

Test Report
Electromagnetic Compatibility

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

Date: 2008-01-30

Type:	JA-82R
Description:	Radio module for control panel JA-82K
Serial number:	0709423-002

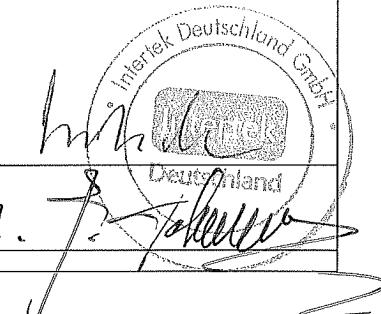
Manufacturer:	Jablotron s.r.o.
Customer:	Jablotron s.r.o.
Address (Customer):	Pod Skalkou 33 CZ 646601 Jablonec nad Nisou Czech Republic

Test Laboratory:	Intertek Deutschland GmbH, Innovapark 20, D- 87600 Kaufbeuren
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FCC registration number:	90714
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Compiled by:	Marek Svoboda Technical Leader
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Approved by:	R. Dressler Project Engineer
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A circular stamp of Intertek Deutschland GmbH. The outer ring contains the text "Intertek Deutschland GmbH". Inside the circle is a smaller rectangle with the Intertek logo and the word "Intertek". Below the circle, there are two handwritten signatures: "M. Svoboda" and "R. Dressler".

This test report consists of 25 pages. All measurement results exclusively refer to the equipment, which was tested.
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1. General description

1.1. Product description

The JA-82R is a radio module for Control panel JA-82K-US (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-82R is connected to JA-82K-US directly by connector that is located on both PCB's. JA-82R includes on its PCB transmitter - receiver part, power supply is provided from the control unit JA-82K-US which 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 via JA-82R with wireless 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 and verification of receiver, both present in the JA-82R.

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 (instructions included in I.M. for JA-82K)
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. Changes to Test Report 07KFE007857-W-FCC-01

Modified text in Ch. 3.1.

New Fig. 2 in Ch. 5.1.

Radiated emission receiver in frequency range $f \in <3 \text{ GHz}, 10 \text{ GHz}$) included.

Test setup photo conducted emissions included.

3. Description Of EUT

3.1. Configuration / Operating Conditions

table-top EUT floor-standing EUT

The device JA-82R is built in and powered from the control unit JA-82K-US (AC mains 120 V 60 Hz equipped with internal backup accumulator battery type 12 V, 1.3 or 2.2 Ah).

There were two samples of the device delivered :

Sample 1: was modified by manufacturer to transmit continuously. This sample was used for measurement of a field strength ;

Sample 2 : has normal operation as specified by manufacturer . It was used for measurement of bandwidth and the duty cycle and receiver measurements. The receiver operates continuously (no operation cycle): under normal operation the receiver is any time ready to accept the alarm transmission.

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
control unit	Jablotron s.r.o.	JA-82K-US	0709016-002	none

The SN given above is valid for the assembly JA-82K-US with JA-82R.

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	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

4. Test Results - Overview

	required	passed	passed with modification	not passed
Transmitter 868.5 MHz				
Bandwidth	< 2.17 MHz, 0.25 % f_{op}	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Duty cycle	< 2 s in 1 hour	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emission radiated :				
30 MHz - 3000 MHz :	FCC 15.231	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 GHz – 10 GHz :	FCC 15.231	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emission radiated : included RX and control unit, excluded TX				
30 MHz – 3 GHz : receiver	FCC 15.109	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emission conducted : entire control panel including TX, RX and control unit				
150 kHz – 30 MHz : entire control panel JA-82K-US + JA-82R	FCC 15.107	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Measurement results detailed

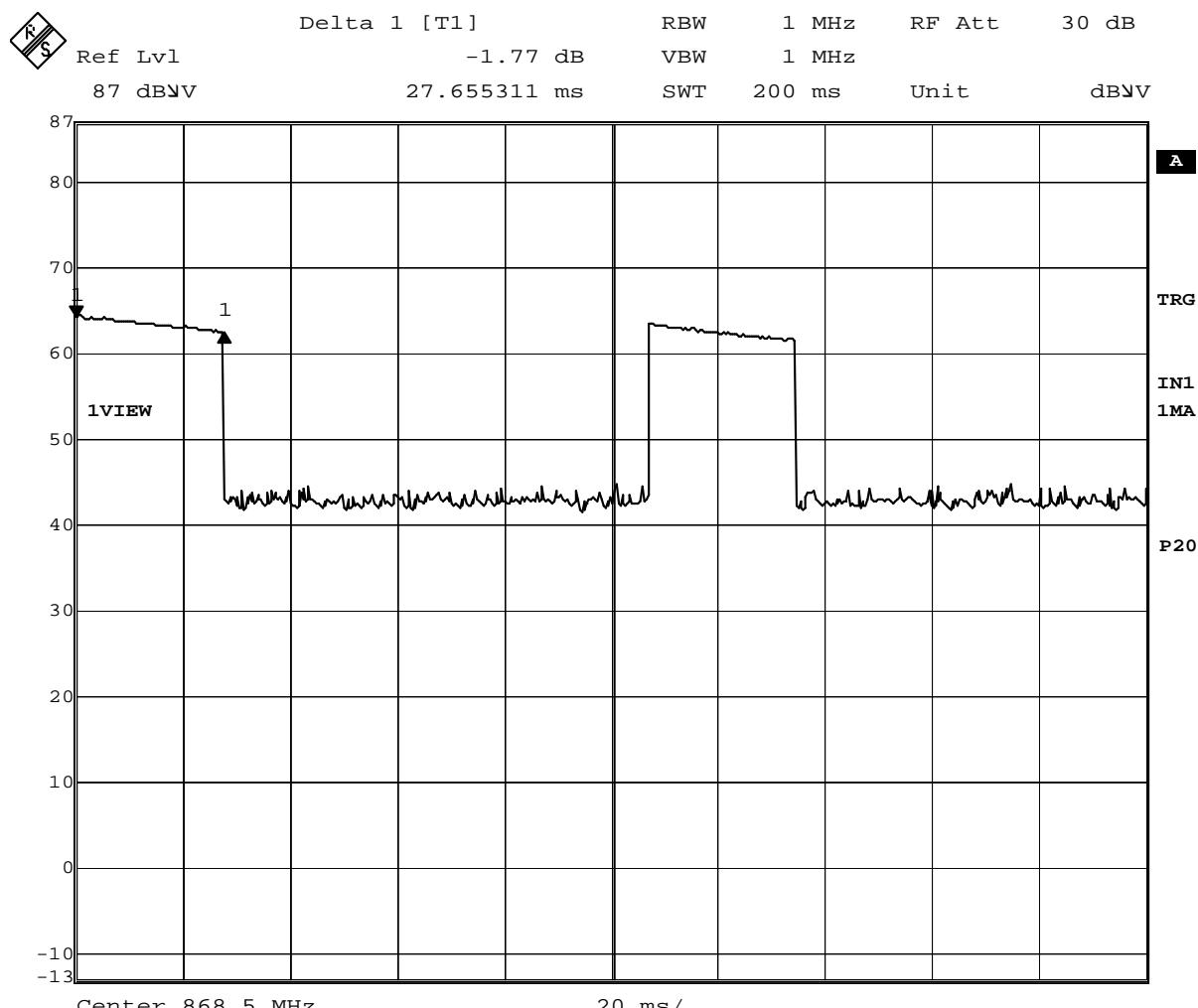
5.1. Duty cycle and Averaging factor (transmitter 868.5 MHz)

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 200 ms window.

Fig. 2 demonstrates the pulse train under normal operation in 3 s window.

Fig. 3 demonstrates the duty cycle under normal operation in 600 s window (periodic transmission).



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Fig.1

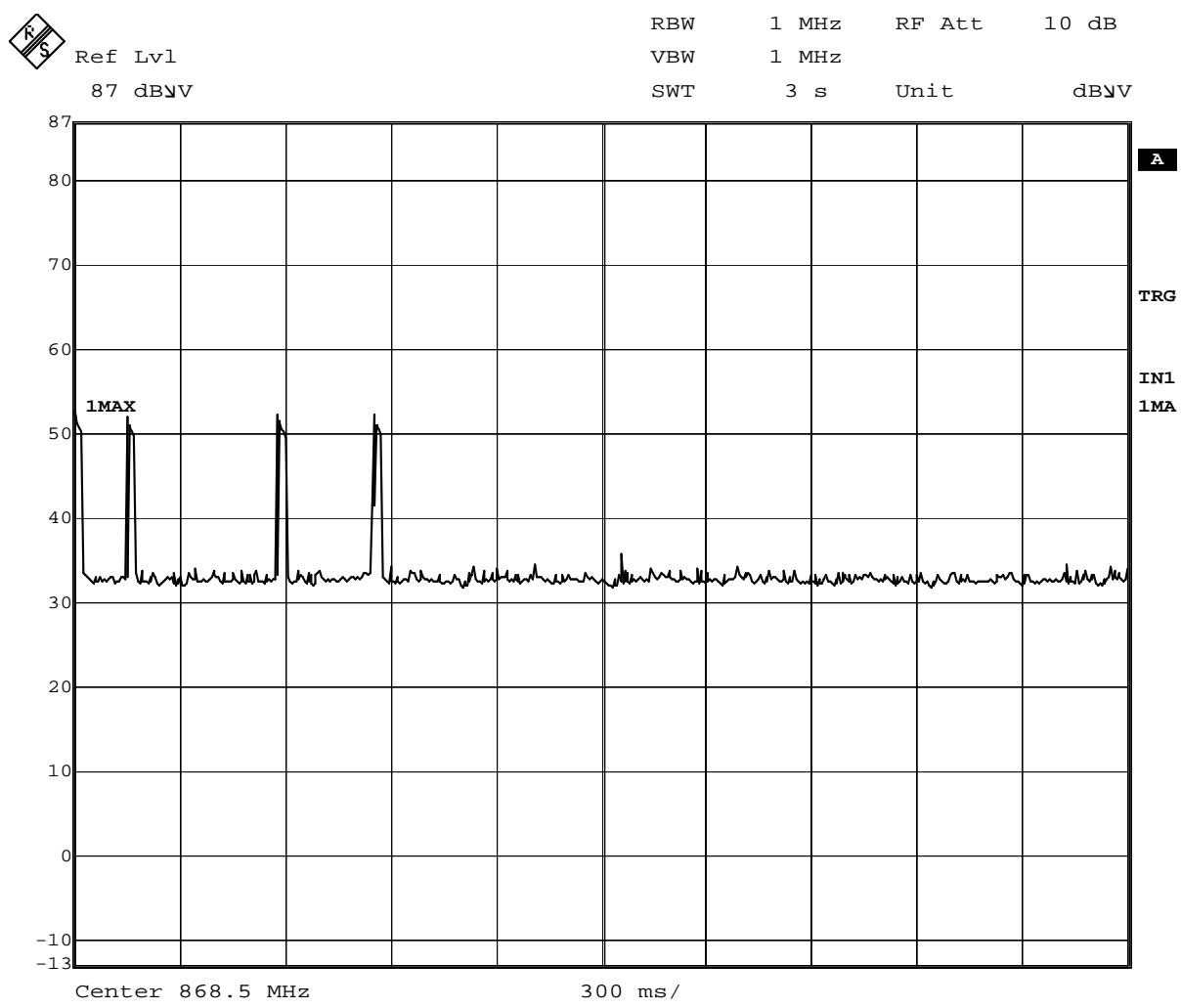
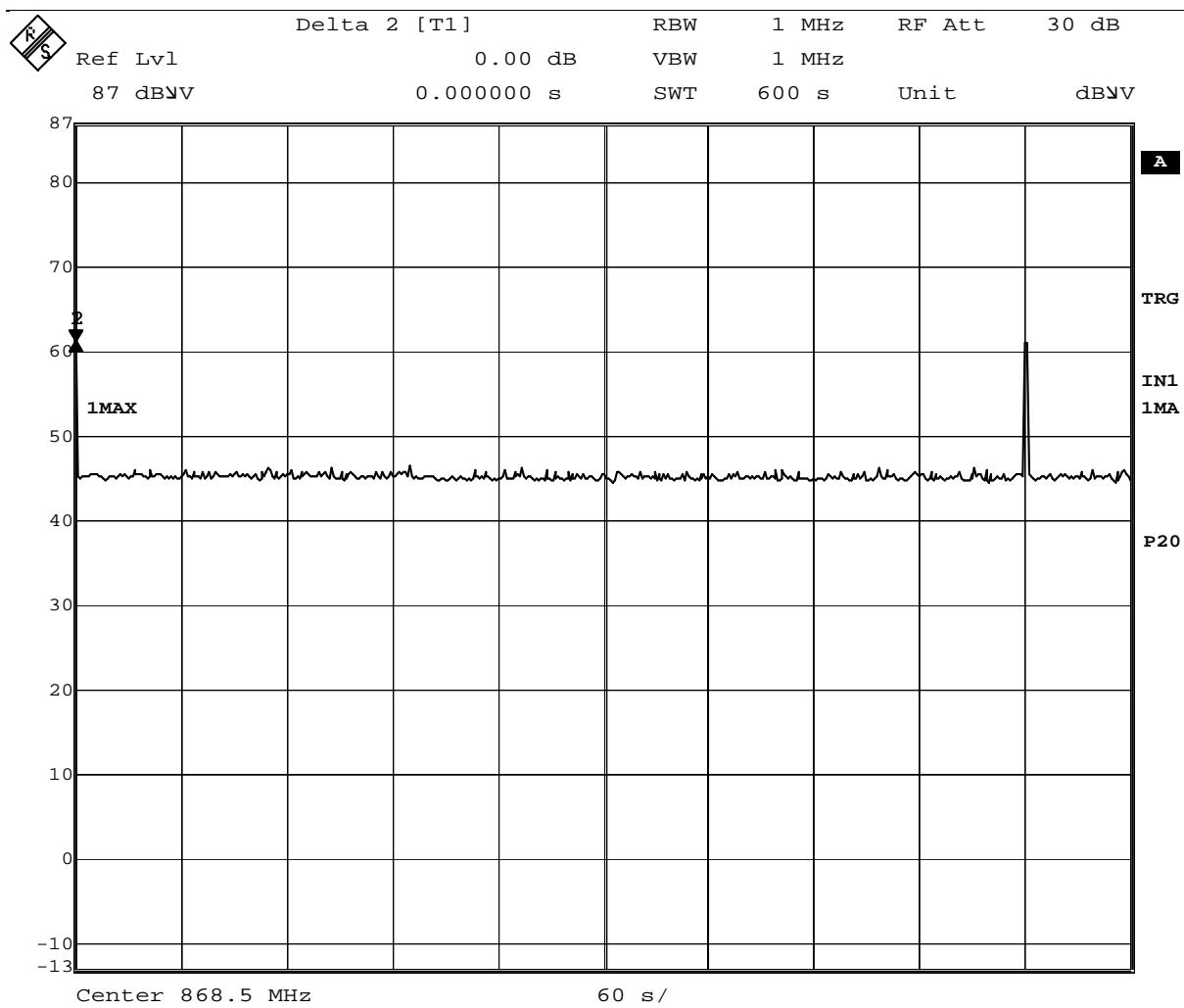


Fig. 2



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Total transmission time in period T = 100 ms is t = 28,45 ms.

Ma

The pulse is transmitted once in 540 s.

The Averaging factor is:

$$20 \cdot \log (28.45/100) = -10.91 \text{ dB.}$$

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

Maximal Transmission time in 1 hour period is :

$$t = \text{int}(3600/540) * 28.45 * 4 = 682 \text{ ms}$$

5.2. Bandwidth (Transmitter 868.5 MHz)

The measured 20 dB bandwidth is shown on Fig. 4

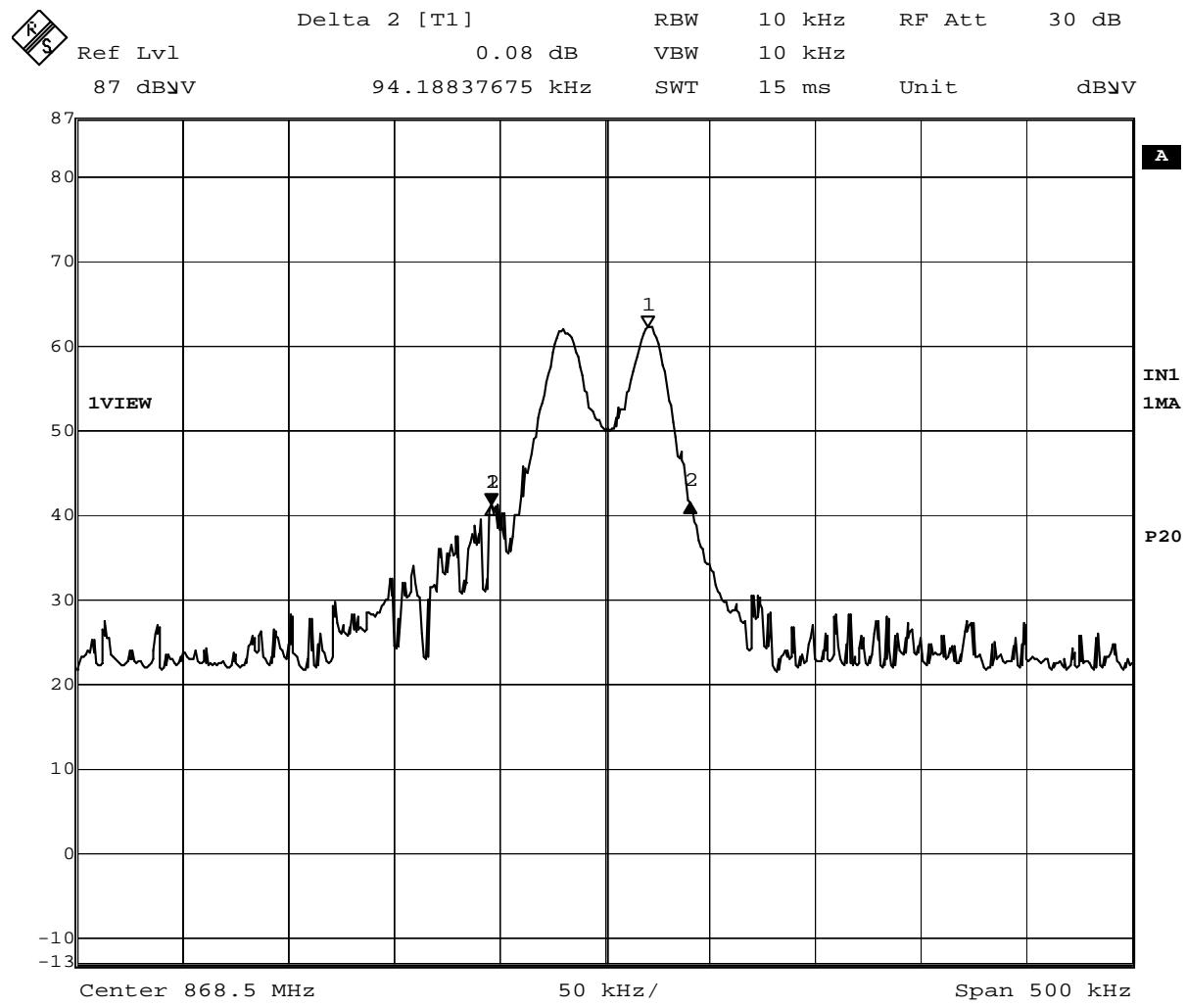


Fig. 4

The BW is 94.188 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 desensitization 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 dB μ V/m
RR	receiver reading including preamplifier in dB μ V
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 dB μ V
CF	= 1.2 dB
AF	= 12.6 dB/m
AG	= 20 dB
PD	= 0 dB
AV	= -10 dB

Then

$$E = 60 + 1.2 + 12.6 - 20 + 0 - 10 = 43.8 \text{ dB}\mu\text{V/m}$$

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
<input checked="" type="checkbox"/> Test receiver, 20Hz-26GHz	ESIB26	Rohde & Schwarz	100150	PM KF 0948	07-03	1
<input checked="" type="checkbox"/> Antenna, 30-3000 MHz	HL562	Rohde & Schwarz	100354	PM KF 1123	07-03	2
<input checked="" type="checkbox"/> Horn antenna, 1-18 GHz	Rohde & Schwarz	HF906	100188	PM KF 0947	07-05	2
<input checked="" type="checkbox"/> Horn antenna preamp.	Bonn	BLMA0118-4A	35352	PM KF 0946	07-05	2
<input checked="" type="checkbox"/> V-Artifical mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	838576/016	PM KF 0141	07-03	2

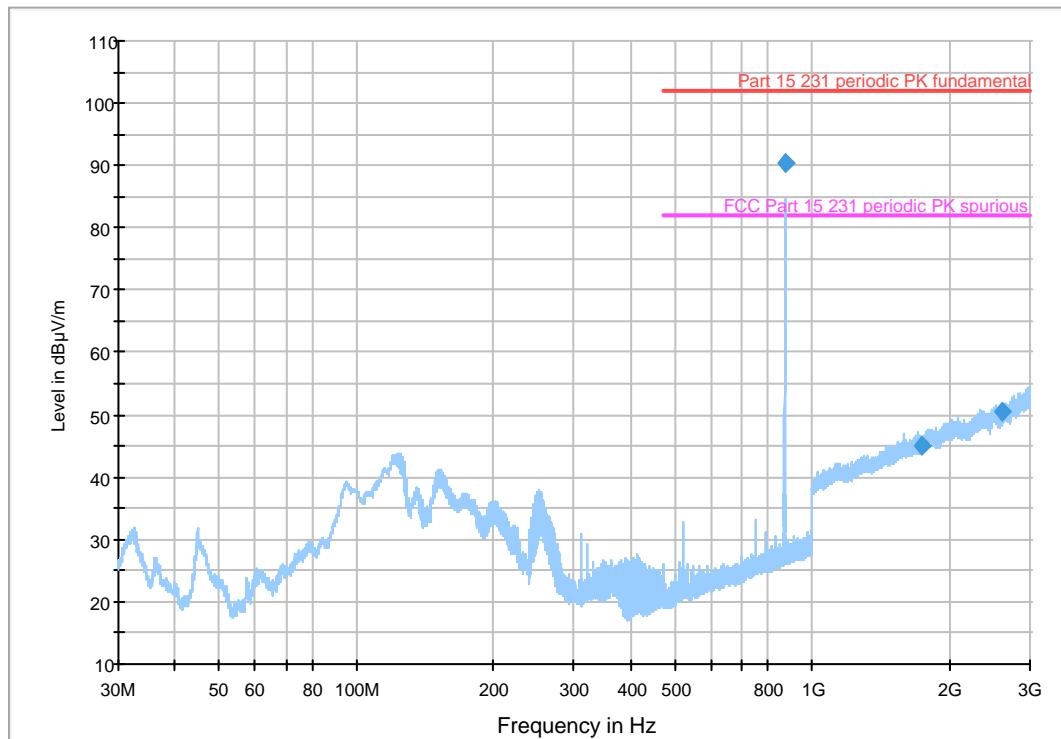
5.3.3. Emission Test results (Transmitter 868.5 MHz)

Test requirements passed passed with modification not passed

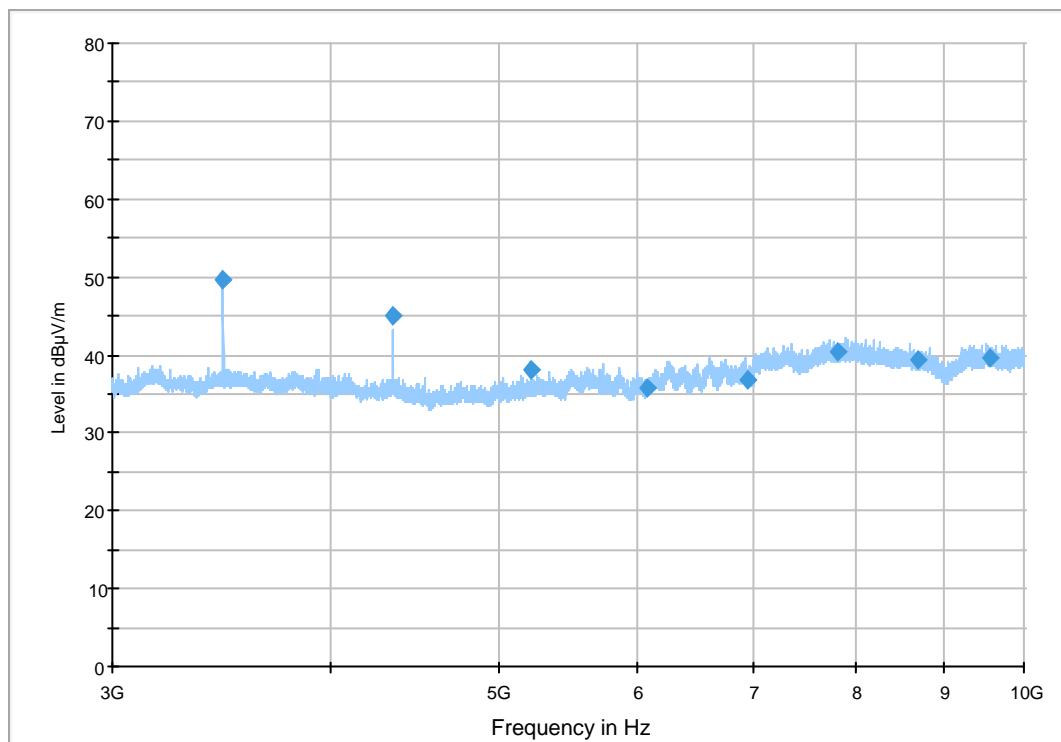
Comment:

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 (MHz)	MaxPeak (dB μ V/m)	Averaging factor (dB)	Average value E (dB)	Limit Average (dB μ V/m)	Margin average (dB)	Limit peak (dB μ V/m)	Margin peak (dB)
868,48	90,5	-10,91	79,59	82	-2,41	102	-11,5
1729,6	45,1	-10,91	34,19	62	-27,81	82	-36,9
2605,5	50,5	-10,91	39,59	62	-22,41	82	-31,5
3473,8	49,5	-10,91	38,59	62	-23,41	82	-32,5
*)4342,3	45	-10,91	34,09	53,9	-19,81	73,9	-28,9
5210,8	38	-10,91	27,09	62	-34,91	82	-44
6082,1	35,9	-10,91	24,99	62	-37,01	82	-46,1
6949,4	36,7	-10,91	25,79	62	-36,21	82	-45,3
7814,7	40,3	-10,91	29,39	62	-32,61	82	-41,7
8686,4	39,3	-10,91	28,39	62	-33,61	82	-42,7
9556,1	39,6	-10,91	28,69	62	-33,31	82	-42,4

*) Frequencies governed by 15.209

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

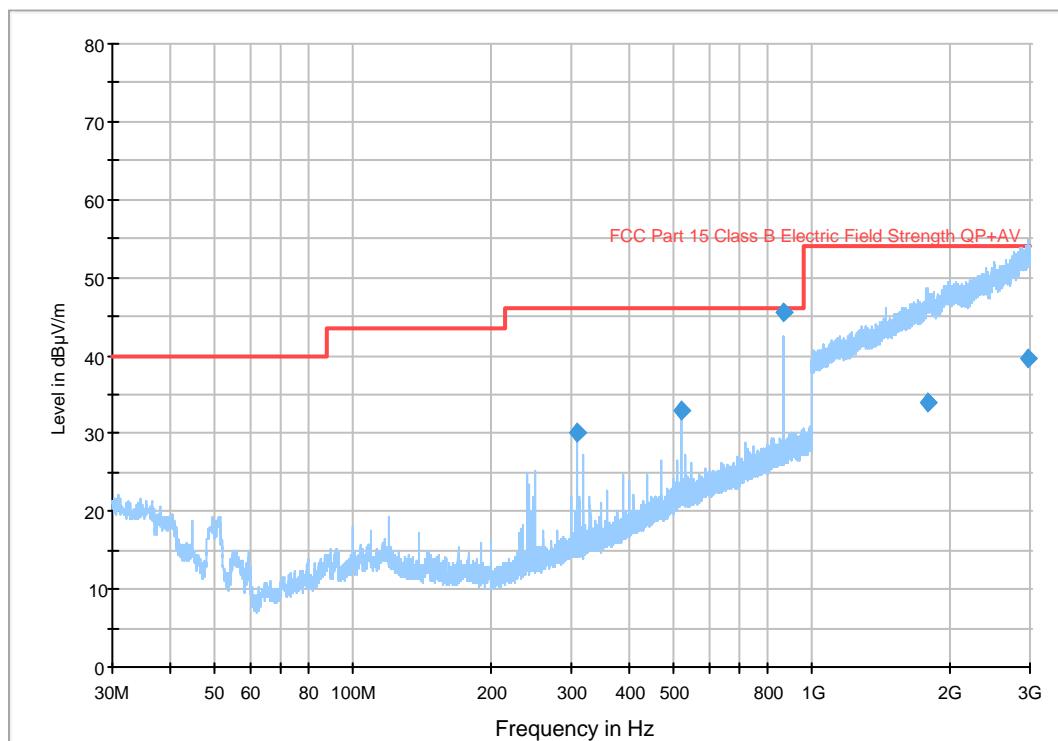
The emissions of receiver were measured during the periods when transmitter was off.

The local oscillator frequency is $f = 868.5$ MHz.

Measurement bandwidth was 120 kHz bellow 1 MHz, and 1 MHz above 1000 MHz.

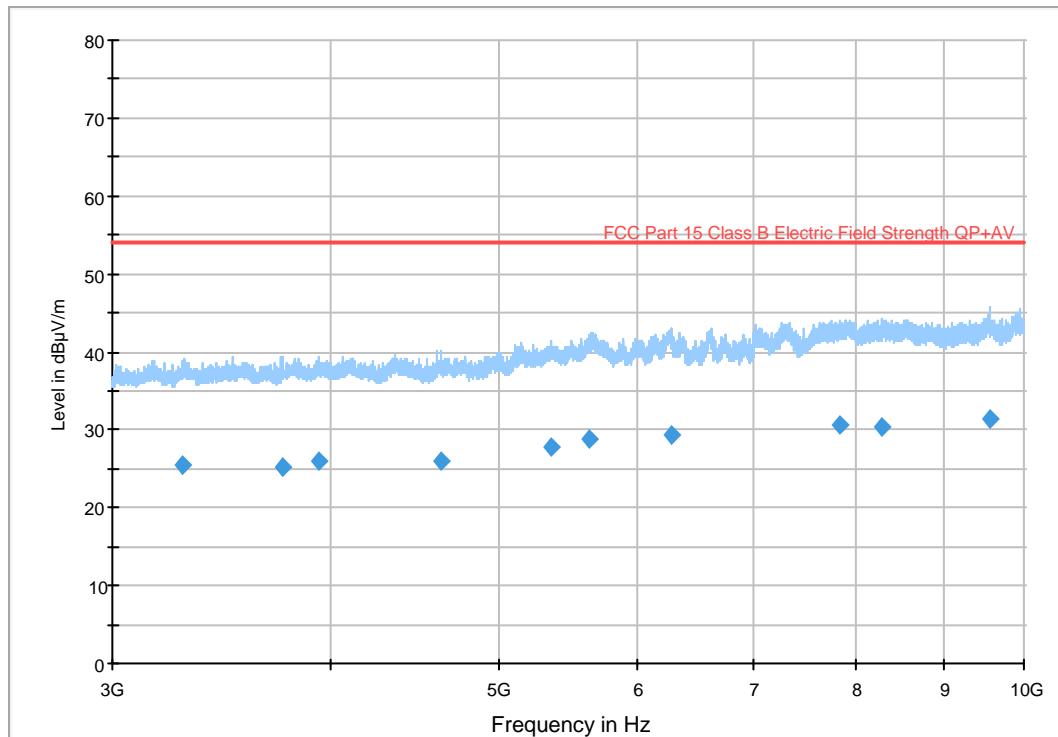
Presented values include JA-82R receiver mounted in JA-82K-US control unit.

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



5.4.2. Radiated Emission (Receiver) 3 GHz – 10 GHz

Rectangle : Average detector values



5.4.3. Radiated Emission (Receiver) Table 30 MHz – 10 GHz

Frequency (MHz)	QuasiPeak (dB μ V/m)	Average (dB μ V/m)	limit QP / AV (dB μ V/m)	Margin (dB)
310,02	30,2	---	46	-15,8
520,02	33	---	46	-13
868,5	45,4	---	46	-0,6
1805,1	---	33,9	54	-20,1
2961	---	39,5	54	-14,5

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

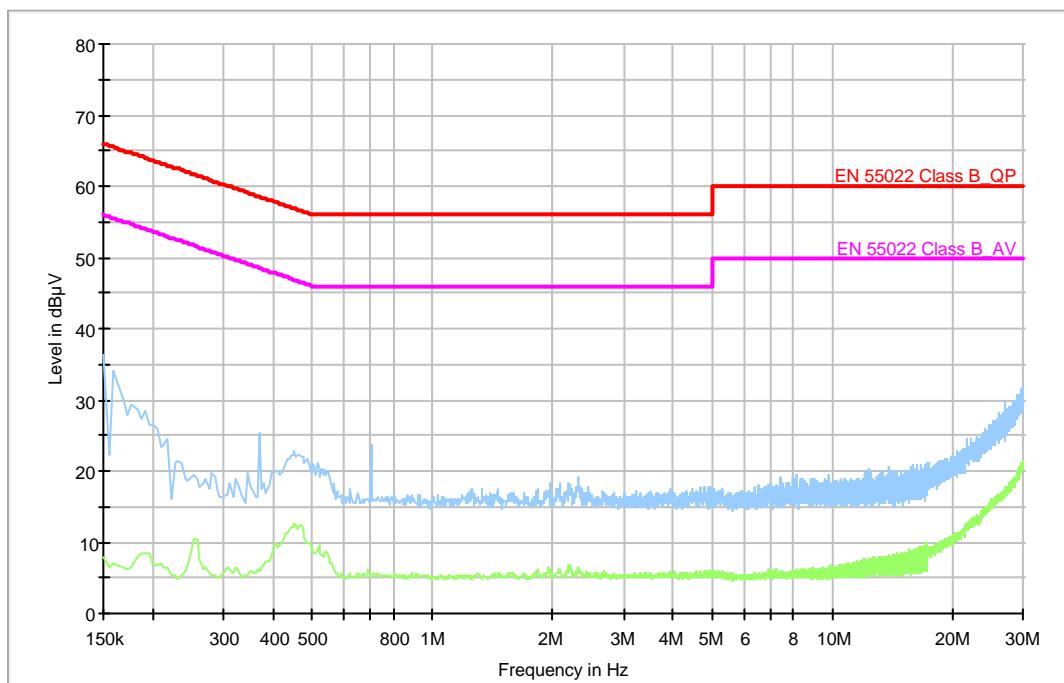
The conducted emissions were measured in configuration transmitter JA-82R continuously transmitting, entire control JA-82K-US panel in function.

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.



5.6. Test setup Photo documentation

EXHIBIT 1

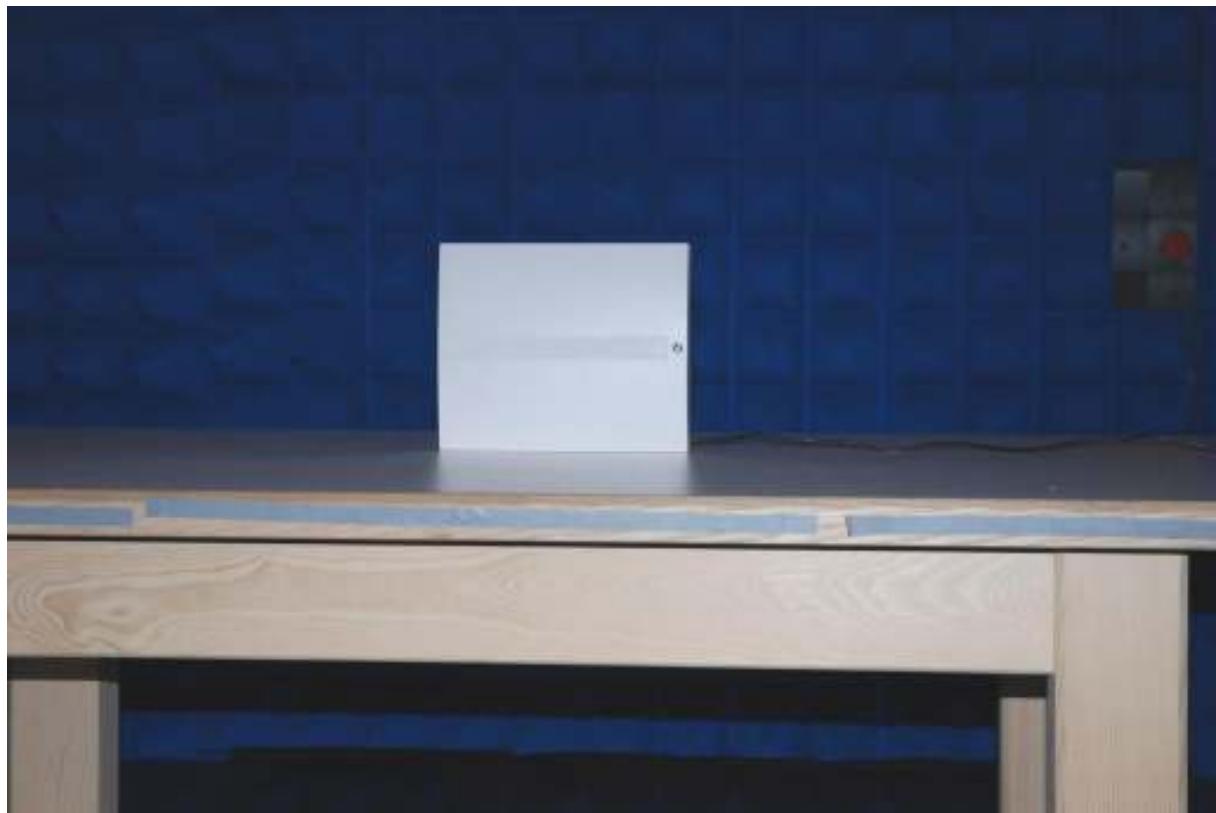


Fig. 1 Front view radiated emission

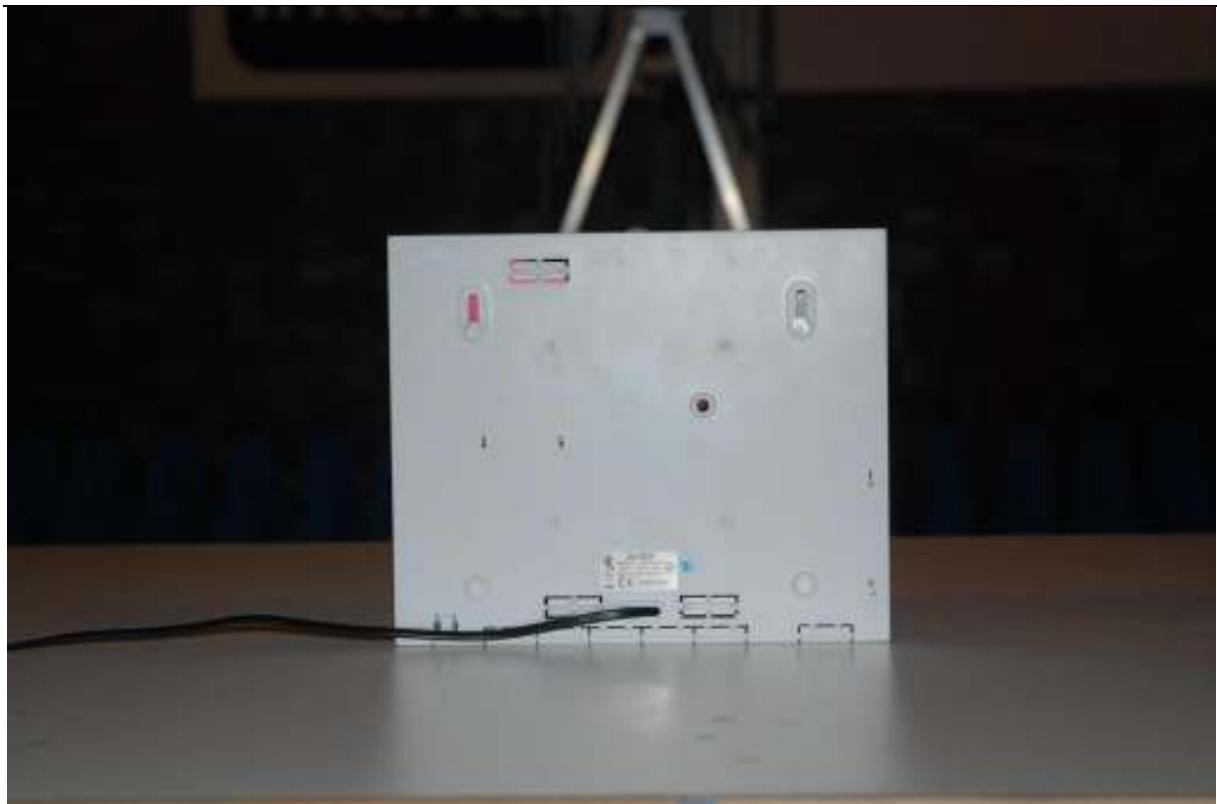


Fig. 2 Rear view radiated emission



Fig.3 Conducted emission setup

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 (Instructions included in Instruction manual for JA-82K)

7.4. Product Labelling

EXHIBIT 8