

EMI - TEST REPORT

- Human exposure -

Test Report No. : T39073-00-07TK

21. April 2015

Date of issue

Type / Model Name : iNet Box

Product Description : Interface box with BT 2.1, BT 4.0 and GSM

Applicant : Truma Gerätetechnik GmbH & Co. KG

Address : Wernher-von-Braun-Strasse 12

85640 PUTZBRUNN, GERMANY

Manufacturer : Feo Elektronik GmbH

Address : Zwergerstrasse 15

88214 RAVENSBURG, GERMANY

Licence holder : Truma Gerätetechnik GmbH & Co. KG

Address : Wernher-von-Braun-Strasse 12

85640 PUTZBRUNN, GERMANY

Test Result according to the standards listed in clause 1 test standards:

POSITIVE



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310 Radiofrequency radiation exposure limits

Part 1, Subpart 2, Section 2.1093 Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

KDB 447498 D01 v05r02 Mobile and portable devices RF Exposure procedures and equipment authorisation policies, February 7, 2014.

ANSI C95.1: 2005 IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

CISPR 16-4-2: 2013 Uncertainty in EMC measurement

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT see ATTACHMENT A

2.2 Equipment type, category

Type: Bluetooth 2.1 BR/EDR device, Bluetooth 4.0 Low Energy device, GSM device.

Category: Fixed equipment.

2.3 Short description of the equipment under test (EUT)

The EUT is an interface box for vehicular use. The used wireless technologies allow to communicate simultaneously via GSM, Bluetooth 2.1 and Bluetooth 4.0 to the end application. The device is battery powered or powered via the vehicular power system.

Items	Description
BT chipset type	Texas Instruments CC2564
BT version	2.1 BR+EDR
BT version	4.0 LE
Antenna type	PCB
GSM module	Sierra HL6528, P/N 1102044
Multislot Class	10 (2 timeslots for uplink)
Antenna type	PCB or SMA-Connector

2.4 Variants of the EUT

None

2.5 Operation frequency range

Equipment category	Range	
GSM 850	824.2 MHz – 848.8 MHz	Uplink
PCS 1900	1850.20 MHz – 1909.80 MHz	Uplink
Bluetooth 2.1 BR/EDR	2402 MHz – 2480 MHz	
Bluetooth 4.0 Low Energy	2402 MHz – 2480 MHz	

2.6 Antennas

The following antennas shall be used with the EUT:

Number	Characteristic	Certification name	Plug	Frequency range (MHz)	Gain (dBi)
1	Omni	PCB antenna	none	824 - 849	2.0
1	Omni	PCB antenna	none	1850 - 1910	2.0
none	Omni	Generic antenna	SMA	824 - 849	5.5
none	Omni	Generic antenna	SMA	1850 - 1910	2.0
2	Omni	PCB antenna	none	2400 - 2483.5	1.7
2	Omni	PCB antenna	none	2400 - 2483.5	1.7

2.7 Power supply system utilised

Power supply voltage, V_{nom} : 13.2 VDC (Battery powered)
 Power supply voltage (extreme) : 8 VDC to 30 VDC

2.8 Determination of worst case conditions for final calculations

Note:

No separate measurement was performed to generate test results for the present document. This test report is based on the results of the test reports **T39073-00-05TK** and **T39073-00-06TK** from CSA Group Bayern. Else the GSM-Section was already certified with FCC ID: **N7NHL6528** and IC ID: **2417C-HL6528**. In this case only worst case considerations for the highest radiated output power of all emitters are taken into consideration to calculate the maximum permissible exposure for fixed equipment devices. Therefore the power of the GSM-/PCS-Module is assumed to have an EIRP of 2 W for the GSM 850 and an EIRP of 1 W for PCS 1900 to calculate the worst case conditions for MPE. The distance of 10 cm between the two PCB antennas also requires a co-location and co-transmission consideration.

3 TEST RESULT SUMMERY

Wireless device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.247(i)	RSS 102, 2.5.2	MPE	passed
KDB 447498	RSS 102, 2.5.1	SAR exclusion consideration	not applicable
OET Bulletin 65	RSS102, 3.2	Co-location, Co-transmission	passed

The mentioned RSS Rule Parts in the above table are related to:
RSS 102, Issue 4, March 2010

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 23 February 2015

Testing concluded on : 23 March 2015

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Tobias Kammerer
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.4 Measurement protocol for FCC and IC

4.4.1 General information

4.4.1.1 Test methodology

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.1.3 Details of test procedures

In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

5 TEST CONDITIONS AND RESULTS

5.1 Maximum peak output power

For test instruments and accessories used see section 6 Part **CPR 3**.

5.1.1 Description of the test location

Test location: NONE

Remarks: No separate measurements were performed. For detailed information refer to section 2.9 of the present document.

6 HUMAN EXPOSURE

6.1 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPC 3**.

6.1.1 Description of the test location

Test location: NONE

6.1.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

6.1.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, can be calculated the MPE in a defined distance away from the product.

Friis transmission formula:

$$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

Where:

P_d = power density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device. The EUT is designed to be used that radiating structures are 20 cm outside of the body of the user. ($r = 20$ cm)

6.1.4 Test result
Bluetooth 2.1

Channel frequency	P _{EIRP}	P	P	P _d	Limit P _d	Exposure ratio
(MHz)	(dBm)	(mW)	(W)	(mW/cm ²)	(mW/cm ²)	(%)
2402	1.7	1.479	0.001479	0.0002943	1.0	0.0294
2441	0.6	1.148	0.001148	0.0002284	1.0	0.0228
2480	1.1	1.288	0.001288	0.0002563	1.0	0.0256

Bluetooth 4.0

Channel frequency	P _{EIRP}	P	P	P _d	Limit P _d	Exposure ratio
(MHz)	(dBm)	(mW)	(W)	(mW/cm ²)	(mW/cm ²)	(%)
2402	-0.9	0.813	0.000813	0.0001617	1.0	0.0162
2442	-1.9	0.646	0.000646	0.0001284	1.0	0.0128
2480	-1.7	0.676	0.000676	0.0001345	1.0	0.0135

GSM 850 / PCS 1900

Channel frequency	P	Antenna gain	P _{EIRP}	Time division correction	P _{EIRPAV}	P	P _d	Limit P _d	Exposure ratio
(MHz)	(dBm)	(dBi)	(dBm)	(dB)	(dBm)	(mW)	(mW/cm ²)	(mW/cm ²)	(%)
824.2	33.3	5.5	38.8	-6.0	32.8	1889	0.376	0.55	68.40
1850.2	29.2	2.0	31.2	-6.0	25.2	329	0.065	1.00	6.54

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/f	2.19/f	180/f ²	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	f/1500	30
1500-100000	---	---	1.0	30

f = Frequency in MHz

The requirements are **FULFILLED**.

Remarks:

6.2 Co-location and Co-transmission

Applicable standard:

OET Bulletin 65, Edition 97-01, Section 2: Multiple-transmitter sites and Complex Environments

The FCC's MPE limits vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100 % in terms of percentage.

6.2.1 Test result

Maximum power density ratio BT (%)	Maximum power density ratio BLE (%)	Maximum power density ratio GSM (%)	Sum of exposure ratios (%)	Limit of exposure ratios (%)
0.0294	0.0162	68.40	68.44	100

The requirements are **FULFILLED**.

Remarks:

6.3 SAR test exclusion considerations

6.3.1 Applicable standard

According to RF exposure guidance:

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

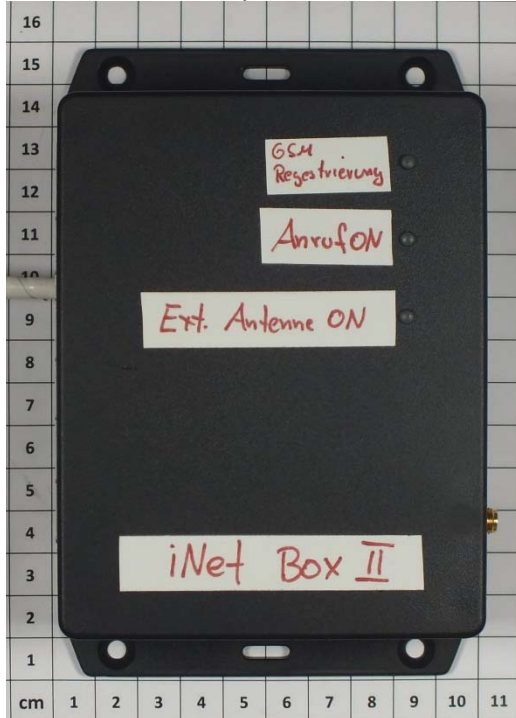
6.3.2 Determination of the standalone SAR test exclusion threshold

Remarks: Not applicable because the EUT is a fixed equipment.

ATTACHMENT A

A1 External views

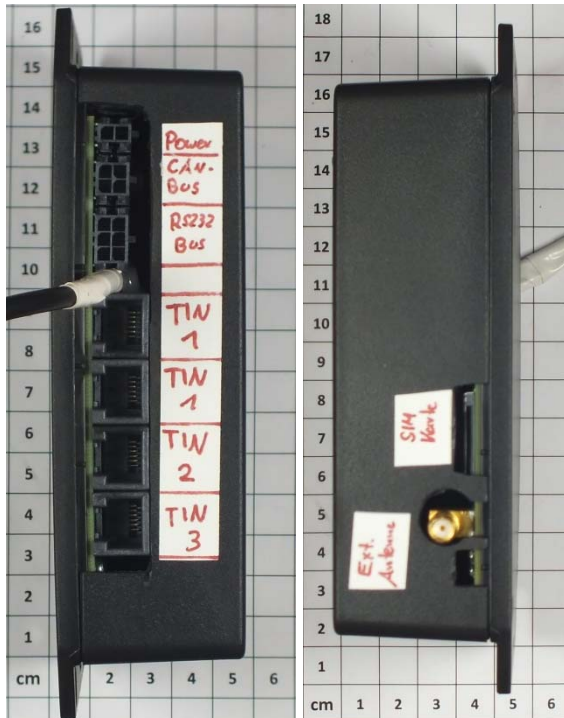
Top view



Bottom view

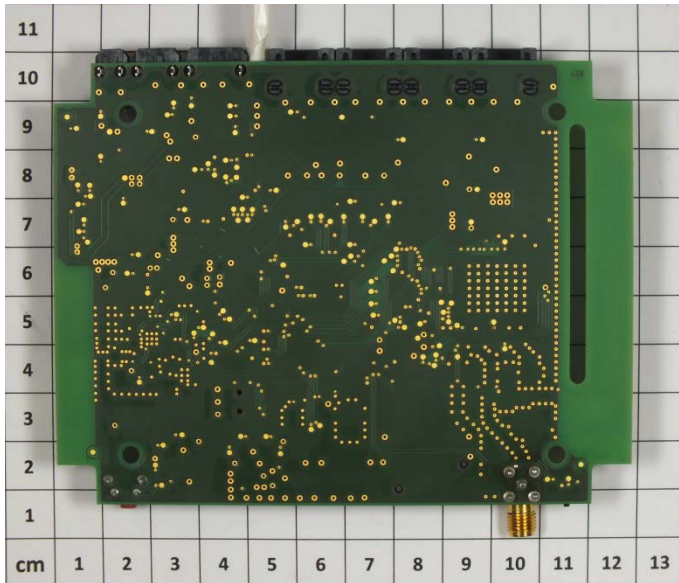


Side views

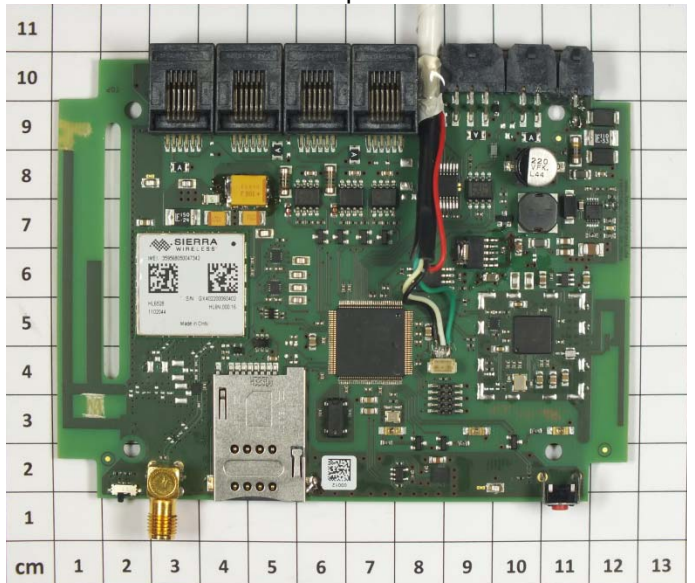


A2 Internal views

PCB bottom view



PCB top view



A3 Antenna structure

Antenna application

