
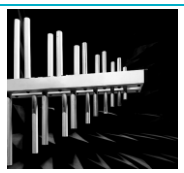
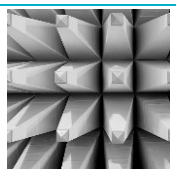

cetecom advanced

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-5533_22-01-07

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

Testing laboratory

cetecom advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: https://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

Carl Zeiss Meditec AG
Goeschwitzer Strasse 51-52
07745 Jena / GERMANY
Phone: -/-
Contact: -/-
e-mail: -/-

Manufacturer

Carl Zeiss Meditec AG
Goeschwitzer Strasse 51-52
07745 Jena / GERMANY

Test standard/s

FCC - Title 47 CFR Part 15	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 11	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment

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

Test Item

Kind of test item:	**Contactless RFID Reader/Writer**
Model name:	**TWN4 MultiTech Core C1**
FCC ID:	**2BF3L30598184300**
ISED certification number:	**7781A-30598184300**
Frequency:	13.56 MHz
Technology tested:	RFID
Antenna:	External PCB loop antenna
Power supply:	4.3 V to 5.5 V DC by USB
Temperature range:	-25°C to +80°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
2025.02.24 08:06:37 +01'00'

Christoph Schneider
Lab Manager
Radio Labs

Test performed:

cn=Tobias Wittenmeier, o=cetecom advanced GmbH, ou=WIT-230601, email=tobias.wittenmeier@cetecomadvanced.com, c=DE
2025.02.24 08:08:19 +01'00'

Tobias Wittenmeier
Testing Manager
Radio Labs

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. cetecom advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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In no case this test report can be considered as a Letter of Approval.

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

2.2 Application details

Date of receipt of order:	2023-05-05
Date of receipt of test item:	2023-09-08
Start of test:*	2023-09-11
End of test:*	2024-03-01
Person(s) present during the test:	-/-

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

2.3 Test laboratories sub-contracted

None

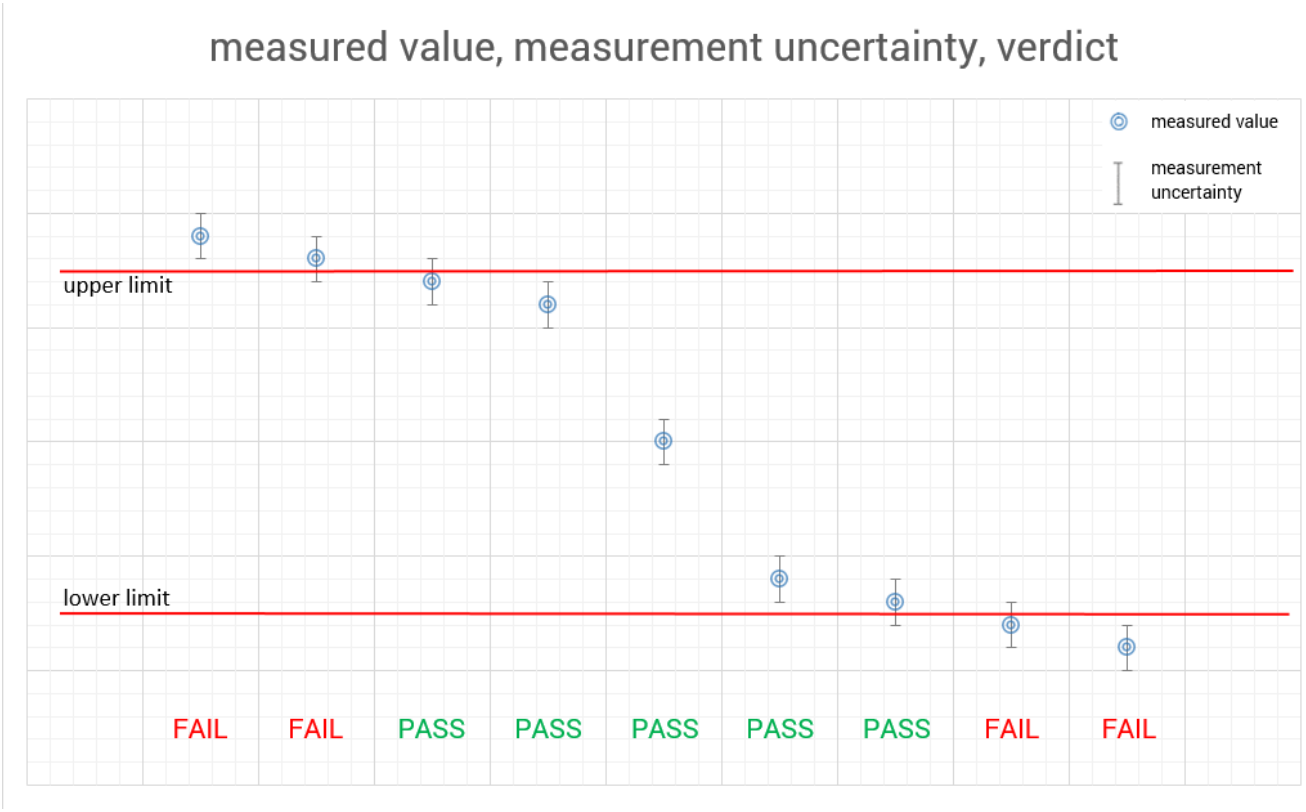
3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 11	June 2024	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment
RSS - Gen Issue 5 incl. Amendment 1 & 2	February 2021	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
ANSI C63.4a-2017	-/-	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2020	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

4 Reporting statements of conformity – decision rule

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



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +80 °C during high temperature tests* -25 °C during low temperature tests*
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	5.0 V DC by USB 5.5 V 4.3 V

*Extended temperature range was tested acc. customer specification

6 Test item

6.1 General description

Kind of test item	:	Contactless RFID Reader/Writer
Model name	:	TWN4 MultiTech Core C1
HMN	:	-/-
PMN	:	RFID -Assembly
HVIN	:	305982-8144-000
FVIN	:	-/-
S/N serial number	:	100732
Hardware status	:	C1
Software status	:	-/-
Firmware status	:	D/B1.06/CKF1.64/STD1.07
Frequency band	:	13.553 MHz to 13.567 MHz
Type of radio transmission Use of frequency spectrum	: :	Modulated carrier
Type of modulation	:	ASK
Number of channels	:	1
Antenna	:	External PCB loop antenna
Power supply	:	4.3 V to 5.5 V DC by USB
Temperature range	:	-25°C to +80°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: 1-5533_22-01-01_AnnexB
1-5533_22-01-01_AnnexD
1-5533_22-01-01_AnnexF

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).

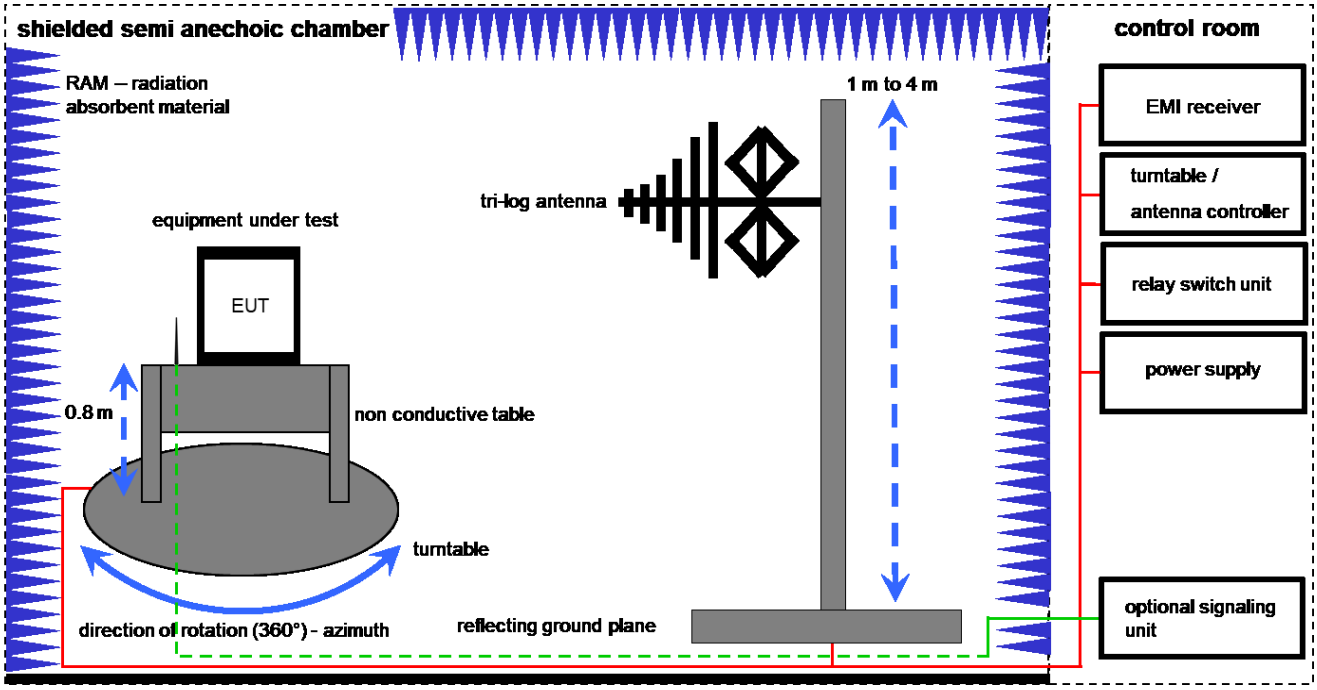
Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

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

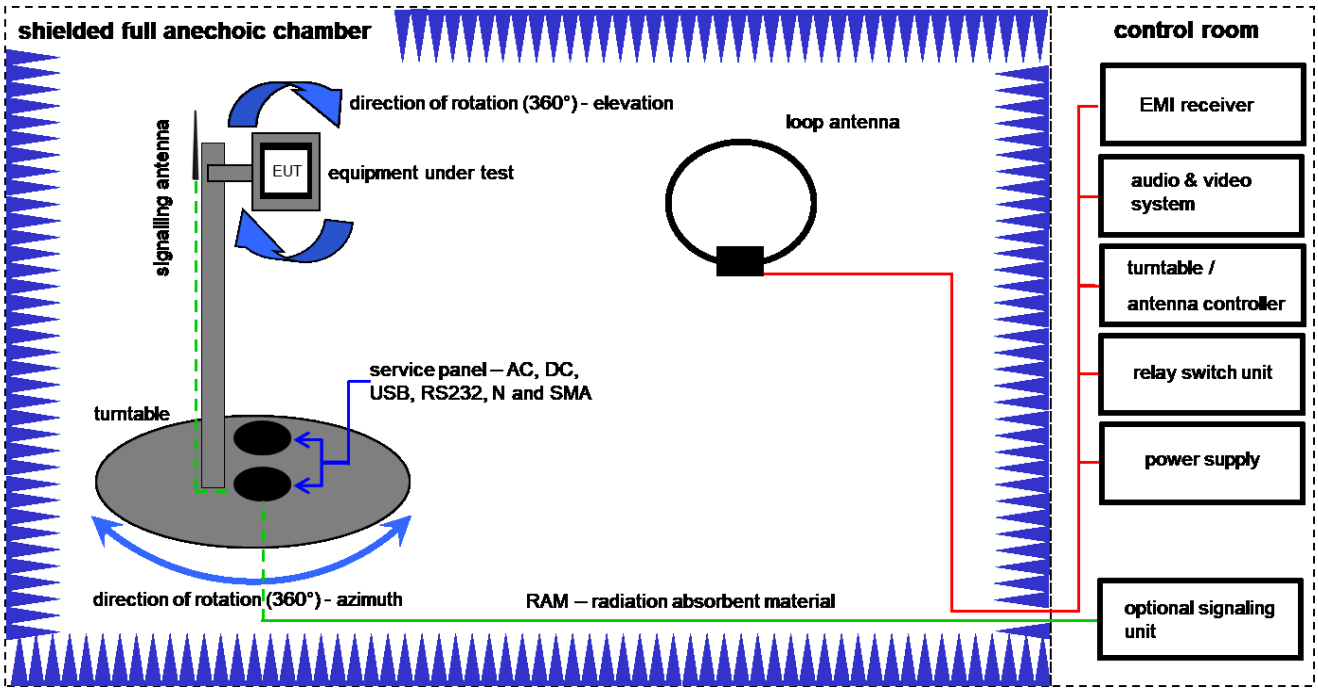
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Semi anechoic chamber	3000023	MWB AG		300000551	ne	-/-	-/-
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	vlKl!	29.12.2023	31.12.2025
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	318	300003696	vlKl!	30.09.2023	29.09.2025
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	09.12.2023	31.12.2024

7.2 Shielded fully anechoic chamber



Measurement distance: loop antenna 3 meter

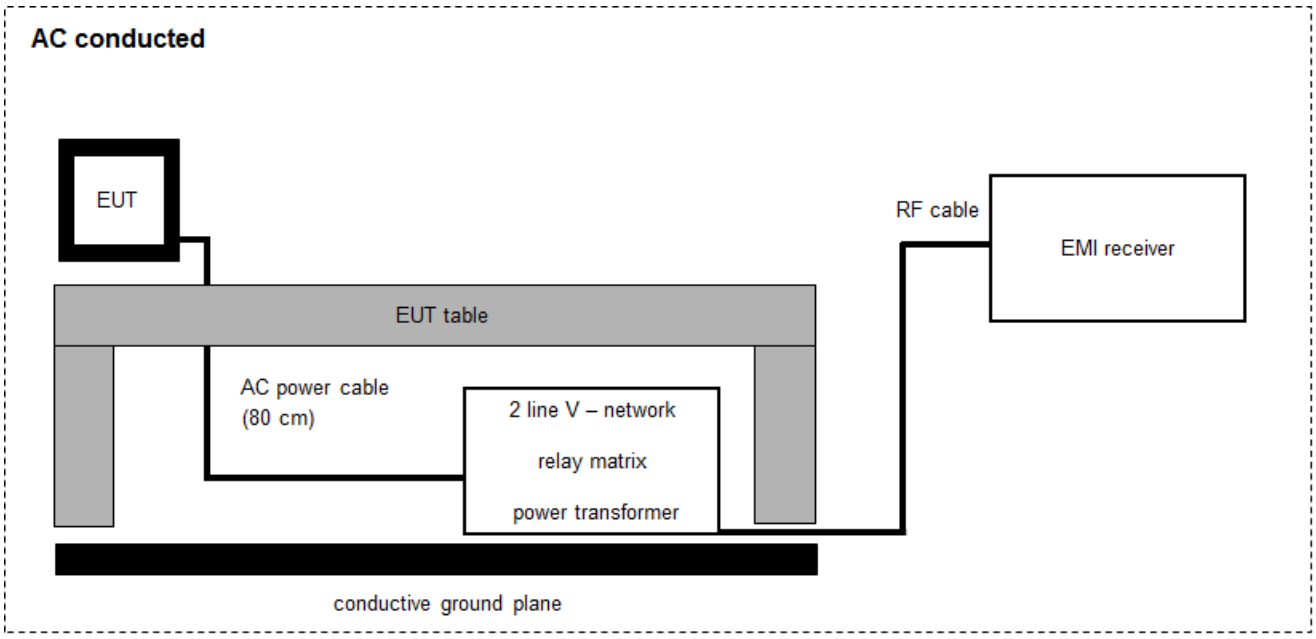
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vIKI!	02.08.2023	31.08.2025
2	A	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	A	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	07.12.2023	31.12.2024
5	A	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
6	A	NEXIO EMV-Software	BAT EMC V2022.0.22.0	Nexio		300004682	ne	-/-	-/-

7.3 AC conducted



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

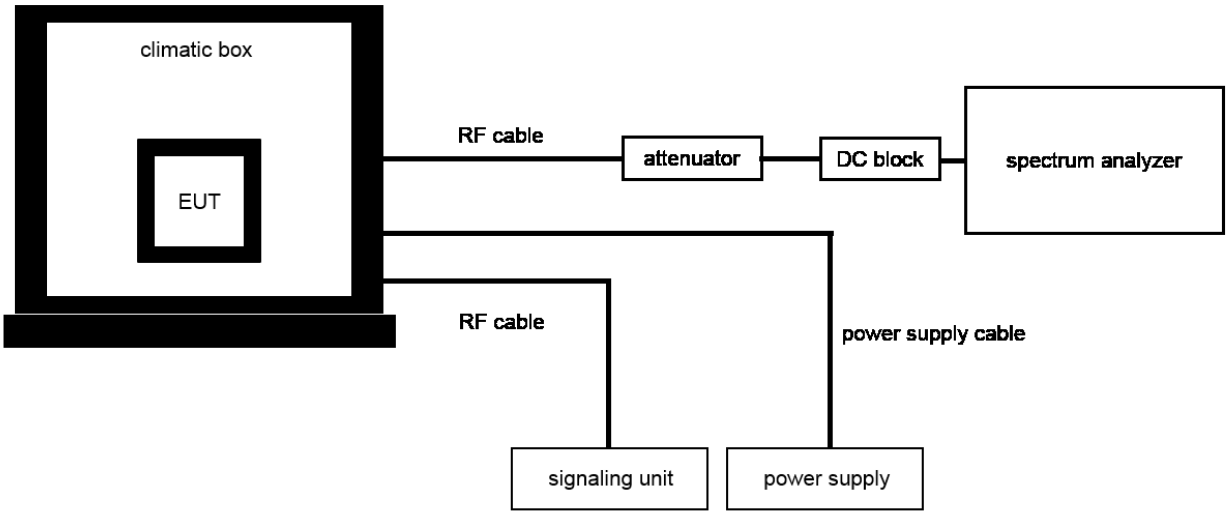
Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	Rohde & Schwarz	892475/017	300002209	vIKl!	14.12.2023	31.12.2025
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	NK!	-/-	-/-
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	vIKl!	29.12.2023	31.12.2025
4	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	-/-	-/-
5	A	PC	TecLine	F+W		300003532	ne	-/-	-/-
6	A	EMI Test Receiver 3.6 GHz	ESR3	Rohde & Schwarz	102981	300006318	k	09.12.2023	31.12.2024

7.4 Conducted measurements normal and extreme conditions

Conducted measurements normal & 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,B	Loop Antenna		ZEG TS Steinfurt		400001208	ev	-/-	-/-
2	A,B	RF Cable BNC	RG58	Huber & Suhner		400001209	ev	-/-	-/-
3	A,B	Signal analyzer	FSV30	Rohde&Schwarz	104365	300005923	k	13.12.2023	31.12.2024
4	B	Power Supply	HMP2020	Rohde & Schwarz	101961	300006102	k	15.12.2022	31.12.2024
5	B	Temperature Test Chamber	VT 4011	Voetsch Industrietechnik	5856623060001 0	300005363	ev	09.05.2022	31.05.2024

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

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

Premeasurement*

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

Final measurement

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

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

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

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

Premeasurement

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

Final measurement

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

9 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Occupied bandwidth	± used RBW
Field strength of the fundamental	± 3 dB
Field strength of the harmonics and spurious	± 3 dB
Receiver spurious emissions and cabinet radiations	± 3 dB
Conducted limits	± 2.6 dB

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	CFR Part 15 RSS 210 Issue 11 RSS Gen Issue 5	See table!	2025-02-24	-/-

Test specification clause	Test case	Temperature conditions	Power source conditions	C	NC	NA	NP	Remark
RSS Gen Issue 5	Occupied bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.225 (a) RSS 210 Issue 11	Field strength of the fundamental	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.209 § 15.225 (b-d) RSS Gen Issue 5	Field strength of the harmonics and spurious	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.107 §15.207	Conducted limits	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.225 (a) RSS 210 Issue 11	Frequency tolerance	Normal & extreme conditions	Normal & extreme conditions	☒	☐	☐	☐	-/-

Note:

C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed

11 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

12 Measurement results

12.1 Occupied bandwidth

Measurement:

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Measurement performed according to ANSI C63.10, chapter 6.9.3, “Occupied bandwidth—power bandwidth (99%) measurement procedure”

Measurement parameters	
Detector:	Peak
Resolution bandwidth:	1 % – 5 % of the occupied bandwidth
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Analyser function:	99 % power function
Used equipment:	See chapter 7.4A
Measurement uncertainty:	See chapter 9

Limit:

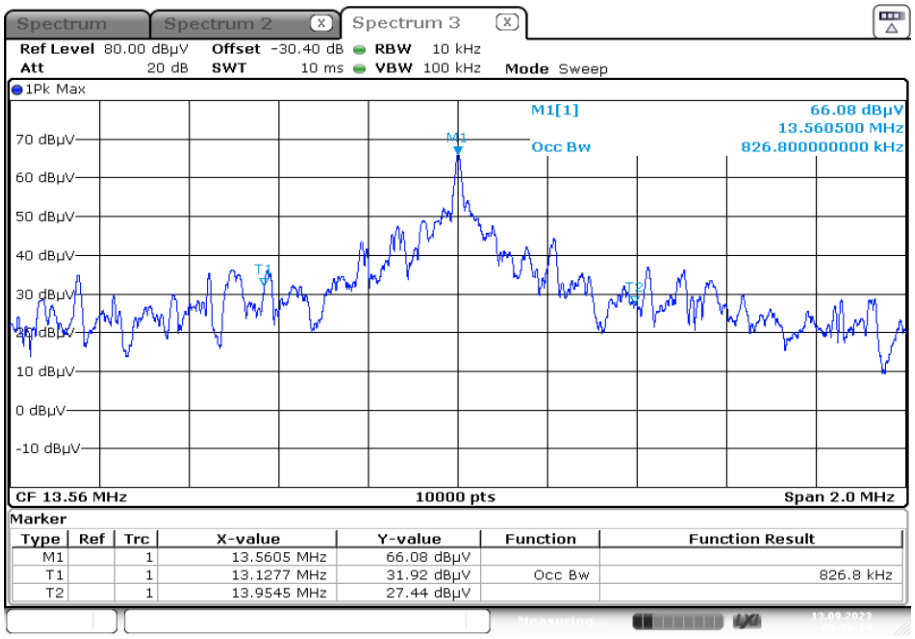
IC
for RSP-100 test report coversheet only

Result:

99% emission bandwidth
826.8 kHz

Plot:

Plot 1: 99 % emission bandwidth



12.2 Field strength of the fundamental

Measurement:

The maximum detected field strength for the carrier signal. Measurement performed according to ANSI C63.10 chapter 6.4

Measurement parameters	
Detector:	Quasi Peak
Resolution bandwidth:	9 kHz
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.2A
Measurement uncertainty:	See chapter 9

Limit:

FCC & IC		
Frequency / MHz	Field strength / (µV/m)	Measurement distance / m
13.553 to 13.567	15,848 (84 dBµV/m)	30

Recalculation:

According to ANSI C63.10		
Frequency	Formula	Correction value
13.56 MHz	$FS_{limit} = FS_{max} - 40 \log\left(\frac{d_{nearfield}}{d_{measure}}\right) - 20\log\left(\frac{d_{limit}}{d_{nearfield}}\right)$ FS_{limit} is the calculation of field strength at the limit distance, expressed in dBµV/m FS_{max} is the measured field strength, expressed in dBµV/m $d_{near\ field}$ is the λ/2π distance $d_{measure}$ is the distance of the measurement point from EUT d_{limit} is the reference limit distance	-21.4 dB from 3m to 30m

Result:

Field strength of the fundamental		
Frequency	13.56 MHz	
Distance	@ 3 m	@ 30 m
Measured / calculated value	66.1 dBµV/m	44.7 dBµV/m

12.3 Field strength of the harmonics and spurious

Measurement:

The maximum detected field strength for the harmonics and spurious. Measurement performed according to ANSI C63.10, chapter 6.4 and 6.5

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz 150 kHz < F < 30 MHz: 9 kHz 30 MHz < F < 1 GHz: 120 kHz
Video bandwidth:	F < 150 kHz: 1 kHz 150 kHz < F < 30 MHz: 100 kHz 30 MHz < F < 1 GHz: 300 kHz
Trace mode:	Max hold
Used equipment:	See chapter 7.1A & 7.2A & 7.4A
Measurement uncertainty:	See chapter 9

Limit:

FCC		
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	30 (29.5 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3

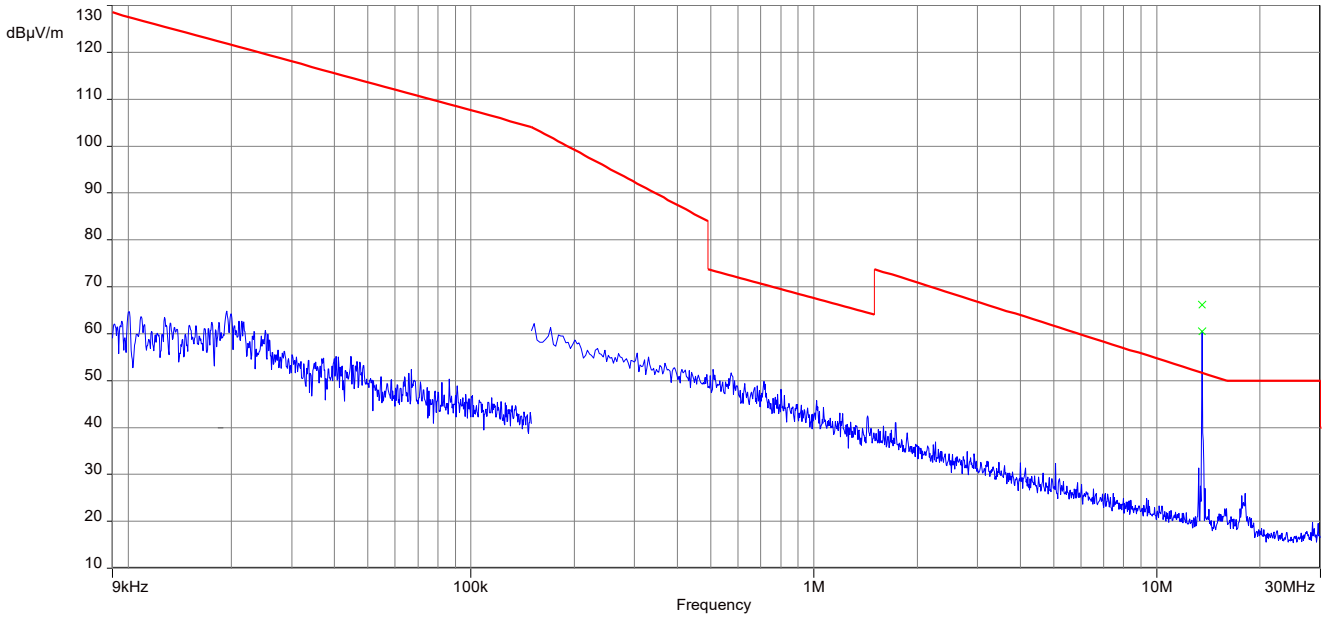
IC		
Frequency (MHz)	Field strength (µA/m)	Measurement distance (m)
0.009 – 0.490	6.37/F (F in kHz)	300
0.490 – 1.705	63.7/F (F in kHz)	30
1.705 – 30	0.08 (-22 dBµA/m)	30

Result:

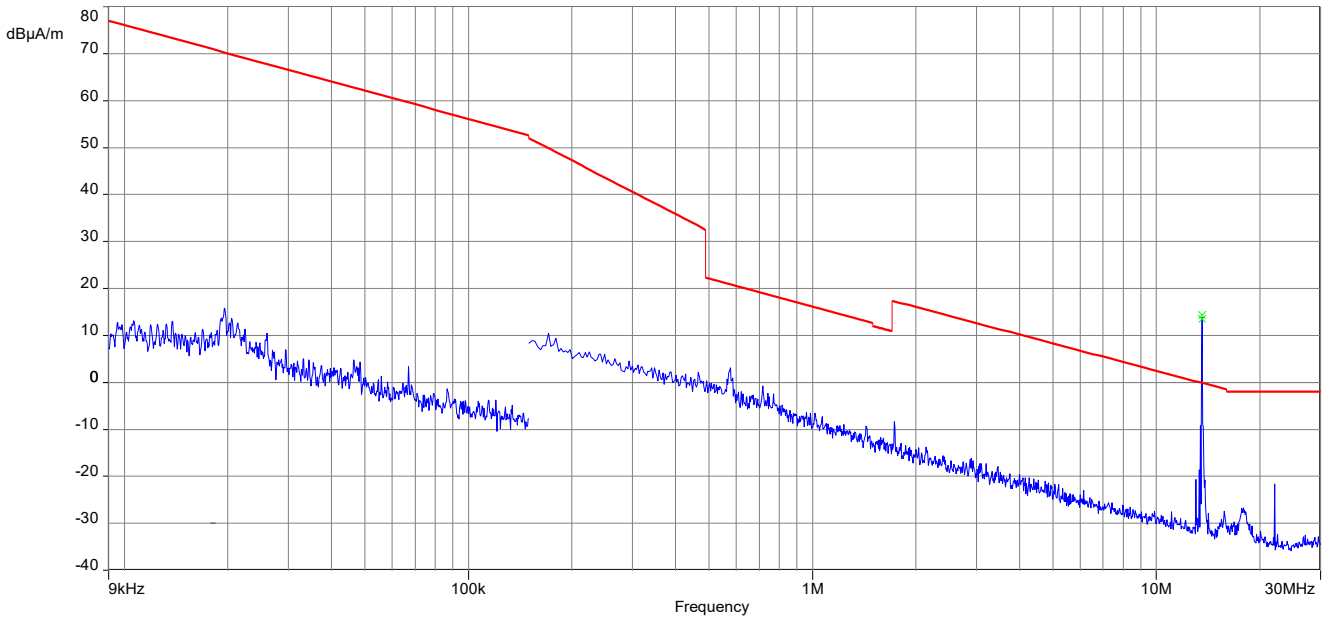
Detected emissions			
Frequency	Detector	Resolution bandwidth	Detected value (@ 3m)
No emissions between 9 kHz and 30 MHz detected. For emissions between 30 MHz and 1 GHz see result table below the plot.			

Plots:

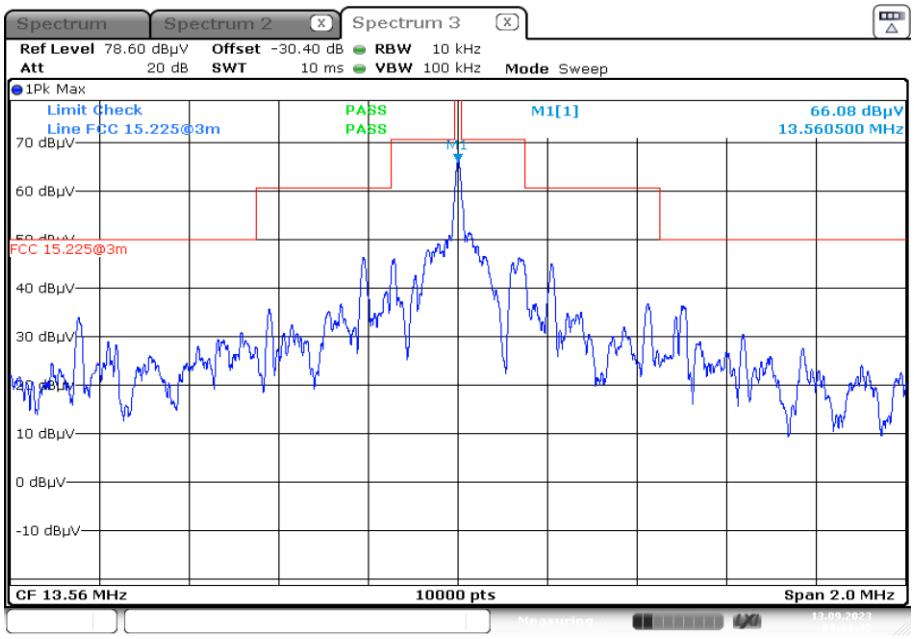
Plot 1: 9 kHz – 30 MHz, magnetic emissions FCC



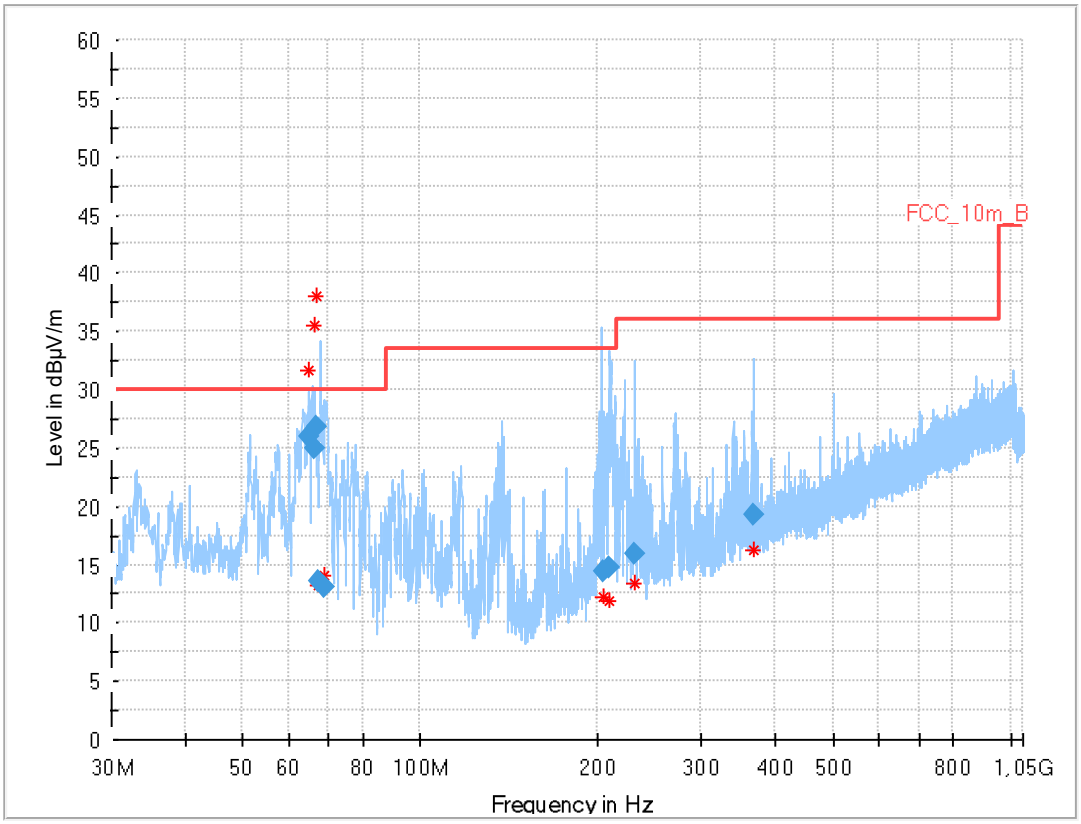
Plot 2: 9 kHz – 30 MHz, magnetic emissions IC



Plot 3: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)



Plot 4: 30 MHz – 1 GHz, vertical and horizontal polarisation



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)
64.620	25.99	30.0	4.0	1000	120.0	195.0	V	233	12
65.983	24.96	30.0	5.0	1000	120.0	195.0	V	56	12
66.519	26.89	30.0	3.1	1000	120.0	195.0	V	121	12
67.437	13.56	30.0	16.4	1000	120.0	98.0	V	73	11
68.852	13.08	30.0	16.9	1000	120.0	161.0	V	74	11
203.909	14.49	33.5	19.0	1000	120.0	195.0	V	271	12
209.578	14.76	33.5	18.7	1000	120.0	195.0	V	232	13
229.970	15.96	36.0	20.0	1000	120.0	195.0	V	142	13
366.257	19.30	36.0	16.7	1000	120.0	195.0	H	-37	17

12.4 Conducted limits

Measurement:

Measurement of the conducted spurious emissions for an intentional radiator that is designed to be connected to the public utility (AC) power line. Measurement performed according to ANSI C63.10, chapter 6.2

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Trace mode:	Max hold
Used equipment:	See chapter 7.3A
Measurement uncertainty:	See chapter 9

Limit:

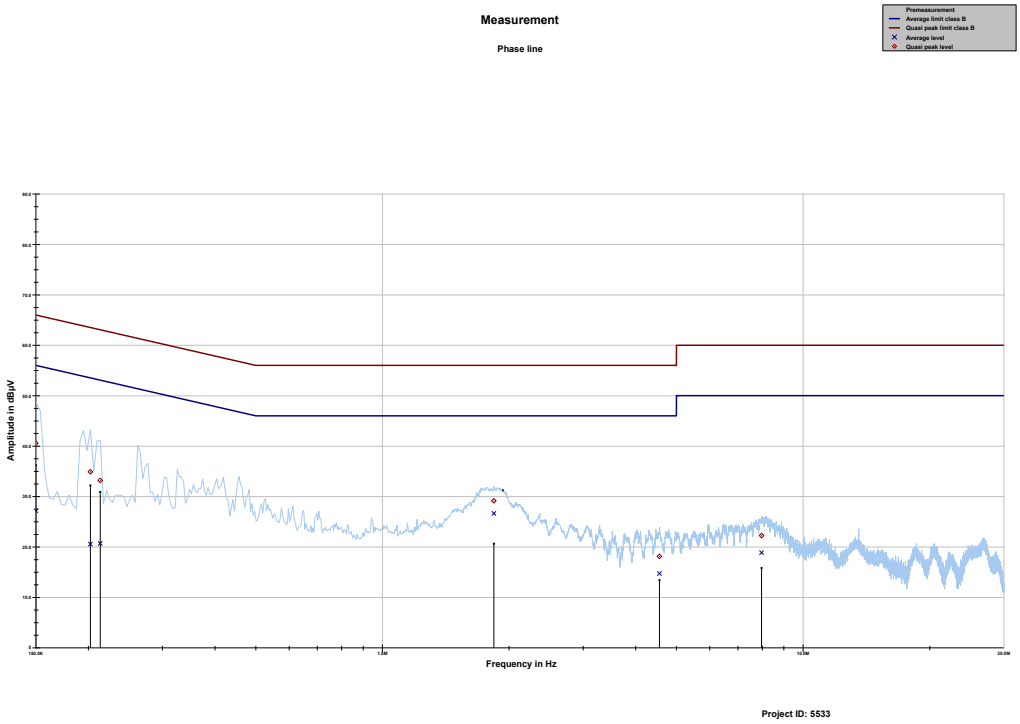
FCC & IC		
Frequency / MHz	Quasi-peak / (dBµV/m)	Average / (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

Result:

See result table below the plots.

Plots:

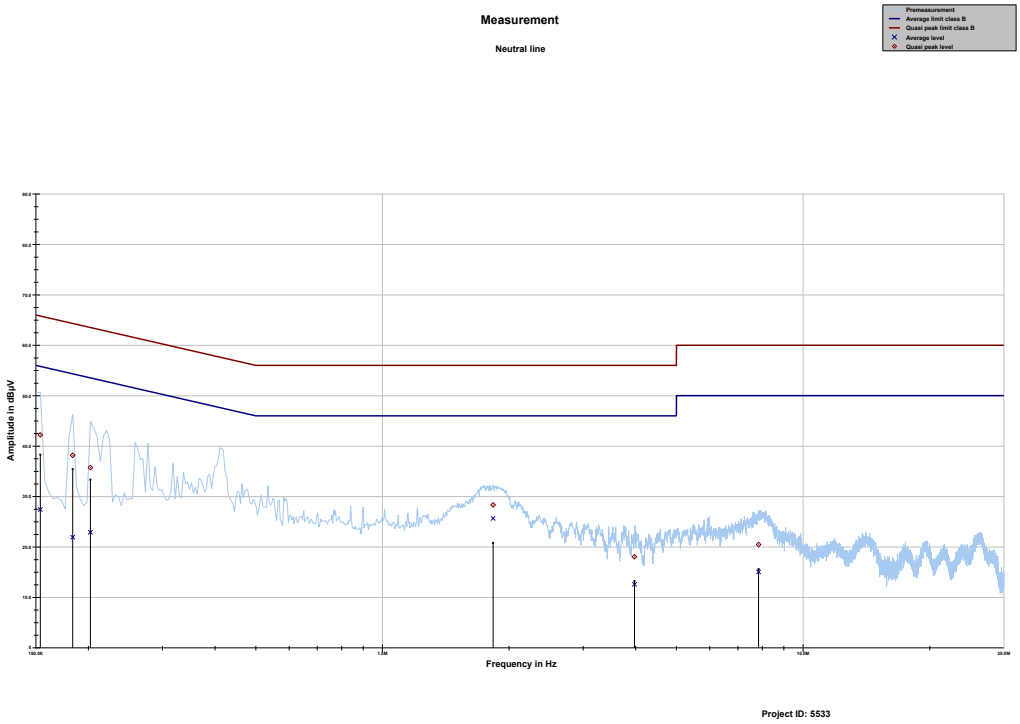
Plot 1: 150 kHz to 30 MHz, phase line



Final_Result

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.150000	40.56	25.44	66.000	27.19	28.81	56.000
0.202237	34.89	28.63	63.518	20.56	33.95	54.508
0.213431	33.19	29.88	63.071	20.69	33.49	54.188
1.840256	29.14	26.86	56.000	26.64	19.36	46.000
4.556606	18.11	37.89	56.000	14.73	31.27	46.000
7.966969	22.25	37.75	60.000	18.85	31.15	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Final_Result

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.153731	42.21	23.58	65.796	27.43	28.47	55.893
0.183581	38.18	26.15	64.322	21.92	33.12	55.041
0.202237	35.73	27.78	63.518	22.89	31.61	54.508
1.832794	28.33	27.67	56.000	25.66	20.34	46.000
3.974531	18.04	37.96	56.000	12.57	33.43	46.000
7.840106	20.46	39.54	60.000	15.06	34.94	50.000

12.5 Frequency error

Measurement:

The maximum detected field strength for the spurious. Measurement performed according to ANSI C63.10, chapter 6.8

Measurement parameters	
Detector:	Peak detector
Resolution bandwidth:	10 Hz / 100 Hz
Video bandwidth:	> RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.4B
Measurement uncertainty:	See chapter 9

Limit:

FCC & IC
The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. (±1.356 kHz) Carrier frequency stability shall be maintained to ±0.01% (±100 ppm)

Result: Temperature variation

Frequency tolerance			
Measured frequency	Frequency error	Conditions	Result
13.5605543	+0.5543	-25 °C & 100% voltage	compliant
13.5605797	+0.5797	-20 °C & 100% voltage	compliant
13.5606287	+0.6287	-10 °C & 100% voltage	compliant
13.5606403	+0.6403	0 °C & 100% voltage	compliant
13.5606345	+0.6345	+10 °C & 100% voltage	compliant
13.5605837	+0.5837	+30 °C & 100% voltage	compliant
13.5605583	+0.5583	+40 °C & 100% voltage	compliant
13.5605407	+0.5407	+50 °C & 100% voltage	compliant
13.5605425	+0.5425	+60 °C & 100% voltage	compliant
13.5605739	+0.5739	+70 °C & 100% voltage	compliant
13.5606483	+0.6483	+80 °C & 100% voltage	compliant

Result: Voltage variation

Frequency tolerance			
Measured frequency	Frequency error	Conditions	Result
13.5605799	+0.5799	+20 °C & 85% voltage	compliant
13.5605799	+0.5799	+20 °C & 100% voltage	compliant
13.5605799	+0.5799	+20 °C & 115% voltage	compliant

13 Observations

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

14 Glossary

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

15 Document history

Version	Applied changes	Date of release
-/-	Initial release	2025-02-24

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