Intertek

Test Report

Electromagnetic Compatibility

Test Report - Nr.: 07KFE007857-U-FCC-02

Date: 2008-01-25

Type:	JA-80K-US
Description:	Control panel of alarm system with wireless data transmission
Serial number:	0705636-007

Manufacturer:	Jablotron s.r.o.
Customer:	Jablotron s.r.o.
Address (Customer):	Pod Skalkou 33 CZ 646601 Jablonec nad Nisou Czech Republic

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

Intertek Deutschland GmbH

Table of Contents

1. General description

1.1. Product description

The JA-80K-US Control panel is the central unit of the alarm system. It communicates with other components of system and reacts on system events as alarm transmissions coming from other components.
The JA-80K-US includes central PCB with control unit and transmitter - receiver module, power supply module and battery.

The control panel has 50 addresses (01 to 50), meaning that up to 50 wireless devices can be enrolled i.e. detectors, keypads, keyfobs, sirens etc.
When triggered, a detector sends a so-called natural signal which dictates what the reaction of the control panel should be. E.g. the natural signal of a door contact or PIR detector can be an instant or delayed alarm which is selectable by a DIP switch inside the detector. A keyfob, for instance, sends signals for set (arm), unset (disarm) and panic.
The control panel is factory-set to perform natural reactions according to the signals sent from wireless devices. By programming the addresses of the devices in the control panel, it is possible to define how the control panel reacts to individual wireless devices. E.g. a door detector assigned to address 15 could trigger a panic reaction, and a keyfob button using address 24 could cause a fire reaction etc.
Wireless devices can be assigned to 3 sections: A,B or C. Assignments to sections either have an effect when partial setting is used e.g. only A is set, AB is set, or ABC is set (which, for example, would be suitable for homes where A could mean afternoon setting, AB night setting and ABC total setting), or if the system was split into two independent partitions A and B, with a common section C. In the second case, each A or B section can be set individually, and C is automatically set when both A and B have been set by users. This would be suitable for two independent families in a single house, or two companies in one building.
There are two hard-wired inputs with programmable functions assigned to addresses 01 and 02. If these two inputs are not used, the two addresses can be used to enroll wireless devices. Hard-wired inputs are also provided by some wireless devices, such as keypads, door detectors, and PIR movement detectors.

The device is powered from AC mains 120 V 60 Hz (internal power module TRF-01-US) with internal backup accumulator battery 12 V.

The antenna is internal – built in the enclosure. Type of antenna is monopole.
Operational frequency is 868.5 MHz.
Oscillator frequency of the receiver is 868.5 MHz.

Under normal operation the control panel communicates with devices of the system as PIR detectors, sirens in regular intervals in order to check the system integrity.

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

2.1. Modifications to Test Report 07KFE007857-U-FCC -01

Ch. 5.1 : Duty cycle and Averaging factor :
correct numbers of figures.
Added Fig. 2 and Fig. 3 to demonstrate the pulse train.
Corrected calculation of total transmission within 1 hour period.

3. Description Of EUT

3.1. Configuration / Operating Conditions

☒ table-top EUT ☐ floor-standing EUT

The device is powered from AC mains 120 V 60 Hz (internal module TRF-01-US) and is equipped with internal backup accumulator battery (type 12 V, 1.3 or 2.2 Ah).
With the device was delivered The Lead-calcium battery type WP 2.6-12
There were two samples of the device delivered :

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

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
Mains cable	2 m	☐	☒	

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 : included RX and control unit, excluded TX				
30 MHz – 3 GHz : receiver	FCC 15.109	☒	☐	☐
Emission conducted : entire control panel including TX, RX and control unit				
150 kHz – 30 MHz : entire control panel JA-80K	FCC 15.107	☒	☐	☐

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 pulse train under normal operation in 10 s window.
Fig. 4 demonstrates the duty cycle under normal operation in 600 s window (periodic transmission).

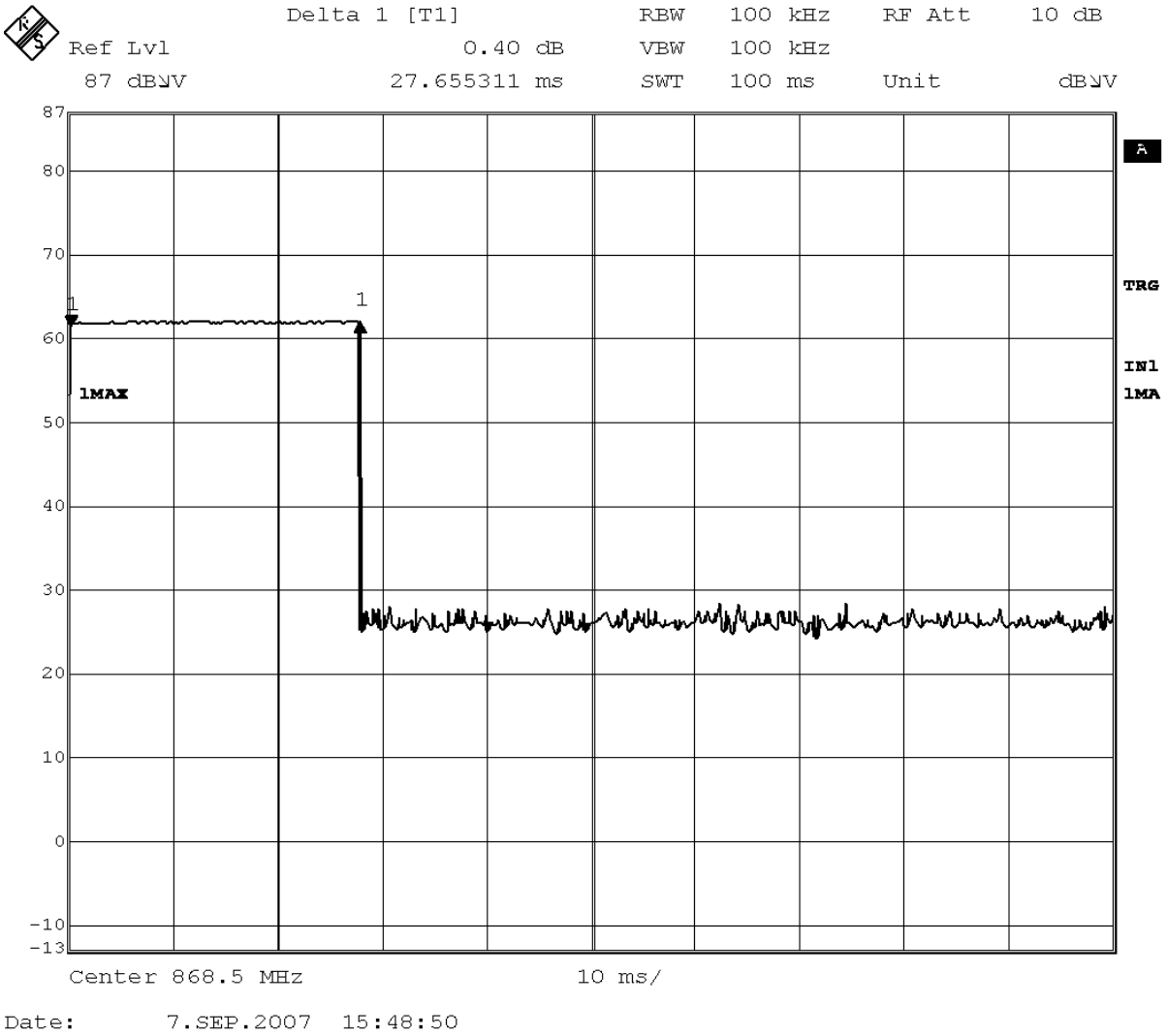


Fig .1

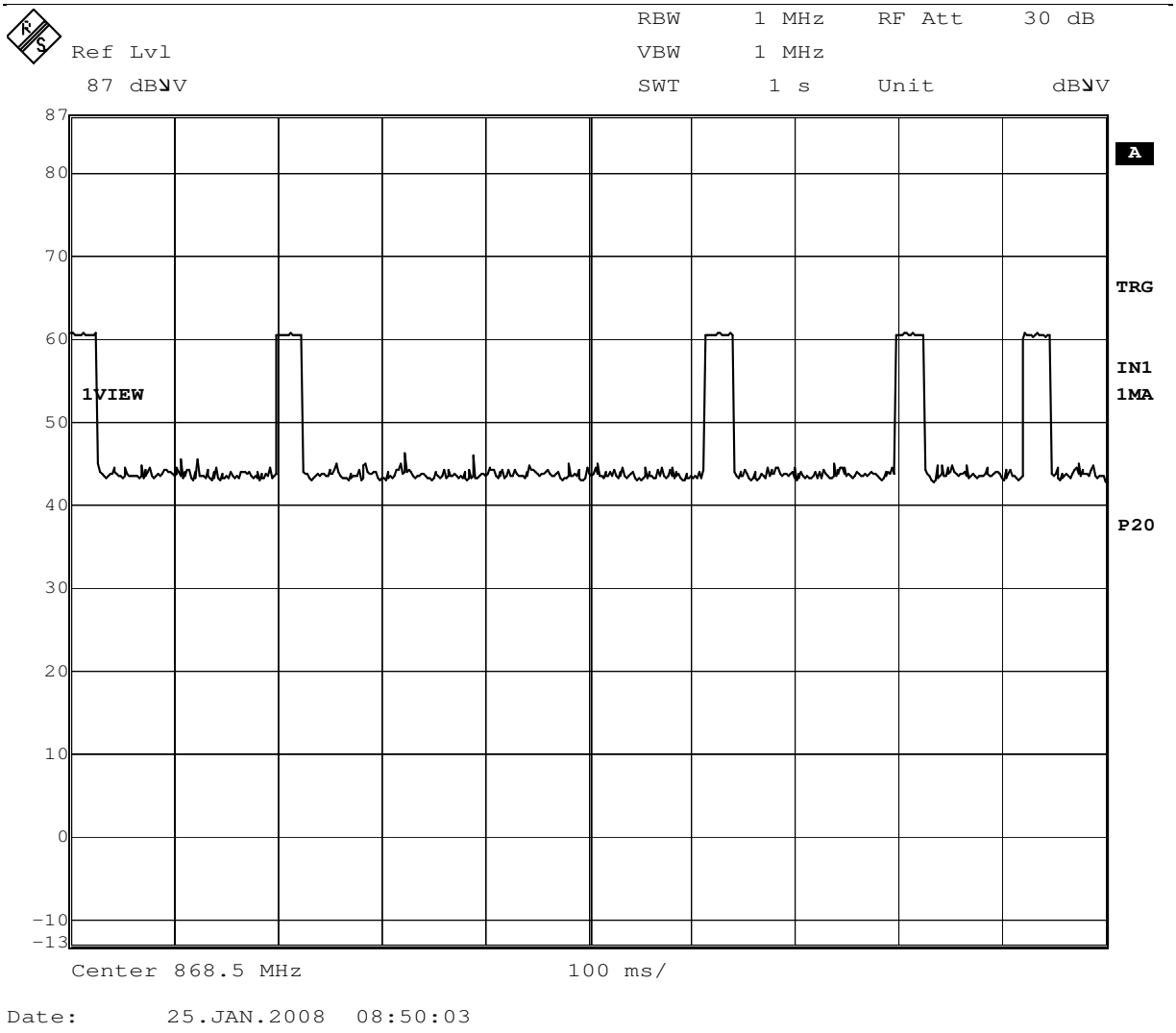

RBW 1 MHz
RF Att 30 dB
Ref Lvl
VBW 1 MHz
87 dBµV
SWT 1 s
Unit dBµV
87
80
70
60
50
40
30
20
10
0
-10
-13
A
TRG
IN1
1MA
P20
1VIEW
Center 868.5 MHz
100 ms/
Date: 25.JAN.2008 08:50:03

Fig .2

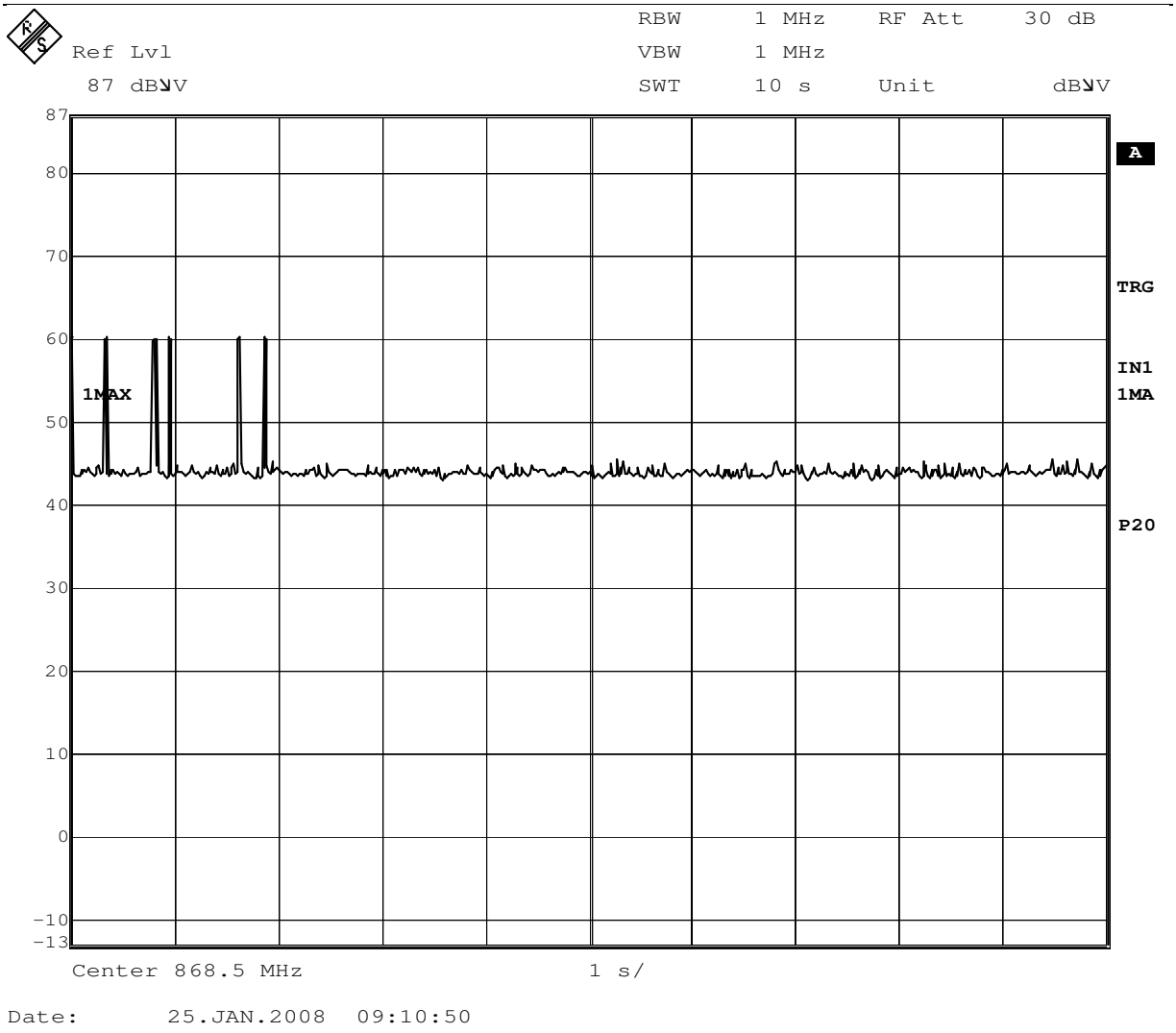

RBW 1 MHz
RF Att 30 dB
Ref Lvl
VBW 1 MHz
87 dBµV
SWT 10 s
Unit dBµV
87
80
70
60
50
40
30
20
10
0
-10
-13
A
TRG
IN1
1MA
P20
1MAX
Center 868.5 MHz
1 s/
Date: 25.JAN.2008 09:10:50

Fig .3

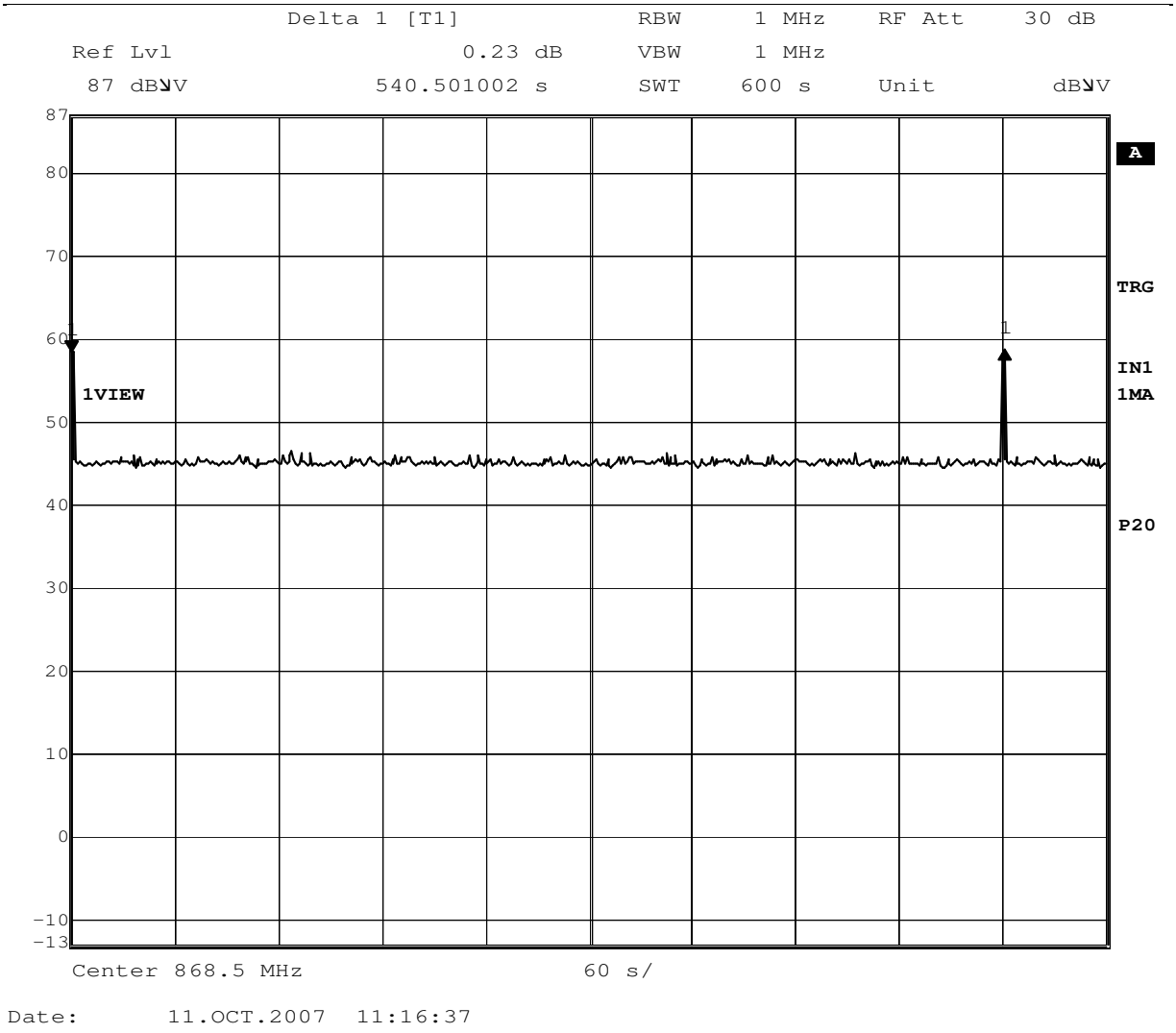


Fig .4

Total transmission time in period T = 100 ms is t = 27.655 ms.
The pulse is transmitted once in 540.5 s.

The Averaging factor is:

20* log (27.655/100) = -11.16 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(3600/540.5) * 27.655*5 = 829.5 ms

5.2. Bandwidth (Transmitter 868.5 MHz)

The measured 20 dB bandwidth is shown on Fig. 4

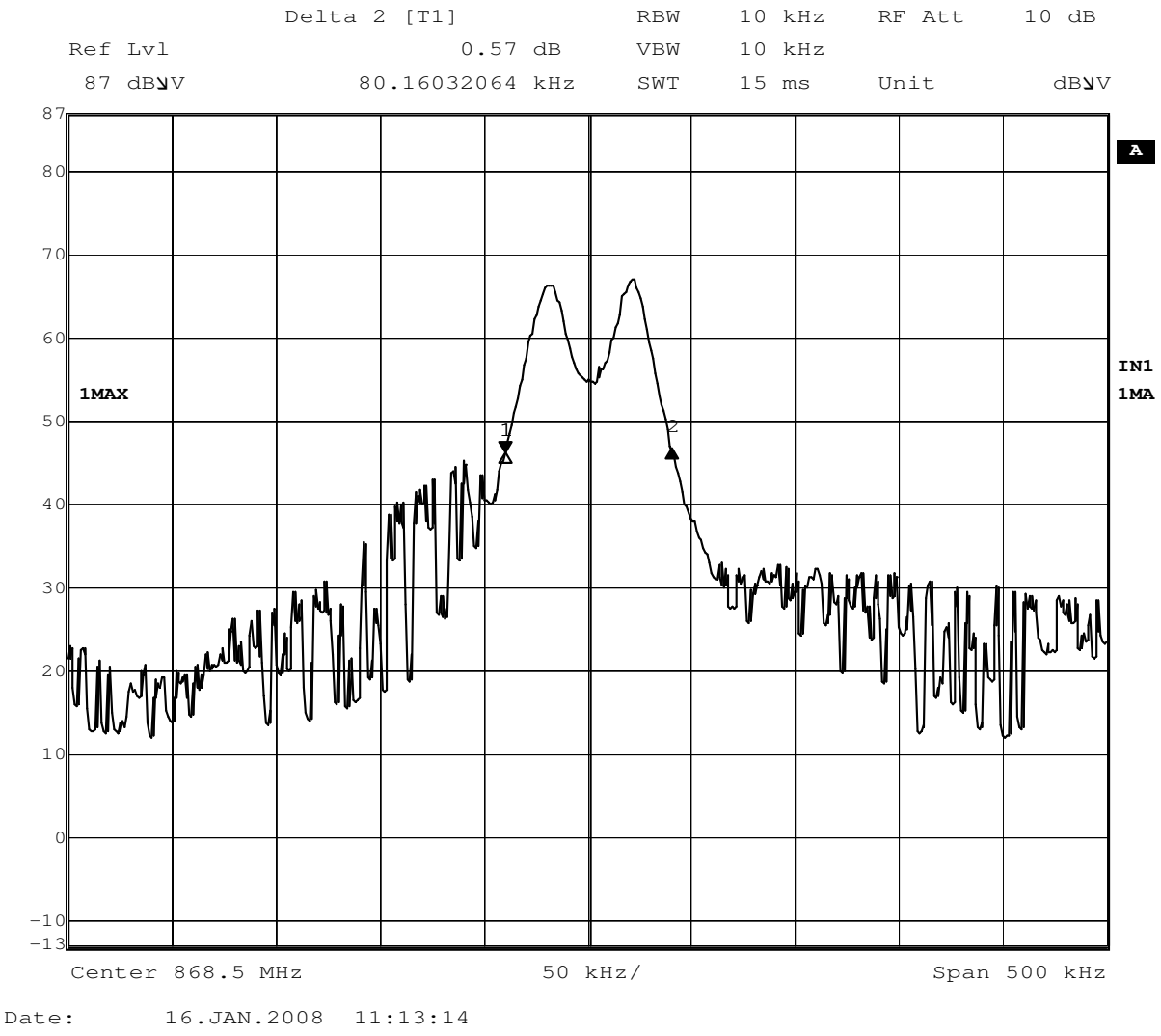


Fig .4

The BW is 80.16 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

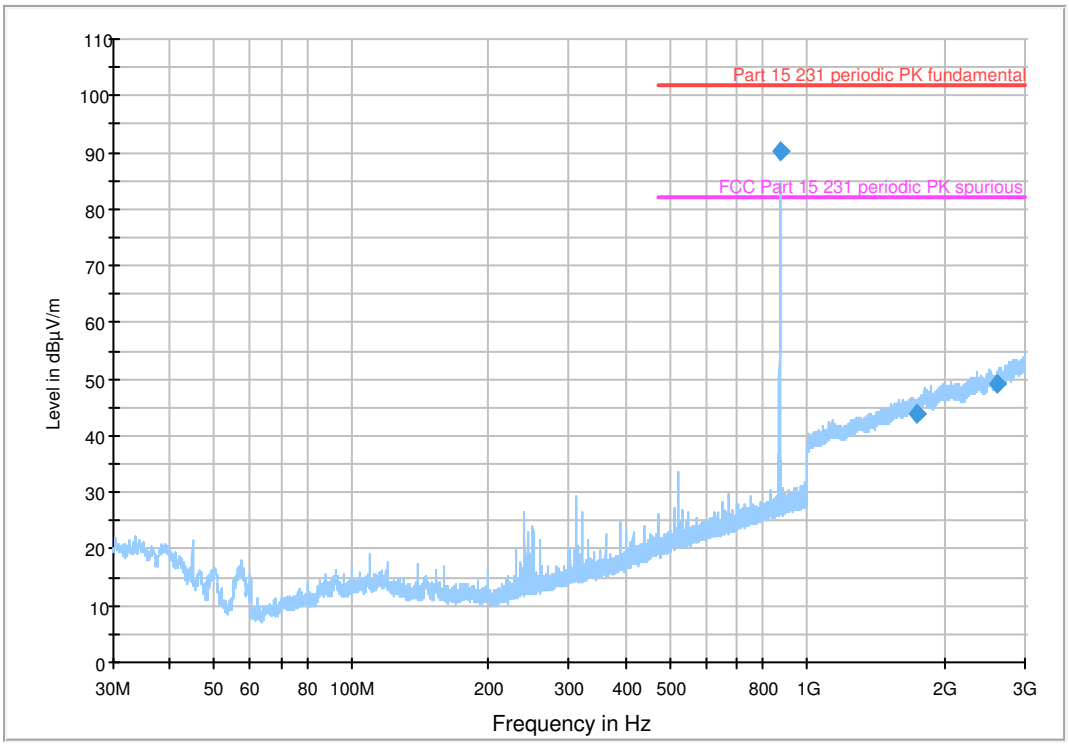
Measurement device	Manufacturer	Type	SN	Asset No.	Last Calibr.ation	Inter-val
☒ Test receiver, 20Hz-26GHz	ESIB26	Rohde & Schwarz	100150	PM KF 0948	07-03	1
☒ Antenna, 30-3000 MHz	HL562	Rohde & Schwarz	100354	PM KF 1123	07-03	2
☒ Horn antenna, 1-18 GHz	Rohde & Schwarz	HF906	100188	PM KF 0947	07-05	2
☒ Horn antenna preamp.	Bonn	BLMA0118 -4A	35352	PM KF 0946	07-05	2
☒ V-Artifical mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	838576/016	PM KF 0141	07-03	2

5.3.3. Emission Test results (Transmitter 868.5 MHz)

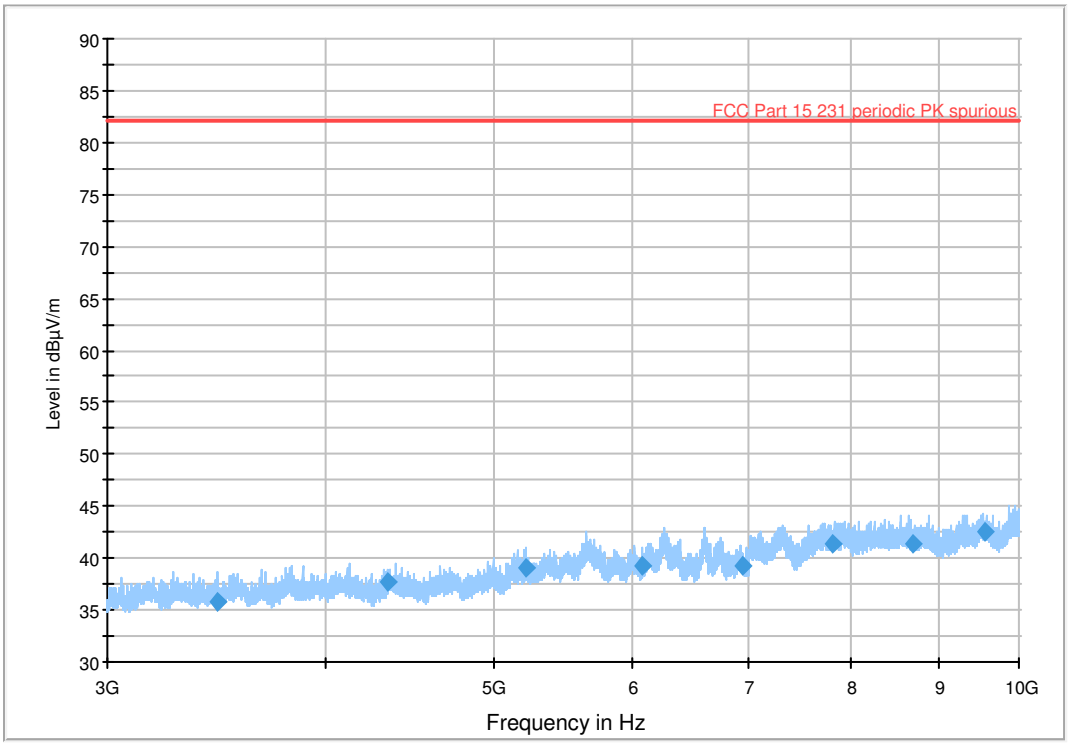
Test requirements	☒ **passed**	☐ **passed with modification**	☐ **not passed**

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.

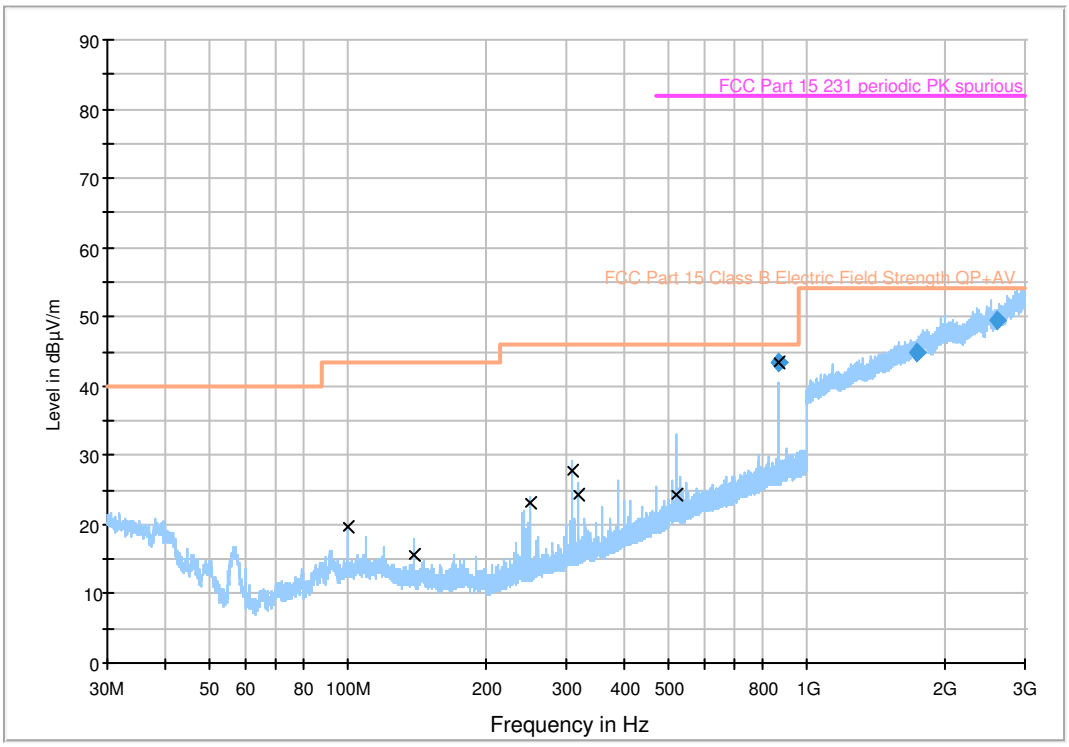
Frequency	MaxPeak	Averaging factor	Average value E	Limit Average	Margin average	Limit peak	Margin peak	Frequency	MaxPeak
868,48	84,8	-11,16	73,64	82	-8,36	102	-17,2	868,48	84,8
1737,2	45,3	-11,16	34,14	62	-27,86	82	-36,7	1737,2	45,3
2605,5	52,9	-11,16	41,74	62	-20,26	82	-29,1	2605,5	52,9
3474,1	47,5	-11,16	36,34	62	-25,66	82	-34,5	3474,1	47,5
*)4342,2	40,5	-11,16	29,34	53,9	-24,56	73,9	-33,4	4342,2	40,5
5211,1	47,9	-11,16	36,74	62	-25,26	82	-34,1	5211,1	47,9
6079,2	41,9	-11,16	30,74	62	-31,26	82	-40,1	6079,2	41,9
6947,7	41,5	-11,16	30,34	62	-31,66	82	-40,5	6947,7	41,5
7816,2	44,3	-11,16	33,14	62	-28,86	82	-37,7	7816,2	44,3
8684,7	47,4	-11,16	36,24	62	-25,76	82	-34,6	8684,7	47,4
9553,2	46	-11,16	34,84	62	-27,16	82	-36	9553,2	46

*) 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)	QuasiPeak (dBµV/m)	limit QP / AV (dBµV/m)	Margin (dB)
100.000000	19.8	43.5	-23.7
140.000000	15.7	43.5	-27.8
250.000000	23.2	46	-22.8
310.000000	27.7	46	-18.3
320.040000	24.2	46	-21.8
520.000000	24.3	46	-21.7
868.500000	43.4	46	-2.6

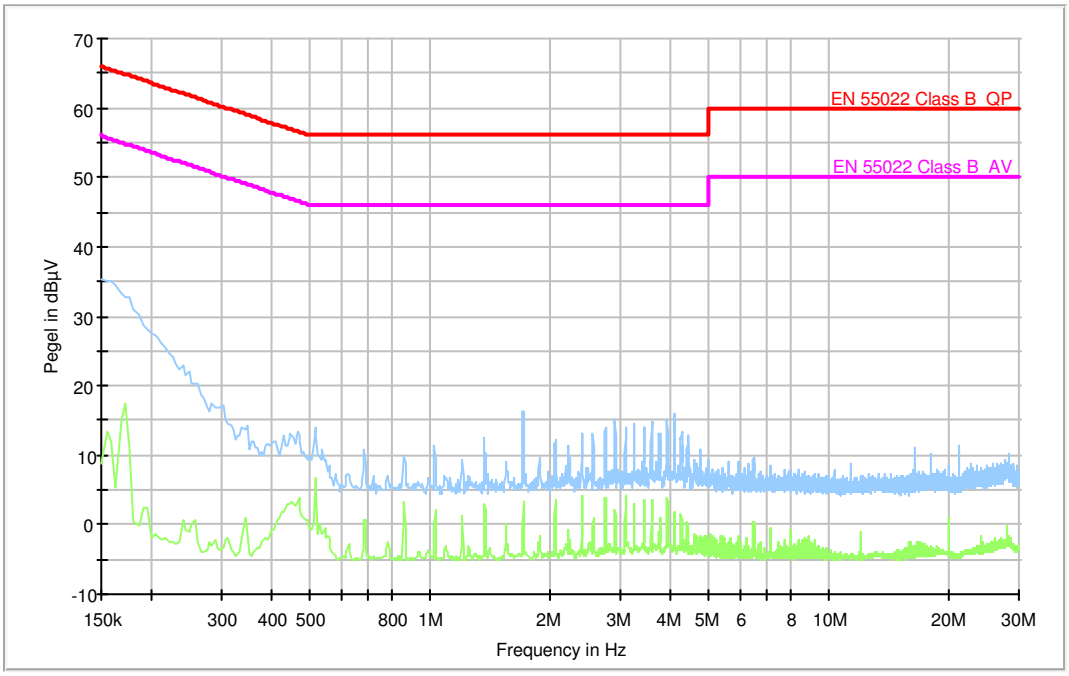
The emissions of receiver were measured during the periods when transmitter was off. There were found no emissions exceeding noise level in the frequency range above 1 GHz.

5.5. Conducted emissions entire control panel

The conducted emissions were measured in configuration transmitter continuously transmitting, entire control panel in function (including receiver).
Displayed curves are merged results (worst cases) of L (phase) and N (neutral) measurements.
Blue trace is prescan – peak detector, green trace is prescan – average detector.
The EMC 32 software performs final measurements only at frequencies where prescan values exceed or are close to limits (PK value vs. QP limit, AV value vs. AV limit).
In this case no final measurements were performed.

Testinformation

EUT Name:	JA-80K-US - control panel
Serial Number:	
Test Description:	120 V AC 60 Hz
Operating Conditions:	Transmitter ON – continuous TX, RX on, control unit on
Operator Name:	MSV
Comment:	



Test setup Photo documentation

EXHIBIT 1

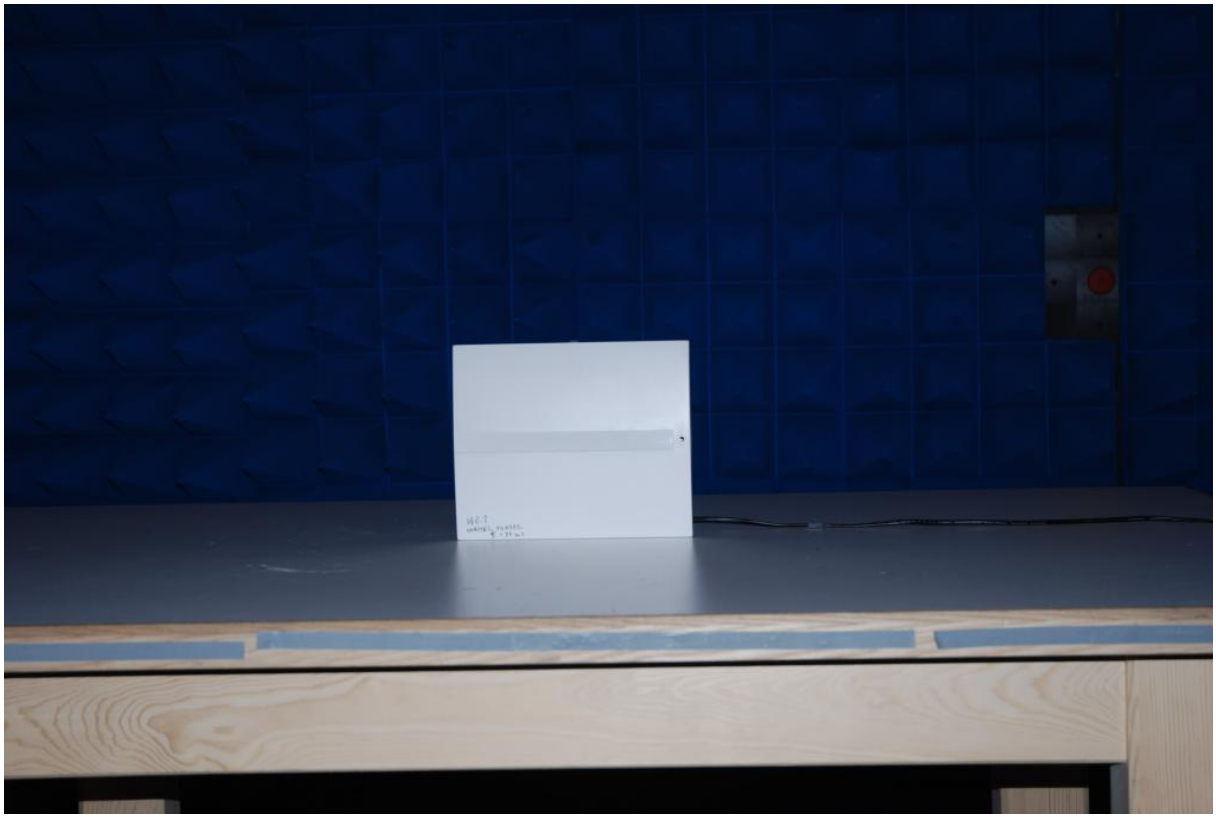


Fig. 1 Front view

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