



# EMI - TEST REPORT

- FCC Part 15B -

**Type / Model Name** : EBI 10-System (IF 100, IF 100-1, IF 150, IF 200)

**Product Description** : Wireless data logger system

**Applicant** : Xylem Analytics Germany GmbH

**Address** : Dr. Karl-Slevogt-Str. 1

82362 Weilheim, Germany

**Manufacturer** : Xylem Analytics Germany GmbH

**Address** : Dr. Karl-Slevogt-Str. 1

82362 Weilheim, Germany

**Licence holder** : Xylem Analytics Germany GmbH

**Address** : Dr. Karl-Slevogt-Str. 1

82362 Weilheim, Germany

|  |                 |
|--|-----------------|
| <b>Test Result</b> according to the standards listed in clause 1 test standards: | <b>POSITIVE</b> |
|--|-----------------|

|  |                                  |
|--|----------------------------------|
| <b>Test Report No. :</b> <b>T40058-00-03HU</b> | 01. August 2016<br>Date of issue |
|--|----------------------------------|



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.

# Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b><u>TEST STANDARDS</u></b>                                      | <b>3</b>  |
| <b>2</b> | <b><u>SUMMARY</u></b>   | <b>4</b>  |
| <b>3</b> | <b><u>EQUIPMENT UNDER TEST</u></b>                                | <b>6</b>  |
| 3.1      | Photo documentation of the EUT – Detailed photos see Attachment A | 6         |
| 3.2      | Power supply system utilised                                      | 6         |
| 3.3      | Short description of the equipment under test (EUT)               | 6         |
| <b>4</b> | <b><u>TEST ENVIRONMENT</u></b>                                    | <b>7</b>  |
| 4.1      | Address of the test laboratory                                    | 7         |
| 4.2      | Statement regarding the usage of logos in test reports            | 7         |
| 4.3      | Environmental conditions  | 7         |
| 4.4      | Statement of the measurement uncertainty                          | 7         |
| 4.5      | Measurement Protocol for FCC, VCCI and AUSTEL                     | 8         |
| 4.6      | Determination of worst case measurement conditions                | 8         |
| <b>5</b> | <b><u>TEST CONDITIONS AND RESULTS</u></b>                         | <b>9</b>  |
| 5.1      | Conducted emissions   | 9         |
| 5.2      | Radiated emissions  | 19        |
| <b>6</b> | <b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>                 | <b>22</b> |



## 2 SUMMARY

### GENERAL REMARKS:

The EuT is capable to exchange data with a PC via Data cable USB.

This test report describes the radiated and conducted disturbance produced by the data transfer via Data cable and the LapTop.

For detailed information about the Equipment under test please refer to the user manual.  
The EuT is declared as Class B digital device.

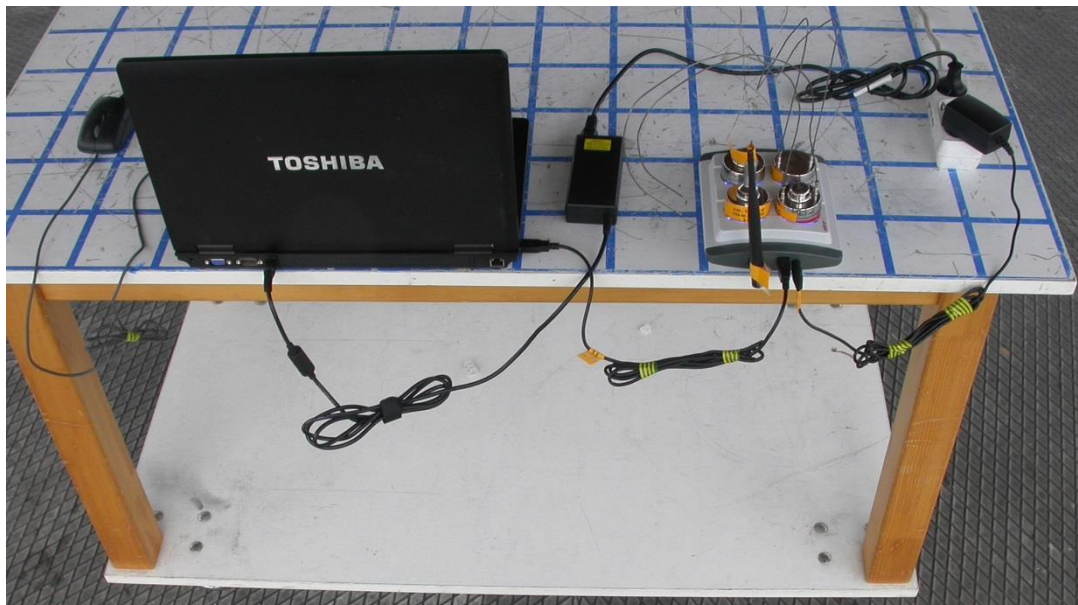
The wireless data logger system consist of a RFID base station and EBI dataloggers which were working at 13.56 MHz. The test was performed as a complete system (base station EBI IF 200 and 4 dataloggers).

- Variants of the system:

| Variant | Device-Name  | Comment            | Antenna    |
|---------|--------------|--------------------|------------|
| I01     | IF200        | programming unit   | external   |
| I02     | IF100        | programming unit   | integrated |
| I03     | IF150        | programming unit   | integrated |
| T01     | EBI 10-Txxx  | temperature sensor | integrated |
| T02     | EBI 10-THxxx | humidity sensor    | integrated |
| T03     | EBI 10-TPxxx | pressure sensor    | integrated |

For testing, the base station and the logger are set in TX-continuous mode. The test software is available for testing only. Radiated tests are performed with base station and logger set in TX-continuous mode.

Test setup:



**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 : 02. May 2016

Testing concluded on : 12. May 2016

Checked by:



Thomas Weise  
I confirm the correctness  
and integrity of this  
document  
2016.08.04 09:44:43  
+02'00'

---

Thomas Weise  
Laboratory Manager

Tested by:



Markus Huber  
I'm the author of  
this document  
2016.08.01  
16:09:54 +02'00'

---

Markus Huber

### 3 EQUIPMENT UNDER TEST

#### 3.1 Photo documentation of the EUT – Detailed photos see Attachment A

#### 3.2 Power supply system utilised

Power supply voltage : 100-240 V / 50-60 Hz / 1 $\phi$ , 6-15 V DC

#### 3.3 Short description of the equipment under test (EUT)

Data logging system for temperature and pressure. The system consists of a fixed base station and one up to 4 mobile data logger (EBI10 Series, EBI100 Series). The base station identifies a logger in the programming slot via 13.56 MHz RFID-Transceiver. The mobile data logger has a RFID-Tag only. A 2.4 GHz "ZIGBEE" port (Chipset according IEEE 802.15.4) is used for data exchange, communication and programming the data logger. The power supply as stand alone system is normally via USB, cascaded up to max. 3 systems the 15 V DC power supply have to be used.

Number of tested samples: 1 System  
Serial number: Prototype

The equipment under test was operated during the measurement under the following conditions:

- Data download via Data Cable USB

---

-

---

-

---

#### EUT configuration:

The following peripheral devices and interface cables were connected during the measurements:

- |                            |  |
|----------------------------|--|
| - <u>Test software</u>     | Model : <u>Supplied by manufacturer</u>          |
| - <u>LapTop</u>            | Model : <u>Supplied by CSA Group Bayern GmbH</u> |
| - _____                    | Model : _____                                    |
| - _____                    | Model : _____                                    |
| - _____                    | Model : _____                                    |
| - _____                    | Model : _____                                    |
| - _____                    | Model : _____                                    |
| - _____                    | Model : _____                                    |
| - _____                    | Model : _____                                    |
| - customer specific cables |  |

## **4 TEST ENVIRONMENT**

### **4.1 Address of the test laboratory**

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

### **4.2 Statement regarding the usage of logos in test reports**

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

### **4.3 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

### **4.4 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.

## 4.5 Measurement Protocol for FCC, VCCI and AUSTEL

### 4.5.1 GENERAL INFORMATION

#### 4.5.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.10: 2009, Testing Unlicensed Wireless Devices."

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.

#### 4.5.1.2 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 in order to obtain maximum disturbances from the unit.

## 4.6 Determination of worst case measurement conditions

- - NONE -

### 4.6.1 DETAILS OF TEST PROCEDURES

#### 4.6.1.1 General Standard Information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

## 5 TEST CONDITIONS AND RESULTS

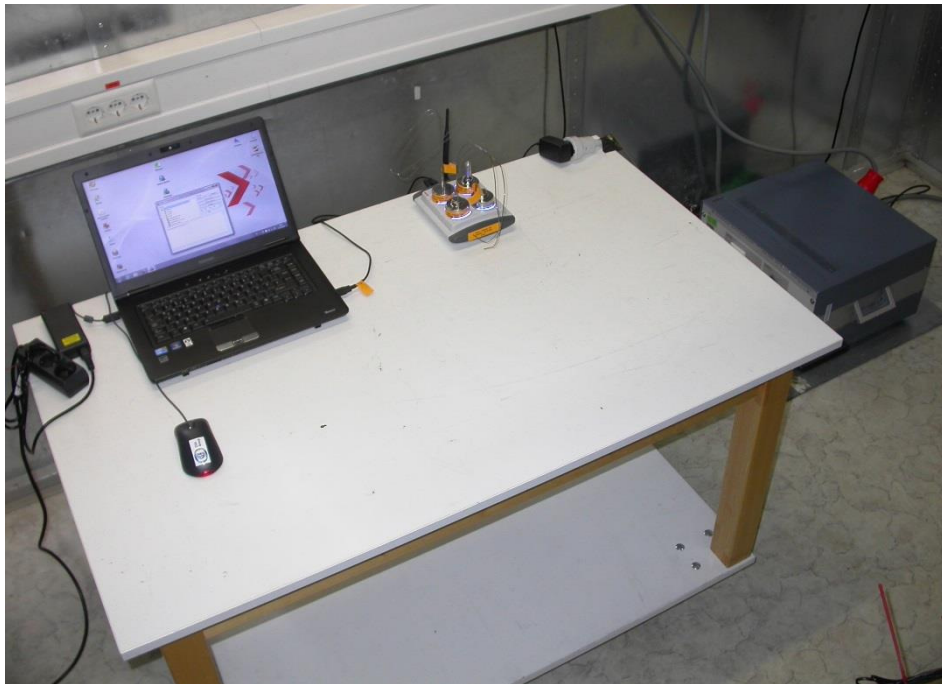
### 5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

#### 5.1.1 Description of the test location

Test location:                   Shielded Room S2

#### 5.1.2 Photo documentation of the test set-up



#### 5.1.3 Applicable standard

According to FCC Part 15B, Section 15.107(a):

Except as shown in paragraphs (b) and (c) of this Section, for an unintentional radiator that is designed to be connected to the public utility AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of emission<br>(MHz) | Conducted limit (dB $\mu$ V) |            |
|--------------------------------|------------------------------|------------|
|                                | Quasi-peak                   | Average    |
| 0.15-0.5                       | 66 to 56 *                   | 56 to 46 * |
| 0.5-5                          | 56                           | 46         |
| 5-30                           | 60                           | 50         |

\* Decreases with the logarithm of the frequency

#### 5.1.4 Description of Measurement

The correction factors for cable loss and antenna gain are stored in the memory of the EMI receiver therefore the final level (dB $\mu$ V) appears directly in the reading of the EMI receiver. This level is compared to the FCC limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50 $\Omega$ /50  $\mu$ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

#### 5.1.5 Test result

|                   |                       |
|-------------------|-----------------------|
| Frequency range:  | 0.15 MHz - 30 MHz     |
| Min. limit margin | 19.59 dB at 0.498 MHz |

The requirements are **FULFILLED**.

Remarks:

---

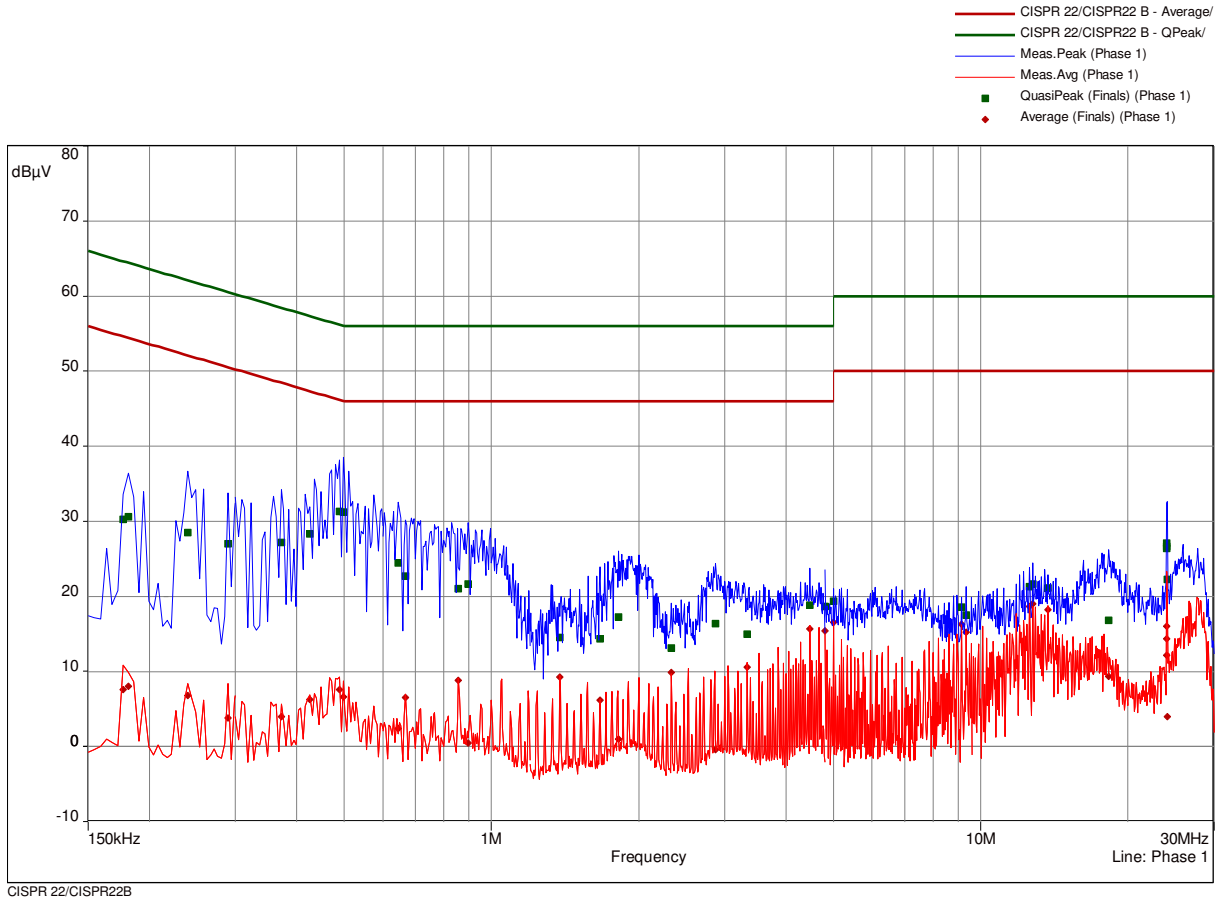
---

---

### 5.1.6 Test protocol

Test point: L1  
 Operation mode: Connection via USB – all ports are filled  
 Remarks:

Result: Passed

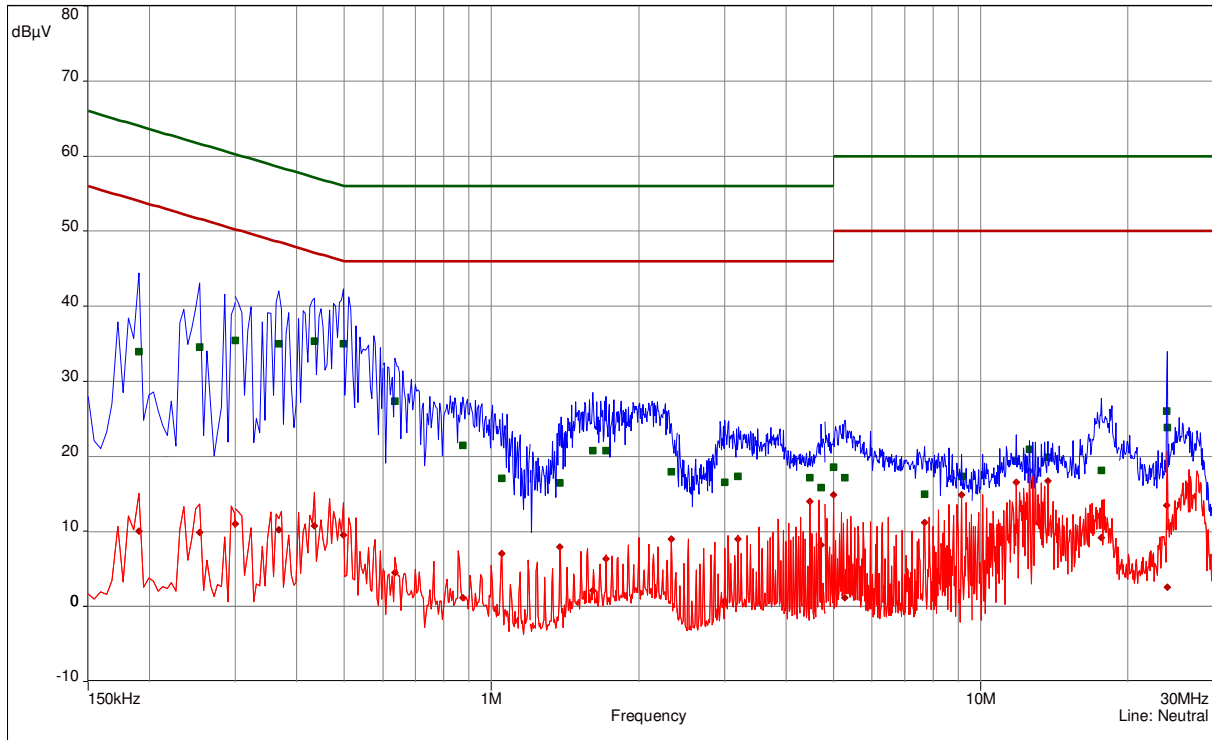


| freq    | SR | QP           | margin | limit | AV           | margin | limit | line    | corr  |
|---------|----|--------------|--------|-------|--------------|--------|-------|---------|-------|
| MHz     |    | dB( $\mu$ V) | dB     | dB    | dB( $\mu$ V) | dB     | dB    |         | dB    |
| 0.177   | 1  | 30.24        | 34.38  | 64.63 | 7.60         | 47.02  | 54.63 | Phase 1 | 9.84  |
| 0.1815  | 1  | 30.66        | 33.76  | 64.42 | 8.04         | 46.38  | 54.42 | Phase 1 | 9.84  |
| 0.24    | 1  | 28.49        | 33.60  | 62.10 | 6.80         | 45.29  | 52.10 | Phase 1 | 9.83  |
| 0.2895  | 1  | 27.02        | 33.52  | 60.54 | 3.82         | 46.72  | 50.54 | Phase 1 | 9.82  |
| 0.372   | 2  | 27.20        | 31.26  | 58.46 | 3.97         | 44.48  | 48.46 | Phase 1 | 9.81  |
| 0.426   | 2  | 28.29        | 29.04  | 57.33 | 6.24         | 41.09  | 47.33 | Phase 1 | 9.81  |
| 0.489   | 2  | 31.29        | 24.89  | 56.18 | 7.60         | 38.59  | 46.18 | Phase 1 | 9.82  |
| 0.498   | 2  | 31.25        | 24.78  | 56.03 | 6.58         | 39.45  | 46.03 | Phase 1 | 9.82  |
| 0.645   | 3  | 24.49        | 31.51  | 56.00 | 2.39         | 43.61  | 46.00 | Phase 1 | 9.81  |
| 0.6675  | 3  | 22.70        | 33.30  | 56.00 | 6.55         | 39.45  | 46.00 | Phase 1 | 9.81  |
| 0.8565  | 3  | 21.07        | 34.93  | 56.00 | 8.86         | 37.14  | 46.00 | Phase 1 | 9.81  |
| 0.897   | 3  | 21.66        | 34.34  | 56.00 | 0.46         | 45.54  | 46.00 | Phase 1 | 9.81  |
| 1.38    | 4  | 14.52        | 41.48  | 56.00 | 9.27         | 36.73  | 46.00 | Phase 1 | 9.79  |
| 1.668   | 4  | 14.36        | 41.64  | 56.00 | 6.16         | 39.84  | 46.00 | Phase 1 | 9.79  |
| 1.8165  | 4  | 17.21        | 38.79  | 56.00 | 1.00         | 45.00  | 46.00 | Phase 1 | 9.80  |
| 2.334   | 4  | 13.12        | 42.88  | 56.00 | 9.83         | 36.17  | 46.00 | Phase 1 | 9.79  |
| 2.868   | 5  | 16.40        | 39.60  | 56.00 | -0.40        | 46.40  | 46.00 | Phase 1 | 9.79  |
| 3.336   | 5  | 14.93        | 41.07  | 56.00 | 10.54        | 35.46  | 46.00 | Phase 1 | 9.81  |
| 4.479   | 5  | 18.86        | 37.14  | 56.00 | 15.71        | 30.29  | 46.00 | Phase 1 | 9.81  |
| 4.809   | 6  | 18.63        | 37.37  | 56.00 | 15.43        | 30.57  | 46.00 | Phase 1 | 9.82  |
| 5.0025  | 6  | 19.35        | 40.65  | 60.00 | 16.56        | 33.44  | 50.00 | Phase 1 | 9.82  |
| 9.147   | 6  | 18.57        | 41.43  | 60.00 | 16.29        | 33.71  | 50.00 | Phase 1 | 9.87  |
| 9.336   | 6  | 17.52        | 42.48  | 60.00 | 15.21        | 34.79  | 50.00 | Phase 1 | 9.88  |
| 12.5745 | 7  | 21.32        | 38.68  | 60.00 | 18.66        | 31.34  | 50.00 | Phase 1 | 10.00 |
| 12.7635 | 7  | 21.67        | 38.33  | 60.00 | 18.98        | 31.02  | 50.00 | Phase 1 | 10.01 |
| 13.7175 | 7  | 21.16        | 38.84  | 60.00 | 18.20        | 31.80  | 50.00 | Phase 1 | 10.05 |
| 18.258  | 7  | 16.77        | 43.23  | 60.00 | 9.31         | 40.69  | 50.00 | Phase 1 | 10.25 |
| 23.997  | 8  | 27.10        | 32.90  | 60.00 | 14.35        | 35.65  | 50.00 | Phase 1 | 10.34 |
| 24.0015 | 8  | 26.63        | 33.37  | 60.00 | 12.19        | 37.81  | 50.00 | Phase 1 | 10.34 |
| 24.006  | 8  | 26.43        | 33.57  | 60.00 | 16.00        | 34.00  | 50.00 | Phase 1 | 10.34 |
| 24.0555 | 8  | 22.29        | 37.71  | 60.00 | 4.03         | 45.97  | 50.00 | Phase 1 | 10.34 |

Test point: N  
 Operation mode: Connection via USB – all ports are filled  
 Remarks:

Result: Passed

- CISPR 22/CISPR22 B - Average/
- CISPR 22/CISPR22 B - QPeak/
- Meas.Peak (Neutral)
- Meas.Avg (Neutral)
- QuasiPeak (Finals) (Neutral)
- ◆ Average (Finals) (Neutral)

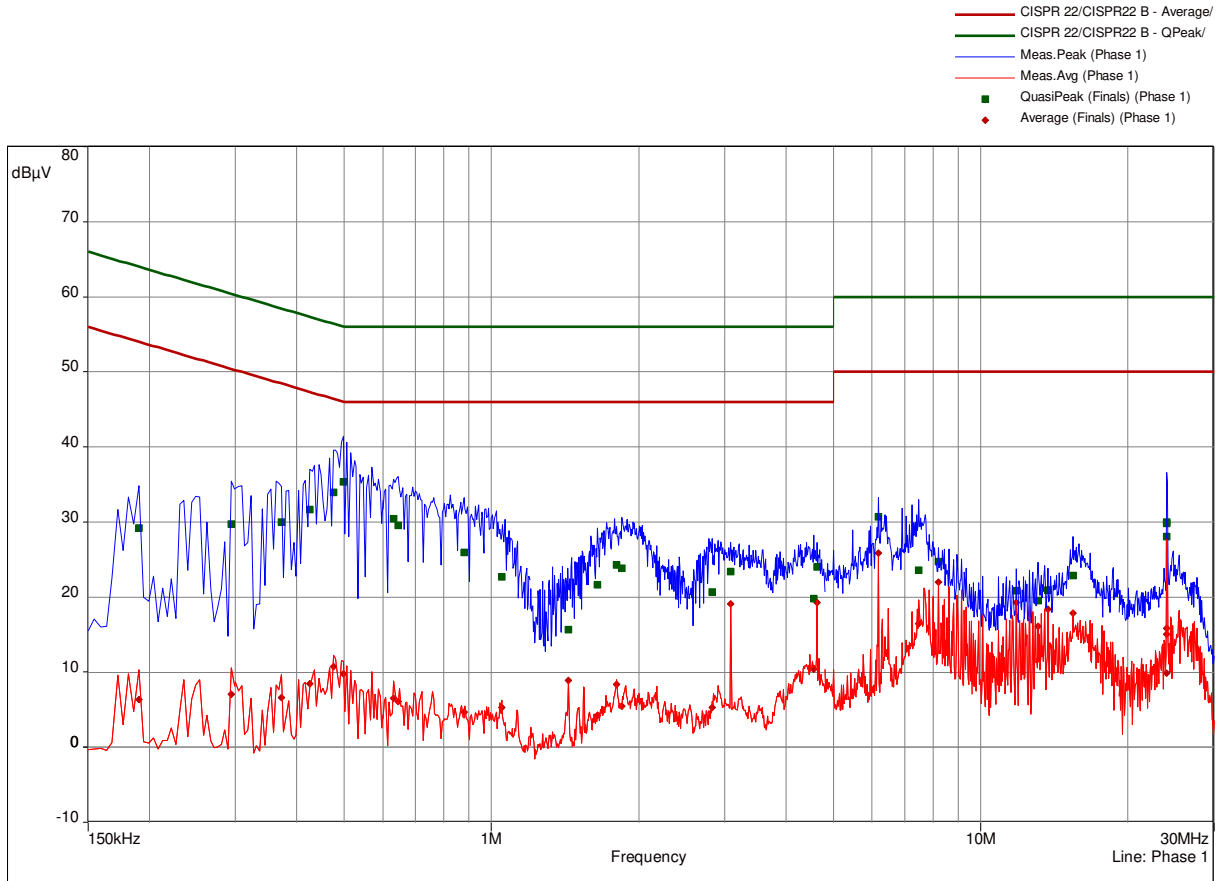


CISPR 22/CISPR22B

| freq<br>MHz | SR | QP<br>dB( $\mu$ V) | margin<br>dB | limit<br>dB | AV<br>dB( $\mu$ V) | margin<br>dB | limit<br>dB | line    | corr<br>dB |
|-------------|----|--------------------|--------------|-------------|--------------------|--------------|-------------|---------|------------|
| 0.1905      | 9  | 33.96              | 30.05        | 64.01       | 10.01              | 44.01        | 54.01       | Neutral | 9.85       |
| 0.2535      | 9  | 34.55              | 27.09        | 61.64       | 9.88               | 41.76        | 51.64       | Neutral | 9.84       |
| 0.3         | 10 | 35.48              | 24.76        | 60.24       | 11.03              | 39.21        | 50.24       | Neutral | 9.82       |
| 0.3675      | 10 | 35.03              | 23.52        | 58.56       | 10.23              | 38.33        | 48.56       | Neutral | 9.81       |
| 0.435       | 10 | 35.37              | 21.78        | 57.16       | 10.78              | 36.38        | 47.16       | Neutral | 9.82       |
| 0.498       | 10 | 35.00              | 21.03        | 56.03       | 9.52               | 36.51        | 46.03       | Neutral | 9.82       |
| 0.636       | 11 | 27.38              | 28.62        | 56.00       | 4.51               | 41.49        | 46.00       | Neutral | 9.81       |
| 0.8745      | 11 | 21.45              | 34.55        | 56.00       | 1.19               | 44.81        | 46.00       | Neutral | 9.81       |
| 1.05        | 11 | 17.05              | 38.95        | 56.00       | 7.08               | 38.92        | 46.00       | Neutral | 9.81       |
| 1.38        | 12 | 16.50              | 39.50        | 56.00       | 7.96               | 38.04        | 46.00       | Neutral | 9.79       |
| 1.614       | 12 | 20.80              | 35.20        | 56.00       | 2.10               | 43.90        | 46.00       | Neutral | 9.79       |
| 1.7175      | 12 | 20.81              | 35.19        | 56.00       | 6.40               | 39.60        | 46.00       | Neutral | 9.79       |
| 2.334       | 12 | 17.92              | 38.08        | 56.00       | 9.03               | 36.97        | 46.00       | Neutral | 9.79       |
| 2.994       | 13 | 16.58              | 39.42        | 56.00       | 0.75               | 45.25        | 46.00       | Neutral | 9.79       |
| 3.192       | 13 | 17.36              | 38.64        | 56.00       | 9.00               | 37.00        | 46.00       | Neutral | 9.80       |
| 4.479       | 13 | 17.20              | 38.80        | 56.00       | 14.00              | 32.00        | 46.00       | Neutral | 9.80       |
| 4.713       | 13 | 15.86              | 40.14        | 56.00       | 8.19               | 37.81        | 46.00       | Neutral | 9.81       |
| 5.0025      | 14 | 18.56              | 41.44        | 60.00       | 14.89              | 35.11        | 50.00       | Neutral | 9.81       |
| 5.2815      | 14 | 17.16              | 42.84        | 60.00       | 1.20               | 48.80        | 50.00       | Neutral | 9.81       |
| 7.671       | 14 | 14.95              | 45.05        | 60.00       | 11.17              | 38.83        | 50.00       | Neutral | 9.81       |
| 9.147       | 14 | 17.36              | 42.64        | 60.00       | 14.84              | 35.16        | 50.00       | Neutral | 9.81       |
| 11.814      | 15 | 19.34              | 40.66        | 60.00       | 16.52              | 33.48        | 50.00       | Neutral | 9.85       |
| 12.5745     | 15 | 20.92              | 39.08        | 60.00       | 18.03              | 31.97        | 50.00       | Neutral | 9.87       |
| 13.7175     | 15 | 19.89              | 40.11        | 60.00       | 16.71              | 33.29        | 50.00       | Neutral | 9.90       |
| 17.628      | 15 | 18.15              | 41.85        | 60.00       | 9.20               | 40.80        | 50.00       | Neutral | 10.02      |
| 23.9745     | 16 | 26.01              | 33.99        | 60.00       | 13.51              | 36.49        | 50.00       | Neutral | 9.96       |
| 24.0915     | 16 | 23.82              | 36.18        | 60.00       | 2.60               | 47.40        | 50.00       | Neutral | 9.96       |

Test point L1  
 Operation mode: Connection via USB – all ports are free  
 Remarks:

Result: Passed

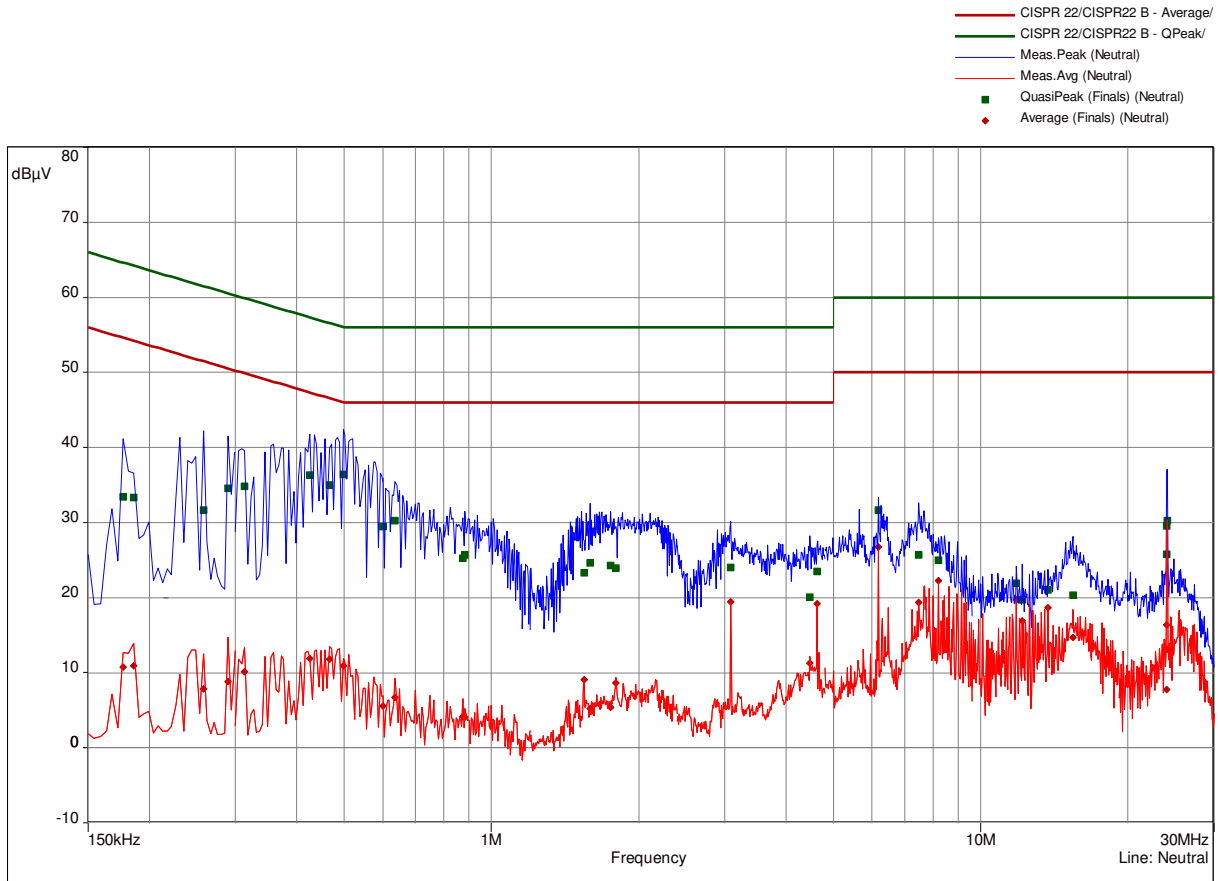


CISPR 22/CISPR22B

| freq    | SR | QP           | margin | limit | AV           | margin | limit | line    | corr  |
|---------|----|--------------|--------|-------|--------------|--------|-------|---------|-------|
| MHz     |    | dB( $\mu$ V) | dB     | dB    | dB( $\mu$ V) | dB     | dB    |         | dB    |
| 0.1905  | 1  | 29.22        | 34.79  | 64.01 | 6.39         | 47.62  | 54.01 | Phase 1 | 9.83  |
| 0.294   | 1  | 29.76        | 30.65  | 60.41 | 7.05         | 43.36  | 50.41 | Phase 1 | 9.82  |
| 0.372   | 2  | 29.97        | 28.48  | 58.46 | 6.58         | 41.87  | 48.46 | Phase 1 | 9.81  |
| 0.426   | 2  | 31.63        | 25.70  | 57.33 | 8.47         | 38.86  | 47.33 | Phase 1 | 9.81  |
| 0.4755  | 2  | 33.98        | 22.44  | 56.42 | 10.76        | 35.66  | 46.42 | Phase 1 | 9.82  |
| 0.498   | 2  | 35.37        | 20.66  | 56.03 | 9.80         | 36.24  | 46.03 | Phase 1 | 9.82  |
| 0.6315  | 3  | 30.41        | 25.59  | 56.00 | 6.52         | 39.48  | 46.00 | Phase 1 | 9.82  |
| 0.645   | 3  | 29.53        | 26.47  | 56.00 | 6.10         | 39.90  | 46.00 | Phase 1 | 9.81  |
| 0.879   | 3  | 25.93        | 30.07  | 56.00 | 4.72         | 41.28  | 46.00 | Phase 1 | 9.81  |
| 1.05    | 3  | 22.69        | 33.31  | 56.00 | 5.32         | 40.68  | 46.00 | Phase 1 | 9.81  |
| 1.4385  | 4  | 15.66        | 40.34  | 56.00 | 8.92         | 37.08  | 46.00 | Phase 1 | 9.79  |
| 1.6455  | 4  | 21.61        | 34.39  | 56.00 | 4.26         | 41.74  | 46.00 | Phase 1 | 9.79  |
| 1.803   | 4  | 24.29        | 31.71  | 56.00 | 8.36         | 37.64  | 46.00 | Phase 1 | 9.80  |
| 1.848   | 4  | 23.80        | 32.20  | 56.00 | 5.50         | 40.50  | 46.00 | Phase 1 | 9.80  |
| 2.823   | 5  | 20.71        | 35.29  | 56.00 | 5.33         | 40.67  | 46.00 | Phase 1 | 9.79  |
| 3.0885  | 5  | 23.37        | 32.63  | 56.00 | 19.06        | 26.94  | 46.00 | Phase 1 | 9.80  |
| 4.56    | 5  | 19.78        | 36.22  | 56.00 | 10.40        | 35.60  | 46.00 | Phase 1 | 9.81  |
| 4.632   | 5  | 24.04        | 31.96  | 56.00 | 19.23        | 26.77  | 46.00 | Phase 1 | 9.81  |
| 6.177   | 6  | 30.74        | 29.26  | 60.00 | 25.87        | 24.13  | 50.00 | Phase 1 | 9.83  |
| 7.473   | 6  | 23.58        | 36.42  | 60.00 | 16.44        | 33.56  | 50.00 | Phase 1 | 9.85  |
| 8.193   | 6  | 24.76        | 35.24  | 60.00 | 22.03        | 27.97  | 50.00 | Phase 1 | 9.86  |
| 11.814  | 7  | 20.88        | 39.12  | 60.00 | 19.25        | 30.75  | 50.00 | Phase 1 | 9.96  |
| 13.101  | 7  | 19.56        | 40.44  | 60.00 | 16.10        | 33.90  | 50.00 | Phase 1 | 10.02 |
| 13.7175 | 7  | 20.90        | 39.10  | 60.00 | 18.38        | 31.62  | 50.00 | Phase 1 | 10.05 |
| 15.4365 | 7  | 22.86        | 37.14  | 60.00 | 17.87        | 32.13  | 50.00 | Phase 1 | 10.13 |
| 23.9835 | 8  | 28.09        | 31.91  | 60.00 | 9.83         | 40.17  | 50.00 | Phase 1 | 10.34 |
| 23.988  | 8  | 29.82        | 30.18  | 60.00 | 15.86        | 34.14  | 50.00 | Phase 1 | 10.34 |
| 24.0105 | 8  | 30.02        | 29.98  | 60.00 | 15.02        | 34.98  | 50.00 | Phase 1 | 10.34 |

Test point N  
 Operation mode: Connection via USB – all ports are free  
 Remarks:

Result: Passed



CISPR 22/CISPR22B

| freq<br>MHz | SR | QP<br>dB( $\mu$ V) | margin<br>dB | limit<br>dB | AV<br>dB( $\mu$ V) | margin<br>dB | limit<br>dB | line    | corr<br>dB |
|-------------|----|--------------------|--------------|-------------|--------------------|--------------|-------------|---------|------------|
| 0.177       | 9  | 33.47              | 31.16        | 64.63       | 10.75              | 43.88        | 54.63       | Neutral | 9.85       |
| 0.186       | 9  | 33.29              | 30.92        | 64.21       | 10.90              | 43.31        | 54.21       | Neutral | 9.85       |
| 0.258       | 9  | 31.68              | 29.81        | 61.50       | 7.84               | 43.66        | 51.50       | Neutral | 9.83       |
| 0.2895      | 9  | 34.53              | 26.01        | 60.54       | 8.77               | 41.77        | 50.54       | Neutral | 9.82       |
| 0.3135      | 10 | 34.79              | 25.09        | 59.88       | 10.12              | 39.76        | 49.88       | Neutral | 9.82       |
| 0.426       | 10 | 36.35              | 20.98        | 57.33       | 11.87              | 35.46        | 47.33       | Neutral | 9.81       |
| 0.4665      | 10 | 34.98              | 21.59        | 56.58       | 11.82              | 34.76        | 46.58       | Neutral | 9.82       |
| 0.498       | 10 | 36.45              | 19.59        | 56.03       | 10.90              | 35.13        | 46.03       | Neutral | 9.82       |
| 0.6         | 11 | 29.45              | 26.55        | 56.00       | 5.57               | 40.43        | 46.00       | Neutral | 9.82       |
| 0.636       | 11 | 30.26              | 25.74        | 56.00       | 6.67               | 39.33        | 46.00       | Neutral | 9.81       |
| 0.8745      | 11 | 25.22              | 30.78        | 56.00       | 4.16               | 41.84        | 46.00       | Neutral | 9.81       |
| 0.8835      | 11 | 25.66              | 30.34        | 56.00       | 4.11               | 41.89        | 46.00       | Neutral | 9.81       |
| 1.5465      | 12 | 23.30              | 32.70        | 56.00       | 9.09               | 36.91        | 46.00       | Neutral | 9.78       |
| 1.5915      | 12 | 24.62              | 31.38        | 56.00       | 5.19               | 40.81        | 46.00       | Neutral | 9.79       |
| 1.7535      | 12 | 24.31              | 31.69        | 56.00       | 5.40               | 40.60        | 46.00       | Neutral | 9.79       |
| 1.7985      | 12 | 23.97              | 32.03        | 56.00       | 8.60               | 37.40        | 46.00       | Neutral | 9.79       |
| 3.0885      | 13 | 24.03              | 31.97        | 56.00       | 19.45              | 26.55        | 46.00       | Neutral | 9.79       |
| 4.4745      | 13 | 20.09              | 35.91        | 56.00       | 11.31              | 34.69        | 46.00       | Neutral | 9.80       |
| 4.632       | 13 | 23.50              | 32.50        | 56.00       | 19.20              | 26.80        | 46.00       | Neutral | 9.81       |
| 6.177       | 14 | 31.65              | 28.35        | 60.00       | 26.72              | 23.28        | 50.00       | Neutral | 9.81       |
| 7.4775      | 14 | 25.67              | 34.33        | 60.00       | 19.35              | 30.65        | 50.00       | Neutral | 9.81       |
| 8.193       | 14 | 24.98              | 35.02        | 60.00       | 22.26              | 27.74        | 50.00       | Neutral | 9.81       |
| 11.814      | 15 | 21.87              | 38.13        | 60.00       | 19.69              | 30.31        | 50.00       | Neutral | 9.85       |
| 12.147      | 15 | 19.75              | 40.25        | 60.00       | 16.93              | 33.07        | 50.00       | Neutral | 9.87       |
| 13.7175     | 15 | 21.06              | 38.94        | 60.00       | 18.62              | 31.38        | 50.00       | Neutral | 9.90       |
| 15.4545     | 15 | 20.29              | 39.71        | 60.00       | 14.70              | 35.30        | 50.00       | Neutral | 9.95       |
| 23.9655     | 16 | 25.82              | 34.18        | 60.00       | 7.73               | 42.27        | 50.00       | Neutral | 9.96       |
| 23.988      | 16 | 29.59              | 30.41        | 60.00       | 16.41              | 33.59        | 50.00       | Neutral | 9.96       |
| 24.033      | 16 | 30.26              | 29.74        | 60.00       | 13.09              | 36.91        | 50.00       | Neutral | 9.96       |

## 5.2 Radiated emissions

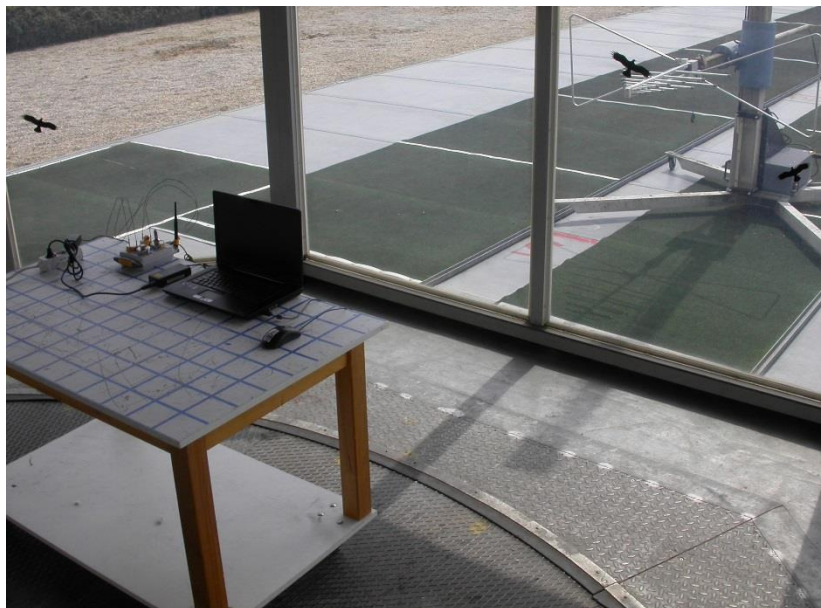
For test instruments and accessories used see section 6 Part **SER 1**, **SER 2**.

### 5.2.1 Description of the test location

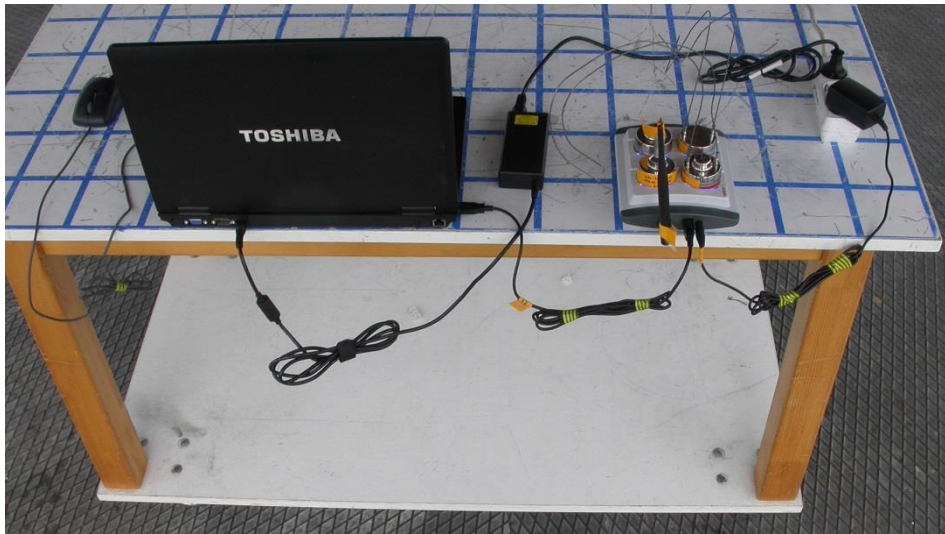
Test location: OATS1

Test distance: 3 metres

### 5.2.2 Photo documentation of the test set-up



Test setup:



### 5.2.3 Applicable standard

According to FCC Part 15B, Section 15.109 (a):

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

### 5.2.4 Description of Measurement

The spurious emissions from the EUT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3, 10 or 30 m horizontally from the EUT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31(f)(2). The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209(d)(2).

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 dB( $\mu$ V/m) non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with horizontal and vertical antenna polarization and the EUT is rotated 360 degrees.

The resolution bandwidth during the measurement is as following:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

30 MHz – 1000 MHz: RBW: 120 kHz

### 5.2.5 Test result

| Frequency [kHz] | L: QP [dBµV] | L: AV [dBµV] | Bandwidth [kHz] | Correct. [dB] | L: QP [dBµV/m] | L: AV [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|-----------------|--------------|--------------|-----------------|---------------|----------------|----------------|----------------|------------|
| 536.8           | 24.1         | 19.7         | 9.0             | 20            | 44.1           | 39.7           | 73.0           | -33.3      |
| 1073.6          | 23.4         | 18.0         | 9.0             | 20            | 43.4           | 38.0           | 67.0           | -29.0      |
| 1342.0          | 21.6         | 15.9         | 9.0             | 20            | 41.6           | 35.9           | 65.0           | -29.1      |

| Frequency [MHz] | L: QP [dBµV] | Correct. [dB] | L: QP [dBµV/m] | Limit [dBµV/m] | Delta [dB] |
|-----------------|--------------|---------------|----------------|----------------|------------|
| 33.78           | 3.7          | 13.4          | 17.1           | 40.0           | -22.9      |
| 118.54          | 9.3          | 12.9          | 22.2           | 43.5           | -21.3      |
| 517.43          | 4.8          | 21.9          | 26.7           | 46.0           | -19.3      |

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.  
Only ambient noises could be detected!

Limit according to FCC Part 15 Subpart 15.209(a):

| Frequency (MHz)    | Field strength of spurious emissions |          | Measurement distance (metres) |
|--------------------|--------------------------------------|----------|-------------------------------|
|                    | (µV/m)                               | dB(µV/m) |                               |
| <b>0.009-0.490</b> | <b>2400/F(kHz)</b>                   | --       | <b>300</b>                    |
| 0.490-1.705        | 24000/F (kHz)                        | --       | 30                            |
| 1.705-30.0         | 30                                   | 29.5     | 30                            |

Limit according to FCC part 15B, Section 15.109(a):

| Frequency (MHz) | Limit (µV/m) | Limit dB(µV/m) |
|-----------------|--------------|----------------|
| 30 - 88         | 100          | 40             |
| 88 - 216        | 150          | 43.5           |
| 216 - 960       | 200          | 46             |
| Above 960       | 500          | 54             |

The requirements are **FULFILLED**.

**Remarks:** The measurement was performed according to FCC Part 15A, Section 15.33(b), up to 1 GHz.

## **6 USED TEST EQUIPMENT AND ACCESSORIES**

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

| <b>Test ID</b> | <b>Model Type</b>      | <b>Equipment No.</b> | <b>Next Calib.</b> | <b>Last Calib.</b> | <b>Next Verif.</b> | <b>Last Verif.</b> |
|----------------|------------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| A 4            | ESHS 30                | 02-02/03-05-002      | 17/07/2016         | 17/07/2015         |                    |                    |
|                | ESH 2 - Z 5            | 02-02/20-05-004      | 26/10/2017         | 26/10/2015         | 21/07/2016         | 21/01/2016         |
|                | N-4000-BNC             | 02-02/50-05-138      |                    |                    |                    |                    |
|                | N-1500-N               | 02-02/50-05-140      |                    |                    |                    |                    |
|                | ESH 3 - Z 2            | 02-02/50-05-155      | 06/11/2016         | 06/11/2015         | 21/09/2016         | 21/03/2016         |
|                | SP 103 /3.5-60         | 02-02/50-05-182      |                    |                    |                    |                    |
| SER 1          | FMZB 1516              | 01-02/24-01-018      |                    |                    | 21/01/2017         | 21/01/2016         |
|                | ESCI                   | 02-02/03-05-004      | 17/09/2016         | 17/09/2015         |                    |                    |
|                | KK-EF393-21N-16        | 02-02/50-05-033      |                    |                    |                    |                    |
|                | NW-2000-NB             | 02-02/50-05-113      |                    |                    |                    |                    |
| SER 2          | ESVS 30                | 02-02/03-05-003      | 09/07/2016         | 09/07/2015         |                    |                    |
|                | VULB 9168              | 02-02/24-05-005      | 20/04/2017         | 20/04/2016         | 20/10/2016         | 20/04/2016         |
|                | NW-2000-NB             | 02-02/50-05-113      |                    |                    |                    |                    |
|                | KK-EF393/U-16N-21N20 m | 02-02/50-12-018      |                    |                    |                    |                    |
|                | KK-SD_7/8-2X21N-33,0M  | 02-02/50-15-028      |                    |                    |                    |                    |