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|--|--|---|-----------------------------|--|
| Prüfbericht-Nr.: <i>Test Report No.:</i> | 50078317 001 | Auftrags-Nr.: <i>Order No.:</i> | 114061321 | Seite 1 von 24 <i>Page 1 of 24</i> |
| Kunden-Referenz-Nr.: <i>Client Reference No.:</i> | N/A | Auftragsdatum: <i>Order date:</i> | 20-Feb-2017 | |
| Auftraggeber: <i>Client:</i> | N.V. Nederlandsche Apparatenfabriek "Nedap" , Parallelweg 2, 7141 DC Groenlo, The Netherlands | | | |
| Prüfgegenstand: <i>Test item:</i> | Luxon IoT Node for wireless control of luminaires operating on 2.45 GHz | | | |
| Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i> | 99844976 | | | |
| Auftrags-Inhalt: <i>Order content:</i> | FCC IC test report | | | |
| Prüfgrundlage: <i>Test specification:</i> | FCC 47CFR Part 15: Subpart C Section 15.249 RSS-210 issue 9 (08-2016) Annex B.10 | | | |
| Wareneingangsdatum: <i>Date of receipt:</i> | 8-Mar-2017 | | | |
| Prüfmuster-Nr.: <i>Test sample No.:</i> | A000512674-007 | | | |
| Prüfzeitraum: <i>Testing period:</i> | 15-Mar-2017 - 10-Apr-2017 | | | |
| 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: | | |
| 2-May-2017 SamC.J. Kuo/Engineer  | | 2-May-2017 Amy Hsu/Project Engineer  | | |
| 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: | | | | |
| 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

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Passed

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1. General Remarks

1.1 Complementary Materials

These attachments are integral parts of this test report.

Appendix P: Photo Documentation

(File Name: 50078317 001APPENDIX P)

Appendix D: Test Result of Radiated Emissions

(File Name: 50078317 001APPENDIX D)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

| Radio |
|---|
| FCC 47CFR Part 15: Subpart C Section 15.249 RSS-210 issue 9 (08-2016) RSS-Gen, Issue 4, November 2014 ANSI C63.10:2013 |

2. Test Sites

2.1 Test Facility

TUV Rheinland Taiwan Ltd.
Taipei Office

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

FCC RegistrationNo.: 799772
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective periods: 2016-Jul-1st to 2019-Jun-30th



Testing Laboratory
0759

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

| Kind of Equipment | Manu-facturer | Type | S/N | Last Calibration | Next Calibration |
|-------------------------------|----------------|--------------|-------------|------------------|------------------|
| Test Software | Farad | EZ_EMCC | Ver. TUV3A1 | N/A | N/A |
| EMI Test Receiver | R&S | ESR7 | 101062 | 2016/09/12 | 2017/09/12 |
| 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 | 2016/07/29 | 2017/07/29 |
| Preamplifier (18 GHz -40 GHz) | COM-POWER | PAM-840 | 461257 | 2016/12/01 | 2017/12/01 |
| Pre-Amplifier (1GHz~18GHz) | EM Electronics | EM01G18G | 060558 | 2016/11/17 | 2017/11/17 |
| Bilog Antenna | TESEQ | CBL6111D | 29804 | 2016/06/23 | 2017/06/23 |
| Horn Antenna | ETS-Lindgren | 3117 | 138160 | 2016/05/03 | 2017/05/03 |
| Horn Antenna (18GHz~40GHz) | COM-POWER | AH840 | 101029 | 2016/10/11 | 2017/10/11 |
| Loop Antenna | Schwarzbeck | FMZB 1513 | 1513-076 | 2016/05/11 | 2017/05/11 |
| EMI Test Receiver | R&S | ESCI7 | 100797 | 2016/12/30 | 2017/12/30 |
| Spectrum Analyzer | R&S | FSL3 | 101943 | 2015/09/07 | 2017/09/07 |
| Temp. & Humid. Chamber | Giant Force | GCT-099-40-S | MAF0103-007 | 2015/07/13 | 2017/07/12 |
| LISN (1 phase) | R&S | ENV216 | 101243 | 2016/06/02 | 2017/06/02 |
| LISN | R&S | ENV216 | 101262 | 2016/06/16 | 2017/06/16 |

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 ± 3 dB.

Table 3: Emission Measurement Uncertainty

| Parameter | Uncertainty |
|--|--------------|
| RF power, conducted | ± 1.5 dB |
| Adjacent channel power | ± 3 dB |
| Radiated emission of transmitter, valid up to 26 GHz | ± 6 dB |
| Radiated emission of receiver, valid up to 26 GHz | ± 6 dB |
| Temperature | ± 2 °C |
| Humidity | ± 10 % |

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a 2.4 GHz universal RF transceiver which can be used for for wireless control of a device
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 | Luxon IoT Node for wireless control of luminaires operating on 2.45 GHz |
| Type Designation | 99844976 |
| FCC ID | CGDLWIOT1 |
| Canada ID | 1444A-LWIOT1 |
| Canada HVIN | 99844976 |

Table 5: Technical Specification of EUT

| Technical Specification | Value |
|-------------------------|-----------------------|
| Operating Frequencies | 2408 - 2475 MHz |
| Channel Spacing | 1 MHz minimum |
| Channel number | 67 |
| Operation Voltage | 12V, 24V |
| Modulation | GFSK, Fixed frequency |
| Antenna Gain | 2 dBi |

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. Receiving
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel

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 testing was performed on two sets of three different samples where the 3 test frequencies are set in the firmware

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

Full test was applied on all test modes, but only worst case was shown.

4.3 Special Accessories and Auxiliary Equipment

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

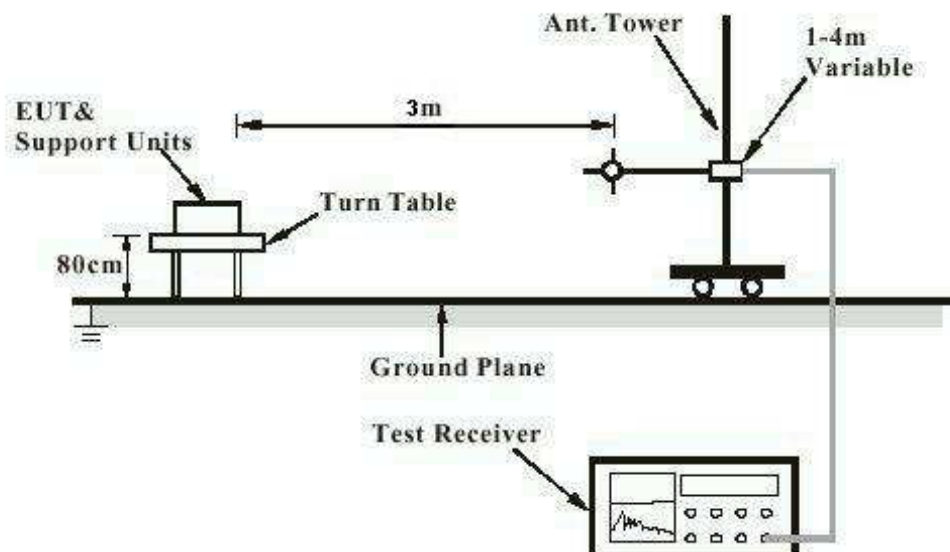
| Description | Manufacturer | Model No. | Serial No. |
|------------------|--------------|-----------|------------|
| Notebook(EMC-06) | Lenovo | TP00048A | PB-0F8B2 |

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.

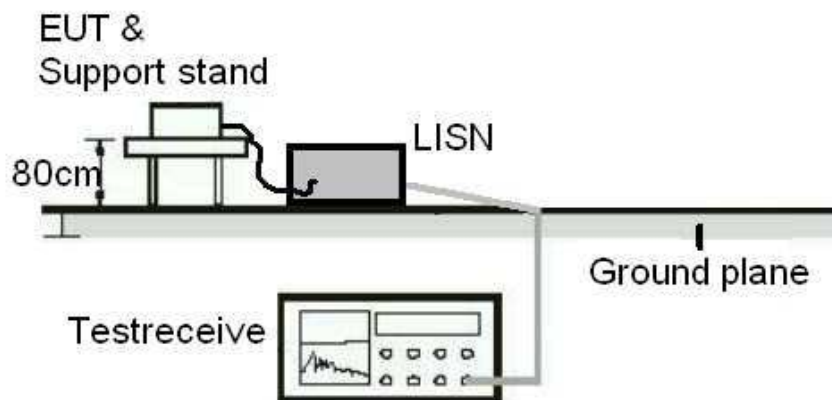
4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m

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 |
| Requirement | : | Part 15.203 and RSS-Gen 7.1.4 use of approved antennas only |

The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by 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 15.249(a), RSS-210 B.10
LP0002: 3.10.2(2)
Basic standard : ANSI C63.10:2013
Kind of test site : Semi-Anechoic Chamber

Test setup

Test Channel : Low/ Middle/ High
Operation Mode : A
Atmospheric pressure : 100-103 kPa

In the table below the maximum results found are reported.

For detailed results of all frequencies tested, please refer to Appendix D.

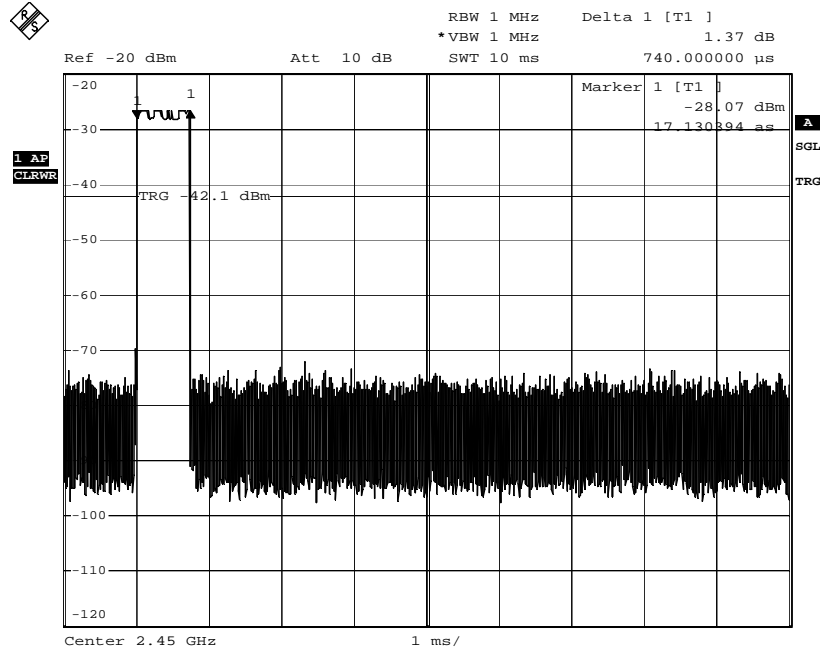
The EUT employs pulsed operation.
The pulse width is: 828 msec.

The Tables below show calculated average values from the pulsed emissions measurement dataMHz, corrected with the worst case duty cycle factor over 100 msec.

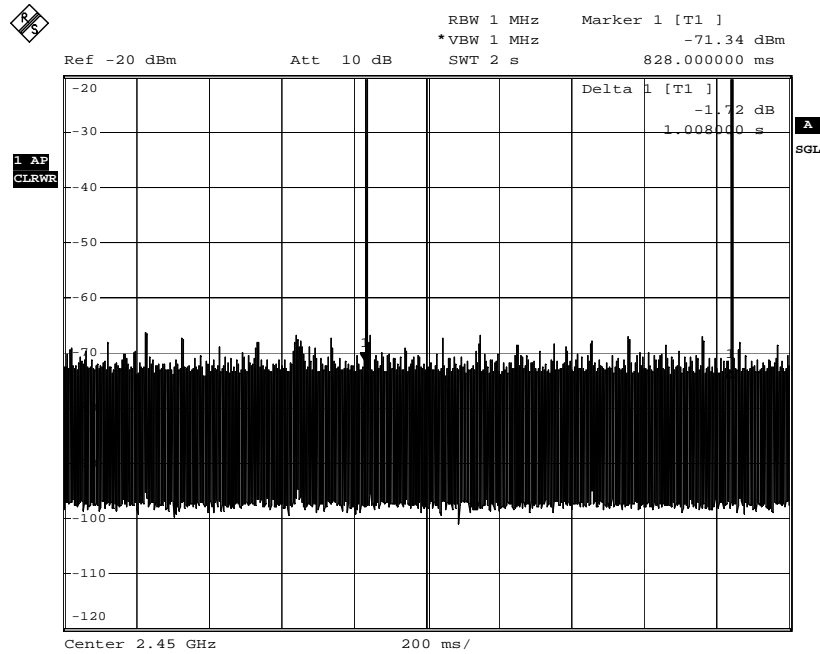
The average values noted are calculated through the application of a duty cycle correction, according to part 15.35c

Duty cycle calculation:
Duty cycle correction (dB) = $20 \log (0.74 \text{ msec} / 100 \text{ msec}) = - 42.62 \text{ dB}$.

The pulse width



Date: 2.MAY.2017 13:15:18



Date: 2.MAY.2017 13:10:44

Table 6: Test result of Field strength of fundamental

| Channel Frequency (MHz) | Test result | | | |
|-------------------------|----------------|----------------|---------------------|----------|
| | Level (dBuV/m) | Limit (dBuV/m) | Antenna orientation | Detector |
| 2408 | 99.62 | 114 | Horizontal | Peak |
| 2408 | 57 | 94 | | Average |
| 2408 | 92.62 | 114 | Vertical | Peak |
| 2408 | 50 | 94 | | Average |
| 2450 | 98.05 | 114 | Horizontal | Peak |
| 2450 | 55.43 | 94 | | Average |
| 2450 | 93.97 | 114 | Vertical | Peak |
| 2450 | 51.35 | 94 | | Average |
| 2475 | 99.8 | 114 | Horizontal | Peak |
| 2475 | 57.18 | 94 | | Average |
| 2475 | 94.19 | 114 | Vertical | Peak |
| 2475 | 51.57 | 94 | | Average |

Remark: For details refer to Appendix D.

5.1.3 99% Bandwidth**RESULT:****Passed**

Test standard : RSS-Gen
Basic standard : ANSI C63.10:2013
Kind of test site : Semi-Anechoic Chamber

Test setup

Test Channel : Middle
Operation Mode : A

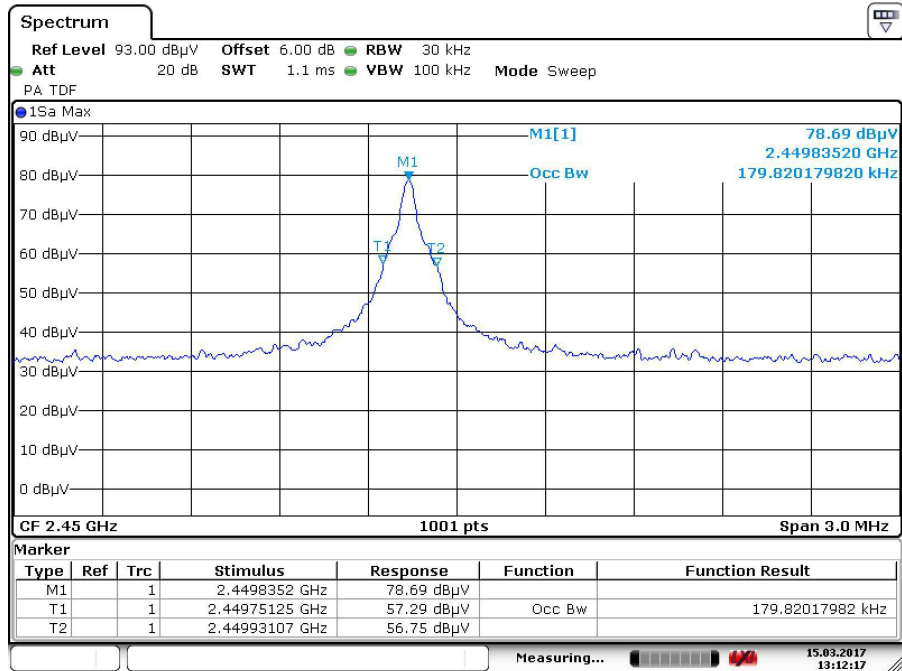
Ambient temperature : 22-26 °C
Relative humidity : 50-65 %
Atmospheric pressure : 100-103 kPa

Table 7: Test result of 99% Bandwidth,

| Channel | Channel Frequency (MHz) | 99% Bandwidth (kHz) |
|-------------|-------------------------|---------------------|
| Mid Channel | 2450 | 179.82 |

Test Plot of 99% Bandwidth

Middle Channel



Date: 15.MAR.2017 13:12:17

5.1.4 Spurious Emission

RESULT:**Passed**

| | | |
|-------------------|---|--|
| Test standard | : | FCC part 15.249(d), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 B.10(b), RSS-Gen 7.2.1 LP0002: 2.8 |
| Basic standard | : | ANSI C63.10:2013 |
| Limits | : | Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a). |
| Kind of test site | : | 3m Semi-Anechoic Chamber |

Test setup

| | | |
|----------------|---|-------------------|
| Test Channel | : | Low/ Middle/ High |
| Operation mode | : | A |

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT: **Passed**

Test standard : FCC KDB Publication 447498 D01 v06
RSS-102 issue 5, Table 1

FCC:

Since maximum peak output power of the transmitter is 0.19mW < 10mW, hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498: Mobile Portable RF Exposure

Canada:

Maximum conducted Average power: 0.19 mW

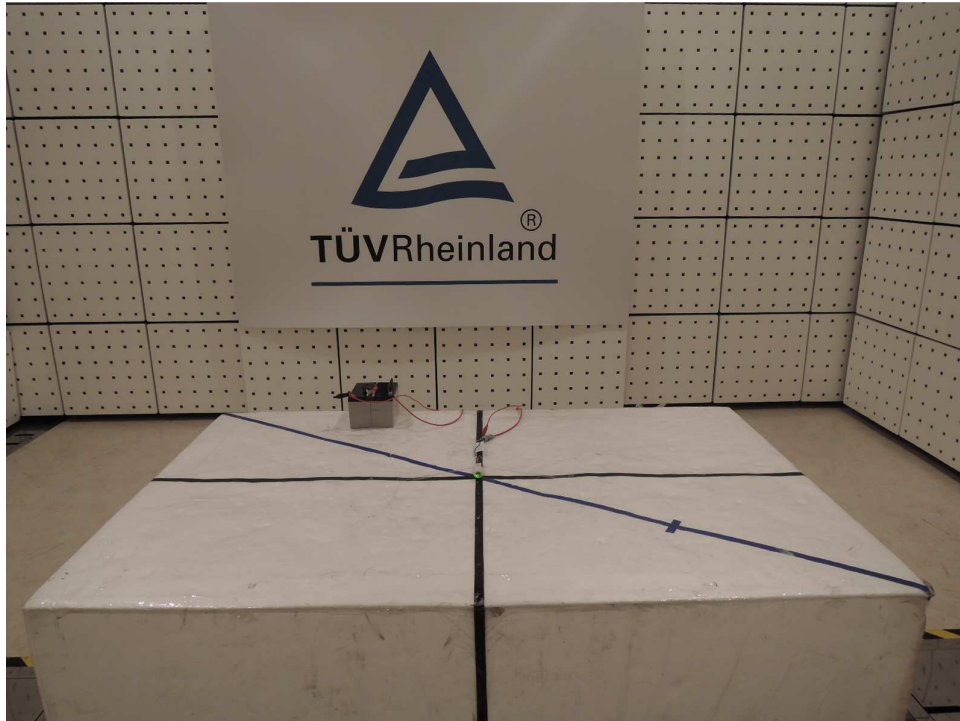
Antenna Gain: x1 dBi -> x 1.26

Maximum Power available: 0.2394 mW

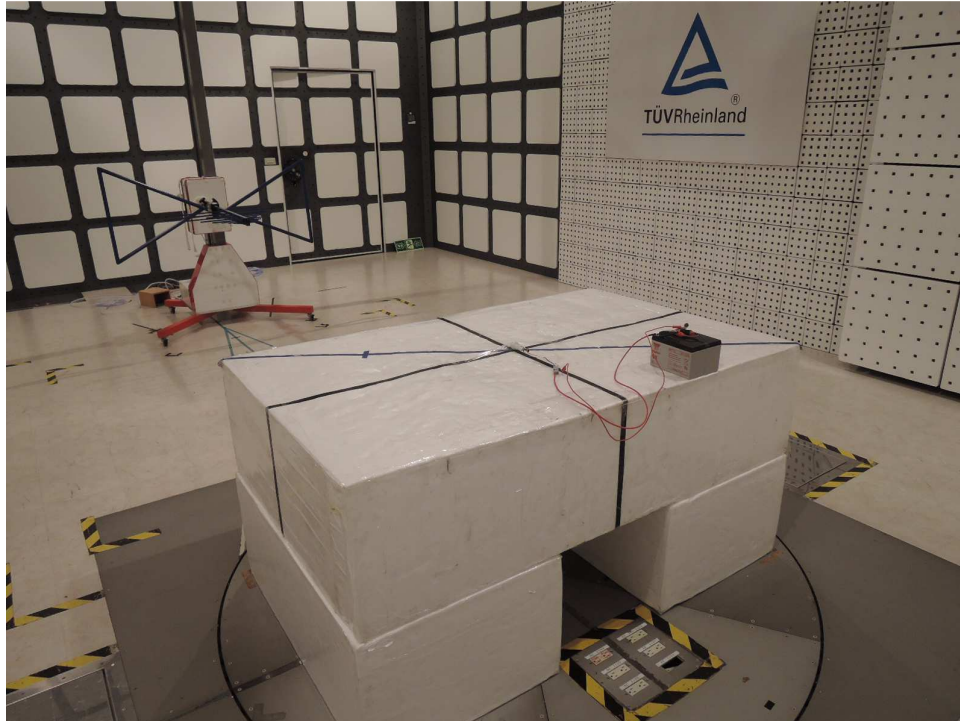
Since maximum output power, either EIRP or conducted, of the transmitter < 4mW, hence the EUT is excluded from SAR evaluation according to Table 1 in RSS-102

7. Photographs of the Test Set-Up

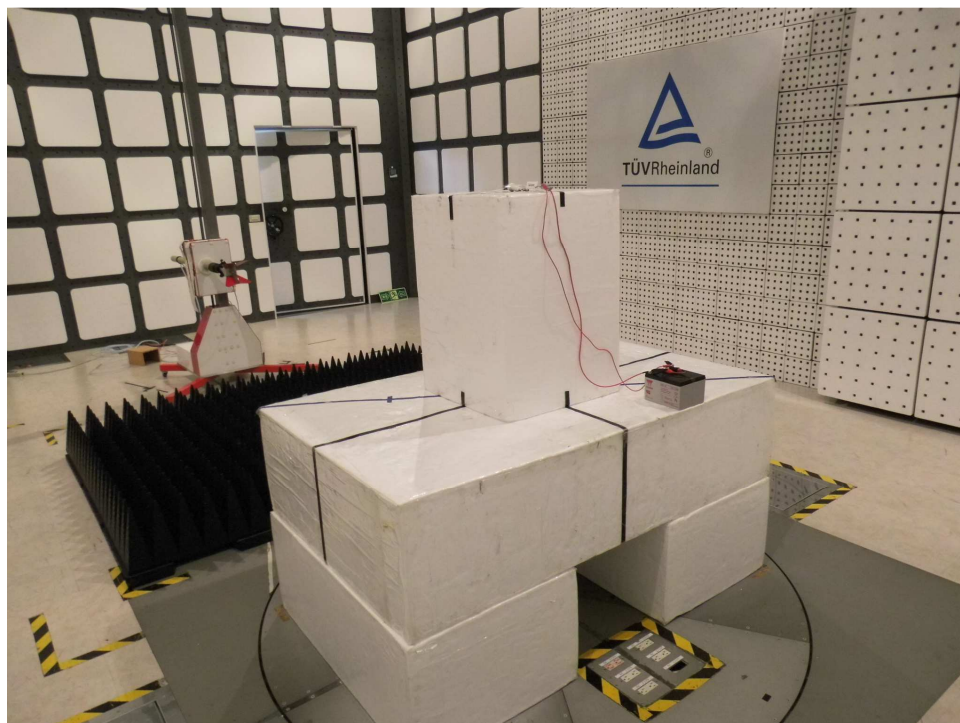
Photograph 1: Set-up for Spurious Emissions (Front View)



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



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



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