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# Test Report

Report Number:

**F192159E1**

Equipment under Test (EUT):

**TN-UHF-Q300-NA Series**
**TN-UHF-Q180L300-NA Series**

Applicant:

**Werner Turck GmbH & Co. KG**

Manufacturer:

**Hans Turck GmbH & Co. KG**

ilac-MRA
DAkkS Deutsche Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

## References


**[1]** **ANSI C63.10: 2013** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

**[2]** **FCC CFR 47 Part 15** Radio Frequency Devices

**[3]** **RSS-247 Issue 2 (February 2017)** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

**[4]** **RSS-Gen Issue 5 (March 2019) Amendment 1** General Requirements for Compliance of Radio Apparatus


## TEST RESULT

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test.
The complete test results are presented in the following.

| | | | |
|---|---|---|---|
| Test engineer: | Thomas KÜHN | | 06.11.2020 |
| | Name | Signature | Date |
| Authorized reviewer: | Bernd STEINER | | 06.11.2020 |
| | Name | Signature | Date |

**This test report is only valid in its original form.**



The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

This test report is valid in hardcopy form as well as in electronic form.

## Contents: Page

# 1 Identification

## 1.1 Applicant

| | |
|---|---|
| Name: | Werner Turck GmbH & Co. KG |
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| Phone: | +49 2353 709-6216 |
| Fax: | +49 2353 709-6174 |
| eMail Address: | sebastian.schuermann@turck.com |
| Applicant represented during the test by the following person: | - |

## 1.2 Manufacturer

| | |
|---|---|
| Name: | Hans Turck GmbH & Co. KG |
| Address: | Witzlebenstraße 7<br>45472 Mülheim an der Ruhr |
| Country: | Germany |
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| Phone: | +49 2353 709-6198 |
| Fax: | +49 2353 709-6174 |
| eMail Address: | dr.matthias.linde@turck.com |
| Manufacturer represented during the test by the following person: | - |

## 1.3 Test laboratory

The tests were carried out at:

**PHOENIX TESTLAB GmbH**
**Königswinkel 10**
**32825 Blomberg**
**Germany**

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

## 1.4 EUT (Equipment Under Test)

| | |
|---|---|
| Test object: * | UHF-RFID read / write device |
| Modelname (PMN): * | TN-UHF-Q300-NA Series, TN-,UHF-Q180L300-NA Series |
| HVIN: * | V2 |
| FCC ID: * | YQ7-TN-UHF-Q300 |
| IC: * | 8821A-TNUHFQ300 |
| Serial number: * | None |
| PCB identifier: *<br>TN-UHF-Q300-NA-CDS | 07677104 A (digital board), 6140/6 (RF board),<br>6864/1A (antenna coupler) and 7082/0 (antenna director),) |
| PCB identifier: *<br>UHF-Q180L300-NA-CDS | 07677104 A (digital board), 6140/6 (RF board),<br>7711/0 B (shield, TN-UHF-Q180L300-NA-CDS only) |
| Software version / FVIN: * | V1.0.2.0 |
| Lowest internal frequency: * | 750 kHz |

* declared by the applicant.

Note: PHOENIX TESTLAB GmbH does not take samples. The sample used for tests is provided exclusively by the applicant.

## 1.5 Technical data of equipment

| | | | | |
|---|---|---|---|---|
| Channel 0 | RX: | 902.750 MHz | TX: | 902.750 MHz |
| Channel 24 | RX: | 914.750 MHz | TX: | 914.750 MHz |
| Channel 49 | RX: | 927.250 MHz | TX: | 927.250 MHz |

| | | | | | | |
|---|---|---|---|---|---|---|
| Rated RF output power: * | 30 dBm | | | | | |
| Antenna type: * | Integral or external (TN-UHF-Q300-NA-CDS),<br>external (TN-UHF-Q180L300-NA-CDS) | | | | | |
| Antenna gain: * | 8.1 dBic or 5.1 dBi | | | | | |
| Antenna connector: * | Reverse TNC | | | | | |
| Adaptive frequency agility: * | No | | | | | |
| Modulation: * | FHSS (GFSK) | | | | | |
| Supply voltage: * | $U_{nom}$= | 24.0 V DC | $U_{min}$= | 18.0 V DC | $U_{max}$= | 30.0 V DC |
| Temperature range: * | -25 °C to +50 °C | | | | | |
| Ancillary used for test: | Laptop PC type Siemens Fujitsu lifebook (supplied by the laboratory)… PoE injector type DeLOCK 802.3at (supplied by the applicant), AC/DC adaptors type PHOENIX CONTACT UNO-PS/1AC/48DC/60W and PHOENIX CONTACT MINI-PS-100-240AC/24/DC/1.3 (both supplied by the laboratory) | | | | | |

* declared by the applicant.

**The following external I/O cables were used:**

| Identification | Connector | | Length * |
|---|---|---|---|
| | EUT | Ancillary | |
| DC power | 5 pole M12 plug | - | 3 m |
| Ethernet | 4 pole M12 plug | RJ45 | 3 m |
| External antenna 1 | RP-TNC male | Left open / adapted to N | - |
| External antenna 2 | RP-TNC male | Left open | - |
| External antenna 3 | RP-TNC male | Left open | - |
| External antenna 4 | RP-TNC male | Left open | - |
| DXP0 | 4 pole M12 plug | Left open | - |
| DXP1 | 4 pole M12 plug | Left open | - |

*: Length during the test if no other specified.

### 1.6 Dates

| | |
|---|---|
| Date of receipt of test sample: | 10.07.2020 (TN-UHF-Q300-NA-CDS) and<br>05.10.2020 (TN-UHF-Q180L300-NA-CDS) |
| Start of test: | 06.08.2020 (TN-UHF-Q300-NA-CDS) and<br>04.11.2020 (TN-UHF-Q180L300-NA-CDS) |
| End of test: | 13.08.2020 (TN-UHF-Q300-NA-CDS) and<br>05.11.2020 (TN-UHF-Q180L300-NA-CDS) |

# 2 Operational states

As declared by the applicant, the TN-UHF-Q300-NA Series is available in two variants: TN-UHF-Q300-NA-CDS and TN-UHF-Q180L300-NA-CDS. Because the TN-UHF-Q180L300-NA-CDS has no internal antenna, its housing is smaller. Full tests were carried out with the TN-UHF-Q300-NA-CDS, limited tests with the TN-UHF-Q180L300-NA-CDS. For details refer the table below. As operation channel for the limited tests of the TN-UHF-Q180L300-NA-CDS the channel was used, were the lowest margin to the limit of the similar measurement of the TN-UHF-Q300-NA-CDS was found.

The tested samples were unmodified and could be configured via Ethernet with the help of a laptop PC with a configuration software (UHF TOOLBOX, supplied by the applicant).

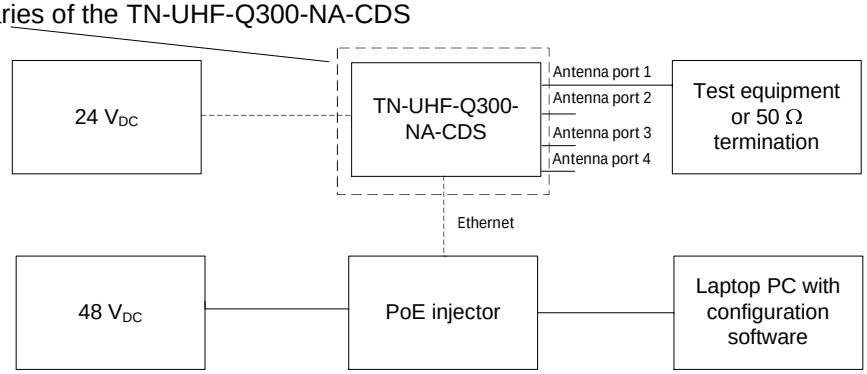
All radiated measurements were carried out with a connection to an external 24 $V_{DC}$ power supply.

The TN-UHF-Q300-NA-CDS uses either the internal antenna or one of the external antenna ports; The TN-UHF-Q180L300-NA-CDS uses one of the external antenna ports. No simultaneous transmission on more than one RF output port of the EUTs RF circuit is possible. The used antenna port was selected with the help of the configuration software.

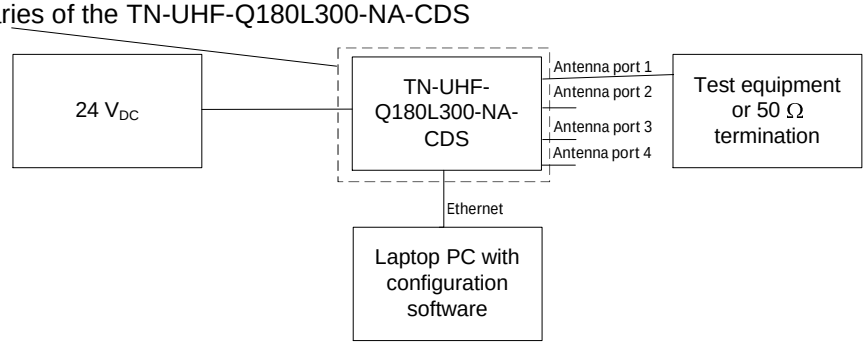
Conducted measurements were carried out at the external antenna port, which causes the highest RF output level (port 1); this port number was investigated during a preliminary measurement with both samples. With the TN-UHF-Q300-NA-CDS, the spurious emission measurements were carried out with the EUT configured operating either with its internal antenna or radiated with the external antenna port used for conducted emissions but terminated with 50 Ω. For the TN-UHF-Q180L300-NA-CDS the spurious emission measurement was carried out with the external antenna port terminated with 50 Ω.

For all measurements the output power of the EUTs was set to 30 dBm with the configuration software.

Physical boundaries of the TN-UHF-Q300-NA-CDS




Physical boundaries of the TN-UHF-Q180L300-NA-CDS




The following test modes were used during the tests:

| Operation | Test items | EUT | Operation channel | Operation mode |
|---|---|---|---|---|
| Transmit with normal modulation on fixed channel | 20 dB bandwidth | TN-UHF-Q300-NA-CDS | 0, 24 or 49 | 1, 2, 3 |
| | Carrier frequency separation | TN-UHF-Q300-NA-CDS | 0, 24 or 49 | 1, 2, 3 |
| | Dwell time | TN-UHF-Q300-NA-CDS | 0, 24 or 49 | 1, 2, 3 |
| | Maximum peak output power | TN-UHF-Q300-NA-CDS | 0, 24 or 49 | 1, 2, 3 |
| | | TN-UHF-Q180L300-NA-CDS | 0, 24 or 49 | 3 |
| | Radiated emissions (transmitter) | TN-UHF-Q300-NA-CDS | 0, 24 or 49 | 1, 2, 3 |
| | | TN-UHF-Q180L300-NA-CDS | 49 | 3 |
| Transmit with normal modulation, hopping on all channels | Number of hopping channels | TN-UHF-Q300-NA-CDS | 0 to 49 | 4 |
| | Conducted emissions on supply line | TN-UHF-Q300-NA-CDS | 0 to 49 | 4 |

# 3 Additional information

During the tests the TN-UHF-Q300-NA-CDS was not labelled.

# 4 Overview

| Application | Frequency range [MHz] | FCC 47 CFR Part 15 section [2] | RSS 247 [3] or RSS-Gen [4] | Status | Refer page |
|---|---|---|---|---|---|
| 20 dB bandwidth | General | 15.247 (a) (1) (i) | 5.1 (a) [3] | Passed | 9 et seq. |
| 99 % bandwidth | General | - | 6.7 [4] | Passed | 9 et seq. |
| Carrier frequency separation | General | 15.247 (a) (1) (i) | 5.1 (c) [3] | Passed | 10 et seq. |
| Number of hopping channels | 902.0 – 928.0 | 15.247 (a) (1) (i) | 5.1 (c) [3] | Passed | 13 et seq. |
| Dwell time | 902.0 – 928.0 | 15.247 (a) (1) (i) | 5.1 (c) [3] | Passed | 15 et seq. |
| Maximum peak output power | 902.0 – 928.0 | 15.247 (b) (2) | 5.4 (a) [3] | Passed | 17 et seq. |
| Radiated emissions (transmitter) | 0.150 - 10,000 | 15.247 (d)<br>15.205 (a)<br>15.209 (a) | 5.5 [3]<br>8.9 [4] | Passed | 18 et seq. |
| Conducted emissons at antennaport | 0.150 - 10,000 | 15.247 (d)<br>15.205 (a)<br>15.209 (a) | 5.5 [3]<br>8.9 [4] | Passed | 39 et seq |
| Conducted emissions on supply line | 0.15 - 30 | 15.207 (a) | 8.8 [4] | Passed | 44 et seq. |
| Antenna requirement | - | 15.203 [2] | 6.8 [4] | Passed * | - |

*: The TN-UHF-Q300-NA-CDS has an internal antenna and reverse TNC antenna connectors, the TN-UHF-Q180L300-NA-CDS has reverse TNC antenna connectors. As declared by the applicant both devices are intended for professional installation. Furthermore, the antenna specifications for the external antenna are defined in the user manual, so the requirement is regarded as fulfilled.

# 5 Test results

## 5.1 Bandwidth

### 5.1.1 Method of measurement (bandwidth)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be disenabled, the transmitter shall work with its maximum data rate.

The following spectrum analyser settings according to [1] shall be used:

- Span: App. 2 to 5 times the 20 dB bandwidth, centred on the actual hopping channel.
- Resolution bandwidth: 1 % to 5 % of the 20 dB bandwidth.
- Video bandwidth: three times the resolution bandwidth.
- Set the reference level of the instrument either above the measured peak conducted output power level or as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

**20 dB bandwidth:** After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency lines shall be set on the intersection points between the second display line and the measured curve. Alternatively, the 20 dB down function of the spectrum analyser could be used.

**99% bandwidth:** Use the 99% power bandwidth function of the instrument

The measurement will be performed at the upper, the lower end and the middle of the assigned frequency band.

Test set-up:

### 5.1.2 Test results (20 dB bandwidth)

| | | | |
|---|---|---|---|
| Ambient temperature | 20 °C | Relative humidity | 26 % |

Measured conducted at antenna port 1 of TN-UHF-Q300-NA-CDS, hopping disabled.

Remark: The plots of this measurements are presented in annex A of this test report.

| Channel number | Channel frequency [MHz] | 20 dB bandwidth [kHz] |
|---|---|---|
| 0 | 902.750 | 43.760 |
| 24 | 914.750 | 43.770 |
| 49 | 927.250 | 43.830 |
| Measurement uncertainty | | +0.66 dB / -0.72 dB |

Test equipment used (see chapter 6):

| |
|---|
| 19, 33, 34 |

### 5.1.3 Test results (99 % bandwidth)

| | | | |
|---|---|---|---|
| Ambient temperature | 20 °C | Relative humidity | 26 % |

Measured conducted at antenna port 1 of TN-UHF-Q300-NA-CDS, hopping disabled.

Remark: The plots of this measurements are presented in annex A of this test report.

| Channel number | Channel frequency [MHz] | 99 % bandwidth [kHz] |
|---|---|---|
| 0 | 902.750 | 49.790 |
| 24 | 914.750 | 49.437 |
| 49 | 927.250 | 49.834 |
| Measurement uncertainty | | +0.66 dB / -0.72 dB |

Test equipment used (see chapter 6):

| |
|---|
| 19, 33, 34 |

## 5.2 Carrier frequency separation

### 5.2.1 Method of measurement (carrier frequency separation)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be enabled.

The following spectrum analyser settings according to [1] shall be used:

- Span: Wide enough to capture the peaks of two adjacent channels.
- Resolution bandwidth: Start with the Resolution bandwidth set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- Video bandwidth ≥ Resolution bandwidth.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

After trace stabilisation the marker and the delta marker function will be used to determine the separation between the peaks of two adjacent channel signals.

The measurement will be performed at the upper, the lower end and the middle of the assigned frequency band.

Test set-up:

### 5.2.2 Test results (carrier frequency separation)

| | | | |
|---|---|---|---|
| Ambient temperature | 20 °C | Relative humidity | 26 % |

Measured conducted at antenna port 1 of TN-UHF-Q300-NA-CDS.

Remark: The plots of this measurements are presented in annex A of this test report.

| Channel number | Channel frequency [MHz] | Channel separation [kHz] | Minimum limit [kHz] |
|---|---|---|---|
| 0 | 902.750 | 500.500 | 43.760 |
| 24 | 914.750 | 500.500 | 43.770 |
| 49 | 927.250 | 500.500 | 43.830 |
| Measurement uncertainty | | | $<10^{-7}$ |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 19, 33, 34 |

## 5.3 Number of hopping frequencies

### 5.3.1 Method of measurement (number of hopping frequencies)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be enabled.

The following spectrum analyser settings according to [1] shall be used:

- Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- Resolution bandwidth: To identify clearly the individual channels, set the Resolution bandwidth to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

After trace stabilisation the number of hopping channels could be counted. It might be possible to divide the span into some sub ranges in order to clearly show all hopping frequencies.

Test set-up:

### 5.3.2 Test results (number of hopping frequencies)

| | | | |
|---|---|---|---|
| Ambient temperature | 20 °C | Relative humidity | 26 % |

Measured conducted at antenna port 1 of TN-UHF-Q300-NA-CDS.

Remark: The plot of this measurement is presented in annex A of this test report.

| Number of hopping channels | Limit |
|---|---|
| 50 | At least 50 |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 19, 33, 34 |

## 5.4 Dwell time

### 5.4.1 Method of measurement (dwell time)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be enabled.

The following spectrum analyser settings according to [1] shall be used:

- Span: Zero, centred on a hopping channel.
- Resolution bandwidth shall be ≤ channel spacing and where possible Resolution bandwidth should be set >> 1 / *T*, where *T* is the expected dwell time per channel.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
- Detector function: peak.
- Trace mode: Max hold.

The marker and delta marker function of the spectrum analyser will be used to determine the dwell time.

The measurement will be performed at the middle of the assigned frequency band.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =
(number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

Test set-up:

### 5.4.2 Test results (dwell time)

| Ambient temperature | 20 °C | | Relative humidity | 26 % |
|---|---|---|---|---|

Measured conducted at antenna port 1 of TN-UHF-Q300-NA-CDS.

Remark: The plots of this measurements are presented in annex A of this test report.

| Channel number | Channel frequency [MHz] | $t_{pulse}$ [ms] | Number of pulses | Dwell time [ms] | Limit [ms] |
|---|---|---|---|---|---|
| 24 | 914.750 | 391.097 | 1 | 391.097 | 400.000 |
| Measurement uncertainty | | | | $<10^{-7}$ | |

Test: Passed

Test equipment used (see chapter 6):

| 19, 33, 34 |
|---|

## 5.5 Maximum peak output power

### 5.5.1 Method of measurement (maximum peak output power)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be disenabled.

The following spectrum analyser settings according to [1] shall be used:

- Span: Approx. 5 times the 20 dB bandwidth, centred on a hopping channel.
- Resolution bandwidth: > the 20 dB bandwidth of the emission being measured.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set on the signal peak. The indicated level is the peak output power, which has to be corrected with the value of the cable loss and an external attenuation (if necessary).

The measurement will be performed at the upper and lower end and the middle of the assigned frequency band.

Test set-up:

### 5.5.2 Test results (maximum peak output power of TN-UHF-Q300-NA-CDS)

| | | | |
|---|---|---|---|
| Ambient temperature | 20 °C | Relative humidity | 26 % |

Measured conducted at antenna port 1

Remark: The plots of this measurements are presented in annex A of this test report.

| Operation mode | Channel number | Channel frequency [MHz] | Maximum peak output power [dBm] | Antenna gain [dBi] | Peak power limit [dBm] |
|---|---|---|---|---|---|
| 1 | 0 | 902.750 | 29.2 | 5.1 | 30.0 |
| 2 | 24 | 914.750 | 29.2 | 5.1 | 30.0 |
| 3 | 49 | 927.205 | 29.8 | 5.1 | 30.0 |
| Measurement uncertainty | | | | +0.66 dB / -0.72 dB | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 19, 33, 34 |

### 5.5.3 Test results (maximum peak output power of TN-UHF-Q180L300-NA-CDS)

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 31 % |

Measured conducted at antenna port 1

Remark: The plots of this measurements are presented in annex A of this test report.

| Operation mode | Channel number | Channel frequency [MHz] | Maximum peak output power [dBm] | Antenna gain [dBi] | Peak power limit [dBm] |
|---|---|---|---|---|---|
| 1 | 0 | 902.750 | 29.4 | 5.1 | 30.0 |
| 2 | 24 | 914.750 | 29.4 | 5.1 | 30.0 |
| 3 | 49 | 927.205 | 29.2 | 5.1 | 30.0 |
| Measurement uncertainty | | | | +0.66 dB / -0.72 dB | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 20, 33, 34 |

## 5.6 Radiated emissions

### 5.6.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into different stages.

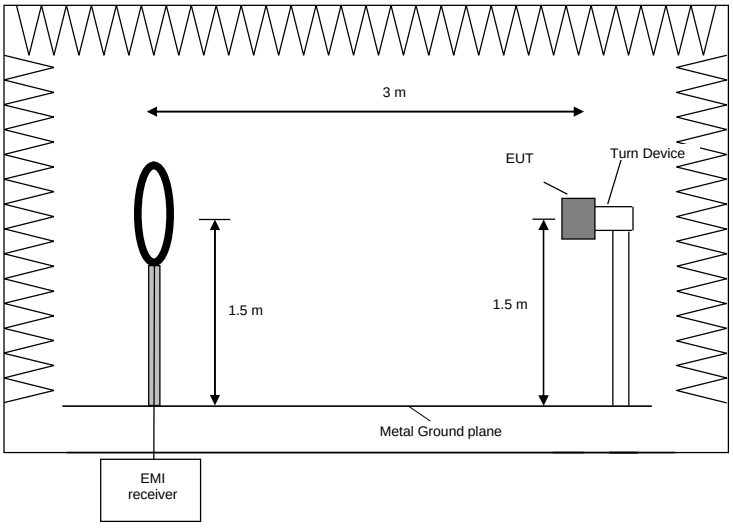
- A preliminary measurement carried out inside a semi anechoic chamber with reflecting ground plane with a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out on an outdoor test side without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A preliminary and a final measurement carried out inside a semi anechoic chamber with reflecting ground and various antenna heights in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and a fixed height in the frequency range 1 GHz to 25 / 40 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 40 GHz.

**Preliminary measurement (9 kHz to 30 MHz):**

The frequency range 10 MHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to find the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

| Frequency range | Resolution bandwidth |
|---|---|
| 9 kHz to 150 kHz | 200 Hz |
| 150 kHz to 30 MHz | 10 kHz |



Preliminary measurement procedure:

Prescans were performed in the frequency range 10 MHz to 30 MHz.

The following procedure will be used:

1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat steps 1) to 5) with the other orthogonal axes of the EUT.
7. Rotate the measuring antenna and repeat steps 1) to 5).

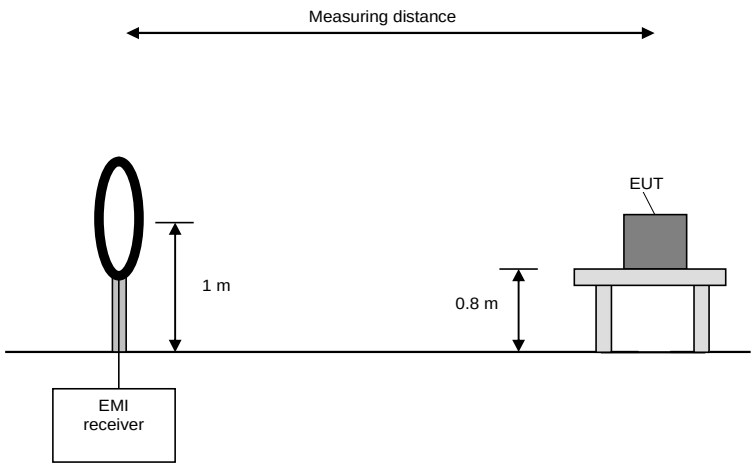
**Final measurement (10 MHz to 30 MHz):**

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m whichever is appropriate. In the case where larger measuring distances were required the results will be extrapolated based on the values measured on the closer distances according to [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak.

On the during the preliminary measurement detected frequencies the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|---|---|
| 10 MHz to 30 MHz | 9 kHz |



Final measurement procedure:

The following procedure will be used:

8. Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
9. Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
10. Rotate the measuring antenna to find the maximum and note the value.
11. Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
12. Repeat steps 1) to 4) with the other orthogonal axes of the EUT (only if the EUT is a module or is used in a handheld application).

**Preliminary and final measurement (30 MHz to 1 GHz)**

The EUT is measured in the frequency range from 30 MHz to 1 GHz inside a semi anechoic chamber with a metal ground plane, which has been validated to the requirements of [1]. It is placed on a 3D-positioner to allow different positions at a distance of 3 meters from the receiving antenna. Both polarizations (vertical and horizontal) have been evaluated and the turn table has been turned to 360° to maximize the emissions. The receiving antenna is raised from 1 to 4 m.

Procedure preliminary measurement:

The following procedure is used:

13. Set the measurement antenna to 1 m height.
14. Monitor the frequency range at vertical polarization and a EUT azimuth of 0 °.
15. Rotate the EUT by 360° to maximize the detected signals in two axes.
16. Repeat 1) to 2) with the horizontal polarization of the measuring antenna.
17. Increase the height of the antenna for 0.5 m and repeat steps 2 – 4 until the final height of 4 m is reached (30 MHz to 1 GHz only).
18. The highest values for each frequency will be saved by the software, including the antenna height, measurement antenna polarization and turntable azimuth for that value.

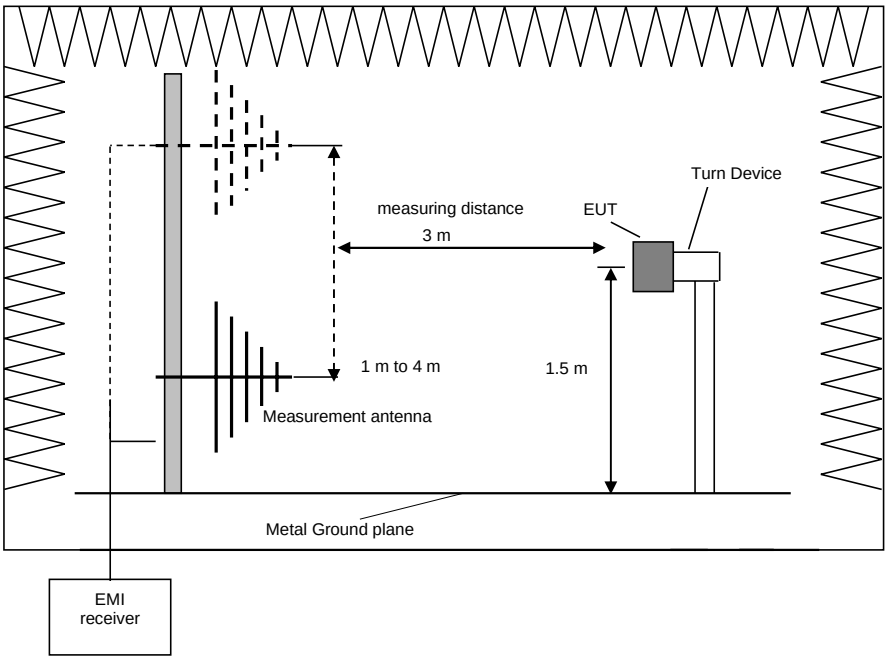
Procedure final measurement:

The following procedure is used:

1. Select the highest frequency peaks to the limit for the final measurement.
2. The software will determine the exact peak frequencies by doing a partial scan with reduced RBW with +/- 10 times the RBW of the pre-scan of the selected peaks.
3. If the EUT is portable or ceiling mounted, find the worst case EUT position (x, y, z) for the final test.
4. The worst measurement antenna height is found by the measurement software by varying the measurement antenna height by +/- 0.5 m from the value obtained in the preliminary measurement, and to monitor the emission level.
5. The worst azimuth turntable position is found by varying the turntable azimuth by +/- 25° from the value obtained in the preliminary measurement, and to monitor the emission level.
6. The final measurement is performed at the worst-case antenna height and the worst case turntable azimuth
7. Steps 2 – 6 will be repeated for each frequency peak selected in step 1.
8. For frequencies above 960 MHz the measured field strength is converted to an EIRP value

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|---|---|
| 30 MHz to 1 GHz | 100 kHz |




Test setup for measurements below 1 GHz

**Preliminary and final measurement (1 GHz to 40 GHz)**

This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting turn device at a height of 1.5 m. The set-up of the Equipment under test will be in accordance with [1].

Procedure preliminary measurement:

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30 ° steps according 6.6.5.4 in [1].

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|---|---|
| 1 GHz to 4 GHz | 1 MHz |
| 4 GHz to 12 GHz | 1 MHz |
| 12 GHz to 18 GHz | 1 MHz |
| 18 GHz to 26.5 GHz | 1 MHz |
| 26.5 GHz to 40 GHz | 1 MHz |

Prescans were performed in the frequency range 1 to 40 GHz.

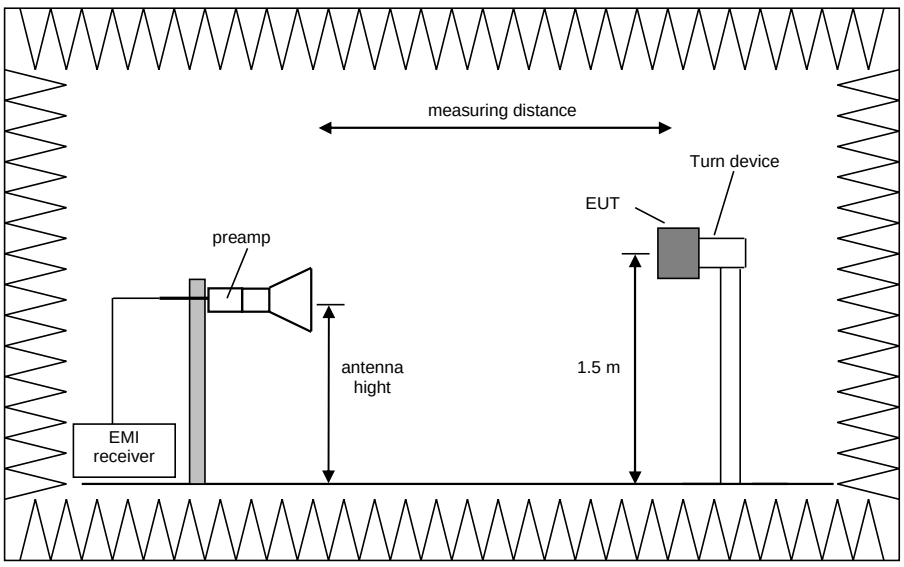
The following procedure will be used:

1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 ° with peak or RMS detector of the spectrum analyser (depending of the noise floor and the applicable limit).
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarisation of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarisation, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

Procedure final measurement:

The measurements were performed in the frequency range 1 GHz to 40 GHz.
The following procedure will be used:

8. Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
9. Set the measurement antenna polarisation to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
10. Set the spectrum analyser to EMI mode with peak and RMS average detector activated.
11. Rotate the turntable from 0° to 360° to find the EUT angle that produces the highest emissions.
12. Note the highest displayed peak and average values
13. Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.
14. Replace the EUT by a substitution antenna, which is fed by a signal generator.
15. Carry out a substitution for each frequency detected during the steps 5) to 6).
16. Calculate the EIRP values with the help of the final measurement and the substitution results.




Test setup for measurements from 1 GHz to 40 GHz

## 5.6.2 Test results (radiated emissions of TN-UHF-Q300-NA-CDS)

### 5.6.2.1 Preliminary radiated emission measurement with internal antenna

| | | | |
|---|---|---|---|
| Ambient temperature | 21 °C | Relative humidity | 50 % |

Position of EUT: The EUT was set-up on the positioner at a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied 24 $V_{DC}$ by an external power supply.

Frequency range: The preliminary measurement was carried out in the frequency range 150 kHz to 10 GHz according to [2].

Remark: As pre-tests have shown, the emissions in the frequency range 150 kHz to 30 MHz are not depending on the transmitter operation mode. Therefore, the emissions in this frequency range were measured only with the transmitter operates in operation mode 2.

**Transmitter operates at the lower end of the assigned frequency band (operation mode 1)**

The following frequencies were found inside the restricted bands during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 240.860 MHz, 280.190 MHz, 2708.100 MHz, 3610.890 MHz and 8124.660 MHz.

The following frequencies were found outside the restricted bands during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 72.155 MHz, 350.000 MHz, 449.990 MHz, 749.990 MHz, 899.980MHz, 902.750 MHz, 912.000 MHz, 929.985MHz, 1805.355 MHz, 2049.840 MHz and 7222.270 MHz.

These frequencies have to be measured in a final measurement. The results are presented in the following.

**Transmitter operates on the middle of the assigned frequency band (operation mode 2)**

No significant frequencies above the noise floor of the system (max. 36 dBµV/m / -15.5 dBµA/m (measured with peak detector) at 3 m distance) were found during the preliminary radiated emission test in the frequency range 150 kHz to 30 MHz, so no final measurements were carried out on the outdoor test site.

The following frequencies were found inside the restricted bands during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 240.005 MHz, 280.745 MHz, 2744.145 MHz, 3658.860 MHz, 7317.900 MHz and 8232.615 MHz.

The following frequencies were found outside the restricted bands during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 72.185 MHz, 350.000 MHz, 449.990 MHz, 749.985MHz, 899.985 MHz, 912.000 MHz, 914.750 MHz, 929.985 MHz, 1829.340 MHz, 2049.840 MHz, 5488.380 MHz and 6403.140 MHz.

These frequencies have to be measured in a final measurement. The result is presented in the following.

**Transmitter operates on the upper end of the assigned frequency (operation mode 3)**

The following frequencies were found inside the restricted bands during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 280.625 MHz, 2781.630 MHz, 3708.855 MHz, 7417.890 MHz and 8345.160 MHz.

The following frequencies were found outside the restricted bands during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 72.200 MHz, 239.990 MHz, 350.000 MHz, 449.990 MHz, 749.985 MHz, 899.985 MHz, 912.000 MHz, 924.000 MHz, 927.250 MHz, 929.985 MHz, 936.000 MHz, 1854.401 MHz, 2049.840 MHz and 6490.620 MHz.

These frequencies have to be measured in a final measurement. The result is presented in the following.

Test equipment used (refer chapter 6):

| |
|---|
| 6 – 31, 33, 34 |

### 5.6.2.2 Final radiated emission measurement (150 kHz to 30 MHz) with internal antenna

No significant frequencies above the noise floor of the system (max. 36 dBµV/m / -15.5 dBµA/m (measured with peak detector) at 3 m distance) were found during the preliminary radiated emission test. So, no final measurements were carried out on the outdoor test site.

### 5.6.2.3 Final radiated emission measurement (30 MHz to 1 GHz) with internal antenna

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 44 % |

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied 24.0 $V_{DC}$ by an external power supply.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m] + 6 dB

The measured points and the limit line in the following diagrams refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with an x are the measured results of the standard final measurement on the open area test site.
The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

**Result measured with the quasi-peak detector:**
**(These values were marked in the diagrams in annex A by an ◆ )**

| Transmitter operates at the lower end of the assigned frequency band (operation mode 1) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol. | Azimuth (deg) | Elevat. (deg) | Corr. (dB) | Restr. Band |
| 72.155 | 28.6 | 107.3 | 78.7 | 1000 | 120 | 242 | Hor. | 206 | 90 | 13.7 | No |
| 240.860 | 38.1 | 46.0 | 7.9 | 1000 | 120 | 166 | Vert. | 30 | 0 | 18.7 | Yes |
| 280.190 | 39.7 | 46.0 | 6.3 | 1000 | 120 | 175 | Hor. | 21 | 0 | 20.4 | Yes |
| 350.000 | 36.3 | 107.3 | 71.0 | 1000 | 120 | 145 | Hor. | 188 | 90 | 22.3 | No |
| 449.990 | 33.3 | 107.3 | 74.0 | 1000 | 120 | 110 | Hor. | 309 | 0 | 25.0 | No |
| 749.990 | 37.2 | 107.3 | 70.1 | 1000 | 120 | 105 | Hor. | 325 | 0 | 30.8 | No |
| 899.980 | 55.4 | 107.3 | 51.9 | 1000 | 120 | 113 | Vert. | 20 | 0 | 32.0 | No |
| 902.750 | 127.3 | Carrier | - | 1000 | 120 | 112 | Vert. | 13 | 0 | 32.2 | No |
| 912.000 | 56.7 | 107.3 | 50.6 | 1000 | 120 | 157 | Vert. | 10 | 0 | 32.5 | No |
| 929.985 | 62.6 | 107.3 | 44.7 | 1000 | 120 | 106 | Vert. | 4 | 0 | 33.3 | No |
| Transmitter operates at the middle of the assigned frequency band (operation mode 2) | | | | | | | | | | | |
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol. | Azimuth (deg) | Elevat. (deg) | Corr. (dB) | Restr. Band |
| 72.185 | 27.8 | 106.7 | 78.9 | 1000 | 120 | 215.0 | Hor. | 200.0 | 90.0 | 13.7 | No |
| 240.005 | 39.1 | 46.0 | 6.9 | 1000 | 120 | 150.0 | Vert. | 36.0 | 0.0 | 18.6 | Yes |
| 280.745 | 40.6 | 46.0 | 5.4 | 1000 | 120 | 197.0 | Hor. | 25.0 | 0.0 | 20.4 | Yes |
| 350.000 | 37.4 | 106.7 | 69.3 | 1000 | 120 | 100.0 | Vert. | 205.0 | 0.0 | 22.3 | No |
| 449.990 | 34.6 | 106.7 | 72.1 | 1000 | 120 | 110.0 | Hor. | 316.0 | 0.0 | 25.0 | No |
| 749.985 | 39.0 | 106.7 | 67.7 | 1000 | 120 | 106.0 | Hor. | 320.0 | 0.0 | 30.8 | No |
| 899.985 | 55.3 | 106.7 | 51.4 | 1000 | 120 | 154.0 | Vert. | 4.0 | 0.0 | 32.0 | No |
| 912.000 | 56.8 | 106.7 | 49.9 | 1000 | 120 | 150.0 | Vert. | 3.0 | 0.0 | 32.5 | No |
| 914.750 | 126.7 | Carrier | - | 1000 | 120 | 194.0 | Vert. | 7.0 | 0.0 | 32.6 | No |
| 929.985 | 62.5 | 106.7 | 44.2 | 1000 | 120 | 105.0 | Vert. | 7.0 | 0.0 | 33.3 | No |
| Transmitter operates at the upper end of the assigned frequency band (operation mode 3) | | | | | | | | | | | |
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol. | Azimuth (deg) | Elevat. (deg) | Corr. (dB) | Restr. Band |
| 72.200 | 29.1 | 106.8 | 77.7 | 1000 | 120 | 250 | Hor. | 336 | 0 | 13.7 | No |
| 239.990 | 39.1 | 106.8 | 67.7 | 1000 | 120 | 150 | Vert. | 29 | 0 | 18.6 | No |
| 280.625 | 41.0 | 46.02 | 5.0 | 1000 | 120 | 193 | Hor. | 14 | 0 | 20.4 | Yes |
| 350.000 | 33.2 | 106.8 | 73.6 | 1000 | 120 | 113 | Vert. | 187 | 0 | 22.3 | No |
| 449.990 | 33.3 | 106.8 | 73.5 | 1000 | 120 | 106 | Hor. | 305 | 0 | 25.0 | No |
| 749.985 | 37.0 | 106.8 | 69.8 | 1000 | 120 | 107 | Hor. | 323 | 0 | 30.8 | No |
| 899.985 | 55.2 | 106.8 | 51.6 | 1000 | 120 | 183 | Vert. | 2 | 0 | 32.0 | No |
| 912.000 | 57.0 | 106.8 | 49.8 | 1000 | 120 | 106 | Vert. | 0 | 0 | 32.5 | No |
| 924.000 | 53.4 | 106.8 | 53.4 | 1000 | 120 | 108 | Vert. | 2 | 0 | 33.0 | No |
| 927.250 | 126.8 | Carrier | - | 1000 | 120 | 150 | Vert. | 8 | 0 | 33.2 | No |
| 929.985 | 62.5 | 106.8 | 44.3 | 1000 | 120 | 107 | Vert. | 8 | 0 | 33.3 | No |
| 936.000 | 47.7 | 106.8 | 59.1 | 1000 | 120 | 150 | Vert. | 7 | 0 | 33.6 | No |
| Measurement uncertainty | | | | ±4.8 dB | | | | | | | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 6 – 13, 15 – 17, 33, 34 |

### 5.6.2.4 Final radiated emission measurement (1 GHz to 10 GHz) with internal antenna

| | | | |
|---|---|---|---|
| Ambient temperature | 21 °C | Relative humidity | 50 % |

Position of EUT: The EUT was set-up on the positioner at a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied 24.0 $V_{DC}$ by an external power supply.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

**Results measured with the peak detector:**

| Transmitter operates at the lower end of the assigned frequency band (operation mode 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Restr. Band |
| 1805.355 | 44.1 | 107.3 | 63.2 | Hor. | 306 | 30 | -13.1 | No |
| 2049.840 | 40.0 | 107.3 | 67.3 | Hor. | 7 | 0 | -11.8 | No |
| 2708.100 | 39.3 | 74.0 | 34.7 | Hor. | 359 | 0 | -8.4 | Yes |
| 3610.890 | 47.5 | 74.0 | 26.5 | Vert. | 303 | 90 | -6.5 | Yes |
| 7222.270 | 44.7 | 107.3 | 62.6 | Hor. | 194 | 0 | 4.0 | No |
| 8124.660 | 46.7 | 74.0 | 27.3 | Vert. | 332 | 30 | 6.0 | Yes |
| Transmitter operates at the middle of the assigned frequency band (operation mode 2) | | | | | | | | |
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Restr. Band |
| 1829.340 | 43.5 | 106.7 | 63.2 | Hor. | 195 | 150 | -12.9 | No |
| 2049.840 | 40.2 | 106.7 | 66.5 | Hor. | 6 | 30 | -11.8 | No |
| 2744.145 | 42.7 | 74.0 | 31.3 | Hor. | 19 | 30 | -8.4 | Yes |
| 3658.860 | 44.6 | 74.0 | 29.4 | Hor. | 195 | 150 | -6.4 | Yes |
| 5488.380 | 42.2 | 106.7 | 64.5 | Hor. | 94 | 60 | -0.1 | No |
| 6403.140 | 44.8 | 106.7 | 61.9 | Vert. | 0 | 0 | 1.6 | No |
| 7317.900 | 47.1 | 74.0 | 26.9 | Hor. | 123 | 30 | 4.6 | Yes |
| 8232.615 | 45.7 | 74.0 | 28.3 | Vert. | 165 | 150 | 6.0 | Yes |
| Transmitter operates at the upper end of the assigned frequency band (operation mode 2) | | | | | | | | |
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Restr. Band |
| 1854.401 | 43.8 | 106.8 | 63.0 | Vert. | 136 | 150 | -13.0 | No |
| 2049.840 | 40.4 | 106.8 | 66.4 | Hor. | 50 | 30 | -11.8 | No |
| 2781.630 | 45.7 | 74.0 | 28.3 | Hor. | 12 | 30 | -8.6 | Yes |
| 3708.855 | 44.5 | 74.0 | 29.5 | Hor. | 213 | 150 | -6.3 | Yes |
| 6490.620 | 47.6 | 106.8 | 59.2 | Vert. | 175 | 150 | 1.9 | No |
| 7417.890 | 48.2 | 74.0 | 25.8 | Hor. | 136 | 0 | 4.6 | Yes |
| 8345.160 | 47.8 | 74.0 | 26.2 | Hor. | 182 | 0 | 6.5 | Yes |
| Measurement uncertainty | | | | ±5.1 dB | | | | |

**Results measured with the average detector:**

| Transmitter operates at the lower end of the assigned frequency band (operation mode 1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Restr. Band |
| 1805.355 | 40.8 | 107.3 | 66.5 | Hor. | 306 | 30 | -13.1 | No |
| 2049.840 | 35.6 | 107.3 | 71.7 | Hor. | 7 | 0 | -11.8 | No |
| 2708.100 | 31.8 | 54.0 | 22.2 | Hor. | 3.0 | 0 | -8.4 | Yes |
| 3610.890 | 43.6 | 54.0 | 10.4 | Vert. | 303 | 90 | -6.5 | Yes |
| 7222.270 | 33.8 | 107.3 | 73.5 | Hor. | 194 | 0 | 4.0 | No |
| 8124.660 | 36.9 | 54.0 | 17.1 | Vert. | 332 | 30 | 6.0 | Yes |
| Transmitter operates at the middle of the assigned frequency band (operation mode 2) | | | | | | | | |
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Restr. Band |
| 1829.340 | 40.1 | 106.7 | 66.6 | Hor. | 195 | 150 | -12.9 | No |
| 2049.840 | 35.2 | 106.7 | 71.5 | Hor. | 6 | 30 | -11.8 | No |
| 2744.145 | 37.3 | 54.0 | 16.7 | Hor. | 19 | 30 | -8.4 | Yes |
| 3658.860 | 39.3 | 54.0 | 14.7 | Hor. | 195 | 150 | -6.4 | Yes |
| 5488.380 | 32.2 | 106.7 | 74.5 | Hor. | 94 | 60 | -0.1 | No |
| 6403.140 | 35.9 | 106.7 | 70.8 | Vert. | 0 | 0 | 1.6 | No |
| 7317.900 | 38.6 | 54.0 | 15.4 | Hor. | 123 | 30 | 4.6 | Yes |
| 8232.615 | 34.8 | 54.0 | 19.2 | Vert. | 165 | 150 | 6.0 | Yes |
| Transmitter operates at the upper end of the assigned frequency band (operation mode 3) | | | | | | | | |
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Restr. Band |
| 1854.401 | 40.4 | 106.8 | 66.4 | Vert. | 136 | 150 | -13.0 | No |
| 2049.840 | 35.4 | 106.8 | 71.4 | Hor. | 50 | 30 | -11.8 | No |
| 2781.630 | 41.2 | 54.0 | 12.8 | Hor. | 12 | 30 | -8.6 | Yes |
| 3708.855 | 38.4 | 54.0 | 15.6 | Hor. | 213 | 150 | -6.3 | Yes |
| 6490.620 | 41.5 | 106.8 | 65.3 | Vert. | 175 | 150 | 1.9 | No |
| 7417.890 | 39.5 | 54.0 | 14.5 | Hor. | 136 | 0 | 4.6 | Yes |
| 8345.160 | 37.0 | 54.0 | 17.0 | Hor. | 182 | 0 | 6.5 | Yes |
| Measurement uncertainty | | | | ±5.1 dB | | | | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 18 – 30, 33, 34 |

### 5.6.2.5 Preliminary radiated emission measurement with external antenna port terminated

| | | | | |
|---|---|---|---|---|
| Ambient temperature | 21 °C | | Relative humidity | 50 % |

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m and 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied 24.0 $V_{DC}$ by an external power supply.

Frequency range: The preliminary measurement was carried out in the frequency range 150 kHz to 10 GHz according to [2].

Remark: As pre-tests have shown, the emissions in the frequency range 150 kHz to 30 MHz are not depending on the transmitter operation mode. Therefore, the emissions in this frequency range were measured only with the transmitter operates in operation mode 2.

**Transmitter operates at the lower end of the assigned frequency band (operation mode 1)**

The following frequencies were found during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 72.375 MHz, 239.990 MHz, 279.235 MHz, 350.000 MHz, 450.000 MHz, 749.990 MHz and 902.750 MHz.

The following frequencies were found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1805.755 MHz, 2049.840 MHz, 2708.100 MHz, 3610.845 MHz, 5416.380 MHz, 6319.125 MHz, 7221.870 MHz, 8124.615 MHz and 9027.405 MHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

**Transmitter operates on the middle of the assigned frequency band (operation mode 2)**

No significant frequencies above the noise floor of the system (max. 38 dBµV/m / -13.5 dBµV/m (measured with peak detector) at 3 m distance) were found during the preliminary radiated emission test in the frequency range 150 kHz to 30 MHz, so no measurements were carried out on the outdoor test site.

The following frequencies were found during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 72.445 MHz, 240.000 MHz, 279.480 MHz, 350.000 MHz, 450.000 MHz, 749.990 MHz, 914.750 MHz.

The following frequencies were found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1829.385 MHz, 2049.840 MHz, 2744.100 MHz, 3658.860 MHz, 5488.380 MHz, 6403.140 MHz, 7317.900 MHz and 8232.660 MHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

**Transmitter operates on the upper end of the assigned frequency (operation mode 3)**

The following frequencies were found during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 72.440 MHz, 239.995 MHz, 279.815 MHz, 350.000 MHz, 450.000 MHz, 749.990 MHz and 927.250 MHz.

The following frequencies were found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1854.360 MHz, 2781.630 MHz, 3708.855 MHz, 4636.125 MHz, 5563.395 MHz, 6490.620 MHz 7417.890 MHz and 8345.160 MHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

Test equipment used (see chapter 6):

| |
|---|
| 6 – 31, 33, 34 |

### 5.6.2.6 Final radiated emission measurement (150 kHz to 30 MHz) with external antenna port terminated

No significant frequencies above the noise floor of the system (max. 38 dBµV/m / -13.5 dBµA/m (measured with peak detector) at 3 m distance) were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

### 5.6.2.7 Final radiated emission measurement (30 MHz to 1 GHz) with external antenna port terminated

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 64 % |

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied 24.0 $V_{DC}$ by an external power supply.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m] + 6 dB

The measured points and the limit line in the following diagrams refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with an x are the measured results of the standard final measurement on the open area test site.
The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

**Result measured with the quasi-peak detector:**
**(These values were marked in the diagrams in annex A by an ◆ )**

| Transmitter operates on the lower end of the assigned frequency band (operation mode 1) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol. | Azimuth (deg) | Elevat. (deg) | Corr. (dB) |
| 72.375 | 27.1 | 40.0 | 12.9 | 1000 | 120 | 197 | H | 202 | 90.0 | 13.7 |
| 239.990 | 38.5 | 46.0 | 7.5 | 1000 | 120 | 157 | V | 25 | 0.0 | 18.6 |
| 279.235 | 42.4 | 46.0 | 3.6 | 1000 | 120 | 201 | H | 17 | 0.0 | 20.3 |
| 350.000 | 35.7 | 46.0 | 10.3 | 1000 | 120 | 302 | H | 152 | 90.0 | 22.3 |
| 450.000 | 38.0 | 46.0 | 8.0 | 1000 | 120 | 227 | H | 148 | 90.0 | 25.0 |
| 749.990 | 34.6 | 46.0 | 11.4 | 1000 | 120 | 150 | H | 313 | 0.0 | 30.8 |
| 902.750 | 78.4 | Wanted signal | | 1000 | 120 | 127 | V | 7 | 0.0 | 32.2 |
| Transmitter operates on the middle of the assigned frequency band (operation mode 2) | | | | | | | | | | |
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol. | Azimuth (deg) | Elevat. (deg) | Corr. (dB) |
| 72.445 | 29.6 | 40.0 | 10.4 | 1000 | 120 | 213 | H | 205 | 90 | 13.7 |
| 240.000 | 40.2 | 46.0 | 5.8 | 1000 | 120 | 160 | V | 25 | 0 | 18.6 |
| 279.480 | 41.7 | 46.0 | 4.3 | 1000 | 120 | 214 | H | 25 | 0 | 20.3 |
| 350.000 | 34.1 | 46.0 | 11.9 | 1000 | 120 | 105 | V | 201 | 0 | 22.3 |
| 450.000 | 38.3 | 46.0 | 7.7 | 1000 | 120 | 220 | H | 149 | 90 | 25.0 |
| 749.990 | 33.8 | 46.0 | 12.2 | 1000 | 120 | 150 | H | 318 | 0 | 30.8 |
| 914.750 | 81.6 | Wanted signal | | 1000 | 120 | 145 | V | 4 | 0 | 32.6 |
| Transmitter operates on the upper end of the assigned frequency band (operation mode 3) | | | | | | | | | | |
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol. | Azimuth (deg) | Elevat. (deg) | Corr. (dB) |
| 72.440 | 29.3 | 40.0 | 10.7 | 1000 | 120 | 223 | Hor. | 192 | 0 | 13.7 |
| 239.995 | 39.4 | 46.0 | 6.6 | 1000 | 120 | 172 | Vert. | 40 | 0 | 18.6 |
| 279.815 | 41.6 | 46.0 | 4.4 | 1000 | 120 | 190 | Hor. | 25 | 0 | 20.3 |
| 350.000 | 35.5 | 46.0 | 10.5 | 1000 | 120 | 300 | Hor. | 158 | 90 | 22.3 |
| 450.000 | 37.9 | 46.0 | 8.1 | 1000 | 120 | 219 | Hor. | 145 | 90 | 25.0 |
| 749.990 | 34.0 | 46.0 | 12.0 | 1000 | 120 | 150 | Hor. | 310 | 0 | 30.8 |
| 927.250 | 82.3 | Wanted signal | | 1000 | 120 | 105 | Vert. | -1 | 0 | 33.2 |
| Measurement uncertainty | | | | ±4.8 dB | | | | | | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 6 – 13, 15 – 17, 33, 34 |

### 5.6.2.8 Final radiated emission measurement (1 GHz to 10 GHz) with external antenna port terminated

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 44 % |

Position of EUT: The EUT was set-up on the positioner at a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied 24 $V_{DC}$ by an external power supply.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

**Results measured with the peak detector:**

| Transmitter operates at the lower end of the assigned frequency band (operation mode 1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1805.755 | 41.1 | 74.0 | 32.9 | Vert. | 276 | 60 | -13.1 |
| 2049.840 | 40.5 | 74.0 | 33.5 | Hor. | 50 | 30 | -11.8 |
| 2708.100 | 46.3 | 74.0 | 27.7 | Hor. | 22 | 30 | -8.4 |
| 3610.845 | 52.0 | 74.0 | 22.0 | Vert. | 303 | 90 | -6.5 |
| 5416.380 | 44.1 | 74.0 | 29.9 | Hor. | 50 | 0 | -0.3 |
| 6319.125 | 44.9 | 74.0 | 29.1 | Vert. | 340 | 0 | 1.1 |
| 7221.870 | 47.6 | 74.0 | 26.4 | Hor. | 184 | 0 | 4.0 |
| 8124.615 | 52.6 | 74.0 | 21.4 | Vert. | 340 | 0 | 6.0 |
| 9027.405 | 49.3 | 74.0 | 24.7 | Hor. | 0 | 0 | 8.8 |
| Transmitter operates at the middle of the assigned frequency band (operation mode 2) | | | | | | | |
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1829.385 | 42.1 | 74.0 | 31.9 | Hor. | 272 | 0 | -12.9 |
| 2049.840 | 40.0 | 74.0 | 34.0 | Hor. | 324 | 30 | -11.8 |
| 2744.100 | 48.2 | 74.0 | 25.8 | Hor. | 350 | 30 | -8.4 |
| 3658.860 | 49.6 | 74.0 | 24.4 | Vert. | 179 | 120 | -6.4 |
| 5488.380 | 45.4 | 74.0 | 28.6 | Hor. | 32 | 30 | -0.1 |
| 6403.140 | 48.9 | 74.0 | 25.1 | Vert. | 174 | 150 | 1.6 |
| 7317.900 | 50.4 | 74.0 | 23.6 | Hor. | 134 | 0 | 4.6 |
| 8232.660 | 52.2 | 74.0 | 21.8 | Hor. | 12 | 30 | 6.0 |
| Transmitter operates at the upper end of the assigned frequency band (operation mode 3) | | | | | | | |
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1854.360 | 52.4 | 74.0 | 21.6 | Vert. | 272 | 90 | -13.0 |
| 2781.630 | 51.8 | 74.0 | 22.2 | Hor. | 0 | 0 | -8.6 |
| 3708.855 | 46.4 | 74.0 | 27.6 | Hor. | 240 | 150 | -6.3 |
| 4636.125 | 45.2 | 74.0 | 28.8 | Vert. | 312 | 60 | -2.7 |
| 5563.395 | 44.4 | 74.0 | 29.6 | Hor. | 65 | 30 | 0.1 |
| 6490.620 | 55.5 | 74.0 | 18.5 | Hor. | 57 | 30 | 1.9 |
| 7417.890 | 54.6 | 74.0 | 19.4 | Hor. | 49 | 150 | 4.6 |
| 8345.160 | 57.0 | 74.0 | 17.0 | Hor. | 41 | 0 | 6.5 |
| Measurement uncertainty | | | ±5.1 dB | | | | |

**Result measured with the average detector:**

| Transmitter operates at the lower end of the assigned frequency band (operation mode 1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1805.755 | 32.8 | 54.0 | 21.2 | Vert. | 276 | 60 | -13.1 |
| 2049.840 | 36.3 | 54.0 | 17.7 | Hor. | 50 | 30 | -11.8 |
| 2708.100 | 42.6 | 54.0 | 11.4 | Hor. | 22 | 30 | -8.4 |
| 3610.845 | 46.5 | 54.0 | 7.5 | Vert. | 303 | 90 | -6.5 |
| 5416.380 | 37.0 | 54.0 | 17.0 | Hor. | 50 | 0 | -0.3 |
| 6319.125 | 37.5 | 54.0 | 16.5 | Vert. | 340 | 0 | 1.1 |
| 7221.870 | 39.5 | 54.0 | 14.5 | Hor. | 184 | 0 | 4.0 |
| 8124.615 | 47.2 | 54.0 | 6.8 | Vert. | 340 | 0 | 6.0 |
| 9027.405 | 39.8 | 54.0 | 14.2 | Hor. | 0 | 0 | 8.8 |
| Transmitter operates at the middle of the assigned frequency band (operation mode 2) | | | | | | | |
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1829.385 | 38.4 | 54.0 | 15.6 | Hor. | 272.0 | 0.0 | -12.9 |
| 2049.840 | 35.4 | 54.0 | 18.6 | Hor. | 324.0 | 30.0 | -11.8 |
| 2744.100 | 44.7 | 54.0 | 9.3 | Hor. | 350.0 | 30.0 | -8.4 |
| 3658.860 | 46.2 | 54.0 | 7.8 | Vert. | 179.0 | 120.0 | -6.4 |
| 5488.380 | 38.4 | 54.0 | 15.6 | Hor. | 32.0 | 30.0 | -0.1 |
| 6403.140 | 42.2 | 54.0 | 11.8 | Vert. | 174.0 | 150.0 | 1.6 |
| 7317.900 | 44.7 | 54.0 | 9.3 | Hor. | 134.0 | 0.0 | 4.6 |
| 8232.660 | 46.6 | 54.0 | 7.4 | Hor. | 12.0 | 30.0 | 6.0 |
| Transmitter operates at the upper end of the assigned frequency band (operation mode 3) | | | | | | | |
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1854.360 | 50.5 | 54.0 | 3.5 | Vert. | 272 | 90 | -13.0 |
| 2781.630 | 48.9 | 54.0 | 5.1 | Hor. | 0 | 0 | -8.6 |
| 3708.855 | 41.3 | 54.0 | 12.7 | Hor. | 240 | 150 | -6.3 |
| 4636.125 | 39.4 | 54.0 | 14.6 | Vert. | 312 | 60 | -2.7 |
| 5563.395 | 37.0 | 54.0 | 17.0 | Hor. | 65 | 30 | 0.1 |
| 6490.620 | 52.3 | 54.0 | 1.7 | Hor. | 57 | 30 | 1.9 |
| 7417.890 | 50.4 | 54.0 | 3.6 | Hor. | 49 | 150 | 4.6 |
| 8345.160 | 53.4 | 54.0 | 0.6 | Hor. | 41 | 0 | 6.5 |
| Measurement uncertainty | | | ±5.1 dB | | | | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 18 – 30, 32, 33, 34 |

## 5.6.3 Test results (radiated emissions of TN-UHF-Q180L300-NA-CDS)

### 5.6.3.1 Preliminary radiated emission measurement with external antenna port terminated

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 33 % |

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m and 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied 24.0 $V_{DC}$ by an external power supply.

Frequency range: The preliminary measurement was carried out in the frequency range 150 kHz to 10 GHz according to [2].

**Transmitter operates on the upper end of the assigned frequency (operation mode 3)**

The following frequencies were found during the preliminary radiated emission test in the frequency range 30 MHz to 1 GHz:

- 927.250 MHz (wanted signal) and 980.100 MHz (highest level of the noise floor).

The following frequencies were found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1854.360 MHz, 2781.630 MHz, 3708.855 MHz, 4636.125 MHz, 5563.395 MHz, 6490.620 MHz 7417.890 MHz, 8345.160 MHz and 9272.385 MHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

Test equipment used (see chapter 6):

| |
|---|
| 6 – 18, 20 – 23, 25 – 30, 33, 34, 36 |

### 5.6.3.2 Final radiated emission measurement (150 kHz to 30 MHz) with external antenna port terminated

No significant frequencies above the noise floor of the system (max. 40 dBµV/m / -11.5 dBµA/m (measured with peak detector) at 3 m distance) were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

### 5.6.3.3 Final radiated emission measurement (30 MHz to 1 GHz) with external antenna port terminated

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 20 % |

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied 24.0 $V_{DC}$ by an external power supply.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m] + 6 dB

Resolution bandwidth: For all measurements a resolution bandwidth of 120 kHz was used.

The measured points and the limit line in the following diagrams refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with an x are the measured results of the standard final measurement on the open area test site.
The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

**Result measured with the quasi-peak detector:**
**(These values were marked in the diagrams in annex A by an ◆ )**

| Transmitter operates on the upper end of the assigned frequency band (operation mode 3) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 927.250 | 55.1 | Wanted signal | | 154 | Hor. | 269.0 | 90 | 32.9 |
| 980.100 | 24.4 | 54.0 | 29.6 | 358 | Vert. | 289.0 | 0 | 33.8 |
| Measurement uncertainty | | | | ±4.8 dB | | | | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 6 – 13, 15 – 17, 33, 34 |

### 5.6.3.4 Final radiated emission measurement (1 GHz to 10 GHz) with external antenna port terminated

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 33 % |

Position of EUT: The EUT was set-up on the positioner at a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex B of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied 24 $V_{DC}$ by an external power supply.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

**Results measured with the peak detector:**

| Transmitter operates at the upper end of the assigned frequency band (operation mode 3) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Peak result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1854.360 | 46.8 | 74.0 | 27.2 | Hor. | 226 | 150 | -13.1 |
| 2781.630 | 51.8 | 74.0 | 22.2 | Hor. | 27 | 0 | -8.7 |
| 3708.855 | 48.2 | 74.0 | 25.8 | Hor. | 318 | 30 | -6.7 |
| 4636.125 | 52.2 | 74.0 | 21.8 | Hor. | 34 | 0 | -3.3 |
| 5563.395 | 49.4 | 74.0 | 24.6 | Hor. | 208 | 150 | -0.4 |
| 6490.620 | 47.3 | 74.0 | 26.7 | Hor. | 69 | 0 | 1.6 |
| 7417.890 | 51.8 | 74.0 | 22.2 | Vert. | 179 | 150 | 4.0 |
| 8345.160 | 52.3 | 74.0 | 21.7 | Vert. | 1 | 150 | 6.0 |
| 9272.385 | 49.2 | 74.0 | 24.8 | Hor. | 153 | 150 | 5.7 |
| Measurement uncertainty | | | ±5.1 dB | | | | |

**Result measured with the average detector:**

| Transmitter operates at the upper end of the assigned frequency band (operation mode 3) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Average result (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Pol. | Azimuth (deg) | Elevation (deg) | Corr. (dB) |
| 1854.360 | 43.8 | 54.0 | 10.2 | Hor. | 226 | 150 | -13.1 |
| 2781.646 | 49.2 | 54.0 | 4.8 | Hor. | 27 | 0 | -8.7 |
| 3708.895 | 44.7 | 54.0 | 9.3 | Hor. | 318 | 30 | -6.7 |
| 4636.157 | 48.9 | 54.0 | 5.1 | Hor. | 34 | 0 | -3.3 |
| 5563.395 | 44.6 | 54.0 | 9.4 | Hor. | 208 | 150 | -0.4 |
| 6490.656 | 41.3 | 54.0 | 12.7 | Hor. | 69 | 0 | 1.6 |
| 7417.891 | 47.3 | 54.0 | 6.7 | Vert. | 179 | 150 | 4.0 |
| 8345.160 | 47.4 | 54.0 | 6.6 | Vert. | 1 | 150 | 6.0 |
| 9272.385 | 41.3 | 54.0 | 12.7 | Hor. | 153 | 150 | 5.7 |
| Measurement uncertainty | | | ±5.1 dB | | | | |

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 18, 20 – 23, 25 – 30, 33, 34, 36 |

## 5.7 Conducted emissions on antenna port

### 5.7.1 Method of measurement (conducted emissions in the restricted bands)

The relating measurements were carried out in a conducting manner. Therefore, the antenna port was connected via a suitable external attenuator to a spectrum analyser. The measurement procedure refers to part 11.12.2.2 in document [1].

If emissions were detected during the preliminary measurements, they were measured using the following measurement procedures:

Procedure for average measurement: 11.12.2.5.2 – Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction:

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:

- The EUT shall be configured to operate at the maximum achievable duty cycle.
- Measure the duty cycle D of the transmitter output signal as described in 11.6 in [1].
- Set the RBW = 1 MHz (unless otherwise specified).
- Set the VBW ≥ 3 x RBW.
- Detector = power average (RMS).
- Ensure that the number of measurement points in the sweep to ≥ 2 x (span/RBW).
- Averaging type = power
- Sweep time = auto
- Perform a trace average of at least 100 traces
- Correct the resulting measurement value by adding the duty cycle correction value (only applicable if not transmit continuously).

Peak measurement procedure: 11.12.2.4 in [1]

- Set the analyzer span to encompass the entire unwanted emission bandwidth.
- Set the RBW = specified in Table 1.
- Set the VBW ≥ RBW.
- Set sweep time = auto.
- Detector = peak.
- Trace mode = max hold.
- Allow the trace to stabilize.
- Use the peak marker function to determine the peak power over the emission bandwidth.

**Table 1 RBW as a function of frequency**

| Frequency | RBW |
|---|---|
| 9-150 kHz | 200-300 Hz |
| 0.15-30 MHz | 9-10 kHz |
| 30-1000 MHz | 100-120 kHz |
| > 1000 MHz | 1 MHz |

#### 5.7.1.1 Limit calculations

The following general procedure is described in chapter 11.12.2.2 in [1].

1. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 11.12.2.3 through 11.12.2.5 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
2. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP (see 11.12.2.6 for guidance on determining the applicable antenna gain).
3. Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies ≤ 30 MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies > 1000 MHz).
4. For MIMO devices, measure the power of each chain and sum the EIRP of all chains in linear terms (i.e., watts and mW).
5. Convert the resultant EIRP to an equivalent electric field strength using the following relationship:

$$E = EIRP - 20\log(d) + 104.8 \qquad (1)$$

where

E is the electric field strength in dBµV/m
EIRP is the equivalent isotropically radiated power in dBm
d is the specified measurement distance in m

1. Compare the resultant electric field strength level with the applicable regulatory limit.
2. C Perform the radiated spurious emission test.

Chapter 14 in [1] states, that for transmitters with multiple outputs in the same band, summing of emissions and accounting for array gain have to be considered.

For this test report the procedure of summing of emissions as described in 14.3.2.2 in [1] was used.

To account for directional gain which might occur in case of N transmit antennas, the directional has to be calculated as

$$G_{Dir} = G_{Ant} + 10\log(N) dBi,$$

whereby N is the number of antennas.

This EUT has only one antenna port, therefore no calculation for multiple ports have to be performed.

### 5.7.2 Method of measurement (conducted emissions in the unrestricted bands)

In any 100 kHz outside the authorized frequency band, the power shall be attenuated by 20 dB, compared to the highest in band power in any 100 kHz. This shall be demonstrated by using the peak power procedure. The reference level shall be measured using the procedure described in 5.7.2.1 and the emission level according to procedure 5.7.2.2. The procedures are based on chapter 11.11.2 and 11.11.3 in [1].

#### 5.7.2.1 Reference level measurement

Set instrument center frequency to DTS channel center frequency.

1. Set the span to ≥ 1.5 times the DTS bandwidth.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum PSD level.

#### 5.7.2.2 Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = peak.
5. Ensure that the number of measurement points ≥ span/RBW
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

### 5.7.3 Test results (conducted emissions)

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 70 % |

Measured conducted at antenna port 1 of TN-UHF-Q300-NA-CDS.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied 24.0 V DC by an external power supply.

Test record: All results are shown in the following. The plots of this measurements are presented in annex A of this test report.

Frequency range: The measurement was carried out in the frequency range 150 kHz to 10 GHz according to [2].

Remark: As pre-tests have shown, the emissions in the frequency range 150 kHz to 30 MHz are not depending on the transmitter operation mode. Therefore, the emissions in this frequency range were measured only with the transmitter operates in operation mode 1.

**Transmitter operates at the lower end of the assigned frequency band (operation mode 1)**

No significant emissions at least 20 dB below the limit were found in the frequency range 150 kHz to 30 MHz, therefore no results are submitted.

The following frequencies were found in the frequency range 30 MHz to 1 GHz:

- 899.985 MHz, 902.750 MHz, 912.000 MHz and 929.985 MHz.

The following frequency was found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1109.981 MHz.

The results of the measurement of these frequencies were presented in the following.

**Transmitter operates at the middle of the assigned frequency band (operation mode 2)**

The following frequencies were found in the frequency range 30 MHz to 1 GHz:

- 899.985 MHz, 912.000 MHz 914.750 MHz and 929.985 MHz.

The following frequency was found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1109.981 MHz.

The results of the measurement of these frequencies were presented in the following.

**Transmitter operates at the upper end of the assigned frequency band (operation mode 3)**

The following frequencies were found in the frequency range 30 MHz to 1 GHz:

- 899.985 MHz, 912.000 MHz 927.250 MHz and 929.985 MHz.

The following frequency was found during the preliminary radiated emission test in the frequency range 1 GHz to 10 GHz:

- 1109.981 MHz.

The results of the measurement of these frequencies were presented in the following.

| Spurious emissions (operation mode 1) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Operating channel | Frequency [MHz] | Reading [dBm] | Max. antenna gain [dBi] | Ground reflection factor [dB] | Calculated EIRP [dBm] | Calculated field strength [dBµV/m] | Min. limit [dBµV/m] | Margin [dB] | Result | Restricted Band |
| 0 (902.750 MHz) | 899.985 | -40.7 | 5.1 | 4.7 | -30.9 | 64.4 | 107.3 *1 | 42.9 | Passed | No |
| | 902.750 | 29.2 | Wanted signal, no spurious emission | | | | | | | |
| | 912.000 | -39.5 | 5.1 | 4.7 | -29.7 | 65.6 | 107.3 *1 | 41.74 | Passed | No |
| | 929.985 | -36.1 | 5.1 | 4.7 | -26.6 | 69.0 | 107.3 *1 | 38.3 | Passed | No |
| | 1109.981 | -51.8 | 5.1 | 0.0 | -46.7 | 48.6 | 54 | 5.4 | Passed | Yes |
| **Spurious emissions (operation mode 2)** | | | | | | | | | | |
| Operating channel | Frequency [MHz] | Reading [dBm] | Max. antenna gain [dBi] | Ground reflection factor [dB] | Calculated EIRP [dBm] | Calculated field strength [dBµV/m] | Min. limit [dBµV/m] | Margin [dB] | Result | Restricted Band |
| 24 (914.750 MHz) | 899.985 | -40.7 | 5.1 | 4.7 | -30.9 | 64.4 *2 | 106.7 *1 | 42.3 | Passed | No |
| | 912.000 | -39.5 | 5.1 | 4.7 | -29.7 | 65.6 *2 | 106.7 *1 | 41.1 | Passed | No |
| | 914.750 | 29.2 | Wanted signal, no spurious emission | | | | | | | |
| | 929.985 | -36.1 | 5.1 | 4.7 | -26.3 | 69.0 *2 | 106.7 *1 | 37.7 | Passed | No |
| | 1109.981 | -51.8 | 5.1 | 0.0 | -46.7 | 48.6 *2 | 54.0 | 5.4 | Passed | Yes |
| **Spurious emissions (operation mode 3)** | | | | | | | | | | |
| Operating channel | Frequency [MHz] | Reading [dBm] | Max. antenna gain [dBi] | Ground reflection factor [dB] | Calculated EIRP [dBm] | Calculated field strength [dBµV/m] | Min. limit [dBµV/m] | Margin [dB] | Result | Restricted Band |
| 49 (927.250 MHz) | 899.985 | -40.7 | 5.1 | 4.7 | -30.9 | 64.4 *2 | 106.8 *1 | 42.4 | Passed | No |
| | 912.000 | -39.5 | 5.1 | 4.7 | -29.7 | 65.5 *2 | 106.8 *1 | 41.3 | Passed | No |
| | 927.250 | 29.8 | Wanted signal, no spurious emission | | | | | | | |
| | 929.985 | -36.1 | 5.1 | 4.7 | -26.3 | 69.0 *2 | 106.8 *1 | 37.8 | Passed | No |
| | 1109.981 | -51.8 | 5.1 | 0.0 | -46.7 | 48.6 *2 | 54.0 | 5.4 | Passed | Yes |
| Measurement uncertainty | | | ±2.7 dB | | | | | | | |

*1: Limit (20 dBc) calculated with minimum antenna gain (0 dBi) from radiated measurement, refer clause 5.6.2.3

*2: Measured with peak detector only, because the peak value is already below the average limit

Test: Passed

Test equipment used (see chapter 6):

| |
|---|
| 19, 30, 32, 33, 34 |

## 5.8 Conducted emissions on power supply lines (150 kHz to 30 MHz)

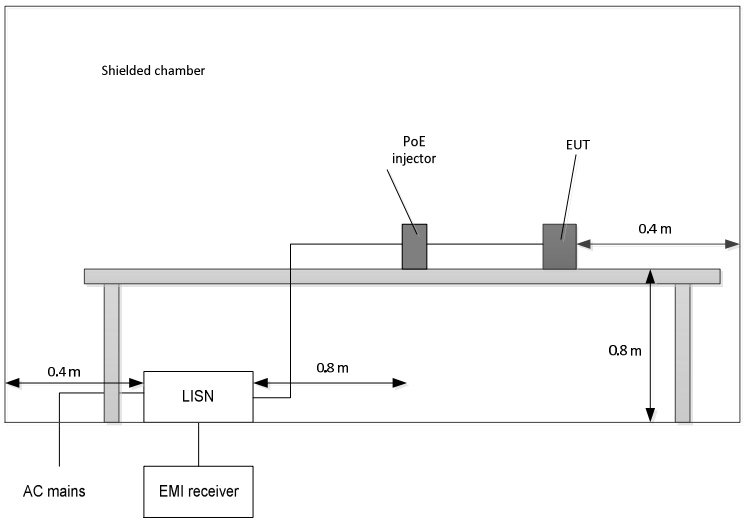
### 5.8.1 Method of measurement

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The setup of the Equipment under test will be in accordance to [1].

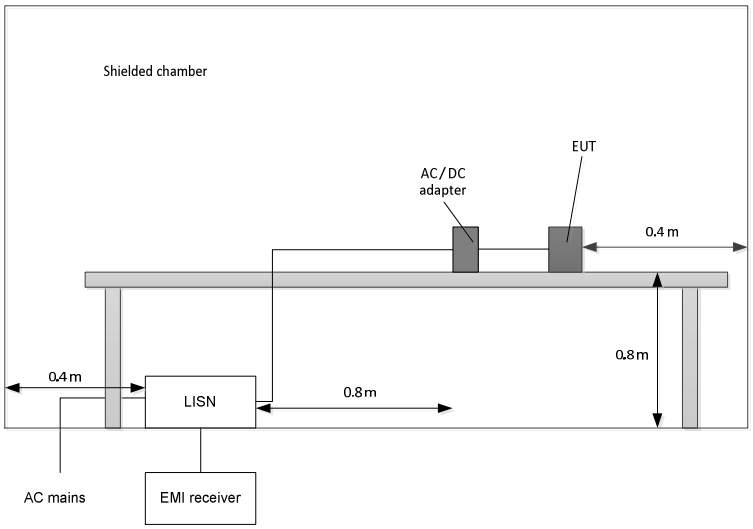
The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriable limit, this emission will be measured with the average and quasi-peak detector on all lines.

| Frequency range | Resolution bandwidth |
|---|---|
| 150 kHz to 30 MHz | 9 kHz |

Test setup for measurement with the EUT supplied via PoE:




Test setup for measurement with the EUT supplied with DC:



## 5.8.2 Test results (conducted emissions on power supply lines)

### 5.8.2.1 Test results with EUT supplied via PoE

| | | | |
|---|---|---|---|
| Ambient temperature | 22 °C | Relative humidity | 73 % |

Testsample: TN-UHF-Q300-NA-CDS

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex B of this test report.

Test record: The test was carried out in operation mode 4 of the EUT (refer also clause 2 of this test report). All results are shown in the following. The plot of this measurements is presented in annex A of this test report.

Supply voltage: During this test the EUT was supplied 48.0 $V_{DC}$ by an PoE injector type DeLOCK 802.3at, which was powered by an AC/DC adaptor type PHOENIX CONTACT UNO-PS/1AC/48DC/60W, which was connected to an AC mains network with 120 $V_{AC}$ / 60 Hz.

The curves in the diagram in annex A only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by ◆, the average measured points with▼.

| Frequency [MHz] | QuasiPeak [dBµV] | Average [dBµV] | Limit [dBµV] | Margin [dB] | Meas. Time [ms] | Bandwidth [kHz] | Line | PE | Corr. [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 0.165300 | 53.1 | --- | 65.2 | 12.1 | 5000 | 9 | L1 | GND | 9.8 |
| 0.166200 | --- | 44.3 | 55.2 | 10.9 | 5000 | 9 | L1 | FLO | 9.8 |
| 0.595500 | --- | 35.9 | 46.0 | 10.1 | 5000 | 9 | L1 | FLO | 9.9 |
| 1.032000 | --- | 42.7 | 46.0 | 3.3 | 5000 | 9 | L1 | FLO | 9.9 |
| 1.032900 | 46.3 | --- | 56.0 | 9.7 | 5000 | 9 | L1 | FLO | 9.9 |
| 1.547700 | --- | 43.6 | 46.0 | 2.4 | 5000 | 9 | L1 | FLO | 9.9 |
| 1.550400 | 43.8 | --- | 56.0 | 12.2 | 5000 | 9 | N | FLO | 9.9 |
| 1.825800 | 43.9 | --- | 56.0 | 12.1 | 5000 | 9 | L1 | GND | 10.0 |
| 2.321700 | --- | 37.9 | 46.0 | 8.1 | 5000 | 9 | L1 | FLO | 10.2 |
| 2.323500 | 43.2 | --- | 56.0 | 12.8 | 5000 | 9 | L1 | GND | 10.2 |
| 3.610500 | --- | 40.2 | 46.0 | 5.8 | 5000 | 9 | L1 | FLO | 10.3 |
| 3.612300 | 43.7 | --- | 56.0 | 12.3 | 5000 | 9 | L1 | GND | 10.3 |
| Measurement uncertainty | | | ±2.8 dB | | | | | | |

Test: Passed

Test equipment used (refer clause 6):

| |
|---|
| 1 – 5, 34, 35 |

### 5.8.2.2 Test results with EUT supplied with DC

| Ambient temperature | 22 °C | Relative humidity | 73 % |
|---|---|---|---|

Testsample: TN-UHF-Q300-NA-CDS

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex B of this test report.

Test record: The test was carried out in operation mode 4 of the EUT (refer also clause 2 of this test report). All results are shown in the following. The plot of this measurements is presented in annex A of this test report.

Supply voltage: During this test the EUT was supplied 24.0 $V_{DC}$ by an external power supply type PHOENIX CONTACT MINI-PS-100-240AC/24/DC/1.3, which was connected to an AC mains network with 120 VAC / 60 Hz.

The curves in the diagram in annex A only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by ♦, the average measured points with▼.

| Frequency [MHz] | QuasiPeak [dBµV] | Average [dBµV] | Limit [dBµV] | Margin [dB] | Meas. Time [ms] | Bandwidth [kHz] | Line | PE | Corr. [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 0.160800 | 56.8 | --- | 65.4 | 8.6 | 5000 | 9 | L1 | GND | 9.8 |
| 0.402000 | --- | 36.5 | 47.8 | 11.3 | 5000 | 9 | L1 | FLO | 9.9 |
| 17.502000 | 49.9 | --- | 60.0 | 10.1 | 5000 | 9 | N | FLO | 10.9 |
| 17.620800 | --- | 46.5 | 50.0 | 3.5 | 5000 | 9 | L1 | GND | 10.9 |
| 17.864700 | 51.2 | --- | 60.0 | 8.8 | 5000 | 9 | N | GND | 10.9 |
| 18.223800 | --- | 47.1 | 50.0 | 2.9 | 5000 | 9 | N | GND | 10.9 |
| Measurement uncertainty | | | ±2.8 dB | | | | | | |

Test: Passed

Test equipment used (refer clause 6):

| 1 – 5, 33, 34 |
|---|

# 6 Test equipment and ancillaries used for tests

| No. | Test equipment | Type | Manufacturer | Serial No. | PM. No. | Cal. Date | Cal. due |
|---|---|---|---|---|---|---|---|
| 1 | Shielded chamber M4 | - | Siemens | B83117-S1-X158- | 480088 | Calibration not necessary | |
| 2 | EMI Receiver | ESIB 26 | Rohde & Schwarz | 100292 | 481182 | 12.02.2020 | 02.2022 |
| 3 | LISN | NSLK8128 | Schwarzbeck | 8128161 | 480138 | 11.02.2020 | 02.2022 |
| 4 | Transient Filter Limiter | CFL 9206A | Teseq GmbH | 38268 | 481982 | Calibration not necessary | |
| 5 | EMI Software | EMC 32 | Rohde & Schwarz | 100061 | 481022 | Calibration not necessary | |
| 6 | Semi anechoic chamber M276 | SAC5-2 | Albatross Projects | C62128-A540-A138-10-0006 | 483227 | Calibration not necessary | |
| 7 | RF Switch Matrix | OSP220 | Rohde & Schwarz | | 482976 | Calibration not necessary | |
| 8 | Turntable | TT3.0-3t | Maturo | 825/2612/.01 | 483224 | Calibration not necessary | |
| 9 | Controller | NCD | Maturo | 474/2612.01 | 483226 | Calibration not necessary | |
| 10 | Positioner | TG1.5-10kg | Maturo | 110/2648.01 | 483042 | Calibration not necessary | |
| 11 | Antenna support | BAM 4.5-P-10kg | Maturo | 222/2612.01 | 483225 | Calibration not necessary | |
| 12 | System software EMC32 M276 | EMC32 | Rohde & Schwarz | 100970 | 482972 | Calibration not necessary | |
| 13 | Ultralog Antenna | CBL6111D | Chase | 25761 | 480894 | 18.09.2017 + 09.10.2020 | 09.2020 + 10.2023 |
| 14 | Loop antenna | HFH2-Z2 | Rohde & Schwarz | 100417 | 481912 | 05.02.2020 | 02.2021 |
| 15 | EMI Test receiver ESW | ESW44 | Rohde & Schwarz | 101828 | 482979 | 12.04.2019 | 04.2021 |
| 16 | Cable C417 | Sucoflex 118 | Huber+Suhner | 500654/118 | - | Calibration not necessary | |
| 17 | 6 dB attenuator | R412706000 | Radiall | 9833 | 410082 | Calibration not necessary | |
| 18 | Fully anechoic chamber M20 | - | Albatross Projects | B83107-E2439-T232 | 480303 | Calibration not necessary | |
| 19 | Spectrum analyser | FSW43 | Rohde & Schwarz | 100586 & 100926 | 481720 | 04.03.2020 | 03.2022 |
| 20 | Measuring receiver | ESW44 | Rohde & Schwarz | 101635 | 482467 | 18.02.2020 | 02.2022 |
| 21 | Controller | MCU | Maturo | MCU/043/971107 | 480832 | Calibration not necessary | |
| 22 | Turntable | DS420HE | Deisel | 420/620/80 | 480315 | Calibration not necessary | |
| 23 | Antenna support | AS615P | Deisel | 615/310 | 480187 | Calibration not necessary | |
| 24 | Antenna | HL50 | Rohde & Schwarz | 100438 | 481170 | 09.10.2017 | 10.2020 |
| 25 | RF-cable No. 36 | Sucoflex 106B | Suhner | 0587/6B | 480865 | Calibration not necessary | |
| 26 | RF-cable No. 3 | Sucoflex 106B | Suhner | 0563/6B | 480670 | Calibration not necessary | |
| 27 | RF-cable No. 40 | Sucoflex 106B | Suhner | 0708/6B | 481330 | Calibration not necessary | |
| 28 | Preamplifier | JS3-00101200-23-5A | Miteq | 681851 | 480337 | Calibration not necessary | |
| 29 | Turn device | TDF 1.5- 10Kg | Maturo | 15920215 | 482034 | Calibration not necessary | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 30 | High Pass Filter | WHKX12-935-1000-15000-40ST | Wainwright | 12 | 482908 | Calibration not necessary | |
| 31 | Tuneable Notch Filter | WRCA800/900-0.2/40-6EEK | Wainwright Instruments GmbH | 15 | 480414 | Calibration not necessary | |
| 32 | 20 dB attenuator | WA8 / 18-20-34 | Weinschel | - | 481450 | Calibration not necessary | |
| 33 | DC power supply | HM8142 | Hameg | 142981P 03955 | 480719 | Calibration not necessary | |
| 34 | Digital multimeter | 971A | Hewlett Packard | JP39009358 | 480721 | 16.01.2020 | 01.2021 |
| 35 | AC source | AC6803A | Keysight | JPVJ002509 | 482350 | Calibration not necessary | |
| 36 | Antenna | HL50 | Rohde & Schwarz | 100908 | 482977 | 13.08.2019 | 08.2022 |

# 7 Test site validation

| Test equipment | PM. No. | Frequency range | Type of validation | According to | Val. Date | Val Due |
|---|---|---|---|---|---|---|
| Semi anechoic chamber M276 | 483227 | 30 – 1000 MHz | NSA | ANSI C63.4-2014 | 19.09.2019 | 18.09.2021 |
| Fully anechoic chamber M20 | 480303 | 1 -18 GHz | SVSWR | CISPR 16-1-4 Amd. 1 | 13.07.2018 | 12.07.2021 |
| Shielded chamber M4 | 480088 | 9 kHz – 30 MHz | GND-Plane | ANSI C63.4-2014 | 06.11.2018 | 05.11.2020 |

# 8 Report history

| Report Number | Date | Comment |
|---|---|---|
| F192159E1 | 06.11.2020 | Document created |
| - | - | - |
| - | - | - |
| - | - | - |

# 9 List of annexes

| | | |
|---|---|---|
| Annex A | Measurement plots | 26 pages |
| Annex B | Test set-up photos | 16 pages |