

TEST REPORT

Test Report No.: 1-5753/12-02-15



Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing Laboratory

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Accredited Test Laboratory:

The testing laboratory (FCC part 15 D) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

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30900 Wedemark
GERMANY
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Phone: +49 5130 600-2621

Manufacturer

Sennheiser electronic GmbH & Co. KG
Am Labor 1
30900 Wedemark
GERMANY

Test Standard/s

FCC Part 15, subpart D Isochronous UPCS Device 1920 – 1930 MHz
Industry Canada 2 GHz Licence-exempt Personal Communication Service Devices (LE-PCS)
RSS-213, Issue 2

Test Item

Kind of test item: **DECT Fixed Part**
Model name: **SL Rack Receiver DW**
FCC ID: DMOEM1G9WE
IC: 2099A-EM1G9WE
S/N serial number: 1234100304
HW hardware status: 551054-09 EM
SW software status: 0.3.4
Frequency [MHz]: 1920 -1930
Type of Modulation: Digital (Gaussian Frequency Shift Keying)
Number of channels: 5 RF Channels, 5x12 = 60 TDMA Duplex Channels
Antenna: 2 dipole antennas
Power Supply: 12 V AC/DC Adapter
Temperature Range: -20°C to 50°C



Test Report authorised:

Test performed:

2015-02-04 Lenjoint, Marco
Testing Manager

2015-02-04 Wolf, Joachim
Senior Consultant

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

| | |
|------------------------------------|------------|
| Date of receipt of order: | 2014-06-01 |
| Date of receipt of test item: | 2014-06-23 |
| Start of test: | 2014-06-23 |
| End of test: | 2014-09-03 |
| Person(s) present during the test: | / |

3 Test standard/s:

| Test Standard | Version | Test Standard Description |
|----------------------------------|------------|--|
| FCC Part 15, subpart D | 2009-10 | Isochronous UPCS Device 1920 – 1930 MHz |
| Industry Canada RSS-213, Issue 2 | 1999-04-24 | 2 GHz Licence-exempt Personal Communication Service Devices (LE-PCS) |

4 Test Environment

Temperature: + 22 °C during room temperature tests
+ 50 °C during high temperature test
- 20 °C during low temperature test

Relative humidity content: 38 %

Air pressure: not relevant for this kind of testing

Power supply: 110V AC/DC Adapter, (12 V DC)

5 Test Item

| | | |
|---------------------|---|--------------------------------------|
| Kind of test item | : | UPCS Base station |
| Type identification | : | SL Rack Receiver (Fixed Part) |
| S/N serial number | : | 1234100304 |
| HW hardware status | : | 551054-09 EM |
| SW software status | : | 0.3.4 |
| Power Supply | : | 110 V AC/DC adapter (12V DC) |
| Temperature Range | : | -20°C to 50°C |

6 RSP100 Test report Cover Sheet/Performance Test Data

| | | |
|---|---|---|
| Test Report Number | : | 1-5753/12-02-15 |
| Equipment Model Number | : | SL Rack Receiver (Fixed Part) |
| Certification Number | : | 2099A-EM1G9WE |
| Manufacturer | : | Sennheiser electronic GmbH & Co. KG |
| Tested to Radio Standards Specification (RSS) No. | : | RSS-213 Issue 2 |
| Open Area Test Site Industry Canada Number | : | IC 3462C-1 |
| Frequency Range (or fixed frequency) | : | 1921.536 – 1928.448 MHz |
| RF Power [W] (max) | : | Conducted: 19.5 dBm, 89.5 mW Rad. EIRP: 20.3 dBm, 107.2 mW |
| Occupied Bandwidth (99% BW) | : | 1.33MHz |
| Type of Modulation | : | Digital (Gaussian Frequency Shift Keying) |
| Emission Designator (TRC-43) | : | 1M33FXD |
| Antenna information | : | 2 ext. inverted SMA connector with dipole antenna |
| Transmitter Spurious (worst case) | : | -44.1 dBm |
| Receiver Spurious (worst case) | : | -69.6 dBm |

ATTESTATION:

DECLARATION OF COMPLIANCE: I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Signature:

Date: 2015-02-04

Test engineer: Joachim Wolf

CETECOM ICT Services GmbH
Untertürkheimerstr. 6-10
66117 Saarbrücken
Germany

7 Summary of Measurement Results

| | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | No deviations from the technical specifications were ascertained |
| <input type="checkbox"/> | There were deviations from the technical specifications ascertained |

CFR 47 Part 15 UPCS

| Name of test | FCC CFR 47 Paragraph | IC RSS-213 Paragraph | Verdict |
|--|---------------------------------|------------------------|-----------------------|
| Coordination with fixed microwave | 15.307(b) | N/A | Complies |
| Digital Modulation Techniques | 15.319(b) | 6.1 | Complies |
| Labeling requirements | 15.19(a)(3) | RSS-GEN 5.2 | Complies |
| Antenna requirements | 15.317, 15.203 | 4.1(e) | Complies |
| Power Line Conducted Emission | 15.107(a), 15.207(a) | 6.3 RSS_GEN 7.2.2 | Complies |
| Emission Bandwidth | 15.323(a) | 6.4 | Complies |
| In-band Emission | 15.323(d) | 6.7.2 | Complies |
| Out-of-band Emissions | 15.323(d) | 6.7.1 | Complies |
| Peak Transmit Power | 15.319(c)(e), 15.31(e) | 6.5 | Complies |
| Power Spectral Density | 15.319(d) | 4.3.2.1 | Complies |
| Automatic discontinuation of transmission | 15.319(f) | 4.3.4(a) | Complies |
| Carrier frequency stability | 15.323(f) | 6.2 | Complies |
| Frame repetition stability | 15.323(e) | 4.3.4(c) | Complies |
| Frame period and jitter | 15.323(e) | 4.3.4(c) | Complies |
| Monitoring threshold, Least interfered channel | 15.323(c)(2);(5);(9) | 4.3.4(b) | Complies |
| Monitoring of intended transmit window and maximum reaction time | 15.323(c)(1) | 4.3.4 | Complies |
| Threshold monitoring bandwidth | 15.323(c)(7) | 4.3.4 | Complies |
| Reaction time and monitoring interval | 15.323(c)(1);(5);(7) | 4.3.4 | N/A ¹ |
| Access criteria test interval | 15.323(c)(4);(6) | 4.3.4 | Complies |
| Access criteria functional test | 15.323(c)(4);(6) | 4.3.4 | Complies |
| Acknowledgments | 15.323(c)(4) | 4.3.4 | Complies |
| Transmission duration | 15.323(c)(3) | 4.3.4 | N/A ¹ |
| Dual access criteria | 15.323(c)(10) | 4.3.4 | N/A ¹ |
| Alternative monitoring interval | 15.323(c)(10);(11) | 4.3.4 | N/A ² |
| Spurious Emissions (Antenna Conducted) | 15.323(d) | 6.7.1 | Complies ³ |
| Spurious Emissions (Radiated) | 15.319(g), 15.109(a), 15.209(a) | 4.3.3 RSS-GEN 7.2.3 | Complies ⁴ |
| Receiver Spurious Emissions | N/A | 6.8 | Complies |

¹ Only applicable for EUT that can initiate a communication link

² The client declares that the tested equipment does not implement this provision

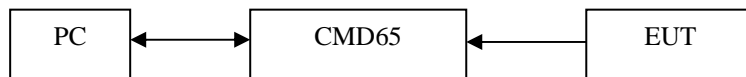
³ The tested equipment has integrated antennas only

⁴ Only requirement FCC 15.109 for unintentional radiators was tested radiated

8 Test Set-up

8.1 Frequency Measurements

Test Set-up 1:

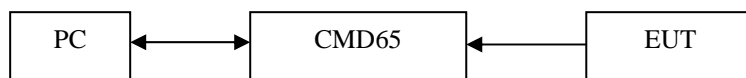


This setup is used for measuring Carrier Frequency Stability at nominal and extreme temperatures.

For long term Frequency Stability, the EUT was in loopback-mode and was controlled with the CMD65, the modulation pattern was set to 01010101....

8.2 Timing Measurements

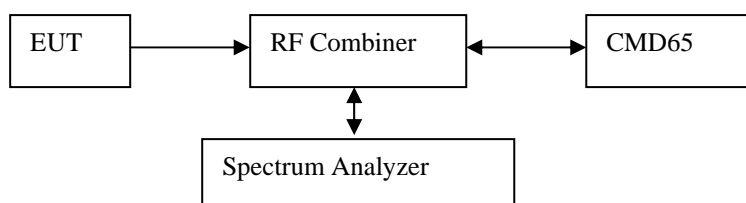
Test Set-up 2:



This setup is used for measuring Frame Repetition Stability, Frame Period and Jitter.

8.3 Conducted Emission Test

Test Set-up 3:



This setup is used for all conducted emission tests.

The EUT was in loopback-mode and was controlled with the CMD65, the modulation pattern was set to Pseudo-Random bit sequence to simulate normal speech.

8.4 Radiated Emission Test

Test Set-up 4:

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2009 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.4-2009 clause 4.2.

Antennas are conform with ANSI C63.2-1996 item 15.

9 kHz - 150 MHz: Quasi Peak measurement, 200 Hz Bandwidth, passive loop antenna.

150 kHz - 30 MHz: Quasi Peak measurement, 9 kHz Bandwidth, passive loop antenna.

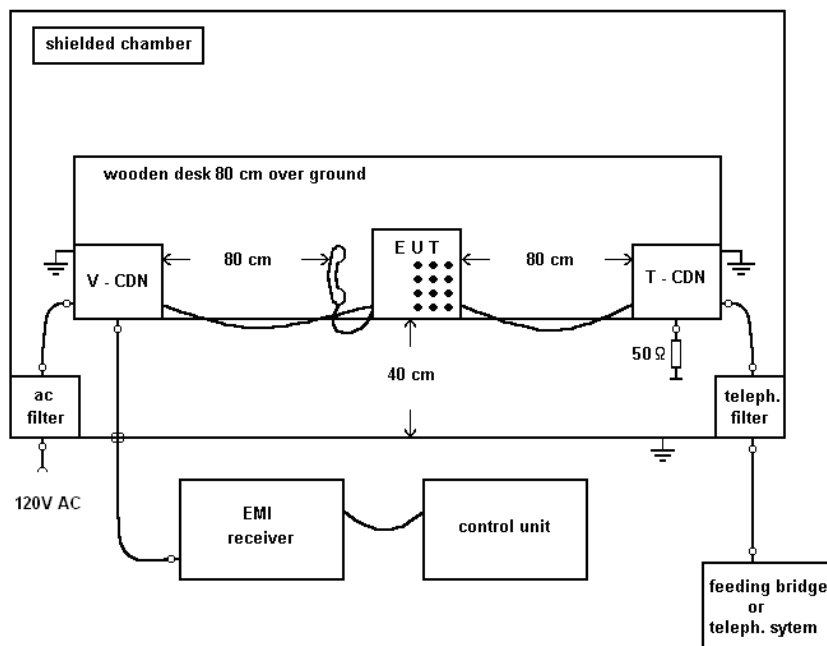
30 MHz - 200 MHz: Quasi Peak measurement, 120 KHz Bandwidth, bilog antenna

200MHz - 1GHz: Quasi Peak measurement, 120 KHz Bandwidth, bilog antenna

1GHz: Average, RBW 1MHz, VBW 10 MHz, waveguide horn

8.5 Power Line Conducted Emissions Test

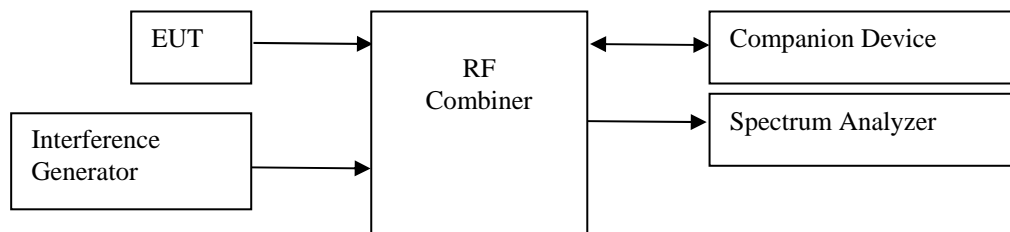
Test Set-up 5:



principle set up: conducted emission at ac power line

8.6 Monitoring Tests

Test Set-up 6:

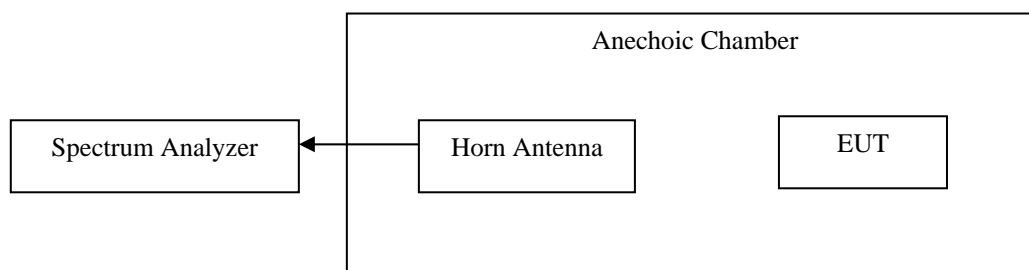


This test setup is used for all Monitoring and Time and Spectrum Access Procedure tests. The path loss from the signal generator to the EUT is measured with a power meter before the testing is started.

A clock signal is used to synchronize the Interference Generator to the start of the DECT frame, this signal always comes from the base station. If the EUT is a DECT Portable Part (i.e. a handset) the clock signal will come from the Companion Device.

8.7 Radiated Output Power Test

Test Set-up 7:



This setup is used for measuring the radiated output power in a fully anechoic chamber with a measurement distance of 1m.

9 Detailed Test Results

9.1 Power Line Conducted Emissions

Measurement Procedure:

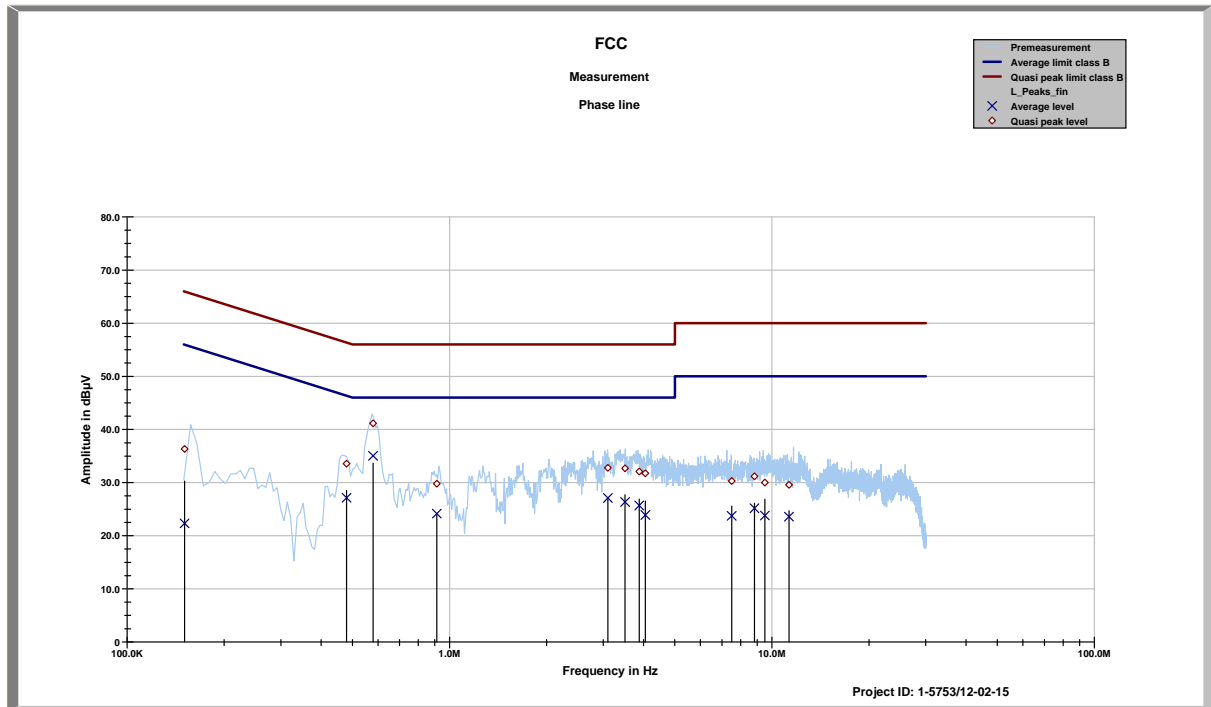
ANSI C63.4-2009 using 50 μ H/50 ohms LISN.

Test Result: Pass

Measurement Data: See attached graphs and tables.

Requirement: FCC 15.207 (a)

Idle mode, phase line



FCC

Phase line tbl

Project ID: 1-5753/12-02-15

11:03:23 AM, Tuesday, July 01, 2014

| Frequency | Quasi peak level | Margin quasi peak | Average level | Margin average |
|-----------|------------------|-------------------|---------------|----------------|
| MHz | dBµV | dBµV | dBµV | dBµV |
| 0.1508 | 36.32 | 29.64 | 22.32 | 33.66 |
| 0.4792 | 33.56 | 22.79 | 27.13 | 19.47 |
| 0.57927 | 41.14 | 14.86 | 35.02 | 10.98 |
| 0.91309 | 29.77 | 26.23 | 24.16 | 21.84 |
| 3.0964 | 32.77 | 23.23 | 27.09 | 18.91 |
| 3.5012 | 32.68 | 23.32 | 26.33 | 19.67 |
| 3.8732 | 32.09 | 23.91 | 25.67 | 20.33 |
| 4.0468 | 31.74 | 24.26 | 23.89 | 22.11 |
| 7.4981 | 30.29 | 29.71 | 23.74 | 26.26 |
| 8.8196 | 31.17 | 28.83 | 25.17 | 24.83 |
| 9.5028 | 30.00 | 30.00 | 23.79 | 26.21 |
| 11.2843 | 29.58 | 30.42 | 23.58 | 26.42 |

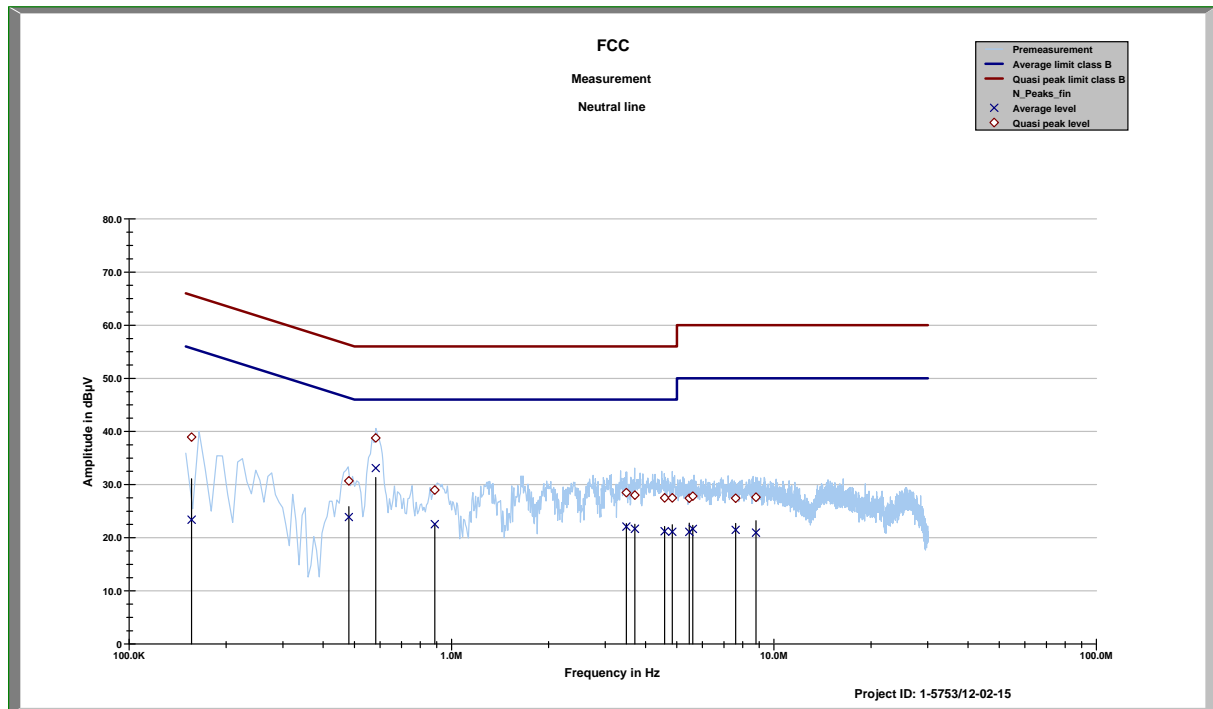
Project ID - 1-5753/12-02-15

EUT - SL Rackreceiver DW

Serial Number - 1234100301

Operating mode - active

Idle mode, neutral line



FCC

Neutral line tbl

Project ID: 1-5753/12-02-15

11:03:23 AM, Tuesday, July 01, 2014

| Frequency | Quasi peak level | Margin quasi peak | Average level | Margin average |
|-----------|------------------|-------------------|---------------|----------------|
| MHz | dBμV | dBμV | dBμV | dBμV |
| 0.15629 | 38.94 | 26.72 | 23.39 | 32.43 |
| 0.48025 | 30.69 | 25.64 | 23.87 | 22.69 |
| 0.58207 | 38.77 | 17.23 | 33.10 | 12.90 |
| 0.88731 | 28.97 | 27.03 | 22.54 | 23.46 |
| 3.4824 | 28.48 | 27.52 | 22.08 | 23.92 |
| 3.7026 | 28.00 | 28.00 | 21.67 | 24.33 |
| 4.5803 | 27.49 | 28.51 | 21.21 | 24.79 |
| 4.8354 | 27.49 | 28.51 | 21.10 | 24.90 |
| 5.4597 | 27.43 | 32.57 | 21.09 | 28.91 |
| 5.5993 | 27.82 | 32.18 | 21.66 | 28.34 |
| 7.6021 | 27.42 | 32.58 | 21.48 | 28.52 |
| 8.7919 | 27.62 | 32.38 | 20.95 | 29.05 |

Project ID - 1-5753/12-02-15

EUT - SL Rackreceiver DW

Serial Number - 1234100301

Operating mode - active

9.2 Coordination with fixed microwave

The affidavit from UTAM, Inc. is included in the documentation supplied by the applicant:

☒ Yes

☐ No

Requirement: FCC 15.307 (b):

Each application for certification of equipment operating under the provisions of this Subpart must be accompanied by an affidavit from UTAM, Inc. certifying that the applicant is a participating member of UTAM, Inc. In the event a grantee fails to fulfill the obligations attendant to participation in UTAM, Inc., the commission may invoke administrative sanctions as necessary to preclude continued marketing and installation of devices covered by the grant of certification, including but not limited to revoking certification.

9.3 Digital Modulation Techniques

The tested equipment is based on DECT technology, the only difference is that the channel allocation is modified to operate in the 1920-1930 MHz band.

The EUT use Multi Carrier / Time Division Multiple Access / Time division duplex and Digital GFSK modulation.

For further details see the operational description provided by the applicant.

Requirement: FCC 15.319(b)

All transmissions must use only digital modulation techniques.

9.4 Labeling Requirements

See separate documents showing the label design and the placement of the label on the EUT.

Requirement: FCC 15.19

The FCC identifier shall be displayed on the label, and the device(s) shall bear the following statement in a conspicuous location on the device or in the user manual if the device is too small:

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label itself shall be of a permanent type, not a paper label, and shall last the lifetime of the equipment.

9.5 Antenna Requirements

Does the EUT have detachable antenna(s)?

☒ Yes

☐ No

If detachable, is the antenna connector(s) non-standard?

☒ Yes

☐ No

The tested equipment has only integral antennas. The conducted tests were performed on a sample with a temporary antenna connector.

Requirements: FCC 15.203, 14.204. 15.317

9.6 Channel Frequencies

| UPCS CHANNEL | FREQUENCY (MHz) |
|-----------------|-----------------|
| Upper Band Edge | 1930.000 |
| 0 (Highest) | 1928.448 |
| 1 | 1926.720 |
| 2 | 1924.992 |
| 3 | 1923.264 |
| 4 (Lowest) | 1921.536 |
| Lower Band Edge | 1920.000 |

Requirement: FCC 15.303(d), (g)

Within 1920-1930 MHz band for isochronous devices.

9.7 Automatic Discontinuation of Transmission

| | | | |
|--|--|---|-----------------------------|
| Does the EUT transmit control and Signaling Information? | | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| Type of EUT: | <input type="checkbox"/> Initiating device | <input checked="" type="checkbox"/> Responding device | |

The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

| Number | Test | EUT Reaction | Verdict |
|--------|-------------------------------------|--------------|---------|
| 1 | Power removed from EUT | A | Pass |
| 2 | EUT switched Off | A | Pass |
| 3 | Hook-On by companion device | B | Pass |
| 4 | Hook-On by EUT | N/A | N/A |
| 5 | Power removed from companion device | B | Pass |
| 6 | Companion device switched Off | B | Pass |

A – Connection breakdown, Cease of all transmissions

B – Connection breakdown, EUT transmits control and signaling information

C – Connection breakdown, companion device transmits control and signaling information

N/A – Not applicable (the EUT does not have an on/off switch and can not perform Hook-On)

Requirement: FCC 15.319(f)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. This provision is not intended to preclude transmission of control and signaling information or use or repetitive code used by certain digital modulation technologies to complete frame or burst intervals.

9.8 Peak Power Output

Measurement Procedure:

ANSI C63.17, clause 6.1.2.

Test Results: Pass

Measurement Data:

Maximum Conducted Output Power

| Channel No. | Frequency (MHz) | Maximum Conducted Output Power (dBm) | Maximum Radiated Output Power (dBm) | Maximum Antenna Gain (dBi) |
|-------------|--------------------|---|--|-------------------------------------|
| 4 | 1921.536 | 19.5 | 20.3 | 0.8 |
| 2 | 1924.992 | 19.5 | 20.3 | 0.8 |
| 0 | 1928.448 | 19.5 | 20.3 | 0.8 |

For this test it was also checked that the input voltage variation of 85 and 115% of nominal value did not have any effect on the measured output power, neither radiated nor conducted.

Limit:

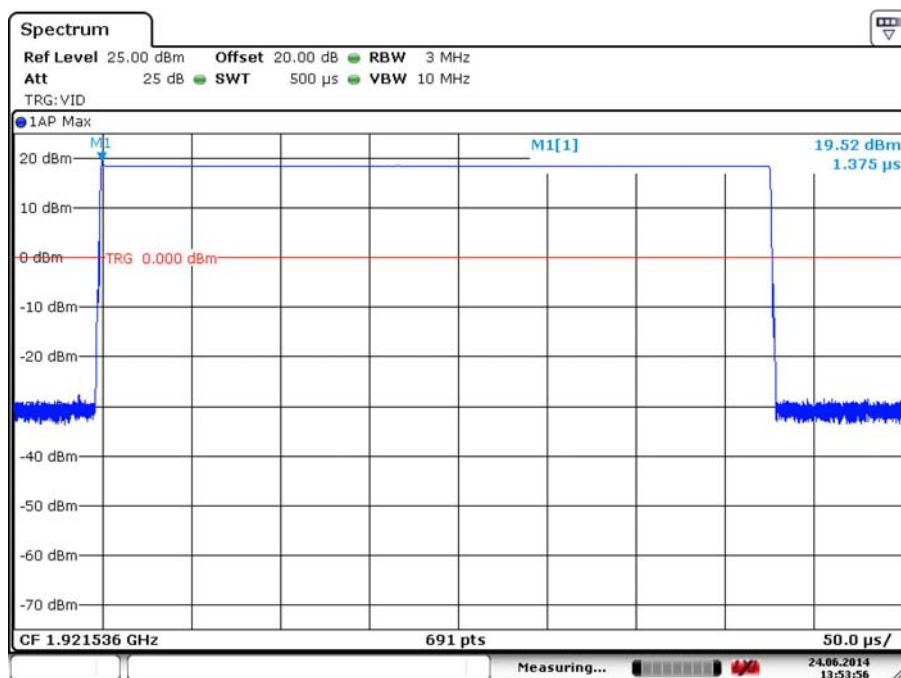
Conducted: $100 \mu\text{W} \times \text{SQRT}(B)$ where B is the measured Emission Bandwidth in Hz
FCC 15.319(c)(e): 20.8 dBm (120 mW)
RSS-213, Issue 2: 20.6 dBm (115 mW)
The antenna gain is below 3 dBi.

Requirements: FCC 15.319(f). RSS-213, Issue 2

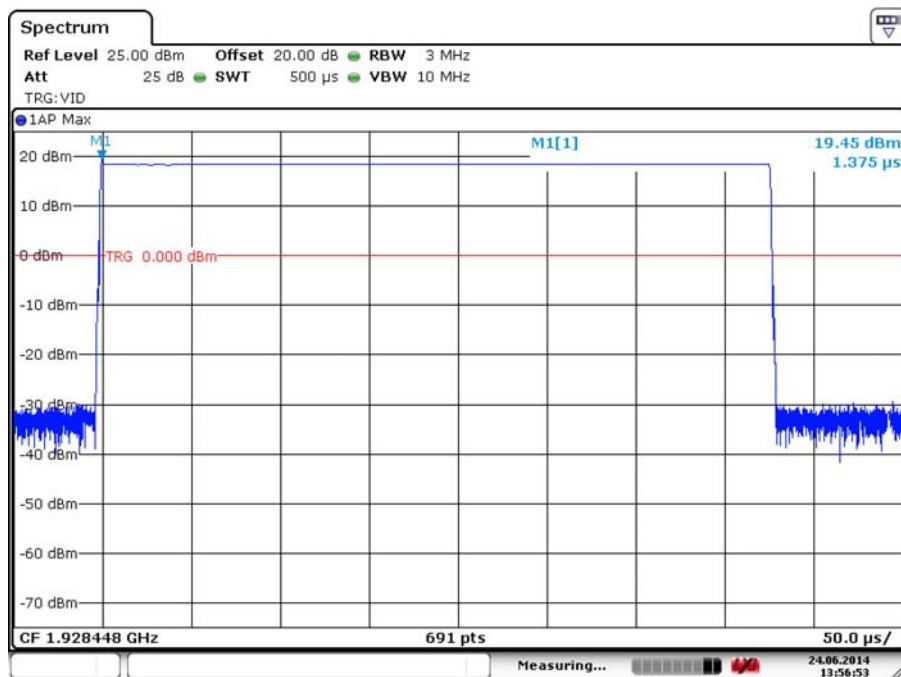
Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

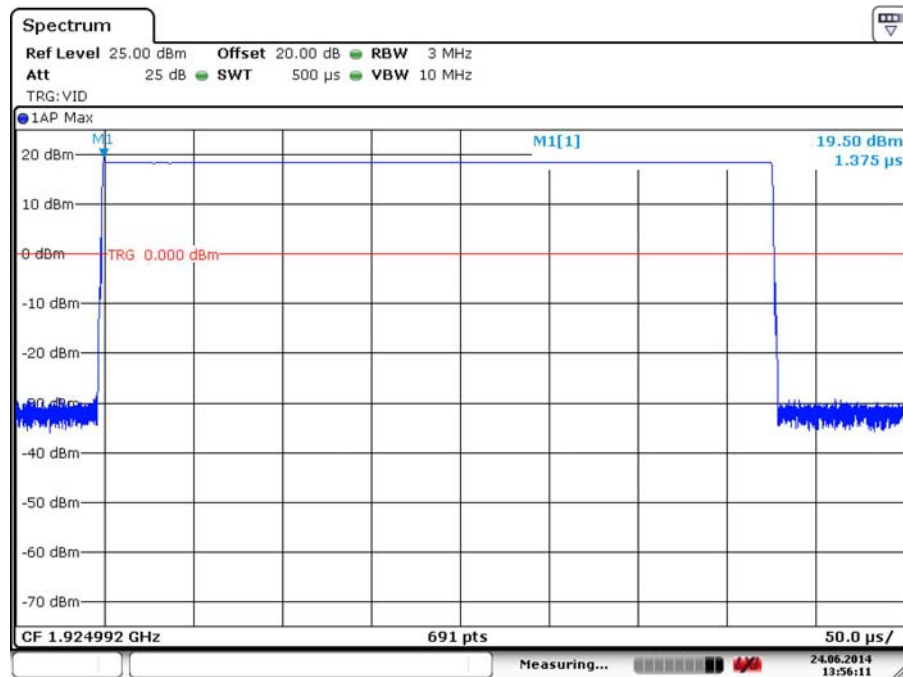
Conducted Peak Output Power



Lower Channel



Upper Channel

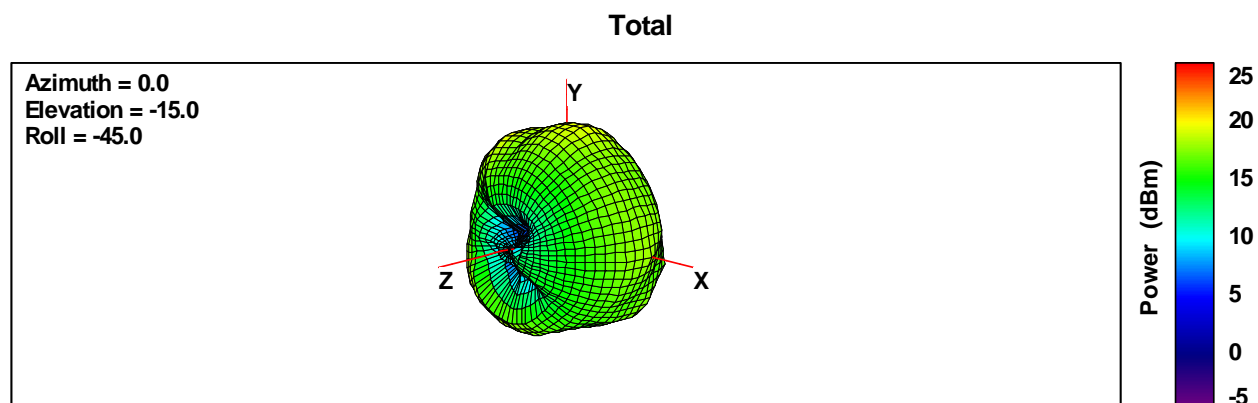


Middle Channel

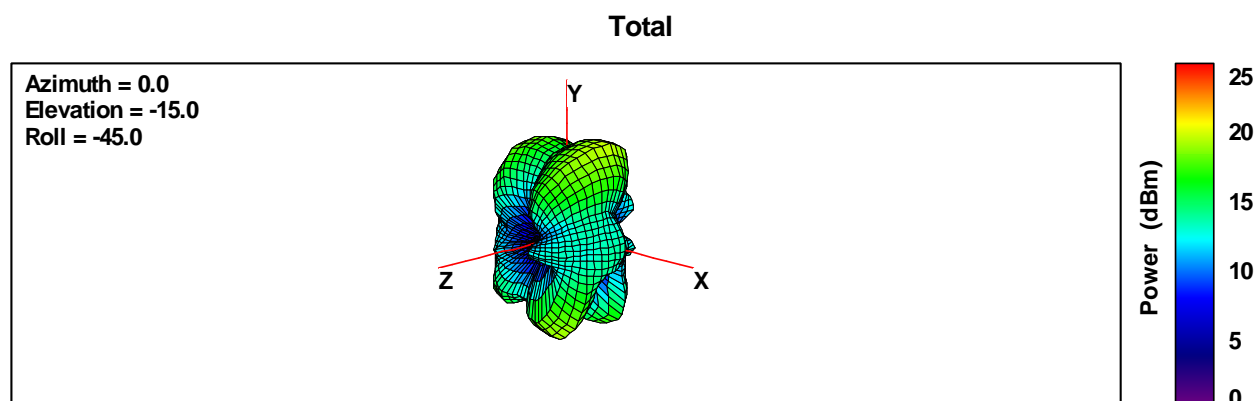
Radiated Peak Output Power

Measured maximum antenna gain: 0.8 dBi

Antenna 1:



Antenna 2:



9.9 Emission Bandwidth B

Measurement Procedure:

ANSI C63.17, clause 6.1.3.

Test Results: Pass

Measurement Data:

| Channel No. | Frequency (MHz) | 26 dB Bandwidth B (kHz) |
|-------------|--------------------|----------------------------|
| 4 | 1921.536 | 1448 |
| 0 | 1928.448 | 1434 |

| Channel No. | Frequency (MHz) | 20 dB Bandwidth B (kHz) |
|-------------|--------------------|----------------------------|
| 2 | 1924.992 | 1328 |

| Channel No. | Frequency (MHz) | 6 dB Bandwidth B (kHz) |
|-------------|--------------------|----------------------------|
| 4 | 1921.536 | N/A |
| 0 | 1928.448 | N/A |
| Channel No. | Frequency (MHz) | 12 dB Bandwidth B (kHz) |
| 4 | 1921.536 | N/A |
| 0 | 1928.448 | N/A |

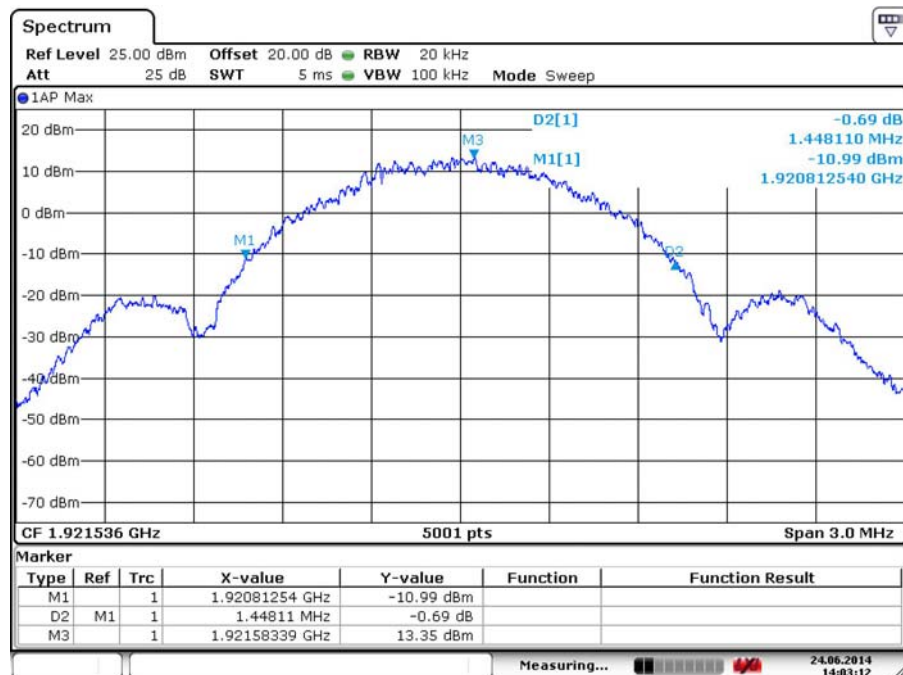
Requirement: FCC 15.323(a)

The 26 dB Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz.

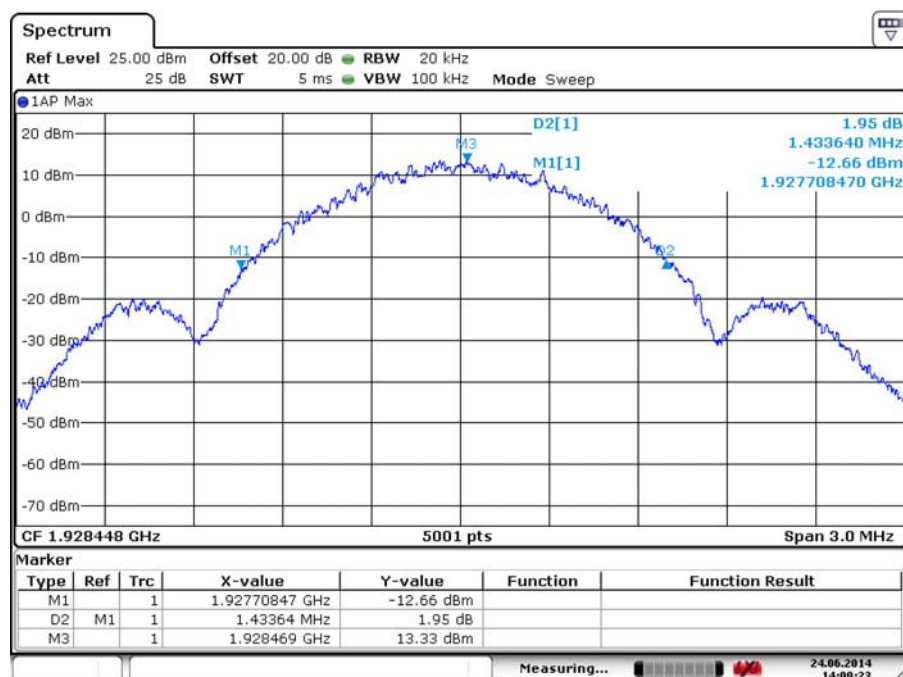
Requirement: RSS-213 Issue 2, clause 6.4

The 20 dB Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz.

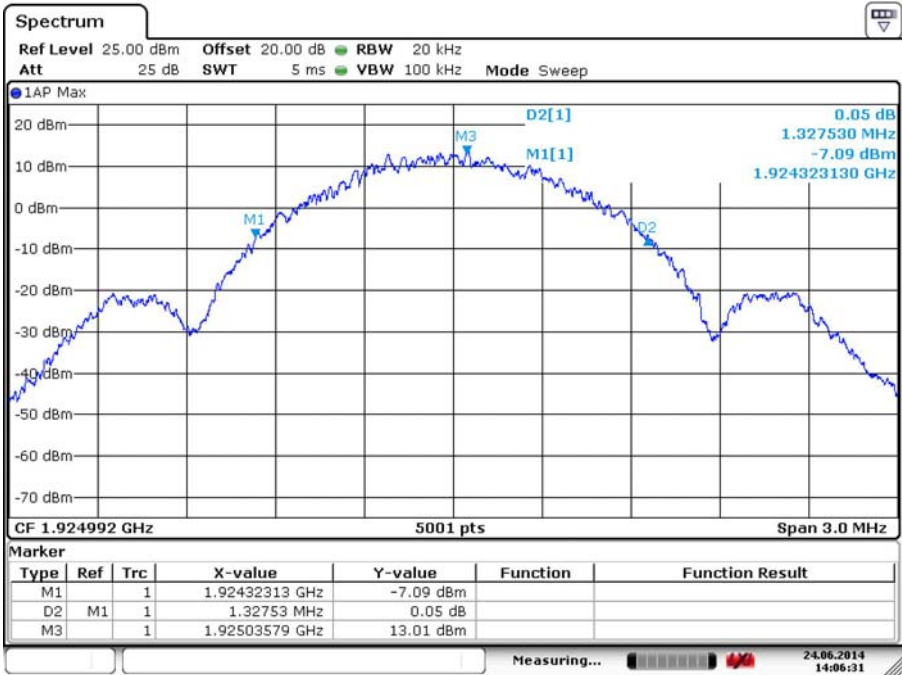
No requirement for 6 dB and 12 dB Bandwidth. These values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).



Emission Bandwidth B, Lower Channel



Emission Bandwidth B, Upper Channel



20 dB Bandwidth B, Middle Channel

9.10 Power Spectral Density

Measurement Procedure:

ANSI C63.17, clause 6.1.5.

Test Results: Pass

Measurement Data:

| Channel No. | Frequency (MHz) | Power Spectral Density (mW/3kHz) |
|-------------|--------------------|----------------------------------|
| 4 | 1921.58339 | 0.23 |
| 0 | 1928.7690 | 0.07 |

Averaged over 100 sweeps.

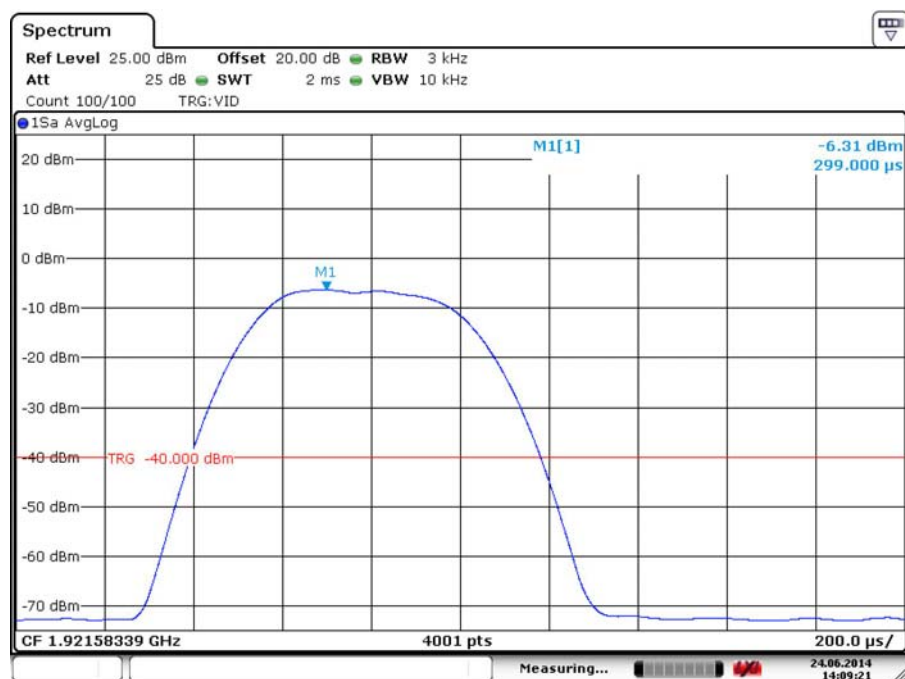
Requirement: FCC 15.319(d)

The Power Spectral Density shall be less than 3 mW (4.77 dBm) when averaged over at least 100 sweeps.

Power Spectral Density

Lower Channel:

Frequency of the maximum level was recorded under chapter 5.9.



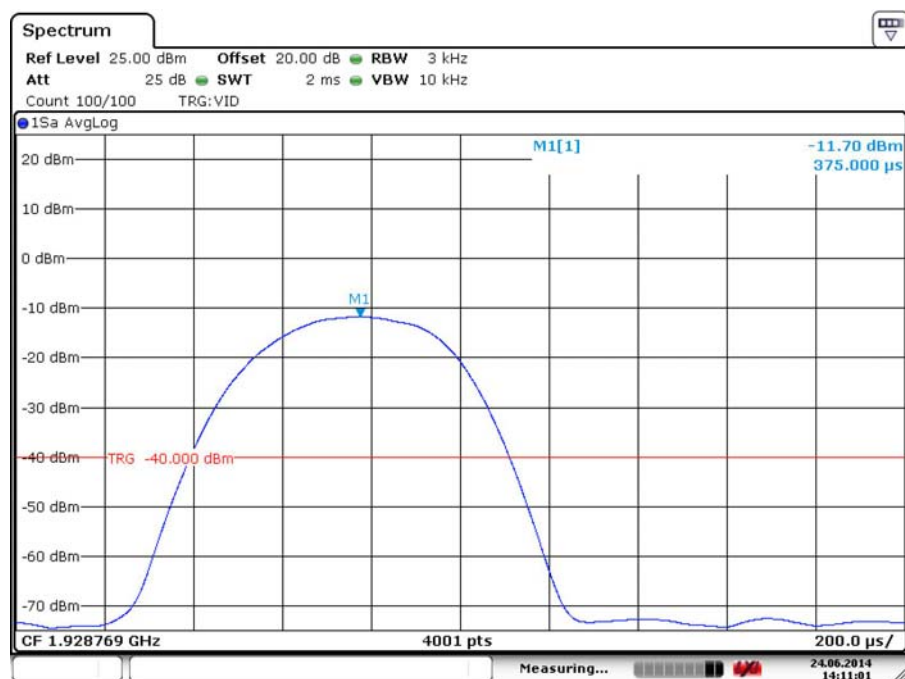
Averaged, 100 Sweeps

| | |
|-------------------|-------|
| Pulse power [dBm] | -6.31 |
| Pulse power [mW] | 0.23 |

Power Spectral Density

Upper Channel:

Frequency of the maximum level was recorded under chapter 5.9.



Averaged, 100 Sweeps

| | |
|-------------------|--------|
| Pulse power [dBm] | -11.70 |
| Pulse power [mW] | 0.07 |

9.11 In-Band Unwanted Emissions, Conducted

Measurement Procedure:

ANSI C63.17, clause 6.1.6.1.

Test Results: Pass

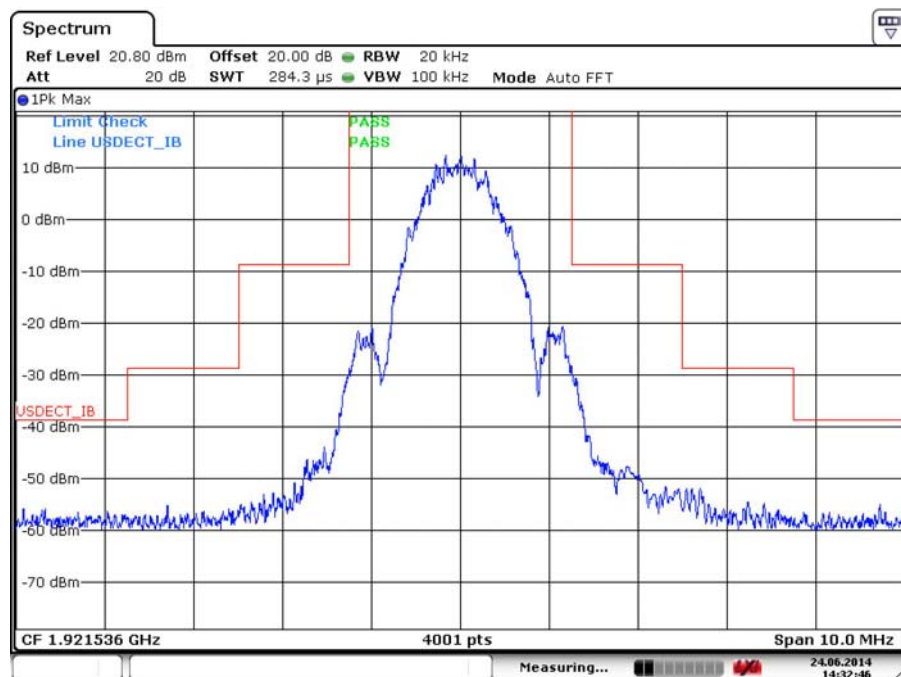
Measurement Data:

See plots.

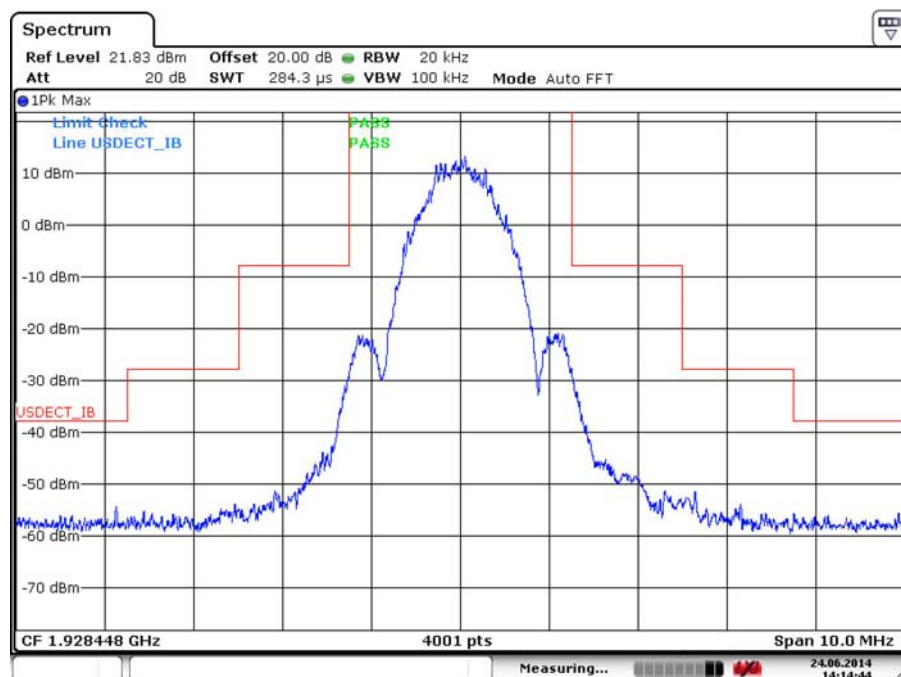
Requirement: FCC 15.323(d)

| | |
|--------------------------|---|
| B < f2 ≤B: | less than or equal to 30 dB below max. permitted peak power level |
| 2B < f2 ≤3B: | less than or equal to 50 dB below max. permitted peak power level |
| 3B < f2 ≤UPCS Band Edge: | less than or equal to 60 dB below max. permitted peak power level |

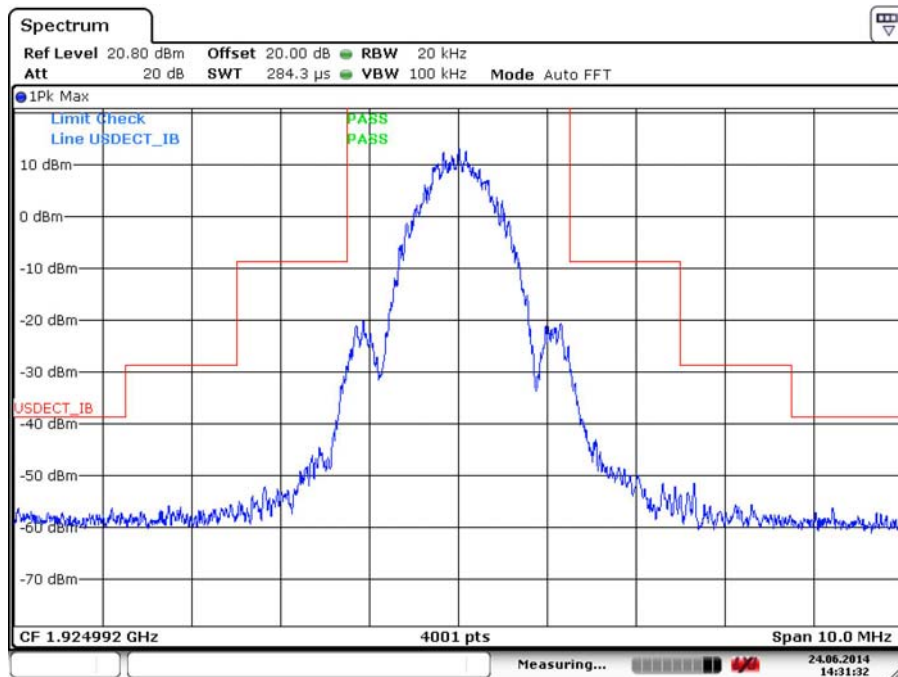
In-Band Unwanted Emissions, Conducted



Lower Channel



Upper Channel



Middle Channel

The BS spurious in-band transmission level is below the indicated limit.

9.12 Out-of-Band Emissions, Conducted

Measurement Procedure:

ANSI C63.17, clause 6.1.6.2.

Test Results: Pass

Measurement Data:

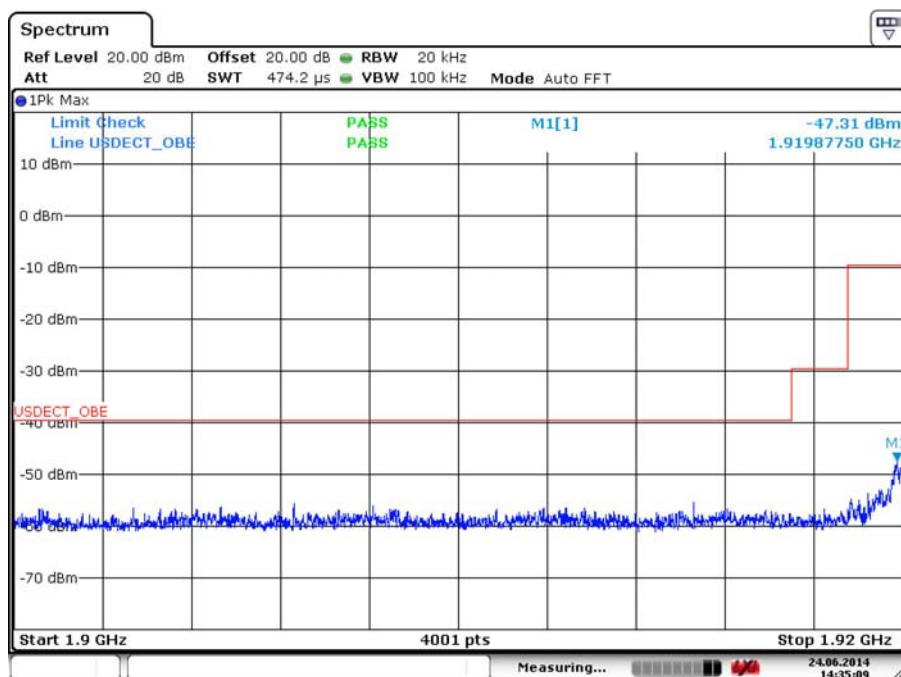
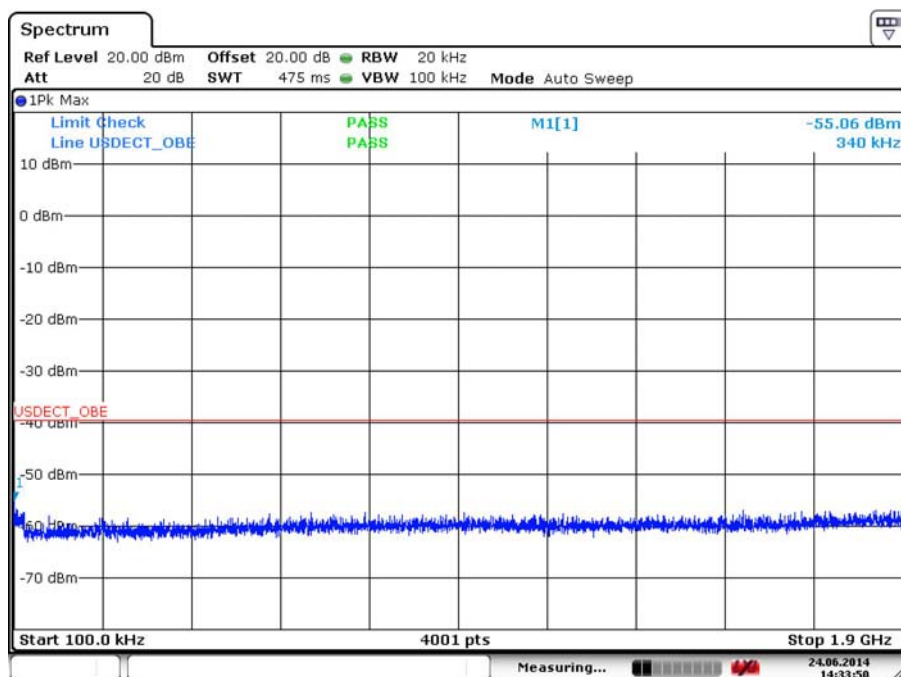
See plots.

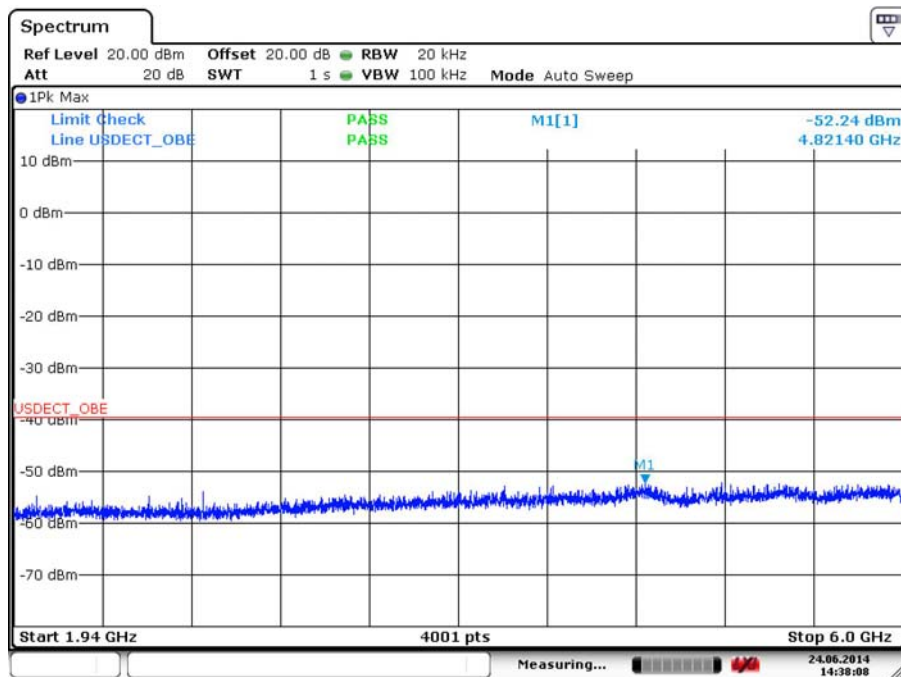
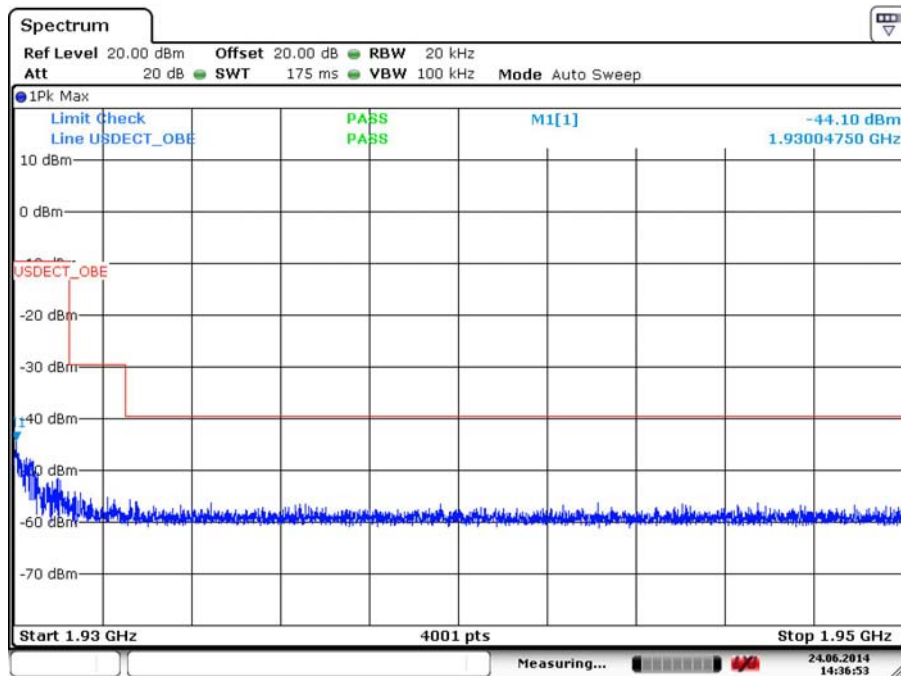
Requirement: FCC 15.323(d)

| | |
|---|------------------|
| $f \leq 1.25$ MHz outside UPCS band: | ≤ -9.5 dBm |
| $1.25 \text{ MHz} \leq f \leq 2.5$ MHz outside UPCS band: | ≤ -29.5 dBm |
| $f \geq 2.5$ MHz outside UPCS band: | ≤ -39.5 dBm |

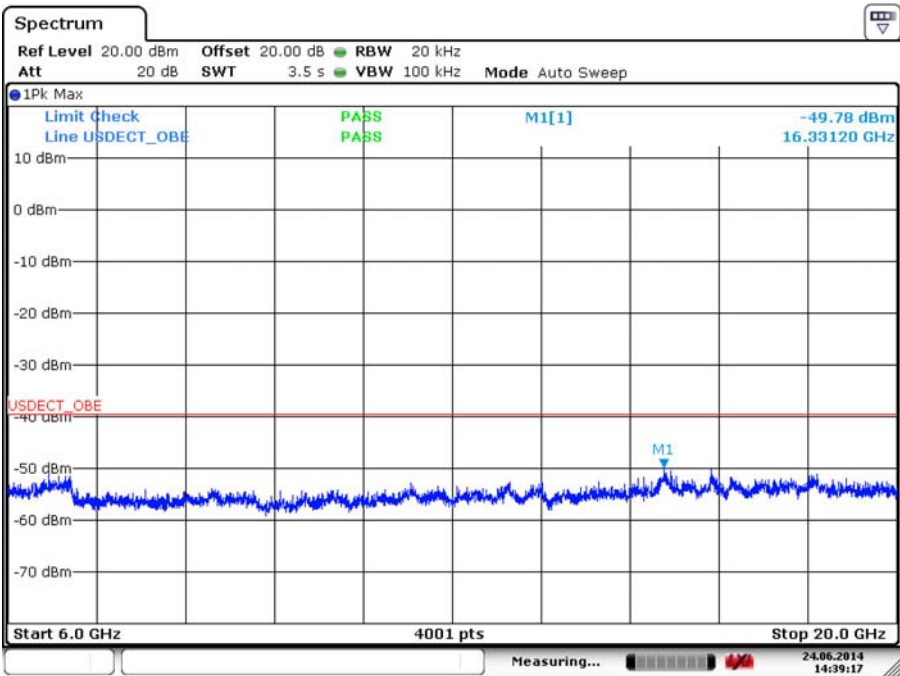
Out-of-Band Unwanted Emissions, Conducted

Upper and Lower Channel:



Out-of-Band Unwanted Emissions, Conducted

Out-of-Band Unwanted Emissions, Conducted



The BS spurious out-of-band transmission level is below the indicated limit.

9.13 Carrier Frequency Stability

Measurement Procedure:

ANSI C63.17, clause 6.2.1.

Test Results: Pass

Measurement Data:

The Frequency Stability is measured with the CMD65. The CMD65 was logged by a computer programmed to get the new readings as fast as possible (about 3 readings per second) over the noted time period or number of readings. The peak-to-peak difference was recorded and the mean value and deviation in ppm was calculated.

The Carrier Frequency Stability over power Supply Voltage and over Temperature is measured also with the CMD65.

Carrier Frequency Stability over Time at Nominal Temperature

| Average Mean Carrier Frequency (MHz) | Max. Diff. (kHz) | Min. Diff. (kHz) | Max Dev. (ppm) | Limit (ppm) |
|--------------------------------------|------------------|------------------|----------------|-------------|
| 1924.988091 | 4.9 | -4.5 | 4.6 | ±10 |

Deviation ppm = ((Max.Diff. – Mean.Diff.) / Mean Carrier Freq.) x 10⁶

Deviation (ppm) is calculated from 3000 readings with the CMD65.

Carrier Frequency Stability over Power Supply at Nominal Temperature

| Voltage | Measured Carrier Frequency (MHz) | Difference (kHz) | Deviation (ppm) | Limit (ppm) |
|----------|----------------------------------|------------------|-----------------|-------------|
| 115 V AC | 1924.989 | Ref. | Ref. | ±10 |
| 98 V AC | 1924.989 | 0.0 | 0.0 | |
| 132 V AC | 1924.989 | 0.0 | 0.0 | |

Deviation ppm = ((Mean – Measured frequency) / Mean) x 10⁶

Carrier Frequency Stability over Temperature

| Temperature | Measured Carrier Frequency (MHz) | Difference (kHz) | Deviation (ppm) | Limit (ppm) |
|-------------|----------------------------------|------------------|-----------------|-------------|
| T = +20°C | 1924.995 | Ref. | Ref. | ±10 |
| T = -20°C | 1925.005 | +10.0 | +5.2 | |
| T = +50°C | 1924.991 | -2.0 | -1.0 | |

Deviation ppm = ((Mean – Measured frequency) / Mean) x 10⁶

9.14 Frame Repetition Stability

Measurement Procedure:

ANSI C63.17, clause 6.2.2.

Test Results: Pass

Measurement Data:

The Frame Repetition Stability is measured with the CMD65. The Frame Repetition Stability is 3 times the standard deviation.

| Carrier Frequency (MHz) | Mean (Hz) | Standard Deviation (ppm) | Frame Repetition Stability (ppm) |
|-------------------------|---------------|--------------------------|----------------------------------|
| 1924.992 | 99.9999991996 | 0.1 | 0.3 |

Limit:

| | |
|----------------------------|----------------|
| Frame Repetition Stability | ±10 ppm (TDMA) |
|----------------------------|----------------|

Ref. FCC 15.323(e). ANSI C63.17, clause 6.2.2.

9.15 Frame Period and Jitter

Measurement Procedure:

ANSI C63.17, clause 6.2.3.

Test Results: Pass

Measurement Data:

The Frame Repetition Stability is measured with the CMD65

| Carrier Frequency (MHz) | Frame Period (ms) | Max Jitter (µs) | 3xStandard Deviation of Jitter (µs) |
|-------------------------|-------------------|-----------------|-------------------------------------|
| 1924.992 | 10.000 | -0.006 | 0.007 |

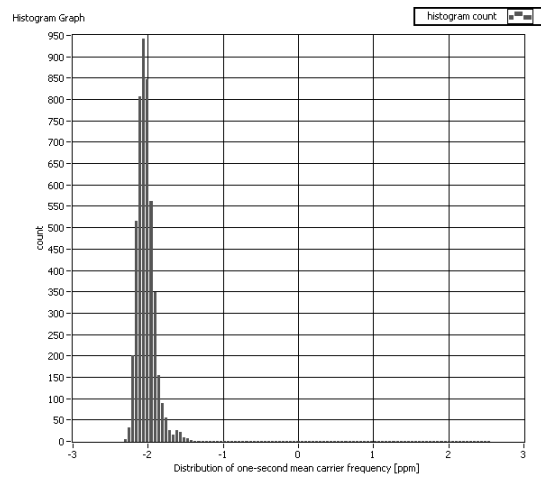
Max Jitter = $(1/(\text{Frame Period} + \text{Pk-Pk})/2) - (1/\text{Frame Period})$, when Pk-Pk and Frame Period are in Hz.

$3 \times \text{St.Dev. Jitter} = 3 \times (1/(\text{Frame Period} + \text{St.Dev})) - (1/\text{St.Dev}) \times 10^6$

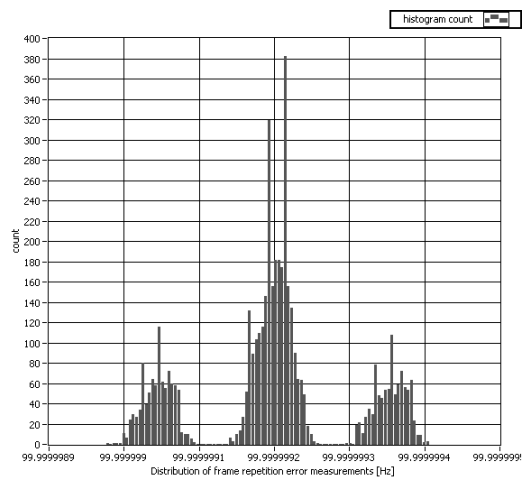
Limit:

| | |
|---------------------------|-------------|
| Frame Period | 20 or 10 ms |
| Max Jitter | 25 µs |
| 3 times St.Dev. of Jitter | 12.5 µs |

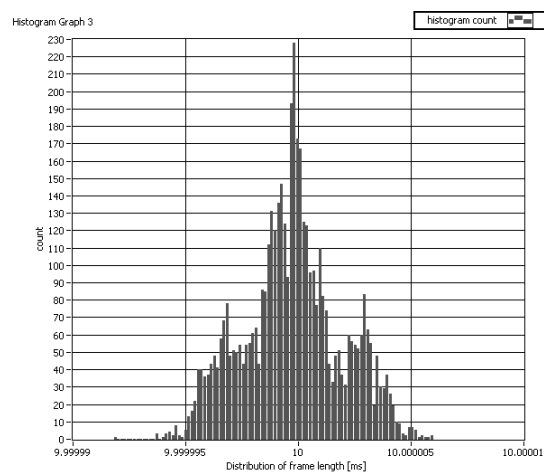
Ref. FCC 15.323(e). ANSI C63.17, clause 6.2.3.



Histogram of Carrier Frequency Stability



Histogram of Frame Repetition Stability



Histogram of Frame Period and Jitter

9.16 Monitoring Threshold, Least Interfered Channel

Monitoring Threshold limits:

Lower Threshold:

$$T_L = 15 \log B - 184 + 30 - P_{EUT} \text{ (dBm)}$$

Upper Threshold:

$$T_U = 15 \log B - 184 + 50 - P_{EUT} \text{ (dBm)}$$

B is measured Emission Bandwidth in Hz

P_{EUT} is measured Transmitter Power in dBm

Calculated values:

| | |
|-----------------|-----------|
| Lower Threshold | -81.1 dBm |
| Upper Threshold | -61.1 dBm |

The Lower Threshold is applicable for systems which have defined less than 40 duplex system access channels. The Upper Threshold is applicable for systems with more than 40 duplex systems access channels and that implements the Least Interfered Channel Procedure (LIC).

Measurement Procedure:

The Upper Threshold is found by the procedure defined in ANSI C63.17 clause 7.3.1 or 7.3.2.

| | |
|---|-----|
| Least Interfered Channel Procedure NOT used: | |
| Lower Threshold | N/A |
| Least Interfered Channel Procedure used: | |
| Upper Threshold | N/A |

Least Interfered Channel (LIC) Procedure Test, FCC 15.323(b), (c)(2) and (c)(5)

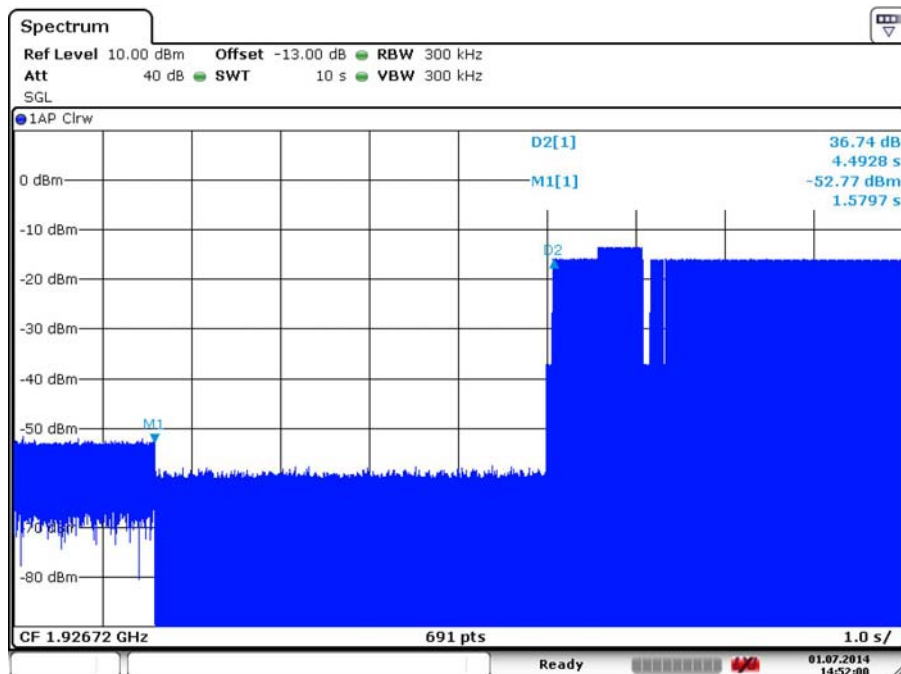
| ANSI C63.17 clause 7.3.3 ref. | Observation | Verdict |
|---|------------------------------|-------------|
| b) $f_1 T_L + 13 \text{ dB}$, $f_2 T_L + 6 \text{ dB}$ | Transmission always on f_2 | Pass |
| c) $f_1 T_L + 6 \text{ dB}$, $f_2 T_L + 13 \text{ dB}$ | Transmission always on f_1 | Pass |
| d) $f_1 T_L + 7 \text{ dB}$, $f_2 T_L$ | Transmission always on f_2 | Pass |
| e) $f_1 T_L$, f_2 at $T_L + 7 \text{ dB}$ | Transmission always on f_1 | Pass |

Selected Channel Confirmation, FCC 15.323(c)(1) and (5)

| ANSI C63.17 clause 7.3.4 ref. | Observation | Verdict |
|---------------------------------------|------------------------|-------------|
| b) Shall not transmit on f_1 | EUT transmits on f_2 | Pass |
| d) Shall not transmit on f_2 | EUT transmits on f_1 | Pass |

Limits:

| | |
|-------------------------------|-----------|
| Lower Threshold + 6 dB margin | -75.1 dBm |
| Upper Threshold + 6 dB margin | -55.1 dBm |



7.3.4 Selected Channel Confirmation, connection 4.5 s after interferer removed

9.17 Threshold Monitoring Bandwidth

This test is only required if a dedicated monitoring receiver is used. If the test is not carried out the manufacturer shall declare and provide evidence that the monitoring is made through the radio receiver used for communication.

Measurement Procedure:

Simple Compliance Test, ANSI C63.17, clause 7.4.1

More Detailed Test, ANSI C63.17, clause 7.4.2

The test is passed if **either** the Simple Compliance Test or the More Detailed Test is passed.

During this test the spectrum analyzer is observed visually to see if the EUT transmits or not.

Test Results:

| Test performed | Observation | Verdict |
|--|------------------|---------|
| Simple Compliance Test, at $\pm 30\%$ of B | No transmissions | Pass |
| More Detailed Test, at -6 dB points | N/A | N/A |
| More Detailed Test, at -12 dB points | N/A | N/A |

The More Detailed Test must be pass at both the -6dB and -12 dB points if the Simple Compliance Test fails.

Comment: The Simple Compliance Test was performed with the level $T_U + U_M + 10$ dB to check that the EUT did not transmit at all.

The tested EUT uses the same receiver for monitoring and communication, this test is therefore not required. However the test was performed nonetheless and the test is passed.

Limits: FCC 15.323(c)(7):

The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.

9.18 Reaction Time and Monitoring Interval

Measurement Procedure:

ANSI C63.17, clause 7.5

Test Results:

By administrative commands and out-of-operating region interference, the EUT is restricted to operate on a single carrier frequency.

Time-synchronized pulsed interference was then applied on the carrier at pulsed levels TU + UM to check that the EUT does not transmit. The level was raised 6 dB for part d) with 35 μ s pulses.

The pulses are synchronized with the EUT timeslots and applied cantered within all timeslots.

| Pulse Width, ref. to ANSI C63.17 clause 7.5 | Observation | Verdict |
|--|-------------|---------|
| c) > largest of 50 μ s and $50 \cdot \text{SQRT}(1.25/B)$ | N/A | N/A |
| d) > largest of 35 μ s and $35 \cdot \text{SQRT}(1.25/B)$ and with interference level raised 6 dB | N/A | N/A |

Comment: Since B is larger than 1.25 MHz, the test was performed with pulse lengths of 50 μ s and 35 μ s.

Limits: FCC 15.323(c)(1), (5) and (7)

The maximum reaction time must be less than $50 \cdot \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be $35 \cdot \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.

Comment: This test is only applicable for EUTs that can be an initiating device.

9.19 Time and Spectrum Window Access Procedure

This requirement is only for EUTs which transmit unacknowledged control and signaling information

Measurement Procedure:

Timing for EUTs using control and signaling channel type transmissions: ANSI C63.17, clause 8.1

Test results:

| Access Criteria, ref. to ANSI C63.17 clause 8.1.1 | Observation | Verdict |
|--|--|-------------|
| b) Check that the EUT transmits on the interference free time slot | EUT transmits on the Interference free time slot | PASS |
| b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s | Transmission stops every 1.3 s | PASS |

If FCC 15.323(c)(6) option Random Waiting Interval is NOT implemented

| Access Criteria, ref. to ANSI C63.17 clause 8.1.2 | Observation | Verdict |
|--|---|-------------|
| b) Check that the EUT changes to interference free time slot when interference is introduced on the time slot in use | EUT changes to Interference free time slot, and stays there | PASS |

If FCC 15.323(c)(6) option Random Waiting Interval is implemented

| Access Criteria, ref. to ANSI C63.17 clause 8.1.3 | Observation | Verdict |
|--|-------------|------------|
| b-d) Check that the EUT uses random waiting interval before continuing transmission on an interfered time slot | N/A | N/A |

Comment: The tested EUT does not support the Random Waiting Interval option.

Limits:

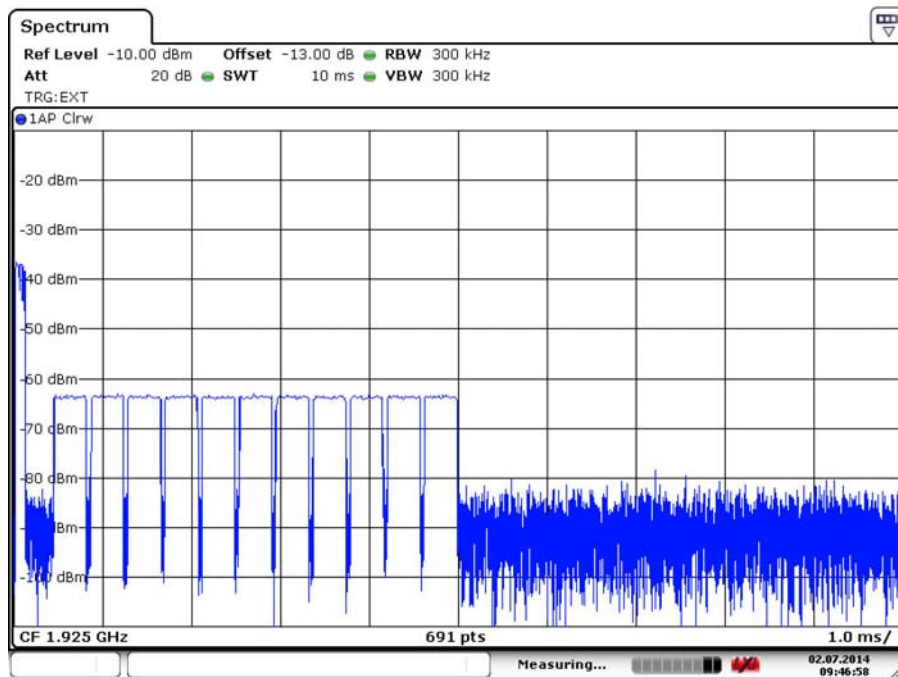
FCC 15.323(c)(4):

Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgments must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which the time access criteria must be repeated.

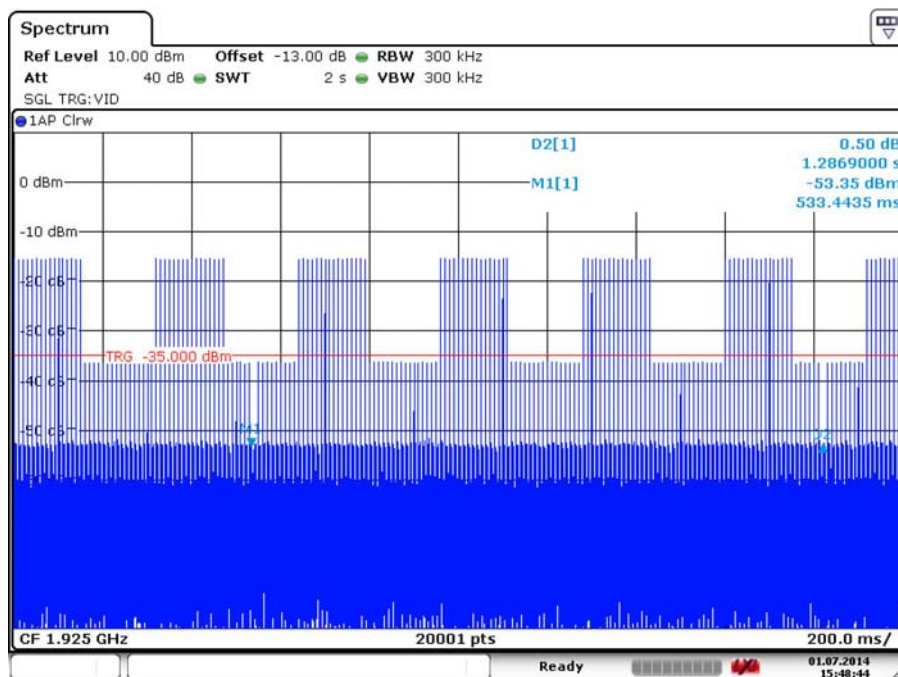
FCC 15.323(c)(6):

If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

Access Criteria Check



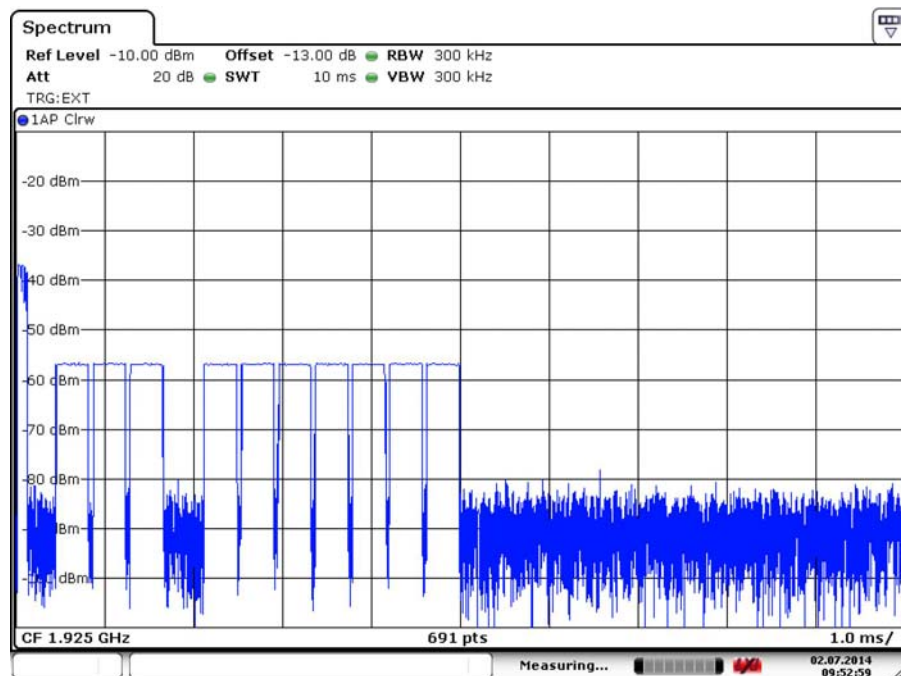
8.1.1b) EUT Transmits on Unblocked Slot



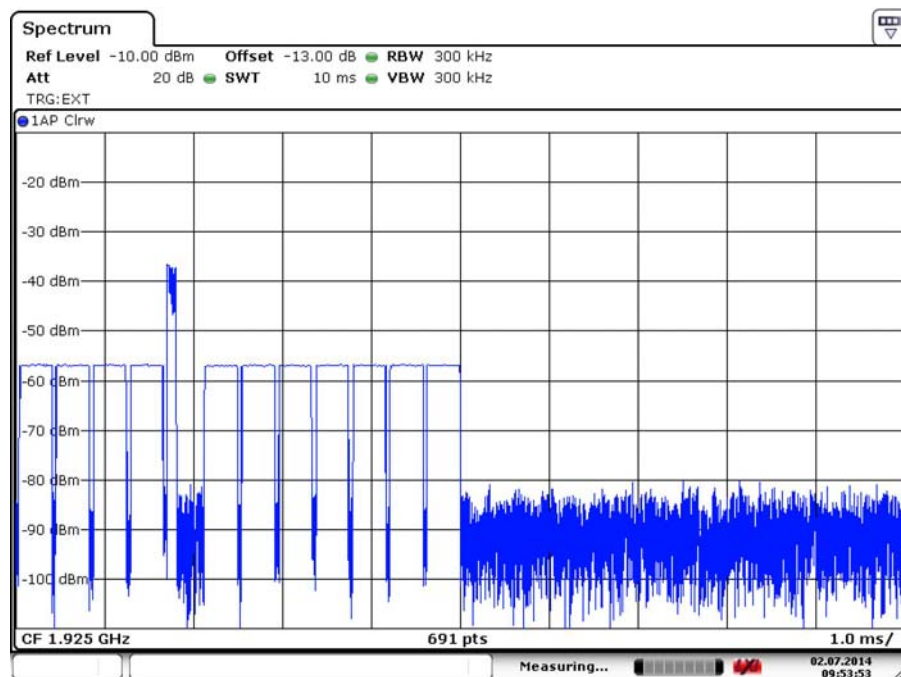
8.1.1b) EUT Terminates Repetitive Transmission

Capture of demodulated transmission of base EUT control and signaling transmissions. The base EUT pauses in its transmission of the control and signaling channel to repeat the access criteria every 1.3 seconds, meeting the requirement that it do so at least as often as every 30 seconds.

Access Criteria Check



8.1.2) EUT Changes to an Interference Free Timeslot, Before



8.1.2) EUT Changes to an Interference Free Timeslot, After

9.20 Acknowledgments and Transmission duration

Measurement Procedure:

Acknowledgments: ANSI C63.17, clause 8.2.1

Transmission Duration: ANSI C63.17, clause 8.2.2

During the test **Initial transmission without acknowledgments** the signal from the EUT to the companion device is blocked by circulators in addition to the tunable attenuator.

The test **Transmission time after loss of acknowledgments** is performed by cutting-off the signal from the companion device by a RF switch the time until the EUT stops transmitting.

The **Transmission Duration** test is performed by monitoring the slot in use and measuring the time until the EUT changes to a different slot.

Test Results:

Acknowledgments

| Test ref. to ANSI C63.17 clause 8.2.1 | Observation | Verdict |
|--|----------------------------|---------|
| a) Initial transmission without acknowledgments | Only for initiating device | N/A |
| c) Transmission time after loss of acknowledgments | 3.2 s | Pass |

Transmission Duration

| Test ref. to ANSI C63.17 clause 8.2.2 | Observation | Verdict |
|--|--|---------|
| b) Transmission duration on same time and frequency window | Only for initiating device that controls which time slot is used | N/A |

Comment: /

Limits: FCC 15.323(c)(3) and (4)

Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease.

Periodic acknowledgments must be received at least every 30 seconds or transmission must cease.

Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which the time access criteria must be repeated.

9.21 Dual Access Criteria Check

Measurement Procedure:

EUTs that do not implement the Upper Threshold: ANSI C62.17, clause 8.3.1

EUTs that implement the Upper Threshold: ANSI C62.17, clause 8.3.2

This test is required for equipment that uses the access criteria in FCC 15.323(c)(10).

Test Results:

EUTs that do NOT implement the Upper Threshold:

| Test ref. to ANSI C63.17 clause 8.3.1 | Observation | Verdict |
|---|-------------|---------|
| b) EUT is restricted to a single carrier f_1 for TDMA systems. The test is pass if the EUT can set up a communication link. | N/A | N/A |
| c) d) No transmission on interference-free receive time/spectrum window. All transmit slots blocked | N/A | N/A |
| e) f) No transmission on interference-free transmit time/spectrum window. All transmit slots blocked | N/A | N/A |

EUTs that implement the Upper Threshold:

| Test ref. to ANSI C63.17 clause 8.3.2 | Observation | Verdict |
|---|-------------|---------|
| b) EUT is restricted to a single carrier f_1 for TDMA systems. The test is pass if the EUT can set up a communication link. | N/A | N/A |
| c) d) Transmission on interference-free receive time/spectrum window. | N/A | N/A |
| e) f) Transmission on interference-free transmit time/spectrum window. | N/A | N/A |
| g) Transmission not possible on any time/spectrum window. | N/A | N/A |

Comment: This test is only applicable for EUTs that can be an initiating device.

Limits: FCC 15.323(c)(10)

An initiating device may attempt to establish a duplex connection by monitoring both, its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

9.22 Alternative monitoring interval

Test procedure described in ANSI C63.17, clause 8.4.

This test is required if the EUT implements the provision of FCC 15.323(c)(11).

Test Result:

Not tested. The tested EUT does not implement this provision. See manufacturer's declaration.

9.23 Spurious Emissions (Radiated)

Measurement Procedure:

FCC 15.209, FCC 15.109

Test Result:

Tests for intentional radiators according to FCC 15.209 are not required when Out-of-Band Emission was tested conducted with a pass result.

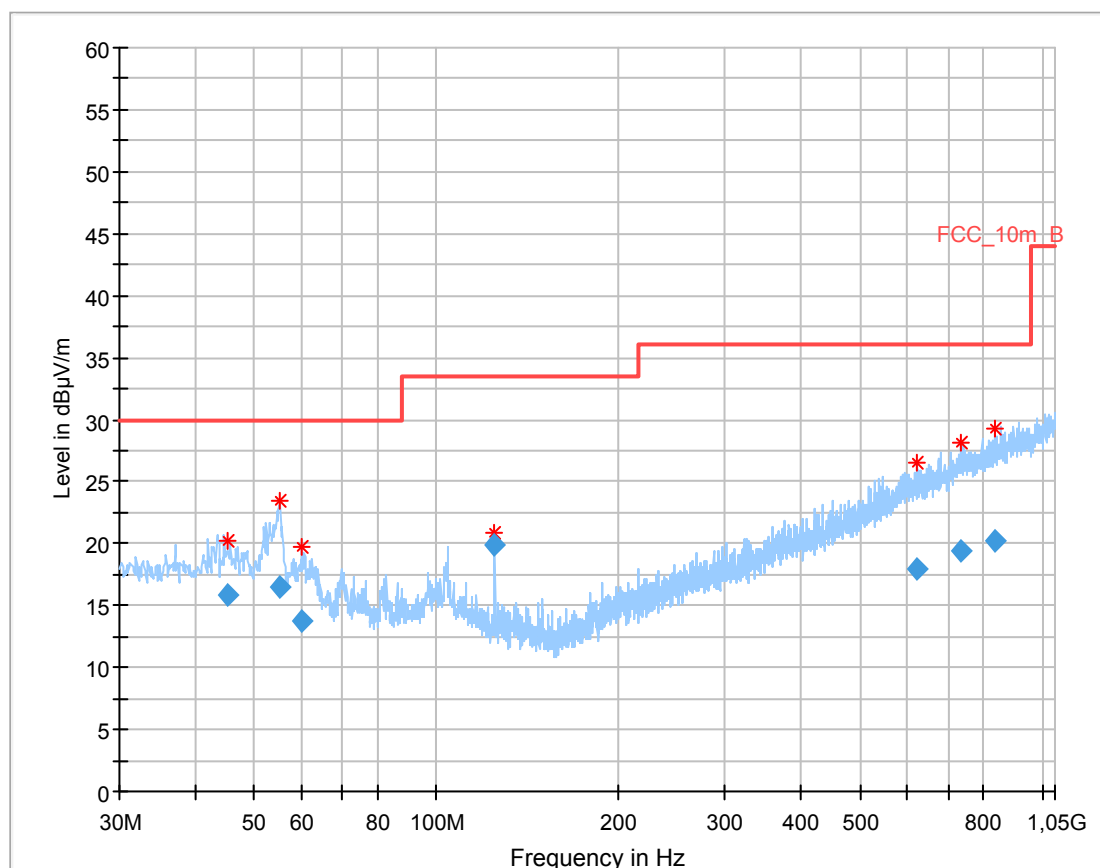
Measurement Data:

See plots.

Requirement: FCC 15.109(b)

Common Information

EUT: SL Rackreceiver DW
 Serial number: 1234100301
 Test description: FCC part 15 B class B @ 10m
 Operating condition: active (RF idle) + traffic on LAN
 Operator name: Hennemann
 Comment: AC 115 V / 60 Hz; ETH-cable. SSTP (Cat. 6)

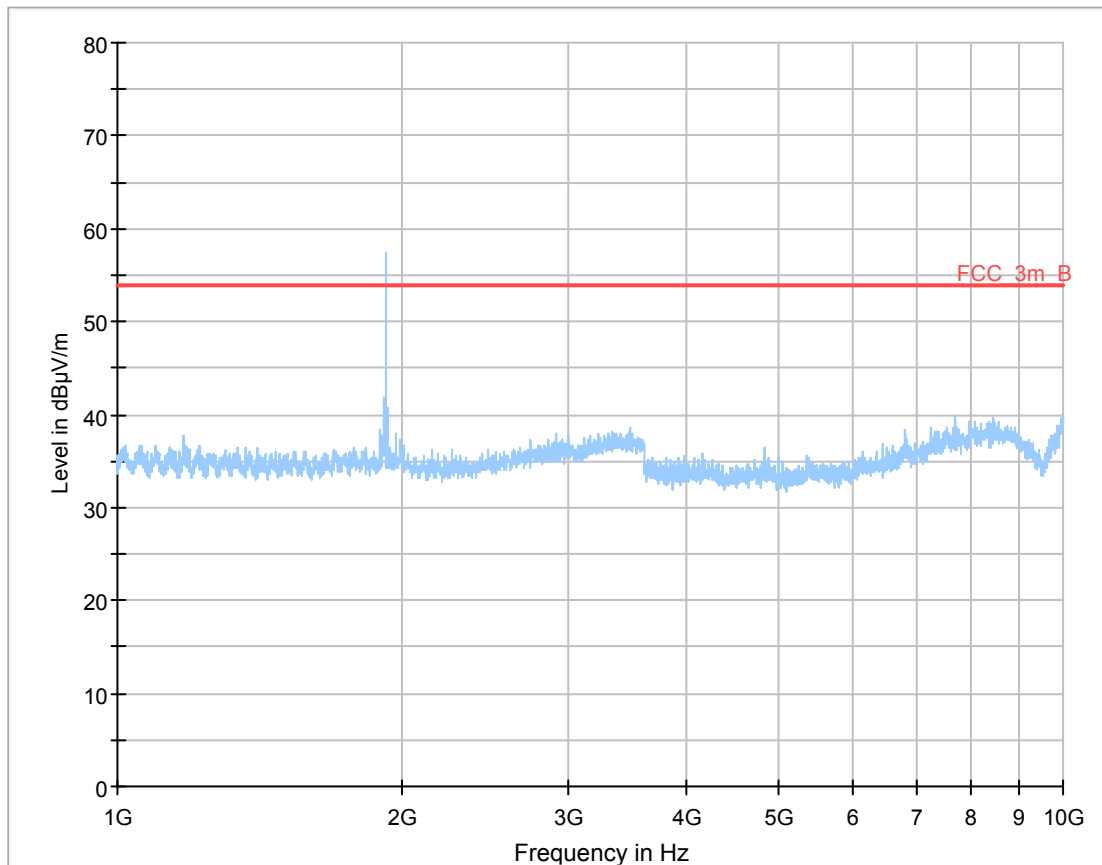


Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 45.248250 | 15.77 | 30.00 | 14.23 | 1000.0 | 120.000 | 100.0 | V | 320 | 13.8 |
| 55.023600 | 16.50 | 30.00 | 13.50 | 1000.0 | 120.000 | 325.0 | V | 192 | 12.8 |
| 59.860500 | 13.78 | 30.00 | 16.22 | 1000.0 | 120.000 | 200.0 | V | 123 | 11.6 |
| 124.971300 | 19.82 | 33.50 | 13.68 | 1000.0 | 120.000 | 200.0 | V | 314 | 9.8 |
| 623.195700 | 17.89 | 36.00 | 18.11 | 1000.0 | 120.000 | 329.0 | V | 5 | 20.9 |
| 734.652900 | 19.36 | 36.00 | 16.64 | 1000.0 | 120.000 | 200.0 | V | 39 | 22.3 |
| 836.853450 | 20.26 | 36.00 | 15.74 | 1000.0 | 120.000 | 140.0 | V | 57 | 23.3 |

Common Information

EUT: SL Rackreceiver DW
 Serial number: 1234100301
 Test description: FCC part 15 B class B
 Operating condition: active + traffic on LAN (carrier @ 1921 MHz)
 Operator name: Hennemann
 Comment: AC 115 V / 60 Hz; ETH-cable. SSTP (Cat. 6)



Final_Result

| Frequency (MHz) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

(continuation of the "Final_Result" table from column 16 ...)

| Frequency (MHz) | Comment |
|-----------------|---------|
| --- | |

The radiated spurious emission of the unintentional radiator is below the indicated limit.

9.24 Receiver Spurious Emissions

Measurement Procedure:

Industry Canada RSS-213 paragraph 6.8 and RSS-GEN paragraphs 4.8 and 6.

Test results:

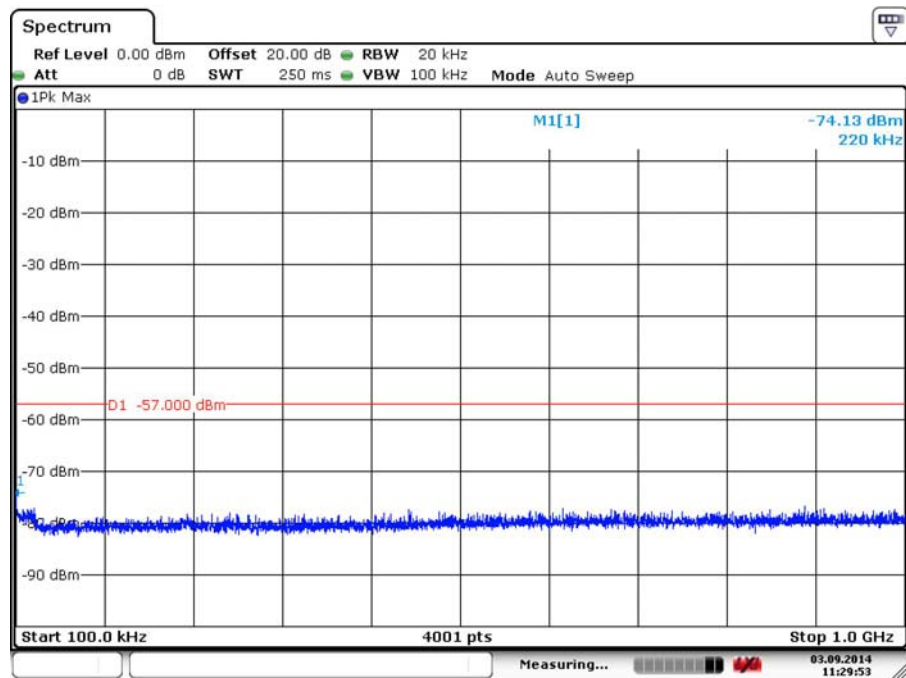
| Frequency MHz | Carrier No. | Measured Value Conducted dBm | Conducted Limit dBm | Margin dB |
|------------------|-------------|---------------------------------|------------------------|--------------|
| 30 - 1000 | all | -74.1 | -57 | 17.1 |
| > 1000 | all | -69.6 | -53 | 16.9 |

Requirements: RSS-GEN Issue 2, clause 6

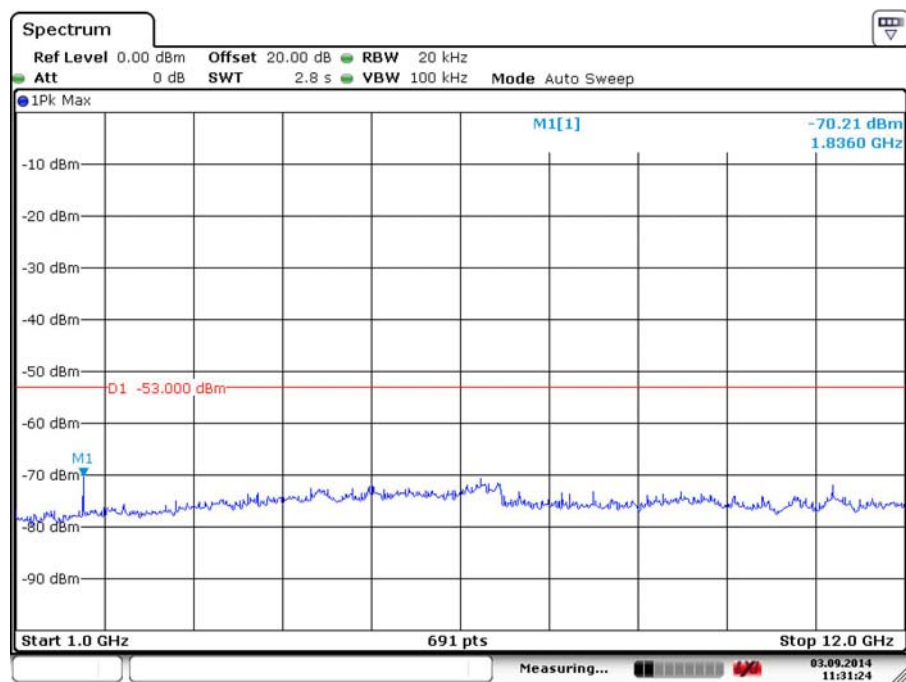
The measurement can be performed either radiated or conducted.

When measured conducted: No spurious signals appearing at the antenna terminals shall exceed 2 nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nW above 1 GHz.

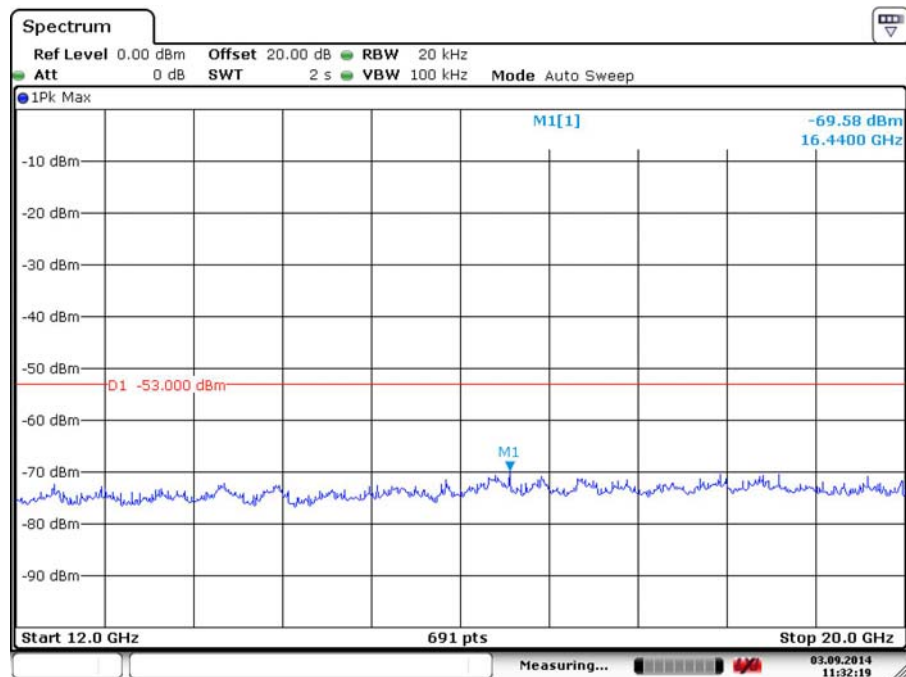
When measured radiated: See table 1 in RSS-GEN Issue2, clause 6.



Receiver Spurious Emissions, Conducted, 100 kHz – 1 GHz



Receiver Spurious Emissions, Conducted, 1 GHz – 12 GHz



Receiver Spurious Emissions, Conducted, 12 GHz – 20 GHz

10 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

| No. | Instrument/Ancillary | Manufacturer | Type | Serial-No. | Internal identification |
|--------------------------------------|-----------------------|-------------------------|-----------------|------------|-------------------------|
| Radiated Emission | | | | | |
| F-1 | Control Computer | F+W | | FW0502032 | 300003303 |
| F-2 | Trilog antenna | Schwarzbeck | VULB 9163 | 9163-295 | - / - |
| F-3a | Amplifier | Veritech Microwave Inc. | 0518C-138 | - / - | - / - |
| F-4b | Switch | HP | 3488A | - / - | 300000368 |
| F-5 | EMI Test receiver | R&S | ESCI | 100083 | 300003312 |
| F-6 | Turntable Controller | EMCO | 1061 3M | 1218 | 300000661 |
| F-7 | Tower Controller | EMCO | 1051 Controller | 1262 | 300000625 |
| F-8 | Tower | EMCO | 1051 Tower | 1262 | 300000625 |
| F-9 | EMI Test receiver | R&S | ESU | - / - | 300003555 |
| Power Line Conducted Emission | | | | | |
| G-1 | EMI Receiver | Hewlett Packard | 8542 E | 3617A00170 | 300000568 |
| G-2 | V-ISN | Rohde & Schwarz | ESH 3-Z5 | 892475/017 | 300002209 |
| G-2a | V-ISN | Rohde & Schwarz | ESH 2-Z5 | 892602/024 | 300000587 |
| G-3 | 2-Wire ISN | Schaffner | ISN T200 | 19075 | 300003422 |
| G-4 | 4-Wire ISN | Schaffner | ISN T400 | 22325 | 300003423 |
| G-5 | Shielded wire ISN | Schaffner | ISN ST08 | 22583 | 300003433 |
| G-6 | Unshielded 8 wire ISN | Teseq | ISN T800 | 26113 | 300003833 |
| G-7 | Unshielded 8 wire ISN | Teseq | ISN T8-Cat. 6 | 26374 | 300003851 |
| G-8 | RF Current probe | FCC | F-33-4 | 46 | 300003257 |
| G-9 | V-ISN | Schaffner | ISN PLC-150 | 21579 | 300003318 |
| G-10 | V-ISN | Schaffner | ISN PLC-25-30 | 21584 | 300003319 |
| G 10a | PLC Filter | TESEQ | Filter PLC | 23436 | 300003598 |
| G 10b | Coupling unit 75 Ohm | Fiedler | AC | - / - | 300003272.04 |
| Conducted | | | | | |
| L-1 | Spectrum Analyzer | R&S | FSV30 | 100763 | 300003950 |
| L-2 | Signal Generator | R&S | SMBV100A | 257858 | 300004529 |
| L-3 | Oscilloscope | R&S | RTO1044 | 30084 | 300004615 |
| L-4 | Signaling Unit | R&S | CMD 65 | 847527/005 | 300003611 |
| L-5 | Combiner | R&S | 1025.3400.02 | - / - | - / - |
| L-6 | Combiner | Suhner | 4901.19A | - / - | - / - |
| L-7 | Combiner | Weinschel | 1515 | KW438 | - / - |
| L-8 | Detector | Hewlett Packard | HP 8473C | 03690 | - / - |
| L-9 | Attenuator | Narda | 4779-50 | 9101 | - / - |
| L-10 | Attenuator | Narda | 4779-30 | 9305 | - / - |
| L-11 | Attenuator | Narda | 4779-20 | 9310 | - / - |
| L-12 | Control PC | F+W | - / - | FW0712052 | 300003735 |

11 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A: Photographs of the Test Set-up

Photo 1: Power Line Conducted Emission Test



Photo 2: Power Line Conducted Emission Test

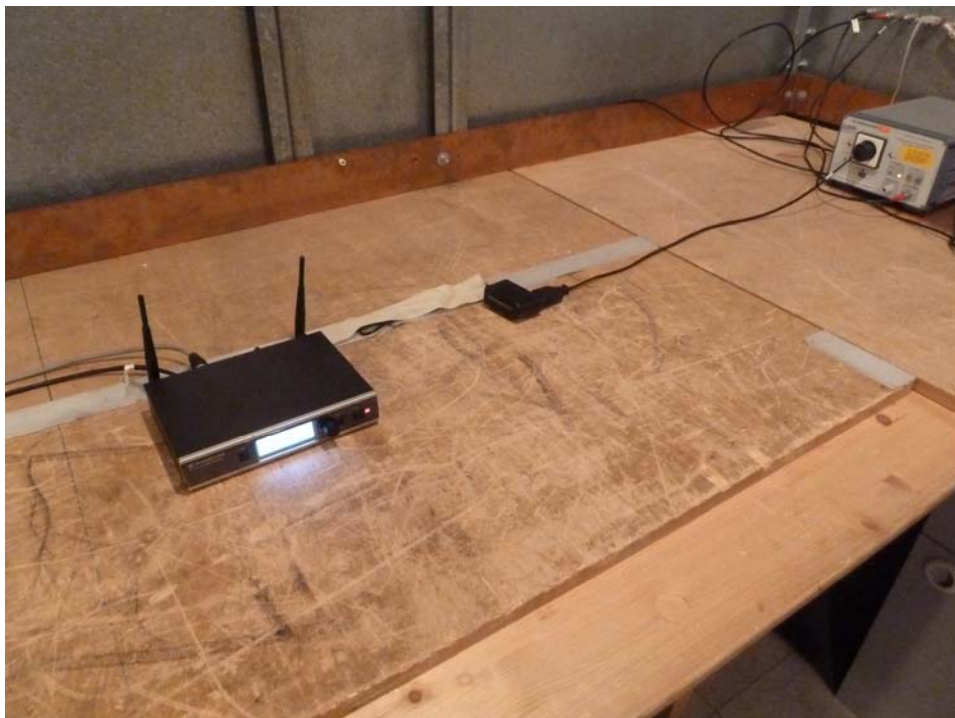


Photo 3: Radiated Emission



Photo 4: Radiated Emission



Annex B: External Photographs of the EUT

Photo 1:



Photo 2:

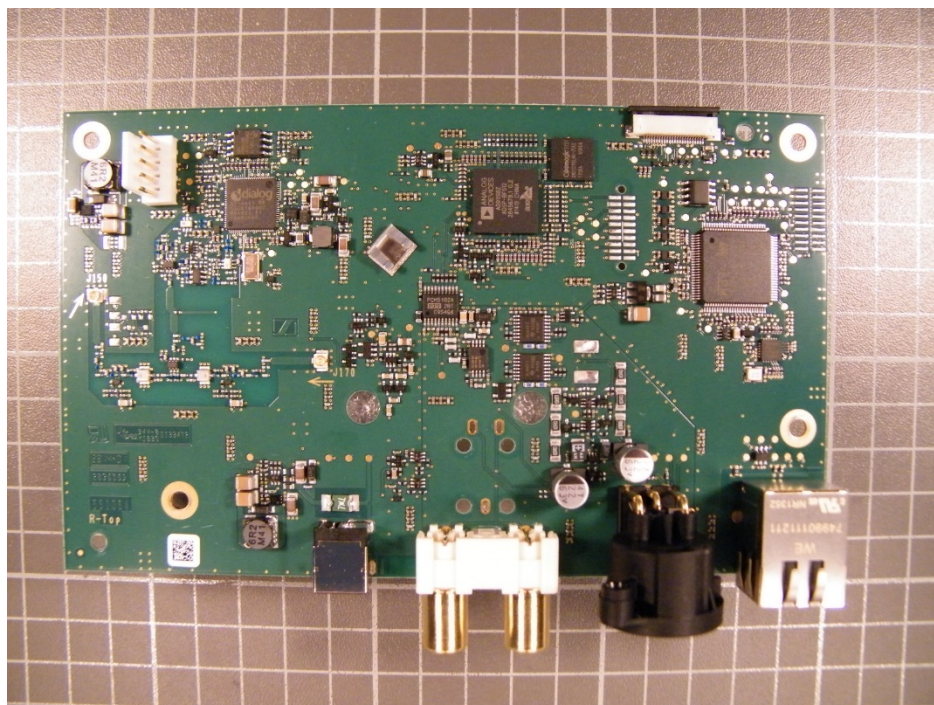


Annex C: Internal Photographs of the EUT

Photo 1:



Photo 2:



Annex D: Document History

| Version | Applied varChanges | Date of Release |
|---------|----------------------|-----------------|
| 1.0 | Initial Release | 2015-02-04 |
| 1.1 | Update of EUT photos | 2015-02-04 |

Annex E: Further Information

Glossary

| | | |
|----------|---|----------------------------------|
| DUT | - | Device under Test |
| EMC | - | Electromagnetic Compatibility |
| EUT | - | Equipment under Test |
| FCC | - | Federal Communication Commission |
| FCC ID | - | Company Identifier at FCC |
| HW | - | Hardware |
| IC | - | Industry Canada |
| Inv. No. | - | Inventory number |
| N/A | - | not applicable |
| S/N | - | Serial Number |
| SW | - | Software |

Annex F: Safety exposure levels

Prediction of MPE limit at a given distance:

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

where: S = Power density

P = Power input to the antenna

G = Antenna gain

R = Distance to the center of radiation of the antenna

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled "Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure"

| Frequency Range (MHz) | Power Density (mW/cm ²) | Averaging Time (minutes) |
|-----------------------|-------------------------------------|--------------------------|
| 300 - 1500 | f/1500 | 30 |
| 1500 - 100000 | 1.0 | 30 |

where f = Frequency (MHz)

Prediction:

| | | |
|---|--------------------------------------|----------------------|
| P | Max power input to the antenna: | 19.52 dBm |
| P | Max power input to the antenna: | 89.5 mW |
| R | Distance: | 20 cm |
| G | Maximum antenna gain: | 3.00 dBi |
| G | Maximum antenna gain: | 2.0 numeric |
| S | MPE limit for uncontrolled exposure: | 1 mW/cm ² |

Calculated Power density: **0.0356 mW/cm²**
0.356 W/m²

This prediction demonstrates the following:

The power density levels at a distance of 20 cm are below the maximum levels allowed by FCC regulations

Annex G: Accreditation Certificate



Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation



The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10
66117 Saarbrücken

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

Wired communications and DECT
Acoustic
Radio
Short Range Devices (SRD)
RFID
WiMax and Richtfunk
Mobile radio (GSM / DCS), Over the Air (OTA) Performance
Electromagnetic Compatibility (EMC) incl. Automotive
Product safety
SAR and Hearing Aid Compatibility (HAC)
Environmental simulation
Smart Card Terminals
Bluetooth
Wi-Fi-Services

The accreditation certificate shall only apply in connection with the notice of accreditation of 2014-03-07 with the accreditation number D-PL-12076-01 and is valid until 2018-01-17. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 77 pages.

Registration number of the certificate: D-PL-12076-01-00

Frankfurt am Main, 2014-03-07

Dir. vgl. (H) Ralf Eber
Head of Division 2

This document is a translation. The definitive version is the original German accreditation certificate.
See notes enclosed.

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAKKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAKKS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAKKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

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EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.eu

Front side of the certificate

Back side of the certificate

Note: The current certificate including annex is published on our website (link see below) or may be received from CETECOM ICT Services on request

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