



EMI – TEST REPORT

- Human Exposure -

Type / Model Name : Truma iNet X

Product Description : Digital Control Panel for caravanning industry

Applicant : Truma Gerätetechnik GmbH & Co. KG

Address : Wernher-von-Braun-Straße 12

85640 Putzbrunn, GERMANY

Manufacturer : 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

Test Report No. : T44863-00-03WP

28. August 2019

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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.

FCC ID: 2ADPZ-INETX**IC: 12552A-INETX**

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ATTACHMENTS A, B as separate supplements

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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 2.1091 Radiofrequency radiation exposure evaluation: **mobile devices**.

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

KDB 447498 D01 v06 Mobile and portable devices RF Exposure procedures and equipment authorisation policies, October 23, 2015.

KDB 865664 D01 v01r04 SAR Measurement Requirements for 100 MHz to 6 GHz, August 7, 2015.

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

ETSI TR 100 028 V1.3.1: 2001-03, Electromagnetic Compatibility and Radio Spectrum Matters (ERM);
Uncertainties in the Measurement of Mobile Radio Equipment
Characteristics—Part 1 and Part 2

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2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – See ATTACHMENTS A, B

2.2 Equipment type, category

BLE device, mobile equipment.

2.3 Short description of the equipment under test (EUT)

The EUT is a Bluetooth 4.0 Low Energy system. It supports the 2.4 GHz frequency band. A single PCB antenna is used within the system. The operational modes of the EUT (continuous TX, RX and PER test) have been set manually. A personal computer was used to control the settings of the EUT.

Number of tested samples: 2
 Serial number: iNet X #1 (conducted sample)
 iNet X #3 (radiated sample)
 Firmware version: ble5_multi_role_cc26x2r1lp_app_FlashROM_Release_v00.01.00.0173.hex

2.4 Variants of the EUT

There are no variants

2.5 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan BT-Standard 802.15.1:

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 37 | 2402 | 18 | 2442 |
| 0 | 2404 | 19 | 2444 |
| 1 | 2406 | 20 | 2446 |
| 2 | 2408 | 21 | 2448 |
| 3 | 2410 | 22 | 2450 |
| 4 | 2412 | 23 | 2452 |
| 5 | 2414 | 24 | 2454 |
| 6 | 2416 | 25 | 2456 |
| 7 | 2418 | 26 | 2458 |
| 8 | 2420 | 27 | 2460 |
| 9 | 2422 | 28 | 2462 |
| 10 | 2424 | 29 | 2464 |
| 38 | 2426 | 30 | 2466 |
| 11 | 2428 | 31 | 2468 |
| 12 | 2430 | 32 | 2470 |
| 13 | 2432 | 33 | 2472 |
| 14 | 2434 | 34 | 2474 |
| 15 | 2436 | 35 | 2476 |
| 16 | 2438 | 36 | 2478 |
| 17 | 2440 | 39 | 2480 |

Note: the marked frequencies are determined for final testing.

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2.6 Transmit operating modes

The EUT uses GFSK modulation and may provide following data rates:

- 1000 kbps

(kbps = *kilobits per second*)

2.7 Antennas

The following antennas shall be used with the EUT:

The EUT has only an integrated PCB antenna, no external antenna shall be connected. For conducted measurements a special test sample with a temporary antenna connector has been prepared by the manufacturer. The following antenna is printed on the PCB:

| Type | Model number | Frequency range (GHz) | Peak gain (dBi) |
|----------------------------|--------------|--------------------------|--------------------|
| 2.4 GHz Inverted F Antenna | DN0007 | 2.4 | 3.3 |

2.8 Power supply system utilised

Power supply voltage, V_{nom} : 12 V DC

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3 TEST RESULT SUMMARY

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 | not applicable ¹ |
| KDB 447498 | RSS 102, 2.5.1 | SAR exclusion consideration | passed |
| OET Bulletin 65 | RSS102, 3.2 | Co-location, Co-transmission | not applicable ² |

¹ N/A, separation distance is < 20 cm

² N/A, EUT incorporates only one transmitter

The mentioned RSS Rule Parts in the above table are related to:
RSS 102, Issue 5, March 2015

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 : 20 August 2019

Testing concluded on : 28 August 2019

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Willibald Probst
Radio Team

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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.

| Measurement Type | Range | Confidence Level | Calculated Uncertainty |
|-------------------------------------|------------------------|------------------|--------------------------|
| AC power line conducted emissions | 0.15 MHz to 30 MHz | 95% | ± 3.29 dB |
| EBW and OBW | 2400 MHz to 3000 MHz | 95% | $\pm 2.5 \times 10^{-7}$ |
| Maximum peak conducted output power | 2400 MHz to 3000 MHz | 95% | ± 0.62 dB |
| Power spectral density | 2400 MHz to 3000 MHz | 95% | ± 0.62 dB |
| Conducted Spurious Emissions | 9 kHz to 10000 MHz | 95% | ± 2.15 dB |
| Conducted Spurious Emissions | 10000 MHz to 40000 MHz | 95% | ± 3.47 dB |
| Radiated Spurious Emissions | 9 kHz to 30 MHz | 95% | ± 3.53 dB |
| Radiated Spurious Emissions | 30 MHz to 1000 MHz | 95% | ± 3.71 dB |
| Radiated Spurious Emissions | 1000 MHz to 10000 MHz | 95% | ± 2.34 dB |
| Field strength of the fundamental | 100 kHz to 100 MHz | 95% | ± 3.53 dB |

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5 HUMAN EXPOSURE

5.1 SAR test exclusion consideration

5.1.1 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.

5.1.2 Determination of the standalone SAR test exclusion threshold

Minimum separation distance between the finger of the user (touching the "Home" button of the EUT) and the radiating structure is 7mm.

The formula under 4.3.1 1) of KDB 447498 D01 v06 for 100 MHz to 6 GHz for standalone equipment is used to calculate the 10-g SAR test exclusion threshold:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}] \leq 7.5;$$

The maximum source-based time-averaged conducted output power (rounded up to the next mW value) is according the equipment:

| | | |
|---|--------------|--------|
| Rated output power: | 5.0 dBm | 3.2 mW |
| Tune-up tolerance: | + 3 / - 3 dB | |
| Maximum output power: | 8.0 dBm | 6.3 mW |
| Maximum Duty-Cycle: | 30.0 % | |
| Duty-Cycle correction: | -5.2 dB | |
| Source-based time-averaged maximum conducted output power | 2.8 dBm | 1.9 mW |

| Channel frequency (MHz) | Output power (mW) | Threshold level | Limit 1g | Limit 10g | Margin 1g | Margin 10g |
|-------------------------|-------------------|-----------------|----------|-----------|-----------|------------|
| 2402 | 1.9 | 0.42 | 3.0 | 7.5 | -2.6 | -7.1 |
| 2440 | 1.9 | 0.42 | 3.0 | 7.5 | -2.6 | -7.1 |
| 2480 | 1.9 | 0.43 | 3.0 | 7.5 | -2.6 | -7.1 |

Conclusion: The Threshold level is much lower than the limit, SAR measurement is NOT necessary.

The requirements are **FULFILLED**.

Remarks: Maximum Duty-Cycle as given by the manufacturer has been used to calculate the source-based, time-averaged maximum conducted output power. Derivation of the maximum Duty-Cycle can be found in a separate document.

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5.2 Exemption limits for routine evaluation - SAR evaluation

5.2.1 Applicable standard

According to RSS-102, item 2.5.1:

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance 4, 5

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | At separation distance of ≤5 mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| ≤ 300 | 71 mW | 101 mW | 132 mW | 162 mW | 193 mW |
| 450 | 52 mW | 70 mW | 88 mW | 106 mW | 123 mW |
| 835 | 17 mW | 30 mW | 42 mW | 55 mW | 67 mW |
| 1900 | 7 mW | 10 mW | 18 mW | 34 mW | 60 mW |
| 2450 | 4 mW | 7 mW | 15 mW | 30 mW | 52 mW |
| 3500 | 2 mW | 6 mW | 16 mW | 32 mW | 55 mW |
| 5800 | 1 mW | 6 mW | 15 mW | 27 mW | 41 mW |

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|
| | At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of ≥50 mm |
| ≤ 300 | 223 mW | 254 mW | 284 mW | 315 mW | 345 mW |
| 450 | 141 mW | 159 mW | 88 mW | 195 mW | 213 mW |
| 835 | 80 mW | 92 mW | 177 mW | 117 mW | 130 mW |
| 1900 | 99 mW | 153 mW | 225 mW | 316 mW | 431 mW |
| 2450 | 83 mW | 123 mW | 173 mW | 235 mW | 309 mW |
| 3500 | 86 mW | 124 mW | 170 mW | 225 mW | 290 mW |
| 5800 | 56 mW | 71 mW | 85 mW | 97 mW | 106 mW |

4 The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

5 Transmitters operating between 0.003-10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in Section 4.

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5.2.2 Conclusion according RSS-102.

Minimum separation distance between the finger of the user (touching the “Home” button of the EUT) and the radiating structure is 7mm.

| | | |
|---|--------------|--------|
| Rated output power: | 5.0 dBm | 3.2 mW |
| Tune-up tolerance: | + 3 / - 3 dB | |
| Maximum output power: | 8.0 dBm | 6.3 mW |
| Maximum Duty-Cycle: | 30.0 % | |
| Duty-Cycle correction: | -5.2 dB | |
| Source-based time-averaged maximum conducted output power | 2.8 dBm | 1.9 mW |
| Antenna gain max: | 3.3 dBi | |
| Maximum EIRP: | 6.1 dBm | 4.0 mW |
| Minimum distance r: | 7.0 mm | |

Maximum output power (EIRP) at 2450 MHz: - **6.1 dBm** \triangleq **4 mW**

For the EUT is SAR measurement is NOT necessary

The requirements are **FULFILLED**.

Remarks: Maximum Duty-Cycle as given by the manufacturer has been used to calculate the source-based, time-averaged maximum e.i.r.p. Derivation of the maximum Duty-Cycle can be found in a separate document