Intertek

Test Report

# Electromagnetic Compatibility

## Test Report - Nr.: 07KFE007857-P-FCC-02

Date: 2008-01-10

| | |
|---|---|
| **Type:** | JA-80F |
| **Description:** | Wireless keypad |
| **Serial number:** | 0708102-006 |

| | |
|---|---|
| **Manufacturer:** | Jablotron s.r.o. |
| **Customer:** | Jablotron s.r.o. |
| **Address (Customer):** | Pod Skalkou 33<br>CZ 646601 Jablonec nad Nisou<br>Czech Republic |

| | |
|---|---|
| **Test Laboratory:** | Intertek Deutschland GmbH,<br>Innovapark 20, D- 87600 Kaufbeuren |
| **FCC registration number:** | 90714 |
| **Compiled by:** | Marek Svoboda<br>Technical Leader |
| **Approved by:** | R. Dressler<br>Project Engineer |

Intertek Deutschland GmbH

# Table of Contents

# 1. General description

## 1.1. Product description

The JA-80F is a component of Jablotron's Oasis 80 alarm system and is designed to control and program the system.
It has a built-in proximity access card reader and allows the wiring up of a separate door detector. The battery-powered keypad communicates wirelessly using Oasis protocol.
Power supply : 2x lithium batteries type CR14505 (AA 3.0V)

**Wireless keypad :**
Operating frequency : 868.5 MHz, Oasis protocol
Antenna type : Internal - wire type soldered to PCB (length 70 mm)
The device includes the receiver with local oscillator frequency f = 868.5 MHz. Measured radiated field data of receiver for verification purposes are included in this report.
Duty cycle : data pulse of length 30 ms, periodic transmission of 3 pulses every 9 minutes.

**Integrated card reader**
Operating frequency: 125 kHz.
Antenna type: internal – multiple loop antenna – located inside enclosure.
The card / tag is passive.
Duty cycle : no duty cycle, no periodic transmission.

## 1.2. Related submittal(s) Grants

This is application for certification of the transmitter.
No related devices are present.

## 1.3. Test Methodology

☒ The test setup and test was done according to: **ANSI C63.4: 2003**
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.

☐ The test setup and test was done according to: **CISPR 22: 1998 + Corrigendum: 2003 + A1: 2000 + A2: 2003 and ANSI C63.4: 2003**
Compliance with CISPR 22 is being used to demonstrate conformity with FCC DoC requirements. This conforms with FCC Part 15.109(g).

The test results detailed in this report apply only to the JA-82F with the test setup described. Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.
The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

## 1.4. Test Facility

The test site was semi-anechoic chamber Intertek Germany (PM KF 1150). Measurement distance EUT – Antenna was d = 3 m.

## 1.5. List of exhibits

Following exhibits are delivered as separate pdf files. The name of file corresponds with description of exhibit with extension **.pdf**

| | |
|---|---|
| EXHIBIT 1 | Test setup photo documentation |
| EXHIBIT 2 | External Photos |
| EXHIBIT 3 | Internal Photos |
| EXHIBIT 4 | Operational description |
| EXHIBIT 5 | Block diagram |
| EXHIBIT 6 | Circuit diagram |
| EXHIBIT 7 | Instruction manual |
| EXHIBIT 8 | Product label |
| EXHIBIT 9 | Confidentiality request |

# 2. Measurements And Test Specifications

**Emission** - Requirements according to

☒ FCC, Part 15, Class B, verification

☐ FCC, Part 15, Class B, DoC

☐ FCC, Part 15, Class B, certification
☒ FCC, Part 15, intentional radiator, certification

# 3. Description Of EUT

## 3.1. Configuration / Operating Conditions

☒ table-top EUT ☐ floor-standing EUT

The device is battery operated. The power source delivered by producer and used for testing was a new set of 2 lithium batteries type CR14505 (AA 3.0V)

There were two samples of the device delivered :

**Sample 1**: was modified by manufacturer to transmit continuously. This sample was used for measurement of bandwidth and field strength ;
**Sample 2** : has normal operation as specified by manufacturer . It was used for measurement of the duty cycle.

The equipment under test (EUT) is placed on wooden table 0,8 m above ground plane.

At all interference frequencies the height of the antenna is scanned in the range 1 m to 4 m with horizontal and vertical polarization and the turntable is rotated in the range 0° to 360° to obtain the highest field strength.

For frequencies bellow 30 MHz the measurement was performed at distance d = 10 m ( shielded loop antenna – EUT). Measured values were bellow the noise level. Therefore measurement was performed at closer distances and measured values of field strength were calculated to d = 300 m (40 dB/dec) and compared to the limit value.

Measurements in frequency range 30 MHz – 3 GHz were performed with bilog antenna HL 562, measurements in frequency range 3 GHz – 10 GHz were performed with horn antenna HF 906 with preamplifier.

## 3.2. Major Subassemblies Or Internal Peripherals

| Device | Manufacturer | Type | SN | FCC ID |
|---|---|---|---|---|
| none | | | | |

## 3.3. Peripheral Devices Used For Testing

| Device | Manufacturer | Type | SN | FCC ID |
|---|---|---|---|---|
| none | | | | |

## 3.4. Supply- And Interconnecting Cables

| Line | Length | shielded | non shielded | Shield on GND / PE |
|---|---|---|---|---|
| none | | ☐ | ☐ | |

# 4. Test Results - Overview

| | required | passed | passed with modification | not passed |
|---|---|---|---|---|
| **Transmitter 868.5 MHz** | | | | |
| **Bandwidth** | < 2.17 MHz, 0.25 % $f_{op}$ | ☒ | ☐ | ☐ |
| **Duty cycle** | < 2 s in 1 hour | ☒ | ☐ | ☐ |
| **Emission radiated :** | | | | |
| 30 MHz - 3000 MHz : | FCC 15.231 | ☒ | ☐ | ☐ |
| 3 GHz – 10 GHz : | FCC 15.231 | ☒ | ☐ | ☐ |
| **Emission radiated : receiver** | | | | |
| 30 MHz – 3 GHz : receiver | FCC 15.109 | ☒ | ☐ | ☐ |
| | | | | |
| **Transmitter 125 kHz** | required | passed | passed with modification | not passed |
| **Bandwidth** | Not required | ☐ | | |
| **Emission** | | | | |
| 9 kHz – 30 MHz | FCC 15.209 | ☒ | ☐ | ☐ |
| 30 MHz - 1000 MHz | FCC 15.209 | ☒ | ☐ | ☐ |

# 5. Measurement results detailed

## 5.1. Duty cycle and Averaging factor (transmitter 868.5 MHz)

The averaging factor was measured by means of the measuring receiver/spectrum analyzer ESIB 26 in “Analyzer mode”.

Fig. 1 shows the length of single data pulse in 100 ms window.
Fig. 2 demonstrates the pulse train under normal operation in 1 s window.
Fig. 3 demonstrates the duty cycle under normal operation in 600 s window (periodic transmission).

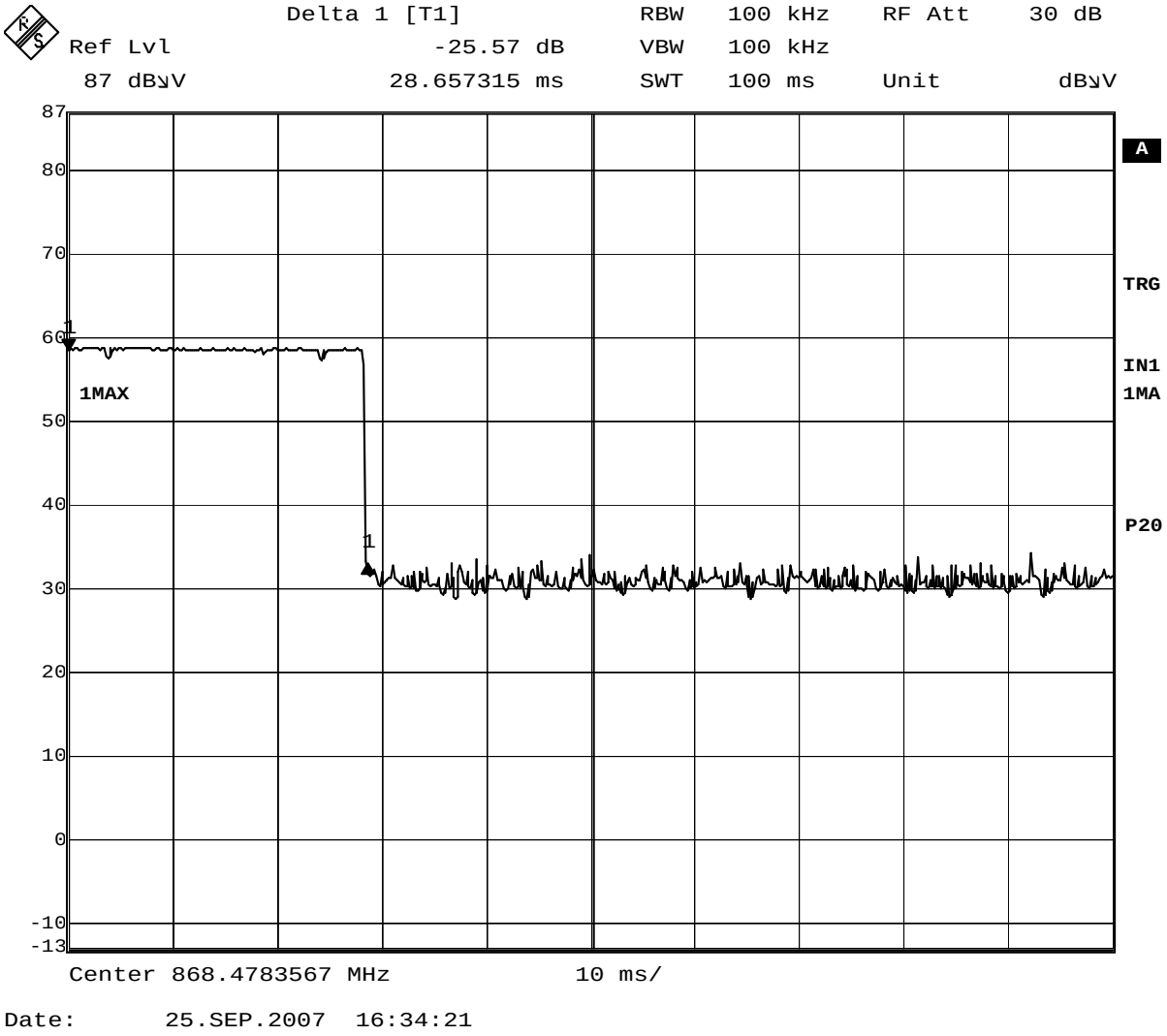



Fig .1

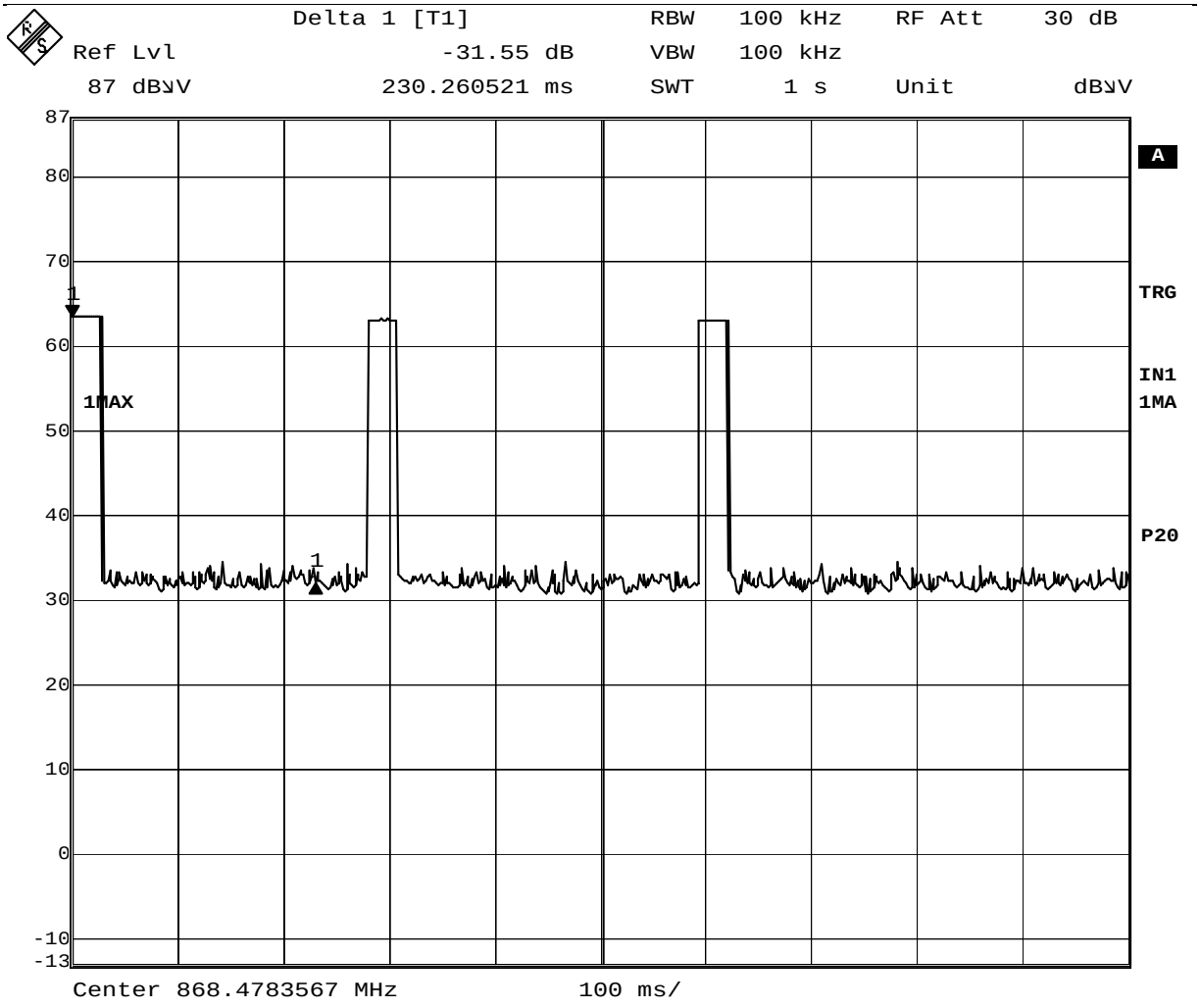

Delta 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-31.55 dB
VBW 100 kHz
87 dBµV
230.260521 ms
SWT 1 s
Unit dBµV
87
80
70
60
50
40
30
20
10
0
-10
-13
1MAX
A
TRG
IN1
1MA
P20
Center 868.4783567 MHz
100 ms/
Date: 25.SEP.2007 16:32:31

Fig .2

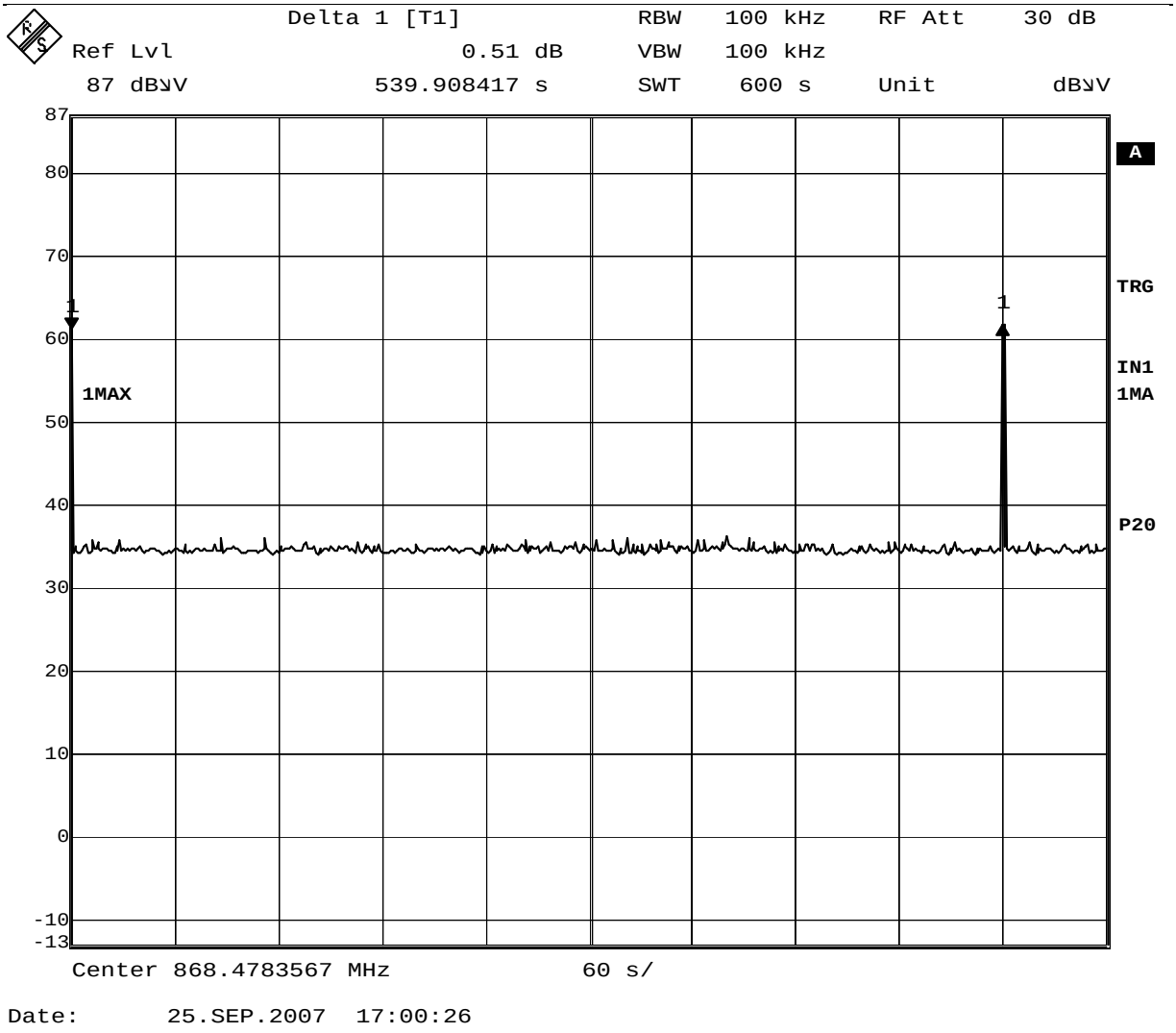



Fig. 3

Total transmission time in period T = 100 ms is t = 28.657 ms.
The pulse is transmitted once in 539.9 s.

**The Averaging factor is:**

**20* log (28.657/100) = -10.85 dB.**

The measured peak values are to be reduced by averaging factor to obtain average values.

**Transmission time in 1 hour period is :**

**t = int(3600/539.9) * 28.657 = 171 ms**

## 5.2. Bandwidth (Transmitter 868.5 MHz)

The measured 20 dB bandwidth is shown on Fig. 4

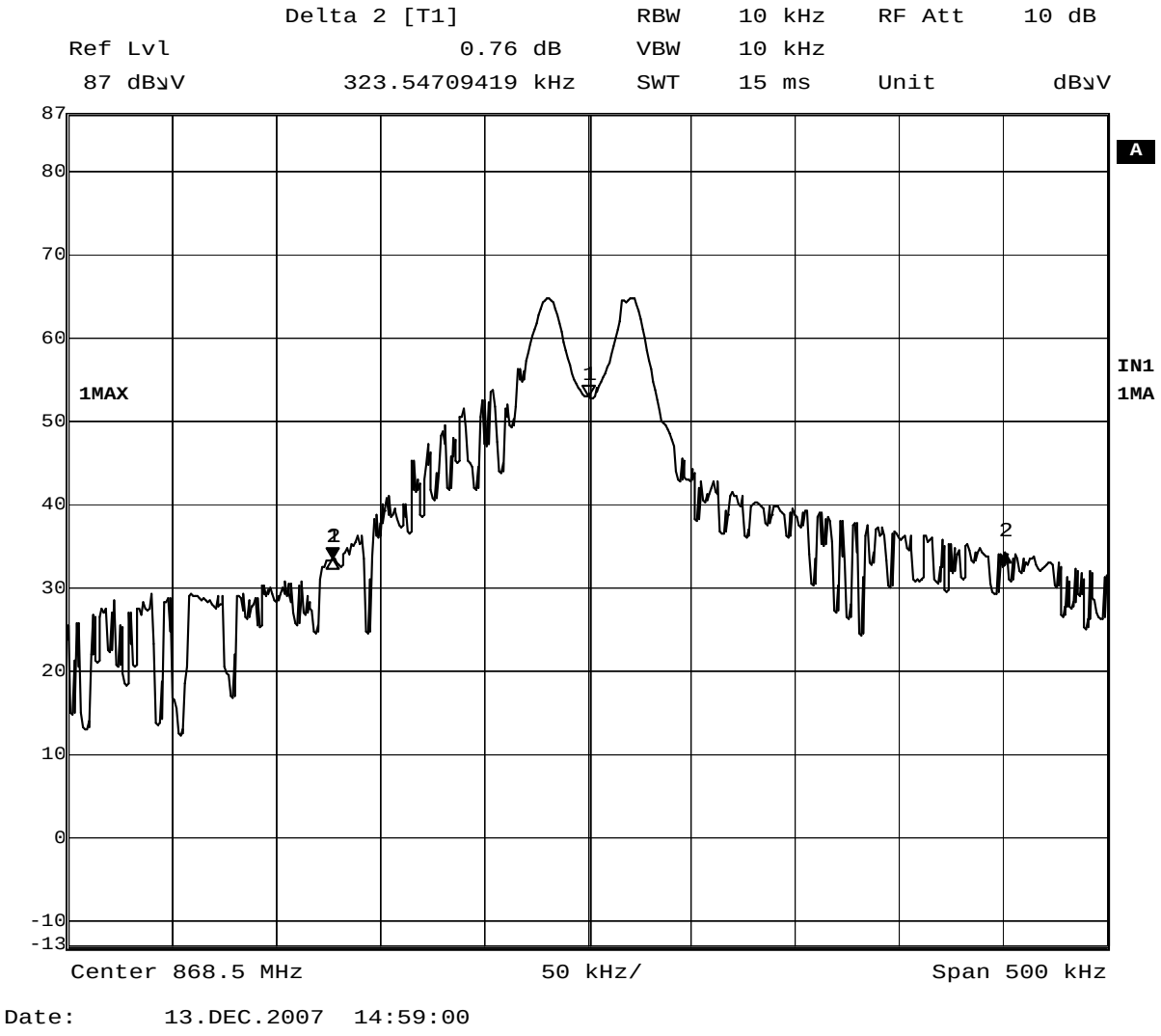



Fig .4

**The BW is 323.54 kHz, operating frequency f = 868.5 MHz.**

## 5.3. Radiated Emission (Transmitter 868.5 MHz) 30 MHz – 10 GHz

Data was measured for worst case configuration which resulted in highest emission levels. A sample calculation, configuration photographs and data tables of emissions are included.
The detector used was PEAK.

### 5.3.1. Field strength calculation

The field strength is calculated by adding the reading on the measuring receiver to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitation and average factors (when the specified limit is related to average detector and measurements are made with peak detector.
A sample of calculation is included below :

E = RR + AF + CF – AG + PD + AV

Where

| | |
|---|---|
| E | field strength in dBμV/m |
| RR | receiver reading including preamplifier in dBμV |
| CF | cable attenuation factor in dB |
| AF | antenna factor in dB/m |
| AG | amplifier gain in dB |
| PD | pulse desensitization in dB |
| AV | average factor in dB |

Example :

Asssume that measured values and factors are as follows :

| | |
|---|---|
| RR | = 60 dBμV |
| CF | = 1.2 dB |
| AF | = 12.6 dB/m |
| AG | = 20 dB |
| PD | = 0 dB |
| AV | = -10 dB |

Then

E = 60 + 1.2 + 12.6 – 20 + 0 -10 = 43.8 dBμV/m

The radiated emission tables which follow the graphical presentation of results were created by the EMC 32 software by Rohde-Schwarz. The data of field strength (peak detector) include the components given above with the exception of PD and AV.

## 5.3.2. Normative references

| | |
|---|---|
| Limits equivalent: | **FCC, Part 15.231, Part 15.209 where appropriate** |
| Methods of Measurement equivalent: | **ANSI C63.4, CISPR 22** |

### Test requirement

| | |
|---|---|
| Class | B |
| Distance Antenna – EUT | 3 m |
| Frequency range | 30 MHz - 10000 MHz |

### Place of measurement

☒ Semi anechoic chamber Intertek Germany PM KF 1150.
☐ Open Area Test Site

### Measurement devices

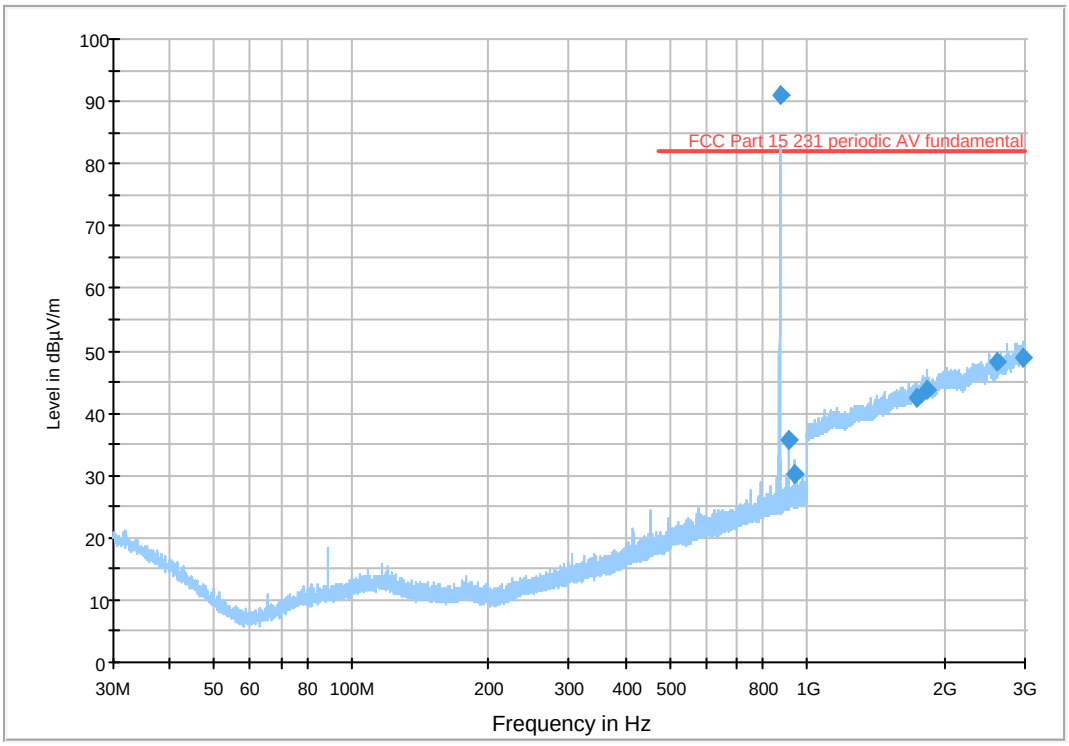
| Measurement device | Manufacturer | Type | SN | Asset No. | Last Calibr.ation | Inter-val |
|---|---|---|---|---|---|---|
| ☒ Test receiver, 20Hz-26GHz | ESIB26 | Rohde & Schwarz | 100150 | PM KF 0948 | 07-03 | 1 |
| ☒ Antenna, 30-3000 MHz | HL562 | Rohde & Schwarz | 100354 | PM KF 1123 | 07-03 | 2 |
| ☒ Horn antenna, 1-18 GHz | Rohde & Schwarz | HF906 | 100188 | PM KF 0947 | 07-05 | 2 |
| ☒ Horn antenna preamp. | Bonn | BLMA0118 -4A | 35352 | PM KF 0946 | 07-05 | 2 |
| ☒ Antenna, 9 kHz -30 MHz | RA 30.1 | MessTec | 960101 | PM KF 0875 | 07-10 | 2 |

## 5.3.3. Emission Test results (Transmitter 868.5 MHz)

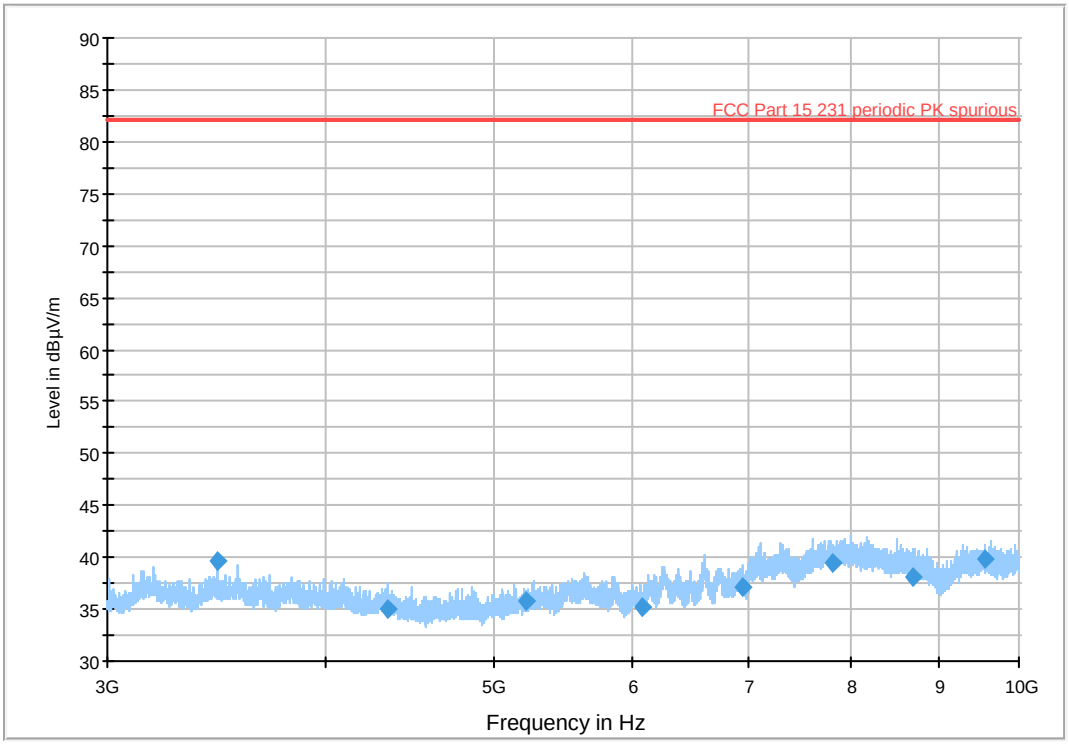
| | | | |
|---|---|---|---|
| Test requirements | ☒ **passed** | ☐ **passed with modification** | ☐ **not passed** |

Comment:
The radiated emissions between 30 MHz and 10 000 MHz are under the limit specified in FCC 15.231

### 5.3.3.1 Radiated Emission (Transmitter 868.5 MHz) 30 MHz – 3 GHz



### 5.3.3.2 Radiated Emission (Transmitter 868.5 MHz) 3 GHz – 10 GHz



### 5.3.3.3 Radiated Emission (Transmitter 868.5 MHz) : table 30 MHz – 10 GHz

Measurements based on a measurement time of 10 ms unless otherwise noted.
Measurement bandwidth is 120 kHz bellow 1 MHz, and 1 MHz above 1000 MHz.

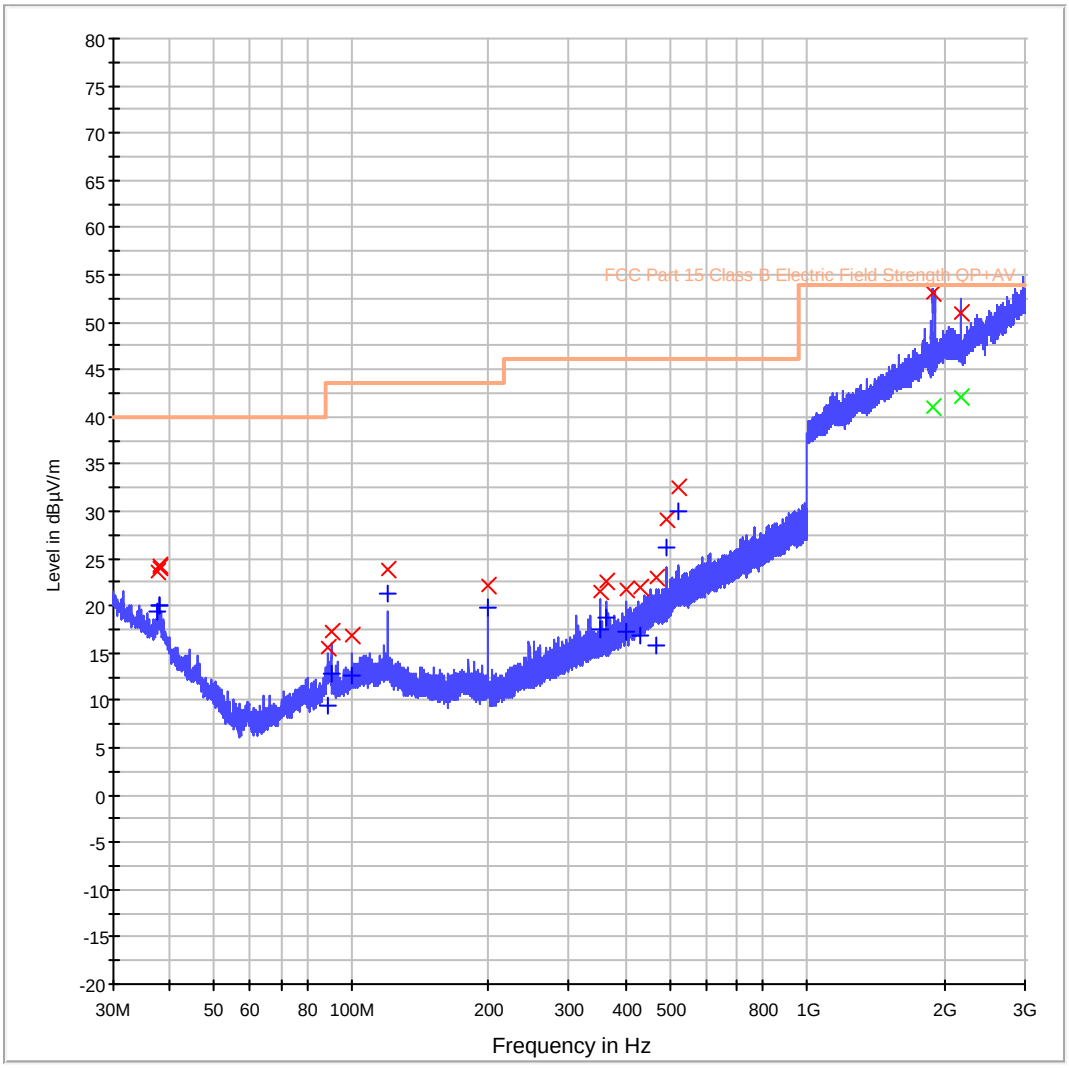
| Frequency | MaxPeak | Averaging factor | Average value E | Limit Average | Margin average | Limit peak | Margin peak | Frequency | MaxPeak |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV/m) | (dB) | (dB) | (dBµV/m | (dB) | (dBµV/m) | (dB) | (MHz) | (dBµV/m) |
| 868,48 | 90,9 | -10,85 | 80,05 | 82 | -1,95 | 102 | -11,1 | 868,48 | 90,9 |
| 907,48 | 35,7 | -10,85 | 24,85 | 62 | -37,15 | 82 | -46,3 | 907,48 | 35,7 |
| 936,04 | 30,1 | -10,85 | 19,25 | 62 | -42,75 | 82 | -51,9 | 936,04 | 30,1 |
| 1737,2 | 42,4 | -10,85 | 31,55 | 62 | -30,45 | 82 | -39,6 | 1737,2 | 42,4 |
| 1819 | 43,7 | -10,85 | 32,85 | 62 | -29,15 | 82 | -38,3 | 1819 | 43,7 |
| 2603,3 | 48,2 | -10,85 | 37,35 | 62 | -24,65 | 82 | -33,8 | 2603,3 | 48,2 |
| 2984,4 | 48,9 | -10,85 | 38,05 | 62 | -23,95 | 82 | -33,1 | 2984,4 | 48,9 |
| 3473,8 | 39,7 | -10,85 | 28,85 | 62 | -33,15 | 82 | -42,3 | 3473,8 | 39,7 |
| *)4346,7 | 35 | -10,85 | 24,15 | 53,9 | -29,75 | 73,9 | -38,9 | 4346,7 | 35 |
| 5214 | 35,8 | -10,85 | 24,95 | 62 | -37,05 | 82 | -46,2 | 5214 | 35,8 |
| 6080,9 | 35,1 | -10,85 | 24,25 | 62 | -37,75 | 82 | -46,9 | 6080,9 | 35,1 |
| 6947,8 | 37,1 | -10,85 | 26,25 | 62 | -35,75 | 82 | -44,9 | 6947,8 | 37,1 |
| 7815,1 | 39,4 | -10,85 | 28,55 | 62 | -33,45 | 82 | -42,6 | 7815,1 | 39,4 |
| 8683,6 | 38,1 | -10,85 | 27,25 | 62 | -34,75 | 82 | -43,9 | 8683,6 | 38,1 |

*) Frequencies governed by 15.209

## 5.4. Radiated Emission (Receiver) 30 MHz – 3 GHz

The emissions of receiver were measured during the periods when transmitter was off.
The local oscillator frequency is f = 868.5 MHz.
Measurement bandwidth is 120 kHz bellow 1 MHz, and 1 MHz above 1000 MHz.

### 5.4.1. Radiated Emission (Receiver) 30 MHz – 3 GHz



## 5.4.2. Radiated Emission (Receiver) Table 30 MHz – 3 GHz

| Frequency (MHz) | MaxPeak (dBµV/m) | QuasiPeak (dBµV/m) | Average (dBµV/m) | limit QP / AV (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 37,52 | 23,6 | 19,3 | --- | 40 | -20,7 |
| 37,76 | 24,2 | 20,1 | --- | 40 | -19,9 |
| 88,68 | 15,7 | 9,5 | --- | 43,5 | -34 |
| 89,96 | 17,3 | 12,8 | --- | 43,5 | -30,7 |
| 100 | 16,9 | 12,7 | --- | 43,5 | -30,8 |
| 120,04 | 23,8 | 21,4 | --- | 43,5 | -22,1 |
| 200 | 22,2 | 19,8 | --- | 43,5 | -23,7 |
| 350 | 21,5 | 17,6 | --- | 46 | -28,4 |
| 360 | 22,5 | 18,7 | --- | 46 | -27,3 |
| 400 | 21,7 | 17,3 | --- | 46 | -28,7 |
| 430,04 | 21,9 | 16,8 | --- | 46 | -29,2 |
| 467,96 | 23 | 15,8 | --- | 46 | -30,2 |
| 490 | 29,2 | 26,1 | --- | 46 | -19,9 |
| 520 | 32,5 | 29,9 | --- | 46 | -16,1 |
| 1881,5 | 53 | --- | 41,0 | 54 | -13 |
| 2165,4 | 51 | --- | 42,0 | 54 | -12 |

## 5.5. Duty cycle and Averaging factor (Transmitter 125 kHz)

The device does not transmit in Duty cycle.

## 5.6. Bandwidth (Transmitter 125 kHz)

The measured 20 dB bandwidth is shown on Fig. 1

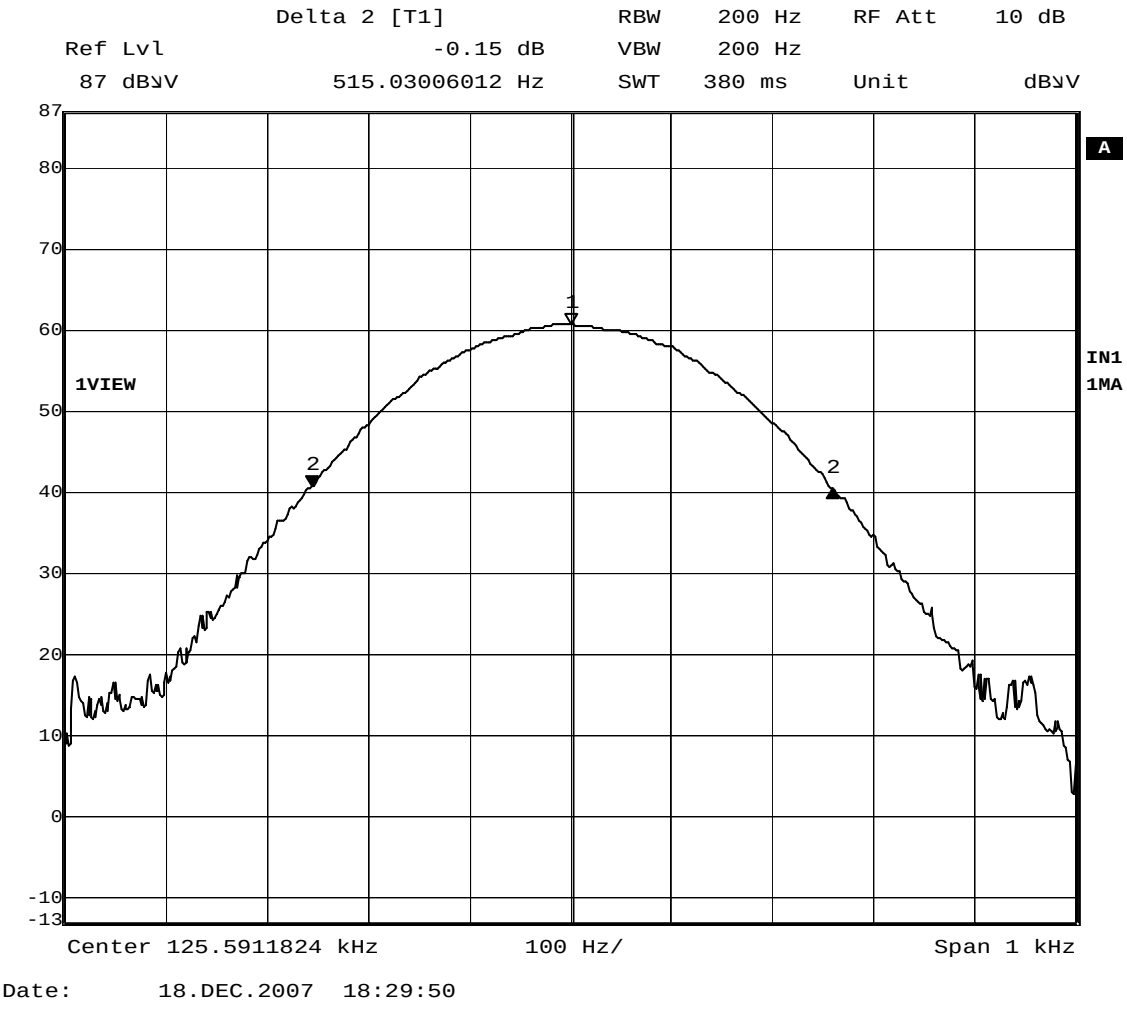
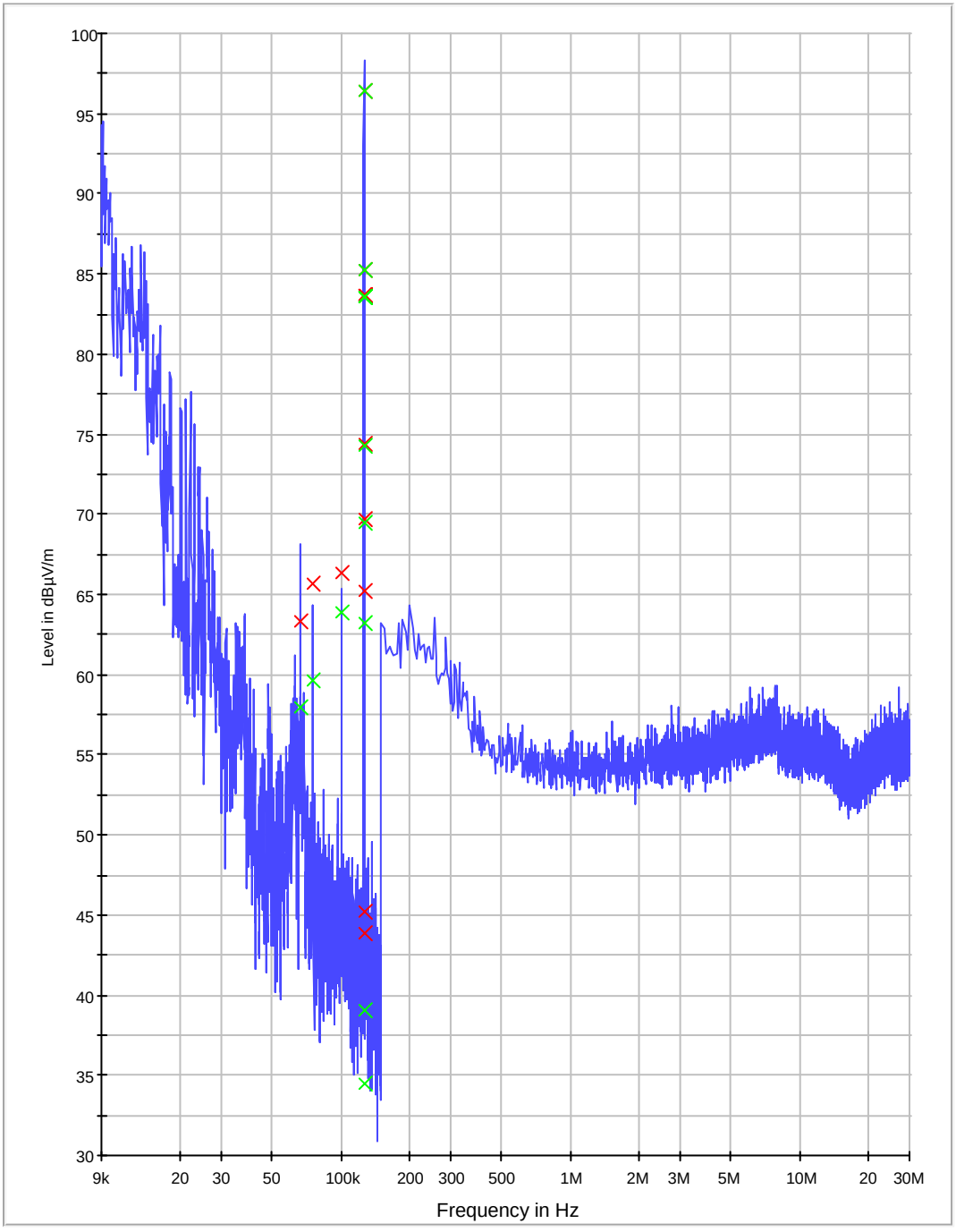



Fig .1

**The BW is 533 Hz, operating frequency f = 125.59 kHz.**

## 5.7. Radiated emissions Transmitter 125 kHz

The displayed graph was measured in the distance d = 1 m. Emissions bellow f = 125 kHz were proved to be ambient disturbances.



The detailed measurement at operation frequency was performed at measurement distances d = 1 m, 2 m,3 m, 4 m with results as follows :

| d | 1 m | 2 m | 3 m | 4 m |
|---|---|---|---|---|
| E dBµV/m | 96,4 | 83,5 | 74,2 | 69,4 |

To compare measured values at operating frequency f = 125 kHz with the limits it was used the 40 dB/decade conversion as given in the table bellow :

| measuring distance d (m) | E measured at d AV (dBµV/m) | Normalizing factor to d = 300 m (dB) | Normalized E to d = 300 m (dBµV/m) | Limit 300 m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 1 | 96,40 | 99,08 | -2,68 | 25,62 | -28,31 |
| 2 | 83,50 | 87,04 | -3,54 | | -29,17 |
| 3 | 74,20 | 80,00 | -5,80 | | -31,42 |
| 4 | 69,40 | 75,00 | -5,60 | | -31,22 |

For comparison with limit the highest value was taken, E = -2,68 dBµV/m with resulting margin -28.31 dB.

# Test setup Photo documentation

**EXHIBIT 1**


Fig. 1 Front view

Fig. 2 Rear view

# 6. EUT Photo documentation

**External Photos :** **EXHIBIT 2**
**Internal Photos :** **EXHIBIT 3**

# 7. Technical specification

**Operational description :** **EXHIBIT 4**

## 7.1. Block Diagram Of The EUT

**EXHIBIT 5**

## 7.2. Circuit Diagram Of The Layout

**EXHIBIT 6**

## 7.3. Instruction manual

**EXHIBIT 7**

## 7.4. Product Labelling

**EXHIBIT 8**