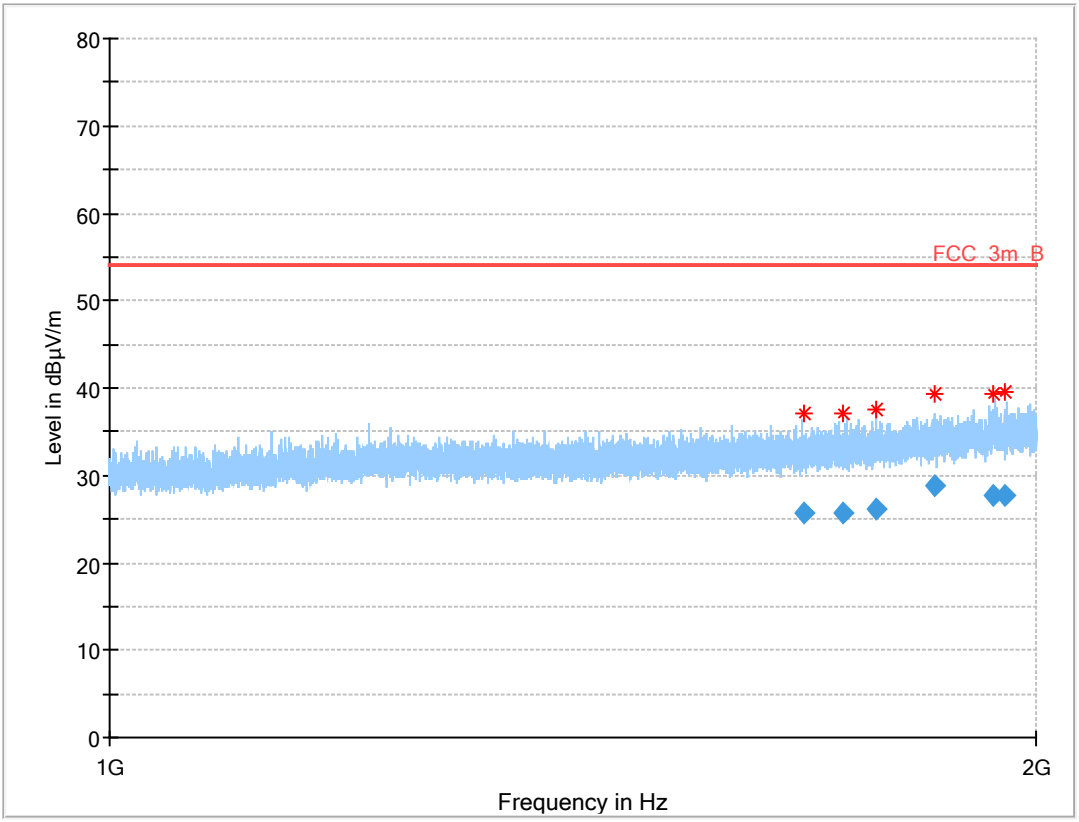
Plot 1: RX spurious emissions 25 kHz, 30 MHz – 1 GHz



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
44.963	14.35	30.0	15.7	1000	120.0	183.0	V	315	15
46.011	15.46	30.0	14.5	1000	120.0	100.0	V	14	15
317.034	15.09	36.0	20.9	1000	120.0	288.0	H	42	16
597.234	13.69	36.0	22.3	1000	120.0	400.0	V	45	22
719.728	10.31	36.0	25.7	1000	120.0	190.0	V	273	23
870.802	12.76	36.0	23.2	1000	120.0	185.0	H	270	25

Plot 2: RX spurious emissions 25 kHz, 1 GHz – 2 GHz



Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
1680.275	25.60	54.0	28.4	1000	1000.0	H	141	-7
1732.031	25.66	54.0	28.3	1000	1000.0	V	37	-7
1773.839	26.09	54.0	27.9	1000	1000.0	V	275	-7
1854.706	28.73	54.0	25.3	1000	1000.0	H	44	-6
1935.527	27.77	54.0	26.2	1000	1000.0	V	131	-5
1955.215	27.66	54.0	26.3	1000	1000.0	H	101	-5

12 Observations

No observations except those reported with the single test cases have been made.

13 Glossary

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

14 Document history

Version	Applied changes	Date of release
-/-	Initial release	2024-04-11
A	Updated model name	2024-04-12
B	Editorial changes	2024-04-22

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