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advanced

## TEST REPORT

Test report no.: 1-7150-24-01-06\_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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### Manufacturer

**FEIG ELECTRONIC GmbH**  
Industriestraße 1a  
35781 Weilburg / 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:	RFID Reader
Model name:	cVEND plug II
FCC ID:	PJMCVENDII
IC ID:	6633A-CVENDII
Frequency:	13.56 MHz
Technology tested:	RFID
Antenna:	integrated antenna
Power supply:	5.0 V DC by external power supply
Temperature range:	-30°C to +70°C

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

### Test report authorized:

Christoph Schneider  
Lab Manager  
Radio Labs

### Test performed:

On behalf of

Hans-Joachim Wolsdorff  
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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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.

**This test report replaces the test report with the number 1-7150-24-01-06\_TR1-R01 and dated 2024-10-02.**

### 2.2 Application details

Date of receipt of order:	2024-06-24
Date of receipt of test item:	2024-07-23
Start of test:*	2024-07-23
End of test:*	2024-07-25
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

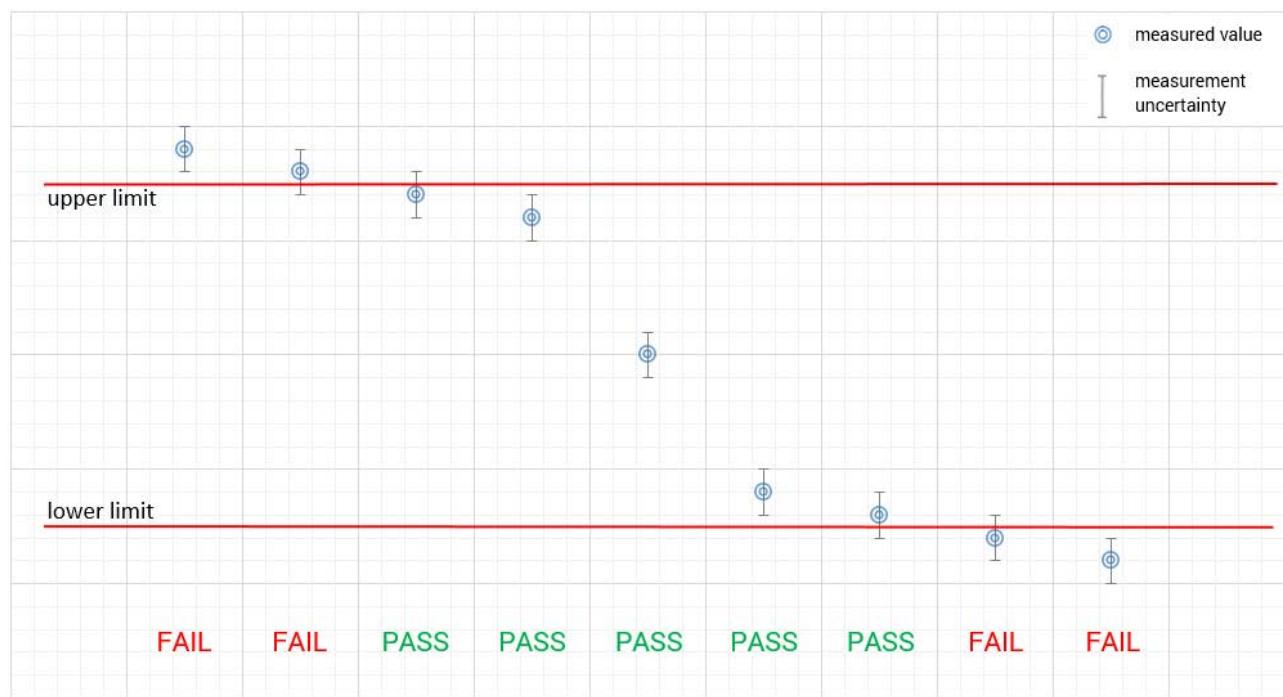
Test standard	Date	Description
FCC – Title 47 CFR Part 15		FCC – Title 47 of the Code of Federal Regulations; Chapter I; Part 15 – Radio frequency devices
RSS – 210 Issue 11	25.06.2024	Spectrum Management and Telecommunications Radio Standards Specification – Licence-Exempt Radio Apparatus: Category 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

## 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 :	$T_{\text{nom}}$	+22 °C during room temperature tests
	$T_{\text{max}}$	+70 °C during high temperature tests
	$T_{\text{min}}$	-30 °C during low temperature tests
Relative humidity content :		57 %
Barometric pressure :		not relevant for this kind of testing
Power supply :	$V_{\text{nom}}$	5.0 V DC by external power supply
	$V_{\text{max}}$	5.5 V DC
	$V_{\text{min}}$	5.0 V DC

## 6 Test item

### 6.1 General description

Kind of test item :	RFID Reader
Model name:	cVEND plug II
PMN:	cVEND plug II
HVIN:	cVEND plug II
FVIN:	feclr 03.02.00
S/N serial number :	9174545
Hardware status :	FE1141
Software status :	aD03.01.00-00.03-2-2 20240125
Firmware status :	feclr 03.02.00
Frequency band :	13.56 MHz
Type of radio transmission :	
Use of frequency spectrum :	modulated carrier
Type of modulation :	ASK
Number of channels :	1
Antenna :	integrated antenna
Power supply :	5.0 V DC by external power supply
Temperature range :	-30°C to +70°C

### 6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report:

1-7150-23-01-01\_TR1-A101-R01

1-7150-23-01-01\_TR1-A102-R01

1-7150-23-01-01\_TR1-A104-R01

## 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).

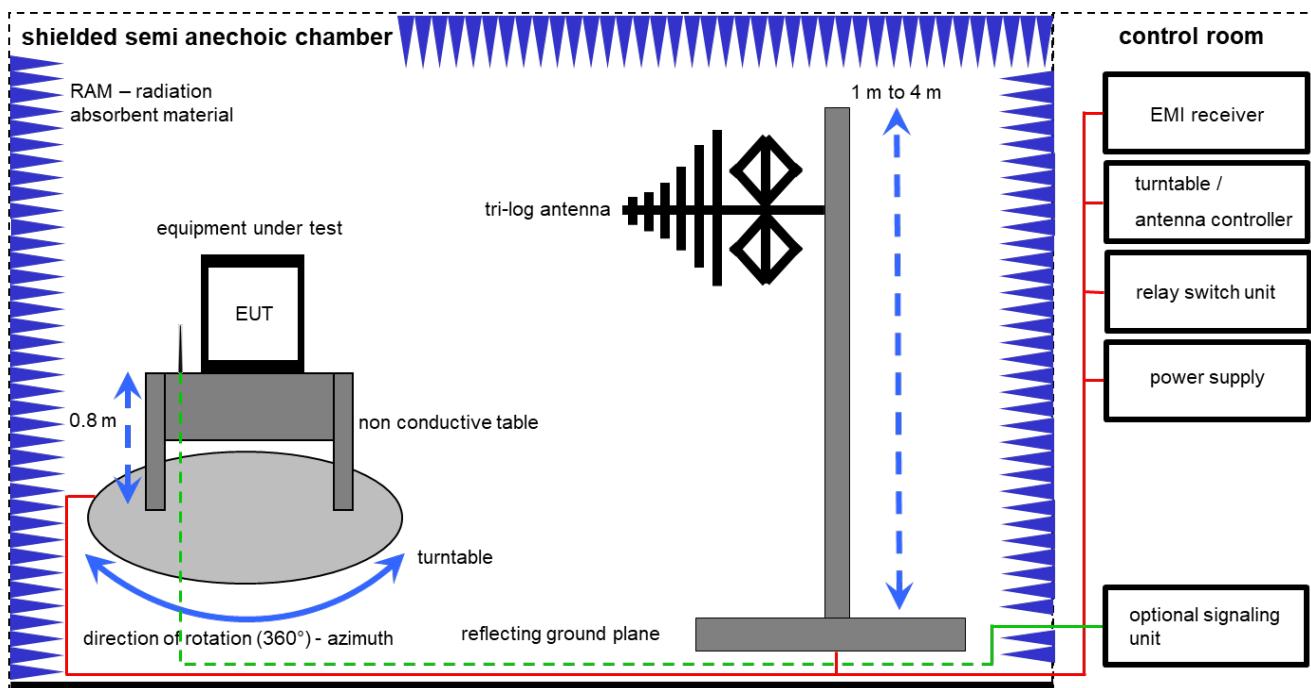
Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

### 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	*	next calibration ordered / currently in progress
NK!	Attention: not calibrated		

## 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)

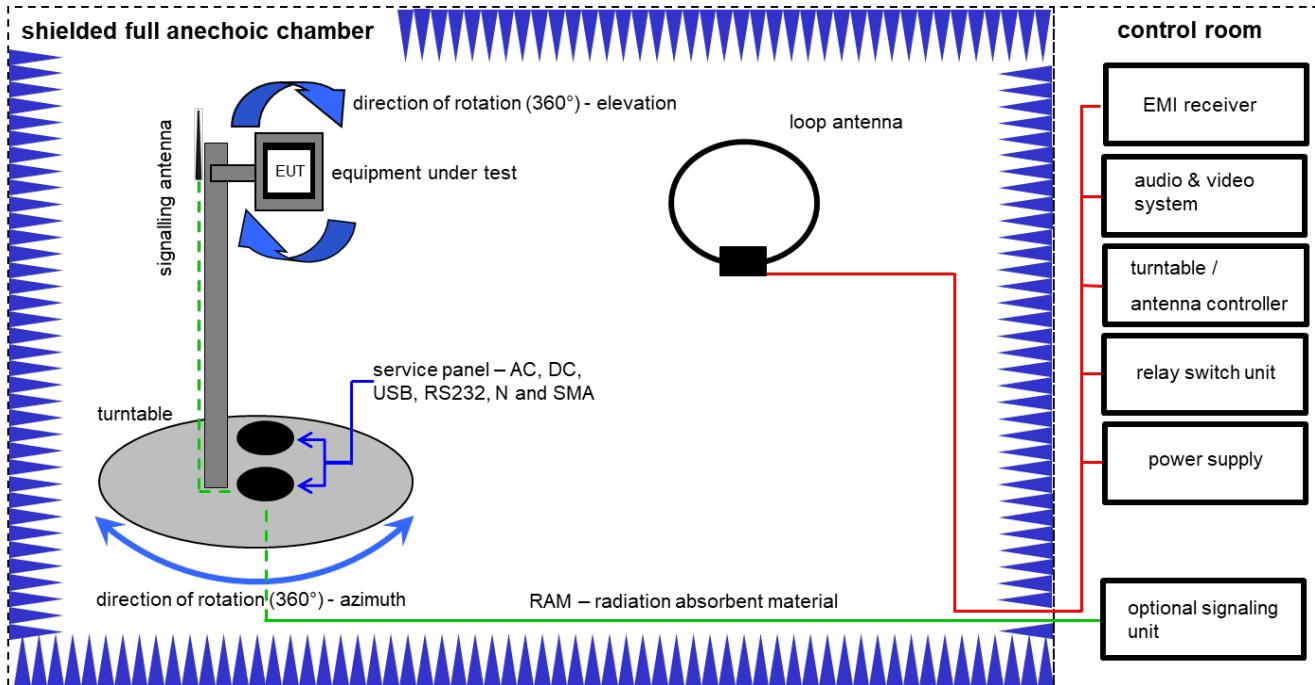
Example calculation:

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

**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	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	295	300003787	vIKI!	23.05.2023	31.05.2025
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	06.12.2023	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)

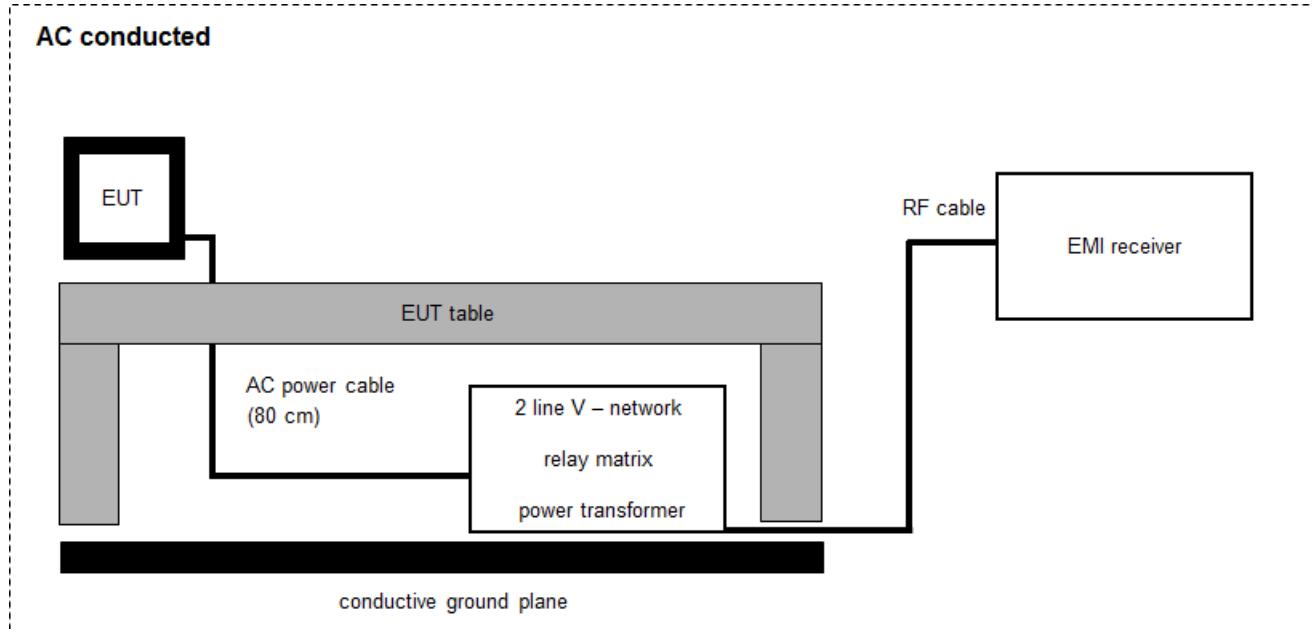
Example calculation:

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

### Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
2	A	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2023	31.12.2024
3	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vlKI!	02.08.2023	31.08.2025
4	A	NEXIO EMC-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:

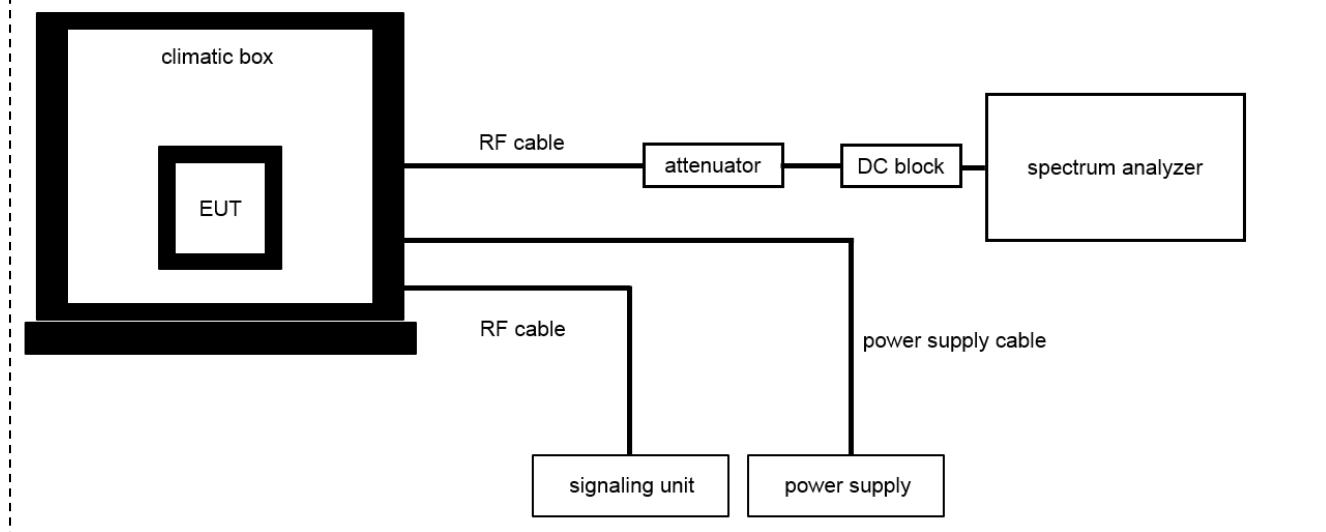
$$FS [\text{dB}\mu\text{V/m}] = 37.62 [\text{dB}\mu\text{V/m}] + 9.90 [\text{dB}] + 0.23 [\text{dB}] = 47.75 [\text{dB}\mu\text{V/m}] (244.06 \mu\text{V/m})$$

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	vIKI!	12.12.2023	31.12.2025
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	NKI!	-/-	-/-
3	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	-/-	-/-
4	A	PC	TecLine	F+W		300003532	ne	-/-	-/-
5	A	Analyzer-Impedance-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	08.12.2023	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	B	Temperature Test Chamber	VT 4011	Voetsch Industrietechnik	58566230600010	300005363	ev	09.08.2022	31.08.2024
4	A,B	Signal analyzer	FSW26	Rohde&Schwarz	101371	300005697	k	07.12.2023	31.12.2024
5	A,B	Power Supply	HMP2020	Rohde & Schwarz	102219	300006192	k	15.12.2022	31.12.2024

## 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.

#### Premasurement\*

- 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	± 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

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input type="checkbox"/>	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!	2024-11-28	-/-

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

**Note:**

C Compliant  
 NC Not compliant  
 NA Not applicable  
 NP Not performed

## 11 Additional comments

Reference documents: none

Special test descriptions: Kurzanleitung\_Inbetriebnahme\_cVEND2

Configuration descriptions: - AC conducted measurement (chapter 12.4) has been performed on a device where the RFID antenna port was terminated with correct nominal impedance according KDB 174176

## 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"

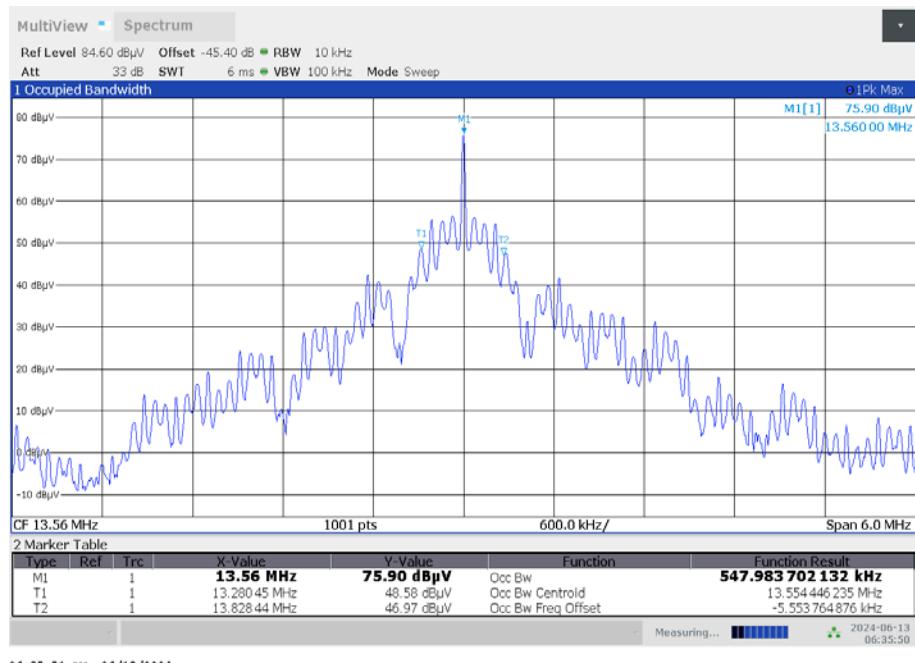
Measurement parameters	
Detector:	Peak
Resolution bandwidth:	1 % – 5 % of the occupied bandwidth
Video bandwidth:	$\geq 3 \times$ RBW
Trace mode:	Max hold
Analyser function:	99 % power function
Used equipment:	See chapter 7.4A
Measurement uncertainty:	See chapter 9

#### Limit:

IC
for RSP-100 test report coversheet only

#### Result:

99% emission bandwidth
547.983 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:	$\geq 3 \times$ RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.2A
Measurement uncertainty:	See chapter 9

### Limit:

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

### Recalculation:

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

### Result:

Field strength of the fundamental		
Frequency	13.56 MHz	
Distance	@ 3 m	@ 30 m
RFI	76.5 dB $\mu$ V/m	55.1 dB $\mu$ V/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 & 7.3A
Measurement uncertainty:	See chapter 9

### Limit:

FCC		
Frequency (MHz)	Field strength ( $\mu\text{V}/\text{m}$ )	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 dB $\mu\text{V}/\text{m}$ )	30
30 – 88	100 (40 dB $\mu\text{V}/\text{m}$ )	3
88 – 216	150 (43.5 dB $\mu\text{V}/\text{m}$ )	3
216 – 960	200 (46 dB $\mu\text{V}/\text{m}$ )	3

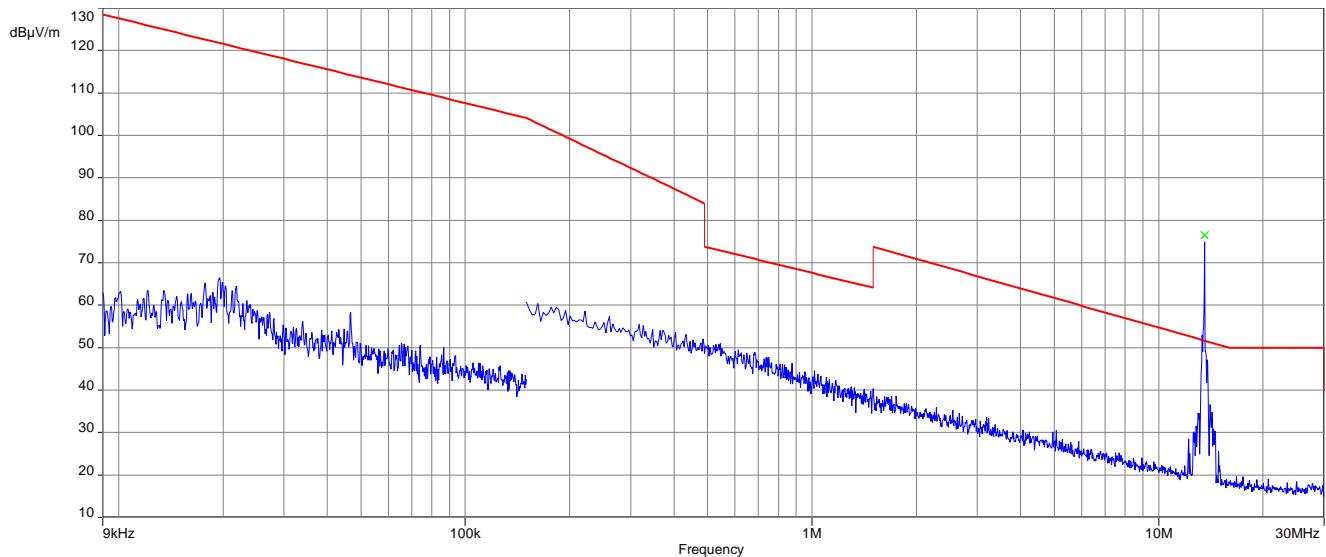
IC		
Frequency (MHz)	Field strength ( $\mu\text{A}/\text{m}$ )	Measurement distance (m)
0.009 – 0.490	6.37/F (F in kHz)	300
0.490 – 1.705	63.7/F (F in kHz)	30
1.705 – 30	0.08 (-22 dB $\mu\text{A}/\text{m}$ )	30

### Result:

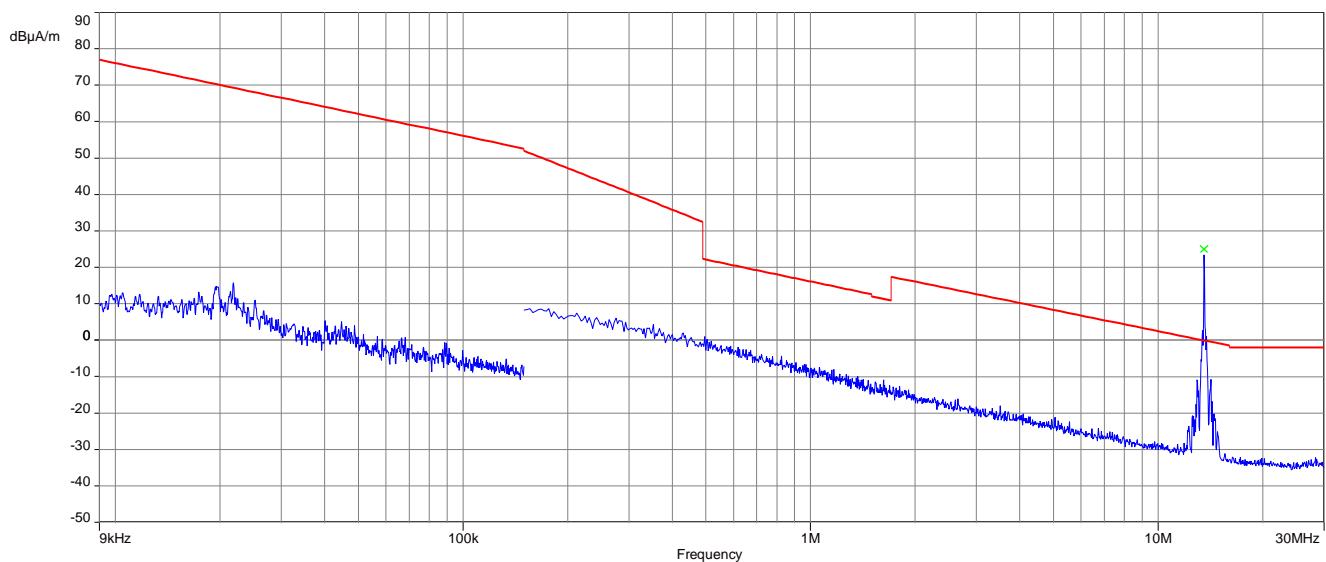
Detected emissions			
Frequency	Detector	Resolution bandwidth	Detected value (@ 3m)
no peaks detected			

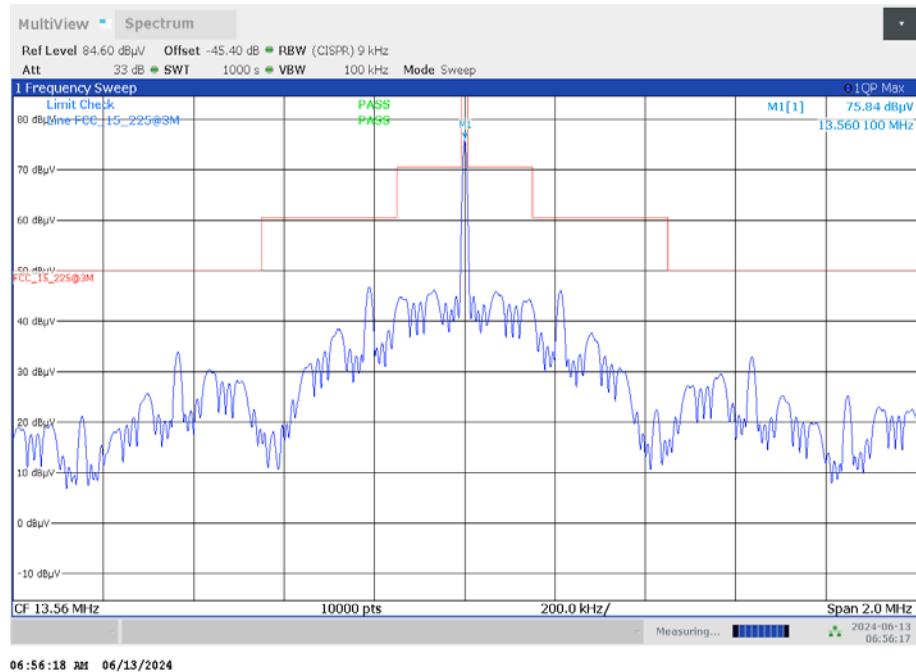
## Plots

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

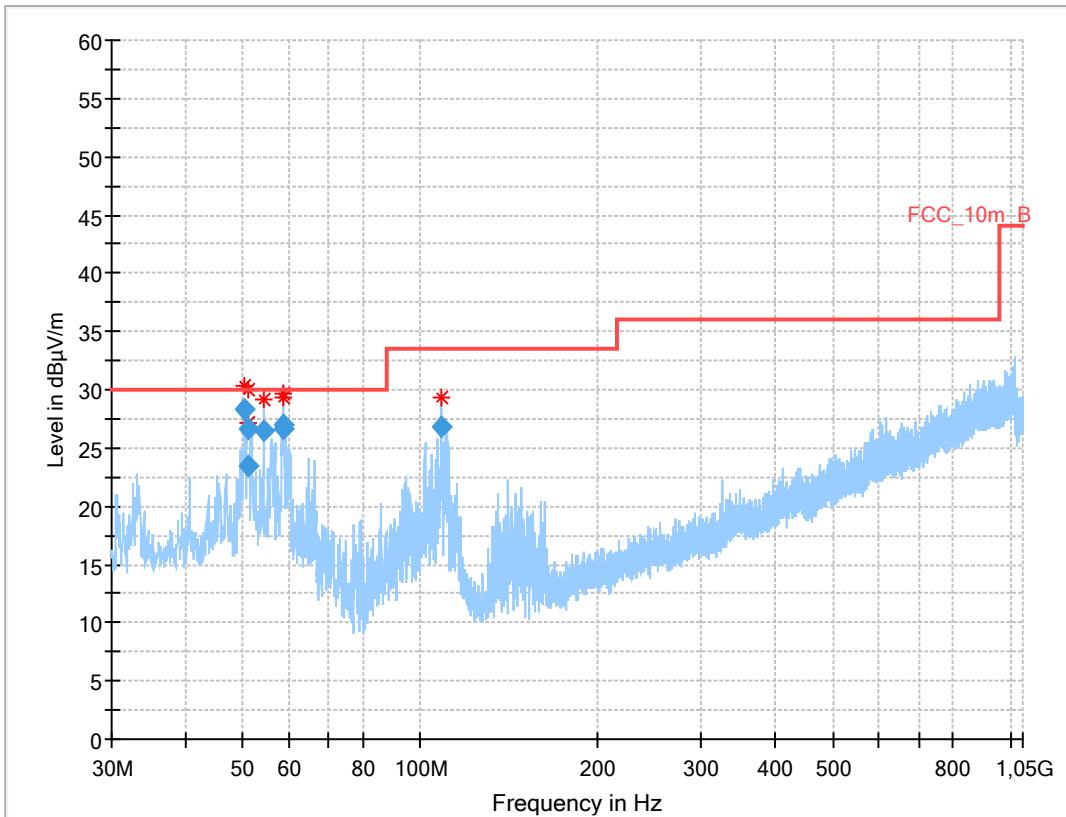


**Plot 2: 9 kHz – 30 MHz, magnetic emissions IC**



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

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



## Final\_Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
50.439	28.31	30.0	1.7	1000	120.0	104.0	V	284	15
51.081	26.65	30.0	3.4	1000	120.0	177.0	V	7	15
51.282	23.50	30.0	6.5	1000	120.0	101.0	V	29	15
54.228	26.43	30.0	3.6	1000	120.0	103.0	V	270	15
58.714	26.98	30.0	3.0	1000	120.0	104.0	V	14	15
58.724	26.58	30.0	3.4	1000	120.0	101.0	V	7	15
108.800	26.79	33.5	6.7	1000	120.0	110.0	V	180	13

## 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

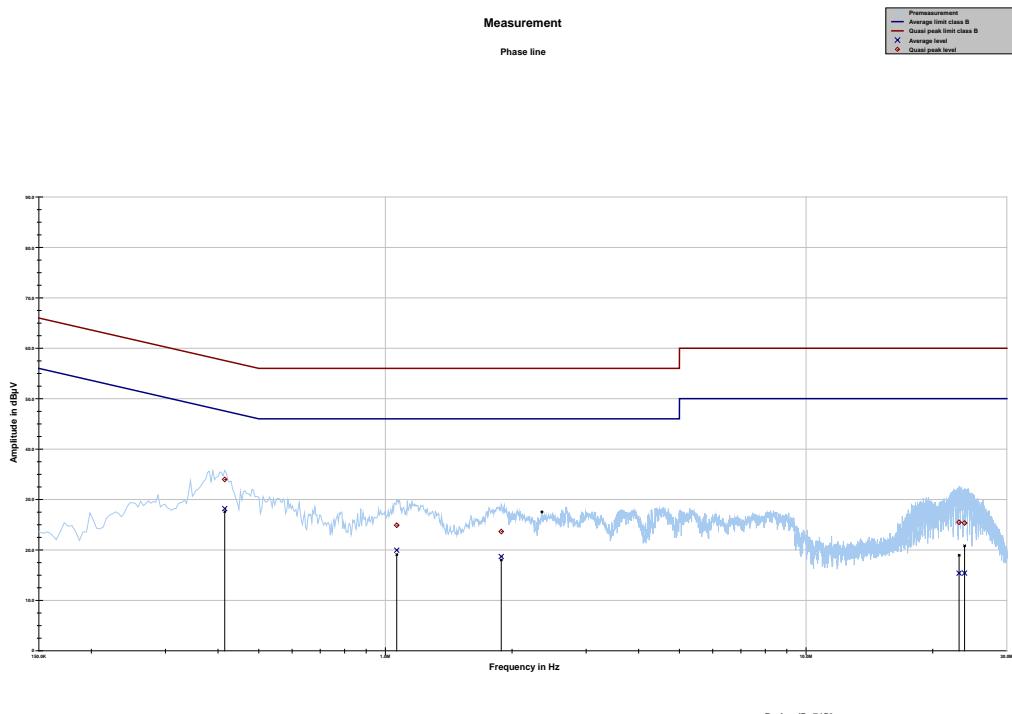
Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Trace mode:	Max hold
Used equipment:	See chapter 7.3A
Measurement uncertainty:	See chapter 9

### Limit:

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

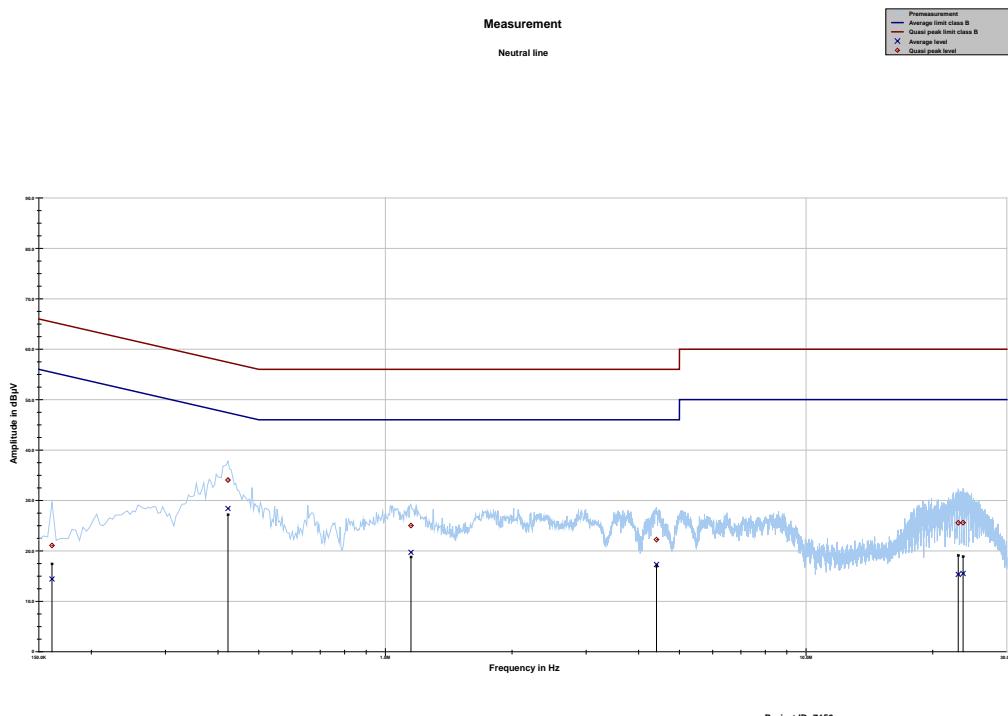
### Result:

see table below plots

**Plots:**
**Plot 1: 150 kHz to 30 MHz, phase line**


Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	$\text{dB}\mu\text{V}$	$\text{dB}$	$\text{dB}\mu\text{V}$	$\text{dB}\mu\text{V}$	$\text{dB}$	$\text{dB}\mu\text{V}$
<b>0.414919</b>	33.97	23.58	57.549	28.20	20.23	48.431
<b>1.064156</b>	24.90	31.10	56.000	19.94	26.06	46.000
<b>1.885031</b>	23.64	32.36	56.000	18.69	27.31	46.000
<b>23.112112</b>	25.49	34.51	60.000	15.40	34.60	50.000
<b>23.813588</b>	25.33	34.67	60.000	15.41	34.59	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
<b>MHz</b>	<b>dBµV</b>	<b>dB</b>	<b>dBµV</b>	<b>dBµV</b>	<b>dB</b>	<b>dBµV</b>
<b>0.161194</b>	21.07	44.33	65.402	14.42	41.26	55.680
<b>0.422381</b>	34.06	23.35	57.401	28.41	19.81	48.218
<b>1.149975</b>	25.03	30.97	56.000	19.71	26.29	46.000
<b>4.411087</b>	22.23	33.77	56.000	17.31	28.69	46.000
<b>23.000175</b>	25.57	34.43	60.000	15.33	34.67	50.000
<b>23.623294</b>	25.60	34.40	60.000	15.51	34.49	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. ( $\pm 1.356$ kHz)
Carrier frequency stability shall be maintained to $\pm 0.01\%$ ( $\pm 100$ ppm)

### Result: Temperature variation

Frequency tolerance			
Measured frequency	Frequency error	Conditions	Result
13.559699	-0.301 kHz	-20 °C & 100% voltage	compliant
13.559717	-0.283 kHz	-10 °C & 100% voltage	compliant
13.559709	-0.291 kHz	0 °C & 100% voltage	compliant
13.559685	-0.315 kHz	+10 °C & 100% voltage	compliant
13.559606	-0.394 kHz	+30 °C & 100% voltage	compliant
13.559571	-0.429 kHz	+40 °C & 100% voltage	compliant
13.559559	-0.441 kHz	+50 °C & 100% voltage	compliant

### Result: Voltage variation

Frequency tolerance			
Measured frequency	Frequency error	Conditions	Result
13.559588	-0.412 kHz	+20 °C & 85% voltage	compliant
13.559588	-0.412 kHz	+20 °C & 100% voltage	compliant
13.559588	-0.412 kHz	+20 °C & 115% voltage	compliant

## 13 Glossary

<b>AVG</b>	Average
<b>C</b>	Compliant
<b>C/N<sub>0</sub></b>	Carrier to noise-density ratio, expressed in dB-Hz
<b>CAC</b>	Channel availability check
<b>CW</b>	Clean wave
<b>DC</b>	Duty cycle
<b>DFS</b>	Dynamic frequency selection
<b>DSSS</b>	Dynamic sequence spread spectrum
<b>DUT</b>	Device under test
<b>EN</b>	European Standard
<b>ETSI</b>	European Telecommunications Standards Institute
<b>EMC</b>	Electromagnetic Compatibility
<b>EUT</b>	Equipment under test
<b>FCC</b>	Federal Communications Commission
<b>FCC ID</b>	Company Identifier at FCC
<b>FHSS</b>	Frequency hopping spread spectrum
<b>FVIN</b>	Firmware version identification number
<b>GNSS</b>	Global Navigation Satellite System
<b>GUE</b>	GNSS User Equipment
<b>HMN</b>	Host marketing name
<b>HVIN</b>	Hardware version identification number
<b>HW</b>	Hardware
<b>IC</b>	Industry Canada
<b>Inv. No.</b>	Inventory number
<b>MC</b>	Modulated carrier
<b>NA</b>	Not applicable
<b>NC</b>	Not compliant
<b>NOP</b>	Non occupancy period
<b>NP</b>	Not performed
<b>OBW</b>	Occupied bandwidth
<b>OC</b>	Operating channel
<b>OCW</b>	Operating channel bandwidth
<b>OFDM</b>	Orthogonal frequency division multiplexing
<b>OOB</b>	Out of band
<b>OP</b>	Occupancy period
<b>PER</b>	Packet error rate
<b>PMN</b>	Product marketing name
<b>PP</b>	Positive peak
<b>QP</b>	Quasi peak
<b>RLAN</b>	Radio local area network
<b>S/N or SN</b>	Serial number
<b>SW</b>	Software
<b>UUT</b>	Unit under test
<b>WLAN</b>	Wireless local area network

## 14 Document history

Version	Applied changes	Date of release
-/-	Initial release	2024-10-02
R02	FCC ID, IC ID, HVIN, PMN and FVIN added	2024-11-28

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