

Prüfbericht-Nr.: <i>Test Report No.:</i>	50050028 001	Auftrags-Nr.: <i>Order No.:</i>	114052380	Seite 1 von 23 <i>Page 1 of 23</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	21-Jun-2016		
Auftraggeber: <i>Client:</i>	N.V. Nederlandsche Apparatenfabriek "Nedap", Parallelweg 2, 7141 DC Groenlo, The Netherlands				
Prüfgegenstand: <i>Test item:</i>	Reader for 120 kHz and 13.56 MHz cards and also NFC, QR and BT				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	MACE READER MM QR, MACE READER MM				
Auftrags-Inhalt: <i>Order content:</i>	FCC/ISED Test Report for 120 kHz portion				
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.207 and 15.209 RSS-210 (08-2016) 4.4				
Wareneingangsdatum: <i>Date of receipt:</i>	1-Jul-2016				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000386950-003 N/A				
Prüfzeitraum: <i>Testing period:</i>	7-Jul-2016 - 15-Aug-2016				
Ort der Prüfung: <i>Place of testing:</i>	EMC Laboratory Taipei				
Prüflaboratorium: <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
02-Sept-2016 Ryan W. T. Chen / Project Engineer		02-Sept-2016 Rene Charton / Senior Project Manager			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other: Worst case situation has been tested being MACE READER MM QR					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT

RESULT: Passed

5.1.2 FIELD STRENGTH OF FUNDAMENTAL

RESULT: Passed

5.1.3 99% BANDWIDTH

RESULT: Passed

5.1.4 SPURIOUS EMISSION

RESULT: Passed

5.2.1 CONDUCTED EMISSIONS LINE AND NEUTRAL

RESULT: Passed

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix P: Photo Documentation

(File Name: 50050028APPENDIX P)

Appendix D: Test Result of Radiated Emissions

(File Name: 50050028APPENDIX D)

Test Specifications

The following standards were applied (in bold: product standards, otherwise: basic standards).

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.207 and 15.209
RSS-210 Issue 9, August 2016
RSS-Gen, Issue 4, November 2014
ANSI C63.10:2013
LP0002(2011)(100年6月28日)

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2. Test Sites

2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

FCC Registration No.: 365730
IC Canada Registration No.: 9465A-1

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Last Calibration	Next Calibration
Test Software	Farad	EZ_EMG	Ver. TUV3A1	N/A	N/A
EMI Test Receiver	R&S	ESR7	101062	2015/09/10	2016/09/10
Spectrum Analyzer	R&S	FSV 40	100921	2016/04/21	2017/04/21
Spectrum Analyzer	Agilent	N9010A	MY53470241	2016/04/25	2017/04/24
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2015/08/31	2016/08/31
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2015/11/19	2016/11/19
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	060558	2015/11/19	2016/11/19
Bilog Antenna	TESEQ	CBL6111D	29802	2014/07/04	2016/08/04
Horn Antenna	ETS-Lindgren	3117	138160	2016/05/03	2017/05/03
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	2015/11/02	2016/11/02
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2016/05/11	2017/05/11
EMI Test Receiver	R&S	ESC17	100797	2015/12/28	2016/12/27
Spectrum Analyzer	R&S	FSL3	101943	2015/09/07	2016/09/07
LISN (1 phase)	R&S	ENV216	101243	2016/06/02	2017/06/02

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are $\pm 3\text{dB}$.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF power, conducted	$\pm 1.5 \text{ dB}$
Adjacent channel power	$\pm 3 \text{ dB}$
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6 \text{ dB}$
Radiated emission of receiver, valid up to 26 GHz	$\pm 6 \text{ dB}$
Temperature	$\pm 2 \text{ }^\circ\text{C}$
Humidity	$\pm 10 \%$

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a SRD system that reads access codes from NFC or BT enabled mobile telephones or Access cards, operating on 13.56 MHz. Additionally, there is a 120 kHz Card reader implemented. The scope of this test report are the two 13.56 MHz and 120kHz inductive reader interfaces. The two model listed differ in the Optical QR reader which is not implemented in the model MACE READER MM. Testing was done on Model MACE READER MM QR. For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 Ratings and System Details

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment	Reader for 120 kHz and 13.56 MHz cards and also NFC, QR and BT
Type Designation	MACE READER MM QR, MACE READER MM
FCC ID	CGDMACER1
Canada ID	1444A-MACER1

Table 5: Technical Specification of EUT

Item	Value
Operating Frequencies	13.56 MHz and 120 kHz
Channel number	1 and 1
Operation Voltage	12-24 Volt DC
Modulation	ASK and CW

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: The EUT has a serial interface which makes it possible to read data from the RFID reader. The RFID readers, both for 13.56 MHz and 120 kHz are permanently on

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Kind of Equipment	Manufacturer	Model Name	S/N
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4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

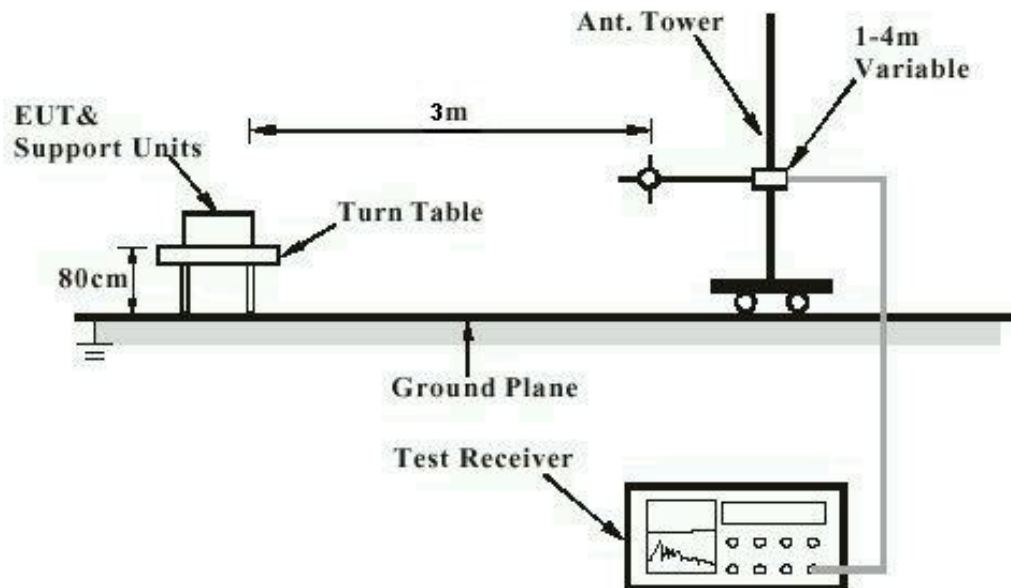
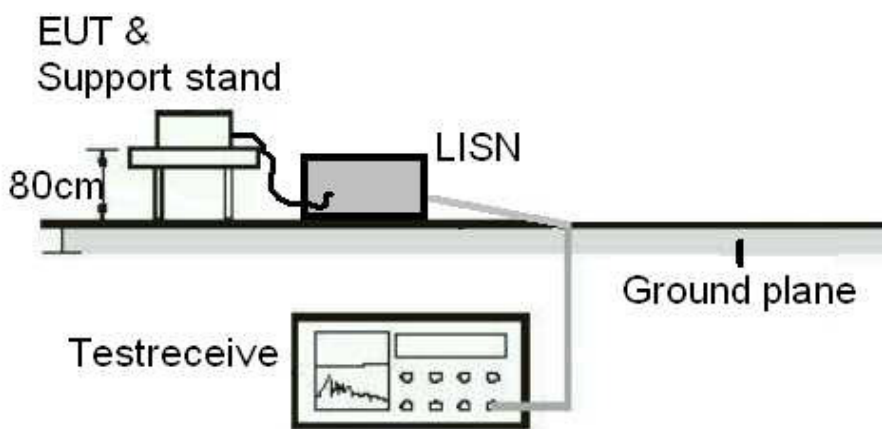


Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Passed**

Standard : LP0002(2011): 2.2
Part 15.203 and RSS-Gen 7.1.4
Requirement : use of approved antennas only

The antenna and the transmitter are one assembly with no possibility of replacement with a non-approved antenna by a normal the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Field strength of fundamental

RESULT:
Passed

Test standard : FCC Part 15.209
 RSS-210 (08-2010) 4.4
 LP0002(2011) 3.3.1
 Basic standard : ANSI C63.10:2013

Test setup

Test Frequency : 120 kHz
 Operation Mode : A
 Atmospheric pressure : 100-103 kPa

Table 6: Field strength of fundamental, maximal level found

Frequency (kHz)	Level(3m) (dBuV/m)	Detector	Limit(3m) (dBuV/m)	Level(300m) (dBuV/m)	Limit(300m) (dBuV/m)	Remark	Result
120	65.24	peak	125.98	-14.76	45.98	--	Pass
120	<65.24	average	105.98	<-14.76	25.98	--	Pass

Remark: For details refer to Appendix D

Limits:

Frequency	Electric Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
9-490 kHz	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	30
1,705-30 MHz	30	30

9-90 kHz and 110-490 kHz: Average detector.

5.1.3 20dB and 99% Bandwidth

RESULT:**Passed**

Test standard : RSS Gen
Basic standard : ANSI C63.10:2013,

Test setup

Operation Mode : A

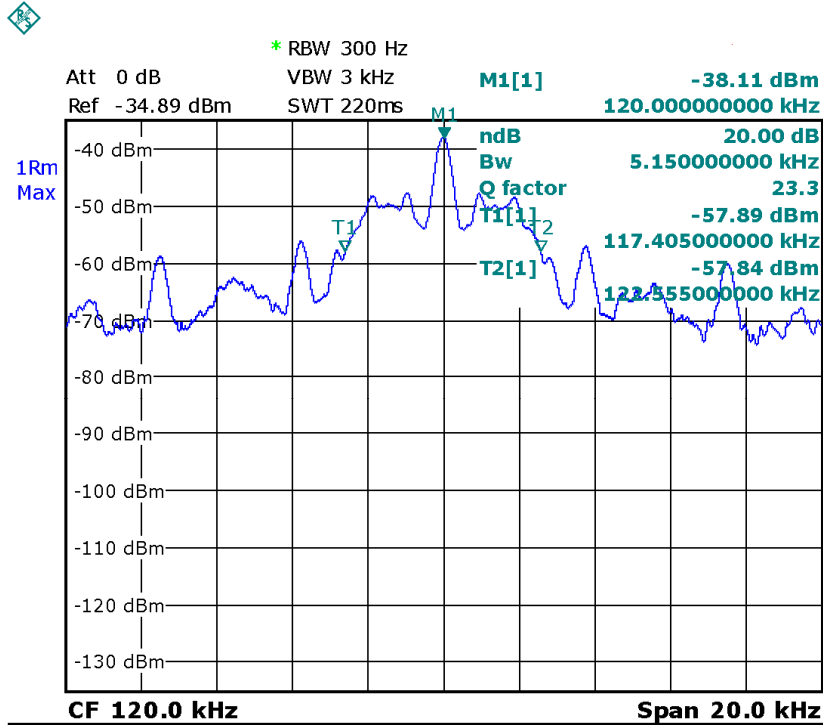
Atmospheric pressure : 100-103 kPa
Supply Voltage : 24Vdc
Setup : RFID Tag in Front of Reader (worst case)

Table 7: Test result of 20dB Bandwidth

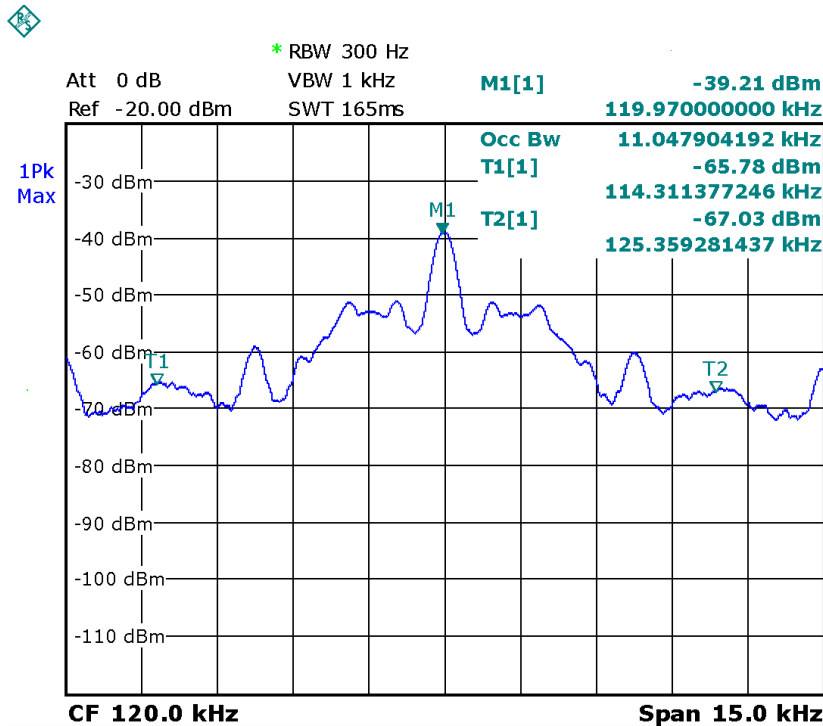
Frequency	20dB Bandwidth	
120 kHz	5.15 kHz	

Table 8: Test result of 99% Bandwidth

Frequency	99% Bandwidth	
120 kHz	11.047 kHz	

Test Plot of 20dB BW


Date: 15.AUG.2016 03:52:41

Test Plot of 99% BW


Date: 15.AUG.2016 03:45:29

5.1.4 Spurious Emission

RESULT:**Passed**

Test standard	:	FCC part 15.207 FCC part 15.209 RSS-Gen LP0002(2011) 2.8
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions must comply with the radiated emission limits specified in FCC 15.209(a) AND 2.8
Kind of test site	:	3m Semi-Anechoic Chamber
Test setup		
Test Channel	:	120 kHz
Operation mode	:	A

Remark: Testing was carried out within frequency range 9kHz to more than the tenth harmonic.

For details refer to Appendix D.

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5.2 Mains Conducted Emissions

5.2.1 Conducted Emissions Line and Neutral

RESULT:**Passed**

Test standard : FCC Part 15.207
FCC Part 15.107
RSS-Gen
LP0002: 2.3

Limits : Mains Conducted emissions as defined in
LP0002: 2.3 , must comply with the mains
conducted emission limits specified in LP0002:
2.3

Kind of test site : Shielded Room

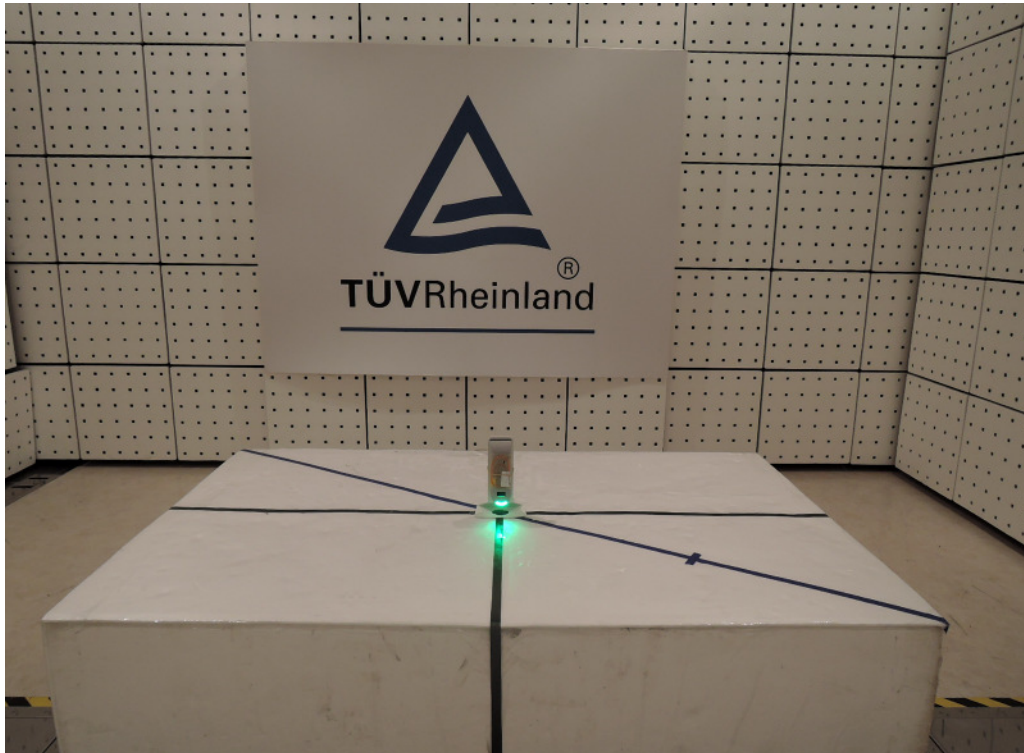
Test setup

Test Channel : 120 kHz
Operation mode : A

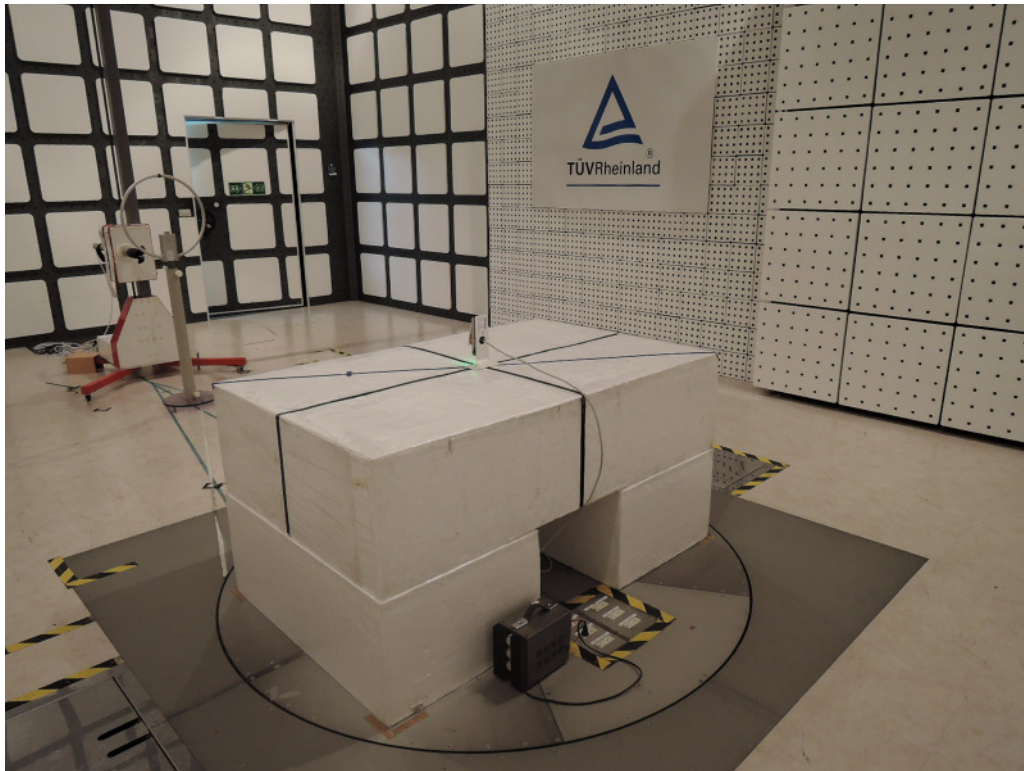
Remark: For details refer to Appendix D.

6. Photographs of the Test Set-Up

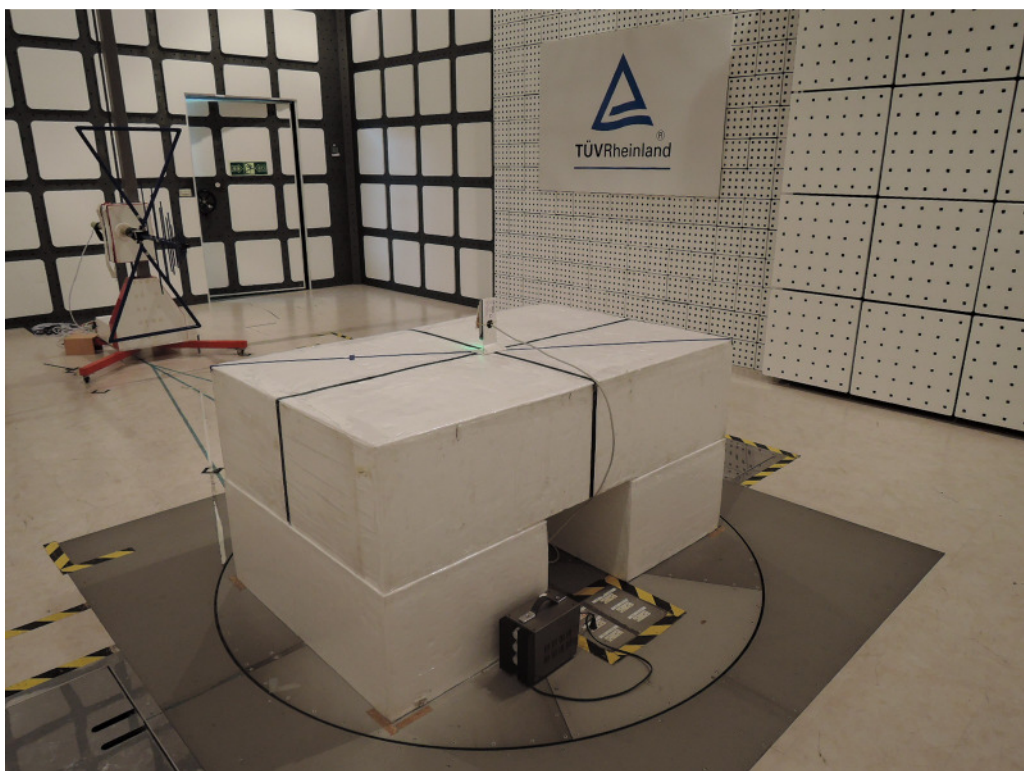
Photograph 1: Set-up for Spurious Emissions TX (Front View)



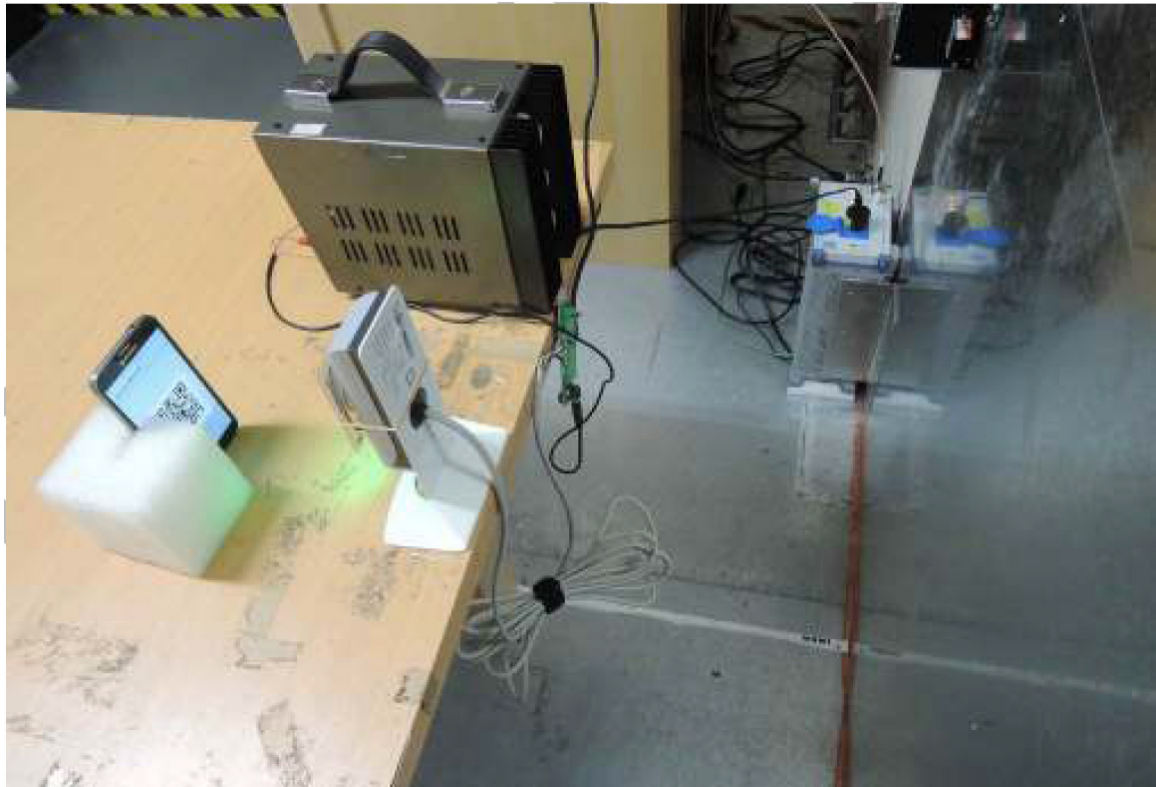
Photograph 2: Set-up for Spurious Emissions (Back View 1)



Photograph 3: Set-up for Spurious Emissions (Back View 2)



Photograph 4: Set-up for for Mains Conducted testing Back



Photograph 5: Set-up for for Mains Conducted testing Front



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