

TEST REPORT

Test report no.: 1-0835-25-01-05_TR1-R02



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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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
RSS - Gen Issue 5 incl. Amendment 1 & 2	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

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

Test Item

Kind of test item:	RFID Read/write head HF
Model name:	DTI213
FCC ID:	UN6-DTI213
ISED certification number:	6799A-DTI213
Frequency:	13.56 MHz
Technology tested:	RFID
Antenna:	Integrated antenna
Power supply:	18 V to 30 V DC, by external power supply
Temperature range:	-20°C to +60°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:

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2025.09.29 14:24:25 +02'00'

Christoph Schneider
Lab Manager
Radio Labs

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Hans-Joachim Wolsdorfer
Lab Manager
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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 1-0835-25-01-05_TR1-R01 and dated 2025-08-27.

2.2 Application details

Date of receipt of order:	2025-08-06
Date of receipt of test item:	2025-08-14
Start of test:*	2025-08-18
End of test:*	2025-09-29
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

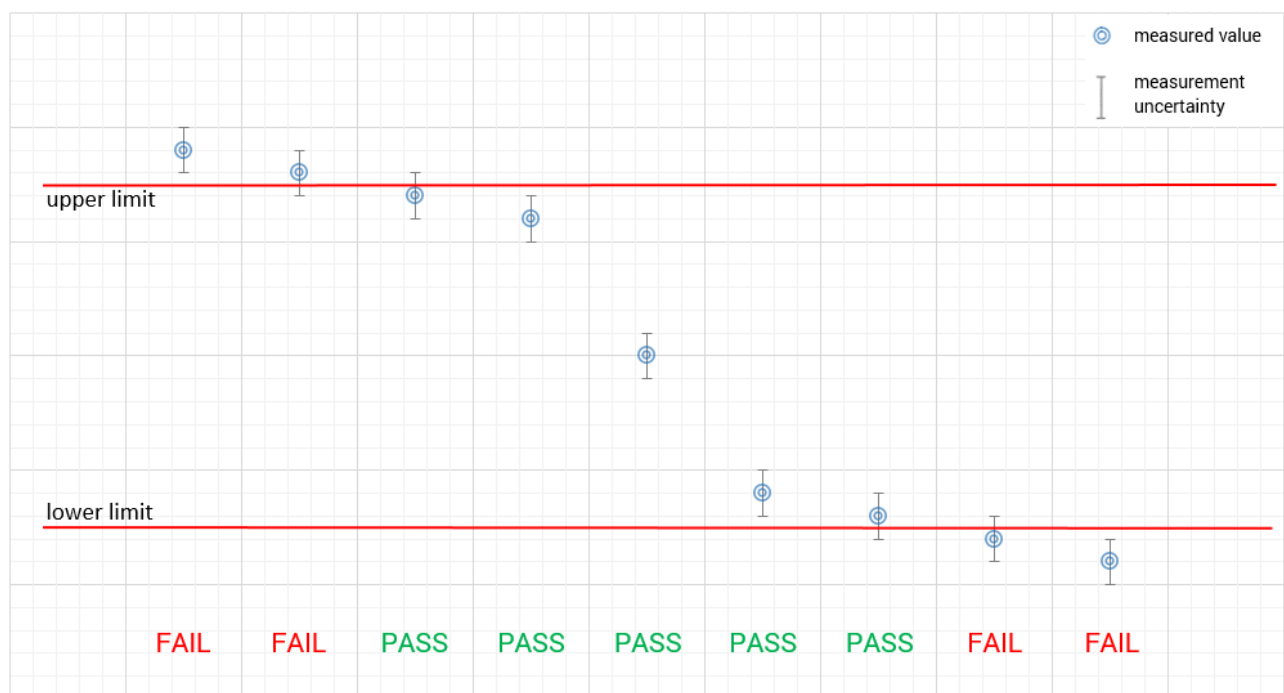
Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 11	25.06.2024	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category 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
KDB 174176 D01	08-2025	Line Conducted FAQ v01r02
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."

measured value, measurement uncertainty, verdict



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +60 °C during high temperature tests -20 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	24 V DC, by external power supply 30 V DC 18 V DC

6 Test item

6.1 General description

Kind of test item	:	RFID Read/write head HF
Model name	:	DTI213
HMN	:	N/A
PMN	:	RFID read/write head HF
HVIN	:	DTI213
FVIN	:	N/A
S/N serial number	:	MCRWIOUS03
Hardware status	:	AA
Software status	:	1.17.
Firmware status	:	-/-
Frequency band	:	13.56 MHz
Type of radio transmission	:	modulated carrier
Use of frequency spectrum	:	
Type of modulation	:	ASK
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	18 V to 30 V DC, by external power supply
Temperature range	:	-20°C to +60°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:

1-0835-25-01-01_TR1-A101-R01
1-0835-25-01-01_TR1-A102-R02
1-0835-25-01-01_TR1-A104-R02

7 Description of the test setup

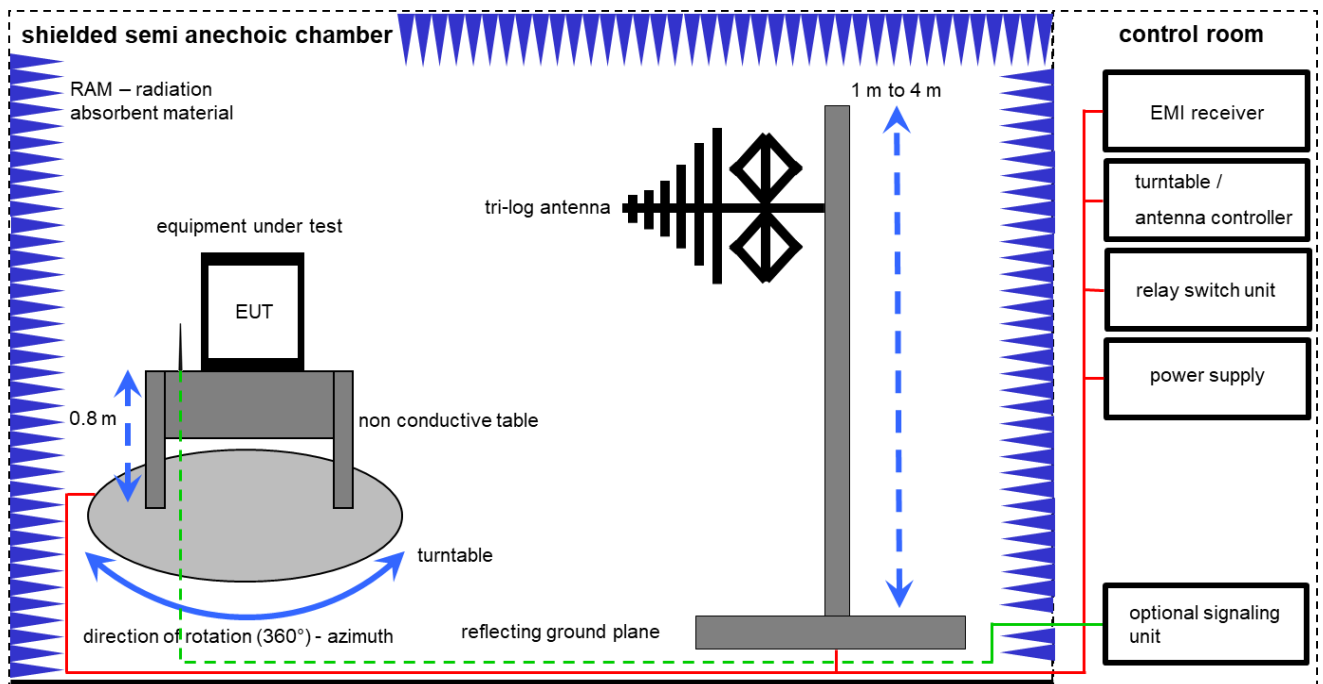
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements 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.

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)

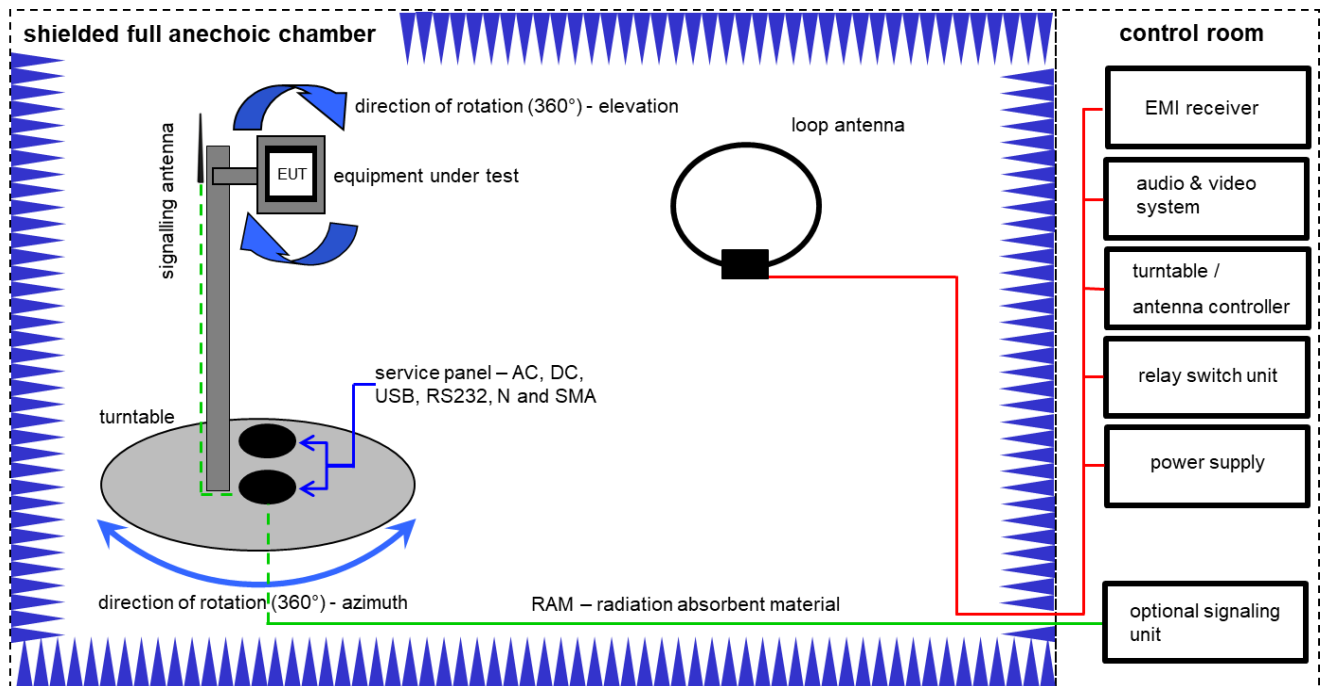
Example calculation:

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

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	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	vIKI!	31.01.2024	30.01.2026
7	A	Turntable	2089-4.0	EMCO	-/-	300004394	ne	-/-	-/-
8	A	PC	TecLine	F+W	-/-	300004388	ne	-/-	-/-
9	A	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	06.12.2024	31.12.2025
10	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
11	A	Attenuator	WA81-30-33	Weinschel Associates	A145	300005327	ev	-/-	-/-

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)

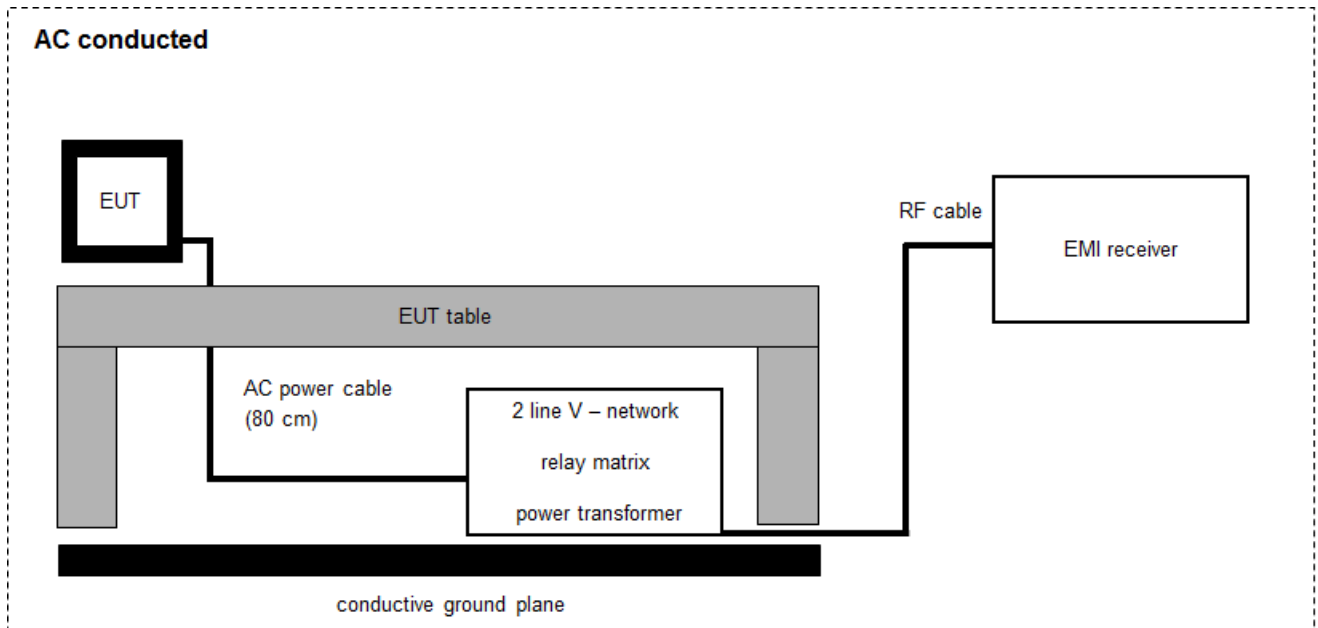
Example calculation:

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

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A,B	EMI Test Receiver	EMI Test Receiver ESR26	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101376	3000050 63-0000	cal	06.12.2024	06.12.2025
2	A	Tunable Band Reject Filter (FDD I)	Tunable Band Reject Filter (FDD I) WRCT1850/2170-5/40-10EEK	Wainwright Instruments GmbH / Andechs	7	3000033 86-0000	cnn	-/-	-/-
3	A	4U RF Switch Platform	4U RF Switch Platform L4491A	Agilent Technologies Deutschland GmbH / Böblingen	MY50000032	3000045 10-0000	cnn	-/-	-/-
4	A	NEXIO EMV-Software	NEXIO EMV-Software BAT EMC V2022.0.32.0	MEC Import: Nexio		3000046 82-0000	cnn	-/-	-/-
5	A	Anechoic chamber	Anechoic chamber	MEC Import: TDK		3000037 26-0000	cnn	-/-	-/-
6	A	Power Supply	Power Supply HMP2020	Rohde & Schwarz Messgerätebau GmbH / Memmingen	120626	3000064 08-0000	cal	02.05.2023	31.05.2026
7	A	Active Loop Antenna	Active Loop Antenna 6502	EMCO Elektronik GmbH / Gilching	2210	3000010 15	cal	07.07.2025	07.07.2027

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:

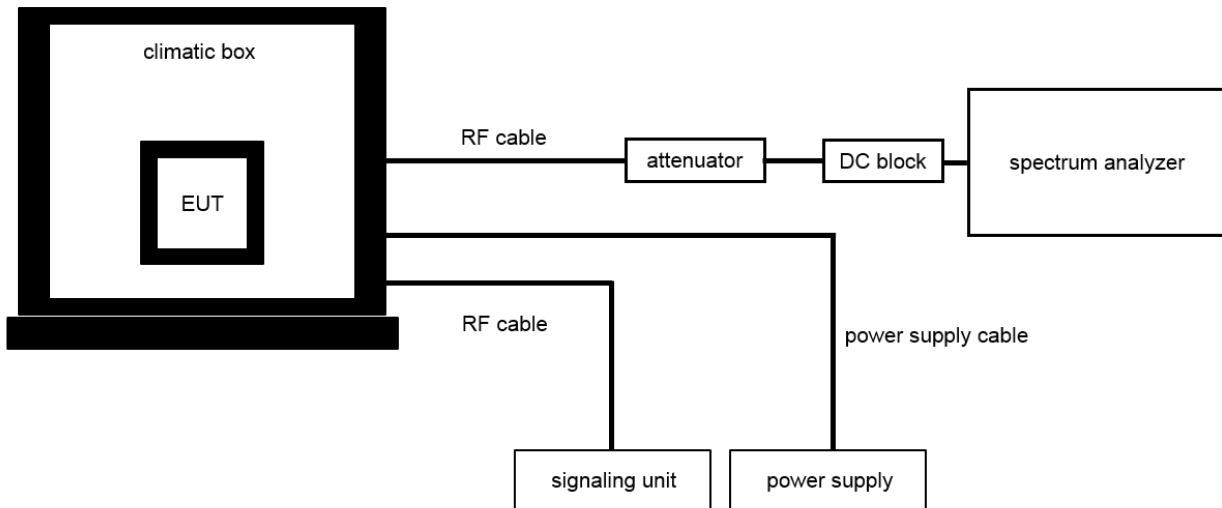
$$FS [dB\mu V/m] = 37.62 [dB\mu V] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m) @ distance$$

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	vIKI!	12.12.2023	31.12.2025
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	NK!	-/-	-/-
3	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	-/-	-/-
4	A	PC	TecLine	F+W	-/-	300003532	ne	-/-	-/-
5	A	Analyzer-Impedence-System	AIS16/1	Spitzenberger + Spies GmbH & Co. KG	UO2076 07/0 1023	400001751	k	19.10.2023	31.10.2025
6	A	EMI Test Receiver 3.6 GHz	ESR3	Rohde & Schwarz	102981	300006318	k	03.12.2024	31.12.2025
7	A	Attenuator	WA81-30-33	Weinschel Associates	A145	300005327	ev	-/-	-/-

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	Signal analyzer	Signal analyzer FSW26	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101455	300004528-0000	cal	09.12.2024	09.12.2025
2	A,B	Loop Antenna	Loop Antenna	MEC Import: ZEG TS Steinfurt		400001208-0000	cpu	-/-	-/-
3	A,B	Power Supply	Power Supply HMP2020	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101961	300006102-0000	cal	05.12.2024	05.12.2026
4	B	Temperature Test Chamber	Temperature Test Chamber VT 4011	Vötsch Industrietechnik GmbH, a schunk company / Balingen-Frommern	58566230600010	300005363-0000	calchk	11.07.2024	11.07.2026

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.

9 Measurement uncertainty

Measurement uncertainty	
Test case	Uncertainty
Occupied bandwidth	$\pm$ 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!	2025-09-29	-/-

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: 20250415_Test operation guide

Configuration descriptions: AC conducted emission tests have been performed according KDB 174176, see chapter 12.4 for detailed test description

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 7.4 A
Measurement uncertainty:	See chapter 9

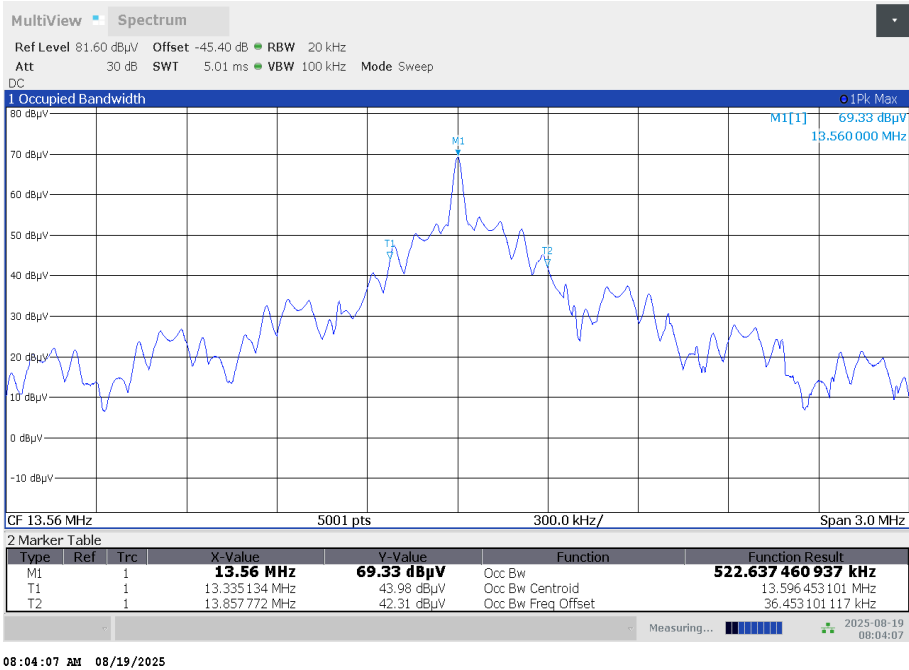
Limit:

IC
for RSP-100 test report coversheet only

Result:

99% emission bandwidth
522.63 kHz

Plot: 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:	$\geq 3 \times \text{RBW}$
Trace mode:	Max hold
Used equipment:	See chapter 7.2 A
Measurement uncertainty:	See chapter 9

Limit:

FCC & IC		
Frequency / MHz	Field strength / ($\mu\text{V}/\text{m}$)	Measurement distance / m
13.553 to 13.567	15,848 (84 dB $\mu\text{V}/\text{m}$)	30

Recalculation:

According to ANSI C63.10		
Frequency	Formula	Correction value
13.56 MHz	$\text{FS}_{\text{limit}} = \text{FS}_{\text{max}} - 40 \log \left(\frac{d_{\text{nearfield}}}{d_{\text{measure}}} \right) - 20 \log \left(\frac{d_{\text{limit}}}{d_{\text{nearfield}}} \right)$ FS_{limit} is the calculation of field strength at the limit distance, expressed in dB$\mu\text{V}/\text{m}$ FS_{max} is the measured field strength, expressed in dB$\mu\text{V}/\text{m}$ $d_{\text{near field}}$ is the $\lambda/2\pi$ 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	69.21 dB $\mu\text{V}/\text{m}$	47.81 dB $\mu\text{V}/\text{m}$

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 7.1 A & 7.2 A & 7.4 A
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

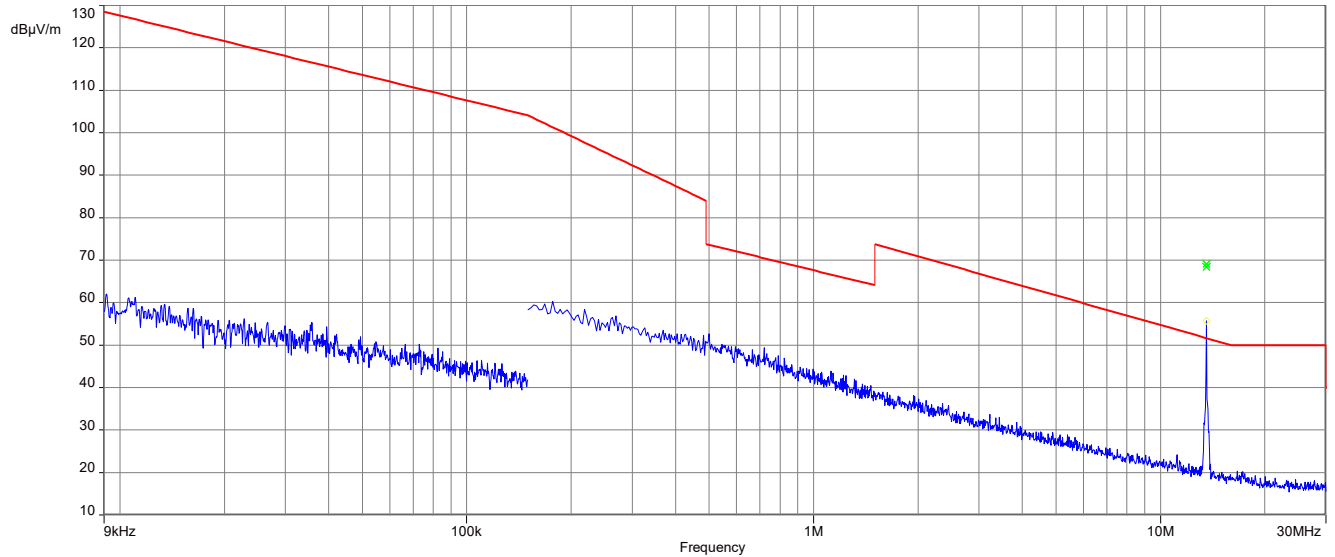
IC		
Frequency (MHz)	Field strength (μA/m)	Measurement distance (m)
0.009 – 0.490	6.37/F (F in kHz)	300
0.490 – 1.705	63.7/F (F in kHz)	30
1.705 – 30	0.08 (-22 dBμA/m)	30

Result:

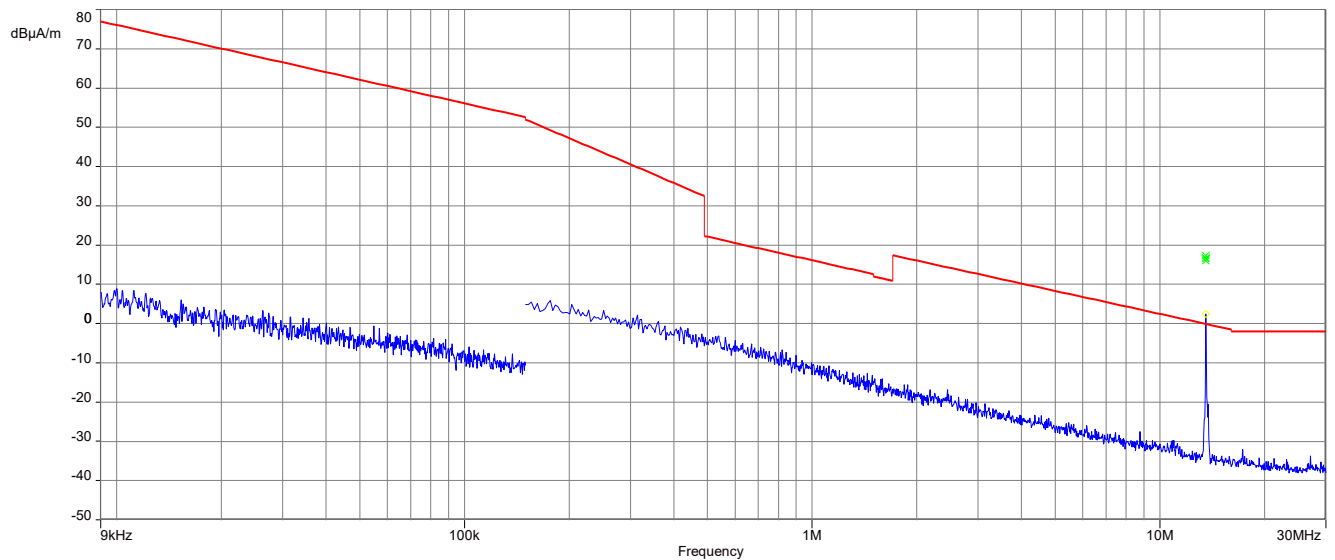
Detected emissions			
Frequency	Detector	Resolution bandwidth	Detected value (@ 3m)
no peaks detected			

Plots:

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

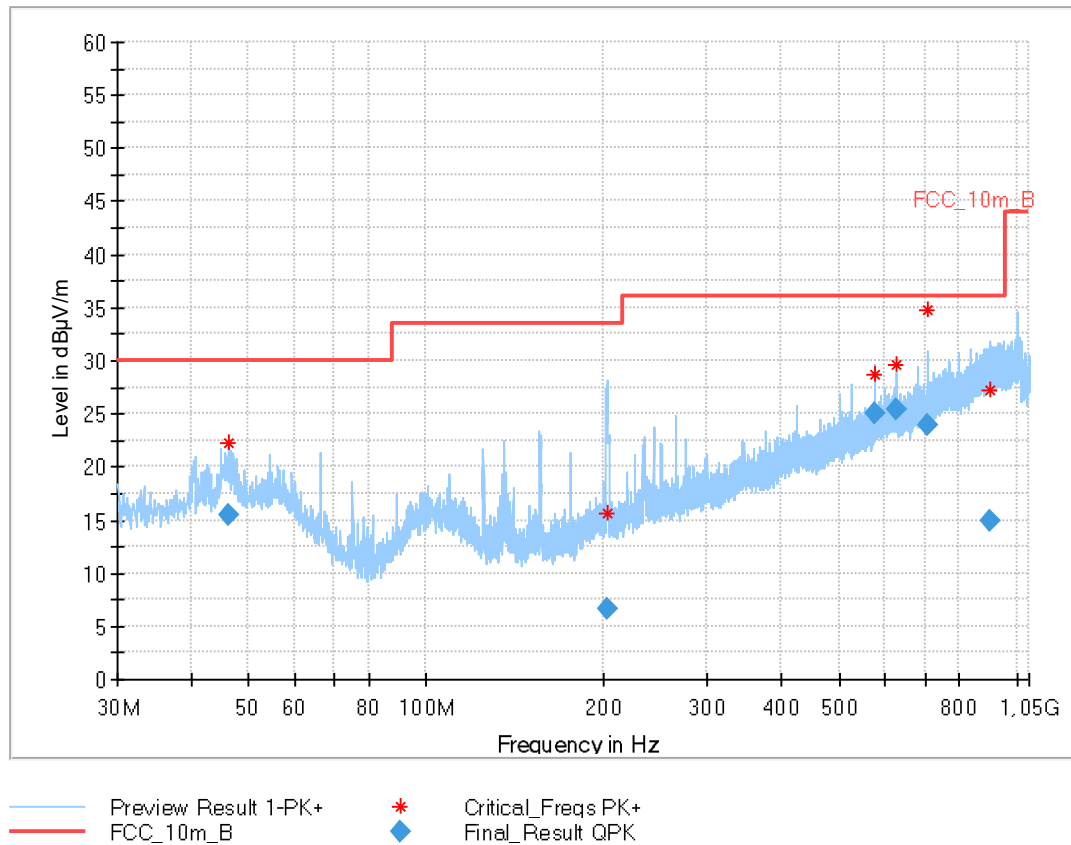


Plot 2: 9 kHz – 30 MHz, magnetic emissions IC



Plot 3: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2020 sub clause 6.4)



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

Final_Result

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.193	15.45	30.0	14.6	1000	120.0	135.0	V	189	15
202.144	6.69	33.5	26.8	1000	120.0	108.0	V	73	12
575.008	24.97	36.0	11.0	1000	120.0	308.0	V	190	20
624.991	25.36	36.0	10.6	1000	120.0	270.0	V	203	22
705.163	23.87	36.0	12.1	1000	120.0	157.0	H	10	22
899.081	14.96	36.0	21.0	1000	120.0	221.0	H	22	25

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 7.3 A
Measurement uncertainty:	See chapter 9

Limits:

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 – 30.0	30	30

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

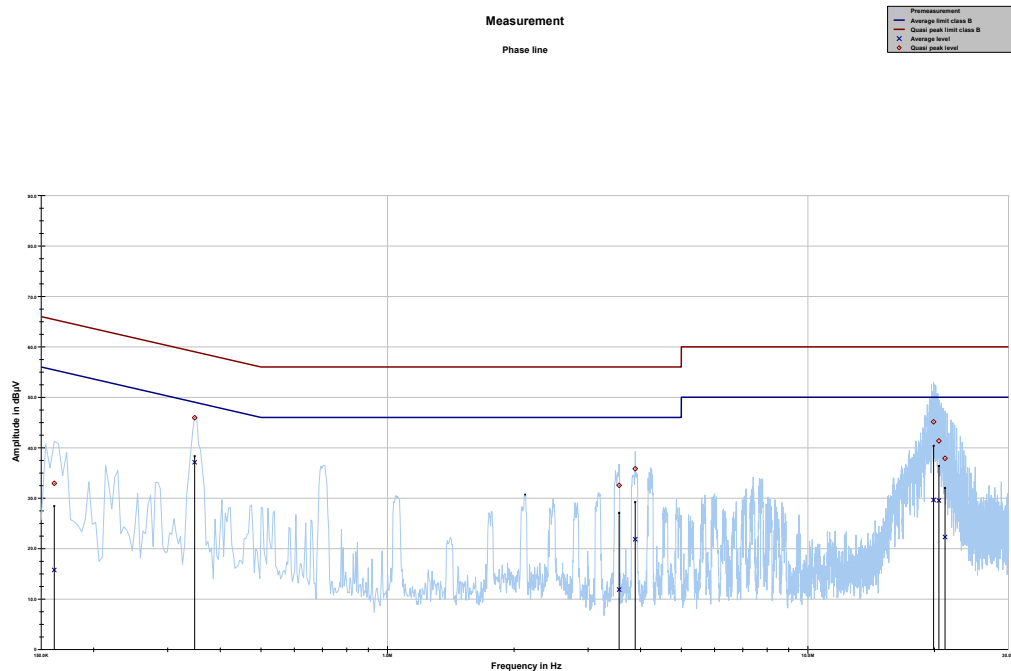
Result:

see table below plots

12.4.1 Plots with dummy load

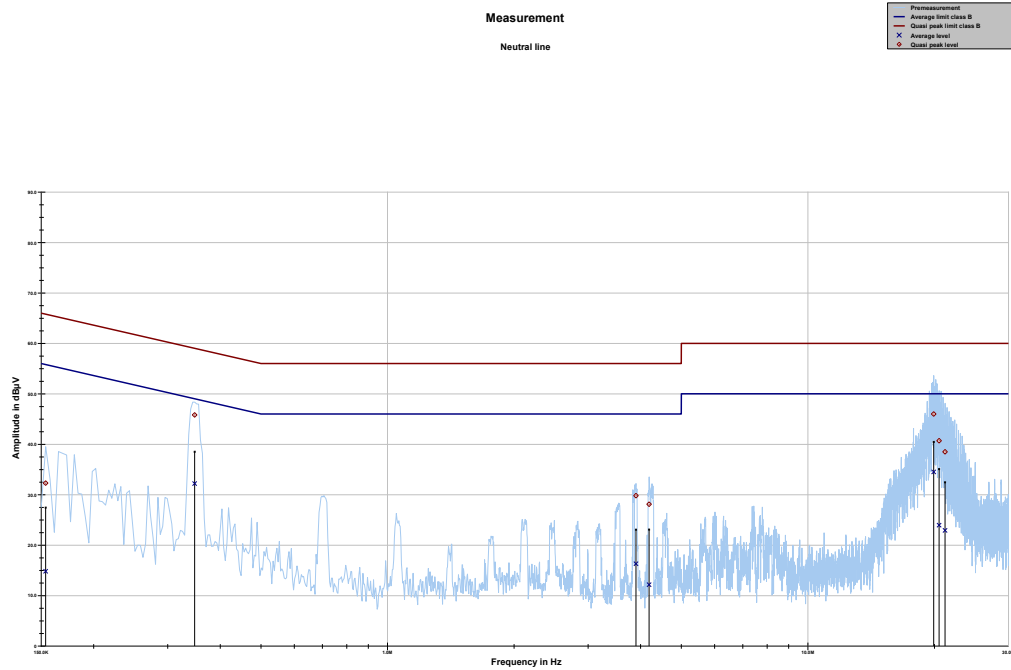
Plots AC 120V/60Hz:

Plot 1: 150 kHz to 30 MHz, phase line



Project ID: 1-0853/25-01-05

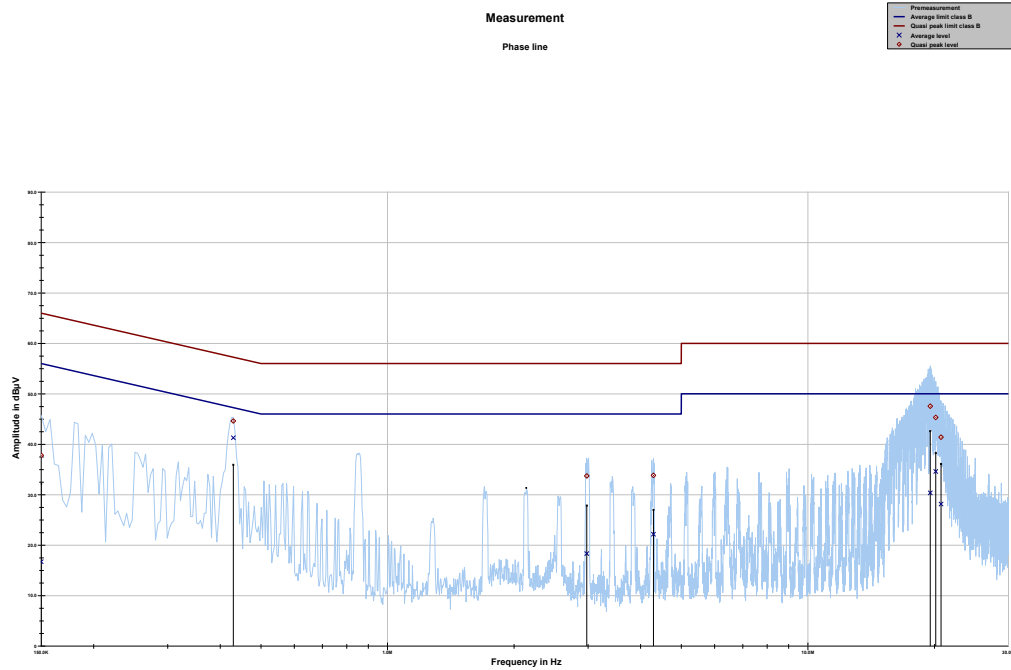
Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.161194	32.94	32.47	65.402	15.76	39.92	55.680
0.347756	45.94	13.07	59.016	37.12	13.23	50.350
3.556631	32.54	23.46	56.000	11.88	34.12	46.000
3.884981	35.83	20.17	56.000	21.84	24.16	46.000
19.914431	45.13	14.87	60.000	29.63	20.37	50.000
20.503969	41.35	18.65	60.000	29.53	20.47	50.000
21.205444	37.89	22.11	60.000	22.29	27.71	50.000

Plot 2: 150 kHz to 30 MHz, neutral line

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.153731	32.30	33.49	65.796	14.82	41.07	55.893
0.347756	45.82	13.20	59.016	32.20	18.15	50.350
3.899906	29.80	26.20	56.000	16.30	29.70	46.000
4.190944	28.11	27.89	56.000	12.16	33.84	46.000
19.918163	46.00	14.00	60.000	34.52	15.48	50.000
20.515162	40.70	19.30	60.000	23.96	26.04	50.000
21.205444	38.49	21.51	60.000	22.91	27.09	50.000

Plots AC 208V/60Hz:

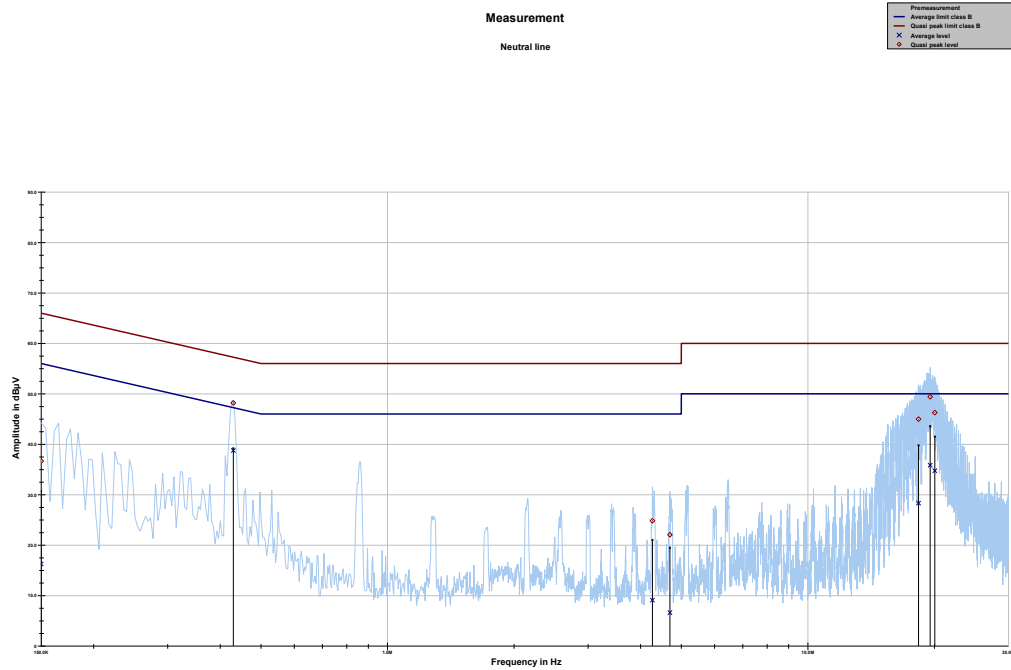
Plot 1: 150 kHz to 30 MHz, phase line



Project ID: 1-0853/25-01-05

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.150000	37.83	28.17	66.000	16.72	39.28	56.000
0.429844	44.61	12.65	57.256	41.29	6.72	48.004
2.978287	33.72	22.28	56.000	18.32	27.68	46.000
4.291688	33.84	22.16	56.000	22.16	23.84	46.000
19.552500	47.55	12.45	60.000	30.36	19.64	50.000
20.145769	45.31	14.69	60.000	34.61	15.39	50.000
20.742769	41.40	18.60	60.000	28.14	21.86	50.000

Plot 2: 150 kHz to 30 MHz, neutral line

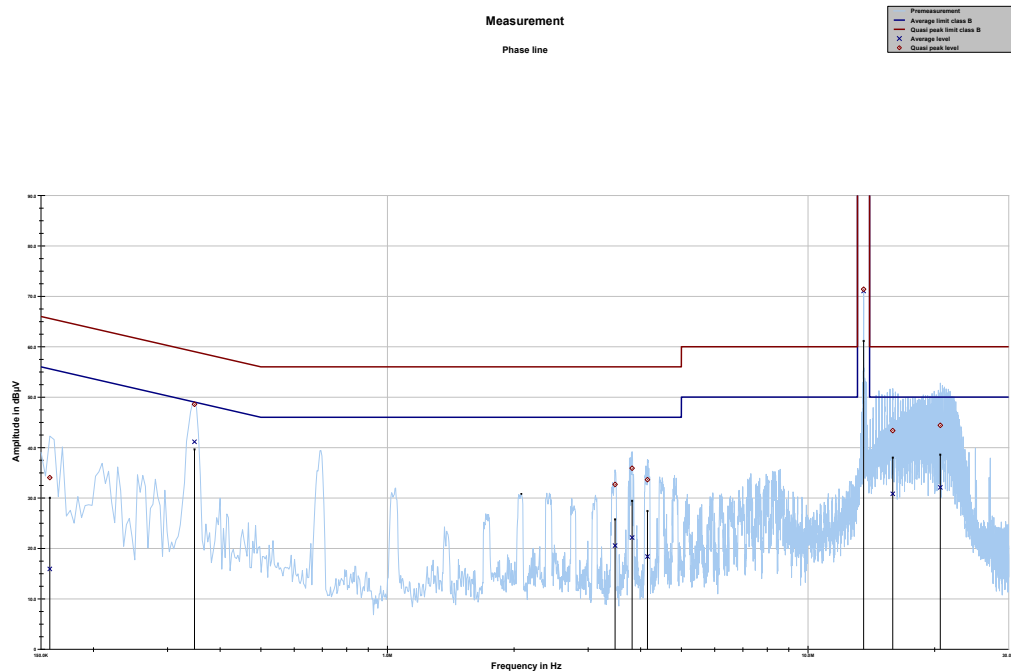


Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.150000	36.65	29.35	66.000	16.27	39.73	56.000
0.429844	48.20	9.06	57.256	38.77	9.24	48.004
4.269300	24.85	31.15	56.000	9.09	36.91	46.000
4.698394	22.06	33.94	56.000	6.62	39.38	46.000
18.332381	44.98	15.02	60.000	28.33	21.67	50.000
19.545037	49.42	10.58	60.000	35.85	14.15	50.000
20.048756	46.28	13.72	60.000	34.75	15.25	50.000

12.4.2 Plots with build in antenna

Plots AC 120V/60Hz:

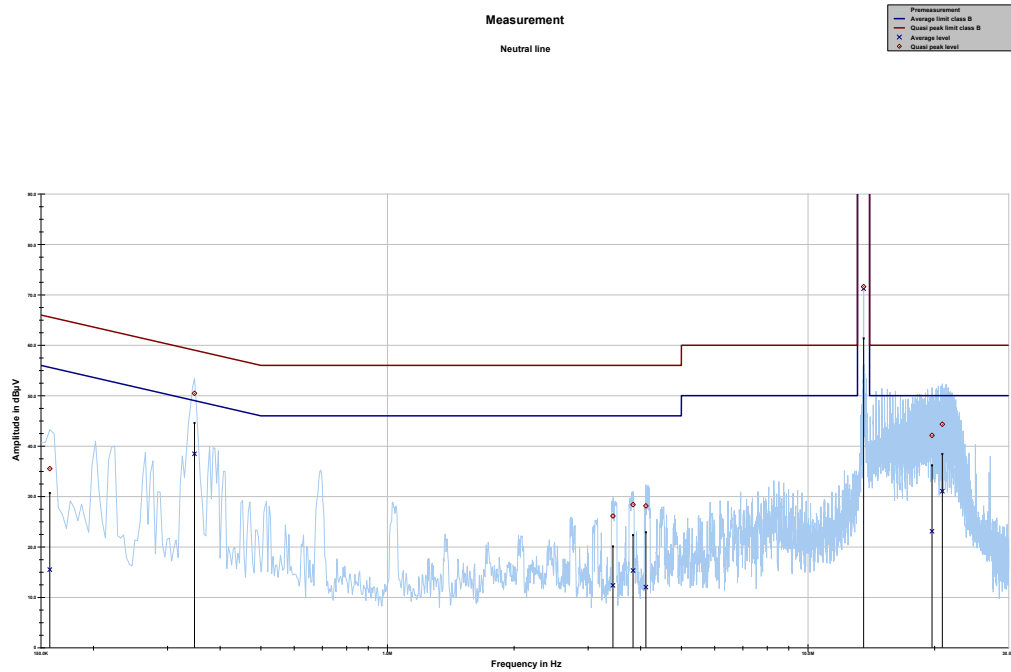
Plot 1: 150 kHz to 30 MHz, phase line



*carrier frequency range (13.110 MHz – 14.010 MHz) not rated

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.157463	34.03	31.57	65.597	15.93	39.86	55.787
0.347756	48.58	10.43	59.016	41.13	9.22	50.350
3.478275	32.68	23.32	56.000	20.55	25.45	46.000
3.817819	35.90	20.10	56.000	22.14	23.86	46.000
4.153631	33.63	22.37	56.000	18.38	27.62	46.000
15.903337	43.36	16.64	60.000	30.83	19.17	50.000
20.638294	44.41	15.59	60.000	32.09	17.91	50.000

Plot 2: 150 kHz to 30 MHz, neutral line

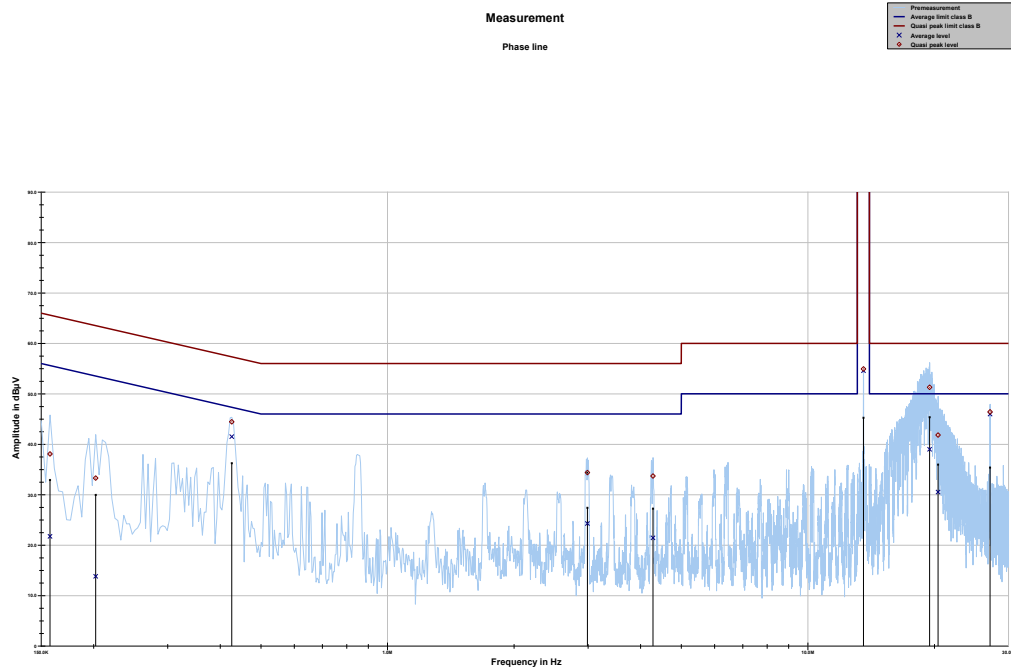


*carrier frequency range (13.110 MHz – 14.010 MHz) not rated

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.157463	35.53	30.07	65.597	15.50	40.29	55.787
0.347756	50.46	8.56	59.016	38.46	11.89	50.350
3.437231	26.13	29.87	56.000	12.38	33.62	46.000
3.836475	28.39	27.61	56.000	15.33	30.67	46.000
4.116319	28.15	27.85	56.000	12.02	33.98	46.000
19.720406	42.12	17.88	60.000	23.10	26.90	50.000
20.869631	44.34	15.66	60.000	31.04	18.96	50.000

Plots AC 208V/60Hz:

Plot 1: 150 kHz to 30 MHz, phase line

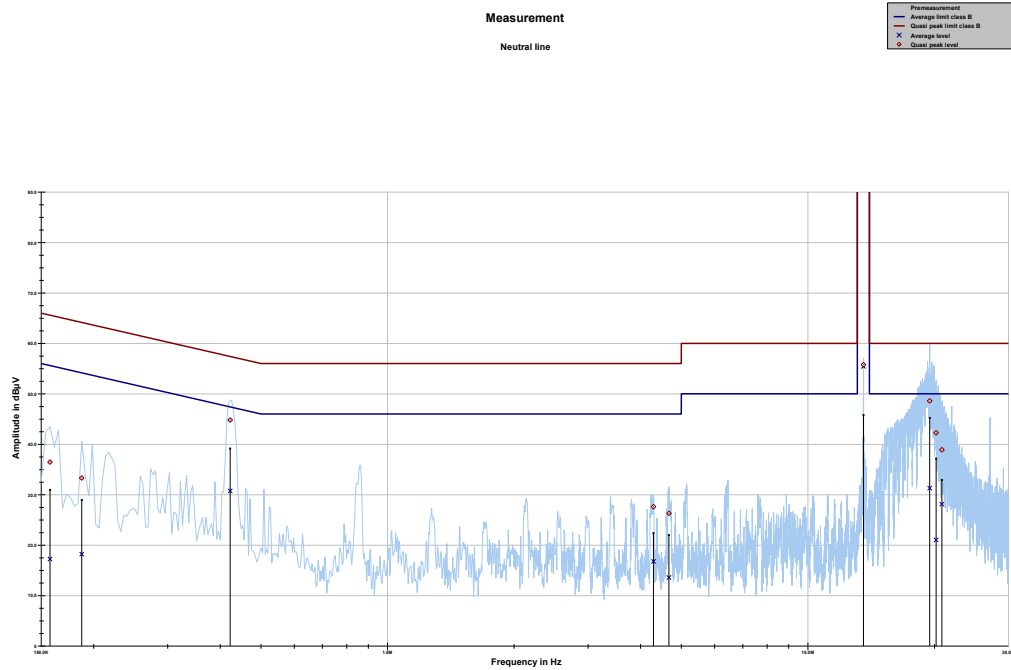


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*carrier frequency range (13.110 MHz – 14.010 MHz) not rated

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.157463	38.07	27.53	65.597	21.73	34.05	55.787
0.202237	33.30	30.22	63.518	13.81	40.70	54.508
0.426113	44.44	12.89	57.328	41.51	6.60	48.111
2.989481	34.38	21.62	56.000	24.29	21.71	46.000
4.280494	33.70	22.30	56.000	21.44	24.56	46.000
13.560113	54.93	45.07	100.000	54.57	55.43	110.000
19.481606	51.30	8.70	60.000	38.99	11.01	50.000
20.406956	41.83	18.17	60.000	30.53	19.47	50.000
27.123206	46.42	13.58	60.000	45.97	4.03	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.157463	36.48	29.12	65.597	17.25	38.54	55.787
0.187312	33.31	30.85	64.155	18.22	36.72	54.934
0.422381	44.79	12.61	57.401	30.76	17.46	48.218
4.291688	27.60	28.40	56.000	16.77	29.23	46.000
4.672275	26.30	29.70	56.000	13.57	32.43	46.000
13.560113	55.79	44.21	100.000	55.43	54.57	110.000
19.489069	48.60	11.40	60.000	31.31	18.69	50.000
20.183081	42.27	17.73	60.000	21.04	28.96	50.000
20.839781	38.90	21.10	60.000	28.13	21.87	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 7.4 B
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 $\pm 0.01\%$ (± 100 ppm)

Result: Temperature variation

Frequency tolerance			
Measured frequency	Frequency error	Conditions	Result
13.560876	64.58 ppm	-20 °C & 100% voltage	compliant
13.560871	64.27 ppm	-10 °C & 100% voltage	compliant
13.560845	62.32 ppm	0 °C & 100% voltage	compliant
13.560791	58.36 ppm	+10 °C & 100% voltage	compliant
13.560604	44.58 ppm	+30 °C & 100% voltage	compliant
13.560577	42.53 ppm	+40 °C & 100% voltage	compliant
13.560501	36.91 ppm	+50 °C & 100% voltage	compliant

Result: Voltage variation

Frequency tolerance			
Measured frequency	Frequency error	Conditions	Result
13.560707	52.11 ppm	+20 °C & 85% voltage	compliant
13.560706	52.05 ppm	+20 °C & 100% voltage	compliant
13.560692	51.03 ppm	+20 °C & 115% voltage	compliant

13 Glossary

AVG	Average
C	Compliant
C/N₀	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
R01	Initial release	2025-08-27
R02	new AC conducted measurements with dummy load	2025-09-29

END OF TEST REPORT