



FCC ID: NDX-ISOMAXV

## EMI -- TEST REPORT

- FCC Part 15B -

<b>Test Report No. :</b>	<b>T32620-00-06HU</b>	24. July 2008
		Date of issue

**Type / Model Name** : ISOMAX V

**Product Description** : Handheld Reader

**Applicant** : Datamars SA

**Address** : Via ai Prati

CH – 6930 Bedano

**Manufacturer** : Datamars SA

**Address** : Via ai Prati

CH – 6930 Bedano

**Licence holder** : Datamars SA

**Address** : Via ai Prati

CH – 6930 Bedano

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



DAT-P-207/05-00

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>2</b>
<b>2</b>	<b><u>SUMMARY</u></b>	<b>2</b>
<b>3</b>	<b><u>EQUIPMENT UNDER TEST</u></b>	<b>2</b>
3.1	Photo documentation of the EUT – Detailed photos see Attachment A	2
3.2	Power supply system utilised	2
3.3	Short description of the Equipment under Test (EuT)	2
<b>4</b>	<b><u>TEST ENVIRONMENT</u></b>	<b>2</b>
4.1	Address of the test laboratory	2
4.2	Environmental conditions	2
4.3	Statement of the measurement uncertainty	2
4.4	Measurement Protocol for FCC, VCCI and AUSTEL	2
4.5	Determination of worst case measurement conditions	2
<b>5</b>	<b><u>TEST CONDITIONS AND RESULTS</u></b>	<b>2</b>
5.1	Conducted emissions	2
5.2	Radiated emissions	2
5.3	Spurious emissions (antenna conducted)	2
<b>6</b>	<b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>	<b>2</b>

# **1 TEST STANDARDS**

The tests were performed according to following standards:

## **FCC Rules and Regulations Part 15 Subpart A - General (October 01, 2007)**

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

## **FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October 01, 2007)**

Part 15, Subpart B, Section 15.107	AC Line conducted emissions
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements
Part 15, Subpart B, Section 15.111	Antenna power conduction

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
------------------	---

ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
-----------------	--

CISPR 16-4-2: 2003	Uncertainty in EMC measurement
--------------------	--------------------------------

CISPR 22: 2005 EN 55022: 2006	Information technology equipment
----------------------------------	----------------------------------

## 2 SUMMARY

### GENERAL REMARKS:

While the power supply is connected to the reader, in charging mode, the reader disables the reading mode; therefore is not possible to read a transponder. The other functionalities are fully active.

### 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 : 27. Mai 2008

Testing concluded on : 04. June 2008

Checked by:

Tested by:

---

Thomas Weise  
Dipl.-Ing.(FH)  
Laboratory Manager

---

Huber Markus

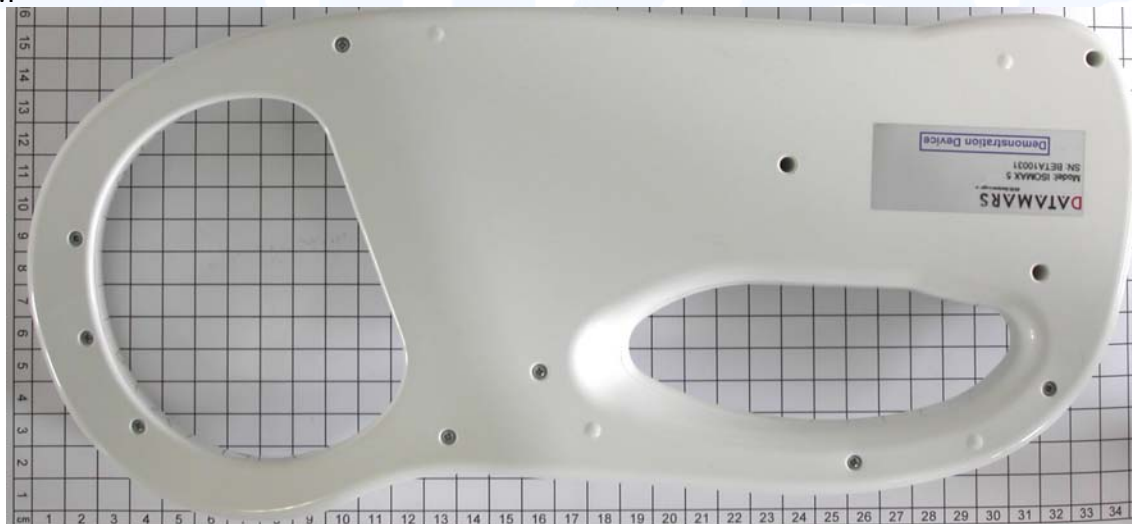
### 3 EQUIPMENT UNDER TEST

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

Front view:



Rear view:



Bottom view:



Back view open cover:

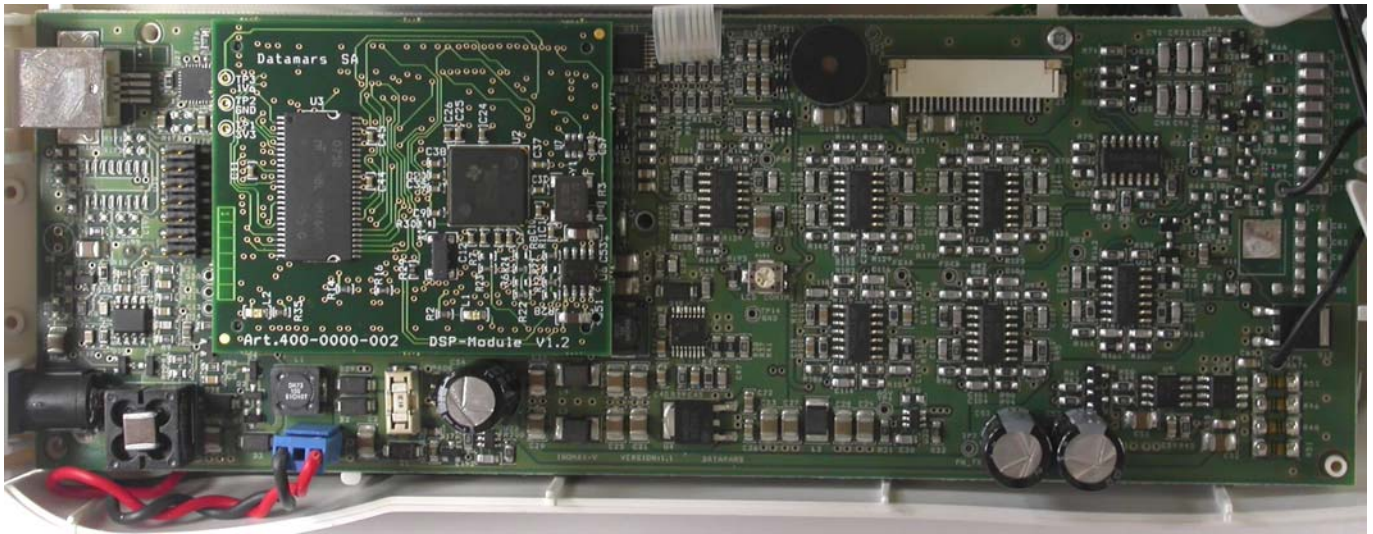


Antenna view:

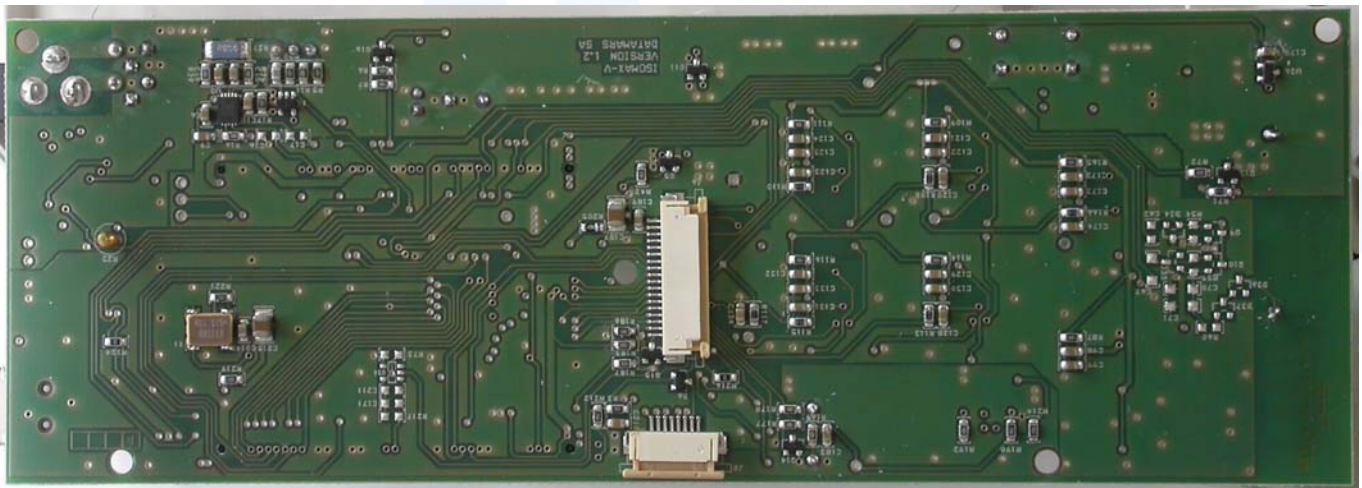




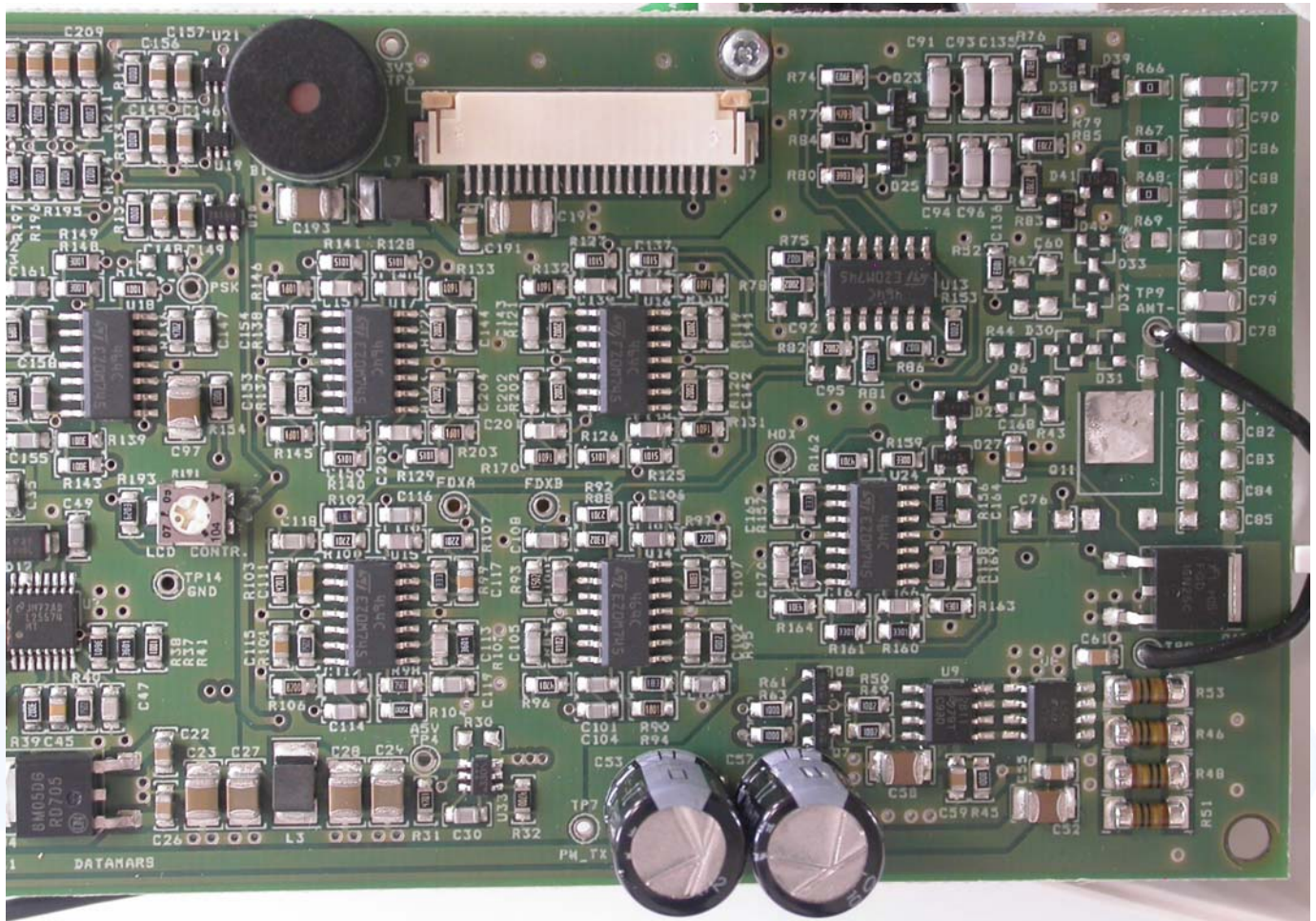
Internal Front view:



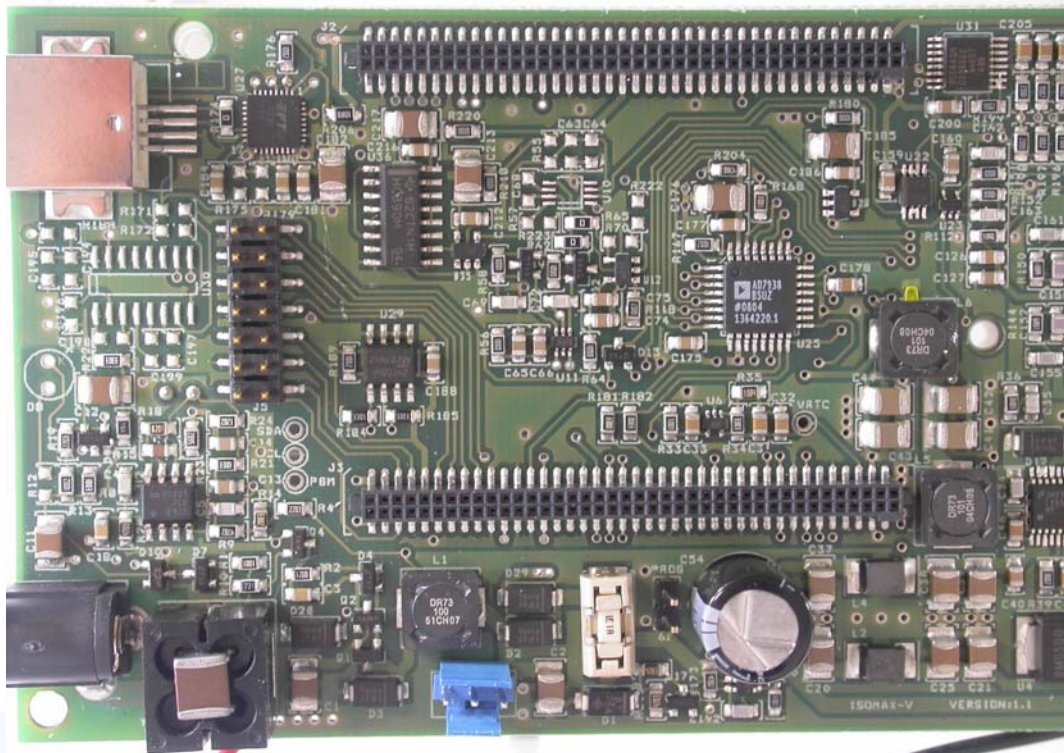
Internal Rear view:



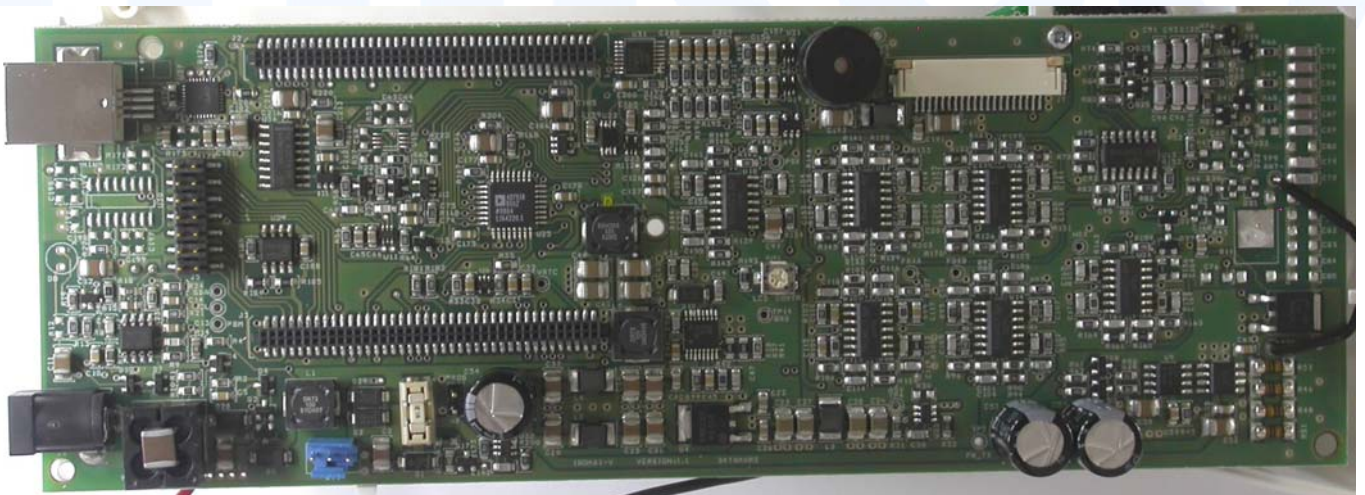
Internal view:





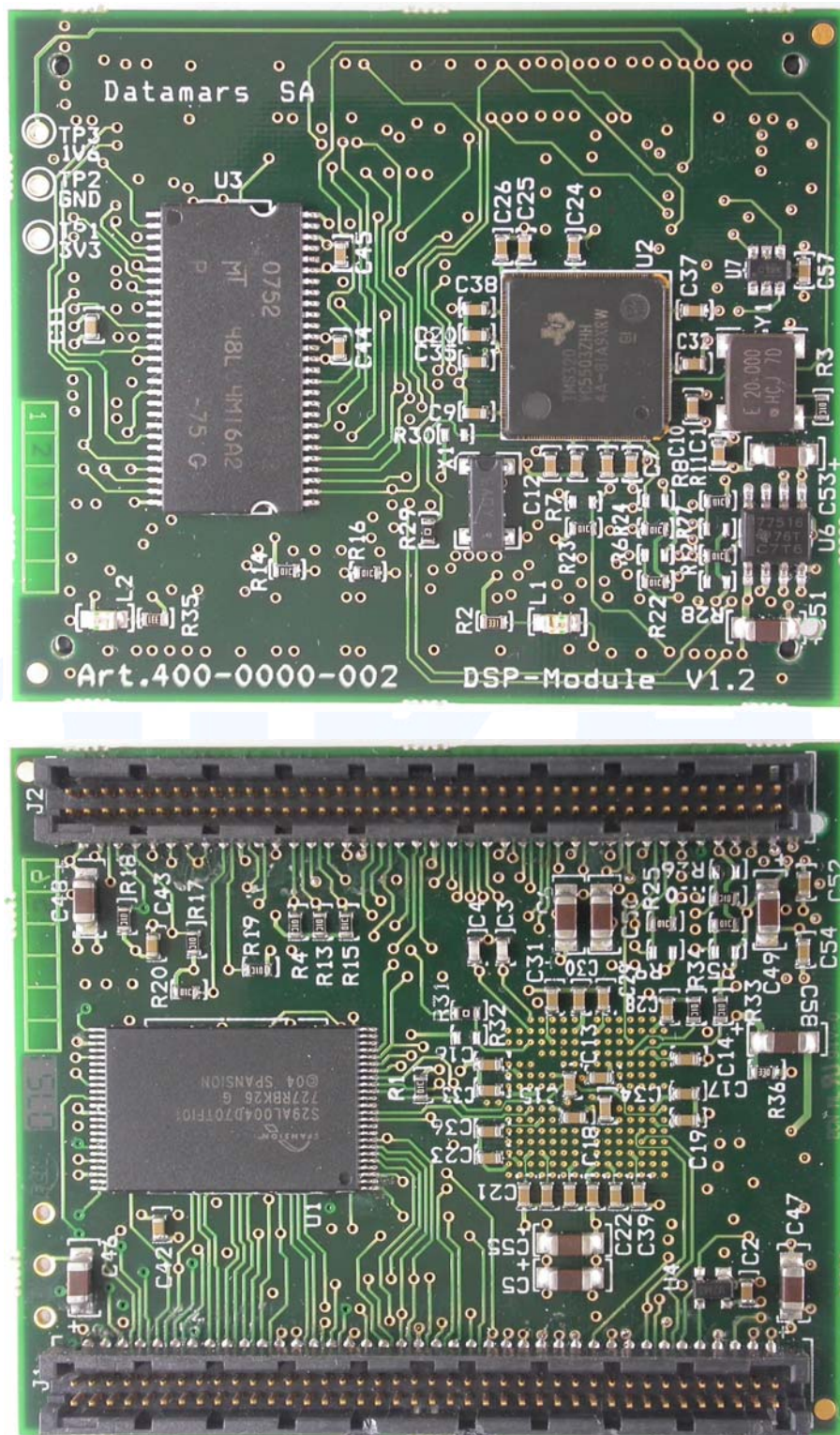


Internal view without DSP Modul:



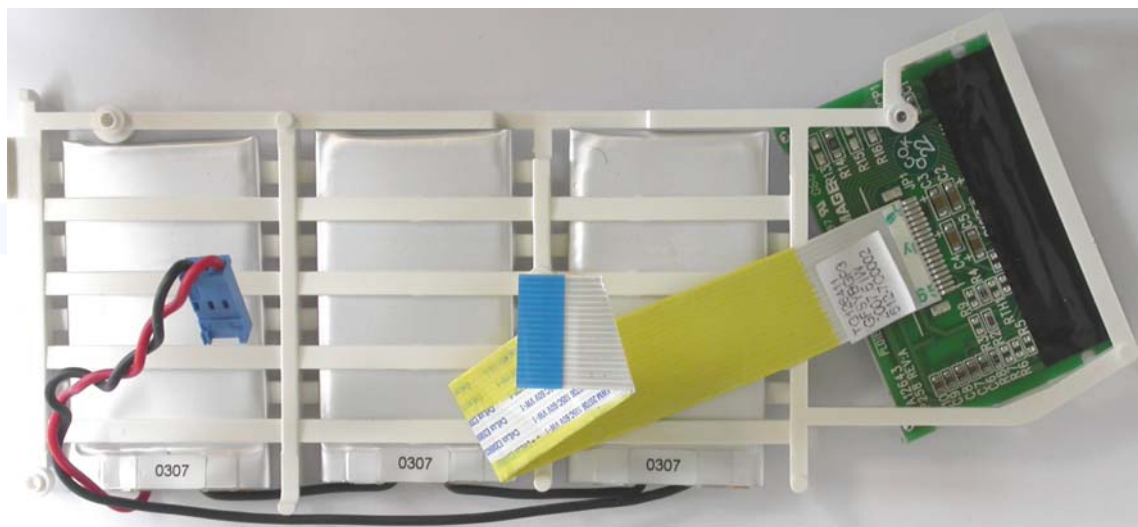


DSP Module:



FCC ID: NDX-ISOMAXV

Battery & Display module:





Power supply:





### 3.2 Power supply system utilised

Power supply voltage : 115 V / 60 Hz / 1 $\phi$   
15 V / DC

### 3.3 Short description of the Equipment under Test (EuT)

The EuT R-PO7470 is a Handheld Reader for industrial use.

Number of tested samples: 1  
Serial number: see Photo documentation of the EuT under Point 3 / Equipment Under Test

#### EuT operation mode:

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

- Data download via USB

- Battery charging mode

-

#### EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

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

- |                            |                             |
|----------------------------|-----------------------------|
| - Power supply             | Model : Sunpower SPD-A15-15 |
| - USB Cable                | Model : Mikes Intern        |
| - Lap Top                  | Model : Mikes Intern        |
| -                          | Model :                     |
| -                          | Model :                     |
| -                          | Model :                     |
| - customer specific cables |                             |
| - unscreened power cables  |                             |

## **4 TEST ENVIRONMENT**

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

**mikes-testingpartners gmbh**  
**Ohmstrasse 2-4**  
**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. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners 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 diversity and modifications in production processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

### **4.4 Measurement Protocol for FCC, VCCI and AUSTEL**

#### **4.4.1 GENERAL INFORMATION**

#### 4.4.1.1 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 C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

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.

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

### 4.4.2 DETAILS OF TEST PROCEDURES

#### 4.4.2.1 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."

### 4.5 Determination of worst case measurement conditions

## 5 TEST CONDITIONS AND RESULTS

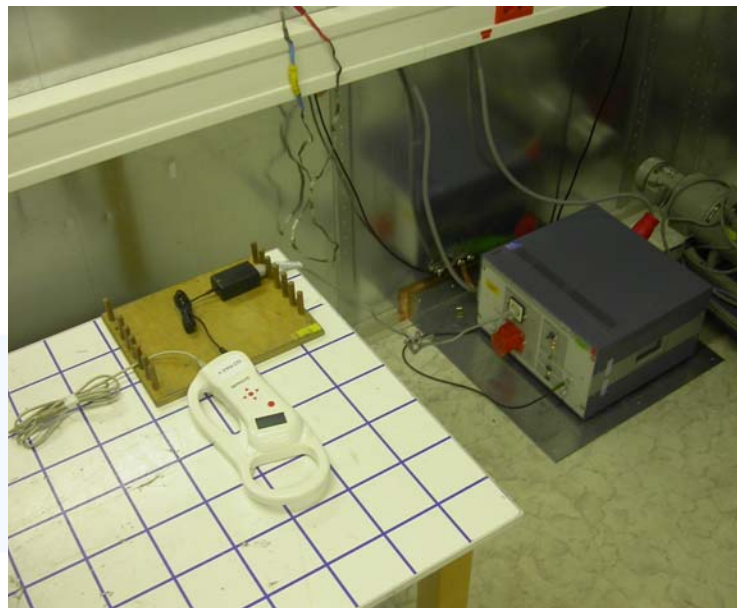
### 5.1 Conducted emissions

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 (MHz)	Conducted limit (dBμV)	
	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 5.2 dB at 0.435 MHz

The requirements are **FULFILLED**.

Remarks:

---

---

---

---

### 5.1.6 Test protocol

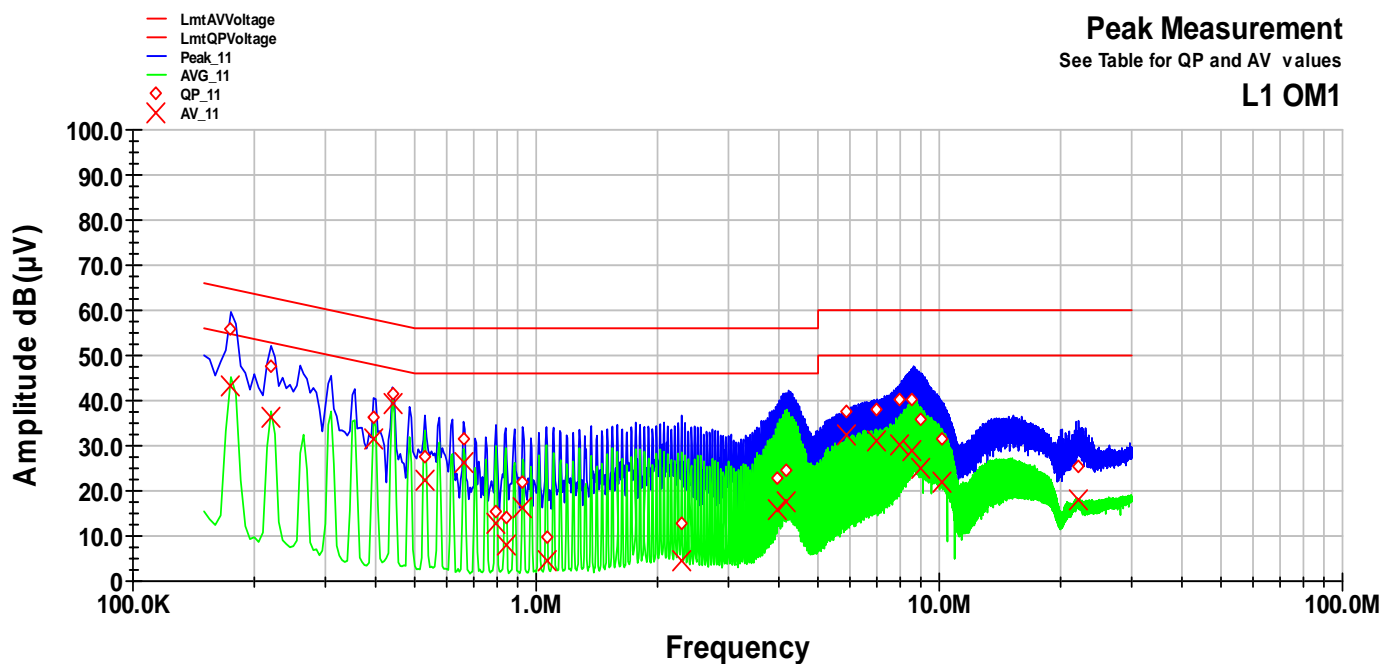
Test point: L1  
Operation mode: Charging Mode  
Remarks:  
Operator: Huber Ma.

Result: passed

### Peak Measurement

See Table for QP and AV values

L1 OM1



Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.175	55.8	-8.9	64.7	43.3	-11.5	54.7
0.22	47.6	-15.2	62.8	36.1	-16.7	52.8
0.395	36.2	-21.8	58.0	31.4	-16.6	48.0
0.44	41.5	-15.6	57.1	39.3	-7.7	47.1
0.53	27.5	-28.5	56.0	22.5	-23.5	46.0
0.66	31.6	-24.4	56.0	26.2	-19.8	46.0
0.795	15.4	-40.6	56.0	12.9	-33.2	46.0
0.84	14.1	-41.9	56.0	8.0	-38.0	46.0
0.925	22.0	-34.0	56.0	16.2	-29.8	46.0
1.06	9.9	-46.1	56.0	4.5	-41.5	46.0
2.295	12.7	-43.3	56.0	4.4	-41.6	46.0
3.97	22.6	-33.4	56.0	16.0	-30.0	46.0
4.19	24.6	-31.4	56.0	17.8	-28.2	46.0
5.905	37.4	-22.6	60.0	32.5	-17.5	50.0
6.96	38.1	-21.9	60.0	31.0	-19.0	50.0
7.97	40.4	-19.6	60.0	30.0	-20.0	50.0
8.585	40.2	-19.8	60.0	29.0	-21.0	50.0
9.025	36.0	-24.0	60.0	25.0	-25.0	50.0
10.12	31.4	-28.6	60.0	22.1	-27.9	50.0
22.14	25.5	-34.5	60.0	17.9	-32.1	50.0

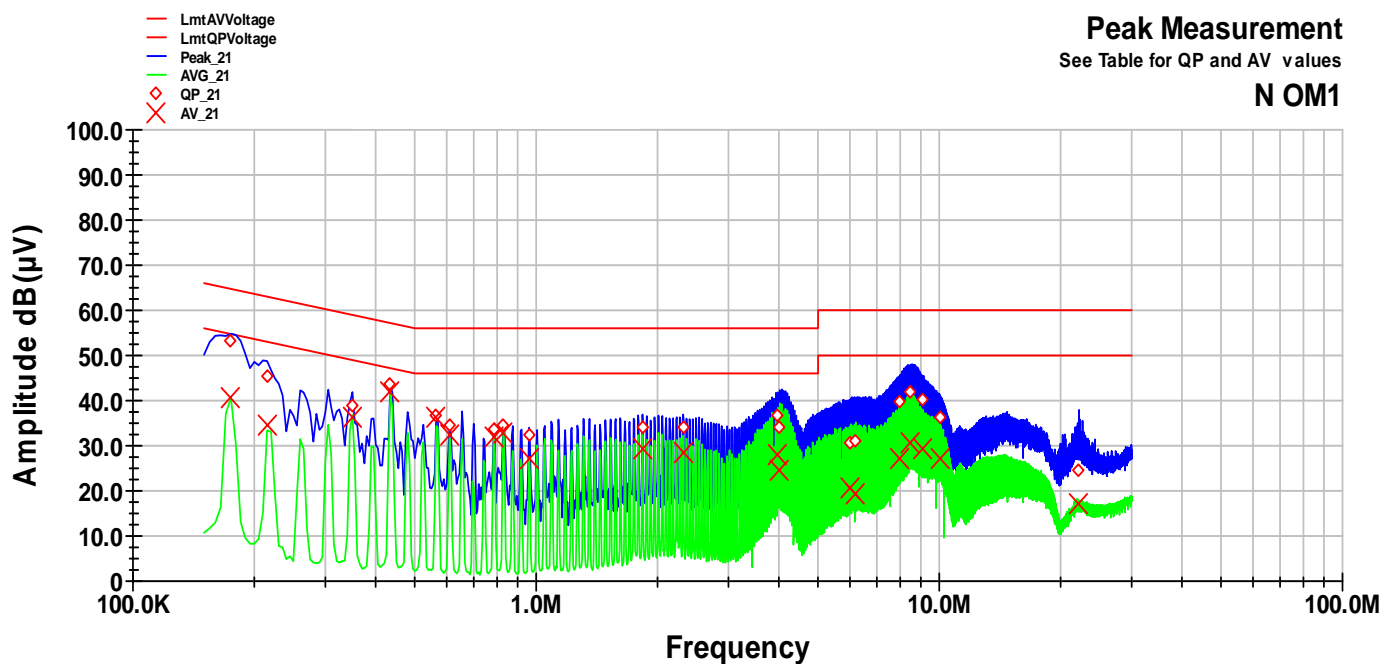
Test point: N  
Operation mode: Charging Mode  
Remarks:  
Operator: Huber Ma.

Result: passed

# Peak Measurement

See Table for QP and AV values

N OM1



Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.175	53.3	-11.5	64.7	40.7	-14.0	54.7
0.215	45.4	-17.6	63.0	34.4	-18.6	53.0
0.35	38.9	-20.0	59.0	36.4	-12.5	49.0
0.435	43.5	-13.7	57.2	42.0	-5.2	47.2
0.565	36.8	-19.2	56.0	36.1	-9.9	46.0
0.61	34.4	-21.6	56.0	32.3	-13.7	46.0
0.785	33.6	-22.4	56.0	32.0	-14.0	46.0
0.83	34.5	-21.5	56.0	32.8	-13.2	46.0
0.96	32.3	-23.7	56.0	27.0	-19.0	46.0
1.835	34.2	-21.8	56.0	29.3	-16.7	46.0
2.315	34.2	-21.8	56.0	28.4	-17.6	46.0
3.975	36.5	-19.5	56.0	27.9	-18.1	46.0
4.02	34.0	-22.0	56.0	24.6	-21.4	46.0
5.985	30.6	-29.4	60.0	20.4	-29.6	50.0
6.205	31.0	-29.0	60.0	19.3	-30.7	50.0
7.95	39.7	-20.3	60.0	27.2	-22.8	50.0
8.475	41.7	-18.3	60.0	30.5	-19.5	50.0
9.085	40.3	-19.7	60.0	29.5	-20.5	50.0
10.045	36.3	-23.7	60.0	27.3	-22.8	50.0
22.195	24.3	-35.7	60.0	17.3	-32.7	50.0

## 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





### **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.

### **5.2.4 Description of Measurement**

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 radiated emissions from the EUT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the 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.

Measurements are made in horizontal and vertical polarization in a fully anechoic chamber. All tests are performed at a test distance of 3 m. Hand-held or body-worn devices are rotated through three orthogonal axes to determine the attitude of the highest emission shall be used for final testing. During the tests the EUT is rotated 360° and the cables and equipment are placed and moved in position in such a way to find the maximum emission level. For testing above 1 GHz, the emission level of the EUT in peak mode complies to the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

The resolution bandwidth during the measurement is as following:

30 MHz – 1000 MHz:                RBW: 120 kHz

Above 1000 MHz:                RBW: 1 MHz

### 5.2.5 Test result

Measurement distance: 3 m

Frequency [MHz]	L: QP [dBµV]	L: AV [dBµV]	Bandwidth [kHz]	Correct. [dB]	L: QP [dBµV/m]	L: AV [dBµV/m]	Limit [dBµV/m]	Delta [dB]
0,009-0,150			0,2	20				>20
0,150-30,0			9,0	20				>20

Frequency [MHz]	L: PK [dBµV]	L: AV [dBµV]	L: QP [dBµV]	Correct. [dB]	L: PK [dBµV/m]	L: AV [dBµV/m]	L: QP [dBµV/m]	Limit [dBµV/m]	Delta [dB]
30-88							<20	40	>20
88-216							<20	43,5	>23,5
216-960							<20	46	>26

Limit according to FCC Part 15 Subpart 15.209(a)

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

Limit according to FCC part , 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:

---



---

### 5.3 Spurious emissions (antenna conducted)

For test instruments and accessories used see section 6 Part SEC 2, SEC 3.

#### 5.3.1 Description of the test location

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

#### 5.3.3 Applicable standard

According to FCC Part 15B, Section 15.111(a):

In addition to the radiated emission limits, receivers that operate in the frequency range 30 MHz to 960 MHz that provide terminals for the connection of a external receiving antenna may tested to demonstrate compliance with provisions of §15.109 with the antenna terminals shielded and terminated.

#### 5.3.4 Description of Measurement

The receiver antenna terminal was connected to the spectrum analyzer. The frequency range was scanned for spurious emissions up to 5 GHz and recorded in the table below if it comes closer as 20 dB to the limit.

Spectrum analyser setting:

RBW: 100 kHz

VBW: 100 kHz

Detector: peak

#### 5.3.5 Test result

SPURIOUS EMISSIONS								
f (MHz)	Bandwidth (kHz)	Level (dBm)	f (MHz)	Bandwidth (kHz)	Level (dBm)	f (MHz)	Bandwidth (kHz)	Level (dBm)
Measurement uncertainty			± 3 dB					

Bandwidth (kHz); refers to the bandwidth of the measuring receiver

Limit according to FCC Part 15B, Section 15.111(a):

Frequency (MHz)	Limit (nW)	Limit (dBm)
30-960	2.0	-57
Above 960	2.0	-57

Effective measurement range according to FCC Part 15A, Section 15.33(b)(1):

Highest frequency generated or used on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.0
1.705 - 108	1000.0
108 – 500	2000.0
500 – 1000	5000.0
Above 1000	5 <sup>th</sup> harmonics of the highest frequency or 40 GHz, whichever is lower.

**Remarks:** The measurement is not applicable, because the EuT has no antenna connector.

\_\_\_\_\_





## 6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.
A 4	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	ESH 2 - Z 5	LISN	Rohde & Schwarz München	02-02/20-05-004
	N-4000-BNC	RF Cable	mikes-testingpartners gmbh	02-02/50-05-138
	N-1500-N	RF Cable	mikes-testingpartners gmbh	02-02/50-05-140
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-155
	SP 103 /3.5-60	Convertor 220V / 110V	mikes-testingpartners gmbh	02-02/50-05-182
SER 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektron	01-02/24-01-018
	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-004
	S10162-B	RF Cable 33m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	UHALP 9108 A	Log. Per. Antenna	Schwarzbeck Mess-Elektron	02-02/24-05-004
	BBA 9106	Biconical Antenna	Schwarzbeck Mess-Elektron	02-02/24-05-023
	S10162-B	RF Cable 33m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113

FCC ID: NDX-ISOMAXV

Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4				
02-02/03-05-002	04/30/2009	04/30/2008		
02-02/20-05-004	03/13/2011	03/13/2008	09/13/2008	03/13/2008
02-02/50-05-138				
02-02/50-05-140				
02-02/50-05-155	09/25/2008	03/25/2008		
02-02/50-05-182				
SER 1				
01-02/24-01-018	02/20/2009	02/20/2008		
02-02/03-05-004	01/08/2009	01/08/2008		
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
SER 2				
02-02/03-05-006	07/24/2008	07/24/2007		
02-02/24-05-004	08/21/2008	02/21/2008		
02-02/24-05-023	03/16/2010	03/16/2007	08/21/2008	02/21/2008
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				