

# RADIO TEST REPORT

**No. 2019843STO-310**

## RF Performance

### EQUIPMENT UNDER TEST

Equipment: Remote care solution  
Type/Model: Hub  
Manufacturer: Pink Nectarine Health AB  
Tested by request of: Pink Nectarine Health AB

### SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the selected requirements according to the following standards:

47 CFR Part 15 Subpart C: Intentional radiators. Section 15.247

RSS-GEN Issue 5 (2018): General requirements of compliance of radio apparatus

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

For details, see clause 2 – 4.

Note: Only transmitter spurious emission in the frequency range 1 – 26 GHz has been tested by request of the client.

Date of issue: December 15, 2020

Tested by:



Robert Hietala

Approved by:



Björn Utermöhl

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**Revision History**

| Test report number | Date              | Description   | Changes |
|--------------------|-------------------|---------------|---------|
| 2019843STO-310     | December 15, 2020 | First release | --      |

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## 1 CLIENT INFORMATION

The EUT has been tested by request of

Company Pink Nectarine Health AB  
Munkbron 11  
111 28 Stockholm  
Sweden

Name of contact Tobias Linghammar  
Phone +46 70 461 48 27

## 2 EQUIPMENT UNDER TEST (EUT)

## 2.1 Identification of the EUT

|                                     |   |   |  |
|-------------------------------------|---|---|--|
| Equipment:                          | Remote care solution  |   |  |
| Type/Model:                         | Hub   |   |  |
| Brand name:                         | Nectarine Health  |   |  |
| Manufacturer:                       | Pink Nectarine Health AB                                      |   |  |
| Transmitter frequency range:        | 2412 – 2467 MHz   |   |  |
| Receiver frequency range:           | 2412 – 2467 MHz   |   |  |
| Frequency agile or hopping:         | <input type="checkbox"/> Yes                                  | <input checked="" type="checkbox"/> No                                    |  |
| Antenna:                            | <input checked="" type="checkbox"/> Internal antenna          | <input type="checkbox"/> External antenna                                 |  |
| Antenna connector:                  | <input checked="" type="checkbox"/> None, internal antenna    | <input type="checkbox"/> Yes  |  |
| Antenna gain:                       | -0.5 dBi  |   |  |
| Rating RF output power:             | +22 dBm (EIRP)  |   |  |
| Type of modulation:                 | IEEE 802.11 b/g/n   |   |  |
| Temperature range:                  | <input type="checkbox"/> Category I (General): -20°C to +55°C | <input type="checkbox"/> Category II (Portable equipment): -10°C to +55°C | <input type="checkbox"/> Category III (Equipment for normal indoor use): +5°C to +35°C |
|                                     | <input checked="" type="checkbox"/> Other: 0°C to +40°C       |   |  |
| Transmitter standby mode supported: | <input checked="" type="checkbox"/> Yes                       | <input type="checkbox"/> No   |  |

## 2.2 Additional information about the EUT

The EUT employs Wi-Fi 2.4 GHz, Wi-Fi 5 GHz and Bluetooth Low Energy. This test report covers transmitter spurious emission in the frequency range 1 – 26 GHz for Wi-Fi 2.4 GHz.

The Wi-Fi 2.4 GHz have previously been tested for full compliance in test report number NTC1712035FV00 by Nore Testing Center.

It was determined by the RF output power and power spectral density from the above-mentioned test report that IEEE 802.11b is the worst-case modulation.

During the tests the EUT supported following software:

| Software    | Version   | Comment   |
|-------------|-----------|---|
| Code Aurora | 4.5.25.42 | Change-Id:<br>Idc2ffabedef75ab79517ddc46b2e9c<br>61b2e3c74<br>85e563927dde7df2292e961f43c9b16<br>8b6c1402568d4c0557deb846ff2c2fe1<br>8_bdwlan30.bin<br>9f2a436dc48e45f98d3bb37cb295a9d<br>8b352ee006c24582c82d67b6fef6d08<br>de<br>eeprom_qca9377_1p1_WB396_olpc.<br>bin<br>a62785f32234029f08c81ad28ce6047<br>2d74f2827361618c4f09a9837d78c88<br>55_otp30.bin<br>364900f2e41cb120e1c50c1b167dfbf3<br>c68c2f274cf6983b36b54706ede13c1c<br>qwlan30.bin<br>315ac1e2ef6637db584d8135f869ad8f<br>6db8874d5c4360fbcea9cf6944048dd<br>1_utf30.bin |

## 2.3 Mode of operation during the tests

The tests were performed on the following channels:

Middle channel = 2437 MHz

The following settings were used during testing:

| Test                          | Modulation | Data rate [Mbps] | Nominal channel bandwidth [MHz] |
|-------------------------------|------------|------------------|---------------------------------|
| Transmitter spurious emission | 802.11b    | 1                | 20                              |

## 2.4 Modifications made to improve EMC-characteristics

No modifications have been made during the tests.

### 3 TEST SPECIFICATIONS

#### 3.1 Standards

Requirements:

47 CFR Part 15 Subpart C: Intentional radiators. Section 15.247

RSS-GEN Issue 5 Amendment 1 (2019): General requirements of compliance of radio apparatus.

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

Test methods:

ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

#### 3.2 Additions, deviations and exclusions from standards and accreditation

Only transmitter spurious emission in the frequency range 1 – 26 GHz have been tested by request of the client.

No other additions, deviations or exclusions have been made from standards and accreditation.

#### 3.3 Test site

Measurements were performed at:

Intertek Semko AB  
Torshamnsgatan 43  
Box 1103  
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913  
Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002  
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G  
Intertek Semko AB is an ISED recognized wireless testing laboratory with CAB identifier SE0003.

Measurement chambers

| Measurement Chamber | Type of chamber   | IC Site filing # |
|---------------------|-------------------|------------------|
| Radiohallen         | Fully anechoic 3m | 2042G-4          |

#### 4 TEST SUMMARY

The results in this report apply only to sample tested:

| Requirement   | Description  | Result      |
|---|--|-------------|
| <b>FCC §15.203<br/>RSS-GEN 8.3</b>                                    | <b>Antenna</b><br>The EUT has integrated non detachable antenna which can't be remove without breaking the EUT.<br><br>The antenna gain is less than 6 dBi   | <b>PASS</b> |
| <b>FCC Part 15.205<br/><br/>RSS-GEN 8.10</b>                          | <b>Restricted bands of operations</b><br><br>The transmit frequency, including fundamental components of modulation, of license-exempt radio apparatus shall not fall within the restricted frequency bands listed in CFR 47 §15.205 and in RSS-GEN section 8.10<br><br>EUT operates in unrestricted 2402 – 2480 MHz frequency band. | <b>PASS</b> |
| <b>FCC §15.207,<br/>15.107<br/>RSS-GEN 8.8 table<br/>3</b>            | <b>Conducted continuous emission in the frequency range<br/>150 kHz to 30 MHz, AC Power input port</b><br><br>Not tested by request of the client.   | <b>NT</b>   |
| <b>FCC §15.247 (d),<br/>15.209(a)<br/>RSS-GEN 8.9<br/>RSS-247 5.5</b> | <b>Radiated emission of electromagnetic fields in the<br/>frequency range 30 – 1000 MHz</b><br><br>Not tested by request of the client.  | <b>NT</b>   |
| <b>FCC §15.247(d),<br/>15.209(a)<br/>RSS-GEN 8.9<br/>RSS-247 5.5</b>  | <b>Radiated emission of electromagnetic fields in the<br/>frequency range above 1 GHz</b><br><br>The EUT complies with the limits.<br>The margin to the limit was at least 3.2 dB.<br>See clause 5.4.  | <b>PASS</b> |
| <b>FCC §15.247(a)(2)<br/>RSS-GEN 6.6<br/>RSS-247 5.2(1)</b>           | <b>Occupied bandwidth</b><br><br>Not tested by request of the client.  | <b>NT</b>   |
| <b>FCC §15.247(b)<br/>RSS-247 5.4(4)</b>                              | <b>Conducted output power</b><br><br>Not tested by request of the client.  | <b>NT</b>   |
| <b>FCC §15.247(e)<br/>RSS-247 5.2(2)</b>                              | <b>Peak power spectral density</b><br><br>Not tested by request of the client.   | <b>NT</b>   |
| <b>FCC §15.247(e)<br/>RSS-247 5.5</b>                                 | <b>Conducted Band edge</b><br><br>Not tested by request of the client.   | <b>NT</b>   |

## 5 RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ TO 26 GHZ

|                      |                              |                           |             |
|----------------------|------------------------------|---------------------------|-------------|
| <b>Date of test:</b> | December 01, 2020            | <b>Test location:</b>     | Radiohallen |
| <b>EUT Serial:</b>   | HNA0101-T2041397BQ           | <b>Ambient temp:</b>      | 22 °C       |
| <b>Tested by:</b>    | Robert Hietala, Ala El-Haery | <b>Relative humidity:</b> | 23 %        |
| <b>Test result:</b>  | Pass                         | <b>Margin:</b>            | 3.2 dB      |

### 5.1 Test set-up and test procedure.

The test method is in accordance with ANSI C63.10-2013.

The EUT was set up in order to emit maximum disturbances.

The EUT was placed on an insulating support 1.5 m above the turntable which is part of the reference ground plane.

Overview sweeps were performed with the measurement receiver in max-hold mode and the peak and average detector activated.

### 5.2 Test conditions

| <b>Test set-up:</b>            | <b>1 GHz – 26 GHz</b>  |                      |
|--------------------------------|--|----------------------|
| Test receiver set-up:          |  |                      |
| Preview test:                  | Peak,  | RBW 1 MHz. VBW 3 MHz |
|                                | Average,   | RBW 1 MHz. VBW 3 MHz |
| Final test:                    | Peak,  | RBW 1 MHz. VBW 3 MHz |
|                                | Average  | RBW 1 MHz. VBW 3 MHz |
| EUT height above ground plane: | 1.5 m  |                      |
| Measuring distance:            | 3 m  |                      |
| Measuring angle:               | 0 – 359°   |                      |
| Antenna                        |  |                      |
| Height above ground plane:     | 1.5 m  |                      |
| Polarisation:                  | Vertical and Horizontal  |                      |
| Type:                          | Horn   |                      |
| Antenna tilt:                  | The EUT is rotated around its axis as described in ANSI C63.10 (2013) clause 6.6.5 |                      |

### 5.3 Requirements

Within restricted bands:

Reference: CFR 47 §15.209, RSS-Gen section 8.9

Field strength of emissions must comply with limits shown in table below

| Frequency range [MHz] | Field strength at 3 m (dB $\mu$ V/m) | Field strength at 10 m (dB $\mu$ V/m) | Detector (dB $\mu$ V/m) |
|-----------------------|--------------------------------------|---------------------------------------|-------------------------|
| 30 – 88               | 40.0                                 | 29.5                                  | Quasi Peak              |
| 88 – 216              | 43.5                                 | 33.0                                  | Quasi Peak              |
| 216 – 960             | 46.0                                 | 35.5                                  | Quasi Peak              |
| 960 – 1000            | 54.0                                 | 43.5                                  | Quasi Peak              |
| Above 1000            | 54.0 / 74.0                          | 43.5 / 63.5                           | Average / Peak          |

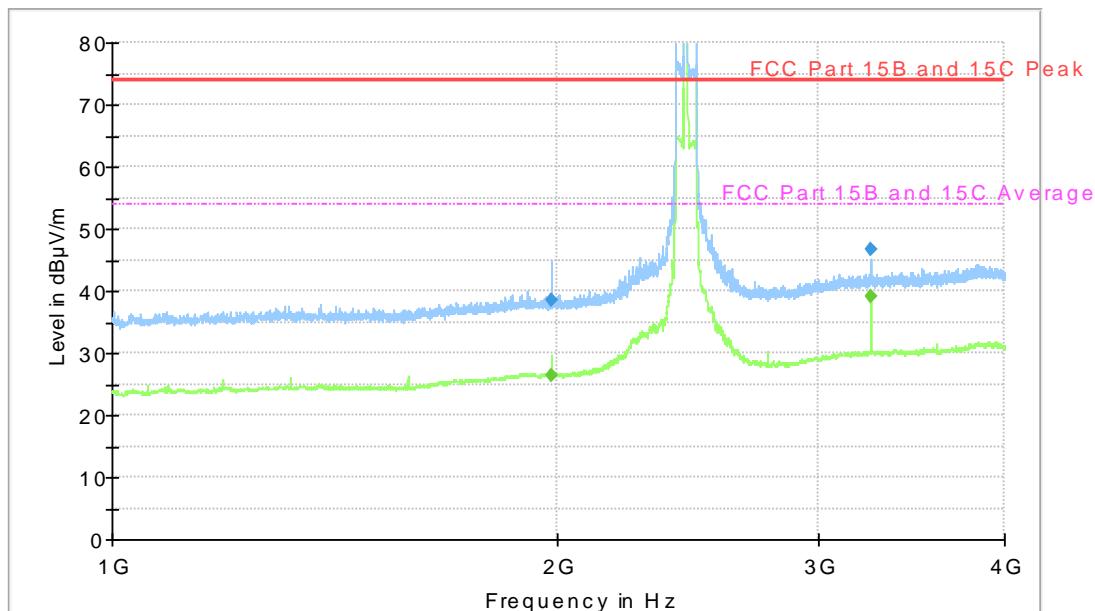
The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit.  
(i.e. an extrapolation factor of 20 dB/decade according to CFR 47 §15.31(f)(1))

Outside the restricted bands:

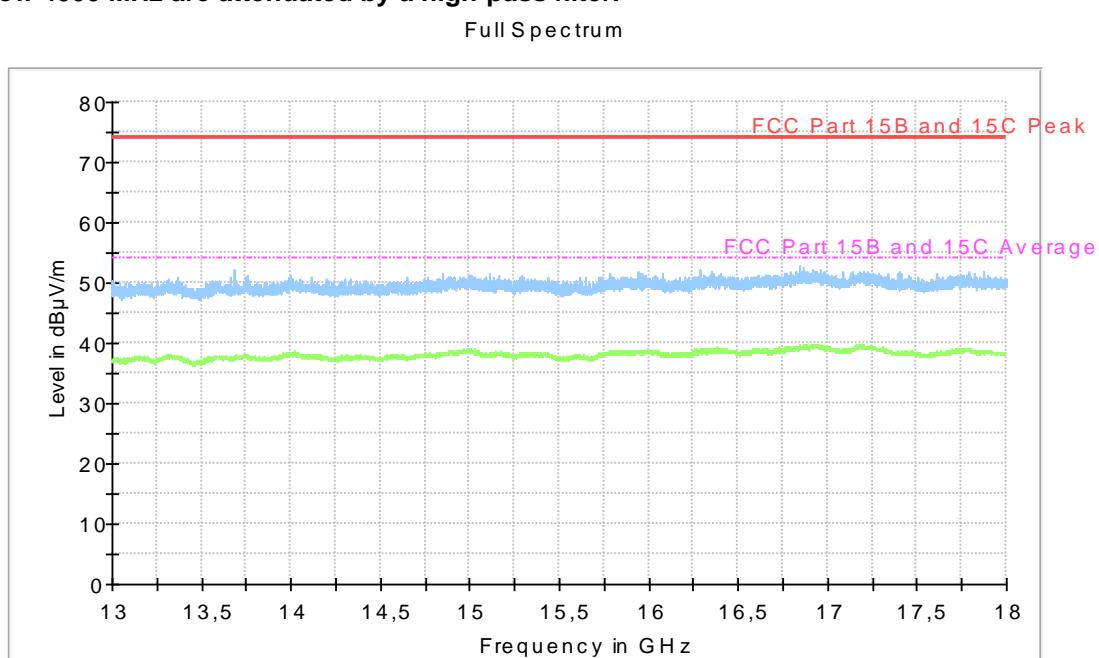
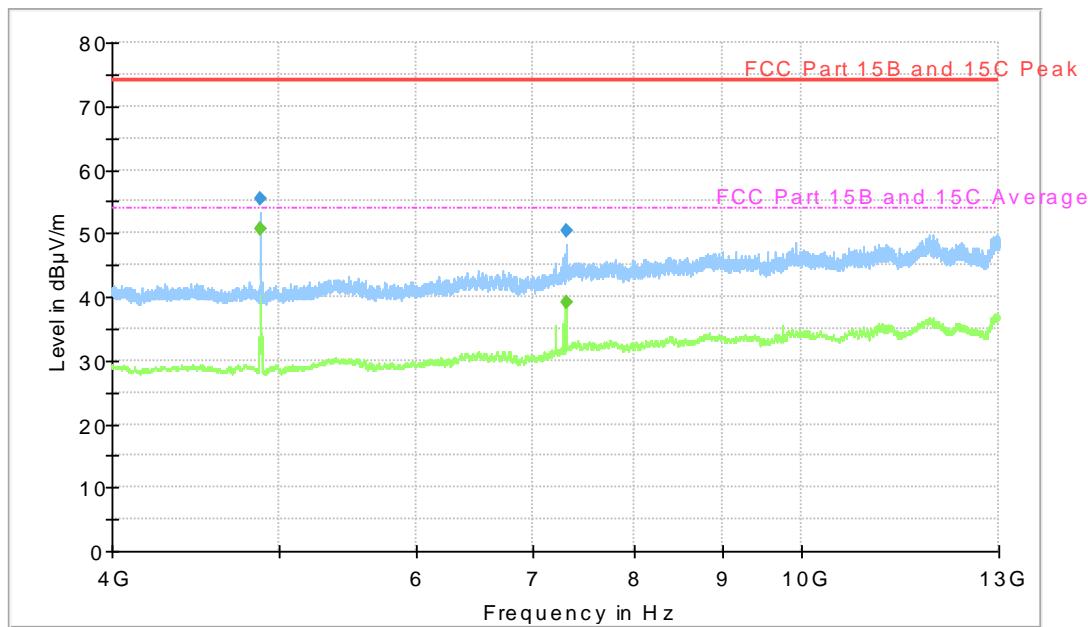
Reference: CFR 47 §15.247(d), RSS-247 5.5,

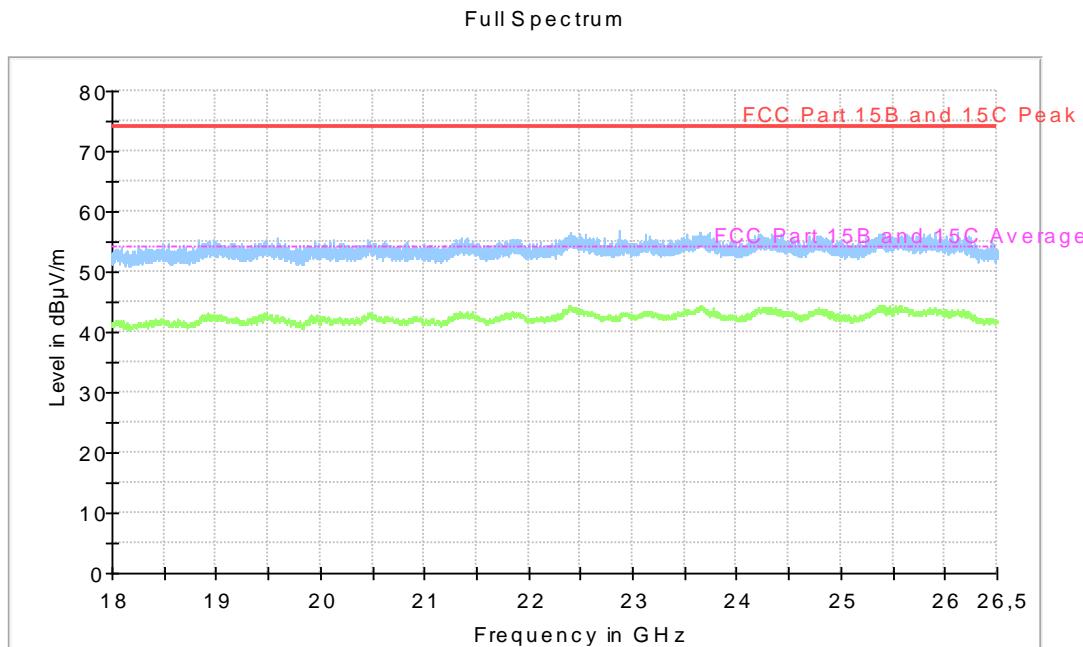
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

### 5.4 Test results 1 GHz – 26 GHz, TX



Diagram, Peak overview sweep, 1– 4 GHz at 3 m distance. TX middle channel. Carrier is attenuated by a band rejection filter.





Diagram, Peak overview sweep, 18 – 26 GHz at 3 m distance. TX middle channel.

Measurement results, Peak, TX middle channel

| Frequency [MHz] | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Polarization H/V | Margin [dB] | Comment |
|-----------------|----------------------|----------------------|------------------|-------------|---------|
| 1979.5          | 38.3                 | 74.0                 | V                | 35.7        | --      |
| 3249.3          | 46.8                 | 74.0                 | V                | 27.2        | --      |
| 4874.0          | 55.4                 | 74.0                 | H                | 18.6        | --      |
| 7312.2          | 50.5                 | 74.0                 | V                | 23.5        | --      |

Measurement results, Average, TX middle channel

| Frequency [MHz] | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Polarization H/V | Margin [dB] | Comment |
|-----------------|----------------------|----------------------|------------------|-------------|---------|
| 1980.0          | 26.4                 | 54.0                 | V                | 27.6        | --      |
| 3249.5          | 39.1                 | 54.0                 | V                | 14.9        | --      |
| 4874.0          | 50.8                 | 54.0                 | H                | 3.2         | --      |
| 7311.5          | 39.2                 | 54.0                 | V                | 14.8        | --      |

Result [dB $\mu$ V/m] = Analyser reading [dB $\mu$ V] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

## 6 TEST EQUIPMENT

Radiohallen (3m FAC)

| Equipment type              | Manufacturer      | Model  | Inv. No. | Last Cal. date | Cal. interval |
|-----------------------------|-------------------|--|----------|----------------|---------------|
| Measurement software        | Rohde & Schwarz   | EMC32 - V10.50.40                                | --       | --             | --            |
| Measurement receiver        | Rohde & Schwarz   | ESU 40   | 13178    | July-2020      | 1 year        |
| Horn antenna                | EMCO              | 3115   | 4936     | Sep-2020       | 3 years       |
| Pre-amplifier               | Sangus            | 00101400-23-10P -6-S ; AFS44-12002400-32-10P -44 | 12335    | Oct-2020       | 1 year        |
| Horn antenna                | EMCO              | 3160-08  | 30099    | Aug-2020       | 3 years       |
| Horn antenna                | EMCO              | 3160-09  | 30101    | Aug-2020       | 3 years       |
| 2,4 GHz band reject filter: | Wainwright        | WRCGV10-2381-2401-2479-2499-40SS                 | 33938    | Sep-2020       | 1 year        |
| 4 GHz high pass filter      | K&L MICROWAVE INC | 4410-X4500/18000-0/0                             | 5133     | Sep-2020       | 1 year        |
| Temperature reader          | Vaisala           | HM40   | 32873    | Sep-2020       | 1 year        |

## 7 MEASUREMENT UNCERTAINTY

Continuous conducted disturbances with AMN in the frequency range 9 kHz to 30 MHz  $\pm 3.7$  dB

Measurement uncertainty for radiated disturbance

|  |              |
|--|--------------|
| Uncertainty for the frequency range 1.0 to 18 GHz at 3 m | $\pm 4.7$ dB |
| Uncertainty for the frequency range 18 to 26 GHz at 3 m  | $\pm 4.8$ dB |

Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011.

The measurement uncertainty is given with a confidence of 95 %.

## 8 TEST SET UP AND EUT PHOTOS

EUT photos are in separate document 2019843STO-320 Annex 1.

Test set up photos are in separate document 2019843STO-321 Annex 2.