

Report on the FCC and IC Testing of the BALTECH AG

Model: 10115-100

In accordance with FCC 47 CFR Part 15C and
ISED Canada RSS-210 and ISED Canada RSS-
GEN

Prepared for: BALTECH AG
Lilienthalstr. 27
85399 Hallbergmoos - Germany

FCC ID: OKY10115100A06A
IC: 7657A-10115100



Product Service

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Date: 2021-07-12

Document Number: TR-69583-20222-01 | Issue: 01

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|----------------------|-----------------|------------|--------------------|
| Project Management | Michael Ingerl | 2021-07-12 | SIGN-ID 531013 |
| Authorized Signatory | Markus Biberger | 2021-07-12 | SIGN-ID 531107 |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C and ISED Canada RSS-210 and ISED Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|-----------------|----------------|------------|--------------------|
| Testing | Michael Ingerl | 2021-07-12 | SIGN-ID 531014 |

Laboratory Accreditation

DAkkS Reg. No. D-PL-11321-11-02

Laboratory recognition

Registration No. BNetzA-CAB-16/21-15

ISED Canada test site registration

3050A-2

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Issue 10 (12-2019) and Issue 05 (03-2019).

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VAT ID No. DE129484267
Information pursuant to Section 2(1)
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Annexes:

- TR-69583-20222-01 Ed.1 Annex A
- TR-69583-20222-01 Ed.1 Annex B
- TR-69583-20222-01 Ed.1 Annex C



1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

| Issue | Description of Change | Date of Issue |
|-------|-----------------------|---------------|
| 1 | First Issue | 2021-07-12 |

Table 1

1.2 Introduction

| | |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicant | BALTECH AG |
| Manufacturer | BALTECH AG |
| Model Number(s) | 10115-100 |
| Serial Number(s) | 43039328 |
| Hardware Version(s) | --- |
| Software Version(s) | --- |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Issue 10 (12-2019) and Issue 05 (03-2019), FCC rule Part 2.1093, KDB 447498 D01, RSS-102 Issue 5 |
| Test Plan/Issue/Date | --- |
| Order Number | 5379331 |
| Date of Receipt of EUT | 2021-07-06 |
| Start of Test | 2021-07-09 |
| Finish of Test | 2021-07-12 |
| Name of Engineer(s) | Michael Ingerl |
| Related Document(s) | ANSI C63.10 (2013) ANSI C63.4 (2014) |



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and ISED Canada RSS-210, ISED Canada RSS-GEN, FCC rule Part 2.1093, KDB 447498 D01 and RSS-102 Issue 5 is shown below.

| Section | Specification Clause | Test Description | Result | Comments/Base Standard |
|-----------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|--------|------------------------|
| Configuration and Mode: 5V DC Powered – Continuous transmitting | | | | |
| 2.1 | 15.225 (a)(b)(c)(d), B.1 to B.9, 6.5 and 6.6. | Field Strength of any Emission | Pass | ANSI C63.10 (2013) |
| 2.2 | 15.225 (e), B.1 to B.9 and 6.11. | Frequency Tolerance Under Temperature Variations | Pass | ANSI C63.10 (2013) |
| 2.3 | 15.215 (c), N/A and 6.7 | 20 dB Bandwidth | Pass | ANSI C63.10 (2013) |
| 2.4 | 15.205, 7.1 and 8.10 | Restricted Band Edges | Pass | ANSI C63.10 (2013) |
| 2.5 | 15.207 and 8.8 | AC Power Line Conducted Emissions | Pass | ANSI C63.10 (2013) |
| 2.6 | 15.107 and 6.1 | Exposure of Humans to RF Fields and SAR exclusion threshold | Pass | ANSI C63.4 (2014) |

Table 2



1.4 Product Information

1.4.1 Technical Description

| Equipment characteristics | |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Type designation: | 10115-100 |
| Type of equipment: | RFID Reader |
| Application ¹ : | Inductive Applications |
| Equipment class: | Equipment for fixed use |
| Kind of equipment | Transceiver |
| Operating Frequency: | 13.56 MHz |
| Channel spacing: | Wideband |
| Number of RF channels: | 1 |
| Antenna: | Integrated Antenna |
| Type(s) of Modulation (e.g. BPSK, FSK, ASK, ...) | ASK |
| Power supply: | DC supplied (USB) Nominal: 5 V Minimum: 4.65 V Maximum: 5.35 V Nominal frequency: DC |

1.5 Deviations from the Standard

None



1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

| Modification State | Description of Modification still fitted to EUT | Modification Fitted By | Date Modification Fitted |
|--------------------|-------------------------------------------------|------------------------|--------------------------|
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

Table 3

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

| Test Name | Name of Engineer(s) |
|-----------------------------------------------------------------|---------------------|
| Configuration and Mode: 5V DC Powered – Continuous transmitting | |
| Field Strength of any Emission | Michael Ingerl |
| Frequency Tolerance Under Temperature Variations | Michael Ingerl |
| 20 dB Bandwidth | Michael Ingerl |
| Restricted Band Edges | Michael Ingerl |
| AC Power Line Conducted Emissions | Michael Ingerl |
| Exposure of Humans to RF Fields and SAR exclusion threshold | Michael Ingerl |

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



2 Test Details

2.1 Field Strength of any Emission

2.1.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.225 (a)(b)(c)(d), B.1 to B.9, 6.5 and 6.6.

2.1.2 Equipment Under Test and Modification State

10115-100, S/N: --- - Modification State 0

2.1.3 Date of Test

2021-07-09

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

Measurements were made at a distance of 3 m. The limit lines shown on the plot were extrapolated from either 300 m or 30 m to the measurement distance of 3 m in accordance with ANSI C63.10 Clause 6.4.4.2.

2.1.5 Environmental Conditions

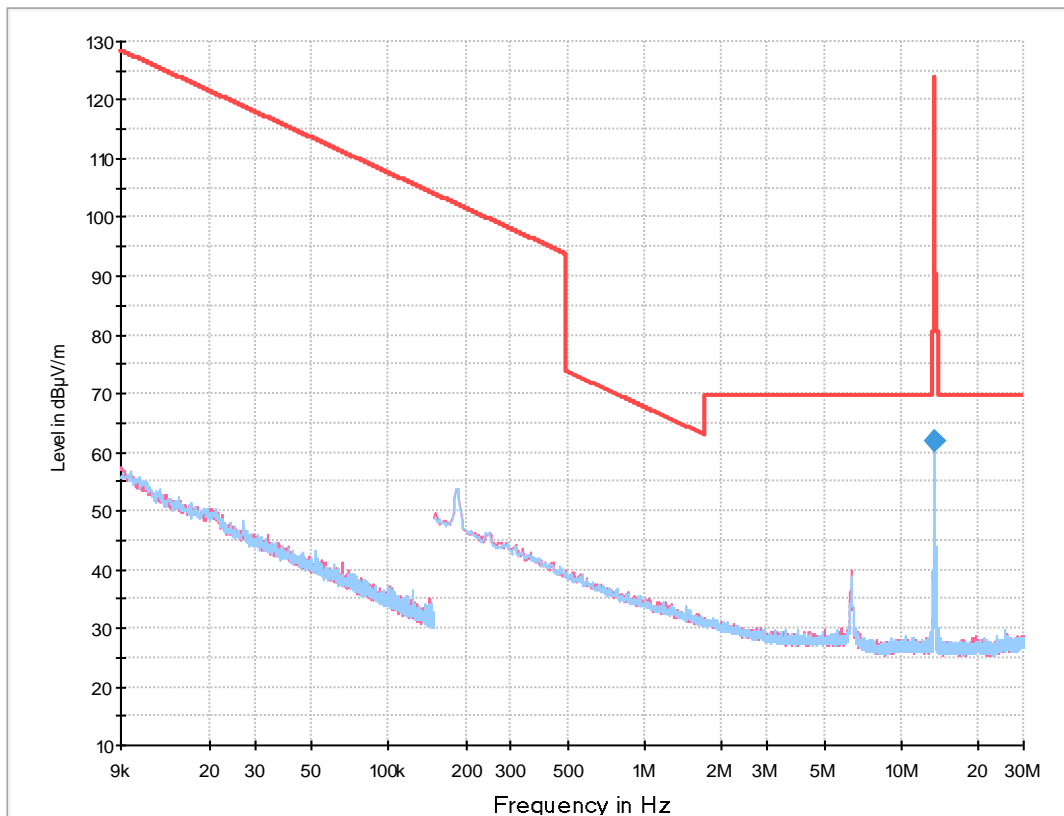
| | |
|---------------------|---------|
| Ambient Temperature | 22,0 °C |
| Relative Humidity | 31,0 % |

2.1.6 Test Results

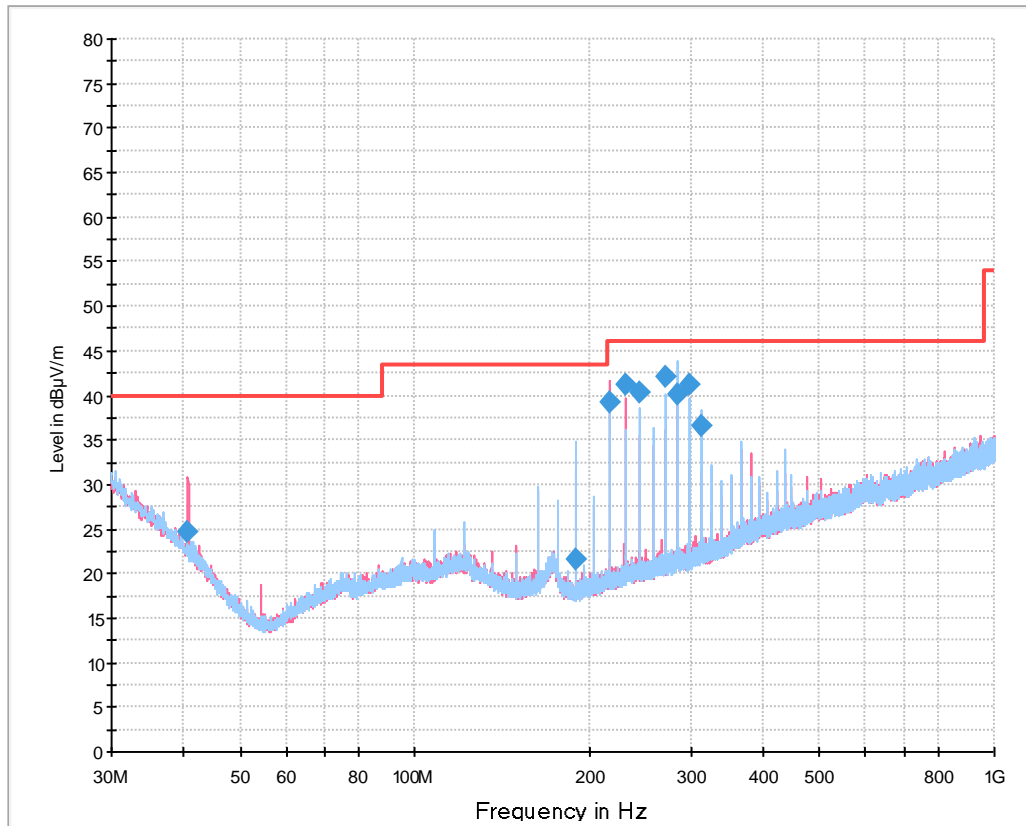
5V DC Powered – Continuous transmitting



| Frequency MHz | Quasi-Peak Level (dB μ V/m) at 3 m | Quasi-Peak Level (dB μ V/m) at 30 m |
|---------------|----------------------------------------|-----------------------------------------|
| 13.56 | 61.94 | 21.90 |



9 kHz to 30 MHz



— PreviewResult 1V-PK+
— FCCPart 15CElect ric FieldStrength 3mQP
— PreviewResult 1H-PK+
◆ Final_Result QPK

30 MHz to 1 GHz

Final Results 1:

| Frequency MHz | QuasiPeak dBµV/m | Limit dBµV/m | Margin dB | Meas. Time ms | Bandwidth kHz | Height cm | Pol | Azimuth deg | Corr. dB/m |
|------------------|---------------------|-----------------|--------------|---------------------|------------------|--------------|-----|----------------|---------------|
| 40.680000 | 24.60 | 40.00 | 15.40 | 1000.0 | 120.000 | 110.0 | V | 150.0 | 20.0 |
| 189.870000 | 21.55 | 43.50 | 21.95 | 1000.0 | 120.000 | 178.0 | H | 94.0 | 16.3 |
| 216.990000 | 39.22 | 46.02 | 6.80 | 1000.0 | 120.000 | 103.0 | V | 14.0 | 17.2 |
| 230.550000 | 41.31 | 46.02 | 4.71 | 1000.0 | 120.000 | 179.0 | V | 201.0 | 17.7 |
| 244.110000 | 40.31 | 46.02 | 5.71 | 1000.0 | 120.000 | 119.0 | H | 124.0 | 18.0 |
| 271.230000 | 42.02 | 46.02 | 4.00 | 1000.0 | 120.000 | 100.0 | H | -117.0 | 18.7 |
| 284.790000 | 40.21 | 46.02 | 5.81 | 1000.0 | 120.000 | 125.0 | H | -108.0 | 19.2 |
| 298.350000 | 41.32 | 46.02 | 4.70 | 1000.0 | 120.000 | 100.0 | H | -127.0 | 19.5 |
| 311.910000 | 36.61 | 46.02 | 9.41 | 1000.0 | 120.000 | 103.0 | H | -125.0 | 20.0 |



FCC 47 CFR Part 15, Limit Clause 15.225 (a)(b)(c)(d)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 m.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 m.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 m.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

FCC 47 CFR Part 15, Limit Clause 15.209

| Frequency (MHz) | Field Strength (µV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009 to 0.490 | 2400/F (kHz) | 300 |
| 0.490 to 1.705 | 24000/F (kHz) | 30 |
| 1705 to 30 | 30 | 30 |
| 30 to 88 | 100** | 3 |
| 88 to 216 | 150** | 3 |
| 216 to 960 | 200** | 3 |
| Above 960 | 500 | 5 |

Table 5 - FCC Radiated Emission Limit



ISED Canada RSS-210, Limit Clause B.6

The field strength of any emission shall not exceed the following limits:

- (a) 15.848 mW/m (84 dBµV/m) at 30 m, within the band 13.553 – 13.567 MHz.
- (b) 334 µV/m (50.5 dBµV/m) at 30 m, withing the bands 13.410 – 13.553 MHz and 13.567 – 13.710 MHz.
- (c) 106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz.
- (d) RSS-GEN general field strength limits for frequencies outside the band 13.110 – 14.010 MHz.

ISED Canada RSS-GEN, Limit Clause

| Frequency | Electric Field Strength (µV/m) | Magnetic Field Strength (H-Field) (µA/m) | Measurement Distance (m) |
|--------------------|--------------------------------|------------------------------------------|--------------------------|
| 9 - 490 kHz | 2,400/F (F in kHz) | 2,400/377F (F in kHz) | 300 |
| 490 - 1,705 kHz | 24,000/F (F in kHz) | 24,000/377F (F in kHz) | 30 |
| 1,705 kHz - 30 MHz | 30 | N/A | 30 |

Table 6 - ISED Canada Radiated Emission Limit - Less than 30 MHz

| Frequency (MHz) | Field Strength (µV/m at 3 m) |
|-----------------|------------------------------|
| 30 - 88 | 100 |
| 88 - 216 | 150 |
| 216 - 960 | 200 |
| > 960 | 500 |

Table 7 - ISED Canada Radiated Emission Limit - 30 MHz to 1 GHz

2.1.7 Test Location and Test Equipment Used

This test was carried out in a Semi anechoic room - cabin no. 11.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|---------------|-----------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde&Schwarz | ESW44 | 39897 | 12 | 2022-04-30 |
| ULTRALOG antenna | Rohde&Schwarz | HL562E | 39969 | 36 | 2022-11-30 |
| Loop antenna | Schwarzbeck | FMZB 1519B | 44334 | 36 | 2023-01-31 |
| EMC measurement software | Rohde&Schwarz | EMC32 V10.50.10 | 42986 | N/A | N/A |

Table 8

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



2.2 Frequency Tolerance Under Temperature Variations

2.2.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.225 (e), B.1 to B.9 and 6.11.

2.2.2 Equipment Under Test and Modification State

10115-100, S/N: --- - Modification State 0

2.2.3 Date of Test

2021-07-12

2.2.4 Test Method

2.2.5 Environmental Conditions

Ambient Temperature 23,0 °C
 Relative Humidity 30,0 %

2.2.6 Test Results

5V DC Powered – Continuous transmitting

| Temperature | Voltage | Measured Frequency (MHz) | Frequency Deviation (%) | Frequency Error (ppm) |
|-------------|---------|--------------------------|-------------------------|-----------------------|
| -20.0 °C | 5.0V | 13.560854 | 0.000449 | 4.494 |
| -10.0 °C | 5.0V | 13.560874 | 0.000594 | 5.944 |
| 0.0 °C | 5.0V | 13.560811 | 0.000131 | 1.313 |
| +10.0 °C | 5.0V | 13.560837 | 0.000325 | 3.249 |
| +20.0 °C | 5.0V | 13.560793 | 0.000000 | 0.000 |
| +30.0 °C | 5.0V | 13.560795 | 0.000014 | 0.139 |
| +40.0 °C | 5.0V | 13,560889 | 0,000705 | 7,051 |
| +50.0 °C | 5.0V | 13,560883 | 0,000664 | 6,637 |

Table 9 - Frequency Tolerance Under Temperature Variation

| Temperature | Voltage | Measured Frequency (MHz) | Frequency Deviation (%) | Frequency Error (ppm) |
|-------------|---------|--------------------------|-------------------------|-----------------------|
| +20.0 °C | 4.25V | 13.560797 | 0.000028 | 0.277 |
| +20.0 °C | 5.0V | 13.560793 | 0.000000 | 0.000 |
| +20.0 °C | 5.75V | 13.560818 | 0.000187 | 1.866 |

Table 10 - Frequency Tolerance Under Voltage Variation



FCC 47 CFR Part 15, Limit Clause 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

ISED Canada RSS-210, Limit Clause B.6

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm)

2.2.7 Test Location and Test Equipment Used

This test was carried out in Non shielded room.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-----------------------|-------------------------|----------|-------|-----------------------------|-----------------|
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 20219 | 12 | 2022-01-31 |
| Climatic test chamber | Feutron Klimasimulation | KPK200-2 | 19868 | 18 | 2021-08-31 |

Table 11

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



2.3 20 dB Bandwidth

2.3.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.215 (c), N/A and 6.7

2.3.2 Equipment Under Test and Modification State

10115-100, S/N: --- - Modification State 0

2.3.3 Date of Test

2021-07-12

2.3.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.9.1.

2.3.5 Environmental Conditions

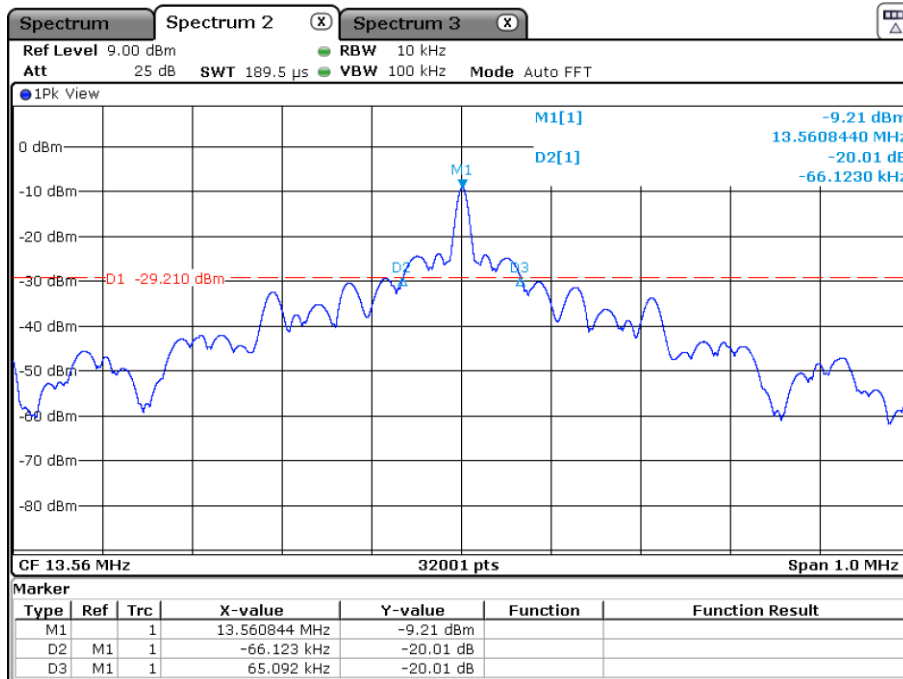
Ambient Temperature 23,0 °C
Relative Humidity 30,0 %

2.3.6 Test Results

5V DC Powered – Continuous transmitting

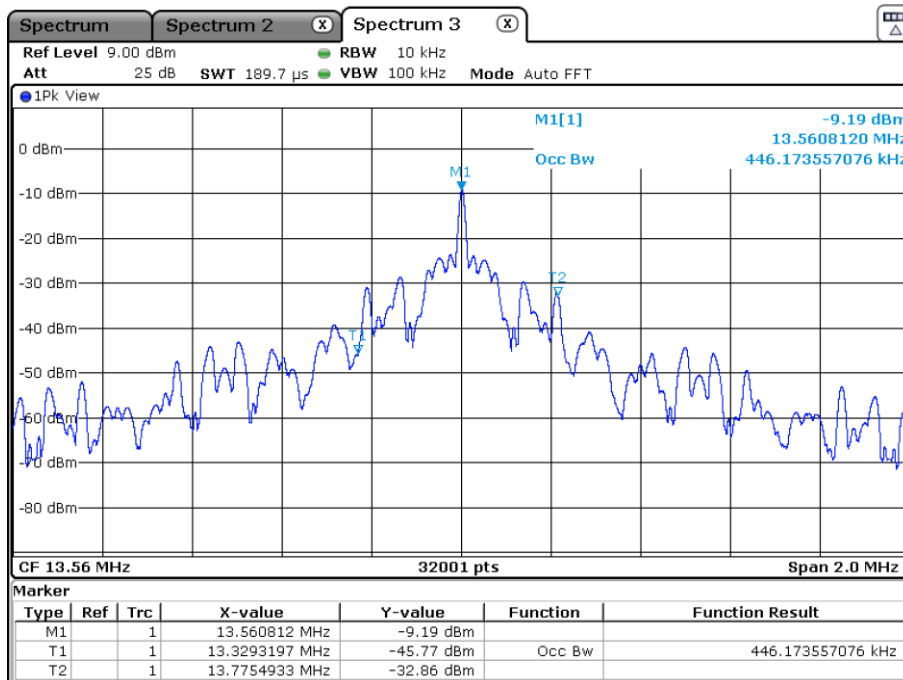
| Frequency (MHz) | 20 dB Bandwidth (Hz) | 99% Occupied Bandwidth (Hz) | F _{LOWER} (MHz) | F _{UPPER} (MHz) |
|-----------------|----------------------|-----------------------------|--------------------------|--------------------------|
| 13.56 | 131215 | 446174 | 13.49472 | 13.62594 |

Table 12



Date: 12.JUL.2021 15:42:28

Figure 1 - 20 dB Bandwidth



Date: 12.JUL.2021 15:47:42

Figure 2 - 99% Occupied Bandwidth



FCC 47 CFR Part 15, Limit Clause 15.215 (c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

ISED Canada RSS 210 and ISED Canada RSS GEN, Limit Clause

None specified.

2.3.7 Test Location and Test Equipment Used

This test was carried out in Non shielded room.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-----------------------|-------------------------|----------|-------|-----------------------------|-----------------|
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 20219 | 12 | 2022-01-31 |
| Climatic test chamber | Feutron Klimasimulation | KPK200-2 | 19868 | 18 | 2021-08-31 |

Table 13

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable



2.4 Restricted Band Edges

2.4.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.205, 7.1 and 8.10

2.4.2 Equipment Under Test and Modification State

10115-100, S/N: --- - Modification State 0

2.4.3 Date of Test

2021-07-09

2.4.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.13.1.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3.

Final average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.2.

2.4.5 Environmental Conditions

| | |
|---------------------|---------|
| Ambient Temperature | 22,0 °C |
| Relative Humidity | 31,0 % |

2.4.6 Test Results

No restricted band in the range



FCC 47 CFR Part 15, Limit Clause 15.205

| | Peak (dBµV/m) | Average (dBµV/m) |
|-------------------------------|---------------|------------------|
| Restricted Bands of Operation | 74 | 54 |

Table 14

ISED Canada RSS-GEN, Limit Clause 8.9

| Frequency (MHz) | Field Strength (µV/m at 3 metres) |
|-----------------|-----------------------------------|
| 30-88 | 100 |
| 88-216 | 150 |
| 216-960 | 200 |
| Above 960* | 500 |

Table 15

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

2.4.7 Test Location and Test Equipment Used

This test was carried out in a Semi anechoic room - cabin no. 11.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|---------------|-----------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde&Schwarz | ESW44 | 39897 | 12 | 2022-04-30 |
| ULTRALOG antenna | Rohde&Schwarz | HL562E | 39969 | 36 | 2022-11-30 |
| Loop antenna | Schwarzbeck | FMZB 1519B | 44334 | 36 | 2023-01-31 |
| EMC measurement software | Rohde&Schwarz | EMC32 V10.50.10 | 42986 | N/A | N/A |

Table 16

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



2.5 AC Power Line Conducted Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.207, N/A and 8.8

2.5.2 Equipment Under Test and Modification State

10115-100, S/N: --- - Modification State 0

2.5.3 Date of Test

2021-07-12

2.5.4 Test Method

2.5.5 Environmental Conditions

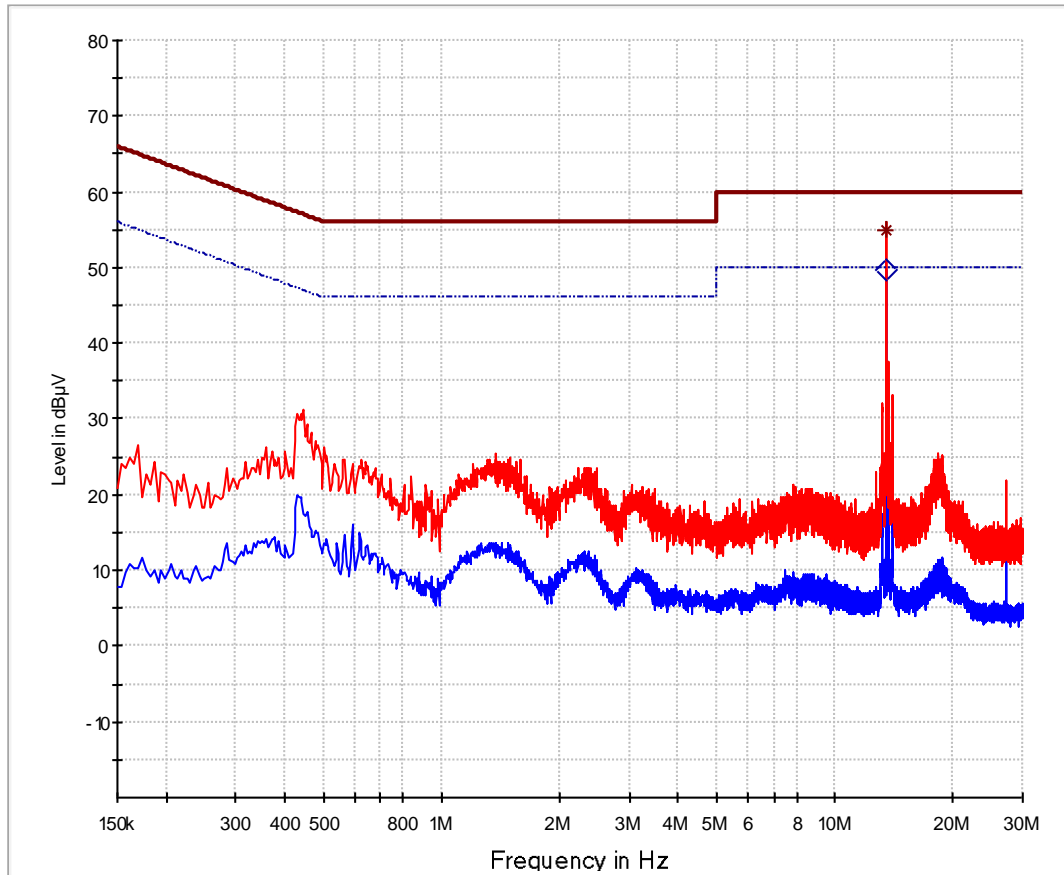
| | |
|---------------------|---------|
| Ambient Temperature | 23,0 °C |
| Relative Humidity | 30,0 % |

2.5.6 Test Results

5V DC Powered – Continuous transmitting



Line L1 - 150 kHz to 30 MHz



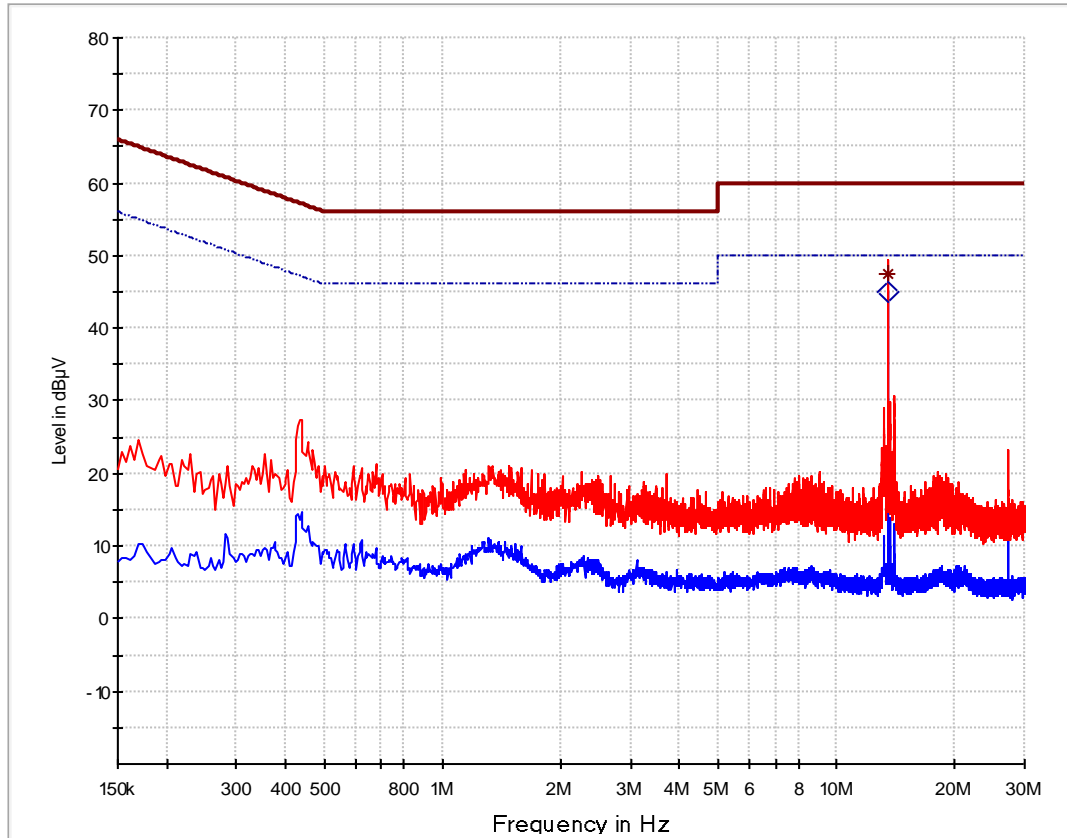
— PreviewResult 2-AVG
 — PreviewResult 1-PK+
 — FCC15.207 QP
- - - FCC15.207 AV
 * Final_Result QPK
 ◇ Final_Result CAV

Final Results 1:

| Frequency MHz | QuasiPeak dBµV | CAverage dBµV | Limit dBµV | Margin dB | Meas. Time ms | Bandwidth kHz | Line | Corr. dB |
|---------------|----------------|---------------|------------|-----------|---------------|---------------|------|----------|
| 13.562000 | --- | 49.68 | 50.00 | 0.32 | 1000.0 | 9.000 | L1 | 10.2 |
| 13.562000 | 54.90 | --- | 60.00 | 5.10 | 1000.0 | 9.000 | L1 | 10.2 |



Line N - 150 kHz to 30 MHz



— PreviewResult 2-AVG
 — PreviewResult 1-PK+
 — FCC15.207 QP
- - - FCC15.207 AV
 * Final_Result QPK
 ◆ Final_Result CAV

Final Results 1:

| Frequency MHz | QuasiPeak dBµV | CAverage dBµV | Limit dBµV | Margin dB | Meas. Time ms | Bandwidth kHz | Line | Corr. dB |
|---------------|----------------|---------------|------------|-----------|---------------|---------------|------|----------|
| 13.562000 | --- | 45.04 | 50.00 | 4.96 | 1000.0 | 9.000 | N | 10.2 |
| 13.562000 | 47.59 | --- | 60.00 | 12.41 | 1000.0 | 9.000 | N | 10.2 |



FCC 47 CFR Part 15, Limit Clause 15.207 and ISED Canada RSS-GEN, Limit Clause 8.8

| Frequency of Emission (MHz) | Conducted Limit (dBµV) | |
|-----------------------------|------------------------|-----------|
| | Quasi-Peak | Average |
| 0.15 to 0.5 | 66 to 56* | 56 to 46* |
| 0.5 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Table 17

*Decreases with the logarithm of the frequency.

2.5.7 Test Location and Test Equipment Used

This test was carried out in Shielded room - cabin no. 4.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|-----------------|-----------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde & Schwarz | ESCI3 | 19730 | 18 | 2022-05-31 |
| V-network | Rohde & Schwarz | ENV216 | 39908 | 12 | 2022-03-31 |
| EMC measurement software | Rohde & Schwarz | EMC32 V10.60.00 | 44377 | N/A | N/A |

Table 18

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



2.6 Exposure of Humans to RF Fields and SAR exclusion threshold

2.6.1 Specification Reference

ISED Canada RSS-102 Issue 5, section 2.5
KDB 447498 D01 V06, section 4.3.1 c)

2.6.2 Equipment Under Test and Modification State

10115-100, S/N: --- - Modification State 0

2.6.3 Date of Test

2020-07-09

2.6.4 Test Results

5V DC Powered – Continuous transmitting

In accordance with Industry Canada RSS-102, Issue 5, chapter 2.5:

| | |
|----------------------------------------------------------------------------|----------------------------------------------------|
| Maximum Radiated Fields Strength: (see chapter 2.1 of this test report) | 61.94 dB μ V/m (at 3 m distance and 13.56 MHz) |
| Calculated Equivalent Radiated Power: | 0.46 μ W (e.i.r.p.) |
| Minimum separation distance: | \leq 5 mm |
| SAR Evaluation Exemption Limit: | 71 mW |

SAR Exclusion threshold

| | |
|----------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Maximum Radiated Fields Strength: (see chapter 2.1 of this test report) | 61.94 dB μ V/m (at 3 m distance and 13.56 MHz) |
| Calculated Equivalent Radiated Power: | 0.46 μ W (e.i.r.p.) < 10 μ W |
| Minimum separation distance: | 5 mm (\leq 50 mm) |
| 1-g numeric threshold: | $(10 \mu\text{W} / 5 \text{ mm}) \cdot \sqrt{(0.01356 \text{ GHz})} = 0.00023$ |
| 1-g numeric threshold limit: | 0.25 |

Note 1: For test distances below 5 mm according to 4.3.1 c) the test distance is fixed to 5 mm.

$$EIRP = \frac{(FS \cdot D)^2}{30}$$



2.6.5 Test Location and Test Equipment Used

This test was carried out in a Semi anechoic room - cabin no. 11.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|---------------|-----------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde&Schwarz | ESW44 | 39897 | 12 | 2022-04-30 |
| ULTRALOG antenna | Rohde&Schwarz | HL562E | 39969 | 36 | 2022-11-30 |
| Loop antenna | Schwarzbeck | FMZB 1519B | 44334 | 36 | 2023-01-31 |
| EMC measurement software | Rohde&Schwarz | EMC32 V10.50.10 | 42986 | N/A | N/A |

Table 19

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable



3 Test Equipment Information

3.1 General Test Equipment Used

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|-------------------------|-----------------|-------|-----------------------------|-----------------|
| EMI test receiver | Rohde&Schwarz | ESW44 | 39897 | 12 | 2022-04-30 |
| ULTRALOG antenna | Rohde&Schwarz | HL562E | 39969 | 36 | 2022-11-30 |
| Loop antenna | Schwarzbeck | FMZB 1519B | 44334 | 36 | 2023-01-31 |
| EMC measurement software | Rohde&Schwarz | EMC32 V10.50.10 | 42986 | N/A | N/A |
| EMI test receiver | Rohde & Schwarz | ESCI3 | 19730 | 18 | 2022-05-31 |
| V-network | Rohde & Schwarz | ENV216 | 39908 | 12 | 2022-03-31 |
| EMC measurement software | Rohde & Schwarz | EMC32 V10.60.00 | 44377 | N/A | N/A |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 20219 | 12 | 2022-01-31 |
| Climatic test chamber | Feutron Klimasimulation | KPK200-2 | 19868 | 18 | 2021-08-31 |

Table 20

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

| Radio Testing | | | |
|-----------------------------------------|------|-----------------------|------|
| Test Name | kp | Expanded Uncertainty | Note |
| Occupied Bandwidth | 2.0 | ±1.14 % | 2 |
| RF-Frequency error | 1.96 | ±1 · 10 ⁻⁷ | 7 |
| RF-Power, conducted carrier | 2 | ±0.079 dB | 2 |
| RF-Power uncertainty for given BER | 1.96 | +0.94 dB / -1.05 | 7 |
| RF power, conducted, spurious emissions | 1.96 | +1.4 dB / -1.6 dB | 7 |
| RF power, radiated | | | |
| 25 MHz – 4 GHz | 1.96 | +3.6 dB / -5.2 dB | 8 |
| 1 GHz – 18 GHz | 1.96 | +3.8 dB / -5.6 dB | 8 |
| 18 GHz – 26.5 GHz | 1.96 | +3.4 dB / -4.5 dB | 8 |
| 40 GHz – 170 GHz | 1.96 | +4.2 dB / -7.1 dB | 8 |
| Spectral Power Density, conducted | 2.0 | ±0.53 dB | 2 |
| Maximum frequency deviation | | | |
| 300 Hz – 6 kHz | 2 | ±2,89 % | 2 |
| 6 kHz – 25 kHz | 2 | ±0.2 dB | 2 |
| Maximum frequency deviation for FM | 2 | ±2,89 % | 2 |
| Adjacent channel power 25 MHz – 1 GHz | 2 | ±2.31 % | 2 |
| Temperature | 2 | ±0.39 K | 4 |
| (Relative) Humidity | 2 | ±2.28 % | 2 |
| DC- and low frequency AC voltage | | | |
| DC voltage | 2 | ±0.01 % | 2 |
| AC voltage up to 1 kHz | 2 | ±1.2 % | 2 |
| Time | 2 | ±0.6 % | 2 |

Table 21



| Radio Interference Emission Testing | | | |
|---------------------------------------------------|----|----------------------|------|
| Test Name | kp | Expanded Uncertainty | Note |
| Conducted Voltage Emission | | | |
| 9 kHz to 150 kHz (50Ω/50μH AMN) | 2 | ± 3.8 dB | 1 |
| 150 kHz to 30 MHz (50Ω/50μH AMN) | 2 | ± 3.4 dB | 1 |
| 100 kHz to 200 MHz (50Ω/5μH AMN) | 2 | ± 3.6 dB | 1 |
| Discontinuous Conducted Emission | | | |
| 9 kHz to 150 kHz (50Ω/50μH AMN) | 2 | ± 3.8 dB | 1 |
| 150 kHz to 30 MHz (50Ω/50μH AMN) | 2 | ± 3.4 dB | 1 |
| Conducted Current Emission | | | |
| 9 kHz to 200 MHz | 2 | ± 3.5 dB | 1 |
| Magnetic Fieldstrength | | | |
| 9 kHz to 30 MHz (with loop antenna) | 2 | ± 3.9 dB | 1 |
| 9 kHz to 30 MHz (large-loop antenna 2 m) | 2 | ± 3.5 dB | 1 |
| Radiated Emission | | | |
| Test distance 1 m (ALSE) | | | |
| 9 kHz to 150 kHz | 2 | ± 4.6 dB | 1 |
| 150 kHz to 30 MHz | 2 | ± 4.1 dB | 1 |
| 30 MHz to 200 MHz | 2 | ± 5.2 dB | 1 |
| 200 MHz to 2 GHz | 2 | ± 4.4 dB | 1 |
| 2 GHz to 3 GHz | 2 | ± 4.6 dB | 1 |
| Test distance 3 m | | | |
| 30 MHz to 300 MHz | 2 | ± 4.9 dB | 1 |
| 300 MHz to 1 GHz | 2 | ± 5.0 dB | 1 |
| 1 GHz to 6 GHz | 2 | ± 4.6 dB | 1 |
| Test distance 10 m | | | |
| 30 MHz to 300 MHz | 2 | ± 4.9 dB | 1 |
| 300 MHz to 1 GHz | 2 | ± 4.9 dB | 1 |
| Radio Interference Power | | | |
| 30 MHz to 300 MHz | 2 | ± 3.5 dB | 1 |
| Harmonic Current Emissions | | | 4 |
| Voltage Changes, Voltage Fluctuations and Flicker | | | 4 |

Table 22



| Immunity Testing | | | |
|----------------------------------------------------------|------|----------------------|------|
| Test Name | kp | Expanded Uncertainty | Note |
| Electrostatic Discharges | | | 4 |
| Radiated RF-Field | | | |
| Pre-calibrated field level | 2 | +32.2 / -24.3 % | 5 |
| Dynamic feedback field level | 2.05 | +21.2 / -17.5 % | 3 |
| Electrical Fast Transients (EFT) / Bursts | | | 4 |
| Surges | | | 4 |
| Conducted Disturbances, induced by RF-Fields | | | |
| via CDN | 2 | +15.1 / -13.1 % | 6 |
| via EM clamp | 2 | +42.6 / -29.9 % | 6 |
| via current clamp | 2 | +43.9 / -30.5 % | 6 |
| Power Frequency Magnetic Field | 2 | +20.7 / -17.1 % | 2 |
| Pulse Magnetic Field | | | 4 |
| Voltage Dips, Short Interruptions and Voltage Variations | | | 4 |
| Oscillatory Waves | | | 4 |
| Conducted Low Frequency Disturbances | | | |
| Voltage setting | 2 | ± 0.9 % | 2 |
| Frequency setting | 2 | ± 0.1 % | 2 |
| Electrical Transient Transmission in Road Vehicles | | | 4 |

Table 23



Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2.05$, providing a level of confidence of $p = 95.45\%$

Note 4:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 7:

The expanded uncertainty reported according to ETSI TR 100 028 V1.4.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

Note 8:

The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$